

HANA O KE KAI

“Work of the Ocean”

NEWSLETTER OF THE OCEAN AND RESOURCES ENGINEERING DEPARTMENT, Spring 2017, Volume 20, Issue 2

Chair’s Message

Eva-Marie Nosal, Chair



Welcome to the Spring 2017 issue of Hana O Ke Kai. The past semester saw several positive changes materialize for our students and department. First, I’m very excited to announce that several MS program changes have been approved, which will make our program more attractive and flexible for students while retaining the academic and engineering rigor and preparation needed for successful careers – read more about it below. Also, thanks to the involvement and dedication of Dr. Kwok Fai Cheung (ORE graduate chair) and Janna Light (ORE representative at the UH Foundation) and to the support of our industry sponsors, we’ve been able to secure several industry internships with Sea Engineering Inc. (SEI) and Navatek Inc. for next year. Regarding internships: It’s been a pleasure working with MS student Ian Hardy over the past year as a teaching assistant and on this and the prior edition of Hana O Ke Kai, and I wish him the very best in his new post as intern at SEI. I’d also like to extend a warm welcome to Dr. David Smith, Senior Ocean Engineering at SEI, who was recently appointed Affiliate Faculty member of ORE – read more about it below. Given their close ties with and support of our programs, SEI is featured in this edition as the first in a series of company profiles.

I welcome your ORE-related feedback, suggestions, or ideas: nosal@hawaii.edu, 808-956-7686, or via my department feedback form:

<https://goo.gl/forms/WGD8iay0l9mUqpVq1>.

Inside this issue:

Chair’s Message	1
China and Ocean Observing	2
SMART Cables for Climate, Ocean Circulation, Earthquakes and Tsunamis—An Update/MS Program Updates	3
Outstanding Student	4
Station ALOHA	5
Company Profile—SEI	6
New in ORE—Dr. David Smith/Recent Publications	7
New in ORE—Students/Meetings Calendar	8
Final Page	9

Editor’s Corner

Ian Hardy, ORE TA



Thank you to everyone who contributed to this issue. This will be my last time as editor of the ORE newsletter as I have moved on to an RA position. Editing the newsletters this past year has been very rewarding and I would like to thank our department chair, Eva-Marie Nosal, for being so involved and working closely with me on each issue. I hope you enjoy this version of *Hana O Ke Kai*.

Department News

- **Vincent Varamo** defended his MS Plan A Thesis presentation “Reliable Acoustic Path Tomography at the ALOHA Cabled Observatory” on May 16, 2017
- **ORE** welcomes Dr. David Smith as an Affiliate Faculty member to the department
- **Vincent Varamo** was awarded the Outstanding Graduate Student Award
- **We’re hiring!** We’ve extended our search for a new faculty member (at the level of assistant or associate professor) and will start another round of reviews on 01 August 2017. The position announcement is available here: <http://workatuh.hawaii.edu/Jobs/NAdvert/22244/3581307/1/postdate/desc>

