

Overview of the Proving Ground

The Hydrometeorological Prediction Center (HPC), the Ocean Prediction Center (OPC), the National Hurricane Center's Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB) of NESDIS received early exposure to GOES-R and JPSS Proving Ground (PG) products in 2012. Pre-operational demonstrations of these GOES-R and JPSS PG data provided HPC, OPC, TAFB, and SAB operational forecasters and analysts an opportunity to use, critique, and make suggestions on improvements to the products prior to the launch of GOES-R (~2015) and the JPSS satellites (~2017).

Goals of the Proving Ground Project

Precipitation and QPF type products will be demonstrated and evaluated within the HPC, offshore thunderstorm and convective-type products will be demonstrated and evaluated within the OPC and TAFB, and hazardous weather related products will be demonstrated and evaluated within the SAB. These products will be provided (near) real-time so the HPC, OPC, TAFB, and SAB forecasters can use, get familiar with, and evaluate the products and provide valuable feedback to the GOES-R Program Office (GPO).

Product Demonstrations in 2012

The GOES-R products demonstrated include those that use proxy Advanced Baseline Imager (ABI) and proxy Global Lightning Mapper (GLM) data. The initial products for 2012 were chosen in consultation with HPC, OPC, TAFB, and SAB based on their mission areas, areas of responsibility, feasibility, the similarity to planned GOES-R and JPSS products, and forecaster availability for evaluation. These products are listed below:

- RGB Airmass – Decision Aid (HPC/OPC/TAFB/SAB)
- RGB Dust – Decision Aid (TAFB)
- SAL Split-Window – Decision Aid (TAFB)
- RGB Pseudo-Natural Color – Decision Aid (TAFB)
- Cloud and Moisture Imagery – Baseline (HPC/OPC/SAB)
- Suomi NPP VIIRS Day-Night Band – JPSS

Suomi NPP VIIRS Imagery (JPSS)

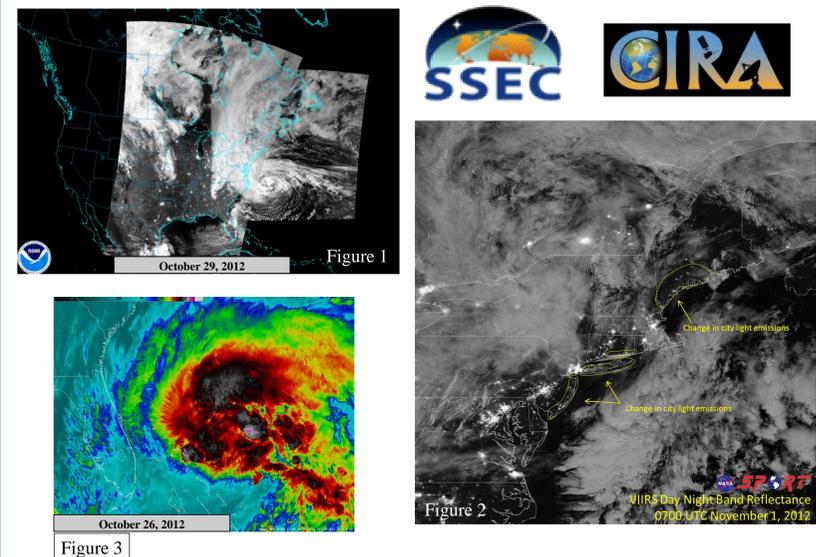


Figure 1: The Suomi NPP VIIRS Day-Night Band (DNB) shows Hurricane Sandy paralleling the East Coast on 10/29/12. The DNB uses the light from the moon to create a night-time version of "visible" imagery highlighting unique features that would otherwise be missed. (Courtesy of CIMSS/SSEC) **Figure 2:** The DNB serves another unique purpose – monitoring power outages! This image is from 11/01/12, a couple days after Sandy made landfall in NJ and the power outages are highlighted in the yellow outlines courtesy of Andrew Molthan's NASA SPoRT blog entry. **Figure 3:** Another facet of the extremely high resolution of the VIIRS instrument is seen in the intricate details of this infrared satellite image. In this image, Sandy's convection and associated gravity waves and outflow are very distinct. (Courtesy of Dan Lindsey, CIRA)

