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Environmental Protection
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Atmospheric Sciences
Research Laboratory
Research Triangle Park NC 27711

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EPA ENVIRONMENTAL RESEARCH BRIEF

Description of UNAMAP (VERSION 6)

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Abstract

UNAMAP (VERSION 6) represents the 1986 update to the Users Network for Applied Modeling of Air Pollution. UNAMAF consists of an ASCII magnetic tape containing FORTRAN codes and test data for 23 Air Quality Simulation Models as well as associated documentation. The tape and documentation are available as a single package from NTIS (Accession Number PB 86-222 361). This provides technical transfer of these models from the Environmental Protection Agency to model users.

Introduction

UNAMAP is an acronym for User's Network for Applied Modeling of Air Pollution. This is a collection of FORTRAN source codes for Air Quality Simulation Models (AQSM). It is used as the method of technology transfer of air quality simulation model computer codes from researcher to model user.

UNAMAP versions are created and maintained by:

Environmental Operations Branch
Meteorology Division
Atmospheric Sciences Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency

Mailing Address: Environmental Operations Branch
Mail Drop 80, EPA
Research Triangle Park, NC 27711

(919) 541-4564; FTS 629-4564

UNAMAP exists in two forms:

1. Source codes and executables reside in EPA's UNIVAC 1110 at Research Triangle Park, NC. These programs can be readily accessed by EPA users and those who establish accounts to use this computer facility. Access is administered by NTIS. For information on establishing an account to use EPA's UNIVAC at RTP call Lois Grooms (703) 487-4807; FTS 737-4807.

2. The magnetic tape containing the current UNAMAP, VERSION 6 is available as UNAMAP (VERSION 6) Accession Number PB 86-222 361, from:

   Computer Products
   National Technical Information Service
   U.S. Department of Commerce
   Springfield, VA 22161

   (703) 487-4763; FTS 737-4763

   The UNAMAP tape from NTIS provides access by the user community to source codes (primarily in ANSI FORTRAN 77) for Air Quality Simulation Models (AQSM).

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The presence of an AQSM in UNAMAP does not constitute endorsement by either the Environmental Operations Branch or by the Environmental Protection Agency.

Background

Since 1973, UNAMAP has served as a source for AQSMs in computer compatible form. These models accept emission and meteorological data and calculate projected air pollutant concentrations. UNAMAP is basically state-of-the-art dispersion research algorithms. These represent air quality models that were funded by EPA in their development or are recommended by the Office of Air Quality Planning and Standards for environmental impact analysis. As an additional service to the regulatory groups in EPA and to those trying to conform to regulations, UNAMAP contains "Guideline Models." Guideline Models are further defined below.

Version 3 of UNAMAP was made available in March 1978. It contained 11 AQSMs. Three changes were issued to purchasers of UNAMAP (VERSION 3): Change 1, 23 August 1978; Change 2, 5 July 1979; and Change 3, 16 August 1979.

Version 4 of UNAMAP dated December 1980 became available from NTIS in March 1981. It contained 21 AQSM s. One change dated December 1981 was distributed to UNAMAP (VERSION 4) purchasers in March 1982

Version 5 of UNAMAP dated December 1982 became available from NTIS in August 1983. It contained 31 models (9 guideline models, 19 non-guideline models, and 3 models of historical interest). One change dated May 1984 was issued.

This is Version 6 of UNAMAP dated July 1986. It contains 23 models, associated processors, test data, and print files of example output.

Contents

UNAMAP Description—File 1

Files 2 through 33 are in 80 character format. (The logical record length is 80, the physical record length is 8000, and the blocking factor is 100.)

Section 1. Guideline (Appendix A) Models.

Appendix A models are those identified for some regulatory use by EPA's Office of Air Quality Planning and Standards (OAQPS) in the guideline document: "Guideline on Air Quality Models (Revised)," EPA-450/2-78-027R, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. 1986.

Model	Dated	File Number on Version 6 Tape	Total Lines in File	UNIVAC 1100 Core Required	UNIVAC 1100 Cost of Test	File Number of Sample Print-Out
BLP	(82102)	2	4527	18K Test 1	$ 0 95	41
				Test 2	0.99	
POSTBLP				19K	0 96	
BLPSUM				9K	1 02	
CALINE-3	(86100)	3	836	8K	1 20	42
CDM-2.0	(85293)	4	2382	27K	7 82	43
RAM	(85364)	5	6293	66K	1 80	44
RAMMET				27K	4 91	
ISCST	(86170)	6	3597	71K	5 39	45
ISCLT	(86210)	7	4077	72K	2 22	46
MPTER	(85165)	8	2867	52K	5 42	47
CRSTER	(86211)	9	1956	57K	13 56	48

Section 2. Other Models or Processors (New Models).

Model	Dated	File Number on Version 6 Tape	Total Lines in File	UNIVAC 1100 Core Required	UNIVAC 1100 Cost of Test	File Number of Sample Print-Out
INPUFF	(86128)	10	3654	48K	$ 4 68	49
PLOTPUFF				43K		
PEM-2	(86016)	11	5322	59K	33 43	50
TUPOS-2.0	(86169)	12	6040	25K	1.90	51
INMET	(86163)			7K	1 28	
LSTMET	(86164)			8K	1 32	
TUPOS-P	(85092)			48K Test 1	2.17	
				Test 2	1.89	
PLUVUE-2	(83304)	13	6289	181K Test 1	109 62	52
				Test 2	263 32	
PBM	(85274)	14	4325	50K	5.93	53
PBMMET				21K		
PBMAQE				16K		
MESOPUFF-2	(85360)	15	8679	92K	5.13	54

Section 2. (Continued)

Model	Dated	File Number on Version 6 Tape	Total Lines in File	UNIVAC 1100 Core Required	UNIVAC 1100 Cost of Test	File Number of Sample Print-Out
READ56	(85357)			13K	2.22	
MESOPAC-2	(85358)			75K	7 40	
MESOFILE	(85361)			56K	1 45	
MPDA-1 0	(86077)	16	9651			40
MPDA-1 0 (PREPROCESSORS)						
SCAN-SFC	(86065)			20K	1.75	
EXTRACT-SFC	(86066)			21K	2 52	
CONVERT-SFC	(86067)			18K		
OA-SFC	(86068)			17K		
SCAN-UPPER	(86069)			18K		
EXTRACT-UPPER	(86070)			20K	3.83	
CONVERT-UPPER	(86071)			19K		
QA-UPPER	(86072)			12K		
REDUCE	(86073)			17K		
HRLY-INTERP	(86074)			37K	1 27	
QA-SITE	(86075)			25K	1.62	
MERGE	(86076)			45K	2.98	
MPDA-1.0 (COMMON BLOCKS)		17	692			
COMMON BLOCKS AND DECLARATIONS						
MPDA-1.0 (LIBRARY)		18	539			
SUBROUTINE LIBRARY						
MPDA-1 0 (PROCESSOR)		19	10345			
DRIVER	(86077)			65K	1.53	
RUNAVG	(86202)	33	810	13K	1.29	55

