

EXTERNAL REVIEW OF THE
COOPERATIVE INSTITUTE FOR CLIMATE, OCEAN, AND ECOSYSTEM STUDIES
UNIVERSITY OF WASHINGTON SEATTLE WASHINGTON (Lead)
UNIVERSITY OF ALASKA FAIRBANKS
OREGON STATE UNIVERSITY

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION SCIENCE ADVISORY BOARD
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SUMMARY

An external review of the research, education, and outreach programs of the Cooperative Institute for Climate, Ocean, and Ecosystem Studies (CICOES) at the University of Washington (UW), in collaboration with the University of Alaska Fairbanks (UAF) and Oregon State University (OSU) was conducted on 22-23 April 2024 in Seattle, Washington. Guidelines for conducting the review were provided by the Cooperative Institute Administrative Office within the National Oceanic and Atmospheric Administration (NOAA). The review was conducted under the auspices of the NOAA Science Advisory Board and, therefore, is subject to the requirements of the Federal Advisory Committee Act. A list of Review Panel members is provided in Appendix I. The Review Panel's on-site agenda is provided in Appendix II.

The overall assessment of the Review Panel for CICOES is **Outstanding**. The Panel identified twelve findings and eight recommendations for improvement covering the following areas:

Strategic Plan

The Review Panel considers that while the lack of a CICOES Strategic Plan is not a significant weakness, undertaking a strategic planning process in the next year would be advantageous to CICOES and further support its success in the next five years. The Review Panel strongly recommends that CICOES undertake a Strategic Planning process over the coming year. The Review Panel also found that the breadth of CICOES research, especially in relation to Human Dimensions and Environmental Data Science themes, could be better reported. The Review Panel recommends that CICOES leadership report some of their research more synthetically to achieve this, rather than just project by project.

Science Review

The Review Panel notes that CICOES researchers are engaged in an array of impressive endeavors that are producing important findings relevant to many aspects of NOAA's mission. The Panel has no recommendations for improvement.

Outreach and Education

The Review Panel found that CICOES strives to use its Task 1 funds strategically and effectively to support workforce development relevant to NOAA's mission. The Task 1 Postdoctoral Fellowship Program offers excellent opportunities for early career scientists, but this report identifies several issues that need to be addressed. For example, several postdocs noted to the Review Panel that challenges with access to NOAA laboratories was a barrier to their work. The Panel's recommendation is to establish a working group to evaluate the CICOES postdoctoral fellowship program and identify opportunities to enhance the CICOES student and postdoctoral community.

Further, the Review Panel notes that existing diversity, equity, and inclusion (DEI) programs, while strong, are operated independently with little evidence of coordination, limiting their potential to provide opportunity to underrepresented groups. The Panel recommends improved coordination and integration across CICOES and partner university educational and DEI programs, for example, as with the former NOAA-UAF undergraduate internship program, Partnership for Education.

In terms of Outreach, the Review Panel notes extensive public/K-12 outreach activity, almost all of which is centered around UW and the Seattle area. The Panel recommends that CICOES seek opportunities to expand outreach across all partner institutions and NOAA laboratories.

Science Management

The Review Panel found that the Research Development Fund is a suitable approach to stimulating research in new areas and recommends that CICOES explore opportunities, for example, through the development of outside partnerships, to increase resources available to the grant program.

The Review Panel considered the structure and function of the existing CICOES advisory boards, and notes that while the Executive Advisory Board (EAB) and the Council are generally appropriately constituted per the Cooperative Institute Handbook, many members did not seem effectively engaged in understanding of their CICOES role. This limits the EAB's ability to provide effective oversight and guidance and the Council's ability to strategize and coordinate research and technology efforts. Further, participation in these groups may not be broad enough to effectively engage the CICOES community. The Panel recommends that the advisory bodies be more effectively utilized and offers suggestions about how the Council could be expanded to play more specific roles and that a formal group of interested parties, stakeholders, and potential partners could be established to broaden CICOES reach and generate interest.

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I. INTRODUCTION

This report describes the findings of the Review Panel of the research, education, and outreach programs of the Cooperative Institute for Climate, Ocean, and Ecosystem Studies (CICOES) at the University of Washington (UW), in collaboration with the University of Alaska Fairbanks (UAF) and Oregon State University (OSU), conducted on 22-23 April 2024 in Seattle, Washington. The Review Panel assigns a rating of **Outstanding**. The Review Panel was especially impressed with the range and quality of the science being conducted under the auspices of CICOES. The Panel has provided several recommendations for improvement, especially relating to governance issues and the need for explicit strategic planning.

Following an overview of CICOES, the report is organized according to the four review topics required by the Science Advisory Board: 1) strategic plan; 2) science review; 3) education/outreach; and 4) science management. The Cooperative Institute (CI) Handbook identifies a series of questions under each of these areas which the CICOES Director used to structure preparatory materials for the Review Panel. This report does not address each of these directly. Rather the Review Panel has focused on key issues identified during their review visit and subsequent deliberations.

II. OVERVIEW OF CICOES

CICOES is a co-located consortium CI comprised of UW, UAF, and the College of Earth, Ocean, and Atmospheric Sciences (CEOAS) at OSU. It was established following a successful proposal in response to the 2019 Notice of Funding Opportunity entitled, “Competition for a Cooperative Institute for the Pacific Northwest and Polar Regions”. Prior to CICOES, UW and the National Oceanic and Atmospheric Administration (NOAA) collaborated through the Joint Institute for the Study of the Atmosphere and Ocean (JISAO) established in 1977. UAF and NOAA collaborated until 2020 through the Cooperative Institute for Arctic Research (CIFAR). JISAO’s original focus was climate dynamics and estuaries, and collaboration was mainly with the Pacific Marine Environmental Laboratory (PMEL). The scope of research was expanded over time to include seven research themes and collaboration with the Alaska Fisheries Science Center (AFSC), the Northwest Fisheries Science Center (NWFSC), and the National Marine Mammal Laboratory (NMML, now MML within the AFSC).

As a regional consortium CICOES draws on faculty from up to ten CICOES-affiliated UW departments, faculty at the College of Fisheries and Ocean Sciences, the International Arctic Research Center, the College of Natural Sciences and Mathematics and the Geophysical Institute at UAF, and faculty at the CEOAS at OSU. CICOES is a research unit headquartered within the UW’s College of the Environment but is designed and organized to integrate all three University partners in all administrative, leadership, and advisory structures (Figure 1).

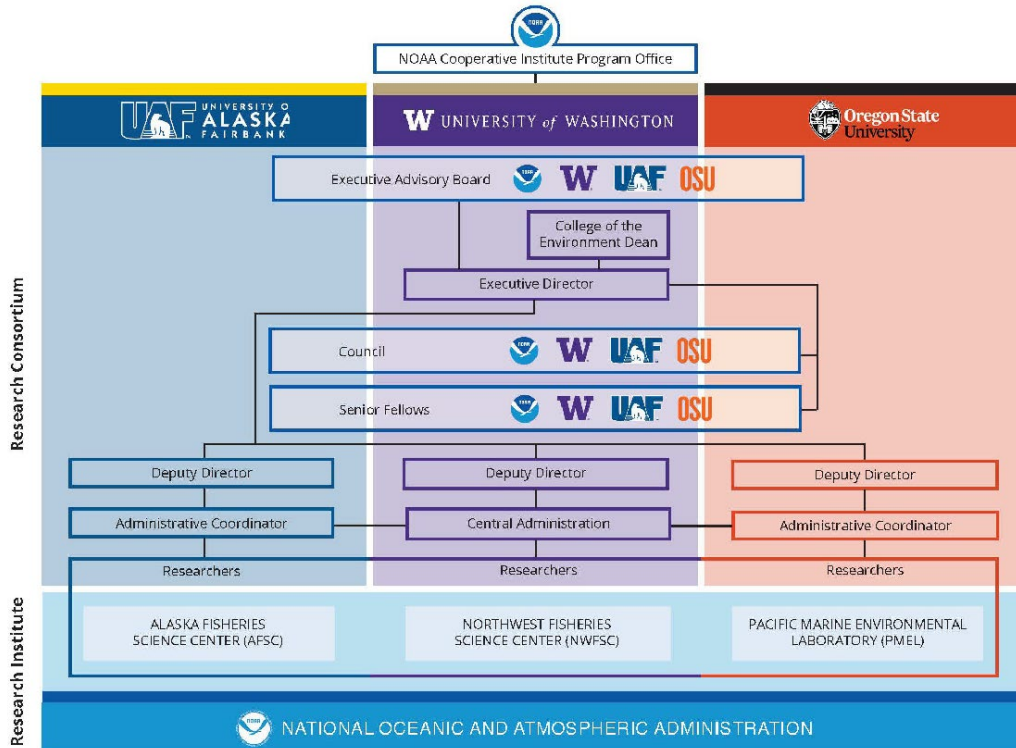


Figure 1. Structure of CICOES.