First Product Demonstrated in HPC/OPC/TAFB/SAB: The RGB Air Mass and Dust Products

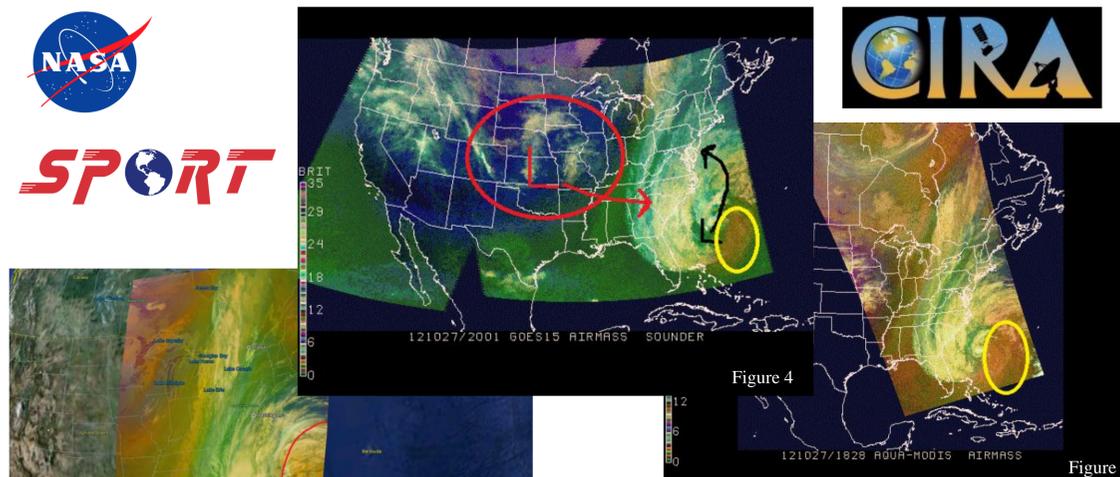
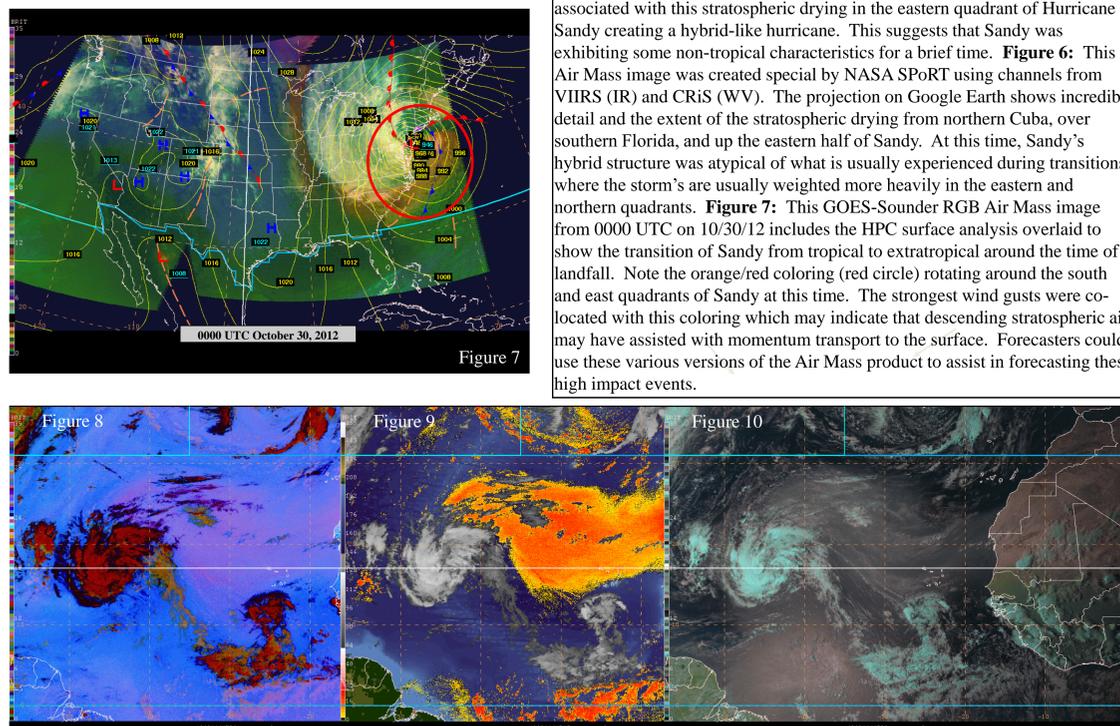
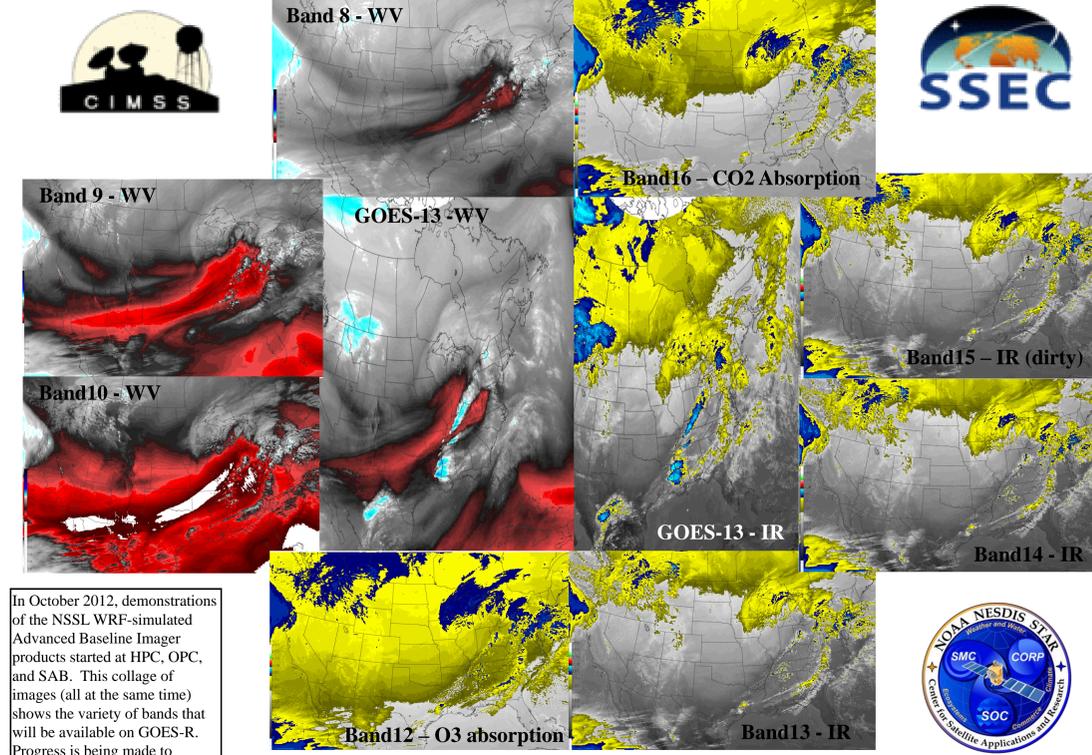


