NOAA Review

Joint Institute for the Study of Atmosphere and Ocean (JISAO)

20 May 2005

Report of a review conducted 19-20 April 2005

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Executive Summary

The National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute Review Panel for the Joint Institute for the Study of Atmosphere and Ocean (JISAO) of the University of Washington (UW) met on 19-20 April 2005 to review the scientific research, education and outreach activities, as well as the direction and management of JISAO for the five-year period 2001-2005. The Review Panel found JISAO to be a valuable asset to NOAA whose research, education and outreach programs are adding substantial value to NOAA.

Major findings

The JISAO research program – an impressive portfolio, characterized by excellent quality, that addresses many of NOAA's strategic goals – should be continued. The partnership with the NOAA Pacific Marine Environmental Laboratory (PMEL) is quite strong and is essential to PMEL's productivity. The desire to increase activities in regional marine ecosystems research should be encouraged, requiring more communication, coordination, planning and prioritization between JISAO and the Seattle-area NOAA laboratories conducting ecosystem research.

The Task-1 post-doctoral program, whose strong emphasis on academic independence attracts the highest quality candidates, and the multi-disciplinary undergraduate and graduate programs that draw on JISAO's strength in research are highly commendable educational activities. The Climate Impacts Group (CIG) of JISAO conducts especially impressive outreach activities that demonstrate the value of NOAA products and services to a wide range of stakeholders.

The management of JISAO is now highly effective. The flexibility of the institutional arrangements is a valuable asset. The challenges facing JISAO in the near future – including re-competition of the Cooperative Institutes, preservation and possibly expansion of its research portfolio and the current Director's departure in 2006 – will require significantly more strategic planning by both JISAO and NOAA and substantially more involvement by UW management.

Major recommendations

JISAO, UW, and NOAA should engage in more proactive strategic planning both to prepare JISAO for the multidimensional challenges to be faced in the future and to derive maximum benefit from JISAO. Specifically, it is recommended that the JISAO Administrative Board be reactivated, a Director transition plan be developed, and an Associate Director be appointed.

JISAO should continue to conduct research in its core areas of ENSO research and ocean observations, while expanding its activity in marine ecosystems research, hydrothermal vents and tsunamis. NOAA should establish the timeline for the re-competition of the Cooperative Institutes such that JISAO would have at least one year to shut down, if necessary. Any new cooperative agreement between NOAA and JISAO should be structured with five-year duration, extensible for another five years. The JISAO offices should be moved onto the UW campus to afford greater interaction with the academic departments.

1. Introduction

The National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute Review Panel for the Joint Institute for the Study of Atmosphere and Ocean (JISAO) met on 19-20 April 2005 at various venues within the University of Washington (UW) and JISAO in Seattle, Washington.

The purpose was to review the scientific research, education and outreach activities, as well as the direction and management of JISAO for the five-year period 2001-2005. At the request of NOAA, several overarching review criteria were used to evaluate JISAO science and management: quality, creativity, integrity, and credibility; timeliness, scale and scope; connection to applications and operational implementation of policy; capacity building; education; efficiency; social science integration; and diversity. While these criteria are not called out separately in this report, they were used to evaluate the various aspects of JISAO science and management in the panel's deliberations and discussions. Where appropriate, specific remarks about these criteria are included in the report.

An external panel of experts was appointed by the NOAA Science Advisory Board. The panel included Ned Cyr of NOAA Fisheries, James Kinter of the Center for Ocean-Land-Atmosphere Studies, Galen McKinley of the University of Wisconsin-Madison, and Robert Weller of Woods Hole Oceanographic Institution (*ex officio,* Cooperative Institute Director). Credentials and contact information for the panelists are included in an Appendix. J. Kinter served as chair. All attending members of the panel participated fully in all aspects of the review.

A briefing document was provided to the review panel in advance of the meeting. The briefing document included considerable information about JISAO, including material prepared in response to questions from NOAA specifically for the five-year review, as well as several appendices with the Memorandum of Understanding between NOAA and UW, the 2004 JISAO Annual Report, the Cooperative Agreement proposal for 2001-2006, a list of projects organized by task, a list of JISAO Senior Fellows, a list of post-doctoral research associates who worked at JISAO during 1999-2005, a list of graduate students who worked at JISAO during 1999-2005, a list of peer-reviewed publications, the most cited publications of JISAO and a list of awards and honors received by JISAO staff. The briefing document along with the contents of various JISAO, UW and NOAA web sites constituted the primary source material for the review.

