Use of Remote Sensing Data to Enhance the National Weather Service (NWS) Storm Damage Toolkit

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Background

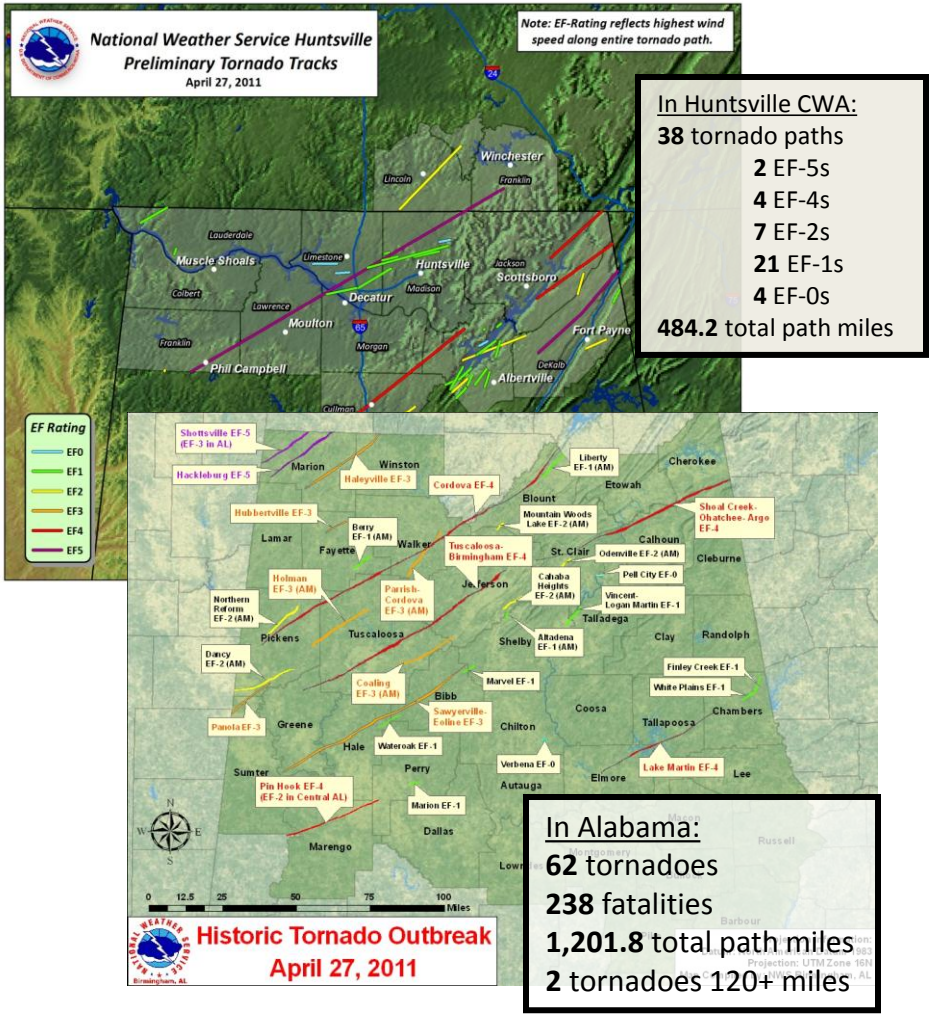
- Following a severe weather outbreak, NOAA/NWS meteorologists are tasked with providing storm reports of damage associated with tornadoes, damaging winds, and hail.
- For tornadoes, this often involves dispatching meteorologists to the field, where they take detailed notes of damage locations, intensity, and gather corroborating evidence such as photos of damaged areas.
- Wide availability of smartphones, tablets, and GIS-capable devices allow for geotagging of data and aggregation within a GIS for further analysis.

Project Goals

- Satellite remote sensing can support damage assessment activities, especially for significant outbreaks.
- Our goal is to incorporate NASA, NOAA, and commercially available satellite data sets into the NOAA/NWS Damage Assessment Toolkit to assist in storm damage survey efforts.
  - The Damage Assessment Toolkit allows storm survey teams to snap photos, take notes, and obtain other information in a GIS framework that colocates the information with radar and other data.
  - Funded as a feasibility study and possible follow-on activity under the NASA Applied Sciences Program.

Case Study: April 27, 2011

- Severe weather on April 27, 2011 led to numerous devastating and deadly tornadoes across the southeast.
- NASA's SPoRT Center collaborated with the NWS to provide MODIS and ASTER data in support of the damage assessment.

