

DISPERSION MODELING FUTURES

MAY 17, 2005

REGIONAL OFFICE
WORKSHOP

Purpose

- Provide background on NSR/PSD modeling and our role/responsibility
- Review current status
 - EPA is model developer in subjective evaluation process
- Detail our new vision
 - EPA is an objective party and promotes ‘community’ model development & evaluation
- Explain “Why do it?”
- Tell you what it will take to accomplish this goal.

Background

- Prevention of Significant Deterioration (PSD)
 - Defined by Clean Air Act of 1977
 - Program established August 1980 (45 FR 52666)
 - Since PSD review is pre-construction, compliance is defined through air quality modeling.
- *Guideline on Air Quality Models* (App W to CFR Part 51)
 - Ensures consistency and equity in PSD/NSR/SIP modeling.
 - Revised periodically to include new models & techniques
 - Modeling workshops and training provided by EPA
- EMAD defined the modeling practices and trained the staff – leadership role.
- In addition to NSR/PSD, these models are applied for Air Toxics (local-scale) and Homeland Security (urban) analyses.

PSD/NSR vs Ozone/PM Fine

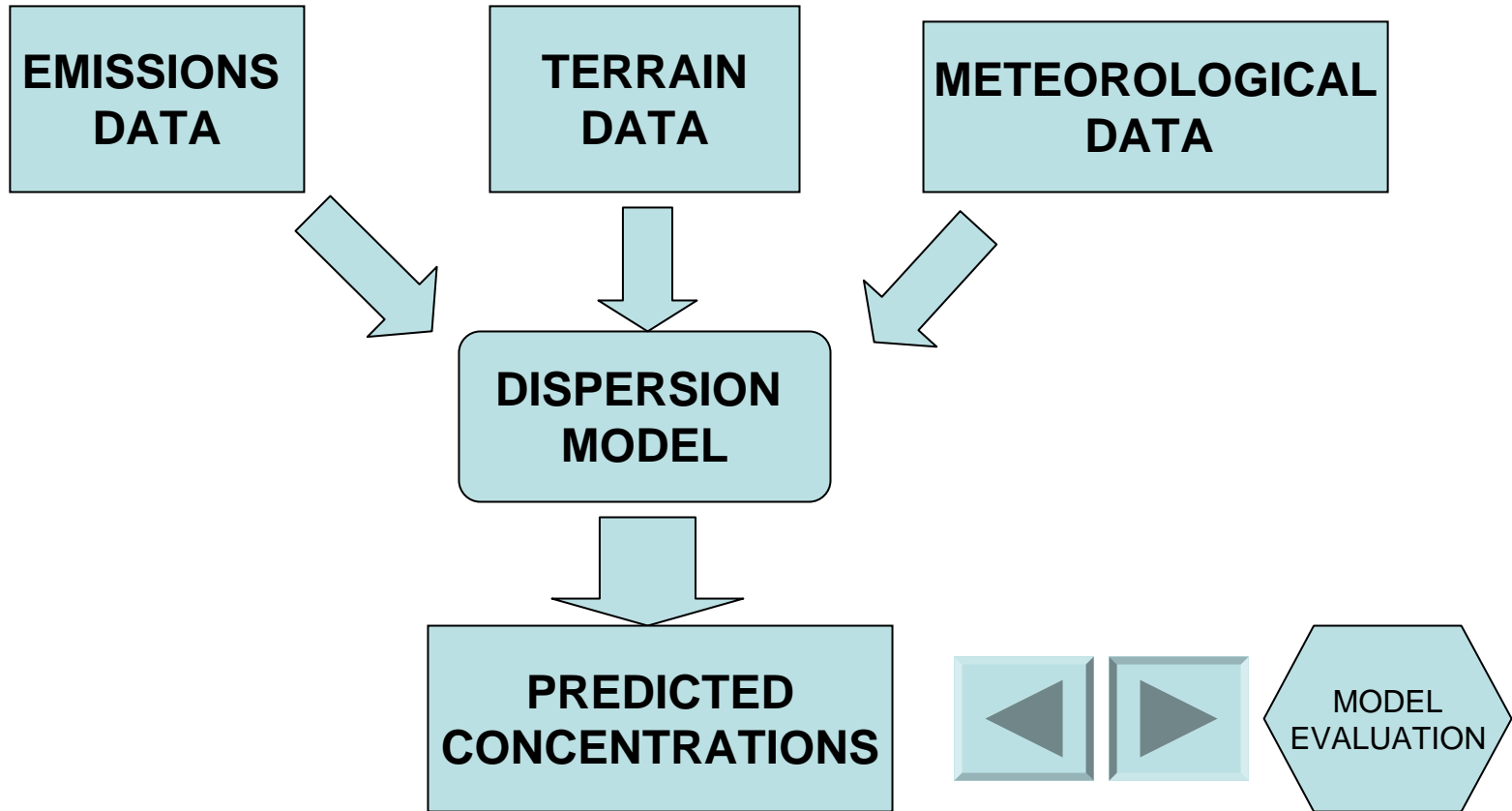
Ozone/PM Fine Modeling

- National/regional grid for rules
- Photochemical models
- Model simulations conducted by EPA (RPOs) to determine need for and efficacy of controls
- Various developers (community) with EPA modeling guidance (open market process)
- Goal is rule justification, RIA benefits analysis, and SIP demonstrations

PSD/NSR Modeling

- Local-scale modeling, usually 50km or less
- Non-reactive dispersion models
- Model simulations conducted by applicant to obtain permit
- “Preferred” model developed and its use promulgated by EPA (bureaucratic process)
- Goal is to determine an individual source’s contribution.

DISPERSION MODELING



Guideline on Air Quality Models: Defines preferred and alternative models and inputs to be used by stakeholder in permit modeling applications.

Model Clearinghouse: Vehicle by which Regional Offices identify technical issues and resolve with OAQPS concurrence.

AERMOD

- AERMOD Modeling System consists of . . .
 - AERMOD: Next generation air dispersion model (replace ISC3)
 - AERMET: A meteorological data pre-processor.
 - AERMAP: A terrain processor.
 - AERSURFACE: Predicts surface characteristics.
 - AERSCREEN: Screening version of AERMOD.
