PB-286 256

# A DIRECTORY OF COMPLITER SOFTWARE APPLICATIONS



# **Atmospheric Sciences**

1970-October, 1978

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# **Atmospheric Sciences**

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U.S. DEPARTMENT OF COMMERCE National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

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# INTRODUCTION

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The technical reports announced by NTIS often contain listings of computer programs and/or documentation covering a wide variety of applications.

The object of this directory is to announce to the scientist, systems analyst, and programmer, the availability of these computer programs, and to disseminate this software as fully as possible to fulfill NTIS' role in information transfer.

These computer program listings or the documentation can be purchased for the regular price of the technical report in either hard copy or microfiche, thereby providing the user with a viable piece of software at an exceptionally low price.

If there are any questions, comments, or suggestions please contact David Grooms, Product Manager (703) 557-4672.

The computer software offered by NTIS was created by a variety of Federal agencies to meet their diverse but quite specific objectives. It is provided without installation, support, or maintenance services and sometimes requires customer modifications to run effectively in customer environments.



# HOW TO USE

# Abstract Entry

Order/accession number. This number must be used to order NTIS products	- PB-239 100/1CP PC A12/MF A01- - Bechtel, Inc., San Francisco, Calif. Path to Self-Sufficiency Directions and Con	<ul> <li>Price codes: PC means paper copy; MF, microfiche. Consult current code-price table for ac- tual prices.</li> </ul>
Keywords — used for indexing	Descriptors: "Energy supplies, "Computer pro- grams, Crude oil, Natural gas, Coal, Oil shale, Uranium, Thorium, Bituminous sands, Hydroelectric power generation, Geothermal prospecting, Solar energy conversion, Wastes, Systems analysis, Systems engineering, Capitalized costs, Fossil fuel deposits, Trans- portation, Planning, Forecasting, Algorithms, Flow charting, Mathematical models, FOR- TRAN.	Title of document
	A computer program that calculates resource — requirements and summarizes results for any fuel mix is presented. The program tabulates an annual schedule of required facilities to be brought on-line and attendant annual schedules of capital (2 classes), manpower (4 types), and materials (9 categories) require- ments. The model is exercised for two likely fuel mixes and the implications in terms of an- ticipated capital, manpower, and materials con- straints are discussed.	— Abstract of document

# Subject Index Entry

Subject Term.-These are arranged in alphabetical sequence in the Index

ENERGY SUPPLIES	
Energy System Network Simulator (ESNS). Ii. A User's Guide BNL-20979 9B	l'itle
Path to Self-Sufficiency Directions and Con- straints PB-239 099/5CP	Orde
Path to Self-Sufficiency Directions and Con- straints. Appendices PB-239 100/1CP 21D	the
An Economic Analysis of Declining Petroleum Supplies in Texas: Income, Employment, Tax and Production Effects as Measured by Input-Output and Supply-Demand Simulation Models PB-243 320/9CP 08I	quen this

ler number. Documents in abstract section are senced alphanumerically by number.

# Corporate Author Index Entry

Corporate author -BECHTEL, INC., SAN FRANCISCO, CALIF. straints = PB-239 099/5CP Order/accession number-21D BECHTEL-10900-74-43-I-App Path to Self-Sufficiency Directions and Con-straints. Appendices PB-239 100/10P 21D

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# ATMOSPHERIC SCIENCES

AD-A001 271/6CP PC A02/MF A01 (Navy) Monterey Calif A Tropical Cyclone Analog Program for the

Southwest Indian Ocean

Technical paper Samson Brand, Jack W. Blelloch, and James M. Long. Oct 74, 20p Rept no. ENVPREDRSCHF-tech paper-16-74

Descriptors: "Tropical cyclones, "Weather forecasting, "Indian Ocean, Statistical analysis, Computer programming, Diurnal variations, Pacific Ocean Islands. Identifiers: SWINJAH74 computer program,

Fleet numerical weather central.

A tropical cyclone analog program for the Southwest Indian Ocean area (SWINJAH74) is described. The program is a statistical computer technique to provide forecasts of Southwest Indian Ocean tropical cyclones from 12-72 hours. The analog program is discussed in terms of its proposed operational use at Fleet Weather Central, Guam, Mariana Islands.

AD-A002 117/0CP PC A04/MF A01 Environmental Technical Applications Center (Air Force) Washington D C A Precipitating Convective Cloud Model Robert D. Smith. May 74, 51p Rept no. USAFETAC-TN-74-3

Descriptors: \*Convection(Atmospheric), \*Cloud physics. Atmospheric temperature, Wind, Mathematical models, Computer programs, Computations.

A model presenting a physical depiction of a precipitating convective cloud is explained in detail. The mathematical computations are shown and a computer program for the model is given. This program uses the primitive equations with initial conditions to compute desired atmospheric parameters in two dimensions at some later time. The initial conditions are defined by a reference temperature, surface temperature, temperature change with height, surface wind, wind shear, and moisture distribution. Model limitations are defined by grid interval, grid size, maximum simulated time, and maximum number of iterations.

PC A03/MF A01 AD-A002 954/6CP Naval Research Lab Washington D C WINDVEL2: A Program for Plotting Wind Velocity as Determined by OTH Radar Final rept.

Mark H. Etzel, and Dennis B Trizna. Dec 74, 39p Rept no. NRL-MR-2935

Descriptors: "Wind velocity, "Over the horizon detection, "Computer graphics, Wind direction, Radar tracking, Plotting, Computer programs, FORTRAN

Identifiers: WINDVEL2 computer program, Calcomp plotters, Remote sensing

A FORTRAN program has been developed for displaying wind direction and wind speed data maps, as determined by the HF Over-the-Horizon Radar. The output products are a grid of wind direction arrows for each range/azimuth radar cell, and continuous contours of wind speed, plotted on a stereographic projection of the Northern Hemisphere about the North Pole by a CALCOMP 565 plotter or compatible CRT display. Data inputted are generated by other programs described el-sewhere, and include radar cell latitude and longitude, ambiguous wind direction pairs, and three independent values of wind speed, all of which can be plotted in a number of different combinations

AD-A003 394/4CP PC A04/MF A01 Emmanuel Coll Boston Mass

Study of Hydromagnetic Wave Propagation in the Magnetosphere: 1. Design and Fabricatne Magnetosphere: 1. Design and Fabrica-tion of Data Processing System. 2. Mathe-matical Analysis of Magnetospheric Models M. Patricia Hagan. Aug 74, 53p Scientific-1, AFCRL-TR-74-0449 Contract E10609.2.0.0001 Contract F19628-73-C-0081

Descriptors: \*Minicomputers, \*Magnetosphere, Memory devices, Computer programs, Mathe-matical models, Numerical analysis.

This report provides a guide to the understanding of the operation of the mini-computer which is currently under development and testing, in preparation for the operation of the micropulsation network

AD-A003 755/6CP PC A05/MF A01 Aerospace Corp El Segundo Calif Lab Operations

Monochromatic Transmittance/Radiance Computations

Interim rept. Charles M. Randall. 31 Dec 74, 86p TR-0075(5647)-3, SAMSO-TR-74-247 Contract F04701-74-C-0075, DARPA Order-2843

Descriptors: 'Radiance, High resolution, Spectra, Plumes, Computerized simulation, At-mospheres, Transmissivity, Computer programming, Spectral lines, FORTRAN. Identifiers: \*Atmospheric attenuation, \*Transmittance, Optical paths, INHOM computer program.

A computer program and associated procedures have been developed to compute high resolution spectra for inhomogeneous optical paths including both atmospheric conditions and conditions typical of a missile plume. These programs and procedures are outlined in this report. The procedures have been used with the Air Force Cambridge Research Laboratories line atlas to demonstrate that ignoring the correlation of atmospheric absorption lines with source emission lines can lead to errors as high as 79 percent for some spectral bands and optical paths. Calculated spectra have been compared with experimental laboratory spectra typical of both atmospheric and missile plume conditions. The AFCRL line atlas requires the addition of lines from highly excited states and the correction of certain inadvertent errors to be applicable to the calculation of high temperature optical properties of gases.

AD-A003 855/4CP PC A04/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

Description and Comparison of the K Method for Performing Numerical Integration of Stiff Ordinary Differential Equations

M. D. Kregel, and E. L. Lortie. Jul 74, 68p Rept no. BRL-1733

Descriptors: \*Differential equations, \*Numerical integration, Matrices(Mathematics), Computer programs, lonosphere, Chemical reactions Identifiers: 'Stiff differential equations, K matrix.

A numerical integration method, termed the K method, has been developed within the Concepts Analysis Laboratory for the integration of about fifty stiff ordinary differential equations. This method is described and, by the use of several benchmark sets of ordinary differential equations, comparisons are made with other methods that have been described in the open literature. Instructions are given on the use of the K method, and a complete listing of the method is included.

AD-A004 026/1CP PC A06/MF A01 Colorado State Univ Fort Collins Coll of Forestry and Natural Resources

# A Stochastic Canopy Model of Diurnal Reflectance

Final rept. Jul 73-Jun 74 Robert E. Oliver, and James A. Smith. Aug 74, 123p ARO-9928.4-EN Grant DAHC04-74-G-0001

Descriptors: 'Solar radiation, 'Vegetation, 'Spectrum signatures, Canopies, Reflectance, Geometry, Mathematical models, Diurnal varia-tions, Stochastic processes, Light transmission, Radiometry, Detection, Interactions, Computer programs. Identifiers: \*Remote sensing.

The spectral signature of most vegetation varies with both direction of view and time of day. This variation is spectrally dependent and is due primarily to differences in canopy geometry. As a means of investigating the interaction of shortwave radiation with vegetation a stochastic canopy model was developed. The model uses random variables based on measured distributions for incoming radiation flux, intrinsic optical properties, and canopy geometry.

AD-A004 602/9CP PC A03/MF A01 Naval Research Lab Washington D C AURORA: An NRL Auroral Chemistry Code Memorandum rept. Ellis Hyman, and Paul Julienne. Jan 75, 34p Rept no. NRL-MR-2965

Descriptors: "Aurorae, "Aeronomy, Electrons, Altitude, Plasma medium, Electric fields, Mathematical models, Excitation, Electron irradiation, Nitrogen, Oxygen, Ions, Reaction kinetics.

Identifiers: AURORAE computer code

A computer code is described which models the chemistry in the atmosphere during and subsequent to the deposition of auroral electrons. In addition to obtaining altitude profiles of 14 atmospheric species as a function of time for any given incident-electron spectrum, the code predicts volume and column emissions of selected UV, visible, and IR spectral lines. Typical results from an ICECAP spectrum are presented.

AD-A005 311/6CP PC A02/MF A01 Compass Systems, Inc., San Diego, Calif. Program TRUWIND Final rept.

Baldwin van der Bijl. Sep 74, 9p 100-16, EPRF-CP-Note-16

Contract N66314-72-C-1824

Descriptors: "Wind velocity, "Computer pro-grams, Computations, FORTRAN. Identifiers: TRUWIND computer program, CDC 1604 computers.

The report describes a CDC 1604 FORTRAN program designed to compute true wind velocity from ship velocity and observed relative wind velocity using a basic vector ap-proach. It was prepared as an adjunct to a requirement to evaluate actual ship data for verification of the Hydrodynamic Numerical Model.

#### AD-A006 189/5CP PC A02/MF A01 Lockheed Missiles and Space Co Inc Palo Alto

Calif Palo Alto Research Lab BREMGAT: A Code for the Generation and Transport of Brensstrahlung Through the Atmosphere

Technical rept.

Lester L Newkirk, William E. Francis, and Martin Walt. Oct 74, 20p Rept no. LMSC-D407007 Contract N00014-70-C-0203

# Descriptors: 'Aurorae, 'Bremsstrahlung, Elec-tron energy, Ionization, Computer pro-gramming, Computations, Monte Carlo method, FORTRAN. Identifiers: BREMGAT computer code, AU-

RORA computer program, FOTONQ computer program, MCBREM computer program.

A computer code is described which determines the rate at which energy is deposited in the lower atmosphere by the bremsstrahlung emitted from an incident flux of auroral electrons interacting with the atmosphere. The code is named BREMGAT (bremsstrahlung generation and transport through the atmosphere) and consists of three major FOR-TRAN programs called AURORA, FONTONQ, and MCBREM. The programs are executed consecutively in the order given. AURORA determines the flux of electrons produced in a model atmosphere by the given incident spectrum of auroral electrons. FOTONQ converts the resulting fluxes into a suitable bremsstrahlung source term. The Born approximation bremsstrahlung cross section given by Sauter, multiplied by a Coulomb correction in the form of the Elwert factor, is used in FOTONQ to calculate the emission of bremsstrahlung.

AD-A006 200/0CP PC A09/MF A01 Utah State Univ Logan Space Science Lab Moment Method Solutions for the Impedance of Asymmetrically Driven RF Probes in the Collisional lonospheric Magnetoplasma Hyun-Shik Hwang. Aug 74, 176p Scientific-4, AFCRL-TR-74-0394 Contract F19628-72-C-0255

Descriptors: "lonosphere, "Electron density, \*Probes(Electromagnetic), Radiofrequency, Boltzmann equation, Partial differential equa-Radiofrequency, tions, Computer programs, Monopole antennas, Dipole antennas. Identifiers: Method of moments.

In order to ascertain the electron density in the earth's ionosphere by direct measurement a radio frequency (RF) impedance probe technique has proved useful. This technique involves monitoring the changes in impedance of an antenna mounted on a rocket or satellite vehicle traversing the inospheric regions of interest. The changes of antenna impedance can be related to the electron density of the surrounding plasma through use of suitable theoretical development of the antenna-plasma interaction. It is the purpose of this treatise to develop a more general expression for the impedance of an antenna in the ionosphere to be useful as an RF probe for measurement of electron density. The investigation of ionospheric plasma characteristics by means of such RF probes has received a great deal of attention since the advent of the rocket allowed direct measurements within the ionosphere.

### AD-A007 034/2CP PC A16/MF A01 Systems Science and Software La Jolla Calif Effects of Meso-Scale and Small-Scale Interactions on Global Climate. Volume I. Orographic Effects on Global Climate Final rept. 1 Nov 73-31 Dec 74

John Schaibly. 28 Feb 75, 359p SSS-R-75-2556-Vol-1, AFOSR-TR-75-0397 Contract F44620-74-C-0035, ARPA Order-2609

See also Volume 2, AD/A-007 035.

Descriptors: \*Atmospheric motion, \*Heat transfer, \*Mountains, Climate, Wind, Mathe-matical prediction. Solar radiation. Boundary value problems, Finite difference theory, Two dimensional flow, Vortices, Fourier transformation, Computer programming, Advection, Numerical integration, Mathematical models, Tur-bulence, Atmosphere models.

Identifiers: Mountain lee waves, HAIFA computer code, Sierra Nevada Mountains.

The report summarizes the three-year research program at Systems, Science and Software to investigate the effects of meso-scale and smallscale interactions on global climate. The research concentrated on two areas, orographic effects on the wind patterns and effects of radiation transport on the climate. Volume I describes the orographic research and includes the theory of momentum transport due to mountain ranges, the formulation of several computer codes to calculate the effects for realistic topography and wind profiles, and the application of these codes to various problems and comparison with other calculations as well as experimental results.

### AD-A007 035/9CP

PC A10/MF A01 Systems Science and Software La Jolla Calif Meso-Scale and Small-Scale interactions on Global Climate. Volume II. Radiation Transport Effects on Giobai Ciimate Final rept. 1 Nov 73-31 Dec 74

John Schaibly. 28 Feb 75, 204p SSS-R-75-2556-Vol-2, AFOSR-TR-75-0398 Contract F44620-74-C-0035, ARPA Order-2609 See also Volume 1, AD/A-007 034.

Descriptors: \*Atmospheric motion, \*Heat transfer, \*Mountains, Atmosphere models, Cli-mate, Wind, Heating, Atmospheric temperature, Mathematical models, Solar radiation, Predictions, Ozone, Atmospheric density, Computer programming, Reflection, Clouds, Heat flux, Correlation techniques.

Identifiers: ATRAD computer code.

The report summarizes the three-year research program at Systems, Science and Software to investigate the effects of meso-scale and smallscale interactions on global climate. The research concentrated on two areas, orographic effects on the wind patterns and effects of radiation transport on the climate. Volume II describes the radiation transport research which produced a benchmark code against which more simplified models can be compared. The code, ATRAD, is characterized by high angular and frequency resolutions and by the ability to calculate radiative atmospheric heating rates taking into account molecular absorption and scattering from arbitrary distributions of aerosols and particulates.

PC A02/MF A01

Pennsylvania State Univ University Park Ionosphere Research Lab

AD-A007 495/5CP

**Propagation Predictions and Studies Using a** Ray Tracing Program Combined with a Theoretical ionospheric Modei

Myung Ki Lee, and John S. Nisbet. 21 Mar 74, 6p Contract N00014-67-A-0385-0017, Grant NGL-39-009-002

Availability: Pub. in IEEE Transactions on An-tennas and Propagation, p132-136 Jan 75.

Descriptors: \*Badio transmission, \*Ionospheric propagation, Ray tracing, Atmosphere models, Computer programs, Mathematical prediction, Space to surface, Electron density, D region, lonospheric disturbances, Solar radiation, Reprints.

Identifiers: \*Ionospheric models, E region, F reaion.

Radio wave propagation predictions are described in which modern comprehesive theoretical ionospheric models are coupled with ray-tracing programs. In the computer code described, a network of electron density and collision frequency parameters along a band about the great circle path is calculated by specifying the transmitter and receiver geo-graphic coordinates, time, the day number, and the 2800-MHz solar flux. The ray paths are calculated on specifying the frequency, mode, range of elevation angles, and range of azimuth angles from the great circle direction. The current program uses a combination of the Penn

State MKI E and F region models and the Mitra-Rowe D and E region model. Application of the rechnique to the prediction of satellite to ground propagation and calculation of oblique incidence propagation paths and absorption are described. The implications of the study to the development of the next generation of iono-spheric models are discussed. (Author)

#### AD-A008 035/8CP PC A15/MF A01 Visidyne Inc Burlington Mass A High Aititude infrared Radiance Model Final rept. 1 Jun 72-30 Apr 74 Thomas C. Degges. 27 Dec 74, 346p VI-236, AFCRL-TR-74-0606 Contract F19628-72-C-0330, ARPA Order-1366

Descriptors: \*Atmosphere models, \*Infrared radiation, \*Upper atmosphere, \*Computer programs, Molecular vibration, Radiance, Background radiation, Molecular energy levels, Energy transfer, Emission spectra. Identifiers: \*Atmospheric radiation, Atmospheric composition.

A knowledge of the natural infrared radiance originating in the earth's upper atmosphere is of interest for systems design, military surveillance and the advancement of knowledge about physical processes in the upper atmosphere. A physical model that includes experimental data on and theoretical estimates of excitation processes that lead to emission of infrared radiation has been implemented in a computer program that computes infrared radiances for an earth limb viewing geometry. The nominal spectral region of this study lies between 2.7 and 25 micrometers and emphasis is placed on radiation originating at altitudes between 70 and 500 km. The physical model is described, with emphasis on the changes required in extending its usefulness. Application of the computer program is described and estimates are given of uncertainties in results due to assumptions made in the model and lack of data on actual atmospheric composition.

### AD-A008 193/5CP Emmanuel Coll Boston Mass

PC A04/MF A01

Sateilite Beacon Studies. 1. Total Electron Content. 2. Scintiliation Studies. 3. Pro-

gramming Robert L. Vesprini, Eileen Martin, Charles Cantor, and M. Patricia Hagan. Nov 74, 60p Scientific-1, AFCRL-TR-75-0069 Contract F19628-72-C-0305

Descriptors: 'lonosphere, Electron density, Scintillation, Magnetic anomalies, Magnetic storms, Diurnal variations, Computer programs. Identifiers: F region, ATS-5 satellite, ATS-3 satellite, DMSP satellite.

This report provides information on (1) Total Electron Content (TEC) studies and their relationship to magnetic disturbances; (2) incidence of, and intensity of scintillations, as studied through indices; (3) programming techniques for handling scintillation indices.

#### AD-A008 515/9CP PC A05/MF A01 IBM Federal Systems Div Burlington Mass Program Structure of Atmospheric Density Programs

Final rept. 1 Jan 72-31 Jan 75 Arnold S. Bramson. 15 Feb 75, 99p AFCRL-TR-75-0063 Contract F19628-72-C-0178

Descriptors: \*Atmospheric density, \*Computer programs, Mathematical models, Partial differential equations, Computations, Numerical integration, Atmosphere models, FORTRAN. Identifiers: CADNIP computer program, BAD-MEP computer program.

Two extensive computer programs have been designed and developed by IBM for AFCRL under the existing and previous contracts. These are the 'Cambridge Atmospheric Density Numerical Integration Program' (CADNIP) and the 'Burlington Atmospheric Density Model Evaluation Program' (BADMEP). CADNIP is an automatic computer program concellence of deterautomatic computer program capable of determining atmospheric densities from an analysis of satellite observations. CADNIP contains a numerical integration scheme combined with a differential correction procedure where the discrepancies between computer and observed position and velocity are reconciled by adjusting the assumed atmospheric model, thereby yielding corrected or refined density data. BAD-MEP is a computer program for testing and evaluating atmospheric models. An important feature of BADMEP is an analytical ephemeris generator which may be used in place of numerical integration resulting in a considerable reduction in required computer time.

AD-A009 069/6CP PC A03/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

Computing Methods Used in Support of Modeling Electron Concentrations in High-Altitude Chemical Releases Final rept.

R. B. Patton, Jr. Mar 75, 35p Rept no. BRL-MR-2453

Descriptors: \*Atmospheric sounding, \*Ionization, \*Electromagnetic wave propagation, Blackout(Propagation), Computations, Electron density, Computer programs. Identifiers: \*Chemical release studies.

The modeling of electron concentrations for high-altitude chemical releases requires a number of supporting computations that have not been reported previously. These computing methods are presented in detail. They include six coordinate transformations, a solution for the position of a cloud's center based on lineof-sight data from a pair of observing sites, and a solution to describe cloud appearance (size, shape, and orientation) as viewed from a given location.

AD-A009 530/7CP PC A03/MF A01 Navy Weather Research Facility Norfolk Va A Computer Program to Select Typhoon Analogs and Print Out Their Descriptions Including Subsequent Changes Progress rept. no. 1

William T. Hodge, and Grady F. McKay. Jan 70, 42p

Descriptors: 'Tropical cyclones, 'Weather forecasting, 'Computer programming, Typhoons, Storms, Sea level, Barometric pressure, Compilers, Control sequences.

Details are given of a computer program that (1) accepts a description of an existing typhoon or tropical storm, (2) searches descriptions of past storms, selects those with similar charac-teristics and ranks them according to similarity, and (3) prints out subsequent track and storm change data needed by typhoon forecasters. The size, sources and features of the internal typhoon history file are described. During the course of extracting the data, and designing and testing the system, several facets of typhoon data were found to need more research. These include: Development of mean or typical storm sea level pressure and 700 mb height profiles with time; The recomputation or rejection of inconsistent aircraft reconnaisrejection of inconsistent and the systematic differences sance data; Study of the systematic differences in Navy and Air Force aircraft eye reports; Research on diurnal changes within the typhoon eye. Preliminary tests of the computer system show that it will rank the storms and print out the data as instructed, but the predictors will have to be weighted in order to most

often select the past storm of most value to the forecaster.

AD-A009 750/1CP PC A04/MF A01 Dugway Proving Ground Utah

Application of the Calder Finite Difference Diffusion Model to Calculations of Instantaneous Elevated Line Source Dosages Final rept.

Albert W. Waldron, Jr. Apr 75, 61p Rept no. DPG-FR-M921A

Descriptors: \*Atmosphere models, Altitude, Profiles, Diffusion theory, Finite difference theory, Dosage, Mathematical models, Computer programs, Eddy currents, Diffusivity. Identifiers: \*Atmosphere diffusion, Line sources.

This paper compares calculations of vertical and surface dosage distributions, obtained from a finite difference numerical solution of the classical line source diffusion equation to calculations obtained from an analytical solution and to observed distributions obtained from several line source releases. The analytical solution uses constant values of vertical turbulence and wind speed averaged with height. This solution then approximates the effects on surface dosages of increasing stability aloft by using reflection from the top of the mixing layer. The finite difference numerical solutions considers the change of eddy diffusivity and wind speed with height in such a way as to produce vertical dosage profile closer to the observed. Turbulence values for use in the numerical model are obtained from calculations of vertical diffusivity based on statistical theory. The numerical solution predicts the vertical dosage profile more accurately than the analytical solution. Both solutions predict surface dosages equally well. Verification of the numerical solution on other data appears desirable.

AD-A009 921/8CP PC A06/MF A01 Naval Postgraduate School Monterey Calif Test and Evaluation of a VTPR Retrieval System from Clear-Column NOAA 2 Radiances Master's thesis

Harry Milton Dyck, Jr. Mar 75, 122p

Descriptors: 'Atmospheric temperature, Radiance, Weather forecasting, Satellites(Artificial), Satellite tracking systems, Scanning, Transmittance, Histograms, Radiometers, Mathematical models, Theses, Computer programs, Water vapor, Carbon dioxide, Ozone. Identifiers: NOAA-2 satellite, Remote scanning.

An iterative technique for the retrieval of temperatures at each of 100 levels ranging from 1000 mb to 0.01 mb is evaluated. Clear-column radiance data in the carbon dioxide channels of the Vertical Temperature Profile Radiometer (VTPR) of NOAA 2 are used in inverting the radiative transfer equations to deduce the T(P) profile. The retrieval technique includes the computation of atmospheric transmittances due to three atmospheric absorber masses (carbon dioxide, water vapor, and ozone) and non-homogeneous temperature-pressure effects along the vertical. The program also corrects these transmittances for zenith path differences between the satellite and the retrieval site when the site is not directly below the sensor.

AD-A069 973/9CP PC A04/MF A01 Naval Postgraduate School Monterey Calif A Numerical Study of an Idealized Ocean Using Non Linear Lateral Eddy Viscosity Coefficients Master's thesis

Julian Maynard Wright, Jr. Mar 75, 74p

Descriptors: 'Ocean currents, 'Atmospheric motion, 'Ocean surface, 'Surface temperature, Air water interactions, Vortices, Eddy currents, Mathematical models, Finite difference theory, Computations, Theses, Computer programs.

Using a one level, barotropic ocean model, driven by surface winds, a finite difference form of the vorticity equation was integrated over 210 days of simulated time. The solutions using a constant coefficients of lateral eddy viscosity were compared with those using a variable coefficients derived from enstrophy cascade and energy cascade. Using a constant eddy viscosity coefficient of rather low magnitude produces a large amplitude computational oscillation which fills the entire basin. An order of magnitude larger coefficient produces a marginally satisfactory solution, where the western boundary current was rather well represented, but a moderate computational oscillation was still evident. By increasing the coefficient yet another order of magnitude, the computational oscillation is negligible, but the solution in the ocean interior is unrealistically damped. An accurate physical and numerical depiction of both the ocean interior and western boundary with no computational oscillation was achieved by using either of the two forms of non linear eddy viscosity.

AD-A009 977/0CP PC A08/MF A01 Naval Postgraduate School Monterey Calif Heat Budget Parameterization for the FNWC Primitive Equation Model Using Data for 16 January 1974 Master's thesis

Warren Theodore Spaeth, Jr. Mar 75, 152p

Descriptors: 'Air water interactions, 'Atmospheric circulation, 'Radiative transfer, 'Atmosphere models, Heat balance, Clouds, Mathematical models, Atlantic Ocean, Pacific Ocean, Computer programs, Theses. Identifiers: Primitive equations.

The radiational model employed here computes the planetary albedo and the solar absorption by atmospheric layers and by earth's surface for the primitive equation model of FNWC. Largescale cloud parameterization in several layers enters into these computations. The solar computations are made on a gridpoint basis em-ploying the water-vapor mass over each gridpoint. Longwave cooling effects over the same layers and at the earth's surface are calculated using emissivity formulas after Sasamori, and are also dependent upon the cloud-parameterizations. Two forms of the cloud-parameterizations were tested using FNWC gridpoint oceanic data for 16 January 1974. The objective was to determine the parameterization which better verified the radiational balance as a function of latitude at the tropopause, as compared with the January satellite climatology. Separate heat-budget checks of the propospheric columns and of the oceanic-water mass were tested for consistency with January climatology. The smaller cloud-parameterization values gave the best verification.

AD-A010 232/7CP PC A07/MF A01 Computer Sciences Corp., Silver Spring, Md System Sciences Div

Feasibility Study of a Quadrilateralized Spherical Cube Earth Data Base Final rept. May 74-Mar 75

F. K. Chan, and E. M. O'Neill. 14 Apr 75, 136p CSC/TR-75/6007, EPRF-TR-2-75(CSC) Contract N66314-74-C-1340

Descriptors: 'Earth sciences, 'Scientific satellites, 'Data bases, 'Meteorological data, Mapping, Partial differential equations, Computer graphics, Computations, Data storage systems, Computer programs. This report describes the results of research into the feasibility of storing satellite meteorological data in a high-resolution, equalarea, computer-accessible data base. Equal area elements are stored in square arrays representing the faces of a cube inscribed within the Earth. The required area-preserving transformation is presented along with its in-verse. A unique array-mapping scheme is presented, which preserves near-neighbor relations and allows rapid index computation. The implementation of this data base on rotational storage devices is discussed, and calculated execution times are presented.

AD-A010 412/5CP PC A03/MF A01 Air Force Cambridge Research Labs Hanscom AFB Mass

Computer Program for the Disturbed Steady-State Nighttime D-Region Environmental research papers

William Swider, and Carol I. Foley. 13 Mar 75, 27p Rept nos. AFCRL-TR-75-0150, AFCRL-**EBP-501** 

Descriptors: \*lonosphere, \*Atmosphere models, \*D region, Ion density, Computer programs, Electron density, Altitude, Polar cap absorption

A computer program has been developed for the nighttime D-region under disturbed steadystate conditions. The program provides for the determination of the electron concentration, total negative ion concentration, and the individual positive ion concentrations as a func-tion of altitude. Model results are computed and compared with nighttime data obtained by various experimentalists during the 2 to 5 November 1969 solar proton event.

# AD-A010 424/0CP

Air Force Cambridge Research Labs Hanscom AFB Mass

PC A02/MF A01

PC A12/MF A01

An Updated Empirical Density Model for Predicting Low-Altitude Satellite Ephemerides Air Force surveys in geophysics Henry B. Garrett. 19 Mar 75, 23p Rept nos.

AFCRL-TR-75-0158, AFCRL-AFSIG-305

Descriptors: \*Upper atmosphere, \*Atmospheric density, \*Atmosphere models, Artificial satel-lites, Ephemerides, Periodic variations, FOR-TRAN, Computer programs.

Two empirical density models based on drag analyses of 22 low-perigee satellites are developed for use in predicting low-altitude satellite ephemerides. A stepwise multiple regression analysis is performed with density at 145 km as the dependent variable, and a number of independent variables chosen to represent variations with solar cycle, geomag-netic activity, latitude, season, day of the year, and time of day. Densities between 120 and 500 km are determined from the hydrostatic law in a simple (but physically realistic) analytic form. The two models compare very well with the 1971 Jacchia model. The main advantage of such models is that they represent a major savings in both computer storage and run time making possible improvements in operational systems

# AD-A010 647/6CP

# Dugway Proving Ground Utah An Atmospheric Dispersion and Environmental Prediction Technique

Final rept.

Vell L. Runolfson, and Carl A. Bower, Jr. May 75, 251p Rept no. DPG-FR-M920A

Descriptors: \*Atmospheric circulation, Atmosphere models, \*Wind, Air pollution, Descriptors: Computerized simulation, Computer programs, FORTRAN

Identifiers: Atmospheric diffusion, FORTRAN 4 programming language.

An Atmospheric Dispersion and Environmental Prediction Technique in model form was developed and validated. The model was developed as a computerized aid to enable rapid objective analysis and calculation of atmospheric trajectories and streamlines on the mesoscale. Several observational weighting techniques were investigated to determine a capability to reconstruct an imposed wind field pattern from uniform and nonuniform measurements in the wind field. From this, a new technique was developed for application to wind interpolation which represented an improvement over the Thiessen polygon method. The developed model provides an adequate interpolated representation of wind fields and atmospheric trajectories in real or near-real time for interpretation of atmospheric pollution and hazard problems. The model can be programmed on small programable calculators with storage capability.

## AD-A011 029/6CP

Not available NTIS Rand Computation Center Santa Monica Calif A RAND Computation Center Reference: Standard Atmosphere Calculations with JOSS Gerhard F. Schilling. Oct 74, 15p Rept no. R-1550/8

Availability: Paper copy available from RAND Corporation, 1700 Main Street, Santa Monica, Calif. 90406, PC\$1.50.

Descriptors: \*Computer programs, \*Atmospheric density, \*Atmospheric tempera-ture, Computations, Standards, Atmosphere models.

Identifiers: \*Atmospheric pressure, JOSS programming language.

This document describes a simple JOSS program that provides the values of temperature, pressure, and density of the U.S. Standard Atmosphere at any desired altitude from sea level to 700 km. It can be coupled with other JOSS programs where such values are needed as input quantities. For general use, the program permits the ready construction of model atmospheres.

AD-A011 253/2CP PC A08/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

Refractive Effects in Remote Sensing of the Atmosphere with Infrared Transmission Spectroscopy

Final rept. Donald E. Snider, and Aaron Goldman. Jun 75, 151p Rept no. BRL-1790

Descriptors: \*Atmospheric refraction, \*Air mass analysis, \*Ray tracing, Tables(Data), At-mospheric temperature, Atmospheres, Computer programs, FORTRAN.

Identifiers: Remote sensing, Atmospheric composition, Atmospheric pressure, FORTRAN 4 programming language.

A ray tracing technique which includes atmospheric refraction is used to tabulate the air mass and the single layer effective temperature and pressure for a grazing ray from the sun. Summer and winter atmospheric profiles are used with observer altitudes ranging from 10 to 50 km in steps of 1 km. Zenith angles ranging from 80 degrees up to 97 degrees are considered. Results indicate that neglecting refraction in the computation of air mass and effective pressure can lead to overestimates of these quantities by up to 25% for aircraft observers. 60% for high altitude balloons, and 200% for satellite observers.

AD-A011 409/0CP PC A03/MF A01 Environmental Prediction Research Facility (Navy) Monterey Calif Basic ZOOM Program Computer programming note

Gerd Wiese. Jan 72, 31p Rept no. EPRF-CP Note-3

Descriptors: 'Weather forecasting, 'Computer programs, Interpolation, FORTRAN. Identifiers: Numerical weather forecasting, FORTRAN 63 programming language, ZOOM computer program.

The numerical hemispheric meteorological and fixed standard grid. FNWC normally maps the hemisphere on a 63 x 63 grid. The subroutine WINDOW selects a window of any desired size, location, and orientation out of this grid and zooms it to a wanted size (interpolation in space). The subroutine ARPOL calculates the forecast values of a window of any desired size, location, and orientation, which can be additionally zoomed to a wanted size, in shorter time steps than those of the given data (interpolation in time and space).

PC A03/MF A01 AD-A011 416/5CP Environmental Prediction Research Facility (Navy) Monterey Calif

**Program Graphic** 

Computer programming note Carol A. Simpson, and David B. Johnson. Nov 73, 40p Rept no. EPRF-CP Note-11

Descriptors: \*Wind, \*Computer programs, Curve fitting, Plotting, Minicomputers, Cumulus clouds.

Identifiers: GRAPHIC computer programs, Varian 3100 computers.

Program GRAPHIC plots data generated by the CUMLIQ cumulus dynamic model. It uses the FNWC 6500 Varian Plot routines to generate a file on PLOT (a disc file internal to the FNWC 6500 system) which then drives the Varian plotter.

AD-A011 931/3CP PC A04/MF A01 Utah State Univ Logan Space Science Lab Design and Calibration of a Rocket-Borne Electron Spectrometer Scientific rept.

Parris C. Neal. Dec 74, 69p HAES-8, Scientific-1, AFCRL-TR-74-0629

Contract F19628-74-C-0130

Descriptors: \*Electron energy, \*Aurorae, Ex-perimental design, Calibration, Electron spectroscopy, Spectrometers, Rocketborne, Performance(Engineering), Resolution, Computer programs.

Identifiers: \*Electron spectrometers.

electron spectrometer was designed An calibrated and applied in an auroral research program to measure the electron energy spectra from 100 to 1500 ev. The approach included the practical application of theoretical mathematics to design and calibrate the instrument. Such design and calibration using a digital computer for fast analysis can be used in the creation of similar instruments

AD-A012 002/2CP PC A05/MF A01 Air Force Weapons Lab Kirtland AFB N Mex Analytic and Numerical Chemistry Algorithms for the WORRY Code. WORRY Document No.

Final rept. 1 Jan 71-15 Jul 74 David W. Goetz, William A. Whitaker, Charles E. Ragan, and Peter W. Lunn. Jun 75, 99p Rept no. AFWL-TR-74-204

Descriptors: \*Atmospheric \*Algorithms, Nuclear explosions, Nitrogen oxides, Nonlinear differential equations, Reaction kinetics, Computer programs, Nitrogen, Ox-ygen, Atmosphere models, Atoms, Ions, ygen, Atr Molecules

Identifiers: \*Nuclear explosion effects, Reaction rates

The WORRY Chemistry Package computes the nonequilibrium chemical behavior of a parcel of air in a quiescent or disturbed environment. Such a computation requires the solution of a set of nonlinear coupled differential equations derived from the set of reactions in which the atomic and molecular species of the parcel participate. The Chemistry Package may solve this set of differential equations by either of two methods: a standard numerical integration or an analytic algorithm. The procedures used in the analytic algorithm are described in detail and comparisons with the numerical solutions are shown.

AD-A012 195/4CP PC A04/MF A01 Air Force Cambridge Research Labs Hanscom AFB Mass

Atmospheric Density Determination from Analysis of Doppler Beacon Satellite Data Special rept.

James N. Bass, Krishin H. Bhavnani, and Isabel M. Hussey. 1 Apr 75, 60p Rept nos. AFCRL-SR-191, AFCRL-TR-75-0176

Descriptors: \*Atmospheric density, \*Navigation satellites, Determination, Radio beacons, Scientific satellites, Doppler systems, Data processing, Computer programs, Orbits, Satellite tracking systems.

Identifiers: Doppler beacon satellites, CADNIP computer program, CELEST computer program, DB-7 satellites, DB-8 satellites, DB-9 satellites.

Atmospheric densities are computed from analysis of Doppler beacon satellite data. Modifications to Doppler beacon data processing program CELEST necessary for this study are described. Results obtained for satellites DB-7(6382), DB-8(6727), and DB-9(6928) are found to be in good agreement with those obtained by analysis of skin track data for the same satellites using program CADNIP. (Author)

#### AD-A012 369/5CP PC A03/MF A01 Ocean Data Systems Inc Monterey Calif

Further Development of a 3-7 Day Typhoon Analog Forecast Model for the Western North Pacific Final technical rept.

Warren S. Yogi, James M. Long, and Julius F. Steuckert. Apr 75, 37p ODSI-674-1, ENVPREDRSCHF-TECH-PAPER-12-75 Contract N66314-74-C-1390

Descriptors: 'Typhoons, 'Hurricane tracking, 'Weather forecasting, 'North Pacific Ocean, Tropical cyclones, Storms, Mathematical models, Patterns, Analogs, Regression analysis, Correlation techniques, Computer applications

Identifiers: TYFOON 72 computer program, TYFOON 73 computer program.

The report presents the results of an investigation of typhoon movement forecasting techniques by computer. The study was accomplished in three phases: Upgrading the former data base of the existing forecast model; ex-tending the forecast to seven days, and incorporation of 500-mb long-wave patterns for predetermination of forecast track. Recommendations regarding findings are included as part of the text.

### AD-A012 476/8CP

PC A07/MF A01 Mission Research Corp Santa Barbara Calif Auroral Simulation Studies. HAES Report No.

Topical rept. 1 Jan-30 Sep 74 Douglas H. Archer, and Paul W. Tarr. 22 Apr 75, 147p MRG-R-152, DNA-3567T Contract DNA001-74-C-0143

See also AD-781 275.

Descriptors: \*Aurorae, \*Computerized simulation, Atmospheric physics, Emission spectra, Atmospheric heave, Electron density, Particle flux, Brightness, Chemiluminescence, Radi-ance, Chemical reactions, Nitrogen, Oxygen, Carbon dioxide, Alaska. Identifiers: ARCTIC computer code, ICECAP

operation.

This report describes work performed in three areas of activity: (1) applications of the ARCTIC code, especially to a study of and comparison with ICECAP data from an auroral event recorded near Poker Flat, Alaska on 27 March 1973, (2) study of certain applications of aurorally-generated extreme ultraviolet (EUV) radiation in an auroral environment, and (3) atmospheric heave resulting from auroral bomhardment

PC A11/MF A01 AD-A012 799/3CP Coastal Engineering Research Center Fort Belvoir Va

Verification Study of a Bathystrophic Storm Surge Model Technical memo

George Pararas-Carayannis. May 75, 248p Rept no. CERC-TM-50

Availability: Microfiche copies only.

Descriptors: \*Hurricanes, \*Atmosphere models, \*Computer programs, \*Hydrodynamics, Tropi-cal cyclones, Floods, Flooding, Mexico Gulf, North Atlantic Ocean, Coastal regions, Numerical analysis, Wind velocity, Tides, Ocean bot-tom, Friction, Stresses, Direction finding, Mathematical models, Barometric pressure, Hydrography, Calibration, Comparison, Weather forecasting, Civil engineering, Data processing.

Identifiers: Bathystrophic storms, Storm surges, Hurricane of October 1949, Carla hur-Storm ricane, Audrey hurricane, Camille hurricane, Carol hurricane

A bathystrophic storm surge numerical model was verified, using data of historical hurricanes at selected traverses on the Gulf of Mexico and the east coast, by calibrating 'coupled' values of wind and bottom stress coefficients in hydrodynamic equations for the numerical computation. These coefficients represented model calibration constants that included more than the physical effects of wind and seabed friction. Surge hydrographs were calculated and compared with observed or recorded surge hydrographs of: (a) Hurricane of 1949 at Galveston and Freeport, Texas; (b) Hurricane Carla at Galveston and Freeport, Texas; (c) Hurricane Audrey at Eugene Island, Louisiana; (d) Hur-ricane Camille at Biloxi, Mississippi; and (e) Hurricane Carol at Narragansett Pier, Rhode Island. Comparisons were made with theoretical results for several hypothetical storm surge problems for which analytical solutions could be obtained. Although reasonable empirical solutions were obtained by combining values of initial rise and of coefficients of bottom friction and wind stress, the significance, variation and interdependence of these parameters could not be determined adequately because of limited historical data. Extrapolation of empirically derived wind stress and bottom friction relationships, as determined from lower windspeeds, to extreme probable maximum conditions associated with the synthetic hurricanes, could not be conclusively verified. Because of the complexity of the problem, data limitations, and the variability of different factors entering the calibration process, correlation for all historical hurricanes at all traverses was difficult to obtain.

PC E03/MF A01 AD-A013 508/7CP Oklahoma Univ Norman

Wind Shear - Thermal Wind Relationships on the Mesoscale

Final rept. 16 Sep 74-31 May 75

Amos Eddy, and Philip A McDonald. May 75, 22p ARO-12813.1-R-GS Grant DAHC04-75-G-0035

Descriptors: \*Wind shear, Atmospheric temperature, Wind, Computer programs, Meteorological data, Temperature gradients, Multivariate analysis, Analysis of variance, Regression analysis, Spatial distribution, Time dependence, Tables(Data), Atmospheric sounding, Guided missile ranges, Tropopause, Jet streams, Atmosphere models, Computer programs, Mathematical prediction, Data processing, Digital computers. Identifiers: Mesometeorology, IBM 370 compu-

ters, \*Thermal winds, Manova computer program.

Space-time relationships between the wind and temperature fields have been examined using rawinsonde observations taken over White Sands Missile Range and nearby locations dur-ing the period 21 August 1973 - 1 March 74. This required the bringing into operation of multivariate analysis of variance (MANOVA) and regression computer programs. (Author)

AD-A013 624/2CP PC A06/MF A01 Naval Postgraduate School Monterey Calif A Microprocessor-Based Communications Information System

Robert Harry Ekstrom, and William Henry III Reinhardt, Jun 75, 109p

\*Weather communications, Descriptors: \*Microcomputers, \*Information systems, \*Naval operations, Weather forecasting, Communications networks, Cathode ray tube screens, Interfaces, Computer programs, Theses. Identifiers: \*Microprocessors, File structures, PL/M programming language.

A functional design of a microprocessor-based system is proposed as a model for the Naval Enivronmental Display Station for use by the Naval Weather Śervice Environmental Detachments. The design consists of four modules: control, communications, storage, and display. A software program prototype that simulates many of the proposed functions of the control module is discussed. The processing requirements for the communica-The tions module are presented along with a proposed hardware configuration. The storage module, based on a floppy disk system, is explained and its required functions defined. A display module using an intelligent terminal and two CRTs is considered. The The microprocessing system was designed to show not only the power and flexibility of this system, but also to demonstrate a potential application of low cost microprocessor technology.

#### AD-A014 434/5CP PC A07/MF A01 Aeronomy Corp Champaign III

**Remote Diagnostics and Correlation Analysis** for Prairie Smoke

Final technical rept. Apr 73-Mar 74

S. A. Bowhill, E. K. Walton, and D. R. Ward. Jul 75, 133p RADC-TR-74-182

Contract E30602-73-C-0178 ABPA Order-1423 Rome Air Development Center, Griffiss AFB,

Descriptors: \*lonospheric modification, Magnetic disturbances, Scintillation, Mathematical models, Computerized simulation, Scientific satellites, Computer programs.

Identifiers: ISIS-1 satellite, Remote sensing, F region, Spread F, Prairie Smoke project.

The disturbed ionospheric region produced by the Platteville heating transmitter facility was studied by the use of orbital and geostationary satellite signals. It was found that the modifier transmitter produces an ellipsoidal disturbed region with an e-folding radius of about 50 km. This region is centered at the height of maximum of the ionospheric layer and displaced about 30 km north of the transmitter. The disturbed region is made up of geomagnetic field-aligned irregularities, having e-folding radius normal to the magnetic field of 75 to 400 m (the larger values are at night). They drift with the neutral wind with velocities of 8 to 25 m/s. These disturbances cause scintillations as high as 25 percent in a VHF radio signal transmitted through it when the line of sight approaches the direction of the magnetic field.

#### AD-A014 965/8CP

PC A11/MF A01

Kaman Aerospace Corp Bloomfield Conn Test and Evaluation of a Real-Time Simulated Transcontinental Supersonic Boomless Flight System. Volume I. Main Text and Appendix A Final reot. 16 Nov 73-19 Nov 74

Robert C. Bundgaard. Apr 75, 235p FAA-RD-75-131-1

Contract DOT-FA74WA-3363

Descriptors: 'Supersonic aircraft, 'Supersonic flight, Sonic boom, Meteorological data, Communications networks, Weather forecasting, Computer graphics, Computer programs. Identifiers: 'Transcontinental flights, 'Boomless supersonic flight, DOT/4DZ/DA, DOT/4IZ/IA.

In the investigation reported, numerical methods simulated supersonic flight carried out in real-time and concurrently at present time. A computer program identifies, acquires, analyzes and predicts the information needed in order to plan, fly and verify boomless flight. It optimizes the cut-off Mach time-gain in tradeoff along with other pertinent necessary considerations now being regularly carried out in the advanced air operations of today. For communication information in current real-time for boomless transcontinental flights, the investigation utilized nationwide networks: ARINC, UNINET. The program foresees the future conditions affecting the cut-off Mach flight performance in sufficient time for carrying out reliable preflight planning and for monitoring the in-flight modifications just ahead of the aircraft, utilizing the appropriate prediction of atmospheric conditions (boom-ahead computer).

AD-A015 542/4CP PC A05/MF A01 Edgewood Arsenal, Aberdeen Proving Ground, Md

A Mathematical Model for the Atmospheric Dissemination of Evaporating Aerosol Clouds (Evaporation Model)

Technical rept. Jan-Dec 74

Ronald O. Pennsyle. Aug 75, 85p Rept no. ED-TR-74098

Descriptors: "Atmospheric motion, "Aerosols, "Computerized simulation, Vapors, Particulates, Transport properties, Mathematical models, Computer programs, FORTRAN, Evaporation.

Identifiers: EVAP computer program, FOR-TRAN 5 programming language, UNIVAC 1108 computers, 'Almospheric diffusion, Settling.

A mathematical model is presented to describe the atmospheric transport and diffusion of a cloud of vapor and/or aerosol particles taking into account the simultaneous evaporation and settling of the particles. The model has been implemented in the computer program EVAP, written in FORTRAN V for the Univac 1108. This report contains complete documentation of the program, including the computer code listing.

# AD-A015 544/0CP

Riverside Research Inst New York A Study of Millimeter and Submillimeter Wave Attenuation and Dispersion in the Earth's Atmosphere

PC A03/MF A01

Final technical rept, 19 Mar-15 Aug 75 M. Greenebaum, and D. Koppel. 15 Aug 75, 45p Rept no. RRI-F-1/306-3-14 Contract DAAH01-74-C-0419, DARPA Order-2281

Descriptors: "Millimeter waves, "Submillimeter waves, "Radiation attenuation, "Far infrared radiation, Atmospheric motion, Molecular spectroscopy, Infrared spectroscopy, Carbon monoxide, Oxygen, Computer programs, Mathematical models, Turbulence, Clouds, Isotopes, Absorption(Physical). Identifiers: SLAM computer program,

Identifiers: SLAM computer program, \*Atmospheric attenuation, Oxygen 16, Oxygen 18, Attitude.

A summary is presented of new calculations of atmospheric absorption line parameters and of a slant-path absorption model (SLAM) intended for use in the millimeter and submillimeter wave spectral regions. Results of a literature survey concerning altitude-dependent attenuation and dispersion in this spectral region, as well as weather-dependent scattering and fading strengths, are also summarized. Recommendafading tions are given for reducing the uncertainties in the model predictions. A list of 318 absorption lines of the molecular oxygen isotopes of principal concern in atmospheric transmission below 300/cm is included, together with their integrated strengths at 296K, line widths, lowerstate energies, and identifying quantum num-bers, in the format of the AFCRL Atmospheric Absorption Line Parameters Compilation

AD-A015 812/1CP PC A09/MF A01 Radiation Research Associates Inc Fort Worth Tex

Sky Radiance Calculations in the 0.5 micrometer - 5.0 micrometer Wavelength Range

Final rept. 1 Feb 74-30 Apr 75 Wolfram G. M. Blattner, and Michael B. Wells. 31 May 75, 188p RRA-T7501, AFCRL-TR-75-0317

Contract F19628-74-C-0140

Descriptors: 'Sky brightness, 'Aerosols, 'Air pollution, Atmospheric scattering, Infrared spectra, Light transmission, Mathematical models, Tables(Data), Atmosphere models. Identifiers: Flash computer program, Atmospheric attenuation, 'Atmospheric emission, Radiative transfer.

The FLASH Monte Carlo code was modified in order to allow for the atmospheric emission and for the emission by the surface of the earth. The modification includes the consideration of the newest absorption data available. The FLASH program was then used for calculations of the radiances obtained for air-borne detectors at 120, 200, and 35,800 km altitudes.

AD-A015 861/8CP PC A02/MF A01 Danish Meteorological Inst Copenhagen Geophysical Dept

Iono'spheric Research Using Satellites Interim scientific rept. no. 4, 1 Jul 74-30 Jun 75 Ib Steen Mikklesen. 27 Aug 75, 5p AFCRL-TR-75-0495

Grant AF-AFOSR-2161-72

Descriptors: 'Faraday effect, 'Ionosphere, Rotation, Photoionization, Computer programs, Greenland, Winter, Maps, Summer, Contours, Electrons. Identifiers: TEC(Total Electron Content), Total electron content.

ATS-3 Faraday-rotation data gathered at Narssarssuaq, Greenland, during the period 72/04/20 - 74/06/11 has been analyzed. This was done by drawing contour-maps of the total electron content (TEC) with the aid of a computer program. These show the general changes of TEC with increasing Kp. It is found that the day-time values of the winter 73-74 are low compared to the winter of 72-73 and are possibly a signature of a long time variation of the solar activity. (Author) AD-A016 673/6CP PC A03/MF A01 Lockheed Missiles and Space Co Inc Palo Alto Calif

Ionospheric Effects Induced by Precipitating Auroral Electrons. HAES Report No. 14 Final rept. 1 Feb 74-1 Feb 75

J. B. Cladis, G. T. Davidson, W. E. Francis, L. L. Newkirk, and M. Walt. 22 Jul 75, 46p DNA-3648F Contract DNA01-74-C-0146

Report on High Altitude Effects Simulation Program. See also report dated Jan 74, AD-779 892.

Descriptors: "lonosphere, "Polar regions, Aurorae, Energy, Deposition, Electrons, Heating, Electron flux, Electron density, Nuclear explosions, High altitude, Ionospheric disturbances. Identifiers: Ice cap operation, AURORA computer code.

The results of a coordinated experiment conducted in the auroral zone on 8 December 1971 were used to determine whether the AURORA computer code includes all of the important processes associated with the precipitation of electrons in the atmosphere. A precipitating electron flux was measured with the 1971-089A satellite simultaneously with ionospheric electron number-density distribution measurements using the Chatanika incoherent-scatter radar. The electron density distribution was compared with the distribution computed by the AURORA code, using the measured electron flux as input. The AURORA code was used to compute energy-deposition profiles in the atmosphere due to the precipitation of electrons released by high-altitude nuclear detonations.

AD-A017 026/6CP PC A07/MF A01 New Mexico State Univ University Park Dept of Physics

Research in the Area of Atmospheric Modeling: High Resolution Atmospheric IR Transmittance Prediction Report for 1 Oct 74-30 Jun 75

August Miller, Robert L. Armstrong, and Charles W. Welch. 1 Jul 75, 128p Rept no. NMSU-PHYS-537-75-1 Contract DAAD07-73-C-0134

See also report dated Aug 75, AD-A016 158.

Descriptors: 'Laser beams, 'Light transmission, 'Aerosols, Atmospheres, Computer programs, Absorption spectra, Atmosphere models, FOR-TRAN, Infrared signatures, Target detection, Atmospheric scattering, Rayleigh scattering, Infrared lasers, Surface targets.

Identifiers: Atmospheric transmissivity, FOR-TRAN 4 programming language, ATRAN computer program.

An atmospheric IR transmittance prediction model which includes the effects of high resolution molecular absorption, certain molecular continuum absorption, Rayleigh scattering and single and multiple scattering by spherical, polydisperse aerosol materials is summarized. The multiple-scattering codes are discussed in some detail, as are its current limitations. Representative results obtained for three aerosol models are presented, together with descriptions of conclusions which may be drawn from them. In addition, the effects on transmittance of using generalized Voight line shape profile are discussed. Complete Fortran IV source code listings, as well as UNIVAC 1108 running instructions are appended

# AD-A017 397/1CP

Riverside Research Inst New York The Calculation of Millimeter and Submillimeter Wave Absorption Line Parameters for the Molecular Oxygen Isotopes: (16)O2, (16)O(18)O, and (18)O2

PC A06/MF A01

Technical rept. 19 Mar-15 Aug 75

M. Greenebaum. 15 Aug 75, 120p Rept no. RRI-T-1/306-3-14

Contract DAAH01-74-C-0419, ARPA Order-2281

\*Electromagnetic radiation. Descriptors: \*Oxygen, \*Microwave spectroscopy, \*Radiofrequency spectroscopy, Attenuation, Al-titude, Line spectra, Electron transitions, Com-\*Microwave

puter programs. Identifiers: \*Oxygen istopes, Oxygen 18, \*Atmospheric attenuation.

Calculations are described which yield absorption line parameters for the three isotopes of molecular oxygen: (16)O2, (16)O(18)O, and (18)O2, in the format of the AFCRL Atmospheric Absorption Line Parameters Compilation. The line parameters are: transition frequency, integrated line strength at 296K, line width, lowerstate energy, and identifying quantum numbers. These parameters are required as input to the SLAM program (described elsewhere) which calculates the attenuation vs. altitude at any fixed frequency in the millimeter-to-submillimeter wave region.

### AD-A017 459/9CP

PC E12/MF E12 Environmental Research Inst of Michigan Ann Arbor Infrared and Optics Div Atmospheric Transmittance and Radiance: Methods of Calculation

IRIA State-of-the-Art rept

Anthony J. LaRocca, and Robert E. Turner. Jun 75, 508p Rept no. ERIM-107600-10-T Contract N00014-74-C-0285, N00014-73-A-0321-0002

Descriptors: \*Light transmission, \*Radiative transfer, "Computations, Absorption(Physical), Light scattering, Atmospheric chemistry, Water vapor, Carbon dioxide, Carbon monoxide, Methane, Ozone, Aerosols, Particles, Mathe-matical analysis, Integral equations, Mathe-matical models. Computer represence matical models, Computer programs. Identifiers: \*Atmospheric transmissivity. At-

mospheric attenuation, Atmospheric composition, Calculations.

The report is broadly divided into the categories of scattering and absorption, with the greater stress laid on absorption. The first of these is the so-called line-by-line direct integration method, which requires a detailed compilation of the characteristics of individual molecular lines. The second of the absorption methods of calculation presented is the band-model technique. In this method, the line spectrum is approximated by some mathematically manipulatable distribution function with undetermined band-model parameters. By comparison of calculated results with laboratory experimental data the parameters are defined, and the bandmodel is used for calculating transmittance under any required meteorological conditions. The third general set of techniques is given the heading Multi-Parameter Analytical heading Multi-Farameter derived Procedures. These techniques are derived from the band-model concept, incorporating a larger number of parameters, with presumably greater accuracy in the resultant calculations. The rest of the report is either tutorial or supportive, presenting details of information which is required as input to the calculation procedures.

AD-A017 552/1CP PC A05/MF A01 Winzen Research Inc South St Paul Minn Criteria for Controlling Vertical Motion of Stratospheric Balloons Final rept. 2 Aug 74-31 Aug 75 Jean R. Nelson. 6 Nov 75, 82p Contract N00014-75-C-0072

Descriptors: 'Balloons, 'Ascent trajectories, Turbulent flow, Laminar flow, Aerodynamic drag, Diurnal variations, Computer programs, Meteorological data. Identifiers: 'Vertical motion, RISRATE com-

puter program.

A successful scientific balloon flight mission is dependent upon accurate control of vertical

motion. The scientist wants a rapid ascent to his altitude of interest, but this desire must be tempered by avoiding aerodynamic stress damage to the balloon. Reasonable limits on altitude variation caused by temperature fluctuation are desired, so effective management of ballast is required on zero pressure balloons. There are also special situations with multiple Increare area is o special situations with multiple altitude requirements that require efficient management of ballasting and valving for verti-cal motion control. Empirical equations were developed by the University of Minnesota (under contract to ONR and jointly sponsored by the U.S. Army, Navy and Air Force) before 1960. The night ascent technique frequently used now also poses a new environment regime so it was considered necessary to re-evaluate the vertical motion response using current computer capabilities.

AD-A017 664/4CP PC A05/MF A01 Colorado Univ Boulder Dept of Computer Science

Software Tools for Climate Simulation Final rept.

John M. Gary. 1975, 88p AFOSR-TR-75-1530 Contract ARPA Order-2792, Grant AF-AFOSR-2732-74

Descriptors: \*Climate, \*Computerized simulation, Data processing, Computer programs, FORTRAN, Preprocessing, Vector analysis. Identifiers: \*Climate simulation, Control statements, Hyperbolic equations, Macro preprocessors. Software.

The macro preprocessor provides a standard type of macro replacement with arguments for FORTRAN programs. Conditional macro expansion and macrotime arithmetic computation is included. Structured control statements (IF...THEN..., etc.) are added to FORTRAN. A preprocessor for FORTRAN containing macro capability, vector arithmetic, and finite dif-ference operators was designed, but only partially implemented. A first version of a package for the solution of hyperbolic-elliptic equations was implemented, but is not yet documented. (Author)

#### AD-A017 734/5CP PC A06/MF A01 Air Force Cambridge Research Labs Hanscom AFB Mass

Atmospheric Transmittance from 0.25 to 28.5 Microns: Computer Code LOWTRAN 3

Environmental research papers J. E. A. Selby, and R. A. McClatchey. 7 May 75, 110p Rept nos. AFCRL-TR-75-0255, AFCRL-EBP-513

Descriptors: \*Atmosphere models, \*Laser beams, Light transmission, Computer pro-grams, Radiative transfer, Infrared radiation, Refraction, FORTRAN. Identifiers: \*Atmospheric transmissivity, At-

mospheric attenuation, LOWTRAN 3 Computer program, Light(Visible radiation).

A FORTRAN computer program, LOWTRAN 3, is described for calculating the transmittance of the atmosphere in the spectral region from 0.25 to 28.5 micrometers at a spectral resolution of 20/cm. The program provides a choice of six at-mospheric models covering seasonal and latitudinal variations from sea level to 100 km, two haze models, and accounts for molecular absorption, molecular scattering, and aerosol extinction. Refraction and earth curvature ef-fects are also included. This program provides some modifications to the molecular absorption and aerosol extinction data provided in an earlier LOWTRAN 2 report. In addition, input modifications have been made, making the LOWTRAN 3 program considerably more flexible in terms of the input of meteorological data.

AD-A018 300/4CP PC A04/MF A01 Naval Postgraduate School Monterey Calif

A Climatology of Marine-Fog Frequencies for the North Pacific Ocean Summer Fog Season Master's thesis Gary Roland Willms. Sep 75, 58p

Descriptors: \*Fog, \*Marine climatology, \*North Pacific Ocean, Summer, Frequency, Computer programs, Statistical analysis, Visibility, Range(Distance), Classification, Synoptic meteorology, Ships, Data acquisition, Record-ing systems, Comparison, Weather, Weather Marine meteorology, Weather, Weather Marine meteorology, Weather, W forecasting, Military requirements, Comparison.

This study continues the Naval Postgraduate School's development of a computerized pro-gram to establish climatological marine-fog frequencies. In particular, fog related informa tion contained in the visibility-weather group elements of the primary synoptic surface re-ports is segregated into 39 fog categories. Representative fog durations for each category are statistically established from North Pacific Ocean Weather Station summer-season data at Ships, P, Q, and S. Climatological frequencies over the North Pacific Ocean, 30-60N, for the months of June, July, August and September are derived from 12 years (1963-74) of OWS and transient ship observations (about three fourths of a million reports). Comparison to previously published climatological frequencies is made. (Author)

# AD-A018 372/3CP

Epsilon Labs Inc Bedford Mass Balloon Measurements of Stratospheric Aerosol Size Distribution Following a Volcanic

PC A04/MF A01

Dust Incursion

Final rept. 1 Oct 74-31 Aug 75 Henry A. Miranda, Jr, and John Dulchinos. Aug 75, 57p AFCRL-TR-75-0518

Contract F19628-75-C-0004

See also report dated Jul 74, AD-784 866.

Descriptors: \*Aerosols, \*Stratosphere, Particle size, Volcanoes, Dust, Cosmic rays, Balloon equipment, Spectrum analysis, Computer programs, New Mexico, FORTRAN. Identifiers: DATRUN computer program.

Stratospheric aerosol size distribution mea-surements of the volcanic dust layer over Southeastern New Mexico, obtained on a balloon flight on January 21/22, 1975 several months following the Fuego volcanic eruption, are presented and discussed in preliminary fashion. Altitude profiles of all particles broken down into a set of contiguous size ranges indicate the presence of a pronounced concen-tration peak in the 16-21 Km region. Above this layer a distinct plateau is seen to exist between 22 and 26 Km which appears to be absent at night. This suggests the possibility of sunlight nucleation effects occurring in this altitude regime. A sunrise nucleation experiment conducted above this plateau region at 28 Km shows no evidence of nucleation during the first 1/2 hour following local sunrise. A distinct altitude-dependent size distribution slope in the 23-27 Km region which had been observed on a series of previous flight in May of 1973, appears to have been shifted to higher altitudes (26-28 Km) and is somewhat less pronounced.

AD-A018 562/9CP PC A06/MF A01 General Dynamics San Diego Calif Electronics Div

Remote Infrared Atmospheric Profiling System (RIAPS)

Final rept. 15 Dec 71-31 Dec 74

C. R. Claysmith. Feb 75, 110p Rept no. R-75-073 Contract N00014-72-C-0175

Descriptors: 'Atmospheric sounding, 'Infrared detectors, 'Radiometers, Far infrared radiation, Infrared scanning, Atmospheric temperature, Water vapor, Profiles, Remote systems, Computer programs.

The report describes the development of an infrared sensor operating in the 11 to 20 micron region using computerized inversion programs to yield temperature and water vapor profiles of the earth's atmosphere up to 6 km. The development of the sensor system hardware and software is summarized for the period 1968 through 1973, and given in detail for system development during 1974. Atmospheric profiles acquired and processed under various at-mospheric conditions are presented. The development work is continuing in 1975 under ONR contract N00014-75-C-0940. (Author)

AD-A018 662/7CP PC A08/MF A01 Digital Programming Services Inc Waltham Mass Development and Application of Data

Techniques Processing Techniques and Procedures to Cloud Physics Data Analytic Final rept. 1 Jul 74-30 Jun 75

Lawrence E. Belsky, Frederic B. Kaplan, and Paul M. Rodenhiser. 28 Jul 75, 162p AFCRL-TR-75-0427

Contract F19628-75-C-0043

Descriptors: \*Cloud physics, \*Data processing, \*Meteorological data, \*Data reduction, Pattern recognition, Data acquisition, Airborne, Digital computers, Real time, Meteorological radar, Computer programs, Radar reflections, At-mospheres, Moisture content, Executive routines

Identifiers: Airborne data collection, PDP 8E computer.

This report outlines the data reduction techiniques used in processing the meteorological data collected by the airborne data collection system. The real time executive system for the on board PDP 8E computer is also fully explained. (Author)

AD-A019 110/6CP PC A06/MF A01 H S S Inc Bedford Mass Auroral Spectrograph Data Reduction System Final rept. 1 Jul 73-30 Jun 75 Lawrence B. Woolaver. 30 Jun 75, 118p HSSB-014, AFCRL-TR-75-0360 Contract F19628-73-C-0299

Descriptors: 'Aurorae, 'Spectrographs, 'Data reduction, Photographic film, Computer programming, Line spectra, Transfer functions, Airglow, Computer programs, Photographic processing, FORTRAN.

Identifiers PATROL computer program, EDITPS computer program.

This report presents a data reduction system for use with photographic records produced by the Model 173 Auroral Spectrograph. The system includes the results of a spectral sensitometric study designed to overcome the variations in field processing of the data film. A computer program is presented which searches the data base for a selected set of spectral lines and computes the line radiance for these lines.

AD-A019 344/1CP PC A03/MF A01 Rand Corp Santa Monica Calif Programming and the Climate Dynamics Pro-

ject

D. Cooper, L. Heiser, R. Mobley, A. Nelson, and D. Pass. Jul 74, 50p Rept no. P-5269

Descriptors: \*Earth models, \*Ocean models, 'Computerized simulation, \*Information retrieval, 'Climate, 'Digital computers, Minicomputers, Data bases, Networks, Circula-tion, Global, Grids(Coordinates), Broadband, Communication and radio systems, Computer programs, Marine climatology. Identifiers: \*ARPANET, ILLIAC 4 computers,

MINTZ - Arakawa model.

Programming for the ARPA funded Climate Dynamics Project is a mixed bag. The primary task is modeling the earth's atmosphere and oceans. The ramifications of that task are often amazing. They include use of the ILLIAC IV computer and the ARPA network, extremely large data bases (50 offline 2314 disk packs at present, and up to the equivalent of 420 online 2314's in the future), and graphic display systems. The wide variety of computers presently used by the project (370/158, 360/91, PDP-10, B6700 and ILLIAC IV) present numerous problems and languages for programmers to contend with. This paper will be an attempt to summarize all of this activity. (Author)

AD-A019 494/4CP PC A06/MF A01 Naval Postgraduate School Monterey Calif Application of a Finite Element Method to the **Barotropic Primitive Equations** Master's thesis

Donald Ernest Hinsman, Sep 75, 110p

Descriptors: \*Weather forecasting, \*Finite element analysis, Partial differential equations, Mathematical models, Finite difference theory, Analytic functions, Computer programs, Matrices(Mathematics), Numerical integration, Theses, FORTRAN.

Identifiers: \*Numerical weather forecasting, Primitive equations, FORTRAN 4 programming language.

A finite element application to the barotropic primitive equations is presented including theoretical development and the model used. Analytic initial data is generated in order to verify as well as possible the accuracy of the model. A comparison of the model with similar finite difference schemes shows that this finite element method exhibits better phase speed propagation than comparable second and fourth order finite differencing and is competi-tive in the size of the allowable time step.

AD-A019 656/8CP PC A03/MF A01 Air Force Cambridge Research Labs Hanscom AFB Mass

The Calculation of Riometer Absorption and an Approximation Connection between Riometer Absorption and Solar Proton Fluxes during Nighttime PCA Events Environmental research papers

Michael A. Stroscio, and Bach Sellers. 5 Sep 75, 39p Rept nos. AFCRL-TR-75-0469, AFCRL-ERP-531

Prepared in cooperation with Panametrics, Inc.

Descriptors: \*Polar cap absorption, \*Riometers, Absorption coefficients, Protons, Solar cosmic rays, Particle flux, Recombination reactions, Night, Atmospheric physics, Mathematical models, Atmosphere models, Transport proper-ties, Diurnal variations, Computer programs, lonosphere, Experimental data, Greenland, Day.

In this report, the calculation of riometer absorption during several PCA events of particular interest is presented. These calculations are based on earlier work in which an improved ef-fective recombination coefficient was derived and an atmospheric model for (1) each month of the year, (2) day and night, and (3) 60 deg N and 90 deg N latitude was presented. In this report, the calculated values of riometer absorp-tion are presented for 5 PCA events: 2 Nov. 69, 7 Mar. 70, 25 Jan. 71, 2 Sep. 71, and 3 Aug. 72. The calculated values of riometer absorption are compared with experimental values measured for both day and night conditions at Thule, Greenland. An approximate connection between riometer absorption and the squareroot of the proton flux for nighttime conditions is presented. This relationship, which has previously been applied only for daytime conditions, is discussed both on a fundamental level and on the level of verification by comparison with experiment. In addition, the basic equation widely used to calculate riometer absorption is compared with the original Sen-Wyller result.

AD-A020 045/1CP PC A06/ME A01 Environmental Prediction Research Facility (Navy) Monterey Calif A Cloud Advection Model

Roland Nagle. May 75, 119p Rept no. EPRF-CP Note-20

Descriptors: "Weather forecasting, "Clouds, "Meteorological satellites, "Numerical analysis, "Algorithms, "Computer programs, Mathematical models, Meteorological data, Subroutines, Flow charting, Data storage systems. Identifiers: Satellite weather, Cloud advection model.

A detailed description of a program which produces cloud forecasts for periods of 12, 24, and 36 hours by Quasi-Lagrangian advection is presented. The principles on which the program is based are explained. Detailed presentations of the logic of each subroutine in the program are provided, along with descriptions of the specific numerical algorithms which are utilized. Program listings and flow diagrams are shown. Options for both extended core storage (ECS) and mass storage versions of the program are provided. Listings of both Varian output and for high quality, hard copy, grey-scale output are presented. Finally, sample output of the Varian and Muirhead output of the program are shown. (Author)

#### AD-A020 301/8CP PC A06/MF A01 Emmanuel Coll Boston Mass Study of Hydromagnetic Wave Propagation in the Magnetosphere

Final rept. 1 Apr 73-31 Jul 75 William F. Bellew, Charles J. Cantor, and M. Patricia Hagan. Nov 75, 121p AFCRL-TR-75-0588

Contract F19628-73-C-0081

Descriptors: "Minicomputers, "Computer pro-grams, "Atmosphere models, "Magnetosphere, Eigenvectors, Wave propagation, Magnetohydrodynamic waves, Magnetic storms, Polarization, Geomagnetism, Forecasting, Data acquisition, Real time, Signal processing, Input output devices, Mass storage, Central processing units.

Identifiers: Varian 72 computers, Magnetic substorms, Micropulsations.

This report details the specifications of the min-computer located at AFCRL, which has been installed for data reception in the MAGAF (Micropulsation Analysis for Geomagnetic Activity Forecasting) network. Further, mathematical analyses of magnetospheric models are presented, together with computer programs written to produce theoretical results for anticipated network problems.

# AD-A020 458/6CP

Arizona Univ Tucson Climatic Modeling of the Earth-Atmosphere

PC A03/MF A01

System Final rept. 1 Jul 70-31 Dec 75 William D. Sellers. 31 Dec 75, 31p ARO-9077.6-EN

Contract DAHC04-70-C-0038

Descriptors: \*Atmosphere models, \*Climate, \*Computer programs, Global, Machine coding, Atmospheric precipitation, Grids(Coordinates), Atmospheric temperature, Distribution, Periodic variations, Oceans, Surface temperature, Land areas, Hydrology, Cycles, Cloud cover, Sea ice, Carbon dioxide, Energy levels, Thermodynamics, Solar radiation, Heat transfer, Aerosols, Horizontal orientation, Vertical orientation, Earth orbits.

During the course of this research three global climate models (I, II, and III) have been developed. The first two are vertically-integrated and use a grid spacing of 10 deg of latitude in the north-south direction. Model I differentiates zonally only between land and water. Model II uses a zonal grid of 10 deg of longitude and is the only one of the models to include a hydrologic cycle and variable cloud cover. Model III is a two-dimensional zonallyaveraged model with a grid spacing of 7.5 deg of latitude horizontally and 3 km vertically (10 layers). Each model has its own advantages and disadvantages. Model I is probably the most practical to use in studies of climatic change. The model is fast, requiring very little computer time, and reproduces the present climate of the earth quite well. Models II and III should both be improved considerably before being used in studies of climatic change. (Author)

AD-A021 213/4CP PC A08/MF A01 Environmental Prediction Research Facility (Navy) Monterey Calif

Objective Analysis Technique in Sigma Coordinates

Technical paper

Dieter Schiessl. Nov 75, 157p Rept no. ENVPREDRSCHF-tech paper-20-75

Descriptors: 'Weather forecasting, Atmosphere models, Wind, Barometric pressure, Mathematical models, Computer programs, Northern hemisphere.

Identifiers: Numerical weather forecasting, \*Objective weather forecasting, Primitive equations.

A three-step objective analysis technique for initializing Fleet Numerical Weather Central's Primitive Equation Forecast Model in the 63x63 Northern Hemisphere Polar Stereographic Grid is described. In the first step, an analysis is performed at 10 mandatory pressure levels. In the second step, the mandatory pressure level heights are transformed into sigma coordinates bv using a mass structure conversion procedure which describes the physical properties of an air column through static stability parameters over defined pressure increments. In the third step, raw data are converted to sigma coordinates by an identical procedure and reanalyzed in sigma coordinates by using the transformed pressure level analysis as initial guess. The applied numerical analysis method is based on the pattern-conserving analysis technique FIB (Field by Information Blending) which allows wind and height reports to be treated as independent information sets and to be analyzed simultaneously.

AD-A021 524/4CP PC A04/MF A01 Missouri Univ Columbia Information Science Group

Disease Information System. Ground Temperature Derived from Other Geophysical Observations Interim rept.

John A. Spratt, Francis R. Watson, and Donald A. B. Lindberg. Jan 76, 73p Rept no MOU-IS-PR-8

Contract DAMD17-74-C-4122

Descriptors: 'Diseases, 'Information systems, 'Climate, Schistosomiasis, Predictions, Temperature, Regression analysis, Topographic maps, Mathematical models, Least squares method, Computer programs, Mathematical prediction, Saudi Arabia, Middle East. Identifiers: Temperature charts, Software.

This paper describes two mathematical methods for predicting temperatures over a relatively large area when only a small amount of actual data is known. Known temperatures from a few locations are compared with the physical characteristics of these locations from data gathered from standard topographic maps. The topographic data for the unknown sites is then recorded and a prediction is made of these site using the data and temperatures from the known sites. The first method is a statistical regression analysis which can only be done with the aid of a large computer. The second method is a simplified version of the first which can be implemented on a smaller machine or by hand if necessary. (Author)

AD-A021 638/2CP PC A05/MF A01 Environmental Prediction Research Facility (Navy) Monterey Calif A Generalized Version of the Fields by Information Blending (FIB) Technique Byron R. Maxwell. Feb 76, 90p Rept no. ENVPREDRSCHF-tech note-24

Descriptors: "Weather forecasting, "Numerical analysis, Wind, Climate, Differential equations, Computerized simulation, Computer programs, Atmosphere models. Identifiers: "Numerical weather forecasting,

Identifiers: "Numerical weather forecasting, FIB(Fields by Information Blending), Fields by information blending.

This report describes a generalized version of the Fields by Information Blending (FIB) technique for generating a scalar analysis. Several highly successful versions of the FIB were developed for operational use at the Fleet Numerical Weather Central. These versions are restricted to the analysis of a particular variable such as sea level pressure, surface winds, or sea surface temperature on a fixed grid projection such as the FNWC 63 x 63 polar stereographic projection. The generalized version described in the report can be used for the analysis of any scalar variable on a prescribed but variable rectangular domain. The report includes a detailed discussion of the underlying principles of the FIB and a basic evaluation of this generalized version for some selected test cases.

AD-A021 772/9CP PC A04/MF A01 Stanford Research Inst Menlo Park Calif Implementation of the SRI Objective Cloud Tracking System at NEPRF Final rept. Jul 74-Sep 75 on Task A David J. Hall, and Daniel E. Wolf. Oct 75, 56p EPRF-TR-9-75-SRI Contract N66314-74-C-2350

Descriptors: \*Clouds, \*Cloud cover, \*Tracking, Meteorological satellites, Pictures, Vector analysis, Clustering, Pattern recognition, Computer programs, Weather forecasting, Navy. Identifiers: Satellite pictures, Cloud tracking systems, Isodata computer program.

This report describes project work for the Naval Environmental Prediction Research Facility (NEPRF) of the U.S. Navy. The unique SRI Objective Cloud Tracking System (also known as ISODATA) has been converted for use on the EPRF's computer hardware - a NOVA computer. The original programs were written in FORTRAN for a CDC 6400 computer. The conversion has been carried out partly by means of an automatic conversion program and partly by mutual conversion. The report not only lists the conversion operations in detail, but also documents and adaptations to interactive use with displays can begin from a clear base.

AD-A021 786/9CP PC A02/MF A01 Aerospace Corp El Segundo Calif Chemistry and Physics Lab

Band Model Parameters for the 4.3-microns Fundamental Band of CO2 in the 100-3000 K Temperature Range Interim rept.

Stephen J. Young. 19 Feb 76, 23p TR-0076(6754-03)-1, SAMSO-TR-76-35 Contract F04701-75-C-0076, DARPA Order-2843 Descriptors: \*Carbon dioxide, \*Band spectra, Parameters, Spectrum analysis, Infrared spectroscopy, Absorption spectra, Computer programs.

Identifiers: Laboratory tests, Atmospheric attenuation.

A set of band model parameters for CO2 in the 4.3-micrometer spectral region and consistent for the entire temperature range from near-ambient atmospheric temperatures (about 200K) to gas combustion temperatures (about 2500K) is constructed. This construction is accomplished by joining together band model parameters derived from the AFCRL at-mospheric absorption line data compilation (LINAVECO2 parameters) and parameters tabulated in the NASA Handbook of Infrared Radiation from Combustion Gases (NASACO2 The former set adequately parameters). describes the low-temperature variations of the parameters, but is inadequate for high-temperature applications. The latter set is suitable for high-temperature applications, but fails for low-temperature cases. Examples of the deficiencies of these two sets are presented by comparison of predicted spectra with experimental absorption and emission spectra for low- and high-temperature gas samples. The adequacy of the combined band model parameter set (COMBCO2 parameters) is demonstrated by comparison with the same experimental data. Examples of the construction of the combined set are given, and a tabulation of the parameter set is included as an Appendix.

AD-A021 907/1CP PC A04/MF A01 Massachusetts Inst of Tech Cambridge Dept of Meteorology

Application of Satellite Cloud-Motion Vectors to Hurricane Track Prediction

Alan L. Adams, and Frederick Sanders. Dec 75, 60p Scientific-1, AFCRL-TR-75-0635 Contract F19628-75-C-0059

Descriptors: 'Tropical cyclones, 'Hurricanes, 'Weather forecasting, Radiosondes, Air mass analysis, Clouds, Motion, Vector analysis, Meteorological satellites, Pictures, Wind, Troposphere, Atmospheric motion, Linear regression analyses.

Identifiers: SANBAR computer program.

The representation of the mean tropospheric flow by satellite-derived cloud-motion vectors is studied for use in a barotropic hurricane prediction model. The systematic use of these vectors is considered over areas not covered by rawinsonde data to aid the inital analysis of the flow pattern. Linear regression analysis is used to develop equations for the pressure-averaged tropospheric flow from data at only 1, 2, or 3 levels. The equations are derived from a large sample of rawinsonde observations, used as simulated cloud-motion vectors, from the tropical and subtropical latitudes of the Northern Hemisphere. The performance of the regression equations on independent data is considered, as is the loss of skill when satellite winds are used in the equations instead of rawinsonde winds. The satellite data is applied. in a pilot study, to two operational SANBAR hurricane forecasts, with inconclusive results. (Author)

AD-A022 268/7CP PC A03/MF A01 Rand Corp Santa Monica Calif Computations with the Band Cloud Model for

the HIPLEX Workshop, June 1975 F. W. Murray. Jul 75, 39p Rept no P-5473

Descriptors: 'Artificial precipitation, 'Cloud physics, 'Atmosphere models, Computations, Computer programs, Nucleation, Two dimensional flow, Vortices, Atmospheric physics, Wind velocity, Water vapor, Ice, Particles, Mixtures, Concentration(Chemistry), Atmospheric temperature, United States, Feasibility studies, Radar reflections, Vertical orientation, Perturbations.

The High Plains Cooperative Experiment sponsored by the Division of Atmospheric Water Resource Management of the Bureau of Reclamation is a large-scale project to study the feasibility of augmenting precipitation in the High Plains region by artificial means. In July 1974 a planning workshop was held in Vail, Colorado, at which intensive studies of the requirements for cloud modeling, measurements, and design and evaluation were made. One recommendation that came from the modeling sessions was that of the models developed by the various participants be tested with the same set of data, and that another workshop be convened to compare the results. This was done, and the modeling workshop was held in Denver on 11-13 June 1975. Approximately 14 participants presented results of their models. Data for two days, 10 and 17 August 1973, for the St. Louis region from Project METROMEX were provided. The remainder of the workshop was devoted to working up recommendations for observations to be made during the high Plains Experiment both for initialization and verification of the model.

