Online Training Course
On

Remote Sensing Data Sources and accessibility

Organized by

International Training Centre for Operational Oceanography (ITCOO)
ESSO-INCOIS, MoES, Hyderabad, India

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INCOIS as Data Centre

- The central repository for marine data in the country, receives voluminous oceanographic data
- Data provides information on physical, chemical, biological and geological parameters
- Spatial and temporal data and data products at different resolutions, and levels
- Data pre-processing, post-processing, quality control, dissemination and archives

Affiliations:

- Designated as the National Oceanographic Data Centre by the International Oceanographic Data Exchange Programme (IODE) of International Oceanographic Commission (IOC)
- Indian Ocean Global Ocean Observing System (IOGOOS) (*http://www.iocperth.org/iogoos*)

INCOIS Marine Data Services

- **Remote Sensing**

  AVHRR, AVHRR-AMSR, MODIS

- **IN-SITU**

  Argo-Core, CTD, XBT, XCTD, BGC-Argo

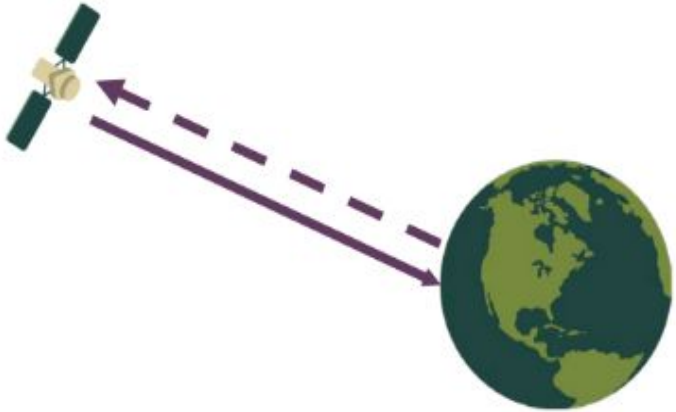
- **Model Data**

  MOM, ROMS, HYCOM

Data types	Parameters
Remote sensing	
• MODIS/Terra and Aqua	• SST
• OCM-1&2/Oceansat-2	• chlorophyll
• TMI	• sea level, SST
• Quicksat & ASCAT	• rainfall
In-situ	
• Argo	• temperature/ salinity
• Moored buoys	• air pressure/temp, humidity, current
• Drifting buoys	• air temperature
• Tide gauge	• wind speed and direction
• Bottom pressure recorders	• water temperature
• XBT observations	• wave height and direction
• Current meters	• current speed and direction
• HF Radars	• wave parameters
• Automatic Weather Stations	• SST and air temperature
• Wave Rider Buoys	• atmospheric pressure
• Wave Height Meter	• sea surface currents
• CTD	• sea level (currents)

Remote Sensing: acquiring of information from a distance

Passive Sensor



Active Sensor

Examples: land and sea surface temperature, vegetation properties, cloud and aerosol properties, and other physical properties

Examples: vertical profiles of aerosols, forest structure, precipitation and winds, sea surface topography, and ice, among others

Source: Earth Data, NASA

Evolution	Duration	Remarks
Airborne remote sensing	First & Second World Wars	Photographs for surveying, mapping, reconnaissance and military surveillance.
Rudimentary spaceborne satellite remote sensing	Late 1950s	The launch of Sputnik 1 by Russia in 1957 and Explorer 1 by US in 1958.
Spy satellite remote sensing	Cold War (1947–1991)	Remote sensing for military use spilled over into mapping and environment applications.
Meteorological satellite sensor remote sensing	1960	The launch of the first meteorological satellite (TIROS-1) by the US in 1960.
Landsat	1972	Landsat satellites have high resolution and global coverage. Applications were initially local and have become global.
Earth observing system (EOS)	Since the launch of the Terra satellite in 1999	Terra/Aqua satellites carrying sensors, such as MODIS and taking measurements of pollution in the troposphere. Global coverage, frequent repeat coverage, a high level of processing, easy and mostly free access to data.

Remote Sensing Products

- Why ?
  - Good spatial coverage
  - Geographical difficulties: Extreme difficult terrain, polar regions
  - Natural disasters: cyclones, high-tides, tsunami
  - Very high resolution
  - Various applications

- Data Products: data from various sensors in a suitable and standard form and format, which can be readily used by user.

Applications

Coastal: coastal mapping, erosion prevention, monitor shoreline changes, track sediment transport, and map coastal features.

Ocean: Monitor ocean circulation and current systems, measure ocean temperature and wave heights, and track sea ice.

