

**EXTERNAL REVIEW
OF THE
COOPERATIVE INSTITUTE FOR MARINE ECOSYSTEMS AND CLIMATE (CIMEC)**

SCRIPPS INSTITUTION OF OCEANOGRAPHY, UNIVERSITY OF CALIFORNIA, SAN
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REVIEW PANEL MEMBERS

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SUBMITTED FROM THE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
SCIENCE ADVISORY BOARD

JULY 2014

SUMMARY

An external review of the research, education, and outreach programs of the Cooperative Institute for Marine Ecosystems and Climate (CIMEC) at the Scripps Institution of Oceanography (SIO) was conducted on 6-7 February 2014 in La Jolla, CA. Guidelines for conducting the review were provided by the Office of Oceanic and Atmospheric Research (OAR) within the National Oceanic and Atmospheric Administration (NOAA). The review was conducted under the auspices of the NOAA Science Advisory Board (SAB) and, therefore, is subject to the requirements of the Federal Advisory Committee Act (FACA). A list of review panel members is provided in Appendix I. The review panel's on-site agenda is provided in Appendix II. The mission, goals, and primary research themes of CIMEC are provided in Appendix III.

CIMEC is a consortium of seven geographically-distributed institutes and universities in California that focuses on the themes of: (1) climate and coastal observations, analysis and prediction; (2) climate research and impacts; (3) marine ecosystems (primarily fish ecology and marine mammals); and to a lesser extent (4) ecosystem-based management. CIMEC is co-located with NOAA Southwest Fisheries Science Center's (SWFSC) facilities on the SIO campus in La Jolla and in Santa Cruz, near the University of California (UC) Santa Cruz.

The review panel found that scientific research activities associated with each of CIMEC's eight research goals range from satisfactory to outstanding and are aligned with three of the four long-term goals stated in NOAA's next generation strategic plan. CIMEC research efforts also are aligned with at least one of the major long-term goals of the University of California System (see below). The review panel also found that the management of CIMEC is in capable hands, though CIMEC will face issues of succession given the impending retirements of both the director and co-director, and the CIMEC business plan will need to be responsive to on-going fiscal challenges. A major concern is that three of the seven partners of CIMEC have been unfunded since its inception. A formal strategic plan for CIMEC does not exist, and developing a plan in the near future will be extremely important in providing a framework for improving collaborative efforts among all seven CIMEC partners and in setting priorities and identifying opportunities at the NOAA level. These opportunities include leveraging the uniqueness of CIMEC in helping NOAA realize new and unmet needs using collaborative approaches.

Based upon these findings, the Panel issued 12 recommendations for CIMEC and 5 for NOAA. The Review Panel concluded that CIMEC is a valuable member of the NOAA CI community and assigned an overall rating of **Outstanding**.

I. OVERVIEW OF CIMEC

CIMEC was established on July 1, 2010 in response to FFO NOAA-OAR-CIPO-2010-2002117, as the successor to the Joint Institute for Marine Observations (JIMO) based at SIO, which ran from 1991-2010. CIMEC expanded the reach of JIMO beyond SIO, with its strengths in long-term observational programs such as California Cooperative Oceanic Fisheries Investigations (CalCOFI) and Argo (a global array of drifting, profiling floats), to create a more formal partnership with University of California Davis (UC Davis), UC Santa Cruz, and, by way of the Southern California Coastal Ocean Observing System (SCCOOS), with the University of California Los Angeles (UCLA) and the University of California Santa Barbara (UCSB). Also, in response to NOAA's workforce and research needs, CIMEC brought into the fold a new partnership with California State University Los Angeles (Cal State Los Angeles) with its

program strengths in conservation genetics and its capacity as a minority-serving institution, as well as Humboldt State University, as home to one of the most well-respected fisheries programs in the country and as an active member in the Central and Northern California Ocean Observing System (CenCOOS).

II. STRATEGIC PLAN

CIMEC's mission is centered on the four scientific themes mentioned above, which are reflected in eight major goals (see Appendix III). These also address three of NOAA's four long-term goals in the Next Generation Strategic Plan: (1) climate adaptation and mitigation; (2) healthy oceans; and (3) resilient coastal communities and economies. The emphasis on the environment coincides with one of the major areas identified by the UC System for future investment (the other two being big data and human health). Having just completed its third year of a five year agreement, CIMEC continues to build on strong pre-existing partnerships between NOAA and the funded partners' institutions, while also facilitating new collaborations, for example through various forums such as the upcoming workshop on Variability and Change in the California Current Ecosystem, involving CIMEC principal investigators (PIs), other North Pacific Cooperative Institutes, and NOAA scientists and managers.

