

# BGC-Argo Data Management INCOIS/India

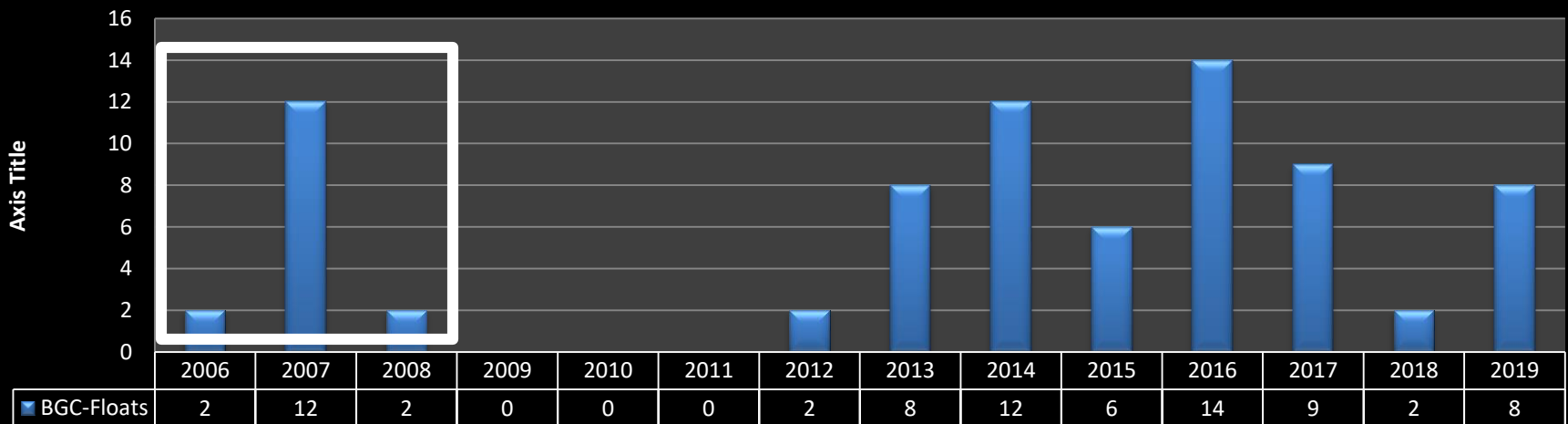
TVS Udaya Bhaskar  
INCOIS, MoES, Govt. Of India  
14 Oct, 2019  
Villefranche – sur – mer, France

# Outline of the talk

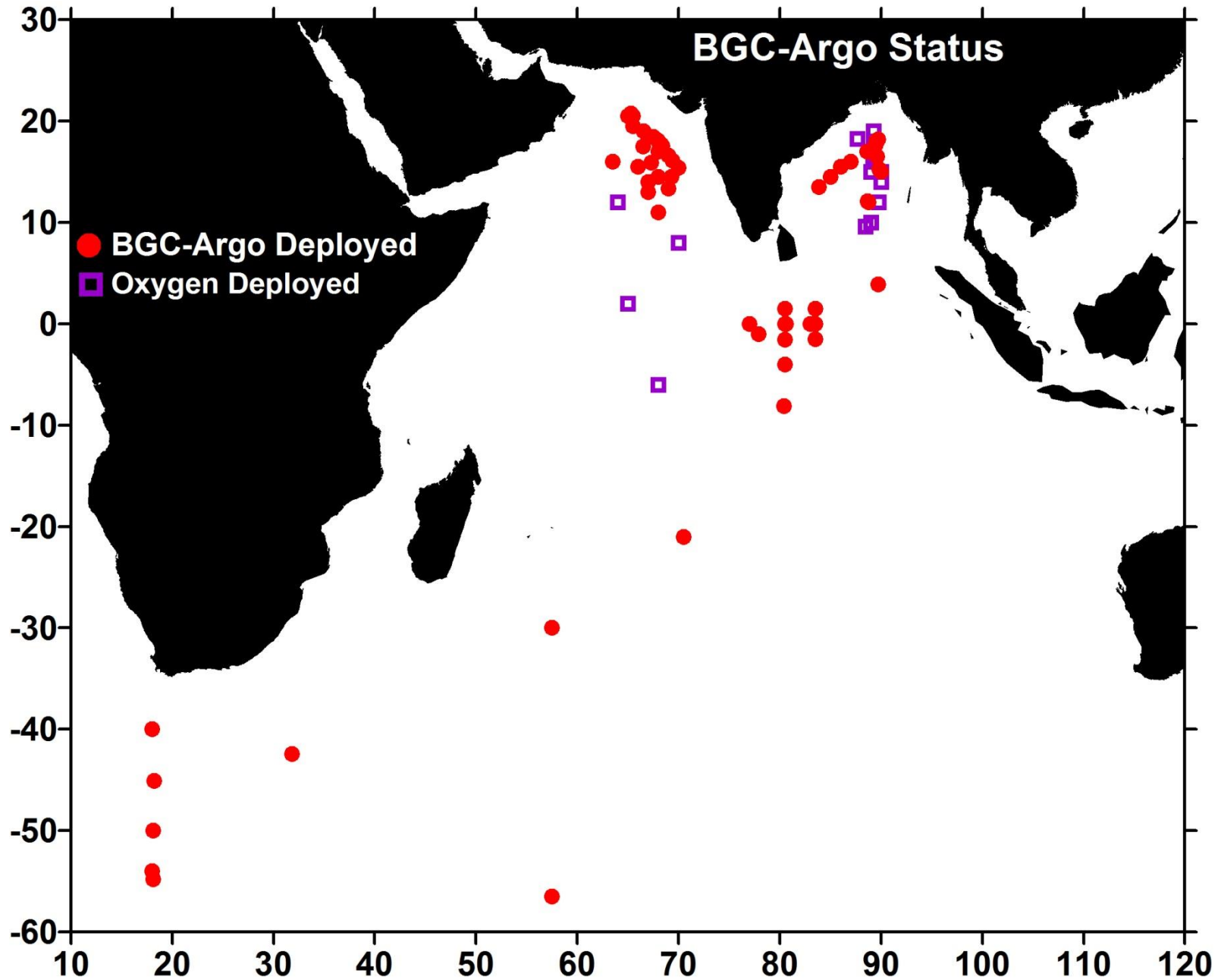
- Indian oxygen and Bio-Argo program.
  - Deployment status and processing.
  - Nitrate floats deployment.
- Data processing and Management Activities
  - QC of data.
  - Delayed Mode QC of Oxygen data
- Usage of data from the Bio-Argo floats.
  - In situ data analysis.
  - Modelling activities.
- Paper published/under pipe line.
- Future projections.

