Agency Report
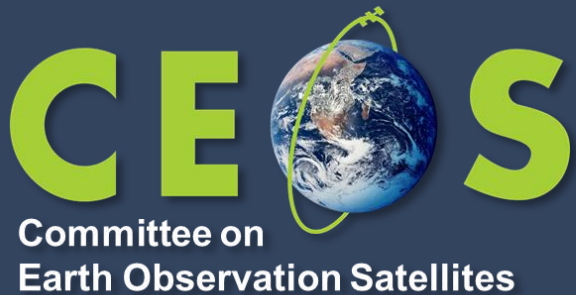## Indian Space Research Organisation

Nitant Dube, ISRO

Agenda ID: 2022.10.05_11.00

WGISS-54

Tokyo, Japan (JAXA)

3-7 October 2022

CEOS
Committee on
Earth Observation Satellites

Executive Summary

- **EOS-6 (Oceansat-3), INSAT-3DS** and **NISAR** for forth coming Earth Observation Satellites

- **Bhoonidhi-EO Data hub** is now enriched with following data
  - EOS-04, Re-processed Ortho-rectified products from IRS-1A/1B/1C/1D, Sentinel1&2,NOVASAR, Soumi NPP, Landsat-8 and Landsat-9 (Over India)

- **Bhoonidhi-Vista** is a new visualization tool, which helps in visualization of Near Real time data

- **Bhoonidhi-Upagrah** is a Real time Satellite Tracker for EO Missions with the ability to track the live location of various in-orbit satellites

- **Bhuvan** (Portal for Geospatial data and Services) : Evapotranspiration Product is now available as part of National Hydrology Project, Urban body Information System, Monitoring for recent Floods and Forest Fire data between 2013-2021 for generation of Forest Fire Zonation Maps released.

- **VEDAS**: This web portal is strengthen to enhance web based geospatial data analysis. New capabilities include Geospatial Query on web, Geospatial calculator, Long term trend analysis, RGB composites and site selection tool for Solar power plants. A customized Processing Platform for International Charter on Space & Major Disasters is developed and operationalized.

- **MOSDAC**: Alert and Forewarning System for Heavy rain, Cloud burst and Cyclone is released for Indian Region and South East Asian Countries. The Safe Beach application provides Rip current and Ocean state forecast for 175 beaches of India.

- **National Information System for Climate and Environment Studies (NICES)**: Generate and Disseminate Terrestrial, Ocean and Atmospheric Products. Recent additions include ECVs for Lightning, LULC, Water Bodies Fraction and Snow Cover Fraction.
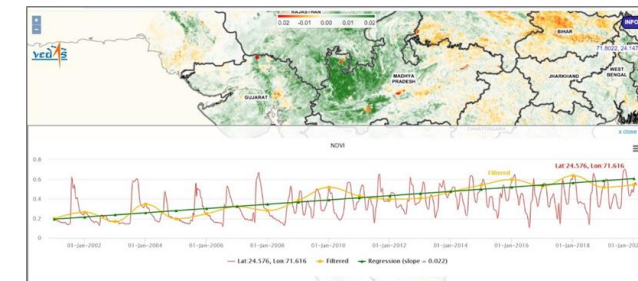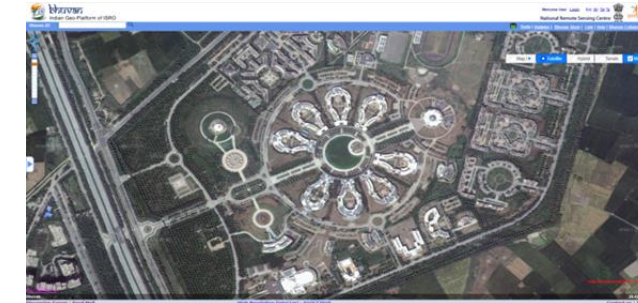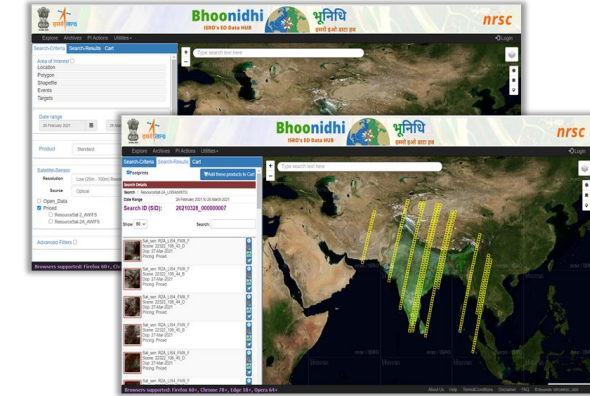
EO Missions (Current)
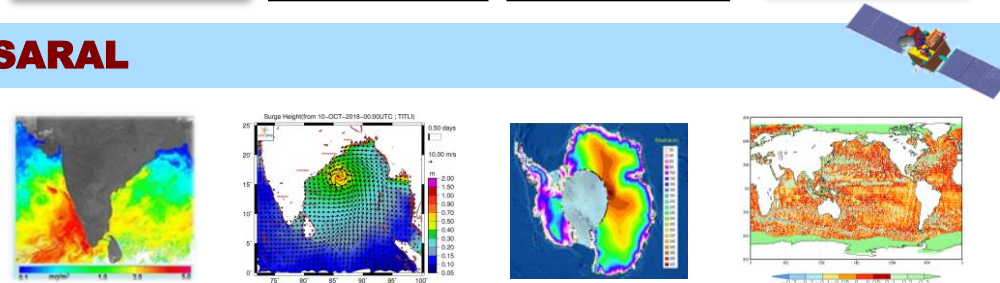

RESOURCESAT- 2 & 2A, EOS-04

- Three tier imaging : 56 m / 23 m / 5.8 m
- Revisit Capability : 03   / 11   / 03 days
- C-Band SAR (3-50m resolution) / 17 to 24 days repeativity
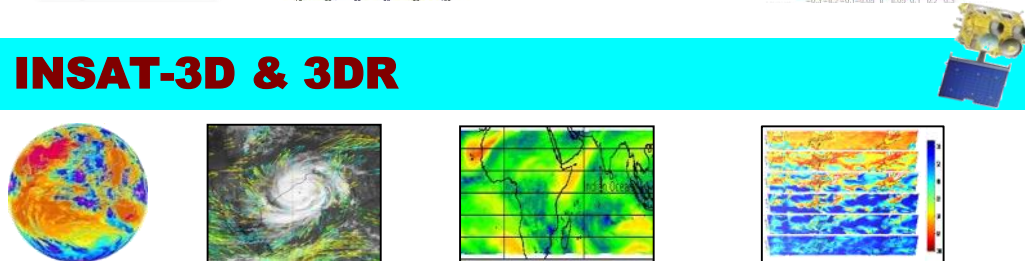
CARTOSAT-2E & CARTOSAT-3

- 60 cm PAN & 1.5 m Multi-spectral
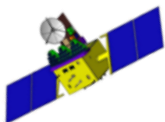- 28 cm PAN & 1 m Multi-spectral

SARAL

- Ocean Altimeter

INSAT-3D & 3DR

- **6 Channel Imager** – 48 images per day
- **19 Channel Sounder** – Atm. Profiles
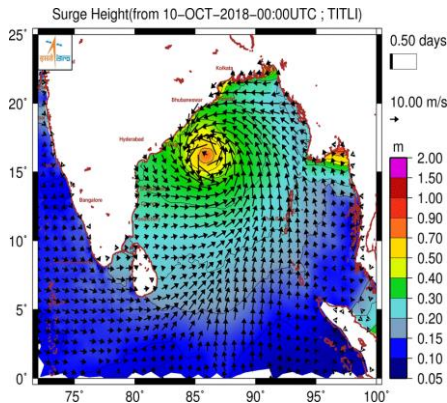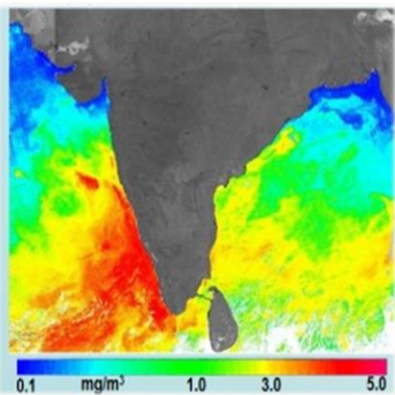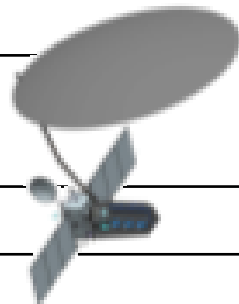
EO Missions (Planned)

