

**US CLIVAR Project Office**

**DOE Grant Number: DE-SC0008494**

**Final Technical Report**

**Performance Period: 09/01/2012 to 08/31/2013**

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Performance Period 9/1/12 to 8/31/13**

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## **1 Activities of the US CLIVAR Project Office**

The United States Climate Variability and Predictability (US CLIVAR) Project Office (hereafter USCPO) was funded in 2012-2013 through a grant by the Department of Energy (DoE) DE-SC0008494 and cooperative agreements the National Science Foundation (NSF) AGS-09061146 and the National Oceanic and Atmospheric Administration (NOAA) NA06OAR4310119. The grant and cooperative agreements provided funding for staffing, travel by US scientists to participate in CLIVAR meetings, activities of US CLIVAR Scientific Steering Committee (SSC) and its Panels, Working Groups, and Science Teams, open science meetings, workshops and symposia, and outreach to communicate CLIVAR findings and opportunities. Activities begun and/or completed in the performance period are described below.

### **1.1 Program Development and Inter-Agency Coordination**

#### US CLIVAR Interagency Group

The USCPO organized eight meetings of the US CLIVAR Interagency Group (IAG) during the past year. It developed the agendas, chaired the meetings, generated materials for consideration, drafted and disseminated summaries, identified action items and ensured their timely completion. The Office provided updates on progress of the International CLIVAR Program and World Climate Research Program (WCRP), the US SSC, the US Atlantic Meridional Ocean Circulation Science Team, US CLIVAR Working Groups (WGs), progress on workshop and conference planning and developments of the US Global Change Research Program (USGCRP). The IAG meeting agendas were also designed to facilitate exchange of information among agency managers on developments in their respective agencies and programs including solicitations and awards; evolving plans for observing system deployment, new data sets and synthesis products, field campaigns, analysis and modeling projects, and predictability/prediction studies. Key 2012 actions included providing guidance and feedback to Science Plan effort, evaluating the status of 5<sup>th</sup> Coupled Model Intercomparison Project (CMIP5) dataset availability from modeling centers to the broader community via the Earth System Grid and recommending approaches to future improvement; identifying research papers that have emerged from US CLIVAR Coupled Model Evaluation Project (CMEP) projects, reviewing Earth System Prediction Capability pilot projects and the potential intersections with US CLIVAR WGs; coordinating agency activities in currently-supported process studies (Dynamics of the MJO (DYNAMO), Salinity Processes in the Upper Ocean Regional Study (SPURS), IntraAmerican Studies of Climate Processes (IASCLIP)) and interest in potential future ones (Bay of Bengal/Indian Monsoon); defining the US CLIVAR Science Team concept and identifying potential topics for forming future Science Teams, developing guidelines for requesting US CLIVAR funding support of workshops and conferences; developing terms of reference and inviting an external review committee for the US AMOC Program; and coordinating agency presentations for meetings (Summit, AMOC Principal Investigator Meeting, International CLIVAR).

#### Coordination with US Carbon Cycle Science Program (USCCSP)

Building upon the progress of 2010-11 in engaging the Carbon Cycle Research community to develop collaborative research thrusts, the USCPO briefed the USCCSP Interagency Working Group and Science Steering Group in September, describing progress of two new 3-year US CLIVAR/Ocean Carbon Biogeochemistry (OCB) WGs established in early 2012 to explore heat and carbon uptake in the Atlantic, Pacific, Indian and Southern Oceans using observational and model analyses. Interest in engagement on terrestrial carbon was also expressed by the USCCSP. An initial effort to explore

climate interactions with both ocean and terrestrial carbon cycle is the focus of a National Center for Atmospheric Research Advanced Studies Program (NCAR ASP) Summer Colloquium being organized by the Ocean Carbon Uptake WG. The USCPO and USCCSP staff meet on occasion to share program developments and information, as well as ideas on how to further coordinate inter-program activities.

