National Aeronautics and Space Administration

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 NOAA Weather Forecast Offices (WFOs) and National Centers, the research leading to the transitional activities benefits the broader scientific community.

Quarterly Highlights

GOES-R Launch and SPoRT Activities

The meteorological community's next generation geostationary satellite, GOES-R, was successfully launched from Cape Canaveral on November 19, 2016. The satellite carries two key Earth-observing sensors and a suite of space weather instruments. The Advanced Baseline Imager (ABI) will provide three times more channels to view the Earth, four times greater spatial resolution, and five times faster coverage than the previous series GOES Imager, providing new means to monitor atmospheric phenomena. Additionally, GOES-R will carry the first-ever lightning observation sensor on a geostationary platform; the Geostationary Lightning Mapper (GLM). Numerous organizations, including SPoRT, have been supporting the GOES-R Proving Ground for many years to aid the operational community in preparing for the new capabilities of GOES-R.

SPoRT has been funded by the GOES-R Proving Ground since 2009 to develop and transition GOES-R proxy products and to train and assist fore-casters from the operational weather community. Using precursor sensors with similar spectral and spatial reso-lution to ABI, such as the Spinning Enhanced Visible and Infrared Imager (SEVIRI), Advanced Himawari Imager (AHI), Moderate resolution Imaging Spectroradiometer (MODIS), and Visible Infrared Imaging Radiometer Suite (VIIRS), SPoRT has transitioned a suite of multispectral (i.e., red-green-blue [RGB]) composites, which are used to combine multiple single channels into a single image in order to identify specific atmospheric phenomena ranging from stratospheric air intrusion to atmo-spheric dust. This work has leveraged collaborations with the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT),

who first developed several of these RGB composites. Targeted assess-ments of the RGB composites have allowed local forecasters to better understand these products and their application prior to GOES-R's launch. SPoRT has also been integral to supporting total lightning (intra-cloud and cloud-to-ground) observations in operational applications for the GLM.

GOES-R's launch aboard a United Launch Alliance Atlas V rocket from Cape Canaveral on Nov. 19, 2016. Photo by Geoffrey Stano.

Recent Accomplishments

SAR Workshop

SPoRT's Jordan Bell, in conjunction with our SERVIR partners, organized and hosted an introduction to SAR Workshop in Huntsville, on October 12-14. This workshop was taught by Dr. Franz Meyer of the University of Alaska Fairbanks and Alaska Satellite Facility (ASF). ASF is the Distributed Active Archive Center (DAAC) responsible for SAR data in the United States. The goal of this workshop was to introduce the participants to SAR, how to interpret SAR imagery, and basic applications. SPoRT is developing expertise in SAR to use current assets such as, European Space Agency's Sentinel 1A and 1B satellites, and prepare for NASA's own SAR mission, the NASA-Indian Space Research Organisation SAR (NISAR) mission, launching in 2020.

VORTEX-SE Meeting

Dr. Chris Schultz attended the NOAA-led VORTEX-SE Workshop in Portland, OR on Nov. 5-6. MSFC and SPoRT received funding from NASA to support a parallel effort called the NASA Severe Thunderstorm Observations and Regional Modeling (NSTORM), which enhanced the North Alabama LMA network, created a new set of radar analysis tools, and enabled the development of a regional modeling ensemble system. Dr. Schultz represented NASA along with Dr. Amber Emory of Goddard Space Flight Center (GSFC) to field questions about NASA's instrumentation/modeling in the area of severe weather and other topics related to GOES-R GLM.

ICESat-2 Focus Session

Bradley Zavodsky collaborated with Sabrina Delgado-Arias, the Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2) mission Applications Coordinator, to host the Melting Ice, Rising Sea Level Focus Session: Monitoring and Forecasting of the Coastal & Marine Environment Focus Session in SPoRT's Visualization and Collaboration Laboratory on November 15-16. Scientists from both the ICESat-2 mission and applications community participated in the workshop, which provided a summary of different groups in the community who plan to use ICESat-2 as part of their decision making process. SPoRT has collaborated with NWS Alaska Region Headquarters on an Early Adopter project for ICESat-2 focused on sea ice model validation and land ice detection for the spring thaw.

Visit to Oak Ridge National Laboratory

Dr. Andrew Molthan and Lori Schultz traveled to Knoxville, Tennessee on October 25 to meet with staff from FEMA Headquarters and ORNL. The team reviewed recent Hurricane Matthew response efforts with Chris Vaughan, Geospatial Information Officer and lead at FEMA HQ. Discussions focused on better understanding FEMA's response timeline and geospatial needs, reflecting upon recent response activities for Hurricane Matthew and improvements in data products and services that can be implemented throughout the NASA Earth Science Disaster response Team. The group also met with Walter Dykas, lead for the Department of Energy EAGLE-I Team, a common geospatial data platform for the monitoring and exchange of information related to energy distribution within the United States. Discussions with EAGLE-I Team focused on possible collaborations around the use of the VIIRS day-night band products for helping to monitor electricity and outages within the U.S. and elsewhere during major disaster events as a supplement to other utility observations.

