

U.S. Indian Ocean Science Workshop

*Scripps Institution of Oceanography, San Diego, USA,
September, 11-13, 2017*



2nd International
**Indian Ocean
Expedition**

 US Steering Committee





IIOE-2

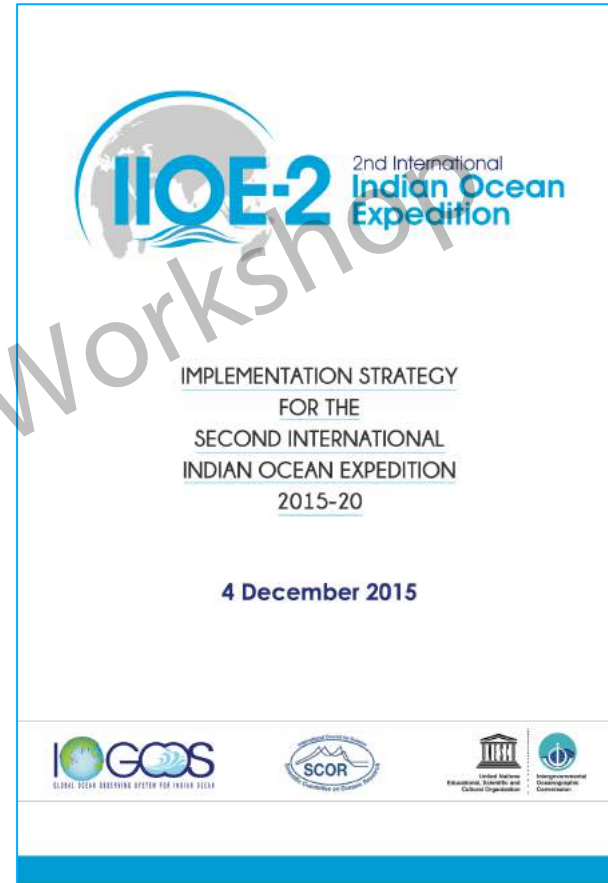
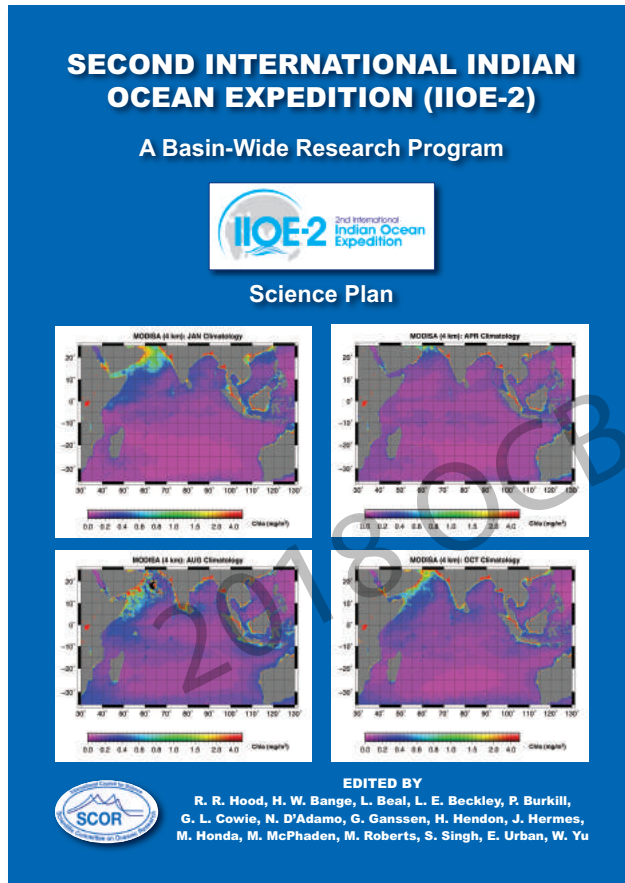
2nd International
**Indian Ocean
Expedition**

Its happening now! 2015-2020 and beyond...



