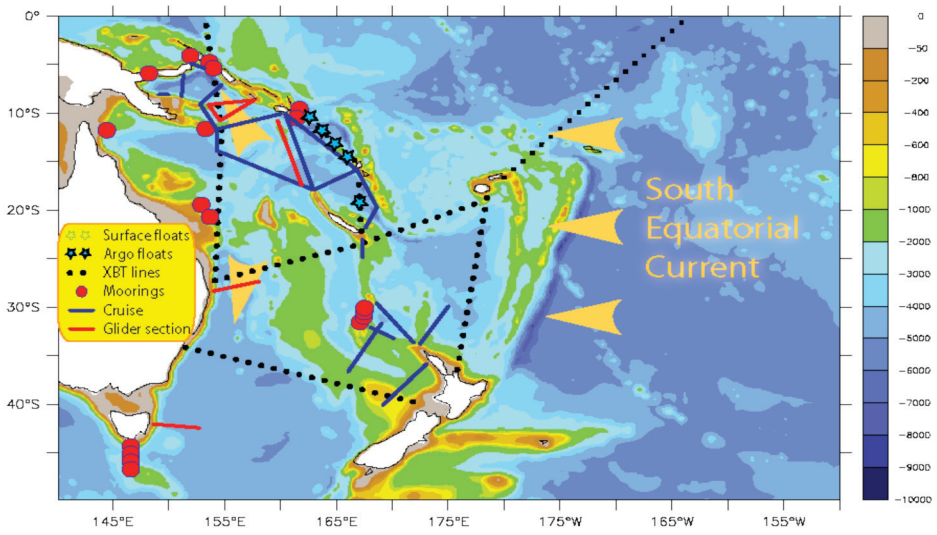
Newsletter of the Climate Variability and Predictability Programme (CLIVAR)

Exchanges

No 51 (Volume 14 No 4)

October 2009



From CLIVAR Pacific Observational Programs: page 7. Figure 2: SPICE field experiment (see the text for progress; moorings against Australia coastline are part of IMOS-GBROOS).

Editorial

Firstly, congratulations to Tim Palmer (CLIVAR SSG co-chair) both on his Professorship and the award of the 2010 Carl Gustav Rossby Research Medal by the American Meteorological Society (see bottom of page 3).

Two major conferences have been held since the last CLIVAR Exchanges newsletter, namely the World Climate Conference-3 (WCC-3, Geneva, 24-28 August 2009) and the OceanObs'09 Symposium (Venice, 21-25 September 2009). CLIVAR and WCRP more widely played a major part in the organisation and contribution to both of these events. In particular, Martin Visbeck (CLIVAR SSG co-chair) acted as chair of the Programme Committee for WCC-3 and Detlef Stammer (co-chair of CLIVAR's Global Synthesis and Observations Panel) acted as Co-chair of the organising committee of OceanObs'09 together with Ed Harrison (former Chair of the Ocean Observations Panel for Climate) and Julie Hall (Chair of IGBP's IMBER). Many members of the CLIVAR community contributed to both of these events and on behalf of the CLIVAR SSG I would like to thank all who took part. The major outcomes of both of these meetings in terms of the conference statement and declaration for WCC-3 and the conference statement for OceanObs'09 (which is also a "call to action") can be found at www.wmo.int/wcc3/page_en.php and www.oceanobs09.net/ respectively.

One of the contributing community white papers to OceanObs'09 was on global hydrography, organised through the Global Ocean Ship-based Hydrographic Investigations Panel (GO-SHIP) which is co-sponsored by the International Ocean Carbon Coordination Project, CLIVAR and in collaboration with the IGBP's SOLAS/IMBER Carbon Coordination Group. An outline of the evolution of GO-SHIP and the way forward for coordination of ship-based repeat hydrography is provided by Maria Hood on page 10 of this edition of Exchanges.

Submarine cables have monitored the Florida current transport since the 1980's and have also been used in other parts of the world. CLIVAR co-sponsored a recent workshop on this topic, led by PACSWIN (the Indonesian Throughflow: PACific Source Water Investigation). An account of this workshop is on pages 11 and 12. PACSWIN is looking to develop a long term submarine cable activity in the Indonesian Throughflow region, co-sponsored by CLIVAR.

A current long-term CLIVAR co-sponsored activity in Africa is AMMA, the African Monsoon Multidisciplinary Analysis. AMMA held its 3rd International Conference in Ouagadougou, Burkina Faso, West Africa in July, a brief account of which is on pages 14 and 15.

In the last edition of Exchanges, we focused on the outcomes of the CLIVAR SSG and CLIVAR's contributions to the overall WCRP Implementation Plan for the period out to 2015. This Plan has now been published and is outlined in the short article by Ghassem Asrar and Tony Busalacchi on page 3 which also gives the web address from which copies of the Plan can be downloaded. Work on a Plan for WCRP for the period beyond 2015 onwards is currently in progress.

The WCRP Implementation Plan puts particular emphasis on the cross cutting areas of WCRP research, one of which is the subject of climate extremes. GEWEX and CLIVAR are currently developing a focus on drought in this area, progress with which and an invitation for wider community involvement are to be found in the article by David Legler on page 4. Another area, one of the emphasised issues identified in the WCRP Implementation Plan, is collaboration with other international bodies and the International Geosphere-Biosphere Programme in particular. One of the areas where CLIVAR connects with IGBP is through the joint CLIVAR/PAGES (Past Global Changes) activity. This group have recently updated their vision document, a summary of which on pages 13 and 14

We have but one research article in this edition of Exchanges. The number of such articles has fallen off over the past 12 months and we will seek to encourage more by returning to "themed issues" based on the CLIVAR research imperatives (see last issue) as we go into 2010. In the meantime, please consider whether you have interesting research contributions, to contribute to Exchanges, the next edition of which (due out in January) will also incorporate the annual VAMOS newsletter.

Finally, I plan to retire from the ICPO at the end of March 2010 and, as you will see from the job advertisement on the inside back cover, we are seeking a new Director for the Project Office. We would be grateful if you could advertise the upcoming vacancy as widely as possible and encourage suitable applications before the closing date of 30 November 2009.

Howard Cattle

WCRP Implementation Plan 2010–2015

Ghassem R. Asrar , WCRP Director and Antonio J. Busalacchi, JSC Chair

In 2008 the sponsors of the World Climate Research Programme (WCRP) (the International Council for Science (ICSU), the World Meteorological Organization (WMO), and the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO)) commissioned an independent review of WCRP. They appointed an international panel of experts to evaluate the extent to which the international global change research programmes such as WCRP add value to their respective areas of research and to the national programmes that contribute to them. They asked the Panel to answer the question "What do scientists, sponsors and the end-users get out of participating in and supporting these international programmes that they would not have gained if the international programmes did not exist?". The Panel has completed its review and the final report can be found at http://www.icsu.org.

The major recommendations resulting from the independent review together with the internal discussions among the WCRP leadership (including the Joint Scientific Committee (JSC) that has the overall responsibility for defining, overseeing, and evaluating the scientific and technical activities of the Programme, the Chairs and Directors of WCRP Core Projects, and Chairs of the Working Groups and Panels who implement the programme activities), resulted in an overall programme assessment and planning activity that is currently continuing. The WCRP team decided to focus their deliberations on two time horizons: an intermediate period (2010-2015), and a long-term period (post 2015). The outline of the intermediate-term plan has been published recently and is available for download at http://wcrp.wmo.int/documents/WCRP_IP.pdf.

The document describes the major research activities and initiatives that WCRP will promote and undertake during the next several years. These activities/initiatives are based on the scientific challenges and opportunities of interest identified by the scientists involved in the Programme, as well as on the national and international scientific priorities that would most benefit from WCRP coordination. In addition to the interdisciplinary research and modelling initiatives identified, the themes of regional climate assessments and climate information for decision-makers also emerged from these discussions as requiring special emphasis by WCRP in the intermediate- and long-term. Indeed, there were considerable discussions on the means and modes for delivery of climate information to decision-makers, and the role that WCRP can and should play in this process. The major issue debated was how best WCRP should spend its limited resources and make use of its network of volunteers in the continuum that begins with observation, research, analysis, modelling and prediction and ends with synthesis and assessment and delivery of the climate information and knowledge to decision-makers. The general view is that WCRP must continue to support and enable excellence in climate observations and research, but also promote and enable a comprehensive climate information system for timely and efficient delivery of the resulting knowledge to decision-makers. Partnerships are essential to WCRP success in both areas.

