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# **Gulf Oil Spill (GOSpill)**

## **According to NASA Earth Science**

Presented to the SDR

Michael Goodman

3 June 2010



# MODIS Synoptic Coverage

MODIS view on 21 April 2010

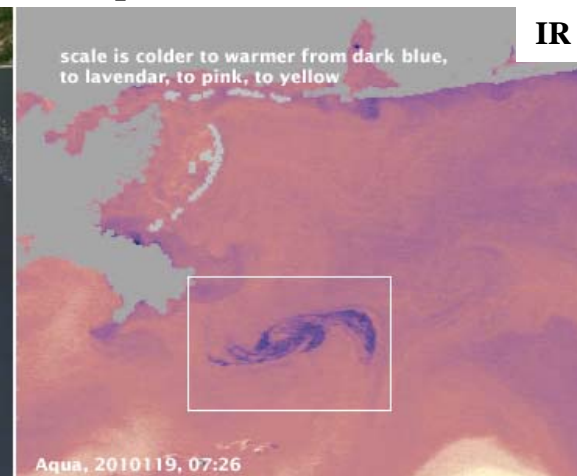


MODIS views on 29 April 2010

Visible



IR



**Satellite instruments: continually monitoring the extent of the spill:**

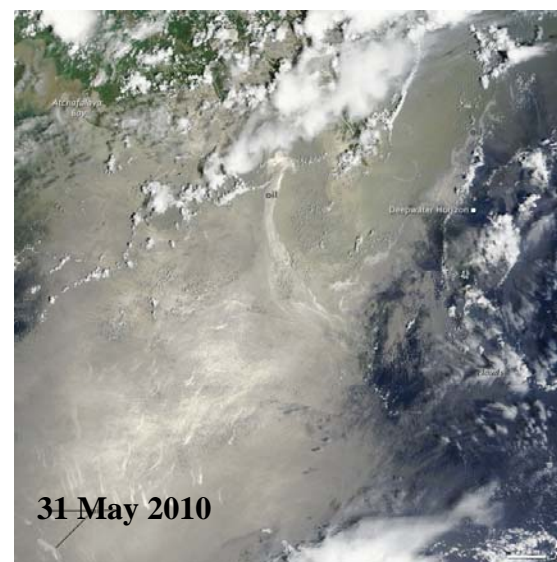
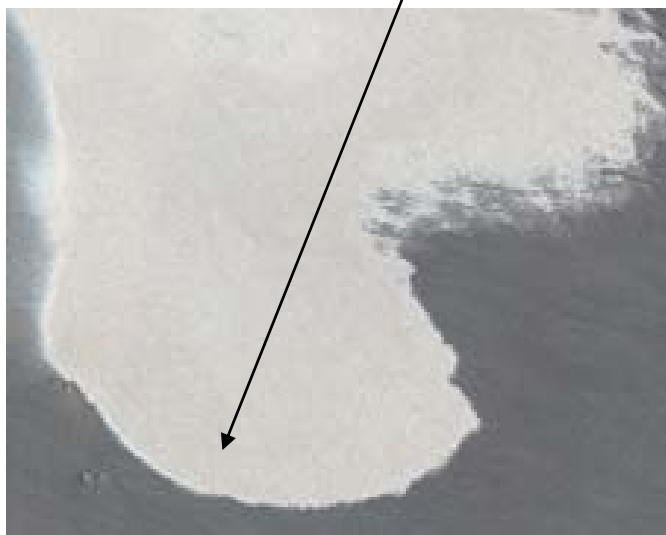
- Terra & Aqua / MODIS – visible and infrared daily synoptic
- Terra / ASTER – visible, near IR and thermal IR high res
- Terra / MISR – multi-angle Image Spectral
- EO-1 / Advanced Land Imager and Hyperion – highest res
- CALIPSO / CALIOP - lidar