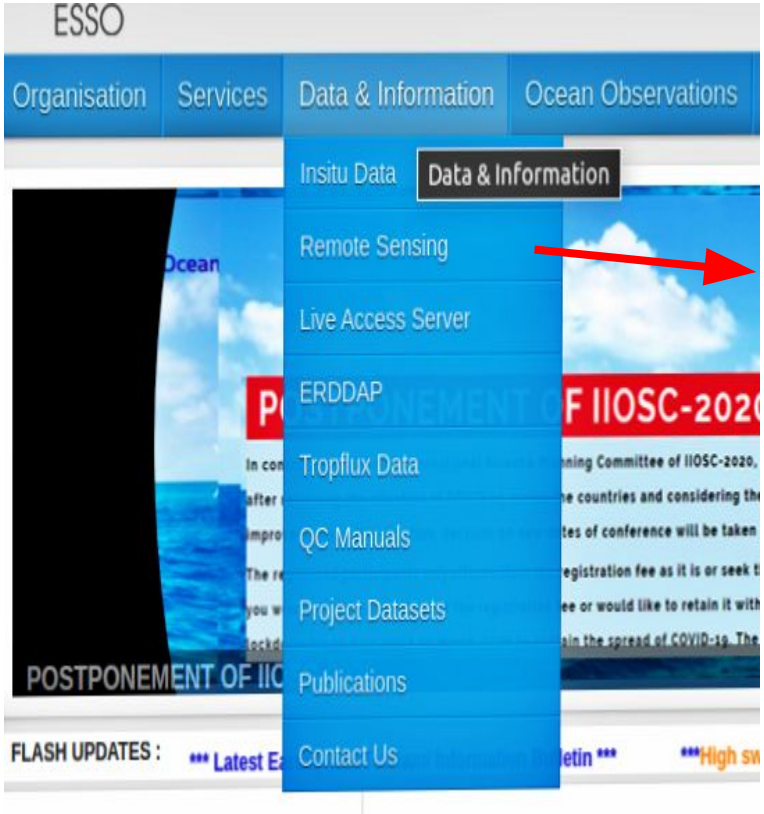
- *Hazard assessment:* Track hurricanes, earthquakes, erosion, and flooding. Assess a natural disaster impacts and design preparedness strategies before and after a hazardous event.
- *Natural resource management:* Monitor land use, map wetlands, and chart wildlife habitats. Information used to minimize the damage that urban growth has on the environment and help decide how to protect natural resources at best.

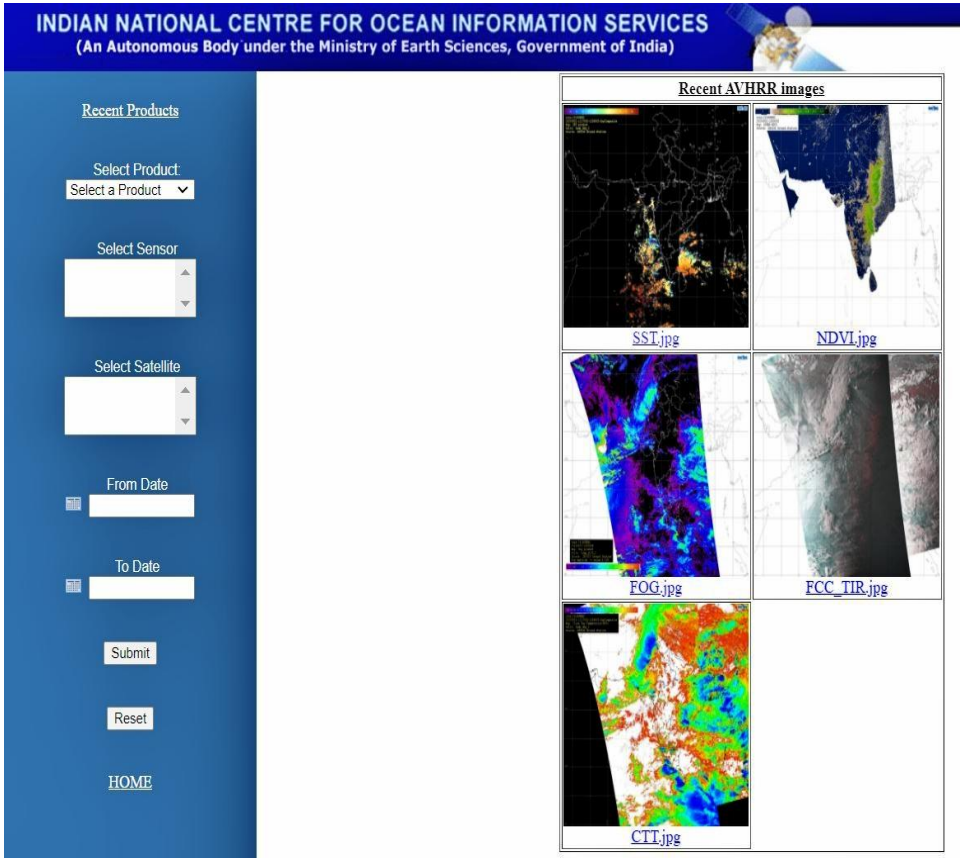
DATA PRODUCTS:Types & Classifications

- Types:
  - processing level
  - output scale
  - coverage area

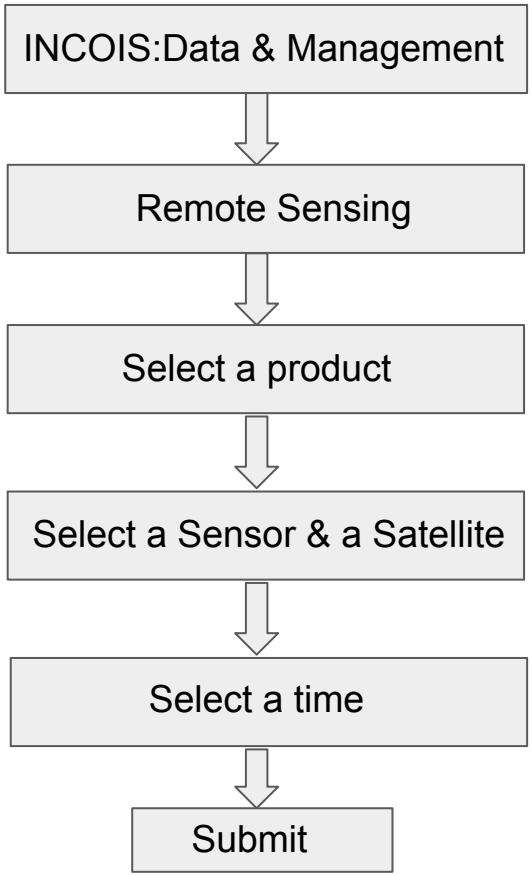
- Classification:
  - *standard products* :- direct information from satellite with necessary corrections (radiometer/geometric)
  - *value-added products* :- standard products processed as per user requirements (merged products)
  - *derived products* :- further data processing/analysing by the providers from the original data (SST)

