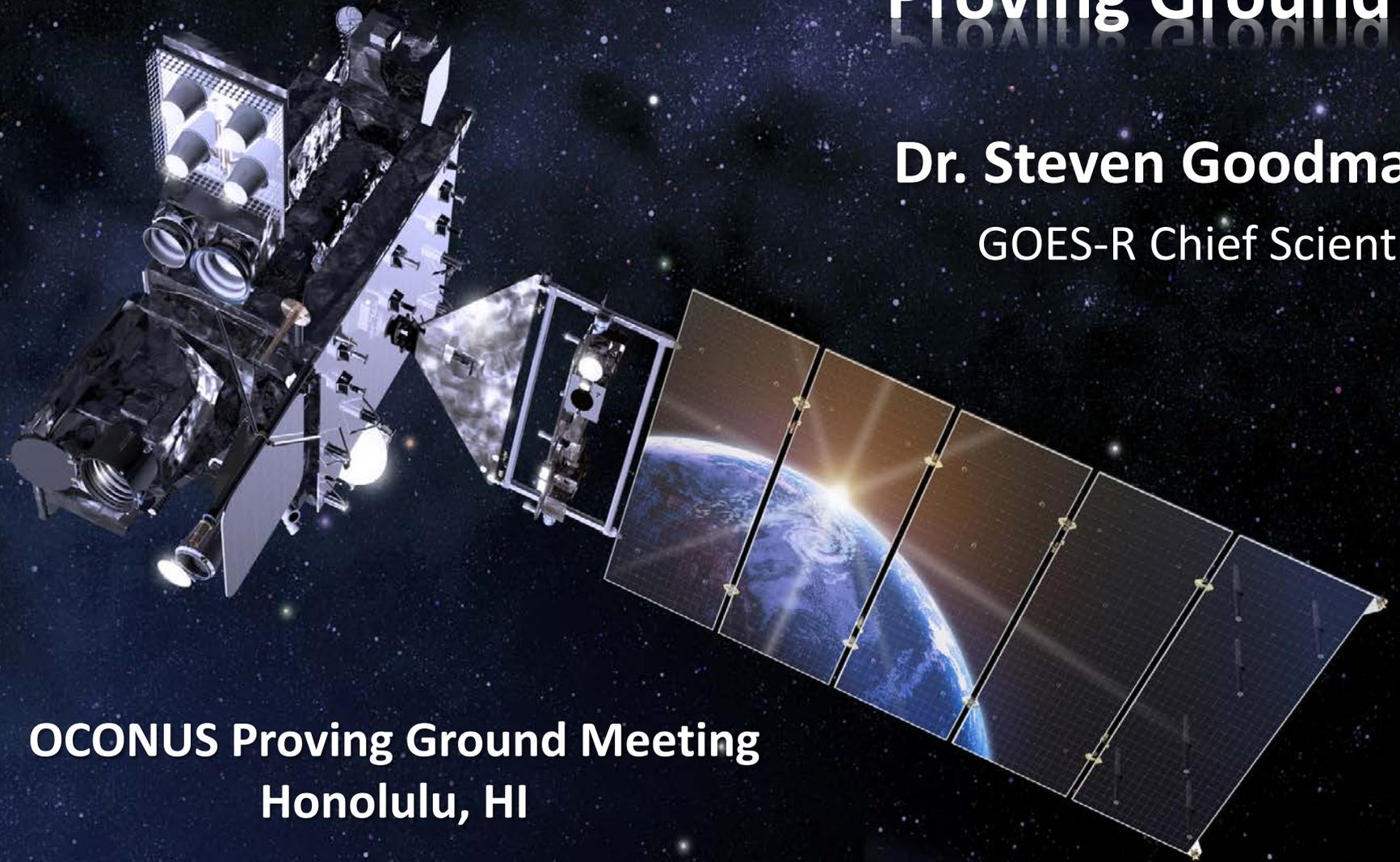




The GOES-R Satellite Proving Ground

Dr. Steven Goodman
GOES-R Chief Scientist



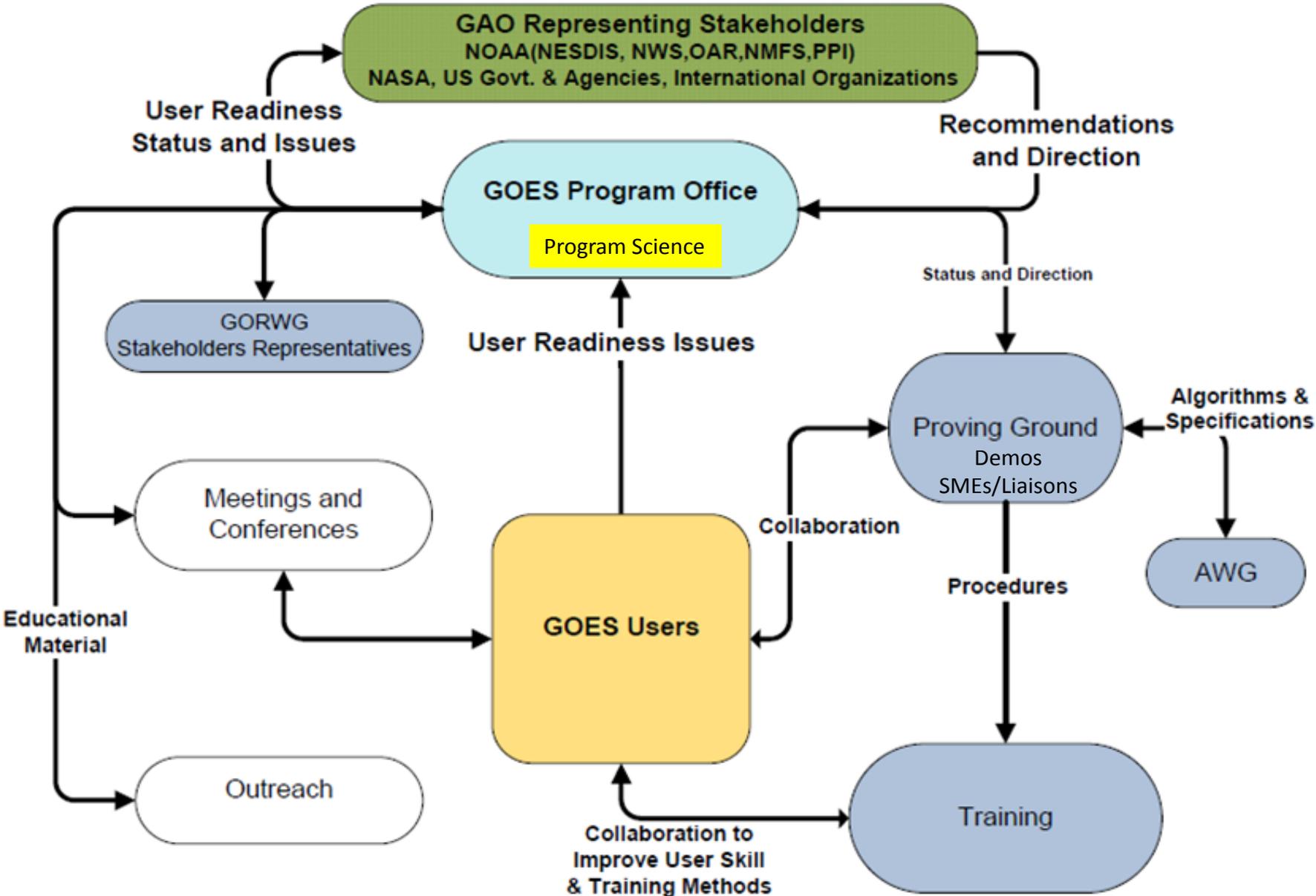
**OCONUS Proving Ground Meeting
Honolulu, HI**

July 29, 2014

Introduction

- All instruments shipped to Lockheed Denver for integration
- GOES-R planned launch date: January 2016- tbc
- GOES-R Science Office budget 2014-2019 confirmed in support of User Readiness
- The GOES-R Proving Ground :
 - Prepare forecasters for GOES-R through product demonstrations and training on the new capabilities within their operational decision support system (AWIPS II)
 - Keep lines of communication open between developers and forecasters
 - Allow end user feedback and assessment of the final product, and evaluate how it is displayed and integrated into operations
- Himawari : With the September 2014 launch of the JMA Himawari sister imager to ABI and through the JMA-NOAA MOU, AHI L1B cloud and moisture imagery will be available in the Proving Ground to forecasters in near real-time and archived by the AWG to generate all Baseline products before the launch of GOES-R
- GOES-R providing support for the development of a GOES-R Training Plan to enable forecasters to use the improved GOES-R products on Day 1

