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2008 Annual Report: Ocean Observatory Initiative

In 2008, Staff from WHOI's Physical Oceanography and Applied Ocean Physics and Engineering Departments continued to develop a major component of the National Science Foundation's (NSF's) new ocean observatory infrastructure program, the "Ocean Observatories Initiative" (OOI).

In August 2007, the NSF announced that it had awarded WHOI and its partners at Oregon State University and Scripps Institution of Oceanography the contract to design and deploy the coastal and global observatories that are to be designed, built, and deployed under this initiative. Thus, WHOI took the lead on these OOI "Coastal and Global Scale Nodes" or CGSN component. The planned start for the effort is September 1, 2009.

Coastal and Global Scale Nodes

The CGSN component will consist of two coastal and four global "arrays" (Fig 1) – constellations of instruments measuring a variety of ocean properties – placed in specific locations in the ocean. The designs for the CGSN arrays matured in 2008 and were presented at a Final Design Review in November. Additional changes directed by the NSF lead to the present plan.

All the CGSN sites use a combination of fixed sampling platforms (moorings), and mobile platforms (gliders and, when possible, AUVs) to carry the instruments and sample across space and time scales of interest. Observations will be made from the sea surface to the sea floor using vertical profilers – assemblies of sensors, or instruments that measure specific properties while moving up and down along a wire or winching themselves up and down.

Key to this new observing initiative is an emphasis on fielding multidisciplinary sensors, making data available to all as quickly as possible – often in real time by various telemetry methods, increasing the power available to the sensors and the power for data communication, and involving the community as users of the sampling infrastructure and as providers of additional sensors and instruments. WHOI engineers are already working to develop new power systems for surface buoys that combine fuel cells, solar panels, and wind-driven generators.

OOI Arrays

Closest to WHOI is the coastal array in the mid-Atlantic Bight known as the Pioneer Array (Fig. 2); this array will be operated for about 5 years and then, as guided by community input, be deployed at a new location. The Pioneer Array includes moorings, ocean gliders, and AUVs. Power generated by surface buoys in the Pioneer Array will be available to recharge the AUVs at docking stations on the sea floor; the AUVs will also be able to download their data at these docking stations for transmission to shore by telemetry systems on the surface buoys.

The Endurance Array (Fig 3), in the Pacific Northwest, will have a line of three moorings off Newport, Oregon. The subsurface moorings will be attached to a seafloor cable providing power and data communication, a line of mooring off Grays Harbor, Washington, and ocean gliders.

The four global arrays will each use four moorings to define a triangular array together with three ocean gliders to sample in and around the array (Fig. 4). They will be located in the Gulf of Alaska (50°N, 145°W), in the Irminger Sea (60°N, 39°W), off the southwestern tip of Chile (55°S, 90°W), and in the Argentine Basin (42°S, 42°W).

Initial work on arrays has already begun under pilot funding. Full funding is anticipated in late 2009. The first part of the effort will focus on design and construction. Deployments of the arrays would begin in 2013 and continue through 2015. NSF plans for 25 to 30 years of operation for each of the sites, with periodic competition forthe contract to carry out the operation and maintenance. WHOI's initial contract will cover the design and build period as well as the first two years of operations and maintenance.

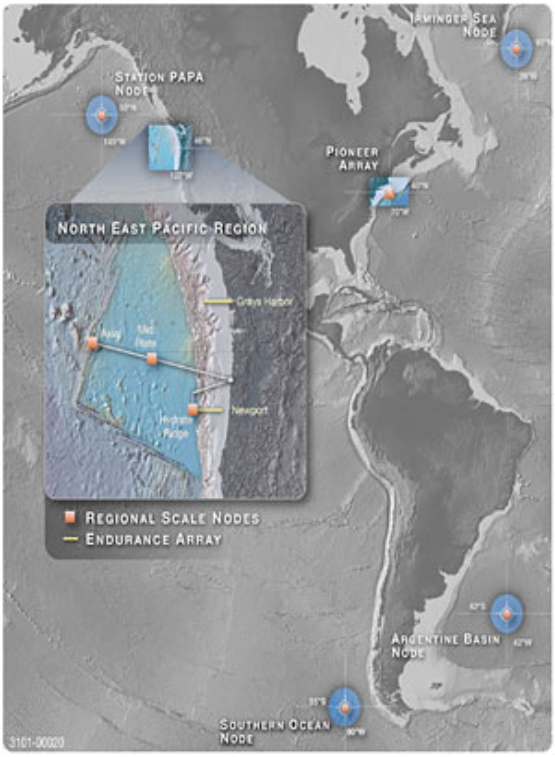

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Figure 1. Overview map of the National Science Foundation's ocean observing program, showing the four global sites and two coastal sites of WHOI-led "Coastal and Global Scale Nodes" observing installations, as well as a detail insert of the "Regional Scale Nodes" installation and the "Endurance Array" located off the coast of Washington state.

