The impact of complex terrain and associated atmospheric processes on the transport and dispersion of smoke from the October 2007 Southern California wildland fires

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Study Overview:

This study is partially supported by the JFSP. Although it was not in the original scope of the project, it fits perfectly to the objective of developing predictive tools for smoke impact from wildland and prescribed fires in complex-terrain region of the Southern Sierra Navada. Air pollution control over the western U.S. is often constrained by the mountainous terrain which greatly affects the regional meteorology. To understand how complex terrain might affect predictions of smoke from wildland fires in environments such as southern California, we performed numerical simulations using a Lagrangian particle dispersion model FLEXPART, driven by the Weather Research and Forecast (WRF) model for the October 2007 Southern California wildland fire episode. The simulated meteorological fields were evaluated by comparing them with data from a network of surface and upper air weather stations in California and Nevada. The simulated smoke plumes were compared with MODIS Hazard Mapping System (HMS) satellite imagery. A series of sensitivity experiments were designed to examine how the complex topography in the region affects local and regional atmospheric circulations and what the subsequent impacts of these circulations are on smoke transport and dispersion under different synoptic weather conditions. This work helps identify uncertainties and biases of these state-of-art prognostic smoke prediction models when applied to complex terrain settings.

Current Status:

The simulations are still on-going. Because of the very fine horizontal and vertical resolution required to resolve the complex terrain in the study domain, these simulations demand substantial computing resources. As a result, the progress has been relatively slow. We have obtained preliminary modeling results and are currently compared them with the in-situ observations. We will be performing sensitivity experiments in the next few months and we hope to have a manuscript ready to submit by the end of the summer.