

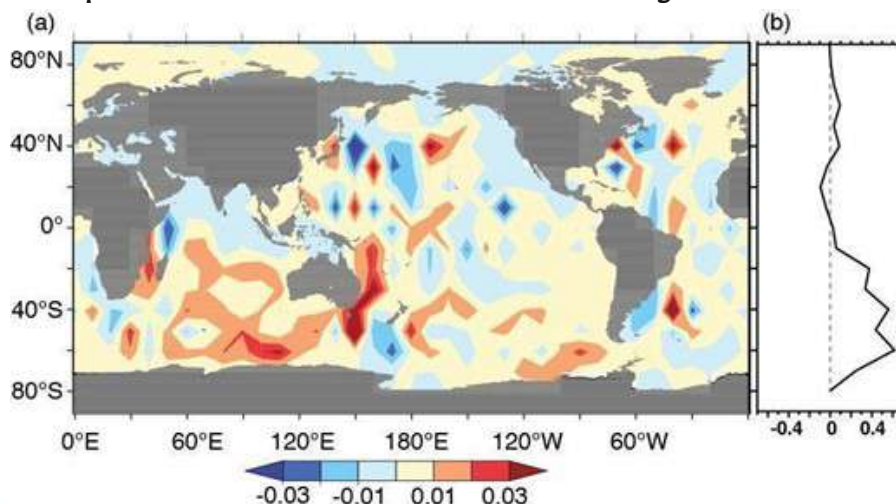


(A basin-wide research program co-sponsored by IOC-UNESCO, SCOR and IOGOOS)

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.

The anomalous 2012-13 boreal winter oceanic excitation of Earth's polar motion

Identifying the effect of distinct modes in the atmosphere and ocean on the wobbles (equivalently polar motion) of the Earth has been the subject of much activity over the past 25 years. The more is known about how such modes affect polar motion, the brighter the prospect that rotation observations might, at some point, be used to constrain the variability of the climate system itself. Recent work has shown that the Madden-Julian Oscillation (MJO) winds around the Maritime Continent can drive a see-saw in oceanic mass between the Indian and Pacific oceans on intraseasonal time scales. During the boreal winter of 2012–13, this see-saw accounted for about two thirds of an unusually large (~ 30 mas, milliarcseconds) fluctuation in the oceanic excitation of Earth's polar motion about the 90°E meridian. Contrary to expectations, the magnitude of the oceanic influence was nearly at par with that of the atmosphere but out-of-phase. In this study we show that the oceanic mass changes and transport anomalies associated with see-saw during the 2012–13 boreal winter were indeed most pronounced in the Indo-Pacific basin, and that they possessed a favorable geometry to excite polar motion variations about the 90°E meridian. Phase alignment of the excitation signals from different regions, as well as between mass and motion terms, amplifies the signal and is a key characteristic of the 2012–13 event, but is far less distinct in other strong see-saw years. Basin-wise, the Indian Ocean acted as a dominant contributor to the 2012–13 polar motion excitation at MJO periods, followed by the Pacific basin. Overall, ocean dynamics in the 10°S – 65°S latitudinal belt over the Indo-Pacific basin accounted for $\sim 93\%$ of the global oceanic excitation function during the 2012–13 winter. The processes figuring most prominently in modulating intraseasonal polar motion were mass rearrangements in the southern Indian Ocean and the south-east Pacific Ocean, the east Australian current, and the Antarctic circumpolar current around the Antarctic landmass. Wind-driven dynamics in the Southern Ocean thus appear to be the only candidate responsible for the 2012–13 oceanic excitation signal not attributable to the see-saw.



(a) Spatial map of fractional covariance (γ) during the most prominent positive cycle of the 2012–13 see-saw. γ denotes the relative contribution of $10^\circ \times 10^\circ$ cells to the polar motion. (b) The corresponding zonal sum of γ at each latitude in 10° steps.

Citation: Paul, A., Afroosa, M., Rohith, B., Schindelegger, M., Durand, F., Bourdallé-Badie, R., & Shenoj, S. S. C. (2024). The Anomalous 2012–13 Boreal Winter Oceanic Excitation of Earth's Polar Motion. *Pure and Applied Geophysics*, 1-17. 10.1007/s00024-024-03429-9.

