

OCEAN OBSERVATORIES INITIATIVE (OOI)

<https://oceanobservatories.org>

Ocean Observatories Initiative Funding

(Dollars in Millions)

	FY 2023		Change over	
FY 2022	Estimate	FY 2024	FY 2023 Estimate Base	
Actual	Base	Request	Amount	Percent
\$45.13	\$51.00	\$53.36	\$2.36	4.6%

Brief Description

The Ocean Observatories Initiative is a networked observatory of *in situ* instrumentation delivering long-term, time-series data for multidisciplinary oceanographic research. It is composed of five arrays of instrumented platforms:

- Two Global Arrays of autonomous surface and sub-surface moorings deployed at deep water, high-latitude locations: (1) Station Papa Array in the Gulf of Alaska (Pacific Ocean), and (2) Irminger Sea Array off Greenland (Atlantic Ocean).
- One Regional Cabled Array (RCA) in the ocean basin off the coast of Oregon and Washington. RCA consists of a cabled network of interconnected sites and sensors on the seafloor spanning multiple geologic and oceanographic features and processes.
- Two Coastal Arrays composed of autonomous surface and sub-surface moorings, profilers, and gliders at shelf locations of the west and east coast of the U.S.: (1) Endurance Array off the coast of Washington and Oregon, and (2) Pioneer Array, a relocatable array off the U.S. East coast.

Real time and archived data from OOI's instruments are processed, stored, displayed, and served by the OOI cyberinfrastructure and are openly available to the public via the OOI website.

Meeting Scientific Community Needs

OOI provides the scientific community with continuous, interactive access to the interior of the ocean through an integrated network of arrays, many located in regions that are challenging to access via ship-board sampling. Deployed in critical parts of the global and U.S. coastal ocean, data from OOI instrumentation enable the study of complex, interlinked physical, chemical, biological and geological processes that occur on both short-term, episodic and long-term climate-related time scales.

OOI is a community resource providing researchers, the public, educators, and students with: (1) long-term time series data sets; (2) *in situ* ocean laboratory capabilities that allow users to develop and apply new technologies by connecting their instruments to OOI network; and (3) tools that support undergraduate classroom applications of OOI observations, as well as public outreach through informal education.

The overarching scientific themes of OOI, developed in close collaboration with and in response to, the needs of the science community, are outlined in the OOI Science Plan.¹ They span six multi-

¹ <https://doi.org/10.23860/ooi-science-plan-2021-01>

disciplinary domains, each with a multitude of research questions.

- *Ocean-Atmosphere Exchange.*
- *Climate Variability, Ocean Circulation, and Ecosystems*
- *Turbulent Mixing and Biophysical Interactions*
- *Coastal Ocean Dynamics and Ecosystems*
- *Fluid-Rock Interactions and the Subseafloor Biosphere*
- *Plate-Scale, Ocean Geodynamics*

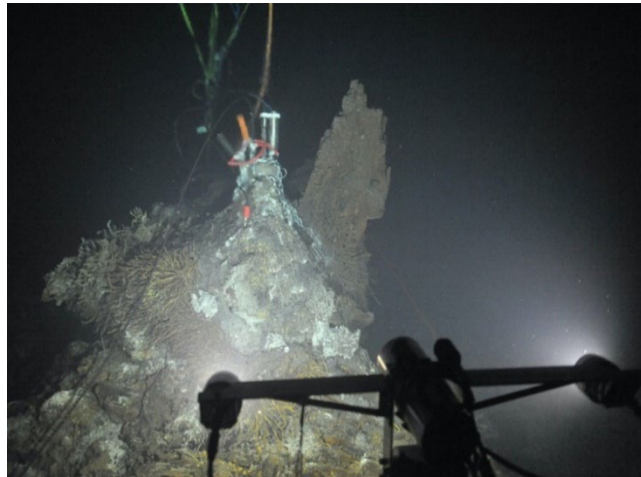
In October 2020, OOI launched a new data discovery tool, Data Explorer. The design of this tool was based on input from the science community and allows users to explore, use, and visualize OOI data in new ways that help advance understanding of the ocean, its processes, and how they are changing.

In 2021, a community consultation process informed the new location of the Pioneer Array, described further below. The OOI team continues to engage with its scientific users at major conferences through town halls, one-on-one engagement, and presentations.

Status of the Facility

OOI began full operations in FY 2016. Maintenance cruises are conducted once a year at each Global Array and the RCA, and twice a year at each Coastal Array. During these cruises, all instruments on both the RCA and mooring lines are replaced with refurbished and re-calibrated ones. At the same time, glider vehicles are replaced with newly serviced ones.

During operations, a subsample of the data collected on the instruments at the Global and Coastal Arrays is transmitted ashore in near-real time via satellite. All data are stored onboard the in-water instrument packages until retrieved during maintenance cruises. The subsampling interval depends on the parameter measured as well as on the bandwidth and power available for transmission. All data collected by the RCA, including video imagery and acoustic data, are transmitted ashore in real-time via the underwater fiber-optic cable.



The RCA cabled digital still camera, redeployed in 2015 by the Canadian ROV ROPOS, lights up the active hydrothermal vent called El Gordo in the international District Hydrothermal Field, located at the summit of Axial Seamount nearly a mile beneath the ocean surface. *Credit: UW/NSF-OOI/CSSF.*

The OOI cyberinfrastructure supports data handling, processing, and serving through the legacy Data Portal and the more recently developed Data Explorer. The latter was the outcome of user community feedback regarding data accessibility and discoverability, provided to the facility through the OOI Facility Board (OOIFB, described below under External Governance) and its Data Systems Committee (DSC). User satisfaction surveys from 2022 showed that the introduction of the Data Explorer increased user satisfaction when compared to the survey from 2019 when only the Data Portal was available.