GOES-R User Readiness Process



User System Readiness

Acronym	System Name	Description
AWIPS	Advanced Weather Interactive Processing System	Interactive computer system that integrates meteorological and hydrological data, enabling forecasters to prepare forecasts and issue warnings. GOES-R will provide selected products to AWIPS.
CLASS	Comprehensive Large Array-data Stewardship System	Web-based data archive and distribution system for NOAA's environmental data. CLASS will provide retrospective data access and distribution services of GOES-R data to all users.
PDA	Product Distribution and Access	The Environmental Satellite Processing and Distribution System (ESPDS) system responsible for receiving and storing real-time environmental satellite data and products and making them available to authorized users. The PDA will provide real-time distribution and access services for GOES-R users.
GRB	GOES Rebroadcast Geo CSPP	One channel of the space data relay service of GOES-R for Level 1b data products. These data are available to all users with GRB receivers in view of a GOES-R series satellite at the East or West operational longitudes

GOES-R Products

Baseline Products

Advanced Baseline Imager (ABI)

Aerosol Detection (Including Smoke and Dust)
Aerosol Optical Depth (AOD)
Clear Sky Masks
Cloud and Moisture Imagery
Cloud Optical Depth
Cloud Particle Size Distribution
Cloud Top Height
Cloud Top Phase
Cloud Top Pressure
Cloud Top Temperature
Derived Motion Winds
Derived Stability Indices
Downward Shortwave Radiation: Surface
Fire/Hot Spot Characterization
Hurricane Intensity Estimation
Land Surface Temperature (Skin)
Legacy Vertical Moisture Profile
Legacy Vertical Temperature Profile
Radiances
Rainfall Rate/QPE
Reflected Shortwave Radiation: TOA
Sea Surface Temperature (Skin)
Snow Cover*
Total Precipitable Water
Volcanic Ash: Detection and Height

Geostationary Lightning Mapper (GLM)

Lightning Detection: Events, Groups & Flashes

Space Environment In-Situ Suite (SEISS)

Energetic Heavy Ions
Magnetospheric Electrons & Protons: Low Energy
Magnetospheric Electrons: Med & High Energy
Magnetospheric Protons: Med & High Energy
Solar and Galactic Protons

Magnetometer (MAG)

Geomagnetic Field

Extreme Ultraviolet and X-ray Irradiance Suite (EXIS)

Solar Flux: EUV
Solar Flux: X-ray Irradiance

Solar Ultraviolet Imager (SUVI)

Solar EUV Imagery

New Product Capabilities

Advanced Baseline Imager (ABI)

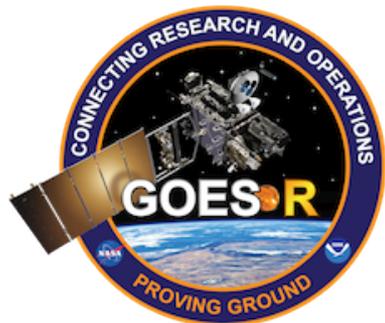
Absorbed Shortwave Radiation: Surface
Aerosol Particle Size
Aircraft Icing Threat
Cloud Ice Water Path
Cloud Layers/Heights
Cloud Liquid Water
Cloud Type
Convective Initiation
Currents
Currents: Offshore
Downward Longwave Radiation: Surface
Enhanced "V"/Overshooting Top Detection
Flood/Standing Water
Ice Cover
Fog and Low Stratus
Ozone Total
Probability of Rainfall
Rainfall Potential
Sea and Lake Ice: Age
Sea and Lake Ice: Concentration
Sea and Lake Ice: Motion
Snow Depth (Over Plains)
SO₂ Detection
Surface Albedo*
Surface Emissivity
Tropopause Folding Turbulence Prediction
Upward Longwave Radiation: Surface
Upward Longwave Radiation: TOA
Vegetation Fraction: Green
Vegetation Index
Visibility

Prob Severe- new R3 product

*Surface Reflectance from Sfc Albedo for Snow Cover Product

Satellite Proving Grounds

Making GOES-R test products available to forecasters,
GOES-R level 2 products for research



- Satellite liaisons (subject matter experts) at NWS National Centers
- Develop training for users
- Several GOES-R level 2 products are demonstrated in the GOES-R Proving Ground.
- Examples can be found on the PG blogs and through the website www.goes-r.gov.
- International Projects
- Visiting Scientist Program

NOAA Hazardous Weather Testbed (HWT)



2014

ESSI Testbed

GOES-R Proving Ground

THE GOES-R PROVING GROUND

Accelerating User Readiness for the Next-Generation Geostationary Environmental Satellite System

BY STEVEN J. GOODMAN, JAMES GURKA, MARK DEMARIA, TIMOTHY J. SCHMIT, ANTHONY MOSTEK, GARY JEDLOVEC, CHRIS SIEWERT, WAYNE FELTZ, JORDAN GERTH, RENATE BRUMMER, STEVEN MILLER, BONNIE REED, AND RICHARD R. REYNOLDS

By demonstrating the advanced capabilities of the next generation of geostationary satellites, the proving ground addresses user readiness and the research-to-operations-to-research loop.

