SIBER: Sustained Indian Ocean Biogeochemistry and Ecosystem Research

Report to IIOE-2 Steering Committee

Raleigh R. Hood (Chair) and Michael Roberts (co-Chair)

IIOE-2 SC1 Meeting, February 3rd, 2017
What is SIBER all about?

SIBER: Sustained Indian Ocean Biogeochemistry and Ecosystem Research

- SIBER initially emerged as a result of the potential opportunity to leverage the CLIVAR/GOOS Indian Ocean mooring array (RAMA/IndOOS) and associated measurements and cruises for doing biogeochemical and ecological research.

- SIBER has expanded to include the entire basin and all Indian Ocean observing components, including Argo, ship of opportunity, etc.

- IIOE-2 has become as a major component of SIBER.

The IndOOS integrated observing system, with basin-scale observations by moorings, Argo floats, XBT lines, surface-drifters and tide-gauges; as well as boundary arrays to observe boundary currents off Africa (WBC), in the Arabian Sea (ASEA) and Bay of Bengal (BOB), the Indonesian throughflow (ITF), off Australia (EBC) and deep equatorial currents.

The long term goal of SIBER is to improve our understanding of the role of the Indian Ocean in global biogeochemical cycles and the interaction between these cycles and marine ecosystem dynamics. This understanding will be required in order to:

- Predict the impacts of climate change, eutrophication and harvesting on the global oceans and the Earth System.
- It is fundamental to policy makers in the development of management strategies for the Indian Ocean.

SeaWiFS biosphere image of the Indian Ocean region showing land vegetation and marine surface phytoplankton concentrations for boreal summer/austral winter. From http://oceancolor.gsfc.nasa.gov/SeaWiFS.
SIBER will endeavor to coordinate with and leverage:
- CLIVAR IOP
- Regional GOOSES
  - NEARGOOS
  - WAGOOS
  - SEAGOOS
  - INAGOOS
- IRF
- IO-CoML
- Other relevant programs and associations:
  - GEOTRACES
  - SOLAS
  - CLIOTOP
  - WIOMSA
  - ICED
  - BASINS
  - IMOS
  - SANCOR
  - ASCLME
  - BOBLME

IMBER and IOGOOS provide logical international programmatic homes for SIBER
SIBER is a regional program under IMBER
SIBER is the biogeochemical and ecosystem research component of IOGOOS
SIBER has very close ties to CLIVAR’s Indian Ocean Panel (IOP)
SIBER (and other programs) are supported by the Indian Ocean Resources Forum (IRF)
SIBER SSC Members:

1) Raleigh Hood (Chair, USA, biological oceanography and biogeochemical modeling)
2) Mike Roberts (co-Chair, South Africa, physical oceanography and biophysics)
3) Jerry Wiggert (CLIVAR IOP, USA, physical-biogeochemical modeling)
4) Somkiat Khokiattiwong (Thailand, IOGOOS representative, marine biology)
5) Lynnath Beckley (Australia, zooplankton, fish and higher trophic levels)
6) M. Ravichandran (India, physical oceanography, Argo program, INCOIS)
7) Jennifer Huggett (South Africa, DEA Oceans and Coasts, crustacean zooplankton)
8) Birgit Gaye (Germany, Institute of Biogeochemistry and Marine Chemistry, University of Hamburg, carbon biogeochemistry)
9) Makio Honda (Japan/JAMSTEC, marine biogeochemical cycles)
10) Mike Landry (USA, zooplankton and food web dynamics)
11) Greg Cowie (UK, benthic biogeochemistry)
12) Dwi Susanto (USA/Indonesia, physical oceanography and remote sensing)
13) Zainal Arifin (Indonesia, physical oceanography)
- **SIBER Website:** We have a new SIBER Website, Served from INCOIS/Hyderabad: [http://www.incois.gov.in/portal/siber/index.jsp](http://www.incois.gov.in/portal/siber/index.jsp)

- **The SIBER International Project office:** It is located in INCOIS Hyderabad, India, courtesy of Satheesh Shenoi (INCOIS). The questions has been raised as to whether or not we should consider merging the SIBER IPO and IIOE-2 JPO.

