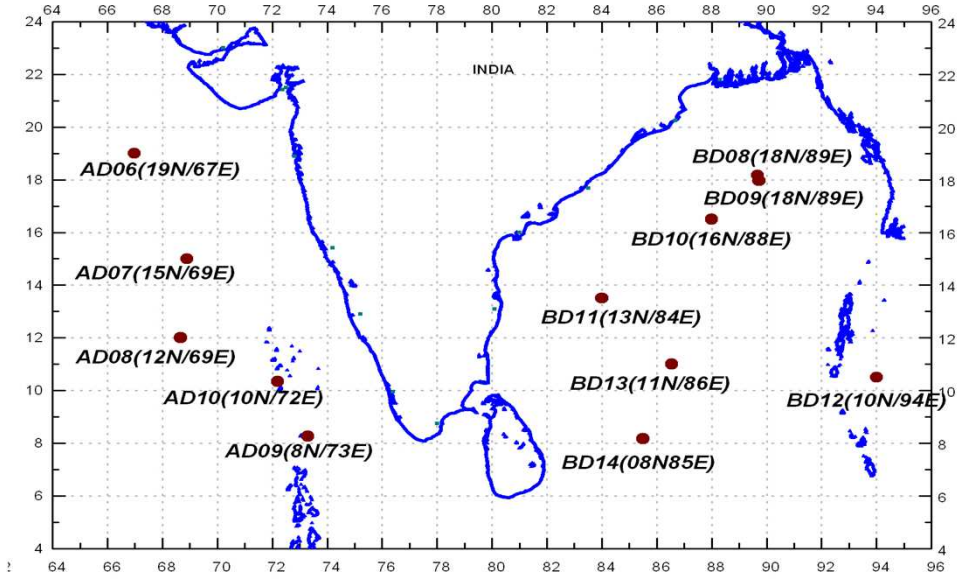
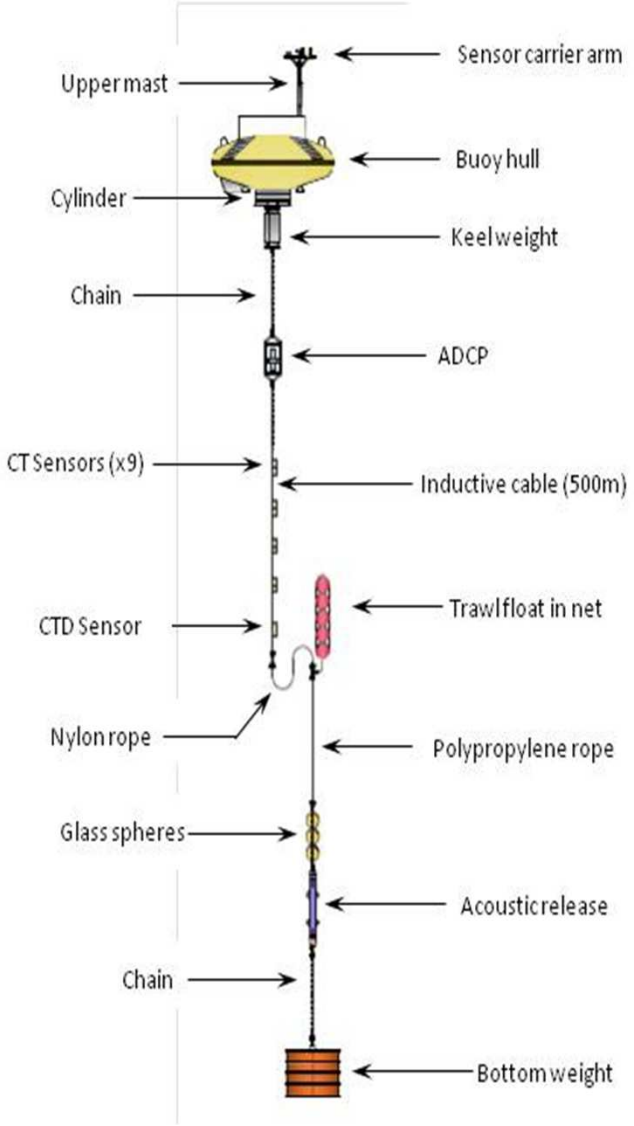
DBCP 30
S&T Workshop
NEW OBSERVATIONS OF SUBSURFACE THERMAL SALINE AND CURRENT STRUCTURE FOR THE ARABIAN SEA FROM OMNI BUOYS

R. Venkatesan
India

LOCATION OF OMNI BUOYS IN THE ARABIAN SEA AND BAY OF BENGAL

State-of-the-art data buoys to measure and transmit 76 parameters are working in Indian waters since 2010



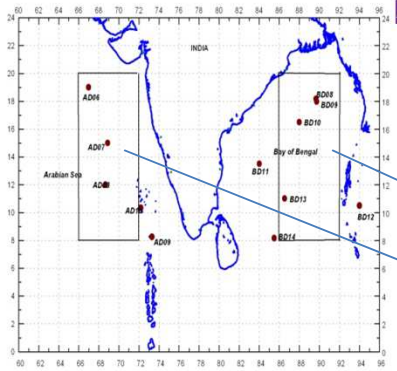


- **MET** — Air humidity, press. & temp., Incoming shortwave radiation, Down-welling long-wave radiation, Wind Speed, Gust & Direction
- **OCEAN** — Temperature, Salinity & Current
- **WAVE** — Wave height and direction

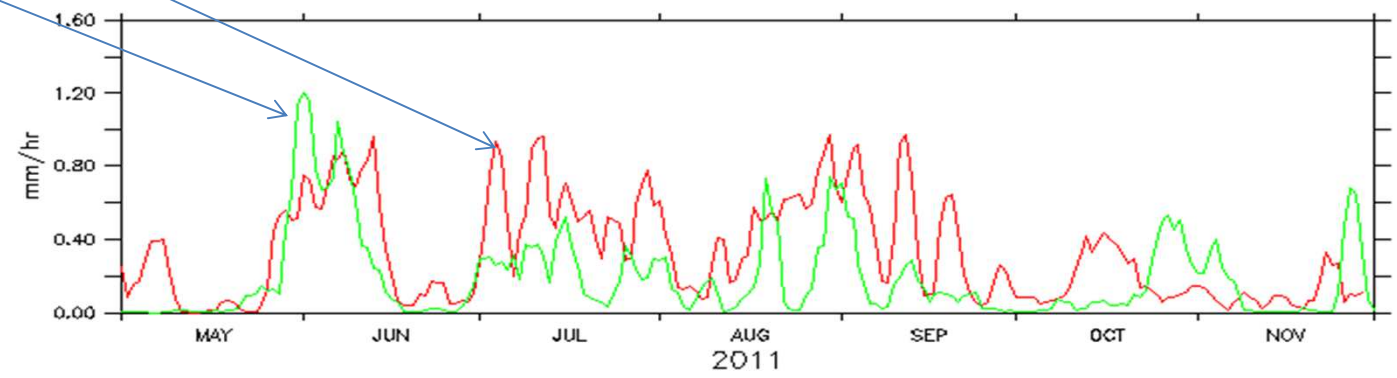
HOW ARABIAN SEA DIFFERS FROM THE BAY OF BENGAL

