



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and
Information Service

Seventh GOES Users' Conference Conference Report



October 20-21, 2011

Birmingham, Alabama

Final Report

Seventh GOES Users' Conference

Conference Report

Authors: Christopher Daughtrey, Kathryn Mozer, and Michelle Tamoria
Editors: Marilyn Mix and Milt Phenneger

Front cover: Images are taken from Tim Schmit, <http://goes.gsfc.nasa.gov>, and http://www.nasa.gov/mission_pages/GOES-O/main/index.html. Images (clockwise starting from top left): An image from GOES-13 on 17 Jan 2012, High resolution GOES visible image from 27 April 2011, and the NOAA GOES-N spacecraft.



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service

FOREWORD

The Geostationary Operational Environmental Satellite Series - R (GOES-R) is a major, collaborative development and procurement effort between the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). The GOES-R series acquisition includes five different environmental instrument suites; spacecraft launch services; ground systems; and the end-to-end systems integration to support GOES-R's design, fabrication, testing, launch, and operations. By 2013, the GOES-R flight hardware will be delivered, with plans to launch in 2015.



NOAA is conducting outreach efforts to exchange information with weather forecasters, broadcasters, and other user communities to ensure user readiness when GOES-R becomes operational. To further this user coordination, NOAA held the Seventh GOES Users' Conference in conjunction with the National Weather Association (NWA) 36th Annual Meeting in Birmingham, Alabama, in October 2011.

The conference was a key event that brought together industry, academia, international partners, weather forecasters, broadcasters, and all other users. The conference showed users where NOAA stands on current and future planning and training for the next generation of geostationary satellites.

The goals of the conference were to:

- Continue to improve communication between NOAA and the GOES user communities
- Inform users on the current status of the GOES constellation, new instruments, operation improvements and updates, training, and short-term plans
- Seek ways/define methodologies to ensure operators and forecasters will be Day 1 ready for GOES-R by using the Proving Grounds for training and testing GOES-R products
- Promote understanding and benefits of the various applications of data and products from the GOES-R series for forecasters/broadcasters and users.

Thanks to NWA and all conference participants, especially the invited speakers, the program committee, and all those who provided valuable suggestions for improving the future GOES program. We appreciate everyone's support of this critical satellite program.

A handwritten signature in black ink that reads "Mary E. Kicza".

Mary E. Kicza
Assistant Administrator for
Satellite and Information Services

EXECUTIVE SUMMARY

The seventh GOES Users' Conference (GUC) was held October 19-21, 2011 in Birmingham, Alabama. The purpose of this conference was to facilitate communication between National Oceanic and Atmospheric Administration (NOAA) and the Geostationary Operational Environmental Satellite (GOES) user communities. The Wynfrey Hotel was the venue for the meeting of more than 200 attendees including forecasters, broadcasters, researchers, scientists, and satellite data users representing government, academia, the international community, and industry. A larger than usual contingent of broadcasters and forecasters was present because the conference was scheduled in conjunction with the 36th Annual Meeting of the National Weather Association (NWA).

A major topic of the GUC was preparation of the user communities for the GOES-R Series satellites; the first of which is scheduled to be launched in 2015. NOAA officials were present to accept feedback from the users and provide answers to their questions. Many opportunities for interaction were available, including poster sessions, scheduled question and answer periods, and group discussions. Some answers were provided on the spot, while others were to be answered later. All of the questions and their answers are documented in this report.

The GUC/NWA joint sessions presented the status of the current and future GOES systems. The GOES-R instruments were described, along with their impact to current user community. Although GOES-R will provide significant improvement in critical atmospheric, oceanic, climatic, solar, and space data, the user community needs to start preparations now. These preparations include training on the use of the new data formats and, in some cases, upgrades to ground stations. The GOES Proving Ground is one means to test the algorithms and to ensure that users will be trained and ready to effectively use the GOES-R data from the day it becomes operational.

Half a day was devoted to the "Benefits of GOES-R Products for Forecasters/Broadcasters". Each session included a Question and Answer section during which the audience and panel members were able to engage in a very precise dialog that encouraged everyone's participation. It was this level of engagement that made the conference a true success. Wrapping up the day was a dinner featuring a talk by James Spann, Chief Meteorologist at WBMA-TV Birmingham, AL. The first part of Mr. Spann's presentation was a very sobering experience as he went through the timeline of events during the April 27, 2011 deadly tornado outbreak in Alabama. He spoke about how satellite data is crucial and taken for granted by many in the operational meteorology community.

The final day was devoted to open discussion centered on three themes: Exploiting GOES Data/Products, Operational Enhancements by Leveraging the GOES-R Proving Ground, and Maximizing Operational User Readiness/Decision Support.

The next GOES Users' Conference is tentatively scheduled for April 2013, in Miami, Florida in conjunction with the NOAA 2013 Satellite Direct Readout Conference

TABLE OF CONTENTS

FOREWORD iii

EXECUTIVE SUMMARY v

OVERVIEW 1

1 SESSION 1 – Welcome/Joint NWA/GUC: Current and Future GOES..... 1

 1.1 Welcome and Opening Remarks 1

 1.2 Welcome/Keynote Address..... 1

 1.3 NOAA’s GOES Satellites: Current Status, Operational Updates, Improvements and Short-Term Plans 2

 1.4 The Tennessee Floods of May 2010: A Satellite Perspective..... 3

 1.5 The Advanced Baseline Imager (ABI) on the GOES-R Series..... 4

 1.6 High Impact Weather Forecasts and Warnings with the GOES-R Geostationary Lightning Mapper (GLM) 4

 1.7 How AWIPS II will bring GOES-R Capabilities and Science to the Field 5

2 SESSION 2 – Joint NWA/GUC..... 6

 2.1 GOES-R Proving Ground Partnership..... 6

 2.2 NWS Field Perspective of the GOES-R Proving Ground 9

 2.3 GOES-R Proving Ground Activities at the National Hurricane Center10

 2.4 The GOES-R Proving Ground at NOAA’s Storm Prediction Center and Hazardous Weather Test bed11

 2.5 Advancements Toward Fused Satellite, Radar, NWP, and In Situ Aviation Weather Decision Support12

GUC Lunch Panel – “The Path Forward to Ensure User Readiness for GOES-R” 13

3 GUC SESSION 3 – Benefits of GOES-R Products for Forecasters/Broadcasters -

Part I 19

 3.1 Overview of GOES-R Proving Ground Activities at SPoRT.....19

 3.2 Training in the NOAA Satellite Proving Ground – Focus on User Readiness and Decision Support Services.....20

 3.3 GOES Data and Products in the Space Weather Forecast Office21

 3.4 GOES-R for Broadcast Meteorologists22

4 GUC SESSION 4 – Benefits of GOES-R Products for Forecasters/Broadcasters -

Part II..... 23

 4.1 Developing and Evaluating RGB Composite MODIS Imagery for Applications in Forecast Offices.....23

 4.2 Improving Short-Term Predictions and the Identification of Hazardous Weather24

 4.3 Meteosat Third Generation (MTG): An Innovative Approach to Advanced Observations from the Geostationary Orbit25

 4.4 Optimizing the Lightning Forecast Algorithm within the Weather Research and Forecasting Model.....27

 4.5 An Overview of New and Unique GOES-R Products for Hazard Assessments.....28

 4.6 GOES-R Post Launch Activities.....29

 4.7 User Input from Past GOES Users’ Conferences30

Question and Answer Session..... 31

GUC Dinner – “Reconnect With Your Passion Now”34

5 GUC SESSION 5 – User Discussion and Recommendations.....36

5.1 Introductions to Group Topics – Discussion on Purpose and Logistics.....36

5.2 Group Discussion I – Exploiting GOES Data/Products36

5.3 Group Discussion II – Operational Enhancements by Leveraging the GOES-R Proving
Ground41

5.4 Group Discussion III – Maximizing Operational User Readiness/Decision Support44

6 Closing Remarks – James Gurka48

APPENDIX A CONFERENCE AGENDA49

APPENDIX B POSTER ABSTRACTS.....55

APPENDIX C GLOSSARY75

APPENDIX D GOES-R Links.....81

APPENDIX E 7th GOES Users Conference Attendance Summary83

APPENDIX F 7th GOES Users Conference Survey Summary.....85

APPENDIX G GOES-R Conference Committee89

APPENDIX H Action Items91

OVERVIEW



The 2011 Seventh GOES Users' Conference (GUC) was held in Birmingham, Alabama at the Wynfrey Hotel. This year the GUC was held in conjunction with the NWA Annual Meeting to disseminate the information to a broader audience. A summary of the attendance at this conference is in Appendix E. Appendix H documents the responses to recommendations and unanswered questions gathered at the conference. The next GUC will be held in conjunction with the DRO and NPOESS/JPSS in April 2013 to reach, in part, a more international user group.

1 SESSION 1 – Welcome/Joint NWA/GUC: Current and Future GOES

Session 1 started the GOES Users' Conference with two joint sessions with the NWA Annual Meeting. This session welcomed the attendees and gave an overview of the status of GOES and the upcoming GOES-R program.

1.1 Welcome and Opening Remarks

James Gurka	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
-------------	-----------------------------------	---------------

Jim Gurka welcomed the attendees, on behalf of the Program Committee, to the seventh GOES User's Conference. He stated that this would be an opportunity to hear the latest information on the current GOES, and to provide input on how the GOES-R Program Office can help users get ready for the next generation GOES—the GOES-R Series. In past conferences, input from the users shaped the instruments, spacecraft design, and user readiness approach. One example is the development of the GOES Proving Ground. User input is key to the success of this conference. Mr. Gurka listed several ways that the attendees would be able to provide feedback and ask questions: the question and answer period after each session, lunch panel, index cards, the GOES User Survey included in the registration packet, and the group discussions on Friday.

1.2 Welcome/Keynote Address

Greg Mandt	NOAA/NESDIS, Director, GOES-R Program	Greenbelt, MD
------------	---------------------------------------	---------------

Greg Mandt, the GOES-R System Program Director, expressed his appreciation for the attendance of more operational forecasters than the previous GUC, and credits that to holding the conference jointly with the NWA. GOES-R has worked hard to reach out to the user community. There is enormous pressure on NOAA to meet budget requirements without sacrificing the satellite programs. Thus, there is a lot of pressure to create a more efficient satellite program in the future. He announced the recent decision that GOES-15 will replace GOES-11 for GOES-West before proceeding with the current GOES-R development status.



By mid-2012, the GOES-R flight hardware will begin to be delivered. The program is moving into the critical design phase of the ground segment and program/system. Since 2007, GOES-R has held to the same cost schedule. Due to budget constraints, the eGVAR program was eliminated, the GOES-R L-band frequency was shifted down to 3.4 MHz (as required from the

Presidential Broadband Initiative), and 31 new and reduced latency products were removed from the Ground System Core Contract.

The Wallops Command Data Acquisition Center is undergoing a facility expansion with three new antennas. The Remote Backup Facility in Fairmont, WV is also installing three new antennas. The National Satellite Operations Facility (NSOF) is installing four L-band receivers to take GRB data and make L-2 products. The facility is also making changes inside to handle new equipment required for operations.

AWG proxy and product application teams have assembled a wide variety of instrument proxy and simulated datasets to use for algorithm development, testing, and validation activities. These datasets are being used through the GOES-R Proving Ground, allowing operational users to test and provide feedback on the products. The GOES-R Program Office re-launched www.goes-r.gov in May 2011 with expanded user community content and launched the GOES-R Facebook page in June 2011 as a new way to communicate to users.

1.3 NOAA's GOES Satellites: Current Status, Operational Updates, Improvements and Short-Term Plans

Tom Renkevans	NOAA/NESDIS/Office of Satellite and Product Operations	Camp Springs, MD
---------------	--	------------------



The Deputy Division Chief of NESDIS Satellite Products and Services Division, Tom Renkevans, updated the audience on the current GOES status, organization of data delivery, select GOES products, GOES direct readout information, space weather, and user services.

Current GOES satellites are used to observe hurricanes and severe weather. They provide input for weather models, sea surface temperature for monitoring fisheries and climate, winds for aviation, and solar imagery for communications satellites, utility companies, and astronaut safety. Satellites provide data relayed from buoys and stream gauges, and aid in search and rescue missions. GOES-12 is providing coverage of South America, GOES-13 is operational as GOES-East, GOES-14 is in storage and GOES-15 is moving to become GOES-West operationally on 6 December 2011.

The GOES-13, -14, -15 series has improved battery life and navigation. The resolution of the IR bands is 4 km. GVAR ingestor needs to be able to handle the GVAR changes associated with the finer spatial resolution on GOES-14 and -15 data. GOES-15 passed its science check-out and will need to be flipped twice a year. It has a finer water vapor band, a new 13.3 micrometer band (no 12 micrometer band), a change in GVAR to support 4 km band 6, and the imager has shifted SRF for bands 3 and 6.

ITT has redesigned the GOES imager to withstand direct views of the sun, reclaiming images that previously were lost during eclipse season. The Extended GOES High Inclination operations with GOES-12 will begin November 14, 2011.

A new data access and distribution policy has been created and can be found at this URL: <http://www.ospo.noaa.gov>. GOES data is delivered through broadcast services (GVAR, LRIT), various Web sites, GINI/NOAAPort (for AWIPS display), DDS, and SATEPSDIST. Improvements to several AWIPS hydrology products are coming to completion and will significantly improve analyses of heavy precipitation events and associated forecasts at the NWS Weather Forecast Offices. The GOES Data Collection Service has made several system improvements which include:

- A new ground system (DADDS) in operation
- New transmitters to cut channels in half thereby doubling the bandwidth
- Finishing the conversion to faster transmitters
- Future implementation of available 2-way communication capability
- Rebroadcast through LRIT and future HRIT service

GOES continues to provide crucial information for solar radiation storms and radio blackouts for space weather.

The official Office of Satellite and Product Operations (OSPO) Web site is undergoing a makeover which should be complete by the end of fiscal year 2012. NOAA NESDIS now has a Facebook page and OSPO has a Twitter account.

Comment: Remind users that information about updates to satellite capabilities is important and training is provided on the NOAA LMS and MetEd Web site for GOES-13,-14, -15.

1.4 The Tennessee Floods of May 2010: A Satellite Perspective

Sheldon Kusselson	NOAA/NESDIS/Satellite Products and Services	Camp Springs, MD
-------------------	---	------------------

Satellite meteorologist Sheldon Kusselson shared a satellite perspective of a case study from the Tennessee floods of May 2010.



Prior to the May 1, 2010 floods in the Tennessee valley, the largest rainfall was from Hurricane Frederic in 1979. Moisture patterns from another historic event in 1995 in the southeast helped forecasters predict the magnitude of the 2010 event. Blended Total Precipitable Water (TPW) is a unified image of polar-orbiting microwave total moisture over oceans and meteorological data from Global Positioning System (GPS) satellites over the continental United States. It is updated hourly and available on AWIPS and the Internet as a tool used in forecasting. The lower amount of heavy precipitation during this event in Louisiana, southern Arkansas, and southern Mississippi might have been due to the smoke from fires in Texas and Mexico.

The TPW Percent of Normal product is also produced hourly and is derived by taking the TPW product and comparing it to satellite climatology. Moisture trends can be analyzed with respect to climatology. Satellite rainfall estimates play a supplemental role in rain gauge and radar observations. In the May 2010 case, satellite rainfall estimates were too low, but were better at identifying the locations of maximum rainfall amount. The NESDIS Satellite Analysis Branch supports NWS forecasters, including those at the Hydrometeorological Prediction Center (HPC) with satellite precipitation advice through satellite messages. These messages include satellite analysis, short-term trends, and analysis and rainfall estimate graphics. The added information provides value that increases the forecaster's confidence in producing more timely and accurate flash flood warnings.

A forecaster at HPC commented that TPW is a useful tool for making forecasts.

1.5 The Advanced Baseline Imager (ABI) on the GOES-R Series

Timothy J. Schmit	NOAA/NESDIS/STAR/CoRP/ASPB	Madison, WI
James Gurka	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Mathew M. Gunshor	CIMSS	Madison, WI



Tim Schmit, a research scientist with NESDIS/STAR, described the technical aspects of the ABI on GOES-R. The ABI has better spectral and spatial resolution. It can scan in two modes: full disk and flex mode. In full disk mode, an image will be generated every 5 minutes. In flex mode, three scales of images will be generated every 15 minutes: one full disk image every 15 minutes, three CONUS images (once every 5 minutes), and 30 mesoscale images (once every 30 seconds). The imager has 16 bands compared with the current five bands on GOES. Synthetic ABI imagery can be generated using NWP model simulations. These improvements will assist in making forecasts and other applications, particularly on meso- and regional scales.

1.6 High Impact Weather Forecasts and Warnings with the GOES-R Geostationary Lightning Mapper (GLM)

Steven Goodman	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Richard Blakeslee	NASA/MSFC	Huntsville, AL
William Koshak	NASA/MSFC	Huntsville, AL
Douglas Mach	University of Alabama - Huntsville	Huntsville, AL

GOES-R Senior Program Scientist Dr. Steve Goodman gave an update on Geostationary Lightning Mapper (GLM) development.

There is a lightning connection to thunderstorm updraft, storm growth, and decay. The GLM will improve severe weather warnings by allowing forecasters to observe lightning activity associated with thunderstorm development. The addition of GLM data to the Tropical Cyclone Rapid Intensification Index is a future capability enabled by GOES-R. This combination can be used to forecast rapid intensification and rapid weakening. Inner core and rainband lightning provide predictive information.



The pseudo-GLM total lightning detection product was tested at the Hazardous Weather Testbed this year. It incorporates data from ground-based total lightning detection networks. The forecaster feedback from the testbed on this product was very positive as it proved to be an excellent tool for monitoring convection and providing forecast confidence. A new demonstration field test to assess the Lightning Jump algorithm has begun. Research indicates severe storm and tornado lead-time could potentially increase to at least 20 minutes with the use of GLM data. Twenty minutes, on average, is an increase from the current national average of 13 minutes where sometimes the lead time is less (rapid spin up) and sometimes longer (long track supercells).

A new field campaign is underway in Sao Paulo, Brazil to generate proxy data sets for GLM and ABI that include total lightning and SEVIRI. The objectives are to validate the algorithm and proxy data, validate systems performance assessment, storm electrification/physics, and nowcasting applications for GLM and ABI.

Question: There is now dual-pol radar at Kennedy Space Center. Will that data be used?

Answer: The GLM Lightning Detection Science and Algorithm Team is getting that data.

1.7 How AWIPS II will bring GOES-R Capabilities and Science to the Field

Jordan J. Gerth	CIMSS/SSEC/UW - Madison	Madison, WI
-----------------	-------------------------	-------------



Graduate student Jordan Gerth gave an overview of the improved capabilities of AWIPS II and how it will be implemented.

AWIPS I was built specifically for NWS multiple server and multiple workstation hardware configuration. It has numerous components which are stand-alone and are each responsible for a different function. The Programming was mostly done in C and FORTRAN. It has basic visualization functionality. The software with source code is not available even at NWS offices. AWIPS II (2012+) has a service-oriented, client-server architecture that is plug-in enabled. It has only two stand-alone components. The code is arranged in object-oriented Java design with some C and FORTRAN used. Configuration is done through eXtensible Markup Language (XML) and Python. Source code and software is non-proprietary and will eventually be available to the community through Unidata. The Environmental Data Exchange (EDEX) has McIDAS Area format file ingest capability for satellite data.

The data fusion methodology is under investigation by NWS OST as a way to prevent future information overload by combining different data sets into a more complete, actionable product than any one component separately.

AWIPS II is an ideal tool for data fusion since it can quickly combine disparate data types into single products and allow for interrogation of original components. This concept has begun to be tested in various Proving Ground testbeds.

Potential AWIPS II capabilities include a user interface for the multi-channel RGB color capability, updated user controls and color scheme selection, a product browser capability, expanded capability for derived parameters, an EDEX plug-in to handle ingest of GOES-R sectorized CMI products in netCDF4, a CAVE plug-in for displaying bit depths greater than 8, and additional configurability via XML.

NOAAPort is the primary delivery mechanism into AWIPS. It increased its bandwidth this year from 10 Mbps to 30 Mbps. The Local Data Manager (LDM) will facilitate the raw data ingest from NOAAPort into AWIPS II. A repository with a "push-pull" and "on-request" system has been investigated as a way to deliver weather data to remote locations and may reduce the demand for NOAAPort bandwidth for regional data and products. Future AWIPS will be available to universities and become an integral part of increasing research to operations.

2 SESSION 2 – Joint NWA/GUC

Session 2 was devoted to discussing how the GOES-R products can be used by the forecasters and broadcasters. The presentations described the Proving Ground (PG) activities. First, an overall discussion of the PG program, then activities at various locations, and finally ending with the future hopes for the PG.

2.1 GOES-R Proving Ground Partnership

James Gurka	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Steven Goodman	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Timothy J. Schmit	NOAA/NESDIS/STAR/CoRP/ASPB	Madison, WI
Anthony Mostek	NOAA/NWS/OCWWS/Training Division/COMET	Boulder, CO
Mark DeMaria	NOAA/NESDIS/RAMMB	Fort Collins, CO

James Gurka, the GOES-R Ground Segment project scientist, started his presentation describing the Proving Ground and its purpose and objectives. Examples were given of the GOES-R proxy products tested at the Cooperative Institutes (CI), Hazardous Weather Testbed (HWT) Spring Experiment, National Hurricane Center (NHC) 2010 Hurricane Season, and the Aviation Testbed at Aviation Weather Center (AWC) and Alaska. Finally, a discussion of the lessons learned from past activities and a look into future activities were outlined.



The value of the Proving Ground is getting the feedback from forecasters, which the developers use to enhance and alter the products for improved operational use. The following products are currently part of GOES-R Proving Ground demonstrations:

Baseline Products

- Cloud and Moisture Imagery
- Volcanic Ash: Detection and Height
- Hurricane Intensity
- Lightning Detection: Events, Groups & Flashes
- Rainfall Rate/QPE
- Total Precipitable Water
- Fire/Hot Spot Characterization
- Cloud Top Phase
- Cloud Top Height
- Cloud Top Temperature
- Derived Motion Winds
- Aerosol Detection
- Aerosol Optical Depth

Future Capabilities

- Aircraft Icing Threat
- Convective Initiation
- Enhanced “V”/Overshooting Top Detection
- Low Cloud and Fog
- SO₂ Detection

The product demonstrations for 2011 were the following (some of these demonstrations are ongoing):

- Severe Weather: NWS Storm Prediction Center and Hazardous Weather Testbed – 2011 HWT/SPC Spring Experiment– Norman, Oklahoma
 - Focus: Convection
 - Products: Cloud and Moisture Imagery, three products with Convective Initiation, Enhanced “V”/Overshooting Top Detection, two products with Total Lightning Detection, Severe Hail Probability, and Nearcasting product
 - Duration: 17 May – 18 June 2011
 - Improved versions of 2010 products, Cloud and Moisture imagery, Nearcasting
 - 24 forecasters participated from across the country
 - 2-week fire weather demonstration in August

- A couple of examples: the lightning detection with the Geostationary Lightning Mapper (GLM) and nearcasting using the GOES-12 sounder, predicting weather up to 6 hours in advance
- The nearcasting products are scheduled to be released to forecasters the summer of 2012 for a broader evaluation
- One feedback from the GLM demonstration was: "I utilized it as a situational awareness product and then kept a watch on my tried and true radar practices to issue the warning. The Pseudo Geostationary Lightning Mapper (PGLM) data gave me more confidence in my warning[...w]hich is always something that is positive."
- Hurricanes and Tropical Cyclones: NWS National Hurricane Center Testbed – Hurricane Season Experiment 2011 – Miami, Florida
 - Focus: Tropical Weather
 - Products: Hurricane Intensity Estimate, Enhanced "V"/Overshooting Top Detection, Super Rapid Scan Imagery, False color imagery, GOES-R natural color imagery, Rapid Intensity Index, RGB Aerosol/Dust, RGB Airmass, and the Saharan Air Layer
 - Duration: 1 Aug – 30 Nov 2011
 - Many samples of the imagery were given
 - Gain more experience with RGB products
 - Feedback from 2010 allowed for better products in the 2011 experiment
 - Continue evaluation of lightning input
 - Potential new products: Overshooting tops, and a product to discriminate thin from thick cirrus over tropical cyclones, and true color products
 - Provide RGB products in N-AWIPS format
- Aviation Weather: OCONUS - Pacific and Alaska Regions, Alaska Aviation Weather Unit and NWS Aviation Weather Center (AWC) – 2011 Aviation Weather Experiment (ongoing) – Kansas City, Missouri
 - Focus: Aviation
 - Products: Cloud top height and phase (Alaska only), Low Cloud and Fog, SO₂ Detection, Volcanic Ash Detection and Height, Aircraft Icing Threat, UW Convective Initiation, and Nearcasting Model (AWC Only)
 - Duration: 1 Jun – Oct 2011
 - Examples from the Volcanic Ash Product Suite and a future capability of Fog Detection were given
- Ocean Prediction: Ocean Prediction Center (OPC) and NESDIS Satellite Analysis Branch (SAB) – 2011 OPC and SAB Demonstration – Camp Springs, MD
 - Focus: Offshore T-Storms
 - Products: Cloud/Moisture Imagery, Convective Initiation, Cloud Top Phase, Height, and Temperature, Enhanced "V"/Overshooting Top Detection, Lightning Detection
 - Duration: June – Sept 2011
- Alaska Region: GINA, WFO Fairbanks, WFO Anchorage, WFO Juneau, AAWU – 2011 High Latitude and Arctic Experiment – Alaska
 - Focus: Snow/Cloud/Ash/Aviation
 - Products: Cloud Mask, Cloud Phase, Low Cloud and Fog, SO₂ Detection, and Volcanic Ash Detection and Height
 - Duration: 6 Dec – 31 Aug
- Hydrometeorological Prediction Center and NESDIS Satellite Analysis Branch – 2011 HPC and SAB Demonstrations - Camp Springs, MD
 - Focus: Precipitation/QPF
 - Products: Cloud/Moisture Imagery, Derived Motion Winds, RGB Airmass, Rainfall Rate/QPE
 - Duration: July – Oct 2011
- Air Quality: EPA Region III and UMBC – 2011 Air Quality Experiment
 - Focus: Air Quality

- Products: Aerosol Optical Depth, Aerosol Detection (Smoke/Dust), Fire/Emissions, RGB Imagery
- Duration: 11 July – 24 2011
- Coincides with the DISCOVER-AQ experiment

Future demonstrations were also featured:

- Pacific Region – Start Date is still yet to be determined
 - Focus: Tropical Cyclone, Heavy Rainfall, Aviation
 - Products (List is under Review): Tropical Cyclone Intensity, Lightning Detection, Volcanic Ash Detection and Height, SO₂ Detection, Aerosol Detection, Rainfall Rate/QPE, Orographic Rain Index, Total Precipitable Water, Atmospheric Rivers, UW Convective Initiation
- Space Weather: NWS Space Weather Prediction Center (SWPC) and NESDIS National Geophysical Data Center (NGDC)
 - Planning phase-implementation plan in development
 - Solar thematic maps, Solar Ultraviolet Imager (SUVI)
 - Products from NASA SDO to approximate GOES-R SUVI
 - Create means to ingest and display GOES-R like Level 2+ products

Training and education was stressed to operators for Day 1 Readiness. Currently, there are online training modules at the following sites:

- meted.ucar.edu/goes_r/envmon
- cimss.ssec.wisc.edu/satmet
- rammb.cira.colostate.edu/visit/video/goesr101/player.html
- rammb.cira.colostate.edu/training/shymet/forecaster_intro.asp

The Proving Ground is a great source of training materials. There are the “GOES-R 101” video tutorial, classes for young students in grades 7-12, COMET modules, and GOES-R flyers and factsheets. Plenty of information on training can be found on the Web site at www.goes-r.gov/users/training.

The future of the Proving Ground has been outlined through launch. Demonstrations are continuing to further develop and test products. A plan for the transition from Warning Related Products to the remaining Baseline Products, Day 2 Future Capability, Decision Aids, and Decision Support Services is in development. Finally, the GOES-R Proving Ground will enhance its collaboration with JPSS and create fused products, using VIIRS and SEVIRI as proxies for the ABI. Mr. Gurka is confident that, with the Proving Ground in place, operators and forecasters will be Day 1 ready.

Question: There are other satellite systems. Is there a way of leveraging other satellite products to improve GOES-R products?

Answer: Yes. The Proving Ground intends to do more blending of products by using multiple satellite sources. NPP and JPSS are linking to the GOES-R Proving Ground.

2.2 NWS Field Perspective of the GOES-R Proving Ground

Jeffrey P. Craven	NOAA/NWS/NWA Treasurer	Sullivan, WI
Marcia Cronce	NOAA/NWS	Sullivan, WI
Steve Davis	NOAA/NWS	Sullivan, WI



Jeff Craven, Scientific Operations Officer at the NWS Milwaukee/Sullivan WFO in Sullivan, WI, started his talk explaining that this would not be a presentation about results, but about the people and the teams building better products. Forecasters have a routine that is already established and in order to change this routine “we must build a little and test a little.” His work takes place at the NOAA NWS Milwaukee-Sullivan site in Wisconsin where a small testbed was created. In 2010 between May and August 27, CIMSS GOES-R Proving Ground shifts were scheduled, each between 6 to 8 hours. These shifts allowed for one-on-one forecaster and developer interaction to test, analyze, and develop the following products: UW-Convective Initiation, Convective Cloud Top Cooling Rate, and the Differential Theta-e Nearcast. After the shift, forecasters were asked to complete a formal survey in order to tally their feedback. The collaboration with forecasters and developers allowed the development of a GOES-R ABI Weather Event Simulator (WES), which uses simulated images to showcase possible uses of each band.

The same testbed was used again from August to October of 2011 where the emphasis was on GOES-R AWG Low Cloud product and Synthetic GOES-R imagery. These products were viewed on AWIPS and on-line, where developers are trained on how the products are derived and how they should be used. This time the use of Web blogs from the forecasters was another means of feedback. This informal method allowed the forecaster to talk in real-time and think outside of the box, which was later followed by an informal survey.

Mr. Craven then explained why forecasters are getting excited with the upcoming GOES-R data. Some of the reasons for the excitement are the rate of the accessible data (5-minute routine, 1-minute meso sector, 1-minute for GLM), and the spatial resolution (500 meter visible, 2 km water vapor)). Another exciting feature is the ability to sync satellite, radar, lightning, profilers, and ASOS/mesonet observations every 5 minutes. This ability has the potential to change the analysis standard from 1 hour to 5 minutes by the year 2020.

From the feedback obtained from the Proving Ground activities, some preferences were expressed. In general, the raw products are preferred over the derived products, except for the fog product. For some items quantitative measurements are preferred over “yes/no” responses, such as the Cloud Top Cooling Rate versus the likelihood of Convective Initiation. These preferences were derived from analyzing the blogs (goesrhwt.blogspot.com), which are gaining popularity and easier to interpret by developers. To conclude, Jeff re-emphasized the value that the human interaction between forecaster and developer brings to improving the GOES-R products while training the forecasters to use the products.