Remote Sensing





Flow Chart



Output

- JPG: Image
- GeoTiff: Informations

Recent Products

Select Product:
Sea Surface Temp

Select Sensor
AVHRR
MODIS

Select Satellite
METOP-1
METOP-2
NOAA-17

From Date
01/08/2020

To Date
30/08/2020

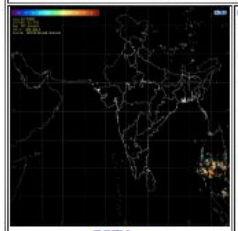
Submit

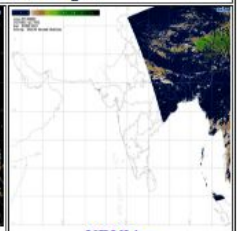
Reset

HOME

For archive data kindly contact pattabhi@incois.gov.in

Recent AVHRR images


SST.jpg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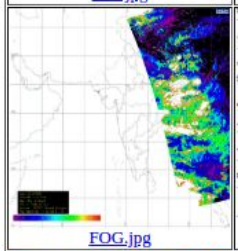
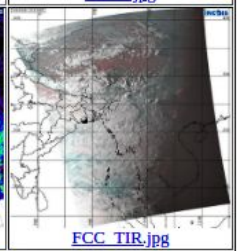
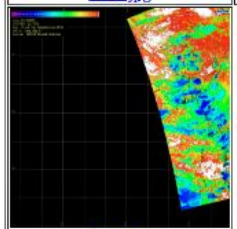

FOG.jpg


FCC_TIR.jpg


CTT.jpg

List of Images

20200830-174100Z-metop-1-sst.jpg
Download JPG GeoTiff

20200830-155610Z-metop-1-sst.jpg
Download JPG GeoTiff

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Download JPG GeoTiff

20200830-142140Z-155610Z-NightComposite-metop-1-sst.jpg
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Download JPG GeoTiff

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Other Data Sources

- Meteorological & Oceanographic Satellite Data Archival Centre (MOSDAC)

  https://www.mosdac.gov.in/

- Met Office Hadley Centre observations datasets

  https://www.metoffice.gov.uk/hadobs/

- NOAA Physical Sciences Laboratory (PSL)

  https://psl.noaa.gov/

- NASA:Global Precipitation Measurement Mission (GPM)

  https://gpm.nasa.gov/

*subject to register

Data Dissemination

- Policy
  - Remote Sensing Data Policy (RSDP): data acquisition and distribution of remote sensing satellite data, from Indian and foreign satellites, for the civilian users

- Process:
  - Less volume data & training datasets : through email
  - Large volume data: through hard drives, DVDs
  - Bulk of data: FTP
  - Geographic Information Systems (GIS): for acquiring, managing, analyzing, and presenting spatially related information

