Towards providing forecasters with better identification and analysis of severe pyroConvection events using GOES-R ABI and GLM Data

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Abstract

The goal of this proposal is to use geostationary data to investigate the impact of wildfire events that become pyroconvective, meaning that plumes quickly grow to incredible heights over the course of hours and become pyroCumulonimbus, or pyroCb (Fromm et al. 2010). The pyroCb events inject huge amounts of emissions into the upper troposphere and even into the lower stratosphere. The emissions contain soot, mineral dust, and "brown carbon" (or BC; complex light absorbing organic material). Because the frequency of pyroCb events is unknown, the PI initiated a blog in 2013 to track the occurrence of new events: http://pyrocb.ssec.wisc.edu. The original focus of the blog was to keep track of pyroCb events beginning with the 2013 fire season so that we have a record of the events for future detailed study. As it turns out, there were numerous pyroCbs in 2013, and fortunately we were able to obtain GOES-14 super rapid scan (1 minute) data for several of them. The pyroCb blog continues to evolve as we gain experience to make it easier for viewers to understand what is in the geostationary animations of reflectance and infrared (IR) brightness temperature. Additionally, there is some evidence that pyroCbs may be associated with clusters of lightning. This aspect of pyroCbs will be investigated with data from the Geostationary Lighning Mapper (GLM) once it becomes operational. The pyroCb blog currently enlists five undergraduate (UG) atmospheric science students. The UG students are proficient at preparing geostationary data animations and organizing ancillary data. This leaves the investigators with more time to spend on the more complex tasks. Our training program will continue to enlist and train UG students to provide analysis and discussion of pyroCb events as they occur. In this project, we intend to focus on the more practical, operational aspects of pyroCbs, such as the plume affect on cloud properties, the role of lightning in the plumes, determination of smoke injection height, and the use of HYSPLIT to gain a sense of the plume dispersion.