

Report to CLIVAR SSG-20

Panel or Working Group:

1. Contributions to developing CLIVAR science and fit, where appropriate, to the CLIVAR imperatives

Monsoons:

- PP is coordinating activities studying western boundary currents NPOCE, GAIA, INSTANT-II, OKMC, SPICE and PACCSF.
- PP is spearheading new activities to improve our understanding of the South Pacific Convergence Zone (SPCZ).

Observing system:

- PP has been in discussion with David Legler, who is program director of the global Ocean Climate Observations within NOAA, on issues of declining report from the US-sponsored TAO array since the ship was retired last June 2012 with others, and on the future of TAO array (2013). The underlying question is "how best to develop a more sustainable and helpful ocean observing system to the tropical Pacific" given the scientific and societal needs, new knowledge, and new technology. An idea is to bring scientists and engineers in a workshop, later this year, to think about this all. An option to explore would be, for instance, to have more international contributions from operational agency as well as research agency, especially in terms of ship time and scientific contribution. It is also necessary that TAO/TRITON buoys sites may also be optimized with new technology and idea.
- A major SPICE cruise took place in the Solomon Sea (2012; IRD/SIO/CNRS) to sample hydrological, geochemical and biological properties, and deploy mooring lines in key straits that feed the equatorial warm pool and EUC (Eldin et al, Clivar Exchanges Newsletter 61)
- A series of NPOCE cruises have been carried out by IOCAS, KIOST and JAMSTEC

2. Briefly list any specific areas of your panel's activities that you think would contribute to the WCRP Grand Challenges as identified by the JSC at its most recent meeting¹

- Provision of skillful future climate information on regional scales

Research conducted by projects in the Pacific's western boundary currents region will provide the necessary understanding to support climate studies and impacts in the region. As an example, changes in the Northwestern Pacific (NWP) water properties and ocean circulation can influence the heat and freshwater budget and hence the atmospheric deep convection and the changes in air-sea interactions over the Indo-Pacific warm pool, thereby playing a role in modulating ENSO cycles and the East Asian Monsoon variations, as well as in the development and evolution of the NWP cyclones.

Panel members organised "The third CLIVAR workshop on the Evaluation of ENSO Processes in the Climate Models" which was held 21-23 January 2013 in CMAR's Hobart site. Fifty oceanographers from Australia and many countries, including leading ENSO researchers Drs Ed Harrison, Mike McPhaden, Gabe Vecchi from NOAA, Dr Fei-Fei Jin from

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1. Provision of skillful future climate information on regional scales (includes decadal and polar predictability)
2. Regional sea-level rise
3. Cryosphere response to climate change (including ice sheets, water resources, permafrost and carbon)
4. Improved understanding of the interactions of clouds, aerosols, precipitation, and radiation and their contributions to climate sensitivity

University of Hawaii, Mat Collins from Exeter University, Eric Guilyardi from IPSL/LOCEAN and many IPCC Fifth Assessment Coordinating Lead Authors and Lead Authors. The workshop reviewed the latest El Niño-Southern Oscillation paradigms, past, present and future ENSO simulation, and the importance of ocean observations in improving ENSO in climate models. One of the outcomes is to further calibrate the IPCC Fifth Assessment statement on how ENSO may change in a warming climate.

- Regional sea-level rise

Long-term sea level changes are driven by a combination of anthropogenically forced climate change and natural climate variability. A clear understanding of the natural sea level variability at decadal to multidecadal timescales is crucial to confidently attribute the long-term sea level changes found in observations. Recent regional long-term sea-level variations in Indo-Pacific are largely wind-driven. Wind-induced sea-level changes may delay sea-level rise in some regions in the Southwestern Pacific by up to several decades. Some models do not capture well the magnitude of recent sea level trends although the pattern of those trends is well captured. There is a strong opportunity for the Pacific Panel to further explore links with sea level research community, and support research on the impact of sea level change for countries in the Pacific basin, mainly Small Islands States.

- Science underpinning the prediction and attribution of extreme events

Rising mean sea level projects onto changes in extreme events. In addition to an increase in sea level extremes, more extreme events are expected as a response of the South Pacific Convergence Zone to greenhouse warming, including droughts and tropical cyclones in regions not accustomed to such events. Further, accelerated warming along western boundary currents may lead to change in cyclone tracks and frequency.

Panel members interacted with south Pacific regional environment programme on using climate information in the organisation's climate change action and adaptation plan. Cai led an international effort and published a Nature paper on South Pacific Convergence Zone extreme swings (Cai, W., M. Lengaigne, S. Borlace, M. Collins, T. Cowan, M. J. McPhaden, A. Timmermann, S. Power, J. Brown, C. Menkes, A. Ngari, E. M. Vincent, and M. J. Widlansky (2012) More extreme swings of the South Pacific Convergence Zone due to greenhouse warming. Nature, 488, 365-369. doi:10.1038/nature11358.

3. Key new science findings in the context of the new ocean-atmosphere CLIVAR (1-3 suggestions)

SPCZ future (Cai et al; Widlansky et al)

WBC warming (Wu et al)

4. Key science questions that you anticipate your community would want to tackle in the next 5-10 years within the context of the new ocean-atmosphere CLIVAR (1-3 suggestions)

a. SPCZ and model biases

How can we improve simulation in global coupled models?

b. ENSO: past, present, future

How may ENSO change in a warmer world?

c. Future ocean transport and heat budget

How will transport and heat redistribution change with global warming? What impact on climate dynamics (ENSO, SPCZ, SAM)?

