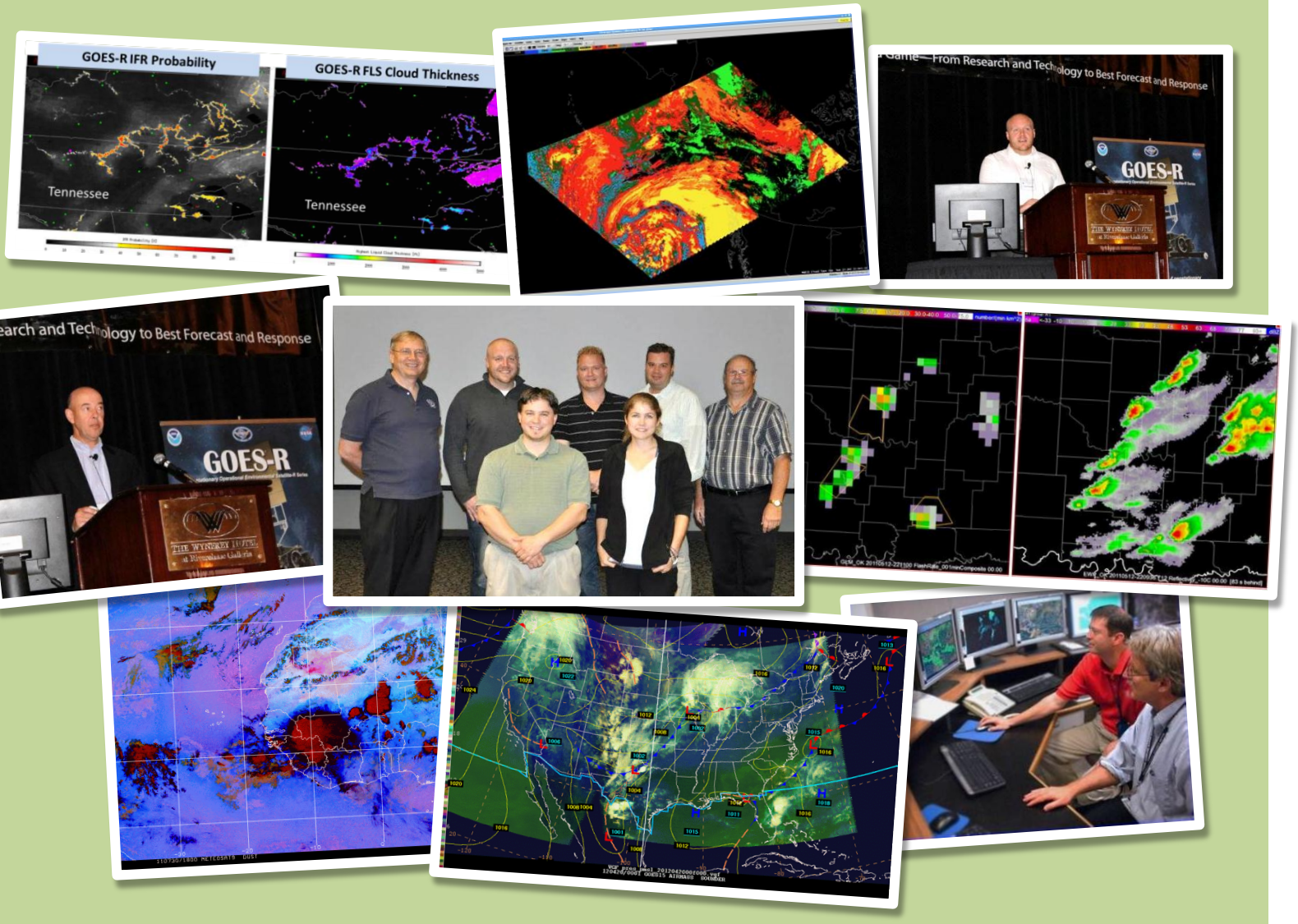
GOES-R Proving Ground

FY12 Annual Report

November 28, 2012



GOES-R Proving Ground FY12 Annual Report[1]

1. Introduction and Background

The GOES-R Proving Ground (PG) is a collaborative effort between the GOES-R Program Office, selected NOAA Cooperative Institutes, NWS forecast offices, NCEP National Centers, the Joint Center for Satellite Data Assimilation, the NASA Short-Term Prediction Research and Transition Center, and NOAA testbeds where proxy and simulated GOES-R products are tested and evaluated in an operational environment before the GOES-R launch. The objective of the PG is to bridge the gap between research and operations by ensuring that there is two-way communication between product developers and the user communities. The intended outcome is that users will be ready for optimal use of GOES-R products on day-1 of operations.

The next generation GOES will continue providing valuable data to support high impact weather warnings as well as key inputs for global and regional NWP models. The large volume of GOES-R data will present new challenges and opportunities that require more intelligent integration of information derived from blended satellite products (e.g., geostationary and polar satellite observations), multi-dimensional classification of severe storm potential by combining satellite, radar, in-situ data and models, and new ways of visualizing GOES-R data within the AWIPS-II forecaster workstation. Algorithm developers at NESDIS, NASA SPoRT, and the NOAA cooperative institutes are already creating JAVA-based satellite application plug-ins for AWIPS-II, which will quickly accelerate the transition from research to operations at NWS.

This report will describe the PG activities leading to an evaluation of the operational value of the proxy GOES-R products and user feedback for future improvements.

