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Operational prediction of air quality for the United States: applications of satellite observations

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Operational predictions of ozone and wildfire smoke over United States (U.S.) and predictions of airborne dust over the contiguous 48 states are provided by NOAA at http://airquality.weather.gov/. North American Mesoscale (NAM) weather predictions with inventory based emissions estimates from the U.S. Environmental Protection Agency (EPA) and chemical processes within the Community Multiscale Air Quality (CMAQ) model are combined together to produce ozone predictions. Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model is used to predict wildfire smoke and dust storm predictions. Routine verification of ozone predictions relies on AIRNow compilation of observations from surface monitors. Retrievals of smoke column integrals from GOES satellites and dust column integrals from MODIS satellite instruments are used for verification of smoke and dust predictions.

Recent updates of NOAA's operational air quality predictions have focused on mobile emissions using the projections of mobile sources for 2012. Since emission inventories are complex and take years to assemble and evaluate causing a lag of information, we recently began combing inventory information with projections of mobile sources. In order to evaluate this emission update, these changes in projected NO_x emissions from 2005-2012 were compared with observed changes in Ozone Monitoring Instrument (OMI) NO_2 observations and NO_x measured by surface monitors over large U.S. cities over the same period. Comparisons indicate that projected decreases in NO_x emissions from 2005 to 2012 are similar, but not as strong as the decreases in the observed NO_x concentrations and in OMI NO_2 retrievals. Nevertheless, the use of projected mobile NO_x emissions in the predictions reduced biases in predicted NO_x concentrations, with the largest improvement in the urban areas. Ozone biases are reduced as well, with the largest improvement seen in rural areas.

Recent testing of PM2.5 predictions is relying on emissions inventories augmented by real time sources from wildfires and dust storms. The evaluation of these test predictions relies on surface monitor data, but efforts are in progress to include comparisons with satellite observed aerosol optical depth (AOD) products. Testing of PM2.5 predictions continues to exhibit seasonal biases: overprediction in the winter and underprediction in the summer. The current efforts focus on bias correction and development of linkages with global atmospheric composition predictions.