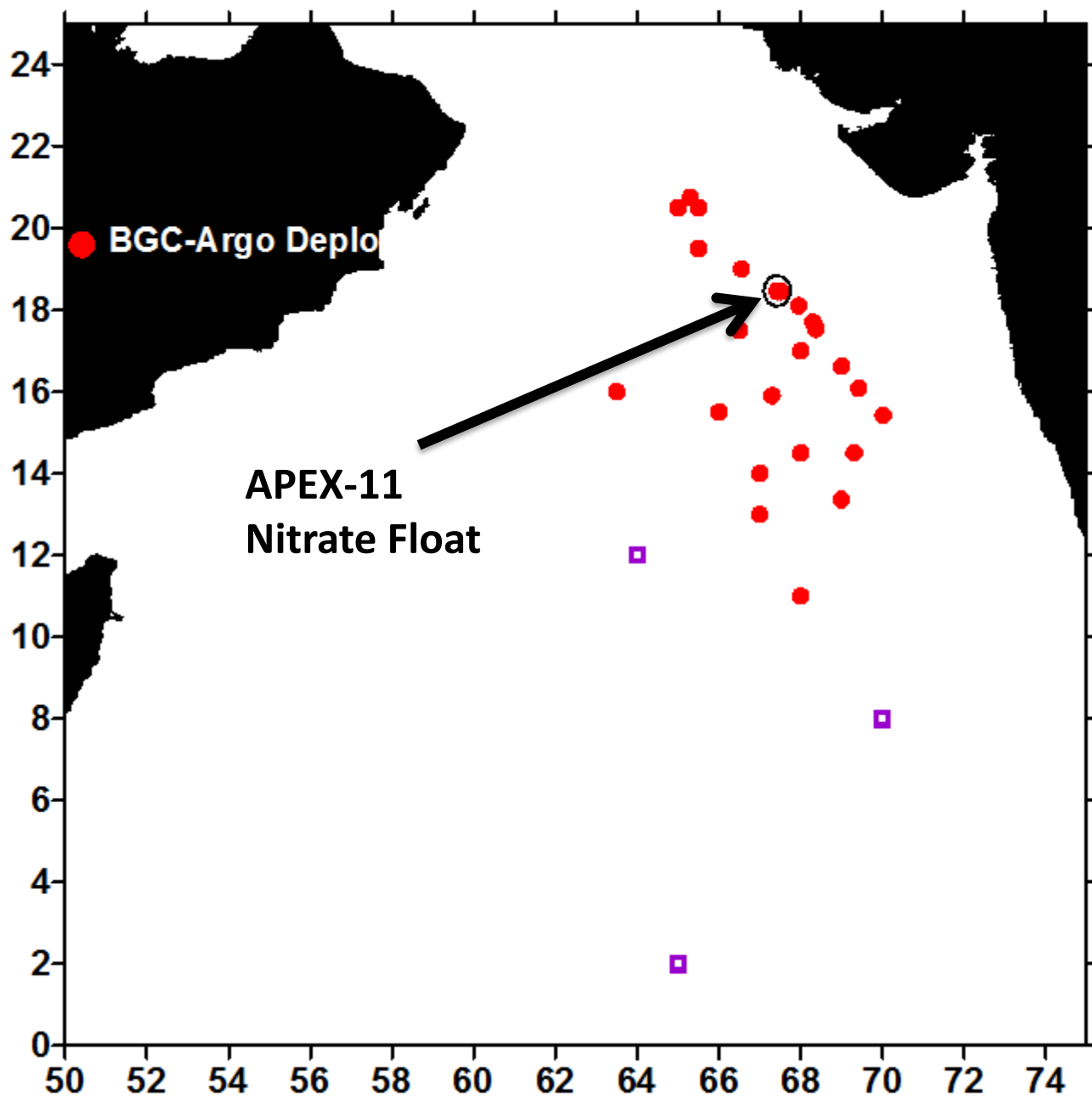
- 16 Oxygen alone (13 with SBE-IDO and 3 with Aanderra Optode) deployed during 2006 to 2008, with none active.
- From 2012 Bio-Argo floats deployment commenced and in total deployed 61 floats in Indian Ocean. Of these 28 are NKE-Provors and 33 are APEX. 36 BioArgo are active currently.
- 4 Bio-Argo APEX floats are deployed in collaboration with NIO-Goa.

**Yearly deployment of BGC-Floats**



## Indian Biogeochemical Argo Program: Status and Planning

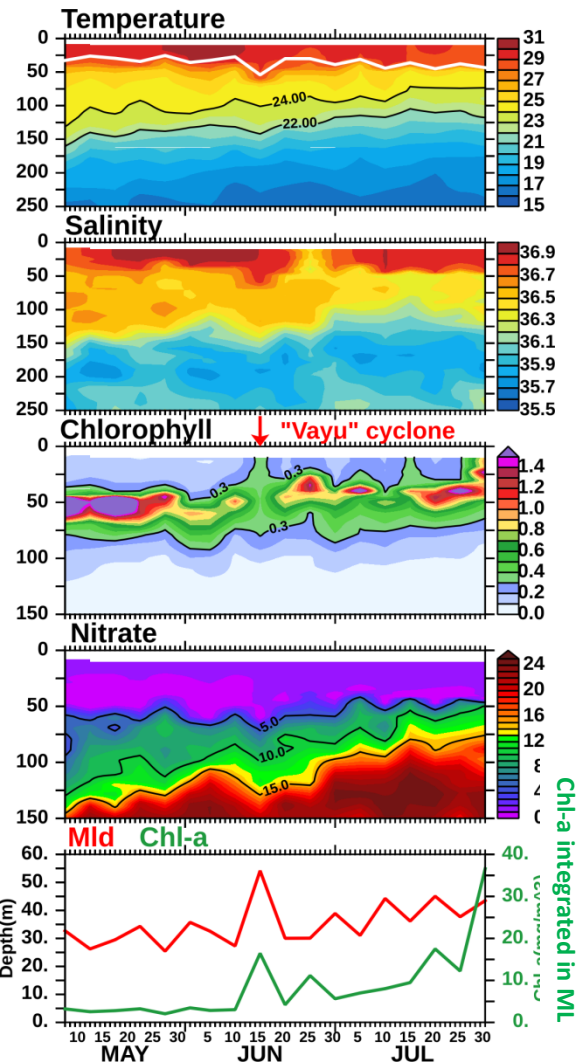




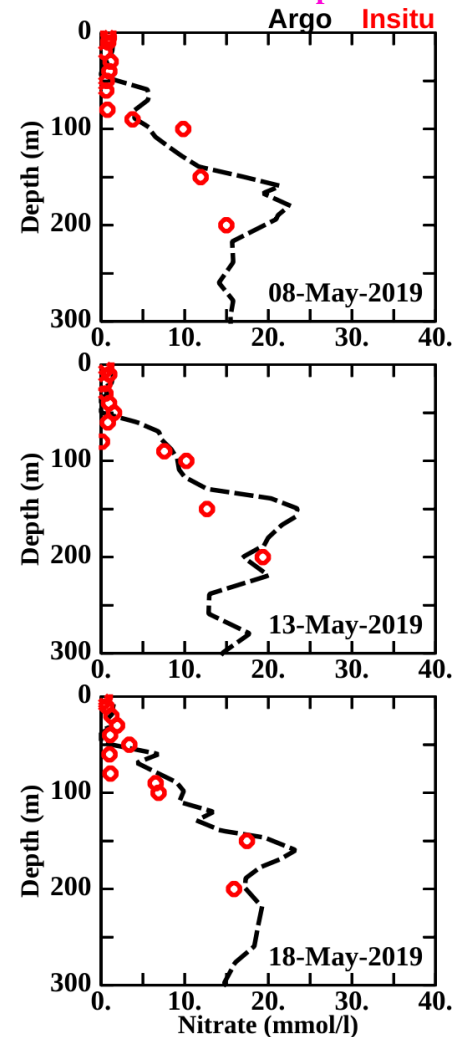
# Initial results from Nitrate float in the Arabian Sea

- To provide data to understand the modulation of biogeochemical parameters in the context of physical and dynamical variability in different temporal scale.
- To validate the marine ecosystem model development stage at INCOIS.