The document provides some specific examples of activities and initiatives to be taken by WCRP and its Core Projects, it is not a comprehensive compendium of WCRP activities. It tries to convey the solid scientific foundation that WCRP has established during the first 30 years of its research on climate variability and change, and that forms the basis for future challenges and opportunities in delivering the resulting information and knowledge to decision makers for developing strategies and options for climate adaptation, mitigation and risk management across the major social and economic sectors and regions of the globe.

To implement these activities and initiatives, the WCRP functions and organizational structure will continue to evolve during the ensuing decade(s). A companion document entitled 'WCRP Long-Term Strategy: Functions and Structure' is currently under preparation and it will describe in detail areas of scientific focus and organizational structure for the Programme, beyond the next decade.

Congratulations to Professor Tim Palmer

Dr Tim Palmer, Co-chair of the CLIVAR Scientific Steering Group, has been awarded the 2010 Carl-Gustaf Rossby Research Medal by the American Meteorological Society. The Rossby Prize is presented to individuals on the basis of outstanding contributions to the understanding of the structure or behaviour of the atmosphere. It represents the highest honour that the AMS can bestow upon an atmospheric scientist. In January Tim also takes on a new challenge as the Royal Society Professor at Oxford's Department of Physics and Jesus College All his friends and colleagues in CLIVAR send their congratulations and best wishes on such great achievements (oh, and thanks for the Howard Song!?).

WCRP Drought Interest Group (DIG) Coordinates Drought Research for Better Prediction of Regional Drought

David Legler (U.S. CLIVAR Office) and Anna Pirani (International CLIVAR Office)
On behalf of the WCRP Drought Interest Group (DIG)

The World Climate Research Programme (WCRP) has identified extreme events as one of its major crosscutting foci. Topics covered by WCRP research on extreme events include prolonged drought, cold periods, the intensity of monsoons, the probability of occurrence of short timescale extreme events dependent on mean climate characteristics (e.g. tropical cyclones, mid- and high-latitude storms), severe frosts, air pollution extremes and heavy precipitation. WCRP is developing new projects in conjunction with The Observing System Research and Predictability Experiment (THORPEX) focusing on the predictability of atmospheric extremes. Various groups within WCRP focus on improving models, assimilation systems and observing system requirements for predictions that provide improved capabilities to provide probabilities of future extreme events. Other activities focus on improving capacity to measure and describe extremes.

The WCRP Drought Interest Group (DIG) was formed as part of the WCRP Extremes crosscutting activity following a joint Global Energy and Water Cycle Experiment-Climate Variability and Predictability Project (GEWEX-CLIVAR) Scientific Steering Group meeting in 2008. DIG aims to identify and leverage current drought research activities already underway within WCRP, especially under CLIVAR and GEWEX, through the activities of the CLIVAR Variability of the American Monsoon Variability of the American Monsoon Systems (VAMOS) panel, the US CLIVAR Drought Working Group, the GEWEX-Coordinated Energy and Water Cycle Observations Project (CEOP), etc. DIG will also assess the missing links in drought research and coordinate drought research at an international level in order to advance, in particular, predictive understanding of extremes .

DIG Activities and Future Plans

Thus far, DIG efforts have concentrated on the coordination of activities and enhanced cross-fertilization between the GEWEX and CLIVAR Projects. DIG has now embarked on identifying of strategic research needs in drought prediction and encouraging increased coordination of regional and international drought-research activities. Work has begun on a WCRP White Paper on 'Drought Predictability and Prediction in a Changing Climate: Assessing Current Capabilities, User Requirements, and Research Priorities'. This White Paper will assess current prediction capabilities against user needs with the aim of identifying areas that would benefit from international coordination.

The working structure of the White Paper focuses on the following objectives:

1. Motivate climate research targeting drought and the need for coordination
2. Summarize user drought prediction requirements
3. Document current drought prediction capabilities
4. Define research and development needs
5. Formulate recommendations on research/development priorities

The White Paper will set the stage for a pan-WCRP workshop that DIG is planning for late 2010. There is a wide-reaching need for drought predictions, and users' requirements for information can be very different depending on the application. The proposed workshop would aim to describe the needs for regional drought information and prediction, and assess what our capabilities are for meeting these needs, including the current understanding of what is, and what isn't, predictable. Special sessions will address how global climate features (e.g. monsoons, ENSO, decadal variability, climate change) can influence the nature and severity of regional drought. The timing of the workshop will coincide with the Coupled Model Intercomparison Project Phase 5 archive becoming available and will motivate the coordinated analysis of the archive in terms of drought. The outcomes of the workshop will be made widely available, possibly as a peer-reviewed article.

DIG aims to survey the drought research activities that are on-going around the world. This information is being collected on the WCRP Extremes website and will be summarized in a short report. An appendix is planned for the White Paper that will list all the groups within WCRP that are working in the area of drought and will include short statements from each group summarizing their activities. This activity will enhance the assessment of current drought prediction capacity and will contribute to the debate on how best to coordinate international research efforts on drought.

Invitation to take part in Future DIG activities

Drought is a major concern on nearly every continent and in many nations. Unfortunately, in terms of prediction, each region or nation has a subtly unique set of local climate conditions and drought forcings that can influence forecasts of drought and other types of drought information. Hence, the DIG invites regional drought researchers and experts interested in improving our capability to predict drought on time scales of weeks to centuries in the future to join its efforts. DIG hopes to facilitate communication between specialists knowledgeable in the demands for drought and drought prediction information and those addressing drought predictability, mechanisms, causes, attribution, observations, and prediction. Those interested in joining the DIG efforts and becoming part of the DIG network should contact Anna Pirani (anna.pirani@noc.soton.ac.uk).

For further information:
WCRP Extremes Crosscut and DIG:
http://www.clivar.org/organization/extremes/extremes.php

WCRP-Extremes/Risks (overview):
http://wcrp.wmo.int/ExtremesRisks_index.html

WCRP-Floods/Droughts (overview):
http://wcrp.wmo.int/FloodsDroughts_index.html

Preliminary Assesment Of The Soil Moisture Memory Role On Southeastern South America Summer Circulation

Saulo, C[1,2], P. Gonzalez[1,2], L. Ferreira[2,3], C. Vera[1,2]
[1]Departamento de Ciencias de la Atmósfera y los Océanos, FCEyN/Universidad de Buenos Aires, Argentina. [2]Centro de Investigaciones del Mar y la Atmósfera (CONICET-UBA), Buenos Aires, Argentina. [3]Servicio Meteorológico Nacional, Buenos Aires, Argentina
Corresponding author: saulo@cima.fcen.uba.ar

1. Introduction

Soil states strongly influence the surface water and energy budgets, which in turn affect the boundary layer conditions that control weather and climate at different time scales. In particular, soil moisture (SM) acts as a strong control on the partitioning between sensible and latent heat flux at the surface, modulating precipitation over given areas. Different mechanisms and/or circulation-land-surface feedbacks have been proposed to explain land-atmosphere coupling over South America. As can be expected, they depend not only on the specific area being considered (i.e Amazon core region, South Atlantic Convergence Zone –SACZ, among others) but also on the season and the temporal scale of the analysis (see Saulo *et al*., 2009 for a short review on available studies). In spite of this, soil moisture influence on both weather and climate anomalies in South America, has not been explored in detail yet.