In Situ

- INCOIS HOME >> Data & Information >> In Situ Data >> Argo

Argo Home

Data Access

Regional Data Centre

APEX User Manuals

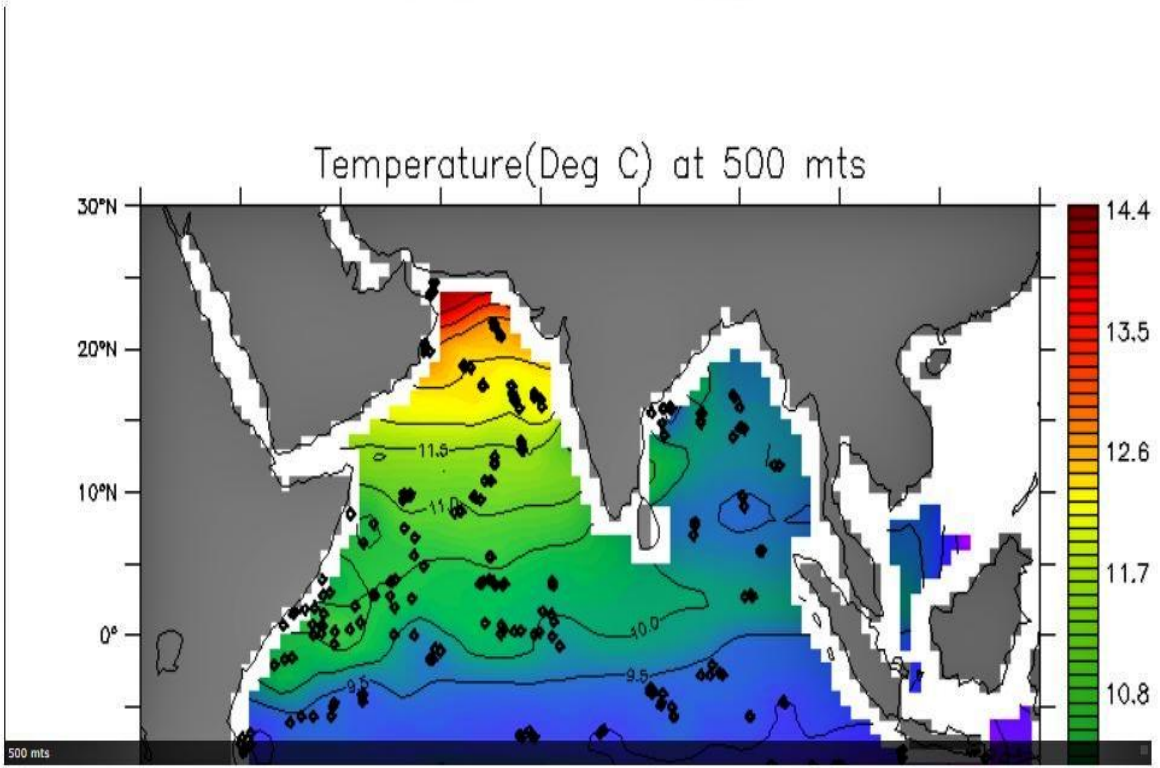
Active Floats in EEZ

Argo Data Viewer

Objectively Analysed Products

Year : 2004 Month: Februan Type: Temperature

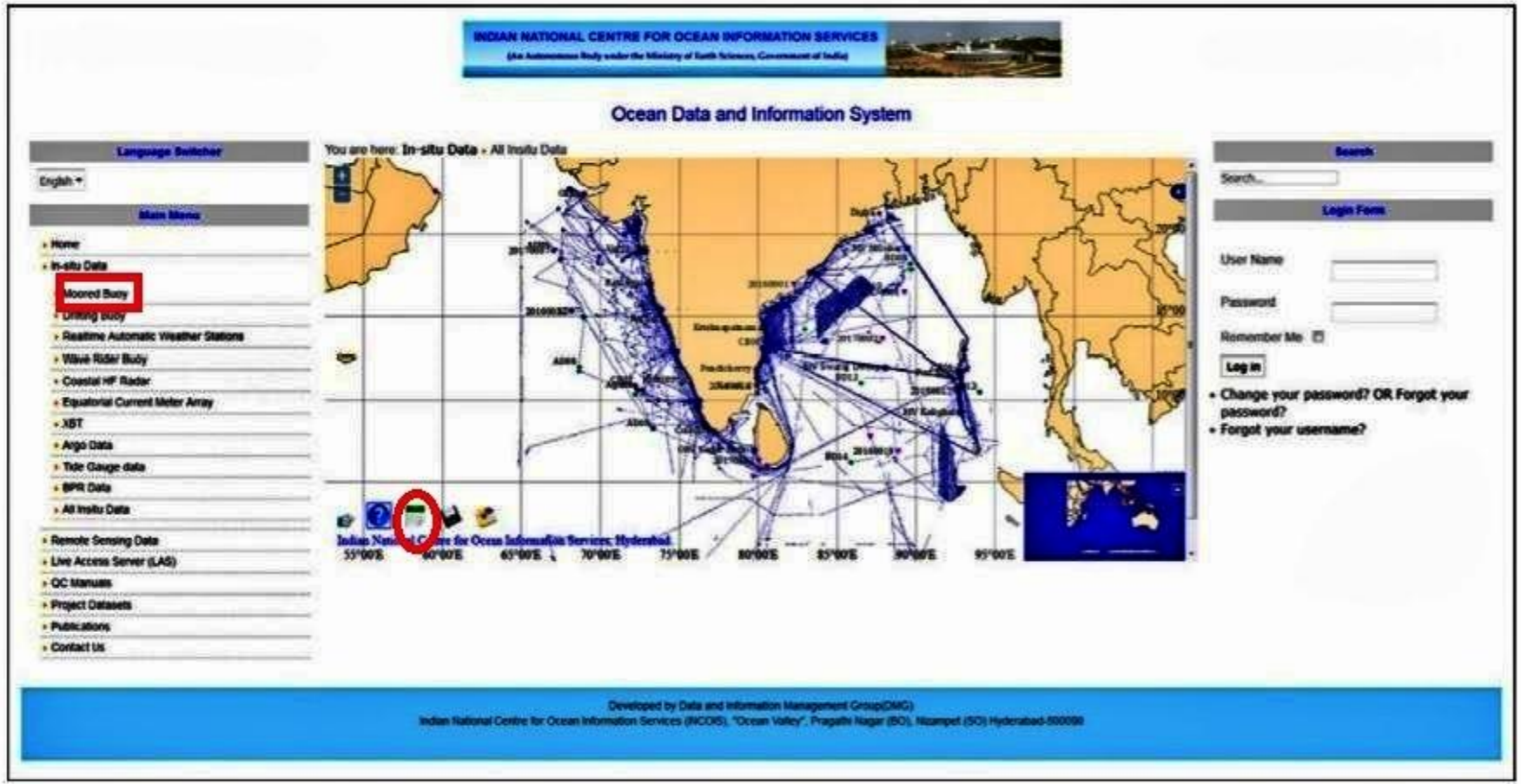
Temperature Products for the Year: 2004 and month: February



