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Cooperative Institute for Climate & Satellites
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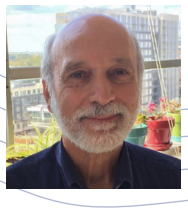


DIRECTOR'S MESSAGE

In the December 2016 issue of the CICS-MD Circular, I referred to the contributions of our institute to the GOES-R Mission (now GOES-16) and how our Proving Ground and Training Center (PGTC) could take advantage of this new information. This issue presents the first examples of our use of the latest technologies to exploit the new satellite information. They were developed by the group of scientists from CICS-MD and NOAA (embedded in CICS-MD) depicted in the right column: (left to right) Pat Meyers, Scott Rudslosky, Larissa Antunes, Michael Peterson, Mark Sannutti and Shenjian Su. Their dedication is recognized and appreciated.

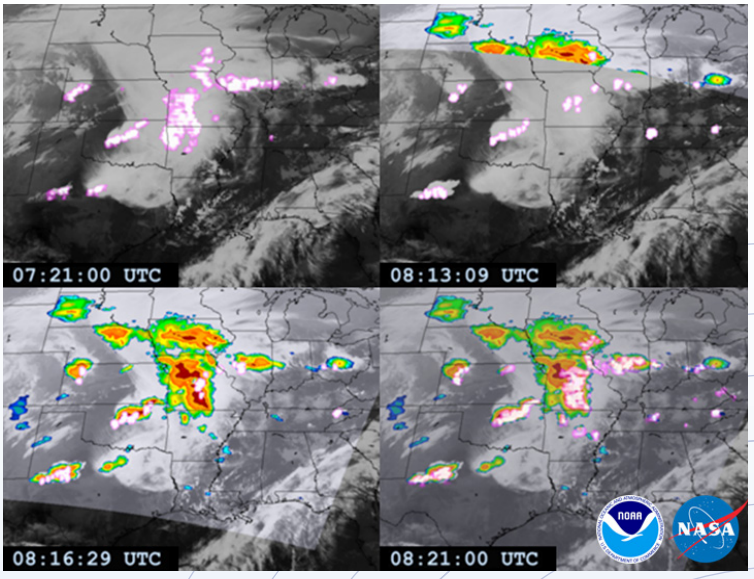
You may have noticed that in the most recent issues of the Circular we have reduced the space dedicated to organizational issues that can be found on our website to give more space for science. We are always looking for stories and new research findings to present in our Circular and Web site. Please do contact us and we will make sure to promote your latest research.

Hugo Berbery

Expanding Satellite Proving Ground Capabilities at CICS-MD

(Contributed by Scott Rudlosky and Patrick Meyers)

The CICS-MD Proving Ground and Training Center (PGTC) continues to grow. Scientists have begun implementing plans to renovate the room that houses our AWIPS machines. CICS-MD purchased and installed new furniture for the room that provides space for NOAA and CICS-MD scientists to visualize their products as viewed operationally by National Weather Service (NWS) forecasters. The PGTC is fully functioning with a Satellite Broadcast Network (SBN) data feed and the Advanced Weather Interactive Processing System (AWIPS) software. This combination is nearly identical to the setup at operational NWS forecast offices, allowing students to learn NWS tools while they are still in school. Several new products have been implemented in AWIPS to explore the ways to optimize their display and usefulness. Scientists have implemented and routinely produce a NESDIS snowfall rate (SFR) product in AWIPS. This was the first STAR product implemented in our AWIPS system. The ability to overlay STAR satellite products in the operational NWS system provide tremendous insights to STAR scientists and helps to ensure the relevance and utility of newly developed products. Scientists worked with a special NWS team to obtain and implement tools for displaying S-NPP aerosol products and active fires in AWIPS. Meetings with the AWIPS development team proved very helpful in identifying the official path to operations for these products. As the official products work their way into operations, CICS-MD will continue to work with the project scientists to visualize enhanced versions of these products. CICS-MD develops training materials in a variety of forms to accompany any newly developed products. Training quick guides provide a brief introduction (accessible from within the AWIPS environment), while instructional modules can be incorporated into the NWS training routine. CICS-MD also works to develop imagery for public consumption, exploiting the exciting new capabilities made possible by the S-NPP and GOES-16 data.



GOES-16 offers new opportunities to integrate observations from NOAA's satellite fleet. Lightning flash density is overlaid on longwave infrared imagery from GOES-16 on May 19th, 2017. A coincident overpass of S-NPP provides MiRS rain rate estimates, collocated with lightning flashes observed by GLM. Synthesizing observations from multiple satellites will ultimately improve NOAA's weather monitoring capabilities.