Previous works have identified significant variability on intraseasonal time scales in precipitation anomalies over tropical and subtropical South America. In particular, the leading pattern of intraseasonal variability, known as the South American See-Saw (SASS) pattern, has been characterized by a dipole-like structure associated with wet (dry) conditions over the South Atlantic Convergence Zone (SACZ) and dry (wet) conditions over southeastern South America (SESA) (Nogués-Paegle and Mo, 1997). Moreover, it has been concluded that SASS variability is strongly influenced by that of tropical convection on the tropical western Pacific (e.g. Nogues-Paegle and Mo, 1997). However, the role of local forcing and

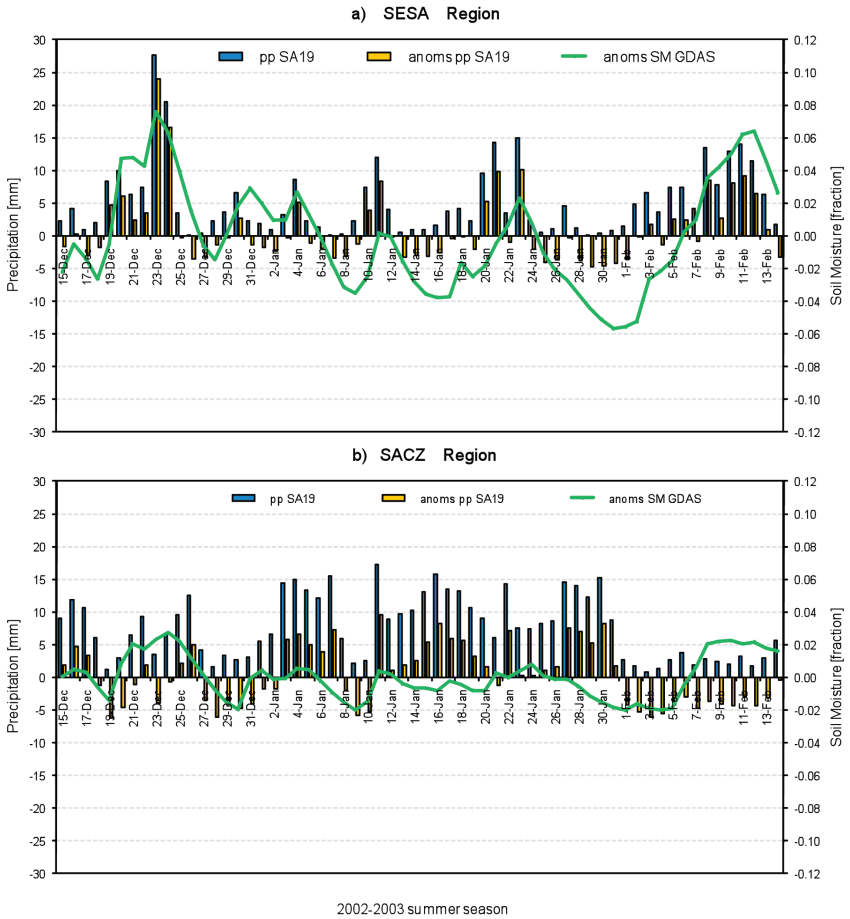


Figure 1: Area averaged evolution of observed daily accumulated precipitation in mm -blue columns-, its anomaly -yellow columns- and SM anomaly (m^3m^{-3})-green line- over SESA (a) and SACZ (b).

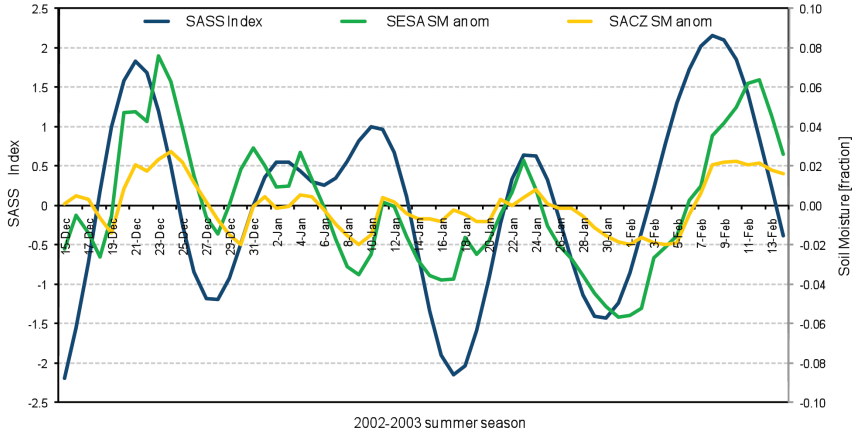


Figure 2: Evolution of the SASS Index and Soil moisture anomalies for SESA and SACZ

particularly that associated with soil moisture changes, in altering SASS activity has not been studied. Therefore, the relationship between soil moisture and precipitation at specific phases of the SASS pattern during the warm season in which the South American Low Level Jet Experiment (SALLJEX) was carried out (Vera *et al.*, 2006) is analyzed here. Special focus is made in exploring the possible influence of soil moisture anomalies on the strength and/or the duration of the SASS pattern.

2. Data And Methodology

The study focuses on the period of the 2002-2003 austral summer starting on December 15, 2002 and ending on February 14, 2003, which includes the intensive observing period of SALLJEX. That period has been selected because more precipitation data is available over the region of interest, and many studies have been devoted to analyze its atmospheric features. That particular period has been characterized by precipitation above normal over both SESA and SACZ regions.

Daily accumulated precipitation has been obtained from the dataset maintained by Liebmann and Allured (2005), using an enhanced observational network gridded with a 1° horizontal resolution. This data set will be referred to as SA19, according to the version used here. For the soil moisture analysis, we have employed the operational GDAS (Global Data Assimilation System) data. SA19 and GDAS soil moisture data at 12 UTC have been area averaged over two boxes covering (approximately) the area where precipitation anomalies are at a maximum at each phase of the SASS. The box to the north has been named "SACZ" (from 15°S, 54°W to 26°S, 45°W) and the one to the south "SESA" (from 25°S, 63°W to 35°S, 50°W).

SM anomalies have been defined with respect to the 2002-2003 seasonal mean, while those for precipitation have been computed considering the 1979-1999 long-term seasonal mean The SASS activity has been monitored through a specific index, as discussed by González *et al.*, (2008). The SASS index essentially is derived from the principal component of the leading pattern resulting from a rotated empirical orthogonal function analysis applied to the outgoing longwave radiation (OLR) filtered anomalies on the 10-90 day band over a domain encompassing 40ºS–5ºN, 75ºW–32.5ºW. The time series of the standardized principal component is considered as the SASS index. Hereafter, SASS positive phase, depicted by positive values of the principal component, is associated with the development of negative OLR anomalies (i.e. enhanced convection) over SESA and positive anomalies (i.e. inhibited convection) over the SACZ region.

3. Temporal Evolution Of Soilmoisture Anomalies And Sass

The evolution of both SM and precipitation anomalies at 12 UTC, spatially averaged over the boxes "SESA" and "SACZ" is shown in Figure 1. It can be seen that SM anomalies are more sensitive to precipitation variability over "SESA" than over "SACZ". In particular, SM response to precipitation changes shows up very fast in "SESA", which in general exhibits very high correlation between the anomalies of both variables. Moreover, it seems that over that region, the system needs a longer period of consecutive rainy days to overcome a SM deficit stage than that needed to evolve from positive SM anomaly conditions to negative ones. On the other hand, the conditions over "SACZ" box present a different behavior: precipitation occurs almost everyday, and that seems to result in a weaker reaction of SM anomaly to precipitation changes.

The possible relationships between SASS evolution and that associated with precipitation and SM anomalies at

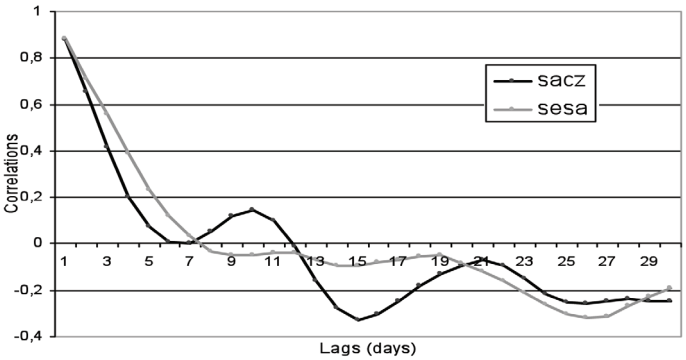


Figure 3: Soil Moisture lagged autocorrelation for "SESA" and "SACZ". Dot-dashed lines denote confidence limits

the two regions is explored with the aid of Figure 2. As it was mentioned before, positive values of SASS index are related to enhanced (inhibited) convection over SESA (SACZ). In general, Figure 2 shows that the temporal evolution of the three time series seems to be associated mainly with intraseasonal time scales. It should be pointed out that while SASS index was derived from filtered OLR anomalies, no further filtering has been applied to daily SM anomalies. Therefore, that behavior confirms the results of previous studies, which show that SM variability is slower than atmospheric variability.

