

SPoRT Quarterly
April – June 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.

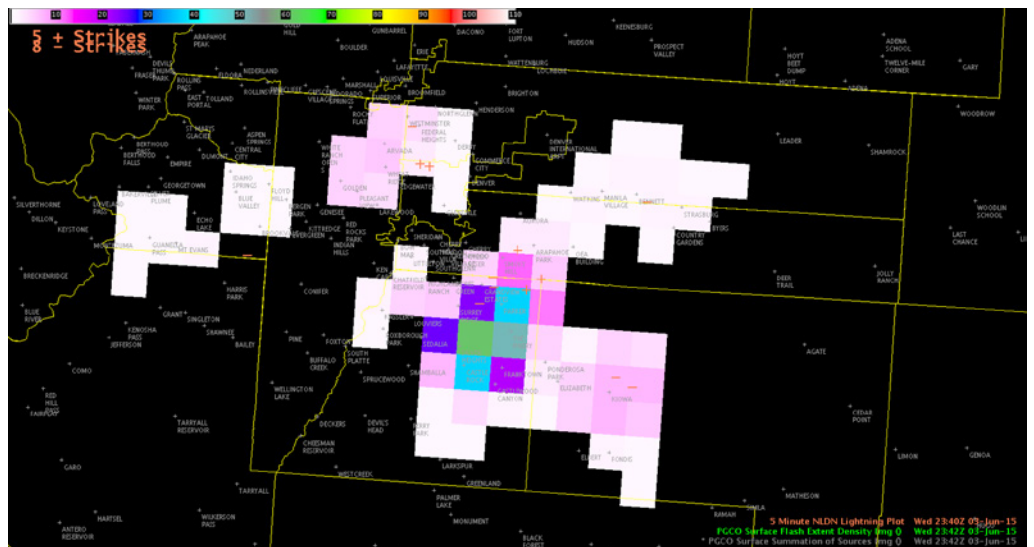
Quarterly Highlights

SPoRT Participation at the 2015 Hazardous Weather Testbed

SPoRT personnel and colleagues from the University of Alabama in Huntsville (UAH) participated as subject matter experts for the 2015 Hazardous Weather Testbed (HWT) Experimental Warning Program (EWP). The HWT EWP is an annual experiment – hosted by the National Severe Storms Laboratory, Storm Prediction Center, and Norman, Oklahoma National Weather Service (NWS) Weather Forecast Office (WFO) – that brings together researchers and forecasters to evaluate experimental products in a simulated operational environment in an effort to facilitate enhanced research-to-operations activities. SPoRT’s participation at the EWP focused on the following objectives: 1) investigate new ways to visualize SPoRT-developed pseudo-Geostationary Lightning Mapper (PGLM) proxy lightning products to develop recommendations for the GOES-R GLM, 2) provide operational training to forecasters with both a training module and on-site discussions

with live data, and 3) compare the PGLM to other demonstration products. SPoRT also supported UAH’s GOES-R Convective Initiation product. With the

launch of the GOES-R GLM scheduled for 2016, there was added emphasis on preparing forecasters for the use of total lightning in operations.



Lightning activity for a storm south of Denver International Airport at 2304 UTC on 3 June 2015. A forecaster noted an obvious core with lightning far away from the parent updraft. The PGLM product (pixels) has the advantage of showing the full spatial extent of the lightning field, while the NLDN (red crosses) is limited to only cloud-to-ground strikes.

