



NASA Data for Extreme Weather and Climate Events

*ESIP Federation Winter Meeting
EC Session II: Decision Support Catalog and
Community of Practice (DSTCCP)*

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Session Questions/Context

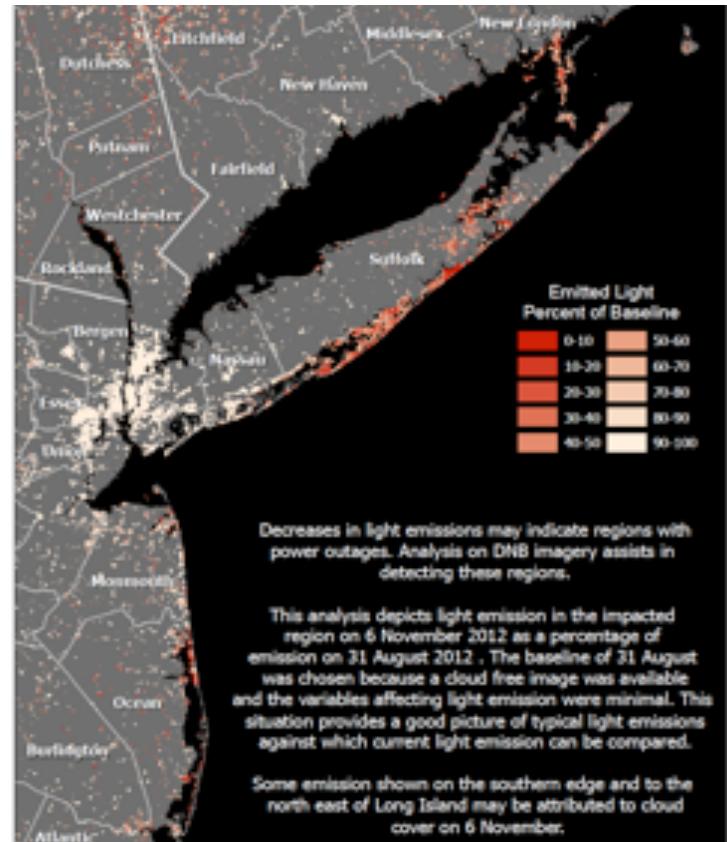
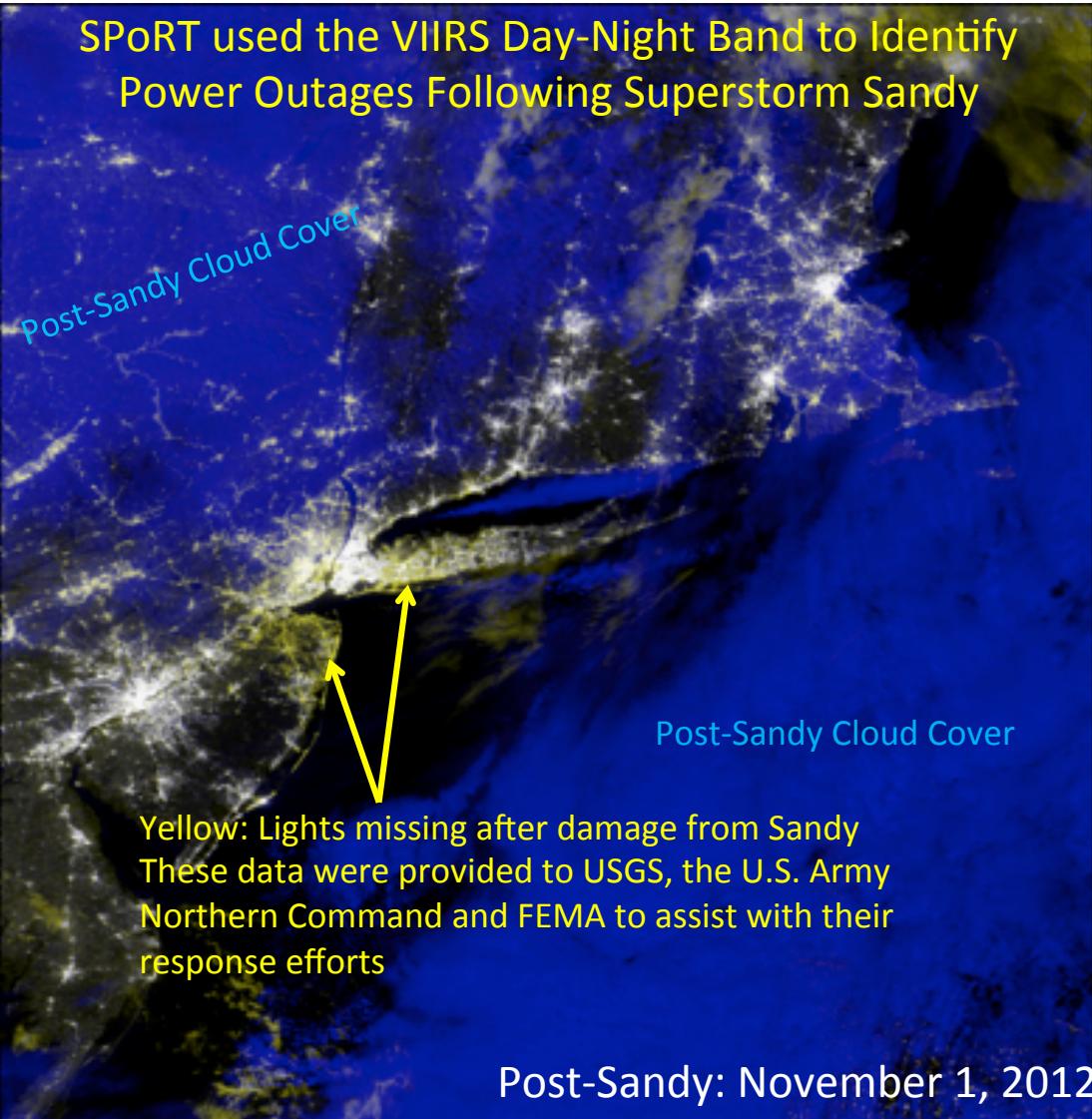


