Ocean Observing System
(OMNI Buoy Network, Bay of Bengal Observatory)

E. Pattabhi Rama Rao
Head, Data and information Management Group
ESSO-Indian National Centre for Ocean Information Services
Hyderabad, India

Genesis

Establishment of

National Data Buoy Programme in 1997

by

National Institute of Ocean Technology
Ministry of Earth Sciences
(erstwhile Department of Ocean Development-DOD)
Government of India


Maiden deployment off Chennai Port.

- National Data Buoy Programme (NDBP) evolved during 1995-96 under the Department of Ocean Development, GoI
- NDBP was established in 1996
- First buoy deployed on 21 August 1997
- Buoy network established in 1998
- Under NORAD programme for 2 years until Oct 2000
- New facility established at NIOT in March 2004

Objectives of Buoy Programme

- ✓ To collect met-ocean parameters in Indian seas
- ✓ To validate satellite data
- ✓ To improve weather and ocean state prediction
- ✓ To monitor the marine environment

Buoy Technology Acquired

Characteristics

- Weight : 450 kg
- Height : 7.5 m
- Diameter : 1.76 m

Sensors

- Air Temperature
- Air Pressure
- Wind Direction
- Wind Speed
- Wave Height
- Wave Direction
- Current Speed
- Current Direction
- Water Temperature
- Conductivity
- Oxygen
- Chlorophyll

Spar Buoy

Discus Buoy

Characteristics

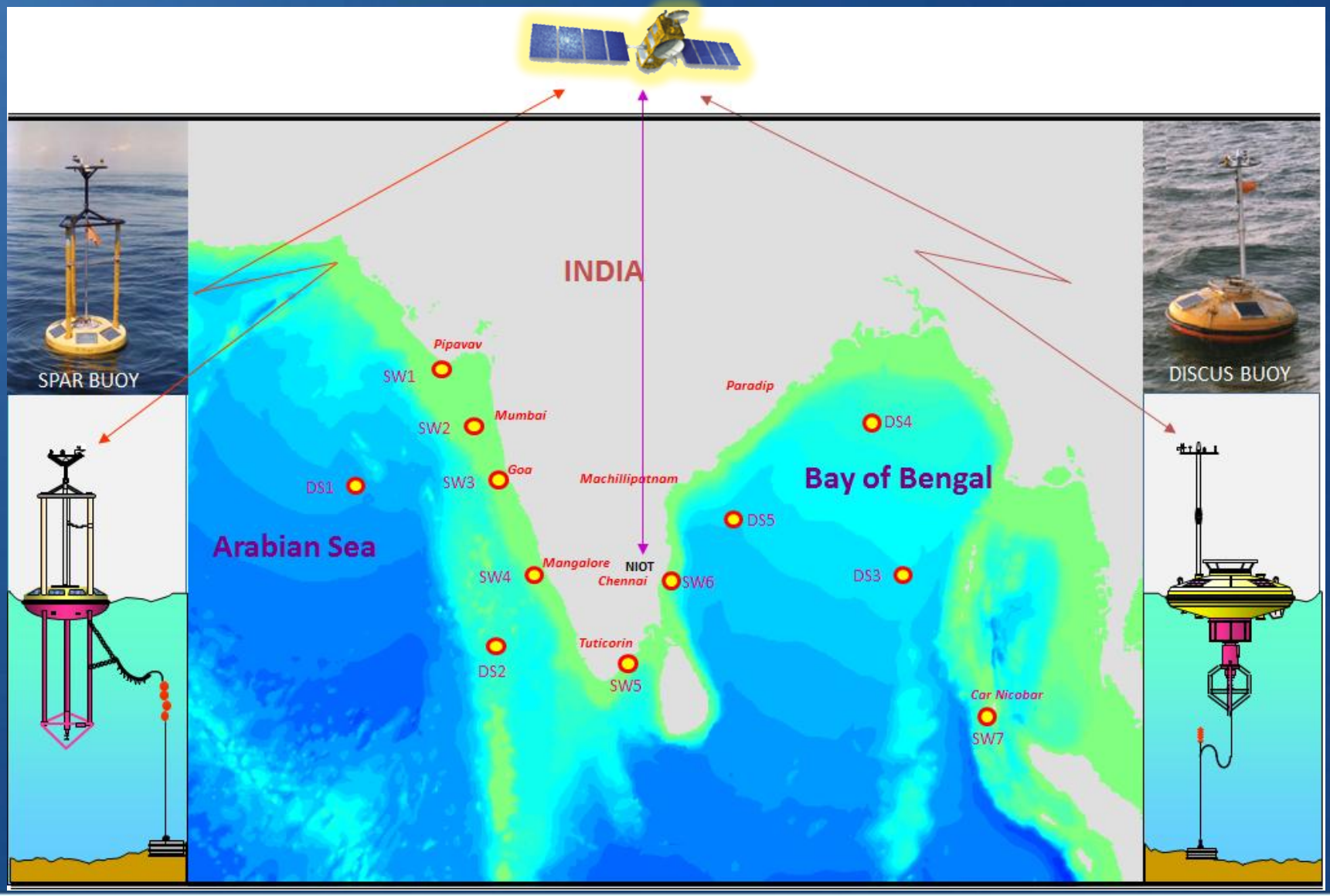
- Weight : 924 kg
- Diameter : 2.8 m
- Max height : 6.75 m

Sensors

- Air Temperature
- Air Pressure
- Wind Speed
- Wind Direction
- Wave Height
- Wave Direction
- Surface Currents
- Water Temp.
- Conductivity

Buoy Network Achieved

(12 buoys – 1997–2001)



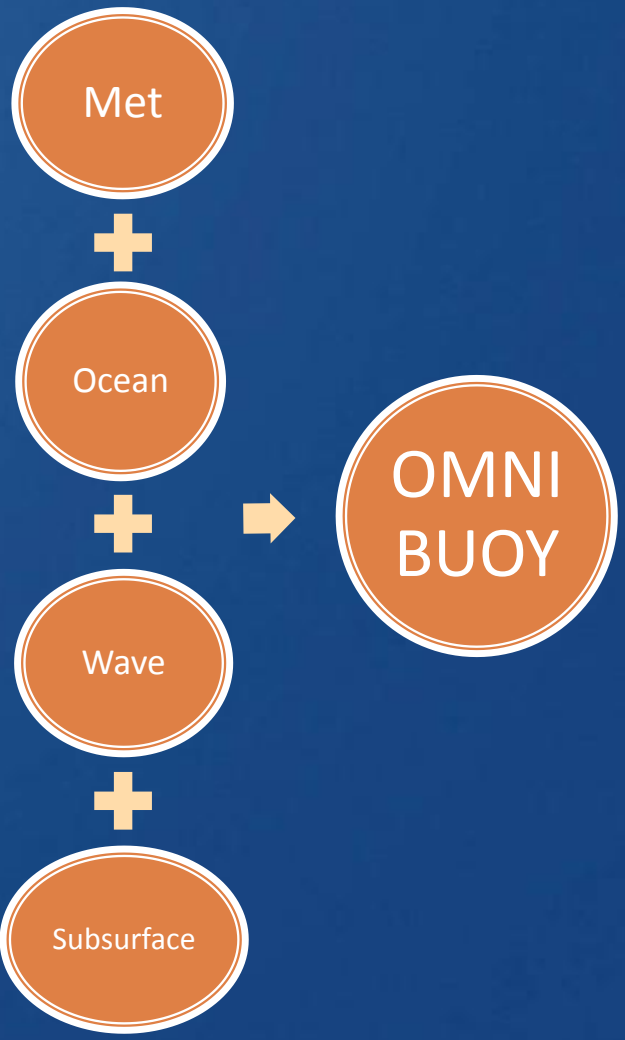
Advanced Scientific Need

- Special underwater, marine and meteorological observational capability was required to improve Oceanographic services and predictive capability of short and long-term climate changes

