Quarterly Highlights

Use of VIIRS Day-Night Band Imagery in Response to Hurricane Sandy Recovery Efforts

In late October 2012, widespread strong winds, torrential rain, coastal flooding, and other effects of Hurricane Sandy contributed to widespread power outages throughout the northeastern United States. Approximately one year prior to Sandy, the NASA/NOAA Suomi National Polar-Orbiting Partnership (S-NPP) satellite was launched, providing continuity for several measurements previously obtained from other NASA, NOAA, and Defense Meteorological Satellite Program systems. Aboard S-NPP, the Visible Infrared Imaging Radiometer Suite (VIIRS) provides high resolution visible, near-infrared, and infrared imaging and includes a low light sensor (or day-night band). The day-night band provides 750 m resolution visible imagery during nighttime periods by sensing emission from city lights, wildfires, and other human activity, or by moonlight reflected off clouds or the land surface. As a result, day-night band imagery can be helpful in monitoring power outages that result from natural disasters or downed infrastructure. This capability will be extended in the future with the planned launch of the Joint Polar Satellite System (JPSS) series of satellites.

In response to Sandy, SPoRT provided day-night band imagery and an experimental, false color blackout composite. Since city lights are typically brighter than moonlight reflected from cloud and surface features, they are prominent in day-night band imagery. Image enhancement techniques help to separate urban cores from highways and rural areas. Comparisons of pre- and post-event imagery draw the eyes to places where lights have disappeared, helping to identify possible outages. SPoRT’s experimental “blackout composite” of pre-storm and post-event imagery also helped to identify missing lights in a single image. The composite is generated by assigning pixel red and green intensities to day-night band imagery obtained in nearly clear sky conditions on August 31, 2012. Blue intensities for each pixel were assigned to the reflectance for each image captured following the landfall of then-Hurricane Sandy. In the composite, lights appearing before and after the storm appear as shades of light blue to white, while outage areas appear as yellow.

Through collaboration with NASA’s Applied Sciences Disasters Program, daily composites were provided to the United States Geological Survey’s Hazards Data Distribution System, where they were then distributed to the Department of Defense (DoD) Joint Task Force-Civil Support (JTFCS). The DoD’s JTFCS used the daily reflectance imagery and experimental blackout composite to help identify regions of power outages for the purposes...continued on page 2
Recent Accomplishments/Activities

**LIS Modeling Experiments:**
SPoRT currently manages a real-time configuration of the NASA LIS that runs over the Southeastern U.S., providing hourly output of land surface variables on a domain with 3-km grid spacing. The output is used by collaborating NWS WFOs for diagnostics, drought/flood outlooks, and initialization of land surface variables for local model runs. The current real-time LIS configuration is run offline, in which variables from atmospheric analyses provide the required input for the integration of the Noah land surface model (LSM) running within LIS, instead of input provided by an NWP model in a coupled system.

One of the most important drivers of an LSM integration is the input precipitation field, which currently comes from the NCEP Stage IV precipitation analyses over the Southeastern U.S. domain. SPoRT is interested in expanding the real-time LIS to a full continental U.S. (CONUS) domain, but has not done so yet due to limitations with the Stage IV domain coverage and quality problems in certain geographical regions such as the intermountain West. In order to expand the real-time LIS application, an adequate solution must be devised in order to provide input precipitation that has good spatial and temporal continuity and does not result in artificial features in the output soil moisture fields.

Therefore, SPoRT has implemented two new precipitation datasets into the LIS software infrastructure and began an inter-comparison test among four different precipitation forcing datasets: the North American Land Data Assimilation System – Phase 2, Stage IV analyses, NSSL’s National Mosaic and Quantitative Precipitation Estimate (QPE) (NMQ) product, and the GOES-R algorithm working group’s QPE product. The latter two datasets were implemented into LIS by SPoRT in order to perform this inter-comparison. SPoRT ran LIS simulations for a year with each of these hourly datasets driving the Noah LSM integration in LIS and preliminary results will be forthcoming.

**SPoRT Southern Region Modeling Collaboration:**
SPoRT staff has teamed with Jeff Medlin, SOO at NWS Mobile, AL (MOB), and Lance Wood, SOO at NWS Houston, TX (HGX) for a Southern Region modeling collaboration. The impetus behind such a collaboration is to infuse SPoRT datasets into the local real-time modeling systems at each WFO and to provide the offices with tools for evaluating model skill and determining the impacts of SPoRT datasets. As part of this collaboration, the MOB and HGX offices are running local model runs using SPoRT initialization data. SPoRT then re-ran the simulations containing SPoRT datasets, so as to ensure that forecasts for comparison were produced on the same computational platform. Finally, model output was sent back to each WFO for generating verification statistics and analyzing results. Preliminary results were presented at the National Weather Associated annual meeting in October in a poster prepared by Lance Wood, and at the AMS Severe Local Storms conference in November in a poster prepared by Jeff Medlin.

SPoRT plans to continue advancing its model verification scripting package and supporting the NWS MOB and HGX in assessing the local model runs using SPoRT initialization data.
WFO Corner — Blog Summary for the Fourth Quarter of 2012

The fourth quarter of 2012 was perhaps the most exciting period in the history of The Wide World of SPoRT blog, counting the most viewership of any quarter by far. The quarter consisted of a total of 28 posts, receiving an astounding 8,246 views! This nearly doubled the previous quarterly record of 4,569 views set just in the 2nd quarter of 2012.