SMAP Data Assimilation Activities

SPoRT recently began work on a NASA ROSES-supported project to assess the use of satellite soil moisture from NASA's Soil Moisture Active-Passive (SMAP) satellite for land surface modeling. Led by Dr. Clay Blankenship, the proposal team is assimilating SMAP Level 2 retrieved soil moisture into SPoRT's high-resolution, real-time run of the NASA Land Information System (SPoRT-LIS), based on earlier research with European Soil Moisture and Ocean Salinity (SMOS) data. A parallel version of the SPoRT-LIS assimilating SMAP data in near-real-time in an experimental mode has been completed and is undergoing testing to determine its viability for replacement of the current SPoRT-LIS (without any data assimilation). This preliminary, unvalidated output is available on the SPoRT web page (http://weather.msfc.nasa.gov/sport/case_studies/lissmapda_CONUS.html) alongside the standard SPoRT LIS product. Quantitative assessment is ongoing, but the SMAP LIS data shows a smoother transition at the US-Canada border. The LIS SMAP soil moisture analyses will be validated against soil moisture networks in the U.S., followed by an assessment of the impact of SMAP data on coupled weather forecasts.

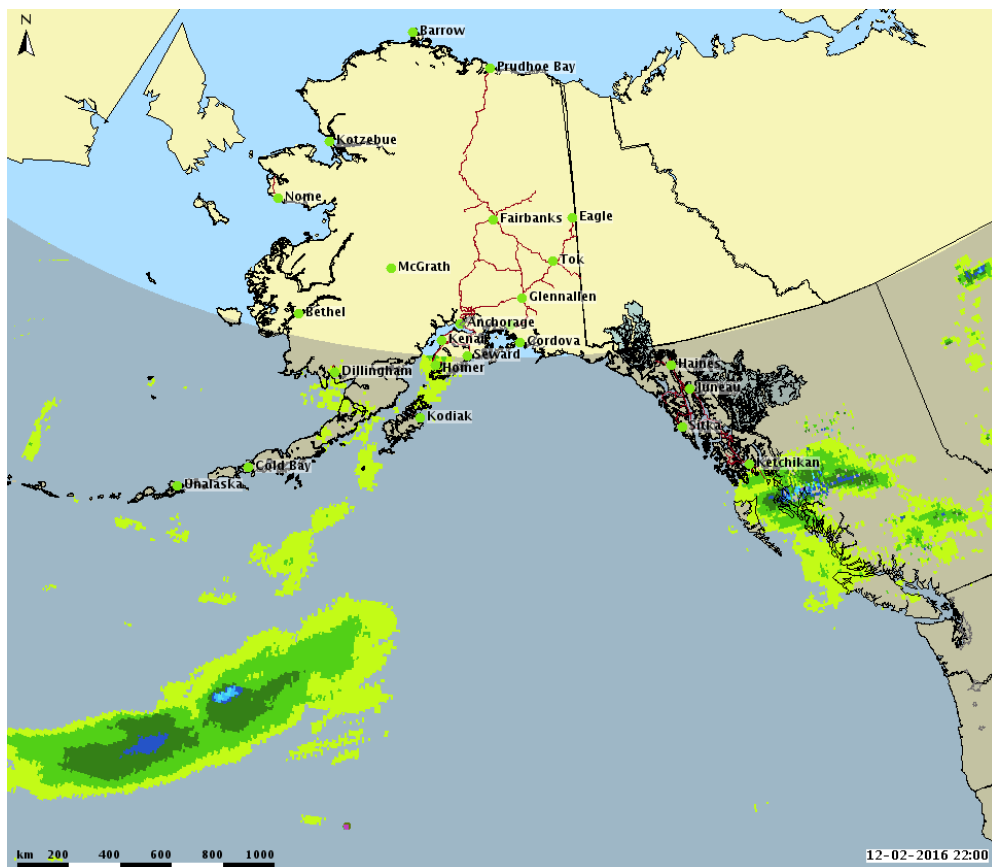ICESat-2 Focus Session held at SPoRT in November 2016.