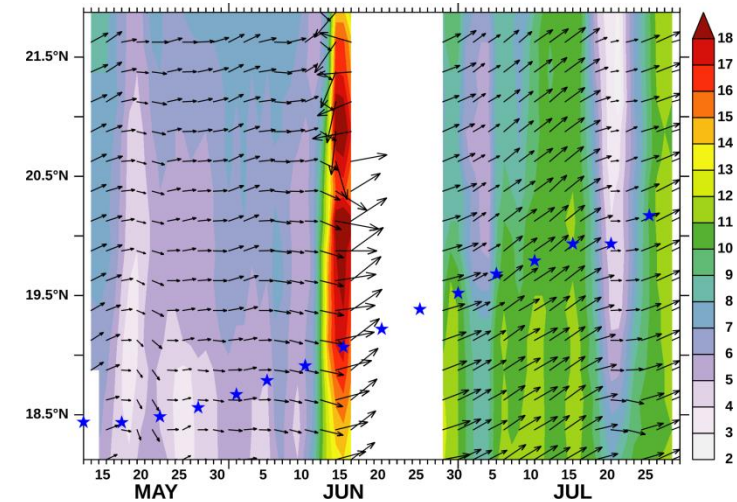
## Data from nitrate float



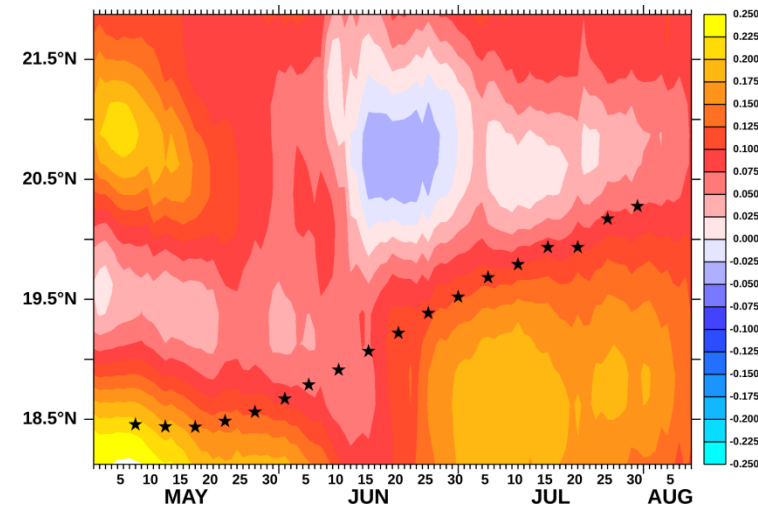
## Validation of Nitrate data from float with water samples