EOS-6

Ocean Color, SST & Winds

Orbit	Sun synchronous
ECT	12:00 Hrs
Payloads	OCM (13 bands: 407 to 1020 nm) : 360 m
	Scatterometer-3 (Ku Band - 13.51GHz)
	SSTM-1 (2 Bands: 11 &12 μm) : 1080 m

NISAR

Frequency	L-band 1.26 GHz
	S-band 3.2 GHz
Swath	Up to 200 km
Incidence Angles	~ 34 - 48 degrees
Resolution	3 to 10m
Repetivity	30 days
Orbit	747 km ; ECT: 6:00 Hrs

INSAT-3DS

Meteorological satellite

Orbit	36000 km (GEO)
	Every 30 min
Payloads	• 6 channel Imager (Visible, MIR, WV, TIR and SWIR) • 19 channel Sounder (18 narrow spectral channels in 3 IR bands, 1 channel in visible band)

EO Data Hub

Bhoonidhi web portal enables access to archive of Remote Sensing data from 46 satellites, including Indian and Foreign Remote Sensing Sensors data acquired over 33 years.

Search , View, Add to Cart, Place work order (Priced data), Download (Free & Open data)

✓ ISRO Microwave satellite EOS-04: EOS-04 is a follow on mission of RADAR imaging satellite-1 with the imaging modes similar to RISAT-1 viz. STRIPMAP, SCANSAR and SPOTLIGHT.

✓ IRS 1A/1B/1C/1D Ortho rectified products with enhanced radiometry in GeoTIFF format are now available

✓ Regional Hub of Sentinel1&2,NOVASAR, Soumi NPP,JP1 data in India.

✓ LANDSAT 8 AND LANDSAT 9 COLLECTION 2 @ BHOONIDHI for free download for all users.

✓ LANDSAT 9 products are with improved geometric accuracy, improved digital elevation modeling, improved radiometric calibration, consistent quality assessment bands and metadata files.
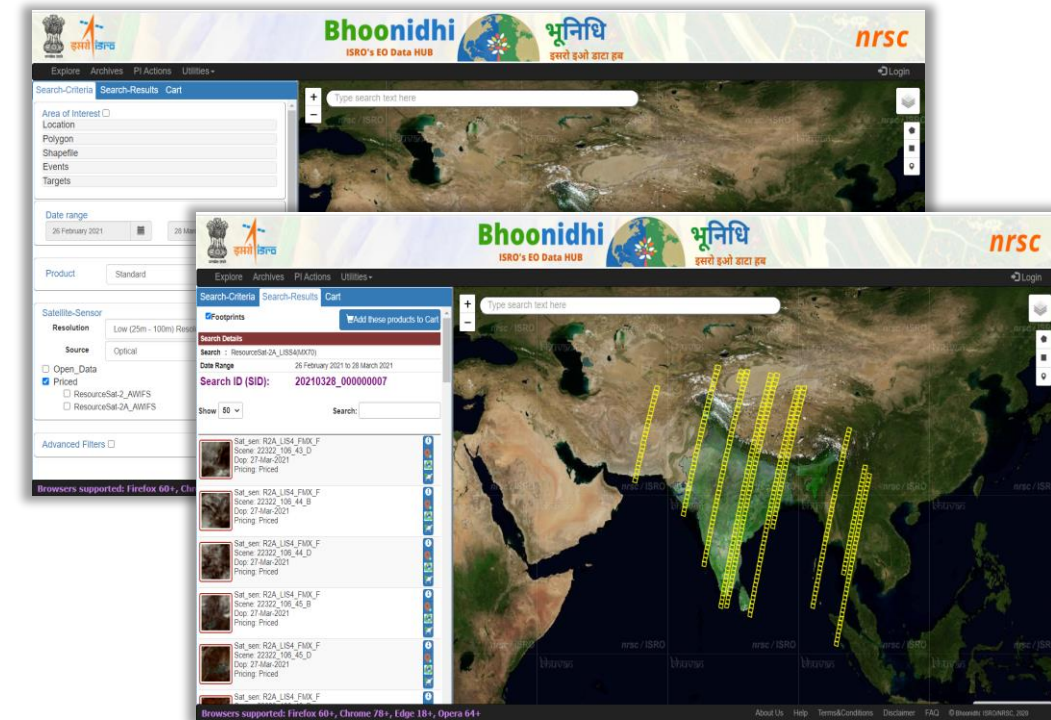
BHOONIDHI-Vista

BHOONIDHI-Vista (Visualisation of terrestrial acquisitions) showcases how Earth looked in the recent past by Indian and other EO sensors in native resolution at various zoom levels.

- ✓ Visualize the NRT daily acquired data and temporal cycle based mosaic

- ✓ First hand valuable visual insights in various spectral and spatial resolutions up to 3m helps applications requiring fast response like monitoring, viewing affected /impacted area of floods, cyclone and other disasters.

- ✓ VISTA can be used for change detection analysis by its time lapse animation and comparison slider tools over the user's area of interest for a date range.

