OSF

CUSTOMISED OPERATIONAL PRODUCTS

Dr.R.Harikumar
Scientist & In-charge, OSF services

Training on OSF services for trainers and operators, 26-27 November 2014

HIGH IMPACT MAJOR PRODUCTS

- Forecast along ship-routes
- Forecast for Port and Harbours
- Web Map Services
- Off-shore windfarm advisory (w.s.r.t. Potential & bathemetry)

- WPA-ONGC
- Coastal data for Navy (DG Varsha)
- IVL for GMB, Goa
- OSF for Maldives
- OOSA (Online Oil Spill Advisory)

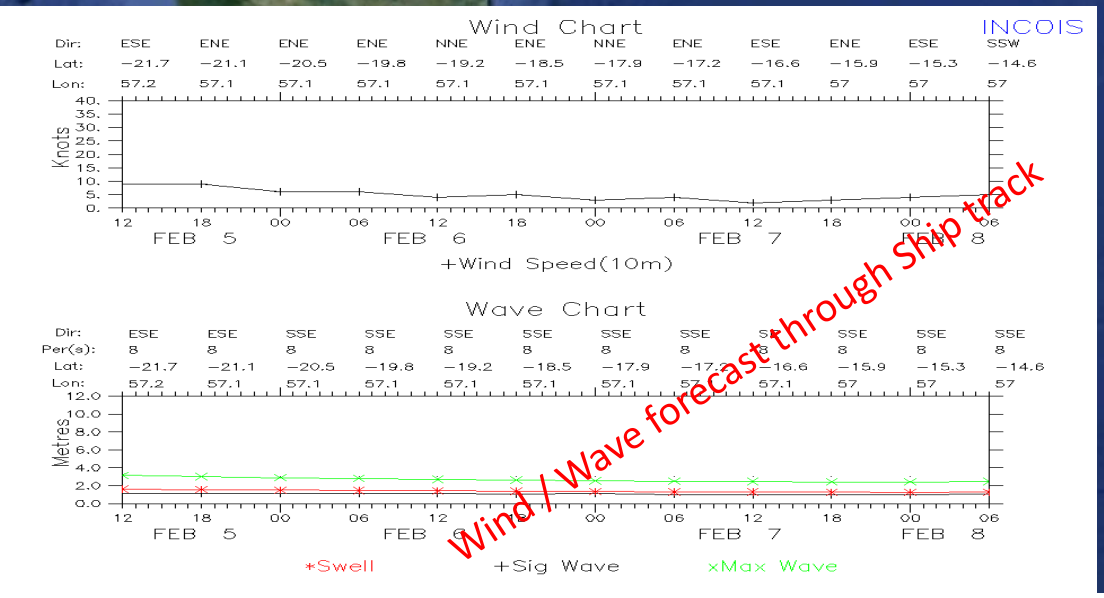
Forecast for Shipping industry

Notes:PLEASE CONTINUE TO UPDATE US YOUR POSITION. REGARDS. DUTY FORECASTER.

Forecast:

ValidAt	Lon	Lat	Wind Dir	Wind speed	Wind/Wa	Swell Dir	Swell Height	Swell period	Sig Height	MaxWave
05-FEB-2012 12	57.20	-21.79	ESE	9	1.14	ESE	1.63	7.92	1.15	3.14
05-FEB-2012 18	57.18	-21.15	ENE	9	1.06	ESE	1.56	7.95	1.15	3.02
06-FEB-2012 00	57.17	-20.50	ENE	6	0.95	SSE	1.51	7.84	1.16	2.90
06-FEB-2012 06	57.16	-19.85	ENE	6	0.89	SSE	1.46	7.81	1.15	2.81
06-FEB-2012 12	57.15	-19.20	NNE	4	0.80	SSE	1.42	7.75	1.16	2.72
06-FEB-2012 18	57.14	-18.55	ENE	5	0.86	SSE	1.38	8.02	1.07	2.64
07-FEB-2012 00	57.12	-17.90	NNE	3	0.71	SSE	1.34	7.72	1.13	2.57
07-FEB-2012 06	57.11	-17.25	ENE	4	0.81	SSE	1.31	7.89	1.02	2.51
07-FEB-2012 12	57.10	-16.60	ESE	2	0.80	SE	1.28	7.90	1.00	2.46
07-FEB-2012 18	57.09	-15.96	ENE	3	0.79	SSE	1.27	7.80	0.98	2.43
08-FEB-2012 00	57.08	-15.31	SE	4	0.76	SSE	1.26	7.68	1.00	2.42
08-FEB-2012 06	57.06	-14.66	SSW	5	0.67	SSE	1.27	7.52	1.07	2.45

Notes: Wind speeds are in Knots. Wave heights are in metres. The significatnt wave height is defi
the average of the highest 1/3rd of waves.The Maximum wave height is the average of the highest
Forecaster: Krishna Prasad B - INCOIS



Wind / Wave forecast through Ship track

भारतीय नौवहन निगम लिमिटेड

THE SHIPPING CORPORATION OF INDIA LIMITED

(A Govt. of India Enterprise)
Jawahar Building 17, Rajaji Salai, Chennai - 600 001.
Phone: 2523 1401 (10 Lines)
Fax: 044 - 2523 1218

MV.SWARAJDWEEP
AT: PORTBLAIR
DATE: 23-06-2012

TO

Dr.K.SRINIVAS (SCIENTIST),
OSF LAB,
INCOIS,
HYDERABAD.

Respected Sir,

I, the Master of MV.Swarajdweep would like to thank you and your entire team for sending weather report data with clear images to our vessels. The weather data/images are very accurate and useful which keeps us updated during sailings. The weather report is very important for our passenger vessels sailing always in low pressure areas like Andaman sea.

I, behalf of my Officer's and Crew members of MV.Swarajdweep sincerely appreciate and thank you and your entire team for rendering us your valuable services for last many years.

Thanking you,

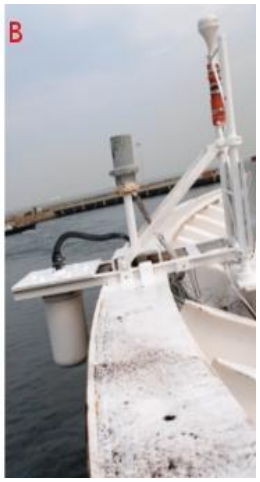
With Best Regards,
Master MV.Swarajdweep.

MASTER
MV SWARAJ DWEEP

Feedback...

