

MOSDAC & VEDAS NEWSLETTER



VOL. 1, NO. 1 | OCT 2025

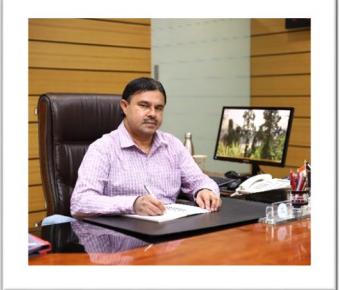
Director's Message

The VEDAS and MOSDAC geo-portals of ISRO are enabling dissemination of Earth Observation (EO) data and its derived products and services to the scientific community, decision-makers, academic institutions, private sector including start-ups and the citizens at large. These portals are continuously augmenting user experience with newer features and novel applications.

We are delighted to launch this newsletter to keep the existing users informed about the updates on these portals, besides introducing these portals to the various potential stakeholders. I am sure, this newsletter will enrich user's knowledge of VEDAS and MOSDAC portals, bringing EO data and analytics from satellites directly to their browsers. We welcome your valuable feedback on this Newsletter.

With warm regards,

Nilesh Desai
(Director-SAC)



In this issue

VEDAS: An Enabler of Geo-data Rich Society	<u>2</u>
MOSDAC: India's Storehouse of Meteorological and Oceanographic Satellite Data	<u>3</u>
VEDAS Application in Focus: Monitoring Droughts	<u>5</u>
API-based Information Dissemination through MOSDAC	<u>6</u>
MOSDAC Application in Focus: Beach Tourism with Safety	<u>8</u>
AI In Action: Where People Live	<u>9</u>
Launch of Krishi Decision Support System (Krishi-DSS)	<u>9</u>
Launch of MOSDAC-IN	<u>9</u>
Industry Partnerships: Ocean Eye, An Application for Shipping Corporation of India	<u>10</u>
MOSDAC Image Gallery	<u>11</u>
Geospatial Crop Estimation System (GeoCrEST) under FASAL 2	<u>12</u>
OCM-3 Products on MOSDAC	<u>13</u>
Leveraging the 250 TF Sagar HPC for Advanced Earth Science Research	<u>14</u>
Extreme Weather Events: Space Based Monitoring and Climate Impact over Mauritius	<u>15</u>
INSAT 3DS Data Products Archival & Dissemination from MOSDAC	<u>16</u>
LAMA: Ladakh-specific Modelling and Space Applications	<u>18</u>
BODHI: Bihar Oriented Spatial Dataset & Hazard Information	<u>19</u>
National Space Science Meet - SAMHITA	<u>19</u>
NISAR Awareness Workshop for Indian Non-Governmental Entities (NGEi)	<u>20</u>

VEDAS: An Enabler of Geo-data Rich Society

Visualisation of Earth Observation Data and Archival System (VEDAS) is ISRO's Earth Observation (EO) data visualisation and analysis platform. It has indigenously developed advanced, state-of-the-art tools for managing and serving vector and raster data in the form of information and map services, which power the platform's diverse applications. These tools provide robust data processing capabilities, enabling seamless integration and analysis of geospatial information for various thematic areas. They are crucial in supporting the platform's mission to bridge the gap between space data and offer actionable insights, enhancing the societal benefits of India's investments in space research.

Key Applications on VEDAS

Unified Visualisation and Analysis: An online data visualisation and analysis platform that allows users to view recent satellite data captured from Indian and foreign remote sensing sensors. It enables basic exploratory analysis without requiring users to download data, providing an efficient way to interact with and analyse geospatial information directly on the platform.

Vegetation Monitoring: Provides visualisation of vegetation indices, soil moisture, and rainfall data, including image differencing and temporal classification for assessing vegetation condition over time.

Hydrological Applications: Offers water level data for rivers and reservoirs, along with experimental flood forecasting tools.

Krishi DSS Drought Portal: A web-based geospatial tool implementing the 2020 drought manual of India, offering critical data for drought management and planning.

Energy Map of India: A collaborative GIS-based initiative by NITI Aayog and ISRO, integrating spatial and non-spatial data on renewable and non-renewable power plants, fossil fuel resources, and other energy assets in India.

Desertification Dashboard: An intuitive online dashboard for viewing maps and zonal statistics of desertification status and processes, which offers key insights into the causes of detrimental land degradation affecting the country.

Renewable Energy Assessment: Includes solar, wind, and wave energy data, with a 72-hour solar energy forecast updating every 15 minutes, tools for estimating urban rooftop photovoltaic potential and geospatial site selection tool for solar power plants.

Sangrahi Mobile Data Collection: A powerful tool developed by VEDAS for field data collection. Sangrahi includes a mobile app that allows customizable data collection through an occasionally connected architecture, supporting offline functionality.

Urban Sprawl Information System: GIS application that hosts information and statistics related to urban sprawl maps. This system uses AI/ML models to map built-up areas and forecast urban growth, and identify development areas.

The screenshot shows the official website of VEDAS (vedas.sac.gov.in/en/). The header features the Indian National Emblem, the VEDAS logo, and the text "Visualisation of Earth Observation Data and Archival System" and "Space Applications Centre, ISRO". The navigation menu includes Home, About Us, Applications, Atlas, Downloads, Site Map, and Contact Us. Below the menu, there are four main application modules: "Unified Visualization and Analysis(UVA)", "Vegetation and Crop Monitoring", "Krishi-DSS : Drought Portal", and "New and Renewable Energy". Each module has a small thumbnail image and a brief description. At the bottom, there are sections for Announcements, a dashboard for Desertification & Land Degradation, and a Global Solar Calculator. A footer at the bottom of the page contains the VEDAS logo and the URL <https://vedas.sac.gov.in>.

Cryosphere Studies: Delivers data on snow cover, sea ice, and melting status in polar regions, supporting navigation and scientific research.

In past seven years of its operations, VEDAS has extended the utility of EO data beyond traditional research, benefiting researchers, policy-

makers and academia by making geospatial data and analysis tools accessible to all. The actionable insights offered by VEDAS, makes it a crucial component of India's efforts in leveraging space technology for public good by bridging the gap between EO data providers and end-users.

MOSDAC: India's Storehouse of Meteorological and Oceanographic Satellite Data

Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC) is a Data Centre of Space Applications Centre (SAC), ISRO, established in 2006. It has facility for satellite data reception, processing, analysis, archival and dissemination. MOSDAC is operationally supplying Earth Observation (EO) data from Indian meteorology and oceanography satellites, to cater to national and international research requirements. MOSDAC portal disseminates datasets from several meteorological and oceanographic mission of ISRO such as EOS-06, EOS-07, INSAT-3D/3DR/3DS, KALPANA-1, INSAT-3A, SCATSAT-1, OCEANSAT-2, Megha Tropiques and SARAL.

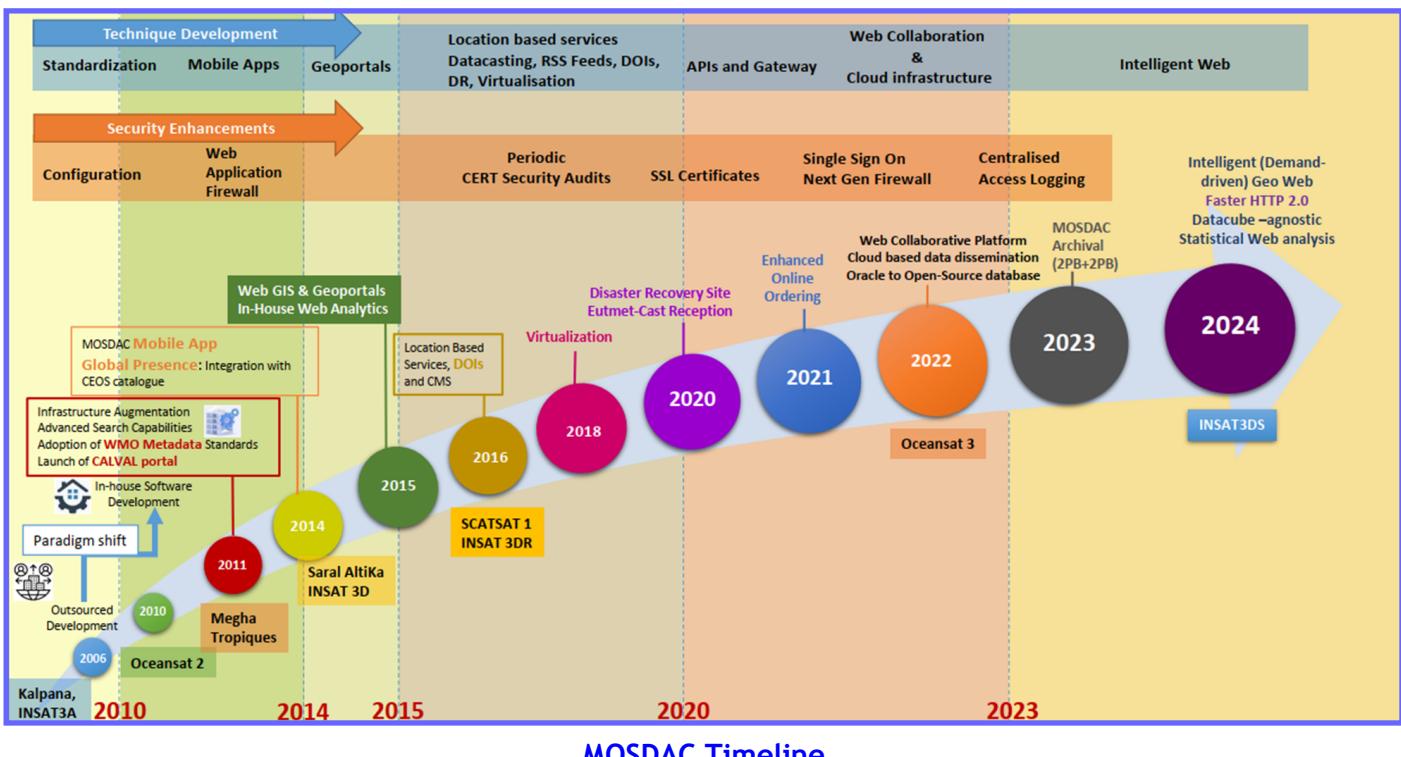
MOSDAC receives the data, processes it, and derives meaningful information in terms of geophysical parameters, standard products, binned products and value added products. **MOSDAC Product Catalogue** provides complete details of data products available at MOSDAC. Currently, MOSDAC is hosting around 230 different data products under Satellite catalogue. Each product has its