2.3 GOES-R Proving Ground Activities at the National Hurricane Center

John L. Beven II	NOAA/NWS/National Hurricane Center	Miami, FL
Michael Brennan	NOAA/NWS/National Hurricane Center	Miami, FL
Mark DeMaria	NOAA/NESDIS	Fort Collins, CO
John Knaff	NOAA/NESDIS	Fort Collins, CO
Chris Velden	CIMSS	Madison, WI



Dr. Jack Beven, Senior Hurricane Specialist at the National Hurricane Center (NHC), outlined the NHC Proving Ground activities. In the year 2010 the NHC evaluated the following baseline imagery products and decision aids: Hurricane Intensity Estimate (HIE), RGB Air Mass, RGB Dust, Saharan Air Layer (SAL), Super Rapid Scan Imagery, and Lightning-based Rapid Intensity Index (RII). The evaluation of those products is ongoing. In the year 2011 three products were added to the list: Tropical Overshooting Top Detection, GOES-R Natural Color Imagery (From MODIS), and Pseudo Natural Color Imagery (from METEOSAT). The observations and comments made at the NHC during the 2011 Hurricane

Season, which was not over by the time of the conference, were:

- NHC is now ingesting N-AWIPS compatible versions of the RGB airmass/dust products provided by SPoRT
- RGB products are very useful in evaluating the environment around eastern Atlantic disturbances – one non-developing disturbance had dry air to the west and dust to the east
- RGB products helped evaluate extratropical transition of several cyclones
- RGB dust product proved capable of showing dust all the way to the image limb
- Pseudo-natural color imagery proved useful in differentiating between convection and low clouds, as well as showing dust outbreaks
- Not a lot of cases to test out rapid intensification algorithms
- HIE evaluation just beginning and will be complete sometime next year. Preliminary indications is that the higher temporal sampling may make the HIE more responsive to short-term changes than the operational ADT.
- Super rapid scan imagery was very useful near sunrise for center location and aircraft go/no go decisions

Dr. Beven concluded that the Proving Ground is a constant learning experience that is benefited by the feedback received on the image products and algorithms. More experience is needed, especially with lightning and overshooting top products however, training more on these products is limited to forecaster availability. New products will be added in the 2012 season. NHC is hopeful that more experience is gained with the forecasters.

Question: This year the Hurricane Center took a much more active role in calling for Rapid Scan Operation periods, especially for the initial development of the storm and as the storm was making landfall. Can you comment further on the use of RSO during those times?

Answer: On the development side, the NHC often needs extra imagery in the morning to make decisions. If there is a system in the Caribbean and an aircraft is scheduled to go there at 18 UTC, a decision to fly or not is needed by sunrise. Sunrise is where there are gaps in the imagery because of the scan strategy. This year the NHC requested a rapid scan operation to get more imagery in the morning to help determine the presence of a low level circulation and whether an aircraft should be sent or not. The landfall is part of the GOES-R process. The NHC is trying to collect more rapid scan and super rapid scan images near landfall. In the past, a lot of research institutes, such as CIRA, have called for rapid scan operation during landfall. This is why the NHC has taken a more active role hand in it this year.

Question: A representative from User Services in NESDIS operations spoke to NHC TSB Branch chief, Dr. Jiann-Gwo Jiing, about his concerns with infrastructure, data flow and antennae preparedness. What have you heard from this branch?

Answer: The NHC has its own GVAR ground station and do not get satellite data through the satellite network, AWIPS, N-AWIPS, or AWIPS II. The GVAR feed is taken and processed internally to display through the N-AWIPS system. With GRB and the necessary upgrades needed, there are concerns about what the next steps will be to have a ground system. A short term issue is that there are not enough technical people available to handle the changes. The GOES-R Proving Ground is a lower priority than the maintenance of the other systems, so progress is slower. The NHC had its own ground station for over 20 years and the longer term decision on the ground station has not been made.

2.4 The GOES-R Proving Ground at NOAA's Storm Prediction Center and Hazardous Weather Test bed

Christopher Siewert	OU-CIMSS	Norman, OK
Kristin Kuhlman	OU-CIMSS	Norman, OK
Steven Goodman	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Bonnie Reed	NOAA/NWS/OST	Silver Spring, MD
Russell Schneider	NOAA/NWS/SPC	Norman, OK

Chris Siewert, GOES-R Satellite Champion stationed at the Storm Prediction Center, started his presentation by defining the Hazardous Weather Testbed (HWT) as a facility and an organization. The goals for the Proving Ground at the HWT are:

- Demonstrate products and capabilities available on GOES-R within an operational forecast/warning environment
 - Severe Weather (forecast and warning), QPF, Convective Initiation, and Fire Weather
- Build connections with non-satellite research community
 - Radar (dual-pol, MRMS), NWP, and Lightning (LMA)
- Discover product, display and demonstration limitations/successes and suggest improvements
- Define product training and display requirements
- Accelerate the R2O (and O2R) process for current satellite decision support tools
 - Expose the satellite research community to operational challenges



The 2011 Spring Experiment occurred from 9 May – 10 June, during the central plains peak severe weather season. The main focus of the experiment was on severe Quantitative Precipitation Forecast (QPF) and Convective Initiation (CI). Twenty-four NWS forecasters and many visiting scientists participated and eight products were demonstrated. During this collaboration, Weather Event Simulator (WES) cases were developed for training purposes.

The feedback from the experiment was captured at the HWT blog (goesrhwt.blogspot.com) and from the informal Web-based surveys: 51 percent of Experimental Weather Program (EWP) forecasters reported increased confidence in using the products, 5 percent reported decreased confidence (which amounts to one to two people), and the rest reported same confidence level.

The 2011 Fire Weather Experiment happened on 22 Aug – 2 Sept, during the Western US fire weather season. The main focus of this experiment was on dry thunder forecasting. Six NWS forecasters and several internal guests participated and 5 products were demonstrated. Real-time fire weather forecasts used N-AWIPS forecasting 24-hour burnable fuels and dry thunder threat.

The final report for the 2011 Spring Experiment is available at the URL: <http://www.goes-r.gov/users/pg-activities-01.html>. The 2011 Fire Weather Experiment Web page is still in development. More information on the Spring Experiment can be found in the Program Overview and Operations Plan document (http://hwt.nssl.noaa.gov/Spring_2011/Spring_Experiment_2011_ops_plan_13May_v5.pdf).

Question: There was talk during the end of the Spring Experiment about the possibility of making nearcast forecasting available to SPC forecasters and operators. Has that happened?

Answer: HWT was going to bring it in as an experimental product. However, a formal approach of bringing this product in was desired. A more solid transfer of data is to send it through NESDIS rather than bringing it in from Wisconsin. There is work being done on a more formal transition of the product.

2.5 Advancements Toward Fused Satellite, Radar, NWP, and In Situ Aviation Weather Decision Support

Wayne Feltz	SSEC/CIMSS/UW- Madison	Madison, WI
-------------	------------------------	-------------

Wayne Feltz was unable to attend the conference and his presentation was given by Tim Schmit. The main focus of the talk was weather decision support fusion. Examples were given of how these fused products have been used. GOES-R/JPSS satellite based weather decision support will be fused systematically at the developmental, subject matter expert, and operational venues.

- GOES-R algorithm development has fostered new decision support applications with current imager technology and new JPSS PG:
 - The applications included Convective Initiation, Overshooting-top, Volcanic ash, SO₂, Fog/low cloud, Cloud typing, Fires
- We have a vested interest in fused satellite-based decision support products (AWG to Proving Ground connections)
- This very exciting interaction and process has shown new ways to uses Polar and Geostationary data fusion for NOAA decision support guidance and will occur at multiple stages within research to operations process

Finally, Mr. Schmit went over the NPP launch and JPSS:

- JPSS will be particularly valuable over northern Alaska and polar regions where multiple overpasses should provide near geostationary-like capabilities and therefore compliment GOES-R
- VIIRS will provide low-light imaging capability, new uniform nadir to limb horizontal resolution and improved temporal latency, all important for aviation applications
- CrIS will provide an additional hyperspectral platform for monitoring atmospheric stability, flight level temperature for fuel conservation purposes, polar wind information, and an improved high latitude volcanic ash monitor. This is of interest because the US to China routes are expected to increase rapidly in the near future

GUC Lunch Panel – “The Path Forward to Ensure User Readiness for GOES-R”



Moderator:

Steven Goodman	NOAA/NESDIS, GOES-R Program Office	Greenbelt, MD
----------------	------------------------------------	---------------

Panelists:

Michael Johnson	NOAA/NWS/OST	Silver Spring, MD
Vanessa Griffin	NOAA/NESDIS, GOES-R Project	Greenbelt, MD
Anthony Mostek	NOAA/NWS/OCWWS/Training Division/COMET	Boulder, CO
Rusty Billingsley	NOAA/NWS/Southern Region HQ	Fort Worth, TX
Dan Satterfield	WHNT NEWS 19	Huntsville, AL

Dr. Steve Goodman was the moderator of Thursday’s lunch panel, which was about opportunities and challenges to user readiness. He wanted the panel to provoke an interesting discussion. The panel started with short presentations followed by questions and comments from the audience.



The first presenter was Rusty Billingsley, Chief of Science and Technology Services Division at the NWS Southern Region Headquarters. The focus of his presentation was on NWS science needs and the relationship of those needs to future instruments and products. He reviewed the science vision written several years ago by the NWS Scientific Services Division (SSD) chiefs, concepts of which have been incorporated into the Office of Science and Technology (OST) road map. The main science priorities from this vision are: warn-on-forecast for high impact events, convective initiation, and skillful use of convective resolving models. Other science

priorities include the development of the next generation forecast system, better analysis and integration of observations, decision support services to aid with lead time, and more social science integration. The SSD chiefs stressed that products are helpful, but are more helpful when integrated and fused with other data sources and applications.

“We are really excited about the Proving Ground,” said Mr. Billingsley. “I was a science officer in the last series of GOES back in the 90’s, and we were excited about just seeing moving pictures. Nevertheless we got products at that point, but we sort of got products thrown at us – ‘here you go’. There was no Proving Ground; there was no way to get to back with the developer, to talk about these things. So we are really excited that it exists.” The bottom line from the SSD stand-point is: “What does GOES-R bring to the table to help us do our job?” Simply bringing satellite products alone is not enough. The products need to be holistic, fused, and integrated to support NWS transitions in the future.



The next presenter was Dr. Mike Johnson, the Satellite Team Lead for the Program and Plans Division, National Weather Service Office of Science and Technology. The focus of his presentation was the planning for new satellite exploitation in future operations and what the roles are at NWS Headquarters. He explained that in the NWS OST, the direction toward integrating new technology comes from input from the SSD chiefs who represent science infusion into operations and the NWS Corporate Board, along with input from science chiefs from the NOAA National Centers.

The SSD chiefs' document mentioned in the previous presentation provided the basis for several planning documents that have been created for the Science and Technology Roadmap, particularly the Services Roadmap. The NWS is moving toward a services support role.

Dr. Johnson recognizes that the challenge right now for NOAA is dealing with strong downward pressure on budgets that has impacted the GOES-R and JPSS programs and all other aspects of NOAA. There is great uncertainty over what the budget will be in the immediate future, which makes planning difficult. He outlined the near, short, and mid-term goals as they currently stand and stressed the continued evolution due to the budget.

Dr. Johnson then discussed Proving Ground and Risk Reduction activities from a NWS standpoint planned from now through the year 2020, and beyond. The current focus for products is on Day 1 Readiness. NWS would like to see JPSS and NPP join the GOES-R Proving Ground effort to develop concepts to aid in forecasting and decision aids. Fused products will be essential to the forecaster as long as the ability to display individual components of the fused product is available. Currently, forecasts are based on Numerical Weather Prediction (NWP) models and the warning process is situational awareness based on observations like radar data. In the future, NWP will be integrated and fused with multiple observations every 15 minutes. This is data that will be available to the forecaster. The data will play an integral role in short-term warning operations and forecasts, fulfilling the goal of a service based organization.



The next presenter was Tony Mostek, who is the Forecast Decision Training Branch (FDTB) Chief from the NOAA/NWS Office of Climate, Water and Weather Services (OCWWS) in the Training Division. He also serves as Federal Program Office of the UCAR COMET program in Boulder, Colorado. Mr. Mostek's focus was user readiness training and its opportunities and challenges. One of many major challenges from his perspective is that some satellite requirements and current data/product concepts are very outdated, primarily, those involving power generating, limited processing, remapping of data, and how people gain access to the data. His concern is that future plans are including the outdated legacy approaches that are difficult for federal agencies to break out from. Budget

and financing issues are a direct cause for the slow evolution.

One opportunity that resulted from re-allocating budget resources to help in the evolution of new ideas was creating the Proving Ground in 2008. This causes the forecasters to get involved early, providing valuable feedback to product developers. From the training perspective, the human must remain a focus, which can be neglected when there is a focus on technology and modernization. The key is to ensure that addressing human needs is keeping pace with technological advancements.

The challenge for training is ensuring that the users and forecasters will be ready for future technology. Training is about performance improvement and user readiness as well as innovative solutions tested using simulations. The training division plans to implement more weather event simulations into future training. Mr. Mostek's final comment was that readiness is about working through the Proving Ground and testbeds, as well as being open to new ideas and opportunities.



Dan Satterfield, the Chief Meteorologist at WHNT-TV News 19 in Huntsville, AL took the stage after Mr. Mostek to give a broadcaster perspective. His perspective captured the view of the general public, whose science knowledge is very rudimentary. He explained that people, in general, do not want the science behind the weather, they just want to know when the next storm is coming, will there be tornadoes, is there a chance for snow, etc. Mr. Satterfield also made the comparison of satellites to radar and how radar technology has products that can predict the arrival of a storm to within 2 to 3 minutes. No satellite software has been shown to the broadcast community with that kind of technology. The average person does not understand the difference between satellite and radar meteorology.

During severe weather broadcasts on television, no satellite images are shown. He says, "The world is about to change big-time and if we want to get the government to think the same way about satellite meteorology as we do about radar meteorology, we have to be better ambassadors. I have to be a better ambassador of the science but you too have to be better ambassadors of the science."



The final lunch panel speaker was Vanessa Griffin, Project Manager for the GOES-R Ground Segment. Her talk was about User System Readiness. One of the major changes with GOES-R is that 40-50 times more data is being transmitted than by the previous N-O-P satellites. This is a major challenge for many users to try to handle that amount of data. GOES-R will have 5-minute full disk images in Mode 4 and 15-minute full disk images in Mode 3 with a full set of Level 1b data. The main goal and challenge for the ground segment is ensuring that the system is ready to stream the data and is ready to produce the baseline products from that data for Day 1 operations.

A full disk image of ABI is about 3 GB of data. Every five minutes, over GRB or the PDA system, the ground segment will receive 325 GB of data a day. In 3 days the data would fill up any home computer hard drive. This will be a huge change for GVAR users whose antennas cannot handle the data volume from GRB. An upgrade will be necessary to new antennas, receiver hardware, and a processing system. There are receiver frequency shifts from 1685.7 MHz to 1686.6 MHz, dual circular polarized signals, and a data rate transition from 2.11 Mbps to a total of 30 Mbps. LRIT and EMWIN systems will have to make similar changes. The GOES-R Program has an approach to help the users and users' systems to become ready. There is a NWS Ground Readiness Project that addresses IT infrastructure issues within the NWS, NPP, GOES-R, JPSS, and others. The User Readiness Plan draft will be ready in November 2011. This is a program plan that describes everything being done to prepare the user including activities from COMET, Risk Reduction, Proving Ground, etc. As part of that plan, the ground segment is responsible for the User System Readiness Plan, which provides support to help external NOAA systems receive GOES-R data. More detailed information is given in her presentation during Session 4.

The presentations sparked an interactive discussion between the audience and the panelists. A summary of the discussion is below.

Question 1: What is the importance of training forecasters on fused products?

Discussion/Comments:

- There will be a deluge of data that is going to be fused together with combined products and there has to be some way that the forecaster can look at the fused product to know if it is actually any good or not.
- Build in a mechanism by which the forecaster can check to see if the data or fused product is any good.
- The ultimate fusion of that data is going to occur in the forecaster's head.

- Keep the human in the loop and up front, even in the cost cutting environment.
- Budget cuts are affecting the training program.
- Focus on users outside of NOAA, which is a challenge to the Proving Ground.
- The international community wants to be partners in the Proving Ground.
- Proving Ground needs to include the broadcasters. The toughest job in forecasting for a broadcaster is not what the forecast is going to be, but what to look at to decide what the forecast is going to be. The most important part is making GOES-R products very useful so the forecasters are trust them.
- Raw data needs to be available.
- AWIPS II is not just for the National Weather Service, but it is publicly available GNU-licensed software that needs the hardware to operate it. It is a capability that could potentially be used by the broadcast community or research community.
- NCEP Centers have bandwidth capabilities far greater than what the forecast offices have. Fused capabilities in the forecast office could be very different – and probably will be very different to what you can do in the Hurricane Center.
- Bandwidth is constraining the way data is accessed and used.

Question 2: What new capabilities and decision support systems does the NWS endorse or will endorse? Will the NWS bring satellite and other data to the user community in ways other than AWIPS II?

Discussion/Comments:

- There is still a struggle with dissemination policy in the NWS and what is made available. There are better plans for a lot of things such as satellite imagery and radar data information to be made available to the users in more raw based formats versus making it available in KMZ files or some sort of decision support frame work. It is done locally and regionally, but not as an entity.
- NWS chat is one area where information is disseminated to the user community.

Question 3: Is there a chance to put some of the Option 2 products (Future Capabilities) into the baseline before GOES-R is launched? If not, multiple users have asked, once GOES-R is launched and in orbit, will Option 2 products be created for operational forecasters to use down the road?

Discussion/Comments:

- The intent of the GOES-R Program Office (GPO) is to try to do what they can.
- NWS thinks that the Option 2 products are really important.
- Funds are somewhat limited.
- These products are viewed as Day 2 capabilities that could be brought forward. Baseline products are at launch and Option 2 products are considered post-launch. There may be a possibility of one or two Option 2 products coming in early, but it is unlikely right now.

Question 4: Besides the NWS, there are other groups that want to see these Options 2 products. Will they definitely be able to use these products after launch or not?

Discussion/Comments:

- There are talks with the users and NESDIS/STAR (who is developing the algorithms) and their partners at cooperative institutes to see if they can implement the Option 2 products so during check-out. For example, during science tests. The products would be distributed perhaps from NESDIS research labs. Even though they are experimental products, people currently use that kind of thing in operation as well.
- Option 2 products are being taken off of the Harris contract from a budget perspective.
- However, the system has been designed from the beginning to be extremely flexible – plug and play, so that new algorithms could be brought in quickly at a later time and put into operations if need be. The design and flexibility to add these products as resources are available in the future.
- There was initial concern from the user community that the science of the products would not be able to be improved due to delivering the algorithms years before launch. By adding the Option 2

products post-launch, there is an opportunity to improve on the science of those products over the next several years.

Question 5: How can the people of GOES make satellite data as accessible as radar, especially with budget issues, and how can we train everyone?

Discussion/Comments:

- If there is a way to develop a useful algorithm from GOES-R for the public to use as an app on their smart phones, then there will be no worry about budget cuts.
- There is a "lite version" app which already has radar and satellite on it. There are a lot of built in capabilities. There are a lot of power users out there, while they might not be scientists, there are a lot of geeks out there, and weather draws them in. While there are some limitations on how many and how well they understand those products, we have a base of some "real fans".
- Once those products get out there, then there is a dumbed down version for almost everyone else that gets to be very popular. Forecasters may not like Yes/No products, but that may be perfect for the public.
- There was a post on Facebook about a recent dust storm with a link to the CIMSS satellite blog that captured a side by side image of all three GOES satellites which showed the dust. Using social media can open a lot of doors which the program needs to be aware of it and build on it.



Dan Satterfield explaining the how phone apps can make a difference

Dan Satterfield had some success with detecting tornadoes and snow using new dual-polarization radar data. These are some lessons learned:

- The problem with forecasting is the need for the algorithm. He can't show on television differential reflectivity on the air without explanation, but he can show the hydrometeor display with rain, snow, graupel, etc.
- Algorithms are good. The forecaster likes the raw data, but if improvements can be to make the algorithms so that people can look at it quickly and understand it, they will like it. That is what happened with dual-polarization radar.
- Bob Baron has made a lot of money off of one little thing that he calls the Baron button or his tornado index, which just shows what the risk of a tornado is on a scale from 1 to 10. The forecaster wants to see the raw data, but the public loves that. The Weather Channel is even using it now.
- If broadcasters can obtain easy to understand graphics and capabilities of GOES-R to broadcast during their shows, it will be very popular.

Question 6: What is in store for the blended products? Who will make them and how?

Discussion/Comments:

- The NWS WFOs really want and need the blended products but do not know where they come from. Some scientists are developing them within NESDIS.
- The NWS is already expanding their vision beyond integrated satellites where they want satellite, radar, *in situ* and NWP integration.
- A team of experts have to work together to develop a blended product, present it to forecasters for the content and then have it validated.

Question 7: What is the latency with satellite products from the end user perspective as well as the ground system perspective?

Discussion/Comments:

- Latency is important for things like convective initiation which has to come within seconds to minutes for it to be useful.
- The development of fog in valleys at night probably does not make much difference if it is 10 or 15 minutes late or does not get processed right away.
- Latency has been an impact in the past on trying to get people excited about some of the products.
- According to the GOES-R ground segment, latency is driving everything from design to cost. It is driving how products are produced with the scientific integrity and quality that is needed and can be done quickly enough to get in hands of operations to save lives and property. Latency is the priority right now.

3 GUC SESSION 3 – Benefits of GOES-R Products for Forecasters/Broadcasters - Part I

Session 3 was the first of two sessions devoted to discussing how the GOES-R products can be used by the forecasters and broadcasters. The presentations describe the status of training courses, and sample data product availability. An overview is given of the improved instruments onboard GOES-R with implications for space weather. Finally, the broadcaster point of view is given.

3.1 Overview of GOES-R Proving Ground Activities at SPoRT

Gary Jedlovec	NASA/Earth Science Office	Huntsville, AL
Kevin Fuell	University of Alabama - Huntsville	Huntsville, AL
Andrew L. Molthan	NASA/Earth Science Office	Huntsville, AL
Matthew Smith	University of Alabama - Huntsville	Huntsville, AL
Geoffrey Stano	ENSCO	Huntsville, AL

Dr. Gary Jedlovec, atmospheric scientist at NASA/Marshall Space Flight Center, Global Hydrology and Climate Center and principal investigator of SPoRT, gave an overview of GOES-R Proving Ground activities at SPoRT. SPoRT is focused on transitioning NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts. It collaborates with 20 WFOs across the country, National Centers, NOAA testbeds, and private sector users.



He summarized the status of the products that have been tested with SPoRT. The Pseudo-Geostationary Lightning Mapper products were tested in the SPC/HWT Spring Experiment. This test concentrated on the flash extent and flash density products derived from ground-based LMA data, AWIPS, and AWIPS II. These products are similar to the Algorithm Working Group optical proxy GLM product which is not yet available. A GOES-MODIS Hybrid Product is being evaluated at eight WFOs. It replicates the spatial resolution of selected ABI channels and combines MODIS imagery with GOES-East 15-minute imagery to create an animation. The Convective Initiation Product was reformatted and disseminated to the SPC/HWT Spring Experiment and is currently being evaluated at three WFOs.

Other products being sent to AWIPS/AWIPS II stations from SPoRT include the Red-Green-Blue (RGB) channel composites that simulate ABI capabilities. This product is the result of collaboration with CIRA. It is generated from MODIS, SEVIRI, GOES Sounder, and simulated ABI radiance data. It is being used at most National Centers and several WFOs. SPoRT has developed a high-resolution SST composite for testing that is created from two to four times daily MODIS derived SSTs combined contiguous field. Lastly, a Lightning Forecast Algorithm (LFA) product has been created which produces total lightning forecasts. It is based on Weather Research and Forecasting (WRF) forecast model microphysics and aids in GOES-R GLM lightning analysis and data assimilation.

Forecaster feedback was provided on a recent hybrid imagery assessment. Of the 30 responses, 21 forecasters said that the imagery had some to large impact while nine indicated little impact on forecasting. Twenty-six forecasters also said that they would recommend the product to other forecasters.

In the future, SPoRT plans to help transition Proving Ground products to AWIPS II. They will also expand collaborations in the Alaska and Pacific regions (OCONUS), as well as enhance the use of RGB proxy products at WFOs and National Centers.

Question: When looking at EUMETSAT web site, they have 10 RGB products. Any plans to expand the RGB products?

Answer: Mimicking those products with MODIS, which are available on the ftp site. There will be continued work with NHC to get those there.

3.2 Training in the NOAA Satellite Proving Ground – Focus on User Readiness and Decision Support Services

Brian Motta	NOAA/NWS/OCWWS	Boulder, CO
Anthony Mostek	NOAA/NWS/OCWWS/Training Division/COMET	Boulder, CO
James Gurka	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Timothy J. Schmit	NOAA/NESDIS/STAR/CoRP/ASPB	Madison, WI



Brian Motta from the NWS Forecast Decision Training Branch spoke about satellite Proving Ground training. The NWS is moving toward impact-based decision support services, mobile device messaging/alerting/locating, full-resolution data and meta-data, and a Weather Ready Nation.

The training community is composed of the NWS Training Division, NWS Training Center, Warning Decision Training Branch, and the Forecast Decision Training Branch. Also, many partners in NOAA including NESDIS, NWS, OAR, OED, NOS, NOAA Cooperative Institutes and Programs, UCAR/COMET, U.S. agencies, colleges and universities, and the private sector. The private sector, in particular, is an area where focused training is lacking and is necessary.

There are many online training sources. Virtual courses are available from VISIT. COMET MetEd provides several online training modules about GOES-R and GOES-R products. The international community has also become involved in training development. Some key partners affiliated with the World Meteorological Organization Space Programme Virtual Laboratory are the Centres of Excellence in Americas (Argentina, Barbados, Brazil, and Costa Rica), EUMETSAT, Canada, China, Japan, Australia, and others.

GOES-R Proving Ground training must keep pace with rapidly evolving technology and operations. It must maintain interaction with human testers in order to provide appropriate training for their needs. It must also be mindful of evolving societal needs and impacts.

Funding has been approved for collaborative projects under the COMET Outreach Program. The new funding is designated to support Proving Ground activities in testing, validating, or finding innovative uses for GOES-R products. Projects are for a year with a \$15,000 limit. To participate, a university must collaborate with a NWS office.

3.3 GOES Data and Products in the Space Weather Forecast Office

Mary Shouldis	NOAA/NWS/Space Weather Prediction Center	Boulder, CO
Rodney Viereck	NOAA/NWS/Space Weather Prediction Center	Boulder, CO
Steven Hill	NOAA/NWS/Space Weather Prediction Center	Boulder, CO
Josh Rigler	NOAA/NWS/Space Weather Prediction Center	Boulder, CO
Juan Rodriguez	NOAA/NWS/Space Weather Prediction Center	Boulder, CO
Paul Lotoaniu	NOAA/NWS/Space Weather Prediction Center	Boulder, CO

Mary Shouldis, research assistant at the University of Colorado/CIRES, is the team lead for the Satellite Data Product Development group at the Space Weather Prediction Center. SWPC provides support to the electric power industry, commercial airlines, GPS users, aerospace and satellite industries, and many government agencies. The National Geophysical Data Center provides the archive, access, and assessment functions for the Space Weather program.



Space weather data from geostationary satellites provides continuous monitoring of the sun and near-earth space environment. GOES-R will host a new suite of space weather sensors. The Energetic Particle Sensor monitors energetic electrons, protons, and heavy ions. The new GOES-R EPS will provide a major increase in energy range and heavy ion composition. Space Environment In-Situ Suite (SEISS) will provide real-time situational awareness for operators of GOES and other geostationary satellites. The Magnetometer monitors the vector magnetic field at geosynchronous orbit. Level 2 algorithms on GOES-R will provide automated magnetopause-crossing detection, quiet field comparisons, and automated sudden impulse detection. The Extreme Ultra-Violet Sensor (EUVS) provides observations of the solar EUV spectrum from 5 to 125 nm. It provides solar EUV input to thermosphere and ionosphere models which provide specification and forecasts. GOES-R EUVS will observe spectral regions with three small spectrometers which measure the intensity of critical solar lines from various parts of the solar atmosphere, and then models the rest of the solar spectrum. This approach will be validated.

The X-ray Sensor is important for monitoring solar flares. In GOES-R, this sensor will have a quad-diode design which will provide the capability to automate flare location on the sun using sensor capabilities. Automated flare event detection will be combined with SUVI flare detection to highly automate flare reports and enhance warning capabilities. The X-Ray Imager provides full disk soft X-ray images. The new imager will also include the ultra-violet range. It will provide flare location information, active region complexity, and coronal hole specification. GOES-R capabilities will improve the SWPC capabilities, timeliness, and accuracy.

3.4 GOES-R for Broadcast Meteorologists

Dan Satterfield	WHNT NEWS 19	Huntsville, AL
-----------------	--------------	----------------



Dan Satterfield, Chief Meteorologist at WHNT News 19 in Huntsville, Alabama presented the challenges faced by broadcast meteorologists and how GOES-R will change that industry. Radar technology has improved tremendously since the eighties and is an integral part of broadcast meteorology. Satellite meteorology is changing rapidly, but not on television weathercasts. In order to show satellite images, such as from MODIS, the broadcaster must obtain the images from the Internet and load them into the graphics machine. With all of the other duties that accompany a broadcast meteorologist, there is little time left to try and find satellite images online to broadcast on a news show. This is a major reason why so few satellite images appear on the local news. The graphics vendors such as Baron, WSI, Weather Central, Accuweather, and others do not have satellite images readily available as they do with radar scans.

GOES-R is the satellite equivalent to the dual-polarization radar revolution. GOES-R products need to be readily available to the public through the broadcast meteorologist as well as outlets like cell phone apps to follow in radar's footsteps. Once the public understands the power and usefulness of satellite data, funding issues would probably start to decline.

4 GUC SESSION 4 – Benefits of GOES-R Products for Forecasters/Broadcasters - Part II

Session 4 was the second of two sessions devoted to discussing how the GOES-R products can be used by the forecasters and broadcasters. The presentations describe sample data product availability, a status from EUMETSAT, GOES-R post launch activities, and finally a recap from the past GUCs. After Session 4 an open discussion was held to answer and capture any unresolved questions from the audience.

4.1 Developing and Evaluating RGB Composite MODIS Imagery for Applications in Forecast Offices

Andrew L. Molthan	NASA SPoRT Center/NASA/MSFC	Huntsville, AL
Hayden K. Oswald	USRP/NASA Summer Intern Program; University of Missouri	Columbia, MO
Kevin K. Fuell	University of Alabama-Huntsville/NASA SPoRT Center	Huntsville, AL

Dr. Andrew Molthan presented for Hayden Oswald, who was unable to attend the conference. The motivation for their research is the high volume of satellite data that will be available from GOES-R. RGB compositing is a more effective way to visualize satellite data than single channel products alone. MODIS data was used to provide a preview of GOES-R capabilities.



