



Realtime Wildfire Smoke Prediction in the United States: the HRRR-Smoke Model

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In this talk, we summarize recent developments within a prototype real-time smoke modeling system, the High-Resolution Rapid Refresh for smoke (HRRR-smoke). The HRRR-smoke makes use of WRF-chem (the WRF model coupled with chemistry) to simulate fine particulate matter (smoke) emitted by biomass burning; the HRRR-smoke ingests fire radiative power (FRP) data from the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor on the Suomi National Polar-orbiting Partnership (S-NPP) satellite to calculate biomass burning emissions. The VIIRS FRP data are processed and remapped over the HRRR-smoke model domains. We process the FRP data to calculate biomass burning emissions (smoldering part) and fire size for the model input. In addition, HRRR-smoke uses the FRP data to simulate the injection height for the flaming emissions using concurrently simulated meteorological fields by the model.

Currently, there are two 3km grid spacing domains covering the contiguous United States and Alaska. The HRRR-smoke is initialized four times per day to forecast smoke concentrations for the next 36 hours. The VIIRS FRP data mapped onto the HRRR-smoke grids, as well as near-surface and vertically integrated smoke mass concentrations, are visualized for each forecast hour. These plots are provided to the public via the HRRR-smoke webpage: <https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/>

Building on data assimilation and model physics advancements within the 3km grid spacing HRRR model, the HRRR-smoke represents an initial step towards incorporating aerosol feedbacks onto meteorology within operational numerical weather prediction.