CICOES presently has nine research themes:

1. Climate and Ocean Variability, Change, and Impacts

Research conducted under this theme guides atmosphere-ocean monitoring, process studies, and the development and implementation of earth-system models. The ultimate objective is to improve predictions of atmospheric and oceanic properties that have societal and environmental importance over time scales from weeks to multiple decades.

2. Earth Systems and Processes

This theme encompasses interactions at interfaces of the solid earth and aquatic systems. Physical and chemical interactions throughout the global ocean are discovered, identified, and characterized to document how these interactions impact biogeochemical cycles, aquatic-habitat creation and maintenance, ocean productivity, biogeochemical cycles, seafloor and coastal morphology, and coastal inundation.

3. Environmental Chemistry and Ocean Carbon

Research focuses on understanding and predicting changes in climate and climate-induced changes in ocean biology through understanding the ocean’s role in the uptake of anthropogenic CO₂ and the response of the ocean’s physical and biological carbon pumps. CICOES’ environmental chemists study the role of the global ocean in controlling atmospheric CO₂ using physical oceanography, chemical tracers, and water column distributions of major biochemicals and CO₂.

4. Marine Ecosystems: Observation, Analysis, and Forecasts

Research conducted within this multidisciplinary theme is motivated by the need to measure, understand, and predict the short and long-term fate of marine ecosystems and to improve ecosystem-based management for present and future generations. Investigations develop and integrate technologies and analytics to simultaneously measure multiple ocean variables, process and analyze voluminous data sets, and conduct end-to-end modeling using empirical data.

5. Ocean and Coastal Observations

Research within this theme develops novel technologies and sampling approaches to understand transport and storage of ocean heat, the subduction and storage of greenhouse gases, and subsequent impacts on the coastal ocean. Fluxes of momentum, heat, and moisture connect the ocean and atmosphere influencing multiscale processes from the global hydrological cycle to extreme weather events and teleconnections that span the tropics to the poles.

6. Environmental Data Science

Efforts to understand climate, manage marine ecosystems, and share knowledge and information rely on collection, dissemination, and analysis of data. Research efforts within this theme are distributed among development and deployment of data best practices, improved data assimilation efforts between modeling and observing, advancement of machine learning and cloud-based techniques, and application of data science to data intensive challenges.

7. Aquaculture Science

This program focuses on the development of sustainable marine aquaculture to promote the culture of shellfish, finfish, and macroalgae. Aquaculture is defined to include hatchery production (where individuals are born in captivity and outplanted) and farming (where individuals are grown in captivity throughout their lifetimes). Aquaculture also continues to play a critical role in ecosystem conservation and restoration efforts.

8. Human Dimensions in Marine Systems

Research efforts on human dimensions in marine systems aim to support adaptations of coastal communities to climate-related changes. Vulnerability assessment – with elements of sensitivity, exposure, and adaptive capacity – provides a framework to examine adaptation strategies. Management strategy evaluation, nonmarket valuation, spatial analysis, and participatory research offer other means to examine and guide adaptation.

9. Polar Studies

With a focus on the unique environments at high latitudes, research in this theme seeks to understand the physical, chemical, biological, and ecological systems in the Antarctic, Arctic, and Alaskan regions. Since this is a geographic theme, it incorporates components of all other research themes within the CICOES research portfolio: climate, earth system, ecosystems, and technology development. Models, products, and observational strategies are developed to improve environmental monitoring and forecasting capabilities in polar regions.

III. STRATEGIC PLAN

The scientific vision for CICOES is to provide a vertically integrated cooperative institute that fosters collaborative, multidisciplinary research across ocean, atmosphere, and fishery sciences

that builds and maintains resilient ecosystems, communities, and economies. The CICOES proposal identifies a vision to develop the *capability* to observe, understand, model, and predict earth-ocean-atmosphere interactions and manage marine resources, and the *capacity* to conduct long term, transformational research and to educate the next generation of scientists. These aspects of the vision were developed to align with the OAR vision to deliver world class science dedicated to the NOAA mission, and the National Marine Fisheries Service (NMFS) mission to manage marine resources and help build resilient fisheries and coastal communities. The nine scientific themes of CICOES are described in the previous section.

The Need for a Strategic Plan

According to the understanding of the Review Panel, a strategic plan is a suggested—but not required—element of a NOAA cooperative institute. Over the course of the Review Panel’s visit to CICOES, including discussions with CICOES and NOAA leadership and subsequent Review Panel deliberation, a few characteristics of CICOES in its current form led the Review Panel to conclude that the process of developing a strategic plan would be advantageous to CICOES and further support its success in the next five years.

The cooperative agreement of CICOES includes nine research themes, with some being much more robust and active than others. It is understood by the Review Panel that the nature of a cooperative agreement entails some inherent uncertainty in terms of which themes will flourish and which will experience fewer opportunities for collaborative projects to emerge and be successfully funded. A further period of reflection upon the breadth and depth of CICOES research would be beneficial in guiding CICOES toward effectively aligning its resources, internal programs, and proposals with the NOAA mission.

In terms of CICOES leadership and governance, sharper focus is needed. CICOES has Directors, Associate Directors, and several advisory bodies (see further discussion of CICOES advisory bodies under Science Management below). A set of priorities and a roadmap in the form of a strategic plan would ensure that decisions being made, resources being allocated, and human resources being entrained into the institute can be done confidently and consistently across the various entities—in line with a set of guiding principles or strategic imperatives that have been developed in collaboration with all stakeholders in the institute from students to administrative staff to Principal Investigators.

The Review Panel does not view the lack of a CICOES Strategic Plan as a significant weakness, but its development is a great opportunity for growth and focus. on the scientific directions and societal impacts that CICOES values and should pursue most vigorously when opportunities allow. The time appears to be right for CICOES—not only the leadership structures but the institute as a whole—to recognize the challenges and opportunities available and build upon the reflection process that began with preparing for the first external review: articulating their strengths, defining their priorities, identifying any areas that need pruning or enhanced focus, clearly articulating a shared vision, and following up with an implementation plan to achieve that vision.

Finding: The process of developing a strategic plan - especially one that could be reviewed and updated on an annual basis - would be advantageous to CICOES and further support its success in the next five years.

Recommendation: The Review Panel strongly recommends that CICOES undertake a Strategic Planning process over the coming year. This is not a time for further external review but for introspection and building excitement for a shared vision for the institute. To that end, the buy-in of members of CICOES across all ranks including faculty and PIs, research support staff, administration, and students will be critical to the success of this process from planning to implementation.

Addressing the Themes

The nine scientific themes represent a broad range of potential scientific endeavors related to climate, oceanographic, and ecosystem science. Opportunities to pursue each of the themes vary over time as the interests of NOAA and funding availability is driven by forces external to CICOES. As discussed under the Science Review section below, progress in many of these areas is impressive with important and groundbreaking science being conducted.