2. Proving Ground Activities:

- **a.** Hazardous Weather Testbed (HWT) Spring Experiment (7 May – 15 June). Participants included 28 forecasters and 16 visiting scientists.
- **b.** National Hurricane Center (NHC) Tropical Cyclone Demonstration (1 Aug. – 30 Nov.) Participants included forecasters from NHC and scientists from NESDIS STAR, CIRA, and SPoRT.
- **c.** Aviation Weather Center (AWC) Summer Experiment (4 June – 15 June). Participants included AWC forecasters and FAA representatives.

[1] Cover page images, top row, from left, 1) GOES-R Instrument Flight Rules (IFR) Fog probability product, 2) GOES-R Fog/Low Stratus Cloud Thickness product 3) Cloud Phase product from the High Latitude/Artic 2011 Proving Ground Experiment, 4) GOES-R Satellite Liaison Chris Siewert provides an update on GOES-R Proving Ground activities at the Storm Prediction Center/Hazardous Weather Testbed during the 6th GOES Users' Conference (GUC). Middle row, from left, 1) GOES-R Project Scientist Jim Gurka provides an overview of the GOES-R Proving Ground and status update at the 6th GUC, 2) GOES-R Satellite Liaisons pose with GOES-R System Program Director and Program Chief Scientist at the 2011 NOAA Satellite Science Week, 3) Pseudo Geostationary Lightning Mapper (PGLM) total lightning product example from the Hazardous Weather Testbed showing the PGLM flash extent density on the left with the corresponding radar reflectivity on the right. Bottom row, from left, 1) SEVIRI RGB Dust Product from NHC 2011 Tropical Cyclone Demonstration, 2) GOES-Sounder RGB Air Mass Product with the HPC surface analysis overlaid for the April 2012 Nor'easter, 3) National Hurricane Center 2010 GOES-R Proving Ground experiment.

d. HPC/ OPC/ TAFB/ and SAB demonstrations (ongoing: focus on precipitation and ocean applications).
e. High Latitude and Arctic Testbed (ongoing: focus on snow/ cloud/ volcanic ash/ and aviation applications). Participants include NWS Alaska Region, CIMSS and UAF.
f. Air Quality (ongoing: focus on aerosol detection). Participants include scientists from UMBC and NESDIS STAR.
g. 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.

3. Funding / Opportunity Announcements

The Proving Ground demonstrations are supported through grants and contracts funded by the GOES-R Program Science Office via proposals for risk reduction research as well as visiting scientist travel grants to participate in the demonstrations. Technical interchange meetings are held throughout the year to review the PG demonstration projects with a major All-Hands meeting of participants during Satellite Science Week, most recently held April 30-May 4 at the NWS Training Center in Kansas City, MO.

4. Publication and Presentations listed in Appendices A and B respectively

5. Significant Outcomes and Product Assessment Highlights

a. Lightning Detection

HWT input:

In terms of operational utility, forecasters noted that the Pseudo Geostationary Lightning Mapper (PGLM) total lightning proxy (as viewed from the 1-minute flash extent density) showed "good correlation" with updraft intensity" and was typically seen "well ahead of the first CG" (cloud-to-ground) flash. Additionally, the total lightning data "pulled focus to individual storms" of interest. This was particularly useful during days that the weather was marginally severe with numerous storms across the county warning area of operations.

In evaluating the individual products, forecasters commented the flash extent density was "very useful in determining which storms were stronger," while the 60-minute tracks were "useful to illustrate storm trends.

AWC input:

The PGLM provides a preview of the future value of the GLM for air traffic flow management, since aircraft should be routed away from in-cloud lightning as well as cloud to ground lightning.

b. Simulated Cloud and Moisture Imagery

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.

c. Convective Initiation

HWT input:

The forecasters were pleased with the new probabilistic Convective Initiation (CI) product output from the Satellite-based Convection Analysis and Tracking **(**SATCAST) product, with 100% of the forecasters responding "yes" in the survey when asked if they preferred the probabilistic approach tested in 2012 to the binary yes/no approach demonstrated previously.

Throughout the length of the experiment, post-event survey responses indicate that forecasters used the SATCAST product during 83% of their warning operations within the EWP. In addition, the majority of forecasters reported that they saw increased strengths of signal preceding convective initiation. Typical values reported within the post-event survey indicate strengths of signal of 50-70% are sufficient for successfully forecasting convective initiation in the future.

In general, forecasters responded that they felt comfortable using SATCAST in warning operations following the training that they received and that it worked as expected, with 88% reporting being comfortable using the product within the post-event surveys. In some occasions, forecasters mentioned that they would like to see some additional training material and display changes to help them understand some of the background data going into the SATCAST CI forecast.

SATCAST continues to flow within the SPC non-operational N-AWIPS workstations and is available for the HWT AWIPS-II systems for any additional experiments.

AWC Input:

While SATCAST showed a great amount of potential, many forecasters noted that it could benefit from additional development to the reduce the false alarm rate (FAR)

If the probability was calibrated in tandem with the environmental information, it could help identify areas of convective initiation relevant to aviation operations.

d. Cloud Top Cooling

HWT input:

Forecasters were asked to use the University of Wisconsin CIMSS Cloud Top Cooling (UW-CTC) product in tandem with the SATCAST CI product to get an end-to-end picture of the CI process, from initial reflectivity signal on radar (from the 0-1 hr nowcast by SATCAST), to rapid intensification (as nowcast by UW-CTC), in an attempt to increase their warning lead-times on the occurrence of severe weather versus using radar alone. Forecasters were also encouraged to evaluate the UW-CTC as an additional warning decision support tool, where strong cooling rates (generally -20 C every 15 minutes or less) have been shown to have some correlation with the occurrence of severe hail (see Hartung et al., 2012).

Overall, the forecasters reported they would like more time to evaluate the product in their operations. Forecasters were asked in their post-event survey how much lead-time the UW-CTC product provided over the first occurrence of 60 dBZ composite reflectivity and 1.0" Maximum Expected Size of Hail (MESH). Responses varied from 10-90 minutes, but were most commonly around 30 minutes.