- The Arabian Sea receives less rain compared to Bay of Bengal, except for the west coast of India.
- Salinity near the surface in the Arabian Sea is much higher than in the Bay of Bengal because evaporation over the Arabian Sea is much greater.
- Bay of Bengal on the other hand had a large influx of fresh water from rivers like Ganges and Brahmaputra and intense rainfall during southwest monsoon results in very low salinity.
- The low-salinity surface waters in the Bay of Bengal in turn warms the surface layer which sustain the cloud system.
- The salinity of the Arabian Sea is maintained by inflow from the southern Indian Ocean as well as the westward-flowing Winter Monsoon Current that carried water from the Bay of Bengal.

LESS RAINFALL RECEIVED OVER ARABIAN SEA WHEN COMPARED AY OF BENGAL BASED ON 3DAY MEAN TMI DATA

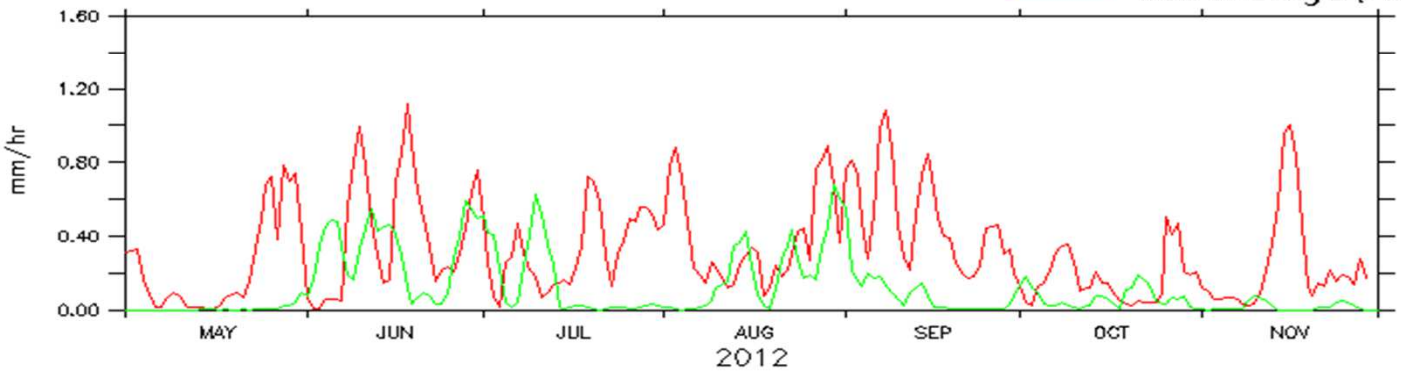


BOX AVERAGE RAINFALL OVER ARABIAN SEA AND BAY OF BENGAL



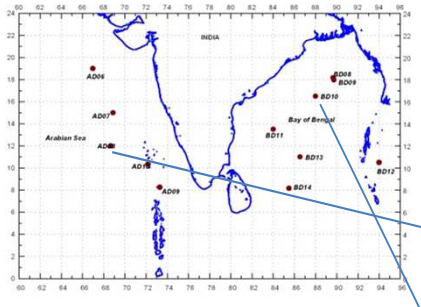
TMI 3 Day Mean Rain (mm/hr)

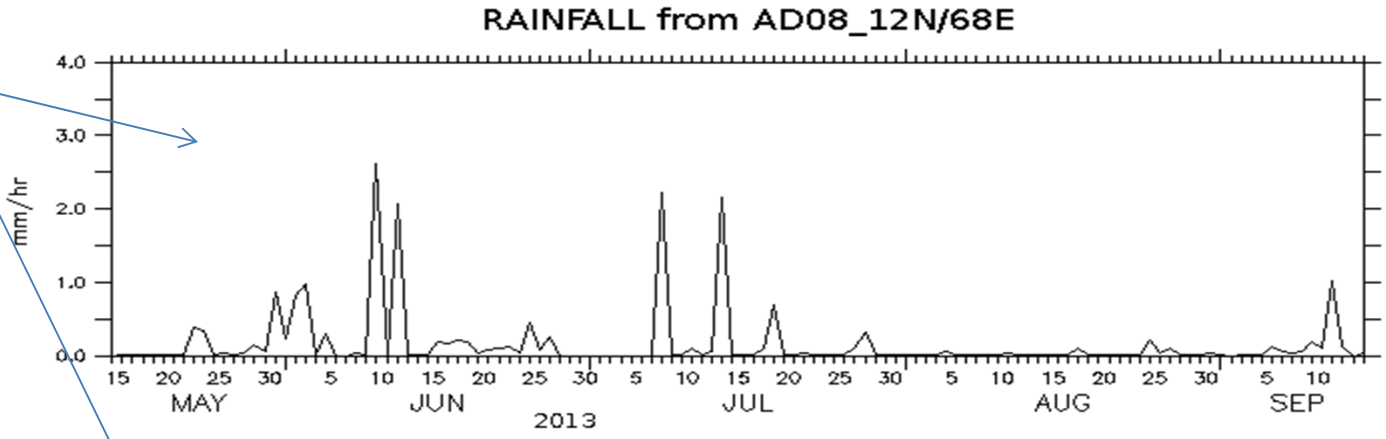
box average (BoB)
box average (AS)

