

GOES-R Proving Ground Severe Weather Forecast and Warning



What Is GOES-R?

The Geostationary Operational Environmental Satellite - R Series (GOES-R) is the next generation of National Oceanic and Atmospheric Administration (NOAA) geostationary Earth-observing systems. Superior spacecraft and instrument technology will support expanded detection of environmental phenomena, resulting in more timely and accurate forecasts and warnings. The Advanced Baseline Imager (ABI), a sixteen channel imager with six visible channels and ten infrared channels, will provide three times more spectral

information, more than five times faster temporal coverage, and four times the spatial resolution than the current system. Other advancements over current GOES capabilities include total lightning detection (in-cloud and cloud-to-ground flashes) and mapping from the Geostationary Lightning Mapper (GLM), and increased dynamic range, resolution, and sensitivity in monitoring solar X-ray flux with the Solar UV Imager (SUVI). GOES-R is scheduled for launch in 2015.

What Is the Proving Ground?

The GOES-R Proving Ground engages the National Weather Service (NWS) forecast and warning community in pre-operational demonstrations of select capabilities of GOES-R. This venture facilitates the examination and validation of new ideas, technologies, and products

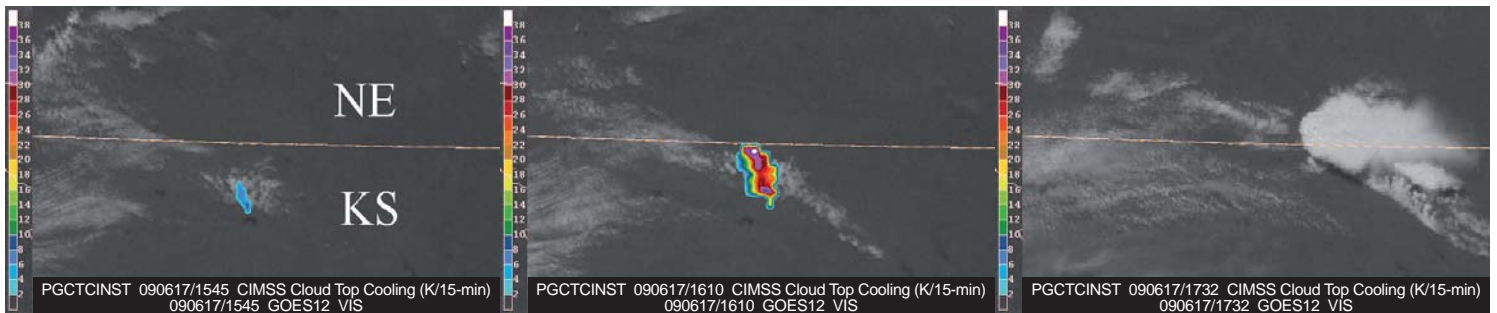


At the Proving Ground workstation located at NOAA's HWT, the SPC's Chris Siewert (seated) demonstrates the GOES-R CI product during an active period of weather in the central U.S. to Don Berchhoff, Director of the NWS Office of Science and Technology.

through the Advanced Weather Information Processing System (AWIPS). Emphasis is placed on the transition from AWIPS-I (AWIPS Legacy) to AWIPS-II (AWIPS Migration), the next-generation decision support system for forecasters. Pre-operational analysis will prepare users for the new types of satellite imagery and tools that will become available with GOES-R.

How Does the Proving Ground Work?

This project joins National Environmental Satellite, Data and Information Service (NESDIS), NOAA's cooperative institutes, and its affiliated partners to participate in early-stage product evaluation. The Proving Ground provides simulated GOES-R products for operational assessment.



GOES-R CI Nowcasting Example from June 17, 2009 of GOES-12 Imager-derived Cloud Top Cooling (CTC) at 1545 UTC (Left) and 1610 UTC (Center). The first satellite-based cloud-top cooling rate at 1545 UTC preceded NEXRAD radar-based convective initiation signal by 37 minutes. At 1732 UTC the GOES-12 visible imagery (Right) shows a severe thunderstorm along the Kansas/Nebraska border. Images courtesy of Wayne Feltz and the Aviation Applications Team.

