

# Newsletter

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

Volume-2, Issue-4 April, 2018

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 MASMA "PEACC" Project: Unveiling the impact of climate change on small pelagic fisheries in coastal Kenya and Tanzania

The "Productivity in the East African Coastal Current under Climate Change" (PEACC) is a two-year multi-disciplinary project which was launched in July 2016. Funded by WIOMSA under the MASMA Competitive Grant Programme, with additional support from UNESCO/IOC and the Tanzanian Deep Sea Fishing Authority, the project is being implemented by ten institutions from within and outside the East African region, and is led by Tanzania Fisheries Research Institute (TAFIRI). PEACC has been endorsed by IIOE-2 (http://www.iioe-2.incois.gov.in/IIOE-2/EP29.jsp ) and its research objectives also align with the Western Indian Ocean Upwelling Research Initiative (WIOURI), one of the flagship initiatives under IIOE-2.

PEACC seeks to investigate the ecosystem and socio-economic impacts due to changes in meteorological and oceanographic conditions in the upwelling region associated with the East African Coastal Current system. Implementation of the project is guided through four work packages: Biophysical and Climate Modelling, Primary Productivity studies, Fisheries Ecology, and Socio-economics and Governance. The main intervention by this project is the provision of management action points to enhance coastal community resilience to vulnerabilities associated with climatic changes in upwelling and small pelagic fisheries.



The study sites (green symbols) in North Kenya Bank (Kenya) and Tanga (Tanzania)



Training of local beach recorders in Tanga, Tanzania, for recording of catch and effort. The recorders use smart phone technology with an application software developed by the PEACC project. The data is entered digitally into an online database and made accessible to the research team.

[Report and images courtesy inputs from Dr. Shigalla Mahongo, Tanzania Fisheries research Institute; <u>shigalla@tafiri.go.tz</u>] A comprehensive report of the PEACC project would be appearing in the July issue of the six-monthly IIOE-2 Bubble.







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# Next generation satellite-derived infrared sea surface temperatures for physical oceanographic applications using deterministic retrievals and novel cloud detection

The main focus of the IIOE-2 science plan is on the Indian Ocean, which is a dynamically complex and highly variable system under monsoonal influence with many boundary currents (e.g., Leeuwin, East Madagascar, Agulhas etc), upwellings, cold core rings, warm-core, mesoscale and downwelling eddies etc. Primarily, IIOE-2 intends to make many cruise-measurements over the dynamic areas. Undoubtedly, it will enrich our knowledge by different types of measurements on ocean surfaces (OS) and profiles, but alone will not suffice to understand the many dynamic features of the Indian Ocean. To achieve a better understanding, vast quantities of available high resolutions satellite data may be used, but there remains the major challenge of converting from top of the atmosphere measurements to OS. Sea surface temperature (SST) among them is an Essential Climate Variable that defines the physical environment and impacts the marine ecosystems. For instance, water masses defined by marine thermal fronts are often denoted by using SST gradient fields as a proxy for identifying regions of optimal growth-conditions of marine phytoplankton (nutrients, light, mixing, and upwelling) as well as tuna tracking.



Multiband instruments with high S/N ratios, such as MODIS and VIIRS provide information-rich measurements suitable for improving both the quality and the coverage of SST retrievals. However, operationally this potential remains underused due to the choice of inverse methods that still employ classical regression. It is evidently inadequate to characterize global geophysical variations with a few coefficients. Our next generation satellite-derived infrared sea surface temperatures retrievals using deterministic method and novel cloud detection combination offers these desired improvements: a) Truncated Total Least Squares (TTLS)/Modified Total Least Squares (MTLS) is superior to other stochastic or deterministic methods because it automatically adjusts sensitivity to enable accurate retrievals when the truth is far from the initial guess, while preventing a degraded (noisy) result when the initial guess is close to truth; b) Our cloud and error mask (CEM) algorithm employs functional spectral differences in conjunction with radiative transfer based tests and offers a dual benefit of increased coverage of areas (reduced false alarms) and detection of actual cloud contamination (improved detection rate). We have recently published using our suite on GOES Imagers and MODIS data that demonstrates the superiority of our approach with 3-4 times information gain compared to current practices. One of the unprecedented capabilities of our algorithm is that it can use aerosol profiles in addition to atmospheric profile information in the forward modeling, and further allows for adjustment of the aerosol burden by including it as a retrieved element.

The project seeks to develop international collaboration to exploit a substantially increased volume of unambiguous SST data for various regions of the Indian Ocean, aptly validated against IIOE-2 cruise measurements to gain a high confidence, for using in dynamic oceanographic applications. The endorsed project (http://www.iioe-2.incois.gov.in/IIOE-2/EP3O.jsp) therefore contributes to the IIOE-2 science plan of understanding the complex behavior of the Indian Ocean by providing improved coverage and high quality satellite observations.

[Report Courtesy: Dr. Prabhat Koner, Earth System Science Interdisciplinary Center; University of Maryland, USA pkoner@umd.edu]









## Call for papers-Special IIOE-2 Issue Volume 2 DEEP SEA RESEARCH- PART II

Manuscripts are being solicited for publication in the second volume of a DSR II Special Issue on IIOE-2, edited by Raleigh Hood, Jerry Wiggert, Lynnath Beckley, Jerome Vialard, Sunil Singh and Birgit Gaye.

The target date for submission is **31<sup>st</sup> May**, **2018** 

If you are interested in submitting a manuscript or would like more information, please contact Raleigh Hood (<u>rhood@umces.edu</u>).

#### **Some Upcoming Events**

- Fust Ocean Ocean Science for a sustainable development, 14 15 May 2018, Brussels, Belgium <u>http://www.fustocean.org/</u>
- A Session on "The Eastern Indian ocean Upwelling Research Initiative (EIOURI) and the Second International Indian Ocean Expedition" at 15<sup>th</sup> Annual Meeting of the Asia Oceania Geosciences Society, Honolulu, Hawaii, 03-08 June 2018. <u>http://www.asiaoceania.org/aogs2018/public.asp?page=home.htm</u>
- 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. <u>http://www.clivar.org</u> or <u>http://www.fio.org.cn/en/training\_center/index.htm</u>
- 2018 Gordon Research Conference (GRC) in Marine Microbes 1-6 July, 2018 <u>https://www.grc.org/marine-microbes-conference/2018/</u> and the affiliated and co-located 2018 Marine Microbes Gordon Research Seminar 30 June-1 July 2018, Lucca, Italy. <u>https://www.grc.org/marine-microbes-grs-conference/2018/</u>
- IV International Conference on El Niño Southern Oscillation: ENSO in a warmer Climate, 16-18 October 2018. Guayaquil – Ecuador. <u>http://www.ensoconference2018.org/</u>

## **Call for Contributions**

Informal articles/short notes of general interest to the IIOE-2 community are invited for the next (May-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 May, 2018

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

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