Multi-model Air Quality Forecast Regional Performance Analysis over North America for the ECCC, NOAA-NWS, and CAMS Operational Systems

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Although a number of operational air quality forecast systems routinely produce AQ forecasts for North America, until recently there has not been any side-by-side evaluation and comparison of these forecasts. Environment and Climate Change Canada (ECCC) has now developed a multi-model verification system that receives, ingests, and evaluates North American AQ forecasts from the ECCC regional, NOAA-NWS regional, and ECMWF-CAMS global operational AQ systems against near-real-time, multi-network North American hourly surface measurements of O_3, NO_2, and $PM_{2.5}$. This new system, which now includes daily forecasts from January 2017 onwards in collaboration with NOAA and ECMWF, automatically generates monthly multi-model performance statistics for North American daily maximum forecasts of O_3, NO_2, and $PM_{2.5}$ at the end of each month. While the system computes a number of standard statistical metrics, a novel, pollutant-specific Air Quality forecast Performance Index (AQPI), which combines unitless measures of model bias, error, and correlation, is used to track and compare overall monthly performance and trends for the three AQ forecast models. The three agencies are now working to exchange these results on a regular basis, which should reinforce this international collaboration and provide useful information to guide future model development.