



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAY 10 2004

SUBJECT: Application of CALPUFF for Long-Range Transport

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

FROM: Peter Tsirigotis, Director
Emissions, Monitoring, and Analysis Division (C-304-02)

TO: See Below

On April 15, 2003, we added CALPUFF to the Guideline on Air Quality Models, 40 C.F.R. Part 51 Appendix W (the "*Guideline*"), and provided direction on the use of CALPUFF in two situations that may arise in a regulatory or permitting context. (See 68 Fed. Reg. 18440.) First, although Appendix W generally recommends the use of the industrial source complex (ISC) model for modeling short-range (typically less than 50 km) source-receptor transport, Appendix W now indicates that CALPUFF may be applied to model such transport where complex winds make use of the ISC model inappropriate. (See App. W Section 8.28.) Second, Appendix W provides that CALPUFF is appropriate for modeling long-range transport involving distances of 50 to several hundred kilometers. In *Guideline* §7.2.3, we said development of a written protocol approved by the appropriate reviewing authorities may be considered when the CALPUFF model is used for long-range transport because of the complexities involved in correctly applying the model. This memorandum further clarifies for long-range transport when and why a written protocol should be used.

Appendix A to the *Guideline* indicates that CALPUFF is appropriate for modeling long range transport at distances out to "several hundred" kilometers. This language reflects our decision not to identify a bright line beyond which reliance on CALPUFF would be considered inappropriate. At the same time, we cautioned in *Guideline* §7.2.3 that given the judgement and refinement involved, conducting long-range impact assessments will require significant consultation with the appropriate reviewing authorities, and written protocols were suggested as a means for developing consensus in the methods and procedures to be followed. Typically, written protocols include discussions on the data files to be used (e.g., terrain heights, land use, meteorology) and quality assurance procedures to be employed (e.g., what checks will be made, treatment of questionable and missing values). Protocols would document the rationale and definition of the modeling domain, the rationale for how model options are to be set, and would discuss sensitivity analyses to be conducted (if any) to determine how model options can best be tailored for the given application.

The following discussion is intended to assist those who must assess whether to use CALPUFF to address a specific modeling need. First, as we noted when we added CALPUFF to the *Guideline*, there is general agreement that CALPUFF has adequate accuracy for modeling

long-range transport in the 50-200 km range. Indeed, the Interagency Workgroup on Air Quality Modeling, which conducted several studies to evaluate CALPUFF's performance, recommended the use of CALPUFF for transport distances on the order of 200 km or less. "Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts" (1998).

Second, IWAQM concluded that there are concerns with the use of puff dispersion, like that in CALPUFF, for transport distances beyond 300 km. That conclusion was borne out by its finding that at such a distance, older versions of CALPUFF tend to overestimate 6-hour average surface concentration values by as much as a factor of 3.7. These results, however, were obtained with no puff splitting. If puff splitting and modern mesoscale meteorological modeling were employed, as we now recommend, we would anticipate CALPUFF to more accurately predict concentration values. Accordingly, while the use of CALPUFF beyond 300 km may be appropriate in certain circumstances and while refinements to CALPUFF may improve upon these results, at this time EPA recommends greater caution in the use of CALPUFF for transport distances beyond 300 km.

Written protocols are useful in any prevention of significant detention/new source review (PSD/NSR) modeling assessment and they are particularly useful when CALPUFF is being used in evaluating a source's long-range transport impacts upon receptors beyond 200 km. In preparing such protocols, the reviewing authorities should consider whether CALPUFF qualifies as an appropriate model for the particular need. In addition, as IWAQM noted, complex wind situations can lead to greater uncertainties in the performance of any model, including CALPUFF. The protocol should therefore address any special considerations that are being taken, (e.g., highly rugged terrain, land-water boundaries, mesoscale wind circulations). Finally, the protocol should specify the manner in which puff-splitting options are to be employed, since these options are expected to enhance the model's performance.

If you or your staff have any questions concerning this guidance on the use of CALPUFF for long-range transport associated with PSD applications, please contact Mr. John Irwin at (919) 541-5682 or Mr. Mark Evangelista at (919) 541-2803.

Addresses

Director, Air Program Branch, Region I
Director, Division of Environmental Planning and Protection, Region II
Director, Director, Air Protection Division, Region III
Director, Air, Pesticides, and Toxics Management, Region IV
Director, Air and Radiation Division, Region V
Director, Multimedia Planning and Permitting Division, Region VI
Director, Air, RCRA and Toxics Division, Region VII
Director, Air and Radiation, Region VIII
Director, Air Division, Region IX
Director, Office of Air, Region X

cc: **Regional Modeling Contacts, Regions I-X**
Dennis Atkinson, AQMG (C243-01)
Tom Coulter, AQMG (C243-01)
Roland Dubois, OGC (2344A)
Mark Evangelista, AQMG (C243-01)
Eric Ginsburg, EMAD (C304-02)
Bill Harnett, ITPID (C304-03)
John Irwin, AQMG (C243-01)
Joe Paisie, IPSG (C504-02)