



Ocean Data and Information Management

By

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Hyderabad

February, 2008

DOCUMENT CONTROL SHEET

01. Report No: **INCOIS-DMG-DM-TR-01-2008** Date: **February 2008**

02. Title & Sub Title:

Ocean Data and Information Management

03. Part No.: — 04. Vol. No.: —

05. Author(s):

Data and Information Management Group

06. Originating agency (Group/Project/Entity): **DMG**

07. No. of Pages: **23** 08. No. of figures: **11**

09. No. of references: **Nil** 10. No. of enclosures/appendices: **Nil**

11. Abstract (Maximum 100 words):

The report is aimed at providing information on the availability of oceanographic data with INCOIS, acquired from various in-situ and remote sensing platforms as well as the other data sets. The proposed Ocean Data and Information System along with the data management plan were also briefed in this document. Present status of the dissemination of data is also discussed.

12. Keywords: **Ocean Data, Argo Floats, Drifting Buoy, Moored Buoy, XBT, Current Meter, Tide Gauge, BPR, Seismic, GTS, In-situ, Remote Sensing, CTD, COMAPS**

13. Security classification: **Unrestricted**

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1. Introduction

INCOIS mission is to provide Ocean information and advisory services to society, industry, government agencies and scientific community through sustained ocean observations, constant improvements through systematic and focussed research in ocean modeling, data and information management.

The observations from the oceans are the backbone for any kind of operational services, viz. storm surges, cyclones, monsoon variability, tsunami, etc. and research development including validation of satellite sensors and parameterising key processes for models and verifying model simulations. A network of in-situ ocean observing systems particularly the cutting edge technology such as Argo floats and other observational platforms such as drifting buoys, XBT surveys, current meter mooring array, moored buoys, tide gauges, bottom pressure recorders, coastal radars have already been established in the Indian Ocean.

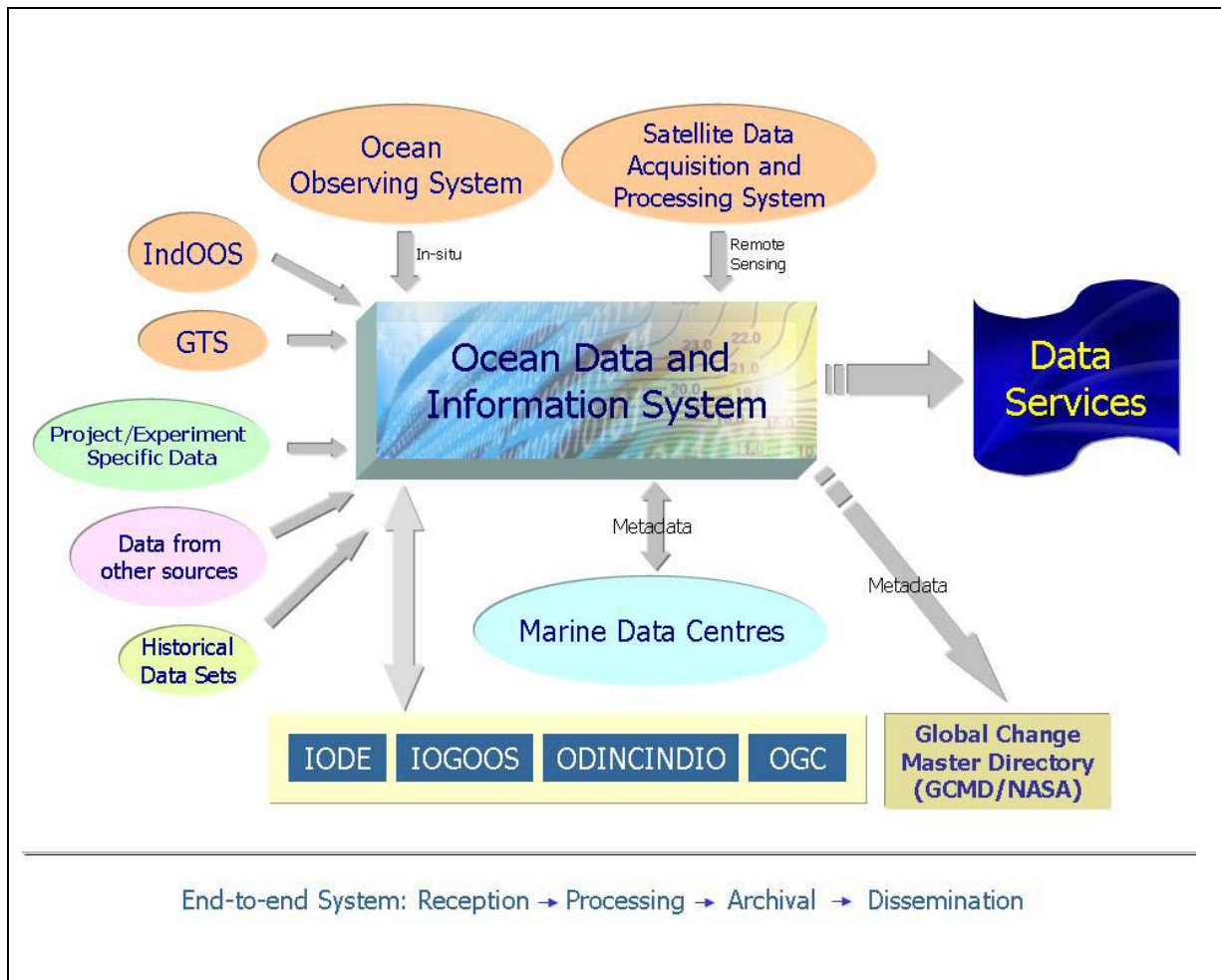
Studies of interaction between biological and physical processes in ocean are based on a collection and comprehensive analysis of large oceanological data sets. INCOIS, being the central repository for marine data in the country, receives voluminous oceanographic data in real time, from a variety of in-situ and remote sensing observing systems. In addition, a large amount of historical data has been obtained from the web and also other sources. With the vast amount of data available, Ocean models could be fruitfully utilized to undertake need based user projects for coastal and offshore applications. It also integrates the design and spatial data from variety of sources, develop applications and distribute maps and spatial data faster and easily.

Apart from serving as a national repository of marine data, the INCOIS has been designated as the National Oceanographic Data Centre by the International Oceanographic Data and Information Exchange (IODE) Programme of Intergovernmental Oceanographic Commission (IOC). Further, as part of the International Argo Programme, INCOIS has been designated as the National and Regional Argo Data Centre. INCOIS also has attained the status of clearing house and Regional Data Centre for the IOGOOS Programme.

