EPA 12TH CONFERENCE ON AIR QUALITY MODELING

Comments by the American Petroleum Institute

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Chris Rabideau – Chair
API Air Modeling Group

energy API 100 YEARS EST. 1919

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API Supports Improving the Science

- API appreciates EPA's willingness to work with the public to improve the science
- Over the past decade
  - Improving NO/NO_2 chemistry
    - ARM2
    - PVMRM improvements
    - CALPUFF chemistry
  - Low wind speed
  - Building downwash

Topics for Discussion – Summary here, details to be submitted in writing to EPA docket

- NO_2 modeling improvements and evaluations
- Low wind modeling options in AERMOD
- Offshore modeling refinements for AERMOD
- Building downwash refinements for AERMOD
- Modeling of secondary $PM_{2.5}$ and ozone formation
- Other issues for written comments

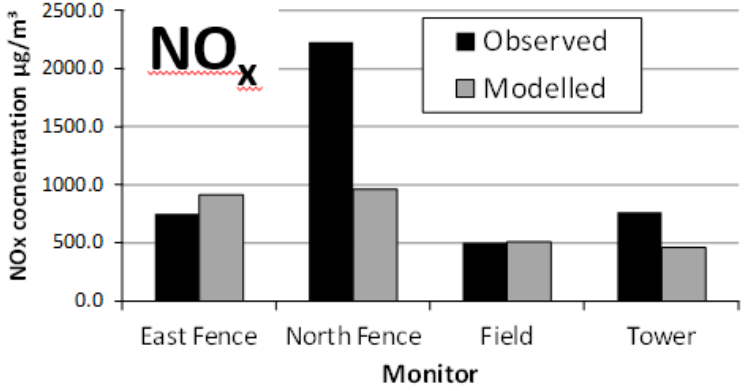
NO_2 Modeling Improvements and Evaluations

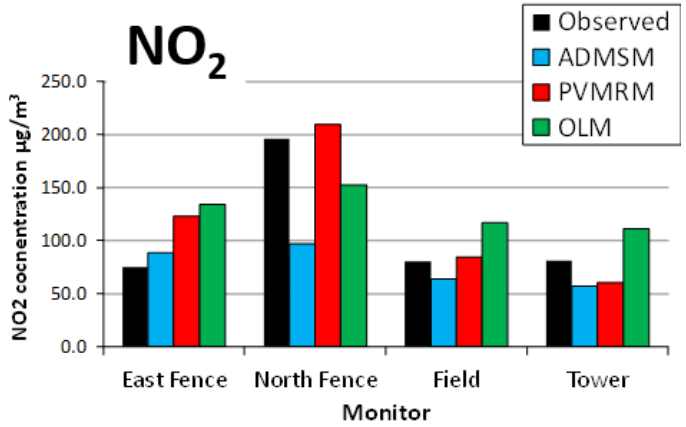
- We appreciate EPA's efforts in support of further NO_2 chemistry refinements and in development of evaluation databases.
- The PVMRM technique discussed in Hanrahan 1999 mentioned the issue of a finite time needed for the conversion of NO to NO_2
  - Not accounted for in AERMOD
  - Potential for at least a factor-of-2 overprediction of the NO_2/NOx ratio at near-field receptors
  - Beta option for conversion time in next release of AERMOD?
- API continues to work with Cambridge Environmental Research Consultants to finalize a new Tier 3 option for AERMOD, called the Atmospheric Dispersion Model Method (ADMSM). ADMSM is an explicit chemistry method that considers both the rate of the chemical reaction between NO and O_3 and the photolysis of NO_2.
  - ADMSM was recently evaluated using a compressor station dataset; further evaluations are planned when a drilling operations dataset becomes available.

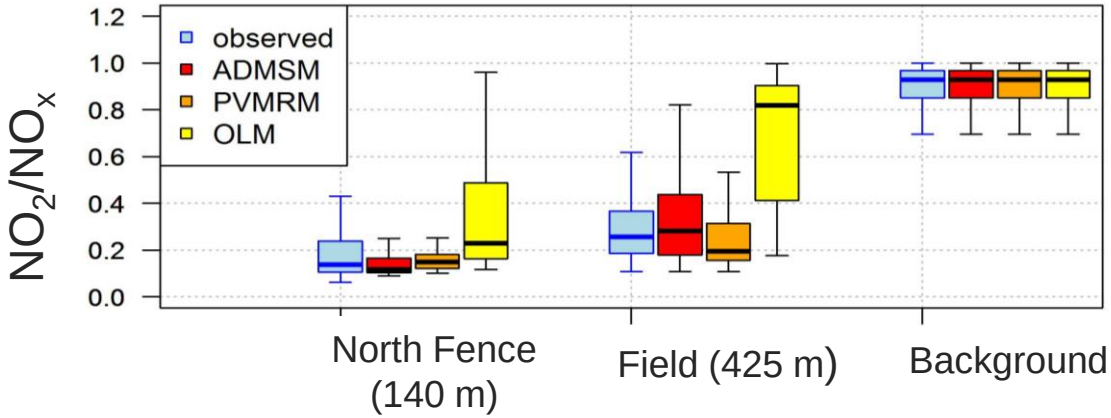
NO_2 Modeling Improvements and Evaluations

