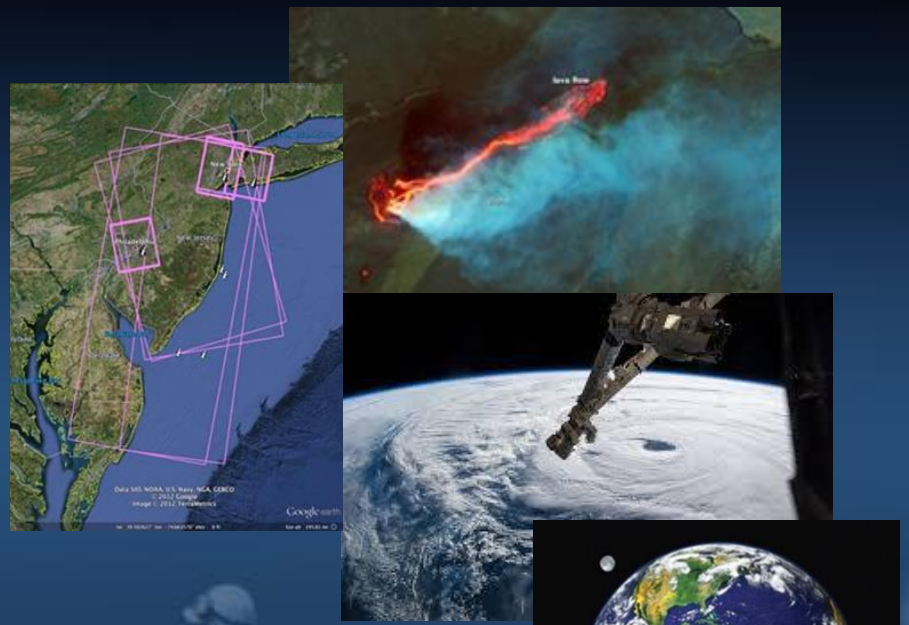
"From Response to Resilience: Space and Disaster Risk Management"

A NASA Perspective?

31st Space Symposium,
Colorado Springs, CO
April 16, 2015



Dr. David Green

Program Manager for Disaster Applications

NASA HQ, Earth Science Division

Overview

NASA Applied Earth Science

- Enabling the DRM cycle – Research to Application
- Communicating Needs and Strengthening Capabilities
  - Near real time data, products and tools
  - Missions and integrated observations - present and future
- Assessing Hazards, Vulnerability and Risk

International to Intergovernmental Collaboration

- Research, Demonstration, and Capacity Building
- Open Data and Data Sharing
- Disaster Response 'the Charter' and Recovery?
- Integrated observations, gaps and opportunities
- Strategy to Implementation (public and private)

Enabling Disaster Risk Management and Reduction

Observation and monitoring

for disaster risk planning, decision making, cost benefit and effective investment

Data management and analysis

for standard collection, sharing and open exchange (near real time to retrospective)

Modeling and Mapping

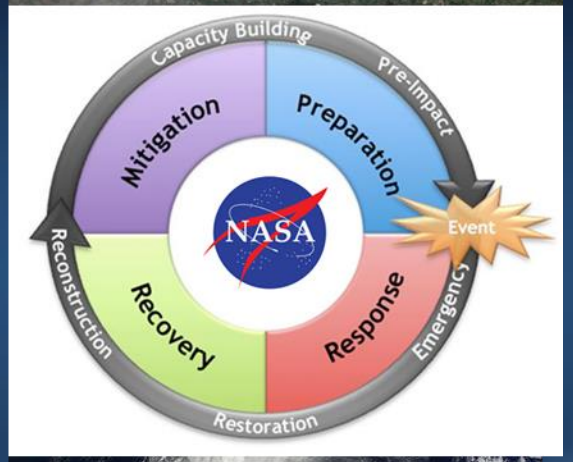
derived data products for practical and accepted application, readiness and response

Assessment and Prediction

data and information products and tools for early warning, restoration and recovery

Response and Recovery

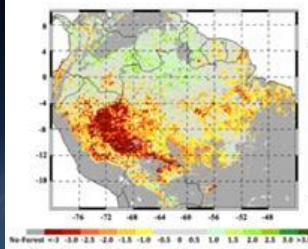
Capacity Building and Education

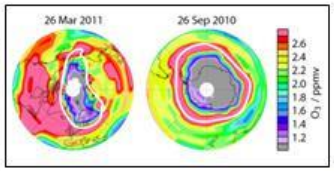


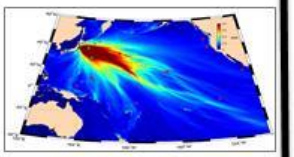
http://earthobservatory.nasa.gov

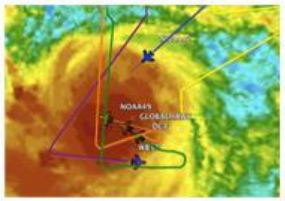
NASA Earth Science – Global and Multi-hazard

