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Remote Sensing Techniques that are Beneficial to Ocean Oil Spill Analysis

Background on oil spills:

Unfortunately, oil spills occur relatively frequently, and can be caused by a multitude of things. Many assume that oil companies that conduct off shore drilling are the main culprit for ocean oil spills, but the main occurrence is actually discharge from ships traveling across the ocean.

When an oil spill occurs, fast action is needed to minimize the impact it will have on marine life and costal areas. Reliable information about locations, size, and distribution of these spills is crucial to effectively plan out clean up measures to reduce the overall pollution created.

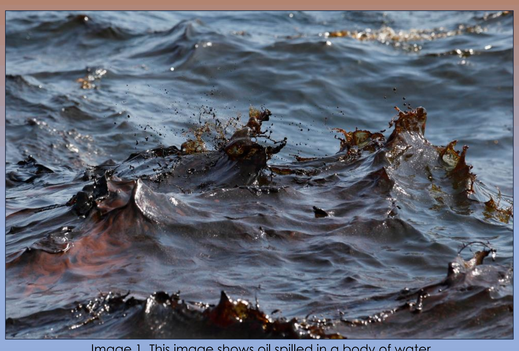

Image 1. This image shows oil spilled in a body of water

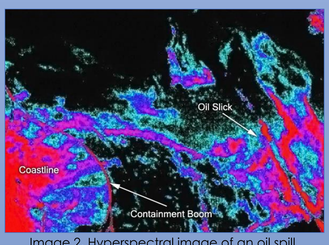

Image 2. Hyperspectral image of an oil spill

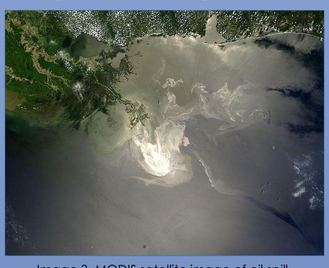

Image 3. MODIS satellite image of oil spill

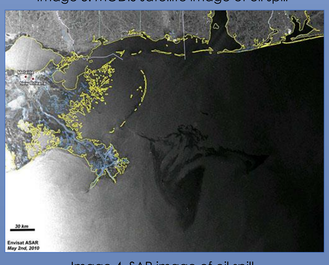

Image 4. SAR image of oil spill

Remote Sensing Techniques:

Both passive and active remote sensing techniques can be used to monitor and analyze oil spills.

Passive Sensors:

Hyperspectral Remote Sensing:

Because of the high abundance of spectral information a hyperspectral image has, it can easily differentiate between objects.

These images have more than 100 bands of information.

Moderate Resolution Imaging Spectroradiometer (MODIS):

MODIS is very useful when monitoring oil spills because it has such a frequent revisiting time.

Because of this, models can be frequently updated with new data to determine where the oil spill is moving.

Active Sensors:

Synthetic Aperture Radar (SAR):

SAR can provide data under all sky conditions, but one of the main downsides is that it cannot differentiate thick oil slicks from thin oil slicks.

Because it can collect data through all weather conditions, all day and all night, and can cover such a wide area range, SAR is an incredibly important tool to monitor oil spills with.

Side Looking Airborne Radar (SLAR):

SLAR can also provide data under all sky conditions.

This optical remote sensing technique can distinguish oil spills from other conditions and sunlight.

Case Study: *Deepwater Horizon* oil spill

On April 20th, 2010 an explosion on the Deepwater Horizon oil rig occurred 41 miles off the coast of Louisiana.

The core that carried the natural gas could not withstand growing pressure, so it was pushed up through the rig's riser to the platform where it ignited.

With nothing stopping it, oil was discharged into the gulf at around 1,000 barrels a day.

Monitoring of the Deepwater Horizon's spill and potential impact was done using both active and passive remote sensing.

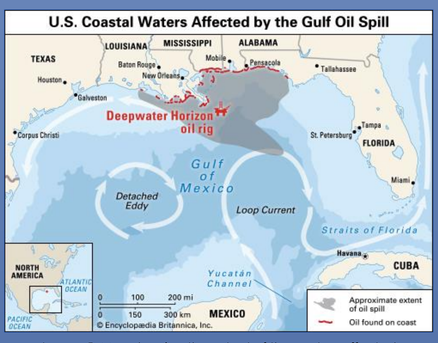

Image 5. Map showing the extent of the waters affected by the Deepwater Horizon oil spill.

Image 6. Fireboats battling the fire on the Deepwater Horizon oil rid a day after it exploded

The MODIS satellite provided frequent data updates, and was one of the main Remote Sensing methods used to aid the recovery from the spill.

Airborne remote sensing platforms like SAR and SLAR were also important in analyzing the spill.

Due to the scale and the urgency of needing frequently updated information on the Deepwater Horizon oil spill, Remote Sensing technology rapidly moved up on the technological readiness scale.

References Cited:

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Images:

Image 1: Sunmoni, M. (1970, January 01). The environmentalist. Retrieved April 16, 2017, from http://ecoremediation.blogspot.com/2012/08/oil-spills-causes-effects-and-control.html

Image 2: Disaster Response. (n.d.). Retrieved April 17, 2017, from http://www.terraremote.com/environment/disaster-response/

Image 3: Science/Nature | Amazonian forest 'more resilient' (2007, September 24). Retrieved April 21, 2017, from http://news.bbc.co.uk/2/hi/science/nature/7003788.st

Image 4: Mühlbauer, S. (2013, October 01). SAR - we love it, we hate it. Take a look! Retrieved April 21, 2017, from http://geoawesomeness.com/sar-we-love-it-we-hate-it-take-a-general-look/

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