

Request to US CLIVAR For Workshop Sponsorship

1. Requesting Panel, Working Group, or person/s:

Dr. Daniel Rudnick, Scripps Institution of Oceanography

Dr. David Legler, NOAA, Global Ocean Monitoring and Observing

Dr. Emanuele Di Lorenzo, Georgia Institute of Technology

Dr. Jan Newton, University of Washington, Northwest Association of Networked Ocean Observing Systems

2. Title of workshop or meeting:

Optimizing ocean observing networks for detecting the coastal climate signal

3. Venue:

UCAR/NCAR, Boulder CO or the Consortium for Ocean Leadership in Washington, DC depending on total participation. These venues were selected due to minimal venue fees so funds can be prioritized for travel support, particularly for early career scientists and participants from underrepresented communities. Consideration will be given to Historically Black Colleges and Universities and/or tribal colleges such as the Alaska Pacific University in Anchorage, AK, if logistically and financially feasible.

4. Dates:

February to April 2023 (2.5 - 3 days), TBD. At this time, we were unable to find any major conferences that would conflict during that time period and will confirm before choosing final dates.

5. Scientific Organizing Committee (include affiliations):

Dr. Clarissa Anderson, Scripps Institute of Oceanography;

Dr. Seth Danielson, University of Alaska Fairbanks

Dr. Alison Gray, University of Washington, US CLIVAR SSC

Dr. Tong Lee, NASA, Jet Propulsion Lab;

Dr. Tommy Moore, Northwest Indian Fisheries Commission;

Dr. Ruth Perry, Shell Renewables & Energy Solutions;

Dr. Nathali Cordero Quirós, UCSC-IMS/NOAA-Southwest Fisheries Science Center;

Dr. Robert Todd, Wood Hole Oceanographic Institution;

6. Proposed attendees, include estimate number (indicate if open or by invitation):

The organizing committee expects 80-120 people to participate in person, with the option for remote participation. The workshop will be **open** to scientists, program managers, regional directors, researchers and others engaged in ocean and coastal climate observing, including early career scientists and people representing diverse points of view. There will be federal agency participation from the Integrated Ocean Observing Committee (IOOC) agencies on both the organizing committee as well as the invited attendees. Ideally, the workshop will include representatives from many relevant observing systems and programs in the US, representing the East, West, Gulf Coast and Caribbean, Great Lakes, Alaska and the Arctic, and the Pacific Islands. Travel support will be made available for attendees who need financial assistance, with dedicated support for early career scientists and experts from underrepresented communities.

7. Aims and objectives:

This workshop will bring together representatives from ocean and coastal observing systems and researchers to identify the key science and climate issues that need to be resolved in order to detect and respond to coastal climate issues in the coming decades. The workshop will address the gaps and recommendations of two recent publications: [Research Challenges on Climate at the Coast: A US CLIVAR White Paper](#) (Nielsen-Gammon et al., 2021) and [IOOS Coastal Climate Signal: The IOOS Contribution](#) (IOOS Association, 2021). While these will be the core drivers of the workshop, the organizers will draw from other recent key events such as the [West Coast Anomalies Workshops](#) and the [NOAA OAR/IOOS workshops](#). Finally, a unique and promising aspect of this proposal is that the Interagency Ocean Observing Committee (IOOC) has approved the formation of a Coastal Climate Signal Task Team that will work to implement the recommendations of this proposed workshop, meaning that there will be dedicated federal capacity to further develop the workshop's recommendations. Staff support is provided through those complementary efforts via the Consortium for Ocean Leadership to enhance workshop administration, communications, financing, and logistics.