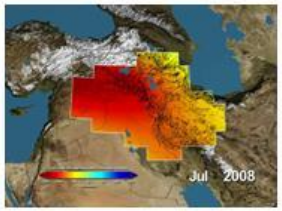
Research

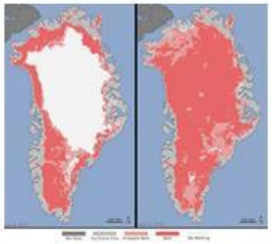




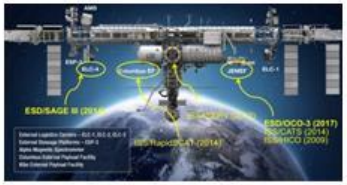




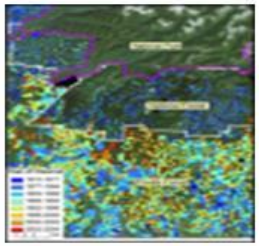


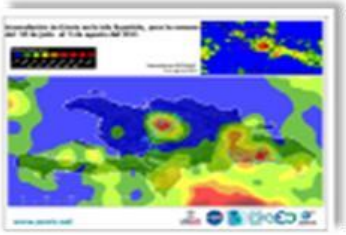


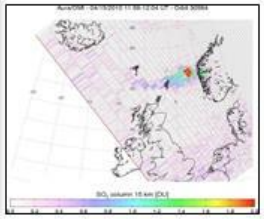
Flight

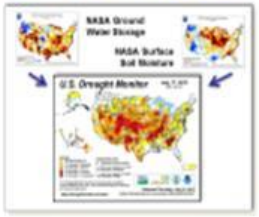


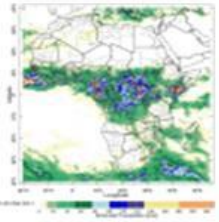
Applied Sciences





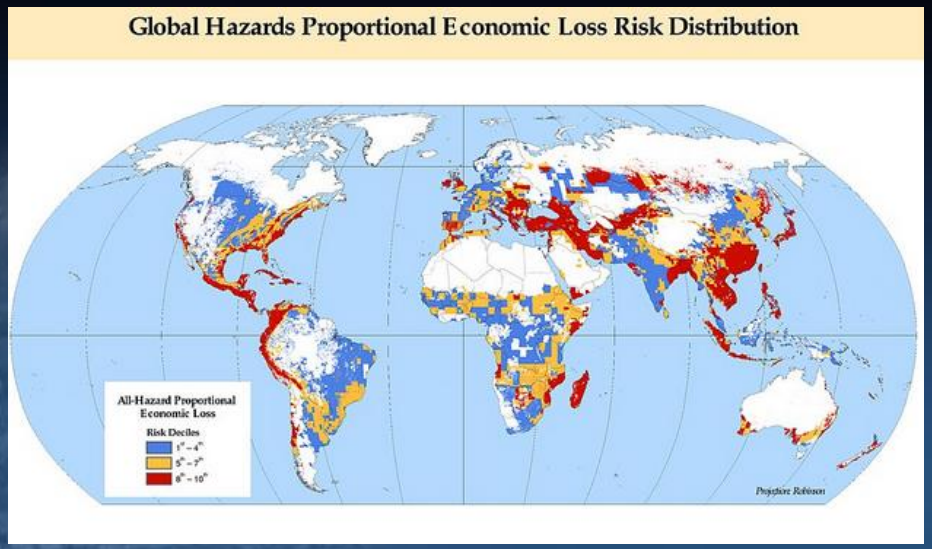






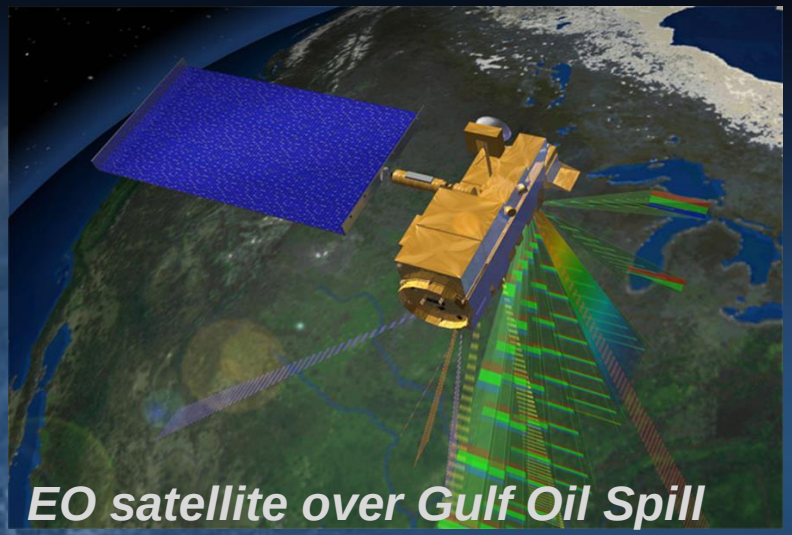
Technology

NASA Earth Science – Global and Multi-hazard



earthquake, landslide, glacier flood, debris flow, volcanic eruption/ash, tsunami, wild fires, dust storms, hurricanes, tropical cyclones, floods, droughts, … crop loss, infrastructure damage, … risk assessment,…

