



2nd International  
Indian Ocean  
Expedition  
2015-2020

# Newsletter

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(A basin-wide research program co-sponsored by IOC-UNESCO, SCOR and IOGOOS)

*To advance our understanding of interactions between geologic, oceanic and atmospheric processes that give rise to the complex physical dynamics of the Indian Ocean region, and to determine how those dynamics affect climate, extreme events, marine biogeochemical cycles, ecosystems and human populations.*

## R. V. Ronald Brown completes GO-SHIP IO7N repeat line in the Indian Ocean

The NOAA Research Vessel Ronald H. Brown (Figure-1) completed sampling of the GO-SHIP IO7N repeat hydrography line, arriving in Goa, India, on June 6, 2018. The cruise, which departed from Durban, South Africa on April 23<sup>rd</sup>, sampled a transect in the western Indian Ocean from 30°S to 20°N along 55°E (Figure-2). This was the first scientific occupation of line IO7N section since 1995. The overall goal of the cruise was to learn how the western Indian Ocean has changed over the last 23 years. Specifically, has the deep ocean warmed? Have the regional concentrations of dissolved oxygen, carbon dioxide, nutrients changed? Has the Western Indian Ocean become more acidic? One of the key objectives of the cruise was to measure the amount of heat that is stored in the ocean. Existing observations from different platforms show that the upper-ocean heat content for the World Ocean has been steadily increasing since 1970s. The Indian Ocean is the fastest warming ocean on the planet and its upper 2000m heat content has also been increasing. But has the excess heat penetrated deeper than 2000 meters in the Western Indian Ocean? The data collected on this cruise will help to answer this question.



Figure -1: NOAA Research Vessel Ronald H. Brown at port in Durban, South Africa before departure to sample GO-SHIP line IO7N.

In addition to the core CTD and chemical observations, state-of-the-art bio-optical measurements were made along the transect to characterize biological processes and link them to satellite ocean color measurements. These measurements included phytoplankton pigments, phytoplankton and zooplankton species composition, primary production and fluorescence / light response. The data will be used to describe the phytoplankton community structure across biogeographic regimes delineated using the core CTD and chemical observations. These data will also be used to help improved satellite remote sensing estimates of chlorophyll concentration, primary production and phytoplankton community size and structure.

The cruise was a resounding success. The IO7N line was completed on schedule and all major scientific objectives were met.

[Report Courtesy : Raleigh R. Hood, University of Maryland Center for Environmental Science, Cambridge, MD, USA]

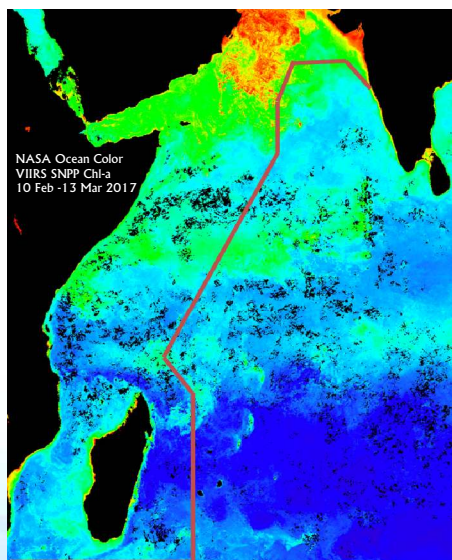
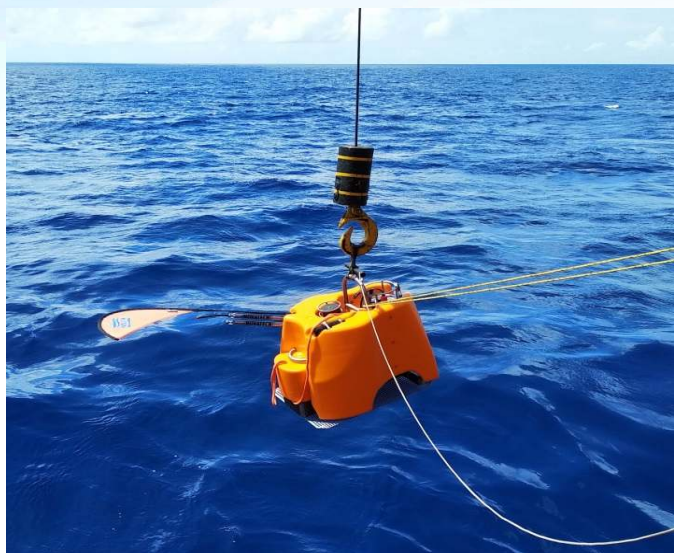


Figure -2: Cruise track superimposed on surface Chlorophyll-a.

## Long-term seismological observations to unravel mysteries behind Indian Ocean geoidal low

Geoid is the hypothetical equipotential surface of Earth's gravity which approximates the mean sea level. Due to the uneven mass distribution in the subsurface of Earth, geoid varies from place to place in terms of highs (positive) and lows (negative). Thus, this undulating surface provides a great understanding of the Earth's interior. Interestingly, Indian Ocean exhibits the world's largest geoidal low with a deficiency of over 100m, which is generally known as the Indian Ocean Geoid Low (IOGL). Even though various hypotheses have been proposed to explain possible causes of IOGL, a conclusive explanation remains unreached.