The Science Advisory Board has identified that social science integration is important to consider relative to NOAA's science projects and programs. CICOES shows a somewhat limited understanding of social science in the Panel's Briefing Book (i.e., mentioning only economics and political science as examples) and notes that it is not explicitly part of the CICOES research mandate. The Review Panel finds this difficult to reconcile with the explicit identification of 'Human Dimensions in Marine Systems' as a research theme. There are, in fact, several excellent examples of where social science is being integrated into projects not seen as directly aligned with the Human Dimensions theme, e.g., the Alaska Climate Integrated Modeling (ACLIM) project (see discussion of ACLIM under IV. SCIENCE REVIEW below).

Summary reporting of CICOES accomplishments seems to diminish these contributions. For example, the listing of CICOES projects (based on self-reporting in Research Performance Progress Reports) in 2023 lists no projects under Human Dimensions which could give the impression that no work relevant to social science is being conducted. However, depictions of the interconnectivity of CICOES research themes presented to the Review Panel (Figure 2) begins to show that relevant work is indeed being conducted.

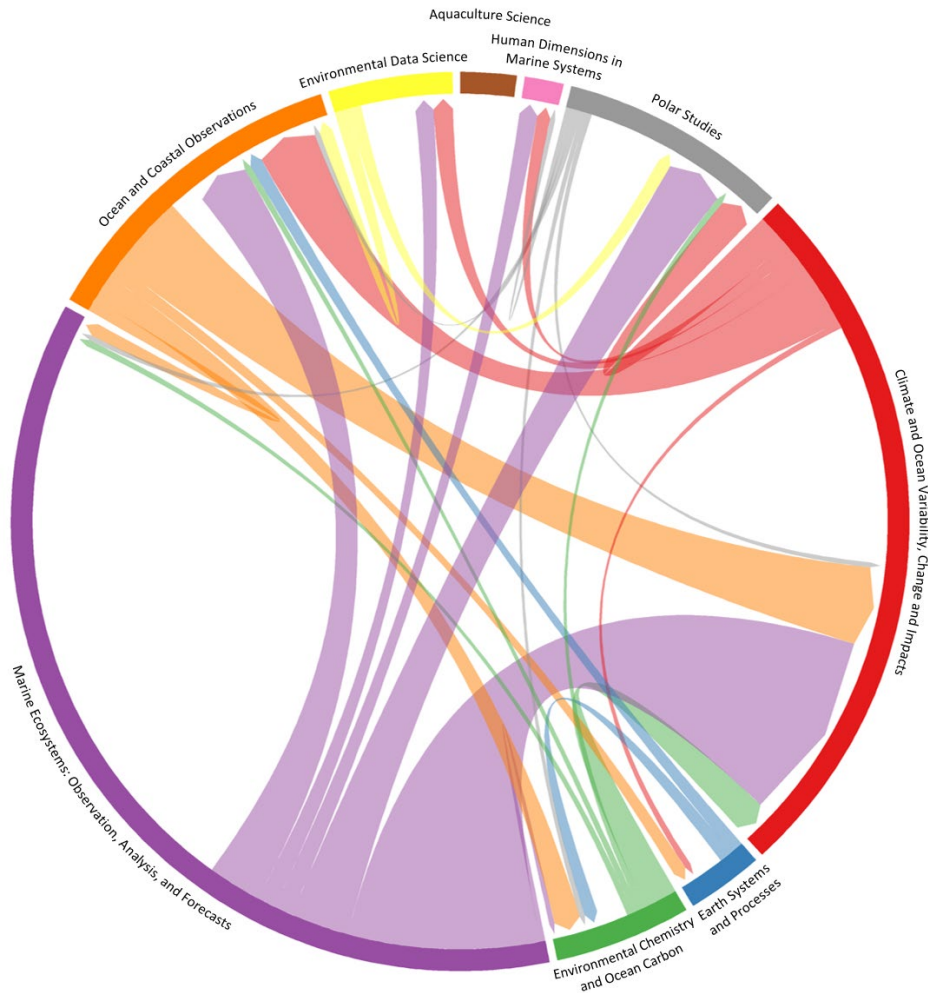


Figure 2. Interconnectedness of CICOES research themes.

The Review Panel sees this lack of acknowledgement of the breadth of social science and its key role in addressing issues of concern to NOAA, especially in relation to NMFS’ mission to help build resilient fisheries and coastal communities, as a lost opportunity to show that CICOES work across the nine themes can be more than the sum of the parts. Making the case for more integrated outcomes will require CICOES leadership to not simply pass on accomplishments as reported by principal investigators, but to show how they are meeting their goals, as played out in themes, through integrated approaches to key scientific and societal challenges.

This is not only an issue related to the Human Dimensions theme. Environmental Data Science was reported in the briefing book as receiving only \$1 million, albeit for 10 projects, in 2023 making it appear less of an emphasis than Marine Ecosystems (73 projects and \$16 million). However, Figure 2 shows how work under Environmental Data Science supports other research themes, and the Review Panel understands that many CICOES projects include elements of Environmental Data Science.

Finding: The Review Panel considers that research themes like Human Dimensions and Environmental Data Science might be better viewed as ‘cross cutting’ themes touching on many of

the others, in a similar way to how Polar Studies is seen as a geographic theme that touches many of the other subject matter themes. However, the breadth of CICOES research can be more effectively reported without the need for structural changes.

Recommendation: CICOES leadership needs to identify and report contributions of the CI to its research themes in a more synthetic manner so that, for example, work in social sciences and data science, an integral part of many projects where it is not the focus, can better emerge, and CICOES integrated contributions can be recognized and built upon.

IV. SCIENCE REVIEW

CICOES science is of outstanding quality and covers the range of research themes within CICOES. Research output is high with typically between 200-300 peer-reviewed papers published each year (except for April 2023-March 2024, where 73 papers are listed). Several of the research topics that impressed the panel are described below but this is by no means a comprehensive list.

- **Freshening of the Waters of the Arctic's Beaufort Gyre and its Impacts.** A significant strategy undertaken by CICOES and its NOAA partners to investigate the CICOES theme of 'Climate and Ocean Variability, Change and Impacts' is to explore phenomena that appear to be most sensitive to, and changing the most quickly because of, Earth's changing climate. The work led by Jiaxu Zhang, a CICOES scientist embedded in PMEL, has found startlingly large and continuing salinity decreases in the Arctic's Beaufort Sea over the past 20 years that reveal a climate change nexus that goes well beyond the "average global change" point of view. The modeled transit of these freshened waters through the Canadian archipelago produces freshening of the upper Labrador Sea water equivalent to that produced by Greenland ice melt. The potential consequences of this aspect of climate change are altered/damaged ecosystems and a hastening of a feared collapse of the Atlantic Meridional Overturning Circulation, with cascading impacts on European and other Northern Hemisphere weather.
- **Global Ocean Carbon.** One of the research themes that the Review Panel found to be particularly exciting and well developed is global ocean carbon and associated biogeochemical cycles (Theme: Environmental Chemistry and Ocean Carbon). A set of compelling project highlights were given by CICOES scientists working under this theme, including Drs. Brendan Carter and Jonathan Sharp. For example, Dr. Carter's presentation on behalf of a sizable group of UW, NOAA, and CICOES collaborators illustrated the extensive collection and synthesis of global ocean carbon measurements as well as emerging approaches to marine carbon dioxide removal (mCDR). The mCDR work led by CICOES involves theory, laboratory experiments, and high-resolution numerical modeling; it is collaborative across institutions, disciplines, and between academia and private industry. Both the longstanding and fundamental programs supporting the measurement and synthesis of global ocean carbon, as well as the innovative work on mCDR, are directly related to NOAA's mission and identified societal challenges. This work is making an impact in the scientific community, society, and other stakeholders including policymakers by informing national research strategy documents.
- **Saildrones.** CICOES and NOAA scientists have partnered with the private company Saildrone Inc. to develop innovative unmanned ocean drones ('Saildrones') equipped with a payload of