IIOE-2 Science Plan and Implementation Strategy:

- The IIOE-2 Science Plan was commissioned by SCOR.
- The IIOE-2 Implementation strategy was commissioned by IOC.



Available at: <http://www.iioe-2.incois.gov.in> or iust Google IIOE-2

Many Countries are involved in IIOE-2:

- USA:** US National Committee formed and active, science plan development workshop funded and convened (September 11-13, 2017 at SIO), draft science plan nearing completion, *RV Ron Brown* cruise in 2018, leading YMC activities
- South Korea:** Engaged through NOAA, especially related to supporting RAMA / IndoOS, science planning workshop to set South Korean science priorities for participating in IIOE-2 will be convened in November, 2017
- India:** IIOE-2 National Organizing Committee formed and active, hosting JPO in Hyderabad / INCOIS, hosting website, multiple cruises undertaken and planned 2016 and beyond including GEOTRACES (Shenoi, Rajan, Singh, Prakash et al.)
- Japan:** Hosted and convened first EIOURI workshop, co-leading EIOURI, research cruises undertaken and planned (Masumoto, Honda, JAMSTEC)
- Germany:** IIOE-2 Organizational Meeting Convened, National Committee formed and active, science plan published, multiple proposals submitted and approved, multiple cruises planned (Visbeck, Bange, Gaye, et al.)
- Indonesia:** Delegation sent to the USA with strong emphasis on IIOE-2, LIPI ship support committed to the effort, hosted 2nd IIOE-2 SC meeting, leading IIOE-2 capacity development efforts (Arifin, Susanto, et al.)
- China:** Hosted and Convened RG-2 meeting, and leading EIOURI effort, research cruises undertaken and planned (Weidong Yu, SOA)
- Australia:** IOC Perth Office hosting JPO secretariate (D'Adamo), National Committee formed and active, science priorities developed and published, 110E repeat line proposal funded (Beckley et al.), EIOURI cruise funded (Wijffels), strong backing from UWA/IOMRC, hosted first IIOE-2 SC meeting and symposium
- Mauritius:** Hosted and Convened RG-3 meeting with strong SWIO representation including South Africa (Badal, Roberts, D'Adamo)
- UK:** IIOE-2 Organizational meeting convened and national committee formed, proposals submitted and funded, Joint UK and South Africa Agulhas Bank study on *RV Discovery* planned (Burkill, Cowie, Roberts, et al.)
- Thailand:** Hosted EIOURI science plan writing workshop and engaged in IIOE-2 through SIBER (Khokiattiwong, Yu, et al.)
- South Africa:** WIOURI under development, strong engagement by Dept. of Environmental Affairs, Agulhas II ship time allocated and carrying out IIOE-2 cruises, Huggett appointed SA IIOE-2 lead (Beal, Huggett, Roberts et al.).
- Kenya and other eastern African countries:** Engaged through IOC, expressed strong desire to participate, promotion video developed, hope to motivate capacity development and equip/deploy a new research vessel (M. Odido and IOC Africa)
- Saudi Arabia:** Initiated discussions to develop a Red Sea Research Initiative (RSRI) under IIOE-2, glider missions through Bab-el-Mandeb also discussed (Jones, Hood et al.)
- Pakistan:** Engaged through IOC and have expressed strong desire to participate. Submissions to DSR II Special Issue on IIOE-2 (Kidwai et al., NIO Pakistan)
- Russia:** Engaged through IOC, geophysical and repeat hydrographic surveys are happening
- Iran:** Engaged through IOC, planning research in the northern Arabian Sea with new vessel
- France:** Engaged through IOC and IORP, cruises ongoing and planned in the northwestern Indian Ocean and in the southern hemisphere
- Norway:** Cruises undertaken and planned, EAF-Nansen, Mauritius Workshop, 21-13 Aug 2017, Negotiations with FAO and Norway research leaders for EAF-Nansen / IIOE-2 linkages and collaboration are underway (T. Stromme, N. D'Adamo)