[Report Courtesy: Arya Paul, INCOIS, India; E-mail: aryapaul@incois.gov.in]

A rare meteotsunami event in the Indian Ocean basin

Meteotsunamis are water-level oscillations occurring at frequencies akin to those of tsunamis, generated by meteorological phenomena such as atmospheric pressure disturbances, gravity waves, and hurricanes. These events have been documented worldwide and possess significant potential for disaster under certain circumstances. However, there has been no reported study of such events in the Indian Ocean basin to date. This study marks the first observation and evaluation of a meteotsunami in the Indian Ocean, triggered by a massive eruption of the Hunga Tonga-Hunga volcano on January 15, 2022, at 04:00 UTC, in the southwest Pacific Ocean, resulting in a tsunami in the Pacific Ocean. This eruption induced atmospheric pressure variations and initiated acoustic gravity waves, which propagated across the ocean's surface at speeds approaching that of sound. Near-field tsunamis were caused by the initial shock wave and underwater earthquake associated with the volcanic eruption, while a global tsunami, termed a meteotsunami, was observed due to the propagation of an atmospheric pressure wave. Across the Indian Ocean, Lamb waves were detected both over the ocean via bottom pressure recorders and over land through automatic weather stations. Meteotsunamis with amplitudes of 10-15 centimeters were observed along the Indian Ocean using tide gauges, with the variability persisting for several days. A numerical model (ADCIRC) was employed to comprehend the ocean's response to meteotsunamis and to assess the underlying dynamics. Model results corroborate the occurrence of the meteotsunami in the Indian Ocean. Furthermore, they elucidate the observed intensification of sea levels along the Indian subcontinent, resulting from a combination of factors including wave-bathymetric interaction, wave refraction, and reflection. The spectral and spatial characteristics of the meteotsunami bear similarities to seismic tsunamis. This research on the rare event addresses unresolved questions and lays the groundwork for future observation and modeling of meteotsunamis and seismic tsunamis. The research team comprised scientists from Cochin University of Science and Technology (CUSAT), alongside various Indian institutions such as the Indian National Centre for Ocean Information Services (INCOIS), the India Meteorological Department (IMD), the Indian Institute of Tropical Meteorology (IITM), and international institutions including LEGOS (France), the University of Hawaii, and the Helmholtz-Zentrum Hereon (Germany).

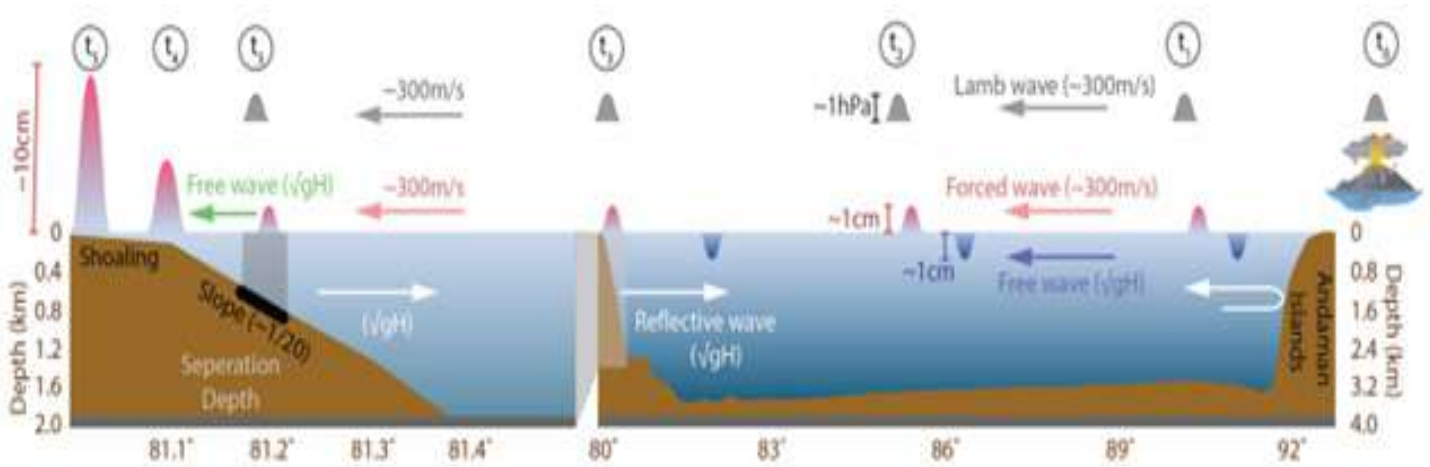


Figure: Conceptual view of the dynamics of meteotsunami due to Hunga Tonga eruption (t_0) in the Bay of Bengal at five instances in time (t_1 - t_5).