- Regulatory package has been reviewed by Regional Offices, OGC, and OAQPS Divisions; should now be in OAQPS front office for review and then transmittal to DC.
- After signature, the final rule allows a one year phase-in during which analyses based on ISC3 may be accepted at the discretion of the Reviewing Authority. Thereafter, AERMOD *must* be used for appropriate applications.

Where Are We?

- Current State of the World

The “system” is leading us, when we should be leading the “system”

- New Vision for Future

“To lead and promote national collaborations that improve source culpability assessments”

Key Program Elements

- Meteorological Data
 - Major influential input to modeling
- Model Evaluation
 - Criteria for judging best performance
- Modeling Guidance
 - Appendix W of 40 CFR Part 51
- Model Support
 - Regions, States, and stakeholders

Meteorological Data

- **CURRENT**

- Use overly simplistic meteorology that stifles model development and future integration.

- **GOAL**

- Improve modeling science & promote model integration (per NAS/CAAAC “one-atmosphere”)

- **NEED TO**

- Promote and facilitate the use of gridded MET data and “state of practice” National Weather Service (NWS) meteorological analyses.

Model Evaluation Methods

- **CURRENT**
 - Subjective evaluation criteria that protracts acceptance
- **GOAL**
 - Improve accepted test methods to determine preferred model
- **NEED TO**
 - Develop objective and transparent model evaluation protocols (through a Standards Development Organization such as ASTM)

Model Guidance

- **CURRENT**

- Model development, testing, and evaluation by EMAD through rulemakings and scarce resources

- **GOAL**

- Promote use of best science and continued & timely improvement in science by modeling community

- **NEED TO**

- Develop guidance based on objective model evaluation and promulgated acceptance criteria (open up the market)
- Promote development of supporting test data bases

Model Support

- **CURRENT**

- Diminished leadership role due to retirement of key staff and lack of clear focus and vision for Model Clearinghouse

- **GOAL**

- Regain leadership role & promote use of best science and evaluation methods

- **NEED TO**

- Strengthen our technical expertise and working relationships with Regional Offices and science community as well as internally within OAQPS policy staff

Why do it?