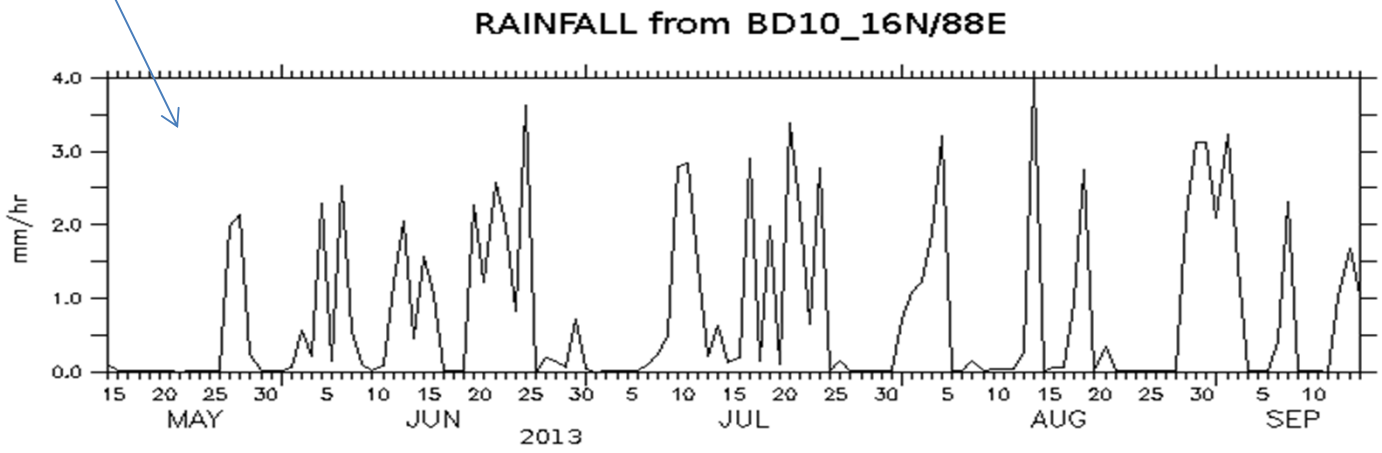


TMI 3 Day Mean Rain (mm/hr)

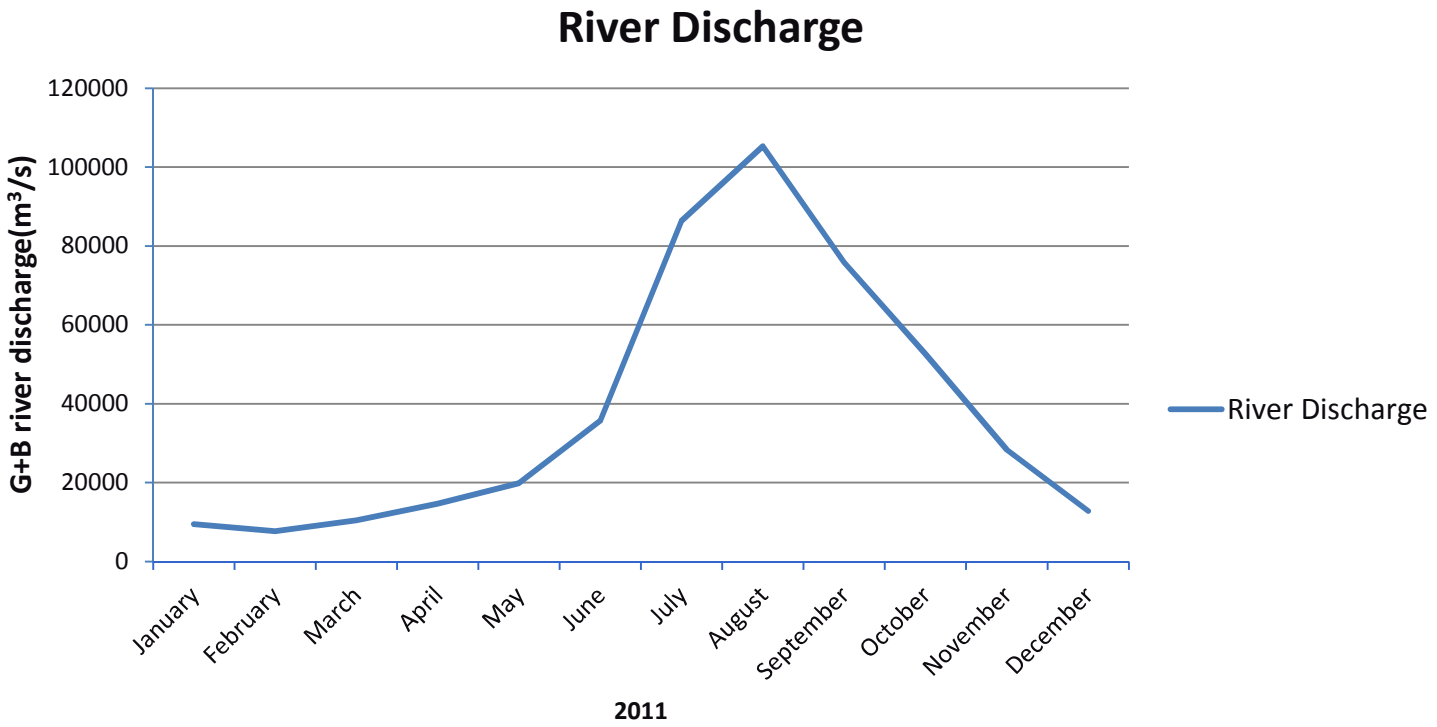
LESS RAINFALL OVER ARABIAN SEA COMPARED TO BAY OF BENGAL BASED ON OMNI BUOY RAINFALL DATA







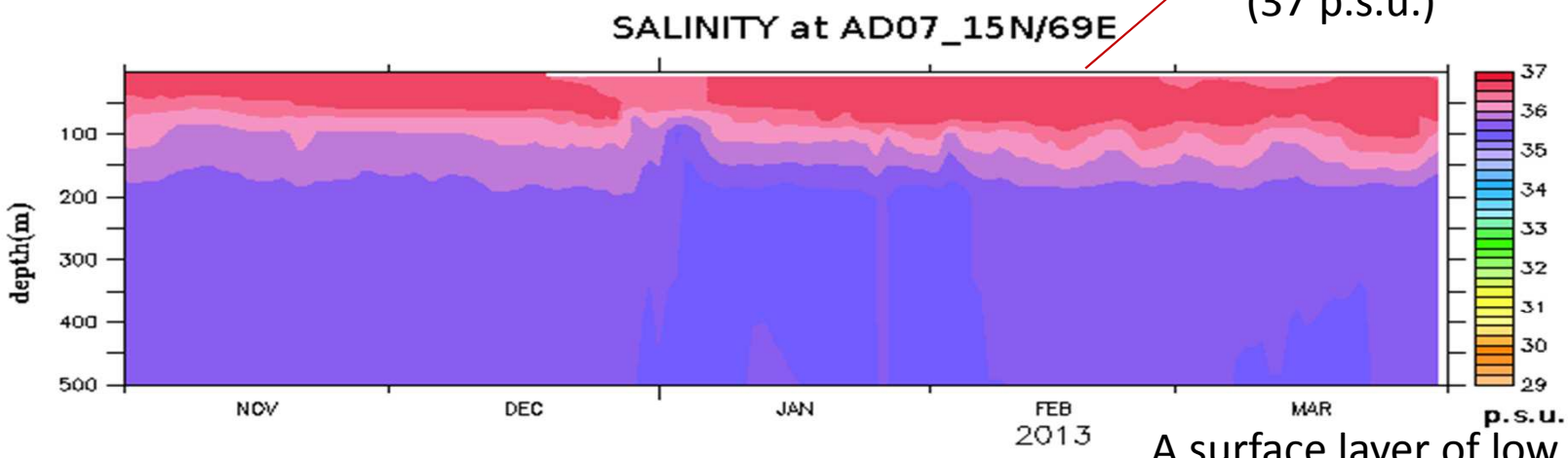
Ganges –Brahmaputra River the third largest freshwater discharge contribute ~25% of freshwater to the Bay of Bengal