# Evolution of the Oil Slick



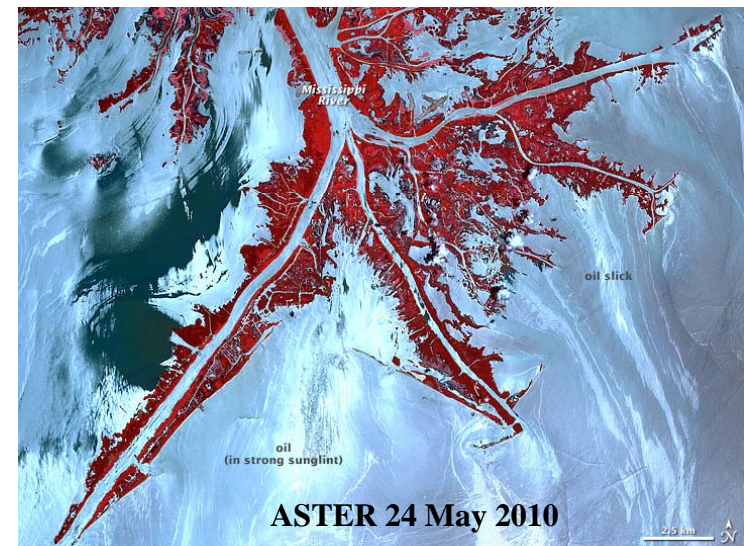
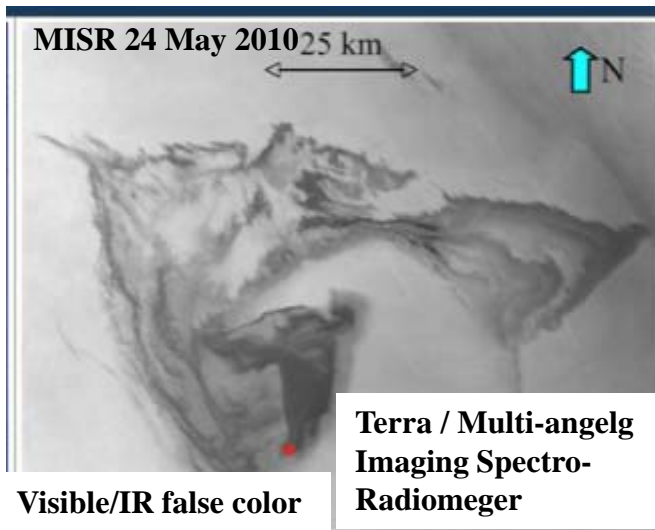
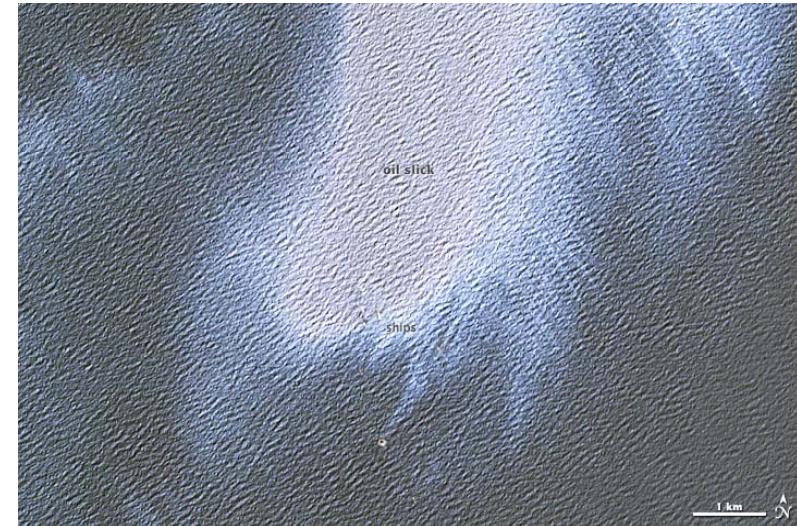
**MODIS image at 250 km res compared to high resolution  
Advanced Land Imager w/ 37 km resolution on 1 May 2010**