unique Document Object Identifier (DOI). Product catalogue contains information like duration, processing level, resolution, description, version etc. MOSDAC also provides catalogue of Doppler Weather Radar (DWR) and In-situ data, providing information about Automatic Weather Stations (AWS) datasets.

These products can be browsed using 'Gallery' application. MOSDAC gallery is the tool to visualise near real time images from Satellite, Forecast and DWR. This software has following capabilities:

- ◆ Animation capability for user defined date selection, satellite, sensor, product type.
- ◆ Capability for customized user interface (Add to favourite) to start image animation using user defined products and number of frames.
- ◆ Capability to zoom and pan with the support of mobile gestures.
- ◆ Capability for URL sharing.

The screenshot shows the MOSDAC website interface. At the top, there is a header with the Indian Government logo, the MOSDAC logo (featuring the text 'मॉस्डैक' and 'MOSDAC'), and the Space Applications Centre logo. The URL 'mosdac.gov.in' is visible in the address bar. To the right of the address bar are links for 'Skip to main Content', 'English', 'SignUp | Login | Logout', and a language selection dropdown. Below the header, a navigation menu includes 'Home', 'Missions', 'Catalog', 'Galleries', 'Data Access', 'Reports', 'Aliases', 'Tools', 'Sitemap', and 'Help'. A sub-menu for 'Galleries' shows options like 'Satellite Images', 'RADAR', 'Weather', 'OceanState', and 'LIVE'. The main content area features a large satellite image of Earth centered over Asia, with a timestamp 'Thu Apr 10 2025 13:30:00 (India Standard Time)'. Below the image is a timeline showing '10-04-2025_12:00', '10-04-2025_13:30', and '10-04-2025_13:30'. Navigation controls include arrows for '«', '||', and '»', and a slider for '8 Frames'. At the bottom left, there is a 'Fullscreen' link, and at the bottom right, a 'Services' section with links for 'Forecast', 'Nowcast', 'Current Events', 'Alerts', 'Met Applications', and 'Ocean Applications'. A decorative footer banner with various icons is at the very bottom.



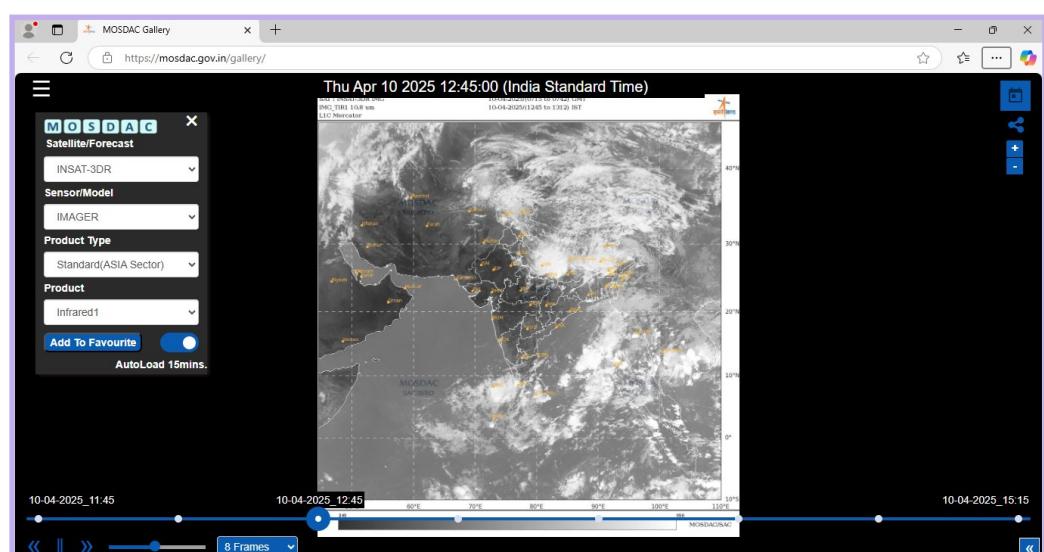
MOSDAC Timeline

MOSDAC has huge storage which is of the order of petabytes where all datasets are available till mission life along with its Disaster Recovery (DR) site. This huge archived dataset is disseminated from its in-house developed ‘User Order Processing Software (UOPS)’. MOSDAC has capability for placing order not only for archived data but also for upcoming data through its Standing order capability. As soon as the products are published on MOSDAC, it is ready to be downloaded by User. Additionally, data from In-situ like Doppler Weather Radar (DWR) and Automatic Weather Stations (AWS) are also disseminated through MOSDAC. Currently, MOSDAC is disseminating digital data to more than 12,000 national and international registered users.

SAC is involved in research using remote sensing datasets. The information products generated under this research are hosted at MOSDAC. SAC has

developed in-house algorithms and customized models for applications like Weather outlook, Nowcast, Cyclone track prediction, Ocean wave model, Ocean circulation model, rip current forecast etc. MOSDAC has developed geospatial applications for visualisation and analysis of various information services. These services are available as following categories:

- ◆ **Outlook:** Weather Outlook, Heavy rain outlook, Heat/Cold Wave outlook, Monsoon and Sea state outlook.
- ◆ **Nowcast:** Cloudburst over Western Himalayan region and Heavy rain nowcast for all India.
- ◆ **Current events:** Let’s Interactively Visualise Earth (LIVE), Heavy rainfall events and visualisation of AWS data.



Satellite Products Gallery

Available at
<https://mosdac.gov.in/gallery>

- ◆ **Alerts:** Alert and forewarning services for Indian States and South East Asian Countries
- ◆ **Met Application:** Customized services for meteorological applications like solar energy (URJA), Rainfall (VARSHA), Winds (VAYU), Soil moisture & Cyclone prediction (SCORPIO).
- ◆ **Ocean Application:** Customized services for oceanic applications like Global Oil Spill tracking, Ocean Subsurface Field, Rip Current Forecast (Safe beach), Ocean State Forecast (Ocean Eye) and Global Eddy Currents visualisation.

Indian Navy Officers Visiting MOSDAC Facility at SAC as part of 2nd Long Meteorological Course held during Feb 17-19, 2025.