Forecasters said it was important to be aware of the surrounding environment before making a warning decision based on the UW-CTC product. Often if there was ongoing supercell activity, a forecaster would warn solely on the appearance of the UW-CTC signal exceeding about -20 C per 15 minutes.

AWC Input:

Reported that the forecasters are aware of the convective environment, it provides excellent situational awareness.

e. Nearcast Atmospheric Stability Indices

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.

f. RGB Airmass Product

HWT input:

Forecasters found the product generally useful in providing them with a quick look at the synoptic scale atmosphere, as well as an innovative way to display satellite imagery outside of the typical visible, water vapor and infrared display. They found it useful to show airmass movement and jet position/structure as a check against NWP models.

The Sounder RGB Airmass product continues to flow into SPC non-operational N-AWIPS workstations in real-time, and is also available for demonstration within the HWT in AWIPS II.

NHC Tropical Cyclone Demonstration:

The RGB Air Mass product continues to be one of the most highly utilized PG products. The training provided by satellite liaison Michael Folmer helped forecasters better understand the application of this product. The Hurricane Specialist Unit (HSU) forecasters found it useful for analyzing the moisture structure in Subtropical Storm Beryl, identification of dry air wrapping around Hurricane Gordon and monitoring the evolution of a trough upstream of that cyclone. TAFB forecasters used the product in the marine analysis of tropical lows, and as supplemental guidance for location of the center of Tropical Depression 10. More experience is still needed to understand the behavior of the product in some cases, and tuning might be needed to better represent tropical cyclone applications.

g. Overshooting Tops/ Enhanced V

AWC input:

These products assist in situational awareness where radar returns aren't available, particularly in identifying the most intense areas of convection.

Generally it can be assumed that there is a high likelihood of moderate or greater turbulence associated with an OT, given the more intense updraft. As such, knowing which cell within a group of cells, or which portion of a squall line contained an OT would give the traffic flow managers an idea of which areas to direct traffic around or over, especially in cases where radar returns do not look particularly intense.

NHC Tropical Cyclone demonstration:

More basic research is needed to understand the relationships between Tropical Overshooting Tops (TOTs) and intensification. There was no obvious signal during the 2012 season so far. TAFB indicated that the TOT product was useful for documenting waning convection in a tropical wave. Hugh Cobb suggested that TAFB forecasters should make an effort to overlay the TOT locations on IR and visible imagery to better understand the relationships with tropical convection

h. WRF/HRRR Lightning Threat Forecast

AWC input:

The general opinion of the forecasters was that the product was a good situational awareness tool in forecasting CI. It can be used to not only highlight areas of potential CI, but also areas for which the potential of lightning is the greatest.

i. Fog and Low Stratus product

AWC input:

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, allowing for a differentiation between that and IFR. These products are now being used in AWC routine operations.

j. Hurricane Intensity Estimates (HIE)

NHC Tropical Cyclone demonstration:

HSU forecasters indicated that the HIE was very responsive for Hurricane Michael and was used to upgrade it to a major hurricane. They also noted that the HIE intensity estimates tended to be on the high side compared to other methods, especially when a storm first develops an eye.

k. Super Rapid Scan Operations Imagery (SRSO)

NHC Tropical Cyclone demonstration:

Both TAFB and HSU forecasters indicated that there is utility for center fixing, especially for weaker systems, and obtaining intensity and center fixes closer to synoptic times. The SRSO data have greater utility for monitoring changes in convective activity, especially for storms such as Hurricane Isaac when it was in the central Gulf of Mexico, where the inner core circulation is the formative stage. TAFB forecasters found the SRSO data useful for their tropical weather discussions, and helped document convection within tropical waves.

HPC/OPC/TAFB and SAB input:

After Hurricane Isaac made landfall in southeast Louisiana, the new Metwatch desk at HPC also found the 1-min rapid-scan imagery useful in identifying a mesohigh which was aiding in the development of a rainband along its periphery. The mesohigh features were easily displayed with the 1-min imagery bringing high confidence to the forecast.

l. RGB Dust Product:

NHC Tropical Cyclone Demonstration:

The RGB Dust product is now used routinely by TAFB forecasters as input to their Tropical Weather Discussion product. It was especially useful for helping to diagnose the atmospheric stability in the early stages of Tropical Storm Florence.

m. Saharan Air Layer Product

NHC Tropical Cyclone Demonstration:

The evaluation of this product was fairly limited due to the lack of an N-AWIPS version, but was sometimes used in combination with the Dust product

n. GOES-R Natural Color Imagery

NHC Tropical Cyclone Demonstration:

HSU forecasters indicated that the utility of the product is limited because it is demonstrated on low-earth orbiting (LEO) proxy data, with low time resolution and some latency issues. However, it has some utility in identification of dust in the storm environment. The geostationary version after the launch of GOES-R will have greater utility for HSU forecasters and for public outreach

o. Pseudo Natural Color Imagery

NHC Tropical Cyclone Demonstration:

HSU forecasters indicated that dust shows up very well and the cyan color helps differentiate upper-level moisture from low-level moisture. They also indicated that in the GOES-R era, this product or the natural color version might serve as the default image loop instead of a standard gray-scale visible image used now.

p. Rapid Intensification Index

NHC Tropical Cyclone Demonstration:

Through exposure to the lightning based Rapid Intensification Index (RII) and direct display of lighting locations on their N-AWIPS systems, the HSU forecasters have gained the experience to recognize that an inner core lighting outbreak is often associated with an increase in vertical shear, and prevents intensification. Forecaster feedback on the RII indicated that the lightning input only modified the RI probabilities by a few percent. This makes it very difficult to evaluate the impact of the lightning input in just one season. This was especially difficult in the 2011 Atlantic season, where there were very few RI cases. A systematic evaluation of the impact of the lighting on the RII will be performed at the end of the 2012 season, after three years of independent data (2010-2012) have been obtained.