Part 1

- PSD/NSR is becoming more visible
 - Population/source growth is encroaching upon pristine areas & PSD increments are shrinking so there are new demands on old dispersion modeling policies and practices.
 - Must be confident of appropriate model applications and ensure national consistency and equity.
- Need an objective role and process in model development & evaluation
 - “Open” participation in a manner that promotes entrepreneurial participation in the development and improvement of modeling tools and evaluation methods.

Why do it?

Part 2

- Lead by example
 - Use of existing proven products (NWS meteorological products) and organizations (ASTM) promotes collaboration, efficiencies, and sharing of resources for the common good.
- Embrace NAS report & CAAAC recommendations
 - Improved MET data and dispersion modeling science will facilitate integrated, one-atmosphere modeling to allow more complete & accurate assessment of multi-pollutant strategies (direct PM, toxics).
 - Apply the best available science in our analyses.

ATTACHMENT

Detailed Slide on Future Direction
for Each Program Element

Meteorological Data

- MET data defines transport, diffusion, fate and reactivity.
 - Simplistic characterizations currently in use limit skill and future dispersion model capabilities.
- Employing grid-based meteorological data can lead to better and more consistent air quality model results than using nearby observation data from monitoring stations.
- We need a system for developing and disseminating grid-based data would be established
 - The NWS is one source of grid-based data; it is routinely disseminated but needs to be archived.
 - We are currently testing the use of this NWS data in national/regional air quality models (forecasting efforts)
 - We can leverage resources and collaborate with NOAA/NWS.
- Use in dispersion modeling would also establish scientific linkage with the photochemical models such as CMAQ.
 - Needed to realize “integrated, one-atmosphere” modeling approach per NAS report and CAAAC recommendations.

Model Evaluation Methods

- Model evaluation tests a model's performance by comparing its predictions with observed/measured concentrations.
- Current model evaluation/selection protocol fails in:
 - Utilizing a robust test method that accounts for the stochastic nature of the atmosphere and model's (transport & diffusion) physics to score performance
 - Relying on EPA's subjectivity in selecting "best performers" from a pool of good-performing candidates
- Thus, a better approach is one that is robust, fully objective and self-maintaining.
 - We need to establish and work with a standing committee of experts to participate in an objective standards setting process.
- The answer is participation through a Standards Development Organization such as the American Society of Testing Materials (ASTM), which provides the appropriate apparatus to obtain collective expertise and allow appropriate vetting of test methods.
- Once the test methods are in place, EPA's role becomes that of setting acceptance criteria that can also be vetted in the public arena.

Future Model Guideline

- EPA allows for use of better MET data.
 - Accepts latest NWS products for characterization of meteorology
 - EPA provides basic tools while private enterprise can create user-friendly GUI's to support processing for stakeholder use.
 - EPA fosters enhancements through collaboration with NOAA.
- EPA adopts ASTM test methods/protocols for testing model performance and then promulgates acceptance criteria.
 - EPA supports the apparatus through grants to ASTM (travel and technical conferences).
- EPA gets out of the business of developing and/or promulgating models.
 - Promulgates only model *acceptance criteria* (“skill scores”)
 - Model development is naturally transferred to user community (consultants and private enterprise) where the incentive to create better, more accurate models is driven by the marketplace.
 - Model developers have clear market advantage to foster acceptance of their models and enhancements.

Modeling Support

- Program has diminished over time, but needs to be revitalized to support our new vision.
- Re-energize the role of the Model Clearinghouse.
 - Provides Regional Offices with assistance from OAQPS concerning the application of a model, analytical technique or data base in a particular regulatory action.
 - Allows for expert review and concurrence across Regions.
 - Insures “acceptance” to EPA mgmt in accord with policy.
 - Newly appointed ‘Director’ in Warren Peters and need resources to upgrade web software for dissemination and archiving.
- Stress more frequent and focused interactions with Regional modelers
 - Monthly conference calls
 - Regional Office visits
 - Annual Regional Modelers Workshop (May 18-20th, New Orleans)
- Proactively utilize technical workgroups to identify/solve modeling issues and promote improved science & applications.