The main objective of this workshop is to develop an execution plan for national coordination to co-design and optimize observing systems for detecting the coastal climate signal that integrate knowledge, data, and approaches. The workshop will foster collaborations between the climate science, operational oceanographic, and basic research communities to improve the management and mitigation of coastal vulnerability to both event-driven and long-term impacts of climate change and connections to stakeholders. The execution plan will articulate ways for optimizing global and coastal observing systems to improve understanding and predictions of how large-scale ocean and climate variability influence changes at the regional and local scale to address societal and science drivers. Societal drivers include maritime commerce and international trade, productive ecosystems with economic impacts, and coastal region vulnerability to extreme weather events (e.g., hurricanes) and coastal hazards (sea level rise, erosion, resource depletion). Boundary currents, coastal waters altered by freshwater use, water management policies, and climate change are all science drivers. Coastal changes from season-to-season and from decade-to-decade are a consequence of phenomena that happen in the open ocean that interact in complex and difficult-to-predict ways at the coast (Stammer et al., 2019). The workshop aims to connect these coastal changes, societal drivers, and ocean dynamics to optimize existing observing systems and recommend ways they can be coordinated and augmented to address future needs.

This workshop, *Optimizing ocean observing networks for detecting the coastal climate signal*, is the culmination of focused efforts in recent years responding to observed climate anomalies and the need for enhancing coastal and ocean observing innovation. Upon considering this workshop, a working group of climate experts and regional observing system operators convened in 2021 to develop the IOOS Coastal Climate Signal white paper and launch a new, ongoing virtual dialogue series exploring related ocean-climate nexus topics. The workshop will also incorporate the outcomes of previous US CLIVAR workshops including the *Daily to Decadal Ecological Forecasting along North American Coastlines Workshop*. Other intellectual drivers for this workshop include the climate-related OceanObs'19 Community White Papers and associated United Nations Decade of Ocean Science for Sustainable Development programs underway. Finally, the workshop will incorporate outcomes and consider the US contributions to the upcoming CLIVAR-GOOS Workshop: *From global to coastal: Cultivating new solutions and partnerships for an enhanced Ocean Observing System in a decade of accelerating change*.

The workshop will assist with bridging the gap between global climate research and regional operational oceanography at the coasts. This will include discussion of how to optimize models and information products that will be critical for adapting human systems to cope with adverse climate impacts. It will capitalize on the national and global climate research expertise of US CLIVAR and connect it with the operational, regional- and global-scale ocean observing systems supported by the US Integrated Ocean Observing System (IOOS), NOAA's Global Ocean Monitoring and Observing (GOMO) Program, NSF's Ocean Observatories Initiative, and others. The workshop will empower these researchers and their stakeholders to reimagine ocean observing systems to detect the coastal climate signal and to prioritize measuring key climate processes that impact coastal regions. The IOOS regionally distributed system delivers real-time ocean observations to coastal communities that are most affected by climate variability. GOMO administers global ocean observations that are used in climate and weather prediction models. US CLIVAR contributes essential research and understanding of dynamics, interaction, and predictability of the climate system, particularly considering ocean-atmosphere interactions. These three bodies: US IOOS, GOMO, and US CLIVAR, bolstered by the research and stakeholder communities present, establish a strong foundation for meeting the lofty objectives of this proposed workshop. US CLIVAR is the perfect host as it can lend the expertise of its strong international climate science community, which complements the global, national, regional and local ocean observing networks that IOOS and OAR have cultivated.

The Scientific Organizing Committee (SOC) members were carefully selected to ensure scale and domain expertise. Many were also involved with the IOOS Coastal Climate Virtual Dialogues, specifically developed to initiate a discussion about the objectives that this workshop aims to achieve: identifying science and societal drivers for coastal climate impacts and ways to optimize the observing system for coastal change. The SOC will organize sessions that:

- 1) Articulate the large-scale climate, ocean, and atmospheric process that influence coastal changes and variation and connect them to key societal and scientific needs to detect and respond to coastal climate signals;
- 2) Describe how to fill critical monitoring, modeling, technology and research gaps to improve detection of coastal climate impacts;
- 3) Identify and recommend opportunities for optimizing existing ocean and climate observing systems to improve detection of physical, biological, and biogeochemical processes; and their associated impact such as extreme events, ocean acidification, sea-level rise, etc.;
- 4) Prioritize scientific and societal variables for large scale regional structures such as the Loop Current, Gulf Stream, California Coastal Current that can be integrated into a national coordination strategy;
- 5) Develop a execution plan for coastal ocean and climate observing systems co-designed by experts from the key communities present at the workshop; and
- 6) Address other priority discussion topics such as ocean and atmospheric processes that translate warming signals between the open-ocean and coastal regions, abilities of global and regional models to detect ocean climate variations seen in observations, and the effect of climate changes on the frequency and strength of natural hazards.

