



Features of the Southern Bay of Bengal: BoBBLE Results

Symposium on science relevant to IIOE-2 15 April 2021

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BOBBLE: Bay of Bengal Bounday Layer Experiment



(A collaborative project between MoES, India and NERC, UK)



India UK IISc, INCOIS, NIOT, NCMRWF UEA, NOC, University of Reading, UKMO

<u>Acknowledgements</u>

BoBBLE project was funded by Ministry of Earth Sci., Govt. of India. Thanks to Dr. M. Rajeevan

INCOIS Hyderabad; long-term funding for ocean modeling. Thanks to Dr. Shenoi.

NIO Goa; for providing *ORV Sindhu Sadhana* on lease. Thanks to Dr. Shankar and Dr. P. S. Rao

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Numerical Simulation of freshwater outflow from the Bay of B



Hole in the Monsoon





The Bay of Bengal Cold Pool



Das et al., Climate Dynamics, 2015; Vinayachandran et al., DSR – II, 2020

CTCZ Experiments during 2009 & 2012





A field experiment in the southern Bay of Bengal was developed to generate new high-quality in situ observational datasets of the ocean, air-sea interface, and atmosphere during the summer monsoon.

BoBBLE Measurements

RV SINDHU SADHANA 12" (23 June – 24 July 2016)

CTD Casts Glider Profiling uCTD Sections Turbulence Profiler Radiometer Argo floats Drifting buoys ADCP measurements Thermosalinogrph AWS, Radiosondes and Flux Chemistry and Biology



Vinayachandran et al., BAMS, 2018

Features

Sri Lanka Dome Summer Monsoon Current **High Salinity Core** Salt Pump Barrier Layer Formation and Erosion Double Diffusion Phytoplankton Blooms Deep Chlorophyll Maxima PG Water Mass





Impact of freshwater: Barrier Layer Formation Northern Bay



BOBMEX 1999

Before freshening



After freshening



Vinayachandran et al., 2002, JGR



BL erosion process



• Mixed layer, Barrier layer and high salinity core are in relative motion.

 Advection of relatively high salinity waters weakened the stratification and induced shear driven mixing.
George et al., JPO, 2019

The High Salinity Core





 Lower part of the High Salinity Core of Arabian Sea origin waters are characterized with double diffusive salt fingering (SF) Instability with Turner angle 45°-90°.

 Double diffusion can be a major mechanism to supply salt from Arabian Sea origin waters to the Bay of Bengal.

Staircase structures in Bay of Bengal



- Staircase structures in temperature/salinity profiles are evidences of active double diffusion.
- Time series observation of microstructure temperature profiles at 8^oN 89^oE showed staircase structures upto 10m thick and gradient upto 1^oC m⁻¹.
- Elevated patches of microstructure temprature gradient in comparison to microstructure shear further confirms the active double diffusion.

Implications to Salt Budget



- The existence of active double diffusion throughout the time series observation at the base of high salinity core (HSC) indicates that double diffusion can be a major mechanism in maintaining the salt budget and the north-south salinity gradient existing in the Bay of Bengal
- Average Salt flux due to salt fingering out of the lower boundary of high salinity core was 10 times higher than that due to the turbulence.

Mixed Layer Heat Budget: Operation Advection





Mixed Layer Energy Budget Closure



Phytoplankton blooms around Sri Lanka



Chlorophyll around Sri Lanka from IRS-P4 OCM





Deep Chlorophyll Maximum



Results upwelling favours sharp and intense DCM, whereas mixing resulted in diffuse and weaker DCM.



Thushara et al., Biogeosciences, 2020

BoBBLE Observations of SMC



Drivers of Summer Monsoon Current



Webber et al., JPO, 2018, Rath et al., Ocean Dynamics, 2019; Sanchz-Frankz, GRL, 2019

The Sri Lanka Dome



The SLD is driven by the curl (vorticity) of the local wind field.

Vinayachandran and Yamagata, 1998, JPO

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Sri Lanka Dome



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Major Objective

Produce new, high-quality, comprehensive observational data sets of ocean state and atmospheric fluxes in a key under-observed region, the southern BoB.

Major Contribution

Description of features of the southern Bay of Bengal, some of them for the first time.

THANK YOU