Figure 4: The GOES-Sounder RGB Air Mass image valid at 2000 UTC on 10/27/12, shows the upper-level disturbance in the Central Plains (red L) that would eventually pick up Hurricane Sandy and turn it towards the Mid-Atlantic coastline (black arrow). The yellow oval highlights stratospheric drying associated with the remnants of an upper-low. **Figure 5:** The MODIS RGB Air Mass image valid at 1828 UTC on 10/27/12, shows much more detail associated with this stratospheric drying in the eastern quadrant of Hurricane Sandy creating a hybrid-like hurricane. This suggests that Sandy was exhibiting some non-tropical characteristics for a brief time. **Figure 6:** This Air Mass image was created special by NASA SPoRT using channels from VIIRS (IR) and CRIS (WV). The projection on Google Earth shows incredible detail and the extent of the stratospheric drying from northern Cuba, over southern Florida, and up the eastern half of Sandy. At this time, Sandy's hybrid structure was atypical of what is usually experienced during transitions where the storm's are usually weighted more heavily in the eastern and northern quadrants. **Figure 7:** This GOES-Sounder RGB Air Mass image from 0000 UTC on 10/30/12 includes the HPC surface analysis overlaid to show the transition of Sandy from tropical to extratropical around the time of landfall. Note the orange/red coloring (red circle) rotating around the south and east quadrants of Sandy at this time. The strongest wind gusts were co-located with this coloring which may indicate that descending stratospheric air may have assisted with momentum transport to the surface. Forecasters could use these various versions of the Air Mass product to assist in forecasting these high impact events.