Transitions and Assessments

GPM Assessment

SPoRT has been involved in assessing the use of NASA's GPM mission's rain rate products within NWS operations at selected NWS Weather Forecast Offices (WFO) and River Forecast Centers (RFC). Forecasters at ABQ (Albuquerque), AFC (Anchorage), AJK (Juneau), and the APRFC (Alaska-Pacific River Forecast Center in Anchorage) provided feedback to help us understand the operational settings in which IMERG and GPM swath rain rates would be most useful and in what circumstances these datasets had the highest impact on operational decision-making. Forecasters also suggested means of providing value-added GPM products and modes of using GPM data. For example, SPoRT has made modifications to the regularly distributed GPM/IMERG netCDF files to allow them to function within the community hydrologic model (CHPS) in use at the RFC (see figure to the right). This will allow them to regularly use IMERG rainfall rate and accumulated rainfall files in their local hydro model. One challenge in Alaska has been the lack of IMERG data poleward of 60°N/S. Through SPoRT's evaluation of the GPM products at northern latitudes and feedback to the mission, GPM scientists are pursuing solutions to provide gridded data products in those regions.

Example of NASA GPM data within the Alaska RFC CHPS Model, used by hydrologists for stream and river forecasting

NUCAPS for Extratropical Transition

During the latter half of the 2016 hurricane season, SPoRT worked closely with the Joint Polar Satellite System (JPSS) Proving Ground and the National Hurricane Center to testbed the utility of retrieved Cross-track Infrared Sounder (CrIS) and Advanced Technology Microwave Sounder (ATMS) temperature and moisture profiles to anticipate hurricane tropical to extratropical transition. CrIS/ATMS soundings are processed through the NOAA Unique

Combined Atmospheric Processing System (NUCAPS) and are available to forecasters in AWIPS. Satellite soundings can provide valuable information about the depth of moist or dry layers of the atmosphere in data sparse regions in which extratropical transition typically occur. SPoRT monitored NUCAPS soundings during Hurricane Matthew in early October and communicated with NHC for feedback on the product utility. SPoRT is continuing to explore the utility of NUCAPS soundings through a post-event analysis of Hurricane Matthew with plans to debrief with the National Hurricane Center (NHC). In addition NHC expressed a desire to explore the utility of NUCAPS Soundings for rapid intensification in high shear environments, unfavorable environments as occurred with Nicole and Matthew this past season.

Gridded NUCAPS Evaluation for Cold Air Aloft

SPoRT has been funded by the JPSS Proving Ground, in collaboration with NOAA/NESDIS and other NOAA Cooperative Institutes, to develop and assess a gridded NUCAPS visualization in the NWS AWIPS system. In mid-December, an evaluation kicked off with the Alaska Center Weather Service Unit and Alaska Aviation Weather Unit to use plan view and cross section visualizations both within AWIPS and on the web to identify areas of Cold Air Aloft (i.e., less than -65°C), which is identified by the aviation community as a hazard for aircraft. This assessment is scheduled to run through late February.

Quarterly Highlights…continued

GOES-R Launch and SPoRT Activities

Using experimental ground-based lightning mapping arrays, SPoRT created the pseudo-geostationary lightning mapper (PGLM) product in 2009 to provide real-time operational training for the GLM. Since then, SPoRT has developed the GLM plug-in for the National Weather Service's (NWS) Advanced Weather Interactive Processing System (AWIPS) system (see figure below), has personnel serving as the National Weather Service liaison for the GLM, and have developed foundational training that is being provided to every forecaster in the National Weather Service (NWS). SPoRT has also coordinated with other product developers to help transition their early development work to NWS forecasters.

SPoRT will continue to be actively engaged in GOES-R applications post launch by performing formal applications training and evaluation of both ABI RGBs and GLM once operationally available to NWS forecasters. Additionally, SPoRT will support training for the broader meteorological community in the form of developing an applications library containing short, 3-5 minute focused case examples, for both the ABI RGBs and the GLM.
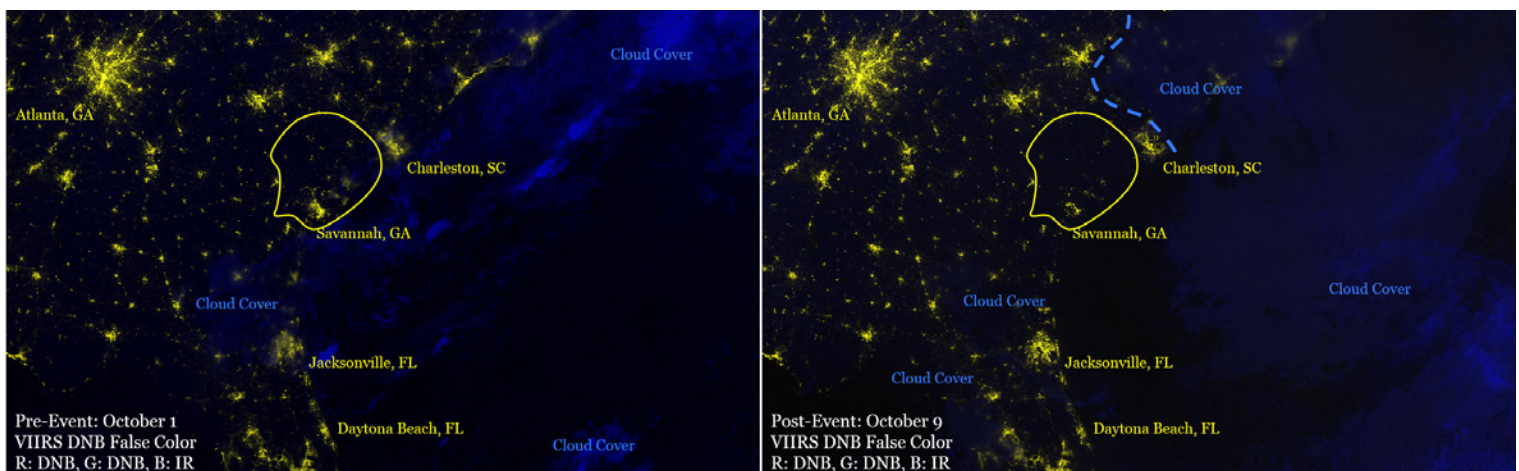
Hurricane Matthew Response Activities

