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

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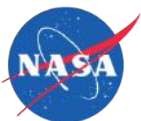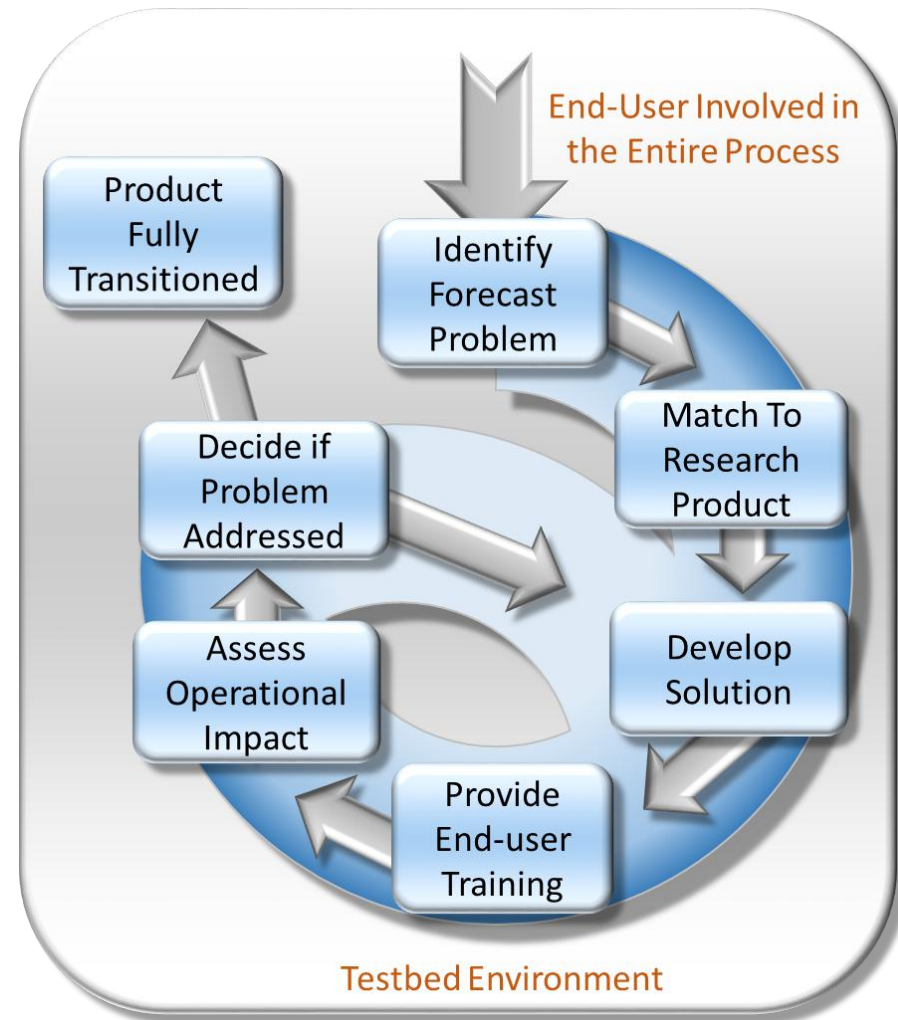
SPoRT History/Budget

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

End-User Involved in the Entire Process

Product Fully Transitioned

Identify Forecast Problem

Match To Research Product

Develop Solution

Provide End-user Training

Assess Operational Impact

Decide if Problem Addressed

Testbed Environment

SP⊕RT

Current Partnerships

National Centers
for Environmental Prediction

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

Over 30 NWS WFOs
and All Regional
Headquarters

NOAA Cooperative Institutes
as Data Delivery and
Product Development Partners

Legend
- 🔴 Product Development Partner
- 🟠 National Center Evaluation Partner
- 🟢 NWS Regional Headquarters
- 🔵 WFO Collaborative Partner
- 🟡 Center Weather Service Unit
- 🟣 RFC Collaborative Partner