Observation and Monitoring



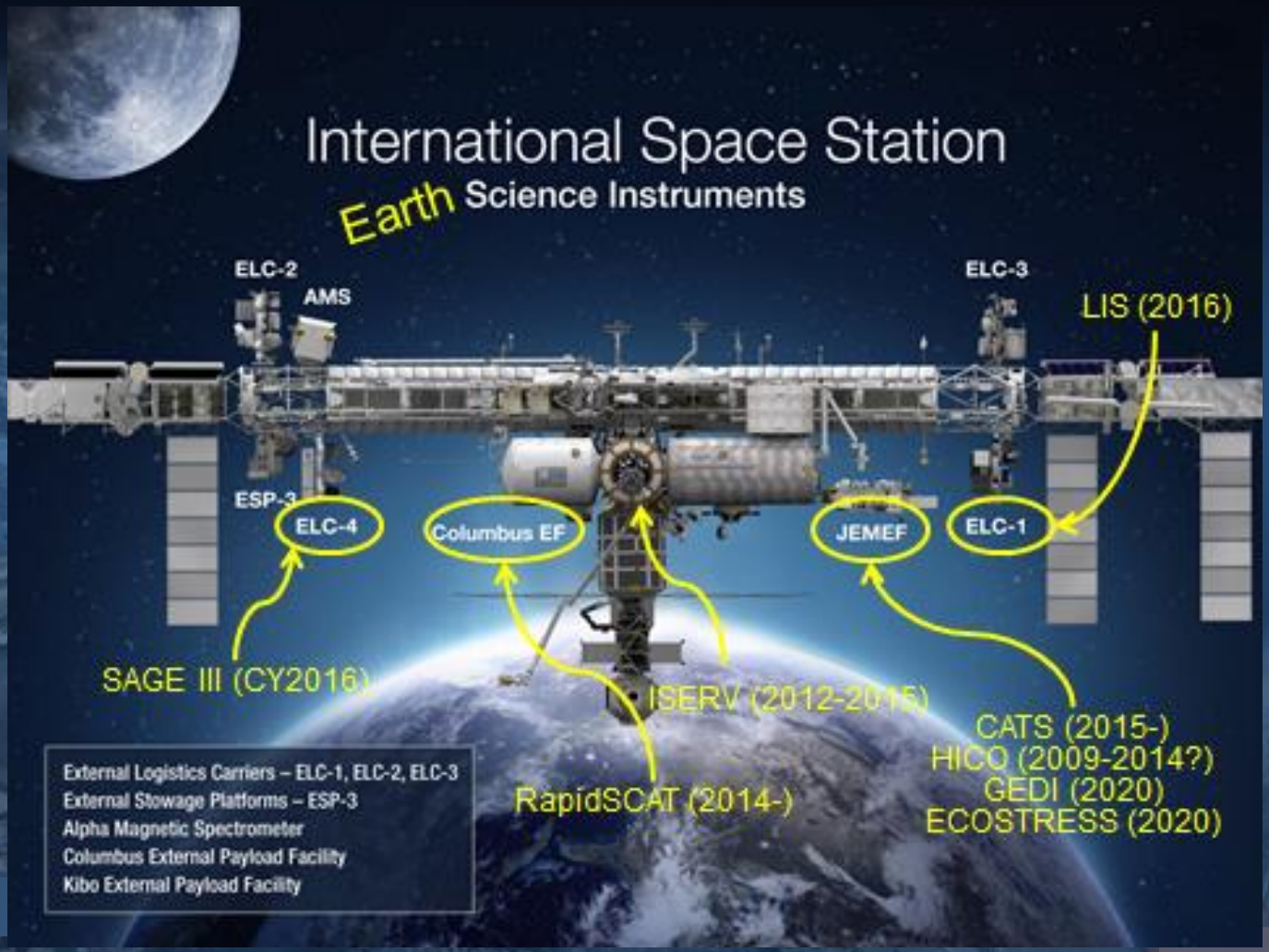
Observation and Monitoring - Recent and Future Planned Missions and Instruments

- Exploration Systems Development (ESD)-developed missions -
  3 launched in CY 2014/15

  11 more ESD EO launches before 2022

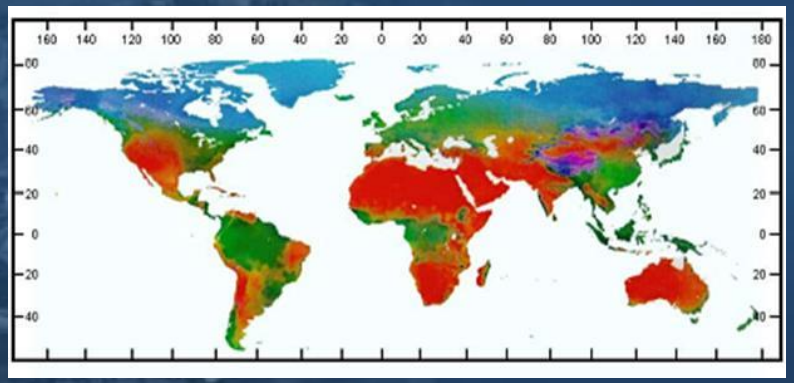
- ISS instruments
  2 in 2014,
  1 in 2016

Observation and Monitoring - Recent and Future Planned Missions and Instruments



Modeling and Mapping – Moving data to information

Apply NASA's remote sensing observations, modeling, and analysis capabilities to provide hazard and disaster information where and when it is needed.