In order to ensure success of the workshop's aims and objectives, workshop organizers will enlist regional participants to identify both science drivers for the region as well as needs and priorities of stakeholders

prior to the meeting. This will enable attendees to focus on the execution plan during the workshop and will model a similar process used for the Pacific Anomalies workshops that was effective. It's important to emphasize that this workshop will go beyond articulating needs and be geared towards actionable outcomes.

8. Relevance and/or benefits to US CLIVAR:

This workshop is directly relevant to many US CLIVAR priorities including the observational issues, modeling, infrastructure, and applications outlined beginning on p.38 of the US CLIVAR Science Plan (US CLIVAR, 2013). This will be a joint effort connecting US CLIVAR and the expansive networks of regional and global ocean observing stakeholders. The results of this workshop will inform observing systems managers and decision-makers for decades to come through the formation of a co-design execution plan. It also directly contributes to US CLIVAR's goal of *fostering collaboration with operational communities that develop and use climate information* that will be present at the workshop. US CLIVAR also stands to gain from the capabilities participating federal agencies can offer US CLIVAR in meeting its own objectives and goals, including commitments to achieve success beyond the workshop by the Interagency Ocean Observation Committee (IOOC). The combination of federal and regional entities will bring capacity related to localized applications which will be a useful balance to US CLIVAR's broad global climate research challenges. One particular area of strength that the SOC will bring through recruiting key participants is the ability to coordinate among the various ocean observing systems to optimize and enhance existing systems to better link global and coastal research and operations for detecting climate change. Additionally, the SOC will help US CLIVAR forge deep connections with diverse stakeholder communities and present opportunities for outcomes to reach broader audiences.

This workshop will inform future US CLIVAR efforts by bringing multiple agencies and coastal climate observing expertise together to optimize regional, national, and global systems to fill critical gaps in our understanding of climate-driven impacts at the coast. The results will contribute directly to the US CLIVAR mission to understand and predict climate variability, while determining how observational systems can help communities respond to changes. The partners for this workshop strive to strengthen resilience in ecosystems, communities, and economies through better communicating the outcomes of US CLIVAR research.

The workshop will engage US CLIVAR community members in the organization of the event, as well as acting as speakers and participants in the workshop itself. Workshop participation by members of US CLIVAR's Scientific Steering Committee may provide inspiration for program goals and help shape and refine implementation planning for the program as a whole.

Climate change, and its effects on the ocean and coastal communities, is a massive, multisectoral and multidisciplinary problem that cannot be addressed by any one organization or community. Creating an execution plan for coordination of observing systems to meet climate observation needs, while strengthening connections between an integrated IOOS ocean observing system (with many of the federal agencies involved in that system) and US CLIVAR will benefit all parties, as well as society and the environment as a whole.

9. Format of meeting:

The workshop will focus on discussions and not on formal presentations. There will be a series of synthesis talks on overarching themes followed by regionally oriented breakout group discussions. The breakout sessions will be tasked with specific deliverables such as identifying gaps, developing recommendations to improve observing systems, and suggesting how to enhance coordination and collaboration. Poster sessions will allow attendees to present ongoing research and observing efforts. Refreshment breaks will be held at the poster area to encourage informal discussion.

To build awareness and interest in coastal oceanography related to this workshop's aims, an evening seminar will be held for students and early career professionals. In addition, they will be encouraged to participate in the workshop as attendees, speakers, facilitators, and staff.

