OO Exchange, September 15, 2026
Topical focus: Standalone Seafloor Seismological Instrumentation
Facilitator(s): Zach Eilon and John Collins

Summary

Twenty-seven attendees participated in the virtual session. After reviewing introductory information about the DCL process and available resources, participants then split into four breakout groups. Attendees considered all questions contained in the request for input, however, much of the discussions focused on:

- Q2: What gaps exist in observations to address high impact science questions and what oceanic regions could benefit from NSF ocean observations system(s)?
- Q3: What types of observations would best advance the national interest?
- Q4: What types of observations (e.g., pre-selected sites vs. moveable assets) are needed and what technologies are ready for implementation to ensure advancement of the state of the science?
- Q5: Which elements in NSF's existing observational portfolio should be maintained or updated to fulfil the identified needs?
- Q8: How should NSF seek to balance the development of new ocean observing technologies with the collection of more data using established technologies?

Key takeaways from this OO Exchange included:

- **The U.S. now lags behind the international community in developing permanent, seafloor geophysical infrastructure** (this includes traditional cabled observatories, DAS cables, etc.) Solid earth observations are needed almost everywhere from the open ocean basins – capitalize on infrastructure to get data return. Building more observatories in seismically prone areas to measure/assess/understand hazards would be of national interest. If we don't invest in continuing and emerging technologies on the seafloor, the U.S. may lose ground internationally in how to utilize that data, which has strong implications for national security ranging from natural hazards resilience to global monitoring programs (related to Naval activities ["Ocean Battlespace Sensing"], etc.) Without our own infrastructure then we also won't have U.S. technicians and scientists with expertise innovating in this critical area and uniquely challenging physical environment.
    - Hazards (e.g. earthquakes, tsunamis, etc.) translate to national security + economic stability (fisheries, critical minerals). Highlight how sustaining critical infrastructure supports these initiatives.
    - Take advantage of infrastructure for delivering continuous real-time data by delivering more diverse data streams, including seafloor observations that can inform hazards, national security, and deep ocean economic interests.
    - Subduction zones, which pose the largest risk to national security here in US (both Alaska and the PNW); in addition to large ground shaking from M9+ events, tsunamis generated by any of these subduction zones could affect other US coastlines (Hawaii, California, etc.).

- The current seafloor sensing/instrumentation community provides a **key data analysis pipeline** (people have the expertise to analyze data from cabled observatories), and also provides a **key benchmark against which emerging technologies can be compared**.
    - Motivate preserving the instrumentation and infrastructure expertise, and consider using geographic scope and technical development to tie into the key NSF priorities
- **Permanent OBSs** (e.g. OOI-RCA) and other seafloor geophysical sensors are essential for building long-term time series and for real-time data streaming, which supports earthquake monitoring and EEW. On top of this, there is a need to maintain the ability to respond to events (submarine volcanic eruptions, large earthquakes, etc.), which requires **portable OBSs** as well. Importance for national security (natural hazard response)
    - Consider the value of a new, permanent seafloor OBS observatory - either stand-alone or built on the back of/supporting OOI-RCA. Mid-ocean OBS-based seafloor observatory (associated for instance with SZ4D) focused on fundamental science questions, and/or also placed with a view to categorizing and rapidly responding to hazards.
- **Flexible PI-oriented systems** are key to nimbly responding to multiple science questions over the **long lifetimes of the instruments** and to enabling rapid response. Flexible systems are often modular and can keep up with advancing technologies.
    - **A good example: the PI-driven deployment of additional autonomous OBSs at Axial Seamount, on top of the existing permanent OBSs on the OOI-RCA**. The PI-driven temporary deployment was needed to answer specific science questions regarding the volcanic seismicity that couldn't be achieved with the more skeleton permanent network
- **AI connections:** permanent OBSs provide long-term time series and high data volumes that are needed for AI development. More flexible autonomous OBS deployments contributed to AI-useful datasets in a different, but necessary way: they enrich the time series and provide unique new coverage both geographically and in data type.
    - AI DAS, ML - earthquake + event detection - the data sets produced by these instruments are excellent for development of these approaches.
- There is **inherent value in maintaining established technologies for reliable, repeatable, long-baseline observations.** Reliability of observing systems data is paramount, especially in the marine realm, where small errors in tech can lead to highly, non-linear data or hardware loss. (workforce development and expertise also ties in here)
- Marine geophysical instrumentation requires a skilled technical workforce to develop, maintain, and operate, particularly given the challenging operational environment of the deep ocean. It is a **national security interest to have these skilled workers and technical/manufacturing capabilities at US institutions**, including those **developing cutting edge technologies.**