

4.2 Cross-Project Interactions

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Asian-Australian Monsoon Panel (AAMP)

- a. AAMP supported the CINDY2011/DYNAMO observational campaign through the procurement of high-resolution forecasts and analyses from available forecast centers. AAMP and YOTC are also promoting coordinated numerical experimentation for CINDY-DYNAMO, making use of the full range of modeling abilities (AGCMs, OGCMs, CGCMs, tropical channel, coupled regional mesoscale, regional, cloud resolving, SCM, ocean mixed layer models).
- b. AAMP is iterating with K. Takano (Coordinator, RAII Sub Group on Climate Application and Services of the Working Group on Climate Services, Adaptation and Agrometeorology [RAII WGCAA-CAS]) and G. Flato (WGNE/WGSIP) on how to improve climate services, especially as they relate to Regional Climate Outlook Products. The primary issue to be addressed is the development of a more systematic approach to making and verifying the seasonal forecasts made through the RCOFs. We recommend (1) that established protocols for making and verifying forecasts should be followed (e.g., Kirtman and Pirani, 2009, BAMS) (2) that training and development should be promoted through the WWRP/WGNE, and (3) that formal sessions on verification should be convened at key meetings, such as an upcoming verification workshop to be held in Melbourne, and the 2013 Fifth International Workshop on Monsoons (IWM-V).
- c. Interactions with the WWRP Monsoon Panel are fostered through the Expert Panel on Climate Impact on Monsoon Weather by B. Wang (co-chair) and H. Hendon and I.-S. Kang (members). B. Wang was one of the editors of the book entitled "The Global Monsoon System: Research and Forecast" which contains the proceedings of the Fourth WMO International Workshop on Monsoons that was held in Beijing, China in 2008. As in 2008, AAMP will contribute to setting the agenda for the IWM-V workshop (see item 4b, above).
- d. AAMP representatives K. Sperber and A. Turner met with representatives of PAGES to discuss differences in approaches toward developing research foci, and discussion of potential common interests. AAMP have sought to engage the PAGES community in the International Workshop on Interdecadal Variability of the Monsoon as mentioned in item 2a above. On intraseasonal time scales, Kim Cobb discussed PAGES work that was indicative of MJO/ISO activity from speleothem observations. Additionally, to foster future interaction it is suggested that she and/or another PAGES representative with monsoon interests be invited to AAMP-12 to give a presentation on prospective PAGES/CLIVAR interactions.
- e. K. Sperber (and until recently H. Hendon) serves as a member of the WWRP-THORPEX/WCRP Year of Tropical Convection MJO Task Force. Contributions have been made in (1) the development of metrics for assessing MJO skill in models, (2) the development of process-oriented MJO diagnostics, (3) improving the method of making forecasts of boreal summer intraseasonal variability, and (4) establishment of a case study diabatic heating experiment to evaluate convective processes and the MJO in climate and NWP models.

- f. A. Kitoh and T. Zhou are lead authors, and B. Wang is a contributing author of Chapter 14 of the IPCC AR5. K. Sperber is a contributing author to Chapter 9 of the IPCC AR5.

Atlantic Implementation Panel (AIP)

CLIVAR TACE has a strong relationship with the German SFB 754 research project, which addresses climate-biogeochemistry interactions in the tropical oceans, with a focus on ocean deoxygenation and tropical oxygen minimum zones (OMZ) in the Atlantic and Pacific, and implications for the global marine biogeochemical system. Annual TACE/PIRATA meetings include always a session Physical-Biogeochemical Interactions. However, biogeochemical community is often not well represented.

Another topic that is well in the scope of AIP is the effect of climate variability and change on the coastal upwelling of the eastern tropics and subtropics. These regions are particularly impacted by a combination of different stressors: increasing temperatures, acidification and deoxygenation, the understanding of this impact requires a close cooperation between CLIVAR, IMBER and others.

CLIVAR/PAGES Working Group

The CLIVAR-PAGES Working Group is an intersection between WCRP CLIVAR and IGBP PAGES.

Expert Team on Climate Change Detection and Indices (ETCCDI)

In addition to CLIVAR/GEWEX, ETCCDI has two sponsors – the WMO Commission for Climatology (CCI) and the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM).

The CCI perspective is that the work of ETCCDI is directed at improving climate change detection and indices with a strong focus on capacity development. ETCCDI contributes to the provision of climate services through its regional capacity development workshops and its continued recommendation of free observational data exchange.

