2nd International Indian Ocean Expedition 2015-2025

Newsletter

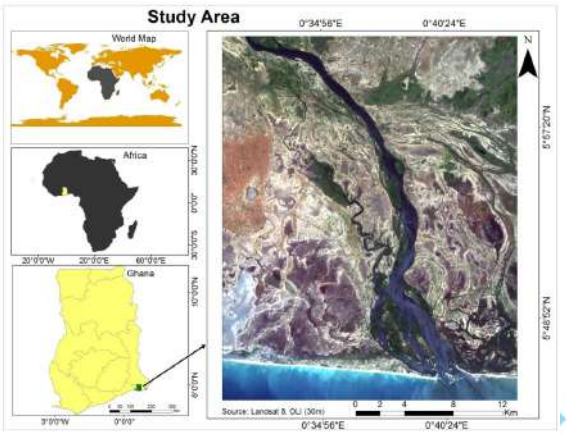
(A basin-wide research program co-sponsored by IOC-UNESCO, SCOR and IOGOOS)

Volume-4, Issue-12
December, 2020

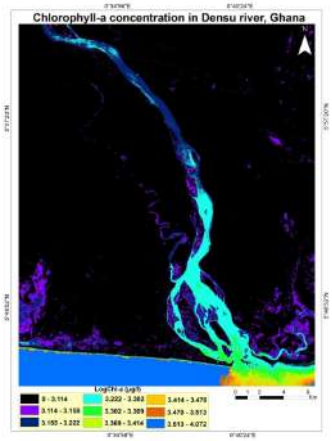
To advance our understanding of interactions between geologic, oceanic and atmospheric processes that give rise to the complex physical dynamics of the Indian Ocean region, and to determine how those dynamics affect climate, extreme events, marine biogeochemical cycles, ecosystems and human populations.

Estimating and Mapping of Chlorophyll-a Concentration using NIR-Red Algorithms based Model

Chlorophyll- a concentration is a critical parameter in the study of river water quality variation. Chlorophyll -a concentrations are an indicator for phytoplankton abundance and biomass in inland as well as coastal waters. Chlorophyll-a strongly absorbs light in the red (680 nm) and blue (400-500 nm) wavelength ranges of the visible spectrum and maximum reflection occurs in the green (550 nm wavelength) and near infra-red (700 nm wavelength) spectrum. Traditional methods of measuring chlorophyll-a concentration included water sampling and lab measurements, which are often expensive, labor intensive, time consuming and weather sensitive. In contrast, high-resolution, multi-spectral Earth observational technology with large spatial coverage and long-time series data provides synoptic and instantaneous field of view of Suspended Sediment Concentration (SSC) and is an effective tool for analyzing chlorophyll-a concentration.



Location map of the study area



Spatial distribution of chlorophyll-a concentration in Densu river, Ghana

Our study described here highlights an approach using publicly accessible satellite data (LANDSAT 8 Optical land imager sensor data) together with in-situ measurements to quantify the chlorophyll-a concentrations in the Densu River in the south eastern part of Ghana, between 5°30' and 6°20' north latitudes and 0°10' and 0°35' west longitudes. In order to get the water reflectance from target, Rayleigh reflectance of atmosphere was calculated to remove the influence by transmission media. Regression models were used with logarithmically transformed chlorophyll -a as dependent variable and logarithmically transformed band ratios as independent variable. This forms a foundation for further processing of LANDSAT image and estimation of chlorophyll- a concentration.

Chlorophyll-a concentration map was prepared using NIR-red algorithm-based model and constant values derived from regression between laboratory-measured and modelled values. Spatial distribution of chlorophyll-a concentration in the Densu River reveal that most of the river has chlorophyll-a concentrations ranging between 3.22 and 3.41 µg/l. The findings of the study indicate that NIR-red algorithm is an effective tool in measuring and mapping moderate to high chlorophyll-a concentrations especially in shallow waters. It may however, be noted that alkalinity, shallowness of the river system and number of samples could affect the model performance.

Citation: Rani, M., Rehman, S., Sajjad, H., Alare, R.S., Chaudhary, B.S., Patairiya, S., Rawat, J.S., Chetri, T., Patel, S. and Kumar, P., 2019. NIR-red algorithms-based model for chlorophyll-a retrieval in highly turbid Inland Densu River Basin in South-East Ghana, West Africa. IET Image Processing, 13(8), pp.1328-1332.

[Report Courtesy: Pavan Kumar, College of Horticulture and Forestry, Rani Lakshmi Bai Central Agricultural University, Jhansi, India E-Mail : pawan2607@gmail.com]

Potential mechanisms responsible for occurrence of core oxygen minimum zone in the north-eastern Arabian Sea

Deoxygenation is one of the most important changes occurring in the marine environment that impacts marine biodiversity, primary production, trace gases emissions, and carbon and nitrogen biogeochemical cycles. Open ocean oxygen minimum zone (OMZ) occurs in many regions of the world ocean such as the Eastern Tropical Pacific (ETP), northern Indian Ocean Arabian Sea (AS) and Bay of Bengal (BoB), Eastern Equatorial Pacific and Tropical Atlantic, but denitrification is noticed only in the former two basins. The denitrification in the Arabian Sea contributes 8-21% of global marine pelagic denitrification. The main denitrification in the upper one-third of the OMZ, where O_2 concentrations fall below 0.06 ml/l (~3µM). This zone is readily identifiable using secondary nitrite maximum due to reduction of NO_3.

