

CLIVAR SSG-18 Action Items

Relating to 'Grand Challenges Teams'

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ACTION ITEM 5: Clarify the WCRP monsoon structure with one paragraph input from GEWEX, WGSIP, VAMOS, AAMP

Scaife, Berbery, Sperber

AAMP

With regard to the structure: AAMP is focused on the unique features of the AA, especially the MJO/BISO, air-sea interactions in the Indian Ocean and western Pacific and interaction of the AA with ENSO. A primary focus has been on advancing multiweek monsoon prediction and improved understanding of mechanism that provide intraseasonal predictability. AAMP also covers decadal and climate change aspect of the monsoon that are unique due to large human influence (brown cloud) and enormous range of landscapes that challenge our modelling capability.

We are set apart from WGSIP with regard to prediction work mainly by the intraseasonal focus.

We are set apart from VAMOS because the AA and SAM are completely different kettles of fish. SAM worries about low-level jet and interaction with a long N-S mountain range. AA is highly intraseasonal, has an enormous human influence (brown cloud), is multifaceted, and air sea interaction plays a key role.

And some questions concerned that, once again, because monsoons cut across land and ocean domains, they may not be adequately addressed in new WCRP structure

- Models do not simulate monsoons well
- How much is resolution (e.g. of topography, land-sea divide)?
- Can models simulate the floods in Pakistan, China, India in summer 2010, and in Australia in their summer 2010-11?
- Are there major themes that can focus coordination?

VAMOS

VAMOS focuses on understanding the regional physical processes that define the North and South American monsoons lifecycles. Field Campaigns have been carried out when feasible to verify or disprove scientific hypothesis on the American monsoons mechanisms. VAMOS has developed a solid modeling plan to investigate the physical processes involved in the American monsoons, but also to identify possible sources of biases and uncertainties affecting the reliability of the models in regards to monsoons. Research in VAMOS has not only aimed at understanding the forcings of the monsoon, but also the impacts of monsoons in precipitation regimes in nearby regions up to the continental scales. Synergies between monsoon circulations and extreme precipitation events are also a theme of interest for VAMOS. The time scales of interest range from intraseasonal to seasonal, although work on interannual and longer scales is also addressed.

Given the sheer differences in magnitude and impacts between the Asian monsoon and the American monsoons, a comparison would mask the most relevant aspects associated with the American monsoons. Previous attempts to create a common framework to monsoons studies have failed precisely for that reason. Therefore, VAMOS has focused on the relevant aspects of the monsoon that are of interest for the regional community rather than attempting an exercise to find similarities and differences between each of the monsoon systems of the world. The value of a large involvement of the regional

scientific community cannot be understated, and we wonder if a more general approach unifying monsoons studies would not be detrimental to the regional initiatives.

ACTION ITEM 6: Develop Terms of Reference (TOR) and list of potential members for Task Force on how WCRP/CLIVAR can best improve components of earth systems models (perhaps modelling on US CLIVAR CPTs)

Terray, Bony, Drange, Scaife, Rintoul, Berbery, Schubert

No action taken because this will be under the purview of the modelling council.

Worth re-visiting at the SSG to find a mechanism for CLIVAR to address key issues for improving the ocean-atmos(-ice) components of ESMs.

ACTION ITEM 7: Develop TOR and list of potential members for Task Force on how best to communicate WCRP/CLIVAR research findings to IMBER and coastal research communities, and develop mechanisms for enhancing collaboration and exchange

Drinkwater, Cai, Yu, Speer, Wang, Haines

TOR and potential members for task force developed by Ken Drinkwater.

Background

The goal of the IGBP-sponsored oceans project Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) is to investigate the sensitivity of marine biogeochemical cycles and ecosystems to global change, on time scales ranging from years to decades. In addition they wish to provide a comprehensive understanding of, and accurate predictive capacity for, ocean responses to accelerating global change and the consequent effects on the Earth System and human society. To achieve this it is critical to understand processes generating climate variability both in the atmosphere and the oceans. Important issues include the air-sea fluxes and the exchanges of heat, momentum and CO₂, also large-scale atmospheric forcing and the coherent variability represented by atmospheric indices such as the southern Oscillation Index (SOI), the Pacific Decadal Oscillation (PDO), or the North Atlantic Oscillation (NAO), or oceanic indices such as the Atlantic Multidecadal Oscillation (AMO). Predictions of future changes in the atmospheric forcing and the ocean's response, as well as the uncertainty in these predictions, are required to test hypothesis concerning impact on the environment. It is important for the impacts community to be able to communicate to the climate community what their requirements are, both in terms of the past climate and the future. Equally important is for the climate community to understand what is required to determine potential impacts, to explain what and may happen and why, and also what cannot be achieved. One example of such cooperation is the involvement of the CLIVAR Indian Ocean Panel in IMBER's regional program, Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER). Another is the interaction between scientists on both sides in the development of the Southern Ocean Observing System (SOOS) plan. To help further such two way communication and collaboration, it was decided at the 2011 CLIVAR SSG meeting to form a CLIVAR/IMBER Task Force, to develop its Terms of Reference and identify potential members.

Terms of Reference

The aim of the CLIVAR/IMBER Task Force is to develop two-way communicate and collaboration between the climate community (CLIVAR) and the community studying the impacts of climate change (IMBER). To achieve this goal the Task Force will:

- a. Work by correspondence during 2011 to develop Terms of Reference for the Task Force;
- b. Put together a list of meetings and workshop where joint participation would be useful and circulate it to the CLIVAR SSG and IMBER SSC to encourage members to consider attending;
- c. Plan and organize a joint session between CLIVAR and IMBER at their 2012 Annual Meetings to be held in La Paz, Mexico;
- d. Meet together during the joint Annual meetings to:

- Discuss an action plan that will include joint meetings, workshops and activities during the coming year or two; and
- Finalize the membership list of the Task Force.

Membership

The membership should be relative small with equally representation between CLIVAR and IMBER, with potentially 1-2 other participants from outside these communities if interested.

Potential Members:

Juergen Alheit	(Germany; former chair of GLOBEC's Small Pelagic fish And Climate Change, SPACC)
Wenju Cai	(Australia; CLIVAR Pacific Panel)
Ken Drinkwater	(Norway; IMBER SSC and Ecosystem Studies of Sub-Arctic Seas (ESSAS) and CLIVAR SSG)
Jean Pierre Gattuso	(France; IMBER Carbon Cycling)
Keith Haines	(UK; CLIVAR Global Synthesis and Observations Panel, GSOP)
Raleigh Hood	(USA; IMBER, SIBER)
Oliver Maury	(France; IMBER, Climate Impact on Oceanic Top Predators, CLITOP)
Eugene Murphy	(UK; Integrating Climate and Ecosystem Dynamics, ICED)
Kevin Speer	(USA; CLIVAR Southern Oceans Panel)
Dongxiao Wang	(China; CLIVAR SSG)
Weidong Yu	(China; CLIVAR Pacific Panel)

(Note that at this stage none of the suggested IMBER members have been approached).

Duration

The duration of the Task Force will be for 3 years (to 2015). At this time the Task Force, in conjunction with the CLIVAR SSG and the IMBER SSC, will assess its effectiveness and need. Based on this assessment the Task Force will recommend whether it should continue or disband.

