



Expert Panel: Treatment of Low Wind Conditions

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Moderated by Chris Owen

US EPA/OAQPS/AQAD

Air Quality Modeling Group



Background

- AERMOD accounts for meander during low wind conditions by interpolating between two concentration fields: a coherent Gaussian plume and the random plume. The final concentration predicted by AERMOD is a weighted sum of these two bounding concentrations.
 - Plume meander has not been implemented for area sources.
- AERMOD version 16216 added adjusted u^* as a regulatory option to address issues with AERMOD model tendency to overprediction from some sources under stable, low wind speed conditions.
 - ADJ_U* option based on Qian and Venkatram (2011, BLM v. 138) and Luhar and Rayner (2009, BLM v.132) with delta-T data.
 - Extensive testing by EPA documented potential to underpredict when ADJ_U* paired with site-specific turbulence data or with the LOWWIND3 option.



Background

- AERMOD version 18081 introduced the LOW_WIND ALPHA option for low wind conditions. The LOW_WIND option has 3 features:
 - Minimum σ_v value – the default value in AERMOD is 0.2 m/s. LOWWIND1 used a value of 0.5 m/s, LOWWIND2 and LOWWIND3 used a value of 0.3 m/s.
 - Plume meander/Upper limit of FRAN – the default upper limit in AERMOD is 1.0, while LOWWIND2 set this value at 0.95.
 - Minimum wind speed – the default value in AERMOD is 0.2828 m/s, consistent with the default applied in previous versions based on $(2*(SV_{\min})^2)^{1/2}$ with $SV_{\min}=0.2$. This was not adjusted in any of the LOWWIND packages.
- Current EPA testing with these options suggest reduced model performance, similar to the original LOWWIND options



Panel Members

- **Rick Gillam** (US EPA Region 4)
- **Bob Paine** (AECOMD)
- **Dr. Akula Venkatram** (University of California, Riverside)



Charge Questions

1. With the 2017 revisions of the Guideline on Air Quality Models, the regulatory ADJ_U* option and the ALPHA LOW_WIND options (i.e., minimum wind speed, sigma-v, and maximum meander factor) were added. Please comment on your experience with the ADJ_U* option in modeling situations involving light wind, stable conditions.
2. Please also comment on the EPA's strategy and the benefits for providing LOW_WIND components as ALPHA options for testing and evaluation purposes. If applicable, share your experiences with testing and evaluations of the ALPHA LOW_WIND options.
3. Do you have additional recommendations for further adjustments or options to address potential overpredict biases in the model during light wind, stable conditions? For example, model performance can be addressed by changes to the processing of meteorology (AERMET) or the treatment of sources via modification to the dispersion curves (AERMOD). Where do you feel that model improvements efforts should be most focused?
4. For assessing model performance during light wind, stable conditions periods, are the existing databases adequate for investigating further model improvements? Are there additional or new dataset needed, and what would be the key features of these datasets?