In early October, 2016, Hurricane Matthew impacted Haiti and the Dominican Republic, portions of Cuba, and then moved northward along the coasts of Florida, Georgia, and the Carolinas before heading back into and dissipating over the Atlantic Ocean. Given the widespread devastation expected to be caused by Matthew in the Caribbean and along the U.S. eastern seaboard, NASA's Earth Science Disaster Response Team organized a response effort, bringing together the applied science capabilities of various NASA Centers and NASA-affiliated investigators, coordinated in part by SPoRT team members at Marshall Space Flight Center.

Team members gathered daily to discuss the forecast path and intensity, looking for opportunities to collaborate with other agencies and international partners on the collection of disaster-relevant remote sensing data sets. Several passes of the Global Precipitation Measurement (GPM) mission core satellite captured false color brightness temperature imagery of the storm, delivered to partners at the National Hurricane Center and Weather Prediction Center, based upon past development of similar products at the Naval Research Laboratory in Monterey. GPM also captured the heavy rainfall associated with Matthew via the Integrated Multi-satellitE Retrievals for GPM (IMERG) product, helpful in identifying heavy rains across the Caribbean in data-sparse areas. Colleagues from Goddard Space Flight Center (GSFC) provided numerous live shots to brief the public on the utility of GPM observations and how NASA's Earth Science missions help to improve weather forecasting. GPM and IMERG data sets were also incorporated within the global streamflow and inundation predictions of partners at the University of Maryland, and other inundation predictions from their modeling over the Carolinas were used to support flood and inundation estimations well ahead of landfall.

With the widespread cloud cover associated with the storm, much of the team's focus was on the acquisition of and generation of products from synthetic aperture radar (SAR), as SAR is particularly helpful for identifying standing water associated with flood. The active nature of the SAR instrument allows for penetration through most cloud cover, versus other visible and near-infrared sensors that must wait for skies to clear before providing follow-up imagery. Team members collaborated on the acquisition and generation of SAR products, delivering final outputs to partners at the United States Geological Survey (USGS) Hazards Data Distribution System

VIIRS DNB False Color imagery showing power outages along the eastern U.S. following the landfall of Hurricane Matthew. Yellow areas denote areas where lights were on when the satellite flew overhead.

Satellite Proving Ground Activities

Participation in SOO/DOH Course

The NWS is conducting a Science and Operations Officer/Development and Operations Hydrologist (SOO/DOH) Prep Course for GOES-R. This activity consists of a 3-day training session that will be conducted seven times at the national training center in Kansas City, Missouri. These seven sessions will ultimately bring in every NWS SOO and DOH to provide additional training on GOES-R to help these individuals support their local offices as soon as GOES-R data are available.

SPoRT has been directly involved with two activities in the prep course. One has been in collaboration with the Operations Proving Ground (OPG) to provide a hands-on session to explore RGB composite imagery using the AHI, which is very similar to the ABI. OPG leads the sessions and SPoRT has helped provide the training and some of the cases. SPoRT is also responsible for the one hour GLM applications training session. This hour covers additional information on the GLM instrument, how it compares to other lightning detection systems, and three short cases showcasing different ways GLM observations can be used. Both the RGB and GLM sessions are designed to encourage discussion among the attendees. Dr. Geoffrey Stano, SPoRT's liaison to the NOAA Proving Grounds, has participated in the first three sessions conducted through the start of January 2017. Initial feedback from the attendees has specifically shown both sessions to be highlights of the course.