Validation of forecast through ship routes

Ship-mounted Wave height meter

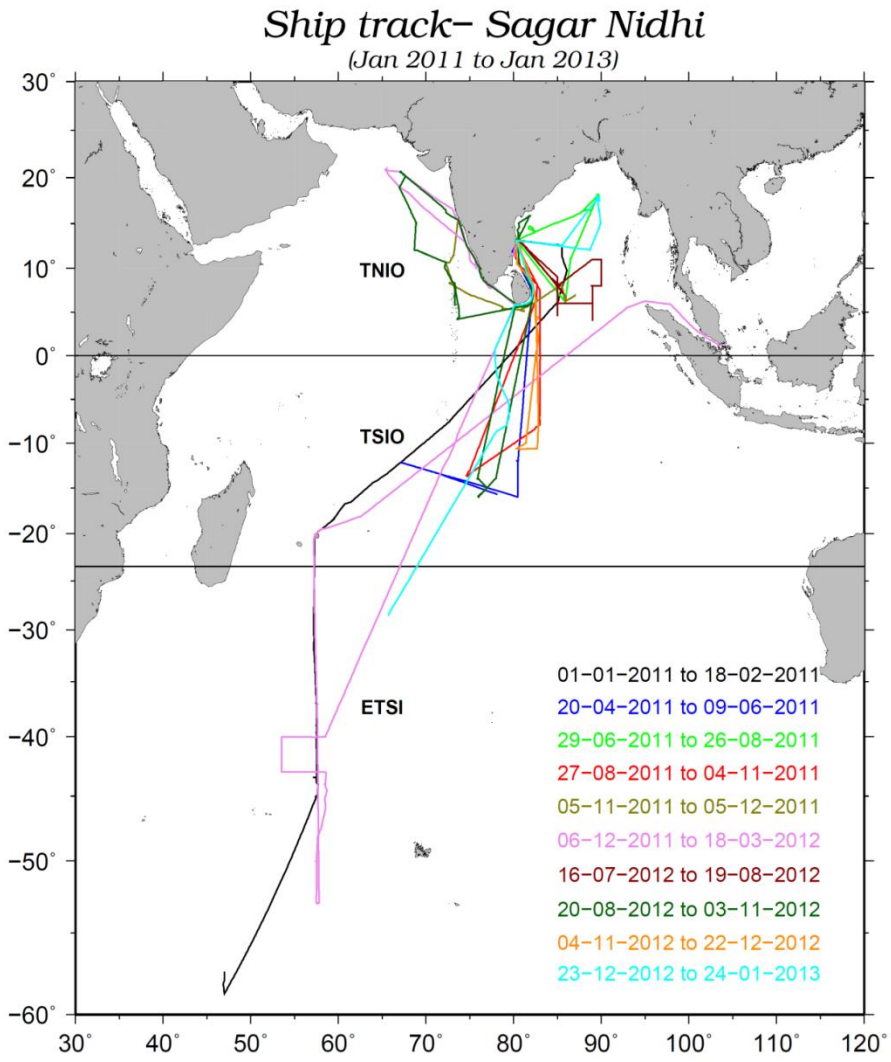


Wave Height Meter Installed onboard ORV Sagar Nidhi

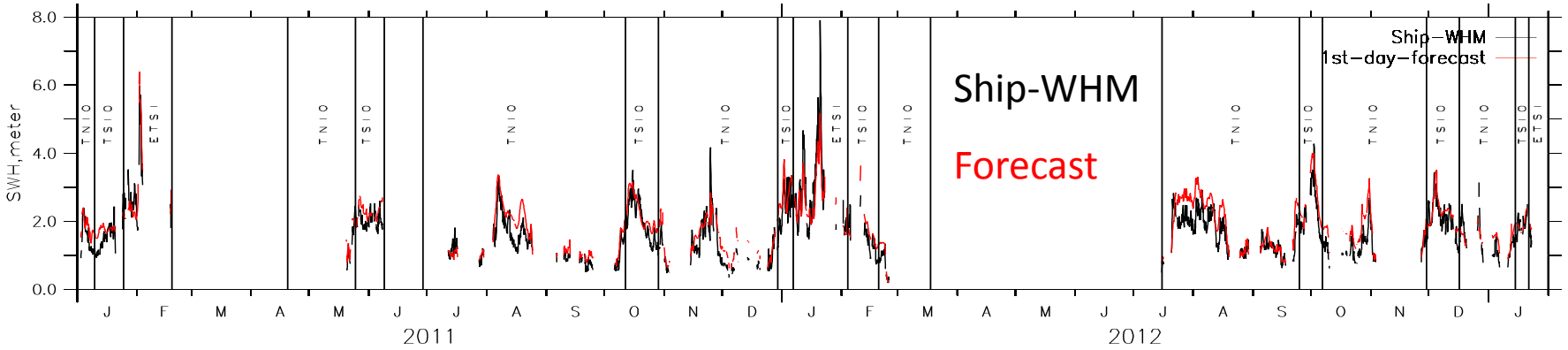
TNIO – Tropical Northern Indian Ocean

TSIO – Tropical Southern Indian Ocean

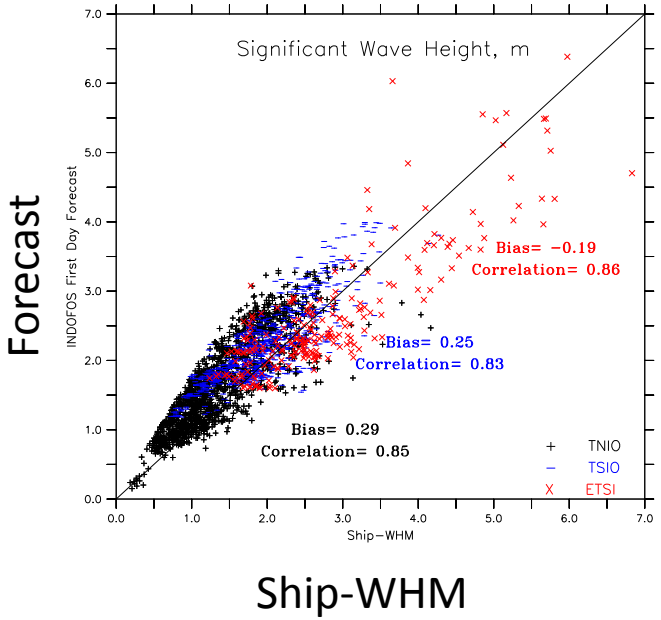
ETSI – Extra Tropical Southern Indian ocean



