



SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

Summer 2023 Newsletter

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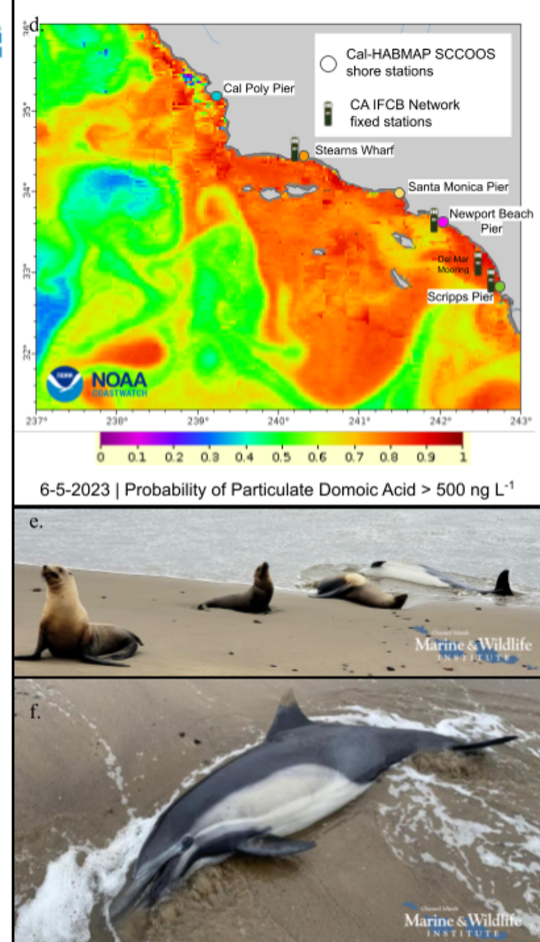
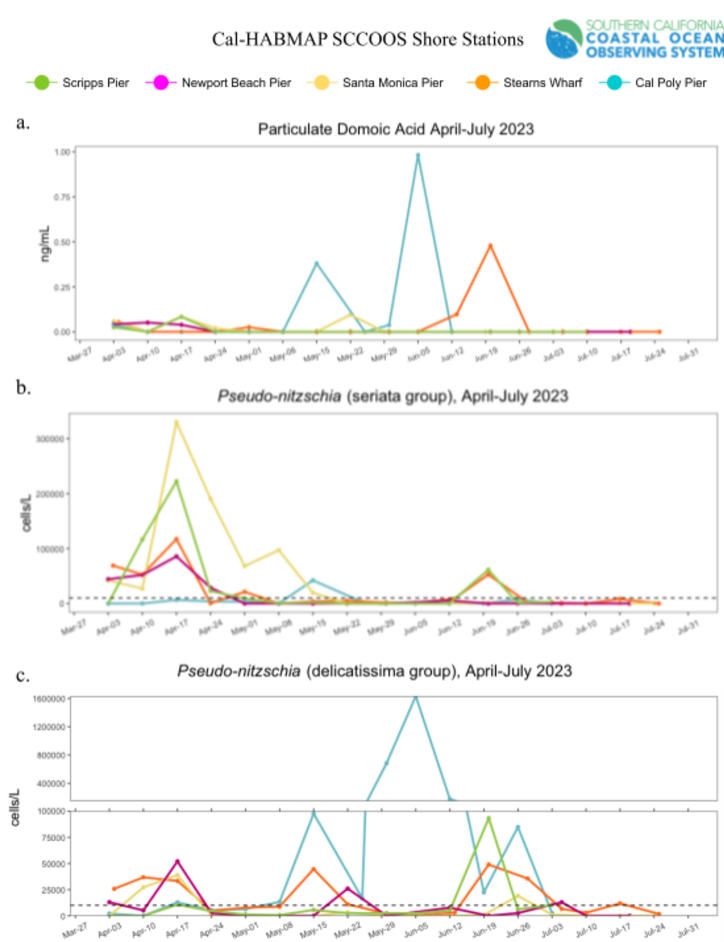
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Highlights

