

CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change



Meeting Report

Report on the 16th Session of the CLIVAR/IOC-GOOS Indian Ocean Region Panel (IORP)

24 March 2020, Virtual Meeting due to COVID-19

May 2020

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List of Actions

Action 01: Co-chairs of IORP and SIBER will further explore how to merge/enhance cooperation between the two groups.

Action 02: To record IndOOS-2 advocacy activities on the [spreadsheet](#) on google drive.

Action 03: Juliet and Nick HM to share the policies on data democracy implemented by GOOS and other international organisations and programmes.

Action 04: Roxy to check with Weidong Yu on EEZ data sharing in EIO.

Action 05: To bring the requirement on data sharing (in particular in EEZ) to IRF-10 (Roxy).

Action 06: To connect with data democracy movement of the UN Decade.

Action 07: To highlight the point on building strategies for interacting with stakeholders to provide more fit-to-purpose observations for products and services during IRF-10 (Roxy).

Action 08: The panel will strengthen the communication and interaction with IOC and GOOS, in particular their regional alliance in Africa, and bring the needs of IndOOS-2 to the regional meetings (Juliet and Elaine).

Action 09: The progress and implementation challenges of RAMA will be put forward to IRF (Roxy).

Action 10: Nick HM will follow up with Tom Trull on the Australia deployment of BGC Argo in the Indian Ocean, and he will also check for the current status on BGC-Argo network of deployment partners.

Action 11: Roxy will bring the suggestion to IRF on regional cooperation and capacity building in small and developing states through participating in the BGC-Argo deployment.

Action 12: To establish a task team for tracking the status of IndOOS-2 recommendations (Juliet, Dwi, Dongxiao, Weiqiang and Jing).

Action 13: To prepare a spreadsheet with all IndOOS-2 recommendations (Jing) and keep track of each recommendation and maintain active interaction with IRF (task team).

Action 14: Jing to create a live document for IORP members to contribute to the zero draft of the UN Decade Implementation Plan, and the comments will be forwarded through CLIVAR SSG and WCRP.

Action 15: To establish a task team on developing WIO partnerships and capacity to join IndOOS and GOOS sustainable framework. Nick HM, Lisa Beal and Juliet Hermes will start discussions and bring in other leads as they are found. Weidong Yu is probably also interested.

Action 16: To elevate up the idea of adding new absolute sea level sites on small islands in W and SW IO through IRF to establish the government links. Roxy will help bring it to IRF-10.

Action 17: To further explore the actions on marine heat wave in Indian Ocean (Lisan Yu, Dongxiao Wang and Ming Feng).

Action 18: IORP members to recommend candidates for IORP members in 2021, with emphasis in Africa.

Report on the 16th Session of CLIVAR/IOC-GOOS Indian Ocean Region Panel Meeting

The 16th Session of CLIVAR/IOC-GOOS Indian Ocean Region Panel (IORP-16), originally planned on March 24, 2020 in Goa, India, was convened virtually due to the global COVID-19 pandemic. The meeting began by reviewing the progress of the IORP-15 action items and the IORP annual report to the SSG-25. The panel then had a joint discussion on the following issues: 1) prioritised actionable recommendations for IndOOS Resource Forum (IRF); 2) establishment of a Task Team to record new contributions to IndOOS-2; 3) ideas to develop transformational projects in Indian Ocean for the UN Ocean Decade; 4) strengthening the linkage with CLIVAR panels/RFs and WCRP Grand Challenges; and 5) membership recommendations. 12 members out of 15 participated in the e-meeting with apologies received from Birgit Gaye (Member, liaison to SIBER), Mike McPhaden (Ex-officio) and Satheesh Shenoi (Ex-officio).

1. Welcome new members/Quick introduction to IORP and all members.

After a quick update on COVID-19 status with regard to IORP members, the co-chairs of IORP send their sincere regards to all members and their families to stay safe.

