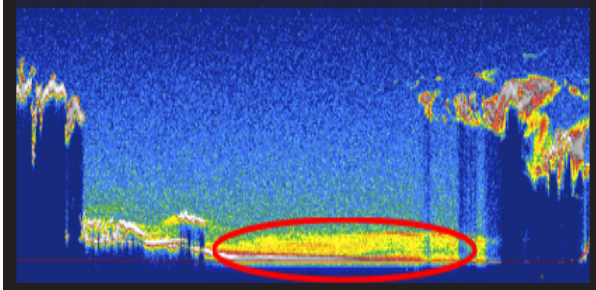
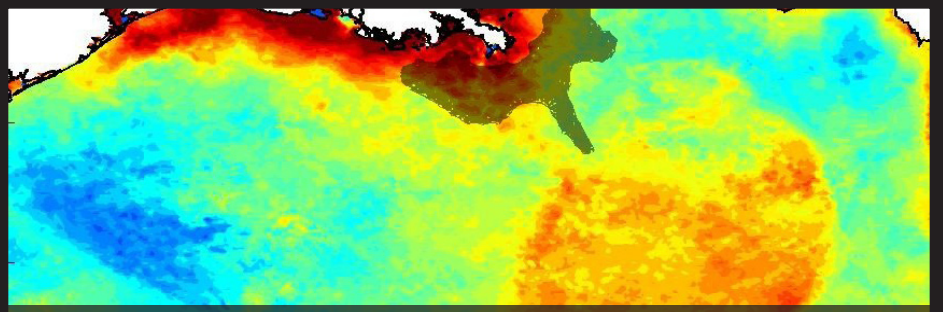
National Aeronautics and Space Administration

NASA Earth Observations Track the Gulf Oil Spill

Oil from the Deepwater Horizon spill laps around the mouth of the Mississippi River delta in this May 24, 2010, image from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) instrument on NASA's Terra spacecraft. The oil appears silver, while vegetation is red.

CALIOP view of the Deepwater Horizon oil spill on 2 May 2010. Red oval outlines the location of the aerosols over the oil spill.





MODIS Ocean Color imagery of Gulf of Mexico sea surface temperatures (SST) in relation to the oil spill (overlaid in black) for the first week of June 2010.

False-color image of the Gulf of Mexico oil spill (appears light blue) around the Deepwater Horizon site (red cross). Credit MISR team.

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Summary

In order to provide useful tools for responders and a better understanding of the environmental impacts, NASA scientists and research partners are contributing satellite and airborne data in the wake of the oil spill in the Gulf of Mexico.

Current research projects are making use of NASA's active and passive remote sensing capabilities to monitor the ever-changing oil slick. One such project is developing new algorithms to provide rapid and enhanced spaceborne monitoring of oil spills. This project is part of the NASA Gulf of Mexico Initiative, which began in response to the impact of hurricanes Katrina, Dennis, Rita and Wilma in 2005 and seeks to enhance the ecological and economic health of the Gulf. NASA is working to achieve these goals through use of expertise in remote sensing, oceanography, coastal processes, signal processing and mathematical modeling. Projects originally intended to monitor the effects of natural disasters are now being applied to study the effects of this human-caused one.

NASA has also mobilized its airborne assets to view and analyze the extent of the oil spill. As part of the national response to the spill, NASA deployed its instrumented research aircraft the Earth Resources-2 (ER-2) to the Gulf in May. NASA sent the ER-2 outfitted with the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) and the Cirrus Digital Camera System to collect detailed images of the Gulf of Mexico and its threatened coastal wetlands.

The AVIRIS team is measuring how the water absorbs and reflects light in order to map the location and concentration of oil, which separates into a widespread, thin sheen and smaller thick patches. Satellites can document the overall extent of the oil but cannot distinguish between the sheen and thick patches. While the sheen represents most of the area of the slick, the majority of the oil is concentrated in the thicker patches. AVIRIS is able to identify the these areas, helping oil spill responders know where to deploy oil-skimming boats and absorbent booms.

Another NASA research aircraft, the King Air B-200 from Langley Research Center in Hampton, Va., changed its flight plan to collect data over the area of the oil spill. The High Spectral Resolution Lidar (HSRL) onboard the plane uses pulses of laser light to locate and identify particles in the environment. HSRL provides measurements similar to those from the CALIOP instrument on CALIPSO. Data from these space-based and airborne lidars will be used to investigate the thickness of the oil spill below the surface of the water, evaluate the impacts of dispersants used to break up the oil and monitor oil-based aerosols that have evaporated into the atmosphere.

Researchers also plan to measure changes in vegetation along the coastline and assess where and how oil may be affecting marshes, swamps, bayous, and beaches that are difficult to survey on the ground. The combination of satellite and airborne imagery will assist NOAA in forecasting the trajectory of the oil and in documenting changes in the ecosystem.

NASA is also getting students involved. Interns with the DEVELOP National Program, part of NASA's Applied Sciences Program, have begun studying the Gulf oil spill using NASA's satellite and airborne sensors. Additionally, students have initiated outreach along the Gulf Coast to increase public awareness of NASA's contributions to the oil spill response efforts and promote the practical benefits of NASA Earth science data. Student researchers are using NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) off-nadir sun glint products to track oil extent, as well as the MODIS Ocean Color products to understand how sea surface temperatures are being affected by the oil. The team is also using the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) sensor onboard the Terra satellite and the USGS Landsat 5 Thematic Mapper (TM) sensor to measure surface reflectance for enhanced oil detection. Results from this research will be presented to local communities in the Gulf Coast to educate the public on the capabilities of Earth observations in enhancing recovery efforts and addressing coastal management issues.

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Key Websites:

NASA's Applied Sciences Program:
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NASA's Applied Sciences Program Gulf of Mexico Initiative:
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DEVELOP National Program:
develop.larc.nasa.gov