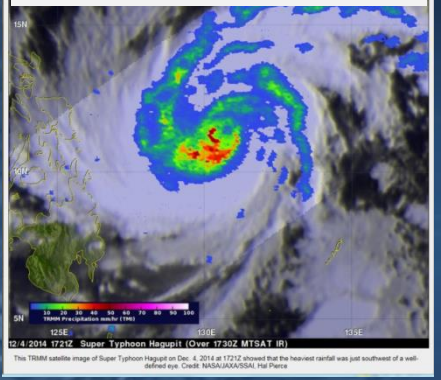
Land Evaporation Biosphere Productivity, soil moisture; freeze/thaw/radiation

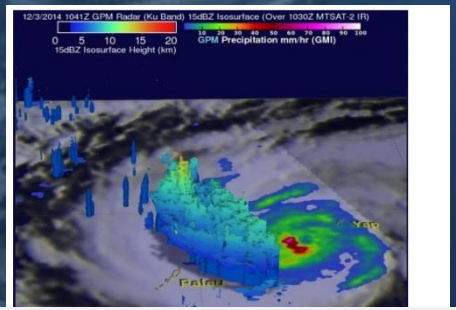
Real-time GPS/seismic Displacements

Volcanic ash plume; cyclones….
http://earthobservatory.nasa.gov

NASA monitors and analyzes Super Typhoon Hagupit's rains and wind on the Philippines

TRMM image on Dec. 4, 2014 at 1721Z showing heavy rainfall





GPM, 1041 UTC Dec 3 showing rain fall of 138 mm/hr in western side of Hagupit's eye

NASA provided forecasters at the Joint Typhoon Warning Center with valuable data on Super Typhoon Hagupit that supported the Philippine national weather agency and the National Disaster Risk Reduction and Management Council guiding decisions for early and targeted evacuation

NASA's Terra satellite, NASA/JAXA's GPM and the RapidScat instrument have provided rainfall and wind data and NASA-NOAA's Suomi NPP satellite provided additional imagery

NASA Mapping Deadly Floods - Informing Risk and Guiding Response and Recovery

November 14, 2014: "Floods and landslides wreak havoc across northern Italy. 5 people dead so far and damage estimated near $US150M (http://floodlist.com/europe/deaths-flooding-continues-italy)

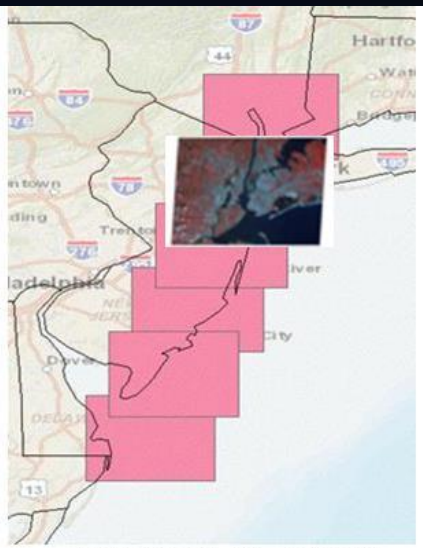
- NASA PI posts "Featured Flood" online to alert responders, Red Cross, and community of immediate risk relative to 10-year flood thresholds, integrating local news, gauge and historical data: http://floodobservatory.colorado.edu/
- MODIS NRT processor maps flood extent; Microwave radiometry using NASA/JAXA AMSR-2 sensor aboard GCOM-W quantifies severity at River Watch sites 660-663 (red dots) guiding response.

Red: Flooding within past 14 days. **Light Red**: Flooded during this event, now dry. **Dark blue**, Permanent water, February, 2000 (SWBD*). **Very light blue**, All flooding mapped since yr 2000. *NASA Shuttle Water Boundary Data. Daily updates published at: http://floodobservatory.colorado.edu/Version3/2014Italy4205.html

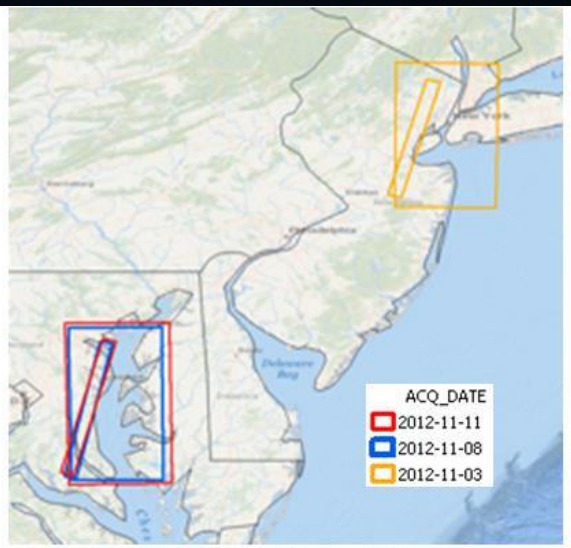
NASA Disaster Research and Applied Science

Working seamlessly with other agencies to aid the government and private sector in meeting the challenges associated with the full cycle of disaster management and risk reduction.

