INITIATIVE ON
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Modeling Pyrocumulonimbus Blowups and Cloud-Aerosol Interactions

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Recent research has documented intense wildfires can generate pyrocumulonumbus (pyroCb) storms which can inject large amounts of aerosols into the upper troposphere and lower stratosphere (UTLS). Remotely sensed data show that the resulting clouds have microphysical features and lifetimes that are very different from “normal” unpolluted clouds. While a typical pyroCb event may only persist a couple hours, the impact is actually much greater due to its anomalous cloud properties and the long residence time of aerosols in the UTLS region. The cumulative radiative impact of numerous pyroCb events around the globe should not be considered insignificant from a climate perspective.

In an effort to better understand these processes and push the frontier of numerical weather prediction modeling, a few case studies were selected for high resolution simulations. One such case study was the large wildfires burning in the Okefenokee swamplands of Georgia during June 2011. These wildfires generated pyroCbs on two different days and are the only known pyroCb events to occur in the eastern U.S. The modeling framework used for this research consisted of the Weather Research and Forecasting Chemistry (WRF-Chem) model fully coupled with the fire-spread model (SFIRE) module. The simulations required utilizing ultra-high resolution land surface input and accurate day-of fire perimeter information from remotely sensed hotspot data. Our simulation was able to successfully reproduce the pyroCb event and loft particulates near the tropopause through very strong updrafts. This research highlights the initial findings of one of the first model simulations depicting a real pyroCb storm.