Developments in AERMOD

A&WMA Ontario Section
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Disclaimer:

The contents of this presentation have not been reviewed or approved by the U.S. Environmental Protection Agency (USEPA) and may not accurately reflect the position of the USEPA as it relates to the current and planned activities associated with the development of the AERMOD Modeling System.

Overview

- **What's happening now?**
  - Anticipated updates (Fall 2013?)
  - Upper air tool
  - Beta options in AERMET/AERMOD
  - NO_X-to-NO_2 conversion
  - Building downwash
  - Prognostic data in AERMOD
  - APTI training courses
  - CALPUFF (regulatory version)

Overview (cont'd)

- **Near Future**
  - BPIPPRM
  - Buoyant Line/Volume Sources in AERMOD
  - Coastal fumigation/AERSCREEN
  - Model performance evaluation
- **Long Range**
  - Incorporate fuller suite of data into AERMOD (e.g., land cover, elevation, ??)

What's Happening Now?

AERMOD System (& Related) Updates (Fall 2013?)

- **Last updates**
  - AERMAP: v.11103 (April, 2011)
  - AERSCREEN: v.11126 (May, 2011)
  - AERMOD, AERMET: v.12345 (December, 2012)
  - AERSURFACE: v.13016 (January, 2013)
- **Anticipated updates (Fall 2013?)**
  - AERMOD: DAYRANGE leap yrs, EVENT BACKGRND
  - AERMET: ONSITE mix. hgts., U-star Adjustment
  - AERMAP: Line source?
  - AERSURFACE: Beta, NLCD 2001/2006 w/ imp. and can.
  - Gust Factor Tool: Est. sfc roughness using 1-minute ASOS

Upper Air Tool

- **Developing upper air tool**
  - Preprocess upper air sounding data prior to AERMET
  - AERMET requires an upper air morning sounding, prior to sunrise, to derive convective mixing height
  - Missing sounding = no mixing heights = missing hour
  - Upper air tool to substitute soundings from alternative station
  - “Diagnostic” and “Substitution” mode
  - Options equivalent to AERMET

AERMET/AERMOD Beta Options

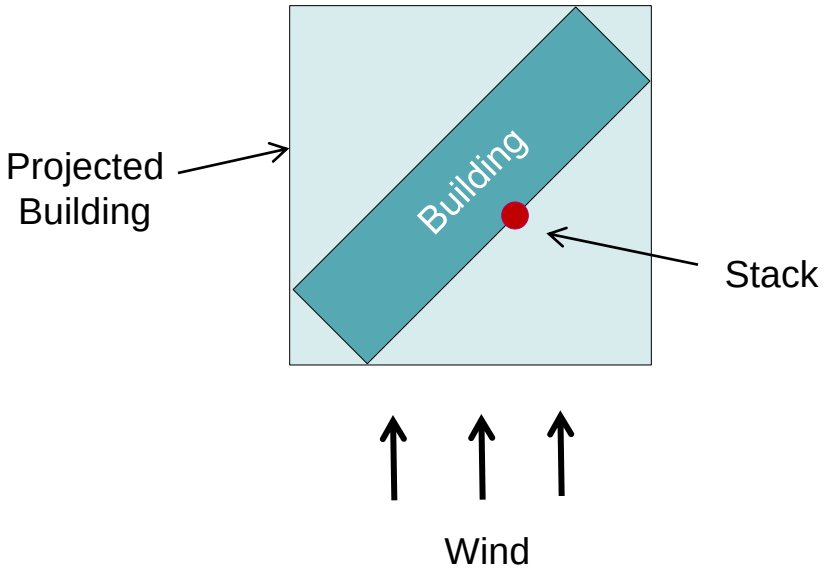
- **U-star Adjustment, LowWind1, LowWind2**
  - Adjust u-star for low wind speeds in stable conditions
  - Lot of interest
  - Issues identified with u-star adjustment
  - Model Clearinghouse statement (June 26, 2013)
  - Currently evaluating
  - Update to AERMET this Fall?

