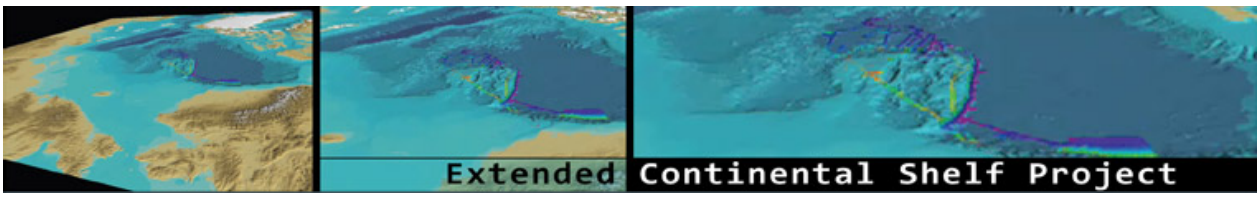
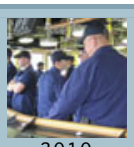
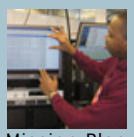
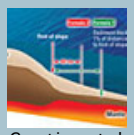


Arctic Seafloor Mapping Project Web Site - arcticseafloormapping.gov


2010 Mission


Mission Plan


Law of the Sea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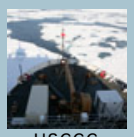
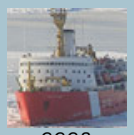

USCGC *Healy*


CCGS *Louis S. St-Laurent*


Healy's Science Team


Teachers

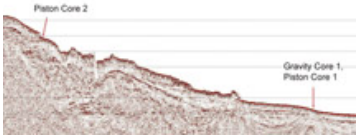
Mud, Glorious, Mud—and Gas Hydrate! A Photo Tour of Our First Day of Sampling

August 11, 2010

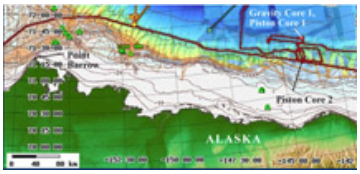
By Helen Gibbons, Web Coordinator, ECS Project

Our primary mission during this cruise is to break ice for *Louis's* seismic-reflection profiling and to collect mapping data from *Healy*. As operational conditions permit, however, we are also collecting samples of the seafloor to assist in delimiting the extended continental shelf and to advance knowledge of Arctic geology. On August 11, we got our first opportunity to put sampling equipment over the side. Here's a photographic log of the day.

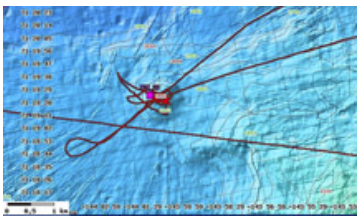
Chief Scientist Brian Edwards always has a ready smile, but he had extra reason to be gleeful on August 11. By the end of our first sampling day (actually by about 6 a.m. the next morning), he was batting 1000, having recovered core samples of the seafloor on three out of three tries: a gravity core followed by two piston cores. Click image for larger view. Credit: Brian Edwards, USGS/ECS Project.



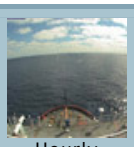
This seismic-reflection profile (the same type of data being collected by the Canadian Coast Guard Ship *Louis S. St-Laurent*



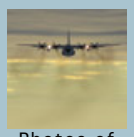
Coring sites labeled on a screenshot from our Map Server. We collected a gravity core and a piston core in the same spot—the flank of a small hill at about 2,550-m water depth—to compare the results from the two corers. Gravity coring is simpler to do, but if piston coring produced better results at our first site, we would use a piston corer at the second site—a sediment-mantled slope at about 1,150-m water depth. The gravity corer worked well, but (as you might guess from the map label at the second site) the piston corer worked better. Click image for larger view. Credit: *Healy* Map Server/Steve Roberts, National Center for Atmospheric Research.

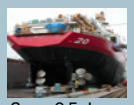


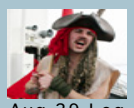
A closer view of the small hill where we collected the first gravity core and piston core. We ran over the area several times to pick a sampling site


Hourly Photos from *Healy's* Aloft Conn


USCG Logs


Photos of the Day

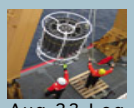

Sep 05 Log

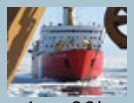

Aug 29 Log


Aug 28 Log


Aug 25 Log


Aug 24 Log


Aug 23 Log


Aug 22b Log

during this joint mission) shows a cross-sectional view of the general areas where we collected a gravity core and two piston cores. (This seismic section does not run exactly through our sites, but through similar structures nearby.) The first two cores were collected atop a diapiric structure, where the layers of sediment have domed upward and formed a small hill on the seafloor. Diapirs form by the movement of less dense material (such as gassy sediment, salt, or liquefied mud) into and through denser overlying material. The second piston core came from a shallower site on a sediment-mantled slope. Click image for larger view or here for a high resolution image. **Credit**: Multichannel seismic-reflection data from USGS cruise conducted in 1977.