## ASCAT wind speed and vector ( $\text{ms}^{-1}$ ) and Argo float locations in star

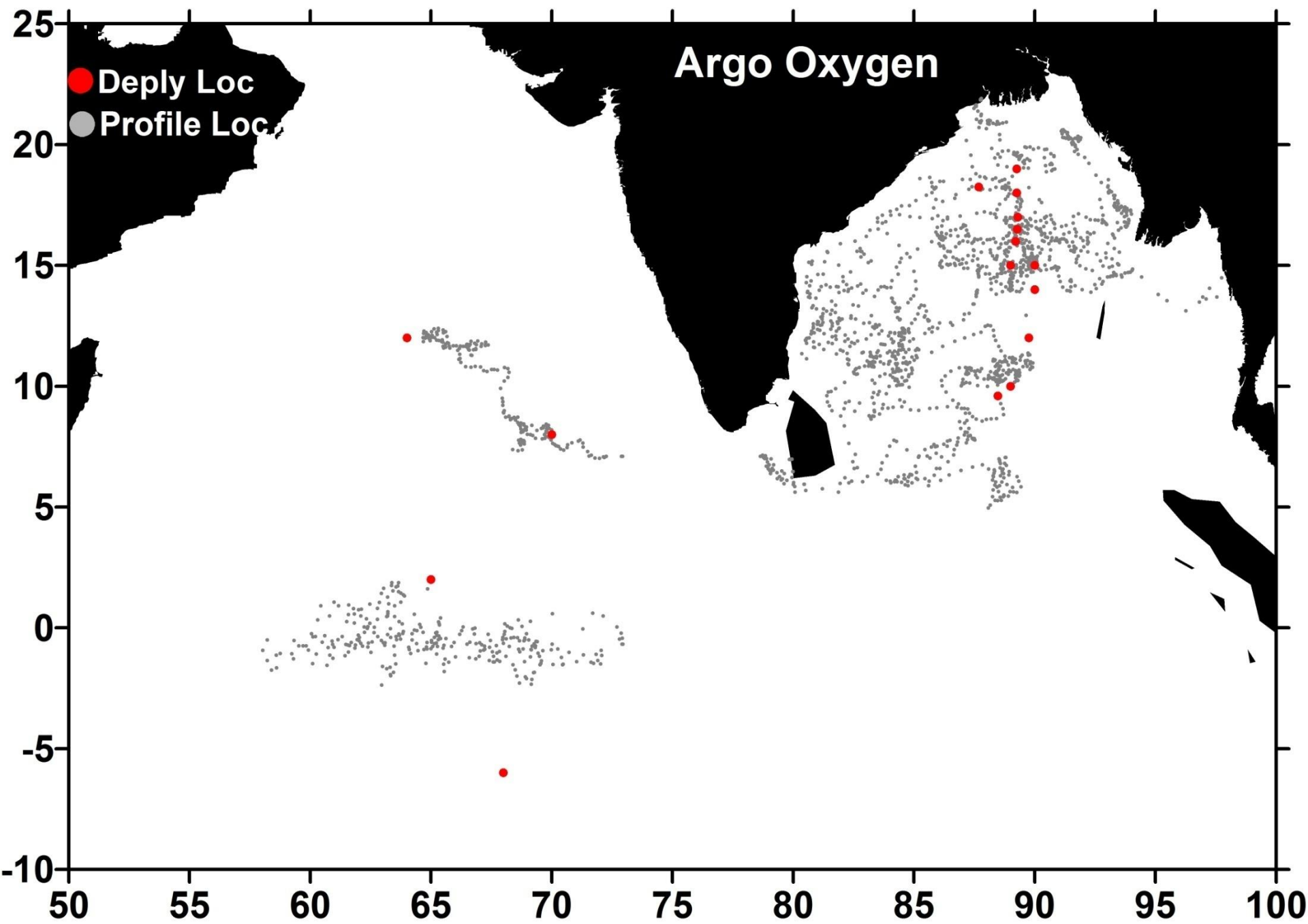


## AVISO SSHA (m) and Argo float locations in star

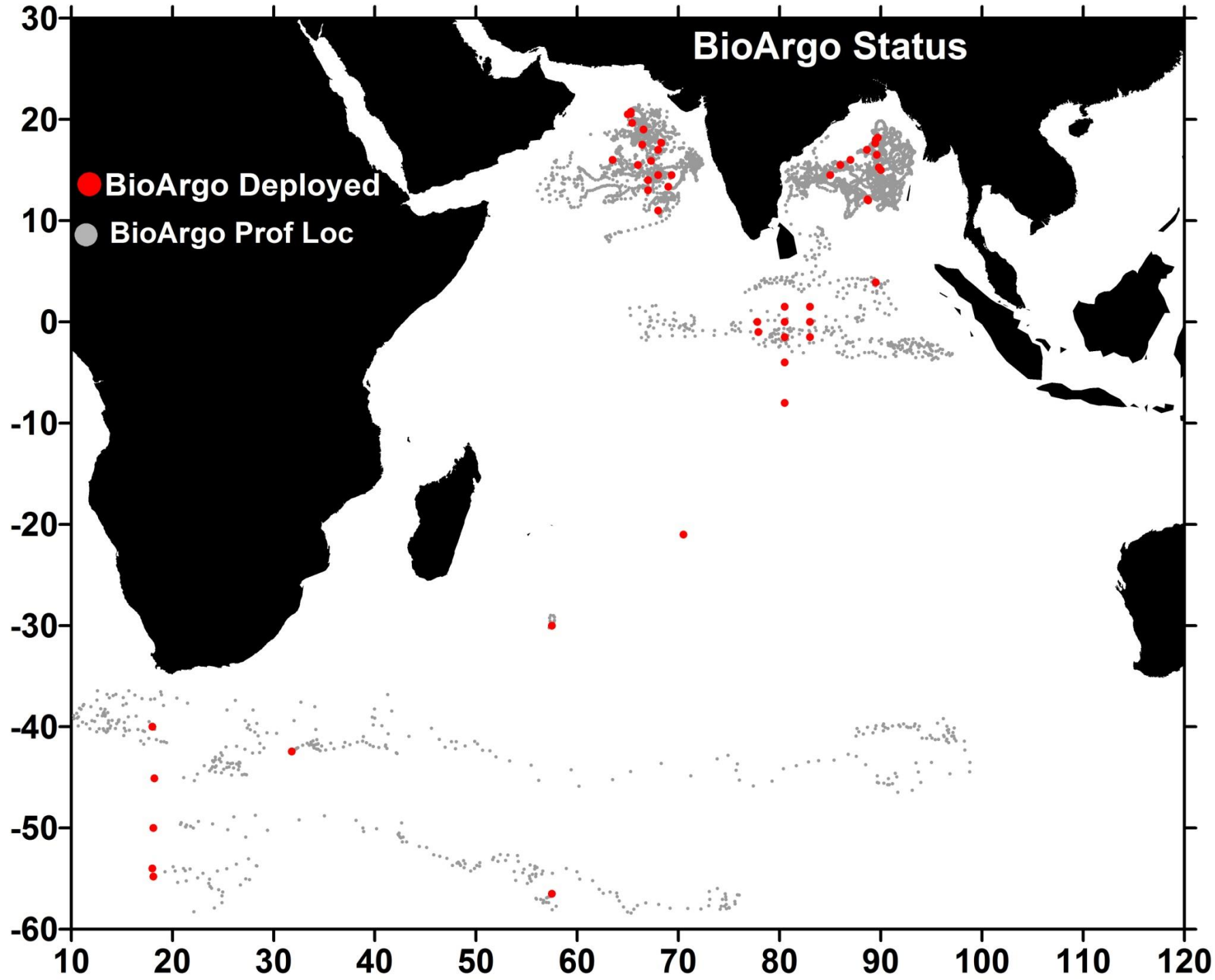


# Data processing R/A/D profiles

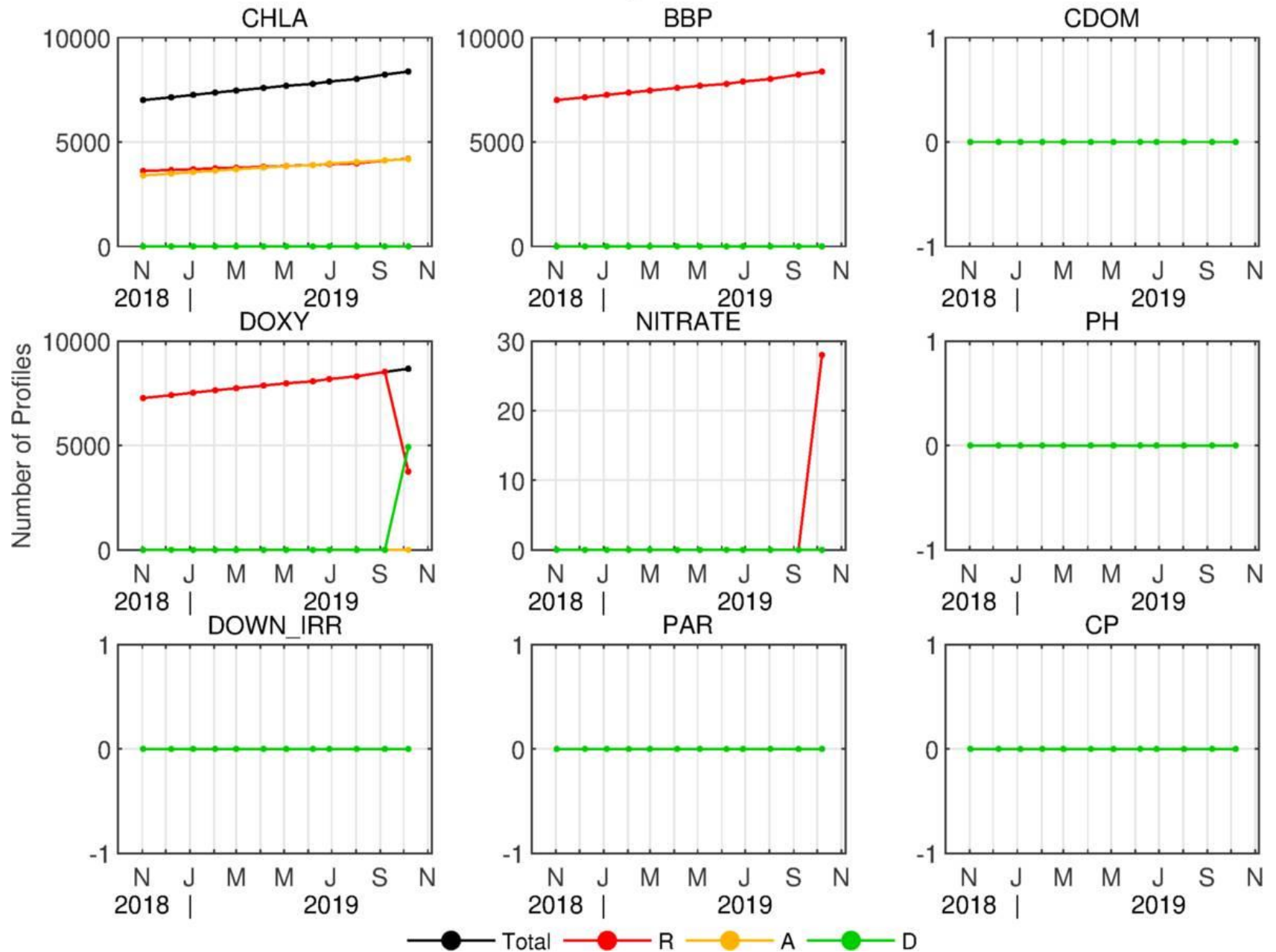
- All the old set of data from Argo floats with O2 alone (deployed between 2006 – 2008) need to be DMQCD (Tested with 2 floats).
- For the BGC floats deployed from 2012 onwards SAGEO2 is being used for performing DMQC. ~ 50 % of these profiles are DMQCD and uploaded on to GDAC.
- Older one's will be done shortly and uploaded.