NO_X-to-NO_2 Conversion

- **Evaluating ARM2**
  - 3-tier approach to NO_X conversion to NO_2
  - Current Tier 2, Ambient Ratio Method (ARM)
  - ARM NO_2/NO_X ratio = 0.8
  - Fixed ARM ratio over estimates NO_2 in the near-field
  - NO_2/NO_X increases with distance from source
  - NO_X decreases with distance
  - ARM2 NO_2/NO_X ratio varies by distance

Building Downwash

- **BPIPPRM Issues**
  - A number of issues/concerns with BPIPPRM
  - Long narrow buildings – projected length > actual fetch
  - Effective length
  - Current wind tunnel study



Evaluation of Prognostic Data in AERMOD

- **Mesoscale Model Interface Program (MMIF)**
  http://www.epa.gov/ttn/scram/dispersion_related.htm#mmif
  - Mesoscale Model (MM5), Weather Research and Forecasting (WRF)
  - Supports AERMOD, SCICHEM, CALPUFF
  - Regulatory applications?

- **AERCOARE**
  http://www.epa.gov/ttn/scram/dispersion_related.htm#aercoare
  - Coupled Ocean Atmosphere Response Experiment
  - Offshore, overwater, ice-free environments – alternative model to AERMET
  - Overwater observations or MMIF output
  - EPA Region 10 – ongoing evaluation

Updates to APTI Training Courses

- **Air Pollution Training Institute (APTI)**

  http://www.apti-learn.net

  - SI 409: *Basic Air Pollution Meteorology* (draft)
  - SI 410: *Introduction to Dispersion Modeling* (planned)
  - APTI 423: *Air Pollution Dispersion Models* (in-progress)
    - Instructor-led, taught remotely (web conference)
    - 3.5 – 4 days
    - Focus on AERMOD (& related pre-processors/tools)
    - Model options
    - Practical application

CALPUFF Update

- **EPA-approved CALPUFF/CALMET**
  - Current EPA-approved: version 5.8
  - Current non-EPA: version 6.42
  - Bug-fixes only from MCB-E, MCB-F, MCB-G *(completed)*
  - No additional enhancements
  - CALPUFF/CALMET
  - Fall/Winter, Version ?

Near Future

- **Update to fix simpler known issues**
  - Use projected gap to determine how to combine tiers
  - Ignore individual tiers when multiple tiers are combined
  - Flag building tiers with similar heights and evaluate – highest GEP not always appropriate based on where stack is located
  - Develop guidance for defining building tiers
- **Options to redefine effective building parameters**
  - Wind tunnel study underway to evaluate projected length

Buoyant Line Source in AERMOD

- **v.12345 Line Source Added**
  - Uses existing AREA source algorithms
  - No buoyancy
  - Identical results to AREA source with equivalent inputs
  - Need a line source with plume rise
  - Add buoyant line source w/ BLP/CALPUFF formulations

Coastal Fumigation - AERSCREEN

- **Coastal Fumigation**
  - Currently in SCREEN3
  - AERSCREEN regulatory screening model (March 2011)
  - No coastal fumigation in AERSCREEN

Model Performance Evalution

- **Automated approach to perform evaluations**
  - Develop automated system using evaluation databases
  - Facilitate updating AERMOD performance evaluation metrics
  - Systematic documention of the impact of model changes
- **Standard Protocol for updating AERMOD system**
- **Tracking, reporting, timely correction of bugs**

Long Range

Incorporate Fuller Suite of Data into AERMOD

- **Land cover / Elevation Data**
  - NLCD, SRTM, NED
  - Eliminate some of the required preprocessing
  - Source-specific meteorology based on land cover and obstacle heights around source and met tower
  - Eliminate distinction between “rural” and “urban”
  - Account for temporal variability of urban heat island
  - Mitigate influence of surface characteristics variability on determination of representativeness
  - Direction-specific “hill height scales” for terrain influences