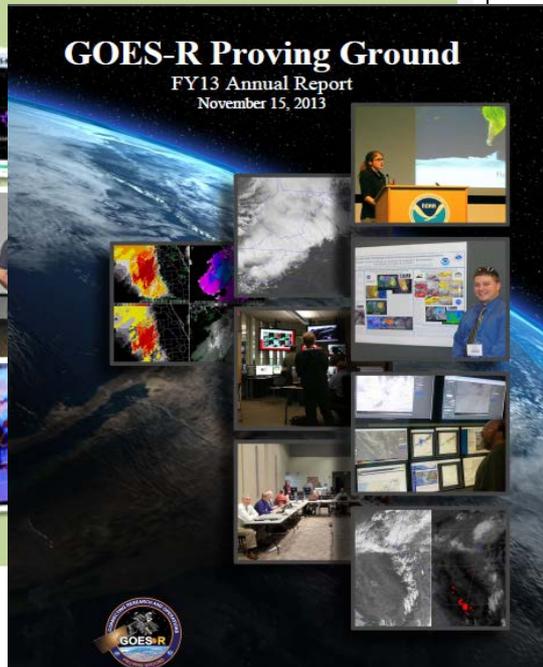
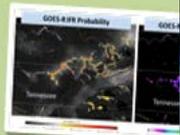
The Geostationary Satellite R (PG) is an for the next geonmental sate development by Space Admini Oceanic and At with NASA r (spacecraft and for the overall GOES-R PG is GOES-R Progr Institutes; NA; and Transition

AFFILIATIONS: Goddard Program Office, Greenbelt NESDIS/Center for Satellite Systems and Applications and Research, National Weather Service Short-Term Prediction Division, Alabama; Siewert—Coastal Studies, Norman Institute for Meteorology; Brummer and Miller—Climate and Space Sciences and Astronautics Center, Fort Collins

AMERICAN METEOROLOGICAL SOCIETY

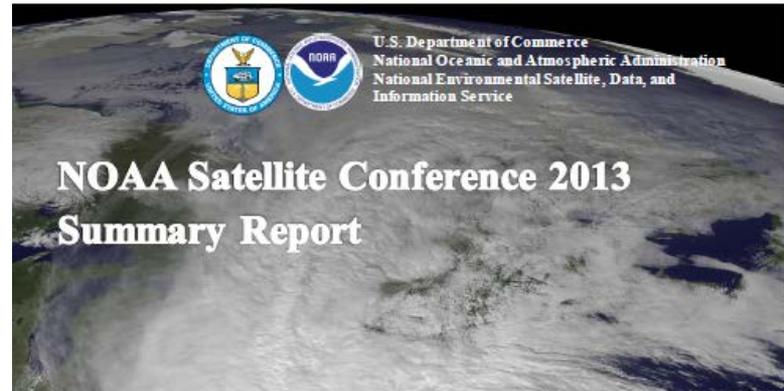
GOES-R Proving Ground

FY12 Annual Report
November 28, 2012
Revised January 22, 2013



GOES-R Proving Ground

FY13 Annual Report
November 15, 2013



NOAA Satellite Conference 2013 Summary Report

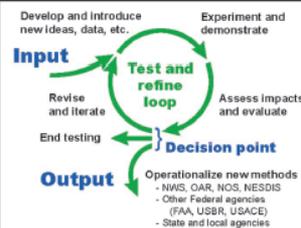
April 8-12, 2013
College Park, MD
Final Report

THE EMERGENCE OF WEATHER-RELATED TEST BEDS LINKING RESEARCH AND FORECASTING OPERATIONS

BY F. MARTIN RALPH, JANET INTIERI, DAVID ANDRA JR., ROBERT ATLAS, SID BOLKABARA, DAVID BRIGHT, PAULA DAVIDSON, BRUCE ENTWISTLE, JOHN GAYNOX, STEVE GOODMAN, JIANN-GHO JING, ANY HARLESS, JIN HUANG, GARY JEDLOVEC, JOHN KAIN, STEVEN KOCH, BILL KUO, JASON LEVIT, SHIRLEY MURILLO, LARS PETER RUSHOYGARD, TIMOTHY SCHNEIDER, RUSSELL SCHNEIDER, TRAVIS SMITH, AND STEVEN WEISS

Test beds have become an integral part of the weather enterprise, bridging research and forecast services by transitioning innovative tools and tested methods that impact forecasts and forecast users.

