Report on the First Meeting of the Indian Ocean Observing System (IndOOS) Resources Forum (IRF-1)
15 July 2010
Perth, Australia

Participants:

IRF Members: Shailesh NAYAK (Chairman), Mitrasen BHIKAJEE, Shiro IMAWAKI, Chet KOBLINSKY, Mark MAJODINA, Gary MEYERS (Convenor), Tim MOLTMANN, Wendy WATSON-WRIGHT

Invited participants: Ken ANDO, Greg AYERS, Lyn BEAZLEY, Howard CATTLE, Nick D'ADAMO, Raleigh HOOD, Somkiat KHOKIATTIWONG, Nagaraja KUMAR, Srinivasa KUMAR, Yukio MASUMOTO, Wajih NAQVI, Lucy SCOTT, Satheesh SHENOI, Fadli SYAMSUDIN, Sid THURSTON, Weidong YU

Apologies: CHEN Zhi, DJAMALUDIN Ridwan, LIN Shanqing, Patrick MONFRAY, Etienne RUELLEN, David VOUSDEN

Actions resulting from the meeting

1. Document the ongoing contributions to IndOOS by various agencies in detail and make the information available on an IRF website to be established at the IOC Perth Regional Programme Office (Gary Meyers, Nick D'Adamo and IRF support staff by end of December).
2. Compile information on how time is allocated for research vessels that operate in the Indian Ocean region, starting with the seven vessels that are already scheduled for 2010/11, and circulate to members. Explore where multiyear allocation processes already exist or might be developed. (Gary Meyers by end of December)
3. Consolidate information on all planned research cruises in the Indian Ocean, and circulate to members. Partial lists may already exist with other research-planning panels (e.g. POGO, GSOP, GO-Ship). (ICPO staff by end of December)
4. Compile a list of potential sources for biogeochemical research funding, and prepare an action-plan to sound out their interest in sustained BGC observing (SIBER SSC by end of December)
5. Develop an initial plan for using gliders in IndOOS, in particular in the gaps in the eastern and western Indian Ocean and for BGC measurements (IOP and SIBER by next IRF meeting)
6. Based on the new business arrangements between GEF and IOC, report on the potential for GEF supporting the new IOGOOS-SEAGOOS-Westpac capacity building project on "Modelling for Ocean Forecasting & Process Studies" (Nick D'Adamo, Keith Alverson and Wendy Watson-Wright, by end of December)
7. Plan the establishment of a SIBER project office (Raleigh Hood, Wajih Naqvi by end of December)
8. Considering their roles as umbrella organisations for IndOOS, invite the Director of International CLIVAR Project office and the Head of IOC Perth

Regional Programme Office to be members of the IRF (Chairman and Convenor by end of December).

9. Set date and venue of next IRF meeting coordinated with the next IOP and SIBER meetings (IOP and SIBER Co-chairmen with IRF Convenor by early October)

The agenda and information about the participants is in the appendix.

Session 1: Plenary with participants from IOGOOS, IOP and SIBER

Prof Lyn Beazley, Chief Scientist of Western Australia opened the session with a talk on the unique marine science and research carried out in this region. Of particular relevance to IndOOS, she noted the critical need to document the base-line environment of pristine regions (e.g. Ningaloo Reef) and valuable resources (e.g. fisheries) before we can address the risks of climate change. She also noted that the University of Western Australia operates a large fleet of gliders under auspices of the Australian Integrated Marine Observing System.

The Chairs of IOGOOS, IOP and SIBER summarized results from the meetings earlier in the week, including advances in science and resourcing-issues. The complete power-point versions of these talks will be available on an IRF website. Selected issues of particular importance to development of IndOOS are

- There has been progress in observing the Indian Ocean, and importantly, improved capability in regional agencies for analysis and prediction of the marine environment. There is a need to enhance capability in all countries through out the region.
- Maintenance and enhancement of the Research Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) requires additional resources. In July 2010, 27 of the planned 46 mooring sites have been occupied. Gaps in the availability of ship-time to refresh mooring sites have already caused loss of data. Approximately 160 days of ship time per year are needed to sustain the whole array of 46 sites.
- Enhanced coverage in the far eastern and far western tropical Indian Ocean is needed. Pirate attacks have delayed implementation in the West. Enhancement of the array design is needed in the East.
- There is an opportunity to establish a SIBER International Project Office associated with the proposed Indian National SIBER Program.
- After consideration of science and logistics, the eight so called flux reference sites in RAMA have been selected for enhancement with biogeochemical sensors. Priority-order for establishing the sites has been documented.
- Completion of RAMA as originally planned plus initial enhancement with biogeochemical sensors is envisioned for 2012.

