Near real-time air quality forecasting using the NASA GEOS composition model

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We give an overview of the GEOS composition forecast (GEOS-CF) model, a new high-resolution (0.25 degree) global forecasting system produced by NASA's Global Modeling and Assimilation Office. GEOS-CF combines the operational GEOS weather forecasting model with the state-of-the-science GEOS-Chem chemistry module to provide detailed analysis of a wide range of air pollutants such as ozone, carbon monoxide, nitrogen oxides, and fine particulate matter. Satellite observations are assimilated into the system for improved representation of weather and aerosols (e.g. smoke from fires). The assimilation system is currently being expanded to include three chemically reactive tropospheric trace gases (ozone, nitrogen dioxide, and carbon monoxide).

Comparisons of modeled trace gases and aerosols against independent surface and satellite observations show that the model realistically captures the diurnal and seasonal variability of air pollutants. The evaluation also reveals current limitations of the model, e.g. in reproducing maximum summertime ozone.

The GEOS composition forecasting system offers a new tool for scientists and the public health community, and is being developed jointly with several government and non-profit partners. Potential applications include air quality warnings, flight campaign planning and exposure studies using the archived analysis fields.