# Other NASA Spaceborne Assets

Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) 24 May 2010

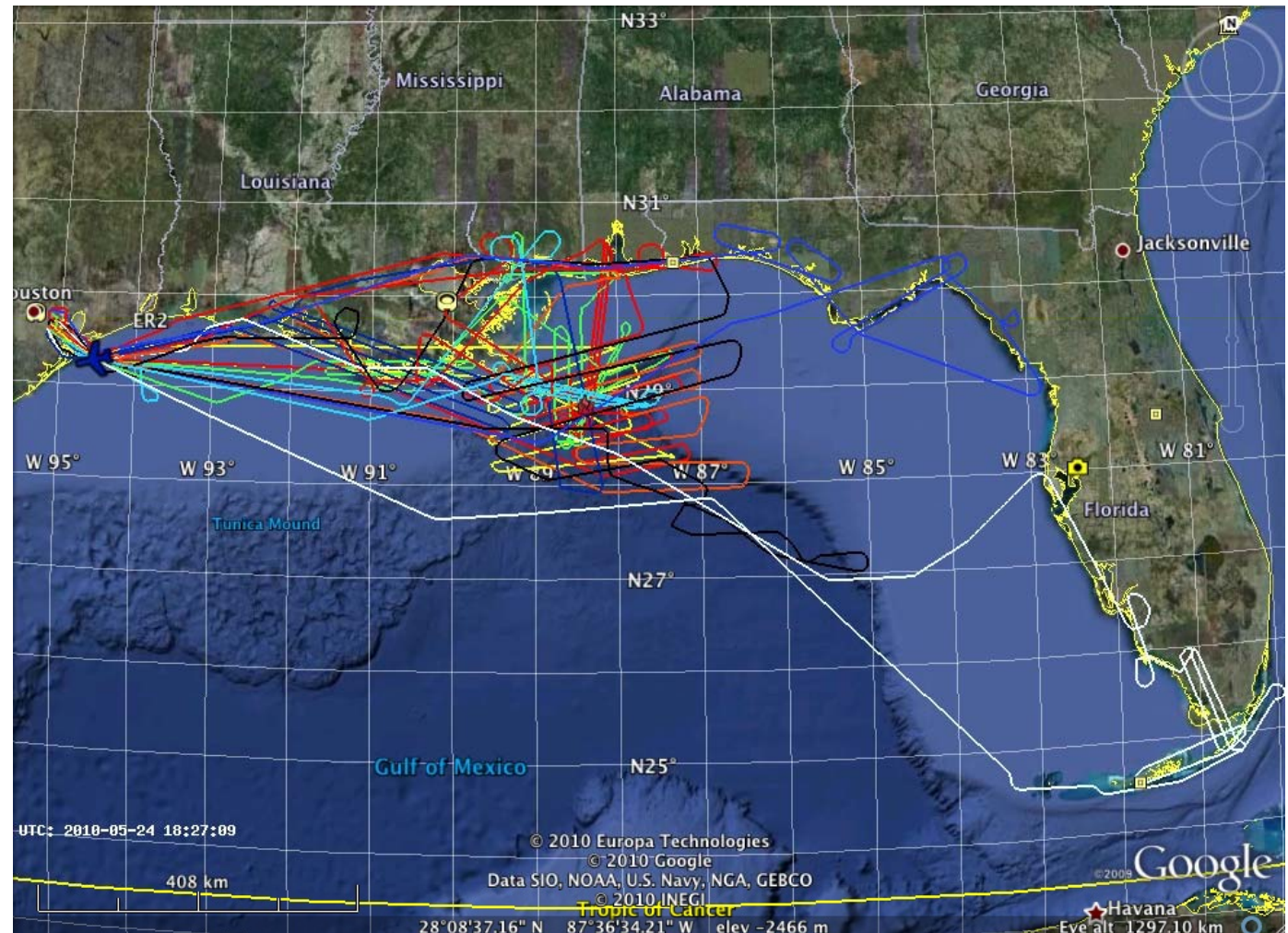




# Airborne Observations of GOSpill

**Airborne instruments are measuring the extent and volume of the spill:**

- **ER-2 / AVIRIS & DCS**
  - 11 flights: 6–25 May 2010
  - Data and products being provided to USGS distribution center for use by first responders to position equipment and for analysis of slick volumes
  - Mapping of coastal zone
- **B-200 / HSRL**
  - 2 flights: 10-11 May
  - Validation of satellite lidar CALIOP
- **G-III / UAVSAR**
  - June flight TBD
  - Health of coastal ecosystems



