OhioEPA

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Dr. Dennis Trout
Regional Meteorologist
USEPA Region V
230 S. Dearborn Street
Chicago, Illinois 60604

Dear Dennis:

Attached you will find a list of modeling concerns which we would like to be addressed at the Regional Meteorologist workshop.

A. Available Meteorological Data for Modeling

In view of recent comments to the effect that improvements in air quality over the past few years have been due, at least in part, to favorable meteorology, we suggest that either: 1) a more recent five years of input data be compiled by USEPA for modeling applications, or 2) an analysis be performed to determine if the data currently available are still adequate and representativ

B. Treatment of Calms

The assumption of persistance of wind direction during calm conditions is an inadequate representation of the real world. A varying component should be incorporated into modeled wind directions during periods of calm. The wind directions could either be totally random or be limited to random azimuths between the wind directions directly preceding and following the calm period. Alternatively, the wind direction could also be interpolated between the two known wind directions on either side of the calm period. Any of these options would be preferrable to the persistance assumption.

C. Complex Terrain - Preferred Procedure

While models for complex terrain are still inadequate, there should be some criteria to determine which is the preferred method: 1) Valley or 2) CRSTER with maximum receptor height limited to stack height.

D. Urban/Rural Coefficients

The present guidance on the use of rural and urban coefficients is proving to be inadequate. Several sources which are well within the influence of an urban surface will be modeled as rural when applying the Auer classification scheme within a 3 km. radius. Areas such as Toledo, Akron and even downtown Cleveland contain "rural" sources. These situations are brought about by the sources being located near the edge of the city or, in Cleveland's case, by being located on the lakefront. This classification procedure even allowed the use of rural coefficients for power plants located on Manhatten Island in New York City (Arthur Kill and Ravenswood SIP revisions). We suggest the

following:

1) Take special care in modeling sources where lake effect fumigation could be the limiting case. Conservative (urban) assumptions might be necessar

2) Take into account the immediate upwind land use. For short term modeling it might be necessary to use urban if any upwind sector is urban.

3) Take into account the land use at the areas of maximum (estimated) impacts. A preliminary screening run may be necessary to determining the approximate area of maximum impact and then determine the appropriate coefficie

4) Develop intermediate coefficients. Most modeling situations don't involve large metropolitan areas or grass prairies. There is a large enough difference between rural and urban coefficients that another set should be developed.

E. Variation in the Use of Urban Dispersion Coefficients

There is inconsistent treatment in the manner in which the various U.S. EPA models handle urban dispersion. The following list summarizes the differences in the models.

1. RAM (Urban) - The dispersion coefficients in this model were developed by McElroy and Pooler from dispersion data in the St. Louis area. The study was based on low-level releases from roofs of buildings in the downtown area, and there were no elevated releases evaluated in the study. The downwash characteristics of the buildings are "blended" into the McElroy-Pooler curves.

2. ISC (Urban Mode 1) - For this urban simulation, the standard Pasquill-Gifford (P-G) dispersion parameters are used under all unstable and neutral conditions. Under P-G stability classes E and F the program calculates dispersio based on stability D.

3. ISC (Urban Mode 2) - In this instance, except for Class A, all of the P-G stability categories are affected. The unstable and neutral categories are modified by changing to the next more unstable category, while the stable categories are changed to neutral under this mode. The ISC user's manual notes that Urban Mode 2 should not be used to model stack sources for regulatory purposes. A comparison of the dispersion parameters are contained in Table 1. The differences in the manner in which urban areas are handled leads to inconsistency in modeling approaches.

Table 1: Treatment of σy and σz in Dispersion Models

Pasquill Stability Category	MPTER, ISC Rural Modes	ISC Urban Mode 1	ISC urban Mode 2	Urban RAM*
A	A	A	A	A
B	B	B	A	A
C	C	C	B	B

D	D	D	C	C
E	E	D	D	D
F	F	D	D	D
G	F	D	D	D

*A direct comparison may not be appropriate

F. Use of Latest Improvements to Modeling Components

During the last ten years, while the application of air quality dispersion modeling has increased dramatically, the fundemental components of these models have undergone little improvement. This is particularly disturbing when the derivation of many of these components is examined. Specifically the Briggs Plume Rise equation and the dispersion coefficients, or sigmas, were initially developed from limited studies and were applicable under a narrow range of circumstances. These equations have become almost universally applied and the economic impact of regulatory decisions based on dispersion modeling is considerable. Why are these most critical elements of gaussian dispersion not undergoing a review and revision?

Briggs and others have published improvements to the plume rise equations but USEPA has not incorporated them in their approved models. Work on revising the sigmas is being done by several people, and alternative sigmas have been published. In fact, the American Meteorological Society and the National Commission on Air Quality have recommended the use of improved methods of determining plume height and plume growth.

The sigmas need to be reexamined to accomodate differences between rural, urban, or hybrid dispersion modes. In addition, they should be validated for use on tall stacks, and for area source or fugitive emission applications.

I hope these items will provoke some interesting discussion among your colleagues and provide the modeling community with some much needed guidance.

Very truly yours,

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RH:tlb