Inside ORE

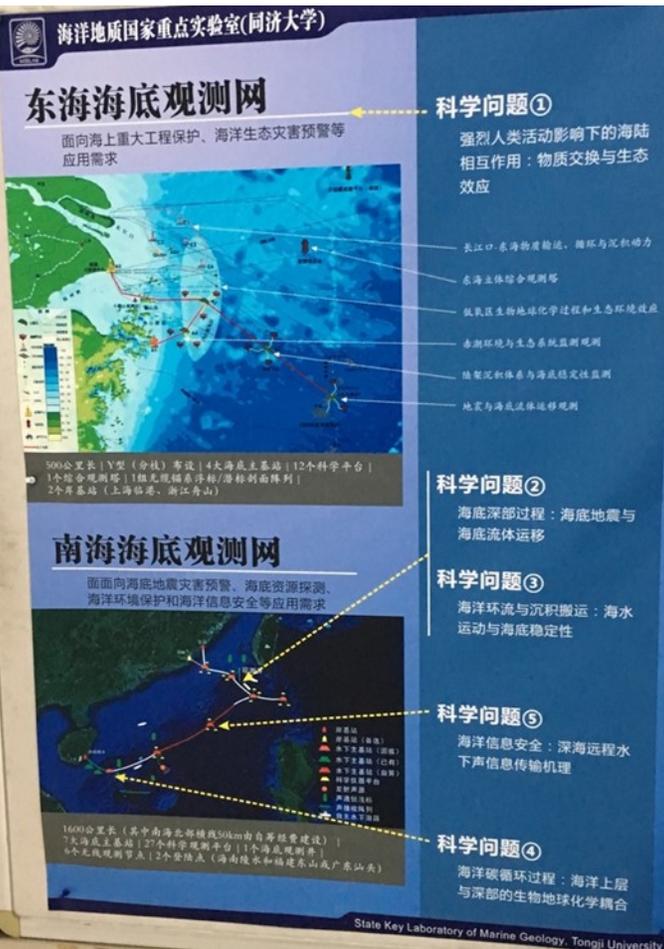
China and Ocean Observing

Bruce M. Howe



During the last week of April, I visited China to learn more about their ocean observing efforts, specifically using cabled systems. Tongji University is leading a major push by China in this area, somewhat similar to our NSF Ocean Observatories Initiative. Other partners include Zhejiang University and the Chinese Academy of Sciences. Two cable systems are planned, one in the East China Sea, and one in the South China Sea (see figure). The current vision for the latter is a 1400-km multi-node system, quite ambitious and never been-done-before. The budget for the total effort is about \$200M.

I visited Tongji University, Zhejiang University, Hengtong Marine Cable Systems, and Zhongtian Technology Marine Systems.



This was my first visit to Tongji. They have built a new ocean campus in Lingang New City just southeast of Shanghai. They are gearing up to hire 200 people for this effort. Our contact there is Professor Huaiyang Zhou, a long-term colleague of John Wiltshire's. He has invited me to be a member of their International Advisory Board. I have interacted with the engineering group at Zhejiang five years, starting with having Yanhu Chen here at UH as a post-doc here.

Tongji and Zhejiang have formed joint ventures with Hengtong and Zhongtian to support this effort. At both companies, I visited both optical fiber plants (~40 Gm per year each) and the cable plants. The latter were for both power and telecoms. All very impressive. The figure shows a primary node at Zhongtian with Dr. Feng Zhang (Zhongtian and Zhejiang) and myself. It is scheduled to be deployed in the South China Sea next month.

Inside ORE

SMART Cables for Climate, Ocean Circulation, Earthquakes and Tsunamis—An Update

Bruce M. Howe

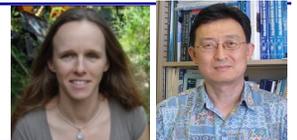


In recent newsletters, I introduced the concept of SMART – Science Monitoring And Reliable Communications – cable systems. Environmental sensors would piggyback on the extensive infrastructure of commercial, trans-oceanic submarine telecommunications cable systems, providing near global coverage for disaster mitigation (earthquake and tsunamis), as well as climate and ocean circulation monitoring.

Here I provide a brief update on various relevant events. 1) In December 2016, an RFP for a new cable system possibly connecting New Caledonia to Fiji was issued by the Office of Post and Telecommunications, including an option for SMART capability. This would be a near ideal situation as there is definitely early warning need in this area, the telecom part will be government financed (so less commercial pressures), and the modest scale is appropriate for a pilot system. 2) The Tsunami Warning, Education and Research Act 2017 was passed by the US Congress and signed by the President in April; it authorizes NOAA to investigate using Federal and commercial telecommunication cables for tsunami early warning. 3) A brief report describing the workshop on tsunami and earthquake aspects last November in Potsdam was published in Eos (<https://eos.org/meeting-reports/submarine-cablesystems-for-future-societal-needs>). 4) At the International Cable Protection annual plenary meeting in Montevideo, Uruguay, I gave a presentation and participated in a panel discussion on the scientific uses of cables. 5) I will be giving a keynote presentation on SMART cables at the Comprehensive Test Ban Treaty Organization (CTBTO) annual science and technology conference this June in Vienna. And 6) I will be spending the first part of my sabbatical leave at Potsdam working with colleagues there on observing simulation experiments, and traveling around Europe giving presentations and meeting with university colleagues and government and UN organizations to promote the concept and to raise funds.