EPDT

Kevin McGrath traveled to the Cooperative Institute for Research in the Atmosphere (CIRA) in Fort Collins, CO to present training material during a 3-day JPSS AWIPS II Experimental Products Development Team (EPDT) classroom session. Eight people from various NWS offices and universities participated in the session, which focused on utilizing baseline AWIPS II capabilities to ingest and display various experimental JPSS datasets. Kevin was joined by Scott Longmore (CIRA) and Deb Molenar (NOAA/NESDIS) in presenting training material and leading hands-on lab exercises covering the McIDAS, Regional Sat, and Pointset AWIPS II plugins for ingesting three common data formats: netCDF3, netCDF4, and Area. Overviews of the NWS Virtual Lab and how to build AWIPS II installation files were also presented.

Visit to Alaska

This past October, Lori Schultz, Anita LeRoy, and Kris White had the opportunity to visit with the three Alaska Weather Forecast Offices (WFOs) located in Anchorage, Juneau and Fairbanks, and the Alaska Pacific River Forecast Center, the Center Weather Service Unit, and the Alaska Aviation Weather Unit, all in Anchorage. The purpose of this 2-week visit was to obtain feedback from forecasters who routinely use experimental satellite products from polar-orbiting platforms in their daily forecasting duties, and to discuss ideas for new areas of study and collaboration. Office visits enhance the overall collaborative process by providing the unique opportunity to understand how products are used and in what ways they complement existing operational activities.

Among the list of tasks SPoRT and NWS personnel completed on the trip was to finish implementing AWIPS improvements that allow RGB products to be generated within the AWIPS framework, which reduces the 45-60 minute data latency and allows data sampling in AWIPS. Other tasks included providing in-person training and observation of newly transitioned NASA and NOAA satellite datasets. NASA's GPM passive microwave rain rates, specifically Level 2 swath rain rates and the gridded IMERG product, are being assessed in operations by hydrologists and forecasters. The aviation weather forecasters got hands-on training on JPSS's NUCAPS satellite soundings and the gridded product derived from them. Feedback from these forecasters is being implemented to improve and value-add these and other satellite datasets provided by SPoRT.

(HDDS) for further distribution to emergency managers, and shapefile output of SAR flood maps were provided to the Federal Emergency Management Agency (FEMA) for use in their geospatial processing.

In addition, the team continued to create prototype power outage depictions by examining changes in emitted city lights via the VIIRS day-night band. Using an improved VIIRS day-night band product developed by colleagues at GSFC, members of the MSFC/SPoRT team compared immediate post-Matthew light conditions to pre-event light emissions and documented areas that appeared to have a loss of power based upon a sharp, short-term decrease in light emission following the storm (see figure on page 4). The resulting product was shared with USGS/HDDS and partners at FEMA, leading to additional discussions on how to best incorporate a power analysis product within other partner research efforts.

The team was encouraged to partner with the Oak Ridge National Laboratory (ORNL)/Department Of Energy's (DOE) EAGLE-I team, which is responsible for providing guidance on the status of the nation's energy distribution system. Going forward, members of the MSFC/SPoRT team will continue to further develop outage detection techniques using the VIIRS day-night band product and seek to include their outage detections within DOE products that are incorporated within FEMA response activities.

Social Media Corner

SPoRT engages with our partners in a number of ways, including through the use of social media. You can also follow us through Facebook (NASA SPoRT Center) and Twitter (@NASA_SPoRT). SPoRT also maintains the Wide World of SPoRT blog (http://nasasport.wordpress.com), where SPoRT scientists and our forecaster partners highlight interesting examples of product use. The SPoRT group is very appreciative of the efforts of all of our collaborative authors. 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!

Wide World of SPoRT Blog

The following posts were highlights from the Wide World of SPoRT Blog this quarter:

- Dr. Emily Berndt highlighted applications related to NUCAPS Sounding use for situational awareness of Hurricane Matthew: https://nasasport.wordpress.com/2016/10/05/nucaps-soundings-and-hurricane-matthew/

- Jonathan Case highlighted changes in soil moisture state across the southeast U.S. following Hurricane Matthew: https://nasasport.wordpress.com/2016/10/14/stark-contrast-in-eastern-u-s-soil-moisture-following-hurricane-matthew/

- Kris White highlighted use of VIIRS Day-Night-Band imagery for wildfire detection: https://nasasport.wordpress.com/2016/11/16/southeastern-fires-observed-in-viirs-imagery/

- Dr. Geoffrey Stano and Kris White posted about the launch of GOES-R: https://nasasport.wordpress.com/2016/11/19/and-goes-r-is-off/; https://nasasport.wordpress.com/2016/11/19/nasa-sport-helps-prepare-for-goes-r/

Tweets of the Quarter

Congratulations

Congratulations are in order to Mr. Tony Cole on his new position with ORNL. Mr. Cole began his work with SPoRT as a NASA Summer Intern in 2013. He, then, worked with SPoRT as a M.S. student at the University of Alabama in Huntsville, completing his Master's thesis entitled "Characterization of Nighttime Light Variability for Power Outage Detection" in spring 2016. Following completion of his degree, he supported SPoRT as a UAH Research Associate until October 2016, when he began his new position at ORNL. Mr. Cole will be continuing his work with the VIIRS DNB in support of an ORNL project with FEMA. We look forward to collaborating with Tony in the near future!

