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# Initial Testing of a Source-Oriented WRF-CHEM Model

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Source-oriented air pollution models track individual source contributions through a full photochemical simulation of atmospheric transport and chemistry. Source-oriented models can also be configured to represent airborne particulate matter as a source-oriented external mixture that describes differences in particle composition even though they have the same aerodynamic diameter. Up to this point, all source-oriented calculations have been embedded in chemical transport models that employ off-line meteorological simulations. This limitation has prevented the exploration of the full effects of source-oriented chemistry on meteorological feedbacks by the majority of the scientific community.

In this study we demonstrate a source-oriented version of the Weather Research & Forecasting model (WRF/Chem V3.1.1) that has been modified to solve the complete equation set governing the emission, transport, transformation, chemical reaction, and deposition of source-oriented pollutants in the domain atmosphere. With this tool it is now possible to trace pollutants from their source through atmospheric chemical transformation with a full accounting of feedback effects to meteorology. The model represents size-resolved particulate matter (PM) in 8 log-normally distributed size bins between 0.01-10 micrometers with close to 30 chemical species. The modified WRF/Chem model is used to predict pollutant concentrations during the California Regional Particulate Air Quality Study (CRPAQS) episode in the winter of 2000-2001. Model predictions are compared to base case WRF/Chem V3.1.1 predictions and to the UCD/CIT source-oriented air quality model that uses off-line meteorology. Similarities and differences will be discussed between all simulations for processes such as deposition, advection and gas-particle equilibrium interactions. The benefits of simultaneous predictions of meteorology and air quality during a severe stagnation event will be quantified.