



SPoRT Quarterly  
July – September 2015

# 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

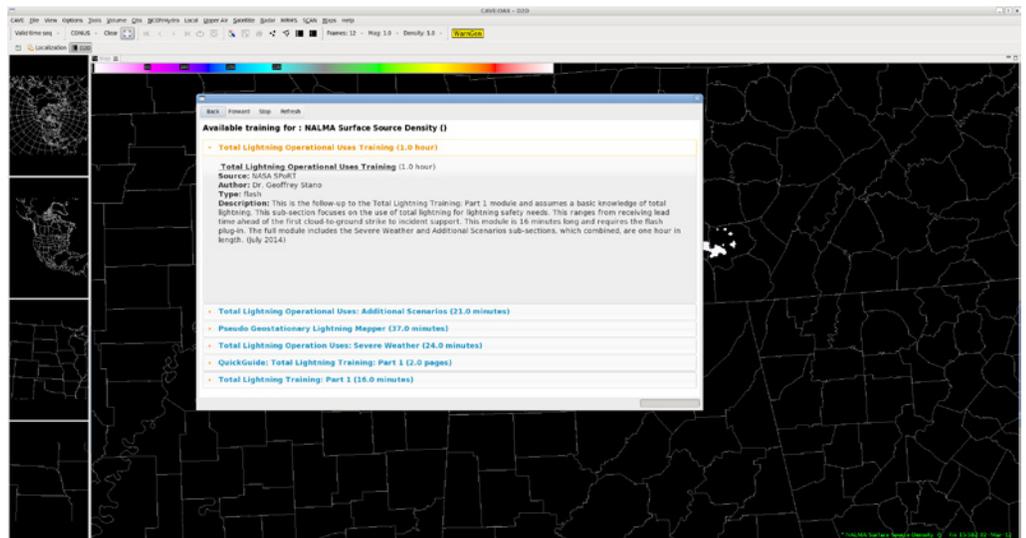
### Just-In-Time Training Plug-in

SPoRT has completed development and initial testing for an AWIPS II plug-in called “Just-in-Time Training” (JIT) to enable training to be directly integrated into Common AWIPS Visualization Environment (CAVE). The goal of the JIT plug-in is to lower the barrier to getting training to the users that need it most and when they need it. A mock-up of this capability was well-received at the NOAA Satellite Meeting in Kansas City, particularly from the Science Division Chiefs from the various regions of the National Weather Service (NWS). The funding for development of this plug-in is being provided by the GOES-R program. The figure to the right shows an example of this training.

An AWIPS II user can right click on a product being displayed and query available training for that product. By integrating the training directly into the CAVE system, forecasters using AWIPS II will be able to access training materials on their operational Decision

Support System (DSS). Currently, forecasters must consult training materials outside the AWIPS II network, which may act as a distraction to direct application of the materials. However, instead of relying on printed materials

or training modules on non-AWIPS computers, forecasters will be able to consult quick-guides or very short training articles that can be compared side-by-side with actual data while making decisions. This type of training



Right clicking on the name of the product in CAVE allows the user to select training on specific products. A window outlining the training on the selected product is displayed for the user to browse and enable decisions on selection of appropriate training.