Over roughly the last decade, a variety of "test beds" have come into existence focused on high-impact weather and the core tools of meteorology—observations, models, and fundamental understanding of the underlying physical processes. They have entered the proverbial "valley of death" between research and forecast operations (NAS 2000), and have survived. This paper provides a brief background on how this happened; summarizes test bed origins, methods, and selected accomplishments; and provides a perspective on the future of test beds in our field. Dabbert et al. (2005) provides a useful description of test beds from early in their development and Fig. 1 summarizes the role of test beds.



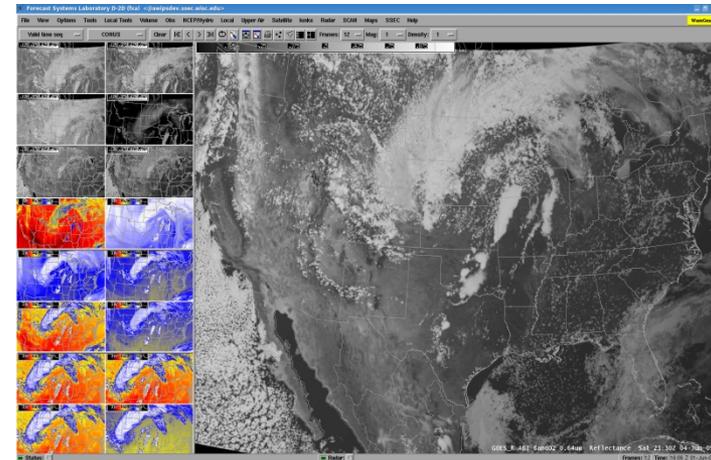
Many trace their origins to the U.S. Weather Research Program (USWRP)'s goals of linking weather research and forecasting operations more effectively. Although USWRP leadership initially envisioned that the associated gaps in capabilities and funding could be filled

FIG. 1. Conceptual schematic of the test bed process for a hypothetical project, tool, or concept—including innovation, demonstration, evaluation, and, where suitable, a transition to operations within a federal, state, or local organization. NOS = National Ocean Service; USBR = United States Bureau of Reclamation; and USACE = U.S. Army Corps of Engineers.

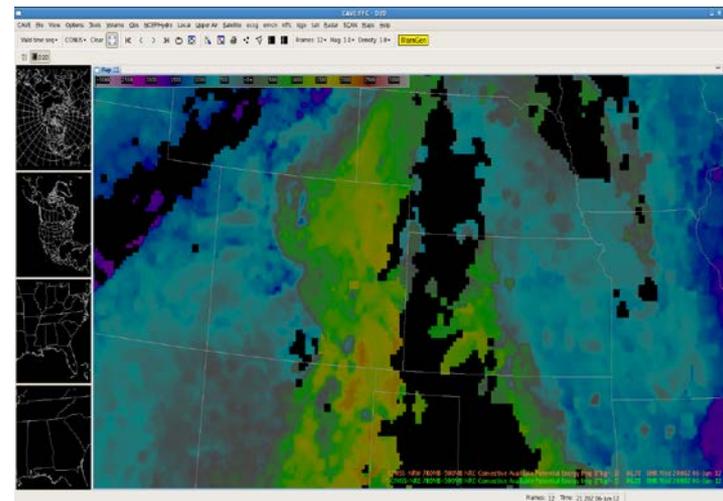
Introducing Forecasters to GOES-R Cloud and Moisture Imagery

Alaska OCONUS Action

- GOES-R Risk Reduction and Proving Ground extending simulated ABI imagery via GFS to cover NWS Alaska and Pacific Regions
- Dan Lindsey, Louie Grasso PIs



