



Evaluating the aerosol indirect effect in WRF-Chem simulations of the January 2013 Beijing air pollution event.

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In January 2013, an unusual weather pattern over Northern China produced unusually cool, moist conditions for the region. Recent peer-reviewed scientific manuscripts report that during this time period, Beijing experienced a historically severe haze and smog event with observed monthly average fine particulate matter (PM_{2.5}) concentrations exceeding 225 micrograms per cubic meter. MODIS satellite observations produced AOD values of approximately 1.5 to 2 for the same time. In addition, over eastern and northern China record-breaking hourly average PM_{2.5} concentrations of more than 700 $\mu\text{g m}^{-3}$ were observed. Clearly, the severity and persistence of this air pollution episode has raised the interest of the scientific community as well as widespread public attention. Despite the significance of this and similar air pollution events, several questions regarding the ability of numerical weather prediction models to forecast such events remain. Some of these questions are:

- What is the importance of including aerosols in the weather prediction models?
- What is the current capability of weather prediction models to simulate aerosol impacts upon the weather?
- How important is it to include the aerosol feedbacks (direct and indirect effect) in the numerical model forecasts?

In an attempt to address these and other questions, a Joint Working Group of the Commission for Atmospheric Sciences and the World Climate Research Programme has been convened. This Working Group on Numerical Experimentation (WGNE), has set aside several events of interest and has asked its members to generate numerical simulations of the events and examine the results. As part of this project, weather and pollution simulations were produced at the NOAA Earth System Research Laboratory using the Weather Research and Forecasting (WRF) chemistry model. These particular simulations include the aerosol indirect effect and are being done in collaboration with a group in China that will produce similar simulations focusing on the direct effect.

The presentation will cover the WRF-Chemistry model, the simulation configuration, and input data used for the retrospective study. In addition, evaluation of the model products in relation to the aerosol impact upon the meteorology will be discussed.