

GOES-R Proving Ground Demonstration Proposal and Operations Plan 2013 National Hurricane Center Demonstrations

- 1. Project Title:** 2013 GOES-R Proving Ground at the National Hurricane Center
- 2. Organization:** NOAA/NCEP/NHC
- 3. Products to be Demonstrated in the NHC GOES-R Proving Ground (See the Appendices for detailed product descriptions):**

Phase 1 (Starting Aug 1, 2013):

- 1) Hurricane Intensity Estimate (HIE)
- 2) Super Rapid Scan imagery
- 3) Tropical Overshooting Tops
- 4) GOES-R natural color imagery product
- 5) Red-Blue-Green (RGB) Air Mass product
- 6) RGB dust product
- 7) Saharan Air Layer (SAL) product
- 8) Rapid Intensification Index (RII)
- 9) Pseudo natural color imagery product

Phase 2 (Starting Sep 1, 2013):

- 10) RGB cloud top microphysics product
- 11) RGB convective storms product
- 12) VIIRS Day/Night band (S-NPP product)

4. Demonstration Project Summary:

- a. Overview:** The NHC will receive early exposure to GOES-R products during the 2013 Hurricane Season Experiment running from August through the end of November. Pre-operational demonstrations of these GOES-R products will provide NHC operational forecasters with an opportunity to critique and improve the products relatively early in their development. This activity will build on the GOES-R PG activities that began during the 2010 Hurricane Season. One JPSS product will also be introduced in 2013.
- b. Plan, Purpose, and Scope:** The purpose of this plan is to identify the goals of the National Hurricane Center (NHC) Hurricane Season Proving Ground (PG) Experiment, provide an overview of the products being demonstrated, describe the activities necessary to conduct the experiment, identify the participants and their responsibilities, establish a project timeline/schedule with milestones and deliverables, and identify related activities at the NHC. The focus of this plan is on products for the Hurricane Specialist Unit (HSU) during the climatologically most active part of the Atlantic hurricane season (Aug-Nov). Some PG products are also being evaluated by the Tropical Analysis and Forecast Branch (TAFB), in coordination with the Ocean Prediction Center/Weather Prediction Center/Satellite Analysis Branch (OPC/HPC/SAB) PG. Some of those demonstrations extend beyond the hurricane season. This plan will only describe the activities associated with the 2013 HSU GOES-R PG activities and the TAFB demonstrations that overlap with

those. Additional TAFB products under evaluation are described in the operations plan for OPC/HPC/SAB/TAFB being led by M. Folmer.

The 12 products to be evaluated are summarized in Table 1 and the Appendices. The products will be introduced in two phases. Evaluation of the nine products that are continuing evaluation from 2012 will begin on Aug. 1, 2013 (Phase 1). Three new products will be introduced in Phase 2 on Sep. 1, 2013. A training session on the new products will be arranged in late August.

- c. Goals:** The goals of the NHC Hurricane Season PG Experiment are to demonstrate identified GOES-R surrogate products in real-time at the NHC during the 2013 hurricane season so the NHC forecasters can use, get familiar with, and evaluate the products and provide valuable feedback to the product developers and GOES-R Program Office (GPO). Feedback will be provided using the same form as in 2012 set up by M. Brennan. The new JPSS/GOES-R Proving Ground feedback web page will also be introduced in 2013.

5. Participants Involved:

a. Providers:

- i.** Hurricane Intensity Estimate (HIE) (CIMSS)
- ii.** Super Rapid Scan imagery (CIRA and CIMSS)
- iii.** Tropical Overshooting Tops (CIMSS)
- iv.** GOES-R natural color imagery product (CIRA)
- v.** Red-Blue-Green (RGB) air mass product (CIRA and SPoRT)
- vi.** RGB Dust Product (Sport)
- vii.** Saharan Air Layer (SAL) product (CIMAS, CIMSS and SPoRT)
- viii.** Rapid Intensification Index (RII) (CIRA)
- ix.** Pseudo natural color imagery product (CIRA)
- x.** RGB cloud top microphysics product (SPoRT and CIRA)
- xi.** RGB convective storms product (SPoRT and CIRA)
- xii.** VIIRS Day/Night band (S-NPP product) (CIMSS and SPoRT)

b. Consumers:

- i.** NHC Hurricane Specialist Unit (HSU)
- ii.** NHC Tropical Analysis and Forecast Branch (TAFB)

6. Project Schedule/Duration (some dates are preliminary and subject to change):

- i.** Jun 1, 2013 – Phase 1 products (continued from 2012) into NHC
- ii.** Aug 1, 2013 – Evaluation of phase 1 products begins
- iii.** Aug 20, 2013 – Training for NHC on phase 2 products
- iv.** Sep 1, 2013 – Phase 2 product evaluation begins, phase 1 evaluation continues
- v.** Sep 17, 2013 – Mid-project review at NHC
- vi.** Oct 31, 2013 – Mid-project report completed
- vii.** Nov 30, 2013 – Evaluation period ends
- viii.** Jan 2014, conference call with all project participants
- ix.** Mar 2014 – Project final report completed

Table 1. The products to be evaluated in the 2013 NHC Proving Ground (Details provided in the Appendices)

GOES-R Proving Ground Product	Category	Acquisition into NHC	Training	Formal Evaluation
Hurricane Intensity Estimate (HIE)	Baseline	June 1, 2013	Aug 2013	Jan 2014
Super Rapid Scan imagery	Baseline	June 1, 2013	Aug 2013	Jan 2014
Tropical Overshooting Tops	Future Capabilities	June 1, 2013	Apr 2013	Jan 2014
GOES-R natural color imagery product	Decision Aid	June 1, 2013	Aug 2013	Jan 2014
Red-Blue-Green (RGB) air mass product	Decision Aid	June 1, 2013	May 2013	Jan 2014
RGB dust product	Decision Aid	June 1, 2013	Apr 2013	Jan 2014
Saharan Air Layer (SAL) product	Decision Aid	June 1, 2013	Aug 2013	Jan 2014
Rapid Intensification Index (RII)	Future Capabilities	June 1, 2013	Aug 2013	Jan 2014
Pseudo natural color imagery product	Decision Aid	June 1, 2013	Aug 2013	Jan 2014
RGB Cloud top microphysics	Decision Aid	Sept 1, 2013	Apr 2013	Jan 2014
RGB Convective Storms	Decision Aid	Sept 1, 2013	Apr 2013	Jan 2014
S-NPP Day/Night Band	NPP Baseline	Sept 1, 2013	Aug 2013	Jan 2014

7. Project Decision Points and Deliverables:

- a. Proving Ground Operations Plan – First Draft: 31 Jul 2013
- b. Proving Ground Operations Plan – Final: 31 Aug 2013
- c. Proving Ground Mid-Term Report: Oct 31, 2013
- d. Proving Ground Final Report: Mar 31, 2014

8. Responsibilities and Coordination:

a. Project Authorization

- Richard Knabb, Director, NHC
- Steve Goodman; GOES-R Chief Scientist and PG Program Manager

b. Project Management

- Mark DeMaria; NOAA/NESDIS/STAR/RAMMB
- Michael Brennan, NOAA/NCEP/NHC
- Jack Beven, NOAA/NCEP/NHC
- Renate Brummer; CIRA/Colorado State University (CSU)

c. Technical Support at NHC

- E. Rappaport and M. DeMaria; Acting Techniques and Science Branch Chiefs, NHC
 - Implementation of all product delivery mechanisms at NHC will be coordinated with the TSB Chief(s)

