Online Training Course
On

Remote Sensing Data Sources and accessibility

Organized by

International Training Centre for Operational Oceanography (ITCOocean)
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
- OCM-1&2/Oceansat-2
- TMI
- Quicksat & ASCAT

- SST
- chlorophyll
- sea level, SST
- rainfall

In-situ

- Argo
- Moored buoys
- Drifting buoys
- Tide gauge
- Bottom pressure recorders
- XBT observations
- Current meters
- HF Radars
- Automatic Weather Stations
- Wave Rider Buoys
- Wave Height Meter
- CTD

- temperature/ salinity
- air pressure/temp, humidity, current
- air temperature
- wind speed and direction
- water temperature
- wave height and direction
- current speed and direction
- wave parameters
- SST and air temperature
- atmospheric pressure
- sea surface currents
- sea level (currents)

Remote Sensing: acquiring of information from a distance
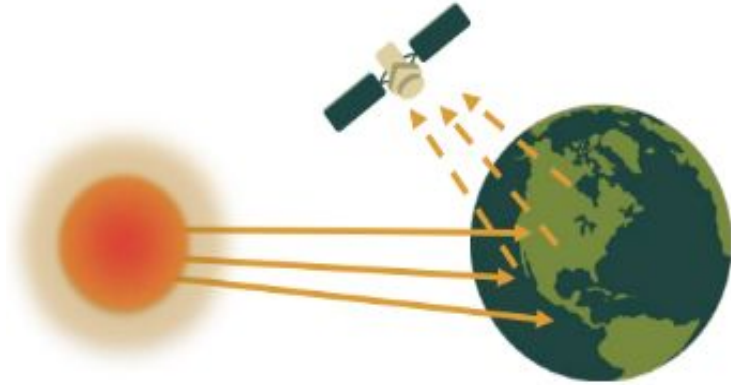
Passive Sensor

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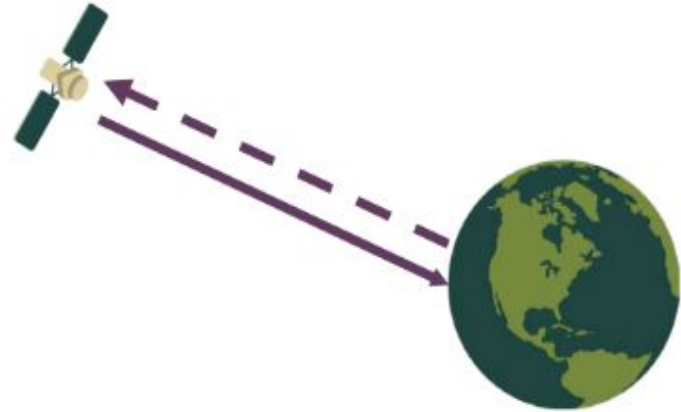
Active Sensor

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

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.

Courtesy: The Lego Data Story (Stanford)

Data Products: Classifications

- 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)

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.
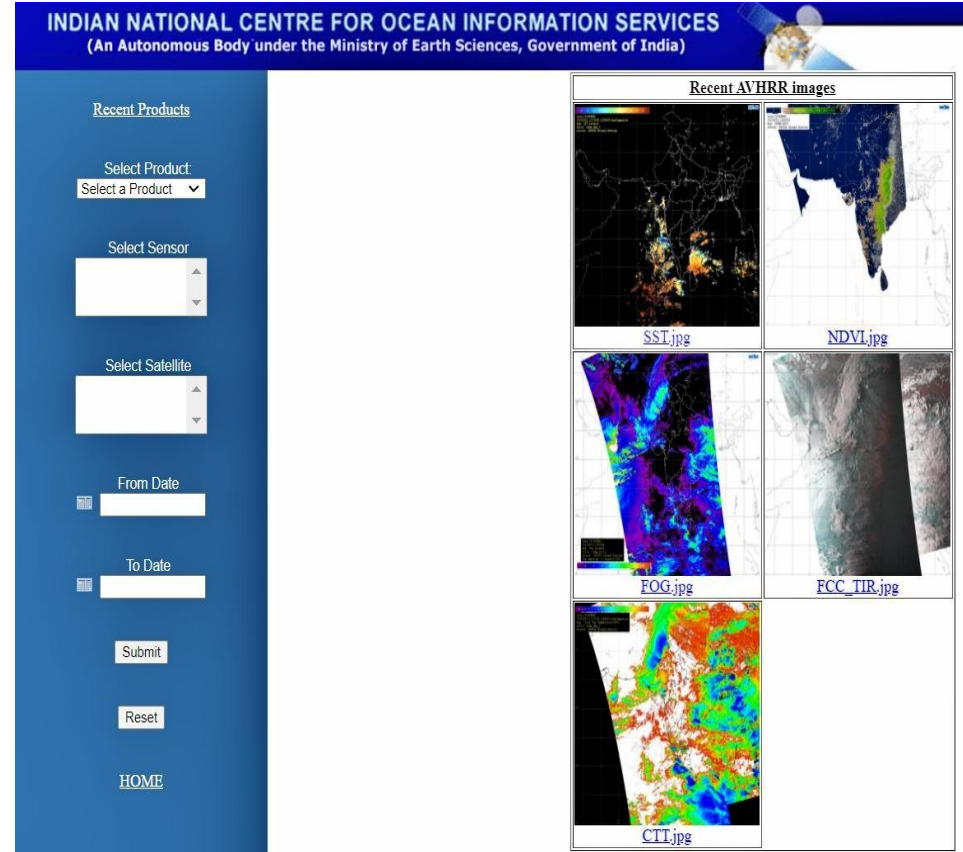
Data Discovery Platforms

