

VOLUME 28 ISSUE #1

Hana O Ke Kai "WORK OF THE OCEAN"

Newsletter of the ♦ Ocean and Resources Engineering Department

Fall 2024



Chair's Message

Zhenhua Huang, Chair

ORE had a fruitful 2024. First of all, let's wellcome Dr. Camille Pagniello aboard! We are excited to have her join the department. Her expertise is in oceanographic engineering, which is an important research area for the department.

Nic Ulm and Shijie Huang successfully defended their PhD dissertation in the Fall semester, congratulations Dr. Ulm and Dr. Huang! We also congratulate Matthew Feeley for completing his MS studies in the Fall semester.

ORE had a successful open-house demonstration at the Discover Mānoa Open House, thanks to George Evans for making a wave generator for demonstration and to Elizabeth Taylor and Clint Chester Reyes for running the demonstration.

I am pleased to announce that the department has decided to use the faculty's RTRF fund to set up a competitive student travel award program, which aims at supporting ORE's students to present their high-impact findings at conferences.

Thanks to Dr. Bruce Howe for managing the department's KNO lab for the last 15 years, Dr. Mike Krieg has officially taken over the KNO's leadership starting from 2025. One more thing to announce: ORE has its new logo, thanks to Kaja Reinhardt for a stylish design.

In this newsletter you can expect:	
Chair's Message	1
ORE Updates	2
2024 UH Open House	<u>3</u>
SMART Cable Updates	4
MTS Student Chapter	<u>6</u>
R3D Progress	7
New in ORE!	<u>8</u>
Publications	<u>10</u>

Congrats to our Graduated MS & PhD Students!



2024 Summer ORE Graduates

- Guilhereme Fernandes defended his MS Plan B Thesis, "Micro-pHAT: A re-envisioned sensor design for measuring seawater pH and Total Alkalinity in situ." in June 2024.
- Merritt Shepherd defended her MS Plan A Thesis, "The Relationship Between Hydrodynamic and Morphologic Changes at Sunset Beach" in July 2024.
- William Robert defended his MS Plan A Thesis, "A Comparative Study of the Tsunamis from the 2021 and 2023 Loyalty Islands Mw 7.7 Thrust-Fault and Normal-Fault Earthquakes" in July 2024.
- Charlotte White defended her MS Plan A Thesis, "Nonhydrostatic XBeach Simulation of Wave Transformations in a Fringing Reef Environment: Validation using Field Observations" in August 2024.

2024 Fall ORE Graduates

- Matthew Feeley defended his MS Plan B Thesis, "A Navigation System to Enable Real-Time Relative Positioning at Sea," in October 2024.
- Nicolas Ulm defended his PhD Dissertation, "Designing Wave-Powered Ocean Observing: Experimental Findings of an Oscillating Water Column Type Wave Energy Converter," in October 2024.
- Shijie Huang defended his PhD Dissertation, "Innovative Coastal Defense in an Idealized Barrier Reef System," in November 2024.





TA ANNOUNCEMENTS

Kaja Reinhardt and Eliza Taylor are our Fall 2024 TAs! Kaja is a new MS student admitted in Fall 2024, and the creator of our new ORE Logo! Eliza is a continuing MS Student in the ORE Program. Eliza's appointment ended early due to her receiving her Research Assistant-ship with Dr. Nosal. We thank her for her services as a TA, and wish her luck with her new appointment!



I'm honored to take on this role as the newsletter editor and am happy to share announcements and updates in ORE via Hana o Ke Kai! The Hana O Ke Kai has gone through a bit of a revamp, incorporating our new ORE Logo Colors.

If you have news, updates, announcements to share for future editions, please send them along to us at oredept@hawaii.edu. We especially welcome updates from our wonderful alumni! Where are you now? What advice do you have for current students? Keep in touch! You can connect with us on Instagram, LinkedIn, or Facebook for realtime updates!





UH OPEN HOUSE

VOLUME 28 ISSUE #1

UH Open House, a new experience for students and incoming students!

On October 26th, McCarthy Mall was filled with energy as the UH Open House welcomed students, families, and the public to explore the university including the innovative research conducted by members of the School of Ocean and Earth Science and Technology (SOEST).

The ORE department featured a small-scale wave flume demonstration, crafted by George Evans, to illustrate how waves transport sediment. Students from kindergarten through high school enjoyed creating waves and observing how the sand moved, leading to conversations about the students' own experiences and observations at local beaches.

Clint Reyes and Eliza Taylor managed the exhibit, engaging visitors with explanations and answering questions about the science behind the demonstration.