As approved by CLIVAR Scientific Steering Group (SSG), two new members were welcomed: *Dwi Susanto* (University of Maryland, USA/Indonesia) and *Birgit Gaye* (University of Hamburg, Germany), both of whom are also members of the [Sustained Indian Ocean Biogeochemistry and Ecosystem Research \(SIBER\)](#) panel, a regional programme of [IMBeR](#), for a better linkage of CLIVAR with biogeochemical (BGC) and biological community. Roxy briefly introduced the IORP and its activities in the past years by highlighting its contribution to provide oversight for the Indian Ocean Observing System (IndOOS) design and to lead the IndOOS decadal review and [IndOOS-2 Roadmap](#) development in the past three years. The next step for the panel is to forward the requirement for IndOOS-2 to the IndOOS Resource Forum (IRF) and move to other tasks. Terms of Reference of IORP are available at <http://www.clivar.org/clivar-panels/indian>.

2. Panel Activities Overview in 2019

2.1 Update on IORP-15 Tasks

Roxy Mathew Koll, co-chair of the IORP took the lead to review the progress of the [action items](#) as agreed during the IORP-15. Among the 28 action items, 20 have been completed or on track. Actions related to the implementation of IndOOS-2 are discussed in Section 3 of this report, in particular, the actions 01, 05 and 10 from the IORP-15 will be brought to IRF for further implementation.

With regard to improving interactions with the biogeochemistry community, three members now have BGC interests/background, *Dwi Susanto*, *Birgit Gaye* and *Taekeun Rho* (member of IORP since 2019). The idea to merge SIBER and IORP was raised again due to reduced funding for both. By doing so, the total number of SIBER SSC members will be reduced.

Further discussion is needed between IORP and SIBER co-chairs. It was commented that the current back-to-back meetings of IORP, SIBER and IRF are efficient to strengthen the interactions among the three groups, in particular for continued cooperation on IndOOS-2 implementation.

Action 01: *Co-chairs of IORP and SIBER will further explore how to merge/enhance cooperation between the two groups.*

2.2 IORP Annual Report to SSG

Roxy and Lisa on behalf IORP participated in the 25th Session of CLIVAR Scientific Steering Group (SSG) meeting, which was organised in San Diego, USA on 14-15 February 2020 alongside the 2020 Ocean Science Meeting (OSM). Roxy highlights the [2018/2019 IORP Annual Report](#) ([Slides](#)), with emphasis on IORP new membership, IndOOS-2 recommendation, RAMA-OMNI Framework, China/Kenya partnership on Indian Ocean observation, the IORP/IRF/IOC's participation in the UN Decade.

Lisa introduces the multi-panel workshop titled '*From global to coastal: Cultivating new solutions and partnerships for an enhanced Ocean Observing System in a decade of accelerating change*', which is planned for May 3-6, 2021 at ICTP in Trieste, Italy. The workshop will bring members from CLIVAR region panels and GSOP, CDP, OMDP, together with invited speakers from developing rim nations and partner programmes (e.g. GOOS, IOC-UNESCO, GOOS regional alliances), to discuss the priorities and cross-cutting strategies as well as explore new partnerships for the expansion of the regional ocean observing systems. Two-day SSG/panel/RF meetings will be organised right after the workshop.

2.3 IndOOS-2 Advocacy and Implementation

Lisa thanked all members who have taken initiatives to lead the advocacy of IndOOS-2: *Caroline Ummenhofer* (IndOOS Town Hall at 2020 OSM; proposed IO session at 2020 EGU), *Juliet Hermes* (OceanObs'19 white paper and poster), *Lisan Yu* (IndOOS-2 special issue on CLIVAR Exchanges), *Motoki Nagura* (preparing for IndOOS-2 presentation at 2020 AGU-JpGU) and others. Lisa encourages everyone to record their IndOOS-2 advocacy activities on the [spreadsheet](#) on google drive. Meanwhile, due to the COVID-19 pandemic, some activities that have been cancelled or postponed will be held online.