*Output available for different depth levels

Moored Buoy Data and Information

- INCOIS provide ocean data and data products required for both research and operational oceanography
- The data received from various observing systems in real-time at different communication systems are assembled and standardized
- Designed and developed using open access data management and web access tools like MySQL, UMN MapServer and OpenLayers
- It serves as an end-to-end ocean data management system
- Ocean observation systems (OOS) group of NIOT is entrusted to undertake the activities on moored buoy programs



Ocean Data and Information System at INCOIS for dissemination of in situ data (Shesu et al., 2013)

Moored Buoy OMNI

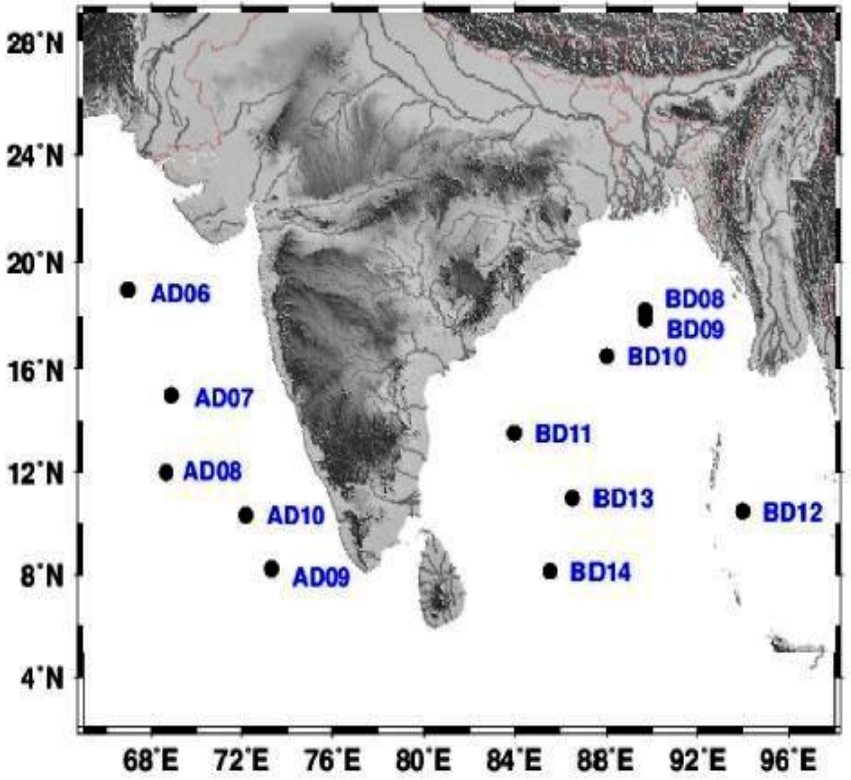
- OMNI provides High resolution real-time Data.
- Record both meteorological and oceanographic parameters

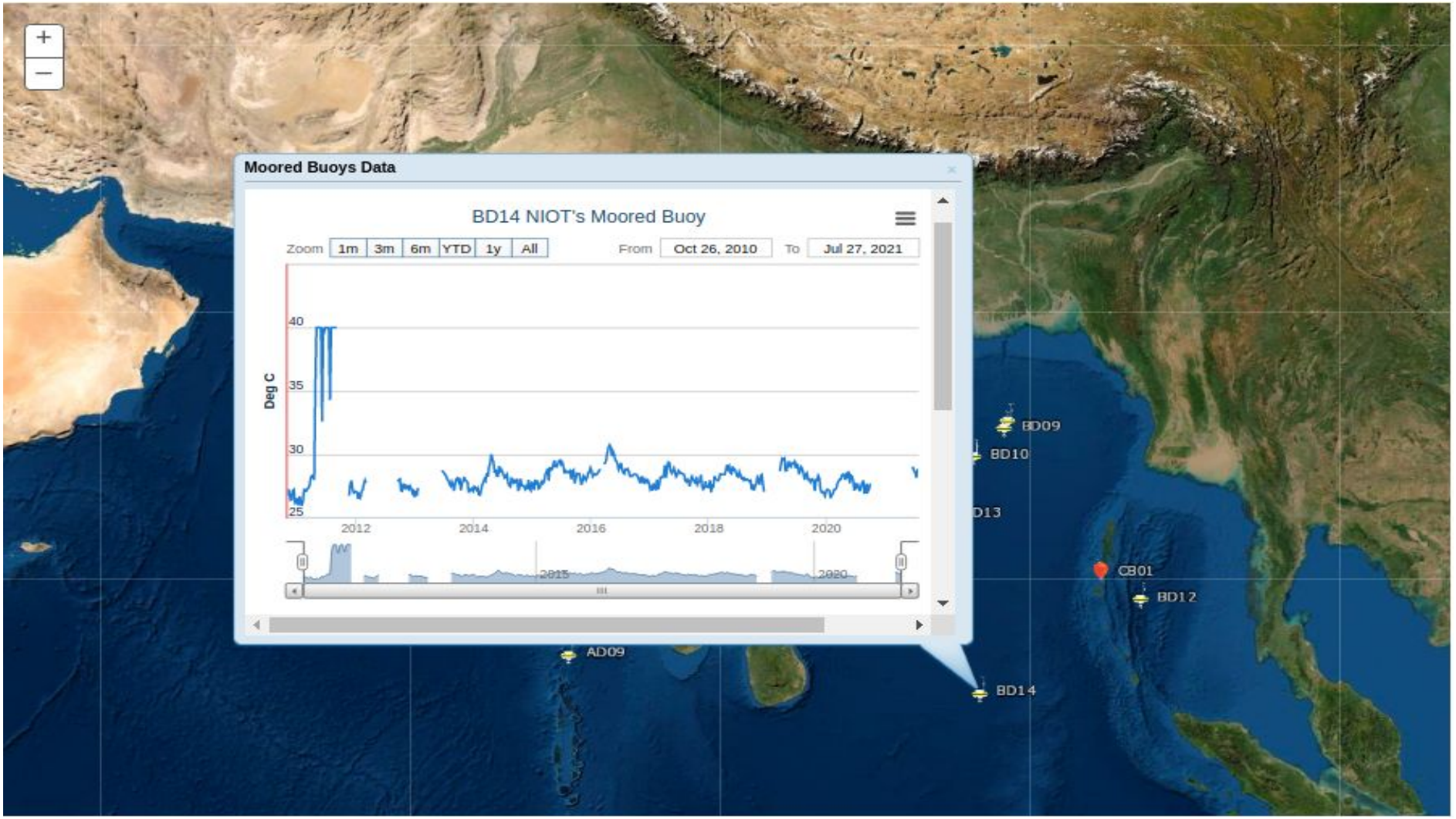
  > air temperature, pressure, surface winds, radiation, rainfall, humidity