Deep-Sea Research Special Issues on IIOE-2

- We are putting together the first two special issues on IIOE-2 for publication in DSR II.
- Guest editor team:
 1. Raleigh Hood (rhood@umces.edu)
 2. Jerry Wiggert
 3. Lynnath Beckley
 4. Birgit Gaye
 5. Jerome Vialard
 6. Sunil Singh
- Title: “The 2nd International Indian Ocean Expedition (IIOE-2): Motivating New Exploration in a Poorly Understood Basin, Volume 1”
- Deadlines:
 - Volume 1
Submission Closed February 1, 2018
21 manuscripts submitted and in review
- 60 contributions identified, 39 more manuscripts anticipated
- Now accepting manuscripts for a second volume:
 - Volume 2
Submission target, May 31, 2018, passed
But will remain open until filled
11 manuscripts submitted so far



Visit the Joint Project Office Website for more info:

<http://www.iioe-2.incois.gov.in> or just Google IIOE-2

Principal Enquiries: JPO Perth Office

Home | Sitemap | Search | Contact Us

IIOE-2 2nd International Indian Ocean Expedition 2015-2020

IOEOS GLOBAL OCEAN OBSERVING SYSTEM FOR INDIAN OCEAN

SCOR Scientific Committee on Oceanic Research

Join IIOE-2 Community

ABOUT IIOE-2 | GOVERNANCE | PARTNERS & INITIATIVES | PROJECTS & ACTIVITIES | DATA | IO BUBBLE | PUBLICATIONS | MEETINGS

The Indian Ocean Bubble

The Indian Ocean Bubble 2

Read more

Flash News

Second International Indian Ocean Expedition (IIOE-2)

"to advance our understanding of the Indian Ocean and its role in the Earth System in order to enable informed decisions in support of sustainable development and the well-being of humankind"

This international program of discovery will be guided by a rich set of contemporary science questions. It will provide new observational data that will be processed, curated, managed and used to underpin characterisation of key oceanic and related atmospheric processes at a wide spectrum of spatial and temporal scales. This will support improved modelling and predictability, and as an integrated body of new information, the transfer of knowledge for societal benefit with an emphasis on capacity development as a key vehicle to achieve this objective.

Science Themes, Working Groups and activities

The IIOE-2 focuses its science pursuits via six overarching Science Themes (STs). In addition, seven Working Groups (WGs) have been established to serve as the operational arms of the IIOE-2 structure, namely, Science & Research; Data & Information Management; Capacity Development; Operational Coordination; Outreach & Communication; Translating Science for Society; and Resources & Sponsorship.

- WG-1 Science & Research**
New knowledge on Indian Ocean bio-physical oceanographic and coupled atmospheric science
- WG-2 Data & Information Management**
Managing the data and related information for maximal utility, access and legacy
- WG-3 Capacity Development**
Education, training, mentoring, relationship building, empowerment through science and applications
- WG-4 Operational Coordination**
Onsite plans, research programs, and related information to plan and manage the logistics
- WG-5 Outreach & Communication**
Advocacy, awareness, connecting the science, its value, its applications to the IIOE-2 constituency
- WG-6 Translating Science for Society**
Connecting the new knowledge with and for the beneficiaries
- WG-7 Sponsorship & Resources**
Underpinning secretariat and resources to help implement and administer the IIOE-2

Six Science Themes

ST-3: Monsoon variability and ecosystem response

U.S. Indian Ocean Science Workshop

*Scripps Institution of Oceanography, San Diego, USA,
September, 11-13, 2017*



2nd International
**Indian Ocean
Expedition**

 US Steering Committee



U.S. Indian Ocean Science Workshop:



- There were 70 participants, mostly US but also India, France and China.
- The goal of this workshop was to identify scientific priorities that are specifically tailored to US research interests and assets to guide US participation in the Second International Indian Ocean Expedition (IIOE-2).
- A draft document with five priority research themes have emerged from the workshop...

US IIOE-2 Science Planning Workshop:

The fourth draft report is complete.