VEDAS Application in Focus:

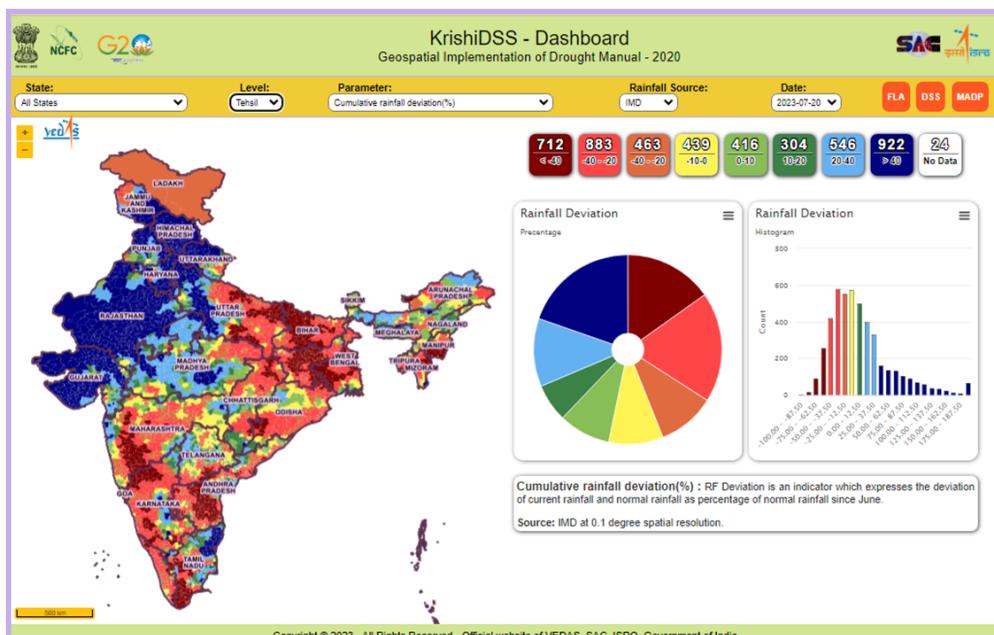
Monitoring Droughts

Drought poses significant threat to world population for water and food security, particularly for the developing countries. In recent years, drought frequency has become more intense and frequent in space and time, partly as a result of Climate Change. The effective near real-time drought monitoring is therefore critical for drought management and mitigation.

The Digital Drought Manual on VEDAS is an interactive application providing several space-based inputs required for understanding the severity of drought condition in India, up to tehsil-level, in accordance with the "Manual for Drought Management" published by the Ministry of Agriculture and Farmer Welfare (MoAFW). The algorithms for

satellite derived mandatory and impact indictors of drought were developed and implemented on VEDAS geoportal by joint effort of SAC, National Remote Sensing Centre (NRSC) and Mahalanobis National Crop Forecast Centre (MNCFC).

All mandatory and impact indicators have been tested with National Agricultural Drought Assessment and Monitoring System (NADAMS) project generated indicators at MNCFC at block and district scale. The application covers various rainfall-based indicators such as rainfall deviation and dry spell duration, along with remote sensing based impact indicators such as vegetation condition, soil moisture etc. The Drought Monitoring System was developed in collaboration with the MoAFW as part of Krishi Decision Support System (DSS).



Digital Drought Manual
Available at: <https://vedas.sac.gov.in/krishi/dashboard/index.html>

API-based Information Dissemination through MOSDAC

Introduction

The Information services at MOSDAC includes in-house implemented output of models. Models' flexibility allows them to be configured for various scales, from local to global, making it invaluable for different applications, including agriculture, disaster management, and urban planning. By simulating atmospheric conditions, model predict weather information like temperature, precipitation, wind speed, wind direction, cloudiness, and humidity for next 3 days. In this article MOSDAC Weather geoportal is described which facilitates users to analyse weather information like time-series chart, TEPHIGRAM received through MOSDAC Weather Application Programming Interface (API).

Geospatial Portals: Bridging Data and Users

MOSDAC Weather Portal is an integration of WRF model output with geospatial technology. The platform enables visualisation of weather data geographically, allowing users to see weather patterns in relation to specific locations. The use of maps enhances understanding as users can pinpoint conditions affecting their region of interest. Major functionalities provided in the portal are:

Overlaying Thematic Layers: to provide contextual information along with weather conditions

Point Probes and Web Analytical Services: Central to MOSDAC weather portal are point probes, which provide localized weather data at specific geographic points. Users can query the system for detailed information, such as current temperature, humidity, and wind speed, tailored to their exact location. This level of granularity is especially useful for users that require precise weather information for their operations. These point

probes are integrated in several applications such as Energy portal, Weather portal and many more.

API-based Information Dissemination

API-based dissemination of information has revolutionized how systems communicate, enabling efficient data sharing across diverse platforms. MOSDAC has developed Weather APIs for dissemination of weather. These APIs are developed using next generation set of tools and techniques supporting open specifications for interoperability, easy integration and security.

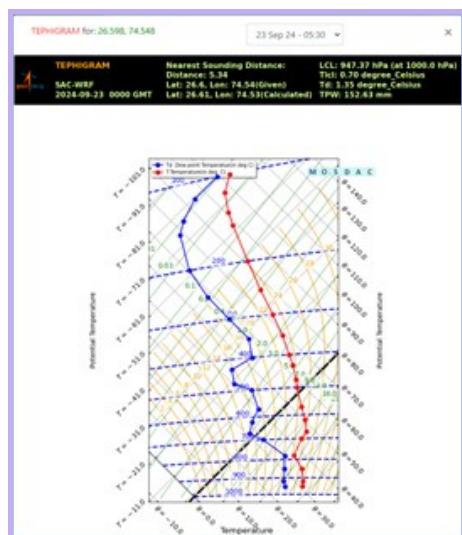
The portal offers web analytical services through MOSDAC Weather APIs. This functionality allows developers to integrate real-time weather data into their applications seamlessly. For instance, an agriculture app can pull in localized weather information to advise farmers on irrigation needs, or a travel app can update users about potential weather disruptions.

Services to disseminate Weather Information: Space Applications Centre (SAC) has a computing facility to generate Weather information for next 3 days with temporal resolution of 3 hours and spatial resolution of 5 X 5 km on daily basis. The next three-day weather information is crucial for short-term planning and decision-making. It provides users with timely and actionable information, enabling sectors like agriculture to optimize planting schedules and allowing event planners to adjust outdoor activities based on weather information.

Services to disseminate Solar and Wind information: The significance of solar and wind information lies in several key areas such as Renewable Energy Integration, Grid Management, Economic benefits, planning and development, climate resilience, environmental impact and many more. MOSDAC disseminates solar and wind related information through geoportal shown in following figure for next 3 days with temporal resolution of 15 minutes and spatial resolution of 5 km. This application is also integrated with MOSDAC Weather APIs for display of time series chart.

Benefits of API Integration

The integration of APIs allows for a broader reach and enhanced utility of weather data. Organizations can build customized applications tailored to specific industries, enhancing the value of weather data across various sectors. APIs can facilitate the automation of weather-related alerts, allowing user agencies to receive real-time notifications regarding severe weather events.