SPoRT Seminars

Dumais, Jr., R., WRF-ARW model research towards an Army Weather Running Estimate-Nowcast capability, SPoRT Seminar Series, Huntsville, AL, 10 November.

Presentations

Bell, J.R., A.L. Molthan, and M. Dabboor, 2016: Developing Initial Response Products Using Data from Optical and SAR Earth Observing Platforms for Natural Disaster Response. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, IN33B-1819.

Blankenship, C.B., J.L. Case, B.T. Zavodsky, and W.L. Crosson, 2016: Near-Real-Time Assimilation of SMAP Soil Moisture Retrievals in the Land Information System. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, H23N-04.

Cole, T., A.L. Molthan, L.A. Schultz, M.O. Roman, and D.W. Wanik, 2016: Improvements to Lunar BRDF-Corrected Nighttime Satellite Imagery: Uses and Applications. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, IN33B-1817.

Elmer, N., J. Case, C. Blankenship, B. Zavodsky, A. Molthan, and J. Bell, 2016: Hydrological Modeling and Data Assimilation Activities at NASA SPoRT. *University of Alabama-National Water Center Water Research Group Seminar Series*, 18 November.

Elmer, N., B. Zavodsky, A. Molthan, J. Case, and C. Blankenship, 2016: Impacts of Real-Time Satellite-Derived Vegetation on WRF-Hydro Simulated Streamflow. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, H51H-1618.

Fuell, K., E. Berndt, A. Molthan, L. Schultz, 2016: Operational Use of VIIRS Multispectral Imagery and NUCAPS Soundings in Short-Term Weather Forecasting.

LeRoy, A., M.R. Smith, J.L. Case, and B. Zavodsky, 2016: Assessing Applications of GPM and IMERG Passive Microwave Rain Rates in Modeling and Operational Forecasting. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, H23F-1641.

Molthan, A., L. Schultz, K. McGrath, J. Bell, T. Cole, P. Meyer, J. Burks, P. Camps, and K. Angle, 2016: Lessons Learned in the Integration of Earth Remote Sensing Data Within the NOAA/NWS Damage Assessment Toolkit. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, NH43D-03.

Naeger, A.R., and B.A. Colle, 2016: Comparison of Simulated Orographic Precipitation Structures Using Different Microphysical Schemes With OLYMPEX Field Program Observations. *2016 Precipitation Measurement Missions (PMM) Science Team Meeting*, Houston, TX, 24-28 October, 108.

Newchurch, M., K. Chance, B. Zavodsky, J. Haynes, B. Lefer, A. Naeger, and the TEMPO Early Adopters Team, 2016: TEMPO Early Adopters in Air-Quality Forecasting, Planning and Assessment, Pollution Emissions, Health, Agriculture, and Environmental Impacts: Applications and Decision Support. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, A33B-2240

Schultz, C.J., P.N. Gatlin, T.J. Lang, J. Srikishen, J.L. Case, A.L. Molthan, B. T. Zavodsky, J. Bailey, R. J. Blakeslee, and G. Jedlovec, 2016: NASA Severe Thunderstorm Observations and Regional Modeling (NSTORM) Project. *28th Conference on Severe Local Storms,* AMS, Portland, OR, 7-11 November, 81.

Schultz, L.A., A. Molthan, K. McGrath, J. Bell, T. Cole, and J. Burks, 2016: Using Satellite Remote Sensing to Assist the National Weather Service (NWS) in Storm Damage Surveys. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, IN33B-1817.

Wu, D., W.-K. Tao, J. Srikishen, B. Zavodsky, J. Case, A. Molthan, and W. Petersen, 2016: Short-range Forecast for ICE-POP using NU-WRF. *2nd ICE-POP 2018 Workshop*, Seoul, Korea, 8-11 November.

Zavodsky, B., A. Molthan, W. Petersen, and J. Roberts, 2016: Near Real-Time NASA Data Dissemination by NASA SPoRT. *2nd ICE-POP 2018 Workshop*, Seoul, Korea, 8-11 November.

Zavodsky, B., 2016: SPoRT Overview. *ICESat-2 Melting Ice, Rising Sea Level Focus Session*, Huntsville, AL, 15-16 November.