May - June 2023 Harmful Algal Bloom Event

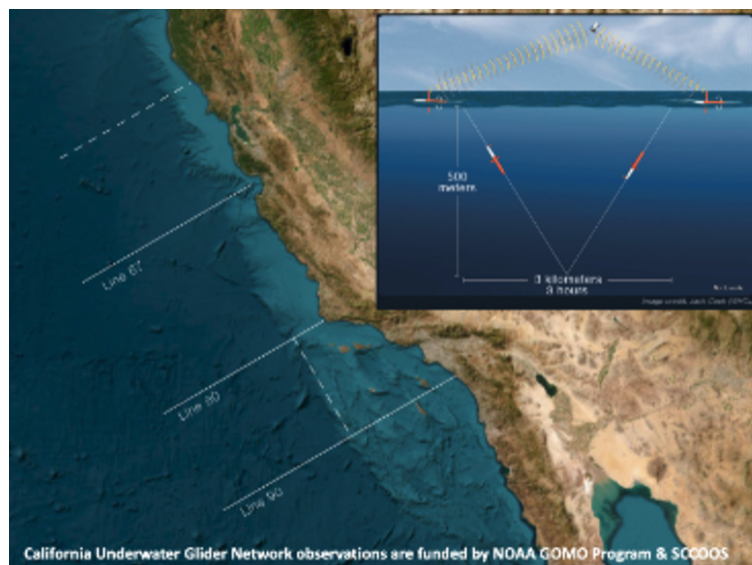
A three-month domoic acid (DA) event began at the end of May with only a few California Sea Lion (CSL) strandings reported and covered the region from the Santa Barbara Channel to San Diego. As the event grew exponentially and then persisted until the end of July, over 1000 CSL were treated (with over 5,000 reports in the Santa Barbara Channel region). Importantly, over 100 long-beaked common dolphins also stranded deceased and live, making this a highly unusual DA event. Tissue samples have so far broken records for dolphin DA cases. In addition, some animals displayed extreme aggression with at least seven reports of attacks on beachgoers. Much respect goes to the Channel Islands Marine and Wildlife Institute, the Pacific Marine Mammal Center, The Marine Mammal Care Center of Los Angeles, and SeaWorld for their tireless efforts to treat, rescue, and rehabilitate hundreds of animals over a grueling three month period. A summary of this event will be published in the next issue of *Harmful Algae News*.



SCCOOS, SIO, SCCWRP, UCSC, and The Marine Mammal Center of Sausalito thank the NOAA NCCOS HAB Event Response program for funding to better characterize the offshore extent of the bloom and levels of DA in animal tissue associated with this massive DA event.

To learn more check out the [May-June 2023 California HAB bulletin](#). If you are interested in receiving our monthly CA HAB bulletin - [Please Subscribe](#).

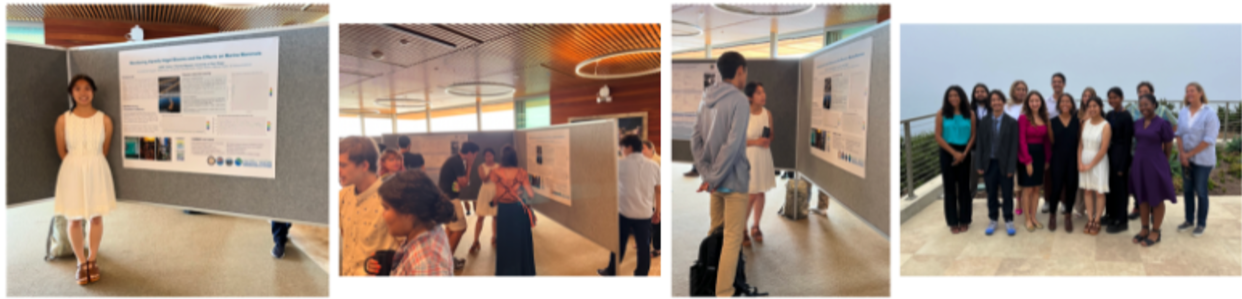
SIO Spray Glider Lab is Tracking El Niño



The [Spray Glider Lab](#) located at Scripps Institution of Oceanography sustains three of the six gliders that make up the California Underwater Glider Network (CUGN). The CUGN provides real-time high-quality data and climatology products. Since 2005, these gliders have been monitoring the effects of El Niño in the California Current System (CCS). Long-term observations like these allow for comparisons of El Niño events to baseline conditions. Check out their

[webpage](#) dedicated to El Niño in Southern California, and NOAA forecasts that suggest there is a **95% chance** that an El Niño will occur at the equator this winter.