The objectives of the data centre at national and regional levels are acquisition, processing, quality control, inventory, archival and dissemination of data and data products in accordance with national responsibilities and also responsible for international data exchange.

2. Ocean Data and Information System

Ocean Data and Information System is the one stop shop for providing information on physical, chemical, biological and geological parameters of ocean and coasts on spatial and temporal domains that is vital for both research and operational oceanography.

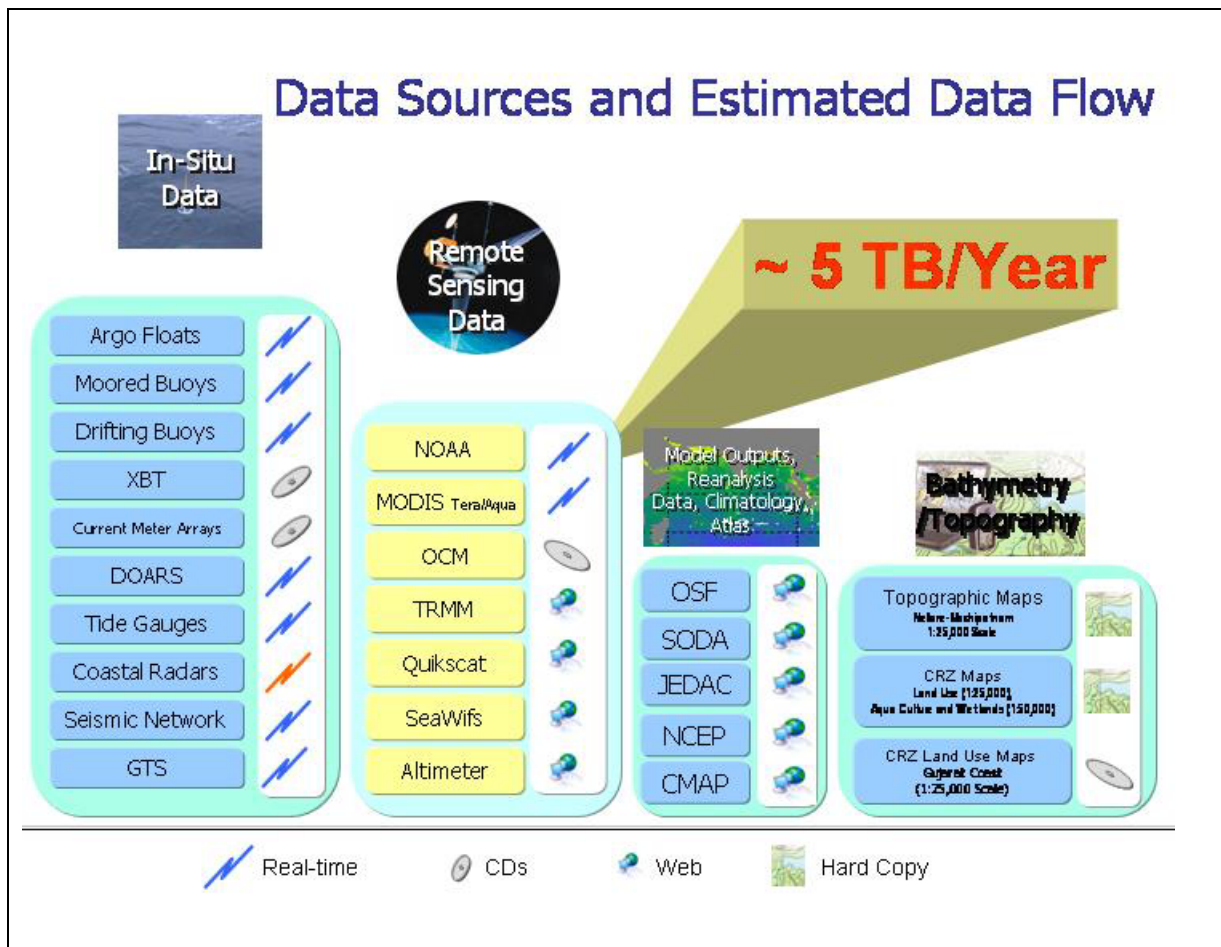


The ODIS is supported by the data received from both the in-situ platforms and satellites, GTS, Project/Experiments funded by the MoES, data from the other sources (web) and the historical data exclusively retrieved for the Indian Ocean

from historical data sets viz., World Ocean Data Base 2005 (WODB), World Ocean Circulation Experiment , etc.

INCOIS has strong organisational arrangements with all the agencies involved in ocean observational programmes, so that there is real-time /near real-time flow of data to ODIS. Further, INCOIS plans to strengthen the ODIS with the data generated from the chain of Marine Data Centres, MoES Institutions, Academia, etc. by networking of these centres and enabling them on the INCOIS web-site with appropriate access privileges. The estimated data flow to the ODIS is about 5 TB per year.

The data sources and the estimated data flow to the ODIS is shown below:



3. Data Holdings

3.1. In-situ Data

Platform/Instrument	Parameters	Period
Drifting Buoy	Sea Surface Temperature, Air Temperature, Barometric Pressure, Surface Drift Monthly Surface Currents Climatology at 2° x 2° intervals	1991- till date
XBT Observations	Temperature Profiles Atlas	1990- till date
Current Meter Data from the Equatorial Current Meter Mooring Array	Current Vector data	2000-2004
Argo Data	Temperature and Salinity Profiles	2001- till date
Moored Buoy Data	Air Pressure, Air Temp., Wind Direction, Wind Speed, Water Temp, Significant wave height, wave direction, Current Speed, Current Direction.	2002- May 2005 & April 2006-till date
Sea-truth Data	Surface Meteorological Parameters	1997-2003

3.2. GTS data

Source	Parameters	Period
Ship	Wind Direction, Wind Speed, Air Temperature, Sea Surface Temperature,	August 2007 – till date
Synop	Wind Direction, Wind Speed, Air Temperature, Dew-Point Temperature, Pressure at Station Level, Pressure at Mean Level	August 2007 – till date
Buoy	Wind Speed, Air Temperature, Sea Surface Temperature, Salinity	August 2007 – till date
Tesac	Temperature and Salinity Profiles	August 2007 – till date

In addition to these parameters, we receive few more parameters which are mentioned at Annexure-1.