#### Coordination with US Agency Arctic Programs

This year, at the urging of the US CLIVAR Greenland Ice Sheet WG, US CLIVAR has engaged Arctic and cryosphere programs at the National Aeronautics and Space Administration (NASA), NSF, NOAA, DoE and the Office of Naval Research (ONR). Briefings of CLIVAR and Arctic program managers by the WG were provided at each of the agencies (DoE participated with NASA) to inform on the state of knowledge and gaps in understanding of coupled ice-ocean-atmosphere interactions responsible for observed and projected Greenland ice sheet mass changes and to explore agency interests in collaborating to address the science gaps. Many managers did express initial interest in the topic and would consider supporting an interdisciplinary workshop to further define specific implementation strategies for observations, fieldwork, and modeling studies. The USCPO subsequently contacted the chair of the Interagency Arctic Research Policy Committee (IARPC) and facilitated an ongoing dialogue with the WG to help foster future interagency and inter-program cooperation. Per its prospectus, the WG undertook planning of the workshop under US CLIVAR auspices and has been developing a workshop proposal for possible co-sponsorship by IARPC agencies.

## **1.2 Scientific Steering Committee, Panels, Science Teams, Working Groups, and Coordination Activities**

#### US CLIVAR SSC and Panels

The USCPO continued to provide secretariat functions for the SSC and the US CLIVAR Panels, facilitating coordination of telecon and in-person meetings, assisting with setting agendas, providing updates, preparing summaries, and ensuring completion of action items.

A primary focus of the SSC and Panels during 2012 has been the drafting of the new US CLIVAR Science Plan, initiated in January with an SSC meeting in Silver Spring, MD, that reviewed the purpose and context for a new Plan, developed a chapter outline and production timeline, identified science questions and topics, and generated initial draft mission statement and goals. The Panels reviewed these materials during the spring and provided feedback, resulting in further refinement of the mission statement, goals and subgoals. The 2012 Summit again engaged the panelists in identifying priority accomplishments of US CLIVAR during its first 15 years, reviewing science questions organized under established program Themes, and generating specific sub-goals required for achieving progress in each of the four program goals. Immediately following the Summit, lead authors and writing teams for each of 10 chapters were confirmed. During the fall, the SSC considered alternate options on how to organize the document, resulting in an additional (first) goal added to the plan: to improve understanding of the role of the oceans in climate variability on different timescales, emphasizing the primary importance of determining time scales during which ocean controls can be established, and relating variability of the ocean to variability of the atmosphere. Recognizing commonality among many of the subgoals generated during the Summit breakout discussions, the SSC decided to collapse them into cross-cutting strategies that underpin all five goals. The SSC chair and co-chairs presented an overview of the draft Plan to the community at a US CLIVAR Town Hall at the fall American Geophysical Union (AGU) meeting in December. The SSC chair also briefed the USGCRP Subcommittee Principals and National Coordination Office staff on the draft Plan in December, highlighting the importance of US CLIVAR science questions to addressing key uncertainties in global change research. In summary, through 10 meetings and telecons during 2012, the SSC and Panels have well scoped and initiated drafting of the new Science Plan, and is on schedule for delivery of the Plan by the start of 2014.

The USCPO supported the planning, execution and reporting of the annual US CLIVAR Summit Meeting held July 17-20, 2012 in Newport Beach, California. In addition to the Science Plan focus described above, the Summit re-engaged the focus of Panels on their terms of reference through careful planning of the Panel business breakout agendas. Key action items emerging from the Summit include improving input to evaluation of adequacy of observing systems, assessing metrics for evaluating CPTs, evaluating process studies' adherence to best practices, exploring strategies for maintaining data archives post-field campaign, drafting recommendations for better practices for model dataset availability, enabling approaches to effectively engage the National Climate Assessment, and developing metrics to measure progress of US CLIVAR. Mr. Patterson worked closely with the SSC to develop and finalize the agenda, coordinate the orientation and introduction session for the first night of the meeting, prepare presentations for SSC Exec members, coordinate the agency manager presentation format, provide the charge to the Panels for their business breakout sessions, and organize the science planning breakout and summary sessions. Ms. Mays organized logistics in close collaboration with University Corporation for Atmospheric Research/Joint Office for Science Support (UCAR/JOSS) staff, posted the agenda, abstracts and presentations to the US CLIVAR website, compiled plenary notes and Panel summaries, and prepared a preliminary draft of the Summit report to be completed and published in early 2012.