# Participation in Aviation Weather Testbed

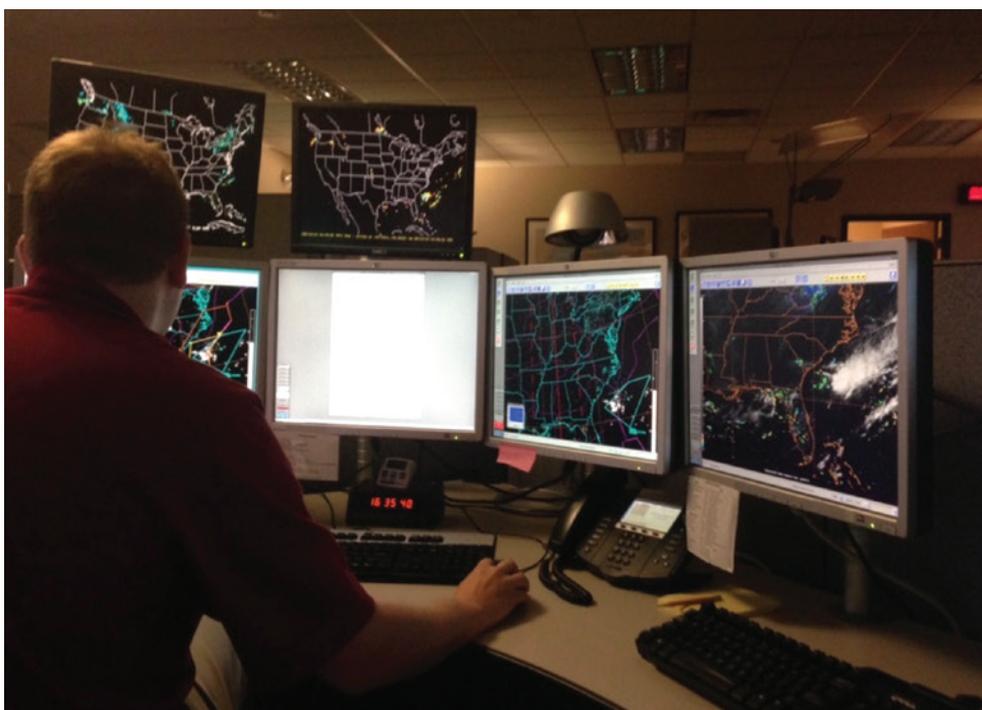
The Aviation Weather Testbed (AWT) summer experiment was held this year from August 10-21 at the Aviation Weather Center (AWC) in Kansas City. The mission of the AWT is “to foster a science-based environment that assures an efficient transfer of innovative research and information technology advancements toward a continuous improvement of NOAA operations, products, and services.” To accomplish this, the AWT brings together scientific researchers and members of the forecast community, both from the public and private sector, who have the opportunity to share experiences, training and feedback with experimental products and data sets. Applications Integration Meteorologist (AIM) Kris White attended this year’s AWT as a representative for the UAH GOES-R Convective Initiation (CI) proxy product and the Pseudo Geostationary Lightning Mapper (PGLM) product.

The AWC is comprised of several forecast “desks”, which have different forecast concerns and areas of responsibility. Three of these desks participated in this year’s AWT: Experimental CAWS (Collaborative Aviation Weather Statement) Desk, Tropical Forecast Desk, and the Cloud and Ceiling Visibility Desk, with additional satellite support from the GOES-R desk. The lack of the Convective SIGMET (SIGNificant METeorological Information) desk at this year’s AWT limited experimental use of and exposure to the CI and PGLM products. The focus of the CAWS desk is primarily for convection in the 4+ hour timeframe, which is generally beyond

the operational utility of either the CI or PGLM products. Nevertheless, this AWT experimented with the issuance of amended CAWS statements, which they currently do not do at the actual operational CAWS desk at the AWC. The CI and PGLM (and future GLM) data will have more utility for this desk (as they do currently for the Convective SIGMET desk), once amendments become standard practice.

While the Convective SIGMET desk did not participate in the testbed activities, AWC forecaster, Ed Holicky (seen below), was able to provide some feedback during one of his operational shifts. Convective SIGMET products are updated between 45-55 minutes

past every hour and cover the 2-6 hour forecast period. They are composed of lines, polygon areas and isolated cells to outline areas where aviation-impacting convection is expected. Convective SIGMETs are advisories consisting of an observation including a 2-hour trend forecast and remarks and may be issued for any convective situation that the forecaster feels is hazardous to all categories of aircraft. The Convective SIGMET forecaster has the PGLM and CI data currently at their disposal and the AIM had the opportunity to interact with Holicky and other forecasters at the AWC about their experiences with the data and offer suggestions and guidelines for their use. The SPoRT group was glad to be a part!



AWC forecaster Ed Holicky works on a convective SIGMET, while utilizing UAH GOES-R CI and SPoRT PGLM products.

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## Seminars

“The Development of a Near-Real Time Hail Damage Swath Identification Algorithm for Vegetation”, Jordan Bell, UAH Master’s Defense, August 3, 2015.

## Proposals

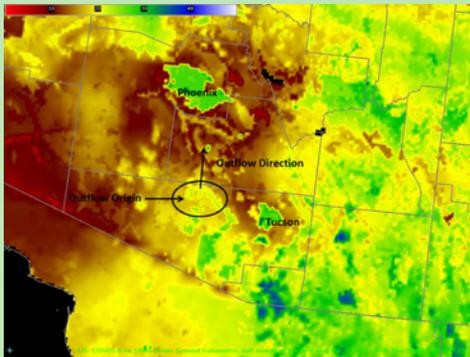
The following proposals were selected for funding during this quarter.