Zavodsky, B., C. Scott, G. Petrescu, N. Eckstein, 2016: ICESat-2 Land and Sea Ice Depth Observations to Support Operational Weather Forecasting in Alaska. *ICESat-2 Melting Ice, Rising Sea Level Focus Session*, Huntsville, AL, 15-16 November.

Zavodsky, B., N. Smith, J. Dostalek, E. Stevens, K. Nelson, E. Weisz, E. Berndt, B. Line C. Barnet, A. Gambacorta, T. Reale, and D. Hoese, 2016: Development and Evaluation of a Gridded CrIS/ATMS Visualization for Operational Forecasting. *American Geophysical Union 2016 Fall Meeting*, San Francisco, CA, 12-16 December, IN31A-1734.

Publications

Berndt, E., A. Molthan, and W. Vaughan, 2016: Transitioning NASA and NOAA Multispectral Composites to Operations. *AGU Earth & Space Science News (Eos)*, in press.

Welcome

New Civil Servant

Dr. Christopher Hain has been hired by NASA MSFC as a Land Surface Remote Sensing Scientist. He previously worked as an Assistant Research Scientist for the Earth System Science Interdisciplinary Center (ESSIC) at the University of Maryland, College Park. He received his B.S. in Meteorology from Millersville University in 2004 and his M.S. and Ph.D. in Atmospheric Science from the University of Alabama in Huntsville in 2007 and 2009. He is also currently a Visiting Scientist with the National Oceanic and Atmospheric Administration's (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS) in College Park, MD. His research interests include thermal infrared remote sensing with applications in surface energy balance modeling, soil moisture retrieval, hydrologic data assimilation and drought monitoring. He has played a significant role in the development of the Atmosphere Land Exchange Inverse (ALEXI) model in ongoing collaboration with scientists at the USDA-ARS Hydrology and Remote Sensing Lab. ALEXI is currently used to monitor continental evapotranspiration, soil moisture, and drought. He also actively works on finding synergistic relationships between soil moisture retrievals from thermal infrared and microwave methods, while showing the benefit of these two soil moisture methodologies in an EnKF dual data assimilation framework. Dr. Hain actively collaborates with a number of national and international scientists in the field of hydrology, land-surface interactions and water resources. He will help lead SPoRT land surface modeling activities, enhancement of land surface products, and engagement with the National Water Center and partners at other government agencies.
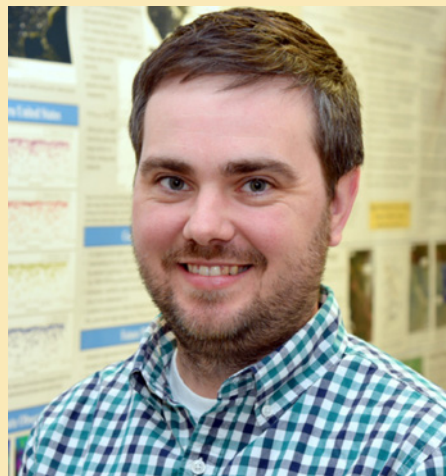
Proposals

ROSES NASA Data for Operations and Assessment

Dr. Aaron Naeger led a proposal entitled "Using Multi-Sensor Aerosol Optical Depth Retrievals to Improve Infrared Radiance Assimilation", which was selected for funding in the NASA Research Opportunities in Earth and Space Science (ROSES) Data for Operation and Assessment Joint Center for Satellite Data Assimilation solicitation. This proposal will use the comprehensive, near-global aerosol information from the SPoRT aerosol optical depth composite product into the Community Radiative Transfer Model (CRTM) in an effort to simulate accurate aerosol-affected radiances for assimilation into numerical weather prediction models. Previous research has conclusive evidence that coarse mode dust particles possess strong scattering and absorbing properties at infrared wavelengths; however, their impact on simulated infrared radiances is currently ignored, which can lead to assimilation of unrepresentative radiances into numerical models.

ROSES Earth Science Applications: Ecological Forecasting

Dr. Andrew Molthan was a Co-Investigator on a proposal entitled "Using NASA Resources to Better Inform Wildlife Conservation in the Anthropocene: Spatially Predicting Impacts of Anthropogenic Nightlight and Noise on Wildlife Habitat Integrity Across the Contiguous United States", which was selected for funding in the NASA ROSES Earth Science Applications: Ecological Forecasting solicitation. This proposal will use VIIRS, MODIS, and Landsat data to develop some decision support tools in collaboration with the U.S. National Park Service to develop risk maps for conservation areas.

ROSES Citizen Science

Dr. Andrew Molthan led a proposal entitled "Crowdsourced Imagery and Ancillary Observations for Drought Monitoring and Agricultural Applications", which was selected for funding in the NASA ROSES Citizen Science for Earth Systems Program. This is a collaboration with scientists at the University of Alabama in Huntsville. This proposal will use a crowdsourcing approach through a smartphone app to obtain soil moisture and crop conditions from the agriculture community to create some validation datasets for land surface modeling and water resource applications.