The USCPO engaged Panel co-chairs to organize telecon meetings aimed at supporting continuity of Panel work throughout the year, including reviewing of progress on action items, introducing and orienting new members, identifying priorities for the Summit, and engaging panelist input for the Science Plan as described above. This process has importantly revitalized Panel participation beyond the annual Summit, laying a foundation to help increase Panel focus on core responsibilities.

The SSC has also addressed more routine responsibilities such as identifying new membership. This year, a new SSC chair, three new Panel co-chairs, and twelve new Panel members are being sought. Realizing that standard practices for selecting new members had not been well documented, the SSC Exec has reviewed options and established written procedures for determining new co-chairs and members of Panels. The USCPO has added to this document the IAG process for selecting the SSC chair and co-chairs, and roles of the IAG, SSC, Panel co-chairs, and USCPO, thereby ensuring consistency in membership procedures from year to year.

#### US Atlantic Meridional Overturning Circulation (AMOC) Science Team:

The USCPO provided ongoing planning, implementation and reporting support to advance coordination of the US AMOC program. The Office organized telecons and meetings, assisted with agenda setting, provided updates and reports, and drafted meeting notes. The USCPO coordinated the collection of project reports, Task Team synthesis summaries, and edited, published and distributed the 4<sup>th</sup> Annual US AMOC Progress Report and periodic updates for the Subcommittee on Ocean Science and Technology (SOST). Working with the Science Team chair, the USCPO produced the final report to SOST highlighting major accomplishments over the first five years of the program and remaining research priorities. With requirements of reporting to SOST completed, the Executive Committee and agency sponsors agreed that future annual reports to inform the community and agencies should continue. New 2012 project awards were confirmed by funding agency managers and newly-identified PI's were contacted by the USCPO to confirm their addition to the US AMOC Science Team and assignment to the Task Teams starting in 2013.

The USCPO helped the Exec Committee plan and successfully implement the 2012 US AMOC meeting by developing and updating the meeting webpage, promoting the event, organizing registration and abstract collection, publishing the abstracts, meeting agenda and presentations, organizing travel of invited speakers and reviewers, sponsoring event meals, breaks and reception, local transportation, and a/v support, and producing summary notes from the mini-workshop reports

and final discussion session. A summary of the meeting and its recommendations is provided later in this report.

Based on a US CLIVAR Interagency Group request, the USCPO engaged the Science Team to organize a mid-term external review of the Program to provide a retrospective examination of progress in achieving objectives during the first five years of the program and to identify opportunities for future program directions. The USCPO drafted terms of reference for the review that were approved by the SSC Executive Committee and the IAG, coordinated the selection of review committee members, invited their participation and arranged travel to attend the annual PI meeting, provided background materials to inform the review, organized introductory and follow-up meetings for the committee with agency managers and the Executive Committee, coordinated the survey of IAG and Science Team members, and monitored progress on developing the review report, which is expected in early 2013.

#### Working Groups

The USCPO continued to support the ongoing activities of four Working Groups (WGs) and the establishment of five new WGs, two in collaboration with the Ocean Carbon Biogeochemistry (OCB) program.