AD-A022 317/2CP PC A02/MF A01 Army Electronics Command Fort Monmouth N

A Digital Data Acquisition Interface for the SMS Direct Readout Ground Station - Concept and Preliminary Design Technical rept

George D. Alexander. Oct 75, 19p Rept no. ECOM-5577

Descriptors: 'Meteorological satellites, 'Ground stations, 'Data acquisition, Images, Digital systems, Interfaces, Data processing, Data storage systems, Information retrieval, Computer program documentation, Preprocessing, Synchronous satellites, Read out techniques, Minicomputers.

Identifiers: Computer software, Design, Digital processing.

General specifications are generated for hardware and software that will permit retrieval, preprocessing, and storage of digital meteorological satellite imagery data that are presently available to researchers only in analogue (transparency) format. (Author)

AD-A022 677/9CP PC A06/MF A01 Boston Coll Chestnut Hill Mass Space Data Analysis Lab

Theoretical and Numerical Studies of the Upper Atmosphere using Satellite and Rocket Measurments

Final rept. 4 Dec 73-3 Dec 75

Carol I. Foley, Susan H. Delay, and Jeffrey M. Forbes. 31 Jan 76, 112p BC-SDAL-76-1, AFGL-TR-76-0025

Contract F19628-73-C-0134

Descriptors: 'Upper atmosphere, 'lonosphere, 'Meteorological phenomena, 'Meteorological satellites, 'Sounding rockets, D region, Ephemerides, Protons, Atmospheric density, Atmospheric chemistry, Ionization, Earth models, Mathematical prediction, Geopotential, Computer programs.

Identifiers: E region, Thermosphere model.

lonospheric phenomena were studied based on analyses of satellite and rocket borne instrumentation measurements. Areas of interest included determination of atmospehric number densities, ionic composition, ionization production rates, and scale heights. Various geopotential and density models were used to verify results. A three-dimensional numerical model of the quiet-time thermosphere was developed. Some of the computer programs written and developed for these studies are included in this report. (Author)

AD-A022 678/7CP PC A02/MF A01 Information Design Inc Bedford Mass Analysis of Chemical Smoke Releases to Characterize Stratospheric/Thermospheric Wind Fields Final rept. 10 Apr-1 Dec 75 Sheldon B. Michaels, Jeffrey S. Morris, and Otis

Philbrick. Jan 76, 10p AFGL-TR-76-0011 Contract F19628-75-C-0146

Descriptors: "Wind, Smoke, Release, Photogrammetry, Triangulation, Position finding, Computer programs, Man computer interface, Stratosphere, Thermosphere, Chemicals, Wind direction indicators, Tracking, Radius(Measure), Densitometers, Photographic analysis, Digitizers, Subroutines. Identifiers: Chemical releases, Smoke trails.

Position data needed for triangulation of smoke trails was obtained from photographic films supplied by AFCRL. Interactive computer programs were developed to locate smoke puff centers and to estimate Gaussian radii.

AD-A022 975/7CP PC A07/MF A01 Analysis and Computer Systems Inc Burlington Mass Development of Numerical Techniques and Computer Systems for Climatological, Ionospheric and Microwave Physics Applications Final rept. 1 Mar 74-31 Dec 75 James F. Atkinson, Harold L. Dolan, Peter W. Lindstrom, and Kenneth C. Zwirble. Jan 76, 146p AFGL-TR-76-0006

Contract F19628-74-C-0122

Descriptors: \*Climate, \*Meteorology, \*Microwaves, 'Ionosphere, 'Radio astronomy, Physics, Computer programs, Transducers, Data processing, Artificial satellites, Solar physics, Numerical analysis. Identifiers: Surface acoustic waves, Total elec-

tron content.

During the period of performance, over 60 programs were completed ranging in complexity and size from conversion of programs from one language or computer system to another, to design and development of a large scale system operating in a real time environment. The computer programs and numerical techniques developed under this contract supported AFGL research projects in such areas as: Climatology, Meteorology, Microwave Physics, Ionospheric Physics and Radio Astronomy. Some of these projects are outlined in this report.

### AD-A023 078/9CP PC A03/MF A01 Harry Diamond Labs Adelphi Md Asymptotic Properties of the Mie Coefficients

Technical rept.

Dominick A. Giglio. Nov 75, 41p Rept no. HDL-TR-1733

Descriptors: 'Mie scattering, 'Asymptotic series, 'Computer programs, 'Aerosols, Coefficients, Computations, Plane waves, Spheres, Refractive index, Rayleigh scattering. Identifiers: Mie coefficient, Atmospheric attenuation, Atmospheric transmissivity.

Analytic expressions for the asymptotic forms of the Mie coefficients are derived. The asymptotic regions are defined as those where one of the dimensionless parameters x or n is much larger than the other, x being the Mie size parameter and n the coefficient index. The accuracy and range of applicability of the results is investigated and some important special cases are treated in detail. The utility of the results in numerical computations is also discussed. (Author) AD-A023 183/7CP PC E03/MF A01 Naval Oceanographic Office Washington D C A Numerical Ice Forecasting System Reference publication

Donald J. Gerson. Oct 75, 146 Rept no. NOO-RP-8

Availability: Microfiche copies only.

Descriptors: \*Sea ice, \*Ice formation, Forecasting, Mathematical programming, Marine meteorology, Weather forecasting, Numerical analysis, Mathematical prediction, Data bases, Estimates, Meteorological data, Snow, Depth, Thickness, Atmospheric temperature, Sea water, Temperature, Ocean surface, Synoptic meteorology, Computer programs, Flow charting, Arctic regions, Naval operations.

This forecasting system provides estimates of current ice thickness and forecasts of ice for-mation and thickness for 62 locations in the Arctic. It also provides forecasting aids such as selected sea surface temperatures, snow depths, mean daily air temperature trends, and degree-day accumulations. The observations are obtained on magnetic tape from the National Meteorological Center on a near-realtime basis. The forecast techniques are statistical processes based on local climatology. The system presently is producing outputs on a daily basis. It is expandable in design so that as new forecasting methods are developed they can be integrated into the program. Since the data base consists of all the world's synoptic weather observations, the expansion may be into fields other than ice prediction.

AD-A023 537/4CP PC A08/MF A01 Science Applications Inc Arlington Va Propagation Modeling and Analysis for High Energy Lasers Final rept. Jul 74-Mar 75

L. N. Peckham, P. R. Carlson, R. T. Liner, and C. W. Wilson. Apr 75, 161p Rept no. SAI-74-629-WA

Contract N60921-75-C-0007

Descriptors: 'Continuous wave lasers, 'Laser beams, Wave propagation, Atmospheric windows, Light transmission, Turbulence, Mirrors, Optical equipment, Apertures, Mathematical models, Computer programs, Deuterium compounds, Fluorides, Far field, Thermal blooming, Finite element analysis.

Identifiers: 'Atmospheric transmissivity, Atmospheric attenuation, Deuterium fluoride lasers, SAICOM computer program.

This report analyzes simplified propagation codes and recommends improved models for characterizing the propagation of high energy CW laser beams. The following are included: A simplified optical train model; Creation of SA-ICOM computer program; Molecular absorption of DF laser radiation.

AD-A023 676/0CP	PC AC	2/MF A01
Naval Environmental	Prediction	Research
Facility Monterey Calif		

A Tropical Cyclone Analog Program for the Southwest Pacific Ocean and Australian Region Samson Brand, and Jack W. Blelloch. Mar 76,

Samson Brand, and Jack W. Blelloch. Mar 76, 22p Rept no. EPRF-Technical paper-1-76

Descriptors: 'Tropical cyclones, 'Computer programs, 'Weather forecasting, Australia, South Pacific Ocean, Fleets(Ships), Indian Ocean, Weather stations, Pacific Ocean Islands. Identifiers: Southeast Indian Ocean, Southwest Pacific Ocean, Guam, Mariana Islands.

A tropical cyclone analog program for the Southwest Pacific Ocean and Australian areas (SWPAC75) is described. The program is statistical computer technique to provide forecasts of Southwest Pacific Ocean and Australian region tropical cyclones from 12-72 hours. The analog program is discussed in terms of its operational use at Fleet Weather Central, Guam, Mariana Islands. (Author)

PC A03/MF A01 AD-A024 146/3CP Minnesota Univ Morris Div of Science and Mathematics

lonospheric Chemistry: Comparison of AIRCHEM Predictions with Results of Laboratory Simulations Final rept.

Merle N. Hirsh, 30 Dec 75, 45p ABO-12145.1-BTI

Grant DAHC04-74-G-0045

See also report dated Jul 74, AD-785 713.

Descriptors: "lonosphere, "Aeronomy, Laboratory tests, Field tests, Reaction kinetics, Tables(Data), Graphs, Ionospheric chemistry, Nitrogen oxides, Nitrogen, Oxygen, Water, Carbon dioxide, lons, Ozone.

Identifiers: \*Atom molecule interactions. AIRCHEM computer code, Computer applications

The AIRCHEM code has been used to calculate the time evolution of ionic and neutral species during a 10 raised to the third power-second bombardment of airlike N2:02 mixtures at p02 and 5 Torr and 300K by 1-MeV electrons. To test the sensitivity of the predictions to assumptions regarding the production rates of specific atomic and molecular ionic and metastable species in collisions of energetic electrons with N2 and O2 molecules, three sets of rates currently used by aeronomists were employed, as tabulated below; here Q(X) is the number of X produced per secondary electron. The importance of Q(N2D) on the buildup of NO and NO2, and on the resulting behavior of O3, is demonstrated. Implications to the ion spectra are pointed out. Etfects of assumed initial concentrations of NO2 in the 10 raised to -7 through 10 raised to -8 range are noted. Ion spectra obtained in the laboratory during elec-tron bombardment of airlike N2O2 mixtures containing traces of H2O and CO2, at 2 and 5 Torr, were compared with the predictions based on AIRCHEM. Many features of the ion spectra agree with theory. Thus, the general ionic composition of the laboratory plasma is as exnected.

# AD-A024 311/3CP

PC A06/MF A01 Massachusetts Inst of Tech Lexington Lincoln Lab

Statistics of Global IR Atmospheric Transmission

Project rept

Anthony P. Modica, and Herbert Kleiman. 3 Mar 76, 101p TT-7, ESD-TR-76-67 Contract F19628-76-C-0002, ARPA Order-2752

Descriptors: \*Light transmission, \*Infrared radiation, Attenuation, Atmospheres, Transmission loss, Visibility, Humidity, Fog, Haze, Rain, Ceiling, Atmosphere models, Mathematical prediction, Sea level, Narrowband, Line ot sight, Northern hemisphere, Meteorological data, Statistical distributions, Seasonal variations, Geographical distribution, Data bases, Electrooptics, Lasers, Weapon system effectiveness

Identitiers: LOWTRAN computer program, HOWLS project, Opaque project, Atmospheric attenuation, Atmospheric transmissivity

RAND weather data tapes have been used to obtain statistics of visibility, relative humidity and cloud ceiling heights for weather stations throughout the Northern Hemisphere to generate global probabilities for atmospheric attenuation in the infrared spectral region. The present analysis predicts seasonal probabilities tor horizontal sea level transmission losses for several narrow IR bands (1.0-1.2), (3.8-4.2), (8.0-11.5 micrometers) and four laser lines (1.06), (3.83), (473) and (10.6 micrometers). The results also include cloud-free-line-of-sight probabilities and attenuation losses through rain. (Author)

AD-A024 393/1CP PC A06/MF A01 Optical Science Consultants Yorba Linda Calif Predetection Compensated Imaging Theory Interim rept. 18 Aug 75-15 Feb 76 David L. Fried. Apr 76, 110p DR-059, RADC-TR-76-103 Contract F30602-76-C-0005

Descriptors: \*Optical images, \*Optical detec-tion, \*Light transmission, Wavefronts, Finite element analysis, Computer programs, Phased arrays, Atmospheres, Optical instruments, Atmospheric sounding, Scintillation, Integral equations, Transfer functions, Apertures. transmissivity, Identifiers: Atmospheric Isoplanatism, Atmospheric attenuation, BASIC programming language.

This report presents results on several subjects related to predetection compensated imaging. In Chanter I, it treats the relationship between noise in phase difference measurements and the resultant noise in the estimated wavefront. In Chapter II, results are presented tor use in reduction and interpretation of the AMOS site characterization measurements. Chapter III presents results on the subject of intensity isoplanatism. Chapter IV is concerned with the accuracy with which the achieved OTF of a predetection compensated image can be esti-. mated.

AD-A024 721/3CP PC A04/MF A01 Georgia Inst of Tech Atlanta School of Mechanical Engineering Geometrical Acoustics Techniques in Far Field Infrasonic Waveform Syntheses Scientific rept. no. 2 Allan D. Pierce, and Wayne A. Kinney. 7 Mar 76, 69p AFGL-TR-76-0055 Contract F19628-74-C-0065 See also AD-A022 978.

\*Ray \*Infrasonics. tracing, Descriptors: Waveforms, Far field, Acoustic velocity, Atmospheres, Wave propagation, Computations, Computer programs, FORTRAN. Caustics, functions. Identifiers: Airy \*Geometrical acoustics.

The present report is concerned with the development of a computational model tor the prediction of long range intrasound propagation in the atmosphere. The computational model discussed here is one which is partly based on ray acoustic concepts; it should be applicable to wave periods less than three minutes and is intended to complement the guided mode model of acoustic gravity wave propagation which has been extensively discussed in previous reports and papers.

AD-A024 951/6CP PC A09/MF A01 Georgia Inst of Tech Atlanta School of Mechanical Engineering Computational Techniques for the Study of Infrasound Propagation in the Atmosphere Final rept. 15 Oct 73-31 Dec 75 Allan D. Pierce, and Wayne A. Kinney. 13 Mar 76, 187p AFGL-TR-76-0056 Contract F19628-74-C-0065

Descriptors: \*Acoustic waves, \*Atmospheres, \*Wave propagation, \*Computer programs, \*Wave propagation, \*Computer programs, \*Nuclear explosion damage, Acoustic signa-tures, Waveforms, Synthesis, Numerical analysis, High frequency.

Identifiers: \*Atmospheric acoustics, Nuclear explosion effects, Infrasonic wavetorm computer , program.

A discussion is given of theoretical studies on infrasound propagation through the at-

mosphere which were carried out under the contract. Topics discussed include (1) the modification and adaptation of a computer program for the prediction of pressure signatures at large distances from nuclear explosions to include leaking guided modes, (2) the nature of guided infrasonic modes at higher infrasonic frequencies and the methods ot extending waveform synthesis procedures to include higher frequencies, and (3) the propagation of infrasonic pressure pulses past the antipodes (over halfway around the globe). Summaries are included of all papers, theses, and reports written under the contract and conclusions and recommendations for future studies are given.

PC A03/MF A01 AD-A025 280/9CP Mission Research Corp Santa Barbara Calif An Examination of the Adequacy of the Three-Species Air Chemistry Treatment for the Prediction of Surface-Burst EMP Topical rept. Apr 74-Dec 75 William A. Radasky. Dec 75, 43p MRC-R-244, DNA-3880T Contract DNA001-75-C-0094

\*Electromagnetic Descriptors: pulses, \*Mathematical models, \*Atmospheric chemistry, \*Nuclear explosions, Electrons, lons, Chemical reactions, Electron density, Gas ionization, Water vapor, Detonations, Dissociation, Reaction time, Transport properties, Surface burst.

Identifiers: DCHEM computer code, Lower atmosphere.

In the past the calculation of the air conductivity tor use in ground-burst EMP codes has been accomplished through the solution of a three species, lumped parameter set of air chemistry equations. This report examines the adequacy this treatment with respect to a more complete solution of the air chemistry equa-tions using the DCHEM code. The study is performed for variations in the peak air ionization rate and the water vapor traction; possible electron temperature dependences normally associated with large electric EMP tields were, however, neglected in order to narrow the scope of the ettort. The conclusions of this study indicate that the lumped parameter approach may be usable, but the coefficients employed in the past were in error.

AD-A025 675/0CP PC A07/MF A01 Naval Academy Annapolis Md Div of Engineering and Weapons

The Kinetics of Evolution of Water Vapor **Clusters in Air** 

Final rept. 1964-1975

A. A. Pouring. Dec 75, 140p Rept no. EW-3-74

Descriptors: "Water vapor, "Condensation, "Clustering, "Nucleation, Kinetics, Air, Supersonic nozzles, Metastable state, Supersaturation, Equilibrium(General), Computer programs, Fortran.

The kinetic theory of cluster formation in a condensing gas proposed by Buckle (1) attempts to calculate the course of homogeneous condensation trom molecular rather than thermodynamic precepts. Here it is applied to the rapid nonequilibrium expansion of atmospheric water vapor in air. A method is established for demonstrating the validity of this theory, originally proposed for a mono-molecular gas, in the case of a complicated species such as water vapor. Cluster conditions in the temperature range 210-295 K and the vapor pressure are calculated throughout the collapse of a supersaturated metastable vapor. An effective molecular pair interaction energy and nearest neighbor coordination number is tound based on the classical zero-point enthalpy ot sublimation and by iteration to satisfy initial equilibrium limiting constraints at 273 K. The internal energy redistribution frequency results trom close matching of the experimental pressure distribution. A method of determining the cluster size at which macroscopic properties become relevant is described; the size is found to be a cluster of about 122 molecules at 273 K based on a hard sphere model collision cross section. For the water vapor dimer an equilibrium constant of 4 x 10 to the -21st power/cc is found at 273 K compared to 3.1 x 10 to the -21st power/cc obtained from Keyes data. Two models for water vapor clusters result (from satisfying all con-straints imposed on the theory) which are given in terms of number of nearest neighbors, pair interaction energy per molecule (2.9kcal/mol at 273 K) and possible structure on a cluster by cluster basis for a classical hard sphere model and for a model approximating a Pauling type clathrate. (Author)

#### AD-A026 456/4CP PC A06/MF A01 Naval Postgraduate School Monterey Calif Transonic Thermal Blooming Doctoral thesis Edwin Fenton Carey, Jr. Mar 76, 120p

Descriptors: \*Laser beams, \*Thermal blooming, \*Transonic flow, Atmospheric motion, Heat, In-tegral equations, Mathematical analysis, Equations of motion, Graphs, Computer programs, Algebraic functions, Theses, FORTRAN. Identifiers: \*Atmospheric transmissivity, Atmospheric attenuation, BLOOM computer program.

According to the linearized solutions for thermal blooming, the density perturbations become infinite (i.e. 'catastrophic' defocusing) as the Mach number approaches unity. However, the nonlinearities in the transonic equations cutoff the trend to infinity, and the values of the flow perturbation quantities are finite. The nonlinear equations with heat addition are transformed into simple linear algebraic equations through the specification of the streamline geometry in the heat release region. At a Mach number of unity, streamtube area variation was found to be directly proportional to the change in total temperature. A steady, twodimensional mixed flow solution has been found for the transonic thermal blooming problem. The solution for the density perturbations within a laser beam at a Mach number of precisely unity is given.

AD-A026 512/4CP PC A05/MF A01 Utah Univ Salt Lake City Dept of Meteorology Remote Sensing of Cirrus Cloud Compositions from Satellites Interim rept.

Kuo-Nan Liou, and Thomas Stoffel. 9 Feb 76, 83p Scientific-1, AFGL-TR-76-0027 Contract F19628-75-C-0107

Descriptors: \*Infrared detectors: \*Cirrus clouds Scientific satellites, Radiative transfer, Infrared radiation, Thickness, Computer programs, Fortran, Computations, Surface temperature, Humidity, Moisture content, Ice, Reflectivity, Emissivity. Nonlinear algebraic equations. Identifiers: Remote sensing, Atmospheric transmissivity, Atmospheric attenuation.

A comprehensive description of the discreteordinate method for the transfer of infrared radiation in an isothermal cloud layer is presented. Applications of such a method to non-isothermal, inhomogeneous atmospheres containing cirrus clouds are carried out and a listing of the computational code of the infrared radiation program is given in the Appendix of this report. On the basis of this radiation pro-gram which allows non-isothermal as well as non-homogeneous structures of clouds, radiative properties of cirrus clouds are investigated in the 10 micrometers window region. Effects of non-isothermal structure of cirrus are shown to be important when its thickness is greater than about 3 km. In addition, we also find that it

seems inappropriate to define an 'emissivity' of a non-isothermal cloud. Utilizing the concept of transmissivity derived from radiative transfer analyses, a retrieval technique is developed for the determination of the surface temperature, the cirrus cloud thickness and its transmissivity at a reference wavenumber and the fraction of cirrus cloudiness. Error analyses employing climatological data reveal that independent random errors in temperature and humidity profiles introduce insignificant errors in the four resulting parameters. Based on the retrieval procedures we illustrate that the vertical ice content may be estimated assuming that ice particles are randomly oriented in a horizontal plane. (Author)

AD-A026 703/9CP PC A06/MF A01 Stanford Research Inst Menlo Park Calif ICECAP '74--Chatanika Radar Results Topical rept. Mar 74-Dec 75 Paul D. Perreault, and Murray J. Baron. Oct 75, 117p DNA-3871T Contract DNA001-74-C-0167

Descriptors: \*Atmospheric sounding. \*lonospheric disturbances, Radar, Aurorae, Incoherent scattering, Electron density, Ions, Velocity, Electric fields, Geomagnetism, Infrared radiation, Plasmas(Physics), Computer programs.

Identifiers: E region, Chatanika radar, Joule heating, ICECAP operation, \*Ionosphere.

ICECAP is an auroral measurements program to acquire geophysical data required for the formulation and testing of models and predic-tive computer codes. The models and codes describe atmospheric ionization, excitation, and optical emissions in the (Aurorally) disturbed ionosphere. These codes are needed to assess and evaluate the operation of critical DoD radar and optical systems in nuclear disturbed environments. Auroral disturbances studied in ICECAP are similar to nuclear disturbances in that both are characterized by dramatic visual displays, enhanced infrared airglows, and enhanced plasma densities resulting from the interaction of energetic electronics with the atmospheric constituents. The general objectives of ICECAP are: to provide measurements of chemical emission processes occurring in the disturbed atmosphere; to uncover unsuspected chemical or interactive processes leading to important infrared radiations; to provide experimental data against which models and computer codes can be compared and evaluated; and to provide data that can be used to update and improve theoretical models and predictive computer codes.

AD-A027 155/1CP PC A04/ME A01 Avco Everett Research Lab Inc Everett Mass Turbulence Characterization and Control Final technical rept. 1 Feb-15 Oct 75 M. G. Miller, P. L. Zieske, and G. Dryden. Jun 76, S6p RADC-TR-76-189 Contract F30602-75-C-0012, ARPA Order-2646

\*Atmospheric Descriptors: refraction 'Turbulence, \*Meteorological instruments, Atmospheric physics, Temperature, Computer programs, Data reduction, Optical data, Moni-Refractive equipment, vaii tors, Photometers, Acoustic Micrometeorology, Meteorological data, Hawaii. Identifiers: Seeing monitor.

This report covers activities relative to the characterization of the turbulent environment at the ARPA Maui Observation Station. Three areas are discussed. The first deals with the deployment of various instrumental systems to be used in the experimental program. These include micrometeorological sensors, a computer data processing system, and acoustic Sounder, the NOAA Star Sensor and the Hughes Seeing Monitor which are all presently operational.

AD-A027 297/1CP PC A04/MF A01 Lockheed Missiles and Space Co Inc Palo Alto Calif Palo Alto Research Lab Ionospheric Effects Resulting from Precipitat-

ing Electrons at Mid and High Latitudes

Final rept. 1 Nov 74-30 Jan 76 J. B. Cladis, W. E. Francis, G. T. Davidson, and M. Walt. 30 Jan 76, 58p LMSC/D500513, DNA-3884F

Contract DNA001-75-C-0139

Descriptors: \*lonospheric disturbances, \*Van Allen radiation belt, \*Electron flux, Electron scattering, High latitudes, Low energy, Com-puter programs, Machine coding, Computa-tions, Nuclear explosions, Explosion effects, Energy levels, Intensity, Atmospheric physics. Identifiers: Aurora computer program, Mid latitudes.

The distributions of electrons resulting from pitch-angle diffusion due to both wave-particle interactions at high altitudes and binary collisions in the atmosphere have been determined. The results seem to be in agreement with available data, however wave fields which may be too high are required to fit the data. Some of the computational routines and cross sections used in the low-energy (1 eV to 500 eV) portion of the AURORA code have been improved. Processes occurring in the disturbed ionosphere other than collision and magnetic mirroring are inferred by comparing measurements of pitch-angle and energy distributions of electrons in the auroral zones with distributions computed with the AURORA code. (Author)

### AD-A027 380/5CP PC A03/ME A01 Calspan Corp Buffalo N Y Simulation of Marine Advection Fog with the Calspan Advection Fog Model Using Prog-nostic Equations for Turbulent Energy

Annual summary rept. no. 4 (Part 2) Eugene J. Mack, and C. William Rogers. Jun 76,

43p Rept no. CALSPAN-CJ-5756-M-2 Contract N00019-75-C-0508

Report on Project Sea Fog. See also Part 1, AD-A027 379

Descriptors: \*Marine atmospheres, \*Fog, \*Atmosphere models, North Atlantic Ocean, Coastal regions, Nova Scotia, Radiative models, Computerized simulation, Computer programs, FORTRAN. Identifiers: Sea fog project.

Partial contents:

- The influence of radiative transfer on fog development:
- The influence of a warming sea surface on the development of advection fog;
- Observations of a marine advection fog; Numerical simulations of fog formed by turbulent heat exchange with a cold sea

surface and comparison with observations.

AD-A027 457/1CP PC A03/MF A01 Air Force Environmental Technical Applications Center Scott AFB III

A Technique to Specify Liquid Water Content at a Point in the Atmosphere

Final rept.

Robert G. Feddes. 1 Jun 73, 41p Rept no. **USAFETAC-6988** 

Descriptors: \*Atmosphere models, \*Cloud physics, Clouds, Moisture content, Meteorology, Computerized simulation, Computer programs.

The liquid water content (LWC) in clouds in a three dimensional reference system is an im-portant input parameter for operational forecast models and for design problems of systems that operate in the atmosphere. The

LWC can be calculated from the cloud's dropsize distribution. An accurate estimate of LWC/DSD depends upon knowing the cloud type, air mass type, ambient temperature, cloud age, geographical locations, degree of satura-tion, and the general meteorological condition. Estimates of these parameters can be obtained from the global cloud analysis and the 10-level synoptic parameter analysis data bases which are produced by the Air-Force Global Weather Central. A percentage of the maximum LWC possible for precipitating and non-precipitating clouds in a layer times the percentage of cloud coverage yields the LWC for that volume.

AD-A028 858/9CP PC A04/MF A01 Naval Postgraduate School Monterey Calif Pulse Height Analyzer Interfacing and Computer Programming in the Environmental Laser Propagation Project Master's thesis John Robert Plett. Jun 76, 74p

Descriptors: \*Pulse height analyzers, \*Light transmission, \*Laser beams, Atmospheric physics, Digital computers, Computer pro-grams, Interfaces, Boundary layer, Marine atmospheres, Scintillation, Extinction, Theses. Identifiers: HP-9810A computers, Atmospheric attenuation.

An effective data interface between a Victoreen PIP-400 pulse-height analyzer and a Hewlett-Packard 9810A calculator was designed, built, and tested. A calculator program was written which enabled a research group studying laser propagation in the marine boundary layer to conduct rapid, local processing of scintillation and extinction data. (Author)

# AD-A029 890/1CP

PC E03/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

Chemistry of Atmospheric Deionization Outside Intermediate-Altitude Fireballs. II. 15-, 20-, and 25-km Altitude

Final rept.

F. E. Niles. Aug 76, 122 Rept no. BRL-1909 See also Rept. no. Brl-1730 dated Jul 74, AD-923 2921

Descriptors: \*Nuclear fireball, \*Atmospheric chemistry, \*Computer programs, Nuclear explosions, Deionization, High altitude, Height of burst, Gas ionization, Machine coding, Computations, Stratosphere, Atmospheric density, Chemical reactions, Yield(Nuclear explosions), Rates, High intensity, Time series analysis, Range(Distance). Identifiers: AIRCHEM computer program,

WEPH D computer program.

Number densities for 59 atmospheric species during the deionization of the atmosphere outside the fireball from a high-yield nuclear burst at an altitude of 30 km have been calculated using the AIRCHEM computer code and are reported for altitudes of 15, 20, and 25 km and horizontal ranges of 0, 1, 5, 10, 20, and 30 km. Equivalent lumped parameters are calculated for each decade in time from 1 microsecond to 1000 seconds and compared with the lumped parameters employed in the WEPH D computer code. Important reactions at three major intervals of time during atmospheric deionization are identified. (Author)

AD-A030 157/2CP PC A13/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

AIRCHEM: A Computational Technique for Modeling the Chemistry of the Atmosphere Edna L. Lortie, Mark D. Kregel, and Franklin E. Niles. Aug 76, 300p Rept no. BRL-1913

Descriptors: \*Atmospheric chemistry, \*Atmosphere models, \*Computer programs, Descriptors:

Stratosphere, Mesosphere, Deionization, Computations, Differential equations, Concentration(Chemistry), FORTRAN, Real time, Subroutines, Machine coding, Photochemical reac-tions, Mathematical models, Photoionization. Identifiers: AIRCHEM computer program.

Deionization processes thought to describe the real-time concentrations of ion and neutral constituents in the ionized stratosphere and mesosphere can be modeled numerically by a number of techniques of varying complexity and efficiency. One very efficient technique for complex cases is the AIRCHEM computer pro-gram. The AIRCHEM program utilizes the Kmethod for solving the ordinary differential equations which arise from the mathematical description of atmospheric deionization processes, many of which are characterized by exceedingly short time constants. This report serves to give the mathematical description of atmospheric deionization as modeled by AIRCHEM and also serves as a user's manual for those interested in using the program. Included is a complete FORTRAN listing of the AIRCHEM program along with sample input and the corresponding output from a sample run. (Author)

AD-A031 212/4CP PC A06/MF A01 Utah State Univ Logan Electro-Dynamics Lab A Specular Chamber for Off-Axis Response Evaluations of High-Rejection Optical Baffling System

John C. Kemp, and Clair L. Wyatt. 1 Jun 76, 116p Scientific-4, AFGL-TR-76-0144 Contract F19628-73-C-0048 See also report dated 30 Jun 74, AD-A004 153.

Descriptors: \*Infrared spectrometers, \*Remote detectors, \*Test equipment, Calibration, Performance(Engineering), Atmospheric scattering, Radiometers, Rocketborne, Radiance, Experimental design, Specular reflection, Baffles, Optical equipment, Instrumentation, Computer programs.

Identifiers: Remote sensing, Field of view, \*Atmospheric radiance.

A special chamber for measuring the off-axis response of high-rejection optical baffling systems was designed and constructed. The ambient background power level caused by at-mospheric scattering was reduced by using high-efficienty particulate filters to remove the atmospheric aerosols and produce a cleanroom environment. The effects of surface scattering were reduced by using specular surfaces in a modified cylindrical shape to direct the scattered radiation away from the baffle entrance. Two computer programs were used to predict the magnitudes of the atmospheric and scattering. Measurements surface which separated the atmospheric scattering from the surface scattering were performed. Rayleigh (molecular) scattering was determined to be the limiting mechanism in achieving a low background.

AD-A032 317/0CP PC A06/MF A01 Saint Louis Univ Mo Dept of Earth and Atmospheric Sciences

Research to Develop Improved Models of Climatology That Will Assist The Meteorologist in the Timely Operation of the Air Force Weather Detachments Addendum to final rept.

Donald E. Martin. 31 Aug 76, 107p AFGL-TR-76-0248

Contract F19628-74-C-0004 Addendum to Rept. no. AFCRL-TR-75-0447 dated 30 Jun 75, AD-A016 850.

Descriptors: \*Weather forecasting, \*Computer programs, Atmosphere models, Climate, Air Force operations, Computer programming, Flow charting, Stochastic processes, Weather stations, Wind direction, Atmospheric temperature. Dew point.

A documentation of the computer programs which commence with processing the hourly history tapes for any given station and end up with climatic forecast aids is presented. The procedure is as follows: (1) the hourly history tapes for any given station are stratified by wind direction; (2) the hourly observations in each of these respective wind-stratified subsets are further partitioned according to the latest observed temperature dew-point spread, (3) Type I and Type II unconditionals are produced for each subset of 2 above, (4) the products of step 3 are computer smoothed, (5) Type I smoothed unconditionals are entered on the ordinate and type II on the abscissa of a Stochastic model to produce conditional probability estimates, (6) these conditional probabilities are assessed to determine the height/distance at which the cumulated conditional probabilities attain a value of 50%, and (7) the data of steps 5 and 6 are formatted.

PC A07/MF A01 AD-A032 377/4CP Naval Postgraduate School Monterey Calif A Microprogrammable Data Acquisition Control System (MIDAS IIA) with Application to Mean Meteorological Data Master's thesis

John Russell Plunkett. Sep 76, 143p

Descriptors: \*Microcomputers, \*Meteorological data, Data acquisition, Microprogramming, Digital systems, Theses, Command and control systems, Analog to digital converters, Teletype systems, Computer programs, Input output processing. Identifiers: Midas 2A system.

The construction and operation of a fully automated microprogrammable data acquisition and control system (MIDAS IIA) with application to the sampling and mean averaging of meteorological data is reported. MIDAS IIA is designed to automatically collect periodic samples of various meteorological data in digital and analog forms, compute mean averages over selectable time intervals, and produce a permanent output record of the time averaged data. The system consists of a microprocessor based on the Intel Corp. 8008 CPU, a 16-channel multiplexed analog-to-digital converter, a digital clock, an incremental digital cassette tape recorder, numerous meteorological data sensors, and a teletype for input/output. Details of system operation and programming are described. (Author)

AD-A033 465/6CP PC A05/MF A01 Naval Research Lab Washington D C Computer Codes for Use in Display of Predicted Scintillation Characteristics and Total

Electron Content John M. Goodman, and Chauncey Myers. Oct 76, 89p Rept no. NRL-MR-3397

Descriptors: "lonosphere, "Electron density, \*lonospheric scintillations, Mathematical models, Computations.

Identifiers: \*Total electron content.

The Global personality of radiowave characteristics such as amplitude scintillation S4 and group path delay may be graphically displayed through use of a plotting code in conjunction with existing scintillation and electron density models. The Fremouw-Rino-Pope model is used for deducing average scintillation attributes and the Ching-Chiu Model is used for deducing average electron density. The former model is used directly and the latter model is integrated to obtain the total electron content of the ionosphere. Since the total electron content (TEC) is proportional to the group path delay, plots of TEC are provided in the manuscript instead of the delay characteristic. Examples of both S4 and TEC are given for various environmental, diurnal, and seasonal conditions.

PC A05/MF A01 AD-A033 654/5CP Visidyne Inc Burlington Mass Analysis of High Altitude Effects Simulation (HAES) Rept. for 16 Apr 74-15 Apr 75

W. P. Reidy, T. C. Degges, and W. Neal. 1 Feb 76, 76p VI-311, Scientific-1, DNA-HAES-40 Contract F19628-74-C-0177

Descriptors: \*Atmosphere models, Electron density, Computerized simulation, Aurorae, Atmospheric physics, Infrared spectra, Carbon dioxide, Ozone, Excitation, Infrared radiation, Band spectra, Computer programs, Mathematical prediction, Weapons effects, Radiance, High altitude, Nuclear explosion simulation, Atmospheric chemistry, Spatial distribution, Night.

Identifiers: Electron deposition, ICECAP project, EXCEDE project, Spectral radiance, Energy deposition

Initial formulation of the analysis of the energy deposition and the electron density profiles in an EXCEDE-type experiment are presented. Altitude profiles are given for the night time zenith spectral radiance for CO2 bands at 4.3 micrometers and 15 micrometers and for the ozone band at 9.6 micrometers. Model calculations of the vibrational population of the first excited level of the CO2 nu sub 3 vibrational mode are also presented.

AD-A034 066/1CP PC A10/MF A01 Logicon Inc Bedford Mass Analysis and Programming for Research in

Physics of the Upper Atmosphere Final rept. 1 Sep 74-31 Aug 76 James N. Bass, Krishin H. Bhavnani, Ben -Zion J. Guz, Robert R. Hayes, and Paul N. Houle. 30 Sep 76, 212p AFGL-TR-76-0231 Contract F19628-75-C-0039

Descriptors: \*Upper atmosphere, \*Atmospheric physics, Computer programs, Ephemerides, Atmospheric density, Aurorae, Geopotential, lonospheric scintillations, Radar signals, Rocket trajectories, Orbits.

This report describes significant analyses and computer programming problems performed in support of Air Force Geophysics Laboratory scientists. Mathematical and logical procedures are discussed, and samples of results are presented. Astronomical ephemeris programs include solar-lunar and stellar viewing information, and special plots.

AD-A034 651/0CP PC A09/ME A01 Texas A and M Research Foundation College Station

Storm Surge Simulation in Transformed Coordinates. Volume II. Program Documentation Technical rent.

John J. Wanstrath. Nov 76, 178p CERC-TR-76-

3-Vol-2 Contract DACW72-73-C-0014

See also Volume 2, AD-A034 763.

Descriptors: \*Storms, \*Computer programs, Surges, Hurricanes, Equations of motion, Wind, Barometric pressure, Continental shelves, Mex-ico Gulf, Conformal mapping, Coordinates, Two dimensional.

Identifiers: Carla Hurricane, Camille Hurricane, Gracie Hurricane, Atlantic Coast(United States), Gulf Coast(United States),

A two-dimensional time-dependent numerical storm surge model using orthogonal curvilinear coordinates is presented. The curvilinear coordinate system is based on a conformal mapping of the interior region bounded by the actual coast, the seaward boundary (taken as the 180meter depth contour) and two parallel lateral boundaries into a rectangle in the image plane. Three regions of the Continental Shelf of the Gulf of Mexico and two regions of the eastern seaboard of the United States are mapped. Since the transformation is conformal, the associated modifications of the vertically integrated equations of motion and mass con-tinuity are minimized. The coast, seaward boundary, and the lateral boundaries of the computing grid are straight lines in the image plane thus facilitating the application of the boundary conditions. The final coordinates allow for the greatest resolution near the coast in a central area of principal storm surge development and modification. The model is employed in the simulation of the storm surge induced by Hurricanes Carla (1961) and Camille (1969) which crossed the gulf coast of the United States and Hurricane Gracie (1959) which crossed the east coast. Analytical interpretations of the wind and atmospheric pressure-forcing functions are used in the computations. (Author)

AD-A034 763/3CP PC A08/MF A01 Texas A and M Research Foundation College Station Storm Surge Simulation in Transformed Coordinates. Volume I. Theory and Application

Technical rept. John J. Wanstrath, Robert E. Whitaker, Robert O. Reid, and Andrew C. Vastano, Nov 76, 168p CERC-TR-76-3-Vol-1 Contract DACW72-73-C-0014 See also Volume 2, AD-A034 651.

Descriptors: \*Storms, \*Computer programs, Simulation, Hurricanes, Continental shelves, Mexico gulf, Equations of motion, Wind, Barometric pressure, Conformal mapping, Coordinates, Two dimensional. Identifiers: Carla Hurricane, Camille Hurricane, Gracie Hurricane, Storm surges.

This report is published to provide coastal engineers with the results of a study to develop an operational program for numerical simulation of storm surges on a given segment of the Continental Shelf, using a curvilinear coordinate system. The report consists of two volumes. This Volume discusses the theory and application of the transformation procedure for generating the curvilinear shelf coordinate system for particular regions, and the theory, numerical algorithm, and application of the storm surge program for simulation of Hurricanes Carla (1961), Camille (1969), and Gracie (1959). Volume II presents the program documentation and the coded programs for carrying out the coordinate transformation (CONFORM), for establishing the spatial lattice (GRID), and for carrying out the storm surge calculations on the shelf (SSURGE). The work was carried out under the wave mechanics program of the U.S. Army Coastal Engineering Research Center (CERC).

AD-A034 847/4CP PC A12/MF A01 Air Force Eastern Test Range Patrick AFB Fla Atmospheric Electricity and Tethered Aerostats, Volume I Final rept. 1 Apr 73-30 Jun 74 Toxey A. Hall. 11 May 76, 254p Rept no. AFETR-

TR-76-07-Vol-1

Contract ARPA Order-2176

Errata sheet inserted. See also Volume 2, AD-A034 848

Descriptors: \*Balloons, \*Atmospheric electricity, \*Lightning, Tethering, Lightning arresters, Protection, Warning systems, Safety, Hazards, Electrical grounding, Interactions, Predictions, Mathematical models, Computer programs, FORTRAN

Identifiers: \*Lightning protection.

The program was conducted for the purpose of determining interaction of tethered balloon systems with atmospheric electricity (particularly lightning) and identifying feasible protective systems. After a brief introductory

section math models of effects of tethered balloons on surrounding electrical field are presented. These models are then compared with measurements taken during extensive flight testing. Effects of both well-conducting and poorly-conducting tethers are shown. Section 3 presents a statistical approach to the prediction of lightning strikes to tethered balloons. Section 4 describes results of an extensive series of tests wherein balloon tethered samples, both wire rope and synthetic fiber, are exposed to simulated lightning currents. Section 5 defines systems and techniques for hardening balloon and support equipment and protection of operating personnel. Section 6 and 7 present conclusions and recommendations oriented toward tether materials, grounding and shielding systems, warning devices, and operational concepts.

AD-A035 170/0CP PC A02/MF A01 Naval Environmental Prediction Research Facility Monterey Calif Ocean Climatology Extraction and Adjust-ment Program for the Mediterranean Program

SOVEL

Taivo Laevastu. Jul 73, 24p Rept no. NEPRF-CP-Note-10

\*Marine climatology. Descriptors: \*Mediterranean Sea, \*Computer programs, FORTRAN, Surface temperature, Temperature, Salinity, Gradients, Subroutines, Underwater sound, Sound transmission.

Identifiers: Sovel computer program, Ocean temperature.

SOVEL was written as part of the Ocean Thermal Structure Analysis package for Fleet Weather Central, Rota, Spain. Its primary purpose is to extract the temperature and salinity levels (by one-degree squares) in desired locations from an ocean climatology tape. It takes the corresponding analyzed sea-surface temperature and the mixed layer depth at given locations which are read from input cards and adjusts the upper standard levels to these parameters. An additional feature of the program is the adjustment of the temperature and salinity gradients below the mixed layer depth. These gradients can be sharp indeed in the Mediterranean. Their sharpness varies with various parameters and seasons and this variation has been taken directly into consideration with this program. (Author)

PC A03/MF A01 AD-A035 504/0CP Air Force Geophysics Lab Hanscom AFB Mass Analysis of Smoke Trail Photographs to Determine Stratospheric Winds and Shears Environmental research papers Antonio F. Quesada, and C. A. Trowbridge. 8

Oct 76, 35p Rept nos. AFGL-TR-76-0243, AFGL-EBP-580

Descriptors: \*Wind, \*Wind shear, \*Stratosphere, Smoke, Tracer studies, Atmospheric motion, Dispersing, Photogrammetry, Triangulation, Photographic equipment, Computer programs, Profiles.

Time-lapse photographs of smoke trails deposited in the stratosphere have been measured and analyzed to provide data for the determination of winds and wind shears. Optimization techniques were required to define camera parameters with sufficiently high preci-sion. In combination with a triangulation program that exploits the advantages of vector and matrix methods, the techniques lead to consistent three-station results that are used to construct wind profiles with an altitude resolution of 10 m.

AD-A035 765/7CP PC A03/MF A01 Institute for Defense Analyses Arlington Va Science and Technology Div

#### Transmission Atmospheric Modeling: Proposed Aerosol Methodology with Application to the Grafenwoehr Atmospheric Optics Data Base

Final rept. Robert E. Roberts. Dec 76, 32p P-1225, IDA/HQ-76-18603

Contract DAHC15-73-C-0200

Descriptors: \*Light transmission, \*Atmosphere models, \*Aerosols, \*Infrared radiation, \*Infrared detectors, Infrared images, Extinction, Coefficients, Mie scattering, Particle size, Electrooptics, Meteorological data, Visibility, Models, Computerized simulation, Data bases

Identifiers: LOWTRAN Computer programs, Atmospheric windows, Meteorological instruments, Air pollution detection, Remote sensing, Optical measurement.

Using Mie calculations for a wide variety of measured and assumed particle size distributions, a strong relationship between the total volume content of the particulate along the transmission path and the aerosol extinction coefficient was established. Field measurements, such as those taken at Grafenwoehr, Federal Republic of Germany, further established the validity of this relationship. Both theory and experiment suggest that a phenomenological scaling of photopic transmission (related to normal meteorological visibility) to the infrared (IR) windows is possible which furthermore is independent of the structure or shape of the particle size distribution. A second important implication is that a simple, possibly remote measurement of a quantity related to the volume or mass of the aerosol could provide a direct measure of the IR transmission (an IR visibility meter). Such a routine meteorological measurement would clearly be of use to sensor performance modeling. (Author)

# AD-A037 395/1CP PC A05/MF A01 Naval Research Lab Washington D C SSPARAMA: A Nonlinear, Wave Optics Mul-tipulse (and CW) Steady-State Propagation Code with Adaptive Coordinates

Final rept.

K. G. Whitney, G. L. Mader, and P. B. Ulrich. 10 Feb 77, 80p Rept no. NRL-8074 Availability: Microfiche copies only.

Descriptors: \*Laser beams, \*Computer programs Light pulses, 'Thermal blooming, Continuous waves, High energy, Computerized simulation.

Identifiers: \*Nonlinear optics, \*Atmospheric transmissivity, Atmospheric attenuation.

This report describes the numerical procedures that are used to calculate the steady-state atmospheric propagation and thermal blooming of either a train of high-energy laser pulses or a CW beam. The calculation is performed through the aid of a sequence of coordinate and variable transformations that enable one to adapt the scale and location of the transverse coordinate system to the amount of diffraction or thermal blooming taking place during beam propagation. A description is also given of the input parameters and diagnostics provided in the calculation along with a listing of the computer program. (Author)

#### AD-A037 492/6CP PC A06/MF A01 Mcdonnell Douglas Astronautics Co-West Huntington Beach Calif Magnetospheric Magnetic Field Modeling Annual scientific rept.

W. P. Olson, and K. A. Pfitzer. Jan 77, 103p AFOSB-TB-77-0156 Contract F44620-75-C-0033

Descriptors: \*Magnetosphere, Magnetic fields, Models, Electric fields, Charged particles, Coordinates, Diurnal variations, Machine cod-

Computer Transformaing, programs, tions(Mathematics). Identifiers: Magnetopause, \*Geomagnetism.

A quantitative model of the magnetospheric magnetic field and associated procedures for accurately cataloging charge particle data out to and beyond geosynchronous orbit is developed. The magnetic field model incorporates all major magnetospheric current systems and is valid for all tilt angles; i.e., angles of incidence of the solar wind on the dipole axis. The model accurately represents the total magnetospheric magnetic field for conditions of low magnetic activity and to a geocentric distance of 15 earth radii or to the magnetopause. A new (B, I) coordinate system is developed to more accurately organize charged particle data. The electric field produced by the daily varying tilt angle is computed. (Author)

#### AD-A038 132/7CP PC A04/MF A01 Stanford Research Inst Menlo Park Calif Modeling of Transionospheric Radio Propagation

Final quarterly technical rept. 16 Feb-14 May 75 E. J. Fremouw, and C. L. Rino. Aug 75, 54p Contract F30602-74-C-0279, ARPA Order-2777

Descriptors: \*lonospheric scintillations, lonospheric models, Radio waves, Geomagnetism, Scattering, Computer programs, Gaussian noise, Statistical processes, Global. Identifiers: \*Radio transmission.

This is the final quarterly technical report on a one-year contract to extend and improve an existing empirical model for worldwide behavior of ionospherically imposed radio-wave scintillation. The objectives of the project were (1) to improve the accuracy of model-based calculations of the intensity-scintillation index and (2) to develop a capability for full description (from the point of view of engineering applications) of the first-order, complex-signal statistics that characterize the trans-ionospheric radio communication channel. A follow-on project has been initiated to extend the channel model to include second-order signal statistics in the temporal, spatial, and spectral domains. The first priority in the follow-on work will be to calculate the fluctuation spectra of relevant signal parameters. In addition, it is intended to extend validity of the model into the multiple-scatter reaime.

AD-A038 155/8CP PC A03/MF A01 Naval Surface Weapons Center Dahlgren Lab Va

A Gravitational Potential for Atmospheric Earth Tides Caused by the Moon Final rept.

R. Manrique, and W. Groeger. Nov 76, 26p Rept no.NSWC/DL-TR-3638

Descriptors: \*Atmospheric tides. \*Orbits Earth(Planet), Artificial satellites, Gravitational fields, Potential theory, Perturbations, Acceleration, Moon, Motion, Computer programs, Equations of motion, Computations. Identifiers: Terra Equations of motion, Geopotential.

A potential function is presented for the force by which the atmospheric tide bulge acts on orbits of artificial earth satellites. The tidal bulge is assumed to result from the fact that the earth rotates within the field of lunar mass attraction. the latter being inhomogeneous across the terrestrial globe. Only the main term of the semidiurnal tide is considered in this report. The perturbing acceleration associated with the tide potential is also specified. The latter is intended for use with computer programs for satellite geodesy. (Author)

AD-A038 263/0CP PC A02/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

The Effects of Uncertainties in the Two-Body Ion-Ion Recombination Coefficient Upon Computed Ion Distributions in the Stratosphere and Mesosphere Final rept.

Joseph M. Heimerl. Mar 77, 18p Rept no. BRL-1972

Descriptors: \*lon ion interactions. \*Recombination reactions, \*Upper atmosphere, Atmospheric chemistry, Reaction kinetics, Coefficients, Machine coding, Communication and radio systems, Very low frequency, Radiation attenuation.

Identifiers: Airchem computer program, \*Mesosphere, \*Stratosphere.

A version of the AIRCHEM code (BENCHMARK-76) has been used to study the sensitivity of the daytime ionic populations to decade changes in selected values of the two-body ion-ion recombination rate coefficient over the altitude range 30-80 km, inclusive. At one extreme, computed ionic populations change by as much as a factor of two in isolated cases. At the other extreme much smaller changes are computed. (Author)

AD-A038 299/4CP PC A13/MF A01 Illinois Univ At Urbana-Champaign Dept of Techniques of Determining Ionospheric

Structure from Oblique Radio Propagation Measurements

Final rept. Oct 74-Sep 76

N. Narayana Rao, K. C. Yeh, M. Y. Youakim, K. E. Hoover, and P. Parhami. Dec 76, 282p UILU-Eng-76-2559, TR-59, RADC-TR-76-401 Contract E19628-75-C-0088

Descriptors: \*Radio transmission, \*!onosphere, Ionospheric propagation, Aiming, Backscattering, Ray tracing, Inversion, Computer applications, Aspect angle, Computer programs. Identifiers: \*Atmospheric sounding.

Computer techniques are developed to home the ray at a specified location with specified ac-curacy. Several methods have been investigated whereby oblique radio propagation data can be used to obtain ionospheric profiles. In one method the optimum quasiparabolic layer can be found that is supposed to fit the given data within a tolerable error. Another method makes use of the Backus-Gilbert inversion technique. (Author)

# AD-A038 399/2CP

MF A01

Cramer (H E) Co Inc Salt Lake City Utah Mixing-Layer Analysis Routine and Transport/Diffusion Application Routine for EPAMS . Final rept.

R. K. Dumbauld, and J. R. Bjorklund. Mar 77, 285p TR-76-106-01, ECOM-77-2 Contract DAAD07-76-C-0023 Availability: Microfiche copies only.

Descriptors: \*Atmosphere models, \*Boundary layer, \*Air pollution, \*Computer aided diagno-sis, Mixing, Depth, Layers, Transport proper-ties, Diffusion coefficient, Predictions, Sensitivity, Computer programs, Automation, Numerical analysis, Wind, FI Grids(Coordinates), Flow charting. Flow fields.

This report describes the development of two subelements of the U.S. Army Experimental Prototype Automatic Meteorological System (EPAMS). One of the subelements is a diagnostic routine (computer program) for the automatic calculation of the mixing depth, as well as the wind velocity and other meteorological parameters in the surface mixing layer, for a mesoscale calculation grid in complex terrain. The output from this routine is used with the

second subelement--a transport/diffusion application routinet-to calculate concentration/dosage fields produced by pollutant emissions from selected sources located within the calculation grid. A two-layer shallow-fluid numerical model is used in the diagnostic routine to calculate the mesoscale wind field. The concentration/dosage fields calculated by the transport/diffusion application routine are obtained by solving generalized dispersion models for both continuous and instantaneous sources. In addition to descriptions of the modeling techniques, calculation procedures and computer program operations, example solutions for several case studies at White Sands Missile Range are also presented. (Author)

AD-A038 869/4CP PC A16/MF A01 Parke Mathematical Labs Inc Carlisle Mass Analysis and Synthesis of Model lonograms Using 3D Ray Tracking Techniques Final rept. Aug 75-Oct 76 Barbara Langworthy, Theodore Barrett, Dean Bandes, and Lorenzo Calabi. Feb 77, 357p RADC-TR-77-60 Contract F19628-76-C-0029

Descriptors: \*lonospheric models, \*lonospheric propagation, \*lonograms, \*Ray tracing, Computer programs, Three dimensional, High frequency, Backscattering, Computerized simulation, Leading edges, Algorithms, Subroutines, Digital computers, Data storage systems, Instruction manuals, Electron density, Geomagnetism, Sweepfrequency radar, Over the horizon detection, Polar regions. Identifiers: Jones-Stephenson ray tracing, User manuals.

A system of digital computer programs for use with the Jones-Stephenson ray trace program is described. Using these programs it is possible to: (1) Produce complex ionospheres with simple input techniques; (2) Trace rays through very large ionospheres by the use of disk storage and word packing techniques; (3) Calculate power loss due to absorption, spreading, backscatter, and antenna patterns; (4) Produce leading edge ionograms; a dominant feature of full backscatter ionograms; (5) Produce probable model ionosphere parameters from information obtained from the leading edge ionograms; and (6) Produce many forms of ray trace information displays including various synthesized backscatter ionograms. (Author)

AD-A039 535/0CP PC A03/MF A01 Radiation Research Associates Inc Fort Worth Tex

Solar Infrared Reflection and Infrared Emission from a Dust Loaded Cloud

Topical rept. M. B. Wells. 6 May 77, 28p RRA-M7701, AFTAC-TR-77-14

Presented at the Annual Satellite Diagnostic Working Group Meeting, Patrick AFB, Fla., 8-10 Feb 77.

Descriptors: 'Infrared detection, 'Dust clouds, Dust, Deserts, Airborne, Saharan Africa, Solar radiation, Reflection, Reflectivity, Load distribution, Cumulus clouds, Scattering, Detectors, Scientific satellites, Detection, Altitude, Monte Carlo method, Computations, Blackbody radiation, Computer programs, Atmospheres, Emission.

Identifiers: Meteorological instruments.

This paper presents the results of Monte Carlo calculations of reflected sunlight and air emission in the 2.653 micrometers to 2.760 micrometers wavelength band for satellitebased detectors viewing a cumulus cloud loaded with various amounts of Sahara dust positioned between 14 and 15 km altitude. The results of the calculations showed that the presence of a dust loading of .00005 cu. cm. of Sahara dust per m cubic meter of the cloud probably cannot be detected at that wavelength. Increasing the dust loading to the cloud by a factor of 100 or more gave results that indicated that the presence of the dust could be determined by the use of reflected sunlight in the 2.7 micrometers wavelength band. Mie calculations for both the cloud and Sahara dust indicates that the best wavelength for detection of the air emission would be wavelengths near 10 micrometers. Additional calculations are in progress for other wavelengths in the 2 micrometers to 15 micrometers wavelength range.

AD-A040 701/5CP PC A05/MF A01 Air Force Geophysics Lab Hanscom AFB Mass Atmospheric Transmittance from 0.25 to 28.5 Micrometers: Supplement LOWTRAN 3B (1976)

Ènvirónmental research papers J. E. A. Selby, E. P. Shettle, and R. A. McClatchey, 1 Nov 76, 77p Rept nos. AFGL-TR-76-0258, AFGL-ERP-587

Descriptors: \*Atmospheric physics, Radiation attenuation, Spectral energy distribution, Computer programs, Machine coding, Water vapor, Atmosphere models, Boundary layer, Aerosols, Fog, Rural areas, Urban areas, Marine atmospheres.

Identifiers: LOWTRAN 3 computer program, Atmospheric attenuation, \*Atmospheric transmissivity, Ultraviolet detection, \*infrared detection.

This supplement provides several additions and updates to the LOWTRAN 3 computer code, which can be used to calculate the transmittance of the atmosphere from the ultraviolet to the middle infrared portion of the spectrum (0.25 to 28.5 micrometers) at a spectral resolu-tion of 20 cm. The major additions are the inclusion of water vapor continuum attenuation in the 3.5 to 4.2 micrometers region, and a temperature dependence to the H2O continuum attenuation coefficient in both the 4 micrometers and 10 micrometers regions. The contribution of foreign gas broadening in the 8-14 micrometers region has also been reduced. Four aerosol models are included in this supplement. These include three boundary layer aerosol models for maritime, urban, and rural conditions in the lower 2 km of the atmosphere, and a tropospheric model for use mainly above 1 or 2 km altitude. The rural model is a replacement for the average continental model presently in LOWTRAN 3. A temporary provision is also given to accommodate fog conditions when the visual range falls below 2 km. (Author)

AD-A040 915/1CP PC A04/MF A01 Utah State Univ Logan Electro-Dynamics Lab Computer-Aided Estimates of the Rotational Temperatures of O2 in the Mesosphere Shou-Chi Sue, and Doran J. Baker. Jul 76, 73p Scientific-5, AFGL-TR-76-0212 Contract F19628-73-C-0048

Descriptors: 'Mesosphere, 'Oxygen, 'Molecular rotation, Temperature, High latitudes, Hydroxides, Airglow, Band spectra, Infrared spectra, Computer programs, Molecular energy levels, Alaska.

Identifiers: Atmospheric chemistry

Measurements have been made of the apparent rotational temperature of O2 (b(1)Sigma(g0)) atmospheric (0,1) band emissions. The data were taken at nighttime in the auroral zone at Poker Flat, Alaska, on March 1, 1975. The average apparent temperature was 210 k and the zenith radiance of the band was 500 R (uncorrected for atmospheric extinction). A comparison technique was developed to compare the band shape of the measured band with theoretical spectra synthesized at different, but specific, rotational temperatures. Three methods of comparison were used and it was concluded that a sum of squares weighting approach is near optimal for estimating rotational temperatures. The effect of noise was tested by adding real typical noise to the synthetic model. The same comparison technique was then applied to assess the benefits of noise. The uncertainty of the measurement is estimated to be 5 K. A 'wavelike' fluctuation of the apparent rotational temperature, with a period on the order of 1/2 to 1 hour, was observed. The fluctuation on this occasion appeared to covary with the intensity of the OH airglow emission.

AD-A041 195/9CP PC A08/MF A01 Raytheon Co Sudbury Mass Equipment Div Weather Radar Processor and Display Radar Interface Adapter. Volume I Equipment Information rept. Peter C. Dunham, William Solimeno, Alfred Bordogna, and Charles Smith. 30 Jan 75, 157p Rept no. ER75-4084-1 Contract F19628-73-C-0279 See also Volume 2, AD-A041 196.

Descriptors: "Meteorological radar, "Data processing equipment, "Weather forecasting, "Minicomputers, "Display systems, Computer programs, Interfaces, Adapters, Meteorological data, Data displays, Resolution, Colors.

This report presents the final configuration of hardware and software. It provides all data necessary to maintain the equipment. It contains theory of operation, functional descriptions, schematics, and part specifications. (Author)

AD-A041 196/7CP PC A02/MF A01 Raytheon Co Sudbury Mass Equipment Div Weather Radar Processor and Display Radar Interface Adapter. Volume II Equipment information rept. Peter C. Dunham, William Solimeno, Alfred

Bordogna, and Charles Smith. 30 Jan 75, 24p Rept no. ER75-4084-2 Contract F19628-73-C-0279 See also Volume 1, AD-A041 195.

Descriptors: \*Meteorological radar, \*Data processing equipment, \*Weather forecasting, \*Minicomputers, \*Display systems, Real time, On line systems, Computer programs, Interfaces, Adapters, Meteorological data, Data displays, Resolution, Colors.

This report contains the information necessary to operate the Weather Radar Processor and Display Equipment. (Author)

AD-A042 059/6C P PC A05/MF A01 Naval Postgraduate School Monterey Calif Statistical Diagnostic Modeling of Marine Fog Using Model Output Parameters Master's thesis

Brian L. Van Orman, and Robert J. Renard. Jun 77, 91p Rept no. NPS-63Rd77061

Descriptors: 'Fog, 'Atmosphere models, 'Marine meteorology, North Pacific Ocean, Meteorological data, Weather forecasting, Spatial distribution, Statistical analysis, Computer programs, Visibility, Mathematical prediction, Climate, Ocean surface, Synoptic meteorology, Advection, Linear regression analyses, Diagnosis(General), Barometric pressure, Sea level, Heat flux, Evaporation, Summer, Theses. Identifiers: 'Marine fog, Sea fog.

Diagnostic model output parameters, provided by the Fleet Numerical Weather Central, Monterey, Calif. (FNWC), and the marine fog frequency climatology developed at the Naval Postgraduate School, are statistically processed in context with marine surface synoptic ship reports in order to develop a linear regression scheme to model distribution of marine fog. The study area includes a large

section of the North Pacific Ocean (from 30-60N) at 0000 GMT, 1-30 July 1976. The diag-nostic capabilities of the regression equations are analyzed through the use of three verification scoring systems. Improvement over cli-matology and FNWC's operational fog proba-bility program (FTER), is demonstrated. Selective mappings of the regression equation outputs and categorized observations are intercompared with the sea-level pressure analysis; FTER; and the evaporative heat flux--the most significant predictor parameter

# AD-A042 263/4CP

MF A01

## Aerodyne Research Inc Bedford Mass MRDA - A Medium Resolution Data Analysis Code for the HP 2100 Computer

Final rept. 26 Mar-31 Dec 76 D. Kryger, and D. Robertson. Jan 77, 89p ARI-RR-97, AFGL-TR-77-0044

Contract F19628-76-C-0173, ARPA Order-2656 See also Rept. no. AFCRL-TR-73-0096, AD-762 904, and Rept. no. AFCRL-TR-75-0255, AD-A017 734

Availability: Microfiche copies only.

Descriptors: \*Atmosphere models, \*Computer programs, Transmittance, Data reduction, Minicomputers, Light transmission, Radiative transfer, Infrared radiation, Radiation attenuation, Resolution. Identifiers: HP 2100 computers, \*Atmospheric

transmissivity, Atmospheric attenuation, MRDA computer program.

This report describes the Medium Resolution Data Analysis Code (MRDA) which is a com-puter software code developed to run on the HP2100 mini-computer at the Air Force Geophysics Laboratory. The code calculates the atmosphere transmittance of radiation in the 1800-6000/cm range. The code can be used for a variety of paths(horizontal, vertical, downward, to space, etc). The user has the option of using either the 1962 U.S. Standard Model atmosphere or radiosonde data Because of size restriction on the HP2100, MRDA is dividied into seven overlays. The spectral absorption coefficients, which are calculated from the AFGL compilation of molecular line parameters (HITRAN), are accessed from a data tape. The transmittance calculated for horizontal paths near sea level agree with those calculated with HITRAN, but MRDA tends to overestimate the absorption in the neighborhood of strongly absorbing lines. Some recommendations for further upgrading of the code are given. (Author)

AD-A042 374/9CP PC A05/MF A01 General Electric Co Syracuse N Y Heavy Military Equipment Dept

An Analysis of Ionospheric Electron Content Measurements Utilizing Satellite-Emitted Signals

George H. Millman. Dec 74, 84p Rept no. **R74EMH24** 

Descriptors: "lonosphere "Electron density Scientific satellites, Radio signals, Faraday effect, Polarization, Doppler effect, Frequency shift, Rotation, Time dependence, Three dimen-sional, Geomagnetism, Earth models, Ray trac-Phase shift, Least squares method, ing, lonosondes, Computerized simulation, Computer programs

Analytical techniques are available which make use of the Faraday polarization rotation and the Doppler frequency shift phenomena for deter-mining the ionospheric electron content by the passive monitoring of radio wave transmissions emanating from earth satellites. The accuracy of the various techniques can be evaluated by the simulator-computer program described in this report. The major components of the simulator consist of a satellite-orbit generator, a time-variant three-dimensional electron density

model and an earth magnetic field model expressed in terms of a series of spherical harmonics. Ray tracings are performed utilizing Simpson's rule for numerical integration of the definite integrals defining the propagation phenomena. Preliminary results are presented of an analysis performed for one location in the midlatitudes. (Author)

AD-A042 549/6CP PC A04/MF A01 Air Force Flight Dynamics Lab Wright-Patter-son AFB Ohio

A Description of the Atmospheric Turbulence Environment Derived from the Critical Atmospheric Turbulence (ALLCAT) Program Final rept. Apr 63-Dec 72

Paul L. Hasty. Apr 77, 66p Rept no. AFFDL-TR-77-4

Descriptors: \*Atmospheric motion. \*Turbulence, \*Computer programs, Wind velocity, Gusts, Criticality, Parametric analysis, Scaling factors, Power spectra, Density, Aviation safety, Hazards, Flight, Takeoff, Aircraft landings, Clear air turbulence. Identifiers: ALLCAT computer program.

This report summarizes the important findings of the individual projects of the Critical Atmospheric Turbulence (ALLCAT) Program. The basic gust parameters are presented for the various altitude regions. Power spectral densities are presented and the results of the investigation are presented in a form useful for gust design procedures. Scale lengths, turbulence intensity, and percentage of flight time in turbulence are presented as a function of altitude. (Author)

AD-A042 624/7CP MF A01 Westinghouse Defense and Electronic Systems Center Baltimore Md HIDE Revised Wavelength Resolution Emission and Transmission Model Interim technical rept. 28 Mar 74, 224p Contract DAAJ01-72-C-0447 Availability: Microfiche copies only.

Descriptors: 'Light transmission, 'Atmosphere models, "Infrared signatures, "Exhaust gases, Background radiation, Computer programs, Contrast, Suppression, Masking, Exhaust plumes, Exhaust pipes, High temperature, Infrared detection, Range(Distance), Light scattering, Atmospheric physics, Water vapor, Car-bon dioxide, Emission spectra, Infrared spectra, High resolution, Long path infrared equipment.

Identifiers: \*HIDE computer program, Rocket exhaust, Infrared detection, Remote sensing, Atmospheric transmissivity, Atmospheric attenuation.

This report describes the high resolution atmospheric transmission and exhaust gas emission models to be incorporated into the HIDE(Helicopter infrared detection estimate) computer model. HIDE is intended to predict the infrared signature of suppressed aircraft 'Suppressed', as used here, implies masking of all hot metal, diluting exhaust plume gases and reducing body contrast with the background. Attention must be applied to the entire spectrum of interest (1-16 microns) and over long paths (such as 40 air masses for a line of sight tangent to the horizon). This is because the signatures of self emitting sources are in-fluenced by the relatively short intervening paths and generally dominate some spectral interval. The body contrast signature, however, is comprised from remote sources (i.e. sun, sky, albedo, etc.) which traverse long atmospheric paths to illuminate the target and this signal is contrasted against a remote background (horizon, terrain, clouds, etc.) whose radiance has also been operated on by long path constituents

AD-A042 769/0CP PC A07/MF A01 Radiation Research Associates Inc Fort Worth Tex

Monte Carlo Studies on the Time-Dependent Transport of Optical and Infrared Radiation in the Atmosphere, Volume II, Thermal Radiation Transport

Final rept. 1 Jul 75-30 Sep 76

Dave G. Collins, and Michael B. Wells. 1 Mar 77, 143p RRA-T7608-Vol-2, AFTAC-TR-77-6-Vol-2 Contract F08606-74-C-0011 See also Volume 1, AD-C010 801L.

Descriptors: "Thermal radiation, "Infrared radiation, Monte Carlo method, Light, Atmosphere models, Transport, Absorption, Mie scattering, Rayleigh scattering, Clouds, Aerosols, Computer programs, Nuclear explosions

Identifiers: Polo computer program. \*Atmospheric attenuation, Atmospheric transmissivity, Mathematical models.

This report describes modifications that were made to the POLO procedures to treat infrared absorption by the gaseous molecules in the atmosphere. Also described are the results of studies performed with the POLO procedure to compute time-dependent scattered light fluxes at satellite receivers for (1) 0.4278-, 0.75-, and 1.07-micrometer wavelength anisotropic point sources; (2) 0.4278-, 0.5-, 0.6-, 0.75-, and 1.07micrometer wavelength point isotropic sources in a 40-km meteorological range atmosphere; (3) point isotropic sources emitting in the 2.7micrometer wavelength band; and (4) point isotropic 0.4278-, 0.75-, and 1.07-micrometer wavelength sources in model atmospheres containing a cloud layer. Three computer codes are described which were developed for convoluting the POLO-calculated wavelength- and time-dependent atmospheric scattering data with wavelength- and time-dependent source data for thermal radiation sources. A calculational method is described that can be used to compute the Legendre polynomial coefficients required in discrete ordinates codes for defining the phase function for light scattering by aerosols and cloud particles.

## AD-A043 178/3CP

MF A01 Naval Research Lab Washington D C Post Stabilization Ionization Level Predictions. Volume III of the Calendar Year 1975 Annual Report to the Defense Nuclear Agen-

Memorandum rept.

Apr 77, 135p Rept no. NRL-MR-3488 Availability: Microfiche copies only.

Descriptors: \*Mesosphere, \*Nuclear weapon debris, 'Beta particles, 'Gas ionization, Wind, Nuclear clouds, Satellite communications, Mathematical models, Solar radiation, Upper atmosphere, Circulation, Electron density, Computerized simulation, Computer programs, Ozone, Stratosphere.

Identifiers: \*Radiofrequency interference.

Patches of ionized air produced by the passage through the atmosphere of beta radiation emitted from nuclear debris clouds pose a potential threat to satellite communications. The distribution of the debris and the consequent ionization has been shown to be strongly a function of the mesospheric wind fields. Observational data for these wind fields is shown, upon analysis, to be inadequate for systems application and theoretical models have been developed to remedy this. The circulations in the upper atmosphere are driven by the time-dependent influx of solar radiation which is represented by a heating function used as input to the general circulation models. An improved heating function has been obtained and included in the NRL linear model, results for which are presented. Results obtained from improvements in the NRL program for the simulation of solar tidal influences are also

presented. Finally, a computer program for predicting beta induced electron density distributions at any time after a nuclear burst is described. The program is suitably efficient for systems applications. (Author)

AD-A043 322/7CP PC A06/MF A01 Raytheon Co Wayland Mass

Liquid Water Content Analyzer. Instruction Manual Final rept.

J. H. Turner, A. J. Jagodnik, and W. C.

Anderson. Sep 75, 102p ER75-4389, DNA-4129F Contract DNA001-75-C-0050

Descriptors: 'Moisture content, Meteorological radar, Analyzers, Radiosondes, Computer programs, Instruction manuals, High altitude, Teletype systems, Display systems, Colors, Computer operators, Radar scanning. Identifiers: 'Liquid water content analyzers.

This manual provides a description of the liquid water content analyzer software and operator interaction with the analyzer system.

AD-A043 499/3CP PC A07/MF A01 General Research Corp Santa Barbara Calif The ROSCOE Manual. Volume 14b. Midlatitude Density Profiles of Selected Atmospheric Species

Final rept. 2 Mar 74-28 Feb 75

B. F. Myers. 13 Jun 75, 137p DNA-3964F-14b Contract DNA001-74-C-0182

Prepared in cooperation with Science Applications, Inc., La Jolla, CA, Rept. no. SAI-75-609-LJ-2B. See also Volume 16, AD-A043 546.

Descriptors: \*Atmospheric chemistry, Nuclear explosions, Antimissile defense systems, Radar, Radiation hazards, Atmospheric heave, Subroutines, Hydrodynamic codes, Yield(Nuclear explosions), Fallout, Nuclear radiation, Blackout(Propagation). Identifiers: \*ROSCOE computer program, Atmospheric density, Oxygen atoms, Nitrogen atoms, Oxygen, Ozone, Nitrogen oxides, Car

atoms, Oxygen, Ozone, Nitrogen oxides, Carbon dioxide, Water vapor.

Atmospheric density profiles are presented for the following species: atomic oxygen, molecular oxygen in the 1 delta g state, ozone, nitric oxide, atomic nitrogen, nitrogen dioxide, carbon dioxide, and water vapor. The profiles are intended to represent mean densities at midlatitudes for noon and midnight conditions. A review and limited discussion of recent observations and calculations are given.

AD-A043 546/1CP PC A10/MF A01 General Research Corp Santa Barbara Calif The ROSCOE Manual. Volume 16. High-Altitude Neutral-Particle Motion Final rept. 1 Mar 74-31 Jan 75

Daniel A. Hamlin, Curtis A. Smith, Melvin R. Schoonover, and Jon Y. Wang. 8 Aug 75, 203p

DNA-3964F-16

Contract DNA001-74-C-0182

Prepared in cooperation with Science Applications, Inc., La Jolla, CA, Rept. no. SAI-75-609-LJ-4. See also Volume 17, AD-A043 547.

Descriptors: 'Nuclear explosions, Radar, Antimissile defense systems, Atmospheric heave, Radiation hazards, Computerized simulation, Hydrodynamic codes, Yield(Nuclear explosions), High altitude, Quadrupole moment, Lagrangian functions, Differential equations, Blackout(Propagation).

Identifiers: \*Roscoe computer program.

Two preliminary, alternative models of the highaltitude (h 0 or 0 90 km) neutral-particle motion have been adopted for use in ROSCOE. Both models are one-dimensional spherical Lagrangian models and describe the vertical hydrodynamic motion in each geocentric column in an array of perhaps 100 such continuous but independent columns covering the disturbed region of interest. The models (SAIHYD, NRLHYD) describe the motion of a set of either Lagrangian cells or points by using the method of either difference equations or dif-ferential quadrature, respectively. Both models have automatic rezone capability. The geocentric columns defining the geometry for the calculations are described in terms of an arbitrarily positioned and oriented quadrupole coordinate system. Each Lagrangian cell or point is characterized by not only the hydrodynamic properties but also a set of chemistry quanti-ties. The chemistry is loosely coupled to the hydrodynamics. Herein are presented details of the quadrupole coordinate system, the working form of the hydrodynamic equations and their initialization and methods for solution, the results of a test problem for a large-yield event at 200-km altitude producing motion in a linear array of six columns. (Author)

AD-A043 547/9CP PC A06/MF A01 General Research Corp Santa Barbara Calif The ROSCOE Manual. Volume 17. High-Altitude Debris-Energy Deposition Final rept. 1 Mar 74-31 Jan 75 Daniel A. Hamlin, Jon Y. Wang, Melvin R. Schoonover, and John I. Valerio. 22 Sep 75, 125p DNA-3964F-17 Contract DNA001-74-C-0182 Prepared in cooperation with Science Applications, Inc., La Jolla, CA, Rept. no. SAI-75-609-LJ-Vol-5. See also Volume 3, AD-A032 640.

Descriptors: "Nuclear explosions, "Ultraviolet radiation, "Radiation hazards, "Atmospheric chemistry, Antimissile defense systems, Radar, Optical detection, X rays, Computerized simulation, Nuclear weapon debris, High altitude, Subroutines, Computer printouts, Hydrodynamic codes, Yield(Nuclear explosions), Radiation shielding, Charged particles, Blackout(Propagation).

\*Roscoe computer program.

Models of the high-altitude debris-energy partition and deposition have been adopted for use in ROSCOE. The models for the debris-energy partition and heavy-particle source spectra incorporate the work of Crevier and Kilb for the loss-cone and ion-leak particles. The deter-mination of the total (and spectrum of the) UV portion of the kinetic yield remaining after that assigned to all the heavy-particle motion is based on the work of Fajen and Sappenfield. Representative points in the spatial distribution function specified for the loss-cone and ionleak particles are used as effective source points through which magnetic field lines are traced in the downward direction through the intercepted grid cells in the geocentric quadrupole coordinate system. Conventional heavy-particle range-energy theory is employed along these paths, without regard to spiralling effects, to deposit the energy of these heavy particles in the traversed cells. Charge-exchange particles are deposited without regard to the magnetic field. The total heavy-particle energies deposited by inelastic and by elastic collisions in each cell are partitioned into various modes and species which are ultimately made compatible with the late-time grid chemistry. The UV energy groups, as well as the x-ray energy, are deposited by tracing ray paths (and con-structing line integrals of relevant species) from the event point to each cell in the high-altitude arid treated as a target cell.

AD-A043 786/3CP PC A04/MF A01 Texas Univ At El Paso Dept of Electrical Engineering

The Atmospheric Sciences Laboratory Photodissociation-Radiation Model of the Middle Atmosphere - A Users Manual Special rept. no. 11 Jerry L. Collins. Jul 77, 51p ECOM-77-4 Contract DAAD07-74-0263

Descriptors: \*Programming manuals, \*Computerized simulation, \*Atmosphere models, \*Photodissociation, Variations, Radiative transfer, Solar radiation, Upper atmosphere, Absorption coefficients, Radiation attenuation, Machine coding, Fortran. Identifiers: Univac 1108 computers.

A computer code to calculate time- and altitude-dependent photodissociation rates and transmitted solar flux intensities in the upper atmosphere has been developed, and is operational on the UNIVAC 1108 computer system. This document is presented to demonstrate to the interested user how to set up and execute the program. Included is a brief discussion of the files of absorption coefficients stored in FASTRAND direct access files and the various solar flux tape files which are stored in the Univac 1108 System B Library.

AD-A043 965/3CP PC A06/MF A01 Lockheed Missiles and Space Co Inc Palo Alto Calif Palo Alto Research Lab Investigation of Ionospheric Disturbances Final rept. 15 Apr 76-28 Jan 77 J. B. Cladis, L. L. Newkirk, M. Walt, G. T. Davidson, and W. E. Francis. 28 Jan 77, 107p LMSC/D555985, DNA-4225F Contract DNA001-76-C-0247

Descriptors: 'Ionospheric disturbances, 'Radiation effects, Trapping(Charged particles), Wave propagation, Charged particles, High altitude, Nuclear explosions, Radio waves, Radio transmission, Radio interference, Scintillation, Electric fields.

Identifiers: Aurora computer code, Farley-Buneman instability.

Methods are described for solving the diffusion equation for trapped particles precipitating in the ionosphere. It is shown that the variation of the particle distribution with spatial location. both latitudinal and longitudinal, must be considered, and that the bounce averaged diffusion equations are inadequate to treat the loss-cone distributions. The coupling of precipitating particles to the iono sphere is described, with applications of the AURORA doce. Mid-latitude WIDEBAND observations are described, with a discussion of interpretations based on trapped particle precipitation. Recent observations are described of loss-cone distributions of ions and electrons which do not fit the simple diffusion model. It is shown that these observations can be accounted for by the presence of kilovolt electric fields aligned with the magnetic field. It is shown that the ionosphere at large distances from a high-altitude nuclear explosion may be unstable to the Farley-Buneman mechanism, thereby providing a new mechanism for ionospheric irregularities. (Author)

AD-A045 090/8CP PC A03/MF A01 Institute for Defense Analyses Arlington Va Science and Technology Div Effect of Weather at Hannover, Federal Republic of Germany, on Performance of Electrooptical Imaging Systems. The Calculation Methodology for a FLIR Using a FOR-

TRAN Program Final rept. Jul 75-Jul 77 Lynne N. Seekam p. Aug 77, 39p N-842, SBIE-AD-E500-002

Contract DAHC15-73-C-0200

Descriptors: \*Forward looWeystems, Fortran, Weather, Military intelligence, Target detection, Target recognition, Electrooptics, West Germany, Mathematical models, Night vision devices.

Identifiers: Lowtran 3 computer program, \*Infrared detection, Hannover(West Germany). This paper documents the computer program (called Program FLIR) to calculate the probabilities of detection and recognition of a target by an observer using a FLIR sensor. It was written to summarize the basic concepts behind the calculation procedures in Program FLIR and to outline those procedures. (Author)

AD-A045 725/9CP PC A03/MF A01 Utah Univ Salt Lake City Negative Molecular lons Final rept. 15 Jun 74-14 Jun 77 John P. Simons. 17 Aug 77, 32p ARO-12031.10-

Grant DAAG-29-74-G-0221

Descriptors: \*Molecular ions. \*Anions Atmospheric chemistry, Reaction Hydration, Solvation, Ionization, Reaction kinetics, Hydration, Solvation, Ionization, Ligands, Chemical bonds, Dipoles, Molecular orbitals, Computations, Computer programs, Perturbation theory, Dimers.

This document look at molecular properties of some light inorganic anions, and of their hydrates and some other solvates.

#### AD-A045 997/4CP PC A03/MF A01 Emmanuel Coll Boston Mass

Calibration of the SSJ/3 Sensor on the DMSP Satellites Rept. for 1 Apr-1 Sep 77

Alan Huber, John Pantazis, A. L. Besse, and P. L. Rothwell. Sep 77, 43p Scientific-2, AFGL-TR-77-0202

Contract F19628-76-C-0039

Descriptors: \*Electron spectroscopy, \*Electrostatic analyzers, Scientific satellites, Computer programs, Electron energy, Monte Carlo method, Signal processing, Calibration, Tritium, Approximation(Mathematics), Electron multipliers, Collimators. Identifiers: DMSP satellites

The SSJ/3 sensor is designed to measure electrons from 50 eV to 20 keV. This is accomplished by using two head assemblies with common signal processing and voltage sources. The low-energy head assembly selects 50.0 to 1,000 eV electrons over eight channels with a normalization factor H 0 0.000043 sq cm-ster. The high-energy assembly similarly selects 1.00 to 20.0 keV electrons over eight channels with an H-factor equal to 0.000013 sq cm-ster. Energy resolution is approximately 10% for an isotropic incident flux. An electron beam was used to determine angular and energy response. These measurements were compared with results from a Monte-Carlo computer code and approximate analytic methods to determine the final normalizations. (Author)

AD-A046 484/2CP PC A02/MF A01 Massachusetts Inst of Tech Lexington Lincoln Lab

Automatic Real-Time Extinction Measurement Project rept.

John M. Sorvari, and Cindy E. Beane. 12 Sep 77, 16p Rept no. ETS-17 Contract F19628-76-C-0002

Descriptors: \*Photometry, \*Atmospheric densi-ty, Computer programs, Attenuation, Real time, Artificial satellites, Measurement. Identifiers: Geodss satellite.

No abstract available.