- ✓ Comparison Slider enables comparison of different satellite imagery facilitating insights for change detection. Measurement tool aids elementary analysis of distance and feature area estimation, useful for disaster impact analysis.
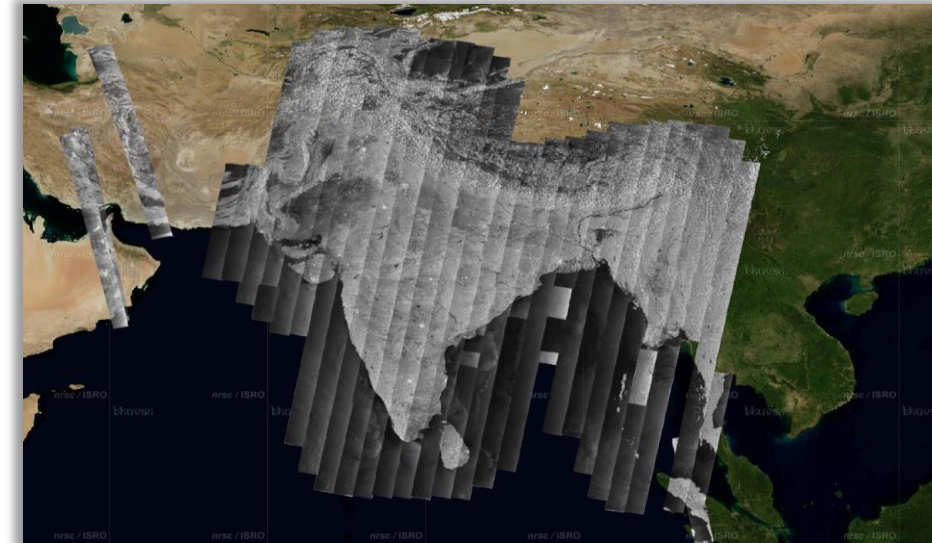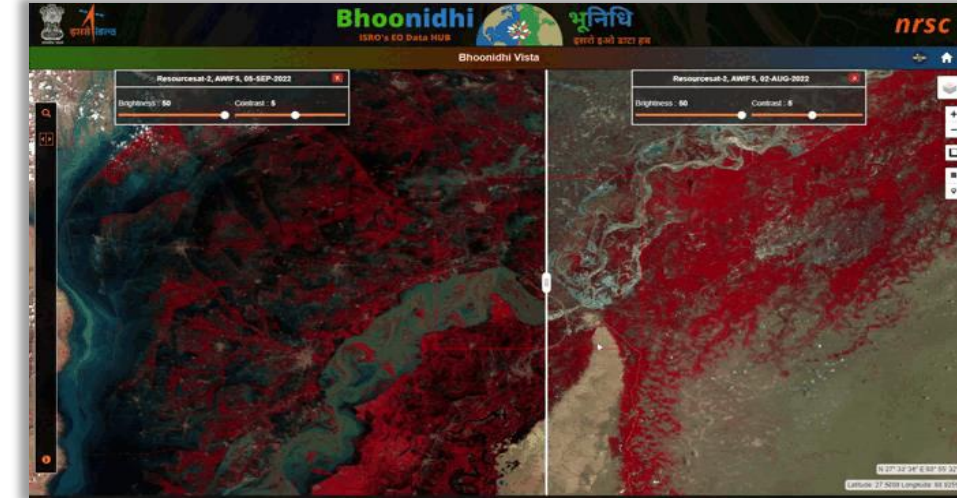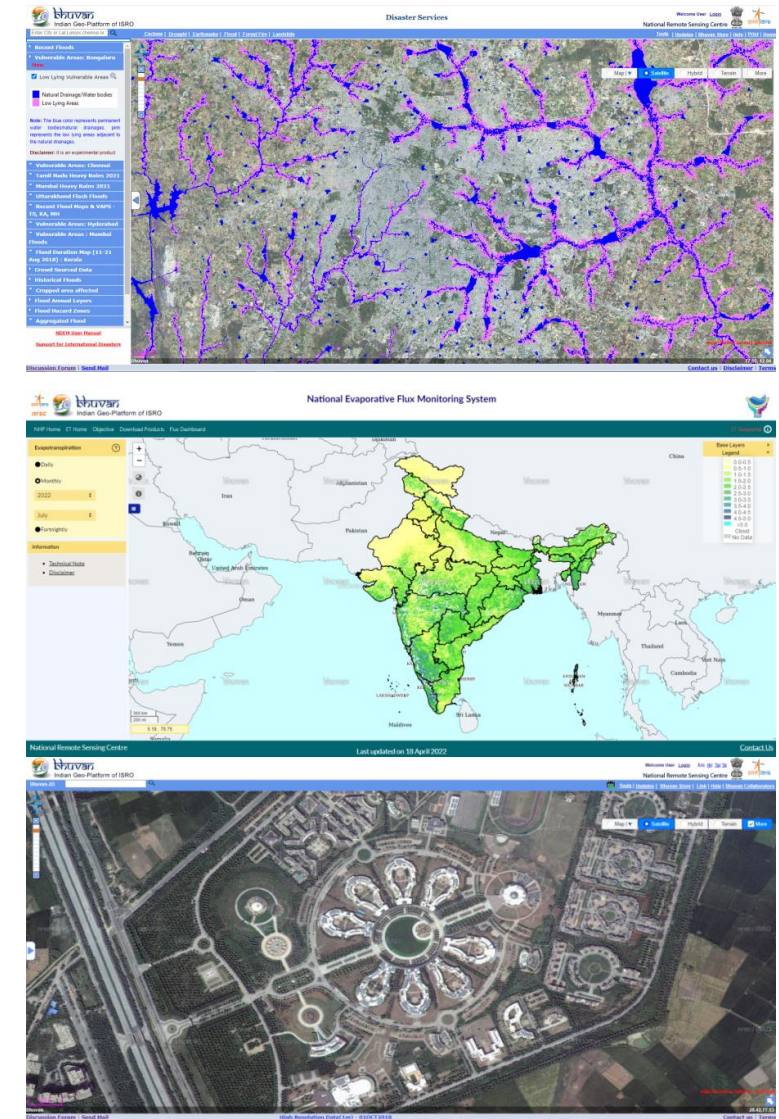
Bhoonidhi : Upagrah

Bhoonidhi-Upagrah is a Real time Satellite Tracker for EO Missions with the ability to track the live location of various in-orbit satellites to assess the feasibility of acquisition of data.

- ✓ All the remote sensing satellites acquired by ISRO, Landsat-8 & Landsat-9 , Sentinel 1 & 2 , NOVASAR

- ✓ Orbit Viewer - Live satellite/orbit tracking

- ✓ Quick View of all satellites at predicted UTC time.

Bhuvan: Geo-Spatial Data and Services
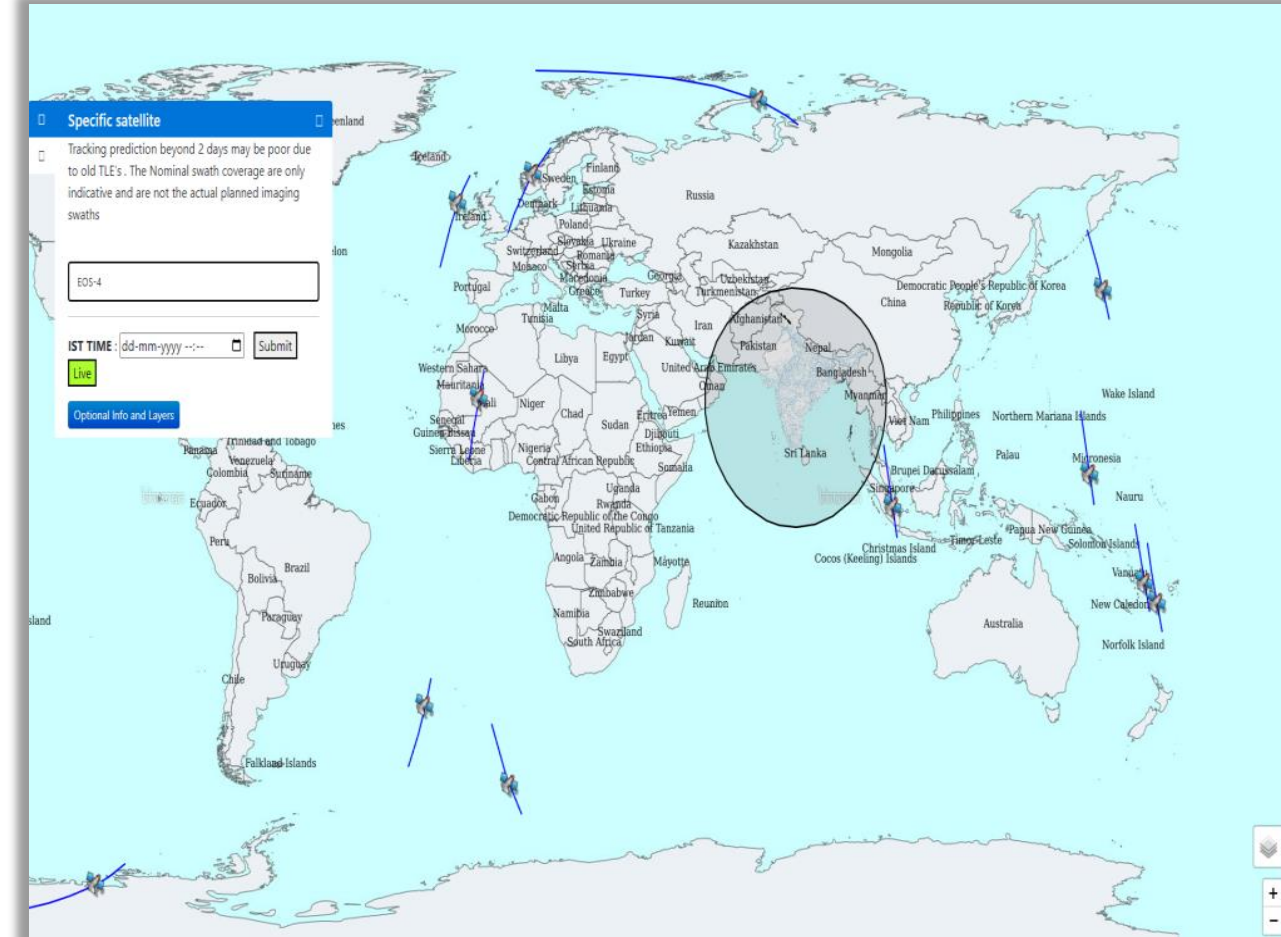
❖ Recent Updates

❖ Actual Evapotranspiration Products part of National Hydrology Project.