Session 1 closed with introduction of the IRF members by the Convenor.

Session 2: Formal session of IRF-1 with members and invited participants

Agenda Item 1: Opening and Introduction

Dr Shailesh Nayak, Secretary of the Indian Ministry for Earth Sciences, welcomed the participants and thanked the Convenor for preparation of the meeting. Resources in terms of scientific and technical staff, equipment, funding and ship-time have to be shared to develop basin scale observing systems and to deliver societal services. Dr Nayak also noted that the IRF will have to promote the continuity of satellite remote sensing as well as in situ observing to achieve our goals.

Agenda Item 2: IRF Business

Dr Gary Meyers led a discussion of the IRF Business Plan and Terms of Reference. The Business Plan calls for the Chair to be elected for a term of two years. Dr Meyers suggested that Dr Nayak should be the first Chair because of his long experience and leadership of IOGOOS, and because the IRF members are just now beginning to work together. Future Chairs should be nominated and elected. The IRF members agreed unanimously. The Business Plan was detailed and accepted, with the exception that Members decided to meet annually, rather than every two years. It was felt that annual meetings are required to achieve the functions of the IRF.

Agenda Item 3: Contributions to IndOOS by each Agency

The Members or their delegates described their national interests in the Indian Ocean and contributions to IndOOS from agencies in their respective countries. The complete power-point versions of these talks will be available on the IRF website. Without providing individual details, the following key points emerged:

- Contributions to the observing platforms that are specifically identified in the IndOOS Plan (XBT lines, Argo floats, surface moorings, flux moorings, ADCP moorings, deep moorings, surface drifters and tide gauges) have been made by agencies in Australia (IMOS), China (FIO), France (LOCEAN), India (MoES), Indonesia (BPPT), Japan (JAMSTEC) and USA (NOAA). A number of additional agencies or institutions that are not directly represented on the IRF also contribute.
- Contributions of ship-time to develop RAMA have been provided by agencies in China, India, Indonesia, Japan, France and ASCLME. These contributions are described in detail in a discussion paper available on the IRF website.
- NOAA will not be able to provide committed ship time in the Indian Ocean; they would be able to provide mooring technologies and data handling systems to match others' contributions of ship-time.
- IMOS in collaboration with NOAA, KORDI and regional partners will monitor the eastern passages of the Indonesian Throughflow until 2013, with a view toward establishing a sustained observing array. NOAA and collaborators are considering a proposal to monitor the western passages.
- The Global Environment Facility is supporting oceanographic activity in the Indian Ocean region (e.g. ASCLME and AMESD), in particular with regard to capacity building.
- Preparation of an IRF Charter with the goal of completing and sustaining the IndOOS plan, and formal endorsement of the Charter at the next IRF meeting was proposed.

Agenda Item 4: Societal Benefits

Dr Meyers gave a presentation on the societal benefits that can be supported by IndOOS data, based on papers that have recently been published. The benefits include

- Improved understanding and ability to predict Tropical Cyclone Heat Potential (TCHP) and cyclone tracks
- Improved understanding and ability to predict intra-seasonal variation (e.g. MJO), and associated probability of seasonal tropical cyclone activity
- The above are important for coastal populations and off shore industries
- Improved prediction of seasonal to inter-annual climate anomalies (e.g. IOD), important for agriculture and other industries
- Improved monitoring and analysis of the marine environment and marine services based on operational oceanography. This is particularly important for management of marine ecosystems and resources.