“Meteorologically Driven Dengue and Chikungunya Forecasts”, NASA Center Innovation Fund, PI: Dale Quattrochi (NASA MSFC); Co-Is: Cory Morin (NASA Post-Doc), **Bradley Zavodsky**, and **Jonathan Case**

# Social Media Corner

## Wide World of SPoRT Blog

The Wide World of SPoRT Blog received nine posts during the July to September quarter. Although there were some exceptions, most of these posts involved information sharing about the use of SPoRT-LIS soil moisture data at the Albuquerque and Tucson NWS offices as part of this summer's evaluation. These posts contributed to a greater understanding of specific forecast challenges in the Southwest CONUS that may be met by the SPoRT LIS data, in addition to opening up opportunities for new projects, products and collaborations.



SPoRT LIS 0-10 cm Volumetric Soil Moisture at 00 UTC 23 Jul 2015, annotated to show location of outflow origin and movement (taken from SPoRT blog post on 24 July 2015 "Update from Tucson"). 0-10 cm volumetric soil moisture values were below a significant 16% threshold in the direction of the outflow. Dust was not apparent, however, on multi-spectral satellite imagery or ground observation data following this event.

The SPoRT blog was glad to welcome new author and lead forecaster from the Tucson office, Jim Meyer, who contributed three informative posts during the quarter. The prescribed use of the SPoRT-LIS data for the Tucson and Albuquerque NWS offices was for drought monitoring and hydrologic situational awareness applications, while experimentation with other potential uses was encouraged. During the evaluation, forecasters at NWS Tucson developed a novel use of the data for determining the likelihood of blowing dust events during strong, convective-driven outflows (see image to the left). Long-time SPoRT collaborator and senior forecaster, Brian Guyer, also contributed a couple of posts during the summer trial period, which highlighted several uses of the data during the trial period. While these data have already garnered much attention by New Mexico state officials for drought monitoring purposes, the use of the data for fire weather applications was also discussed in these posts. Additional posts highlighted fire weather applications described in the previous section. SPoRT will be working with forecasters at the NWS Albuquerque and Tucson offices to follow up on these exciting new applications of the LIS data.

As usual, while we can't mention all social media posts made during the quarter, the SPoRT group is very appreciative of the efforts of all of our collaborators. Please visit the Wide World of SPoRT blog at <http://nasasport.wordpress.com> to view these and other posts.

## Twitter

SPoRT also receives feedback from its partners through other social media avenues, such as Twitter and Facebook. This is part of the formulation of a more comprehensive social media plan to increase our presence and improve interactions with our stakeholders. Beginning with this Quarterly we will feature several tweets that feature SPoRT products and their use by partners. Some highlights from this quarter include tweets from OPG regarding SPoRT's visit to discuss upcoming RGB assessment activities and use of high-resolution imagery for post disaster response. Also, our partners in Albuquerque made a great tweet highlighting use of the SPoRT-LIS to determine wet and dry soils in the domain. You can get these and other updates from SPoRT on Twitter (@NASA\_SPoRT) and Facebook (NASA SPoRT Center).

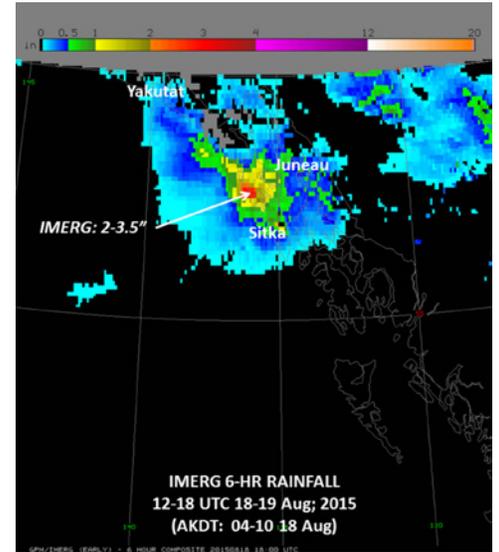
# Transitions and Assessments

## LIS/GPM

SPoRT conducted an evaluation of three inter-related product families during late July and August: NASA LIS (Land Information System), GPM (Global Precipitation Measurement) passive microwave swath Rain Rate (Level 2), and GPM IMERG (Integrated Multi-satellitE Retrievals for GPM) gridded Rain Rate (Level 3). The GPM observations are valuable because they add information regarding precipitation in data void regions, such as over oceans or land areas without good radar coverage. This is the first evaluation of retrieved rain rate products with operational forecasters. The LIS fields are valuable because they provide higher spatial resolution observations of soil conditions that can aid forecasters in the detection of flood, drought, and fire weather. This is the first evaluation of a full CONUS domain LIS.