Eliza Taylor, George Evans, Clint Reyes ORE students



ORE's volunteers for Open House



George, the creator of our mini portable waveflume

The SOEST Open House offered a wonderful opportunity for the community to connect with the university's research and discover the exciting work happening across a range of disciplines.





ORE

SMART CABLE UPDATES

Advancing SMART Cables Globally

The SMART Cables initiative represents a groundbreaking effort to integrate environmental sensors into subsea telecommunications cables, providing critical data for climate monitoring, seismic activity, tsunami detection, and oceanographic processes. Over the past 14 years, the initiative has achieved significant milestones, including its recognition as an Emerging Network by the Global Ocean Observing System (GOOS). This designation highlights the progress made toward establishing SMART Cables as a mature and globally impactful network.

Key Achievements and Developments

In 2024, the initiative marked significant progress through the successful deployment of the InSEA Wet Demonstration, which is providing high-quality seismic and environmental data. This prototype system represents a pivotal step in integrating environmental sensing into telecommunications infrastructure. Additionally, the Atlantic CAM and Tamtam SMART cable systems have moved forward, with installations scheduled for 2026. These projects, connecting Portugal to its island territories and Vanuatu to New Caledonia, respectively, aim to set new standards for disaster resilience and climate observation.



The SMART Cables initiative has also contributed to the development of a new Recommendation ITU -T G.9730.2 standard that provides the capabilities and features of optical submarine telecommunication cable systems equipped with scientific monitoring sensors located along the length of optical submarine cables. It describes the qualitative high-level characteristics and requirements of Scientific Monitoring And Reliable Telecommunication cables (SMART) using optical submarine cables to enable both telecommunication and sensing functionalities for ocean and climate monitoring as well as disaster warning.

It describes functional blocks, interfaces between various sensor sets and submarine cables and defines the predominant rules between the telecommunication and sensing functionality of the SMART cables concerning interference, powering, operation and maintenance. These standards ensure global interoperability and effective use of the data generated by these cables, further reinforcing their value as part of a global ocean observation network.



South America trip: The JTF SMART Cables in Ecuador was coordinated by the Natural Science Officer/SC of UNESCO-Ecuador, which had the attendance of different government agencies in Ecuador from DRR, Oceanography, regulatory & Ministry of Telecommunications.

Global Sponsorship and Support

The sponsorship by the ITU, WMO, and UNESCO-IOC of SMART Cables has been instrumental in the initiative's progress. These partnerships have facilitated advancements in governance, funding, and technical integration. Notably, the European Union's Digital Connect CEF2 process and partnerships with financial institutions have provided substantial funding, demonstrating growing recognition of SMART Cables potential to address global challenges.

Efforts to raise awareness and foster collaboration have extended to regions such as South America, where meetings in countries like Brazil, Colombia, Ecuador, Chile, and Peru have introduced the initiative to new stakeholders. These engagements have highlighted the societal and scientific benefits of SMART Cables, securing broader acceptance and support.



ORE '

SMART CABLE UPDATES

Advancing SMART Cables Globally continued...

Applications and Future Plans

SMART Cables are uniquely positioned to address critical global needs. By integrating sensors for seismic, oceanographic, and environmental monitoring, these systems provide essential data for improving disaster preparedness, understanding climate change, and advancing scientific research. Upcoming projects, such as the Chile-Antarctica and New Zealand Antarctic cables, aim to enhance monitoring capabilities in under-observed regions like the Southern Ocean, a vital area for understanding global carbon cycles and ocean circulation.

Future initiatives also include exploring new SMART systems in the Northern Hemisphere, with potential projects like the Far North Fiber and Polar Connect cables. These systems are expected to contribute valuable data to studies of ocean circulation and climate change, reinforcing the initiative's commitment to global sustainability.



South America trip: We held a meeting for government agencies a telecom local companies in the Ministry of Telecommunication of Peru leaded by the Chair of the JTF and the Peru Director General of Communications Policies and Regulation.

Challenges and Opportunities

Despite these advancements, challenges remain, particularly in securing consistent funding and achieving widespread adoption. The initiative's success relies on continued collaboration among governments, the subsea telecom industry, scientific communities, and funding agencies. Educational efforts targeting policymakers, academia, and industry stakeholders are critical to sustaining momentum and ensuring the long-term viability of SMART Cables.

The geopolitical importance of subsea infrastructure adds another layer of complexity, but it also presents opportunities. The New York Principles on undersea cable security, endorsed by multiple nations, underscore the strategic significance of these systems. SMART Cables can leverage this recognition to promote their dual role in telecommunications and environmental monitoring.