- *High-Latitude Surface Fluxes Working Group*  
This WG, in its fifth year, is completing its work with the acceptance for publication of a *Bulletin of the American Meteorological Society (BAMS)* article entitled "High-Latitude Ocean and Sea Ice Surface Fluxes: Challenges for Climate Research." The article describes the current state of knowledge and scientific requirements for air-sea surface fluxes in high latitudes, identifies logistical and physical reasons for why existing products do not meet requirements, and recommends specific actions to improve flux products, including (1) acquiring more *in situ* observations; (2) developing improved satellite flux observing capabilities; (3) making observations and flux products more accessible; and (4) encouraging flux intercomparisons. The USCPO is supporting the publication charges for the 22-page article and 50 reprints. WG members continue to dialogue through WG email exchanges and at meetings of opportunity.
- *Decadal Predictability Working Group*  
In its third year, the WG has completed its second objective with a *Climate Dynamics* paper titled "A Verification Framework for Interannual-to-Decadal Predictions Experiments," published in August, 2012. The paper presents consistent metrics for evaluating forecast quality across predictions systems, guidance on the use of model predictions including correction of mean and conditional biases, and consideration of how best to approach forecast uncertainty. The USCPO has assisted the WG in setting up telecons, updating web pages, and providing support of open access charges for the 28-page journal article. The WG is exploring possible follow-on activities by linking with the Working Group on Coupled Modeling (WGCM)/Working Group on Seasonal to Interannual Prediction (WGSIP) Decadal Climate Prediction Panel, which provided recommendations on the submission of decadal runs to the CMIP5, to form a WCRP Task Force to map out decadal variability and predictability across CLIVAR.
- *Hurricane Working Group*  
During its second year, the WG continued collecting runs of baseline climatological and idealized model experiments from 12 participating modeling centers and initiating analyses exploring the ability of atmospheric global climate models used in CMIP5-class models to reproduce observed tropical cyclone metrics and the sensitivity of model response to perturbations in SST. Bi-monthly telecon meetings continue to review progress of model center experiments, data storage and access issues, analysis results, and publication author

policies. Co-chairs Drs. Gabriel Vecchi and Suzana Camargo are preparing a manuscript describing the WG objectives, models participating, and experimental design for submission to *BAMS*. A special issue *Journal of Climate* has been approved and approximately 15 WG papers are in preparation, the first of which has been submitted (Strazzo, et al., see publication list). The USCPO has assisted in setting up telecons, establishing and updating web pages, and providing logistics planning for the Hurricane Workshop to be hosted by the NOAA Geophysical Fluid Dynamics Laboratory (GFDL) in Princeton, New Jersey, June 5-7, 2013.

- *Greenland Ice Sheet-Ocean Interactions Working Group*

The WG has progressed well in its second year, with the completion and publication in May, 2012, of a US CLIVAR white paper titled "Understanding the Dynamic Response of Greenland's Marine Terminating Glaciers to Oceanic and Atmospheric Forcing." The paper provides a cross-disciplinary synthesis of the current state of knowledge on Greenland Ice Sheet mass loss and the relevant mechanisms and forcings affecting glacial retreat; identifies key gaps in understanding of mechanisms; and recommends approaches to address the knowledge gaps, combining monitoring, process studies, and Earth system modeling. A *BAMS* article, based on the white paper, is accepted for publication. As described earlier, WG-led briefings summarized the state of the science and research gaps for NSF, NOAA, NASA, DoE, and ONR managers of climate and Arctic programs to engage and gauge agency and cross-program interest. The WG has also successfully engaged the Interagency Arctic Research Policy Committee (IARPC), providing recommendations on the ice sheet-ocean research that have been incorporated into the IARPC agencies' five-year research plan. Finally, the WG is planning an international workshop to be held in Salem, Massachusetts, June 4-7, 2013, to develop the needed cross-disciplinary and multi-faceted implementation approaches, combining fieldwork, remote sensing, long-term observations, laboratory experiments, modeling, data analysis and synthesis. The USCPO has assisted the WG with setting-up briefings, engaging the IARPC program, editing manuscripts, publishing and distributing the white paper, supporting publication charges for the 12-page *BAMS* article and 25 reprints, updated webpages, and providing logistics assistance for planning the 2013 workshop.