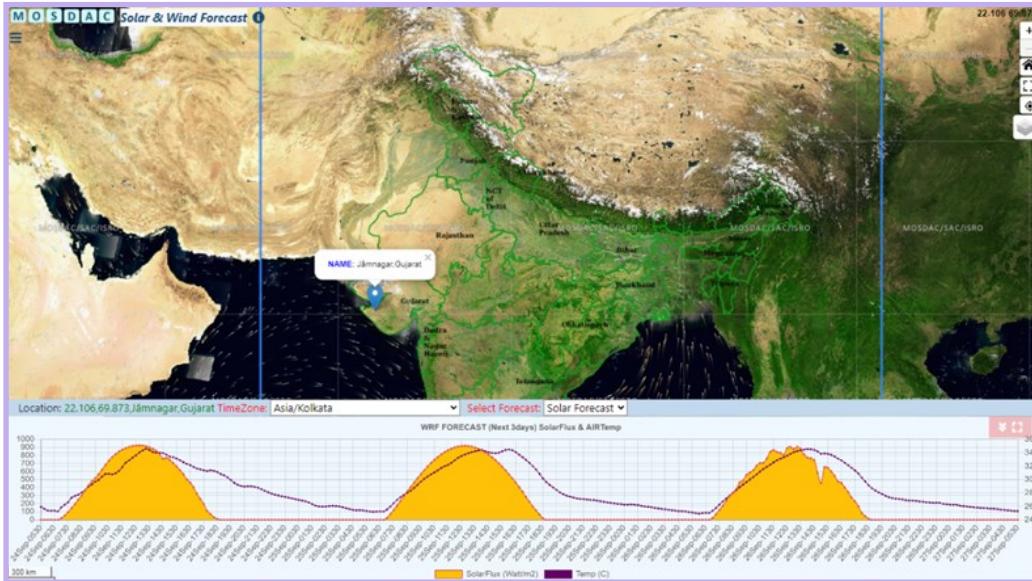


Point Probe Tephigram for analysis at a specific location

Conclusion

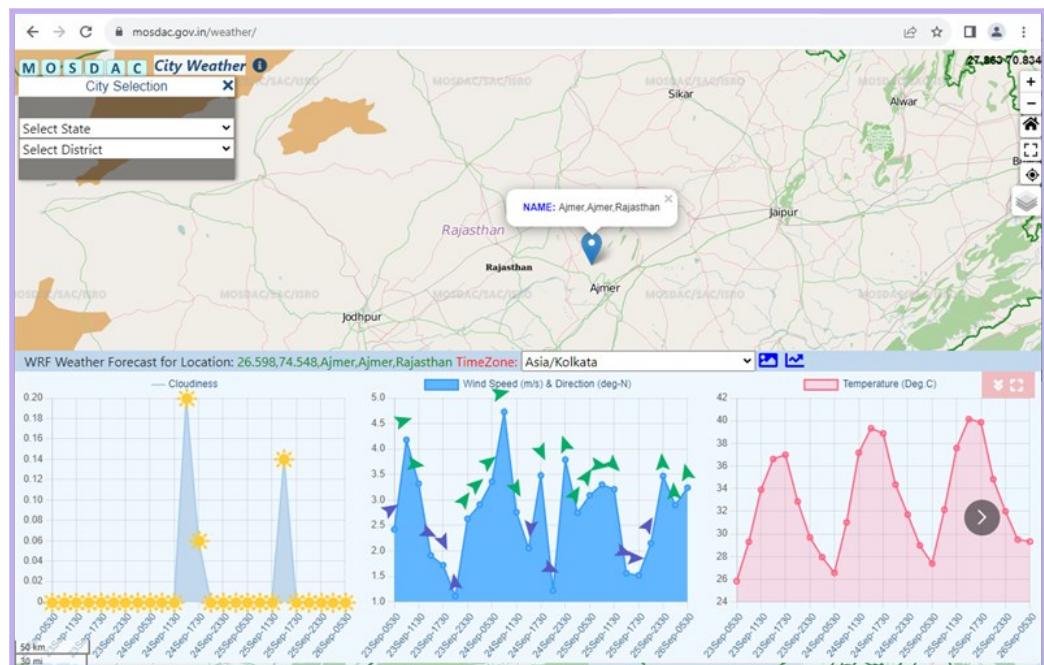
The fusion of Weather related information with geospatial technology has transformed how we access and interpret weather data. MOSDAC Weather and Energy portals are example of such fusion. These applications creates a comprehen-

sive framework that empowers users to make informed decisions. As technology continues to advance, such tools will become even more integral in our daily lives, from enhancing public safety to optimizing business operations.



MOSDAC Energy Portal with Point Probes

Available at
<https://mosdac.gov.in/energy/>



MOSDAC Weather Portal with Point Probes

Available at
<https://mosdac.gov.in/weather/>

How To: Create Story Maps on Unified Visualisation and Analysis Application

1. Open Satellite Data Visualisation Application on VEDAS.
<https://vedas.sac.gov.in/uva/index.html>
2. Click on Add Layer button and select Satellite data and Reference Layers that you want to add in your map. Set Layer Parameters such as Date of Acquisition and duration to composite.
3. Zoom and Pan to your Area of Interest.
4. Click on Share button and copy the link displayed in dialog box.

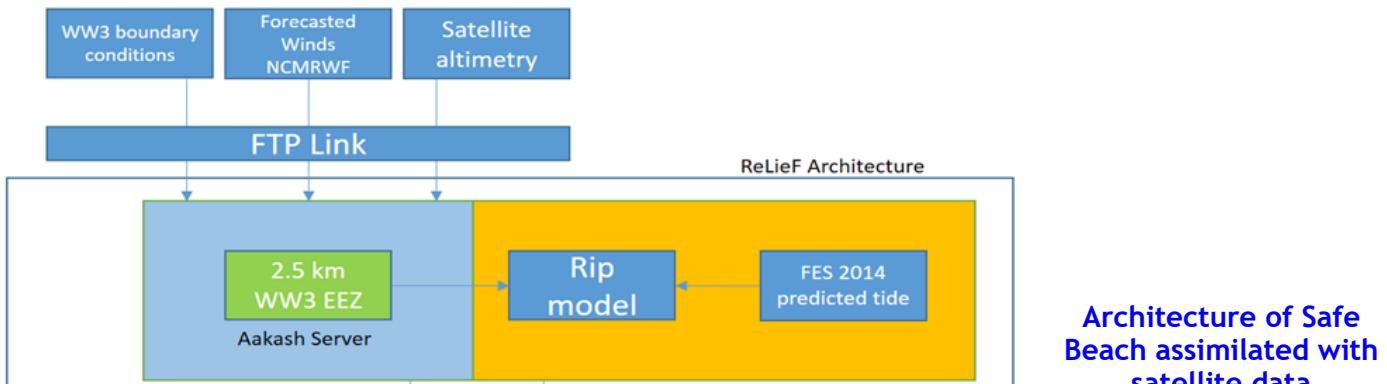
Ex: <https://vedas.sac.gov.in/uva/index.html#appId=&storyId=1745376534> displays LISS-4 false colour composite image of Girnar Hills, Gujarat acquired on Jan 7, 2025.

MOSDAC Application in Focus:

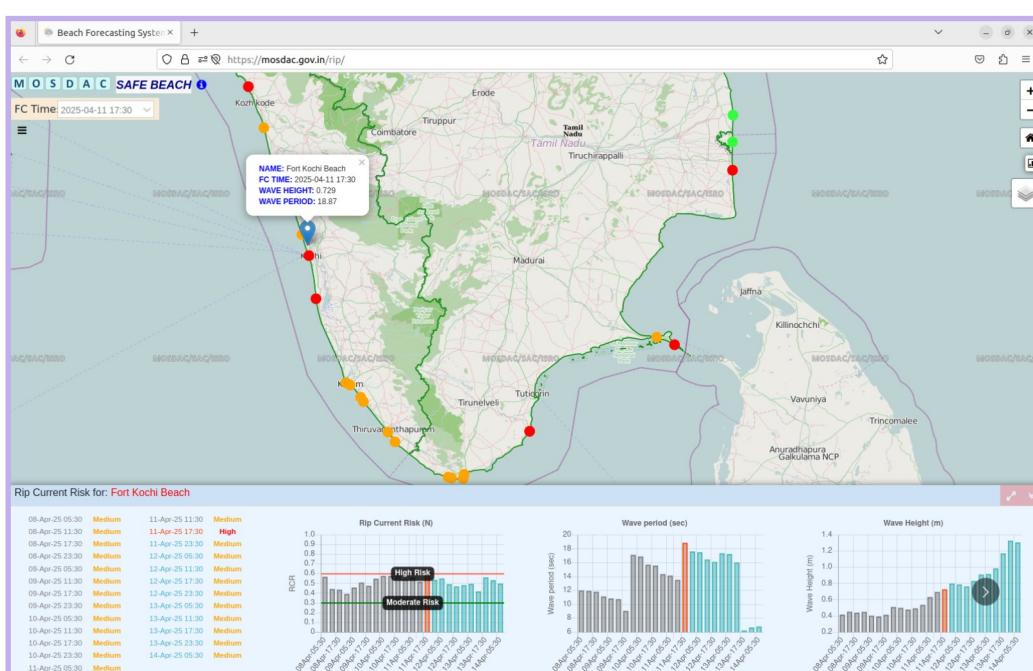
Beach Tourism with Safety

The Safe Beach portal, hosted on the MOSDAC website, is a dedicated platform designed to issue rip current warnings, ensuring the safety of beachgoers along India's extensive coastline. Launched in 2018, the portal has since undergone continuous enhancements, making it a robust tool for forecasting rip currents at nearly 175 beaches across the country. The user-friendly interface allows visitors to select their desired state and beach to view rip current risk levels. For mobile users, the portal conveniently utilizes built-in GPS to automatically detect the user's location and display the nearest beach forecast.

Rip currents are influenced by a combination of waves, tides, and local bathymetry (the underwater topography of the seabed). While bathymetry can be difficult to predict, waves and tides are more reliable indicators. The Safe Beach portal leverages this predictability, focusing on the combined effects of waves and tides in forming rip currents. The Safe Beach portal provides a three-day forecast for rip current risk, automatically updated every day between 4-5 PM IST, based on the previous day's satellite data.



Architecture of Safe Beach assimilated with satellite data



Available at
<https://mosdac.gov.in/rip/>

AI In Action:

Where People Live

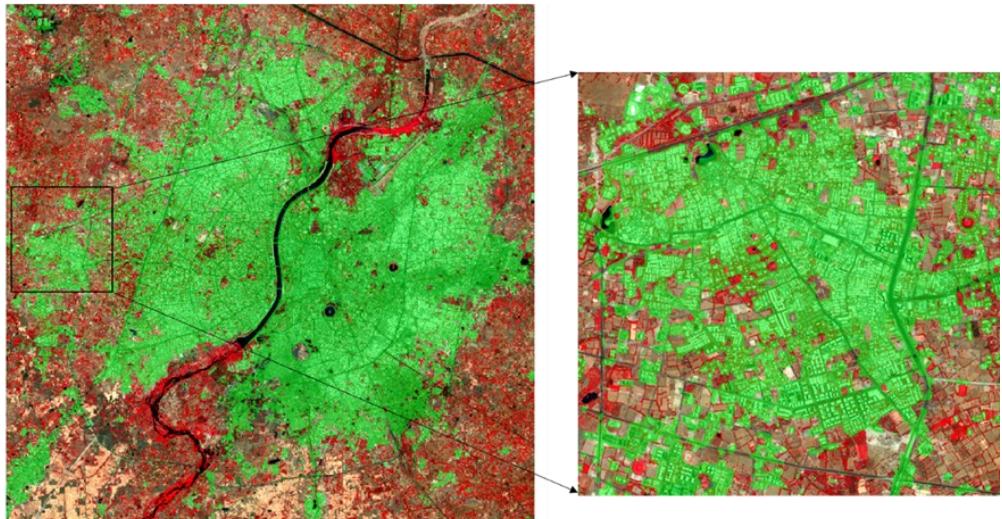
Space-borne sensors offer a valuable means of acquiring a long-term record of rapidly expanding urban centres. Urban sprawl studies play a crucial role in assessing the future land requirements for cities and simulating urban expansion under varying policies and investment decisions. Built-up area, a key parameter in such assessments, serves as an indicator of economic growth and anthropogenic activity while marking a significant factor endangering the natural environment.