Recent Accomplishments

SPoRT Project Helps National Weather Service Perform Storm Surveys

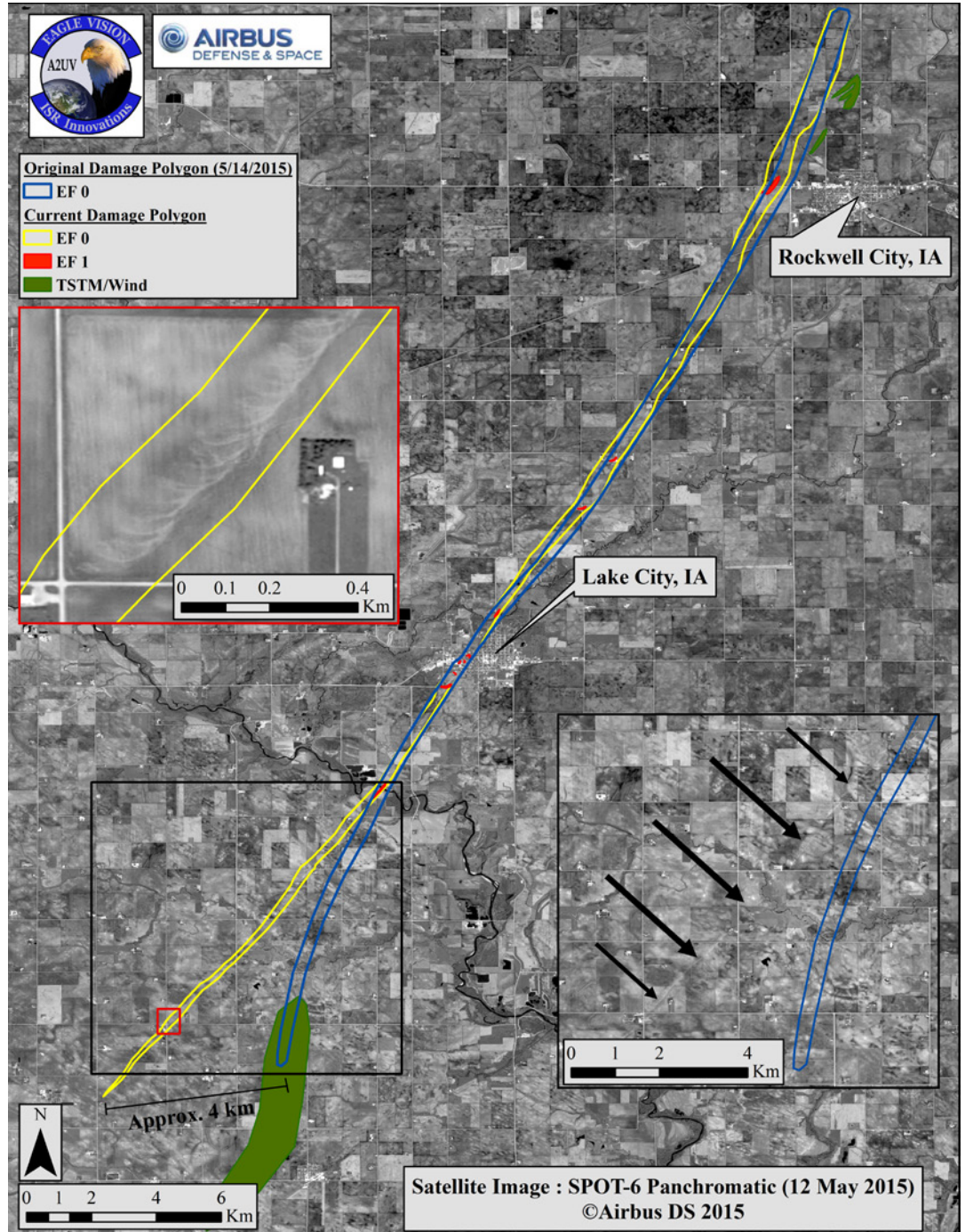
As part of a NASA Applied Science: Disasters proposal awarded in 2012, SPoRT has been working to incorporate remote sensing imagery into the NWS Damage Assessment Toolkit (DAT), the operational application used by forecasters performing storm surveys.

Following a successful prototype phase in Year 1 of the project, current Year 2 activities are focused on case studies and a transition plan to incorporate the process in NWS operations by the end of Year 3. SPoRT has developed a system to collect and publish remote sensing imagery to a Web Mapping Service (WMS) that can be consumed by the DAT. After a disaster has occurred, SPoRT works with partners such as USGS to collect data from various sources and integrates them into the SPoRT WMS. The inclusion of these data sets in the storm damage assessment process has helped the NWS quickly and easily determine tornado path width and length, establish continuity with ground damage assessments, and direct ground survey crews. The addition of these datasets to the storm survey process has allowed offices to quickly get an overview of the damage, leading to more accurate storm surveys at reduced costs by allowing the office to focus their efforts.

SPoRT has developed training to help survey teams utilize the new remote sensing imagery in the survey process. The training was provided in teleconferences, meeting participation, and in the form of quick-guides. To promote use of remotely sensed data in the DAT, SPoRT also presented at the NWS Decision Support System (DSS) Boot Camp training course held in mid-April. The DSS

Bootcamp provides NWS personnel with expertise on handling disaster and onsite response for a range of events. SPoRT team members presented a session on utilizing remotely sensed data to aid in the damage assessment process.

These imagery have been used by NWS offices in Central Region to improve their survey process. On 9 April 2015, a series of storms impacted Central and Northern Illinois, producing 11 tornadoes. The imagery helped the Chicago WFO accurately map the long



SPOT-6 Panchromatic imagery provided to the Des Moines NWS WFO for use within the survey process. Blue contour indicates initial survey tornado damage path, and yellow contour is the final adjusted path based on the provided SPOT-6 imagery. Zoomed insets are the respective black and red boxes on the broader map.

