Operational implementation of the smoke forecasting capability in the RAP/HRRR numerical weather prediction system

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Since December, 2020 NOAA’s operational Rapid Refresh and High-Resolution Rapid Refresh (RAP/HRRR) numerical weather prediction modeling systems include smoke forecasting capability. In RAP/HRRR-Smoke primary aerosols (smoke) emissions from wildland fires are simulated by ingesting the fire radiative power data from the VIIRS (onboard S-NPP and NOAA-20) and MODIS (Terra and Aqua) satellite instruments in real time. I will describe the development and applications of the RAP and HRRR-Smoke models, which cover 3 domains – North America (at 13.5 km spatial gridding), CONUS and Alaska (3km resolution). I will present the applications of these models to forecast smoke distributions on regional and continental scales, and how adding the smoke direct feedback capability can improve weather and visibility forecasting. The RAP/HRRR-Smoke models are the first operational weather models in the US, which include the impact of the smoke aerosols on weather and visibility forecasting. The verification of the HRRR-Smoke model for July-August 2018 over the CONUS domain using various meteorological and aerosol measurements will be presented. For verification of the fire plume injection height simulations in HRRR-Smoke, we use the aircraft lidar and in-situ measurements from the FiREX-AQ campaign during August 6-8, 2019. Finally, I will discuss the future plans for improving forecasting of smoke-weather interactions in coupled air quality models.