USGS Engineering Technician Pete Dal Ferro slides a plastic core liner into the metal core barrel. The core liner will encase the sediment sample and help keep it intact as it is removed from the core barrel, packaged for storage, and, ultimately, split open for study at our shore-based laboratories. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

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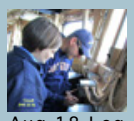
The gravity corer relies on a weight at the top to drive the barrel into the sediment. In this photo, the weight, with a 10-ft barrel attached, is cradled in the blue “bucket,” which has been moved to the end of a specially built track. The bucket will be rotated 90° so that the core barrel points straight down, then the corer will be

Aug 22a Log

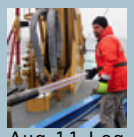
Aug 21 Log

Aug 20 Log

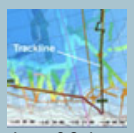


Aug 18 Log

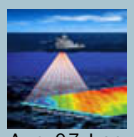
Aug 17 Log



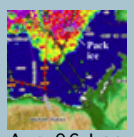
Aug 11 Log



Aug 08 Log

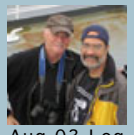


Aug 07 Log



Aug 06 Log

Aug 04 Log



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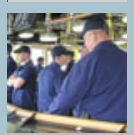

Photo Log

and then stayed on station for several hours. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

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My roommate, USGS Engineering Technician Jenny White, begins rigging the gravity corer for our first sampling attempt. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

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Several of us stand on the flight deck, ready to take photographs as the gravity corer is deployed off *Healy's* stern. Left to right: Caroline Singler (NOAA Teacher at Sea), Bill Schmoker (PolarTREC teacher), Jerry Hyman (Branch Chief, National Geospatial-intelligence Agency), and Captain Michel Bourdeau (Canadian Coast Guard). Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

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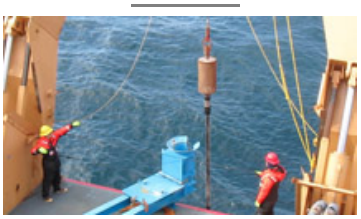


Marshal uses hand signals to communicate with MST3 Daniel Purse in the Aft Conn (a control room overlooking the stern), who winches the corer into the water at about 1430 hrs (Pacific Daylight Time). The core will take 30 to 45 minutes

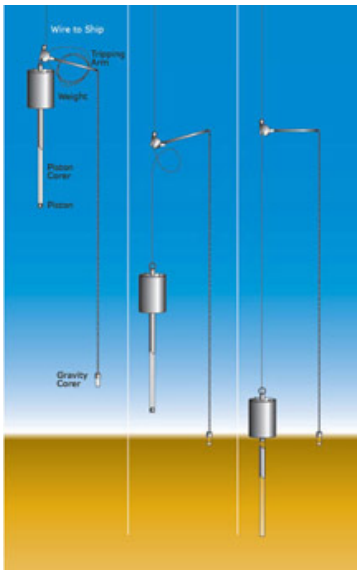
winched out of the bucket, into the water, and down to the seafloor. Standing by (right to left) are Pete, Jenny, and Coast Guard Marine Science Technician MST3 Marshal Chaidez. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

We've got core! The gravity corer is back on deck and Pete is using a vice grip to pull out the core catcher. Chief Scientist Brian Edwards prepares materials for packaging sediment samples from the core. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

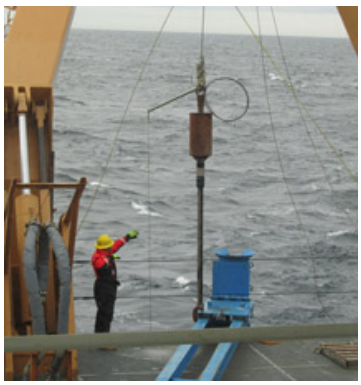
Brian (left) and Andy Stevenson (USGS geologist co-leading the sampling effort) collect a sample of sediment from the core cutter (metal piece attached to the bottom of the core barrel, with a sharp edge that helps the barrel cut into the sediment). The muddy sediment felt gritty with silt and contained small angular rock fragments. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

to reach the seafloor and about the same time to come back up. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project