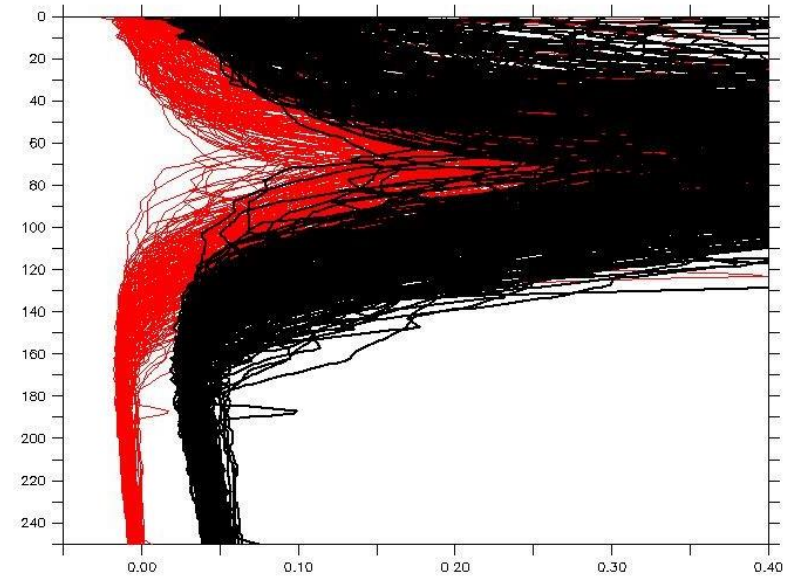
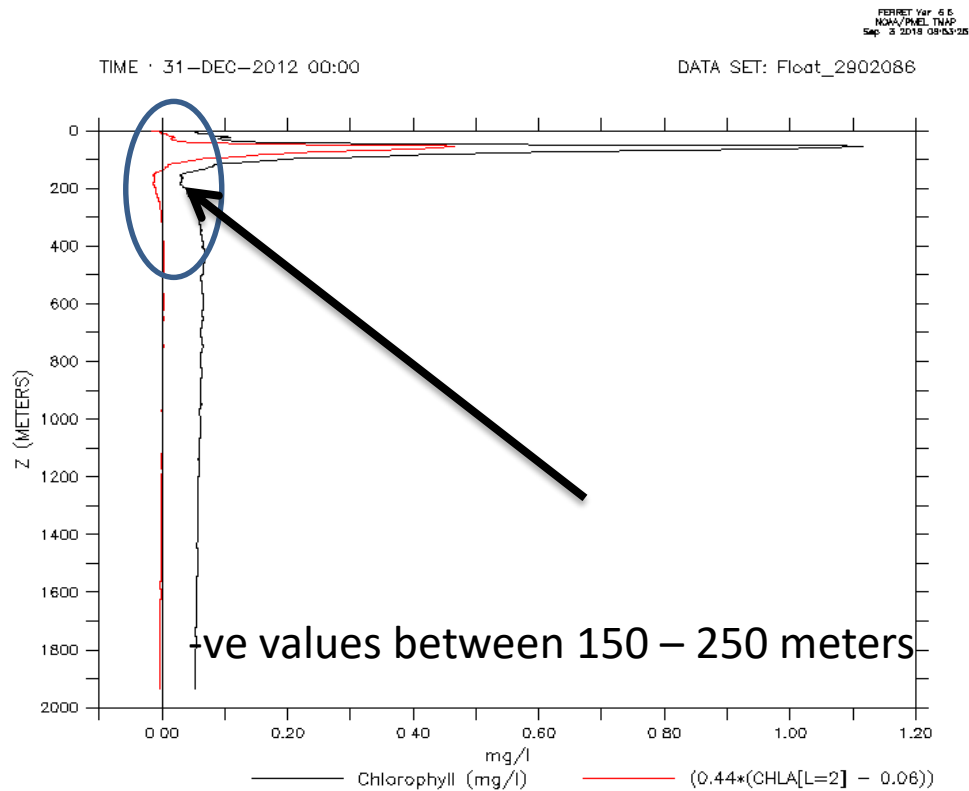






# Evolution of R/A/D-profiles for INCOIS DAC



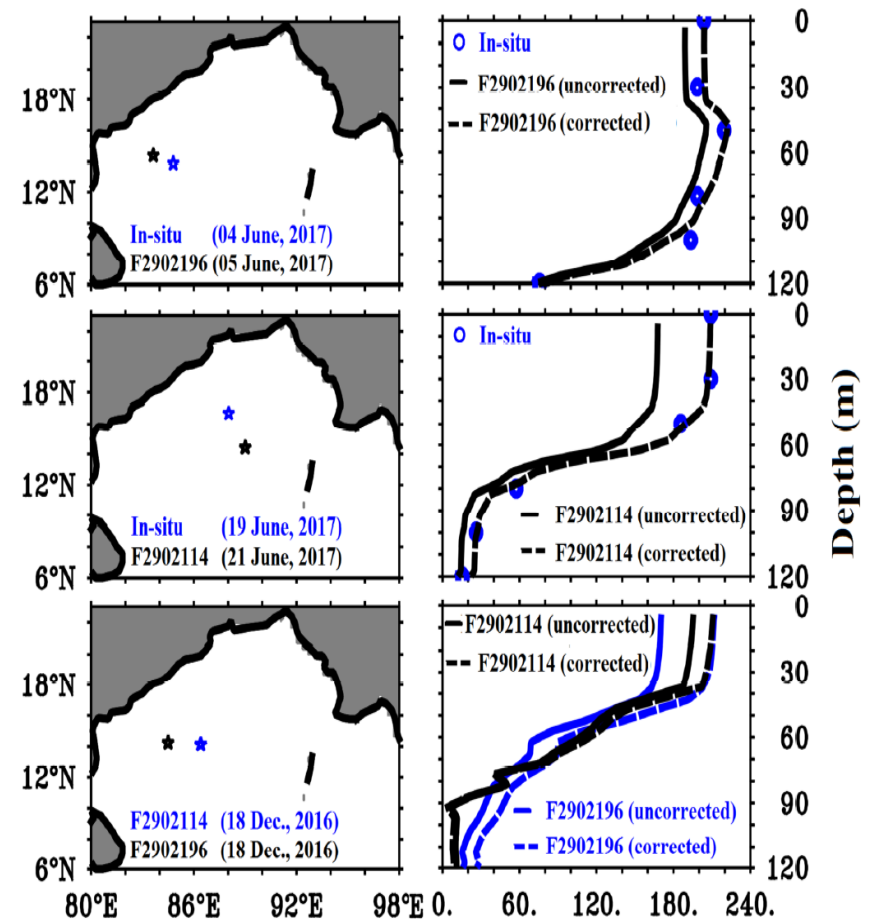


Bozena et al (2017) recommended that any values below the chla min followed by DCM can be set a zeros.

A hybrid approach of combining both is will be tested

# Continuing to obtain sample nearby

- Obtaining profiles to the nearly live Bio-Argo float during any possible cruise.
- Bio-Argo floats data and data obtained from nearby locations were used to calibrate the Argo float data.




