

**SCOR/IOC/IOGOOS Second International Indian Ocean Expedition (IIOE-2)**  
**Report to SCOR 2022/2023**  
**Marie-Alexandrine (SCOR Executive Reporter)**

**GOAL**

The goal of IIOE-2 is *to advance our understanding of the Indian Ocean and its role in the Earth System in order to enable weather-climate predictions and informed decisions in support of sustainable ocean development, climate resilience, and the well-being of humankind.*

**MANAGEMENT**

While delivery of IIOE-2 occurs through national activities, these are coordinated by a Core Group comprising the following key personnel:

| <b>Role</b>   | <b>Name</b>                    | <b>Affiliation</b> |
|---|--------------------------------|--------------------|
| <b>Co-Chair IIOE-2</b>                                    | <b>Marie-Alexandrine Sicre</b> | <b>SCOR</b>        |
|   | <b>Vladimir Ryabinin</b>       | <b>IOC</b>         |
|   | <b>T. Srinivasa Kumar</b>      | <b>IOGOOS</b>      |
| <b>Co-Chair WG 1 (Science &amp; Research)</b>             | <b>Raleigh Hood</b>            | <b>USA</b>         |
|   | <b>Hermann Bange</b>           | <b>Germany</b>     |
| <b>Co-Chairs WG 2 (Data &amp; Information Management)</b> | <b>E. Pattabhi Rama Rao</b>    | <b>India</b>       |
|   | <b>Harrison Ong'Anda</b>       | <b>Kenya</b>       |
| <b>Chair WG 3 (Operational Coordination)</b>              | <b>Rajan Sivaramakrishnan</b>  | <b>India</b>       |
| <b>Supported by</b>                                       |                                |                    |
| <b>International Project Office (Hyderabad)</b>           | <b>M. Nagaraja Kumar</b>       | <b>IOGOOS</b>      |
| <b>SCOR Office</b>  | <b>Emily Twigg</b>             | <b>SCOR</b>        |

**The Core Group** comprises 3 Working Groups (WG1 Science & Research; WG2 Data & Information Management & WG3 Operational Coordination). Each of these interact with each other, the International Project Office (IPO) in Hyderabad and the 3 Co-Chairs who represent the sponsors (SCOR, IOC and IOGOOS), oversee the Core Group. The International Project Office that deals with day-to-day functions within IIOE-2, is co-located with the IOGOOS Secretariat based at the Indian National Centre for Ocean Information Services (INCOIS) of the Ministry of Earth Sciences (MoES).

In addition, there is ongoing engagement with the CLIVAR Indian Ocean Regional Panel, IORP, the GOOS Regional Alliance for the Indian Ocean, IOGOOS, SIBER co-sponsored by IMBeR (Integrated Marine Biosphere Research) and IOGOOS and IRF. Additional synergies are foreseen with the newly-established sub-commission of IOC for the Central Indian Ocean, IOCINDIO, as well as with the Indian Ocean Rim Association Academic Group (IORAG, academia-led functional body of the IORA).

**Impact of Covid-19:** The International Indian Ocean Science Conference 2020 (IIOSC-2020) that was scheduled to take place from 16 to 20 March 2020 in Goa, India, was postponed and took place from 14 to 18 March 2022 in hybrid mode with local organisational support provided by the IPO, IOGOOS Secretariat and INCOIS. Our inability to have in-person meetings for two years has had a significant negative impact on IIOE-2 activities, in particular activities at sea. In-person meetings resumed with the IIOE-2 joint meeting organized in Perth, Australia (February 2023).

### **Meetings of the IIOE-2 Joint Program Office**

#### ***The 6th meeting of the Steering Committee of IIOE-2 (SC-6)***

After two years of meeting online, this meeting was again held in person in Perth at the Indian Ocean Marine Research Centre (IOMRC), University of Western Australia (UWA) during 6<sup>th</sup> to 7<sup>th</sup> of February, 2023. The SC-6 was organized with the IPO hosted by INCOIS, with the continued pro-bono support and local convenership of Nick D'adamo (Adjunct Research Fellow of the UWA Oceans Institute (OI)), ex-head of UNESCO IOC Perth Programme Office. Professor Charitha Patiaratchi of UWA-OI co-convened the meeting with Nick D'Adamo. The meeting was chaired by Srinivasa Kumar (IOGOOS) and Marie-Alexandrine Sicre (SCOR) who succeeded former co-chair Peter Burkill (UK) who stepped down in October 2020. CSIRO of Australia provided significant sponsorship for the meeting, in conjunction with co-sponsors SCOR, UWA-OI / IOMRC, WAGOOS, Wise Wines Western Australia.