Action 02: *To record IndOOS-2 advocacy activities on the [spreadsheet](#) on google drive.*

3. Actionable Recommendations for IndOOS Resource Forum (IRF)

The major focus of the two-hour IORP e-meeting was on the prioritisation of the actionable recommendations of the IndOOS-2 to be brought to the IndOOS Resource Forum meeting (IRF-10). The panel recognises the importance to: (1) Bring more Indian Ocean rim countries into IndOOS-2, including EEZ agreements; (2) Build strategies for interacting with stakeholders to provide more fit-to-purpose observations for products and services and (3) Strengthen regional cooperation in particular during the COVID-19 period to sustain RAMA buoys and BGC-Argo deployment.

(1) Bring more Indian Ocean rim countries into IndOOS-2, including EEZ agreements

It was suggested to use the China-Kenya experiment in the EEZ as a starting point to further explore: (i) access to EEZ in WIO; (ii) capacity building in eastern Africa and small islands; (iii) development of Agulhas and Somali current arrays; and finally (iv) push India and others to open up their EEZ for scientific data sharing.

Lisa suggests not linking the Somali and Agulhas Current together as they are far away and at different stages in terms of international cooperation. South Africa (SA) and China are beginning a collaboration to observe the Agulhas Current and SA has committed a large sum of funding to this. It will be a great way to start supporting best practices within South Africa. Nick HM suggests bringing in other countries linking to Agulhas, e.g. Mozambique, Madagascar, Tanzania.

According to Lisa, South Africa has been very open to people working in their EEZs and allowing that data to be shared. Gaining permission to work in the EEZ of South Africa has always been easy. Over the 20 years in growing partnership in SA, it is not an issue to share data in EEZ of SA, and the SA government make it a mandate. The ASCA data are made completely open to everyone and data from the US side are all shared in NCEI (USA oceanographic database). However, EEZ data sharing is a problem in eastern IO. Data sharing in Indian continent is a big issue. However, progress has been achieved in the past years. According to Roxy, data obtained in the Bay of Bengal (BoB) by China is open and he will check with Weidong Yu on the overall situation in EIO. Also, according to Dwi, the ITF measurement has no problem sharing data and Indonesia follows the rule of US on data sharing.

Further inputs were received from panel members on how to encourage the EEZ data sharing, including:

- Dongxiao - the metadata to be shared at a minimum;
- Juliet - suggested linking in with the GOOS EEZ work;
- Nick HM – UN-ECLAC has developed the Escazu Agreement: <https://www.cepal.org/en/escazuagreement>. According to this agreement, sharing data is a human right which provides transparency - DATA DEMOCRACY;
- Roxy - If Juliet and Nick can provide these policy docs, we can use them as examples; Maybe IOC can help. It will also be an important part of the UN Decade;
- We should ask IRF to support the IndOOS data sharing and leverage partners with high quality data;
- By linking to the operational forecast that are of important social and economic relevance to the IO rim countries, IORP may convince people to share their data;
- IORP may also emphasize the importance and benefits of participating the IndOOS.

Action 03: Juliet and Nick HM to share the policies on data democracy implemented by GOOS and other international organisations and programmes.

Action 04: Roxy to check with Weidong Yu on EEZ data sharing in EIO.

Action 05: To bring the requirement on data sharing (in particular in EEZ) to IRF-10 (Roxy).

Action 06: To connect with data democracy movement of the UN Decade.

(2) Build strategies for interacting with stakeholders to provide more fit-to-purpose observations for products and services

This point will be highlighted at the IRF-10. Juliet originally planned to attend the OOPC-23 meeting in South Africa and further discuss this issue, but the meeting has been cancelled due to COVID-19. Also, both of the GOOS Steering Committee (SC) meeting and regional GOOS Africa meeting on operational oceanography and meteorological services in Tanzania are cancelled, and regional web-based meetings will be organised instead. Juliet will keep the panel informed with the regional web-based meetings and try to connect with people being interested in Somali Current observation during those meetings. IOC-Africa is carrying out a mapping of ocean observing institutes and gap analysis. Elaine comments that the stakeholder engagement is a key point of the [GOOS 2030 Strategy](#), and the regional perspective and stakeholder engagement are good ways to strengthen people's support for the ocean observing systems. She is willing to represent IORP at GOOS meetings. Juliet will update the panel when the regional meetings are held hoping that relevant people may be able to attend and to provide input on the needs of IndOOS.