Next Steps:

- Review by the US IIOE-2 SC ✓
- Review by workshop participants ✓
- Review by US community (in progress)
- Presentation to NSF/OCB ✓ community and program managers (June 2018 mtg. at WHOI)
- Motivate coordinated proposal submissions to NSF, NASA and NOAA in 2018 / 2019 (in progress)
- Secure funds for a US project office?

U.S. Contributions to the Second International Indian Ocean Expedition (U.S. IIOE-2)

UNITED STATES CONTRIBUTIONS TO THE SECOND INTERNATIONAL INDIAN OCEAN EXPEDITION (US IIOE-2)

Fourth Draft Copy
(8 June 2018)



Hood, R. R., L. Beal, H. M. Benway, C. Chandler, V. Coles, G. Cutter, H. Dick, A. Gangopadhyay, J. Goes, S. Humphris, M. R. Landry, K. G. Lloyd, M. J. McPhaden, R. Murtugudde, B. Subrahmanyam, R. D. Susanto, L. Talley, J. D. Wiggert, C. Zhang (Eds.)

Overarching goal:

The overarching goal of US IIOE-2 is synonymous with the international effort: to advance our understanding of interactions among geologic, oceanic and atmospheric processes that give rise to the complex physical dynamics of the Indian Ocean region, and determine how those dynamics affect climate, extreme events, marine biogeochemical cycles, ecosystems and human populations.

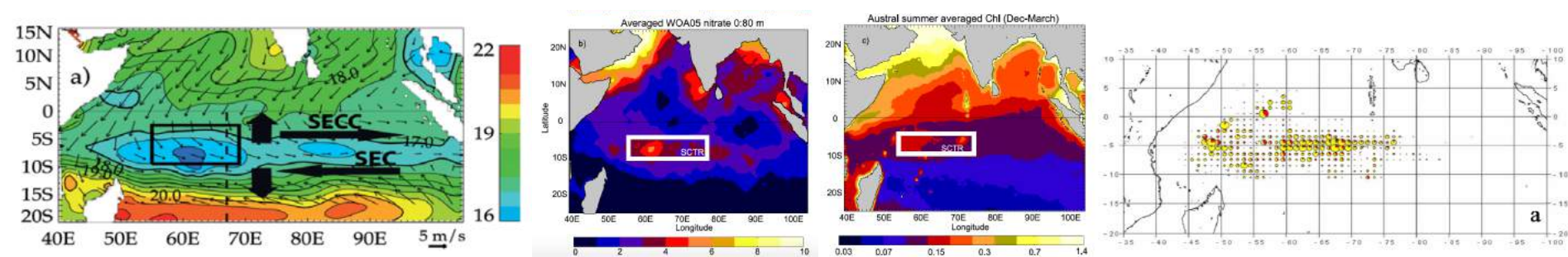
- *But the US national effort is more focused.*
- *There are five research themes.*
- *And there is an explicit theme focused to marine geology and geophysics, deep ocean biogeochemistry and ecology, and the subsurface biosphere.*

Scientific Themes

Theme 1: Physical, Biogeochemical and Ecological Dynamics of the Seychelles-Chagos Thermocline Ridge (SCTR)

Scientific Questions:

- What is the relative importance of local versus remote forcing on the three-dimensional circulation of SCTR and how does this forcing vary on intraseasonal, seasonal, and interannual time scales?
- How do physical processes and related biogeochemical factors affect the seasonal cycle of primary productivity, the microbial food web and ecosystem dynamics?
- Is the prey of large tuna in the SCTR supported by advection and convergence from adjacent ocean waters or from local upwelling of nutrients that enhances primary and secondary productivity? Alternatively, could the presence of large numbers of tuna schools in the SCTR be related to spawning?