- *El Niño Southern Oscillation (ENSO) Diversity Working Group*

The WG has been supported for one year with approval of a second year pending evaluation by the SSC of the WG's demonstration that different flavors of ENSO are distinguishable in analysis of observational data sets and are reproducible in climate model simulations. The WG has worked quickly to begin evaluating recent observational analyses and model simulations supporting their thesis, including a recent AGU session that it organized. The WG is organizing a workshop for February 6-8 in Boulder, Colorado, providing a venue for review and discussion of the existence of a continuum versus preferred longitudes of maximum warming, dynamical processes, teleconnections/impacts, possible precursors, and the ability to predict the different flavors. The USCPO has organized WG telecons and webcasts of presentations, established and updated webpages providing relevant literature, supports WG meetings (e.g., at AGU), established a workshop webpage for registration and abstract submission, promoted the upcoming workshop, and encumbered funding for 2013 to support breaks, reception, and invited speakers.

- *Eastern Tropical Ocean Synthesis Working Group*

The WG started with and continues to work at an aggressive pace. It has been identifying and assembling satellite, buoy and research cruise datasets and assembling plots of readily available CMIP3 and CMIP5 simulations for annual and seasonal-mean values of SST, cloud cover, surface winds, thermocline depth for a climatological time period beginning ~1950 up to 2012 for selected domains in the eastern Pacific and Atlantic. The WG coordinated a science session at AGU on tropical biases that helped inform a WG meeting the next day to share updates on planned activities and begin developing a white paper summarizing state of the science and

recommendations for metrics. Updates were provided on two new European observational campaigns being proposed that would significantly improve the network in the Southeast Atlantic. The USCPO organized telecons, supported and participated in the WG meeting AGU, created a WG webpage, and assisted in drafting telecon summaries.

- *Extremes Working Group*

The WG launched with an ambitious agenda to develop two papers describing the state of understanding of the role of large-scale atmospheric circulation patterns in generating short term (5-day) temperature and precipitation extremes, and then to assess the ability of models to simulate the large-scale patterns, thereby evaluating the suitability of such models for simulations of extreme events. An extensive literature review was immediately undertaken to inform the summary papers. The recent WG meeting at AGU developed annotated outlines for both papers, identified writing teams, and discussed the scope, format, and logistics for a workshop in Berkeley, California, August 19-21, 2013. The USCPO organized WG telecons and the in-person meeting, established and updated the WG webpages, produced telecon summaries, and assisted in planning of the workshop logistics.

- *Ocean Carbon Uptake Working Group*

The WG, co-sponsored by OCB, aims to identify common metrics of physical ocean/climate, compare them in the various models and in the observations for the North Atlantic and the Tropical Pacific, and coordinate model evaluation of the climatic influence on CO<sub>2</sub> uptake at different time scales. A preliminary focus has been to conduct a literature review and identify new analyses of CMIP5 simulations. Only limited work has been published and the relevant draft 5<sup>th</sup> International Panel on Climate Change Assessment Report (AR5) chapter has only recently become accessible for consideration by the WG. WG members have successfully proposed an NCAR ASP Colloquium, “Carbon-Climate Connections in the Earth System” for August 2013 to help 25 graduate students gain an integrated conceptual understanding of key physical and biological processes regulating the global carbon cycle and identify key uncertainties. The USCPO scheduled WG telecons (including one joint with the Southern Ocean WG), organized the in-person meeting at AGU, established WG webpages, and produced telecon summaries.

- *Southern Ocean Working Group*

The WG, also joint with OCB, seeks an improved understanding of the role of mesoscale eddies in the heat and carbon uptake by the Southern Ocean and the response of the Southern Ocean stratification, circulation and heat and carbon uptake to a changing climate. Progress of the WG was accelerated at the 2-day meeting at AGU, during which presentations and discussion focused on the main biases in climate model simulations, with suggestions for types of studies and a list of observation-based metrics to improve the model skill emerging. The WG has also discussed approaches to identifying the most critical observational targets and planning observational campaigns. The USCPO organized WG telecons, participated in the meeting at AGU, and established WG webpages.

