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Undersea Natural Hazards

This special issue of *Oceanography* takes a look at a variety of *undersea* natural hazards—hazards resulting from natural processes such as earthquakes, tsunamis, volcanic eruptions, and landslides. These undersea natural hazards are generally more difficult to assess than those on land because of the challenges and expense of working in the ocean. Seafloor monitoring networks, deep drilling of fault zones, new computational methods, high-resolution sonar imaging, and paleoseismology, among other technologies and strategies, are all shedding new light on hazard risk and assessment around the globe.

We begin the special issue section with an examination by **Embley et al.** of an unexpected submarine volcanic eruption of South Sarigan Seamount on the southern Mariana arc in 2010. This hidden geohazard—the seamount’s crest is at 200 m water depth—produced a gas and ash plume that rose 12 km into the atmosphere. While most submarine volcanoes, such as those along the mid-ocean ridge, pose no hazard to society, those along island arcs are often located closer to population centers and tend to be more explosive due to their shallower depths, higher volatile contents, and more viscous magmas. Hundreds of them are located in the western Pacific Ocean and in the Mediterranean and Caribbean Seas.

Submarine landslides are potential risks because they can generate damaging tsunamis, disrupt global communications by severing seafloor cables, and severely damage infrastructure such as offshore oil rigs and pipelines. Monitoring submarine landslides is a great challenge because failures are infrequent and the chance that any monitoring instruments remain intact after slope failure is small. **Talling et al.** describe landslide hazards along continental slopes where failures can occur on extremely gentle slopes that would almost always be stable on land. Many different

potential triggering mechanisms are discussed, including climate change. **Watt et al.** concentrate instead on volcanic island landslides, looking into the sedimentary record to learn more about associated hazards. Turbidite deposits suggest that some volcanic landslides occur in multiple stages, significantly reducing their potential to generate a large tsunami. **Carter et al.** report on cable-damaging events that disrupted a key part of the modern fiber-optic network off southernmost Taiwan and suggest possible strategies for reducing cable breaks in the future.

Since the 2004 Indian Ocean and 2011 Japan Trench tsunamis associated with great subduction zone earthquakes, there is increased awareness of this potentially devastating natural hazard. In addition to increasing the number of sensors in the ocean and improving communication to coastal communities that may be affected by tsunamis, modeling is an important component of hazard mitigation.

Geist and Lynett describe a computational method for defining the severity of a tsunami hazard at an explicit likelihood, called probabilistic tsunami hazard analysis, or PTHA. **Yalciner et al.** model tsunami generation and propagation from moderate-sized hypothetical landslides at the Nile Delta, while **Necmioglu and Özel** assess how earthquake source parameters affect tsunami generation and propagation in the Mediterranean.

The next set of articles reviews different approaches to assessing hazards generated at plate boundaries where earthquake-generating faults are covered by the ocean. Monitoring networks such as those in the Northeast Pacific (**Toomey et al.**) are blending onshore and offshore seismic and geodetic networks to understand how and where megathrust earthquakes are generated at this subduction margin, among other objectives. Sidebars by **Kaneda, Heesemann et al.**,

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and **Best et al.** summarize some of the numerous efforts by ocean observatories to monitor the seafloor, understand the physical processes underlying the hazards, provide early warning of hazards, and construct databases that can be input to hazard models. **Sgroi et al.** describe an ocean floor observatory in the Mediterranean that is providing insights into the area's geohazards by analyzing seismic signals associated with submarine landslides, volcanic tremor, and possibly hydrofracturing of outcrops due to changes in the stress field around Mt. Etna. **Mori et al.** discuss the Japan Trench Fast Drilling Project (JFAST) that drilled boreholes in the seafloor through the fault zone of the 2011 Tōhoku-Oki earthquake (M9.0) to improve understanding of the rupture process and tsunami generation. **Hori et al.** take a computational approach, assimilating real-time data from both onshore and offshore seismic networks to construct a forecasting

system for the Nankai Trough off Japan based on the physical processes that generate earthquakes. In contrast, **Wallace et al.** and **McHugh et al.** use historical and geologic evidence of earthquakes, among other tools and observations, to better understand the seismic and tsunami potential in New Zealand (Wallace et al.) and in Haiti and Turkey (McHugh et al.).

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ELLEN S. KAPPEL, EDITOR

Dear Editor,

In the December 2013 issue of *Oceanography* our president made some insightful and worrying observations about the impact of social media on research choices, particularly of young scientists. It appears that online conversation lets people make remarks publicly that they would have reserved for private face-to-face insults or relegated to behind-the-back comments in the past. We in the science community should strive to maintain proper standards of communication, no matter how controversial a topic may be.

Online technology brought about social media and their frequent toxicity, but it can also help to promote good standards of debate through immediateness and openness. The European Geoscience Union (EGU) began several years ago to publish its journals under the Public Peer-Review & Interactive Public Discussion system. It puts submitted papers online as "Discussions", which are open for public comment and debate while they are

reviewed by expert referees. The reviewers' comments, the author's reply and the editor's decision are also posted as part of the discussion. If the paper is accepted for publication the final version is published in the appropriate EGU journal. All contributions to the Discussion process remain available, regardless of the editor's decision to accept or reject the submitted paper.

In my view the system has several advantages over the traditional peer-review system. It makes the review process more transparent; even if the referees choose to remain anonymous, public availability of their reports eliminates instances of malicious judgment. Young scientists who submit a paper on a controversial topic may receive adverse comments, but if the points they make are of any value they will also find support from others in the discussion, which can help them to counter malevolence from established colleagues. Even if a paper is rejected and its main ideas are found valid

only years later, its existence in the Discussions section provides proof of priority of the ideas and can help the author to rectify earlier career setbacks.

The print edition of *Oceanography* is one of the finest publications in our science fields. There is no need to change its ways. But now that *Oceanography* has an online edition as well it may be time to consider whether the online edition should not move to the Public Peer-Review & Interactive Public Discussion system.

Matthias Tomczak
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LETTER TO THE EDITOR