The Level-1 strategy to interact with stakeholders in Africa is to connect with the UN Decade. Juliet has participated in the UN Decade Regional Workshop for Pan Africa and Surrounding Island States, which was organised in Kenya in January 2020. This workshop covers both sides of Africa with domination by the east African, as most west African countries connect to the UN Decade meeting for Atlantic Ocean. The workshop covers the discussion on both basins (Atlantic Ocean and Indian Ocean), with emphasis on coastal to deep south scale of the ocean observations. It is suggested that eastern Africa be connected to the UN Decade in Indian Ocean.

Participants also realised the importance to connect closer to people who are using and can use IndOOS data, in order to leverage their support. We could learn from the Year of Maritime Continent (YMC) initiative which does this well.

Action 07: *To highlight the point on building strategies for interacting with stakeholders to provide more fit-to-purpose observations for products and services during IRF-10 (Roxy).*

Action 08: *The panel will strengthen the communication and interaction with IOC and GOOS, in particular their regional alliance in Africa, and bring the needs of IndOOS-2 to the regional meetings (Juliet and Elaine).*

(3) Recommendations for agencies at the IRF-10 meeting

Roxy presented a list of agencies¹ that are represented in IRF and encouraged IORP members to suggest prioritised recommendations to be brought to the agencies. The discussions are focusing on the implementation of RAMA and BGC-Argo.

- **RAMA**

Mike McPhaden has shared the [RAMA Progress Report](#) which states that regional cooperation is urgently required to ensure that RAMA is sustained despite the (i) COVID-19 dilemma that

¹ Agencies represented at IRF-10: 1. Japan/JAMSTEC - Kentaro Ando; 2. India/Ministry/MoES – Satheesh; Shenoi; 3. South Asia Co-operative Environment Programme (SACEP), South Asia Seas Programme (SASP) - Sivji Patrafor; 4. USA/NOAA/RAMA – Mike Mcphaden; 5. Indonesia/BMKG - Nelly Florida; 6. China/Sun Yat-Sen University (SYSU) - Weidong Yu; 7. Global Oceans – Jim Costopulos; 8. USA/NOAA Global Drifter Program(GDP) – Luca Centurioni; 9. India/Nansen Environmental Research Centre India (NERCI) - Ajith Joseph.

many cruises are postponed or delayed; (ii) spike in vandalism; (iii) lack of ship time; and (iv) flattening funds and rising operational costs.

So far, all but three RAMA moorings stations have been occupied at least once. However, there has been an uptick in vandalism at some sites along 90E (0, 4N and 8N especially) and the losses of equipment cannot be sustained at the current budget. Also, according to Dwi, a Bailong Buoy, which is part of RAMA and was deployed jointly by Indonesia (LIPI) and China (FIO) at the end of 2018 at 100E, 8S, has been destroyed by vandalism. It has been redeployed in 2019, but the surface buoy was destroyed again by vandalism. Vandalism is probably from Tuna line but not sure from which country. Inquiry received on whether Indonesia could help in countering vandalism at 90E. According to Mike, it is not clear what Indonesia (or anyone) can do about fishing vandalism. NOAA has been dealing with it in all three tropical oceans for at least 30 years. They have tried outreach in the past to no avail. There are thousands of fishing vessels of all sizes, types, and national registries operating in the Indian Ocean. Educating local communities about the value of the buoy data is a worthy cause, but it will be costly and probably not be very effective, especially considering the mix of artisanal and far seas fisheries fleets. NOAA has also tried engineering solutions, but only marginally effective.