It is evident that SASS index provides an "integrated view" of the general behavior of the OLR-anomaly dipole-like pattern. However, SASS evolution seems to be more closely related to SM anomalies over "SESA" than to those over "SACZ" (Fig. 2). In general, SASS leads SM anomaly changes over "SESA", except from December 28 to January 4 when SM anomalies slightly lead SASS, and between January 17 and January 28, when they seem to vary almost simultaneously. An analysis of the synoptic evolution associated with those particular periods is currently being done in order to improve understanding of such differences.

An autocorrelation analysis has been performed, in order to document SM memory over SACZ and SESA (Figure 3). In agreement with previous results (Dirmeyer *et al*., 2009), it was found that SM memory is relatively short, being below a week for "SACZ" and slightly longer for "SESA". Significant anti-correlated signatures have been found between 13 and 18 days in SACZ region and after 23 days in both regions. However, such correlation values should be considered with caution, since the period under study is short (only 61 days).

4. Concluding Remarks

Soil moisture, precipitation and SASS evolution have been explored during the 2002-2003 warm season. The aim has been to establish if there is a relationship between soil conditions and precipitation occurrence and ultimately, if land surface processes exert some control on the regional circulation. This preliminary analysis suggests that SESA region may be more clearly affected and modulated by soil moisture changes than SACZ region. On the other hand, it seems that remote scale forcing (i.e. that driving the SASS) was the most effective control on the precipitation variability over the area of interest, during that particular warm season. Further analyses of the role of surface processes should be done in order to understand particular responses under different large-scale conditions. Also, it would be of interest to analyze a longer period in order to detect if SM variability exhibits significant signals at lower frequencies, and to quantify their strength compared with those detected at synoptic time-scales. This could be relevant to assess if SM can provide enhanced predictability at longer time scales over this region.

Acknowledgments:

This study has been supported by the following projects: ANPCyT PICT 2004 25269, UBACyT X204, CONICET PIP 5417 and GC06-085 from NOAA/OGP/CPPA.

References

Dirmeyer, P.A., C.A. Schlosser, and K.L. Brubaker, 2009: Precipitation, Recycling, and Land Memory: An Integrated Analysis. *J. Hydrometeor.*, **10**, 278–288.

González , P., C. S. Vera, B. Liebmann and G. Kiladis, 2008: Intraseasonal variability in subtropical South America as depicted by precipitation data. *Clim. Dyn*., **30**,727–744.

Liebmann, B., and D. Allured, 2005: Daily Precipitation Grids for South America. *Bull. Amer. Meteor. Soc.*, **86**, 1567–1570.

Nogués-Paegle, J., and K. C. Mo, 1997: Alternating wet and dry conditions over South America during summer. *Mon. Wea. Rev.*, **125**, 279-291.

Saulo, C., L. Ferreira, J. Nogués-Paegle, M. Seluchi and J. Ruiz, 2009: Land-atmosphere interactions during a Northwestern Argentina Low event. Submitted to *Mon. Wea. Rev*, 39 pp.

Vera, C.; J. Baez; M. Douglas; C. B. Emmanuel; J. Marengo; J. Meitin; M. Nicolini; J. Nogues-Paegle; J. Paegle; O. Penalba; P. Salio; C. Saulo; M. A. Silva Dias; P. L. Silva Dias; and E. Zipser, 2006: The South American Low-Level Jet Experiment (SALLJEX). *Bull. Am. Met. Soc* , **87**, 63–77.

CLIVAR Pacific Panel Observational Programs

W. Cai, A. Ganachaud, C. Maes, D. Hu, B. Qiu, J. Lee, and M. Fukasawa

There are many significant, multi-national, multi-institutional, and multi-investor observational programs in the Pacific on-going or about to commence. These include Origins of Kuroshio and Mindanao Current (OKMC), the Southwest Pacific Ocean circulation and Climate Experiment (SPICE), the Northwest Pacific Ocean Circulation and Climate Experiment (NPOCE), Korean (Topical Western Pacific Climate Experiment (GAIA)) and Japanese activities in the western boundary currents. There are also activities of an inter-basin nature such as measurements of the Indonesian Throughflow. As a whole, these programmes cover the entire tropical to midlatitude western Pacific (Figure 1, page 8).

The CLIVAR Pacific Panel has been promoting and coordinating these efforts to maximise the synergy and value, and to achieve a greater scientific outcome. Together with the tropical array, these observations provide the necessary inputs to seasonal and decadal prediction and detection of long-term climate change. In addition, these activities will help address important scientific issues of tropical-extratropical linkages, the role of western boundary currents in heat and freshwater transports and in ENSO discharge/recharge processes, and the inter-basin oceanic teleconnection.

At the recent OceanObs'09 in Venice, principal investigators (PIs) of these projects met to show case the

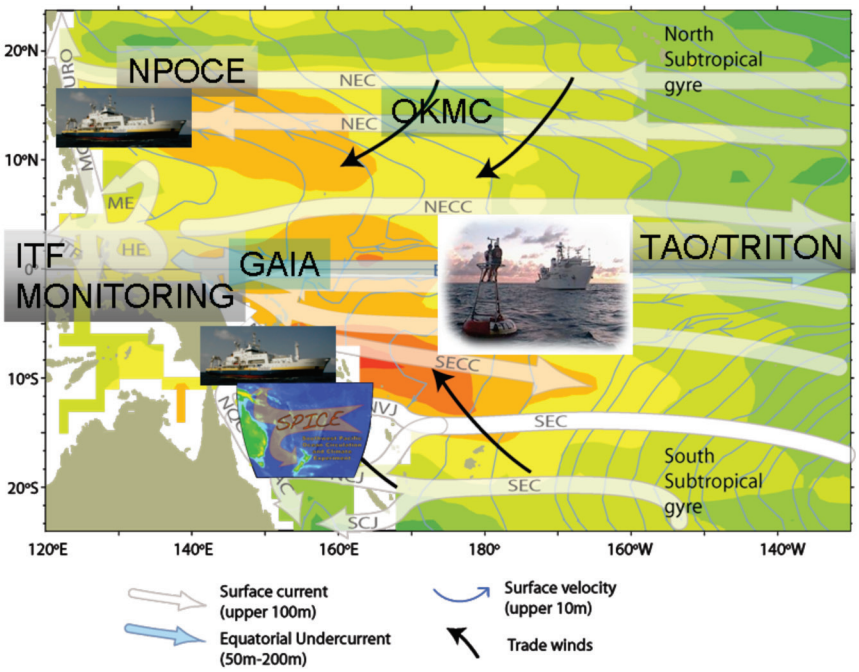


Figure 1: Schematic indicating major observational programs in the western Pacific (see text for details).

latest progress, exchange science and implementation plans, and foster linkages. This note presents a brief summary.

Progress of SPICE

Endorsed by CLIVAR in 2008, the Southwest Pacific Ocean Circulation and Climate Experiment (SPICE) provides a coordination platform to national and international projects in the Southwest Pacific region. It consists of a comprehensive observational program (Figure 2, front cover). The numerous projects that contribute to SPICE objectives have made significant progress.

A number of modeling groups have focused on the Coral, Solomon and Tasman Sea, providing improved realistic simulations in this difficult region with highly energetic currents and labyrinthine topography.

The field and modeling experiments, whose preliminaries started in 2004, have reached their intensive phase, which is expected to continue until 2012, and beyond for specific monitoring. A field experiment was designed to monitor the entrance of the large, easterly South Equatorial Currents into the Coral Sea, along with its outflows toward the equator and to the Southern Ocean. Using repeated XBTs and Argo profiles, an experimental monitoring system is ongoing. Near the Australian shelf, the expanding IMOS mooring network measures the coastal boundary current flows. This is completed with glider surveys across the boundary currents (currently starting). Surface drifters are released repeatedly across the East Australian Current to calibrate the ocean simulations and forecast from the Bluelink operational system (BMRC). In the Solomon Sea, intensive glider monitoring is ongoing and, after an exploratory hydrographic survey in 2007, a major cruise has been funded (2010-2011). During this cruise, mooring deployments are planned in key places of the Solomon Sea to monitor the transports toward the equator.