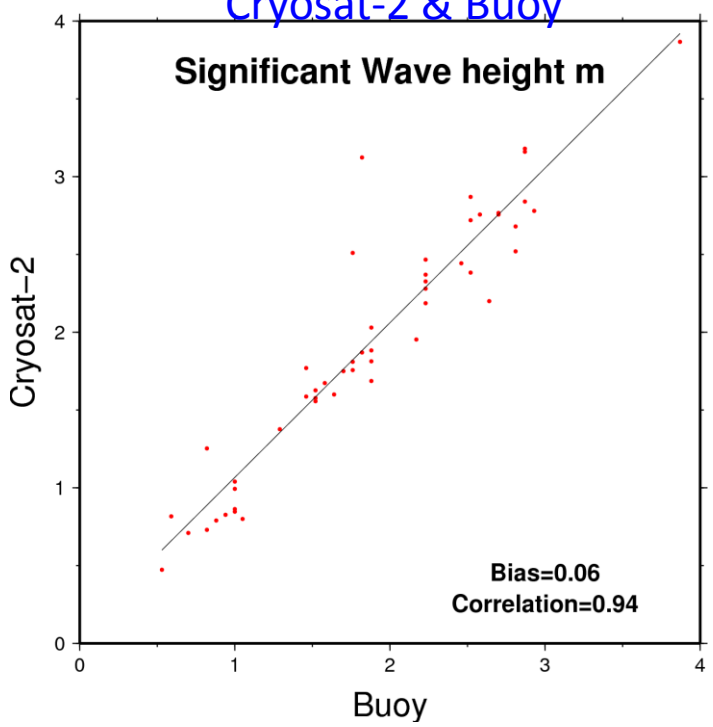
Ship forecast vs WHM



Mean bias(m)	0.12	0.40		0.25	0.25	−0.06	0.45	0.20	0.26	0.12	0.36	−0.11	0.19		0.43	0.41	0.17	0.53	0.15	0.09	0.21
Correlation	0.83	0.92		0.82	0.32	0.46	0.81	0.67	0.91	0.85	0.86	0.83	0.82		0.66	0.87	0.85	0.96	0.92	0.74	0.79



Cryosat-2 & Buoy



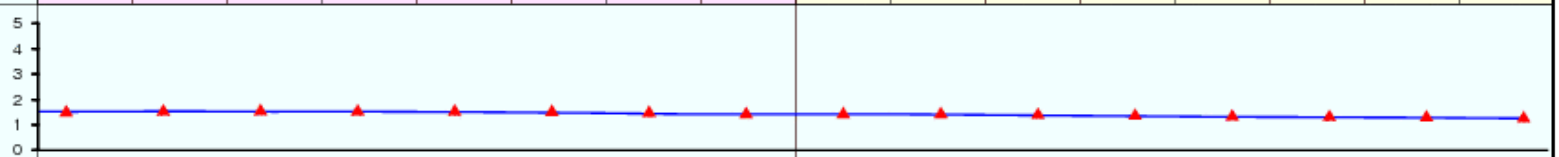
The forecast wave parameter with SI of less than 30% is widely accepted by the user community for operational planning (*Woodcock & Greenslade, 2007*).

Forecast for Port and Harbours

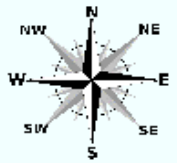
Okha Port – Gujarat

48 hr Sea State Forecast, Issued on: Tuesday 26 August 2014

INCOIS

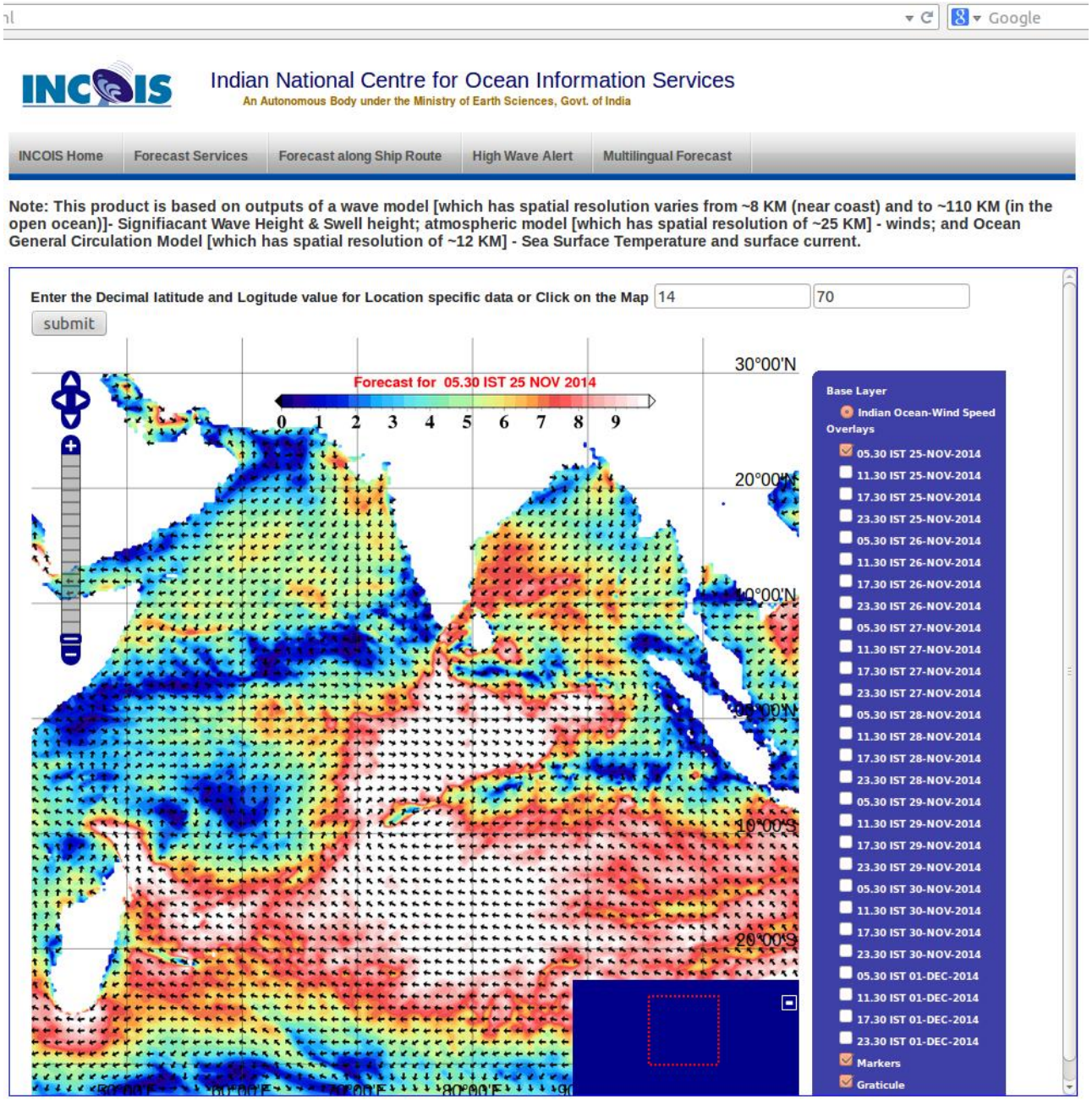
Date	Wednesday 27–08–2014								Thursday 28–08–2014							
Time (IST)	02.30 AM	05.30 AM	08.30 AM	11.30 AM	02.30 PM	05.30 PM	08.30 PM	11.30 PM	02.30 AM	05.30 AM	08.30 AM	11.30 AM	02.30 PM	05.30 PM	08.30 PM	11.30 PM
Significant Wave Height (m) & direction	1.5 NE	1.5 ENE	1.5 ENE	1.5 ENE	1.5 ENE	1.5 ENE	1.5 ENE	1.4 ENE	1.4 ENE	1.4 ENE	1.4 ENE	1.4 ENE	1.3 ENE	1.3 ENE	1.3 ENE	1.2 NE
Wave Period(s)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7
Significant Wave Height (m)																
Wind Speed(kmph) & direction	27 ENE	31 E	27 E	29 E	28 E	29 E	25 ENE	22 ENE	24 E	23 E	22 ESE	16 ENE	19 ENE	18 ENE	17 ENE	16 ENE
Swell Height (m) & direction	1.0 NNE	0.9 NNE	0.9 NNE	0.9 NNE	0.9 NNE	0.9 NNE	0.9 NE	0.9 NE	0.9 NE	0.9 NE	0.8 NE	0.8 NE	0.8 NE	0.8 NE	0.8 NE	0.8 NE
Time (IST)	05.30 AM		11.30 AM		05.30 PM		11.30 PM		05.30 AM		11.30 AM		05.30 PM		11.30 PM	
Current (cm/s) & direction	21 NNW		23 NW		24 NW		21 NW		19 NNW		17 NW		19 NW		18 NNW	
Tide Height (m)	2.04		2.23		0.73		3.36		1.60		2.72		0.16		3.58	