sensors to take measurements of atmospheric and ocean conditions. As part of a project to enhance observations of the tropical Pacific for process studies, CICOES scientists have explored the ability of Saildrones to capture needed upper ocean and air-sea interface variables for field observations and to estimate the upper ocean vertical velocity using acoustic doppler current profiler data. PMEL and Saildrone Inc. have developed Saildrones that can withstand hurricane-force wind and sea states which were deployed by a team of PMEL/CICOES scientists during the 2021 Atlantic hurricane season. Unprecedented measurements of atmospheric and ocean conditions were taken in the core of category-4 Hurricane Sam in 2021. The Saildrone Hurricane mission in 2023 deployed 10 Saildrones that intercepted nineteen tropical storms and 6 hurricanes, demonstrating their capability for real-time hurricane observation to enhance tropical cyclone prediction. At least 13 papers were published by CICOES scientists using Saildrones during the 2020-2024 period. The Review Panel was impressed by the demonstrated potential for Saildrones to enhance ocean observations given their unique advantages over traditional buoys and crewed vessels. A concern raised by the Review Panel was with the ownership and accessibility of data produced by the ocean drones given that Saildrone is a private company.

- The **Alaska Climate Integrated Modeling** project (ACLIM) is an interdisciplinary collaboration to project and evaluate climate impacts on marine fisheries in the Bering Sea, Alaska. ACLIM has been at the leading edge of integrating the broad array of climate sciences into stock assessment and management of harvested and protected species. Such integration is currently rare but is widely acknowledged as necessary to maintain sustainable fisheries in the US in the face of climate change. The ACLIM framework has been widely viewed as a success and has recently been replicated in other regions including the Gulf of Alaska (GOACLIM) and the Northeast US (NCLIM). The ACLIM team includes approximately 50 mostly NOAA and university-based scientists including physical oceanographers, ecosystem modelers, economists, social scientists, and fishery and living marine resource managers. Much of the funding for university-based researchers contributing to this project has come through CICOES and before then, through JISAO.

Finding: The Review Panel notes that CICOES researchers are engaged in an array of impressive endeavors that are producing important findings relevant to many aspects of NOAA's mission.

V. EDUCATION AND OUTREACH

For NOAA to continue to achieve its mission, it needs a strong educational pipeline to provide a talented and diverse pool of scientists from which it can recruit. This need is recognized in the 2021-2040 NOAA Education Strategic Plan, especially Objective 1.1: "Youth and adults, particularly from underserved groups, engage with NOAA-related sciences through education and outreach opportunities." CIs connect NOAA to universities that are well positioned to train this workforce at the undergraduate, graduate, and postdoctoral level. NOAA support to CIs expands the scope of this training in multiple ways, including through explicit funding of educational programs and support for graduate students and postdoctoral researchers in research funding. NOAA and most universities in America have increased their commitment to the goals of diversity, equity, and inclusion (DEI) in education to ensure that our future scientific workforce draws from the broadest

range of talents in our society. CICOES contributes to this important goal in multiple ways yet has room for improvement in engaging the full diversity of talents available within its partner institutions and coordinating among multiple educational and DEI initiatives.

Education and Workforce Development

CICOES has multiple high-quality training programs for undergraduates, graduate students, postdoctoral researchers (postdocs), and early career scientists. Notably and commendably, CICOES supports the continued education of its research scientist staff through dedicated professional development funds to attend conferences, short courses, and workshops. For undergraduates, CICOES training opportunities come primarily through the Undergraduate Summer Intern program. CICOES has purposely chosen to invest a smaller amount of Task 1 funding in graduate fellowships, equivalent to 6 quarters per year with a focus on final semester/quarter funding and stop-gap funding. However, many MS and PhD students are also supported on projects directly from Task 2 research funds, and greater recognition should be given to these students.

The CICOES Task 1 postdoctoral fellowship program is relatively large, supporting three two-year fellowships per year. This program has helped recruit highly trained early career scientists from around the world to advance the science conducted at NOAA and the partner universities. The CICOES postdoctoral fellowship program serves as a key educational and research component of CICOES, and it provides the bridge for collaboration between scientists at NOAA and UW. There are also CICOES postdocs hired from CI grants. Overall, the Review Panel noted that postdocs have appreciated the opportunity to do research in CICOES and are positive about the scientific mentorship they received.

However, there is limited identification of graduate students and postdocs with the broader CICOES community. Some postdocs mentioned that they find more community support with their host departments, but there is unevenness with how CICOES postdocs are supported by their home departments. Geography plays a role: CICOES postdoctoral fellows may have 2-3 offices, one in the host UW department, another at a NOAA lab, and a third at Wallace Hall, and the decentralization contributes to a lack of belonging. Several mentioned that the postdoc offices at Wallace Hall do not provide an attractive working environment. The CICOES science briefing book describes a Postdoctoral Professional Development program with monthly meetings, but the Review Panel was left with the impression that this program is not as vibrant as it could be and that it is left largely to the postdocs themselves to organize (in addition to their individual research commitments). The COVID-19 pandemic may have added to the dilution of the sense of community.

CICOES students and postdocs expressed frustration with the difficulty of accessing NOAA facilities because of security restrictions including the requirement of having a NOAA chaperone during their visits. There is a legal constraint for all foreign nationals accessing NOAA facilities and the issue is not CICEOS-specific; regardless, this has made it more difficult for CICOES postdocs in particular international postdocs to collaborate with NOAA scientists and gain access to NOAA resources. Postdocs point to collaboration with NOAA as a strong draw of the CICOES postdoctoral fellowship, so the difficulty with physical access is disappointing. A large fraction of CICOES postdocs are international. The Review Panel heard from NOAA personnel involved in

CICOES that there is a standard process for gaining access to NOAA facilities, but apparently this process is slow, cumbersome, or unknown to many CICOES students and postdocs and thus limits their interactions with NOAA scientists. In practice, postdocs individually navigate procedures for access to NOAA labs.

CICOES postdoctoral fellows all have NOAA and academic mentors but fall under direct supervision by the CICOES Director, and postdocs meet individually with the Director once or twice a year. These evaluations may have material consequences for the postdocs, and it is unclear to the Review Panel how the CICOES Director can fully appreciate the issues (both opportunities and challenges) the fellows encounter in their work and/or provide them guidance.

Findings:

- CICOES is strategically and for the most part effectively utilizing Task 1 funds to support workforce development to support NOAA's mission.
- CICOES postdoctoral fellowships are a remarkable opportunity for early career scientists to gain from both academic departments and the breadth of scientific research conducted by CICOES but this needs to be deliberately cultivated rather than left to chance. The Review Panel sees an opportunity for better integration of the postdocs with the CICOES community.
- Ready access to NOAA facilities is essential to the advancement of postdoctoral fellows and their contribution to NOAA science needs and is presently often hampered by a cumbersome process and lack of support to navigate it.

Recommendation:

The Review Panel recommends that a working group be formed to evaluate the CICOES postdoctoral fellowship program and identify opportunities to enhance the CICOES student and postdoctoral community. Issues that could be examined and addressed for the benefit of CICOES students and postdoctoral fellows include:

- Expanding opportunities for interaction between CICOES students, postdocs, and NOAA scientists, e.g., visiting speakers, social events, and providing resources to support these interactions.
- Providing formal assistance to CICOES postdocs to facilitate access to NOAA laboratories.
- Examining procedures for the selection of CICOES postdoctoral fellows (see Scientific Management section for additional context).
- Taking steps to ensure that host departments treat CICOES postdoctoral fellows as they would their own, and with access to all departmental facilities and events.
- Providing guidance for evaluating postdoctoral fellows, which should fall primarily to the scientific mentor as they are in the best position to holistically evaluate the fellow.