ACTION ITEM 8: Develop TOR and list of potential members for Task Force on how best to communicate CLIVAR research findings

Detemmerman, Boscolo, Drinkwater, Gulev, Rintoul, Masson-Delmotte, Blade, ICPO

Task Force Members

V. Masson-Delmotte (chair)

C. Beswick

I. Blade

K. Drinkwater

L. Goddard

S. Gulev

S. Rintoul

Terms of Reference

The Task Force will:

1. Advise the CLIVAR Scientific Steering Group (SSG) and International CLIVAR Project Office (ICPO) on action regarding the communication of CLIVAR science, with a priority on:
 - Scientists communicating to scientists: i.e. communicating about the project to entrain scientists into the CLIVAR community. Also to encourage communication and collaboration across different disciplines.
 - Scientists communicating to decision makers and funders: i.e. communicating CLIVAR's aims and achievements for the purposes of maintaining support for the project.
2. As time permits, consider how to interact with the ongoing efforts with respect to communicating climate issues to the media and the general public.
3. Develop a communications strategy to address the following major topics:
 - Provide input to the ICPO on the website;
 - Help to stimulate the development of networks of scientists to communicate across different groups and disciplines;
 - Advise the ICPO on the need for and content of brochures, banners, and generic presentations.
 - Promote access to existing training modules, for scientists to better communicate, through the ICPO.

Deal with any other business as appropriate.

ACTION ITEM 9: Develop TOR and list of potential members for Task Force on design of ocean climate indices on time scales from days to centuries

Harrison, Masson-Delmotte, GSOP, basin panels

It was proposed to wait for the upcoming GSOP workshop and intercomparisons synthesis and move from there.

ACTION ITEM 10: Develop TOR and list of potential members for Task Force to map out CLIVAR decadal variability and predictability activities across all panels, linking with US CLIVAR Decadal WG and WGCM/WGSIP DCP

Goddard, Boer, Scaife, WGSIP, WGCM, basin panels

The WGCM/WGSIP Decadal Panel satisfies this action item.

**ACTION ITEM 13: Report on on-going studies of regional sea level changes to ICPO
PP, IOP, AOP, SOP**

AIP

In Germany the research program BMBF NORDATLANTIK that focuses on ocean variability in the Atlantic sector from the Arctic Ocean to the Equator includes modeling studies of Atlantic sea level changes on regional scale.

IOP

IndOOS has a tide gauge component and sea level change is a big concern in Indian Ocean community, with some countries facing challenges regarding changes on sea level. In the Indian Ocean warming is quite clear and this is related to the sea level change. There are some studies working on understanding the local/remote forcing of sea level and thermocline depth at the "Thermocline ridge (the open-ocean upwelling zone of the Indian Ocean)" on intraseasonal, seasonal and interannual timescales

PP

There is a work on the decadal variations in the Indo-Pacific regions using and OGCM and CMIP3 results, with an article to be submitted which will focus on decadal and long-terms variations of the Indo-Pacific Warm-pool. In the Pacific region, it is difficult to separate anthropogenic and natural variability signals. Also PCCSP has sea level projection, and a sea level seasonal prediction project with involvement from panel members.

SOP

There are not a lot of observational studies focused on sea level in the Southern Ocean due to the difficulty in measurement there. To overcome this difficulty, it is important to extend the Argo coverage to ice-covered regions by the installation of more sound sources (currently available only in the Weddell Sea). Since recent studies (Purkey and Johnson, 2010; Kouketsu et al., 2011) have pointed out that basins around Antarctica have large temperature increase in abyssal layers, it is also important to carry out revisit full-depth hydrographic surveys along the WOCE lines. Recent modeling studies on 21st century projections of sea level rise have pointed out the presence of the belt-like negative anomalies around Antarctica (Yin et al., 2010) and the dominance of thermosteric changes in the Southern Ocean (Pardaens et al., 2011).

ACTION ITEM 14: Report on on-going work and future aspirations on upwelling systems to ICPO

AOP, VOCALS, IOP

IOP

Upwelling is considered as one potential grand challenges and it draws much attention in IOC. This topic is very important for Indian Ocean. There are at least two upwelling systems of great scientific value, Java-Sumatra upwelling and upwelling in the northwestern coastal Indian Ocean. The seasonal upwelling along Java-Sumatra plays the critical role in the Indian Ocean Dipole. These two upwelling systems are also addressed in SIBER Science Plan. There are already some preliminary discussion to think about the multi-discipline research on these two upwelling and look at their contrast. I believe in the next several years we will have upwelling research project and very likely Java-Sumatra upwelling will be the first step. Han et al. 2010 shows enhanced upwelling pattern in the TRIO region, which is the mean upwelling zone. Also, in the Maldives Islands region, there are strong "seasonal sea level change" since the 1960s: wintertime sea level shows increasing trend and summer time sea level shows decreasing trend. The Indian Ocean also has an open-ocean upwelling region in the South Indian Ocean thermocline ridge area. IOP members have been conducting studies for this region from mixed-layer temperature and salinity balance to sea level variations. Next IOP meeting will discuss this issue in more detail.

PP

A modelling framework is currently being developed by French colleagues to investigate the global climatic impact of Eastern Pacific upwelling using a tropical coupled model (WRF-NEMO) with high resolution in the upwelling region (upscaling). This will allow to investigate influence on trade winds intensity, SPCZ characteristics and ENSO. At NCAR we work on nesting a high-resolution ROMS into the fully coupled CESM. The focus is currently on the California coast, but this nesting will also be applied to the South Eastern Pacific.

AIP

In Germany, the research program BMBF NORDATLANTIK that focuses on ocean variability in the Atlantic sector from the Arctic Ocean to the Equator (it includes for example the Labrador Sea Boundary Current and Equatorial mooring arrays), is likely to include observations with a component in the Benguela upwelling region (IOW, Warnemünde, Germany). This BMBF program is thought to fundamentally contribute to CLIVAR goals. Another ongoing program is the SFB754 "Climate-Biogeochemistry Interactions in the Tropical Ocean" (University Kiel and IFM-GEOMAR, Germany) that analyze physical-biogeochemical coupling in the eastern North Atlantic coastal upwelling region and their interaction with the oxygen minimum zone within several subprojects. Several studies are in place in the Benguela upwelling system mainly in relation to fisheries. The Benguela Current Commission (BCC) is supposed to coordinate activities for Angola, Namibia and South Africa in relation to fisheries in the Benguela upwelling. Also the newly founded Nansen Tutu Center for Environmental Study (A Norway - South Africa initiative) wants to do operational oceanography in the Benguela and Agulhas Currents systems. ICEMASA is a French initiative that also has strong component on upwelling systems.

ACTION ITEM 20: Contribute to the model improvement CPT and develop a strategy on how to best reduce tropical biases with a focus on the Atlantic in the context of a cross cutting CLIVAR ‘challenge’

AIP, WGSIP, WGCM, WGOMD

Report being written describing results of Atlantic bias workshop and actions to be taken.

There is a proposal of a US CLIVAR working group to work on this issue. Therefore the best way forward may be to collaborate with them.

ACTION ITEM 35: Identify capacity building activities for CLIVAR with ICPO developing a template

Panels, Working groups, ICPO

A template was developed by the ICPO and distributed to CLIVAR's panels and working groups. Completed forms can be found in Annex A. A summary is provided below.

Capacity building is predominantly in the form of providing travel support for early career researchers and scientists (and other groups such as government agencies, NGOs, private sector) from developing countries, to attend panel/wg meetings and workshops. ETCCDI also now plans for transferring workshop teaching material to an online Moodle course on data processing, quality control and indices calculations.

Dedicated CLIVAR workshops are also utilized as a forum for capacity building (e.g. VACS 2006 workshop aimed at training young scientists, NMHSs and the wider research community; Pacific Panel providing training and tools for South Pacific Countries; IASCLiP training for island nations), as well as co-sponsorship of summer schools and training for young scientists (e.g. ClimECO summer school, CLARIS LPB, the Pacific Panel's ENSO Summer School).