- MoES-NOAA: OMNI-RAMA joint data portal

- In-situ data & information portal

- Remote sensing portal

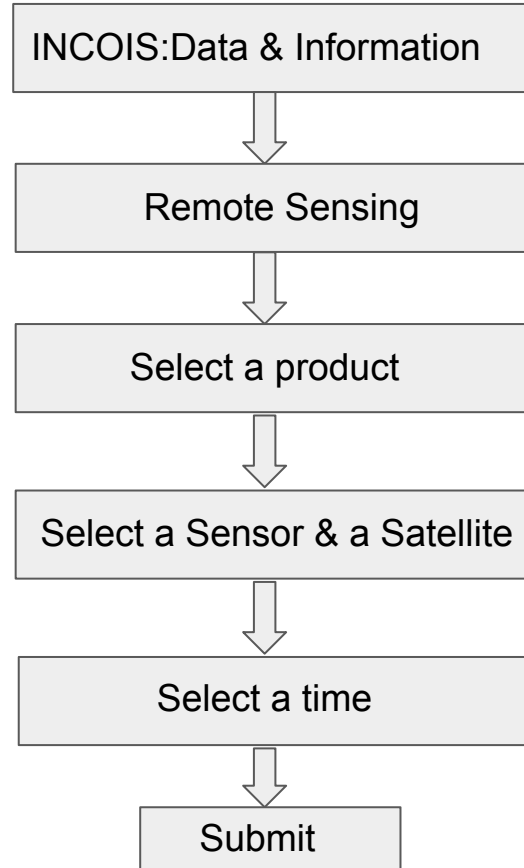- Live access server (LAS)

- ERDDAP-NOAA

- TropFlux portal

https://incois.gov.in/portal/index.jsp

*Note: Some portal may require authentication

Remote Sensing

Flow Chart

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
(An Autonomous Body under the Ministry of Earth Sciences, Government of India)

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

Recent Products

Select Product:
Sea Surface Temp

Select Sensor
AVHRR
MODIS

Select Satellite
METOP-1
METOP-2
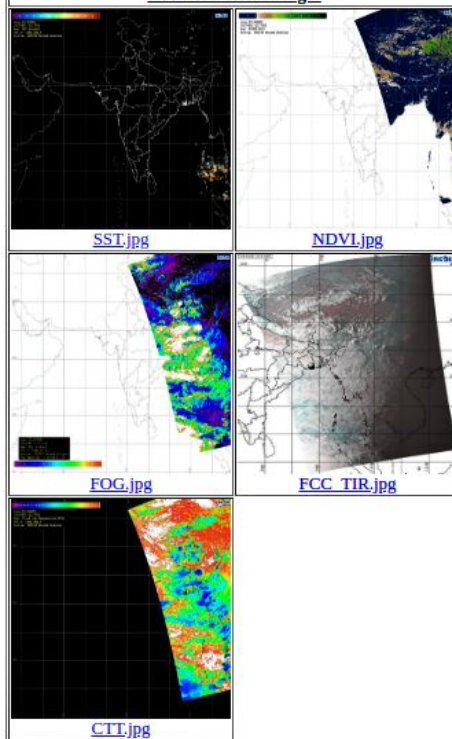NOAA-17

From Date
01/08/2020

To Date
30/08/2020

Submit

Reset

HOME

Recent AVHRR images

SST.jpg

NDVI.jpg

FOG.jpg

FCC_TIR.jpg

CTT.jpg

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

MoES-NOAA: OMNI-RAMA Portal

OMNI

- Ocean Moored buoy Network for Northern Indian (OMNI)
- 12 OMNI buoys collect and transmit high resolution real-time data for upper ocean, surface meteorology, and wave parameters

RAMA

- Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction, designed to study the Indian Ocean monsoons
- Physical oceanographic and meteorological parameters

Data Extraction-OMNI

- Select an ID and preview metadata

- Prompt new window, select- parameters, time-range

- Save output either as image, .csv, etc.

OMNI Buoy BD13

Programme: OMNI
Agency: NIOT, INDIA
Buoy: BD13
Latitude: 13.99 degrees
Longitude: 87.00 degrees
EEZ Status: No
Data Status: Reporting
Metadata: Click here to view
Data Graph & Downloads: Click here to view

Zoom to

Select Parameter [Water Temperature @ 001m ▾] [Submit]

BD13 NIOT's Moored Buoy
Go to menu => for download graph and data options

save

Zoom 1m 3m 6m YTD 1y **All**   From [May 7, 2012] To [Oct 7, 2021]