Diversity Equity and Inclusion

CICOES places a strong emphasis on DEI primarily through its Undergraduate Summer Intern program and a DEI committee that has focused on creating a more welcoming and inclusive scientific community at CICOES. This program has had a DEI focus since its inception in 2008 as a

partnership between JISAO and Howard University (a Historically Black College and University). CICOES has continued and grown this program - including a significant expansion through a successful National Science Foundation (NSF) Research Experience for Undergraduates grant - and maintained its DEI focus.

The Undergraduate Summer Intern program, for example, conducts recruiting at local community colleges, the Northwest Indian College, Heritage University, and at conferences such as the American Indian Science and Engineering Society (AISES) National Conference. The Intern program also includes a group cohort-building and professional development component that is recognized as crucial to the success of undergraduate research programs focused on DEI. The DEI committee at CICOES has focused on community building with events such as a monthly DEI book club and a Conversations program where CICOES and NOAA employees are randomly paired for virtual coffee chats to help build relationships.

However, connection across programs with a DEI focus is largely missing and there are many untapped opportunities for synergy with existing DEI-focused programs at NOAA and partner institutions. The existing programs, while strong, are operated independently with little evidence of coordination. There may also be an opportunity to revive the apparently lapsed Alaska Partnership for Education Program (PEP¹) that was run collaboratively between UAF, a CICOES partner institution, and the NOAA Alaska Fisheries Science Center. Better coordination among programs could have multiple benefits including: (1) sharing of best practices for DEI recruitment, (2) providing steppingstones from one educational program to the next to enhance retention of program participants within marine science, and (3) potentially improving the pipeline to NOAA through direct hire authority, which allows NOAA offices to hire qualified recent graduates into entry-level federal positions through a more direct process. Alumni of many NOAA internship programs receive this valuable benefit.

Finding: Existing DEI programs, while strong, are operated independently with little evidence of coordination limiting their potential to provide opportunity to underrepresented groups.

Recommendation: Improve coordination and integration across CICOES and partner university educational and DEI programs. Better coordination among programs could have multiple benefits for students, resulting in a more effective pipeline to careers in marine science and employment at NOAA.

Outreach

CICOES outreach activities to the public and K-12 students are impressive. These include hands-on presentations for the public at the Pacific Science Center, the Seattle Aquarium, the Museum of Flight, local schools, and community centers. Popular events include career days at high schools, UW and NOAA open houses, Science on Tap, Skype a Scientist, and collaborations with Washington's chapter of the Mathematics, Engineering, Science Achievement program. Outreach activities seem to have pivoted appropriately during the COVID-19 pandemic to virtual options. CICOES leaders report that CICOES employees have engaged with 1,960 people/year since 2020.

¹ <https://www.fisheries.noaa.gov/alaska/careers-and-opportunities/meet-pep-ak-students>

The CICOES magazine also appears to be a potentially useful mechanism to reach a wider audience.

Finding: The Review Panel notes that almost all of the public/K-12 outreach activities described were centered on UW and the Seattle area. If CICOES is to operate effectively as a consortium, efforts must be made to ensure CICOES science is visible and accessible to these audiences via OSU and UAF as well.

Recommendation: Seek opportunities to expand outreach across all partner institutions and NOAA laboratories, and the audiences they can reach.

VI. SCIENCE MANAGEMENT

The total funding to CICOES from 2021 to 2024 is almost \$94 million. Funding per year for 2021-2023 was around \$23 million, increasing to over \$25 million in 2024. Of these total funds ~\$86 million was at UW, \$7.5 million at UAF, and under \$300,000 at OSU. Numerous policies support administrative and researcher roles within CICOES. To provide additional autonomy and the ability to augment and/or create initiatives at UAF and OSU, 90% of all indirect cost revenue from all research activity is returned to the host institution. This 90% indirect cost return policy is also applied to UW departments with CICOES-affiliated faculty, and approximately 37% of external indirect cost return is transferred to CICOES-UW research scientists.

Progress is tracked in a number of ways: through Principal Investigator activity summaries, tangible products summaries, funds allocated, etc. Many of these are self-reported, and impacts or outcomes are documented project by project in annual Research Performance Progress Reports.

Emerging Issues

CICOES ability to respond to emerging scientific issues of concern to NOAA relies on collaborations with NOAA partners. In addition, CICOES personnel and affiliated faculty can pursue NOAA competitive sources of funds or external sources (e.g. North Pacific Research Board, NSF, Lenfest Ocean Program) to extend or initiate new research that contributes to NOAA's mission.

The Research Development Grant program is used to stimulate and leverage new research activities within the CICOES community. Funding is provided for new or a significant extension of existing but unfunded research that is encompassed by at least one of the nine CICOES research themes. Collaboration with researchers in other UW units, CICOES partner Universities, and/or NOAA scientists is encouraged. An annual budget of \$150,000 to \$200,000 is allocated for the Research Development Grant initiative.

Finding: The structure of CICOES and its funding through a cooperative agreement means there is little opportunity to explore new areas without specific funding being available. The Research Development Fund is a suitable approach to stimulating research in new areas given the limited amount of discretionary funding (Task 1) available.

Recommendation: Explore opportunities, (e.g., through the development of outside partnerships), to increase resources available through the Research Development Fund.

Advisory Boards

The CI Handbook (dated 5/2023) states that each Cooperative Institute (CI) shall "have at least two advisory boards: an Executive Board and a Council of Fellows. The Executive Board consists of senior management officials/employees from NOAA and the CI." "The Council of Fellows consists of mid-and senior-level scientists from NOAA, the CI, and if a consortium CI, the Council of Fellows must contain at least one member from each consortium member." The CICOES Executive Advisory Board and the CICOES Council generally adhere to the Handbook's directives for their establishment and the minimum membership specifications.

The CI Handbook envisions that the Executive Board is to be a reactive, not proactive, body "to study matters brought before it and provide such management and oversight duties necessary for the advancement and welfare of the CI." The Council of Fellows on the other hand "may be the principal vehicle for the research strategy, annual research plans, publication peer-review, research and technology coordination, and achieving the overarching goal of regional and disciplinary integration." CICOES has framed the Executive Advisory Board as providing oversight and direction. The CICOES Council is seen as more proactive and develops program initiatives, conducts peer reviews, allocates resources, coordinates research and technology, and advances regional and disciplinary integration. However, the Review Panel notes that the current Council does not appear representative of the various interests within CICOES. For example, there are at least 10 CICOES-affiliated departments at UW and only two are represented on the Council.

It is unclear why CICOES does not use the term 'Council of Fellows' as noted in the CI Handbook. The Review Panel noted the confusion added to this inconsistency by the appearance of "Senior Fellows" in both the management structure diagram (Figure 2) and the CICOES website. These Senior Fellows, who are listed on the CICOES website as coming from various departments at UW and PMEL (not the breadth of academic and NOAA entities engaged in CICOES), are not mentioned in the materials presented to the Panel. Neither are Senior Fellows mentioned in the current CI Handbook.

In addition to the Council, CICOES has developed extensive user-level partnerships among the consortium members (UW, UAF and OSU) and NOAA Line Offices and labs. This strategy of extensive user-level partnerships that necessarily results, for instance, in the evolution of research strategies and plans and the coordination of regional and disciplinary objectives, augments the Council's ability to achieve its objectives. The Review Panel views these user-level partnerships as value added and supportive of CICOES mission.

Despite these articulated roles, and the diversity and wealth of scientific experience, the current advisory bodies appear underutilized and not effectively engaged to the surprise of the Review Panel. During the Review Panel discussion with Executive Advisory Board and Council members, there was little reference to recent topics that had been discussed, with some members relaying topical discussions from JISAO rather than CICOES.