#### Scientific Workshops

The USCPO provided the scientific program, logistical and/or financial support to a number of workshops, conferences and symposia during the past year, including:

- *WCRP CMIP5 Workshop, March 5-9*

Approximately 170 participants convened in Honolulu, Hawaii last March for the WCRP-organized CMIP5 workshop to share new results emerging from analyses of the multi-model data, including those of the US CLIVAR agency-sponsored CMEP 2011 projects. Patterns of future change of temperature and precipitation, equilibrium climate sensitivity, and spread among CMIP5 models were shown to be similar to previous model generations. Characteristics

of model simulations in CMIP5, when compared CMIP3, demonstrate that some quantities (e.g., rate of Arctic sea ice loss) had improved significantly, while others (e.g., double ITCZ) showed little gain. Participants were encouraged to examine the wide variety and diversity of the CMIP5 model experiments that provide opportunities to analyze novel aspects of the climate. The USCPO promoted the workshop (particularly among the CLIVAR-funded PIs), advocated for agency manager participation (despite limited size), sponsored local transportation and breaks, and shared the workshop summary with the sponsoring agencies.

- *WCRP Global Drought Information System Workshop, April 11-13*  
Organized to inform the development of an experimental Global Drought Information System (GDIS), the workshop reviewed mechanisms and predictability of drought by region and for specific recent extreme case studies, examined drought information products available from service providers, and explored user needs and capabilities to use information. The key workshop recommendation urged the community to implement basic elements of the GDIS including an experimental real-time global monitoring and prediction system, a drought catalogue summarizing our understanding of drought world-wide, and a research component centered on internationally coordinated cases studies of recent high profile droughts, with strong ties to users. The USCPO supported travel grants for 10 students (9 international) to attend.
- *US AMOC Science Meeting, August 15-17*  
The US AMOC Executive Committee organized the annual meeting of the US AMOC Science Team, held in Boulder, Colorado in August to present new individual project results; assess progress toward main program goals; define challenges and potential approaches; and set priorities for near-term *collaborative* research. The last goal was informed through four “mini-workshops,” to examine near term priorities and future directions in four topical areas: the AMOC observing system; AMOC fingerprinting from historical and proxy data; AMOC mechanisms and predictability; and AMOC’s impact on the carbon cycle. Focused discussion sessions generated specific action items to advance all seven near-term program priorities that will be reflected in the 2012 annual report. The USCPO supported the organizing committee planning, meeting promotion and webpage information, registration, abstract collection and publication, travel of invited speakers and reviewers, event meals, breaks and reception, local transportation, and the production of summary notes from the mini-workshop reports and final discussion session.
- *Global Synthesis and Observations Panel (GSOP) Ocean Synthesis and Air-Sea Flux Evaluation Workshop, November 27-30*  
The workshop, sponsored by International and US CLIVAR, brought together observationists and modelers to identify approaches to improve air-sea flux estimation and global consistency from different observational analysis and modeling methods, to further develop and present synthesis metrics for different purposes (including air-sea fluxes and ocean heat content), and to apply synthesis products to studies of transport, biogeochemistry and coupled climate prediction. Key recommendations included (1) checking physical consistency of net heat and freshwater fluxes by implementing a field experiment using ocean heat and salinity content as direct measures of integrated surface fluxes; (2) evaluating ocean heat and freshwater flux components using buoy measurements at selected OceanSITES; and (3) developing/enhancing a data base of fluxes (versus air-sea variables) from buoy measurement, research vessels, and direct flux measurements for use in synthesis and modeling. The NASA and NOAA contributions funded travel for 12 US participants and workshop meals/breaks.

### 1.3 Program Promotion/Reporting

#### Website

Ms. Mays led the USCPO efforts to announce and promote program activities. Working with the UCAR/JOSS web designer, she designed an improved US CLIVAR website, migrating and refining material from the old site, generating new material for newly established efforts, and merging the previously separate US AMOC site. She established a US CLIVAR Twitter account, linked through the website homepage, that she updates regularly with timely news of climate research advances and program announcements.