Deg C
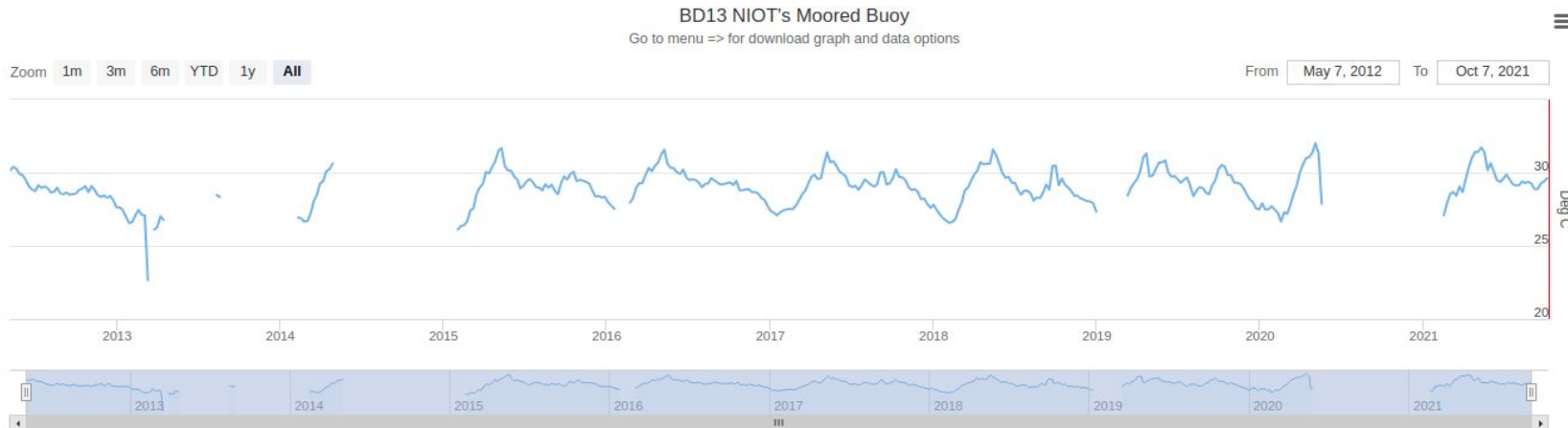
Data Extraction-RAMA

- Select an ID and preview data
- Select parameters, range, depth (if any)
- Check availability, download the output via Deliver cap

Rama Buoys:2300008

Programme: RAMA
Agency: PMEL,USA
Buoy: 2300008
Latitude: 12.01 degrees
Longitude: 88.51 degrees
EEZ Status: No
Data Status: Reporting
Data Graph & Downloads: Click here to view

Zoom to

Data Display and Delivery

► Learn about RAMA   Show Instructions   Show Historical and Active Sites

| TAO/TRITON (Pacific) | PIRATA (Atlantic) | RAMA (Indian) |

De-Select Sites   Select All Sites

| Time Series | Profiles | Time Section | Lat Lon Map | Depth Section |

○ One Variable ○ One Site ◉ Separate Plots ○ Overlay ◉ Subsurface Area ○ Subsurface Lines

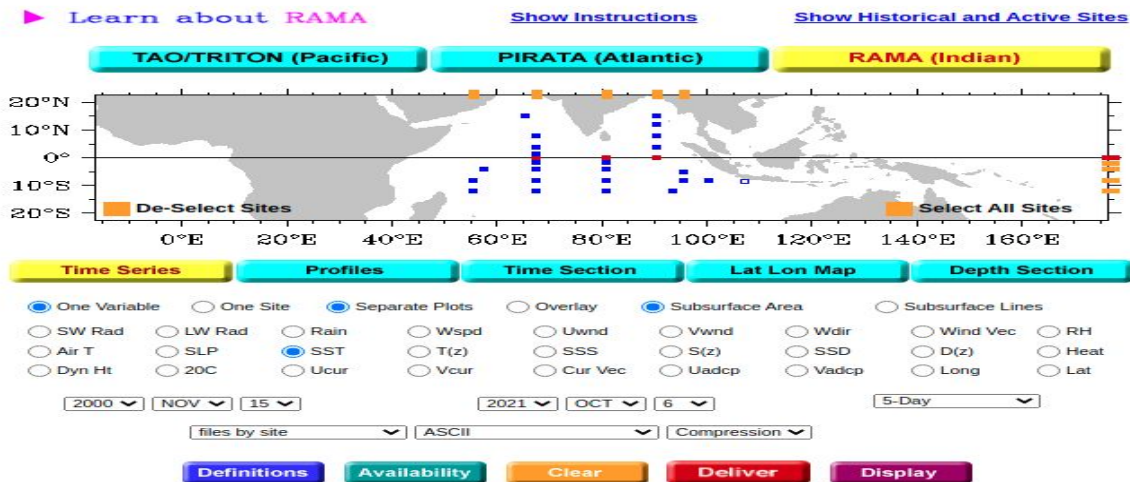| ○ SW Rad | ○ LW Rad | ○ Rain | ○ Wspd | ○ Uwnd | ○ Vwnd | ○ Wdir | ○ Wind Vec | ○ RH |
| ○ Air T | ○ SLP | ◉ SST | ○ T(z) | ○ SSS | ○ S(z) | ○ SSD | ○ D(z) | ○ Heat |
| ○ Dyn Ht | ○ 20C | ○ Ucur | ○ Vcur | ○ Cur Vec | ○ Uadcp | ○ Vadcp | ○ Long | ○ Lat |

[2000 ▾] [NOV ▾] [15 ▾]   [2021 ▾] [OCT ▾] [6 ▾]   [5-Day ▾]

[files by site ▾] [ASCII ▾] [Compression ▾]

| Definitions | Availability | Clear | Deliver | Display |

FTP Access   Acknowledgment for use of data   Realtime High Resolution Data
Send Questions to oar.pmel.taotech@noaa.gov

Output:
ASCII, .NC, etc.