Using remote sensing or numerical simulation/assimilations, several studies have been started on the nature and physics of the SPCZ-the major dynamical driver of the southwest Pacific Ocean. A SPCZ workshop will be organized in mid-2010.

Most of the experiments are following the initial science plan; those are indexed on www.ird.nc/UR65/SPICE/spice.html. The emergence of experiments from NPOCE and GAIA, in the equatorial, the ITF region, and the tropical North Pacific will provide grounds for coordination to optimize the monitoring of the warm pool water supply and the fieldwork in remote areas that are difficult to access with research vessels.

NPOCE, OKMC, and GAIA

The Northwestern Pacific (NWP) features a complicated ocean circulation system with intensive multi-scale air-sea interactions. Under the leadership of Chinese scientists, NPOCE is designed to observe, simulate, and understand the dynamics of the NWP ocean circulation and its role in low-frequency modulations of regional and global climate.

NWP is a crossroad and major pathway whereby different water masses from mid- and high-latitudes and the southern hemisphere enter the equatorial thermocline. As the origin of several major currents including the northward Kuroshio, the eastward North Equatorial countercurrent, the Indonesian Throughflow (ITF), as well as the recently identified the South China Sea Throughflow, the NWP strongly interacts with the ambient oceans and marginal seas, and participates in the

recharge-discharge process of the western Pacific warm pool. The changes in the NWP water properties and NWP ocean circulation can influence the heat and freshwater budget and hence the atmospheric deep convection over the Indo-Pacific warm pool, thereby playing a role in modulating El Niño-Southern Oscillation (ENSO) cycles and Asian-Australian Monsoon variations, as well as in the development and evolution of the NWP cyclones.

The coordinated NPOCE observational program and modeling analysis will provide a more complete description of the structure and variability of the ocean circulation in the NWP, and help improve prediction of the climate drivers discussed above, and projection of local/regional ocean and climate conditions.

An implementation workshop is being organized to further calibrate the observational plan. This provisionally includes a series of multi-array moorings for examination of the bifurcation dynamics of the North Equatorial Current, heat and mass balance of the "confluence region" of the lower latitude Northwest Pacific linking the ITF and the Marginal Seas, and along a section extending into the warm pool (Figure 3).

Complementing NPOCE is the effort of the OKMC project, initiated by a group of investigators from several US institutions/universities. The goal of OKMC is to investigate the horizontal structure and temporal variability of the westward-flowing North Equatorial Current and its bifurcation into the Kuroshio and Mindanao Currents in the Philippine Sea. Planned in-situ measurements will include glider surveys across the Mindanao Current along 8°N and the Kuroshio along 18°N, mooring arrays along the Philippine coast, profiling float deployments along 135°E (north of Palau), and surface drifter deployments in the domain of NPOCE (Figure 3).

The effort in the area of the tropical-extratropical and Indo-Pacific linkage will be enhanced by GAIA. Like NPOCE, there is a modeling component as well as a substantial observational effort, which includes moorings in the western boundary current and the equatorial region. A focus is on equatorial thermocline mixing over the upper 500 m depth. GAIA will deploy CTD, LADCP, MSP, and Gliders. Some of the measurements will be along a TAO/TRITON line to increase resolution of measurements. The main experiments will commence in 2011.

An upcoming galvanizing workshop

At OceanObs'09, the PIs expressed the need for scientific and logistical coordination of these activities, in terms of experiment design and timing of deployments, taking into account other upcoming projects. One such project is a possible INSTANT2, hopefully an enhanced continuation of the successful INSTANT1, which measured and monitored the ITF over the past few years. A detailed NPOCE implementation plan will be constructed at the NPOCE Implementation workshop in Xiamen, China, January 2010.

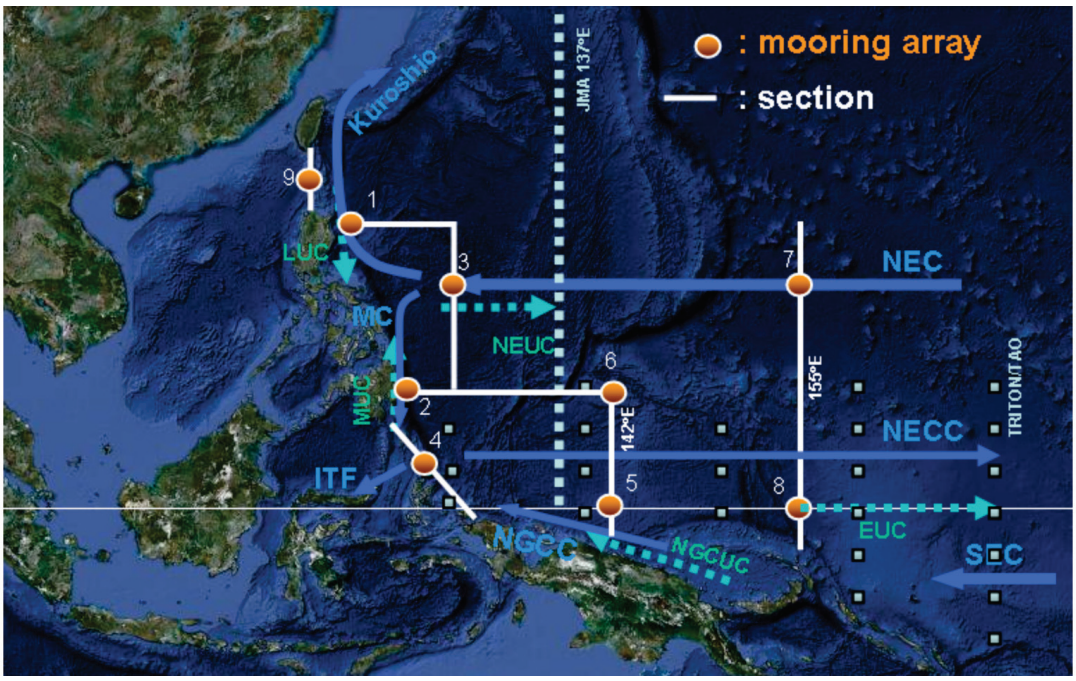


Figure 3. Design of NPOCE field experiments, indicating positions of mooring array and sections.

From Panel to Program: The evolution of GO-SHIP

M.Hood
corresponding author: maria.hood@ioccp.org

In late 2005, the International Ocean Carbon Coordination Project (IOCCP) and CLIVAR organised an International Repeat Hydrography Workshop in Japan. The workshop brought together experts on ocean carbon and biogeochemistry, physical hydrography, modeling and data assimilation, and the Argo program to review the science framework and implementation status of post-WOCE hydrography. The aim of the workshop was to provide guidance for a more coordinated system of data and information management, and establish plans to begin data synthesis activities. An outcome of that workshop was the formation of an advisory group called GO-SHIP (the Global Ocean Ship-based Hydrographic Investigations Panel). The Panel was charged with establishing guidelines and advice for the development of a globally coordinated network of sustained ship-based hydrographic sections that will become an integral component of the ocean observing system, and updating the 1994 WOCE hydrographic program manual.

GO-SHIP presented its community white paper at the OceanObs'09 conference from 21-25 September in Venice, Italy. The white paper brings together 46 co-authors from nine countries to give scientific justification and guidelines for the development of a regular and coordinated global survey. The strategy describes two types of surveys required to meet scientific objectives: 1) a global decadal survey conducted such that each full ocean basin is observed over an approximately synoptic time-period (< three years), and 2) a sub-set of the decadal survey lines sampled at high-frequency (repeats at least every two to three years). The strategy also recommends core variables for the decadal survey lines and advocates for a rapid release of data.

The paper was well received and used by many plenary speakers to develop their presentations. With the increased emphasis on biogeochemistry and biological variables to be included in the observing system for the next 10 years, repeat hydrography was recognized as the only method for obtaining high-quality, high horizontal and vertical resolution measurements of a suite of physical, chemical, and biological parameters over the full water column. However, in several side meetings and keynote presentations on the future of the in situ observing system, ship-based repeat hydrography was missing. When asked about this omission, speakers replied that hydrography was assumed to continue as part of the system without further intervention from the community.