The colors in RGB images have direct physical correlations and each color (red, green, and blue) is assigned to a channel or channel difference. The relative intensity defines the color of the pixel. The contribution of each color to a pixel in the image is proportional to the contribution of its assigned channel. These RGB techniques being used by SPoRT with MODIS data have been adapted from EUMETSAT using SEVIRI data. Two RGB products were discussed in this presentation.

The first product discussed was Nighttime Microphysics, which helps distinguish among high clouds, low clouds, and fog. Current observations and satellite products do not resolve nocturnal fog events. They use single channel 10.8 μm infrared or a spectral difference 10.8 μm - 3.9 μm . This product uses MODIS channels 12.0 μm - 10.8 μm (red), 10.8 μm - 3.9 μm (green), and 10.8 μm (blue). One case study on 24 November 2010 at 0815 UTC in the Southeast was presented as an example of how the product can be used. One conclusion from the case study showed that fog events are clearer and the product was able to detect low clouds. This was an improvement compared with single channel imagery. However, the unconventional color scheme (adapted from EUMETSAT) will require training for forecasters. The new images show shades of blue to detect fog, rather than a binary output. Another disadvantage is that the appearance can be influenced by surface temperatures. Nevertheless nighttime microphysics product provides a better technique for nocturnal fog detection than current techniques.

The next product discussed was Air Mass, which helps to distinguish among synoptic-scale features, such as fronts and jets. This product uses MODIS channels 6.2 μm -7.3 μm (red), 9.7 μm - 10.8 μm (green), and 6.2 μm (blue). The blue channel is inverted so instead of water vapor appearing bright white, it will appear in darker tones. This is what the sensor actually sees before the image is flipped. The current technique is single channel water vapor imagery from GOES at 6.7 μm . A case study was performed for the data from 18 April 2011 at 0815 UTC during a severe weather event in the Southeast. Some conclusions for this case study are that RGB color characteristics increase certainty when identifying features, the product combines several channels into one product, it provides a preview of GOES-R capabilities, and it can be used to identify vorticity maximums in some cases. However, clouds can obscure frontal boundaries and lower clouds can have similar colors as the air masses. The air mass

product efficiently combines a larger volume of data to provide the operational community with a more versatile, accurate diagnostic tool than water vapor imagery.

Efficient methods must be employed to utilize available data to its full potential. RGB compositing provides a way to optimize multiple satellite data with a single product. The NASA SPoRT Center will continue developing RGB satellite product for transition to NWS forecast offices.

Question 1: A question about the data volume, which depends on where the combining is being done: If these products are not centrally generated for the bands in AWIPS II, and there is no data loading and offloading, maybe it can save bandwidth, as opposed to centrally generating one and sending it to another product.

Answer: It is true that it depends how the products are made. If all of the bands are already being provided, then they can be combined on site and there is no savings in bandwidth. If only select bands are distributed, then rather than send additional full bands of data, the RGBs can be provided and still contain some of the data without distributing the full data set. Regardless, it is probably better to have algorithms established to produce a consistent set of RGBs among all forecasters and offices rather than allowing for significant in-office tuning, since even minor adjustments will impact the color of the composite and complicate image interpretation. The development of standard training among all groups requires standard algorithms among all users.¹

Question 2: Is the microphysics the same as the dust product?

Answer: These products are not the same. They use different wavelengths and color combinations. SPoRT provides both of these products. The daytime microphysics product is also NOT the same as either of these – it provides capabilities similar to the nighttime product but is derived differently because it uses the 3.9 μm reflectance, whereas the nighttime microphysics product uses the 3.9 μm temperature (hence ‘nighttime’ because it doesn’t use the solar component). Yes, the resulting color combinations from the different products result in different interpretations, even for two products named “microphysics”.

4.2 Improving Short-Term Predictions and the Identification of Hazardous Weather

Deirdre Kann	NOAA/NWS WFO	Albuquerque, NM
Brian Guyer	NOAA/NWS WFO	Albuquerque, NM
Annette Mokry	NOAA/NWS WFO	Albuquerque, NM



Deirdre Kann, Scientific Operations Officer at the NWS Albuquerque, NM WFO, spoke about the GOES-R product testing being conducted at her office. A suite of four SPoRT products was chosen based on the following local forecast challenges: large county warning area (~90,000 square miles, largest in OCONUS), diverse terrain (elevation ranges from 3,000 to 10,000 feet above ground level), relatively few surface observations (none in the east and northwest), poor radar coverage (not positioned close together), and a wide range of hazardous weather (such as fog, winter weather, severe thunderstorms, flash floods, and fire weather).

In September 2010 the CIRA blended TPW product accurately predicted the surprising amount of rain where some areas received 6 inches. The use of MODIS False Color Composite product accurately evaluated snow areas in January and February 2011 and was used to track snow and learn more about snow distribution. MODIS-GOES hybrid imagery is the combination of high-resolution imagery from MODIS and standard GOES. A MODIS swath replaces GOES whenever it is available and GOES fills time periods between MODIS overpasses.

¹ Dr. Molthan expanded on his response for inclusion in this report.

The Wallow fire in Southeast Arizona on 29 May 2011 created a smoke plume on 2 June. Southwest winds pushed the smoke towards central and northern New Mexico. Visibility was about one mile and the air quality was poor over large areas. The MODIS Color Composite was used to verify the initial point of the fire.

The CIMSS Convective Initiation product has been a success. It improved the decision making process by supplementing data void areas and enhancing current satellite analysis techniques.

4.3 Meteosat Third Generation (MTG): An Innovative Approach to Advanced Observations from the Geostationary Orbit

Rolf Stuhlmann	EUMETSAT	Darmstadt, Germany
Sergio Rota	EUMETSAT	Darmstadt, Germany
Lothar Schwarz	EUMETSAT	Darmstadt, Germany
Chris Hartley	EUMETSAT	Darmstadt, Germany

Dr. Rolf Stuhlmann began his presentation with a brief history of the EUMETSAT Satellites. The first generation of EUMETSAT spinning satellites began in the year 1977. In the year 2002 the second generation was launched with improved instruments: Geostationary Earth Radiation Budget Experiment (GERB) and Spinning Enhances Visible and Infrared Imager (SEVIRI) having 12 channels on a spinning satellite. The Meteosat Third Generation (MTG) will be launched in 2017-2019 and will be based on 3-axis stabilized platforms with a payload consisting of new instruments: the Flexible Combined Imager (FCI), Infrared Sounder (IRS), Lightning Imager (LI), and Ultra-violet, Visible and Near Infrared Sounder (UVN). The MTG series will comprise of six satellites, with the first spacecraft likely to be ready for launch from 2017. The in-orbit configuration will consist of two parallel positioned satellites: the MTG-I (imager) and the MTG-S (sounder) platforms.



The payload complement of the MTG-I satellite consists of three instruments:

- Flexible Combined Imager (FCI)
 - Full Disk High Spectral resolution Imagery (FDHSI), global scales (Full Disk) over a BRC = 10 minutes, with 16 channels at spatial resolution of 1 km (8 solar channels) and 2 km (8 thermal channels)
 - High spatial Resolution Fast Imagery (HRFI), local scales (1/4th of Full Disk) over a BRC = 2.5 minutes with 4 channels at rapid scan high spatial resolution 0.5 km (2 solar channels: 0.6 μm and 2.2 μm) and 1.0 km (2 thermal channels: 3.8 μm and 10.5 μm)
- The Lightning Imager (LI)
 - Global scales (80 percent of Full Disk) detecting and mapping continuously the optical emission of cloud-to-cloud and cloud-ground discharges. Detection efficiency between DE = 90 percent (night) and DE = 40 percent (overhead sun)
 - Similar to the GLM on GOES-R
- The Data Collection System (DCS) and Search and Rescue (GEOSAR)

The payload complement of the MTG-S satellite consists of two instruments:

- Infrared Sounder (IRS)
 - Global scales (Full Disk) over a BRC = 60 minutes at spatial resolution of 4 km, providing hyperspectral soundings at 0.625 cm^{-1} sampling in two bands: Long-Wave-IR (LWIR: 700 – 1210 cm^{-1} ~ 820 spectral samples) Mid-Wave-IR (MWIR: 1600 – 2175 cm^{-1} ~ 920 spectral samples)

- Ultra-violet, Visible and Near Infrared Sounder (UVN)
 - UVN is provided as GMES Sentinel 4 Instruments

The benefits for the new instruments in the third generation include:

Flexible Combined Imager (FCI):

- The 0.444 μm and the 0.51 μm channels with improved RGB will permit surpassing current aerosol retrievals especially over land – also an important contribution to air quality monitoring.
- The 0.91 μm channel will provide during daytime total column precipitable water especially over land surfaces.
- The 1.375 μm channel will improve detection of very thin cirrus clouds not seen by the current system introducing errors in all clear sky products.
- The 2.26 μm channel will provide the capability for an improved retrieval of cloud microphysics.
- The improved spatial resolution (1 km and 2 km) and the extended dynamical range (from 350 K to 450 K) of the 3.8 μm channel will outperform the fire detection quality of MSG and outbid the quality of products as Fire Radiative Energy (FRE) – a climate relevant product directly related to the CO₂ production of active fires.

Infrared Sounder (IRS):

- Provides observations with a thirty-minute repeat cycle over Europe, which will fill large spatial and temporal voids in the 12-hour time standard radiosonde observations and will allow time and space interpolation of moisture/temperature observations taken from the polar orbit.
- Derived information on low tropospheric moisture and its variation are expected to lead to a better depiction of the hydrological cycle in models, potentially providing better precipitation forecast.
- Provides information on vertically resolved atmospheric motion vectors with improved height assignment, which in particular is beneficial for the tropical areas having only a weak coupling between the dynamic and thermodynamic atmospheric fields.
- Provides information to identify pre-convective situations supporting NWC applications to forecast convective initiation.
- Supports forecasting pollution and monitoring of atmospheric minor constituents through its capability to provide estimates of diurnal variations of tropospheric contributions of atmospheric trace gases as O₃ and CO.

Lightning Imager (LI):

- The measurements of total lightning will complement global measurements of ground based systems (e.g., ATDnet) improving the quality of information essential for air traffic routing and safety.
- Inter Cloud and Cloud to Ground (IC+CG) lightning information is used to assess impact of climate change on thunderstorm activity by monitoring and long-term analysing lightning characteristics (coordination with NOAA's GLM mission on GOES-R and GOES-S is essential.)
- IC+CG information on a global scale is a prerequisite for studying and monitoring the physical and chemical processes in the atmosphere regarding NO_x, which plays a key role in the ozone conversion process and acid rain generation.
- IC+CG information on a global scale with known error-characteristic is a prerequisite for assimilation into regional models to improve very short range forecasts of convective events verification/validation of algorithms to nowcast (time and location) convective initiation.

In conclusion the MTG missions will ensure continuation and improvement of existing services and enable new services expected for 2018 – 2038. There are hopes for breakthrough in precipitation forecast exploiting MTG information for regional Numeric Weather Prediction (NWP) and National Weather Center (NWC).

4.4 Optimizing the Lightning Forecast Algorithm within the Weather Research and Forecasting Model

Eugene W. McCaul, Jr.	NASA SPoRT Center/USRA	Huntsville, AL
Jonathan L. Case	NASA SPoRT Center/ENSCO, Inc.	Huntsville, AL
Steven J. Goodman	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Scott R. Dembek	USRA/CIMMS	Kennett Square, PA
Fanyou Kong	Center for Analysis and Prediction of Storms	Norman, OK

Dr. Bill McCaul, research scientist at NASA SPoRT, started his presentation by talking about the motivation of the project. Traditionally, lightning is detected through the measurement of convective available potential energy (CAPE). However, there are many circumstances in which the CAPE fields cover a much larger area than the actual lightning activity detected. A project was created to try to find a more specific technique than just using broad brush indicators. Using the link between lightning and large ice along with a cloud-scale model (like the Weather Research and Forecasting (WRF) model) which prognoses hydrometeors, the Lightning Forecast Algorithm (LFA) seeks to:



1. Create WRF forecasts of lightning threat (from 1 to 36 hours in advance), based on simple proxy fields from explicitly simulated convection
2. Construct a calibrated threat that yields accurate quantitative peak flash rate densities for the strongest storms, based on LMA total lightning observations
3. Provide a robust algorithm for proxy data sets

At the start of this project in 2009, they chose two calibration methods, LTG1 (FLX) and LTG2 (VII). LTG1 is widely used because it seemed to give a more accurate accounting for the lightning, but both are very effective.

From the case study on 24 April 2010, they found that the model accurately shows where the lightning will hit, but still has issues with detecting the intensity. From this case study, it was found that the scatter plot for LTG1 and LTG2 start to diverge. Because of the amount of high false alarms in the current approach, future studies will involve trying to look into two main areas: very low and very high flash rates. Other studies show that by increasing the threshold in LTG1 it decreases the amount of false alarms in winter weather by about 85 percent. The false alarms detected were caused by sleet which is hard to eradicate. However, increasing the threshold could compromise the detected area of the storm. The project still needs to find a balance between precision in detecting the area and providing the fewest false alarms.

Question 1: Forecasters at WFOs are somewhat novices about numeric weather prediction (NWP). You say there are issues with spin-up in the first 4 hours, are you using a hot or cold start?

Answer: A cold start is used. It can have a bias of too much convection in the first 4 hours.

Comment: A group at ESRL is incorporating this routine in their code. Are you aware of that?

Response: Yes, we have been in contact with them and hopefully we'll get a chance to look at their data as well.

Question 2: How do you suggest forecasters use any model predicted lightning data? Do you suggest that they become comfortable with it after some period of time looking at how a lightning prediction model verifies in real-time?

Answer: The algorithm attempts to characterize convection as accurately as possible. The WRF is not going to generate exactly the right storms at exactly the right place, but it can correctly simulate the general character of convection given the lightning density in the region. If forecasters see storms with high flash rate of densities, they might think something will happen later that day. The

algorithm is only a general characterization at this point. When more accurate forecasts can be made with models like WRF, we can focus on pinpointing the location of the lightning.

4.5 An Overview of New and Unique GOES-R Products for Hazard Assessments

Michael Pavlonis	NOAA/NESDIS/STAR	Madison, WI
Daniel C. Hartung	UW-Madison/CIMSS	Madison, WI
Justin Sieglaff	UW-Madison/CIMSS	Madison, WI



Mike Pavlonis, physical scientist at NOAA/NESDIS/STAR, began his talk on the impact of GOES-R with quantitative products in hazard assessment. The hazards discussed were: volcanic clouds, severe weather, fog and low clouds, and lake and sea ice.

Volcanic ash can have an impact to the global economy, for example, planes cannot fly through volcanic ash. In April 2010 the Eyjafjallajökull eruption canceled approximately 100,000 flights and airlines lost nearly \$200 million/day giving a total economic impact of \$2 billion. UK Met asked CIMSS for the products of the volcanic ash cloud and used them for the air traffic grounding during the eruption.

On 24 June 2011, Cordon Caulle erupted in South America where ash circumnavigated the earth a few times causing air traffic to stop in Australia. Another eruption was detected in Western Africa. The ash cloud from the Nabro Volcano (which never had a historic eruption) had high levels of SO₂ which could kill many people. No one detected it until 7.5 hours after eruption. The vertical growth rate was much greater than other general convection occurring at the same time, so it stands out if looked at quantitatively. This quantitative assessment can be built into an automatic warning system. Forecasters cannot just rely on imagery that they monitor 24/7. There have been advancements in creating a volcanic cloud alert system and the aim is for early 2012. GOES-R will have a 7.3 μm channel specifically designed to be sensitive to SO₂. However, SO₂ is a future capability with hope that it can be added later as a product.

The GOES-R fog detection product (which is another future capability) will significantly improve geostationary satellite fog monitoring capabilities in two ways:

1. Improved algorithm technology - the GOES-R algorithm provides quantitative information on fog probability, while heritage GOES fog detection products are more qualitative in nature
2. Improved sensor technology - the ABI has greatly improved spectral information, spatial resolution, and temporal resolution

Mr. Pavlonis concluded with a summary of their cryosphere work. The algorithms for estimating sea and lake ice concentrations have been developed, tested, and validated with proxy data from AVHRR, MODIS, and SEVIRI. There is the development of snow and ice products, which have been validated for NPOESS VIIRS with *in situ* measurements from submarines and stations. Also, a 23-year long dataset of ice products including ice extent, concentration, thickness/age, and volume has been generated for the Arctic Ocean from 1982 until 2004.

4.6 GOES-R Post Launch Activities

Vanessa Griffin	NOAA/NESDIS, GOES-R Project	Greenbelt, MD
Satya Kalluri	NOAA/NESDIS, GOES-R Project	Greenbelt, MD
Christopher Wheeler	NOAA/NESDIS, GOES-R Project	Greenbelt, MD

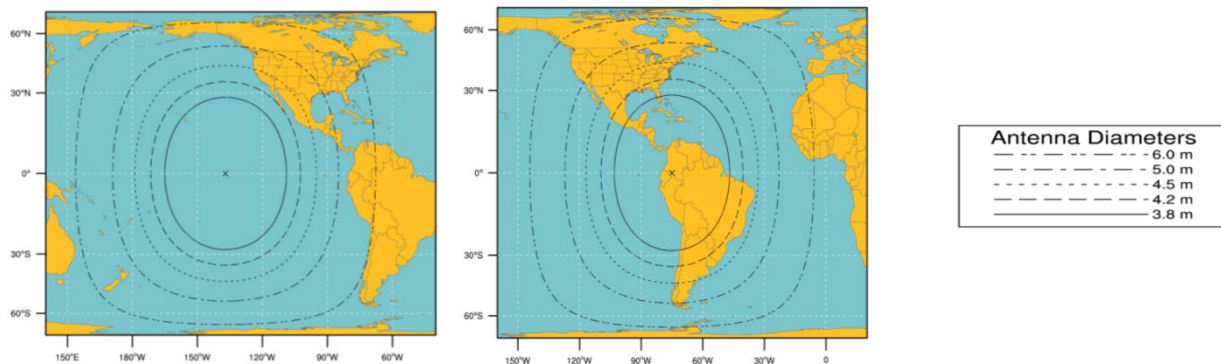
Vanessa Griffin started out with a brief overview of the ground system and project schedule. She continued to outline how GOES-R will prepare for operations:

- Transition to GOES Rebroadcast (GRB), replacing GVAR, and post-launch testing
- New Product Distribution and Access (PDA) capabilities
- Post-launch test for GOES-R Series Satellites and Ground Segment
- Algorithm improvements and the addition of new data products



Ms. Griffin showed a slide that succinctly compared the differences between GVAR and GRB.

The GRB engineers analyzed antennae characteristics needed to receive GRB. If a user wants to read both east and west, a 6 meter dish is required. If a user just needs east or west, most GVAR dishes, which are 4.5 meters, may be acceptable. Below is a depiction of the predicted areas covered by certain dish sizes. The picture on the left is of the West predictions and the right is of the East predictions. There is also an operational margin of 2 dB because of varying dual polarization isolation within antennae size.



The specifications for GRB are still preliminary and will be finalized in April 2012 and posted on the GOES-R Web site. There will be five GRB Simulators available in early 2013.

Question: Does NOAAPort provide the L2 product?

Answer: Generally, it gives cloud and moisture imagery. You may be able to get some L2 products from PDA system but it is their decision. At a minimum, CMI products are available.

Question: Is it possible in terms of storage, to operate a GLM while GOES-R is in storage?

Answer: No, there will be no fixed pointing capabilities needed for GLM while in storage. The only thing available while in storage is to operate one of the space weather suites.

Comment: During the check-out, the satellite will be turned on for 6 months and then turned off. This could be inconvenient for the users because the GRB recipients would need two ground stations at the same time. The easiest option would be to turn it on after its 180-day check-out and not put it in storage.

4.7 User Input from Past GOES Users' Conferences

James Gurka	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
-------------	-----------------------------------	---------------

Jim Gurka started by stating the attendees of past GUCs have made an impact on the program with recommendations. There has been a main recurring theme from the past GUCs: Users need to be "Day 1 Ready." Other recurring recommendations were:

- Use proxy and simulated data sets to test and validate data processing and distribution systems
- Provide test data sets well in advance of operations
 - GOES-R is currently providing test data sets
- Leverage NPP/ NPOESS synergy and experiences
 - Now that NPP is in orbit, the data will be used.²
- Need to utilize GOES-R data in mesoscale analysis and forecast models
 - The program has started this with Ralph Peterson's "Nearcasting" models, but still needs more work
- Develop and validate new or improved products including decision-aids before launch
- Multiple recommendations on data archiving
- Users must be ready on day-1, most of the bullets below have been addressed and continue to improve:
 - Re-package products to support multiple levels of users
 - User education is critical
 - User input is critical
 - GOES-R System should be tested end-to-end before launch
 - Use proving ground/testbed approach



The recommendation for use of proxy and simulated data sets to test and validate data processing and distribution systems is currently being done by the GOES-R program. SEVIRI and MODIS data are used as proxies for the Advanced Baseline Imager (ABI). NPP data will also be used. TRMM/LIS and the ground based Lightning Mapper Arrays (LMA) provides good previews for GLM data. Finally, the WRF model is being used to generate simulated Cloud and Moisture Imagery (CMI).

The recommendation for Decision Aids is being addressed. The volume of data and products will mandate use of decision aids to focus user attention. NEXRAD provides a good model with alerts for critical values of vertically integrated liquid (VIL), Gate to Gate Shear, and tornadic vortex signature (TVS). Some satellite candidates for alert notifications are: Enhanced V, Fog formation, rapid changes in stability, mismatch between model forecasts and satellite observation (cloud cover, water vapor, winds, precipitation, lightning, and rate of fog formation or dissipation).

The next topic was education and training where the primary goal is to ensure that all data are fully utilized immediately following the start of operations. There are many education venues, such as COMET, VISIT, schools, universities, conferences, etc. The key to success is ensuring that trainers are fully engaged with developers, evaluators, users, and program managers. The need for training is tailored for unique user needs. An example is NWS forecasters, where the GPO is preparing them for new products within new operational concepts. The idea behind the NWS Operations Proving Ground in Kansas City is deciding how to use all of the data operationally. The need for weather event simulators and training is a key tool because the interactivity increases knowledge retention.

² This text was updated for this report. At the time of the conference NPP had just launched.

There were about 15 pages of recommendations and 14 pages of Q&A from GUC6. All the questions, answers, and recommendations can be found in the GUC 6 Final Report that is posted on the GOES-R Web site.

The most challenging aspects of GOES-R:

- Ensuring end-to-end capabilities (building, training, user access)
- There is a lot more information and with it a risk that information will not be fully utilized
- Training for all users. Education of users, new paradigm with decision aids, etc, training to help manage/decide what is useful.
- Creating the proxy data and algorithm test plans to validate the data products, then disseminating that to users so they can test their systems. This lets the users know what the products look like and how they will fit in existing systems.
- Display systems, i.e., AWIPS II
- Use of data in NWP

Recommendations from past conferences have impacted GOES-R baseline instruments and plans for user readiness. NOAA and the GOES-R Program Office are committed to keeping lines of communication open with the user communities. The GOES Users' Conference will continue and the next one is scheduled for April 2013, in conjunction with the DRO. Users should use or continue to use the GOES-R Web site (www.goes-r.gov).

Question and Answer Session

Immediately after Mr. Gurka's presentation, the question and answer portion commenced. This session allowed the audience to ask questions about any of the presentations given in the last two days or any other questions pertaining to the GOES Program. The comments and questions centered on the upcoming GOES-R Program.

Comment: The issue of storing GOES-R after the 180-day commissioning period was brought up. Once the science test is done, the satellite should be used operationally. Otherwise, people will think, "Why is GOES-R so important if it is just going to sit in storage?"

Question 1: There is a need for the satellite community to develop ways to help with nowcasting, mesoscale and high resolution models. There are still weaknesses in the first 3 to 6 hours of model spin-up, but it is getting better. There is a growing need to give higher detail in a really small time frame because of the huge gap with observed and model data. Is there a way that the satellite community can help us fill the gap from model handling?

Discussion/Comments:

- There is more focus on global models and not enough work on mesoscale models and short term models.
- Risk reduction science program is working more on forecast.
- Funded a visiting scientist to work with High Impact Weather Working Group last year to work on mesoscale data assimilation using GOES-R.
- Simulations for GLM and ABI are trying to push the mesoscale forward.
- Getting funding for JPSS and GOES-R to have high resolution and produce new models. Dr. Goodman says they are working in that direction.

Question 2: How will the GPO include groups outside of NOAA into the Proving Ground?

Response/Discussion:

- There were many requests at the DRO this year to include the international community into the PG and heard the same request from broadcasters at this GUC.

- Even NOAA is saying it's important, it's not good enough. We have to bring in a bigger weather community.
- The Program needs to really get serious about bringing in the international community. It's very challenging, but to be honest it'll bring it to another level.
- Will probably hear the same from operational forecasters once the satellite checks out. It needs to be turned on operationally after the 180-day checkout.
- Mr. Gurka thinks it certainly would be beneficial to take international and private partners into the PG.
- Dr. Goodman brought up the WMO who is having a nowcasting workshop in Rio de Janeiro. Some of the topics are geostationary satellites, flash flooding, and irrigation. Wayne Feltz and the aviation team are also trying to put together something so we have a presence there.
- At the last OCONUS PG meeting, Canada was invited.
- Receiving proposals for the visiting scientist program.

Question 3: What steps are being taken to ensure the mapping and geolocation of the data processing is as precise as it can be and communicate the processing of it properly to the users?

Discussion/Comments:

- The navigation registration in the ABI will be much improved and state of the art.
- Dr. Kalluri mentioned there are star sensors on the spacecraft and other geolocation devices, and a requirement to monitor the location on the ground.
- Made good improvements with jitter, which is a big concern. Jitter is when the spacecraft isn't holding its pointing quite right when the GLM is changing from scene to scene. See a change of brightness. We can remove leftover jitter on the ground using an algorithm. Geolocation at night.
- Able to do some mitigation on that (on the spacecraft and radiator), the GLM and ABI share the same radiator space and jitter is coming from that radiator. We're making efforts to dampen that and we are successful in doing so.

Question 4: Is the GPO using social media tools (i.e., Facebook, Twitter, etc.)?

Discussion/Comments:

- Dr. Goodman said that tools are being developed

Question 5: What are the system formats?

Discussion/Comments:

- The Hurricane Center uses GIS format.
- CIMSS and NOAA had a GOES-R meeting earlier this week and received comments on lack of unified approach on Web; the GOES Web site is outdated.
- Nothing like Google Earth and radar data. This might be setting us back.

Question 6: Questions for Vanessa were: How are you getting the GRB simulator data out? Was there a poll of how many people need it so it is known if data reached everyone? Will there be priorities for customers that need GRB? How do users sign up?

Response from Vanessa:

- All good questions and will be brought up at the next Critical Design Review (CDR). Polling has not started yet, but that will be the topic at the next meeting.

Question 7: Why did no one stay from NWA for Sessions 3 and 4 (non-joint section)?

Discussion/Comments:

- NWS WFO has two major things coming up before GOES-R: training on AWIPS II and dual-pol. So they are thinking of those other things before they can even think about GOES-R.
- Developers need a lot of feedback, but don't be disappointed if there is no response for the next 24 months.

- There are limited resources in the offices as well and the need to train on non-satellite work takes priority.
- Most of the presentations in NWA are focused on radar, meso analysis, and things like that and not much on satellites.
- Once GOES-R is getting closer to launch there may be more interest.
- Radar is being updated every 5 minutes and the interest will grow once satellites have the same response time.
- Here is where fused products can come in. There is interest, just don't expect it right away.
- From one perspective there are satellite groups and radar groups. There is a lot of appeal that satellite data can bring to severe weather. It helps for low cloud and fog, but seems to go into parallel paths with radar rather than emerging from radar.
- There is a lot of activity going on within the NOAA testbeds and the software developing groups in Boulder. Satellites are useful in severe weather because most talks given here this week were only showing radar data that are referencing boundaries, which need satellite data and rapid satellite data delivered in real-time with little latency. The Spring Experiment demonstrated that they are producing something important with CI.
- A representative from the international community stated that there are many places with no radar, so satellite data is very important. The information can be used for decision making.

Question 8: Are there any training materials in Spanish?

Discussion/Comments:

- It would be good to get training material in Spanish because many people only speak Spanish. We need to create training material in Spanish, and maybe even Portuguese.
- We already have some COMET modules that are in Spanish.

Question 9: With respect to the transition from GOES-NP to GOES-R: For planning purposes, since we need to upgrade our systems. Are there any specifications posted for GRB?

Discussion/Comments:

- A Product User Guide (PUG) will be posted by April 2012. It will have all the information you need. There is nothing published now, but will be posted on the GOES-R Web site.

Question 10: What are the advertising efforts for GOES-R?

Discussion/Comments:

- Good things are happening at the testbeds; however there is little advertisement of the good results coming out from the work. If there is, it takes a lot of effort to find it.
- There's only a small pocket of forecasters using satellite data. It will take a while to get the word out on satellite data. Make an effort to increase satellite advertisement. Start changing that culture now because it could take years.
- GOES-R Program Office just hired a satellite liaison to start an Operations Proving Ground in Kansas City to start getting that interest going. That's one way we're hoping to persuade users to use satellite data.
- The WES cases will include an integration of radar, satellite, etc.
- When there is a large community, culture change is hard. The PG was created early because it takes a while to get a community to change its culture on using satellite work.

GUC Dinner – “Reconnect With Your Passion Now”

Guest Speaker:

James Spann	Chief Meteorologist, WBMA-TV	Birmingham, AL
-------------	------------------------------	----------------



James Spann, Chief Meteorologist at WBMA-TV Birmingham, AL was the guest speaker for the conference dinner. The first part of his presentation went through the timeline of events during the April 27th tornado outbreak in Alabama. Mr. Spann shared some opinions as to why the death toll was so high that day. The reasons included complacency and apathy on the part of the local people due to a high false alarm ratio (FAR) and the “siren mentality”, as well as challenges in forecasting for Quasi-Linear Convective System tornadoes.

Mr. Spann emphasized that there was a morning storm event before the afternoon tornado outbreak. The morning event was not forecasted well. Five people died and a quarter million people lost power after the morning storms. He charged the researchers to find out why this morning event was poorly forecasted. The Cullman tornado was the first of the afternoon outbreak in Alabama. Eighteen minutes of video footage of the tornado aired on television in real-time. His station contacted the local hospital after the tornado had passed. They were treating some injured citizens and reported no deaths at the time. However, tremendous infrastructure damage had been caused by the morning round of storms in which microwave paths, cameras, Internet, and power was out in a wide spread area. Mr. Spann and others were very concerned that people who normally receive their weather warnings via television would not be able to receive those warning due to infrastructure damage.