However, respondents noted a lack of funding to hold dedicated capacity building workshops. One suggestion was to establish a network of funding partners to support sustained activities. Dealing with cultural differences can also be a challenge.

ETCCDI activities have highlighted a specific challenge: many nations do not as yet commit to the free and unrestricted international exchange of meteorological and related data and products. In some cases where the raw data is not permitted for exchange, nations will contribute post-processed indices data only, which is problematic in terms of transparency

It was suggested that programmes endorsed by CLIVAR should be asked to report on their activities regarding capacity building. AIP will develop a structure to collect information on capacity building activities and distribute them via the panel webpage.

Looking at other programmes, there have been some successful activities, such as AMMA, which aimed at improving the understanding of the African Monsoon as well as weather and climate prediction in sub-Saharan Africa.

It was noted that panel/working group members carry out capacity building activities, but not necessarily as part of CLIVAR activities. IndOOS is an example where CLIVAR members are actively involved in capacity building of Indian Ocean rim countries.

ACTION ITEM 36: Determine who is using CLIVAR information, how the transfer of knowledge is organized using an ICPO developed template

Panels, working groups, ICPO

A template was developed by the ICPO and distributed to CLIVAR's panels and working groups. Completed forms can be found in Annex B. A summary is provided below:

Knowledge transfer is predominantly in the form of the following:

- Workshops
- Workshop reports
- Exchanges and other newsletters
- Webpages (e.g. ETCCDI indices and software, VACS climate atlas, REOS, CORE, easyINIT synthesis information repository, IndoOS data portal)
- Review papers, white papers, guideline documents
- IPCC authorships
- Listserves
- Peer reviewed papers
- AAMP have developed diagnostics for operational centres and climate model diagnosticians
- The Southern Ocean panel has a consortium of national representatives on the Southern Ocean.

The target audience is primarily the scientific community, but also funders, decision makers and the public to a lesser extent.

Successes, such as the global synthesis evaluation effort championed by GSOP and IOP activities under IndoOS, are improving technical knowledge and capabilities, and research activities in countries such as Indonesia. However, it is noted that with respect to IndoOS, to better use the data in national and regional application is still challenging. There is a need to educate the importance of IndoOS data and utilize datasets efficiently to understand different Indian Ocean Processes.

Several challenges were highlighted:

- Some of the capacity building and knowledge transfer activities are based on rather short-term projects and/or in-house funding. Mechanisms to secure long-term commitments from both sides, i.e. knowledge providers and receivers, should be established.
- Additional support/skills needed to further develop software, websites.
- A lack of new generation of expertise / expertise in developing countries is a problem.
- Using appropriate languages suitable for different target audiences.
- There is a need to establish better linkages to the user community to inform the users of the capabilities and limitations of the ongoing experimental forecasting.

There was a suggestion that programmes endorsed by CLIVAR should be asked to report on their activities regarding knowledge transfer.

Annex A – Capacity Building Forms

Southern Ocean Panel

1) Date form completed:

23rd April 2012

2) Working group/panel responding:

Southern Ocean Panel

3) Responder and position (e.g., co-chair):

Catherine Beswick, Staff Scientist, with input from panel co-chairs (Kevin Speer and Matthew England)

4) Who is the target group/s of working group/panel's capacity building efforts?

Early career researchers

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Invitations to panel meetings and workshops, to present and contribute to discussions (e.g. SOP7)

6) Past capacity building activities

As above

7) Present capacity building activities

As above

8) Planned future capacity building activities

Continue to engage younger scientists in Southern Ocean science, by participation at meetings

9) What have been the greatest successes?

10) What have been the greatest challenges?

Lack of funding to hold dedicated capacity building workshops/meetings

11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming?

Better guarantee of funding for specific activities

1) Date form completed

May 7, 2012

2) Working group/panel responding

ETCCDI

3) Responder and position (e.g., panel co-chair)

A. Pirani

4) Who is the target group/s of working group/panel's capacity building efforts?

National Hydrological and Meteorological Services (NHMS) staff and young scientists

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Regional workshops, that are modeled after the Asia-Pacific Network for Global Change Research (APN) Indices and Indicators Workshops, are important activities of the ETCCDI and its predecessors. The general goals of the workshops include:

- Derive indices from daily data, especially measures of changes in extremes
- Fill in blank data areas in "global" analysis of climate indices
- Increase confidence in local analyses by placing these analyses in a larger, regional context that includes results from neighboring stations and countries.
- Increase regional research synergies by sharing insights and improve analyses between neighboring countries
- Foster greater appreciation for data and data archeology
- Specific goals for each workshop include producing a peer-reviewed journal article on analysis of climate change for the giving region, and making available the data and indices in the analysis.

6) Past capacity building activities

Dec 2011	Gambia, Western Africa
Feb 2011	ICPAC, Kenya, Greater Horn of Africa
Jan 2011	CIIFEN, Ecuador, South America
Dec 2009	Indonesia, Indonesia
Oct 2009	Mauricien Met Service, Mauritius, Indian Ocean Nations
Mar 2009	Mexico, Central America
Feb 2008	Republic of Korea, Eastern Asia
Dec 2007	Vietnam, Southeast Asia
Apr 2007	Congo, Central Africa
Jan 2006	GCISC, Pakistan, South Asia
Feb 2005	IITM, India, Central & South Asia

Nov 2004	CRRH, Costa Rica, INSIVUMEH, Guatemala	Central America
Oct 2004	Turkish State Meteorological Service, Turkey,	Middle East
Aug 2004	Universidade Federal de Alagoas, Brazil,	South America
June 2004	University of C.T, South Africa,	Southern and Eastern Africa
Mar 2004	BMRC, Australia, S.E. Asia and S. Pacific	
Dec 2002	BMRC, Australia, S.E. Asia and S. Pacific	
Apr 2001	BMRC, Australia, S.E. Asia and S. Pacific	
Feb 2001	Moroccan Meteorological Service, Morocco,	North Africa
Jan 2001	University of West Indies, Jamaica,	Caribbean
Dec 1999	BMRC, Australia, S.E. Asia and S. Pacific	
Dec 1998	BMRC, Australia, S.E. Asia and S. Pacific	

7) Present capacity building activities

Workshop: May 2012, Jamaica, Caribbean

8) Planned future capacity building activities

- a. Continued program of regional workshops
- b. Transferring workshop teaching material to an online Moodle course on data processing, quality control and indices calculations.

9) What have been the greatest successes?

Regional workshops are aimed at regions of the world where data availability is limited. The result has been an improved global view of temperature and precipitation changes and increased capacity in local specialists in data analysis for climate monitoring. Internationally exchanged indices reveal global changes in extremes while the continuing series of workshops is enhancing the capacity of countries to extract important climate change information from their long-term daily data. These workshops increase regional research synergies by sharing insights between neighboring countries, and foster greater appreciation for data rescue and data archeology.

Producing peer-reviewed publications from most training workshops, a global paper (Alexander, L. V., et al., 2006: Global observed changes in daily climate extremes of temperature and precipitation, JGR, 111, doi:10.1029/2005JD006290) and contributed significantly to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (AR4 IPCC). Publications since then will be contributing to AR5.

10)What have been the greatest challenges?

Many nations do not as yet commit to the free and unrestricted international exchange of meteorological and related data and products. In some cases where the raw data is not permitted for exchange, nations will contribute post-processed indices data only, which is problematic in terms of transparency.

11)If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming

There is the possibility of linking an ETCCDI-style indices workshop component to other workshops planned for a particular region (if the audience is right)

Variability of the African Climate System (VACS)

1) Date form completed

May 9, 2012

2) Working group/panel responding

VACS

3) Responder and position (e.g., panel co-chair)

A. Pirani

4) Who is the target group/s of working group/panel's capacity building efforts?