ETCCDI collaborates with the following CCI Task Forces:

- OPACE-I Task Team on Climate Data Rescue (TT-DARE)
- OPACE-II Task Team on National Climate Monitoring Products (TT-NCMP)
- OPACE-IV Expert Team on Climate Risk and Sector specific Climate Indices (ET-CRSCI)

JCOMM provides the mechanism for international coordination, regulation and management of oceanographic and marine meteorological observing, data management and services systems. JCOMM is interested in the use of indices and in developing an improved suite of indices to provide information for its stakeholders.

Despite CLIVAR and JCOMM co-sponsorship, the ET recommended list of indices are currently only land based. Whether these should expand to include marine indices is a topic of continuing discussion and will be expanded upon by a JCOMM position paper that is in preparation.

Work on marine indices generally considers better characterizing variability and ocean-land links, rather than marine extremes. While the ET is not limited to considering extremes indices, there is reluctance to expand its charter to include indices that are not place-based, in other words, indices on global teleconnections. The expertise within other parts of the CLIVAR community is better suited to make recommendations on these types of indices and to use such indices to understand teleconnection patterns. How these indices are linked to extremes over land is an important research area, for example the attribution of long-term trends in land extremes in relation to the longer timescales of ocean variability.

Indices that include marine place-based indices that describe variability and the development of joint terrestrial-ocean indices are being considered. Monthly marine indices would be appropriate for example based on the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) data set and model output. Monitoring and attributing surface temperature variability is the most obvious terrestrial-land linkage. The definition of sub-surface indices such as ocean heat content is an active research area and is constrained by limitations in the coverage of observations. The latter would require recommendations on which data sets should be used and best practices on how to combine data sets since there are intrinsic differences between land and marine data. Marine data could also be useful to derive land variability in the absence of land observations, such as for small islands. The usefulness of combining marine and land datasets is best explored in well-observed regions including Europe and North America.

Global Synthesis and Observations Panel (GSOP)

GSOP began working with the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER), a project endorsed by IGBP, through a collaboration with the Marine Ecosystem Task Team of the Global Ocean Data Assimilation Experiment (GODAE) OceanView program. Tong Lee, GSOP co-chair, is a member of that task team working closely with marine ecosystem scientists from the IMBER community to ensure that ocean synthesis products meet the need of biogeochemistry modeling.

GSOP has also begun communicating with the CliC community on Arctic synthesis products.

Indian Ocean Panel (IOP)

Although IOP does not have specific items in its Terms of Reference that address cooperation with IMBER, the panel leadership recognized from its start the importance of establishing meaningful interdisciplinary ties and collaborations aimed at understanding how physical processes impact biogeochemical cycles and particularly air-sea CO₂ exchange and carbon export. The panel has

supported since the beginning the development of the Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) program. Several successes have been achieved:

- Plan and Implementation Strategy which emphasizes interdisciplinary research and IOP/SIBER/IMBER mutual leveraging of effort.
- Motivation for an interdisciplinary modeling study of the physical and biological factors that determine the spatial distribution of the oxygen minimum zone in the Arabian Sea.
- Implement bio-geochemical sensors on the existing RAMA flux mooring
- New interdisciplinary collaborations focusing on the biogeochemical impacts of the Indian Ocean Dipole (IOD)
- Several ongoing interdisciplinary studies that are focused on the southern hemisphere boundary currents in both the western and eastern Indian Ocean; many of these projects fit both into SIBER Theme 1 and are also of considerable interest to the IOP

IOP and SIBER is discussing to further enhance the linkage by initializing the joint project on Eastern Indian Ocean Upwelling: Dynamics and Ecosystem.

Pacific Panel

The Pacific Panel has had some strong interaction with PICES and IMBER in the past. However, in general, the investigation of physical processes responsible for these biogeochemical and ecological impacts are not well covered by the current scope of programs under the WCPR. This is in contrast to the importance of the ocean and its interactions with the atmosphere given in the successful studies by TOGA for the equatorial Pacific and that have been expanded globally by CLIVAR. Therefore, the Pacific Panel and PICES are prepared to develop a project to address the “variability and change of physical processes of the global oceans impacting on biogeochemical cycles and marine ecosystems”, which could use field observations, data analysis and numerical modelings.