Proposed Agenda:

Day 1	Topics
Registration	Breakfast served
AM1 Plenary	Welcome and overview Keynote/s: Measuring climate variation at the coast: Challenges and opportunities for the coming decade & History of climate observing in the US: A patchwork of integral programs
AM2 Plenary	Connecting global and coastal observing systems to resolve how ocean and climate variability influences coastal variability
Lunch	Poster sessions and informal conversations
PM1 Regional Breakout Sessions	Regional Breakout #1: Oceanographic and societal drivers: East Coast, Caribbean and Gulf, West Coast, Arctic, Pacific Islands. These breakouts will empower regional networks to commit to workshop outcomes. Attendees will identify the key climate inputs, gaps in observing systems, and prioritize implementation. Continuity among experts will be maintained throughout the workshop with report-outs and discussion that builds toward common priorities.
PM2 Plenary	Report-outs, discussion, and summary
Reception	Poster sessions and informal conversations

Day 2	Topics
AM1 Plenary	Welcome and day 1 recap Panels on Coastal climate community impacts, climate impacts on tribal fishing rights, extreme events, and ecological impacts
AM 2 Plenary	Roundtable: Optimizing ocean and coastal observing systems for society
Lunch	Poster sessions and informal conversations
PM1 Breakouts	Regional breakout #2 : Regional optimization and execution plans: East Coast, Caribbean and Gulf, West Coast, Arctic, Pacific Islands. These breakouts will empower regional networks to commit to workshop outcomes. Attendees will identify the key climate inputs, gaps in observing systems, and prioritize implementation.
PM2 Plenary	Afternoon Keynote/Report Outs
Reception	Poster sessions and informal conversations

Day 3	Topic/s
AM1 Plenary	Welcome and day 2 recap Roundtable: Linking regional plans to a national execution agenda
AM2 Plenary	Summary, actions, official meeting adjourns
Lunch	SOC Working lunch
PM2 Writing	SOC meeting to capture key points, develop summary report outline, and plan for addressing deliverables

10. Tentative list of invited speakers/participants

Below is the initial list of invited speakers/attendees. The SOC will advertise to key institutions that support observing system design, Observing System Simulation Experiments (OSSEs), modeling, and other relevant bodies of knowledge to round out the expertise.

Adrienne Sutton, NOAA PMEL
Alexander Kurapov, OSU
Alex Whiting, Native Village of Kotzebue
Alice Ren, WHOI
Allison Gray, University of Washington
Andrea J. Fassbender, NOAA/PMEL
Andrew Allyn, GMRI
Andy Mahoney, University of Alaska Fairbanks
Carrie Schmaus, DOE
Christopher Edwards, UCSC

Cisco Werner, NOAA OAR
Daniel Costa, UCSC
Debra Hernandez, SECOORA
Elliott Hazen, NOAA SWFSC
Emily Smith NOAA
Eoin Howlett, Trinnex
Gerhard Kuska, MARACOOS
Grace Saba, Rutgers
Gustavo Goni, AOML
Harvey Seim, UNC

Hassan Moustahfid, NOAA IOOS
Henry Ruhl, CenCOOS
Jake Kritzer, NERACOOS
Jessica Snowden, NOAA GOMO
John Wilkins, Rutgers University
Jon Hare, NOAA NMFS
Jorge Brenner, GCOOS
Kathy Mills, GMRI
Kelli Paige, GLOS
Kiley Dancy, MAFMC
Laura Lorenzoni, NASA
Lauren Divine, Indigenous Sentinels Network
Maggie Chory, NOAA
Megan Cimino, NOAA
Melissa Iwamoto, PacIOOS
Mercedes Pozo Buil, UCSC