NASA Enabling Disaster Response 'Superstorm Sandy: Daily Recovery Support To FEMA

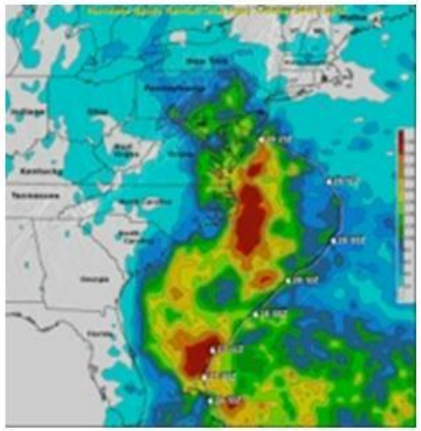


ASTER VNIR 4Nov 2012 16Z



EO-1 3, 8, and 11 Nov 2012

Aqua and Terra MODIS, 23 August 2011, Clear Image



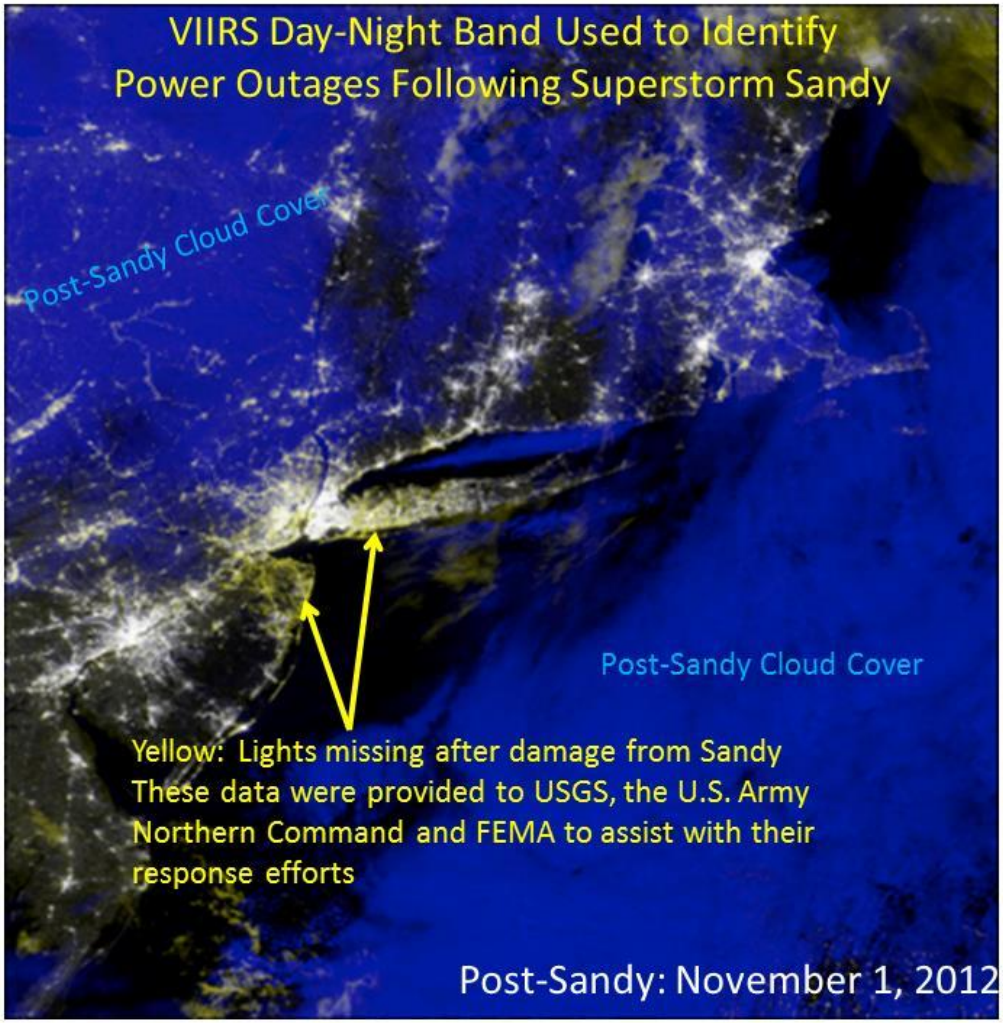
TRMM Rainfall Total Analysis 29 Nov 2012