Conclusion

The SMART Cables initiative exemplifies how innovative technology can address pressing global issues. Βv combining with telecommunications advanced environmental sensing, these systems offer transformative benefits for disaster risk reduction, climate monitoring, and scientific research. With several major projects underway and а strong foundation of international collaboration, SMART Cables are poised to become a cornerstone of global ocean observation networks.

The initiative's vision for the future includes expanding its reach, overcoming technical and funding challenges, and solidifying its role as a vital tool for Science and Society. By continuing to unite diverse stakeholders. SMART Cables aim to create a resilient and sustainable infrastructure that serves humanity's broader needs.



The Moore Project UH team visited the future location of the Vanuatu end of the Tamtam SMART Cable System.



The Chair of the JTF SMART Cables checking in the logistics, operations and location of the Vanuatu end of the Tamtam SMART Cable System.

MTS Hawaii Student Chapter! Beginning Spring 2025!

The Marine Technology Society (MTS) is a global community that brings together professionals, researchers, and students who are passionate about marine technology and the ocean. We are thrilled to introduce the Hawaii Student Chapter, launching this spring, to foster collaboration and innovation right here in the islands!

What is MTS?

MTS is dedicated to advancing the global understanding of marine technologies and their applications. Through partnerships, publications, and professional development opportunities, MTS connects individuals and organizations to tackle some of the ocean's greatest challenges.

Why Join the Hawaii Student Chapter?

Our student chapter is designed to provide a platform for engagement, growth, and inspiration. Whether you're a student in ORE, Oceanography, or another marine-related discipline, this chapter offers you the chance to:

- *Build Connections*: Network with fellow students, faculty, and leading marine professionals.
- *Gain Access*: Enjoy free or discounted entry to MTS conferences, workshops, and exclusive events.
- Grow Your Career: Access scholarships, grants, and career development resources tailored for emerging professionals in marine sciences.
- *Make an Impact*: Contribute to community projects and initiatives that support sustainable ocean technology.

What's Next?

Be part of this exciting journey from the very beginning! Stay tuned for announcements about our kickoff events, upcoming activities, and ways to get involved.

Together, we can explore and shape the future of marine technology.

For more information or to join, reach out to us today at inkley@hawaii.edu or visit https://www.mtsociety.org/.

R3D Progress! What's Next?

Coastal communities worldwide are facing increasing challenges from rising sea levels, stronger storms, and erosion. Traditional coastal defense methods, such as seawalls and breakwaters, can be effective but often come with high maintenance costs and negative environmental impacts. That's why the Rapid Resilient Reefs for Coastal Defense (R3D) Project), funded by the Defense Advanced Research Projects Agency (DARPA), is exploring a more sustainable nature-based solution to protect our shorelines.

Ben Jones: Principal Investigator Zhenhua Huang: CO-Principal Investigator Mert Gokdepe: ORE Engineer

Led by the University of Hawai'i's Applied Research Laboratory (UH ARL), the R3D project is developing engineered coral reef structures that mimic natural reefs. These structures help absorb wave energy, reduce coastal erosion, and provide habitat for marine life, making them a dual-purpose solution for both coastal resilience and ecosystem restoration. Instead of simply blocking waves like a concrete seawall, these engineered reefs work in harmony with nature to strengthen shorelines while supporting biodiversity.

The project has gained significant media attention, as it represents a major shift in how coastal defense is approached. We have recently moved beyond research and modeling into full-scale manufacturing of these reef structures. One major milestone was launching the manufacturing process, followed by a visit to the precast yard to observe production firsthand. Seeing these structures in person is an exciting step forward and we prepare for deployment and full-scale testing in coastal waters.

By combining advanced engineering with ecological restoration, R3D has the potential to redefine coastal protection strategies. With DARPA's support and collaboration from scientists and engineers, this project is paving the way for innovative solutions that not only protect communities but also contribute to healthier ocean ecosystems and support indigenous activities such as fishing. As we move closer to deployment, we are excited to see how these reefs perform in real-world conditions and how they can be scaled for broader coastal resilience efforts.

New ORE Faculty! Camille Pagniello, PhD

Dr. Camille Pagniello joins the Department of Ocean and Resources Engineering as an Assistant Professor of Oceanographic Engineering.

She completed her MSc and PhD in Oceanography (with a Certificate in Engineering Leadership and a Micro-MBA) at Scripps Institution of Oceanography, and her BSc Honours, Co-op in Marine Biology and Physics with minors in Mathematics and Ocean Sciences (First Class Honours) at Dalhousie University. She was previously a Postdoctoral Fellow at Stanford University's Hopkins Marine Station and a SOEST Early Career Fellow and Assistant Researcher at the Hawaii Institute of Marine Biology.

