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Analysis and simulation of heavy pollutions in Shanghai during October 2006 using a nested air quality model

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A nested air quality model (NAQM) has been developed by Institute of Atmospheric Physics and used for operational daily forecast of Shanghai's air quality at Shanghai Environmental Protection Administration. The model is driven by meteorological inputs from MM5. The model is running at horizontal solution of 81 km, 27 km, 9 km, 3 km, respectively. During October 2006 there were two heavy pollution episodes that the model failed to make fair forecasts. In this study, we evaluate the model's performance against observed concentration of PM10, SO2, O3 and NO2 and make an attempt to analysis the causes of the wrong forecasts. Though the simulation can well descript the patterns of PM10, O3, SO2 and NO2, the model underestimated concentration values of SO2, O3, PM10 and NO2 when the concentration reached their peaks. We focused on two main uncertainty sources: emissions and meteorological inputs. Numerical sensitivity experiments are performed using different perturbations of emissions and meteorological inputs to analysis the effects of emissions and meteorological inputs on air quality forecasts. Some hints for improvement of the air quality forecast system and implementation of ensemble forecast in future are given by this study.