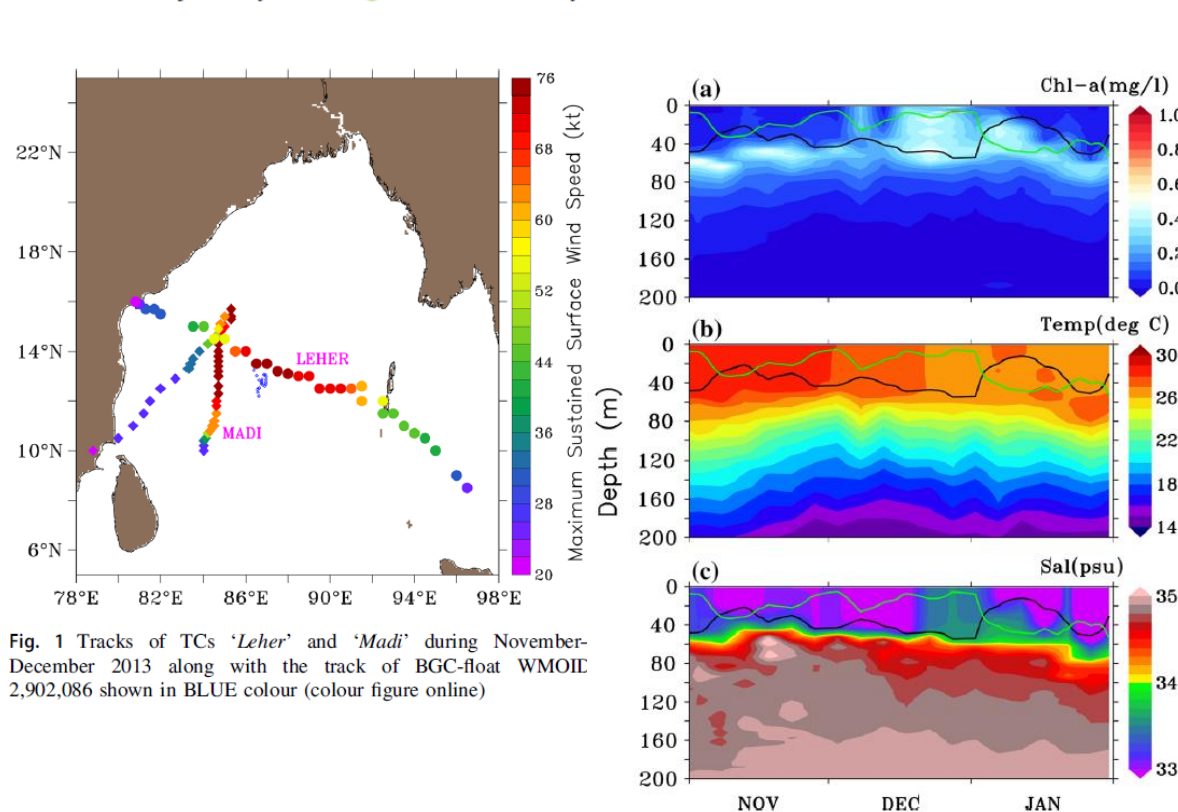
# Data usage

- Data is being used for bio-parameter related studies like:
- Insitu analysis
  - Productivity during cyclones (ISR and JGR papers)
  - DCM and MLD relation studies under latitudinal belt but different oceanographic regions (Arabian Sea and BoB).
- Modelling studies:
  - ROMS models set up, fine tuning and assimilation experiments.

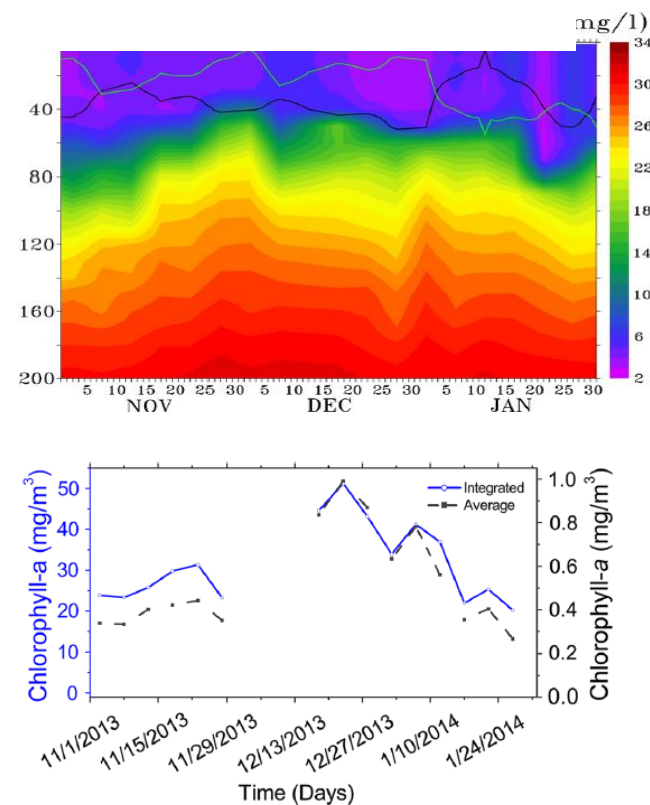


# Cyclone Enhanced Chlorophyll in the Bay of Bengal as Evidenced from Satellite and BGC-Argo Float Observations

Chiranjivi Jayaram<sup>1</sup>  · T. V. S. Udaya Bhaskar<sup>2</sup> · J. Pavan Kumar<sup>2</sup> · Debadatta Swain<sup>3</sup>



**Fig. 1** Tracks of TCs 'Leher' and 'Madi' during November-December 2013 along with the track of BGC-float WMOID 2,902,086 shown in BLUE colour (colour figure online)








**Fig. 4** Integrated and averaged chlorophyll-a concentration within the euphotic depth at each of the float locations



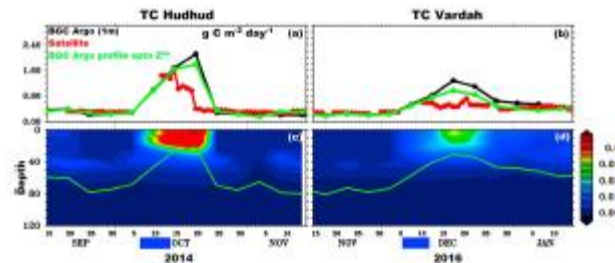
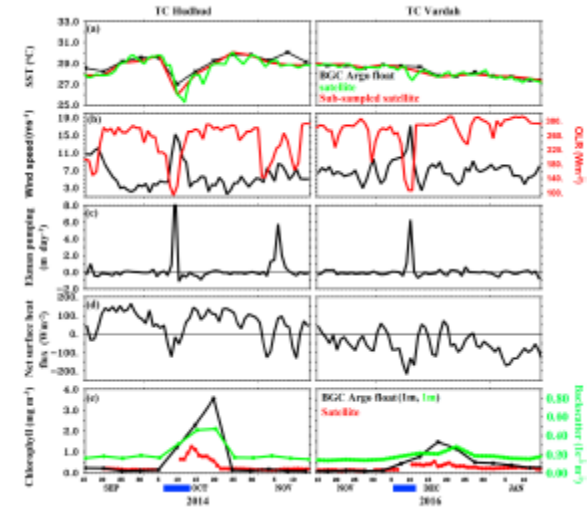
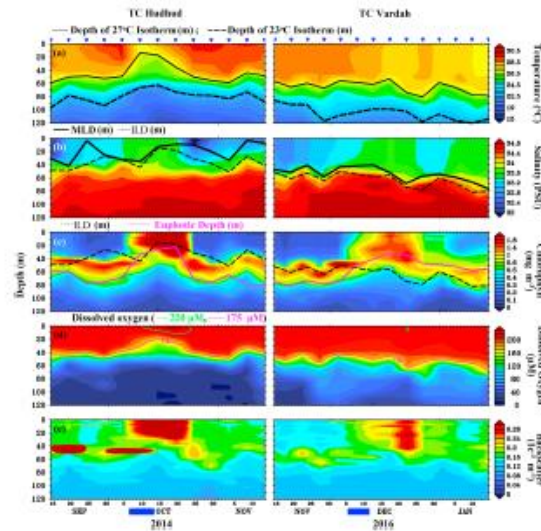
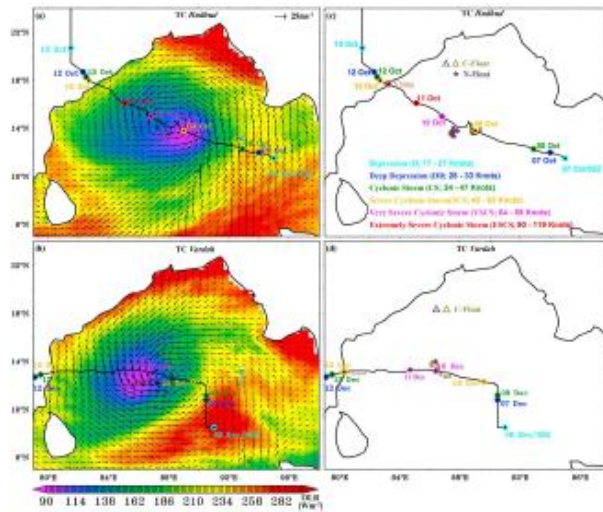
## Key Points:

- Upper ocean biogeochemical response to the tropical cyclone Hudhud and Vardah using BGC-Argo float in the Bay of Bengal
- Preexisting oceanic conditions and TC translation speed on biogeochemical responses are examined
- The importance of profiling float on the calculation of primary productivity is examined