Camille conducts research that directly addresses the growing need to rapidly develop cost-effective tools and approaches that expand our understanding of the interplay between biological, physical and chemical aspects of marine ecosystems at unprecedented, ecologically relevant scales that can also be used in science-based solutions.

Figure 2. Track and archived depth time series of Atlantic bluefin tuna tagged off Norway from recent publication Ferter*, Pagniello* et al. (2024): https://doi.org/10.1098/rspb.2024.1501

To achieve this, she develops and innovative uses oceanographic instrumentation, builds advanced algorithms to extract novel information about the ocean from existing data streams and collects new oceanographic data in the field. This requires us to work at the intersection of engineering, data science, oceanography & marine biology.

Figure 1. Camille diving in the kelp forest during her PhD photographed with the camera system she constructed.

Results from her work help meet the goals of the United Nations Decade of Ocean Science for Sustainable Development to better predict ocean phenomena, to protect and restore ocean biodiversity, and to encourage a more inclusive and participative approach to ocean science.

To learn more about her work, check out the Marine Innovation Lab for Leading-edge Oceanography (MILLO) website: https://pagniellolab.github.io/.

Camille is excited to join ORE and looks forward to meeting and working with the department's faculty and students. Feel free to stop by her office in POST 413A to say hi!

Kaja Reinhardt

Kaja is a new MS student admitted in Fall 2024.

"As a swimmer and surfer, I have always been fascinated by the ocean. During my B.S. degree in Florida, I witnessed the devastating impacts of Hurricane Ian firsthand, which grew my interest in protecting coastal environments and marine renewable energy technologies. Pursuing a master's degree in ORE from the University of Hawaii is the ideal next step to gain the expertise needed to make a professional impact in these areas. Studying in Hawaii is an amazing opportunity to be surrounded by the island's unique nature and incredible ocean environment every day."

Darin Hiraldo

Darin is a new MS student admitted in Fall 2024.

"All my life I have been drawn to the ocean. That led to me to pursue a Bachelor's of Science in Ocean Engineering with a Minor in Sustainability where I worked on designing a new method of converting ocean waves in renewable energy. However, I always felt like my work wasn't done. I am here now in Hawaii to pursue my passion in trying to revolutionize the renewable energy industry, and I plan to go on as many adventures as possible while I do so."

Olivia DeCroix

Olivia is a new MS student admitted in Fall 2024.

"I have always wanted to work with marine robots and was able to take an ORE class as an undergraduate in mechanical engineering, this then influenced me to join the ORE department for my masters."

Scott Hellinger

Scott is a new MS student admitted in Fall 2024.

"My passion for protecting the coastlines of my hometown, Miami, and my love for the ocean -witnessing its drastic and negative changes over time-led me to pursue a Master's in Ocean and Resource Engineering at the University of Hawai'i at Mānoa. Under the guidance of my academic advisor, Dr. Kwok Fai Cheng, I focus on nature-based solutions for coastal engineering. My research will explore innovative methods to make coastal projects overall greener, such as implementing living shorelines, incorporating renewable materials, and designing projects that enhance ecosystem services to mitigate the effects of the Anthropocene world."

Willem Kernkamp

Willem is a new MS student admitted in Fall 2024.

"My passion for the ocean led me to achieve a B.S. in Oceanography which has taken me across many marine science jobs from Humboldt Bay in California to the Bering Sea in Alaska. Through my various experiences I became fascinated by the instruments and technology being used, especially with recent advancements in remote sensing. I decided to pursue a M.S. in Ocean Engineering so that I can learn and develop skills related to the more technical aspects of oceanography and the marine environment."

Publications: Updated!

Huang S, Z Huang (2024). A quasi-three-phase flow simulation of the interactions between solitary waves and a vertical seawall installed on a sandy beach. Coastal Engineering, 194, 104621.

Halvorson B, Z Huang (2024). Study of effects of perforation layouts on wave energy dissipation caused by a submerged perforated breakwater in front of a vertical seawall. Ocean Engineering, 311, 119025.

Reyes CC, M Walker, Z Huang , P Cross (2024). A Dual-Function Design of an Oscillating Water Column Integrated with a Slotted Breakwater: A Wave Flume Study. Energies, 17(15), 3848.

Gruden P, E-M Nosal, E Henderson (2024). Automated Acoustic Tracking of a Sperm Whale (Physeter macrocephalus) using a Wide Baseline Array of Sensors. 2024 27th International Conference on Information Fusion (FUSION).