The Tucson, AZ and Albuquerque, NM Weather Forecast Offices evaluated GPM datasets for diagnosing the summer monsoon related to areal flooding and for applications related to drought and fire weather. Alaska WFOs and River Forecast Centers (RFCs) evaluated the product mostly as it related to heavy rainfall, which can lead to flooding and mudslides. RFCs in the Southeast U.S. evaluated the GPM products only to supplement other ground-based precipitation observations. Only the Southwest U.S. WFOs evaluated the LIS fields to determine ground conditions related to areal flooding, drought, and fire weather.

The LIS data in the Southwest U.S. was particularly useful for discussions during drought classification activities but also for their potential in diagnosing

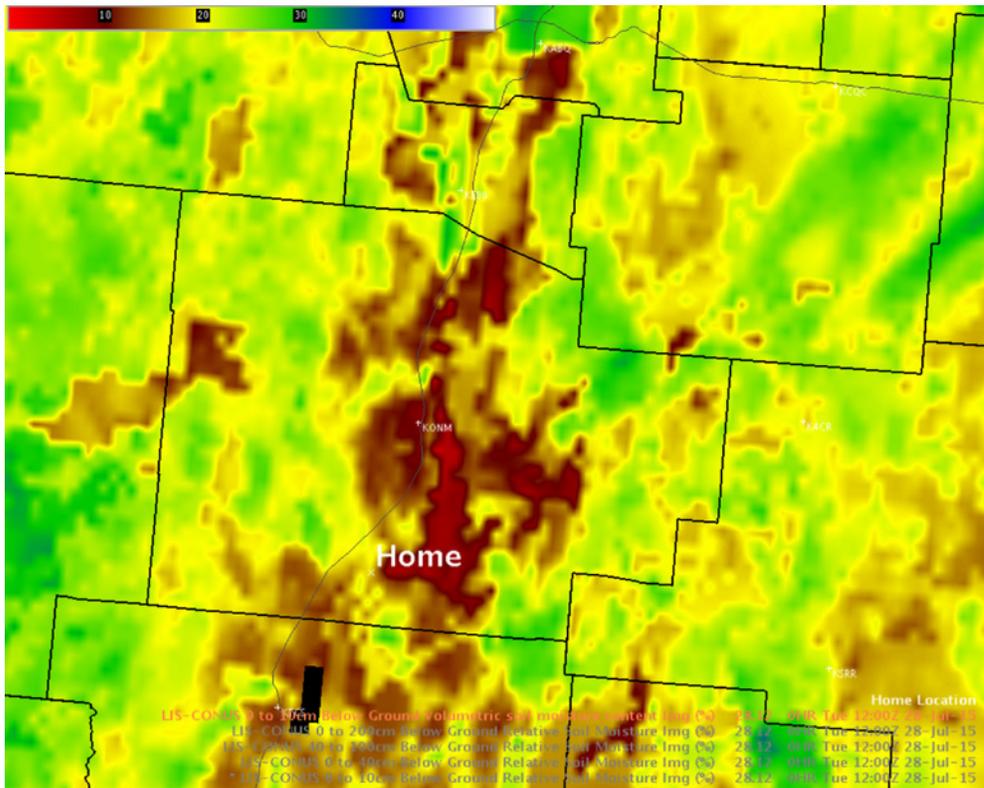


GPM/IMERG 6-hr accumulation over SE Alaska showing bull's eye of heavy rain rates (2015/08/18 12-18 UTC).

conditions favorable for fire weather. Specifically, the LIS data were used for identifying localized dry regions where wildfire potential might be higher, including the Fort Craig wildfire, which burned over 700 acres in New Mexico during July (see figure to the left below).

In general, both the GPM L2 Rain Rate and L3 IMERG products were useful in getting rainfall information in data void regions. Forecasters found that the GPM products correctly identified the pattern of rainfall intensity but tended to slightly underestimate amounts. In particular, the GPM data showed good agreement with precipitation patterns associated with a landslide event near Sitka, AK on 18 August (see figure above). However, the latency of the data (6+ hours for the Early Run IMERG product) limited the operational utility of the GPM products mainly to post-event analysis. Forecasters, though, found enough value in the products that they requested continued access to the data beyond the evaluation period.

A final report on this evaluation is being prepared and will be available on the SPoRT website later this autumn.

