2nd International Indian Ocean Expedition 2015-2020

IIOE-2

Newsletter

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

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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.

First IIOE-2 WIOURI Cruise on the Madagascar Ridge

The Western Indian Ocean Upwelling Research Initiative (WIOURI) is the counterpart to the Eastern Indian Ocean Upwelling Research Initiative (EIOURI) and has nine proposed Regional Upwelling Regions (referred to as Projects RUPs). Both WIOURI and EIOURI are flagship initiatives of the IIOE-2. The overarching theme of WIOURI is ecosystem functioning, food security and the impact of Climate Change and a changing Indian Ocean.

The first WIOURI cruise endorsed by IIOE-2 (http://www.iioe-2.incois.gov.in/IIOE-2/EP04.jsp) was successfully undertaken on the Madagascar Ridge (RUP3, commonly referred to as MAD-Ridge) on board RV Antea, between 9 November and 15 December 2016. The cruise focused on two seamounts on the Ridge - the Walter Shoal at 33°S with a shallow summit depth of 18 m and an unnamed seamount just south of Madagascar at 27.5°S that has a deeper summit depth of 264 m (Figure-1). The first leg of the cruise along perpendicular transects crossing over the summit of the unnamed seamount measured the hydrodynamics, hydrology and the lower trophic levels (phyto and zooplankton) around the seamount - including S-ADCP, L-ADCP, CTD profiles, seawater sampling for biogeochemistry, and plankton net hauls - all at regularly spaced stations. The latter comprised bongo 300 and 500 µm nets and a multi-net with 5x200 µm nets. Other size classes of plankton were collected using a driftnet (63 µm) and a surface Manta net (330 µm). Two bottom mounted ADCP moorings each with 400 m thermistor arrays were deployed on the upper slopes (600 m) of the seamount. These will be recovered in May 2017 by the second cruise using the RV Marion Dufresne.

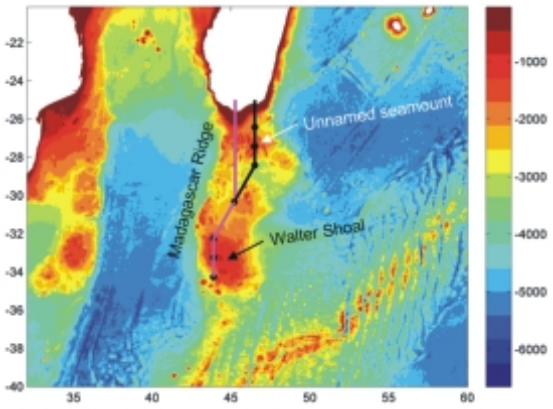

Figure-1. MAD-Ridge focuses on two seamounts on the Madagascar Ridge - Walter Shoal and an unnamed pinnacle just south of the Madagascar shelf.

Leg 2 focused on a reduced area around the seamount and had two main objectives: (1) improving the spatial resolution of physics observations around the seamount (from 30M away to the summit) and (2) investigate the spatio-temporal distribution of biological organisms using multi-frequency acoustics and mesopelagic trawls. Current- topographic interactions were investigated using high resolution transects comprising discrete surface to bottom CTD casts complemented with a high resolution CTD and fluorescence survey using a towed undulating Scanfish (0-120m). Trials to measure small-scale turbulence were performed with a Vertical Microstructure Profiler (VMP, Rockand, Canada) deployed close to the moorings as references to assess energy transfer between different scale processes.

[Report by Jean-François Ternon[1] and Mike Roberts[2]. 1. Institut de Recherche pour le Développement (IRD), France; 2. National Oceanography Centre (NOC), Southampton, UK and Nelson Mandela University (NMU), Port Elizabeth, South Africa; also co-chair of SIBER]

A detailed report of the cruise would be published in the July 2017 issue of the IO Bubble.

Dust induced primary productivity and N_2 fixation experiments in the Arabian Sea

The first phase of studies of the IIOE-2 endorsed cruise "Dust-stimulated nitrogen fixation in the Arabian Sea: An assessment of the HNLC region hypothesis" (http://www.iioe-2.incois.gov.in/IIOE-2/EP12.jsp) was undertaken during 15 April- 03 May 2017 onboard India's FORV Sagar Sampada by scientists from four Indian institutions. The onboard investigations comprised water sampling at 13 stations along three transects in the Arabian Sea (Figure-2) to estimate N_2 fixation rates, chemical characterization of the sea water, primary production and for community structure analysis. In addition, nutrient concentration measurements and biogeochemical experiments (such as nitrate uptake rates), as well as determination of optical parameters of the seawater (radiance and irradiance profiles up to the depth of 5% of surface light) were carried out to analyse the response of bloom in the visible and near infrared region. Samples for incubation and nutrients were collected mostly from seven different depths within 1000 m.

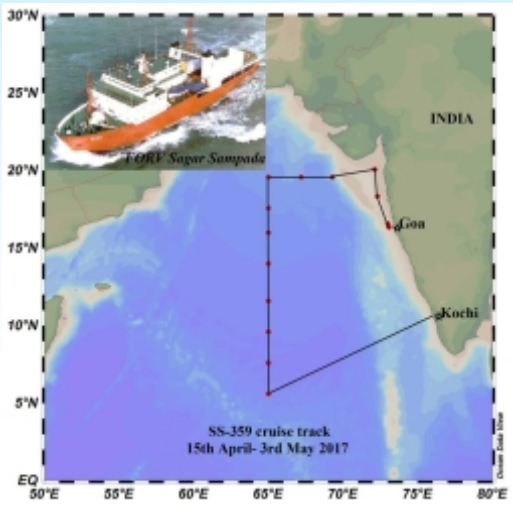

Figure-2. Sampling Locations

The depths were decided based on the variation in light penetration, oxycline and chlorophyll a: four depths were within the euphotic zone including the depth of chlorophyll maximum, whereas the other three depths included the oxycline, mid-oxygen minimum zone and 1000 m. Phytoplankton was collected from five depths in the upper 200 m based on the light penetration and oxycline depth and zooplankton was collected by vertical hauling from various depth layers down to 1000 m. To understand the atmospheric deposition of dust over the Arabian Sea, atmospheric PM_{10} samples (particulate matter with aerodynamic diameter less than or equal to 10 μm) were collected along the cruise track. A total of 22 PM_{10} samples was collected on tissue quartz filters. Macro and micro nutrients in the PM_{10} samples will be analysed to understand the relation between atmospheric deposition and ocean primary productivity.

[Report by P. Kiran Kumar[1], Rupa Mukherjee[1], Anil Patel[1], Anima Tirkey[2], Hiren Bhatti[2], Jabir Thajudeen[3], Kusum Komal Karati[4], Arvind Sahay[2], Mini Raman[2], Neeraj Rastogi[1], Sanjeev Kumar[1], Arvind Singh[1]. 1. Physical Research Laboratory (PRL), India; 2. Space Application Centre (SAC), India; 3. Cochin University of Science and Technology (CUSAT), India; 4. CSIR-National Institute of Oceanography (NIO), India. This is an IIOE-2 endorsed ECSN Project; PI: Arvind Singh (arvinds@prl.res.in)]

A detailed report of the cruise would be published in the July 2017 issue of the IO Bubble.

Indian Ocean Community Workshop

Being organised by the US IIOE-2 Steering Committee during 11- 13 September, 2017 in La Jolla, CA
Registration is now open and the poster abstract submission deadline is July 14, 2017.

Please visit http://web.whoi.edu/ioworkshop2017/agenda/ for further details.

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