TexAQS-II Meteorological Model Coordination
(Task A6)

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Purpose

The purpose of this report is to describe actions taken to encourage and ensure coordination among modelers and persons relying on model information during the TexAQS-II field program.

Motivation

The forecast model being run at Texas A&M University is not to be run in isolation. Instead, because no single model is necessarily optimal in every situation, the ability to compare numerical model output directly without transformation to different grid structures or coordinates is highly desirable. Furthermore, other participants in TexAQS-II are to use the model output for various purposes, so it was essential to strive to make the model configuration as useful as possible to as wide a population as possible.

Coordination Activities

1. The Texas Commission on Environmental Quality

Because of the strong statewide interest in high-quality photochemical model simulations, an MM5 model configuration that could be used directly by TCEQ for photochemical modeling was highly desirable. After some model testing to ensure that the vertical resolution was adequate, a vertical resolution was adopted that was identical to that used by Texas A&M University in support of modeling of the 2000 Houston ozone episode.

Past testing on the 2000 case had shown that a grid spacing of at most 4 km is essential for properly modeling the sea breeze front and associated circulations in the Houston area and elsewhere along the coast. Because TCEQ's interest in TexAQS-II was partly because of regional haze issues, this inner 4 km domain was designed to cover almost the entire state of Texas, from the Guadalupe Mountains and Big Bend area to the Mississippi River. The original domain included all of Texas but did not extend as far east. However, to be sure to at least encompass the entire 4 km domain of the 2000 modeling, the inner domain was shifted east.

2. The University of Houston

The University of Houston was also interested in the model grid configuration. In particular, UH wanted to ensure that the grid orientation and navigation was unchanged from the 2000 modeling. Because the emissions inventories had been developed by TCEQ relative to a particular grid projection, it was important to retain the same grid projection in the TexAQS-II modeling so that emissions inventories would not need to be translated or converted.

UH planned to begin their photochemical modeling with an 1800 UTC (1 PM CDT) initialization so as to ensure that complete two-day forecasts were completed by the following morning. Texas A&M, on the other hand, wanted to begin the meteorological model run later, off of 0000 UTC (7 PM CDT) analyses, so that the latest available information could be incorporated into the forecast. After some discussion, a compromise was reached, whereby UH would continue their independent 1800 UTC photochemical runs and would run a separate one-day photochemical simulation off the Texas A&M model output.

UH expressed some concern about the large 4 km meteorological model domain, noting that it was impractical to run a photochemical model in real time on such a large domain. Texas A&M advised that particular subdomains, such as those around Houston or Dallas, could be extracted from the master 4 km domain and be used to drive metropolitan-scale photochemical simulations.

Texas A&M began reliably sending UH model output in early June. However, just as Texas A&M had technical difficulties getting the model to run operationally, UH has had difficulty incorporating the Texas A&M model output into their photochemical modeling scheme. A meeting in Houston in July was useful, and it appears that UH knows what it needs to do to make best use of the Texas A&M numerical model output.

3. The University of Alabama in Huntsville

The University of Alabama in Huntsville was funded to generate plume and tetroon trajectories for field program mission support, using the high-resolution model output from the Texas A&M MM5 modeling system. Texas A&M coordinated with UAH by sharing the model grid configuration as it was developed and modified, and by working with UAH to provide a reliable mechanism of data transfer between the two sites.

During trajectory model testing in early July, Texas A&M discovered an inconsistency between the winds simulated by the MM5 and the trajectories produced by the UAH trajectory model. UAH was notified, and apparently stayed up all night to fix the problem. During the field program period, July 15 through August 31, we are aware of no communication problems that prevented the trajectories from being run properly, and the trajectories from UAH appeared to be fully consistent with the model output being sent to them.

Early in the Northeast Texas Plume Study, it became clear that the mission scientists wanted information at the normal afternoon briefing about not only the next day's suitability for operations but also the day after that. Until that point, Texas A&M had only planned to produce 56-hour forecasts on an operational basis. However, in response to this customer need, Texas A&M switched to a 72-hour operational forecast run two days later. The 72-hour run is still the operational model duration at this writing, and (resources permitting) we plan to keep the operational model at 72 hours for the indefinite future.