Section 3. Other Models or Processors (Revised)

Model	Dated	File Number on Version 6 Tape	Total Lines in File	UNIVAC 1100 Core Required	UNIVAC 1100 Cost of Test	File Number of Sample Print-Out
PAL-2	(86087)	20	4843	49K	$ 1.89	56
PTPLU-2	(86196)	21	3102	13K	1 39	57
PTPLUI-2	(86195)			17K		
HIWAY-2	(80346)	22	1060	13K	2.77	58
MPTDS	(82299)	23	3434	74K		59
ROADWAY-2	(86010)	24	2871	27K	3 61	60
CHAVG	(81180)	25	775	15K		61
UTMCON	(83012)	26	388	8K	0 58	62
APRAC-3	(82203)	27	13827	83K	2.68	63
PREMOD				56K	29 46	
CALMPRO	(84152)	32	494	103K	4 97	64

Section 4. Additional Models for Regulatory Use

Model	Dated	File Number on Version 6 Tape	Total Lines in File	UNIVAC 1100 Core Required	UNIVAC 1100 Cost of Test	File Number of Sample Print-Out
VALLEY	(85338)	28	1145	13K	$ 0.84	65
SHORTZ	(82326)	29	5236	56K	1 57	66
METZ	(86326)			12K	0 92	
POSTZ	(86224)					
LONGZ	(82327)	30	3113	52K	8 02	67
COMPLEX-1	(86064)	31	3270	54K	1.73	68

Section 5. Data Files

Files 34 through 39 have differing formats. The format of each is described in the following tables

Data File Name	File Number on Version 6 Tape	Number of Records (Logical)	Logical Record Length	Physical Record Length	Blocking Factor
SURFACE DATA	34	8784	80	8000	100
READ-56 INPUT	35	299	2000	20000	10
MESOPUFF-2 UPPER AIR DATA	36	82	132	13200	100
MPDASFC (SFC DATA FOR MPDA)	37	300	80	800	10
MPDASITE (ONSITE DATA FOR MPDA)	39	962	132	13200	100

	File Number on Version 6 Tape	Block Number	Characters Per Block
MPDAUPPER (UPPER AIR DATA FOR MPDA)	38	1	5572
		2	4748
Note: File 38 has variable record length.		3	5620
The number of characters contained in each of		4	4668
the six blocks is therefore given		5	4592
		6	5796

Section 6. Output Print Files

Files 40 through 68 are in 132 character format. (The logical record length is 132; the physical record length is
13200; and the blocking factor is 100.)

Model	File Number on Version 6 Tape	Total Lines in File
MPDA	40	11986
BLP	41	1735
CALINE-3	42	416
CDM-2	43	604
RAM	44	4914
ISCST	45	645
ISCLT	46	339
MPTER	47	317
CRSTER	48	1127
INPUFF	49	147
PEM-2	50	482
TUPOS	51	2474
PLUVUE-2	52	1266
PBM	53	1515
MESOPUFF-2	54	3086
RUNAVG	55	57
PAL-2	56	244
PTPLU-2	57	103
HIWAY-2	58	69
MPTDS	59	3164
ROADWAY-2	60	201
CHAVG	61	1224
UTMCON	62	56
APRAC-3	63	1720
CALMPRO	64	462
VALLEY	65	361
SHORTZ	66	718
LONGZ	67	1282
COMPLEX-1	68	377

Program Descriptions

Series 600 (ORD) publications are available from NTIS In cases where copies were printed by EPA, copies may be available from

USEPA
ORD Publications
26 West St. Clair St.
Cincinnati, OH 45268
(513) 569-7562; FTS 684-7562

Series 450 (OAQPS) publications are also available from NTIS. In cases where copies are printed by EPA, copies may be available from:

Library
Mail Drop 35, USEPA
Research Triangle Park, NC 27711
(919) 541-2777; FTS 629-2777

Section 1. Guideline (Appendix A) Models

BLP (Dated 82102)

Abstract

BLP (Buoyant Line and Point Source Dispersion Model) is a Gaussian plume dispersion model designed to handle unique modeling problems associated with aluminum reduction plants, and other industrial sources where plume rise and downwash effects from stationary line sources are important. POSTBLP and BLPSUM are related postprocessors in this system .

References

Schulman, L. L., and Scire, J. S., 1980: Buoyant Line and Point Source (BLP) Dispersion Model User's Guide. Document P-7304B. Prepared for the Aluminum Association, Inc., by Environmental Research and Technology, Inc., Concord, MA. (NTIS Accession Number PB 81-164 642). (July 1980).

Schulman, L. L., and Scire, J. S., 1980. Development of an Air Quality Dispersion Model for Aluminum Reduction Plants. Document P-7304A. Prepared for the Aluminum Association, Inc., by Environmental Research and Technology, Inc , Concord, MA. (NTIS Accession Number PB 81-164 634). (August 1980)

Addendum/Supplemental Information for BLP. 2 pp. (December 1982). (Distributed as part of UNAMAP, VERSION 5, Documentation.) (Included as part of UNAMAP (VERSION 6) Documentation.)

CALINE-3 (Dated 86100) California Line Source Model

Abstract

The California line source dispersion model, CALINE-3, can be used to predict carbon monoxide concentrations near highways and arterial streets given traffic emissions, site geometry and meteorology. The model has adjustments for averaging time and surface roughness, and can handle up to 20 links and 20 receptors. It also contains an algorithm for deposition and settling velocity so that particulate concentrations can be predicted.

References

Benson, P. E., 1979: CALINE-3—A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets. FHWA/CA/TL-79/23. Federal Highway Administration. (NTIS Accession Number PB 80-220 841).

Benson, P. E., 1980: Background and Development of the CALINE-3 Line Source Dispersion Model. FHWA/CA/TL-80/31. Federal Highway Administration.

