EPA 13th CONFERENCE ON AIR QUALITY MODELING

Comments by the American Petroleum Institute

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American Petroleum Institute

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
    - GRSM
    - TTRM
  - Low wind speed
  - Building downwash

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

- AERMOD Updates
  - Tier 3 NOx – GRSM
- Proposed Recommendations for Background Concentrations
- Transition Period for Applicability of Revisions
- Modifications to PRIME
- TTRM/TTRM2
- Other issues for written comments

AERMOD Updates – Tier 3 NO_2 - GRSM

- We appreciate EPA's efforts in support of further NO_2 chemistry refinements and in development of evaluation databases.
- API worked with Cambridge Environmental Research Consultants to finalize a new Tier 3 option for AERMOD, called the GRSM (Generic Reaction Set Method). GRSM explicitly solves key chemical equations (NOx titration by O_3 and NO_2 photolysis), accounting for pollutant travel time.
- We support the EPA proposal to include the GRSM as a regulatory non-default Tier 3 NO_2 screening option.
- We also support proposal to include a statement indicating GRSM performance may be better than OLM and PVMRM under certain source characterization situations.

Proposed Recommendations for Background Concentrations

- Support wording that is aimed at being clear to reduce possibility of double counting emissions. Provide examples.
- Support the recommendation that the monitoring network used for developing background concentrations is expected to conform to the same quality assurance requirements as those established for PSD purposes.
- Just as the guidance calls for emissions data to be representative of “normal” operating conditions, the ambient monitoring data should represent normal conditions.
- Regarding the “Additional Considerations” section in the *Draft Guidance on Developing Background Concentrations for Use in Modeling Demonstrations*
  - This section is unnecessary. The determination of background is based on the isolated or multi-source analysis which covers NAAQS, PSD, SILs, etc. There is no need for redundancy modeling using EJScreen and CEJEST.

Transition Period for Applicability of Revisions

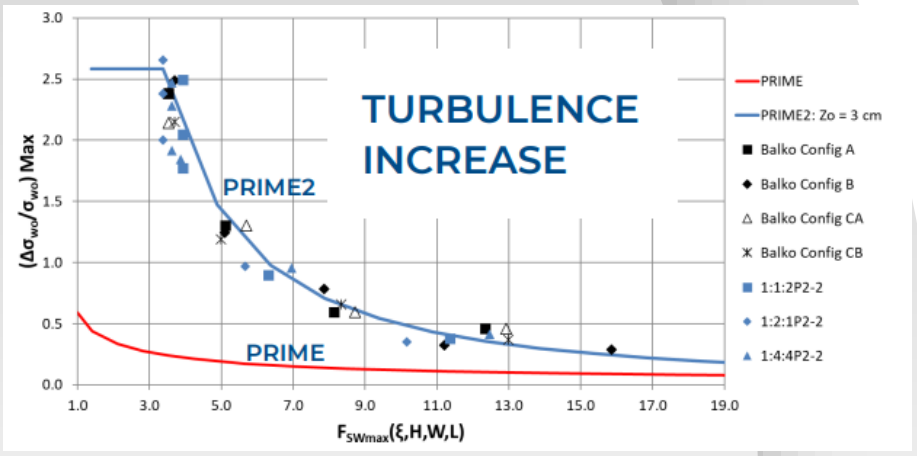
- We support timely incorporation of model updates. Model updates for technical advances should not be delayed for several years.