EF-4 Fairdale tornado and also used it to discover a few smaller, short-lived tornadoes. More on this event is highlighted in the “Blog Summary” section. On 10 May 2015, an EF-1 tornado struck near Lake City, IA. The NWS WFO in Des Moines, IA (DMX) began to survey the damage the following day and released an initial storm track. On 14 May, panchromatic imagery from SPOT-6 was loaded into the DAT, and forecasters discovered that the previously identified track from storm surveys might need to be adjusted. In this case, the SPOT-6 image clearly identified field scarring from the tornado, located southwest of the original track.

This allowed forecasters to adjust the track further southwest and toward this imagery, instead of the original survey, which included damage primarily from thunderstorm winds. The adjustment resulted in an approximately 4 km shift in the beginning of the tornado track (see figure on Page 2). The imagery gave the NWS surveyors the ability to corroborate survey findings and get a larger picture of the damage. Kevin Skow, one of the surveyor’s from the DMX office who worked the event, provided the Disasters team positive feedback on the usefulness of this imagery with regards to their work (see block quote).

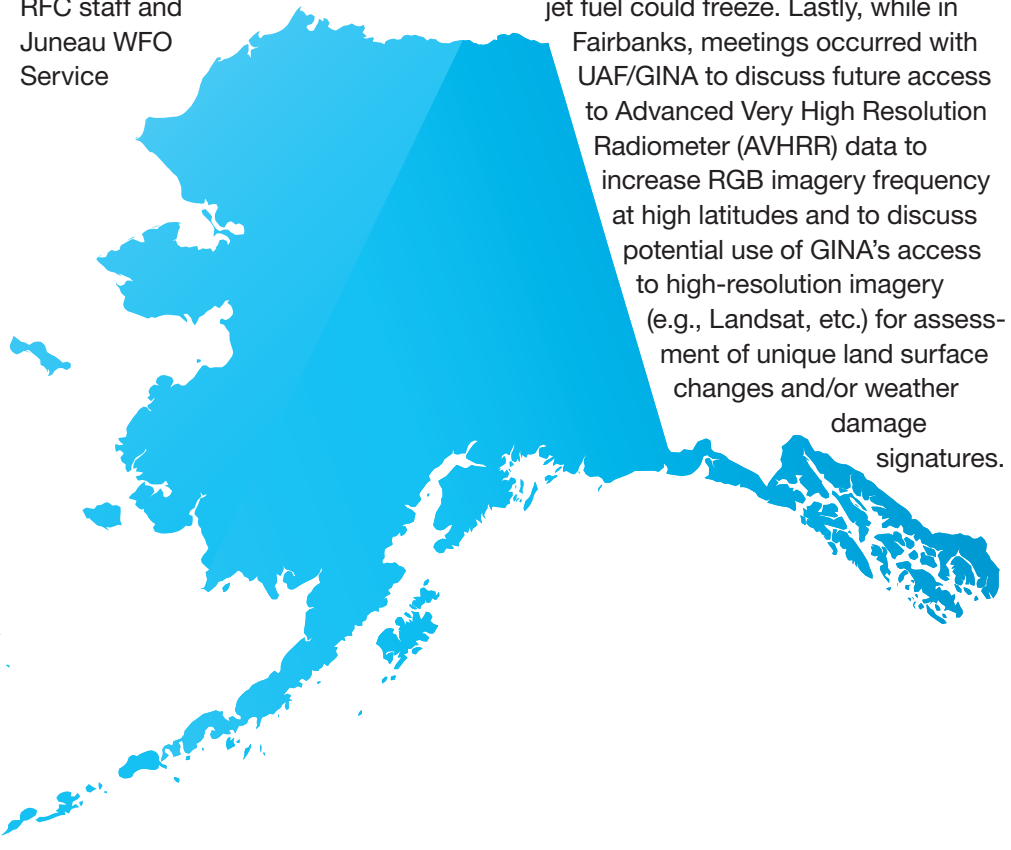
“...the modifications you are seeing in the DAT are a direct result of what we found in the satellite data. A second storm produced wind damage within a few miles of the actual tornado path that same night. The ground survey team thought that this damage might be from the tornado. However, the satellite data showed that the path was further to the NW. The satellite data also helped us fine tune the path north of Lake City. The satellite data has proven once again to be a great asset for our storm surveying operations.”
 ~ Kevin Skow (DMX WFO)

