Report on IO50 Symposium, IRF-6, IORP, SIBER and IOGOOS-XII Meetings held in Goa, India

IO50 Symposium held at NIO, Goa (30 Nov - 4 Dec, 2015)

As a part of the Golden Jubilee celebrations of the establishment of CSIR-NIO in Goa and the culmination of the International Indian Ocean Expedition (1959-65), an International Symposium on “Dynamics of the Indian Ocean: Perspective and Retrospective” during 30 November – 4 December 2015. This Symposium was co-sponsored by Government of India, Scientific Committee on Oceanic Research (SCOR) and Intergovernmental Oceanographic Commission (IOC of UNESCO).

The Symposium comprised of 15 scientific sessions during which 161 oral and 383 poster presentations were made. On the last day of the Symposium plans for future Indian Ocean research, Science Plan and national plans for Second International Indian Ocean Expedition (IIOE-2) were presented and discussed. The first cruise of the IIOE-2 onboard ORV Sagar Nidhi was flagged off at the Marmugao harbour on 4 Dec, 15.

Indian Ocean Resource Forum (IRF)-6 Meeting held at Bogmallo Beach Resort, Goa (5 Dec, 2015)

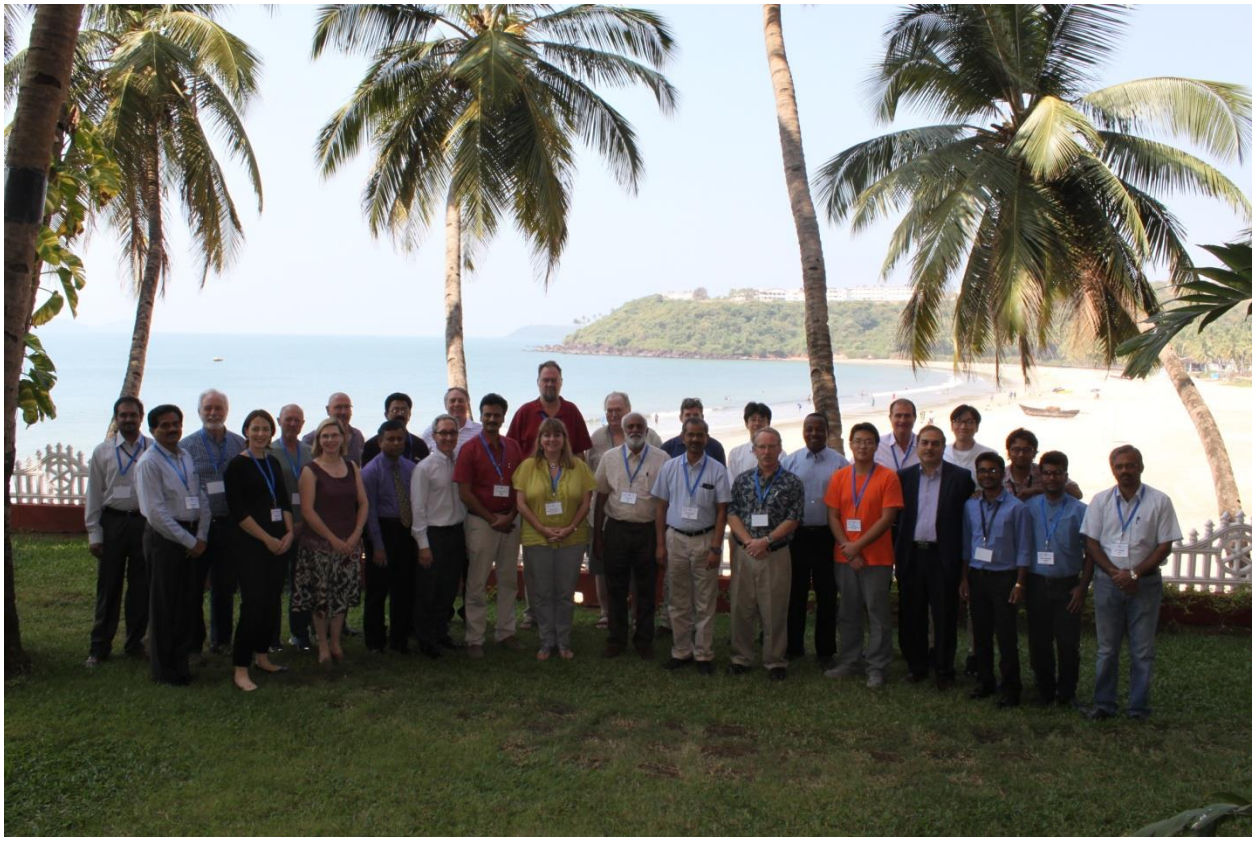
Key points from discussions

- Status reports given by IOP and SIBER on the Indian Ocean Observing System (IndOOS) in the respective physical and biogeochemical contexts. Key points noted:
  - RAMA is 74% complete. Piracy appears to no longer be impeding the completion of RAMA.
  - Currently 754 Argo floats and 150 drifters are operational in the IO. Distribution Argo floats is adequate, however up to 55 drifters have been deployed within the Bay of Bengal and better distribution around the IO is required.
  - Several new initiatives: ASIRI-OMM, EIOURI, ASCA.
  - The top priority for IOP is to complete RAMA and to sustain IndOOS. Sustained observations are required to understand all physical and biological drivers in the IO and for lengthening of time series. Ongoing challenge remains availability ship time.