ERDDAP
Easier access to scientific data

- 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	W M S	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
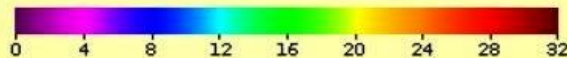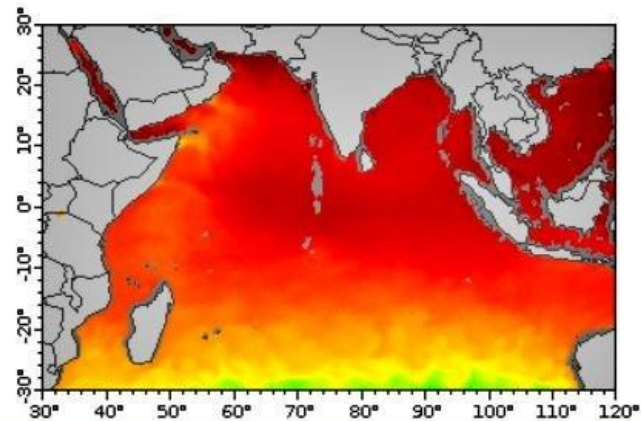
Sea Surface Temperature (Degree C)
AMSR2 Monthly Global Data
(2020-07-15T00:00:00Z)
Data courtesy of INCOIS

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

Live Access Server

- Web server designed to provide flexible access to geo-referenced scientific data

- It provides visualization, comparison and substituting of multi-dimensional scientific data for web users

- LAS functions as a virtual window, supports Windows, Unix / Linux platform

- This is Ferret based application, though tools (Matlab,GrADS) can also be used

- LAS in INCOIS (I-LAS) is being maintained since 2010

Cntd...

- Visualize data on-the-fly with graphics

- Request customize variables or subsets in a choice of formats

- Provide background references about the datasets (metadata)

- Enable feature for comparison of plots with different datasets

- Provide variations in output and in downloading files

- Documentation, Video tutorial, and Contact to the Admin

List of products on I-LAS

- Argo Products
  - Agro derived products
  - Value added products
- ASCAT wind product
  - wind speed and wind stress
- Microwave data products
  - AMSR-E & AMSR-2
  - TMI