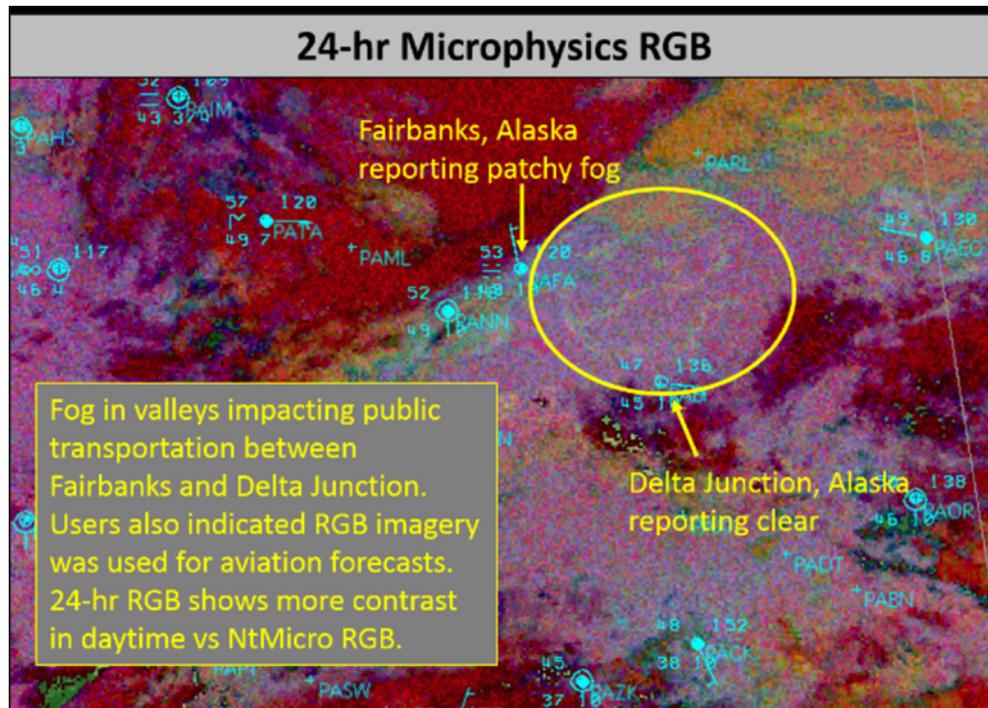


SPoRT-LIS from 1200 UTC on 15 July showing a localized dry region that was the site of the start of the Fort Craig Wildfire (marked as "Home" in the image).

## 24-Hour Microphysics RGB Summer Assessment in Alaska

VIIRS and MODIS data via the Direct Broadcast receivers operated by GINA of the University of Alaska Fairbanks have been used to create multi-spectral (RGB) imagery for use in aviation forecasting and as a proxy to future GOES-R capabilities. This RGB product was assessed from mid-June to early August as a follow-on activity to the introduction of the 24-hr Microphysics (24hrMicro) from the prior winter period. In this summer assessment, the 24-hr Microphysics RGB was adjusted to provide greater contrast between cloud features with small water particles (i.e., fog/low cloud) and large water particles (i.e., mid-level cloud); users were positive about its new look that was closer in appearance to the Nighttime Microphysics (NtMicro) RGB. While the low clouds and fog stood out better with this contrast change, the sensitivity to the particle size is less in the 24hrMicro RGB compared to the NtMicro, which users tended to favor,

if available. The lessons learned from winter translated into better application of the 24hrMicro RGB for daytime applications when the more familiar and favored NtMicro would not be available during Alaska's long daylight periods of summer. Several cases of improved contrast of the 24hrMicro were highlighted in user comments. While improvements were seen, users still preferred the contrast and detail in the NtMicro RGB at night and some users suggested the need for even more contrast before making the product widely available in operations. According to user feedback, both Public and TAF forecast products were impacted frequently, with occasional impact to marine forecasts, including an event in late June where fog was detected in valleys near Fairbanks (see image below). The RGBs were complimentary to other products such as the GOES IFR/LIFR Probability product.



24-hour Microphysics RGB from MODIS/VIIRS datafeed at 1405 UTC (6:05 AM, Daytime) 28 June 2015 w station observations overlaid, for central Alaska.

## Ocean Prediction Center

On 9 September, Joe Sienkiewicz from the Ocean Prediction Center (OPC) visited the NSSTC to present a seminar on how the OPC works with four geostationary satellites that cover their forecasts areas to address specific forecasting challenges. SPoRT was able to give Mr. Sienkiewicz a detailed briefing during his time in here at the NSSTC, regarding the entire SPoRT profile to help strengthen future collaborations between OPC and SPoRT, especially with the upcoming GOES-R mission.