A few hours later, live streaming video of the violent Tuscaloosa tornado was being aired on the station. Mr. Spann credits and praises a former colleague, John Oldshue, for being one of the first people to capture the tornado and stream it live about 45 minutes before it hit the city. He believes that the trained spotters who capture and stream video like that are heroes because people will take action to seek shelter

if they see those videos on television. In addition, the videos themselves are being analyzed to determine debris content. The tornado went between DCH Regional Medical Center and University Mall. Fifty-two people died in the city.

Mr. Spann then spoke about how satellite data is crucial and taken for granted by many in the operational meteorology community. He expressed gratitude for the satellite researchers in the audience, but questioned why satellite data is not available on programs such as RadarScope and Gibson Level 3 and 2. He stressed that the "end game" is preventing loss of life the next time this happens.

The second part of his presentation focused on three virtues to live by. The first is to have a passion for your job. Everyone can become fatigued with budget issues and the economy and lose sight of their job. For Mr. Spann, he loves the weather. He was a child of the super outbreak in April 3rd & 4th of 1974 and operated a Ham radio as a hobby. That night he was sent to a hospital in Jasper, Alabama with his radio equipment to broadcast. He witnessed things that night which forever changed his life and set him on the career path he is in today. He made a point that there will be many children of the super outbreak of 2011 that will be at conferences such as this in 30 years. They will be brilliant scientists, which is one good thing that comes out of this. Aside from that, the reason Mr. Spann is in his current profession is that he loves what he does. He believes everyone should walk into their jobs every day with a passion he defines as a positive energy. Having a passion for your job will make you very successful in life.

The second virtue is integrity. Mr. Spann believes that integrity is a problem we have in society today. Nobody likes to talk about it. His definition of integrity is doing the right thing when nobody is looking. He has seen many brilliant colleagues have their careers end due to a chronic problem with integrity.

His third virtue is having a servant's heart. That means looking after others. If you are in the weather business, that is the "end game". He believes that if we could develop these three characteristics, especially the third since it means keeping people alive on days like April 27th. Then we will do our job with a passion and with integrity. It starts with researchers at the top and filters down to operations.

Mr. Spann spoke about how the use of social media was so extreme in the recovery and relief effort. People turned to him through Twitter and Facebook to receive information which he provided as much as he could to the point where he could not step back and process everything that had happened until later. Mr. Spann closed his talk by challenging the audience to remember that we are here to serve others. That the operational meteorologists like him, cannot do their jobs unless the researchers at the top do their jobs. "But remember that and if you do that, you cannot wait to get back to work on Monday. You'll have that passion. You'll want to be a man or woman of integrity and you'll do it with a servant's heart."

5 GUC SESSION 5 – User Discussion and Recommendations

5.1 Introductions to Group Topics – Discussion on Purpose and Logistics

James Gurka, NOAA/NESDIS GOES-R Program Office, brought the session to order and introduced the first group discussion.

5.2 Group Discussion I – Exploiting GOES Data/Products.



Facilitator:

Ken Carey	Noblis, Inc.	Falls Church, VA
-----------	--------------	------------------

Subject Experts:

Timothy J. Schmit	NOAA/NESDIS/STAR/CoRP/ASPB	Madison, WI
Tom Renkevans	NOAA/NESDIS/Office of Satellite and Product Operations	Camp Springs, MD

Presenter:

Deirdre Kann	NOAA/NWS WFO	Albuquerque, NM
--------------	--------------	-----------------

NWS Field Representative:

Jeffrey Craven	NOAA/NWS/NWA Treasurer	Sullivan, WI
----------------	------------------------	--------------

NWS National Center Representative:

John L. Beven II	NOAA/NWS/NHC	Miami, FL
------------------	--------------	-----------

Proving Ground Representatives:

Wayne Feltz	SSEC/CIMSS/UW- Madison	Madison, WI
Michael Folmer	NOAA/NWS/OPC	Camp Springs, MD

Broadcasters:

James Spann	Chief Meteorologist, WBMA-TV	Birmingham, AL
Dan Satterfield	Chief Meteorologist, WHNT NEWS 19	Huntsville, AL

Deirdre Kann, Science Operations Officer at the Albuquerque, New Mexico WFO, gave a short presentation about the need to enhance communication efforts of current and future GOES products. She brought up several points to consider:

- Is there currently a “one stop shop” Web site for GOES products that is more detailed than www.goes-r.gov?
- Are Web sites the best method for the distribution/evaluations of satellite products?
- What is the best way to communicate available products for testing?
- How is the transition from research product to operational product best accomplished?

Increased visibility of products not routinely available on workstations or from vendors was emphasized. More training on how new products will enhance the use of legacy products was also suggested.

The Hazardous Weather Testbed and other testbeds are an effective way to evaluate and promote visibility of products that are not routinely available or are under development. Forecasters who participate in such activities can share their newfound knowledge with others at their local WFO. In order to ensure success when transitioning products, three things are needed:

1. A coherent support team
2. "Buy in" from the local staff or users
3. Two-way collaboration with developers

A desirable composition of a support team would include product experts, technical support, and a local project manager. In order to increase "buy in" from local staff, they need to see examples of success, training and examples must be provided to them, methodologies such as AWIPS procedures must be shared with them, and their work load must not increase in order to accommodate these transition requirements. Blogs are an excellent way to share information, but may not be a good way to quantify information on how good a product might be.

Discussion:

- It is good to have a "satellite champion" at WFOs but a larger response is needed. There are only a few forecasters at the HWT at a time (approximately six), and it is only for 5 weeks out of the year. What is happening at the NWSTC is a great way to start to show people these products. Eventually, the information will be passed along from forecaster to forecaster. One issue is that products are available from cooperative institutes and not readily available via AWIPS for WFOs. A bigger effort should be made for cooperative institutes to deliver to WFOs. WFOs have to adhere to certain bandwidth issues and have to pull things from the region.
- There are at least 14 satellite years left of the current GOES. It is not too late to see how the current GOES can be improved with new products.

Question 1: Are there any particular products that are not being exploited?

Discussion/Comments:

- Things are exploited in certain areas but it is not consistent.
- Vendors like Baron, Weather Central, and WSI need to be included in the conversation in order to provide images and products for broadcast meteorologists to use. It is hard to find good satellite images.
- This business is changing rapidly. Most of the products and services delivered to users are done via the Internet. It is challenging to find satellite images on the Web. It would be great to have one portal with all the information on it instead of searching through all the university sites. It would help to get KML files since Google Earth is used more.

Question 2: If there is a portal, who would collect it?

Discussion/Comments:

- The public loves this imagery. There are lots of hits if it is put on blogs or Facebook. The public loves science stuff.
- One problem with having these sites that are a clearing house is that no one takes responsibility for updating them. There are a few issues: one is finding information and knowing about it. The other is that this data is going to cooperative institutes and regional headquarters. WFOs have a small straw to pull data at their offices. They have to evaluate on their LDM what they want. It will clog the data pipeline. Even though WFOs want everything on AWIPS, forecasters still go to the Web if they have something they like.
- One developer has stuff available for forecasters through SPoRT, but the forecasters say they do not want it. There is a need to show them how it is useful at NWS stations.

- OSPO is working on updating the old GOES and POES Web sites. OSPO needs to do a better job at advertising and consolidating the Web pages. Links need to be integrated on the page. There are products out there now that forecasters do not know about or use. The office has a Twitter account but they need to do a better job advertising who they are and what they do. The office does not do a good job with broadcasters or WSI or Weather Central, etc. and maybe it is something that needs to be worked on.
- Forecasters have a limited amount of time to look at stuff. The more integration of products into the operational system, the better. There is the Joint Hurricane Testbed and forecasters do not look at products all the time, a few minutes here and there. The program needs to look at what WFOs and testbeds can take given their bandwidth. There is an element of criticism and skepticism among the forecasters and there is a need to make sure the products are sound and the forecasters know when it will and will not work.
- Forecasters use very little of what is currently available with satellites. It is the “creature of habit” mentality. It would be good to have a common place for these products (Web page, etc.).
- Communication is a big problem when trying to move forward. WFOs continue to absorb large cuts in staffing while workload increases. Or, there are too many emails that come through in a day and important communications are missed. Other ways to make sure the message goes out should be found. In the NWS Central Region, there are monthly calls with SOOs, SSD chiefs, and guest presenters on the call. Drafting a monthly letter and trying to find creative ways to communicate should be further explored.
- Having the satellite champions is one great way of laying that framework to try and get more local offices involved. There is a lot of satellite data coming in and forecasters are crunched for time. Has some kind of artificial intelligence been considered that senses what kind of weather regime a location is in and based on that, it feeds the correct products to the forecasters?
- There are challenges with that as far as the practicality. In the case of a hurricane, one scale might be needed to see the storm now and a different scale to forecast days out what will happen. Forecasters need to be able to get as much as possible.
- The time constraint is a big issue. The program needs to ensure the tools there are the best ones possible.

Question 3: How do forecasters know that product is the best tool?

Discussion/Comments:

- Forecasters need to know what to spend their time on if something is going wrong. For example, in the AWIPS system in a WFO, looking at a GOES sounding is a multi-step process. There is nothing worse than trying to look at something, going through all the steps and seeing that it is exactly what the forecaster thought was happening. They really need something to help them when something is happening that they do not expect. Such as, if the sounding says something different from the models. They do not need to spend time looking at things that reaffirm what they expected anyway. We need something that catches the forecaster's attention.
- Relationships need to be built between researchers, developers and the folks in the field (forecasters, broadcasters, etc.). Maybe it is just between the developers and the people in the field. The bridge between research and development is really important. Maybe there should be more than just the Spring Experiment at the NWSTC.

Question 4: What are the differences in format between GOES and GOES-R? Are there any issues?

Discussion/Comments:

- At SAB, for example, the tropical page is being reworked to better address the customer's needs. They are trying to communicate with their users to ensure it is done the best way. That communication back and forth is essential.
- With radar, the kinds of products for that are clear. With satellite data, there are so many more options. How does the satellite community get to where the radar community is and use satellite data in some meaningful way?

- Getting data to vendors is crucial. People are on various boards within AMS and NWA. If information is given to broadcasters, it can travel through the broadcast community rather quickly. The challenging part is finding the information.
- The SPC Meso analysis page is fantastic. That is an example of the “one-stop-shop.” Maybe someone can get ideas from that. There is no broadcast media training center like the NWSTC. Broadcasters need training that is quick, easy, and available on the Web. They often feel bewildered by this.

Question 5: Other suggestions about blended products?

Discussion/Comments:

- There are good 500 mb wind retrievals, close to a 0-6 km shear, and there is a CAPE product. Someone could create a blended significant severe parameter or if nothing else add a shear product. That would be a very good thing to evaluate.

Question 6: How are the products blended today?

Discussion/Comments:

- It is not done with satellite. That parameter is fairly simple and there is pretty good reliability on it. People are attracted to severe weather applications. Forecasters hate limitations like field-of-view issues with clouds, etc. Products have to find a way around those issues or else the forecasters will go somewhere else.
- Is there a venue to be able to do that today?
- The HWT is doing a good job at that. The developers look at this stuff at their desk. When it is used 24/7, a lot of limitations are learned that were not know before. For example, a lot of changes were made to the UW-CI product based on 5 weeks a year of testing. There is a need to get products in the testbed.
- MODIS has been out there for a while along with other products. RGB has been there for a while. One thing is for people to look at current GOES products and give feedback to the various levels of operational use. There is some work being done at the WFO level, etc. There is a lot of information going on at the WFOs. Just getting info to the door does not ensure that it is operational or that every forecaster will maximize the effective use. If there was a way to create categories of actions and analyze the weaknesses, that can have huge benefits. Training is important. Maybe a forecaster should be pulled out of a WFO for a week at a time to learn about a new product. Satellite champions will have a huge impact. Train the person who everyone follows.

Question 7: When products are shown, the program wants to find a reviewer before bringing it to the masses. Do you think some of these things are being brought to the Proving Ground without sufficient validation? Is the way the product being presented not the best way?

Discussion/Comments:

- WFOs do not have a strategy to write a skill score about something like that. That is an obstacle.
- Introducing new products to these testbeds is the way to go as long as the forecasters know it is experimental. A lot of products that were brought into the HWT needed to be changed and forecaster input helped make a better product for them.
- The more that the forecasters can get one-on-one training with developers the better.
- If the product is to be evaluated fairly, a representative should be present to do hands on work with forecasters; to talk to them and serve as the subject expert.

Question 8: Will the panel express what is good with the current GOES and what needs change?

Discussion/Comments:

- The current GOES is not bad. If you live in a place where there are not a lot of observations, it is critical.
- If all GOES could see are the tropical oceans and what the hurricanes do, it would be worth it. All the data should be in one place, in a way where it could be downloaded easily.

- The current GOES is adequate for what we have done to this point. It would be good to see better usage of differencing and blended products.
- The stuff from the current GOES is good but we are looking forward to improving on them with GOES-R. It would be nice to change the scan strategy and go back to the all full disk system. The NHC has such a big area of international responsibility; the current scan strategy does not see them.
- Water vapor is king, so any water vapor channel is good. The next breakthrough in satellite meteorology will be having high resolution in the boundary layer. A Hyperspectral Environmental Suite (HES) to help with convective forecasting. There will be more deaths without it.
- Better clarity and training on use of DBI products and easy access would be good.
- An HES is a good idea. There used to be a moisture convergence product.
- Having 3 operational GOES would be ideal.



A captivated audience ready for discussion on important GOES topics

5.3 Group Discussion II – Operational Enhancements by Leveraging the GOES-R Proving Ground



Facilitator:

Ken Carey	Noblis, Inc.	Falls Church, VA
-----------	--------------	------------------

Subject Experts:

Steve Goodman	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
---------------	-----------------------------------	---------------

Presenter:

Rusty Billingsley	NOAA/NWS/SR	Fort Worth, TX
-------------------	-------------	----------------

NWS Field Representative:

Rusty Billingsley	NOAA/NWS/SR	Fort Worth, TX
-------------------	-------------	----------------

NWS National Center Representative:

Jamie Kibler	NOAA/NESDIS/OSPO	Camp Springs, MD
--------------	------------------	------------------

Proving Ground Representatives:

Christopher Siewert	OU-CIMSS	Norman, OK
---------------------	----------	------------

Broadcasters:

James Spann	Chief Meteorologist, WBMA-TV	Birmingham, AL
Dan Satterfield	Chief Meteorologist, WHNT NEWS 19	Huntsville, AL

Rusty Billingsley was given three questions for him to address in his Discussion II presentation:

- How might satellite resources be more effective in helping provide operational products/services?
- Do you have any recommendations on better use of satellite resources (including the GOES-R Lightning Mapper) in the Proving Ground (PG) exercises?
- What actions do you recommend to ensure the PG is more effective in using future satellite data for decision support?

Mr. Billingsley mentioned that there are two viewpoints concerning satellite services. One view is from the satellite developers who bring us new products and who need feedback for improvement of those products. The other viewpoint is from the forecaster who sees satellite data and products as only a piece of the forecast solution.

The Scientific Services Division (SSD) chiefs and the weather service put together a science vision a couple of years ago as the basis for the Office of Science and Technology roadmap. The “Warn on Forecast” concept was a big part of this science vision. Current severe weather warnings are based on detection primarily using radar. Warn on Forecast is a concept that utilizes convectively resolving models to produce a warning based on “forecast” conditions. The question is raised: How can satellite data and products be integrated into a convective resolving model to help provide a solution for the Warn on

Forecast problems? An example is convective resolving models and concepts like Warn on Forecast can be the basis for solutions to other problems such as forecasting of mesoscale snow bands. The next generation of forecasters in the coming 5 to 10 years needs to think about what they will do with these kinds of capabilities. The future need is for an integrated system, not separate solutions using satellite or radar individually. We need to ask the question: What are the innovative ways to incorporate all types of data? In conclusion, the SSD chiefs love the idea of the PG with the communications between forecasters and developers/researchers and testbeds.

Question 1: What do broadcasters know about the Proving Ground? The two broadcasters on the panel were Dan Satterfield and James Spann and shared their views.

Discussion/Comments:

- All Dan knew about the PG was it had something to do with GOES-R. It was not until later, with his participation in the Algorithm Development Executive Board (ADEB) meetings, that he was really able to grasp the idea of the PG.
- The GOES-R Web site is confusing and does not give a good description of the PG.
- The average broadcaster does not know much about satellites:
 - 3 in 4 meteorologists do not know about the PG
 - 1 in 4 meteorologists do not know about the GOES satellites.
- The broadcasters concluded that they are excited about GOES-R, but the information needs to continue to be disseminated among the other broadcasters. Both Dan and James have influence on a lot of people, and can use their contacts to leverage getting the information to a broader audience.
- Dr. Goodman said that the objective of the PG was to work with the NWS. When it first started, the PG tried to involve more organizations, but there was some backlash. There are other ideas of disseminating information (pilot projects), one idea was road shows; visiting and talking to WFOs and/or the broadcast community. Dr. Goodman indicated that he is open to suggestions on how to be more impactful and get more people involved.

Question 2: How can the GPO leverage the outreach that is going to broadcast meteorologists? The GPO is trying to use available resources and working together would be a great help.

Discussion/Comments:

- When it comes to the consumer, people understand radar because there are smart phone applications readily available. Why can't the same thing be done for satellite data? Once the public starts to use it, there won't be any funding cuts.
- Dan and James have not seen the GOES-R brochures.
- People are unaware of the NWA and NOAA sites. They don't know what they are. They get the forecast from local news.
- Maybe have a workshop for broadcasters and forecasters in the private sector
- The weather service doesn't bring in other people at the HWT Spring Experiment. We are still looking internally to see how we can do a better job in the NWS. The challenge is that NWS can't stop there--we still have our science hats on. We need to challenge ourselves and bring in broadcasters.
- Broadcasters are the most misunderstood in the field. James Spann invited the satellite community to visit him and see what a typical broadcaster goes through in the day.
- CIMSS' current process in the PG for products is to place them on the Local Data Manager (LDM) to the Weather Forecast Offices (WFOs). There is currently no efficient, non-bureaucratic way to move products up to the satellite broadcast network to give broadcasters more exposure to products and help alleviate bandwidth concerns. What is the operational legacy of the products and who should be involved for doing that?
- We need to challenge ourselves and bring a couple of key people (i.e. forecasters and broadcasters) to the test bed and have them tell us.
- Dr. Goodman made some comments on current attempts involving the Broadcast Community. Dave Jones Channel 4 in Washington, DC had a NASA grant and was putting MODIS on

television occasionally and breaking new ground, but still unsure how the audience reacted to the new information. In Ft. Worth, TX, there was a group working with GLM testbed to get lightning mapping arrays to the area. The agreement with Steve Zubrick, Scientific Operations Officer, from the Sterling, Virginia NWS WFO was to control the messaging from the testbed to the eastern area to get lightning data to the broadcast community, including Dave Jones. Unfortunately, Dave Jones has left, but Dr. Goodman has been heading a Visiting Scientist Program. This is a great way for more private sector broadcasters to be more involved at the testbed. Broadcasters just need to apply to the program and can cover cost for travel so broadcasters can visit the testbeds.



Jack Beven asks his question to the panel

Question 3: How will the products be enhanced?

Discussion/Comments:

- There are many products that can use the PG to enhance techniques such as the Dvorak technique used in Hurricane Intensity Estimation (HIE) algorithm, but it's seventies technology and does not take advantage of GOES-R. How can we blend the new channels into the HIE?
- Dan said that he may be confused about the PG, but he thought the purpose of the PG is to figure out how to use the extra channels to improve the HIE.
- Where was the PG 25 years ago, with the first GOES sounding products? Soundings and DPI were presented to the WS, but now near-casting is important where the GOES sounder is a marginal instrument. The PG has been effective in doing something innovative with DPI.
- Leave options in the RGB product for personal color enhancements for other people (i.e. the color blind).
- A lot of times researchers will find that products can be used for other things than their original intention.
- We need to be patient sometimes because there are multiple groups working on multiple projects.
- The relationship between operational forecaster and research developer has increased, which is helpful.
- It takes a while to adapt and push products in a new direction from what they were intended.

Question 4: What is happening now with fused products and what can happen in the future?

Discussion/Comments:

- There are a number of products in development at CIRA.
- There is a desire not to limit fusion to GOES-R products. We want to take advantage of everything that is up there: microwave, radar, polar, etc.
- For clarification, at NHC we will overlay surface observation, satellite visible imagery, lightning data, wind vector data, etc. Those are capabilities we already have to make something fused.
- There are a lot of products in development now. One merged product is satellite rainfall rate. You can take the microwave and IR data, and put them into a merged product that has a better estimate.

Question 5: How can the PG be more effective?

Discussion/Comments:

- Some of the comments lead back to the discussion on how to involve the broadcaster community more. Bridging the gap between the broadcaster and researchers.
- PG should be a nexus for a real-time distributed test to emulate what people do at the broadcaster job. In order to do that, it needs to have a remote component.

5.4 Group Discussion III – Maximizing Operational User Readiness/Decision Support



Facilitator:

Ken Carey	Noblis, Inc.	Falls Church, VA
-----------	--------------	------------------

Subject Experts:

James Gurka	NOAA/NESDIS/GOES-R Program Office	Greenbelt, MD
Brian Motta	NOAA/NWS/OCWWS	Boulder, CO

Presenter:

Jim LaDue	NOAA/NWS/OCWWS	Boulder, CO
-----------	----------------	-------------

NWS Field Representative:

Anthony Mostek	NOAA/NWS/OCWWS/ Training Division/ COMET	Boulder, CO
----------------	--	-------------

NWS National Center Representative:

Jim LaDue	NOAA/NWS/OCWWS	Boulder, CO
-----------	----------------	-------------

Proving Ground Representatives:

Bonnie Reed	NOAA/NWS/OST	Silver Spring, MD
-------------	--------------	-------------------

Broadcasters:

James Spann	Chief Meteorologist, WBMA-TV	Birmingham, AL
Dan Satterfield	Chief Meteorologist, WHNT NEWS 19	Huntsville, AL

Jim LaDue, a Meteorologist at the Warning Decision Training Branch, NWS/NOAA, presented on the directions for GOES-R training. He started the final discussion with a brief demonstration of a new iPhone app that uses virtual AWIPS GOES-R simulation from the test bed. This is one of the techniques that will be used for training meteorologists at remote sites to monitor the simulations of products in real-time.

There are many tools and knowledge-based courses available for example in COMET. The focus of the talk was how to take the next step from attaining knowledge and applying it to the human factor. One part of this is Situational Awareness (SA). The first step for SA is recognizing the problem and extending the present into the future. The next step is team SA, where most times each person has their own expertise, but move towards merging the knowledge to everyone to be a better overall team. This is the idea of bringing in forecasters into the testbeds by giving the forecasters one-on-one experience with the products and the people with the expert knowledge on the products. This starts to merge the gap of knowledge within the team. The past couple of years the goal has been trying to solve issues as a team using the idea of problem based experience learning. Having experts from different fields (i.e., emergency managers, broadcasters, forecasters from National Centers and WFOs, and Weather Service Forecasters) in the same room and going through simulations together to solve the problems.

One example of using the idea of team solving that Jim mentioned was the storms in Alabama on 27 April 2011. Emergency managers want a better preparation time, longer than a warning, but shorter than a watch. Possible simulations with GOES-R data and convective initiation processes can help solve this issue.

Comment:

- Instead of COMET as the base of the pyramid used in the talk, research should be the base. Papers and new ideas funnel into the courses at COMET.

Question 1: Are people fully aware of what currently exists with respect to training, and are there gaps or short-falls in the training and education?

Discussion/Comments:

- Forecasting is a process in decision making. There is never a doubt to warn people on severe weather, but it is what to do with marginal weather that causes many debates in the forecast offices. It is this type of decision making that needs training and education.
- Users need training on how to access GOES-R data.
- Training should come from the paradigm of decision support and supporting the forecasters in their decisions.
- One issue brought up was that some researchers work on products expecting to bring them to the testbed and find out later that those products were not utilized. It was suggested that people from the training centers participate in the testbed experiments to hear firsthand from the developer what the product is and how should it be used and observe any training gaps for forecasters.
- "Seasonal Readiness" is a term discussed within NWS training. Forecasters forget things they need to remember each season and need to learn new tools that could help them. It would be good to have a meteorological checklist or refresher at the start of each season (i.e. winter, spring, severe weather, etc).
- Finding the right training for the right product is difficult.

Question 2: What are the issues with training during the Spring Experiment at the Hazardous Weather Testbed?

Discussion/Comments:

- There was training for a full day on the first day of the 2011 Spring Experiment, which helped, but was not enough.
- There needs to be more a structure where the participants are already fully trained before they arrive at the Spring Experiment.

- The Forecast Decision Training Branch is looking into creating a learning path and training the forecasters and participants before the Spring Experiment. This will allow the participants to know where the research is coming from and how the products are derived. It will also save time for forecasters and participants who have minimal extra time for additional training. Participants can enhance their new knowledge from the Spring Experiment by teaching it to other forecasters who were unable to attend.

Question 3: Is there a unified training and education plan for GOES-R?

Discussion/Comments:

- There is a plan for an outreach component followed by an education component, similar to a class in college with course work.
- Then there is a plan for job specific training and education such as decision aids for forecasters. One thing that is missed from the past is in-residence training. However, time and budgets limit that, so the next best thing would be Webinar based training to keep the human in the loop and maintain forecaster-developer relationships.



Tim Schmit adds some insight to the discussion

Question 4: Will NOAA support putting algorithms into something like the International MODIS/AIRS Processing Package (IMAPP) or IPOPP?

Discussion/Comments:

- This support is strongly needed in the direct broadcast community.
- Training is important, but there are users (military customers, other universities, etc.) that need the algorithms to get ready.
- A copy of the draft Algorithm Theoretical Basis Documents (ATBD) can be found on the GOES-R web site, but as of right now that is the only thing available to the public. The code that Harris is developing is not going to be available.
- There was an idea of IPOPP for NPP where there is something between the ATBDs and the next step. That way, each company does not have to code each algorithm written by different

programmers. The University of Wisconsin usually does this. Is there money for GOES-R to have this for people who use direct readout ground stations?

- A researcher from CIMSS thinks it is a great idea to distribute the code in that way, so users know where the product is coming from and how they are derived and can customize the code if needed. It is not in the current plan.
- If this is not provided, every user other than NOAA will be delayed in terms of readiness.

Question 5: Will the data be readily available with easy access?

Discussion/Comments:

- If the data can be implemented into the private sector, someone will make something interesting out of it, like a smart phone application.
- Having data readily available to the public and easy to access can allow for improved awareness of satellite data and its importance to the weather community in the same way that radar data is available.
- With the radar Dual-Polarization transition, training courses are available on the new system designed for, NWS meteorologists, partners that are meteorologists, and partners that are not meteorologists. The objective is to remove all barriers to understanding the data such as having access to the data on mobile devices. Also, making announcements in as many places as possible like a one-stop-shop Web page or through social media. The same model can be used for GOES-R.

Comments on training:

- The satellite community asked for a one-stop-shop Web site several years ago for training. COMET developed the Environmental Satellite Resource Center in response. This can be utilized to store GOES-R PG training that is still experimental.
- Reflecting on training that was done during the Doppler radar transition many years ago, two training modules were used (20 and 15 hours long respectively) along with a 4 week in-person training course. The training was successful because developers caught the attention of the forecasters by showing them how Doppler radar can be used in detecting and predicting severe weather. In a GOES-R era, budget constraints will limit previous training capabilities. Successful training will occur if forecasters can embrace one or two products and become "hooked" on the technology.
- One of the fastest ways to change a culture is to appeal to young adults and train them in the new technology initially.
- Operational forecasters will be excited about the products if someone shows them something specific that will help them in their jobs.
- Start with products forecasters already know and then introduce one new product at a time. Show how the new product works with current data. Make partnerships with emergency managers, broadcasters, etc. to evaluate the data. Show value in the product and introduce it correctly.
- Need to utilize broadcasters to use new products and explain to the general public things like snow storms and why an airport might experience delays later.
- From the 3 May 1999 tornado outbreak studies, we know satellite data is the key to predict those events. It is important to learn from devastating events and use that as motivation to improve forecasts and warning times.

Question 6: In 30 seconds, what would you say or do to maximize the user readiness for the capabilities of GOES-R. What would you recommend to have impact?

Discussion/Comments:

- Follow the same method that was used for NEXRAD and have a high intensity in-residence training course, at least for NOAA users.
- Broadcasters learned about NEXRAD from a high intensity, weekend course. The same idea would be very beneficial to broadcasters for GOES-R.

- Broadcasters would like to be more involved in learning and remaining up-to-date on GOES-R status. Even participating in meetings remotely via Webinars would be useful.
- Broadcasters would like this type of training to begin now.
- Some researchers and members from the training community also agree to begin now.

6 Closing Remarks – James Gurka

Jim thanked everyone for attending and looks forward to the next meeting set to happen in April 2013 in Miami, Florida.

APPENDIX A CONFERENCE AGENDA



AGENDA
7TH GOES Users' Conference
20-21 October 2011
The Wynfrey Hotel, Birmingham, Alabama

October 19 (Wednesday)

6:00- 9:00 PM

Registration, NWA/GUC Joint Poster Session and Reception

October 20 (Thursday)

Welcome and Opening Remarks

8:00 AM

James Gurka, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD

Keynote Address

8:05 AM

Gregory Mandt, NOAA/NESDIS, Director, GOES-R Program Office, Greenbelt, MD

Joint NWA/GUC Session 1: Current and Future GOES

Session Chair: Ken Carey, Noblis, Inc., Falls Church, VA

8:30 AM

NOAA's GOES Satellites: Current Status, Operational Updates, Improvements and Short-Term Plans - Thomas Renkevans, NOAA/NESDIS/OSPO, Camp Springs, MD

9:00 AM

The Tennessee Floods of May 2010: A Satellite Perspective - Sheldon Kusselson and Limin Zhao, NOAA/NESDIS/OSPO/Satellite Products and Services Camp Springs, MD, Stanley Kidder and John Forsythe, Cooperative Institute for Research in the Atmosphere, (CIRA)/Colorado State University, Ft.