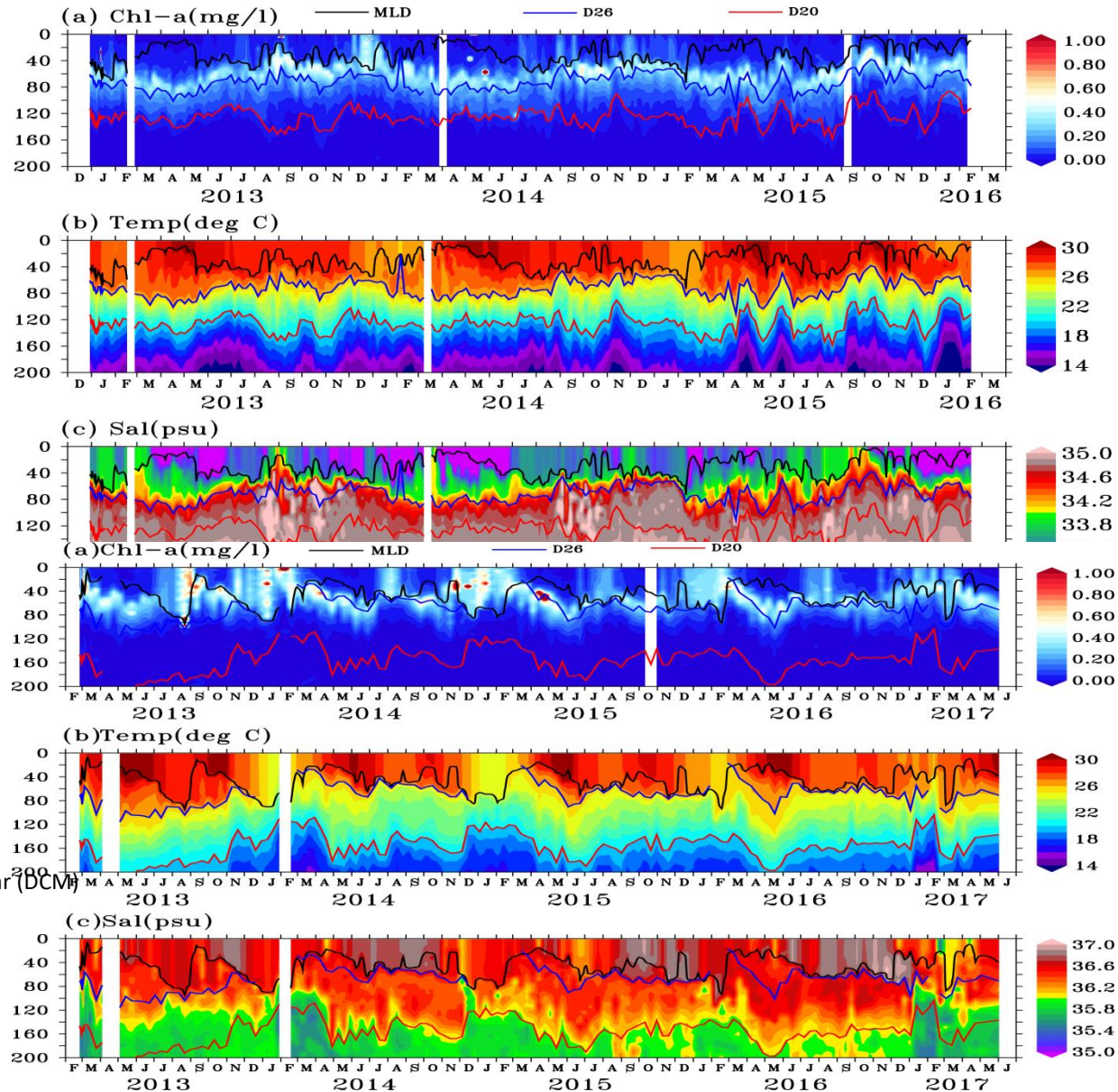
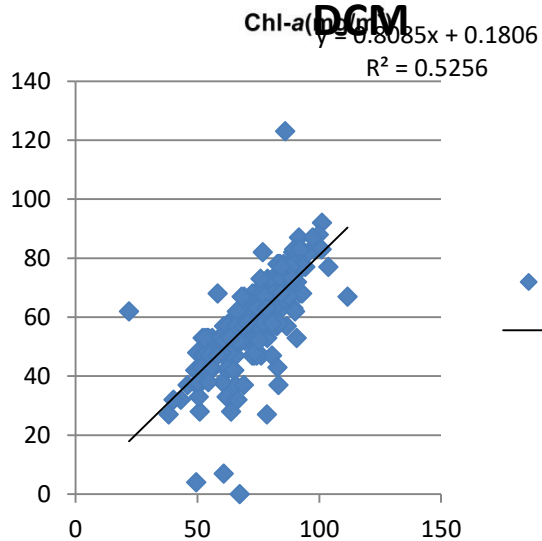
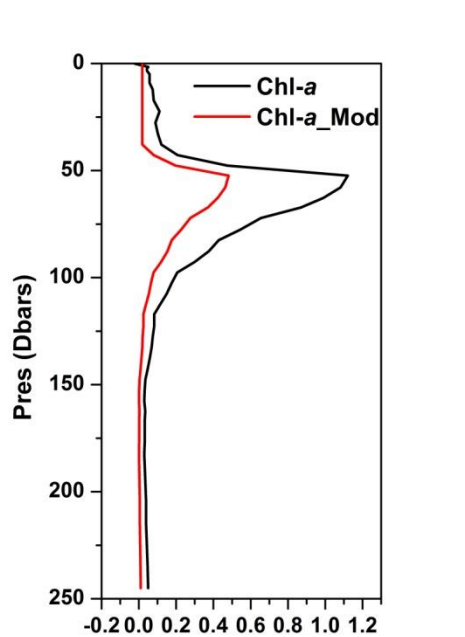
# Quantifying Tropical Cyclone's Effect on the Biogeochemical Processes Using Profiling Float Observations in the Bay of Bengal

M. S. Girishkumar<sup>1</sup> , V. P. Thangaprakash<sup>1</sup> , T. V. S. Udaya Bhaskar<sup>1</sup>, K. Suprit<sup>1</sup> , N. Sureshkumar<sup>1</sup>, S. K. Baliarsingh<sup>1</sup> , J. Jofia<sup>1</sup>, Vimlesh Pant<sup>2</sup>, S. Vishnu<sup>1</sup>, G. George<sup>3</sup>, K. R. Abhilash<sup>4</sup> , and S. Shivaprasad<sup>1</sup>

