

Ocean Observatories Initiative



Photo by Andy Cripe, Corvallis Gazette Times

About the OOI

Greater knowledge of our ocean is vital for improved detection and forecasting of environmental changes and their effects on coastal ecosystems, biodiversity, weather and climate. The Ocean Observatories Initiative (OOI) is funded by the National Science Foundation to provide a networked system of instruments to measure physical, chemical, geological, and biological properties in the ocean, the atmosphere, and on the seafloor. This transformational technology will provide information to ocean users, researchers, policymakers and the public.

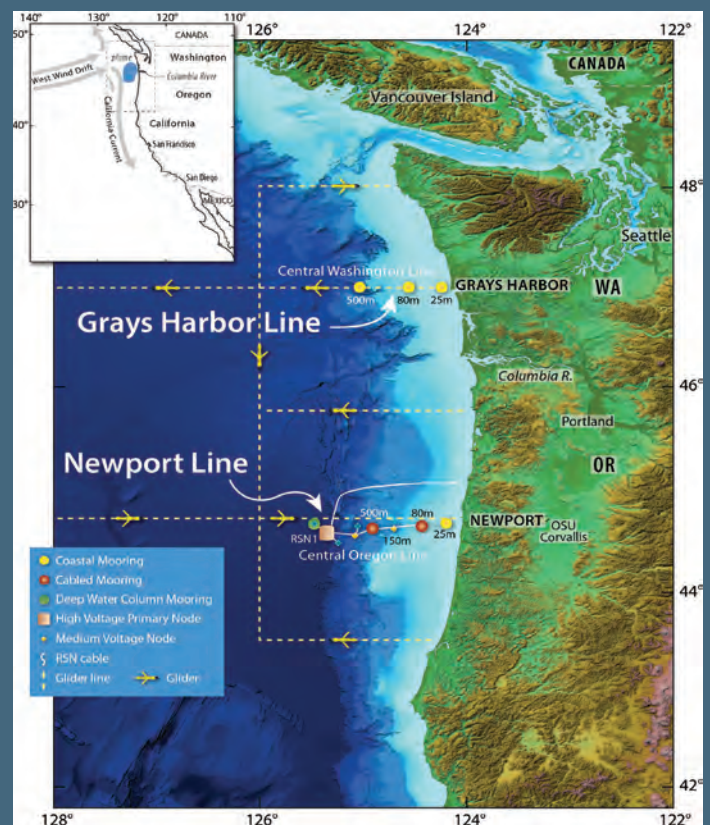
The Endurance Array

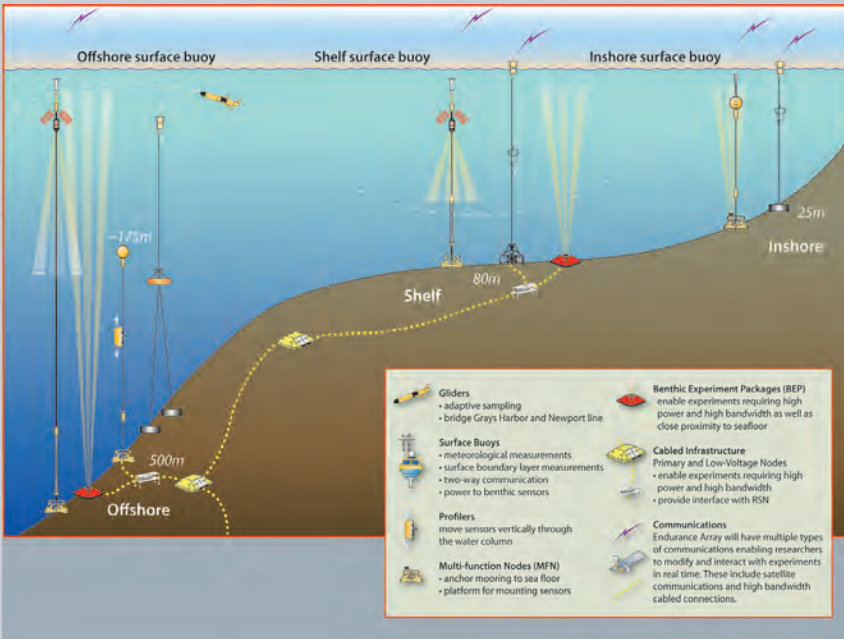
The Endurance Array, installed and operated by Oregon State University, is intended to function for decades. It uses fixed and mobile platforms to observe ocean variability over the continental shelf off of Oregon and Washington. The array covers the Northern California Current, the eastern boundary current of the North Pacific, and connects with the Cabled Array operated by the University of Washington.

