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AN OPERATIONAL NESTED AIR QUALITY PREDICTION MODELING SYSTEM (NAQPMS) FOR SHANGHAI CITY WITH DATA ASSIMILATION

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ABSTRACT

An operational nested air quality prediction modeling system (NAQPMS) has been developed to realize the real-time forecast of air quality for Shanghai city, China. The NAQPMS (Wang et al. 2001) investigated the various processes that govern the loading of chemical species and anthropogenic aerosols at various scales of atmospheric motions with emissions from East Asia to urban Shanghai. The model employs flexible horizontal grid resolution with multiple multi-level nested grids from 81, 27, 9, to 3km with options for one-way and two-way nesting procedures in a spherical and terrain-following coordinate. The meteorological driver used here is the NCAR/Penn State Fifth-Generation Mesoscale Model (MM5). Hourly pollutant levels of 25 stations covering Shanghai are used to evaluate the modeling system. Half year's forecasts clearly show that the technique of the model is capable of catching the variations of air pollutants and affording more realistic temporal and spatial structures of concentration fields, processes and precursors, especially for heavy pollution days. Furthermore, several case studies for high PM10 episodes are also discussed in this study to investigate the contributions of various sources. In this study, the spatial objective analysis technique based on the statistical interpolation analysis scheme is used to make data assimilation in NAQPMS. The assimilation of concentration of PM10 for August 2004 shows that that the bias error of assimilation results at independent observational location is smaller than that of model outputs, suggesting that assimilation results are closer to observed values than model outputs

Keywords: Operational forecast, air quality, Shanghai, regional and urban scale, numerical model.

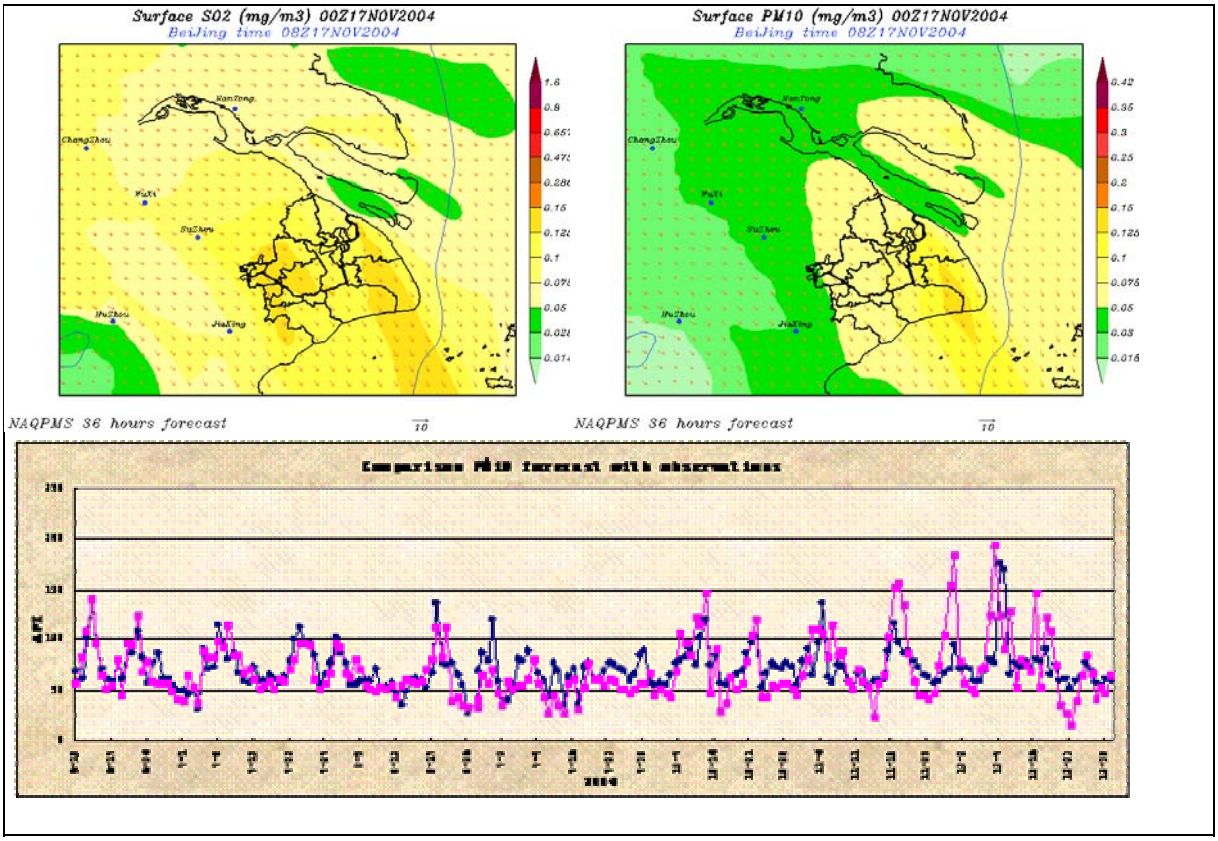

Figure 1. Snapshot of 36-hour forecast and comparison models with observed API from June to December 2004

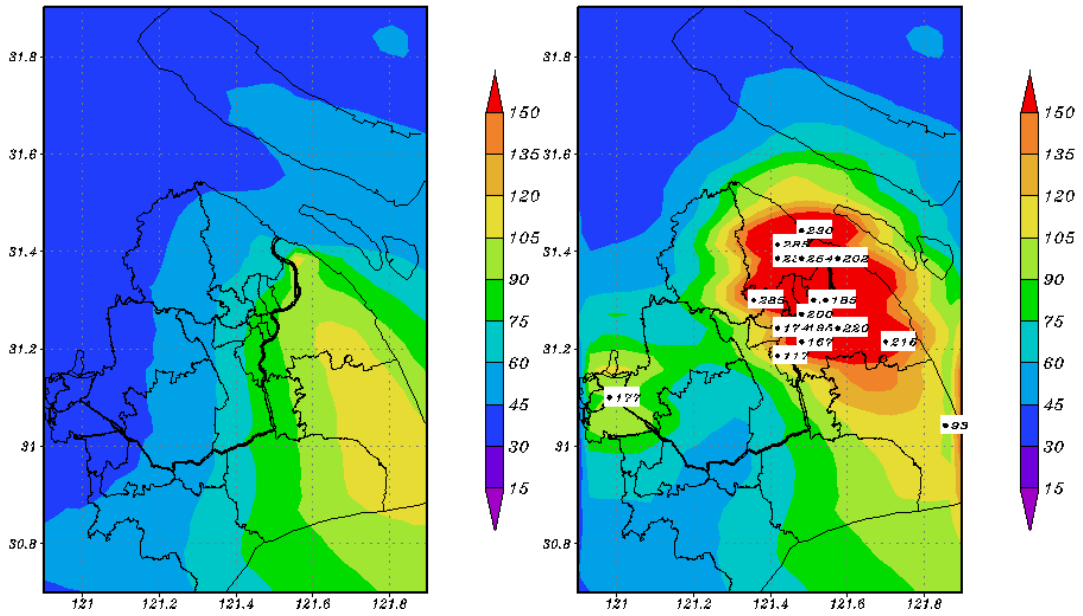

Figure 2. Difference between model outputs and assimilation results, indicating that the assimilation results are much larger than model output after assimilation of high observational values.

REFERENCES

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