Collins, CO, and Robert Kuligowski, NOAA/NESDIS/Center for Satellite Applications and Research, Camp Springs, MD

9:15 AM

The ABI (Advanced Baseline Imager) on the GOES-R Series - Timothy J. Schmit, NOAA/NESDIS/STAR/CoRP/ASPB, Madison, WI, James Gurka, NOAA/NESDIS/GOES-R Program Office, Greenbelt, MD, and Mathew M. Gunshor, CIMSS, Madison, WI

9:30 AM

High Impact Weather Forecasts and Warnings with the GOES-R Geostationary Lightning Mapper (GLM) - Steven Goodman, NOAA/NESDIS/GOES-R Program Office, Greenbelt, MD, Richard Blakeslee and William Koshak, NASA/MSFC, Huntsville, AL and Douglas Mach, University of Alabama in Huntsville, AL

9:45 AM

How AWIPS II will bring GOES-R Capabilities and Science to the Field - Jordan J. Gerth (Student Member, NWA Council), CIMSS/SSEC/University of Wisconsin at Madison, Madison, WI

10:00 AM

Coffee Break and NWA Poster Session

Joint NWA/GUC Session 2: GOES-R Proving Ground

Session Chair: Frank Brody, NOAA/NWS, NASA Spaceflight Meteorology Group, Houston, TX

10:30 AM

GOES-R Proving Ground Partnership - James Gurka and Steve Goodman, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD; Timothy J. Schmit, NOAA/NESDIS/STAR/CoRP/ASPB, Madison, WI; Anthony Mostek, NOAA/NWS, Boulder, CO and Mark DeMaria, NOAA/NESDIS/RAMMB, Fort Collins, CO

10:45 AM

NWS Field Perspective of the GOES-R Proving Ground - Jeffrey P. Craven, Marcia Cronce and Steve Davis, NOAA/NWS, Milwaukee/Sullivan, WI

11:00 AM

GOES-R Proving Ground Activities at the National Hurricane Center - John L. Beven II and Michael Brennan, NOAA/NWS/National Hurricane Center, Miami, FL; Mark DeMaria and John Knaff, NOAA/NESDIS, Fort Collins, CO, and Chris Velden, CIMSS, Madison, WI

11:15 AM

The GOES-R Proving Ground at NOAA's Storm Prediction Center and Hazardous Weather Testbed - Christopher Siewert and Kristin Kuhlman, OU-CIMSS, Norman, OK, Steven Goodman, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD, Bonnie Reed, NOAA/NWS, Silver Spring, MD, and Russell Schneider, NOAA/NWS/SPC, Norman, OK

11:30 AM

Advancements Toward Fused Satellite, Radar, NWP, and In Situ Aviation Weather Decision Support Wayne Feltz, SSEC/CIMSS, University of Wisconsin-Madison, Madison, WI

11:45 AM

Lunch

GUC Lunch Panel – “The Path Forward to Ensure User Readiness for GOES-R”

Moderator: Steven Goodman (NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD)

12:15 PM

Panelists: Michael Johnson (NOAA/NWS/OST, Silver Spring, MD), Vanessa Griffin (NOAA/NESDIS, GOES-R Project, Greenbelt, MD), Anthony Mostek (NOAA/NWS/OCWWS/ Training Division, Boulder, CO), Rusty Billingsley (NOAA/NWS/SR, Fort Worth, TX), Dan Satterfield (WHNT NEWS 19, Huntsville, AL)

GUC Session 3: Benefits of GOES-R Products for Forecasters/Broadcasters - Part I. Session Chair: Dan Satterfield, WHNT NEWS 19, Huntsville, AL

1:30 PM

Overview of GOES-R Proving Ground Activities at SPoRT - Gary Jedlovec and Andrew Molthan, NASA/ Earth Science Office, Huntsville, AL, Kevin Fuell and Matthew Smith, UA-Huntsville, Huntsville, Alabama, and Geoffrey Stano, ENSCO, Huntsville, AL

1:45 PM

Training in the NOAA Satellite Proving Ground – Focus on User Readiness and Decision Support Services - Brian Motta, NOAA/NWS/OCWWS and Anthony Mostek, NOAA/NWS/OCWWS/Training Division/COMET, Boulder, CO, James Gurka, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD, and Timothy J. Schmit, NOAA/NESDIS/STAR/CoRP/ ASPB, Madison, WI

2:00 PM

GOES Data and Products in the Space Weather Forecast Office – Mary Shouldis, Rodney Viereck, Steven Hill, Josh Rigler, Juan Rodriguez, and Paul Lotoaniu, NOAA/NWS/ Space Weather Prediction Center, Boulder, CO

2:15 PM

GOES-R for Broadcast Meteorologists – Going from a Trickle to a Fire Hose
Dan Satterfield, WHNT NEWS 19, Huntsville, AL

2:30 PM

Coffee Break and NWA/GUC Joint Poster Session

GUC Session 4: Benefits of GOES-R Products for Forecasters/Broadcasters - Part II. Session Chair: Jeffrey Craven, NOAA/NWS, Milwaukee/Sullivan, WI

3:30 PM

Developing and Evaluating RGB Composite MODIS Imagery for Applications in NWS Forecast Offices – Andrew L. Molthan, NASA Short-term Prediction Research and Transition (SPoRT) Center, NASA/MSFC, Huntsville, AL, Hayden K. Oswald, USRP/NASA Summer Intern Program, University of Missouri, Columbia, MO, Kevin K. Fuell, University of Alabama Huntsville/NASA SPoRT Center, Huntsville, AL

3:45 PM

Improving Short-Term Predictions and the Identification of Hazardous Weather –
Deirdre Kann, Brian Guyer, and Annette Mokry, NOAA/NWS WFO, Albuquerque, NM

4:00 PM

Meteosat Third Generation (MTG): An Innovative Approach to Advanced Observations from the Geostationary Orbit – Rolf Stuhlmann, Sergio Rota, Lothar Schwarz, and Chris Hartley, EUMETSAT, Darmstadt, Germany

4:15 PM

Optimizing the Lightning Forecast Algorithm within the Weather Research and Forecasting Model – Eugene W. McCaul, NASA SPoRT Center/USRA, Huntsville, AL, Jonathan L. Case, NASA SPoRT Center/ENSCO, Inc., Huntsville, AL, Steven J. Goodman, NOAA/ NESDIS/GOES-R Program Office,

Greenbelt, MD, Scott R. Dembek, USRA/CIMMS, Kennett Square, PA, and Fanyou Kong, Center for Analysis and Prediction of Storms, Norman, OK

4:30 PM

An Overview of New and Unique GOES-R Products for Hazard Assessments – Michael Pavolonis, NOAA/NESDIS/Center for Satellite Applications and Research, Madison, WI, Daniel C. Hartung and Justin Sieglaff, UW-CIMSS, Madison, WI

4:45 PM

PM GOES-R Post Launch Activities – Vanessa Griffin, Satya Kalluri and Christopher Wheeler, NOAA/NESDIS, GOES-R Project, Greenbelt, MD

5:00 PM

User Input from Past GOES Users' Conferences – James Gurka, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD

5:15 PM

Question and Answer Session – James Gurka, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD

6:00 PM

GUC Dinner – "Reconnect With Your Passion Now!" Guest Speaker: James Spann, Chief Meteorologist, WBMA-TV, Birmingham, AL

October 20 (Friday)

7:30 AM

Continental Breakfast

GUC Session 5: User Discussion and Recommendations

Session Chair: James Spann (NWA Annual Meeting Program Committee), WBMA-TV, Birmingham, AL

8:00 AM

Introductions to Group Topics; Discussion on Purpose and Logistics - James Gurka, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD

8:10 AM

Group Discussion I--Exploiting GOES Data/Products: Share and discuss methods to better exploit current GOES data and products for your applications area (e.g., Are there operational products that you do not currently have access to in your system?). Are there "best practices/lessons learned" for transition to the GOES-R system?

This includes but is not limited to discussing the following questions:

- What other information would you like to see on the suite of operational products currently available from GOES?
- What existing (or new) products would you want more information about that could help your area of interest?
- Current GOES products are in a number of formats (netCDF, AREA, BUFR, etc.), while GOES-R formats are slated to be netCDF and AREA. If products were available in other formats, would that help your applications? If so, what formats would you like to see available?
- What are some of the strengths with current GOES system that should be continued?
- What are some of the weaknesses with current GOES system that should be improved?
- Do you have any suggestions for blended/merged products (i.e. merged TPW)? Would a comparison to climatological means/extremes be useful?
- What else would you like to discuss on this topic?

Facilitator: Ken Carey (Noblis, Inc.)

Subject Experts: Timothy J. Schmit, (NOAA/NESDIS/STAR/CoRP/ASPB), Tom Renkevans (NOAA/NESDIS/OSPO)

Executive Secretaries: Michelle Tamoria, Omitron, Beltsville, MD and Kathryn Mozer, ASRC, Greenbelt, MD (NOAA/NESDIS/GPO).

Presenter: Deirdre Kann (NOAA/NWS/Albuquerque)

NWS Field Representative: Jeff Craven (NOAA/NWS/Milwaukee/Sullivan)

NWS National Center Representative: Jack Beven (NOAA/NWS/NHC)

Proving Ground Representatives: Wayne Feltz (SSEC/CIMSS), Michael Folmer (NOAA/NWS/OPC)

Broadcasters: James Spann (WBMA-TV), Dan Satterfield (WHNT NEWS19)

9:05 AM

Group Discussion II--Operational Enhancements by Leveraging the GOES-R Proving Ground:

How might satellite resources be more effective in helping provide operational products/services? Do you have any recommendations on better use of satellite resources (including the GOES-R Lightning Mapper) in the Proving Ground exercises? What actions do you recommend to ensure the Proving Ground is more effective in using future satellite data for decision support?

This includes but is not limited to discussing the following questions:

- How might satellite information best improve your services?
- How would you envision the optimum combination of the GLM with the ABI? How do you suggest we integrate observing systems (satellite, radar, ground-based, in-situ) with NWP for nowcasting high impact weather, short term forecasts? What should be the priority near-term activities?
- What are some of the strengths with current GOES-R Proving Ground?
- What are some of the weaknesses with current GOES-R Proving Ground that could be improved?
- Are there other user groups that should be involved in Proving Ground efforts?
- What else would you like to discuss on this topic?

Facilitator: Ken Carey (Noblis, Inc.)

Subject Expert: Steve Goodman (NOAA/NESDIS/GPO)

Executive Secretaries: Michelle Tamoria, Omitron, Beltsville, MD and Kathryn Mozer, ASRC, Greenbelt, MD (NOAA/NESDIS/GPO).

NWS Field Representative/Presenter: Rusty Billingsley (NOAA/NWS/SRH)

NWS National Center Representative: Jamie Kibler (NOAA/NESDIS/OSPO)

Proving Ground Representative: Chris Siewert (OU-CIMSS)

Broadcasters: Dan Satterfield (WHNT NEWS19), James Spann (WBMA-TV)

10:00 AM

Break

10:20 AM

Group Discussion III--Maximizing Operational User Readiness/Decision Support: What training and education is needed for users to maximize GOES-R data and products? What methods (e.g., delivery, user involvement) would be most beneficial to operational forecasters and broadcasters?

This includes but is not limited to discussing the following questions:

- Are you aware of existing training materials related to GOES-R? What could we do to enhance awareness and usefulness of GOES-R training/education material?
- Are there other needed training materials needed? If so, when would you need the materials, and in what form should the materials be for maximum impact?
- Do you understand how you might get the GOES-R imagery and products? If not, what could be done to improve an understanding?

- What other decision support tools do you envision during the GOES-R era?
- How else might the information from GOES-R best be exploited?
- What information do you need in order to receive the data directly from the GOES-R satellite via antenna?
- What else would you like to discuss on this topic?

Facilitator: Ken Carey (Noblis, Inc.)

Subject Experts: Jim Gurka (NOAA/NESDIS/GPO), Brian Motta (NOAA/NWS/OCWWS)

Executive Secretaries: Michelle Tamoria, Omitron, Beltsville, MD and Kathryn Mozer, ASRC, Greenbelt, MD (NOAA/NESDIS/GPO).

Presenter: Jim LaDue (NOAA/NWS/OCWWS)

NWS Field Representative: Tony Mostek (NOAA/NWS/OCWWS)

NWS National Center Representative: Jim LaDue (NOAA/NWS/OCWWS)

Proving Ground Representative: Bonnie Reed (NOAA/NWS/OST)

Broadcasters: James Spann (WBMA-TV), Dan Satterfield (WHNT NEWS19)

11:15 AM

Group Topical Discussion Summaries - Ken Carey (Noblis, Inc.)

11:45 AM

Closing Remarks

James Gurka, NOAA/NESDIS, GOES-R Program Office, Greenbelt, MD

APPENDIX B POSTER ABSTRACTS

NWA/GUC Joint Satellite Poster Sessions

Poster presenters available Wednesday, 6:00-9:00 p.m. and Thursday, 2:30-3:30 p.m.

P4.1 ABI Flight Performance Predictions Based on PTM Test Results. Dr. Paul C. Griffith, Alan Bell, John Van Naarden, Erik Hoffman and Chris Ellsworth, ITT Geospatial Systems, Fort Wayne, IN

The Advanced Baseline Imager (ABI), a NASA administered and NOAA funded program, designed and built by ITT Geospatial Systems, provides significantly increased capabilities over the current operational GOES Imager (significantly more channels, higher resolution, and faster image repetition rate). The prototype model (PTM) is the qualification instrument for the ABI design and test program. This paper takes the measured performance of the PTM and predicts the on-orbit performance of the ABI flight instrument, showing significant performance margin in many areas including SNR, NE Δ T, dynamic range, MTF, edge response, spatial response uniformity, and image quality.

P4.2 A Grobner Basis Solution for Lightning Ground Flash Fraction Retrieval. Richard Solakiewicz and Rohan Attele, Chicago State University, Chicago, IL and William Koshak, NASA Marshall Space Flight Center, Huntsville, AL

A Bayesian inversion method was previously introduced for retrieving the fraction of ground flashes in a set of flashes observed from a (low earth orbiting or geostationary) satellite lightning imager. The method employed a constrained mixed exponential distribution model to describe the lightning optical measurements. To obtain the optimum model parameters, a scalar function was minimized by a numerical method. In order to improve this optimization, we introduce a Grobner basis solution to obtain analytic representations of the model parameters that serve as a refined initialization scheme to the numerical optimization. Using the Grobner basis, we show that there are exactly 2 solutions involving the first 3 moments of the (exponentially distributed) data. When the mean of the ground flash optical characteristic (e.g., such as the Maximum Group Area, MGA) is larger than that for cloud flashes, then a unique solution can be obtained.

P4.3 Assimilation of Atmospheric Infrared Sounder (AIRS) Data into the Prototype High Resolution Rapid Refresh for Alaska (HRRRAK). Don Morton, Arctic Region Supercomputing Center, University of Alaska at Fairbanks, Fairbanks, AK and Developmental Testbed Center, NCAR, Boulder, CO; Kayla Harrison, Arctic Region Supercomputing Center, University of Alaska at Fairbanks, Fairbanks, AK and Brad Zavodsky and Gary Jedlovec, NASA/Short-term Prediction Research and Transition Center, Huntsville, AL

The Arctic Region Supercomputing Center has been running a quasi-operational prototype of a High Resolution Rapid Refresh for Alaska (HRRRAK) at 3km resolution, initialized by the 13km Rapid Refresh (RR). Although the RR assimilates a broad range of observations into its analyses, preliminary experiments with the HRRRAK suggest that there may added value in assimilating observations into the 3km initial conditions, downscaled from the 13km RR analyses.

In this work we assess the use of assimilated satellite soundings and the effect on control (non-assimilated) HRRRAK case studies as a preliminary step towards deploying the assimilation in the quasi-operational environment. The Atmospheric Infrared Sounder (AIRS) data is an instrument aboard NASA's polar-orbiting EOS Aqua satellite. Among its many products are two key ones - temperature and moisture vertical profiles. The NASA Short-term Prediction Research and Transition (SPoRT) group has been experimenting with the use of AIRS for data assimilation since 2004, using WRF and WRF-Var over the contiguous United States with promising results. Through the use of the Gridpoint Statistical

Interpolation (GSI) system for assimilating AIRS data into the HRRRAK, we will perform two case studies to qualitatively and quantitatively assess the impacts of AIRS data on the forecasts.

P4.4 Demonstration of RGB Composite Imagery at NOAA National Centers in Preparation for GOES-R. Kevin Kenneth Fuell, University of Alabama in Huntsville & NASA/SPoRT Center and Dr. Andrew Molthan, NASA/SPoRT Center and MSFC, Huntsville, AL

The NASA Short-term Prediction Research and Transition (SPoRT) Center, in collaboration with the Cooperative Institute for Research in the Atmosphere (CIRA), is providing red-green-blue (RGB) color composite imagery to several of NOAA's national prediction centers as a demonstration of future Advanced Baseline Instrument (ABI) capabilities on GOES-R. Forecasters at national centers rely heavily on geostationary satellite imagery to monitor conditions over a wide area of responsibility, such as the CONUS or entire ocean basins. RGB imagery uses multiple channels or channel differences for each component color of the composite in order to enhance physical features in the atmosphere and at the surface. A standard suite of RGB imagery was developed by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) in order to more efficiently apply the 4-fold increase in available geostationary spectral channels from the Spinning Enhanced Visible and Infrared Imager (SEVIRI) instrument. Similarly, the ABI on GOES-R will usher in a new era of geostationary capabilities. As part of the GOES-R Proving Ground, SPoRT is facilitating the use of RGB imagery by providing the imagery in the user's native display system and developing training. The Air Mass RGB via SEVIRI is being provided by SPoRT over the Atlantic basin to expose forecasters to its application for support of tropical weather as well as events affecting trans-Atlantic travel. CIRA is providing the appropriate GOES Sounder channels to SPoRT in order to create an Air Mass RGB over the CONUS for national centers with interests outside the SEVIRI view. For both SEVIRI and GOES Sounder products, SPoRT has developed a method to transform the imagery into a color palette displayable within N-AWIPS used by the various national centers. The National Hurricane Center will be evaluating other relevant RGB composites such as Dust and Natural Color imagery, to improve the depiction of the Saharan Air Layer, blowing dust, and other features. This presentation will discuss the application of various RGB composites at these national centers to improve short-term forecasting and situational awareness. It will also focus on specific events where evaluations from operational forecasters at national centers indicated the multi-spectral RGBs improved awareness over the use of single channel imagery. Future capabilities discussed will include the combination of current geostationary and polar-orbiting data as a proxy RGB for the future GOES-R capabilities.

P4.5 Development of GOES-R Algorithms Using a Common Framework and Data Model Design Approach. Scott Zaccheo, Craig Richard, David B. Hogan and Edward Kennelly, Atmospheric and Environmental Research, Inc., Lexington, MA

The development of a common/robust algorithm framework and data model(s) are two key elements of Harris GOES-R Team ground system infrastructure design. These modern software design elements will facilitate the transition of Government provided algorithms packages to operational Level 1 and 2+ software. The Harris Team GOES-R GS algorithm framework provide general design principles and standardized methods for initializing general algorithm services, interfacing to external data, generating intermediate and L1b and L2 products and implementing common algorithm features such as meta-data generation and error handling. The data model interface is an essential part of this framework, and provides abstract classes/methods for reading external data and writing output products and meta-data. The data model design provides a seamless mechanism for transition core algorithm software between algorithm engineering and operational environment. Algorithm developed and tested in an engineering environment will need not significant if any interface re-work as they are transitioned to the production facility, since data model classes and methods employed in the development environment will mimic those in the operation system. This modular design approach not only enables a smooth transition from development to operations, but also enables buy-back from the production to the development environment. This work described the basis Harris GOES-R GS team's algorithm architecture and

engineering approach, and demonstrates how the algorithm framework and data model are an integral part of this process. It also provides a preliminary implementation road map for the development of the GOES-R GS software infrastructure, and view into how the framework and data model will be integrated into the final design.

P4.6 End-to-End Design and Development of GOES-R Level 2 Algorithms: Cloud Pathfinder

Algorithm Case Study. Andra Ivan, P. A. Van Rompay, L. Belvin, and X. Papadakis, Atmospheric and Environmental Research, Inc., Lexington, MA

GOES-R is the next generation of the National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite (GOES) System, and it represents a new technological era in operational geostationary environmental satellite systems. GOES-R will provide advanced products, based on government-supplied algorithms, which describe the state of the atmosphere, land, and oceans over the Western Hemisphere. The Harris GOES-R Core Ground Segment (GS) Team will provide the ground processing software and infrastructure needed to produce and distribute these data products. As part of this effort, new or updated Level 1b and Level 2+ algorithms will be deployed in the GOES-R Product Generation (PG) Element. In this work, we describe the general approach currently being employed to migrate these Level 1b (L1b) and Level 2+ (L2+) GOES-R PG algorithms from government-provided scientific descriptions to their implementation as integrated software, and we present an illustrated case study of this process for a single "Pathfinder" algorithm. The ABI Cloud Mask algorithm was selected for this purpose based on its maturity and level of complexity. In general, GOES-R L2+ algorithms ingest calibrated and geo-located GOES-R L1b data and other ancillary/auxiliary/intermediate information to produce L2+ products such as aerosol optical depth, rainfall rate, derived motion winds, and snow cover. In this work, we describe the ABI Cloud Mask algorithm's journey from its scientific description in an Algorithm Theoretical Basis Document (ATBD) to a working engineering solution, and we highlight milestones in the software development life cycle. This process begins with requirements analysis and continues on through design and implementation to reproducibility testing, with final integration into the functional PG test environment. Throughout this process, the ways in which an algorithm interacts with the common algorithm framework and the larger PG infrastructure are defined and refined. This presentation outlines the software development process approach, refinements that were developed during this "Pathfinder" exercise, and provides a discussion of lessons learned about translating scientific specifications into software design with follow-on implementation.

P4.7 Enhanced Use of GOES for Estimating Land Surface Wetness with Application to Wildfire Forecasting at the NOAA Storm Prediction Center. Robert Rabin, NOAA/OAR/National Severe Storms Laboratory and Phillip Bothwell, NOAA/NWS/Storm Prediction Center, Norman, OK

A new tool to provide fire weather forecasters daily changes in surface wetness and weekly changes in fuel loads will be presented. The tool provides estimates of surface dryness from the rate of daytime warming observed from GOES skin temperature in clear sky. It is augmented with estimates of Normalized Difference Vegetation Index (NDVI) from the Advanced Very High Resolution Radiometer (AVHRR) on NOAA polar orbiting satellites for information on biomass and dry fuels. Based on previous work which used clear-sky sounder surface temperature to estimate surface wetness, this approach makes use of enhanced spatial and temporal resolution of the GOES imager.

The evolution of the recent dry surface conditions in the south central U.S. from the GOES measurements will be compared to other estimates of soil moisture and drought index; for example the Advanced Microwave Scanning Radiometer (AMSR-E) on the NASA Aqua satellite, and the U.S. Drought monitor. It is expected that the product developed here will be enhanced with future availability of GOES-R data; especially with the enhanced resolution and capability of directly estimating NDVI from the Advanced Baseline Imager (ABI).

P4.8 Evaluation of NASA SPoRT's Pseudo-Geostationary Lightning Mapper Products in the 2011 Spring Program. Geoffrey T. Stano, NASA SPoRT Center/ENSCO, Inc., Huntsville, AL, Christopher Siewert, CIMMS University of Oklahoma, Norman, OK and Kristin M. Kuhlman, NOAA/OAR/LCI & CIMMS University of Oklahoma, Norman, OK

NASA's Short-term Prediction Research and Transition (SPoRT) program is a contributing partner with the GOES-R Proving Ground (PG) helping prepare forecasters to understand and utilize the unique products that will be available in the GOES-R era. This presentation emphasizes SPoRT's actions to help prepare the end user community for the Geostationary Lightning Mapper (GLM). This preparation is a collaborative effort with SPoRT's National Weather Service partners, the lightning Algorithm Working Group (AWG), the National Severe Storms Laboratory (NSSL), and the Hazardous Weather Testbed's Spring Program. SPoRT continues to use its effective paradigm of matching capabilities to forecast problems through collaborations with our end users and working with the developers at NSSL to create effective evaluations and visualizations. Furthermore, SPoRT continues to develop software plug-ins so that these products will be available to forecasters in their own decision support system, AWIPS and eventually AWIPS II.

In 2009, the SPoRT program developed the original pseudo geostationary lightning mapper (PGLM) flash extent product to serve as a demonstration for what forecasters may see once the GLM is launched. The PGLM was created as a replacement of the existing GLM demonstration product and as a stepping-stone product until the AWG's official GLM proxy is ready. The PGLM algorithm itself is simple and can be applied to any ground-based total lightning network. For the Spring Program, the PGLM used observations from four ground-based networks (North Alabama, Kennedy Space Center, Oklahoma, and Washington D.C.). While the PGLM is not a true proxy product, the PGLM is intended as a tool to train forecasters about total lightning as well as foster discussions on product visualizations and incorporating GLM-resolution data into forecast operations. The PGLM was successfully used during the 2010 and 2011 Spring Programs in a joint effort between SPoRT and NSSL. It is likely to remain the primary lightning training tool for the GOES-R program for the near future.

This presentation will emphasize the feedback received during the 2011 Spring Program. This will discuss several topics. Based on feedback from the 2010 Spring Program, SPoRT created two variant PGLM products, which NSSL produced locally and provided in real-time within AWIPS for 2011. The first is the flash initiation density (FID) product, which creates a gridded display showing the number of flashes that originated in each 8 by 8 km grid box. The second product is the maximum flash density (MFD). This shows the highest PGLM value for each grid point over a specific period of time, ranging from 30 to 120 minutes. In addition to the evaluation of these two new products, the evaluation of the PGLM itself will be covered. The presentation will conclude with forecaster feedback for additional improvements requested for future evaluations, such as within the 2012 Spring Program.

P4.9 Geospatial Assessment of the Reconstruction of the 1999 Moore, Oklahoma Tornado. Melissa A. Wagner, Randy S. Cerveny and Soe W. Myint, Arizona State University, Tempe, AZ

Remote sensing has demonstrated to be an instrumental tool in monitoring land changes as a result of anthropogenic change or natural disasters. Few studies have focused on small-scale disasters like the aftermath of a tornado providing only damage assessments using geospatial techniques or statistical analyses of recovery from economic and migration perspectives. This study examines reconstruction of the 1999 Moore, OK tornado disaster for 2000, 2001 and 2002 by analyzing remotely sensed data through a series of image processing algorithms. Using spectral enhancements (vegetative, urban, and two new indices), reconstruction was assessed for each year employing a recovery index and statistical thresholds. Classification accuracy assessments proved that geospatial techniques and medium resolution imagery could be used to capture the recovery. The Shortwave Radiation Index (SWIRI), a new index designed for disaster management, was the most effective at assessing reconstruction using the 1.5 standard deviation threshold. Computed annual and Fujita Scale recovery rates indicate that (a) the most severely damaged

areas associated with an F5 rating were the slowest to recover, while the lesser damaged areas (F1-F3) were the quickest to rebuild, and (b) complete recovery was never attained even 3 years after the disaster in any of the F-scale damage zones. The critical and most significant finding is that recovery appears to be a direct function of the level of damage sustained. With these results, decision makers and other policyholders could implement more resilient approaches to reconstruction in the most severely damaged areas.

P4.10 GOES Imager Stray Light Correction. Hyre Bysal, NOAA/NESDIS/OSPO, Suitland, MD; Steven Buford, ITT Geospatial Systems; Timothy J. Schmit, NOAA/NESDIS/STAR/CoRP/ ASPB, Madison, WI; Grant Matthews, ITT Geospatial Systems and Xiangqian (Fred) Wu, NOAA/NESDIS/STAR, Camp Springs, MD

With the GOES-N/P (13/15) series of satellite and instrument improvements there is no longer a health and safety risk of imaging close to the sun. However, NOAA has discovered significant product degradation due to sun intrusion when scanning up to 10° of the sun. This happens around satellite midnight both during the spring and fall. The sun intrusion is more detectable on shorter wavelength IR channels (especially Channel 2) of the imager with the effect increasing as the scan mirror line-of-sight (LOS) gets closer to the sun.

NOAA and ITT Industries have completed characterizing the effect of the sun intrusion and developed an algorithm to correct for the stray light and maximize scanning around satellite midnight during the eclipse season. The algorithm consists of two parts:

1. Subtracting the known amount of additional stray light from the signal (outside of 6° for Imager Channel 2 and 1° for other channels)
2. Using the longer wavelength (10.7 and 13.3 um) signal in combination with 3.9-um signal to estimate a truer 3.9-um signal in areas where the sun is within 6° of the pixel and the stray light effect is overwhelming.

The algorithm will work in real-time and within the Sensor Processing System (SPS) resulting in corrected GVAR stream to the users. The stray light correction and minimum sun angle for each line will be included in the GVAR stream in Block 0 so the users can opt not to use any line or frame when too close to the sun. This stray light correction will allow for additional images to be scanned and disseminated and hence a better monitoring of the earth-ocean-atmosphere system. Due to this partial degradation and NOAA's commitment to quality, all image frames within 6° of the sun is currently being canceled, a total of 6 days of imager time per year.

P4.11 GOES Playback and Display: Interacting with Movies. James L. Carr, Michael D. Smith and David M. Zakar, Carr Astronautics, Greenbelt, MD

The GOES-R satellite has three imaging instruments: the Advanced Baseline Imager (ABI), the GOES Lightning Mapper (GLM), and the Solar Ultraviolet Imager (SUVI). These instruments provide enhanced imagery with better spatial, spectral, and temporal resolution compared to previous GOES imaging instruments. As a result, GOES-R requires software that can enable the operator to quickly review new imagery in an effective fashion as either movies or still images. GOES-R is not just still photography; GOES-R is movie-making. The subject of this presentation is the Playback and Display component (PAD) of the Product Monitor software (PM) for the GOES-R series, which can accomplish this requirement. We will focus on the image display and interaction capabilities of PAD.

Incoming image data from the GOES Re-Broadcast (GRB) is progressively encoded into JPEG-2000 images by the Ingest and Store component (IAS) of the PM. These image files are then quickly made available to PAD the latency between the full image data being received from the GRB by IAS and being made available to PAD is just a few seconds. The operator, using the PAD GUI, is able to intuitively and flexibly interact with new images as still pictures, or as part of a movie of past imagery. This movie-making capability is a key part of PAD's effectiveness, as it gives temporal context of the imagery to the operator and makes it easier to spot small changes in the imagery. This new capability helps operators

ensure the quality of the GRB data to provide GOES users the best possible data for forecast and response.

P4.12 GOES-R AWG Product Processing System Framework: System Design. Walter Wolf, NOAA/NESDIS/STAR, Camp Springs, MD; Shanna Sampson, IMSG, Ray Garcia, CIMMS, Graeme Martin, CIMSS, and Xinpin Liu, Dell, Camp Springs, MD

NOAA/NESDIS/STAR has designed, developed, and implemented the GOES-R Algorithm Working Group (AWG) Product Processing System Framework. The Framework enabled the development and testing of the Level 2 Advance Baseline Imager (ABI) and the GOES-R Lightning Mapper (GLM) products within a single system. Fifty-six GOES-R ABI algorithms and one GLM algorithm have been integrated and run within the framework with product precedence. The Framework has been modified to be plug-and-play system with the scientific algorithms. To enable the plug-and-play capabilities, the fifty-seven ABI and GLM algorithms were adjusted such that any data required by the algorithm is brought into the algorithm through function calls. These modifications allowed an algorithm to be developed either within the Framework or within the scientist's offline research system. This approach provided both the algorithm developers and algorithm integrators the ability to work on the same software since the algorithm may be dropped into both systems resulting in simple algorithm rollbacks. The design of this system also enables the GOES-R ABI algorithms to be easily modified to process GOES data. Implementation of GOES processing with the Framework will allow the creation of GOES products using the state of the art algorithms enabling the users to prepare for the GOES-R ABI products. The Framework design and the adjustment of algorithms to produce GOES products shall be discussed.

