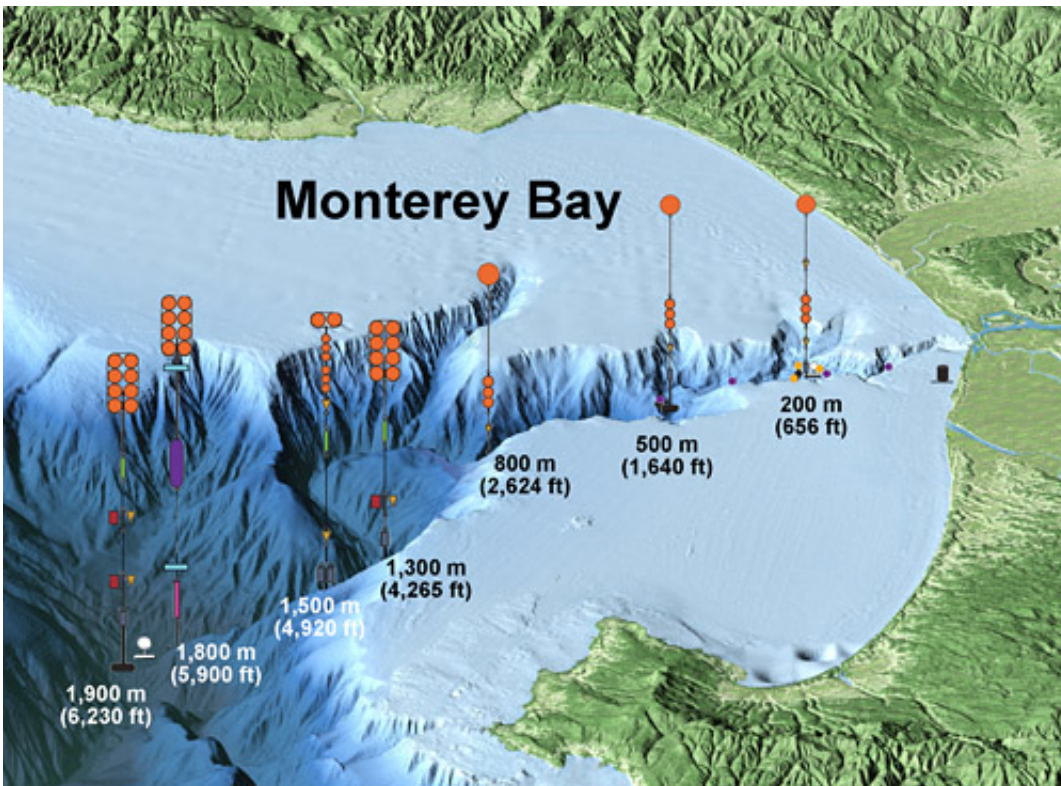


International experiment tracks underwater avalanches in Monterey Canyon

October 15 2015



This illustration (not to scale) shows the locations and depths of some of the instruments being placed within Monterey Canyon as part of the Coordinated Canyon Experiment. Credit: © 2015 MBARI

Underwater avalanches and turbidity currents carry huge amounts of sediment, organic material, and pollutants down submarine canyons and into the deep sea. Yet geologists know very little about how sediment

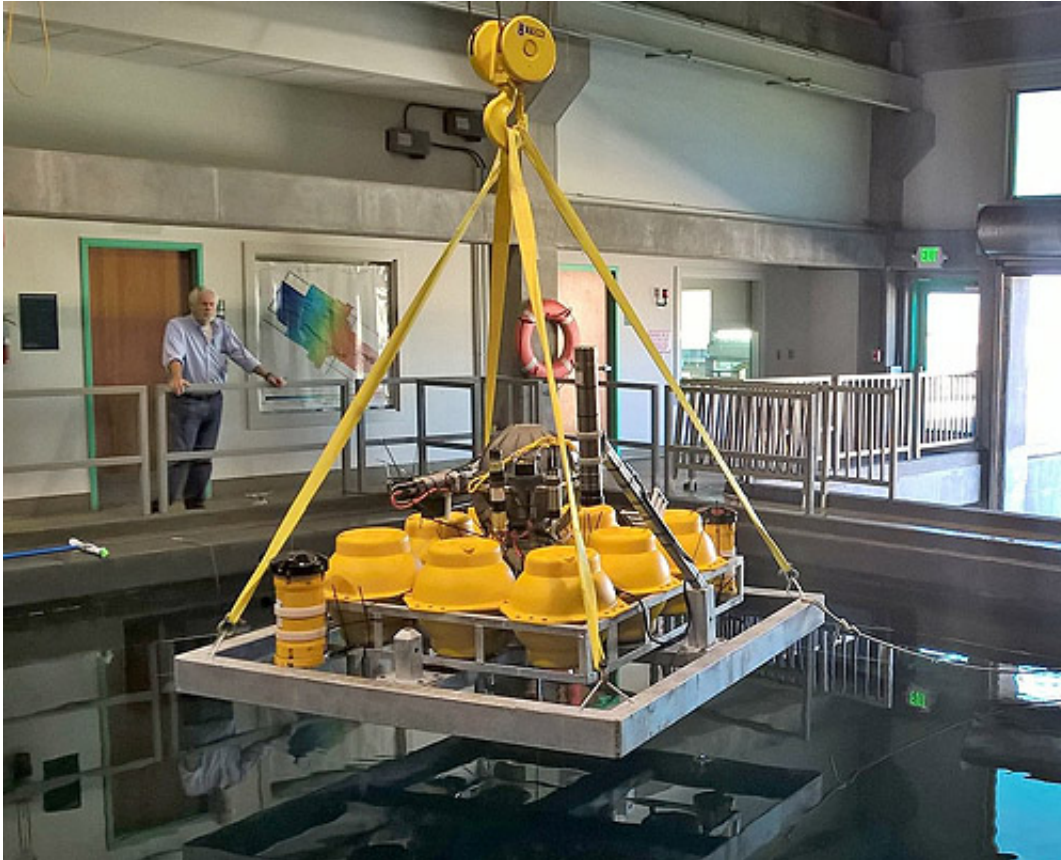
moves during these events. This month, in what may be the most ambitious submarine-canyon study ever attempted, marine geologists from several countries are placing dozens of sophisticated instruments in Monterey Canyon. This international effort, the Coordinated Canyon Experiment (CCE), promises to give scientists a uniquely detailed and comprehensive view of sediment movement within the canyon.