By far, the most viewed post of the quarter involved an unusually large and long-lived dust event that affected states from the central High Plains to the Tennessee Valley. Titled, “Dust Storm in the Plains Captured Well in MODIS Dust RGB Imagery”, this post, which received over 3,000 views in a single day, highlighted the ability of the RGB Dust product to differentiate airborne dust from the Earth’s surface as the dust plume made its way across the Great Plains and into the Tennessee Valley. This post may have captured a lot of attention due to the rarity of such an event, but displayed the potential usefulness of RGB products in operational settings. Another interesting post involving the use of the MODIS RGB Dust product was authored by the Miami NWS office. This post showed how the product could be used in tandem with other data to track Saharan dust into the Miami area.

Many posts for the quarter and especially for the month of October centered on unique observations of Sandy offered by SPoRT imagery and data sets. Some of these posts highlighted the ability of the relatively new Soumi NPP VIIRS satellite to provide nighttime visual imagery, or the day-night band (DNB) product. One of these posts illustrated the potential usefulness of the VIIRS DNB and other sophisticated techniques to show areas without power along the U.S. East Coast several days following the passage of former Hurricane Sandy.

While we can’t mention all posts for this articles, we are very appreciative of our collaborative authors, especially the informative posts of Michael Folmer of OPC, and Brian Guyer at the Albuquerque NWS offices. We would also like to welcome newcomers at the Raleigh NWS office to our blog and appreciate their recent activity. If you would like access to post on the SPoRT blog, please send an email to Kris White (kris.white@noaa.gov). Thanks and we hope you’ll keep reading!

SPoRT Seminars

October 16th – Dr. Haiyang Chao (West Virginia University) gave a presentation on “A Low-Cost Multispectral Remote Sensing System Using Unmanned Aircraft”. Dr. Chao explained that small unmanned aircraft system (UAS), including unmanned aerial vehicle (UAV) and ground devices, have many advantages in environmental monitoring applications over traditional aircraft- or satellite-based platforms or ground-based probes for many applications. UAVs also remove the need for human pilots to perform tedious or dangerous jobs such as aerial mapping, or tornado chasing. Small UAVs combined with ground and orbital sensors can form a multi-scale remote sensing system. The presentation focused on the UAS platform development and example applications of small low-cost UAS for civil environmental monitoring tasks based from years of UAS flight experiences. It first provides an overview of the state-of-the-art small UAS technology. A low-cost multi-spectral remote sensing system called Aggie-Air was introduced in detail with several typical missions including land survey, water area survey, and riparian applications.

December 12th — Dr. William Blackwell (MIT Lincoln Labs) gave a presentation on “New Techniques for High-Resolution Atmospheric Sounding”. Dr. Blackwell gave an overview of his neural network algorithm for temperature and moisture profile retrieval that is being used as part of the AIRS Science Team Version 6 algorithm. He also presented highlights of recent technology developments funded by NASA to demonstrate a hyperspectral microwave receiver subsystem, and concluded with an overview of system performance analyses of nanosatellite constellation architectures, including the MicroMAS 3U atmospheric sounding Cubesat to be launched by NASA next year.

Proposals Funded

GOES-R Risk Reduction VSP
Four proposals submitted to NOAA’s GOES-R Risk Reduction Visiting Scientist Program (VSP) were selected for funding in FY13. These awards support travel between collaborative partners and SPoRT to enhance knowledge and usage of future GOES-R products. The titles and Principal Investigators on the projects are listed below.

- AWIPS II governance policy development for GOES-R PG (Burks)
- Operational Application Development of Demonstration GLM Total Lightning Observations in Colorado Front Range (Stano)
- AWIPS2 (Fuell)
- Early Training at the NHC for GOES-R Proxy Products within the Tropical Proving Ground (Fuell)
Presentations

NWA (October 6–11)

AGU (December 3–7)

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


Other

J. Case attended the SMAP/GPM/GRACE-FO/SWOT Joint Mission Tutorial Workshop at USGS headquarters in Reston, VA, 17–18 October.

SPoRT Awards

In order to recognize the efforts of our collaborative partners in helping to carrying out the SPoRT mission, several new awards were initiated this year.

- Collaborative Partner of the Year — presented to the Albuquerque WFO for “Extraordinary Efforts in Demonstrating the Utility of Experimental Products in NWS Operations”
- Satellite Champion of the Year — presented to Michael Folmer (UMd, CICS) for “Outstanding Efforts to Integrate Experimental Data in to a National Center or WFO Operations”.
- Blog Post of the Year — awarded to Kris White (HUN WFO) for his post titled “SPoRT Blended SSTs, VIIRS Day-Night-Band RGBs, and Observations of Sandy”

Calendar of Events 2013

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<tr>
<td>January 6–10</td>
<td>AMS Annual Meeting - Austin, TX</td>
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<td>January 23–25</td>
<td>Suomi NPP Science Team Meeting, Greenbelt, Maryland</td>
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<td>February</td>
<td>Experimental Products Development Team (EPDT) Workshop, Huntsville, Alabama</td>
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<tr>
<td>March 18–22</td>
<td>NOAA Satellite Science Workshop (Virtual)</td>
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<td>April 2–4</td>
<td>NOAA Testbed and Operational Proving Ground Workshop</td>
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<td>April 8–12</td>
<td>NOAA Satellite Conference, NCWCP, College Park, Maryland</td>
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<td>April 18</td>
<td>Mission Applications Status Review</td>
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<td>May 1–2</td>
<td>LANCE User Group Meeting, Greenbelt, Maryland</td>
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<td>June 23–29</td>
<td>GOES-R Proving Ground OCONUS Technical Interchanged Meeting, Anchorage, Alaska</td>
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<td>July 11–12</td>
<td>Coordination Group for Meteorological Satellites (CGMS) meeting, Tokyo, Japan</td>
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<td>September 16–20</td>
<td>EUMETSAT Meteorological Satellite Conference and AMS Conference on Satellite Meteorology and Oceanography, Vienna, Austria</td>
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