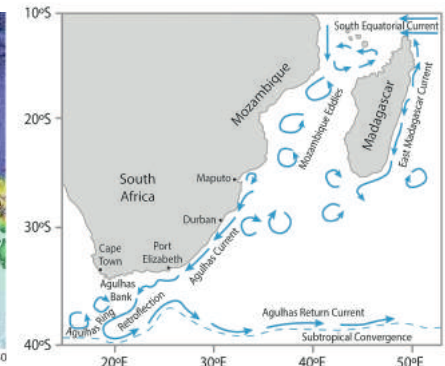
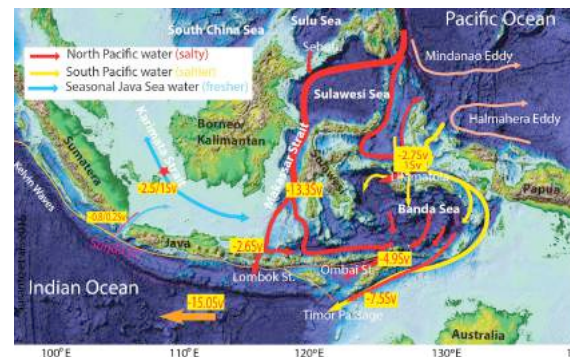
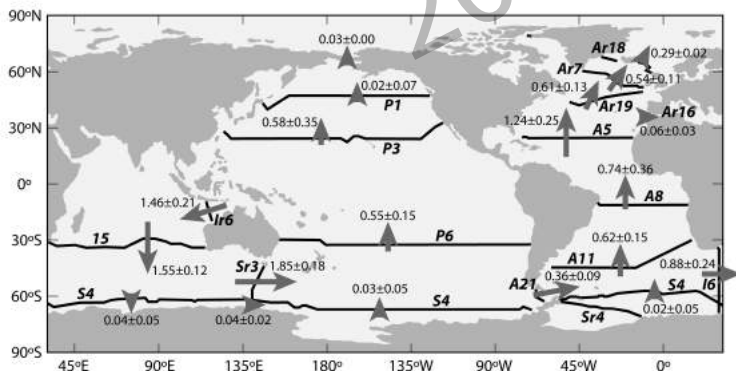


Scientific Themes

Theme 2: Physical and Biogeochemical Budgets and Exchanges

Scientific Questions:

- How does the Indian Ocean heat budget vary over timescales from seasonal to decadal?
- What is the role of the subtropical gyre, the shallow and deep overturning cells, mode water formation, and the Indonesian Throughflow and the Agulhas system in basin-wide heat and nutrient budgets and their changes?
- How are the Indian Ocean heat and nutrient budgets linked to decadal variability of sea surface temperature, sea level, primary productivity and food web dynamics?

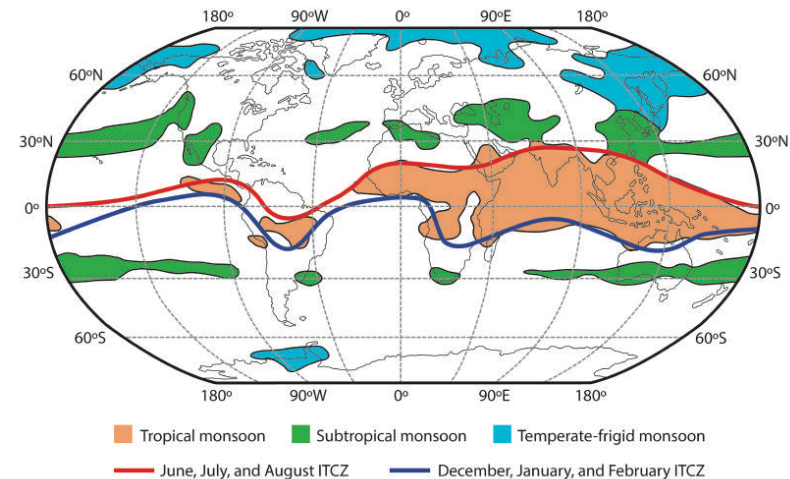
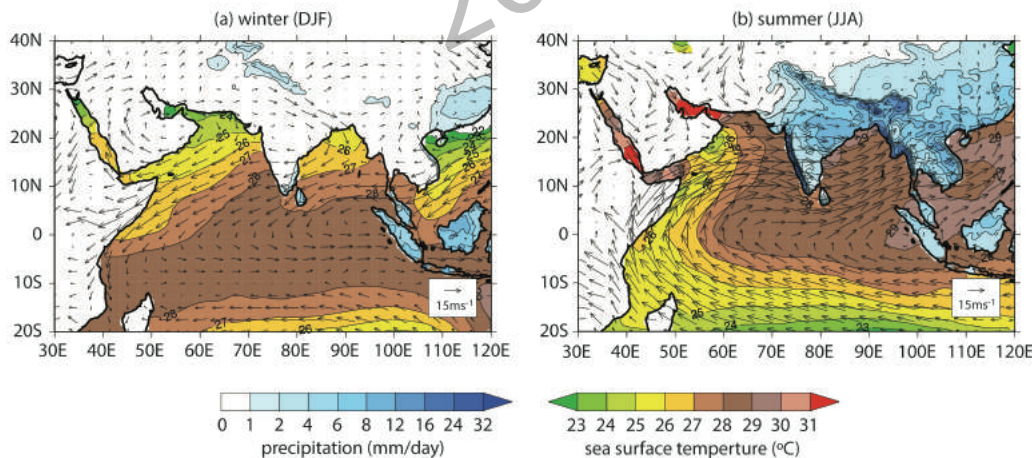