- NOAA
  - AVHRR & AVHRR-AMSR
- New Global Climatology (NIO)
  - Temperature and Salinity
- Ocean colour products
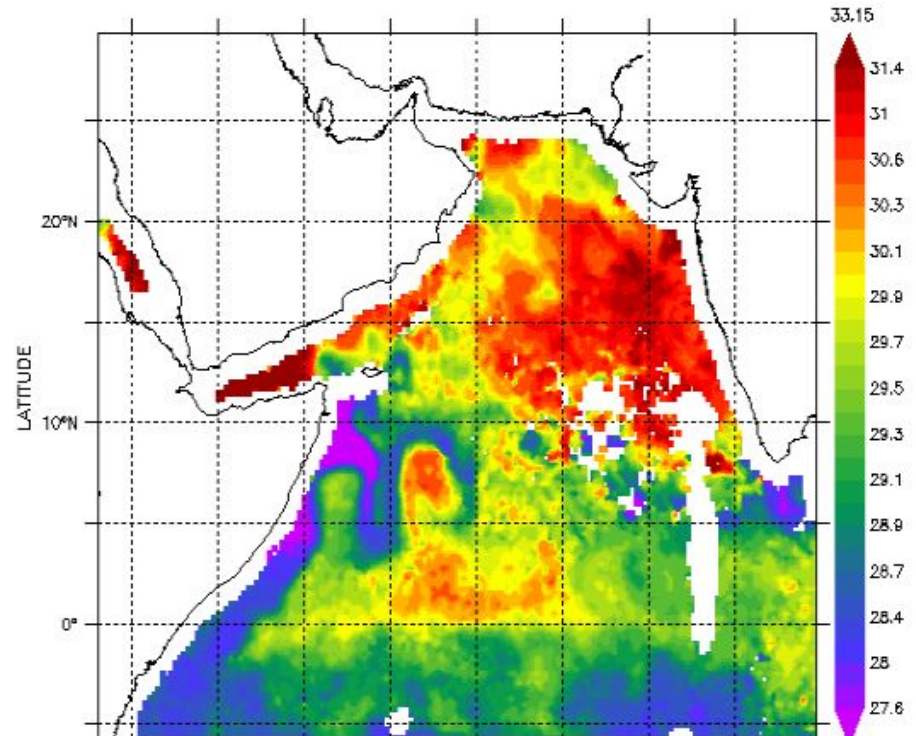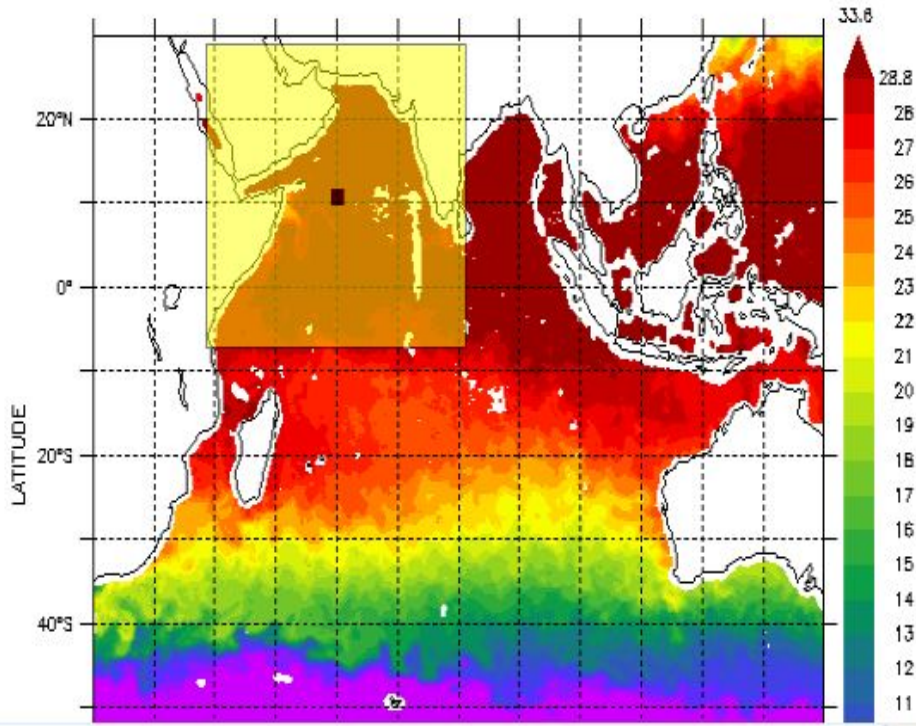 - OCM-1 : Chlorophyll
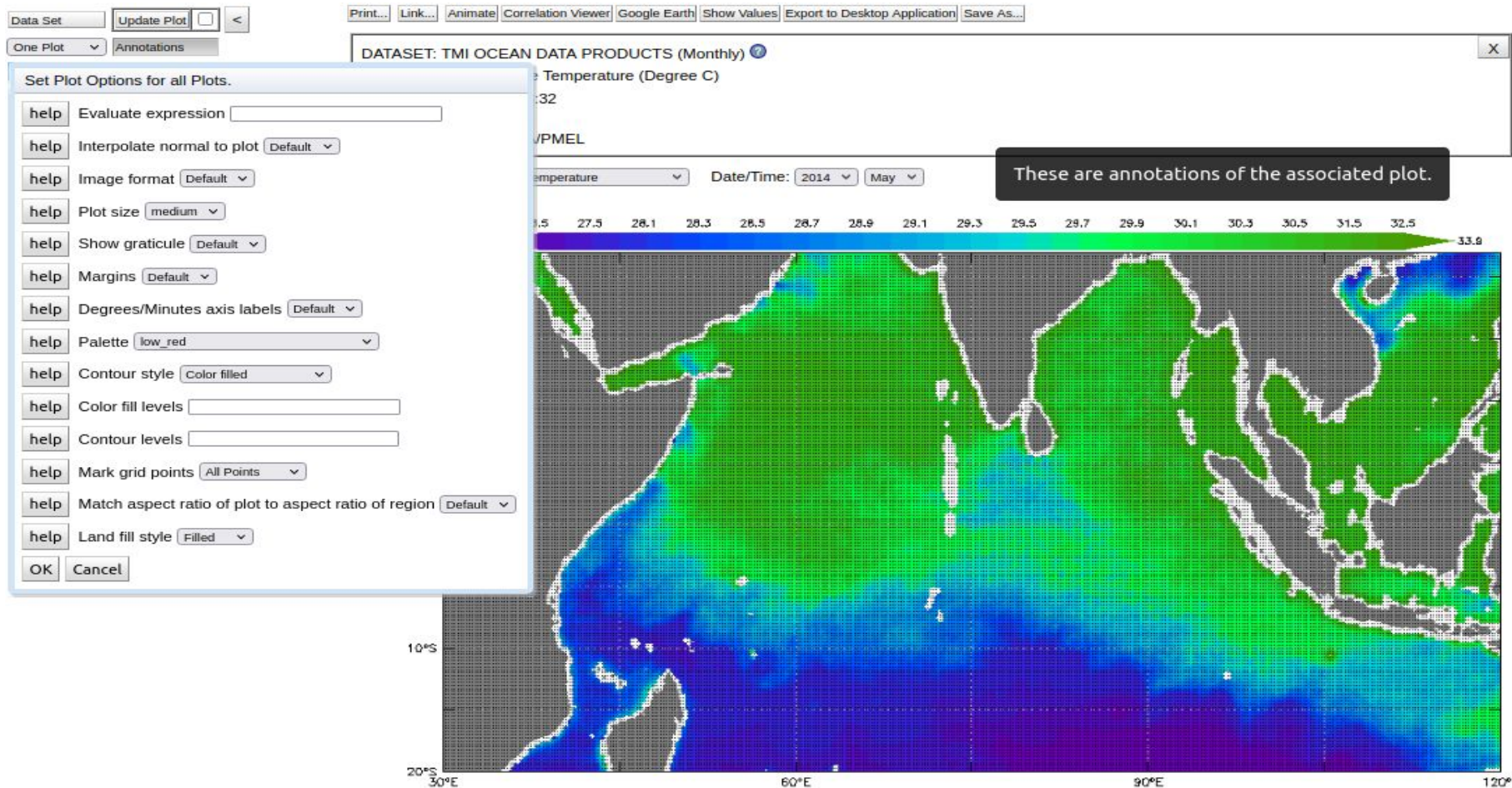 - OCM-2 : Chlorophyll-a