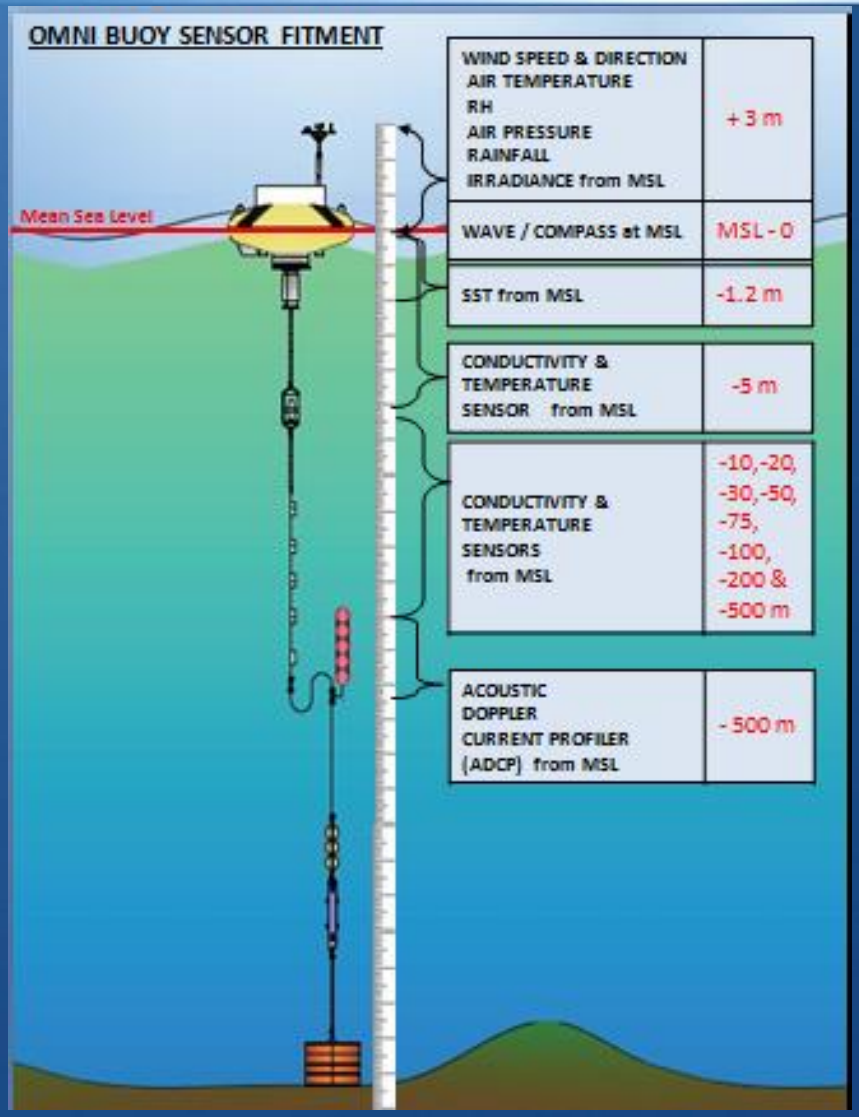
- To meet this scientific requirement, the Next Generation Buoys - Ocean Moored Network on Moored buoys in Northern Indian Ocean(OMNI) evolved.

OMNI Buoy – New generation buoy with surface and subsurface measurements

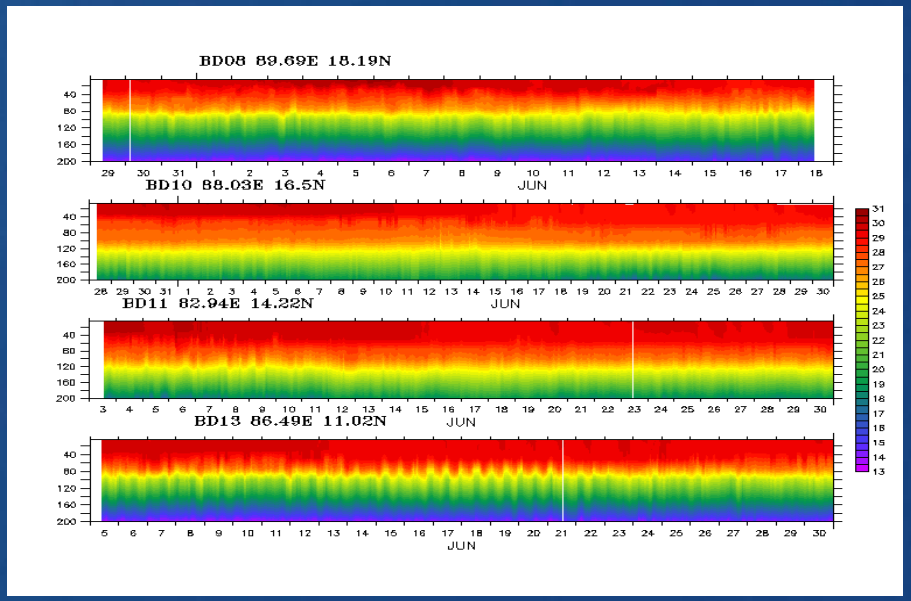
- **MET**
  Air humidity,
  Pressure
  Temperature
  Wind Speed, Gust & Direction
  Irradiation
  Rainfall
- **OCEAN**
  Sub surface Temperature,
  Salinity & Current profiles
- **WAVE**