CDM-2.0 (Dated 85293)

Abstract

CDM-2.0 (Climatological Dispersion Model—Version 2.0) determines long-term (seasonal or annual) quasi-stable pollutant concentrations in rural or urban settings using average emission rates from point and area sources and a joint frequency distribution of wind direction, wind speed, and stability. The Gaussian plume hypothesis forms the basis for the calculations. Contributions are calculated assuming the narrow plume hypothesis, and involve an upwind integration over the area sources. Computations can be made for up to 200 point sources and 2500 area sources at an unlimited number of receptor locations. The number of point and area sources can be easily modified within the code. CDM-2.0 is an enhanced version of CDM and includes the following options: 16 or 36 wind-direction sectors; initial plume dispersion; buoyancy-induced dispersion; stack-tip downwash; and gradual (transitional) plume rise. The user has a choice of seven dispersion parameter schemes. Optional output includes point and area concentration rises and histograms of pollutant concentration by stability class.

Reference

Irwin, J. S., T. Chico, and J. Catalano, 1986: CDM-2.0—Climatological Dispersion Model User's Guide. EPA/600/8-85/029. U.S. Environmental Protection Agency, Research Triangle Park, NC. (Available only from NTIS. Accession Number PB 86-136 546/AS.)

RAM (Dated 85364)

Abstract

Gaussian-plume multiple-source air quality algorithm. This short-term Gaussian steady-state algorithm estimates concentrations of stable pollutants from urban point and area sources. Hourly meteorological data are used. Hourly concentrations and averages over a number of hours can be estimated. Briggs plume rise is used. Pasquill-Gifford dispersion equations with dispersion parameters thought to be valid for urban areas are used. Concentrations from area sources are determined using the method of Hanna, that is, sources directly upwind are considered representative of area source emissions affecting the receptor. Special features include determination of receptor locations downwind of significant sources and determination of locations of uniformly spaced receptors to ensure good area coverage with a minimum number of receptors.

Reference

Catalano, J. A., D. B. Turner, and J. H. Novak, 1986: User's Guide for RAM—Second Edition. (Under Preparation) U.S. Environmental Protection Agency, Research Triangle Park, NC. (To be available from NTIS.)

RAMMET (Dated 84136)

Abstract

RAMMET processes hourly surface meteorological observation data (a disk or tape record for each hour) to determine a Pasquill stability class for each hour and interpolates between twice-a-day mixing height data (an input card for each day) to obtain a mixing height value for each hour. An output tape or disk file is produced with a record for each day. Normal use is to process a calendar year of hourly data. The output file can be used as meteorological input to models such as RAM, CRSTER, and MPTER. RAMMET optionally generates random numbers used in the processing or will read as input a specified set of random numbers from a separate file (included in the RAM file in UNAMAP). Optionally available also is the use of opaque cloud cover (preferred) or total cloud cover

Reference

Catalano, J. A., D. B. Turner, and J. H. Novak, 1986: User's Guide for RAM—Second Edition. (Under Preparation) U S. Environmental Protection Agency, Research Triangle Park, NC. (To be available only from NTIS.)

ISCST (Dated 86170)

Abstract

The Industrial Source Complex Short-Term model is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial source complex. This model can account for settling and dry deposition of particulates, downwash, area, line and volume sources, plume rise as a function of downwind distance, separation

of point sources, and limited terrain adjustment. Average concentration or total deposition may be calculated in 1-, 2-, 3-, 4-, 6-, 8-, 12- and/or 24-hour time periods. An 'N'-day average concentration (or total deposition) or an average concentration (or total deposition) over the total number of hours may also be computed.

Reference

Environmental Protection Agency, 1986: Industrial Source Complex (ISC) Dispersion Model User's Guide—Second Edition. Volumes 1 and 2. EPA-450/4-86-005A and B. Office of Air Quality Planning and Standards. Research Triangle Park, NC 27711. (To be available only from NTIS. Submitted to NTIS for assignment of Accession Number.)

ISCLT (Dated 86210)

Abstract

The Industrial Source Complex Long Term model is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial source complex. This model can account for settling and dry deposition of particulates, downwash, area, line and volume sources, plume rise as a function of downwind distance, separation of point sources, and limited terrain adjustment.

ISCLT is designed to calculate the average seasonal and/or annual ground level concentration or total deposition from multiple continuous point, volume and/or area sources. Provision is made for special discrete X, Y receptor points that may correspond to sampler sites, points of maxima, or special points of interest. Sources can be positioned anywhere relative to the grid system.

Reference

Environmental Protection Agency, 1986: Industrial Source Complex (ISC) Dispersion Model User's Guide—Second Edition. Volumes 1 and 2. EPA-450/4-86-005A and B. Office of Air Quality Planning and Standards. Research Triangle Park, NC 27711. (To be available only from NTIS. Submitted to NTIS for assignment of Accession Number.)

MPTER (Dated 85165)

Abstract

MPTER is a multiple point-source Gaussian model with optional terrain adjustment. MPTER estimates concentrations on an hour-by-hour basis for relatively inert pollutants (i.e., SO_2 and TSP). MPTER uses Pasquill-Gifford or Briggs urban dispersion parameters and Briggs plume rise methods to calculate the spreading and the rise of plumes. The model is most applicable for source-receptor distances less than 10 kilometers and for locations with level or gently rolling terrain. Terrain adjustments are restricted to receptors whose elevation is no higher than the lowest stack top. In addition to terrain adjustments, options are also available for wind profile exponents, buoyancy induced dispersion, gradual plume rise, stack downwash, and plume half-life.

References

Pierce, T. E., and D. B. Turner, 1980: User's Guide for MPTER: A Multiple Point Gaussian Dispersion Algorithm with Optional Terrain Adjustment. EPA-600/8-80-016. U.S. Environmental Protection Agency, Research Triangle Park, NC. 239 pp. (April 1980). (NTIS Accession Number PB 80-197 361).

Chico, T., and J. A. Catalano, 1986: Addendum to the User's Guide for MPTER. EPA/600/8-86/ 021. U.S. Environmental Protection Agency, Research Triangle Park, NC. 196 pp. (July 1986). (Available only from NTIS. Accession Number PB 86-217 163/AS.)