3.3. Remote Sensing Data and Products

3.3.1. AVHRR- NOAA

Platform/Instrument	Parameters	Period
AVHRR - NOAA	AVHRR Raw Data	1986 – till date
SST ARCHIVES	SST Parameter (Processed)	2001 – till date
IRS - P4 OCM	Raw Data	2000 - 2006
IRS - P4 OCM	Processed Data (Chl)	2002 - 2006

3.3.2. MODIS (Aqua & Tera) –

Atmosphere	Aerosols	Atmospheric aerosol optical depth	Period
	Water Vapor	Water_Vapor_Near_Infrared	March 2005 –till date
	Cloud	Brightness_Temperature, Cirrus_Reflectance_Flag, Cloud_Effective_Emissivity, Cloud_Fraction, Cloud_Height, , Cloud_Optical_Thickness, Cloud_Phase_Infrared, Cloud_Top_Pressure, Cloud_Top_Temperature, Surface_Pressure, Surface_Temperature, Tropopause_Height	
	Profiles	Retrieved_Moisture_Profile, Retrieved_Temperature_Profile, Water_Vapor Tropopause_Height, Total_Ozone, Total_Totals, K_Index, Lifted_Index, Brightness_Temperature at 20 Levels	
	Cloud Mask	Cloud_Mask_1km, 5km	
Ocean	SST	SST	
	Ocean	Tau_865,nLw_443, nLw_531, nLw_667, Chl, K_490,	

	Color	Log_inst_photo_avail_radiation, Chla_conc_semianalytic, Total_absorption_443nm	
Land	Land	CorrRefl_01, CorrRefl_02 CorrRefl_03, CorrRefl_04 CorrRefl_05, CorrRefl_06 CorrRefl_07, NDVI, EVI	
	Fire	Bright_temp_Ch21 Bright_temp_Ch31 Bright_temp_Ch32	

3.3.3. Remote Sensing Data downloaded from the Web for the Indian Ocean region

Data Type	Parameters	Period
Altimeter	Sea Surface Height Anomaly	1996 - till date
TMI	SST, Rainfall, Wind Speed	1997 - till date
Quicksat	Wind Vector	1998 - till date
SeaWifs	Chlorophyll	1997 - tilldate

3.4. Model, Reanalysis Data etc

The following data sets have been downloaded from the internet for various studies at INCOIS and are made available to the scientific community through Live Access Server.

Data Type	Parameters	Period
Simple Oceanographic Data Assimilation	Currents, Temperature, Salinity	1955-2001
Joint Environmental Data Analysis Centre	Temperature Profiles	1955-2004
National Centre for Environmental Prediction	Surface meteorology, Surface fluxes	1950-2005
CMAP	Rainfall	1979 - 2006

3.5 Bathymetry Data

Bathymetric dataset for the shallow water regions in the Indian Ocean

Dataset	Latitude		Longitude		Format	Size
	From	To	From	To		
ETOPO5	38.000°S	32.000°N	20.000°E	112.000°E	netCDF	4.5 MB
					ASCII	3.9 MB
					Binary	7.1 MB
ETOPO2	38.0167°S	31.9833°N	20.0167°E	112.0170°E	netCDF	28 MB
					ASCII	24 MB
					Binary	45 MB

3.6. Project/Experiment Specific Data Sets

Arabian Sea Monsoon Experiment (ARMEX-I) Data

Platform/Instrument	Parameters	Period
NCMRWF T80/L18 Analysis Data	Geopotential Height, Zonal Wind, Meridional Wind, Specific Humidity, Temperature and Mean Sea Level Pressure,	Jun 1 – Aug 31, 2002
XBT Sections along Kochi-Colombo and Mumbai-Lakshadweep sections	Temperature Profiles Surface Salinity	May 2002- Nov 2003
Automatic Weather Stations at Ratnagiri, Goa, Mumbai, Hannai, Karwar, Vengurla, Honnavar, Vijaydurg and ORV SK	Surface Meteorological Parameters	Jun 1 – Aug 31, 2002
RS/RW at Ahmedabad, Mumbai, Goa, Mangalore, M.O. Amini, Cochin, INS Hansa- Goa(Digicora) and ORVSK (Digicora)	Upper atmosphere parameters	Jun 1 – Aug 31, 2002
Pilot Ballon at Bhuj, Ahmedabad, Surat, Veraval, Bombay, Ratnagiri, Gadag	Upper atmosphere parameters	Jun 1 – Aug 31, 2002

3.7. Historical Data Sets

3.7.1. World Ocean Data Base

Data Type	Parameters	Period
CTD	Water Temperature and Salinity	1968-1998
XBT	Water Temperature	1967-1996
MBT	Water Temperature	1941-1994
BD	Physical and Chemical Parameters	1901-1998

3.7.2. World Ocean Circulation Experiment (WOCE) Data

Data Type	Indian Ocean	Pacific Ocean	Atlantic Ocean
Drifting Buoy	1985-1999	1979-1999	1989-1999
XBT	1990-1997	1990-1997	1990-1997

3.7.3. Climatology

Data Type	Parameters
Levitus Climatology	Temperature & Salinity – ¼° grid, 33 standard depth levels (0-5500m) Mixed Layer Depth (1°x1°grid) Dynamic Height (1°x1° grid)
Reynolds SST (1950-1998)	Sea Surface Temperature

3.8. Maps

- Topographic Maps from Nellore to Machipatnam (1:25,000 Scale) – Hard copy
- CRZ Maps - Land Use (1:25,000) and Aqua Culture and Wet lands (1:50,000) – Hard Copy
- CRZ Land Use Maps for Gujarat Coast (1:25,000 Scale) – Digital data

4. Data Volume

4.1 AVHRR - NOAA

Satellite Name	Sensor Name	Channel	Parameter	Size	Frequency	Format
Noaa-15	AVHRR	AVHRR_ch1 AVHRR_ch2 AVHRR_ch3 AVHRR_ch4 AVHRR_ch5	Visible	5.4MB	Daily	TDF HDF
			Water vapor -Single -Composite	5.4MB 5.4MB		
			SST -Single -Composite	5.4MB 5.4MB		
			Whole Pass -Avhrr -Tovs	89MB 8.5MB		
			Thermal	5.4MB		
			Tovs -Tovs -GPH -Wind	8.5MB 40KB 80KB		
			Fog -Fog -Metalines	5.4MB 200KB		
			Noaa-17	AVHRR		
Water vapor -Single -Composite	5.4MB 5.4MB					
SST -Single -Composite	5.4MB 5.4MB					
Whole Pass -Avhrr	89MB					
Thermal	5.4MB					
Fog -Fog -Metalines	5.4MB 200KB					

