Impact of wildfires on ambient air quality and health burden.

Background

Wildfire events produce massive amounts of fine particulate matter (PM2.5) harmful to health and reduce local and regional air quality. An important step toward assessment of health burden attributable to PM2.5 exposures during fire events is the assessment of magnitude and spatial scales of exposures in population. However, fires are unpredictable and often occur at remote locations where ambient air quality measurements are not readily available. Deterministic chemical transport and dispersion models as well as satellite data products are useful tools for understanding exposure levels in population at wider spatial and temporal scales but their predictive power has to be examined with respect to the observed measurements for use in health burden assessment.

Goal

To evaluate performance of modeled PM2.5 during fire events to predict ambient concentrations with respect to magnitude and spatial domain and evaluate health burden for specific health outcome.

Data

- Chemical transport model predictions of smoke (EPA). Daily values of PM2.5, at 12km grid.
- Dispersion model predictions of smoke by HYSPLIT model (NOAA). Daily values of PM2.5, at ~14km grid.
- Data from ambient air quality monitors (EPA), Daily averages, ~1000 monitoring stations across the continental US
- Satellite data products – Hazard Mapping System (NOAA)
- Population baseline rates of health outcome (such as asthma) and risk estimates

Methods to Consider

- Visualization of spatio-temporal data
- Spatial and time-series analysis
- Uncertainty quantification
- Health impact assessment

Research Directions to Consider

a. Characterize the magnitude and direction of bias between modeled and measured concentrations of PM2.5. Does the bias very by space, time, or quantiles of PM2.5.
b. Characterize the spatial overlap between the ground level plume as predicted by a model vs the plumes observed by various satellite data products such as Hazard Mapping System
c. Impact of uncertainty in PM2.5 on the burden assessment for a specific health outcome.