The panel heard presentations on the organization of JISAO (Mike Wallace, JISAO Director), the scientific research and educational activities of JISAO (several members of the JISAO scientific staff), the UW Earth Initiative (UWEI; David Battisti, UWEI Director), and other JISAO outreach activities (Ed Miles, Climate Impacts Group Director; Amy Snover, CIG Principal and Research Scientist; Dave Secord, Program on the Environment Director; and Jim Murray, Program on Climate Change Director). The presentations provided a reasonably good overview of the breadth of scientific research, educational activities and outreach engaged in by JISAO management, staff and students.

The panel held meetings with JISAO management (Wallace, Craig Hogan – Vice Provost for Research, and Dennis Moore, representing the NOAA Pacific Marine Environmental

Laboratory); the JISAO Senior Fellows; representatives of PMEL and the NOAA Alaska Fisheries Science Center and the NOAA Northwest Fisheries Science Center; and the UW chairs, directors and deans of the departments, programs and schools of relevance to JISAO. The meetings provided an opportunity for the panel to obtain additional information, primarily about the management and direction of JISAO and how it is viewed by the various interest groups.

For the convenience of NOAA management, the panel's findings are organized in the same way as the briefing materials. The following section describes the findings of the review panel with respect to the JISAO science plan, its scientific partnerships, the scientific research being conducted, its education and outreach activities, and its science management plan. At the end of the section, some issues of a more administrative nature are described. In section 3, the panel's recommendations are described.

2. Findings

Science Plan

JISAO researchers are engaged in programs that, in aggregate, represent an impressive portfolio, characterized by quality, and addressing many of NOAA's strategic goals. These activities should be continued. In particular, the long-term strengths of JISAO research on El Niño and the Southern Oscillation (ENSO) and on ocean observing systems are expected to continue. The excellent work on the impacts of climate variability and change on fisheries and on the Pacific Northwest is a strength that is also expected to continue.

At the same time, it is evident that there is the desire both by JISAO and the Seattle-area NOAA laboratories (PMEL, the NOAA Alaska Fisheries Science Center or AFSC, and the NOAA Northwest Fisheries Science Center or NWFSC) to increase activities in regional marine ecosystems research. This is consistent with present NOAA strategic plans and with the President's response to the Ocean Commission Report. In addition to marine ecosystems, there is the intent by JISAO to increase, through additional appointments of Senior Fellows, the emphasis and activity in the areas of hydrothermal vents and tsunami research. The review panel found that this growth and the potential for further expansion of the research portfolio would place additional emphasis on the need for communication, coordination, planning, and prioritization within JISAO, between JISAO and UW, and between JISAO and the NOAA laboratories.

Scientific Partnerships

The co-location of JISAO with a range of NOAA research facilities in the Seattle area has led to a number of scientifically diverse and valuable partnerships. Most notable among these is JISAO's partnership with PMEL, which serves as JISAO's Host Institute and which has the longest, most extensive and most scientifically robust collaboration. JISAO represents an immensely important intellectual resource to PMEL, and it is unlikely that the laboratory could maintain its diverse, high-quality research portfolio without this partnership.

JISAO's relationship with the other Seattle-area NOAA facilities is more limited than that with PMEL, but is valuable to them and growing. The AFSC and NWFSC have developed partnerships with JISAO in the areas of fisheries oceanography, climate and ecosystems, and stock assessment that have proven useful for meeting specific research needs outside the Centers' scientific scope or current staff resources. However these partnerships have tended to be more opportunistic, in contrast to the long-term strategic partnership between JISAO and PMEL.

Science Review

The panel finds that the quality, creativity, integrity and credibility of the diverse scientific activities conducted by JISAO is uniformly excellent and that productivity is high. This finding

is reflected in the large number of publications, high citation rate and willingness of PMEL and the NOAA Fisheries labs to maintain and expand investment in the partnership.

The JISAO-NOAA partnership appears to function most effectively in small groups that are allowed to maintain a discrete research focus. Examples include the ENSO forecast group, the Climate Impacts Group (CIG) and the JISAO-PMEL-AFSC Fisheries Oceanography Coordinated Investigations (FOCI) partnership.

Education and Outreach

The Task-1 post-doctoral program, with its strong emphasis on academic independence, has been able to attract extremely strong and productive scientists at the outset of their careers. This is clearly a significant asset to both NOAA and UW.