Satellite Name	Sensor Name	Channel	Parameter	Size	Frequency	Format
Noaa-18	AVHRR	AVHRR_ch1	Visible	5.4MB	Daily	TDF HDF
		AVHRR_ch2	Water vapor -Single -Composite	5.4MB		
		AVHRR_ch3		5.4MB		
		AVHRR_ch4	SST -Single -Composite	5.4MB		
		AVHRR_ch5		5.4MB		
		Whole Pass -Avhrr -Tovs	95MB			
			2.4MB			
		Thermal	5.4MB			
Tovs -Tovs -GPH -Wind	2.1MB 32KB 116KB					
Fog -Fog -Metalines	5.4MB 200KB					

4.2 MODIS – AQUA & TERA

Satellite Name	Sensor	Channels	Parameter	Size	Frequency	Format
Aqua	MODIS	MODIS_ch01 to MODIS_h36	Aerosols	88MB	Daily	TDF HDF
			-MYD_04L2	148MB		
			-MYD_05L2			
			Cloud Mask	20MB		
			-MYD35_L2			
			Clouds	509MB		
-MYD_06CR	335MB					
-MYD_07						
Fire	225MB					
-MYD14_L2						
Level1	1GB					
-MYD021KM	1GB					
-MYD02HKM	1GB					
-MYD02QKM	267MB					
-MYD_03						

			NDVI -NDVI -CREFL			
			Ocean Color -MYDCL2A -MYDCL2B -MYDCL2	800MB 616MB 657MB		
			SST -MYD28L2	82MB		
			Sea ice - MYD_29L2	150MB		
			Snow cover - MYD_10L2	246MB		

Satellite Name	Sensor Name	Channels	Parameter	Size	Frequency	Format
Terra	MODIS	MODIS_ch01 to MODIS_ch36	Aerosols - MOD_04L2 - MOD_05L2	86MB 145MB	Daily	TDF HDF
			Cloud Mask - MOD35_L2	20MB		
			Clouds - MOD_06CR -MOD_07	497MB 330MB		
			Fire - MOD14_L2	220MB		
			Level1 - MOD021KM - MOD02HKM - MOD02QKM -MOD_03	1.5GB 1.1GB 1.2GB 261MB		
			NDVI -NDVI -CREFL	1.2GB 2.1GB		

			Ocean Color -MODCL2A -MODCL2B -MODCL2	783MB 602MB 642MB		
			SST -MYD28L2	82MB		
			Sea ice - MOD_29L2	150MB		
			Snow cover - MOD_10L2	246MB		

4.3 GTS data

Source	Parameters	Frequency	Volume
Ship	Wind Direction, Wind Speed, Air Temperature, Sea Surface Temperature,		Approximately 180 MB per day
Synop	Wind Direction, Wind Speed, Air Temperature, Dew-Point Temperature, Pressure at Station Level, Pressure at Mean Level		
Buoy	Wind Speed, Air Temperature, Sea Surface Temperature, Salinity		
Tesac	Temperature and Salinity Profiles		

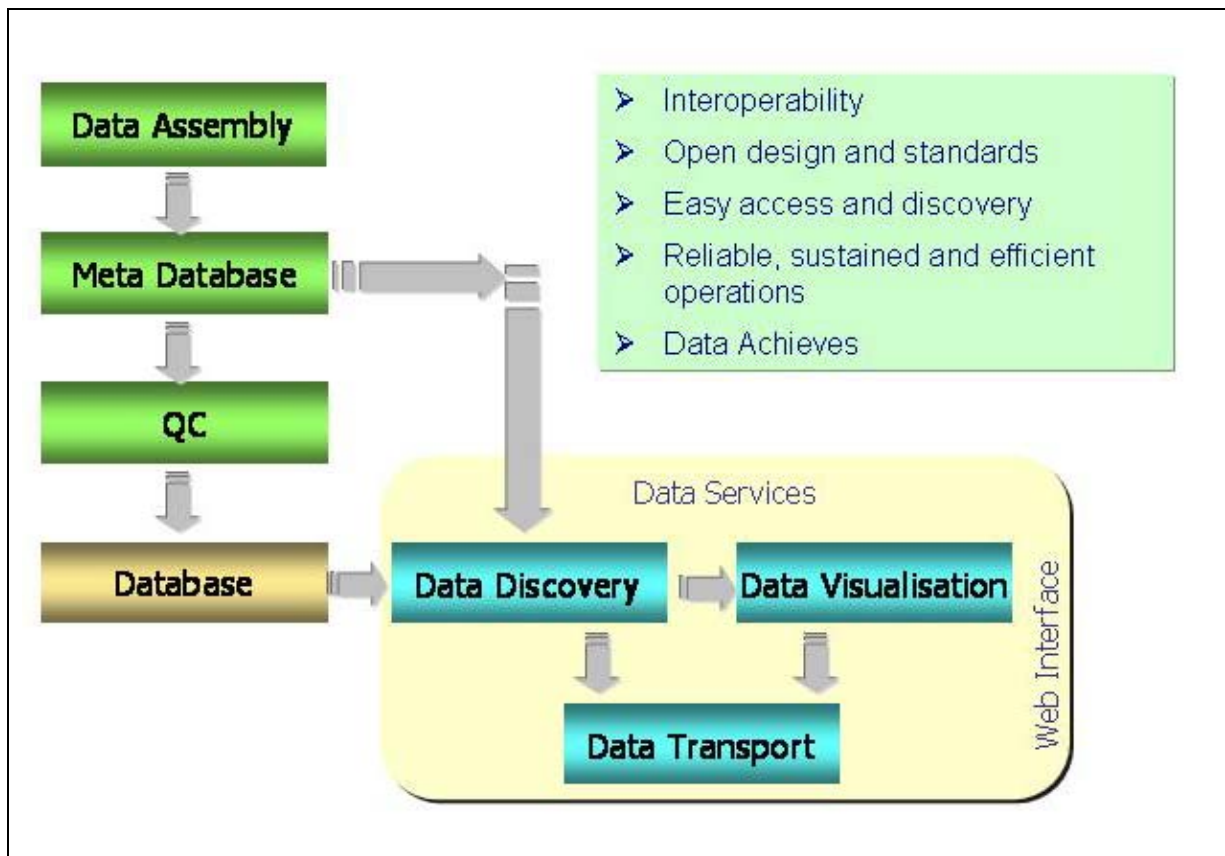
4.4 Data downloaded from Web for Indian Ocean Region

Data From	Parameters	Size	Frequency	Format
Altimeter	Sea Surface Height Anamoly	9MB	10 days	netCDF
TMI	SST, Rainfall, Wind Speed	1.2GB (daily) 236MB(Monthly)	Monthly	netCDF
Quicksat	Wind Vector	1.7GB(daily) 33MB(Monthly)	Monthly	netCDF
SeaWifs	Chlorophyll	62MB	Montlhy	netCDF

5. Database Management

To meet the objectives of the data centre at national and regional levels and the data demands from various users, exploiting the advances in the information and communication technology, it is necessary to harmonise the data in to standard formats, organising into database, generation of metadata and applying quality control procedures, providing data services and value added data products, while adopting the international standards for seamless exchange of data. Further, the data from observing system both in-situ and satellites need to be communicated for developing robust ocean and coastal forecasting system.