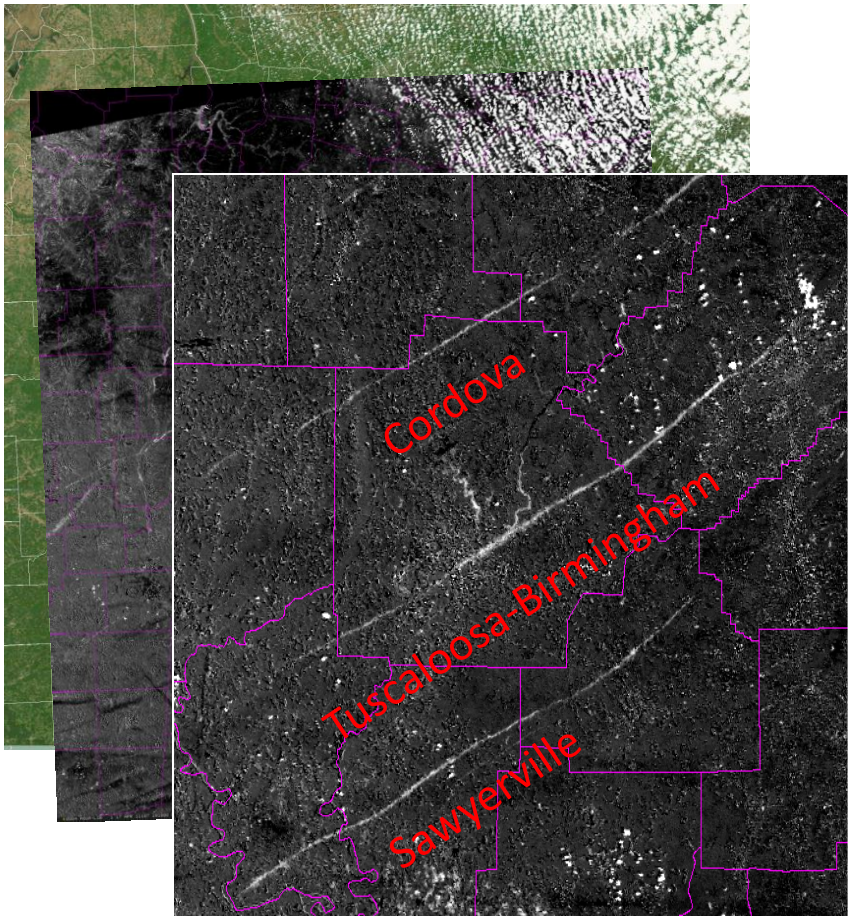


In Huntsville CWA:
38 tornado paths
2 EF-5s
4 EF-4s
7 EF-2s
21 EF-1s
4 EF-0s
484.2 total path miles

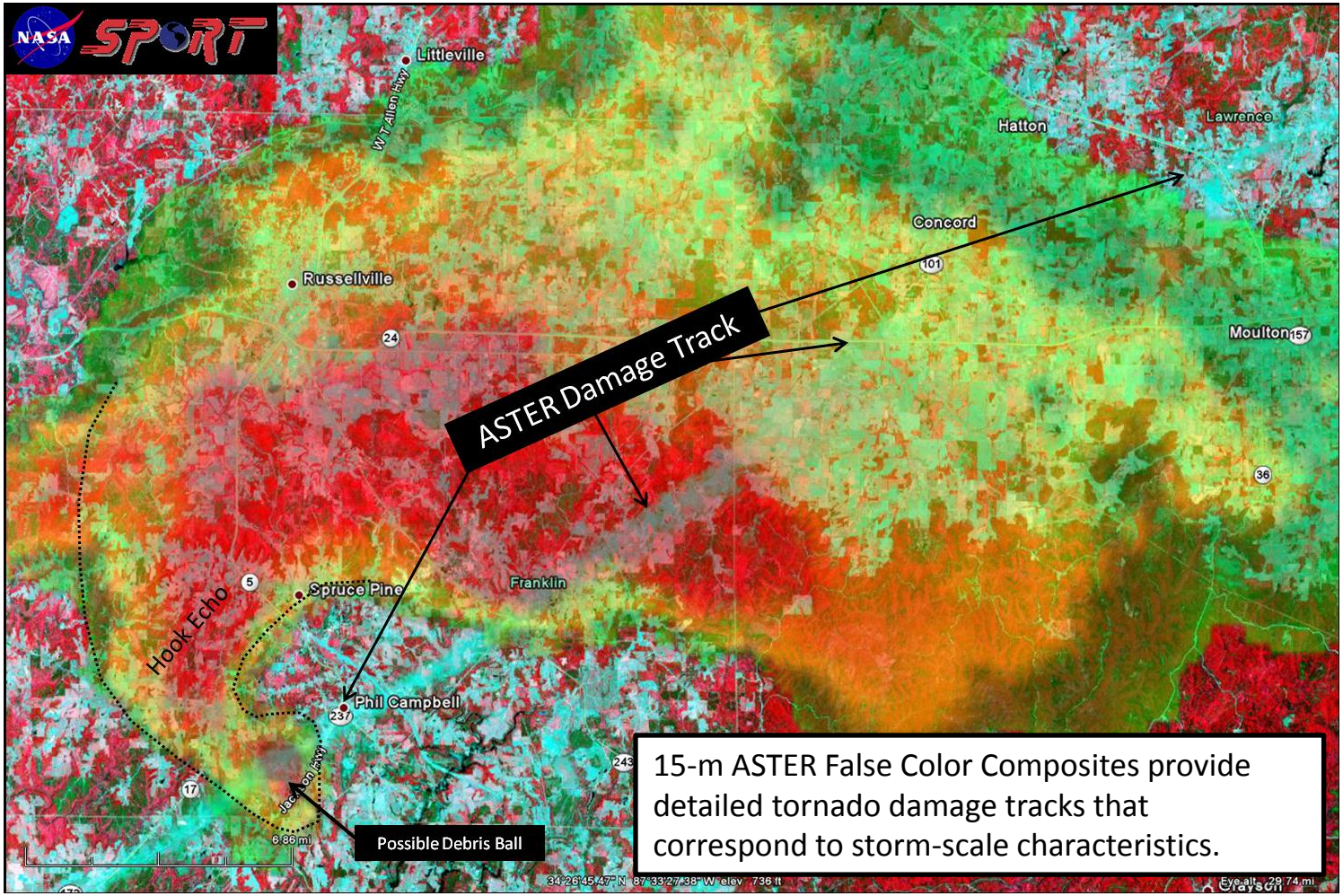
In Alabama:
62 tornadoes
238 fatalities
1,201.8 total path miles
2 tornadoes 120+ miles

