P1.6 COMPARING MM5 PREDICTED RADIATIVE FLUXES WITH OBSERVATIONS TAKEN DURING THE TEXAQS 2000 AIR QUALITY EXPERIMENT

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1. INTRODUCTION

Recent research has shown that radiative transfer parameterization errors can have an adverse effect on mesoscale numerical weather forecasts of the atmospheric boundary layer (ABL) wind, temperature, and mixing depth. (Zamora et al., 2001). Typically, mesoscale model forecasts of wind, temperature, and mixing depth are used by air quality modelers to forecast chemical concentrations of atmospheric pollutants.

During the Texas Air Quality Study 2000 (TEXAQS 2000) the National Oceanic and Atmospheric Administration Environmental Technology Laboratory (NOAA/ETL) made detailed observations of the solar and infrared radiative fluxes at the La Porte, Texas air chemistry site located about 30 km southeast of downtown Houston. In this paper we will compare the observed solar irradiance for a six-day period beginning at 0000 UTC, August 25, 2000 with real-time forecast values from the NOAA Forecast Systems Laboratory (FSL) coupled weather-chemistry forecast model described in **P1.28** of this volume.

2. NUMERICAL MODEL

The coupled chemistry model was run twice daily on multiple 1-way meshes of 60, 15, 5 and 1.67 km using initial conditions generated by the FSL Rapid Update Cycle (RUC). The Dudhia cloud radiation parameterization was used along with the Burk-Thompson 1.5 order ABL scheme. Radiation was calculated at 30-minute intervals on all the grids. The Grell convective parameterization was used only on the 60, 15 and 5 km grids. We used the Reisner 1 mixed cloud physics package on all five grids. In this paper we show results from the 24-h daily simulations initialized at 0000 UTC, each day.

3. PRELIMINARY RESULTS

The La Porte observations beginning at 0000 UTC August 25, 2000 are shown in Figure 1. The observations indicate that the first five days of the period are cloudy ahead of the sea-breeze front followed by clearing in the late afternoon after the front passes the air chemistry site. August 30 was a clear sky day. The MM5 forecast values for the 60-km grid, averaged over the six grid points surrounding La Porte, show no signs of clouds with the exception of August 29 (Fig. 2). The difference between the observations and MM5 are shown in Figure 3. The largest differences found can be attributed to the early morning cloud cover and subsequent enhanced diffuse solar irradiance over the La Porte site on August 25, 27 and 28.

A more subtle difference is apparent each day. In the morning the MM5 simulated solar fluxes are smaller than the observations by about 50 W m^{-2}. In contrast, the afternoon MM5 fluxes are around 80 W m^{-2} higher than the observations. During the afternoon on the clear sky day the model shows the near 100 W m^{-2} bias noted by Zamora et al. (2001).

4. CONCLUDING REMARKS

These preliminary results suggest that the phase of the diurnal heating cycle in the 60-km model results could be impacted by the convective parmeterization, the explicit MM5 microphysical package, and the radiation scheme. The large scale differential heating function for the smaller grids comes from the 60 km mesh. The motion and strength of the sea-breeze front depends on having the correct thermal gradient between land and water.

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Thus, we expect that if the large-scale (60-km) diurnal heating cycle is in error, these errors can propagate through all the meshes. Further tests and the 1.67-km grid results will be presented at the conference.

5. REFERENCES.

Zamora, R. J., S. Solomon, E.G. Dutton, J.W. Bao, M. Trainer, R.W. Portmann, A.B. White, and D.W. Nelson., 2001: Comparing MM5 radiative fluxes with observations gathered during the 1995 and 1999 Nashville Southern Oxidants Studies. *J.Geophy. Res.* Submitted.

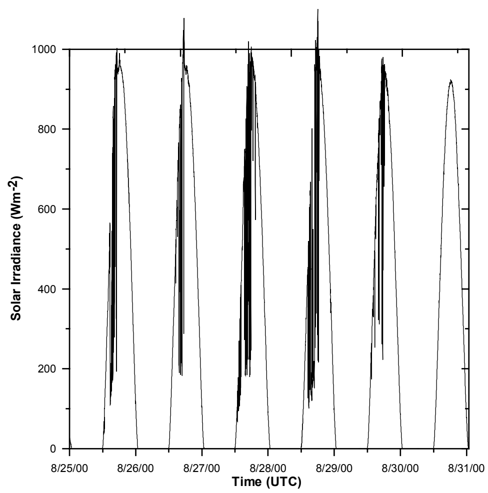

Figure 1. Solar radiative flux observed at La Porte, TX, for August 25-30, 2000.

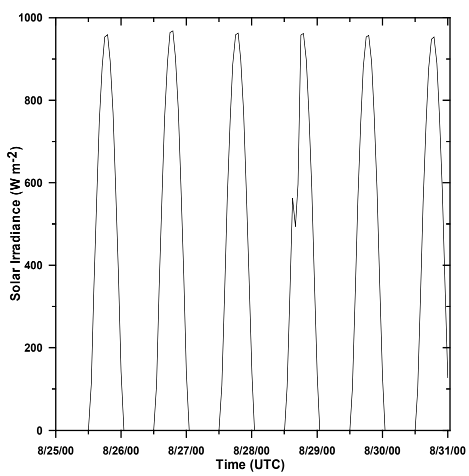

Figure 2. MM5 predicted radiative flux for La Porte, TX, August 25-30, 2000.

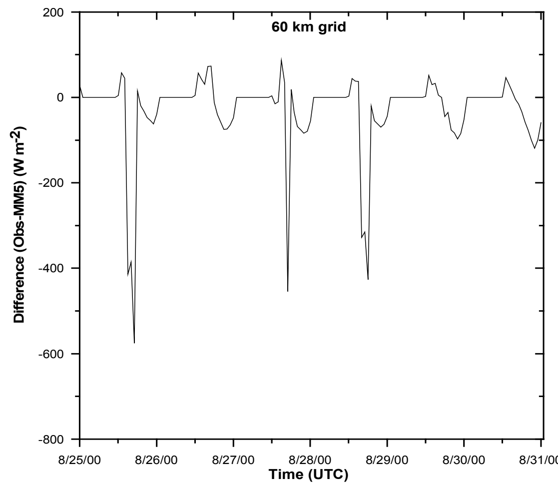

Figure 3 Difference (Observations - MM5) for La Porte, TX, August 25-30, 2000.