Nick HM suggested [Global Fishing Watch](#) could help counter vandalism. It has been effective in detecting a variety of fishing behaviors at sea (e.g. trans-shipment, illegal fishing in marine protected areas, etc.). He suggested seeing if they can use their platform to monitor fishing activities around the observing infrastructure sites. Nick HM has been willing to initiate a conversation with Tony Long, the CEO of the Global Fishing Watch. Mike McPhaden feeded back on this by mentioning that NOAA has been using Global Fish Watch, but to no significant avail so far. They have occasionally seen some vessels with Automatic Identification System (AIS) appearing near the 4N, 8N, and 12N sites. However, even if they were able to use that web tool to identify a specific vessel responsible, they probably would still not have sufficient evidence to support direct punitive measures, nor would they be able to do much about it after the fact anyway. Global Fishing Watch is an interesting and useful site, but when it gets down to the details, there are limits to the data in terms of actionable response to vandalism.

Due to the flattening budget from NOAA for RAMA in the past ten years, and even larger funding deficit in 2020, NOAA has frozen further implementation of T-Flex moorings (nine sites are currently maintained with T-Flex). The funding situation and the actions planned or taken to alleviate budget pressures have been communicated to Sidney Thurston, the NOAA program manager for RAMA and IRF chair.

Action 09: *The progress and implementation challenges of RAMA will be put forward to IRF (Roxy).*

- **BGC Argo**

According to Nick HM, an Australian BGC-Argo is being funded by IMOS although it was unclear what level of activity is planned for the Indian Ocean. Nick will check with Tom Trull for the current status of BGC-Argo deployed in IO. Need the participation of developing and coastal states (e.g. Seychelles, Mauritius) for the deployment, which could also increase the local capacity. Lisa inquires if the BGC-Argo is also building on the existing Argo network of deployment partners, and Nick HM comments that is the case at least in US, Europe and Australia, and he will check for the updated status on this. Dongxiao Wang offers the support from China on the ship time for BGC-Argo deployment in EIO, through their annual cruise in IO. Elaine comments that though the combined effort on BGC-Argo is great, there are many issues need to be settled, e.g. how the calibration data are being collected from the smaller

vessels, as they are taking different measures for the deployment. Nick suggests providing training on calibration measurement to technicians on the RV beforehand.

Action 10: Nick HM will follow up with Tom Trull on the Australia deployment of BGC Argo in the Indian Ocean, and he will also check for the current status on BGC-Argo network of deployment partners.

Action 11: Roxy will bring the suggestion to IRF on regional cooperation and capacity building in small and developing states through participating in the BGC-Argo deployment.

4. Task Team - Record new contributions to IndOOS-2

There are already new contributions to IndOOS-2, e.g. the RAMA-OMNI Framework, and China-Kenya partnership on Somali Current observation. There is an urgent need to record these new contributions. People agree to establish a Task Team (TT) for tracking the status of IndOOS-2 recommendations. The TT will be led by *Juliet Hermes* (Western IO) with the participation of *Dwi Susanto* (BGC), *Weiqliang Wang* and *Dongxiao Wang* (Eastern IO), with support from ICPO. A spreadsheet including all the IndOOS-2 recommendations will be prepared by Jing and shared with the TT members for comments. It is also suggested to share the spreadsheet with IndOOS Resource Forum (IRF).

Action 12: To establish a task team for tracking the status of IndOOS-2 recommendations (*Juliet, Dwi, Dongxiao, Weiqliang and Jing*).

Action 13: To prepare a spreadsheet with all IndOOS-2 recommendations (*Jing*) and keep track of each recommendation and maintain active interaction with IRF (task team).

5. Transformational Projects in Indian Ocean for the UN Decade

Panel members were encouraged to provide comments on the [zero draft of Implementation Plan](#) of the UN Decade of Ocean Science for Sustainable Development by **23 April 2020**. Lisa emphasised that by partnering with or synergizing with the UN Decade, we could elevate the goals of IndOOS and leverage resources. We need to influence the UN Decade Implementation Plan to include the importance of sustainable ocean observations. Thus, any level of comment and feedback on the zero draft is encouraged. This is an urgent task, to be sure the Indian Ocean community has a voice in the document.

Meanwhile, the panel agrees on a couple of priorities for the transformational projects to further contribute to the UN Ocean Decade, with an overarching focus on the **western Indian Ocean (WIO) and its coastal and island states**. Specific ideas include: (1) Capacity building on ocean observations in WIO/Eastern Africa; and (2) New tide gauge and land motion sites in small island states of W and SW Indian Ocean for absolute sea level measurement.