The database management plan is as follows:



The main challenge of the data centre is managing highly heterogeneous and voluminous data, developing open standards and addressing the interoperability issues for seamless exchange of data. Open standards and interoperability are being widely used for the land based GIS applications and now gaining wider acceptance in marine community. The recent international projects in ocean

sciences deals with compliance with open standards and interoperability for exchange of the data.

INCOIS joined the Ocean Interoperability (Ocean IE) Project evolved by the Open Geospatial Consortium, in its early stages to play a major role in developing open standards and addressing the interoperability issues. These developments certainly facilitate enormous potential for sharing oceanographic and meteorological data with common standards for providing web-based and location based services.

Our data and information management would focus on the standards, protocols for data, metadata, data discovery, transport, on-line browse and archival policies. It should facilitate the use and exploitation of open standards and interoperability addressed by international community, promote coordination and cooperation with other data programs, participate in and proactively coordinate with relevant national, regional and international data management activities.

6. Data Delivery

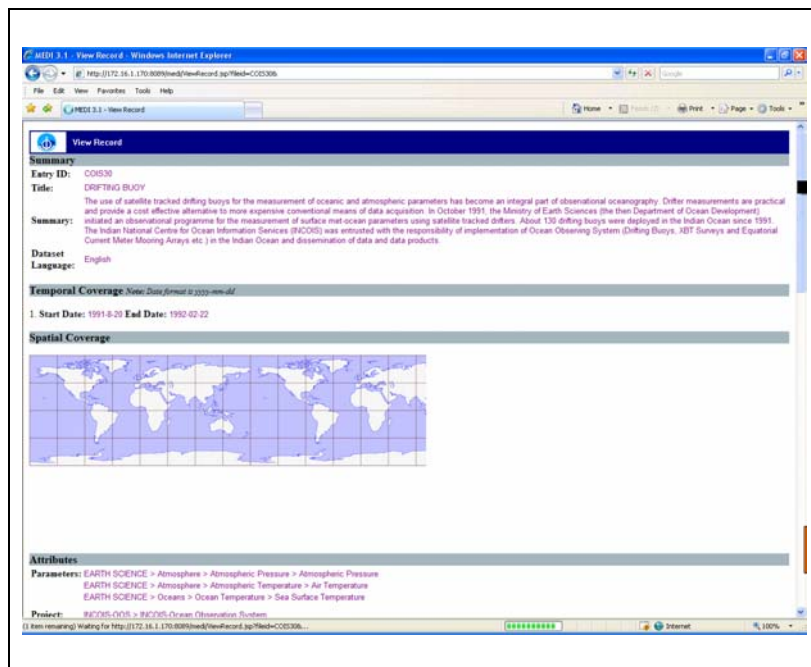
Real time display of in-situ and remote sensing observations

Web interfaces were developed for display of real time data from Moored Buoys, Tide Gauges and as also Remote Sensing Data (AVHRR- NOAA and MODIS-Terra & Aqua) and extraction of met-ocean data acquired from GTS. An application for display of COMAPS Data has been developed. The web interfaces developed for various applications needs to be integrated with INCOIS web-site for providing web-based data services.

INCOIS as the National and Regional Argo Data Centre is providing the Argo float data from the Indian Ocean in real time. The Argo data management team at INCOIS is providing individual float-wise data products and monthly gridded data products through Web-GIS application on INCOIS web-site. This web-GIS application facilitates users to query, analyse, visualise and download Argo float data.

Meta Database

Metadata base was developed using the MEDI Software developed by the Joint Oceanographic Data Centre of Australia as per the ISO 9115 Standards. About 200 metadata records generated for the MB, DB, XBT, CMA data sets. Metadata generation for other data sets is under progress. This data will be published on the Global Change Master Directory (GCMD/NASA) for global visibility.