A full agenda and links to the background documents can be found at: <https://iioe-2.incois.gov.in/IIOE-2/SC6.jsp>. A draft report of the SC-6 meeting can be found at [https://indiannational-my.sharepoint.com/:w:/g/personal/iioe-2\\_incois\\_gov\\_in/EQ5p6DPl1YNKmSi\\_3K6YbWkB4VU8GiyDevMxhqH0c3aKRg?e=uQFt1j](https://indiannational-my.sharepoint.com/:w:/g/personal/iioe-2_incois_gov_in/EQ5p6DPl1YNKmSi_3K6YbWkB4VU8GiyDevMxhqH0c3aKRg?e=uQFt1j)

#### ***Joint meeting of IIOE-2 /IORP/SIBER/IRF/IndoOS***

Following the IIOE-2 SC-6 meeting, the integrated IIOE-2 meetings with IOGOOS, IORP, SIBER, IRF, IIOE-2 were held back-to-back with meetings of the IndoOS Resource Forum (IRF) (15<sup>th</sup> major meeting), SIBER (13<sup>th</sup> major meeting), IORP (18<sup>th</sup> major meeting), IOGOOS (18<sup>th</sup> major meeting) and KUDOS Workshop as part of the International Indian Ocean Science Conference (IIOSC-2023).

The IIOSC-2023 was organized under the auspices of IOGOOS, with IOMRC providing the venue and local logistics, and CSIRO sponsoring the conference's special events. During that meeting we also had a one-hour on-line presentation and discussion of the UN Decade of Ocean Science for Sustainable Development made by Alison Clausen, to discuss possible engagement of IIOE-2.



Group picture of IIOE-2/IORP/SIBER/IRF/IndoOS, Perth, February 10, 2023

## **WG1: SCIENCE and RESEARCH (co-chairs: Raleigh Hood and Hermann Bange)**

Recent efforts of the IIOE-2 WG-1 have revolved around integrating and promoting all aspects of IIOE-2 science to achieve a holistic view of the Indian Ocean System. In pursuit of the latter goal WG-1 has been promoting the development of synthesis papers and special issues focused on the Indian Ocean. WG-1 is also involved in supporting the efforts of IIOE-2 WG-2 (Data and Information Management). There has also been discussion on the future of IIOE-2 beyond 2025 together with ECS as well as if/how to engage in the UN Decade. These issues will continue to be discussed in a meeting scheduled in Hyderabad, India, 28-30 November 2023.

### **• Science Highlights**

#### DSR II Special Issue Series on IIOE-2

WG-1 is leading the development and publication of a set of special issues on IIOE-2 for publication in *Deep-Sea Research II*. These special issues cover a diverse body of research from the Indian Ocean and include papers on physical, chemical and biological oceanography, with the latter covering trophic levels from phytoplankton to whales. >50 papers have been published to date:

Hood, R. R., Z. Lachkar, L. E. Beckley, B. Gaye, J. Vialard, and V. V. S. S. Sarma (2022) The 2<sup>nd</sup> International Indian Ocean Expedition (IIOE-2): New Exploration in a Poorly Understood Ocean Basin (Volume 4). *Deep-Sea Research II*, volume 197.

#### Elsevier Book on the Indian Ocean

In addition, we put together an interdisciplinary compilation of 20 synthesis chapters on the Indian Ocean for publication as an Elsevier book. The editors of this book are Caroline Ummenhofer and Raleigh Hood. The target date for publication of the book is December, 2023. The final list of chapters is as follows:

1. Raleigh Hood et al., "Introduction"
2. Timothy Walker, "History of the Indian Ocean"
3. Caroline Ummenhofer et al., "Monsoon variability and its drivers"
4. Helen Phillips et al., "Indian Ocean circulation"
5. Toshi Yamagata, "Climate phenomena of the Indian"
6. Jerome Vialard, "Decadal Indian Ocean variability"
7. Charlotte Demott, "Indian Ocean intraseasonal variability"
8. Janet Sprintall et al., "Oceanic Interbasin connections"
9. Caroline Ummenhofer et al., "Indian Ocean impact on global climate"
10. Francis Marsac et al., "Indian Ocean primary productivity & fisheries variability"
11. Raleigh Hood et al., "Nutrient, phytoplankton and zooplankton variability in the Indian Ocean"
12. Raleigh Hood et al., "Oxygen, Carbon and pH variability in the Indian Ocean"
13. Hermann Bange et al., "Air-sea exchange and its impacts on biogeochemistry in the Indian Ocean"
14. Carolin Löscher et al., "Microbiology of the Indian Ocean"
15. Faiza Al-Yamani et al., "Physical and biogeochemical characteristics of Indian Ocean marginal seas"
16. Michael McPhaden et al., "Observing the Indian Ocean"
17. Toshi Shinoda, "Modeling the Indian Ocean"
18. Mahyar Mohtadi et al., "Paleo evidence to understand Indian Ocean variability across a range of timescales"
19. Mathew Koll Roxy et al., "Future projections for the Indian Ocean"
20. Ming Feng et al., "Extreme events & impacts"

- **Participation in international meetings**

Recent meetings and special sessions related to or motivated by IIOE-2:

- EGU General Assembly, April 23-28, 2023, in Vienna, Austria, session ID: OS1.7/BG4/CL1.2: "Understanding the Indian Ocean's past, present, and future ", Conveners: Caroline Ummenhofer, Alejandra Sanchez-Franks, Peter Sheehan, Yan Du, and Muhammad Adnan Abid
- IUGG, The 28th General Assembly of the International Union of Geodesy and Geophysics, 11-19 July 2023 in Berlin, Germany. IAPSO meeting, session P06: "IIOE-2: A Huge Step Forward for the Indian Ocean Sciences", **Convener(s):** Yukio Masumoto (Japan), **co-convener(s):** Nick D'Adamo (Australia) Raleigh Hood (USA) Satheesh Shenoi (India).

### **Status of IIOE-2 Research Activities**

In addition to these efforts to motivate synthesis and research publications, WG-1 continues to promote research in the Indian Ocean under two major IIOE-2 Research Initiatives. **The Eastern Indian Ocean Upwelling Research Initiative** is ongoing with research cruises anchored by China, Japan and the USA. The main focus of this initiative is on the upwelling regions that develop seasonally off Java, Sumatra, and northwestern Australia. The USA NSF-funded "Mesoscale Variability in Nitrogen Sources and Food-Web Dynamics Supporting Larval Southern Bluefin Tuna in the Eastern Indian Ocean" (Mike Landry, P.I.) cruise was recently completed (February-March, 2022 on the *R. V. Roger Revelle*). **The Western Indian Ocean Upwelling Research Initiative** is also ongoing, anchored by South Africa's Department of Environment, Forestry and Fisheries *R. V. Agulhas II* research cruises, and UK/South Africa funded Solstice Project (Sustainable Oceans, Livelihoods and Food Security Through Increased Capacity in Ecosystem Research in the Western Indian Ocean). SOLSTICE is a four-year collaborative project funded by the UK Global Challenges Research Fund (GCRF). This project brings together recent advances in marine technologies, local knowledge and research expertise to address challenges facing the Western Indian Ocean region in a cost-effective way via state-of-the-art technology transfer, collaborative environmental and socio-economic research and hands-on training. In addition to these two research initiatives, the IIOE-2 has coincided with and embraced the **Years of the Maritime Continent (YMC)** as a major IIOE-2 field campaign.

The Korea Institute of Ocean Science and Technology (KIOST) recently achieved a successful completion of the KIOS 2023 expedition. This cruise was a part of the KIOS (KIOST Indian Ocean Study), which received endorsement from IIOE-2 earlier this year (IIOE2-EP51: Korea-US Joint Observation Study of the Indian Ocean led by Dr. Dong-Jin Kang, PI/Chief Scientist, KIOST, djocean@kiost.ac.kr, funded by the Ministry of Oceans and Fisheries, the Republic of Korea).

