



SIBER

*Sustained Indian Ocean
Biogeochemistry and Ecosystem
Research*

**7th Scientific Steering Committee Meeting,
January 31st, 2017, Perth, Australia**

Meeting Proceedings

Attendees:

SIBER SSC Members: Raleigh Hood (Chair), Mike Roberts, (co-Chair), Jerry Wiggert, Dwi Susanto, Mike Landry, Greg Cowie, Makio Honda, Lynnath Beckley, M. Ravichandran, Somkiat Khokiattiwong

SIBER IPO Staff: Satya Prakash

IOC Perth Office: Nick D'Adamo, Louis Wicks

SIBER-7 was held in conjunction with the 13th Indian Ocean Regional Panel (IORP) meeting, the 13th Indian Ocean GOOS (IOGOOS) meeting, the 7th IndOOS Resources Forum (IRF) meeting and the 1st IIOE-2 Steering Committee meeting. SIBER also participated in a joint IndOOS Review Workshop with IOP and IOGOOS on January 30 through February 1 (3-days, see IOP Workshop agenda). The SIBER SSC business meeting was convened from 8:30 am – 11:30 am on January 31st. An additional 1.5 hour time slot was also set aside on February 1st, from 4:00 pm – 5:30 pm, to continue the SIBER business meeting focusing on IIOE-2 updates.

Tuesday 31 January 0830-1130 (SIBER BUSINESS MEETING)



0830-0835

CONVENE SIBER SSC BUSINESS MEETING: (Hood and Roberts).

Dr. Raleigh Hood, Chair SIBER, welcomed all Steering committee members. He briefed the committee on the proceedings of the executive committee meetings which meets in every quarter. The executive committee discusses on the progress of SIBER periodically and plan way forward. Discussions during the executive committee have lead to many articles in the “Ocean Bubble-2” from SIBER SSC members.

0835-0845

SIBER SSC ROTATIONS: Update on Steering Committee rotations (Hood).

The steering committee realizes that some of the members are not very active / responsive due to their other commitments. Also, SIBER has received request to nominate one of the SIBER SSC members for the recently formed Bio-Argo group. Since Dr. M. Ravichandran, SIBER SSC members has been closely involved with the Argo team and has served as Argo Science team member, steering committee felt that SIBER should nominate Dr. M. Ravichandran to represent SIBER in the Bio-Argo community.

Xavier Irigoyen has expressed his inability to continue on the SIBER SSC. Raleigh Hood suggested that Island nations should be engaged in the SIBER community to strengthen their participation in the Biogeochemistry related research in the Indian Ocean. He suggested that Dr. Francis Marsac should be invited to be member of the SIBER SSC. Dr. Hood also suggested to explore possibility of having next SSC meeting at an Island Nation.

0845-0855

SIBER UPDATE: Overview and of SIBER-5 and SIBER-6 meeting reports (Prakash and all SSC).

SIBER Executive Director Dr. Satya Prakash had participated in the 1st cruise of the IIOE-2 and therefore was absent in the SIBER-6 meeting. SIBER-6 report, therefore, was very thin. SSC also felt that since Dr. Prakash has taken additional responsibility of IIOE-2 Joint project office, though at present he is also assisting Dr. Rajan of IIOE-2 JPO India, it has become difficult to develop full meeting report. Committee then suggested that the annotated agenda can be developed as a meeting report.

0855-0910

THE SIBER IPO: Update on the IPO and progress on the website, etc.,

-Review progress on suggested website development from last Executive Committee meeting (Prakash and the EC).

Raleigh pointed out that Satya and his web team have made tremendous progress on the website. The committee went through the content and appreciated the effort. Committee suggested to have regular updates on the websites and requested SSC to provide information to Satya.

0910-0925

SIBER PRODUCTS I: Deep-Sea Research Special Issue on IIOE-2 / SIBER (Hood and the EC).