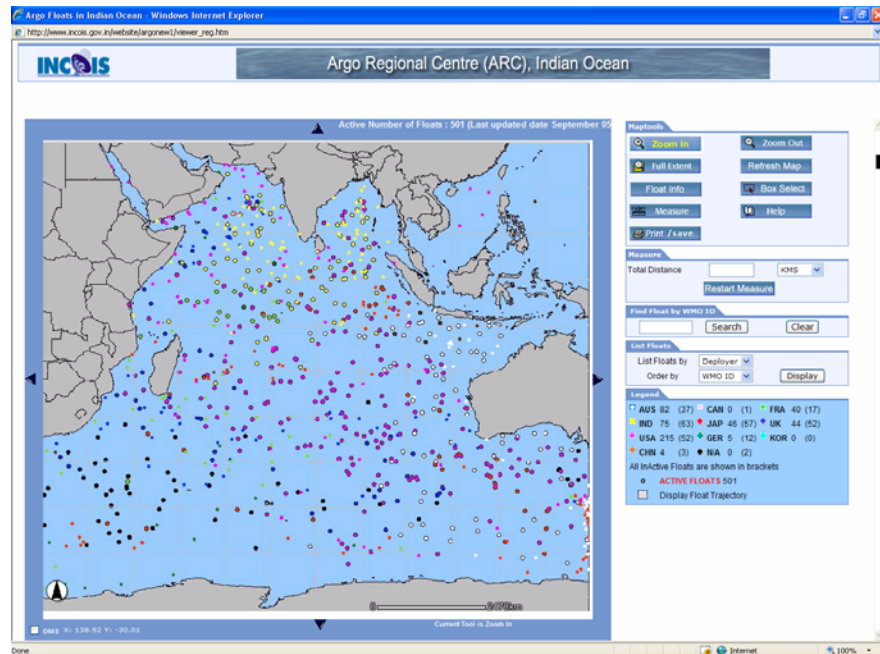


Argo Float Data

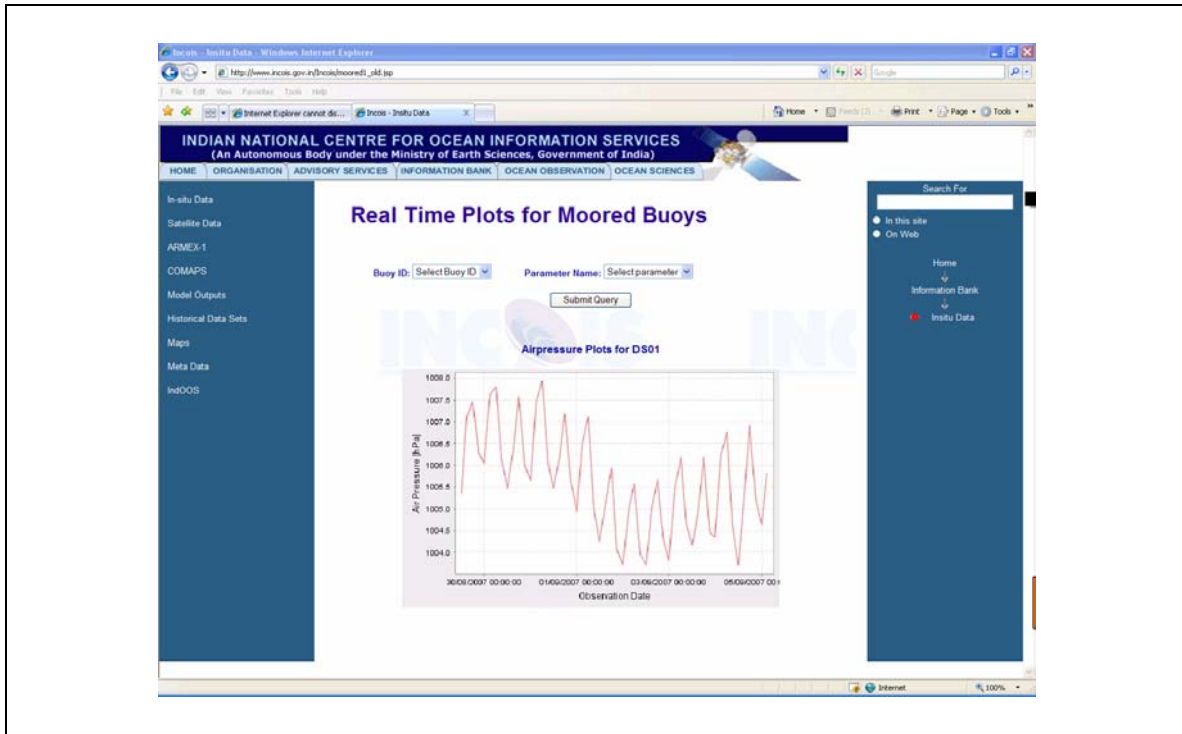
As part of the Indian Argo Programme, the Argo Data Centre at INCOIS in the national and regional levels is providing various data and data products through INCOIS Web-site.

The Argo value added data products available on INCOIS Website are listed below:

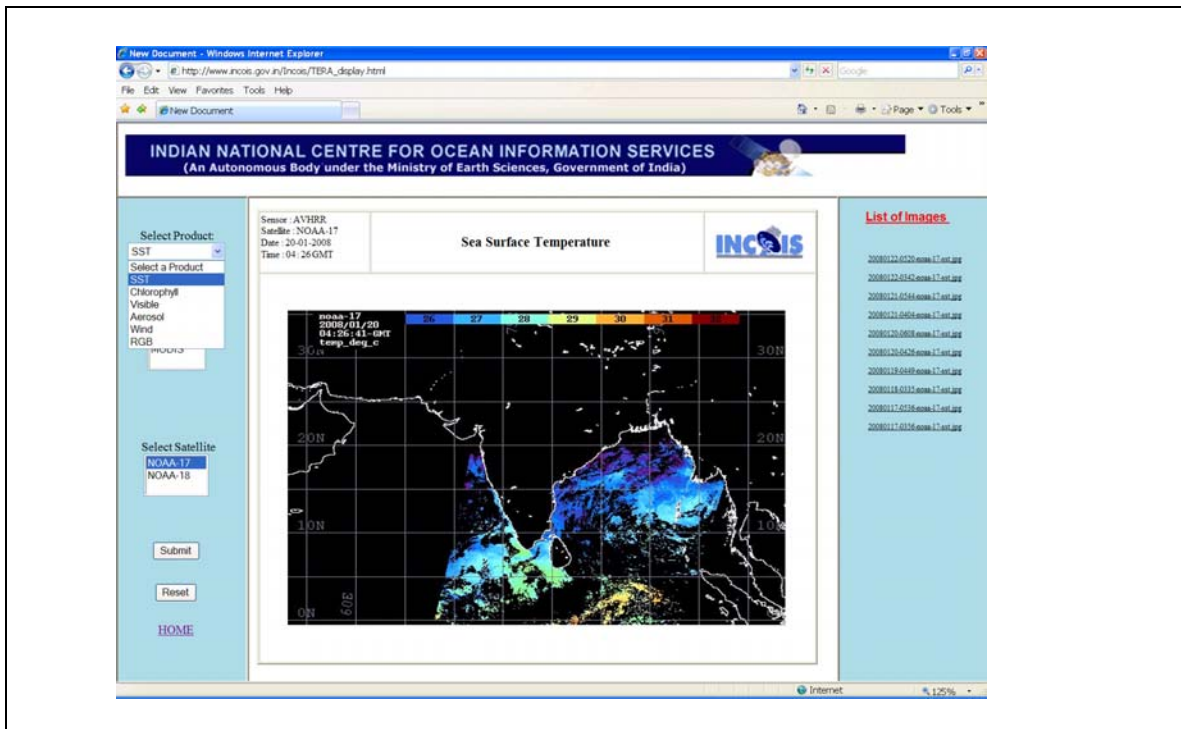
Individual Floatwise Data products (2002 – Till date)	Monthly Data Products (2002 – Till date)
<ul style="list-style-type: none"> • Water Plot of Temperature • Water Plot of Salinity • Temp Vs Sal Plot • Time Series Surface Temperature • Time Series Surface Salinity • Time Series Surface Pressure • Time Series Bottom Pressure • Float Trajectory 	<ul style="list-style-type: none"> • Temperature (at 0, 75, 100, 200, 500, 1000m depths) • Salinity (at 0, 75, 100, 200, 500, 1000m depths) • Geostrophic Currents (at 0, 75, 100, 200, 500, 1000m depths) • Mixed Layer Depth • Isothermal Layer Depth • Depth of 20° Isotherm • Depth of 26° Isotherm • Heat Content • Dynamic Height • Sea Surface Height Anomaly



Display of Moored Buoy data in real-time



Display of remote sensing data in real time.