Satellite Data

- In response, SPoRT provided applications of NASA satellite data:
  - MODIS true color imagery
  - MODIS before and after changes in 250-m red channel surface reflectance.
  - ASTER false color composites at 15-m resolution.

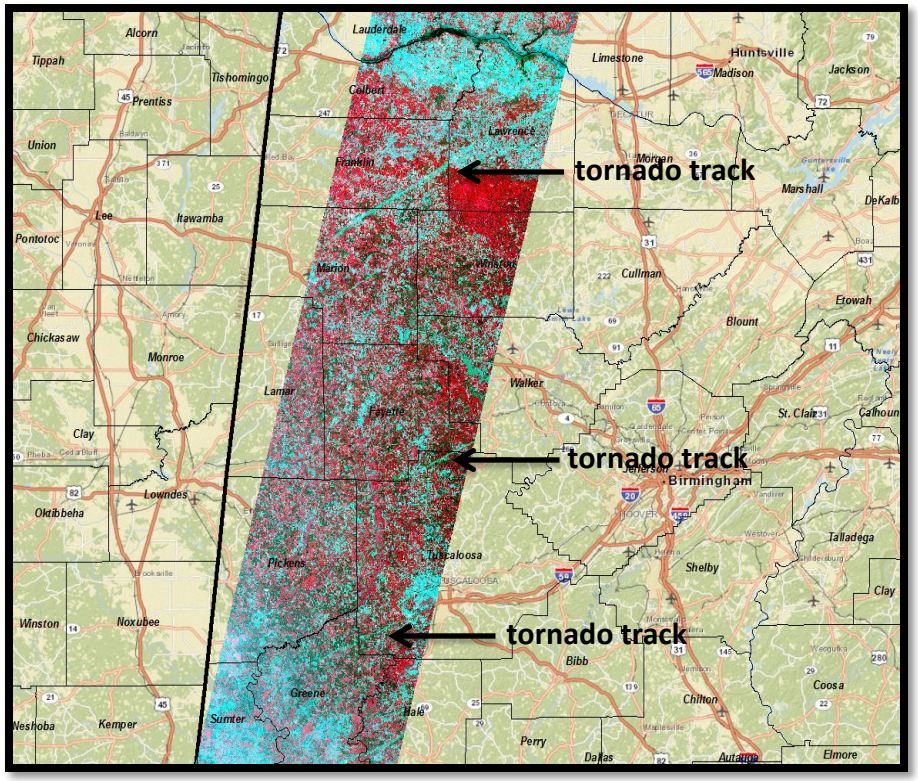


Satellite Data



Going Forward

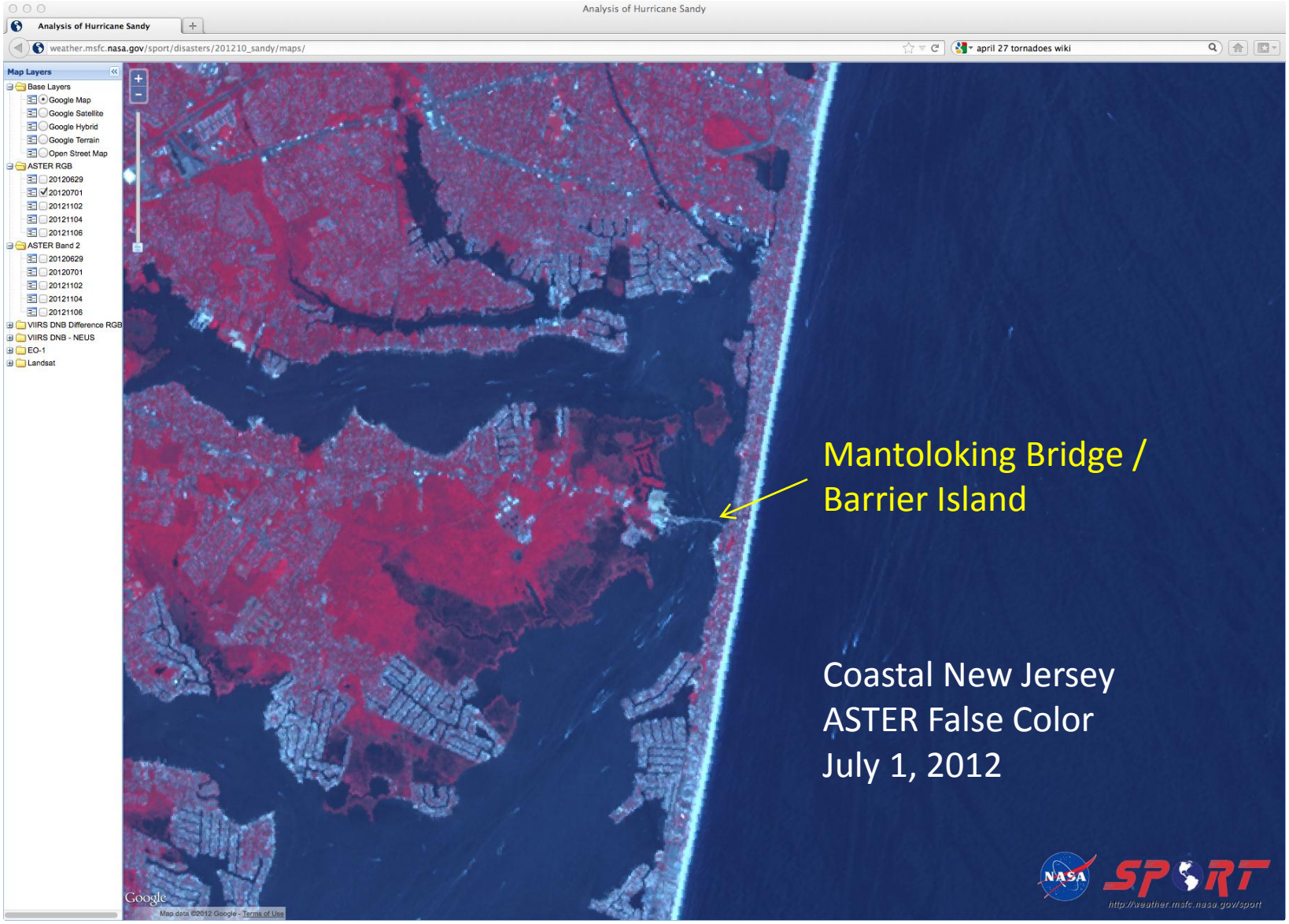
- Goals of the proposed feasibility:
  - Incorporate these data sets within the DAT.
  - Demonstrate application for a case study (Apr. 27)
  - Develop improved MODIS capabilities.
  - Explore inclusion of VIIRS (MODIS-like) data.
  - Explore inclusion of commercial data sets.



Above: ASTER false color composite shown (zoomed out) within the NWS Damage Assessment Toolkit

Recent Application

- Ongoing development of products for the DAT application was leveraged in response to Hurricane Sandy.
  - ASTER collections tiled, staged, and used to identify damage areas.
  - New applications explored with VIIRS data, emphasizing the day-night band.
- Although not specific to the feasibility study's emphasis on tornadoes, demonstrates additional applications possible within NOAA's DAT.


