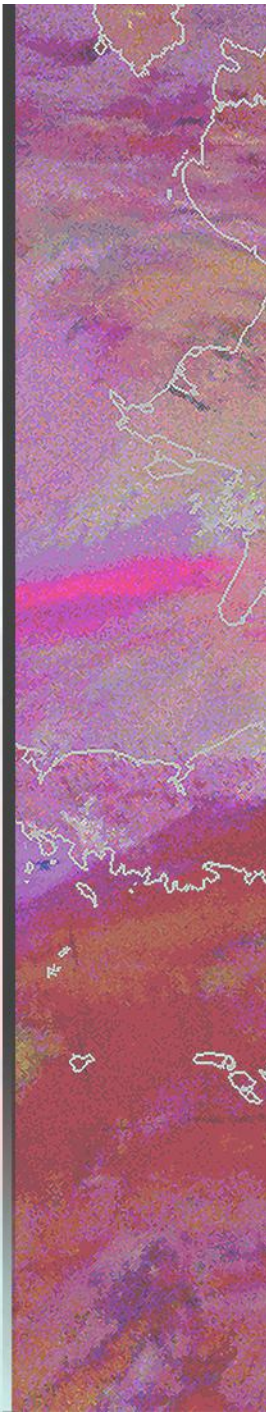


NASA's Short-term Prediction Research and Transition (SPoRT) Center: A Paradigm for Transitioning Research into Operations

Andrew Molthan, Brad Zavodsky
NASA Marshall Space Flight Center

2018 AMS Annual Meeting, Austin, Texas



SPoRT History/Budget

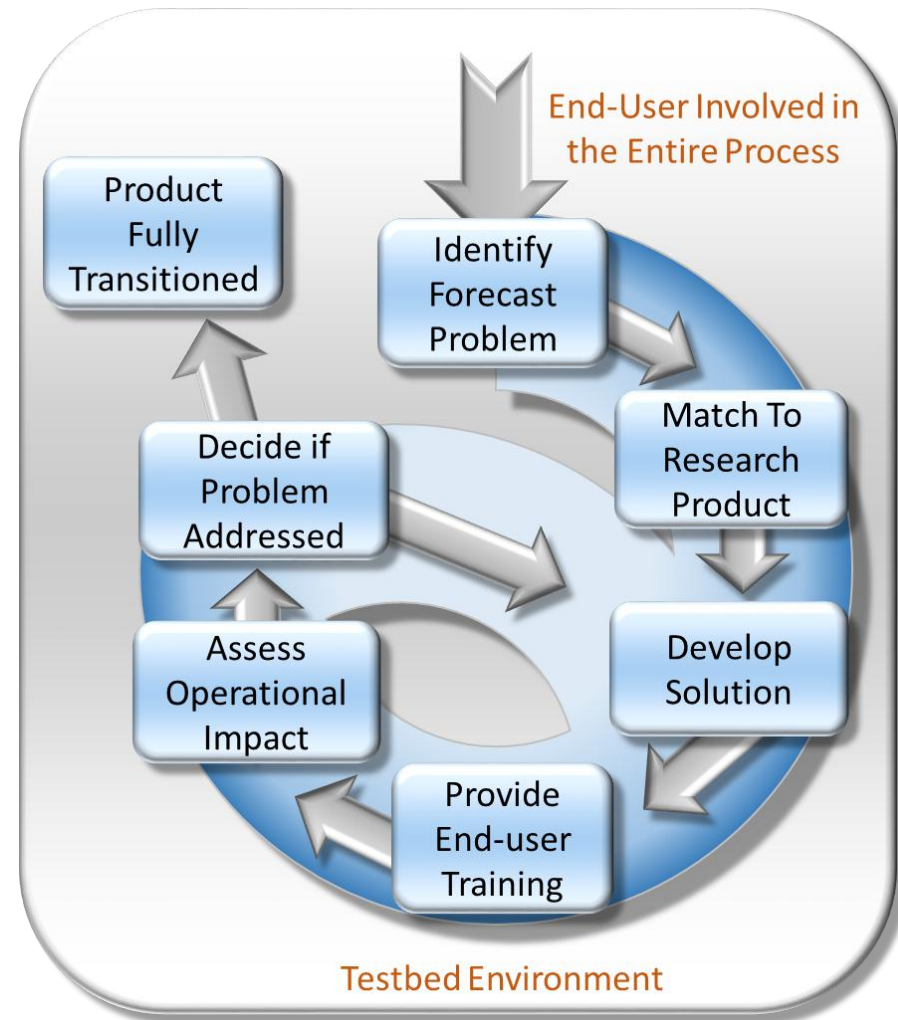
Mission: Transition unique NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts on a regional and local scale.