Young scientists, National Meteorological and Hydrological Services staff, and the research community at large.

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Workshops and tutorials on using the IRI Climate Predictability Tool (CPT)

6) Past capacity building activities

VACS Southern and Eastern African Climate Predictability Workshop, Tanzania Meteorological Agency, Dar es Salaam, Tanzania, 10-13th July 2006

7) Present capacity building activities

8) Planned future capacity building activities

Activities that aim to 'train the trainers' are favoured to build up a sustained capacity development approach.

9) What have been the greatest successes?

10) What have been the greatest challenges?

Funding constraints are a significant challenge. Developing a network of funding partners to support sustained activities would be helpful.

11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming

Working Group on Ocean Model Development (WGOMD)

1) Date form completed

May 9, 2012

2) Working group/panel responding

WGOMD

3) Responder and position (e.g., panel co-chair)

A. Pirani

4) Who is the target group/s of working group/panel's capacity building efforts?

Young scientists, climate model analysts and climate/ocean model development groups.

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Workshops are part of the WGOMD terms of reference to educate and communicate topical ocean science issues to the science community. Each workshop provided pedagogical lectures introducing state-of-the-science ideas and results; offered opportunities for discussions and candid debates; and facilitated networking and collaboration.

WGOMD maintains the CLIVAR Repository for Evaluating Ocean Simulations (REOS - <http://www.clivar.org/organization/wgomd/resources/clivar-repository-evaluating-ocean-simulations>). This website guides the community on how to best evaluate ocean models with directions to recommended data sets, information on metrics and a comprehensive reference list.

The Coordinated Ocean-ice Reference Experiment (CORE) is a framework that serves as a basis for a broad ocean model intercomparison activity. Ocean-ice model experiments are useful since they are less costly than fully coupled experiments, they can be used in hindcast mode to reproduce the history of ocean and ice variables and hence help in the interpretation of observations, they allow for the understanding of processes in the absence of biases introduced by the atmospheric model and hence potentially give superior representations (compared to the ocean component of a coupled model) of key physical, chemical and biological processes and so help in model development.

Experience has shown that groups that are developing new ocean models have benefited significantly by joining the CORE framework, repeating past multi-model analysis to validate their development progress.

6) Past capacity building activities

WGOMD has organized the following workshops:

"Workshop on Evaluating the ocean component of IPCC-class climate models": June 2004, Princeton/GFDL USA. Roughly 120 scientists attended this 3-day workshop to discuss the status of ocean climate modeling, based largely on development of the AR4 coupled models. The workshop consisted of four sessions, each introduced by an overview lecture, followed by a selection of shorter specialized presentations. Presentations are available at:

<http://www.clivar.org/organization/wgomd/activities/gfdl04>.

“Southern Ocean Modeling Workshop”: November 2005, Hobart Australia. Roughly 100 scientists attended a 2-day workshop consisting of 10 lectures and discussion, each of 90 minutes duration. The lecturers provided insights regarding key elements of Southern Ocean physics, biogeochemistry, and modeling. Presentations are available at:

<http://www.clivar.org/organization/wgomd/activities/southern-ocean-modeling-workshop>.

“Numerical Methods in Ocean Models”: August 2007, Bergen Norway. Roughly 100 scientists attended this 2-day workshop consisting of seven sessions, each introduced by an overview lecture and then followed by a selection of specialized presentations. This workshop focused on uncovering the latest ideas in numerical and physical methods for simulating the ocean. Presentations are at:

<http://www.clivar.org/organization/wgomd/activities/nmw>.

“Ocean Mesoscale Eddies: Representations, Parameterizations, and Observations”. April 2009, UK Met Office Hadley Centre, Exeter, UK. Roughly 140 participants attended this 3-day workshop to discuss different views on the state-of-the-science in ocean mesoscale eddies as seen through observations, simulations, and theory. The workshop consisted of six speakers per day with 70 minutes each to delve in-depth into the chosen subject, and for questions and discussion. Additionally, there were more than 40 posters from students, post-docs, and senior scientists. The presentations and most of the posters are available at:

www.clivar.org/organization/wgomd/activities/meso.

“WGOMD-GSOP Workshop on Decadal Variability, Predictability, and Prediction: Understanding the Role of the Ocean”. September 2010, NCAR, Boulder, USA. Roughly 120 participants attended this 4-day workshop to discuss the current state of research into the ocean’s role in decadal timescale climate variability and predictability. Session Chairs led end of session discussions assessing community consensus and future coordinated directions. The workshop culminated in a final summary discussion on what could be achieved by a joint effort, whether the community could develop a common framework in decadal variability, predictability and prediction research. Most of the presentations are available at:

<http://www.clivar.org/organization/wgomd/activities/decadal>.

7) Present capacity building activities

8) Planned future capacity building activities

“WGOMD-SOP-CliC Workshop on Sea Level Rise, Ocean-Ice Sheet Interactions and Ice Sheets”: February 2013, CSIRO, Hobart, Australia

9) What have been the greatest successes?

Interest in the WGOMD workshops is high and attracts attendance both from the leaders of the field and young scientists. We have been successfully awarded funding that has enabled us to support many young scientists to participate, both as speakers and to present posters. 23 young scientists applied for funding support to attend the last meeting in 2010 and we were able to support 13.

10) What have been the greatest challenges?

11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming

Atlantic Panel

- 1) Date form completed**
- 2) Working group/panel responding**
Atlantic Panel
- 3) Responder and position (e.g., panel co-chair)**
L. Terray, P. Brandt (panel co-chairs)
- 4) Who is the target group/s of working group/panel's capacity building efforts**
Students and early career scientists from developing countries
- 5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)**
Co-sponsoring Summer Schools; workshops
- 6) Past capacity building activities**
ClimECO summer school was convened with GLOBEC and focused on climate driving on marine ecosystem changes

Invitation, when financial support is available, for students and early career scientists from developing countries to attend workshops
- 7) Present capacity building activities**
N/A
- 8) Planned future capacity building activities**
N/A
- 9) What have been the greatest successes?**
Although these are not driven by the panel, some successful activities in the Atlantic region are the French activities (IRD) to establish Master courses in Physical Oceanography at the University in Cotonou, Benin or to improve the teaching in physical climate sciences at the Dakar University. There were also several French and German research cruises with participants from African countries or even explicitly dedicated for capacity building and knowledge transfer (three German Maris S. Merian cruises in 2011 in South West Africa). A particularly successful program was the AMMA program (funding from different nations and the EU) aimed at improving the understanding of the African Monsoon as well as weather and climate prediction in Sub-Sahara Africa. A large part of the funding was dedicated to enhance the science infrastructure in Sub-Sahara Africa. Two of the AMMA conferences were held in Africa (Dakar, Senegal and Ouagadougou, Burkina Faso). In most of the larger programs funded in Europe such capacity building activities are required.
- 10) What have been the greatest challenges?**
Travel support is always an issue, if available scientists from different countries could be invited to attend panel meetings to report on dedicated (successful) activities

Even with successful activities as described above, it has been difficult to network them.

11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming

Briefing of different activities (projects and programs) at the panel meetings should always include aspects of capacity building

Programs endorsed by CLIVAR, should be asked to report on their activities regarding capacity building

AIP will develop a structure to collect information on capacity building activities and distributed them via the panel webpage.

