Overview of UW-Madison CIMSS/ NOAA ASPB Satellite Proving Ground Participation

Wayne Feltz[1], Michael Pavolonis[2], Andrew Heidinger[2], Jordan Gerth[1], Justin Sieglaff, Scott Bachmeier[1], Scott Lindstrom[1], Kaba Bah[1], Christopher Velden[1], Ralph Petersen[1]

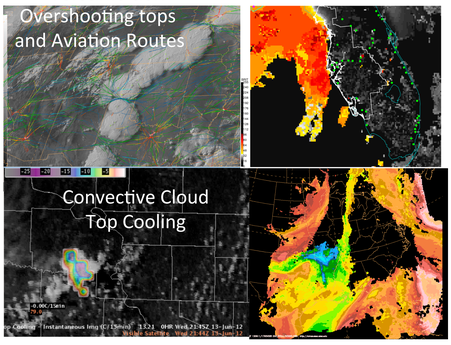
[1]Cooperative Institute for Meteorological Satellite Studies (CIMSS), Space Science and Engineering Center (SSEC), University of Wisconsin – Madison, Wisconsin 53706, U.S., [2]NOAA/NESDIS/STAR/CoRP Advanced Satellite Products Branch (ASPB) Madison, WI, [3]Space Science and Engineering Center (SSEC), University of Wisconsin – Madison, Wisconsin 53706

GOES-R and JPSS Baseline and Future Satellite Capability Decision Support

2012-2013 UW-CIMSS GOES-R Proxy Products

Providing multiple near real-time GOES-R proxy decision support products for evaluation at NOAA demonstration/ testbed sites within AWIPS, N-AWIPs, and AWIPS-2 :

- Fog/cloud detection
- Convective cloud top cooling
- WRF simulated satellite imagery
- Convective overshooting-top
- Hurricane intensity estimation
- Fires
- Cloud properties
- Atmospheric Stability Nearcasting
- Volcanic ash



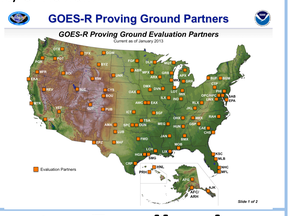
Fog/Low Cloud Decision Support

Nearcasting Convective Instability

2012-2013 NOAA PG Testbed and Demonstrations

The following Proving Ground activities occurred in 1 April 2012 – 30 March 2013 funding cycle where several GOE-R proxy decision support products developed at CIMSS were demonstrated with operational forecasters to obtain feedback:

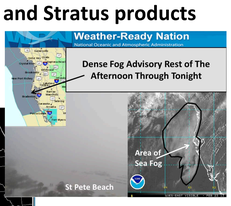
- Hazardous Weather Testbed (HWT) Spring Experiment (7 May – 15 June). Participants included 28 forecasters and 16 visiting scientists.
- National Hurricane Center (NHC) Tropical Cyclone Demonstration (1 Aug. – 30 Nov.) Participants included forecasters from NHC
- Aviation Weather Center (AWC) Summer Experiment (4 June – 15 June). Participants included AWC forecasters and FAA representatives.
- HPC/ OPC/ TAFB/ and SAB demonstrations (ongoing: focus on precipitation and ocean applications).
- High Latitude and Arctic Testbed (ongoing: focus on snow/ cloud/ volcanic ash/ and aviation applications). Participants include NWS Alaska Region
- Air Quality (ongoing: focus on aerosol detection).
- Pacific Region OCONUS Demonstration (ongoing: focus on tropical cyclones/ heavy rainfall/ and aviation applications). Participants include NWS forecasters and scientists from the University of Hawaii.

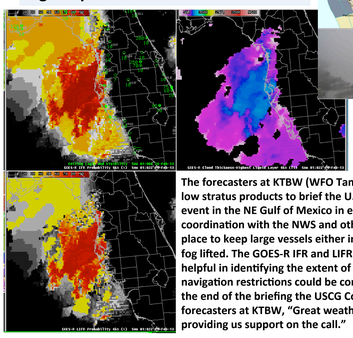


GOES-R Decision Proxy Support Examples and NOAA NWS Forecaster Feedback

1) GOES-R AWG Fog, Low Cloud, and Stratus products

KTBW routinely utilizes the GOES-R AWG FLS products, including during high impact events





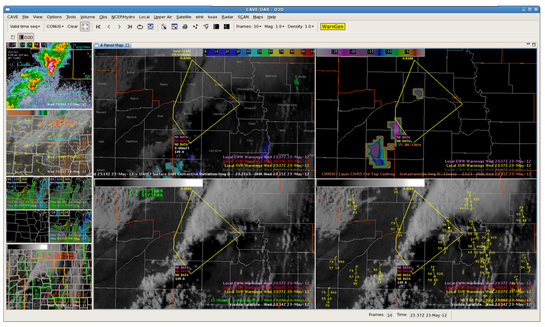
The forecasters at KTBW (WFO Tampa Bay, FL) used the GOES-R fog/ low stratus products to brief the U.S. Coast Guard (USCG) during a fog event in the NE Gulf of Mexico in early February 2013. Through coordination with the NWS and other agencies, restrictions were put in place to keep large vessels either in port or anchored at sea until the fog lifted. The GOES-R IFR and LIFR probability products were very helpful in identifying the extent of the hazardous areas so that navigation restrictions could be confined to only necessary areas. At the end of the briefing the USCG Commander Omar told the forecasters at KTBW, "Great weather information and thank you for providing us support on the call."