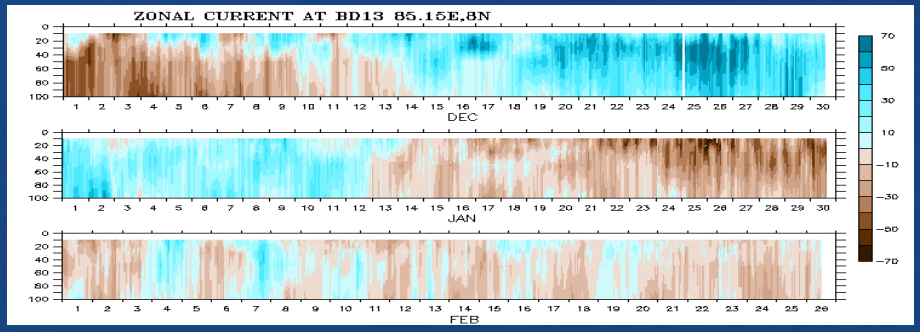
OMNI Buoy Configuration



Temperature Profile

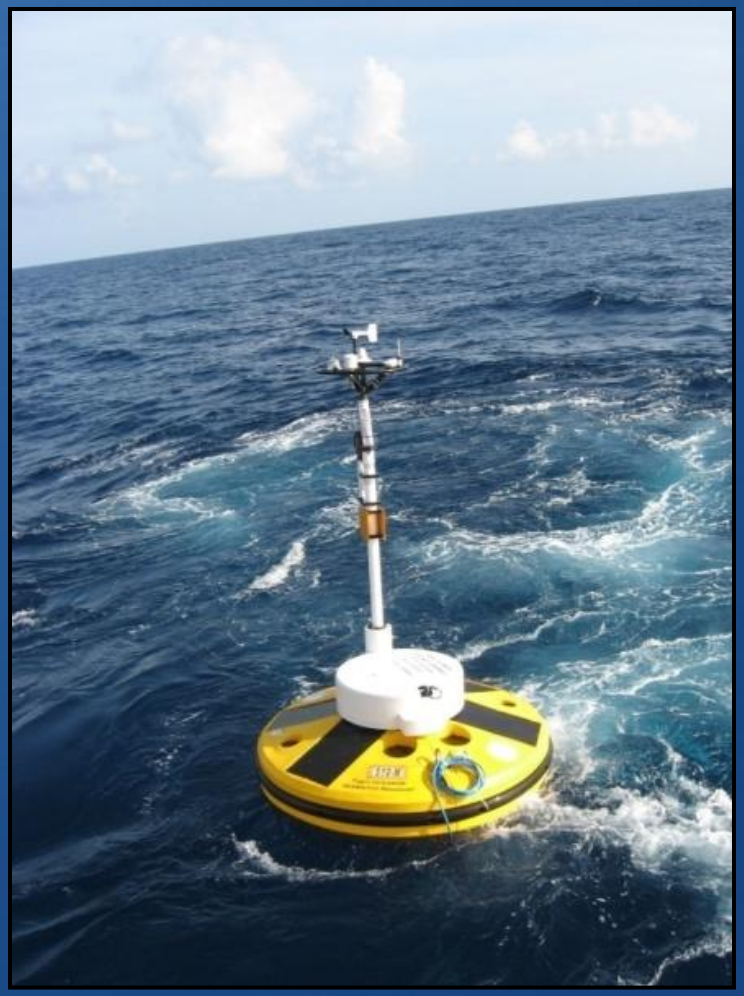


Current Profile



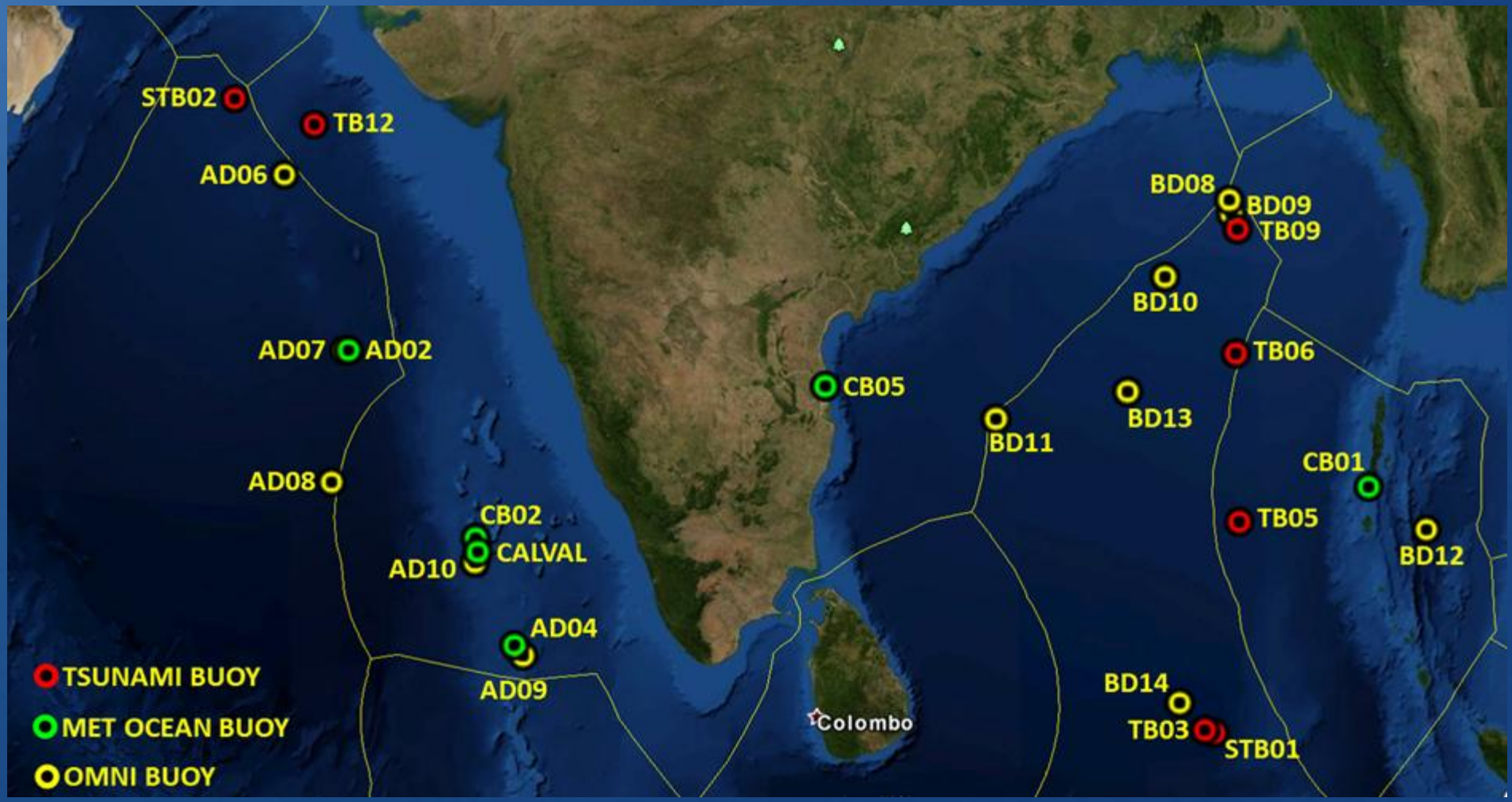
Types of buoy Systems Handled

OMNI BUOY



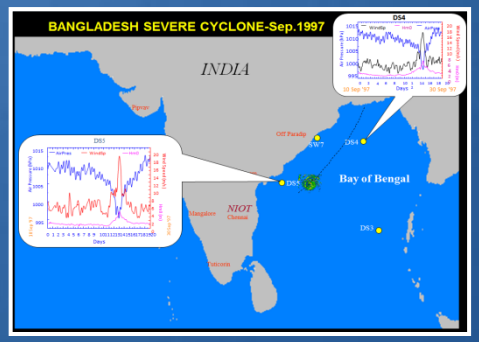
MET OCEAN BUOY

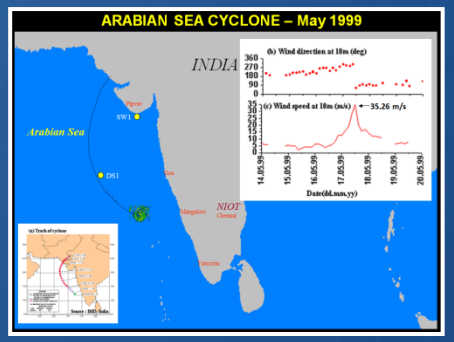
Present Buoy Network

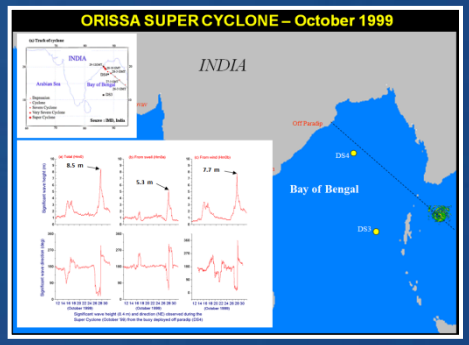


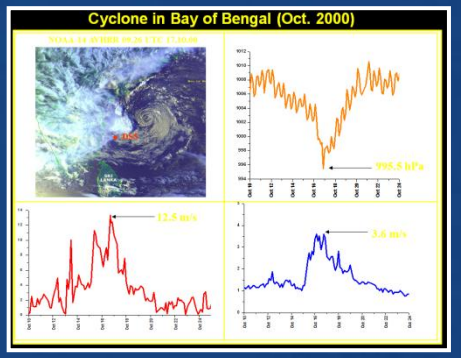
Significance & Utilization of Buoy data

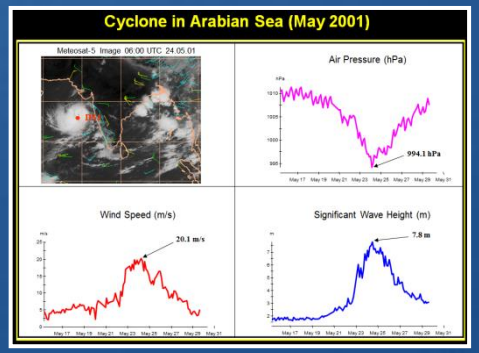
Cyclones Since 1997

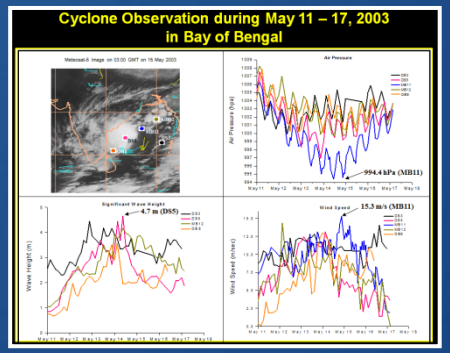


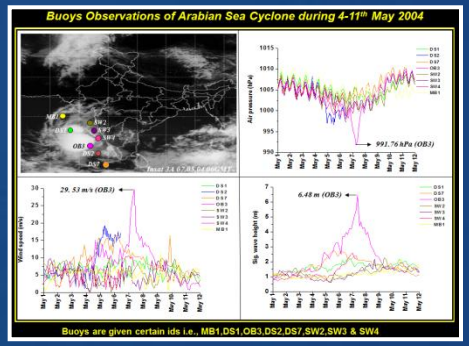


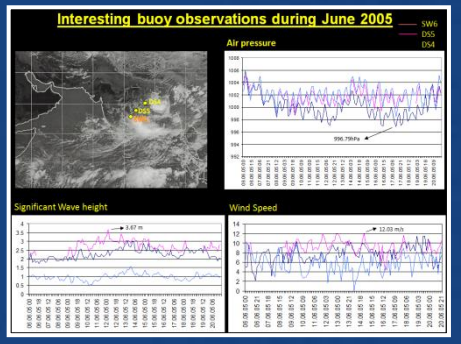


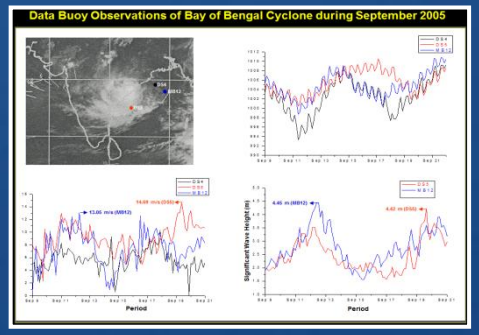


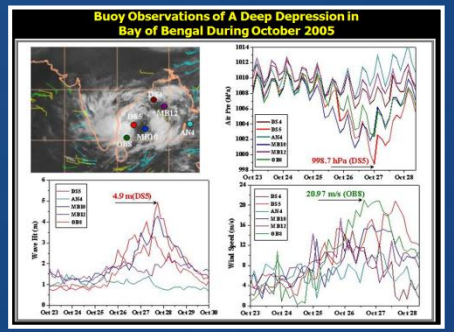


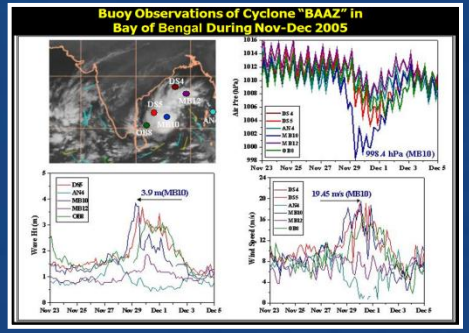


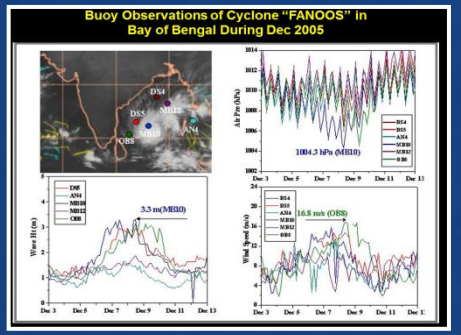






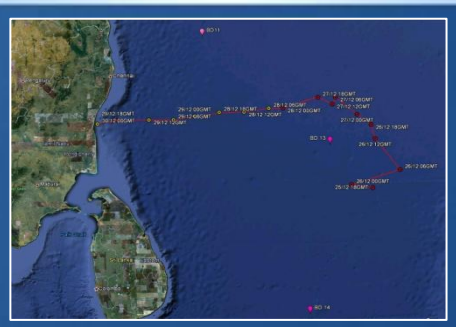






Significance & Utilization of Buoy data

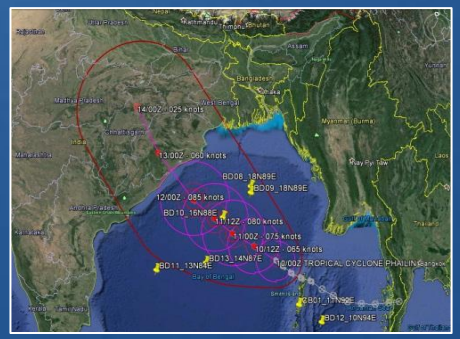
JAL – November 2010



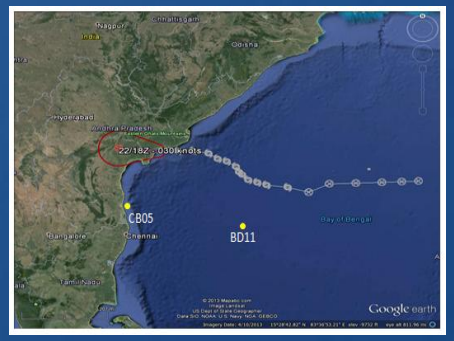
THANE – December 2011

NILAM – October 2012

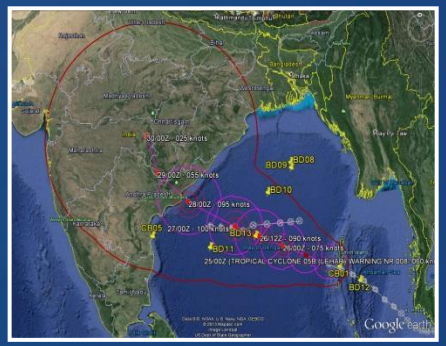
MAHASEN – May 2013



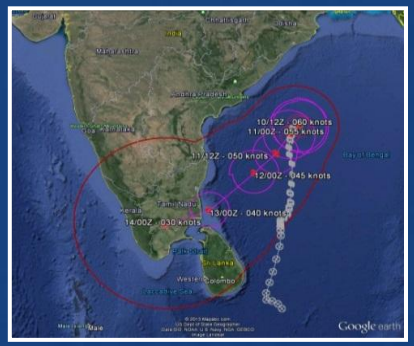
PHAILIN - October 2013



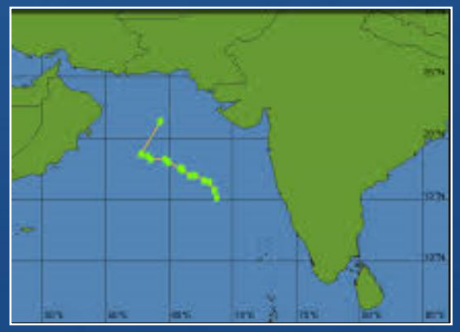
HELEN - November 2013



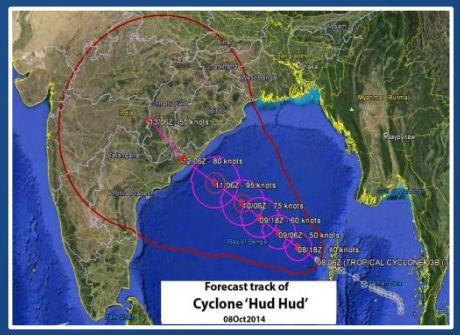
LEHAR - November 2013



MADI – December 2013



NANAUK – June 2014



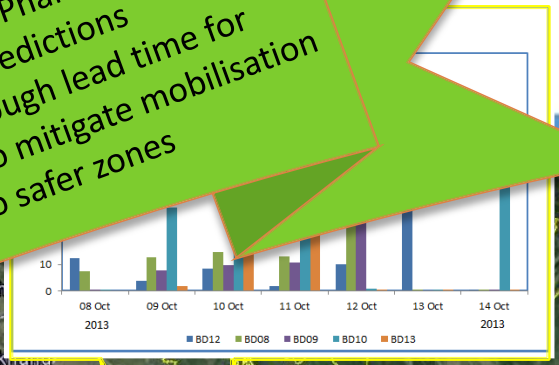
HUD HUD – Oct 2014