Indian Remote Sensing Satellites have been acquiring remote sensing data at a spatial resolution of 5.8 m, suitable for mapping sprawl in cities, since the launch of the IRS 1C satellite in 1997. The Urban Sprawl Information System (USIS) application on VEDAS provides information on the extent of built-up areas of 500 Indian cities for 2023 -2024 timeframe. This data is derived from the Linear Imaging Self-Scanning Sensor - 4 (LISS-4) instrument on-board Resourcesat-2/2A satellites, utilizing the AI-based Convolutional Neural Network (CNN) technique.

**Deep Learning Extracted
Built-up Area of
Ahmedabad City**

Available at
<https://vedas.sac.gov.in/urban/>

 Built-up Area



Launch of Krishi Decision Support System (Krishi-DSS)



The Krishi Decision Support System (Krishi-DSS) is the agro-tech platform developed by Indian Space Research Organisation (ISRO) in collaboration with Ministry of Agriculture and Farmer Welfare. The portal was launched by **Shri Bhagirath Choudhary**, Minister of State for Agriculture and Farmer Welfare, on the occasion of "National Space Day" on Aug 23, 2024 at one-day National Level Conference organized by Department of Agriculture & Farmers Welfare (DA&FW), New Delhi.

Launch of MOSDAC-IN



MOSDAC-IN is a dedicated web portal hosting satellite based products for Indian Navy, developed by ISRO's Space Applications Centre. The portal was launched during the one-day Meteorological and Oceanological Symposium (Meghayan 25) held on April 14, 2025 at Nausena Bhawan, New Delhi to commemorate the WMO Day 2025.

Shri Nilesh Desai, Director SAC and Vice Admiral, **Shri Krishna Swaminathan**, the Vice Chief of Naval Staff launched the portal.

Industry Partnerships:

Ocean Eye : An Application for Shipping Corporation of India

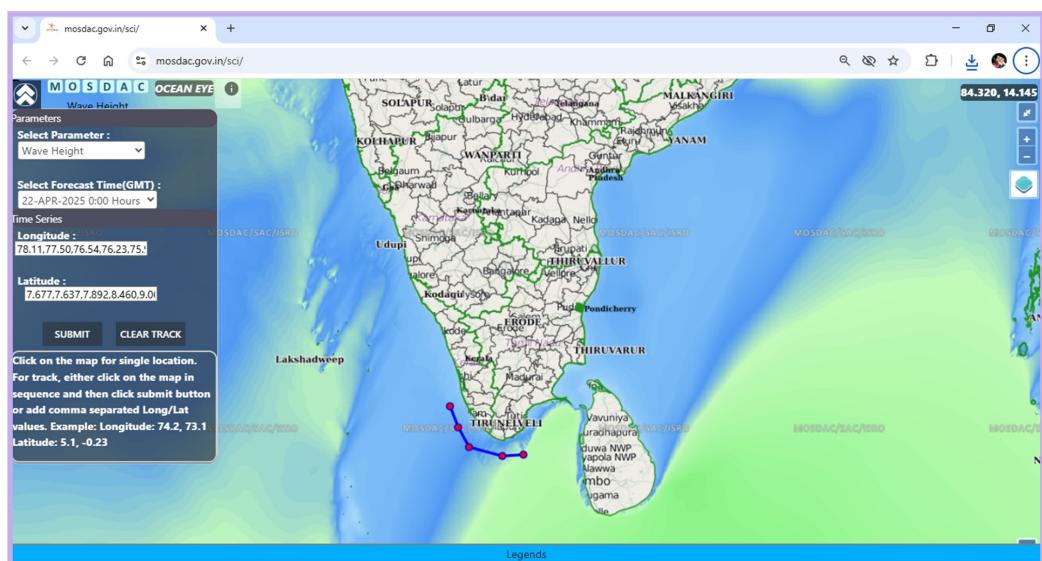
Safe navigation refers to the provisioning of sea state conditions that may affect the stakeholders at work in the sea and advise them to take an alternate route accordingly. The sea state information is of utmost importance for safe navigation. The sea state conditions include the physical state of the sea in terms of its wave height, wave period, surface currents, and surface wind conditions in the present and future (up to 5 days). The present sea state conditions are obtained in near real-time from satellite observations of scatterometers, altimeters, and other remote sensing sensors. These initial conditions are assimilated into the numerical models of the ocean (wave and circulation)

and atmosphere to generate a forecast of the conditions up to 5 days in advance. For providing the optimal routes for the ships, Dijkstra's algorithm, which is based on a weighted graph of connected nodes, has been used.

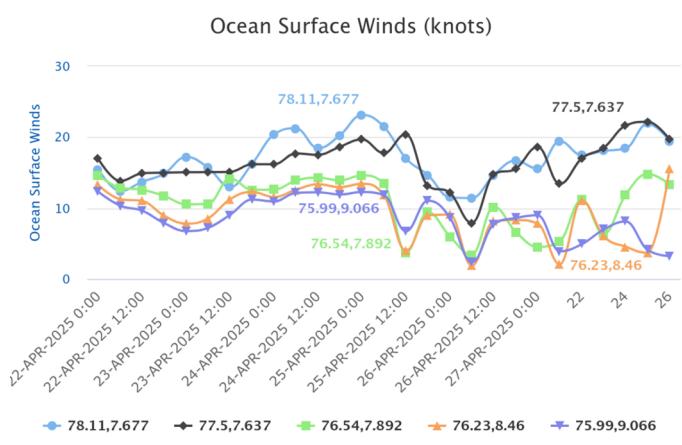
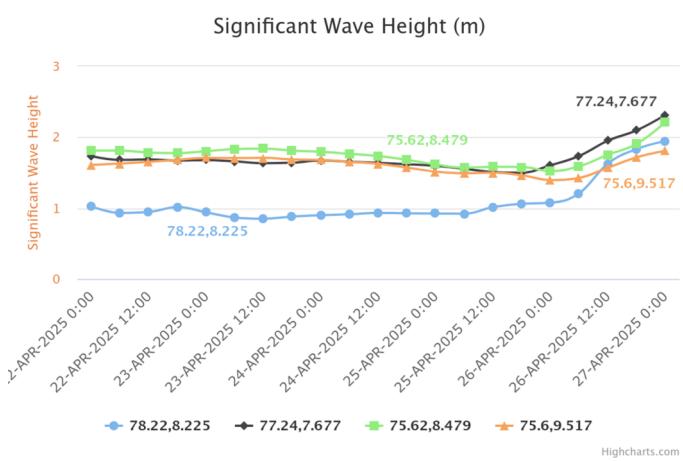
The weather and ocean state forecast for wind speed, sea level pressure, sea surface currents, and significant wave height is generated regularly using satellite data assimilative weather and ocean models and are hosted in near real-time on the "Ocean Eye" web application hosted on the MOSDAC web portal. This web portal is specifically designed in partnership with the Shipping Corporation of India.