SPoRT Visit to Collaborators in Alaska

Several user groups in Alaska continue to participate with NASA/SPoRT on activities with the NOAA Satellite Proving Ground as well as NASA-related missions, such as Global Precipitation Measurement (GPM). In early June, SPoRT staff visited the NWS WFOs, Alaska-Pacific River Forecast Center (RFC), and Center Weather Service Unit (CWSU) as well as the Geographic Information Network of Alaska (GINA) within the University of Alaska Fairbanks. One of the objectives of the trip was to have face-to-face discussion with forecasters regarding the winter assessment of the 24-Hour and Nighttime Microphysics RGB imagery products. Users provided a first-hand summary of their application and discussed caveats. In general, equal value between the two RGBs was indicated by user feedback; thus, suggesting that the 24-Hour RGB could be used both day and night. However, some changes were possible and SPoRT staff provided on-site training of the newest version of these products and improvements such as the limb and bias correction being applied to MODIS and VIIRS instruments. A report

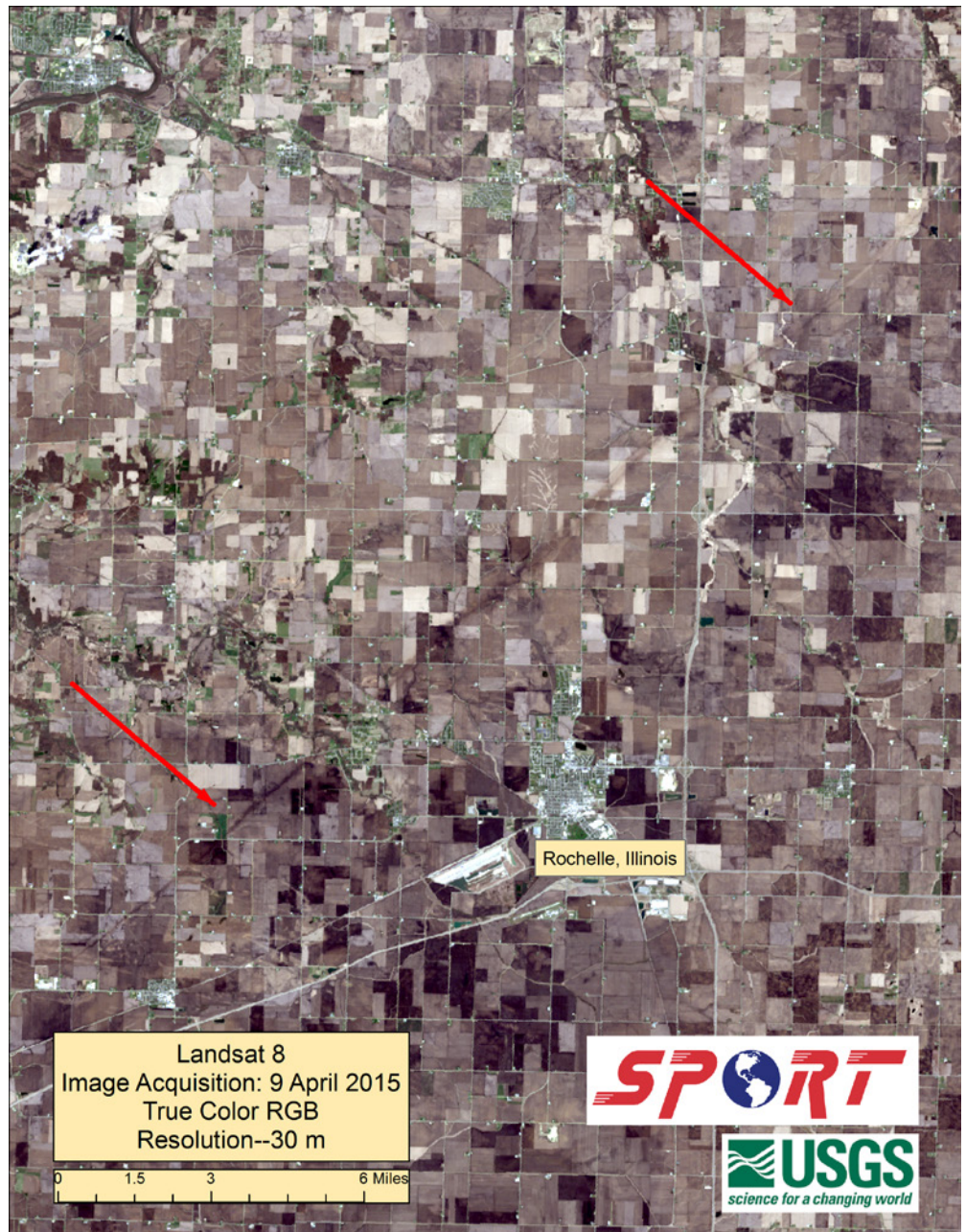
of the winter assessment is available from SPoRT Transition webpage. Time was also spent presenting information in preparation for the trial evaluation of NASA GPM Rain Rate, including the new Level 3 IMERG Product. While IMERG only goes to 60 degrees North latitude at this time, the Alaska-Pacific RFC staff and Juneau WFO Service