#### Publications

Ms. Mays managed the production and distribution of US CLIVAR documents including the summer issue of the *Variations* newsletter on the climate and carbon cycle (winter issue on decadal prediction is pending), monthly US CLIVAR newsgrams, the US CLIVAR Summit Report, the 2012 US AMOC Report, and Working Group white papers and journal articles. She migrated 2012 publications, including all future newsletters, to online electronic form, reducing program costs. Limited printing of reports, papers and articles for agency and authors will continue. A list of publications and reports is provided below.

### 1.4 International Program Support and Coordination

#### International CLIVAR Project Office

The USCPO supports activities of the International CLIVAR Program, including the funding of three staff positions of the International CLIVAR Project Office (ICPO): two full-time through a subcontract with the United Kingdom Natural Environment Research Council (U.K. NERC); one half-time through a NOAA awarded contract to the University of Buenos Aires. Work of each of the three staff over the past year is summarized below.

Dr. Anna Pirani, working from the International Center for Theoretical Physics in Trieste, Italy, assisted WG chairs in organizing meetings of International CLIVAR three modeling working groups: the 15<sup>th</sup> Session of the WG on Seasonal-to-Interannual Prediction (WGSIP) in conjunction with the 16<sup>th</sup> Session of the WG on Coupled Modeling (September in Hamburg), and the 10<sup>th</sup> Session of the WG on Ocean Model Developments (WGOMD, January 2012 in Venice) and drafted reports for each. She continued to coordinate the WGSIP Climate System Historical Forecast Project, developing the website and providing guidance on diagnostics and. She led the development of the WGOMD Repository for Evaluating Ocean Simulations (REOS), the development the Coordinated Ocean-Ice Reference Experiments (CORE) website, including a wiki page for the collaborative development and analysis of CORE-II experiment. Dr. Pirani supported the renamed African Climate Panel, including the design of a searchable database of African climate scientists, launch of the WCRP Africa Newsletter, and contributions to the Exchanges Special Issue on Africa. She presented on the Expert Team on Climate Change Detection and Indices (ETCCDI) at the Climate Change and Development in Africa Conference (CCDA-II), leading the development of an online course based on the ETCCDI regional workshop lecture presentations.

Dr. Nico Caltabiano, based in the ICPO at Southampton, UK, supported meetings of CLIVAR's ocean panels, including the 7<sup>th</sup> Session of the Pacific Implementation Panel (April in Noumea), the 12<sup>th</sup> Session of the Atlantic Implementation Panel (September in Kiel), the 9<sup>th</sup> Indian Ocean Panel meeting (October in Capetown), and the 6<sup>th</sup> Session of the Global Synthesis and Observations Panel (GSOP, November in Woods Hole). Dr. Caltabiano worked with panel co-chairs regarding meeting agendas, panel membership, meeting reports, website content updates and preparation of summaries for other meetings. Important contributions to advance the work of the ocean panels during the past year include coordinating the GSOP Workshop on Ocean Synthesis and Air-Sea Flux Evaluation (November in Woods Hole), developing the proposal to establish an ENSO Task Team, updating the

Indian Ocean Observing System (IndOOS) bibliography list, and assisting in the evaluation process to establish sustained observations in the Agulhas system as part of the IndOOS. He also served as editor of the CLIVAR Exchanges Special Issue on Africa and prepared the first WCRP Africa Newsletter (with Dr. Pirani). Dr. Caltabiano also participated in the US CLIVAR Summit, providing the update by the ICPO.