Compressor Station Dataset

- NO_x evaluation: AERMOD performs well at some monitors
- NO_2 evaluation:
  - PVMRM and ADMSM perform better than OLM; OLM overpredicts
  - PVMRM and ADMSM broadly replicate near-field NO_2/NO_x ratios
  - PVMRM predicts some high NO_2 concentrations exceeding the 'upper bound' OLM values – likely related to entrainment method rather than lack of explicit chemistry
  - ADMSM NO_2 statistics more consistent with NOx than PVMRM; ADMSM shows better performance in ratio plots







Low Wind Options in AERMOD

- Promulgation of ADJ_U* option was helpful, but consideration of minimum turbulence levels is also important.
- Independent research indicates low frequency mesoscale motions (wind fluctuations with periods of 20-30 minutes) exist under all meteorological conditions.
  - These slow mesoscale motions will set a lower limit for turbulence-based dispersion
  - Not accounting for this effect can result in substantial underpredictions of plume dispersion in stable conditions
- As discussed during low wind panel, there are issues with meandering plumes – coherent versus pancake plumes. Updates needed to avoid simulating plumes that are too compact.
- Also suggested during low wind panel, EPA should consider a minimum sigma-v of 0.5 m/s and minimum sigma-w of 0.1 m/s (option for a minimum sigma-w could be added to the next version of AERMOD).

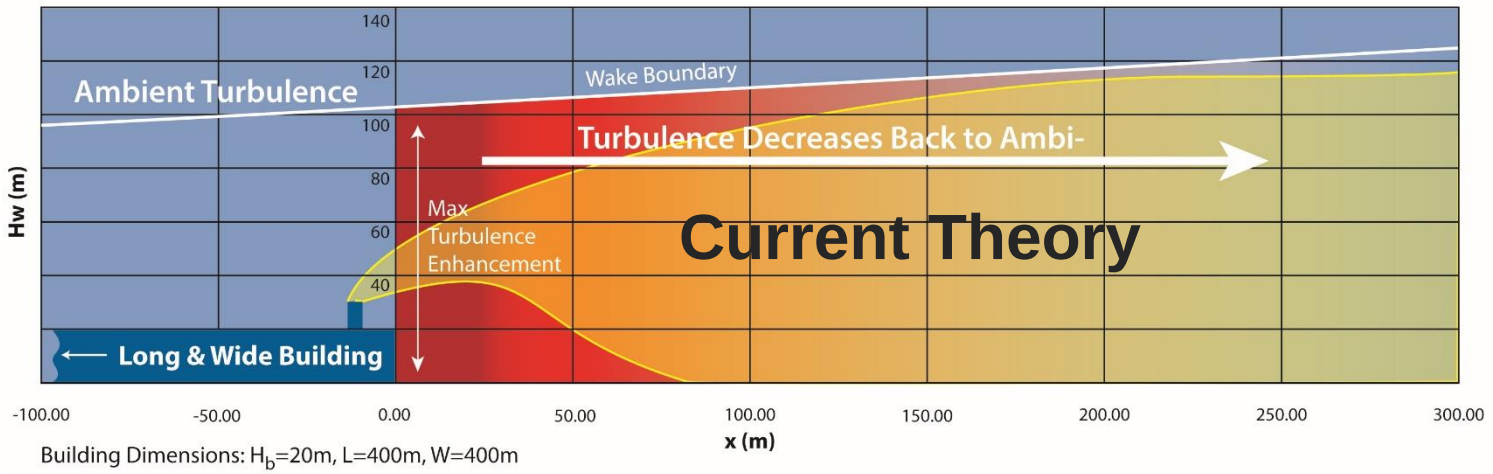
Building Downwash Refinements for AERMOD