Findings

- A. CIMEC does not have a formal strategic plan. A strategic plan for JIMO was recommended in the SAB's 2005 review of JIMO (pp. 6: *Develop and implement a strategic plan for JIMO, which is consistent with NOAA and SIO objectives [and plans]*). As with JIMO, an explicit strategic plan has not been viewed internally as critical by CIMEC, reflecting the preferences of the PIs for a "flatter" structure allowing them to be flexible and responsive to NOAA's needs. Thus strategic planning has typically occurred at the project level in consultation with sponsors rather than the CIMEC executive level. This planning approach, however, tends to favor continuation of existing research projects and does not foster collaboration between different institutions or across project areas. Several of the CIMEC partner institutions have not yet received CIMEC funds, despite many possible CIMEC-relevant ideas outlined in the existing proposal. Greater interaction between these unfunded partners, currently funded institutions, and NOAA is needed to align those ideas with NOAA priorities, as well as those of CIMEC. Strategic planning would provide an opportunity to integrate these perspectives (e.g., UCSB's vision and expertise with respect to ecosystem-based management).
- B. The CIMEC Executive Board and Council of Fellows appear to have little influence on the strategic direction of CIMEC research, which is almost entirely determined at the individual PI level.
- C. The eight major goals of CIMEC are appropriate and relevant but are not linked very strongly to metrics. Metrics of success for CIMEC should be based on measuring the success of progress towards achieving these eight goals. This also has implications for strategic planning.

Recommendations

- A. Develop an integrative strategic plan, merging in broader “vertical integrative” concepts including ecosystem-based management and policy. Developing a thoughtful strategic plan will provide a framework that can improve collaboration among all seven CIMEC partners, determine priorities, and identify opportunities in partnership with NOAA supporters, foster new areas of research and collaboration, and bring new ideas to NOAA’s attention. Strategic planning would also help in identifying synergies between program areas (e.g., observations and modeling, climate and fisheries), and among the seven CIMEC partners.
- B. Metrics of success for CIMEC should be based on measuring the success of the eight goals specified in the original proposal. Building metrics around the eight goals and designing CIMEC annual reports around these metrics would be more valuable than reporting on a "basket of separate projects."
- C. NOAA’s western regional collaboration team should include the CIMEC director and co-director in their meetings. Informing NOAA of CIMEC's evolving strategic plans will enhance alignment with NOAA’s strategic plan, as well as allowing for possible transformation of NOAA’s plans by input from CIMEC.
- D. The notion of vertical integration (CIMEC Goal 1) is excellent as it applies to the development and implementation of ocean observing systems. However, this important notion largely has been applied to technical integration (i.e., instrumentation development to observing system design and maintenance of drifters, floats, gliders, and moorings to analysis/synthesis of data). It should also be extended to integration with ecosystem-based management and policy. Further, integration should be extended from the concept of **vertical** integration for ocean-observing to a more **horizontal** integration across all project themes (ocean observing, climate, ecosystems, and ecosystem-based management) involving all seven partners.

III. SCIENCE REVIEW

Presentations were made to the Review Panel that demonstrated the great breadth of CIMEC scientific research activities and impressive accomplishments across its four major themes. Appendix 1 shows the full schedule of presentations. Some highlights include: 1) the development of deep Argo floats (down to 6000 m); 2) the development of new moored sensors for biogeochemical sampling; 3) scientific evidence that a recent warming hiatus may be related to Pacific cooling; 4) advances in stock assessment analyses; and, 5) support by SIO in providing quality assurance/quality control analytical support for the NOAA Ocean Acidification Program. In addition, 2014 marks the 65th anniversary of ocean observing by the California Cooperative Oceanic Fisheries Investigations (CalCOFI) for which NOAA provides the majority of funding, including ship time, through the CIMEC program. CalCOFI research and data are used in a variety of applications, particularly fishery science and management (e.g., temperature as a predictor of sardine recruitment).