Note: The closest Tidal prediction station is Okha. Arrows indicate direction.



Disclaimer: The forecast products and the conclusions drawn thereof are mainly based on different mathematical models being run at INCOIS.

WEB MAP SERVICES



Value-added consultancy services

Advisory to offshore wind farming

Back groud…

Advisory to offshore wind farming

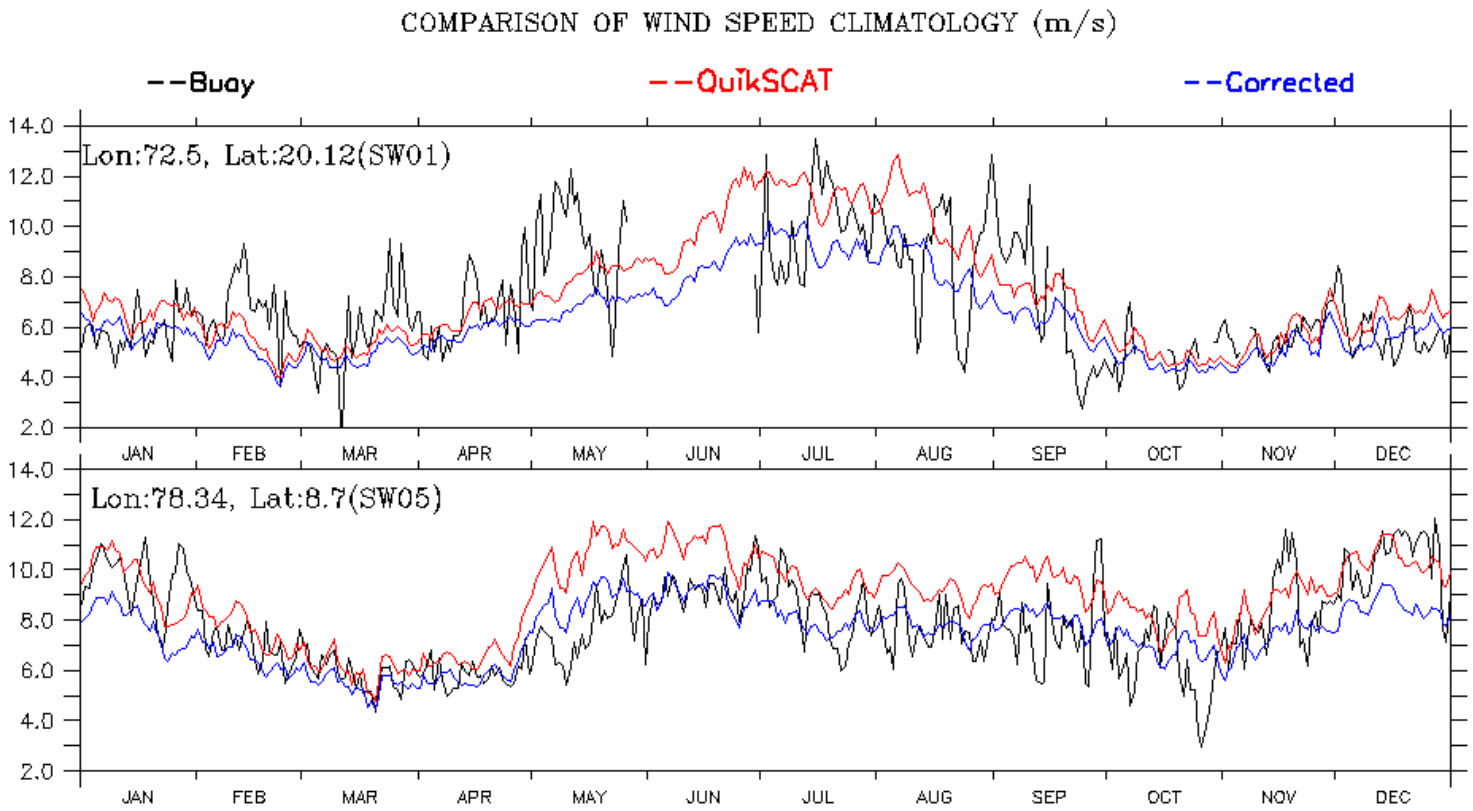
- INCOIS is the main member of Offshore Wind Steering Committee (OWSC)

Methodology

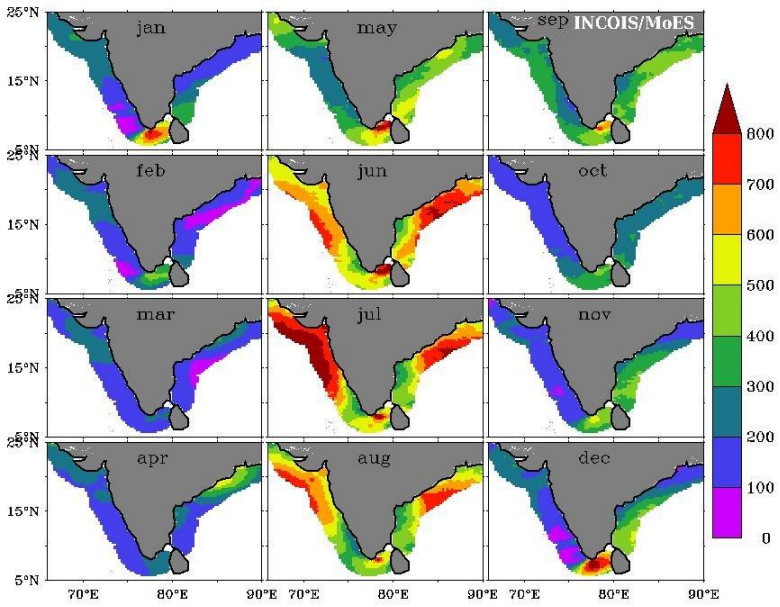
- The buoy wind at 10 metre has been derived following Monin and Obukhov (1954).
- The buoy data is averaged over a day and compared with QuikSCAT.
- QuikSCAT wind has been validated using five available coastal Buoys.
- Average bias has been found out.
- This average bias (for each wind range) has been removed from all the coastal grids of QuikSCAT data.
- Daily climatologies (of 80 m wind) have been found out for the exceedance of wind speed from a particular value (>3, >6, >8, >10, > 12 m/s).
- Wind energy potential maps and also Wind Power Density (WPD) maps are made.
- Potential wind regions has been identified.