SCCOOS Hosts Summer Intern



Each year Scripps Institution of Oceanography hosts an 8-week Scripps Undergraduate Research Fellowship ([SURF](#)). This program seeks to increase the diversity of students that can successfully prepare to pursue Earth and ocean sciences career pathways. As a part of this fellowship, SCCOOS hosted SURF intern Theresa Nguyen, a USD undergraduate, to work to examine our HABMAP records of domoic acid concentration and its relationship to Pseudo-nitzschia abundance during blooms. During her internship, Theresa was introduced to the programming language, R, for statistical computing and graphics, and spent countless hours learning about HAB monitoring. Theresa also had the unique experience of observing water sampling at the Scripps Pier with the [COOL lab](#) in support of the [Harmful Algal Bloom Monitoring Alert Program](#).

In The Field

Bipartisan Infrastructure Law funding = Increasing SoCal's Animal Telemetry Tagging Network and Recapitalizing Aging HF Radar Equipment and Infrastructure



The Bipartisan Infrastructure Law (BIL) provided SCCOOS with funding in support of improved and enhanced coastal, ocean, and Great Lakes observing systems. One of the beneficiaries of these funds is Chris Lowe's [Shark Lab](#) at CSU Long Beach. In August, they deployed two new Innovasea Nexsens data buoys outfitted with dissolved oxygen, temperature, and chlorophyll sensors to track white shark movement -- one at Redondo Beach and one near the Scripps Pier. The Shark Lab will be operating and maintaining real-time acoustic receivers to detect tagged animals in the area with a focus on white sharks.

Lifeguards will receive real-time SMS/email alerts when tagged great white sharks are detected by a buoy receiver, enhancing public beach safety management. Special thanks to Shark Lab for graciously inviting SCCOOS' own, Megan Medina, on a recent tagging trip.



Of the 61 HF radar in the [California Surface Current Mapping Network](#), 18% (11 HFR) have exceeded their 20-year expected service life. In order for SCCOOS, in collaboration with CeNCOOS, to provide continuous and accurate measurements of surface currents, SCCOOS received BIL funding to upgrade aging HF radar equipment and infrastructure in our region. In August, SCCOOS PIs, Ryan Walter and Ian Robbins at Cal Poly SLO upgraded the HFR near Pt. Sal on Vandenberg Space Force Base, deployed in 2007 (top left and right images), with a new combined transmit-receive dome-style radar antenna (bottom left and right). The new dome antenna will provide upgrade capabilities including extended range and reduced interference as the network moves to the International Telecommunication Union (ITU) band frequencies.

More project updates can be found on the [SCCOOS website](#). See Progress Report updates from SCCOOS Award (NA21NOS0120088) and SCCOOS BIL Award (NA23NOS0120084) latest project periods.

New Machine Learning and Deep Learning Automated Plankton Image Classification Training Sets Available

A group of scientists (not all pictured), including SCCOOS plankton experts - Clarissa Anderson, Kasia Kenitz,



Melissa Carter, Dave Caron, and Rebecca Shiye - have created training sets that employ machine learning and deep learning to perform automated image classification of plankton images. This effort is featured in [ASLO's Bulletin of Limnology and Oceanography](#).

This project highlights the importance of facilitating a dialog between taxonomists and engineers to better integrate ecological goals with computational constraints, and encourage continuous involvement of taxonomic experts for successful implementation of automated classifiers.

New Summary Reports of Seabirds and Ocean Conditions Now Available on SCCOOS Website



(Top left: Elegant Tern, top right: Brown Pelican, bottom left: Brandt's Cormorant, bottom right: Pacific Loon. Photo Credit: Ron Le Valley)

In the California Current Ecosystem (CCE), changes in seabird relative abundance, breeding success, diet, and foraging behavior have shown to be sensitive to shifts in climate-ecosystem states. Since 2011, SCCOOS has funded the Farallon Institute to provide seabird reports as indicators of habitat and food web changes in the Southern California current. These reports address the need for further data and studies to enhance the scientific basis for

understanding of coupled climate-ecosystem-seabird fluctuations.