Additional product assessments will be found in the individual Proving Ground and Testbed reports at http://www.goes-r.gov.

6. Proving Ground Activities that Worked Well:

a. The PGLM and other ABI Proxy GOES-R products continue to be available for demonstration within the HWT on the AWIPS II workstations and are now ingested into SPC non-operations N-AWIPS workstations in real-time.

b. The low cloud and stratus product is currently transitioning from experimental to operational use at the AWC and Alaska.

c. All training material for the HWT participants was provided prior to their arrival in Norman. This provided a quicker spin-up to operations and an additional day of testing and evaluation during the week of their visit.

d. A weather event simulator (WES) case was included in the training material for the HWT participants that allowed the forecasters to interact with the experimental products in an AWIPS environment in their office or at home.

e. Participants in the HWT spring experiment provided 5 webinars on products they found particularly useful. They also provided 225 blog postings and 109 completed surveys.

7. Lessons learned that are relevant to future projects and/or agency priorities:

In the HWT spring experiment EFP and EWP participants would also like to have more collaboration with each other throughout the day. We attempted some cross-participation previous years with a joint EFP-EWP discussion period, as well as having some of the EWP forecasters participate at an EFP desk in the morning. However, some additional planning is needed for this to work given the different rigid daily timetables of each of the programs.

Good planning and coordination will produce an effective demonstration experience. While there is no perfect substitute for face to face interaction, the use of on-line training and virtual meetings will increase. We are learning from COMET how to make these experiences and technical interchange meetings more effective beginning with the virtual Satellite Science Week planned for March 17-22 and the OCONUS Proving Ground meeting June 17-21.

8. Methods to foster collaborations between research and operations/ applications and external stakeholders

Methods used to foster collaborations between research and operations/applications and external stakeholders are the visiting scientist program, bringing forecasters and product developers to the Hazardous Weather Testbed, and also inviting broadcasters to participate in conferences and future proving ground demonstrations. These methods help to fulfill the goal of aligning the Proving Ground with the NOAA Weather Ready Nation initiative.

9. Project alignment with agency technical and service priorities

The alignment with NWS and corporate service priorities is coordinated through the Office of Science and Technology and the NWS Operational Advisory Team (NOAT), comprised of the Region Scientific Services Division chiefs and a representative from NCEP.

10. Balance of PG portfolio (incremental evolutionary ideas vs larger revolutionary ideas)

The PG portfolio priorities in order are user readiness for the at-launch baseline products, followed by the new products and applications made possible by the advanced capabilities of the GOES-R instruments. The revolutionary advancements will come from the development of fused

products and decision aids that will be possible with enterprise processing systems and early integration into AWIPS-II.

11. Demonstrations of consistent practices with guidelines

Guidelines for PG demonstrations are developed by the Science and Demonstration Executive Board in coordination with the NOAT and satellite liaisons.

12. Efficiency and effectiveness of PG in terms of timeliness, cost savings, cost sharing, re-use and/or low overhead.

Efficiency is achieved through regular virtual technical interchange meetings while resources are used most effectively through partnerships with our Proving Ground partners and NOAA Testbed facility managers. Utilizing forecasters who are already on-site, and at nearby offices, to participate in demonstrations is an effective way to reduce costs in the Proving Ground. They receive product training during regularly scheduled shifts which has no additional cost to the program.

13. Leveraged resources from broader community

Leveraged resources are provided by NASA SPoRT, Cooperative Institute infrastructure, and NOAA Testbeds.

Appendix A: Publications

Bedka, K. M., R. Dworak, J. Brunner, and W. Feltz, 2012: Validation of Satellite-Based Objective Overshooting Cloud-Top Detection Methods Using *CloudSat* Cloud Profiling Radar Observations. *J. Appl. Meteor. Climatol.*, 51, 1811-1822, doi: 10.1175/JAMC-D-11-0131.1

Bikos, D., D. T. Lindsey, J. Otkin, J. Sieglaff, L. Grasso, C. Siewert, J. Correia Jr., M. Coniglio, R. Rabin, J. S. Kain, and S. Dembek, 2012: Synthetic Satellite Imagery for Real-Time High Resolution Model Evaluation. *Weather and Forecasting*, 27(3), 784-795, doi: 10.1175/WAF-D-11-00130.1

DeMaria, M., R. T. DeMaria, J. A. Knaff, D. Molenar, 2012: Tropical Cyclone Lightning and Rapid Intensity Change. *Mon. Wea. Rev.*, 140(6), 1828-1842, doi: 10.1175/MWR-D-11-00236.1

Denlinger, R. P., M. Pavolonis, and J. Sieglaff, 2012: A robust method to forecast volcanic ash clouds, *J. Geophys. Res., 117,* D13208, doi:10.1029/2012JD017732

Dworak, R., K. Bedka, J. Brunner, and W. Feltz, 2012: Comparison between GOES-12 Overshooting-Top Detections, WSR-88D Radar Reflectivity, and Severe Storm Reports, *Weather and Forecasting*, 27(3), 684-699, doi: 10.1175/WAF-D-11-00070.1

Goodman, S. J., J. Gurka, M. DeMaria, T. J. Schmit, A. Mostek, G. Jedlovec, C. Siewert, W. Feltz, J. Gerth, R. Brummer, S. Miller, B. Reed, and R. R. Reynolds, 2012: The GOES-R Proving Ground: Accelerating User Readiness for the Next-Generation Geostationary Environmental Satellite System. *Bull. Amer. Met Soc.*, 93, 1029 -1040.

