

Action: OOIFB- 2017-3 – Develop an OOIFB Recommendation Regarding Supporting Science with NSF-Owned Equipment Purchased for OOI

Final action - submission to NSF 10/5/2017

Supporting Science with NSF-Owned Equipment Purchased for OOI

In fall 2017, the Ocean Observatories Initiative will remove its two Southern Hemisphere arrays. The Southern Ocean sites and array design were considered by the OOI community consultation process to have the potential to yield observations that would provide transformational insights to the processes that control biological productivity in the Southern Ocean, and influence the earth's weather and climate. Though the engineering challenges and remote locations make these observations costly, the OOIFB believes that they remain extremely valuable and that the NSF should strive to develop partnerships with other agencies (both national and international) and countries to restore this observational capacity particularly at the site of the OOI Southern Ocean Array.

This change may also open new opportunities for PI-led science initiatives that might be able to make use of equipment purchased by OOI and owned by NSF in order to carry out cost-efficient and well-targeted science objectives. Instrumentation and moorings purchased for OOI represent an NSF-supported community resource, much like ship time, and these resources have the potential to facilitate transformative science. The OOIFB recommends that equipment that is still operating and no longer needed by OOI should be managed by NSF, with the specific aim to support PI-led core science proposals focused on ocean sciences and on processes at the air-sea interface.

Here we identify some key considerations.

- Equipment purchased for the two OOI global moorings that are being removed include 4 surface moorings (at each site, in any given year, one buoy is in the water and one is being prepped to be deployed the next year), 12 subsurface moorings (of which 4 are profiler moorings and 8 are fixed-instrument moorings), and 16 gliders. These moorings consist of electrical and power components, instrumentation, floatation and mechanical components, and mooring riser components (e.g., wire rope, anchors, etc.) Some of this equipment was purchased off-the-shelf from instrument suppliers, and some was special-ordered to meet OOI requirements or engineered and configured for OOI.
- NSF holds title to the equipment but does not usually have the facilities to warehouse equipment, so once equipment is removed from the OOI array it will need to be stored at an institution that is willing to provide storage space. It is unnecessary for the OOI operator to hold the equipment.

- Because much of the electronic and instrument components are common across the Coastal and Global Arrays, some of the decommissioned instruments and electronics could be used to ensure full baseline functionality and science measurements at the remaining Coastal and Global arrays. However, some components are only used at the Global Arrays and therefore could be stored for a number of years before needing to be deployed. The existence of these "excess" instruments should not prevent technology refresh cycles from occurring when deemed necessary to ensure high quality science measurements.
- NSF should plan to provide an inventory of equipment to the broader community. The inventory should identify the advanced capabilities intrinsic to the equipment and should identify the engineering and operations teams who built and deployed the equipment and have experience with the specific configurations.
- We recommend that NSF entertain proposals to use the OOI equipment as part of the regular twice-per-year ocean sciences proposal deadlines. Proposals should undergo standard peer review, which will likely focus on hypothesis-driven science rather than long-term monitoring or facility-class measurements. Since the engineering teams that initially configured the OOI moorings have considerable expertise, proposers should be encouraged to include the engineering design teams and operators as collaborators or in some other way that capitalizes on their expertise. (By no means should funding opportunities be construed as being appropriate only for the original instrument teams.)
- Although science could be carried out by fully dismantling the moorings to make each sensor available individually, there are considerable scientific opportunities available that could benefit from the specific engineering carried out to meet OOI objectives. The peer review process should favor proposals that will carry out the best science with the equipment that is available, and should take into consideration the scientific opportunities that are possible because of the considerable investment in engineering carried out as part of OOI.
- Pre-deployment and post-deployment calibration of sensors should be the responsibility of PIs funded through the peer-review process, PIs should request appropriate levels of funding in their proposals, and OOI should not be expected to carry out calibration to support investigators using OOI equipment.
- Equipment that breaks or is lost at sea should not need to be replaced to maintain an instrument pool. Equipment that survives one field program in good shape could either vest with the PI who used it or return to the OOI instrument pool, depending on its functionality.
- OOI equipment could be used by non-NSF projects. OOI surface moorings include considerable capabilities for measuring meteorological variables, which would justify consideration of proposals via NSF ATM as well as NOAA.

Ideally, all requests for equipment should work through the NSF proposal process.

We highlight some examples of mooring-centered science opportunities that have emerged in recent community discussions:

- The Year of Polar Predictability (YOPP) will carry out an Antarctic Special Observing Period from 16 November 2018 through 15 February 2019, and investigators planning for YOPP have indicated that they would value having a surface mooring, with meteorological sensors, with data transmitted via the Global Telecommunications System (GTS) to make the data available in support of numerical weather prediction carried out during the observing period.
- The Southern Ocean Observing System (SOOS) working group on air-sea fluxes has highlighted challenges in determining air-sea fluxes in high-wind, high-wave conditions typical of the Southern Ocean. The working group has suggested the potential value of carrying out a process study to compare multiple flux measurement systems in the neighborhood of a surface flux mooring, with the goal of obtaining information about spatial and temporal variability in surface heat and momentum fluxes.
- The current OOI Station Papa Array does not include an OOI Surface Mooring due to the presence of a NOAA/PMEL mooring in the vicinity. However, the NOAA/PMEL Ocean Station Papa mooring does not have the same measurement capabilities of an OOI Surface Mooring. Adding an OOI Surface Mooring would increase the meteorological measurements, notably by adding flux covariance measurements, and add subsurface measurements consistent with the other OOI Global Arrays.
- The Irminger Sea is an area of active interest by US and international researchers. The excess OOI surface and/or subsurface moorings could be used to expand the presence in the area.
- The OOI science planning documents were drafted after extensive consultation to gather input from a broad range of ocean scientists. These documents highlight a broad range of science objectives, some of which could be carried out with a less extensive mooring system than was originally planned for the OOI global sites.