(1) Building capacity for sustained observations in the WIO

One of the transformational projects that IORP is proposing under the UN Decade is to build capacity for sustained observations of the western Indian Ocean. Nick HM suggested to focus on WIO rather than eastern Africa, in order to bring in Small Island Developing States (SIDS). The China-Kenya pilot operation in the Somali EEZ region is a good example. Lisa proposed the idea to support South Africa (SA) in their leadership to develop a sustained Agulhas Array as part of IndOOS and GOOS. Juliet Hermes from IORP is heading the Agulhas Array development in the SA side, and a funding committee has already been

established. **We may assist SA in the transformational change of developing a climate-quality CTD program and bringing online a new research vessel**, perhaps by providing consultations with a group of oceanographers. Nick HM suggests to link with existing regional cooperation programmes and expand them under the UN Decade.

Meanwhile, Nick HM emphasised that in framing for UN decade, we should focus on **how to deliver on sustainable development** rather than what we can produce, i.e. what are the long-term outcomes to be achieved and the logical framework for getting there. We need to be able to evaluate how effective the observations are. He proposes to establish **a task team (TT) on helping the programs fit into an IndOOS and GOOS sustainable framework**. Nick HM volunteered to lead the TT and also to bring in the Commonwealth Blue Charter group. According to Juliet, the UK funding agencies invite scientists from Africa when they are working on their proposals for the UN Decade, as they want to understand what the UK can support and what have already been done. We should link with those efforts. However, it is not clear how detailed the transformational projects should be.

(2) To develop new sites for absolute sea level measurement on small islands in western and southwestern Indian Ocean

We could focus on new tide gauge and land motion sites in small island states of western and southwestern Indian Ocean for long-term measurement of absolute sea level. The idea comes from the IndOOS-2 Roadmap. Small islands in W and SW IO are particularly important not only because they are most vulnerable regions to sea level change, but also because they could provide very good ground truth measurement for satellite observations, as they are in the marine-climate, thus avoiding wet tropospheric correction issues of coastal regions of large continent. They are also sites where long-term records from corals are available. By combining the new modern measurements with longer-term measurements, we could get the 100-year record in those areas. Another reason is that there is declining trend in sea level across Seychelles-Chagos Thermocline Ridge (SCTR), which might be caused by a spin-up cyclonic gyre, but currently there is no ground truth of that signal.

Several scientists have been identified during the meeting to be further engaged with, including: *Weiqing Han (University of Colorado, USA)*, who led the sea level chapter in IndOOS-2 Roadmap; *A.S. Unnikrishna (CSIR-National Institute of Oceanography, India)*, who contributed in terms of the tide gauge in IndOOS-2; *Ming Feng* and *Andrew Stevens (CSIRO, Australia)*, who may also interested as they are trying to expand CSIRO to address sustainable development issues; *Xuhua Cheng (Hohai University, China)*, who is good at sea level issues over the Indian Ocean. It is also important to involve the local oceanographers and scientists, who are driving the interest, and to avoid the empirical approach for ocean observation. Seychelles maybe a good foot hold, as there used to be some British programmes, as well as the programmes running by US ONR (Office of Navy Research) out of there in the last two years. The President of Seychelles is currently a strong advocate for the ocean and sustainable development around Seychelles, as he did some live broadcast in the underwater vehicles asking for actions on climate change and sea level rise. Mauritius and Mozambique (Bernadino) may be also interested in working on sea level. Jing suggests that ICPO could help link with scientists from sea level grand challenge of WCRP.

We need to formulate ideas in a viable way and elevate up through the IRF to someone who has government links.

