

## Report to CLIVAR SSG-18

### Panel or Working Group: Indian Ocean panel

Indian Ocean Panel (IOP) was established in 2004 and has met on seven occasions. The most recent meeting was held in Perth in July 2010, jointly with the first Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER) project SSG meeting, the seventh Indian Ocean GOOS annual meeting, and the first IndOOS Resources Forum (IRF). The Panel is coordinating implementation of the Indian Ocean Observing System (IndOOS) and research activities using data from IndOOS and modeling outputs. The Panel's activities (e.g. meetings) are supported jointly by IOC-Perth Regional Office and WCRP, a cost-sharing arrangement that is expected to continue. IOP is also the science sub-group of the Indian Ocean GOOS Regional Alliance. IOP in collaboration with Alliance-partners is developing regional applications of research and re-analysis products.

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

IOP mainly contributes to CLIVAR imperatives through building the ocean observing capability in the tropical Indian Ocean and stimulating the data and model based studies. It has developed the Implementation Plan for IndOOS and is coordinating its development.

IndOOS has developed in response to the urgent data requirements by the science and social communities. It is a multi-platform long-term observing system, which consists of Argo floats, surface drifting buoys, tide gauges, mooring array, VOS based XBT/XCTD lines and satellite measurements as a backbone observation for monitoring sea surface conditions. Its critical component, the Research moored Array for African-Asian-Australian Monsoon Analysis and prediction (RAMA), which is the Indian Ocean counterpart of the TAO/TRITON array in the Pacific and PIRATA in the Atlantic, consists of 46 planned moorings. **As of April 2011, 27 of the RAMA mooring sites are already occupied (59%),** with the equipment and/or ship time contributions from the US, Japan, India, China, Indonesia, and France, as well as from regional programs such as ASCLME. Due to insufficient ship time and piracy issue in the northwestern Indian Ocean, the RAMA implementation rate is only gradually increasing in the recent years. However, several additional moorings are expected to be deployed in 2011 and the implementation rate will be close to 70% of the full array by the end of 2011. Most of the IndOOS data are available through the IndOOS data portal site at [http://www.incois.gov.in/Incois/iogoos/home\\_indoos.jsp](http://www.incois.gov.in/Incois/iogoos/home_indoos.jsp). The most-related CLIVAR imperatives for this activity is "Imperatives VI: Ocean observing system".

Because of the rapid progress in the implementation of IndOOS, new data obtained has already helped to improve our understanding of various phenomena of climate importance, such as *i)* the ocean dynamics associated with Indian Ocean Dipole, *ii)* dynamics of the equatorial currents at intra-seasonal, semi-annual and annual time scales, and *iii)* upper ocean response (SST and mixed layer depth) to MJO and cyclone forcing and its potential feedbacks. More detailed information, and the full list of publications can be obtained at the IndOOS bibliography site at <http://www.clivar.org/organization/indian/IndOOS/biblio.php>.

The data stream from IndOOS will be vital for advancing monsoon research, particularly from the point of view of monsoon-ocean interaction. IndOOS data will certainly help to advance our understanding of the monsoon dynamics, and lead to improvements in seasonal prediction skill in the African-Asian-Australian monsoon region. An international research project focusing on MJO initiation in the Indian Ocean, named CINDY2011/DYNAMO project, is coordinated by IOP and AAMP, and its intensive observation campaign will be conducted in October to December, 2011. These research activities are relevant to "Imperatives III: Intraseasonal and seasonal predictability and prediction".

IOP is cooperating with Pacific Panel to develop an Indonesian Throughflow Task Team

(ITF-TT). ITF-TT was approved by CLIVAR/SSG in February 2011, and it starts discussions about working strategies and a first workshop which will be held in Indonesia in early 2012.

## **2. Cooperation with other WCRP projects, outside bodies (e.g IGBP) and links to applications**

- IOP has been developing a strong linkage with the Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER) project, which is a regional program under IMBER/IGBP. Dr. Raleigh Hood is a liaison member of IOP from SIBER group. SIBER and IOP are planning to organize a workshop in 2011 on biogeochemical instruments on the IndOOS infrastructure, and also planning to convene joint sessions on the physical and biogeochemical aspects in the Indian Ocean at several international conferences. These activities are outcomes from the previous IOP-SIBER joint meeting in Perth. This activity may partly be relevant to “Imperatives V: Data synthesis, analysis, reanalysis and uncertainty”, in which the linkage with IGBP related activities is a key.
- IOP is also working as a sub-panel under IO-GOOS. At the same time, IO-GOOS has established IndOOS Resources Forum (IRF), which is a critical activity to secure the ship-time and other resources for IndOOS. The IRF members are executive-level managers from agencies and national or international programs that are currently supporting the development of IndOOS. During the last IO-GOOS meeting in Perth in July 2010, the first IRF meeting was organized and all the IRF members recognized the present status of IndOOS and issues to be considered in short-term implementation and/or long-term maintenance of IndOOS. The collaboration with IO-GOOS is quite efficient and will contribute to further development of IndOOS, regional/coastal observing systems in the Indian Ocean, and related research activities.