- Established in 2002 through an unsolicited proposal from MSFC scientists (Lapenta, S. Goodman, and Jedlovec)
- Receive yearly directed funding from NASA R&A Weather Focus Area (Tsengdar Lee) based on 5 year proposal (current proposal is FY15-19)
- Write competitive proposals (NASA/NOAA) to expand core capabilities/partnerships
- **SPoRT receives NOAA Reimbursable dollars from the Satellite Proving Grounds through MOU (GOES-R, since 2009), Risk Reduction proposals (JPSS, since 2011), and Modeling, Analysis, Predictions and Projections (MAPP) proposals (starting in 2017)**



SPoRT R2O/O2R Paradigm

- Bridge the “Valley of Death”
- Can’t just “throw data over the fence”
 - Maintain interactive partnerships with help of specific advocates
 - Integrate into user decision support tools
 - Create product training
 - Perform targeted product assessments
- Concept has been used to successfully transition more than 40 satellite datasets to operational users for nearly 15 years
- Other groups in the community have adopted this paradigm



Current Partnerships



Over 30 NWS WFOs
and All Regional
Headquarters



National Centers
for Environmental Prediction

- Environmental Modeling Center
- National Hurricane Center
- Weather Prediction Center
- Ocean Prediction Center
- Aviation Weather Center
- Storm Prediction Center



NOAA Cooperative Institutes
as Data Delivery and
Product Development Partners

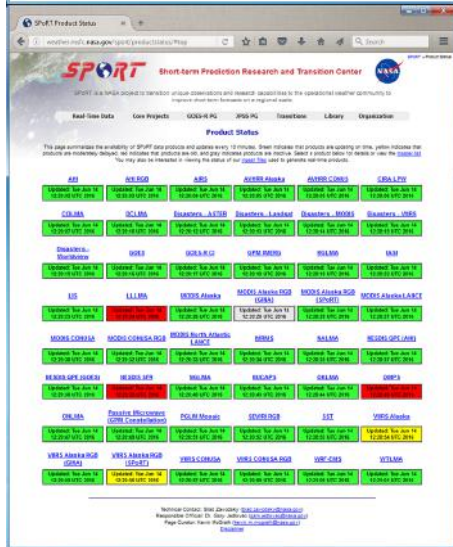
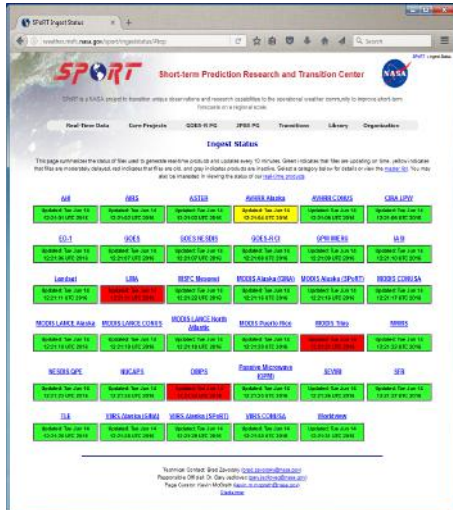


Updated: June 3, 2016



Data Approach

- SPoRT provides experimental data to NWS users by LDM, FTP, and WMS depending on application
- Uses “backdoor” to provide data into AWIPS
- Not a 24/7 “operational” data provider but do our best to maintain data feeds because product reliability is a key to product demonstration and use by operational forecasters
- Monitor our product ingest and status for all experimental products going to a customer