P4.13 GOES-R Ground System and Algorithm Implementation Design. Alexander Werbos and Elizabeth Lundgren, Atmospheric and Environmental Research, Inc., Lexington, MA and Robert Kaiser, Harris Corporation, Melbourne, FL

The next generation of NOAA's Geostationary Operational Environmental Satellite system, Series R (GOES-R) provides continuity of the GOES mission and improvement of its remotely-sensed environmental data. The GOES-R system consists of the Space and Ground Segments. The Space Segment consists of spacecraft bus, its remote-sensing instruments, and communications payloads; while the Ground Segment consists of all Earth-based functions, provides satellite operations, instrument product generation, and distribution. The GOES-R Ground Segment operates from three sites: the NOAA Satellite Operations Facility (NSOF) in Suitland, MD; the Wallops Command and Data Acquisition Station (WCDAS), located in Wallops, VA; and a geographically diverse remote backup facility (RBU) located at Fairmont, WV. The architecture has been developed to allow integrated operation within a geographically distributed information systems framework. GOES-R will provide advanced products, based on government-supplied algorithms, that describe the state of the atmosphere, land, and oceans over the Western Hemisphere as well as products for monitoring the local space environment and the solar state. The Harris GOES-R Core Ground Segment (GS) Team will provide the software and engineering infrastructures to produce and distribute these next-generation data products both directly to users and to the archival systems. Within the Ground Segment, the Product Generation Element (PG) is responsible for the software implementations of scientific algorithms. In this presentation we provide an overview of how Product Generation software works with the other elements of the Ground Segment to produce Level 2+ end-products. We discuss the specific software structures used to implement Level 2+ algorithms, and how those structures interface with other components in a way that meets the needs of a distributed, high-performance computational environment.

P4.14 GOES-R GS Product Generation Infrastructure Operations. Mike Blanton, Harris Corporation, Melbourne, FL

GOES-R GS Product Generation Infrastructure Operations: The GOES-R Ground System (GS) will produce a much larger set of products with higher data density than previous GOES systems. This

requires considerably greater compute and memory resources to achieve the necessary latency and availability for these products. Over time, new algorithms could be added and existing ones removed or updated, but the GOES-R GS cannot go down during this time. To meet these GOES-R GS processing needs, the Harris Corporation will implement a Product Generation (PG) infrastructure that is scalable, extensible, extendable, modular and reliable. The primary parts of the PG infrastructure are the Service Based Architecture (SBA), which includes the Distributed Data Fabric (DDF). The SBA is the middleware that encapsulates and manages science algorithms that generate products. The SBA is divided into three parts, the Executive, which manages and configures the algorithm as a service, the Dispatcher, which provides data to the algorithm, and the Strategy, which determines when the algorithm can execute with the available data. The SBA is a distributed architecture, with services connected to each other over a compute grid and is highly scalable. This plug-and-play architecture allows algorithms to be added, removed, or updated without affecting any other services or software currently running and producing data. Algorithms require product data from other algorithms, so a scalable and reliable messaging is necessary. The SBA uses the DDF to provide this data communication layer between algorithms. The DDF provides an abstract interface over a distributed and persistent multi-layered storage system (memory based caching above disk-based storage) and an event system that allows algorithm services to know when data is available and to get the data that they need to begin processing when they need it. Together, the SBA and the DDF provide a flexible, high performance architecture that can meet the needs of product processing now and as they grow in the future.

P4.15 GOES-R Product Definition and Users' Guide - Work in Progress. Christa C. Hornbaker and Michelle Burch, GOES-R Ground Segment Project/Boeing, Fort Walton Beach, FL

The number, variety and quality of products that are planned for the era of GOES-R operations will be a significant increase and advancement from what is available today. One of the efforts currently underway as a part of the GOES-R Ground Segment Project (GSP) development & design effort is the creation of the GOES-R Product User's Guide (the PUG), a document that is intended to provide product descriptions, as well as specific information on formats for GOES-R Rebroadcast (GRB) data, Level 0 data, Level 1b products, and all Level 2+ end-products. It will include descriptions of the product content, formats to enable/enhance end-product usability, and uses and applicability of each end-product. At this point in the GOES-R Ground Segment development process, the definitions for the Level 2+ products is fairly mature, as are the algorithms that drive the creation of these products. The information available for Level 0, Level 1b and GRB data is still fairly immature/incomplete, but it will still be beneficial, we believe, to begin to expose the PUG to the larger user community.

One of the primary purposes of the PUG is to support Government remote tele-training and public outreach efforts. As such, we would like to use the occasion of the 7th GOES (Geostationary Operational Environmental Satellite) Users' Conference (GUC) to present as a poster session, the PUG as a Work In Progress. The goal is to enhance our outreach to the end-user community and to solicit feedback/ideas for possible incorporation in the PUG as development & design continues.

P4.16 GOES-R Products List and Planned Availability. Donald Gray, NOAA/NESDIS, Goddard Space Flight Center, Greenbelt, MD

The launch of GOES-R in 2015, the next generation of Geostationary Operational Environmental Satellites, will represent a significant step forward in space based remote sensing capabilities. The instrument suite consists of the Advanced Baseline Imager (ABI), the Geostationary Lightning Mapper (GLM), the Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS), the Space Environment In-Situ Suite (SEISS), the Solar Ultraviolet Imager (SUVI), and the GOES-R Magnetometer (MAG). This article will describe the complete set of GOES-R products, including both the calibrated and navigated radiances (Level 1b) and derived end-products (Level 2+), the operational implementation schedule (both Baseline and Option 2) and their planned availability to the user community following launch.

P4.17 GOES-R Proving Ground Product Development at CIRA. Daniel T. Lindsey, Don Hillger, Deb Molenar, John A. Knaff and Mark DeMaria, NOAA/NESDIS/RAMMB, Fort Collins, CO and Steve Miller, Renate Brummer, Louie Grasso, Stan Kidder, Dan Bikos, Jeff Braun, Bernie Connell, Ed Szoke, Hiro Gosden, Kevin Micke and Robert DeMaria. Cooperative Institute for Research of the Atmosphere, Fort Collins, CO

The GOES-R Proving Ground is a program to help bridge the gap between GOES-R product development and the operational weather community. At the Cooperative Institute for Research in the Atmosphere (CIRA), a number of experimental GOES-R products are being developed using simulated, synthetic and proxy GOES-R datasets and delivered to various participating National Weather Service offices and National Weather Centers, such as the Storm Prediction Center and the National Hurricane Center. A primary short-term goal is to obtain feedback from the operational forecasters on product performance, limitations, and ideas for improvement. The longer-term benefit of the program is to have products and algorithms ready for use when GOES-R becomes operational.

This poster will provide examples of the various Proving Ground products being developed at CIRA. These include, but are not limited to, GeoColor and true color imagery, low cloud and fog imagery, blowing dust detection, cloud/snow discrimination, red, green, blue (RGB) image combinations, experimental probabilistic forecasts of rapid tropical cyclone intensification and synthetic ABI imagery from the NSSL WRF-ARW. Examples of the feedback between the developers and operational forecasters will also be provided.

P4.18 GOES-R Sectorized Cloud and Moisture Imagery Products. William H. Campbell, NOAA/NWS/OST, Silver Spring, MD; Marge M. Ripley and Jean-Jacques P. Bedet, NOAA/NESDIS/GOES-R Program Office, Greenbelt, MD; James N. Heil, NOAA/NWS/OCWWS and Brian S. Gockel, NOAA/NWS/OST, Silver Spring, MD

The GOES-R Ground Segment (GS) will send sectorized Cloud and Moisture Imagery (CMI) Products to the Advanced Weather Interactive Processing System (AWIPS) via a dedicated interface to the primary, backup, and test Network Control Facility (ANCF, BNCF, TNCF). From there the products will be disseminated to the AWIPS field sites via NOAAPort. Spatial, temporal, and spectral resolution will be greatly enhanced with 16 spectral bands at ½ km to 2 km resolution. The improved temporal resolution will refresh Full Disk and CONUS imagery every 5 minutes in one scanning mode and Full Disk, CONUS and Mesoscale (1000 km by 1000 km area) at 15 minutes, 5 minutes, and 30 seconds, respectively, in the other scanning mode. Products can be tailored using the six operator-configurable parameters that define a sectorized CMI Product. This poster will describe those six parameters and a representative set of operational products that will be used to test the GOES-R GS performance. The product latency requirements (for Full Disk, CONUS, regional, and mesoscale products) are very stringent and the IT infrastructure needed to support those latency requirements will be shown.

P4.19 How GOES-R Will Limit Outages and Breaks In Continuity. Les Spain, Harris Corporation, Melbourne, FL

The GOES-R Series with new spacecraft and a new ground system contains a number of features designed to limit outages and breaks in continuity. The GOES-R spacecraft will make use of GPS based navigation to maintain position and operate for up to 14 days without command contact with the ground and lower outage time during and following maneuvers. The use of Consultative Committee for Space Data Systems (CCSDS) standards and Low Density Parity Check (LDPC) code permits improved communications packet handling and error detection and correction. The ground system contains a geographically isolated back-up facility that mimics the ability of the primary site to command the spacecraft, produce and uplink GRB and generate KPPs. The spacecraft and ground system both contain features designed to meet stringent availability requirements. The spacecraft contain autonomous fault detection and correction capabilities that contribute to successful recovery from component failures. The

ground system uses an Enterprise Management capability to enable operators to supervise their local site and distributed GS components, infrastructure, and interfaces. The Ground Product Processing Infrastructure uses mainstream, standards-based hardware technology based on mature, vendor-neutral, commodity hardware components, reducing risk during upgrades. Hardware processing capacity can be increased by adding commodity blade servers to a high-performance computing grid. The Product Processing Software allows changes to algorithm complements and precedence dependencies and the addition of new sensors, without adversely affecting the generation of other executing algorithms.

P4.20 Improved Forecasts of Convective Initiation Associated with the North American Monsoon System. Brian Guyer and Deirdre Kann, NOAA/National Weather Service, Albuquerque, NM

The North American Monsoon season within New Mexico is generally characterized by daily cycles of terrain-driven slow-moving thunderstorms that produce locally heavy rainfall, gusty winds, and small hail. The temporal and spatial variability of the mesoscale precipitation pattern is a challenge to forecast and depends strongly on complex terrain and the larger synoptic scale atmospheric circulation. The early identification of atmospheric signals leading up to hazardous monsoon thunderstorm events that produce more widespread heavy rainfall, flash flooding, and strong winds is key to providing advance notification to customers and stakeholders. Satellite products provided to WFO Albuquerque through NASA's Short-term Prediction and Transition (SPoRT) Center are currently being used in an effort to increase the lead time and better define potential areas of heavy rainfall and flash floods.

During the 2010 monsoon season, operations at WFO Albuquerque benefitted from the use of the Cooperative Institute for Research in the Atmosphere's Blended Total Precipitable Water (TPW) and the Percent of Normal TPW, both made available by the NASA SPoRT Center. Regions of well above normal TPW and strong gradients of TPW have been used to more accurately forecast areas of convective initiation and the associated heavy rainfall and potential flash flooding. Sharp gradients in TPW are common during the summer months and the radiosonde network does not have the spatial resolution to identify these dramatic transition zones. The GOES-MODIS hybrid products recently developed at the NASA SPoRT Center, that combine higher resolution MODIS data with the legacy GOES imagery, have been used to better identify areas of convective initiation and to more accurately determine convective cloud top temperatures. The staff at WFO Albuquerque are currently using these NASA SPoRT products in conjunction with guidance from high-resolution numerical prediction models to better identify the timing and location of convective initiation as well as the days convection has the enhanced potential to become hazardous. This presentation will show how the use of these unique NASA SPoRT satellite observations combined with high resolution model data can improve the understanding of the spatial and temporal characteristics of convective initiation patterns prior to the onset of hazardous monsoon thunderstorm events.

P4.21 Improving High Impact Weather Forecasts with Combined GOES-R Measurement and Advanced Infrared Soundings from JPSS. Jun Li, Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin-Madison, Madison, WI

Since the Hyperspectral Environmental Suite (HES) was removed from the GOES-R/S series, the high spectral resolution Cross-track Infrared Sounder (CrIS) onboard the Joint Polar-orbiting Satellite System (JPSS) can be used together with the high temporal and spatial resolution GOES-R Advanced Baseline Imager (ABI) (Schmit et al. 2005) to enhance the high impact weather (convective storms, tropical cyclones, etc.) nowcast and short-range forecasts. The combination of GOES-R ABI and JPSS CrIS will provide useful information of atmospheric temperature and moisture with high temporal resolution, which can help improve monitoring the mesoscale environment for severe weather forecasting and other applications. In addition, the EUMETSAT (EUropean organization for the exploitation of METeorological SATellites) will fly a high spectral resolution sounder called InfraRed Sounder (IRS) on the geosynchronous Meteosat Third Generation (MTG) in 2017, other international communities are also planning to fly advanced IR sounders in geostationary orbit in the 2014 time frame; thus it is essential to

study the use of advanced IR sounding data for high impact weather warning, nowcasting and short-range forecasting. The Atmospheric InfraRed Sounder (AIRS), and the current GOES Sounder are used to emulate the JPSS and GOES-R ABI for atmospheric profiling, the single field-of-view (SFOV) AIRS and GOES soundings are derived in clear skies, the 3DVAR, Ensemble Kalman Filter (EnKF), 4DVAR assimilation techniques are used together with regional numerical weather prediction (NWP) forecast system for AIRS and GOES sounding assimilations. The AIRS and GOES soundings are applied to severe storms such as convective precipitation and hurricanes for forecast improvement. Results show that AIRS SFOV soundings with both WRF (Weather Research and Forecasting)/3DVAR and WRF/DART (data assimilation research test bed) assimilation and forecast systems improve the hurricane track and intensity forecasts, AIRS soundings also improve the precipitation forecast with 4DVAR assimilation technique. The experiments on the application of combined AIRS and GOES soundings for hurricane forecast are ongoing.

P4.22 Investigating the Impact of AIRS Thermodynamic Profiles on Convective Forecasts for the April 25-27, 2011 Severe Weather Events in the Southeastern United States. Bradley T. Zavodsky, NASA SPoRT Center and MSFC, Huntsville, AL; Danielle M. Kozlowski, USRP/NASA Summer Intern Program, University of Missouri at Columbia, Columbia, MO; Andrew L. Molthan, NASA SPoRT Center and MSFC, Huntsville, AL and Jonathan L. Case, ENSCO Inc./ NASA SPoRT Center, Huntsville, AL

The period of 25-27 April 2011 produced widespread severe weather across the southern and southeastern United States, ranging from east Texas into the Carolinas and as far north as central New York, including the devastating tornado outbreak focused in Mississippi, Alabama, Tennessee, and Georgia on 27 April. During this period, the NASA Short-term Prediction Research and Transition (SPoRT) Center produced daily, 36-hour forecasts initialized at 0000 UTC to mimic the configuration of experimental forecasts produced by the National Severe Storms Laboratory, but with additional NASA-contributed data sets. These data sets include the assimilation of temperature and moisture retrievals provided by the Advanced Infrared Sounder (AIRS) instrument aboard NASA's Aqua satellite, land surface fields provided by the Land Information System, vegetation composites provided by the Moderate Resolution Imaging Spectroradiometer (MODIS), and high resolution sea surface temperature composites produced as a blend of MODIS infrared and Advanced Microwave Scanning Radiometer for Earth Observing System (AMSR-E) passive microwave observations.

Given the synoptic-scale forcing of these events, AIRS profiles are the strongest contribution, providing additional information about the temperature and moisture characteristics of the upper atmosphere. This study reports on the impact of AIRS profiles in a data-denial experiment, comparing forecast runs encompassing the three-day series of events both with and without AIRS data assimilation, while retaining other NASA contributions. The assimilation technique is discussed and related to differences in the resulting forecasts that impact convective storm mode, timing, intensity, and evolution. These differences are related to modifications to the storm environment in terms of stability and overall evolution of synoptic and mesoscale features resulting from AIRS profile assimilation.

P4.23 Nighttime Oil Spills Detection and Monitoring by Infrared Satellite Remote Sensing. Sungwook Hong, In-Chul Shin, Su-Mi Koh and Jong-Seo Park, National Meteorological Satellite Center (NMSC) / Korea Meteorological Administration (KMA), Republic of Korea

One of the worst oil spill disasters occurred on April 20, 2010 by the explosion of the Deepwater Horizon oil platform in the Gulf of Mexico. Current optical satellite remote sensing for oil spill detection mainly is useful during the daytime. However, it has limitations on cloudy days or at night. This study proposes a unique infrared satellite remote sensing method for detecting oil spills at night using the differences of refractive index between water and oil. The Moderate Resolution Imaging Spectroradiometer (MODIS) data were used. The results show the capability to distinguish the oil spills from the false recognition of cloud in the current MODIS products by the refractive index. The estimated refractive index values range from 1.1 to 1.2 for water and from 1.2 to 1.4 for oil and dispersants. Consequently, this approach could

serve as an effective and useful method for discriminating between an oil spill and sea-water in the nighttime for the Geostationary Operational Environmental Satellite R Series (GOES-R) satellite mission.

P4.24 NOAA's 2011 Satellite Direct Readout Conference: Summary and Outcomes. Marlin O. Perkins, NOAA/NESDIS/Office of Satellite and Product Operations, NSOF, Suitland, MD

The National Oceanic and Atmospheric Administration's (NOAA) National Environmental Satellite, Data and Information Service (NESDIS), Office of Satellite Products and Operations (OSPO) and the International and Interagency Affairs Office (IIA) held the 2011 Satellite Direct Readout Conference (SDRO) April 4-8, 2011 in Miami, Florida. The aim of this paper is to present conference summary and conclusions on the following services: The purpose of the Conference was to continue discussions initiated during the 2008 Satellite Direct Readout Conference for the Americas and to expand the scope to include all users worldwide. The 2011 Conference theme was: Real-time Access for Real-time Applications. The goal was to meet with users who receive data directly from NOAA's environmental satellites and provide a forum to help them prepare for upcoming changes as NOAA transitions into new technologies for direct readout and broadcast services. More than 200 representatives from 32 countries have attended the Conference.

This year's conference was very important considering the restructuring of the National Polar-orbiting Environmental Satellite System (NPOESS) program to create the Joint Polar-orbiting Satellite System (JPSS) as the follow-on civilian polar program. The GOES-R Program provided new information on the ground system development and their direct readout services. Also, the NTIA provide an update on the proposal for the re-allocation of the 1675-1710 MHz frequency band. This frequency is the health and safety band that supports all environmental monitoring, transmission of global observations and provides critical information to decision makers to produce forecasts and warnings. This presentation also will provide an update on the activities, actions and recommendation from the important SDRO conference.

P4.25 NOAA's Suite of Operational Geostationary Sea Surface Temperature Products Current and Future. Eileen Maturi, NOAA/NESDIS/STAR, Camp Springs, MD, Andy Harris and Jon Mittaz, University of MD, CICS, College Park, MD, and John Sapper and Robert Potash, NOAA/NESDIS/OSPO, Camp Springs, MD

The National Oceanic and Atmospheric Administration's satellite office generates sea surface temperature (SST) retrievals on an operational basis from a suite of satellites, the NOAA GOES-East and West satellites, the European Meteosat Second Generation (Meteosat-9) satellite, and the Japanese Multi-functional Transport Satellite (MTSAT-1R). The SST retrievals are generated using Physical Retrieval Methodology. Products from these satellites include regional hourly and 3-hourly hemispheric imagery, and 24 hour merged composites. They are generated in both binary and netCDF formats.

A new cloud masking methodology based on a probabilistic (Bayesian) approach has been implemented for improved retrieval accuracy. Radiance bias and residual calibration corrections are estimated and applied to each satellite instrument channel at the start of the cloud detection process using information derived from the fast RTM and numerical weather prediction fields. The confidence level of the cloud detection is included as a separate variable in the netCDF product, allowing end-users the option of choosing the cloud threshold level to suit their requirements. The code has been generalized to allow data from any geostationary satellite instrument to be easily ingested.

Operational SST retrievals from NOAA and non-NOAA geostationary satellites and POES satellites are used to produce an operational daily global, high resolution SST Analysis at 11 and 5KM. Comparisons of these analyses with pathfinder SST show the high quality of the Blended SST analysis.

In 2012, NOAA plans to generate Elektro-L1 SST binary and NetCDF L2P products which will provide

complete coverage of the global. The NOAA operational AMSR-E SST product will be included in the Blended SST Analysis.

P4.26 NREPS Applications for Water Supply and Management in California and Tennessee. Patrick Gatlin, Mariana Felix Scott and Lawrence D. Carey, Earth System Science Center, University of Alabama in Huntsville, and Walter A. Petersen, NASA Marshall Space Flight Center, Huntsville, AL

Management of water resources is a balancing act between temporally and spatially limited sources and competitive needs which can often exceed the supply. In order to manage water resources over a region such as the San Joaquin Valley or the Tennessee River Valley, it is pertinent to know the amount of water that has fallen in the watershed and where the water is going within it. Since rain gauge networks are typically sparsely spaced, it is typical that the majority of rainfall on the region may not be measured. To mitigate this under-sampling of rainfall, weather radar has long been employed to provide a real rainfall estimates. The Next-Generation Weather Radars (NEXRAD) make it possible to estimate rainfall over the majority of the conterminous United States. The NEXRAD Rainfall Estimation Processing System (NREPS) was developed specifically for the purpose of using weather radar to estimate rainfall for water resources management. The NREPS is tailored to meet customer needs on spatial and temporal scales relevant to the hydrologic or land-surface models of the end-user. It utilizes several techniques to mitigate artifacts in the NEXRAD data from contaminating the rainfall field. These techniques include clutter filtering, correction for occultation by topography as well as accounting for the vertical profile of reflectivity. This presentation will focus on improvements made to the NREPS system to map rainfall in the San Joaquin Valley for NASA's Water Supply and Management Project in California, but also ongoing rainfall mapping work in the Tennessee River watershed for the Tennessee Valley Authority and possible future applications in other areas of the continent.

P4.27 Objective Validation of Satellite-Based Convective Initiation Algorithms Using Radar.

Valliappa Lakshmanan, University of Oklahoma & NOAA/OAR/NSSL, Norman, OK; Robert Rabin, NOAA/OAR/NSSL, Norman, OK; Justin Sieglaff, CIMSS University of Wisconsin at Madison, Madison, WI; John Walker, University of Alabama in Huntsville and Gary Wade, NOAA/NESDIS/STAR, Madison, WI

In order to validate the forecasts of convection created by the UWCI and UAH-developed SATCAST, we created a radar-based CI verification field by looking for the first occurrence of radar reflectivity above 35 dBZ at a -10C height. These thresholds were chosen because they have been shown to be associated with hail and lightning. Creating this verification field is complicated by the fact that storms move and evolve. Hence it is necessary to account for storm motion and growth when identifying CI, but because of the problems inherent in identifying storms in a pre-convective environment, CI needs to be identified independent of storm identification.

CI forecasts and nowcasts from UWCI and SATCAST were both operated during Spring 2011 in the NSSL Hazardous Weather Testbed and validated within an hour time window (-15 to +45 minutes) and skill scores computed based on association with radar-based CI in varying degrees of isolation. Results and directions for future work are presented.

P4.28 Operational Applications of New Satellite Data Sets in NWS Eastern Region. Dave Radell, NOAA/NWS Eastern Region Headquarters, Bohemia, NY and Frank Alsheimer, NOAA/National Weather Service, Charleston, SC

As part of the national GOES-R Proving Ground initiative, Eastern Region Weather Forecast Offices (WFOs) and Eastern Region Headquarters (ERH) are testing new products and visualization techniques

created by GOES-R satellite algorithm and product developers. These products are being evaluated for their potential use and effectiveness in future operational weather forecasting, giving meteorologists real-time operational demonstrations with the look and feel of anticipated satellite products. While this effort directly addresses the GOES-R Proving Ground mission, it also benefits the Eastern Region emphasis on enhanced short term (0-36 hours) public forecasting, decision support services, and aviation and marine forecasting, since satellite data provides critical information in support of these program areas. Over the past nine months, new satellite products focused on convective initiation, low clouds/fog and cloud phase, sea surface temperature and lake ice cover have been introduced into the Advanced Weather Interactive Processing System (AWIPS) for evaluation by operational forecasters and used in local WFO Weather Research and Forecast (WRF) modeling initiatives. Forecasters note the strengths and weaknesses of the products, then give feedback to ERH and the developer(s), maintaining a direct link between operations and research. These exchanges ensure the operational community is not only well prepared for new satellite data and visualization techniques, but also has a voice in the development stage. This poster will give an overview of new satellite products currently under evaluation by Eastern Region WFOs and ERH, along with some recent examples of use in operational forecasting.

P4.29 Severe Storm Identification with the Advanced Microwave Sounding Unit (AMSU). Ralph Ferraro (Chair, NWA Remote Sensing Committee) and Chi Quinn, NOAA/NESDIS, College Park, MD and Daneld Cecil, University of Alabama in Huntsville, Huntsville, AL

Previous work by Cecil (2009, 2011) and Cecil and Blankenship (2011, in press) have demonstrated a strong relationship between the occurrence of hail and the microwave brightness temperatures primarily at 37 GHz. These studies were performed with the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI) and the Aqua Advanced Microwave Scanning Radiometer (AMSR-E) sensors.

NOAA and EUMETSAT have been operating the Advanced Microwave Sounding Unit (AMSU-A and B) and the Microwave Humidity Sounder (MHS) on several operational satellites since 1998: NOAA-15 through NOAA-19 and MetOP-A. With multiple satellites in operation since 2000, the AMSU/MHS sensors provide near global coverage every 4 hours, thus, offering a much greater sampling of the diurnal cycle than TRMM or AMSR-E. With similar observation frequencies near 30 GHz and additionally three at the 183 GHz water vapor band, the potential to detect strong convection associated with severe storms on a more comprehensive time and space scale exists. Preliminary studies have indicated a strong signature at these channels associated with large hail episodes over the United States (e.g., the Vivian, SD July 2010 record sized hail stone produced some of the coldest AMSU/MHS temperatures ever witnessed).

In this study, we develop an AMSU-based climatology of hail occurrence over the continental U.S and compare it with the results found by Cecil et al. The climatology is developed based on AMSU brightness temperatures correlated with severe storm reports generated by the Storm Prediction Center. Case study examples will also be presented. The performance of the hail detection will also be discussed in context with the potential development of a geostationary based microwave sensor.

P4.30 The GOES-R Product Generation Architecture. Gerald Dittberner, Harris Corporation, Greenbelt, MD, Satya Kalluri, NOAA/NESDIS/GOESPO, Greenbelt, MD and Allan Weiner and Anderson Tarpley, Harris Corporation, Melbourne, FL

The GOES-R system will substantially improve users' ability to succeed in their work by providing data with significantly enhanced instruments, higher resolution, much shorter relook times, and an increased number and diversity of products. Considerably greater compute and memory resources are necessary to achieve the necessary latency and availability for these products. Over time, new and updated algorithms are expected to be added and old ones removed as science advances and new products are developed. The GOES-R GS architecture is being planned to maintain functionality so that when such changes are

implemented, operational product generation will continue without interruption.

The primary parts of the PG infrastructure are the Service Based Architecture (SBA) and the Data Fabric (DF). SBA is the middleware that encapsulates and manages science algorithms that generate products. It is divided into three parts, the Executive, which manages and configures the algorithm as a service, the Dispatcher, which provides data to the algorithm, and the Strategy, which determines when the algorithm can execute with the available data. SBA is a distributed architecture, with services connected to each other over a compute grid and is highly scalable. This plug-and-play architecture allows algorithms to be added, removed, or updated without affecting any other services or software currently running and producing data. Algorithms require product data from other algorithms, so a scalable and reliable messaging is necessary. The SBA uses the DF to provide this data communication layer between algorithms.

P4.31 The GRB Simulator: A System for Testing GOES-R Rebroadcast (GRB) Data Streams. Kevin Gibbons, Harris Corporation, Melbourne, FL; Randall Race, SGT, Inc., Greenbelt, MD; Cliff Miller and Ken Barnes, Harris Corporation, Melbourne, FL and Gerald Dittberner, Harris Corporation, Greenbelt, MD

GOES Rebroadcast (GRB) signals in the GOES-R era will replace the current legacy GOES Variable (GVAR) signal and will have substantially different characteristics, including a change in data rate from a single 2.1 Mbps stream to two digital streams of 15.5 Mbps each. The GRB Simulator is a portable system that outputs a high-fidelity stream of Consultative Committee for Space Data Systems (CCSDS) formatted GRB packet data equivalent to live GRB data. The data is used for on-site testing of user ingest and data handling systems known as field terminal sites.

The GRB Simulator will provide GRB data as either baseband or Intermediate Frequency (IF) output to the test system. GRB packet data will be sent in the same two output streams as used in the operational system: one for Left Hand Circular Polarization (LHCP) and one for Right Hand Circular Polarization (RHCP). Use of circular polarization in the operational system allows the transmitting antenna to multiplex the two digital streams into the same signal, thereby doubling the available bandwidth. The GRB simulator is compliant with MIL-STD-1472F transportability guidelines and may be used at any site that receives GRB downlink.

The GRB Simulator is a fully self-contained system which includes all hardware units needed for operation. The GRB Simulator has two modes of operation, online and offline. The offline mode allows the user to manage various setup configurations, test scenarios, event logs, and reports. The online mode continuously outputs the GRB data stream at IF or baseband levels.

Simulations are controlled by test scenarios, which are scripts that specify the test data and provide a series of actions for the GRB Simulator to perform when generating GRB output. Scenarios allow for the insertion of errors or modification of GRB packet headers for testing purposes. The GRB Simulator provides a built-in editor for managing scenarios.

Data output by the simulator is derived from either proxy data files containing Level 1b (L1b) data or test pattern images. Proxy data and test patterns provide the capability to test both nominal and error cases. The GRB Simulator outputs both instrument packets and GRB Information packets. Instrument packets contain data simulated from any instrument: the Advanced Baseline Imager (ABI), Solar Ultraviolet Imager (SUVI), Space Environment In-Situ Suite (SEISS), Extreme Ultraviolet Sensor (EUVS) and X-ray Irradiance Sensor (XRS) called EXIS, Geostationary Lightning Mapper (GLM), or the Magnetometer.

P4.32 The Ground Segment Architecture for GOES-R. Dennis Hansen and Allan Weiner, Harris Corporation, Melbourne, FL; Satya Kalluri, NOAA/NESDIS/GOESPO, Greenbelt, MD; Gerald Dittberner, Harris Corporation, Greenbelt, MD and J. Bistrow, NASA/GSFC, Greenbelt, MD

Continuity of the GOES mission and improvement of its remotely-sensed environmental data will be provided by the next generation of NOAA's Geostationary Operational Environmental Satellite system, Series R (GOES-R). GOES-R as a system will have both Space and a Ground Segments. The Space Segment consists of the spacecraft bus, its remote-sensing instruments, and communications payloads; while the Ground Segment consists of all Earth-based functions, including satellite operations, user product generation, and product distribution. This paper presents an overview of the GOES-R Ground Segment (GS) architecture as it continues to evolve consistent with the GOES-R Ground Segment Project (GSP) approved requirements documents.

