Predicting Prescribed Fire Impacts in the Southeast

Talat Odman, Yongtao Hu and Ted Russell
Prescribed fire: Largest source of PM$_{2.5}$ emissions in the southeastern U.S.

Prescribed fire improves native vegetation and wildlife habitat, controls insects and disease, and reduces wildfire risk.

2014 NEI attributes 24% of all PM$_{2.5}$ emissions in the southeastern U.S. to prescribed fire.
HiRes-X: Operational forecasting of prescribed fire impacts for health, air quality and ecosystem management

- Daily forecasts of prescribed-fire related air quality impacts to state agencies for prescribed burn and air quality management
  [https://forecast.ce.gatech.edu](https://forecast.ce.gatech.edu)

- Prescribed-fire related exposures to CDC and its partners for public health tracking and source-specific epidemiological assessments
  [https://ephtracking.cdc.gov](https://ephtracking.cdc.gov)

**PM$_{2.5}$ Forecast**

**Burn Impact Forecast**

**Public Health Tracking Network**
Health impacts layer of HiRes-X (under development)

Health burden:

$$\Delta H = H_0 (1 - e^{-\beta \Delta c})$$

where

$H_0$ is baseline health rate

$\beta$ is effect estimate coefficient (obtained from C-R function)

$\Delta c$ is fire impact on concentration

C-R function for ER visits

Also for asthma medication use
Prescribed fire activity forecasts for the Southeast: Based on weather forecast and historic fire patterns

- 2010-2016 burn permit data in Georgia (GA)
- 2015-2016 GBBEP data in other states
- County-specific CART models in GA for “burn day” forecast
- Meteorological burn/no-burn criteria in other states

HMS Fire Detections | Our Burn Forecast | Cloud Cover
Low-cost sensors collecting data in smoke impacted areas of Southwest GA

2018 active burn season data analyzed
Year 2 Progress Update, PI Russell

**HiRes-X: … Extension of Operational … Smoke Impacts Forecasts for Health …**

- Enhance HiRes-2 using Earth observations
  - Expanded prescribed (Rx) fire forecasts to Southeastern U.S. using satellite fire observations; manuscript in preparation
- Provide Rx fire impacts forecasts to local and state agencies
  - Held a workshop; launched and operated SIPFIS website; upcoming webinar; manuscript in preparation
- Maintain a sensor network
  - Deployed and operating a low-cost sensor network in Southwest Georgia; manuscript in preparation
- Presentations at 5 conferences/meetings; 2 papers published

**Tiger Team Participation**

- TT Fiore: Satellite Data in SIPS
  - Technical Guidance document on “Comparison of CMAQ simulations to satellite observations” (completed, in review and testing); manuscript in preparation
- TT Pierce: Improved NO\textsubscript{x} emissions using OMI
  - Investigated how to improve O\textsubscript{3} simulations in the Great Lakes Region; 2 manuscripts submitted, 1 in preparation
- Co-PI Talat Odman is guest editing a special issue of International Journal of Environmental Research and Public Health (IF: 2.145) on “Air Quality and Health Predictions”