d. Additional POCs

- Jack Beven – NHC focal point
 - Coordinate with other hurricane specialists as well as forecasters from the NHC Tropical Analysis and forecast Branch.
- Michael Brennan – Alternate focal point at NHC
 - Assist Jack in planning, preparation, and execution
- Hugh Cobb and Jessica Schauer – NHC focal points for the Tropical Analysis and Forecast Branch (TAFB)
- Mark DeMaria (NOAA/NESDIS/STAR/RAMMB)
 - Overall NHC PG project management
 - Lightning-based rapid intensification index
- John Knaff (NOAA/NESDIS/STAR/RAMMB)
 - MSG product generation
 - POC for Super Rapid Scan Imagery
- Don Hillger (NOAA/NESDIS/STAR/RAMMB)
 - GOES-R true color algorithm
- Debra Molenaar (NOAA/NESDIS/STAR/RAMMB)
 - Technical support for CIRA products
- Kevin Micke (CIRA/CSU)
 - Technical support for CIRA products
- Jason Dunion (U. of Miami, CIMAS-NOAA/Hurricane Research Division)
 - Coordinate with CIMSS and CIRA on demonstrating RGB aerosol/dust product
 - Saharan air layer product
 - Pseudo natural color imagery product
- Chris Velden (U. Wisconsin, CIMSS)
 - POC for HIE and overshooting tops product
- Gary Jedlovec and Kevin Fuell (SPoRT)
 - Provision of RGB and other image products in N-AWIPS format and related training
- Michael Folmer (CICS/UM)
Coordination with OPC/HPC/SAB/TAFB proving ground and demonstration of GOES-R tropical cyclone products to NASA during the HS3 field experiment

- 9. Budget and Resource Estimate:** Funded through the GOES-R Science Office as part of the Omnibus Proving Ground funding to CIRA, CIMSS, NASA/SPoRT.

Appendix 1– General Product Descriptions

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Product Name: Hurricane Intensity Estimate (HIE)

Primary Investigator: Chris Velden, UW/CIMSS

NWS Center/Office Relevance: Infrared estimates of tropical cyclone intensity have been the cornerstone of operational tropical cyclone forecast agencies for several decades. The HIE is the next generation version of the Automated Dvorak Technique (ADT) for GOES-R.

Product Overview:

- The HIE GOES-R algorithm will estimate hurricane intensity (mean sea level pressure (MSLP) and max surface wind) from ABI IR-window channel imagery.
- Product will also be run using 15 min GOES-East CONUS (MSG) IR imagery for those systems west (east) of 60°W
- The code for the product was derived from the current Advanced Dvorak Technique (ADT).

Product Methodology:

- Product will be run in real-time at UW/CIMSS in Madison, WI, during Atlantic tropical cyclone events.
- It will be automatically activated upon NHC declaring any such system a Tropical Depression or greater strength.

Hurricane Intensity Estimate Products:

- Maximum wind, minimum sea-level pressure estimates

Recent Product Modifications:

- June 2013, HIE now run using ADT version 8.1.4 (SAB operational version)

Concept for Pre-Operational Demonstration:

- The HIE will be generated at CIMSS and provided using the mechanisms as the current Advanced Dvorak Technique (ADT)

Concept for Operations:

- The HIE is a baseline GOES-R product and will be provided as part of the operational processing system

Document last updated: 31 July 2013

Product Name: Super Rapid Scan Imagery

Primary Investigator: T. Schmit, NESDIS/ASPB, J. Knaff, NESDIS/RAMMB

NWS Center/Office Relevance:

- GOES-R will provide routine 5-min imagery and better capabilities for providing 1 min imagery than the current GOES satellites. The 1-min imagery are not routinely utilized by NHC for tropical cyclone applications, so special datasets are being collected to provide experience the higher time resolution imagery.
- Will provide super rapid scan operations (SRSO) data during hurricane events to better document convective evolution, and provide research datasets for improving atmospheric motion vectors

Product Overview:

- The 1-min imagery will be provided from current GOES satellites. This will include Super Rapid Scan Operations (SRSO) data from the operational GOES-east and –west when possible and SRSO-Research (SRSO-R) from GOES-14.