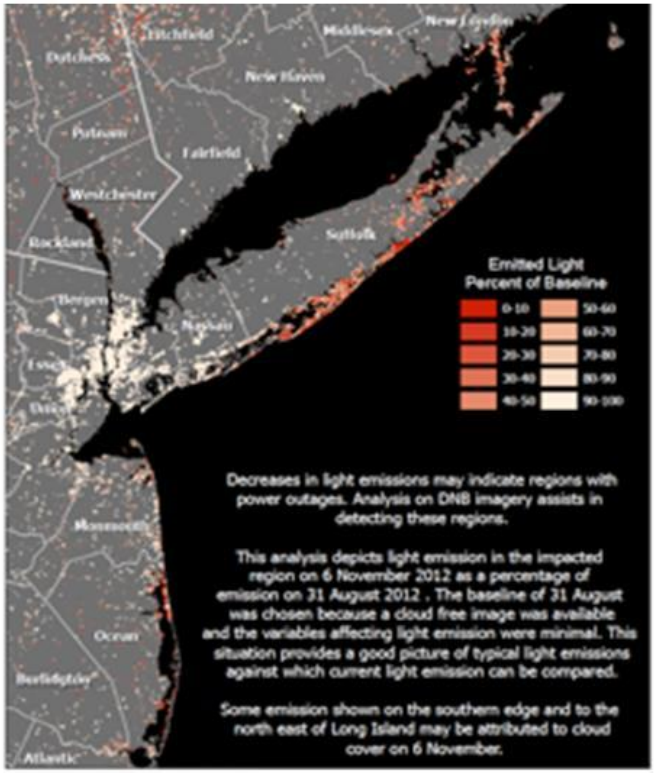
MODIS Flood Map, 7-8 Nov 2012

VIIRS 750 m Day Night Band, 31 October 2012

30

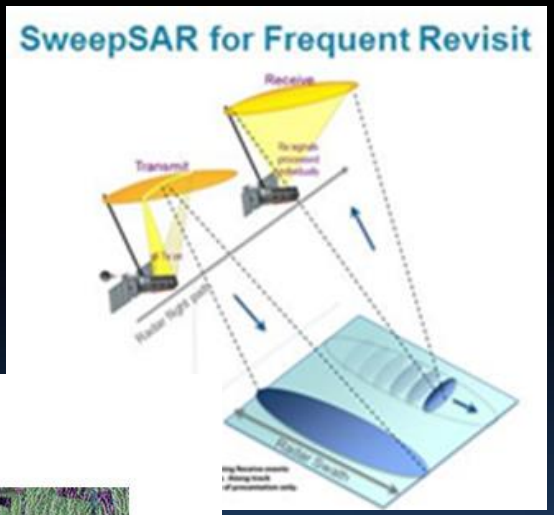
NASA Enabling Disaster Recovery 'Superstorm Sandy: Support Civil and Military agencies

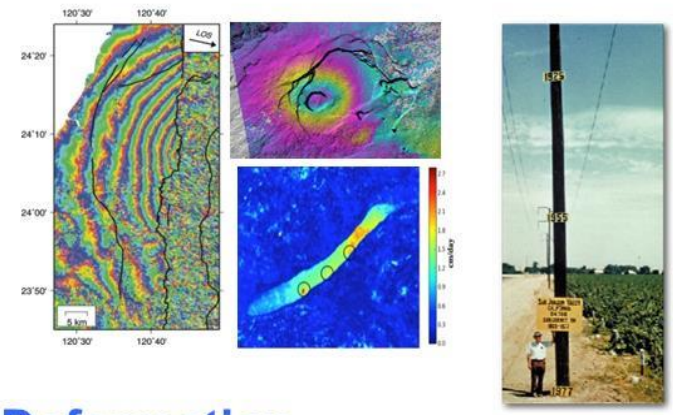




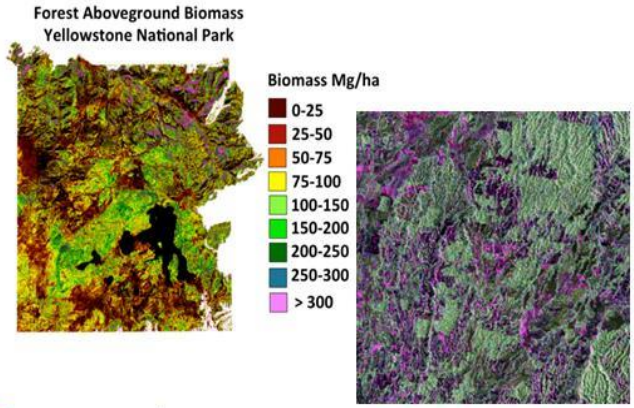
SPoRT provided VIIRS data to the Joint Task Force Civil Support (JTF-CS) and the Department of Defense Northern Command (NORTHCOM). With SPoRT's support, analysts adapted the VIIRS data into their own product to help gauge power restoration in support of recovery efforts.