Heidinger, A. K., A. T. Evan, M. J. Foster, and A. Walther, 2012: A Naïve Bayesian Cloud Detection Scheme Derived from *CALIPSO* and Applied within PATMOS-x, *J. Appl. Meteor. Climatol.*, 51(6), 1129-1144, doi: 10.1175/JAMC-D-11-02.1

Hoff, R. M., S. Kondragunta, P. Ciren, E.-S. Yang, H. Zhang, C. Xu, S. Christopher, and A. K. Huff, 2012: Development of Synthetic GOES-R Aerosol Products. Sumitted to *J. Atmos. Oceanic Technol.*

Lakshmanam, V., R. Rabin, J. Otkin, J. S. Kain, and S. Dembek, 2012: Visualizing Model Data Using a Fast Approximation of a Radiative Transfer Model. *J. Atmos. Oceanic Technol.*, 29, 745-754, doi: 10.1175/JTECH-D-11-00007.1

Lindsey, D. T., T. J. Schmit, W. M. MacKenzie Jr., C. P. Jewett, M. M. Gunshor, and L. Grasso, 2012: 10.35μm: atmospheric window on the GOES-R Advanced Baseline Imager with less moisture attenuation. *J. Appl. Remote Sens.*, 6(1), doi:10.1117/1.JRS.6.063598

Miller, S. D., C. C. Schmidt, T. J. Schmit, and D. W. Hillger, 2012: A case for natural colour imagery from geostationary satellites, and an approximation for the GOES-R ABI. *Int. J.*

Rem. Sens., 33(13), 3999-4028, doi: 10.1080/01431161.2011.637529

Monette, S. A., C. S. Velden, K. S. Griffin, and C. M. Rozoff, 2012: Examining Trends in Satellite-Detected Tropical Overshooting Tops as a Potential Predictor of Tropical Cyclone Rapid Intensification. *J. Appl. Meteor. and Climatol.*, 51, 1917-1930.

Otkin, J. A., 2012: Assimilation of water vapor sensitive infrared brightness temperature observations during a high impact weather event. *J. Geophys. Res., 117*, D18213, doi:10.1029/2012JD017568

Otkin, J. A., 2012: Assessing the Impact of the Covatiance Localization Radius when Assimilating Infrared Brightness Temperature Observations Using an Ensemble Kalman Filter. *Mon. Wea. Rev.*, 140(2), 543-561. doi: 10.1175/MWR-D-11-00084.1

Petrenko, B., A. Ignatov, N. Shabanov, and Y. Kihai, 2011: Development and evaluation of SST algorithms for GOES-R ABI using MSG SEVIRI as a proxy. *Rem. Sens. of Env.*, 115(12), doi: 10.1016/j.rse.2011.09.003.

Ralph, M., J. Intrieri, D. Andrea, Jr., R. Atlas, S. Boukabara, D. Bright, P. Davidson, B. Entwistle, J. Gaynor, S. Goodman, J. Gwo-Jiing, A. Harless, J. Huang, G. Jedlovec, J. Kain, S. Koch, B. Kuo, J. Levit, S. T. Murillo, L. P. Riishojgaard, T. Schneider, R. Schneider, T. Smith, and S. Weiss, 2012: The Emergence of the Weather-focused Tesetbeds Linking Research and Forecasting Operations. Accepted for publication in Bull. Amer. Met. Soc.

Remer, L. A., S. Mattoo, R. C. Levy, A. Heidinger, R. B. Pierce, and M. Chin, 2012: Retrieving aerosol in a cloudy environment: aerosol product availability as a function of spatial resolution. *Atm. Measurement Techniques*, 5(7), 1823-1840, doi: 10.5194/amt-5-1823 2012

Schultz, C. J., W. A. Petersen, and L. D. Carey, 2011: Lightning and Severe Weather: A Comparison between Total and Cloud-to-Ground Lightning Trends. *Weather and Forecasting*, 26(5), 744-755, doi: 10.1175/WAF-D-10-05026.1

Walther, A. and A. K. Heidinger, 2012: Implementation of the Daytime Cloud Optical and Microphysical Properties Algorithm (DCOMP) in PATMOS-x. *J. Appl. Meteor. Climatol.*, 51, 1371-1390, doi: 10.1175/JAMC-D-11-0108.1

Wang, C., P. Yang, B. A. Baum, S. Platnick, and A. K. Heidinger, 2011: Retrieval of Ice Cloud Optical Thickness and Effective Particle Size Using a Fast Radiative Transfer Model. *J. Appl. Meteor. Climatol.*, 50(11), 2283-2297, doi: 10.1175/JAMC-D-11-067.1

Webley, P. W., T. Steensen, M. Stuefer, G. Grell, S. Freitas, and M. Pavolonis, 2012: Analyzing theEyjafjallajokull 2010 eruption using satellite remote sensing, lidar and WRF-Chem dispersion and tracking model. *J. Geophys Res.*, *117*, D00U26, doi:10.1029/2011JD016817

Yu, Y., D. Tarpley, J. L. Privette, L. E. Flynn, H. Xu, M. Chen, K. Y. Vinnikov, D. Sun, and Y. Tian, 2012: Validation of GOES-R Satellite Land Surface Temperature Algorithm Using SURFRAD Ground Measurements and Statistical Estimates of Error Properties. *IEEE Trans. on Geo. and Rem. Sens*, 50(3), 704-713, doi: 10.1109/TGRS.2011.2162338

Zupanski, D., M. Zupanski, L. D. Grasso, R. Brummer, I. Jankov, D. Lindsey, M. Sengupta, M. DeMaria, 2011: Assimilating synthetic GOES-R radiances in cloudy conditions using an ensemble-based method. *Int. J. Rem. Sens.*, 31(24), 9637-9659, doi: 10.1080/01431161.2011.572094

Other publications:
Schmit, T., 2012: The ABI on GOES-R. *NWA Newsletter*, 12(4).

