Air Quality Forecast Verification using Satellite Data

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This paper addresses the utilization of satellite observed aerosol optical depth data (MODIS and GOES) to analyze and assess NOAA-EPA Community Multiscale Air Quality (CMAQ) model PM2.5 forecasts for July 2004, when large fires in Alaska/Canada resulted in long range pollution transport to the central and eastern United States. The CMAQ model uses inputs of precursor emissions, a set of initial conditions, and parameterized gas phase and heterogeneous photochemical processes to compute concentrations of ozone and PM2.5. The PM2.5 concentrations are then used to calculate aerosol optical depth (AOD) and visibility. Uncertainties in ozone and PM2.5 forecasts arise from uncertainties in precursor emissions, meteorology, physics, chemistry, and initial/boundary conditions in the model. This paper will use model predicted and satellite observed AODs to investigate uncertainties in PM2.5 forecasts on different spatial and temporal scales. While current satellite data provide good spatial and temporal coverage, they cannot provide vertical information. Ground and aircraft observations of aerosol vertical profiles made during the study period will be used to augment satellite observations. This top-down (satellites) and bottom-up (lidars) view of long-range pollution transport scenario is expected to provide a comprehensive evaluation of the CMAQ forecast modeling system and lead to potential improvements.