CLIVAR is in a strong position to lead such project, with a close collaboration of climatologists/physical oceanographers and scientists with biogeochemical and biological disciplines under a proper international framework. Integrated Marine Biogeochemistry and Ecosystem Research (IMBER), the core program of IGBP and SCOR, focuses on marine biogeochemical and ecological studies. It's worth pointing out that one of the themes of IMBER is “Responses of society”. Collaboration with IMBER is advantageous and could contribute to CLIVAR products that solve emerging issues of society in the Global Change Era. In the North Pacific, PICES (The North Pacific Marine Science Organization) has carried out several interdisciplinary marine science programs. PICES recently launched an integrated program FUTURE to understand how marine ecosystems in the North Pacific respond to climate change and human activities. FUTURE has developed new working groups on North Pacific Climate Variability and Change (WG27) and Regional Climate Modeling (WG29). Physical oceanographers and biogeochemical oceanographers have been collaborating in these activities.

FUTURE and FUTURE-related national programs would be desirable partners for the CLIVAR Pacific Panel in their interdisciplinary collaborations.

Southern Ocean Panel (SOP)

The CLIVAR/CliC/SCAR Southern Ocean Region Panel acts as an intersection between WCRP CLIVAR, WCRP CliC and the Scientific Committee on Antarctic Research, which is an interdisciplinary committee of the International Council for Science. The link with SCAR is particularly prevalent with the development of the Southern Ocean Observing System.

The panel is building on links with the carbon community; the 7th meeting of the Southern Ocean panel had three 'themes', one of which was *Southern Ocean Carbon*, lead by Dr Nicole Lovenduski who joined the panel in 2010. During this session the panel heard about a variety of initiatives from invited speakers with expertise in this field.

The panel is also developing links with SPARC/DynVar; Edwin Gerber was an invited speaker at SOP7, and was highly engaged in the discussions. Ed also agreed to attend the WCRP Polar Climate Predictability Initiative as a representative of SOP, to communicate current activities in the Southern Ocean.

Variability of the African Climate System (VACS)

GEWEX – Since the last CLIVAR SSG, there has been dialogue with GEWEX on how to strengthen the partnership between GEWEX and CLIVAR for VACS. The interaction with GEWEX falls under what was CEOP and is now the GEWEX Hydroclimatology Panel (GHP), chaired by Dennis Lettenmaier. The direct contact for VACS has been Sam Benedict who coordinates GHP, and who was present at the 4th VACS meeting last year. The GHP regularly holds teleconference calls with its Regional Hydroclimate Projects that VACS will be invited to participate in.

NOAA and JCOMM Data Buoy Cooperation Panel (DBCP) – VACS has supported capacity development workshops organized in the Western Indian Ocean sector. Our main interlocutor is Sidney Thurston, International Coordinator for the NOAA Climate Program Office.

CORDEX – VACS is working to strengthen its links to the CORDEX-Africa activity to encourage community analysis of the CORDEX dataset. The CORDEX output will be potentially useful across many African regions and for use by the science, impacts, adaptation and vulnerability research communities. With the availability of CORDEX datasets and CMIP5 model runs, there scope for the update of the VACS African Climate Atlas (<http://www.clivar.org/organization/vacs/resources/vacs-climate-atlas>).

International Programmes

A number of international programmes were discussed by the panel at its last meeting are listed on the VACS website (<http://www.clivar.org/organization/vacs/resources/africa-regional-activities>) as well as in the meeting report. VACS has a key involvement in many of these

initiatives and is directly represented in the majority. However, some of these activities e.g. ACMAD, need to have a stronger VACS representation.

Variability of the American Monsoon System (VAMOS)

- VAMOS supports activities under the WCRP extremes cross-cut, such as the WCRP Drought Interest Group (DIG), and more recently the development of a Global Drought Information System (GDIS)
- VAMOS supports activities under the WCRP Modeling Theme, particularly with the CLIVAR Working Group on Seasonal to Interannual Prediction (WGSIP)
- The VAMOS endorsed project, La Plata Basin Regional Hydroclimate Project (LPB), is also endorsed by the GEWEX Hydroclimatology Panel (GHP)
- The CLARIS-LPB (a Europe-South America network for climate change assessment and impact studies in La Plata Basin) Project has involvement from both VAMOS and CORDEX (COordinated Regional climate Downscaling EXperiment)

Working Group on Ocean Model Development (WGOMD)

WGOMD maintains strong links with the following activities:

- US CLIVAR AMOC Program
- Arctic Ocean Model Intercomparison Project (AOMIP)
- WCRP Climate Model Metrics Panel (WCMMP)
- CLIVAR Atlantic Implementation Panel (AIP)

Ocean modelling groups are moving to developing the physical and biogeochemistry components in a collaborative way. This paves the way for potential cooperation between WGOMD and IMBER (see note prepared for the SSG on WGOMD-IMBER collaboration).