**ER-2 flight tracks (11) with the Airborne Visible Infrared Imaging Spectrometer and Cirrus Digital Camera System for the period 6 – 25 May 2010**



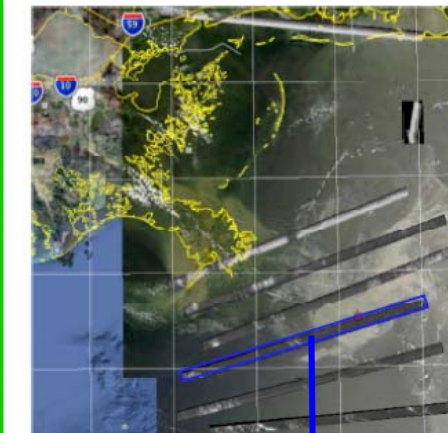
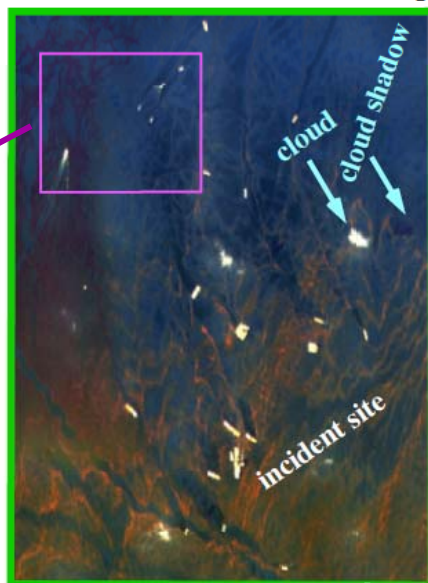
# Closer Look at AVIRIS and MODIS in GOSpill

## AVIRIS Quicklook 17 May 2010

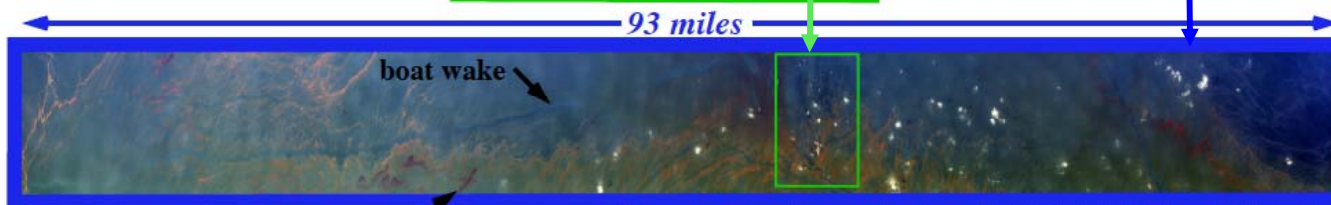
Airborne remote sensing observations of oil slick and oil spill operations.\*



Boom operation. Note oil thickens towards boom apex, near skimmer.



AVIRIS quicklooks and MODIS Terra



thick oil emulsion, ?dispersant sprayed?

93 miles

\*interpretation in consultation with NOAA, USGS, and Clean Seas

AVIRIS calibrated radiances provided to USGS-Denver Spectroscopy Lab for their application to derive Gulf of Mexico surface oil volume estimated between 130,000 and 270,000 barrels. Oil volumes to be provided to NOAA/NOS / Office of Response and Restoration as input into ocean oil trajectory models

# USGS science response activities: Deepwater Horizon oil spill

SDR round-robin presentation – June 3, 2010

USGS Responds to Deepwater Horizon Oil Spill - Windows Internet Explorer

http://www.usgs.gov/deepwater\_horizon/

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### USGS Responds to Deepwater Horizon Oil Spill

Note: We will be continually updating this page as more information is made available.