Product Methodology:

- Short periods of SRSO data may be collected for land-falling cases, although this ability is constrained by the operational RSO scanning mode that is triggered when tropical storm operations are in place. Typically RSO is called for GOES-east, so SRSO will be called for GOES-west if the storm is far enough west.
- The GOES-14 satellite will be available during the main part of the 2013 Hurricane Season (Aug-Oct) and will be centered at 105°W. Extended periods of 1 minute imagery will be available (SRSO-R), and will be called for cases of interest. With SRSO-R, 26 images can be collected every ½ hour.

Super Rapid Scan Imagery Products:

- Full resolution 1 minute visible imagery

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- The current satellite systems at NHC are not set up to ingest the 1 min imagery, so these will be ingested at CIMSS and CIRA and made available via web pages.

Concept for Operations:

- SRSO data will be available via direct readout systems or NESDIS servers and displaced on AWIPS2 systems at NHC when GOES-R becomes operational.

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Product Name: Tropical Overshooting Tops

Primary Investigator: Sarah Monette and Chris Velden

NWS Center/Office Relevance:

- The product can help to identify vortical hot towers, which are related to tropical cyclone formation and intensification. For TAFB applications, the TOT product has the potential to help identify the most active areas of convection for their marine products.
- NHC forecasters will provide feedback on the utility of the TOT in the preparation of their operational products.

Product Overview:

- Real time OT timing and location over the tropical and subtropical Atlantic east (west) of 55°W based on 15-min Meteosat (GOES-east) imagery.

Product Methodology:

- Uses infrared window channel imagery to identify domelike protrusions above cumulonimbus anvils associated with very strong updrafts.

Tropical Overshooting Tops Products:

- Lat/Lon and time of tropical overshootings updated every 15 min

Recent Product Modifications:

- July 2013 – ADT used to identify CDO pattern, TOT threshold reduced from 9K to 5K in cold CDO region as defined by IR brightness temperatures

Concept for Pre-Operational Demonstration:

- The TOT product is generated at CIMSS and made available through a web page (http://cimss.ssec.wisc.edu/goes_r/proving-ground/nhc/ot/) and are also distributed in N-AWIPS format

Concept for Operations:

- The TOT product is a variation on the GOES-R Overshooting Tops algorithm. The TOT product could be generated on a central system at NESDIS and distributed along with the OT product.

Document last updated: 27 September 2013

Product Name: GOES-R Natural Color Imagery

Primary Investigator: Don Hillger, NESDIS/STAR/RAMMB

NWS Center/Office Relevance:

- GOES-R will provide natural color products with high time resolution. Although GOES-R will not have a green channel so that a true color image cannot be generated, a very close approximation is possible by predicting the green channel from neighboring visible and near-IR channels. This approximation to a true color imagery (called natural color) hold great potential for public outreach. The product also can be used for analysis similar to what the current single channel visible imagery is used for. This includes identification of cloud features and structure, aerosols, etc. Tropical specific applications are described in Appendix 2.

Product Overview:

- Natural color imagery will be generated from MODIS imagery and made available in real time via a web page. Since MODIS has a green band, the true color image can also be generated for comparison with the natural color version to evaluate the GOES-R algorithm.

Product Methodology:

- ABI will have blue and red bands, but no green band. Thus, it will not be possible to provide a true color image.
- The AWG imagery team has developed a method to accurately estimate the green band using look up tables, where the green band is estimated from the blue, red and near-IR bands.
- The simulated green band is combined with the blue and red bands to generate the natural color imagery.
- This algorithm will be tested using MODIS data to create storm-centered natural color images.

GOES-R Natural Color Imagery Products:

- Natural color imagery (and true color imagery for verification) will be generated routinely using MODIS.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- Imagery centered on features of interest (e.g., tropical cyclones) will be generated and made available via a web page. For tropical cyclone applications, these are available from http://rammb.cira.colostate.edu/products/tc_realtime/. These products will also be generated in AWIPS2 format as those systems become available at National Centers.