Ocean Eye Available at

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



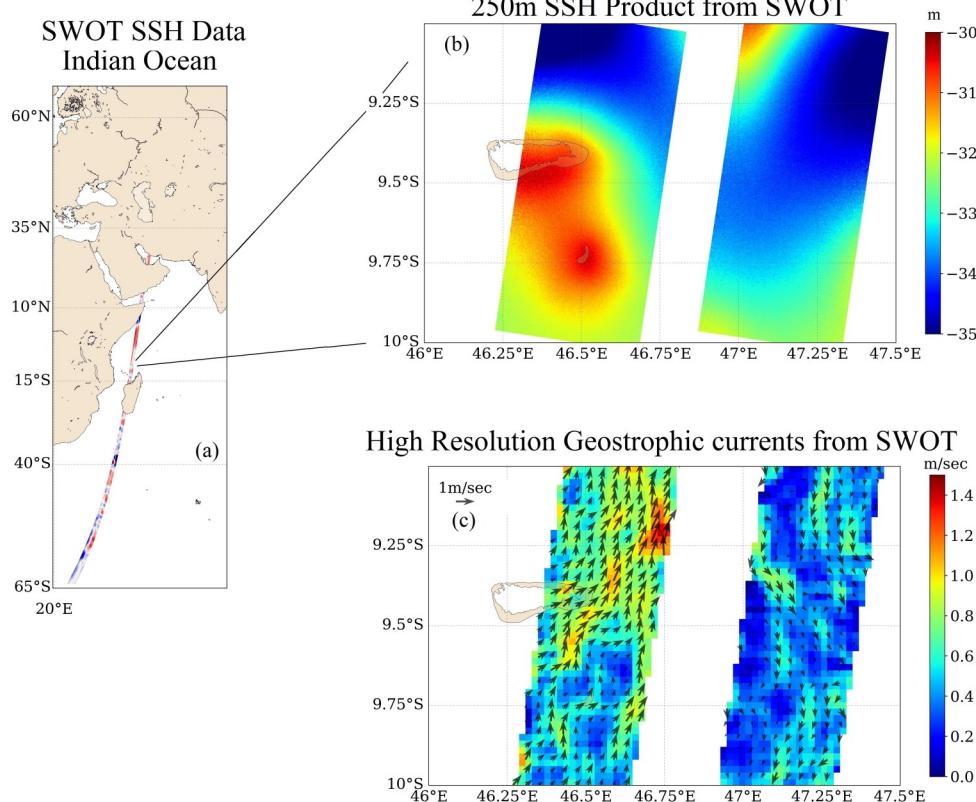
Charts showing 3-day forecast of Significant Wave Height (m) and Ocean Surface Winds (knots)



In Partnership with the Shipping Corporation of India



MOSDAC Image Gallery

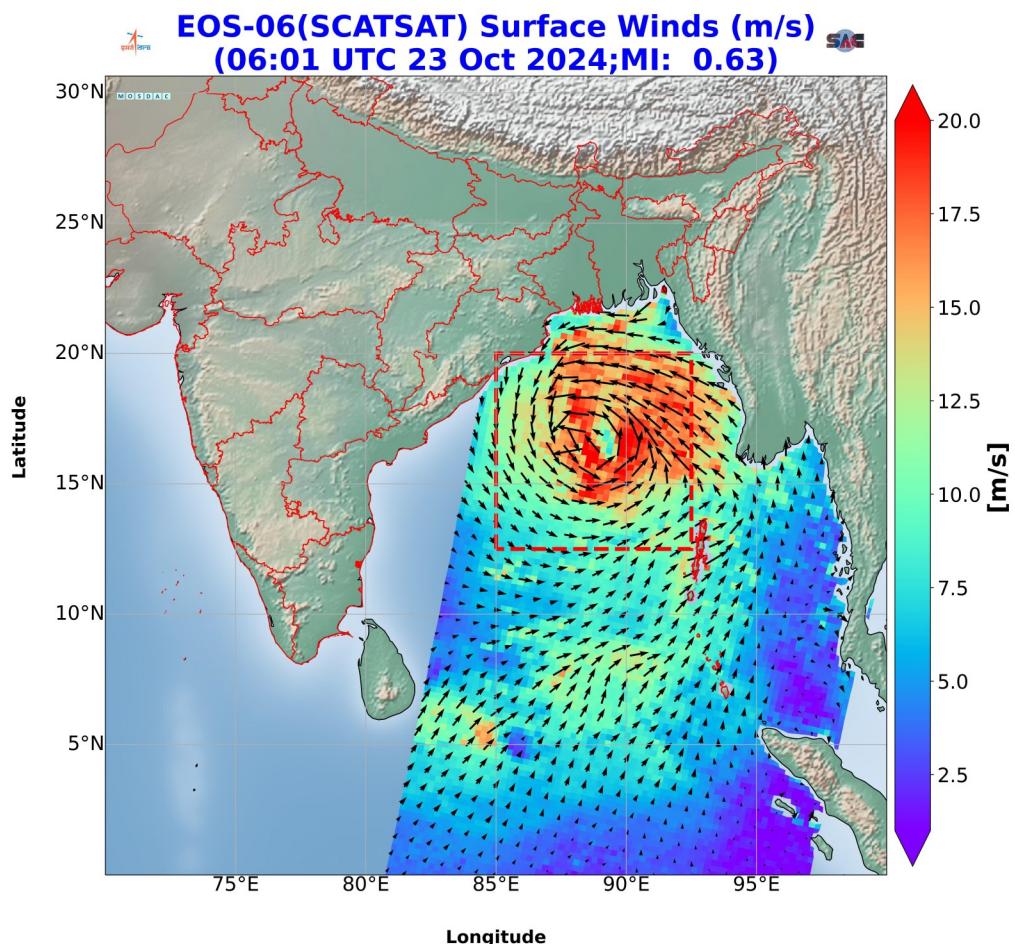


SWOT Image over Indian Ocean

The SWOT (Surface Water and Ocean Topography) mission is a joint NASA and CNES satellite mission designed to map the Earth's surface water. Figure shows (a) Pass from SWOT in the Indian Ocean, (b) Zoomed-out high resolution Sea Surface Height (SSH) showing the small scale features, (c) Derived sea surface geostrophic currents derived from the SSH gradients over the zoomed out region showing high resolution current features.

Cyclone 'Dana' Tracking

The scatterometer on-board EOS-06 provides surface wind observations, which are used for the prediction of tropical cyclogenesis and estimating critical wind radial parameters. The TIR-1, visible and water vapour channel imageries obtained from INSAT-3DR/3DS are used for real-time cyclone monitoring and estimating the cyclone geolocation and intensity. The image on right shows the **Surface Wind Structure** at 06 UTC 23 October 2024 during tropical cyclone 'Dana' in the Bay of Bengal.



New Application on VEDAS:

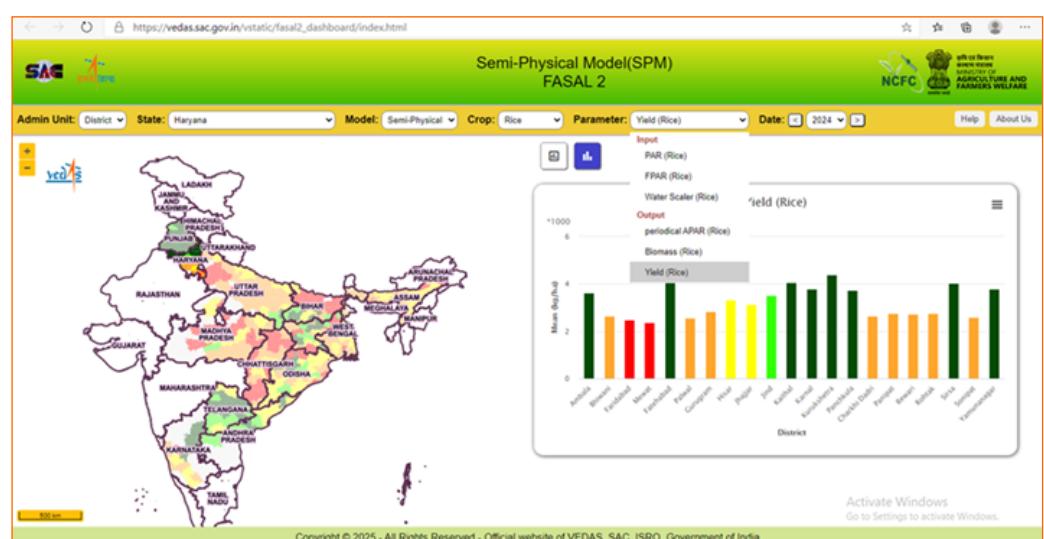
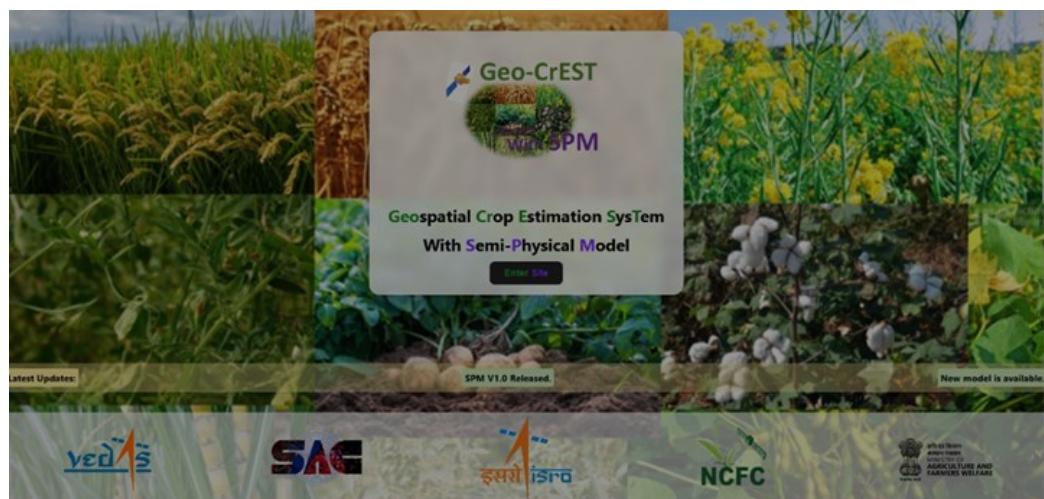
Geospatial Crop Estimation System (GeoCrEST) under FASAL 2

An automated system for crop yield estimation prototype is developed under the FASAL 2 program of MoA&FW at SAC for generating crop yield estimates using semi-physical model at district and state level for 10 crops (Rice, Wheat, Mustard/Rapeseed, Soybean, Arhar/Tur, Gram, Lentil, Sugarcane, Cotton and Potato). This system is now operational on VEDAS portal and will be transferred to MoA&FW.