How has and will regional sea level change (including relative importance of anthropogenic and natural variability contribution)?

- e. What are the changes in the characteristics of air-sea interactions in the Pacific Ocean?

5. Cooperation with other WCRP projects, other global change bodies (e.g. IGBP) and links to applications

Panel members participated in a coordinated effort (2008-2012) to assess the response of tropical Pacific fisheries and aquaculture to climate change. This effort, lead by the Secretariat of the Pacific Community, aimed at building a bridge between Pacific Island needs and most recent research results. It resulted in the edition of a 925-page review book (ISBN 9789820005082) oriented to Pacific Island decision-makers, a special issue in Climatic Change and a Nature review paper (10.1038/nclimate1838), associating ~80 scientists from different nations.

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 WCP. 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.

6. Activities in the context of scientific capacity building and career support?

Students from Africa and the Pacific Islands (University of the South Pacific, Fiji) have been enrolled in PhDs related to SPICE and trained in France

7. Activities in the context of knowledge exchange with societal actors?

SPCZ workshop in SAMOA (2010)

Participation / climate expertise to two “Head of fisheries” meetings (Ministries of fisheries of Pacific Island Countries) at SPC

8. New activities being planned, including timeline, request for endorsements, potential for new funding opportunities

Response to upcoming European FP-7 on climate change and ecosystems of the Pacific and (2014). This will follow results from Pacific INCONET Pace-Net (<http://pacenet.eu>).

9. Workshops / meetings planned

- 8th Pacific Panel meeting, July 2013 – China
- Second international workshop on the Western Boundary Currents prior to the Panel Meeting.

10. Issues for the SSG

Support actions to sustain TAO/TRITON type of measurements

Annex A

Proforma for CLIVAR Panel and Working Group requests for SSG approval for meetings

1. **Panel or Working Group:** ITF Task Team
2. **Title of meeting or workshop:** Capacity Building Workshop
3. **Proposed venue:** Bandung Institute of Technology (ITB), Bandung, Java, Indonesia
4. **Proposed dates:** early 2014
5. **Proposed attendees, including likely number:** ~25-30 graduate and final-year undergraduate students and junior scientists that major in physical oceanography. These junior scientists will be from universities within Indonesia as well as from major Indonesian government marine agencies. Students will be selected in conjunction with the local organizing committee.
Five international plus three Indonesian lecturers will be in attendance to undertake the teaching effort.
6. **Rationale, motivation and justification, including: relevance to CLIVAR themes & JSC cross cutting topics and any cross-panel/working group links and interactions involved:**
To fulfill the capacity building component as part of the CLIVAR Indonesian Throughflow (ITF) - Task Team to train regional students and scientists with interests in the ITF and its role in the climate. Also, determining what data, models and methodologies are appropriate for understanding a range of Indonesian Throughflow problems
7. **Specific objectives and key agenda items:**
The theme of the workshop is "Matching Indonesian Throughflow Problems to the Right Models and Data Sets". The specific objectives are to provide instruction for young Indonesian researchers to develop skills in the application, analysis and interpretation of remotely sensed and in situ data, as well as output from state-of-the-art models. In particular we aim to provide hands-on guidance for these students to be able to collate data sets and model output for their own specific regional applications. One of the special foci of the workshop is the applications of spaceborne measurements from the Earth Observation (EO) Program of the European Space Agency (ESA) and from the Earth Observation System (EOS) Program of the National Aeronautic and Space Administration (NASA). The agenda of the workshop will take the form of guest lectures in the morning from both international and Indonesian senior scientists (see below), followed by practical hands-on tutorial sessions in a computer laboratory each afternoon using models and data that will be provided by the senior researchers to the trainees.
8. **Anticipated outcomes (deliverables):** A training workshop will more readily enable regional Indonesian researchers and students to be directly engaged in the use of data, models and tools for monitoring the ITF and understanding its potential impacts on climate.
9. **Format:** A 3-day workshop with lectures given by international and Indonesian oceanographers in tandem with hands-on tutorial practical sessions.
10. **Science Organising Committee (if relevant)**

International Lecturers

Dr. Janet Sprintall (Scripps Institution of Oceanography, USA)
Prof. Arnold Gordon (Lamont-Doherty Earth Observatory, USA)
Dr. Tony Lee (Jet Propulsion Laboratory, USA)
Dr. Arianne Koch-Larrouy (LEGOS, France)
Dr. Susan Wijffels (CSIRO, Australia)
An EO satellites observations expert to be identified.

Indonesian Lecturers

Dr. Kandaga Pujiana (ITB, Bandung (presently at LDEO), local host)
Dr. Safwan Hadi (ITB, Bandung)
Dr. Nining Sari Ningsih (ITB, Bandung)
Dr. Agus Atmadipoera (IPB, Bogor)
Dr. Indra Jaya (IPB, Bogor)

11. Local Organising Committee (if relevant)

Dr. Kandaga Pujiana (ITB, Bandung, local host)
Dr. Safwan Hadi (ITB, Bandung)
Dr. Nining Sari Ningsih (ITB, Bandung)
Dr. Agus Atmadipoera (IPB, Bogor)
Dr. Indra Jaya (IPB, Bogor)

12. Proposed funding sources and anticipated funding requested from WCRP:

Funding of \$15K is requested from WCRP. Local host ITB, Bandung, Indonesia will provide the lecture room, projection and computing facilities for the students from their own resources. The association of Indonesian Marine Scientists have also indicated they are willing to provide some financial support for the workshop. The Organising Committee will also seek support from other local agencies such as the IOC Singapore office and other international agencies of ONR, NSF etc.