AD-A046 755/5CP PC A02/MF A01 Facilities Experimental National Aviation Center Atlantic City N J Executive Summary: New York City Pilots Au-tomatic Telephone Weather Answering Ser-vice (PATWAS) Test

Final rept. Aug 75-Jul 76

Frank Staiano, and Ephraim Shochet. Oct 77, 14p FAA-NA-77-23, FA/RD-77/80

Descriptors: \*Weather communications, "Information centers, "Telephone systems, Per-formance(Engineering), Operational test and evaluation, Pilots, Flight testing, Flight paths, Automatic, Recording systems, Computer programs, Surveys, Questionnaires, New York City(New York), Weather. Identifiers: Pilots Automatic Telephone

Weather Answering Service.

improved Pilots Automatic Telephone Weather Answering Service (PATWAS) was subjected to a year-long test in the New York City metropolitan area. The improvements consisted primarily of the following: (1) user access to three route-oriented briefings, (2) an in-crease in the number of access lines to PAT-WAS, (3) more frequent updating of information, (4) the addition of special early morning recordings, (5) capability to request meteorological and aeronautical information from the Weather Message Switching Center for incorporation into the PATWAS message, (6) reduction in the time required for updating, (7) addition of more meteorological and econautical information to the PATWAS aeronautical information to the PATWAS message, (8) new and more efficient magnetic tape equipment, (9) installation of an acoustic enclosure for PATWAS tape recording, and (10) more efficient organization of the message format. The purpose of the experiment was to test and evaluate the new PATWAS products, schedules, user acceptance, and the effects on the telephone briefing workload at the flight service station (FSS).

AD-A047 252/2CP

Lockheed Missiles and Space Co Inc Huntsville Ala Huntsville Research and Engineering Center

PC A08/MF A01

Verification of Wind Measurement with Mobile Laser Doppler System Final rept. Jul 75-Nov 76

M. R. Brashears, and W. R. Eberle. Sep 77, 162p LMSC-HREC-TR-D497071, TSC-FAA-77-14 Contract DOT-TSC-1098

Descriptors: \*Wind velocity, \*Laser velocimeters, Doppler effect, Remote detectors, Atmospheric circulation, Accuracy, Surface truth, Anemometers, Algorithms, Data processing, Validation, Computer programs, Wind shear, Identification. Identifiers:

Laser Doppler velocimeters, Meteorological instruments.

The Mobile Atmospheric Unit is a laser Doppler velocimeter system designed for the remote measurement of the three components of atmospheric wind. The unit was tested to verify the capability of the system to measure wind remotely and to evaluate alternative data-processing algorithms. Remotely measured wind data are compared with concurrent data measured by anemometers on a 150-meter meteorological tower. The test program showed that the laser Doppler velocimeter system is an accurate instrument for the remote measurement of winds.

AD-A047 357/9CP PC A04/MF A01 Jet Propulsion Lab Pasadena Calif Statistical Analysis of NOAA Solar/Weather Tapes. Program Summary Final rept.

6. Goltz, L. M. Kaiser, and H. Weiner. Jun 77, 52p JPL-5040-39, -CGR/DC-19/76 See also AD-A047 356 and AD-A047 542.

\*Cloud cover, Descriptors: \*Solar cells. Electric batteries, \*Power supplies, \*Navigational aids, Statistical analysis, Com-puter applications, Meteorological data, Solar radiation, Geographical distribution, Weather forecasting, Computer programming, Flow charting, Feasibility studies. Identifiers: DSPA computer program.

A major mission of the U.S. Coast Guard is the task of providing and maintaining Maritime Aids to Navigation. These aids are located on and near the coastline and inland waters of the United States and its possessions. A computer program, Design Synthesis and Performance Analysis (DSPA), has been developed by the Jet Propulsion Laboratory to demonstrate the feasibility of low-cost solar array/battery power systems for use on flashing lamp buoys. To provide detailed, realistic temperature, wind, and solar insolation data for analysis of the flashing lamp buoy power systems, the two DSPA support computer program sets: MERGE and STAT were developed. A general description of these two packages is presented in this program summary report. The MERGE program set will enable the Coast Guard to combine temperature and wind velocity data (NOAA TDF-14 tapes) with solar insolation data (NOAA DECK-280 tapes) onto a single sequential MERGE file containing up to 12 years of hourly observations. This MERGE file can then be used as direct input to the DSPA program. The STAT program set will enable a statistical analysis to be performed of the MERGE data and produce high or low or mean profiles of the data and/or do a worst case analysis. The STAT output file consists of a one-year set of hourly statistical weather data which can be used as input to the DSPA program.

AD-A047 526/9CP

Visidyne Inc Burlington Mass Comparison of ICECAP and EXCEDE Rocket Measurements with Computer Code Predictions

PC A10/MF A01

Final rent, 9 Oct 74-30 Dec 76

A. G. Hurd, J. W. Carpenter, T. C. Degges, W. F.

Grieder, and W. P. Reidy. 15 Feb 77, 222p VI-

381, DNA-HAES-61 Contract F19628-74-C-0177

See also Rept. no. AFCRL-ERP-466, AD-780 620.

Descriptors: \*Atmospheric sounding, \*Aurorae, \*Computerized simulation, Comparison, Emission spectra, Electron energy, Infrared spectra, Arctic regions, Radiance, Near infrared radiation, Infrared spectrometers, Rocketborne, Machine coding. Identifiers: ICECAP Operation, EXCEDE Pro-

gram, HAES Program.

An analysis is made of rocketborne HAES experiments performed as part of the ICECAP and EXCEDE II test programs. The results are compared to atmospheric emissions from code modelling. Relationships between auroral electron spectra and visible aurora have been determined. Sources of auroral IR are explained. (Author)

AD-A048 013/7CP MF A01 General Research Corp Santa Barbara Calif The ROSCOE Manual. Volume 14A. Ambient Atmosphere (Major and Minor Neutral Species and lonosphere) Final rept. 1 Mar 74-31 Jan 75 Daniel A. Hamlin, and Melvin R. Schoonover. 13 Jun 75, 151p DNA-3964F-14A Contract DNA001-74-C-0182

Prepared in cooperation with Science Applications, Inc., La Jolla, CA. Rept. no. SAI-75-609-LJ-2A. See also Volume 14B, AD-A043 499. Availability: Microfiche copies only.

\*Atmospheric Descriptors: chemistry. \*Atmosphere models, \*Nuclear explosion simulation, Computer programs, Radiation hazards, Atmospheric heave, Hydrodynamic codes, Computer programming, Computer applica-tions, Yield(Nuclear.explosions), High\_allitude, Instruction manuals, Nitrogen oxides, Oxygen. Identifiers: ROSCOE computer programs, Fortran.

A preliminary model of the ambient atmosphere and ionosphere has been adopted for use in ROSCOE. The model provides at all altitudes all the needed properties of the neutral atmosphere, including a dependence on the solar cycle and the local (apparent) time for altitudes above 120 km. Analytic fit-functions to Myer's minor-species data base provide all the minor neutral species (O, CO2, N, NO, H2O, O2(1 delta g), O3, and NO2) required by the chemistry module. Interim electron density profiles and effective ion production rates serve as the basis for the ionospheric model. Herein are presented derivations, flow diagrams, Fortran listings, and test problems. (Author)

AD-A048 014/5CP PC A03/MF A01 General Research Corp Santa Barbara Calif The ROSCOE Manual. Volume 10. Models of Ion Leak and Loss Cone Patches Final rept.

W. F. Crevier, and R. W. Kilb, 16 Dec 74, 36p DNA-3964F-10

Contract DNA001-74-C-0182

Prepared in cooperation with Mission Research Corp., Santa Barbara, CA. Rept. no. MRC-R-157. See also Volume 14A, AD-A048 013.

Descriptors: \*Atmospheric physics, \*Nuclear explosion simulation, Computer programming, Nuclear energy levels, Losses, Radiation hazards, Hydrodynamic codes, Subroutines, High altitude, Yield(Nuclear explosions), Input output processing. Identifiers: ROSCOE computer program.

This report presents simple models suitable for use in systems analysis codes of those two of the several possible energy loss mechanisms from high altitude nuclear bursts referred to as the LOSS CONE and the ION LEAK. The LOSS CONE represents the escape of debris into the narrow cone of angles parallel to the magnetic field in which the Larmor coupling theory is either inapplicable or partially fails. The ION LEAK represents the loss of energy due to ions that at any stage receive a velocity component parallel to the field that is sufficient to allow them to escape along that direction. (Author)

AD-A048 067/3CP PC A03/MF A01 Office of Telecommunications Boulder Colo Inst for Telecommunication Sciences EHF Transfer and Shielding Properties of Air (Summary of 1974-1977 Activities) Final rept.

H. J. Liebe, and G. G. Gimmestad. Oct 77, 33p OT/ITS-910, ARO-12233.8-GS

Descriptors: \*Atmospheric physics, \*Clear air Descriptors. Attinospieric physics, Clear air turbulence, Ultrahigh frequency, Shielding, Transfer functions, Microwave spectroscopy, Oxygen, Resonators, Spectrometers, Radiofrequency pulses, Paths, Transmission loss, Mathematical models, Computer programs, Data bases, Experimental data, Bibliographies.

The microwave spectrum of oxygen (O2 -MS) was investigated with a pressure-scanning dual-resonator spectrometer between 53 and 64 GHz and with a nonresonant cavity spec-trometer at 119 GHz under simulated at-mospheric conditions. This summary is intended as a wrap-up and guide to the various outputs covering three main topics: new spec-troscopic measurement technique; extensive 02 -MS laboratory studies; and engineering formulation and modeling of clear air (molecular) EHF radio path transfer properties. (Author)

#### AD-A048 481/6CP PC A07/MF A01

Regis Coll Weston Mass A Generalized Computer Program for Primitive-Equation Models Rept. for 1 Oct 76-30 May 77

Thomas J. Leonard, and Jack C. Mettauer. 30 May 77, 146p SCIENTIFIC-1, AFGL-TR-77-0183 Contract F19628-77-C-0010

Descriptors: \*Atmospheric circulation. \*Computer programs, \*Atmosphere models, Numerical integration, Mathematical prediction, Diagnosis(General), Global, Subroutines, Data storage systems, Buffer storage, Time, Savings, Flow charting. Identifiers: Primitive equations

This program is an attempt at a large scale, multi-level general circulation model of the atmosphere. The original conception was to implement a very flexible program. The major programs are: INITE (Since a typical problem will require more storage than can be accomodated, this program parcels the data and codes information as to how it is partitioned.); GEX (A solution program to step the fields ahead in time.); and DISPLY (This program displays the various fields which have been saved from the GEX run.) (Author)

#### AD-A048 564/9CP PC A12/MF A01 Sperry Research Center Sudbury Mass Development of Cloud/Fog Analysis and Application Subroutines for Experimental Prototype Automatic Meteorological System (EPAMS)

Final technical rept.

B. R. Fow, and W. D. Mount. Nov 75, 261p Rept no. SCRC-CR-75-17 Contract DAAD07-74-C-0251

Descriptors: \*Cloud cover, \*Computer programs, Fog, Subroutines, Meteorological data, Real time, Automatic, Teletype systems, Data processing, Systems analysis, Flow charting, Weather communications, Weather forecasting, Field conditions, Data reduction, Clouds, Communications networks, Tactical data systems, Tactical reconnaissance, Army operations, Field army, Fortran. Identifiers: CFAS system.

This report describes a computer software system called the Cloud/Fog Analysis system (CFAS), which was designed to be a subsystem of the U. S. Army's Experimental Prototype Automatic Meteorological System (EPAMS). The function of the CFAS is to create and maintain information on cloud cover, fog and weather in near real-time on a mesoscale grid network covering a given geographical area. The data sources which the CFAS uses include teletype network transmissions of surface and upper air observations and cloud cover prognostications. State of the art techniques in automated meteorological data analysis were adapted and utilized in the CFAS. An overall system description as well as detailed descriptions of its component modules, principally via the medium of annotated flow diagrams, are presented. (Author)

AD-A048 603/5CP PC A04/ME A01 National Severe Storms Lab Norman Okla Application of Doppler Weather Radar to Turbulence Measurements Which Affect Aircraft Final rept.

J. T. Lee. Mar 77, 52p NSSL-1, FAA/RD-77/145 Contract DOT-FA74WAI-495

Descriptors: \*Atmospheric motion. Turbulence, Meteorological radar, Thunderstorms, Doppler radar, Meteorological data, Display systems, Vortices, Wind shear, Wind velocity, Real time, Aviation safety, Tornadoes, Flight maneuvers, Flight paths, Signal processing, Radar signals, Jet fighters, Flight recorders, Computer programs, Spectrum analvsis

Identifiers: F-100 aircraft, F-101 aircraft, F-4 aircraft.

Analysis of thunderstorm turbulence hazardous to aircraft operation and coordinated Doppler radar observations indicate a high potential for Doppler radar utilization particularly the mean velocity spectrum breadth observations in defining severe turbulence areas. The mean Velocity Processor (MVP, the first real-time display of Doppler radar data) and the Multi-moment Ling Display (MMD), both developed at NSSL, are utilized with the radars to study vortex motion, turbulence, and wind shear areas. In addition, the Plan Shear Indicator (PSI) developed by the Air Force Cambridge Research Laboratory (AFCRL) was also em-ployed. A number of severe convective storms were penetrated by an instrumented aircraft directed into areas which analysis inferred to be turbulent. Aircraft recorded turbulence and concurrent Doppler data are compared. Utilization of the spectrum breadth calculated from the mean velocity data as a turbulence signa-ture is discussed. Vortex motion signature is also defined. (Author)

AD-A049 019/3CP PC A03/MF A01 Naval Oceanographic Office Washington D C The Naval Oceanographic Office Numerical Ice Forecasting System Operations Manual Technical note

Lester B. Owens, Jr, and Donald J. Gerson. Nov 74, 27p Rept no. NOO-TN-6150-33-74

Descriptors: "Weather forecasting, "Ice formation, Diurnal variations, Computer programs, Data processing, Instruction manuals, Oceanographic data, Meteorological data. Identifiers: \*Sea ice, Numerical weather forecasting

Standard computer deck set-ups and data tapes of the Numerical Ice Prediction System are specified for each day of the week. Methods for temperature forecast inputs, limits changes, expanded charts and temperature regime reversals are given. (Author)

PC A07/MF A01 AD-A049 066/4CP Mission Research Corp Santa Barbara Calif Auroral Simulation Effects Final rept. 1 Nov 75-31 Mar 77

Douglas H. Archer, and Paul W. Tarr. 31 Mar 77, 130p MRC-R-313, DNA-HAES-62, AD-E300-039 Contract DNA001-76-C-0138

Descriptors: 'Aurorae, 'Nuclear explosion simulation, Comparison, High altitude, Near in-frared radiation, Rocketborne, Sounding rockets, Experimental data, Data reduction, Mathematical models, Machine coding, Electron energy, Energy transfer, Radiance, At-mosphere models, Computer programs. Identifiers: 'Icecap operation, ARCTIC com-puter program, AURORAL computer program, HAES program, Energy deposition.

This report describes the continuing and concluding work related to analyses of ICECAP data with emphasis on short wavelength in-frared radiation in the auroral environment. A brief description of some satellite-communications related work is also included. Data from two auroral events, taken by ICECAP rockets IC 519.07-B and IC 507.11-2A, were analyzed and compared with results from computer calculations. These comparisons, along with those from earlier studies, are used to draw conclusions and recommendations related to IR modeling in the nuclear environment. A new and more accurate procedure for calculating electron temperatures was devised and incorporated into the auroral code ARCTIC. The results were used, along with ion mass spectrometer measurements in an aurora, to infer enhanced values for the NO concentration. (Author)

AD-A049 448/4CP PC A03/MF A01 Naval Research Lab Washington D C

# Comparison of the 3-5 Micrometer and 8-12 Micrometer Regions for Advanced Thermal Imaging Systems: LOWTRAN Revisited Interim rept.

A. F. Milton, G. L. Harvey, and A. W. Schmidt. 30 Dec 77, 34p NRL-8172, EOTPO-41, AD-E000-100

Descriptors: \*Infrared detection, \*Aerosols, Atmospheric windows, Light transmission, Marine atmospheres, Computer programs, Slant range, Wave propagation, Far infrared radiation, Infrared images, Electrooptics, Atmospheres, Models. Identifiers: Thermal images, \*Atmospheric

transmissivity, Rural atmospheres, LOWTRAN 3B computer program, Atmospheric attenuation

Four spectral bands for advanced infrared imaging systems are compared on the basis of calculations of atmospheric transmission, using the LOWTRAN 3B atmospheric transmission model. Slant paths, MTF effects, and Maritime and Rural aerosol models are in-cluded in the analysis. The relative advantage of the 3- to 5-micrometer band is shown to be strongly influenced by the choice of aerosol models. (AUthor)

AD-A050 170/0CP PC A05/MF A01 SRI International Menlo Park Calif Modeling for Multispectral Infrared and Microwave Remote Sensing of the Troposphere Final rept. 6 Aug 76-30 Sep 77

Paul A. Davis, and John S. Ostrem. Sep 77, 88p AFGL-TR-77-0201 Contract F19628-76-C-0275

\*Atmospheric Descriptors: sounding. Meteorological satellites, Troposphere, Clouds, Remote detectors Infrared radiation Microwaves, Atmosphere models, Mathemati-cal models, Absorption coefficients, Transmittance, Radiometry, Radiation absorption, Frequency response, Weighting functions, Computer programs, Numerical analysis. Identifiers: Remote sensing, Multiband spectral reconnaissance, Microwave equipment, In-frared detectors, Remote sensing.

The major objective of this study was to establish background information on the relative responsiveness of multispectral infrared and microwave sensors typical of satellite radiometric sounders that probe tropospheric regions containing clouds. Such information supports satellite techniques to improve sensing of atmospheric structure and cloud features, and reduces the dependence on increased surface and airborne instrumentation. Different spectral intervals with the same equivalent temperature response from the cloud-free atmosphere also facilitate the interpretation of remote measurements in the presence of clouds or other aerosols.

AD-A050 256/7CP	PC A09/MF A01
Naval Ocean Systems Cent	ter San Diego Calif
'INVERT', A Computer Pro	ogram For Obtaining
<b>D-Region Electron Densi</b>	ty Profiles from VLF
Reflection Coefficients	-
Research rent	

David G. Morfitt, and Charles H. Shellman. 30 Nov 77, 188p Rept no. NOSC-IR-782 Contract DNA-MIPR-77-521, DNA-MIPR-78-504

Descriptors: \*Electron density, \*D region, Ionospheric propagation, Computerized simulation, lonospheric models, Reflectometers, Reflectivity, Very low frequency, Fortran, Global commu-nication systems, Ionosondes, Plasma medium. Identifiers: INVERT computer program, Density profiles, Strategic communications.

INVERT is a FORTRAN computer program designed to study the feasibility of obtaining

electron density distributions of the D-region of the ionosphere. These electron density profiles would be derived from measurements of iono-spheric reflection coefficients. The radio propagation frequencies would be limited to the VLF band, particularly 3-20 kHz. This report contains a discussion of the analytical approach taken in INVERT, a FORTRAN listing of the program, instructions for using the program and some sample calculations using simulated data. The program has not been used with real data. (Author)

AD-A050 874/7CP PC A09/MF A01 Ohio State Univ Columbus Electroscience Lab Theoretical Study of the Turbulence Induced Scintillation of a Dirty Laser Beam Interim rept. Jan-Sep 77 D. D. Duncan. Jan 78, 178p ESL-4232-5, RADC-

TR-77-430

Contract F30602-76-C-0058

Descriptors: \*Laser beams, Scintillation, Atmospheric motion, Turbulence, Light scattering, Electromagnetic wave propagation, Spectral energy distribution, Gaussian quadrature, Asymptotic series, Computer programs, Theses.

Identifiers: Huygens-Fresnel principle, \*Atmospheric transmissivity, Atmospheric attenuation.

This work is concerned with predicting the temporal scintillation spectrum of a laser beam which has propagated through the turbulent atmosphere. Use is made of the Extended Huygens-Fresnel principle in deriving a very general but compact mathematical expression for the temporal scintillation spectrum of an unspecified source field with an arbitrary shaped extended receiver aperture. This formula, which is restricted to the weak turbulence regime, is then applied to the analysis of several situations of contemporary interest. Specifically, the analysis is directed toward the description of the effects of such a laser beam which is blemished in a deterministic sense. Spectra obtained under these conditions are shown to display increased sensitivity to the path distribution of the turbulence strength.

AD-A051 126/1CP PC A08/MF A01 Logicon Inc Lexington MA for Integrated Analysis and Research Systems in Physics of the Atmosphere Final rept. 1 Sep 76-30 Sep 77 James N. Bass, Krishin H. Bhavnani, Ben-Zion J. Guz, Robert R. Hayes, and Shu T. Lai. 30 Nov 77, 171p AFGL-TR-77-0265 Contract F19628-76-C-0304

\*Atmospheric Descriptors: physics, Ephemerides, Computer applications, Computer programs, Mathematical prediction, Earth orbits, Solar eclipses, Accuracy, Mapping, Ionospheric scintillations, Plasmas(Physics), Electric fields, Data reduction, Curve fitting, Steepest descent method.

This report describes significant analyses and computer programming problems performed in support of Air Force Geophysics Laboratory scientists. Mathematical and logical procedures are discussed; reference material and samples of results are presented. Various AFGL rapid orbit generation programs have been modified for satellite observation by aircraft, for prediction of longitude drift due to resonances, and for improved estimation of solar eclipsing. Geopotential model studies were conducted to identify significant terms and evaluate results in operational orbit deter-mination programs. lonospheric research programs include data reduction and analyses for plasma motion and electric field mapping, top-side plasma monitoring on a Univac 1110, and scintillations modeling for equatorial and high latitude station coverage. A geographicgeomagnetic background continental outline plot program is also described. Analysis and data processing for the Multi-Spectral Mea-surement Program includes calibrations and initial flight data base design. A general data compaction routine for use with large data bases is described. A revised astronomical ephemeris program which uses the new JPL planetary system was developed. (Author)

AD-A051 617/9CP PC A03/MF A01 Army Missile Research and Development Command Redstone Arsenal Al Technology Lab Methods for Prediction of Atmospheric Effects on Laser Guidance Systems Technical rept.

J. Q. Lilly. 15 Nov 77, 42p Rept no. DRDMI-T-78-16

Descriptors: \*Laser beams, \*Laser guidance, Atmospheric scattering, Mathematical predic-tion, Atmospheric motion, Aerosols, Radiative transfer, Radiation absorption, Molecular states, Mathematical models, Fast fourier transforms, Frequency response, Dispersion rela-tions, Monte Carlo method, Terminal homing, Computer programs.

Identifiers: \*Atmospheric transmissivity, Atmospheric attenuation.

This report describes mathematical models which predict effects of atmospheric turbulence, molecular absorption and scattering, aerosol absorption and scattering, and radiative transport. Turbulence-induced angle-of-arrival fluctuations of a laser target designator are formulated to permit calculation of the fluctuation power spectrum. A numerical procedure employing the fast Fourier transform is used to convert the frequency-dependent power spectrum into the time domain giving angular beam wander. A separate computation gives the angular beamspread due to atmospheric turbulence. Descriptions of other models to determine molecular line absorption and aerosol absorption and scattering are also given. Models developed during this effort also provide firstorder radiative transfer predictions and a multiple scattering model using Monte Carlo predictions. Utilization instructions are included for each of the models. (Author)

AD-A051 700/3CP PC A05/MF A01 Dytec Engineering Inc Huntington Beach Ca Atmospheric-Absorption Adjustment Procedure for Aircraft Flyover Noise Measurements Final rept. May-Sep 77 Alan H. Marsh. Dec 77, 90p DYTEC-R-7705, FAA-RD-77-167

Contract W1-77-5660-1

Descriptors: \*Aircraft noise, \*Overflight, \*Atmospheric physics, \*Acoustic absorption, Acoustic measurement, Computer programs, Sound pressure, Sound transmission, Jet plane noise, Atmospheric temperature, Humidity, Barometric pressure, FORTRAN, Ambient

noise, Bandpass filters. Identifiers: \*Noise pollution, Fortran 4 programming language.

An analytical method was developed for adjusting measured aircraft noise levels for dif-ferences in atmospheric absorption between test and reterence meteorological conditions along the sound propagation path. The method is based on the procedure in the proposed American National Standard ANS S1.26 for calculating pure-tone sound absorption as a function of the frequency of the sound and the temperature, humidity, and pressure of the air. Measured aircraft noise levels are assumed to be 1/3-octave-band sound pressure levels. A computer program was written in FORTRAN IV to carry out the calculations. The operation of the computer program, the required input data. and all symbols and terms used in the program

are described. A program listing of source statements is provided. Recommendations are given for applying the method to routine processing of aircraft noise measurements. (Author)

AD-A051 754/0CP PC 405/ME 401 Illinois Univ At Urbana-Champaign Dept of

Electrical Engineering A Multi-Channel Digital Data Logging System for lonospheric Scintillation Studies Scientific rept.

K. S. Yang, and A. L. Hearn. Jul 77, 85p UILU-ENG-77-2259, TR-61, ARO-14260.3ELX Grant DAAG29-76-G-0286

Descriptors: \*Digital recording systems, \*Data processing equipment, \*Ionospheric scintilla-tions, Analog to digital converters, Multichannel communications, Radio beacons, Radio in-terference, Communication satellites, Magnetic tape, Data processing, Computer programs, Control systems, Schematic diagrams. Identifiers: Satellite communications.

This report describes a multi-channel digital data logging system designed specifically to digitize and record the analog transmissions from radio beacon satellites which are subsequently used for ionospheric scintillation studies. System specifications and design diagrams are given. This system has been actually built and is currently recording data. The computer software necessary to produce a digital magnetic tape for further data processing is described in the Appendix. (Author)

AD-A052 535/2CP PC A05/ME A01 Environmental Research and Technology Inc. Concord Mass

Parameterization of Weather Radar Data for Use in the Prediction of Storm Motion and Development

Final rept. 6 Aug-31 Dec 76 Robert K. Crane. Mar 77, 100 ERT-P-2095, AFGL-TR-77-0216 Contract F19628-76-C-0264

Descriptors: \*Storms, Weather forecasting, Radar signals, Radar tracking, Motion, Parametric analysis, Doppler radar, Convec-tion(Atmospheric), Shear properties, Turbulence, Radar signatures, Algorithms, Computer programs.

Identifiers. \*Radar meteorology

Algorithms were developed for the rapid and efficient representation of digital data from a single Doppler weather radar. The data are processed to obtain a number of attributes which describe small convective cells, larger echo areas, and isolated regions of high tangential shear. The data are also processed to provide estimates of the environmental wind velocity profile and the total reflectivity profile. The attributes are obtained to represent the essential information content of the radar data with the fewest possible number of parameters. The attributes were selected to describe the development and motion of severe storms and, in particular, the small convective elements that are viewed as the building blocks of the storm. Attributes were also selected to describe isolated tangential shear maxima to obtain signatures of storm severity. (Author)

AD-A052 636/8CP PC A06/MF A01 Oklahoma Univ Norman Dept of Engineering Physics

A Study of the Applicability of Lasers to the Measurement of Tornado Wind Speeds Master's thesis

David Arnold Ross, 1976, 109p

Descriptors: \*Tornadoes, \*Pulsed lasers, \*Wind velocity, Weather forecasting, Cloud physics, Doppler effect, Heterodyning, Mie scattering, Infrared lasers, Near infrared radiation, Atmosphere models, Computerized simulation, Computer programs, Theses. Identifiers: \*Laser velocimeters, Meteorological

instruments.

The purpose of this research is to examine the theoretical possibility of using pulsed lasers to determine the velocity structure of the turbulence associated with tornadoes, particularly, the funnel cloud. Laser technology has progressed to the point that velocity discrimination on the order of 1 m/sec is achievable outside the laboratory. Furthermore, detectors are available (at the cited wavelengths) with sensitivities of the order required to process the returned signal. However, it is recommended that a system containing the required components including the ancillary equipment be constructed and tested to verify the results obtained in this study.

## AD-A052 685/5CP

PC A09/MF A01 Texas Univ At El Paso Dept of Electrical Engineering

A Computational Method for Spectral Molecular Absorption Using an Improved Voigt Algorithm

Master's thesis

Peter Clark Van Derwood. May 77, 179p

Descriptors: \*Atmosphere models, Transmittance, Molecular spectroscopy, Spectral lines, Absorption spectra, Doppler effect, Computerized simulation, Algorithms, Atmospheric temperature, Atmospheric sounding, Infrared spectra, High resolution, Remote detectors, Meteorological satellites, Atmospheric motion, Computer programs, Theses.

Identifiers: \*Infrared radiation, \*Atmospheric transmissivity, Atmospheric attenuation.

Discussion of the fundamental elements and theory related to atmospheric transmittance is presented. A line-by-line transmission computer program is developed that utilizes the combined Doppler-Lorentz (Voigt) line broadening function. In addition a rapid algorithm to evaluate the Voigt function with a maximum relative error of about one part in 10,000 is described and a software package that processes the absorption line parameters necessary to calculate transmittance is given. The results of transmittance calculations for seven channels in the fifteen micrometer band, corresponding to the seven High Resolution Infrared Radiation Sounder (HIRS) channels, are furnished and the procedure to compute a band averaged transmission discussed. It is concluded that the Voigt algorithm developed here is an excellent computational procedure and the resulting transmittance program correctly calculates atmospheric transmission. (Author)

AD-A052 686/3CP PC A07/MF A01 Texas Univ At El Paso Dept of Electrical Engineering

An Efficient Computational Approximation to the Lorentz Line Molecular Absorption Coefficient

Master's thesis

Michael T. Potter, May 77, 147p

Descriptors: \*Atmosphere models, \*Absorption coefficients, Molecular spectroscopy, Absorp-tion spectra, Lorentz force, Spectral lines, Shape, Transmittance, Nitrous oxide, Carbon monoxide, Carbon dioxide, Water vapor, Computer programs, Savings, Time, Approximation(Mathematics), Theses. Identifiers: \*Atmospheric transmissivity, At-

mospheric attenuation, Atmospheric composition

A rapid and accurate approximation to the Lorentz line molecular absorption coefficient has been developed which significantly reduces the time of line-by-line transmittance calculations. By separating computations required for each spectral line, atmospheric level, and absorbing gas under consideration, arithmetical operations are minimized. Time tests were conducted while computing the monochromatic absorption coefficient for five frequency channels in the 4.3 micrometers band. The approximation was compared to the evaluation of the Lorentz line shape (Standard manner) for a 33 level atmosphere and an average of 1000 absorption lines per region. Absorption coefficient values computed by this approximation agreed to those computed in the standard fashion to at least three decimal places regardless of molecule type, channel, or atmospheric level. Average percent-relative er-rors were typically: .0001 for H2O; .0001 for CO2: .001 for N2O; .00000001 for CO. For transmittance calculations over a band, time savings can be predicted by analyzing the required number of arithmetical operations. For 1,000 spectral lines over a bandwidth of 25/cm and a step increment of 0.02/cm, a reduction in computation time of 450% is anticipated.

AD-A053 154/1CP PC A08/MF A01 Sri International Menlo Park Ca

Chatanika Model of the High-Latitude lonosphere for Application to HF Propagation Prediction

Final rept. 1 Jan-30 Sep 77

R. R. Vondrak, G. Smith, V. E. Hatfield, R. T. Tsunoda, and V. R. Frank. Jan 78, 158p RADC-TR-78-7

Contract F19628-77-C-0102

\*Mathematical models Descriptors: 'Radar pulses, propagation, 'Mathematica \*Computer programs, High altitude, High frequency, Radio waves, Aurorae, Electron density, Incoherence, Scattering, Ray tracing, Geo-graphic areas, Data bases, D region, E band, F region.

Identifiers: Chatanika radar, Chatanika(Alaska).

Electron density measurements made with the incoherent-scatter radar at Chatanika, Alaska have been used to obtain a synoptic model of the high-latitude ionosphere. This Chatanika model is a modification of the RADC-POLAR model developed by Elkins and coworkers for use in raytracing codes for HF propagation prediction. Because the existing RADC model was derived from a larger and more geographically extensive data base than that used in this study, many of its features have been retained in the new model. The major modification that we made was an improved specification of the auroral E-layer and the altitude interval between the E and F regions. This region sometimes acts as a duct in which HF signals may travel for great distances without traversing the D region, where most absorption occurs.

AD-A053 164/0C P PC A03/MF A01 Air Force Geophysics Lab Hanscom AFB Mass Modeling of the Geosynchronous Plasma Environment. Part I Orbit

Air Force surveys in geophysics Henry B. Garrett. 14 Dec 77, 46p Rept nos

AFGL-TR-77-0288-PT-1, AFGL-AFSG-380-PT-1

Descriptors: \*Space charge, \*Space environments, Synchronous satellites, Plasmas(Physics), Ionization, Computer pro-grams, FORTRAN, Mathematical models, Electron density, Electron energy, Ion density, Temperature.

Identifiers: ATS-5 satellite.

Although the role of the environment in generating spacecraft potential variations at geosynchronous orbit is well documented, variations in the ambient environment itself have not been well-defined. Similarly, no stu-dies of the environment have attempted an analytic formulation of the various parameters needed to model the spacecraft charging

phenomenon. This paper describes the parameters needed to formulate such a model and outlines a systematic procedure for constructing a simple analytic model that includes the effects of local time and geomagnetic ac-tivity. Observational data from the ATS-5 satellite are analyzed using this procedure to give a preliminary analytic description of the geosynchronous environment in the form of a FORTRAN program. (Author)

AD-A053 178/0CP PC A12/MF A01 National Aeronautics and Space Administration Huntsville Ala George C Marshall Space Flight Center

Wind Shear Modeling for Aircraft Hazard Definition

Final rept. Apr 76-Feb 78 Walter Frost, Dennis W. Camp, and S. T. Wang. Feb 78, 257p FAA/RD-78/3

Contract DOT-FA76-WA1-620

Prepared in cooperation with FWG Assoc., Inc., Tullahoma, TN., Contract NAS8-32217.

Descriptors: \*Aviation safety, \*Wind shear, \*Aircraft landings, Hazards, Mathematical Thunderstorms, models, Gusts. Fronts (Meteorology), Low altitude, Takeoff, Glide slope, Terminal flight facilities, Computer programs, Computerized simulation.

Wind shear at low altitudes in the terminal area has been identified as hazardous to aircraft operations. Mathematical models of wind profiles have been developed for use in fast time and manned flight simulation studies aimed at defining and eliminating these wind shear hazards. A set of wind profiles and associated wind shear characteristics for stable and neutral boundary layers, thunderstorms, and frontal winds potentially encounterable by aircraft in the terminal area are given. Wind shear is defined as significant changes in wind speed and/or direction up to 500 m above the ground that may adversely affect the approach, landing, or takeoff of an aircraft. Engineering models of wind shear for direct hazard analysis are presented in mathematical formulae, graphs, tables, and computer lookup routines. The wind profile data utilized to establish the models is described as to location, how obtained, time of observation and number of data points up to 500 m. These models provide the three components of wind speed in two-dimensional vertical planes, i.e., as functions of the vertical and horizontal coordinates. Statistical data is provided, where available, as to the risk of exceeding the wind shear environment predicted by the models.

AD-A053 199/6CP PC A04/MF A01 Air Force Geophysics Lab Hanscom AFB Mass Persistence, Runs, and Recurrence of Sky Cover

Environmental research papers Iver A. Lund, and Donald D. Grantham. 30 Dec 77, 53p Rept nos. AFGL-TR-77-0308, AFGL-**FBP-621** 

Descriptors: \*Cloud cover, Mathematical models, Computer programs, Sky, Predictions, Probability density functions, Continuity, Intervals, Recursive functions, Weather forecasting, Observation, Counting methods, Weather sta-tions, Meteorological data.

A total of 511, 056 hourly observations of total sky cover, taken over a thirteen-year period at nine stations, was studied to obtain a better understanding of the characteristics of persistence, runs, and recurrence. Each hourly total sky cover observation was categorized as either zero-tenths (clear), less than or equal to three-tenths, greater than or equal to eighttenths, or ten-tenths (overcast). Probabilities of each category were estimated from relative frequencies-determined from this large data sample and were compared with some theoreti-

cal models. The models can be applied to estimate probabilities that any of the above sky cover categories will be observed for sequences of x hours, or more; for exactly x hours; or at time t and also at time t0x hours. (Author)

AD-A053 608/6CP PC A07/MF A01 New Mexico State Univ Las Cruces Development of a Real-Time Rocketsonde and a Real-Time Radiosonde Computer Pro-

gram Contractor rept.

M. Don Merrill, and Scott Fry. Jan 78, 141p ERADCOM/ASL-CR-78-0115-1 Contract DAAD07-76-C-0115

Descriptors: \*Atmospheric sounding, \*Radiosondes, Sounding rockets, Computer programs, Data acquisition, Meteorological data, Real time, Layers, Wind, Temperature, Subroutines, Assemblers, Fortran, Data processing, Input output processing, Flow charting.

This report contains a detailed description of a computer program that was developed for use with the Interdata 7/32 computer and the interfaced Nike Hercules radar systems located at the MTTR site at White Sands, New Mexico and the Poker Flat site in Alaska. The program can process in real-time a complete data reduction for an MRN rodketsonde or a list of 2 minute layer winds for a radiosonde. For a rocketsonde, the program utilizes the temperature telemetry data, the positional radar data, and the operator inputs of rocketsonde temperature calibration values and base level tie-in data from a radiosonde flight to produce an MRN(WDC-A) format listing of the following: 1 KM corrected and uncorrected winds; Significant level temperature data; 1 KM thermodynamic data; Significant level ther-modynamic data; MRN 30 cards (image); Mandatory thermodynamic data; MRN 40 cards (image); and Printer plot of X and Y component winds and temperatures versus 1 KM altitudes. For a radiosonde, the program utilizes the positional radar data to produce a listing of two-minute layer winds at 1 minute intervals.

AD-A053 620/1CP PC A05/MF A01 Sri International Menlo Park Ca Evaluation of the FIB Methodology for Appli-

cation to Cloud Motion Wind Data Final rept. 23 Jun 76-23 Jun 77 William Viezee, Daniel E. Wolf, and Roy M. Endlich. 23 Jul 77, 92p Rept no. SRI-TR-77-08 Contract N00228-76-C-3182

Descriptors: \*Meteorological data, Numerical analysis, Computer programs, Clouds, At-mospheric motion, Wind, Least squares method, Weighting functions, Meteorological satellites, Finite difference theory, Vortices, Hurricanes, Cyclones, Case studies. Identifiers: FIB computer program.

A comprehensive technique for the objective analysis of scalar and vector fields was developed. The technique is called the Fields by Information Blending (FIB) technique. This report describes the results of a research study to evaluate the application of the FIB technique to the blending of satellite-derived cloud motion wind data and their finite-difference derivatives (e.g., vorticity and divergence) with conven-tional wind analyses. The FIB program was supplied to SRI by NEPRF as part of a set of computer programs that, after adaption to SRI's CDC-6400 computer, allowed for the processing, analyses, and subsequent blending of selected trial data sets. Conclusions are based on the results obtained by executing FIB on the data of two case studies, one of the passage of Hurricane Carmen through the Gulf of Mexico (1-7 September 1974) and the other of migration of an extratropical cyclone in the

eastern North Pacific Ocean (5-8 February 1976). Both areas are over water and are relain conventional tively sparse data. so meteorological analyses could benefit from the assimilation of cloud motion data. It is concluded that the FIB program and its associated program segments are operationally suitable for blending cloud motion data with conventional wind analyses.

AD-A053 840/5CP PC A03/MF A01 Air Force Avionics Lab Wright-Patterson AFB Ohio

Meteorological Sensitivity of LOWTRAN 3B Final rept. 1 Jul-1 Oct 77 Ronald R. Gruenzel. Dec 77, 36p Rept no.

AFAI -TR-77-229

Descriptors: \*Atmosphere models, Transmittance, Computerized simulation, Radiative transfer, Frequency response, Radiation attenuation, Water vapor, Ozone, Carbon dioxide,

Air, Absorption spectra. Identifiers: LOWTRAN 3B computer program, Atmospheric composition, \*Atmospheric transmissivity, Meteorology, Atmospheric attenuation, Computer programs.

Mathematical expressions are developed which permit calculations of the meteorological sensitivity of LOWTRAN 3B, a computer code which can be used to calculate the transmittance of the atmosphere from the ultraviolet to the middle infrared portion of the spectrum. Mathematical relationships are developed which relate the water vapor line, uniformly mixed gases and ozone transmissions directly to the meteorological observables. These relationships are then used in conjunction with the existing expressions for the other atmospheric constituents to determine the meteorological sensitivity of this model. (Author)

AD-A054 013/8C P PC A02/MF A01 Photometrics Inc Lexington Mass

**Recording and Analysis of Optical Data from** Stratospheric Dynamics Experiments

Final rept. 15 Jun 76-14 Jan 78 Christian A. Trowbridge, Irving L. Kofsky, and

Ronald H. Johnson. 14 Jan 78, 24p PHM-03-78, AFGL-TR-78-0015

Contract F19628-76-C-0239

Descriptors: \*Atmospheric sounding, \*Atmospheric temperature, \*Wind shear, Optical data, Transport properties, Stratosphere, Mesosphere, Thermosphere, Triangulation, Mesosphere, Thermosphere, Triangulation, Photometry, Photographic images, Tracer studies, Trace elements, Trace gases, Upper atmosphere, Atmospheric scattering, Algorithms, Computer programs, Vector analysis, Matrices(Mathematics), Smoke, Chemicals, Atmospheric motion, Calibration.

A program whose objective is the study of stratospheric winds and temperatures, and mass transport processes in the stratosphere and upper atmosphere, is described. . These parameters are determined through reduction and analysis of photographs of sunlight-scattering chemical and smoke (particulate) tracers deposited from rockets. Computer programs implementing triangulation by vector and matrix methods were developed to measure three-dimensional smoke trail positions from multiple photographic projections of the trails. Horizontal winds and shears were derived from the transport of these trails. (Author)

AD-A054 325/6CP PC A04/MF A01 Army Armament Research and Development Command Aberdeen Proving Ground Md Ballistics Research Lab

**BENCHMARK-76: Model Computations for** Disturbed Atmospheric Conditions. II. Results for the Stratosphere and Mesosphere Technical rept.

J. M. Heimerl, and F. E. Niles. Mar 78, 54p ARBRL-TRs02050, AD-E430-017

Descriptors: "Ionospheric models, "Electron density, Ion density, Mesosphere, Stratosphere, Atmospheric disturbances, Hydrodynamic codes, Electrons, Cations, Anions, Ionization, Recombination reactions, Reaction kinetics. Identifiers: BENCHMARK-76 hydrodynamic code, AIRCHEM computer code.

Electron, positive ion and negative ion densities have been computed as a function of time and altitude under conditions where the prompt ionization parameter is set to ten to the eleventh power per cubic centimeter and the delayed ionization parameter is taken to be 10 to the eighth power ion-pairs per cubic centimeter per second. Model times extend to 10,000 s for most conditions and the altitude regions are 10-80 km for daytime conditions. Selected results, limited comparisons and brief sensitivity studies are reported together with temporal and altitude variations of the computed effective rate coefficients. (Author)

AD-A054 376/9CP PC A04/MF A01 Army Armament Research and Development Command Aberdeen Proving Ground Md Ballistics Research Lab

BENCHMARK-76: Model Computations for Disturbed Atmospheric Conditions. III. Results for Selected Excitation Parameters at 60 km

Technical rept.

J. M. Heimerl, and F. E. Niles. Mar 78, 52p ARBRL-TR-02051, AD-E430-022

Descriptors: 'lonospheric models, 'Electron density, 'lon density, Mesosphere, Atmospheric disturbances, Ionization, Anions, Cations, Excitation, Parameters, Time, Hydrodynamic codes, Reaction kinetics, Diurnal variations. Identifiers: BENCHMARK-76 hydrodynamic code, AIRCHEM computer code.

Electron, positive and negative ion densities have been computed as a function of time at an altitude of 60 km under conditions where the prompt ionization parameter was assigned the values ten to the eighth, tenth or eleventh power per cubic centimeter and the delayed ionization parameter was assigned the values ten to the sixth, eighth or tenth power ion pairs per cubic centimeter per second, subject to the condition that the magnitude of the former be greater than the magnitude of the latter. Model times extend the 10,000 seconds in most cases and computations were made for daytime and nighttime conditions. Selected results and limited comparisons are reported together with the variations of the computed equivalent rate coefficients with time and with ionization conditions. (Author)

AD-A055 273/7CP PC A04/MF A01 Stanford Research Inst Menio Park Calif Two Fortran Programs for Calculating Global Ionospheric Amplitude and Phase Scintillation

Final technical rept. 15 May 76-15 Jul 77 Charles L. Rino, Edward J. Fremouw, Anne R. Hessing, and V. Elaine Hatfield. Apr 78, 67p RADC-TR-78-87

Contract F30602-75-C-0236, ARPA Order-2777

Descriptors: 'lonospheric scintillations, 'lonospheric models, 'lonospheric disturbances, Amplitude modulation, Phase modulation, Electron density, Scientific satellites, Inclined orbit trajectories, Fortran, Subroutines, Autocorrelation, Sunspots, Drift. Identifiers: IONSCNT computer program, DIST computer program.

This report contains detailed descriptions of the FORTRAN computer codes IONSCNT,

which calculates average ionospheric amplitude and phase scintillation conditions on a global basis, and the auxiliary statistics program DIST, which uses the IONSCNT outputs to calculate fading statistics. Operating instructions for the programs together with examples and descriptions of the various outputs are included. The theoretical background and data base for the program development is contained in a separately published report.

AD-A055 463/4CP PC A03/MF A01 Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering

A Matrix Approach to a Propagation Code Master's thesis Peter Leonard Misuinas. Dec 77, 46p Rept no.

AFIT/GEO/PH/77-1

Descriptors: \*Laser beams, Carbon dioxide lasers, Atmosphere models, Pulsed lasers, Light transmission, Thermal blooming, Radiation absorption, Infrared lasers, High power, Wind, Theses.

Identifiers: COMBO computer program, \*Atmospheric transmissivity, Atmospheric attenuation.

A transfer matrix for CO2 laser beams with an assumed gaussian intensity distribution is developed that includes parameters for absorption, turbulence, and thermal blooming. Calculated parameters are an effective beam radius (1/sq e point) and an on-axis intensity. For moderate power levels, results are consistent with the computer code COMBO. The blooming model predicts results worse than those predicted by COMBO for high power levels. (Author)

AD-A055 861/9CP MF A01 Mission Research Corp Santa Barbara Calif Physically-Based High Resolution Surface Wind and Temperature Analysis for EPAMS Final rept.

Joseph A. Ball, and Steven A. Johnson. Mar 78, 278p MRC-R-7731-1-278, ERADCOM/ASL-CR-78-0043-1

Contract DAEA18-77-C-0043

Availability: Microfiche copies only.

Descriptors: "Wind, Meteorological instruments, Computer programs, High resolution, Wind direction, Atmospheric temperature, Prototypes, Automatic, Terrain, Mathematical models, Wind velocity. Identifiers: Experimental Prototype Automatic

Identifiers: Experimental Prototype Automatic Meteorological System.

This report documents the theoretical basis. development, and computational structure of a numerical computer analysis routine incor-porated in the US Army Experimental Prototype Automatic Meteorological System (EPAMS) for the estimation of surface layer wind fields at sub-mesoscale resolution (approx. 100 meters) over a limited area in broken topography. The geographically re-locatable analysis exploits detailed topographic information but requires only limited meteorological information. The physically-based analysis uses Gauss' Principle of Least Constraints for a variational adjust-ment of an initial estimated wind field in a single surface layer to conform with terrain structure, mass conservation, and buoyancy forces. Fields of surface air temperature are also produced. Initial meteorological input is obtained from the EPAMS data base by an automated analysis which is described in detail. The segmentation structure of the computational program levels is presented. Appendices provide user instructions, detailed algorithms, and example wind field estimates. (Author)

AD-705 566/CP HC E01 MF A01 Utah Univ Salt Lake City Dept of Electrical Engineering A Data Reduction Computer Program for the AFCRL Triaxial Accelerometer Inflated Falling Sphere Atmospheric Density Measuring System. Final rept. 1 Dec 68-31 Aug 69

Final rept. 1 Dec 68-31 Aug 69 Forrest L. Staffanson, and Ray G. Phibbs. Oct 69, 232p UTEC-MR-69-140, AFCRL-69-0446 Contract F19628-69-C-0124 PORTIONS OF THIS DOCUMENT ARE NOT FULLY LEGIBLE.

Descriptors: \*lonosphere, Density, \*Meteorological instruments, Falling bodies, Accelerometers, Drag, Flight speeds, Altitude, Uncertainty, Computer programs. Identifiers: Falling spheres, \*Atmospheric density.

A digital program is presented for the automatic processing of flight data from the triaxial accelerometer inflated falling sphere system developed by Air Force Cambridge Research Laboratories for the measurement of upper atmospheric air density. The program also computes the uncertainty of each final data point according to input estimates of component uncertainties and computed varying measures of data quality. Results using flight data from three recent launchings of the experiment are presented (16 and 23 May 1968 at Kauai, Hawaii and 31 January 1969 at Wallops Island, Virginia). (Author)

AD-706 410/CP HC E01 MF A01 Dartmouth Coll Hanover N H Thayer School of Engineering

Short-Term Predictions on the Course of Polar Cap Absorption.

Final rept. (Part 1), 1 Apr 68-31 May 69 Leif Owren. Dec 69, 127p AFCRL-69-0541(I) Contract F19628-68-C-0308

Descriptors: \*Solar radiation, Protons, \*Ionospheric disturbances, Polar regions, \*Ionospheric propagation, Blackout(Electromagnetic), High frequency, Absorption, Solar flares, Riometers, Mathematical prediction, Statistical analysis, Computer programs.

Identifiers: PCA(Polar Cap Absorption), Polar cap absorption, Nomographs, \*Solar cosmic rays.

The physical and empirical facts of polar cap absorption (PCA) produced by solar proton events are reviewed. A description of PCA, its measurement, and the solar-terrestrial environment is included. The physical conditions of the lower ionosphere during PCA are discussed together with the frequency law of PCA, nightime recoveries, the polar cap distribution of absorption, and arctic HF propagation during PCA. A procedure for short-term prediction of the future course of PCA is developed, based on single frequency riometer measurements and computer processing of the data. The application of the prediction technique is illustrated by a detailed discussion of two PCA events. It is concluded that for most PCA events satisfactory short-term predictions can be made from riometer observations.

AD-707 122/CP HC E01 MF A01 Massachusetts Inst of Tech Cambridge Dept of Mechanical Engineering Theoretical Prediction of Acoustic-Gravity Pressure Waveforms Generated by Large Explosions in the Atmosphere. Final rept. 1 Feb 67-31 Jan 70 Allan D. Pierce, and Joe W. Posey. 30 Apr 70, 295p AFCRL-70-0134 Contract F19628-67-C-0217 Descriptors: "Nuclear explosions. Upper at-

Descriptors: \*Nuclear explosions, Upper atmosphere, 'Microbarometric waves, Predictions, Detonation waves, Numerical analysis, Approximation(Mathematics), Mathematical models, Computer logic, Subroutines, Computer programs, Acoustics. Identifiers: Computer analysis, Computerized simulation, Acoustic gravity waves.

A computer program is described which enables one to compute the pressure waveform at a distant point following the detonation of a nuclear explosion in the atmosphere. The theoretical basis of the program and the numerical methods used in its formulation are explained; a deck listing and instructions for the program's operation are included. The primary imitation on the program's applicability to realistic situations is that the atmosphere is as-sumed to be perfectly stratified. However, the temperature and wind profiles may be arbitrarily specified. Numerical studies carried out by the program show some discrepancies with previous computations by Harkrider for the case of an atmosphere without winds. These discrepancies are analyzed and shown to be due to different formulations of the source model for a nuclear explosion. Other numerical studies explore the effects of various atmospheric parameters on the waveforms. In the remainder of the report, two alternate theoretical formulations of the problem are described. The first of these is based on the neglect of the vertical acceleration term in the equations of hydrodynamics and allows a solution by Cagniard's integral transform technique. The second is based on the hypothesis of propagation in a single guided mode and permits a study of the effects of departures from stratification on the waveforms. (Author)

AD-707 875/CP HC E01 MF A01 Stanford Univ Calif Dept of Geophysics Microbarograph Studies. Annual technical rept., 1 Apr 69-1 Apr 70 Jon F. Claerbout, and Lee Lu. 13 May 70, 48p AFORS-70-1689-TR Contract F44620-69-C-0073, ARPA Order-1362-69

Descriptors: \*Microbarometric waves, Propagation, Sound signals, Jet streams(Meteorology), Barometric pressure, Wind, Simulation, Atmospheric temperature, Computer programs.

Theoretical work included mathematical-computational simulation of an air wave propagating around the earth. The effect of horizontal variations of wind and temperature was in-cluded. These explain the severe defocussing always observed at the antipodes. Observational work included installation and operation of an LTV-LASA type microbarograph. Regular inspection of the records revealed a nuclear explosion and numerous incompletely understood meteorologic phenomena. Computer programs have been written and documented for reading LASA data tapes and Stanford data tapes.

AD-709 233/CP HC E01 MF A01 Smithsonian Astrophysical Observatory Cambridge Mass Study of Meteor Wind Measurement Techniques. Volume II. Final rept. 1 Jun 63-31 May 66 Norman F. Deegan, Robert J. Fitzpatrick, Giuseppe Forti, Mario D. Grossi, and Mario R. Schaffner. Feb 70, 241p 002-106, AFCRL-70-0168-Vol-2 Contract AF 19(628)-3248 See also Volume 1, AD-709232.

Descriptors: \*Upper atmosphere, Wind \*Meteors, Radar echo areas, Computer programs, Instruction manuals, Radio astronomy, Flow charting, Magnetic tape, Punched cards, Pattern recognition, Pulse analyzers, Calibration, Radar signals, Doppler radar.

Wind data in the height range 80 to 100 km can be obtained with a multistatic VHF phase-coherent pulse-doppler meteor radar capable of monitoring a volume in space measuring arrpoximately 50 km x 50 km horizontally, and 20 km vertically. An eight-station phase-coherent system has been established for this purpose near Havana, Illinois, by reworking an existing six-station, incoherent, pulse meteor radar operating at 40.92 MHz. A 4-Mw transmitter and eight receiving sites dispersed up to 50 km away from the transmitter site have been locked together in phase within a few parts in 10 to the 10th power by distributing a 2.5 kHz reference tone via commercial telephone lines. The system operates satisfactorily and is capable of collecting enough range-doppler samples from meteor trails for an adequate description of the wind pattern at meteor heights. Wind profiles have been obtained by processing in Cam-bridge with a CDC-6400 computer the mul-tichannel digital tapes recorded in Havana. The method can, potentially, be used for real-time wind measurements. It competes favorably with alternative approaches when wind measurements at meteor height must be performed with continuity and without resorting to horizon-tohorizon spatial averaging. (Author)

AD-709 673/CP HC E01 MF A01 Stanford Univ Calif Stanford Electronics Labs The Stanford Meteor-Trails Radar Mark II. Final rept. 1 Mar 67-31 Dec 69 Robert Nowak, Edgar M. North, and Michael S. Frankel. Jun 70, 165p SU-SEL-70-021, AFCRL-70-0365

Contract AF 19(628)-6152

Descriptors: \*Meteors, Radar tracking. \*Meteorological radar, Design, \*Wind, Upper at-mosphere, \*Upper atmosphere, Density, Com-puter programs, Wake, Atmospheric motion, Radar equipment.

In the study of upper-atmosphere winds and densities, radar measurements of the ionized trails of meteors in the height region between 80 and 110 km have proven valuable. In the present report, this measurement technique is compared to other methods and its advantages and problems are outlined. Considerations for the design of a meteor-trail radar system are presented. The desire for a global network of meteor-trail radar stations, which would aid significantly in the study of synoptic atmospheric patterns, calls for a reliable, simple, and inexpensive design. Such a design, realized at Stanford University and tested in operation, is described in detail. Data are recorded automatically on digital magnetic tape and are reduced completely by computer; except for tape changes, the station operates unattended. Circuit diagrams, assembly, and tuning procedures for the complete station are presented, and the computer program used for data reduction is listed. The equipment was built on printed circuit cards for which negatives are available, on request, from Stanford University. (Author)

AD-709 888/CP HC E01 MF A01 Weather Wing (4th) Ent AFB Colo Detachment 1 Ionospheric Electron Density Profile Model. Technical memo.

Thomas D. Damon, and Franklin R. Hartranft. Jul 70, 39p 4WW-TM-70-3

Descriptors: \*lonosphere, Electron density, Mathematical models, Motion, Predictions, Radar tracking, Refraction, Satellites(Artificial), Computer programs. Identifiers: \*Electron density profiles, E layer,

F1 layer, F2 layer.

The paper describes a project undertaken by 4th Weather Wing to produce a realistic elec-tron density profile based upon parameters which can be forecast with reasonable accura-cy. The ionospheric electron density profile model presented in this paper consists of the sum of three Chapman layers (E, F1, F2). Electron densities in the topside ionosphere are controlled by complex motions rather than a production-loss balance and cannot be successfully described strictly by a Chapman layer. After some experimentation a best fit was ob-tained by simply using the Chapman equation for the topside ionosphere, but computing the electron densities by using a variable scale height throughout the region. The program described in this report has been used routinely for eight months to predict profiles for radar refraction. This report should be considered interim as improvements in accuracy are sure to be required as the model is evaluated for dif-ferent purposes. (Author)

AD-713 052/CP HC E01 MF A01 Naval Postgraduate School Monterey Calif Calculated and Observed Changes in Sea Surface Temperature Associated with Hur-ricane Passage. Master's thesis

Jack James Jensen. Sep 70, 56p

Descriptors: \*Mexico Gulf, Surface temperatures, \*Tropical cyclones, Heat transfer, Mathe-matical models, Atmospheric temperature, Computer programs, Simulation, Theses. Identifiers: Hurricane Betsy, Hurricane Camille, Computerized simulation, \*Air water interactions

Analyses were made of the sea surface temperatures in the Gulf of Mexico in August for the four years 1965 through 1968. No one pattern was found to predominate. The subsurface temperature profiles were then considered, and a rate of simulated withdrawal of 4000 calories of heat per day was made, until there was no heat in excess of 26C. This withdrawal represented heat removed during passage of a hurricane. Difference analyses were constructed for the initial sea surface temperature at each station and that after twenty-four hours of simulated withdrawal. The differences ranged from less than one degree to over four degrees. Again, no consistent pattern was found but generally areas of high concentrations of heat experienced smaller decreases. Actual sea surface temperatures collected after two hurricanes were then analyzed and compared to temperature patterns predicted by the computer model. Illustrations of the relative availability of sensible heat energy for different sea surface temperatures are presented and a hypothesis made to account for the greater than average intensities of Hurricane Betsy (1965) and Camille (1969). (Author)

AD-714 571/CP PC E01 MF A01 Illinois Univ Urbana lonosphere Radio Lab Investigations of lonospheric Total Electron Content Behavior at Conjugate Points and During a Solar Eclipse.

Final rept. 1 Sep 69-31 Aug 70 Kung C. Yeh, Bernard J. Flaherty, Han R. Cho, and Homayoun Nomani. Sep 70, 87p TR-41, AFCRL-70-0539 Contract F19628-70-C-0001

Descriptors: "lonosphere, Electron density, \*Solar eclipses, lonospheric disturbances, Alaska, New Zealand, Magnetic storms, Com-puter programs, Magneto-optic effect, Naviga-tion satellites, Radiofrequency interference. Identifiers: Thermosphere, Faraday effect

The Faraday rotation data were collected a Cold Bay, Alaska in an effort to correlate with similar data collected at Invercargill, New Zealand. Cold Bay and Invercargill form an approximate conjugate pair. Day-to-day variations of content at these two stations have been compared and studied. It has been found that these changes were negatively correlated during periods of magnetic quiet, uncorrelated during weak magnetic activities and increasingly positively correlated with increasing magnetic activities. In the second experiment two field stations were

set up along the path of March 7, 1970 solar eclipse. These data, when combined with data obtained by others, show that the delay between the time of maximum obscuration and the time of minimum content varies systematically with latitude. The theoretical study is concerned with studying the effect of a dynamo electric field on the thermospheric winds. (Author)

AD-715 068/CP PC E01 MF A01 New York Univ N Y Courant Inst of Mathematical Sciences

Frontal Motion in the Atmosphere.

Technical rept.

Eli L. Turkel. Sep 70, 149p Rept no. IMM-385 Contract N00014-67-A-0467-0016

Descriptors: \*Air mass analysis, Mathematical models, Coriolis effect, Atmospheric motion, Atmosphere models, Weather forecasting, Boundary value problems, Numerical analysis, Integration, Computer programs. Identifiers: \*Fronts(Meteorology), Finite dif-

ference theory.

The motion of frontal disturbances in the atmosphere is studied based on several nonlinear models proposed by Stoker. In the first model, the air is considered to be an incompressible fluid moving over a plane tangent to the rotating earth. The fluid consists of two layers and the density in each layer is assumed to be constant. The hydrostatic pressure law is then used to reduce this to a two space dimensional model. The boundary between these layers is a contact discontinuity and so instabilities may occur at this frontal surface. (Author)

AD-716 801/CP PC E01 MF A01 Gulf Energy and Environmental Systems Inc San Diego Calif

Atmospheric Transport of X-Rays.

Final rept.

R. J. Harris, Jr, M. J. Nowak, J. A. Lonergan, J. P. Wondra, and D. F. Willoughby. 16 Jun 70, 156p GA-10165, DASA-2571 Contract DASA01-69-C-0038

Descriptors: \*Atmosphere models, X rays, \*X rays, Transport properties, Photons, Spectrum analyzers, Integrals, Integration, Curve fitting, Monte Carlo method, Statistical distributions, Programming(Computers), Radioactive isotopes.

Identifiers: PHOTRAN computer code, Germanium(Li) detectors.

Due to the lack of measured data for checking calculational results, an experimental program was initiated at Gulf General Atomic (GGA) for studying the atmospheric transport properties of X-rays by using liquid nitrogen to simulate air. Measurements of the photon spectrum and angular distribution were made as a function of source-detector separation distance in an 'infinite' medium of liquid nitrogen provided by a large cryogenic dewar. Radioactive isotopes of 241Am, 141Ce, and 203Hg were used as sources of approximately monoenergetic photons with energies of 60 keV, 145 keV and 279 keV, respectively. A 20 cc cm Ge(Li) detector was used to measure photon spectra for energies from approximately 20 keV to the source energy. Measurements were made for source detector distances of 1-15 mfp for each source energy. Transport calculations were made for comparison with the measurements using the PHOTRAN Monte Carlo code and the 1DF discrete ordinates code. (Author)

AD-716 823/CP PC E01 MF A01 Massachusetts Inst of Tech Cambridge Measurement Systems Lab

Determination of a Hypsometer Performance Function from Airborne Data. Master's thesis

Patrice Marie Latron. Feb 70, 175p Rept no. TE-

Contract F29600-69-C-0028

Descriptors: \*Hypsometers, Performance(Engineering), Altitude, Measure-ment, Pressure, Sensitivity, Airborne, Elec-tronic recording systems, Analog-to-digital converters, Integration, Statistical functions, Computer programs, Data processing systems, Theses.

Identifiers: Gravimetric geodesy.

Integrated data from a vertical pendulous integrating gyro accelerometer were used to as-sess the altitude measuring performance of a hypsometer in an airborne gravimetric installation. Both gravity and Eotvos correction were assumed constant to simplify the integration process. The aircraft-autopilot short period (about 0.044 Hz) longitudinal mode dominates the altitude profile. The hypsometer recordings relative to the integrated accelerometer data showed lags between 2 and 3 seconds, and amplitude ratios between 0.4 and 0.9. A backlash nonlinearity of 3 feet amplitude would explain the varying amplitude ratio but only part of the lag (1 to 2 seconds). The auto-correlation and crosscorrelation functions were used in an attempt to examine the linear behavior of the hypsometer; however, the spread of the data suggested that the nonlinearity was a very significant element in the instrument dynamics. (Author)

AD-718 105/CP PC E01 MF A01 New Hampshire Univ Durham Antenna Systems Lab

Computer Processing of Data from the UNH/AFCRL Meteor Trails Radar

Filson H. Glanz, and Ronald R. Clark. 20 Aug 70, 41p Scientific-4, ASL-70-4, AFCRL-70-0717 Contract F19628-67-C-0230

Descriptors: \*Meteors, Radar tracking, \*Data processing systems, Computer programs, Atmospheric sounding, Wind, Density, Direction finding

Identifiers: FORTRAN, Meteor trails, Off line systems.

The report describes the UNH Meteor Trails Radar Main Off-Line Computer Program. The report consists of a summary of the program and a complete listing and flowgraph of the program. The main contribution is the method of determining azimuth and elevation angles from the UNH/AFCRL Meteor Trails Interferometric azimuth-elevation system. (Author)

AD-718 422/CP PC E01 MF A01

Weather Wing (4th) Ent AFB Colo Predicting Heavy Snowfall for Colorado Springs Based on Computer Derived Synoptic Map Types

Franklin R. Hartranft, Joe S. Restivo, and Robert C. Sabin. Dec 70, 209p Rept no. 4WW-Technical Paper-70-5

Descriptors: \*Weather forecasting, Snow, Snow, \*Colorado, \*Meteorological charts, Programming(Computers), Computer programs, Mathematical prediction, Surface properties, Classification, Upper atmosphere, Instruction manuals.

Identifiers: Computer mapping techniques, Objective weather forecasting, Stratification.

The paper contains the results of applying the weather map typing procedures described in 4 WWg Technical Paper 70-2, Computerized Map Typing Procedures and Their Application in the Development of Forecast Aids, to the specific problem of heavy snow forecasting in Colorado Springs, Colorado. The case study technique described in SECTION IIIA of 4WWTP 70-2 was employed to derive sets of surface and 700 mb map types which are necessary conditions for

the occurrence of heavy snow. The objective forecast study technique described in Section IIIB of 4WWTP 70-2 was used to develop a set of forecast aids (scatter diagrams) for each sur-face/700 mb map type. The snow study described in this paper demonstrates a new approach to objective forecast study development. The synoptic situation has been objectively integrated into the initial stratification of climatological data and therefore permits an objective consideration of surface and 700 mb map patterns as the initial step in the forecast procedure. The inclusion of climatologicallyderived map types in the forecast study also allows an excellent means of incorporating prognostic chart information. (Author)

PC E01 MF A01 AD-721 089/CP Royal Aircraft Establishment Farnborough (England)

Theoretical Aspects of the Determination of Particle-Size Distributions from ments of Scattered Light Intensity Measure-Technical rept.

J. B. Abbiss. Aug 70, 46p RAE-TR-70151, TRC-BR-21859

Descriptors: \*Clouds, Particle size, \*Fog, Parti-cle size, \*Light transmission, Aerosols, Digital computers, Computer programs, Diffraction, Distribution functions, Integral equations, Great Britain.

The technique of determining the distribution of particle sizes in a cloud by measuring the intensity of the light scattered from it over a range of angles (sometimes known as the 'small an-gles' method) is discussed and the feasibility of the method demonstrated with the aid of digital computer calculations. The effect of experimental errors is considered and a detailed examination made of the special difficulties associated with monodispersions, in which all particles are of the same size. It is shown that in both cases modification of the experimental data by means of suitable weighting functions yields enhanced reconstruction of the original distribution function. The limitations of the small angles method are discussed, together with the data requirements which should be met if good results are to be achieved. (Author)

AD-721 112/CP PC E01 MF A01 Pacific Southwest Forest and Range Experiment Station Berkeley Calif

Synoptic-Scale Weather Disturbances that In-fluence the Fire Climate in Southeast Asia **During the Normally Dry Period** Final rept.

Morris H. McCutchan, and Bernadine A. Taylor. 1971, 78p Contract ARPA Order-818

Descriptors: \*Climatology, \*Southeast Asia, \*Forest fires, Southeast Asia, Atmospheric tem-Wind, Humidity, Atmospheric perature. perature, Humidity, Wind, Atmospheric precipitation, Cloud cover, Drying, Meteorolog-ical charts, Upper atmosphere, Tropical cyclones, Computer programs, Reviews. Identifiers: Synoptic meteorology, Monsoons, Troughs(Meteorology), Westerlies, Easterlies.

Fire climate in Southeast Asia is affected by two major factors, rainfall and cloud cover. By 'fire climate' one means the climate that affects the inception and behavior of wildfire. In our study of the fire climate in Southeast Asia we in-vestigated, when, for how long and by what mechanism the normally dry period (November through April) is interrupted by widespread rain and clouds. The author found five types of synoptic-scale weather disturbances usually responsible for extensive rainfall over Southeast Asia during the dry period. Case histories are given of general rain that were caused by these five types of disturbances: (1) 30 November 1962--tropical cyclones and east-erly waves; (2) 21-23 March 1963--troughs in
the westerlies; (3) 24 and 25 November 1962-superposition of trough in the westerlies on easterly waves; (4) 29 March 1963--surges of the northeast monsoon; and (5) 7-9 March 1963--tropical troughs. (Author)

AD-721 242/CP PC E01 MF A01 Naval Postgraduate School Monterey Calif A Mesoscale Investigation of Convective Activity Master's thesis

Leo Harvey Craiglow, Jr. Mar 71, 89p

Descriptors: \*Convection(Atmospheric), Mathe-Tornadoes, Oklanou.... \*Tornadoes, Oklanou.... transfer, matical models, \*Tornadoes, Oklahoma, \*Thunderstorms, \*Oklahoma, Upper at-mosphere, Atmospheric motion, Heat transfer, Energy, Networks, Weather forecasting, Computer programs, Theses. Identifiers: Finite difference theory, Computation.

A mesoscale investigation of a series of tornadoes and thunderstorms that passed through the NSSL mesonetwork in Oklahoma, on 10 June 1967, between 1700 and 2300 CST, was conducted. Utilizing upper air data provided by NSSL, the divergence, vertical motion, and energy fields were computed. A finite-dif-ference technique for computing and smoothing divergence was developed. The vertical motion was then computed by means of the kinematic method. Both the total derivative and the local rate of change of static energy were computed. Using the values of the local rate of change, prognostic fields of static energy and an energy index were obtained. Finally, forecast energy indexes, divergence, and vertical motion fields were compared to the ob-served locations of tornadoes and thun-derstorms. (Author)

AD-722 076/CP PC E01 MF A01 Emmanuel Coll Boston Mass Physics Research

Div Analysis of Stratospheric Balloon Programs Final rept. 1 Jan 68-31 Dec 70

M. Patricia Hagan. 31 Mar 71, 20p AFCRL-71-0115

Contract F19628-68-C-0065

Descriptors: \*Stratosphere, Wind, \*Meteorological balloons, Flight paths, \*Programming(Computers), Flight paths, Computer programs, Tracking.

Identifiers: FORTRAN, SIMBALL computer program, MAGMED computer program.

The work under this contract has been computational and analytical services in support of operations analysis, applications research and post flight analysis of stratospheric scientific balloon programs conducted by the Air Force Cambridge Research Laboratories (AFCRL). Geophysical and flight data, furnished by the Government, were utilized for transcription, analysis, graphing, and mathematical computa-tions. The work performed includes hand and machine plotting and the writing of several computer programs. (Author)

## AD-722 103/CP

PC E01 MF A01 Raytheon Co Bedford Mass Missile Systems Div Curve Fitting General Least Squares Program with Side Conditions

Ray Greenfield, and Mark Hale. 15 Oct 62, 105p Rept no. BR-2069

Contract AF 19(604)-5230

Prepared in cooperation with IBM-Federal Systems Div., Cambridge, Mass. Cambridge Div

Descriptors: \*Computer programs, Instruction manuals, "Ionosphere, Electron density, Least squares method, Matrix algebra, Special func-tions(Mathematical), Curve fitting. Identifiers: FORTRAN, Orthogonal functions.

Although the prime motivation of this work has been a 'constrained' curve fitting of ionospheric electron density and collosion frequency profiles, the method proved to be an effective tool of more general applicability. It is for this reason that the author present this work apart from the particular ionospheric research program for which it was conceived. (Author)

AD-722 216/CP PC E01 MF A01 Atmospheric Sciences Lab White Sands Missile Range N Mex

One-Dimensional Quasi-Time-Dependent Nu-merical Model of Cumulus Cloud Activity Research and development technical rept. Walter S. Nordquist, Jr, and Neil L. Johnson. Dec 70, 186p ECOM-5350

Descriptors: \*Cumulus clouds, Mathematical models, Atmospheric precipitation, Cloud cover, Atmospheric temperature, Weather forecasting, Radar reflections, Data processing systems, Computer programs. Identifiers: Meteorological data, Cloud physics, FORTRAN 4 programming language, FOR-TRAN.

A numerical model for the description of some of the major features of isolated cumulus clouds formed as the result of surface heating is described. This one-dimensional model is an elaboration of the Weinstein and Davis Steady State Cumulus Dynamics model and has been extended to include a method for forecasting the environmental meteorological conditions. Detailed discussions concerning the development of the theory, the application of numerical techniques to the theory, and the computer calculation processes are provided. (Author)

AD-722 713/CP PC E01 MF A01 Radiation Research Associates Inc Fort Worth Tex

**Computer Procedure for Calculating Time De**pendent Light Scattering in Spherical-Shell Atmospheres Final rept. 1 Jul 68-31 Jan 71

Dave G. Collins, and Michael B. Wells. Apr 71, 140p RRA-T7017, DASA-2640 Contract DASA01-68-C-0169 Companion report to AD-722 714

Descriptors: \*Atmosphere, \*Light transmission, Scattering, Monte Carlo method, Absorption, Infrared radiation, Refractive index, Reflection, Polarization, Intensity, Pro-

gramming(Computers). Identifiers: FORTRAN, FORTRAN 4 programming language, Light(Visible radiation), FLASH computer program, SHINE computer program, MIE 2 computer program.

report describes three Monte Carlo The procedures that were developed for the purpose of providing calculational tools that could be used to study the transport of visible and in-frared light in spherical-shell atmosphere. These procedures, designated as FLASH, treat atmospheric scattering problems for planeparallel, point, volume and spherical surface sources. The FLASH procedures consider the effect of Rayleigh and aerosol scattering and ozone, water vapor, CO2, and aerosol particle absorption on the transport of light. The procedures also consider the changes in polarization that occurs at each scattering event. The input formats of the codes allows one to describe the scattering and absorption properties of the atmosphere as a function of altitude. Provisions are incorporated for treating the reflection of light from ground and cloud surfaces with an albedo method. Also described are the MIE-II and SHINE procedures. The MIE-II procedure uses Mie theory to generate aerosol particle scattering and absorption coefficients and the four elements of the aerosol phase matrix for use as input data to the FLASH procedures. The SHINE

procedure was developed to integrate the results of FLASH CALCULATIONS FOR POINT MONOCHROMATIC SOURCES OVER AN AR-BITRARY WAVELENGTH AND TIME DEPEN-**DENT SOURCE SPECTRUM. (Author)** 

AD-722 714/CP

PC E01 MF A01 Radiation Research Associates Inc Fort Worth

Computer Procedure for Calculating Time Dependent Light Scattering in Plane Parallel Atmospheres

Final rept. 1 Jul 68-31 Jan 71 Dave G. Collins, and Michael B. Wells. Apr 71, 70p RRA-T7016, DASA-2641 Contract DASA01-68-C-0169 Companion rept. to AD-722 713.

Descriptors: \*Atmosphere, \*Light transmission, Scattering, Monte Carlo method, Absorption, Monochromatic light, Infrared radiation Polarization, Reflection, Intensity, Albedo, Programming(Computers).

Identifiers: FORTRAN, FORTRAN 4 gramming language, Light(Visible 0 radiation), TPART 1 computer program, TPART 2 computer program.

The report describes two Monte Carlo procedures that were developed for the purpose of providing calculational tools that could be used to study the transport of visible and infrared light in plane-parallel atmospheres. These procedures, designated as TPART-I and TPART-II, treat atmospheric scattering problems for point and plane parallel monochromatic sources, respectively. The TPART procedures consider the effect of Rayleigh and aerosol scattering and ozone, water vapor, CO2, and aerosol particle absorp-tion on the transport of light. The procedures also consider the changes in polarization that occurs at each scattering event. The input format of the codes allows one to describe the scattering and absorption properties of the atmosphere as a function of altitude. Provisions are incorporated for treating the ground sur-face with an albedo method. The output of the TPART procedures gives the scattered light intensity at each receiver position as a function of a polar and azimuthal angle and time. The procedures were written in FORTRAN-IV language for both the CDC-6600 and IBM Direct Couple Systems. The codes have been verified through comparisons with results of other calculations of light transport in the atmosphere. (Author)

AD-723 602/CP PC E01 MF A01 Williams Coll Williamstown Mass Fourier Analysis of Weather and Wave Data

from Holland, Michigan, July 1970 Technical rept. William T. Fox, and Richard A. Davis, Jr. 1 May

71, 84p Rept nos. WC-3, TR-3

Contract N00014-69-C-0151 Prepared in cooperation

with Western Michigan Univ., Kalamazoo.

\*Meteorological Descriptors: parameters. Fourier analysis, "Lake waves, Fourier analysis, "Time series analysis, Spectrum analyzers, Har-monic analysis, Computer programs, Series, Michigan, Great Lakes, Atmospheric temperature, Barometric pressure, Cyclones, Wind. Identifiers: Holland(Michigan), Wind direction, Wind velocity, Lake Michigan, Ground water, Smoothing(Mathematics)4 Spectrum analysis, Fourier series.

During July, 1970, weather and wave parameters were measured at two hour intervals on the beach and in the nearshore area two miles north of Holland, Michigan. Parameters measured include barometric pressure; wind speed and direction; air and water temperature; sky condition; lake and groundwater level, wave period and height; breaker depth, type,

distance and angle; and longshore current velocity. The computer was used to calculate the phase and amplitude for the first 15 Fourier harmonics and to plot the observed data and cumulative curves. The curves were influenced by low pressure systems which passed north of the area of 4, 9, 15 and 19 July. Wave height and direction are related to cyclonic winds moving counterclockwise around the low pressure system. Longshore current velocity can be predicted as a constant times the derivative of the barometric pressure. (Author)

AD-723 864/CP PC E01 MF A01 Saclant ASW Research Centre La Spezia (Italy) Numerical Filtering Techniques for the Time-Series Analysis of Oceanographic and Meteorological Data

Technical memo. Riccardo Pesaresi. 1 Apr 71, 43p Rept no. SACLANTCEN-TM-166

Descriptors: "Oceanographic data, "Time series analysis, "Meteorological parameters, Time series analysis, Spectrum analyzers, Programming(Computers), Low-pass filters, Highpass filters, Band-pass filters, Wind, Italy. Identifiers: "Spectrum analysis, Wind velocity, FILTERS 3 computer program, FILTER 4 computer program, ALGOL.

The basic concepts of the numerical filtering technique, using symmetrical filters is introduced. Two computer programs are described: one, given certain input informations, plots the impulse, step and frequency response and specifies the weights of one of eight different filter types selected by the user; the other calculates the minimum number of weights necessary to achieve a certain frequency response of the Linnette type filter. (Author)

# AD-724 599/CP PC E01 MF A01 Army Electronics Command Fort Monmouth N

Data Reduction Program for Rocketsonde Temperatures

Technical rept.

Bruce W. Kennedy, Elton P. Avara, and Bruce. T. Miers. Mar 71, 35p Rept no. ECOM-5367

Descriptors: \*Meteorological parameters, \*Data processing systems, \*Atmospheric sounding, Meteorological instruments, Temperature, Wind, Sounding rockets, Computer programs, Test methods, Flight testing. Identifiers: Data reduction, Rocketsondes.

The paper describes a computer program that simplifies the reduction of temperature data from routine Meteorological Rocket Network instruments. The program is versatile enough to be used with standard and R and D sondes. Laboratory and flight tests related to temperature correction are described, and complete program and coding instructions are presented. (Author)

#### AD-726 304/CP PC E01 MF A01 Allied Research Associates Inc Concord Mass Development of Techniques for the Operational Use of ITOS Satellite Data by the Fleet Final rept. 21 May 70-21 May 71 James H. Willand, and James R. Greaves. May

71, 131p ARA-8680-F, FAMOS-TN-2-71 Contract N62306-70-C-0443

Descriptors: 'Meteorological satellites, Data transmission systems, 'Naval vessels(Support), Weather communications, 'Weather communications, Data processing systems, Meteorological parameters, Display systems, Resolution, Mapping, Global communication systems, Control sequences, Computer programs. Identifiers: 'ITOS(Improved Tiros Operational Satellites), 'Improved tiros operational satellites, Image enhancement, 'Data compression. Two broad classes of data processing programs were developed. The first type extracts and prepares for transmissio full-resolution subsets of the original ITOS array. The data product is ideal for detailed research studies or for transmission to remote locations not equipped to directly read out the ITOS sensor systems. The second class of program compresses the original full hemisphere data arrays by averaging or by selecting maximum or minimum values. The new array is then prepared for transmission. This data product is particularly useful for input to global environ-mental prediction models. Additional support programs were developed to output the data products described above onto either a CRT or printer display. These displays were used to perform tradeoffs between the data preparation and transmission times and the scientific or meteorological usefulness of the various data products. It was found that a factor of four redution in resolution of the original ITOS array yields a data product which is transmittable in an acceptable period of time and which is as useful for most purposes as the original array.

AD-726 628/CP PC E01 MF A01 Drexel Univ Philadelphia Pa Dept of Physics Diagnostic Studies of Sybsynoptic Atmospheric Structure Sumner Barr, Paul E. Long, and Irvin A. Miller. Sep 70, 72p Scientific-2, AFCRL-70-0617 Contract F19628-69-C-0092 Report on tmospheric Sensing and Prediction Project.

Descriptors: \*Atmospheric motion, Mathematical models, 'Weather forecasting, Atmosphere models, Cloud cover, Aerial photographs, Velocity, Meteorological satellites, Meteorological radar, Computer programs. Identifiers: Themis project, VELOCI computer program, FORTRAN 4 programming language, FORTRAN, Spaceborne photography.

A fine mesh diagnostic vertical velocity model is presented and compared with cloudiness observed from surface satellite observations in order to document some properties of subsynoptic atmospheric variations. The model proves to be useful as a tool for studies on this scale as indicated by the validation against observed data and independent model prepared by Krishnamurti. Application of the model to a series of case studies reveals some aspects of the interactions between subsynoptic and larger synoptic scale motion systems and their characteristic cloud patterns. (Author)

AD-728 128/CP PC E01 MF A01 Army Coastal Engineering Research Center Washington D C

Storm Surge on the Open Coast: Fundamentals and Simplified Prediction Technical memo.