Met-Ocean Data received from GTS

The image shows two overlapping browser windows from the Indian National Centre for Ocean Information Services. The main window displays the following content:

- Indian National Centre for Ocean Information Services**
- Real Time Met-Ocean Data from GTS**
- Navigation links:
 - Surface Observation from a Sea Station (Ship)
 - Surface Observation from a Fixed Land Station (Trop)
 - Boat Observation (Boat)
 - Temperature, Salinity and Current Report from a Sea Station (Texas)
 - Marine Surface Observations along a Ship's Track (TrackOB)
 - Bathymetric Observation (Bath)
- Contact information for **Mr. E. Parthasarathy Rao**, Head, Data & Information Management Group.

The smaller window shows a data selection interface with a map of the Indian Ocean region and the following fields:

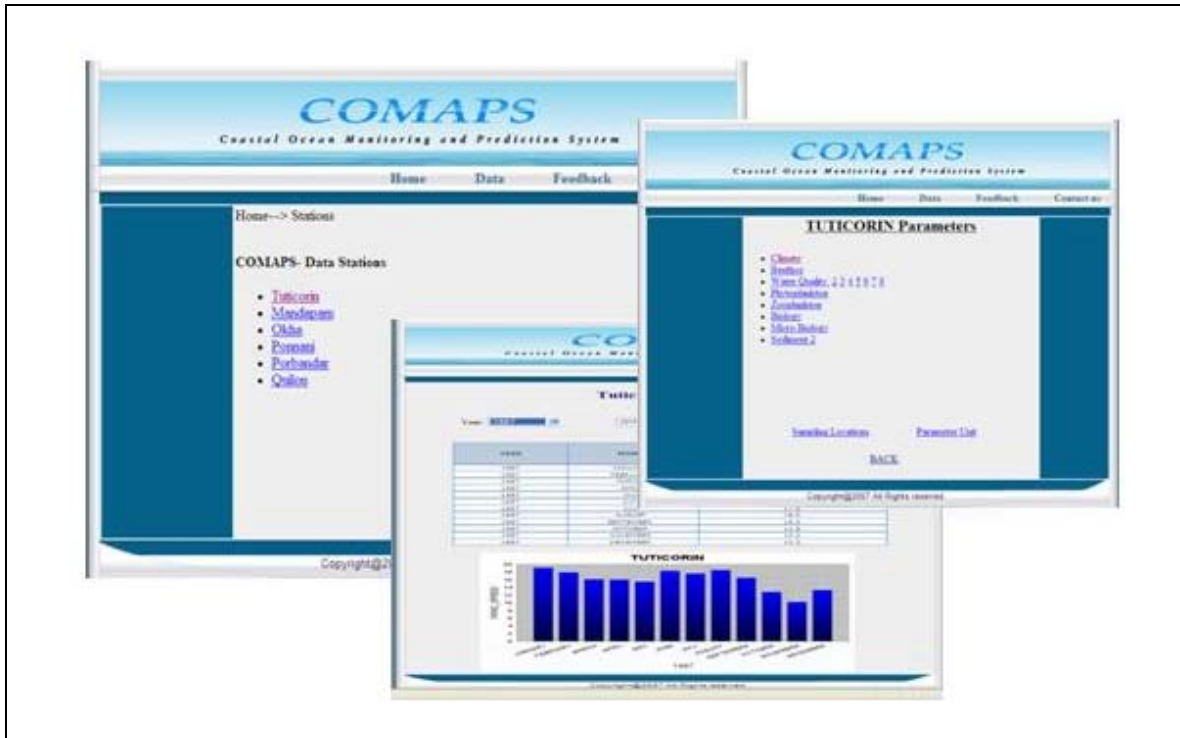
- Position:** Latitude (N/S) and Longitude (E/W) input fields.
- Starting Date:** Date input field.
- Ending Date:** Date input field.
- Parameters:** A list of checkboxes for data types such as Wind Direction, Air Temperature, Sea Surface Temperature, etc.
- Buttons:** "Get Data" and "Reset".

Equatorial Current Meter Mooring Array Data

The image displays a web application interface for "Current Meter Mooring Array Data". It includes the following elements:

- Map:** A satellite-style map showing the equatorial region of the Indian Ocean with a mooring array indicated by a red dot.
- Plot:** A time-series plot titled "Eight30011_sta (150 Meter Depth)" showing current data over time.
- RAW DATA [Recording Current Meter]:** A section with input fields for "Station Name" and "Date Range", and checkboxes for "Speed (m/s)", "Direction (deg)", "U (m/s)", "V (m/s)", and "Psi (deg)".
- QUALITY CHECKED DATA [Recording Current Meter]:** A section with input fields for "Station Name" and "Date Range", and checkboxes for "Speed (m/s)", "Direction (deg)", "U (m/s)", and "V (m/s)".