Scientific Themes

Theme 3: Monsoon Dynamics

Scientific Questions:

- How do the multiscale ocean dynamics and air-sea interactions in the tropical Indian Ocean influence variability and predictability of the monsoon on subseasonal to seasonal timescales?
- What are the root causes of biases and errors in key tropical regions in the state-of-the-art climate and Earth system models?
- What are the dominant low-frequency natural variability patterns and timescales in the Indian Ocean? How are the low-frequency variabilities in the Indian Ocean affected by the response in the Southern and Pacific oceans to global warming?

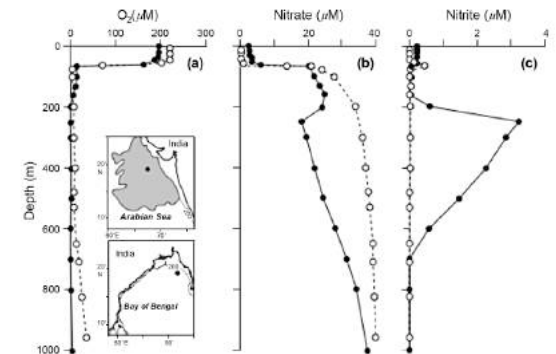
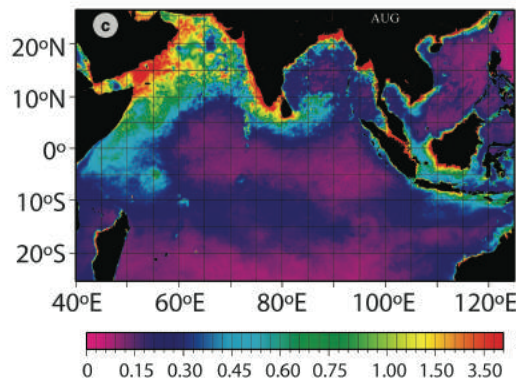
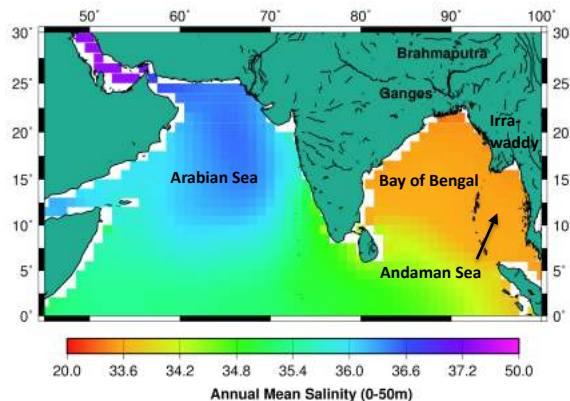