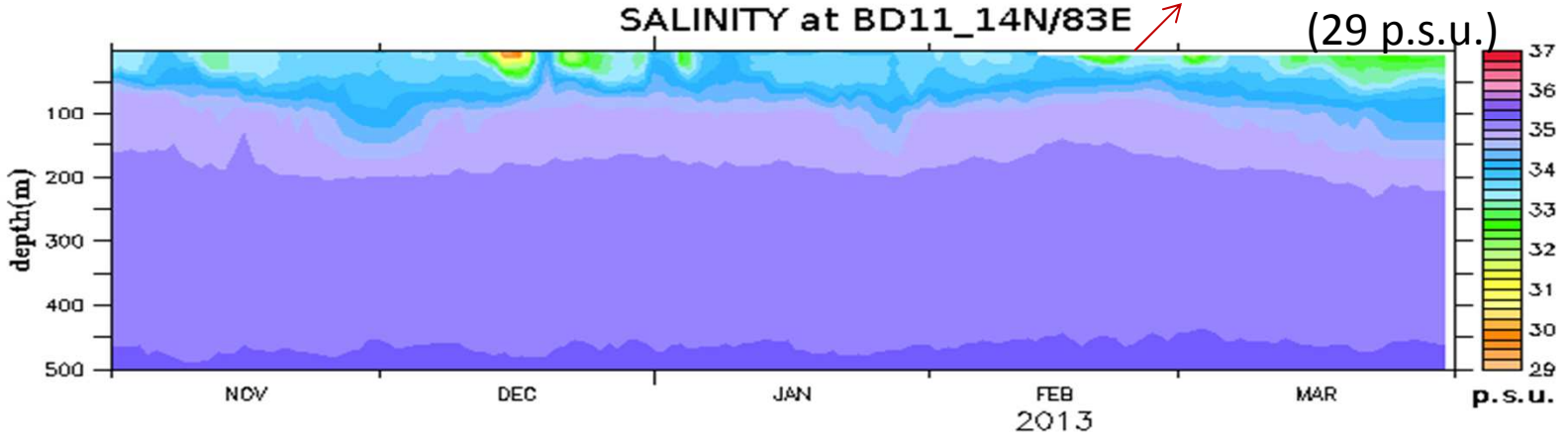
Reference : Fabien Durand et. al. , JGR, Vol. 117, 2012. Ganga-Brahmaputra river discharge from Jason-2 radar altimetry: An update to the long-term satellite-derived estimates of continental freshwater forcing flux into the Bay of Bengal

SALINITY STRUCTURE DIFFERENCE IN THE ARABIAN SEA AND BAY OF BENGAL

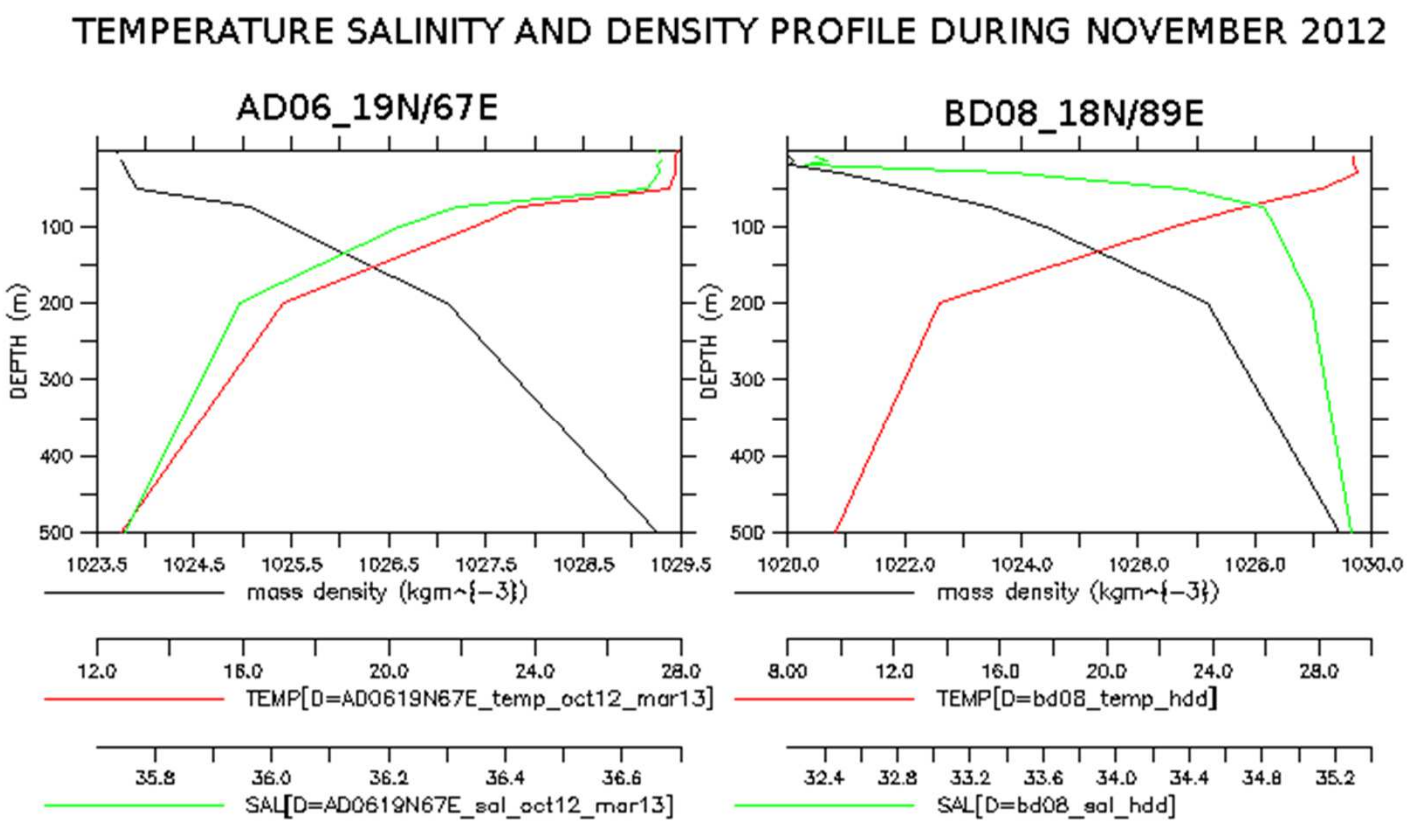
A surface layer of high Salinity in the Arabian Sea (37 p.s.u.)