For example, postdoctoral fellowship applications are evaluated by a separate, seemingly ad-hoc panel representing the three universities. The strategy for postdoctoral fellowship assignments has varied. An evaluation rubric is distributed to each committee member each year. In 2020, 4 positions were allocated with the specification that overall, one appointment would go to one of

the partner universities and one appointment would go to one of the new four research themes (this was accomplished with one position). Specific themes or universities have not been used since 2020. In years with no conditional appointments, science quality has been the primary criterion used to select candidates (the Review Panel is not aware how this is assessed), and there is apparently some effort to look at diversity of institutions, gender, and discipline when looking at the final composition of appointments. This is one example of where an effective, engaged Council could provide support to a key resource allocation with an eye for advancing regional and disciplinary integration, and guide recruitment, selection, and evaluation.

It is clear to the Review Panel that some restructuring of CICOES advisory groups would be advantageous to CICOES and could support many of the recommendations made in this report. The Review Panel makes the following observations:

- The Executive Advisory Board composition is appropriately constituted and includes leaders across the CICOES organization. However, there appears to be untapped potential on the Board to support and advise CICOES. Areas of potential engagement identified by the Review Panel include: support for engagement and outreach (see Recommendation under V. EDUCATION AND OUTREACH above), discussion of strategic direction, relationships among university and CICOES priority research areas, and potential external partnerships.
- The Council – which should be renamed the Council of Fellows – should be expanded in size to encompass more academic departments/units and NOAA entities (the Review Panel notes that there are over 30 members of the Council of Fellows at CIRES) and engage directly with aspects of CICOES decision making. Members of such a Council of Fellows could be ‘champions’ for CICOES within their home departments/labs and engage in key tasks such as strategic planning and review of postdoctoral fellowship applications. For example, each year a subset of the Council of Fellows could review fellowship applications and make recommendations back to the entire Council of Fellows and the CICOES Director. A larger Council of Fellows broadens engagement across the CICOES family and enables the formation of subcommittees or workgroups to address specific issues (e.g., see recommendation under V. EDUCATION AND OUTREACH on the postdoctoral program and student engagement), alleviating the burden from the CICOES Executive Committee.
- A wider group of CICOES Associates could be formed that included faculty and NOAA scientists (not necessarily ‘senior’), as well as stakeholders and potential partner institutions (public, private and non-profit) who are interested in CICOES research and activities. Their role would be to promote outreach and engagement, connect CICOES researchers with opportunities for new partnerships, and increase the profile of CICOES. This would replace the ‘Senior Fellows’ listed on the website. This group would receive informational materials about CICOES (e.g., newsletters, notices of public events), and perhaps meet virtually once a year for selected science briefings and to be updated on new initiatives.

Finding: The existing advisory groups are appropriately constituted per the CI Handbook, but many members did not seem effectively engaged in, nor understand, their CICOES role. This limits the EAB’s ability to provide effective oversight and guidance and the Council’s ability to strategize and coordinate research and technology efforts. Participation in these groups may not be broad enough to effectively engage the CICOES community.

Recommendation: The advisory bodies need to be more effectively utilized. Their roles and membership could be strengthened and used more strategically to build relationships between

NOAA and university faculty, and to support the coordination and integration of research across CICOES. Specifically:

- The Council of Fellows needs to be expanded, engaged more frequently, and tasked with specific roles important to CICOES.
- A formal group should be established to foster wider engagement in CICOES activities from university and NOAA researchers, potential partners, and interested stakeholders.

Building Relationships to Advance CICOES Research

A consortium CI such as CICOES depends extensively upon relationships in developing and maintaining research coordination and collaboration. There are no formal procedures for scientific or administrative planning between CICOES and its NOAA partners. Research projects are determined through consultation between NOAA scientists and CICOES Principal Investigators and faculty from affiliated departments. The challenge is to make NOAA scientists aware of interested faculty and their cutting-edge research who are keen to engage in NOAA research as well as to make faculty aware of NOAA research needs (according to the CICOES Science Briefing Book).

Relationships between PMEL and UW are strong and well established. Relationships between the two fisheries science centers (AFSC and NWFSC), UW, and UAF are growing. The relationship with OSU's CEOAS continues to be in its infancy, despite four years of effort by the CICOES Director.

CICOES has used town halls, seminars and informal briefings at UW and OSU, a biannual science symposium attended by university and NOAA scientists, and other mechanisms for enhancing relationships among its partners. The CICOES Director should be commended for his efforts in these activities.

The CICOES Director and CEOAS Dean are both aware of the need to develop a stronger relationship between the college and NOAA to justify continued participation in the cooperative institute consortium. Making this a higher priority for CICOES could support increased engagement from OSU in CICOES and enable NOAA to capitalize on the extensive scientific expertise and resources OSU brings to CICOES.

A number of opportunities are available, or could be developed, to facilitate the strengthening and enhancing of existing relationships and the development of new ones. It is important to find novel ways to reach out to new university researchers who may not be aware of NOAA's research needs. For example, town halls at professional conferences (fisheries society, Alaska Marine Science Symposium, AGU, Ocean Sciences, Arctic Science Summit Week, etc.) can be a good way to make connections.

One obvious area for new relationships is with human dimension researchers and social scientists, including extensive expertise in this area within CICOES partner institutions. NOAA, especially NOAA leadership, has consistently highlighted this need but has rarely provided sufficient resources to support such relationship building. This need should be communicated through the CI leadership structure to NOAA and its leadership.

Further, many NOAA programs have extensive engagement and outreach mechanisms. Alaska and Washington State Sea Grant Programs are obvious connectors, as are the two fishery management councils (North Pacific and Western Pacific), the regional programs of the Integrated Ocean

Observing System (IOOS) (i.e., the Northwest Association of Networked Ocean Observing Systems and the Alaska Ocean Observing System), Canada IOOS, the national sanctuary programs and national estuarine research reserves. In Alaska, the North Pacific Research Board is widely connected to a diverse group of state and federal agencies as well as local and regional research centers (e.g., Alaska SeaLife Center and Prince William Sound Science Center).

There are also tribal research entities, citizen science advisory councils for oil development, environmental nonprofit organizations, and other organizations that could be tapped as partners in future research activities. The UN Decade of Ocean Science’s Northeast Pacific Collaborative Center housed at the Hakai Institute in British Columbia, the North Pacific Marine Science Organization, the Sustaining Arctic Observing Network, and other programs of the Arctic Council all provide opportunities for new relationships and future research collaboration. The private sector should also not be overlooked, especially foundations such as the Moore Foundation, the Wendy Schmidt Foundation, and Pew Trusts.

Findings:

- There are opportunities for additional partnership and relationship building that could be utilized if prioritized by the CICOES administration and the resources to do so made available.
- Nurturing relationships among OSU, UAF, and NOAA researchers will be critical to building the role of OSU and UAF within the CICOES consortium.

Recommendation: CICOES should explore additional opportunities for strengthening and enhancing existing relationships between NOAA scientists and university researchers, including reaching out more aggressively to existing NOAA programs that have extensive engagement and outreach mechanisms.

VI. SUMMARY AND CONCLUSIONS

An external review of the research, education, and outreach programs of the Cooperative Institute for Climate, Ocean, and Ecosystem Studies (CICOES) at the University of Washington (UW), in collaboration with the University of Alaska Fairbanks (UAF) and Oregon State University (OSU) was conducted on 22-23 April 2024 in Seattle, Washington. The overall assessment of the Review Panel for CICOES is **Outstanding**. The Panel identified twelve findings and eight recommendations for improvement covering the following areas:

Strategic Plan: The Review Panel considers that while the lack of a CICOES Strategic Plan is not a significant weakness, undertaking a strategic planning process in the next year would be advantageous to CICOES and further support its success in the next five years. The Review Panel strongly recommends that CICOES undertake a Strategic Planning process over the coming year. The Review Panel also found that the breadth of CICOES research, especially in relation to Human Dimensions and Environmental Data Science themes could be better reported and recommended that CICOES leadership report some of their research more synthetically to achieve this, rather than just project by project.