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
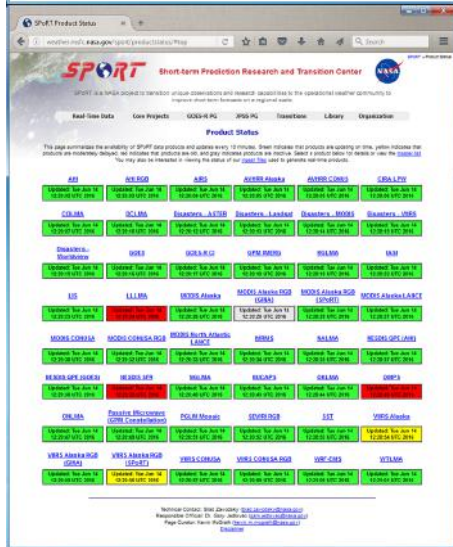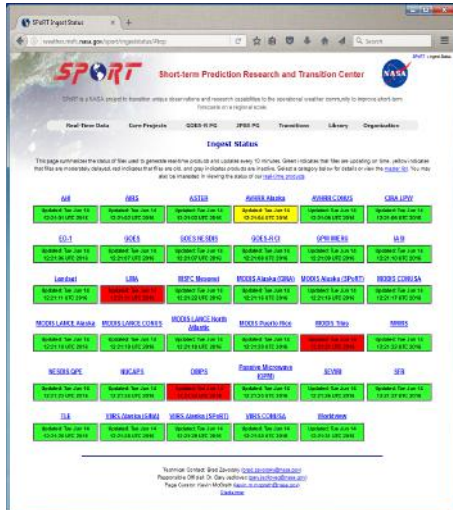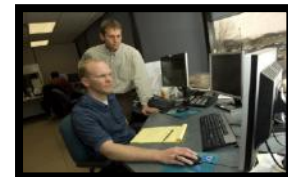

Data downlinked from satellite

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

Flood risk can be inferred

Clearly defined agricultural signal

3-Month Evaporative Stress Index for Period Ending 31 Aug 2016 indicates location of drought in upper midwest
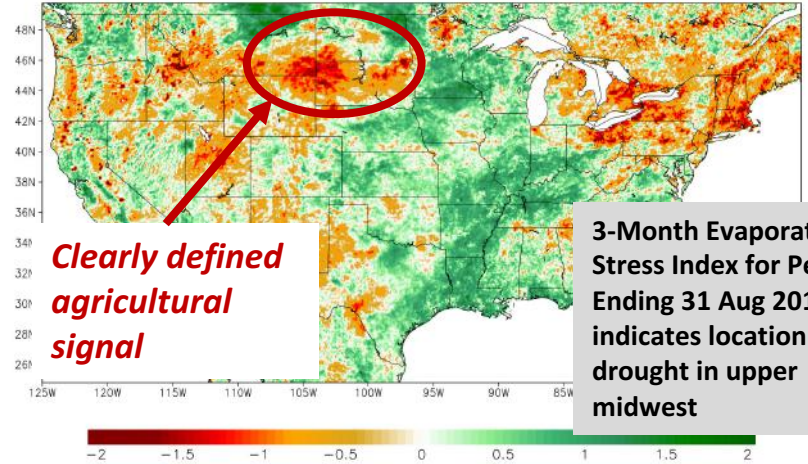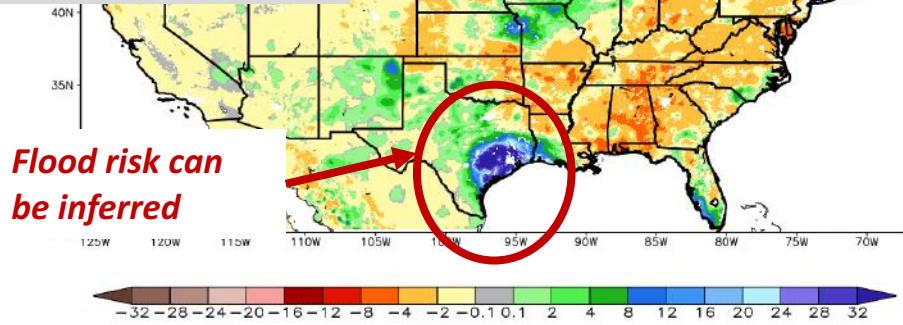
- **Land surface (LIS; SMAP) to improve short-term weather and agricultural forecasts**
- **Use satellite-derived aerosols to improve satellite data assimilation and cloud microphysics in models**