- How such a **Decision Support Catalog** might serve the stakeholders in the extreme weather/disaster response communities.
- Types of the observations you use and the DSTs that have been created by your program's end-users would be very helpful.
- (a) planning for resilience and (b) for responding to extreme events when they do happen to protect lives, minimize inconvenience, and reduce loss of property and infrastructure.
- Considering the damage that Sandy did to the east coast, how can NASA data have helped in minimizing the pain?
- What can be made available to entrepreneurs to build tools (working with federal agencies) that can advance our ability to deal with such events? Data sources, models, real-time imagery, meaningful predictions etc., are all good candidates.

NASA's Supports Disaster Response for “Superstorm Sandy”

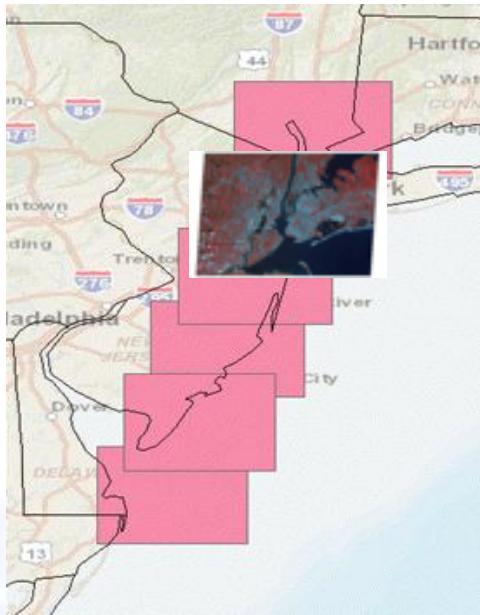


SPoRT used the VIIRS Day-Night Band to Identify Power Outages Following Superstorm Sandy