Hydrologist have high interest in evaluating the product due to large marine and land areas not covered by either radar or rain gauge instruments. SPoRT also visited the Anchorage CWSU to discuss the funded “Cold Air Aloft” project that will use NUCAPS data for analysis of cold pools where jet fuel could freeze. Lastly, while in Fairbanks, meetings occurred with UAF/GINA to discuss future access to Advanced Very High Resolution Radiometer (AVHRR) data to increase RGB imagery frequency at high latitudes and to discuss potential use of GINA’s access to high-resolution imagery (e.g., Landsat, etc.) for assessment of unique land surface changes and/or weather damage signatures.



Blog Summary

Seven posts were authored in the Wide World of SPoRT blog during the second quarter of 2015. Although this is a relatively small number, these posts garnered the most views of any quarter since summer 2013. Especially popular were a few posts during the months of April and June, detailing the use of satellite imagery to detect tornado tracks or recovery from past damage. The most popular post during the quarter showed the use of Landsat 8 imagery to detect tornado track scarring that occurred northwest of Rochelle, Illinois following the 9 April tornado severe weather outbreak in the Midwest that resulted in a total of 11 tornadoes across Central and Northern Illinois. As mentioned on Page 2, SPoRT is working with a team of developers within the NWS and USGS to bring high-resolution imagery into the DAT used by NWS personnel during severe weather surveys. The imagery helped the Chicago WFO accurately map the long EF-4 Fairdale tornado and also used it to discover a few smaller short-lived tornadoes. This post led to additional communication with the Chicago WFO and forecasters at that office were able to obtain all of the satellite imagery through the DAT via the SPoRT WMS. The imagery was used alongside other high-resolution sources to assist in producing the final tornado track. In fact, the final Public Information Statement on 15 April explicitly mentions the use of the imagery provided by SPoRT as a key contribution to the final survey (see block text on Page 5).



Landsat 8 Imagery showing tornado track scarring northwest of Rochelle, Illinois following the April 9th severe weather outbreak. Red arrows denote the start and end of the track.

Satellite Proving Ground Activities

The second quarter of 2015 saw the conclusion of project year activities for both GOES-R and JPSS Proving Ground efforts. The primary accomplishment from Q2 is the kick-off of the evaluation of the 24-Hour Microphysics RGB Summer Assessment in Alaska detailed on Page 5. Another key accomplishment is ingest and generation of the RGB imagery from the Japanese Himawari

satellite. The Advanced Himawari Imager (AHI) is almost identical in resolution and capability to the Advanced Baseline Imager (ABI) that will be available from the GOES-R series of satellites. SPoRT is working with CIRA and the Operations Proving Ground on an assessment of RGB products to demonstrate capabilities from AHI that will be available operationally in the United States from ABI

following the launch of GOES-R in 2016. More details on this upcoming evaluation will be highlighted in future quarterlies. Additionally, SPoRT staff members participated in a number of NOAA meetings and conferences to highlight accomplishments from 2014 and early 2015 and outline plans for the rest of 2015. These presentations are listed in the "Presentation" section on Page 7.

NWS METEOROLOGISTS HAVE NOW CONFIRMED SEVEN TORNADOES ACROSS NORTH CENTRAL ILLINOIS FROM THE EVENING OF APRIL 9. NWS CHICAGO WOULD LIKE TO EXPRESS APPRECIATION TO NASA SPORT FOR THE SATELLITE IMAGERY... NOAA REMOTE SENSING DIVISION FOR THE HIGH RESOLUTION AERIAL PHOTOGRAPHY...THE CIVIL AIR PATROL FOR AREAL PHOTOGRAPHY...AS WELL AS THE ILLINOIS STATE POLICE AND THE MCHENRY COUNTY EMERGENCY MANAGEMENT AGENCY FOR THEIR AERIAL DAMAGE PHOTOS AS WELL. ALL OF THIS REMOTE SENSING DATA ALONG WITH THE GROUND SURVEYS WERE INSTRUMENTAL IN IDENTIFYING THE TORNADO PATHS

LISTED BELOW AS WELL AS THE DAMAGE INTENSITY.

Other posts during the quarter detailed the use of RGBs for better detection of various meteorological phenomena from dust to low clouds and fog to smoke. A post from long-time collaborators at the Albuquerque NWS office detailed the use of the NESDIS Snowfall Rate Product during a late April snow event. The product helped to show snowfall over an area that typically receives poor coverage from regional radars. One post from the Huntsville NWS office detailed the successful use of total lightning data from the North Alabama Lightning Mapping Array to help with warning decision-making. The Huntsville office

has a long history with using these types of total lightning data, which will become more ubiquitous during the GOES-R era.

