2014 Winter Satellite Proving Ground Demonstration Proposal:
OPC, SAB, TAFB, and WPC Proving Ground
Theme: Stratospheric Air Intrusions and Fog Analysis

1. **Project Title:** 2014 Winter Satellite Demonstrations at the Satellite Proving Ground for Marine, Precipitation, and Satellite Analysis (MPS).

2. **Organizations**: The Ocean Prediction Center (OPC), NESDIS Satellite Analysis Branch (SAB), NHC Tropical Analysis and Forecast Branch (TAFB), and the Weather Prediction Center (WPC)

3. **Products to be Demonstrated as a GOES-R and/or JPSS Proving Ground Activity in the PG:**
    - **a.** RGB Air Mass (GOES-R)
    - **b.** AIRS Total Column Ozone Retrievals (JPSS)
    - **c.** Fog/Low Stratus (GOES-R)
    - **d.** Hybrid Imagery (JPSS)
    - **e.** Forecasters at these centers have expressed interest in evaluating the convective products (Overshooting Top Detection and Lightning Detection) that were demonstrated during the "Summer 2013 Convective Demonstrations". Due to the infrequency of convective events in the winter, these products will not be included in this list though any feedback collected on cool season convective events will be included in the final report.

4. **Demonstration Project Summary:**
    - **a. Overview:** The GOES-R and JPSS Proving Grounds will provide demonstration products to the OPC, SAB, TAFB, and WPC. Pre-operational demonstrations of these products will give forecasters the opportunity to evaluate and provide feedback to algorithm developers on the performance and usefulness of the products in forecast operations. The GOES-R and JPSS Proving Ground and product developers can use this information to potentially improve the GOES-R and JPSS algorithms during the pre-launch phase. Due to the diverse range of focus in each of these national centers, it is necessary to demonstrate these products for an extended period to allow forecasters the opportunity to evaluate the products in various weather regimes. Michael Folmer, the GOES-R and JPSS Satellite Liaison at the Satellite Proving Ground for Hazardous Weather Applications, Marine, and Precipitation (HAZMAP), will be handling all logistics and coordination of the product demonstrations within this proposal. The demonstration and report deadline dates are not finalized and should only be considered as placeholders.
    - **b. Plan, Purpose, and Scope:** The OPC, SAB, TAFB, and WPC will provide the GOES-R and JPSS Proving Grounds with pre-operational environments within which

to deploy and demonstrate algorithms at the operational centers. These product demonstrations are designed to familiarize end users with the next generation of geostationary satellite and polar-orbiting satellite products prior to launch.

c. **Goals:** The main objectives of the GOES-R and JPSS product demonstrations proposed herein are to integrate products into OPC, SAB, TAFB, and WPC operations, and have forecasters evaluate and provide feedback through text products, a feedback form, online surveys, and/or email correspondence. These demonstrations will allow forecasters the opportunity to evaluate the products for their readiness in providing decisions support information for both forecasters and partners.Feedback will be gathered during each demonstration by the Satellite Liaison and a final report will be written and submitted to the GOES-R and JPSS Proving Grounds.

5. Participants Involved:

a. Providers:

i. RGB Air Mass (Molthan/Fuell - SPoRT)
ii. AIRS Total Column Ozone Retrievals (Berndt/Zavodsky – SPoRT)
iii. Fog/Low Stratus (FLS) (Pavolonis – NESDIS/STAR)
iv. Hybrid Imagery (Smith/McGrath – SPoRT)

b. End Users:

i. Ocean Prediction Center (OPC)
ii. NESDIS Satellite Analysis Branch (SAB)
iii. NHC Tropical Analysis and Forecast Branch (TAFB)
iv. Weather Prediction Center (WPC)

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

RGB Air Mass – Decision Aid

	Product Ingest Date	Display	Training Period	Evaluation Period	Final Evaluation Report
OPC	Available year-round	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
SAB	Available year-round	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
TAFB	Available year-round	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
WPC	Available year-round	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014

AIRS Total Column Ozone Retrievals – Decision Aid

	Product Ingest Date	Display	Training Period	Evaluation Period	Final Evaluation Report
OPC	1 Oct 2013	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
SAB	1 Oct 2013	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
TAFB	1 Jan 2014	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
WPC	1 Oct 2013	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014