Action 14: *Jing to create a live document for IORP members to contribute to the zero draft of the UN Decade Implementation Plan, and the comments will be forwarded through CLIVAR SSG and WCRP.*

Action 15: *To establish a task team on developing WIO partnerships and capacity to join IndOOS and GOOS sustainable framework. Nick HM, Lisa Beal and Juliet Hermes will start discussions and bring in other leads as they are found. Weidong Yu is probably also interested.*

Action 16: *To elevate up the idea of adding new absolute sea level sites on small islands in W and SW IO through IRF to establish the government links. Roxy will help bring it to IRF-10.*

6. IORP TOR#3: Interaction with CLIVAR Research Foci and WCRP Grand Challenge

Possible cooperation to be developed through linking with WCRP Grand Challenge on [Regional Sea Level Rise and Coastal Impacts](#) (e.g. on development of new sustained absolute sea level sites on small islands in W and SW Indian Ocean, see 5(2)); WCRP Grand Challenge on [Weather and Climate Extremes](#) (e.g. on Marine Heat Waves (MHW) related to surface and atmospheric forcing); the [CLIVAR/GEWEX Monsoons Panel](#) and CLIVAR new Research Foci on Tropical Basins Interaction (TBI).

As pointed by Lisan Yu, the regional sea level change is not only related to the historical changes, but also related to the regional wind forcing changes. She suggests to start at climate event/extreme, and focus on the surface forcing change.

Lisan Yu also emphasises on the importance of working on marine heat wave (MHW), as it is relevant and important to understand extreme events, such as the coral bleaching and the Australia fire in IO region. Dongxiao comments that he is currently working on a project with Ming Feng, who has already published some papers on both sides of IO on MHW, on sub-seasonal warming events over the eastern Indian Ocean, and found such events do have strong footprint on sea level height, SST, flux and etc. The MHW involves much more than the sub-seasonal warming but the mechanism is yet to be understood. Roxy comments that the MHW is an interesting topic and worth to be further explored, as it shows that in the northern Indian Ocean, the marine heat wave has affected the coral reefs, and according to the IPCC report, the MHW occurs many folds.

Action 17: *To further explore the actions on marine heat wave in Indian Ocean (Lisan Yu, Dongxiao Wang and Ming Feng).*

7. Report from SIBER-10 (by Birgit Gaye)

The 10th Meeting of the SIBER Scientific Steering Committee was organised on March 24th via GoToMeeting. The meeting chaired by the SIBER chair Greg Cowie was attended by 14 members, including attendees from the SIBER IPO staff and the IOC Perth office.

The main topics of the meeting were the updates on SIBER products and updates on ongoing and planned IIOE-2 related research.

SIBER products:

- Deep-Sea Research special issues Vol. 1-4: Two Deep-Sea Research special issues with 25 papers in total were published. The third volume will have more than 11 papers and submission has been terminated. A fourth volume is planned with a special focus on the 110°N *R.V. Investigator* cruise.

The first two volumes of our DSR-II Special Issue series on IIOE-2 are published and available at:

Vol 1: <https://www.sciencedirect.com/journal/deep-sea-research-part-ii-topical-studies-in-oceanography/vol/161/suppl/C>

Vol 2: <https://www.sciencedirect.com/journal/deep-sea-research-part-ii-topical-studies-in-oceanography/vol/166/suppl/C>

- In addition to the review paper on SIBER Theme 1 published in 2017 in P&O, several review papers have been submitted or will be submitted in the near future.
- Submission of articles in the IO Bubble-2 are planned.

IIOE-2 updates and reports:

- Eastern Indian Ocean Upwelling Research Initiative (EIOURI): Three cruises were carried out by Chinese vessels with partners (TRIUMPH project); a Japanese cruise is planned for September 2020 with three legs to investigate the upwelling system off Java/Sumatra and the Leeuwin current system; two cruises were carried out in Nov-Dec 2019 by Indonesian vessels within the TRIUMPH project (Transport Indonesian Seas, upwelling and mixing physics) including the servicing of RAMA moorings and deployment of moorings in Makassar and Lombok strait regions; a Blue-fin Tuna project in the Indonesian through flow region has been planned and was rescheduled for 2021.
- Western IOURI/Sustainable Oceans, Livelihoods and food Security Through Increased Capacity in Ecosystems (WIOURI/SOLSTICE): Three cruises were carried out in 2019 led by South Africa including multidisciplinary ecosystem studies in the region off the east coast of South Africa and the Agulhas Current; there is a strong focus on capacity building including a workshop in Tanzania held in Feb/Mar 2019; more regional cruises are planned for 2020 and 2021.
- Other IIOE-2 activities: India plans MOSAIC and “Deep Sea Mission” programme; a cruise along the 110°E repeat line led by Australian colleagues has been carried out and results will probably be published in a DSR-II special issue; the German *R/V SONNE* research programme in the Indian ocean has been stopped and cruises to the south-western and northern Indian ocean postponed to 2020/2021 or later; several French cruises are planned for 2021 to the Saya de Malha Bank, Mahe Plateau and Durban offshore area by the *R/V ANTEA*.
- Additional proposals and research programmes by colleagues from the US, South Korea, UK and Australia were presented and discussed.

8. Membership

Seven members of IORP will have their terms due by the end of 2020, four of which are in their initial terms. Lisa Beal will step down from co-chair by the end of 2020 and new co-chair candidates need to be identified. The panel will look for scientists who are active either on research, or can play critical role in connecting agencies over the Indian Ocean region. Panel

members are encouraged to recommend the names for IORP members in 2021, with particular emphasis in Africa.

Action 18: *IORP members to recommend candidates for IORP members in 2021, with emphasis in Africa.*

9. Next Meeting

The next IORP meeting (IORP-17) will be organised in conjunction with the multi-panel workshop for ocean observation in Trieste, Italy, in May 2021.

10. Wrap up

The IORP-16 e-meeting is wrapped up at 14:00 UTC, and participants are encouraged to make more input to the [online document](#) in next couple of days and the IORP-16 action items will be consolidated.

Annex 1: Agenda

IORP-16 Time Table, 24th March 2020 12:00 UTC

12:00–12:05 UTC	Welcome new members/Quick introduction to IORP and all members. Quick update on COVID-19 status w.r.to IORP members
12:05–12:15 UTC	Update on IORP-15 Tasks and Annual Report to SSG and Advocacy
12:15–12:45 UTC	Actionable Recommendations for IndOOS Resource Forum (IRF)
12:45–12:50 UTC	Task Team - Record new contributions to IndOOS-2
12:50–13:30 UTC	Transformational projects in Indian Ocean for the UN Decade
13:30–13:50 UTC	IORP TOR#3 . CLIVAR Research Foci and WCRP grand challenges
13:50–13:55 UTC	IORP Business - IORP Membership Rotation/Renewal
13:50–14:00 UTC	Wrap up. Consolidate IORP-16 Tasks

Annex 2: List of Participants

Name	Affiliation	Role
Lisa Beal	University of Miami	Co-Chair
Roxy Mathew Koll	Indian Institute of Tropical Meteorology (IITM)	Co-Chair
Elaine McDonagh	Norwegian Research Centre (NORCE)	Member
Dongxiao Wang	School of Marine Sciences, Sun Yat-Sen University	Member
Lisan Yu	Woods Hole Oceanographic Institution (WHOI)	Member
Dwi Susanto	University of Maryland	Member
Juliet Herms	South African Environmental Observation Network (SAEON)	Member
Motoki Nagura	JAMSTEC	Member
Weiqiang Wang	South China Sea Institute of Oceanology, China Academy of Science (SCSIO-CAS)	Member
Caroline Ummenhofer	Woods Hole Oceanographic Institution (WHOI)	Member
Nick Hardman Mountford	Oceans & Natural Resources, Commonwealth Secretariat	Member
Rho Taekeun	Korean Institute of Ocean Science and Technology KIOST	Member
Jing Li	International CLIVAR Project Office (ICPO)	Staff Scientist
Apologies for absence		
Birgit Gaye	University of Hamburg	Member
Mike McPhaden	Chair / Tropical Moored Buoy Implementation Panel	Ex officio
Satheesh Shenoi	Indian National Centre for Ocean Information Services (INCOIS) / Chair of IOGOOS	Ex officio