Graduate education has received substantial attention at JISAO and has produced an impressive list of graduates who have gone on to productive careers in the Earth sciences. The remote location of JISAO with respect to the academic departments in which the graduate students' advisors have their offices and facilities, however, is a serious drawback to the sort of communication and community that is necessary among graduate students and their mentors.

The UW Program on the Environment and the Program on Climate Change educational programs, especially CIG's involvement, have been highly valuable in promoting environmental awareness, and establishing a science-based interdisciplinary undergraduate curriculum.

The CIG has undertaken a great deal of outreach to the community, particularly with the stakeholders in the water resources sector, to increase the region's resilience to climate variability and change. The CIG, as one of the first of NOAA's Regional Integrated Sciences and Assessments (RISA) centers, has demonstrated the value of NOAA research and climate information products to its community in the Pacific Northwest.

A number of PMEL scientists have been involved in science camps and other public venues (lectures, panel discussions etc.) that significantly enhance the public view of the scientific research being conducted.

Recently, UW has undertaken a new enterprise called the UW Earth Initiative (UWEI), which aims to draw together the diverse environmental research and education activities on the UW campus, providing opportunities for collaboration, outreach and fund-raising from the private sector to the diverse UW academic and administrative units that have some environmental flavor. Despite the commendable goals of UWEI, it is unclear to the review panel what benefit is derived by JISAO in its contribution toward and its collaborations with UWEI.

Science Management Plan

NOAA benefits from the substantial value added by faculty affiliates and researchers engaged in Task II activities through JISAO. This is particularly true at PMEL where there are 65 full-time JISAO employees working side-by-side with 95 federal employees. The intellectual contribution

of JISAO to PMEL is enormous and critical for the science accomplished there. There is less involvement of JISAO employees at the AFSC and NWFSC, but there is an effort underway to increase this involvement.

The flexibility of cooperative institute institutional arrangements, both in terms of facilitating the flow of funding and in terms of creative arrangements for accomplishing science tasks is very beneficial to NOAA. JISAO employees working at NOAA laboratories can access research funds not available to federal employees, effectively increasing NOAA's research portfolio. Access to UW research facilities and University-National Oceanographic Laboratory System (UNOLS) ships is facilitated by JISAO and gives NOAA employees the capacity to efficiently accomplish many science goals. JISAO was also the vehicle for funding the innovative chartering of a New Zealand research vessel to allow the ARGO float program to fill large voids in the profiling float array in the South Pacific.

Though JISAO is large and loosely-organized, it facilitates a wide range of fruitful collaborations between NOAA and UW. Central to JISAO's effectiveness is the Director's capacity to build partnerships and provide strategic direction. The panel heard multiple instances of how JISAO's effectiveness has been much improved over the past two years following a change in Director and administrative staff. Previous changes were noted to have had major negative impacts. The choice of and transition to a new Director will be critical for JISAO in the next two years.

JISAO faces many challenges in the near future, including the adoption of a more business-oriented model by NOAA, the re-competition of the Cooperative Institutes, the Director's departure in 2006, possible reductions in NOAA support for competitive external awards in climate research and climate observations coupled with very constrained NSF budgets in oceanic and atmospheric research and the reorganization at NASA that seems likely to de-emphasize atmospheric research, and expansion of the JISAO research portfolio into the areas of marine ecosystems and tsunamis. In the past, UW management has had the luxury of taking a fairly casual attitude toward JISAO, but that situation is changing. Given the complex and changing funding and management environment, JISAO needs (1) more involvement from and coordination between the research administration of UW, the leadership of the academic departments, and the heads of the NOAA labs, and (2) a comprehensive strategic plan.

Miscellaneous

There is some potential for disquiet among the JISAO staff, including the possible loss of high-quality, productive scientists, due to possible inequities in compensation between UW and NOAA employees and due to issues arising from the different levels of status within the UW system available to JISAO staff members. In particular, there is evidence that staff with similar credentials and seniority are compensated at quite different levels, depending on whether they are paid by NOAA or UW. While the panel did not encounter any evidence of morale problems, the potential exists when such employees are situated in close proximity, as are many JISAO and PMEL scientists, for example. Similarly, several JISAO scientists have acquired sufficient experience and have demonstrated sufficient capacity for independent research that they have the potential to successfully compete for research funding on their own; however, they are precluded from submitting proposals because they lack principal investigator status within the UW system. This is a potential point of contention with the academic departments associated with JISAO.