Findings

- A. NOAA sponsors expressed a high level of appreciation for CIMEC scientific accomplishments and capabilities. CIMEC PIs are international leaders in sustained ocean observations (e.g., Argo, surface drifters, CalCOFI), the development of new instrumentation for physical and biogeochemical observing platforms, and innovative ecosystem and climate research. Through the long relationship between SIO and NOAA, CIMEC PIs continue to help NOAA fulfill goals in observing system development and implementation.
- B. The in-house development and manufacturing of observing systems helps in managing costs, ensures higher-quality data, and enables development focused on science needs. NOAA's funds appear to be used efficiently with minimal bureaucracy, and most resources are targeted at the PI level.
- C. CIMEC includes observation-based monitoring, research, and modeling of the California Current System. There is little integration, however, of CIMEC programs with similar programs along the entire West Coast. Such integration is critical in developing a coherent understanding of the California Current Large Marine Ecosystem.
- D. There appears to be very little, if any, social science integration. The Review Panel rarely heard the terms "ecosystem services" or ecosystem-based management in the presentations delivered by CIMEC PIs (this was especially true since we did not hear from partner UCSB). Ecosystem services are an integrative concept linking physical and biological sciences with social science disciplines—the CIMEC mission could be more fully met by using this integrative science framework.

Recommendations

- A. Collaborative research projects that involve the full breadth of CIMEC's capabilities should be encouraged (e.g., coordinated California Current ecosystem study). This should include integrating different observational programs with modeling research (for example involving the unfunded partners at UCLA), and integrating climate research with ecosystems.

- B. CIMEC should integrate observing, climate, and ecology work with social science, especially in making science relevant to management and policy. In particular, use the strengths of unfunded partner institution UCSB and economists at UC Davis for social science, policy, and management research.
- C. The four science themes of CIMEC, while all excellent in their own right, have been pursued largely in isolation of each other. For example, the exciting fisheries and marine mammal research conducted by CIMEC has remained largely disconnected to climate research. One of CIMEC's unique strengths – the presence of researchers with outstanding expertise in both climate observations and marine ecosystems – should be leveraged with research connecting these themes.

IV. EDUCATION/OUTREACH

While the original proposal for CIMEC included education and outreach as part of Task 1 (administrative oversight) and Task 4 (education and outreach), CIMEC currently has no Task 1 funds for education or outreach, and graduate students and postdoctoral researchers and other education and outreach activities are supported by Task 2 and 3 (research) projects. Two CIMEC projects have particularly large educational components, including graduate teaching, workshops, and postdoctoral researchers: (1) the Center for Stock Assessment Research (CTAR; <http://users.soe.ucsc.edu/~msmangel/CSTAR.html>) at UC Santa Cruz is a longstanding program in fisheries stock assessment research and education; and (2) the Center for Advancement of Population Assessment Methodologies (CAPAM; <http://www.capamresearch.org/>) at SIO which was just established in 2013, focusing on fisheries stock assessment research and training. Under CIMEC's new Task 1 formula, additional Task 1B funds are anticipated for Education & Outreach, but a detailed plan for how these funds would be used remains to be developed by the CIMEC Executive Board.

Findings

- A. CIMEC has an impressive record of training postdoctoral, graduate, and undergraduate students. CIMEC graduate students and postdocs expressed satisfaction with the support that they receive through the CI and the opportunities that are made available to them. The CAPAM program is off to a very positive start with obvious benefits for NOAA and CIMEC institutes, but a number of outreach and education activities outlined in the initial CIMEC proposal have not been pursued due to the lack of Task 1 and 4 funding.
- B. CSTAR and CAPAM are excellent examples of educational programs that help NOAA to meet its stock assessment needs and mission. CAPAM in particular is an excellent example of integrated research, education and outreach. CAPAM includes online courses developed with other institutions, and provides an education/outreach model that could be employed by other CIMEC programs. Greater sharing of resources between CSTAR and CAPAM in the future is envisaged.
- C. At UC Santa Cruz, the current system of students and postdocs funded by CIMEC and working with NOAA scientists leads to a large burden on a single UC Santa Cruz faculty member (Eric Palkovacs) who is official advisor to these students and postdocs.

Palkovacs is doing an exemplary job as lead PI of this large fisheries ecology program, but as an untenured faculty member, this large administrative responsibility may harm his career by jeopardizing his chances for promotion and tenure – decisions which are made by Palkovacs's academic department and the University. This places Palkovacs in a vulnerable position, which is understandably causing concern and anxiety. Normally one would expect to see a more senior, tenured faculty member leading such a program. This challenge has implications for NOAA's ability to effectively continue the relationship with UC Santa Cruz.