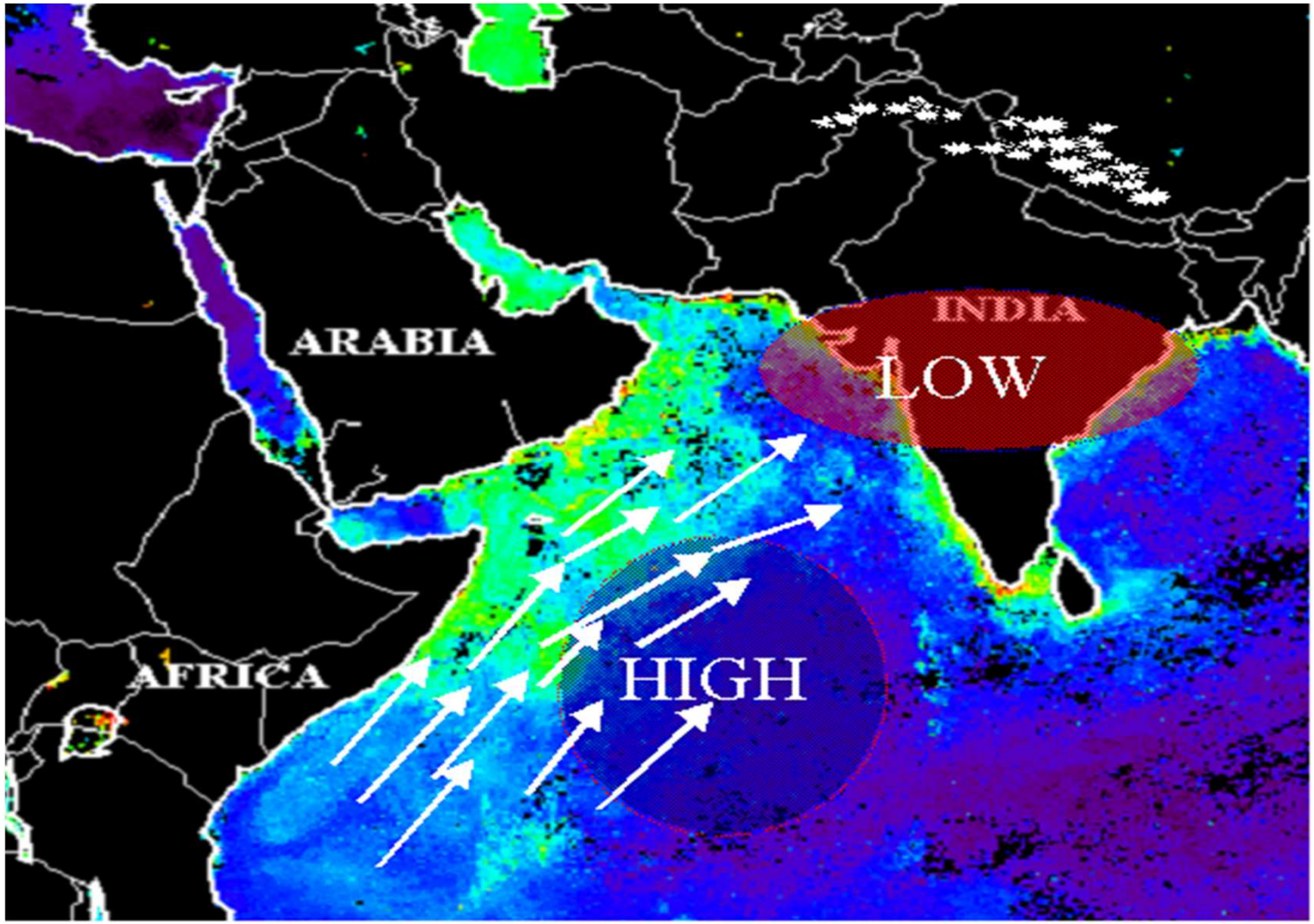
A surface layer of low Salinity in the Bay of Bengal (29 p.s.u.)