Dr Watson-Wright gave a presentation on the history and activities of IOC, with emphasis on the organisation's commitments to building capability in ocean sciences and services in all countries. Of particular interest for the IRF, Roger Revelle was the Founding Father of IOC, and the organisation has its origin in the International Indian Ocean Expedition during 1960-1965.

Agenda Item 5: discussion of resource-needs with the Chairs of IOP and SIBER

The modes of weather and climate variation that determined the IOP IndOOS Implementation Plan are tropical cyclones, MJO, IOD, multi-decadal variation and warming trends. Ocean circulation and mixed layer process change as these modes develop and affect interaction with the atmosphere. IndOOS' in situ observations and satellite remote sensing support research to characterise, understand, model and predict the impacts of these phenomena. SST is the parameter for which we have the longest records and both in situ and satellite measurements are needed to characterize the critically important SST patterns. Salinity is particularly important in the Indian Ocean and we will have a salinity measuring satellite in the future. This will enable further understanding of ocean surface processes and ocean-atmosphere interaction. The critical need to progress IndOOS/RAMA at this time is 160 days of ship time per year committed out to 2-3 years in advance.

The SIBER Implementation Plan was driven by the need to understand how ocean circulation and the above weather and climate modes affect biogeochemistry and ecosystems. SIBER recognized the opportunity to enhance IndOOS, RAMA in particular, with new biological sensors that are becoming available. The data will support research to identify the impacts of anthropogenic activities & climate change (warming) on ecosystems, as well as the impacts of other human activities, e.g. fishing. The critical need to progress enhancement of RAMA with BGC sensors is funding to purchase sensors, approximately $138K per mooring site.

The following specific issues were raised:

- Dr Naqvi informed that SIBER includes numerous other observations in addition to those being planned as part of their engagement with IndOOS.
- Dr Masumoto was requested to provide his views on the process of implementation of BGC sensors on the RAMA Array. He noted that some sensors have already be trialed on RAMA moorings and he suggested that a

working group will address details of the implementation, starting with a workshop in early 2011.

- Dr Hood thanked Drs Nayak and Shenoi for agreeing to set up an international project office of SIBER at INCOIS. He indicated that SIBER is putting together a proposal that would also request for a monetary funding.
- Dr D'Adamo raised the issue of data management w.r.t. the SIBER data and reminded that this could be flagged as an issue to be discussed and come up with a work plan.

Agenda Item 6: Discussion on Resourcing Issues:

Ship Time:

RAMA requires 160 days per year committed well in advance. Dr. Nayak noted that ship-time is a issue that generally needs to be addressed on a bilateral basis. An approach to developing a forward schedule will begin with the Convener compiling information on how time is allocated for research vessels that operate in the Indian Ocean region, starting with the seven vessels that are already scheduled for 2010/11. This will give the IRF an idea of what is available and then take further action. Dr Cattle noted that it will beuseful to obtain the plans of POGO and CLIVAR regarding ship cruises.

Enhancement of RAMA with BGC sensors:

Dr Hood noted that one set of BGC sensors on a RAMA mooring would be approximately $138K. It is only the hardware and ship time that matters. Human resources are available for equipping the RAMA buoys with the BGC sensors. An approach to getting the funding is to compile a list of potential agencies and PI's. Then a plan of action with support from the IRF will be developed.

Gliders

Dr Imawaki and Dr Hood noted the need to incorporate the use of gliders into IndOOS. They could be useful in the gaps in the arrays in the far eastern and western Indian Ocean and for BGC measurements.

Next meeting

Participants re-affirmed that the IRF should meet annually, with IOP, SIBER and/or IOGOOS as opportunities permit. The Chairs will let the IRF Convener know the venues and a range of possible dates for the next meetings, then the date of the next IRF meeting will be discussed by email with IRF members.

Dr Watson-Wright, Executive Secretary of IOC and Assistant Director General of UNESCO for IOC, expressed appreciation of the work undertaken by the IRF and support of our future activities.