The [Spring](#) and [Summer](#) 2023 reports can be found on the [SCCOOS website](#).

SCCOOS In The News

New Model Under Development Addressing Cross Border Water Quality

Falk Feddersen, a physical oceanographer at Scripps, is leading a study to develop a model to forecast the presence of pathogens in San Diego coastal and tidal waters. In addition, Clarissa Anderson, Andrew Barton, Jeff Bowman, Bruce Cornuelle, Sarah Giddings, and Uwe Send will be working on this project. SIO August 25th press release is available [here](#).



UC SAN DIEGO'S SCRIPPS OCEANOGRAPHY AWARDED FUNDING TO DEVELOP PATHOGEN FORECAST MODEL

Model aims to predict presence of harmful pathogens in Tijuana River Valley and Imperial Beach

The program will fund regular and event-based water sampling at beach and coastal locations to pinpoint the types of pathogens in the water and their abundance. Additional laboratory experiments will quantify the lifetime and decay of key microbial and viral pathogens in seawater under a range of conditions. The model will also enable effective decision-making and project implementation for proposed cross-border water quality infrastructure solutions. Modeling results will be used to directly support and inform capital project planning, implementation, and monitoring. This robust modeling effort will help determine the net benefit and effectiveness of proposed capital projects.

Once developed, the forecasts will be directly accessible to the public and decision-makers on the SCCOOS website.

Study Characterizes 2020 Bioluminescent Bloom



A major red tide event occurred in waters off Southern California in the spring of 2020, resulting in dazzling displays of bioluminescence along the coast. The spectacle was caused by exceedingly high densities of *Lingulodinium polyedra* (*L. polyedra*), a plankton species renowned for its ability to emit a neon blue glow. While the red tide captured the public's attention and made global headlines, the event was also a harmful algal bloom. Toxins were detected at the height of the bloom that had the potential to harm marine life, and dissolved oxygen levels dropped to near-zero as the extreme biomass of the red tide decomposed. This lack of oxygen led to fish die-offs and other destructive impacts on local ecosystems.

Now, for the first time, a [study](#) published in Proceedings of the National Academy of Sciences (PNAS), led by scientists at UCSD SIO and Jacobs School of Engineering has pinpointed how this plankton species — a dinoflagellate — was able to create such an exceptionally dense bloom. The answer lies in dinoflagellates' remarkable ability to swim, which lends them a competitive advantage over other species of phytoplankton. This swimming ability can lead to the formation of dense blooms, including those of the bioluminescent variety.

SCCOOS provided an early synthesis of the event in a special issue of the monthly [CA HAB](#)

[Bulletin: Spring 2020 Red Tide](#) and facilitated rapid response funding from NOAA to deploy instruments and utilize in situ observations to test a 50-year-old [hypothesis](#) in Spring 2020.

Read more in [SIO Aug 28th press release](#) and download [Zheng et al., 2023 PNAS](#) paper. *Image credit: Philipp Arndt, UCSD.*

Multiple Ecosystems in Hot Water After Marine Heatwave Surges Across the Pacific



Rising ocean temperatures are sweeping the seas, breaking records and creating problematic conditions for marine life. Unlike heatwaves on land, periods of abrupt ocean warming can surge for months or years. Around the world these ‘marine heatwaves’ have led to mass species mortality and displacement events, economic declines and habitat loss. New research reveals that even areas of the ocean protected from fishing are still vulnerable to these extreme events fueled by climate change.

A study published by Smith et al., in *Global Change Biology*, led by researchers at UC Santa Barbara, found that while California’s network of marine protected areas (MPAs) provide many social and ecological benefits, they are not resilient to the effects of ocean warming. MPAs are locations in the ocean where human activities such as fishing are restricted to conserve and protect marine ecosystems, habitats, species and cultural resources. The study, part of a 10-year review of California’s MPA network

conducted at UCSB’s National Center for Ecological Analysis & Synthesis (NCEAS), found that marine heatwaves impact ecological communities regardless of whether they are protected inside MPAs. Read more in [UCSB July 13th press release](#) and download [Smith et al., 2023](#) paper.