Analysis of Hurricane Sandy
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weather.msfc.nasa.gov/sport/disasters/201210_sandy/maps/
april 27 tornadoes wiki
Map Layers
Base Layers
Google Map
Google Satellite
Google Hybrid
Google Terrain
Open Street Map
ASTER RGB
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ASTER False Color
July 1, 2012
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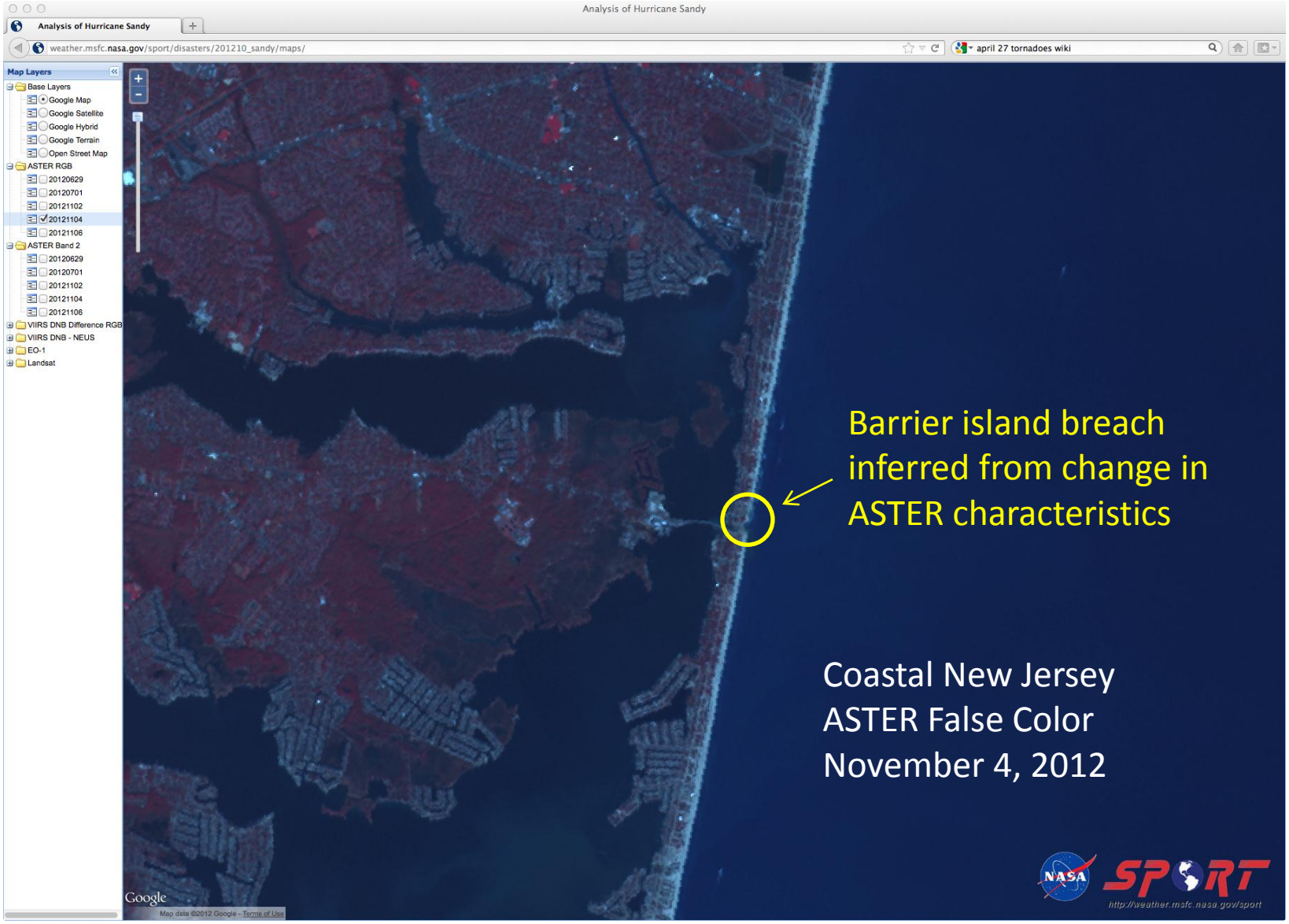