## **3. Workshops/meetings held**

- 7<sup>th</sup> IOP meeting, Perth, Australia, July 2010

## **4. New activities being planned, including timeline**

- 8<sup>th</sup> IOP meeting, in association with SIBER SSC-2 and IRF-2 meetings, Chennai, India, 25-29 July 2011
- Two sessions proposed to the Planet Under Pressure conference: (1) Role of the Indian Ocean and monsoon prediction, and (2) Climate and anthropogenic impacts on regional oceanography, ecosystems and fisheries in the Indian Ocean

## **5. Workshops/meetings planned (see ANNEX B also)**

The 8<sup>th</sup> IOP meeting will be held in July 2011 in Chennai, India, in conjunction with SIBER SSC, and the second IRF. This integrated approach is expected to enhance mutual collaborations among different communities and enhance capability to develop and maintain IndOOS.

## **6. Issues for the SSG**

## **Annex B**

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

Requests should be made through D/ICPO (Robert.Molinari@noc.soton.ac.uk), against the following headings:

- 1. Panel or Working Group:** Pacific Panel and Indian Ocean Panels
- 2. Title of meeting or workshop:** Indonesian Throughflow Workshop
- 3. Proposed venue:** Indonesia
- 4. Proposed dates:** early 2012
- 5. Proposed attendees, including likely number:**
  - ITF Task Team members
- 6. Rationale, motivation and justification, including: relevance to CLIVAR themes & JSC cross cutting topics and any cross-panel/working group links and interactions involved:**

Sustained observational and modeling efforts are needed in the ITF region to provide insight into the long-term behavior and to elucidate the climatic impacts of this complex system in response to future climate change. As the ITF has multiple streams and undergoes significant modification in its stratification en route through the Indonesian seas, a cost-effective, long term monitoring system is no easy matter to design. The ITF research community proposes that an ITF Task Team be established to consider the specifics to evolve such a cost-effective plan. The overarching objective of the ITF Task Team is to identify the scientific gaps in our knowledge of the ITF and develop an integrated strategy towards an internationally sustained ITF observing system.

Development of an ITF plan would benefit from coordination under the auspices of CLIVAR. Despite the importance of the ITF to the earth climate system, in the past issues related to the climate variation within the Indonesian seas have largely been assessed in a fragmented way by the individual CLIVAR Indian and Pacific Panels and the Asian-Australian Monsoon Panel. This is possibly related to the geographical location of the Indonesian archipelago that bridges the Indo-Pacific region, while having a significant impact on the mean and variable circulation within both ocean basins. Coordination of the ITF Task Team under CLIVAR will provide a more formal linkage to these individual panels, and will help emphasize the societal benefits of ITF observations through a better understanding of the connection between the ITF variability with the IOD, ENSO and the monsoon systems.

- 7. Specific objectives and key agenda items:**
  - Facilitate international collaboration between observational and modeling efforts, in order to target the urgent gaps towards understanding the ITF variability and maximize the scientific outcome.

**8. Anticipated outcomes (deliverables):**

A workshop report will be written that outlines the justification and main elements identified as necessary for developing an internationally coordinated sustained monitoring of the ITF.

**9. Format:** 2 and half days meeting.

**10. Science Organising Committee (if relevant)**

Janet Sprintall, Yukio Masumoto, Wenju Cai

**11. Local Organising Committee (if relevant)**

Nico Caltabiano (ICPO)

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

US\$ 10K

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

Requests should be made through D/ICPO (Robert.Molinari@noc.soton.ac.uk), against the following headings:

**13. Panel or Working Group:** Indian Ocean Panel

**14. Title of meeting or workshop:** The 9<sup>th</sup> Indian Ocean Panel Meeting

**15. Proposed venue:** TBD

**16. Proposed dates:** TBD

**17. Proposed attendees, including likely number:**

- Attendees include the Indian Ocean Panel members, ICPO secretaries and invited experts. The likely number is around 20.

**18. Rationale, motivation and justification, including: relevance to CLIVAR themes & JSC cross cutting topics and any cross-panel/working group links and interactions involved:**

The 9<sup>th</sup> Indian Ocean Panel meeting will review the progress of the IndOOS implementation and in research activities of the Indian Ocean. Also the meeting will discuss follow-up actions to the second IndOOS Resources Forum that will be held immediately after the 8<sup>th</sup> IOP meeting in July in Chennai, India. These topics will meet the climate research and prediction requirements in the Indian Ocean basin.

**19. Specific objectives and key agenda items:**

Specific objectives include the efficient coordination of the IndOOS implementation and related observational activities, and stimulating the application of IndOOS data in the climate research and prediction.

Key agenda items include: (1) review of the IndOOS implementation; (2) science progress based on the IndOOS observations; (3) follow-up actions to the second IndOOS Resources Forum; (4) implementation strategy of biogeochemical sensors on RAMA; (5) demonstration of the scientific and social values of IndOOS.

**20. Anticipated outcomes (deliverables):**

The 8<sup>th</sup> Indian Ocean Panel meeting report will be delivered.

**21. Format:**

2 and half days meeting.

**22. Science Organising Committee (if relevant)**

Weidong Yu and Yukio Masumoto

**23. Local Organising Committee (if relevant)**

Nico Caltabiano (ICPO)

**24. Proposed funding sources and anticipated funding requested from WCRP:**

The funding will come from WCRP and IOC Perth Regional Office. The anticipated funding request to WCRP/CLIVAR would be 10,000. USD