Future Collaborative Missions and Instruments – NISAR



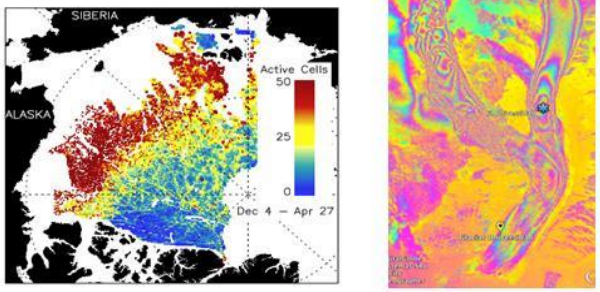


Deformation

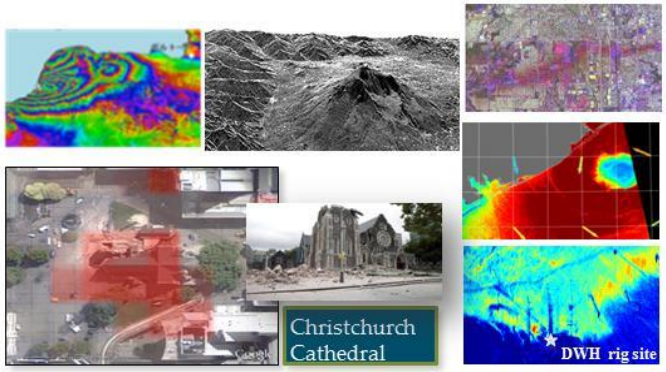


Ecosystem

Cryosphere



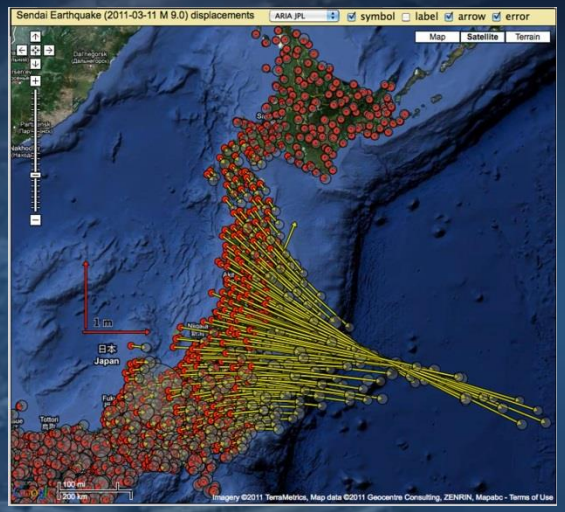
Hazard Response +Applications

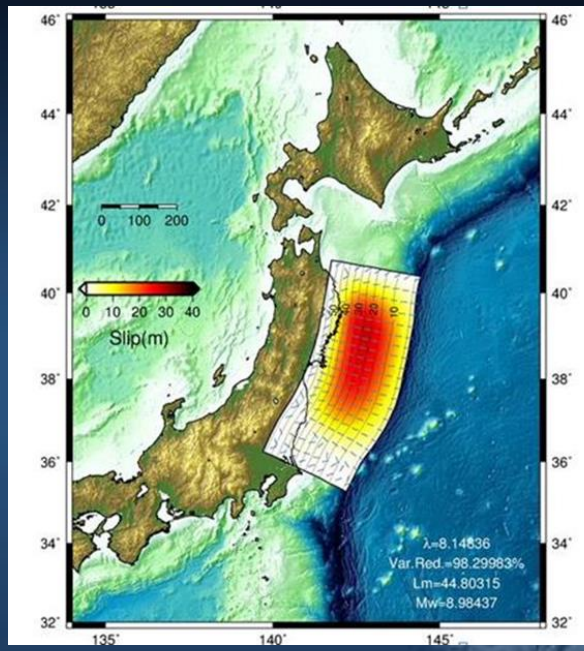


NASA Applied Science Enabling Operations

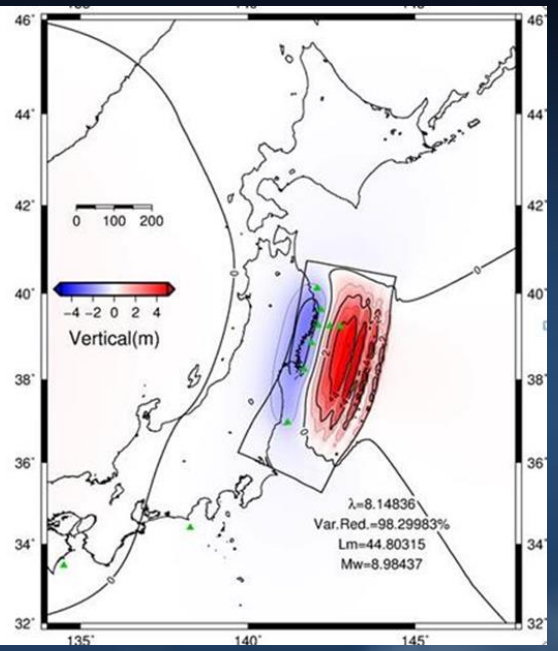
Working with other agencies and private sector to transfer research results and technologies to other organizations and to commercialization as they become routinely used and ready for operations.