Recommendations

- A. A plan is needed for using and distributing education and outreach funds anticipated through the new Task 1B formula when they become available. Education and outreach support could be used as incentives to encourage unfunded partner institutions to submit proposals through CIMEC, and as seed funds at primarily teaching partner institutions, such as Cal State Los Angeles.
- B. CIMEC is encouraged to support, where possible, the expansion of long-distance learning opportunities that have proven successful under the CAPAM project.
- C. Regarding a possible cooperative science center (CSC), this is an excellent idea for bolstering education in research, improving diversity, and providing an avenue for funding Cal State Los Angeles (already a partner in NOAA's Cooperative Remote Sensing and Science and Technology Center or CREST led by City University of New York), and hopefully UCLA and UCSB. This is strategically important as there is currently no minority-serving cooperative science center on the West Coast. A CSC must be located at a lead academic institution that grants PhDs and is minority serving. In California, UC Irvine and UC Merced are two eligible UC campuses, but neither is a CIMEC partner. However, as CSCs are encouraged to partner with cooperative institutes, we recommend that CIMEC partner with any new CSC established in California. We also encourage CIMEC to use mechanisms available through Cal State Los Angeles' existing involvement in CREST (e.g., internships to allow students to spend time at one of the research universities).
- D. The lead PI duties in the joint fisheries ecology program between the SWFSC and UC Santa Cruz should not be placed on a *junior* faculty member. The current arrangement, which involves three NOAA scientists, helps fund over 40 UC Santa Cruz graduate students, postdocs, and lab assistants. Although the NOAA lab significantly benefits from this program, NOAA does not oversee the tenure and promotion of the junior faculty member. The administrative burden should be shared with more senior faculty, and/or his other duties (e.g., teaching load) should be lessened. NOAA could provide administrative support to the lead PI, and/or NOAA could provide more benefit to UC Santa Cruz through NOAA personnel teaching courses, or by providing some internally competed grants.

V. SCIENCE MANAGEMENT

CIMEC partner institutions and PIs will develop based on the following factors: 1) the strengths and expertise of the respective institutions; 2) the needs of NOAA and society; 3) review of the scientific literature, NOAA planning documents, and other publications; and, 4) participation in local, regional, national, and international meetings and workshops. New opportunities include both announced competitions, such as the recent Superstorm Sandy funds made available by OAR and a Biodiversity Observation Network competition through NOAA's National Ocean Service, and connections between individual PIs and NOAA personnel. A key challenge to CIMEC is determining how to best facilitate these connections and networking opportunities to the mutual benefit of CIMEC partners and NOAA supporters. While the CI is in good financial health, no discretionary funds are available to seed new ideas, foster connections between institutions and PI's, or improve scientific and workforce skills.

Findings

- A. The CI and the CI director have few resources available to support innovative ideas, to seed pilot projects, or support partner institution communication. CIMEC has no discretionary or reserve funds to foster new ideas and opportunities. CIMEC partner institutions must seek new funds from a variety of sources in order to conduct preliminary work. For example, at UC San Diego, the Academic Senate provides small grants to faculty for such purposes.
- B. Lack of participation of all the partner institutions is a major problem. NOAA encouraged the involvement of more institutions in the CI, as compared to JIMO, but funding has not followed to support the larger set of partners. For some institutions, the problem is a lack of established links between PIs and NOAA. For some partner institutions that obtain NOAA funding outside the CIMEC structure, there is no incentive to participate in CIMEC, primarily due to the higher level of administrative costs or absence of discounted overhead rates. Access to new Task 1B education and outreach funds would be one inducement to participate in CIMEC.
- C. Leadership succession, and general demographic succession pose major challenges. Senior scientists lead most SIO long-term observational projects dating back to JIMO. Similarly to the lack of full involvement of CIMEC partners, comparatively few junior scientists at SIO are involved in CIMEC projects. CIMEC needs to ensure all observational systems have younger scientists prepared to take over management upon the retirement of senior scientists (e.g., as has happened with Davis to Rudnick with gliders and Niiler to Centurioni with global drifters). Bryce Semmens is an example of a young SIO faculty member with substantial (and leveraged) CIMEC funding to get research/teaching off to a great start. This is a good example for other partner institutions.
- D. Workshops (e.g., the recent Tropical Pacific Observing Systems, Climate Impacts on California Ecosystems) have strong support from CIMEC participants, and provide great opportunities to focus partners on topics of mutual interest and to initiate new collaborations.