Chen Y, Hayatdavoodi M, B Zhao, **Ertekin RC** (2024). Waves Generated by the Horizontal Motions of a Bottom Disturbance. Journal of Marine Science and Engineering, 12(11), 1990-.

Hetherington, ED, C Anderson, L Bastian, N Boon, NC Chu, **C Rodriguez**, H Drennon, A Gates, B Gertz, KD Goodwin, S Halfter, K Howell, E Howes, V Lopes, T Martin, T McConnell, PY Qian, S Seabrook, L Smith, G Snyder, KI Stocks, R Sylvan, D Wright, LA Levin (2024). eepening the Decade: Collaborative Action for Advancing Deep-Ocean Science and Policy in the United Nations Decade of Ocean Science for Sustainable Development. Limnology and Oceanography Bulletin, 33(4), 149–158.

B. Pirenne, K. Moran and **BM Howe** (2024). "Real-Time, Year-Round, Cross-Arctic Observations Integrating Three Complementary Technologies into Submarine Telecommunication Cables," OCEANS 2024 - Halifax, Halifax, NS, Canada, 2024, pp. 1-4,.

Stopa, J., Vandemark, D., Foster, R., Emond, M., Mouche, A. and Chapron, B. (2024), Characterizing the Atmospheric Boundary Layer for Offshore Wind Energy Using Synthetic Aperture Radar Imagery. Wind Energy, 27: 1340-1352.

C. Rowe, **BM Howe,** M. Begnaud and A. Conley (2024). "Science Monitoring And Reliable Telecommunications (SMART) Cables -- The Future of Global Undersea Observing," 2024 IEEE Photonics Society Summer Topicals Meeting Series (SUM), Bridgetown, Barbados, 2024, pp. 01-02.

C Rodriguez, **BM Howe**, M., C Rowe, CW Moore, P Heimbach, B Pirenne, LM Wallace, WS Wilcock (2024). SMART Cables for Observing the Ocean and Earth: Present and Future. In AGU24. AGU.

Volume 28 Issue #1

ORE is under full sail! We're powering forward strong and fast. Our faculty and student numbers are up, our office is in full swing, we have an exciting array of well-funded projects, our programs are being guided and supported by industry, and we are now developing our new spaces to jump-start our plans for an improved teaching lab, a computing lab/facility, and improvements to our student and researcher spaces. This is an exciting time for ORE— a time of expansion and impact. We've pulled people and resources together to make some exciting improvements, and we need your support! Your gift will be used directly in support of our programs, resources and infrastructure, and to help talented students reach their potential for impactful contribution to the Ocean State of Hawaii, and to a dynamic world that increasingly relies on well-trained engineers who are prepared to work in, on, and around the ocean. Please consider donating to ORE today: <u>https://giving.uhfoundation.org/funds/12373104</u> To pay by check, please make payable to University of Hawaii Foundation, indicate the donation is for "ORE 12373104", and send to: <i>ORE Enrichment Fund Administrator</i> <i>Department of Ocean and Resource Engineering</i> <i>University of Hawaii at Manoa</i> 2540 Dole Street, Holmes Hall 402 Honolulu, HI 96822 USA	HANA O KE KALNewsletter of theDepartment of Ocean & Resources EngineeringSchool of Ocean and Earth Science & TechnologyUniversity of Hawai'i at Mānoa2540 Dole Street, Holmes Hall 402Honolulu, HI 96822-2303 USTEL: +1(808) 956-7572FAX: +1(808) 956-7572FAX: +1(808) 956-7572FAX: +1(808) 956-7572FAX: +1(808) 956-7572FAX: +1(808) 956-7572FAX: : ORE DEPT@HAWAII.EDUURL: ORE DEPT@HAWAII.EDUURL: ORE DEPT@HAWAII.EDUURL: ORE DEPT@HAWAII.EDUURL: ORE UHMANOAFACEBOOK: ORE FACEBOOK PAGELINKEDIN: ORE LINKEDIN PAGETo Subscribe, obtain copies of previous issues ofHANA O KE KAI, and send your material for thenewsletter publication, please visit our website andclick the "Newsletter" link.
If you are interested in making an in-kind donation, if you have any questions about your donation or about how ORE is using donor support, or if you would like to explore other avenues of support, please don't hesitate to contact Eva- Marie Nosal at 808-956-7686 or <u>nosal@hawaii.edu</u> .	Engineering the Oceans since 1966

The ORE's Office Decorations!

Page 10 ORE