MS Program Updates

Eva-Marie Nosal &
Kwok Fai Cheung



ORE has made several changes to our graduate program at the MS level that will become effective in the Fall 2017 semester. In addition to our existing 3 tracks of coastal, offshore, and ocean resources engineering, we've added the option for students to pursue an oceanographic engineering track or to develop an interdisciplinary field of study. Oceanographic engineering involves the design and maintenance of the mechanical, electrical, and computing systems and instrumentation that support oceanographic and marine operations. The interdisciplinary option caters to rapidly evolving elements of ocean engineering and attract students who want to combine ocean engineering with other disciplines in science and engineering. The program changes also give students in all options areas more flexibility in their class selection, allowing them to tailor their program more closely to their educational objectives. The changes serve to accommodate the educational objectives of a wider student body, thereby improving student enrolment and retention in the program, as well as improving the preparation that students receive for their future careers. The change is prompted by input from alumni and local and international advisory panels, by changes in the faculty and interests/expertise, and by ever-changing societal needs, funding climates and job markets for ocean engineers. For details, please refer to section on MS coursework requirement on our website (http://www.soest.hawaii.edu/ore/OE/ore_courses#COURSE) or in the updated ORE graduate student handbook (<http://www.soest.hawaii.edu/ore/OE/downloads/OREGraduateStudyGuide.pdf>)

Inside ORE

Outstanding Student

The annual Outstanding Graduate Student Award was presented to Vincent Varamo this past semester.

Vincent grew up in Charlotte, NC, and graduated from the University of North Carolina Wilmington with a B.S. in Physics in 2013. Upon graduating, he worked as a Research Assistant for Dr. Frederick Bingham on NASA's Salinity Processes in the Upper Ocean Regional Study (SPURS) project. He started at the University of Hawaii as a M.S. student in August 2014 under Professor Bruce Howe to work on underwater acoustics. His thesis was sponsored by the Office of Naval Research and is titled: "Reliable Acoustic Path Tomography at the ALOHA Cabled Observatory". Vincent developed and tested an experiment to measure acoustic travel times from a shipboard source down to a bottom mounted hydrophone. He created a model to compute the sound speed field for the surrounding area using these travel times. The results have been presented at the ASA/ASJ '16 in Honolulu, Hawaii and will be presented at the UACE '17 conference in Greece. When Vincent is not at the university he enjoys surfing, hiking, or doing some climbing around the island.



ORE would like to thank Vincent for all his hard work during his time as a graduate student and wishes him all the best in his bright future.

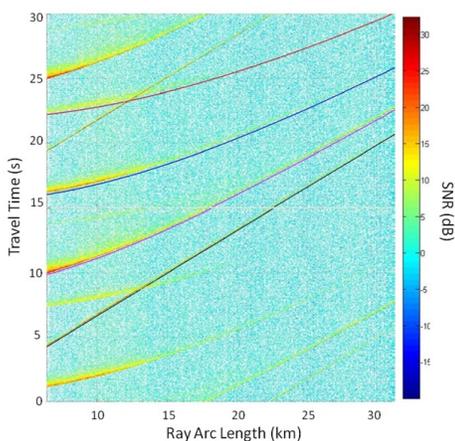


Figure 1—Signal to Noise Ratio (SNR) of acoustic arrivals at the ALOHA Cabled Observatory hydrophone. The direct path is outlined by the black line and the subsequent bottom-surface bounce arrivals are given with the other colors. The zero time on the y-axis corresponds to the time after an acoustic transmission. The x-axis corresponds to the ray arc length of the direct ray path.

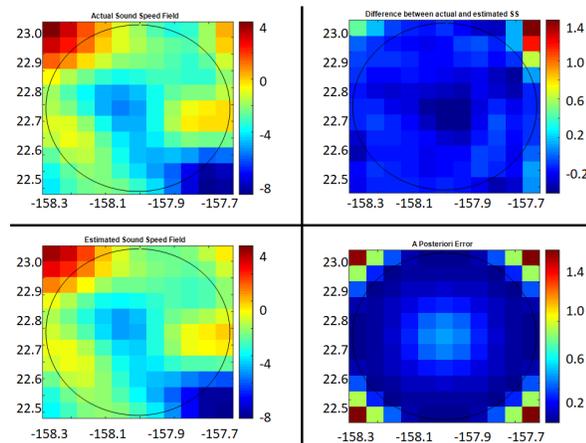


Figure 2—(Top left) Simulated perturbed ocean sound speed field (m/s) surrounding the hydrophone with a 30 km radius. The black circle corresponds to the area where acoustic transmissions (or data) is present. (Bottom left) Estimated perturbed sound speed field (m/s) using the acoustic data and stochastic linear inverse theory. (Top right) Difference between the actual and estimated sound speed field (m/s). (Bottom right) RMS a posteriori error (m/s) for each location, with the largest errors occurring furthest from where data is present.