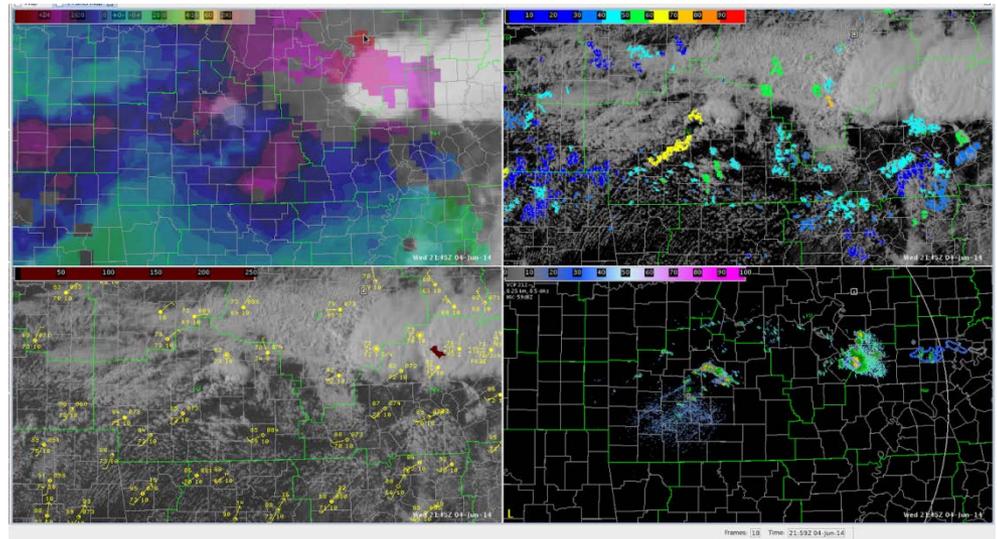
Simulated ABI bands in AWIPS



CAPE- an example of Derived Stability Indices indicates a strong instability axis extending into the high plains east of the Rockies.

2014 HWT Spring Experiment

- 2014 HWT Spring Experiment - EWP
 - Weeks of May 5, 12, 19, June 2; AWIPS-II; 8 hr shifts
 - 3 NWS forecasters, 1 broadcast met. per week, and visiting scientists
 - Feedback: Daily surveys, blog posts (358), daily and weekly debriefs, weekly “Tales from the Testbed” webinar.
 - Blog: <http://www.goesrhwt.blogspot.com/>, Tales: <http://hwt.nssl.noaa.gov/ewp/>
 - Report to be completed by end of July
 - Training: Articulate Powerpoint for each product
 - 9 products and capabilities demonstrated
 - GOES-R product 4-panel display



International Collaboration

- Japan Meteorological Agency (JMA)
 - Information exchange and collaborative research on volcanic ash and cloud analysis science
 - Algorithm Working Group team member visits
 - Access to full resolution HIMAWARI imagery for PG demonstrations
- European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)
 - Collaboration in research and applications through the Convection Working Group and the Satellite Application Facilities
 - Development of training materials through the World Meteorological Organization (WMO) Virtual Laboratory and CGMS



2014 EUMETSAT Convection Working Group workshop, April 7–11, Zagreb, Croatia.

Training and User Education Update

New!



Updated!



Online Training Modules

- GOES-R ABI: Next Generation Satellite Imaging (COMET)
- GOES-R: Benefits of Next-Generation Environmental Monitoring (COMET)
- GOES-R 101
- Satellite Hydrology and Meteorology for Forecasters (SHyMet)
- SPoRT product training modules
- VISIT Training Resources
- Commerce Learning Center

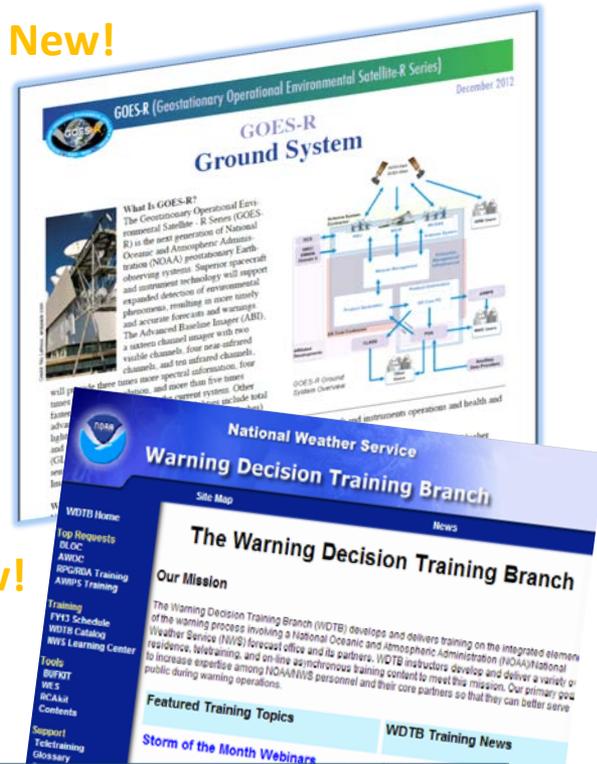
Printed Materials

- GOES-R Fact Sheets (18)
- GOES-R Tri-fold
- User Readiness Plan
- GRB Downlink Specifications and Product Users Guide

GRB Simulators

- Available late 2013 – Industry Day October 25, 2013

New!