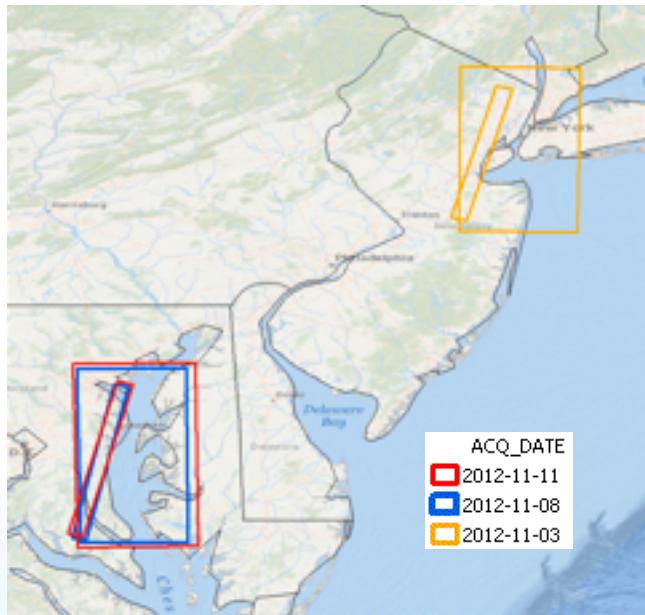


SPoRT provided VIIRS data to the Joint Task Force Civil Support (JTF-CS) and the Department of Defense Northern Command (NORTHCOM). With SPoRT's support, analysts adapted the VIIRS data into their own product to help gauge power restoration in support of recovery efforts.