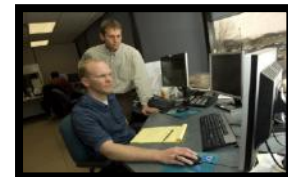
Data downlinked from satellite



Data obtained by SPoRT; value-added products generated



Product disseminated to end-user formatted for their decision support system



End-user makes operational decisions using SPoRT products



SPoRT Areas of Expertise

Modeling and Data Assimilation

Lightning

Remote Sensing

Disasters

Decision Support Systems

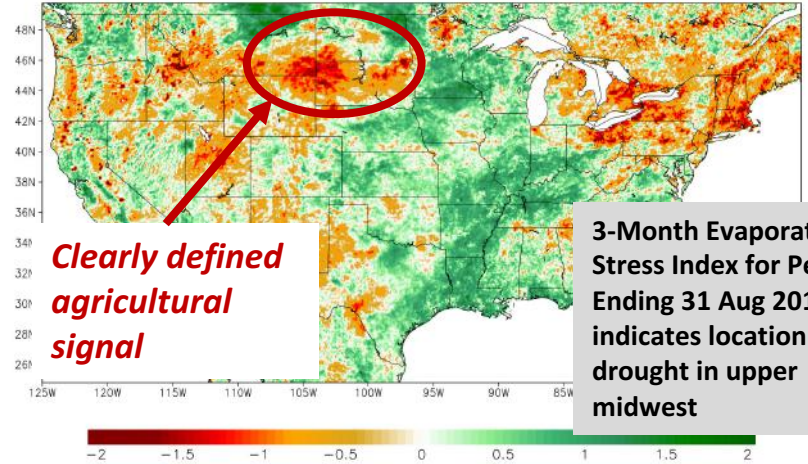
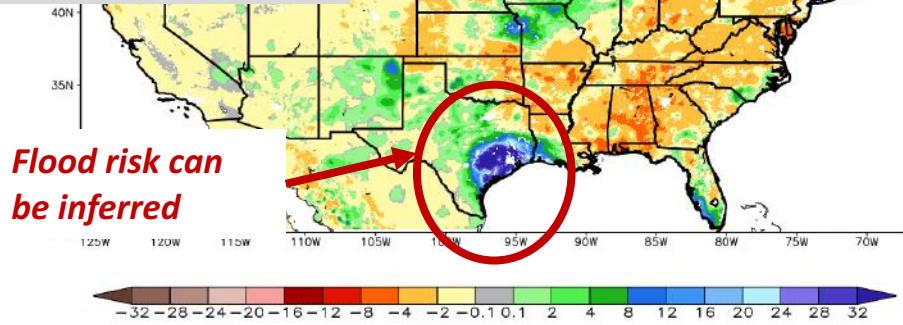
Transitions, Training, and Assessment

- Perform targeted research activities to exploit unique capabilities of NASA satellites and technologies to solve specific weather forecasting challenges
- Support for product dissemination to AWIPS, AWIPS II, N-AWIPS, WMS, etc.
- Apply unique R2O/O2R paradigm for transitioning data and obtaining valuable feedback from NWS forecasters



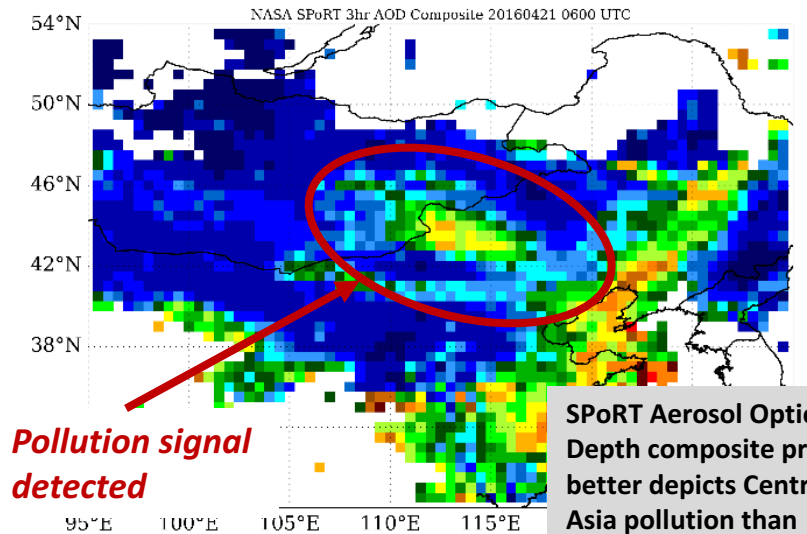
Modeling & Data Assimilation

1-Week Difference in Column Relative Soil Moisture (%) on 28 Aug 2017 shows impact of Hurricane Harvey



3-Month Evaporative Stress Index for Period Ending 31 Aug 2016 indicates location of drought in upper midwest