LAS > Dataset
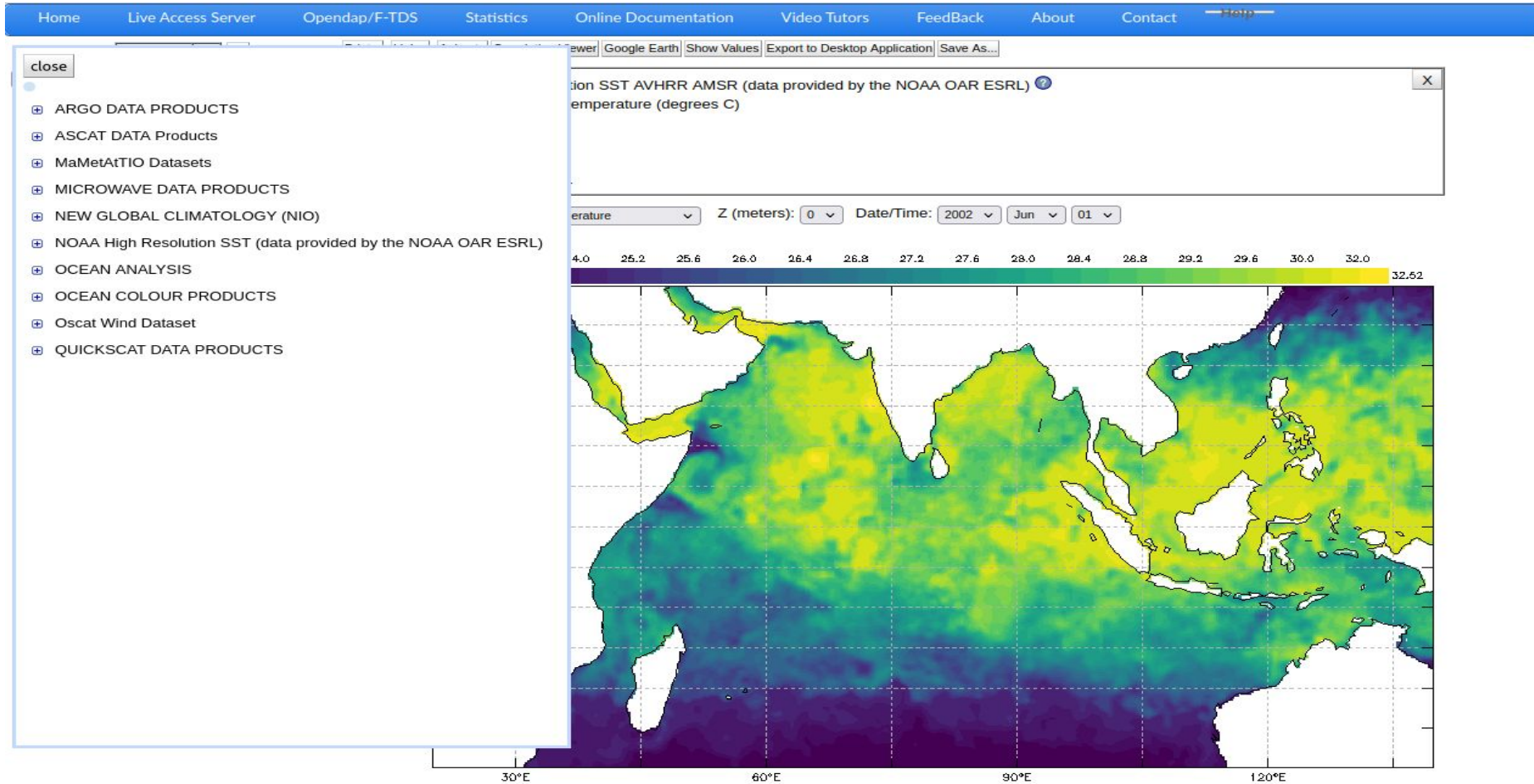
Data set > select variable; set domain; update plot