❖ Latest Data for recent floods.

❖ Forest Fire Regimes Data between 2013 and 2021 to calculate forest fire zonation across India .

❖ Latest high resolution satellite imagery acquired during year 2019 to 2021 from Cartosat-2S and Cartosat-3.
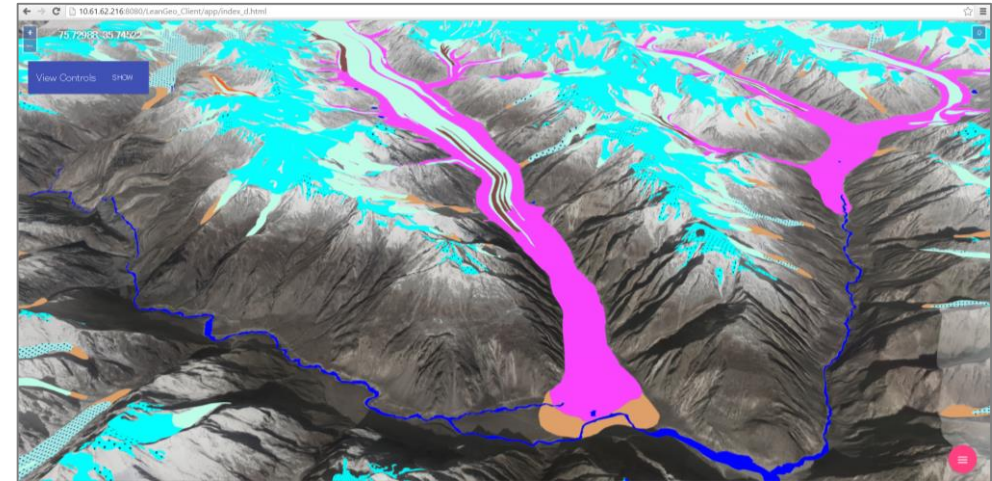
❖ **Urban Water body Information System** – A portal to help conserve and restore water bodies in urban areas across India.

❖ **Bhuvan Aadhaar Seva Kendra** – A portal to visualize and navigate to all the Aadhaar enrolment/ update centers for general public.

❖ **Soil Moisture Dashboard** – A dashboard to visualize near real time weather and soil moisture data from 10 flux towers.

Geospatial Services on VEDAS

- Satellite based Geo-spatial data **archival**, **visualisation** (2D/3D) and **analysis** Platform.
- Web services of thematic data generated by scientists in various fields of applications.
- Web based Geo-processing tools for analysis.
- Platform for Big Data analytics & AI/ML applications.
- Integrate Web Map Service (WMS) from various sources. Publish WMS and APIs of data.
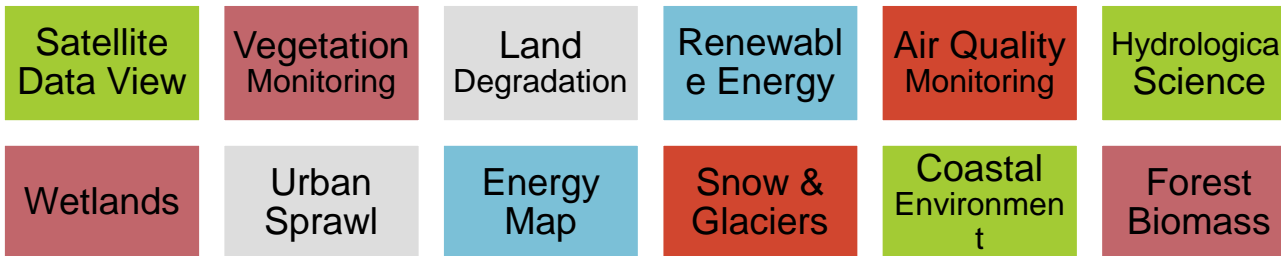
Glaciers Draped on Cartosat-1 DEM

**Field Level Crop Monitoring**

Web Applications on VEDAS

Satellite Data View	Vegetation Monitoring	Land Degradation	Renewable Energy	Air Quality Monitoring	Hydrological Science
Wetlands	Urban Sprawl	Energy Map	Snow & Glaciers	Coastal Environment	Forest Biomass

and many more …

https://vedas.sac.gov.in

VEDAS: Geo-Spatial Analysis
Geo-spatial web Query and Calculator on VEDAS

Geospatial Query on Web
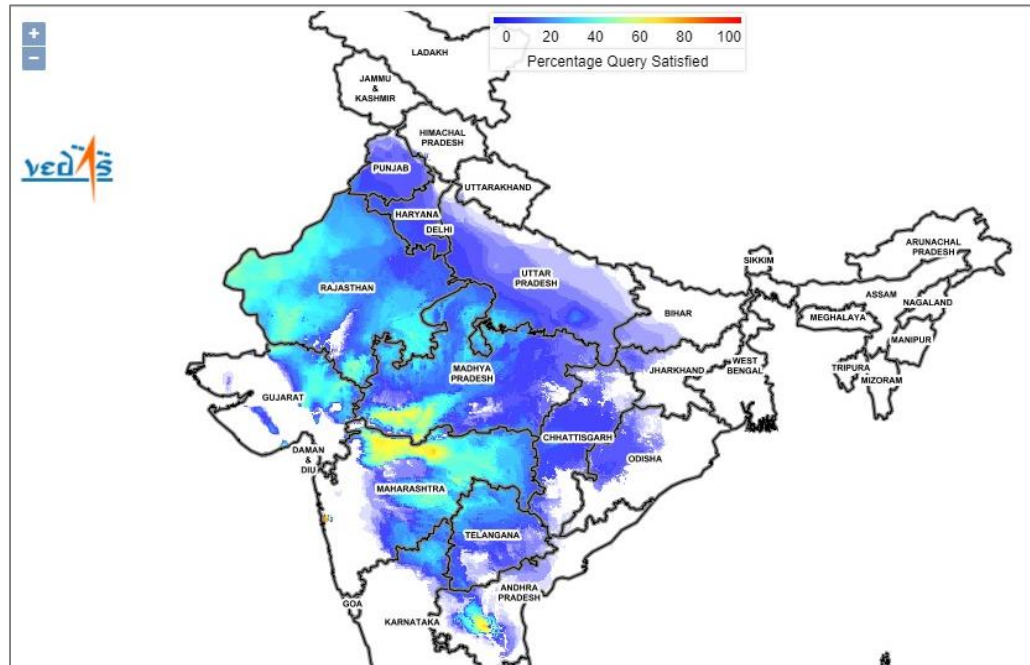
Geospatial Query
1 April – 31 May, 2020 : 40 < Max Temp < 50