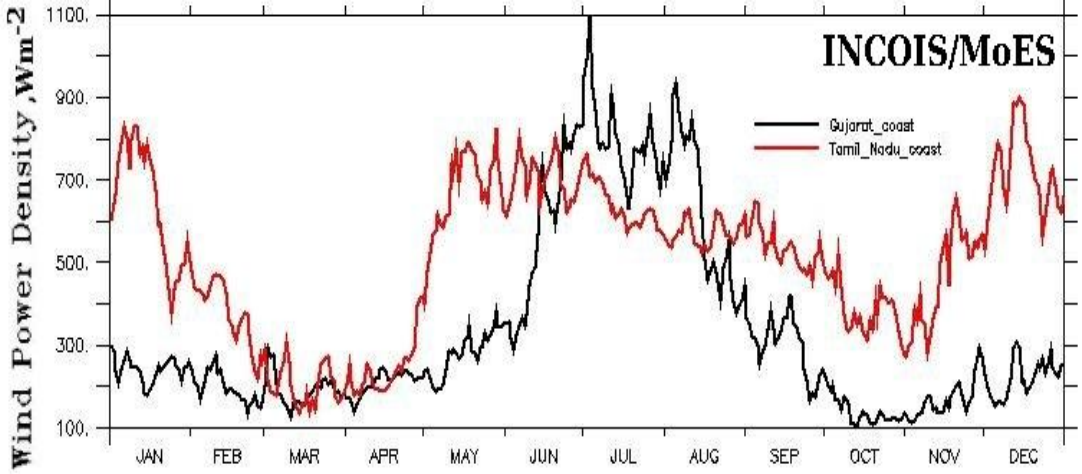
• Location-specific 7-day wind, wave and current forecasts are requested recently…

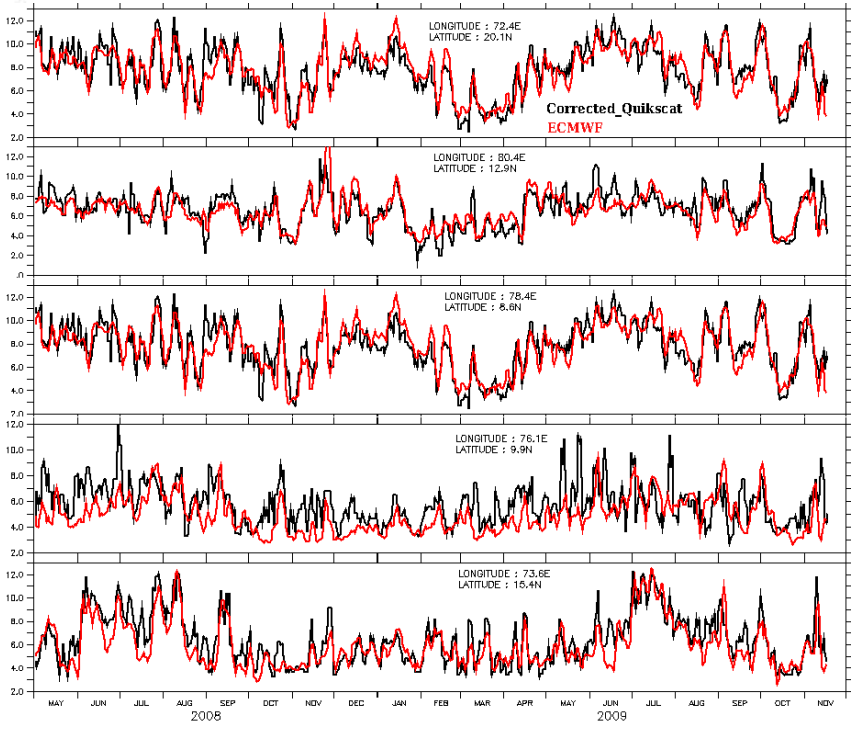
Daily climatology of wind speeds at 80 metre height derived from the buoy data and from the bias corrected QuikSCAT data



Wind Power Density map







Wind at 80 m

Corrected QuikSCAT

ECMWF

Conclusion

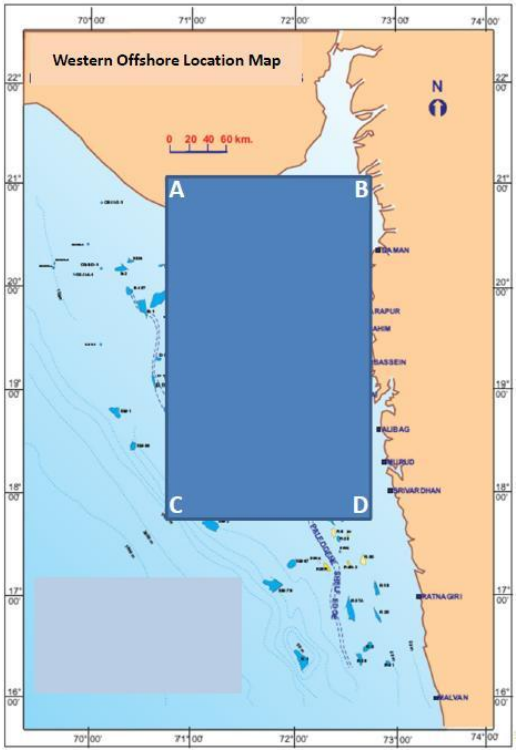
- High Resolution Wind atlas is prepared.
- Southern coast of Tamil Nadu and the coast of Gujarat-Maharashtra are the two areas of high wind potential.
- ERA-Interim wind is found to be a best asset for WRA at heights