Scientific Themes

Theme 4: Physical, Biogeochemical and Ecological Contrasts Between the Arabian Sea and the Bay of Bengal

Scientific questions:

- What controls the source variability, local ventilation, biological oxygen demand, and biological and biogeochemical impacts of the two Northern Indian Ocean oxygen minimum zones (OMZs)?
- Are the Northern Indian Ocean OMZs uniquely sensitive to climate change? How will climate change impact the OMZs and, in particular, the interactions between monsoon intensity and timing, increased anthropogenic nutrients and carbon inputs, low oxygen and acidification?
- What are the spatial and temporal extents of nutrient limitations in the northern Indian Ocean? How do these limitations impact the the microbial food web and primary production that fuels biological oxygen demand?

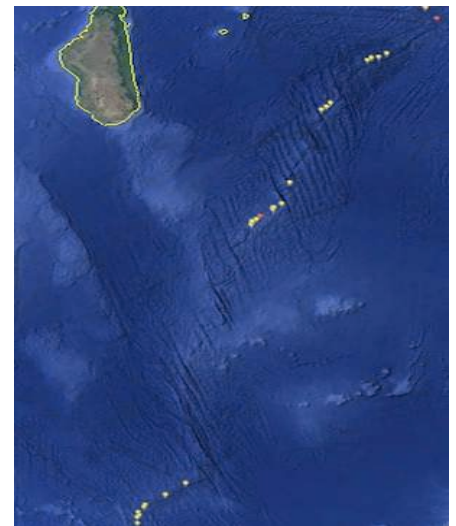
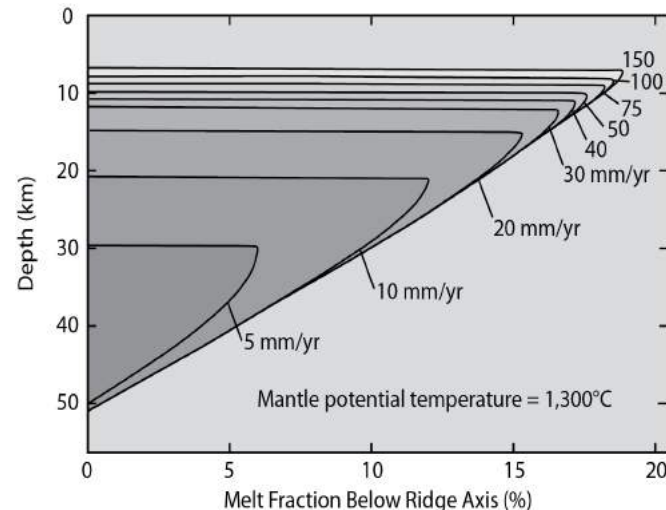
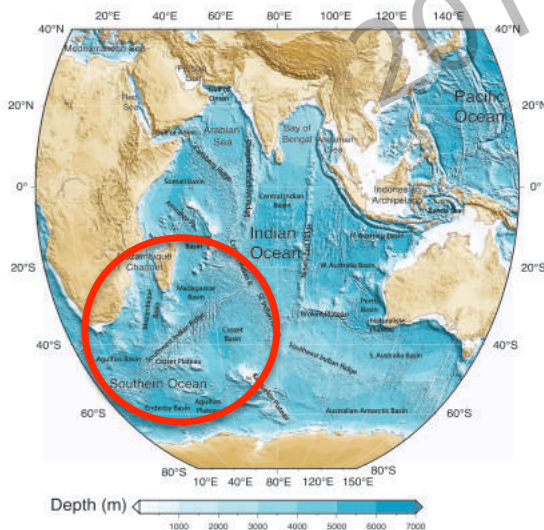


Scientific Themes

Theme 5: Marine Geology and Deep Ocean Biogeochemistry and Ecology

Scientific questions:

- What controls the local and regional variability of mid-ocean ridge basalt and ridge tectonics at the **Ultralow Spreading Southwest Indian Ridge**, and how does this reflect mantle prehistory? How is the rock-hosted subsurface biosphere at the Southwest Indian Ridge impacted by mantle below ocean crust in magmatic segments?
- How does chemical exchange during **hydrothermal circulation at the Southwest Indian Ridge affect the biogeochemistry and ecology of the deep Indian Ocean water column and subsurface biosphere?** How do different rock substrates affect the nature and composition of hydrothermal mineral deposits?