B. R. Bodine. May 71, 65p Rept no. CERC-TM-

35 Errata sheet inserted.

Descriptors: "Storms, Mathematical models, "Ocean waves, Seacoast, Construction, Tropical cyclones, Differential equations, Tides, Ocean waves, Wind, Barometric pressure, Hydrodynamics, Simulation, Data processing systems, Computer programs, Chesapeake Bay.

Identifiers: \*Storm surges, FORTRAN 4 programming language, FORTRAN.

A quasi-two-dimensional numerical model for open-coast storm-surge computations is discussed from the standpoint of underlying assumptions, range of validity, calibration, and application. While it is possible to make computations manually, electronic digital calculations are generally preferred. Elementary aspects of hurricanes and the physical factors of stormgeneration processes are discussed. The basic hydrodynamic equations are given, together with the assumptions generally made in their development. The equations consistent with the model are reduced forms of the basic equations in which several terms have been neglected. These omissions are indicated, and their effects on the resulting numerical scheme are discussed. The use of design hurricanes for engineering studies is treated. Effects of astronomical tide, initial water level, and atmospheric-pressure setup are considered. A problem is solved for the Chesapeake Bay Entrance by computer and manually. The computer program used is listed. (Author)

AD-729 909/CP PC E01 MF A01 Radiation Research Associates Inc Fort Worth

Monte Carlo Codes to Study the Transport of X-Rays and Fluorescent Light in the Atmosphere Final rept.

F. O. Leopard, D. G. Collins, and M. B. Wells. 1 Aug 70, 91p Rept no. RRA-T7012 Contract F33657-70-C-0076

Descriptors: \*Atmosphere, X rays, Programming(Computers), Electrons, Interactions, Photoelectric effect, Compton scattering, Terrestrial magnetism, Electrostatic fields, Monte Carlo method, Transport properties, Fluorescence.

Identifiers: Pair production, AURORA computer code.

A machine procedure, designated as AURORA, was developed for use in studies of the effects of non-local energy deposition by X-rays in the atmosphere. The AURORA procedure provides two optional methods of treating the slowing down in the atmosphere of the electrons produced by X-ray collisions. The first method assumes that the earth's magnetic field and the ambient electrostatic field have no effect on the path of the electron. The second method assumes that the electrons are trapped by the earth's magnetic field at the altitude of the Xray-electron collision. Modifications were made to the ZAP procedure to provide for the use of source angle, source energy, and path length biasing. The PFLASH procedure was modified to allow for calculation of the standard devia-tion of the computed results. Biased sampling schemes for picking distances between collisions and the polar and azimuthal angle of scattering were incorporated in FLASH. An option was incorporated in FLASH and DFLASH for printing their results as a function of the retarded time. A study was performed to determine the effect of varying the size of the air fluorescence source volumes used in FLASH on the results generated by FLASH. A method of determining the size of the volume increments is outlined. (Author)

AD-730 748/CP PC E01 MF A01 Systems Science and Software La Jolla Calif The Effects of Meso-Scale and Small-Scale Interactions on Global Climate

Semi-annual technical rept. 15 Feb -1 Sep 71. 30 Sep 71, 213p Rept no. 3SR-795

Contract DAHC04-71-C-0018, ARPA Order-1752

Descriptors: \*Climatology, Atmospheric motion, \*Atmospheric motion, Mathematical models, Meteorological parameters, Wind, Boundary layer, Thermal radiation, Coriolis effect, Vortices, Numerical analysis, Computer programs.

Identifiers: HAIFA computer code, Global climatology

The present study was undertaken in an effort to improve numerical models for meso-scale and small-scale effects which influence global weather and its modification. Two major areas are being studied: the effects of mountain ranges on energy and momentum transfer, and the transient interactions of solar radiation with the earth's atmosphere. It is hoped that the results of these studies will lead to calculationally inexpensive prescriptions which can be incorporated into meso-scale and global-scale atmospheric circulation codes. (Author)

AD-731 134/CP PC E01 MF A01 Air Force Global Weather Central Offutt AFB Nebr

**Turbulence Forecasting Procedures** 

Technical memo. Paul T. Burnett. 15 Dec 70, 84p Rept no. AFGWC-TM-70-7

Descriptors: \*Weather forecasting, \*Clear air turbulence, Wind, Atmospheric sounding, Tur-bulence, Atmospheric temperature, Boundary layer, Tropopause.

Identifiers: Planetary boundary layer, MTWV computer program, HITURB computer pro-gram, SIXCAT computer program, TELCAT computer program, Synoptic meteorology.

The Air Force Global Weather Central operational procedures are described for the forecasting of low-level mechanical, mountain wave associated, and clear air turbulence significant to aircraft. These procedures involve both manual and automated diagnostic techniques for analyzing individual rawinsonde soundings, data at constant pressure levels, and data from the AFGWC planetary boundary layer model. Brief outlines of computational procedures used in the computer diagnostic and prognostic programs are included. The basic forecast procedure is to associate reported turbulent and potentially turbulent areas with meteorological and orographic features, forecast the future positions of the meteorological features, and re-associate the turbulent areas. Forecasts of low-level mechanical turbulence rely to a considerable extent on prognoses of a numerical turbulence index. Index parameters are the gradient level wind, vertical motion, low-level atmospheric stability, 3hourly sea-level pressure change, and terrain roughness. Formation of mountain waves is forecast using an automated adaptation of the Harrison technique, and considers sea-level pressure gradients and wind data above the mountain range. (Author)

AD-731 138/CP

Air Force Global Weather Central Offutt AFB Nebr

PC E01 MF A01

Validation of Meteorological Data Technical memo.

Thomas M. Kaneshige, and Bernard C. Diesen. 15 Sep 70, 41p Rept no. AFGWC-TM-70-8

Descriptors: 'Weather forecasting, Reliability, Meteorological parameters, Atmospheric Meteorological parameters, sounding, Atmospheric 1 Programming(Computers). Atmospheric temperature, Wind,

Identifiers: RAOB computer program, PIBAL computer program, ROCOB computer program.

The AFGWC computer programs for the validation of surface, aircraft and upper air (RAOB, PIBAL, and ROCOB) reports are described. All reports received in standard codes from the DoD Automated Weather Network are subjected to a number of validation checks: timeliness, gross error, internal consistency and deviation from a previous analysis or forecast. Failure to pass these checks can result in one of two actions: one or two parameters may be discarded, or the entire report may be discarded. Validation of data from atmospheric soundings is discussed in detail. Examples are given to illustrate the methods used to determine whether upper air height and /or temperature data are in error. Missing or garbled upper air temperature and height data for mandatory reporting levels are recomputed by solving a system of two simultaneous equations. Procedures to merge newly validated data with similar data validated earlier are briefly described. (Author)

AD-731 570/CP PC E01 MF A01 Goodyear Aerospace Corp Akron Ohio Investigation of Stability Characteristics of **Tethered Balloon Systems** George R. Doyle, Jr, and Jerome J. Vorachek. 30 Jul 71, 231p GER-15325, Scientific-2, AFCRL-71-0406 Contract F19628-71-C-0091

Descriptors: \*Meteorological balloons, Stabili-\*Mooring, Meteorological balloons, Cables(Mechanical), Equations of motion, Altitude, Wind, Detents, Mathematical models, Computer programs. Identifiers: Computer aided analysis, Compu-

terized simulation, \*Tethered balloons, Design criteria.

An analytical investigation of the dynamic behavior of tethered balloons is in progress. The report, the second of three scientific reports, covers a study of stability characteristics of tethered balloon systems. Balloon systems which are investigated use the British BJ Bar-rage Balloon, the Vee Balloon and a Goodyear Aerospace Model No. 1649 Single-Hull Balloon. The major tether construction is Columbian Rope Company's NOLARO utilizing prestretched polyester filaments. Three design altitudes, 5,000, 10,000 and 20,000 feet, are considered. The model for the tethered balloon system consists of the streamlined balloon and a tether made up of three discrete links. Computer programs for the IBM 360 digital computer are presented to determine the characteristic equations of the systems, and obtain the roots which represent the frequency and damping qualities. (Author)

AD-731 574/CP PC E01 MF A01 Alaska Univ College Geophysical Inst Project SECEDE. Tracking Barium releases using the TV-TRACK System Technical rept. 16 Dec 70-30 May 71 T. Neil Davis, and S. P. Geller. 20 May 71, 42p TR-2, RADC-TR-71-195 Contract F30602-70-C-0179, ARPA Order-1057

Descriptors: \*Atmospheric sounding, Upper atmosphere, \*Condensation trails, Optical tracking, Television equipment, Real time, Computer programs, Digital recording systems, Position finding. Identifiers: SECEDE project, \*Chemical release

studies, Barium clouds, INTERDATA-4 computer program.

Described herein is a TC tracking system capable of real-time visual object tracking. The total system consists of low-light TV cameras and communications allowing for data to be sent from remote sites to a small centrally located computer. The position of the object that the three cameras are observing is calculated by the computer and transmitted to other sites for the purpose of 'pointing' other equipment. Solutions are available once per second. This report describes the actual use of this system during the SECEDE 2 test series and some problems encountered. It also contains enough detailed information to allow dunlication of the system software or to extract certain portions of that may be useful to other applications. (Author)

AD-731 723/CP PC E01 MF A01 Radiation Research Associates Inc Fort Worth Tex

Monte Carlo Calculations of the Scattering of 450, 550, and 650 NM Wavelength Light in Model Atmospheres for Point Isotropic Sources

Final rept. 1 Oct 70-30 Sep 71

Michael B. Wells, Wolfram G. Blaettner, and Dave G. Collins. 15 Aug 71, 151p Rept no. RRA-T7108 Contract N60921-71-C-0053

Descriptors: \*Atmosphere, Light transmission, \*Nuclear explosions, Monochromatic light, Scattering, Absorption, Monte Carlo method, Programming(Computers), Tables. Identifiers: Point sources, \*Atmospheric at-tenuation, \*Atmospheric scattering, Light scattering, FLARE computer program

The FLARE Monte Carlo procedure, which computes the transport of monochromatic light semitted by either point or plane-parallel sources in a plane atmosphere, was made operational. The FLARE procedure treats problems involving light transport in atmospheres where the scattering and absorp-tion processes vary with altitude. The FLARE procedure was used to compute the scattered and direct intensities as a function of direction and horizontal range at receiver altitudes of 0, 1, 2, 5, and 10 km. Problems were run for 550 nm wavelength point isotropic sources at 1, 2, 5, 20 and 80 km altitude in a model atmosphere with a ground level meteorological range of 10 km. Calculations were made for the 550 nm wavelength point isotropic source at 2 km altitude in model atmospheres with ground level meteorological ranges of 3, 10, 25, and 50 km. Additional calculations were also performed for 450, 550, and 650 nm wavelength point isotropic sources at 2 km altitude in the model at-mosphere with a 10 km ground level meteorological range. (Author)

PC E01 MF A01 AD-732 205/CP Environmental Technical Applications Center (Air Force) Washington D C Numerical Preprocessing of Rawinsonde Position Vectors Technical note Thomas E. Stanton. Oct 71, 27p Rept no. USAFETAC-TN-71-11

\*Meteorological balloons, Descriptors: Tracking, 'Wind, Atmospheric sounding, Radiosondes, Position finding, Height finding, sounding, Vector analysis, Numerical analysis, Computer programs. Identifiers: AN/GMD-4.

Martin-Graham filters are used subsequent to correction for erroneous data points to smooth the rawinsonde set AN/GMD-4 spherical measurements. This smoothing produces not only a corrected wind profile but also allows an or-derly pressure integration of the hydrostatic equation. The major data problems besides high frequency elevation-angle noise include range jumps and diffraction phenomena. The range jumps are identified and corrected through the inspection of first and second differences in the range field. The diffraction phenomena are adjusted by assuming a linear change in the balloon-ascent-rate field and reconstructing the elevation angles. Erroneous data due to other causes are adjusted by comparing filtered with raw data and imposing limitations on the height, wind, and position vector fields. (Author)

AD-733 227/CP PC E01 MF A01 Naval Postgraduate School Monterey Calif An Investigation into the Effect of an Industrial Heat and Moisture Source on Local Atmospheric Conditions Master's thesis

James Clinton Kraft, Sep 71, 81p

Descriptors: 'Air pollution, Heat, 'Atmospheric motion, Heat, 'Electric power production, Air pollution, Power plants(Establishments), Moisture, Temperature, Computer programs, California, Water vapor, Theses. Identifiers: 'Thermal pollution, 'Temperature

inversions, Monterey County(California).

Using a steam electric generating plant as the source, an investigation was made into the local atmospheric effect of a large industrial heat and moisture source. Data collection was attempted with ground- and helicopter-borne equipment with a final resort to the helicopter when the ground equipment collection techniques proved unsatisfactory. Cross sections of temperature and moisture were drawn from this data and yielded some very interesting profiles. (Author)

AD-733 284/CP PC E01 MF A01 Army Electronics Command White Sands Missile Range N Mex Atmospheric Sciences Lab A Study of Cloud Dynamics Utilizing Stereo-scopic Photogrammetry

Research and development technical rept. William H. Hatch. Mar 71, 56p ECOM-5368

\*Clouds, Photogrammetry, Descriptors: \*Photogrammetry, Stereoscopic photography, Computer programs, Cumulus clouds, Cloud cover, Height finding.

Identifiers: HCLOUD computer program, Cloud physics.

A case study in the utilization of stereoscopic photogrammetry in the investigation of cloud dynamics is presented. Analysis of a 30-minute period in the life of an orographic cloud shows a continuous series of turrets, each lasting approximately eight minutes, with peaks reaching 24,000 to 26,000 feet MSL. The methods of analysis and data reduction used are described, and the computer program written to perform the analysis computations is presented in the appendix. (Author)

#### AD-733 295/CP

PC E01 MF A01 Chicago Univ III Lab for Atmospheric Probing Digital Processing of FM-CW Radar Data Technical note

Ernst Stratmann, and James I. Metcalf. 16 Aug 71, 36p Rept no. TN-6 Grant DA-ARO-D-31-124-71-G71

Prepared in cooperation with Illinois Inst. of Tech., Chicago. Dept. of Electrical Engineering.

Descriptors: \*Atmospheric sounding, Radar reflections, \*Clear air turbulence, Detection, Meteorological parameters, Computer programs, Calibration, Meteorological radar, Radar echo areas

Identifiers: FORTRAN, Signal processing.

Quantitative data recorded from a FM-CW radar provide a unique means of studying the micros-tructure of radar echoes from the clear atmosphere. A computer program is developed to compute reflectivity from digitized radar signal data, using a derived power calibration function, and correcting for range dependence of the received power. The report discusses the handling of the data and the derivation of the calibration equation, and present sample output from the computation including a con-toured height-time record of reflectivity. (Author)

AD-733 419/CP PC E01 MF A01 Institute for Storm Research Inc Houston Tex The B-MALMID-4 Program: Ballistic Messages at Arbitrary Locations from Mixed Input Data

Final rept. Feb 70-Jun 71 John C. Freeman, Jr, Joseph C. Calabretta, Leon F. Graves, Troxel Ballou, and John Zeis. Jul 71, 68p ISR-0-04, ECOM-0115-F Contract DAEA18-70-C-0115

Descriptors: \*Computer programs, Impact pre-diction, \*Guided missile trajectories, Meteorological parameters, Atmosphere models, Boundary layer, Weather forecasting, gramming(Computers). Pro

Identifiers: B-MALMID computer program

The B-MALMID computer program for computing ballistic messages at arbitrary locations from mixed input data is developed along two lines: (1) There is an analysis program B-MAL-MID 4 for introducing new data in many forms and processing to Ballistic Messages, (2) There is a dynamic sub-routine, (3) ACTIVE LAYER model, for processing data with full use of the physics of atmospheric processes to help spread and remember data. Examples of the analysis are given using large scale and boundary layer weather estimates as input. (Author)

AD-734 985/CP PC E01 MF A01 Naval Postgraduate School Monterey Calif Further Verifications of and Experiments to Improve the Modified Hatrack Scheme for Forecasting the Motion of Tropical Cyclones Master's thesis

Stephen Gregory Colgan. Sep 71, 57p

\*Tropical cyclones, Motion, recasting, Tropical cyclones, Descriptors: \*Weather forecasting, Mathematical prediction, Wind, Atlantic Ocean, Statistical data, Numerical analysis, Pro-gramming(Computers), Theses. Identifiers: Geostrophic wind, Typhoons, Hurricanes, HATRACK program, MODHATR com-

puter program, FORTRAN 4 programming lan-quage, FORTRAN.

The MODIFIED HATRACK(MODHATR) scheme for forecasting tropical cyclone motion consists of a numerical steering component using geostrophic winds derived from Fleet Numerical Weather Central's SR height field to steer the storm center, and a statistical modification component to correct for bias and improve forecast accuracy. MODHATR forecasts from the 1969 and 1970 North Atlantic hurricane seasons are analyzed, and average errors presented and compared to earlier years' results MODHATR forecasts are shown to be superior on the average to OFFICIAL forecasts, NHC-67, and TYRACK forecast schemes for forecast intervals to 48 hours, with relative accuracy of MODHATR decreasing with time. (Author)

AD-736 443/CP PC E01 ME A01 IBM Federal Systems Div Burlington Mass Ad-vanced Systems Design Dept Atmospheric Model Evaluation Final rept. Jan 70-Sep 71 Arnold S. Bramson, and Jack W. Slowey. Nov 71,61p AFCRL-71-0543

Contract F19628-70-C-0085

Descriptors: \*Upper atmosphere, \*Atmosphere models, \*Satellites(Artificial), Position finding, Computer programs, Instruction manuals, Orbital trajectories, Perturbation theory. Identifiers: Evaluation.

The report documents a computer program which has been developed for testing and evaluating atmospheric models. The present version of the program contains ten such models which have been evaluated using a variety of staellite orbits as test data. An important feature of the program is an ephemeris generator which requires considerably less computer time than a standard numerical in-tegration technique. This procedure is docu-mented in Appendix B. Complete instructions for running the program are given in Appendix A, and a description of the ten atmospheric models presently contained in the program may be found in Appendix C. (Author)

AD-736 529/CP PC E01 MF A01 Naval Postgraduate School Monterey Calif Calculation of Levels of Relative Contribution of the Carbon-Dioxide Channel Radiance from TIROS VII in the Case of a Large-Scale Stratospheric Warming in January 1964 Master's thesis

Larry Lee Giauque. Sep 71, 62p

Descriptors: "Atmospheric temperature, Strato-sphere, "Stratosphere, Heating, Thermal radia-tion, Meteorological satellites, Computer pro-grams, Statistical\_analysis, Carbon dioxide, Spectra(Infrared), Theses.

Identifiers: TIROS 7 satellite, TIROS, \*Remote sensing, Stratospheric warming.

A case study of a winter stratospheric warming in the western hemisphere in January 1964 between 60 degrees and 40 degrees north north latitudes was conducted. Utilizing TIROS VII radiance data and analyzed height fields, a stepwise regression equation was determined to specify lower stratospheric layer temperatures. These temperatures were used with standard atmospheric temperatures to construct a sounding for use in a radiance computer pro-gram. Finally, this computed radiance was compared to regression values to determine if prediction and study of stratospheric warmings are valid and useful. (Author)

AD-736 798/CP PC E01 MF A01 Air Force Global Weather Central Offutt AFB Nebr

Improved Three Dimensional Nephanalysis Model

Technical memo. Allen R. Coburn. 1 Jun 71, 81p Rept no. AFGWC-TM-71-2

Descriptors: \*Cloud cover, Photointerpretation, \*Data processing systems, Meteorological satellites, \*Weather forecasting, Automation, Photographic reconnaissance, Infrared Spaceborne, Computer prophotography, grams, Meteorological parameters.

Identifiers: Remote sensing, Nephanalysis, 3DNEPH computer program, \*Spaceborne photography.

The AFGWC objective three-dimensional computer program (3DNEPH) produces high resolution, three-dimensional analyses of clouds in the atmosphere. A horizontal grid spacing of approximately 25 nautical miles is used. Analyses are made for 15 layers from the earth's surface to 55,000 feet MSL, with highest vertical resolution near the surface (150 feet depth for layer 1) and lowest vertical resolution at the top of the model (20,000 feet depth for layer 15). The program is a stream of individual processors. The improved program has added a processor to permit forecaster-prepared data to be used, a satellite infrared data processor, a forecast processor and a verification processor. The improved version also includes improvements to the other processors. A description of each major processor is included. Selected samples of displayed data are shown. (Author)

AD-737 395/CP PC E01 MF A01 Naval Academy Annapolis Md Div of Engineering and Weapons

**Computer Aided Nucleation Nozzle Design** Technical rept.

Andrew A. Pouring. Oct 71, 58p Rept no. EW-72-1

Contract DI-14-06-D-7119

Descriptors: \*Spray nozzles, Design, \*Artificial precipitation, Spray nozzles, Mathematical models, Nozzle throats, Nucleation, Nozzle gas flow, Equations of motion, Computer programs. Identifiers: Computer aided design, Nucleation nozzles, Sonic nozzles, Inviscid flow.

As an aid to designing nozzles for use in the homogeneous seeding of clouds, the onedimensional equations of motion for a compressible, inviscid flow of air and water vapor are solved together with the classical nucleation rate equations for any arbitrary nozzle profile. The occurrence of shockwaves at high initial humidities is sensed and transition calculated by the Rankin-Hugoniot shock relations. Onset of condensation in the nozzle is observable by plots of condensate versus distance; other thermodynamic parameters are also obtained. Results are compared with previous experimental findings and limitations of the design procedure are discussed (Author)

#### PC E01/MF A01 AD-737 802/CP Gca Corp Bedford Mass Gca Technology Div A Balloon-Borne Aerosol Counter

Final rept. 17 Apr 70-20 Nov 71 Henry A. Miranda, Jr, and John Dulchinos. Jan 72, 71p GCA-TR-71-3-A, AFCRL-71-0416 Contract F19628-70-C-0265

Descriptors: \*Atmospheric sounding, Aerosols, \*Stratosphere, \*Aerosols, Meteorological in-struments, Counting methods, Meteorological balloons, Particle size, Gas lasers, Scattering, Environmental tests, Power supplies, Recording systems, Calibration, Computer programs, Flight testing. Identifiers: Mie scattering, Helium neon lasers.

A balloon-borne aerosol counter which samples and sizes individual particles to an accuracy of plus or minus 10 percent over an order of magnitude size range extending down to 0.1 -0.2 micron diameter regime, has been successfully flown. The device is completely self-contained and recoverable. The data are recorded on 9-channel magnetic tape in digital format compatible with an IBM 360 computer, and are processed automatically. Stratospheric aerosol size distributions have been obtained in increments of one and two kilometers, up to and including balloon float altitudes (above 23 km). These represent the first such direct information available, and are presented here in preliminary form. A description of the device, together with a discussion of calibration and automatic data reduction procedures, as well as recommendations for improvements in the latter, is given. (Author)

#### AD-739 166/CP

Air Force Cambridge Research Labs L G Hanscom Field Mass

PC E01/MF A01

Photo-Egullibrium of Barium

Environmental research papers

Gordon T. Best, and Victor L. Corbin. 30 Nov 71, 38p Rept nos. AFCRL-71-0600, AFCRL-ERP-377

\*Barium. \*Gas Descriptors: ionization. \*Atmospheric sounding, Barium, Electron transitions, Atomic energy levels, Photon bombardment, Emissivity, Excitation, Chemical equilibrium, Computer programs. Identifiers: \*Photoionization, Chemical release studies.

A model for numerical simulation of the solar pumping of a simple atomic system is constructed and compared with the exact analytical solution. The process is then extended to cover the more complex 5-level 5-transition barium ion term scheme and the 61-level 86transition barium neutral term scheme. An advantage of the step-wise simulation is that in addition to yielding the equilibrium relative level populations and transition intensities, it also permits the dynamic grow-in to equilibri-um to be studied. The neutral barium system has also been studied with the inclusion of photoionization from each of several metastable levels. (Author)

#### AD-739 541/CP PC E01/MF A01 Systems Science and Software La Jolla Calif The Effects of Meso-Scale and Small-Scale Interactions on Global Climate

Semi-Annual technical rept. 1 Sep 71-1 Mar 72. 31 Mar 72, 220p 3SR-1034, AROD-9951:1 Contract DAHC04-71-C-0018, ARDA Order-1752 See also report dated 30 Sep 71, AD-730 748.

Descriptors: \*Climatology, Atmospheric mo-\*Atmospheric motion, Mathematical tion. models, Meteorological parameters, Wind, Boundary layer, Mountains, Thermal radiation, Heat transfer, Coriolis effect, Numerical analysis, Computer programs.

Identifiers: Global climatology, HAIFA computer code, Finite difference theory. Hydrometeorology.

The results reported are part of a continuing study to improve numerical models for meso scale and small-scale effects which influence global weather and its modification. The two major areas being studied are the effects of mountain ranges on energy and momentum transfer and the transient interaction of solar radiation with the Earth's atmosphere. A new theoretical and numerical scheme for solving the radiative transfer equation in the Earth's atmosphere has been developed. Some improvements in the treatment of Mie scattering are presented, and the overall status of the radiation code is reviewed. (Author)

#### AD-740 093/CP PC A18/MF A01 Rand Corp Santa Monica Calif

A Documentation of the Mintz-Arakawa Two-Level Atmospheric General Circulation Model W. L. Gates, E. S. Batten, A. B. Kahle, and A. B. Nelson. Dec 71, 417p Rept no. R-877-ARPA Contract DAHC15-67-C-0141, ARPA Order-189-

Descriptors: \*Atmospheric motion. Mathematical models, Atmosphere models, Computer programs, Partial differential equations, Equations of motion, Heat transfer, Solar radiation, Wind, Atmospheric temperature, Cloud cover, Atmospheric precipitation, Barometric pres-sure, Terrain, Maps.

Identifiers: Global climatology, FORTRAN, Finite difference theory.

Summary of the physical bases of the Mintz-Arakawa two-level atmospheric model and presentation of numerical procedures and computer program for its execution. Discussion covers the physics of the model, with particular attention given to the treatment of the moisture and heat sources, including parameterization of convective processes, cloudiness, and radiation. Numerical approximations and finite-difference equations used in the numerical simulations are also given. To facilitate the use of this model, a complete listing of the code as written in FORTRAN language is given, together with a description of all constants and parameters used. Also included are a dictionary of FORTRAN variables and a dictionary of principal physical features. (Author)

#### AD-742 776/CP PC E01/MF A01 Stanford Univ Calif Stanford Electronics Labs **Direction Finding on Whistlers and Related** VLF Signals

# Technical rept.

Michael D. Cousins. May 72, 201p Rept nos. SU-SEL-72-013, TR-3432-2 Contract N00014-67-A-0112-0012

Descriptors: \*Whistlers, Direction finding, Very low frequency, lonospheric propagation, Mag-netosphere, Loop antennas, Circuits, Fourier analysis, Integral transforms, Computer programs.

The direction of arrival of whistlers and related VLF signals has been measured by a new technique. This technique consists of applying an already existing theory (the 'four-parameter method') to data collected by a novel measurement procedure. Measurements of signals induced in orthogonal loop antennas and a verti-cal monopole located at a single site provide the necessary data. The four-parameter theory relates the loop and vertical voltages, taking into account both amplitudes and phases so

that polarization error may be eliminated. The technique can be shown equal or superior in accuracy to any other VLF direction-finding scheme in current use, such as the standard crossed-loops-and-goniometer technique. (Author)

AD-743 301/CP PC E01/MF A01 Weather Wing (4th) Ent AFB Colo Applying a Window Pane Technique to the Colorado Springs Snow Study Robert C. Sabin. Jan 72, 25p Rept no. 4WW-

Technical Paper-72-1

Descriptors: "Weather forecasting, "Snow, Computer programs, Meteorological charts, Correlation techniques.

The paper supplements 4 WWg Technical Paper 70-5, 'Predicting Heavy Snowfall for Colorado Springs Based on Computer Derived Synoptic Map Types' (AD 718422). The success of the map typing technique described in 4WWTP 70-5 depends upon the size of the area or 'window' selected for typing. In the Colorado Springs snow study the map size chosen covered an area of 10 degrees latitude and 15 degrees longitude. Since this is approximately the size of a synoptic scale disturbance, the map types which were developed gave a good indication of the general circulation pattern required for heavy snow. However, where heavy snowfall is influenced by the local area flow superimposed upon the broader scale features, it is possible that the circulation pattern could correlate highly with a snow type and still not produce the forecast snowfall. The paper describes an attempt to zero-in on the small scale circulation by correlating only one corner of the large window. (Author)

### AD-743 549/CP

PC E01/MF A01 Lockheed Missiles and Space Co Palo Alto Calif Palo Alto Research Lab

Trapped Radiation Studies Involving Plasma Instabilities and Radial Diffusion

Annaul rept. Jan 71-Feb 72

John B. Cladis, Gerald T. Davidson, William E. Francis, Walter I. Futterman, and Lester L. Newkirk. Apr 72, 52p LMSC/D246353, DNA-2824F

Contract DASA01-71-C-0047

Descriptors: \*Magnetosphere, Charged parti-\*Plasma medium, Stability, Van Allen cles. radiation belt, Electromagnetic waves, Interactions, Cyclotron resonance phenomena, Dispersion relations, Wave functions, Curve fitting, Computer programs, Nuclear explosions, Airburst, Plasma oscillations. Identifiers: Vlasov equation, Microinstabilities, Computerized simulation.

The generation of unstable waves in the magnetosphere is reviewed, with emphasis on waves occurring near the trapped particles' gyrofrequencies. Relativistic modifications to the basic theory are described. The evolution of trapped particles' distribution (diffusion) is discussed, and the non linear theories of wave propagation and growth are invoked as the means whereby the evolution of the distribution functions can be studied. It is pointed out that, because of difficulties in the analytic theories, computer simulation may be the most certain technique for investigating effects of unstable waves on particles. Some particular unsolved problems are indicated, with special emphasis on trapping of artificially injected electrons. The development of a computer program which simulates actual physical processes in the magnetosphere is described. (Author)

AD-743 760/CP PC E01/MF A01 Naval Postgraduate School Monterey Calif A Statistical Model of Atmospheric Temperature Signals Master's thesis

# Edward Marvin Kline. Mar 72, 62p

Descriptors: \*Atmospheric temperature, Mathematical models, Statistical analysis, Turbulence, Computer programs, Theses.

The 'ramp' is an often observed feature in temperature fluctuations during unstable atmospheric conditions. It is characterized by a gradual increase in temperature followed by a sudden drop to an ambient level. This ramp clearly distinguishes temperature signals from other turbulence signals such as velocity. Three different ramp-type atmospheric temperature fluctuations and their derivatives are constructed and statistically examined for the parameters skewness and coefficient of excess. These statistical values are compared with values obtained from actual signals. (Author)

AD-743 934/CP PC E01/MF A01 Northeastern Univ Boston Mass Dept of Mathematics

Certain Finite Difference Methods for the Solution of Large Scale Circulation Problems Final rept. 1 Dec 68-20 Nov 71

Robert D. Klein, Jack C. Mettauer, Vito P. Maglione, and Stanley L. Spiegel. 1 Jan 72, 60p AFCRL-72-0155

Contract F19628-69-C-0001

Descriptors: \*Atmospheric motion, Mathematical models, Equations of motion, Difference equations, Computer programs, Partial differential equations, Integration, Numerical analysis.

Identifiers: \*Atmospheric circulation, Finite difference theory, FORTRAN 4 programming language, FORTRAN, GAUJOR computer program.

Program environments suitable for the investigation of a large number of different grid systems and algorithms relevant for the solution of large scale meteorological circulation problems are presented. One of them employs a mixed grid system to solve the barotropic problem. Inconsistencies arising from linear interpolation between the grids followed by numerical differentiation are examined. Also, a spherical grid system with flexibility of definition on the globe is described and the relationship necessary for its use in a finite differencing scheme are developed. Additionally, a program is presented which is useful for calculating the parameters needed for the numerical evaluation of arbitrary differential operators using information from arbitrarily selected grid points. (Author)

#### AD-743 948/CP PC E01/MF A01 Naval Electronics Lab Center San Diego Calif Mode Conversion Program for an Inhomogeneous Anisotropic Ionosphere Interim rept., Jun 71-Apr 72

Richard A. Pappert, and Linda R. Shockey. 1 May 72, 69p Rept no. NELC-IR-722

Descriptors: \*Ionospheric propagation, Numerical analysis, Computer programs, Very Iow frequency, Electron density, Terrestrial magnetism, Magnetic fields, Electric fields, Waveguides. Identifiers: FORTRAN 4 programming Ian-

Identifiers: FORTRAN 4 programming language, FORTRAN.

The report presents a program for numerically determining mode conversion coefficients and mode sums for a waveguide which is inhomogeneous along the direction of propagation. The program allows for vertical inhomogeneity of the ionosphere as well as its anisotropy due to the geomagnetic field. The model assumes the perturbation has no horizontal space dependence perpendicular to the transmitter receiver line. Mode conversion coefficients are obtained by ignoring reflections associated with the inhomogeneity along the direction of propagation. The latter assumption greatly simplifies the calculations and appears to be justified for a broad class of horizontal inhomogeneities. However, its validity under severe artificial ionospheric disturbances requires further study. (Author)

AD-744 094/CP PC E01/MF A01 Raytheon Co Wayland Mass Equipment Development Labs Pulse Pair Estimation of Doppler Spectrum

Parameters Final rept. 1 Feb-31 Jan 72

Herbert L. Groginsky, Aaron S. Soltes, George A. Works, and Frederick C. Benham. 30 Mar 72, 158p AFCRL-72-0222 Contract F19628-71-C-0126

Descriptors: \*Meteorological radar, \*Radar reflections, \*Weather forecasting, \*Doppler radar, White noise, Signal-to-noise ratio, Statistical analysis, Random variables, Doppler effect, Curve fitting, Graphics, Computer programs, Real time, Backscattering. Identifiers: Signal processing, Spectrum analysis, FORTRAN.

The results of an expanded study and investigation of the Pulse Pair technique for estimating the first and second moments (mean and variance) of doppler spectra for radar backscatter from atmospheric phenomena are presented. The theory is extended to include the effects of non-ideal conditions, such as noise, and experimentally verified by extensive performance tests using simulated weather signals with controllable parameters. A proposed experimental model of a real-time digital pulse pair processor is defined and compared with alternate processing techniques. Based on the encouraging results of the study, recommendations are made to carry the theory into practice; these include the construction of a real-time digital pulse pair processor with flexiable characteristics to gather and reduce data for evaluation while operating with real radars, and the development of additional related theory needed to guide the experimental effort. (Author)

## AD-744 833/CP PC E01/MF A01 General Electric Co Philadelphia Pa Space Div A Compendium of Optical Interferometer Results on Secede II

Final technical rept. Irwin M. Pikus, and Gerald Liebling. 31 Jan 72, 61p RADC-TR-72-122 Contract F30602-71-C-0064. ARPA Order-1057

Report on Project Secede.

Descriptors: \*Atmospheric sounding, Upper atmosphere, Interferometers, Barium, Calibration, Computer programs. Identifiers: Secede 2 project, \*Chemical release

studies, Barium clouds, Data reduction.

Project Secede is an ARPA program aimed at solving certain defense related problems through the study of chemical releases in the ionosphere. The chemical of primary interest has been barium. The aspects of the release which are of most interest include the growth of the cloud and the evolution of its striated structure. Several test series of releases have been conducted the latest of which was Secede II. The present report concerns data obtained during Secede II by an optical interferometer. The report consists of a number of data volumes and this one summary textual volume. Interferometer data on events Spruce, Olive, Redwood and Plum has been reduced and photographs of representative IO records on Spruce have been made. The interferometer data is presented in detail in the Event Data Books published separately while the IO records on Spruce are reproduced in this volume. (Author)

AD-745 319/CP PC E01/MF A01 Visidyne Inc Woburn Mass A High Altitude Radiance Model Final rept. 17 Mar 71-14 May 72 Thomas C. Degges. 14 May 72, 218p VI-91, AFCRL-72-0273 Contract F19628-71-C-0156

Descriptors: \*Upper atmosphere, \*Infrared radiation, Background, Infrared spectroscopy, Computer programs, Chemical reactions, Molecular spectroscopy, Chemiluminescence, Airglow.

Identifiers: SNAPS 2 computer program, BCKGND computer program, SPCTRA computer program.

A physical model that includes experimental data on and theoretical estimates of excitation processes that lead to emission of infrared radiation has been implemented in a computer program that computes infrared radiances for an earth's limb viewing geometry. The nominal spectral region of this study lies between five and twenty-five micrometers and emphasis is placed on radiation originating at altitudes between 70 and 500 km. An earlier model for the transport of infrared radiation in molecular bands with Doppler line shape, accurate only for linear molecules, has been extended to bands of polyatomic molecules. A chemistry program which includes the effects of vertical transport by eddy mixing and molecular diffu-sion has been developed to make possible an estimate of diurnal variation in the abundances of infrared emitting species. (Author)

AD-745 946/CP PC E01/MF A01 Air Force Flight Dynamics Lab Wright-Patterson AFB Ohio

Atmospheric Turbulence Field Parameters Determination

Final rept.

Robert L. Neulieb, Jan N. Garrison, and Dennis J. Golden. Apr 72, 50p Rept no. AFFDL-TR-72-51

Descriptors: "Atmospheric motion, Curve fitting, "Gust loads, Aircraft, Aerodynamic loading, Structural properties, Graphics, Computer programs, Confidence limits. Identifiers: GUSTP computer program, FOR-TRAN, LO-LOCAT project.

A Newton-Raphson least squares percentage error method is developed for the determination of atmospheric turbulence field parameters. A correction function is proposed to deemphasize the effects of data points with low statistical confidence. The method is used on various sets of LO-LOCAT data to demonstrate the excellence of the curve fits obtained. Comparisons are made with other curve fits found in the literature. It is recommended that this method be adopted as the standard method for the determination of atmospheric turbulence field parameters. (Author)

AD-746 314/CP PC E01/MF A01 Thayer School of Engineering Hanover N H Radiophysics Lab Travelling Ionospheric Disturbances Final rept. 1 Oct 67-30 Sep 71

Carlos H. J. Calderon, and Millett G. Morgan. 31 Oct 71, 176 AFCRL-72-0234 Contract F19628-68-C-0099 Doctoral thesis.

Doctorar the

Descriptors: 'lonospheric disturbances, Theory, Atmospheric sounding, lonospheric propagation, Radio waves, Computer programs.

Identifiers: \*Traveling ionospheric disturbances, Internal gravity waves.

A general study of travelling ionospheric disturbances (T. I. D. 's) has been undertaken. In the theoretical aspect, the gravity-wave reso-

nant mode has been studied and the concept of an ionospheric predictive function has been introduced. In the experimental aspect the digital data processing portion of the Dartmouth ionosonde network has been brought into operation and seven T.I.D. events have been analyzed with it. The data have been interpreted in light of Hooke's theory and substantial agreement has been found. (Author)

### AD-746 678/CP

Stevens Inst of Tech Hoboken N J Dept of Mechanical Engineering A Compendium of the Mechanical Properties

PC E01/MF A01

of Polyethylene Balloon Films

Harold Alexander, and Dan Weissmann. Jan 72, 148p ME-RT-72001, Scientific-2, AFCRL-72-0068

Contract F19628-69-C-0069

Report on Project SABAR.

Descriptors: \*Polyethylene plastics, Mechanical properties, \*Balloons, Polyethylene plastics, Films, Test methods, Low-temperature research, Loading(Mechanics), Computer programs, Failure(Mechanics), Stresses. Identifiers: \*Polymeric films.

During the process of establishing test procedures that can be used in determining the suitability of various polyethylene films for balloon use and in subsequent testing of various balloon and balloon candidate materials much information has been collected on the mechanical properties of these films and the structural factors affecting them. This information includes the results of an extensive low temperature biaxial failure test sequence, a detailed discussion of the relationship of structure to mechanical properties and mechanical behavior, experimentation for the establishment of a failure criterion for balloon films the development of an approximate constitutive theory for polyethylene balloon films, and a discussion of the effect of orientation balance on mechanical properties. It is the purpose of the report to place this information at the disposal of the ballooning community. (Author)

#### AD-748 283/CP

PC E01/MF A01 Gca Corp Bedford Mass Gca Technology Div

Infrasonic Data Reduction

Final rept. Mar 68-Dec 70 George Ohring. Dec 70, 37p GCA-TR-70-9-A, AFCRL-72-0429

Contract F19628-68-C-0305

Descriptors: \*Microbarometric waves, Data processing systems, Power spectra, Spectrum analyzers, Signal-to-noise ratio, Mathematical models.

Identifiers: \*Signal processing, Digital filters, Data reduction, MAXLKH computer program, "Infrasonic radiation, Wiener filters.

multi-channel prediction-error filter technique is developed for suppressing noise on infrasonic signals. The technique uses sam-ples of noise prior to a signal for deriving a Wierner prediction filter that is used to predict the noise during the first motion of the infrasonic signal. A computer program entitled MAXLKH is written to carry out the filtering technique. Application of the technique to actual infrasonic records indicates that noise has some degree of predictability and, hence, an enhancement of the infrasonic signal results. Further tests are suggested to quantify the amount of noise suppression and to optimize technique parameters such as filter length and prediction span. A discussion of the computer program is included. (Author)

#### AD-748 796/CP PC E01/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass

Arctic Ionosphere Modelling - Five Related Papers

Air Force surveys in geophysics George J. Gassmann, Jurgen Buchau, Rosemarie A. Wagner, Charles P. Pike, and Martin G. Hurwitz. 16 May 72, 61p Rept nos. AFCRL-72-0305, AFCRL-AFSIG-241

\*lonosphere, Descriptors: Arctic regions. \*Atmosphere models, lonosphere, lonospheric propagation, lonospheric disturbances, Au-rorae, Ionization, Electron density, Computer programs.

Identifiers: Auroral sporadic E layer, F region, lonograms.

Contents:

Instantaneous versus averaged ionosphere; Modelling the auroral E-layer;

Model of arctic sporadic E;

Modelling the arctic F-laver

Coordinate conversion and other computer programs for arctic ionospheric research.

AD-749 285/CP PC E01/MF A01 Ohio State Univ Research Foundation Columbus

A Study of Charged Particle Motion in a Free Vortex Flowfield

Interim technical rept

R. A. Cudnick, and H. R. Velkoff. Jul 72, 135p TR-12, AROD-4942:17-E

Contract DA-31-124-ARO(D)-246

Master's thesis.

Descriptors: \*Charged particles, Particle trajectories, \*Particle trajectories, Electrostatic fields, \*Atmospheric motion, Charged particles, Flow fields, Tornadoes, Dust storms, Vortices, Gas ionization, Magnetohydrodynamics, Differential equations, Computer programs, Graphics, Theses

Identifiers: Gas dynamics, Dust devils.

A study was made of charged particle motion in a free-vortex flow field to determine the parameters affecting particle motion and to determine the extent to which applied electric fields can influence the particle motion. Four different cases were investigated. These included first, the analysis of the motion of an uncharged particle in a free-vortex; second, analysis of the motion of a charged particle in a viscous medium under the influence of an applied electrostatic field; third, analysis of charged particle motion in a free-vortex under the influence of the applied electrostatic field, assuming the particle is first positively and then negatively charged; and fourth, analysis of the motion of two charged particles in a free-vortex, accounting for field effects due to particle charge. (Author)

AD-750 082/CP PC E01/MF A01 Army Electronics Command White Sands Missile Range N Mex Atmospheric Sciences Lab Two-Dimensional Short-Range Fog Δ. Forecast Model

Research and development technical rept. Charles A. III Doswell. May 72, 76p ECOM-5443

Descriptors: \*Fog, \*Weather forecasting, Wind, Vortices, Diurnal variations, Partial differential equations, Computer programs.

Identifiers: Numerical weather forecasting, Finite difference theory, FORTRAN 5 pro-gramming language, FORTRAN, Fog dispersal.

two-dimensional dynamical model is developed for the specific purpose of forecasting fog for time periods of as much as eight hours on a local scale. Time-dependent winds are generated by calculating a streamfunction from a model-produced vorticity field. A diurnal variation at the surface is simulated by sinusoidally varying boundary conditions on temperature. Surface terrain effects can be incorporated through boundary conditions to provide a means of adapting the method to a particular location. Only grosser features of microphysical processes have been incor-porated, and the values of the wind forecasts are limited by the inability of a two-dimensional model in the X-Z plane to include synopticscale variations. Fine-scale data are required for the model, which is thereby well-suited to provide forecast support for such activities as fog modification experiments. (Author)

AD-750 083/CP PC E01/ME A01 Army Electronics Command White Sands Missile Range N Mex Atmospheric Sciences Lab

An Iterative Method for Saturation Adjustment

Research and development technical rept Charles A. III Doswell. Jun 72, 28p ECOM-5444

Descriptors: "Water, "Phase studies, "Fog, Mathematical models, Weather forecasting, Mathematical prediction, Computer programs, Numerical analysis.

Identifiers: Computerized simulation, Numerical weather forecasting, Weather modification, Fog dispersal, FORTRAN, FORTRAN 5 programming language.

A fast and accurate technique for iterative solution of the saturation adjustment problem is developed. The method is intended for use on digital computers, and a sample FORTRAN program is provided. Results (for vapor pressures) are accurate to the order of 0.01 mb. (Author)

AD-750 727/CP PC E01/MF A01 Systems Science and Software La Jolla Calif The Effects of Meso-Scale and Small-Scale Interactions on Global Climate

Semiannual technical rept. 15 Feb-14 Aug 72. 15 Sep 72, 202p 3SCR-72-1255, AROD-9951:4-A Contract DAHC04-71-C-0018, ARPA Order-1752

Descriptors: \*Climatology, Atmospheric motion, \*Atmospheric motion, Mathematical models, Meteorological parameters, Wind, Turbulence, Coriolis effect, Heat transfer, Thermal radiation, Mountains, Subroutines.

Identifiers: Global climatology, HAIFA com-puter code, Finite difference theory, FORTRAN.

The results reported herein are the continuation of numerical studies of meso-scale phenomena related to the effects of orography on momentum and energy transfer in the atmosphere and the interaction of solar radiation with the Earth's atmosphere.

AD-751 267/CP PC E01/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass

Modeling the Bottomside Ionospheric Elec-tron Density Profile

Environmental research papers

Robert E. Cookingham. 5 Jun 72, 69p Rept nos. AFCRL-72-0340, AFCRL-ERP-401

Descriptors: \*lonosphere, \*Electron density, \*lonospheric propagation, High frequency, Diurnal variations, Curve fitting, Graphics, Mathematical models, Computer programs. Identifiers: F2 region, ARLINE computer pro-

gram.

A model describing the mid-latitude bottomside electron density profile is presented. The only geophysical input parameters required for the model are critical frequency, M-factor, planeta-ry index (Ap), and 2800 MHz solar radio flux. An empirically-determined formula for calculating H(m)F2 is derived and used in the model. This formula is a function of the M-factor, local time, day number and magnetic activity. The results obtained by comparing predicted profiles to observed electron density profiles are presented in the form of mean percentage er-

rors as a function of height and local time. The New Model IS COMPARED TO A MODEL CUR-RENTLY IN OPERATIONAL USE AND IS SHOWN TO BE A 10 TO 20 PERCENT IM-PROVEMENT. (Author)

AD-751 517/CP PC E01/MF A01 Ghana Univ Legon Dept of Physics

Total Electron Measurements of the lonosphere using Beacon Satellites BEB(S66) and BEC

Final rept. Oct 64-Jul 67

John R. Koster, and Llewellyn G. Grimes. 1 Jun 67, 114p AFCRL-72-0562

Contract AF 61(052)-800

Descriptors: \*lonosphere, Electron density, Scientific satellites, lonospheric propagation, Scientific satellites, fonospheric propagation, Radio waves, Polarization, Tables, Computer programs, Magneto-optic effect, Ghana. Identifiers: Polarized electromagnetic radia-tion, FORTRAN, FORTRAN 2 programming language, Faraday effect, Beacon satellites.

The report describes the physical principles in-volved in measuring the Total Electron Content (TEC) together with the equipment used. Details are also given of the main steps in the computer program used to calculate the TEC. The report deals with the TEC results measured simultaneously at two stations. This provides a means of testing the consistency of the results obtained using the first and second order theory. The report contains the tabulated results of the values of the TEC as measured at Legon. The results cover the period October 1964 to July 1967 and are given for both the first and second order theory. Various appendices give the source programs (in Fortran II) used in the calculations. (Author)

AD-751 590/CP PC E01/MF A01 Naval Postgraduate School Monterey Calif Hurricane Heat Potential of the North Atlantic and North Pacific Oceans Master's thesis

Richard Francis Heffernan. Sep 72, 107p

Descriptors: "Atlantic Ocean, Surface tempera-tures, "Pacific Ocean, Surface temperatures, "Tropical cyclones, Potential energy, Correla-tion techniques, Bathythermograph data, Thermoclines, Computer programs, Theses, Hurricane tracking. Identifiers: North Atlantic Ocean, North Pacific

Ocean. Ocean surface.

The thesis has two primary objectives, the first is to produce a Monthly Mean Hurricane Heat Potential Atlas based upon bathythermograph data for selected regions in the Tropical Atlantic and Pacific Oceans (this atlas also includes Mean Monthly Sea Surface Temperatures, Mean Monthly Depths of the 26C Isotherm, and Mean Monthly Layer Depths). The second objective is to compute changes in sea surface temperature and in the convective layer depth which would be associated with heat loss from the ocean in a severe tropical storm passage. Upwelling effects upon these quantities has been considered by other authors.

AD-751 780/CP PC E01/MF A01 Army Electronics Command White Sands Missile Range N Mex Atmospheric Sciences Lab A General-Purpose Meteorological Rocket Data Reduction Program

Research and development technical rept. Mary Ann B. Seagraves. Aug 72, 123p ECOM-5462

Descriptors: 'Atmospheric sounding, Data processing systems, 'Computer programs, In-struction manuals, Wind, Atmospheric tem-perature, Barometric pressure, Density, Meteorological radar, Sounding rockets, Ozone

Identifiers: METROC computer program. Univac 1108 computers, Data reduction, FOR-TRAN.

METROC is a general-purpose meteorological rocket data reduction program designed to be run on the Univac 1108 computer system at White Sands Missile Range, New Mexico (WSMR). Wind data may be input on cards or may be computed from radar data input on digital tape. Temperature data may be input on data cards. Layer winds are computed for selected altitudes, as are corrected temperatures. Pressure and densities are derived by using the hydrostatic equations and an initial data point from a conjunctive rawinsonde measurement. Some specially formatted data may be output to meet project requirements at WSMR. (Author)

#### AD-752 141/CP

Virginia Inst of Marine Science Gloucester Point

PC E01/MF A01

Forecasting Storm-Induced Beach Changes along Virginia's Ocean Coast Final rept.

Wyman Harrison, Paul A. Bullock, and N. A. Pore. 31 Dec 71, 117p Rept no. Contrib-451 Contract DACW72-69-C-0031 Prepared in cooperation with National Weather Service, Silver Spring, Md.

Descriptors: \*Storms, Weather forecasting, \*Beaches, Erosion, Regression analysis, Cor-relation techniques, Mathematical prediction, Computer programs, Virginia.

Identifiers: Storm surges, 'Beach erosion, IBM 1130 computers, FORTRAN 4 programming language, FORTRAN.

The purpose of this study was to begin work on a method for operational prediction of storminduced beach changes. The thought was to use wind and storm-surge data that are predicted on a routine basis by the National Weather Service, NOAA, and it was felt that if such a procedure could be developed, it would be possible to provide estimates of beach erosion or deposition as part of routine weather forecasts whenever storms threatened. It was also hoped that it might be possible to make estimates of shoreline erosion during previous years by using historical storm data in the prediction scheme.

AD-753 268/CP PC E01/MF A01 Colorado State Univ Fort Collins Fluid Dynamics and Diffusion Lab

Mass Dispersion from an Instantaneous Line Source in a Turbulent Shear Flow

Technical rept.

Surya Narayana Putta, and Jack E. Cermak. Jun 100p Rept nos. CER71-72SNP-JEC1, THEMIS-CER-TR-19

Contract N00014-68-A-0493-0001, DAAB07-68-C-0423

Descriptors: \*Atmospheric motion, Mathematical models, \*Air pollution, Atmospheric motion, Atmosphere models, Density, Transport proper-ties, Equations of motion, Shear stresses, Statistical analysis, Turbulence, Computer programs.

Identifiers: Turbulent flow. Shear flow. Turbulent diffusion, Themis project.

The report discusses the statistical properties of the dispersion of air pollutants released from an instaneous line source and specifies a realistic probability density function for the spatial distribution of concentrations within the smoke puff. A probable shape of smoke puff is presented for a source released at ground level.

AD-755 390/CP Regis Coll Weston Mass PC E01/MF A01

Rocket and Satellite Experiments for the Measurement of the Properties of Thermal and High Energy Plasma Final rept. 30 Jul 71-30 Sep 72

Mukhtar Ahmed, and Lalitha D. V. Rao. 2 Nov 72, 68p AFCRL-72-0662 Contract F19628-72-C-0021

Descriptors: \*Magnetosphere, Atmospheric sounding, lonosphere, Computer programs, Scientific satellites, lons, Electron density, Temperature, Magnetic storms, Data

processing systems. Identifiers: OGO 1 satellite, OGO 3 satellite, Injum 5 satellite, ISIS-I-satellite.

The work carried under this contract covers the routine reduction and analysis of data obtained from the Spherical Electrostatic experiments on board the OGO 1 and 3, INJUN 5 and ISIS-1 satellites. The data analysed were examined and theoretical interpretations were made thereby enabling an understanding of the physical processes operating in the magnetospheric region of space. (Author)

AD-755 403/CP

MF A01 Environmental Technical Applications Center (Air Force) Washington D C

An Operational Decision Model Employing **Operational and Environmental Factors** Technical note

Dana P. Hall. Nov 72, 22p Rept no. USAFETAC-TN-72-8

Availability: Available in microfiche only.

Descriptors: \*Weather forecasting, \*Decision theory, \*Air transportation, Armed Forces sup-plies, Climatology, Operational readiness,

Computer programs. Identifiers: FORTRAN, FORTRAN 4 programming language.

The model discussed in the paper combines conditional climatological probabilities, climatological probabilities, and operational loss values for specified actions in a manner to make the best operational decision. A sample scenario is given and demonstrated using a hypothetical problem of airlift supply. (Author)

AD-757 085/CP PC E01/MF A01 Washington Univ Seattle Stimulated Amplification of VLF and ULF Waves in the Magnetosphere by Localized In-jections of Plasma Clouds and Particle Beams

Final rept Harold B. Liemohn, and G. K. Parks. Dec 72.

135p

Contract N00014-67-0103-0027, ARPA Order-1479

Prepared in cooperation with Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs.

Descriptors: \*Magnetosphere, Plasma physics, \*Radio transmission, Magnetosphere, Very Iow frequency, Ultralow frequency, Cyclotron resonance phenomena, Ionospheric resonance phenomena, Ionospheric disturbances, Electron beams, Proton beams, Lithium, Barium, Computer programs. Identifiers: Chemical release studies, N.

The cyclotron resonance interaction between ULF-VLF waves and trapped particles may be strongly enhanced in the magnetosphere by the injection of either cold plasma or energetic par-ticle beams. A variety of natural conditions and injections are investigated numerically using the linear theory. Both satellite and rocket in-jection of cold plasma provide significant enhancements of amplification. Conventional enhancements of amplification. Conventional hot electron beams may also amplify narrow frequency bands, if the beam geometry can be effectively altered at injection. Heavy ion beams appear to offer attractive propagation condi-tions as well as stimulate amplification. (Author)

AD-757 256/CP PC E01/MF A01 Naval Postgraduate School Monterey Calif An Optical Apparatus to Determine the Effect of Turbulence on the Modulation Transfer Function of the Atmosphere Master's thesis

Wayne Thompson Hildebrand. Dec 72, 43p

Descriptors: \*Atmosphere, Optical properties, Optical instruments, Transfer functions, Coherent radiation, Optical images, Degradation, Turbulence, Experimental design, Test equipment, Computer programs, Theses, Light communication systems. Identifiers: Modulation transfer functions,

Laser beams, Atmospheric attenuation, N.

An apparatus was designed and constructed to determine the effect of atmospheric turbulence on the modulation transfer function (MTF) of the atmosphere. A reflecting telescope and reti-cle system provided optical information in the visible region to a silicon photodiode detector which was responsive from .35 micron to 1.1 microns. The output of the detector was processed to measure irradiance modulation from a target of known spatial frequency. The modulation transfer function of the atmospheric transmission medium and the optical system was measured under calm conditions and conditions of turbulence on a 270 meter round trip path through a building corridor. The optical apparatus described was capable of detecting, in the visible range, the degrading effect of tur-bulence on MTF. All reflective optics were used so that the visual through 10 micrometers range can be covered with use of different detectors. (Author)

#### AD-757 623/CP PC E01/MF A01 Army Electronics Command White Sands Missile Range N Mex Atmospheric Sciences Lab Numerical Approximations of Selected MeteorologicI Parameters Related to Cloud Physics

Research and development technical rept. Walter S. Nordquist, Jr. Mar 73, 50p ECOM-5475

Descriptors: \*Meteorological parameters, Numerical analysis, Vapor pressure, Dew point, Specific heat, Clouds, Approximation(Mathematics), Computer programs. Identifiers: FORTRAN, \*Cloud physics, Latent heat, Wet bulb temperature, A.

Methods of computation and error estimates are presented for numerical approximation of selected meteorological parameters used in the solution of cloud physics problems. These parameters are latent heat, saturation vapor pressure, dew point and wet bulb temperatures, specific heat of liquid water, temperature of the lifting condensation level, change in mass of freely falling water drops, and saturationadiabatic temperatures. The FORTRAN programming language listings of the approximations are provided in the appendix. (Author)

AD-758 007/CP PC E01/MF A01 Environmental Prediction Research Facility (Navy) Monterey Calif

The 1972 Typhoon Analog Program (TYFOON-72)

Jerry D. Jarrell, and Richard A. Wagoner. Jan 73, 40p Rept no. ENVPREDRSCHFAC-techpaper-1-73

Descriptors: \*Tropical cyclones, Weather forecasting, Programming(Computers), Meteorological parameters, Curve fitting, Pacific Ocean.

Pacific Ocean. Identifiers: TYFOON computer program, TYFOON 72 computer program, Storm tracks, North Pacific Ocean, N.

TYFOON, an analog program for the prediction of tropical cyclones in the western North Pacific Ocean, has been in operational use at FWC/JTWC Guam since August 1970. A brief review of TYFOON is presented focussing on its concept, operational results and limitations. Modifications to remedy shortcomings and limitations in the original version are discussed. The modified program TYFOON-72 resulted in the reduction of both computer run time and data storage requirements. Testing and development of the modified program using a sample of 131 forecast situations are reported. TYFOON-72 compared favorably with the official JTWC and TYFOON forecasts at 24 and 48 hr and was superior to both at 72 hr. (Author)

AD-758 196/CP PC E01/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass Numerical Model of the Equatorial Electroiet

Environmental research papers Arthur D. Richmond. 16 Nov 72, 69p Rept nos. AFCRL-72-0668, AFCRL-ERP-421

Descriptors: \*lonospheric disturbances, Mathematical models, Computer programs, Electron density, Ions, Ionization, Photochemistry, Electric currents, Equations of motion. Identifiers: \*Equatorial electrojet, ELJET computer program, CDC 6600 computers, F region, Ion density(Concentration). AF.

A computer program which calculates electron and ion densities, ionospheric conductivities, electric fields and currents, and magnetic variations in regions near the magnetic equator is described in detail. It is also explained how this numerical model can be used to deduce F-region vertical plasma drifts in the equatorial ionosphere from observed magnetic variations at ground level. (Author)

## AD-759 546/CP PC E01/MF A01 Texas Univ Austin Electronics Research Center Application of Adaptive Estimation to Tem-

Application of Adaptive Estimation to Temperature Forecasting Technical rept.

Newton B. Penrose, and Demetrios G. Lainiotis. 5 Dec 72, 153p TR-140, AFOSR-TR-72-2185 Contract F44620-71-C-0091

Descriptors: "Atmospheric temperature, "Weather forecasting, Stochastic processes, Probability density functions, Mathematical models, Climatology, Computer programs. Identifiers: Nonlinear filtering, Estimation theory, Autocorrelation, Histograms, Lainiotis filters, AF.

The work is an application of adaptive estimation to temperature forecasting. It is presented as a feasibility study demonstrating the efficacy of the adaptive approach. The local station temperature forecasting problem is chosen to focus the discussion on the efficiency of the filtering algorithm by using only surface level sin-gle geographic location data. A diagnostic study is made to ascertain the appropriate statistical properties of the weather data for algorithm selection. A phenomenalistic approach is taken since no differential equation or complete quantitative description exists to describe the temperature process. The Lainiotis Filter is chosen for model identification and classification as well as prediction results. The Lainiotis Filter, given in the Partition Theorem, provides an efficient, powerful tool in the application of adaptive estimation techniques. The feasibility of the adaptive approach is established with comparative results with previ-ous objective forecast methods while greatly reducing the amount and variety of required input data. (Author)

AD-760 117/CP PC E01/MF A01 Emmanuel Coll Boston Mass Mathematical-Model Programs Final rept. 15 Oct 70-15 Feb 72 M. Patricia Hagan. 30 Oct 72, 23p AFCRL-72-0674

#### Contract F19628-71-C-0064

Descriptors: \*Magnetic storms, \*Computer programs, Numerical analysis, lonospheric disturbances.

Identifiers: CDC 6600 computers, \*Geomagnetic micropulsations, AF.

Programs were compiled to compare experimental data with mathematical models with respect to magnetic activity. Micropulsations were investigated and programs were written to compute the eigenperiod and modulus of decay, so the predicted results could be compared with experimental observations. This was a particularly difficult problem, because the dispersion relationship was a complex trans-cendental equation, and required a 2-part fit. The complex function was mermorphic with respect to its complex arguments, and so the Cauchy-Riemann conditions were applicable. The secular equation was expanded in a Taylor Series, and then the equation was cast in a form immediately amenable to the numerical analysis. The programs were written and can now be easily reformated, suitable for production basis on the CDC 6600. (Author Modified Abstract)

AD-760 123/CP PC E01/MF A01 Drexel Univ Philadelphia Pa Dept of Physics and Atmospheric Sciences

A One-Dimensional Numerical Model to Study the Effects of Cumulus Clouds on the Environment

Donald J. Perkey, and Carl W. Kreitzberg. Dec

72, 109p Scientific-5, AFCRL-TR-73-0014 Contract F19628-69-C-0092

Report on Atmospheric Sensing and Prediction Project.

Descriptors: \*Cumulus clouds, Mathematical models, \*Convection(Atmospheric), Environment, Atmospheric precipitation, Atmospheric motion, Partial differential equations, Computer programs, Atmospheric temperature, Barometric pressure.

Identifiers: Themis project, FORTRAN, CDC 6600 computers, CDC 7600 computers, Computerized simulation, MESOCU computer program, AF.

The report documents and provides a users guide for a one-dimensional numerical model to study the effects of convection on the environment. The model combines a one-dimensional Lagrangian cumulus cloud model with the basic physical processes of cyclonic scale lifting, surface eddy mixing, cloud induced ensubsidence, vironmental sub-cloud hydrometeor water evaporation and horizontal diffusion of the dissipating cloud. Included in this documentation are a detailed model description, derivation of the model equations, a basic flow diagram, a list of program mnemonics, a description of the input data format and a model listing and output from the National Center for Atmospheric Research's Control Data 6600 and 7600 computers. (Author)

#### AD-760 175/CP

Kms Technology Center Irvine Calif Theoretical Investigation of the Effect of Particle Contaminants on Laser-Induced Air Breakdown

PC E01/MF A01

Technical rept. 22 Jun 71-30 Aug 72

Frank D. Feiock, and Lester K. Goodwin. Apr 73, 196p AFWL-TR-72-172

Contract F29601-71-C-0118, ARPA Order-1256

Descriptors: 'Gas discharges, 'Air, 'Aerosols, Gas discharges, Electron density, Quartz, Sapphires, Particles, Gas ionization, Impurities, Hydrodynamics, Computer programs, Partial differential equations, Distribution functions. Identifiers: 'Dielectric breakdown, Laser beams, Atmospheric attenuation, AF.

The effect of atmospheric contaminants on the laser-induced breakdown of air is investigated. Taser-induced breakdown of air is investigated. Calculations were performed using a one-dimensional, Lagrangian, hydrodynamic code developed for the study. The results of this study indicate that the interaction of a laser beam with atmospheric contaminants such as SiO2 and AI2O3 can supply a primary electron density that will lead to a significant decrease in the laser-induced breakdown threshold for air. (Author)

AD-760 767/CP PC E01/MF A01 Panametrics Inc Waltham Mass Design, Fabrication and Use of an Instrument for Real-Time Determination of Polar Elec-

trojet Position and Current Parameters Final rept. 15 Mar 70-28 Feb 73

Bach Sellers, Frederick A. Hanser, and Paul R.

Morel. Mar 73, 58p AFCRL-TR-73-0166 Contract F19628-70-C-0224

Descriptors: \*Magnetosphere, \*Magnetic storms, \*Aurorae, Measurement, \*Ionospheric disturbances, Magnetic storms, Instrumenta-tion, Magnetometers, Height finding, Position finding, Design, Atmospheric sounding, Polar regions, Real time, Data processing systems, Computer programs. Identifiers: Auroral electrojets, PDP-8 compu-

ters, AF.

An instrument was designed and fabricated for real-time determination of the auroral electrojet current, velocity, and location in order to assist in selection of the optimum launch time for rockets used to study auroral phenomena associated with substorms. The instrument incorporates a small digital computer to calculate these quantities by use of inputs from up to five 3-axis magnetometers. During two on-site applications at Churchill Research Range data from 3-axis magnetometers situated at two different locations on a north-south line from Churchill were used. During the two substorms studied, the jet was located near 140 km altitude and the intensity of each was as high as 0.5 megaamps. In one case, both stations gave results similar to the two station fit, so the jet was well approximated by a line current. In the second case, the data suggest that the current was either a sheet current or a group of filaments. Recommendations are made for increasing the data processing capability of the instrument in order to handle such realistic electrojet configurations in real-time. (Author)

AD-762 383/CP PC E07/MF A01 Range Commanders Council White Sands Missile Řange N Mex

Comparisons of Radar Refraction Correction Computer Programs at Selected Test Ranges 1973, 180p Rept no. RCC-113-70

Descriptors: \*Atmospheric refraction, Cor-rections, \*Programming(Computers), At-mospheric refraction, Refractive index, Curve fitting, Graphics, Radar tracking, Inertial guidance, Errors, Accuracy. Identifiers: FORTRAN, FORTRAN 2 pro-

gramming language, SD

A detailed comparison of atmospheric refraction computer programs used at various National and Service Ranges has been made. This comparison shows that the data correction programs investigated give one order of magnitude better agreement when all are given the same refractive index profile than they do when they are allowed to use that surface value to determine the profile by their own internal methods. A profile with a strong super-refractive layer was also used in comparing the programs. Widely differing refractive bending effects, is less than 10 feet. The report shows that the numerical methods of the various refraction correction programs produce similar results with similar input data. It also shows that care

should be exercised to assure that data taken at one range and processed at another is refraction corrected with atmospheric data for the range at which the data was taken. Numerical methods of refraction correction are similar at the various ranges but local atmospheres are not. (Author)

AD-762 584/CP PC E08/MF A01 Systems Science and Software La Jolla Calif The Effects of Meso-Scale and Small-Scale Interactions on Global Climate Semiannual technical rept. 16 Oct 72-16 Apr 73

15 Jun 73, 246p SSS-R-73-1727, AROD-9951:5-

Contract DAHC04-73-C-0003 DABPA Order-1752

Descriptors: \*Climatology, Atmospheric mo-tion, \*Atmospheric motion, Mathematical models, Meteorological parameters, Wind, Turbulence, Heat flux, Solar radiation, Mountains, Promodels Atmosphere gramming(Computers).

Identifiers: Global climatology, Atmospheric circulation, Atmospheric radiation, HAIFA com-puter code, STUFF computer code, Mie scatterina. A.

The results reported are part of a continuing study to improve numerical models for mesoscale and small-scale effects which influence global weather and its modification. The two major areas being studied are the effects of mountain ranges on momentum transfer, and the transient interaction of solar radiation with the earth's atmosphere. The results of the research on the solar radiation include several calculations and comparisons with experimental data of heat fluxes in the atmosphere. The major tasks of the orographic study have been to: (1) develop a three-dimensional transient Boussinesq code, (2) continue development and check out of the linear steady state codes, and (3) continue to test the HAIFA codes and runs using real topography data. (Modified author abstract)

AD-763 082/CP PC E01/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass

Application of a Computer-Controlled Two-Dimensional Densitometer to Photograph Chemical Releases Instrumentation papers

Norman W. Rosenberg. 9 Mar 73, 37p Rept nos. AFCRL-TR-73-0155, AFCRL-IP-182

Descriptors: \*Upper atmosphere, Atmospheric sounding, \*Densitometers, Photographic sounding, \*Densitometers, Photographic techniques, Photographic recording systems, Data processing systems, Television display

systems, Computer programs, Identifiers: "Chemical release studies, Minicomputers, Datamate 16 computers, FOR-TRAN, SHIFTS computer program, GRAPHS computer program, AF.

The use of a computer-controlled two-dimensional film densitometer in analysis of photographs of chemical releases at high altitudes is reported. The unit makes possible rapid interactive studies of extensive film records for measurement of chemical inventory and reac-tions, radial growth and diffusion processes, and turbulent spatial structure. Application to other problems is briefly discussed. (Author)

AD-763 721/CP PC E01/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass

Atmospheric Transmittance from 0.25 to 28.5/micrometers Computer Code LOWTRAN

Environmental research papers J. E. A. Selby, and R. M. McClatchey. 29 Dec 72, 82p Rept nos. AFCRL-ERP-427, AFCRL-72-0745

Descriptors: \*Atmosphere models, Light transmission, \*Computer programs, Atmosphere models, Ultraviolet radiation, Infrared radiation, Meteorological parameters.

Identifiers: LOWTRAN 2 computer program, FORTRAN, Light(Visible radiation), Trans-mittance, AF.

A Fortran computer program LOWTRAN 2 is described for calculating the transmittance of the atmosphere in the spectral region 0.25 to 28.5 micrometers at a spectral resolution of 20/cm. The program provides a choice of six atmospheric models covering seasonal and latitudinal variations from sea level to 100 km, two haze models, and accounts for molecular absoprtion, molecular scattering, and aerosol extinction. Refraction and earth curvature effects are also included. (Author)

PC A08/MF A01 AD-766 240/6CP Air Force Cambridge Research Labs L G Hanscom Field Mass

An Empirical Model of the Polar lonosphere Air Force surveys in geophysics Terence J. Elkins. 23 May 73, 151p Rept nos.

AFCRL-TR-73-0331, AFCRL-AFSIG-267

Descriptors: \*lonosphere, Polar regions, \*Atmosphere models, lonosphere, lonospheric propagation, Electron density, Aurorae, Magnetosphere, Mathematical models, Computer programs.

Identifiers: F region, Sporadic E layer, FOR-TRAN, AF.

Four separate articles are collected which deal with the construction of empirical models of the polar ionosphere. The particular emphasis in these articles is towards the radio propagation application of the models. Numerical models of the vertical electron density profiles on the top-side and bottomside of the F-region are developed, and a model for sporadic-E is included. Special attention is devoted to features which are characteristic of the polar ionosphere-auroral effects, the trough, and magnetospheric cleft regions. The models are constructed specifically for convenience in computer programming, and in fact, all aspects of the models contained in this report are available in the form of Fortran computer programs. (Author)

AD-766 241/4CP PC E01/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass

Geomagnetic Field Models for Ray Tracing Environmental research papers Ming S. Wong, Krishna-Sastry Vanguri, and

Manfred P. Friedman. 8 May 73, 49p Rept nos. AFCRL-TR-73-0294, AFCRL-ERP-446

Descriptors: \*lonospheric propagation, Terrestrial magnetism, Magnetic fields, Mathematical models, Electron density, High frequency, Computer programs. Identifiers: Ray tracing, ITSA computer pro-

oram. AF.

An accurate geomagnetic-field model, consisting of the dipole plus seven higher-order harmonics in dipolar coordinates, is incorporated into a computer program for three-dimensional ray tracing. Three options of using magnetic-field models are provided: (1) using accurate field in computing both the ray trajectory and the propagation-aspect angle between the geomagnetic-field vector and the wave-normal vector associated with each point along the ray; (2) using the dipole field for computing rays but using the accurate field for computing aspect angles; (3) using the dipole field for both the rays and aspect angles. Comparisons are made among the results computed, using the three options, in the HF band for a nighttime polar ionosphere and for a noontime equatorial iono-sphere. Typical differences of few to ten

degrees occur in the aspect angle, for aspect angles hear 90 degrees -- the value under which geomagnetic-field-aligned ionization, if present, would give rise to maximum backscatter of HF waves and thus cause clutter in Over-the-Horizon radars. (Author)

AD-766 472/5CP PC A07/MF A01 Massachusetts Inst of Tech Cambridge Generation and Propagation of Infrasonic Waves

Final rept. 1 Feb 70-31 Jan 73

Allan D. Pierce, Charles A. Moo, and Joe W. Posey. 30 Apr 73, 131p AFCRL-TR-73-0135 Contract F19628-70-C-0008

Descriptors: \*Microbarometric waves, Atmosphere models, Sources, Nuclear explosions, Storms, Wave transmission, Mathematical models, Programming(Computers). Identifiers: Gravity waves, Acoustic gravity waves, INFRASONIC WAVEFORMS computer program, AF

A review is given of theoretical studies on infrasound generation and propagation through the atmosphere which were carried out under the contract. These studies include (1) further development and application of a computer program for the prediction of pressure signatures at large distances from nuclear explosions, (2) development of an alternative approximate model for waveform synthesis based on Lamb's edge mode, (3) development of a geometrical acoustics' theory incorporating nonlinear effects, dispersion, and wave distortion at caustics, and (4) a theoretical model for the prediction of acoustic gravity wave generation by rising and oscillating fireballs. Numerical studies are reviewed which indicate the dependence of far field waveforms on energy yield and burst height. Implications of the Lamb edge mode theory include a new method for estimating energy yield from waveforms and an explanation of amplitude anomalies in terms of focusing or defocusing of horizontal ray paths. (Author)

## AD-766 525/0CP

Reprint Air Force Cambridge Research Labs L G Hanscom Field Mass Formulation of Diurnal D-Region Models

Using a Photochemical Computer Code and Current Reaction Rates

T. J. Keneshea, and W. Swider. 25 Apr 72, 8p Rept no. AFCRL-TR-73-0525

Availability: Pub. in Jnl. of Atmospheric and Terrestrial Physics, v34 p1-7 1972.

Descriptors: 'lonosphere, 'Photochemistry, lonospheric disturbances, Polar regions, lons, Chemical reactions

Identifiers: D region, Polar cap absorption, Atmospheric composition, AF.

Application of the photochemical computer code, developed by Keneshea, to the D-region is considered. Only the use of high speed computers can provide the required analysis under such transient conditions as twilight. Even for equilibrium conditions, the performance of the calculation by a computer is necessary for a complete description of the D-region since a very large number of processes is involved. The photochemical code presently includes 195 reactions for the 40 species considered. Certain constituents like NO, also O and O3 at the higher altitudes, must be inserted as constants since transport processes are required for the proper description of their atmospheric profiles. The results obtained from application of the code to the D-region during a PCA event are presented. The problem of the quiet D-region is briefly discussed. (Author)

AD-766 929/4CP PC A09/MF A01 Weather Squadron (12th) Ent AFB Colo

# Map Typing Computer Programs

Hal W. Wold. Jun 73, 180p Rept no. Technical-Paper-73-6

Descriptors: \*Meteorological charts, Mapping, forecasting, Weather Catalogs. \*Programming(Computers), Instruction manuals, Computer programs, Barometric pressure. Identifiers: Synoptic meteorology, Pro-gramming manuals, IBM 7090 computers, IBM

360/40 computers, Honeywell 6050 computers. Honeywell 6070 computers, Computer aided mapping, FORTRAN, AF.

The paper describes the computer techniques and lists the computer programs used in the preparation of map type catalogs. Flow charts are also included. (Author)

PC A04/MF A01

## AD-767 934/3CP

Environmental Prediction Research Facility (Navy) Monterey Calif Oceanic Fog, a Numerical Study Final rept. Edward H. Barker. Sep 73, 73p Rept no. ENVPREDRSCHFAC-tech paper-6-73

Descriptors: \*Fog, Marine meteorology, Weather forecasting, Mathematical models, Wind, Water vapor, Infrared radiation, At-mospheric temperature, Computer programs. Identifiers: Planetary boundary layer, Fog dispersal, Cloud physics, N.

A numerical model was developed for the simulation of fog and stratus in the marine planetary boundary layer. Physical processes described by the model are eddy diffusion, horizontal advection, fog droplet settling, infrared radiation and change of thermodynamic state of moist air. Results of the computations show the relative importance of the processes considered in the development of stratiform clouds in the planetary boundary layer. Among the most important factors governing the extent of fog are the magnitudes of horizontal advection of heat and infrared radiation by cloud and water vapor. Comparisons of the computational results with existing observations show that the formation process has been adequately described. Additionally, it was shown that occurrence of fog over the ocean could result in air temperature colder than that of the sea surface, caused by radiation heat loss from the cloud top. Results indicate that a practical fog forecast model is feasible with certain refinements, such as inclusion of the effects of haze on the infrared radiation balance, inversion strength on the growth of the mixing layer depth, and insolation. (Author)

AD-769 739/4CP PC E01/MF A01 Army Electronics Command Fort Monmouth N

Algorithms for Generating a Skew-T, log p Diagram and Computing Selected Meteorological Quantities G. S. Stipanuk. Oct 73, 40p Rept no. ECOM-

5515

Descriptors: \*Meteorological data, Computations, Atmospheric temperature, Barometric pressure, Computer programs, Tables(Data), FORTRAN. Identifiers: A

The paper discusses numerical methods of computing meteorological quantities which are usually manually derived from analysis on a SKEW-T log p DIAGRAM. The numerical methods used were selected for their simplicity and accuracy. A mathematical characterization of the SKEW-T and algorithms for computing meteorological quantities several are presented. (Author)

AD-770 053/7CP PC A06/MF A01 General Electric Co Santa Barbara Calif Tempo WEPH V Code Modifications for HF Propagation and System Performance Modeling Topical rept.

Royden R. Rutherford. 19 Oct 73, 115p GE73TMP-20, DNA-3153T Contract DNA001-72-C-0180

Descriptors: "Ionospheric propagation, High frequency, "Ionospheric disturbances, "Nuclear explosions, Electron density, Computer pro-gramming, Nuclear fireball, Ray tracing, Radio waves, Signal processing, lonizing radiation, Communication and radio systems, Computations.

Identifiers: WEPH V computer code, D region, F region, SD.

The report describes modifications to the WEPH V code that permit the use of the code for evaluation of HF propagation and system performance in nuclear-disturbed environments. The propagation and system models are an extension of those presented in the DNA HF Communication Handbook (DASA 1955-1 and-2). The principal degradation effect modeled is D-region absorption. While changes in sky-wave geometry due to the disturbed environment are not determined, modifications to F-region critical frequencies at selected points are evaluated from approximate models. The modified WEPH V code is intended for use in rapid evaluation of the effects of propagation, system, and environment parameters on system performance, and to identify situations where analysis with detailed ray tracing codes such as the NUCOM code (DASA 2035) is required. (Author)

AD-770 207/9CP PC A06/MF A01 Ocean Data Systems Inc Rockville Md Extending the Computerized Typhoon/Tropical Storm Prediction Program (Tyfoon 72) Toward Seven Days Final rept.

4 Sep 73, 105p ENVPREDRSCHFAC-Tech paper-1-73

Contract N66314-72-C-1750

Descriptors: \*Typhoons, \*Tropical cyclones, \*Weather forecasting, Computer programming, Atmospheric circulation, Climate.

Identifiers: TYFOON computer program, TYFOON 72 computer program, CDC 3100 computers, Storm tracks, N.

The objective of the research was to develop methods for improved prediction of the movement of tropical cyclones in the 3-7 day time scale; the improved system was to be based on the existing TYFOON and/or TYFOON 72 automated programs for producing predictions out to 3 days. The work was divided into 3 tasks: A survey of the 2 existing prediction models and the updating and extending of the analog historical file used by these programs in producing their predictions; to determine the value of large-scale patterns in the prediction of typhoon formation and in subsequent track prediction; to refine the typhoon analog predictive techniques (Modified author abstract)

PC A05/MF A01 AD-771 038/7CP Army Electronics Command Fort Monmouth N

Fog Clearing Using Helicopter Downdrafts: A Numerical Model Research and development technical rept. Walter S. Nordquist, Jr. Dec 73, 79p Rept no. ECOM-5527

Descriptors: \*Fog, \*Weather modification, Helicopters, Downwash, Mathematical models, Dissipation, Heat, Meteorological parameters, Feasibility studies, Computer programs, FOR-TRAN

Identifiers: \*Fog dispersal, Helicopter downwash, A.

A one-dimensional parameterized numerical model is presented which depicts the physical conditions attendant with the use of helicopter downdrafts for the creation of temporary clearings in fog. The results generated by the numerical model are compared to the data available from helicopter downdraft experiments. An example is given of the application of the model for investigation of the utility of the helicopter downdraft fog clearing technique for a particular set of meteorological conditions (Author)

AD-772 490/9CP PC 405/MF 401 Systems Science and Software La Jolla Calif The Effects of Meso-Scale and Small-Scale

Interactions on Global Climate Semiannual technical rept. 17 Apr-15 Oct 73. 7 Jan 74, 86p Rept no. SSS-R-74-2023

Contract DAHC04-73-C-0003, DARPA Order-

1752 See also report dated 15 Jun 73, AD-762 584.

Descriptors: \*Climate, \*Atmospheric motion, Mathematical models, Atmospheric circulation, Atmosphere models, Mountains, Wind, Com-puter programming, Turbulence. Identifiers: Global climatology, Atmospheric radiation, STUFF 3 computer code, HAIFA computer code, SD,

The report discusses the reorganization and reading of a 3-D, linear, steady-state computer code based on the Bretherton formulation. A discussion of the numerical method is included and results of a study of the Sierra Nevada-Owen's Valley region in north-central California is presented. Modification of the Bousinesq hydro-code STUFF used in atmospheric research of turbulence is also presented.

AD-772 640/9CP PC A05/MF A01 Radiation Research Associates Inc Fort Worth Tex

# Monte Carlo Studies of Sky Radiation

Final rept. 29 Jan-31 Jul 73 Wolfram G. Blaettner, and Michael B. Wells. 31 Aug 73, 85p RRA-T7311, AFCRL-TR-73-0613 Contract F19628-73-C-0130 See also AD-757 494.