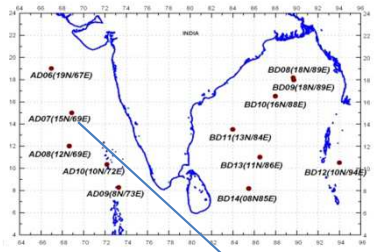
DENSITY OF BAY OF BENGAL WATERS ARE DETERMINED MANILY BY THE SALINITY

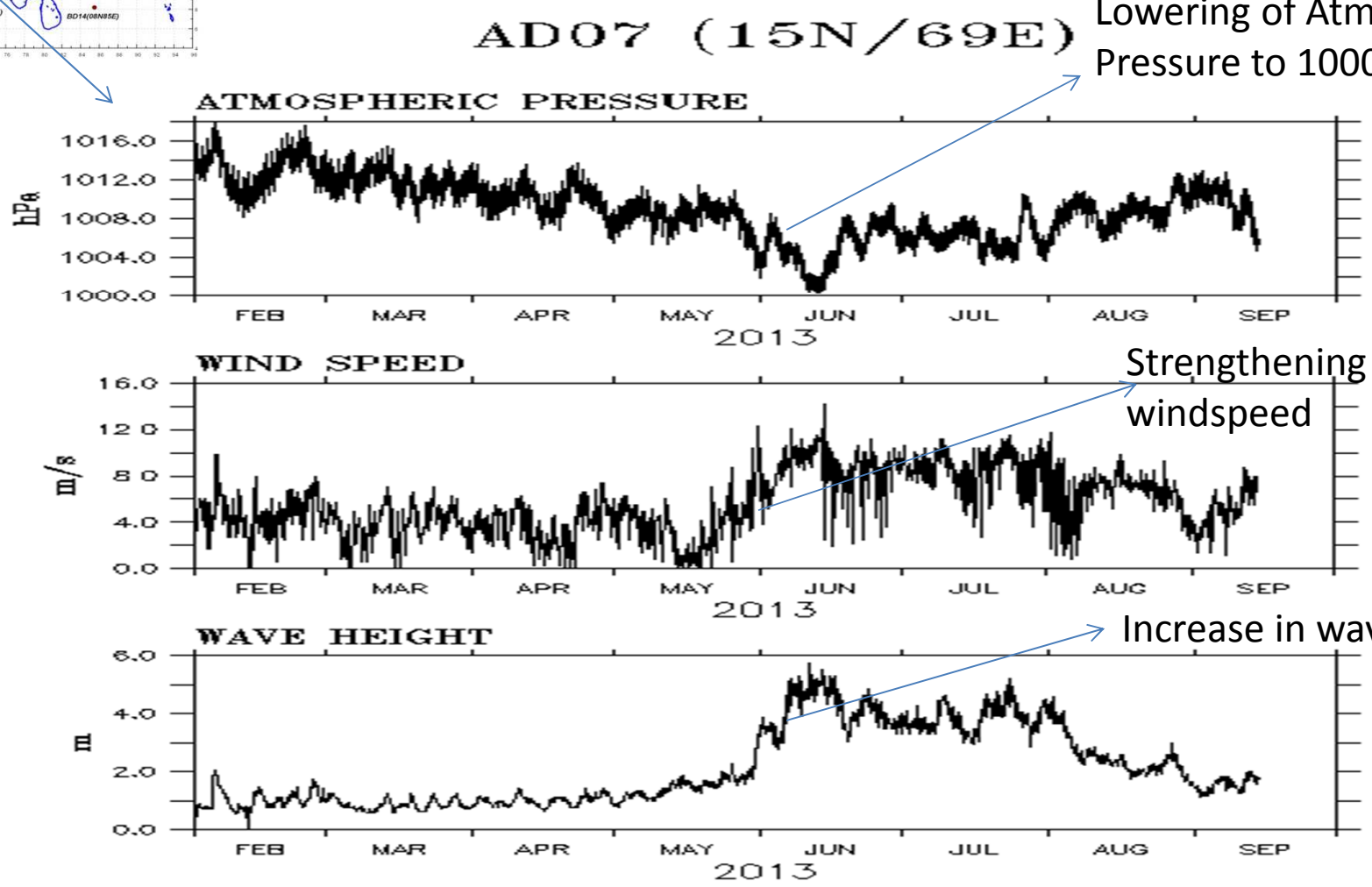


ONSET OF SOUTHWEST MONSOON WITH THE LOW PRESSURE PREVAILING OVER THE NORTHERN INDIA



MONSOON ONSET IN THE ARABAIN SEA



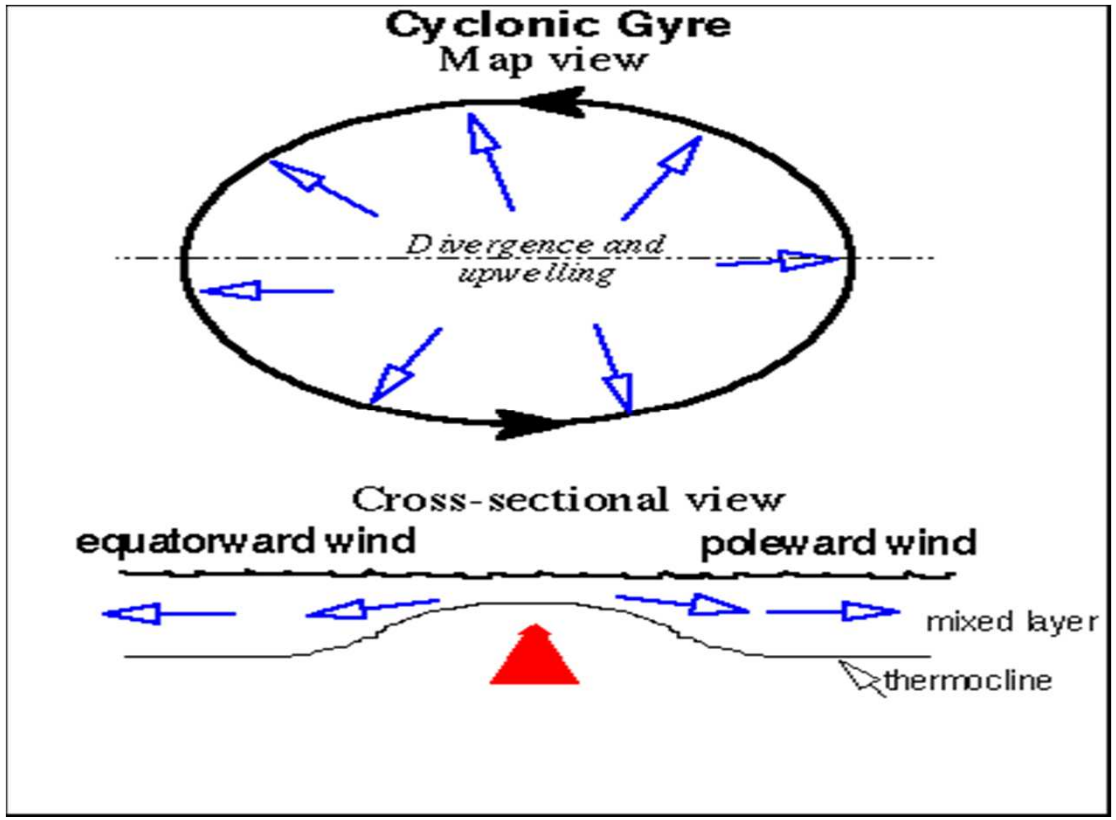


Lowering of Atmospheric Pressure to 1000hPa

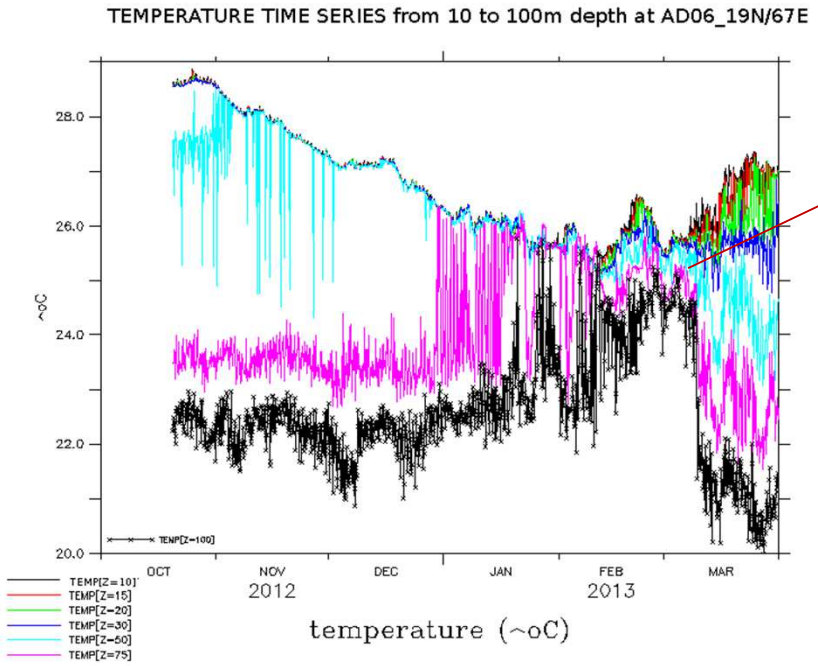
Strengthening of the windspeed

Increase in waveheight