Examples of Daily Coordinated Support to FEMA



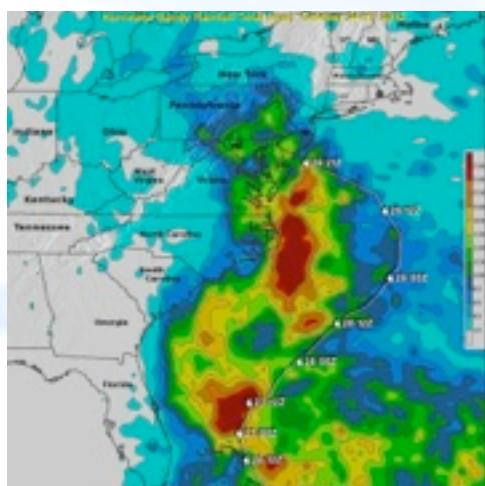
ASTER VNIR 4 Nov 2012 16Z



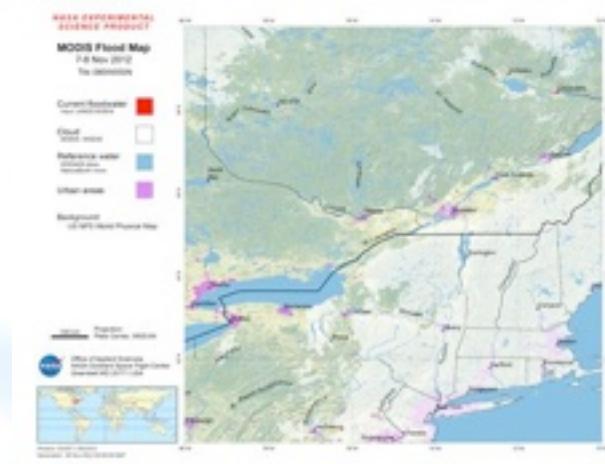
EO-1 3, 8, and 11 Nov 2012



Aqua and Terra MODIS, 23 August 2011, Clear Image



TRMM Rainfall Total Analysis 29 Nov 2012



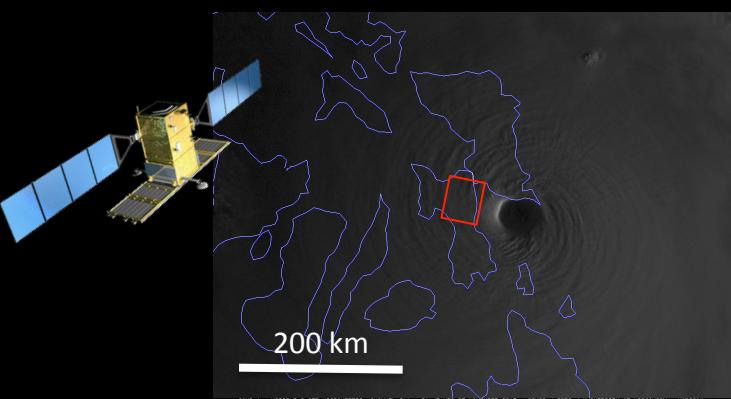
MODIS Flood Map, 7-8 Nov 2012



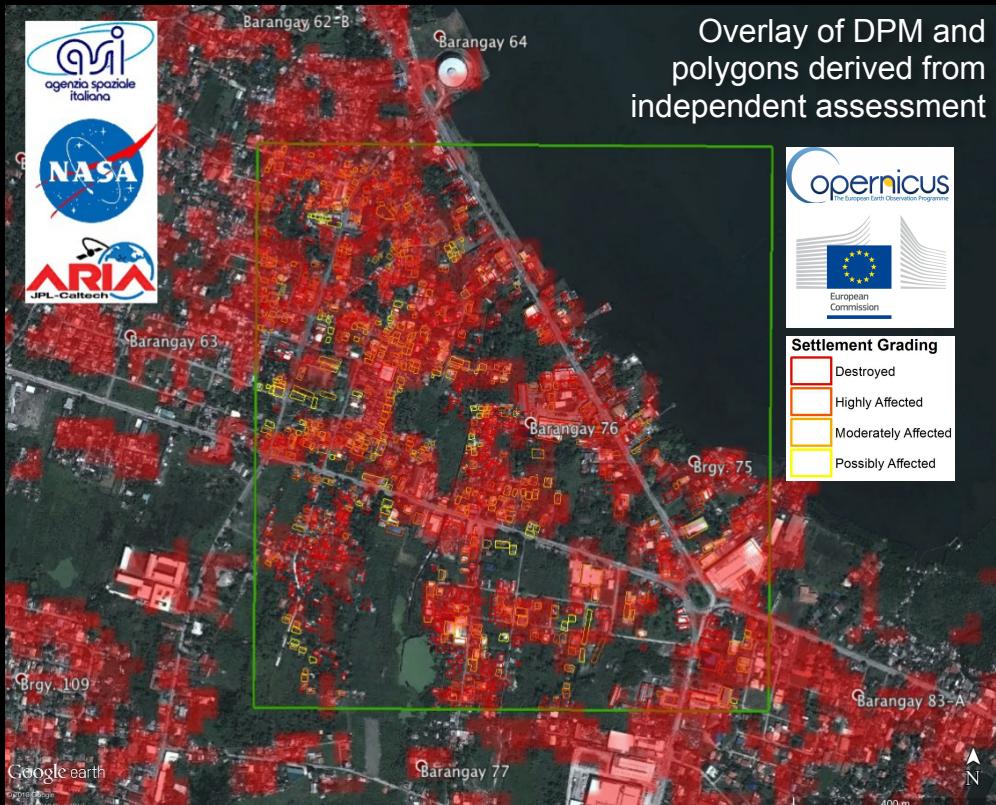
VIIRS 750 m Day Night Band, 31 October 2012

Super Typhoon Haiyan Damage in Tacloban, Philippines Imaged with COSMO-SkyMed

- 2013-11-08 05:00 (UTC): Haiyan hit Philippines
- 2013-11-11 (Day 3): COSMO-SkyMed (X-band) data acquired
- 2013-11-11 (Day 3): Damage Proxy Map produced by ARIA



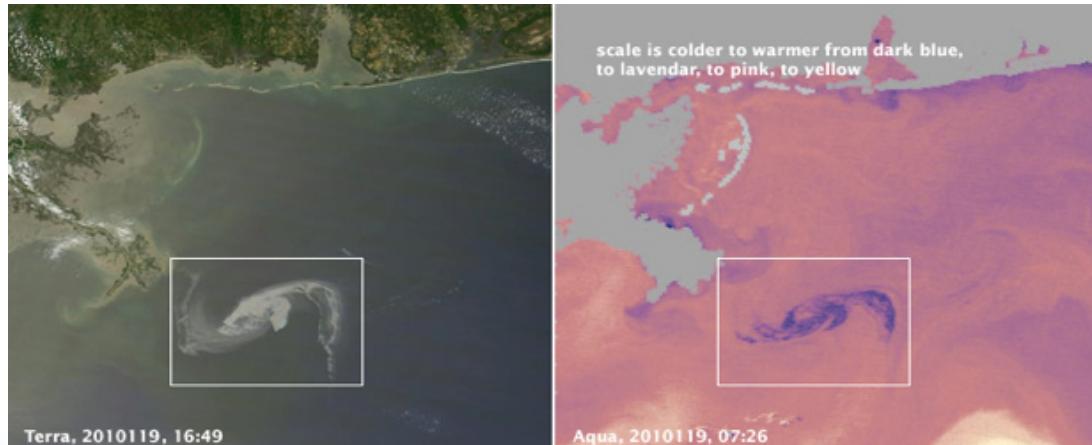
COSMO-SkyMed © ASI (acquired on 2013/08/15, 2013/08/19, 2013/11/11)