Recommendations

- A. The UC System should consider providing a portion of returned overhead to the CI for the purposes of providing seed funds to explore new ideas, foster new collaborations, and improve communication between partner institutions and NOAA program managers.
- B. Both NOAA and CIMEC should consider ways to improve links between NOAA labs and academic partners (especially those not currently funded). This is particularly needed at the partner institute level for PIs who do not have visibility with NOAA program managers, and at SIO for junior PIs who have not yet formed connections with NOAA. CIMEC should sponsor forums that would allow new PIs to share ideas and inform NOAA of their capabilities. These forums could include periodic meetings of the whole CIMEC team, or CIMEC seminar series at NOAA labs. The CIMEC director and co-director and NOAA CI Program Director Philip Hoffman could coordinate visits of unfunded partners and young PIs to NOAA headquarters to learn of NOAA opportunities and, conversely, help NOAA learn about and recognize their work.
- C. CIMEC should explore ways to better function as a catalyst that fosters 1) integration of science between NOAA and the universities; 2) integration between the multiple research areas (climate, ecosystems) and policy/management, and; 3) collaborative multi-institutional projects which entrain additional partners and junior PIs. Key mechanisms include developing an integrated strategic plan and conducting timely workshops that foster collaborative and innovative research, education, and outreach.

VI. SUMMARY AND CONCLUSIONS

In summary, the review panel noted the many accomplishments of CIMEC with respect to ocean observing (e.g., through design and implementation of a comprehensive and cost-effective ocean observing system from regional CalCOFI scales to global Argo scales), informing stakeholders, and teaching the next generation of scientists by way of two truly outstanding programs CSTAR and CAPAM. CIMEC openly acknowledges the challenges it faces including constrained budgets and lack of discretionary funds, increasing costs, the lack of a formal strategic plan, education and outreach needs, leadership succession, and lack of funding for three of the seven partners. CIMEC is positioning itself to take advantage of opportunities for better networking, coordination, and efficiency through opportunities inherent in the April 2014 workshop on Climate Impacts on California Current Ecosystems. CIMEC is committed to boosting its education and outreach potential, particularly through collaboration with a future California-based cooperative science education initiative. We look forward to seeing CIMEC involve all seven of its partners more effectively, work toward funding those partners, and develop integrative frameworks that are horizontal across all partners, as well as vertical in science, management, and policy.

The Review Panel concluded that CIMEC is a very valuable member of the NOAA CI community and assigned an overall rating of **Outstanding**. We see potential for CIMEC to be not only "outstanding" but also "transformative" in helping NOAA achieve their mission and goals, and recognize and seize new opportunities in integrative marine science and management. These transformative approaches include: 1) new strategies for linking climate

change with ecosystem dynamics; 2) developing concepts for ecosystem management important for coastal and marine fisheries; 3) coordinating and leading regional, national, and international consortia in ocean observing, and research and modeling of oceanographic and marine ecosystems (e.g., California Current System); and 4) integrating natural and social sciences to improve policy and management using conceptual and modeling frameworks such as bioeconomic modeling and ecosystem services.

In addition to CIMEC, many of our recommendations are intended to help NOAA improve the success of CIMEC and similar CIs. These recommendations include:

- A. NOAA should use CIMEC and other CIs to systematically identify cutting edge science issues, develop new integrative approaches, sponsor pilot projects, and support leadership in outreach and education.
- B. In response to NOAA's workforce and research needs, CIMEC brought new institutional partners into the organization but has been unable to fund them. NOAA must develop approaches that align the RFPs with the actual financial resources provided by the supporting NOAA agencies.
- C. NOAA should support actions and strategies that encourage participation and networking of CIMEC unfunded and/or young PIs with NOAA programs, scientists, and research networks. For example, CINAR recently held a workshop ("CINAR 101") to help the smaller institutions in the consortium get started with NOAA funding, such as navigating through the paperwork requirements, connecting investigators, etc. NOAA might assist CIMEC with a similar opportunity.
- D. NOAA must work with the collaborating California universities and provide incentives that encourage their partnership in ways that also advance NOAA's mission. For example, NOAA could earmark a percentage of NOAA funds from each supporting agency (e.g., 5-10%) that are used to encourage CI workshops, pilot projects, new partnerships, integrative concepts across projects, etc. The Universities could also use this support to leverage a decrease in overhead rates.
- E. NOAA's western regional collaboration team should include the CIMEC director and co-director in their meetings. Informing NOAA of CIMEC's evolving strategic plans will enhance alignment with NOAA's strategic plan, as well as allowing for possible transformation of NOAA's plans by input from CIMEC.