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Striking Views of Lightning from Above and Below

(Contributed by Scott Rudlosky, Michael Peterson and Larissa Da Silva)

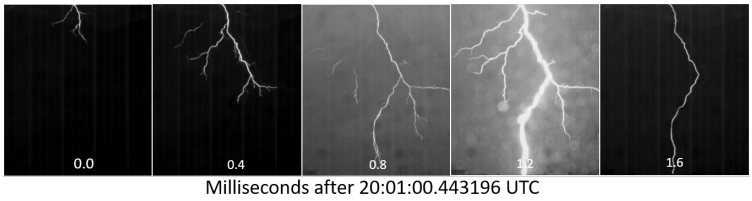
A whole sky camera and DCLMA lightning measurements are used to create a Virtual Reality thunderstorm experience

GOES-16 is the first geo-stationary satellite that can record lightning from orbit and monitor changes over the thunderstorm life cycle. The lightning group at CICS-MD is combining these valuable satellite measurements with simultaneous observations from ground level to study the physics of lightning flashes and communicate the hazards they pose.

Lightning measurements are used to create an immersive Virtual Reality (VR) experience that places an observer in the middle of nature's fury as lightning flashes crack through the sky around them – all from the safety of indoors, of course. This is accomplished by superimposing the lightning flash structure measured by the Washington D.C. Lightning Mapping Array (DCLMA) on top of whole sky time lapse imagery. The resulting videos show the detailed lightning channels with the passing clouds and document their evolution as the storm progresses.

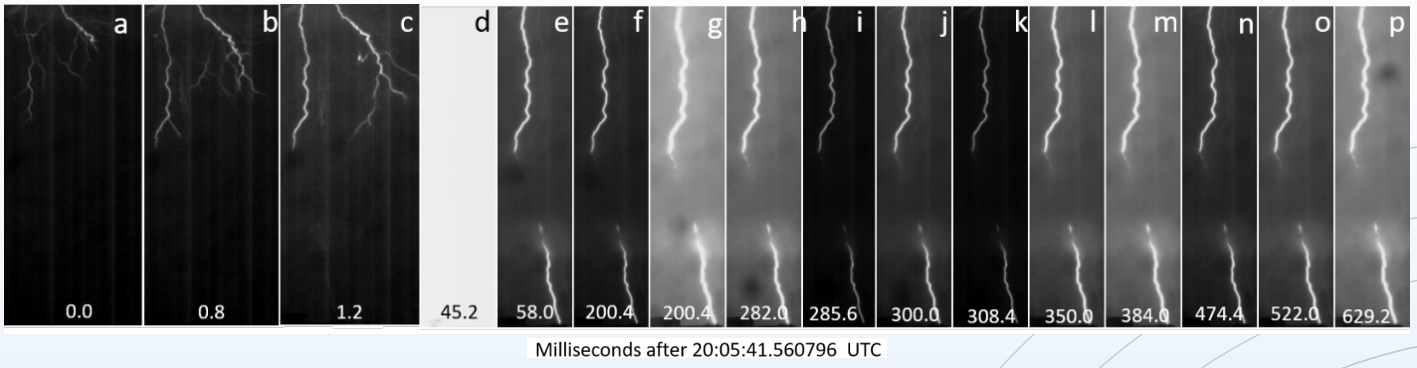
High-speed cameras are being used to study the visible processes of Cloud-to-Ground (CG) lightning flashes. These cameras record the development of the flash at hundreds to thousands of frames per second, revealing the detailed structure of the path the lightning discharge takes to ground (the lighting channel) and individual luminous discharges after the lightning makes contact (subsequent return strokes). What starts out as a large-scale electrical discharge in the cloud often comes to ground in a single point where a tremendous amount of charge is removed from the thundercloud in just a few milliseconds resulting in a peak current of thousands of Amperes.

These high-speed camera measurements are being used to gain a better understand of the physics of lightning. In particular, we are interested in relating the luminosity recorded by the cameras to the peak current of the strokes that comprise the flash. To do this, we are taking high-speed lightning measurements in the Washington, DC region throughout the summer of 2017 and comparing the flashes we record with DCLMA and other lighting locating system measurements.



A single return stroke in a CG flash in College Park, MD recorded at 20:05 UTC on 6/19/2017.

These ground-based lightning videos are compared with GOES 16 Geostationary Lightning Mapper (GLM) imagery from above. GLM measures the optical development of the flash with high temporal resolution of ~500 frames per second or 1/5th the speed of these cameras. Thus, it can measure many of the same physical processes captured in the high-speed videos. Combined optical measurements on the ground and from orbit will help us understand the detailed structures evident in GLM imagery and guide us towards making GLM a platform for studying the physics of lightning flashes across the entire western hemisphere.



A single CG flash in College Park, MD with 12 strokes after the return stroke

CICS-MD BACKGROUND

The Cooperative Institute for Climate and Satellites-Maryland (CICS-MD) is engaged in collaborative research with several NOAA Centers and Laboratories. CICS-MD consists of about 60 scientists that implement the Institute's mission of supporting NOAA's ability to use satellite observations and Earth System models to advance the national climate mission. Full information, including our research topics, is available at cicsmd.umd.edu.

NOAA SPONSORS

- Center for Satellite Applications and Research (STAR)/National Environmental Satellite, Data and Information Service (NESDIS)
- Climate Prediction Center/National Centers for Environmental Prediction/National Weather Service
- National Centers for Environmental Information/NESDIS (NCEI)
- Air Resources Laboratory/Office of Oceanic and Atmospheric Research

Dr. E. Hugo Berbery, CICS-MD Director
Debra Baker, CICS-MD Coordinator

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