GPS-Aided and DART-Ensured Real-time Tsunami Early Detection System





Source Model

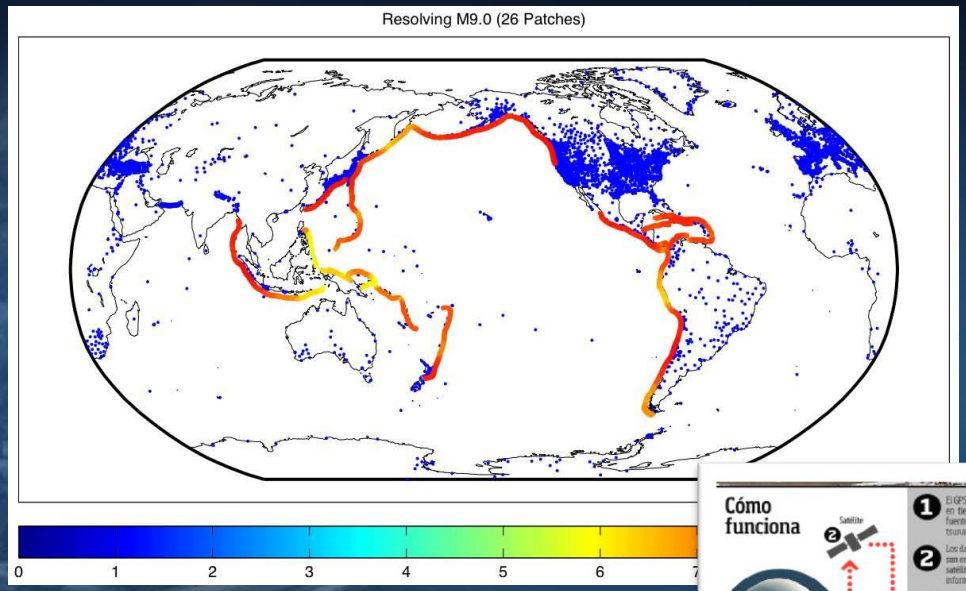


Sea Floor Deformation

Earthquake Model: 2011 Mw 9.0 Tohoku-oki Earthquake

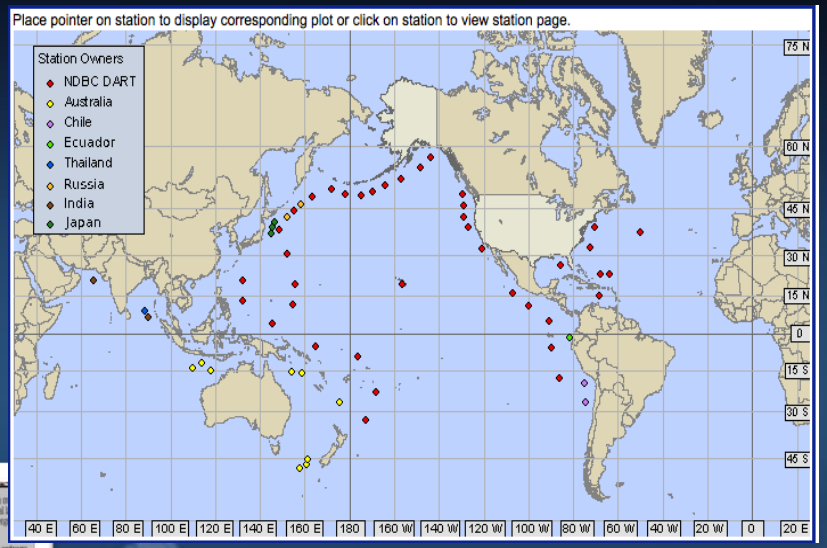
Global Partnerships to Advance Tsunami Early

GNSS stations: blue dots



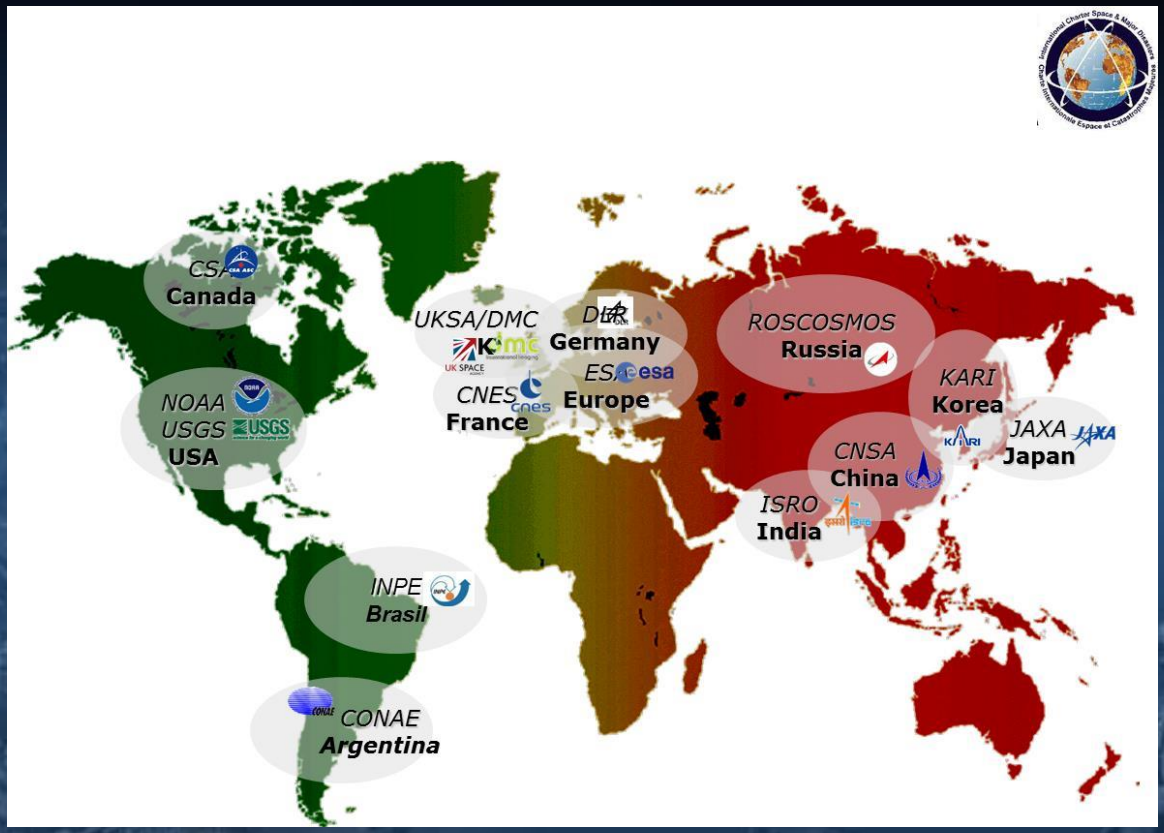
Moment magnitude

DART stations:



Deep-ocean Assessment and Reporting of Tsunami (DART) Network

The International Charter: Space and Major Disasters



- Fast access to satellite data to help manage natural and technological disasters.
- Universal access to data for the benefit of societies worldwide in times of disaster.
- USGS and NOAA are U.S. agencies representing the International Charter and supported by NASA.

Dr. David Green
david.s.green@nasa.gov

NASA Earth Science
Applied Sciences Program
NASA Headquarters
Washington, DC

http://AppliedSciences.NASA.gov