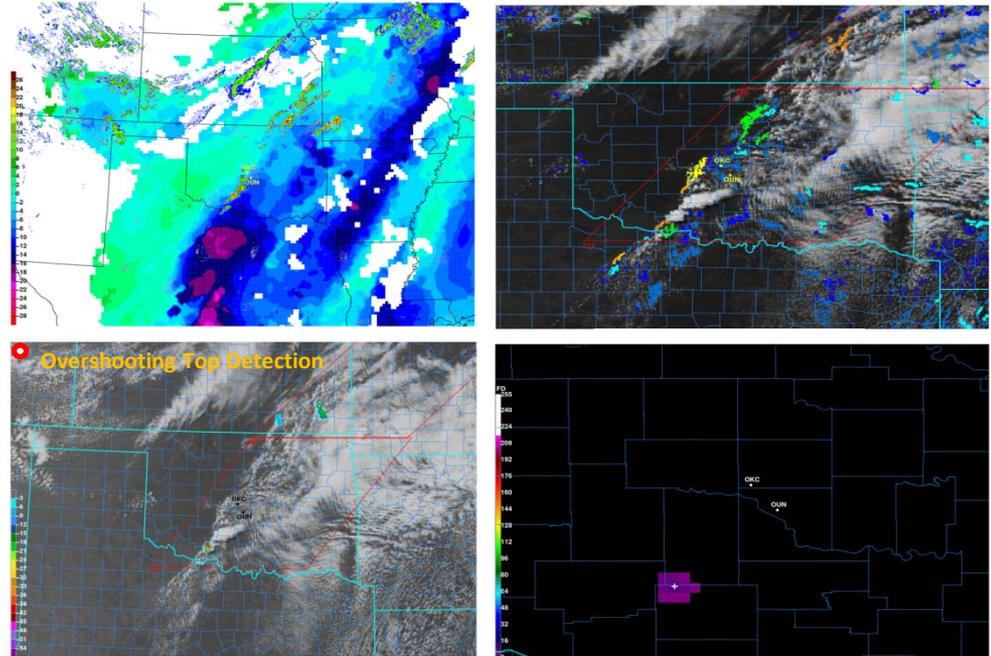
New!



GOES-R Science Seminars

- Promote more frequent communication with the user community about GOES-R science and demonstration activities
 - Semi-monthly virtual science seminars
 - Allow scientists to highlight their work to the rest of the community
 - <http://www.goes-r.gov/users/sci-sem/index.html>

GOES-R Convective Situational Awareness Display Moore, OK Tornado Outbreak May 20, 2013



From January 24, 2014 Science Seminar on Severe Weather. These products provide enhanced situational awareness of the convective environment. Courtesy of Chad Gravelle, CIMSS

GOES-R Quarterly Newsletter



A Note from Greg Mandt, GOES-R System Program Director

The GOES-R Series Program marked a number of significant achievements this quarter. The GOES-R spacecraft system module and solar array were delivered, and two GOES-R instruments were integrated with the satellite. Ground segment development continues to progress, with the majority of the hardware and software that forms the network infrastructure now installed. In June, the program completed its Mission Operations Review, the largest review of the program to date. The GOES-R Proving Ground was part of a successful spring experiment at NOAA's Hazardous Weather Testbed, sponsoring broadcast meteorologist participation for the first time. GOES-14 provided special Super Rapid Scan Operations one-minute imagery for forecaster assessment of the utility of the types of imagery that will be routinely available from the GOES-R series satellites. Finally, check out the GOES-R images in the new NOAA Satellites [Plickr](#) photostream!

Highlights

The GOES-R spacecraft system module

Pre-Shipment Review (PSR) was held April 11, at Lockheed Martin's facility in Newtown, Pennsylvania. The system module was shipped to Denver International Airport aboard a C-17 military transport aircraft, then completed its journey to Lockheed Martin's Littleton, Colorado, facility by convoy on April 16. The system module joined the propulsion module in the cleanroom and preparations are underway for the modules to undergo the integration and test phase of the GOES-R spacecraft development. The system and propulsion modules will be mated in July, prior to payload integration, functional testing and environmental testing in preparation for launch in 2016. Lockheed Martin issued a [press release](#) on May 1 to mark the milestone.



The GOES-R propulsion module (left) and system module (right) in the Lockheed Martin Littleton, Colorado, facility cleanroom. Credit: Lockheed Martin



...that space weather affects us here on Earth? The GOES-R series satellites will carry four instruments that will significantly improve detection of approaching space weather hazards that can disrupt power utilities, communication and navigation systems and cause harmful radiation.

