The 2012 HPC/OPC/SAB GOES-R Proving Ground Demonstration

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Overview of the Proving Ground

The Hydrometeorological Prediction Center (HPC), the Ocean Prediction Center (OPC), and the Satellite Analysis Branch (SAB) of NESDIS will receive early exposure to GOES-R PG products from the end of 2011 through 2012. Pre-operational demonstrations of these GOES-R PG data will provide HPC, OPC, and SAB operational forecasters and analysts an opportunity to use, critique, and improve the GOES-R products so they can get a feel for the data that will be available after GOES-R is launched (~2015).

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

Products to be Demonstrated

The GOES-R products to be demonstrated include those that use proxy Advanced Baseline Imager (ABI) and proxy Global Lightning Mapper (GLM) data. The initial products for 2011-2012 were chosen in consultation with HPC, OPC, and SAB based on their mission areas, areas of responsibility, feasibility, the similarity to planned GOES-R products, and forecaster availability for evaluation. These products are listed below:

- RGB Airmass – Decision Aid (HPC/OPC/SAB)
- Cloud and Moisture Imagery – Baseline (HPC/OPC/SAB)
- Lightning Detection – Baseline (OPC/SAB)
- Convective Initiation – Baseline (OPC)
- Enhanced "V" / Overshooting Top Detection – Baseline (OPC)
- Cloud Top Phase – Baseline (OPC)
- Cloud Top Height – Baseline (OPC)
- Cloud Top Temperature – Baseline (OPC)
- Volcanic Ash Detection and Height – Baseline (SAB)
- Rainfall / QPE – Baseline (HPC)
- Derived Motion Winds – Baseline (HPC/OPC)

RGB Airmass Product used in Research at OPC

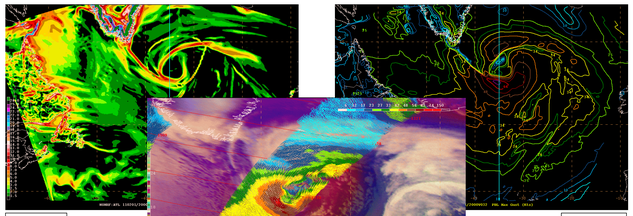


Figure 1

Figure 2

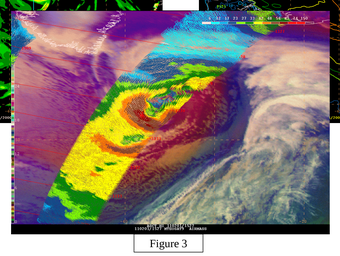


Figure 3

Figure 1 shows the WRF-simulated 975 hPa theta gradient and **Figure 2** is the PBL maximum gust for a large extratropical cyclone in the North Atlantic from 01/31/11-02/02/11 (courtesy of Benjamin Albright (Howard U.) and Joseph Sienkiewicz (OPC)). **Figure 3** is the SEVIRI RGB Airmass product with an ASCAT wind pass overlaid to highlight the strong winds associated with the bent-back front feature (RGB imagery courtesy of Andrew Molthan (NASA SPoRT) with overlay produced by Joseph Sienkiewicz (OPC)). The WRF was able to reproduce this wind event to allow for further studying of the phenomena. The RGB Airmass image identifies the advection jet associated with a stratospheric intrusion wrapping in towards the cyclone center, thus identifying the PV anomaly.

*Reference: Hurricane Force Winds in Winter Ocean Storms: A Look At the Evolution . ***Benjamin Albright***, *Howard Univ., Washington, DC; and J. M. Sienkiewicz and T. W. Yu,* ***18th Conference on Satellite Meteorology, Oceanography and Climatology/ First Joint AMS-Asia Satellite Meteorology Conference*** *01/25/11, 2:30 pm – 4:00 pm*

First Product to be Integrated into HPC/OPC/SAB Operations: The RGB Airmass Product