Station ALOHA

ACO 10-Year Anniversary

The Aloha Cabled Observatory (ACO) celebrated 10 years of operation this past semester. The ACO is the deepest active ocean observatory on the planet and provides scientific instruments on the seafloor with power and communication. ACO was put into operation in 2007 with the use of a retired AT&T cable which had been resting on the seafloor for near 20 years. The AT&T cable was retrieved from the seafloor and brought to station ALOHA where it was attached to a pressure sensor and hydrophone and would relay information back to shore at Makaha on Oahu. These instruments were lowered to the seafloor and ACO was born. In 2011 ACO was expanded to include instrumentation for temperature, salinity, currents, and acoustics along with a video camera. These instruments were installed with the use of the ROV *Jason*. Most recent work has been completed by the UH Manoa ROV *Lu'ukai* which will be used for future maintenance and installation of equipment. Station ALOHA provides data for the study of deep-sea biology, abyssal circulation and mixing, along with acoustic signatures of earthquakes, ship,

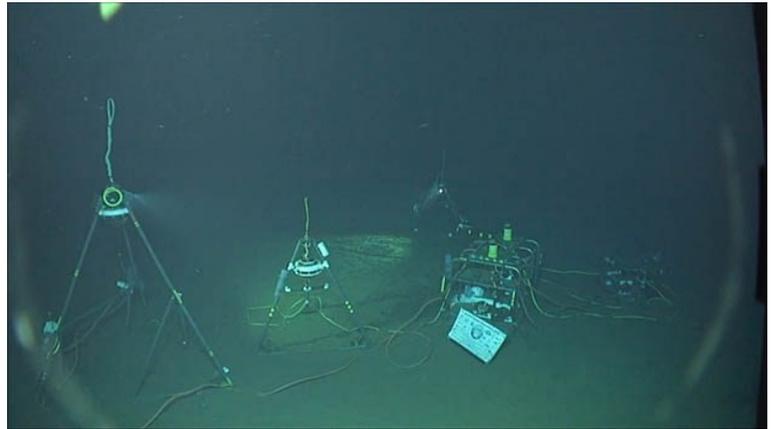


Figure 1—Current layout of the scientific equipment at ALOHA Cabled Observatory.

ACO & RAP Cruise: If at First You Don't Succeed, Try, Try, Try Again

Jessica Lotts, Marine Journalist

On June 1, 2017, the R/V *Kilo Moana* set sail with a mission to service the instrumentation of the ALOHA Cabled Observatory (ACO), while collecting acoustic travel time data for the Reliable Acoustic Path (RAP) tomography project. Although only the RAP portion of the cruise was successful, the crew of ROV *Lu'ukai* worked tirelessly to solve each problem encountered during operations.

Resting at a whopping 4728m below the surface, the ALOHA Cabled Observatory is the deepest scientific outpost in the world, providing power, communications and timing connectivity for scientific use all the way to station ALOHA, 100km north of Oahu. However, with greater depths comes greater problems. The cruise started smooth with a successful test to 430 m, however, the deeper *Lu'ukai* went, the more complications the team encountered. Despite the amount of set backs, the ROV team worked round the clock to fix & service the ROV. It seemed as though there was not a minute in the day that the ROV team was not working to enhance *Lu'ukai's* performance. However, despite their valiant efforts, the cruise was cut short after multiple fiber optics complications, TMS communication disconnection and a winch failure.

Coincidentally, the morning after the winch failure was gloomy and quiet, matching the emotions of everyone aboard the ship. Although disappointed, the RAP Tomography portion of the cruise continued successfully. After a few lessons from the OTG crew, myself and another intern overlooked the progress of each LFM chirp, m-sequence pseudo-random noise signal, and deployed nearly 60 XBTs while remaining over the ACO station.

