Post-processing of surface Ozone from the Community Multiscale Air Quality (CMAQ) model.

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A Kalman filter- Analog (KFAN) post-processing method for correcting surface ozone predictions from the NOAA Community Multiscale Air Quality (CMAQ) forecasting system used in the National Air Quality Forecasting Capability (NAQFC) recently has been developed. The post-processing scheme of ozone follows a similar algorithm for post-processing surface PM 2.5 that has been used operationally since 2015 by the NOAA/NWS/National Centers for Environmental Prediction (NCEP). First it creates a set of the best-matching analog ozone forecasts to the current CMAQ prediction, then calculates a weighted average of the ozone observations that correspond to these closest historical analogs over a set training period, and finally applies a Kalman filter to the weighted analog ensemble mean (KFAN bias correction). Several model parameters (called analog predictors) are used in the search for analogs, including ozone itself, ozone precursors NOx and NOy, and meteorological predictors including wind speed and direction, surface temperature, surface solar radiation, and planetary boundary layer height. An optimal weighting scheme is applied to the analog predictors. The ensemble means of the selected analogs at each observation site are used to compute site-dependent bias corrections for each ozone forecast. These corrections are then spread across the model domain by an iterative objective analysis technique and used to compute a grid-point specific correction applied to the current forecast, resulting in a new bias-corrected forecast over a 2D grid. A methodology will also be discussed that improves the forecasts of extreme high ozone events, which is challenging due to the short training periods typically available (often less than a year). Finally, the availability of the analog ensemble members allows one to calculate probabilistic air quality forecasts. Reliability diagrams and spread-skill relationships are examined to demonstrate the skill of the probabilistic forecasts.