A31K-2865 - Modeling Wildfire Smoke Exposure from the 2013 California Rim Fire using CMAQ and HYSPLIT

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Abstract
Wildfire smoke, which contains nitrogen oxides, volatile organic compounds, and particulate matter, has harmful impacts on human health. Estimating wildfire smoke exposure is one important step in understanding the health effects of wildfire smoke. Atmospheric chemical transport models (CTMs) are useful tools to aid in modeling spatially resolved air pollution exposure estimates, including exposures related to wildfire smoke emissions. However, CTMs suffer from uncertainties in meteorological fields, chemical mechanisms, and emission inventories. Dispersion models can also be used to study wildfire smoke transport, but they do not consider the intricate chemical reactions in atmosphere. To provide wildfire smoke exposure information for health effects studies, we investigate the wildfire air quality impacts using both CTMs and dispersion models for one major wildfire event, the Rim Fire. The Rim Fire started in August 2013 and burned over 1041 km2 of land in central California. The smoke impacted multiple communities downwind. We use the Community Multi-scale Air Quality (CMAQ) model driven by meteorological fields from the Weather Research Forecasting (WRF) model to simulate the air quality impacts during the Rim Fire. The emission inventory for CMAQ is based on the 2011 National Emission Inventory platform and the 2013 wildfire emissions inventory was developed using the BlueSky modeling framework. We used the Hybrid Single Particle Lagrangian Integrated Trajectory Model (HySplit) dispersion model to calculate the plume rise, as well as smoke transport and dispersion. Results from CMAQ and HySplit are compared and evaluated to assess their differences and capabilities in modeling the smoke plume transport downwind of the Rim Fire. Then the wildfire smoke exposure for the 2013 California Rim Fire is estimated based on integrated results from the two models. This work provides the modeling framework necessary to estimate the wildfire smoke exposure for planned health effects studies.

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