The primary goal of the KIOS scientific cruise was to gain insights into the physical, biogeochemical, and ecological characteristics of the Seychelles-Chagos Thermocline Ridge (SCTR) region, which is a significant open ocean upwelling region in the tropical Indian Ocean. This understanding would contribute to enhancing the predictability of global climate patterns. Throughout the cruise, numerous oceanographic studies and sample collections took place. On R/V ISABU, a range of observations and analyses were conducted, such as CTD observations from the surface to the bottom, high-resolution nitrate observation with ISUS, dissolved oxygen, nutrients, dissolved inorganic carbon analysis, and primary productivity measurements. Moreover, researchers studied particles and dissolved organic carbon, nitrogen isotope of nitrate, and dissolved noble gas. Zooplankton samples were also collected using a multi-net. Furthermore, the deployment of a BGC-Argo equipped with a nitrate sensor and underwater glider observation further enhanced the data collection efforts.

Notably, NOAA PMEL staff participated in the cruise, leading the RAMA moored buoy operations. Three RAMA moored buoys were successfully deployed at 12°S-65°E, 8°S-65°E, and 4°S-65°E, alongside one subsurface ADCP mooring and eight Lagrangian drifter buoys. Additionally, the RAMA mooring that had gone adrift at 8°S, 67°E on September 18th, 2022, was successfully recovered. An exciting development is the establishment of the "RAMA-K study site" around 8°S, 65°E, where KIOST plans to relocate additional subsurface moorings in 2024. Adding to the significance of this expedition, a

producer and cinematographer from EBS (Educational Broadcast System) in Korea accompanied the team to document the shipboard research. The coverage is scheduled to be broadcast in Korea early next year. [Report Courtesy: Sujin Kang and Dong-Jin Kang, Korea Institute of Ocean Science & Technology, Busan, Korea; E-mail: [sjkang@kiost.ac.kr](mailto:sjkang@kiost.ac.kr)].

West Indian Ocean ocean science also proceeded under the significant Monaco Explorations 'Indian Ocean Expedition', a project endorsed by IIOE-2 and the UN Decade and involving a multi-disciplinary multi-national effort aboard RV Agulhas II (field survey Oct/Nov 2022) along a clockwise loop circuit between La Reunion and Seychelles, focussing on Aldabra Atoll, Saya De Malha Bank and the Mascarene Plateau. Scientific reporting is underway and will appear in major science journals. Ref: <https://www.monacoexplorations.org/en/>.

Additional projects/cruises related to IIOE-2 that have been recently completed or planned include:

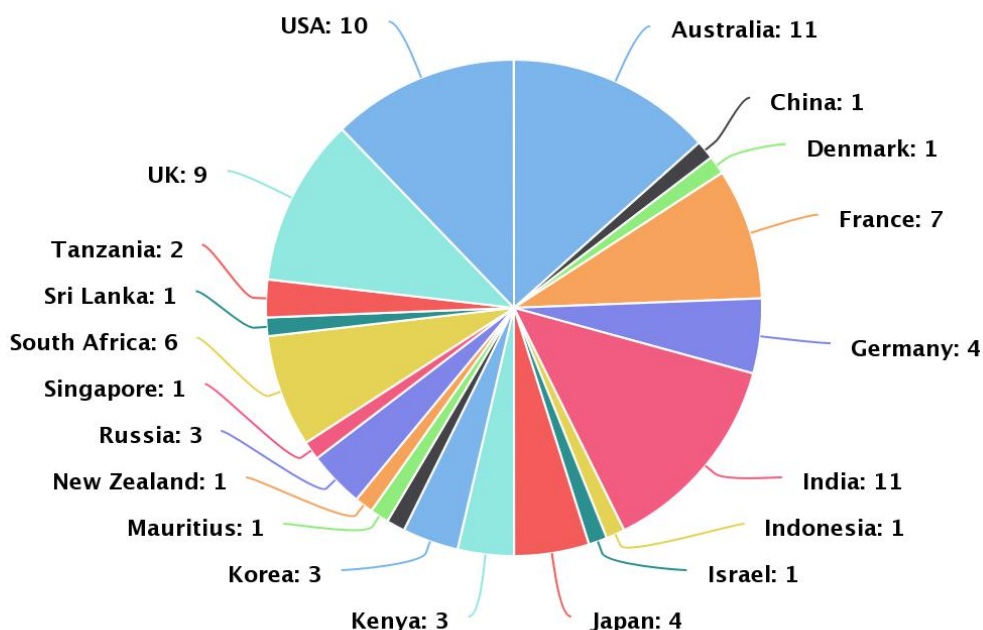
- Deep Madagascar Basin (DMB) Experiment: A Quest to Find the Abyssal Water Pathways in the Southwest Indian Ocean" (Viviane Menezes, P.I.) - The field portion of the study was undertaken on a 24-day research cruise, in 2023 on the US global-class research vessel *Roger Revelle*.
- MINTIE (US NSF): ITF Study, Recently Deployed 5 Riser floats in the Banda Sea, Working on research clearance for MINTIE mooring voyage in 2023 on Indonesian Vessel.
- TRIUMPH (BRIN/US NSF): ITF Study, Cruise in 2022 completed in the upwelling season on Indonesian vessel, More cruises in 2023 and beyond likely with NSF support. BGC MODELING (US/NSF): Oxygen minimum zones, physical drivers, biogeochemical feedbacks, coastal hypoxia. A couple of papers already submitted. One paper published on coastal hypoxia.
- BIOSCAPE (NASA Applied Sciences Division): Mapping Biodiversity at Southern tip of South Africa, from ocean color data.
- EKAMSAT (ONR/MOES/NOAA): Air-Sea exchange in the Arabian Sea. Will/has involved R.V. Roger Revelle in 2023, 2024, 2025.
- GO-SHIP IO5 (NOAA/NSF): Freemantle to Cape Town, Spring/Summer 2023 on R.V. Roger Revelle.
- BGC Argo (NSF, \$53 million): Agulhas deployments done off the R.V. Agulhas II to Marion Island, and the R.V. Investigator to Kerguelen/Cape Darnley, Madagascar from the Agulhas II, IO5 (30S) in late spring/early summer 2023 from the R.V. Roger Revelle, NB Palmer from Hobart to East Antarctica to Cape Town, Arabian Sea ONR project (EKAMSAT) from the R.V. Revelle.