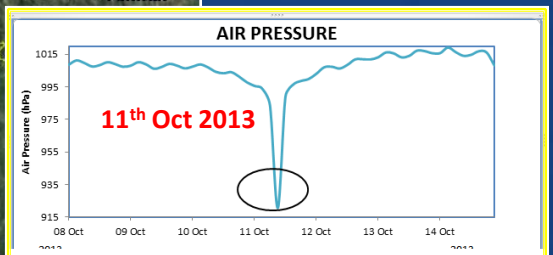
More cyclones occur in the Bay of Bengal than the Arabian Sea.

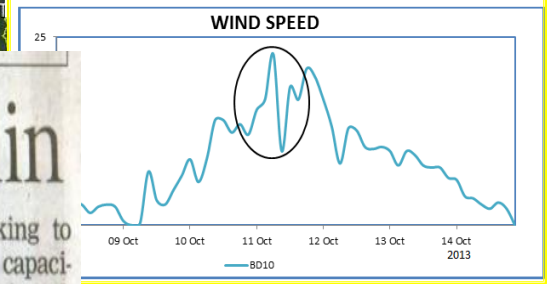
Since inception, moored buoys have made measurements during extreme events and provided real time data to IMD, for data assimilation in operational forecasting models for cyclones. State-of-the-art observation technology helped to track many cyclones

PHAILIN CYCLONE COMES UNDER CATEGORY 5 AND ONE OF MOST FURIOUS CYCLONE FORMED IN THE BAY OF BENGAL IN THE LAST 14 YEARS.

Very few causalities reported during Phailin Cyclone as
Accurate and Advanced predictions
by forecasting agencies gave enough lead time for
disaster management authorities to mitigate mobilisation
of coastal population to safer zones







Buoys 400km away helped track Phailin

TIMES NEWS NETWORK

New Delhi: Strategically located buoys, some as far as 400km from India's coastline, telegraphed via satellite vital data on sea pressure, surface temperature and wind speeds that helped Indian scientists read Cyclone Phailin with unerring accuracy.

The sea-borne platforms add significant muscle to India's capacity to decipher destructive weather systems like Phailin days before they strike the Indian coast, saving thousands of lives by giving authorities crucial lead time to take pre-emptive action.

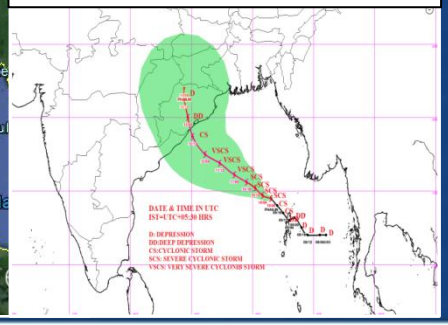
At present, there are 14 buoys in the Arabian Sea and Bay of Bengal busily supplying meteorologists, analysts, programmers and researchers a wealth of information.

A man looks at his damaged house in Podampeta village

India is now looking to step up its scientific capacities by acquiring an aircraft equipped with advanced gadgetry that allows a specialist crew to take readings of clouds and atmospheric exchanges as much as 12-14 km above the earth's surface.

The fruits of a modernization programme has seen the IMD and the department of earth sciences' various facilities deliver more precise information on the monsoon and weather systems.

IMD track of the Phailin cyclone



After every cyclone, the error margin in our forecast and the actual event are calculated. This error has been reducing every year.

Ph…nd now Hudhud, show how India …rnt to tackle cyclones

Google + 2

HudHud, Phailin - Quick Facts

Cyclones

On an average, cyclones in the Bay of Bengal and the Arabian Sea are of moderate intensity compared to hurricanes in West Atlantic and typhoons in West Pacific regions.

Death Toll

Phailin left 38 people dead, and till Monday evening, the death toll from Hudhud was only 25 – 21 in Andhra Pradesh and four in Orissa.

Cause of fatalities

One reason for the large number of fatalities in the past is that the Indian coastline is densely populated.

Accurate forecast

The key to success was an accurate and timely forecast system. The experience of Phailin and Hudhud has showed that progress has been made.