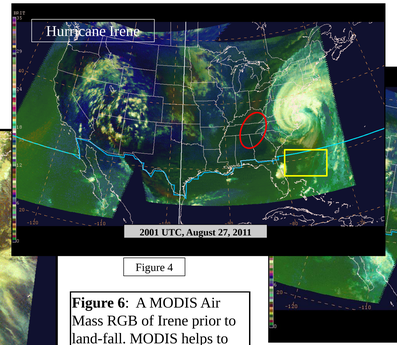


Figure 4

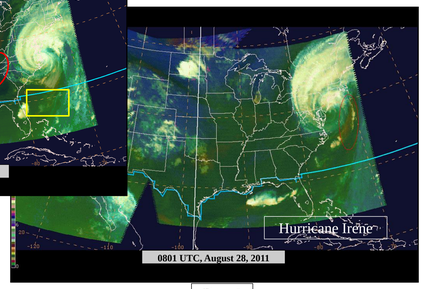


Figure 5

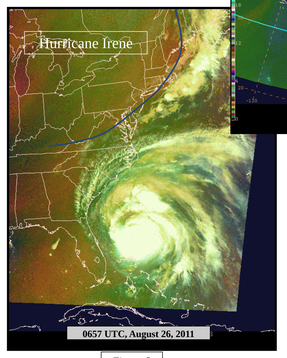


Figure 6

Figure 6: A MODIS Air Mass RGB of Irene prior to land-fall. MODIS helps to improve the color contrast within the RGB compared to the GOES Sounder due to the MODIS higher spatial and spectral resolution, and hence compliments the hourly imagery. (Image description courtesy of Kevin Fuell (NASA SPoRT))

Figure 4: The GOES Sounder RGB Air Mass produced by John Knaff (NOAA/NESDIS/STAR) shows Hurricane Irene (2011) as it approached the NC Coast. The imagery shows that a cold front would intersect with Irene (blue line in MODIS image to left), which suggested an earlier-than-normal extratropical transition would occur. The GOES Sounder image at 20Z on 8/27 shows dry upper levels in an orange streak over OH and KY (red oval), but more importantly, the dry air mass behind the cold front is mixing into the south side of the storm. Out-flow of high-level clouds on the south side of Irene have been replaced by thick mid-level clouds as indicated by the RGB in light pink shades (yellow rectangle). (Image description courtesy of Kevin Fuell (NASA SPoRT))

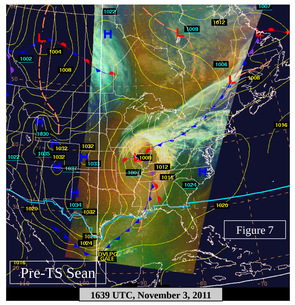


Figure 7

Figure 7: HPC is monitoring a storm pulling into the Ohio Valley after producing snow from CO into Kansas City. This was the precursor to Tropical Storm Sean (2011). The MODIS RGB Airmass imagery above shows an advection jet still evident cutting into the cyclone's center (yellow ellipse).

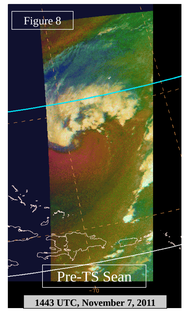


Figure 8

Figure 8: The MODIS RGB Airmass image shows the former snowstorm now northeast of the Bahamas with a very evident PV anomaly. OPC forecasters are now monitoring the system for Gale to Storm force winds.

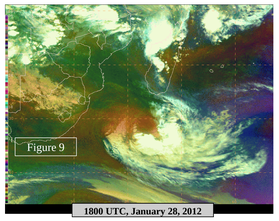


Figure 9

Figure 9: The SEVIRI RGB Airmass image to the left shows the extratropical transition of Tropical Cyclone Funso as it interacted with a small upper-level low. SAB was issuing satellite bulletins on this system and will benefit from having this additional imagery to help with classifications.

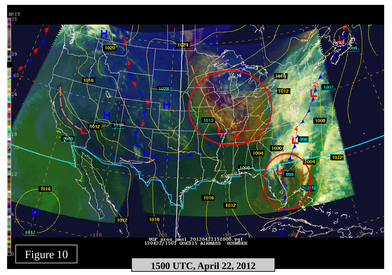
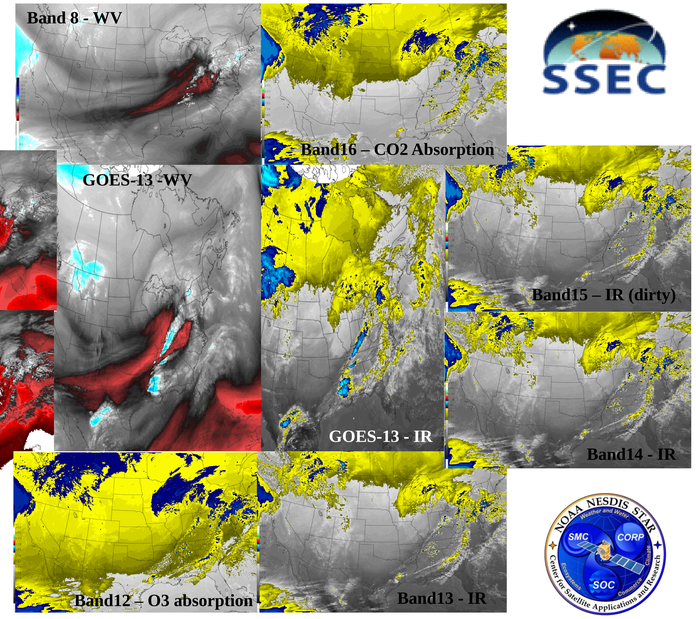