Descriptors: \*Atmospheres, \*Light scattering, \*Sunlight, Monte Carlo method, Computer programming, Atmosphere models, Aerosols, Clouds, Dust, Daylight, Twilight, Polarization, Turbidity.

Identifiers: FLASH computer program, BRITE computer program, Atmospheric scattering, ΔF

The report describes the work involved in making modifications to the FLASH and BRITE Monte Carlo procedures and using these programs to evaluate (1) the effects of neglecting polarization on the scattered light intensities in molecular and turbid atmospheres; (2) the error involved in using plane-parallel atmospheres to represent spherical atmospheres for large zenith angles of incidence; and (3) the effect of dust layers at different altitudes on the color ratios computed for twilight conditions. (Modified author abstract)

AD-772 717/5CP PC A15/MF A01 Aerospace Corp El Segundo Calif Lab Operations

The Low-G Accelerometer Calibration System Orbital Accelerometer Experiment. Volume I. Experiment Description and Methodology Rept. for Jun 66-Jun 70

J. A. Pearson, R. W. Bruce, Y. T. Chiu, W. A. Feess, and E. G. Fotou. 1 Jul 73, 344p TR-0074(4260-10)-1-Vol-1, SAMSO-TR-73-355-Vol-

Contract F04701-73-C-0074 See also Volume 2, AD-772 718. Descriptors: \*Scientific satellites, \*Accelerometers, \*Atmospheric density, \*Upper atmosphere, Calibration, Acceleration, Aerodynamic drag, Data acquisition, Computer programs.

Identifiers: LOGACS(Low G Accelerometer Calibration System), Low g accelerometer calibration system, MESA(Miniature Electrostatic Accelerometers), Miniature electrostatic accelerometers, AF.

The LOGACS (Low-G Accelerometer Calibration System) experiment, which contained a miniature electrostatic accelerometer (Mesa), was placed in a low-altitude polar orbit on 22 May 1967. The experiment provided approximately 100 hours of acceleration data from which the accelerometer scale factor, accelerometer null bias, and atmospheric drag on the satellite were calculated. The mission description, the characteristics of the accelerometer, the instrumentation used in the experiment, and a summary of the results of the inflight accelerometer calibration are presented in this volume. The accelerometer's sensing environment is discussed, as are the data reduction methods used to extract the scale factor and bias of the accelerometer and the methods of determining the acceleration due to aerodynamic drag. (Author)

AD-772 733/2CP PC A10/MF A01 Atlantic Science Corp Indialantic Fla Documentation and Description of the Bent Ionospheric Model Final rept.

Sigrid K. Llewellyn, and Rodney B. Bent. Jul 73, 208p SAMSO-TR-73-252 Contract F04701-73-C-0207

Descriptors: \*lonosphere, \*Atmosphere models, \*Computer programs, FORTRAN, Electron density, Radio transmission, Atmospheric refraction

Identifiers: FORTRAN 4 programming language, ION computer program, TABGEN computer program, ION 1 computer program, AF.

The report documents the computer programs of the Bent Ionospheric Model and briefly describes the development of the model. The FORTRAN Program is designed for general use and can generate ionospheric data on a worldwide basis for any past or future date. For a given condition consisting of station, satellite and time information, the electron density versus height profile is computed from which range, range rate, and angular refraction corrections as well as vertical and angular total electron content are obtained. The model has the additional capability of improving its predictions by updating with actual ionospheric observations. Considerable tests in the past have proved this empirical model highly successful. Also included in the documentation is an alternate version of the ionospheric program to be used when stringent space and time requirements are imposed by the operating system. However, several options of the standard program are not incorporated and the accuracy of the results is somewhat reduced. (Author)

#### AD-772 828/0CP PC E03/MF A01 Stevens Inst of Tech Hoboken N J Analytic Solution of Coupled Mode Equations

by Computer Final technical rept. 20 Dec 71-31 Mar 73

Bernard Rosen. 7 Dec 73, 55p Grant DA-ARO-D-31-124-72-G73

Descriptors: \*Climate, \*Weather forecasting, \*Solar activity, Differential equations, Computer programming, Numerical integration, Com-puter programs, Modification, Instability. Identifiers: A.

The author uses automated symbolic manipulation to generate approximate solutions to the prognostic equations of meteorology. These equations are treated in the form that would arise by means of modal analysis and truncation. Consequently the equations take the form of coupled non-linear first-order ordinary dif-ferential equations; the number of such equations may be very large if many modes are included in the analysis. The work was performed in conjunction with an extensive program to investigate climate prediction and modification. Also of interest is the long term behavior of the atmosphere under the influence of the driving 'force' of the sun.

AD-773 046/8CP PC A19/MF A01 Oklahoma State Univ Stillwater School of Elec-

trical Engineering A Center for the Description of Environmental Conditions. Weather Phenomena Final rept.

William L. Hughes, Paul A. McCollum, Edward L. Shreve, and Emmett J. Pybus. Sep 73, 428p OSU-WP-73-F-14, ECOM-0083-14 Contract DAAB07-68-C-0083 See Annual progress rept. no. 4, AD-739 544.

Descriptors: \*Atmospherics, \*Thunderstorms, \*Data processing, Data acquisition, Data reduction, Pattern recognition, Spectrum signatures, Weather forecasting, Meteorological instruments, Very low frequency, Clouds, Magnetic detectors, Atmospheric electricity, Computer programs, Clear air turbulence, Tornadoes, Weather modification. Identifiers: Themis project, A.

A summary of results is made in this Final Report. Five major categories of information about severe storm sferics and severe storm characterizations are presented: (1) Statistical Descriptions of Lightning as a VLF Source; (2) Model Studies of Cloud and Sferic Behavior; (3) Hardward Developments; (4) Software Developments; and (5) Results of a Cumulus Cloud Magnetic Field Survey. It is concluded that VLF sferics has no intrinsic predictive content. However, sferic behavior is closely correlated with cloud development and vigor and thus has very high indicative content. A method for examining the electric current motions within a cumulus cloud by sensing the resulting magnetic field is shown to be feasible. (Author)

AD-773 913/9CP PC E01/MF A01 Mission Research Corp Santa Barbara Calif An Analytic Boundary for the MHD Magnetic **Field Equation** 

Topical rept. W. W. White. 29 Nov 73, 27 MRC-R-92, DNA-

3232T Contract DNA001-73-C-0138

Descriptors: \*Magnetohydrodynamics, \*Nuclear explosions, \*Ionospheric disturbances, Partial differential equations, Ion density, Geomagnetism, Approximation, Computer applications.

Identifiers: MICE computer code, SD

A magnetic field boundary condition for use with high altitude phenomenology codes has been developed. The solution of a boundary value problem in the region external to the MHD grid provides a current-free analytical approximation for the magnetic field outside the grid. The applicability of the current-free field as a boundary condition rests on the assumption that electrical currents of significance are contained within the MHD grid. Magnetic field data for a high altitude nuclear burst as computed by the MICE MHD code are presented. (Author)

AD-774 043/4CP PC A11/MF A01 Franklin Pierce Coll Rindge N H Dept of Research

# Solar Cycle Variations of Geomagnetically **Trapped Radiation**

Final rept. 20 Nov 68-30 Jun 73 Ernest C. Holeman. 31 Jul 73, 248p AFCRL-TR-73-0481 Contract F19628-69-C-0139

Descriptors: \*Van Allen radiation belt, \*Protons, Solar cycle, Solar cosmic rays, Particle flux, Periodic variations, Computer programs, Scientific satellites. Identifiers: S72-1 satellite, AF.

Observations of energetic geomagnetically trapped protons at low altitudes were made during the period December 1968 through May 1973 in order to study the solar cycle variations of geomagnetically trapped proton radiation for the eleven year solar cycle dating from November 1961. These observations consist of a series of flux measurements of 55 Mev protons made on nuclear emulsion radiation detectors flown on recoverable Air Force satellites, flux measurements of 115 Mev protons made on a sample selected from these, and preliminary flux measurements of six to 35 Mev protons from the AFCRL particle identifier on Air Force satellite S72-1. These observations form the basis for a series of trapped proton radiation models with variable parameters which are capable of predicting angular dis-tributions, differential fluxes, integral fluxes, and omnidirectional fluxes as a function of spacial geometry and time. (Author)

AD-774 524/3CP PC A07/MF A01 Allied Research Associates Inc Baltimore Md Development of Digital Enhancement Techniques Applicable to Direct Read-Out (APT) Meteorological Satellite Images Final rept. Mar 72-Jul 73 llan Tamches, and Nathaniel J. Belknap. Sep 73, 128p ARA-101F, EPRF-TR-3-73(ARA) Contract N62306-72-C-0103

Descriptors: \*Meteorological satellites. \*Meteorological data, \*Images, \*Data processing, Signal processing, Digital filters, Fourier transformation, Computer programs. Identifiers: Fast Fourier transform, Image processing, IBM 1130 computers, CDC 3100 computers, N.

Digital enhancement techniques applicable to Direct Readout (APT) Meteorological satellite images were developed, and computer routines designed and tested. Areas covered include melding of geographic grids with digital images; display of image arrays at mercator and polar stereographic projections; Fast Fourier Transform subroutine; digital filters for low frequency reduction, high frequency spatial enhancement, single frequency, and edge search and sharpen; and gray scale histograms. (Author)

AD-774 751/2CP PC E04/MF A01 Visidyne Inc Burlington Mass Modeling of Optical IR Backgrounds Annual rept. no. 1 Oscar P. Manley, Henry J. P. Smith, Yvain M. Treve, Thomas C. Degges, and Jack W. Carpenter. 15 Nov 72, 84p VI-129, AFCRL-72-0730 Contract F19628-71-C-0212

Descriptors: "Atmosphere models, "Upper atmosphere, "Infrared radiation, "Nuclear explosions, Background, Explosion effects, Chemiluminescence, Airglow, Atmospheric chemistry, Reaction kinetics, Shock waves, Airburst, Computer programming.

Identifiers: OPTIR 3 computer code, AF.

Status of studies of numerical methods, analog and digital, in support of the OPTIR code are re-ported. The possibility of Treanor-type al-gorithms with expanded stability regions is established. Laumbach and Probstein treatment of strong shocks in the exponential atmosphere is extended to the more general case of an atmospheric density with an arbitrary vertical profile. (Author)

AD-774 760/3CP PC A15/ME A01 California Univ Los Angeles Dept of Meteorolo-

Morphology and Dynamics of ionospheric Storms

Scientific rept. (Final) 1 Jan 71-31 Jan 73 S. V. Venkateswaran. 7 Sep 73, 346p AFCRL-TR-73-0610 Contract F19628-71-C-0075

Descriptors: \*lonosphere, \*Computerized simulation, Mathematical models, Computer pro-grams, lonospheric disturbances, Magnetic storms, Atmospheric motion, Electrostatic fields.

Identifiers: Equatorial electrojet, AF.

The document consists of five scientific reports. In the first report, computer programs are described which simulate ionospheric currents responsible for quiet-day ground magnetic variations at middle and equatorial geomagnetic latitudes. The program enables us to deduce the large-scale electrostatic fields generated by dynamo actions in the ionosphere. The second report describes a computer program for mapping of the ground magnetic potential pattern on any given day, either quiet or disturbed. The other reports are reprints of articles which have been either fully or partially supported by this contract. (Author)

AD-775 027/6CP PC E05/MF A01 Naval Postgraduate School Monterey Calif An Experiment to Measure Laser Beam Wander and Beam Spread in the Marine Boundary Layer Near Shore Master's thesis

David Albert Beall. Dec 73, 94p

Descriptors: \*Laser beams, \*Marine at-mospheres, Turbulent boundary layer, Atmospheric disturbances, Light transmission, Variations, Analog to digital converters, Com-puter programs, FORTRAN, Theses. Identifiers: Monterey Bay, Helium neon lasers, N.

A system to measure laser beam wander and beam spread in the atmosphere over the ocean has been designed, constructed, and tested. The apparatus employed a high resolution scanning telescope with a potential for use in a broad range of visual and infra-red wavelengths, and with the ability to measure beam wander and beam spread variations on the order of a few microradians in angle of incidence. Three successful trials with a propagation path over the southern end of Monterey Bay were conducted. Data was processed using analog and digital computers. RMS values of beam wander from 4.6 to 30.2 microradians were observed. (Author)

AD-775 076/3CP PC E08/MF A01 Northeastern Univ Boston Mass Certain Finite Difference Methods for the Solution of Large Scale Circulation Problem II Final rept. 1 Dec 71-30 Jun 73 Robert D. Klein, Jack C. Mettauer, Vito P. Maglione, and Stanley L. Spiegel. 8 Nov 73, 238p AFCRL-TR-73-0640 Contract F19628-72-C-0009

Descriptors: \*Atmospheric circulation. \*Equations of motion, \*Finite difference theory, Numerical integration, Computer programs, FORTRAN. Identifiers: CDC 6600 computers, AF.

A program description for a large scale multilevel general circulation model of the atmosphere is presented. Several time integra-tion scheme algorithms are discussed, and a linear stability analysis of finite difference approximation to a meteorological equation of motion is given. In addition, experiments in-volving the numerical solution of the non-divergent barotropic general circulation problem, using overlapping grid systems, are described and evaluated. Problems involving the numerical solution, via relaxation, of Poisson's equation on the sphere, and the evaluation of finite difference derivations of interpolated quantities are discussed. (Author)

PC E03/MF A01 AD-775 080/5CP Air Force Cambridge Research Labs L G Hanscom Field Mass

A FORTRAN Program for Computing Steady-State Composition Models of the Upper Atmosphere

Air Force surveys in geophysics J. M. Forbes, and A. S. Bramson. 9 Oct 73, 36p Rept nos. AFCRL-73-0635, AFCRL-AFSIG-276

Descriptors: \*Upper atmosphere, \*Atmosphere models, "Computer programs, Composi-tion(Property), Nitrogen, Oxygen, Argon, Heli-um, Hydrogen, Dissociation, Steady state, FOR-TRAN.

Identifiers: \*Atmospheric composition, AF

The report describes a method for computing steady-state composition models of the earth's thermosphere, including a FORTRAN program and usage guide. It originated in connection with work being performed for the Committee on the Extension of the U.S. Standard At-mosphere (COESA). The program computes profiles from 120 to 500 km of N2, O2, O, Ar, He, H, and H2, including the effects of vertical flow of the minor escaping species (He and H), and the production of H by chemical dissociation of H2 in the lower thermosphere. (Author)

AD-775 361/9CP PC E01/MF A01 Weather Squadron (12th) Ent AFB Colo Comparing Correlations between Weather Maps with Similar Isobaric Configurations but Varying Pressure Intensities Peter R. Scholefield. Jul 73, 20p Rept no. Technical Paper-73-8

Descriptors: \*Meteorological charts, Weather forecasting, Correlation techniques, Barometric pressure, Flow fields, Computer programs, FORTRAN.

Identifiers: FORTRAN 4 programming language, Comparison, AF.

In all 4th Weather Wing and 12th Weather Squadron map typing studies one mathematical formula has been used exclusively as the basis for determining the similarity between weather map patterns. This paper illustrates how this linear correlation coefficient formula behaves when it is used to correlate surface weather map patterns that are similarly configured but differ in respect to their direction of flow patterns, their pressure gradients and their pressure magnitude. Ten pictorial surface weather maps are used as examples in the computer correlation procedure and the results clarify the relationship between similar map types, their pressure gradients and their degree of correlation with each other. (Author)

PC A07/ME A01 AD-775 392/4CP Massachusetts Inst of Tech Cambridge Operations Research Center Optimal Control of Sulfur Dioxide Emissions at Power Stations: Models and a Case Study Technical rept Nitin R. Patel. Sep 73, 127p TR-82, AROD-9239.10-M Contract DAHC04-73-C-0032

Descriptors \*Sulfur oxides, \*Meteorological phenomena, Linear programming, Mathematical models, Combustion products, Dynamic response, Stochastic processes, Electric power plants, Costs, Computer programs, FORTRAN, Theses.

Identifiers: \*Air pollution control, Fossil fuels, Boston(Massachusetts), Sulfur dioxide, A.

The principal concern of this thesis is to analyze emission control strategies which de-pend upon meteorological conditions. A meterological model is developed to relate source emissions with average concentration of a pol-lutant in a region under different meteorological conditions. The problem of determining optimal dynamic controls for SO2 emissions at fossil-fueled power stations is treated by con-structing a linear programming model. This model is extended to encompass seasonal control of sources which are not amenable to more frequent controls. Another extension is con-structed to analyze the effects of errors in meteorological forecasts. The various models are applied to the Metropolitan Boston Air Pollution Control District. The impact of dynamic emission controls on new site selection for fossil-fueled power stations is examined. A stochastic linear programming formulation is developed and an algorithm is designed to solve the stochastic linear programming problem. (Modified author abstract)

AD-775 752/9CP PC E06/MF A01 Utah State Univ Logan Center for Research in Aeronomy Developmental Studies of the Hydrogen-

Nitrogen-Oxygen Systems Final rept. 1 May 70-30 sep 73

William M. Moore, and Thomas K. Eccles. 31 Jan 74, 135p AFCRL-TR-73-0749 Contract F19628-70-C-0221

Descriptors: \*Computerized simulation, \*Aeronomy, \*Atmospheric chemistry, Meso-sphere, Solar radiation, Metastable state, Chemical reactions, Photochemical reactions, Oxygen, Nitrogen, Thermosphere, Upper atmosphere, Stratosphere, Reaction kinetics, Computer programs, Variations, Diurnal variations, Hydrogen. Identifiers: AF.

a computer model has been developed which can predict the chemistry and photochemistry of the atmosphere in the regions of the upper stratosphere, mesophere, and lower thermosphere. The solar flux is calculated as a function of the sun's position with respect to any altitude above any coordinate point in the northern hemisphere. This means that the time dependent chemistry of the twilight periods can be treated in detail. the temperature altitude profiles are matched for seasonal and latitudinal changes, the chemical reaction set can be quickly changed, and laboratory problems can be treated by turning off the solar flux routines. the numerical integration method is new, rapid, and inherently conserves mass. A stiff equation technique is used to increase the time increment during steady-state conditions. The cur-rent model can be used to predict events that can be correlated with rocket observations, or other atmospheric measurements. (Modified author abstract)

AD-776 306/3CP PC E04/ME A01 Naval Postgraduate School Monterey Calif Examination of Shipboard Measurements of the Vertical Profiles of Mean Temperature, Humidity and Wind Speed Master's thesis

Michael Patrick Cavanaugh. Mar 74, 69p

Descriptors: \*Marine atmospheres, \*Turbulent boundary layer, Air water interactions, At-mospheric temperature, Momentum transfer, Heat transfer, Wind velocity, Theses, Computer programs.

#### Identifiers: N.

The suitability of shipboard profile measurements of mean temperature, mean humidity and mean wind over the open ocean is ex-amined on the basis of six hours and 20 minutes of simultaneous profile measurements made from the R/V Acania on 20-21 September 1973 near San Nicolas Island, California. Comparisons of the profiles obtained from the shipboard measurements, as well as the meteorological parameters derived from those profiles are made with results obtained from more stable platforms. Parameters examined include the Richardson number, the friction velocity, the drag coefficient and the roughness length. The results indicate that a ship can be a suitable platform for measuring profiles. (Modified author abstract)

AD-776 321/2CP PC E05/MF A01 Naval Postgraduate School Monterey Calif Initialization of a 5-Level Global Atmospheric General Circulation Model Using a Staggered, Spherical, Sigma Coordinate System Master's thesis

James Michael McCollough, Mar 74, 95p

Descriptors: \*Atmospheric circulation, Mathematical models, Wind, Barometric pressure, Partial differential equations, Weather forecasting, Theses, Computer programs. Identifiers: Numerical weather forecasting, Primitive equations, N.

Initialization of a five-level global baroclinic primitive equation model was examined using real data. Experiments were conducted using a Robert (1965) time frequency filter, Euler backward time integration, and an iterative ini-tialization scheme to determine the effect of each on the generation of inertial-gravity waves resulting from an improper balance between initial mass and wind fields. In addition, a global sigma-surface linear balance equation solution was examined for the purpose of determining initial winds. Although all forecast fields were meteorological, certain undesirable features were generated in the polar and equatorial reaions. (Author)

AD-776 390/7CP PC A03/MF A01 Nevada Univ Reno Lab of Atmospheric Physics An Experimental Study of the Freezing of Drops in Free Fall Final rept. 5 Jun 70-4 Sep 73 Thomas E. Hoffer, and Marc L. Pitchford. Jan 74, 50p AROD-9095 1-EN

Grant DA-ARO-D-31-124-70-G81

Descriptors: \*Atmospheric physics, \*Water, \*Drops, Free fall, Nucleation, Ice, Freezing, Lead compounds, Iodides, Particle size, Computer programs.

Identifiers: Phloroglucinol, A.

One process to explain natural ice pellets in the atmosphere is the heterogeneous freezing of large cloud drops. These experiments show that this process is of little importance. Drops of about 180 micrometer diameter which fell through high concentrations of aerosol nucleating particles showed consistantly very low percentages of freezes. From the information gathered a temperature threshold for lead iodide and phloroglucionol of -10C. and -6C respectively was determined. Also a dependence on the relative humidity of the air in the vicinity of particle collection was observed. This gave rise to relative humidity thresholds of 65% for lead iodide and 75% for phloroglucionol. The nucleating ability of airborne ice crystals was experimentally tested and found to be much lower than expected. This difference is attributed to a collection efficiency for drops collecting non-spherical ice crystals, which is much lower than a calculated collection assuming the ice to be spherical. (Author)

AD-776 950/8CP PC A06/MF A01 Ballistic Research Labs Aberdeen Proving Ground Md

Survey of Two-Body and Three-Body Reac-tion-Rate Coefficients for the Ionized Stratosphere and Mesosphere

Franklin E. Niles. Mar 74, 107p Rept no. BRL-1702

Descriptors: \*Stratosphere, \*Mesosphere, \*Aeronomy, Upper atmosphere, Cations, Anions, Gas ionization, Excitation, Reaction kinetics, Atmospheric chemistry, Ionosphere, Electron capture, Dissociation, Electrons, Com-

puter programming. Identifiers: \*Reaction rates, Ion molecule in-teractions, Ion ion interactions, D region, AIRCHEM computer code, A.

Rate coefficients for two-body and three-body reactions applicable to the ionized stratosphere and mesosphere have been surveyed. The reac-tions are divided into five classes, viz., (1) positive-ion reactions, (2) electron reactions, (3) negative-ion reactions, (4) ion-ion reactions, and (5) neutral reactions. Reactions and their measured rate coefficients are given in tables and the values selected for inclusion in the AIRCHEM atmospheric deionization computer code are identified. The current status of knowledge regarding these reactions is summarized. (Author)

AD-776 971/4CP PC A04/MF A01 Texas Univ El Paso Dept of Electrical Engineering

Atmospheric Modeling for Molecular Absorption Research Project Final rept.

Joseph H. Pierluissi. 31 Jan 74, 65p Rept no. PR2-74-AM-5 Contract DAAD07-73-C-0127

Descriptors: \*Atmosphere models. \*Transmittance, \*Infrared spectra, Computer programs, Absorption spectra, Computerized simulation, Water vapor, Carbon dioxide, FOR-TRAN, Surface targets.

Identifiers: \*Atmospheric attenuation, Remote sensing, A.

developed a project number The of phenomenological and physical variations of the five-parameter band model for molecular transmittance in the infrared using data from line-by-line calculations in the 15 micron - CO2 band. Conversion from a standard in-homogeneous atmosphere to a homogeneous medium is obtained with the use of modified Curtis-Godson relations and calculated line intensities averaged over 5/cm. Comparisons are made between the calculated and original data indicating that band modeling yields accura-cies comparable to the degree of validity of the original transmittance provided that the number and nature of the band parameters are allowed spectral dependence. (Modified author abstract)

AD-777 135/5CP PC A05/MF A01 Epsilon Labs Inc Bedford Mass Stratospheric Balloon Ae Aerosol Particle Counter Measurements Final rept. 2 Feb-30 Nov 73 Henry A. Miranda, Jr, John Dulchinos, and Henry P. Miranda. Nov 73, 77p FR-2001-73, AFCRL-TR-73-0700 Contract F19628-73-C-0138 Descriptors: \*Counters, \*Aerosols. \*Stratosphere, \*Troposphere, Balloon equip-ment, Samplers, Particle size, Distribution,

Computer programs, FORTRAN. Identifiers: Particle size distribution, FORTRAN 4 programming language, IBM 370/155 compu-ters, PLOT01 computer program, PULSE 2 computer program, DATRUN computer pro-gram, CORRE 3 computer program, RATIO 1 computer program, AF. A balloon-borne submicron aerosol counter developed under previous Air Force contracts was successfully flown on three stratospheric balloon experiments over Holloman AFB, New Mexico in May of 1973. The results indicate that particulate matter at higher levels is charac-terized by markedly different scattering parameters than is the case at lower levels. This effect is manifested in the form of exceedingly sharp cut-offs in the size distribution at about 0.4 micrometer diameter, which is only ob-served above 23 km. The extent to which this sharp cut-off is attributable either to nonspherical particles or to index of refraction uncertainties rather than to the actual size distribution, is a matter of conjecture. Recommendations for equipment modifications tending to eliminate these ambiguities, are discussed. Also described here are the several hardware and software modifications incorporated in the system under the present contract in prepara-tion for these flights. (Author)

PC A06/MF A01 AD-777 406/0CP Environmental Prediction Research Facility (Navy) Monterey Calif

A Three-Parameter Model for Limited Area Forecasting

L. Bengtsson. Mar 74, 113p Rept no. ENVPREDRSHCHFAC-tech-paper-5-74

Descriptors: \*Weather forecasting, \*Computer programs, FORTRAN, Numerical analysis, At-mospheric motion, Vortices, Humidity. Identifiers: 'Numerical weather forecasting, FORTRAN 4 programming language, PROG 3P computer program, STEP 3P computer program, STEPEXT computer program, Primitive equations, Sensible heat, Latent heat, N.

The report describes an operational quasioriginal model was developed by Dr. L. Bengtsson and has been used or Bengtsson and has been used operationally for several years at the Swedish Meteorological and Hydrological Institute. The improved model described in this report incorporates an Ekman function and the effect of the flow over mountains as well as sensible and latent heat sources. Humidity and precipitation are also predicted by the model. (Modified author ab-. stract)

#### AD-777 971/3CP

Naval Postgraduate School Monterey Calif 1973 Variations of Hurricane Heat Potential in the Philippine Sea and the Gulf of Mexico Master's thesis

PC A06/MF A01

Paul Dennis Shuman, and Dale F. Leipper. Mar 74, 112p Rept no. NPS-58LR74031

Descriptors: 'Hurricanes, 'Ocean surface, 'Mexico Gulf, 'Air water interactions, Surface temperature, Bathythermograph data, Computer programs, Wind velocity, Seasonal variations, Heating, Pacific Ocean, Advection, Theses.

Identifiers: \*Philippine Sea, N.

The 1973 summer growth of hurricane heat potential (HHP) and its relation to tropical cyclones was studied in the Philippine Sea and the Gulf of Mexico on a monthly basis. BT information was processed through the Fleet Numerical Weather Central CDC 6500 computer to output maps of HHP, which were hand con-toured. Inadequate data coverage and questionable BT observations resulted in monthly maps of varying validity and areal ex-tent. HHP values peaked near 35,000 cal/sq cmcolumn in the Gulf of Mexico and 40,000 cal/sq cm-column in the Philippine Sea in the months of August and September, the months of highest tropical storm activity. Some evidence was found correlating rises in HHP with increases in typhoon maximum wind speed. (Modified author abstract)

AD-778 820/1CP PC A04/MF A01 Air Force Cambridge Research Labs L G Hanscom Field Mass An Empirical Density Model for Predicting Low-Altitude Satellite Ephemerides. Part 1. Data Analysis and Model Formulation Environmental Research papers J. M. Forbes, and D. F. Gillette. 1 Feb 74, 58p Rept nos. AFCRL-TR-0062, AFCRL-ERP-464

Descriptors: \*Upper atmosphere, \*Atmospheric density, \*Atmosphere models, Satel-lites(Artificial), Ephemerides, Predictions, Computer programs, FORTRAN, Orbits, Regression analysis.

An empirical density model based on drag analyses of 25 low-perigee satellites is developed for use in predicting low-altitude satellite ephemerides. A stepwise multiple regression analysis is performed with density at 145 km as the dependent variable, and a number of independent variables chosen to represent variations with solar cycle, geomagnetic activity, geomagnetic latitude, season, day of the year, and time of day. Densities between 120 and 500 km are determined from the hydrostatic law in a simple (but physically realistic) analytic form. Comparison of our model with the 1971 Jacchia model shows them both to give very similar variations, differing mostly with respect to solar activity and geomagnetic latitude. The main virtue of our model is that it is represented in an extremely simple analytic form, and therefore ideally suited for implementation in an operational system. (Author)

AD-778 873/0CP PC E06/MF A01 Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering A Semi-Markov Weather Model Master's thesis Kenneth O. Merrill, Mar 74, 126p Rept no. GSA/SM/74-8

Descriptors: \*Weather forecasting. \*Atmosphere models, Stochastic processes, Mathematical models, Winter, Ceiling, Visibility, Long range(Time), Short range(Time), Computer programs, FORTRAN, Theses. Identifiers: \*SemiMarkov processes, Maximum likelihood estimation, FORTRAN 4 programming language.

The study traces the development of a weather model based on a real transition Semi-Markov process. The data consisted of eighteen years of taped hourly weather observations from Bitburg Air Base, Germany. Maximum likelihood estimators were used to construct the basic parameters of the model from the taped data. The results consist of weather models for each season. The model for the winter season was used to develop both short and long-term weather statistics. The results confirmed that the Semi-Markov process may be used to develop a weather model that requires few assumptions, is small in size, independent of geographic location, and is distribution free.

AD-779 091/8CP PC E04/MF A01 Electronic Associates Inc West Long Branch N J Scientific Computation Dept Final rept. 10 Aug 67-31 May 70 Elias H. Hochman. 15 Feb 71, 72p Rept no. 30-307001 Contract F19628-67-C-0358 Descriptors: \*Ionospheric propagation, \*Ray

tracing, 'Hybrid simulation, Electromagnetic wave propagation, Electron density, Computer programs, FORTRAN.

The report describes the application of hybrid computer techniques to the simulation of the propagation of electromagnetic energy in the ionosphere. The study incorporates a two dimensional electron density profile. (Author)

AD-779 551/1CP PC A06/MF A01 Battelle Pacific Northwest Labs Richland Wash Atmospheric Sciences Dept Precipitation Scavenging of Organic Contaminants

Final rept. Jeremy M. Hales, and Richard N. Lee. Apr 74, 105p AROD-10417.1-EN Contract DAHC04-72-C-0035

Descriptors: \*Organic compounds, \*Air pollution, Solubility, Vapors, Atmospheric precipita-tion, Contaminants, Tracer studies, Computerized simulation, Mathematical models, At-mospheric diffusion, Plumes, Computer programs.

Identifiers: \*Acetoacetic acid/(ethyl-ester), \*Diethylamine, \*Precipitation washout.

The EPAEC gas washout model has been applied to the organic tracers ethylacetoacetate and diethylamine. This model uses source strength, vapor solubility and basic meteorological parameters to estimate the tracer concentration in downwind rain samples. A detailed error analysis has identified poorly defined tracer solubility as the major source of measured discrepancy with predictions. Field results have also been used to calculate the fractional washout of the vapor per kilometer from the source. The results together with existing diffusion models may be used to estimate the vapor concentrations of these materials along a plume trajectory. (Modified author abstract)

AD-781 094/8CP PC A04/MF A01 Mission Research Corp Santa Barbara Calif Stimulated Skyglow Final technical rept. 1 Aug-31 Dec 73 D. H. Archer, and P. W. Tarr. Jan 74, 73p MRC-R-107, RADC-TR-74-109

Contract F30602-71-C-0374, DNA001-73-C-0239

Descriptors: "Aurorae, "Atmosphere models, Atmospheric physics, Electron flux, Radiative transfer, Infrared radiation, Chemical reactions, Luminescence, Emission spectra, Nitrogen, Oxygen, Carbon dioxide. Identifiers: ARCTIC computer program.

The report describes the development of a code, called ARCTIC, that is suitable for the study and analysis of auroral data. The code inputs a flux spectrum of primary electrons, incident on or in the atmosphere, with a specified magnetic dip angle and initial pitch angle, and computes the detailed energy deposition and partition in the atmosphere. The deposition subroutine is coupled to a chemistry and radiation subroutine with the result that the optical/infrared emission, as functions of altitude and time, are then determined. The code is essentially complete, except for certain refine-ments, and has been run for the case of a hypothetical class II 0 aurora. (Author)

AD-781 275/3CP PC E02/MF A01 Mission Research Corp Santa Barbara Calif Studies of Auroral Simulation Final rept. 15 May-31 Dec 73 P. W. Tarr, D. H. Archer, and N. G. Utterback. 11 Apr 74, 103 MRC-R-122, DNA-3297F Contract F30602-71-C-0374, DNA001-73-C-0239

Descriptors: \*Aurorae, \*Computerized simulation, Atmospheric physics, Emission spectra, Nuclear explosions, Radiation effects, Chemi-cal reactions, Nitrogen, Oxygen, Carbon dioxide, Electron scattering. Identifiers: ARCTIC computer code.

The final report describes an effort, under the Simulation Program, to understand infrared backgrounds in an auorally-disturbed environment. A large part of this effort has been devoted to the development and use of a code, called ARCTIC, that is suitable for the study and analysis of auroral data. The code inputs a flux spectrum of primary electrons, incident on or in the atmosphere, with a specified magnetic dip angle and a given initial pitch angle distribution, and computes the detailed energy deposition and partition in the atmosphere. Scattering of the primary electrons is provided for in the deposition subroutine by two options: one, that allows for the full effects of range variance, gives excellent agreement with observations in nitrogen; the other, that is considerably more economical to use, assumes mean scattering only. (Modified author abstract)

AD-782 358/6CP PC E03/MF A01 North Carolina State Univ Raleigh Dept of Geosciences

Detection and Analysis of Synoptic-Scale Periodicities in Rocketsonde Data Final rept.

Gerald F. Watson, and Walter J. Saucier. Nov 73,47p

Contract DAAD07-72-C-0260

Descriptors: \*Stratosphere, \*Mesosphere. \*Atmospheric sounding, Periodic variations, Atmospheric Wind, temperature, Data processing. Identifiers: WAVEFIT computer program,

Synoptic meteorology.

In order to examine the synoptic-scale time variability (oscillation periods of 2 to 6 days) in the zonal and meridional wind components and in the temperature at altitudes 25 to 60 km, a computer program for wave period analysis was devised and applied to rocketsonde data of the Meteorological Rocket Network. The method consisted of fitting sinusoidal waveforms of various periods and phases to data in biweekly periods and evaluating the goodness of fit. Simple mathematical considerations and results from numerous tests with hypothetical data for idealized oscillations of known characteristics showed that the axis of symmetry and amplitude of the wave to be fitted to the data could be represented by the monthly mean and the square root of 2 times the standard deviation of the daily values, respectively. Aliasing effects would be minimized as long as ther were at least 12 ob-servations during the month. (Modified author abstract)

AD-782 685/2CP **MF A01** Range Commanders Council White Sands Missile Range N Mex Meteorological Group IRIG Standards for Range Meteorological Data Reduction. Part I. Rawinsonde Oct 71, 128p Rept no. MG-108-72-Pt-1 See also Part 2 AD-782 686 Availability: Available in microfiche only.

Descriptors: \*Meteorological data. \*Radiosondes, \*Computer programs, Wind, Humidity, Atmospheric temperature, Subroutines, FORTRAN, Atmospheric sounding, Data processing, Guided missile tracking systems,

Guided missile ranges. Identifiers: RAWINX computer program, FOR-TRAN 4 programming language, IBM 7044 computers.

The document describes the rawinsonde data reduction program called RAWINX. The pro-IBM 7044 computer. (Author)

AD-782 686/0CP PC A06/MF A01 Range Commanders Council White Sands Missile Range N Mex Meteorological Group

IRIG Standards for Range Meteorological Data Reduction. Part II. Rocketsonde Oct 71, 101p Rept no. MG-108-72-Pt-2 See also Part I, AD-782 685.

Descriptors: \*Meteorological data. \*Radiosondes, \*Computer programs, Wind, Atmospheric temperature, Atmospheric sound-ing, Subroutines, FORTRAN, Data processing, Guided missile tracking systems, Guided mis-

sile ranges. Identifiers: ROKRED computer program, FOR-TRAN 4 programming language, IBM 7044 computers, \*Rocketsondes.

A committee was formed to pursue a task entitled 'Standardization of Range Meteorological Data Reduction'. The results of the Committee's work are currently published in a two part IRIG document; Part I encompassing Rawinsonde and Part II encompassing Rocketsonde data reduction. This document describes the rocketsonde data reduction program called ROKRED. The program is written in FORTRAN IV lan-guage for the IBM 7044 computer.

#### AD-783 246/2CP PC A03/MF A01 Air Force Weapons Lab Kirtland AFB N Mex Propagated EMP from Tangent and Buried Bursts

Final rept. Mar-Dec 73

James Ė. Brau, Gregory H. Canavan , Leon A. Wittwer, and Arthur E. Greene. Jul 74, 30p Rept no. AFWL-TR-74-47

Descriptors: \*Electromagnetic pulses. \*lonospheric propagation, \*Nuclear explosions, \*lonospheric modification, Electron density, Electron energy, Heating, Fourier transforma-tion, Monte Carlo method.

Identifiers: CHEMP computer code, E region, D region.

Calculations describing the ionospheric propagation of high-altitude electromagnetic pulses (EMP) to satellite altitudes are reported. Both tangent and buried burst scenarios are treated. The calculations are based on the AFWL CHEMP code for self-consistent calcula-tions of radiated EMP, modified by the inclusion of a swarm treatment of secondary and ionospheric electrons. The region of applicability of this swarm treatment has been determined by a separate Monte Carlo calculation. By carrying the calculations all the way from the burst point through the E region, the authors are able to account fully for the D region heating, the increased absorption and cascading it produces, and the increased cutoff frequency which results. The code calculations are evalu-ated for sensitivity to the ambient ionospheres used. (Author)

AD-783 807/1CP PC E04/MF A01 Naval Postgraduate School Monterey Calif An Experiment to Measure the Modulation Transfer Function of the Atmosphere in the Marine Boundary Layer Master's thesis

Marion Romaine Alexander, Jr. Jun 74, 66p

Descriptors: \*Laser beams, Laser communications, Carbon dioxide lasers, Fourier transformation, Computer programs, Transfer functions, Attenuation, Theses. Identifiers: Modulation transfer functions, At-

respheric boundary layer, Monterey Bay, \*Atmospheric attenuation, Helium neon lasers, Fast Fourier transform, MODFUN computer program, AVSPEC computer program, AV-WAVE computer program.

A system to measure the modulation transfer function (MTF) of the atmosphere over the ocean has been designed, constructed, and tested. The apparatus employs a high resolution scanning telescope with the capability for use in a broad range of visual and infrared

wavelengths. Two successful trials were conducted with a gyro-stabilized 6328 A laser mounted on board the R. V. ACANIA. The propagation path was approximately one km over open water from the ACANIA to Point Pinos. Two more successful trials were conducted with a 6328 A laser and a 10.6 micrometer laser propagating simultaneously from shore to shore across 4 km of the southern end of Monterey Bay. Data was processed using fast Fourier transform methods. The MTF of the atmosphere for 6328 A light was measured. (Author)

AD-784 866/6CP

PC A03/MF A01 Epsilon Labs Inc Bedford Mass Balloon-Borne Aerosol Counter Modifica-tions, Particle Sizing Accuracy Tests Final rept. 1 Nov 73-15 Sep 74 Henry A. Miranda, Jr, John Dulchinos, and Henry P. Miranda. Jul 74, 32p FR-2003-74, AFCRL-TR-74-0349 Contract F19628-74-C-0078 See also report dated Nov 73, AD-777 135.

Descriptors: \*Aerosols, \*Counters, \*Stratosphere, \*Troposphere, Balloon equipment, Electron microscopes, Samplers, Signal processing, Logic devices, Particle size. Identifiers: DATRUN computer program.

This report describes refurbishing work performed on the AFCRL aerosol counter which had sustained damage on the last of three successive stratospheric balloon flights in 1973. Certain improvements in the signal processing circuitry and associated software, which simplify the background level determination procedure and generate useful in-flight diagnostic information, are also described. In addition the results of exploratory tests to examine the combined effects of polarized illumination and particle shape as well as index of refraction on the sizing accuracy of the counter, are presented. Particles from several types of polishing compounds were nebulized and the size distribution as measured by the aerosol counter were compared with scanning electron microscope data. (Author)

AD-786 414/3CP PC A05/ME A01 IBM Federal Systems Div Burlington Mass Some Recent Innovations in Atmospheric Density Programs

Scientific rept. no. 1, 1 Jul 73-30 Jun 74 Arnold S. Bramson, and Jack W. Slowey. 15 Aug 74, 88p AFCRL-TR-74-0370 Contract F19628-72-C-0178

Descriptors: \*Atmospheric density, \*Upper atmosphere, Diurnal variations, Computer programming, Data processing, Thrust, Magnetosphere, Atmosphere models, Orbits. Identifiers: CADNIP computer program, BAD-MEP computer program.

This report documents the latest modifications incorporated into a series of computer programs for determining atmospheric densities and for evaluating existing atmospheric density models. Emphasis is placed on requirements for actual program usage, with complete user's manuals and related information appearing as separate appendices. (Author)

AD-786 647/8CP PC A03/MF A01 Oregon Graduate Center Beaverton Dept of Applied Physics and Electronic Science

Experimental Pulsed Laser, Remote Crosswind Measurement System -- Feasibility Study and Design Final rept. 7 Dec 73-30 Jun 74

J. Fred Holmes, and J. Richard Kerr. Jul 74, 47p ECOM-740094-1

Contract DAAD07-74-C-0094

Descriptors: \*Ruby lasers, \*Wind velocity, Light pulses, Measurement, Vidicons, Real time, Computer programs, Meteorological instruments.

Identifiers: Q switched lasers, \*Pulsed lasers, Remote sensing.

The feasibility determination and design for an experimental, pulsed laser, diffuse target, remote crosswind measurement system is described. The system consists of a laser transscheme using a double-pulsed, Q-switched ruby laser is used to measure the slope of the time delayed autocovariance function at zero time delay which under appropriate conditions is proportional to the weighted average crosswind along the laser propagation path. The receiver consists of two silicon vidicons, a spinning disk for directing alternate pulses to the vidicons and appropriate scanning circuitry for generating a 10 x 10 array of apertures on each vidicon. (Modified author abstract)

AD-815 625/CP HC E01 MF A01 Pacific Missile Range, Point Mugu, Calif. Some Variable-Parameter, Steady-State Diffusion Results.

Technical memo

C. J. Thorne, and R. W. Claassen. 9 Jun 67, 70p Rept no. PMR-TM-67-3 Distribution Limitation now Removed.

Descriptors: \*Two-dimensional flow, Mathematical models, \*Air pollution, Diffusion, Sta-bility, Computer programs, Partial differential equations, Bessel functions, Chemical con-tamination, Meteorological parameters. Identifiers: Steady state.

Numerical and analytical methods of solution of a two-dimensional problem in diffusion of fluids are developed. The coefficient of diffusion and the wind velocity are considered to be variables dependent on altitude. The resultant computer program and graphical examples of results obtainable from meteorological data are shown. (Author)

AD-818 985/CP PC E01 MF A01 Naval Postgraduate School, Monterey, Calif. Numerical Forecasting of Clear Air Turbulence

Masters thesis

Michael Joseph Ettel, and William Allen

Morgan. Jun 67, 172p Distribution Limitation now Removed.

Descriptors: \*Clear air turbulence, \*Weather

forecasting, Computer programs, Numerical analysis, Air mass analysis, High altitude, Stratosphere, Atmospheric temperature. Micrometeorology, Aviation safety, Probability, Theses.

There is much disagreement as to (1) what causes clear air turbulence (turbulence which is not in or near convective clouds and is above 15,000 feet in altitude) and (2) which meteorological parameters can be used to detect and forecast its occurrence. The approach to this problem has been to relate not one parameter to clear air turbulence but various parameters. By summing these parameters areas can be defined where there is a high probability of encountering clear air turbulence. Each parameter has been based on a statistical study which found a relationship with clear air turbulence. The parameters used were horizontal and vertical shear, curvature, kinetic energy and their derivatives. The numerical forecasting program proposed here can be extended to the stratosphere when more reliable height and temperature fields are available. (Author)

AD-849 142/CP HC E01 MF A01 Naval Missile Center, Point Mugu, Calif.

#### A Method for Determination of Atmospheric **Refraction Characteristics Through Use of** Navigational Satellite Data. Technical memo.

R. W. Claassen. 5 Mar 69, 46p Rept no. NMC-TM-68-67

Distribution Limitation now Removed.

Descriptors: \*Atmospheric refraction, Mathematical models, Navigation satellites, Doppler effect, Atmosphere models, Least squares method, Snell's law, Computer programs, Ac-curacy, Sound, Propagation.

A theoretical development of a method for determining refraction characteristics of the atmosphere is described. The determination is based on data obtained from navigational satellites. Thus, the only instrumentation required by the method is a receiver for the signals from the satellite, and a computer. A principal purpose for determining atmospheric refraction characteristics would be the location of possible ducting and trapping layers. An estimate is given for the degree of accuracy that the method requires of the data received from the satellite to accomplish this purpose. (Author)

AD-864 887/CP PC E01/MF A01 Texas A and M Univ., College Station. Dept. of Oceanography and Meteorology. Simulation Research to Develop Objective Meteorological Prediction Capability Semi-annual rept. no. 3, 15 May-16 Nov 69 William H. Clayton, and Tom E. Sanford. Dec 69, 237p A/M-Ref-69-13-T, ECOM-0280-3 Contract DAAB07-68-C-0280

Distribution Limitation now Removed

Descriptors: \*Weather forecasting, processing systems, \*Atmosphere models, Programming(Computers), Models(Simulations), Low altitude, Towers, Networks, Weather stations, Analog computers, Wind, Soils, Temperature, Vapor pressure, Evapotranspiration. Identifiers: LLMM(Low level meteorological models), Low level meteorological models, Wind profiles, Computerized simulation.

In order to assess further the system of equations currently employed for simulating the atmospheric friction layer, four sets of data, each 12 hours in length, were collected on successive days in August 1969 at Dugway Proving Ground, Utah. Solutions of the equation system for these initial conditions as well as comparisons of the solutions with observed data are contained in this report. (Author)

PC E05/MF A01 AD-915 570/6CP Aerojet Electrosystems Co., Azusa, Calif. Microwave Radiometry Applications Study. Volume I Final rept.

R. C. Olson, W. Hubbard, L. J. Delaney, C. E. Dunning, and J. C. Blinn. Nov 73, 117 AESC-1798-FR-1-Vol-1, SAMSO-TR-73-381-Vol-1 Contract F04701-73-C-0338 See also AD-911 746 and AD-915 571. Distribution Limitation now Removed.

Descriptors: \*Radiometers, \*Meteorological in-\*Meteorological struments, satellites. Microwave equipment, Atmospheric physics, Atmospheric temperature, Passive, Data processing, Information retrieval, Infrared equipment, Infrared detectors, Remote detectors, Spaceborne, Weather forecasting, Regression analysis, Data reduction, Satellite anten-nas, Computers, High rate, Miniaturization, Clouds, Oceans, Terrain, Water vapor, Weather stations, Barometric pressure, Computer pro-grams, Mobile. Identifiers: SD.

This study examined methods of integrating atmospheric parameters profiles obtainable from a spaceborne passive microwave radiometer

into the air force global weather central and a remote station typified by the air force trasterm van. A statistical regression data retrieval technique used for sensor evaluation in a previous study was used to size the computer requirements. However, other retrieval techniques were examined to ensure that any eventual data reduction approach could be accommodated.

AD-915 571/4CP PC E06/MF A01 Aerojet Electrosystems Co., Azusa, Calif. Microwave Radiometry Applications Study. Volume II. Appendices Final rept.

R. C. Olson, W. A. Hubbard, L. J. Delaney, C. E. Dunning, and J. C. Blinn. Nov 73, 143p AESC-1798-FR-1-Vol-2, SAMSO-TR-73-381-Vol-2 Contract F04701-73-C-0338 See also AD-911 746, and AD-915 570. Distribution Limitation now Removed.

Descriptors: \*Radiometers, \*Meteorological instruments. \*Meteorological satellites, Microwave equipment, Atmospheric physics, Atmospheric temperature, Passive, Infrared equipment, Infrared detectors, Computers, High rate, Miniaturization, Spaceborne, Weather forecasting, Weather stations, Regression analysis, Data reduction, Clouds, Oceans, Terrain, Water vapor, Information retrieval, Al-gorithms, Iterations, Remote systems, Data processing, Environments, Barometric pressure, Computer programs, Mobile. Identifiers: AF.

Contents: Detailed descriptions of several retrieval algorithms; the computation of weighting functions in an iterative retrieval requirements for remote-site method: processing of microwave radiometric data; survey of satellite sounders; and Environmental Research and Technology, Inc., Final report.

AEEW-R-1002 PC A04/MF A01 UKAEA Reactor Group, Winfrith. Atomic Energy Establishment.

Tutank: A Two-Dimensional Neutron Kinetics

Code. M. G. Watts, M. J. Halsall, and F. J. Fayers. Apr 75.56p

U.S. Sales Only

Descriptors: \*Thermal reactors, \*Reactor kinetics, \*Pwr type reactors, Reactor kinetics, kinetics. \*Bwr type reactors, Reactor kinetics, \*Computer codes, \*T codes, Excursions, Neutron diffusion equation, Two-dimensional calculations.

For abstract, see NSA 32.08, number 21705.

# ANL-IIPP-2

MF A01

Argonne National Lab., III. Evaluation of Emission Control Strategies for Sulfur Dioxide and Particulates in the Chicago Metropolitan Air Quality Control Re-

gion J. E. Norco, M. A. Snider, J. J. Roberts, K. G. Croke, and A. S. Cohen. Dec 70, 227p Contract W-31-109-ENG-38

Portions of document are illegible.

Descriptors: "Aerosols, "Chicago, "Plumes, "Sulfur dioxide, "Urban areas, "Air pollution control, A codes, Air quality, Computer calcula-tions, Computer codes, Diffusion, Environmental transport, Gaussian processes, Mathematical models, Particles, Point pollutant sources, Regional analysis, Surface air, Time depen-

dence, Velocity, Wind Identifiers: ERDA/500200, "Gaussian plume models, Atmospheric diffusion, AQDM com-puter program, Chicago(Illinois), Metropolitan . areas

This report documents all aspects of the analyses of long-range regulations for control of SO sub 2 and particulates in the Chicago Metropolitan Air Quality Control Region: dispersion model, strategy model, emission in-ventory, present regional air quality, a compendium of possible control regulations for SO sub 2 and particulates, and extensive calculational results. The application of the Air Quality Display Model (AQDM), a computer program designed to estimate the spacial distribution of sulfur dioxide and particulate concentrations, is described. The AQDM, which is derived from the Martin-Tikvart (1968) diffusion model, is based on the Gaussian-diffusion equation which describes the spreading, or diffusing, of a plume as it is transported downwind from an elevated, continuously emitting point source. The model is utilized here to compute annual, arithmetic-, and geometric-mean ground-level pollutant concentrations resulting from specified point and area sources. The model calculates the effects of each source on each receptor for the observed combinations of wind direction, wind speed, and stability class. The relative frequency of occurrence for each combination is then included as a factor, and the resulting data are summed for each receptor over all combinations and all sources. (ERA citation 03:029317)

ANL-Trans-1103 PC A03/MF A01 Karlsruhe Univ. (West Germany). ATMOSPHERE. Fluid-Dynamic Simulation Model for Predicting Spreading Processes in the Atmospheric Boundary Layer M. Schatzmann, and W. Flick. Oct 77, 41p Contract W-31-109-ENG-38 Translation of SFB--80/T/90.

Descriptors: \*Air pollution, \*Computer codes, \*Plumes, \*Smokes, \*Stack disposal, \*Mathematical models, Earth atmosphere, A codes, Boundary layers, Computer calculations, Diffusion, Gaseous diffusion, Turbulence. Identifiers: ERDA/500100, Translations, West Germany, Atmospheric diffusion, Combustion products, Industrial wastes, Atmospheric boundary layer, ATMOSPHERE computer program, Computerized simulation.

The computer program ATMOSPHERE permits prediction of the diffusion of exhaust gases expelled by high industrial chimneys into the atmospheric boundary layer. In addition, the pro-gram can be used to compute the diffusion of cooling or sewage fluids in lakes and oceans. The assumptions on which the model is based limit the application to continuous flows characterized by axial symmetry introduced into approximately infinitely extended flows free of return flows and shear. The simulation model can predict the diffusion of bouyant jets even when the free stream contains temperature and concentration gradients and when the density differences between the jet and ambient fluid are not negligibly low. The effects of background turbulence and possible inversion layers on the diffusion process are taken into consideration. The predictions of the model are compared with experimental data. (ERA citation 03:019676)

BNWL-B-361 PC A04/MF A01 Battelle Pacific Northwest Labs., Richland, Wash

Hetran: A Subprogram Package for Predicting the Heat Transfer Across the Surface of a Natural Body of Water

Natural Body of Water. D. G. Daniels, and C. A. Oster. Jun 74, 62p Contract AT(45-1)-1830

Descriptors: "Computer codes, "H codes, "Heat transfer, "Computer calculations, "Surface waters, Heat transfer, Air, Daily variations, Forecasting, Interfaces, Meteorology, Water.

For abstract, see NSA 31 02, number 05432.

BNWL-SA-5117 PC A02/MF A01 Battelle Pacific Northwest Labs., Richland, Wash. Application of the Epace Scavenging Model to Calculations for Industrial Plumes. J. M. Hales, M. T. Dana, and M. A. Wolf. 1974, 10p Rept no. CONF-741003-7 Contract AT(45-1)-1830

Descriptors: \*Gaseous wastes, \*Stack disposal, \*Washout, \*Mathematical models, Aerosols, Air pollution, Computer codes, E codes, Industrial plants, Plumes, Precipitation scavenging, Rain.

For abstract, see NSA 31 05, number 11307.

CEA-R-4549 PC A06/MF A01 Cea Centre d'Etudes Nucleaires de Fontenayaux-Roses, 92 (France). Dept. De Physique du Plasma et de la Fusion Controlee. Determination of the Particle Size Distribution

of an Aerosol Using a Diffusion Battery. J. P. Maigne. Feb 74, 104p In French. U.S. Sales Only.

Descriptors: \*Aerosols, \*Particle size, Computer codes, Data, Diffusion, Distribution, Earth atmosphere, Mathematical models, Measuring methods. Identifiers: AEC.

For abstract, see NSA 29 09, number 23862.

CEA-R-4837 MF A01 CEA Centre d'Etudes Nucleaires de Fontenayaux-Roses (France). Dept. de Protection. Cartographic Forecasts of Short-Term Air Pollution Averages

J. M. Quinault, C. Caput, and Y. Belot. May 77, 37p

Available in microfiche only. U.S. Sales Only.

Descriptors: \*Air pollution, \*Plumes, \*Urban areas, Computer codes, Diffusion, Mathematical models, Point pollutant sources, Weather. Identifiers: ERDA/500200, France, Point source, Gaussian plume models, Weather forecasting, Atmospheric diffusion.

A computer program was developed in order to evaluate pollutant distributions in an area affected by multiple point sources, such as a typical industrial area. Classical gaussian relationships were used with some improvements taking account of ground roughness, pollutant deposition and sampling duration. The program written in A.P.L., and it is easy to use by a non-specialized operator on a console linked to a computer through the telephone network. (Atomindex citation 08:341271)

COM-71-00012/CP PC E01 MF A01 State Univ. of New York, Albany. Atmospheric Sciences Research Center.

Great Lakes Snowstorms. Part 1. Cloud Physics Aspects.

Final rept. 1968-70

James E. Jiusto, and Edmond W. III Holroyd. Jun 70, 153p NOAA-E22-49-70(G)-1 Grant ESSA-E22-49-70(G) See also Part 2, COM-71-00011.

Descriptors: \*Cloud seeding, \*Great Lakes, \*Snowstorms, Reduction, Cloud physics, Silver iodide, Aerosols, Freezing, Condensation nuclei, Atmospheric physics, Temperature, Meteorological radar, Dry ice, Snow fall, Radar cross sections, Networks, Mathematical models, Computer programs. Identifiers: Lake Erie, Lake Ontario, \*Lake effect snowstorms.

Studies of the synoptic, mesoscale, and microphysical characteristics of snowstorms occurring to the lee of Lakes Erie and Ontario were done, with emphasis on defining precipitation mechanisms, land structure, aerosol characteristics and snowfall patterns. Cloud seeding was performed with silver iodide and with dry ice. The practical implications of each modification concept can not be definitely assessed, but seeding with additional freezing nuclei to increase ground or lake precipitation can be accomplished, and seeding from the ground offers experimental and operational advantages. Snow crystal concentration at ground level is an effective measure of modification efficacy. It is recommended that the ground observer network be increased by a factor of 3, and that the duration and area of seeding be increased by at least a factor of 2 to 3. (Author)

COM-71-00020/CP

Tetra Tech, Inc., Arlington, Va. Computer Simulation of Severe Storm Observations with Doppler Radars. Final rept.

PC E01 MF A01

30 Aug 70, 30p ESSA-E22-77-70(N)-1 Grant ESSA-E22-77-70(N)

Descriptors: \*Storms, Radar detection, Computer programs, Doppler radar, Computerized simulation, Precipitation(Meteorology), Intensitional detection (Meteorology), Intensi-

Identifiers: STORMS computer program.

A computer program developed for simulating the performance of severe storm observations with Doppler radars is described. The computer program consists of the main calling program, STORMS, six subroutines entitled POINT, SAM-PLE, MONO, INVERT, GRID and INTGL, and one function subprogram, PHI. The liberal use of comment cards in the program source deck provides detailed documentation of interest to the programmer. The purpose of this report is to describe briefly, for the potential user, the capabilities of the program, the functions of the main program, subroutines and subprogram, and to document some results which have already been obtained by exercising the program. (Author)

COM-71-00136/CP PC E01 MF A01 National Severe Storms Lab., Norman, Okla. Papers on Operational Objective Analysis Schemes at the National Severe Storms Forecast Center. Technical memo.

Rex L. Inman. Nov 70, 99p NOAA-ERLTM-NSSL-51, NOAA-71010701

Descriptors: "Weather forecasting, Numerical analysis, "Meteorological data, Data processing, Storms, Wind(Meteorology), Meteorological charts, Radiosondes, Weather stations, Dew point, Computer programs, FOR-TRAN.

The document contains three papers concerning the following topics: Objective analysis routines; Objective analysis of mean moisture aloft utilizing radiosonde and surface data; and, Kinematic vertical velocity computed from low level mean winds.

COM-71-00707/CP PC E01 MF A01 National Severe Storms Lab., Norman, Okla. Rawinsonde Observation and Processing Techniques at the National Severe Storms Laboratory Technical memo.

Stanley L. Barnes, James H. Henderson, and Robert J. Ketchum. Apr 71, 255p Rept no. NOAA-ERLTM-NSSL-53

Descriptors: \*Radiosondes, Networks, \*Meteorological data, Data processing, Thunderstorms, Atmospheric sounding, Squalls, Computer programs, Networks, Data reduction, Quality control, Evaluation.

The report is intended to serve as a user's guide to the archived soundings which have been reduced to basic meteorological parameters recorded on magnetic tapes. Following brief descriptions of the arrangement and purposes of the various networks and the types of other data available from NSSL, the current observa-tion and reduction procedures are described in detail. Computer programs for quality control and final data reduction are listed and explained. Archive formats are defined and examplas given. Appendices include capsule descriptions of each day's operations and weather, and a list of quality evaluations for each archived sounding. (Author)

COM-71-00875/CP PC E01 MF A01 Environmental Research Labs., Boulder, Colo. Office of the Director.

Outline of a Bayesian Approach to the EML Multiple Cloud Seeding Experiments Technical memo.

Joanne Simpson, and Jacques Pezier. Jun 71, 68p Rept no. NOAA-TM-ERL-OD-8 Prepared in cooperation with Thayer School of Engineering, Hanover, N.H.

Descriptors: \*Cloud seeding, Statistical analy-sis, Weather forecasting, Decision theory, Statistical tests, Bayes theorem, Computer programs, Cumulus clouds, Florida. Identifiers: Numerical weather forecasting.

Decision analysis techniques, using Bayes equation in several forms, are evolved for use in analyzing Florida cumulus seeding experiments. In order to apply decision analysis to evaluate the seeding effect upon rainfall, it is necessary to know the distribution and its sufficient statistics for both seeded and natural rain. Lacking this knowledge, several assumptions are made for use in the evolution of the Bayesian approach. A procedure is outlined showing how decision analyses may be used with forthcoming experiments. These methods are likely to have rather wide application in the analysis of meteorological experiments. (Author)

#### COM-71-00911/CP PC E01 MF A01 National Severe Storms Lab., Norman, Okla. Model of Precipitation and Vertical Air Currents

Technical memo.

Edwin Kessler, and William C. Bumgarner. Jun 71, 106p Rept no. NOAA-TM-ERL-NSSL-54

Descriptors: \*Atmospheric circulation. Atmospheric models. \*Precipitation(Meteorology), Mathematical models, Wind (Meteorology), Buoyancy, Temperature, Condensing, Convection, Weather forecasting, Moisture content, Computer programs.

Time-dependent moist columnar convection is numerically modelled as an extension of Priestley's 1953 study of buoyant dry elements in a turbulent environment. The distinctive velocity regimes characteristic of the model and akin to those discussed by Priestly, may be classified in terms of environmental lapse rate, moisture content, and the size and amplitude of initiating and following disturbance. Several types of conditions develop in conditionally unstable cases: a strong steady updraft may develop without precipitation beneath but with precipitation outside an implied area of strong updraft, when there is a strong starting perturbation, small mixing rate, an elevated condensation level, and a steep lapse rate. The model suggests that a critical horizontal size and critical perturbation buoyancy must be exceeded in nature if sustained moist convection is to result in any given conditionally unstable lapse rate and moisture condition. (Author) COM-71-50082/CP PC-SOD/MF A01-NTIS Atmospheric Physics and Chemistry Lab., Boulder, Colo. Computer Subroutine for Presenting Meterological FI (CURVPT) Technical rept. Flight Data on the Printer Heinz H. Grote. Mar 71, 27p APCL-17, NOAA-TR-ERL-199

Paper copy available from SOD \$0.35 as C55.13:ERL-199-APCL-17.

Descriptors: \*Meteorological data. \*Data processing, "Weather reconnaissance aircraft, Meteorological data, Subroutines, Printouts, Computer programming. Identifiers: CURVPT computer program.

The paper describes a subroutine that provides a plot on the peripheral printer of up to six parameters with curve separation and automatic scaling. It was developed for automatic presentation of meteorological flight data by the computer but can be used universally. (Author)

COM-71-50410/CP PC-GPO/ME A01-NTIS National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab. A Program for Calculating Three-Dimensional Acoustic-Gravity Ray Paths in the Atmosphere Technical rept.

T. M. Georges. Aug 71, 47p WPL-16, NOAA-TR-ERL-212

Paper copy available from GPO \$0.50 as C55.13:ERL212-WPL-16.

Descriptors: \*Gravity waves, Ray tracing, \*Computer programs, Gravity waves, FORTRAN, Microbarometric waves, Atmosphere models. Identifiers: \*Acoustic gravity waves.

The ITS-Jones-Haselgrove ray-tracing program is adapted to calculate acoustic-gravity ray paths in a compressible atmosphere with arbitrary three-dimensional wind and tempera-ture variability and spherical earth. The program and its use are described, including deck listings and sample runs. Application to ocean acoustics should be possible with little modification. (Author)

COM-72-10297/CP Texas Univ., Dallas. PC E01/MF A01

Analysis of Incoherent Scatter Data Obtained at the Jicamarca Radar Observatory Final rept.

J. P. McClure. 30 Sep 71, 14p NOAA-72020405 Grant ESSA-E22-92-71(G)

scattering, Descriptors: \*Atmospheric \*lonosphere, Atmospheric sounding, Electron density(Concentration), Electron energy, F region, Data processing. Identifiers: JDPLOT computer program.

The research objective was the analysis of incoherent scatter data from the Jicamarca Radar Observatory. The electron concentration (N sub e) and the electron and ion temperatures (T sub e) and (T sub i) are available from most of the data. The vertical plasma drift velocity and the ionic composition are also available from part of the data. (Author)

COM-72-10807/CP PC E01/MF A01 National Weather Service, Silver Spring, Md. Techniques Development Lab

SPLASH (Special Program to List Amplitudes of Surges from Hurricanes) I. Landfall Storms

Technical memo. Chester P. Jelesnianski. Apr 72, 58p NOAA-TM-NWS-TDL-46, NOAA-72062701

Descriptors: "Weather forecasting, Tropical cyclones, \*Storm surges, Forecasting, Data processing, Statistical data, Nomographs, Hurricanes.

Identifiers: SPLASH computer program.

Two separate methods (based on dynamics) to estimate or forecast the surge are developed. The first method in which precomputed nomograms are used is designed only to arrive at a peak surge value. Arguments for the nomograms are simple meteorological parameters. In the second method, a dynamic model is used to compute surges along an entire coastline. Computations are done by an electronic computer; surface meteorological parameters are used as input to the operational program. Qualitative explanations for the surge phenomena are interspersed throughout part I. The relative importance of various meteorological parameters, continental shelf topography, and coastal geography are discussed. (Author)

COM-72-11491/CP PC E01/MF A01 Stanford Research Inst., Menlo Park, Calif. Computer Model for Investigating the Strategy of Automatically Estimating Prevailing Visibility Final rept.

R. L. Mancuso, and E. E. Uthe. Sep 72, 97p SRI1336-FR, NOAA-72100611 Contract NOAA-1-36081

Descriptors: \*Weather forecasting, Visibility, \*Visibility, Computerized simulation, Optical properties, Fog, Haze, Optical radar, Meteorological instruments, Backscattering, Aerosols, Computer programs, Automation, Accuracy, FORTRAN.

Identifiers: VISMOD computer program, CDC 6400 computers.

Means of automatically measuring prevailing visibility are investigated by computer simulation. The effects of instrument type, numbers, locations, and sampling intervals on the accuracy of the measurements are estimated. However, due to uncertainties associated with the parameters used in the visibility model, the usefulness in studying sampling strategy is limited. A field study to evaluate the technique developed under this study and the parameters used in the visibility model is recommended. It is concluded that lidar may be the most appropriate instrument for automatically measuring prevailing visibilities. (Author)

COM-72-50079-04-01/CP

(Order as COM-72-50079-04) National Hurricane Center, Coral Gables, Fla. Performance Analysis of the HURRAN Tropi-

cal Cyclone Forecast System Charles J. Neumann, and John R. Hope. 21 Dec 71, 12p NOAA-72060206-1

Revision of report dated 27 May 71. Pub. in Monthly Weather Review, v100 n4 p245-

255 Apr 72, COM-72-50079-04.

Descriptors: 'Hurricane tracking, Weather forecasting, Analog simulation, Frequency distribution, Error analysis, Storm tracks. Identifiers: HURRAN computer program, Hurricane Camille.

The HURRAN (hurricane analog) technique, a fully computerized objective forecast aid making use of past tracks in forecasting hurricane motion, was developed prior to the 1969 hurricane season. Encouraging operational results during the 1969 and 1970 hurricane seasons suggested further evaluation of the technique. To this end, HURRAN computations were made for approximately 1,000 forecast situations. Results are stratified according to initial direction and speed of movement of the sample storms and the number of analogs selected. The utility of the technique is discussed, and the importance of position accuracy at forecast time is demonstrated. Initial indications of the value of the technique are substantiated. (Author)

COM-73-10365/CP PC E07/MF A01 National Weather Service, Silver Spring, Md. Office of Hydrology. National Weather Service River Forecast System Forecast Procedures Technical memo. Dec 72, 257p\* Rept no. NOAA-TM-NWS-HYDRO-14 See also COM-73-10298.

Descriptors: \*Flood forecasting, \*Computer programs, River basins, Rainfall, Weather forecasting, Mathematical prediction, Periodic variations Evapotranspiration, Data processing Identifiers: NOAA.

The report serves the following purposes: A guide for implementation of conceptual river forecasting models by field offices; A tool for use in testing and evaluating new concepts and procedures by the Hydrologic Research Laboratory, and A vehicle for providing the results to others in the hydrologic community. The report describes the package which includes the techniques and programs needed for developing operational river forecasts based on the use of a continuous conceptual model, from the initial processing of basin data to the preparation of forecasts. The programs are written for a large-capacity digital computer and are generalized for use on any river system. Thus, they may or may not be the most efficient programs for use in a particular situation. (Author Modified Abstract)

#### COM-73-10781/CP PC E01/MF A01 National Severe Storms Lab., Norman, Okla. Mesoscale Objective Map Analysis Using Weighted Time-Series Observations Technical memo.

Stanley L. Barnes. Mar 73, 69p NOAA-TM-ERL-NSSL-62, NOAA-73050302

Descriptors: \*Atmospheric circulation, Time series analysis, Air masses, Thunderstorms, Mathematical prediction, Graphic methods, Computer programs, Wet bulb temperature, FORTRAN. Identifiers: NOAA.

An objective map analysis technique applicable to quasi-steady, translating atmospheric circulations is developed from the mathematical premise that distributions of meteorological variables can be represented by an infinite sum of independent, harmonic waves. In addition to the usual space-weighting of simultaneous observations to obtain interpolated values at regularly arrayed grid points, the scheme uses asynoptic observations by positioning them relative to a moving disturbance and weighing them according to both space and time. Analysis response for several choices of the arbitrary parameters is tested on simple analytically determined distributions and on selected meteorological observations during the passage of three thunderstorms over the National Severe Storms Laboratory mesonetwork of surface and upper air stations in central Oklahoma. (Modified author abstract)

COM-73-11202/1CP PC A05/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Office of the Director(ERL). On the Use of Gamma Functions and Bayeslan Analysis in Evaluating Florida Cumulus Seeding Results Technical memo.

Joanne Simpson, Jane C. Eden, Anthony Olsen, and Jacques Pezier. Feb 73, 92p NOAA-TM-ERL-OD-15. NOAA-73062703

Descriptors: \*Cloud seeding, \*Florida, \*Cumulus clouds, Cloud seeding, Weather modification, Precipitation(Meteorology), Descriptors: modification, Precipitation( Gamma function, Statistical distributions. Curve fitting, Graphic methods, Computer programs.

Identifiers: Bayesian analysis, RAIN computer program, NOAÁ.

Bayesian techniques are used to evaluate the seeding factor or rainfall and its probability distrubution in the Experimental Meteorology Laboratory randomized dynamic seeding ex periments on isolated cumuli in Florida. A framework is constructed for later use of these tools with the randomized multiple cumulus seeding experiment in the 4000 nautical square miles target area. Used together with the properties of gamma functions, Bayesian techniques have produced new results for the single cloud experiments and opened up promising approaches to the multiple cloud seeding or area experiments.

COM-73-11401/9CP PC 406/MF 401 National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.

A Note on a Gamma Distribution Computer Program and Graph Paper

Technical rept.

Harold L. Crutcher, Gerald L. Barger, and Grady F. McKay. Apr 73, 118p NOAA-TR-EDS-11, NOAA-73082106

Descriptors: \*Meteorological data, Statistical analysis, \*Precipitation(Meteorology), Gamma function, \*Gamma function, Computer programs, Statistical distributions, Curve fitting, Graphic methods, FORTRAN, Plotters. Identifiers: FORTRAN 4 programming lan-

quage, NOAA.

The gamma distribution function may be used as a model for many sets of data. The electronic computer program in the Formula Translator (FORTRAN) 4 for this function here provides the analytic solution to a set of data, gives the probabilities of exceeding or not exceeding arbitrary amounts, and indicates the amounts ex-ceeded or not exceeded for arbitrary probabilities. The developed gamma probability plotting paper serves also for the special cases of the chi-squared, the exponential, and the Poisson distribution functions. Estimates of the scale and shape parameters permit construction of the graph. The graph paper may be used to estimate the scale and shape parameters. The program, in its general form, permits a maximum of 52 entries, which will suffice for those dealing with weekly data through the year. In addition, in precipitation studies, the user has the option to compute in one pass of the data the two du-ration and three duration period distributions. These computations are done without program change but by appropriate changes in the con-trol cards. This feature is not limited to the study of precipitation data. An option permits the computation of the required probabilities and inverses when only the scale and shape parameters are given. (Modified author abstract)

COM-73-11634/5CP PC E01/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Aeronomy Lab. Accurate Langmuir Probe Measurements with an On-Line Computer

Technical memo. K. H. Geissler, and J. H. Darr. Jun 73, 27p Rept

nos. NOAA-73090404, NOAA-TM-ERL-AL-6

Descriptors: \*Atmospheric sounding, Langmuir probes, \*Langmuir probes, Data processing, \*Ionosphere, Electron density, Plasmas(Physics), densi-Electron ty(Concentration), Computer programs, FOR-TRAN. Identifiers: NOAA

The report is a study of a method for measuring Langmuir probe characteristics accurately enough to either verify or exclude the hypothesis of non-Maxwellian velocity distributions. Section 2 gives general considerations for the use of Langmuir probes. Section 3 reviews the equations used for evaluating the measured probe characteristics. Sections 4 and 5 outline the data accepting and reduction procedures used. Program listings are given in the Appendix.

## COM-74-10525/5CP

Ohio State Univ., Columbus. Dept. of Physics. The Effects of Refraction and Dispersion on **High-AltItude Measurements of Atmospheric** Gases

PC-GPO

# Interim rept.

James K. G. Watson, and Peter K. L. Yin. Oct 73, 1040p NOAA-74012807 Grant NOAA-NG-2872

Descriptors: \*Upper atmosphere, \*Atmospheric composition, Gases, Concentra-tion(Composition), Solar radiation, Infrared radiation, Absorption spectra, Refractive index, Water vapor, Jet engines, Exhaust gases, Com-puter programs, FORTRAN.

Identifiers: ANGDEV computer program, FOR-TRAN 4 programming language, Sea Grant program, NOAA.

A study has been made of the theories of atmospheric refraction and anomalous dispersion for the purpose of assisting the interpretation of measurements of atmospheric gases by the solar occultation technique, and a com-puter program has been written to calculate a theoretical occultation spectrum in the vicinity of an isolated absorption line. A brief discussion of the pertinent physical parameters, such as refractive index, line intensities and line shapes, is included. The numerical calculations have been performed with computer programs written in the Fortran 4 language, in which the refractive and dispersive angular deviations of the ray path and the absorption with or without instrumental corrections are evaluated. (Modified author abstract)

COM-74-10720/2CP PC E05/MF A01 Michigan Univ., Ann Arbor. High Altitude Engineering Lab.

Feasibility of Satellite Measurement of Stratospheric Minor Constituents by Solar Occultation Technical rent.

S. R. Drayson, F. L. Bartman, W. R. Kuhn, and R. Tallamraju. Oct 73, 113p UMICH-011023-2-T, NOAA-74030404 Grant NOAA-NG-1072

Descriptors: \*Stratosphere, \*Spectrosropic analysis, \*Atmospheric composition, Absorp-tion spectra, Aerosols, Nitrogen oxide(N20), Carbon monoxide, Trace elements, Ozone, Methane, Water vapor, Optical properties, Computer programs, Infrared spectra, Computer programs, Infrared spectra, Spaceborn detectors, Transmissivity, Mathe-matical models, Solar radiation, Refractivity, <u>Gas detectors</u>, Gas analysis, Data reduction, FORTRAN, Transmittance, Chemical composition.

Identifiers: Air pollution detection, FORTRAN 4 programming language, Occultation, NOAA

The determination of stratospheric concentration of minor constituents by satellite solar oc-culation is examined. The method is shown feasible for ozone up to 50 km, water vapor up to 50 km, nitrous oxide up to 30 km, methane up to 50 km and carbon monoxide up to 20 km. Transmittance calculations for these and other gasses are presented for optimal spectral regions. Calculations of extinction by aerosols in the lower stratosphere show a dominant effect in the window regions near 10 micro meters. Several inversion techniques are developed

and examples of profiles retrieved by different methods are compared. Computer programs are described to calculate the transmittances by the use of a band model and by the line-byline integration technique. (Author)

COM-74-10824/2CP PC A02/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab. SCINTDR-A Program for Controlling the Fremouw Scintillation Model Technical memo.

T. A. Burrows. Jan 74, 20p NOAA-TM-ERL-SEL-30. NOAA-74032007

\*lonospheric propagation, Descriptors: Scintillation, \*Computer programs, FORTRAN, Input output routines. Identifiers: SCINTOR computer program, CDC 3800 computers, NOAA.

A description of a program that computes the ionospheric scintillation index as a function of a number of input variables, such as transmitter frequency, sunspot number, time, and other parameters relating to transmitter-receiver geometry, is presented. The program, obtained from Stanford Research Institute, has been modified at NOAA for operation with the NOAA computational facility and for ease in inputting various parameters. The printed output is not as flexible as that obtained from the original driver program, but the new program allows more control over the manner in which the input parameters are incremented and also allows the semiautomatic production of punched output that may be directly submitted to the contour-plotting program.

COM-74-10908/3CP PC E04/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Air Resources Lab. Geophysical Monitoring for Climatic Change No. 1. Summary Report 1972 John M. Miller. Jan 74, 85p NOAA-74032910

Descriptors: \*Climatic changes, \*Atmospheric physics, Atmospheric composition, Aerosols, Carbon dioxide, Ozone, Volcanic ejecta, Air pollution, Wind(Meteorology), Atmospheric temperature, Dew point, Atmospheric pressure, Precipitation(Meteorology), Solar radiation, Strontium 90

Identifiers: LIDAR computer program, NOAA.

This is the first in an annual series reporting on the program designed to establish and maintain observation and analysis of data representative of the global background of selected gases and aerosols. The focus of the program is on establishing a long-term time series from ground-based instrumentation. Information is given on the baseline stations and the measurement programs relating to gases, aerosols, meteorology, solar-terrestrial radiation, and cooperative programs. The data acquisition system is described. Appendices contain the computer programs for LIDAR computations and MLO selected monthly measurements of Aitken Particles by a Gardner Counter 1971-1972

COM-74-10925/7CP PC E03/MF A01 National Weather Service, Silver Spring, Md Techniques Development Lab.

SPLASH (Special Program to List Amplitudes of Surges from Hurricanes). Part 2. General Track and Varlant Storm Conditions Technical memo.

Chester P. Jelesnianski, Mar 74, 62p NOAA-TM-NWS-TDL-52, NOAA-74040908 See also report dated Apr 72, COM-72-10807.

Descriptors: "Storm surges, "Hurricanes, "Weather forecasting, Tropical cyclones, Storm tracks, Coasts, Forecasting, Computer programming. Identifiers: SPLASH computer program, NOAA.

An operational computer program has been expanded to accommodate storms with generalamples are storms that move alongshore. recurve, remain stationary, accelerate, and landfall (exit). Also, storm strength and size are allowed to vary in a continuous monotonic manner with time. Surges generated by these generalized storms are complicated in space and time, and they can occur on an extensive coastline (hundreds of miles). Five track positions (spaced at 6-hr increments on the storm path) and simple meteorological parameters are the meteorological input for the program. Detailed meteorological phenomena such as explosive deepening of storms, violent changes in storm track, and sudden accelerations of the storm are not considered. In a qualitative and heuristic manner; several strange dynamic phenomena generated by the storms with generalized motions are discussed. Several special examples are computed by the program and then interpreted for forecasting. (Modified author abstract)

COM-74-11253/3CP PC A05/ME A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office. Computer Software for Rainfall Analyses and

Echo Tracking of Digitized Radar Data Technical memo.

Stellan Sven Ostlund. Mar 74, 88p NOAA-TM-ERL-WMPO-15, NOAA-74052009

Descriptors: \*Rainfall, \*Radar echoes. Computer programs, Flux rate, Interpolation, Fourier analysis, Meteorological radar, Radar tracking.

The paper describes computer software designed for digitized radar data. Program packages include a scan-conversion from a polar to a Cartesian grid system, a rain summation analysis over selected areas within the whole area, and an echo tracking program which calculates total rainrates and rainfalls from isolated echoes matched from frame to frame. All the results may be drawn on a pen plotter for easier interpretation. (Modified author abstract)

COM-74-11286/3CP PC A06/ME A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office. Guide to Computer Programs Used in the Statistical Analysis of Florida Cumulus Seeding Experiments Technical memo. Jane C, Eden, Apr 74, 122p NOAA-TM-ERL-WMPO-14, NOAA-74061201

Descriptors: "Cumulus clouds, "Cloud seeding, "Florida, "Computer programs, Statistical anal-ysis, Programming manuals, FORTRAN, BASIC programming language. Identifiers: FORTRAN 5 programming language.

The decision analyses to evaluate the seeding effect of Florida cumulus experiments has required the use of several computer programs. The purpose of this guide is to assist anyone interested in this type of analysis, and to help eliminate the duplication of effort that is often present in developing software for similar tasks. Detailed discussions of the mathematics and statistical procedures are explained in various references. The instructions included here will enable the reader to run the programs and to anticipate the output.

COM-74-11295/4CP PC A05/MF A01 Stanford Research Inst., Menlo Park, Calif. Atmospheric Transmittance Models for Infrared Radiometric Measurements Final rept.

Paul A. Davis. Mar 74, 82p NOAA-74060302 Contract NOAA-3-35208

Descriptors: "Remote sensing, "Radiometers, "Atmospheric sounding, Water vapor, Carbon dioxide, Ozone, Transmittance, Atmospheric attenuation, Infrared radiation, Computer programs, FORTRAN.

The goal of this study was the design of comprehensive but simplified models for computing atmospheric transmittances appropriate to the specific response characteristics of infrared radiometers used in remote sensing. Representations were derived which describe the transmittance as a universal function of absorber amount, pressure, and temperature; absorber amounts appearing in a universal representa-tion are scaled to convert nonhomogeneous paths into equivalent homogeneous paths. For any given spectral interval the total trans-mittance was divided into independent factors for water vapor and carbon dioxide or a combination of uniformly mixed gases. (Modified author abstract)

PC E01/MF A01 COM-74-11336/6CP National Oceanic and Atmospheric Administration. Idaho Falls, Idaho. Air Resources Lab.

Program for Evaluating Atmospheric Dispersion from a Nuclear Power Station Technical memo.