In spite of the critical malfunctions that ended our journey three days early, the ACO remains to be a critical part in understanding oceanographic processes, and continuously provides us with knowledge previously unknown. The team standing behind ACO remain optimistic and there is already talk of a follow up cruise in the spring of 2018, after the winch cable is replaced of course.

Company Profile

Sea Engineering, Inc.

Sea Engineering, Inc. (SEI) was founded in 1973 by University of Hawaii ORE graduate students to provide marine-related engineering, construction and diving services. Today, Sea Engineering has three office locations in Hawaii and California and over 50 employees. SEI's core services include coastal engineering, geophysical surveys, oceanographic and environmental studies, as well as marine waterfront construction and industrial diving.

Sea Engineering has three office locations: the Hawaii Engineering/Environmental division is located at the Makai Research Pier in Waimanalo, Oahu; the Marine Construction, Vessels and Diving Divisions are located at 863 N. Nimitz Highway in Honolulu; and the California Engineering/Environmental division is located at 200 Washington Street in Santa Cruz. Sea Engineering also has a Guam business license, and maintains office space in Guam.

SEI has a continuous 20-year record of support to the U.S. military on IDIQ contracts in Hawaii. Projects have been completed throughout the world including over 70 projects in Guam, American Samoa, Kwajalein and other Pacific Islands.



Sea Engineering awards include:

- 2014 ASBPA National Award - Best Restored Beach - Iroquois Point Beach
- 2012 Outstanding ACASS rating received from TEC, Inc & NAVFAC Pacific for Monitoring of Existing Turbidity at the CVN Capable Berth Project, Apra Harbor, Guam.
- 2011 Outstanding ACASS rating received from TEC, Inc. & NAVFAC Pacific for the Oceanographic/Marine Ecological Assessment, Apra Harbor, Guam.
- 2012 ASCE Best Special Project Award – Waikiki Beach Restoration
- 2009 ASCE Hawaii Best Small Project Award – Analysis and Prediction of Waves and Surge in Kahului Harbor
- 2008 ASCE Hawaii Outstanding Civil Engineering Achievement Award for the Design of Kaunapali Harbor Breakwater Modification
- SBA Administrator’s Award of Excellence, Region IX, 2006 Subcontractor
- 2004 ASCE Outstanding Civil Engineering Achievement Award for the Sewer Outfall Extension at Fort Kamehameha, Pearl Harbor, Oahu, Hawaii.
- 2001 CNO Environmental Planning Team Award – Ehime Maru Recovery

Website: www.seaengineering.com

Phone: (808) 259-8143



Figure 1—Makai Research Pier

New in ORE

David Smith, PhD, P.E.

We are very pleased to welcome Dr. David Smith as an Affiliate Faculty member of ORE. Since obtaining his PhD from ORE in 2003, Dr. Smith has worked as a consulting coastal engineer, including the most recent ten years with Sea Engineering. As a senior coastal engineer, project manager, and licensed Civil Engineer in Hawaii, California, and Guam, Dr. Smith brings years of experience in coastal assessment, design parameters and reports, coastal structure design, environmental assessment, regulatory issues, construction documents, and coastal structure inspection. Along with his research background in coastal engineering and sediment transport, Dr. Smith’s real-world knowledge and understanding in handling coastal projects are valuable additions to our program.

David is not a new face to ORE graduate programs. He has served as a mentor for our ORE 783 capstone class since 2012, working closely with students to develop real-world projects. He has also supported interns in development of their MS projects. As an Affiliate Faculty member, Dr. Smith will have the opportunity to assist ORE students in a more formal capacity as a thesis or dissertation committee member.

Welcome aboard David!



