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Improving visibility forecast during haze-fog processes for Eastern China

Ying Xie (1,2), Xiaofeng Wang (1,2), Baode Chen (2), Xiaolin Xu (1,2), Xu Zhang (2), Weiqiang Ge (1,2), Yuhua Yang (2), Ronald van der A (3), and Jieying Ding (3)

(1) Shanghai Ecological Forecasting and Remote Sensing Center, Shanghai Meteorological Service, Shanghai, China, (2) Innovative Center of Regional High-Resolution Numerical Weather Prediction, Shanghai Meteorological Service, Shanghai, China, (3) Royal Netherlands Meteorological Institute (KNMI), De Bilt, the Netherlands

In recent years haze-fog processes occurs frequently for the Eastern China region, causing significant disruptions on transportation, shipping, aviation, and daily activities. For fog visibility prediction, operational NWP models often only consider particle scattering and absorption of light due to hydrometers. In this study, we show that visibility calculated based on hydrometers only tends to be severely overestimated during combined haze-fog processes in Eastern China.
The Shanghai Meteorological Service WRF ADAS Real-time Modeling System (SMS-WARMS) is an operational NWP system that provides strong support for weather predictions in Eastern China. In this work, we use the 3-D meteorology fields from the 9-km SMS-WARMS system to drive the Community Multiscale Air Quality (CMAQ) model to provide detailed aerosol chemical compositions. Satellited derived NO_x emissions have been incorporated to traditional bottom-up inventory to give more up-to-date emissions. A visibility forecasting framework is developed by combining extinction effects due to hydrometers and hydrated aerosols based on SMS-WARMS and CMAQ predictions. We will show detailed model evaluations of visibility forecast over Eastern China. Significant improvement in visibility prediction is found during combined haze-fog processes. Uncertainties of the method and future works will also be discussed.