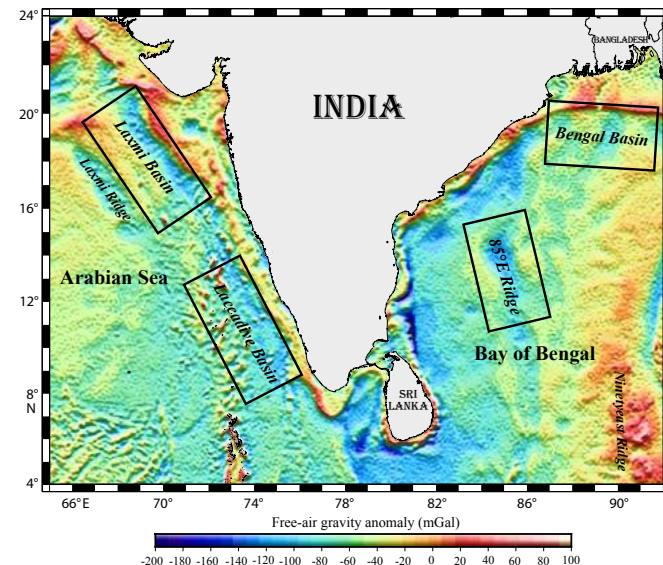


Scientific Themes

Theme 5: Marine Geology and Deep Ocean Biogeochemistry and Ecology

Core questions:

- Do potentially high cell numbers in the **Bengal and/or Indus fans** alter **global estimates of the size of the marine deep subsurface biosphere**? How do subsurface microbial populations respond to long-term exposure to elevated organic matter content in an anoxic environment?
- How did the diffuse plate boundary starting from **Central Indian Ridge** to the **Sunda subduction zone** evolve? How and where are micro-continents like **Elan Bank** and **Southern Kerguelen Plateau** split from the Indian subcontinent? What is the structure and evolution of the **85°E Ridge**? What is the nature of **crust beneath the Bangladesh Margin**?



Strategy for Obtaining Funding

The funding model for U.S. IIOE-2 will follow that for the ongoing GEOTRACES program. The U.S. IIOE-2 Steering Committee will help motivate and coordinate proposal development and submission. Proposals should be submitted to relevant core programs of both federal and private funding agencies.

Theme 1 (Dynamics of the SCTR): Participate in the ongoing South Korean and U.S. bilateral planning process that is focused on the Seychelles-Chagos Thermocline Ridge.

Theme 2 (Inter-Ocean Exchanges): Contact the U.S. IIOE-2 Steering Committee for help coordinating collaborations, proposal development, and submission.

Theme 3 (Monsoon Dynamics): Formulate proposals for submission to NSF's Atmospheric and Geospace Sciences, Earth Sciences, and Physical Oceanography programs. Submissions to NOAA's Office of Oceanic and Atmospheric Research and the Climate Program Office, and to NASA's Earth Science Division are also encouraged.

Theme 4 (Contrasts between the AS and BoB): This theme is particularly relevant to OCB, which is supported by the NSF Chemical and Biological Oceanography programs and NASA's Ocean Biology and Biogeochemistry program. Formulate proposals for submission to these programs.

Theme 5 (MG&G and Deep Ocean Biology): Formulate proposals for submission to NSF's Marine Geology and Geophysics and Chemical and Biological Oceanography programs.

Other Sections of the Report

- Training, Education and Outreach
- Leveraging and Coordination
- Conclusions and Legacy

2018 OCB Workshop

Thank You

2018 OCB Workshop