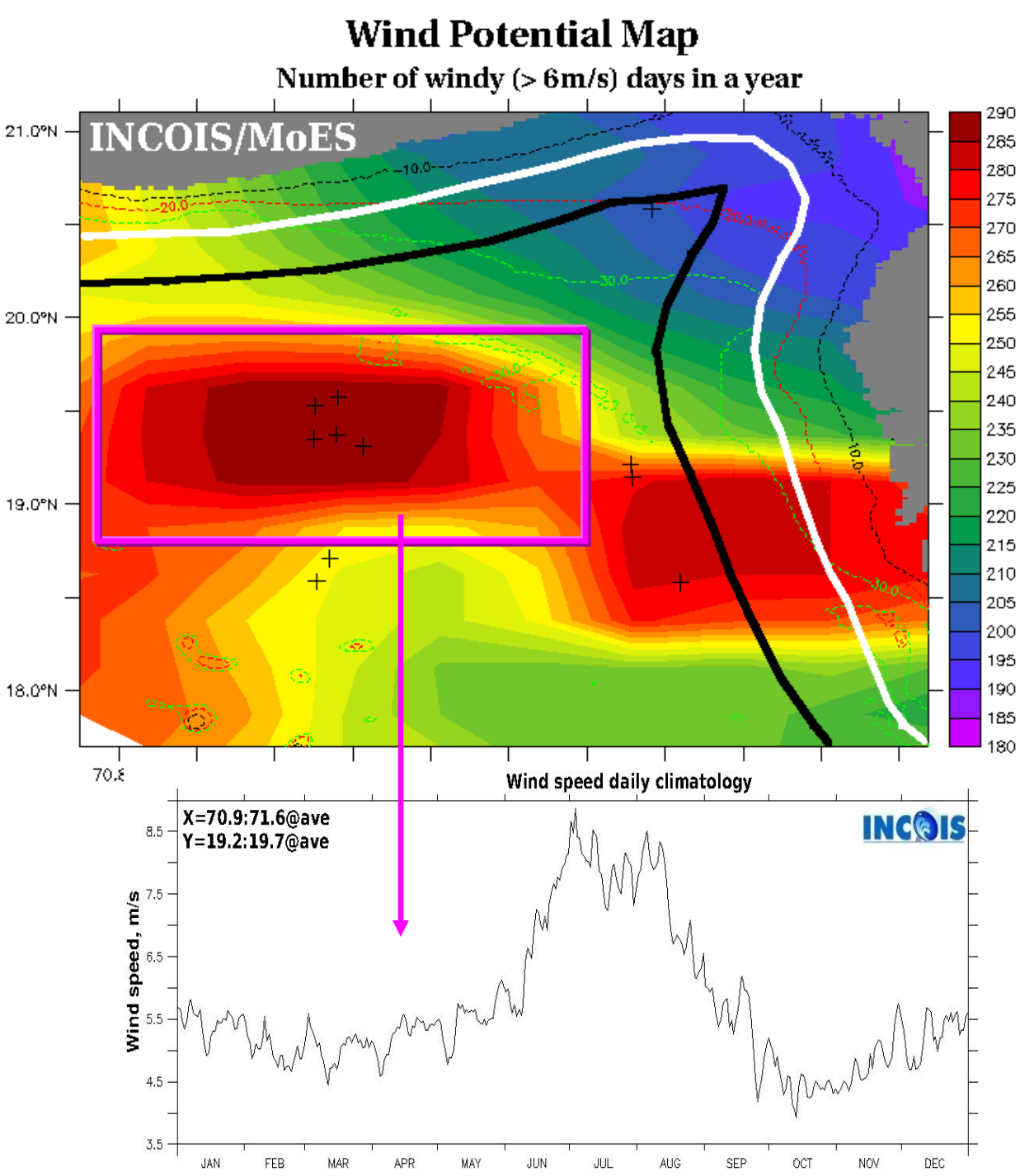
R. Harikumar, L.Sabique, T.M. Balakrishnan Nair and S.S.C. Shenoi, 'A preliminary Report on the Potential of winds along the Indian coast for offshore wind farming', INCOIS Report No.: INCOIS-MOG&ISG-OSF-TR-2010-01, 2010

R. Harikumar, L.Sabique, T.M. Balakrishnan Nair and S.S.C. Shenoi, 'Report on the assessment of wind energy potential along the Indian coast for offshore wind farm advisories', INCOIS Report No.: INCOIS-MOG&ISG-OSF-TR-2011-07, 2011

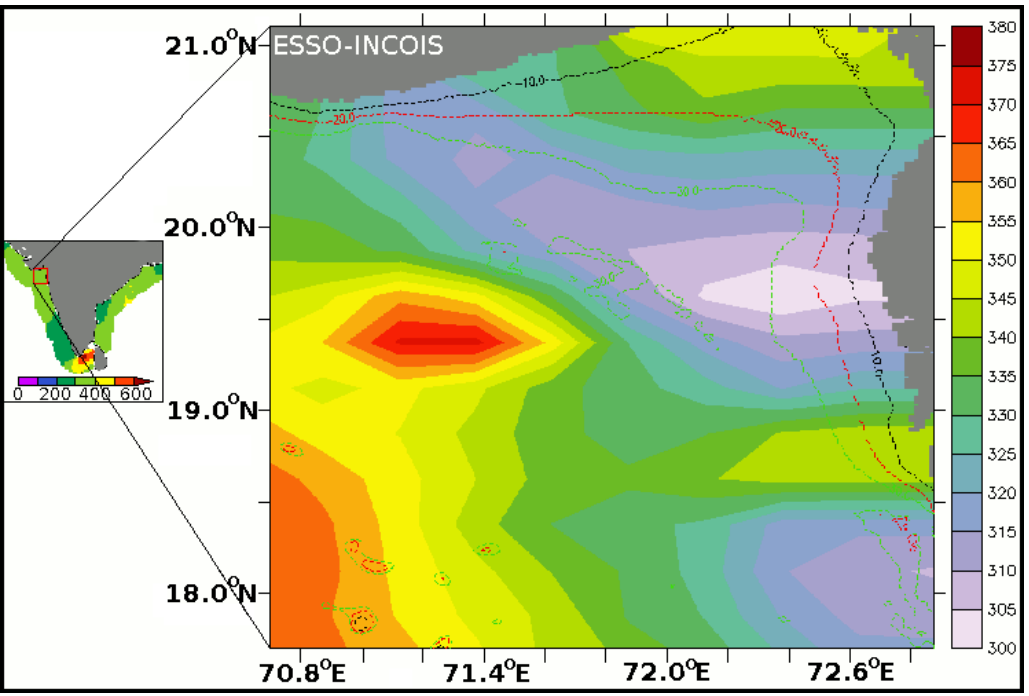
R. Harikumar, L. Sabique, T.M. Balakrishnan Nair and S.S.C. Shenoi. Study on the potential of winds along the Indian coast for offshore wind farming (manuscript in finalisation)