  > surface temperature, conductivity, surface layer currents

- Currently 12 active buoys
- Deploy and maintained by NIOT; data processing and dissemination through INCOIS

INCOIS > Data & Information>IN SITU Data




Moored Buoys Data
BD14 NIOT's Moored Buoy
Zoom
1m
3m
6m
YTD
1y
All
From
Oct 26, 2010
To
Jul 27, 2021
Deg C
40
35
30
25
2012
2014
2016
2018
2020
2015
2020
BD09
BD10
D13
CB01
BD12
AD09
BD14

- Serve different type of data at unifies platform
- Simple and consistent data server to download subsets of scientific datasets
- Outputs are available in many formats as as .html table, ESRI .asc and .csv, Google Earth .kml, OPeNDAP binary, .mat, .nc, ODV .txt, .csv, .tsv, .json, and .xhtml
- ERDDAP can also return a .png or .pdf image with a customized graph or map.

Protocol	Description
griddap datasets	Griddap lets you use the OPeNDAP hyperslab protocol to request data subsets, graphs, and maps from gridded datasets (for example, satellite data and climate model data). griddap documentation
tabledap datasets	Tabledap lets you use the OPeNDAP constraint/selection protocol to request data subsets, graphs, and maps from tabular datasets (for example, buoy data). tabledap documentation
"files" datasets	ERDDAP's "files" system lets you browse a virtual file system and download source data files. WARNING! The dataset's metadata and variable names in these source files may be different than elsewhere in ERDDAP! You might prefer using the dataset's Data Access Form instead. "files" documentation
WMS datasets	The Web Map Service (WMS) lets you request an image with data plotted on a map. WMS documentation

ERDDAP HOME >> GRIDDED DATASETS >> MAKE A GRAPH

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Title	Sum-mary	Meta-data	Back-ground Info	RSS	E mail	Institution	Dataset ID
data			graph	M	AMSR2 Monthly Global Data		M	background	RSS		INCOIS	AMSR2_mnt_Global
data			graph	M	AMSRE 3Day Global Data		M	background	RSS		INCOIS	AMSRE_3DAY_GLOBAL
data			graph	M	AMSRE Monthly Global Data		M	background	RSS		INCOIS	AMSRE_MONTHLY_GLOBAL
data			graph	M	Daily ASCAT global wind field		M	background	RSS		ifremer	ascat_daily_datasets
data			graph	M	Daily-OI-V2, final, Data (Ship, Buoy, AMSR-E, AVHRR, GSFC-ice)		M	background	RSS		INCOIS	NOAA_AVHRR_AMSR_datasets
data			graph	M	Daily-OI-V2, final, Data (Ship, Buoy, AVHRR, GSFC-ice)		M	background	RSS		INCOIS	NOAA_AVHRR_datasets
data			graph	M	Data from a local source.		M	background	RSS		???	AMSR2_3day_Global
data			graph	M	INCOIS ARGO 10 Day data Kessler-McCreary Methodology		M	background	RSS		INCOIS	incois_argo_10day_McCreary
data			graph	M	INCOIS ARGO 10 day data Variational Analysis Methodology		M	background	RSS		INCOIS	incois_argo_10d_VAM
data			graph	M	INCOIS ARGO Monthly data Kessler-McCreary Methodology		M	background	RSS		INCOIS	incois_argo_mnt_McCreary
data			graph	M	INCOIS ARGO Monthly data Variational Analysis Methodology		M	background	RSS		INCOIS	incois_argo_mnt_VAM
data			graph	M	INCOIS argo SST data Weekly		M	background	RSS		INCOIS	incois_argo_sst_weekly
data			graph	M	INCOIS Oceansat 2 OCM Data		M	background	RSS		INCOIS	incois_oceansat2_datasets
data			graph	M	INCOIS Quickscat Daily Data		M	background	RSS		INCOIS	incois_quickscat_daily_datasets
data			graph	M	INCOIS Quickscat Monthly Data		M	background	RSS		INCOIS	incois_quickscat_mnt_datasets
data			graph	M	INCOIS TMI 3Day Data		M	background	RSS		INCOIS	incois_tmi_3day_datasets
data			graph	M	INCOIS TMI Monthly Data		M	background	RSS		INCOIS	incois_tmi_mnt_datasets
data			graph		INCOIS Value Added Products		M	background	RSS		INCOIS	incois_valueadded_products_datasets
data			graph	M	IRS P4 OCM-Chlorophyll		M	background	RSS		INCOIS	IRS_chlorophyll_datasets
data			graph	M	Monthly ASCAT global wind field		M	background	RSS		ifremer	ascat_mnt_datasets