APPENDIX I

LIST OF EXTERNAL REVIEWERS

Dawn Wright, Ph.D. [Review Panel Chair, Member of the NOAA Science Advisory Board]

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Dawn J. Wright received a B.S. (*cum laude*) in Geology from Wheaton College (Illinois) in 1983, an M.S. in Oceanography from Texas A&M in 1986, and individual interdisciplinary Ph.D. in physical geography and marine geology from the University of California, Santa Barbara in 1994. She then completed a 1-year postdoc under the supervision of Christopher G. Fox with the Vents Group of NOAA PMEL in Newport, Oregon. After 17 years on the faculty of Oregon State University, she was appointed Chief Scientist of the Environmental Systems Research Institute (Esri) in 2011. In this role, she aids in formulating and advancing the intellectual agenda for the environmental, conservation, climate, and ocean sciences aspect of Esri's work, while also representing Esri to the national/international scientific community. Wright also maintains an affiliated faculty appointment as Full Professor of Geography and Oceanography in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University. Her research interests include geographic information science, ocean informatics and cyberinfrastructure, as well as benthic terrain and habitat characterization, tectonics of mid-ocean ridges, and the processing and interpretation of high-resolution bathymetry and underwater videography/photography. She has participated in over 20 oceanographic research expeditions worldwide, including 10 legs of the Ocean Drilling Program and 3 dives in the *Alvin* submersible. Wright is a fellow of the American Association for the Advancement of Science (AAAS) and of Stanford University's Aldo Leopold Leadership Program. In 2007 the Carnegie Foundation for the Advancement of Teaching and the Council for the Advancement and Support of Education named her U.S. Professor of the Year for the state of Oregon.

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Paulinus Chigbu earned a B.S. in Zoology from the University of Benin in 1984 and a Ph.D. in Fisheries from the University of Washington in 1993. He is currently Professor in the Department of Natural Sciences at the University of Maryland Eastern Shore where he is the Director of the University's NOAA Living Marine Resources Cooperative Science Center, as well as Director of the NSF CREST Center for the Integrated Study of Coastal Ecosystem Dynamics and Processes. He teaches graduate level courses and conducts research in fish ecology, fish

population dynamics, and zooplankton ecology. Throughout his career, he has been involved in initiatives to expand career opportunities in oceanic and atmospheric sciences. Dr. Chigbu is a Fulbright Scholarship recipient. He also currently serves on the NOAA Sea Grant National Advisory Board.

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Sonya Legg received her B.A. in physics from Oxford University in 1989, and Ph.D. in physical oceanography from Imperial College, London in 1993. She carried out postdoctoral research at the University of Colorado, Boulder, and at the University of California Los Angeles (UCLA), the latter as a NOAA Climate and Global Change postdoctoral fellow. Prior to arrival in Princeton in 2004, she was a member of the scientific staff at the Woods Hole Oceanographic Institution. Legg is a member of the Princeton Atmospheric and Oceanic Sciences program faculty and served as the Director of Graduate Studies from 2009-2012. Legg has served on the US CLIVAR Process Studies and Model Improvement Panel for 5 years including 3 years as panel chair, and is currently a member of the steering committee of MPOWIR (Mentoring Physical Oceanography Women to Increase Retention), a nationwide mentoring effort funded by NSF, NOAA, and NASA. Legg is currently the Associate Director of the NOAA Cooperative Institute for Climate Science – Princeton University. Legg's research interests focus on turbulent mixing in the ocean and their role in the climate.

Mark Merrifield, Ph.D. [Ex-Officio, Cooperative Institute Representative]

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Mark Merrifield received a bachelor's degree in physics in 1982 from the University of California, Berkeley and a Ph.D. in oceanography in 1989 from the Scripps Institution of Oceanography, UC San Diego. He is a professor in the Department of Oceanography at the University of Hawaii and serves as director of the Joint Institute for Marine and Atmospheric Research, the University of Hawaii Sea Level Center, and the Pacific ENSO Applications Climate Center. His current research interests include global and regional sea level rise and variability, island coastal processes, and internal waves and ocean mixing.

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Gil Sylvia is a Marine Resource Economist, Director of the Coastal Oregon Marine Experiment Station (COMES) and Professor in the Department of Applied Economics at Oregon State University. He obtained his M.S. at Colorado State University in Fishery and Wildlife Biology and a Ph.D. in Natural Resource Economics at the University of Rhode Island. His research focuses on fishery management, policy, and seafood marketing. As Director of COMES, the largest applied marine research group in Oregon, he works in close collaboration with the fishing and seafood industry, coastal communities, and management agencies to increase benefits from utilizing and sustaining West Coast marine resources. He is President-Elect of the North American Association of Fishery Economists.