Program Office Updates



For those of you who haven’t heard, Clarissa now also serves as Lead Project Director of the Cooperative Institute for Marine, Earth, and Atmospheric Systems (CIMEAS) at SIO. CIMEAS is a NOAA-funded and SIO and UCSC-led program that delves into multidisciplinary research spanning climate, oceans, and ecosystems. CIMEAS aims to advance our understanding of natural and human-caused impacts on ecosystems and seeks sustainable ways to strengthen our environmental and economic well-being.

After 5 years at SCCOOS, Megan Medina has been promoted from Program Coordinator to Deputy Director. Her dedication and hard work are a cornerstone of the SCCOOS program office, and we are lucky to have her. Congratulations Megan!



Opportunities

- IOOS Association Seeking Nominations for [2024 Caraid Award](#). Nominations are due on **October 27th**.
- [startBlue](#) applications are open until **Oct. 31st** for entrepreneurs with startups tackling an ocean-related challenges with a science and engineering based solutions.
 - Eligibility & Application: <https://startblue.ucsd.edu/apply/>
- National Centers for Coastal Ocean Science (NCCOS)/Competitive Research Program (CRP) is [soliciting proposals](#) for the Social, Cultural and Economic Assessment of Harmful Algal Bloom program.
 - Expects to fund 3 to 5 projects, for up to three years, at the level of \$300,000 to \$400,000 per year per proposal.
 - Letter of intent due **Oct 13th**, Full proposal by **Jan 17th**.
- [Whale Tail® Grants](#) are open through **Nov 5th**.
 - Support experiential education and stewardship of the California coast and its watersheds. Grant projects can engage youth or adults and can take place anywhere in California.
- [CA Sea Grant Marine Debris Challenge Competition 2024](#).
 - Partnership form due **October 20th**.
 - Letters of intent due **January 31st**.
- A career in data science awaits at [Axiom Data Science](#). There are several positions available
 - Software Engineer (Full-Stack)
 - Front-End Engineer
 - Cyberinfrastructure Operations Engineer
 - Technical Project Manager
- US Fish & Wildlife Service [posted 30 positions](#) for Wildlife Biologists on their Recovery Planning Team. These positions require a PhD or equivalent experience and training through education and work.
- The Ocean Protection Council is hiring a Sustainable Fisheries and Aquaculture Program Manager. Application deadline is **October 4**, 2023. See [here](#) for more information

Where SCCOOS has been Spotted this Summer

SCCOOS has co-organized, participated in, and presented at several activities over the past few months. Meeting programs, notes, and presentations are linked below.

- **May 1-3:** [ECO HAB](#) TAC, Sitka, AK - Clarissa
- **May 8-12:** NASA Carbon Cycle Meeting, College Park, MD - Clarissa invited to present