GOES-R Ground Segment operations will be performed at three sites. The first is the NOAA Satellite Operations Facility (NSOF) in Suitland, MD which houses the primary Mission Management (MM), and selected Enterprise Management (EM), Product Generation (PG), and Product Distribution (PD) functions. The Wallops Command and Data Acquisition Station (WCDAS), located in Wallops, VA, provides primary space communications services, EM and MM functions, and selected PG and PD functions. The third site is a geographically separated remote backup facility (RBU) to be located at Fairmont, WV.

This concept allows the Enterprise Management element to have available a wide range of capabilities governed by operations policy rather than the need for system upgrades. In the event of an emergency, control of satellite operations can be transferred immediately from NSOF to the Wallops Command and Data Acquisition Site. Service Based Architecture concepts within the Product Generation (PG) element provide service interaction capabilities for product generation with only a fraction of the necessary overhead.

P4.33 The Reproducibility of Research Baseline Results in Implemented Algorithms. Rajiv Khanna, Noblis, Inc., Falls Church, VA and Ted Kennelly, Atmospheric and Environmental Research, Lexington, MA

The research to operations transition for satellite observations is an area of active interest as identified by The National Research Council Committee on NASA-NOAA Transition from Research to Operations. Their report recommends improved transitional processes for bridging technology from research to operations. Assuring the accuracy of operational algorithm results as compared to research baselines, called reproducibility in this paper, is a critical step in the GOES-R transition process. This paper defines reproducibility methods and measurements for verifying that operationally implemented algorithms conform to research baselines, demonstrated with examples from GOES-R software development. The approach defines reproducibility for implemented algorithms that produce continuous data in terms of a traditional goodness-of-fit measure (i.e., correlation coefficient), while the reproducibility for discrete categorical data is measured using a classification matrix. These reproducibility metrics have been incorporated in a set of Test Tools developed for GOES-R and the software processes have been developed to include these metrics in the validation of both the scientific and numerical implementation for the GOES-R algorithms. This approach addresses the operational accuracy of algorithms that generate vital products used by meteorologists, researchers, and the public and is a key element of the GOES-R transition to operations methodology.

P4.34 The Satellite Analysis Branch Hazard Mitigation Programs. Jamie Kibler, NOAA/NESDIS/OSPO/SPSD/Satellite Analysis Branch, Camp Springs, MD
The Satellite Analysis Branch (SAB) produces and distributes a wide variety of operational hazard mitigation products to the user community for use in operations, research, validation and verification. The programs associated with these products are many; including a precipitation analysis and estimation, tropical position and intensity classification, volcanic ash tracking, oil detection and a smoke and fire detection. This presentation will focus on hazard and disaster detection and product generation.

Satellite analysts of SAB have an expertise in satellite meteorology. They conduct satellite analyses using

data from NOAA's Geostationary Operational Environmental Satellites (GOES), Polar Orbiting Environmental Satellites (POES), also, NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) and other high resolution satellite constellations to provide hazard mitigation products on a 24/7 daily basis. Hazard mitigation products are time sensitive and SAB users depend on the information provided to be of highest quality. SAB will continue to improve each program and related product with the help of user input and new satellite techniques.

P4.35 The SUVI On-Orbit Calibration Underflight Program: A Feasibility Study. Linda Habash Krause, Amy R. Winebarger, and Jonathan W. Cirtain, NASA Marshall Space Flight Center; Ken Kobayashi and Brian M. Robinson, University of Alabama in Huntsville, and Steven D. Pavelitz, NASA Marshall Space Flight Center, Huntsville, AL

The GOES-R Solar Ultraviolet Imager (SUVI) is a Cassegrain-type telescope designed to observe the full solar disk and atmosphere out to 1.3 solar radii and record images in six discrete pass-bands in the Extreme UltraViolet (EUV) spectrum. Precise calibration throughout the duration of the GOES-R mission is critical for the proper application of these data to space weather forecasting models. It is expected that the SUVI Instrument performance characteristics will degrade over the operational lifetime of GOES-R due to space environmental effects. To ensure the GOES-R/SUVI instrument meets the operational performance requirements through mission end-of-life, it is proposed to calibrate the instrument at regular intervals during the mission with a series of underflight sounding rockets. The standard underflight calibration payload would consist of a transmission diffraction grating with a 4096×1024 Charged Coupled Detector (CCD) and an aluminum filter fixed over the entrance aperture. The 4096-pixel axis provides for a 0.06 \AA spectral resolution over the dynamic range of 80 \AA through 330 \AA . With 1024 pixels imaging over the 2.6 solar radii centered on the solar equator, ideally it is possible to attain a 5-arc-second pixel width. Underflight spectrometer calibration would be conducted using a NIST-calibrated monochromator operating at NASA Marshall Space Flight Center shortly before and after each flight to provide an absolute irradiance calibration for the SUVI operational instrument. Additionally, underflight measurements of discrete solar structures (e.g., coronal holes, active regions, limb features) can be used to quantify the changes in SUVI's point spread function and sensitivity to stray/scattered light. The preliminary operations concept specifies launching the flights from White Sands Missile Range on Black Brant IX rockets guided by the specialized Solar Pointing Attitude Rocket Control System (SPARCS). Possible scientific topics for campaigns of opportunity will be discussed.

P4.36 Transitioning Improvements in the GOES Sounder Profile Retrieval Algorithm into Operations. Gary S. Wade, NOAA/NESDIS/STAR/CoRP/ASPB, Madison, WI; James P. Nelson III, CIMSS University of Wisconsin at Madison, Madison, WI; Amerigo S. Allegrino, IM Systems Group, Inc., Rockville, MD; Seth I. Gutman and Daniel L. Birkenheuer, NOAA/ESRL/GSD, Boulder, CO; Zhenglong Li and Anthony J. Schreiner, CIMSS University of Wisconsin at Madison, Madison, WI; Timothy J. Schmit, NOAA/NESDIS/STAR/CoRP/ASPB, Madison, WI; Jaime Daniels, NOAA/NESDIS/STAR/SMCD/OPDB, Suitland, MD and Jun Li, CIMSS University of Wisconsin at Madison, Madison, WI

The Geostationary Operational Environmental Satellite (GOES)-R is tentatively scheduled for launch in 2015, with potential operational use by 2016. The GOES-R Advanced Baseline Imager (ABI) is not an atmospheric sounder, but does contain three dedicated water vapor sensitive channels (out of 16 total). Nonetheless, the official GOES-R Day-1 baseline products still include: legacy vertical moisture profiles, legacy vertical temperature profiles, derived stability indices, and Total Precipitable Water (TPW) [<http://www.goes-r.gov/products/index.html>].

The current (2011) GOES suite of satellites do carry a sounder instrument (a relatively low spectral-resolution filter wheel radiometer). Vertical profiles, and their attendant derived stability indices and TPW, are routinely generated by the NOAA/NESDIS Office of Satellite and Product Operations (OSPO). The profile retrieval algorithm used is the physical approach as described by Ma et al (1999). An

improved physical algorithm has been developed by Li et al (2008) and has been implemented at the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison (UW). [References for the two algorithms are listed at <http://cimss.ssec.wisc.edu/goes/rt/exp-work.php>.] In the research-to-operations process, this profile retrieval code has been successfully transferred, this year, to the Operational Products Development Branch (OPDB) within the NOAA/NESDIS Center for Satellite Applications and Research (STAR). The OPDB is now completing the final phase by working with the co-housed OSPO staff to implement the (new) retrieval processing into NOAA/NESDIS operations.

Results will be shown for two case periods from the summer of 2010 where both the older Ma version and newer Li version products will be compared. Other examples with forecasting implications will be drawn from simultaneous processing (of Ma and Li versions) that has continued into the summer of 2011. Emphasis will be on TPW, with both statistical evaluation (versus radiosonde and GPS (geostationary positioning satellite) measurements) as well as comparison of the so-called Derived Product Imagery (DPI). The Lifted Index (LI) product will also be discussed as an example of a derived stability index.

Although the GOES-R ABI will have markedly improved horizontal and temporal resolution compared to current GOES, the spectral coverage for vertical differentiation will be no better, and notably less for temperature (compared to the current GOES Sounder). Development of techniques to improve profiles from current GOES Sounders remains valid and of interest, due to (1) the expected, continued availability of current GOES Sounders until late into the decade, as well as (2) the close connection between the quality and usefulness of current retrievals and those to be generated from GOES-R, given that the GOES-R retrieval algorithm at the moment is essentially that of the current GOES Li version.

P4.37 Updated Analysis of Lossless Compression Techniques for the GOES-R Rebroadcast (GRB)

Sub-System. Peter Finocchio, Bobby H. Braswell, Yuguang He, David B. Hogan and Daniel Hunt, Atmospheric and Environmental Research, Inc., Lexington, MA

This work describes an in-depth analysis of potential lossless data compression techniques for use in the design, development and deployment of the GOES-R Rebroadcast (GRB) sub-system. GRB is the next generation transponder-based communication link integrated into the GOES-R system, and is designed to provide the NOAA Satellite Operations Facility (NSOF) and other real-time users with Level 1b and Level 2+ GOES data. The GRB data stream will include calibrated and geo-located Level 1b imagery from the Advance Baseline Imager (ABI), Level 1b Solar Ultraviolet Imager (SUVI) data and Level 2+ Geostationary Lightning Mapper (GLM) products. In order to ensure that the GRB bandwidth constraints are met at all times, lossless data compression must be employed. In this study we assess the potential use of szip and lossless jpeg2000 compression algorithms to meet these constraints. We also explore the impacts of various data block configurations on the latency of the compression algorithms. The results from this study were developed using an integrated testbed environment that combines the use of modular software techniques with extensive proxy scenes derived from similar data. These data include a diverse set of temporally and seasonally varying information from the Moderate Resolution Imaging Spectroradiometer (MODIS), the Spinning Enhanced Visible and Infrared Imager (SEVIRI), the Lightning Imaging Sensor (LIS), and solar imagers on board the Solar Dynamics Observatory (SDO), Solar and Heliospheric Observatory (SOHO) and the Solar Terrestrial Relations Observatory (STEREO). This study indicates that well established lossless compression methods can be used to meet the GOES-R bandwidth constraints. Under nominal conditions, these constraints can be met with additional margin. However, rigorous design principles must be employed to meet the data demands of an extreme weather event.

P4.38 NOAA/NESDIS Satellite and Product Operations: User Services, Outreach and Help Desk

Overview. Matthew Seybold and Natalia Donoho, NOAA/NESDIS, Camp Springs, MD

NOAA's National Environmental Satellite, Data and Information Service (NESDIS) offers environmental satellite data and products for many applications. Additionally, NESDIS provides for the development of satellites and ground systems, the enterprise architecture needed to maintain operations and data archives, and the end-to-end life cycle management from planning and development to operations and beyond. Several satellite programs are operated by NESDIS to generate critical atmospheric, land and oceanic data and products to various users, both public and private. In order to better serve customer's needs, a User Services team is developing a comprehensive customer relationship management database, improved monitoring and notification processes, and expanded Web displays. This poster highlights NESDIS satellite and product operations, including the data acquisition, product processing, data and product distribution, unique services and just-in-time operational user support. A primer on NESDIS operational products and services is available on the Web at the Office of Satellite Products and Operations: <http://www.ospo.noaa.gov/>

P4.39 Using High-Resolution Sea Surface Temperature Data and a NASA Land Information System to Initialize a Local Weather Forecast Model at NWS Houston/Galveston. Lance Wood and Scott Overpeck, NOAA/National Weather Service, Houston/Galveston, TX

Benefiting from a partnership with the NASA Short-term Prediction Research and Transition Center (SPoRT), the NWS Houston/Galveston Weather Forecast Office has been using high resolution NASA datasets to initialize a local weather forecast model (a version of the Weather Research and Forecasting model run with a 4 km grid spacing). The NASA datasets include the Moderate Resolution Imaging Spectroradiometer (MODIS) sea surface temperature data, and the surface data from the NASA Land Information System. For comparison purposes, a version of the local model initialized with the National Centers for Environmental Prediction (NCEP) Real-time Global SST analysis and coarser land surface data from the NCEP North American Mesoscale model has been run in parallel.

The goal of this study was to assess the impact of the NASA data on the local model forecasts. Several examples from the 2009-2010 cold season, categorized by flow regime (onshore, offshore, coastal low), will be shown to display differences between the model initialized with the NASA SST data and the control configuration. In a majority of the coastal low cases and for most forecast hours, the version of the model initialized with the NASA SST data provided more accurate forecasts of surface weather parameters (dewpoints, winds, temperatures). In contrast, the control version provided more accurate temperature forecasts during cases with onshore flow and significant warm air advection.

During the 2010 warm season there were a few cases where the higher resolution SST data improved the forecasts of sea breeze timing/orientation. However, on most occasions little to no forecast differences could be identified. During the 2011 warm season, the NASA Land Information System surface data were also used to initialize the model. Forecasts of the orientation and inland penetration of the sea breeze from that version of the model will be compared to those from the control configuration.

P4.40 Using the Water Body Database for GOES-R Landmarking. James L. Carr, David J. Herndon and Sarah Reehl, Carr Astronautics, Greenbelt, MD

The GOES-R satellite has two imaging instruments used for landmarking: the Advanced Baseline Imager (ABI) and the Geostationary Lightning Mapper (GLM). These instruments provide enhanced imagery with better spatial, spectral, and temporal resolution compared to previous GOES imaging instruments. The Shuttle Radar Topography Mission (SRTM) Water Body Data (SWBD) was chosen as a more up-to-date and accurate set of shoreline points to be used for defining landmarks. This presentation describes the SWBD and shows how it will be used to extract the shoreline points that define a landmark.

P4.41 Validation of a Convective Storm Growth Detection Algorithm using a Satellite-Based Object Tracking Methodology. Lee M. Cronce, Justin M. Sieglaff, Daniel C. Hartung and Wayne F. Feltz, SSEC/CIMSS, University of Wisconsin at Madison, Madison, WI

A semi-automated satellite object-based methodology has been recently developed at the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison to validate the University of Wisconsin Convective Initiation (UWCI) algorithm (Sieglaff et al., 2010). This validation concept uses the satellite-derived quantity, 11-micrometer top-of-troposphere cloud emissivity (Pavolonis, 2010) as input into the Warning Decision Support System Integrated Information (WDSS-II) object-tracking framework developed at the University of Oklahoma (Lakshmanan et al., 2007). The WDSS-II software is configured to create cloud objects based upon the 11-micrometer top-of-troposphere cloud emissivity field. Within WDSS-II the cloud objects are assigned object IDs, which are followed in time to minimize broken tracks and allow individual cloud clusters to maintain the same unique object ID for as long as they are present in the corresponding satellite data. Finally, a unique post-processing step preserves the oldest object IDs for those clusters that overlap between consecutive satellite scans allowing WDSS-II cloud clusters to maintain the same unique object ID from infancy (very small object) to convective storm maturity (large object).

This validation approach combines satellite observations, satellite-derived algorithm outputs, and ground-based observations (radar and lightning detection observations) to validate the UWCI algorithm and explore relationships between the algorithm and various NEXRAD fields including composite reflectivity, vertically integrated liquid (VIL), echo tops, Probability of Severe Hail (POSH), etc., that directly impact public safety and forecaster operations.

This work showcases an overview of the validation approach, demonstrates an application of the validation procedure relating the UWCI algorithm output and NEXRAD observations, and highlights the predictive lead-time capabilities of the algorithm ahead of ground-based radar signatures.

P4.42 Advances in Technology to Optimize Use of DCS on GOES-R. Kay Metcalf, NOAA/NESDIS/Office of Satellite & Product Operations, Suitland, MD

The GOES Data Collection System (DCS) is a radio relay system used to transmit in situ observations through the GOES satellite for real-time use during meteorological and hydrological events. The system is used operationally for monitoring of events such as tsunamis, floods, wildland fires and many other traditional meteorological parameters. A platform consisting of sensors, a data logger, and a transmitter can be set up anywhere within the footprint of the satellite to automatically collect and send observations on a regular schedule, or in a mode triggered by an extreme event. Use of the DCS has more than tripled in the past 5 years, and demand is still increasing. NOAA is serving more users, deploying more platforms, and sending more frequent transmissions all around the hemisphere. On a typical day more than 700,000 observations from 30,000 stations are sent through the DCS. In an effort to keep up with the demand, NOAA has developed new technologies and implemented new practices to provide for system optimization. This talk will focus on how advances in technology have increased capacity and reliability to make the DCS the critical communication path for environmental observations over 2/3 of the earth's surface.

P4.43 HRIT/EMWIN: The Evolution of LRIT and EMWIN. Paul Seymour, NOAA/NESDIS, Suitland, MD; Robert Wagner and Santos Rodriguez, NOAA/NWS/OOS, Silver Spring, MD; Craig Keeler, NOAA/NESDIS/GOESPO, Greenbelt, MD and Kevin McMahon, Washington Consulting, Inc., Vienna, VA

The current Low-Rate Information Transmission (LRIT) and Emergency Managers Weather Information Network (EMWIN) operations will undergo significant changes when the GOES-R series of satellites become operational. The respective NOAA (LRIT) and NWS (EMWIN) project teams are working closely to ensure that the impact to the end user is kept at a minimum while increasing the throughput of the system and migrating to a new architecture.

On operational GOES satellites, LRIT and EMWIN broadcasts are transmitted via separate, dedicated on-

board transponders. LRIT is currently broadcast at a rate of 128kbps while EMWIN is broadcast at 19.2kbps. On the GOES-R satellites, the LRIT and EMWIN broadcasts will be combined to use a single transponder and frequency; the data will be segregated by means of Virtual Channelization. In addition to combining the two data streams, the throughput will be increased from a total of ~148kbps to 400kbps, which requires, in compliance with Coordination Group for Meteorological Satellites (CGMS) standards, the name to be changed from LRIT to High-Rate Information Transmission (HRIT). Since the new system combines HRIT and EMWIN into one program, the new combined system will be called HRIT/EMWIN.

Existing LRIT or EMWIN antennas should be able to receive the new service, but a different receiver will be needed to decode the newly modified signal. The GOES-R program has created a prototype receiver that can not only process the future signal, but is backwards compatible with the current services. This demonstrates the feasibility of a low-cost receiver upgrade path for users to implement before GOES-R is operational, without disrupting the ability to process the existing signals.

HRIT/EMWIN system modifications will include an improved utilization of Consultative Committee for Space Data Systems (CCSDS) virtual channels to permit the end users to more simply choose which portions of the signal they want to process and which to discard. Current LRIT users must receive and store a complete file from the broadcast before assessing their interest in that particular file. Optimal utilization of virtual channels will help reduce any overlap in the merged HRIT and EMWIN signals. The project is currently in the process of determining which GOES-R and external products to include in the new HRIT/EMWIN signal.

This presentation will summarize and inform the user community of relevant changes to the system so that they can be prepared for the 2015 launch of GOES-R and not experience any service disruptions. It will also be utilized to facilitate discussion with the community about the types and frequencies of products that should be included in the future broadcast.

P4.44 Available Tools for Visualizing and Analyzing GOES-R Advanced Baseline Imager (ABI).

Kaba Bah, CIMSS UW-Madison, Madison, WI; Timothy J. Schmit, NOAA/NESDIS/STAR/CoRP/ASPB, Madison, WI; Tom Achtor, CIMSS UW-Madison, Madison, WI; Marcia Cronce, NOAA/National Weather Service, Milwaukee/Sullivan WI and Gary Wade, CIMSS NOAA/NESDIS, Madison, WI

The capabilities of the Advanced Baseline Imager (ABI) that will be on board the GOES-R satellite are being demonstrated by using AWIPS, McIDAS-V and Google earth to visualize and analyze simulated GOES-R ABI data. This includes support to the Algorithm Working Group (AWG) and National Weather Service (NWS) forecasters and the general public. These simulated images were created by the GOES-R AWG who used super computers to run high resolution numerical models, which were then input into the Cooperative Institute for Meteorological Satellite Studies (CIMSS) advance radiative transfer models. The simulated datasets includes 2 km resolution Continental United States (CONUS) images, and higher resolution meso-scale images for the convective outbreak on June 4-5 2005, 2 km resolution Hurricane Ike images, and 2 km sampling full disk images showing GOES-R ABI from 137 degrees longitude. Multiple band analysis were also tested, which includes Normalized Difference Vegetation Index (NDVI), simple band differences, scatter analysis and data transacts. Sample data in the GOES-R ABI Fixed Grid Format (FGF) will also be shown.

APPENDIX C GLOSSARY

ABI	Advanced Baseline Imager
ABS	Advanced Baseline Sounder
ADEB	Algorithm Development Executive Board
ADEOS	Advanced Earth Observing Satellite
ADT	Advanced Dvorak Technique
AFWA	Air Force Weather Agency
AIRS	Atmospheric Infrared Sounder
AMS	American Meteorological Society
AMSU	Advanced Microwave Sounding Unit
AO	Announcement of Opportunity
ASPB	Advanced Satellite Products Branch
Aqua	NASA Earth Satellite mission named for the large amount of information being obtained about water in the Earth system
ARH	Alaska Regional Headquarters
ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High Resolution Radiometer
AWC	Aviation Weather Center
AWG	Algorithm Working Group
AWIPS	Advanced Weather Interactive Processing System
BRC	Basic Repeat Cycle
CAPE	Convective Available Potential Energy
CAVE	Common AWIPS Visualization Environment
CI	Cooperative Institutes
CI	Convective Initiation
CICS	Cooperative Institute for Climatic Studies
CIMSS	Cooperative Institute for Meteorological Satellite Studies
CIMMS	Cooperative Institute for Mesoscale Meteorology Studies
CIOSS	Cooperative Institute for Oceanographic Satellite Studies
CIRA	Cooperative Institute for Research in the Atmosphere
CIRES	Cooperative Institute for Research in Environmental Sciences
CLASS	Comprehensive Large Array-data Stewardship System
CMI	Cloud and Moisture Imagery
CNMOC	Commander, Naval Meteorology and Oceanography Command
COMET	Cooperative Program for Operational Meteorology, Education, and Training
CONUS	CONTinental United States
CoRP	Cooperative Research Program
CrIS	Cross-track Infrared Sounder
CWSA	Commercial Weather Services Association
CWSU	Center Weather Service Unit
DADDS	DCS Administration and Data Distribution System
DBI	Decision Based Index
DBI	Dual Beam Interferometer
DBI	Decision Based Information
DCS	Data Collection System
DDS	Data Distribution System
DoD	Department of Defense
DPI	Derived Product Image
EDEX	Environmental Data EXchange

eGVAR	Emulated GVAR
EMWIN	Emergency Managers Weather Information Network
ENVISAT	Environmental Satellite
EOS	Earth Observing System
EPA	Environmental Protection Agency
ESA	European Space Agency
ESRL	Earth System Research Laboratory
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EUVS	Extreme Ultra-Violet Sensor
EWP	Experimental Weather Program
FAR	False Alarm Ratio
FCI	Flexible Combined Imager
FDHSI	Full Disk High Spectral resolution Imagery
FDTB	Forecast Decision Training Branch
FRE	Fire Radiative Energy
GCOM	Global Change Observation Mission (JAXA)
GEM	Geostationary Microwave
GERB	Geostationary Earth Radiation Budget Experiment
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer
GIFTS-IOMI	Indian Ocean METOC Imager
GINI	GOES Ingest and NOAAPort Interface
GINA	Geographic Information Network of Alaska
GLM	Geostationary Lightning Mapper
GOES	Geostationary Operational Environmental Satellite
GOESAR	Geostationary Search and Rescue
GOS	Global Observing System
GPO	GOES-R Program Office
GPS	Global Positioning System
GRB	GOES-R Rebroadcast
GS	Ground Segment
GSD	Global Systems Division
GSFC	Goddard Space Flight Center
GUC	GOES Users' Conference
GVAR	GOES Variable Format
HES	Hyperspectral Environmental Suite
HIE	Hurricane Intensity Estimate
HPC	Hydrometeorological Prediction Center
HRFI	High spatial Resolution Fast Imagery
HRIT	High-Rate Information Transmission
HWT	Hazardous Weather Testbed
IASI	Infrared Atmospheric Sounding Interferometer
IMAPP	International MODIS/AIRS Processing Package
IOO	Instrument of Opportunity
IPOPP	International Polar Orbiter Processing Package
IR	InfraRed
IRIS	Improved Resolution and Image Separation
IRS	InfraRed Sounder
ISCCP	International Satellite Cloud Climatology Project
JPSS	Joint Polar Satellite System
KML	Keyhole Markup Language
KMZ	KML archive (zipped)
LMA	Lightning Mapping Array
LMS	Learning Management System

LTG	Lightning
LDM	Local Data Manager
LFA	Lightning Forecast Algorithm
LI	Lightning Imager
LRIT	Low Rate Information Transmission
McIDAS	Man-computer Interactive Data Access System
METEOSAT	Geostationary meteorological satellites operated by EUMETSAT
MODIS	MODerate-resolution Imaging Spectroradiometer
MRMS	Multiple-Radar/Multiple-Sensor
MSFC	Marshall Space Flight Center
MSG	Meteosat Second Generation
MTG	Meteosat Third Generation
MTG-I	MTG Imager
MTG-S	MTG Sounder
MTSAT	Multi-functional Transport Satellite
N-AWIPS	NCEP Advanced Weather Interactive Processing System
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCDC	National Climatic Data Center
NCEP	National Centers for Environmental Prediction
NDVI	Normalized Difference Vegetation Index
NESDIS	National Environmental Satellite, Data, and Information Service
NEXRAD	NEXt Generation RADar
NGDC	National Geophysical Data Center
NHC	National Hurricane Center
NIST	National Institute of Standards and Technology
NMFS	National Marine Fisheries Service
NMSC	National Meteorological Satellite Center
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NOSA	NOAA Observing System Architecture
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NPP	NPOESS Preparatory Project
NSOF	National Satellite Operations Facility
NSSL	National Severe Storms Laboratory
NWA	National Weather Association
NWC	National Weather Center
NWP	Numerical Weather Prediction
NWS	National Weather Service
NWSTC	NWS Training Center
O2R	Operations to Research
OAR	Office of Oceanic and Atmospheric Research
OCWWS	Office of Climate, Water and Weather Services
OCONUS	Outside Contiguous U. S.
OFCM	Office of the Federal Coordinator for Meteorological Services and Supporting Research
OED	Office of Education
ONR	Office of Naval Research
OOS	Office of Operational Systems
OPC	Ocean Prediction Center
OPDB	Operational Products Development Branch
OSPO	Office of Satellite & Product Operations
OST	Office of Science and Technology
PDA	Product Distribution and Access

PFEL	Pacific Fisheries Environmental Laboratory
PG	Product Generation
PG	Proving Ground
PGLM	Pseudo GOES-R Lightning Mapper
POES	Polar Operational Environmental Satellite
PPI	Office of Program Planning and Integration
PUG	Product User Guide
QPE	Quantitative Precipitation Estimates
QPF	Quantitative Precipitation Forecast
R2O	Research to Operations
RAMMB	Regional and Mesoscale Meteorology Branch
RGB	Red-Green-Blue
RII	Rapid Intensity Index
RSO	Rapid Scan Operation
SA	Situational Awareness
SAB	Satellite Analysis Branch
SAR	Search and Rescue
SATEPSDIST	A server for McIDAS converted geostationary satellite data
SAL	Saharan Air Layer
SDO	Solar Dynamics Observatory
SEC	Space Environment Center
SEISS	Space Environment In-Situ Suite
SEVIRI	Spinning Environmental Visible and InfraRed Instrument
SMCD	Satellite Meteorology and Climatology Division
SOO	Science Operations Officer
SPC	Storm Prediction Center
SPoRT	Short-Term Prediction Research and Transition Center
SPSD	Satellite Products and Services Division
SRF	Spectral Response Function
SSD	Scientific Services Division
SST	Sea Surface Temperature
STAR	Center for Satellite Applications and Research
SUVI	Solar UltraViolet Imager
SWPC	Space Weather Prediction Center
Terra	The EOS flagship satellite (EOS AM)
TPW	Total Precipitable Water
TSB	Technical Support Branch
TVS	Tornadic Vortex Signature
UAV	Unmanned Aerial Vehicle
UCAR	University Corporation for Atmospheric Research
UTC	Coordinated Universal Time
UVN	Ultra-violet, Visible and Near Infrared Sounder
UW	University of Wisconsin-Madison
UW-CI	University of Wisconsin-Madison Convective Initiation
VIL	Vertically Integrated Liquid
VIIRS	Visible/Infrared Imager/Radiometer Suite
VISIT	Virtual Institute for Satellite Integration Training
WES	Weather Event Simulator
WFO	Weather Forecast Office
WMO	World Meteorological Organization
WRF	Weather Research and Forecasting
WSI	Weather Services International (private weather company owned by The Weather Channel)

XML eXtensible Markup Language

APPENDIX D GOES-R Links

GOES-R Main Web site:

<http://www.goes-r.gov>

Web site with all of the posters and presentations:

<http://www.goes-r.gov/users/past-GUC7.html>

Additional paged linked from the main GOES-R page mentioned in this Final Report:

<http://www.goes-r.gov/users/pg-activities-01.html>

www.goes-r.gov/users/training.html

<http://www.goes-r.gov/products/baseline.html>

Related Government Web sites:

<http://www.ospo.noaa.gov>

Links to the Cooperative Institutes:

Cooperative Institute for Meteorological Satellite Studies (CIMSS):

<http://cimss.ssec.wisc.edu/>

Cooperative Institute for Research in the Atmosphere (CIRA):

<http://www.cira.colostate.edu/>

NASA Short-term Prediction Research and Transition (SPoRT):

<http://www.ghcc.msfc.nasa.gov/sport/>

National Weather Service (NWS) Storm Prediction Center (SPC):

<http://www.spc.noaa.gov/>

NOAA National Environmental Satellite, Data and Information Service, Center for Satellite Applications and Research (NESDIS/STAR):

<http://www.star.nesdis.noaa.gov/star/index.php>

NOAA National Severe Storms Laboratory (NSSL):

<http://www.nssl.noaa.gov/>

Proving Ground Web site:

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

HWT Sprint Experiment 2011 Final Report:

http://hwt.nssl.noaa.gov/Spring_2011/Spring_Experiment_2011_ops_plan_13May_v5.pdf

CIMSS Delivered Products List:

<http://cimss.ssec.wisc.edu/goes/rt/exp-work.php>

CIRA Product List:

http://rammb.cira.colostate.edu/research/goes-r/proving_ground/cira_product_list/

Proving Ground Blogs:

<http://cimss.ssec.wisc.edu/goes/blog/cimss-satellite-proving-ground>

goesrhwt.blogspot.com

Air Quality Proving Ground:

<http://alg.umbc.edu/aqpg/>

Social Media:

<https://www.facebook.com/GOESRsatellite>

<https://www.facebook.com/goesrpg>

http://en.wikipedia.org/wiki/Geostationary_Operational_Environmental_Satellite

Training sites:

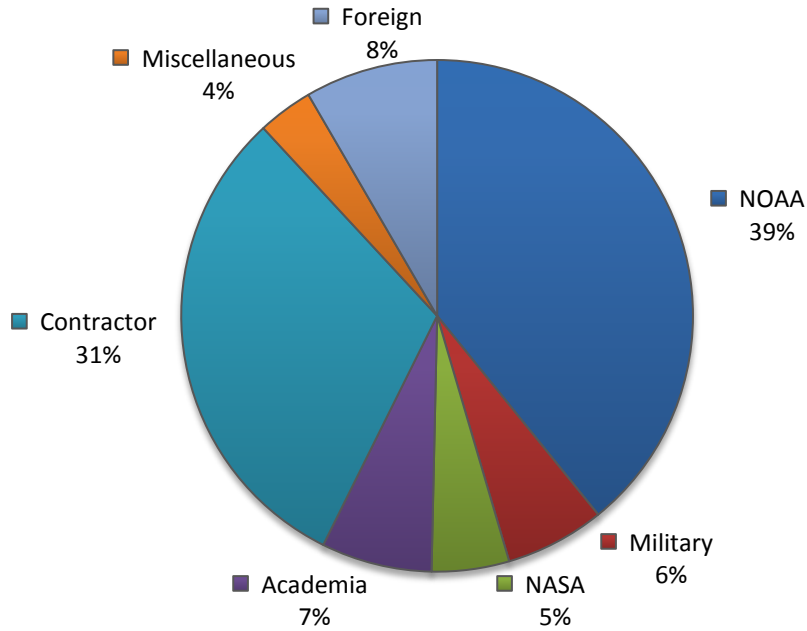
<http://rammb.cira.colostate.edu/visit/video/goesr101/player.html>

<https://www.meted.ucar.edu/> (COMET)

<http://www.ssec.wisc.edu/visit> (VISIT)

APPENDIX E 7th GOES Users Conference Attendance Summary

GUC 7 Attendees - 143



APPENDIX F 7th GOES Users Conference Survey Summary

This appendix provides a summary of the results of the 2011 NOAA GOES Product and Service Survey taken at the 7th GOES Users' Conference in Birmingham, Alabama. Even though there were only 9 respondents, the general tone of those who did turn in a survey indicated that NOAA users and customers continue to rate NOAA's products and services at satisfied to extremely satisfied levels. There were a couple of lower ratings; the most important was some dissatisfaction with the NOAA data catalogs and directories. This was also shown in similar surveys conducted at Direct Readout Conferences in 2004 and 2008. This information will be passed to NOAA offices responsible for these services.