Concept for Operations:

- The natural color imagery could be generated at an operational location in NESDIS and distributed along with the GOES-R ABI. A local application could also be developed for AWIPS2 systems, to reduce the bandwidth required to send the extra natural color images.

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Product Name: MSG RGB Air Mass

Primary Investigators: Kevin Fuell (SPoRT) and John Knaff (NESDIS/STAR/RAMMB)

NWS Center/Office Relevance and Product Overview:

- Product allows for a three-dimensional assessment of the best state of the atmosphere.
- Allows for a more accurate analysis of where rapid cyclogenesis, jet streaks, and PV anomalies occur.

Product Methodology:

- Product is generated from Meteosat Second Generation SEVIRI channels 12 (WV6.51), 10 (WV7.43), 9 (IR9.71), and 8 (IR11.03).
- Highlights differences between dry, tropical and cold air masses and is accomplished by:
 - Differencing the two water vapor channels (i.e., at 6.51 μm and 7.41 μm) (Red)
 - Differencing the ozone channels (i.e., 9.71 μm and 11.03 μm). (Green)
 - Uses the 6.51 μm channel to indicate gross air mass temperature differences. (Blue)

MSG Air Mass Products:

- MSG-based RGB Air Mass imagery will be generated every 15 minutes.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- Product is generated at SPoRT and then provided to NWS Regional HQ via the SPoRT LDM and on to local NWS Weather Service Offices where they are converted to a format suitable for display in AWIPS. For National Centers they are converted to a format suitable for N-AWIPS at SPoRT and provided via an ftp server or the LDM.

Concept Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that this RGB product can be locally generated from the individual ABI bands.

Document last updated: 31 July 2013

Product Name: GOES Sounder RGB Air Mass

Primary Investigator: John Knaff (CIRA) and Kevin Fuell (SPoRT)

NWS Center/Office Relevance and Product Overview:

- Product allows for a three-dimensional assessment of the best state of the atmosphere.
- Allows for a more accurate analysis of where rapid cyclogenesis, jet streaks, and PV anomalies occur.

Product Methodology:

- Product was developed for Meteosat Second Generation SEVIRI channels 12 (WV6.51), 10 (WV7.43), 9 (IR9.71), and 8 (IR11.03) and applied here to the GOES sounder data. Sounder version uses WV6.2 and WV7.3, IR9.7 and IR10.8 in place of the SEVIRI channels mentioned above. Sounder version is 10 km spatial resolution and is updated once per hour.
- Highlights differences between dry, tropical and cold air masses and is accomplished by:
 - Differencing the two water vapor channels (i.e., at 6.2 μm and 7.3 μm). (Red)
 - Differencing the ozone channels (i.e., 9.7 μm and 10.8 μm). (Green)
 - Uses the 6.2 μm channel to indicate gross air mass temperature differences. (Blue)

Sounder Air Mass Products:

- The combined GOES-east, GOES-west sounder-based RGB Air Mass imagery will be generated once per hour.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- GOES Sounder RGB Air Mass product is generated at CIRA and then provided to NWS Regional HQ via the SPoRT LDM and on to local NWS Weather Service Offices and National Centers where they are converted to a format suitable for display in AWIPS. For National Centers they are converted to a format suitable for N-AWIPS at SPoRT and provided via an ftp server or the LDM.

Concept Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that this RGB product can be locally generated from the individual ABI bands.

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Product Name: RGB Dust

Primary Investigator: Kevin Fuell (SPoRT) and John Knaff (NESDIS/STAR/RAMMB)

NWS Center/Office Relevance:

- The dust product will allow for the monitoring of dust storms over the African continent and tracking of dust plumes into the tropical Atlantic waters where easterly waves move and sometimes develop into tropical cyclones. This will be of value to NWS National Centers that have marine forecast responsibilities.

Product Overview:

- Product designed to monitor the evolution of dust storms during both day and night.