Raleigh Hood updated SIBER SSC that he has been approached by Deep Sea Research-II to do a special issue on the IIOE-2. He proposed that the special issue can be also be highlighted as SIBER and IORP issue. He informed the SSC that the special issue will be co-edited by Lynnath Beckley, Jerry Wiggert, Jeorome Vialard, Sunil Singh and Birgit Gaye,

The call for proposal has been highlighted in the Feb 2017 issue of “Ocean Bubble”. SSC proposed to contact leadership of IORP/IOGOOS/IRF/IIOE-2 and float idea of this special issue, possible recognition for Gary Meyers for his outstanding contribution in the Indian Ocean research.

0925-0940

SIBER PRODUCTS II: Progress on motivating SIBER review papers on the SIBER SPIS themes and other topics (Hood and the EC).

SIBER science Plan and Implementation strategy (SPIS) has several themes and each theme is aimed to address pertaining scientific questions. During the last SSC and ECs it was decided to write review articles on each theme. A review paper, lead by Raleigh, Jerry and Lynnath has been submitted in Progress of Oceanography and the 1st round of reviews were encouraging. The revised manuscript is also submitted. The second review paper on Theme-2 is being lead by Jerry along with Jerome and Mike McPhaden. Dr. Tim Rixen has agreed to do a review paper on theme 3 which is on the contrast between Arabian Sea and Bay of Bengal. Raleigh Hood and Gregg Cowie will also be part of this review paper on theme 3. The papers are in final stage and will be submitted soon.

Mike Roberts has agreed to do paper highlighting overview of upwelling systems in the western Indian Ocean. Roberts informed the SSC that basic structure of the paper is being worked out and find tuned to include SCTR, Mascarene plateau etc.

Tuesday 31 January 0830-1130 (SIBER BUSINESS MEETING)
continued...



0940-0955

SIBER PRODUCTS III: Motivating IO Bubble-2 Articles (Hood and the EC).

SIBER has played an important role in motivating international community on IIOE-2 and has contributed significantly towards development of science plan of IIOE-2. To continue the momentum it is important that SIBER has has significance presence in

issues of “Ocean Bubble-2”, informal news letter of IIOE-2 which is being published bi-annually. SIBER SSC members have contributed interesting articles in previous issues and will continue to write for Ocean Bubble-2. Satya Prakash, who is also coordinating IIOE-2 and Ocean Bubble newsletter, will approach SIBER SSC periodically and seek articles from them.

0955-1010

SIBER AND IIOE-2: SIBER and IOP representation on the IIOE-2 SSC (Hood and the EC).

During the last SSC meeting many of the SSC members raised concern regarding poor representation of SIBER in the core group of IIOE-2 despite the fact that SIBER has played a very important role in planning and vision of IIOE-2 expedition. This sentiment was brought to the notice of IIOE-2 community. As a result, SIBER is now well represented in the core group of IIOE-2. It is important to note here that SIBER is an IMBER supported programme that can help IIOE-2 deliver in terms of science. The new science coming out of efforts of SIBER may help generate new products, services that can help the community/organizations involved in sustainable development efforts. Science is the backbone of humane oriented efforts of IIOE-2 and SIBER can certainly help achieve the targets/goals set by IIOE-2. A good representation of SIBER community/scientists on different themes and working groups of IIOE02 is an example.

SIBER should also be well represented/listed on the IIOE-2 website. Satya Prakash to ensure that both SIBER and IIOE-2 websites are well linked.

1010-1130

SIBER “HOT TOPICS” PRESENTATIONS AND DISCUSSION:

The SIBER Science Plan was written almost seven years back. Though most of the questions raised in the science plan are still pertinent, there are several emerging new topics/issues which need immediate attentions of SIBER colleagues and scientific community at large. During the internal discussions, followed by this issues raised by Jerry Wiggert, the SSC decided to discuss and brainstorm on few selective topics which have received a wider perspective/concern from oceanographic community. The idea behind this brainstorm on selected “Hot Topics” is to motivate new initiative, new proposals to address some of the concern and review our state of knowledge and convert them into one or more review articles. SIBER delegates and other attendees of this meeting were asked to make a brief presentation of few hot topics.