Dataset Title: **AMSR2 Monthly Global Data** ✉ RSS
Institution: INCOIS (Dataset ID: AMSR2_mnt_Global)
Information: Summary | License | Metadata | Background | Data Access Form

Graph Type: surface
X Axis: longitude
Y Axis: latitude
Color: SST

Dimensions	**Start**	**Stop**
time (UTC)	specify just 1 value →	2020-07-15T00:00:00Z
latitude (degrees_north)	-30.0	30.0
longitude (degrees_east)	30.0	120.0

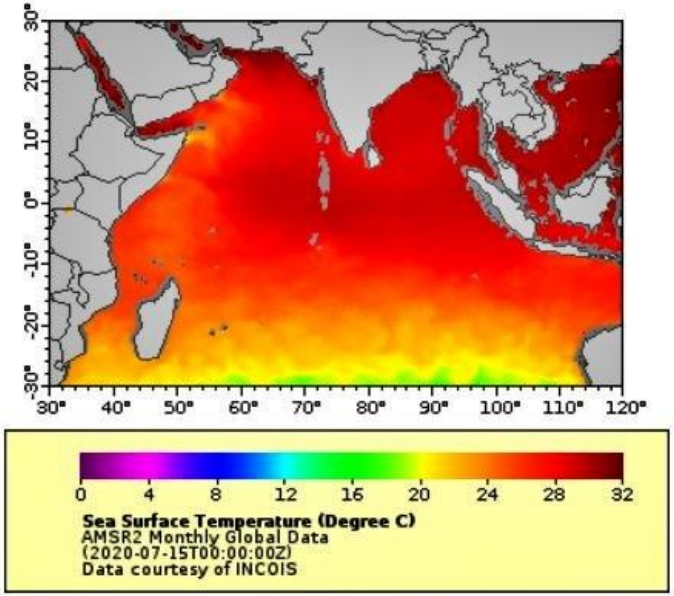
Graph Settings

Color Bar: Continuity: Scale:
Minimum: Maximum: N Sections:
Draw land mask:
Y Axis Minimum: Maximum: Ascending

Redraw the Graph (Please be patient. It may take a while to get the data.)

Optional:
Then set the File Type: .htmlTable (File Type information)
and Download the Data or an Image
or view the URL: /erddap/griddap/AMSR2_mnt_Global.htmlTable?SST%5B(2020-07-15T0
(Documentation / Bypass this form)

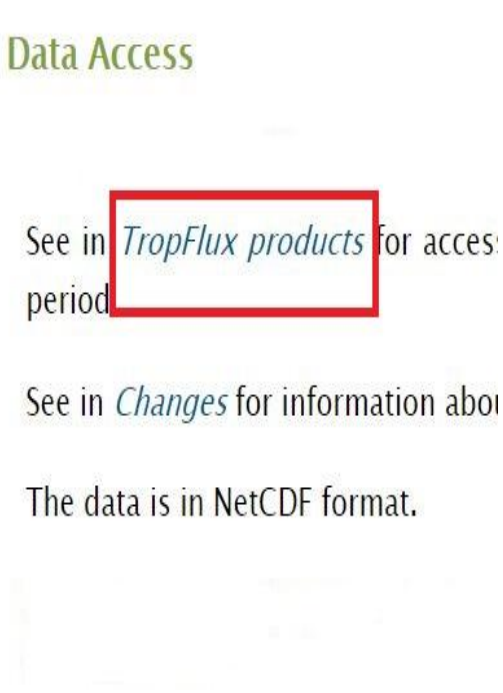
Click on the map to specify a new center point.
Zoom: Data | Out 8x | Out 2x | Out | In | In 2x | In 8x



Set file type as your choice, viz. png for download image etc.