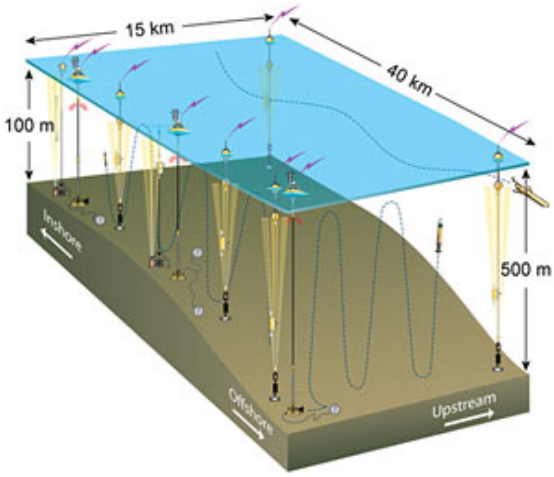

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Figure 2. The Pioneer Array, to be deployed in the Mid-Atlantic Bight, will use moorings, gilders, and AUVs. Data will be telemetered to scientists and the public via satellite. Some of the surface buoys will generate power and provide that power to AUV docking stations on the sea floor.

Other OOI Components

In addition to the CGSN component, there will be a seafloor cabled observatory off Washington under a Regional Scale Node (RSN) led by the University of Washington, and a Cyberinfrastructure or CI component led by the University of California at San Diego. The Consortium for Ocean Leadership in Washington DC directs the program under contract to the NSF.

–Robert Weller, OOI Principal Investigator

Last updated: August 10, 2009

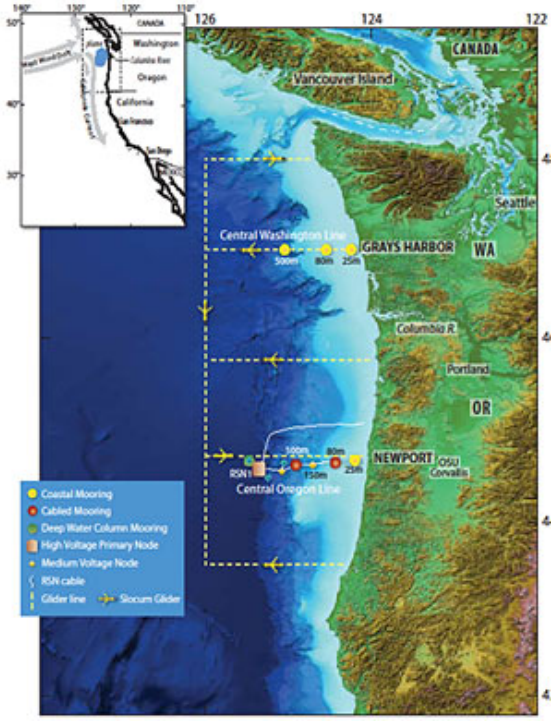

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Figure 3. The Endurance Array will include two lines of moorings off Oregon and Washington and three gliders sampling the region around the moorings.

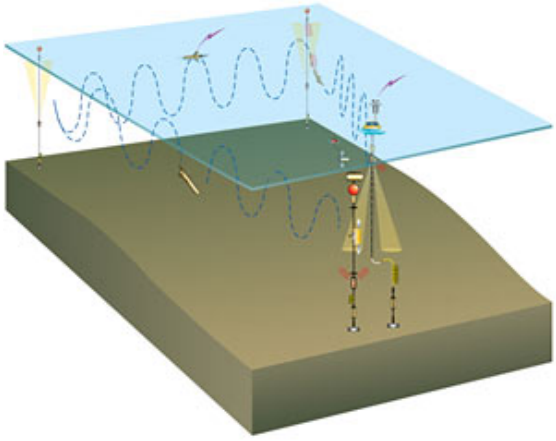

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Figure 4. Schematic of the sampling platforms at a global array site: In the near corner of the triangular array (about 100 km on a side) there is a surface mooring and an adjacent profiler mooring. The surface mooring has power generation, a platform for sampling the air-sea interface, and hardware for sending data via satellite. The profiler mooring has two profilers: one below a subsurface float at about 200m depth, which profiles from there down to the sea floor, and one that winches itself from 200m up to the sea surface, profiling 0-200m. The far corners of the array have taut subsurface moorings with instruments attached along the mooring lines. Three gliders will sample between and around the moorings and will acoustically collect data from the subsurface moorings.

Related Links

» Ocean Observatory Initiative (OOI) Web Site

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