The feedback from this product was very positive all around. However, there was one suggestion for improvement that a majority of the forecasters brought up. While they appreciated the IFR and LIFR differentiation, this also expressed a need for MVFR probability to help determine where VFR conditions are likely. In response, the MVFR probability product has been made available to AWC These products are now being used in AWC routine operations.

NWS Central Region input:
Within the Central Region (CR), 16 forecasters from 4 WFO's formally evaluated the GOES-R AWG fog/low cloud products. A post-evaluation survey indicated that 15/16 forecasters thought the products were useful, with 10/16 forecasters classifying the products as "very useful" or "extremely useful." In addition, the products were referenced in Area Forecast Discussions at various times by 4 CR forecasters.

NWS Eastern Region input:
Two WFO's within the Eastern Region (ER) formally evaluated the GOES-R AWG fog/low cloud products. Formal feedback was collected from the 7 participating forecasters. All 7 forecasters indicated that the products were useful and they would continue to use the products. The GOES-R AWG products were referenced several times in Area Forecast Discussions in the ER.

2) Convective Cloud Top Cooling Detection Decision Support



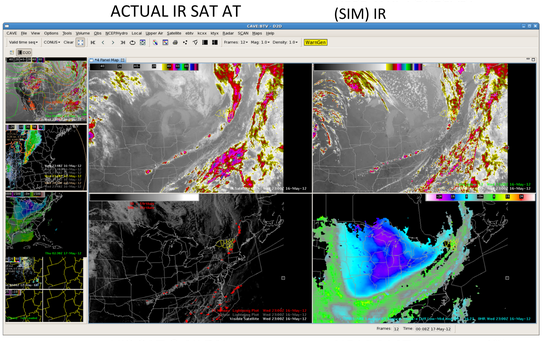
***HWT input*:**
Forecasters reported during their post event surveys that they used the University of Wisconsin CIMSS Cloud Top Cooling (UW-CTC) product during 89% of their warning operations. When forecasters were asked whether the CTC product provided signals beneath non-opaque cirrus clouds, the results were mostly positive. Specific forecaster comments:

- "CTC did enhance confidence/lead time for a severe warning. A warning was probably issued one scan before I would have without CTC, after seeing -20C/15 min rates." *NWS Forecaster, Post Event Survey*
- "The UW-CTC rates exhibited greater than -35C/15 min for a particular storm on the southern extent of a broken line. The reflectivity aloft peaked with this storm about 45-60 minutes after the CTC signature, and a strong core of +45kt (near the surface) was observed around 30 minutes after the peak as well." *NWS Forecaster, Post Event Survey*

3) GOES-R Simulated Imagery from NSSL WRF 4-km

ACTUAL IR SAT AT

NSSL-WRF FORECAST (SIM) IR



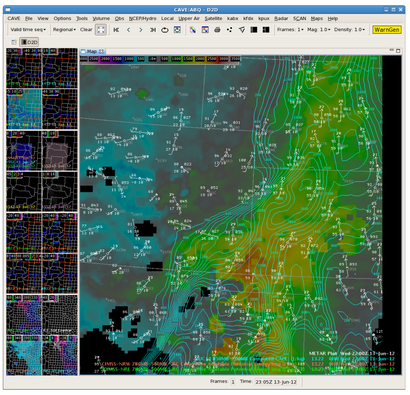
VIS SAT & NLDN Lightning at 2300 UTC

NEARCAST (theta-e diff)

***HWT input*:**
In general, forecasters were very excited about the simulated satellite imagery and would like to have it provided within their operations. Many of the visiting NWS forecasters have already worked to bring this product into their forecast offices.
Synthetic Weather Research and Forecast (WRF) model-derived imagery can enhance forecasts by providing model data in a familiar satellite format which makes model analysis, model comparison to observations, and model forecast projections easier to visualize and understand.
***AWC input*:**
This product did a nice job picking-up on wave turbulence activity during the experiment. This showed the situational awareness utility of the product.

4) Atmospheric Stability Nearcast Product

Nearcast 780-500 mb layer CAPE analysis overlaid with RAP 850-700 mb layer CAPE analysis in AWIPS II at 2200 UTC on 13 June 2012.



***HWT input*:**
According to post event surveys, forecasters reported using the Nearcast product in their warning operations 70% of the time. In addition, forecasters were asked which fields (other than the long lived convective parameter and CAPE) helped delineate areas of convective development, inhibition and the relative strength of convection. In each instance, forecasters responded that the theta-e difference was the most useful, gaining more than 70% of the responses in each category. In each category, the low-level theta-e field had the second most responses.
Forecasters found the instability fields from the Nearcast products particularly useful in determining convective maintenance. The Nearcast product continues to be delivered within the SPC and HWT N-AWIPS workstations and is still available for demonstration in HWT AWIPS II systems.
***AWC input*:**
The product was very useful in terms of assessing where the atmosphere would be most favorable for convection should there be a trigger mechanism. It may aid in evaluating the evolution of mid-level instability in data void areas and between radiosonde launches in both space and time.

Final GOES-R Proving Ground 2012 NOAA NWS Feedback Reports: http://www.goes-r.gov/users/pg-activities-01.html

Acknowledgments: The support of the research sponsor, the GOES-R and JPSS Program Office is greatly appreciated. The authors would also like to thank Steve Goodman, Mitch Goldberg, Walter Wolf, and Greg Mandt for their support in this endeavor.