Citation: Anup, N., Rohith, B., Vijith, V., Rose, L., Sreeraj, P., Sabu, A., et al. (2024). Volcanic eruption triggers a rare meteotsunami in the Indian Ocean. *Geophysical Research Letters*, 51, e2023GL108036.

<https://doi.org/10.1029/2023GL108036>

[Report Courtesy: Rohith B, INCOIS, India; E-mail: rohith.b@incois.gov.in]

DEEP-SEA RESEARCH PART II



Special
Issue

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The 2nd International Indian Ocean Expedition (IIOE-2): Motivating New Exploration in a Poorly Understood Basin (Volume 7)

Deep Sea Research Part II: Topical Studies in Oceanography

Edited by

Raleigh Hood, Birgit Gaye, Lynnath Beckley, VVSS Sarma, Laure Resplandy, P.N. Vinayachandran

THE SUBMISSION PORTAL FOR VOL. 7 OF THE DEEP-SEA RESEARCH II SPECIAL ISSUE SERIES ON THE IIOE-2 IS NOW OPEN

Submission of manuscripts that describe the results of studies related to the physical, chemical, biological, and/or ecological variability and dynamics of the Indian Ocean (including higher trophic levels) is encouraged.

Submission of manuscripts from students and early career scientists is also encouraged.

If you are interested in submitting a manuscript, please contact Raleigh Hood (rhood@umces.edu).

Important Dates:

Manuscript Submission Deadline: August 15, 2024

Editorial Acceptance Deadline: February 15, 2025

For more details please visit

<https://www.sciencedirect.com/journal/deep-sea-research-part-ii-topical-studies-in-oceanography/about/call-for-papers#the-2nd-international-indian-ocean-expedition-iioe-2-motivating-new-exploration-in-a-poorly-understood-basin-volume-7>

Join us for the Ocean Insights – Indian Ocean Seminar Series feat. ECRs. !

The IIOE-2 Early Career Scientist Network is thrilled to present yet another exciting talk of "Ocean Insights – Indian Ocean Seminar Series feat. ECRs", designed especially for early career scientists focusing on the Indian Ocean to share about their research. This captivating seminar series offers a unique opportunity for the Early Career Researchers to showcase their work, build connections, and explore collaborations within the marine sciences community.

Whether you are an early career researcher, an experienced scientist, or simply an enthusiast seeking to broaden your knowledge of marine science in the Indian Ocean, **ALL ARE INVITED!**

Why Should You Join?

- Engaging presentations from early career marine scientists.
- Interactive Q&A sessions to delve deeper into research topics and foster innovative ideas.
- A platform to connect with like-minded researchers and experienced scientists.

Don't miss out on the opportunity to enhance your understanding of marine science in the Indian Ocean and connect with fellow researchers. [Register now](#) and mark your calendars!

Details on the upcoming talk are given below. We look forward to your enthusiastic participation!

Key Details:

Title: Ocean Insights – Indian Ocean Seminar Series feat. ECRs ; Region: Indian Ocean; Format: Online

Link: https://zoom.us/meeting/register/tJ0kcOGgqjgsGtFVzWF5AWcoqVH_bEgrXzkT

Date: Every first Friday of the month, starting on **01st March 2024**

Time: 10:30-11:30 SAST; 14:00-15:00 IST; 16:30-17:30 AWST

If you are enthusiastic about sharing your contributions, please reach out to us at the e-mail address: ecsn.iioe@gmail.com

Ocean Insights
Indian Ocean Seminar Series feat. ECRs
Overview of Marine heatwaves in the South West Indian Ocean
by
Daneeja Marwen
Clea Welch