APPENDIX II

**Cooperative Institute for Marine Ecosystems and Climate
NOAA Program Review
February 6-7, 2014
Scripps Institution of Oceanography
La Jolla, CA**

Agenda

Thursday, February 6, 2014
Martin Johnson House

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|---------------|---|
| 8:00 – 9:00 | <i>Review Panel Executive Session</i>
Panel |
| 9:00 – 9:15 | <i>Welcome</i>
Margaret Leinen, Director of SIO and Vice Chancellor of Marine Sciences UCSD |
| 9:15 – 9:30 | <i>Welcome and Overview of Research</i>
Jeff Gee, Deputy Director of Research, SIO |
| 9:30 – 10:30 | <i>Overview of CIMEC and Science Management within CIMEC</i>
Dave Checkley, Director of CIMEC and Dean Roemmich, Deputy Director of CIMEC |
| 10:30 – 11:00 | <i>Highlights of CIMEC Science</i>
CIMEC Investigators and Partners <ul style="list-style-type: none"> • Uwe Send, SIO: <i>Highlights from Consortium on Ocean's Role in Climate (CORC), California Current Ecosystem (CCE) Meridional Overturning Variability Experiment (MOVE)</i> - link |
| 11:00 – 11:30 | <i>Break</i> |
| 11:30 – 12:30 | <i>Highlights of CIMEC Science</i>
CIMEC Investigators and Partners <ul style="list-style-type: none"> • Eric Terrill, SIO: <i>US HF Radar National Network</i> • Dan Cayan, SIO: <i>California-Nevada Climate Applications Program</i> • Ralph Keeling, SIO: <i>Scripps Atmospheric O2 Program</i> • Andrew Dickson, SIO: <i>NOAA Ocean Acidification Program Theme 1: CalCOFI OA Monitoring and QA/QC Analytical Support</i> |
| 12:30 – 1:15 | <i>Lunch (provided)</i> |
| 1:15 – 2:45 | <i>Highlights of CIMEC Science, continued</i>
CIMEC Investigators and Partners |

- Shang-Ping Xie, SIO: *Climate Variability and Change*
- Baldo Marinovic, UC Santa Cruz: *Shipboard Monitoring of the California Current System off Central California (2003-2013)*
- Eric Palkovacs, UC Santa Cruz: *Investigations in Fisheries Ecology*
- Brian Tissot, Humboldt State University (HSU): *CIMEC Fisheries Research and Ocean Observing at HSU*
- Ana Širović, SIO: *Marine Mammals and Noise: SIO Collaboration with the NOAA Pacific Islands Fisheries Science Center*
- Marc Mangel, UC Santa Cruz: *Brief Overview of the Center for Stock Assessment Research (CSTAR), 2001-2014*

2:45 – 3:00	<i>Break</i>
3:00 – 3:30	<i>CIMEC Education and Outreach</i> Closed Session: Review Panel with Students & Postdocs (2 via telecom from UC Santa Cruz)
3:30 – 4:15	<i>Review Panel Meets with NOAA Sponsors</i> Closed Session: Cisco Werner, Director of NOAA SWFSC, and via teleconference: Richard Merrick, NOAA National Marine Fisheries Service (NMFS) Chief Scientist; Ned Cyr, Director of NMFS Office of Science & Technology; and David Legler, Division Chief OAR Climate Observations Division
4:15 – 5:00	<i>Review Panel Meets with CIMEC Leadership</i> Closed Session: Dave Checkley, Dean Roemmich, SIO; Eric Palkovacs, UC Santa Cruz; Jon Largier, UC Davis; Mark Brzezinski, UCSB; Brian Tissot, Humboldt State University; Andres Aguilar, Cal State Los Angeles; and via telecon, Jim McWilliams, UCLA
5:00 – 5:30	<i>Executive Session of Review Panel</i>
5:30 – 7:00	<i>Reception – Drinks and Light Hors d'oeuvres</i>

Friday, February 7, 2014

W.M. Keck Foundation Center for Ocean-Atmospheric Research and Martin Johnson House