Jerrold F. Sagendorf. May 74, 18p NOAA-TM-ERL-ARL-42, NOAA-74062710

Descriptors: 'Nuclear power plants, 'Air pollu-tion, 'Wind, Mathematical models, Computer programming\_FORTRAN, Site surveys. Identifiers: SEP computer code, FORTRAN 4 programming language, IBM 360/75 compu-

A computer code (SEP for Site Evaluation Program) is described. The program uses a joint frequency distribution of winds and stability classes to evaluate the atmospheric dispersion potential near a nuclear power station. The code includes models for short-term and longterm effluent releases. A description of the input parameters is included.

COM-74-11464/6CP PC E04/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.

Digitizing, Recording. and Computer Processing Weather Radar Data at the Experimental Meteorology Laboratory Technical memo.

Victor Wiggert, and George F. Andrews. May 74, 73p NOAA-TM-ERL-WMPO-17, NOAA-74080611

Prepared in cooperation with Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.

Descriptors: \*Rainfall, \*Cloud seeding, \*Meteorological radar, \*Data processing, \*Cloud seeding, Descriptors: Storms, Computer programs, Meteorological data, FORTRAN.

Identifiers: Florida area cumulus experiment, FORTRAN 5 programming language, WSR-57 radar

Weather radar data, in the form of average power returned from a sampled volume, contains information which may permit calculating an average rainfall rate in that volume. The average power returned within 200 discreet range bins and at 2 degrees azimuthal increments can be digitally quantified and then tape recorded by using equipment designs and concepts originated by the National Severe Storms Laboratory. During the summer 1973, the Ex-perimental Meteorology Laboratory conducted the Florida Area Cumulus Experiment (FACE); one of the purposes of FACE was to gain knowledge of rainfall rates and total rain

volumes from convective showers and storms, including those seeded with silver iodide flares. One means of ascertaining such rainfall characteristics was to have the Miami WSR-57 radar output digitally quantified and tape recorded. The electronic equipment and computer programs used to obtain and assess the radar information are discussed. (Modified author abstract)

COM-74-11470/3CP PC A04/MF A01 National Oceanic and Atmospheric Administration, Idaho Falls, Idaho. Air Resources Labs.

Program Descriptions. Supplement to Mesoscale Wind Fields and Transport Estimates Determined from a Network of Wind Towers

Technical memo.

L. L. Wendell. May 74, 55p NOAA-TM-ERL-ARL-43, NOAA-74080605

Sponsored in part by Atomic Energy Commission. Washington, D.C.

Descriptors: \*Wind(Meteorology), \*Computer programs, Data processing, Subroutines. Identifiers: Computer graphics.

A computer program was developed to analyze objectively two-dimensional wind data from a mesoscale network of stations. The result is a graphic display of the network wind field at any particular time and a plot of computed air trajectories as a function of time and point of origin. A brief description, a list of input variables, and program listings for the computer program are provided.

COM-74-11627/8CP PC A04/MF A01 National Oceanic and Atmospheric Administration, Idaho Falls, Idaho. Air Resources Labs. Regional Effluent Dispersion Calculations Spatial Considering Spatial Meteorological Variations and Temporal Technical memo.

G. E. Start, and L. L. Wendell. May 74, 71p NOAA-TM-ERL-ARL-44, NOAA-74091808 Sponsored in part by Atomic Energy Commission, Washington, D.C.

Descriptors: \*Air pollution, \*Atmospheric motion, Computer programs, Diffusion, Mathematical models, Wind velocity, Regional planning, Meteorological data. Identifiers: Wind roses

An objective regional trajectory analysis scheme has been combined with a Gaussian diffusion model to yield a technique called MESODIF (mesoscale diffusion). The trajectory analysis scheme utilized wind data from a network of tower-mounted wind sensors to consider the effects of spatial variabilities of horizontal wind flow near the surface, incorporated time changes in rates of diffusion, and used an upper level lid to vertical mixing. The diagnostic comparisons of regional dispersion effects from each technique showed significant differences over the range of scales con-sidered. For short or accidental type of emissions, the greatest shortcoming of the single wind-station dispersion model was its failure to identify, when applied within a region of spatially variable winds, the subregion which would be affected. Current usage of the wind rose technique for regional dispersion calculations, especially at the longer distances, incorporates some systematic bias in the evaluations. These shortcomings are points of concern and should be reconciled with whatever impact assessment schemes are to be utilized within the mesoscale or regional domain.

COM-74-11808/4CP PC A04/ME A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.

A Semi-Automated System for True Height Analysis of Film lonograms. Part 3. Documentation of Software Technical memo.

R. B. Jurgens, G. Goe, and G. M. Lerfald. Oct 74, 73p NOAA-TM-ERL-SEL-34, NOAA-74111809

Descriptors: \*lonograms, \*Computer programs, lonosphere, Electron density(Concentration), Data processing, Mathematical models.

Part 1 of this series described an analysis system that automates many of the steps required to obtain electron density versus 'true' height profiles from film ionogram data. The semi-automated system retains the judgment and pattern recognition capabilities of trained operators to select and identify ionogram traces of interest, but relies on automatic data processing techniques to perform essentially all other functions. The computer subroutines documented in this memorandum relate primarily to the processing of the data after the ionogram traces have been digitized, but before the true height is computed. These intermediate data processing steps are necessary to provide accurate digital input data for the true height computer program.

COM-75-10117/0CP PC A03/MF A01 Notre Dame Univ., Ind. Dept. of Civil Engineering.

Tornado Photographic Analysis

Final rept.

Bruce J. Morgan. Jul 74, 50p NOAA-74123110 Contract NOAA-04-3-022-32, Grant NOAA-04-4-022-8

Descriptors: "Tornadoes, "Weather observations, Storm tracks, Meteorological instruments, Photography, Data processing, Com-puter programs, FORTRAN, Oklahoma. Identifiers: Union City(Oklahoma).

On May 24, 1973 a severe storm system was tracked from early afternoon until approximately 5:00 P.M. CDT when it produced a large tornado near Union City, Oklahoma. The field tracking crew was in excellent position at the time of tornado touchdown and obtained considerable photographic documentation of the event. The report provides data concerning the tornado obtained by analysis of the films, discusses what was learned about how to study films of this type, and finally makes recommendations concerning what procedures should be used in the future to achieve maximum data from severe weather photography.

COM-75-10588/2CP PC A05/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab. The Search for Most Unstable Scales of Disturbances in Three-Layer Atmospheric Models with Shear and Static Stability--Procedure and Results Technical rept.

W. R. Moninger. Dec 74, 82p NOAA-TR-ERL-314, WPL-36, NOAA-75041104 Paper copy also available from GPO as C55.13:ERL314.

Descriptors: \*Atmospheric disturbances Mathematical models, Complex variables, Roots of equations, Eigenvectors, Algorithms, Computer programs

A program for finding the roots of a complex function has been adapted to find buoyancywave eigenfunctions of a three-layer at-mospheric model of E.E. Gossard. Eigenfunctions are found in stable and unstable regions; the most unstable wavelengths are presented for various sets of model parameters. The program and its use are described, including deck listings and sample runs. COM-75-10595/7CP PC A06/MF A01 Ohio State Univ., Research Foundation, Columbus, Ohio.

The Effects of Refraction and Dispersion on High-Altitude Measurements of Atmospheric Gases. II. Calculations with the Voigt Line Shape Final rept.

James K. G. Watson, and Peter K. L. Yin. Jan 75, 118p NOAA-75041412 Grant NOAA-NG-28-72

Descriptors: \*Atmospheric sounding. \*Atmospheric attenuation, Atmospheric scat-tering, Refraction, Solar radiation, Computer programs, Absorption, Temperature, Water vapor, Spectral lines, Spectrum analysis, FOR-TRAN

Identifiers: \*Voigt profiles, Line shape, \*Solar occultation absorption technique.

A general study of the effects of refraction and dispersion in the solar occultation absorption technique is described, based on the Voigt profile for the shapes of individual spectral lines. New numerical techniques are developed to evaluate both the absorption and the dispersion of the Voigt profile. These techniques are then applied to calculations of the angular deviation and atmospheric absorption, taking into account the curvature of the path and the effect of anomalous dispersion. The feasibility of the sounding of the water vapor mixing ratio profile by intensity measurements of the line at 1404.988/cm is investigated with the strong line approximation. The possibility of atmospheric temperature sounding by means of the occultation absorption technique is discussed, and sensitivity tests are performed. The computer programs for these calculations, written in the FORTRAN IV language, are included in the Appendix.

COM-75-10945/4CP PC A04/MF A01 National Bureau of Standards, Washington, D.C. Inst. for Applied Technology. Statistical Analysis of Extreme Winds Final technical note

Emil Simiu, and James J. Filliben. Jun 75, 55p Rept no. NBS-TN-868

Library of Congress Catalog Card No. 75-600028. Paper copy also available from GPO as C13.46:868

Descriptors: "Wind pressure, "Hurricanes, "Building codes, Probability distribution func-tions, Wind velocity, Structural engineering, Risk, Statistical analysis, Weather stations, Meteorological data, Storms, Predictions, Computer programs, Errors.

With a view to assessing the validity of current probabilistic approaches to the definition of design wind speeds, a study was undertaken of extreme wind speeds based on records taken at 21 U.S. weather stations. For the purpose of analyzing extreme value data, a computer pro-gram was developed, which is described herein. The following results were obtained: (1) The assumption that a single probability distribution is universally applicable to all extreme wind data sets in a given type of climate was not confirmed, and (2) predictions of 100-year wind speeds based on overlapping 20-year sets of data taken at the same station differed between themselves by as much as 100%. Similar predictions for 1000-year winds differed by as much as a few hundred %. Since wind pressures are proportional to the square of the wind speeds, errors of such magnitude are unacceptably high for structural design purposes.

COM-75-11143/5CP PC A04/MF A01 Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.

Global Representation of Annual and Solar Cycle Variation of foF2 Monthly Median 1954-1958 Research rept.

William B. Jones, and David L. Obitts. Oct 70, 51p Rept no. OT/ITSRR-3

Descriptors: \*Solar activity, \*F 2 region, \*Ionosphere, Sunspots, Electromagnetic noise, Solar radio emission, Solar cycle, Diurnal variations, Tables(Data), Graphs(Charts), Statistical data, Computer programs, FORTRAN.

Annual and solar cycle variations of foF2 monthly median numerical maps are analyzed for the 60 months of 1954 through 1958. The re-port includes a description of the procedures used in the analysis, an analysis of residuals between observed data and computed values, and FORTRAN program statements.

COM-75-11332/4CP PC A04/MF A01 National Weather Service, Silver Spring, Md. Office of Hydrology. Estimation of Hurricane Storm Surge in

Apalachicola Bay, Florida Technical rept.

James E. Overland. Jun 75, 73p NOAA-TR-

NWS-17, NOAA-75082610 Sponsored in part by Federal Insurance Ad-

ministration, Washington, D.C.

Descriptors: \*Storm surges, \*Hurricanes, \*Apalachicola Bay, Climate, Mathematical models, Hydrodynamics, Wind velocity, Flooding, Models, Atmospheric pressure, Islands(Landforms), Barriers, Hydrology, Bays(Topographic features), Coasts, Florida, Computer programs. Identifiers: Hurricane Agnes.

A vertically integrated two-dimensional numerical hydrodynamic model is developed for simulation of hurricane surge in Apalachicola Bay. Standard explicit time differencing is used in conjunction with a single Richardson lattice. Model features include finite amplitude effects, space variable wind velocities, and parameterization of flooding of terrain, overtopping of barrier islands and flow through narrow passes. The model utilizes the results of C.P. Jelesnianski's SPLASH model computation for open coast surge as input seaward of the Bay and continues the same storm tract and wind field as used in the SPLASH computation across the Bay. The Bay model was calibrated for the astronomical tides and verified against hurricane Agnes. The response of Apalachicola Bay has been determined from numerical computations for a variety of hypothetical hurricanes as specified by various storm parameters. Surge heights in the Bay increase with hurricane central pressure depression in a nearly linear fashion as does the open coast surge. An important parameter is the duration that the open coast surge remains high, a function of the forward speed of the storm and, to a lesser extent, the radius of the maximum winds.

COM-75-11395/1CP PC A17/MF A01 Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.

Rainfall-Runoff as Spatial Stochastic Processes: Data Collection and Synthesis Rafael L. Bras, and Ignacio Rodriguez-Iturbe Jan 75, 384p\* 196, R75-5, NOAA-75091809 Contract C-4-36738, DI-14-31-0001-9021

Descriptors: "Bainfall, "Bunoff, "Flood forecasting, Stochastic processes, Rainfall intensity, Optimization, Mathematical models, Sampling, Computer programs, Weather forecasting, Correlation techniques, Storms, Theses, Identifiers: \*Storm water runoff

This work recognizes rainfall and runoff as multidimensional stochastic processes. Using the knowledge of such processes, a procedure for designing an optimal network to measure the total precipitation of an event over a fixed area is given. The methodology used in this static

problem allows consideration of the following aspects of network design: (1) Spatial correla-tion of process (2) errors of measurement techniques and their correlation (3) non-homogeneous sampling costs. Optimal net-works are given in terms of the number and location of stations together with the resulting cost and mean square error of estimation. The relation between rainfall and runoff is recognized as a dynamic problem. A statistically nonstationary, multi-dimensional rainfall generator is suggested. The suggested rainfall model is used together with a runoff model to study the accuracy of discharge prediction as a function of the rainfall sampling network.

COM-75-11442/1CP PC A05/MF A01 National Bureau of Standards, Washington, D.C. Center for Building Technology. The Buffeting of Tall Structures by Strong

Winds Building science series

Emil Simiu, and Daniel W. Lozier. Oct 75, 93p\* Rept no. NBS-BSS-74

Library of Congress Catalog Card no. 75-30727.

Descriptors: \*Skyscrapers, \*Wind pressure, Gust loads, Lateral pressure, Buffeting, Build-ing codes, Dynamic response, Structural en-gineering, Computer programs. Identifiers: \*Tall buildings.

Certain shortcomings of current procedures for computing alongwind structural response have been shown to result in unrealistic estimates of tall building behavior under the action of strong winds. Differences between predictions of fluc-tuating response based on various such procedures may be as high as 200%. In recent years, advances in the state of the art have been made which provide a basis for significantly improved alongwind response predictions. The purpose of the present work is to present a procedure for calculating alongwind response which incorporates and utilizes these ad-vances. The basic structural, meteorological and aerodynamic models employed are described, and expressions for the alongwind deflections and accelerations, consistent with those models, are derived. A computer program is presented for calculating the alongwind response of structures with unusual modal shapes or for which the contribution of the higher modes to the response is significant.

COM-75-50059/5CP PC-GPO/ME A01-NTIS National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab. Global Scintillation Model Technical rept. J. H. Pope. Aug 74, 37p NOAA-TR-ERL-308, SEL-30, NOAA-74121115 GPO Paper copy availal C55.13:ERL308-SEL30. available from as

Descriptors: \*lonosphere, \*Sunspots, Scintillation, Electron density(Concentration), Mathematical models, Computer programs, Magnetic storms, Ionospheric disturbances, Seasonal variations, Diurnal variations. Identifiers: \*Ionospheric scintillations.

This report describes a recently developed global scintillation model and its use for estimating scintillation effects under various operational conditions. This model includes frequency, solar cycle activity, seasonal effects, diurnal effects, and variations with global loca-tion. Certain geometrical effects are also considered.

CONF-731205-1 PC E01/MF A01 Argonne National Lab., III. (Usa). The What System: A New Digitized Radiosonde and Double Theodolite Balloon Tracking System for Atmospheric Boundary Layer Investigations P. Frenzen, and L. L. Prucha. 1973, 9p

Descriptors: \*Meteorology, \*Measuring instru-ments, \*Air pollution, Measuring instruments, Balloons, Boundary layers, Computer codes, Electronic equipment, Optical systems, Spatial distribution, Temperature measurement, W codes, Wind. Identifiers: AEC

For abstract, see NSA 29 03, number 07423.

PC A02/MF A01 CONF-770210-3 Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.

Pathways of Trace Elements in the Environment

R. J. Raridon. 1977, 19p

Contract W-7405-ENG-26

A.A. advancement of science conference, Denver, Colorado, United States of America (USA), 20 Feb 1977.

Descriptors: \*Elements, \*Fossil-fuel power plants, \*Gaseous wastes, \*Sulfur dioxide, \*Mathematical models, \*Trace amounts, A codes, Calcium, Computer calculations, Computer codes, Ecosystems, Environmental effects, Environmental transport, H codes, Mag-nesium, Nitrogen, Nutrients, Phosphorus, Potassium, Sodium, Surface air, Surface

waters, Toxicity. Identifiers: ERDA/500200, ERDA/520200, ERDA/010900, 'Path of pollutants, Combustion products, Industrial wastes, Air pollution sam-pling, Atmosheric motion, Concentrapling, Atmosheric motion, Concentra-tion(Composition), Hydrology, Air water interfaces.

Applications of computer models for air transport (ATM) and hydrologic transport (HTM) to determine the pathways of trace elements in the environment are discussed. Computed data and measured data are compared for potentially toxic contaminants found in gaseous wastes from fossil-fuel power plants. It is pointed out that meteorological data are required for the air transport model and that for each source it is necessary to know the emission rate source height and location relative to the receptor point. Results of studies on ground level SO sub 2 concentrations in mu g/m exp 3 as a function of distance from a proposed fossil-fuel power plant, the environmental impact of an existing power plant on its surroundings, and in monitoring a 98 hectare watershed for nutrient elements (K, Na, Ca, Mg, N, and P) are discussed. (ERA citation 02:046215)

CONF-771109-58 PC A02/MF A01

Oak Ridge National Lab., Tenn. Monte Carlo Simulation of Turbulent At-mospheric Transport: Comparison with Experimental Data

R. G. Alsmiller, Jr, F. S. Alsmiller, H. W. Bertini, and C. L. Begovich. 1977, 6p Contract W-7405-ENG-26

ANS winter meeting, San Francisco, CA, USA, 27 Nov 1977.

\*Plumes, \*Computer codes. Descriptors: Smokes, \*Stack disposal, Earth atmosphere, Computer calculations, Diffusion, Monte Carlo method, S codes, Simulation, Turbulence, Wind.

Identifiers: ERDA/500100, Combustion products, Industrial wastes, Atmospheric mo-tion, \*Air pollution, SPOOR computer program.

The Monte Carlo computer code SPOOR permits simple trajectories of individual tracer particles in the atmosphere to be followed. As originally formulated, SPOOR provided the mo-tion of the centroid of a puff of airborne tracers released instantaneously from a fixed source and the time evolution of the puff shape. SPOOR has now been modified to allow for continuous particle emission from a smoke stack. Comparisons were made with experimental data. (ERA citation 03:029307)

COO-1199-45

# PC A02/ME A01

Illinois State Water Survey, Urbana. **Operational Aspects of Project Metromex: An** Inadvertent Weather Modification Study. R. Cataneo. 1974, 3p Rept no. CONF-741165-1

Weather, \*Weather, pheric precipitations, Descriptors: \*Illinois, \*Monitoring, \*Atmospheric precipitations, Monitoring, Aircraft, Computer codes, Human populations, Measuring instruments, Meteorology, Radar, Sociology, Urban areas, Water

Identifiers: ERDA/500200, ERDA/500100. "Urban areas, "Inadvertent weather modification.

The goals of METROMEX are: to study the effects of urban environments upon the frequen-cy, amount, intensity and duration of precipitation and related severe weather; to identify the physical processes of the atmosphere which are responsible for producing the observed urban weather effects; to isolate the factors of the city complex which are the causative agents of the observed effects; and to assess the impact of urban induced inadvertent weather changes upon society. To achieve these goals, the Water Survey has established and operates networks of surface meteorological instrumen-tation in the St. Louis region, operates a meteorological aircraft, and utilizes weather radars to observe clouds and precipitation.

COO-1340-52 Not available NTIS Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

Effects of Atmospheric Variability on Energy Utilization and Conservation

E. R. Reiter, G. R. Johnson, W. L. Somervell, Jr,

E. W. Sparling, and E. Dreiseitly. Nov 76, 86p Contract EY-76-S-02-1340 Available from ERDA, P.O. Box 62, Oak Ridge, TN 37830, Attn: TIC.

Descriptors: \*Buildings, \*Energy conservation, \*Energy consumption, \*Energy models, Com-puter codes, USA, Economics, Energy demand, Forecasting, H codes, Mathematical models, Meteorology, Research programs, Space heating, Weather.

Identifiers: ERDA/320100.

Research conducted between 1 July 1975 and 31 October 1976 is reported. A "physical-adap-tive" model of the space-conditioning demand for energy and its response to changes in weather regimes was developed. This model includes parameters pertaining to engineering factors of building construction, to weather-related factors, and to socio-economic factors. Preliminary testing of several components of the model on the city of Greeley, Colorado, yielded most encouraging results. Other components, especially those pertaining to socio-economic factors, are still under development. Expansion of model applications to different types of structures and larger regions is presently underway. A CRT-display model for energy demand within the conterminous United States also has passed preliminary tests. A major effort was expended to obtain disaggregated data on energy use from utility com-panies throughout the United States. The study of atmospheric variability revealed that the 22to 26-day vacillation in the potential and kinetic energy modes of the Northern Hemisphere is related to the behavior of the planetary longwaves, and that the midwinter dip in zonal available potential energy is reflected in the development of blocking highs. Attempts to classify weather patterns over the eastern and central United States have proceeded satisfactorily to the point where testing of our method for longer time periods appears desirable. (ERA citation 02:022698)

JPRS-53174 PC E01 MF A01 Joint Publications Research Service, Washington, D.C.

# Global Contamination of the Atmosphere by Krypton-85 from Worldwide Nuclear Power Plants and the Radiation Danger

I. L. Karol, V. M. Ivanov, V. M. Kolobashkin, O. I. Leipunskii, and V. I. Nekrasov. 20 May 71, 18p\* Trans. from mono. Globalnoe Zagryaznenie Atmosfery Kriptonom-85 ot Mirovoi Yadernoi Energetiki i Ego Radiatsionnaya Opasnost, Moscow, n.d., 25p.

Descriptors: \*Krypton 85, \*Atmospheric com-position, \*Air pollution, \*Radioactive contami-nants, \*Nuclear power plants, Air pollution, Mathematical models, Computer programs, Radiation dosage, Troposphere, Stratosphere, Atmospheric motion, Forecasting, Cosmic rays, Concentration(Composition), Nuclear explo-sion effects, Standards, USSR, Translations.

In the report the annual mean and zonally averaged concentration of krypton-85 in the troposphere and lower stratosphere of the Northern and Southern hemispheres is calculated on the basis of a numerical solution with a computer of boundary problems for an equa-tion of a numerical derivation of a model of the global spread of the admixture in a meridional plane of the atmosphere as constructed by Karol. The results of the calculations with various combinations of the parameters of the transfer of the model are compared with results of measurements both in our country and abroad. Predicted distribution of the expected levels of concentration of krypton-85 have been obtained up to the year 2000. The correspond-ing radiation dose strengths in the air for the whole body and for individual organs of the human body have also been calculated. These dose strengths and concentrations are compared with the maximum allowable levels which have been established on the basis of the cur-rent recommendations of the International Commission for Radiological Defense and medical rules. (Author)

LA-6103 PC A03/MF A01 Los Alamos Scientific Lab., N.Mex. Monte Carlo Simulation of the Turbulent Transport of Airborne Contaminants. C. W. Watson, and S. Barr. Sep 75, 28p Contract W-7405-Eng-36

Descriptors: \*Air pollution, \*Diffusion, Com-puter codes, Monte Carlo method, S codes, Simulation, Time dependence, Transport, Turbulence, Wind.

Identifiers: \*Atmospheric diffusion, Mathematical models, Computer programs.

A generalized, three-dimensional Monte Carlo model and computer code (SPOOR) are described for simulating atmospheric transport and dispersal of small pollutant clouds. A cloud is represented by a large number of particles that we track by statistically sampling simulated wind and turbulence fields. These fields are based on generalized wind data for large-scale flow and turbulent energy spectra for the micro- and mesoscales. The large-scale field can be input from a climatological data base, or by means of real-time analyses, or from a separate, subjectively defined data base. We introduce the micro- and mesoscale wind fluctuations through a power spectral density, to include effects from a broad spectrum of turbu-lent-energy scales. The role of turbulence is simulated in both meander and dispersal. Complex flow fields and time-dependent diffusion rates are accounted for naturally, and shear effects are simulated automatically in the ensemble of particle trajectories. An important adjunct has been the development of computergraphics displays. These include two- and three-dimensional (perspective) snapshots and color motion pictures of particle ensembles, plus running displays of differential and in-tegral cloud characteristics. The model's ver-satility makes it a valuable atmospheric research tool that we can adapt easily into broader, multicomponent systems-analysis codes. Removal, transformation, dry or wet deposition, and resuspension of contaminant particles can be readily included.

LA-6763 PC A06/MF A01 Los Alamos Scientific Lab., N.Mex Rainout Assessment: The ACRA System and Summaries of Simulation Results C. W. Watson, S. Barr, and R. E. Allenson. Sep

77, 123p Contract W-7405-ENG-36

Descriptors: \*Nuclear weapons, \*Precipitation scavenging, \*Radioactive aerosols, \*Radioactive clouds, A codes, Climates, Com-puter calculations, Computer codes, Diffusion, Earth crust, Environmental transport, Europe, Forecasting, Meteorology, Monte carlo method, Nuclear explosions, Probability, Rain, Randomness, Simulation, Storms, Surface air, Time de-

pendence, Washout. Identifiers: ERDA/500300, ERDA/450202. Mathematical models, Atmospheric diffusion, ACRA system.

A generalized, three-dimensional, integrated computer code system was developed to estimate collateral-damage threats from precipitation-scavenging (rainout) of airborne debrisclouds from defensive tactical nuclear engagements. This code system, called ACRA for Atmospheric-Contaminant Rainout Assessment. is based on Monte Carlo statistical simulation methods that allow realistic, unbiased simulations of probabilistic storm, wind, and precipitation fields that determine actual magnitudes and probabilities of rainout threats. Detailed models (or data bases) are included for synoptic-scale storm and wind fields: debris transport and dispersal (with the roles of complex flow fields, time-dependent diffusion, and multidimensional shear effects accounted for automatically); microscopic debris-precipitation interactions and scavenging probabilities; air-to-ground debris transport; local demographic features, for assessing actual threats to populations; and nonlinear effects accumulations from multishot scenarios. The authors simulated several hundred representative shots for West European scenarios and climates to study single-shot and multishot sensitivities of rainout effects to variations in pertinent physical variables. (ERA citation 03:019731)

N70-22632/CP HC E01 MF A01 TRW Systems, Redondo Beach, Calif. Feasibility Study for Remote Sensing of At-mospheric Turbulence Profiles. R. S. Margulies, A. Peskoff, and L. K. Wanlas. Mar 70, 99p Rept nos. NASA-CR-1491, TRW-10636-6001-R0-00 Contract NAS12-2023

Coll- 99 P Refs

Descriptors: \*Atmospheric models, \*Clear air turbulence, \*Remote sensors, Computer pro-grams, Correlation, Data reduction, Environment simulation, Mathematical models.

For abstract, see STAR 0810

N70-22824/CP HC E01 MF A01 Danish Space Research Inst., Lyngby.

The Effect of Large Scale Irregularities on the Propagation of VLF Waves Through the Lower lonosphere with Special Reference to Auroral Hiss.

E. Ungstrup. Oct 69, 21p

Spon-Sponsored By Tech. Univ. of Den.

Descriptors: \*Arcs, \*Hiss, \*Lower ionosphere, \*Ray tracing, \*Very low frequencies, Computer programs, D region, E region, Electromagnetic scattering, Electron density (concentration), Ionospheric propagation, Irregularities, Snells law, Whistlers.

For abstract, see STAR 0810

N70-25092/CP HC E01 MF A01 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

Explorer 22 Electrostatic Probe Data Analysis - Testing the Results for Accuracy. E. J. Gregg. Mar 70, 21p Rept nos. NASA-TM-X-63879, X-621-70-71 Subm- Submitted for Publication

Descriptors: \*Data reduction, \*Electron probes, \*Error analysis, \*Explorer 32 satellite, Computer programs, Electron density (concentration), Electron energy.

For abstract, see STAR 0811

HC E01 MF A01 N70-26323/CP Ludwig-maximilians-universitat, Munich (West Germany). Meteorologisches Inst.

Statistical Evaluation of Measured Data Obtained at the Meteorological Station of the Munich Research Reactor. Statistische Bearbeitung Der An Der

Meteorologischen Station Beim

Forschungsreaktor Muenchen Gewonnenen

Messdaten E. Schoellmann. Apr 68, 106p Rept no. MITT-14 Lang- in German

Descriptors: \*Meteorological parameters, \*Reactor technology, \*Statistical analysis, An-nual variations, Atmospheric moisture, Atparameters, mospheric temperature, Computer programs, Diurnal variations, Fortran, Germany, Nuclear research and test reactors, Vapor pressure, Wind velocity.

For abstract, see STAR 0812

### N70-29050/CP

HC E01 MF A01 Departement D Etudes Et de Recherches en Technologie Spatiale, Toulouse (France). Theoretical Study and Calculation of Particle Flux in the Stable Region of the Magnetosphere.

Evaluation Theorique Et Calcul des Flux de Particules Dans La Zone Stable De'la Magnetosphere J.-P. Philippon. 10 Mar 70, 145p

Lang- in French

Descriptors: \*Aerospace environments, \*Flux (rate), \*Magnetosphere, \*Radiation belts, \*Satellite orbits, Computer programs, Geomag-netism, Trapped particles.

For abstract, see STAR 0814

## N70-29112/CP

Meteorologisches Observatorium, Hohenpeissenberg (West Germany).

HC E01 MF A01

Program for Electronic Evaluation of Radiosonde Ascents.

Programm Zur Elektronischen Auswertung Von Radiosondenaufstiegen Oct 69, 62p

Lang- in German Seri- Its Sonderbeobachtungen des Meteorol. Obs. Hohenpeissenberg No.

Descriptors: \*Atmospheric composition, \*Atmospheric physics, \*Computer programs, \*Ozonometry, \*Radiosondes, Cdc 3800 com-puter, Data processing equipment, Evaluation, Observatories.

For abstract, see STAR 0814

N70-31479/CP HC E01 ME A01 Luftwaffenamt, Porz (West Germany). Inspektion Geophysikalischer Beratungsdienst Der Bundeswehr.

**Radiosonde Ascents Reaching High Altitudes** - Tripoli, Libya, 1951-1957. Part 1 - Work Re-

port. Hochreichende Radiosondenaufstiege -Tripolis/Libyen, 1951-1957. Teil 1 -Arbeitsbericht W. Alfuth. Nov 68, 51p Rept no. GEOPHYSBDBW-FM-I/138 Lang- in German

Descriptors: \*Computer programs, \*Digital computers, \*High altitude, \*Meteorological charts, \*Meteorological parameters, \*Radiosondes, Atmospheric pressure, Data acquisition, Frequency distribution, Statistical analysis, Tables (data).

For abstract, see STAR 0816

#### N70-35689/CP

HC E01 MF A01 Lockheed Missiles and Space Co., Palo Alto, Calif. Space Sciences Lab.

Lockheed Experiment on Ats-5 Quarterly Report, 1 Mar. - 31 May 1970.

31 May 70, 67p Rept nos. NASA-CR-110029, OR-3

Contract NAS5-10392

Descriptors: \*Ats 5, \*Auroral spectroscopy, \*Data reduction, \*Magnetospheric instability, Computer programs, Spectrum analysis.

For abstract, see STAR 0819

# N70-35774/CP

HC E01 MF A01 National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.

A Ray Tracing Digital Computer Program for the Study of Magnetospheric Duct Propagation.

J. Ramasastry, and E. J. Walsh. 1970, 299p Rept no. NASA-SP-3055

Descriptors: \*Computer programs, \*Digital \*Electromagnetic radiation, computers, 'Magnetosphere, 'Ray tracing, Control units (computers), Input/output routines, Integrators, Manuals, Mathematical models.

For abstract, see STAR 0819

#### N70-36971/CP

HC E01 MF A01 Weapons Research Establishment, Salisbury (Australia).

Extinction of a Tangential Ray, by Ray Tracing Through the Atmosphere. F. C. Hymus, and K. H. Lloyd. May 69, 46p Rept

no. WRE-TN-HSA-152

\*Atmospheric Descriptors: radiation. Computer programs, "Radiation absorption, "Ray tracing, "Solar radiation, Atmospheric \*Ray tracing, models, Atmospheric refraction, Fortran, Twilight glow.

For abstract, see STAR 0820

N70-40978/CP PC E01 MF A01 Pennsylvania State Univ., University Park. Ionosphere Research Lab.

Tables from the Penn State Mark 1 Iono-spheric Model. J. S. Nisbet. 20 Aug 70, 174p Rept nos. NASA-

CR-113799, SR-362/E/ Contract NGL-39-009-003

Descriptors: \*F 2 region, \*lonospheric electron density, \*Sporadic e layer, \*Tables (data), At-mospheric models, Computer programs.

For abstract, see STAR 0823

N70-42935/CP PC E01 MF A01 Illinois Univ., Urbana. Aeronomy Lab.

Fortran Programs for Calculating Lower lonosphere Electron Densities and Collision Frequencies from Rocket Data. N. Golshan, E. A. Mechtly, P. E. Monro, and R. S. Sastry. 1 Jul 70, 62p Rept nos. NASA-CR-110899, UILU-ENG-70-260 Contract NGR-14-005-013 Seri- Its Aeronomy Rept. No. 37

Descriptors: \*Collision rates, \*Computer pro-grams, \*Electron density (concentration), \*Lower ionosphere, \*Nike-apache rocket vehicle, Fortran, Numerical analysis, Radio transmission, Standing waves.

For abstract, see STAR 0824

N71-10986/CP

PC E01 MF A01 Scientific Translation Service, Santa Barbara, Calif.

Machine Analysis of Infrared Cloud Images Obtained by the Cosmos-122 Satellite. Mashinnyy Analiz Infrakrasnykh Izobrazheniy Oblachnosti Poluchennykh So Sputnika

Kosmos-122 L. G. Maxina. Nov 70, 15p Rept no. NASA-TT-F-

13369

Contract NASW-2035

Coll- 15 P Refs Tran- Transl. Into English From Tr. Gidrometeorol. Nauchno-issledovatel' Skogo Tsentra Ssr (USSR), No. 20, 1968 P 59-66

Descriptors: \*Cloud photography, \*Cosmos satellites, \*Infrared imagery, \*Television equipment, Algorithms, Computer programs, Decoding.

For abstract, see STAR 0901

N71-22619/CP PC E01 MF A01 Cornell Aeronautical Lab., Inc., Buffalo, N. Y. Investigation of Warm Fog Properties and

Thresugation of Warm Fog Properties and Fog Modification Concepts W.J. Eadie, W. C. Kocmond, R. P. Leonard, E. J. Mack, and R. J. Pilie. Apr 71, 113p Rept nos. NASA-CR-1731, CAL-RM-2864-P-1 Contract NASW-1933 Coll- 113 P Refs

Descriptors: \*Chemical reactions, \*Cloud seed-ing, \*Fog, \*Hygroscopicity, Computer pro-grams, Dissipation, Meteorological parameters, Turbulent diffusion. Identifiers: NASA subject code 20.

For abstract, see STAR 0911

N71-25669/CP PC A03 Office National D Etudes Et de Recherches Aerospatiales, Toulouse (France). Dept. D'etudes Et de Recherches en Technologie Spatiale.

Program Eldose for Calculating the Distribution of Absorbed Doses in Space Environment and Charged Particle Acceleration Thin Films (Protons and Electrons)

Programme Eldose pour le Calcul des Repartitions de Doses Absorbees Dans les Ecrans Minces en Environnement Spatial Et en Simulation A l'Accelerateur de Particules Chargees (Protons - Electrons) J. Bourrieau, and R. Schuttler. Dec 70, 34p Rept

no. ONERA-NT-/02/20/70

Lang- in French

Descriptors: 'Computer programs, 'Electron flux density, 'Proton flux density, 'Radiation dosage, 'Satellite orbits, 'Spatial distribution, Computerized simulation, Pulse amplitude, Space environment simulation, Synchronous satellites, Thin films.

For abstract, see STAR 0914

N71-30149/CP PC E01 MF A01 Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.

#### Taer Wind Conversion Program (Tarwon) User's Manual J. E. Tyson. May 71, 134p Rept nos. NASA-CR-

J. E. Tyson. May 71, 134p Rept nos. NASA-CR-119176, HREC-6128-1 Contract NAS8-26128

Descriptors: "Computer programs, "Data reduction, "Data storage, "Low pass filters, "Magnetic tapes, "Radar tracking, Balloons, Curve fitting, Mathematical models, Univac 1108 computer, Wind velocity.

For abstract, see STAR 0917

N71-33870/CP PC E01 MF A01 Wisconsin Univ., Madison. Space Science and Engineering Center.

Time Domain Data Extraction, Radio Altimetry, and Application of Ats Data Quarterly Report, 1 Apr. - 30 Jun. 1971 V. E. Suomi. 30 Jun 71, 8p Rept no. NASA-CR-

121438 Contract NAS5-11542

Contract NAS5-11542

Descriptors: \*Applications technology satellites, \*Data reduction, \*Meteorology, \*Radio altimeters, Cloud photographs, Computer programs.

For abstract, see STAR 0920

N71-35701/CP PC E01/MF A01 United Aircraft Corp., East Hartford, Conn. Research Labs.

Additional Research on Instabilities in Atmospheric Flow Systems Associated with Clear Air Turbulence

R. C. Stoeffler. Aug 71, 105p Rept nos. NASA-CR-122041, K910563-19 Contract NASW-1582

Descriptors: "Atmospheric circulation, "Clear air turbulence, "Computer programs, "Shear layers, Atmospheric density, Flow stability, Jet streams (meteorology), Mountains.

For abstract, see STAR 0922

N72-14641/CP PC E01/MF A01 Georgia Univ., Athens. Dept. of Physics. Use of the Negative Binomial-Truncated Poisson Distribution in Thunderstorm Prediction A. C. Cohen. Dec 71, 18p Rept no. NASA-CR-61370 Contract NAS8-11175

Descriptors: 'Poisson density functions, 'Statistical weather forecasting, 'Thunderstorms, Approximation, Binomial theorem, Computer programs, Mathematical models, Probability distribution functions.

For abstract, see STAR 1005

N72-16144/CP PC E01/MF A01 National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex. A UNIVAC 1108 Computer Program for Use with Worldwide Cloud Cover Distribution Data K. D. Kyle. Oct 71, 35p Rept no. NASA-TM-X-58071

Descriptors: 'Cloud cover, 'Computer programs, 'Data processing, 'Earth resources program, 'Mission planning, Earth resources survey aircraft, Earth resources technology satellites, Remote sensors, Univac 1108 computer.

For abstract, see STAR 1007

N72-18359/CP PC E01/MF A01 Northrop Services, Inc., Huntsville, Ala. Auroral Oval Kinematics Program R. H. Comfort. Jan 72, 109p Rept nos. NASA-CR-61373, TR-241-1028 Contract NAS8-21810 Descriptors: "Auroral zones, "Computer programs, "Kinematics, Geography, Magnetic storms, Universal time.

A computer program which determines the geographic location of the auroral oval for given universal time and level of geomagnetic activity was developed for use on the IBM 7094 computer. The program provides both printed output of geographic coordinates of auroral oval boundaries and polar plots of the auroral oval. In addition, there is available a time-integration option which indicates how long a given location is under the auroral oval during a specified period. A description is given of the program and its use.

N72-20322/CP PC E01/MF A01 United Aircraft Corp., East Hartford, Conn. Additional Research on Instabilities in Atmospheric Flow Systems Associated with Clear Air Turbulence R. C. Stoeffler. Apr 72, 75p Rept no. NASA-CR-

1985

Contract NASW-1582

Descriptors: \*Atmospheric models, \*Clear air turbulence, \*Flow stability, Computer programs, Fluid mechanics, Lee waves, Open channel flow, Shear flow, Velocity distribution.

Analytical and experimental fluid mechanics studies were conducted to investigate instabilities in atmospheric flow systems associated with clear air turbulence. The experimental portion of the pd using an open water channel which allows investigation of flows having wide ranges of shear air turbulence. The experimental portion of the pd using an open water channel which allows investigation of flows having wide ranges of shear and density stratification. The program was primarily directed toward studies of the stability of straight, stratified shear flows with particular emphasis on the effects of velocity profile on stability; on studies of threedimensional effects on the breakdown region in shear layers; on the the interaction of shear flows with long-wave length internal waves; and on the stability of shear flows consisting of adjacent stable layers. The results of these studies were used to evaluate methods used in analyses of CAT encounters in the atmosphere involving wave-induced shear layer instabilities of the Kelvin-Helmholta type. A computer program was developed for predicting shear-layer instability and CAT induced by mountain waves. This technique predicts specific altitudes and locations where CAT would be expected. (Author)

N72-24972/CP PC A03/MF A01 Institut Franco-allemand de Recherches, St. Louis (france).

Equation of State of the Air for Pressures Up to 1000 Bar and Temperatures Up to 3000 K. Equation Detat de Lair pour Une Pression Inferieure a 1000 Bar et Une Temperature Inferieure a 3000 K

G. Freiss. 21 Sep 70, 26p Rept no. ISL-19/70

Descriptors: \*Computer programs, \*Equations of state, \*Nuclear explosions, \*Shock waves, \*Thermodynamics, Air, Gas mixtures, Gas pressure, Gas temperature, Real gases.

The equation of state for air behind the shock wave of a nuclear explosion where pressure might be as high as 1000 bar is developed. Thermodynamic parameters such as pressure, enthalpy, and entropy of the air, considered as a mixture of oxygen and nitrogen, are calculated. The computer program is included. (Author)

N72-26289/CP PC E01/MF A01 Mississippi State Univ., State College. Inst. for Environmental Studies. A Direct Numerical Method for Predicting Concentration Profiles in a Turbulent Boundary Layer over a Flat Plate M.S. Thesis

J. W. Dow. Jun 72, 116p Rept nos. NASA-CR-2050, IES-72-02-001 Contract NGL-25-001-32

Descriptors: \*Atmospheric diffusion, \*Flat plates, \*Mass transfer, \*Numerical analysis, \*Turbulent boundary layer, Ammonia, Atmospheric models, Computer programs, Fortran, Turbulent diffusion.

A numerical solution of the turbulent mass transport equation utilizing the concept of eddy diffusivity is presented as an efficient method of investigating turbulent mass transport in boundary layer type flows. A FORTRAN computer program is used to study the two-dimensional diffusion of ammonia, from a line source on the surface, into a turbulent boundary layer over a flat plate. The results of the numerical solution are compared with experimental data to verify the results of the solution. Several other solutions to diffusion problems are presented to illustrate the versatility of the computer program and to provide some insight into the problem of mass diffusion as a whole. (Author)

N72-28639/CP PC A02/MF A01 Finnish Meteorological Inst., Helsinki. Numerical Weather Prediction in Finland Dur-

ing 1969 D. Soederman. Dec 71, 22p Rept no. TR-1

Descriptors: \*Computer programs, \*Finland, \*Numerical weather forecasting, Climatology, Data acquisition, Data processing, Meteorological parameters.

The numerical weather prediction activities in Finland during 1969 are presented. The report includes a comparison of weekly 96 hour barotropic forecasts with the corresponding Swedish routine forecasts for the 500 mb level and verification of 52 cases of baroclinic 36 hour forecasts, computed by using five separate versions of a filtered three-parameter model for each synoptic situation. (Author)

N72-32833/CP PC E06/MF A01 Radiation Research Associates, Inc., Fort Worth, Tex.

Analysis of Radiation and Meteoroid Satellite Data

Final Report

B. J. Farmer. Jul 72, 145p Rept nos. NASA-CR-128535, RRA-T7206 Contract NAS9-11903

Descriptors: "Artificial satellites, "Extraterrestrial radiation, "Meteorites, "Radiation and meteoroid satellite, "Remote sensors, "Satellite observation, Computer programs, Data acquisition, Data processing equipment, Data systems.

The data obtained in earth orbit by the Radiation and Meteoroid Satellite (RMS) were interpreted and reduced to a form which will be usable by future space experimenters. The required tasks are detailed. Computer programs were written which lifted the raw data and associated emphemeris data from the GFE magnetic tapes. The engineering data was then used to evaluate the performance of the spacecraft and the experiments. The radiation data was used to prepare flux, spectral, and dose maps of the South Atlantic magnetic anomaly where possible. The meteoroid data was used to determine a rough estimate of the meteoroid flux and in general evaluate the performance of the thin-film meteoroid sensors. The degree of success of the RMS mission was evaluated in light of the separation anomaly which occurred between RMS and OFO during launch. (Author) N73-11656/CP PC A04/MF A01 Research Inst. of National Defence, Stockholm (Sweden).

Program for Calculation Computer Geostrophic Trajectories . Datorprogram Foer Beraekning AV Geostrofiska Trajektorier A. Ekroth. Jul 71, 58p Rept no. FOA-4-C-4469-A1

Descriptors: \*Computer prog \*Geostrophic wind, Fortran, Trajectories. programs, Descriptors:

A method and program are described for calculating geostrophic trajectories. The calculation is based on information about topography of an isobar contour and can be done either forwards or backwards in time for up to 99 simultaneous trajectories. Input and output data are specified so that calculations can be made to continue on from the trajectories end point. The program is written in FORTRAN 4 for the IBM 7090 computer. (Author)

N73-13376/CP PC A03/MF A01 Michigan Univ., Ann Arbor. Space Physics Research Lab.

### **OGO-F-02 Data Analysis** Final Report

A. F. Nagy, W. M. Silvis, and E. C. Foust. Nov 72, 37p Rept no. NASA-CR-130128 Contract NAS5-9306, ORA PROJ. 078900

Descriptors: \*Computer programs, \*Electron energy, \*Ogo-d, Electron density energy, \*Ogo-d, Electron density (concentration), Electrostatic probes, Statistical analysis.

The OGO-VI satellite, which was launched on June 5, 1969 carried a complement of twenty-six experiments. One of those instruments, the F-02 package, was a cylindrical Langmuir probe experiment whose primary purpose was to measure ionospheric electron temperatures and densities. This report briefly describes the F-02 experiment itself, outlines the computer programs developed to analyze the raw data, and gives a summary of the scientific information obtained, with the aid of this experiment. (Author)

## N73-14808/CP

PC E01/MF A01 California Univ., Los Angeles. Space Science Center

Correlative Studies of the Solar Wind. The Interplanetary Magnetic Field, and Their Effects on the Geomagnetic Cavity Using Explorer 33 and 35 Data **Final Report** 

P. J. Coleman, Jr. 9 Aug 72, 13p Rept no. NASA-CR-129924

Contract NGR-05-007-305

Descriptors: \*Bow waves, \*Explorer satellites, \*Magnetic effects, \*Solar wind, Computer programs, Magnetic storms, Shock waves

The work completed in the study of the effects of the solar wind and interplanetary magnetic field on the bow shock and geomagnetic cavity is reported along with work underway but not yet completed. The correlative data from Ex-plorer 33 and 35, and the computer programs for processing the data are described. The research discussed includes: polar cusps, substorms, geomagnetic activity, and North-South component of the interplanetary magnetic field. Lists of publications, and papers presented at meetings are included.

### N73-20309/CP

PC E05/MF A01 Lockheed Electronics Co., Houston, Tex. Applied Mechanics Dept.

Computations of Non-Reacting and Reacting Viscous Blunt Body Flows, Volume 1 C. P. Li. Feb 73, 123p Rept nos. NASA-CR-128871, TR2007-VOL-1

Contract NAS9-12200

Descriptors: "Atmospheric entry, "Flow dis-tribution, "Flow equations, "Nose cones, "Space shuttle orbiters, Boundary layer flow, Computer programs, Reentry physics, Viscous flow. dentifiers: NASA

The computer programs developed for computation of viscous shock layer flow distribution surrounding the nose of a shuttle orbiter during reentry are presented. The problem formulation and the numerical procedures used to solve the basic set of equations are described. The results of flow distribution properties at several trajectory points, ranging from the high altitude rarefied region to the low altitude boundary layer region are analyzed. (Author)

N73-28050/5CP PC E09/MF A01 Cramer (H.E.) Co., Inc., Salt Lake City, Utah. Nasa/Msfc\_Multilayer\_Diffusion\_Models\_and **Computer Program for Operational Prediction** of Toxic Fuel Hazards R. K. Dumbauld, J. R. Bjorklund, and J. F. Bowers. Jun 73, 293p Rept no. NASA-CR-129006

Contract NAS8-29033

Descriptors: \*Atmospheric diffusion, \*Computer programs, \*Operational hazards, \*Rocket launching, Exhaust gases, Meteorolog-ical parameters, Toxicity and safety hazard. Identifiers: NASA.

The NASA/MSFC multilayer diffusion models are discribed which are used in applying meteorological information to the estimation of toxic fuel hazards resulting from the launch of rocket vehicle and from accidental cold spills and leaks of toxic fuels. Background information, definitions of terms, description of the multilayer concept are presented along with formulas for determining the buoyant rise of hot exhaust clouds or plumes from conflagra-tions, and descriptions of the multilayer diffusion models. A brief description of the computer program is given, and sample problems and their solutions are included. Derivations of the cloud rise formulas, users instructions, and computer program output lists are also included. (Author)

N73-30627/6CP PC E06/MF A01 Colorado State Univ., Fort Collins. Dept. of Civil Engineering

A Comparison of a Coaxial Focused Laser Doppler System in Atmospheric Measurements Final Report.

S. Karaki. 25 Jun 73, 161p Rept no. NASA-CR-124355

Contract NAS8-26234

Descriptors: \*Anemometers, \*Atmospheric turbulence, \*Doppler effect, \*Lasers, \*Wind measurement, Computer programs, Flow distribu-tion, Meteorological parameters. Identifiers: NASA.

Measurements of atmospheric velocities and turbulence with the laser Doppler system were obtained, and the results compared with cup anemometer and hot-wire measurements in the same wind field. The laser Doppler velocimeter (LDV) is described along with the test procedures. It was found that mean values determined from the LDV data are within 5% of other anemometer data for long time periods, and the LDV measures higher velocities.

N73-31147/4CP PC E07/MF A01 Pennsylvania State Univ., University Park. Ionospheric Research Lab. D-Region Blunt Probe Data Analysis Using Hybrid Computer Techniques W. J. Burkhard. 28 Jun 73, 177p Rept nos. NASA-CR-135646, PSU-IRL-SCI-415 Contract NGR-39-009-218, DA-ARO(D)-31-124-

72-G158

Descriptors: \*Computer techniques, \*D region, \*Data processing, \*Data reduction, \*Hybrid computers, Blunt bodies, Computer programs, Space probes. Identifiers: NASA.

The feasibility of performing data reduction techniques with a hybrid computer was studied. The data was obtained from the flight of a parachute born probe through the D-region of the ionosphere. A presentation of the theory of blunt probe operation is included with emphasis on the equations necessary to perform the analysis. This is followed by a discussion of computer program development. Included in this discussion is a comparison of computer and hand reduction results for the blunt probe launched on 31 January 1972. The comparison showed that it was both feasible and desirable to use the computer for data reduction. The results of computer data reduction performed on flight data acquired from five blunt probes are also presented. (Author)

N73-31638/2CP PC E01/MF A01 Lockheed Missiles and Space Co., Palo Alto, Calif. Space Sciences Lab. Analysis of Low Energy Electrons Final Report. R. D. Sharp. 1 Jun 73, 15p Rept nos. LMSC-D350709, NASA-CR-133920 Contract NASW-2253

Descriptors: \*Auroral zones, \*Electron energy, \*Plasma sheaths, Computer programs, Geophysical observatories, Mapping, Ogo-c, Spectrometers. Identifiers: NASA

Simultaneous observations of low energy electrons in the plasma sheet and in the auroral zone were analyzed. Data from the MIT plasma experiment on the OGO-3 satellite and from the Lockheed experiment on the OV1-18 satellite were processed and compared. The OV1-18 carried thirteen magnetic electron spectrometers designed to measure the intensity, angular, and energy distributions of the auroral electrons and protons in the energy range below 50 keV. Two computer programs were developed for reduction of the OV1-18 data. One program computed the various plasma properties at one second intervals as a function of Universal Time and pitch angle; the other program produced survey plots showing the outputs of the various detectors on the satellite as a function of time on a scale of approximately 100 seconds per cm. The OV1-18 data exhibit the high degree of variability associated with substorm controlled phenomena.

#### N74-14754/7CP

General Electric Co., Pittsfield, Mass. Analysis and Calculation of Lightning-Induced Voltages in Aircraft Electrical Circuits Final Report.

PC A04/MF A01

J. A. Plumer. Jan 74, 65p Rept nos. NASA-CR-2349, SRD-72-066

Contract NAS3-14836

Descriptors: "Aircraft equipment, "Circuits, "Electric equipment, "F-89 aircraft, "Lightning, "Transfer functions, Aircraft design, Computer programs, Electrical properties, Numerical analysis. Identifiers: NASA

Techniques to calculate the transfer functions relating lightning-induced voltages in aircraft electrical circuits to aircraft physical characteristics and lightning current parameters are discussed. The analytical work was carried out concurrently with an experimental program of measurements of lightning-induced voltages in the electrical circuits of an F89-J aircraft. A computer program, ETCAL, developed earlier to calculate resistive and inductive transfer functions is refined to account for skin effect, providing results more valid over a wider range of lightning waveshapes than formerly possible. A computer program, WING, is derived to calcu-late the resistive and inductive transfer functions between a basic aircraft wing and a circuit conductor inside it. Good agreement is ob-tained between transfer inductances calculated by WING and those reduced from measured data by ETCAL. This computer program shows promise of expansion to permit eventual calculation of potential lightning-induced voltages in electrical circuits of complete aircraft in the design stage. (Author)

N74-18336/9CP PC A02/MF A01 California Univ., Berkeley. Space Sciences Lab. Energetic Particle Flux Experiment (Imp F and G)

Final Report, 28 Jan. 1965 - 30 Jun. 1971. K. A. Anderson. Apr 73, 13p Rept nos. NASA-CR-132869, SSL-SER-14-ISSUE-19 Contract NAS5-9091

Descriptors: \*Data reduction, \*Explorer 34 satellite, \*Explorer 41 satellite, \*Flux (Rate), Bibliographies, Computer programs, Geiger counters, Solar flares. Identifiers: NASA.

The data reduction procedures and programs for analysis of the IMP F and G energetic particle flux experiments are summarized. The IMPexperiment contained two thin-window Geiger-Mueller detectors and an ionization chamber. There were two IMP-G experiments: one with six Geiger-Mueller detectors and an ionization chamber, and the other with two funnel mouthed channeltrons in a parallel plate electrostatic analyzer. These experiments measured particles in the energy range above 20 keV (IMP-F) and above approximately 5 keV (IMP-G). A bibliography is presented of papers containing the scientific results. These data were predominantly used for the study of low energy solar particles from flares. (Author)

## N74-19237/8CP

Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

PC A03/MF A01

Brazilian Participation in the Exametnet. Nov 72, 46p Rept no. INPE-254-LAFE Subm-Sponsored by Exptl. Inter AM. Meteorol.

Rocket Network (Exametnet). Conf-Presented at 8TH Ann. Meeting of the Exptl. Inter AM. Meteorol. Rocket Network (Exametnet); Mar Del Plata, Argentina, Oct. - Nov. 1972.

Descriptors: \*Data processing, \*Meteorological parameters, \*Sounding rockets, Computer programs, International cooperation, Meteorological flight, Tables (Data). Identifiers: NASA

Data from the EXAMETNET Meteorological Rocket Launchings at Barreira do Inferno, are presented for the period June 1971 - September 1972. Eleven successful launchings are re-ported, all of them for thermodynamic mea-surements. Two failures occurred in the period. (Author)

# N74-19836/7CP

PC A04/MF A01 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt,

Md. The Use of the Inner Zone Electron Model AE-5 and Associated Computer Programs. M. J. Teague, and J. I. Vette. Nov 72, 75p Rept

nos. NASA-TM-X-69988, NSSDC-72-11 Descriptors: \*Electrons, \*Inner radiation belt, 'User manuals (Computer programs), Com-

puter graphics, Mathematical logic, Satellite observation.

A users guide to the inner radiation zone electron model AE-5 is introduced. The guide covers a description of the model, the forms in which it is available, directions on how to use the model, and a discussion of its limitations. Computer programs MODEL and ORP are described. These are major programs needed to use the electron models AE-4 and AE-5 and the smoothed proton models. (Author)

PC A04/MF A01

California Univ., La Jolla. Studies of the Structure of the Plasmasphere as Seen by Radiosounder Measurements Aboard the Alovetti-Satellite. Final Technical Report.

N74-20467/8CP

P. M. Banks, and J. R. Doupnik. 13 Nov 73, 74p Rept no. NASA-CR-137371 Contract NGR-05-009-180

Descriptors: \*Alouette satellites, \*Plasmapause, \*Radiosondes, Computer programs, Diurnal variations, Electron density (Concentration), lonosphere.

The structure of the plasmasphere was studied as seen by radiosounder measurements aboard the Alovetti-2 satellite. Magnetic tape data files were obtained from the NASA Ames Research Center to give a reasonably complete set of high latitude electron density profiles. Considerable effort was expended to develop models of ion flow in the topside ionosphere. These models took both H(0) and O(0) into account and permitted various parameter studies to be made of the various factors which affect H(0) escape in polar wind flows. The results of these studies are included. Extensive computer programs were written to display the measured electron density profiles in ways useful to geophysical analysis. The expected midlatitude trough was easily discernable in the nightime ionosphere at locations expected from similar observations of the plasmapause. In the dayside ionosphere, however, it proved extremely difficult to find any trough-like phenomena. Using the previously developed computer models, it was possible to study the region where the plasmapause appeared to be absent. It was found that over much of the dayside, large fluxes were computed well inside the plasmapause extending down to L-shells as low as 2.5. (Author)

N74-20502/2CP PC A09/MF A01 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

The Inner Zone Electron Model AE-5. M. J. Teague, and J. I. Vette. Nov 72, 200p Rept nos. NASA-TM-X-69987, NSSDC-72-10

Descriptors: \*Computer programs, \*Electrons, \*Flux (Rate), \*Inner radiation belt, \*Mathematical models, Explorer 26 satellite, Graphs (Charts), Ogo-a, Ogo-3, Ov-3 satellites, Solar cycles.

A description is given of the work performed in the development of the inner radiation zone electron model, AE-5. A complete description of the omnidirectional flux model is given for energy thresholds E sub T in the range 4.0 E sub T/(MeV) 0.04 and for L values in the range 2.8 L 1.2 for an epoch of October 1967. Confidence codes for certain regions of B-L space and certain energies are given based on data coverage and the assumptions made in the analysis. The electron model programs that can be supplied to a user are referred to. One of these, a program for accessing the model flux at arbitrary points in B-L space and arbitrary energies, includes the latest outer zone elec-tron model and proton model. The model AE-5, is based on data from five satellites, OGO 1, OGO 3, 1963-38C, OV3-3, and Explorer 26, spanning the period December 1964 to December 1967. (Author)

N74-22355/3CP PC A04/MF A01 California Univ., San Diego. Behavlor of Thermal Plasma in the Iono-Sphere and Magnetosphere. Final Technical Report. P. M. Banks, and J. R. Doupnik. 13 Nov 73, 74p Rept no. NASA-CR-138115

Contract NGR-05-009-180

Descriptors: \*Electron density (Concentration), \*Ionosphere, \*Thermal plasmas, Atmospheric models, Computer programs, Display devices, lons, Magnetosphere, Polar regions, Wind velocity.

Models of ion flow in the topside ionosphere were developed. These models took both H(0) and O(0) into account and permitted various parameter studies to be made affecting H(0) escape in polar winds. Extensive computer programs were written to display the measured electron density profiles in ways useful to geophysical analysis. The relationship between the location of the plasmapause as it is found in the equatorial plane and the location of the ionospheric trough was also investigated.

PC A09/MF A01 N74-30053/4CP Environmental Research and Technology, Inc., Lexington, Mass.

Studies in the Use of Cloud Type Statistics in Mission Simulation.

D. T. Chang, J. H. Willand, D. T. Chang, and J. L. Cogan. Jul 74, 182p Rept no. NASA-CR-129030 Contract NAS8-28721

Descriptors: \*Clouds (Meteorology), \*Mission planning, \*Statistical analysis, Atmospheric models, Cloud cover, Computer programs, Remote sensors.

A study to further improve NASA's global cloud statistics for mission simulation is reported. Regional homogeneity in cloud types was ex-amined; most of the original region boundaries defined for cloud cover amount in previous studies were supported by the statistics on cloud types and the number of cloud layers. Conditionality in cloud statistics was also examined with special emphasis on temporal and spatial dependencies, and cloud type interdepen-dence. Temporal conditionality was found up to 12 hours, and spatial conditionality up to 200 miles; the diurnal cycle in convective cloudiness was clearly evident. As expected, the joint occurrence of different cloud types reflected the dynamic processes which form the clouds. Other phases of the study improved the cloud type statistics for several region and proposed a mission simulation scheme combining the 4dimensional atmospheric model, sponsored by MSFC, with the global cloud model. (Author)

N74-32747/9CP PC A05/ME A01 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

An Experimental and Numerical Study of Wave Motion and Upstream Influence in a Stratified Fluid.

D. A. Hurdis. Aug 74, 90p Rept nos. NASA-TN-D-7744, G-7440

Descriptors: \*Fluid mechanics, \*Stratified flow, \*Wave propagation, Computer programs, Geophysics, Liquids, Upstream.

system consisting of two superimposed layers of liquid of different densities, with a thin transition layer at the interface, provides a good laboratory model of an ocean thermocline or of an atmospheric inversion layer. This research was to gain knowledge about the propagation of disturbances within these two geophysical systems. The technique used was to observe the propagation of internal waves and of upstream influence within the density-gradient region between the two layers of liquid. The

disturbances created by the motion of a vertical flat plate, which was moved longitudinally through this region, were examined both experimentally and numerically. An upstream in-fluence, which resulted from a balance of inertial and gravitational forces, was observed, and it was possible to predict the behavior of this influence with the numerical model. The prediction included a description of the propagation of the upstream influence to steadily increasing distances from the flat plate and the shapes and magnitudes of the velocity profiles. (Author)

## N74-33021/8CP

PC A06/MF A01 National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

# Four-D Giobai Reference Atmosphere Technicai Description, Part 1. C. G. Justus, A. W. Woodrum, R. G. Roper, and

O. E. Smith. Sep 74, 114p Rept no. NASA-TM-X-64871

Descriptors: \*Atmospheric models, \*Computer programs, \*Meteorological parameters, Atmospheric pressure, Atmospheric temperature, Perturbation theory, Space shuttles, Spacecraft trajectories, Wind (Meteorology).

empirical atmospheric model was developed which generates values for pressure, density, temperature, and winds from surface levels to orbital altitudes. The output parameters consist of components for: (1) latitude, longitude, and altitude dependent monthly and annual means; (2) quasi-biennial oscillations; and (3) random perturbations to simulate partially the variability due to synoptic, diurnal, planetary wave, and gravity wave variations. Quasi-biennial and random variation perturbations are computed from parameters determined from various empirical studies and are added to the monthly mean values. This model has been developed as a computer program called PROFILE which can be used to generate altitude profiles of atmospheric parameters along any simulated trajectory through the atmosphere. The PROFILE program was developed for design applications in the space shuttle program. Other applications of the model are discussed, such as for global circulation and diffusion studies, and for generating profiles for comparison with other atmospheric measurement techniques, (e.g. satellite mea-sured temperature profiles). (Author)

N74-33022/6CP PC A10/ME A01 National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

Four-D Giobai Reference Atmosphere Users Manual and Programmers Manual, Part 2. C. G. Justus, A. W. Woodrum, R. G. Roper, and O. E. Smith. Sep 74, 213p Rept no. NASA-TM-X-

64872 Contract NAS8-29753

Descriptors: \*Atmospheric models, \*Computer programs, \*Meteorological parameters, Atmospheric pressure, Atmospheric temperature, Perturbation theory, Space shuttles, Spacecraft trajectories, Wind (Meteorology).

For abstract see N74-33021.

N75-12531/0CP

Texas A&M Univ., College Station. Center for Applied Geosciences.

PC A07/MF A01

Reduction and Error Analysis of the AVE 2 Pilot Experiment Data. H. E. Fuelberg. Oct 74, 142p Rept no. NASA-CR-

120496

Contract NAS8-26751

Descriptors: "Atmospherics, "Computer pro-grams, "Dafa reduction, "Error analysis, grams, "Dafa reduction, "Error analysis, "Experimental design, "Meteorological parameters, \*Rawinsondes, Atmospheric circulation, Calibrating, Flow charts, Humidity, Meteorological services. Wind direction.

The reduction techniques used to process data from the pilot experiment of the second NASA atmospheric variability experiment (AVE IIP), which was conducted during a 24 hour period beginning at 1200 GMT on May 11, 1974, and ending at 1200 GMT on May 12, 1974 are described. Each step of the data handling process is described through the presentation of computer flow charts, programs, equations, and narrative. An error analysis of the final output is presented, and results of the AVE IIP reduction process are compared with results from the National Weather Service. The AVE IIP sounding data contain more detail than National Weather Service data, but the two data sets may be used together without difficulty. (Author)

#### N75-24526/6CP

PC A12/MF A01 McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

Zero-Gravity Atmospheric Cloud Physics Experiment Laboratory; Programmatics Report. Sep 74, 266p Rept nos. NASA-CR-120725, MDC-G5456

Contract NAS8-30272

Descriptors: \*Atmospheric physics, \*Cloud physics, \*Weightlessness, Computer programs, Costs, Research and development, Technology

The programmatics effort included comprehensive analyses in four major areas: (1) work breakdown structure, (2) schedules, (3) costs, and (4) supporting research and technology. These analyses are discussed in detail in the following sections which identify and define the laboratory project development schedule, cost estimates, funding distributions and supporting research and technology requirements. All pro-grammatics analyses are correlated among themselves and with the technical analyses by means of the work breakdown structure which serves as a common framework for program definition. In addition, the programmatic analyses reflect the results of analyses and plans for reliability, safety, test, and main-tenance and refurbishment. (Author)

#### N75-28749/0CP

PC A03/MF A01 Environmental Research and Technology, Inc., Concord Mass.

Computer Program Compatible with a Laser Nepheiometer.

Final Report, 20 May 1974 - 20 May 1975 R. M. Paroskie, H. H. Blau, Jr, and J. C. lii Blinn. Jun 75, 29p Rept nos. NASA-CR-143816, ERT-P-821

Contract NAS5-20496

Descriptors: \*Computer programs, \*Data processing, \*Lasers, \*Nephelometers, Clouds \*Data (Meteorology), Particle size distribution, Rea time operation, Water.

The laser nephelometer data system was up dated to provide magnetic tape recording o data, and real time or near real time processing of data to provide particle size distribution and liquid water content. Digital circuits were pro vided to interface the laser nephelometer to a Data General Nova 1200 minicomputer. Communications are via a teletypewriter. A dual Linc Magnetic Tape System is used for program storage and data recording. Operational programs utilize the Data General Real-Time Operating System (RTOS) and the ERT AIRMAP Real-Time Operating System (ARTS). The programs provide for acquiring data from the laser nephelometer, acquiring data from auxiliary sources, keeping time, performing real time calculations, recording data and communicating with the teletypewriter. (Author)

N75-29531/1CP PC A07/MF A01 Martin Marietta Corp., Baltimore, Md. Ground Truth Data for Test Sites (SI-3) 29 Mar 74, 142p Rept nos. NASA-CR-141911, MSC-05537 Contract NAS8-24000

Descriptors: \*Brightness temperature, \*Ground truth, \*Skylab 3, \*Solar radiation, \*Thermal truth, \*Skylab 3, \*Solar radiation, \*Thermal radiation, Calibrating, Computer programs, Erep, Radiative transfer, Remote sensors, Spectrum analysis.

Field measurements performed simultaneously with Skylab overpasses in order to provide comparative calibration and performance evaluation measurements for the EREP sensors are presented. The solar radiation region from 400 to 1300 nanometers and the thermal radiation region from 8 to 14 micrometer region were investigated. The measurements of direct solar radiation were analyzed for atmospheric optical depth; the total and reflected solar radiation were analyzed for target reflectifity. These analyses were used in conjunction with a radiative transfer computer program in order to calculate the amount and spectral distribution of solar radiation at the apertures of the EREP sensors. The instrumentation and techniques employed, calibrations and analyses per-formed, and results obtained are discussed. (Author)

N75-29602/0CP PC A09/MF A01 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

Atmospheric Transmission Computer Program Cp. D. E. Pitts, T. L. Barnett, C. L. Korb, W. Hanby,

and A. E. Dillinger. Dec 74, 187p Rept nos. NASA-TM-X-58137, JSC-09063

Descriptors: \*Atmospheric attenuation. \*Computer programs, Atmospheric models, Carbon dioxide, Methane, Nitrous oxides, Ozone, Radiosondes, Remote sensors, Water vapor.

A computer program is described which allows for calculation of the effects of carbon dioxide, water vapor, methane, ozone, carbon monox-ide, and nitrous oxide on earth resources remote sensing techniques. A flow chart of the program and operating instructions are provided. Comparisons are made between the atmospheric transmission obtained from laboratory and spacecraft spectrometer data and that obtained from a computer prediction using a model atmosphere and radiosonde data. Limitations of the model atmosphere are discussed. The computer program listings, input card formats and sample runs for both radiosonde data and laboratory data are included. (Author)

5	N76-11736/5CP PC A08/MF A01
L	TRW Systems Group, Redondo Beach, Calif.
	Space Sciences Dept.
	Amps Data Management Requirements
-	Study.
f	Final Report.
)	30 Jun 75, 156p Rept nos. NASA-CR-143995,
i i	TRW-26487-6008-RU-00
-	Contract NAS8-31208
3	

Descriptors: "Computerized simulation, "Data management, "Display devices, "Experimentation, "Ionosphere, "User manuals (Computer programs), Data systems, Electromagnetic wave transmission, lonospheric composition, lonospheric sounding, Plasmas (Physics), Remote sensors,

A data simulation is presented for instruments and associated control and display functions required to perform controlled active experiments of the atmosphere. A comprehensive

user's guide is given for the data requirements and software developed for the following experiments: (1) electromagnetic wave transmission; (2) passive observation of ambient plasmas; (3) ionospheric measurements with a subsatellite; (4) electron accelerator beam measurements; and (5) measuremnt of acoustic gravity waves in the sodium layer using lasers. A complete description of each experiment is given. (Author)

N76-12912/1CP PC A04/MF A01 European Southern Observatory, Hamburg (West Germany). Eso Bulletin No. 12. Jun 75, 60p

\*Astronomical Descriptors: spectroscopy \*Computer programs, \*Microdensitometers, \*Zeeman effect, Astronomical observatories, Chile, Comparators, Europe, Hewlett-packard computers, Photometers, Radial velocity, Southern hemisphere, Spectrograms, Stellar spectra.

A Grant comparator microdensitometer used in connection with an HP 2100 computer for data acquisition and programs for Zeeman spectroscopy data reduction and radial velocity measurements data reduction are described. A program used for data acquisition in the HP 2114B computer in connection with the ESO photometer is also discussed. Prismatic spectrograms of southern MK stars are presented. (Author)

PC A05/MF A01 N76-13663/9CP Old Dominion Univ. Research Foundation, Norfolk, Va. School of Engineering. Evaluation of Upwelling Infrared Radiance from Earth'S Atmosphere. S. K. Gupta, and S. N. Tiwari. Nov 75, 80p Rept nos. NASA-CR-145711, TR-75-T14 Grant NSG-1153

Descriptors: \*Atmospheric radiation, \*Infrared radiation, Atmospheric composition, Atmospheric models, Computer programs, Equations, Pollution monitoring, Radiance, Transmittance

Basic equations for calculating the upwelling atmospheric radiation are presented which account for various sources of radiation coming out at the top of the atmosphere. The theoretical formulation of the transmittance models (line-by-line and guasi-random band model) and the computational procedures used for the evaluation of the transmittance and radiance are discussed in detail. By employing the Lorentz line-by-line and quasi-random computer programs, model calculations were made to determine the upwelling radiance and signal change in the wave number interval of CO fundamental band. These results are useful in determining the effects of different interfering molecules, water vapor profiles, ground temperatures, and ground emittances on the upwelling radiance and signal change. This information is of vital importance in establishing the feasibility of measuring the concentrations of pollutants in the atmosphere from a gas filter correlation instrument flown on an aircraft or mounted on a satellite. (Author)

N76-13673/8CP PC A04/MF A01 Denver Univ., Colo. Dept. of Physics and Astronomy.

Measurements of Trace Constituents from Atmospheric Infrared Emission and Absorption Spectra, a Feasibility Study. Final Report.

A. Goldman, W. J. Williams, and D. G. Murcray. Sep 74, 67p Rept no. NASA-CR-137762 Contract NAS2-8200

Descriptors: \*Atmospheric composition, \*Gas analysis, "Infrared spectroscopy, Absorption spectra, Atmospheric models, Computer pro-grams, Emission spectra, Feasibility analysis, Hydrochloric acid, Hydrofluoric acid, Methane, Nitrogen compounds, Sulfur dioxides

The feasibility of detecting eight trace constituents (CH4, HCI, HF, HNO3, NH3, NO, NO2 and SO2) against the rest of the atmospheric background at various altitudes from infrared emission and absorption atmospheric spectra was studied. Line-by-line calculations and observational data were used to establish features that can be observed in the atmospheric spectrum due to each trace constituent. Model calculations were made for experimental conditions which approximately represent state of the art emission and absorption spectrometers. (Author)

## N76-13702/5CP

PC A05/MF A01

Calspan Corp., Buffalo, N.Y. Project Fog Drops 5. Task 1: A Numerical Model of Advection Fog. Task 2: Recommendations for Simplified Individual Zero-Gravity Cloud Physics Experiments.

C. W. Rogers, W. J. Eadie, U. Katz, and W. C. Kocmond. Dec 75, 80p Rept nos. NASA-CR-2633 M156 Contract NAS8-30776

Descriptors: \*Cloud physics, \*Fog, Advection, Atmospheric models, Computer programs, Marine meteorology, Weather modification, Weightlessness.

A two-dimensional numerical model was used to investigate the formation of marine advec-tion fog. The model predicts the evolution of potential temperature, horizontal wind, water vapor content, and liquid water content in a vertical cross section of the atmosphere as determined by vertical turbulent transfer and horizontal advection, as well as radiative cooling and drop sedimentation. The model is designed to simulate the formation, development, or dissipation of advection fog in response to transfer of heat and moisture between the atmosphere and the surface as driven by advection over horizontal discontinuities in the surface temperature. Results from numerical simulations of advection fog formation are discussed with reference to observations of marine fog. A survey of candidate fog or cloud microphysics experiments which might be performed in the low gravity environment of a shuttle-type spacecraft in presented. Recommendations are given for relatively simple experiments which are relevent to fog modification problems. (Author)

N76-14336/1CP PC A03/MF A01 Research Inst. of National Defence, Stockholm (Sweden).

Computed Mie Scattering Properties for Laser Wavelengths in Various Atmospheric Media

O. Steinvall. Mar 74, 41p Rept no. FOA-2-C-2662-E1-E3

Descriptors: \*Atmospheric models, \*Laser outputs, \*Mie scattering, Wave scattering, Aerosols, Backscattering, Computer programs, puts. Fog, Particle size distribution, Wavelengths. Identifiers: Laser beams, \*Atmospheric trans-missivity, Atmospheric attenuation clouds, Infrared radiation.

Computer calculations of the Mie scattering properties of some haze, fog, cloud and smoke models were made for six laser wavelengths from 0.337 to 10.6 microns. For each wavelength the volume backscattering function and the total extinction and scattering coefficients are given. The angular volume scattering for some wavelengths is also presented. (Author)

N76-15717/1CP PC A07/MF A01 Bonn Univ. (West Germany). Inst. fuer Astrophysik und Extraterrestrische Forschung. Determination of Altitude Dependence of the Exospheric Rotation Above 350 Km Bestimmung der Hoehenabhaengigkeit der Ex-osphaerischen Rotation Oberhalb 350 Km. K. G. H. Schuchardt. Jun 75, 132p Rept no.

BMFT-FB-W-75-11

Contract WRK-253, GFW-RV-I-1-B-8/73-SE-11 In German; English Summary.

Descriptors: \*Earth rotation, \*Exosphere, \*Satellite orientation, \*Satellite perturbation, \*Wind effects, Computer programs, Explorer 24 satellite, Least squares method, Radiation pressure, Satellite orbits.

The theory of determining mean thermospheric zonal winds above 150 km by analysis of the inclination change of satellites is discussed. The decrease of upper-atmospheric rotation rate from 1.4 times the earth's angular velocity at a height of 375 km to 0.7 at 500 km, from the analysis of only three satellite orbits, was derived without eliminating the effects of solar radiation pressure. These satellites do not allow the exact computation of radiation pressure effects due to their irregular shape. Therefore the orbit of the balloon satellite Explorer 24 (1964-76A) has been thoroughly analyzed at perigee heights between 480 and 600 km and during various time intervals. A computer program was developed for this purpose, which directly computes the zonal wind magnitude with regard to all significant perturbations using the method of least squares. The parts of the program which compute the radiation pressure effects have previously been tested with the aid of the orbit of the balloon satellite Dash 2 (1963-30D). The results from Explorer 24 could be changed by altering the investigated time intervals. Altogether they indicate a corotation of the atmosphere and the earth at heights of 550 to 600 km. A local time dependence of zonal winds in this height region could not be detected. (Author)

N76-17658/5CP PC A14/MF A01 Cramer (H.E.) Co., Inc., Salt Lake City, Utah. Nasa/Msic Multilayer Diffusion Models and Computer Programs, Version 5. R. K. Dumbauld, and J. R. Bjorklund. Dec 75, 322p Rept nos. NASA-CR-2631, M155 Contract NAS8-29033

\*Atmospheric Descriptors: diffusion. \*Atmospheric models, \*Computer programs, Algorithms, Prediction analysis techniques, Rocket exhaust, Transport properties.

The transport and diffusion models and algorithms developed for use by NASA in predicting concentrations and dosages downwind from normal and abnormal launches of rocket vehicles are described along with the as-sociated computer programs for use in performing the calculations. Topics discussed in-clude: the mathematical specifications and procedures used in the Preprocessor Program to calculate rocket exhaust cloud rise, cloud dimensions, and other input parameters to the transport and diffusion models, the revised mathematical specifications for the Multilayer Diffusion Models; users' instructions for implementing the Preprocessor and Multilayer Diffusion Models Programs; and worked example problems illustrating the use of the models and computer programs. (Author)

N76-17683/3CP

PC A02/MF A01 Old Dominion Univ., Norfolk, Va. Investigation of Aerosol Characteristics and

Their Measurement. Final Report, 15 Aug. 1974 - 15 Aug. 1975. A. Deepak. Mar 76, 8p Rept nos. NASA-CR-

146398, PGSTR-AP76-23 Grant NSG-1090

Descriptors: \*Aerosols, \*Computer programs, \*Measuring instruments, \*Particle size distribution, Auroras, Mie scattering, Photographic measurement, Video equipment.

Various techniques for the measurement of aerosol properties are described. Methods considered include: solar aureole photographic technique; densitometric techniques; and video electronic isodensity mapper. Other topics briefly discussed include: multiple scattering experiment; multiple scattering computer program; the generation of the Mie theory results; and the NASA/OAST technology workshop.

#### N76-19598/1CP

PC A05/MF A01

Royal Netherlands Meteorological Inst., De Bilt. Manual for the Computer Program of the Gaussian Plume Model Handleiding voor Het Computerprogramma van Het Gaussische Pluimmodel.

E. H. J. Vermaas, and F. T. M. Nieuwstadt. 1975, 80p Rept no. KNMI-WR-75-7 In Dutch; English Summary.

Descriptors: \*Air pollution, \*Computer programs, \*Meteorological parameters, Normal density functions, Algol, Concentration (Composition), Dispersing, Input, Netherlands, Output.

Identifiers \*Gaussian plume models. \*Atmospheric diffusion.

The Gaussian plume model, which simulates the dispersion of air pollution, for the calculation of long term averaged concentrations from point and area sources is discussed. The equations of the Gaussian plume model are given. The structure of the computer program is discussed. The input of the program is dealt with, several examples given, and the values of different input parameters discussed. The output of the program, together with some examples, is also discussed. The complete listing of the program, in ALGOL 60, is given.

N76-20180/5CP PC A03/MF A01 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

The Production of Nitric Oxide in the Troposphere as a Result of Solid-Rocket-Motor Afterburning.

R. B. Stewart, and R. I. Gomberg. Mar 76, 45p Rept nos. NASA-TN-D-8137, L-10594

Descriptors: \*Afterburning, \*Nitric oxide, \*Solid propellant rocket engines, \*Troposphere, Booster rocket engines, Chemical reactions, \*Troposphere, Computer programs, Exhaust gases, Space shuttles, Turbulent mixing. Identifiers: \*Atmospheric chemistry, Air pollu-

tion

As part of an ongoing assessment of the en-vironmental effects of solid-rocket-motor operations in the troposphere, estimates were made of the nitric oxide produced in the troposphere by the space shuttle and Titan 3-C boosters. Calculations were made with the lowaltitude plume computer program and included the effects of coupled finite-rate chemistry and turbulent mixing. A recent measurement of nitric oxide taken in the effluent cloud of a Titan 3-C booster is compared with calculations made with this computer code. The various chemical reactions of the exhaust gases are listed in tabular form. (Author)

### N76-20699/4CP

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala

PC A04/MF A01

Diffusion Algorithms and Data Reduction Routine for Onsite Real-Time Launch Predictions for the Transport of delta-Thor Exhaust Effluents.

J. B. Stephens. Mar 76, 75p Rept no. NASA-TN-D-8194

Descriptors: "Atmospheric diffusion, "Computer programs, "Delta launch vehicle, "Exhaust gases, "Air pollution, Algorithms, Launching sites, Pollution monitoring, Prediction analysis techniques, Real time operation. Identifiers: Mathematical models

The National Aeronautics and Space Administration/Marshall Space Flight Center multilayer diffusion algorithms have been specialized for the prediction of the surface impact for the dispersive transport of the exhaust effluents from the launch of a Delta-Thor vehicle. This specialization permits these transport predictions to be made at the launch range in real time so that the effluent monitoring teams can optimize their monitoring grids. Basically, the data reduction routine requires only the meteorology profiles for the thermodynamics and kinematics of the atmosphere as an input. These profiles are graphed along with the resulting exhaust cloud rise history, the centerline concentrations and dosages, and the hydrogen chloride isopleths. (Author)

#### N76-22637/2CP

PC A03/ME A01 Old Dominion Univ. Research Foundation, Norfolk. Va.