TropFlux

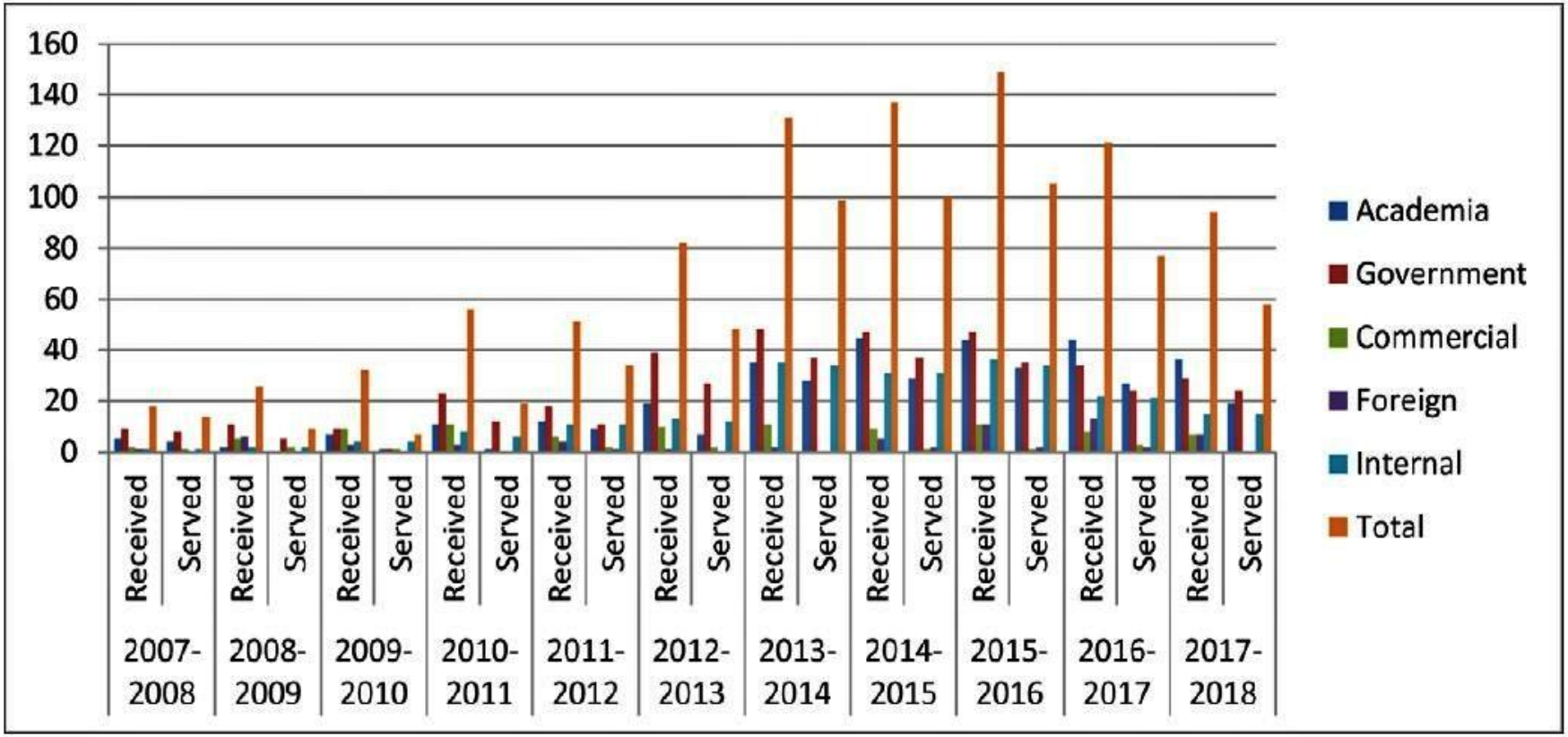
- Aims at providing daily, timely, accurate air-sea heat and momentum flux data for the entire Indian ocean region
- Data available since 1979
- TropFlux data is freely available for research and education purposes.



Note: To download TropFlux data, registration is required.

Offline dataset via DVDs

- RS data and data products for Indian Ocean region consists huge profiles, and is prepared and being distributed to students and researchers
- Upon registration or request, DVD contains software with Graph User Interface, similar feature to traditional Web GIS where in the user can search, query, visualize and download the data of their choice
- For huge data sets, FTP platform can be provided to transfer the desired datasets



Distribution of the different types of requests processed (Pattabhi et al. 2018)

DATA REQUISITION FORM

INCOIS

DATA REQUISITION FORM

1. Institution / Dept. Address:
2. Name & designation of the officer requiring data:
3. Details of data requirement:

Parameters	Platform / Instrument	Period

4. Project for which the above data is required and the project cost:
5. Please indicate whether the data is required for:
   a. Own research
   b. Sponsored & consultancy projects *
6. If it is for consultancy project, whether the project has obtained the approval from Central/State Government, if so, please provide the details:

7. **CERTIFICATE OF UNDERTAKING:**
   a. Data supplied are exclusively for the use of the organization only.
   b. The data will be used only for the purpose for which it is supplied.
   c. These data shall not be passed on to any other party or agency (India/abroad) either in part, in full or in any form. If needed, prior approval should be taken from Indian National Centre for Ocean Information Services for the same under special circumstances.
   d. Due acknowledgement shall be given to Indian National Centre for Ocean Information Services for the source of data in all reports / publications etc. made by you.

Signature of the Officer (Requisite) Signature of the Head of the Institution

Station:
Date & office seal:

Note:
* For sponsored and consultancy projects, INCOIS will be charging for the data to be supplied as per INCOIS norms.

https://incois.gov.in/portal/datainfo/drform.jsp

THANK YOU!!

References

Bhaskar et al; 2007. *An operational objective analysis at INCOIS for generation of value added products*, Technical Report, Report No. INCOIS-MOG-ARGO-TR-04-2007.

Devender et al; 2013. *INCOIS Live Access Server: A platform for serving Geo-Spatial data of Indian Ocean*. Int. J. of Oceans and Oceanography, 7(2): 143–151.

Pattabhi et al; 2009. *Ocean data and Information System (ODIS) and web based services*. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XXXVII. Part B4. Beijing 2008.

Pattabhi et al; 2018. *Marine Data Services at National Oceanographic Data Centre-India*. Data Science Journal, 17: 11, pp. 1–7.

Shesu et al; 2013. *Open source architecture for web-based oceanographic data services*. Data Science Journal.

Lingli Zhu et al; 2017. A Review: Remote Sensing Sensors, Multi-purposeful Application of Geospatial Data, IntechOpen.

Open Sources: NOAA, NASA, RMetS.