ScienceDirect

Ocean Engineering

Volume 145, 15 November 2017, Pages 263-267

Review

Indigenized Indian Drifting Buoys with INSAT Communication for Ocean Observations

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https://doi.org/10.1016/j.oceaneng.2017.08.054

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Highlights

- Indigenized drifting buoy with INSAT communication.
- Highly sensitive NTC thermistors has been successfully developed and implemented in the indigenization of drifting buoy.
- Data Buoy Cooperation Panel (DBCP) recommendations have been effectively implemented for SST measurements in drifting buoys.
- Concept of every minute data sampling and 15 minutes average has been implemented for SST measurements which mimic temperature anomalies of ocean surfaces.

Abstract

Drifting buoys are widely deployed to measure near surface ocean currents and temperature. The Global Ocean Observation System program designed a global array of 1250 drifter buoys to cover oceans at resolution of one per 5°×5° grids spatially. The National Institute of Ocean Technology, India indigenized drifting buoy in 2012 with geostationary satellite communication to have near real-time data at every hour. The drifting buoy technology is applied for intellectual property right and transferred to Industries. The measurement scheme in the drifting buoys is capable to measure variability in sea surface temperature and small mesoscale surface eddies. This article describes case studies of indigenous drifting buoys in the Indian Ocean from 2012 onwards. The sea surface temperature and drifting speed measured with indigenous drifting buoy is compared with market available drifting buoy (Marlin-Yug), moored data buoy (BD11) and remote sensed data. We also report results from a drifting buoy with General Packet Radio Service (GPRS) telemetry in the coastal region.

Introduction

Measurement and knowledge on Sea Surface Temperature (SST) is important to understand atmospheric convection, amount of heat exchange between ocean and atmosphere, high productive ocean regions and climatic state. Ocean currents transfer heat from lower latitude to higher latitude. Hence SST and ocean currents have significant impact on world's climate. The Lagrangian drifting floats are widely deployed to measure near surface ocean currents (Smith etal., 1984, Lanza, 1984). A significant development of drifting buoys for measuring SST and current took place under surface velocity program (SVP) of the Tropical Ocean Global Atmosphere (TOGA) experiment and the World Ocean Circulation Experiment (Woce). The Global Ocean Observation System (GOOS) program designed a global array of 1250 drifter buoys (DB) to cover oceans at resolution of one per 5°×5° (Ioc-goos,, Soreide etal., 2001). In general DB is powered with internal battery and communicates over short range radio frequency or through low orbit satellites.

The National Institute of Ocean Technology (NIOT), India indigenized DB in 2012 (Srinivasan etal., 2013, Sudhakar etal., 2013, Zacharia etal., 2015). The DB technology is applied for intellectual property right and transferred to Industries (Srinivasan etal., 2013). The industries are produced the DB at a very competitive price. This paper describes case studies of indigenous drifting buoys in the Indian Ocean from 2012 onwards. The sea surface temperature and drifting speed measured with indigenous drifting buoy is compared with market available drifting buoy (Marlin-Yug), moored data buoy (BD11) and remote sensed data. We also report results from a drifting buoy with General Packet Radio Service (GPRS) telemetry in the coastal region.

Section snippets

Drifting buoy description

The DB is made of a flanged two part spherical float of 0.4m diameter made of acrylonitrile butadiene styrene. The bottom half of the float houses battery, embedded system, power control switch, power controller and satellite modem or a General Packet Radio Service (GPRS) modem (Fig.1). The bottom half of the sphere is coated with antifouling paint. The upper half portion of the float is coated with ultra violet protective coating. A 12m stainless steel tether wire is connected to an eye

Results and discussion

The trajectories of the indigenous drifting buoys deployed from 2012 onwards are shown in Fig.3. The field test results of P2 drifting buoy is validated with the data from a commercially available drifting buoy (Marlin-Yug) deployed along with it, data from a nearby moored data buoy (BD11, at the location Lat. 14.203 ºN, Lon. 82.93 ºE) and data from Advanced Very High Resolution Radiometer (AVHRR) satellite data.

Conclusion

In this article, we described about the indigenous DB and their case studies in the Indian Ocean form 2012 onwards. The DB (P1) detected of sea-surface temperature anomaly in the equatorial region of Bay of Bengal in May 2012. The SST and Surface current measured with indigenous DB (P2) is compared with Marlin-Yug (Marlin-Yug) (coefficient of determination R^2 value of 0.80. for SST, coefficient of determination R^2 value of 0.88 for current), BD11 (coefficient of determination R2 value of 0.93

Acknowledgement

The authors are thankful to Ministry of Earth Sciences (MoES), Government of India (Administrative Order ref:12 dated 19/10/2012) for funding this work. We sincerely acknowledge the support of Ocean Electronic Department, NIOT for deployment operations. The authors are also thankful to INCOIS for providing AVHRR data service in Live Access Server.

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