“The OOI array off Oregon and Washington provides a laboratory for the study of processes in one of the great coastal upwelling systems in our planet,” says Ed Dever, project manager for the Endurance Array.

The Endurance Array backbone includes the Oregon Line, off Newport near 44.6°N, and the Washington Line, off Grays Harbor near 47°N. These lines each have three sites at the continental slope (~500-600 m water depth), the shelf (~80-90 m) and the inner shelf (~25-30 m). Moorings on these lines provide intensive observations at fixed locations while underwater gliders bridge the gaps and allow for adaptive spatial sampling.

The Oregon and Washington Lines are both affected by wind-driven upwelling and downwelling as well as the Columbia River. Shelf stratification and upper-ocean properties differ north and south of the Columbia River, so observations along both lines allow for a greater understanding of coastal ocean ecosystem responses to climate variability.





Instrumentation

The Endurance Array Oregon Line 80- and 500-m sites include cabled and uncabled platforms, while the remaining Endurance Array sites are uncabled. Endurance Array platforms include surface moorings, water column profilers, near-bottom instruments, and six underwater gliders. Fundamental ocean properties like temperature, salinity, pressure, chlorophyll fluorescence, and dissolved oxygen are measured on nearly all the Endurance Array platforms and sites.

Uncabled moorings support instruments at and near the surface, and at the bottom. Moored instruments provide high time resolution at fixed points. These moorings have high power availability thanks to large capacity batteries fueled by wind and solar power. Instruments that require significant power, space and bandwidth, such as cameras, acoustic current profilers, bioacoustic instruments, and sensors for ocean acidity and carbon dioxide are on these moorings. Meteorological instruments on the buoys provide key measurements of winds, air temperature and humidity, and solar radiation.

“These buoys are game-changers,” says Jack Barth, project scientist for the Endurance Array, “we will be able to monitor and assess all components of the ocean simultaneously, from the physics to the chemistry to the biology.”

Profiling moorings have self-contained instrument packages that move up and down through the water column. They provide good vertical coverage at a fixed location. In addition to low-power instruments measuring temperature, salinity and dissolved oxygen, profilers power instruments that measure nutrients and underwater light properties.

Underwater gliders provide the greatest geographic coverage, spanning about 500 km from northern Washington to Coos Bay, Oregon. The gliders sample

the fine vertical structure of the ocean from the sea surface to within meters of the seafloor or up to 1000 m depth, whichever is deepest. Gliders measure temperature, salinity, pressure, water velocity, chlorophyll fluorescence, light backscatter from particles, and dissolved oxygen. Data is transmitted to shore via satellite phone.

OOI instrument types and sampling are coordinated such that Endurance Array measurements can be compared and contrasted with those on the Cabled Array operated by the University of Washington, and the Global and Pioneer Arrays operated by Woods Hole Oceanographic Institution.

Data Collection Network

The Ocean Observatories Initiative networked sensors will collect atmosphere, ocean, and seafloor data at high sampling rates over years to decades. The Endurance Array raw data are transmitted to either Oregon State University via satellite (for uncabled platforms) or to a shore station in Pacific City (for cabled platforms). The data are then transferred over the internet to the OOI cyberinfrastructure system for processing, storage and dissemination via the web.

More information about the Ocean Observatories Initiative, the Endurance Array, and the OOI data can be found at oceanobservatories.org.