India has also funded the MOSAIC (Marine Observation System Along Indian Coast) coastal observing program under the IIOE-2 banner. This effort is being led by INCOIS and aims to establish sustained time-series observations using automated moored buoys at six different locations along the Indian coast to monitor and now-cast water quality of the Indian coastal waters. This effort has been funded by India's Ministry of Earth Sciences. An automated moored buoy has already been deployed off the coastal waters of Kochi and another is being prepared to be deployed off Visakhapatnam. Several MOSAIC research cruises have been carried out in the coastal Bay of Bengal and the Arabian Sea.

**Finally, IIOE-2 now has 51 endorsed projects involving 21 Countries with India (11 projects), Australia (11 projects), the USA (10 projects), UK (9 projects), France (7) and South Africa (6 projects) leading the way.**

Collaborated and continued with the endorsement of scientific activities ([https://iioe-2.incois.gov.in/IIOE-2/Endorsed Projects.jsp](https://iioe-2.incois.gov.in/IIOE-2/Endorsed_Projects.jsp)).

## Participant Nationalities Wise No. of Endorsed Projects Submitted as on 2023



### **WG 2: DATA AND INFORMATION MANAGEMENT WORKING GROUP** (co-chairs: E. Pattabhi Rama Rao and Harrison O. Ong'Anda)

This Working Group is charged with early sharing of data using internationally agreed rules of data exchange. WG has finalized the IIOE-2. The draft data and information management policy was reviewed and finalized through consultations. The data policy was presented to the IIOE-2 Steering Committee during its 5<sup>th</sup> meeting held on March 21-22, 2022 and approved by the SC. Metadata portal to make oceanographic data from the region discoverable is hosted on IIOE-2 website (<https://iioe-2.incois.gov.in/IIOE-2/data.jsp>). Metadata of 6 scientific cruises were uploaded on the web-site.

A template was developed for submission of metadata. An e-mail notification was sent to all the IIOE-2 Endorsed Projects PIs to submit the Metadata of the scientific cruises.

The OMNI-RAMA Joint Indian Ocean Data Portal has been established between MoES and NOAA and launched mid-August 2021 (<https://incois.gov.in/portal/datainfo/buoys.jsp>) was updated regularly.

### **WG 3: OPERATIONAL COORDINATION (chair: Dr. Rajan Sivaramakrishnan)**

This WG is charged with developing and integrating web-based tools, databases and partnerships to enable a sufficient level of cooperation, resource-sharing, scientific collaboration and capacity alignment. The WG is led by Dr. Rajan Sivaramakrishnan.