CRSTER (Dated 86211)

Abstract

This algorithm estimates ground-level concentrations resulting from up to 19 colocated elevated stack emisions for an entire year and prints out the highest and second-highest 1-, 3-, and 24-hour concentrations as well as the annual mean concentrations at a set of 180 receptors (5 distances by 36 azimuths). The algorithm is based on a modified form of the steady-state Gaussian plume equation which uses either Pasquill-Gifford or Briggs urban dispersion coefficients and includes adjustments for plume rise and limited mixing. Terrain adjustments are made as long as the surrounding terrain is physically lower than the lowest stack height input. Pollutant concentrations for each averaging time are computed for discrete, non-overlapping time periods (no running averages are computed) using measured hourly values of wind speed and direction, and estimated hourly values of atmospheric stability and mixing height.

References

Monitoring and Data Analysis Division, 1977: User's Manual for Single-Source (CRSTER) Model. U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA-450/2-77-013 (NTIS Accession Number PB-271 360.)

Catalano, J. A., 1986 Addendum to the User's Manual for Single Source (CRSTER) Model (Being assigned an EPA number.) U.S. Environmental Protection Agency, Research Triangle Park, NC (To be available only from NTIS.)

Section 2. Other Models or Processors (New Models)

INPUFF (Dated 86128)

Abstract

INPUFF is a Gaussian integrated PUFF model with a wide range of applications. The implied modeling scale is from tens of meters to tens of kilometers. The model is capable of addressing the accidental release of a substance over several minutes, or of modeling the more typical continuous plume from a stack Several requests to the Meteorology Division for assistance in modeling the air quality downwind of incineration ships prompted the development of an integrated PUFF model. INPUFF is, therefore, capable of simulating moving point sources as well as stationary sources.

Computations in INPUFF can be made for multiple point sources at up to 100 receptor locations. In practice, however, the number of receptor locations should be kept to a minimum to avoid excessive run time. INPUFF is primarily designed to model a single event during which one meteorological transition period may occur, such as going from afternoon to evening conditions. Up to 144 separate meteorological periods of the same length may be used to characterize the meteorology during the event; this provides a time resolution that ranges from minutes to an hour. The user has the option of specifying the wind field for each meteorological period at up to 100 grid locations or allowing the model to default to a homogeneous wind field.

Three dispersion algorithms are used within INPUFF for dispersion downwind of the source. The user may select the Pasquill-Gifford (P-G) scheme (Turner, 1970) or the on-site scheme (Irwin, 1983) for short travel time dispersion. The on-site scheme, so named because it requires specification of the variances of the vertical and lateral wind direction, is a synthesis of work performed by Draxler (1976) and Cramer (1976). The long travel time scheme is the third dispersion algorithm in which the growth of the puff becomes proportional to the square root of time. Optionally, the user can incorporate their own subroutine for estimating atmospheric disperions.

INPUFF utilizes the deposition algorithms given by Rao (1981). In the limit when pollutant settling and dry deposition velocities are zero, these expressions reduce to the Gaussian diffusion algorithms.

A CALCOMP software plotting package has also been provided to display concentrations versus time for a given receptor and the puff trajectories after each simulation period.

References

Petersen, W. B., and L. G. Lavdas, 1986: IPUFF 2.0—A Multiple Source Gaussian Puff Dispersion Algorithm. EPA/600/8-86/024. U.S. Environmental Protection Agency, Research Triangle Park, NC. (Available only from NTIS. Submitted to NTIS for assignment of Accession Number.)

PBM (Dated 85274) Photochemical Box Model

Abstract

The PBM is a simple stationary single-cell model with a variable height lid designed to provide volume-integrated hour averages of O_3 and other photochemical smog pollutants of interest for an urban area for a single day of simulation. The PBM is most appropriate for application in air stagnation conditions with light and variable winds. Horizontal dimensions of the box are typically on the order of 10-50 km; the vertical dimension may vary between 0.1 and 2 km. Chemical reactions are simulated using a 63-step kinetic mechanism that includes diurnal variation of photolytic rate constants. The depth of the mixed layer, or depth of the PBM domain, also follows a diurnal pattern; it can be optionally specified as following a non-linear growth curve. The PBM assumes that emission sources are homogeneously distributed across the surface face of the box volume and that the volume is well mixed at all times Atmospheric diffusion and wind shear are neglected.

The user must provide the PBM with initial species concentrations, hourly inputs of wind speed, source emission fluxes of CO, NO_x, THC, hydrocarbon reactivity classes, and boundary species concentrations. Values of measured solar radiation and mixed layer depth may be specified at sub-hourly intervals throughout a simulation. The services of a qualified dispersion meteorologist, a chemist, and a computer programmer may be necessary to implement and apply the PBM and to interpret the results.

PBM has two preprocessors, PBMMET and PBMAQE. Output from these two preprocessors, are required for PBM input. The order of execution is PBMMET, PBMAQE and PBM.

Reference

Schere, K. L., and K. L. Demerjian, 1984: User's Guide for the Photochemical Box Model (PBM). EPA/600/8-84/022a. U.S. Environmental Protection Agency, Research Triangle Park, NC. (November 1984). (NTIS Accession Number PB 85-137 164.)

MPDA-1.1 (Dated 86077)

Abstract

Version 1 of the Meteorological Processor for Diffusion Analysis (MPDA-1) is a processor that can orgnize available meteorological data into a format accessible to diffusion analysis. MPDA-1 provides methods for preparing three types of data: National Weather Service (NWS) twice-daily radiosonde reports; NWS hourly surface observations; and user-supplied onsite data. To determine the surface scaling parameters, the meteorological processor is structured in accordance with current concepts of the idealized states of the planetary boundary layer. Profiles of wind velocity, temperature, and the standard deviations of vertical and lateral wind velocity fluctuations at user-specified heights are estimated. The output from MPDA-1 was formatted to accommodate the TUPOS Gaussian-plume model which uses wind fluctuation data to characterize the diffusion parameters. Future versions will provide additional output formats to accommodate other popular diffusion estimation models.

Reference

Paumier, J., D. Stinson, T. Kelly, C. Bollinger, and J. S. Irwin, 1986: MPDA-1: A Meteorological Processor for Diffusion Analysis—User's Guide. EPA/600/8-86/011. U.S. Environmental Protection Agency, Research Triangle Park, NC. 192 pp. (Available only from NTIS. Accession Number PB 86-171 402/AS.)