## Environment Canada

During the second half of the summer, Dr. Mohammed Dabboor from Environment Canada was a visiting scientist with the Earth Science Office at MSFC. The purpose of Dr. Dabboor's residency was to expose MSFC's Earth Scientists to synthetic aperture radar (SAR) data. SAR data has a number of applications, including disaster response imagery (even with significant cloud cover). SPoRT is beginning to increase its knowledge on how SAR instruments work and how to interpret the data for potential future disaster response related activities.

## Acknowledgments

On 12 August, the Science and Technology office at Marshall Space Flight Center held their Annual Peer Awards Ceremony. Jason Burks, Jonathan Case, Kevin McGrath, Andrew Molthan, Jayanthi Srikishen, and Bradley Zavodsky were all nominated for awards.

A special congratulations to Lori Schultz, who was nominated and won the Peer Award for Excellence. Lori is involved in many projects and is very thorough in all her duties. She is a great asset to the SPoRT team. Congrats Lori!

# Satellite Proving Ground Activities

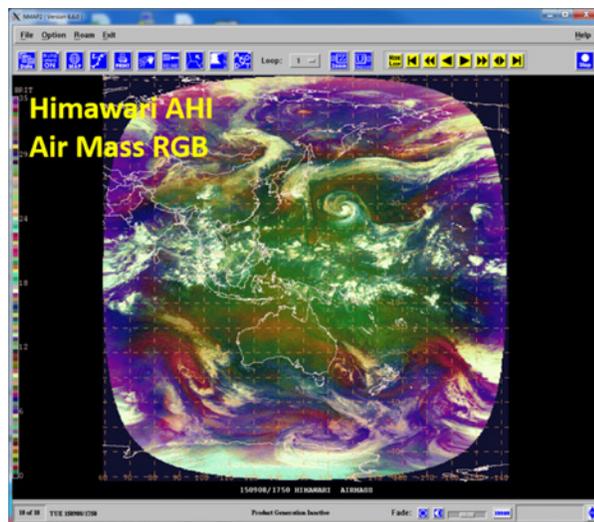
## AHI Updates

With the launch of Himawari-8 and the new capabilities of the Advanced Himawari Imager (AHI) payload, meteorologists can monitor the Pacific Ocean basin with increased temporal (every 10 minutes) and spatial resolution (2 km). For National Centers such as the Ocean Prediction Center (OPC) and Weather Prediction Center (WPC) with forecast responsibilities that cover much of the northwest hemisphere, this imagery is integral to their operations. SPoRT has begun providing its suite of RGB products to the National Centers for use in operations (24-Hour Microphysics, Air Mass, Dust, Nighttime Microphysics, and Natural Color). Additional capabilities to calculate the 3.9µm reflectance were developed to provide products such as the Day-time Microphysics and Day-time Convective storms RGBs. A formal evaluation of AHI RGBs is planned with the Operational Proving Ground (OPG) in 2016.

## Client-side RGBS

In the fall of 2014, AWIPS II Experimental Product Development Team (EPDT) members from SPoRT, CIRA, and NWS developed a foundation for generating EUMETSAT-based 24-bit RGB satellite products within AWIPS II. These “client-side” RGBs preclude the necessity for SPoRT to pre-generate the products and offer a much greater color fidelity ( $2^{24}$  colors versus 254 colors). SPoRT has expanded on this work and deployed these capabilities to testbed partners at the Huntsville WFO and OPG. An assortment of single-band MODIS and VIIRS data are being disseminated by SPoRT and ingested at Huntsville that allows them to generate Air Mass, Dust, Nighttime Microphysics, and 24-hour Microphysics RGB products. SPoRT is disseminating full-disk AHI data to OPG and has provided configuration files

and software offering forecasters the following assortment of client-side RGBs: 24-hr Microphysics, Air mass, Daytime Microphysics, Daytime Storms, Dust, Natural Color, Nighttime Microphysics, and True Color. These capabilities will be refined based upon feedback from Huntsville and OPG before being offered to a larger set of offices.



AHI Air-mass RGB displayed in NAWIPS

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## Just-In-Time Training Plug-in...continued

would be especially useful in cases where a forecaster encounters a forecast challenge that is not routine, or they need a quick refresher on the utility of a product. Alternatively, the JIT plug-in will feature hooks within the training to invoke actions in the CAVE display, such as zooming and loading of data and map overlays. This could allow training to drive the user through visual displays of data and allow the user to save off views of the data in AWIPS procedures for later use.