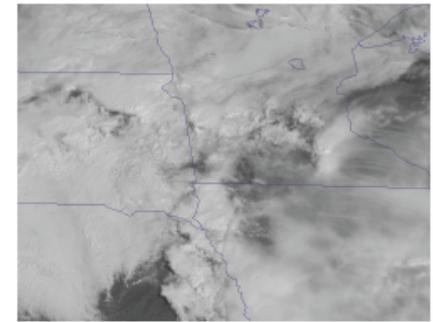
Proving Ground and Program Science

The **GOES-R Proving Ground Hazardous Weather Testbed (HWT) 2014 Spring Experiment** took place May 5-June 6, at NOAA's HWT in Norman, Oklahoma. A number of GOES-R severe weather products and tools were evaluated during the experiment. The Spring Experiment is a unique opportunity for researchers and forecasters to work side-by-side to evaluate emerging research concepts and tools and to participate in experimental forecast and warning generation exercises. For the first time, broadcast meteorologists were invited to the HWT under the sponsorship of the GOES-R program with the goal of understanding future capabilities and products from GOES-R and preparing for the production and dissemination of the new high-resolution information to the public. Details of the experiment, including demonstrations and forecaster feedback, can be found on the NOAA Hazardous Weather Testbed [website](#) and GOES-R Proving Ground Hazardous Weather Testbed [blog](#).



Forecaster/investigator interaction during the HWT 2014 Spring Experiment. Credit: NOAA

The **GOES-14 Super Rapid Scan Operations for GOES-R (SRSOR)** experiment successfully conducted phase one of its 2014 campaign May 8-25. Numerous GOES-14 [one-minute data sets](#) of severe and high-impact weather phenomena were collected across the country. The special datasets were provided to select National Weather Service (NWS) centers, Weather Forecast Offices and NOAA testbeds in real time for forecaster assessment of the utility of the one-minute imagery that will be routinely available from the GOES-R series satellite's ABI. The unique data collected during the experiment provided a rich dataset for research and operational assessment as well as algorithm refinement. Phase two of the experiment will take place August 14-28.



GOES-14 visible imagery of severe thunderstorms over the South Dakota/Nebraska/Minnesota/Iowa region on May 8. See also an [animation](#) of the event. Credit: Cooperative Institute for Meteorological Satellite Studies

Conferences and Events

The **Warn-on-Forecast and High-Impact Weather Workshop** was held April 1-3, at the National Weather Center (NWC) in Norman, Oklahoma. Co-organized by the National Severe Storms Laboratory, the NWS Storm Prediction Center and the GOES-R Program Science Office, the meeting addressed the state of science for storm-scale numerical weather prediction and new and on-going collaborations between the research and operational communities and among the NOAA weather radar, satellite and mesoscale weather forecasting communities.

Select GOES-R science team members participated in the 2014 European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) Convection Working

Group (CWG) workshop held April 7-11, in Zagreb, Croatia. Topics included the use of geostationary satellite data for understanding the pre-convective storm environment, early convection, mature convection, rapid update imagery (such as Meteosat two-and-a-half-minute imagery and GOES-14 one-minute imagery) and combining datasets for storm diagnostics and nowcasting severe storms.

The **GOES-R Program Science Office, National Environmental Satellite, Data and Information Service (NESDIS)** Center for Satellite Applications and Research and the NWS participated in the International Association of Meteorology and Atmospheric Sciences Conference on Atmospheric Electricity (ICAE) held June 16-20, at the

Summary

- **Launch Readiness Date- October 2015 - 2nd Quarter FY 2016**
- **User Readiness Components-**
 - **User System**
 - **Risk Reduction**
 - **Proving Ground**
 - **Training**
- **Training coordination with WMO VLAB**
- **Products available for testing 60 days after launch, available to users for science assessment/validation**
- **AMS Broadcast Board in discussions for a GOES-R Short Course for broadcast meteorologists at 2015 AMS Broadcasters Conference.**
- **JARS and BAMS (in review) describe SRSOR 2012, 2013 experiments**
- **1-min Super Rapid Scan 2014 Experiments**
 - ❖ **May 8-25, August 14-28**



Geostationary Operational Environmental Satellite (GOES)-14 super rapid scan operations to prepare for GOES-R

Timothy J. Schmit
Steven J. Goodman
Daniel T. Lindsey
Robert M. Rabin
Kristopher M. Bedka
Mathew M. Gunshor
John L. Cintineo
Christopher S. Velden
A. Scott Bachmeier
Scott S. Lindstrom
Christopher C. Schmidt

http://cimss.ssec.wisc.edu/goes/srsor2013/GOES-14_SRSOR.html