Product Methodology:

- The dust product is an RGB composite based upon infrared channel data from the Meteosat Second Generation satellite. The resulting product depicts dust in magenta and purple colors over land during day and night, respectively. Over the ocean the dust also shows up as magenta, although with a little less contrast than over the land.
- Product is generated from Meteosat Second Generation SEVIRI channels 7 (IR8.7), 9 (IR10.8), and 10 (IR12.0).
- Highlights dusty regions, which is accomplished by:
 - Differencing two IR channels related to optical thickness (i.e., at 12.0 μm and 10.8 μm) (Red)
 - Differencing two IR channels related to particle phase (i.e., 9.71 μm and 11.03 μm). (Green)
 - Uses the IR window channel (10.8 μm) to indicate surface temperature. (Blue)

MSG Dust Products:

- MSG-based RGB Dust imagery will be generated every 15 minutes.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- Product is generated at SPoRT, converted to a format suitable for N-AWIPS and provided via an ftp server or the LDM.

Concept Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that this RGB product can be locally generated from the individual ABI bands.

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Product Name: Saharan Air Layer (SAL)

Primary Investigator: Jason Dunion (UM/CIMAS and NOAA/OAR/HRD)

NWS Center/Office Relevance:

- The SAL is associated with dusty and stable air that can traverse the Atlantic Ocean from east to west and can reach as far west as the western Caribbean, Florida, and Gulf of Mexico during the summer. There is evidence that they can negatively impact tropical cyclone activity in the North Atlantic.

Product Overview:

- This product can be used to track the SAL's dust laden low- to mid-level dry air. It can also be used to monitor relatively dust-free low to mid-level dry air originating from the mid-latitudes.

Product Methodology:

- The SAL product uses a split window (10.8 and 12.0) algorithm to identify and track dry, dusty air (e.g., Saharan dust outbreaks) in the lower to middle levels of the atmosphere. The product is a simple two channel difference product (12.0 μm - 10.8 μm) with a color table chosen to highlight the features of interest.
- Dry (and possibly dusty) air is indicated by yellow to red shading in the SAL product.

Saharan Air Layer Products:

- The SAL imagery is generated from MSG every 15 minutes

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- The product will be created at CIMSS and sent to NHC in N-AWIPS format via a SPoRT ftp server.

Concept for Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that multi-spectral imagery products can be locally generated from the individual ABI bands.

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Product Name: Tropical Cyclone Rapid Intensification Index (RII)

Primary Investigator: M. DeMaria, NESDIS/STAR/RAMBB

NWS Center/Office Relevance:

- The comparison of operational and experimental RII products will provide an estimate of the utility of lightning data for rapid intensity prediction. The operational product run by NHC does not include lightning input.

Product Overview:

- A prototype rapid intensification index (RII) will be run in real time to demonstrate a decision aid using proxy GLM Lightning Detection data in combination with global model forecast fields, GOES imagery, SST and oceanic heat content analyses

Product Methodology:

- The various data sources are combined in a discriminant analysis algorithm that provides optimal weights of the independent variables to provide a classification of whether or not a tropical cyclone will rapidly intensify (max wind increase of 30 kt or greater) in the next 24 hours.

Rapid Intensification Index Products:

- The RII produces a text product, which provides a quantitative estimate of the RI probability, and time series of the lightning density information that is the input to the algorithm.

Recent Product Modifications:

- Aug 2013 – 3-class version (rapid weakening, average intensity change, rapid intensification) reduced to 2-class (rapid weakening eliminated) due to degradation of performance of RI detection, based on 2011-2012 tests. 2013 Algorithm redeveloped with 2012 cases added.

Concept for Pre-Operational Demonstration:

- The experimental version of the RII will be run at CIRA and made available to NHC via an ftp server (<ftp://rammftp.cira.colostate.edu/demaria/NHCPG>)

Concept for Operations:

- If the lightning input adds value to the RII probability, the operational version of the RII, which runs on the NCEP supercomputer, would be modified to routinely include the lightning input from GLM total lightning.