Major Facilities

The Data Explorer allows the user to: search for and download data of 200 different ocean parameters, from approximately 80 platforms and 800 instruments; compare datasets across regions and disciplines; and generate and share custom data views. It also allows the download of full datasets using NOAA's Environmental Research Division's Data Access Program. OOI serves data from each of OOI's five active arrays plus archived data from prior deployments. Users can search for data by parameter, location, and/or instrument type.

While most OOI Arrays are associated with a particular region or sampling site, the Pioneer Array was designed to be relocated every five years to a new region of scientific interest. Since 2013, the array had been located south of Martha's Vineyard on the New England shelf. NSF, in collaboration with the science community, initiated the process for its relocation to a new site. Through a series of Innovation Labs and with community input, NSF decided the Pioneer Array should be relocated to the Mid-Atlantic Bight, north of Cape Hatteras, North Carolina. In November 2022, the array was fully recovered from its New England location after nine years of continuous data collection. The Pioneer Array infrastructure and instrumentation packages are under refurbishment and in preparation for deployment in the new location in 2024.



Coastal Endurance Surface Buoy with sea lions.
Credit: Coastal Endurance Array Team. OSU.

Governance Structure and Partnerships

NSF Governance Structure

NSF oversight is provided by a program officer in the GEO Division of Ocean Sciences (OCE), who works cooperatively with staff from Office of Budget, Finance, and Award Management (BFA), the Office of the General Counsel, and the Office of Legislative and Public Affairs. Within BFA, the Large Facilities Office provides advice to program staff and assists with agency oversight and assurance. The GEO facilities team and the Chief Officer for Research Facilities also provide high-level guidance, support, and oversight.

External Governance Structure

The Woods Hole Oceanographic Institution (WHOI) is the primary awardee and managing organization for OOI, responsible for overall operations, management, and maintenance. WHOI provides sub-awards to Oregon State University (OSU) and University of Washington (UW), and all three institutions comprise the OOI Implementing Organizations with the following responsibilities:

- WHOI – Overall OOI facility operation and maintenance, Global Stations, and Pioneer Array
- OSU – Endurance Array and the OOI Cyberinfrastructure Data Systems Center
- UW – RCA

The OOIFB, established in FY 2017, comprises members of the oceanography community, and provides independent input and guidance to NSF regarding the O&M of OOI. The DSC of the OOIFB evaluates and recommends improvements to data services policies and practices.

Partnerships and Other Funding Sources

OOI O&M is supported exclusively by NSF. Additional funding from NSF or other U.S. agencies is provided to individual researchers to cover costs associated with specific project expenses.

Funding

Total Obligations for OOI
(Dollars in Millions)

	FY 2023		FY 2024	ESTIMATES ¹				
	FY 2022	Estimate		FY 2025	FY 2026	FY 2027	FY 2028	FY 2029
	Actual	Base	Request					
Operations & Maintenance	\$45.13	\$51.00	\$53.36	\$53.36	\$53.36	\$53.36	\$53.36	\$53.36

¹ Outyear estimates are for planning purposes only. The current cooperative agreement ends in September 2023.

The FY 2024 Request includes \$53.36 million for OOI. The increase above FY 2023 is associated with the recapitalization of the primary in-water infrastructure, upgrades to data-serving operations and cybersecurity, and addressing inflationary increases in equipment replacement, supplies, and other operational costs.

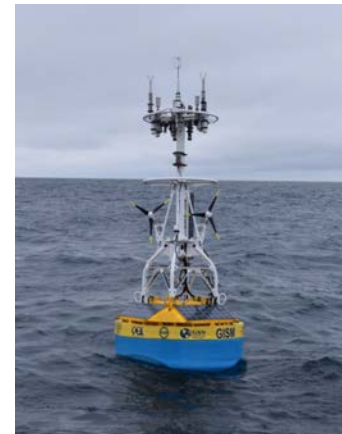
Reviews and Reports



All Global and Coastal Arrays utilize gliders to collect physical and biogeochemical data to supplement those collected by the stationary moorings. At the Global Arrays, the gliders collect data from the subsurface moorings using acoustic technics and relay the data to shore via satellite.
Credit: Sawyer Newman, WHOI.

A mid-award review was conducted in November 2020 and covered all aspects of the OOI program. The outcome of the review was positive, and the panel recommended that the cooperative agreement with WHOI be renewed under the existing administrative and operational structure.

NSF completed a Business Systems Review (BSR) of WHOI's administrative business systems in October 2021, which determined that the administrative business systems supporting OOI are in alignment with federal regulations and meet compliance requirements. The report noted some areas that could be further strengthened to better meet NSF's expectations. Following the development and approval of an Implementation Plan, NSF closed the BSR in November 2022.



Global Irminger Array surface mooring that consists of a large surface buoy with meteorological instrumentation, satellite telemetry, wind turbines and solar panels to generate power, and instrumentation in the water to 1500 m depth.
Credit: OOI/WHOI.

Renewal/Recompetition/Disposition

NSF completed the process of recompeting the O&M award through an open, merit-based external peer-review process, resulting in an award to WHOI as the OOI Program Management Office, that started October 1, 2018, and runs through September 30, 2023. NSF is engaged in a process to continue support for the facility beyond the current award period. Currently, there are no plans for disposition of the facility.