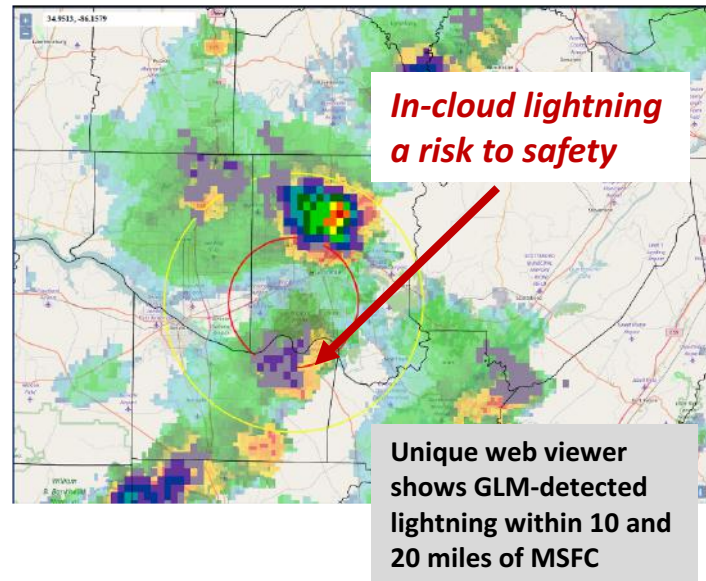
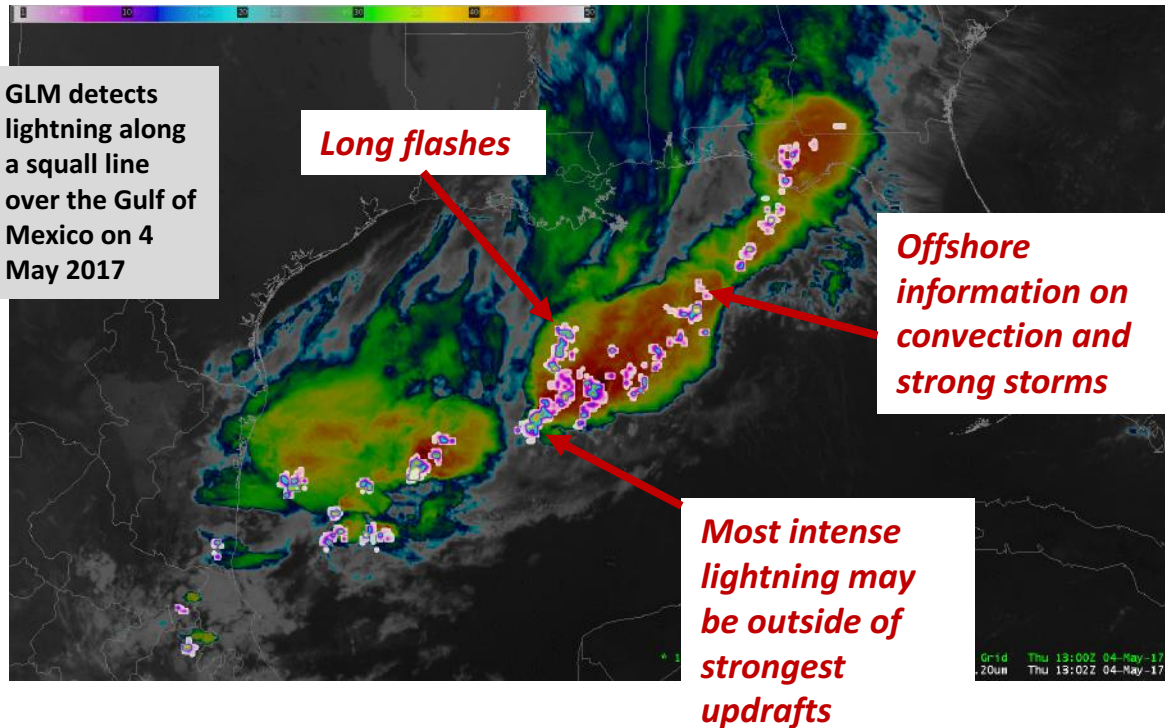
- Land surface (LIS; SMAP) to improve short-term weather and agricultural forecasts
- Use satellite-derived aerosols to improve satellite data assimilation and cloud microphysics in models