**VEDAS Web-based Geo-spatial Calculator**
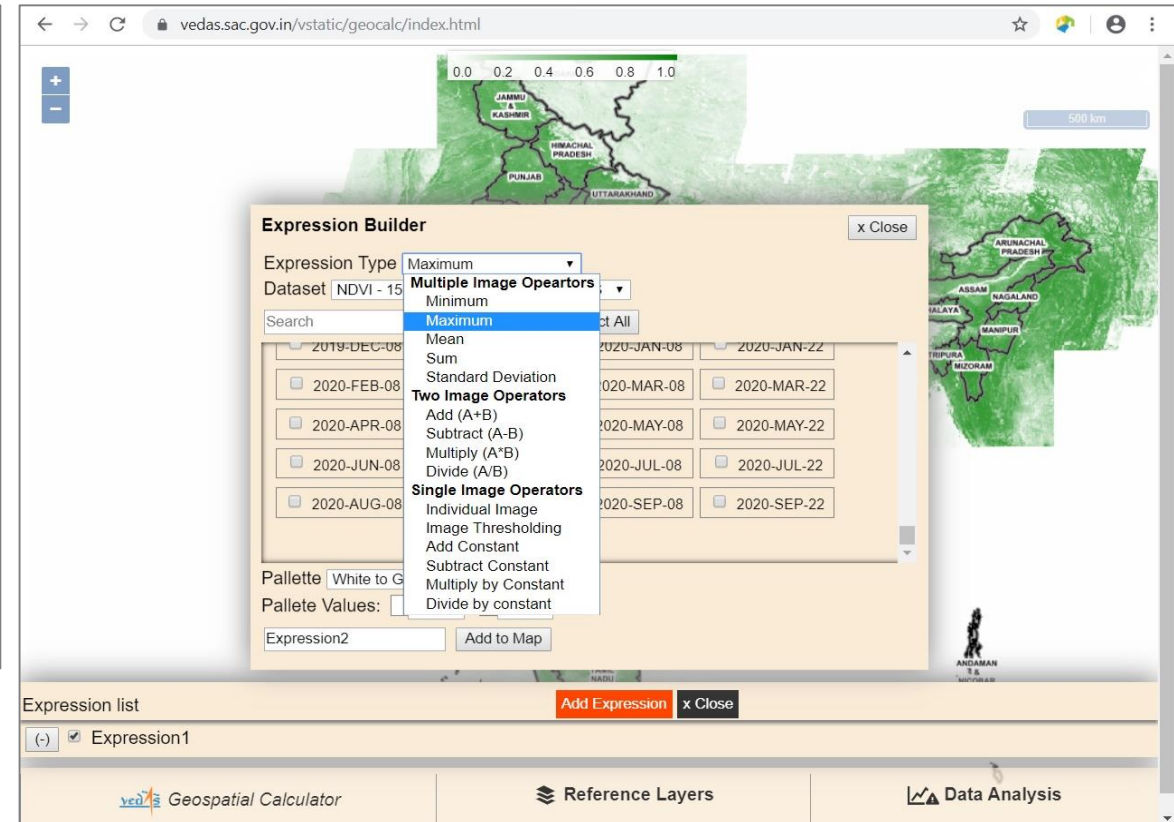
Other Application Specific Capabilities on Web: Long-term Statistics of NDVI (2001-2018), Vegetation Condition Index (VCI Dashboard), Solar Site Selection Tool, Processing Platform for International Charter on Space & Major Disasters, Water spread area extraction and visualization using Sentinel-1 data.
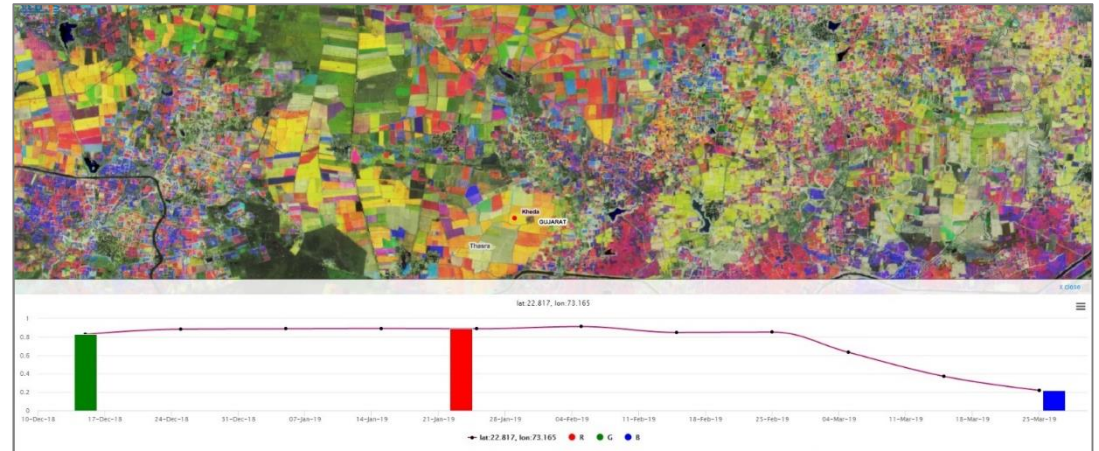
NDVI difference (Jan and March
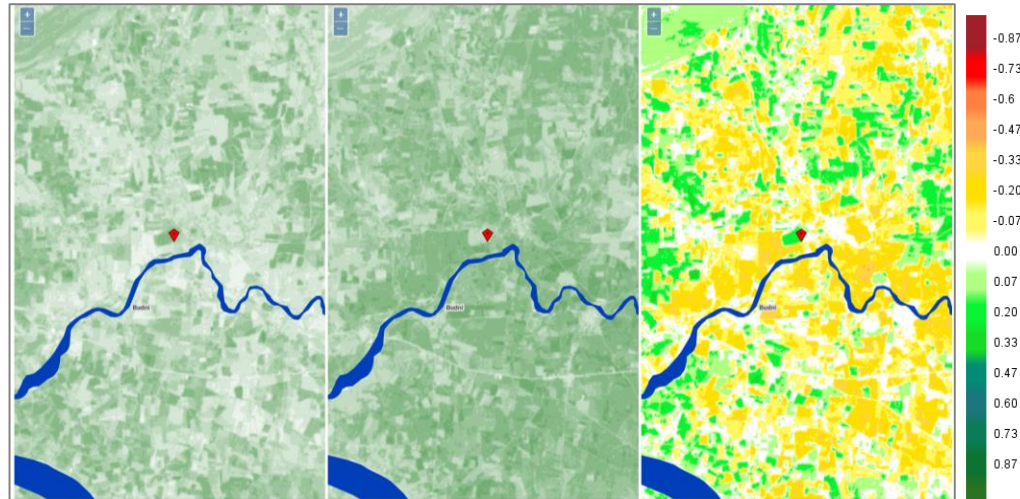
RGB composite of multi-temporal NDVI data

LISS-IV NDVI images of 23-Jan-2019, 23-Dec-2018, 23-Mar-2019

Long-term Trend Analysis of NDVI

Classification using multi-temporal NDVI data
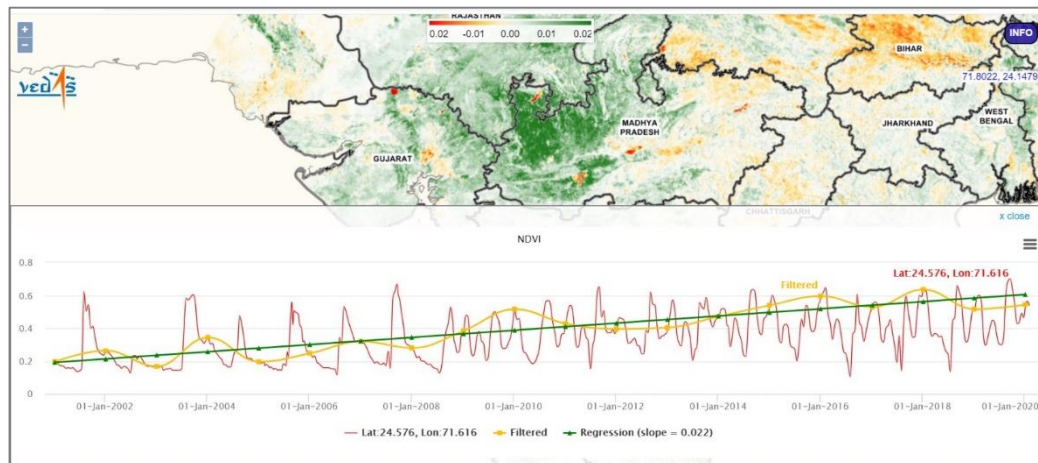
MOSDAC: Meteorology and Oceanography

Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC)

