Fine resolution regional dust forecast

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Wind-blown dust impacts human health, visibility, ground and air transportation, and modulation of radiative forcing through direct and indirect effects. The NOAA dust forecasting capability is part of a core mission to build a “Weather Ready US”. Dust is recognized as an important contributor to air quality especially in the western US. At present, the NOAA dust forecast includes the NEMS Global Aerosol Component and the regional National Air Quality Forecasting Capability (NAQFC). They respectively provide global and Continental United States (CONUS) experimental forecast for dust. The former is a 5 day 1^o by 1^o forecast as air-borne non-reactive crustal particles and the latter is a 12 km 48 h forecast as modal distributed particles with possible surface reactions. Such dust forecast can be used to assist assessing and mitigating the impact of dust storms on the society and the environment, including human health (e.g., Valley Fever), air and ground transportation (traffic accidents), local economy (e.g., real estate prices), and climate change.

This work evaluates the performance of the NAQFC’s CTM and dust emission module when driven by the High Resolution Rapid Refresh (HRRR) meteorology and several dust emission source modules within the HRRR-dust forecasting system. The NOAA operational High Resolution Rapid Refresh (HRRR) model runs on a 3km horizontal grid over the CONUS domain and is initialized hourly. Because of this high temporal and spatial resolution used in the forecast model, the HRRR is credited with providing more detailed information to decision makers. The next implementation of the HRRR over the CONUS will use an aerosol-aware microphysics parameterization component (Thompson and Eidhammer, 2014) explicitly treating cloud droplet activation and ice nucleation as well as a dust parameterization. Ranking among these fine-resolution dust forecasting systems at 3 km spatial grid spacing were attempted.