Dispersion Modeling to Estimate Wildfire Smoke Transport During the Yosemite Rim Fire

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Inhalation of wildfire smoke can cause serious health problems for humans. Estimating human exposure to wildfire smoke to understand the health impacts becomes more crucial as a changing climate leads to a more extended wildfire season with more intense fires. The complex, mountainous terrain poses an acute challenge to atmospheric dispersion models used to determine wildfire smoke transport in the western United States. These challenges are further exacerbated by the limitations of determining individual wildfire characteristics (i.e., amount of emissions released), which are used as inputs into the atmospheric dispersion models.

This work presents a method to combine two sources of fire emissions data to create a more robust fire emissions inventory, which will be used as inputs into a Hybrid Single-Particle Lagrangian Trajectory (HYSPLIT) model to determine smoke transport during the Yosemite Rim Fire of 2013. For the HYSPLIT simulations, the North American Mesoscale Forecast System (NAM) 12 km horizontal resolution analysis product provides gridded meteorological inputs. Fire emissions information will come from several different fire emissions inventories and a new combination of fire emissions inventory products to determine the impact of fire emissions input data on HYSPLIT dispersion modeling. Since these fire emissions inventories only provide daily emissions estimates, the emissions data will be rescaled to a 3-hourly time scale using recent literature to create a diurnal profile that matches the diurnal profile exhibited by fires in the western United States. This case study will compare data for the Yosemite Rim Fire from several fire emissions inventories and the differences in HYSPLIT results from each fire emissions inventory used as input.