Indeed, global repeat hydrography has lacked formal overall global organization since the end of WOCE and this has led to a lack of visibility of this component in the global observing system and a significant decrease in the number of trans-basin sections carried out by some countries. More importantly, the lack of international agreements for implementation of hydrographic sections has led to disparate data sharing policies, duplication of some sections, and sections being carried out without the full suite of core variables.

The GO-SHIP Panel met during the conference to discuss the way forward for coordination of ship-based repeat hydrography. While it is essential to maintain a repeat hydrography program firmly linked to national, regional and global research programs, the Panel noted that some elements of coordination and implementation could benefit from a more pro-active oversight structure and formal agreements. The Panel recommends the development of a sustained repeat hydrography program to:

- develop formal international agreements for a sustained international repeat ship-based hydrography program, including an internationally-agreed strategy and implementation plan building on the guidelines in the Community White Paper,
- advocate for national contributions to this strategy and participation in the global program,
- provide a central forum for communication and coordination, and
- develop syntheses of hydrographic data, in partnership with national, regional, and global research programs.

The program would be guided by an international steering committee composed of scientists from disciplines or projects that use and collect hydrographic data, including physical oceanography, carbon and biogeochemistry, biological oceanography, the Argo Project and the OceanSITES Project. The committee should also include regional representation to ensure coordination and communication within and between regions.

The IOCCP and CLIVAR International Project Offices have agreed to provide part-time project office support for GO-SHIP as the program develops. The Panel has been expanded and given new Terms of Reference to guide GO-SHIP through the next phase of development, specifically seeking endorsement by international/ intergovernmental organizations. Formal recognition, endorsement, and sponsorship of this project will be discussed at the next session of the Intergovernmental Oceanographic Commission (IOC) Executive Council (June, 2010). The GO-SHIP program is also described in the background documents for the November 2009 meeting of the WMO-IOC Joint Technical Commission on Oceanography and Marine Meteorology (JCOMM) for Member States' consideration. Panel Members include co-chairs Christopher Sabine (NOAA, USA) and

Bernadette Sloyan (CSIRO, Australia), continuing Panel members Masao Fukasawa (JAMSTEC, Japan), Nicolas Gruber (ETH-Zurich, Switzerland), Gregory Johnson (NOAA, USA), and Toste Tanhua (IFM-GEOMAR, Germany), and new Panel members Masao Ishii (MRI-JMA, Japan), Brian King (NOCS, UK), Lynne Talley (SIO, USA), and Richard Feely (NOAA, USA, ex-officio).

A 1-day international planning meeting in conjunction with the AGU / ASLO / TOS Ocean Sciences Meeting in Portland, Oregon, USA is tentatively planned for 21 February 2010 to discuss the way forward. This meeting is open to all, and scientists wishing to attend should contact Maria Hood at the IOCCP, or join the GO-SHIP email list to stay informed of the latest news.

For more information, visit the GO-SHIP web-site (www.go-ship.org), join the GO-SHIP email list by sending an email to sympa@lists.unesco.org with "subscribe go-ship" in the subject line, or contact Maria Hood at maria.hood@ioccp.org.

The First PACSWIN Submarine Cable Workshop

You, Y.,[1] T. Sanford[2], C.–T. Liu[3], P. Sigray[4], M. Koga[5], W. Pandoe[6], J. H. Lee[7], N. Palshin[8], Z. Szuts[9] and K. Taira[10]
[1]University of Sydney Institute of Marine Science, Australia; currently visiting the Taiwan Ocean Research Institute, Taiwan. [2] Applied Physics Lab and School of Oceanography, University of Washington, USA. [3]Institute of Oceanography, National Taiwan University, Taiwan. [4] Dept. of Meteorology, Stockholm University, Sweden. [5] Physical Oceanogr. Lab., University of the Ryukyus, Japan. [6] BPPT Technology Center for Marine Survey, BPPT 1st Bld, Indonesia. [7]Climate Change and Costal Disaster Research Dept., Korea Ocean Research and Development Institute (KORDI), Korea. [8] Shirshov Institute of Oceanology, Russian Academy of Sciences, Russia. [9]Max–Planck–Institut fur Meteorologie, Germany. [10]University of the Ryukyus, Japan
Corresponding author: yuzhu.you@gmail.com

1. Introduction

Submarine cables are simple and cost-effective systems for monitoring ocean transport – only a voltage recorder and computer are needed to make the observations (aside from calibration data) and as such, cables are promising sensors for obtaining long-term ocean climate measurements. This technique is especially useful in shallow straits and marginal seas such as the Indonesian seas, which are not sampled by the Argo network due to technical constraints. The PACSWIN (Indonesian Throughflow: PACific Source Water INvestigation) international ocean climate program will measure the Indonesian Throughflow (ITF) with submarine cables in addition to a broad range of standard oceanographic measurements (ADCP and XBT using commercial ships, satellite, moorings and floats etc.).

Submarine cables have monitored the Florida Current transport since the 1980s and have also been used around the world. Ocean currents studied by cables include the Kuroshio between Taiwan and Luzon, Taiwan and Okinawa, and Honshu and the Izu Islands; the Tsushima Current in the Korea / Tsushima Strait; transports between Gran Canaria and Tenerife; and wind-forced flow in the Baltic Sea. However, so far the application of submarine cables to oceanic currents has been carried out for only

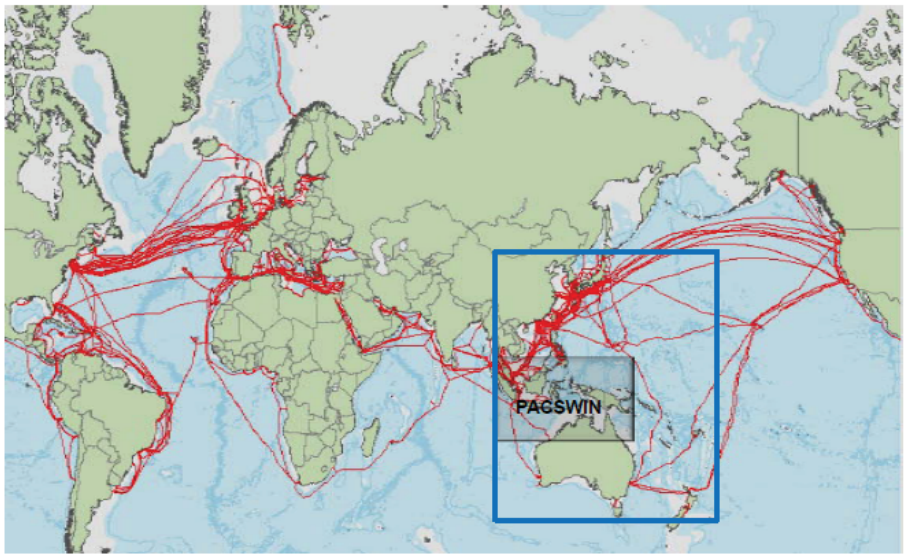


Figure 1. The global distribution of submarine cables (courtesy of Alcatel-Lucent) is shown by red lines; the domain of PACSWIN is shown by the green square and covers the region including and adjacent to the Indonesian seas; and the region of CLIVAR-endorsed-and-endorsing programs (SPICE, PACSWIN, NPOCE, GAIA and OKMC) in the western Pacific is shown by the blue square.

a minor proportion of the existing cable networks (see Figure 1) and, as yet, the technique is not being exploited to its fullest.

The western Pacific is an important region because of strong western boundary currents, closely-coupled atmosphere and ocean, and the upper-limb return flow of the global overturning circulation through the marginal seas of Indonesia. The ITF is complex and passes through many straits. Only recently were simultaneous mooring measurements (the INSTANT project, 2004-2006) carried out in this region to measure the ITF velocity and transport. It is very costly to maintain a set of moorings for timescales longer than a few years, however, and submarine cables allow long-term measurements to be continued on a sustainable basis.

Several submarine cables cross straits through which the ITF flows (Figure 2). In particular, two cables cross Makassar Strait, which contains the majority (estimated at 70-80%) of the ITF transport. PACSWIN has set the submarine cable as one of its priority monitoring components along with ADCP and XBT using commercial ships, satellite, moorings and floats. The cable routes in the Indonesian seas avoid the magnetic equator, which lies to the north near Mindanao.