NASA SPoRT 3hr AOD Composite 20160421 0600 UTC

Pollution signal detected

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

Lightning

GLM detects lightning along a squall line over the Gulf of Mexico on 4 May 2017

Long flashes

Offshore information on convection and strong storms

Most intense lightning may be outside of strongest updrafts

In-cloud lightning a risk to safety

Unique web viewer shows GLM-detected lightning within 10 and 20 miles of MSFC

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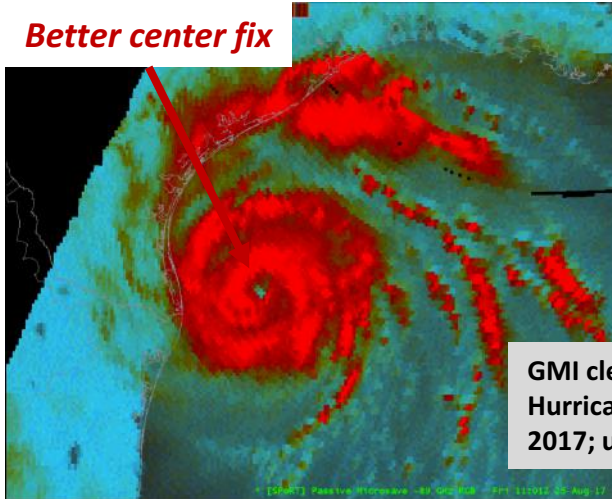
GMI clearly shows center of Hurricane Harvey on 25 Aug 2017; used by NHC

Nighttime Microphysics RGB from GOES-16 of a TN Valley fog event on 28 Mar 2017
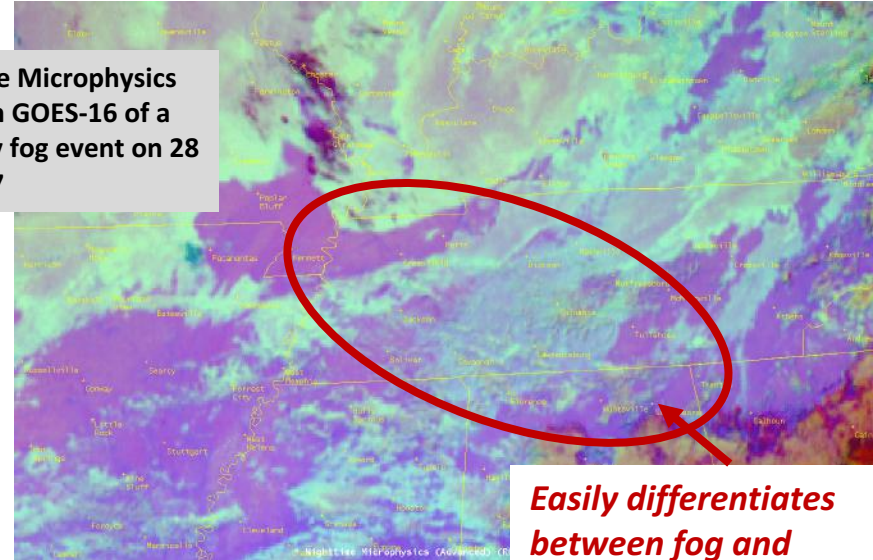
Easily differentiates between fog and low cloud

