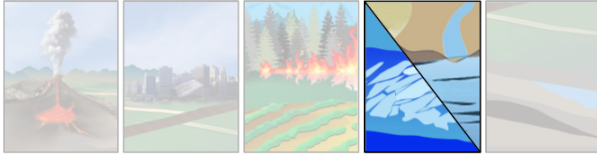




## NISAR: The NASA-ISRO SAR Mission



# Protecting Water, Land, and People from Oil Spills

Every year, emergency responders work to prevent hundreds of oil and chemical spills from harming people and the environment. Rapid identification of spilled oil in the vast open waters of the oceans and gulf is key to minimizing damage, and radar remote sensing can provide the necessary information.

### Searching for Oil Spills, 24 x 7 x 365

In a small area of the NOAA Center for Satellite Applications and Research building in College Park, Maryland, people sit at computers every hour of every day of the year searching for the first hint of an oil or chemical spill, downloading any image of the U.S. ocean and coastal waters as it becomes available. Early detection is critical to identifying the source of the spill, determining whether the release is accidental, intentional, or natural, and fielding responders to corral or collect the material before it spreads. Currently, this early critical phase of spill detection is hampered by lack of information, mainly because none of the satellite radars in operation—all operated by other countries—routinely image U.S. coastal waters. NISAR would change that, providing high quality radar images of U.S. coastal waters, even at night or when it is overcast, in any sea conditions.

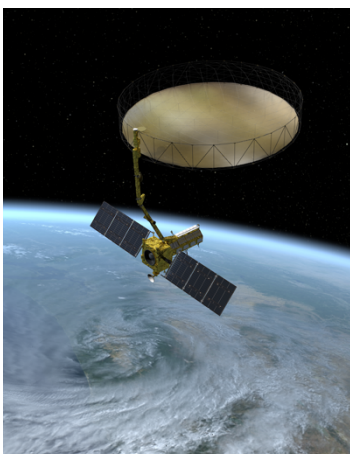


Photos: NOAA/Office of Response and Restoration

### Oil Spills: Frequent and Costly Accidents

In 2010, the *Deepwater Horizon* oil spill released an estimated 210 million gallons of oil into the Gulf of Mexico over a period of 86 days; the largest accidental spill in history. Though this spill was remarkable for its extent,

release volume, and duration, spills are not an infrequent occurrence: Every year the U.S. responds to hundreds of oil and chemical spills within its borders and to the influx of oil spread here from spills outside our waters.



### The NISAR Mission – Reliable, Consistent Observations

The NASA–ISRO Synthetic Aperture Radar (NISAR) mission, a collaboration between the National Aeronautics and Space Administration (NASA) and the Indian Space Research Organization (ISRO), will provide all-weather, day/night imaging of nearly the entire land and ice masses of the Earth repeated 4-6 times per month. NISAR's orbiting radars will image at resolutions of 5-10 meters to identify and track subtle movement of the Earth's land and its sea ice, and even provide information about what is happening below the surface. Its repeated set of high resolution images can inform resource management and be used to detect small-scale changes before they are visible to the eye. Products are expected to be available 1-2 days after observation, and within hours in response to disasters, providing actionable, timely data for many applications.



*Cont. from front page*

During the *Deepwater Horizon* spill, the International Charter, “Space and Major Disasters”, was activated to provide satellite-based Earth Observation data by the space agencies of all participating nations, to support the disaster response effort in the United States. This worldwide collaboration acquired and made available the radar data used to track the oil as it surfaced and spread in the Gulf of Mexico. The radar data was invaluable because radar, which emits its own energy pulses instead of relying on scattered sunlight, could see below the clouds to easily identify the oil slick on the surface. Oil damps the small-scale roughness of the water surface, reducing the amount of energy backscattered into the radar antenna. This makes it very easy to detect oil,

because it shows up in radar images as very dark areas within the brighter clean water.

Without the radar data provided by the International Charter, available only during major disasters for which the charter is activated, the U.S. would not have been able to track the spill nearly as quickly and without paying for the images.

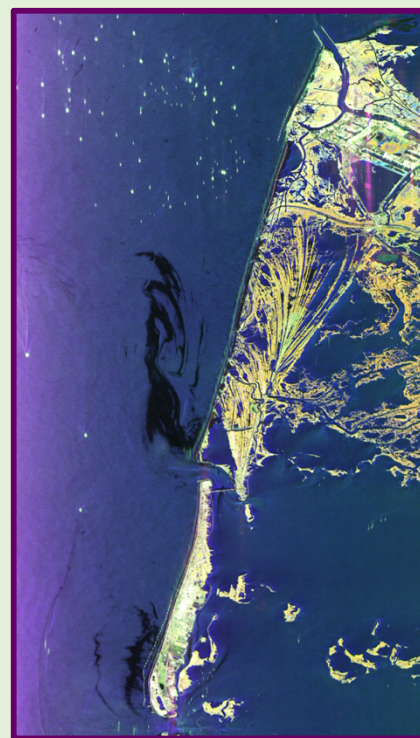
NISAR will change this situation. NISAR will be able to acquire images of U.S. coastal waters on every satellite pass over the entire border of the United States, so that we not only have the data during an emergency, but can identify the spills earlier. This will improve response time and even, for cases of intentional spills made from ships, identify and more readily apprehend those responsible.

### Radar Imaging of Oil-on-Water

Earth observations from space using the NISAR radar instrument will enable reliable and repeated measurements to be made of the coastal and inland large water bodies of the United States, all of which are sites of frequent accidental or intentional oil spills. Coastlines will be imaged by NISAR every six days. Oil slicks are particularly easy to identify using radar, because they show up as dark features, as is shown in the figure to the right. It is even possible to identify larger slicks on land in cases where they form smooth-surfaced puddles that can be resolved from space.

Oceanographers have long used radar to study ocean wave spectra, which gives details about the ripples on the ocean surface. Today, studies are underway to relate the changes in wave spectra to the amount or type of oil present on the water surface. In this way, radar could be used to go beyond detection of slicks, to identify where oil is concentrated within the slick in order to direct clean-up activities even more effectively.

*Right: Radar image of oil from the Deepwater Horizon spill nearing the beach of southeastern Louisiana. The oil slick shows up as a dark area in the open water, and in this false color image, the slick-free water is blue/purple in color. Oil smooths the water surface, reducing the backscattered energy, making it easy to identify slicks on open water with radar. This image was acquired with UAVSAR, which is the prototype airborne instrument for NISAR [modified from Jones et al., 2011].*



*Below: Photographs of spills and their impact. Credit: NOAA Response and Restoration Office, DHS*



National Aeronautics and Space Administration

For more information, visit <http://nisar.jpl.nasa.gov/applications>

Jet Propulsion Laboratory / California Institute of Technology / Pasadena, California / [www.jpl.nasa.gov](http://www.jpl.nasa.gov)