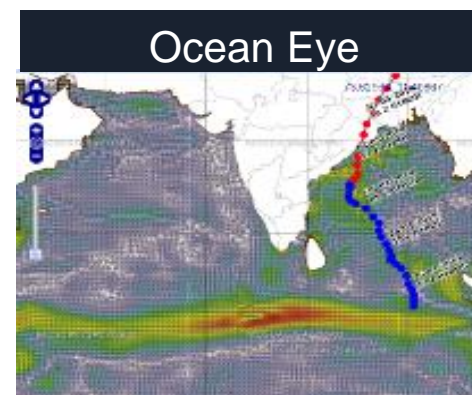**Indian Store-house for Meteorological and Oceanographic Data**

- **8** Indian Satellite**, 200** Products and **25** applications (INSAT-3D/3DR, SCATSAT-1, Megha-Tropiques, SARAL, Kalpana-1, INSAT-3A, Oceansat-2)
- GISAT, Oceansat-3 and INSAT-3S planned
- Total of **17 million** products disseminated to **139 countries**
- Weather and Ocean State Forecast to users
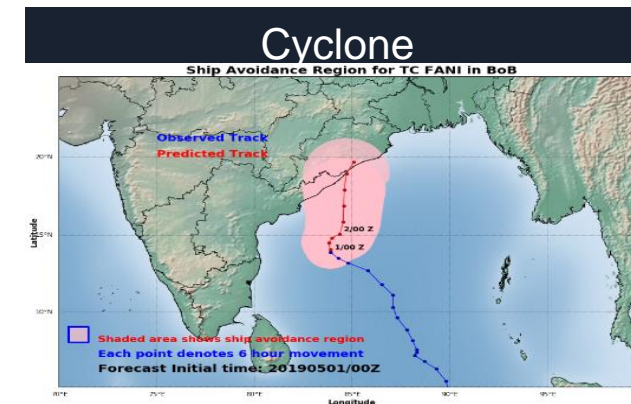
Major Applications

- Automated Ocean Forecast to ships **(Ocean-Eye) 85** Ships of SCI currently registered
- Cyclone Track and Intensity forecasting **(SCORPIO)**
- Nowcasting of Heavy rain and Cloud burst **(Netra)**
- Rip current forecast for **175** beaches (**Safe Beach**)
- **Solar and Wind forecast** along with a visualization tool provided to POSOCO for Grid management
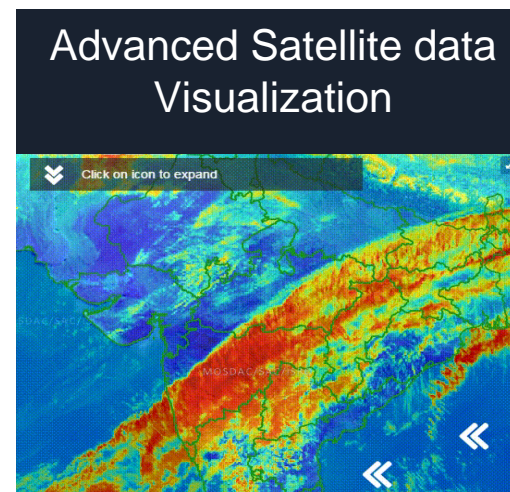- State Portal for Alert Services (**DMSP**)

Data Analytics and Visualization

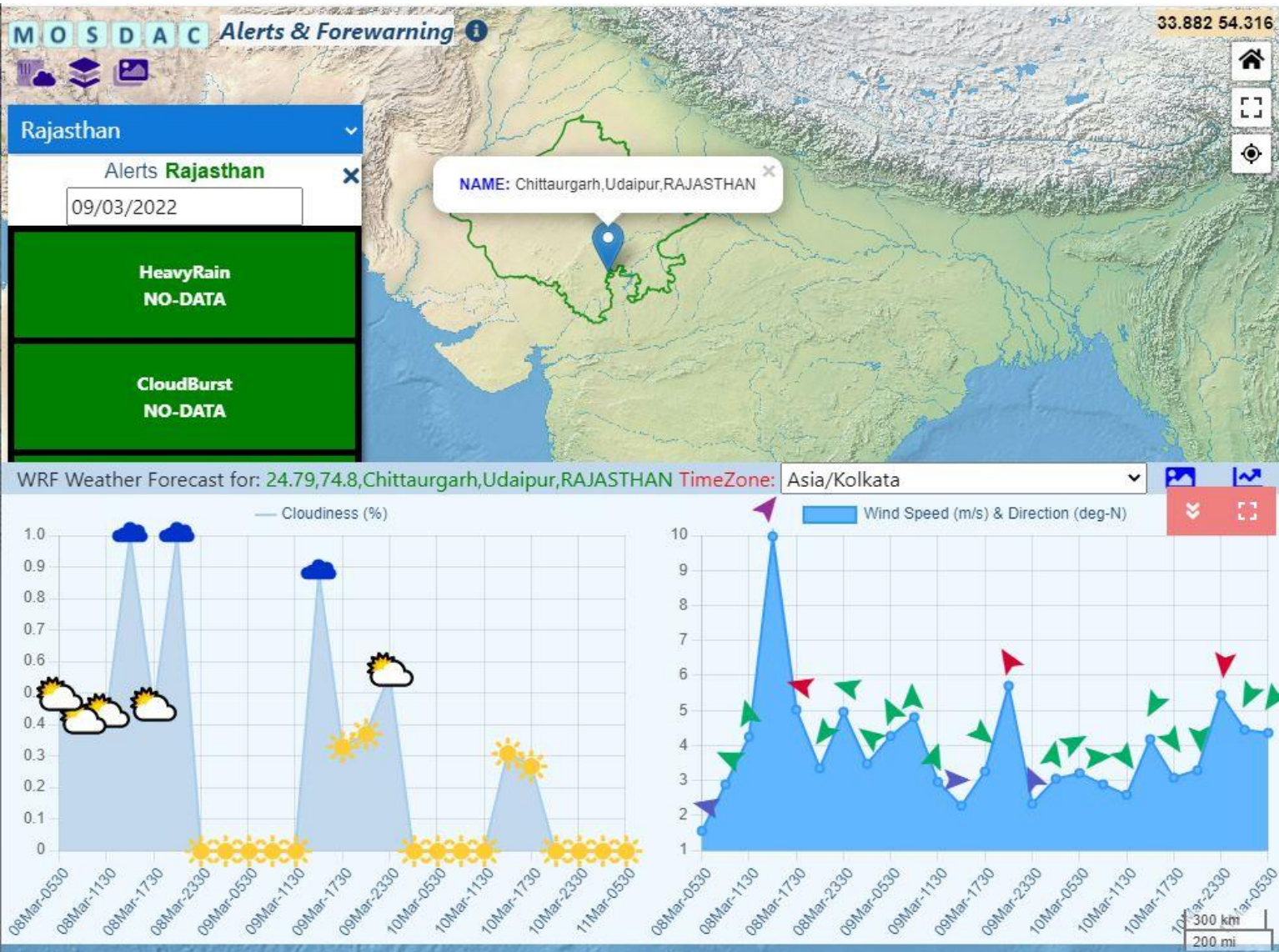- An Integrated data visualization system for Earth Observation, In-situ data & Forecast Information (https://mosdac.gov.in/live)

