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Pursuing Earth and Ocean Sciences Priorities As One Community

From May 4–6, 2015, I had the privilege of attending the “Workshop on Future Seismic and Geodetic Facility Needs in the Geosciences” in Leesburg, Virginia. Roughly 100 scientists from the largely land-based US seismic and geodetic communities gathered to formulate the key scientific research questions that they will be pursuing beyond 2018, and to develop recommendations regarding the “foundational” and “frontier” facilities required to conduct the science (for more information, see http://www.iris.edu/hq/workshops/2015/05/future_seismic_and_geodetic_facility_needs_in_the_geosciences). The workshop took place in the context of the National Science Foundation’s Division of Earth Sciences’ need for community input as it plans to re-competite management and operations of its seismic and geodetic facilities in 2016 (see <http://www.nsf.gov/pubs/2015/nsf15076/nsf15076.jsp>). Those facilities include the Incorporated Research Institutions for Seismology (IRIS; <http://www.iris.edu>), UNAVCO (<https://www.unavco.org>), and EarthScope (<http://www.earthscope.org>), which is managed jointly by IRIS and UNAVCO.

From the outset of the May workshop, it was clear that many in the seismic and geodetic communities believe that pursuing their scientific priorities requires an extension of land operations into the ocean. Recommendations include deploying arrays of ocean bottom seismometers for passive and active seismic experiments, installing seafloor

geodetic instruments to measure horizontal and vertical motion of the seafloor, and establishing several long-term broadband seismic stations to extend global seismic coverage into the ocean. Workshop participants also discussed the need to add sensors—such as those that continuously record bottom pressure and temperature—to ocean floor seismic and geodetic instruments. The concept of deploying permanent ocean bottom seismographs to complete uniform global coverage of the Global Seismographic Network (<http://www.iris.edu/hq/programs/gsn>) dates back to the 1990s (e.g., Stephen et al., 2003). These stations have become more feasible thanks to technological advances that include autonomous underwater vehicles that could download and transmit the data from remote sites, and improved battery lifetimes and very precise atomic clocks that enable multi-year deployments. Workshop participants also mentioned the need for improved marine magnetotelluric and controlled source electromagnetic capabilities and for high-resolution bathymetry to enable more precise knowledge of site characteristics for input into crustal models.

These foundational and frontier facilities would support studies of subjects ranging from subduction zone systems beyond Cascadia (e.g., see Toomey et al., 2014), deep mantle structure (slabs and plumes), magmatic systems (mid-ocean ridges, underplating), and also “water” (e.g., cryosphere, sea level, and fault zone

properties). Not surprisingly, these topics are similar to several decadal science priorities, such as sea level change, the formation and evolution of ocean basins, and the character of the seafloor environment, set forth in the just-released report of the NRC Committee on Guidance for NSF on National Ocean Research Priorities: Decadal Survey of Ocean Sciences (NRC, 2015, see Table 3-2 summary). The NRC report also lists geohazards (earthquakes, volcanoes, landslides, tsunamis) as a priority. While discussion of geohazards research at the recent “Futures” workshop was vigorous and was seen as important, the participants remained focused on land-based studies.

The Futures writing committee is now crafting the workshop report, which will articulate the outcomes of the meeting discussions and describe in more detail the seismic and geodetic communities’ scientific priorities and infrastructure needs. The report will be made available for community input in mid-to-late June for one month on the meeting website. I strongly encourage members of the ocean sciences community to review this draft and provide comments to the writing committee. The TOS website will provide a link to the workshop draft.

In this age of multidisciplinary, interdisciplinary, and transdisciplinary research, the overlap in science priorities for Earth and ocean sciences articulated by the two groups is not at all surprising. The 2015 NRC report and the Futures workshop report (final to be released in



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early to mid-September 2015) provide an opportunity for Earth and ocean sciences communities to review future requirements holistically and work together to ensure the availability of infrastructure necessary to conduct priority science. NSF program managers from both the Earth and the Ocean Sciences Divisions must be part of this discussion. It is imperative that scientists and managers begin this conversation immediately and work quickly to remove any barriers to the necessary joining of the two communities.

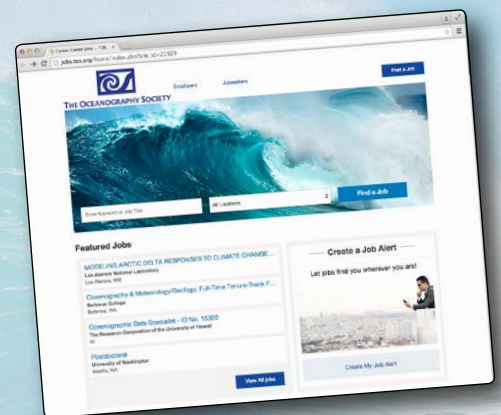
Ellen S. Kappel, Editor

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