TUPOS-2.0 (Dated 86169)

Abstract

TUPOS and its postprocessor, TUPOS-P, form a Gaussian model which resembles MPTER but offers several technical improvements. TUPOS estimates dispersion

directly from fluctuation statistics at plume level and calculates plume rise and partial penetration of the plume into stable layers using vertical profiles of wind and temperature. The model user is thus required to furnish meteorological information for several heights above-ground in a separate input file.

TUPOS can be used for short-term (hours to days) impact assessment of inert pollutants from single or multiple sources and can be expected to have greatest accuracy for locations within 10 km of the source. Although TUPOS will make computations for receptors having any ground-level elevation, it is not intended as a complex terrain model, but rather as a model for calculations over flat or gently rolling terrain. TUPOS will optionally treat buoyancy-induced dispersion but does not include building downwash, deposition, or fumigation. TUPOS-2.0 adds a hesitant plume model. This is employed when F*, the non-dimensional buoyancy flux, exceeds 0.09.

The maximum number of point sources and the maximum number of receptor locations are easily adjusted at the time of program compilation and so have no specific limit.

Output from TUPOS consists principally of tape or disk concentration files which are then analyzed and summarized by the postprocessor, TUPOS-P. An hourly concentration file is automatically created by TUPOS; the user has the option of creating a partial concentration file.

References

Turner, D. B., T. Chico, and J. A Catalano, 1986: TUPOS—A Multiple Source Gaussian Dispersion Algorithm Using On-Site Turbulence Data. EPA/600/8-86/010. U.S. Environmental Protection Agency, Research Triangle Park, NC. 171 pp. (Available only from NTIS. Accession Number PB 86-181 310/AS.)

Turner, D. B., 1986: Addendum to TUPOS—Incorporation of a Hesitant Plume Algorithm. (Being assigned an EPA number.) U.S. Environmental Protection Agency, Research Triangle Park, NC. (To be available only from NTIS.)

TUPOS-P (Dated 85092)

Abstract

TUPOS-P is a postprocessor program for analyzing concentration files produced by the air quality dispersion model TUPOS. The program reads either hourly concentration or hourly partial concentration files and provides the following output: hourly concentration summaries, averaging period concentration summaries; and high-five concentration tables for five averaging times (1-hr, 3-hrs, 8-hrs, 24-hrs, and an averaging time selected by the user).

If the concentration file being read consists of partial contributions, the user may request hourly contribution summaries and averaging period contribution summaries for up to 25 significant sources. Much of the printed output is optionally available so that unneeded output volume is avoided.

Reference

Turner, D. B., T. Chico, and J. A. Catalano, 1986: TUPOS-P— A Program for Reducing Hourly and Partial Concentration Files Produced by TUPOS: User's Guide. EPA/600/8-86/012. U.S. Environmental Protection Agency, Research Triangle Park, NC. 106 pp. (Available only from NTIS. Accession Number PB 86-181 328/AS.)

PEM-2 (Dated 86016) Pollution Episodic Model

Abstract

The Pollution Episodic Model (PEM) described by Rao and Stevens (1982) is an urban scale (up to 50 km distances) air pollution model capable of predicting short-term (1 to 24-hour) average surface concentrations and deposition fluxes of two gaseous or particulate pollutants at up to a maximum of 2500 ground-level receptors located on a 50 km by 50 km square receptor grid. Predictions are based on steady-state Gaussian plume assumptions, Briggs' plume rise formulations, and Pasquill-Gifford (P-G) dispersion parameters. The surface concentration and deposition flux estimates of two independent non-reactive (gaseous or particulate) pollutants or one pollutant with first-order chemical decay can be obtained as special cases of the model. Up to 300 point sources and up to 50 area sources may be included in the model inputs. Calculations are performed for each hour using the specified meteorological data. Up to 24 different sets of hourly meteorological data may be specified as inputs for the determination of air quality for 24 distinct weather scenarios. Pollutant concentrations and deposition fluxes for a 2 to 24-hour averaging period are calculated by averaging the corresponding values calculated for each hour in the period.

PEM is based on the Texas Episodic Model (TEM, Version 8) developed by the Texas Air Control Board (1979).

PEM accounts for the dry deposition, gravitational settling, and a first-order chemical transformation or decay of gaseous or particulate pollutants (of any size) in the concentration algorithms. These algorithms, based on exact solutions of a gradient-transfer (K-theory) model, were given by Rao (1981, 1982) as analytical extensions of the widely used Gaussian plume dispersion algorithms under various atmospheric stability and mixing conditions. Thus, PEM treats deposition, sedimentation, and chemical transformation in a physically realistic and straightforward manner, and it is subject to the same basic assumptions and limitations associated with all Gaussian plume-type models. For further details regarding the gradient-transfer model formulations, analytical solutions, parameterizations, and the development of the algorithms for PEM, the user should consult the reports by Rao (1981, 1982). An evaluation of the PEM using the St. Louis/RAPS data for five pollutant species can be found in the report by Pendergrass and Rao (1983)

The PEM-2 model (Rao, 1984) is developed from the PEM (Rao and Stevens, 1982) with the following key modification:

1. PEM-2 uses Briggs' urban dispersion parameters (based on the St. Louis diffusion data of McElroy and Pooler) for both point and area sources. Whereas PEM uses the same dispersion parameter as the TEM-8.

2 The number of stability classes in PEM-2 are reduced to six (from seven in the PEM).

3. For buoyancy-dominated plumes in unstable/neutral atmosphere, Briggs' new plume rise equations and plume penetration (of an elevated stable layer) schemes are included as optional features in PEM-2.

4. An option is provided to use site-specific values for the exponents of the wind-profile power law and anemometer height as inputs to PEM-2.

5. Concentrations from area sources are computed by numerical integration in PEM-2, while they are calculated from concentration algorithms based on mass budgets of the species in PEM. The user may specify an effective height of emission for urban area sources in PEM-2, whereas these emissions are assumed to occur only at ground-level in PEM. The number of calculation grid squares used for each area source have been increased to 9 (in PEM-2) from 5 in PEM to increase the plume length and improve the model performance.

Based on the number of pollutants (NPOL=1 or 2) and the chemical transformation/decay option parameter (TCT=0 or 1) specified in the model input, PEM-2 program does one of the following:

1. If NPOL=1 and ICT=0 or 1, surface concentrations and deposition fluxes of one gaseous or particulate pollutant, with the given deposition and settling velocities, VD1 and W1 respectively, are calculated. If ICT=1, then chemical decay of pollutant is also considered if the decay rate in percent per hour, XKT > 0.