Jenny holds a clean core catcher. This device attaches to the bottom of the core barrel with its metal teeth pointing upward. The teeth are pushed open by sediment entering the core barrel as it penetrates the seafloor. When the core barrel is pulled back out, the sediment inside the barrel presses the teeth down and together, so they hold the sediment in place. Click image for larger view. **Credit**: Helen Gibbons, USGS/ECS Project



Next we deployed a piston corer at the same site. A piston corer is rigged with a triggering device that lets it free-fall from several meters above the seafloor, enabling it to penetrate deeper into the seafloor than a gravity corer. Our piston corer was rigged with a 20-ft core barrel, twice as long as the barrel on our gravity corer. (Learn more this instrument at Woods Hole Oceanographic Institution.) Click image for larger view. **Credit**: Fritz Heide, Woods Hole Oceanographic Institution.



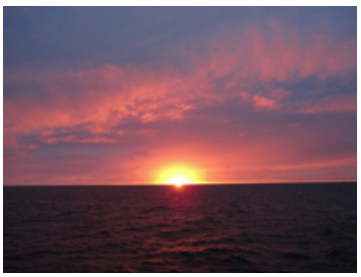
Marshal signals to MST2 Owen Dicks in the Aft Conn as Owen winches the piston corer into the water. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

The piston corer, which hit bottom at about 2,550-m water depth, came back with gas hydrate in the core cutter at the bottom of the core barrel. Gas hydrate looks like water ice but is actually made up of water cages that enclose gas molecules, usually methane. Gas hydrate is stable at relatively low temperatures and moderate pressures like those beneath the seafloor at the coring site. At the surface, gas hydrate is not stable and breaks down (dissociates) into water and gas. Gas hydrate is sometimes called the “ice that burns” because it will sustain a flame as the gas molecules are released. Learn more at the USGS Gas Hydrates Project Web site. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

Recovery of the piston corer was complicated by a small group of ice floes that drifted past the ship around 2100 hrs. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

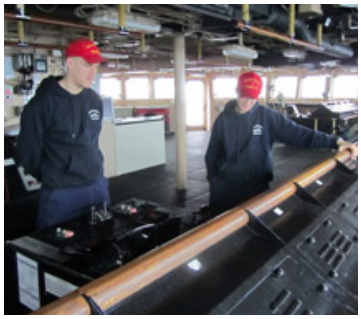
Brian pulls the chunk of gas hydrate out of the core cutter. Later he put a piece of it onto a lab table, where it gently bubbled as the hydrate dissociated into water and gas (probably methane). Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

Under Brian’s direction, Caroline Singler (NOAA Teacher at Sea) records information about the first piston core and the sediment samples and core sections into which it was divided. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project



The sun set at about 0025 hrs on August 12, while we were

Andy fits a cutting device onto the plastic core liner of the piston core, which has been pulled partway out of the metal core barrel. The core liner with sediment inside is cut into sections for ease of storage and transfer. Back onshore at a USGS lab in Menlo Park, California, the core sections will be logged, then split longitudinally down the middle; one half will be studied, the other half stored in a refrigerated archive. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

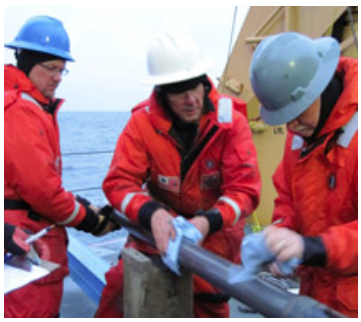


On the bridge: Officer of the Deck ENS Emily Kehrt (right) and Break-in Officer of the Deck ENS Nick Custer were on watch when we collected our first piston core. They kept the ship over one spot for several hours while the piston corer was deployed from the stern, winched to the seafloor and back, and re-secured on the deck—a challenging task, especially in the nearly 20-knot winds and 4 to 5-ft swells that prevailed on Wednesday night. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

transiting to our second piston core site. Click image for larger view. Credit: Caroline Singler, NOAA Teacher at Sea.

After supervising his crew through each coring run, Captain Bill Rall came down to the deck to view the cores and discuss ways to improve operations. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

Andy and Brian are pretty happy about the day's successful coring! Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project



Another success! The second piston core came back on deck at about 0420 hours Pacific Daylight Time on August 12. No gas hydrate in this one; the muddy sediment was dense and stiff. Left to right: Bill Schmoker (PolarTREC teacher), Andy, and Brian prepare to cut the core into sections. Click image for larger view. Credit: Helen Gibbons, USGS/ECS Project

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