

An Integrated System for Studying the effect of Central American smoke aerosols on air quality and climate over the Southeastern United States

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Observation shows that smoke aerosols from biomass burning in Central America can be transported to the United States. However, the impact of this transport on regional climate is not well known and timely forecasts for air quality applications have not been readily available. An integrated system is under development that includes assimilation of satellite fire and aerosol products in the Colorado State University Regional Atmospheric Modeling Systems (CSU RAMS), to enable better forecasts of the smoke transport and understanding of physical processes. A four-stream (4S) radiative transfer model (RTM) has also been integrated to study the role of smoke aerosols on regional climate. Fire locations from the GOES ABBA product along with emission estimates derived from the Fire Locating and Modeling of Burning Emissions (FLAMBE) project is utilized. This integrated system not only provides 4D aerosol distributions for aerosol forcing studies, but also has the potential for operational air quality forecasts. By building an aerosol transport model and integrating 4S RTM within the RAMS, the aerosol forcing can be computed online, and the aerosol transport process are modeled in a real manner, i.e., the atmospheric response to the aerosol radiative effect (such as change of atmospheric heating rate, surface and top-of-atmosphere energy budget, relevant boundary layer processes including temperature/wind profiles) is taken into account systematically and simultaneously during the simulation. This results in an overall improvement of the model performance. Preliminary results from several case studies and comparisons of model results with ground-based observations will be presented and discussed.