The JIT plug-in will allow the user to sort training based on length and relevance by using a unique identifier of the product within AWIPS II. For instance, the user may select training on a specific satellite product such as the cloud top pressure from the GOES satellite. They could be presented

training specifically on Cloud Top Pressure and also on the GOES satellite. The JIT plug-in will also allow users to rate training to see if other forecasters have found the training useful. Additionally, the user's location will be captured to display regionally-focused training that features case study examples from their area. The training for a product in Alaska, for example, might be quite different than the training for that same product in the Southern United States.

The JIT plug-in is being developed to support both locally-developed and national training, benefitting established training by integrating with the NWS training system. The JIT plug-in uses a web-based view to render the training, which allows existing training to be easily integrated and does not

require changes to current training tools or methodologies. The use of a web browser to render the training also allows the support of web-based plug-ins to help with rendering other content such as Portable Document Format (PDF) or HTML5 to allow for interactive training. In addition, because the AWIPS II system is also going to be utilized for training by using the Warning Event Simulator 2 Bridge (WES2Bridge), the JIT plug-in will allow training to be accessible natively within that system, further enhancing the training process.

# Presentations

Berndt, E.B. and B.T. Zavadsky, 2015: Applications using Satellite Sounder Products at the NASA SPoRT Center. *STAR JPSS 2015 Annual Science Team Meeting*, College Park, MD., 24-28 August.

Blankenship, C.B., B.T. Zavadsky, and J.L. Case, 2015: Assimilation of SMOS retrieved soil moisture into the Land Information System. *2015 EUMETSAT Meteorological Satellite Conference*, Toulouse, France, 22 September.

Burks, J. and A. Molthan, 2015: Applications of Satellite Imagery for Disaster Assessment and Response. *National Weather Service Decision Support Services Bootcamp*, Kansas City, MO, 14 August.

Elmer, N.J., E.B. Berndt, and G.J. Jedlovec, 2015: Limb and bias correction of VIIRS and SEVIRI IR channels for the improved interpretation of RGB composites. *2015 EUMETSAT Meteorological Satellite Conference*, Toulouse, France, 22 September.

Fuell, K.K. and G.T. Stano, 2015: Operational uses and demonstrations of total lightning in preparation for space-based platforms. *2015 EUMETSAT Meteorological Satellite Conference*, Toulouse, France, 22 September.

Fuell, K.K., E. Stevens, L. Schultz, and A. Molthan, 2015: Transition and assessment of LEO nighttime and 24-hour microphysics imagery to support nowcasting for aviation at high latitudes. *2015 EUMETSAT Meteorological Satellite Conference*, Toulouse, France, 22 September.

Naeger, A.R., B.A. Colle, A.L. Molthan, and S.W. Nesbitt, 2015: Evaluating microphysical schemes in simulating the mixed-phase processes of a winter storm during GPM-GCPEX. *16th Conference on Mesoscale Processes*, Boston, MA, *Amer. Meteor. Soc.*, 10.6A.

Zavadsky, B., N. Smith, J. Dostalek, E. Stevens, K. Nelson, T. Reale, E. Berndt, A. Gambacorta, C. Barnett, J. Srikishen, and C. Francouer, 2015: The Cold Air Aloft Problem: Applications of Temperature Sounding in High Latitude Regions for Aviation. *STAR JPSS 2015 Annual Science Team Meeting*, College Park, MD., 24-28 August.

## Recent Accomplishments

### New Computing Capabilities

SPoRT has completed purchase of a new supercomputer to support modeling and data assimilation activities. This cluster has 728 compute nodes, 2 high-performance analysis computers, and more than 220 TB of RAID storage. The cluster is housed in the Marshall Space Flight Center Data Center to ensure 24/7 uptime. The new cluster will allow for SPoRT to perform research at higher spatial resolutions and generate real-time high-resolution model output that incorporates modeling research activities—including real-time high-resolution land surface model output initialization with satellite soil moisture data assimilation, sea surface temperature initialization, assimilation of passive microwave precipitation, and assimilation of hyperspectral IR profile data. The system will also be robust enough to perform either ensemble or deterministic runs to support local modeling collaborations with National Weather Service partners. Funding for these new computing resources were provided by Science Mission Directorate at NASA HQ.