Global Synthesis and Observations Panel

- 1) Date form completed**
- 2) Working group/panel responding**
GSOP
- 3) Responder and position (e.g., panel co-chair)**
Keith Haines and Tony Lee (panel co-chairs)
- 4) Who is the target group/s of working group/panel's capacity building efforts**
Students and early career scientists, esp. from developing countries
- 5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)**
Workshop.
- 6) Past capacity building activities**
CLIVAR/GSOP-GOCAE OceanView workshop on Observing System Evaluation, Santa Cruz, California, June 2011.
- 7) Present capacity building activities**
N/A
- 8) Planned future capacity building activities**
Panel will consider, based on funding available, inviting students and early career scientists from developing countries to attend the Ocean Synthesis and Air-Sea flux evaluation Workshop to be held at WHOI, in November 2012.

CLIVAR/GSOP will coordinate with GODAE OceanView to plan a workshop on Observing System Evaluation and Coupled Data Assimilation in April, 2013 that will provide a capacity building opportunity for students and early career scientists.

Panel will discuss ideas at next meeting, recognizing limitations of available resources.
- 9) What have been the greatest successes?**
N/A
- 10) What have been the greatest challenges?**
Resources needed to explicitly engage developing countries.

Global focus of the GSOP synthesis activity naturally reduces interest from groups who may have a strong regional interest.
- 11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming**
To be addressed at panel meeting. Perhaps engaging interest in best practice in regional observation exchanges and data management to improve products.

Indian Ocean Panel

1) Date form completed

May 15, 2012

2) Working group/panel responding

Indian Ocean Panel

3) Responder and position (e.g., panel co-chair)

Weidong Yu, M. Ravichandran (panel co-chairs)

4) Who is the target group/s of working group/panel's capacity building efforts

Scientific community, government agency, NGO, private sector, marine-related industry sector in the countries around Indian Ocean rim and outside countries with interests in the Indian Ocean.

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Workshops, training to young scientists/students for utilizing IndOOS data

6) Past capacity building activities

Due to limited resources, IOP did not directly involve in the capacity building activities till now. However, IOP get much involved in many capacity building activities through its members, experts, involved agencies and its regional programs. The experience has proved that these are efficient ways. IOP members are the resource personals for the IOGOOS conducted workshops and trainings.

IOP members/experts are very active in various capacity building activities, especially in the Indian Ocean rim region. For example, Dr. Sidney Thurston from NOAA as IOP expert leads the In-Region Western Indian Ocean Capacity Building Workshop of the WMO/IOC Data Buoy Cooperation Panel (DBCP) and Partners. This workshop was successfully held in Kenya in 2012, in Mauritius in 2011 and in South Africa in 2010. Some of the IOP members were actively participated in the above capacity building workshops as a resource personal. Such activities primarily aim to involve more African countries to participate in building IndOOS in terms of deployment of floats, drifters, etc., and also use the data from IndOOS array for their own area or requirements. IndOOS involved agencies have various bilateral capacity building program. For example, NOAA/US and MoES/India developed the arrangement on IndOOS collaboration and capacity building. NOAA train Indian researchers for using IndOOS data in Ocean model for generating ocean analysis products, which are used for initial condition for coupled ocean-atmosphere model for prediction of seasonal forecast of Monsoon. JAMSTEC/Japan and BPPT/Indonesia, FIO/China and BRKP/Indonesia, also developed the similar arrangements. These mechanisms in fact have been supporting the implementation of IndOOS and will play the important role in the future sustaining IndOOS.

The regional programs affiliated with IndOOS also played important role in capacity building in the region. For example, Monsoon Onset Monitoring and its Social and Ecosystem Impact (MOMSEI), as one regional program of IndOOS, organized two summer schools in 2010 and 2011 to train the young scientists from the region to use the IndOOS data and monsoon knowledge in their own research. Another successful example is the Arabian Sea and Bay of Bengal regional observing system from India. User interaction workshops are organised every year by India by inviting

university students / young researchers to know about the availability of ocean data in the Indian Ocean.

7) Present capacity building activities

All the activities mention in Item 6 are still on going.

8) Planned future capacity building activities

IOP will discuss its capacity building plan in its 9th panel meeting in 15-17 Oct. 2012 in South Africa. The discussion will result in the coordinated plan for capacity building conducted by IOP members and its regional programs.

9) What have been the greatest successes?

The capacity building increased the regional awareness of the scientific and social value of the IndOOS, which in turn helped the efficient implementation of IndOOS and its long-term sustaining. The IndOOS data access has significantly increased after these awareness programs.

Through the capacity building, the Indian Ocean rim countries are using the IndOOS data in their own researches and applications with various successes. This will realize the social value of our research.

10)What have been the greatest challenges?

It is always the big challenges to identify the local and national requirements and to set up the useful linkage between the IOP research and national/regional requirements.

However, these challenges will be understood and well resolved by more communication with the local scientific communities, governments, NGOs, social sectors, especially through the capacity building activities.

Funding issue is another long existing concern to strengthen capacity building activities.

11)If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming

CLIVAR/PAGES Working Group

- 1) Date form completed:**
23rd April 2012
- 2) Working group/panel responding:**
CLIVAR/PAGES Working Group
- 3) Responder and position (e.g., co-chair):**
Catherine Beswick, Staff Scientist
- 4) Who is the target group/s of working group/panel's capacity building efforts?**
Early career researchers
- 5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)**
Invitations to panel meetings and workshops, to present and contribute to discussions (e.g. March 2012 workshop)
- 6) Past capacity building activities**
As above
- 7) Present capacity building activities**
As above
- 8) Planned future capacity building activities**
Continue to engage younger scientists in CLIVAR/PAGES science, by participation at meetings
- 9) What have been the greatest successes?**
- 10) What have been the greatest challenges?**
Lack of funding to hold dedicated capacity building workshops/meetings
- 11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming?**
Better guarantee of funding for specific activities

Asian-Australian Monsoon Panel (AAMP)

1) Date form completed

May 17, 2012

2) Working group/panel responding

AAMP

3) Responder and position (e.g., panel co-chair)

Harry Hendon, Ken Sperber (AAMP co-chairs), Carlos Ereno (ICPO representative)

4) Who is the target group/s of working group/panel's capacity building efforts?

Support for young scientists

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

MJO workshop

6) Past capacity building activities

(1) Workshop on Modelling Monsoon Intraseasonal Variability, 15-17 June, 2010, Busan, Korea and

(2) participation in the Seventh Session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRAII) 6-8 April 2011, Beijing, China, (research talks and participation in forecast forum)

7) Present capacity building activities

Iterating with RCOF Coordinator, and WGNE/WGSIP representative to develop an implementation plan to ensure that RCOF forecasting and verification procedures follow established norms developed by the NWP community

8) Planned future capacity building activities

(1) September 2012 Decadal workshop sponsored by AAMP, and

(2) Plan to participate in the organization of the International Workshop on Monsoons next year.

9) What have been the greatest successes?

WCRP/WGNE coordination on implementing experimental MJO forecasting

10) What have been the greatest challenges?

(1) Achieving actionable predictions on subseasonal to decadal time scales,

(2) Establishing links to user/application communities,

(3) Developing the necessary tie-ins with GEWEX to explore the role of land surface processes in simulating/predicting monsoon variability,

(4) Establish a closer working relationship with the WWRP Monsoon Panel

11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming?

Variability of the American Monsoon System (VAMOS)

1) Date form completed

May 17, 2012

2) Working group/panel responding

VAMOS

3) Responder and position (e.g., panel co-chair)

Hugo Berbery, Dave Gochis (VAMOS co-chairs), Carlos Ereno (ICPO representative)

4) Who is the target group/s of working group/panel's capacity building efforts?