JISAO is underpopulated with female and minority Senior Fellows (14% women, 5% non-white) and PI-level research scientists (13% women and 7% minorities). However, this distribution is generally consistent with that of the UW faculties from which the Senior Fellows draw most heavily (20% women and no non-white in Physical Oceanography, 10% women and no non-white in Chemical Oceanography, 13% women and 6% non-white in Atmospheric Sciences). At PMEL, the distribution is similar (3% women and 2% minority at the Senior Research Scientist level, and 20% women and 2% minority at the Scientist/Engineer 4 level). The panel concludes that diversity within the senior ranks at JISAO is consistent with its constituent institutions.

3. Recommendations

***Overarching recommendation*: JISAO, UW, the Seattle-area NOAA laboratories, and NOAA management should engage in more proactive strategic planning both to prepare JISAO for the multidimensional challenges to be faced in the future and to derive the maximum benefit from JISAO.**

These challenges include the engagement of JISAO (and through JISAO the external community) in the evolution of basic research and the detailed plans for future research at NOAA, coordination of NOAA research at UW with the research funded by other agencies, the tight Federal research budgets, and the ever evolving context and support for basic research within the Federal government.

Specifically, it is recommended first that the Administrative Board be reactivated and that its membership include representation from the research administration of UW, the Deans and Department Heads of the colleges, schools and departments with staff engaged in JISAO research themes, the Director of JISAO, and the heads of PMEL, AFSC and NWFSC. This board should provide the broad UW and NOAA perspectives and guidance on the changing research landscape, foster collaboration, and jointly plan future research cooperation. This board should also interact with the JISAO Senior Fellows to achieve a balance between diversification of the research portfolio and continued excellence and strength in core research themes.

The increased strategic planning will place additional demands on the JISAO Directorate. Communication with the Seattle-area labs and with NOAA Goal Teams and management will be an important and necessary activity. Resources must be made available to allow the JISAO Director to spend more time working with the heads of the Seattle-area labs and with NOAA Headquarters to accomplish coordinated long-term planning. At the same time, an Associate Director of JISAO should be added to assist with day-to-day operations and reporting requirements. This will not only free time for the Director to devote to long-term planning, but will also allow a second person to be brought up to speed on the diverse challenges affecting JISAO and thus ease the transition that will occur when Mike Wallace steps down as Director.

The transition of the Directorship is itself an issue that raises concern. The panel recommends that UW, NOAA, and JISAO immediately start to develop a plan for the selection of a new Director and for the transition to that new Director that ensures continuing excellence at JISAO.

Finally, knowing that there will be a re-competition of the Cooperative Institutes, the partners now invested in JISAO (UW, the Seattle-area labs, and the JISAO staff) should soon engage in dialogue and joint planning to prepare for that re-competition.

Recommendation to NOAA

The panel recommends that NOAA establish the timeline for Cooperative Institute re-competition so as to allow at least one year to close down, if necessary. This is desirable to limit

stress on and attrition of CI staff during the recompetition process. In addition, cooperative agreements should be structured with a five-year duration, extendable for an additional five years, based on satisfactory performance.

The panel also recommends that NOAA make broader use of JISAO, where appropriate, in the area of marine ecosystem science.

Recommendations to UW

The panel recommends that the JISAO offices be moved to the UW campus. This would increase interaction for both research and education with the Department of Atmospheric Sciences, the School of Oceanography and the School of Aquatic and Fishery Sciences. It should also increase the willingness of key JISAO faculty and their graduate students to have their offices at JISAO. Since the facilitation of one-on-one and small group collaborations is a core strength of JISAO, a closer proximity should allow JISAO to be increasingly effective.

The panel recommends that UW reconsider the distribution of JISAO's Task II indirect costs to the Earth Initiative and return at least a portion of these funds to JISAO. While the Earth Initiative does perform outreach functions for JISAO, the panel finds it questionable that JISAO is the sole source of funds for this group. None of the other 23 Departments in 10 Schools and 44 research centers for which the Earth Initiative also conducts outreach provide financial support. JISAO could readily use these funds for additional post-doctoral support.

Recommendations to JISAO

The panel recommends that JISAO continue to "go with its strengths", particularly in the areas of ENSO and ocean observing systems. JISAO should continue to pursue an increased focus in marine ecosystems activities, but should work proactively to create opportunities in this area rather than react to opportunities.