SPoRT Aerosol Optical Depth composite product better depicts Central Asia pollution than model



Lightning

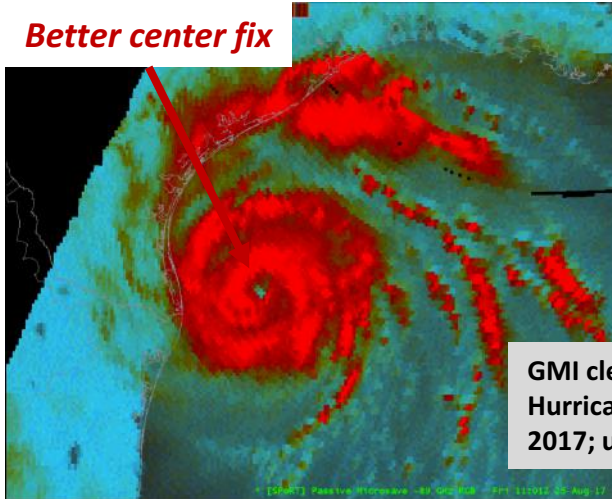


- Transition unique total lightning data from ground-based Lightning Mapping Array for severe weather and lightning safety applications
- Prepared forecasters for the Geostationary Lightning Mapper (GLM) on GOES-R/S satellites and prepare for international satellites



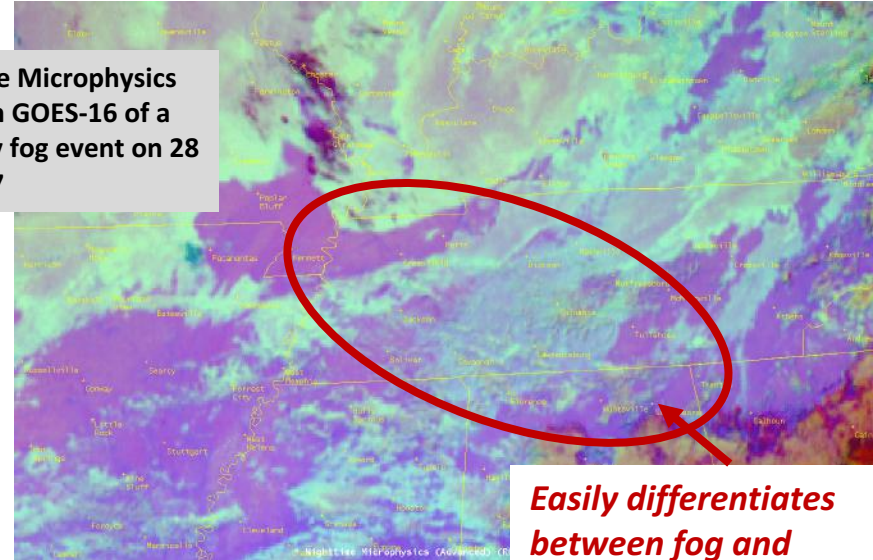
Remote Sensing

Better center fix



GMI clearly shows center of Hurricane Harvey on 25 Aug 2017; used by NHC

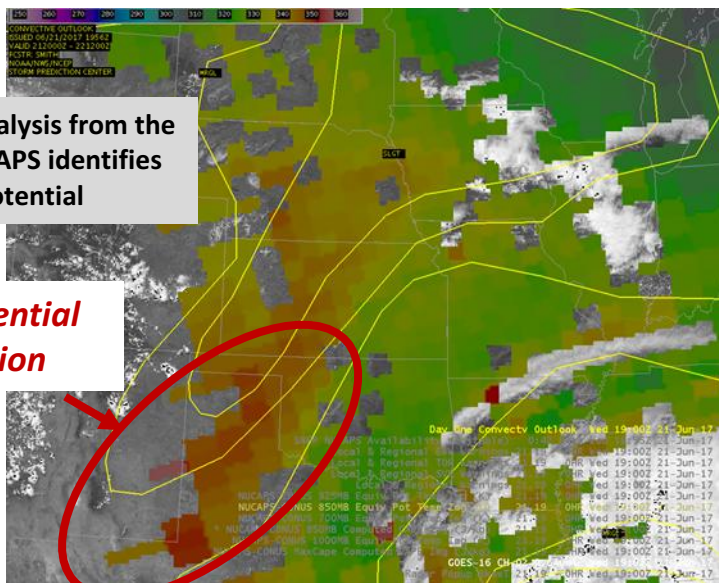
Nighttime Microphysics RGB from GOES-16 of a TN Valley fog event on 28 Mar 2017