Appendix B: Conference/Meeting Presentations

Jim Gurka and Steve Goodman gave oral presentations on the GOES-R Proving Ground at the following conferences/meetings:

1) GOES Users' Conference/joint with the National Weather Association (NWA) Annual Meeting in Birmingham, AL (Oct. 2011)
2) American Geophysical Union Annual Meeting in San Francisco, CA (Dec. 2011)
3) 8th Annual AMS Symposium on Future Environmental Satellite Systems at the Annual AMS meeting in New Orleans, LA (Jan. 2012)
4) EUMETSAT Convection Working Group Meeting in Prague, Czech Republic (Mar. 2012)
5)Vaisala International Lightning Detection and Meteorology Conference in Broomfield, CO (Apr. 2012)
6) Office of the Federal Coordinator for Meteorology (OFCM) Meeting in Silver Spring, MD (June 2012)
7) 40th AMS Broadcast Meteorology Conference in Boston, MA (Aug. 2012)
8) WMO Symposium on Nowcasting and Very Short Range Forecasting in Rio de Janeiro, Brazil (Aug. 2012)
9) EUMETSAT Users' Conference in Oslo, Norway (Sept. 2012)
10) National Weather Association Annual Meeting in Madison, WI (Oct. 2012)
11) WMO Workshop on NWP for Nowcasting in Boulder, CO (Oct. 2012)

Michael J. Folmer gave oral presentations on the GOES-R Proving Ground at the following conferences/meetings:

1) The 2012 GOES-R product demonstrations for marine and precipitation applications, 37th Annual NWA meeting in Madison, WI (Oct. 2012)
2) The Use of the RGB Airmass Product at the HPC, OPC, NHC, and SAB GOES-R Proving Grounds during the 2011 Atlantic Hurricane Season, AMS 30th Conference on Hurricanes and Tropical Meteorology (Apr. 2012)
3) The Use of the RGB Products at the HPC, OPC, NHC, and SAB Proving Grounds, NOAA Satellite Science Week (May 2012)
4) CICS annual science meeting (Sept. 2012)

SPoRT conference presentations:

Burks, J., M. Smith, and K. McGrath, 2012: NASA SPoRT AWIPS II Activities. 37th NWA Annual Meeting, October 6-11, Madison, WI.

Burks, J., Smith, M. 2012: SPoRT AWIPS II Activities. NOAA Satellite Science Week, April, Kansas City, MO.

Burks, J., Smith, M., McGrath, K. 2012: NASA SPoRT / AWIPS II Activities. NOAA Satellite Science Week, April, Kansas City, MO.

Carcione, B., **J. Burks, M. Smith, and K. McGrath**, 2011: Preparing NASA SPoRT Data Sets for the Next Generation of AWIPS. 36th NWA Annual Meeting, October 17-20, Birmingham, AL.

Folmer, M. **B. Zavodsky, and A. Molthan**, 2012: Operational use of the AIRS Total Column Ozone Retrievals along with the RGB Airmass product as part of the GOES-R Proving Ground. AGU Fall Meeting, San Francisco, CA.

Fuell, K.K., A. Molthan, M. Folmer, M. DeMaria 2012: Demonstration of RGB Composite Imagery at NOAA National Centers in Preparation for GOES-R. 7th GOES Users' Conference Annual Meeting, October 15-20, Birmingham, AL.

Fuell, K.K., A. Molthan, 2012: RGB Imagery Applications within U.S. National Weather Service: Demonstrating Future GOES-R Capabilities with Current Instruments. 2nd RGB Composite Satellite Imagery Workshop, September 17-19, Seeheim, Germany.

Fuell, K.K., G. J. Jedlovec, A. L. Molthan, and G. T. Stano, 2012: NASA/SPoRT's GOES-R Activities in Support of Product Development, Management, and Training. AGU Fall Meeting, San Francisco, CA.

Fuell, K. K., M. Smith, and G. Jedlovec, 2012: Early Transition and Use of VIIRS and GOES-R Products by NWS Forecast Offices. 8th Annual Symposium on Future Operational Environmental Satellites, 92nd AMS Annual Meeting, 22-26 January 2012, New Orleans, LA.

Fuell, K. K. and A. L. Molthan, 2012: Transition and Evaluation of RGB Imagery to WFOs and National Centers by NASA SPoRT. NOAA Science Week, April, Kansas City, MO.

Jedlovec, G., M. Demaria, T. Schmit, 2012: RGB activities for the GOES-R Proving Ground. NOAA Science Week, April, Kansas City, MO.

Jedlovec, G., 2011: Overview of GOES-R Proving Ground Activities at SPoRT. 7th GOES Users Conference, October 19-21, Birmingham, AL.

McCaul, E. W., **J. L. Case**, S. J. Goodman, S. R. Dembek, and F. Kong, 2011: Optimizing the Lightning Forecast Algorithm within the Weather Research and Forecasting Model. 7th GOES Users Conference, October 19-21, Birmingham, AL.

Molthan, A. L., H. K. Oswald, and K. K. Fuell, 2011: Developing and Evaluating RGB Composite MODIS Imagery for Applications in National Weather Service Forecast Offices. 7th GOES Users Conference, October 19-21, Birmingham, AL.