2. If NPOL=2 and ICT=0, surface concentrations and deposition fluxes of two different and uncoupled gaseous or particulate pollutant species with the given deposition and settling velocities VD1 and W1 (for species-1) and VD2 and W2 (for species-2) respectively, are calculated. Emission rates for both species may be different. Chemical decay is not considered for either species even if a value of XKT > 0 is specified.

3. If NPOL=2 and UCT=1, the two gaseous or particulate pollutant species are coupled through a first-order chemical transformation. The surface concentrations and deposition fluxes of both the primary pollutant (species-1 or reactant) as well as the secondary pollutant (species-2 or reaction product) are calculated. The chemical transformation rate (XKT > 0) should be given. Both species may be given non-equal deposition and settling velocities. A non-zero direct emission rate for the secondary pollutant from the point and/or area sources may also be specified as input for this case.

For further details the user should consult the PEM-2 User's Guide by Rao (1984).

References

Staff of the Texas Air Control Board, 1979: User's Guide: Texas Episodic Model. Texas Air Control Board, Permits Section, Austin, TX 78723, 215 pp. (Available only from NTIS. Accession Number PB 80-227 572.)

Pendergrass, W. R., and K. S. Rao, 1983: Evaluation of the Pollution Episodic Model Using the RAPS Data. EPA/600/3-84/087. U.S. Environmental Protection Agency, Research Triangle Park, NC; NOAA Tech. Memo. ERL ARL-128, NOAA-ATDL, Oak Ridge, TN 37831, 47 pp. ATDL Contribution File. 83/18. (Available only from NTIS. Accession Number PB 84-232 537.)

Rao, K. S., 1981: Analytical Solutions of a Gradient-Transfer Model for Plume Deposition and Sedimentation. EPA-600/3-82-079. U.S. Environmental Protection Agency, Research Triangle Park, NC; NOAA Tech. Memo. ERL ARL-109, NOAA-ATDL, Oak Ridge, TN 37831. 75 pp. ATDL Contribution File No. 81/14. (Available only from NTIS. Accession Number PB 82-215 153.)

Rao, K. S., 1982: Plume Concentration Algorithms with Deposition, Sedimentation, and Chemical Transformation. EPA/600/3-84/042. U.S. Environmental Protection Agency, Research Triangle Park, NC; NOAA Tech. Memo. ERL ARL-124, NOAA-ATDL, Oak Ridge, TN 37831. 87 pp. ATDL Contribution File No. 82/27. (Available only from NTIS. Accession Number PB 84-138 742.)

Ku, Jia-Yeong and K. S. Rao, 1986: Evaluation of the PEM-2 Using the 1982 Philadelphia Aerosol Field Study Data Base. EPA/600/3-86/016. U.S. Environmental Protection Agency, Research Triangle Park, NC. (Available only from NTIS. Accession Number PB 86-167 921/AS.)

Rao, K. S., 1986: PEM-2: Pollution Episodic Model (Version 2) User's Guide. (Being assigned an EPA number.) U.S. Environmental Protection Agency, Research Triangle Park, NC. (To be available only from NTIS.)

MESOPUFF-2.0 Model System (Dated 85360)

Abstract

The MESOPUFF 2.0 model is a Lagrangian variable-trajectory puff superposition model suitabale for modeling the transport, diffusion, and removal of air pollutants from multiple point and area sources at transport distances beyond the range of conventional straight-line Gaussian plume models (i.e., beyond 10-50 km). It is an extensively modified version of the MESOPUFF model.

MESOPUFF 2.0 is one element of an integrated modeling package that also includes components for preprocessing of meteorological data (READ56) and postprocessing of concentration data (MESOFILE).

Reference

Scire, J S., F. W. Lurmann, A. Bass, and S. R. Hanna, 1984: User's Guide to the MESOPUFF II Model and Related Processor Programs. EPA/600/8-84/013. U.S. Environmental Protection Agency, Research Triangle Park, NC. 223 pp. (Available only from NTIS. Accession Number PB 84-181 775.)

PLUVUE-2 (Dated 83304)

Abstract

PLUVUE-2 is a visibility model designed to predict the transport, atmospheric diffusion, chemical conversion, optical effects, and surface deposition of point-source

emissions. PLUVUE-2 performs plume optics calculations in two modes. In the plume-based mode, the visual effects are calculated for a variety of lines of sight and observer locations relative to the plume parcel; in the observer-based mode, the observer position is fixed and visual effects are calculated for the specific geometry defined by the positions of the observer, plume, and sun.

References

Seigneur, C., C. D. Johnson, D. A. Latimer, R. W. Bergstrom, and H. Hogo, 1984: User's Manual for the Plume Visibility Model (PLUVUE II). EPA/600/8-84/005. U.S. Environmental Protection Agency, Research Triangle Park, NC. (Available only from NTIS. Accession Number PB 84-158 302.)

U.S. Environmental Protection Agency, 1985: Addenda to the User's Manual for the Plume Visibility Model (PLUVUE II). (Included as part of the UNAMAP (VERSION 6) documentation.)

RUNAVG (Dated 86202)

Abstract

RUNAVG is a postprocessor program for determining the highest and second-highest non-overlapping running average. RUNAVG accepts hourly concentration file input from either ISCST, TUPOS, RAM, MPTER, or CRSTER. It can handle an averaging time from 2 hours to 24 hours for up to 30 receptors. The algorithm used in RUNAVG for determining running averages is substantially faster than the algorithm used in CHAVG. Instructions for executing RUNAVG are contained in the source listing.

Reference

Pierce, T. E., 1986: An Efficient Algorithm for Determining Non-Overlapping Running Averages. (Accepted by Environmental Software.)