The USGS continues to mobilize equipment and personnel to gather scientific data and information on the environmental impacts of the oil spill to affected coastal habitats.

USGS scientists will be:

- Collecting satellite imagery to assess the impact on wetlands and coasts
- Developing maps showing NOAA projections of spill trajectory with respect to DOI Lands
- Collecting samples to ascertain source and levels of toxicity to soils and water systems
- Conducting tests to determine cause of mortality of wildlife
- Developing models that depict how local tidal and current conditions will interact with seafloor bathymetry to carry oil over barrier islands
- Providing decision support tools to help DOI land managers mitigate the effects of the oil spill and assist in restoration efforts

#### Coastal Impacts

- [Local Tidal and Current Conditions to Characterize Relative Risk and Extent of Oil Deposition](#)

#### Satellite Imagery and other Geospatial Data

- [Deepwater Horizon Oil Spill 2010](#) gallery (continually updated)
- [Hazards Data Distribution System \(HDDS\)](#) Full-resolution GeoTIFF and JPEG images.

#### Related Links

- [Joint Information Center \(JIC\)](#)
- [Department of the Interior \(DOI\)](#)
- [U.S. Fish and Wildlife Service \(FWS\)](#)
- [Minerals Management Service \(MMS\)](#)
- [National Park Service \(NPS\)](#)
- [Department of Homeland Security \(DHS\)](#)
- [U.S. Coast Guard \(USCG\)](#)
- [Environmental Protection Agency \(EPA\)](#)
- [National Oceanic and Atmospheric Administration \(NOAA\)](#)
- [U.S. Air Force \(USAF\)](#)



[http://www.usgs.gov/deepwater\\_horizon](http://www.usgs.gov/deepwater_horizon)

# Estimating the flow rate

- National Incident Command Flow Rate Technical Group
  - Federal and university scientists and engineers chaired by USGS Director Marcia McNutt
  - Three separate methodologies: Mass balance, plume modeling, and riser insertion tube tool
  - 12,000 to 19,000 barrels per day