- a. Support for young scientists
- b. Consulting with island nations in the Intra-Americas Sea region as part of IASCLiP

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Modeling workshop, Petropolis, Brazil, 4-6 June, 2012

Support for student participation in CLARIS LPB meetings through CLARIS LPB

Training for young South American students and scientists in European institutes through CLARIS LPB

For IASCLiP, this work has involved visits from VAMOS panel member Arthur Douglas to numerous island nations helping them evaluate their regional synoptic observing networks. It has also involved consultations and networking regarding the establishment of regional GPS-precipitable water vapour networks in the Caribbean and in Mexico.

6) Past capacity building activities

Nov 2009: The international summer school on land-cover change and hydroclimate of the La Plata Basin. About 45 students from seven countries in South America participated in an intensive course on the role of land cover and ecosystems on the La Plata Basin regional hydroclimate. Iguassu, Brazil.

As part of CLARIS LPB Project - special calls with grants for:

- Young Scientists participation at project meeting
- Poster Prizes for young scientist posters: presented at project meetings based on scientific and multidisciplinary criteria
- Exchange grants for all scientists: based on scientific and multidisciplinary criteria
- Publication grants and in European Journals

IASCLiP:

2010 several VAMOS panel members participated in a GPS network workshop in Mexico helping to articulate the scientific justification for GPS networks and to prioritize research and operational goals related to the design and implementation of these networks.

2010 and 2011, Art Douglas has made several trips to Caribbean island nations to help identify critical priorities for improving surface, upper air and oceanographic observing platforms.

2009-present: IASCLiP has developed and provided, free of charge, an online forecast forum which synthesizes numerous seasonal forecast products for the Caribbean region.

7) Present capacity building activities

The VAMOS team is organizing and supporting the VAMOS modelling workshop which is aimed at attracting participation of early-career scientists into climate research and climate-services activities.

IASCLiP: Art Douglas is presently in the Dominican Republic consulting with their national weather service in the development of improved seasonal forecasts and improving observational infrastructure

VAMOS team members continue to collaborate with scientists and agency personnel throughout Mexico and the Caribbean to help establish GPS observing networks in the region. The involvement here is primarily through helping local scientists and agencies formulate their within-country proposals.

8) Planned future capacity building activities

Generally, VAMOS envisioning coordinate its capacity building activities around the concept of 'climate services' which is growing rapidly throughout Latin America. Prioritization of key climate service activities and their connections to VAMOS science will be a focus topic of discussion at the VPM-15 meeting in Petropolis Brazil in June, 2012.

9) What have been the greatest successes?

LPB activity: The course taught in 2009:

- The school was attended by 45 graduate students and young scientists with different backgrounds from seven countries, including underrepresented ones.
- The *University of Buenos Aires* and the *Universidad Nac. Del Centro* has given credits to Ph D students that attended the course.
- Both GEWEX/WCRP and CLIVAR/WCRP have developed respective sets of "Imperatives" (Priorities), and both refer to our Summer School as an example of Capacity Building.
- Through two field trips, one to the Itaipú central facilities and the other to visit nontraditional farms, the students were presented with new technologies, conservationist practices and alternative ways of producing energy.
- Thanks to a partnership with IAI, travel expenses of most students were covered by the Summer School, so that the student's selection (there were around 100 candidates) was primarily based on their scholarly merits.

For IASCLiP, several proposals have been developed regarding the deployment of GPS water vapour observing networks. The international project in the Caribbean called COCONET was funded in 2010-2011 and the network is being built. The status of the proposals for Mexico are still pending.

10) What have been the greatest challenges?

The fiscal situation in many American countries remains difficult, particularly for climate service oriented activities funded by the U.S.

11) If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming?

Pacific Panel

1) Date form completed

21/May/2012

2) Working group/panel responding

Pacific Panel

3) Responder and position (e.g., panel co-chair)

Wenju Cai and Alex Ganachaud (panel co-chairs)

4) Who is the target group/s of working group/panel's capacity building efforts

Early career scientists and students

Pacific Island Countries

Developing countries

5) Which methodology of capacity building activities have been used (e.g., workshops, activities for Early Career Scientists, etc.)

Summer school

Building data portal and climate data base

SPCZ workshop, and training

Coaching (one on one) of young scientists from the South Pacific Countries (SPC) for attendance to international conference (e.g., 30 to 10 ICSHMO)

6) Past capacity building activities

ENSO Summer School

7) Present capacity building activities

- a. The panel facilitates training of SPC scientists to explore the likelihood of future changes in temperature, rainfall, wind, sunshine, humidity and evaporation based on 20-year time periods around 2030, 2055 and 2090 under several greenhouse gas emissions scenarios.
- b. The panel is involving in building user-friendly tools that provide past and current climate information for the SPCs
- c. Panel scientists are working with SPC scientists, in writing joint paper (e.g., SPCZ under climate change, Nature paper).
- d. Workshop on the ITF and impact in Jakarta (March 2012) held as a training session for regional scientists, giving out certificates.

8) Planned future capacity building activities

Capacity building component to continue to train regional scientists with interests in the ITF and its role in the climate. This will more readily enable regional researchers and students to be directly engaged in the use of data and tools for monitoring the ITF and understanding its potential impacts on climate.

Continue to facilitate training sessions for SCP scientists, warm pool and impact on fisheries, ocean acidification, and coral bleaching.

Young scientist scholarship to attend major international workshop (e.g., Open Science Symposium for WBC workshop in Qingdao).

With IOC/WESTPAC, training sessions are planned for regional scientists on extreme sea level events.

9) What have been the greatest successes?

Scientists from SPC and other developing countries appreciate that there is a large body of empowering knowledge and resources they can tap into.

10)What have been the greatest challenges?

Dealing with culture differences

11)If no capacity building activities are planned by this working group/panel what actions can be taken to remedy this shortcoming

Annex B – Knowledge Transfer Forms

Southern Ocean Panel (SOP)

1) Date form completed:

23rd April 2012

2) Working group/panel responding:

Southern Ocean Panel

3) Responder and position (e.g., co-chair):

Catherine Beswick, Staff Scientist, with input from panel co-chairs (Kevin Speer and Matthew England)

4) Which knowledge transfer methods have been used?

- Workshops
e.g. planning workshop for SOOS
- Contribution to newsletters
e.g. Exchanges 58 (thematic issue on CLIVAR's ocean basin panels), Exchanges 35 (Southern Hemisphere Climate Variability)
- Panel webpages on the CLIVAR website
Posting information on panel activities and other resources
- Email
Generally utilising CLIVAR mailing lists
- Consortium of national representatives on the Southern Ocean
The following countries have national representatives: Argentina, Australia, Belgium, Brazil, Chile, China, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Russia, South Africa, Spain, UK, USA
At present more knowledge transfer from SOP to the national reps. To facilitate a more two-way interaction, short reports are being requested from national reps to feed into SOP-8, to get an overview of activities in the region
- Documents
e.g. community paper on Southern Ocean Observing System: Rationale and strategy for sustained observations of the Southern Ocean. This was released for broad community input
e.g. Southern Ocean Vision Document. This is an evolving document, to highlight to funders etc. what the key science questions in Southern Ocean science over the next few years
e.g. provided input to the group preparing the ACCE document (J Turner at BAS)
e.g. contribution to US Clivar documents

5) Who has been targeted to receive the new information?

- Public

- Funders
- Other science programmes
- Consortium of national representatives on the Southern Ocean

6) What have been the greatest successes?

SOOS, CASO, DIMES

7) What have been the greatest challenges?

Icebreaker access for science, measurements in the ice zone, basic meteorology data and fluxes.

8) What are the plans to make CLIVAR science more 'actionable'?

Scientific exchange and coordination centered around observations and programmes like SOOS, and the development of key process modeling for climate studies. A new Antarctic Reanalysis to contribute to SOOS.

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming?