Easily differentiates between fog and low cloud

850 mb θ_e analysis from the Gridded NUCAPS identifies convective potential

Higher potential for convection

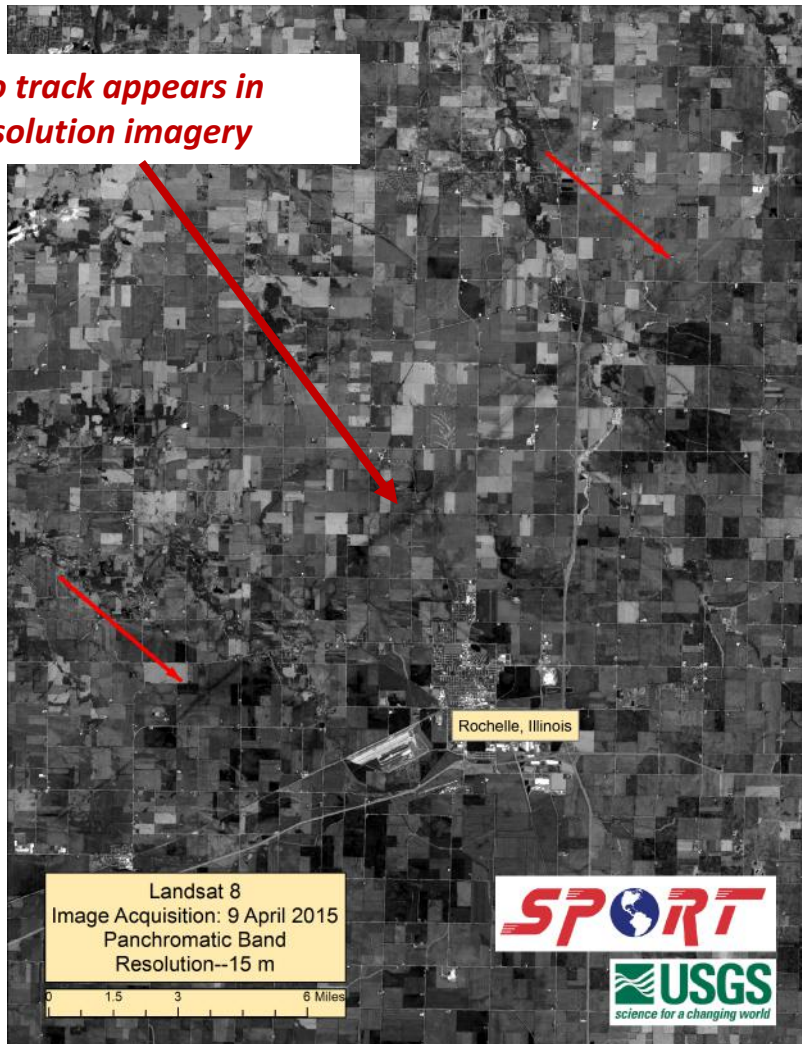


- Transition satellite imagery from the instruments along with unique multispectral products that can be applied to GOES-16 and JPSS
- Transition other value-added products from NASA GPM
- Unique visualizations and science initiatives with NUCAPS

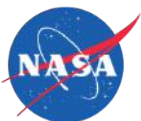
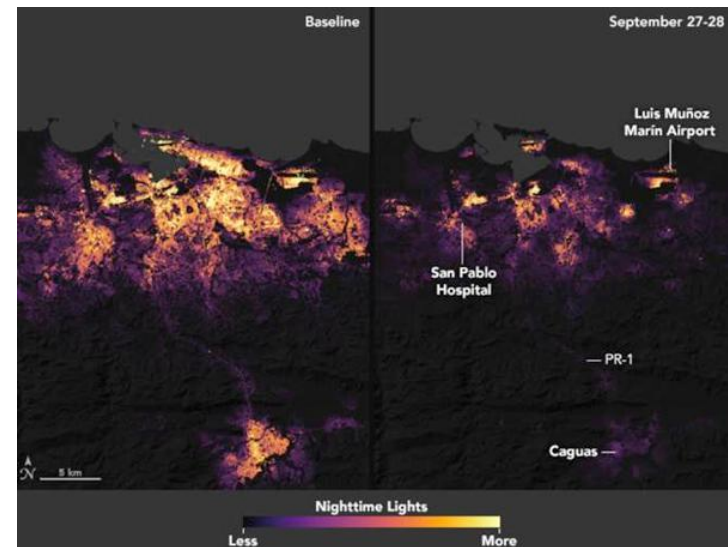