- **India National SIBER Program:** Sponsored by MoES, Open Ocean cluster – 6 projects, Estuaries & Coasts cluster – 8 projects, ongoing.

- **SIBER review papers:** The SIBER SSC has been working since 2013 to motivate review papers based on the SIBER Science Plan Research themes.

- **Hot Topics Exploration:** The SIBER SSC is exploring several “Hot Topics” in Indian Ocean biogeochemical and ecosystem research as potential new SIBER research themes / proposals / papers.

- **Capacity Development:** IOP-SIBER winter school at NIO (Goa, India) in 2018? Timeframe: Shifted to spring of 2018, proposed by Jerome Vialard (IOP) and Raleigh Hood (SIBER), Need a new chair to drive this forward.
SIBER Biogeochemical Sensor Deployments in the Indian Ocean

Deployment at three flux reference sites so far:

BoBLME CO₂ and pH at RAMA Bay of Benal Flux Reference Site in November 2013 (Hood et al., in prep.)

Pilot Deployment of a fluorometer and backscatter sensor at the EQ, 80E Mooring (Strutton et al., 2015).

Fluorometer and backscatter sensor was deployed at 26° S 97° E in September of 2012 (Strutton et al., in prep.).
Efforts to quantify nutrient fluxes through the Indonesian Throughflow:

Three Efforts have been motivated:

- CSIRO/UTAS led by Jennifer Ayers (U. Tasmania). A paper has been published (Ayers et al., 2014).
- LDEO/UMD led by Dwi Susanto (UMD) and Ray Sambrotto (LDEO). Proposals submitted to NSF, but have failed so far.
- Modeling effort (Hood, McCreary and Yu). Needs funding.

- The transport variability through the ITF has been studied for many years and is well-characterized.
- In contrast, there are very few published studies of the nutrient and carbon fluxes.
- Biogeochemical models suggest that the entire basin is sensitive to ITF nutrient fluxes.
Bio-Argo Deployments in Joint Indian-Australian Project

- Led by Nick Hardman-Mountford (Australia) and M. Ravichandran (India).
- Bio-Argo floats are being deployed in the northern Indian Ocean and in the southern Indian Ocean.
- Temperature, salinity, fluorescence, oxygen, nutrients.
- Many interesting results have emerged.
- See presentations and workshop led by Nick Hardman-Mountford.
SIBER and IIOE-2

- Sponsored by SCOR, IOC and IOGOOS
- Has become a major focus of SIBER
IIOE-2 Science Plan and Implementation Strategy:

- The IIOE-2 Science Plan was commissioned by SCOR.
- The SIBER SSC played an important role in the development of this document.
- The IIOE-2 Implementation strategy was commissioned by IOC.
- The SIBER SSC contributed significantly to the development of this document.
We have been invited to put together the first special issue on IIOE-2 for publication in DSR II.

Special issue questionnaire completed and accepted.

Guest editor team:

1. Raleigh Hood
2. Jerry Wiggert
3. Lynnath Beckley
4. Birgit Gaye
5. Jerome Vialard
6. Sunil Singh


Tentative Deadlines:

Submission: November 1, 2017
Acceptance: June 1, 2018
Publication: August 15, 2018

8 contributions already identified, would like to have 25 papers.

Dedicated to Gary Meyers
Thank You
Outline:

- Introduction to SIBER
- SIBER SSC and EC membership update
- SIBER website update
- Update on the SIBER International Project Office
- SIBER-6 SSC meeting
- India National SIBER Program update
- SIBER review papers
- Hot topics explorations
- Capacity development (IOP-SIBER winter school at NIO in 2018)
- Update on biogeochemical sensor deployments in the Indian Ocean
- Update on SIBER efforts to quantify ITF nutrient fluxes and their impacts
- Bio-Argo deployments in joint Indian-Australian project
- Update on SIBER and IIOE-2