Forecasters at TAFB use RGB products that are geared towards diagnosing and analyzing the Saharan Air Layer (SAL) which may play a significant role in tropical cyclogenesis in the Atlantic. The SEVIRI RGB Dust product (EUMETSAT/SPoRT) (**Figure 8**), the SEVIRI Split-Window SAL product (Jason Dunion (NOAA/HRD)/CIMSS) (**Figure 9**), and the SEVIRI Pseudo-Natural Color product (EUMETSAT/Dunion) all provide added information about suspended dust/dry air associated with the SAL. Michael Formosa (TAFB) included a mention of these products in his Tropical Weather Discussion on September 11, 2012 (same as images above): "A CONSIDERABLE AMOUNT OF AFRICAN DUST AND DRY AIR ARE OVER THE E ATLANTIC FROM 13N-28N E OF 37W BASED ON THE CIMSS SAL PRODUCT AND THE SEVIRI RGB DUST PRODUCT."

Current Product Demonstrations at HPC/OPC/SAB: NSSL WRF-simulated Advanced Baseline Imagery



In October 2012, demonstrations of the NSSL WRF-simulated Advanced Baseline Imager products started at HPC, OPC, and SAB. This collage of images (all at the same time) shows the variety of bands that will be available on GOES-R. Progress is being made to include simulated imagery from the NAM which will be demonstrated in the Proving Ground in 2013. **Figure 11:** An example of one of the band difference products that is being developed at CIRA using the simulated imagery from the NSSL WRF is the Band 13 - Band 6 Fog product. In this particular image, the NSSL WRF forecast for low clouds and fog on 03/18/12 verified in the Mid-Atlantic as visibilities in the area dropped to less than ¼ mile. **Figure 12:** Another example of a difference product is the Band 10 - Band 12 Longwave Difference product. In this example from 10/29/12, the light greens near the core of Hurricane/Superstorm Sandy indicate a warm, moist core.

Proving Ground Vision for 2013 and Feedback from 2012

- The evaluation of the RGB Air Mass and Dust product was a success and a final report will be issued in early 2013. Although the evaluations are complete, the products are still available in operations and continue to be used routinely.
- The first round of training on the NSSL WRF ABI ran from 10/17/12 – 12/31/12 with the majority of trainees coming from SAB. Additional GOES-R products will be evaluated in 2013 including QPE and Atmospheric Motion Winds.
- JPSS products using the Suomi NPP satellite will become available in operations in early-mid 2013.
- Evaluations involve feedback gathered in real-time operations along with a possible online survey to address the forecaster's and analyst's main objectives.
- Example feedback (SAB) on the RGB Air Mass product: "The air mass product does not apply to every event, as noted during my use of it during this test period. What the air mass product brings is another tool to the table for satellite analysts (like myself) and forecasters. It provides a unique perspective on the data, highlighting certain aspects that are sometimes not seen in typical water vapor imagery."