Deployment of a passive ocean bottom seismometer in the IOGL region onboard ORV Sagar Kanya.

With a great hope to unveil the mysteries behind the IOGL, the Geosciences Group at National Centre for Antarctic and Ocean Research, Goa has initiated an ambitious deep ocean mission involving passive ocean bottom seismometer (OBS) deployments in the IOGL region. In a recently concluded ocean expedition onboard ORV Sagar Kanya, 17 OBS instruments have been deployed in Indian Ocean to make an array of ocean observations. The broadband passive OBS instruments deployed in the region will be recording most of teleseismic events/distant earthquakes for period of one year or more. The new marine seismological observations will provide high resolution images of the Earth's interior which could unfold the enigmas of the largest geoidal low, the Indian Ocean Geoid Low.

[Report Courtesy : Ningthoujam Lachit Singh & Dhananjai K Pandey, NCAOR, Goa, India]

## India-USA Colloquium: Earth Observations and Sciences for Society and Economy

The three-day India-USA Colloquium: Earth Observations and Sciences for Society and Economy was held at National Institute of Oceanography (CSIR-NIO) at Dona Paula during 11-13 June, 2018. It was attended by about 100 delegates from India and United States.



Delegates of India-USA Colloquium



Dr. M. Rajeevan, Secretary, MoES and Dr. Craig McClean, Chief Scientist, NOAA visited R. V. Ronald H. Brown along with their colleagues on 11<sup>th</sup> June 2018.

This event marked ten years of MoES- NOAA Science collaboration and helped in setting the course of action for the next decade in the areas of weather, climate, ocean and fisheries. India and United States expressed to work in co-operation, exchanging valuable data and findings and help each other in research and development activities in ocean and earth sciences. As part of the event, NOAA Ship Ronald H. Brown, the organisation's largest research vessel, was docked in the Mormugao Port in Goa, India.

[Report Courtesy : Gopal Raman Iyengar, MoES, New Delhi, India]

Photo Courtesy : Arvind Kumar Saran, CSIR-NIO, Goa, India and Nick D'Adamo, IIOE-2 JPO, Australia]

## Endorse your projects in IIOE-2

Don't miss the opportunity to network, collaborate, flesh out your research project and participate in IIOE-2 cruises!!

Over 30 international, multi-disciplinary scientific projects have already been endorsed to date by the IIOE-2. Yours could be the next one!

Visit <http://www.iioe-2.incois.gov.in/IIOE-2/EndorsementForm.jsp> for further details and for projects already endorsed by IIOE-2.

## Some Upcoming Events

- ☞ 2018 Gordon Research Conference (GRC) in Marine Microbes 1-6 July, 2018  
<https://www.grc.org/marine-microbes-conference/2018/> and the affiliated and co-located 2018 Marine Microbes Gordon Research Seminar 30 June-1 July 2018, Lucca, Italy.  
<https://www.grc.org/marine-microbes-grs-conference/2018/>
- ☞ CLIVAR-FIO Joint Summer School on 'Past, Present and Future Sea Level Changes' and the UNESCO/IOC ODC Training Course on 'Ocean Forecast Systems', at Qingdao, China, from June 25 - 30, 2018 and July 2-7, 2018, respectively. <http://www.clivar.org> or [http://www.fio.org.cn/en/training\\_center/index.htm](http://www.fio.org.cn/en/training_center/index.htm)
- ☞ OTGA-INCOIS Training Course on "Data Visualization of Marine Met data (using FERRET)" during 27 - 31 August, 2018, International Training Centre for Operational Oceanography (ITCOcean), ESSO-INCOIS, Hyderabad, India. <http://www.incois.gov.in/ITCOcean/otga0818.jsp>
- ☞ IV International Conference on El Niño Southern Oscillation: ENSO in a warmer Climate, 16-18 October 2018. Guayaquil – Ecuador. <http://www.ensconference2018.org/>
- ☞ "Ocean sustainability for the benefit of society: Understanding, challenges, and solutions", 17-21 June 2019, Brest, France. Call for Sessions and Workshops at the Second Open Science Conference of the Integrated Marine Biosphere Research (IMBeR) Project.  
<http://www.imber.info/en/events/osc--imber-open-science-conference/osc-2019/2019-imber-open-science-conference>

## Call for Contributions

Informal articles/short notes of general interest to the IIOE-2 community are invited for the next (July-end) issue of the IIOE-2 Newsletter. Contributions referring IIOE-2 endorsed projects, cruises, conferences, workshops, "plain language summary" of published papers focused on the Indian Ocean etc. are welcome. Articles may be up to 500 words in length (Word files) accompanied by suitable figures, photos. (separate.jpg files).

Deadline: **25 July, 2018**

Send your contributions to [iioe-2@incois.gov.in](mailto:iioe-2@incois.gov.in)

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