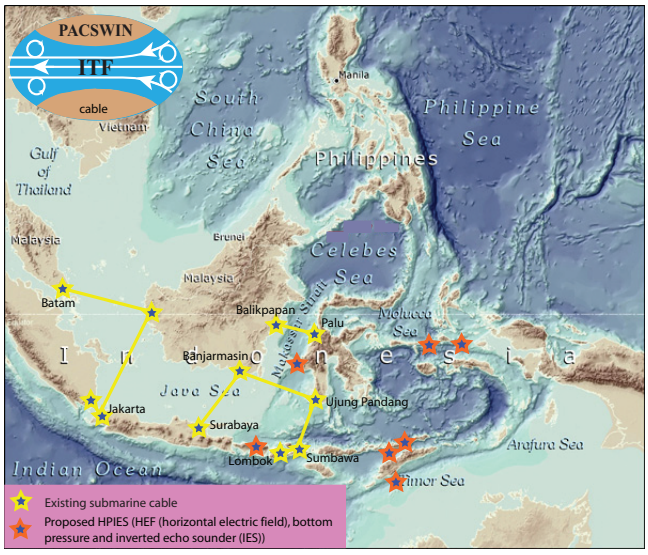


Figure 2. Submarine cables in the Indonesian seas (You et al., 2009) and proposed EFS/IES (E-field sensor/inverted echo sounder) for the straits without a cable.

2. Organization of the workshop

The First PACSWIN Submarine Cable Workshop was endorsed by CLIVAR on April 23, 2008. The workshop, held at the Howard International House, Taipei on 9-10 Sept 2009, included one and half days of presentations and a half day of discussion. One additional day was arranged for a field tour of the cable station that measures the Kuroshio transport between Taiwan and Okinawa.

Yuzhu You and Tom Sanford co-chaired the Organizing Committee responsible for the scientific program. Other committee members include Peter Sigray, Cho-Teng Liu and Momoki Koga. Two Organizing Committee meetings were held during the workshop for instructing the workshop activities. Cho-Teng Liu, as chair of the Local Organizing Committee, arranged the multiple activities with enthusiasm and hospitality.

The workshop was sponsored by the National Taiwan University, Taiwan Ocean Research Institute, the (Taiwanese) Coast Guard Administration and Environmental Protection Administration. After an official welcome speech and two opening speeches, the workshop comprised two invited lectures, given by Profs. Tom Sanford and Chao-Shing Lee (the National Taiwan Ocean University) and nine scientific presentations by scientists from Australia, USA, Germany, Russia, Japan, Sweden, Korea, Indonesia and Taiwan. A half-day discussion on the afternoon of the second day covered technical details and how to implement the cables. There were nearly 30 people in attendance (see the workshop photo, Figure 3).

3. Outcomes

The workshop provided an opportunity to update the community about recent developments in cable measurements and to review and promote the technique. Scientists familiar with this technique exchanged their experiences and shared their knowledge with those less familiar.

Since calculating meaningful water transport from cable measurements depends upon accurate determination of parameters such as tides, sediment conditions, channel depth, local magnetic field and comparison with independent velocity and transport measurements, the workshop allowed cable users to exchange methodologies to help standardize the technique. Discussions were focused on the issues of cable installation and calibration led by Peter Sigray and Tom Sanford.

Workshop participants agreed the basic setup for taking data (a voltmeter, time from GPS-synchronized clocks, and a computer for recording the data), the need for sampling every minute (or less) since rapid sampling might reduce noise and provide better hourly averages, the importance of knowing the electrochemical potential of the cable ends and/or the local ground, the necessary extensive and repeated calibrations to assure accurate performance and interpretation, and hourly mean data as a standard output.

Compared with the success story of the Florida cable, the workshop made a diagnosis for two other cables. First, the cable measurement of the Kuroshio between Taiwan and Okinawa (the OKITAI cable) shows time-varying cable calibrations dependent on the presence of cold and warm eddies and which may be associated with bottom topography (an empirical correction using data from repeat surveys, moorings, or ship measurements is anticipated to provide a more accurate calibration). Second, the cable measurement of the Tsushima Current in the Korea/Tsushima Strait has recently exhibited a

small but unexplained linear trend. After confirming that concurrent velocities from moorings, do not allow for a linear trend, the electrodes and devices should be checked for anomalous electrochemical changes and offsets.

To help establish the cable component of PACSWIN for long-term and cost-effective monitoring of the ITF, a scientific steering committee has been set up and its operation is being prepared. The next workshop will be after the initial implementation of the program and will likely be held in Indonesia in 2010.

More generally, the workshop not only prepares for the PACSWIN cable or the ITF monitoring program, but also for an increased global use of submarine cables. More detailed information can be found in the workshop webpage, http://sol.oc.ntu.edu.tw/pacswin/index.htm, with presentations in both digital and video forms to be available soon.

Acknowledgments
We thank CLIVAR for their endorsement of this workshop, especially Director Dr. Howard Cattle of CLIVAR IPO for his strong support. The sponsorship from the National Taiwan University, Taiwan Ocean Research Institute, the (Taiwanese) Coast Guard Administration and Environmental Protection Administration is gratefully acknowledged. The staff and a group of postgraduate students from the Institute of Oceanography, National Taiwan University, and from the Central Police University, are especially acknowledged for preparing the workshop and working hard to make the workshop successful.

Reference

Y. You, T. Rossby, W. Zenk, A. G. Ilahude, M. Fukasawa, R. Davis, D. Hu, D. Susanto, P. L. Richardson, C. Villanoy, C.-T. Liu, J. H. Lee, R. Molcard, W. W. Pandoe, M. Koga, T. Qu, R. A. Fine, A. Gabric, R. Robertson, Y. Masumoto, S. Riser, H. Hasumi, P. Sigray and T. Lee, 2009: Indonesian Throughflow: PACific Source Water INvestigation (PACSWIN): An international ocean climate program. In: Climate Alert: Climate Change Monitoring and Strategy, Y. You and A. Henderson-Sellers (eds.), University of Sydney Press, in press.

Figure 3. The participants of the PACSWIN 2009 workshop.

The PAGES/CLIVAR Intersection: Vision for the future

G. Schmidt[1], V. Masson-Delmotte[2], and Intersection Panel members
[1]Goddard Institute for Space Studies, NASA, New York, USA; gschmidt@giss.nasa.gov
[2]Laboratory Modelisation du Climat et l'Environment, France; valerie.masson@cea.fr

The PAGES/CLIVAR Intersection Working Group is jointly sponsored by PAGES and the Climate Variability and Predictability (CLIVAR) project of the World Climate Research Programme (WCRP), and plays an important role in developing and implementing the overlapping research interests of both these programs. The formation of the Intersection was predicated on the idea that paleoclimate studies provide a useful adjunct to studies of modern climate variability and likely future change. Since its establishment in the mid-1990's, the goals of the Intersection have evolved with the changing focus of each parent organization. At the Panel meeting in Italy in June 2008 the goals were again updated and are now detailed in a new PAGES/CLIVAR Vision Document.

A number of key scientific issues were identified by the Panel and will be addressed by the Intersection over the coming years. They are categorized into overarching cross-cutting issues, in addition to four more specific topical issues.

1) Overarching and cross-cutting issues
Forward modeling of proxy data:

- Whereby the proxy data is modeled directly by Earth System Models (ESM), is considered of fundamental importance to improving model-paleodata comparisons.
- Reducing uncertainties in proxy reconstructions (and data synthesis in general)
- Are important for improving climate modeling targets and for understanding the intrinsic variability and forced response of the climate system.
- Calibration of proxies against variability seen in the instrumental period
- Is a pre-requisite for improved synthesis of proxy- and observation-based approaches and requires interaction

between paleoclimatologists and climatologists.

2) Climate variability over the last few millennia

Well-dated, high-resolution proxy reconstructions and model simulations incorporating estimates of natural and anthropogenic forcings for the last 2 ka offer opportunities to assess the natural decadal- to centennial-variability and forced responses in conditions similar to present. Despite progress in recent years, however, important uncertainties and caveats exist with regard to both empirical reconstructions and model estimates.

