A Suite of Smoke Tools for Forecasting and Managing Air Quality Impacts from Fires

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ABSTRACT – Dealing with smoke is a growing issue as larger and more frequent wildfires and increasing populations amplify the various concerns generated by smoke exposure--from firefighter and transportation safety to economic losses to public health effects. Modeling smoke impacts is inherently difficult and requires bringing together disparate and noisy information into a real-time system capable of bridging the various disciplines involved into a coherent forecast. Moreover, smoke is increasingly playing a role in numerous decision making processes from questions at the incident about methods of fire suppression to decisions around road closures, evacuations, and more. As such, more is being asked of smoke modeling systems in terms of comprehensiveness, accuracy, timeliness, and output capabilities. The U.S. Forest Service AirFire Research Team has been building smoke modeling systems and tools for the U.S. for the past 15+ years that are designed to fit into operational support systems in different arenas such as wildfire operations, prescribed fire activities, and public health notifications. In doing so, we have created a suite of systems encompassing data acquisition and display systems for smoke monitoring data, fire detection and information acquisition and aggregation systems, and smoke modeling frameworks, that can work together and serve as the basis for a variety of products and tools in use daily across the U.S. These products include daily smoke forecast runs done at a variety of spatial scales and resolutions, the BlueSky Playground on-demand interactive modeling web tool, a real-time extensible observational Monitoring web tool, and others. Many of the underlying systems and tools have been recently revamped and updated, and all are freely distributed for use and adaptation, as has been done in Canada, New Zealand, and elsewhere. Here we present the full suite of technologies that have been used in international smoke response programs such as the new U.S. Interagency Wildland Fire Air Quality Response Program. This includes the newly released BlueSky Smoke Modeling Framework version 4, the new Fire Information System, and a variety of data analysis and visualization packages in R, and information about where to find them for downloading, how they are built, and how they can be adopted for your needs.

Keywords: Smoke; Air Quality; Monitoring; Forecasting; Modeling; Incident Support

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