The following Hot Topics are proposed:

-Biogeochemical and ecological impacts of upwelling in the eastern Indian Ocean: From physics to fish. (Landry)

Mike Landry presented a progress on their efforts with Lynnath towards a project in the eastern Indian Ocean to study and understand nitrogen sources for the food dynamics that supports yellow fin Tuna in this region. He highlighted that a considerable quantity of

nitrogen sources through the Indonesian through flow comes from the Pacific Ocean where di-nitrogen fixation is significant. They have planned to do experiments to quantify nitrogen fluxes and how they are utilized based on their isotopic signatures. With the experience and knowledge from the Gulf of Mexico, where yellow fin Tuna spawn right on the fringes of the eddies, it will be important to understand how Indonesian through flow, and eddies in that area, helps transport nitrogen and finally impact the Tuna spawning.

- Physical and biological impacts of topographic highs in the Indian Ocean. (Beckley)

Despite having many sea mounts in the Indian Ocean, particularly along 90E ridge area, these regions are not well studied in terms of their physico-chemical characteristics. It is also worth noting here that sea mounts are biogeochemically important regions due to the interplay of shallowing thermocline, transport of nutrients to the upper zone and the associated primary productivity including fisheries. Fisherman community of the small mount island areas have survived long on these resources. Quite a few studies have been done in the Pacific Ocean, but the Indian Ocean sea mount zones are poorly studied. Lynnath highlighted the importance of sea mount zones in her talk and suggested that SIBER can possibly contribute and motivate new initiatives. She proposed to explore possibility of having a scientific cruise in the Indian Ocean waters on board RV Investigator to carry out sampling in the sea mount regions.

-Fe limitation in the Indian Ocean: Where, when and how much? (Wiggert)

Jerry Wiggert talked about iron limitation in the western Indian Ocean. Most of his talk was based on the model simulations. The western Arabian Sea appears to be iron stressed during both the monsoons. Dissolved bio-available Iron appears to be a major limiting factor compared to nitrogen limitation in this part of the basin. A comparison of the Jerry's model simulations and satellite derived Aeolian deposit maps and chlorophyll images suggests that despite having significant Aeolian deposition in this area, the region is largely iron stressed? Is the Aeolian deposition not providing enough iron to the sea water? What kind of deposition, chemically, is taking place? These are some of the pertinent questions that SIBER should aim to address.

-Biogeochemical, ecological and human impacts of expanding hypoxic and anoxic zones. (Cowie)

Gregg Cowie talked about expanding hypoxic and anoxic zones and their impact on the marine food web. Several reports on expansion of hypoxic zones have been published in the recent past from different corners of the world ocean. The Indian Ocean hosts two thick oxygen minimum zones in the Arabian Sea and Bay of Bengal. Though Bay of Bengal is not as anoxic as the Arabian Sea but a recent report has indicated that even the Bay of Bengal OMZ could be getting strengthened. Coastal upwelling not only brings high nutrients to the surface layer but also transports low oxygen water. The presence of these low oxygen water often results in fish mortality. We only consider low oxygen for fish mortality but there may be other aspects such as transport of harmful toxins which are getting dumped into the coastal waters through rivers and lakes. These changing chemical dynamics may also result in growth of new species which will possibly alter the food web by disrupting the grazer feeding pattern and composition.