Towards that, SAC has developed the automated geo-processor for yield estimation and generated the algorithm for implementing the Semi-physical model in this system for generating yield estimates of rice, soybean (kharif), wheat and mustard (rabi) crops. The remote sensing based semi-physical model developed at SAC is based on the physiological process of plant-light absorption for photosynthesis and the radiation use efficiency, which is a measure of plant's efficiency to con-

vert intercepted radiation and CO₂ into dry matter based on the genetic makeup as well as the environmental stress factors that prevailed in actual field conditions. Its strength lies in adopting a process-based framework with limited parameterization.

The dashboard displays both inputs and outputs. The input parameters of the model include PAR, FAPAR, and Water & temperature scalar at different temporal intervals. The outputs from the system include the area, biomass, yield and production at district and state level. District and state level rice yield (Kharif) estimates of 13 major states and soybean yield of MP for the year 2024-25 as well as for mustard and wheat yields for 2024-25 in rabi season has been generated through this automated system and has been shared to MoA&FW and MNCFC. The same is under progress for other targeted crops.

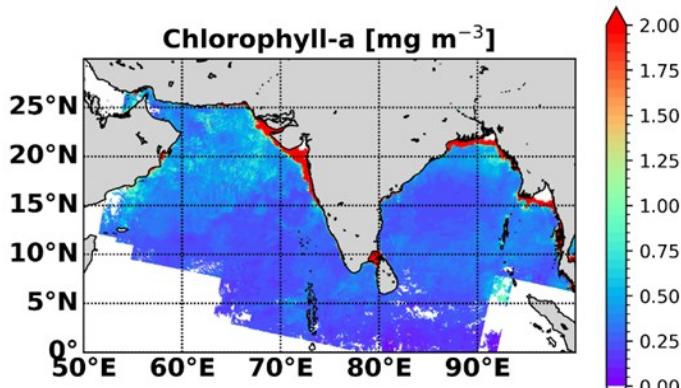


Semi-Physical Model (SPM) FASAL-2

District-level Rice Yield (Kharif) Estimates of 13 Major States for 2024-25

Data Products:

OCM-3 Products on MOSDAC



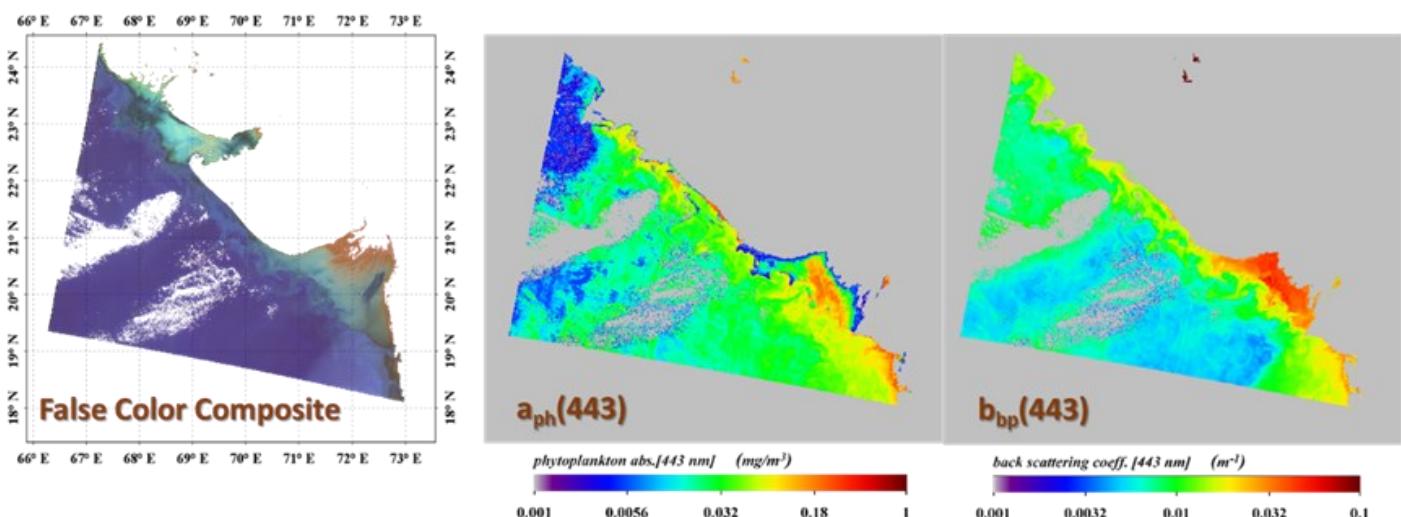
8-day composite (Feb 8-15, 2025) of Chlorophyll-a concentration derived from OCM-3

Chlorophyll-a Concentration

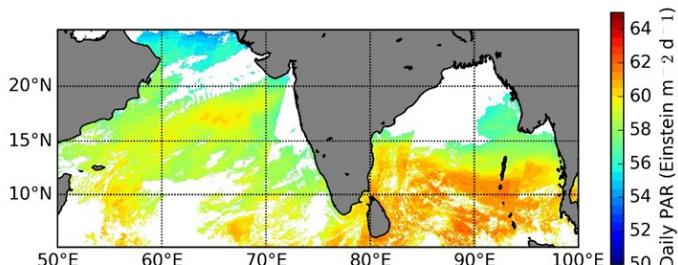
Chlorophyll-a is the primary pigment in phytoplankton, and its concentration indicates the amount of these microscopic algae in the water. It is a key indicator of ocean productivity where the high chlorophyll levels often mean nutrient-rich areas crowded with life (useful for identifying potential fishing zones). Phytoplankton form the base of the marine food web and play a vital role in global cycles by producing oxygen and absorbing carbon dioxide.

Inherent Optical Properties (IOPs)

Inherent Optical Properties are the fundamental light-absorbing and light-scattering characteristics of water and its constituents. They include measures like absorption coefficients (how different substances such as phytoplankton, coloured dissolved organic matter (CDOM), and detritus absorb light at various wavelengths) and backscattering coefficients (how particles scatter light). These properties are important because they determine the colour of the water as seen by a satellite sensor.



Phytoplankton abs. (a_{ph}) and particle backscattering (b_b) derived from OCM-3 (Feb 11, 2025)



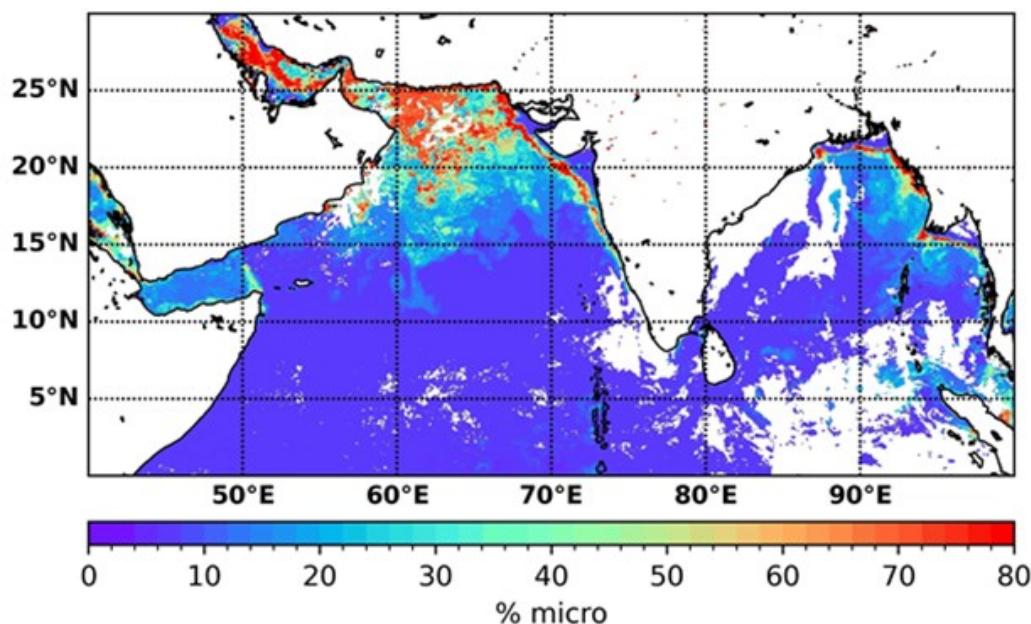
2-day composite of PAR derived from OCM-3
(April 1 & 2, 2024)

Photosynthetically Available Radiation (PAR)

Photosynthetically Available Radiation (PAR) is the portion of sunlight (approximately 400-700 nm in wavelength) that can be used by plants and phytoplankton for photosynthesis. Essentially, it represents the solar energy available in the upper layers of the ocean to drive the growth of phytoplankton. In ocean applications, knowledge of PAR is important for modelling how much carbon is being fixed in the oceans (oceanic primary production) and for understanding ecosystem dynamics.

