Chemical Weather Forecast: Online Inclusion of Chemical Component into NOAA's Next Generation Global Prediction System (NGGPS)

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The global Finite-Volume cubed-sphere dynamical core (FV3) developed by GFDL was chosen by NOAA to be the Next Generation Global Prediction System (NGGPS) of the National Weather Service in the US. In this study we describe the model that has been coupled with GOCART aerosol modules (FV3GFS-GSDChem) and is now used at NOAA ESRL GSD to provide real-time experimental aerosol forecasts at ~25km horizontal resolution globally from the surface to the top of atmosphere. The initial chemistry modules include simplified parameterization of sulfur/sulfate chemistry, hydrophobic and hydrophilic black and organic carbon, a 4-bin sea salt, 5-bin dust, volcanic ash. The wildfires modeling is using MODIS and Fire Radiative Power (FRP) data from satellite observation and plume rise modeling with an online 1d cloud model. The global anthropogenic emissions are from a Community Emissions Data System (CEDS) and HTAP_v2. Both the GOCART and emission modeling systems are residing within the new National Unified Operational Prediction Capability (NUOPC)-based NOAA environmental modeling system (NEMS) component, driven by FV3GFS. Progress and implementation of the coupling structure and workflow (including the pre and post processing) will be described. The model is able to simulate wild fires and forecast the transport of smoke plumes over northwestern California during late July, 2018. It also captures the movement of high sea salt and dust concentrations associated with tropical and desert storms, respectively. The impact of using different global anthropogenic and fire emission inventories will also be discussed.