Upcoming activities will therefore focus on advancing process-based comparisons of models and data through an enhanced appreciation of forward modeling of specific proxies and at specific sites, including an appreciation of the role of downscaling from large-scale model simulations. The Paleoclimate Reconstruction Challenge (http://www.pages.unibe.ch/science/prchallenge/index.html) and the regional PAGES 2k Network (http://www.pages-igbp.org/science/last2millennia.html) will both play key roles in driving the science of this issue.

3) North Atlantic circulation changes

Interactions among the ocean, atmosphere, and sea ice are the likely cause of decadal-multi-decadal and centennial variability in the Atlantic meridional overturning circulation (MOC), with attendant impacts on spatial patterns of temperature and precipitation. Thus improved understanding of MOC variability may serve to improve the climate projections in these regions. Uncertainties in model parameterizations and the response of the climate system to anthropogenic forcings make projections of future MOC behavior unclear. Since multiple proxy records reflect MOC changes and their climatic impact, MOC variability is an excellent showcase for the worth of using forward models of paleo-proxies, specifically ocean proxies, water, carbon and nitrogen isotopes, atmospheric chemistry, dust and sea salt aerosols.

The Panel will support synthesis activities focused on data-model integration, particularly those that seek to improve mechanistic understanding of multidecadal variability and its impacts on, in particular, hydrology.

4) Hydrological changes and interactions with the land surface

Recent observations indicate that the tropical realm is expanding with increasing occurrence of drought in the sub-tropics. This trend is projected to continue under IPCC AR4 scenarios. There is also considerable evidence suggesting terrestrial climate variability is strongly influenced by hydrological and biospheric interactions and feedbacks. This is particularly relevant to high-latitude regions and the tropics, where it has been shown that feedbacks between the monsoon and land surface conditions have significantly influenced climate variability on all timescales.

ESMs that incorporate these feedbacks are now being used for future climate change prediction and need to be rigorously tested against the paleoclimate record. The emphasis of the Intersection will primarily be on initiating and supporting data syntheses activities concerned with data-model interaction. Particular emphasis lies on forward modeling of climate proxy data with relevance for low latitude changes in hydrology.

5) Tropical Cyclones, Extreme Precipitation Events

For some extreme events (e.g., tropical cyclones, droughts and floods), there is some theoretical basis for expecting changes in their occurrence, associated with changes in background climate state. However, it is the nature of extreme events that they are rare, and so the observational record is often sparse. By targeting specific proxies (paleo-tempestology) or by increasing the appreciation of long documentary records available in Europe, US East Coast, Japan, China and Korea, an improved basis for the characterization of some extreme events could be developed.

For more detailed information on the planned activities of the Intersection, and the full Vision Document, please see http://www.clivar.org/organization/pages/pages.php

3rd AMMA International Conference : A great success

A. Sonneville
aude.sonneville@cnrm.meteo.fr
www.amma-international.org

The AMMA International Conference held in Ouagadougou from 20 to 24 of July 2009 represented a major rendez-vous of the community involved in research on the West African monsoon and its interactions with environment, resources and societies. Following on from the success of the field campaigns, data analysis has yielded significant advances in the knowledge of the monsoon mechanisms and paves the way to real improvement of forecasts and their applications, in particular for early warning systems. The presentation of such results in an enthusiastic atmosphere has highlighted a cohesive scientific community, and has also demonstrated a new step in the momentum of the African scientific community.

The conference brought together 500 people of whom 440 contributed to the 660 page book of abstracts (available on line at http://www.amma-international.org/rubrique.php3?id_rubrique=122). Approximately one third of the presentations were concerned with Society-Environment-Climate Interactions.

AMMA capitalises today on an unprecedented set of high-quality observations. The programme has facilitated

the networking of African scientists at a high level. One of the aims of this conference was to assess the outcomes from the first phase of AMMA and to strengthen and guide the plan for its second phase through debates and through AMMA international steering committee meetings.

The conference presentations are available on line on the AMMA website and the fall issue of the AMMA International newsletter will be dedicated to the synthesis of the results. 13 journalists from Africa and 20 French media representatives covered the event and attended the press conferences organised in Ouagadougou and Paris.

Director, International CLIVAR Project Office

£47,630 to £60,420 per annum

International CLIVAR Office, National Marine Facilities Division,

National Oceanography Centre, Southampton (NOCS)

The World Climate Research Programme (WCRP) and the UK's National Oceanography Centre, Southampton (NOCS) invite applications for the position of Director of the International CLIVAR Project Office (ICPO), located at NOCS. NOCS is a collaborative centre between the Natural Environment Research Council and the University of Southampton.

The Climate Variability and Predictability (CLIVAR) project is one of four core projects of the WCRP. CLIVAR coordinates and facilitates national and international activities that contribute to our understanding and prediction of climate variability and change on seasonal, decadal and centennial timescales. The Director of the Project Office takes a leading role in the development and implementation of CLIVAR under the general guidance of the CLIVAR Scientific Steering Group. The successful applicant will provide science and administrative leadership of the ICPO and of the CLIVAR programme. Your role will be to oversee and manage the implementation of the plans and activities of each of the project elements of CLIVAR in support of the overall mission and strategy of WCRP. You will maintain active links between CLIVAR and the wider science community stimulating and organizing scientific meetings, workshops and conferences and ensuring the timely flow of information on CLIVAR. You will be responsible for the management of the Project Office staff budget and operations and for maintaining and developing its funding base.

You will have a Ph.D or equivalent in a relevant field and considerable experience of working in climate-science. A proven ability in science management including winning external funding is essential and you should have demonstrated the ability to conceive, organize and manage interdisciplinary and international science activities and initiate and sustain international cooperation. This post is for 3 years and the salary is in the range of £47,630 to £60,420 per annum. Benefits include RCUK pension scheme and up 30 days leave and 10 ½ public/privilege days. The role will include periods of travel both within the UK and internationally.

Enquiries regarding CLIVAR and its international role should be made to Dr Howard Cattle on +44 (0)23 8059 6208; email hyc@noc.soton.ac.uk

It is proposed that interviews will take place on 12 January 2010.

For further information on this position and to download an application pack, please visit http://www.oceanography.ac.uk/jobs or alternatively contact Judith Gardham, Human Resources, NOCS, European Way, Southampton SO14 3ZH (Telephone +44 (0)23 8059 6155 or e-mail: jacg@noc.soton.ac.uk) for an application pack.

The closing date for completed applications is **30 November 2009.**

Please quote reference number NOCS 102/09 on all correspondence.

Contents

Editorial	2
WCRP Implementation Plan 2010 – 2015	3
WCRP Drought Interest Group (DIG) Co-ordinates Drought Research for Better Prediction of Regional Drought	4
Preliminary Assessment of the Soil Moisture Memory Role on Southeasten South American Summer Circulation	5
CLIVAR Pacific Panel Observation Programs	7
From Panel to Program: The Evolution of GO-SHIP	10
The First PACSWIN Submarine Cable Workshop	11
The PAGES / CLIVAR Intersection: Vision for the Future	13
3rd AMMA International Conference: A Great Success	14

The CLIVAR Newsletter Exchanges is an un-refereed means of rapidly disseminating scientific results and information about the CLIVAR programme and related science and organisational issues. The articles that we accept often present preliminary results or summaries and are of limited length Contributors are invited to discuss proposed articles with the Newsletter editor before submission.

Full details of how to submit articles can be found at

http://www.clivar.org/publications/exchanges/guidel.php

The CLIVAR Newsletter Exchanges is published by the International CLIVAR Project Office
ISSN No: 1026 - 0471

Editor: Howard Cattle and Kate Stansfield
Layout: Sandy Grapes
Printing: Indigo Press, Southampton, UK

CLIVAR Exchanges is distributed free of charge upon request (email: icpo@noc.soton.ac.uk)

The ICPO is supported by the UK Natural Environment Research Council and NASA, NOAA and NSF through US CLIVAR.

If undelivered please return to:
International CLIVAR Project Office
National Oceanography Centre Southampton
University of Southampton Waterfront Campus
Southampton, SO14 3ZH, United Kingdom
http://www.clivar.org