**Retrieval of Surface Temperature by Remote** Sensing.

S. K. Gupta, and S. N. Tiwari. Apr 76, 42p Rept nos. NASA-CR-147145, TR-76-1T8 Grant NSG-1153

Descriptors: \*Air pollution, \*Brightness tem-perature, \*Earth surface, \*Remote sensors, Temperature measurement, Atmospheric effects, Carbon monoxide, Computer programs, Infrared radiation, Printouts, Radiometers, Spectral emission, Spectrometers.

A simple procedure and computer program were developed for retrieving the surface temperature from the measurement of upwelling infrared radiance in a single spectral region in the atmosphere. The program evaluates the total upwelling radiance at any altitude in the region of the CO fundamental band (2070-2220 1/cm) for several values of surface temperature. Actual surface temperature is inferred by interpolation of the measured upwelling radiance between the computed values of radiance for the same altitude. Sensitivity calculations were made to determine the effect of uncertainty in various surface, atmospheric and experimental parameters on the inferred value of surface temperature. It is found that the uncertainties in water vapor concentration and surface emittance are the most important factors affecting the accuracy of the inferred value of surface temperature. (Author)

PC A07/MF A01 N76-22643/0CP Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab. Aafe Radscat Data Reduction Programs

User's Guide. J. P. Claassen. 1976, 146p Rept nos. NASA-CR-144992, CRES-TR-186-9 Contract NAS1-10048

Descriptors: \*Computer programs, \*Data reduction, "Remote sensors, "User manuals (Computer programs), Earth resources, Radiometers, Scatterometers.

Theory, design and operation of the computer programs which automate the reduction of joint radiometer and scatterometer observations are presented. The programs raduce scatterometer measurements to the normalized scattering coefficient; whereas the radiometer measurements are converted into antenna tempera-

tures. The programs are both investigator and user oriented. Supplementary parameters are provided to aid in the interpretation of the observations. A hierarchy of diagnostics is available to evaluate the operation of the instrument, the conduct of the experiments and the quality of the records. General descriptions of the pro-grams and their data products are also presented. This document therefore serves as a user's guide to the programs and is therefore intended to serve both the experimenter and the program operator. (Author)

N76-24681/8CP PC A02/MF A01 Old Dominion Univ., Norfolk, Va. Dept. of Physics and Geophysical Sciences.

Use of Lars System for the Quantitative Determination of Smoke Plume Lateral Diffusion Coefficients from ERTS Images of Vir-

ginia. R. N. Blais, G. E. Copeland, and T. H. Lerner. 1975, 13p Rept no. NASA-CR-148137 Contract NGL-47-003-067

Descriptors: \*Air pollution, \*Landsat 1, \*Pollution monitoring, \*Remote sensors, \*Smoke, \*Virginia, Chimneys, Computer pro-grams, Electric power plants, Industrial wastes, Mathematical models, Wind (Meteorology). Identifiers: \*Gaussian plume models, \*Air pollution detection, Scientific satellites, Plumes, Spaceborne photography, Chester(Virginia).

A technique for measuring smoke plume of large industrial sources observed by satellite using LARSYS is proposed. A Gaussian plume model is described, integrated in the vertical, and inverted to yield a form for the lateral diffusion coefficient, Ky. Given u, wind speed; y sub I, the horizontal distance of a line of constant brightness from the plume symmetry axis a distance x sub I, downstream from reference point at x0x sub 2, y00, then K sub y 0 u ((y sub 1) to the 2nd power)/2 x sub 1 1n (x sub 2/x sub 1). The technique is applied to a plume from a power plant at Chester, Virginia, imaged August 31, 1973 by LANDSAT I. The plume bends slightly to the left 4.3 km from the source and estimates yield Ky of 28 sq m/sec near the source, and 19 sq m/sec beyond the bend. Maximum ground concentrations are estimated between 32 and 64 ug/cu m. Existing meteorological data would not explain such concentrations. (Author)

N76-24798/0CP

PC A04/MF A01 Pennsylvania State Univ., University Park. Ionosphere Research Lab. F sub 2 Peak Electron Densities in the Main

Trough Region of the lonosphere, B. W. Halcrow. May 76, 57p Rept nos. NASA-CR-147153, PSU-IRL-IR-55 Contract NGL-39-009-003

Descriptors: \*F 2 region, \*Ionospheric electron density, Alouette 1 satellite, Alouette 2 satellite, Atmospheric models, Computer programs, lonospheric propagation, Troughs.

A study of the main trough in the F2 region was made using observations from Alouette I and II. Parameters needed to predict the occurrence of the trough were determined from the many observations. These parameters were used to develop a modification factor for use with C.E.I.R. model of predicted MmF2. This modification factor reduced the C.E.I.R. model predicted NmF2 to more representative values of MmF2 in the main trough region. (Author)

N76-24843/4CP Not available NTIS Kernforschungszentrum, Karlsruhe (West Germanv).

Meteorological Data Acquisition System. Functional Description and General Characteristics of the Different Components. S. Bouharrour, and P. Thomas. Jul 75, 157p Rept no. KFK-2181

# Language in German.

Descriptors: \*Meteorological instruments, \*Weather data recorders, Computer programs, Computers, Data acquisition, Data reduction, Ground wind, Maintenance, Meteorological parameters, On-line programming. Identifiers: West Germany.

The 200 m meteorological tower of the Karlsruhe Nuclear Research Center was equipped with 45 instruments measuring the meteorological parameters near the ground level. Frequent inquiry of the instruments implies data acquisition with on-line data reduction. This task is fulfilled by some peripheral units controlled by a PDP-8/I. This report presents details of the hardware configuration and a short description of the software configuration of the meteorological data acquisition system. The report also serves as an instruction for maintenance and repair work to be carried out at the system. (Author)

N76-25712/0CP PC A03/ME A01 Pennsylvania State Univ., University Park. Ionosphere Research Lab.

lonosphere Research. Semiannual Status Report, 1 Oct. 1975 - 31 Mar. 1976

31 Mar 76, 38p Rept nos. NASA-CR-148200, PSU-IRL-SAR-76/1 Contract NGL-39-009-003

Descriptors: \*lonospheric composition. \*lonospheric propagation. Atmospheric chemistry, Computer programs, D region, E region, F region, Mass spectrometers, Planetary atmospheres.

A report is presented on on-going research projects in ionospheric studies. The topics discussed are planetary atmospheres, E and F region, D region, mass spectrometer measurements, direct measurements and atmospheric reactions.

N76-27745/8CP PC A06/MF A01 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. Cubic Spline Function Interpolation in Atmosphere Models for the Software Development Laboratory: Formulation and Data. J. C. Kirkpatrick. May 76, 125p Rept nos. NASA-TM-X-58183, JSC-08964

Descriptors: \*Atmospheric models, \*Interpolation, \*Spline functions, Acoustic velocity, Atmospheric pressure, Computer programs, Density (Mass/volume), Fortran, Tables (Data), Viscosity Identifiers: Cubic spline technique.

A tabulation of selected altitude-correlated values of pressure, density, speed of sound, and coefficient of viscosity for each of six models of the atmosphere is presented in block data format. Interpolation for the desired atmospheric parameters is performed by using cubic spline functions. The recursive relations necessary to compute the cubic spline function coefficients are derived and implemented in subroutine form. Three companion subprograms, which form the preprocessor and processor, are also presented. These subprograms, together with the data element, com-pose the spline fit atmosphere package. Detailed FLOWGM flow charts and FORTRAN listings of the atmosphere package are presented in the appendix. (Author)

N76-27748/2CP PC A07/MF A01 Alabama Univ., Huntsville. School of Graduate Studies and Research.

Environmental Dynamics at Orbital Altitudes. Final Technical Report.

G. R. Karr. Jun 76, 146p Rept nos. NASA-CR-149932, UAH-RR-186 Contract NAS8-28248

Descriptors: \*Atmospheric density, \*Satellite drag, \*Upper atmosphere, Aerodynamics, At-mospheric models, Computer programs, Falling spheres, Gas flow, Satellite orbits, Wind (Meteorology).

The influence of real satellite aerodynamics on the determination of upper atmospheric density was investigated. A method of analysis of satellite drag data is presented which includes the effect of satellite lift and the variation in aerodynamic properties around the orbit. The studies indicate that satellite lift may be responsible for the observed orbit precession rather than a super rotation of the upper atmosphere. The influence of simplifying assumptions con-cerning the aerodynamics of objects in falling sphere analysis were evaluated and an improved method of analysis was developed. Wind tunnel data was used to develop more accurate drag coefficient relationships for studying altitudes between 80 and 120 Km. The improved drag coefficient relationships revealed a considerable error in previous falling sphere drag interpretation. These data were reanalyzed using the more accurate relationships. Theoretical investigations of the drag coefficient in the very low speed ratio region were also conducted. (Author)

N76-31809/6CP PC A05/MF A01 The Haque RVO-TNO. Hague Physics Lab. (Netherlands). Solumat: A Programme for Measuring the In-

fluence of the Atmosphere on Contrast Transfer.

A. A. Vanmeeteren, and J. Vanschie. Dec 75, 86p Rept nos. PHL-1975-46, TDCK-67163 Contract A72/KL/027

Descriptors: \*Atmospheric effects, \*Image contrast, \*Light transmission, \*Luminance, \*Optical data processing, Computer programming, Daytime, Statistical analysis, Tables (Data). Identifiers: SOLUMAT computer program, Netherlands, Atmospheric transmissivity.

The results of the SOLUMAT (Statistical in-vestigation of the Luminance of the At-mosphere) program for measuring contrast decrease in the atmosphere are presented. For the past 3.5 years an automated observatory has performed measurements (by day only) of contrast decrease and related variables. Data were handled and interpreted by a computer. Distributions of many variables are presented in tabular form. In addition a few special treat-ments of the data are discussed. (Author)

N76-33273/3CP PC A13/MF A01 TRW Systems Group, Redondo Beach, Calif. Phase B-Final Definition and Preliminary Design Study for the Initial Atmospheric Cloud Physics Laboratory (Acpl). A Spacelab Mission Payload. Interim Report.

23 Sep 76, 289p Rept no. NASA-CR-150017 Contract NAS8-31844

Descriptors: \*Atmospheric cloud physics lab (Spacelab), \*Cloud physics, \*Spacelab, Aerosols, Computer programs, Optical equip-ment, Radiography, Systems engineering, Test chambers.

Progress in the development of the Atmospheric Cloud Physics Laboratory is outlined. The fluid subsystem, aerosol generator, expansion chamber, optical system, control systems, and software are included.

N77-15056/3CP PC A03/MF A01 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

User Guide to a Command and Control System; a Part of a Prelaunch Wind Monitoring Program.

R. Cowgill. Nov 76, 29p Rept nos. NASA-TM-X-73558, E-8999

Descriptors: \*Command and control, \*Computer systems programs, \*User manuals (Computer programs), \*Wind (Meteorology), Computer programs, Meteorological balloons, Microprocessors, Univac 1100 series compu-tors ters.

A set of programs called Command and Control System (CCS), intended as a user manual, is described for the operation of CCS by the personnel supporting the wind monitoring portion of the launch mission. Wind data obtained by tracking balloons is sent by electronic means using telephone lines to other locations. Steering commands are computed from a system called ADDJUST for the on-board computer and relays this data. Data are received and automatically stored in a microprocessor, then via a real time program transferred to the UNIVAC 1100/40 computer. At this point the data is available to be used by the Command and Control system.

N77-18983/5CP PC A09/MF A01 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

Ap-8 Trapped Proton Environment for Solar Maximum and Solar Minimum. D. M. Sawyer, and J. I. Vette. Dec 76, 176 Rept

nos. NASA-TM-X-72605, NSSDC/WDC-A-R/S-76-06

Descriptors: \*Computer programs, \*Proton flux density, \*Solar flux, \*Solar protons, \*Trapped particles, Periodic variations, Azur satellite, Data systems, Magnetic fields, Ov-3 satellites, Solar cycles.

Data sets from Ov-3 and Azur indicate a need for improvement in models of the stably trapped proton flux with energies between 0.1 and 400 MeV. Two computer accessible models are described: AP8MAX and AP8MIN. The models are presented in the form of nomo-graphs, B-L plots, R-lambda plots, and equatorial radial profiles. Nomographs of the orbitintegrated fluxes are also discussed. The models are compared with each other, with the data, and with previous AP models. Requirements for future improvements include more complete data coverage and periodic comparisons with new data sets as they become available. The machine-sensible format in which the models are available are described.

N77-19710/1CP PC A05/MF A01 Techno-Sciences, Inc., Annapolis, Md. Reduction and Analysis of Data Collected During the Electromagnetic Tornado Experi-

ment. Final Report, Jul. 1975 - Jun. 1976. L. D. Davisson. Jul 76, 91p Rept nos. NASA-CR-

152455, TSI-76112

Contract NAS5-22489

\*Computer Descriptors: programs, \*Electromagnetic fields, \*Tornadoes, Data reduction, Ocean surface, Digital simulation, Meteorological radar, Monte carlo method, Pulsed radiation, Radar signatures. Identifiers: \*Sea states.

Techniques for data processing and analysis are described to support tornado detection by analysis of radio frequency interference in various frequency bands, and sea state determination from short pulse radar measurements. Activities include: strip chart recording of tornado data; the development and implementation of computer programs for digitalization and analysis of the data; data reduction techniques for

short pulse radar data, and the simulation of radar returns from the sea surface by computer models.

N77-19715/0CP PC A09/MF A01 Science Applications, Inc., Huntsville, Ala. Determination of Constant-Volume Balloon Capabilities for Aeronautical Research. F. B. Tatom, and R. L. King. Mar 77, 186p Rept nos. NASA-CR-2805, M-208 Contract NAS8-31173

Descriptors: "Atmospheric models, "Flow measurement, "Meteorological balloons, "Wind velocity measurement, Computer programs, Equations of motion, Flow distribution, Three dimensional flow. Identifiers: BALLOON computer program.

The proper application and interpretation of constant-volume balloons (CVB) for measurement of atmospheric phenomena was determined. A literature survey covering 176 references is included, the governing equations describing the three-dimensional motion of a CVB immersed in a flow field are developed. The flowfield model is periodic, three-dimensional, and nonhomogeneous, with mean translational motion. The balloon motion and flow field equations are cast into dimensionless form for greater generality, and certain significant dimensionless groups are identified. An alternate treatment of the balloon motion, based on first-order perturbation analysis, is also presented. A description of the digital computer program, BALLOON, used for numerically integrating the governing equations is provided.

#### N77-20629/0CP PC A04/MF A01 Royal Netherlands Meteorological Inst., De Bilt. Manual for the Gaussian Plume Model Computer Program Handlelding voor Het Computerprogramma van Het Gaussische Pluimmodel.

P. A. T. Nieuwendijk, C. A. Engeldal, and F. T. M. Nieuwstadt. 1976, 73p Rept no. KNMI-WR-76-16 In Dutch; English Summary.

Descriptors: "Air pollution, "Computer programs, Gauss equation, Normal density functions, Plumes, Algol, Dispersing, User manuals (Computer programs).

Identifiers: Netherlands, \*Gaussian plume model, Computerized simulation.

The Gaussian plume model, which simulates the dispersion of air pollution, and the input parameters of the model are discussed. A manual to operate the program is presented. The equations of the model are given, together with the values of the recommended input parameters. The structure of the program is described; the input is discussed in general form. Also, an input model is given together with three input examples. The output of the examples is discussed, and a listing of the program is given. The manual, which replaces the old version by Vermaas, 1975, facilitates the use of the computer program. Useful advice for future users of the long term model is annexed.

N77-20659/7CP PC A07/MF A01 Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science.

Techniques for Computing Regional Radiant Emittances of the Earth-Atmosphere System from Observations by Wide-Angle Satellite Radiometers, Phase 3.

Final Report, 1 Jan. - 31 Dec. 1974. J. F. Pina, and F. B. House. Aug 75, 126p Rept no. NASA-CR-145011

Contract NAS1-11871

Descriptors: "Earth atmosphere, "Energy budgets, "Radiometers, Radiation measurement, Satellite observation, Wide angle lenses, Absorptiorf spectra, Angular distribution, Computer programs, Solar radiation. Radiometers on earth orbiting satellites measure the exchange of radiant energy between the earth-atmosphere (E-A) system and space at observation points in space external to the E-A system. Observations by wideangle, spherical and flat radiometers are analyzed and interpreted with regard to the general problem of the earth energy budget (EEB) and to the problem of determining the energy budget of regions smaller than the field of view (FOV) of these radiometers.

N77-20660/5CP PC A12/MF A01 Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering. The Global Reference Atmospheric Model,

The Global Reference Atmospheric Model, MOD 2 (With Two Scale Perturbation Model). Interim Technical Report.

C. G. Justus, and W. R. Hargraves. Jul 76, 262p Rept no. NASA-CR-150214 Contract NAS8-20657

Descriptors: \*Meteorological parameters, \*Random processes, \*Reference atmospheres, Perturbation, User manuals (Computer programs), Geostrophic wind, Gravitational waves, Periodic variations, Pressure measurements.

The Global Reference Atmospheric Model was improved to produce more realistic simulations of vertical profiles of atmospheric parameters. A revised two scale random perturbation model using perturbation magnitudes which are adjusted to conform to constraints imposed by the perfect gas law and the hydrostatic condition is described. The two scale perturbation model produces appropriately correlated (horizontally and vertically) small scale and large scale perturbations. These stochastically simulated perturbations are representative of the magnitudes and wavelengths of perturbations produced by tides and planetary scale waves (large scale) and turbulence and gravity waves (small scale). Other new features of the model are: (1) a second order geostrophic wind relation for use at low latitudes which does not blow up at low latitudes as the ordinary geostrophic relation does; and (2) revised quasi-biennial amplitudes and phases and revised stationary perturbations, based on data through 1972.

#### N77-21516/8CP PC A02/MF A01 Naval Research Lab., Washington, D. C. Measurements of Far-Ultraviolet Photographs from Skylab 4 and APOLLO 6. Final Report.

T. Page. 8 Mar 77, 5p Rept no. NASA-CR-151242 Contract NASA ORDER T-9602-B

Descriptors: \*Far ultraviolet radiation, \*Spaceborne photography, Apollo 16 flight, Skylab 4, Airglow, Computer programs, Kohoutek comet, Magellanic clouds, Stellar radiation.

Over 700 far UV photos were obtained with the S201 electrographic camera on Skylab 4 (27 Nov. 1973 - 28 Jan. 1974) and from the Apollo-16 Iunar site (21 - 23 Apr. 1972). The Lymanalpha geocorona was found to fit R. R. Meier's model, and the tropical airglow belts were measured quantitatively. The history of Comet Kohoutek's Ly-alpha halo (and lack of an oxygen halo) was followed from 32 days before to 13 days after perihelion passage, and fitted to a model of hydrogen production from the comet. Far UV emissions from the Large Magellanic Cloud were also measured quantitatively and compared with ground-based measurements of stellar associations and nebulae. Computer programs were developed to contour the densities measured by microphotometer on the original film and to locate and sum densityvolumes in each starlike image. In addition, thousands of stars were identified and their far UV flux measured in two band-passes (1050 - 1600 A, 1250 - 1600 A).

N77-21734/7CP PC A03/MF A01 National Aeronautical Establishment, Ottawa (Ontario).

Some Environmental Measurement of the Vertical Spread of Pollutants from Low-Level Sources.

R. S. Crabbe. Apr 75, 45p Rept no. LTR-UA-28

Descriptors: "Contaminants, "Environmental surveys, "Pesticides, Air pollution, Aerosols, Atmospheric circulation, Computer programs. Identifiers: "Air pollution sampling, Atmospheric motion.

As a contribution to pesticide accountancy, a series of environmental experiments on the mean vertical spread of gaseous and aerosol pollutants from ground-based sources has been performed. For the former, reasonable agreement between theoretical analysis and airborne and surface measurements is demonstrated. A dimensional analysis is suggested for using similar data to predict the general case. A method to predict the required number of crosswind passes to obtain the time mean values of laterally integrated concentration in a plume is also presented and verified by experiment.

N77-21788/3CP PC A02/MF A01 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. All-Weather Ice Information System for

R. T. Gedney, R. J. Jirberg, R. J. Schertler, R. A. Mueller, and T. L. Chase. 1977, 14p Rept nos.

NASA-TM-X-73619, E-9108 Conf-Presented at 9TH Ann. Offshore

Technology Conf., Houston, Tex., 2-5 May 1977.

Descriptors: "Ice formation, "Ice mapping, "Radar imagery, Alaska, Computer programs, Forecasting.

near real-time ice information system designed to aid arctic coast shipping along the Alaskan North Slope is described. The system utilizes a X-band Side Looking Airborne Radar (SLAR) mounted aboard a U.S. Coast Guard HC-130B aircraft. Radar mapping procedures showing the type, areal distribution and concentration of ice cover were developed. In order to guide vessel operational movements, near real-time SLAR image data were transmitted directly from the SLAR aircraft to Barrow, Alaska and the U.S. Coast Guard icebreaker Glacier. In addition, SLAR image data were transmitted in real time to Cleveland, Ohio via the NOAA-GOES Satellite. Radar images developed in Cleveland were subsequently facsimile transmitted to the U.S. Navy's Fleet Weather Facility in Suitland, Maryland for use in ice forecasting and also as a demonstration back to Barrow via the Communications Technology Satellite.

77-24935/	7 <b>CP</b>		PC A04/MF A01		
hysics	Lab.	RVO-TNO,	The	Hague	
letherland					

Infrared Sea and Sky Background Radiation. J. B. Vandevrie. Nov 76, 53p Rept nos. PHL-

1976-41, TDCK-68562

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Descriptors: "Background radiation, "Infrared radiation, "Ocean surface, "Sky radiation, Atmospheric models, Infrared scanners, Meteorological parameters, Surface temperature, Water temperature.

Identifiers: Solar radiation, Air water interface, Atmospheric attenuation, "Atmospheric transmissivity, Lowtran 3 computer program, Netherlands.

An investigation of sea and sky background radiance as a function of elevation in three wavelength intervals 3.0-5.0, 3.4-4.1 and 8.0-14.0 micrometers is described. A computer model, which has the Lowtran 3 atmospheric

transmission model as a subroutine, was developed to study the separate influence of a few meteorological parameters on these functions. The occurrence of a dip in the apparent temperature of the sea near the horizon has notably been analyzed. Results are summarized of the measurements of the background radiation around the horizon, made during a year by a scanning radiometer at an altitude of 30 meter above the sea surface. The radiance of the sky is measured and computed also for higher elevations (0-90 deg). Computations and measurements are in very good agreement except for the small interval 3.4-4.1 micrometers. The latter might be caused by an overestimation of the transmission by the Lowtran 3 model in this wavelength band.

N77-25714/5CP PC A07/MF A01 Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Dispersion within the Stratosphere of Minor Constituents.

Ph.D. Thesis - Toulouse Univ., 1976. A. M. Bouchardy. Jan 77, 127p Rept nos. ONERA-P-1976-7, FR-ISSN-0078-379X Misc-Report Will Also Be Announced as Translation (Esa-TT-381). In French; English Summary.

Descriptors: \*Air pollution, \*Artificial clouds, \*Stratosphere, \*Trace contaminants, Cloud physics, Computer programs, Diffusion coefficient, Exhaust gases, Mathematical models, Optical radar, Turbulent diffusion. Identifiers: France, \*Atmospheric diffusion, Theses.

The experimental method consists in creating artificial clouds within the stratosphere, and in observing their evolution from the ground. The observation means used are either a lidar and a still camera, or two ballistic chambers and two still cameras. The measurements carried out allow determination of cloud motion and cloud sizes, during an average of 600 sec. A numerical model was realized which makes it possible to simulate the evolution of these clouds and to emphasize the influence of turbulent mixing and wind shear. With this model and experimental results the horizontal diffusion coefficients and their variations with scale can be determined. The values found are between 0.5 and 11 sg m/s, for a time of 300 sec. Some values of the vertical diffusion coefficient were also measured. The results obtained are discussed. A study of the microstructure of clouds permitted the study of the phenomena at a smaller scale.

#### N77-26177/4CP

Computer Sciences Corp., Silver Spring, Md. Skylab S191, S192 Program Descriptions. M. Mack. Feb 76, 424p Rept no. NASA-CR-152508 Contract NAS5-11999

PC A18/ME A01

Descriptors: "Terrestrial radiation, Computer programs, Data reduction, Satellite observation, Skylab program, Algorithms, Data storage, Documentation, Format, Information management, Plotting, Telemetry.

Software developed to assist in assessing and analyzing earth radiation data obtained from Skylab S191 and S192 experiments are described. A block data generation routine is included along with a plot program for the S191 experiment. Changes in format from that of the original JSC tapes are discussed.

N77-26753/2CP PC A07/MF A01 Sperry Support Services, Huntsville, Ala. Engineering Operations. Atmospheric Cloud Physics Thermal Systems Analysis.

Final Report. 15 Jun 77, 140p Rept no. NASA-CR-150312

#### Contract NAS8-32231

Descriptors: \*Cloud physics, Atmospheric chemistry, Mathematical models, Computer programs, Computers, Thermal stability.

Engineering analyses performed on the Atmospheric Cloud Physics (ACPL) Science Simulator expansion chamber and associated thermal control/conditioning system are reported. Analyses were made to develop a verified thermal model and to perform parametric thermal investigations to evaluate systems performance characteristics. Thermal network representations of solid components and the complete fluid conditioning system were solved simultaneously using the Systems Improved Numerical Differencing Analyzer (SINDA) computer program.

N77-29673/9CP PC A03/MF A01 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

Monte Carlo Analysis of Uncertainty Propagation in a Stratospheric Model. 1: Development of a Concise Stratospheric Model.

R. D. Rundel, D. M. Butler, and R. S. Stolarski. May 77, 35p Rept nos. NASA-TM-X-71360, X-624-77-122

Subm-Submitted for Publication.

Descriptors: "Atmospheric models, "Ozonometry, "Perturbation, "Stratosphere, Air pollution, Computer programs, Monte carlo method.

Identifiers: Mathematical models, Uncertainty.

A concise model has been developed to analyze uncertainties in stratospheric perturbations, yet uses a minimum of computer time and is complete enough to represent the results of more complex models. The steady state model applies iteration to achieve coupling between interacting species. The species are determined from diffusion equations with appropriate sources and sinks. Diurnal effects due to chlorine nitrate formation are accounted for by analytic approximation. The model has been used to evaluate steady state perturbations due to injections of chlorine and NO(X).

N77-31012/6CP PC A06/MF A01 National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.

Atmospheric and Oceanographic Information Processing System (Aoips) System Description.

P. A. Bracken, J. T. Dalton, J. B. Billingsley, and J. J. Quann. Mar 77, 118p Rept nos. NASA-TM-X-71342, X-933-77-148

Conf-Presented at Machine Process. Of Remotely Sensed Data, West Lafayette, Ind., 21-23 Jun. 1977.

Descriptors: "Information management, "Meteorological parameters, "Oceanographic parameters, "Optical data processing, Systems engineering, Computer programs, Data processing terminals, Imagery, Minicomputers, Pdp computers.

The development of hardware and software for an interactive, minicomputer based processing and display system for atmospheric and oceanographic information extraction and image data analysis is described. The major applications of the system are discussed as well as enhancements planned for the future.

N77-31678/4CP PC A07/MF A01 European Space Agency, Paris (France). Dispersion of Trace Constituents in the Stratosphere. A. M. Bouchardy. Jul 77, 143p Rept nos. ESA-TT-381, ONERA-P-1976-7 Tran-Transl. Into English of 'Dispersion dans la Stratosphere de Constituants en Traces', Onera, Paris Report Onera-p-1976-7, Jan. 1977. Misc-Original Report in French Previously Announced as N77-25714.

Descriptors: \*Air pollution, \*Artificial clouds, \*Stratosphere, \*Trace contaminants, Cloud physics, Computer programs, Diffusion coefficient, Exhaust gases, Mathematical models, Optical radar, Turbulent diffusion. Identifiers: Translations, France, \*Atmospheric diffusion.

The experimental method consists in creating artificial clouds within the stratosphere, and in observing their evolution from the ground. The observation means used are either a lidar and a still camera, or two ballistic chambers and two still cameras. The measurements carried out allow determination of cloud motion and cloud sizes, during an average of 600 sec. A numerical model was realized, which makes it possible to simulate the evolution of these clouds, and to emphasize the influence of turbulent mixing and wind shear. With this model and experimental results the horizontal diffusion coefficients and their variations with scale can be determined. The values found are between 0.5 and 11 sq m/s, for a time of 300 sec. Some values of the vertical diffusion coefficient were also measured. The results obtained are discussed. A study of the microstructure of clouds permitted the study of the phenomena at a smaller scale.

N77-31700/6CP PC A05/MF A01 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A Model for Simulating Random Atmospheres as a Function of Latitude, Season, and Time. J. W. Campbell. Sep 77, 91p Rept nos. NASA-TN-D-8470, L-11308

Descriptors: \*Atmospheres, \*Mathematical models, \*Monte carlo method, \*Thermodynamic properties, Computer programs, Pressure, Spacecraft trajectories, Stochastic processes, Temperature.

An empirical stochastic computer model was developed with the capability of generating ran-dom thermodynamic profiles of the atmosphere below an altitude of 99 km which are characteristic of any given season, latitude, and time of day. Samples of temperature, density, and pressure profiles generated by the model are statistically similar to measured profiles in a data base of over 6000 rocket and high-altitude atmospheric soundings; that is, means and standard deviations of modeled profiles and their vertical gradients are in close agreement with data. Model-generated samples can be used for Monte Carlo simulations of aircraft or spacecraft trajectories to predict or account for the effects on a vehicle's performance of atmospheric variability. Other potential uses for the model are in simulating pollutant dispersion patterns, variations in sound propagation, and other phenomena which are dependent on atmospheric properties, and in developing data-reduction software for satellite monitoring systems.

N78-11642/3CP PC A05/MF A01 National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

Development of a Procedure to Model High-Resolution Wind Profiles from Smoothed or Low-Frequency Data. D. W. Camp. Nov 77, 92p Rept nos. NASA-TP-

D. W. Camp. Nov 77, 92p Rept nos. NASA-TP 1071, M-239

Descriptors: "Wind profiles, High resolution, Models, Rawinsondes, Computer programs, Computerized simulation, Jimsphere balloons. The derivation of simulated Jimsphere wind profiles from low-frequency rawinsonde data and a generated set of white noise data are presented. A computer program is developed to model high-resolution wind profiles based on the statistical properties of data from the Kennedy Space Center, Florida. Comparison of the measured Jimsphere data, rawinsonde data, and the simulated profiles shows excellent agreement.

### N78-14235/3CP

PC A02/MF A01 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen

(West Germany). Calculation of the Desired Angle Values for the Alignment of a Stabilized Two Axis Rotating Platform in an Aircraft Berechnung der Winkel-Sollwerte fuer die Ausrichtung Eines Stabilisierten Zwei-Achsen-Drehstandes in

Einem Flugzeug. E. Hoermann. Feb 77, 24p Rept no. DLR-IB-552-76/27

Language in German.

Descriptors: \*Airborne equipment, \*Alignment, \*Antennas, \*Backscattering, \*Meteorological parameters, Azimuth, Computer programs, Elevation angle, Scatterometers, Seas, Stabilized platforms.

Identifiers: West Germany.

A procedure to calculate from the navigation gyroscope values the desired values for the drive control of an antenna rotating platform (azimuth and elevation) on board an aircraft is described. The study is part of the scatterometer project in which the possibility of establishing from backscatter measurements, information on the motion of the sea and hence the wind direction and the wind force was in-vestigated. To this end, a stabilizing antenna pointed slanted towards the sea is mounted on board an aircraft flying along a predetermined path. The position of the antenna should not be influenced by the movements of the aircraft. The method gives simplified equations for elevation over azimuth and for azimuth over elevation values.

#### N78-15629/6CP

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PC 405/ME 401

Aoips Data Base Management Systems Support for Garp Data Sets. Technical Report, Oct. 1976 - Sep. 1977.

J. P. Gary. Oct 77, 86p Rept no. NASA-TM-78042

Descriptors: \*Data management, \*Global at-mospheric research program, \*Information mospheric research program, \*Information systems, Data bases, Computer programs, Data retrieval, Data storage. Identifiers: \*Data base management systems,

Data retrieval system.

A data base management system is identified, developed to provide flexible access to data sets produced by GARP during its data systems tests. The content and coverage of the data base are defined and a computer-aided, interactive information storage and retrieval system, implemented to facilitate access to user specified data subsets, is described. The computer programs developed to provide the capability were implemented on the highly interactive, minicomputer-based AOIPS and are referred to as the data retrieval system (DRS). Implemented as a user interactive but menu guided system, the DRS permits users to invenor subset data sets based on a user selected window defined by time and latitude/longitude boundaries. The DRS permits users to select, display, or produce formatted hard copy of individual data items contained within the data records.

N78-18573/3CP PC A11/MF A01 Cramer (H.E.) Co., Inc., Salt Lake City, Utah. Users' Instructions for the NASA/Msfc Cloud-Rise Preprocessor Program, Version 6, and the NASA/Msfc Multilayer Diffusion Program, Version 6: Research Version for UNIVAC 1108 System.

J. R. Bjorklund. Jan 78, 233p Rept nos. NASA-CR-2945, M-245

Contract NAS8-31841

Descriptors: \*Atmospheric diffusion, Univac 1108 computer, User manuals (Computer programs), Computer programs, Environmental tests, Rocket exhaust, Shear layers, Space shuttles.

Identifiers: Concentration(Composition), \*Exhaust emissions, \*Air pollution sampling.

The cloud-rise preprocessor and multilayer diffusion computer programs were used by NASA in predicting concentrations and dosages downwind from normal and abnormal launches of rocket vehicles. These programs incorporated: (1) the latest data for the heat content and chemistry of rocket exhaust clouds; (2) provision for the automated calculation of sur-face water pH due to deposition of HCI from precipitation scavenging; (3) provision for automated calculation of concentration and dosage parameters at any level within the vertical grounds for which meteorological inputs have been specified; and (4) provision for execution of multiple cases of meteorological data. Procedures used to automatically calculate wind direction shear in a layer were updated.

N78-18623/6CP PC A04/MF A01 M&S Computing, Inc., Huntsville, Ala. Wisp Information Display System User'S Manual. Final Report.

P. L. Alley, and G. R. Smith. 30 Jan 78, 68p Rept nos. NASA-CR-150541, REPT-77-042 Contract NAS8-32024

Descriptors: \*Display devices, \*Information systems, \*User manuals (Computer programs), \*Wind shear, Data acquisition, Data storage, Laser doppler velocimeters, Magnetic tapes. Identifiers: WISP System.

The wind shears program (WISP) supports the collection of data on magnetic tape for per-manent storage or analysis. The document structure provides: (1) the hardware and software configuration required to execute the WISP system and start up procedure from a power down condition; (2) data collection task, calculations performed on the incoming data, and a description of the magnetic tape format; (3) the data display task and examples of displays obtained from execution of the real time simulation program; and (4) the raw data dump task and examples of operator actions required to obtained the desired format. The procedures outlines herein will allow continuous data collection at the expense of real time visual displays.

N78-21692/6CP PC A02/MF A01 Systems and Applied Sciences Corp., Riverdale, Md.

Software Development: Stratosphere Modeling.

Final Report.

H. C. Chen. 9 Dec 77, 14p Rept nos. NASA-CR-156722, R-SAD-12/77-34 Contract NAS5-24255

Descriptors: \*Atmospheric chemistry. \*Atmospheric models, \*Ozone, \*Stratosphere, Transport theory, Computer programs, Mathe-matical models, Photochemical reactions, Radiation, Stratosphere.

A more comprehensive model for stratospheric chemistry and transport theory was developed for the purpose of aiding predictions of changes in the stratospheric ozone content as a consequence of natural and anthropogenic processes. This new and more advanced stratospheric model is time dependent and the dependent variables are zonal means of the rele-vant meteorological quantities which are func-tions of latitude and height. The model was constructed by the best mathematical approach on a large IBM S360 in American National Standard FORTRAN. It will be both a scientific tool and an assessment device used to evaluate other models. The interactions of dynamics, photochemistry and radiation in the stratosphere can be governed by a set of fundamental dynamical equations.

PC A05/MF A01 N78-21694/2CP National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

User'S Guide to the Nimbus-4 Backscatter UItraviolet Experiment Data Sets. B. E. Lowrey. Jan 78, 96p Rept no. NASA-TM-

78069

Contract NAS5-23854

\*Backscattering, Descriptors: \*Ozone. \*Ultraviolet radiation, Nimbus 4 satellite, Computer programs, Data bases, Manuals, Statistical tests.

The first year's data from the Nimbus 4 backscatter ultraviolet (BUV) experiment have been archived in the National Space Science Data Center (NSSDC). Backscattered radiances in the ultraviolet measured by the satellite were used to compute the global total ozone for the period April 1970 - April 1971. The data sets now in the NSSDC are the results obtained by the Ozone Processing Team, which has processed the data with the purpose of determining the best quality of the data. There are four basic sets of data available in the NSSDC representing various stages in processing. The primary data base contains organized and cleaned data in telemetry units. The radiance data has had most of the engineering calibrations performed. The detailed total ozone data is the result of computations to obtain the total ozone; the Compressed Total Ozone data is a convenient condensation of the detailed total ozone. Product data sets are also included

N78-23650/2CP PC A06/MF A01 Geophysical Observatory, Christchurch (New Zealand). Physics and Engineering Lab. A Program for Reading Ionospheric Data L. A. Tomlinson. Nov 77, 109p Rept no. REPT-540

Descriptors: \*Computer programs, \*Ionospherics, Data systems, PDP computers, Data acquisition, Data storage, Fortran, Minicomputers, Subroutines.

Identifiers: PDP-11 computers, New Zealand.

A PDP 11 minicomputer with an XY digitising table was programmed so that the relevant points from a record were directly entered into the computer. The data were stored in a file on disk for subsequent processing and, finally, the production of tabulated data sheets for publication.

N78-23668/4CP PC A02/MF A01 Royal Netherlands Meteorological Inst., De Bilt. Computer Program for Calculation of the In-cident Radiation Per Day on a Horizontal Surface at the Edge of the Atmosphere een Computerprogramma voor Het Berekenen van de Inkomende Straling Aan de Rand van de At-mosfeer Per DAG Door een Horizontaal Oppervlak.

H. A. R. Debruin. Apr 77, 21p Rept no. KNMI-V-294

Language in Dutch.

Descriptors: \*Atmospheric radiation, \*Computer programs, \*Incident radiation, Daytime, Declination, Latitude, Sunlight. Identifiers: Solar radiation, Netherlands.

A program is described for the calculation of the incident solar radiation per day on a horizontal surface at the edge of the atmosphere as a function of the location on earth (latitude) and the day number. By-products of this program are declination and sun length, as well as day length and the distance earth-sun as function of latitude and day number for an average year. The program was written for meteorological applications.

N78-23788/0CP PC A03/MF A01 Royal Netherlands Meteorological Inst., De Bilt. Description of Automatic Plotting Computer Programs Beschrijving van Het Programmapakket T.B.V. Het Automatisch Plotten. G. D. G. Folkers. 1977, 28p Rept no. KNMI-V-292 Language in Dutch.

Descriptors: \*Computer programming, \*Meteorological charts, \*Plotting, Aerology, ALGOL, Digital computers, Plotters, Water waves.

Identifiers: Burroughs 6700 computers, Computer aided mapping, Netherlands.

Automatic plotting programs for wave maps, detail maps, rain maps, aerology, and aerology/temps are described. The programs are written in Burroughs Extended ALGOL (BEA) for use on a Burroughs B6700 computer. The output consists of plotfiles stored on disks using the Xynetics basic software package. The plotfiles can be used on a Xynetics plotter. The program package being quite large, the listings have not been printed in the document.

N78-24754/1CP PC A03/MF A01 City Univ. of New York. Dept. of Earth and Planetary Sciences. Simulations of the Monthly Mean Atmosphere for February 1976 with the Giss Model. J. Spar, and R. J. Lutz. 1978, 39p Rept nos. NASA-CR-157158, CONTRIB-105

Contract NGR-33-013-086

Descriptors: \*Atmospheric models, \*Computerized simulation, \*Weather forecasting, Climatology, Computer programs, Troposphere.

Identifiers: GISS model, Atmospheric temperature.

Monthly mean simulations of the global atmosphere were computed for February 1976 with the GISS model from observed initial conditions. In a replication experiment, two of these computations generated slightly different monthly mean states, apparently due to the schedule of interruptions on the computer. The root-mean-square errors of replication over the Northern Hemisphere were found to be about 2 mb, 20 m, and 1 K for sea-level pressure, 500 mb height, and 850 mb temperature, respectively. The monthly mean 500 mb forecast results for February 1976 over the Northern Hemisphere were consistent with those from earlier GISS model experiments.

ORNL/CSD/TM-40 PC A02/MF A01 Oak Ridge National Lab., Tenn. WNDROS: A Program for Displaying Wind

Rose Data E. C. Schlatter. Mar 78, 22p

Contract W-7405-ENG-26

Descriptors: \*Computer codes, \*Wind, Computer graphics, Data processing, Display devices, Fortran, Spatial distribution, Velocity, W codes.

Identifiers: ERDA/500100, WNDROS computer program.

The FORTRAN IV program WNDROS uses the computer graphics system DISSPLA to produce a wind rose plot. The plot indicates wind frequency at a site as a function of wind speed and direction as read from Star data listings of the Environmental Data Service, National Climatic Center, NOAA. Options are available which allow the user to control the final appearance of the plot. A program description, user's guide, a data sample, a finished plot, and FORTRAN and JCL listings are included. (ERA citation 03:035933)

ORNL/NSF/EATC-17 PC A06/MF A01 Oak Ridge National Lab., Tenn. Comprehensive Atomospheric Transport and

Diffusion Model. W. M. Culkowski, and M. R. Patterson. Apr 76,

117p Contract W-7405-eng-26

Descriptors: 'Air pollution, 'Plumes, 'Sulfur dioxide, 'Mathematical models, Aerosols, Computer codes, Diffusion, Earth atmosphere, Environmental effects, Forecasting, Mass transfer, Meteorology, Power plants, Tennessee. Identifiers: ERDA/500200, ERDA/200202,

dentifiers: ERDA/500200, ERDA/200202, \*Atmospheric diffusion.

A comprehensive version of the Atmospheric Transport Model is described that includes the effect of aerodynamic roughness on dispersion constants, clarifies the roles of the terminal velocity and deposition velocity, incorporates a tilting plume for heavy particulates, and includes an episodic calculation of exposure maxima. This model also limits the maximum value of the dispersion constants in order to retain the emitted material in the planetary boundary later. The structure of the program has been modularized in order to clarify the flow of calculation and allow more flexibility. Values for atmospheric concentration as well as both wetfall and dryfall deposition are calculated. The model is applied to the vicinity of three power plants, and correlations between model predictions and observed values are presented. (ERA citation 01:014370)

ORNL/NSF/EATC-21 PC A05/MF A01 Oak Ridge National Lab., Tenn.

SULCAL: A Model of Sulfur Chemistry in a Plume

C. F. Baes, Jr, J. T. Holdeman, and W. M. Culkowski. Apr 76, 78p Contract W-7405-eng-26

Descriptors: \*Computer codes, \*Fossil-fuel power plants, \*Air pollution, \*Plumes, \*Sulfur dioxide, Aerosols, Ammonia, Ammonium sulfates, Chemical effluents, Chemical reactions, Droplets, Mathematical models, Oxidation, Oxygen, Ozone, Ph value, S codes, Sulfates, Sulfites, Sulfur trioxide. Identifiers: ERDA/010900, ERDA/200202, ERDA/500200, \*Atmospheric chemistry, Sulfuric acid, SULCAL model.

A computer program has been written that models the following features of the chemical behavior of sulfur emitted to the atmosphere from fossil-fuel burning power plants: (1) the rapid reactions of SO sub 2 with aerosol droplets to produce the dissolved sulfite species H sub 2 SO sub 3 ,HSO sub 3- and SO sub 32-; (2) the rapid reactions of SO sub 3 to produce the dissolved sulfate species HSO sub 4- and SO sub 42- ; (3) the neutralization of the acid thus produced by atmospheric ammonia and (4) the eventual formation of particulate ammonium sulfate; (5) the slow oxidation of SO sub 2 to sulfate species by hydroxyl radical, and (6) the slow oxidation of species of SO sub 2 in aerosol droplets to sulfate species by dissolved ozone and oxygen. The model employs averaged concentrations based on the Gaussian plume and can calculate deposition rates for gaseous and particulate material as a function of such variables as distance from the source, wind speed, meterological stability class, temperature, relative humidity, and the ambient concentrations of OH radical, ozone, and ammonia. (ERA citation 01:015492)

# ORNL/TM-5201

Oak Ridge National Lab., Tenn. Oak Ridge Fog and Drift Code (ORFAD) User's Manual M. E. LaVerne, Jan 77, 118p Contract W-7405-ENG-26 Microfiche copies only.

MF A01

Descriptors: \*Computer codes, \*Cooling towers, \*Fog, \*Plumes, Climates, Computer calculations, Daily variations, Diffusion, Environmental effects, Gaseous wastes, Gaussian processes, Meteorology, O codes, Seasons, Thermal effluents, Vapor condensation, Water vapor.

Identifiers: ERDA/500400, ERDA/200200, Gaussian plume models, Mathematical models, Atmospheric diffusion, Programming manuals, ORFAD computer program.

ORFAD is a computer program written for the purpose of providing estimates of fog and drift resulting from the operation of wet cooling towers. The program uses hourly weather data from tapes. The physical and calculational models are described, and detailed instructions are given for input preparation and running the program. A program listing and sample output are appended. (ERA citation 02:030816)

PB-191 189/CP HC E01 MF A01 National Environmental Satellite Center, Washington, D.C.

Mapping of Geostationary Satellite Pictures: An Operational Experiment.

Technical memo. R. C. Doolittle, C. L. Bristor, and L. Lauritson.

Mar 70, 44p Rept no. NESCTM-20

Descriptors: \*Meteorological satellites, Cloud cover, \*Aerial photographs, Data processing systems, Aerial photographs, Computer programs, Photographic images, Stereoscopic photography, Photographic techniques. Identifiers: ATS-I satellite, \*Spaceborne photography.

Spin scan cloud pictures from the ATS-I geostationary satellite were mapped for daily operational experimental use during the period from June to December 1969. The details of this continuing experiment are discussed herein. Computer programs are used, first to preprocess the digitized image data to produce a geometrically normalized picture, then to map the normalized image on Mercator or polar stereographic projections. In the summary, recommendations are made for operational processing of data from the projected operational geostationary satellite, and some speculative suggestions are advanced in regard to the possibilities for expanded computer processing in the future. (Author)

PB-191 870/CP HC E01 MF A01 Nebraska Univ., Lincoln. Agricultural Experiment Station.

Computer Program for Plotting Time Dependent Data with Instruction and Examples. K. W. Brown, and Norman J. Rosenberg. Jul 69,

34p\* MP-23, OWRR-A-001-NEBR(4)

Descriptors: \*Micrometeorology, Data processing systems, \*Plotters, Computer programs, Input-output devices. Identifiers: TIMEPLOT computer program.

The use of multichannel automatic data recorders has necessitated the development of techniques for rapid analysis and presentation of data. A computer program was developed to
plot time dependent data from a storage matrix. The body of the program, entitled TIMEPLOT, is written in FORTRAN IV. To minimize the run time required, the input and output subroutines are written in F level COBOL. Time, which may range from 1 hour to 16 days, is plotted on the abscissa. The program computes the intervals at which labels are placed and determines the required annotation. Data may be plotted as frequently as one observation per minute or as infrequently as one observation per day. The ordinate may represent any parameter. A single parameter may be plotted or several parameters may be superimposed upon each other. Combinations may be arranged on a single time axis. The program was designed with special features to facilitate the plotting of microclimatic, micrometeorological, and other types of time-dependant data. Plots drawn in india ink may be photographically reduced for use in reports and journal articles. Associated utility programs are also described. (Author)

PB-192 757/CP HC E01 MF A01 EG and G, Inc., Boulder, Colo. Environmental

Services Operation. A Parameterized Numerical Model of Orographic Precipitation. Paul T. Willis. 28 Jan 70, 95

Contract DI-14-06-D-5640

Descriptors: \*Atmospheric precipitation, Mathematical models, Atmospheric motion, Condensation, Clouds, Air mass analysis, Water vapor, Nucleation, Artificial precipitation, Atmospheric temperature, Flow fields, Mountains, Ice, Computer programs. Identifiers: Cloud seeding.

The model described in the report calculates the steady state field of vertical velocity over an orographic barrier, the production of cloud water by this vertical velocity field, the conver-sion of this cloud water to hydrometeor water and the subsequent trajectory of this hydrometeor water to the surface. (Author)

PB-202 199/CP PC E01 MF A01 Denver Univ., Colo. Dept. of Geography. The Development of Computer Programs Applicable to Meaningful Precipitation Management Experiments

Final rept. William A. Peterman. 1 Jul 71, 101p REC-14-06-D-6646-F

Contract DI-14-06-D-6646 Errata sheet inserted.

Descriptors: \*Weather modification, \*Computer programming, \*Weather forecasting, Mathe-matical prediction, Cloud physics, Cloud seedmatical prediction, Cloud physics, Cloud seed-ing, Precipitation(Meteorology), Decision mak-ing, Management engineering, Atmospheric sounding, Computer programs, Numerical analysis, Meteorological data.

Identifiers: Numerical weather forecasting, Skywater project.

Computer programs have use in precipitation management experiments. Operational use of computers and computer products has been limited, however, because of several limitations which restrict their use. Scientists conducting precipitation management operations need user-oriented computer products specifically designed for their needs. Several numerical models and programs have been studied and tested. A philosophy for the field use of computers has been developed. From this has grown a system for transmitting data and computer products to field users. This system has undergone a series of field tests and has been carefully evaluated. This system has been made operational by the Bureau of Reclamation, and its data and computer programs are currently available to all Project Skywater field programs. (Author)

PB-206 938/CP PC E01/MF A01 Research Corp. of New England, Hartford, Conn.

A Regional Air Quality Simulation Model (A Description of the Connecticut Air Pollution Model as Developed by the Travelers Research Center)

Norman E. Bowne, and G. D. Robinson. Sep 71, 81p\* APTD-0930

Contract CPA-70-155

Prepared in cooperation with the Center for the Environment and Man, Inc., Hartford, Conn.

Descriptors: \*Air pollution, \*Atmospheric models, Computer programs, Sources, At-mospheric composition, Atmospheric diffusion, Mathematical models Concentration(Composition), Wind(Meteorology), Connecticut.

An air quality model which assumes a form of solution of the equation for a single source, inserts appropriate empirical parameters, and sums the solutions over all sources is described. Three categories of source are recognized in the model: major, intense, discontinuous, i.e., point and line, sources (examples are the stacks of electrical generating or other major industrial plants and highways, etc.); numerous minor sources which are treated as continuous area sources; and sources beyond the boundary of the model. Special devices, effectively a sub-model, which were needed to deal with the proximity of very large sources, unknown in detail, in the area of New York City are described. (Author)

PB-209 290/CP PC E01/MF A01 Systems, Science and Software, La Jolla, Calif. A Particle-In-Cell Method for Numerical Solution of the Atmospheric Diffusion Equation, and Applications to Air Pollution Problems. Volume I Final rept.

R. C. Sklarew, A. J. Fabrick, and J. E. Prager. Nov 71, 173p 3SR-844-Vol-1, APTD-0952 Contract DI-68-02-0006

Descriptors: \*Air pollution, \*Atmospheric diffusion, Smog, Turbulent diffusion, Mathematical models, Computer programming, Carbon monoxide, Photochemical reactions, Lagrange equations of motion, California. Identifiers: Los Angeles(California), NEXUS computer code, PICFIC computer code.

The document reports the development and initial applications of a new method for the solution of the turbulent atmospheric diffusion equation. The method, called PICK, is based on the use of Langrangian mass points and is one of a family of Particle-in-Cell techniques for the solution of partial differential equations. The purpose of the study was the development of the PICK method and the demonstration of the method in the solution of evaluation test cases and actual air pollution problems. Test cases for the evaluation of feasibility and accuracy and for comparison to finite difference solutions were conducted with a two-dimensional computer code PICFIC. For actual air pollution studies, the PICK method was used in the three dimensional code NEXUS. The description of NEXUS and its application to the simulation of CO in Los Angeles is given. The NEXUS/P code was developed to solve equations with photochemical terms. NEXUS/P's description and its application to photochemical fog in Los Angeles is described. (Author)

PB-210 702/7CP PC A05/MF A01 EG and G Inc., Boulder, Colo. Environmental Services Operation. Environmental Potentiai Modifications

Produced by Large Evaporative Cooling Towers Water pollution control research series.

Jan 71, 80p EPA-16130-DNH-01/71 Contract FWPCA-14-12-542

Paper copy available from GPO \$0.75 as EP2.10:16130DNH01/71.

Descriptors: \*Cooling towers, \*Plumes, \*Air pol-Iution, Heat, Water vapor, Fog, Humidity, Mathematical models, Computer programs, At-mospheric diffusion, Cloud physics, Topog-raphy, Cloud seeding, Site surveys. Identifiers: \*Thermal pollution.

A readily usable model was developed for evaluating the extent of plumes from large evaporative cooling towers. Mathematical models were used to describe the dynamics of the wet cooling tower plume and its interaction with the environment. Primary emphasis was placed on predicting the height of the plume. Classical atmosphere diffusion theory was used to determine the downwind spread. The saturation deficit of the atmosphere controls the downwind spread of and fogging used by the plume. A map of the U.S. indicating locations of potential adverse atmospheric effects due to cooling towers can be used in conjunction with local data. Appendix contains a description of the computer program, including input specifications.

PB-211 232	/CP	PC E01/MF A01		
Transport	and	Road	Research	Lab.,
Crowthorne				

A Program for Calculating Thiessen Average Rainfall

A. O. Grigg. 1972, 21p Rept no. TRRL-LR-470

Descriptors: \*Rainfall, Average, \*Computer programs, Rainfall, FORTRAN, Rain gages, Polygons, Great Britain, Hydrology.

The report describes a digital computer program for the determination of the mean rainfall over an area using the Thiessen method. The area can be of any shape and there is no necessity for the rain-gauge network to be the same for all storms. It is suggested that the program may have applications outside the field of hydrology. (Author)

PC E01/MF A01 PB-211 806/CP Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

**Digital Simulation of Thunderstorm Rainfall** Partial completion rept.

Unal A. Sorman, and James R. Wallace. Aug 72, 194p ERC-0972, OWRR A-036-GA(1)

Descriptors: \*Rainfall intensity, Digital simulation, \*Thunderstorms, Rainfall, Storms, Atomospheric disturbances, Spatial distritution, Hydrology, Coastal topographic features, Mathematical models, Stochastic processes, Georgia, Computer programs, FORTRAN. Identifiers: Little River watershed, Tifton(Georgia).

The purpose was to obtain a better understanding of the temporal and spatial variability of thunderstorm rainfall and to develop a digital model for the stochastic simulation of thunderstorm rainfall for the Southeast Coastal Plain areas. Rainfall patterns were thoroughly analyzed from rainfall data made available by the Agricultural Research Service, U. S. Department of Agriculture. Statistical properties and frequency distritutions of rainfall cell characteristics, such as cell duration, size, spatial and temporal distribution of rainfall intensity, cell movement, and the number and orientation of cells, were analyzed. A digital model of thunderstorm rainfall was formulated from observed storm cell characteristics and the parameters of the model were evaluated from isolated thunderstorms. (Author)

PB-213 091/2CP PC E01/MF A01 Stanford Research Inst., MenIo Park, Calif.

User's Manual for the APRAC-1A Urban Diffusion Model Computer Program R. L. Mancuso, and F. L. Ludwig. Sep 72, 122p\*

CBC-CAPA-3-4

Contract CAPA-3-68(1-69)-CRC

Sponsored in part by Environmental Protection Agency.

Descriptors: \*Urban areas, Air pollution, \*Air Descriptors: Orban areas, Air poliution, Air pollution, \*Atmospheric motion, \*Highway transportation, Air pollution, \*Computer pro-grams, Programming manuals, Handbooks, At-mospheric diffusion, Mathematical models, Wind(Meteorology), Exhaust gases, Carbon monoxide, Streets, Concentra-tion(Composition), FORTRAN.

Identifiers: Automobile exhaust, CDC 6400 computers, APRAC 1A computer program, IBM 360/50 computers, \*Computerized simulation.

The APRAC-1A diffusion model was developed as a versatile and practical model for computing the concentrations of pollutants at any point within a city. The model calculates pollutant contributions from diffusion on various scales, including: extraurban diffusion, mainly from sources in upwind cities; intraurban diffu sion from freeway, arterial, and feeder street sources: local diffusion of emissions within a street canyon. The model treats only carbon monoxide (CO), a relatively inert gas in the atmosphere but an important pollutant in terms of health. Motor vehicles are the major source of this gas. (Author)

PB-225 123/9CP PC A09/MF A01 North Carolina Water Resources Research Inst., Raleigh.

Precipitation Variability Over North Carolina W. J. Saucier, A. H. Weber, and C. K. Bayne. Aug 73, 198p UNC-WRRI-73-84, OWRR-A-061-NC(3) Contract DI-14-31-0001-3833

Prepared by North Carolina State Univ., Raleigh.

Descriptors: \*North Carolina, \*Precipitation (Meteorology), Periodic varia-Computer programs, Tables(Data), tions. Probability theory. Identifiers: Numerical weather forecasting, OWRR.

Variability of precipitation is analyzed in detail for records of 40 to 50 years or more. The probability of occurrence of wet or dry days is calculated for various thresholds of rainfall. Using the Freyerherm-Bark model, tables of initial and transitional probabilities and con-fidence limits are calculated. Tables of sequences of wet and dry days are also calculated. Computer programs and example problems are presented. Monthly total precipitation is calculated by station and tables and maps are given for the monthly means and of variance about the means. Long-term variations in precipitation were found in analyzing 40-year data series. Variations due to tropical storms are also analyzed. Conclusive evidence is presented that long-term variations do occur and affect nearby locations quite differently.

PB-226 513	/0CP	PC A02/MF A01				
Transport	and	Road	Research	Lab.,		
Crowthorne (England).						
Estimated	Rainfal	I for Dra	inage Calcul	ations		
in the United Kingdom						

C. P. Young. 1973, 25p Rept no. TRRL-LR-595

Descriptors: \*Rainfall, \*Estimating, \*Sewers, \*Design criteria, Rainfall intensity, Statistical data, Tables(Data), Great Britain, Computer programs, FORTRAN. Identifiers: FORTRAN 4 programming Ian-

guage, GBRRL

The report gives tables of rainfall from the Bilham rainfall formula taking account of the latest work of the Meteorological Office together with an algorithm for calculating the figures. The rainfall profile used in most of the computer programs based on TRRL hydro-graph method of sewer design is also given. (Author)

PB-227 346/4CP PC A07/MF A01 National Environmental Research Center, Research Triangle Park, N.C. Control Systems Lab

User's Guide for the Climatological Dispersion Model

A. D. Busse, and J. R. Zimmerman. Dec 73, 137p\* Rept no. EPA-R4-73-024

Descriptors: \*Air pollution, \*Atmospheric motion, \*Climatology, Mathematical models, Com-puter programs, FORTRAN, Algorithms, Atmospheric composition, Concentration(Chemistry).

Identifiers: Climatological Dispersion Model, IBM 360/370 computers, EPAO.

The Climatological Dispersion Model (CDM) determines long-term (seasonal or annual) quasi-stable pollutant concentrations at any ground-level receptor using average emission rates from point and area sources and a joint frequency distribution of wind direction, wind speed, and stability for the same period. This model differs from the Air Quality Display Model (AQDM) primarily in the way in which concentrations are determined from area sources, the use of Briggs' plume rise formula, and the use of an assumed power law increase in wind speed with height that depends on the stability. The material presented in directed toward the engineer familiar with computer techniques and will enable him to perform calculations with the CDM. Technical details of the computer programming are discussed; complete descriptions of input, output, and a test case are given. Flow diagrams and a source program listing are included. Campanion papers on the technical details of the model and on validation are included as appendices. (Author)

# PB-229 771/1CP

CP T03 National Environmental Research Center, Research Triangle Park, N.C. Meteorology Lab. Users Network for Applied Modeling of Air Pollution (UNAMAP) Rept. for 1 Mar 73-1 Mar 74.

A. D. Busse, P. E. Ruff, and D. B. Turner. 1 Mar 74, 1 reel mag tape, Rept no. UNAMAP-001 See also PB-213 091.

Specify tape recording mode desired: 7 track, 556 or 800 BPI, odd and even parity; or 9 track, 800 BPI, odd parity.

Descriptors: \*Air pollution, \*Urban areas, \*Mathematical models, \*Magnetic tapes, FOR-TRAN.

Identifiers: FORTRAN 4 programming lan-guage, IBM 360 computers, NERC.

The single reel of magnetic tape contains (9) files of data relevant to the UNAMAP air quality models. The first file contains brief descriptions of the models. The second through seventh UNAMAP models, APRAC, HIWAY, CDM, PTMAX, PTDIS, and PTMTP respectively. The eighth file is a test set of emission inventory and meteorological data for CDM; the ninth file contains similar data for APRAC. The remainder of the models are interactive where the data is supplied by the user upon prompting by the master program. Mnauals are being prepared for the models and will have spearate NTIS accession numbers. The Fortran IV source code is self-documenting with frequent comments. The source computer and operating system is an IBM 360-OS. The tape recording mode is 9 track, 800 bits per inch, EBCDIC code, odd pari-ty. Physical records each contain 10 logical records in card image format (i.e. 80 byte logical records; 800 byte block size). The tape can

be copied to 7 track form without loss of data. (Author)

PB-232 445/7CP PC A10/MF A01 Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept. Natural Precipitation Washout of Sulfur Compounds from Plumes

Final rept.

M. Terry Dana, J. M. Hales, W. G. N. Slinn, and M. A. Wolf, Jun 73, 215p\* EPA-R3-73-047

Descriptors: \*Air pollution, \*Sulfur dioxide, \*Electric power plants, Plumes, Sulfates, Rain, Acidity, Models, Computer programs, FOR-TRAN

Identifiers: \*Precipitation washout.

This report describes field measurement and modeling of the washout of SO2 and sulfate from plumes. Field measurements of precipitation washout were conducted in conjunction with both controlled test sources and actual power plant plumes. A primary achievement of this work has been the formulation of an SO2 washout model, which predicts rain-borne SO2 concentrations that agree favorably with those observed. An approximate theoretical analysis of sulfate washout in conjunction with field observations indicates that sulfate formation and scavenging exhibit a strong inverse dependence on acidity levels in the background rain. (Modified author abstract)

#### PC A04/MF A01 PB-233 674/1CP

Hawaii Univ., Honolulu. Water Resources Research Center.

Some Statistical Analyses of Hawaiian Rainfall

Technical rept. 1 Jul 70-30 Jun 71 Edmond D. H. Cheng, and L. Stephen Lau. Aug 73, 64p TR-72, OWRR-A-029-HI(1) Contract DI-14-01-0001-3011

Descriptors: "Rainfall, "Watersheds, "Hawaii, Rainfall intensity, Regression analysis, Precipitation(Meteorology), Seasonal variations, Correlation techniques, Stability, Rain gages, Oahu Island, Computer programs, FOR-TRAN.

Monthly rainfall data of several stations in Kalihi Basin, Manoa Basin, and Kaneohe Area, all on Oahu, and the central sloping area of Molokai were correlated to watershed parameters of the areas. Distance measured from the station to a common station located seaward from all stations has proven to be the most important of the three parameters studied, the other two being the exposure and the elevation of the area. Both linear and nonlinear regression functions were developed. The central tendency of the monthly rainfall for the high rainfall part of the southeastern part of the Island of Oahu was found to require approximately forty years of record to stabilize. The intensity-duration rela-tion of intense rain for specified recurrence interval for the high rainfall part of the Manoa Basin portrays accurately an inverse straightline relationship on a plot of log-log coordinates, suggesting extension of effort to other climatically widely different regions in Hawaii.

PB-236 902/3CP PC A03/MF A01 Geological Survey, Tacoma, Wash. Water

Resources Div. Direct Beam Solar Radiation. A Digital Computer program

Lowell A. Rasmussen. Oct 74, 47p Rept no. USGS/WRD-74-036

Descriptors: \*Solar radiation, \*Transmissivity, Computer programs, Atmospheric refraction, FORTRAN

A digital computer program is described that provides bihourly direct beam solar radiation

values (langleys/minute) and daily totals (langleys) for one or more sites anywhere on the Earth, for one or more days of the year, for eight different atmospheric transmissivity values. The site may have arbitrary elevation above sea level, and the horizon may be arbitrarily modified topographically; the plane of the site may have arbitrary inclination from the horizontal, including vertical. The program gives the (truc solar) times of sunrise and sunset, as well as of the beginning and conclusion of other topographic obstructions of the Sun. Care has been taken in the FORTRAN coding to enhance the ease of installation of the program on the widest possible selection of computers, both existing and anticipated, of the preparation of input data and the use of the output data, and of possible modification of the program to serve specialized purposes.

PB-238 948/4CP PC A09/MF A01 Northwestern Univ., Evanston, III. Dept. of Civil Engineering.

A Stochastic Rainfall Model and Statistical Analysis of Hydrologic Factors Final rept. Apr 73-Sep 74

Ross B. Corotis. Dec 74, 188p\* Rept no. NUCE-ST74-15

Grant NSF-GK-37442

Descriptors: \*Thunderstorms, \*Rainfall, \*Flood forecasting, Surface water runoff, Mathemati-cal models, Stochastic processes, Probability theory, Floods, Statistical decision theory, Watersheds, Computerized simulation, Regression analysis, Damage, Urban areas, Stream flow Reviews.

Identifiers: STORM computer program.

The observed behavior of thunderstorm-type activity is used to formulate a multidimensional stochastic model for runoff-producing rainfall. In Part 1 of this report the physical model of observed activity is used to describe the thunderstorm process, and probability distributions are assigned to all random variables. This model follows the hourly development of storms in terms of thunderstorm clouds and rainfall-producing convective cells. The process is programmed, and use of the model illustrated. Part 2 approaches several different theoretical aspects associated with rainfall and runoff. A somewhat simplified thunderstorm model is used to derive a probability distribution for instantaneous rainfall, and several statistical relations are considered briefly. There is a state-of-the-art report on the effect of urbanization on both rainfall and runoff, and a statistical regression analysis relating flood damage to characteristics of the watershed basin, precipitation data, and streamflow data. Finally, the use of statistical decision theory analysis is illustrated.

PB-239 268/6CP PC A06/MF A01 Kentucky Water Resources Inst., Lexington. Stochastic Simulation of Daily Rainfall Research rept. Jul 72-Jun 74 David M. Allen, C. T. Haan, Don Linton, Jim Street, and David Jordan. Jan 75, 121p RR-82,

OWRT-A-045-KY(1) Contract DI-14-31-0001-3817, DI-14-31-0001-

4017

Descriptors: \*Rainfall, \*Water \*Kentucky, Stochastic processes, supply, Markov chains, Probability theory, Estimates, Mathe-matical models, Precipitation(Meteorology), Design, Computerized simulation, Computer programs.

The design of many water resources projects requires knowledge of possible long-term rain-fall patterns. A stochastic model based on a first order Markov chain was developed to simulate daily rainfall at a point. The model is applicable to any point in Kentucky (and other areas with similar rainfall patterns). The model in its present form is useful in providing rainfall in-puts into hydrologic models for designing water supply facilities and other water resources systems. The model uses historical rainfall data to estimate the Markov transitional probabilities. A separate matrix is estimated for each month of the year. In this report 7 x 7 transitional probability matrices were used. The model is capable of simulating a daily rainfall record of any length based on the estimated transitional probabilities and frequency distributions of rainfall amounts within each class interval. The simulated data have statistical properties similar to historical data.

PB-239 797/4CP PC A10/MF A01 Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.

**Bidimensional Spectral Analysis of Rainfall** Events

Alonso E. Rhenals-Figueredo, Ignacio

Rodriguez-Iturbe, and John C. Schaake, Jr. Nov 74, 217p 193, R-74-59, OWRT-C-4118(9021)(8) Contract DI-14-31-0001-9021, Grant NOAA-4-36738

Descriptors: \*Rainfall, \*Storms, Patterns. Stochastic processes, Mathematical models, Interpolation, Spatial distribution, Fourier analysis, Correlation techniques, Computer programs, Autocorrelation, Harmonic analysis, Theses.

Total storm depths over a given area are assumed to be composed of a regional component, explaining the large-scale variations of rainfall, and a local component, explaining the small-scale variations. In order to study the characteristics of the regional component, a number of storms over a given area are analyzed. For each storm, a double Fourier analysis of the total storm depths is performed, and the principal harmonics of the storm are determined. This analysis is aimed to investigate whether or not there exists a persistent pattern in total storm depths over a given area. The local component, or storm residuals, is obtained by subtracting the periodic component of the storm from the total storm depths. It is assumed that the residuals of each storm are a sample function of a homogeneous random field, which, in principle, may be different for each storm. The analysis of the storm residuals has illustrated a methodology for the statistical analysis of areal rainfall data and the characterization of homogeneous isotropic random fields.

PB-239 944/2CP PC A04/MF A01 National Environmental Research Center, Research Triangle Park, N.C. Meteorology Lab. User's Guide for Hiway. A Highway Air Pollution Model Final rept.

John R. Zimmerman, and Roger S. Thompson. Feb 75, 68p\* Rept no. EPA/650/4-74-008

Descriptors: 'Highway transportation, 'Air pollution, \*Atmospheric motion, Highways, Mathematical models, Computerized simulation, Wind(Meteorology), Turbulent diffusion, Com-puter programs, FORTRAN. Identifiers: \*HIWAY Computer program.

A computer model, called HIWAY, that can be used for estimating the concentrations of nonreactive pollutants from highway traffic is described. This steady-state Gaussian model can be applied to determine air pollution concentrations at receptor locations downwind of at-grade and cut-section highways located in relatively uncomplicated terrain. The air pollution concentration representative of hourly averaging times at a downwind receptor location is found by a numerical integration along the length of each lane and a summing of the contributions from each lane. With the exception of receptors directly on the highway or within the cut, the model is applicable for any wind direction, highway orientation, and receptor location. The model was developed for situations in which horizontal wind flow occurs. The model cannot consider complex terrain or large obstructions to the flow such as buildings or large trees. An interactive version of the computer model is available on Environmental Protection Agency's Users' Network for Applied Modeling of Air Pollution (UNAMAP).

#### PB-240 273/3CP

CP T01 National Environmental Research Center, Research Triangle Park, N.C. Meteorology Lab. User's Network for Applied Modeling of Air Pollution (UNAMAP) Version 2 Models-Simulation

D. B. Turner, and Adrian Busse. 29 Nov 74, 1 reel mag tape EPA/DF-74/038

Specify tape recording mode desired: 9 track, 800 or 1600 bpi, odd parity, EBCDIC; or 7 track, 556 or 800 bpi, odd or even parity, BCD.

Descriptors: \*Models-simulation, \*Air pollution. \*Atmospheric diffusion, \*Highway transportation, Mathematical models, Magnetic tapes, FORTRAN.

Identifiers: \*HIWAY computer program.

This single reel of magnetic tape contains 2 files relevant to VERSION 2 changes to the UNAMAP air quality models. The first file contains all of the source code affected by the VER-SION 2 changes, in a partitioned or element-file format. Batch versions of all models were in-cluded and the HIWAY Model was entirely replaced. File 2 is sample test data for the batch versions. Manuals are available for APRAC and CDM. Accession Numbers for the publications are PB-213-091 and PB-227-346-AS, respectively. Manuals for HIWAY and the three point source models are available in draft form and should be published early 1975. The FORTRAN Source code is largely self-documenting and should be machine independent in most cases. Tape recording mode is 9-track, 800 frames per inch. EBCDIC code, odd parity. Physical records each contain 10 logical records (i.e., 10-card images per block). Tape can be copied to 7-track without loss of data.

PB-243 508/9CP

PC A03/MF A01 Hawaii Univ., Honolulu. Water Resources Research Center.

Methodological Approaches in Hawaiian Fog Research Technical rept.

James H. McKnight, and James O. Juvik. Mar 75, 40p TR-85, OWRT-A-041-HI(1) Contract DI-14-31-0001-4011

Descriptors: \*Fog, \*Precipitation(Meteorology), 'Hawaii, Moisture content, Hygrometers, Mountains, Particle size, Estimations, Mathematical models, Rainfall, Sampling, instruments, Wind(Meteorology), Computer programs, Spatial distribution.

Recent studies have demonstrated the important moisture contribution from fog precipitation and mountain areas on the island of Hawaii. Research methodologies useful in the study of Hawaiian upslope fog, were investigated, including; (1) Development of an improved fog gage; (2) development of indirect approximation methods for estimating average droplet sizes during precipitation episodes and separating fog and rainfall components; (3) establishment of an extensive fog sampling network on the island of Hawaii employing continuous recording equipment, for both rain, fog, and wind; (4) development of an original computer program for detailed temporal and spatial analysis of rain, fog, and wind parameters.

PC A03/MF A01 PB-244 760/5CP Alabama Agricultural Experiment Station, Auburn.

Scheduling and Application Rates of Irriga-tion in Humid Climate

C. D. Busch, and E. W. Rochester. Jun 75, 39p Bull 470, OWRT-A-025-ALA(3)

Descriptors: \*Irrigation, \*Humidity, \*Arid land, Weather forecasting, Scheduling, Mathematical models, Soil water, Probability theory, Cotton plants, Production, Rainfall, Field tests, Computer programs, Alabama. Identifiers: Water demand, Water utilization.

A four-year study of two irrigation scheduling methods and application rates was conducted to determine more efficient uses of supplemental water in a humid climate. One model based the decision to irrigate on weather forecast and soil moisture conditions; the other, irrigation by demand, based on soil moisture conditions only. Two application rates of 0.13 in/hr (low) and 0.43 or 0.7 in/hr (high) were used. A com puter program was developed to calculate soil moisture and predict irrigation needs in the forecast scheduling model. A 0.5 probability of rainfall greater than 0.5 inch was the lower limit. The weather forecast also provided the basis of deciding how much rainfall would be included in the soil moisture balance. The method of irrigation by demand improved production 160 lbs. of seed cotton per acre for each inch of water applied. Simulation studies following the field experiment supported the results of the field study.

PB-249 913/5CP PC A13/ME A01 Health Effects Research Lab., Research Triangle Park, N.C.

Annual Catalyst Research Program Report. Appendices. Volume VII

Annual program status rept. Jan-Sep 74. Sep 75, 281p Rept no. EPA/600/3-75/010h See also PB-249 908.

Descriptors: \*Automobiles, \*Air pollution control, "Air pollution, "Atmospheric chemistry, "Toxicology, "Exhaust emissions, Mathematical models, Gas analysis, Sulfuric acid, Sulfates, Smog, Catalysts, Aerosols, Highway transportation, Fuels, Palladium, Platinum, Computer programs, Atmospheric motion.

Identifiers: "Air pollution effects(Humans), HIWAY computer program, Smog chambers, Automobile exhaust, Saint Louis(Missouri), Los Angeles(California).

Contents: Inhalation toxicology; Meteorological modelling; Atmospheric chemistry.

PB-251 066/7CP PC A07/MF A01 JRB Associates, Inc., La Jolla, Calif. A Methodology for Treating Large Localized Emissions of Reactive Pollutants Final rept. A. J. Fabrick, P. I. Nakayame, and E. J.

Fredricksen. Feb 74, 136p EPA/650/4-74/006 Contract EPA-68-02-1238

Descriptors: \*Computerized simulation, \*Air pollution, \*Atmospheric diffusion, Boundary layer, Dispersions, Concentration(Composition), Plumes, Particles. Photochemical reactions, Transport properties, Mathematical models, Computer programs, Nitrogen oxides, Navier-Stokes equations, Numerical integration.

Identifiers: Gaussian plume model, \*VARMINT computer program.

This report presents the results of a study to develop a numerical model to accurately calcu-late the trajectories and concentrations of reactive pollutants emitted from localized sources. The numerical model employs the solution of

the full three-dimensional Navier-Stokes equations along with the solution of the species density equation by summing over Lagrangian mass points. The mass points are transported by the mean wind field and moved with a random walk technique that simulates the turbulent diffusion. The effect of chemical reactions are modeled by reweighing the Lagrangian mass points. The equations are solved for re-gions of space where terrain features or buildings may cause strong distortions in the flow field. The numerical techniques are verified by comparisons with analytic formulas. including the boundary layer above a plate and the Gaussian plume. The method was used to calculate photochemically reacting plumes using a simplified inorganic photochemical reaction model. Portions of this document are not fully legible.

PB-251 138/4CP PC A08/MF A01 Jet Propulsion Lab., Pasadena, Calif. Wind Field and Trajectory Models for Tornado-Propelled Objects Technical rept.

G. Redmann, J. Radbill, J. Marte, P. Dergarabedian, and F. Fendell. Feb 76, 166p EPRI-308-1

Descriptors: \*Tornadoes, Mathematical models, Aerodynamic characteristics, Boundary layer flow, Tropical cyclones, Dynamics, Trajectories, Vortices, Computerized simulation, Degrees of freedom, Tumbling, Computer programs, Nuclear power plants, Safety engineering. Identifiers: Six degrees of freedom.

As part of a research program to develop a mathematical model to bound the impact characteristics of tornado-propelled objects based on verifiable experimental data, this phase consists of the following tasks: (1) Define the worst-case tornado and its associated wind field; (2) survey the availability of aerodynamic coefficients for the postulated missiles; (3) develop a model which will evaluate the sensitivity of the preimpact characteristics to uncertainties in the aerodynamic data; (4) identify significant areas requiring additional research. This report presents in great detail the physical characteristics, conditions, and mathematical formulations upon which the worst-case tornado, its associated wind field and the trajectory model are based.

PB-251 703/5CP PC A10/MF A01 Environmental Research and Technology, Inc., Westlake Village, Calif. Western Technical Center. Design of the Sulfate Regional Experiment (SURE). Volume ill: Appendices Final rept. Feb 76, 216p EPRI/EC-125-Vol-3 Paper copy also available in set of 4 reports as PB-251 700-SET, PC E99. \*Sulfates.

Descriptors: \*Sulfur oxides, \*Nitrogen oxides, Laboratory equipment, Re-Nitrogen oxides, Laboratory equipment, He-gions, Particles, Atmospheric chemistry, United States, Combustion products, Fossil fuels, Electric power plants, Tables(Data), Chemical analysis, Computer programs, Air filters, Aerometers, Fossil fuel power plants. Identifiers: "Sulfate regional experiment, \*Air pollution standards, \*Air quality data.

This planning study - Design of the Sulfate Re-gional Experiment (SURE) - was conducted on project RP 485 to determine ways of predicting the impact of emissions from fossil fuel combustion by the electric utilities industry on ambient sulfate, nitrate and related concentrations in a large region downwind of groups of major sources. The end goal of the analysis and interpretation of seven specific hypotheses is the adoption and verification of an air guality model which will be used to investigate the relation between sulfur oxide emissions and ambient sulfate concentrations, and, to a lesser extent, the relation between NOx emissions and ambient nitrate. The results are presented in four volumes. This report (volume 3) is a compilation of technical appendices. Topics considered in-clude the following: Description and evaluation of laboratory analytical procedures; Archive of aerometric data; Inventory of sulfur dioxide emissions; Sulfate measurement technology; and, User's manual to the air trajectory box model.

PB-252 385/0CP

PC A03/MF A01 Texas A and M Univ., College Station. Dept. of Aerospace Engineering. Load Introduction into Pressurized Films Final rept.

James L. Rand. Dec 75, 50p Rept no. TAMRF-921-7501

Contract NCAR-1-73

Descriptors: \*Meteorological balloons, \*Stress analysis, Loads(Forces), Stress concentration, Polymeric films, Computer programs, FOR-TRÁN.

This report presents a numerical method for predicting the distribution of stresses in a superpressure balloon system manufactured from a homogeneous, isotropic, elastic film sufficiently pressurized to prevent geometric instabilities. A computational model of the problem was established in the area of load attachment by considering a rectangular region subjected only to an in-plane load at the corner and neglecting any effects of curvature. The grid size is sufficient to obtain detailed stress distributions in and around seams and load patches. Results are presented for two particular load patches as well as the stresses associated with three different seam to film stiffness ratios. As expected the results indicated the most highly stressed region to be in the vicinity of load introduction. The magnitude of these stresses is acceptable but dependent on the payload being supported uniformly by all load lines. The results also indicate that some load is retained in the seam, the amount depen-dent on the ratio of seam to film stiffness.

PB-252 558/2CP PC A07/MF A01 Environmental Research and Technology, Inc., Concord, Mass.

Adaptation of Gaussian Plume Model to Incorporate Multiple Station Data input. Volume II. Appendices Final rept.

Harvey S. Rosenblum, Bruce A. Egan, Claire S. Ingersoll, and Michael J. Keefe. Jun 75, 135p ERT-P-1121-Vol-2, EPA/600/3-75/003b Contract EPA-68-02-1753 See also Volume 1, PB-252 557.

Descriptors: \*Computer programs, \*Air pollution, \*Mathematical models, Revisions, Air pollution control, Improvement, Concentra-tion(Composition), Atmospheric chemistry, Dispersions, Exhaust emissions, Combustion products, Wind velocity, Numerical analysis, Plumes, FORTRAN.

Identifiers: 'Gaussian plume models, Air quality, Climatological dispersion model, Real time air quality simulation model, Sampled chronological input model, Nonpoint sources, Point sources, FORTRAN 4 programming lanquage.

EPA urban dispersion models were modified to consider multiple station information on wind speed and direction. Three models were modified: the Real-Time Air-Quality-Simulation Model (RAM) and the Sampled-Chronological Input Model (SCIM), both short-term averaging models, and the Climatological Dispersion Model (CDM), a long term averaging model. This report contains the appendices and computer program listings.

PC A04/MF A01 PB-253 205/9CP National Oceanic and Atmospheric Administration, Boulder, Colo. Air Resources Lab. Wind Energy Flux Calculated from Idaho Na-

tional Engineering Laboratory (INEL) Sensor Network Data Technical memo. John H. Cate, and Robert G. Nisle. Jul 75, 61p

NOAA-TM-ERL-ARL-54, NOAA-76030502

\*Wind(Meteorology), Descriptors: \*Wind velocity, Flux(Rate), Anemometers, Telemetering data, Data processing, Computer programs, Tables(Data), Computation, Idaho. Identifiers: Aquilla project.

Computer programs to calculate root mean cube of windspeed, developed for Project Aquilla, are presented with details of their use. Data from the Idaho National Engineering Laboratory (INEL) wind sensing network for 1968 through 1970 and 1972 through April 1975 serve as input. From these data, the programs calculate the available energy flux for the upper Snake River plain.