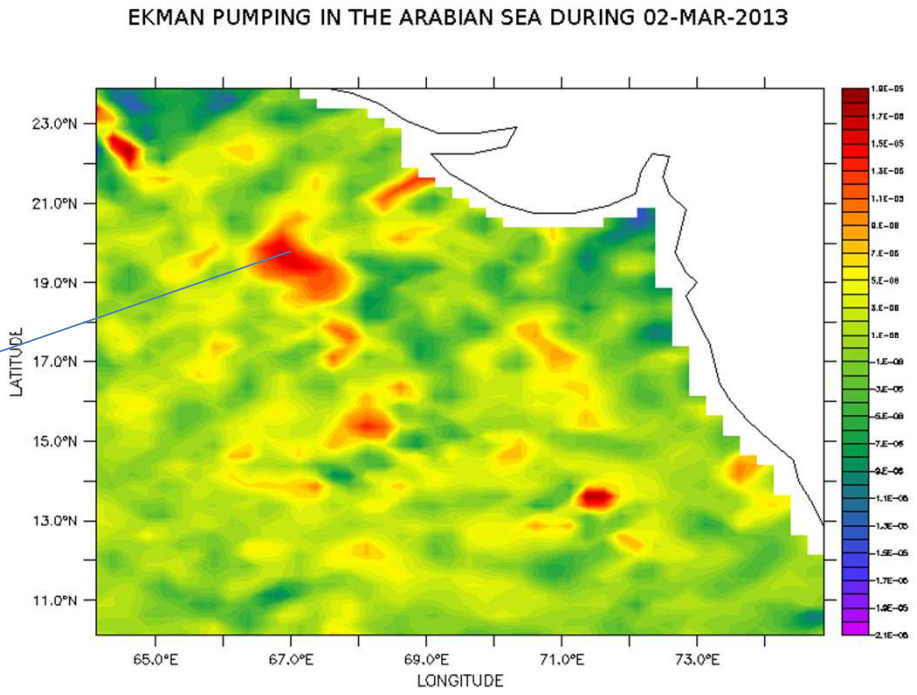
OPEN OCEAN UPWELLING DRIVEN BY THE DIVERGENCE IN THE WIND FORCING



STRONG MIXING IN THE OPEN OCEAN DUE TO WIND DRIVEN UPWELLING IN THE ARABIAN SEA



Strong mixing upto 100m depth which raises the temperature at 100m depth to the surface value.



Strong positive Ekman pumping driven by the divergence in the open ocean.

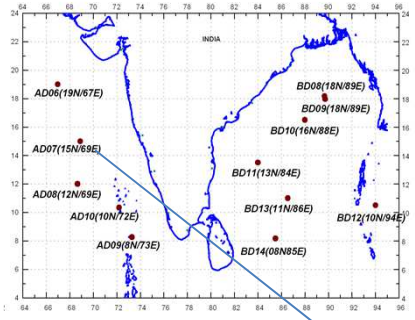
$W_E = 1/\rho f * (\partial\tau_y/\partial x - \partial\tau_x/\partial y)$