For 2011, the survey also included questions regarding the success of the experience at the conference. (The conference experience questions were requested by participants at previous conferences). The results also generally showed a very high level of satisfaction.

NOAA will carefully examine the information contained in the entire survey and take appropriate actions where indicated. Since planning is already underway for the next NOAA satellite conference, currently planned in 2013, NOAA is developing recommendations for an improved survey and methods of collecting valuable questions and comments from users. Prior to the next NOAA Satellite Conference, NOAA expects to:

1. Restructure the survey to improve the quality and usefulness.
2. Consider an interactive "social network" approach to improve the number of responses.
3. Build a strategy for advertising the survey at the conference and provide incentives for completion.

NOAA again thanks all participants who turned in a survey and looks forward to user comments from this Final Report.

Experience at the GOES Users' Conference: 9 responses unless otherwise indicated.

	Not at All Satisfied	Not Satisfied	No Opinion	Satisfied	Extremely Satisfied	Not Applicable
Content				5	4	
Oral Presentations				4	4	1
Poster Presentations			1	5	2	1
Support Services				5	2	2
Location			1	5	2	1
Meeting Facilities		1		3	4	1
Hotel Accommodations		1	1	4	3	
Food				8	1	
Conference Announcements		1		5	3	
Breakout Sessions			1	3	2	3
* Breakout Session 1: Exploiting GOES Data/products				4	2	2
* Breakout Session 2: Operational Enhancements by Leveraging the GOES-R Proving Ground				3	3	2
* Breakout Session 3: Maximizing Operational User Readiness/Decision Support				3	3	2

* Only 8 responses

Product/Service Satisfaction

Number of Responses	Question	Not at All Satisfied	Not Satisfied	No Opinion	Satisfied	Extremely Satisfied	Not Applicable
7	1. Quality/timeliness of product/service				5	2	
7	2. Quality/timeliness of data received				5	2	
6	3. Timeliness of response to request				3	2	1
7	4. Courtesy of staff who dealt with you				2	3	2
7	5. Competence of staff in dealing with your needs				2	3	2
8	6. Degree that product/service met your needs				5	3	
8	7. Clarity and accuracy of responses from staff to your questions after receipt				4	3	1
8	8. Ease in reaching correct NOAA office to deal with your request			2	4		2
8	9. Format of data received			2	5	1	
7	10. Documentation/metadata of data received			1	5		1
7	11. Description of data in catalogs and directions		1	3	2		1
8	12. Accessibility of data desired				6	2	
8	13. Overall satisfaction with service received				5	2	1
8	14. Overall satisfaction compared with service/data obtained from private sector				5		3
8	15. Overall satisfaction compared with service/data obtained from other Federal agencies				6	1	1

APPENDIX G GOES-R Conference Committee

Name	Affiliation
Ken Carey	Noblis, Inc.
Dane Clark	NOAA/NESDIS/OSPO
Chris Daughtrey	Omitron, Inc.
Steve Goodman	NOAA/NESDIS/GOES-R Program Office
Jim Gurka	NOAA/NESDIS/GOES-R Program Office
Jim Heil	NOAA/NWS/OCWWS
Don Hillger	NOAA/NESDIS/RAMMB
Kay Metcalf	NOAA/NESDIS/OSPO
Marilyn Mix	Omitron, Inc.
Tony Mostek	NOAA/NWS/OCWWS/Training Division/COMET
Brian Motta	NOAA/NWS/OCWWS
Kathryn Mozer	ASRC Aerospace, Inc.
Valerie Randall	SSAI
Tom Renkevans	NOAA/NESDIS/OSPO
Tim Schmit	NOAA/NESDIS/STAR/CoRP/ASPB
Bill Sjoberg	General Dynamics
Michelle Smith	NOAA/NESDIS/GOES-R Program Office
Michelle Tamoria	Omitron, Inc.

APPENDIX H Action Items

This appendix lists the recommendations and unanswered questions gathered at the conference. It contains the responses obtained by the publication date of the Final Report. A document containing current Action Item responses is available in both the GOES Users' Conference section and the Documents section of the GOES-R web site. The Action Item document on the web page will contain additional responses as they become available.

In the listing below, each action item is assigned an identifier, for reference purposes, which is based on the Session the statement is associated with. For example, "S1-1" is a statement from conference Session 1. The person(s) providing the response is given in italics after the response.

Session 1

S1-1 Remind users that the updates about the new satellite capabilities are important and that training exists on the NOAA LMS and MetEd Web site for GOES 13-15.

Response: We do regular monthly notifications to all of the NWS Science and Operations Officers (SOOs) to introduce new training and VISIT teletraining. We also work with COMET, which covers an extensive user community, to include NWS, Broadcast Meteorologists, the entire University Community, Unidata, World Meteorological Organization, United States Air Force, United States Navy, Environment Canada, and other specialized user communities (such as aviation, coastal/marine, winter weather and tropical weather) to name just a few. COMET's reach is detailed more fully on the COMET and MetEd web site.

The most recent GOES satellite, GOES-15, included special teletraining from VISIT targeted to the NWS offices covered by GOES-West (15) when it became operational early in the year. That training specifically itemized the new satellite capabilities aboard GOES-15 and the improvements in the calibration, signal-to-noise, and spatial resolution increase in the Water Vapor channel on the Imager. *(From Brian Motta, 4/27/2012)*

Session 2

S2-1 What is the status of the more formal approach on making the near cast forecasting available to SPC forecasters?

Response: In order to transition the Nearcast product into operations we will need a more formal training module for the product, which is currently in development for the 2012

Spring Experiment. Once that is available, we will be able to include the Nearcast within one of the bi-annual SPC forecaster training sessions that occur around Feb and Oct of each year. *(From Chris Siewert, 1/4/2012)*

Session 3

There were no action items taken from Session 3.

Lunch Panel

LP-1 How will the GOES project address outdated satellite products and techniques (generating, processing, and sending out data) for GOES-R with a limited budget.

Response: The Ground Segment is funded to build a state of the art system for PG and PD. Due to budget limitations, some of the originally planned products will not be produced in the Ground System. *(From Satya Kalluri, 12/23/2011)*

LP-2 How do we get broadcast meteorologist to use satellite data during severe weather?

Response: GOES-R will be a real turning point in this regard, but a part of this problem is that resolution is lost when the imagery is remapped over a color base map. The remapping of the 1km visible GOES data is especially poor and only looks good on air for about 4 hours per day. Low sun angles and remapping do not work well. If some company or NASA/NOAA comes up with an inexpensive way of showing hi-res visible imagery that looks really good on air, then news directors will stumble over one another to get it on air. A good example is the MODIS images from Aqua and Terra. Viewers love those images.

The lack of rapid scan availability to broadcast mets is another reason. The vendors almost never send this data to on air mets. This is something that can and should be corrected, and I plan on mentioning to the folks at WSI, Baron, and Weather Central. (These three companies supply 90% of the on air weather imagery to TV stations.)

Last, but perhaps most important is the fact quite a few on air mets are not that comfortable interpreting the satellite data in regards to severe weather. This is true of both VIS and IR imagery. *(From Dan Satterfield, 12/24/2011)*

LP-3 Create a mechanism or allow the access of the meta data for fused products so the user knows how the product is being created.

Response: Response pending.

LP-4 Are the bandwidth issues being addressed with the development of products? The bandwidth is considerably lower at the forecast offices than the NCEP centers?

Response: The most recent GOES satellite, GOES-15, included special teletraining from VISIT targeted to the NWS offices covered by GOES-West (15) when it became operational early in the year. *(From Mike Johnson / Satya Kalluri).*

LP-5 Work on the dissemination policy at NWS for decision support systems endorsing satellite and other data to the user community in ways other than AWIPS II.

Response: That training specifically itemized the new satellite capabilities aboard GOES-15 and the improvements in the calibration, signal-to-noise, and spatial resolution increase in the Water Vapor channel on the Imager. *(From Mike Johnson / Kevin Schrab, 4/27/2012).*

LP-6 Make products intuitive for the public to understand (i.e., colors that correspond to natural physical attributes).

Response: This issue is being worked. Refer to Steve Miller's paper on GOES-R ABI synthetic green published in the *International Journal of Remote Sensing* entitled: A case for natural colour imagery from geostationary satellites, and an approximation for the GOES-R ABI. The paper is available at:

<http://www.tandfonline.com/doi/abs/10.1080/01431161.2011.637529>

(From Steve Miller, 3/21/2012)

LP-7 Utilize social media more to increase public awareness of GOES-R.

Response: There is already a GOES-R Facebook page at: <http://www.facebook.com/GOESRsatellite>, a GOES-R specific Wikipedia page was recently launched at: <http://en.wikipedia.org/wiki/GOES-R>, and a GOES-R Twitter page will be available closer to the launch of GOES-R. GOES-R will also be developing a YouTube Channel and will look at other social media applications as appropriate *(From Dann Karlson, 8/2/2012)*

LP-8 Continue creating blended/fused products for operational forecasters.

Response: Response pending.

Session 4**S4-1 Produce the specifications for GRB by April 2012.**

Response: The GRB product specifications will be in the PUG which will be available by the fall of 2012. Refer to the GOES-R website when the PUG is published. *(From Satya Kalluri, 8/2/2012)*

S4-2 What are the plans to produce more work on meso scale models and near cast forecasting?

Response: As global and mesoscale models both advance to increasingly finer spatial and temporal resolution, the assimilation of rapidly refreshed observations such as those as will become available from GOES-R in NWP models is expected to be increasingly important, especially for short-term forecasting. Current efforts to assimilate the hourly GOES AMV wind products may provide a bridge to optimal exploitation of the GOES-R wind products. The implementation of operational mesoscale models (including the WRF) on non-operational computing platforms such as the JCSDA JIBB will provide opportunities to develop and test methods to assimilate GOES-R datasets. The development of forward models for GOES-R observations, including the GLM, should be pursued.

The GOES-R program is continuing to fund NearCasting development and applications activities. Initial efforts have focused on feedback from the 2011 HWT and AWC evaluations. Specific emphasis has been placed on improving education and training, product presentation and interpretation and expanded testing. Testing is planned to continue for the next several years and could expand to include HPC and OPC, as well as additional WFOs. Development efforts over the next two years include:

- 1) Moving the NearCasting model from an isobaric to an isentropic framework and thereby make the NearCasts more responsive to variations in the peak weighting function levels across different air masses and more representative of the adiabatic flow implicit in areas for clear-sky GOES IR products
- 2) Identifying and removing biases from the GOES moisture retrievals

- 3) Determining the seasonally varying information content of the GOES retrievals relative to NWP model 'first guess' fields to understand when the NearCast fields should be most beneficial to forecasters
- 4) Developing plans for real-time testing of the NearCasting model over Europe and central Africa using SEVIRI data as a proxy for GOES-R ABI data (and as requested by EUMETSAT and CGMS)
- 5) Lastly, studying month-long loops of the hourly evolution of lower- and mid-level moisture fields across the US to help understand the mesoscale climatology of moisture transports and destabilization processes.

(From Ralph Petersen and Jim Yoe, 4/27/2012)

S4-3 Suggested that the Proving Ground include broadcasters and international users.

Response: Agreed. Two broadcasters were invited to GOES-R Science Week April 30-May 4 to begin relationship with the broadcast community. Broadcasters will be included in future plans. International participants at GOES-R Science Week will include EUMETSAT, Environment Canada, JMA, INPE, WMO, and the Australian Bureau of Meteorology. *(From Jim Gurka and Steve Goodman, 12/23/2011)*

S4-4 Request to clarify the available system formats. A lot of users use GIS format.

Response: GOES-R data will be available in NetCDF and McIDAS formats for ABI, and in FITS for space weather formats from PDA. *(From Satya Kalluri, 1/19/2012)*

S4-5 When will the polling on who will need the GRB simulator data occur. And will there be a priority system? If so, what is the priority system? And how can users sign up for the GRB simulator data?

Response: Details of this are being worked. *(From Satya Kalluri, 1/19/2012)*

S4-6 Need a Product User Guide (PUG) by April 2012.

Response: PUG will be available by July 2012. *(From Satya Kalluri, 1/19/2012)*

Discussion 1

D1-1 More effort needs to be put into delivering proxy products to WFOs.

Response: More products are added each year to the PG locations. Some products are now ported to the AWIPS II environment and will gain more use over the coming year. We welcome participation by additional WFOs. *(From Steve Goodman and Jim Gurka, 12/23/2011)*

- D1-2 Broadcast community requests a "one stop shop" Web site for satellite data and imagery, as well as collaboration with their graphics vendors like Baron, WxCentral, and WSI, to generate satellite imagery the way radar imagery is so readily available. "One Stop Shop" Web site was also strongly supported by WFO personnel and satellite champions.**

Response: The Office of Satellite and Product Operations was formed as merger of two offices (Office of Satellite Operations and Office of Satellite Data Processing and Distribution). With that merger, many web pages are being consolidated and merged. The web site of <http://www.ospo.noaa.gov/> has links to data imagery.

In the future, the "PDA" (Product Distribution and Access server) will be managed to allow authorized users access to satellite data and products.

For users wishing to access current data, they may follow the NESDIS policy at <http://www.ospo.noaa.gov/Organization/About/access.html>

All users have free and open access to data that are direct broadcast from the satellites via their own antenna systems.
(From Tom Renkevans, 1/6/2012)

- D1-3 WFOs are understaffed and overworked. Better communication from the GPO/PG to the WFOs is needed (more than just email). Monthly teleconferences with short presentations or a monthly newsletter were suggested.**

Response: We will use the NWS Operational Advisory Team presentations by our algorithm teams as a springboard for broader participation by forecasters. Additional coordination with the new NWS Operational Proving Ground will be discussed at GOES-R Science Week. *(Response from Steve Goodman / Jim Gurka)*

- D1-4 Forecasters need products that will highlight situations they DO NOT expect, rather than spending valuable time looking at a product that reaffirms their thinking. That will be more valuable.**

Response: We acknowledge the need for decision aids that alert the forecaster to unexpected events. These will be incorporated in future PG activities. *(From Jim Gurka, 12/23/2011)*

- D1-5 Broadcast community does not have a media training center like the NWSTC. They need training that is quick, easy, and available on the internet.**

Response: Many of the TV folks use COMET. This is quite good and the AMS committee on Station Science has worked hard to make sure that all of those in the TV met community know about it. Continuing education is required to keep the AMS CBM seal and those COMET modules count for that. *(From Dan Satterfield, 12/23/2011)*

D1-6 Suggested that to have a product evaluated fairly in a testbed, the forecasters need one-on-one training with a subject expert on the product.

Response: This has been put into practice, principally at the Hazardous Weather Testbed Spring Experiment in Norman Oklahoma which is a cooperative effort hosted by the NOAA/Oceanic and Atmospheric Research/National Severe Storms Laboratory and the National Weather Service Storm Prediction Center. For the past few years, both the Experimental Warning Program and the Experimental Forecast Program have made research team members and trainers with deep knowledge about their techniques, products, algorithms, models, etc. available to the forecasters participating in the real-time forecast and warning exercises and evaluations. Other testbeds do similar focus periods and evaluations: The NOAA HydroMeteorological Testbed and the Northern Latitude PG to name a couple. Other testbeds are in a formative stage and have been preparing for such exercises but have not executed them yet. The most mature and best test bed to model would be the HWT Spring Experiment. *(From Brian Motta, 4/27/12)*

D1-7 Suggestion to train more WFO forecasters than just the testbed experiments at the National Centers. Train at least one person from a WFO to take that new knowledge back to their local office to share with others.

Response: This fits the long-time practice of the NWS train-the-trainer model. VISIT, COMET, SPoRT, NWS, NESDIS and other training providers routinely use remote meeting software and VISITview software to "bring the experts" to the forecasters remotely. This provides multiple forecasters at a WFO the opportunity to not only get trained but inquire with the algorithm or product developers directly and get authoritative expert answers directly. Subsequent application and verification of correct application of the training is done onsite by the SOO, Satellite Focal Point, or local training facilitator. *(From Brian Motta, 4/27/12)*

Discussion 2

- D2-1 Suggested ways to promote to the broadcast meteorologists: include them in HWT Spring Experiment, Testbed activities, other PG activities, and the visiting scientist program.**

Response: I think all of these are good ideas. If the on air met can bring back some video to show on air, and make it promotable, then stations will be more likely to give paid time off. Making it an educational experience for the TV met, and on a different level, an educational experience for the viewers is a win-win! This is how I approached my trips to Antarctica and Greenland. *(From Dan Satterfield, 12/24/2011)*

- D2-2 Suggested that more focus be put on the development and research of fused and merged products (radar, satellite, microwave, polar, etc.).**

Response: Response pending.

- D2-3 Suggested that the PG has a real time test to see if it fits into the time availability of a broadcaster in the work field.**

Response: We will discuss way forward with Dan Satterfield, who is now the on-air broadcast meteorologist in Salisbury, MD. *(From Brian Motta/Steve Goodman/Jim Gurka)*.

- D2-4 CIMSS' current process in the PG for products is to place them on the Local Data Manager (LDM) to the Weather Forecast Offices (WFOs). There is currently no efficient, non-bureaucratic way to move products up to the satellite broadcast network to give broadcasters more exposure and help alleviate bandwidth concerns. What is the operational legacy of the products and who should be involved for doing that?**

Response: If user groups desire access to operational satellite products from NESDIS, they can follow the policy and procedures at <http://www.ospo.noaa.gov/Organization/About/access.html>

If authorized, these users would gain access to the operational products requested. *(From Tom Renkevans, 1/6/2012)*

- D2-5 Are there any efforts into creating smart phone applications or products that can be readily used by the public?**

Response: GOES-R is part of the NASA App for iPhone/iPad and Android operating systems. We are listed as one of the official "Missions" in the app which provides users general information about GOES-R and its capabilities. A significant update of the information running on the app was released in the summer of 2012 to provide more user

content and program-related information. Information on the NASA App can be accessed at: <http://www.nasa.gov/centers/ames/iphone/index.html> or on USA.gov's app web site at: <http://apps.usa.gov/nasa-app.shtml>

In addition, GOES-R developed NOAA's first iOS app game called "Satellite Insight". Educational as well as entertaining, the game challenges players to keep up with the stream of data from GOES-R's six main instruments. While primarily geared to middle school and high school students, the game builds awareness of the GOES-R mission. The game instructions include basic information about GOES-R and geostationary satellites as well as links to GOES-R.gov, The Space Place (one of NASA's primary web sites for elementary school education); and SciJinks.gov, the web site about weather and Earth science for middle-school kids jointly sponsored by NASA and NOAA. Satellite Insight can be accessed from the following web sites:

<http://apps.usa.gov/satellite-insight.shtml>

<http://www.goes-r.gov/education/fun.html>

<http://scijinks.jpl.nasa.gov/satellite-insight>

Above and beyond this, GOES-R has plans to develop its own GOES-R app to provide the general public and users with an enhanced user content and information about the GOES-R mission and products that will be available to the user community. Development of this application will likely take place beginning in FY13.

(From Dann Karlson, 8/2/2012)

D2-6 The GOES-R web site is difficult to navigate and somewhat confusing if you are not part of the program. Suggested to clarify and/or re-arrange things on the web site.

Response: The GOES-R web site (www.goes-r.gov) was completely overhauled and redesigned in 2011, making it more relevant, comprehensive, and user-friendly. As part of the redesign, a "search" feature was added, making it simple for users to find the information they are looking for. In addition, top menus are organized by respective segments, with specific drop-down menus clarifying all pages in each section. The GOES-R Program is continually updating and improving the site, expanding content and enhancing the user experience. Specific recommendations for improvement are always welcome. *(From Dann Karlson, 8/2/2012)*

Discussion 3

D3-1 Suggested that people from training be more present at PG testbeds and need to work to make training an easier task.

Response: This has been a more difficult challenge in FY12 with drastic reductions in NOAA travel budgets. Training staff have worked diligently with development and

research staff to promote early availability of training for operational forecasters and to promote short-duration easily taken training in online and recorded formats for PG and testbed activities. Additional travel resources are needed for NWS and NESDIS training experts to be able to travel and be present at all of the testbeds during their focus exercises. Significant effort is expended to deliver training remotely and facilitate interactions from a distance. *(From Brian Motta, 4/27/2012)*

D3-2 Suggested that forecasters be trained on products before they participate in PG activities/testbeds.

Response: This was a major finding from the Hazardous Weather Testbed last year. Many participants and the HWT SE organizers noted that significant time was spent on the first day of the week completing briefings and training that could have been delivered remotely before their residence/attendance in person at the testbed. The Experimental Warning Program instituted deadlines for training development and readiness well in advance of the experiment for 2012. The Experimental Forecast Program instituted similar goals but in a less restrictive way to allow for more flexibility among its participants who may have certain focus areas or specialties.

For the larger-scale PG activities, VISIT also participated and facilitated delivering training to forecasters before their offices were provided PG participation or new data sets. New offices or existing offices requesting new products are often the result of new offices/forecasters attending VISIT training to find out about new products or capabilities that are available through the Satellite/GOESR PG to their operational AWIPS/Information Processing Systems. VISIT even had NWS Regional HQ attendance at alpha- and beta-test training sessions to provide reviews and comments on soon-to-be-released training for NWS forecasters. *(From Brian Motta, 4/27/2012)*

D3-3 Direct broadcast community strongly asks for products to be available through IMAPP or IPOPP as was done with NPP. Otherwise, the products will not reach all the users.

Response: Users should submit a request to the GOES-R program office for consideration. This may be accomplished through private sector enterprises or university endeavors but would need to be formally allocated as requirement space for some group to pursue. *(From Tom Renkevans, 1/6/2012)*

D3-4 Suggested that a good way to get people excited and familiar with the new satellite products is to introduce them one at a time and build upon products they already know.

Response: This is essentially the philosophy followed in the Proving Ground. *(From Chris Siewert, 12/23/2011)*

D3-5 Become involved in the Short Course for Broadcast Meteorologists at the Annual AMS meeting.

Response: Jim Gurka will attend the next AMS Broadcasters Conference in Massachusetts and is presenting a talk on the GOES-R Proving Ground to begin the conversation with the broadcaster community.

Other Questions from Attendees**Q-1 Provide a description of the descope of the Option 2 products and the impact. What is the process for these products be made in the future?**

Response: Most Option 2 algorithms were completed and delivered to the Program in 2011. The remaining Option 2 algorithm will be delivered in 2012. The ATBDs are available if someone wants to implement them. Option 2 products, now referred to as Future Capabilities, may be implemented post-launch if NWS decides they are a high priority, the science meets their needs as a stand-alone GOES-R or fused product, and funding within the Ground Segment Project is available for implementation. *(From Steve Goodman)*

Q-2 When will the specs for the GRB (GOES Rebroadcast) be available, and where? Vendors need this so they can build ingest equipment. Lots of questions from DoD and International users in side bars on the GUC on this one.

Response: The specs for the GRB will be finalized at the CDR and will be in the PUG by July 2012. *(From Satya Kalluri, 1/19/2012)*

Q-3 What is the rough cost for a current GVAR user to upgrade to a GRB system, what is involved, and where is that information?

Response: It depends. A current GVAR antenna may be modified (depending on the size and the geographic location) to receive GRB. The user will need a new feed horn and new hardware to process the data. *(From Satya Kalluri, 1/19/2012)*

Q-4 What is the update as to the change/shift in downlink spectrum and impact to products or users?

Response: The spectrum changes should not have an impact on GRB. *(From Satya Kalluri, 1/19/2012)*

Q-5 It is slated for GOES-R to go to the west orbital slot first... can this be changed to east, and if so, what is the process to request?

Response: NWS would need to make the request to NESDIS Senior leadership. *(From Steve Goodman).*

Q-6 Are the plans to check GOES-R out, then store, before operating? Can it be considered for GOES-R to either operate initially or go into an extended checkout phase so as not to lose continuity of data?

Response: Yes, it can be considered. The current plan is 6 months of on-orbit checkout and it may be possible to extend it. *(From Steve Goodman)*

Q-7 What formats will be available for products in the PDA? If not McIDAS, then what are plans for current McIDAS users to do to gain access for data?

Response: ABI products will be available in both McIDAS and NetCDF format. *(From Satya Kalluri, 1/19/2012)*

Q-8 For those users (largely NWP centers) that make use of products in BUFR or GRIB formats, will they be able to get products in these formats? If not, what is their potential alternative?

Response: ABI products will be available in both McIDAS and NetCDF format. *(From Satya Kalluri, 1/19/2012)*

Q-9 What images and/or products will users see in the NOAAport broadcast? For example, all 16 channels of imagery at full disk, or some smaller subset?

Response: Response pending.

Q-10 For an AWIPS user at a WFO, how will Level 2+ products (such as winds, stability, total precipitable water) be presented? Automatically delivered? Push vs. Pull?

Response: The products will be automatically delivered. *(From Mike Johnson, 12/23/2011)*

Q-11 What will be the default scanning mode of the ABI - Mode 3 (flexible) or Mode 4 (Continuous Full Disk) and in the flex mode? Who/how will the center points be set for the 30 second mesoscale?

Response: TBD, but mode 3 is anticipated to be in effect most often. Center points will be decided similar to today, with a WFO requesting a location, and approved by the NCEP shift supervisor. *(From Steve Goodman/Jim Gurka/Tim Schmit, 12/23/2011)*

Q-12 What is the full list of products to be backed up at the remote backup, and if a limited subset, why, and will anything be done to augment these products at the backup?

Response: The RBU will produce the following data and products: L0; L1b; GRB; L2+ GIM; and 2+ Cloud and Moisture Imagery. *(From Satya Kalluri, 12/23/2011)*

Q-13 Is there a CONOPS for the way users will gain access to the PDA, and how products will be accessed and delivered?

Response: Response pending.

Q-14 Describe the HRIT/EMWIN migration and what users will need to do to gain access to this blended stream of data.

Response: The GOES-R High Rate Information Transmission (HRIT)/Emergency Managers Weather Information Network (EMWIN) relay service is an evolution of the current Low rate Information Transmission (LRIT) service of the GOES-8/15 spacecraft. LRIT is an unencrypted, clear channel L-Band hemispheric downlink from GOES at 1691 MHz with BPSK (Binary Phase Shift Keyed) modulation at 128 K bits per second (BPS). LRIT contains selected environmental and weather data products from NOAA produced by or derived from a variety of space and in-situ sensors, as well as EMWIN and Data Collection System (DCS) Platform Reply (DCPR) data as embedded virtual channels. EMWIN data is also available on its own dedicated L-Band hemispheric downlink from current GOES at 1692.7 MHz with QPSK (Quadrature Phase Shift Keyed) modulation.

HRIT, like LRIT, will be an unencrypted, clear channel L- Band hemispheric downlink from GOES at 1694.1 MHz (a new frequency)with BPSK modulation, but at a higher information rate (400 Kbps, on a link transmission rate of 927 Kbps). HRIT will contain selected environmental and weather data products, as well as EMWIN and DCS data as embedded virtual channels. There will be no separate, dedicated EMWIN channel available through GOES-R spacecraft.

Aside from a frequency and demodulator change, and possible modification of the CCSDS (Consultative Committee for Space Data Systems) channel identifiers, a current user of LRIT will be able to receive HRIT on the same antenna and front-end equipment. Functionality of the user post-front-end processing and display hardware and software is

a choice of the individual user in conjunction with available commercial vendors. *(From Richard G. Reynolds, 1/29/2011)*

Q-15 Will direct readout users have a chance to acquire a test GRB stream prior launch? If so, how?

Response: A test GRB stream will be available through the GRB simulator. Specifics will be on the GOES-R web site. *(From Satya Kalluri, 1/29/2011)*

Q-16 How can users get involved in any end-to-end product testing?

Response: Users can get involved with end-to-end product testing through the Proving Ground. Contact Bonnie Reed, bonnie.reed@noaa.gov, for details. *(From Steve Goodman/Satya Kalluri, 1/29/2011)*

Q-17 With all the current blended products (GOES and POES, or GOES and foreign geosats), how will these blended products continue? Who makes them and how?

Response: The continuation of blended products will depend on their complexity. Some products, such as the Red, Green, Blue (RGB) products tailored to specific phenomena such as dust or air mass boundaries, are relatively simple image combinations and could be generated from the basic imagery by end users. Other more complex blended products will still need to be generated centrally by NESDIS or other operational agencies and distributed by the mechanisms that are in place at the time of the GOES-R launch. *(From Mark DeMaria, 3/20/2012)*

Q-18 Once GOES-R is operational, will the proving ground still provide GOES-R products to AWIPS-2?

Response: If the interest is still there after launch, we can continue the Proving Ground. *(From Jim Gurka/Steve Goodman, 12/23/2011)*