The IIOE-2 website ([iioe-2.incois.gov.in](https://iioe-2.incois.gov.in)) is well maintained and made up to date with the events happening. Supporting Project Office India in the endorsement of new projects under IIOE-2 and publishing it on the IIOE-2 Website. The IIOE-2 newsletter is Published Online monthly Newsletter by Project Office India, to update the Indian Ocean community on the recent IIOE-2 activities, developments and new results. It also lists the upcoming events, meetings, conferences etc, and



provides early information and a platform for young scientists to explore the opportunity to participate in cruises. Seventy-eight issues have been published to date.

Recent IIOE-2 activities, developments, Newsletter, IO Bubble, upcoming events, meetings, conferences etc. are posted on Facebook and Twitter for wider publicity. The Indian Ocean Bubble, Issue No. 16 was released in December 2022 and made available online at [https://iioe-2.incois.gov.in/IIOE-2/pdfviewer\\_pub.jsp?docname=IIOE-2-DOC\\_OM\\_259.pdf](https://iioe-2.incois.gov.in/IIOE-2/pdfviewer_pub.jsp?docname=IIOE-2-DOC_OM_259.pdf). The main aim of the IIOE-2 Bubble is to initiate informal discussions on the outstanding scientific issues in the Indian Ocean and to update the Indian Ocean community on the progress on IIOE-2. 16 issues have been published till date.

**Following the IIOE-2 meeting, the IIOSC-2023 joint meetings in Perth had a review of the progress of its activities with its allied projects, i.e. IOGOOS, the Indian Ocean Regional Panel (IORP) of WCRP-Clivar, Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER of IMBeR), and IndOOS Resource Forum (IRF).**

#### **IIOE-2 and the Indian Ocean Observing System Resource Forum (IRF)**

IRF also met during IIOSC-2023, convened by Nick D'Adamo, with thanks to outgoing Chair Dr Sidney Thurston who chaired IRF these past few years with excellence, building its constituency, focussing on high level objectives and ensuring IRF met regularly and undertaking well its role as a support mechanism to IORP and SIBER in the context of IndOOS's mission. The brief meeting focussed on IOGOOS's task (as patron of IRF) during 2023 of arranging for a replacement to Dr Thurston (with the Convener Nick D'Adamo acting as Chair in the interim).

#### **IIOE-2 and SIBER /IMBeR in the IO region**

SIBER SC members continued to play important roles in IIOE-2 governance but also in leading major research cruises and projects, as part of both the EIOURI (e.g. BLOOFINZ [Landry] and TRIUMPH [Susanto and Radjasa]) and WIOURI (e.g. SOLSTICE and ReMoTURB [Roberts]) programmes. Other SIBER-led projects included CYCLOPS, RESILIENCE and the Monaco Explorations 'Indian Ocean Expedition' [Marsac; D'Adamo] and development of India's coastal observing programme (MOSAIC [Lotliker]).

SIBER also continues to lead publication of results of Indian Ocean research. This included completion in 2022 of a special issue of DSR II focused on the WIOURI/SOLSTICE Algal Bank programme and the South African squid fishery, and another dedicated to the 2019 *RV Investigator* cruise along 110°E. Also, a sixth IIOE-2 special volume had a manuscript submittal deadline of May 15, 2023, and a seventh volume is being planned. Finally, a collection of synthesis papers on the Indian Ocean is being prepared as a 20-chapter book, and is nearing completion.

SIBER members have also been involved in various training courses, including workshops in Mozambique (POGO coastal observation training workshop, June 2022 [Cowie] and India (POGO ocean observations training workshop, Nov 22 [Cowie and Lotliker]). A key SIBER-IORP activity has been co-development (with Juliet Hermes) of the Coastal Observation Lab in a Box (COLaB) programme, focused on delivering low-cost tools and training for coastal observations in under-resourced countries. Western Indian Ocean rim and island nations are important intended delivery areas.

Important outcomes of the SIBER SC meeting included confirmation of Ocky Karna Radjasa (BRIN, Indonesia) and Eric Raes (Minderoo Foundation and UWA Ocean Institute, Australia) as SC members, and a decision to extend SC membership to additional early career scientists.

Notably, Ocky Karna Radjasa gave a presentation about BRIN/Indonesia research activities in the Indian Ocean region and the facilities available at BRIN's marine science facility in Lombok. An important outcome of the IIOE-2 meeting was a proposal to hold the next joint meetings (2024) in Lombok.

