



SPoRT Quarterly
Oct. – Dec. 2012

The SPoRT REPORT

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Short-term Prediction Research and Transition (SPoRT) Center
NASA Marshall Space Flight Center (MSFC), Huntsville, AL
<http://weather.msfc.nasa.gov/sport/>

The SPoRT Center is a NASA- and NOAA-funded project to transition unique observations and research capabilities to the operational community to improve short-term weather forecasts on a regional scale. While the direct beneficiaries of these activities are Selected Weather Forecast Offices (WFOs) and National Centers, the research leading to the transitional activities benefits the broader scientific community.

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 of 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

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of staging generators as part of their role in supporting recovery. In addition, composites were provided to the Federal Emergency Management Agency's GIS portal for colocation with other accumulated data sets. This event provided a great example of the capabilities of the VIIRS day-night band and possible interagency collaborations for applying satellite data in response to major disasters. SPoRT plans to continue collaborations with CIMSS, CIRA, and NASA's Applied Sciences

Disasters Program to improve upon these products and their dissemination to end users within NOAA, the National Weather Service, and other federal agencies.

Acknowledgments: VIIRS data are provided to SPoRT by CIMSS at the University of Wisconsin and additional imagery enhancements are performed based upon code provided by Dr. Steven Miller of CIRA.



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 sea surface temperatures, MODIS green vegetation fraction (GVF), and LIS land surface fields. SPoRT developed a model verification package of scripts based on Perl, which invokes the capabilities and programs of the NCAR Model Evaluation Tools (MET) package. SPoRT assisted the staff at NWS MOB and HGX with installing

MET and setting up the scripts to generate model verification statistics of the real-time simulations.

During this past summer, NWS MOB and HGX ran their local models with SPoRT datasets and collected daily 24-hour forecasts to assemble a list of cases of interest for assessing forecast convective initiation in the model. Each office ran with very similar configurations, including identical model physics, initial, and boundary conditions. SPoRT ran control forecasts each day for both offices, using the identical domain configuration in the Environmental Modeling System. When the warm season neared an end, each WFO compiled a list of convective initiation cases of interest for evaluating the model forecasts. 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 Association 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.

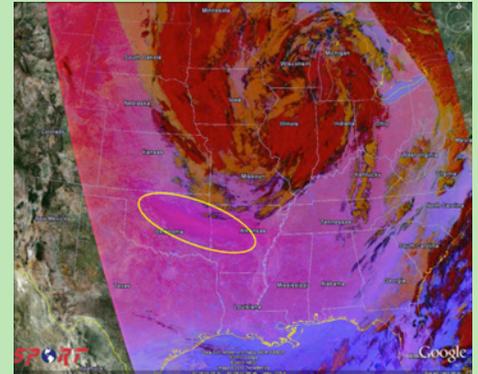
By far, the most viewed post of the quarter involved an unusually large and long-lived dust event that affected states from the central High Plains to the Tennessee Valley. Titled, “Dust Storm in the Plains Captured Well in MODIS Dust RGB Imagery”, this post, which received over 3,000 views in a single 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 sub-system, 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)

- Burks, J., M. Smith, K. McGrath, 2012: NASA/SPoRT AWIPS II Activities.
- Case, J.L., F.J. LaFontaine, A.L. Molthan, B.T. Zavodsky, and R.A. Rozumalski, 2012: Recent upgrades to NASA SPoRT initialization datasets for the Environmental Modeling System
- Jedlovec, G.J., M. Smith, F. LaFontaine, and B. Atkinson, 2012: JPSS Proving Ground–VIIRS Activities at NASA/SPoRT.
- Molthan, A. L., K. K. Fuell, J. Knaff, T. Lee, 2012: Current Usage and Future Prospects of Multispectral (RGB) Satellite Imagery in Support of NWS Forecast Offices and National Centers.
- White, K.D., G.T. Stano, and B. Carcione, 2012: An Investigation of North Alabama Lightning Mapping Array Data and Usage in the Real-time Operational Warning Environment During the March 2nd, 2012 Severe Weather Outbreak in Northern Alabama.
- Wood, L., J.M. Medlin, B. Zavodsky, J. Case, and A. Molthan, 2012: Preliminary Results of a U.S. Deep South Modeling Experiment using NASA SPoRT Initialization Datasets for Operational National Weather Service Local Model Runs.

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.
- Fuell, K.K., G.J. Jedlovec, A.L. Molthan, and G. T. Stano, 2012: NASA/SPoRT's GOES-R Activities in Support of Product Development, Management, and Training. AGU Fall Meeting, San Francisco, CA.

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- Jedlovec, G.J., A.L. Molthan, K. White, J. Burks, K. Stellman, and M. Smith, 2012: Use of Remote Sensing Data to Enhance NWS Storm Damage Toolkit. Session IN035: Near Real-time Data Uses for Earth Science and Space Weather Applications, AGU Fall Meeting, San Francisco, CA.
- Molthan, A., J. Case, J. Venner, M.J. Moreno-Madriñán, and F. Delgado, 2012: Development of a High Resolution Weather Forecast Model for Mesoamerica Using the NASA Nebula Cloud Computing Environment. AGU Fall Meeting, San Francisco, CA.
- Smith, M.R., K. Fuell, A. Molthan, and G. Jedlovec, 2012: Transition of Suomi National Polar-Orbiting Partnership (S-NPP) Data Products for Operational Weather Forecasting Applications. 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.
- 10th JCSDA Workshop on Satellite Data Assimilation: Zavodsky, B., J. Srikishen, S.-H. Chou, C. Blankenship, and G. Jedlovec, 2012: Evaluation of the Impact of AIRS Radiance and Profile Data Assimilation in Partly Cloudy Regions. College Park, MD, 10–12 October 2012.
- 26th Conference on Severe Local Storms: McCaul Jr., E.W., J.L. Case, S.R. Dembek, F. Kong, S.J. Goodman, and S.J. Weiss, 2012: The WRF Lightning Forecast Algorithm: Recent updates and results from convective ensemble forecasts.

- 26th Conference on Severe Local Storms Medlin, J., L. Wood, B. Zavodsky, J.L. Case, and A. Molthan, 2012: Preliminary Results of a U.S. Deep South Warm Season Deep Convective Initiation Modeling Experiment using NASA SPoRT Initialization Datasets for Operational National Weather Service Local Model Runs Nashville November 2012
- “Transitioning NASA Earth Science to Address Real World Weather Related Issues”, by Gary Jedlovec to the NASA Advisory Council Subcommittee on IT Infrastructure during its visit to MSFC, November 27, 2012.

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

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