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ADDOSS: Autonomously Deployed Deep-ocean Seismic System - Communications Gateway for Ocean Observatories

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We describe an autonomously deployable, communications gateway designed to provide long-term and near real-time data from ocean observatories. The key features of this new system are its abilities to telemeter sensor data from the seafloor to shore without cables or moorings, and to be deployed without a ship, thereby greatly reducing life-cycle costs.

The free-floating surface communications gateway utilizes a Liquid Robotics wave glider comprising a surfboard-sized float towed by a tethered, submerged glider, which converts wave motion into thrust. For navigation, the wave glider is equipped with a small computer, a GPS receiver, a rudder, solar panels and batteries, and an Iridium satellite modem. Acoustic communications connect the subsea instruments and the surface gateway while communications between the gateway and land are provided by the Iridium satellite constellation. Wave gliders have demonstrated trans-oceanic range and long-term station keeping capabilities.

The acoustics communications package is mounted in a shallow tow body which utilizes a WHOI micro modem and a Benthos low frequency, directional transducer. A matching modem and transducer is mounted on the ocean bottom package.

Tests of the surface gateway in 4350 m of water demonstrated an acoustic efficiency of approximately 396 bits/J. For example, it has the ability to send 4 channels of compressed, 1 sample per second data from the ocean bottom to the gateway with an average power draw of approximately 0.15 W and a latency of less than 3 minutes.

This gateway is used to send near real-time data from a broadband ocean bottom seismic observatory, first during short week-to-months long test deployments but will ultimately be designed for a two-year operational life. Such data from presently unobserved oceanic areas are critical for both national and international agencies in monitoring and characterizing earthquakes, tsunamis, and nuclear explosions.

We present initial results from a two short-term OBS test deployments off-shore La Jolla, at water depths of 1000 m and of nearly 4000 m.