ROSES Earth Science Applications: Water Resources

Dr. Christopher Hain has been selected for funding on two NASA ROSES Earth Science Applications: Water Resources proposals. The first is a proposal led by Dr. Hain entitled "Development of a Global Evaporative Stress Index Based on Thermal and Microwave LST towards Improved Monitoring of Water and Vegetation Stress". The second is a proposal where Dr. Hain is a Co-Investigator entitled "Monitoring Vineyard Water Use and Vine Water Status with Land Surface Temperature for Improved and Sustainable Water Management from Field to Regional Scales". Both of these proposals leverage previous land surface model products developed at the University of Maryland and engagement with end users in the agriculture and food security communities. These proposals will afford new opportunities for the SPoRT team to engage with new partners in strategic areas of growth.

Visitors

Dr. Kiran Alapathy

Dr. Kiran Alapathy, the Associate for Science in the Environmental Prediction Agency's National Exposure Research Laboratory; Systems Exposure Division, visited with some SPoRT team members as part of a visit to the University of Alabama in Huntsville. SPoRT team members discussed ongoing work with SPoRT's near-real-time aerosol product and land use/flood applications related to water quality.

Robert Dumais, Jr.

Robert Dumais, Jr., a Research Meteorologist from the U.S. Army Research Laboratory in White Sands, NM, visited SPoRT on November 10 to brief the team on their current research activities and to discuss potential collaboration areas between SPoRT and the U.S. Army Research Laboratory. Dumais and his team are developing a configuration of the Advanced Research version of the Weather Research and Forecast (WRF-ARW) model that can be used tactically as a forward-deployable deterministic nowcasting tool for supporting Army mission execution operations. After a full day of face-to-face meetings with SPoRT team members, Dumais determined that the Land Information System (LIS) and aerosol optical depth composite product would aid in their modeling activities. The near-real time dust RGB products would also be useful for tracking and monitoring dust storms over the White Sands region.

Dr. Walter Gonzales

Dr. Walter Gonzales, a senior research and Head of the Heliospheric and Magnetospheric Division of the

National Institute for Space Research of Brazil (InPE), visited SPoRT as part of a broader visit to the MSFC Science Research Office. SPoRT staff gave an overview presentation on our activities related to GOES-R. InPE is looking to use data from the GOES-R satellite for lightning and space weather applications, and SPoRT has offered to collaborate to provide training and any necessary data to researchers from that agency or its affiliated universities.

Dr. Olufem Omitaomu

Dr. Olufemi Omitaomu from ORNL visited the SPoRT team as part of a visit to the University of Alabama in Huntsville. SPoRT team members discussed ongoing work with the Suomi-NPP VIIRS day-night band and opportunities to collaborate around geospatial data sets and improvements on detection of large-scale power outages and recovery.

Kim Runk

Kim Runk Director of the NOAA/NWS Operations Proving Ground and Chair of the SPoRT Science Advisory Committee visited the SPoRT team from November 29 through December 1 to provide the team with leadership development experience and a debrief of the SAC report that was completed during the summer months. Kim led the team on a variety of introspective discussions focused on better understanding individuals as part of their Myers-Briggs personality type, explored various strengths through the Gallup Strengthfinders approach and how to leverage those strengths in ways that support situational leadership, and wrapped by teaching the team the Six Thinking Hats methodology for dissecting a thought or opportunity into specifics modes of thinking in order to bring more clarity for decision-making. A key highlight of the visit was participation in the "Marshmallow Challenge", a team-building exercise to explore individual strengths and personalities while constructing the tallest free-standing structure, using limited supplies, and to be capped with a marshmallow. To close out the visit, a debrief of the recently completed SAC report highlighted the outstanding accomplishments of the SPoRT team and continued opportunities in the GOES-R era, land surface modeling, data assimilation, numerical weather prediction, and decision support in the disaster response arena.

Upcoming Calendar of Events

- January 23–27, American Meteorological Society Annual Meeting (Seattle, WA)
- January 24–25, Committee on Earth Observation Satellites (CEOS) Data Cube Training (Huntsville, AL)
- February 7–9, Grape Remote sensing Atmospheric Profile and Evapotranspiration eXperiment (GRAPEX) Science Team Meeting (Logan, UT)
- February 13, National Tornado Conference (Oklahoma City, OK)
- February 13–15, ESRI Federal Conference (Washington, DC)
- February 28–March 2, NASA Applied Science Program: Wildfire Program Review and Meeting (Boulder, CO)
- March 22–23, Natural Environments Day of Launch Working Group Meeting (Cape Canaveral, FL)