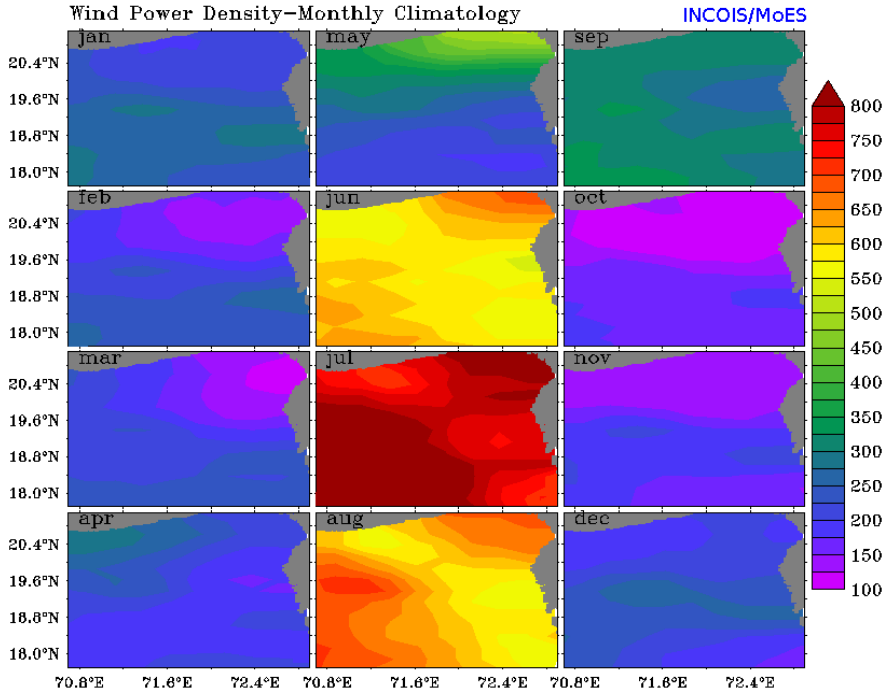
Area of interest of ONGC

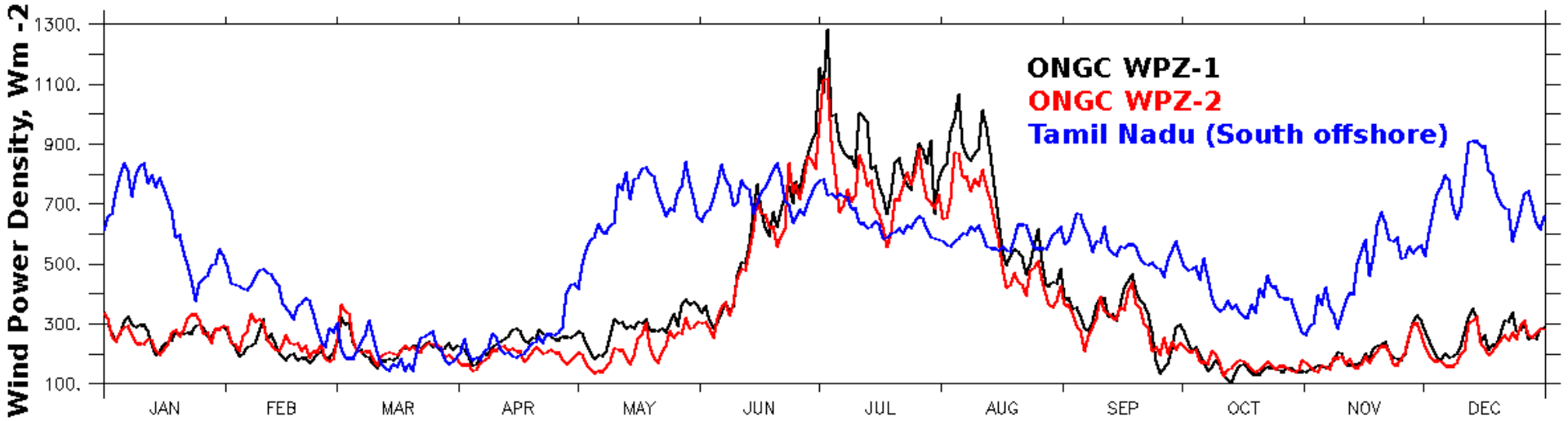




Wind Power Density





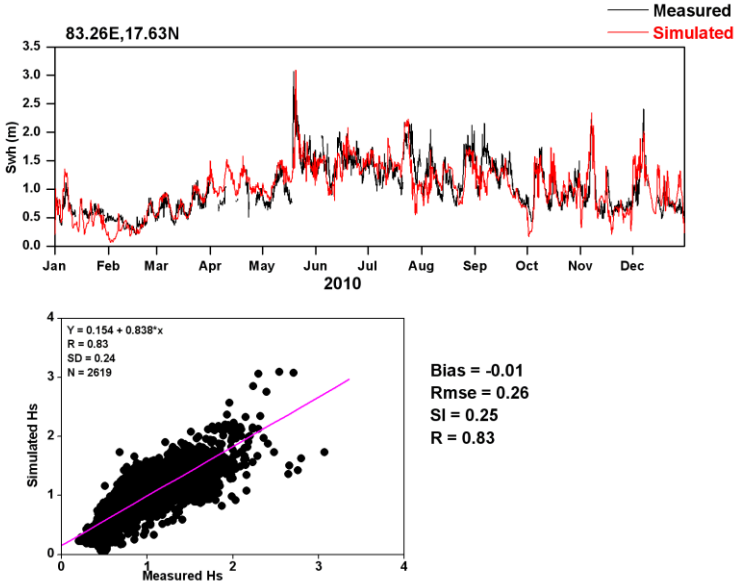


Harikumar et al., 2012c

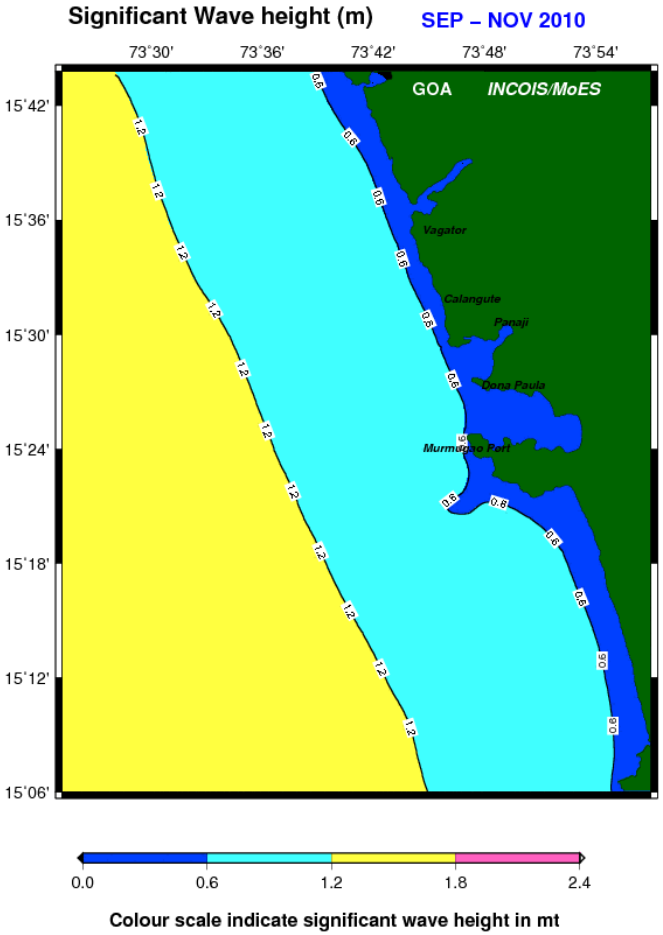
Study of waters of the Goa coast on significant wave heights up to a distance of 12 Nautical miles to enable extension/fixation of I V Limits