Fog/Low Stratus – Level 2

	Product Ingest Date	Display	Training Period	Evaluation Period	Final Evaluation Report
OPC	1 Oct 2013	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
TAFB	1 Oct 2013	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014

Hybrid Imagery – Baseline

	Product Ingest Date	Display	Training Period	Evaluation Period	Final Evaluation Report
OPC	1 Jan 2014	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
SAB	1 Jan 2014	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
TAFB	1 Jan 2014	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014
WPC	1 Jan 2014	N-AWIPS	1 Jan – 1 Mar 2014	15 Jan – 15 Apr 2014	30 Jun 2014

7. **Project Decision Points and Deliverables:**
   - **a.** Proving Ground Operations Plan – First Draft: 5 December 2013
   - **b.** Proving Ground Operations Plan – Final Draft: 31 December 2013
   - **c.** Proving Ground Final Report: 30 June 2014

8. **Responsibilities and Coordination:**
   - **a.** Michael Folmer, UMCP/ESSIC/CICS – Satellite Liaison
   - **b.** Joseph Sienkiewicz, NOAA/NWS/NCEP/OPC – OAB Branch Chief
   - **c.** David Novak, NOAA/NWS/NCEP/WPC – DTB Branch Chief
   - **d.** Hugh Cobb, NOAA/NWS/NCEP/NHC/TAFB – Branch Chief
   - **e.** Jamie Kibler, NOAA/NESDIS/OSPO/SAB – GOES-R Lead
   - **f.** Kathryn Miretzky, AS&D for GOES-R Program Office – PG Coordinator
   - **g.** Janel Thomas, Omitron – End User Coordinator

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

Product Name: RGB Air Mass

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

MPS 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 Potential Vorticity (PV) anomalies occur.

Product Methodology:

- MSG and MODIS RGB Air Mass Product is generated from Meteosat Second Generation SEVIRI channels 12 (WV6.51), 10 (WV7.43), 9 (IR9.71), and 8 (IR11.03) with 3 km and 2 km spatial resolution, respectively.
- MSG product was adapted to GOES sounder to provide coverage over and near the U.S. 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.
- 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 or 6.51 µm and 7.41 µm). (Red)
    - Differencing the ozone channels (i.e., 9.7 µm and 10.8 µm or 9.71 µm and 11.03 µm). (Green)
    - Uses the 6.2 µm or 6.51 µm channel to indicate gross air mass temperature differences. (Blue)

Air Mass Products:

- MSG-based RGB Air Mass imagery will be generated every 15 minutes.
- Sounder-based RGB Air Mass imagery will be generated once per hour.
- MODIS RGB Air Mass imagery will be generated whenever a new pass is available.

Recent Product Modifications:

- None

Concept for Pre-Operational Demonstration:

- MSG and MODIS Products are generated at SPoRT and then provided via an ftp server or the LDM to the MPS in a format suitable for N-AWIPS.
- GOES Sounder RGB Air Mass product is generated at CIRA and then converted to a format suitable for N-AWIPS at SPoRT and provided via an ftp server or the LDM.

Concept for 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: 21 August 2013

Product Name: AIRS Ozone Retrievals (JPSS)

Primary Investigators: Emily Berndt and Bradley Zavodsky (SPoRT)

MPS Relevance and Product Overview:

- Product(s) allows identification of potential stratospheric air intrusions into the troposphere by highlighting anomalous ozone levels, which also identifies regions of increased PV.
- Allows for a more accurate analysis of where rapid cyclogenesis, jet streaks, and PV anomalies occur and compliments the RGB Air Mass product.

Product Methodology:

- Products are generated from the Atmospheric Infrared Sounder (AIRS) aboard the Aqua polar-orbiting satellite. Both a total column ozone and ozone anomaly product are available. The products are available twice a day with a latency of approximately four hours.

- The products are then made available in vector graphic format (VGF) or griddid format to overlay on current satellite imagery. The total column ozone concentration is mapped in a way to easily identify areas of interest with measurements made in Dobson units. Additionally the ozone anomaly product highlights regions where the ozone values significantly deviate from climatology and are representative of stratospheric air.

