1.075 Improving the short-term air quality predictions over the U.S. using chemical data assimilation and analog-based uncertainty .

Presenting Author:
Rajesh Kumar, NCAR, rkumar@ucar.edu

Co-Authors:
Luca Delle Monache, NCAR
Stefano Alessandrini, NCAR
Pablo Saide, NCAR
Jamie Bresch, NCAR
Zhiquan Liu, NCAR
Gabriele Pfister, NCAR
Irina Djalalova, NOAA
Barry Baker, NOAA
Pius Lee, NOAA
Youhua Tang, NOAA
James Wilczak, NOAA

Abstract:

The National Oceanic and Atmospheric Administration National Air Quality Forecasting Capability (NAQFC) is one of the key tools used by decision makers across the U.S. to protect the public from poor air quality. This project funded by the National Aeronautics and Space Administration (NASA) aims to enhance the decision making activity by improving the accuracy of NAQFC short-term predictions of ground-level ozone and particulate matter less than 2.5 µm in diameter ($PM_{2.5}$) and to provide reliable quantification of their uncertainty, by exploiting NASA Earth Science Data with chemical data assimilation and analog-based approaches. The project has following three main objectives:

- The first objective is to improve the initialization of the NAQFC operational air quality prediction system, which is based on the Community Multiscale Air Quality (CMAQ) model, via chemical data assimilation of multiple satellite retrieval products within the community Gridpoint Statistical Interpolation system. We are currently developing a framework in GSI to assimilate retrievals of aerosol optical depth from the NASA Aqua/Terra Moderate Resolution Imaging Spectroradiometer, carbon monoxide from the Measurement of Pollution in the Troposphere and nitrogen dioxide from the Ozone Monitoring Instrument. We also plan to assimilate surface observations of $PM_{2.5}$ (and possibly of ground-level ozone) from selected stations of the AIRNow and the Interagency Monitoring of Protected Visual Environments.
- The second objective is to improve the CMAQ deterministic predictions considerably and reliably quantify their uncertainty with a probabilistic analog ensemble (AnEn) applied to the CMAQ deterministic predictions.
- The third objective is to extrapolate the deterministic and probabilistic point-based

predictions to a two-dimensional grid over the U.S.

This presentation will report results from each of the aforementioned project objectives, quantify the developed system performance with a range of metrics for both deterministic and probabilistic $PM_{2.5}$ predictions across several hundreds stations over the U.S.