75185 nm sailed since the year 2010
(equals to 10 times the Earth's diameter)
Tropic to Artic
Surface to Atmosphere
Sea bed to Desktop

OMNI buoy data availability: Overview

12 Active buoys

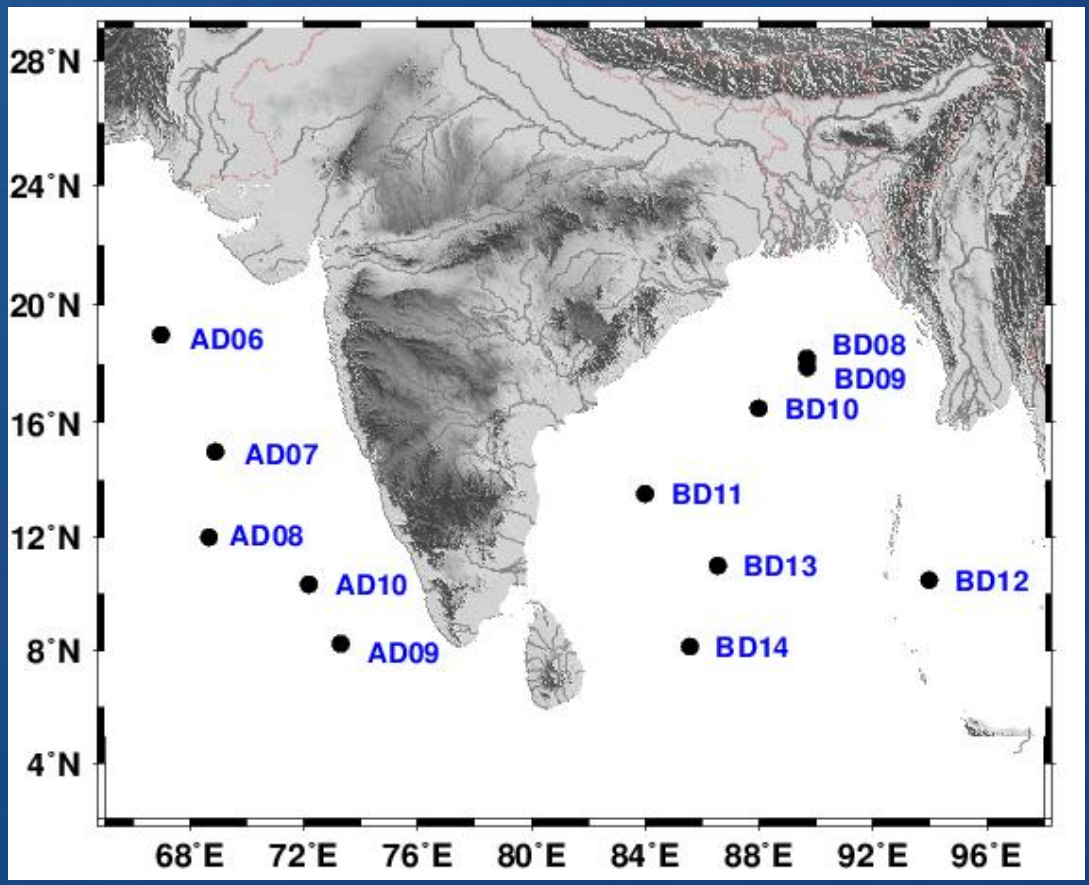
Spatial coverage:

-5 in Arabian Sea

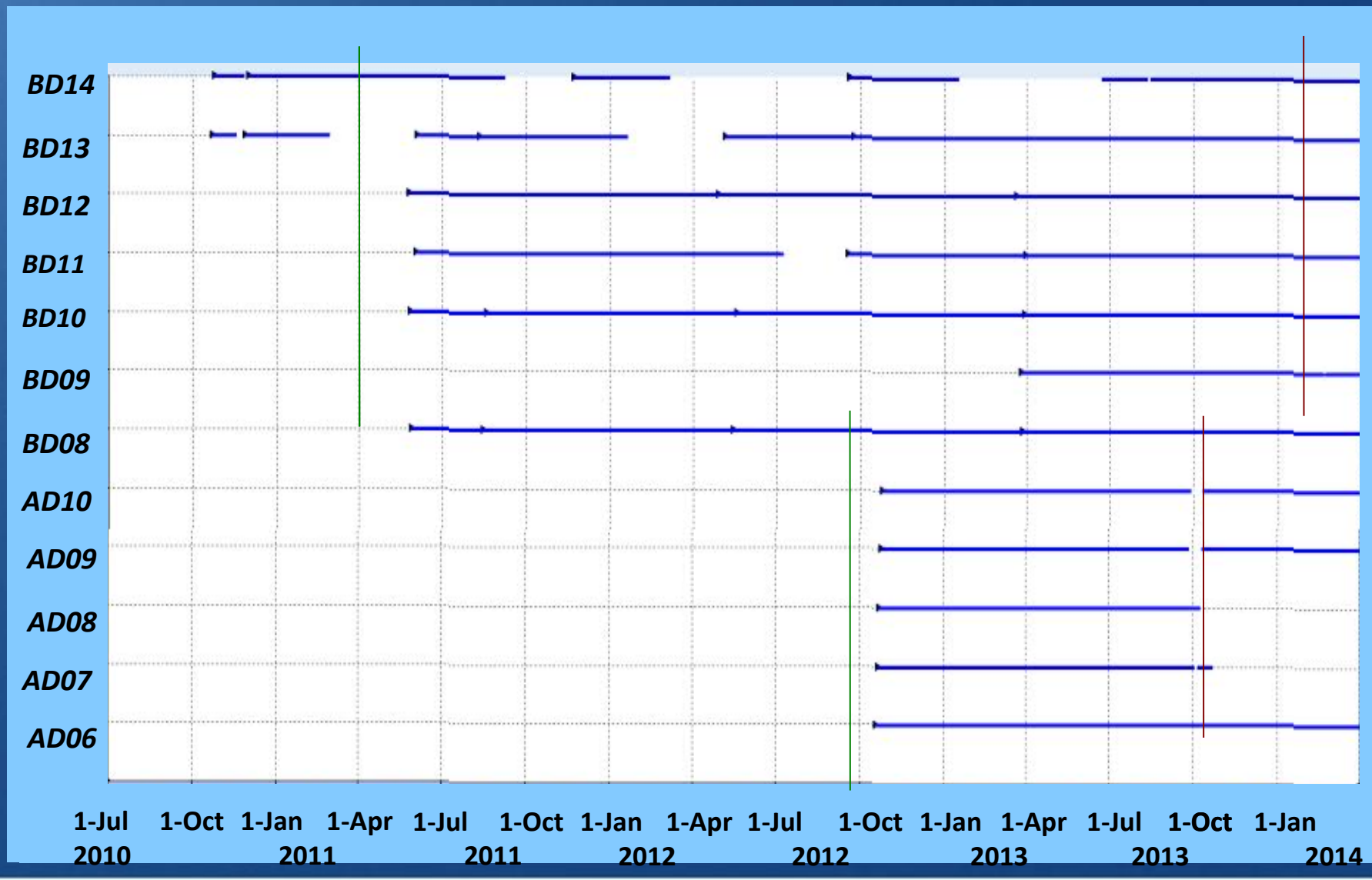
-7 in Bay of Bengal

Temporal coverage:

-from October 2010 to present

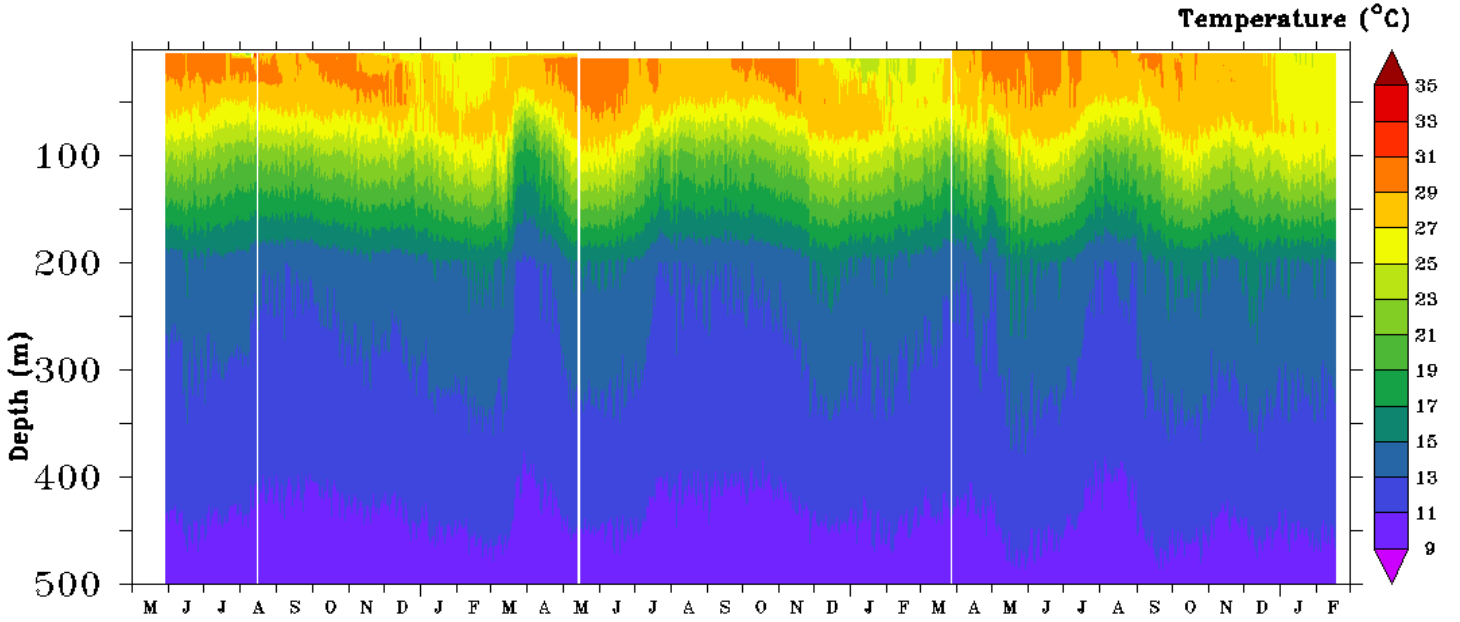


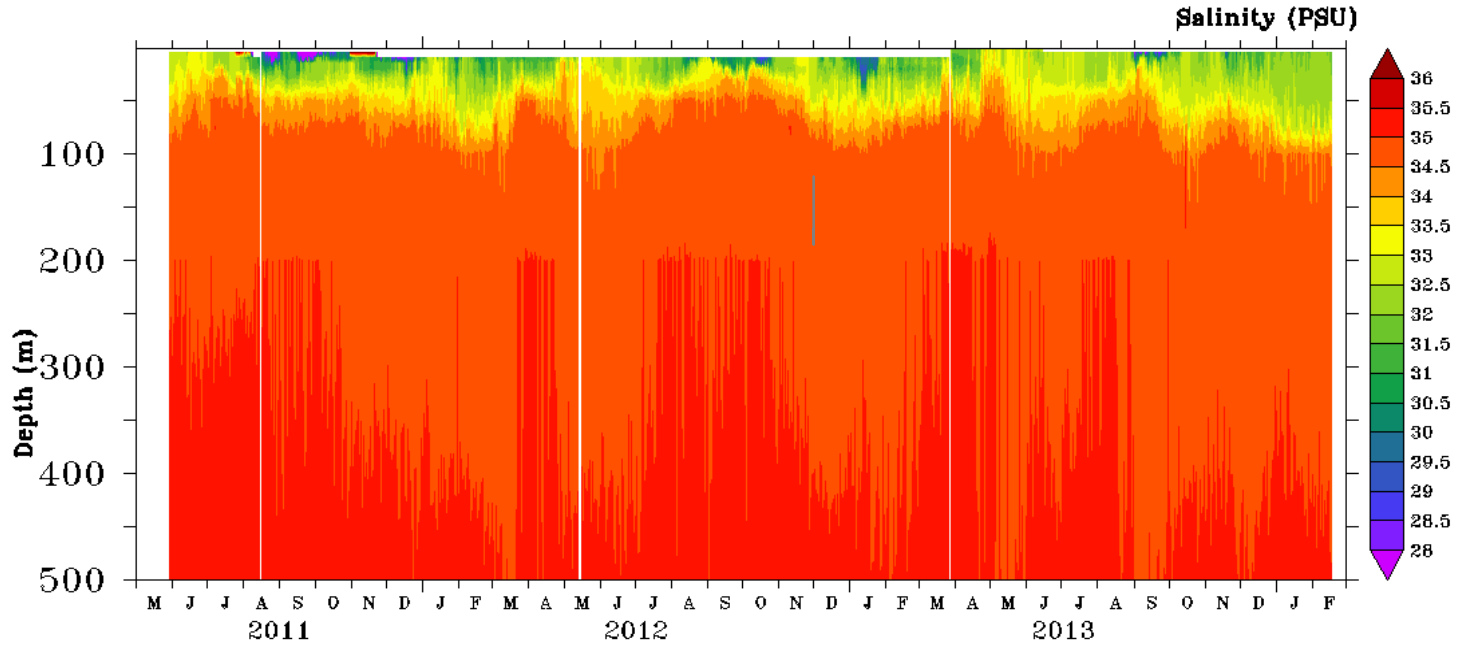
OMNI buoy deployment: Overview



BD08 (Temperature and Salinity) 18° 10′ N&89° 40′ E

Excellent subsurface data





Ongoing works...
OceanSITES delivery of OMNI data

OceanSITES status

- Data converted from instruments level to netCDF format
- Provisional QC is done
- DMQC is in progress
- Data conversion in OceanSITES (ver 1.3, 2014) format

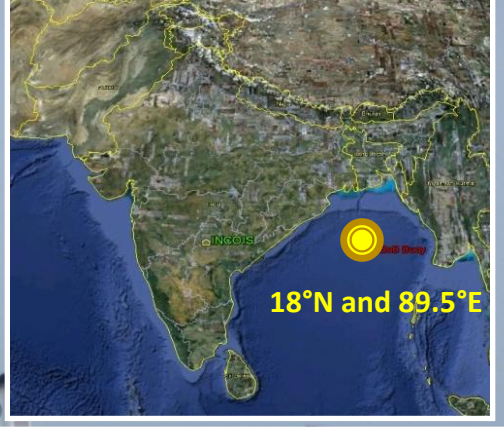
Data Delivery

- Initially GTS data in OceanSITES format

- Met parameters (humidity, Air temperature, pressure, winds) ready for conversion, SST/Surface Salinity needs to be augmented

