

THE AERMOD MODELING SYSTEM

AN OVERVIEW FOR THE 8TH MODELING
CONFERENCE

SEPTEMBER 22, 2005

AERMOD

- THE AERMIC (AMS/EPA REGULATORY MODEL IMPROVEMENT COMMITTEE)
 - Jeff Weil, University of Colorado, Chair
 - Akula Venkatram, University of California at Riverside
 - Robert Paine, ENSR International
 - Steven Perry, NOAA (EPA/ORD)
 - Alan Cimorelli, Region III, EPA
 - Russell Lee, Russel F. Lee Consulting
 - Robert Wilson, Region X, EPA
 - Warren Peters, OAQPS, EPA
- Recognize Roger Brode, MACTEC

AERMOD

- Brief regulatory history
 - April 2000 AERMOD proposal (version 99351)
 - June 2000 7th modeling conference
 - Sept 2003 Notice of Data Avail. (02222)
 - Any minute Promulgation (04300)

AERMOD

- **Updates since proposal to obtain AERMOD (version 02222)**
 - Added PRIME
 - Modified complex terrain algorithms
 - Modified urban dispersion for low-level sources and minimum mixing heights for calculating dispersion
 - Added meander for all stable and unstable point source conditions
- **Updates to obtain version 04300**
 - Minor bug fixes

AERMOD MODELING SYSTEM

- 3 COMPONENTS
 - **AERMET** – THE METEOROLOGICAL PREPROCESSOR
 - **AERMAP** – THE TERRAIN DATA PREPROCESSOR
 - **AERMOD** – THE DISPERSION MODEL

AERMOD

- 2 SUPPORT TOOLS
 - **AERSURFACE** – PROCESSES SURFACE CHARACTERISTICS DATA
 - **AERSCREEN** – PROVIDES A SCREENING TOOL

AERMOD

- DOCUMENTATION

1. THE MODEL FORMULATION DOCUMENT
2. THE 3 USERS GUIDES
3. THE MODEL EVALUATION REPORT
4. THE CONSEQUENCE ANALYSIS

**PLEASE READ AND USE THESE
DOCUMENTS**

AERMOD

- BETTER BASIC SCIENCE WRT ISC
 - PLANETARY BOUNDARY LAYER CONCEPTS – CONTINUUM OF ATMOSPHERES
 - MORE ADVANCED BUILDING DOWNWASH ALGORITHMS
 - ATMOSPHERIC PROFILING FOR MORE VARIABLES
 - OTHER ENHANCEMENTS (SEE HANDOUT)

AERMOD

- AERMOD IS SIMILAR TO ISC IN SETUP
 - THE CONTROL FILE STRUCTURE IS THE SAME
 - VIRTUALLY ALL THE CONTROL KEYWORDS AND OPTIONS ARE THE SAME

AERMOD

- AERMOD IS DIFFERENT FROM ISC
 - REQUIRES SURFACE CHARACTERISTICS (ALBEDO, BOWEN RATIO, SURFACE ROUGHNESS) IN AERMET
 - HAS PRIME FOR BUILDING DOWNWASH AND THE BUILDING PARAMETERS ARE MORE EXTENSIVE
 - REQUIRES LONGER COMPUTER RUN TIMES

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CONSEQUENCE ANALYSIS - ratios of AERMOD predicted high concentrations to ISCST3 predicted high concentrations:

**flat and simple terrain
point, volume and area sources.**

	1hour	3hour	24hour	annual
average	1.04	1.09	1.14	1.33
high	4.25	2.82	3.15	3.89
low	0.32	0.26	0.24	0.30
Total	48	48	48	48

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CONSEQUENCE ANALYSIS - ratios of AERMOD predicted high concentrations to ISCST3 (and PRIME) predicted high concentrations:

flat terrain
point sources with significant bldg downwash

ANNUAL

24 H2H

3 H2H

	<u>AER/ISC3</u>	<u>AER/ISCP</u>	<u>AER/ISC3</u>	<u>AER/ISCP</u>	<u>AER/ISC3</u>	<u>AER/ISCP</u>
ave	1.08	1.05	1.25	1.01	0.71	1.05
max	1.35	1.29	1.87	1.14	1.20	1.17
min	0.69	0.79	0.69	0.84	0.38	0.93
No cases	6		6		6	

AERMOD

CONSEQUENCE ANALYSIS - ratios of AERMOD predicted high concentrations to ISCST3 predicted high concentrations:

**complex terrain
point sources**

	<u>AER/ISC3</u>
AVERAGE	0.24
MAX	0.79
MIN	0.07
no of cases	196

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- AERMOD performance
 - 17 databases – 7 with building downwash, 10 w/o building downwash
 - W/o downwash – AERMOD outperformed ISCST in 9 of 10 evaluations, had the same performance in 1 evaluation
 - With downwash – AERMOD outperformed ISCST-PRIME in 2 evaluations, had the same performance in 4 evaluations, was outperformed in 1 evaluation
 - * ISC-PRIME slightly outperformed ISCST3

AERMOD

- On-going activities
 - Parallel processing
 - Various minor upgrades such as running AERMOD in multiple urban areas
 - Beta test with deposition
 - Beta test with OLM, PVMRM