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Non-random errors in real-time emissions models caused by input data limitations

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Real-time monitoring of emissions from biomass burning is an application with data requirements different from, and generally more stringent than, the general scientific problem of estimating emissions from past events. The FLAMBE project generates estimated aerosol emissions over the globe every six hours for input into an aerosol transport and evolution model. This model, the Navy Aerosol Analysis and Prediction System (NAAPS), is coupled to the US Navy's global-scale weather model (NOGAPS) to produce forecasts of tropospheric aerosol distribution in real time. The ongoing development and refinement of the FLAMBE biomass-burning aerosol emissions source has led to several important insights into the fundamental limitations of available data for the problem of real-time emissions estimation. The impacts of the limited spatial, temporal, and quantitative accuracy of model inputs do not always manifest themselves as random error, frequently causing highly directional bias in emissions estimates. Examples of these errors and how they arise from input data including active fire detections, land cover maps, and fuel structure models will be given, with quantitative evaluation of their impacts on emissions estimates. Methods of minimizing emissions biases by accounting for data limitations will be discussed.