τ is the wind stress term

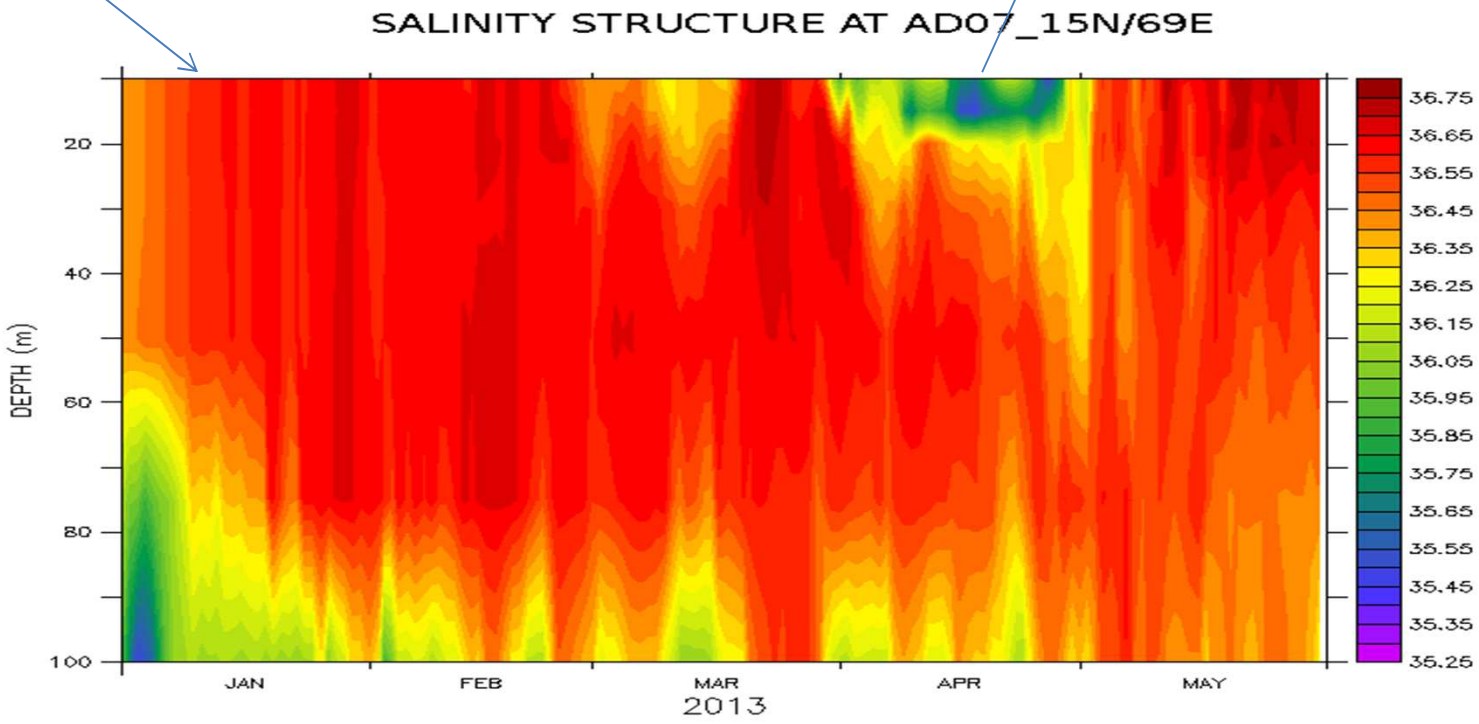
ρ is the density of the sea water

f is the Coriolis parameter

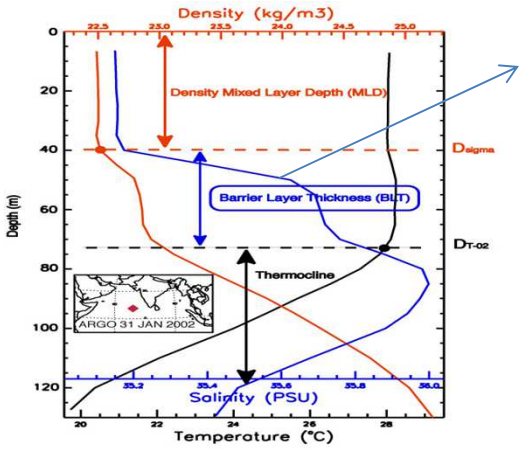
POCKETS OF LOW SALINE WATERS ARE OBSERVED IN THE ARABIAN SEA DURING THE MONTH OF APRIL-2013



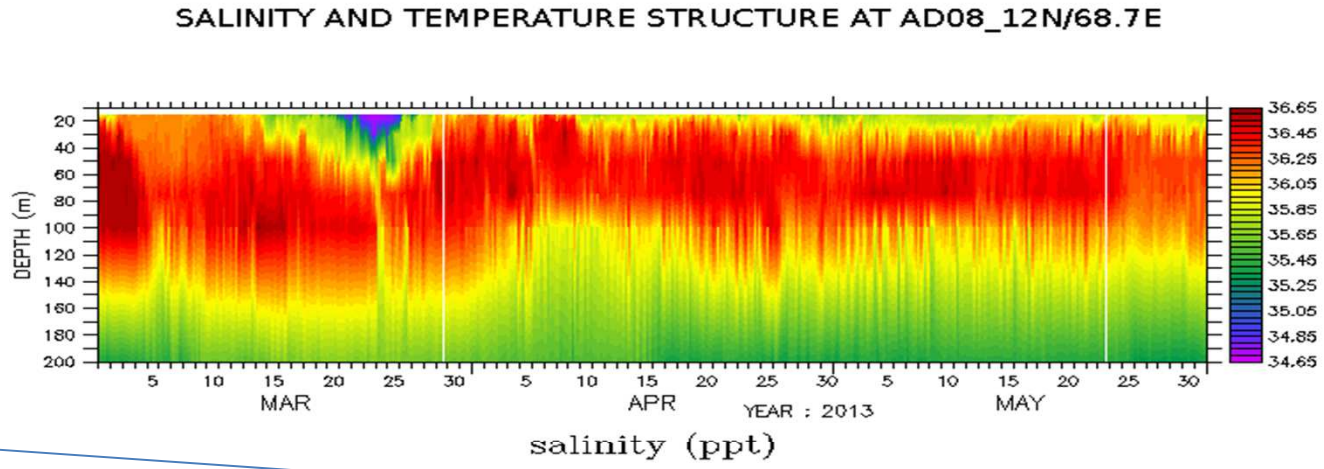
LOW SURFACE SALINE WATERS OF 35.5 p.s.u. OBSERVED IN THE CENTRAL ARABIAN SEA



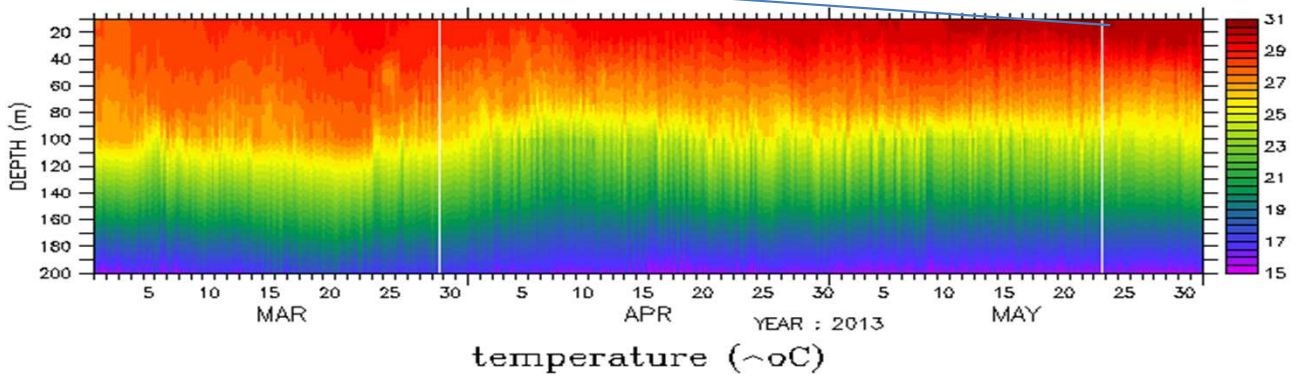
BARRIER LAYER FORMATION DURING THE SUMMER TRANSITION PERIOD (APRIL-MAY) - HIGH SUB-SURFACE SALINE WATERS INDUCED WARMING OF THE SURFACE



Barrier layer - formed by the high sub-surface salinity



Surface temperature Increased upto 31°C



CONCLUDING REMARKS

- The uninterrupted sea truth data from the Arabian Sea is very helpful to study the onset of monsoon.
- The strong wind forced mixing which induces strong mixing in the open ocean helps to mix the waters deep upto 100m depth.
- Pockets of low saline waters is also observed in the Arabian Sea during the pre-monsoon period.

Thank you for your kind attention