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Barrier island breach inferred from change in ASTER characteristics
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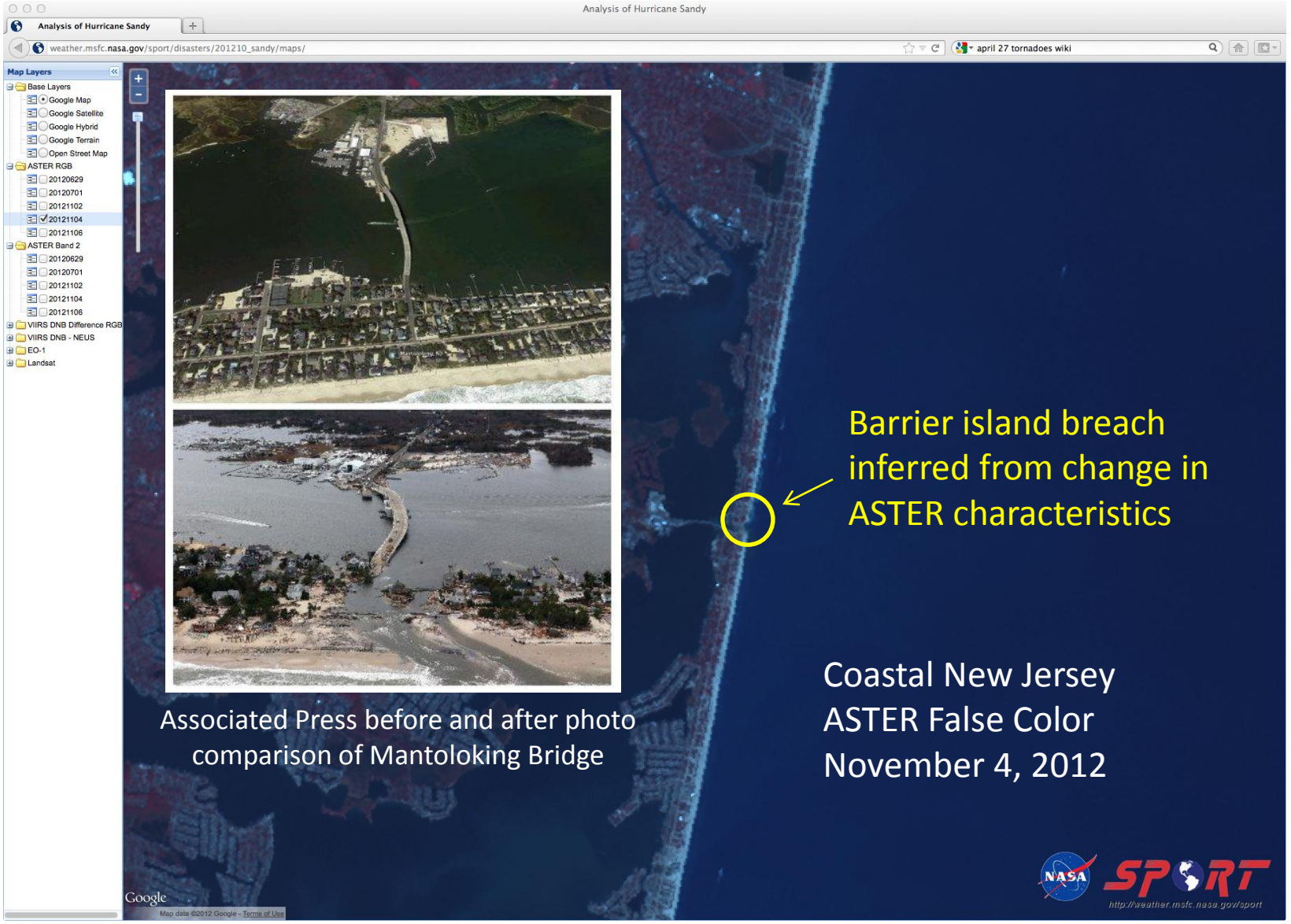
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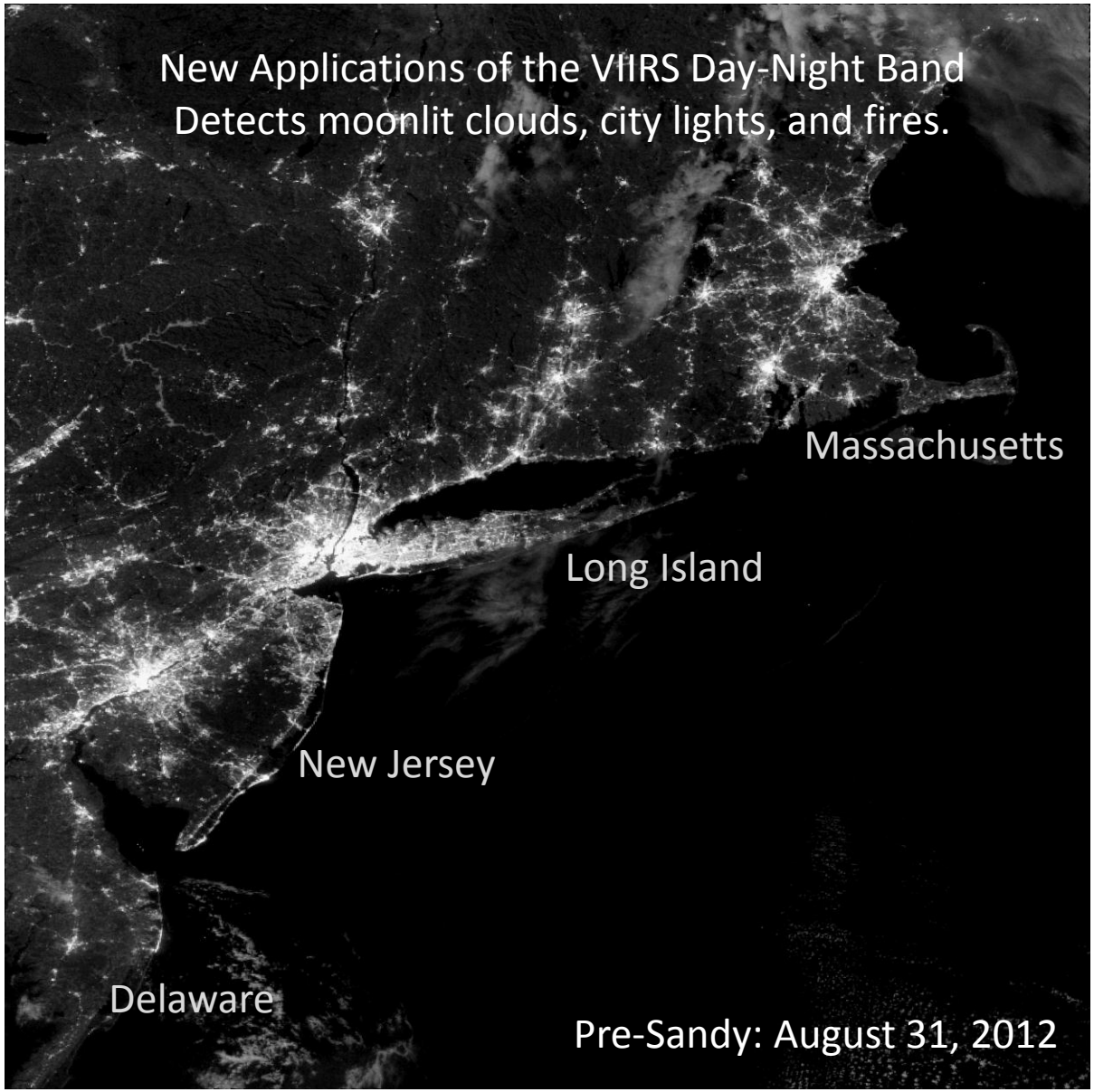
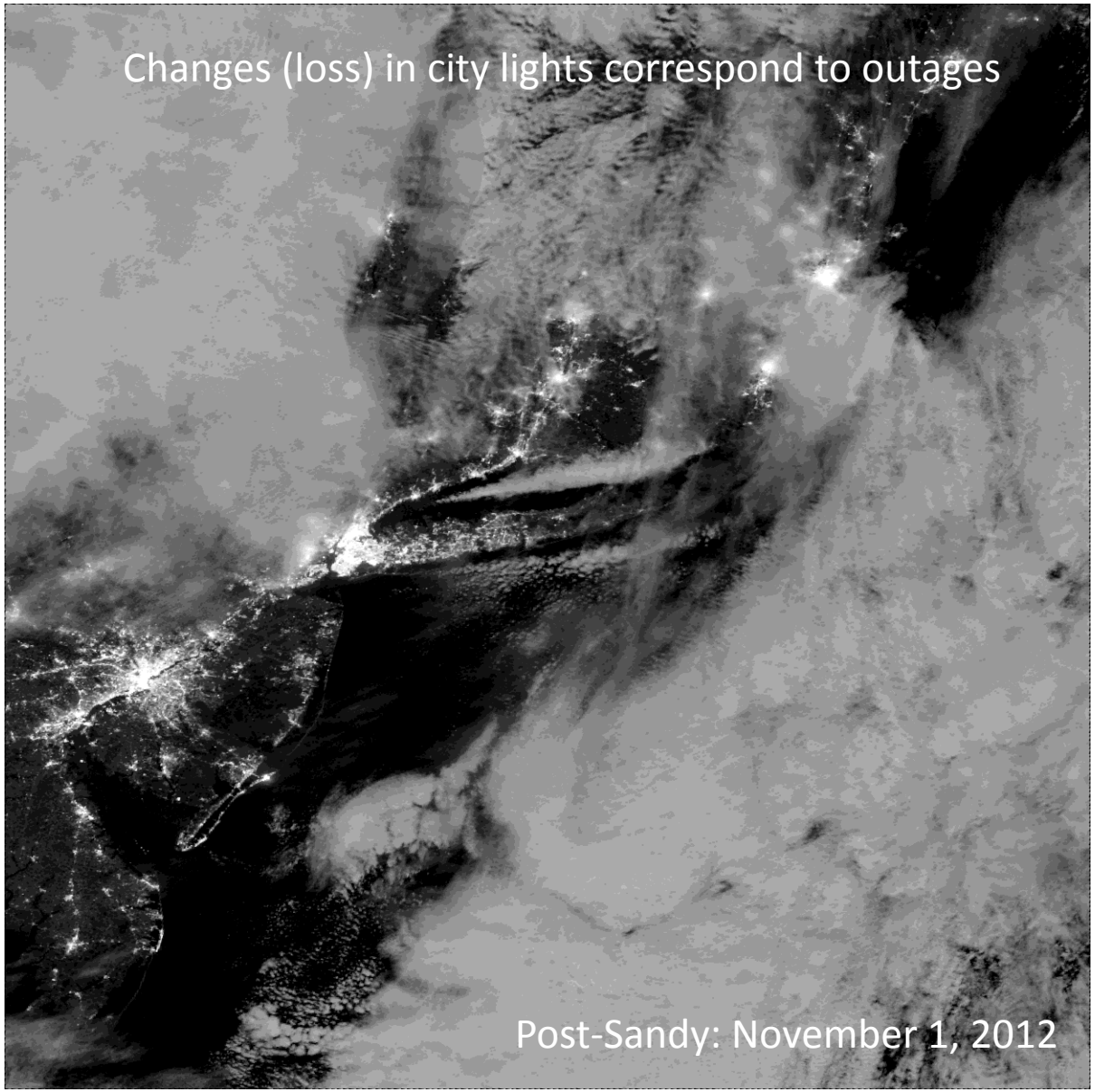
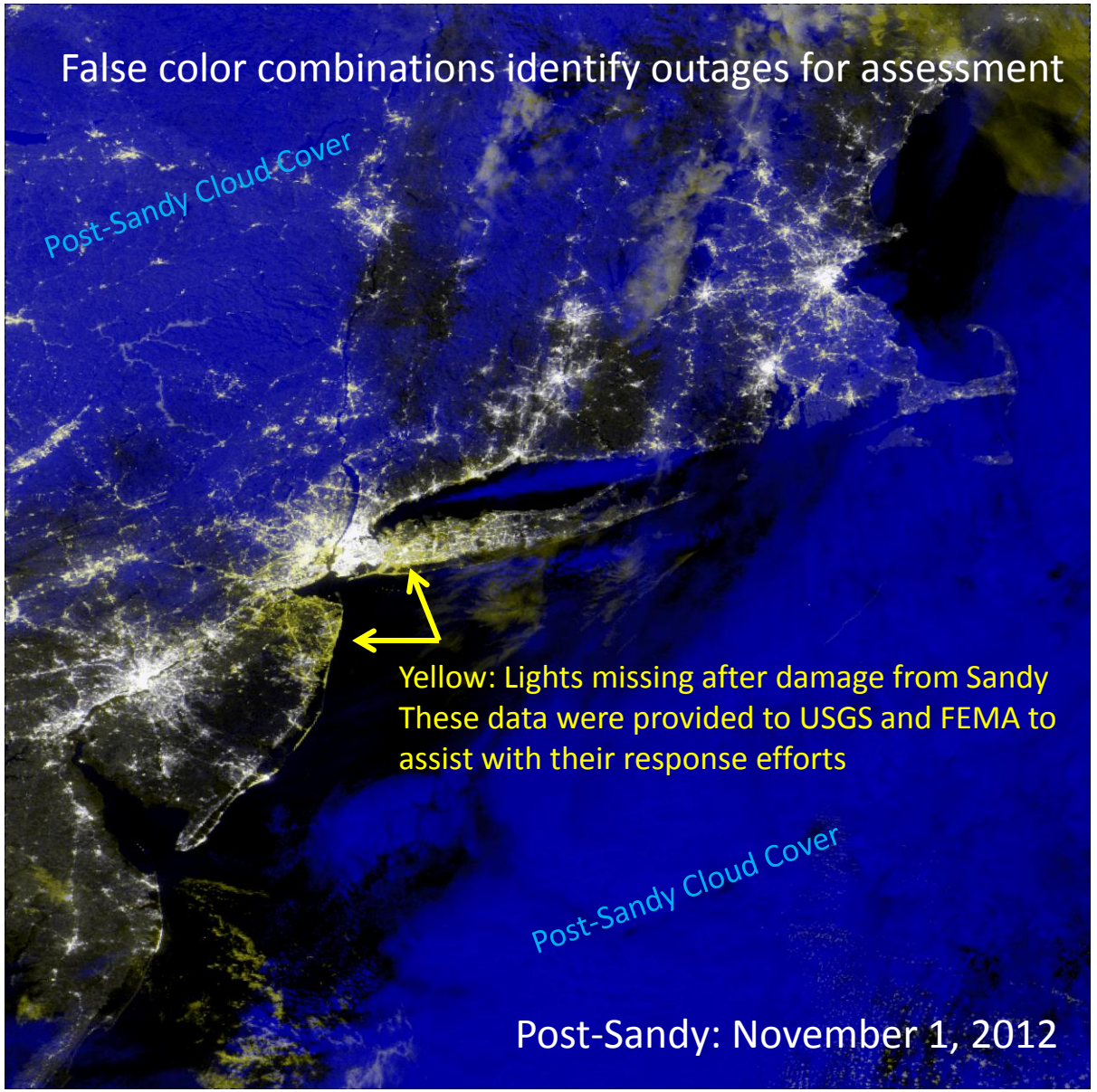

New Applications of the VIIRS Day-Night Band
Detects moonlit clouds, city lights, and fires.
Massachusetts
Long Island
New Jersey
Delaware
Pre-Sandy: August 31, 2012


Changes (loss) in city lights correspond to outages
Post-Sandy: November 1, 2012


False color combinations identify outages for assessment
Post-Sandy Cloud Cover
Yellow: Lights missing after damage from Sandy
These data were provided to USGS and FEMA to assist with their response efforts
Post-Sandy Cloud Cover
Post-Sandy: November 1, 2012

Summary

- SPoRT is improving the use of near real-time satellite data in response to severe weather events and other diasters.
  - Supported through NASA's Applied Sciences Program
- Planned interagency collaboration to support NOAA's Damage Assessment Toolkit, with spinoff opportunities to support other entities such as USGS and FEMA.
- Interested in hearing more?
  - Check out our NASA Hyperwall Presentation on Thursday morning, 10:20-10:40 am.