Dr. Carlos Ereno, working halftime for the ICPO from University of Buenos Aires in Argentina, supports activities of the monsoon panels of International CLIVAR. He supports the organization and reporting of meetings of the Asian-Australian Monsoon Panel (AAMP) and the Variability of the American Monsoons (VAMOS) Panel. For AAMP, he has helped organize the Proposed Workshop on Interdecadal Variability and Predictability of the Asian-Australian Monsoon (fall 2013 in China), and maintains the AAMP database of scientists in the Asian-Australian region interested in Asian-Australian monsoon and CLIVAR activities. Assisting VAMOS, Dr. Ereno coordinate logistics for the VAMOS Modeling Workshop (June in Petropolis), and collated the workshop report, as well as published the VAMOS newsletter (in conjunction this year with CLIVAR Exchanges, 2012) and maintain the VAMOS database of scientists in the Americas interested in CLIVAR activities. Further, he coordinated relevant La Plata Basin (LPB) activities among the Global Energy and Water Exchanges (GEWEX) regional hydroclimate project and the European-supported network for climate change assessment and impact studies. He also provided local support to the regional WCRP Stratospheric Processes As Related to Climate (SPARC) Workshop with focus on the Southern Hemisphere and South America and the 20th Session of the SPARC SSG (November in Buenos Aires).

#### International CLIVAR Scientific Steering Group (SSG), Panel and WG Meetings

The USCPO arranged and funded travel for all non-Federal US members of International CLIVAR SSG, Panels and Working Groups. Support for NOAA members was coordinated among the USCPO, the NOAA Climate Program Office and the traveling committee member. The USCPO closely monitored support of International CLIVAR meeting travel to ensure the 10% budget reduction through attrition was successfully achieved.

Mr. Patterson and Ms. Mays participated in the 19<sup>th</sup> meeting of the International CLIVAR SSG in La Paz, Mexico, June 11-14, 2012. Mr. Patterson prepared the US CLIVAR report presented by SSC Chair Dr. Lisa Goddard, providing updates on US activities including the development of a new US CLIVAR Science Plan, updates on the US AMOC Program, and progress of eight active US CLIVAR WGs.

Mr. Patterson participated in CLIVAR GSOP Panel and workshop on Ocean Synthesis and Air-Sea Flux Evaluation in Woods Hole, MA, November 27-December 1, 2012. He provided opening remarks from the US CLIVAR perspective (incorporating sponsoring agency guidance) and captured summary session meeting notes for the workshop organizers.

## 2 Publications and Reports

### US CLIVAR Reports and Newsletters

- US CLIVAR Office, 2012: 4<sup>th</sup> Annual Progress Report for a SOST Near-term Priority Assessing Meridional Overturning Circulation Variability: Implications for Rapid Climate Change., Report 2012-1, US CLIVAR Office, Washington, DC 20006, 100 pp.
- US CLIVAR Office, 2012: Understanding the Dynamic Response of Greenland's Marine Terminating Glaciers to Oceanic and Atmospheric Forcing. Report 2012-2, US CLIVAR Office, Washington, DC 20006, 22pp.
- US CLIVAR Office, 2012: 2011 US CLIVAR Summit Report. Report 2012-3, US CLIVAR Office, Washington, DC 20006, 32pp.
- US CLIVAR Office, 2012: US CLIVAR Variations, Vol. 10, No. 1, Washington, DC, 20006, 12 pp. *Focus: Climate and Ocean Carbon/Biogeochemistry*
- US CLIVAR Office, 2012: US CLIVAR Variations, Vol. 10, No. 2, Washington, DC, 20006, 16 pp., in preparation. *Focus: Decadal Predictability*
- US CLIVAR Office, 2012: 2011 US CLIVAR Summit Report. Report 2012-4, US CLIVAR Office, Washington, DC 20006, in preparation.
- US AMOC Science Team, 2012: 5<sup>th</sup> Annual Progress Report Assessing Meridional Overturning Circulation Variability. Report 2013-1, US CLIVAR Office, Washington, DC 20006, in preparation.

### US CLIVAR-Sponsored International Newsletters

- CLIVAR Exchanges, No. 58, Vol. 17, 56pp, 2012. *Focus: Ocean Basin Projects*
- Joint Edition of the Newsletter of CLIVAR Exchanges and CLIVAR VAMOS, No. 59, Vol. 17, 28pp, 2011.
- CLIVAR Exchanges Special Issue on Africa, No. 60, Vol. 17, 36pp, 2012.

### US CLIVAR-Sponsored Publications

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