Damage grade polygons derived by Copernicus Emergency Management Service from visual interpretation of before – GeoEye-1 © Digitalglobe (2013/11/10) and after – Pleiades © CNES (2013/04/07) optical images



NASA Response to the Deep Water Horizon Oil Spill



Satellites: monitored the extent of the spill daily

- Terra & Aqua / MODIS – visible and infrared daily synoptic
- Terra / ASTER – visible, near IR and thermal IR high res
- EO-1 / Advanced Land Imager and Hyperion – highest res
- Terra / MISR and CALIPSO / CALIOP

Airborne sensors: Measured spill extent and oil volume

- ER2 / AVIRIS and DCS: **18 sorties, >120 flight hours**
- Twin Otter / AVIRIS: **32 sorties, 107 flight hours**
- B200 / HSRL: **5 sorties, 16 flight hours**
- UAVSAR: **22-24 June, 4 sorties, 21 flight hours**

Data provided for use by first responders; NOAA used radiances to initialize trajectory model; USGS used data to detect oil concentrations

NASA's Data Repository for National/International Disaster Response



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NASA's Near Real-Time Data Systems



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Hazards and Disasters

LANCE EOS data and imagery enable users to get a snap shot of the Earth in near-real time. This timely data is useful for a range of applications e.g. to detect fires, track smoke, ash and dust plumes; to monitor aerosols, carbon monoxide and sulfur dioxide, which in turn are useful for air quality assessments; and to determine the extent of sea ice, snow, and flooding which are useful to support shipping in the polar regions and to allow rapid assessment of areas worst affected by snow or flood water. Visualize the data by category in [Worldview](#).

NOTE: [Worldview](#) currently does not work with Internet Explorer.

[Register](#) to start downloading data.
Please read the [disclaimer](#) for more information about using the data.

Air Quality
AIRS data have been used to track propagation of toxic gases like Carbon Monoxide (CO) from massive fires; accurate early warnings of such pollution spikes are useful because they give people the option to reduce their risk of exposure to poor air by limiting outdoor activity at these times. Air quality forecasters use NRT data from LANCE to improve some local and national air quality forecasts.

Ash Plumes
MODIS imagery are useful for identifying and tracking ash plumes from volcanic eruptions. The use of NRT satellite data for monitoring volcanic plumes is undergoing further developments to enable quantitative retrievals to be produced, which should enable a global capability for volcanic ash monitoring to be introduced.

The Whole Earth at 250m Twice a Day Online



Information Delivery: Fires

Challenge: Fire managers (especially in remote locations) need timely information on fires still burning in and around their areas of responsibility.



Terra & Aqua satellites possess sensors to identify thermal anomalies and active fire locations.

Fire Information Sent Out via Rapid Response System
Email alerts, SMS/Text messages, images, active fire data

Monitoring Levees and Subsidence in the Sacramento-San Joaquin Delta



Bradford Island levee monitoring

On August 28, 2009 a ship rammed the north levee on Bradford Island. This image was made from an interferogram between UAVSAR data collected on July 17 and Sept. 10, so evidence of the impact and repair are seen in the data. We have been using the data from this project to monitor the repaired levee for changes since the damage occurred.