Disasters

Tornado track appears in high-resolution imagery



- Transition unique high-resolution satellite imagery (Landsat, VIIRS, Sentinel, private sector) to decision makers in the aftermath of disasters
- Pre- and post-event imagery used to detect tornado/hail tracks and flood extent from space



Forecaster Training

Training is developed to complement more conceptual training developed by COMET or NOAA's Training Office

Multiple flavors of training are needed to reach all forecaster learning styles

- Site visits
- Microlessons
- User-based, operational modules
- Quick Guides

SPoRT Applications Library

- 1-minute examples
- Short videos
- 21 total cases (and counting)

Collaborate with NWS forecasters for operational perspective

Viewable online or within the AIR Tool

The screenshot shows the SPoRT application interface. On the left is a navigation menu with a table of contents. The main content area displays a slide titled "Night-time Microphysics RGB" with a list of bullet points and a corresponding satellite image with color-coded annotations.

micro_lesson_RGB_Fog_20130823_NASA_SPoRT (01:30 / 08:20)

Kevin Fuell Meteorologist

Outline	Thumbnails	Notes	Search
1. RGB Imagery for Aviation and Cloud Analysis			
2. Forecast Issue and Solution			
3. Night-time Microphysics RGB			
4. Fog vs Low Clouds Application			
5. Hybrid Conceptual Diagram			
6. Fog Case: Hybrid 11-3.9um loop			
7. VIIRS 11-3.9um vs NTmicro, 0621 UTC			
8. MODIS 11-3.9um vs NTmicro, 0746 UTC			
9. VIIRS 11-3.9um vs NTmicro, 0805 UTC			
10. VIIRS Day-Night Band RGB			
11. Summary / Resources			

Night-time Microphysics RGB

- Utilizes MODIS & VIIRS channels/channel differences:
 - 12.0um-10.8um (optical depth)
 - Thicker = more red
 - 10.8um-3.9um (particle size & phase)
 - Small water droplets = more green
 - 10.8um (thermal)
 - Warmer = more blue

Annotations on the satellite image:

- Low stratus (bluish green)
- Mid-level Cumulus, Cumulonimbus (tans, browns)
- Mid/Upper level stratus (purples)
- Fog in elevated valleys (grayish aqua)
- Fog in Sequatchie and TN valleys (grayish aqua)
- Mid/Upper level stratocumulus (red tones)
- Upper level cirrus (dark blue tones)

artaculate POWERED PRESENTATION SLIDE 3 OF 11 PAUSED



The screenshot shows a slide titled "Application Library: Day Convection RGB" with a detailed description of the product and its use.

Application Library: Day Convection RGB

Damaging Convective Activity Across Georgia

Contributed by: Kris Wate

Region: COCSX East/Southwest

Office: NWS Huntsville, AL (HUN)

Date: 2 April 2017

Presenter: Day Convection RGB

Application Area: Convective Aviation Public Event Decision Support

Features: Sense Convective causing strong winds, hail and meteoric conditions

Instrument(s): GOES-16, SEVIRI, VIIRS

Works well with: Visible Channels Day Land Cloud RGB Radar Reflectivity GEM LMA Grid output density

Related Links: [SPoRT Day Convection RGB](#) [Interactive Quick Guide](#) [VIIRS COMET \(Microphysics\) Specific Application RGB](#) [Fog Detection](#)

Event Description: A long-lived small size tracked convective system Georgia to the southeast. The storm system organized above winds and hail that downed trees and produced and some surface wind gusts observed as lowering ground stop of all aircraft operations at Atlanta International Airport.

Product Impact: The Day Convection RGB provides the ability to identify convective clouds due to strong updrafts and small ice particles which indicate areas of intense convection. The system is designed to detect microphysical characteristics of convective clouds in existing rapid-scan. Areas of strong convection identified by the RGB product (Figure 1) corresponds to preliminary severe weather reports received by the NWS.