As usual, while we can't mention all posts made during the quarter, the SPoRT group is very appreciative of the efforts of all of our collaborative authors. Please visit the Wide World of SPoRT blog to see these and other posts when you can, at <http://nasasport.wordpress.com>. Also, you can follow us through Facebook (NASA SPoRT Center) and Twitter (@NASA_SPoRT). If you would like privileges 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!

Transitions and Assessments

24-Hour Microphysics RGB Summer Assessment in Alaska

During summer months in Alaska the length of daytime is at its peak and the frequency of the popular Nighttime Microphysics RGB is very low. After adjustments to the 24-Hour Microphysics RGB from the user feedback during the Winter assessment, a follow-on assessment during summer is being conducted to test the value of the 24-Hour RGB product from MODIS (Aqua & Terra) and VIIRS (S-NPP). The 24-Hour RGB has had

impact on marine, public and aviation forecasts based on user feedback. In particular, the 24-Hour RGB has been used by the Fairbanks WFO to analyze low stratus and fog features in the Arctic Coast and Yukon River valley regions. While some effects remain, the imagery has been corrected for limb cooling and "normalized" to allow for inter-comparison between differing instruments. Forecasters at the Alaska WFOs will continue assessing the

24-Hour RGB through July. UAF/GINA continues to collaborate with SPoRT to provide direct broadcast data and local compute resources to minimize latency of product delivery to end users. Several examples of WFO application of the 24-Hour RGB have been gathered during the various assessments and are being turned into short micro-lesson training lessons to be accessible via an applications training library.

Seminars

"Spaceborne Synthetic Aperture Radar (SAR) Technology and its Applications for Earth Observation", Dr. Mohammed Dabboor, Environment Canada, June 2, 2015.

Publications

Folmer, M. J., M. DeMaria, R. Ferraro, J. Beven, M. Brennan, J. Daniels, R. Kuligowski, H. Meng, S. Rudlosky, L. Zhao, J. Knaff, S. Kusselson, S. D Miller, T. Schmit, C. Velden and **B. Zavadsky**, 2015: Satellite Tools to Monitor and Predict Hurricane Sandy (2012): Current and Emerging Products. Accepted, Atmospheric Research.

SPoRT Participation at the 2015 Hazardous Weather Testbed...continued

SPoRT leveraged the collaborations it has fostered for the past several years to provide real-time PGLM observations for seven ground-based lightning mapping arrays (LMAs), each with observation ranges of about 250-km. The PGLM can see total lightning (i.e., cloud-to-ground and intra-cloud) with high accuracy, but the resolution of the data is limited to an 8-km by 8-km box to match the spatial resolution of GLM. Based on feedback from previous assessments of the PGLM, SPoRT provided a 6-minute summation product to complement the standard flash extent density product and phased out products associated with flash initiation density and 30 minute maximum flash density. The SPoRT PGLM products were evaluated alongside a lightning product based off data from Earth Networks Total Lightning Network (ENTLN), an objective-based lightning jump algorithm display generated using the ENTLN data, and the more traditional National Lightning Detection Network (NLDN). ENTLN does observe some intra-cloud lightning and covers the full extent of the contiguous United States (CONUS). NLDN observes only cloud-to-ground strike locations and polarity with high accuracy over all of CONUS.

The overall impression of the PGLM observations and the potential for future GLM applications was very positive. Feedback noted the utility of PGLM in

decision support for warning operations and potential to better convey lightning safety information. While the ENTLN and NLDN had superior spatial coverage (full CONUS compared to the relatively small range around individual LMA networks), the forecasters appreciated the accuracy that the PGLM provided when within an LMA domain. The figure below demonstrates the ability of the PGLM to show more than just a point source of observations, which are provided by the current ENTLN and NLDN networks. This aided forecasters attempting to ascertain the threat of lightning extending away from the core of a storm, such as from anvils or trailing stratiform regions behind a convective line. Specifically, the initial lead time afforded by total lightning from the PGLM observations versus the first cloud-to-ground strike detected by the ENTLN and NLDN networks was noted in several survey forms. Another advantage of the PGLM product as noted by most forecasters was the ability to interrogate the lightning data directly instead of just using the objective lightning jump algorithm or the ProbSevere Product. Discussion indicated that this was not due to a failure on the other products but because the “raw” observations were considered valuable to the forecasters. In several cases, having the PGLM observations was a valuable backup to when the ENTLN-based objective lightning jump algorithm was unavailable. This was demonstrated

in several long-lived, re-intensifying supercells where the total lightning PGLM observations highlighted the strengthening storms and the cloud-to-ground products indicated weakening. This was used to help maintain and re-issue severe weather warnings. In a similar use, these “raw” observations were used to identify new updrafts forming. Perhaps the best quote and endorsement for the PGLM came with this forecaster quote, “The (PGLM) flash extent density was awesome, and it has science behind it which is good.”