Michael Jacox, USSC
Molly McCammon, AOOS
Nick Bond, University of Washington
Nick Rome, Consortium for Ocean Leadership
Oscar Schofield, Rutgers University
Paul Matthais, OOI/WHOI
Rashmi Shah, NOAA JPL
Renellys Perez, NOAA AOML
Rich Signell, USGS
Rodney Cluck, BOEM
Roger Griffis, NOAA NMFS
Sheyna Wisdom, AOOS
Sophie Clayton, ODU BIO-GO-SHIP
Tessa Hill, UC Davis
Weidong Yu, Sun Yat-Sen University, China

11. Deliverables:

1. Execution plan that summarizes the state of knowledge and gaps and recommends a framework for coordinating and enhancing the coastal climate observing.
 - Develop recommendations for optimizing coastal climate observing systems to address society's needs for better coastal climate information
 - Provide near-term regional climate trends, variables, and prioritize core data sets
2. Publish synthesis of the workshop in US CLIVAR "Variations"
 - Engage broad communications of the workshop's results crowd-sourced via the SOC and its partners
 - Connect to relevant global initiatives, including UN Decade for Ocean Science and Sustainable Development programs such as Observing Co-Design, Ocean Air-Sea Interactions Strategy (OASIS), Ocean Acidification Research for Sustainability (OARS), and others
3. Initiate an IOOC Coastal Climate Observing Task Team to implement recommendations
 - Produce an initial suite or categorization of coastal climate signal indicators
 - Design a structure for conducting feasibility-impact assessments and cost-benefit analysis to determine how to optimize investments in ocean observing systems for climate
4. Create a website to ensure longevity and evolution of workshop outcomes

12. Approaches to address diversity, equity, and inclusion:

This is a workshop with a truly national scope, attempting to answer questions about the needs and requirements for a national coastal climate observing system. As a result, it will strive to have participation that represents the broad diversity of the ocean and climate science community, and the nation, both in its organizing committee and in the attendees of this workshop. More than just representation from all the different coasts and regions, this includes diversity of race, ethnicity, gender, ability, age, and experience. Travel support is requested to encourage early career and representatives from diverse backgrounds to attend.

13. Budget request from US CLIVAR:

We request support for meeting logistics and travel for organizers, invited speakers, and participants, including early career scientists and professionals from underrepresented communities.

Funding Category	Event Cost
Venue	In-Kind
Workshop costs (catering, shuttle, bank fees, badges, handouts)	\$8,260
Travel support (airfare and lodging) x50 travelers	\$47,350
Indirect (15.5%)	\$8,620
Subtotal	\$64,230
Registration	\$0
IOOC Revenue	(\$20,000)
US IOOS Program Office Revenue	(\$5,000)
Total amount requested	\$39,230

14. Other sources of funding:

The Interagency Ocean Observing Committee (IOOC) and the US IOOS Program Office will provide up to \$25,000 towards the workshop. We are seeking funds from private sources to assist with poster session refreshments.

References

Di Lorenzo, E., A. Miller, C. Anderson, K. Karnauskas, J. Keister, N. Mantua, M. Ohman, and A. Subramanian, 2019: Forecasting ENSO Impacts on Marine Ecosystems of the US West Coast: A Joint US CLIVAR and OCB Workshop Report, 2019-1, 58pp., doi:10.5065/15kw-ep41.

IOOS Association, 2021: Detecting the Coastal Climate Signal: The IOOS Contribution. IOOSassociation.org. 11 pages.

Nielsen-Gammon, J., K.A. Reed, S. Elipot, and M. Patterson, 2021: Research Challenge on Climate at the Coasts: US CLIVAR Report, 2021-2, 20pp, doi: 10.5065/0g4s-5w68.

Stammer D., A. Bracco, K. AchutaRao, L. Beal, M. K. Roxy and co-authors, 2019: Ocean climate observing requirements in support of Climate Research and Climate Information. *Frontiers in Marine Science*, 2019, 6:444, doi: 10.3389/fmars.2019.00444.

US CLIVAR Scientific Steering Committee, 2013: US Climate Variability & Predictability Program Science Plan. Report 2013-7, US CLIVAR Project Office, Washington, DC 20005.