Ocean Eye

https://mosdac.gov.in/sci/

Cyclone

https://mosdac.gov.in/scorpio

Advanced Satellite data Visualization

Rip Current Forecast

https://mosdac.gov.in/rip_current_forecast

MOSDAC: Alert and Forewarning

State Portal for Alert and Forewarning

- Capability for user to select his state or can see alerts for full India
- **Heavy Rain** and **Cloud Burst** Nowcast (Valid for next 6 hours from the time of forecast)
- Also provides capability for user to click on location and see next 72 hours **forecast.**
- Can see the animation of **Blended Satellite images** for the selected state, this provides information on how clouds are moving
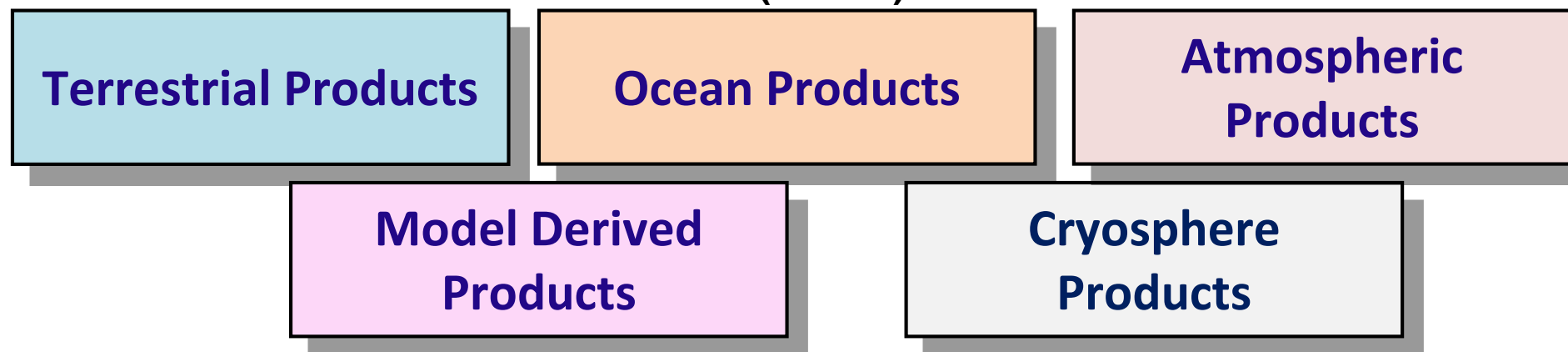- User can select previous date and see the alerts issued for the sate on the selected date.

https://mosdac.gov.in/state

MOSDAC: Safe Beach
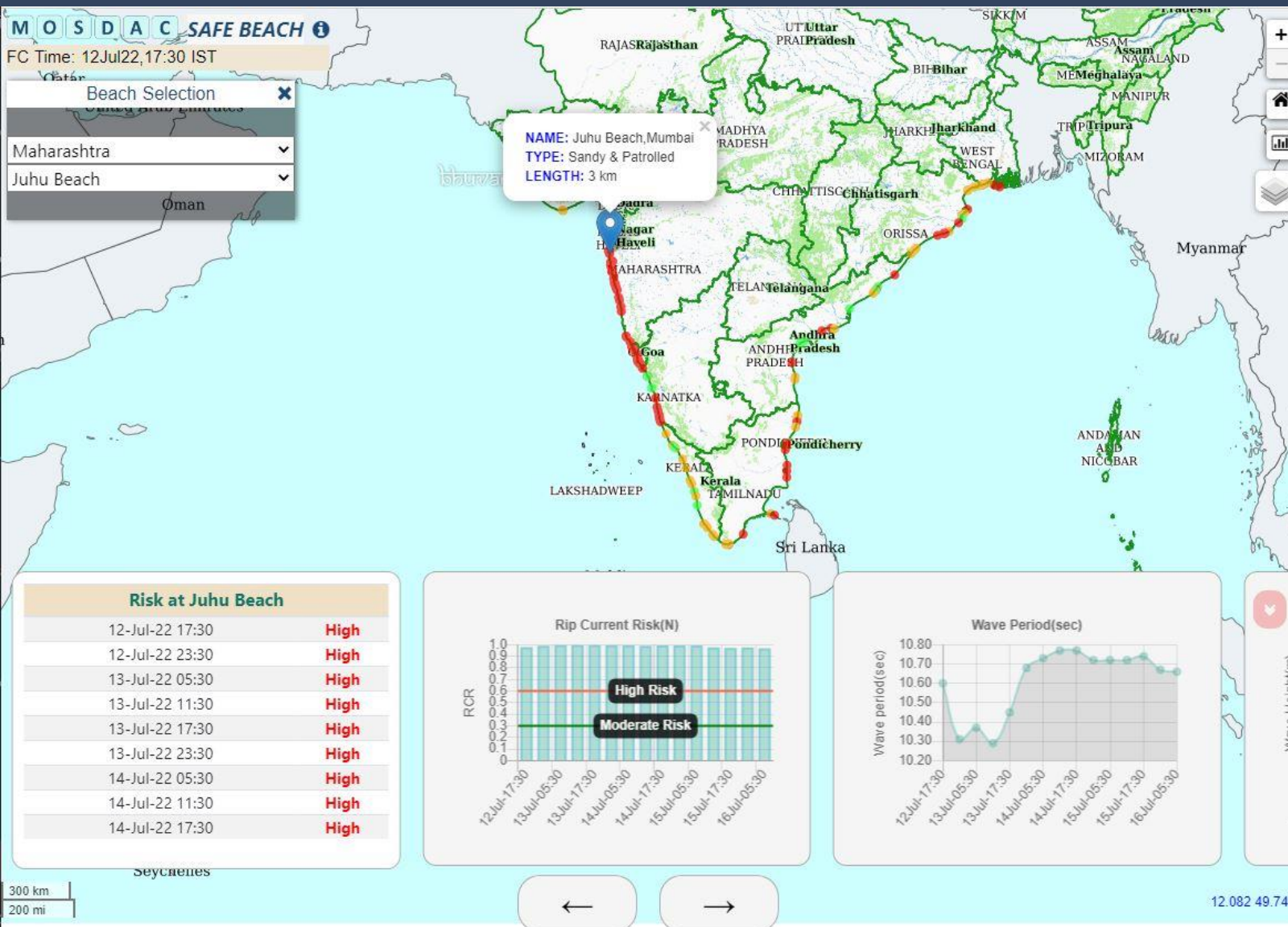
- **"Safe Beach"** is an application for dissemination of Rip current forecast for 175 beaches of India
- 6 Hourly forecast for next 5 days

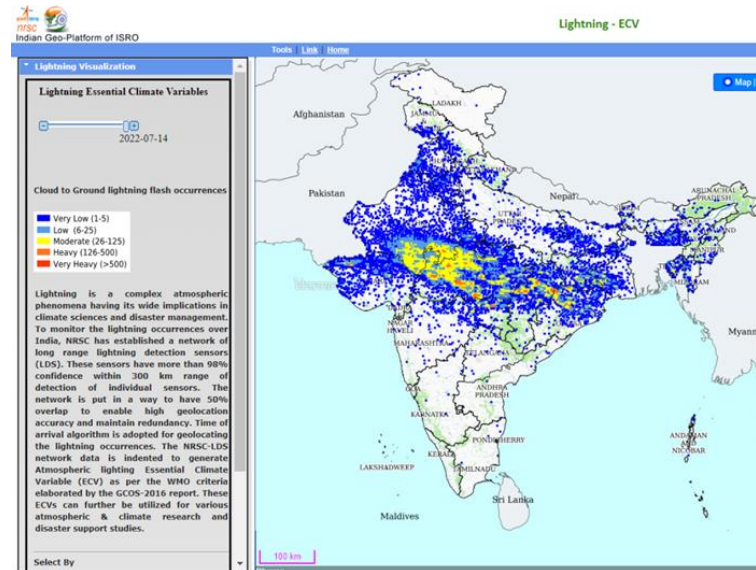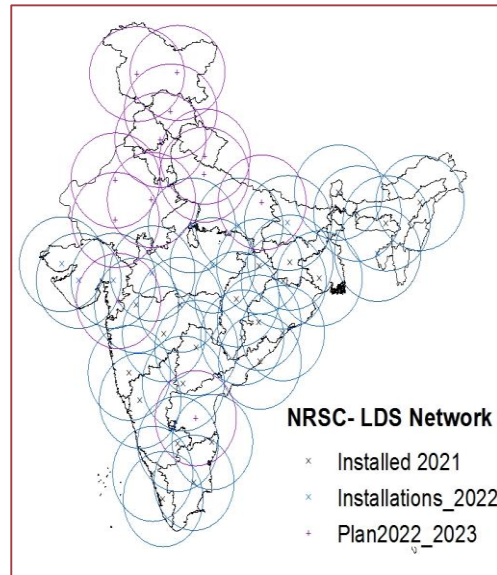https://www.mosdac.gov.in/rip/

National Information System for Climate and Environmental Studies (NICES)

