

# Description and Evaluation of the Aerosol Component, based on NASA's GOCART2G, in the Latest Prototype of the Unified Forecast System; Application to the NOAA Global Ensemble Forecast System version 13

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## ABSTRACT

The current NCEP/EMC operational application GEFSv12-aerosol predicts aerosols out to 5 days and runs with prescribed ocean and sea ice forcing. GEFSv13 is planned as a fully coupled atmosphere/land/ocean/sea-ice/wave/aerosols systems developed within the Unified Forecast System (UFS) framework. In its final configuration, the coupled UFS system will consist of: (1) FV3 dynamical core and CCPP atmospheric physics package using the Noah-MP land model, (2) MOM6 ocean model, (3) CICE6 sea ice model, (4) WAVEWATCH III wave model, and (5) Aerosol component, based on NASA's 2<sup>nd</sup> generation GOCART aerosol model. The latest completed GEFS prototypes are coupled for the first five components listed above and include a two-way coupling for the aerosol component with feedback to the atmosphere. GOCART2G is a simplified chemistry and aerosol component that predicts the major aerosol species including dust, organic and black carbon, sea salt, and sulfate aerosols. The model is configured using a blend of the CEDS global emissions combined with 2010 HTAP aviation emissions, the QFED biomass burning emissions, and the ARL-developed FENGSHA dust emission model. In this presentation, we will discuss the configuration of the latest coupled GEFS prototype, improvements to the FENGSHA dust emission model and present an assessment of its ensemble predictions focusing on the aerosol component. This assessment will highlight the system's biases and forecast skill for weeks 1 through 5, seasonal biases, and

errors over the 35-day period. The next steps for the development of the coupled UFS with aerosols will be discussed in the context of attained forecast improvements and remaining challenges.