A further development from the IIOE-2 meeting is that SIBER SC member Lynnath Beckley is leading an overhaul of Science Theme 6 with Marie-Alexandrine Sicre to enhance paleoclimate activities.

Finally, in relation to the proposed extension of IIOE-2 beyond 2025, SIBER (through Cowie and Hood as Co-Chairs) will contribute to the preparation of an updated IIOE-2 science plan, notably to include a greater emphasis on coastal processes and observations, and their relevance to human welfare, in terms of resources and food security, natural hazards etc. It was proposed that the SIBER-IORP COLaB model for capacity building in standardized coastal observations could represent a significant facet and legacy of the extended IIOE-2.

### **IIOE-2 and the Indian Ocean Global Ocean Observing System (IOGOOS)**

IOGOOS annual meeting was held on February 9, 2023 as part of the IIOSC joint meetings in Perth and had a review of the progress of its activities and its allied projects i.e. Indian Ocean Regional Panel (IORP), Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER), IndoOS Resource Forum (IRF), Second International Indian Ocean Expedition (IIOE-2), Modeling for Ocean Forecasting and Process Studies and Indian Ocean Core Remote Sensing Project (MOSAIC). The major outcomes of the meeting are:

- INCOIS, India will continue to host the IOGOOS Secretariat through October 2026.
- Dr. T. Srinivasa Kumar, Director, INCOIS will act as the IOGOOS Officer representing the Central Indian Ocean and as the Chair of IOGOOS.
- IOGOOS is participating in the Ocean Decade Activities
- IOGOOS will continue to conduct workshops and training to enhance the capabilities of the region in the fields of observations, modeling and operational services. Some important events related to IIOE-2 were organized during the reporting period include:

- Together with the IIOE-2 Co-chair representing SCOR, the IOGOOS was involved in preparation of the proposal for recognising IIOE-2 as a Ocean Decade activity. Several coordination meetings were held with the UN Decade DCU to follow up on the submission and scheduled discussions at the February 2023 meeting in Perth. Further follow up will be undertaken after the November 2023 meeting that is scheduled at INCOIS, Hyderabad to discuss the future of IIOE-2 beyond 2025. Further, discussions were also initiated with IOC to clarify the funding arrangements for IIOE-2 and IOGOOS activities that were impacted due to the closure of the Perth Office.
- IOGOOS Chair participated and delivered a keynote talk in the Ocean Prediction - Decade Coordination Centre (DCC) Kick-off meeting held during 11 - 12 January 2023. As a follow up, the IOGOOS Secretariat is acting as the Indian Ocean Seas Regional node for the Ocean Prediction - DCC.
- A comprehensive survey to gather the capacities and user needs of IOGOOS Member States with respect to Ocean Forecasting and Modelling is being undertaken under the IOGOOS project on Modelling for Ocean Forecasting and Process Studies (MOFPS)
- Participated in the meetings of the relevant regional bodies such as IOCINDIO, GOOS - Steering Committee, IndoOS Resource Forum, IORP, etc.
- Organised the training programme on “Ocean Observation to Societal Applications” during October 30 to November 05 2022 with support from POGO and International Training Centre for Operational Oceanography at INCOIS, Hyderabad (UNESCO Category2Centre). The training included in-class and on-sea sessions by international experts, and was attended amongst others, by several IOGOOS Member Countries including Bangladesh, Indonesia, Mozambique, Sri Lanka, Tanzania, Maldives and India.
- Organized the training programme on “Ocean Colour remote Sensing - data, Processing and Analysis” during December 12 - 16, 2022 with support from Ocean Teacher Global Academy of the IOC and the International Training Centre for Operational Oceanography at INCOIS,



Hyderabad (UNESCO Category2Centre). The training included in-class lectures and hands-on sessions by international experts, and was attended amongst others, by several IOGOOS Member Countries including Bangladesh, Indonesia, India, Kenya and Sri Lanka

- Organized the training programme on "Fundamentals of remote Sensing and other Oceanographic Application" during September 05 - 09, 2022 with support from the International Training Centre for Operational Oceanography at INCOIS, Hyderabad (UNESCO Category2Centre). The training included online lectures by international experts, and was attended amongst others, by several IOGOOS Member Countries including Australia, Bangladesh, Indonesia, India, Kenya, Mauritius, Mozambique, South Africa and Sri Lanka.
- Ocean Institute of University of Western Australia became a new Member of IOGOOS and is represented by Dr. Nick D'Adamo.