- **May 16:** NOAA [West Watch](#) Webinar - Clarissa presented
- **May 23-24:** CeNCOOS GC/PI Meeting, Bodega, CA and virtual
- **May 30:** SCCOOS BOG/ESC Meeting, Costa Mesa, CA
- **June 13-15:** NOAA West Regional Collaboration Meeting, La Jolla, CA - Megan presented
- **June 20:** NOAA West Watch Webinar - Megan presented
- **June 28-30:** CCIEA & State of the California Current Integrated Data Flow Workshop, La Jolla, CA - Megan attended
- **June 26 - August 18:** [Scripps Undergraduate Research Fellow \(SURF\)](#) Internship
- **June 27-29:** IOOS Advisory Committee, Monterey, CA - Dan Rudnick
- **June 29:** [Marine Exchange of Southern California](#) 100-year celebration
- **July 21:** Marine Exchange of Southern California Tour - Clarissa and Danielle facilitated
- **July 21:** Decommissioning of [R/V Flip](#) Farewell Event - Clarissa and Danielle attended
- **July 26-27:** NOAA Science Advisory Board Mtg, Costa Mesa, CA - Megan attended
- **August 3:** [Ventura River Watershed](#) Meeting, Santa Barbara - Clarissa presented
- **August 10-11:** NANOOS 20 Years of Ocean Observing, Astoria, OR - Megan attended
- **August 11:** IOOS RA Director's Retreat - Clarissa and Megan attended
- **August 14:** NOAA West Watch Webinar - Clarissa presented
- **August 17:** SURF Intern, Theresa Nguyen, Poster Presentation
- **August 22:** Senator Feinstein staff visit - Clarissa presented
- **August 22:** Congresswoman Porter's Ocean Roundtable - Megan presented
- **September 7:** Scheduled meetings with partners and users in Santa Barbara to discuss potential future collaborations with IRA funding including the 1) City of Santa Barbara and Environmental Science Associates on sea level rise and coastal inundation monitoring, 2) Lindsey Peavy with NOAA's NMSF on ocean sound, and 3) Teresa Romero with Santa Ynez Band of the Chumash Tribe and Strategic Earth Consulting on tribal engagement.
- **September 8:** CINMS SAC, Santa Barbara, CA - Clarissa presented & Megan attended
- **September 9:** Torrey Pines State Natural Reserve Docent General Mtg - Clarissa presented
- **September 13-15:** SCCWRP, Costa Mesa, CA
- **September 14:** [Global Wave Conference Kick-off](#), San Diego, CA - Led Scripps Pier Tour
- **September 20:** NHABON Webinar #9: HAB Observing Data Needs for Socio-Economic Analysis.

On The Horizon

Celebrating Ocean Observing in California

May 14-16, 2024 | San Diego, CA



SCCOOS is excited to announce we will be teaming up with CeNCOOS and CalCOFI for a three-day meeting and anniversary celebration from May 14-16, 2024 in San Diego, CA. The California Ocean

Observing Systems (SCCOOS & CeNCOOS) will be celebrating 20 years of ocean observing and 75 years of CalCOFI. Stay tuned in the coming months for registration and meeting information.

- **September 24-27:** [EPOC](#), Fallen Leaf Lake, South Tahoe, CA - Clarissa presenting
- **September 26-28:** [IOOS DMAC Meeting](#), Washington D.C.
- **October 11:** San Diego Chapter of the [American Cetacean Society](#) Mtg - Clarissa presenting
- **October 14:** [Walter Munk Day](#), La Jolla, CA - SCCOOS hosted booth
- **October 14:** [AltaSea Blue Hour](#): above and below, San Pedro, CA
- **October 16-17:** [The Oceanography Society](#) Planning Mtg, Washington D.C. - Clarissa (AGU)
- **October 23-27:** [IFCBWorks23](#), Woods Hole, MA - Kasia Kenitz presenting
- **October 23-27:** North Pacific Marine Science Organization ([PICES](#)), Seattle, WA, Theme: Connecting Science and Communities for Sustainable Seas
- **October 26-28:** [SACNAS](#): Build community. Create a legacy, Portland, OR
- **November 5-11:** [International Conference on Harmful Algae](#), Hiroshima, Japan
- **November 12-16:** [CERF](#) Biennial Conference, Portland, OR
- **November 13-17:** [TMA BlueTech Week](#), San Diego, CA
- **November 14-17:** International Ocean Colour Science [Meeting](#), St. Petersburg, FL
- **November 17:** San Diego Area Committee [Meeting](#) - Megan presenting
- **November 28:** BEACON Manager-Scientist [Summit](#)
- **November 29-Dec 1:** IOOS Fall Meeting, SIO - SCCOOS Hosting
- **December 11-15:** [AGU23 Fall Meeting](#), San Francisco, CA
- **December 14:** Port of Los Angeles/Long Beach [Area Planning Mtg](#)
- **December 19:** West Watch [Webinar](#) - Clarissa Presenting
- **January 22-26:** [POGO25](#), CICESE, Ensenada, MX
- **January 28-Feb 1:** [104th American Meteorological Society](#), Baltimore, MD
- **February 18-24:** [Ocean Sciences Meeting 2024](#), New Orleans, LA
- **March 3-9:** [World Fisheries Congress](#), Seattle, WA
- **May 14-16:** Celebrating Ocean Observing in California with SCCOOS, CeNCOOS, and CalCOFI, San Diego, CA

Recent Publications

SCCOOS Principal Investigators are in **bold**.