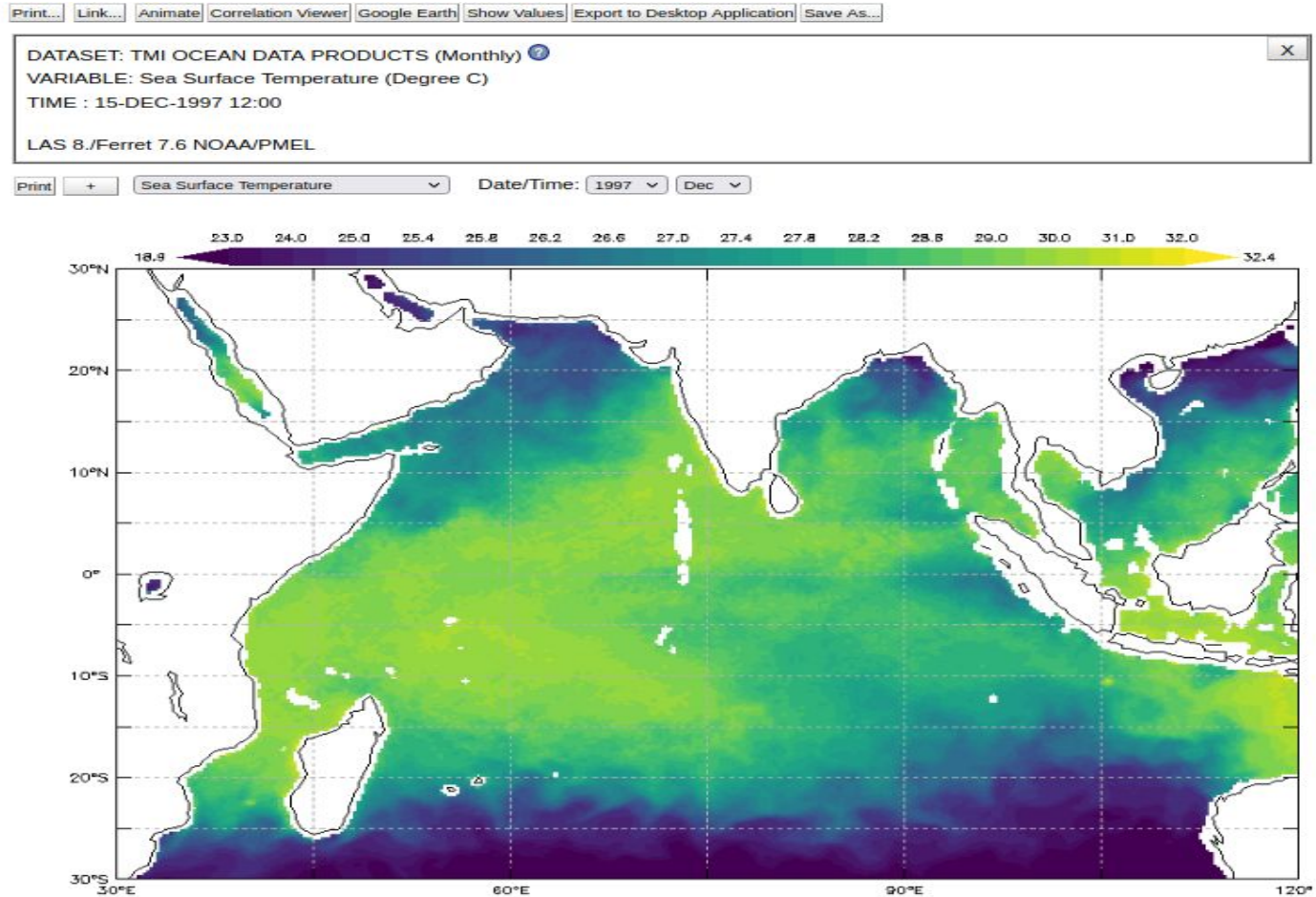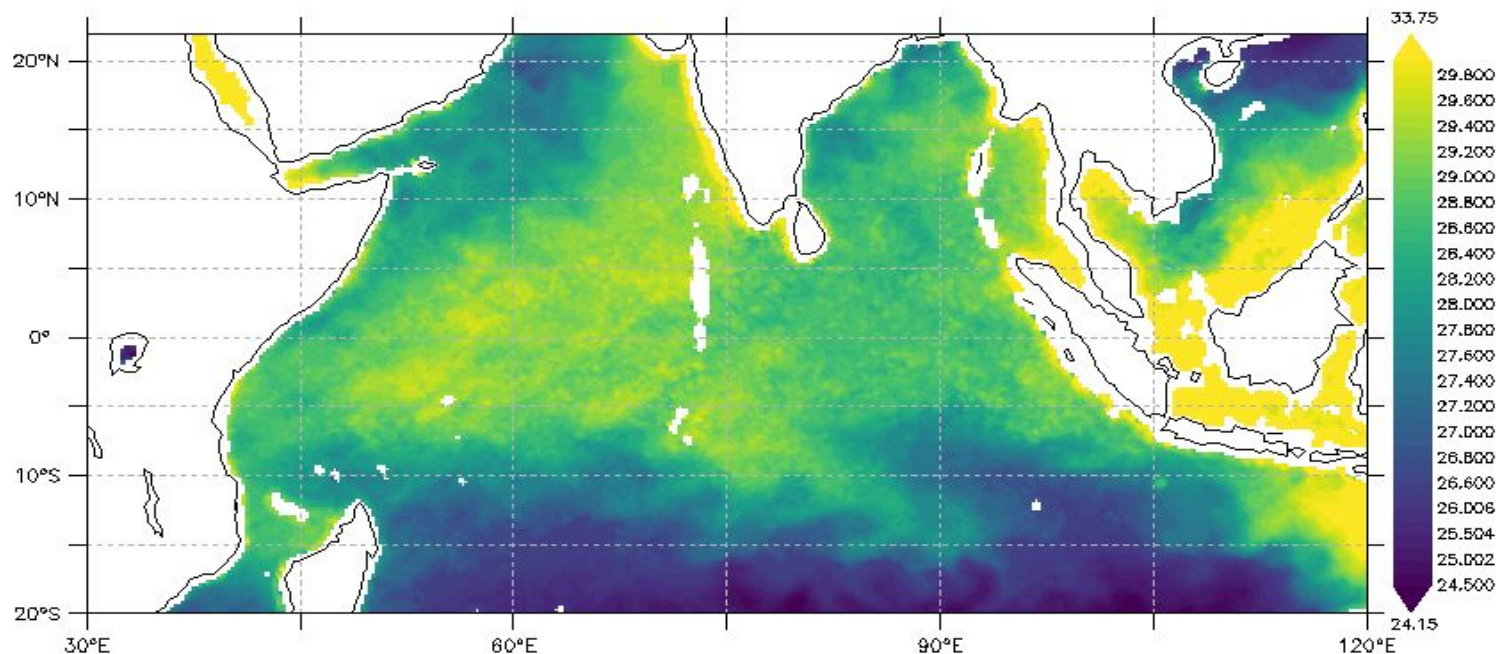
Output image > select area > update plot