Molthan, A., H. Oswald, and K. Fuell, 2012: Developing and Evaluating Multispectral RGB Satellite Imagery for Applications in National Weather Service Forecast Offices or National

Centers. 8th Annual Symposium on Future Operational Environmental Satellites, 92nd AMS Annual Meeting, 22-26 January 2012, New Orleans, LA.

Molthan, A. L., K. K. Fuell, J. Knaff, and T. Lee, 2012: Current Usage and Future Prospects of Multispectral (RGB) Satellite Imagery in Support of NWS Forecast Offices and National Centers. 37th NWA Annual Meeting, October 6-11, Madison, WI.

Smith, M, K. McGrath, J. Burks, and B. Carcione, 2012: Application Programming in AWIPS II. 10th Symposium on the Coastal Environment, 92nd AMS Annual Meeting, 22-26 January 2012, New Orleans, LA.

Stano, G. T. and B. Carcione, 2012: Latest Activities and Evaluations as NASA SPoRT Prepares for the Geostationary Lightning Mapper. 8th Annual Symposium on Future Operational Environmental Satellites, 92nd AMS Annual Meeting, 22-26 January 2012, New Orleans, LA.

Stano, G. T., 2012: Utilizing Space-based Lightning Observations to Improve Lightning Awareness and Safety. 7th Symposium on Policy and Socio-Economic Research, 92nd AMS Annual Meeting 22-26 January 2012, New Orleans, LA.

Stano, G. T., C. Siewert, and K. M. Kuhlman, 2011: Evaluation of NASA SPoRT's Pseudo-Geostationary Lightning Mapper Products in the 2011 Spring Program. 36th NWA Annual Meeting, October 17-20, Birmingham, AL.

Stano, G. T., and B. Carcione, 2011: Total Lightning Visualizations to Enhance Forecast Operation. 36th NWA Annual Meeting, October 17-20, Birmingham, AL.

Stano, G. T., 2012: Preparing for GOES-R: The Pseudo Geostationary Lightning Mapper. Preprints, *37th Natl. Wea. Assoc. Annual Meeting*, Madison, WI.

Stano, G. T., K. K. Fuell, and G. J. Jedlovec, 2012: NASA SPoRT's GOES-R Proving Ground Activities. NOAA Satellite Science Week, April, Kansas City, MO.

White, K. D., G. T. Stano, and B. Carcione, 2012: An Investigation of North Alabama Lightning Mapping Array Data and Usage in the Real-time Operational Warning Environment During the March 2nd, 2012 Severe Weather Outbreak in Northern Alabama. 37th NWA Annual Meeting, October 6-11, Madison, WI.

CIRA Conference Presentations:

Connell, B., M. Davison, T. Mostek, and K. Caesar, 2011: What drives online participation patterns for a focus group? CALMet IX Conference, October 3-7.

Szoke, E., 2011: Update on CIRA GOES-R Proving Ground products. Boulder WFO Winter Workshop, October 4 and 13.

Lindsey, D., L. Grasso, D. Bikos, C. Stewart, R. Rabin, and J. Kain, 2011: 36th NWA Annual Meeting and GOES Users' Conference, October 17-21 (poster).

Lindsey, D., D. Hillger, D. Molenar, J. Knaff, M. DeMaria, S. Miller, R. Brummer, L. Grasso, S. Kidder, D. Bikos, J. Braun, B. Connell, E. Szoke, H. Gosden, K. Micke, and R. DeMaria, 2011: 36th NWA Annual Meeting and GOES Users' Conference, October 17-21 (poster).

Grasso, L., D. Hillger, and S. Miller, 2012: Synthetic Natural Color ABI Products. 2nd Annual NOAA GOES-R Air Quality Proving Ground Workshop, January 12.

Hillger, D., and T. J. Schmit, 2012: GOES Science Tests: Results for the Last Two of the Current GOES Series. 18th Conference on Satellite Meteorology, Oceanography and

Climatology/First Joint AMS-Asia Satellite Meteorology Conference, 92nd AMS Annual Meeting, January 23-26.

Hillger, D., and T. J. Kopp, 2012: First Images and Products From VIIRS on NPP. Eighth Annual Symposium on Future Operational Environmental Satellite Systems, 92nd AMS Annual Meeting, January 23-26.

DeMaria, M., J. A. Knaff, A. B. Schumacher, J. F. Dostalek, and R. T. DeMaria, 2012: Applications of Atms/CrIS Soundings to Tropical Cyclone Analysis and Forecasting. Eighth Annual Symposium on Future Operational Environmental Satellite Systems, 92nd AMS Annual Meeting, January 23-26.

Connell, B., and K. Gebhart, 2012: Golden Words from Elementary Kids: Can I Show You My Observation! 21st Symposium on Education, 92nd AMS Annual Meeting, January 23-26.

Connell, B., D. Bikos, J. Braun, A. S. Bachmeier, S. Lindstrom, A. Mostek, M. Davison, K. A. Caesar, V. Castro, L. Veeck, M. DeMaria, and T. J. Schmit, 2012: Satellite Training Activities: VISIT, SHyMet and WMO VLab Focus Group. Eighth Annual Symposium on Future Operational Environmental Satellite Systems, 92nd AMS Annual Meeting, January 23-26 (poster).

Lindsey, D., T. J. Schmit, W. M. MacKenzie Jr., L. Grasso, M. M. Gunshor, and C. P. Jewett, 2012: The 10.35 Micrometer Band: A More Appropriate Window Band for GOES-R ABI than 11.2? . Eighth Annual Symposium on Future Operational Environmental Satellite Systems, 92nd AMS Annual Meeting, January 23-26.