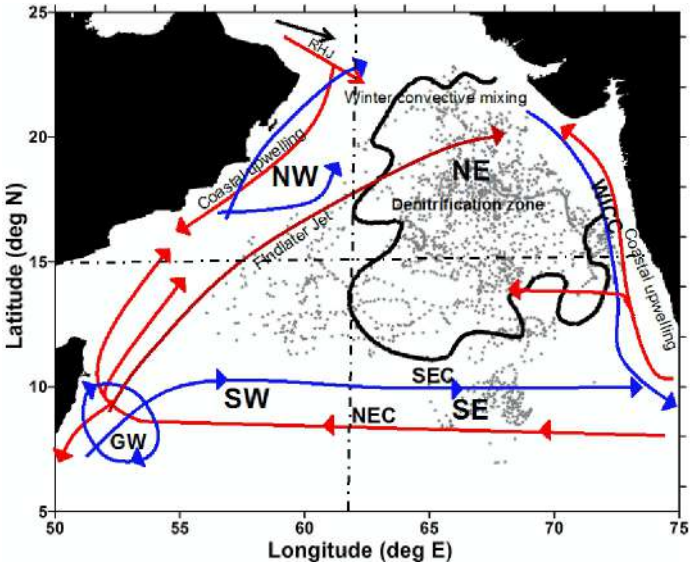


Figure 1. A schematic representation of identified surface current flow during southwest monsoon (blue) and northeast monsoon (red). Currents indicated are WICC-West India Coastal Currents, GW-Great Whirl, RHJ-Ras al Hadd Jet, NEC-North Equatorial Current, and SEC-South Equatorial Current after Schott and McCreary (2001). The region of denitrification is shown as black line after Naqvi (1991). The regions of coastal upwelling are shown and the brown line represents the Findlater Jet where open ocean upwelling associated with findlater Jet is also known to occur. The positions of the Bio-Argo DO profiles used in this study are given as black dots.

The thickness of oxygen minimum zone (OMZ) in the Arabian Sea has been estimated for the first time using dissolved oxygen (DO) profiles obtained from the Biogeochemical Argo floats collected between 2013 and 2019 in the Arabian Sea. The depth of upper boundary of the OMZ varied narrowly between 70 and 220 m in the entire Arabian Sea whereas the lower boundary of OMZ significantly deepened from southern (500 m) to northern Arabian Sea (1200 m). The thickness of OMZ decreased from north (> 1050 m) to south (400 m) with the thickest OMZ in the northeastern Arabian Sea (950- 1050 m). The thick OMZ in the northeastern Arabian Sea is associated with low concentration of depth integrated Chlorophyll-a, primary production in the upper 100 m and sinking carbon fluxes at 100 m depth than other regions. The particle back-scatter, proxy for particulate organic matter, is higher in the northeastern than other regions in the Arabian Sea. The high particle back-scatter data is found in the core of OMZ and it is increased from shelf to offshore indicating that cross shelf transport of organic matter may be supporting bacterial carbon demand in the OMZ in the northeastern Arabian Sea. The eastward shift in the OMZ is attributed to weak mixing, high penetration time of intermediate water masses, and organic matter transport from the shelf region. Numerical models estimated negligible changes in DO in the OMZ since past several decades, whereas long-term observational data indicates decline in DO levels in the OMZ. Such contrasting results may be caused by lack of cross-shelf transport of organic matter in the models. Though this study identifies the occurrence of cross-shelf transport, the nature, quality and composition of organic matter transported from shelf is unknown. Nevertheless, inclusion of such processes in the models may improve predictability of possible changes in OMZ in future in the Arabian Sea.