The project is being led by MBARI geologist Charlie Paull, in collaboration with researchers from the United States Geological Survey, Ocean University China, the National Oceanography Centre in Southampton, England, and the University of Hull, England.

During the [canyon](#) experiment, Paull and his fellow researchers hope to gather information on what triggers underwater sediment flows, how fast they move, and how far they travel. They will also try to measure how much coarse sediment is carried along near the seafloor and how much fine sediment is carried tens of meters above the seafloor. Finally, they will study how the sediment flows change the contours of the seafloor and the shape of the canyon over time.

To make these measurements, the researchers will be pooling both their expertise and their instruments (see sidebar). Robotic vehicles will be used to place instruments on the seafloor, provide communications links to shore, and make detailed maps of the canyon floor.

Ten arrays of instruments will be installed on the seafloor to monitor movements of water and sediment at depths of 200 to 1,900 meters and distances of four to 40 kilometers from shore. These instruments will measure currents, sediment concentrations, and the physical properties of the seawater. The instruments will be left in place for up to 18 months, documenting any flows that take place during that time.



MBARI geologist Charlie Paull watches as an array of instruments (a "benthic instrument node") is lowered into MBARI's test tank in preparation for being placed on the seafloor during the Coordinated Canyon Experiment. Credit: Krystle Anderson © 2015 MBARI

In addition to the fixed instrument arrays, four beach-ball-sized "benthic event detectors" (BEDs) will be buried in the seafloor sediment. When sediment flows occur, the BEDs will be carried along with the sediment. Sensors inside each BED will record how fast they move, how far they go, and how they are tumbled by the flow.

Unusual instruments such as the BEDs are necessary because the floor of Monterey Canyon is such an active place. If you could see Monterey Canyon from the sea surface, it would look somewhat like the Grand

Canyon, with steep-sided walls and a narrow, winding canyon floor. Both canyons have central channels filled with sand.



MBARI engineers Brian Kieft and Bob Herlien lower a benthic event detector into Monterey Canyon. Credit: Krystle Anderson (c) 2015 MBARI

Sand in the Grand Canyon is moved down-canyon by the Colorado River. After studying the "river of sand" in Monterey Canyon for 15 years, Paull and colleagues have concluded that sediment moves down Monterey Canyon in a variety of ways. Some sediment flows consist of strong water currents carrying just a small amount of sediment. Other flows, known as turbidity currents, consist of dense, fast-moving slurries of sand and water that can travel kilometers down the canyon in a matter of minutes. Still other flows occur when sediment on the floor of the canyon becomes unstable and slumps down-canyon. To make matters even murkier, some canyon events could involve all three of these processes.

During the Coordinated Canyon Experiment, researchers hope to study all of these different types of sediment flows by gathering extremely detailed data from a wide variety of instruments over a large area. As Paull put it, "We want to determine not just when [sediment](#) moves in the axis of the canyon, but how it moves, how long it moves, and where it moves. The point is to cover as much of the canyon as possible, from the head down to a couple of thousand meters depth.

"We usually measure just a snapshot in time and space, so we're like the blind men and the elephant—just seeing part of the picture," Paull said. "By putting as many instruments in the canyon as we can, all at one time, we'll get a better view of what's going on down there."

Placing all of these instruments in the canyon involves a concerted effort throughout the month of October 2015. But that's just the beginning. The CCE is scheduled to continue for another 18 months, until spring 2017. In fact, because it is so hard to communicate with instruments on the seafloor, the researchers won't get detailed information from the instruments until April 2016. That's when Paull will use MBARI's underwater robots to service the instruments and retrieve the data.

The coming winter may give the researchers plenty to think about. If strong El Niño conditions continue in the Equatorial Pacific, the Central California coast is likely to experience powerful winter storms and unusually large waves. Such waves can sweep huge volumes of sand along the beaches of Monterey Bay and into the head of Monterey Canyon, potentially triggering underwater avalanches. Thus Paull is optimistic that the team will be able to collect plenty of interesting data...even if not all of their instruments survive.

"There is always a risk in putting instruments in the canyon," Paull said. "But after many years, I think we've learned how to minimize these risks. And if we don't take risks, we're never going to be able to figure

out what's going on down there."

Provided by Monterey Bay Aquarium Research Institute

Citation: International experiment tracks underwater avalanches in Monterey Canyon (2015, October 15) retrieved 19 April 2024 from <https://phys.org/news/2015-10-international-tracks-underwater-avalanches-monterey.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.