As with previous HWT assessments, the PGLM served as an excellent tool with which to help substantiate what was being seen with other guidance. Forecasters further noted that they will appreciate the more uniform detection efficiency that the GLM will bring once launched. The HWT assessment noted the continued need for lightning training. While SPoRT has provided training for the PGLM, the NLDN and ENTLN lightning products available to the National Weather Service still require training. SPoRT is working with NOAA’s Total Lightning Implementation Working Group to address this need.

Additional feedback from forecasters can be found on the blog for the Satellite Proving Ground at the Hazardous Weather Testbed (<http://goesrhwt.blogspot.com/>). A final report from HWT is expected in the coming months.

Proposals

The following is a summary of proposals selected for funding during this quarter.

“Expanded Demonstration of Suomi NPP Data to Improve Situational Awareness and Short-Term Forecasts”, JPSS Proving Ground/Risk Reduction, **PI: Andrew Molthan, Co-Is: Matthew Smith, Kevin Fuell, Anita LeRoy, Lori Schultz, Nicholas Elmer, and Kevin McGrath**

“Integration of JPSS Experimental Products in AWIPS II through EPDT Code Sprints”, JPSS Proving Ground/Risk Reduction, **PI: Jason Burks**

“The utility of NUCAPS retrieved profiles to diagnose Extratropical Transition”, JPSS Proving Ground/Risk Reduction, **PI: Emily Berndt**

“The Cold Air Aloft Aviation Hazard: Detection Using Observations from the JPSS Satellites and Application to the Visualization of Gridded Soundings in AWIPS II”, **PI: Bradley Zavodsky**

“Continued Expansion, Enhancement and Evolution of the NESDIS Snowfall Rate Product to Support Weather Forecasting”, **PI: Huan Meng (NESDIS); Co-I: Bradley Zavodsky**

Presentations

- Berndt, E., B. Zavadsky, J. Srikishen, and C. Blankenship**, 2015: [Assimilation of NUCAPS Retrieved Profiles in GSI for Unique Forecasting Applications](#). *13th Joint Center for Satellite Data Assimilation Technical Review & Science Workshop on Satellite Data Assimilation*, College Park, MD., 13–15 May.
- Blankenship, C. B., J. L. Case, and B. T. Zavadsky**, 2015: [Improved NWP Forecasts from Soil Moisture Assimilation: Results from SMOS, Plans for SMAP, SMAP Mission Applications Benchmark Meeting](#), College Park, MD, 3–4 June.
- Burks, J. E.**, 2015: [Experimental Products Development Team \(EPDT\), 2015 NOAA Satellite Proving Ground/ User Readiness Meeting](#) Kansas City, MO., 15–19 June.
- Case, J. L.**, and Coauthors, 2015: [Assessing the Fidelity of Dynamical Downscaling with the NASA Unified-WRF Model](#). *16th Annual WRF Users' Workshop*, Boulder, CO, 4b.3.
- Molthan, A., K. Fuell, A. LeRoy, G. Stano, and L. Schultz**, 2015: [Recent and Upcoming Activities Supporting OCONUS Regions and National Centers](#), presented at the 2015 NOAA OCONUS Technical Interchange Meeting, 11–15 May, Anchorage, AK.
- Molthan, A.**, 2015: [Transition to Operations Activities to Support CYGNSS](#), presented at *CYGNSS Applications Workshop*, May 27, 2015, Silver Spring, MD.
- Molthan, A. L.**, 2015: [RGB Products, Applications, and Future Opportunities](#), presented at the *NOAA Satellite Proving Ground and User Readiness Meeting*, 15–19 June, Kansas City, MO
- Molthan, A. L., J. E. Burks, L. A. Schultz, K. Angle, J. P. Camp, K. M. McGrath, and J. R. Bell**, 2015: [Applications of Earth Remote Sensing Data for Severe Weather and Disaster Assessment](#), preprints, *27th Conference on Weather Analysis and Forecasting*, 29 June–3 July, Chicago, IL, 16B.4.
- Molthan, A. L., K. K. Fuell, G. T. Stano, K. M. McGrath, L. A. Schultz, and A. LeRoy**, 2015: [Use and Assessment of Multi-Spectral Satellite Imagery in NWS Operational Forecasting Environments](#), preprints, *27th Conference on Weather Analysis and Forecasting*, 29 June–3 July, Chicago, IL, 15B.6.
- Naeger, A. R., B. Colle, and A. L. Molthan**, 2015: [Evaluating microphysical schemes in simulating the mixed-phase processes of a winter storm during GPM-GCPEX](#), *16th Annual WRF Users' Workshop*, Boulder, CO, 15–19 June, P26.
- Stano, G. T.**, 2015: [NASA SPoRT Collaborations with the Aviation Weather Community](#). *6th Southwest Aviation Weather Safety Workshop*, Las Vegas, NV, 17–18 Apr 2015.
- Stano, G.**, 2015: [Engaging the User Community to Prepare for Operational RGB Applications](#), presented at the NOAA Satellite Proving Ground and User Readiness Meeting, 15–19 June, Kansas City, MO.
- White, K.**, 2015: [Fog and Low Stratus Case Study – RGB Nighttime Microphysics and Other Products](#), presented at the NOAA *Satellite Proving Ground and User Readiness Meeting*, 10–15 June, Kansas City, MO.
- Zavadsky, B., G. Jedlovec, J. Burks, and A. Molthan**, 2015: [Short-term Prediction Research and Transition Center \(SPoRT\)](#), presented at the *6th Annual NOAA Testbeds & Proving Grounds Workshop*, April 14–16, Boulder, CO.
- Zavadsky, B.**, 2015: [SPoRT GPM Early Adopter Activities](#), presented at the *2015 GPM Applications Workshop*, 9–10 June, College Park, MD.
- Zavadsky, B. T., J. L. Case, E. Berndt, C. B. Blankenship, J. Srikishen, and A. Naeger**, 2015: [NASA SPoRT Modeling and Data Assimilation Research and Transition Activities](#), preprints, *23rd Conference on Numerical Weather Prediction*, 29 June–3 July, Chicago, IL, 15A.2
- Zavadsky, B. T., J. L. Case, C. B. Blankenship, and K. D. White**, 2015: [Land Surface Modeling and Data Assimilation at NASA SPoRT for Improved Situational Awareness and Local Model Initialization](#), preprints, *23rd Conference on Numerical Weather Prediction*, 29 June–3 July, Chicago, IL, 9A.5.