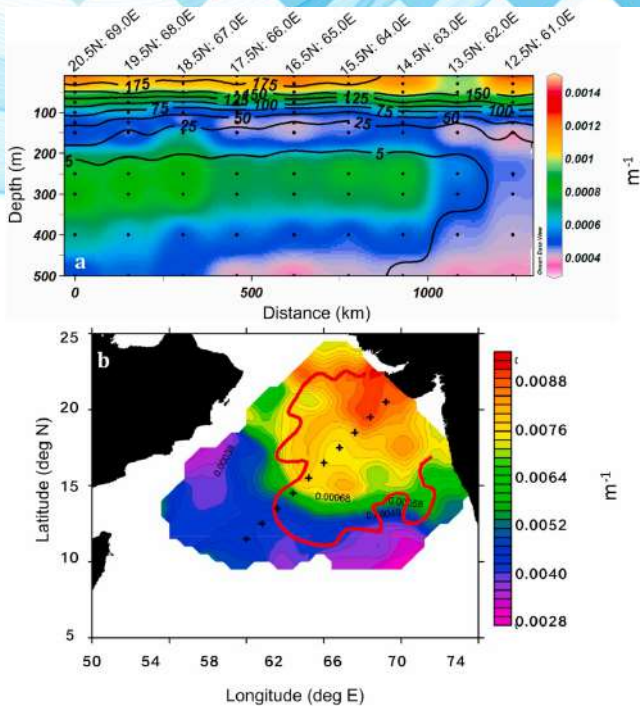


Figure-2: Spatial variations in back-scatter (m^{-1}) (a) along northeast-southwest transect (color shade) shown in (b). The dissolved oxygen concentrations are shown as contours. The position of the profiles are shown in the upper x-axis. (b) distribution of back-scatter at the core of OMZ (300 m depth) in the Arabian Sea. Red line shows the denitrification area.

Citation: V.V.S.S. Sarma, T.V.S. Udaya Bhaskar, J. Pavan Kumar, Kunal Chakraborty, Potential mechanisms responsible for occurrence of core oxygen minimum zone in the north-eastern Arabian Sea, Deep Sea Research Part I: Oceanographic Research Papers, Volume 165, 2020, 103393, ISSN 0967-0637, https://doi.org/10.1016/j.dsr.2020.103393

[Report Courtesy: T.V.S. Udaya Bhaskar, INCOIS, Hyderabad, *India E-Mail : uday@incois.gov.in]*

POSTPONEMENT of International Indian Ocean Science Conference (IIOSC)-2020

In view of the recent outbreak of COVID-19, the safety of delegates is of paramount importance for the conference organisers. Therefore, upon recommendation of UNESCO-IOC amid concerns raised by many delegates spread across the world, the International Indian Ocean Science Conference (IIOSC)-2020 has been postponed till further notice.

More details on the Conference are available at the website https://

MESSAGE BOARD

- IIOSC-2020 Letter to Airlines
- Instructions for Presenters
- Allowed Poster size A0 (118 cm height x 84 cm width)

IIOE-2 2nd International Indian Ocean Expedition 2015-2025

IOGOOS GLOBAL OCEAN OBSERVING SYSTEM FOR INDIAN OCEAN

United Nations Educational, Scientific and Cultural Organization | Intergovernmental Oceanographic Commission

International Council for Science SCOR Scientific Committee on Oceanic Research

POSTPONEMENT of 14th International Conference on Copepoda (ICOC 2020) to 2021

Due to the COVID-19 virus, the ICOC 2020 and pre-conference workshop scheduled to take place in June 2020, have been postponed by one year. The new dates will be 31 May – 4 June 2021 for the preconference workshop at the University of Limpopo in Polokwane, and 6 – 12 June for the conference in Skukuza, Kruger Park, South Africa. The conference will still be referred to as the ICOC2020 and not the ICOC2021.

Unfortunately, increase in prices and costs can be expected, with an increase in the accommodation costs and probably also in the registration fees. These can only be calculated at a later date. The registration website will stay open for new participants to register and book, while the list of people who already registered will be saved, together with all the payments already received, and transferred to the bookings for June 2021.

Abstract submissions for the ICOC 2020 in June 2021 have re-opened. Please go to https://app.oxfordabstracts.com/dashboard/events/1160 where you can decide whether you want to keep your abstract as submitted for June 2020 or whether you want to change it for June 2021. Note that there is no deadline yet, and this will be determined at a later stage, probably 30 December, 2020.

Visit https://www.abevents.co.za/web_icoc2020/ for further details.

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 42 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.

CLIVAR December 2020 Bulletin is available online

The International CLIVAR Project Office distributes a monthly bulletin with announcements, funding opportunities, meeting notifications relevant to the ocean/climate science community.

The latest CLIVAR Bulletin December, 2020 is available at:

https://mailchi.mp/clivar.org/clivar-december-2020-bulletin

Call for Contributions

Informal articles/short notes of general interest to the IIOE-2 community are invited for the next (January-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 January, 2021**

The Indian Ocean Bubble-2

Access the latest issue of Indian Ocean Bubble-2

https://iioe-2.incois.gov.in/IIOE-2/Bubble.jsp

Join IIOE-2 Community

Enroll yourself with IIOE-2 Community

https://iioe-2.incois.gov.in/IIOE-2/Signup.jsp

Follow us:

iioe-2.incois.gov.in

@IIOE2

@iioe_2

Feedback? iioe-2@incois.gov.in

The IIOE-2 Newsletter is published online by:

INCOIS

2nd International Indian Ocean Expedition 2015-2025

IOGOOS Global Ocean Observing System for Indian Ocean

UNESCO United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

SCOR Scientific Committee on Oceanic Research