Lindsey, D., and L. Grasso, 2012: Predicting Where Convective Clouds Will Form with the GOES-R ABI. Eighth Annual Symposium on Future Operational Environmental Satellite Systems, 92nd AMS Annual Meeting, January 23-26 (poster).

Miller, S., 2012: Introducing DEBRA: A Dust Enhancement with Background Reduction Algorithm Applicable to Next-Generation Optical Spectrum Imaging Radiometers. 18th Conference on Satellite Meteorology, Oceanography and Climatology/First Joint AMS Asia Satellite Meteorology Conference, 92nd AMS Annual Meeting, January 23-26.

Miller, S. T. F. Lee, C. Elvidge, and J. D. Hawkins, 2012: Dramatic Improvements to Nighttime Imaging with the VIIRS Day/Night Band. Eighth Annual Symposium on Future Operational Environmental Satellite Systems, 92nd AMS Annual Meeting, January 23-26

Grasso, L. R. Brummer, R. DeMaria, D. Lindsey, and D. Hillger, 2012: GOES-R ABI as a warning aid. Warn-on Forecast and High Impact Weather Workshop, February 23-25.

DeMaria, M, 2012: Improvements in Statistical Tropical Cyclone Forecast Models: A Year 1 Joint Hurricane Testbed Project Update. 66th Interdepartmental Hurricane Conference, March 5-8.

Szoke, E., 2012: Overview of CIRA Products. Pueblo WFO Spring Workshop, March 13.

Szoke, E., 2012: Update on CIRA Products. Boulder WFO Spring Workshop, April 6 and 13.

Knaff, J., M. DeMaria, D. W. Hillger, D. T. Linsdey, D. A. Molenar, J. L. Beven II, M. J. Brennan, H. D. Cobb III, R. Brummer, A. B. Schumacher, J. Dunion, K. K. Guell, A. K. Molthan, C. S. Velden, 2012L Overview of the GOES-R Proving Ground Activities at National Hurricane Center. AMS 30th Conference on Hurricanes and Tropical Meteorology, April 16-20 (poster).

Miller, S., 2012: VIIRS Imagery. NOAA Satellite Science Week, April 30 – May 4.

DeMaria, M., 2012: New Tropical Cyclone Products from GOES-R and JPSS. NOAA Satellite Science Week, April 30 – May 4.

Gosden, H., 2012: Potential Applications in AWIPS II. NOAA Satellite Science Week, April 30

– May 4.

Lindsey, D., L. Grasso, J. Mecikalski, J. Walker, L. Schultz, C. Velden, S. Wanzong, R. Rabin, and B. Vant-Hull, 2012: Convective Storm Forecasting 1-6 Hours Prior to Initiation. NOAA Satellite Science Week, April 30 – May 4 (poster).

Knaff, J., M. DeMaria, and C. Rozoff, 2012: Improved Understanding and Diagnosis of Tropical Cyclone Structure and Structure Changes. NOAA Satellite Science Week, April 30 – May 4 (poster).

DeMaria, M., J. A. Knaff, J. L. Beven, M. J. Brennan, S. Miller, A. Schumacher, R. DeMaria, J. Dostalek, D. Welsh, 2012: Application of Joint Polar Satellite System Imagers and Sounders to Tropical Cyclone Track and Intensity Forecasting. NOAA Satellite Science Week, April 30 – May 4 (poster).

Connell, B., 2012: National and International Training: Merging New and Old Frontiers. NOAA Satellite Science Week, April 30 – May 4 (poster).

Szoke, E., R. Brummer, H. Gosden, S. Miller, M. DeMaria, D. Linsdey, D. Molenar, 2012: The GOES-R Proving Ground: An opportunity for forecasters to shape the satellite products of the future. 46th Canadian Meteorological and Oceanographic Society and 21st AMS NWP and 25th WAF Conference, May 29 – June 1.

Bikos, D., J. Braun, B. Connell, S. Lindstrom, and S. Bachmeier, 2012: Recent VISIT and SHyMet Training: Applications of Satellite Imagery and Products to Operational Forecasting. 37th NWA Annual Meeting, October 6-11 (poster).

Grasso, L., D. Hillger, R. Brummer, and R. DeMaria, 2012: Systhetic GOES-R ABI imagery of hazardous aerosols. 37th NWA Annual Meeting, October 6-11 (poster).

Szoke, E., R. Brummer, H. Gosdeb, S. Miller, and M. DeMaria, 2012: An Update on CIRA's GOES-R Proving Ground Activities. 37th NWA Annual Meeting, October 6-11 (poster).

Lindsey, D., J. Otkin, J. Sieglaff, D. Bikos, and L. Grasso, 2012: Improving Forecasts of Clouds and Convection using Simulated Satellite Imagery. 37th NWA Annual Meeting, October 6-11.

Szoke, E., 2012: Update on CIRA GOES-R Proving Ground products. Boulder WFO Winter Workshop, October 19 and 23.

CIMSS Conference Presentations can be found at the following website:
http://library.ssec.wisc.edu/research_Resources/bibliographies/goesr

Posters:

1) GOES-R Fog and Low Cloud Product Demonstration Within the National Weather Service Central Region - **Chad M Gravelle**, CIMSS/SSEC/University of Wisconsin-Madison, NWS Operations Proving Ground, Kansas City, MO, Michael J Pavolonis and Corey G Calvert (presented at NWA Oct. '12)

2) The 2011 HPC/OPC/SAB GOES-R Proving Ground Demonstration – **Michael J. Folmer** University of Maryland – ESSIC, CICS, B. Reed, S. Goodman, J. M. Sienkiewicz, E. Danaher, D. R. Novak, and J. Kibler (presented at AMS Jan. 2012)