Visitors

National Water Center

On 24 June, Thomas Adams and two colleagues from the National Water Center (NWC) in Tuscaloosa, AL visited the NSSTC to give a seminar focused on hydrological modeling and applications for flooding. During their visit, SPoRT gave a briefing detailing our land surface expertise and potential for integrating new NASA datasets into the operational Weather Research and Forecasting-Hydro (WRF-Hydro) system.

EPDT

SPoRT hosted an Experimental Products Development Team (EPDT) training session on 19–21 May. This training was a hands-on classroom type training for new EPDT participants. There were 14 attendees from throughout NOAA, from AWIPS developers to forecasters, who participated in the three-day session.

Downscaling Face to Face

SPoRT has been participating in a NASA-wide, multi-center initiative to investigate dynamical downscaling of global climate models. The objective of the project is to determine whether regional dynamic models can be used to produce comparable results to global climate models run at higher spatial resolution. On 20–21 May, sixteen of the key project participants (including two remote participants) met at SPoRT to review the progress of the project and what work for the final months of the project.

Alaska WFO/RFC

On 11 May, Aaron Jacobs, the surface hydrologist at the Juneau WFO, and Sam Albanese, the Meteorologist in Charge at the Anchorage WFO, visited with SPoRT to discuss ongoing and future collaborations related to efforts in Alaska Region. The meeting focused on obtaining direct forecaster feedback

on the various RGB assessments that have been performed in Alaska over the last two years as well as discussion of potential new datasets, such as precipitation data from the NASA GPM mission and future capabilities from the real-time SPoRT Land Information System (LIS).

UAH Atmospheric Science Department Chair Candidates

SPoRT maintains strong collaborations with UAH. During May, the university hosted a number of candidates for the chair position of the Atmospheric Sciences Department. Because of the recognized collaborations, the UAH selection committee asked SPoRT to brief each of the candidates to understand how their work might enable collaborations with SPoRT. Dr. Larry Carey, the acting chair of the department, was selected as the permanent chair, and SPoRT looks forward to continued collaborations with UAH.

Upcoming Calendar of Events

- July 15–August 31: GPM/LIS Evaluation, Multiple WFO Partners
- July 27–31: NASA Disasters Workshop, Pasadena, CA
- August 4: National Water Center Visit, Tuscaloosa, AL
- August 11–14: NOAA/NWS DSS Boot Camp; Operations Proving Ground Site Visit, Kansas City, MO
- September 21–25: EUMETSAT Meteorological Satellite Conference, Toulouse, France
- September 28–29: NASA Disasters Workshop, Huntsville, AL

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