### Visit to National Water Center

The primary mission of the National Water Center (NWC) in Tuscaloosa, AL is to perform transition to operations activities to support operational flood response for NOAA, FEMA, USGS, and the Army Core of Engineers. SPoRT scientists visited the NWC to continue collaborative discussions with NOAA and UCAR scientists performing hydrologic modeling activities associated with the Weather Research and Forecasting (WRF) Hydro system, which is a next-generation coupled land, atmosphere, and hydrologic model to aid in flood forecasting. SPoRT produces real-time, high-resolution land surface model output that includes assimilation of satellite-derived soil moisture observations and can be used to initialize hydrologic models. SPoRT has begun research into running WRF-Hydro to demonstrate the impacts of NASA datasets and will coordinate with these NWC collaborators to develop a transition to operations strategy for these NASA datasets and capabilities to support NOAA flood forecasting initiatives.

### EUMETSAT and Visit to CESBIO

Dr. Clay Blankenship and Mr. Kevin Fuell participated in the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Meteorological Satellite Conference in Toulouse, France from September 21-24. Dr. Blankenship presented results from his work assimilating SMOS soil moisture measurements into the NASA Land Information System. Mr. Fuell presented the results of SPoRT's transition of total lightning products to operational weather forecasters (on behalf of Dr. Geoffrey Stano) as part of user readiness activities funded by the GOES-R Proving Ground. In anticipation of the Lightning Imager on the MTG satellite (anticipated launch in 2019), several research and operation institutes in Europe and Africa are beginning their own campaigns to prepare users for their new era and they were eager to hear about the U.S. experiences and plans. In addition, Dr. Blankenship visited the Centre d'Etudes Spatiales de la Biosphere (CESBIO) and participated in discussions on the use of SMOS retrievals with the scientists there. CESBIO is responsible for producing the Level 2 soil moisture retrievals being assimilated by SPoRT.

## New Staff

Jordan Bell recently joined the SPoRT team full time as a Research Associate with the UAH. Jordan finished his Master's work at UAH in August 2015 while also working with SPoRT as a Graduate Research Assistant. Jordan's thesis focused on developing an automated algorithm to detect potential hail damage in vegetation imagery. He has worked extensively with the Disaster's team and hopes to expand his thesis work to pertain to tornado tracks and provide a product in a near-real time setting. Jordan will continue working with the Disaster's team, while also leading SPoRT's exploration with future uses of SAR data. He will also help SPoRT to increase its presence on social media and interactions with end users and partners. Before coming to UAH and SPoRT, Jordan received

his Bachelor's degree in atmospheric science from the University of Missouri. He was also a SPoRT summer intern in 2011, working with Jonathan Case.



## Upcoming Calendar of Events

- October 13–15: NASA NISAR Applications Workshop, San Jose, CA
- October 17–22: National Weather Association's 40<sup>th</sup> Annual Meeting, Oklahoma City, OK
- November 9–11: VORTEX-SE Workshop, Huntsville, AL
- November 18–20 Damage Assessment Toolkit (DAT) Summit, TBD
- December 14–18: AGU Fall Meeting, San Francisco, CA
- January 10–14, 2016: American Meteorological Society 96<sup>th</sup> Annual Meeting, New Orleans, LA

National Aeronautics and Space Administration

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## Publications

Berndt, E.B., B.T. Zavodsky, M.J. Folmer, 2015: Development and Application of Atmospheric Infrared Sounder Ozone Retrieval Products for Operational Meteorology. Accepted, IEEE Transactions on Geoscience and Remote Sensing.

Fuell, K., B.J. Guyer, B.J., D. Kann, A.L. Molthan, and N. Elmer, (accepted, w/ minor revisions 2015): Next Generation Satellite RGB Dust Imagery Demonstration Leads to Changes in Communication and Services by NWS Albuquerque Forecast Office. *Journal of Operational Meteorology*.

Naeger, A.R., P. Gupta, B. Zavodsky, and K. McGrath (accepted, 2015), Monitoring and Tracking the Trans-Pacific Transport of Asian Aerosols Using Multi-Satellite Aerosol Optical Depth Retrievals, *Atmos. Meas. Tech. Discuss.*

Zavodsky, B.T. and W.W. Vaughan, 2015: Transitioning NASA and NOAA Satellite Products, Modeling & Data Assimilation Techniques, and Nowcasting Tools to Operation. *AMS Certified Consulting Meteorologist Newsletter*, Vol. 6, Issue 2, Summer 2015.