1) Date form completed

May 9, 2012

2) Working group/panel responding

ETCCDI

3) Responder and position (e.g., co-chair)

A. Pirani

4) Which knowledge transfer methods have been used?

ETCCDI indices and software

Issues being addressed by ETCCDI include the practical aspects of developing guidance and materials for National Meteorological and Hydro Services (NMHSs) are toolkits including software, documentation, and other material to guide the calculation and use of climate change detection indices and climate data homogenization, improvement of global coverage and assessment of indices. The ET is also concerned with improving indices and analysis tools.

The main purpose of the ETCCDI indices and software website is to provide:

- ET approved definitions and guidance on the calculations of climate change indices, along with standard software packages
- Practical guidance on the homogenization of climate data
- Materials for use in ETCCDI training workshops
- Access to online resources of climate indices
- A place for the submission of new or updated indices data

The software packages for data homogenization (RHtestsV3) and indices calculation (RClimDex) are based on a very powerful and freely available statistical package R that runs under both Microsoft Windows and Unix/Linux.

Review papers and guidelines

- a. Guidelines on Analysis of extremes in a changing climate in support of informed decisions for adaptation.
A. M.G. Klein Tank, F. W. Zwiers and X. Zhang, 2009, Climate Data and Monitoring WCDMP-No. 72, WMO-TD No. 1500, 56pp.
- b. Indices for monitoring changes in extremes based on daily temperature and precipitation data
Zhang Xuebin, Alexander Lisa, Hegerl Gabriele C., Jones Philip, Tank Albert Klein, Peterson Thomas C., Trewin Blair, Zwiers Francis W., 2011, *WIREs Clim Change*, 2: 851-870. doi: 10.1002/wcc.147
- c. Detection and attribution of climate change: a regional perspective
Stott, P.A., N. P. Gillett, G. C. Hegerl, D. J. Karoly, D. A. Stone, X. Zhang, and F. Zwiers, 2010, *Wiley Interdisciplinary Reviews: Climate Change*, 1(2), 192-211.

ETCCDI Moodle Course on extremes and indices

Material that is used for teaching purposes during the ETCCDI regional workshops is being adapted for a general online, freely available course.

5) Who has been targeted to receive the new information?

NMHS staff and young scientists

6) What have been the greatest successes?

Mobilising ETCCDI and its community at large to continually refine and come to consensus on a core set of extremes indices, developing and maintaining software that is freely available for all, producing recommendations and review papers to guide and explain climate extremes analysis, monitoring and detection and attribution studies.

7) What have been the greatest challenges?

More could be done for outreach and website, though this depends on additional support and other skills since most ET members are scientists.

8) What are the plans to make CLIVAR science more 'actionable'?

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming?

Variability of the African Climate System (VACS)

1) Date form completed

May 9, 2012

2) Working group/panel responding

VACS

3) Responder and position (e.g., co-chair)

A. Pirani

4) Which knowledge transfer methods have been used?

Development of the VACS Climate Atlas

A climate atlas with a focus on the observed and modelled climate of Africa. The Atlas currently has five parts, with a sixth part (FAQs on African Climate) in draft form. Parts I and II are on the observed climatology over Africa and surrounding tropics. Variables include minimum temperature, maximum temperature, diurnal temperature range, water vapour and cloud cover. Part III deals with mineral aerosols from satellite observations. Part IV features components of the ERA40 Reanalysis Project and Part V the WCRP CMIP3 multi-model climate change data archive. VACS aims to expand the Atlas to include CMIP5 and CORDEX data.

CLIVAR Exchanges Special Issue – August 2012

This Exchanges issue will feature short articles that give an overview of many key programmes that are on going on African climate research. The issue will be a very useful one-stop piece where the community can find out about these major initiatives.

WCRP Africa Newsletter

VACS is initiating a (quarterly) newsletter to communicate new research from emerging scientists in Africa, to share funding and training opportunities and events, and to distribute programmatic news. The first issue will be timed to come out with the VACS Exchanges special issue. The aim is to make the newsletter informal enough for scientists to submit short notes, whether they have results or not, to inform and so strengthen the network across African research groups. The newsletter will be an important mechanism to encourage people to circulate news on their hard work, since publishing an article in the international peer-reviewed literature can be problematic.

5) Who has been targeted to receive the new information?

The network of African climate scientists as well as scientists outside Africa interested in African climate. The WCRP newsletter will not only serve to strengthen the network of scientists within Africa, but also familiarise scientists working outside Africa with who is who within the local research groups, both of which will help to create points of contact for new collaborations. Climate impacts and adaptation specialists working on African issues will also be interested to receive the new information.

6) What have been the greatest successes?

- 7) What have been the greatest challenges?**
- 8) What are the plans to make CLIVAR science more 'actionable'?**
- 9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming?**

Working Group on Ocean Model Development

1) Date form completed

May 9, 2012

2) Working group/panel responding

WGOMD

3) Responder and position (e.g., co-chair)

A. Pirani

4) Which knowledge transfer methods have been used?

- Workshops
- Resource websites (REOS, CORE)
- CORE model intercomparison framework
- Review papers, recommendations and guidelines documents

Griffies, S. M. and G. Danabasoglu, 2011: Physical Ocean Fields in CMIP5. *CLIVAR Exchanges – WCRP Coupled Model Intercomparison Project – Phase 5*, No. 56, Vol. 16, 32-34.

Griffies, S. M., *et al.*, 2010: Problems and Prospects in Large-Scale Ocean Circulation Models, Proceedings of the OceanObs'09 Conference: Sustained Ocean Observations and Information for Society, Venice, Italy, 21-25 September 2009, Volume 2, Eds. J. Hall and D.E. Harrison and D. Stammer, ESA Publication WPP-306.

Griffies, S. M., *et al.*, 2009a: Coordinated Ocean-ice Reference Experiments (COREs). *Ocean Modelling*, **26**, 1–46.

Griffies, S. M., *et al.*, 2009b: Sampling Physical Ocean Fields in WCRP CMIP5 Simulations. ICPO Publication Series 137, WCRP Informal Report No. 3/2009

- CLIVAR Exchanges Special Issues
Furthering the Science of Ocean Climate Modelling - CLIVAR Exchanges Special Issue, No. 44, Vol 13, 40pp, 2008.
Ocean Model Development and Assessment - CLIVAR Exchanges Special Issue, No. 42, Vol. 12, 28pp, 2007.

5) Who has been targeted to receive the new information?

The climate modelling community

6) What have been the greatest successes?

Working with the strong ocean modelling community to produce consensus documents and pedagogical knowledge transfer material. The CORE I reference paper (Griffies *et al.*, 2009a) so far has a citation index of 71.

The CORE-II experimental framework has successfully attracted a lot of interest, with 20 modelling groups participating in the simulations, currently with 5 major publications in preparation.

7) What have been the greatest challenges?

The biggest challenge for WGOMD is a lack of new ocean model developers. The new generation of scientists are mostly model users rather than developers, in other words 'black box' modellers that not have a good understanding of what ocean models can actually do. A particular challenge is to find ocean modellers from developing countries.

- 8) What are the plans to make CLIVAR science more 'actionable'?**
- 9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming?**

Atlantic Implementation Panel (AIP)

1) Date form completed

2) Working group/panel responding

Atlantic Panel

3) Responder and position (e.g., panel co-chair)

L. Terray, P. Brandt (panel co-chairs)

4) Which knowledge transfer methods have been used?

Workshop reports

5) Who has been targeted to provide the knowledge to?

Wider scientific community with interests in the Atlantic Ocean

6) What have been the greatest successes?

