GOESR3 Periodic Reporting

Project Team: Dr. Bryan A. Baum (SSEC/CIMSS) and Scott Bachmeier (CIMSS)

Reporting Period: July 2014 - December 2015 (first half of FY14 funding cycle)

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Project Title: Towards providing forecasters with better identification and analysis of severe PyroConvection Events using GOES-R ABI and GLM Data

Project Number: 244

Executive Summary

The primary 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). The
pyroCb blog is a training ground for undergraduate students to discuss a severe pyroCb event as it unfolds, provides information to the NWS forecast office as well as the general public, and also supports scientific research that will eventually make its way into the peer-review literature. A number of events were documented during 2014, and undergraduate students were actively involved. A number of our blog posts were mentioned on other blogs, which increased attention to some severe events. A Twitter account was initiated to increase the speed with which we can provide information to forecasters as well as anyone else with an interest in these events.

**FY14 Milestones**

- Documented extreme pyroconvection events; collect pertinent data necessary for detailed case studies and post results on PyroCb blog (http://pyrocb.ssec.wisc.edu).
- Prepared VISITView module for training purposes.
- Worked with Andrew Heidinger to collect/analyze cloud/aerosol products from geostationary data using the GOES-AWG software.
- Integrated HYSPLIT software into geostationary data analysis.
- Undergrad (Britta Gjermo) presented PyroCb poster at AMS annual meeting in Jan 2015.
- Further documented selected PyroCb events per requests by Dr. Timothy Lang

**Accomplishments & Plans**

**Highlights of the first year:**

Our blog continues to track the occurrence of new events: [http://pyrocb.ssec.wisc.edu](http://pyrocb.ssec.wisc.edu). The original intent 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. The pyroCb blog continues to evolve as we learn how to integrate other data products with more efficiency and expertise. For fast-moving events, information will be posted to a twitter account initiated in 2014: @PyroCb_CIMSS.

A VISITview® training module (see Fig. 1) titled "Satellite Identification and Tracking of Pyrocumulonimbus (PyroCb) Clouds" was developed to assist end-users (for example, National Weather Service forecasters and incident meteorologists or IMETS, US Forest Service wildfire management teams, etc.) in the interpretation of satellite images/products and other tools needed for (1) pyroCb detection, and (2) monitoring long-range transport of the high-altitude smoke aerosols.

As demonstrated in recent work by our collaborator Dr. Timothy Lang, 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 Lightning Mapper (GLM) once it becomes operational. Dr. Lang requested additional information on approximately a dozen PyroCb events captured on the blog, and we are expanding the original blog posts as requested. For example, the Hardluck Fire (26 July, 2013) case was expanded to include more ancillary data and GOES satellite analyses using Dr. Andy Heidinger’s ACHA (AWG Cloud Height Algorithm) software.
The pyroCb blog currently enlists three undergraduate atmospheric science students; the number fluctuates as students graduate and new students are trained. The 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 students to provide analysis and discussion of pyroCb events as they occur. One such example is provided in Figure 2, where undergraduate student Ms. Britta Gjermo led the discussion. The rather spectacular shot is taken by an F-15 Eagle pilot from the 173rd Fighter Wing, Oregon Air National Guard. Since Ms. Gjermo is in ROTC, she was able to go through channels and establish a connection with the 173rd Fighter Wing group. We also sent Britta to the AMS conference in January, where she presented a poster.

The blog focuses on the more practical, operational aspects of pyroCbs, such as the plume impact on downstream cloud properties, inspection of the OMPS Aerosol Index to identify regions of high-level absorbing aerosols, 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.

### Additional Information

1. **Interaction with operational partners** –

2. **Conference/workshop participation** – Undergrad (Britta Gjermo) presented PyroCb poster at AMS annual meeting in Jan 2015.

3. **Funding concerns** –

4. **Outside project publicity** – Our PyroCb blog is sometimes cited by other blogs that are writing about extreme fire events. Additionally, we now provide information on quickly unfolding events via a Twitter account: @PyroCb_CIMSS.

5. **Journal articles** –

### Plans for the next Reporting Period:

- Analyze selected pyroconvection case studies and document pertinent results.
- Schedule VISITView training events for meteorologists.
- Work with NOAA to collect more high temporal resolution (1-minute) GOES-14 data when it is taken out of storage mode during the summer of 2015, assuming it is not already in operational use.
- Document the findings in Year 2 via relevant conference presentations and peer-reviewed publications.
Key Graphics

Figure 1: Screen-shot of the first slide of the recently-developed VISITview module.

Figure 2: Britta Gjermo, an undergraduate working with our team, obtained permission to use this image by contacting the pilot who took this picture. This shows an F-15 Eagle from the 173rd Fighter Wing, Oregon Air National Guard, in the foreground of a pyroCb produced from the Beaver Complex Fire on 1 August, 2014. (Photo Credit: Jim “Hazy” Haseltine, HIGH-G Productions.)