A WRF/CHEM SENSITIVITY STUDY TOWARDS HIGH RESOLUTION AIR QUALITY FORECASTING FOR SOUTHWESTERN UNITED STATES

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Modeling at high spatio-temporal resolution is the key in forecasting high impact air quality events. Here, we assess the performance of WRF/Chem to simulate the dust mobilized by thunderstorm outflows/coldpools (haboobs) in Arizona. This is an extension of the modeling system currently applied in University of Arizona to provide near-real time weather forecasts at convective resolving scales (<3km). We use MOZCART mechanism at 1.8km resolution to simulate the July 5, 2011 haboob in Phoenix and investigate the coupling between the meteorology and chemistry under this environment. Model simulations of meteorology are in good agreement with the radar observations of storm genesis locations, propagation and confluence of coldpools near Phoenix that caused the massive dust mobilization. Results from WRF/Chem agree with the general spatio-temporal patterns of dust abundance from observations of MODIS, CALIPSO, IMPROVE and EPAAQS sites. However, we find that the model severely underestimates the dust concentrations due to unresolved dust sources in Arizona. Sensitivity simulations were also carried out to 1) test high resolution dust source dataset, 2) confirm previous reports on the impact of haboobs on local radiation at different vertical levels, and 3) explore the connection between Mesoscale Convective System and air quality trends.