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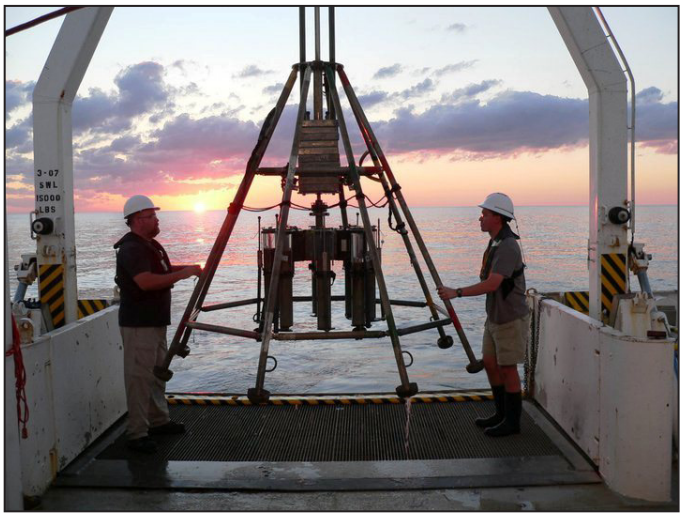
Discovery Porthole

Sharing Research with Educators and the Public

Responses of Benthic Communities to Oil Exposure

Initially, much of the oil released from the Macondo well during the Deepwater Horizon disaster floated on the surface of the water. Over time, physical processes drove some of the oil onto beaches and into other shallow habitats of the northern Gulf of Mexico. Researchers from the University of Southern Mississippi are trying to determine where the rest of the oil went. They want to see if oil has also reached the sea floor at greater depths, and if so, where.



Researchers prepare to deploy a multi-corer which will collect sediment samples from the sea floor. Photo: USM

The relatively shallow sea floor across the ***continental shelf*** of the northern Gulf of Mexico is abundant in life. Unfortunately, spilled oil that settles on the sea floor has the potential to disrupt natural processes taking place there. This is why Drs. Kevin Yeager and Charlotte Brunner believe it is critical to measure and document the amount of oil in this environment, the impacts it is having on the biological, chemical and physical components and processes, and how the oil is degrading over time. Their research has included sample sites near the coast, in the Chandeleur and Mississippi Sounds off Louisiana and Mississippi, off shore along the continental shelf, and in the deeper waters of the ***continental slope***. The deep water samples include areas surrounding the Deepwater Horizon site.

Scientists used the ***core sampling*** device above to lower sediment collection tubes to the bottom of the sea floor. They are currently analyzing the sediment samples, called cores, to look at the distribution and concentration of total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs). They are also looking for ***biomarkers*** in their samples that will tell them what type of hydrocarbons they have found, how they will degrade over time, and whether the contamination came from the Deepwater Horizon site. While the source has not yet been confirmed, initial results show above normal concentrations of weathered PAH compounds in areas surrounding the wellhead.

Yeager and Brunner are also closely examining the invertebrate animals that live on the sea floor. These animals are highly susceptible to sediment contamination because they live directly in or on the bottom and because they cannot easily flee. By sampling in oiled and unoiled areas they are able to determine potential impacts of hydrocarbon contamination on the health of the benthic (bottom) ecosystem. Since the spill, researchers have been documenting changes in how many animals of a particular species are present, how many different species are present, and how the animals are dispersed in a given area. So far, while they have seen changes in the composition of the benthic community, no mass die offs were observed in their sample areas.

A core tube with a plug of sedmiment collected from the sea floor, and an unlucky brittle star. Photo: USM

Education Extension

Key Terms: *deep sea, sediment, benthic, core sampling, weathering*

Classroom Activity: Deep-Sea Sediments

The ocean floor is made up of sediment including sand, silt and clay particles. The skeletons of tiny animals also contribute to deep-sea sediments. The particles take different amounts of time to reach the sea floor, depending on their density and size. Scientists study the layers of particles to create a historical record of the ocean floor. In this lesson, students will examine a core sample and conduct an experiment to see what factors influence settling rates.

Ocean Literacy Principles: 1. The Earth has one big ocean with many features, 5. The ocean supports a great diversity of life and ecosystems, 7. The ocean is largely unexplored

National Science Standards: A. Science as Inquiry: Abilities necessary to do scientific inquiry; C. Life Science: Organisms and environments; E. Science and Technology: Understandings about science and technology

Supplies: *transparent cylinder (tall), assorted food items, stop watch, ruler, data sheet*

Directions: 1) Discuss with students the various sources of marine sediments and how scientists sample sediments to learn both about current and historical conditions. 2) Using a tall clear cylinder filled with water, have the students add common food items of various shapes, sizes and densities to time their settling rates. 3) Add various "particles" at one time to examine layering. 4) Have the students measure the diameter of the particles and graph settling time against diameter. 5) What would happen if you coated the particles in oil?

Visit **http://dhp.disl.org/resources.html** for lesson plans and additional marine-related activities.

****Use the key terms above to search for additional lesson plans on the web!***

Did You Know...

The ***continental shelf*** of the northern Gulf of Mexico is relatively shallow and easily accessible. It has therefore been fairly well explored by scientists from a variety of fields.

The ***continental slope*** lies at the edge of the shelf at a depth of nearly 700 feet (200 meters) and plummets to depths of almost 7,000 feet (2,000 meters) at the abyssal plain. It is much more difficult and expensive for scientists to explore these depths, often resorting to remotely operated vehicles. Therefore, little is known about the deep-sea communities that exist here and the processes that drive them.

Core sampling allows scientists to examine the geologic, biologic or climatic history of an area. At the sea floor, researchers collect cores to examine the layers of sediment and organic matter. At the poles, ice cores allow scientists to reconstruct climatic records.

Biomarkers, or biological markers, are characteristics that can be accurately measured to aid in the identification of particular components or processes.

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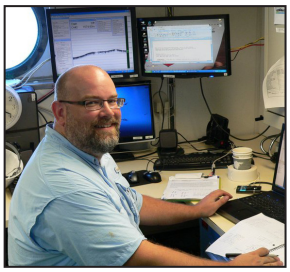

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