Appendix

Agenda (draft 20100601)
Indian Ocean Observing System (IndOOS) Resources Forum
Thursday 15 July 2010 Citigate Hotel, Perth, Australia

Plenary Session with IOGOOS, IOP, SIBER and IRF
0900-0920 Plenary Talk by Chief Scientist of Western Australia
0920-0940 Plenary Talk by IOGOOS Chair. *IOGOOS-7 Report.*
0940-1000 Plenary Talk by IOP Chair. *IOP-7 Report.*
1000-1020 Plenary Talk by SIBER Chair. *SIBER-1 Report.*
1020-1030 Plenary Talk by IRF Convenor. *Introduction to IRF*

1030-1100 Morning tea

1100-1700 First meeting of the IndOOS Resources Forum (by invitation members and observers)
1. 1100-1115 Welcome and Introductions (15 min)
2. 1115-1200 IRF business (45 minutes)
   --Elect chairman, approve agenda
   --Discuss and revise terms of reference, objectives and modus operandi
3. 1200-1245 IRF members briefly describe contributions to IndOOS and interests in observing the Indian Ocean from a personal, or agency-, or national perspective (45 minutes)

1245-1400 Lunch
4. 1400-1420 Presentation and discussion of societal benefits from IndOOS (20 minutes)
5. 1420-1440 Presentations to recap--key science issues and future resource-needs
   1420-1440 Chair Indian Ocean Panel (10 minutes)
   1440-1500 Chair SIBER (10 minutes)
6. 1440-1500 Convenor discussion of the resources needed by IndOOS (20 min)

1500-1530 Afternoon tea
7. 1530-1700 Round table discussion of resourcing issues (90 minutes)
   --Sustaining the RAMA climate array: Ship-time is a critical challenge. Members will brief the Forum on how ship time is allocated in each country and agree common action.
   --Enhancement of RAMA with biogeochemical sensors
   --Other issues (IRF members invited to raise issues)
8. 1700-1715 Next meeting, review of post-meeting actions, closing (15 min)

Participants

IRF members

Bhikajee, Mitrasen: Director Mauritius Oceanography Institute (Mauritius)
Koblinsky, Chet: Director Climate Program Office NOAA (USA)
Imawaki, Shiro: Executive Director JAMSTEC (Japan)
Majodina, Mark: Manager of International Relations SAWS (S. Africa)
Meyers Gary Honorary Fellow CSIRO and University of Tasmania (Australia)
Moltmann, Tim: Director Integrated Marine Observing System (Australia)
Nayak, Shailesh: Secretary Ministry of Earth Sciences (India)
Watson-Wright, Wendy: Assistant Director General UNESCO, Executive Secretary IOC

Invited participants

Ando, Ken: JAMSTEC (Japan)
Ayers, Greg: Director Bureau of Meteorology (Australia)
Beazley, Lyn Chief Scientist of Western Australia
Cattle, Howard: Director International CLIVAR Project Office
D'Adamo, Nick: Head IOC Perth Regional Program Office (International)
Hood, Raleigh: Co-Chair Sustained Indian Ocean Biogeochemical and Ecological Research
Khokiattiwong, Somkiat: Officer IOGOOS
Kumar, Nagaraja: Secretary IOGOOS
Kumar, Srinivasa: Officer IOGOOS
Masumoto, Yukio: Co-chair CLIVAR-GOOS Indian Ocean Panel
Naqvi, Wajih: Co-Chair Sustained Indian Ocean Biogeochemical and Ecological Research
Scott, Lucy: Agulhas and Somali Current Large Marine Ecosystems
Shenoi, Sateesh: Director Indian Centre for Ocean Information Systems
Syamsudin, Fadli: CLIVAR-GOOS Indian Ocean Panel
Thurston, Sidney: International Coordinator Climate Program Office NOAA (USA)
Yu, Weidong: Co-chair CLIVAR-GOOS Indian Ocean Panel

Apologies

Chen, Zhi: Director: Office of Ocean Observation SOA (China)
Djamaluddin, Ridwan: Director Environmental Services BPPT (Indonesia)
Lin, Shanqing: Director General, Department of Ocean Forecast and Disaster Mitigation (China)
Monfray, Patrick: Directeur-adjoint de l'Institut National des Sciences de l'Univers (France)
Ruellan, Etienne: Technical Division INSU (France)
Vousden, David: Director Agulhas and Somali Current Large Marine Ecosystems