Science Review: The Review Panel notes that CICOES researchers are engaged in an array of impressive endeavors that are producing important findings relevant to many aspects of NOAA’s mission. The Panel has no recommendations for improvement.

Outreach and Education: The Review Panel found that CICOES strives to use its Task 1 funds strategically and effectively to support workforce development relevant to NOAA’s mission. The Task 1 Postdoctoral Fellowship Program offers excellent opportunities for early career scientists, but this report identifies several issues that need to be addressed. For example, several postdocs noted to the Review Panel that challenges with access to NOAA laboratories was a barrier to their work. The Panel’s recommendation is to establish a working group to evaluate the CICOES postdoctoral fellowship program and identify opportunities to enhance the CICOES student and postdoctoral community.

Further, the Review Panel notes that existing DEI programs, while strong, are operated independently with little evidence of coordination limiting their potential to provide opportunity to underrepresented groups. The Panel recommends improved coordination and integration across CICOES and partner university educational and DEI programs, for example, as with the former NOAA-UAF undergraduate internship program, Partnership for Education.

In terms of Outreach, The Review Panel notes extensive public/K-12 outreach activity, almost all of which is centered around UW and the Seattle area. The Panel recommends that CICOES seek opportunities to expand outreach across partner institutions and NOAA laboratories.

Science Management: The Review Panel found that the Research Development Fund is a suitable approach to stimulating research in new areas and recommends that CICOES explore opportunities, for example, through the development of outside partnerships, to increase resources available to the grant program.

The Review Panel considered the structure and function of the existing CICOES advisory boards, and notes that while the Executive Advisory Board (EAB) and the Council are generally appropriately constituted per the CI Handbook, many members did not seem effectively engaged in nor understanding of their CICOES role. This limits the EAB’s ability to provide effective oversight and guidance and the Council’s ability to strategize and coordinate research and technology efforts. This limits the EAB’s ability to provide effective oversight and guidance and the Council’s ability to strategize and coordinate research and technology efforts. Further, participation in these groups may not be broad enough to effectively engage the CICOES community. The Panel recommends that the advisory bodies be more effectively utilized and offers suggestions about how the Council could be expanded to play more specific roles, and that a formal group of interested parties, stakeholders and potential partners could be established to broaden CICOES reach and generate interest.

APPENDIX I - LIST OF EXTERNAL REVIEWERS

Denise Reed, Review Panel Chair

Research Professor Gratis
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Denise Reed is presently a Research Professor Gratis at the University of New Orleans. Dr. Reed has served as a Distinguished Research Professor at the University of New Orleans and spent five years as Chief Scientist at The Water Institute of the Gulf. She has been involved in restoration and resilience planning in coastal Louisiana for over 3 decades, as well as in the California Bay-Delta, San Francisco Bay and Puget Sound, and has published extensively on the effects of sea-level rise on coastal marshes. She has served on numerous boards and panels addressing the effects of human alterations on coastal environments and the role of science in guiding restoration including the NOAA Science Advisory Board, the Chief of Engineers Environmental Advisory Board, and a number of National Academies' committees. Dr. Reed received her B.S. degree in Geography from Sidney Sussex College, Cambridge and her M.A. and Ph.D. degrees from University of Cambridge, UK.

John Chiang, Review Panel Member

Professor
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John Chiang is Professor in the Dept of Geography at the University of California, Berkeley. He earned an M.S. in Physics at Cornell University, and a Ph.D. (awarded with distinction) in Earth and Environmental Sciences at the Lamont-Doherty Earth Observatory of Columbia University. After a two-year stint as a NOAA Climate and Global Change postdoctoral fellow at the University of Washington, he started his current faculty position at UC Berkeley. Chiang's research focus is on global climate dynamics working on both contemporary and paleoclimate research questions, and with a focus on understanding mechanisms of rainfall changes. His teaching interests include climate and atmospheric dynamics, and the science and implications of global warming. Dr. Chiang served as co-Chief Editor of the Journal of Climate from 2015-2019.

Olaf Jensen, Review Panel Member

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Olaf Jensen is an Associate Professor at the University of Wisconsin - Madison's Center for Limnology. His research group studies fisheries and aquatic ecosystems, including marine, estuarine, and freshwater environments with the ultimate goal of improving the scientific basis for sustainable management. Dr. Jensen's work relies on a combination of mathematical modeling, data synthesis and field studies in locations ranging from coastal ecosystems of Louisiana and New Jersey to the lakes and rivers of Mongolia and Wisconsin. He received his Ph.D. at the University of Wisconsin, followed by a David H. Smith Conservation Research Fellowship at the University of Washington and was previously an Associate Professor at Rutgers University

Kristopher Karnauskas, Review Panel Member

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Kris Karnauskas is a Fellow of the Cooperative Institute for Research in Environmental Sciences (CIRES) and an Associate Professor in the Department of Atmospheric and Oceanic Sciences (ATOC) at the University of Colorado Boulder, with secondary faculty appointments in the CU School of Medicine and the Colorado School of Public Health. Prior to joining the CU Boulder faculty, Kris spent six years on the faculty of the Woods Hole Oceanographic Institution (WHOI) and the MIT-WHOI Joint Program in Oceanography (also teaching at Boston College) followed by sabbatical at the Institut Pierre Simon Laplace (IPSL) in Paris, France through a Research Fellowship from the Alfred P. Sloan Foundation. Kris completed his B.S. at the University of Wisconsin-Madison and Ph.D. at the University of Maryland-College Park, both in Atmospheric and Oceanic Sciences, followed by a postdoctoral fellowship in Ocean and Climate Physics at the Lamont-Doherty Earth Observatory of Columbia University. Kris currently serves as Editor for AGU's Geophysical Research Letters and Section Editor for PLOS Climate, and recently served on the Scientific Steering Committee (SSC) of the U.S. Climate Variability and Predictability Program (US CLIVAR). Kris was the recipient of the 2017 Ocean Sciences Early Career Award from the American Geophysical Union (AGU) "for important contributions to better understanding the tropical oceans and atmosphere." During the spring of 2022, Kris was on sabbatical at Harvard University's Center for the Environment. In 2023, Kris became a founding co-chair of the Joint US CLIVAR/NIH Working Group on Climate & Health.

Douglas Luther, Review Panel Member, *Ex-Officio* CI Director

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Douglas S. Luther is Director of CIMAR and Professor at the University of Hawai'i at Mānoa. The predominant theme of Luther's research career has been the dynamics of energy flow through the oceans: where does the energy come from, where does it go and how does it get there? This theme is now manifesting in the development of models of gravity wave impacts at island coasts for the promotion of resilience in coastal communities as sea level rises. For 3 years, Luther served as Chairman of the Science and Technical Advisory Committee that shepherded the development of the \$400M NSF Ocean Observatories Initiative. Luther has served on a variety of national and international oversight and review panels, most notably the Review Panel for the German Frontiers in Arctic marine Monitoring initiative (2012); and, twice on the quadrennial Review Committee for NOAA's Atlantic Oceanographic and Meteorological Laboratory (2008 & 2014). Luther has served as Editor of Reviews of Geophysics (7 years); Editor on the AGU Book Board (5 years); and Associate Editor of the Journal of Physical Oceanography (16 years). Luther received B.S.E.E. and B.S. Geophysics degrees from M.I.T., and a Ph.D. from the M.I.T.-W.H.O.I. Joint Program. He teaches graduate level courses on ocean waves.