Section 3. Other Models or Processors (Old or Slightly Revised Models)

PAL-2.0 (Dated 86087)

Abstract

PAL is an acronym for the Point, Area, and Line source algorithm. PAL is a method of estimating short-term dispersion using Gaussian-plume steady-state assumptions The algorithm can be used for estimating concentrations of non-reactive pollutants at 99 receptors for averaging times of from 1 to 24 hours, and for a limited number of point, area, and line sources (99 of each type). Calculations are performed for each hour The hourly meteorological data required are wind direction, wind speed, stability class, and mixing height. Single values of each of these four parameters are assumed representative for the area modeled. The Pasquill-Gifford or McElroy-Pooler dispersion curves are used to characterize dispersion. This algorithm 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 hundreds of meters, of portions of urban areas such as shopping centers, large parking areas, and airports. Level terrain is assumed The Gaussian point source equation estimates concentrations from point sources after determining the effective height of emission and the upwind and crosswind distance of the source from the deceptors. Numerical integration of the Gaussian point source equation is used to determine concentrations from the four types of line sources. Subroutines are included that estimate concentrations for multiple lane line and curved path sources, special line sources (line sources with endpoints at different heights above ground), and special curved path sources. Integration over the area source which includes edge effects from the source region is done by considering finite line sources perpendicular to the wind at intervals upwind from the receptor. The crosswind integration is done analytically: integration upwind is done numerically by successive approximations. The PAL model can treat deposition of both gaseous and suspended particulate pollutants in the plume since gravitational settling and dry deposition of the particles are explicitly accounted for. The analytical diffusion-deposition expressions listed in this report are easy to apply and, in the limit when pollutant settling and deposition velocities are zero, they reduce to the usual Gaussian plume diffusion algo-rithms.

Reference

Petersen, W. B., and E. D. Rumsey, 1986: User's Guide for PAL 2.0—A Gaussian-Plume Algorithm for Point, Area, and Line Sources. (Being assigned an EPA number.) U.S. Environmental Protection Agency, Research Triangle Park, NC. (To be available only from NTIS.)

PTPLU-2 (Dated 86196)

Abstract

PTPLU is a point source dispersion Gaussian screening model for estimating maximum surface concentrations for 1-hour concentrations. PTPLU is based upon Briggs' plume rise methods and can use either Pasquill-Gifford or Briggs' urban dispersion coefficients. PTPLU is an adaptation and improvement of PTMAX which allows for wind profile exponents and other optional calculations such as buoyancy induced dispersion, stack downwash, and gradual plume rise. PTPLU produces an analysis of concentration as a function of wind speed and stability class for both wind speeds constant with height and wind speeds increasing with height. Use of the extrapolated wind speeds and the options allows the model user a more accurate selection of distances to maximum concentration. PTPLUI is the interactive version of this model

References

Pierce, T. E , D B Turner, J. A. Catalano, and F V Hale III, 1982 PTPLU—A Single Source Gaussian Dispersion Algorithm—User's Guide. EPA-600/8-82-014. U S Environmental Protection Agency, Research Triangle Park, NC. (August 1982). (NTIS Accession Number PB 83-211 235)

Pierce, T. E , 1986 Addendum to PTPLU—A Single Source Gaussian Dispersion Algorithm (Under preparation) U S Environmental Protection Agency, Research Triangle Park, NC (To be available only from NTIS)

HIWAY2 (Dated 80346)

Abstract

HIWAY2 is a model which computes the hourly concentrations of non-reactive pollutants downwind of roadways. It is applicable for uniform wind conditions and level terrain. Although best suited for at-grade highways. It can also be applied to depressed highways (cut sections). HIWAY2 is intended as an update to the HIWAY model.

References

Petersen, W. B., 1980: User's Guide for HIWAY2: A Highway Air Pollution Model. EPA-600/8-80-018. U.S. Environmental Protection Agency, Research Triangle Park, NC. 70 pp. (May 1980) (NTIS Accession Number PB 80-227 556.)

Rao, S. T., and M. T. Keenan, 1980: Suggestions for Improvement of the EPA HIWAY Model. J. Air Pollution Control Assoc., 30(6):247-256.

Addendum/Supplemental Information for PAL, HIWAY2, and RAM. 5 pp. (December 1980). (Originally distributed as part of the UNAMAP, VERSION 5, documentation.) Included as part of UNAMAP (VERSION 6) documentation.)

MPTDS (Dated 82299)

Abstract

MPTDS is a modification of MPTER to explicitly account for gravitational settling and or deposition loss of a pollutant. Surface deposition fluxes can be printed under an optional output feature MPTDS is a multiple point source code with an optional terrain adjustment feature. The code is primarily based upon MPTER which has Gaussian modeling assumptions. Execution is limited to a maximum of 250 point sources and 180 receptors. Hourly meteorological data are required. Period of simulation can vary from 1 hour to 1 year.

References

Rao, K. S., 1982: Analytical Solutions of a Gradient-Transfer Model for Plume Deposition and Sedimentation. EPA-600/3-82-079. U.S. Environmental Protection Agency, Research Triangle Park, NC. (November 1982) (NTIS Accession Number PB 82-215 153.)

Rao, K. S., and L. Satterfield, 1982: MPTER-DS: The MPTER Model Including Deposition and Sedimentation. EPA-600/8-82-024. U.S. Environmental Protection Agency, Research Triangle Park, NC. (October 1982) (NTIS Accession Number PB 83-114 207.)

ROADWAY-2.0 (Dated 86010)

Abstract

ROADWAY is a finite-difference model which solves a conservation of species equation to predict pollutant concentrations within two hundred meters of a highway. It uses surface layer similarity theory to predict wind and eddy diffusion profiles from temperature at two heights and wind velocity upwind of the highway. A unique feature of the model is its use of vehicle wake theory. It is assumed that vehicle wakes affect the wind and turbulence fields in a linear manner with wake intensity a function of vehicle speed, downwind distance, and distance from the wake center. The user has the option of considering NO, NO_2, and O_3 chemical reactions near the road. Output from the model consists of X-Z fields of wind components, eddy diffusion coefficients, and concentration of pollutant species.

Reference

Eskridge, R. E., and J. A. Catalano, 1986: ROADWAY—A Numerical Model for Predicting Air Pollutants Near Highways: User's Guide. (Under preparation) U.S. Environmental Protection Agency, Research Triangle Park, NC. (To be available only from NTIS.)

CHAVG (Dated 81180)

Abstract

CHAVG is a postprocessor program for computing running averages (averages that begin each hour and overlap) and end-to-end averages (averages that do not overlap) from hourly concentration disk or tape files. Since running averages are greater than or equal to the end-to-end averages, there frequently may be a need to analyze concentration data (from measurement or from air quality simulation models, such as those in the UNAMAP series) using both methods of averaging. Calculations are made for selected receptors, and these values are ranked for each of four averaging periods plus a fifth period selected by the user. Output tables are generated for each averaging period for each type of average selected by the user. The program as written is compatible with hourly output generated by RAM and MPTER.

Reference

Catalano, J. A., and F. V. Hale III, 1982: CHAVG—A Program for Computing Averages of Hourly Air Pollutant Concentrations—User's Guide. EPA-600/8-82-015. U.S. Environmental Protection Agency, Research Triangle Park, NC. (September 1982) (NTIS Accession Number PB 83-107 342.)