850 mb θ_e analysis from the Gridded NUCAPS identifies convective potential

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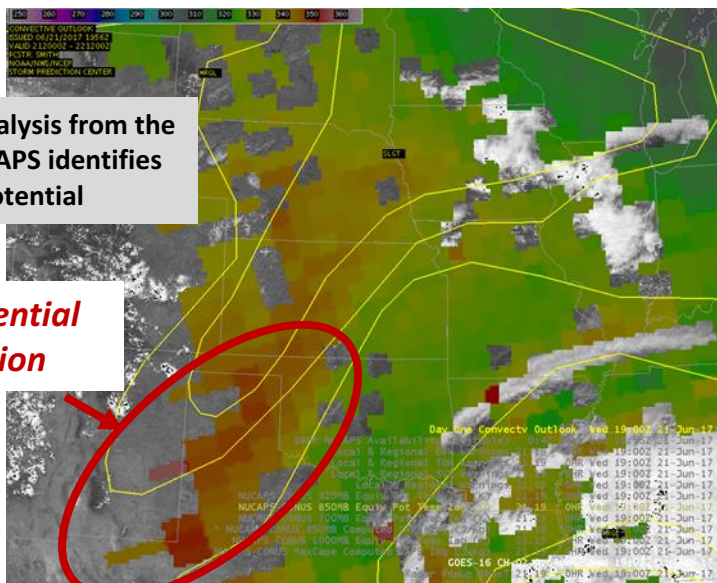
- **Transition satellite imagery from the instruments along with unique multispectral products that can be applied to GOES-16 and JPSS**
- **Transition other value-added products from NASA GPM**
- **Unique visualizations and science initiatives with NUCAPS**

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Disasters

Tornado track appears in high-resolution imagery

Landsat 8
Image Acquisition: 9 April 2015
Panchromatic Band
Resolution--15 m

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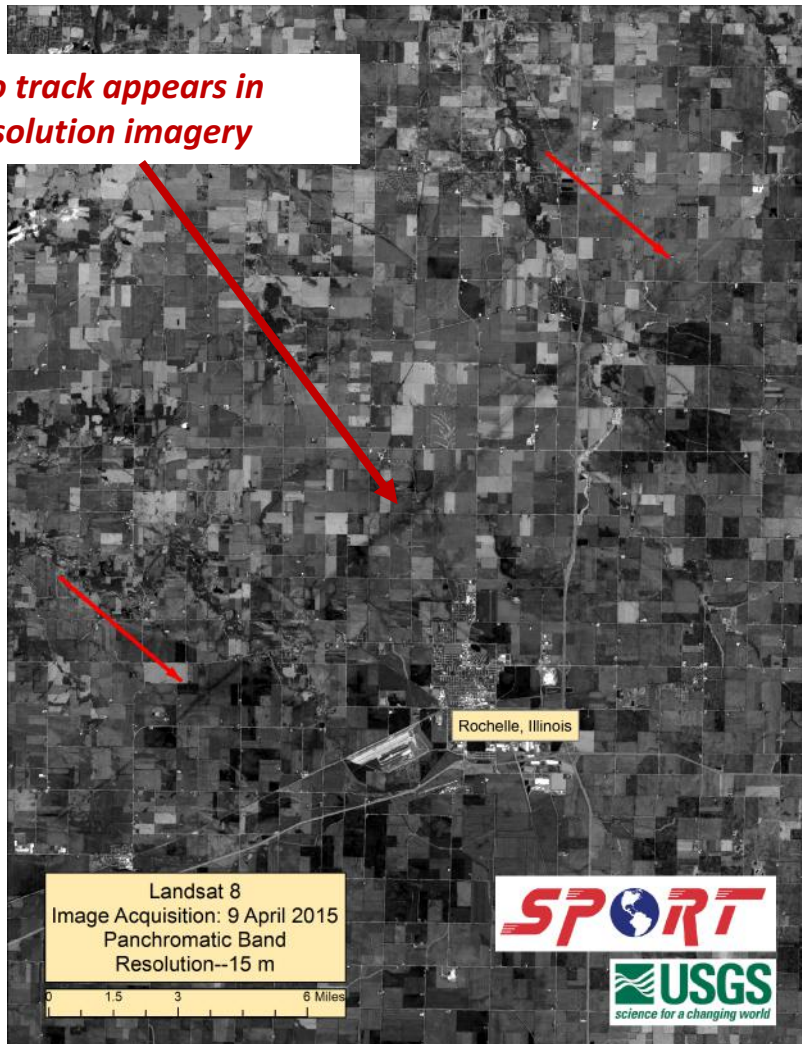
- **Transition unique high-resolution satellite imagery (Landsat, VIIRS, Sentinel, private sector) to decision makers in the aftermath of disasters**
- **Pre- and post-event imagery used to detect tornado/hail tracks and flood extent from space**
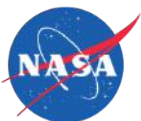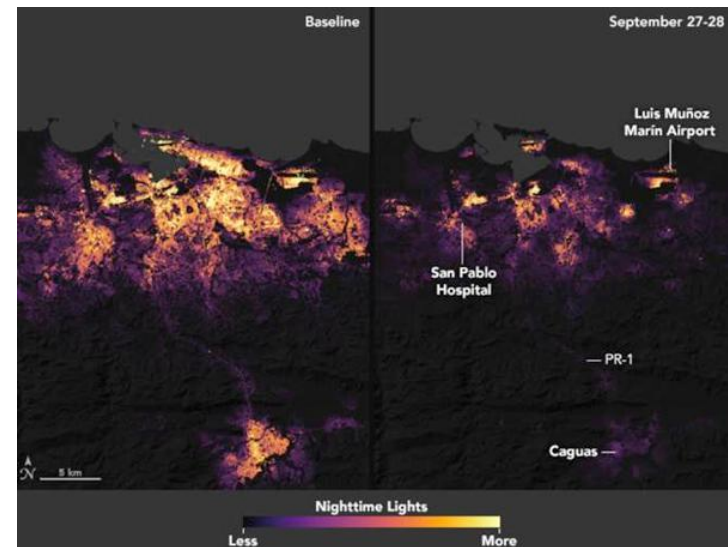
Forecaster Training