PB-256 651/1CP PC A08/MF A01 IBM Research Lab., San Jose, Calif. Development of an Urban Air Quality Simulation Model with Compatible RAPS Data. Volume I

Final rept. 1 Jul 74-30 May 75

C. C. Shir, and L. J. Shieh. May 75, 152p EPA-600/4-75/005-a Contract EPA-68-02-1833

See also Volume 2, PB-256 652.

Descriptors: \*Urban areas, \*Mathematical models, \*Sulfur dioxide, \*Atmospheric diffusion, \*Air pollution, Sulfur oxides, Computer programming, Computer simulation, Concen-tration(Composition), Numerical analysis, Wind velocity, Urban area, FORTRAN, Exhaust emissions, Combustion products, Missouri. Identifiers: \*Saint Louis(Missouri), Point sources, Nonpoint sources, Fortran 4 pro-gramming language, Regional Air Monitoring System, \*IBMAQ-2 computer program.

An advanced generalized urban air quality model (IBMAQ-2) is developed based on the theory utilized in an existing model (IBMAQ-1) as prescribed in Ref. 1. The model, based on numerical integration of the concentration equation, computes temporal and three-dimensional spatial concentration distributions resulting from specified urban point and area sources by using NEDS (National Emission Data System) and simulated RAMS (Regional Air Monitoring System) data. The UTM (Universal Transverse Metric) coordinates are used in all geographical, source emission, and monitoring data. A new method to incorporate point sources into the grid compution is developed by using a Lagrange trajectory method. Many model options are provided which enable users to study conveniently the significant effects which these options have on the final concentration distributions. The program description is included to provide a guide for users. The program is constructed in a modular form which allows users to change or improve each component conveniently. The input auxiliary model, which processes geographical, source emission, and monitoring data, is also included.

PB-256 652/9CP PC A09/MF A01

IBM Research Lab., San Jose, Calif.

Development of an Urban Air Quality Simulation Model with Compatible RAPS Data. Volume II

Final rept. 1 Jul 74-30 May 75 C. C. Shir, and L. J. Shieh. May 75, 186p EPA-600/4-75/005-b

Contract EPA-68-02-1833

See also Volume 1, PB-256 651.

Descriptors: \*Air pollution, \*Mathematical models, \*Sulfur dioxide, \*Urban areas, \*Atmospheric diffusion, \*Computer programs, FORTRAN, Atmospheric diffusion models, Urban area, Concentration(Composition). Identifiers: \*Saint Louis(Missouri), Regional Air Monitoring System, \*IBMAQ-2 computer prooram.

Contents: Main Program Listing; Auxiliary Program Listing; Input Data Listing; Output Samples; Report of IBMAQ-1; Finite Difference Scheme for the Horizontal Advection Terms of the Concentration Equation.

PB-257 376/4CP PC A03/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab. A Stellar Scintillometer for Measurement of **Refractive-Turbulence** Profiles

G. R. Ochs, Ting-i Wang, and F. Merrem. Apr 76, 26p Rept no. NOAA-TM-ERL-WPL-15 Contract F30602-74-0108

Descriptors: \*Extraterrestrial atmospheres, \*Optical measuring instruments, Atmospheric attenuation, Light transmission, Optical detectors, Refractive index, Remote sensing, Computer programs, BASIC programming lanquage.

Identifiers: \*Atmospheric transmissivity, Optical spatial filters, \*Stellar scintillometers.

An optical system for measuring refractive-turbulence profiles in the atmosphere is described. The instrument measures the profile along the light path to a star by analyzing the scintillation of the star by the atmosphere. The circuit diagram, computer program, and operating instructions for the instrument are included

PC A14/ME A01 PB-257 527/2CP Systems Applications, Inc., San Rafael, Calif. Continued Research in Mesoscale Air Pollution Simulation Modeling: Volume II. Refinements in the Treatment of Chemistry, Meteorology, and Numerical Integration Procedures

Final rept. Jun 74-Jun 75

S. D. Reynolds, J. Ames, T. A. Hecht, J. P. Meyer, and D. C. Whitney. May 76, 303p SAI/EF75-69, EPA/600/4-76/016b Contract EPA-68-02-1237

Also available in set of 4 reports as PB-257 525-SET. PC F99/MF F99.

Descriptors: \*Air pollution, \*Atmospheric models, \*Computerized simulation, Computer programs, Reaction kinetics, Concentra-tion(Composition), Mathematical models, Nu-merical analysis, Carbon monoxide, Nitrogen oxides, Sensitivity, Photochemical reactions, Physical properties, Chemical properties, Urban areas, Assessments, Modifications, Dif-fusion, Wind velocity, Smog, Los Angeles Basin, California, FORTRAN. Identifiers: Chemical reaction mechanisms,

\*Airshed models, Grid model, MODKIN computer program.

This report describes the refinement of a mesoscale photochemical air quality simulation model through studies of selected chemical and meteorological phenomena that contribute to air pollution. The chemistry activities focused on the design of an automatic com-puter program for evaluating kinetic mechanisms, the improvement of a photochemical mechanism for incorporation in mesoscale models, and the development of a chemical mechanism for describing SO2 oxidation. The meteorology studies examined the

sensitivity of the model to the inclusion of wind shear, algorithms for deriving mass-consistent wind fields, and the treatment of turbulent diffusivities and elevated inversion lavers. Alternative numerical techniques for solving the advection/diffusion equation in grid models are evaluated, including various finite difference, particle-in-cell, and finite element methods, in an attempt to find a suitable methodology for accurately calculating the horizontal transport of pollutants. Finally, the report considers the problem of multiday model usage and presents results from a two-day CO simulation for the Los Angeles basin.

PB-257 528/0CP PC A11/MF A01 Systems Applications, Inc., San Rafael, Calif. Continued Research in Mesoscala Air Pollu-tion Simulation Modeling: Volume III. Modeling of Micsoscale Pheonoena Final rept. Jun 74-Jun 75 R. G. Lamb. May 76, 245p SAI/EF75-25, EPA/600/4-76/016c Contract EPA/68-02-1237

Also available in set of 4 reports as PB-257 525-SET, PC E99/MF E99.

\*Air pollution, \*Atmospheric Descriptors: models, "Computerized simulation, Com-bustion products, Atmospheric circulation, Concentration(Composition), Mathematical Concentration(Composition), Mathematical models, Numerical analysis, Carbon monoxide, Nitrogen oxides, Sensitivity, Photochemical reactions, Physical properties, Chemical properties, Urban areas, Assessments, Modifications, Diffusion, Wind velocity, Turbulence, Reaction kinetics, Plumes, Forecasting, Computer programs, FORTRAN, Industrial wastes. Identifiers: \*Airshed models, Grid model.

This report develops mathematical techniques that influence the development of urban air pollution but are not resolvable by grid networks used in airshed simulation models. These phenomena include turbulence-generated fluxes of pollutants, turbulence-induced fluctuations in the contaminant concentrations, and subgrid-scale variations in the mean concentration distribution. In addition, the report examines the problem of resolving the spatial details that exist in the mean concentration fields in the vicinity of point and line sources. The analysis concludes with a discussion of the problem of accounting for pollutant dispersion effects caused by buoyancy forces in hot stack exhausts.

PB-258 821/8CP PC A10/MF A01 National Center for Atmospheric Research, Boulder, Colo.

Physical Mechanisms Responsible for the Major Synoptic Systems in the Eastern Canadian Arctic in the Winter and Summer of

Doctoral thesis

Ellsworth Frank LdDrew. 1976, 220p Rept no.

NCAR-CT-38 Contract NSF-C760

Sponsored in part by Colorado Univ., Boulder.

Descriptors: "Synoptic meteorology, "Cyclones, "Arctic regions, "Canada, Atmospheric models, Vorticity, Advection, Mountains, Winter, Summer, Mathematical models, Atmospheric circulation, Eigenvectors, Theses, Latent heat, Enthalpy, Thickness, Heat flux, Surfaces, Friction, Computer programs, FORTRAN.

In this study the physical processes producing the major centers of synoptic activity in the eastern Canadian Arctic are examined. The author chose the total vertical velocity at 85 centibars as an indicator of the intensity of the synoptic activity. A diagnostic 3-D atmospheric model from which the total vertical velocity from 6 physical processes may be computed is designed and validated. These processes are: the differential advection of vorticity, the

thickness advection, the release of latent heat, the effects of the surface enthalpy flux, and the influence of friction and orography at the surface. By partitionment of this diagnostic model (the omega equation) into the component vertical velocities the magnitude and relative importance of each process may be determined. The significance of each physical mechanism is examined at 48 h intervals throughout the history of a mid-latitude depression system which enters the region as a developing cyclone on July 13, 1973 and leaves on July 22 as a stagnant vortex.

#### PB-259 719/3CP PC A08/MF A01 Alaska Univ., College. Inst. of Water Resources. User's Guide for Atmospheric Carbon Monoxide Transport Model

Final rept. Robert F. Carlson, and William R. Norton, Jun 76, 160p IWR-76, FHWA/AK-76-IWR76

Descriptors: \*Air pollution, \*Carbon monoxide, \*Transport properties, \*Computerized simula-tion, \*Atmospheric motion, Mathematical models, Finite element analysis, Programming manuals, FORTRAN, Alaska, Temperature inversions

Identifiers: \*ACOSP computer program, Fairbanks(Alaska).

In the winter months of Fairbanks, Alaska, a highly stable air temperature inversion creates high levels of carbon monoxide (CO) concentrations. As an aid to understanding this problem, a CO transport computer model has been created which provides a useful tool when used in conjunction with other measurement and analytic studies of traffic, meteorology, emissions control, zoning, and parking management. The model is completely documented and illustrated with several examples. Named ACOSP (Atmospheric CO Simulation Program), it predicts expected CO concentrations within a specific geographic area for a defined set of CO sources. At the present time, the model is programmed to consider automobile emissions as the major CO source and may include estimates of stationary sources. The model is coded for computer solution in the FORTRAN programming language and uses the finite-element method of numerical solution of the basic convective-diffusion equations. Although it has a potential for real-time analysis and control, at the present time the model will be most valuable for investigating and understanding the physical processes which are responsible for high CO levels and for testing remedial control measures at high speed and low cost.

#### PB-259 971/0CP PC A04/MF A01

Corvallis Environmental Research Lab., Oreg. Assessment and Criteria Development Div. Cooling Tower Plume Model

Lawrence D. Winiarski, and Walter E. Frick, Sep 76, 72p Rept no. EPA/600/3-76/100

towers, \*Plumes, on, \*Mathematical \*Cooling tov simulation, Descriptors: \*Computerized models, Atmospheric diffusion, Wind, Computer programs, Drag, Air entrainment.

A review of recently reported cooling tower plume models yields none that is universally accepted. The entrainment and drag mechanisms and the effect of moisture on the plume trajectory are phenomena which are treated dif-ferently by various investigators. In order to better understand these phenomena, a simple numerical scheme is developed which can readily be used to evaluate different entrainment and drag assumptions. Preliminary results indicate that in moderate winds most of the entrainment due to wind can be accounted for by the direct impingement of the wind on the plume path. Initially, the pressure difference across the plume is found to produce a substantial drag force. Thus, it is likely that a certain portion of the plume bending is due to these pressure forces, and artificially increasing wind entrainment to fit experimental data is unnecessary.

PB-261 144/0CP PC A16/MF A01 Wiggins (J. H.) Co., Redondo Beach, Calif. Methodology for Hazard Risk Evaluation of Buildings. Volume I: Technical Report Final rept.

John H. Wiggins, Gary C. Hart, T. K. Hasselman, and Richard W. White. 14 Dec 73, 353p TR-73-35773 NBS-GCB-75-36 Contract NBS-3-35773 See also Volume 2, PB-261 145.

\*Buildings, Descriptors: \*Earthquakes, \*Hurricanes, \*Tornadoes, Damage assessment, Wind pressure, Earthquake resistant structures, Dynamic structural analysis, Structural engineering, Hazards.

Identifiers: \*Natural disasters, \*Risk analysis, \*Computer program \*Earthquake engineering. documentation,

A methodology is presented for evaluation of existing buildings to determine the risk to life safety from natural disasters and to estimate the amount of expected damage. Damage to both structural and non-structural building components resulting from the extreme environments produced by earthquakes, hur-ricanes, and tornados is considered. The methodology is capable of treating a large class of structural types including braced and unbraced steel frames, concrete frames with and without shear walls, bearing wall structures, and long-span roof structures. The procedure for the methodology is based on a computer analysis of the entire structure and is based on the current state-of-the-art. Numerical examples illustrating applications of the procedure are included. (Portions of this document are not fully legible.)

PB-261 145/7CP PC A06/MF A01 Wiggins (J. H.) Co., Redondo Beach, Calif. Methodology for Hazard Risk Evaluation of Buildings. Volume II: Computer Program User's Manual

Final rept. T. K. Hasselman, Richard W. White, and Gregg Brandow. 14 Dec 73, 112p TR-73-35773, NBS-GCR-75-37 Contract NBS-3-35773

See also Volume 1, PB-261 144.

\*Buildings, \*Earthquakes, Descriptors: \*Hurricanes, \*Tornadoes, Damage assessment, Wind pressure, Earthquake resistant structures, Dynamic structural analysis, Structural engineering, User needs.

Identifiers: \*Natural disasters, \*Risk analysis, \*Computer program \*Earthquake engineering. documentation,

A methodology is presented for evaluation of existing buildings to determine the risk to life safety from natural disasters and to estimate the amount of expected damage. Damage to both structural and non-structural building components resulting from the extreme environments produced by earthquakes, hurricanes, and tornados is considered. The methodology is capable of treating a large class of structural types including braced and unbraced steel frames, concrete frames with and without shear walls, bearing wall structures, and long-span roof structures. The procedures for the methodology is based on a computer analysis of the entire structure and is based on the current state-of-the-art. Numerical examples illustrating applications of the procedures are included. (Portions of this document are not fully legible.)

PB-261 178/8CP PC A14/MF A01 Northwestern Univ., Evanston, III. Dept. of Civil Engineering. Stochastic Modelling of Site Wind Characteristics Final rept. Jan 75-Sep 76 Ross B. Corotis. Nov 76, 311p ERDA/NSF-00357/76/1 Grant NSF-AER75-00357

Descriptors: \*Wind velocity, \*Wind power, Data acquisition, Periodic variations, Autocorrela-tion, Confidence limits, Stochastic processes, Mathematical models, Computerized simulation, Computer programs, United States. Identifiers: Midwest Region(United States), Rocky Mountain Region(United States).

The economic feasibility of a wind energy conversion system depends on an accurate assessment of the wind characteristics at each site. Statistical methods and probability models are used to determine optimal evaluation procedures for survey data. Several years of hourly records from six Midwest sites and one Rocky Mountain site provide a data base to develop the models and procedures. (Portions of this document are not fully legible.)

PB-263 498/8CP PC A07/MF A01 National Center for Atmospheric Research, Boulder, Colo.

Efficient FORTRAN Subprograms for the Solution of Elliptic Partial Differential Equations

Technical note Paul Swarztrauber, and Roland Sweet. Jul 75, 147p Rept no. NCAR/TN-1090IA

Contract NSF-C760

Descriptors: \*Elliptic differential equations, \*Numerical integration, \*Computer pro-\*Numerical integration, \*Computer pro-gramming, Partial differential equations, At-mospheric circulation, Mathematical models, Computation, FORTRAN, Subroutines. Identifiers: Helmholtz equation.

The numerical solution of elliptic partial differential equations in computer models of atmospheric processes can be a formidable programming task. But with recent advances in computing methods, a very large class of elliptic equations can be solved rapidly and with minimal storage. This report describes seven Fortran subroutines and contains an appendix dealing with solutions of linear systems of equations. Five subroutines solve a Helmholtz equation in various coordinate systems; they solve two-dimensional problems, but can be adapted for use in three-dimensional problems. The other two subroutines can solve a more general class of equation.

#### PB-263 580/3CP

PC A06/MF A01 Meteorology Research, Inc., Altadena, Calif. M-33 Radar Modifications at Snyder, Texas Final rept. Mar 75-Jun 76

R. E. Carbone, R. Schaff, and P. LeVier. 1 Sep 76, 114p Rept no. MRI76-FR-1445 Contract DI-14-06-D-7657

Descriptors: \*Meterological radar, Revisions, Data acquisition, Storms, Radar echoes, Data recording, Computer programs.

Extensive modifications were performed on M-33 radar system for the purpose of performing quantitative measurements of radar reflectivity factor emanating from convective storms. Digital scan auto control and digital data acquisition systems were implemented together with video time-lapse recording. A central data acquisition/control facility was Capabilities of the reconfigured created. system include antenna-slaved dual-wavelength measurements at 10 cm and 3 cm, contoured range-normalized displays, and programmable scan sequencing. Recommendations for further development of the radar system are made to ensure reliability and develop tri-wavelength measurement capability. (Portions of this document are not fully legible.)

PB-263 921/9CP PC A03/MF A01 California State Dept. of Transportation, Sacramento, Transportation Lab.

Transportation Systems and Regional Air Quality. An Approach and Computer Program for Wind Flow Field Analysis Interim rent.

James A. Racin, and Andrew J. Ranzieri. May 76, 50p CA-DOT-TL-7169-4-76-38, 657169, FHWA/CA-76/38

Descriptors: "Air pollution, "Wind(Meteorology), Mathematical models, Simulation, Regional planning, Computer programs, Environmental surveys, Photochemical reactions, Pattern recognition, Monitoring, Data acquisition, Fortran.

Identifiers: \*Air quality maintenance, Flow fields, Fortran 4 programming language.

Regional air quality studies and photochemical simulation models require the description of wind flow patterns for specific hours of various meteorological regimes. An interdisciplinary team that includes a meteorologist, and air pollution modeler, an environmental planner, and an air quality engineer can use plots of wind vectors to design a network of wind monitoring stations. Along with user instructions, input forms, and a computer program, an approach for conducting a wind flow field analysis is presented.

PB-264 243/7CP PC A06/MF A01 Delaware Univ., Newark. Water Resources Center.

Estimation of Areal Average Precipitation Using Different Network Densities and

Averaging Techniques

Technical completion rept.

John R. Mather. Dec 75, 115p Contrib-22, OWRT-A-029-DEL(1)

Also pub. as Publications in Climatology,

Volume XXVIII, No. 2, 1975, Thornthwaite (C. W.) Associates, Elmer, N.J. Lab. of Climatology.

Descriptors: \*Precipitation(Mełeorology), Weather stations, Periodic variations, Hydrology, Estimating, Spatial distribution, Area, Runoff, Tables(Data), Water storage, Mapping, Watersheds, Computer programs, New Jersey. Identifiers: SYMAP computer program.

A three-year record of monthly precipitation from a 10-station National Weather Service network, from a 27-station network operated by Thornthwaite Associates, and from the combined 37-station network located in a twocounty area in southern New Jersey was used to: (1) Evaluate alternative network densities for estimating precipitation for water resources purposes; (2) evaluate several different methods of estimating areal average precipitation over a region; and (3) determine the reliability of estimated patterns of precipitation as network density changes. Only very small differences in monthly areal average precipitation were found using three different estimating techniques--arithmetic averaging of station values, weighting of point observations by construction of Thiessen polygons, and by evaluation of isohyetal patterns drawn by a SYMAP

#### PB-264 562/0CP

Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div. Synoptic Rainfall Data Analysis Program (SYNOP). Release No. 1 Software

CP T04

Daniel Szumski, Dolloff F. Bishop, and Richard G. Eilers. Dec 76, mag tape EPA/600/9-76/014a, EPA/DF-77/002

Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB-264 563.

Descriptors: "Software, "Water quality, "Rainfall, Storms, Magnetic tapes, Statistical analysis, Computation, Fortran. Identifiers: "Synop computer program.

An integral part of the assessment of storm loads on water quality is the statistical evaluation of rainfall records. Hourly rainfall records of many years duration are cumbersome and difficult to analyze. The purpose of this rainfall data analysis program is to provide the user with a tool for summarizing and statistically characterizing a rainfall record of interest using U.S. Weather Bureau magnetic tapes. Statistical analysis of variables of interest (volume, duration, intensity, and time between storms) are given to determine seasonal trends which are of importance in accessing impacts and selecting control alternatives for storm related loads. The program is written in the Fortran programming language for implementation on an IBM 1130 computer using the DMS, version 2 operating system. 32K bytes of core storage are required to operate the model.

PB-264 563/8CP PC A06/MF A01 Hydroscience, Inc., Westwood, N.J. Synoptic Rainfall Data Analysis Program (SYNOP) Final rept.

Jul 76, 115p EPA/DF-77/002a Contract EPA-68-03-2428

For system on magnetic tape, see PB-264 562.

Descriptors: \*Water quality, \*Rainfall, \*Computer programs, Storms, Surface water runoff, Statistical analysis, Computation, Fortran, Tables(Data).

Identifiers: \*Synop computer program, IBM 1130 computers.

An integral part of the assessment of storm loads on water quality is the statistical evaluation of rainfall records. Hourly rainfall records of many years duration are cumbersome and difficult to analyze. The purpose of this rainfall data analysis program is to provide the user with a tool for summarizing and statistically characterizing a rainfall record of interest using U.S. Weather Bureau magnetic tapes. Statistical analysis of variables of interest (volume, duration, intensity, and time between storms) are given to determine seasonal trends which are of importance in accessing impacts and selecting control alternatives for storm related loads.

PB-264 813/7CP PC A09/MF A01 National Oceanic and Atmospheric Administration, Washington, D.C.Environmental Data Service.

Separation of Mixed Data Sets into Homogeneous Sets Technical rept.

Harold L. Crutcher, and Raymond L. Joiner. Jan 77, 185 NOAA-TR-EDS-19, NOAA-77020701

Descriptors: "Weather forecasting, 'Data processing, 'Statistical analysis, Wind, Atmospheric temperature, Dew point, Radiosondes, Multivariate analysis, Clustering, Factor analysis, Normal density functions. Identifiers: Data sets, Normix computer program.

The use of a clustering technique to separate mixed data sets into subsets which exhibit group characteristics is illustrated. The relative

importance of the subsets, and the nature of the subsets are assessed, and an assumption is made as to whether a particular subset is biased, contaminated, or adulterated. That is, an assessment of the quality of the data may be made. The techniques are applicable to any data set which is multivariate normal. Here, they are applied to weather data subsets: (1) landsea breeze, (2) tropical stratospheric winds, (3) mid-latitude tropospheric winds, (4) mountain pass winds and temperatures, (5) surface marine weather temperatures, dew points and winds, and (6) radiosonde observation of heights, winds, temperatures, and dew points.

PB-265 109/9CP PC A02/MF A01 Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. Computer Simulation of Snowmelt Forest Service research paper Rhey M. Solomon, Peter F. Ffolliott, Malchus B. Baker, Jr, and J. R. Thompson. Oct 76, 14p FSRP-RM-174, OWRT-A-042-ARI2(13) Prepared in cooperation with Arizona Univ.,

Prepared in cooperation with Arizona Univ., Tucson. School of Renewable Natural Resources, Contract DI-14-31-0001-3803.

Descriptors: \*Snowmelt, \*Snowdrifts, Forest land, Mathematical models, Atmospheric temperature, Precipitation(Meteorology), Watersheds, Runoff, Solar radiation, Computerized simulation, Flow charting, Diffusion, Heat transfer, Cloud cover, Subroutines, Forecasting, Arizona. Identifiers: \*Forest watersheds, SNOWMELT computer program, CDC 6400 computers.

A modification of a previously developed computer model of snowmelt provides for modeling intermittent snowpacks, and is believed to be a more generalized model than the original program. The modified program SNOWMELT is dependent on four daily input variables--maximum and minimum temperatures, precipitation, and shortwave radiation or percent cloud cover. Initializing the model requires limited knowledge of local watershed and snowpack parameters. Model verification on seven experimental watersheds in Arizona proved satisfactory.

PB-265 382/2CP PC A11/MF A01 Wisconsin Univ.-Milwaukee. Air Pollution Analysis Lab.

Mesoscale Air Pollution Transport in Southeast Wisconsin

Final rept. 1972-1976 Walter A. Lyons. Feb 77, 238p EPA/600/4-

77/010 Grant EPA-R-800873

Descriptors: \*Lake Michigan, \*Sulfur dioxide, \*Air pollution, \*Atmospheric circulation, Dispersion, Coasts, Mathematical models, Wind(Meteorology), Plumes, Climate, Computer programming, Computations, Wisconsin, Shores.

Identifiers: Milwaukee(Wisconsin), Glump computer program, Mainline computer program.

This research program comprised a comprehensive study of mesoscale meteorological regimes on the western shore of Lake Michigan and their effect upon air pollution dispersion and transport. It is felt that the results are applicable in a generic way to other mid-latitude coastal zones. Continuous fumigation from elevated sources in shoreline zones during stable davtime onshore flow was intensively investigated by a large scale field program. A model was proposed, constructed, validated and calibrated. It was shown that the fumigation spot, while causing very high surface SO2 concentrations, was so highly mobile as to generally reduce dosages below the three-hour standard (at least for the plants studied). An intensive case study of a lake breeze was performed. Data were used as input to a Kinematic

Diagnostic Model (KDM) which simulated mesoscale trajectories for pollutants released within the coastal zone. Both mesoscale and synoptic scale transport of photochemical oxidants were found to be a significant problem in the Milwaukee area.

PB-265 551/2CP PC A18/MF A01 National Bureau of Standards, Washington, D.C. Center for Building Technology. Hourly Solar Radiation Data for Vertical and Neurosci Surface on Average Days in the

Horizontal Surfaces on Average Days in the United States and Canada

Final building science series rept.

T. Kusuda, and K. Ishii. Apr 77, 416p\* Rept no. NBS-BSS-96

Library of Congress Catalog Card no. 77-608023.

Descriptors: \*Solar radiation, United States, Canada, Variations, Variability, Walls, Roofs, Tables(Data), Computer programs.

This report outlines the technique that was used to compute and tabulate the monthly average incident radiation on an hourly basis during the day for each month of the year, and each of eight different vertical orientations. The data was tabulated for 80 different locations in the United States and Canada. An additional parameter called sol-air temperature for glass was also computed and tabulated for each of the locations.

PB-265 727/8CP PC A05/MF A01 National Center for Atmospheric Research, Boulder, Colo. Comparison Between Dual-Wavelength Radar Estimates and Ground Measurements of Precipitation Master's thesis

Sergio Reyes. 1977, 99p Rept no. NCAR-CT-41 Contract NSF-C760

Descriptors: \*Precipitation(Meteorology), \*Measurement, Thunderstorms, Hail, Atmospheric attenuation, Radar echoes, Microwaves, Mathematical models, Estimates, Computer programs.

In the radar method most widely used to locate and measure precipitation within thunderstorms, a single radar measures the reflec-tivity factor of the hydrometeors. This technique is accurate only under certain circumstances, such as when the precipitation consists of rain. But when hail is present and the radar reflectivity factors due to rain and hail are approximately equal, the results are inaccu-With a dual-wavelength X- and S-band rate. radar (XSR), X-band microwave attenuation is determined and then particle precipitation rate is estimated. Quantities so derived appear independent of large precipitation rates. Eccles (1975) has proposed observational and numerical techniques to recognize X-band attenuation by precipitation particles. To test the numerical technique, we correlated the derived precipitation rate and total precipitation depth with ground measurements from northern Colorado. Four cases were considered in the presence and absence of hail: light and heavy precipitation rates and small and large total water deposition. The XSR gives better estimates for heavy precipitation rates and for large total water deposition, both with and without hail. The single radar method is accurate for light precipitation without hail.

PB-266 255/9CP PC A04/MF A01 Control Data Corp., Minneapolis, Minn. An Objective Analysis Technique for the Re-

gional Air Pollution Study. Part I Final rept.

D. Hovland, D. Dartt, and K. Gage. Jan 77, 55p EPA/600/4-77/002a Contract EPA-68-02-1827 Descriptors: \*Atmospheric models, \*Wind(Meteorology), \*Temperature, \*Meteorological data, \*Air pollution, Data analysis, Mathematical models, Computer programs, Computation.

Identifiers: \*Air quality, \*Saint Louis(Missouri).

This report documents the development of an objective analysis program for the mesoscale gridding of wind and temperature for the Regional Air Pollution Study being conducted in St. Louis by the Environmental Protection Agency. The program is designed to produce a 5-km spaced horizontal grid analysis from a distribution of observations which are sparse at the boundaries of the grid and dense near the center. An iterative scan procedure is used successively to correct an initial guess field until the analysis agrees reasonably well with observations. A procedure is used where widely spaced observations and a large scan radius are first used to approximate the field. This is successively followed by the addition of more observational data and reduction in scan radius until the field converges to the desired analysis (usually five iterations are required). This procedure of simultaneously adding more data and shrinking the scan radius insures that the small-scale variability in areas of dense observations does not propagate into the surrounding areas where there are few data. The special problems of producing three-dimensional fields of gridded data from the observation network are discussed. They include the inconsistency of the surface and upper air observation networks, the non-uniform density of the basic observing network, and the difficulty of producing a reliable analysis when data from one or more key stations are missing.

PB-266 739/2CP PC A04/MF A01 Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div. Calculation of Selected Photolytic Rate Con-

stants over a Diurnal Range. A Computer Algorithm

Kenneth L. Schere, and Kenneth L. Demerjian. Mar 77, 73p Rept no. EPA/600/4-77/015

Descriptors: \*Reaction kinetics, \*Air pollution, \*Atmospheric modeling, Photochemical reactions, Mathematical models, Computerized simulation, Computer programs, Diurnal variations, Smog, Nitrogen dioxide, Ozone, Nitrous acid, Nitric acid, Formaldehyde, Hydrogen peroxide, Acetaldehyde, Fortran, Aerosols, Algorithms.

Identifiers: \*Rate constants.

A computer program has been created and is described herein which employs the theoretical formulation of the photolytic rate constant to calculate these rate constants for specific chemical species over a diurnal time period in clear-sky conditions. A user of the program must specify the date, time and location for which the rate constants are desired. With this information and specific data on zenith angles. solar irradiance, and species characteristics of absorption cross-sections and primary quantum yields, which are provided in the program package, the computer program generates a diurnal range of photolytic rate constants for each species. The species included are NO2, O3, HONO, HONO2, H2CO, CH3CHO, and H2O2. The appendices to this report contain program and data listings as well as a User's Guide to program operation. The program-generated photolytic rate constants for NO2 are compared to direct measurements of this quantity as taken at Research Triangle Park, N.C. during April 1975. The two methods are generally in close agreement after the theoretically computed rate constants are scaled by a simplistic method for the compensation of solar radiation attention by clouds.

PB-266 756/6CP PC A04/MF A01 Control Data Corp., Minneapolis, Minn. An Objective Analysis Technique for the Regional Air Pollution Study. Part II Final rept. D. Hovland, D. Dartt, and K. Gage. Feb 77, 59p EPA/600/4-77/002b Contract EPA-68-02-1827

See also Part 1, PB-266 255.

Descriptors: "Atmospheric models, "Air pollution, "Wind (Meteorology), Atmospheric motion. Mathematical models, Trajectories, Grids (Coordinates), Computer programs, Missouri.

Identifiers: \*Saint Louis(Missouri), \*Air quality.

This report discusses the application of objective analysis techniques to the computation of trajectories from surface wind observations of the Regional Air Pollution Study in St. Louis. Trajectories were computed over a 100-kilometer square grid centered on St. Louis for two 5hour periods during July 1975. The variability of the surface wind field was investigated by examining the temporal and spatial variability of computed trajectories. Also, the sensitivity of the computed trajectories to the amount of data employed in the analysis was examined in some detail. The results showed a general lack of sensitivity of the computed trajectories to a single missing observation. However, computed trajectories were very sensitive to missing adjacent observations. In addition to the trajectory analysis, a set of tapes containing gridded winds and temperatures for the St. Louis area were generated.

PB-266 968/7CP PC A02/MF A01 National Weather Service, Salt Lake City, Utah. Western Region. Program to Calculate Winds Aloft Using a

Hewlett-Packard 25 Hand Calculator Technical memo.

Brian W. Finke. Feb 77, 12p NOAA-TM-NWS-WR-115, NOAA-77033105

Prepared by National Weather Service Forecast Office, Los Angeles, Calif.

Descriptors: \*Wind(Meteorology), \*Computation, Radiosondes, Theodolites, Computer programs, Forest fires. Identifiers: HP 25 computers.

A method of calculating winds aloft data from theodolite observation is offered without resorting to the use of plotting boards. This program, using the Hewlett-Packard 25 hand calculator, was originally intended for fire weather mobile unit use at going fires where time and space are at a premium. No new theory has been developed. The tangent plane approximation is the only compromise; but within the accuracy of the observations, this approximation results in no error.

PB-267 413/3CP PC A14/MF A01 National Center for Atmospheric Research, Boulder, Colo. Atmospheric Technology Div. Central Pacific VLF Signal Survey and Omega Wind Error Predictions

Technical note

Michael L. Olson. Mar 77, 312p Rept no. NCAR/TN-1200EDD Contract NSF-C760

Descriptors: "Wind direction, "Wind velocity, "Radiosondes, "Radio tracking, Tropical regions, Errors, Very low frequencies, Predictions, Pacific Ocean, Computer programs, FORTRAN.

Identifiers: First GARP Global Experiment, Omega navigation system.

The First GARP Global Experiment in 1979 will include two tropical wind-finding systems which use Omega navigation signals to determine the relative positions of a radiosonde as a function of time, and hence winds. Complete coverage of the deep tropics with Omega signals is not possible in 1979, since the Australian Omega station will not yet be completed. The wind accuracies are computed for a 13.6 kHz Omega signal between 30 degrees N and 30 degrees S latitudes for local noon and midnight in January. The effect of Australia is clearly il-lustrated. The results are compared with data from Majuro Atoll in the Marshall Islands. Observations near local noon are shown to pro-vide the greatest accuracy. The FGGE requirement for 2 m/s accuracy will be met in substantial areas of the tropical Pacific and Atlantic Oceans at local noon. The Indian Ocean region will suffer large errors south of the equator without Australia. At local midnight, when stations with potential modal interference are not used in the wind computation, the regions of acceptable wind errors are decreased. (Portions of this document are not fully legible.)

# PB-268 033/8CP

PC A05/MF A01 National Oceanic and Atmospheric Administra-

tion, Boulder, Colo. Wave Propagation Lab. Microcomputer-Controlled Acoustic E Echo Sounder

Technical memo.

Edward J. Owens. Apr 77, 85p NOAA-TM-ERL-WPL-21, NOAA-77050104

\*Atmospheric sounding, Descriptors: \*Meteorological instruments, Acoustics, Mea-suring instruments, Remote sensing, Doppler radar, Signal processing, Atmospheric temperature, Turbulent boundary layer, Wind(Meteorology), Computers, Digital to analog converters, Computer programs. Identifiers: \*Atmospheric echo sounding, Acoustic detection and ranging, Planetary boundary layer, Microcomputers.

This report is the result of research into new concepts of remote sensing of the atmosphere and includes a literature survey of the theory and practical application of atmospheric sounding using acoustic methods. The 'state of the art' has been advanced in that a new type of system was designed, fabricated, and tested using modern digital methods. The major advances of replacing the typically troublesome facsimile recorder with a dot-matrix line printer using special characters called 'tonels' and the development of a new and novel method of digital Doppler signal processing using a real covariance technique, is presented in detail. The ecosonde is capable of monitoring and displaying in real time the temperature fluctuations, turbulent velocity inhomogeneities, and vertical wind profile of the planetary boundary layer to a height of 680 meters and includes a microcomputer, a high-speed line printer, and various author-designed and-constructed digital and analog circuits. User control of various system parameters and a wide choice of display possibilities make this a versatile and desirable atmospheric research tool.

### PB-268 329/0CP

PC A06/MF A01

California State Dept. of Transportation, Sacra-

mento. Transportation Lab. Transportation Systems and Regional Air Quality - A Difkin Sensitivity Analysis Interim rept.

P. D. Allen, W. B. Crews, A. J. Ranzieri, and E. C. Shirley. Apr 76, 115p CA-DOT-TL-7169-2-76-27, 657169, FHWA/CA-76/27

See also report dated May 76, PB-263 921.

Descriptors: \*Mathematical models, \*Air pollution, Atmospheric motion, Ozone, Compu-terized simulation, Concentration(Composition), Reaction kinetic, Photochemistry, Hydrocarbons, Nitrogen oxide(NO), Motor vehicles, Industrial wastes, Trajectories, Wind velocity, Traffic, Sensitivity, Computer programs, Exhaust emissions, Combustion products.

Identifiers: \*DIFKIN photochemical models, \*Air quality maintenance, \*DIFKIN computer program

An analysis of the DIFKIN photochemical model characteristics and sensitivities to various input parameters is presented. DIFKIN is a trajectory type photochemical air quality simulation model. The most sensitive input parameters to Ozone production are initial concentrations, reaction rate constants, and inversion base height. The ratio of Reactive Hydrocarbons to Nitric Oxide emissions are far more important in determining Ozone production than the actual magnitudes for emissions. The DIFKIN model is most applicable to projects that result in changes in emissions in a few adjacent grid cells rather than widespread changes in emissions over an air basin. Five or more trajectories should be used to determine air quality impacts of a particular project.

#### PB-268 753/1CP

National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office. Computer Software for the Assessment of

PC A05/MF A01

# Growth Histories of Weather Radar Echoes Technical memo.

Victor Wiggert, Stellan S. Ostlund, Gloria J. Lockett, and John V. Stewart. Nov 76, 93p NOAA-TM-ERL-WMPO-35, NOAA-77051812

Descriptors: \*Weather forecasting, \*Radar cross sections, \*Computer programs, \*Statistical analysis, Rainfall, Radar tracking, Regression analysis, Normal density functions, \*Computer Fortran, Florida.

Identifiers: \*Peaks computer program, \*Stats computer program, Bivariate analysis.

Two new computer programs are described. One is an echo isolation and tracking program called PEAKS, which fits a bivariate normal distribution to each echo, and also to each relative maximum in rain rate within each echo's perimeter. This program is based upon different principles than its predecessor (TRACK) and appears to make fewer errors in judgment. After a whole day's data has been processed with the tracking program, all tracked echo information is transferred to the second computer program named STATS. It formulates hourly and whole day summaries of South Florida echo areas and rain volumes for all combinations of location (land/sea/both) and status (unmerged/merged/all). Also, a whole day of tracked echo data is accumulated and results are tabulated for echo areas versus rain volumes within quartiles of growth tendency. Regression equations for these combinations are created and histograms can be displayed. Examples depict results from the two programs using the enlarged array. Appendices provide the complete Fortran code for the entire ensemble of NhemI software for processing digitally recorded WSR-57 data. (Portions of this document are not fully legible.)

PB-269 659/9CP PC A07/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office. Raindrop Size Distributions and Z-R Relation-

ships Measured on the NOAA DC-6 and the Ship RESEARCHER within the GATE B-Scale Array Technical memo.

John B. Cunning, and Robert I. Sax. Apr 77, 144p NOAA-TM-ERL-WMPO-37, NOAA-77060202

Descriptors: \*Raindrops, \*Rainfall, Meteorological radar, Precipitation(Meteorology), Tropical atmospheres, Meteorological instruments, Convection, Reflectivity, Airborne, Shipborne detectors, Cloud physics, Meteorological data, Experimental design, Mathematical analysis, Computer programs, Least squares method, Regression analysis, Fortran, North Atlantic Ocean.

Identifiers: GARP Atlantic tropical experiment.

This paper discusses drop size distributions obtained by both an airborne foil impactor and a shipborne distrometer and provides an analysis of the relationship between radar reflectivity and rainfall rate within the GATE B-scale array. Discussion of the use of a cumulative distribu-tion function to transform drop spectra derived from the foil data is provided in an appendix. The advantage of this technique lies in the alleviation of sampling volume problems occurring at the large end of the drop size distribution.

PB-270 265/2CP PC A09/MF A01 Western Scientific Services, Inc., Fort Collins, Colo.

Development of ап Experimental Hydrometeorological Data Collection Network Final rept. 1 Jul 74-30 Apr 77

James H. Wagner. 30 Apr 77, 190p Rept no. FR-807-55

Contract DI-14-06-D-7551 See also PB-248 865.

Descriptors: \*Rain gages, Collecting methods, Data acquisition, Surveys, Automatic control equipment, Precipitation(Meteorology), Telemetering data, Remote control, Meteorological satellites, Weather stations, control, Performance evaluation, Feasibility, Diagrams, Computer programs. Identifiers: LANDSAT satellites, Remote areas,

Microprocessors.

This final report describes the development of an automatic microprocessor based data col-lection system using VHF telemetry links capable of collecting hydrometeorological data from remote sites distributed over a wide area or in relatively inaccessible terrain. Results of an extensive test program are included along with recommendations for improving the reliability and performance of the system. Detailed schematics for all equipment developed are provided and the operation of each piece of equipment is described.

PB-270 534/1CP PC A02/MF A01 Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif. Controlling Solar Light and Heat in a Forest

by Managing Shadow Sources Forest Service research paper (Final) Howard G. Halverson, and James L. Smith. 1974, 18p Rept no. FSRP-PSW-102

Descriptors: \*Insolation, \*Micrometeorology, \*Forest land, Solar radiation, Forest trees, Plant growth, Management, Snow cover, Harvesting, Computer programs, Fortran.

Identifiers: Sunrise, Sunset, SHDW computer program.

Control of solar light and heat to develop the proper growth environment is a desirable goal in forest management. The amount of sunlight and heat reaching the surface is affected by shadows cast by nearby objects, including trees. In timbered areas, the type of forest management practiced can help develop desired microclimates. The results depend on the size and orientation of openings created and on the shade cast by surrounding vegetation. A computerized method to calculate the extent of boundary shading for any combina-tion of date, slope, and aspect between 23.45 degrees N. latitude and 50 degrees N. latitude is described. For those who do not wish to develop their own, a set of shadow-length ta-bles is available upon request. These may be secured as an entire set or by individual latitudes. They provide coverage for the contiguous United States in increments of 2 from 36 degrees N. latitude to 50 degrees N. latitude. By extrapolation, the tables can be used from the Mexican to the Canadian border.

PB-270 618/2CP PC A04/MF A01 National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div

The Delta-Eddington Approximation for a Vertically Inhomogeneous Atmosphere Technical note

W. J. Wiscombe. Jul 77, 73p Rept no. NCAR/TN-1210STR

Grant NSF-ATM72-10157

Descriptors: "Albedo, "Solar radiation, Numerical analysis, Atmospheric models, Approximation, Computer programs, Computation. Identifiers: "Eddington approximation, "Radiative transfer.

The delta-Eddington approximation of Joseph, Wiscombe, and Weinman (1976) is extended to an atmosphere divided up by internal levels into homogeneous layers. Flux continuity is enforced at each level, leading, as the mathematical essence of the problem, to a penta-diagonal system of linear equations for certain unknown constants. Fluxes (up, direct down, diffuse down, and net) are then predicted at each level. Unphysical results of the model are examined in detail. Potential numerical instabilities in the solution are noted and corrected, and an extremely fast, well-documented computer code resulting from this analysis is described and listed. Actual computed fluxes are given for several test problems.

PB-270 778/4CP PC A08/MF A01 Battelle Pacific Northwest Labs., Richland, Wash.

STRAM - An Air Pollution Model Incorporating Nonlinear Chemistry, Variable Trajectories, and Plume Segment Diffusion Final reot.

J. M. Hales, D. C. Powell, and T. D. Fox. Apr 77, 157p EPA/450/3-77/012 Contract EPA-68-02-1982

Contract El A-00-02-13

Descriptors: \*Air pollution, \*Mathematical models, Computer programs, Concentration(Composition), Plumes, Numerical analysis, Dispersion, Reaction kinetics, Manuals, Atmospheric diffusion. Identifiers: \*STRAM model, Atmospheric

chemistry.

This document provides a technical description, user's guide and program listing for (1) STRAM - a variable trajectory, reactive plumesegment model for ground level air pollution assessments resulting from multi-source emissions on a multi-state scale, and (2) a supporting program, Random-to-Grid, which generates gridded wind data for STRAM from synoptic wind data at arbitrarily located observing stations. The reactive plume chemistry is calculated by a Subroutine STRAC and related subroutines, which calculate the diffusion, the wet and dry depletion, and the reactive chemistry within each plume segment. The principal output of STRAM is concentrations on the sampling grid and at each particularly specified sampling point for each of the analyzed chemical components. These are available for three averaging periods (1) once for the entire running time, (2) serially for the basic sampling interval, and (3) serially for an arbitrarily specified intermediate time. Matrices of maximum values over all matrices of this last type are also printed out.

PB-271 360/0CP PC A13/MF A01 Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards. User's Manual for Single-Source (CRSTER) Model

Final rept. Jul 77, 297p Rept no. EPA/450/2-77/013

Descriptors: \*Manuals, \*Mathematical models, \*Air pollution, Computerized simulation, Plumes, Concentration(Composition), Meteorological data, Chimneys, Computer programs, Atmospheric motion, Fortran. Identifiers: Point sources, \*Air quality, \*CRSTER model, Gaussian plume models.

The Single Source (CRSTER) Model is a steadystate, Gaussian plume dispersion model designed for point-source applications. It calculates pollutant concentrations for each hour of a year, at 180 receptor sites on a radial grid. The hourly concentrations are averaged to obtain concentration estimates for time increments of specified length, such as 3-hour, 8hour, 24-hour, and annual. The model contains the concentration equations, the Pasquill-Gifford dispersion coefficients, and the Pasquill stability classes, as given by Turner. Plume rise is calculated according to Briggs. No depletion of the pollutant is considered. Technical details of the programming are presented with complete descriptions of data acquirements and output. Flow diagrams and source program listings, including subprograms, are given as well as input data forms. Three papers on application, sensitivity and validation of the model are included as appendices.

PB-271 643/9CP PC A15/MF A01 California Univ., San Diego, La Jolla. Dept. of Chemistry. Evaluation of a Short Term Oxidant Control Strategy

Strategy Final rept. 1965-1972 Kent R. Wilson, and Barbara Elkus. May 76, 342p ARB-R-4-718-76-61

Contract ARB-4-718

Descriptors: \*Air pollution control, \*Oxidizers, \*Hydrocarbons, \*Nitrogen oxides, Monitoring, Photochemistry, Regression analysis, Smog, Ozone, Concentration(Composition), Tables(Data), Computer programs, Algol. Identifiers: Atmospheric chemistry, Burroughs 6700 computers.

A possible short term oxidant control strategy would involve (1) reduction of overall reactive hydrocarbon and NOx emissions, (2) restriction of morning commuter traffic and (3) a shift of emissions into the evening and nighttime photochemically inactive hours. These photochemically photochemically inactive hours. These represent the emissions alterations which usually mark the change from the weekdays to weekends, and can be evaluated in advance from statistical studies of past weekday-weekend differences in monitored oxidant levels. This study uses data from the South Coast Air Basin to demonstrate that there exists a definable subset of conditions under which switching to weekend emissions would significantly decrease average oxidant levels both one and two days into the future. This strategy works best under conditions of particularly adverse oxidant levels

PB-273 921/7CP PC A02/MF A01 National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab. Stellar Scintillometer Model II for Measurement of Refractive-Turbulence Profiles Technical memo.

G. R. Ochs, Ting-i Wang, and F. Merrem. Apr 77, 24p NOAA-TM-ERL-WPL-25, NOAA-77092205 Sponsored in part by Rome Air Development Center, Griffiss AFB, N.Y. Descriptors: "Optical measuring instruments, "Scintillation counters, Telescopes, Atmospheric attenuation, Computer programs, Minicomputers, Light transmission, Optical detectors, Refractive index, Remote sensing, Spatial filtering, Instrumentation, BASIC programming language. Identifiers: "Atmospheric transmissivity,

Scintillometers. \*Atmospheric transmissivity,

An optical system for measuring refractive-turbulence profiles in the atmosphere is described. The instrument measures the profile along the light path to a star by analyzing the scintillation of the star by the atmosphere, and is an improved version of an earlier system. The circuit diagram, computer program, and operating instructions for the instrument are included.

PB-274 054/6CP PC A06/MF A01 Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards. Valley Model User's Guide

Final rept.

Edward W. Burt. Sep 77, 111p\* Rept no.

EPA/450/2-77/018 See also report for 1 Mar 73-1 Mar 74, PB-229 771

Descriptors: \*Mathematical models, \*Air pollution, Numerical analysis, Concentration(Composition), Wind velocity, Wind speed, Plumes, Computer programs, Atmospheric diffusion, Dispersion, Fortran.

Identifiers: \*Gaussian plume models, Valley computer program, UNIVAC-1110 computers, Point sources, Valley model.

The Valley Model is a steady-state, univariate Gaussian plume dispersion model designed for multiple point- and area-source applications. It calculates pollutant concentrations for each frequency designated in an array defined by six stabilities, 16 wind directions, and six wind speeds for 112 program-designated receptor sites on a radial grid of variable scale. The output concentrations are appropriate for either a 24-hour or annual period, as designated by the user. The model contains the concentration equations, the Pasquill-Gifford vertical disper-sion coefficients and the Pasquill stability classes, as given by Turner. Plume rise is calculated according to Briggs. Plume height is adjusted according to terrain elevation for stable cases. Technical details of the program are presented, with descriptions of data requirements. Flow diagrams and input data forms are presented. Four appendices include a complete test-case analysis, a complete program listing and a paper in which estimated and observed data are compared at several sites for 24-hour periods during which the upper limits of concentrations were observed.

PB-274 529/7CP			PC A06/MF A01				
Bureau	of	Reclamation,	Denver,	Colo.	En-		
gineering and Research Center.							

Atmospheric Simulation Using Stratified Liquid Models

H. T. Falvey, and R. A. Dodge. Jul 77, 101p Rept no. REC-ERC-77-8

Descriptors: "Atmospheric models, "Stratification, "Cloud seeding, Simulation, Density(Mass/volume), Equations of state, Air flow, Plumes, Topography, Liquids, Velocity measurement, Feasibility, Aerial reconnaissance, Effectiveness, Colorado River Basin, Computer programs, Fortran.

Computer programs, Fortran. Identifiers: Model studies, Skywater Project, Meteorological phenomena, Leadville Climax Pilot Project, Sierra Cooperative Pilot Project, Colorado River Basin Pilot Project.

Analytical and laboratory studies were made to demonstrate the feasibility of using stratified

liquids and distorted scale maps of an area to simulate mesoscale (2 to 20 kilometres) atmospheric phenomena. Techniques and instrumentation were developed for creating velocity gradients, creating density gradients, for visualization, and for making measurements. The effectiveness of both aerial and ground seeding station locations was investigated for various pilot study areas of Project Skywater. (Color illustrations reproduced in black and white)

PB-275 327/5CP

PC A18/MF A01

SRI International, Menlo Park, Calif. The Relation of Oxidant Levels to Presursor Emissions and Meteorological Features. Volume III. Appendices (Analytical Methods and Supplementary Data) Final rent.

F. L. Ludwig, P. B. Simmon, R. L. Mancuso, J. H. S. Kealoha, and E. Reiter. Sep 77, 415p EPA/450/3-77/022c Contract EPA-68-02-2084 See also Volume 2, PB-275 326.

Descriptors: \*Ozone, \*Air pollution, Meteorology, Statistical analysis, Trajectories, Graphs, Mathematical models, Concentration(Composition), Computer programs, Stratosphere, Troposphere, Atmospheric composition.

Identifiers: METINDX computer program.

Contents:

- Data selection and methodology for trajectory analysis:
- Meteorological and emission index
- computer program; Computation of Montgomery stream
- functions:
- Daily weather and peak-hour ozone maps for 1974.

PB-275 380/4CP PC A03/MF A01 National Oceanic and Atmospheric Administration, Idaho Falls, Idaho. Air Resources Labs. A Feasibility Study for the Application of K-Band Radar in the Investigation of Cooling Tower Plumes Technical memo

Norman R. Ricks. Aug 77, 45p NOAA-TM-ERL-ARL-66, NOAA-77110803

Descriptors: \*Air pollution, \*Plume detection, \*Radar detection, \*Cooling towers, Plumes, Feasibility, K band, Computer programs, Electric power plants, Remote sensing, Water vapor

Identifiers: Air pollution detection.

The feasibility of using commercially available K-band (1 cm) radar for indirect sensing of cooling tower plumes is investigated. Using the radar equation, commercially available systems are evaluated by means of a computer model which estimates the strength of the expected return signal under sampled conditions known to exist in actual plumes. Recommendations are made for the adaptation of available radar systems and for areas of additional study. Complete data and program documentation are provided.

PB-275 459/6CP PC A12/MF A01 Stanford Research Inst., Menlo Park, Calif. Users' Manual for the APRAC-2 Emissions and Diffusion Model Jun 77, 257p Contract EPA-68-01-3807 See also PB-213 091.

Descriptors: \*Computer programs, \*Mathematical models, 'Air pollution, 'Exhaust emissions, \*Atmospheric diffusion, Concentra-tion(Composition), Computerized simulation, Programming manuals, Hydrocarbons, Carbon monoxide, Nitrogen oxides.

Identifiers: Emission factors, \*APRAC2 computer program.

The computer program for a completely revised version of the APRAC-1A diffusion model is presented and discussed. The new code uses EPA's emissions calculation methodology from Supplement No. 5 to AP-42. Gridded, and link by link emissions can be output for hydrocarbons, carbon monoxide or oxides of nitrogen. Diffusion calculations make use of a receptororiented Gaussian plume model. Local winds at the receptor can be used, they are interpolated from multiple wind inputs. Mixing heights may be calculated from sounding data, or input directly. Two local source models are available, one treating pollutant behavior in a street canyon, the other treats vehicle and pollutant effects at a signalized intersection. A small program is included for decoding Federal Highway Administration data tapes.

PB-275 683/1CP PC A06/MF A01 California State Dept. of Transportation, Sacramento. Transportation Lab.

CALINE 2 - An Improved Microscale Model for the Dispersion of Air Pollutants from a Line Source Interim rept.

C. E. Ward, Jr, A. J. Ranzieri, and E. C. Shirley. Jun 77, 111p CA-DOT-TL-7218-1-76-23, FHWA/RD-77-74 Contract OT-FH-11-7730 See also mag tape, PB-271 105 and User's Manual, PB-271 106.

Descriptors: \*Automobile exhaust, \*Air pollu-tion, \*Carbon dioxide, Mathematical models, Exhaust emissions. Concentration(Composition), Comparison, Wind velocity, Highways, Computerized simulation, Numerical analysis, Atmospheric diffusion. Identifiers: CALINE2 computer program, Gaussian plume models, \*Atmospheric dispersion.

In order for transportation planners and engineers to evaluate the air quality impact of a proposed project, mathematical means are required to describe the dispersion of air pollutants from a line source. CALINE2, the California Line Source Dispersion Model, is presented and discussed as one such mathematical approach. CALINE2 is based on the generalized Gaussian dispersion theory, and simulates the dispersion of carbon monoxide from a uniform line source. A sensitivity analysis of the model relates the behavior of its predictions as a function of the input parameters. A preliminary verification study using carbon monoxide data from the Los Angeles region gives the user an estimate of CALINE2's predictive capabilities. An earlier version of the model, which was dis-tributed nationwide in 1972, is compared with the present version.

#### PB-275 700/3CP

Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div

# Valley Model Computer Program

Model-Simulation

Ed Burt, and Jerry Mersch. Sep 77, mag tape EPA/DF-78/002

Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB-274 054. Also available as punched cards

Descriptors: \*Model-simulation, \*Air pollution, Fortran, Concentration(Composition), Plumes, Atmospheric diffusion, Magnetic tapes. Identifiers: \*Gaussian plume models, VALLEY computer program, UNIVAC-1110 computers, VALLEY model.

The Valley Model Computer Program is an analytical technique whose primary use is for estimating the upper limits of 24-hour average pollutant concentrations due to isolated sources in rural, complex terrain...Software Description: The simulation model is written in the Fortran programming language for imple-mentation on a UNIVAC 1110 computer using the EXEC 8 operating system. 56K 36-bit words of core storage is required to operate the model. The User's Manual, Valley Model User's Guide, is also available separately from NTIS as PB-274 054, at \$6.50 per copy.

#### PB-275 701/1CP

Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.

CP T03

Single Source (CRSTER) Model Computer Programs Model-Simulation

Russ Lee, and Jerry Mersch. 1977, mag tape EPA/DE-78/004

Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Also available as punched cards. Price includes documentation, PB-271 360.

Descriptors: \*Model-simulation, \*Air pollution, Computerized simulation, Magnetic tapes, Formotion, tran, Atmospheric Concentration(Composition).

Identifiers: \*Air quality, CRSTER model, UNIVAC-1110 computers, Gaussian plume models.

The Single Source (CRSTER) Model contains two computer programs designed to simulate atmospheric dispersion processes for the purpose of calculating ambient concentration levels of atmospheric contaminants. It is used primarily in simulating the behavior of stack effluents from combustion sources...Software Description: The model is written in the Fortran programming language for implementation on a UNIVAC 1110 computer using the EXEC 8 operating system. 40K 36-bit words of core storage is required to operate the model. The User's Manual is available from NTIS separately as PB-271 360 at \$11.00 per copy.

PB-276 140/1CP PC A09/MF A01 North American Weather Consultants, Goleta, Calif.

Methods for Estimating Areal Precipitation in Mountainous Areas Final rent.

Robert D. Elliott. 31 Oct 77, 190p 77-13, NOAA-77111506

Contract NOAA-6-35358

CP T03

\*Mountains, Descriptors: \*Precipitation(Meteorology), \*Weather forecasting, Physical geography, Watersheds, Distribution(Property), Barriers, Storms, Wind direction, Mathematical models, Computer programs, Fortran, Utah, Synoptic meteorology, Stream flow, Cloud physics, Profiles, Tables(Data), Weather stations. Identifiers: TRAJDRV computer program,

BETAS computer program.

The development and testing of a method for predicting the distribution of precipitation over a mountainous watershed is presented. A valid estimate of the mean areal precipitation over the entire watershed can be formed given a precipitation observation. The accuracy of the average hinges upon the ability to extrapolate the precipitation away from the observation point over the watershed, or even over an entire orographic barrier. The orographic component of precipitation is identified as the mountain precipitation minus the upwind valley precipita-

tion, the latter representing the storm component. A simple numerical model is developed for projecting the precipitation pattern over a given barrier, knowing the basic wind direction and speed, and various cloud and air mass parameters. The method was tested on one well instrumented mountain barrier and then ex-tended to four other barriers. The tests indicated the method's precipitation pattern prediction capability is good over the barrier where over the other barriers. However, the method appears to have a general capability in account pattern changes with wind direction. (Portions of this document are not fully legible)

#### PB-276 516/2CP

Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.

CP **T03** 

Climatological Dispersion Model QC (CDMQC) Computer Program Model-Simulation

Bruce Turner, and Jerry Mersch. May 77, mag tape EPA/DF-78/003

Source tape is in EBCDIC character set. Tapes can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Also available as punched cards. Price includes documentation, PB-274 040.

Descriptors: \*Models-simulation, \*Atmospheric motion, \*Air pollution, \*Climatology, Fortran, Mathematical models, Magnetic tapes. Identifiers: \*Climatology Dispersion Model, CDMQC computer program, Point sources, UNIVAC 1110 computers.

The Climatological Disperson Model QC (CDMQC) is an expanded version of the CDM program. The CDM program is part of the UNAMAP system, PB-229 771, which is expected to be updated during the first quarter of 1978. The CDMQC includes three new features: (1) source contribution table, (2) internal calibration, and (3) statistical conversion of averaging times.

PB-276 582/4CP PC A04/MF A01 Environmental Sciences Research Lab... Research Triangle Park, N.C. Non-Divergent Wind Analysis Algorithm for

the St. Louis RAPS (Regional Air Pollution Study) Network

Terry L. Clark, and Robert E. Eskridge. Nov 77, 72 Rept no. EPA/600/4-77/049

Descriptors: \*Wind(Meteorology), \*Mathematical models, Algorithms, Air pollution, Atmospheric motion, Fortran, Computer programs, Missouri. Identifiers: \*Saint Louis(Missouri), RAPS pro-

gram, Atmospheric boundary layer.

An objective wind analysis algorithm capable of producing non-divergent wind fields at up to ten levels in the atmospheric boundary layer for St. Louis, Missouri is described. Wind data collected during the St. Louis Regional Air Pollution Study (RAPS) and averaged over 15-minute intervals were used to construct u and v wind component fields on a 46 by 46 grid network with a grid spacing of 1 km via a sean-radius technique. The divergence across grid squares was minimized by a non-divergence algorithm. Several analyses produced by the algorithm are illustrated. A user's guide and computer program listing are included

#### PB-276 694/7CP PC A04/MF A01 National Center for Atmospheric Research,

Boulder, Colo. Atmospheric Analysis and Prediction Div

#### **Description of the General Program Structure** of the Third-Generation NCAR General Circulation Model

Technical note Richard K. Sato, and Gerald L. Browning. Dec 77, 58p Rept no. NCAR/TN-1270IA Grant NSF-ATM77-23757

Descriptors: \*Atmospheric circulation, Atmospheric models, \*Computerized simula-ion, \*Computer programming, Weather Descriptors: tion, forecasting. Identifiers: \*General circulation models, Nu-

merical weather forecasting, CDC-7600 computers.

This document is a description of the design implementation, and operation of the thirdgeneration NCAR General Circulation Model (GCM). It contains the information needed by the scientist or programmer who intends to modify and/or run the model.

PB-281 028/1CP PC A04/MF A01 South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences Computer Modeling of Cumulus Clouds During Project Cloud Catcher Technical rept. John H. Hirsch. Apr 71, 70p Rept no. 71-7

Contract DI-14-06-D-6796

Descriptors: \*Cumulus clouds, \*Cloud physics, Cloud seeding, Precipitation(Meteorology), Mathematical models, Temperature, Ice formation, Thermodynamics, Moisture, Correlation techniques, Fortran, Field tests, Computer programs, South Dakota.

Identifiers: Skywater project, Cloud Catcher project, Sensitivity analysis, CLD computer program, Convection (Atmospheric).

A steady-state, one-dimensional model of cumulus convection with parameterized microphysics is applied to cumulus clouds of the Northern Great Plains Region. The numerical model is reviewed and comparisons are made between diagnosed cloud characteristics of the model and observations obtained during an extensive field program in cumulus modification. Correlation coefficients near 0.8 are achieved between model predictions of cloudtop heights and radar reflectivity maxima whereas poorer agreements are reached between in-cloud characteristics measured by aircraft. The model appears to be a useful objective tool for diagnosis of potential for convective cloud development and the effects of cold cloud seeding. It is an inexpensive, fast, numerical model which may be used operationally in real-time on many rawinsondes with little expense.

PB-281 306/1CP PC A08/MF A01 Environmental Sciences Research Lab... Research Triangle Park, N.C. User's Guide for PAL A Guassian-Plume Algorithm for Point, Area, and Line Sources William B. Petersen. Feb 78, 163p\* Rept no. EPA/600/4-78/013

\*Air pollution, \*Atmospheric Algorithms, Concentra-Descriptors: models. tion(Composition), Atmospheric diffusion. Wind(Meteorology), Urban areas, Industrial wastes, Stadiums, Parking facilities, Shopping centers, Airports, Computer programs, Fortran. Identifiers: "Gaussian plume models, "Air quality, Point sources, Nonpoint sources, PAL computer program.

PAL is an acronym for this point, area, and line source algorithm. PAL is a method of estimating short-term dispersion using Gaussianplume steady-state assumptions. The algorithm can be used for estimating concentrations of non-reactive pollutants at 30 receptors for averaging times of from 1 to 24 hours, and for a limited number of point, area, and line sources (30 of each type). Calculations are performed for each hour. The hourly meteorological data required are wind direction, wind speed, stabili-ty class, and mixing height. Single values of each of these four parameters are assumed representative for the area modeled. This al-gorithm is not intended for application to entire urban areas but is intended rather, to assess the impact on air quality, on scales of tens to hun-dreds of meters, of portions of urban areas such as shopping centers, large parking areas, and airports. Level terrain is assumed.

PB-282 834/1CP

Science Applications, Inc., La Jolla, Calif. A New Wind Energy Site Se Selection

PC A11/MF A01

Methodology Final rept. 17 Mar 75-16 Apr 76 B. E. Freeman. May 76, 236p SAI-76-614-LJ, NSF/RA-761229

Contract NSF-C1006, Grant NSF-AER75-00834

Descriptors: \*Wind power, \*Site surveys, Wind power generation, Wind(Meteorology), Wind velocity, Velocity measurement, Data acquisi-tion, Mathematical models, Planning, Computer programming, Computerized simulation. Identifiers: Site selection, SIGMET computer program, MICMET computer program.

The objectives of this study were to develop simulation methods to make the siting of wind energy devices more accurate, to identify and obtain data on meteorological field experiments, and to begin the process of evaluation of computer codes by the comparison of calculations with field data. One of the major tasks accomplished was the adaptation, develop-ment, and initial testing of meteorological simulation models. The mesoscale computer codes (SIGMET) were extensively modified to broaden the physical effects to be taken into account, and a microscale computer code (MICMET) was selected, modified, and tested.

PB-283 080/0CP PC A02/MF A01 National Weather Service, Salt Lake City, Utah. Western Region.

Hand Calculator Program to Compute Parcel Thermal Dynamics Technical memo.

Dan Gudgel. Apr 78, 12p NOAA-TM-NWS-WR-

128, NOAA-78051002

Prepared by National Weather Service Forecast Office, Reno, Nev.

Descriptors: \*Atmospheric temperature, \*Computer programs, Thunderstorms, Finite difference theory, Computation, Programming manuals, Adiabatic conditions, Calculators. Identifiers: HP-67 programmable calculators.

This program computes the temperature of an air parcel raised dry adiabatically to the lifted condensation level, LCL, and then pseu-doadiabatically thereafter. The procedure is ac-complished without aid of an energy diagram (Skew-T, Pseudo-adiabatic chart, etc.) using iterative computations on a Hewlett-Packard 67 hand computer. The iterative computations in-volve using finite difference to solve the energy balance equation for the ascending parcel. The program can be used in lieu of an energy diagram for computation of atmospheric stability indices (e.g., determination of a thunderstorm gust potential). A sample problem and a computer program are in the Appendix.

S.E.S.-75/3 PC A02/MF A01 Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Global Horizontal Solar Radiation for Australian Locations Stored in the CSIRO CYBER 7600 System: The Data and Method of Retrieval

J. W. Bugler. Jun 75, 10p U.S. Sales Only.

Descriptors: \*Australia, \*Insolation, Computer codes, Data processing. Identifiers: ERDA/140100, \*Solar radiation.

The Commonwealth Bureau of Meteorology has established and operates a network of sta tions throughout Australia measuring solar radiation. The network was established early in 1968 and, with subsequent additions, consists of some 20 stations recording total global horizontal solar radiation integrated over halfhourly periods; some of these stations also record diffuse horizontal solar radiation over the same periods. These data are processed and stored on magnetic tape in the Computer Section of the Meteorological Bureau in Melbourne. A complete copy of the tape of global horizontal solar radiation has been reproduced in a form compatible with the C.S.I.R..O. CYBER 7600 computer. This report describes the information stored on the C.S.I.R.O. magnetic tape and the method of retrieving that information. (ERA citation 01:018888)

SAND-75-0321 PC A02/MF A01 Sandia Labs., Albuquerque, N.Mex. Automatic Digital Acquisition System for

Meteorological Data. M. S. Rogers, R. D. Aden, J. P. Watterberg, and J. E. Van Meter. Aug 75, 25p

Contract AT(29-1)-789

Descriptors: \*Meteorology, \*Data acquisition systems, \*Weather, Data acquisition systems, Automation, Computer codes, Flowsheets, Humidity, Pressure dependence, Turbulence, Velocity, Wind.

A system was installed at Tonopah Test Range to facilitate the continuous automatic collection and display of meteorological data. All readings are converted to digital form to simplify transmission from remote areas and reduce noise interference, to permit easy data manipulation, and to provide a compatible interface for computer reduction of the data.

SCI-DB-720097 PC E01/MF A01 Sandia Labs, Livermore, Calif. Recursive Relationships for the Ther-modynamic Properties of the Earth's Atmosphere at a Set of Geopotential Altitudes R., Humphrey, Feb 73, 28p Contract AT(29-1)-789

Descriptors: \*Atmosphere, \*Computer proarams Identifiers: AEC.

For abstract, see NSA 27 08, number 19405.

TID-26686-P2 PC A03/MF A01 National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Atmospheric Turbulence and Diffusion Lab.

Meteorological Effects of the Cooling Towers at the Oak Ridge Gaseous Diffusion Plant. Ii. Predictions of Fog Occurrence and Drift Deposition. S R. Hanna, Mar 74, 41p

Descriptors: 'Orgdp, Cooling towers, 'Cooling towers, Plumes, 'Plumes, 'Diffusion, At-mospheric precipitations, Chromates, Com-puter codes, Deposition, Droplets, Earth at-mosphere, Corporate worker, Materializer, mosphere, Gaseous wastes, Meteorology, Moisture, Numerical solution, Thermal ef-fluents, Waste heat, Water vapor, Wind

For abstract, see NSA 31 04, number 08740.

UCID-16827-2 PC A02/MF A01 California Univ., Livermore. Lawrence Livermore Lab

Current Status of LLL Four-D Atmospheric Propagation Code Effort

J. A. Fleck, Jr, and J. R. Morris. 16 Mar 76, 21p

Contract W-7405-Eng-48

Descriptors: \*Laser radiation, Computer codes, F codes, Uses, Wave propagation, Wind. Identifiers: ERDA/420300, \*Laser beams, At-

mospheric transmissivity, Atmospheric attenuation, Optical detection.

The deployment of high-energy lasers against moving targets is almost always noncoplanar. This noncoplanarity creates a vertical wind component in the transverse plane that causes the effective wind vector to rotate continuously. All propagation codes that have been developed in the past have been based on the assumption of a purely horizontal wind. The scenario capability of the Four-D code has now been generalized from the previous coplanar version, which assumed a moving laser plat-form, a target on a collision course with the platform, and an arbitrarily oriented coplanar wind. Currently the laser can be displaced to any height above the platform, and the scenario plane can be aribitrarily oriented with respect to the horizon. The scenario routine returns to the hydrodynamics routine of the code a transverse wind velocity vector of varying magnitude and orientation. The hydrodynamics routine of the Four-D code is now capable of treating both CW and multipulse steady state sources with winds of arbitrary magnitude and direction relative to the x-axis. A complete time-dependent capability for arbitrary wind directions will be completed some time in the near future. (ERA citation 01:020419)

UCID-17203 PC A03/MF A01 California Univ., Livermore. Lawrence Livermore Lab. Modeling of Transport in the Two-Dimensional Atmospheric Transport and Kinetics Codes SPHERNEW and TRACER A. Edwards. 23 Jul 76, 31p Contract W-7405-Eng-48

Descriptors: \*Aerosols, \*Earth atmosphere, \*Air pollution, \*Mathematical models, Chemical reaction kinetics, Computer calculations, Computer codes, Diffusion, S codes, T codes, Wind. Identifiers: ERDA/500100, SPHERNEW computer code, TRACER computer program, \*Atmospheric motion.

The report describes how transport by the wind is modeled in the 2-D atmospheric transport and chemical kinetics codes SPHERNEW and TRACER. The description includes the equations for transport by a specified velocity field, the eddy diffusion approximation for short-term fluctuations in the velocity, other simplifying approximations, the geometric grid, the difference equations, and the coefficient matrix of the grid. The assumption of a constant vertical density distribution was used to derive massconsistent forms of the difference equations. These forms eliminate the instabilities and unrealistic solutions associated with specified wind fields which are not exactly mass-consistent. An option is allowed for variable weighting between central (second-order) and upstream (first-order) forms of the spatial differencing of the advection terms, to modulate phase and amplitude errors in the advection model. (ERA citation 02:005659)

UCID-17701 PC A02/MF A01 California Univ., Livermore. Lawrence Livermore Lab.

PATRIC: A Three Dimensional Particle-in-Cell Sequential Puff Code for Modeling the Transport and Diffusion of Atmospheric Pollutants R. Lange. Jan 78, 11p Contract W-7405-ENG-48

Descriptors: \*Air pollution, \*Computer codes, Diffusion, Distribution, Environmental transport, Mathematical models, Particles, Wind.

Identifiers: EBDA/500200 \*Air quality. Assessments, Normal density factors, PATRIC computer program.

PATRIC is a transport and diffusion code designed to calculate the three-dimensional distribution of atmospheric pollutants in a given space and time varying flow field. It is based on the particle-in-cell model in which the pollutant mass or activity is represented by the spacial distribution of a large number marker particles. The temporal evolution of this particle distribution results from the transport of each individual marker particle due to advection by the mean wind and diffusion by the Gaussian formula. The code is capable of computing instantaneous or time-integrated air concentrations and deposition for a variety of instantaneous or continuous sources, including inert and radioactive materials. PATRIC was developed as a simplified and speeded-up version of the Lawrence Livermore Laboratory three-dimen-sional transport and diffusion code for complex terrain ADPIC. PATRIC computer time is approximately one minute for every 24 hours modeled which makes the code suitable for annual air quality assessments. (ERA citation 03:026884)

PC A04/MF A01 UCRL-51826 California Univ., Livermore Lawrence Livermore Lab.

Time-Dependent Propagation of High Energy Laser BEAMS Through the Atmosphere. J. A. Fleck, Jr, J. R. Morris, and M. J. Feit. 2 Jun

75, 61p

Contract W-7405-eng-48

Descriptors: \*Laser radiation, Wave propagation, Computer codes, Earth atmosphere, Time dependence.

ERDA/420300, Laser beams, Identifiers: \*Atmospheric transmissivity.

A general time-dependent three-space-dimensional propagation code is described. This code is capable of treating the propagation of high energy laser beams through the at-mosphere in the presence of a horizontal wind and turbulence for most situations of interest. Possible cases are propagation of cw beams through stagnation zones, multipulse propagation, including the self-consistent treatment of pulse self-blooming, and propagation involving transonic slewing. The solution of the Maxwell wave equation in Fresnel approximation is obtained by means of a discrete Fourier transform method, which, surprisingly, gives excellent results for diffraction problems. The latter provide a stringent test for the accuracy of any solution method. Considerable use is also made of discrete Fourier transform methods in solving the hydrodynamic equations. The treatment of turbulence is based on the generation of random phase screens at each calculation step along the propagation path. In a time-dependent calculation the random phase screens can be either made to move with the wind at a given propagation position or generated anew for each successive time. The code is equipped with a general scenario routine involving a moving laser platform as well as target. This routine allows the code to treat an effective transverse wind velocity that varies with time as well as axial position. Thus it is possible to take into account the motion of the stagnation point in treating the propagation of beams through stagnation zones. The code is equipped with extensive editing facilities which generate various averages, contour plots, and plots of quantities of interest as a function of time. The report also contains illustrative examples of the code's different calculational features.

UCRL-52049

PC A06/MF A01 California Univ., Livermore. Lawrence Livermore Lab.

CPS: A Continuous-Point-Source Computer Code for Plume Dispersion and Deposition Calculations

K. R. Peterson, T. V. Crawford, and L. A. Lawson. 21 May 76, 105p Contract W-7405-ENG-48

Descriptors: \*Air pollution, \*Chemical effluents, \*Plumes, \*Radioactive effluents, Atmospheric precipitations, Computer calculations, Com-puter codes, Diffusion, Fortran, Gaussian processes, Height, Meteorology, Point sources, Spatial distribution, Stack disposal, Surface air, Topography, Velocity, Wind. Identifiers: ERDA/500200,

ERDA/500300, Atmospheric diffusion.

The continuous-point-source computer code calculates concentrations and surface deposition of radioactive and chemical pollutants at distances from 0.1 to 100 km, assuming a Gaus-sian plume. The basic input is atmospheric stability category and wind speed, but a number of refinements are also included. (ERA citation 02.007973)

PC A02/MF A01 UCRL-52366 California Univ., Livermore. Lawrence Livermore Lab.

Development of a Three-Dimensional Model of the Atmospheric Boundary Layer Using the Finite Element Method

R. L. Lee, and P. M. Gresho. 22 Nov 77, 24p Contract W-7405-ENG-48

Descriptors: 'Boundary layers, 'Earth at-mosphere, Air pollution, Algorithms, Altitude, Computer calculations, Computer codes, Equa-tions of state, Humidity, Mathematical models, Measuring methods, Temperature gradients, Three-dimensional calculations, Two-dimen-sional calculations, Velocity, Wind. Identifiers: ERDA/500100, ERDA/500200, At-mospheric boundary layer, Atmospheric models, Enite element analysis.

models, Finite element analysis.

This report summarizes our current effort and ideas toward the development of a model for the planetary boundary layer using the finite element technique. As an initial step, the finite element methooology is applied to simpler ver-sion of the boundary layer equations given by the two-dimensional, constant-property, in-compressible conservation equations (Navier-Stokes equations). Solution procedures for both the steady-state and transient equations are discussed. For the transient problem, a variable time-step, trapezoid-rule algorithm with dynamic time-truncation error control is presented. The resulting system of nonlinear algebraic equations is solved by a Newton itera-tion procedure with a frontal solution scheme used for the linear set of equations. The need to develop a suitable linear equation solver, with respect to minimization of computer storage and execution costs, particularly for large (three-dimensional) finite element problems, is also discussed. (ERA citation 03:037946)

UCBL-75868 PC A03/MF A01 California Univ., Livermore Lawrence Livermore Lab

Applications of Episode: An Experimental Package for the Integration of Systems of Or-

dinary Differential Equations of Systems of C dinary Differential Equations. A. C. Hindmarsh, and G. D. Byrne. Jun 75, 30p Rept no. CONF-750902-3

Descriptors: \*Computer codes, \*E codes, \*Differential equations, \*Numerical solution, \*Earth atmosphere, \*Simulation, Cdc compu-ters, Chemical reaction kinetics, Fortran. Identifiers: ERDA/990200, EPISODE computer code

A brief description, with examples of usage, is given of a new FORTRAN package called EPISODE, for the numerical solution of the ini-

tial-value problem for systems of ordinary dif-ferential equations. EPISODE contains both a variable-step, variable-order implicit Adams method and a variable-step, variable-order backward differentiation method. Since the user may select either of these methods simply by assigning the appropriate value to a method flag, EPISODE can be used to solve either stiff or nonstiff problems. Similarly, the user also selects one of four corrector iteration methods to be used. EPISODE was motivated by problems in atmospheric modeling at LLL in which chemical rate constants vary with time in an abrupt diurnal manner. Examples of such problems, and others, are given to illustrate the use and effectiveness of the program. Outside LLL the EPISODE package is being supplied in double precision, but contains the single preci-sion version imbedded in it. Conversion to single precision can be easily done with a converter subroutine, supplied with the package.

#### UCRL-76170

PC A03/MF A01 California Univ., Livermore Lawrence Livermore Lab.

Adpic: A Three-Dimensional Transport-Diffusion Model for the Dispersal of Atmospheric Pollutants and Its Validation Against Regional Tracer Studies.

R. Lange. May 75, 40p Rept no. 0CONF-750533-40

Descriptors: 'Argon 41, 'Diffusion, 'Iodine 131, Diffusion, 'Aerosols, Diffusion, 'Air pollution, 'Mathematical models, A codes, Computer codes, Distribution, Environmental effects, Lagrangian function, Particles, Plumes, Reactors, Tracer techniques. Identifiers: ERDA/500200, ERDA/500101.

For abstract, see ERA 75 06, number 01263.

UCRL-78120 PC A02/MF A01 California Univ., Livermore. Lawrence Livermore Lab. Modeling the Planetary Boundary Layer Using the Galerkin Finite-Element Method P. M. Gresho, R. L. Lee, and R. L. Sani. 28 Apr 76, 9p Rept no. 0CONF-761003-190 Contract 0W-7405-Eng-480 Symposium on atmospheric turbulence, diffusion, and air quality, Raleigh, North Carolina, United States of America (USA), 19 Oct 1976.

Descriptors: \*Earth atmosphere, Boundary layers, Computer calculations, Computer codes, Diffusion, F codes, Mathematical models, Air pollution. Identifiers: ERDA/500100, \*Planetary boundary layer, Finite element analysis, \*Atmospheric models.

Finite-element-methods computer programs that approximate the solution to the advectiondiffusion equation are discussed for planetary boundary layer modeling. It has application in regional modeling studies and in real-time ac-cident situations relative to air pollution monitoring. (ERA citation 02:005660)

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## CALIFORNIA UNIV., LA JOLLA.

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  - Energetic Particle Flux Experiment (Imp F and G) N74-18336/9CP
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# CEA CENTRE D'ETUDES NUCLEAIRES DE FONTENAY-AUX-ROSES, 92 (FRANCE). DEPT. DE PHYSIQUE DU PLASMA ET DE LA FUSION CONTROLEE.

Determination of the Particle Size Distribution of an Aerosol Using a Diffusion Battery. CEA-R-4549

#### CEA CENTRE D'ETUDES NUCLEAIRES DE FONTENAY-AUX-ROSES (FRANCE). DEPT. DE PROTECTION.

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#### COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, MELBOURNE (AUSTRALIA).

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- COMPUTER SCIENCES CORP., SILVER SPRING, MD. NASA-CR-152508

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COMPUTER SCIENCES CORP., SILVER SPRING, MD. SYSTEM SCIENCES DIV

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- CONTROL DATA CORP., MINNEAPOLIS, MINN. An Objective Analysis Technique for the Regional Air Pollution Study. Part I (EPA/600/4-77/002a)

  - PB-266 255/9CP

An Objective Analysis Technique for the Regional Air Pollution Study. Part II (EPA/600/4-77/002b) PB-266 756/6CP

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## NASA-CR-1731

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GERMANY).

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DANISH METEOROLOGICAL INST COPENHAGEN GEOPHYSICAL DEPT

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DANISH SPACE RESEARCH INST., LYNGBY.

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DEPARTEMENT D ETUDES ET DE RECHERCHES EN

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DENVER UNIV., COLO. DEPT. OF GEOGRAPHY.

DENVER UNIV., COLO. DEPT. OF PHYSICS AND

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ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., WESTLAKE VILLAGE, CALIF. WESTERN TECHNICAL CENTER.

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ENVIRONMENTAL RESEARCH INST OF MICHIGAN ANN ARBOR INFRARED AND OPTICS DIV

## ERIM-107600-10-T

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## ENVIRONMENTAL SCIENCES RESEARCH LAB.,

## RESEARCH TRIANGLE PARK, N.C.

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ENVIRONMENTAL SCIENCES RESEARCH LAB.,

RESEARCH TRIANGLE PARK, N.C. METEOROLOGY AND ASSESSMENT DIV.

## EPA/600/4-77/015

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#### ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER (AIR FORCE) WASHINGTON D C

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#### EPSILON LABS INC BEDFORD MASS

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EUROPEAN SOUTHERN OBSERVATORY, HAMBURG (WEST GERMANY).

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#### EUROPEAN SPACE AGENCY, PARIS (FRANCE).

**ESA-TT-381** 

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