INCOIS- Bay of Bengal Observatory

- Phase-I (Nov 2009-Nov 2010- Successfully retrieved)
- Phase-II (Deployed in Sep 2011-Could not retrieve the buoy due to vandalism)
- Phase-III (Deployed in 1st Jan, 2013-expected to retrieve during October, 2013)



Phase-III specifications:

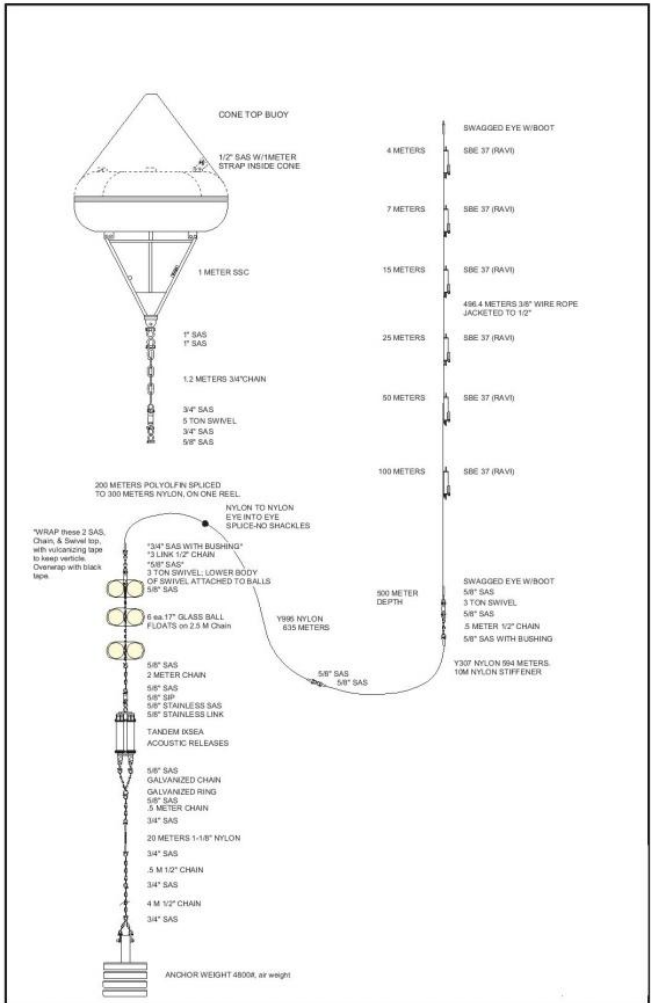
Sensors:

- 2 Doppler volume current meters (5 m & 30 m)
- 8 temperature, conductivity and pressure recorders.
  1 SSS (1m), 7 MicroCATs (1, 4, 7, 15, 25, 50 m and 100m)
- The buoy is also fitted with a ARGOS beacon to track the buoy position in case it drifts away from the watch circle (~3 Km radius)

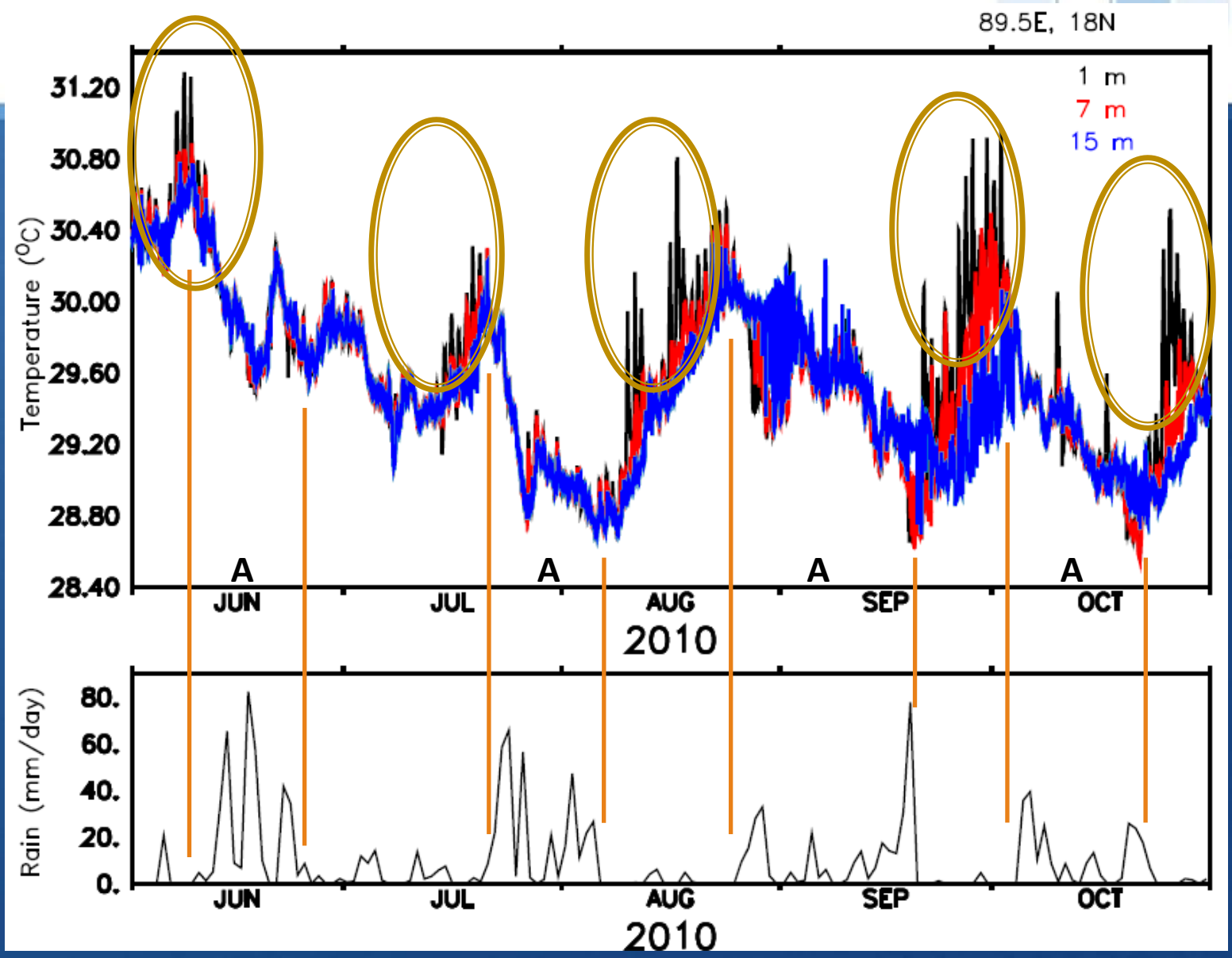
Sampling time:

- 10 minute for each sensor

The primary objective of this mooring is to understand the complex near surface thermohaline structure in the northern Bay of Bengal.



Diurnal variations of temperature during active and break phase.



Sengupta et al., (2013) manuscript under preparation

Thank You