Update on operational and experimental air quality predictions for the United States

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This presentation will provide an overview of recent work in support of NOAA's operational air quality predictions. The National Air Quality Forecast Capability (NAQFC) uses implementations of the Community Multiscale Air Quality (CMAQ) modeling system and NOAA's Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model, each linked with the North American Mesoscale modeling system (NAM). The combined system provides predictions for ozone and fine particulate matter (PM2.5) and for wildfire smoke over the United States (U.S.) as well as predictions of airborne dust over the contiguous 48 U.S. states. Ozone, smoke and dust predictions are available at http://airquality.weather.gov and as web service at https://idpgis.ncep.noaa.gov/arcgis/rest/services/NWS_Forecasts_Guidance_Warnings

In the recent years PM2.5 predictions from the model and post-processed to reduce biases have been made publicly available. The latest testing includes post-processed ozone predictions to be implemented in the next system update. Anthropogenic emission upgrades include recent monitoring data for point sources and oil-and-gas industrial activities. There is testing underway of two versions of CMAQ (5.0.2 and 5.2) with new emissions inventories from the National Emission Inventories (NEI) 2014. Testing of CMAQ with meteorology from the Next Generation Global Prediction System (NGGPS) that includes Finite Volume cubed sphere dynamical core (FV3) is also being performed. In addition to coupling with CMAQ, a simplified global aerosol chemistry using GOCART has been coupled to FV3 in an inline fashion. Two versions of FV3 are planned to be evaluated for air quality capabilities based on the global FV3GFS and a regional FV3Meso models. Another area of recent focus has been the modification of the way wildfires are identified and included into the models to account for changes on the National Environmental Satellite data and Information Services (NESDIS) operational procedures. We will show how these changes had affected particulate matter predictions. Our testing for the next operational implementation also includes updates on the post-processing scheme for PM2.5 predictions. Updates to the PM2.5 bias-correction system include the use of consistent training model predictions for the unified Kalman Filter Analog (KFAN) method and an increased number of observation sites for PM2.5 bias correction to an average of over 900 monitors. The scheme is also modified to account for the prediction of extreme events for ozone and PM2.5 by adding the difference between the current raw model forecast and historical analogs mean to the KFAN bias-corrected predictions. Impacts of these recent updates, including verification case studies and future plans will be discussed.