

Recent developments of the FENGSHA dust emission module:
Implementation into FV3-CHEM and future developments

Barry Baker^{2,3}, Daniel Tong^{1,2,3}, Rick Saylor³

(1) GMU; (2) UMD; (3) NOAA ARL

As drought becomes the new normal in many western states, the frequency of windblown dust storms increases rapidly. Long-term dust observations show that large dust storms have increased by 240% from 1990s to 2000s. In regions frequented by dust storms, there is an 800% increase in the infection of Valley Fever, an infectious disease caused by inhaling soil-dwelling fungi. In light of the enormous air quality and health burden imposed by dust storms, it is vital to provide accurate early warnings to mitigate the detrimental effects of dust storm hazards. We present here the latest development of the FENGSHA (Windblown dust in Mandarin) dust emission module, which has been incorporated into the CMAQ model to support the National Air Quality Forecast Capability (NAQFC) PM_{2.5} forecasting over North America. Lessons learned to apply FENGSHA in regional dust forecasts are also highlighted. Since its initial implementation into NAQFC in 2015, the FENGSHA module has been updated with several improvements, including 1) new threshold friction velocities from a reanalysis of wind tunnel measurements conducted by Gillette and colleagues; 2) a high-resolution global soil texture map; and, 3) an emission data assimilation capability to make use of satellite observations of land surface conditions. We will discuss the first implementation into the global aerosol forecasting with the NOAA Next-Generation Global Prediction System (NGGPS) and future development of FENGSHA.