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Product Name: Pseudo Natural Color Imagery

Primary Investigator: Jason Dunion (UM/CIMAS, NOAA/OAR/HRD)

NWS Center/Office Relevance:

- The GOES-R ABI will include a number of bands that can be combined to create color imagery products that highlight specific features of interest, such as cloud features, land-sea contrasts, surface features, etc. This particular product provides experience with image combinations designed to highlight cloud and other features in the main development region of the tropical Atlantic.

Product Overview:

- Although not a quantitative algorithm like the MODIS-based natural color products, four SEVIRI bands are combined and special enhancement tables are applied to highlight ocean, land, aerosol, and cloud features in colors that are qualitatively similar to those in true color imagery.

Product Methodology:

- The product combines MSG SEVIRI 0.6, 0.8, 1.6 and 3.9 μm channels to highlight the cloud and other features described above. The product colors are chosen to somewhat resemble a true color image.
- Daytime:
 - 1.6 μm (Red)
 - 0.8 μm (Green)
 - 0.6 μm (Blue)
- Nighttime
 - 3.9 μm with a gray scale chosen to highlight high clouds in lighter shades and low clouds and surface features in darker shades

Pseudo Natural Color Imagery Products:

- The product imagery files will be generated every 15 min in N-AWIPS format

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- The product will be created at CIMSS and sent to NHC in N-AWIPS format via a SPoRT ftp server.

Concept for Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that multi-spectral imagery products can be locally generated from the individual ABI bands.

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Product Name: MSG RGB Daytime Cloud-Top Microphysics

Primary Investigators: Kevin Fuell (SPoRT) and John Knaff (NESDIS/STAR/RAMMB)

NWS Center/Office Relevance and Product Overview:

- Cloud top microphysics are related to cloud properties such as precipitation type, updraft strength, hail product, and cloud thickness. These have implications for a number of NWS forecast applications. Tropical applications are described in Appendix 2.

Product Methodology:

- Product is generated from Meteosat Second Generation SEVIRI channels VIS0.8, IR3.9, IR10.8
- Highlights differences in cloud top particle size and phase by
 - Using VIS0.8 in Red for cloud top structure
 - Using VIS3.9 in Green for particle size
 - Using IR10.8. in Blue to for cloud top temperature and phase

RGB Daytime Cloud-Top Microphysics Products:

- MSG-based imagery will be generated every 15 minutes.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- Product is generated at SPoRT, converted to a format suitable for N-AWIPS, and provided via an ftp server or the LDM.

Concept Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that this RGB product can be locally generated from the individual ABI bands.

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Product Name: MSG RGB Daytime Convective Storms

Primary Investigators: Kevin Fuell (SPoRT) and John Knaff (NESDIS/STAR/RAMMB)

NWS Center/Office Relevance and Product Overview:

- Convective storms are important for many NWS forecast applications. Tropical applications are described in Appendix 2.
- This product provides information about cloud top particle size (related to updraft strength), cloud top phase, and precipitation.

Product Methodology:

- Product is generated from Meteosat Second Generation SEVIRI channels WV6.2, WV7.3, IR3.9, IR10.8, NIR1.6 and VIS0.6.
- Highlights differences between dry, tropical and cold air masses and is accomplished by:
 - Differencing the two water vapor channels (6.2 μm and 7.3 μm) (Red)
 - Differencing the two IR channels (3.9 μm and 10.8 μm). (Green)
 - Differencing the Near IR and Vis channels (1.6 μm and 0.6 μm) (Blue)

MSG Air Mass Products:

- MSG-based RGB Air Mass imagery will be generated every 15 minutes.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- Product is generated at SPoRT, converted to a format suitable for N-AWIPS, and provided via an ftp server or the LDM.

Concept Operations:

- It is anticipated that by the time GOES-R is operational, the AWIPS2 deployment will be completed, so that this RGB product can be locally generated from the individual ABI bands.