Figure 1. GOES-16 Day Convection RGB, valid 1802 April 3, 2017.



Assessment Methodology

Assessment page

- Quantitative questions
- Open comments

Follow-up Emails/Phone calls

- Submitted feedback receives a follow-up via e-mail (“Thank You”, and questions).
- Info exchange with product developers

Wide World of SPoRT Blog

(<https://nasasport.wordpress.com/>)

- Case examples

Assessment “Wrap-up” Telecon

Results in an Assessment Report

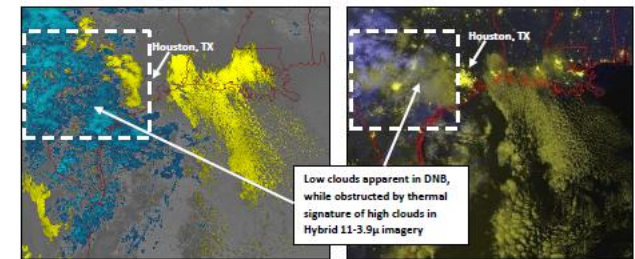
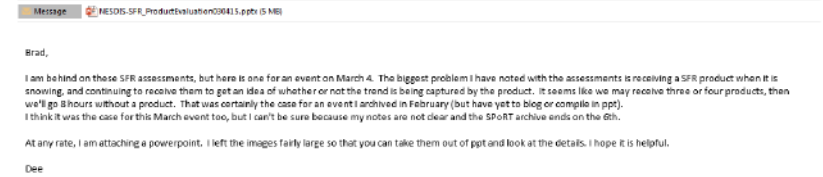
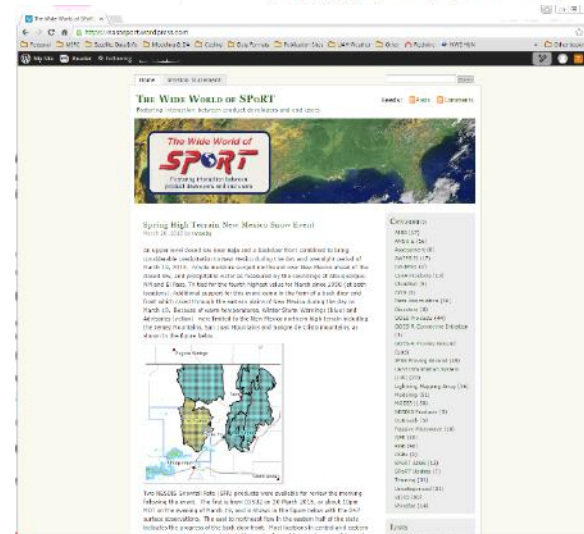


Figure 7. The SPoRT Hybrid GEO/LEO 11-3.9µm with VIIRS inserted (left) and the VIIRS Day-Night Band Radiance RGB Imagery for 0749 UTC on 19 December 2013.



so provided to all forecasters at each evaluation. The chat room was created to collaborate in an open forum setting. In addition, providing information about specific products and conducted via email with users to acknowledge its or ask for clarification. These conversations and uses that can then be shared with other ed.

sters came from 8 different WFOs stretching 51 surveys were submitted during the two on above. In addition, a variety of blog posts and being considered here from users. Overall, the was the preferred product and 2/3rd of the users ecast issues (Figure 8).



Continued Collaboration w/ NOAA / NWS

- SPoRT has traditionally worked with NOAA / NWS using NASA weather satellite data (e.g., MODIS, AIRS, VIIRS, CrIS), but NOAA has developed a robust proving ground and these instruments will be operational within the year
- ***SPoRT plans to continue engaging with its NWS partners on use of these new datasets in coordination with NWS and will continue to investigate development of additional value-added products from these weather sensors***
- SPoRT has developed experience using the NWM through collaborative discussions and visits to the NWC
- ***SPoRT plans to work collaboratively with other partners within NASA to testbed NASA datasets and capabilities for the NWM***



Continued Collaboration w/ NOAA / NWS

- Upcoming NASA instruments have limited weather applicability; however, they do have some characteristics that might be relevant to NOAA / NWS
- ***SPoRT plans to continue working with forecasters to collaboratively identify new NASA datasets; would like to engage with NWS HQ on these upcoming missions and aid in testbedding agreed-upon datasets for more effective use of these U.S. space-based assets***



NASA Earth Science Fleet

