

November 06, 2017 | By Tiffany Fox

Tackling ‘Ocean Exploration in a Sea of Data’ at the National Ocean Exploration Forum

Ocean explorers from around the world gathered at the UC San Diego Qualcomm Institute last month for a National Ocean Exploration Forum (NOEF) to discuss a challenging problem: how to make sense of the vast quantities of oceanographic data generated by both historic and contemporary studies of the sea.

This fifth annual forum attracted nearly 125 participants, including scholars of data science, ocean exploration and other disciplines who are interested in how data science analysis and visualization techniques can be applied to oceanographic data. The theme of this year’s Forum, “Ocean Exploration in a Sea of Data,” was intended to elicit forward-looking recommendations for how data scientists and ocean explorers can smoothly collaborate to expand traditional concepts of ocean exploration while driving new discoveries, providing greater access to data and engaging more effectively with the public.

“The Forum is an integral part of an emerging national program for ocean exploration,” said Dominique Rissolo, an assistant research scientist at the Qualcomm Institute (QI) and a member of the National Oceanic and Atmospheric Administration (NOAA) Ocean Exploration Advisory Board (NOAA co-organized the event). “Participants play key roles in setting priorities for NOAA’s Office of Ocean Exploration and Research (OER) and its many partners.”

Added McKinnie: “We have always thought of ocean exploration as multidisciplinary – oceanographers, marine geologists, biologists and marine archeologists collaborate to plan expeditions and participate to ensure we learn as much as possible when we explore an unknown deep-ocean environment. This year, it was very energizing to also collaborate with data scientists, computer scientists, and visualization experts who also represented expertise in music, art, and dance.”

The demonstrations at NOEF relied on technologies developed at the Qualcomm Institute, a division of the California Institute for Telecommunications and Information Technology (Calit2). These demonstrations included:

- “Exploring Ocean Data Through Audio Spatialization and Sonification,” held in the QI Audio Spatialization Lab (SpatLab) and presented by QI affiliate Sharokh Yadegari and Grady Kestler, as well as Copeland
- “WAVELab Underwater Photogrammetry: Point-Based Visual Analytics and Habitat Characterization,” held in the Structural Materials and Engineering Building and presented by QI affiliates Falko Kuester (also of the Jacobs School of Engineering) and Rissolo
- “SunCAVE: Seabed Mapping – New Perspectives from Immersive Visualization,” presented by Vicki Ferrini of the Lamont-Doherty Earth Observatory on the QI SunCAVE
- “Cultural Heritage Engineering Lab: Visualizing Antarctic Ice Shelf and Bathymetry with Airborne Radar Data,” presented by Nicholas Frearson of the Lamont-Doherty Earth Observatory
- “Being There Without Being There,” a demonstration of real-time robotic interactions with a remote seafloor ecosystem presented by Oceanography Professor John Delaney and Aaron Marburg of the University of Washington, Timothy Crone of the Lamont-Doherty Earth Observatory and Friedrich Knuth of Rutgers University using the QI Vroom (Virtual Room) display wall.

The carefully crafted demos at the Forum reflect the ocean exploration community’s focus on a multi-disciplinary, technology-enabled research ‘presence’ within the ocean. Researchers at NOEF noted that exponential changes in a host of technologies are rapidly transforming their ability to explore, experiment with and begin to more deeply understand the complex processes that take place throughout the global ocean basins, which function as Earth’s life support system.

“Having the opportunity to incorporate my expertise in ocean acoustics, with collaborators in deep ocean exploration and music provided me with a unique opportunity to give others a multi-sensory experience with data,” remarked Copeland. “Getting to work with the SpatLab team was incredibly rewarding. As a Sea Grant Knauss Fellow and early career scientist, this truly was an honor – both exciting and humbling at the same time. It made me think about other ways in which to express data to make the experience more meaningful to both the scientific community and non-scientists. I think these techniques will ultimately make data more accessible and interesting to people.”

“What I found most inspiring about the demos,” added Ferrini, “is that they presented new ways of experiencing data that can really transform the way we understand the ocean. New data science and visualization techniques also challenge our community to think beyond the limitations of our traditional approaches and can have a real impact on our current data

acquisition and data management practices. They also have the potential to bring new life to legacy data and present exciting opportunities for more effective communication of our results.”

According to the researchers, this is all just the beginning. Sophisticated remote undersea laboratories will become more common as new and evolving technologies – including optical communications, routine genomic analyses, nanotechnology, artificial intelligence, and a number of other breakthrough capabilities – are integrated into the routine activities of ocean scientists in the coming decades.

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