1 March 2024
10:30-11:30 CEST | 14:00-15:00 IST

ECSN IIOE-2 2nd International Indian Ocean Expedition

ICES - PICES 7th International Zooplankton Production Symposium during Autumn 17-22 March 2024, Hobart, Australia

SCOPE

We are living in the Anthropocene. Our oceans are warmer, more acidic, have widespread plastic and other pollution, and are subjected to increasing exploitation including overfishing. Zooplankton play a pivotal role in our oceans, as grazers of primary production, as drivers of carbon and nutrient cycles, and as prey for higher trophic level consumers including both harvested fish species and iconic marine mammals and seabirds. How zooplankton will respond to the dramatic changes in our marine ecosystems will impact the health and productivity of our oceans and our planet.



To better understand zooplankton in a changing world, ICES and PICES are holding the 7th International Zooplankton Production Symposium as a forum to discuss the latest zooplankton research. The ICES/PICES Zooplankton Production Symposium will bring together the top zooplankton researchers globally, showcasing recent advances. Understanding the current and evolving role of zooplankton will require new insights provided by:

- Assessing the impact on zooplankton of climate change, fishing, and pollution such as microplastics
- State-of-the-art sampling techniques such as DNA, imaging, and bioacoustics
- Biochemical methods applied to unravelling complex trophic ecology
- The application of cutting-edge approaches in zooplankton modelling, including size and trait-based biogeochemical and ecosystem models
- Revealing the role of microzooplankton in biogeochemical cycling and food webs
- Exploring the structure and functioning of macrozooplankton communities and their impact on carbon sequestration and trophic ecology
- Examining zooplankton in fisheries science, including dynamics of fish larvae, the impact of zooplankton on fish larval mortality and growth, and the commercial harvest of zooplankton
- Elucidating the vital role of zooplankton in polar environments
- Understanding the role of gelatinous filter feeders and jellyfish in carbon sequestration and trophic ecology
- The use of zooplankton as ecosystem indicators in a changing ocean

Our Symposium will be held over five days in the historic waterfront district of Hobart, Australia, during Autumn, from 17-22 March 2024. This event will be held in-person and provide the first opportunity since 2016 for zooplankton researchers to meet, build networks, and hear the latest science. We are monitoring the COVID-19 situation closely and will adapt our plans as needed.

The Organizing Committee invites proposals for sessions to be held during the Symposium. Proposals are welcome for sessions incorporating talks and posters, panel discussions and/or workshops. Sessions could cover, but are not limited to, the key areas listed above.

The symposium website may be accessed here: <https://meetings.pices.int/meetings/international/2024/zps7/scope>

Proposals may be submitted here: <https://meetings.pices.int/meetings/international/2024/zps7/proposals>

Asia Oceania Geosciences Society (AOGS) - 21st Annual Meeting
 Pyeongchang, Gangwon-do, Home to Winter Olympics during 23 - 28 June 2024

AOGS2024
21ST ANNUAL MEETING
 Pyeongchang, Gangwon-do
 Home to Winter Olympics
 23 to 28 Jun 2024



Asia Oceania Geosciences Society (AOGS) was established in 2003 to promote geosciences and its application for the benefit of humanity, specifically in Asia and Oceania and with an overarching approach to global issues. Asia Oceania region is particularly vulnerable to natural hazards, accounting for almost 80% human lives lost globally. AOGS is deeply involved in addressing hazard related issues through improving our understanding of the genesis of hazards through scientific, social and technical approaches. AOGS holds annual conventions providing a unique opportunity of exchanging scientific knowledge and discussion to address important geo-scientific issues among academia, research institution and public. Recognizing the need of global collaboration, AOGS has developed good co-operation with other international geo-science societies and unions such as the European Geosciences Union (EGU), American Geophysical Union (AGU), International Union of Geodesy and Geophysics (IUGG), Japan Geo-science Union (JpGU), and Science Council of Asia (SCA).