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

Assessment Methodology

Assessment page

- o Quantitative questions
- o Open comments

Follow-up Emails/Phone calls

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

Wide World of SPoRT Blog
(https://nasasport.wordpress.com/)

- o Case examples

Assessment "Wrap-up" Telecon

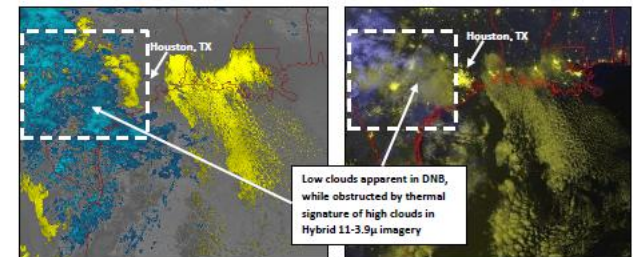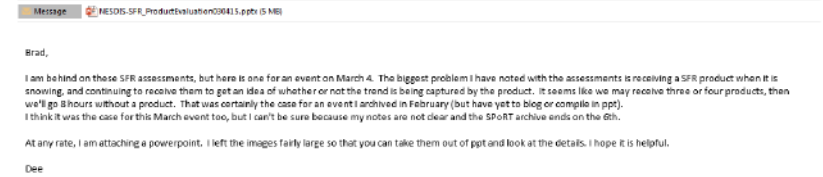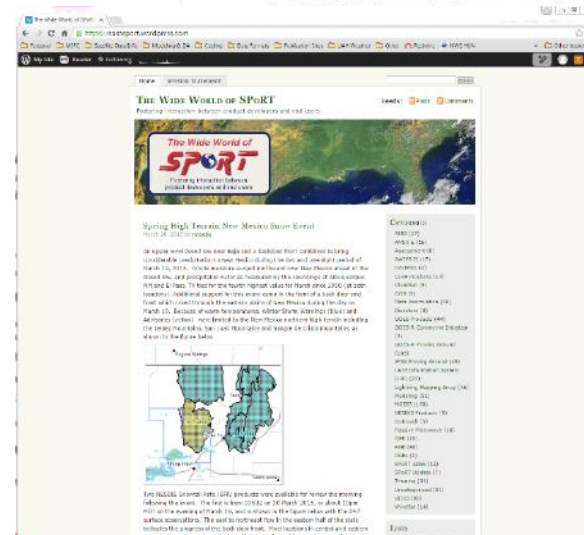**Results in an Assessment Report**

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

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