

Benthic Event Detection System

2013 Status Report

M B A R I



Program Number: 901006
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Development efforts in 2013 focused on initial prototype deployments, gaining experience operating BEDs, and incrementally improving the system with the goal of a smooth transition into a larger collaborative canyon experiment scheduled for 2015.

First Deployment

Early 2013 was spent preparing for the first extended deployment of a prototype BED scheduled for early Q2. The team conducted a tethered test on the north side of the canyon at a depth of 250 meters. This test validated event detection, acoustic communication between the *R/V Paragon* and the BED, and also proved that geolocation by acoustic ranging would be sufficient to meet the science requirements. Further testing included an ROV dive which allowed the BED to spend a more extended time under pressure.

Satisfied with the results, the team continued as

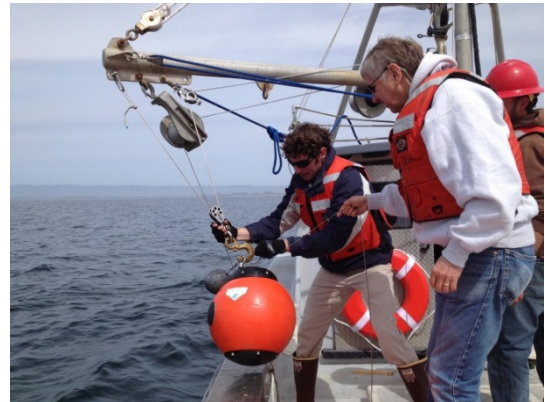


Figure 1 –Prototype BED moments before first tethered deployment

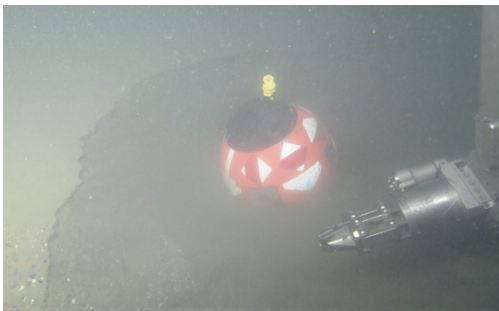


Figure 2–BED #1 deployed in canyon

planned with two *R/V Carson* dives in mid-April. Beyond deploying the prototype unit in the seafloor, the team also ran geolocation testing and multiple acoustic tests with an additional tethered BED to test the ability to selectively address, configure, and communicate with multiple units on the seafloor.

Development

The prototype BED remained on station and the team conducted periodic checks acoustically to retrieve health and status information. In parallel, work was done to

provide a more intuitive visualization of BED orientation on shore. An example of this visualization tool using data from a lab test conducted in April is shown here: \\Atlas\ProjectLibrary\901006.BEDS\BEDS.Data\2013_04_29_Bench_Orientation\video_clips\BEDS_2013_04_29_Video_X3D_orientation.mov

Further work was done to integrate the data stream into STOQS (the Spatial Temporal Oceanographic Query System) in preparation for a larger data set in the future. Static plots of the IMU and sensor data are also being developed in an effort to determine basic information about velocity and orientation during an event.

Benthic Event

In June, approximately six weeks prior to a scheduled *Carson* dive on the BED, the team lost

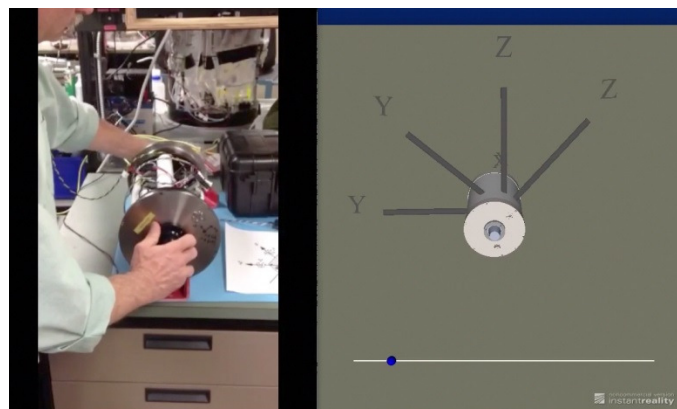


Figure 3–An example of orientation visualization

communication with the instrument. Five unsuccessful searches were conducted from various small boats into early July. It wasn't until July 15th that the BED was located via its homer nearly 9 km down the canyon's axial channel. Event data was downloaded and showed that the BED was swept down canyon during a ~50 minute long event that occurred on June 1. Less than one week later, *Ventana* searched for and

recovered the BED half buried in 500m of water. The novel data set recovered is still undergoing analysis but met the requirements of recording the motion of the event. On the same cruise, *Ventana* did

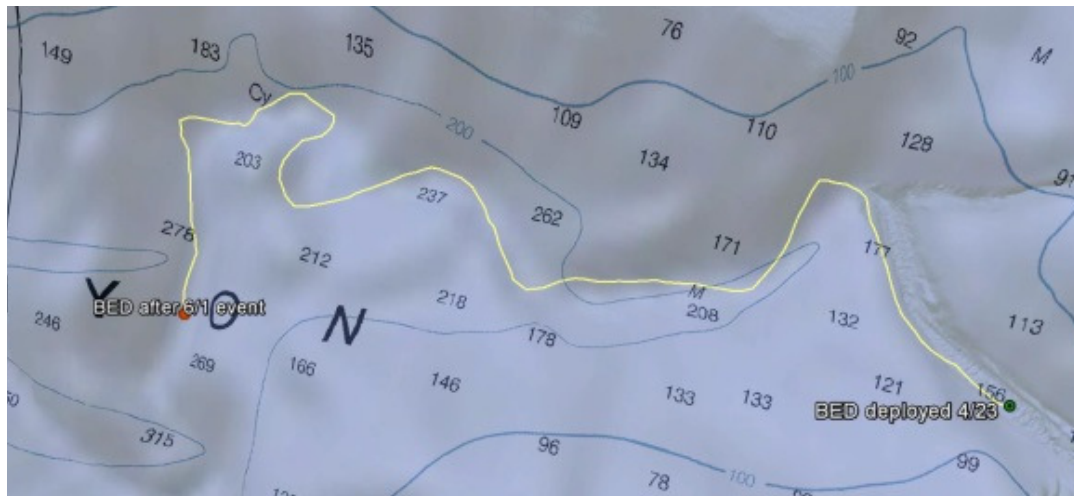


Figure 4–The nearly 9 km path BED #1 traveled during the June 2013 event.

another dive back at the original 300m deployment

site to place the second BEDs unit in the seafloor. This unit remained roughly on station until its recovery December 12. Despite not encountering a large canyon event, the data is proving to be interesting in determining sensor drift and exploring the possibility of small movements in the bottom of the canyon.

The team's final *Carson* cruise of the year was on December 12th which, apart from recovering BED #2, included deploying two BEDs spheres and two cubical concrete monuments. This experiment is designed to determine whether the previous density and shape contributed to the rolling motion noticed in the event data.

Acoustics

Communicating with multiple BEDs over a long period of deployment can be time consuming for personnel so the team has been working to offload some of the monitoring and data download to the Wave Glider. Initial steps were completed in early December when the Wave Glider was launched with a modified skag that housed a Benthos acoustic modem. The test proved to be successful with the Wave Glider providing 3G communication to shore allowing users to query BEDs for events without having to leave the dock. Further Wave Glider deployments next year will include data downloads made possible by recent upgrades to the BEDs software.



Figure 5– Wave Glider “Tex” equipped with acoustic modem.