

#### **4a.6 Indirect impact of ozone assimilation using the Grid-point Statistical Interpolation data assimilation system for regional applications**

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The Grid-point Statistical Interpolation (GSI) Data Assimilation (DA) System is a three-dimensional (3D-Var) and hybrid DA system currently used by various United States agencies as part of operational forecast systems for both regional and global applications. Assimilation of ozone within the GSI system is typically reserved for global models or applications coupled to an atmospheric chemistry forecast model. Although Weather Research and Forecasting Advanced Research WRF (WRF-ARW) does not include ozone as a prognostic variable, an indirect short-term forecast benefit has been identified by assimilating ozone data types into GSI when coupled with WRF-ARW.

Model simulations were run over a 15-km limited-area domain with a 2 hPa model top for a 1-month period. The two experiments were conducted to assimilate Solar Backscatter Ultraviolet (SBUV/2) and Global Ozone Monitoring Experiment (GOME-2) data, respectively, to investigate the impact of both profile and total ozone types. To obtain background ozone, Global Forecast System (GFS) ozone was interpolated to the regional grid. Verification against the European Centre for Medium-Range Weather Forecasting (ECMWF) reanalysis (ERA-Interim) dataset showed improvement from the ozone assimilation in both the temperature and wind fields, with the largest statistically significant differences favoring the configuration with ozone assimilation primarily confined to short-range forecasts (under 24 hours). The indirect impact from the ozone assimilation stems from changes in the satellite radiance assimilation via the Community Radiative Transfer Model (CRTM) calculation. This presentation will further examine this behavior through verification against satellite radiances directly and analysis of the diagnostics from the GSI system. Finally, new community tools for GSI diagnostic investigation within the Model Evaluation Tools (MET) package used for this study will be introduced.