- Noted gaps included: boundary currents, circulation below 2000m – what deployments are needed to cover these depths? Noted observing system experiments may be required to optimize design as part of planning for next decade.

- Korean (KIOST) participant indicated Korea keen to engage in IndOOS related activities, including IIOE-2.
- IOP and SIBER Co-Chairs provided outlines of their resource requirements, as a standing item on annual IRF meeting agendas
    - Ship time for deployment and servicing of RAMA and related observational infrastructure remains a key requirement.
    - Enhanced secretariat support and services to IOP and SIBER also needed.
    - Focus in the future should include emerging technologies, eg gliders, other robotics.
- Bio-Argo project status presented by Dr Nick Hardman-Mountford, CSIRO [ref: Australia India Strategic Research Fund project). 44 floats now in place in the IO.
- GRAs discussed in context of GRA-5 forum, Greece, Sep 2015.
- TPOS discussed also. Noted that TPOS can provide a case study for reference to IOP/SIBER in terms of future assessments/reviews of IndOOS.
- Update given on IIOE-2. See www.iioe-2.incois.gov.in website.
- Discussions regarding proposed reviews of IndOOS and IRF.

- Next meeting (IRF-7)
    - Consensus reached that aspiration of IRF is for IRF-7 to be held (i) in conjunction with IOGOOS-13 + SIBER-7 + IOP-13, as per joint concurrence on this integrated modality (from the joint 2014 meetings); to accept IOC Perth Programme Office / Uni of Western Australia offer for hosting in Perth, Western Australia; and for the timing to be the week of 5-9 Dec 2016; and for hopefully the four meetings to be back to back with an IIOE-2 workshop and also hopefully with a complementary IIOE-2 Steering Committee meeting (TBC).



IORP and SIBER Meetings held at Bogmallo Beach Resort, **Goa (7-8 Dec, 2015)**

The IORP and SIBER have met together on December 7-8, 2015, and IOGOOS members have also participated. The two days meetings have mainly focused on the review of the observing systems in the Indian Ocean, IIOE-2 and associated initiatives by various countries and new observing initiatives and process studies that are in place or proposed to undertake under IIOE-2. In addition to this, individual business meetings of IOP and SIBER were held in parallel.

The first IIOE-2 science conference provided an excellent context for the CLIVAR Indian Ocean Region Panel meeting. An almost-complete panel met for two days, together with the SIBER (the biogeochemical counterpart of the IORP), IO-GOOS (the Indian Ocean regional alliance of the Global Ocean Observing System program) and several invited experts. It was an opportunity to review the current state of IndOOS (the Indian Ocean Observing System). Ten years ago the Indian Ocean was considered to be the most poorly observed tropical ocean; it now has a fairly comprehensive observing system, with the RAMA mooring array 76% complete (35 moorings out of 46 planned ones) and an Argo profiler density above the nominal 1 profiler per 3° x 3° (547 floats, including 180 iridium ones). With piracy in the Arabian Sea having almost vanished and the completion

of IndOOS as an explicit objective of IIOE-2, there are now good chances to complete the Indian Ocean observing system within 5 years. The beginning of IIOE-2 also provides the opportunity to review the IndOOS design, to account for new observational technologies and challenges, and this will be undertaken by the IORP in the coming years. The IORP was also the opportunity to discuss new science results from the Indian Ocean region. Finally, a couple of joint initiatives were decided at this meeting. IORP and SIBER will jointly organize a winter school on Indian Ocean physics and biogeochemistry, hosted at NIO in early 2017. Members of the IORP and Pacific Region Panel will collaborate to write a review article on interactions between the Pacific and Indian Oceans.

IOGOOS-XII Annual Meeting held at Bogmallo Beach Resort, **Goa (9 Dec, 2015)**

The IOGOOS Annual meeting was held on December 9, 2015. Reports were submitted by the Co-chairs / Conveners of IORP, SIBER and IRF. The project leaders presented updates on the pilot projects Modeling for Ocean Forecasting and Process studies, Indian Ocean Core Remote Sensing Project. A brief presentation on the Capacity development initiatives of Perth Programme Office was made. The IOGOOS Chair summarized his report on IOGOOS activities. The Secretary, IOGOOS made reported on IOGOOS XI annual meeting, capacity building opportunities facilitated to IO rim countries, action taken against the actions identified in the IOGOOS XI annual meeting, Governance, Elections and Financial summary (including the membership fees and the audit of accounts). The remote sensing products made available to a few IO countries under ChloroGIN - IO project being implemented through Indian Ocean Core Remote Sensing Project has been showcased. Kuwait has shown interest in the products and requested to generate similar products for the Kuwait region and make it available. IOGOOS Secretariat was tasked to coordinate this. Kuwait Institute for Scientific Research (KISR) has joined as Member of IOGOOS and the Annual meeting appreciated and welcomed KISR.

The IOGOOS annual meeting agreed that the IIOE-2 should be considered as the Flagship of programme of GOOS. The IIOE-2 Steering Committee will be co-chaired by

the representatives from IOGOOS, SCOR and IOC. In this regard, the meeting discussed about the possible nomination from IOGOOS to the co-chair of IIOE-2 SC. Keeping in view of the vast experience and leadership of Dr. S.S.C. Shenoi, Director, INCOIS, India as IPC chair, he was nominated by the IOGOOS Members to be the Co-chair of IIOE-2 SC representing IOGOOS. IOGOOS committed to provide USD 10000 per year for the next two years towards IIOE-2 activities