The website may be accessed here: <https://www.asiaoceania.org/aogs2024/public.asp?page=home.asp>

Session-OS06: Physics, Biogeochemistry, and Climate Dynamics of the Indian Ocean

Session Details

Section(s):
 OS - Ocean Sciences (Primary)
 AS - Atmospheric Sciences



Announcements

SUBMIT ABSTRACTS	APPLY FUNDING SUPPORT	2024 AWARD NOMINATIONS
17 Oct 2023 – 02 Jan 2024	17 Oct 2023 – 02 Jan 2024	17 Oct 2023 – 02 Jan 2024
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Conveners

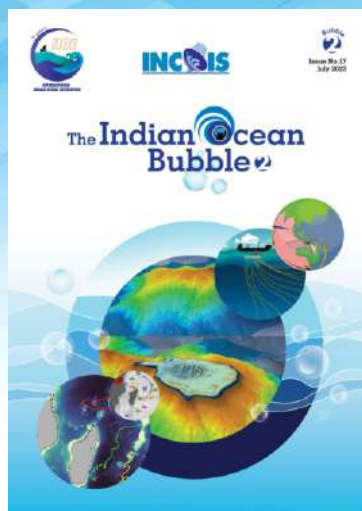
* Prof SungHyun Nam (Seoul National University)
 Dr Nicolino (Nick) D'Adamo (Adjunct Research Fellow, Oceans Institute of the University of Western Australia)
 Dr Dong-Jin Kang (Korea Institute Of Ocean Science And Technology)
 Dr Yukio Masumoto (The University of Tokyo)

Session-OS06: Description

Recent increases in extreme events such as flooding, droughts, heatwaves, and tropical cyclones have a large impact on the population living in the Asia and Oceania countries. Increasing evidence on the roles of Indian Ocean in impacting climate extremes, climate variability, and climate change via changes in energy, hydrological and biogeochemical cycles has been reported. The Indian Ocean is of particular interest, for example, as influenced by the seasonally reversing monsoon forcing and upwelling centers in the Indian Ocean are found in the off-equatorial regions unlike in the easterly wind-forced Pacific and Atlantic Oceans. The northern region is dominated by the monsoons whereas the seasonal reversal is less pronounced in the southern region. This session invites contribution of physics, biogeochemistry, and climate dynamics of Indian Ocean based on in-situ and remotely-sensed observations, models, theories, and paleo proxies that reveal processes, variability, and projected changes within the Indian Ocean. This includes, but not limited to 1) Indian Ocean variability such as Indian Ocean Basin Mode, Indian Ocean Dipole Mode, Madden-Julian Oscillations, 2) Upwelling in the Indian Ocean such as open-ocean upwellings or thermocline ridge/dome (e.g., Seychelles-Chagos Thermocline Ridge) and coastal upwellings at both western and eastern sides, 3) Processes underlying basin-scale or regional circulation, 4) Ocean-atmosphere interaction processes (heat, freshwater, momentum, carbon, etc.), 5) Biogeochemistry of the Indian Ocean water masses, 6) Links between ocean sciences and socio-economic requirements in the Indian Ocean, and 7) Interactions and exchanges between the Indian Ocean and other basins. Abstracts on related activities, such as capacity building, education, outreach, project development in the Indian Ocean, contributing to the UN Decade of Ocean Science for Sustainable Development and to the Second International Indian Ocean Expedition are also welcome.

Keyword(s): Indian Ocean; Physics; Biogeochemistry

The Indian Ocean Bubble, Issue No.17 is now available online



Web Link: https://iioe-2.incois.gov.in/IIOE-2/pdfviewer_pub.jsp?docname=IIOE-2-DOC_OM_260.pdf

Informal articles are invited for the next issue. Contributions referring Indian Ocean studies, cruises, conferences, workshops, tributes to other oceanographers etc. are welcome.

Articles may be up to 1500 words in length (Word files) accompanied by suitable figures, photos (separate .jpg files)

Send your contributions as usual to iioe-2@incois.gov.in

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!!

The endorsement of your scientific proposal or a scientific activity focusing on the Indian Ocean region is a recognition of the proposal's or activity's alignment with the mission and objectives of IIOE-2, of its potential for contributing to an increased multi-disciplinary understanding of the dynamics of the Indian Ocean, and of its contribution to the achievement of societal objectives within the Indian Ocean region. Over 52 international, multi-disciplinary scientific projects have already been endorsed to date by the IIOE-2. Yours could be the next one!

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

Call for Contributions

Informal articles/short notes of general interest to the IIOE-2 community are invited for the next (March-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 March, 2024**



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