Pictures of training programmes organized by the IOGOOS.

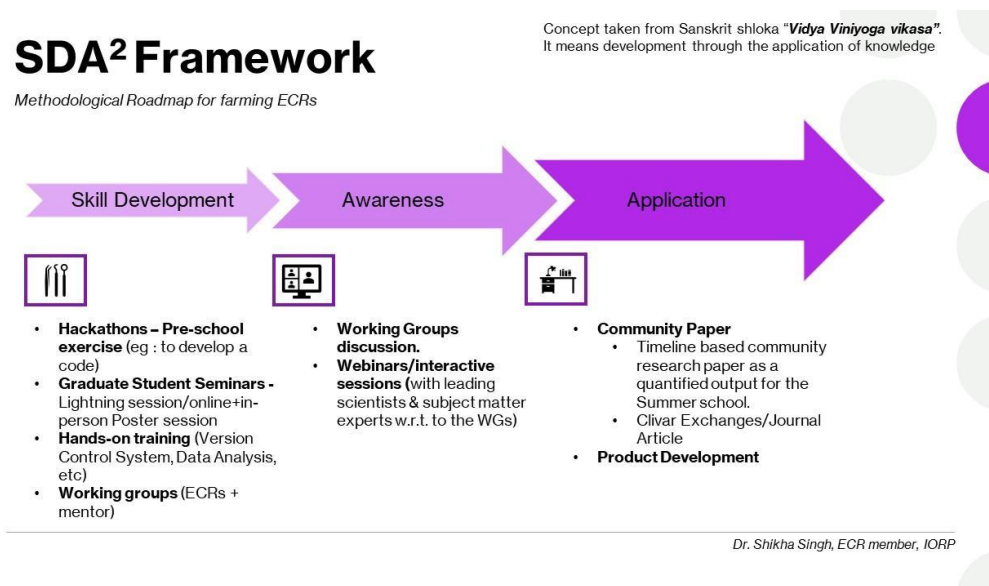
#### **IIOE2 and IORP collaborative activities**

The IORP, along with SIBER, and with the support of IIOE-2 team, conducted the CLIVAR-POGO "Regional Training Workshop on Observing the Coastal and Marginal Seas in the Western Indian Ocean". The workshop was conducted successfully from 7 to 9 June 2022 in the hybrid format, with 25 in-person participants in the physical venues at the Universidade Eduardo Mondlane main campus in Maputo, Mozambique and over 110 attendees online from the WIO countries and beyond. The workshop focused on addressing the observational needs of the western Indian Ocean region and paved the way to the exchange of best practices in ocean observations and capacity building.



Other activities which have been a focus of IORP include submitting proposals for a marine heat wave summer school (to be held in Trieste in July 2023) and a cross basin MHW research focus group. The IORP also has a task team looking at the impacts of COVID on IndoOOS as well as using OSSEs further to assess the impact of IndoOOS on forecasting large scale events.

Dr. Shikha Singh was recruited as an ECR member of IORP to help build up the ECR research in the Indian Ocean. She developed the SDA<sup>2</sup> Framework (Skill Development, Awareness and Application) for promoting the ECR research, communications, and collaborations in the Indian Ocean.



The 2<sup>nd</sup> Indian Ocean Early Career Scientists WG Telecon was organized on 5 November 2022. Representatives from IORP, YESS, WIOMSA-ECSN and IIOE-2 ECSN, IIOE-2 SCOR attended the telecon. The telecon was focused on the SDA<sup>2</sup> Framework as well as the ECS' active involvement in planning for the upcoming CLIVAR/ICTP Summer School on Marine Heatwave (MHW).



IORP is working with SIBER in further developing the Coastal Observing Lab in a Box. As part of this IORP and SIBER members contribute to an IODE/GOOS Ocean Best Practices Task Team on coastal observations in under-resourced countries and have submitted a proposal to the Commonwealth for funding to develop COLaB further. In addition, the co-chair of the IORP, Juliet Hermes is the Indian Ocean Rim Association Academic Group Chair and will be hosting the IORA-AG meeting in September in Cape Town.

#### **Request to SCOR**

We request that SCOR allocate \$15k to support the next joint steering committee meeting (SC-7) that will take place in person in Lombok, Indonesia in March 2024 together with allied projects for the IIOSC-24.