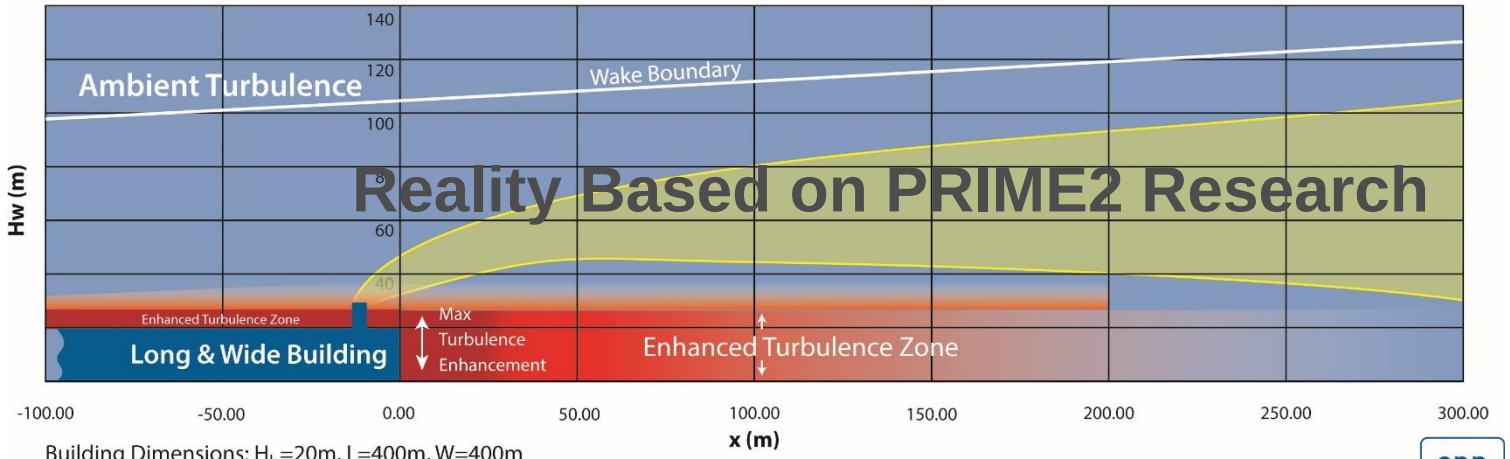
- AERMOD version 19191 has new algorithms available for testing and evaluation - PRIME2 (or "AWMA")[1] and ORD alpha options.
- There is also an alternative Building Profile Input Program that attempts to correct for limitation of BPIP to deal with long and narrow buildings for winds approaching the building corner.
  - This alternative BPIP approach preserves the actual building footprint and has promise to correct the overly large building footprint passed to AERMOD by the current BPIP
- Several investigators have noted that for some existing AERMOD evaluation databases such as Bowline Point and the Alaska North Slope, PRIME2 (and ORD) options overpredict, while PRIME has a lower bias.
- PRIME2 appears to be more sensitive than PRIME to plume rise.
- Building downwash panel – updates needed for plume rise, streamlined equations, porous structures.
- More evaluation databases are desired to assess these new options.

[1]The PRIME2 work was funded by EPRI, API, AF&PA, and CRA

Building Downwash Refinements for AERMOD

PRIME2 - CURRENT AND NEW AERMOD BUILDING DOWNWASH THEORY





Offshore Modeling Refinements for AERMOD

- This is a challenging undertaking, since a substantially different meteorological pre-processor formulation is needed for overwater modeling – the AERCOARE program is a candidate.
- Lots of challenges
  - The definition of the shoreline geometry - irregular coastlines
  - Inclusion of Thermal Internal Boundary Layer (TIBL)
  - Complex terrain near the shoreline - TIBL does not consider complex terrain
  - The inventory of evaluation databases is limited
- Adding this feature to the AERMOD modeling code would make it even more complicated; it already needs a restructuring due to many additions made in the past 25 years.
- Is there a role for API? Are there certain areas that need research/funding?

Modeling of Secondary $PM_{2.5}$ and Ozone Formation

- We appreciate the additional clarifications and inclusion of more hypothetical source locations in the updated April 2019 MERP guidance.
- The ability to use a Tier 1 approach, even if the proposed project's precursor emissions are above the MERPs, is helpful.
- For $PM_{2.5}$ modeling, it is often conservative to assume that the peak impacts from primary and secondary $PM_{2.5}$ are at the same distance.
  - It would be helpful if EPA posted its distance-dependent $PM_{2.5}$ CAMx results for all MERP sites, or at least provides the information on a timely "as requested" basis.
- We look forward to commenting on the draft permit modeling guidance when it is released.

Other Issues Included in Forthcoming Written Comments

- Updates to model evaluation procedures for probabilistic NAAQS - EPA needs to adjust the form of the test statistic to match the form of the NAAQS.
- Surface roughness concerns - AERMOD is sensitive to input of very low roughness; we support EPA's efforts to consider minimum Monin-Obukhov lengths and less conservative vertical potential temperature gradient parameterizations.
- Permitting is more cumbersome without an approved long-range transport model.
- Modeling of sources with partial utilization and variable emissions – Randomly Reassigned Emissions (RRE) – could it be added to AERMOD?
- RLINE and roadway emissions
- Feedback from panel discussions
- Is it time for EPA to consider an eventual replacement of AERMOD?