- **Bell, T. W.**, Cavanaugh, K. C., Saccomanno, V. R., Cavanaugh, K. C., et. al. (2023). Kelpwatch: A new visualization and analysis tool to explore kelp canopy dynamics reveals variable response to and recovery from marine heatwaves. *Plos one*. <https://doi.org/10.1371/journal.pone.0271477>
- Bresnahan, P., Briggs, E., Davis, B., Rodriguez, A. R., Edwards, L., Peach, C., **Merrifield, M.**, et. al. (2023). A Low-Cost, Diy Ultrasonic Water Level Sensor For Education, Citizen Science, And Research. *Oceanography*. <https://www.jstor.org/stable/27200038>
- Byrne, S., **Merrifield, M.**, **Carter, M.**, Cayan, D., Flick, R., Gershunov, A., & Giddings, S. (2023). Southern California winter precipitation variability revealed by 100-year ocean salinity record. *Research Square*. <https://doi.org/10.21203/rs.3.rs-1769820/v1>
- Cavanaugh, K. C., Pawlak, C. C., **Bell, T. W.**, & Saccomanno, V. R. (2023). CubeSats show persistence of bull kelp refugia amidst a regional collapse in California. *Remote Sensing of Environment*. <https://doi.org/10.1016/j.rse.2023.11352>
- Dalsin, M., **Walter, R. K.**, & Mazzini, P. L. (2023). Effects of basin-scale climate modes and upwelling on nearshore marine heatwaves and cold spells in the California Current. *Scientific Reports*. <https://doi.org/10.1038/s41598-023-39193-4>

- Dennison, C. E., Salhotra, G., Kangaslahti, A., **Caron, D. A.**, & Sukhatme, G. S. (2023). Learned Parameter Selection for Robotic Information Gathering. arXiv preprint. <https://doi.org/10.48550/arXiv.2303.05022>
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- **García-Reyes, M.**, Koval, G., **Sydeman, W. J.**, Palacios, D., Bedriñana-Romano, L., DeForest, K., ... & Hines, E. (2023). Most eastern boundary upwelling regions represent thermal refugia in the age of climate change. *Frontiers in Marine Science*. DOI:10.3389/fmars.2023.1158472
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- **Kenitz, K.M.**, **Anderson, C.R.**, **Carter, M.L.**, Eggleston, E., Seech, K., Shipe, R., et. al. (2023). Environmental and ecological drivers of harmful algal blooms revealed by automated underwater microscopy. *Limnology and Oceanography*, 68(3), 598-615. <https://doi.org/10.1002/lno.12297>
- Lange, A. M., Fiedler, J. W., **Merrifield, M. A.**, & Guza, R. T. (2023). Free infragravity waves on the inner shelf: Observations and Parameterizations at two Southern California beaches. *ESS Open Archive*. DOI: [10.22541/essoar.169447469.92501989/v1](https://doi.org/10.22541/essoar.169447469.92501989/v1)
- McCarthy, R. A., Merrifield, S. T., Sarkar, J., & **Terrill, E. J.** (2023). Reduced-Order Machine-Learning Model for Transmission Loss Prediction in Underwater Acoustics. *IEEE Journal of Oceanic Engineering*. DOI: [10.1109/JOE.2023.3291004](https://doi.org/10.1109/JOE.2023.3291004)
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- Zheng, B. New observations of fine-scale physical and biogeochemical dynamics enabled by ocean-wave-powered profiling. (2023) Doctoral dissertation, UC San Diego.
- Zheng, B., Lucas, A. J., Franks, P. J., Schlosser, T. L., **Anderson, C. R.**, Send, U., ... & Sosik, H. M. (2023). Dinoflagellate vertical migration fuels an intense red tide. *Proceedings of the National Academy of Sciences*, 120(36), <https://doi.org/10.1073/pnas.2304590120>
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Southern California Coastal Ocean Observing System
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