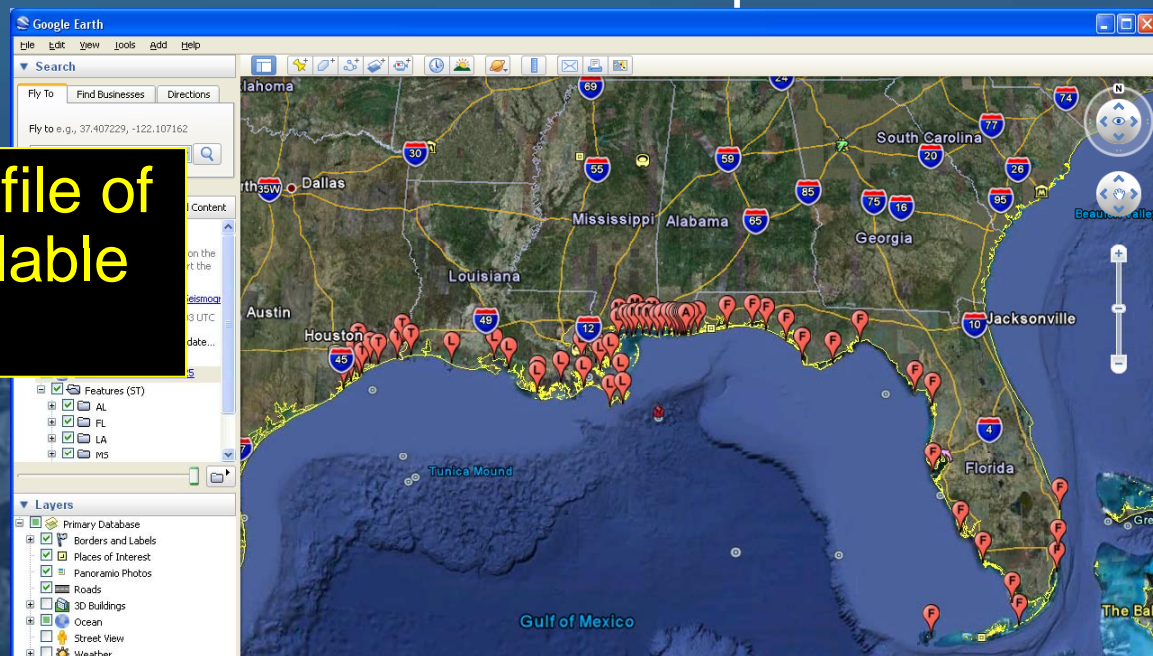




# Baseline water/sediment/flora sampling

- USGS has completed water and sediment sampling on the coast and barrier islands in Texas, Grand Isle, LA, coastal Alabama, Mississippi and the Florida Panhandle to capture baseline conditions.
- Work with NPS in South Florida to coordinate collection of water-quality samples, conduct sea-grass bed surveys, and deploy semi-permeable membrane devices to sample lipids or fat-soluble semi-volatile compounds.

Google Earth KMZ file of sampling sites available on USGS website



# Geospatial response

- The International Charter for Space and Major Disasters activated at request of NOAA and U.S. Coast Guard.
- Imagery and other geospatial products posted to USGS Hazards Data Distribution System (<http://hdds.usgs.gov/hdds/>) web portal.
- USGS EROS Data Center staff facilitate the interagency Remote Sensing Working Group, which coordinates requirements and products.
- Constructing detailed maps depicting habitats, topography, and bathymetry that cover NPS and FWS protected areas along Gulf Coast.
- Provide predictions of overwash for barrier islands within NPS and FWS protected areas for guidance on the locations of probable oil deposition on beaches.

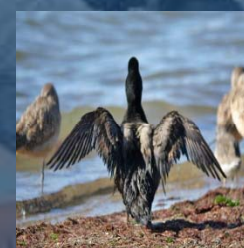
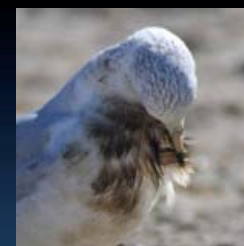


USGS Science Response Vehicle at USFWS Ops Center, Houma LA



# Biological response

- USGS is creating map products of sensitive species in the affected region, and compiling a list of all Threatened and Endangered Species and Species of Special Concern for the Gulf coast states and Atlantic states through the Carolinas.
- USGS National Wildlife Health Center providing USFWS and NOAA with gross external and internal examinations of carcasses and documentation of oiling via photographs for sea turtles, pelicans, and marine mammals.
- USGS is using low-level aerial surveys and oblique photography to determine damage to the mangroves from the 2010 winter freeze and under pre-oil conditions.





U.S. Department of Energy  
Office of Electricity Delivery and Energy Reliability

# Deep Water Horizon Activities

U.S. Department of Energy  
3 June, 2010



U.S. Department of Energy  
Office of Electricity Delivery and Energy Reliability

## Expert Consultation with BP

- Secretary Chu leading effort with a small team of senior scientists
- Backed up with support from ~150 personnel
- Efforts Include:
  - Gamma Radiography of the Blow Out Preventer (BOP)
  - Hydrodynamic/Two Phase computer flow models
  - Assisting with Imaging and Sampling of the Seafloor
  - Independent Evaluation and Risk Assessment of options



U.S. Department of Energy  
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## Flow Characteristics/Flow Estimation Modeling

- Effort Led by National Energy Technology Lab
- Development of End to End Oil Flow Model
  - Reservoir to Well to BOP to Riser
  - Analyzing Flow Indicators to Tune Model
    - No actual pressure and flow data
    - Utilizing secondary data collection (acoustical/visual)
- Analysis of Methane Hydrate Formation and Impacts