Terrestrial Products	Ocean Products	Atmospheric Products

Model Derived Products	Cryosphere Products

Domain	ECV	Near future	Non-ECV products retrieved	Derived	Satellite + Model based products	Total
Terrestrial	5	1	16	8	5	35
Ocean	3	2	5	11	8	29
Atmosphere	2(+1)	1	0	2	0	6
	10(+1)	4	21	21	13	70

NICES: Climate and Environment

Lightning ECV

NRSC- LDS Network
- × Installed 2021
- × Installations_2022
- + Plan2022_2023
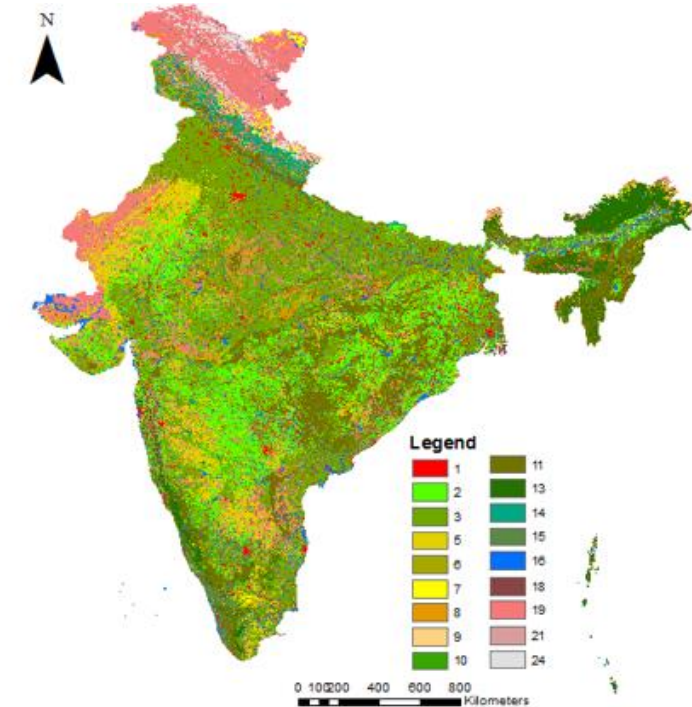

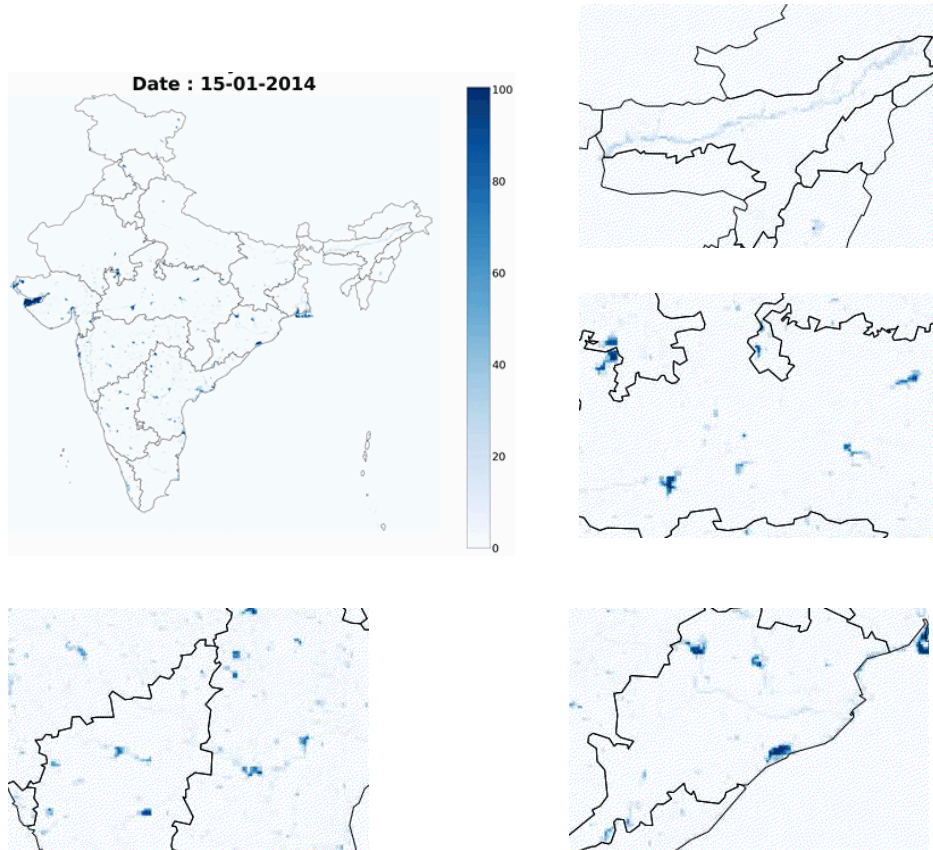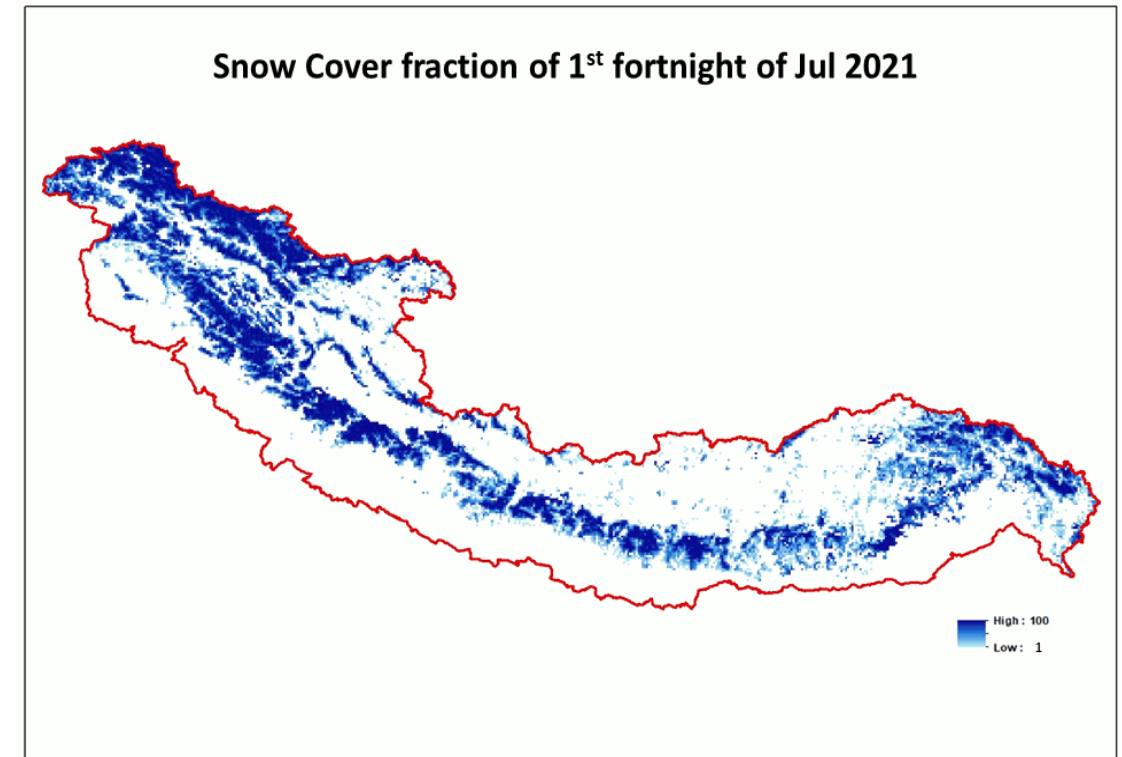## Land Use Land Cover ECV

Fig-4. Recoded AWiFS LULC for Indian region

Water Bodies Fraction ECV

Snow Cover Fraction of Indian Himalayas (ECV)

Thanks

nitant@sac.isro.gov.in

Inputs from

Space Applications Centre (SAC)

National Remote Sensing Centre (NRSC)

ISRO Head Quarters