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Product Name: VIIRS Day-Night Band Reflectance

Primary Investigators: Kevin Fuell (NASA/SPoRT), Kathy Strabala (UW/SSEC), Steve Miller (CIRA/CSU)

NWS Center/Office Relevance:

- The VIIRS Day-Night Band (DNB) on S-NPP is a new low light sensing capabilities that has numerous NWS applications, including nighttime tropical cyclone center fixing, and cloud, fog and smoke detection. The DNB can also be used in conjunction with the ABI to give high resolution snapshot to complement the high time resolution from the ABI.

Product Overview:

- The DNB senses reflected moonlight at night. It can be used in similar ways to the visible channel during the day.

Product Methodology:

- The DNB measures reflected moonlight and emitted light from surface sources such as city lights and fires. To provide a more uniform image as the moon phase changes, a reflectance product is generated using the moonlight algorithm from CIRA.

Pseudo Natural Color Imagery Products:

- The reflectance product is available twice per day from the ascending and descending passes of S-NPP

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- The DNB is obtained from servers at CIMSS and provided via a SPoRT ftp server. The CIRA moonlight code is applied at SPoRT to create the reflectance product before the data is posted for distribution.

Concept for Operations:

- The DNB and other VIIRS channels will be part of the operational satellite data stream for the NWS.

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Appendix 2 – Tropical-Specific Aspects of the Products

The 12 product descriptions in Appendix 1 are the from the Proving Ground document folder. Some products are used in multiple demonstrations, and so do not always include specific details about tropical applications. Additional product details are provided here.

1) Hurricane Intensity Estimate (HIE)

This is a hurricane-specific baseline product, so no further description is needed.

2) Super Rapid Scan imagery

Tropical applications include improved tropical cyclone center fixing, especially near sunrise, and identification of active regions of convection for general marine forecasting. Another method to demonstrate ABI rapid scan capabilities is synthetic imagery. The HSU has not shown interest in this, but there may be opportunities in the future to utilize this general marine forecast application for TAFB.

3) Tropical Overshooting Tops

This is a tropical-specific application, so no further description is needed. Possible HSU and TAFB applications were described in Appendix 1.

4) GOES-R natural color imagery product

The natural color imagery is a general product, but will have a number of important tropical applications. It is useful to meteorologists for cloud, dust, aerosol and land/ocean surface feature identification. The product also has tremendous potential for illustrating the advances with GOES-R by showing natural color loops in media briefings.

5) Red-Blue-Green (RGB) Air Mass product

This is useful for forecasting extratropical transition of tropical cyclones, interaction of tropical cyclones with upper level features for intensity prediction, and for genesis and intensity forecasting through the identification of moisture gradients. The product utility is enhanced when overlaid on model fields, which helps to provide a connection to quantitative applications, and providing insight into the accuracy of model initialization of air mass boundaries and other features.

6) RGB dust product

Dust outbreaks are very common in the eastern Atlantic, and sometimes move all the way from Africa to North America. The proximity of tropical disturbances and TCs to dust boundaries is useful for genesis and intensity prediction.

7) Saharan Air Layer (SAL) product

The SAL is associated with dry, stable air, which has implications for tropical cyclone genesis and intensity prediction. This product is used in conjunction with the RGB dust product, but keys more on thermodynamic properties such as dry mid-level air, rather than the aerosols.

8) Rapid Intensification Index (RII)

This is a hurricane-specific application as described in Appendix 1. The version being demonstrated includes lightning input, which has the potential to improve the accuracy of the operational RII.

9) Pseudo natural color imagery product

This product complements the natural color imagery product by providing higher time resolution, but lower spectral resolution. Tropical applications are similar to those described for that product.

10) RGB cloud top microphysics product

Tropical applications include tropical cyclone intensity forecasting, since the particle size is related to updraft speed, as well as convective monitoring in the marine environment.

11) RGB convective storms product

Tropical applications include cloud discrimination, (convective, stratiform), and genesis and intensity forecasting.

12) VIIRS Day/Night band (S-NPP product)

Tropical applications are the same as for visible imagery, including center location, storm structure identification (spiral bands, eye formation), and cloud monitoring.