COMAPS Data

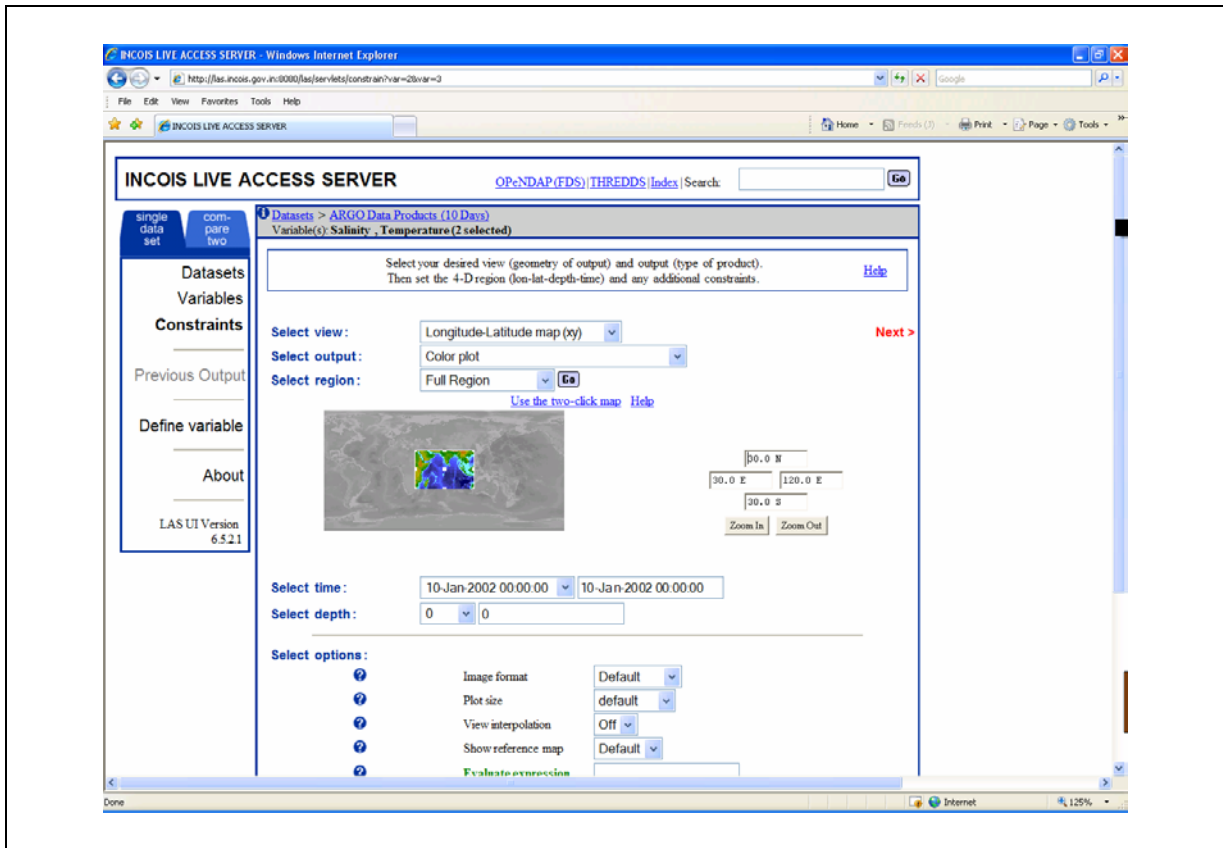


INCOIS Live Access Server

The Live Access Server (LAS) is a highly configurable Web server designed to provide flexible access to geo-referenced scientific data. The LAS allows the user to download and visualize data using a simple graphical user interface. It frees data users from the hassle of writing programs to deal with the native format of the data.

LAS enable the Web user to (i) visualize data with on-the-fly graphics (ii) request custom subsets of variables in a choice of file formats (iii) access background reference material about the data (metadata) and (iv) compare (difference) variables from distributed locations

LAS enable the data provider to (i) unify access to multiple types of data in a single interface, (ii) create thematic data servers from distributed data sources, (iii) offer derived products on the fly (iv) remedy metadata inadequacies (poorly self-describing data), (v) offer unique products (e.g. visualization styles specialized for the data)



Presently, INCOIS LAS has the following data sets:

Data Set	Parameters	Period
ARGO Data Products (10 Days)	Temperature and Salinity (0, 10, 20, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000 m depths)	10-Jan-2002 - till date
ARGO Data Products (Monthly)	Temperature and Salinity (0, 10, 20, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000 m depths)	Jan-2002 to till date
Levitus Climatology	Temperature and Salinity (0, 10, 20, 30, 50, 75, 100, 150, 200, 400, 600, 800, 1000, 1200, 1500, 2000, 3000, 4000 m depths)	
Quikscat Data Products (Daily and Monthly*)	Meridional wind speed component* Meridional wind stress component Wind speed module* Wind stress curl	Jul 1999 to till date

	Wind stress magnitude Zonal wind speed component* Zonal wind stress component	
Sea Surface Height Anomaly (10 Day Composite)	Sea Surface Height Anomaly	10 Jan 1996 – till date
TMI Data Product Sea Surface Temperature (3 Day Composite)	Sea Surface Temperature	01 Jan 1997 – till date
TMI Data Products (Monthly)	Atmospheric Water Vapour (mm) Cloud Liquid Water (mm) Rain Rate (mm/hr) Sea Surface Temperature (degree C) Surface Wind Speed using 11 Ghz channel (m/s) Surface Wind Speed using 37 Ghz channel (m/s)	Jan 1997 – till date

More data sets viz., Climatology of Currents ($2^{\circ} \times 2^{\circ}$) derived from drifting buoy data, Ocean Atmospheric Fluxes, etc. will be added to the LAS soon.

Data Delivery – Present Status

At present, the Argo float data and their data products are made available through INCOIS web-site with Web-GIS features and Live Access Server. The data from Drifting Buoys, XBT and Current Meter Mooring Array are made available to the users on request. Users need to contact INCOIS for obtaining data which is not available through INCOIS web-site.

The web-interface developed for real-time display of Moored Buoys, Tide Guages, and Remote Sensing Data (AVHRR-NOAA and MODIS-Terra and Aqua) provides only the real time plots or images. Data will be provided to the users on request.

The tables below indicate the present status of the data base management activity.

Table 1. In-situ data sets

Data Set Availability	Metadata	QC	Database	Data Delivery	
				Data	Visualization
Argo (2002-Till date)	√	√	√	√	√
Current Meter Array (2000-2006)	√	√	√	√	√
Moored Buoy (1997-till date)	√	√	√	√ (on request)	√
Drifting Buoy (1991-2007)	√	√	√	√ (on request)	underway
XBT (1990-2006)	√	√	√	√ (on request)	To be taken up
COMAPS (1991-2004)	√	√	√	√	√
Tide Guages (2007- till date)	(to be done)		√	(presently used for in-house applications only)	√
BPR (2007- till date)			√		√
Seismic (2007- till date)			√		√

Table 2. Remote Sensing data sets.

Data Set (Availability)	Parameters	Inventory	Database	Data Delivery	
				Data	Visualization
NOAA (2001-till date)	SST	√	Storage	√ (on request)	√ (latest one week)
OCM (2000-2006)	Chlorophyll	√	Storage	X	X
MODIS (Aqua & Terra) (2001-till date)	SST, Chl Kd940, TSM	√	Storage	√ (on request)	√ (from Oct '07)
Altimeter (2001-till date)	SSHA	√	LAS	√	√
Quikscat (2001-till date)	Winds	√	LAS	√	√
SeaWifs (1997-2006)	Chlorophyll	√	Storage	x	x

The web-interfaces developed for Meta database, Current Meter Mooring Array, GTS and COMAPS will soon be integrated with INCOIS web-site.

7. Future Plan

INCOIS has implemented state-of-the-art data base driven user friendly dynamic web site with multilingual capability, Web-GIS facilities for providing ocean information and advisory services such as PFZ, OSF, Argo data and products, etc. This has been widely used web site among wide spectrum of users.

To improve the functionality of the Website and maintain a centralised repository of enterprise data, INCOIS has initiated the development of data warehouse and data mining facility. Towards this, INCOIS has designed a data base using Oracle for managing in-situ as well as remote sensing data. Also a GIS based interface for selection and retrieval of data from various observing platforms in the Indian Ocean has been developed. During the XI Plan it is proposed to make this as a full fledged data warehousing with data mining capabilities which enables online data discovery, data visualisation and data transport. This will also facilitates timely, reliable, up-to-date ocean data and information to various users in appropriate formats to meet their requirements.