UTMCON (Dated 83012)

Abstract

UTMCON is a utility program to convert from latitude and longitude to UTM coordinates and vice versa (Thanks to William Belanger, EPA Region III, for sharing this program.)

APRAC-3 (Dated 82203)

Abstract

APRAC3 contains two recent modifications to previous versions: (1) the emission factor computation methdology has been revised to reflect recent updates, and that portion of the code that performs emissions computations has been separated from the other portions of the model to facilitate incorporation of future emission factor methodology updates, and (2) treating traffic links in the primary network with low vehicle miles traveled as area sources

Gridded and link-by-link emissions can be output for hydrocarbons, carbon monoxide, or oxides of nitrogen. Dispersion calculations use a receptor-oriented Gaussian plume model. Local winds at each 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: (1) treating pollutant behavior in a street canyon, and (2) treating vehicle and pollutant effects at a signalized intersection. A preprocessor PREMOD2 is associated with this model. This program produces emissions compatible with MOBILE 2.

Reference

Simmon, P. B., R. M. Patterson, F. L. Ludwig, and L. B. Jones, 1981: The APRAC-3/MOBILE1 Emissions and Diffusion Modeling Package. EPA-909/9-81-002. (July 1981). (NTIS Accession Number PB 82-103 763).

CALMPRO (Dated 84152)

Abstract

CALMPRO is a postprocessor for MPTER, CRSTER, or ISC that reads data from an hourly concentration file (output from MPTER, CRSTER, or ISC). The influence of calms is eliminated by zeroing hourly concentrations at all receptors if the corresponding hour of met data is calm. The program outputs a MPTER format printout of annual averages and high five 1-, 3-, 8- and 24-hour average concentrations and an ISC format tape.

Reference

U.S. Environmental Protection Agency, 1984: Calms Processor (CALMPRO) User's Guide. EPA-901/9-84-001. U.S. Environmental Protection Agency, Region I, Boston, MA 02003 (Available only from NTIS. Accession Number PB 84-229 467.)

Section 4. Additional Models for Regulatory Use

VALLEY (Dated 85338)

Abstract

This algorithm is a steady-state, univariate Gaussian plume dispersion algorithm designed for estimating either 24-hour or annual concentrations resulting from emissions from up to 50 (total) point and area sources. Calculations of ground-level pollutant concentrations are made for each frequency designated in an array defined by six stabilities, 16 wind directions, and six wind speeds for 112 program-designed receptor sites on a radial grid of variable scale. Empirical dispersion coefficients are used and include adjustments for plume rise and limited mixing Plume height is adjusted according to terrain elevations and stability classes.

References

Burt, E W., 1977: VALLEY Model User's Guide. EPA-450/2-77-018. U.S. Environmental Protection Agency, Research Triangle Park, NC (September 1977) (NTIS Accession Number PB 274 054.)

Addendum/Supplemental Information to the VALLEY Model. 8 pp. (December 1982). (Distributed as part of the UNAMAP, VERSION 5, Documentation.) (Included as part of UNAMAP (VERSION 6) documentation.)

SHORTZ (Dated 82326)

Abstract

SHORTZ is designed to calculate the short-term pollutant concentration produced at a large number of receptors by emissions from multiple stack, building, and area sources. SHORTZ uses sequential short term (usually hourly) meteorological inputs to calculate concentrations for averaging times ranging from 1 hour to 1 year. The model is applicable in areas of both flat and complex terrain, including areas where terrain elevations exceed stack-top elevations. The program requires random-access mass storage capability. An associated compatible meteorological data processor is METZ.

References

Bjorklund, J. R., and J. F. Bowers, 1982: User's Instructions for the SHORTZ and LONGZ Computer Programs, Vols. I and II. EPA-903/9-82-004A and B. U.S. Environmental Protection Agency, Middle Atlantic Region III, Philadelphia, PA (March 1982). (NTIS Accession Numbers PB 83-146 092 and PB 83-146 100.)

Winges, Kirk D., 1986: User's Guide for POSTZ—A Postprocessor for the SHORTZ Air Quality Model. EPA-910/9-86-144. U.S. Environmental Protection Agency, Region X, Seattle, WA 98101 (Available only from NTIS. Submitted to NTIS for Accession Number.)

LONGZ (Dated 82327)

Abstract

LONGZ is designed to calculate the long-term pollutant concentration produced at a large number of receptors by emissions from multiple stack, building, and area sources LONGZ uses statistical wind summaries to calculate long-term (seasonal or annual) average concentrations. The model is applicable in areas of both flat and complex terrain, including areas where terrain elevations exceed stack-top elevations. The program requires random-access mass storage capability.

References

Bjorklund, J. R., and J. F Bowers, 1982: User's Instructions for the SHORTZ and LONGZ Computer Programs, Vols. I and II EPA-903/9-82-004A and B. U.S. Environmental Protection Agency, Middle Atlantic Region III, Philadelphia, PA (March 1982) (NTIS Accession Numberd PB 83-146 092 and PB 83-146 100.)

Winges, Kirk D , 1986: User's Guide for POSTZ—A Postprocessor for the SHORTZ Air Quality Model. EPA-910/9-86-144. U.S. Environmental Protection Agency, Region X, Seattle, WA 98101 (Available only from NTIS. Submitted to NTIS for Accession Number)

COMPLEX-I (Dated 86064)

Abstract

COMPLEX-I is a multiple point source code with terrain adjustment. The model specifications for testing were suggested by team "B" on complex terrain at the Regional Workshop on Air Quality Modeling in Chicago, February 1980. It is a sequential model utilizing hourly meteorological input. It assumes a normal distribution in the vertical and a uniform distribution across a 22.5 degree sector: the initial screening technique for complex terrain applications, described in the Guideline on Air Quality Models (Revised), has been incorporated as an option in COMPLEX-I.

Reference

There is no user's guide for COMPLEX-I and no plans to develop any as of July 1986. (Since COMPLEX-I is based upon MPTER, the user guide for MPTER is useful. Also note the differences from MPTER given in comment statements in the first few pages of the COMPLEX-I source code.)

The complete system, including a magnetic tape and documentation entitled "UNAMAP (VERSION 6)," (Order No. PB 86-222 361/AS; Cost: $1,285.00, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone (703) 487-4650

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