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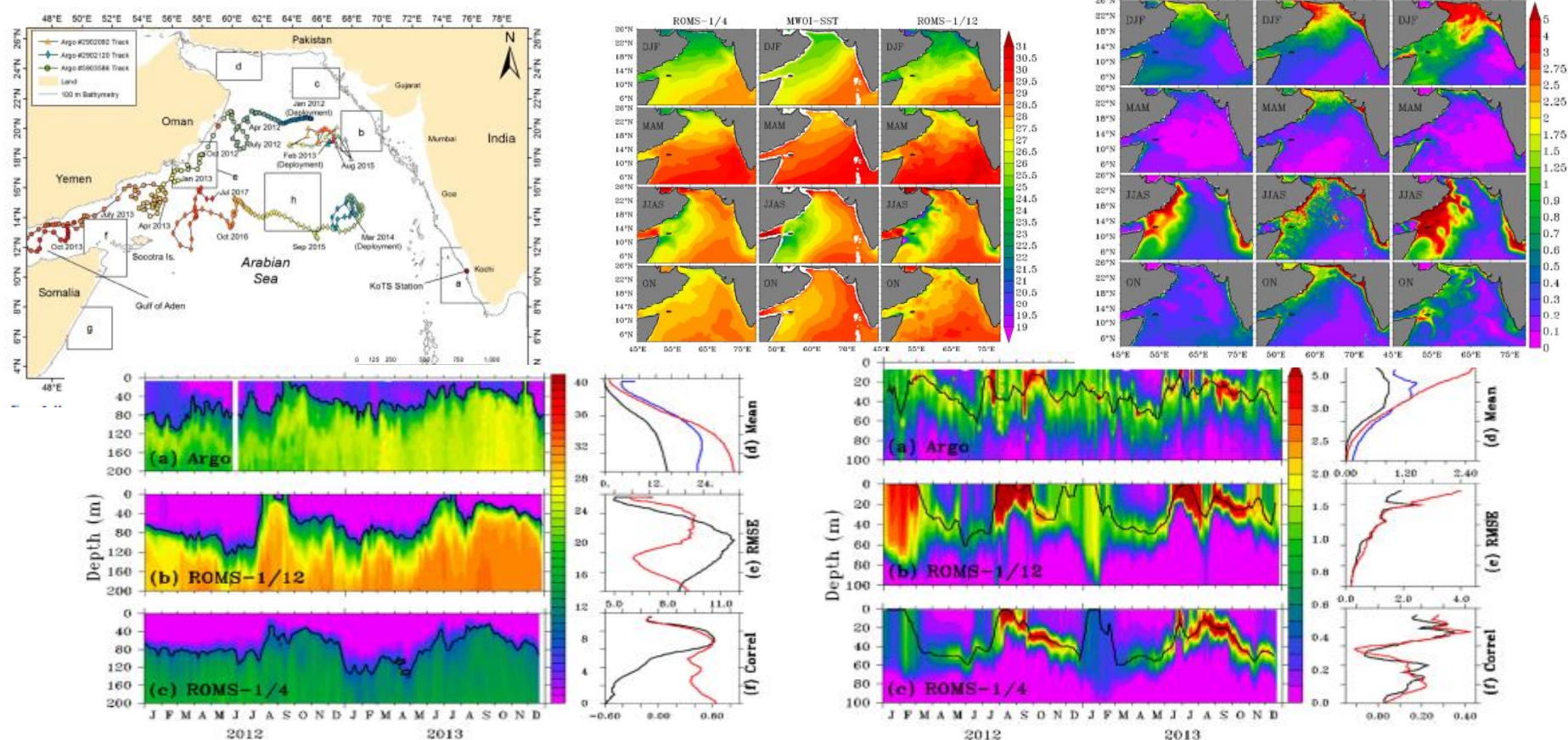
# Spatio-temporal variability of chlorophyll in the northern Indian Ocean: A Satellite and BGC-Argo data perspective





# Assessment of the impact of spatial resolution on ROMS simulated upper-ocean biogeochemistry of the Arabian Sea from an operational perspective

Kunal Chakraborty, Nimit Kumar, M. S. Girishkumar, G. V. M. Gupta, Jayashree Ghosh, T. V. S. Udaya Bhaskar & V. P. Thangaprakash



# Modeling the enhancement of sea surface chlorophyll concentration during the cyclonic events in the Arabian Sea

Kunal Chakraborty<sup>a</sup>, Kumar Nimit<sup>a,\*</sup>, Anirban Akhand<sup>b</sup>, Satya Prakash<sup>a</sup>, Arya Paul<sup>a</sup>, Jayashree Ghosh<sup>a</sup>, T.V.S. Udaya Bhaskar<sup>a</sup>, Abhra Chanda<sup>c</sup>

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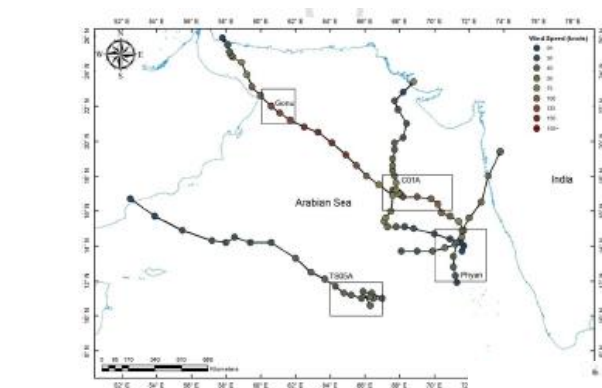


Fig. 1. Tracks of four cyclone case studies (a) Cyclone GDA, year 2001, (b) Severe Cyclonic Storm Goss, year 2007, (c) Tropical year 2006 in the study area. Boxes correspond to the areas over which observation and simulation outputs were area averaged.

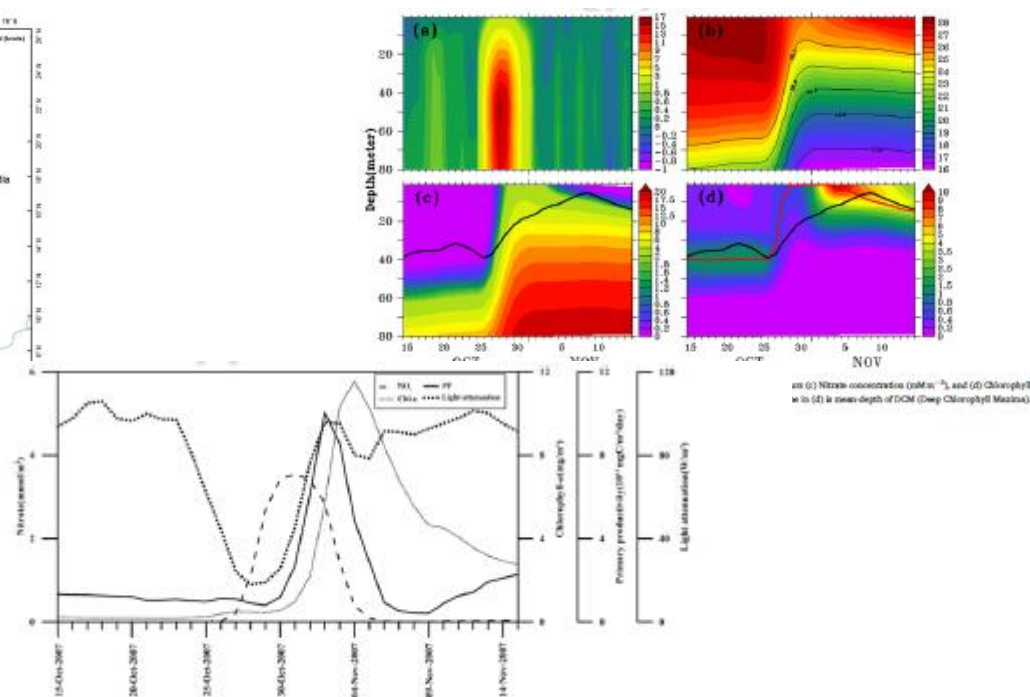


Fig. 7. ROMS model simulated sea-surface Nitrate concentration ( $\mu\text{M m}^{-3}$ ), Chlorophyll concentration ( $\text{mg m}^{-3}$ ) and light attenuation ( $\text{W m}^{-2}$ ) during storm event T055A, along with primary productivity ( $\text{mg C m}^{-2} \text{d}^{-1}$ ) integrated up to MLD. All values were area integrated over the box T055A in Fig. 1.

# Future

- Work on DMQC of remaining O2 data sets. Start the QC work of Chla.
- We are procuring 40 floats next year (26 Core and 14 Bio) to be deployed next year.
  - 1 Nitrate float to be deployed in Bay of Bengal.
- Assimilation experiments with BGC data in ROMS model.