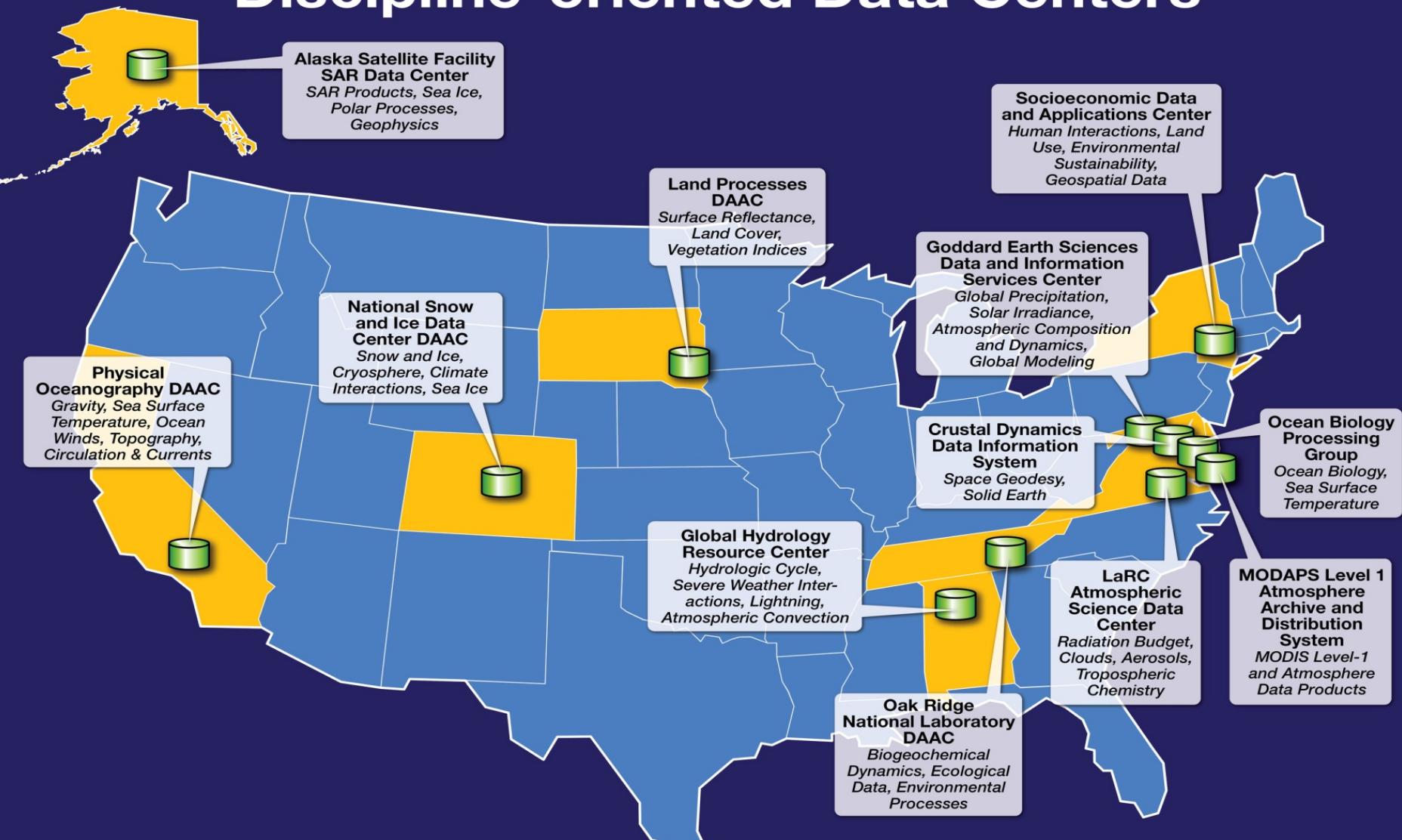


Bradford Island north levee damage, Sept. 2009 [photo courtesy of Ca. DWR]

UAVSAR – An L-band Synthetic Aperture Radar Optimized for Small-Scale Surface Change Detection
Studies Differential Interferometry is a technique that compares two radar images of the same location made at different times to detect small-scale surface deformation.



Discipline-oriented Data Centers



Whither a Decision Support Catalog



- Aggregations/collections of pertinent data and information for improving responses to extreme weather events are inherently useful.
- NASA has been an active promoter and funder of the development of systems allowing the seamless sharing of data and information across heterogeneous networks and interfaces.
- There are opportunities to improve our timely delivery of information to communities needing access to information for extreme weather and disaster response. These systems often have a means for outside users to leverage or ‘build to’ these service via APIs, subscriptions and other means.
- Despite our best intentions it is likely that gaps will remain to be bridged regarding the use, usefulness, understanding and latency of NASA data for disaster support.