Impact of natural / anthropogenic eolian dust input on marine biogeochemistry in the Indian Ocean. (Honda)

It has been reported that aerosol supplied from the land to the ocean affects ocean biogeochemistry. Not only in the modern age, but also during the glacier age, macro- and micro-nutrient in aerosol possibly increases ocean nutrients resulting in increases of primary productivity and settling particles. On the other hand, aerosol input possibly has negative impact: the harmful trace metals in aerosol might damage ocean primary producer and some chemical substances might accelerate the ocean acidification. The Bay of Bengal (BoB) is located in the northeast of the Indian Ocean. The BoB is semi-closed tropical maritime surrounded by the land on its north, east, and west. In addition to strong insolation, large amount of fresh water input from Ganges and Brahmaputra rivers that are one of largest river in the world and large precipitation during the boreal summer monsoon season strongly stratify the ocean. As a result, the supply of nutrient from the subsurface is strictly inhibited and the BoB is oligotrophic. As mechanisms of nutrients supply to the sun-lit layer in the BoB, in addition to passes of meso-scale cyclonic eddy and of meteorology turbulence such as cyclone, aerosol input is very important. Because of the unique monsoon system in the Indian Ocean, the northeast wind is pre-dominant during winter season. Thus, especially in spring-winter, natural and anthropogenic aerosol that originates from the consumption of fossil fuel and the biomass burning are largely transported from the land to the BoB. Another characteristic of the BoB is that about one-quarter of the world population live around the BoB. Especially, Indo and Bangladesh are well known as a country that magnitude of air pollution (concentration of PM_{2.5}) is quite high and gigantic anthropogenic aerosol are emitted. It is reported that, in spring, an amount of anthropogenic aerosol input to the BoB is much higher than that to the Arabian Sea. It has been reported that concentration of iron (Fe) in the anthropogenic aerosol that serves as micronutrient is higher and solves more easily (namely, more bioavailable) than that in the natural aerosol. Thus in future, increase of anthropogenic aerosol input might enhance ocean primary productivity in the pelagic ocean with Fe deficiency. Moreover, large amount of aerosol that is attributed to wildfire, volcanic explosion and biomass burning are emitted from Indonesia located in the southeast of the BoB. These aerosols possibly affect biogeochemistry in the BoB too. There is another negative feedback that irradiance to the BoB would decrease resulting decrease of primary productivity if large amount of aerosol were transported over the BoB. Therefore the BoB is a “hot spot” for the study on impact of aerosol on ocean biogeochemistry.

Update on WIOURI planning efforts (Roberts).

WIOURI is an IIOE-2 and SIBER new initiative to study and understand the upwelling regions in the eastern Indian Ocean. Mike Roberts presented a detailed report on his and his colleagues efforts to set up an integrated observation system in the region. The WIO contains a rich diversity of geophysical mechanisms that induce upwelling and make this region so different from the EIO, and in fact unique worldwide. This is largely due to the interaction of wind (especially the monsoon), currents, eddies and Coriolis force with unique coastlines and topographic features such as the landmass of Madagascar, the Mascarene Plateau, seamounts and ridges all to produce great contrast in the size, intensity and seasonality of upwelling between the eastern and western parts of the basin, as well as between the north, southern and central WIO. Two complementary, regionally unifying, projects have therefore been set up to study upwelling and its influence on the dependant ecosystems. The projects are referred to as the Western- and Eastern Indian

Ocean Upwelling Research Initiatives respectively (i.e., WIOURI and EIOURI). The varying forms of upwelling in the WIO have been distinguished into 9 systems referred to as regional "upwelling" projects (RUPs) in WIOURI. These include: (1) Agulhas Current driven upwelling, (2) Upwelling in the Mozambique Channel, (3) Madagascar Ridge and seamounts upwelling, (4) Southeast Madagascar shelf and SICC chlorophyll bloom, (5) Upwelling in the East African Coastal Current (EACC) and influence of major islands (Mafia, Zanzibar, Pemba), (6) Upwelling Somalia Current system, (7) Oman/Arabian Sea upwelling system, (8) Chagos-Seychelles upwelling dome and Chagos Ridge, and (9) Mascarene Plateau induced upwelling. WIOURI is designed to have at least two cruises per RUP and for the data collection phase to run between 2016 and 2021. It aims to leave several legacies in the form of research centres, schools, and scientific outputs.