Although these are not driven by the panel, some successful activities in the Atlantic region are the French activities (IRD) to establish Master courses in Physical Oceanography at the University in Cotonou, Benin or to improve the teaching in physical climate sciences at the Dakar University. There were also several French and German research cruises with participants from African countries or even explicitly dedicated for capacity building and knowledge transfer (three German Maris S. Merian cruises in 2011 in South West Africa). A particularly successful program was the AMMA program (funding from different nations and the EU) aimed at improving the understanding of the African Monsoon as well as weather and climate prediction in Sub-Saharan Africa. A large part of the funding was dedicated to enhance the science infrastructure in Sub-Saharan Africa.

7) What have been the greatest challenges?

8) What are the plans to make CLIVAR science more 'actionable'?

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming

Briefing of different activities (projects and programs) at the panel meetings should always include aspects of knowledge transfer

Programs endorsed by CLIVAR, should be asked to report on their activities regarding knowledge transfer

Global Synthesis and Observations Panel

1) Date form completed

2) Working group/panel responding

GSOP

3) Responder and position (e.g., panel co-chair)

Keith Haines and Tony Lee (panel co-chairs)

4) Which knowledge transfer methods have been used?

CLIVAR website (including meeting reports and whitepapers), particularly with the development of the Ocean Synthesis Directory and Air-sea flux Directory

Scientific publications resulted from CLIVAR/GSOP coordinated activities such as the global synthesis evaluation/intercomparison effort.

easyINIT synthesis information repository.

Recent strong engagement with GODAE-Oceanview leading to joint meetings (held and planned) and discussions on engagement and outreach.

5) Who has been targeted to provide the knowledge to?

Wider scientific community with interests in Ocean Synthesis and Air-sea fluxes

6) What have been the greatest successes?

As a result of the global synthesis evaluation effort championed by GSOP, a number of peer-reviewed publications have been published that help the synthesis community to gain a better understanding of the quality and consistency of synthesis products.

The global synthesis evaluation also leads to a renewed effort to consolidate and sustain the evaluation, as well as to an effort of near realtime ocean monitoring (e.g., of upper ocean heat content) using ensemble synthesis products.

GSOP workshop on synthesis and air sea fluxes

7) What have been the greatest challenges?

8) What are the plans to make CLIVAR science more 'actionable'?

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming

Explicit discussions at next panel meeting

Indian Ocean Panel

1) Date form completed

15 May, 2012

2) Working group/panel responding

Indian Ocean Panel

3) Responder and position (e.g., panel co-chair)

Weidong Yu, M. Ravichandran (panel co-chairs)

4) Which knowledge transfer methods have been used?

CLIVAR website

IndOOS Data portal (http://www.incois.gov.in/Incois/iogoos/home_indoos.jsp), particularly the RAMA data link at <http://www.pmel.noaa.gov/tao/rama/>

Ocean buoy technology transfer from JAMSTEC/Japan to BPPT/Indonesia

Training and Knowledge transfer from PMEL/NOAA, USA to NIOT/INCOIS, India for buoy technology, especially moorings and deployment techniques

NDBC/NOAA provided training on Quality control procedure for in-situ data (IndOOS) to NIOT/MoES, India

JAMSTEC transfers, under SATREPS project of JICA/JST, mooring buoy technology and related knowledge to BPPT, Indonesia, and knowledge on regional climate prediction to ACCESS and universities in South Africa.

5) Who has been targeted to provide the knowledge to?

Wider community utilising data and information from IndOOS, including young researchers and students.

Regional countries with better capacity in observing technology so as to ensure the sustainability of IndOOS

6) What have been the greatest successes?

Data, information and knowledge from IOP are well known to the region and being applied into the local and regional purpose with various successes. IOP activity is one of the success stories of IOGOOS Pilot projects.

Local countries, like Indonesia, are quickly improving their technical capability in ocean observing.

Research activities in regional countries have been improving.

7) What have been the greatest challenges?

To better use the IndOOS data in national and regional application is still challenging. We need to educate the importance of IndOOS data and utilize them efficiently to understand different Indian Ocean Processes.

Some of the capacity building and knowledge transfer activities are based on rather short-term projects and/or in-house funding. Mechanisms to secure long-term commitments from both sides, i.e. knowledge providers and receivers, should be established.

8) What are the plans to make CLIVAR science more 'actionable'?

IOP is discussing the best way to bridge the open ocean observation and the national/regional social applications. One potential solution is through the regional programs. How to coordinate better the regional program will be discussed in the 9th panel meeting.

- 9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming**

CLIVAR/PAGES Working Group

1) Date form completed:

23rd April 2012

2) Working group/panel responding:

CLIVAR/PAGES Working Group

3) Responder and position (e.g., co-chair):

Catherine Beswick, Staff Scientist

4) Which knowledge transfer methods have been used?

- Workshops
e.g. March workshop on Using Paleo-Climate Model/Data Comparisons to Constrain Future Projections
- Contribution to newsletters
e.g. Exchanges 58 (thematic issue on CLIVAR's ocean basin panels)
- Panel webpages on the CLIVAR website
Posting information on panel activities and other resources
- Email
*Generally utilising CLIVAR mailing lists
Recently established open Clivar/Pages listserv to encourage discussion with the wider community*
- Documents
e.g. CLIVAR/PAGES Vision Document

5) Who has been targeted to receive the new information?

- Scientific community

6) What have been the greatest successes?

7) What have been the greatest challenges?

8) What are the plans to make CLIVAR science more 'actionable'?

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming?

Pacific Panel

1) Date form completed

22/May/2012

2) Working group/panel responding

Pacific Panel

3) Responder and position (e.g., panel co-chair)

Wenju Cai and Alex Ganachaud (panel co-chairs)

4) Which knowledge transfer methods have been used?

- Panel meeting reports, review papers
- Training sessions for scientists from developing countries including SPC
- IPCC lead authorships
- Workshops targeting a specific Pacific science area

5) Who has been targeted to provide the knowledge to?

- a. Scientists from developing countries including SPC
- b. General public
- c. Policy makers
- d. Resource managers

6) What have been the greatest successes?

- Review papers in Nature Geoscience on ENSO and climate change
- Oceanic hot spots and implication for marine ecosystems and biodiversity, and the need for long-term ocean observations – a Nature Climate Change paper
- Nature paper on more extreme swings of the SPCZ and implications for SPC
- Three CLA and lead authors from the panel members

7) What have been the greatest challenges?

Use appropriate languages to different audiences

8) What are the plans to make CLIVAR science more 'actionable'?

Several workshops/training sessions are planned

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming

Asian-Australian Monsoon Panel (AAMP)

1) Date form completed

May 17, 2012

2) Working group/panel responding

AAMP

3) Responder and position (e.g., co-chair)

Harry Hendon, Ken Sperber (AAMP co-chairs), Carlos Ereno (ICPO representative)

4) Which knowledge transfer methods have been used?

Through MJO working group/task force:

- implemented MJO diagnostics at operational centres
- developed boreal summer BSISO diagnostics for real time monitoring and assessment of predictions (hasn't happened yet, but close)
- developed diagnostics that can be applied to climate/forecast models to assess shortcomings of MJO/BSISO

5) Who has been targeted to receive the new information?

Operational centres, climate model diagnosticians

6) What have been the greatest successes?

Getting endorsement from WGNE for experimental MJO forecasting was an actionable item that prompted the NWP community to contribute their real-time forecasts to this ongoing project.

7) What have been the greatest challenges?

Many NWP centres have insufficient historical forecasts to do proper bias correction of experimental MJO forecasts.

8) What are the plans to make CLIVAR science more 'actionable'?

Need to establish better linkages to the user community to inform them of the capabilities and limitations of the ongoing experimental forecasting

9) If no transfer mechanisms are in place what actions can be taken to remedy this shortcoming?