Recent Publications

- ◆ Fang He, Huliang Dai, **Zhenhua Huang**, Lin Wang, 2017. “Nonlinear Dynamics of a Fluid-Conveying Pipe Under the Combined Action of Cross-Flow and Top-End Excitations.” *Applied Ocean Research*, Volume 62, January 2017, Pages 199-209.
- ◆ Rajagopalan, K. and **G.C. Nihous**, “Study of the Force Coefficients on Plates Using an Open Source Numerical Wave Tank.” *Ocean Engineering*, 118, 187-203, 2016.
- ◆ Wei Jian, Deping Cao, Edmond Yat-man Lo, **Zhenhua Huang**, Xiaobo Chen, Zhiping Cheng, Hai Gu, Binbin Li, 2017. “Wave Runup on a Surging Vertical Cylinder in Regular Waves.” *Applied Ocean Research*, Volume 63, February 2017, Pages 229-241.
- ◆ Lynett, P.J., Gately, K., Wilson, R., Montoya, L., Arcas, D., Aytore, B., Bai, Y., Bricker, J.D., Castro, M.J., **Cheung, K.F.**, David, C.G., Dogan, G.G., Escalante, C., González-Vida, J.M., Grilli, S.T., **Heitmann, T.W.**, Horrillo, J., Kânoğlu, U., Kian, R., Kirby, J.T., Li, W., Macías, J., Nicolsky, D.J., Ortega, S., Pampell-Manis, A., Park, Y.S., Roeber, V., Sharghivand, N., Shelby, M., Shi, F., Tehranirad, B., Tolkova, E., Thio, H.K., Velioğlu, D., Yalçiner, A.C., Yamazaki, Y., Zaytsev, A., Zhang, Y.J. (2017). “Inter-model analysis of tsunami-induced coastal current.” *Ocean Modelling*, 114, 14-32.

New in ORE

Victor Clark, MS Student



Howdy! I'm Victor Clark: new grad student and the department's current Technical TA. I completed my undergraduate in civil engineering at the University of Texas where I focused on Structures and Engineering Fluid Mechanics. I hope to further develop my understanding of these topics throughout my studies here in ORE. Following the completion of my Master's, I plan to pursue Ph.D. work in the applied mechanics and computational modeling of hydroelastic and hydrodynamic phenomena.

Kei Manabe, MS Student



Hi, my name is Kei Manabe. I was born and raised in Hokkaido, the northernmost and rich in natural beauty island in Japan. I have also lived in Tokyo to go to a university and to work for a company for over a decade in total. I have come to ORE because I want to study sounds in the ocean. I feel the world in the sea is very romantic. I enjoy listening to music, swimming, and skateboarding in my free time and plan to start surfing as well. I also enjoy skiing when I am staying at my parents' house in Sapporo.

Meetings Calendar

- ◆ **The Acoustical Society of America Fall Meeting** will be held in New Orleans, Louisiana from December 4-8, 2017.
<http://acousticalsociety.org/content/174th-meeting-acoustical-society-america>
- ◆ **32nd Symposium on Naval Hydrodynamics** in Hamburg, Germany from August 5-10, 2018.
<https://www.tuhh.de/SNH2018/>
- ◆ **OCEANS'17 MTS/IEEE Conference** in Anchorage, Alaska, from September 18-21, 2017.
<http://www.oceans17mtsieeeanchorage.org/>
- ◆ **36th International Conference on Coastal Engineering** will be held in Baltimore, Maryland from July 30-August 4, 2018. <http://icce2018.com/>
- ◆ **Underwater Acoustics Conference and Exhibition** will be held in Koukounaries, Skiathos Island, Greece from September 3-8, 2017.
<http://www.uaconferences.org/>
- ◆ **Acoustics Week in Canada 2017** will be held in Guelph, Ontario, Canada from October 11-13, 2017.
<https://awc.caa-aca.ca/index.php/AWC/awc17>

Final Page

The ORE Department relies on involvement and support from our alumni and friends—we wouldn't be where we are without you! Please consider donating to ORE enrichment fund to help us as we move forward in the next 50 years. To donate online, visit the ORE Enrichment Fund website:

<https://giving.uhfoundation.org/funds/12373104>

To pay by check, please make payable to University of Hawaii Foundation, indicate the donation is for "ORE 12373104," and send to:

Jana Light
School of Ocean and Earth Science and Technology
1680 East West Road, POST 841
Honolulu, HI 96815

If you have any questions about your donation, or about how ORE is using donor support, please contact Jana Light at 808-956-9172 or jana.light@uhfoundation.org.

Mahalo for your support!



Figure 1—Jonathan Koons and John Casilio, ORE graduates, cross paths in Diego Garcia. Photo courtesy of Jonathan Koons



Hana O Ke Kai

Newsletter of the
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**ENGINEERING THE
OCEANS SINCE 1966!**