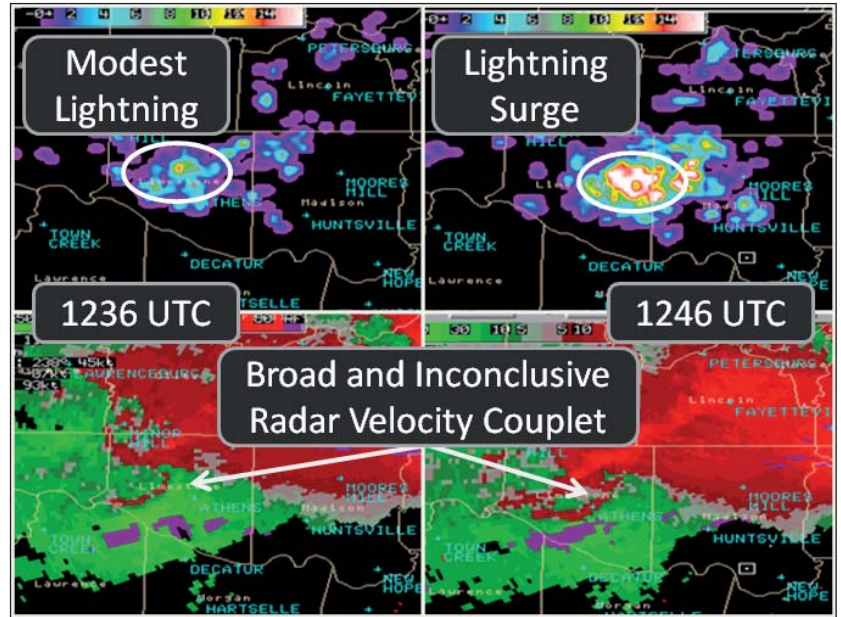
GOES-R (Geostationary Operational Environmental Satellite-R Series)

Testing methodology includes the combination of current GOES channels with other satellite channels, utilization of analogous Moderate Resolution Imaging Spectroradiometer (MODIS) channels, and the use of synthetic, model-generated imagery to replicate GOES-R products.

What Products Are Being Tested?

Three initial severe-weather products are currently being tested at NOAA's Hazardous Weather Test-bed (HWT), located at the NWS Storm Prediction Center (SPC) in Norman, OK. **Convective Initiation (CI)**, developed by the Cooperative Institute for Meteorological Satellite Studies (CIMSS), detects rapidly forming cumulus clouds in a pre-convective initiation state throughout day and night. The CI nowcast can be used by forecasters to objectively determine where significant convection is presently developing. Atmospheric wind shear and stability parameters can be analyzed for the surrounding environment of newly developed storms to estimate their future severity. The product offers up to a 30–45-minute lead time before significant radar echoes and cloud-to-ground lightning are present.

Lightning Detection identifies total lightning activity occurring over land and water. Researchers at NASA's Short-term Prediction Research and Transition (SPoRT) center are using ground-based Lightning Mapping Array (LMA) data to demonstrate **Lightning Detection** and the GLM's capabilities. **Lightning Detection** will give the forecast and warning community a new means by which to observe



Total lightning (Upper) from the North Alabama LMA coincident with NEXRAD radar-derived storm relative velocity (Lower) at 1236 (Left) and 1246 (Right) UTC on 6 May 2003. The lightning surge of over 200% occurs 14 minutes prior to a confirmed tornado touchdown and could provide forecasters with early indication of a potential tornado that otherwise would be inconclusive based on radar alone. Image courtesy of Geoffrey Stano and SPoRT.

all lightning with near-uniform coverage of the United States and adjacent oceans. This product will offer early indication of storm intensification and severe-weather events, providing increased warning lead time.

Statistical Hail is a risk-reduction product developed by the Cooperative Institute for Research in the Atmosphere (CIRA). It uses Rapid Update Cycle (RUC) regional forecasting model data to diagnose the environment and combines the satellite infrared brightness temperature to identify where cold clouds are present, forecasting the probability of severe hail.

What Are the Benefits?

The GOES-R Proving Ground bridges the gap between research and operations, providing sustained interaction between developers and end users for the purposes of training, product evaluation, and user feedback-based development. Proving Ground activities will enable day-one readiness. These efforts will maximize utilization of GOES-R products and services and provide an effective transition to operations. The severe-weather tools being tested through the Proving Ground will improve lead time and accuracy in the watch and warning process.

Proving Ground Partners in Severe Weather Forecast and Warning

- Cooperative Institute for Meteorological Satellite Studies (CIMSS)
- Cooperative Institute for Research in the Atmosphere (CIRA)
- NASA Short-term Prediction Research and Transition (SPoRT)
- National Weather Service (NWS) Storm Prediction Center (SPC)
- NOAA National Environmental Satellite, Data and Information Service, Center for Satellite Applications and Research (NESDIS/STAR)
- NOAA National Severe Storms Laboratory (NSSL)

On the Web http://cimss.ssec.wisc.edu/goes_r/proving-ground.html

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