

Forecasting Air Quality and Health Impacts of Prescribed Fires in Southeastern U.S.

M. Talat Odman¹, Ha H. Ai, Yongtao Hu,
Ambarish Vaidyanathan, and Armistead G. Russell

School of Civil and Environmental Engineering
Georgia Institute of Technology
Atlanta, GA 30332-0512

Prescribed fire is the leading source of PM_{2.5} emissions in southeastern U.S. and PM_{2.5} has been associated with increased incidences of cardiovascular and respiratory disease. We developed the HiRes-X modeling system to forecast prescribed fires and their impact on air quality and human health in southeastern U.S. We disseminate these forecasts through the Southern Integrated Prescribed Fire Information System (SIPFIS).

HiRes-X uses innovative statistical learning and modeling approaches to identify areas most impacted by prescribed fires. In particular, a regression tree model was built using meteorology and prescribed fire data from recent years. Using the weather forecast, this model generates highly resolved forecasts predicting the number, location and size of prescribed fires. Smoke emissions are calculated using satellite enhanced fuel maps, fuel consumption estimates and region specific emission factors. Community Multiscale Air Quality (CMAQ) model is used to compute the contribution of smoke emissions to local and regional air quality. HiRes-X modeling system is integrated with measures of cardiorespiratory health impacts and social vulnerability to identify communities most vulnerable to smoke from prescribed fires.

SIPFIS dashboard provides map and chart visualization tools that are built using open source software and features interactive capabilities to respond dynamically to user selections. Analyses that can be performed with SIPFIS include comparisons of prescribed fire forecasts to burn permit records or satellite fire detections, and air quality forecast to observations. SIPFIS can be used for managing prescribed burning operations to reduce human exposure to fire smoke and for emergency planning and preparedness purposes.

In this presentation, we will describe the HiRes-X modeling system and report on its past performance. We will show examples of how the HiRes-X forecasts and SIPFIS can be used for cohesive prescribed fire, air quality and health management. Planned updates in view of stakeholder feedback will also be reviewed.

¹ Phone: 404-894-2783, Fax: 404-894-8266, E-mail: odman@gatech.edu