There is also some interest among the JISAO Senior Fellows to expand the research themes to include weather, which is a strength in the Department of Atmospheric Sciences. While it is not obvious which NOAA laboratory or line organization would be most appropriate to approach to explore such an expansion of JISAO's mission, the panel suggests that some exploratory discussions be undertaken with the NOAA National Centers for Environmental Prediction.

It is recommended that JISAO and UW recognize the unique opportunity afforded by the high quality research staff within the Joint Institute by exploring ways of effecting a more equitable compensation distribution and refining the career tracks available to such staff, in consultation with the relevant academic departments. This issue could be addressed by the reactivated Administrative Board, as recommended above.

It is recommended that JISAO do all that is possible to encourage the participation of women and minorities in senior-level research and leadership positions.

Appendix – Review Panel Membership

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Dr. James L. Kinter III is Director of the Center for Ocean-Land-Atmosphere Studies (COLA) where he manages all aspects of basic climate research conducted by the Center. Dr. Kinter's research includes studies of atmospheric dynamics and predictability on seasonal and longer time scales. Of particular interest in his research are prospects for prediction of El Niño and the extratropical response to tropical sea surface temperature (SST) anomalies using general circulation models of the Earth's atmosphere. Dr. Kinter is also an Associate Professor in the Climate Dynamics Ph.D. Program of the School of Computational Sciences at George Mason University, where he has responsibilities for curriculum development and teaching atmospheric dynamics as well as advising Ph.D. students. After earning his doctorate in geophysical fluid dynamics at Princeton University in 1984, Dr. Kinter has served as a National Research Council Associate at NASA Goddard Space Flight Center, and as a faculty member of the University of Maryland (teaching faculty 1984-1987; research faculty 1987-1993) prior to joining COLA. Dr. Kinter has served on many national review panels for both scientific research programs and supercomputing programs for computational climate modeling. A full resume is available on request.

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Dr. Cyr received his Ph.D. from the University of South Carolina in 1991. Prior to his current position as Chief of the NOAA Fisheries (NMFS) Marine Ecosystems Division, he was employed as a Fisheries Biologist with the NMFS Office of Protected Resources and International Affairs Specialist with NOAA's Office of the Deputy Assistant Secretary for International Affairs. His areas of interest include fisheries oceanography, climate effect on marine fisheries, ecosystem approaches to fisheries research and management, and development and implementation of large-scale ecosystem monitoring and assessment programs. Dr. Cyr also serves as Manager of NOAA's Climate and Ecosystem Program.

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Dr. Galen McKinley is an ocean biogeochemist who uses global and regional models to understand the ocean carbon cycle and global carbon cycle. Her current research foci are the interactions of physical and biogeochemical processes in the ocean; interannual variability in air-sea CO2 fluxes; and the use of inert gases both to improve our understanding of gas exchange and deep mixing, and to better represent these processes in models. Dr. McKinley received her PhD in Climate Physics and Chemistry from MIT in 2002. She worked as a consultant to the Mexican National Institute of Ecology from 2002-2003. From 2003-2004, she was a post-doc at Princeton University. Most recently, Dr. McKinley has joined the faculty of the Department of Atmospheric and Oceanic Sciences at the University of Wisconsin - Madison. Her website, http://www.aos.wisc.edu/~galen/, has additional information about her background, research interests and publications.

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Robert A. Weller received his Ph.D. in 1978 from Scripps Institution of Oceanography. He is the Director of the Cooperative Institute for Climate and Ocean Research at Woods Hole Oceanographic Institution (WHOI), and has worked at WHOI since 1979. His research focuses on atmospheric forcing (wind stress and buoyancy flux), surface waves on the upper ocean, prediction of upper ocean variability, and the ocean's role in climate. He has served as the Secretary of the Navy Chair in Oceanography. He has been on multiple mooring deployment cruises and has practical experience with ocean observation instruments. Dr. Weller has served on several NRC committees over the years, including the recent Committee to Review the U.S. Climate Change Science Program Strategic Plan and the Committee on Implementation of a Seafloor Observatory Network for Oceanographic Research, he was also a member of the Board on Atmospheric Sciences and Climate. He is currently serving on the NRC Committee on Strategic Guidance for NSF's Support of the Atmospheric Sciences. He also serves on the NOAA Climate Observing System Council and the UNESCO/World Climate Research Program's Ocean Observations Panel for Climate. He is author or coauthor of over 75 research papers.