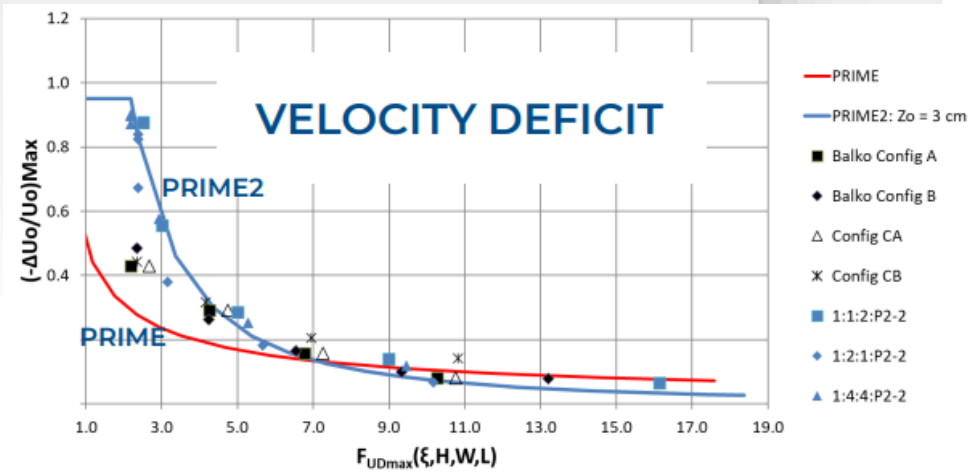
Modifications to PRIME

- API is working with Ron Petersen and CPP on evaluation of AERMOD dispersion and wake computations versus wind tunnel and Balko, OK field observations.
- Extensive wind tunnel database was collected that documents plume dispersion and velocity fields for two hours from the Balko field study.
- Wind tunnel database was used to evaluate AERMOD plume rise, wake and dispersion algorithms.
- Comparisons to Balko field observations for two hours showed:
  - Wind tunnel agrees well with the field observations
  - AERMOD agrees well with field observations for one hour and underpredicts for the other case

Modifications to PRIME

- PRIME wake velocity and turbulence equations do not agree with Balko wind tunnel results. (Also supported by BOEM study)
- PRIME wake height and width equations do not agree with wind tunnel observations.
- PRIME σ_Y and σ_Z overpredicts but agrees better with Balko wind tunnel observations than PRIME2 due to offsetting errors.
  - Wake turbulence underestimated
  - Dispersion overestimated
  - Wake height and width equations incorrect
- PRIME2 wake velocity and turbulence equations agree well with Balko wind tunnel test results.
- PRIME plume rise predictions need improvement





Modifications to PRIME

- AERMOD/PRIME had the overall worst agreement with field observations.
- PRIME2 with updated building wake dispersion constants provided the best agreement with field observations.
- The new wake growth equations did not improve model performance because of other problems with PRIME (cavity length criterion for σ_Y and σ_Z).
- PRIME2 velocity deficit and turbulence enhancement and BOEM wake growth equations should replace PRIME equations once the following changes are made and can be evaluated:
  - Omit the criterion that the building downwash calculations are made if the plume rise is less than the height of the wake.
  - Change the code so that cavity length does not affect the σ_Y and σ_Z calculation but is still used for the streamline calculation.

TTRM/TTRM2

- The Travel Time Reaction Method (TTRM) was introduced in AERMOD v21112 as an ALPHA option to address the void in the NO-to-NO_2 conversion techniques that do not consider the initial non-instantaneous rate of conversion of NO to NO_2.
  - The issue of finite time needed for the conversion of NO to NO_2 has been well documented in a peer-reviewed publication (Hanrahan 1999) and EPA White Papers.
- AERMOD has ARM2 (Tier 2) and OLM, PVMRM, and GRSM (Tier 3) techniques available for computing the conversion of NO to NO_2. GRSM is the only technique that accounts for travel time conversion rate of NO to NO_2 without TTRM.
- In AERMOD v22112, TTRM2 was more fully integrated and could be used simultaneously with ARM2, OLM, or PVMRM.
- TTRM/TTRM2 are based on well-established scientific methods and have been demonstrated to improve model performance in the near-field (typically < 100 m from source); comparable in performance to GRSM.
- EPA should elevate TTRM2 to "BETA" or completely integrate into ARM2, OLM, and PVMRM to allow for multiple NO_2 modeling options in addition to GRSM that account for the chemistry in the near-field that TTRM and GRSM both address.

Hanrahan, P.L., 1999. "The plume volume molar ratio method for determining NO2/NOx ratios in modeling. Part I: Methodology," *J. Air & Waste Manage. Assoc.*, 49, 1324-1331

Other issues for written comments

- Downwash from offshore platforms / overwater dispersion
- Low wind default override
- Improvements needed to the downwash pre-processor (BPIP)
- $PM_{2.5}$ NAAQS Modeling
- Appendix W should allow modeling approaches that account for emissions variability and partial utilization of a source.
- Surface roughness
- Updates needed for model evaluation procedures