Figure 10

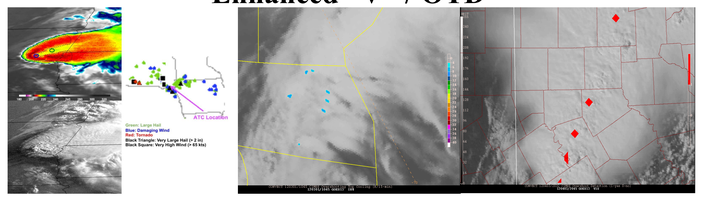
Figure 10: DEVELOPMENTAL GOES RGB IMAGERY REALLY SHOWING THIS EVOLUTION AND RAPID INTENSIFICATION OF NRN STREAM PIECE OF ENERGY WELL THE PAST FEW HRS. THIS EVIDENT BY INTRUSION OF STRATOSPHERIC AIR/DEVELOPMENT OF A STRONG JET OVER ERN MO/SRN IL/KY/TN AND DEVELOPMENT OF COLD POOL OVER WI/MI/IN/NRN IL. MEANWHILE, THESE SAME FEATURES WITH SRN STREAM UL LOW HAVE BECOME LESS DEFINED AND SUGGEST THIS PIECE OF ENERGY MAY BE WEAKENING. SO WOULD EXPECT, NRN STREAM PIECE OF THE PUZZLE TO BECOME MAIN INFLUENCING FACTOR IN WHAT HAPPENS WITH PRECIP/SFC LOW HEADING THROUGH THE NEXT FEW HRS. ~John Newhard (SAB, SPENES Product)

Future Products to be Integrated into HPC/OPC/SAB Operations: WRF-simulated Advanced Baseline Imagery



Future products to be incorporated into the HPC, OPC, and SAB operations in the coming months include the WRF-Simulated ABI imagery as seen above and the Enhanced "V" / Overshooting Top Detection (OTD) shown to the right. This imagery will be useful in helping forecasters identify even the most innocuous of disturbances that could trigger high impact events. OPC will find the Enhanced "V" / OTD very useful for its offshore waters area of responsibility as mariners are frequently affected by strong thunderstorms where radar is not available.

Enhanced "V" / OTD



The upper-left portion of the left image shows an enhanced-V producing storm over the Northern Plains in GOES-12 IR window channel imagery on 9 July 2009. The enhanced-V signature is outlined with a dashed line, the objective OT detection is shown with a blue circle, and the downstream warm region detection is shown with a green circle. (lower-left, left image) GOES-12 Visible channel image for the same scene. (right, left image) Severe weather reports from this storm. The image in the center shows cloud-top-cooling magnitude of the overshooting tops from the OTD algorithm overlaid on IR over the Gulf Stream on 03/01/12. The image on the right shows the OTD algorithm overlaid on GOES-13 visible imagery over the Dallas Metroplex on 04/03/12.

Proving Ground Vision for 2012

- Training on the RGB Airmass product is in full swing with evaluations slated to being in February.
- Training on the Cloud and Moisture Imagery and Enhanced "V" / OTD products will begin late February and run through March with evaluations starting shortly thereafter.
- The goal is to have as much forecaster/analyst participation as possible so we can help incorporate these products into operations prior to the GOES-R launch.
- A training session involves using materials provided by the developers, then referencing current and past weather events to identify the usefulness to operations.
- Evaluations will involve feedback gathered in real-time operations along with a possible online survey to hit the developer's main prerogatives.
- Additional training material is provided where possible including COMET or VISIT modules.