8:30 – 10:30	<i>Highlights of CIMEC Science, Education and Outreach, continued Keck Center</i> <ul style="list-style-type: none"> • Dean Roemmich, SIO: <i>The Argo Program: Systematic Observations of the Global Ocean</i> • Brice Semmens, SIO: <i>Quantitative Marine Science: Research and Training</i> • Dan Rudnick, SIO: <i>Spray Underwater Gliders</i> • Luca Centurioni, SIO: <i>The Global Drifter Program</i>
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- Dave Checkley, SIO: *California Cooperative Oceanic Fisheries Investigations (CalCOFI)* [time did not allow for the presentation of this talk, but Dave supplied the review panel chair with the PPT file, and the panel was already well familiar with CalCOFI]

9:30 – 11:00	<i>Tour of CIMEC Facilities, Keck Center</i> Argo Floats (Dean Roemmich), Spray Underwater Gliders (Dan Rudnick), Surface Drifters and Wave Glider (Luca Centurioni), CCE Moorings (Uwe Send)
11:00 – 11:30	<i>Break and Return to Martin Johnson House</i>
11:30 – 12:30	<i>Executive Session of Review Panel</i> Introduced by Phillip Hoffman, Cooperative Institute Program Director, NOAA OAR
12:30 – 1:30	<i>Lunch (provided)</i>
1:30 – 3:30	<i>Executive Session of Review Panel, continued</i>
3:30 – 4:15	<i>Debrief</i> Dave Checkley, Director of CIMEC and Dean Roemmich, Deputy Director of CIMEC
4:15	<i>Adjourn and Depart</i>

Appendix III CIMEC Mission, Goals, and Themes

The **mission** of CIMEC (from the original CIMEC proposal to NOAA, p. 13) is, “in collaboration with NOAA, to develop and consolidate leading research and educational programs across its member institutions in support of NOAA’s mission ‘to understand and predict changes in the Earth’s environment and conserve and manage coastal and marine resources to meet our Nation’s economic, social and environmental needs.’”

The mission of CIMEC is to be achieved through eight major **goals** as expressed in the original CIMEC proposal to NOAA (p. 13):

1. Establishing CIMEC as the leading vertically-integrated research institute in the areas of global and regional climate studies affecting marine and coastal ecosystems.
2. Establishing CIMEC as a center for education and outreach in climate and the ecological sciences in support of NOAA’s manpower needs.
3. Developing the next generation of sensors and platforms to improve our monitoring of global and regional climate variability and its impact on marine and coastal ecosystems.
4. Working with NOAA to develop sustainable observing systems.
5. Developing new methods of data analysis, integration and assimilation in support of assessments of climate variability and ecosystem impacts.
6. Developing numerical Earth System Models and downscaled regional models that integrate the physical, chemical and biological components of marine and terrestrial ecosystems.
7. Improving climate and ecosystem predictions through process studies supporting the development of better numerical models.
8. Working with NOAA to transition observational and prediction products into management tools in support of climate mitigation and adaptation policies, and ecosystem- based management of resources.

CIMEC works in close collaboration with NOAA on the aforementioned **themes** of: (1) climate and coastal observations, analysis and prediction; (2) climate research and impacts; (3) marine ecosystems (primarily fish ecology and marine mammals); and (4) ecosystem-based management. Specifically by way of these themes CIMEC seeks to: (1) work with NOAA to collect and analyze observations of the ocean and coastal environments to understand and monitor climate change on various spatial and temporal scales, providing the scientific foundations for sustainable stewardship of the southwest US marine and coastal environments; (2) conduct research to understand oceanic and atmospheric processes associated with climate change and its impacts on various spatial and temporal scales; (3) conduct research leading to forecasting the structure and function of marine ecosystems, particularly those in the Eastern Tropical Pacific, the California Current System and the Southern Ocean; and (4) conduct research to promote sustainable coastal development, community resiliency, and an ecosystem approach to management of the California Current System in the context of climate change. Additionally, CIMEC works with NOAA to provide education and outreach to users of NOAA’s products and services, and to enhance the pipeline of skilled graduates from member institutions for potential NOAA employment.

Given CIMEC’s fundamental mission of collaborating with NOAA in developing and consolidating leading research and education programs across its member institutions in support of NOAA’s mission, the NOAA sponsors of CIMEC noted these unique strengths:

- Extraordinary expertise of partnering organizations.
- Long history of ocean observing and related innovations.

- Excellence in international partnerships, bringing in associated international infrastructure to save NOAA significant dollars (e.g., Argo, Global Drifter Program).
- Uniquely positioned as scientific and educational leaders in the ocean observing and fisheries ecosystem communities.
- CIMEC is unique among CIs in its responsiveness to NOAA needs and active outreach to NOAA sponsors.