Molly McCammon, Review Panel Member

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Molly McCammon is a Senior Advisor for the Alaska Ocean Observing System (AOOS), after serving as its founding executive director from 2013 through 2020. She is currently chair of NOAA Science Advisory Board's Ecosystem Sciences and Management Working Group, serves on the IOOS Federal Advisory Committee, and is on a task team planning for an Arctic Global Ocean Observing System Regional Alliance. She is a past member of the Ocean Research Advisory Panel and the National Research Council's Polar Research Board, serving on its Committee on Designing an Arctic Observing Network. She also served on the initial Advisory Group for the National Academy of Science's Gulf Research Program. Prior to her position at AOOS, she served for 10 years as the Executive Director of the *Exxon Valdez* Oil Spill Trustee Council, managing the restoration program following the 1989 oil spill. McCammon moved to Alaska in 1973 after graduating from the University of California Berkeley, with her early years in Alaska spent as a journalist, homesteader in the Brooks Range, and natural resource policy specialist for state government.

APPENDIX II REVIEW PANEL MEETING AGENDA



AGENDA CICOES Five-Year Science Review April 22, 2024 Alder Hall, University of Washington

- 8:15 **Closed Session** (Room 105)
Review Panel
- 8:45 **WELCOME AND INTRODUCTIONS** (Alder Auditorium)
John Horne, Director (CICOES)
Mari Ostendorf, Vice Provost (UW Research)
- 9:00 **Remarks from NOAA OAR** (Alder Auditorium)
Michelle McClure, Director (PMEL)
John Cortinas, Deputy Assistant Administrator for Science (OAR)
- 9:15 **CICOES Panel Overview & Questions** (Alder Auditorium)
John Horne, Director (CICOES)
- 10:00 **NOAA Panel Review & Questions** (Room 105)
Robert Foy, Science and Research Director (AFSC)
Michelle McClure, Director (PMEL)
Diane Stanitski, Deputy Director (PMEL)
Kevin Werner, Director (NWFSC)
- 10:45 **BREAK**
- 11:00 **CICOES Initiatives + Education/Outreach Panel** (Room 105)
John Horne (UW), Joseph Resing (UW), Muxin Wang (UW), Carol Perez (UW), Jed Thompson (UW)
- 11:30 **Ecology/Fisheries: Overview, Highlights, Questions** (Alder Auditorium)
Ivonne Ortiz, Associate Director, CICOES / Senior Research Scientist
- . **Methods, Tools, Application, and Impact (Highlights of Fisheries/Ecology)**
Andre Punt
 - . **Ontogenetic Spatial Constraints and Range Shifts of Marine Fish**
Lorenzo Ciannelli
 - . **Global Collaborations to Enhanced Cetacean Research and Conservation**
Alex Zerbini
 - . **Ocean Acidification Products for Fisheries Management in the Bering Sea**
Darren Pilcher
 - . **Research in Support of Alaska's Marine Fisheries**
Curry Cunningham
 - . **Q&A**
- 12:30 **LUNCH Panel w/Postdocs & Graduate Students** (Room 105)
- | | |
|---------------------------------------|--|
| <i>Grant Adams (Grad Student)</i> | <i>Xinyu Li (Postdoc)</i> |
| <i>Nan-Hsun Chi (Postdoc)</i> | <i>Owen Liu (Postdoc)</i> |
| <i>Larissa Dias (Postdoc)</i> | <i>Alexandra McInturf (Former Postdoc)</i> |
| <i>Ernesto Fernandez (Postdoc)</i> | <i>Hauke Schulz (Postdoc)</i> |
| <i>Michael Kinneen (Grad Student)</i> | <i>Sam Setta (Postdoc)</i> |

AGENDA
CICOES Five-Year Science Review
April 22, 2024
Alder Hall, University of Washington

- 13:30 **Department/Faculty Panel** (Room 105)
*Uma Bhatt (UAF), Tim Essington (UW), Allison Gray (UW), Jim Lerczak (OSU),
Andre Punt (UW), Joel Thornton (UW), Justin Wettstein (OSU), Kevin Williams (UW)*
- 14:15 **Climate: Overview, Highlights, Questions** (Alder Auditorium)
Uma Bhatt, Associate Director, CICOES-UAF / Professor, Atmospheric Sciences
- **Climate-Fire Research and Tools for Wildland Management**
Andy Chiodi
 - **Statistical Forecasts of River Ice Breakup Timing Across Alaska**
Chris Waigl
 - **Meeting Gaps in Ocean Observations and Understanding**
Yolande Serra
 - **Aerosols, Climate and Marine Cloud Brightening**
Sarah Doherty
 - **A New CICOES-Enabled Perspective on Atmosphere-Ocean
Climate Variability in the North Pacific**
Justin Wettstein
 - **Q & A**
- 15:15 **BREAK**
- 15:30 **Oceanography: Overview, Highlights, Questions** (Alder Auditorium)
Muyin Wang, Deputy Director, CICOES / Principal Research Scientist
- **Ocean Carbon Cycle Science at CICOES**
Brendan Carter
 - **Capacity Building in Expanding CICOES Tsunami Research Contributions
to NOAA's Coastal Resilience Efforts**
Yong Wei
 - **Beaufort Gyre Freshwater Pathways and Their Impact on North Atlantic
Deepwater Formation**
Jiaxu Zhang
 - **Enhanced Climate Downscaling for the Northeast Pacific Using Deep Learning Methods**
Al Hermann
 - **New Horizons for Mapping Ocean Biogeochemistry**
Jon Sharp
 - **Q & A**
- 16:30 **Poster Session** (Alder Commons)
- 17:30 **Review Panel Closed Session** (Room 105)
- 18:30 **DINNER** (By Invitation Only)

Zoom Addresses

Monday April 22, 2024

Auditorium: <https://washington.zoom.us/j/99591868191>

Room 105: <https://washington.zoom.us/j/94237272775>

AGENDA
CICOES Five-Year Science Review
April 23, 2024
Alder & Wallace Halls, University of Washington

- 8:15 **Closed Session** (Alder 105)
Review Panel
- 8:45 **Meet w/CICOES Director**
John Horne
- 9:00 **Ocean & Coastal Observations: Overview, Highlights, Questions** (Alder Auditorium)
Joseph Resing, Deputy Director, CICOES / Research Scientist
- **Innovative Uncrewed Surface Vehicle Observation of Tropical Cyclones and Hurricanes**
Dongxiao Zhang
 - **Arctic Marine Ecosystems: Observations Catalyzed by Technological Innovation**
Calvin Mordy
 - **Impacts of Warming, Ocean Acidification, and Hypoxia on Arctic and West Coast Ecosystems as Revealed by Ocean Molecular Ecology**
Sean McAllister
 - **New Insights into Ocean Production in the Subtropical Gyre**
Yang Xiang
 - **Q&A**
- 10:00 **Transfer to Wallace Hall**
- 10:15 **BREAK**
- 10:30 **Executive Advisory Board & Council Members Panel** (Wallace Conference Room)
Tim Essington (UW)
Robert Foy (NOAA)
Allison Gray (UW)
Rick Keil (UW)
Jim Lerczak (OSU)
Kate Litle (UW)
Michelle McClure (NOAA)
Bradley Moran (UAF)
Tuba Ozkan-Haller (OSU)
Andre Punt (UW)
Patricia Quinn (NOAA)
Joel Thornton (UW)
Maya Tolstoy (UW)
Sharon Walker (NOAA)
Kevin Werner (NOAA)
Justin Wettstein (OSU)

AGENDA
CICOES Five-Year Science Review
April 23, 2024
Alder & Wallace Halls, University of Washington

- 11:00 **Closed Session** (Wallace Conference Room)
Review Panel
- 12:30 **LUNCH w/CICOES Leadership** (Wallace Conference Room)
Uma Bhatt (UAF)
John Horne (UW)
Jim Lerczak (OSU)
Joe Resing (UW)
Muyin Wang (UW)
- 11:00 **Closed Session** (Wallace Conference Room)
Review Panel
- 12:30 **Debrief Session w/CICOES Leadership** (Wallace Conference Room)
- 14:30 **Adjourn**

Zoom Addresses

Tuesday April 23, 2024

Auditorium: <https://washington.zoom.us/j/96320371560>

Room 105: <https://washington.zoom.us/j/97541235501>