&

Also for GMB



Comparison of SWH during the year 2010



For Navy-DG Varsha

Preparation of Coastal Modelling data for Indian Navy

Forecast Products

- Wave
- Wave period
- Swell
- Swell period
- Wind
- Sea Surface Temperature
- Mixed Layer Depth
- Surface Currents
- Location Specific
- High Wave Alert

Indian Ocean Forecast System (INDOFOS)

The need

Having more than a quarter of the population residing along the coastlines of India, information on the state of the ocean surrounding the subcontinent is vital for the well being of the countrymen as well as for the socio-economic development of the country. Our marine activities ranges from conventional fishing to high-tech oil and natural gas exploration; transportation of goods to search and rescue operations in the high seas. Prior information of the state of the ocean would highly benefit these activities and ensure the safety of all those who venture into the sea. Further, the oceans around us play critical role in regulating the regional climate. In short, forecasting oceanographic parameters (both in surface and subsurface) at different time scales is extremely important for a wide spectrum of users ranging from weathermen to fishermen and from the navy to the off-shore industries. Keeping this in mind, Indian National Centre for Ocean Information Services (INCOIS) is bringing out a new integrated Indian Ocean Forecasting System (INDOFOS), which is capable of predicting the surface and subsurface features of the Indian Ocean well in advance.

At present, INCOIS is providing forecasts of

- **Northern Maldives**
- **Central Maldives**
- **Southern Maldives**

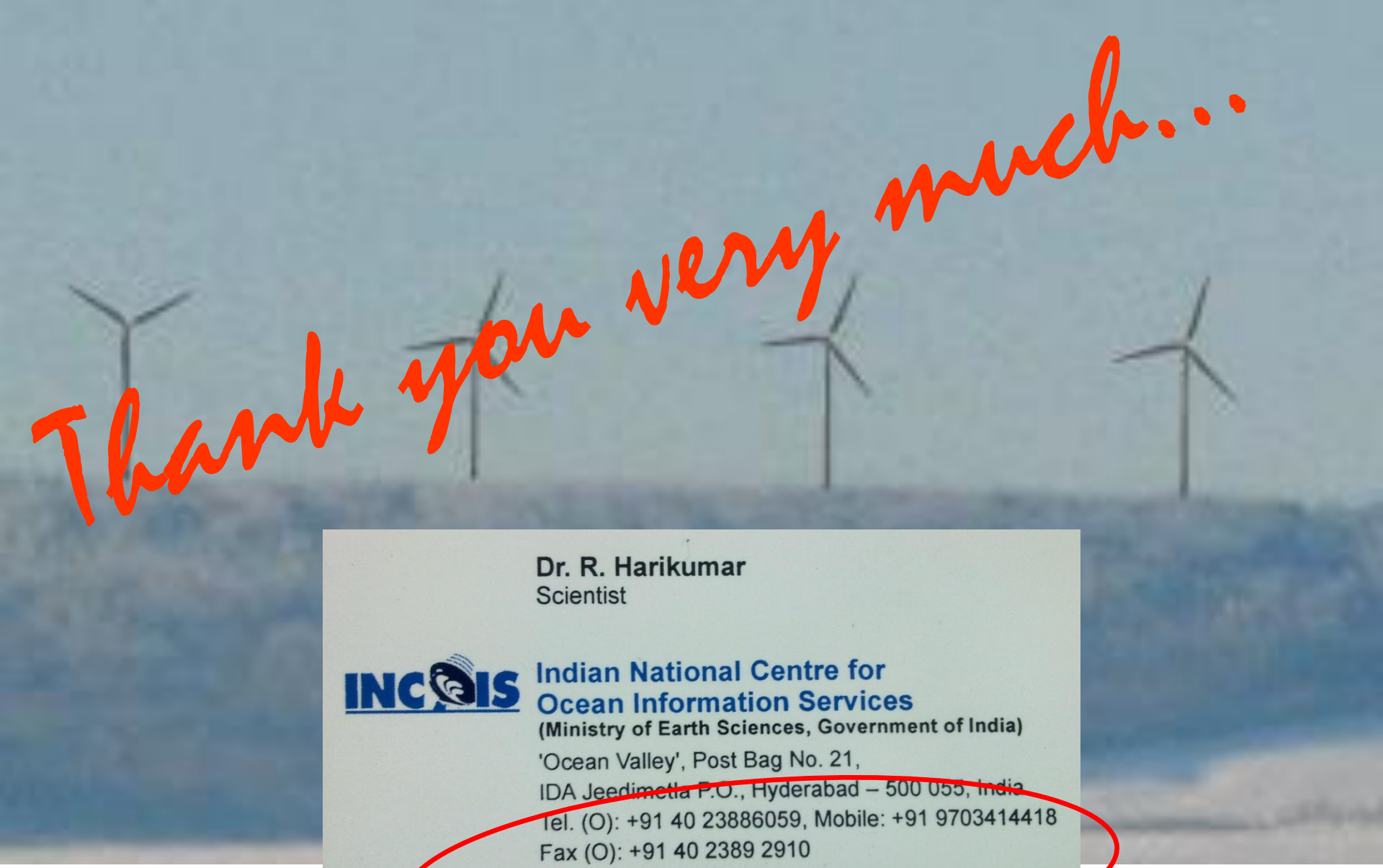
4. Mixed Layer Depth
5. Depth of the 20 degree isotherm (as a measure of thermocline).

The Generation

The forecasts are generated by a suit of state-of-the art numerical models, which are customized to simulate and predict the Indian Ocean features realistically. Important models used are I) Wave Watch III, Mike, WAM and Regional Ocean Modeling System (ROMS). Atmospheric forecast products from different met agencies (NCMRWF, ECMWF, and NCEP) are used for forcing the models in forecast mode. Global forecast and regional forecast differ mainly in spatial and temporal resolution of the forecast, extent of validation carried out etc. In coastal forecast, the models are set up using the concept of 'multiple grid' with coarse resolution in the open ocean region and very fine resolution for the specified coast or locations aimed at, there by incorporating the influence of remotely forced waves along the coast. Four type of forecast is generated operationally in addition to value added services.

Services

1. Location Specific forecast (3 days - 3 hourly interval)
2. Coastal forecast (7 days - 3 hourly interval)
3. Regional forecast (7 days - 3 hourly interval)
4. Indian Ocean forecast (5 days - 6 hourly interval)
5. Global forecast (5 days - 6 hourly interval)
6. Value added services.



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Scientist

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