Play with Plot Options
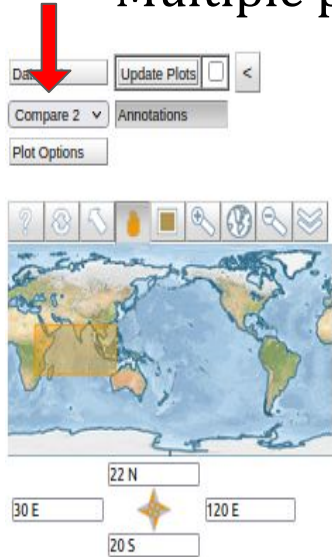
Animation plot

TIME : 15−NOV−2014 04:27

DATA SET: TMI OCEAN DATA PRODUCTS (Monthly)

Sea Surface Temperature (Degree C)

Multiple plots in a frame: compare 2 > select requirement > update plot
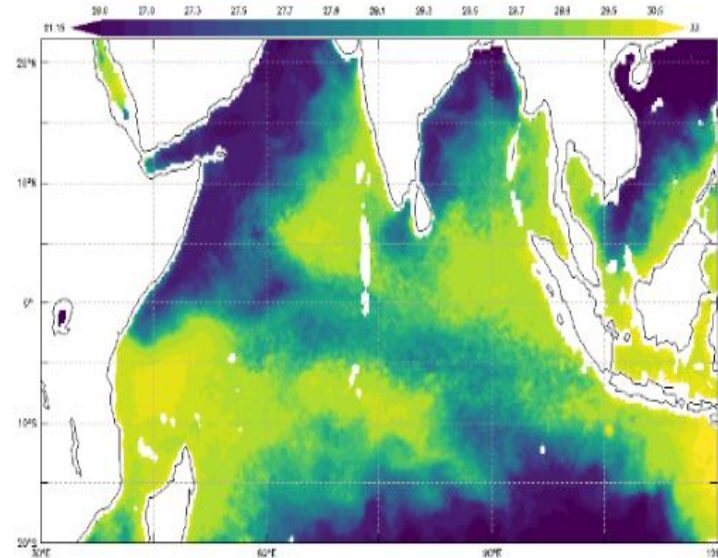
Save as > select data format > time > save

Specify your data's requirements and then click "Save" to download.

Selected Region:
Longitude range: [30, 120]
Latitude range: [-20, 22]
Select a Data Format:
NetCDF ⌄ ←

Select Time:
Start date/time: 2014 ⌄ May ⌄
End date/time: 2014 ⌄ May ⌄

Save ←

Opening 9263F4659C5C5F523BD1F619D6C30C00_ferret_listing.nc ⊗

You have chosen to open:

🄰 **9263F4659C5C5F523BD1F619D6C30C00_ferret_listing.nc**

which is: NC file (244 KB)
from: https://las.incois.gov.in

What should Firefox do with this file?
◯ Open with   Browse...
⦿ Save File
☐ Do this automatically for files like this from now on.

Cancel   OK
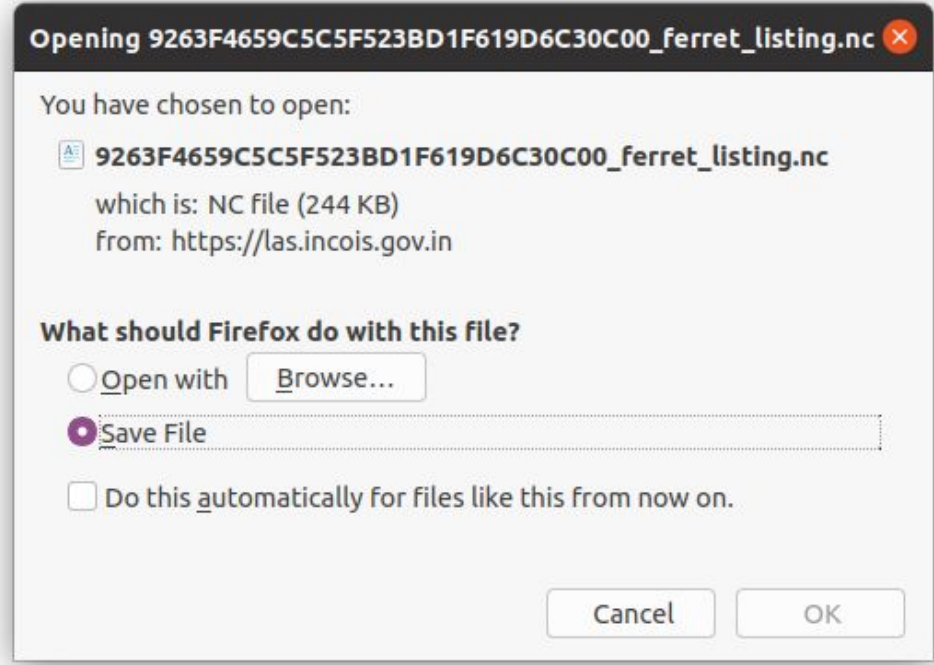
Output: ASCII, NetCDF, CSV, arcGrid

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.

Overview

Motivation

Description

Selected Results

Data Access

Documentation

Data Access

See in *TropFlux products* for acces
period

See in *Changes* for information abo

The data is in NetCDF format.

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

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!!