AIRS Ozone Products:

- Total Column Ozone and Ozone Anomalies in VGF format to be overlaid on satellite imagery (works best with the RGB Air Mass product).

Concept for Pre-Operational Demonstration:

- Products are generated at SPoRT and then provided to the MPS Proving Ground in VGF format for use in N-AWIPS and provided via LDM.

Concept for Operations:

- It is anticipated that this product will be created using CrIS and/or OMPS on S-NPP satellite as part of the JPSS mission. The product would be generated by NESDIS and distributed to NWS WFOs and National Centers. If the product is not adopted by NESDIS, then SPoRT would provide an operational version of these products (if global data latencies are reduced over currently available data).

Document last updated: 11 December 2013

Product Name: GOES-R Fog and Low Stratus

Primary Investigator: Mike Pavolonis (NOAA/NESDIS/STAR)

MPS Relevance:

- Provides decision support and tactical decision aids for NWS forecasters when identifying the presence and location of fog and low stratus.
- Products can be used during the day and when high cirrus or ice clouds are present.
- Comparisons to surface observations indicate the IFR probability product outperforms (almost twice as much skill) the traditional 3.9–11 μm brightness temperature difference.
- Fused product that incorporates GOES satellite observations and Rapid Refresh model output.
- Addresses one of the top future-capability priorities of the NOAT.

Product Overview:

- GOES-R Fog and Low Stratus detection products are designed to quantitatively (expressed as a probability) identify clouds that produce MVFR, IFR, and LIFR conditions.
- Physical thickness of water cloud layers is estimated in the Water Cloud Thickness product.
- Primary limitation is that some discontinuity will be associated with the transition from sunlit to non-sunlit conditions and vice-versa.

Product Methodology:

- Satellite and NWP model data are used as predictors and ceilometer based surface observations of cloud ceiling are used to train the algorithm.
- During the day, the 0.65, 3.9, and 11 μm channels (in various ways) along with boundary layer relative humidity information from the NWP model are used as predictors (similar approach is utilized at night without the 0.65 μm channel).

GOES-R Fog and Low Stratus Products:

- MVFR, IFR, and LIFR Probabilities
- Water Cloud Thickness (Fog Depth)
- The products are available using GOES-13, GOES-15, and MODIS data.

Concept for Operational Demonstration:

- Fog and Low Stratus product will be delivered to the MPS PG through the University of Wisconsin LDM where they are converted to a format suitable for N-AWIPS and AWIPS 2.

Concept for Operations:

- The Fog and Low Stratus Products are currently scheduled to be operationalized on OSPO ESPC systems and will be delivered to NWS users via SBN, NCO backbone, Direct Broadcast, and possibly AWIPS DDS as alternative.

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Product Name: Hybrid Imagery (JPSS)

Primary Investigators: Matt Smith and Kevin McGrath (SPoRT)

MPS Relevance and Product Overview:

- Products allow forecasters to utilize polar-orbiting imagery, while keeping the consistency of geostationary imagery in space and time.
- Geostationary imagery is available in 15 minute increments and polar-orbiting imagery from MODIS and VIIRS replaces a portion of the geostationary image at the time that most closely matches the geostationary time stamp.

Product Methodology:

- The product is created in 15-minute increments using geostationary imagery from GOES-13 and GOES-15. MODIS and VIIRS swaths are then inserted with the geostationary imagery when available and a file is resent to replace the first GOES-only image.
- There may be seams due to the different scan times.
- The products are made available in McIDAS AREA format to be displayed in N-AWIPS.

Hybrid Imagery Products:

- Longwave Infrared
- Shortwave Infrared
- Visible
- Water Vapor

Concept for Pre-Operational Demonstration:

- Products are generated at SPoRT and then provided to the MPS Proving Ground in AREA format for use in N-AWIPS and provided via LDM.

Concept for Operations:

- It is anticipated that this capability will be available within the AWIPS II framework, allowing for forecasters to overlay polar-orbiting imagery on geostationary imagery as part of a routine. This product allows forecasters the opportunity to use high-resolution imagery from JPSS for mesoscale analysis as will occur in the GOES-R era and during AWIPS II transitions.

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