Phytoplankton Size Classes (PSC)

Phytoplankton Size Classes refer to categorizing phytoplankton by their cell size (for example, micro-plankton, nano-plankton, and pico-plankton). This classification is important because the size of phytoplankton influences marine food webs and biogeochemical processes as different sizes are consumed by different grazers and have varying roles in carbon export. Satellite ocean-color data (like OCM-3's measurements) can be used not only to estimate total phytoplankton abundance but also to infer the prevailing size classes. This is possible because phytoplankton of different sizes have distinct optical signatures in how they absorb and scatter light. This translates into subtle changes in the color of the ocean observed by the sensor.



8-day composite (Mar 5-12, 2024) of micro-phytoplankton (in %) derived from OCM-3

Leveraging the 250 TF Sagar HPC for Advanced Earth Science Research

The 250 TF Sagar High-Performance Computing (HPC), comprising 70 nodes, was established in the EPSA, SAC for a range of Earth science applications. It was inaugurated by Dr V. Narayanan, Secretary DOS and Chairman ISRO, on February 17, 2025. This high-performance computing environment plays a pivotal role in supporting various atmospheric and oceanic modelling activities. It is also essential for conducting Observation System Simulation Experiments (OSSEs) aimed at defining future spaceborne sensors.

Research using the current HPC system has already led to significant advancements, including the sensor definition of future hyperspectral Microwave and Infrared Sounders, as well as an ad-

vanced Imager. Additionally, high-resolution ocean modelling and data assimilation research have been successfully carried out. The HPC has also enabled magnetohydrodynamic simulations for astrophysical flows and supported various space science models.

Moreover, the system is being used for hydrological modeling in flood prediction and air quality studies. This existing hardware is a cornerstone for these critical applications, but it will need to be upgraded to accommodate future research demands, particularly for high-spectral, spatial, and temporal resolution observations from upcoming Indian satellites.



New Application on MOSDAC:

Extreme Weather Events: Space Based Monitoring and Climate Impact over Mauritius Island

Mauritius is severely affected by extreme weather events, leading to human and economic losses. Space based Remote sensing observations from satellites have huge potential in monitoring and prediction of these extreme weather events. Long term satellite data and climate records can help in studying the climate impact and propose adaptation strategies.

A web portal for Near Real Time (NRT) Satellite Data products visualisation and analysis along with weather and ocean information services over Mauritius is designed, developed and operationalised at MOSDAC. This Web portal provides web applications for various science themes like Severe Weather, Storm Surge, Sea Level, Swell, Precipitation, Inundation, water quality etc.

The Geo-portal offers following capabilities:

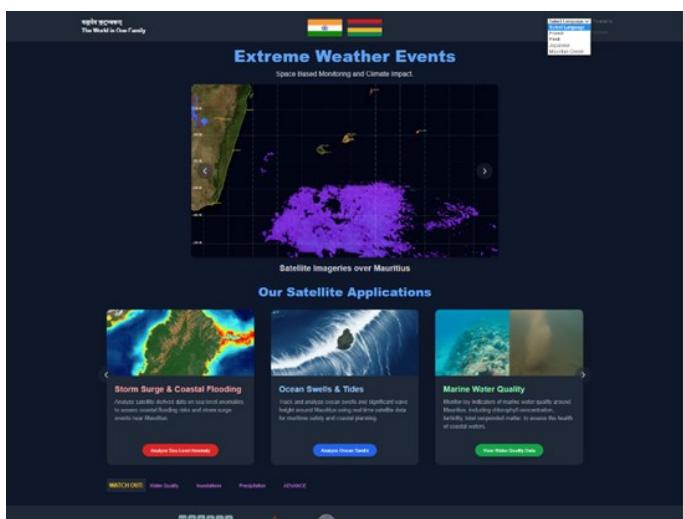
- Web-GIS based information Service for dissemination of information related to Extreme weather events.
- Theme-based visualisation and analysis capability for Cyclones, rainfall, storm surge, swell, significant wave height, Sea level anomaly, nowcast and forecast.

- Capability of visualisation and analysis of Satellite data in Near Real Time for Satellites like INSAT3DR/INSAT3DS/EOS-06/MSG-9 SEVIRI etc.

State-of-the-art Data Services available from the portal are:

- Tailored Products: Customized meteorological and oceanographic products specific Mauritius Island
- Reliable Data Archival: Robust archival systems ensure historical data availability for trend analysis, training, and planning
- User-Friendly Interface with responsive design: Intuitive web portal designed for quick data discovery, visualization, and download.
- Automated Alerts: Early warning alerts for extreme weather conditions monitoring and management of Disaster.

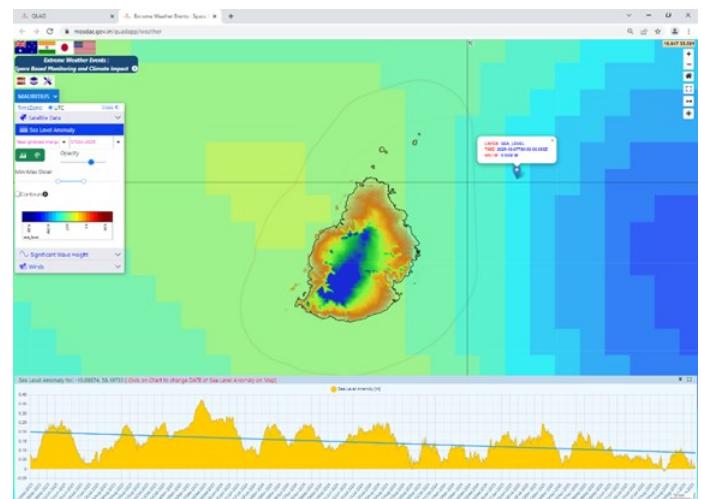
“Extreme Weather Events : Space Based Monitoring and Climate Impact” application uses the concept of open science to develop the Earth Observation Applications for Mauritius.



Extreme Weather event over Mauritius
(Home page)

Available at

<https://mosdac.gov.in/quad>



Time series analysis of Sea Level Anomaly

Data Products:

INSAT 3DS Data Products Archival & Dissemination from MOSDAC

INSAT-3DS satellite, launched on February 17, 2024, is the state-of-the-art meteorological satellite developed by ISRO. Positioned in geostationary orbit at 82° East, it is equipped with advanced payloads, including a 6 Channel imager and an 19 Channel sounder, designed to monitor atmospheric and oceanic parameters. The data generated by INSAT-3DS is crucial for weather forecasting, disaster management, and environmental monitoring.

MOSDAC portal serves as the central repository and distribution hub for INSAT-3DS data. At MOSDAC, the data archival and dissemination framework, robust catalogue and order processing system, ensures seamless and efficient access to high-quality meteorological data. The platform's user-centric design facilitates easy data discovery, order placement, and download, thereby empowering diverse users with timely satellite information crucial for weather prediction, disaster response, and climate research.

Key functionalities include:

Data Storage & Archival: Secure and scalable storage of voluminous INSAT-3DS datasets across multiple levels of processing are maintained at MOSDAC Data Centre. The entire mission datasets along with the raw data is archived at MOSDAC with the data mirroring at the DR site.

Catalog System: MOSDAC maintains a detailed metadata catalog with DOIs that indexes all satellite data, enabling efficient search and retrieval based on parameters like date/time, geographic region, sensor type, and data product level. Users can explore the catalog through filters such as date, region, sensors etc.

Data Dissemination: Provides users with access to data products through a user-friendly web interface and API based services, supporting various formats and delivery methods. The order system supports bulk selection, subscription based data download and customization of output formats (e.g., HDF, GeoTIFF, NetCDF) and also allowing AOI based region of interest data ordering. Registered users can place orders via the web portal. Orders are processed automatically, with datasets made available via secure download links or APIs for programmatic access. MOSDAC also supports near real-time data streams via RSS and push services, enabling timely applications such as cyclone tracking and flood alerts.

Data Analysis and Visualisation: Provides data analysis capabilities over web along with intuitive satellite data visualisation using the WebGIS platform. MOSDAC also provides the Near Real time Quick look image display through the satellite image gallery which help users identify relevant datasets before download.

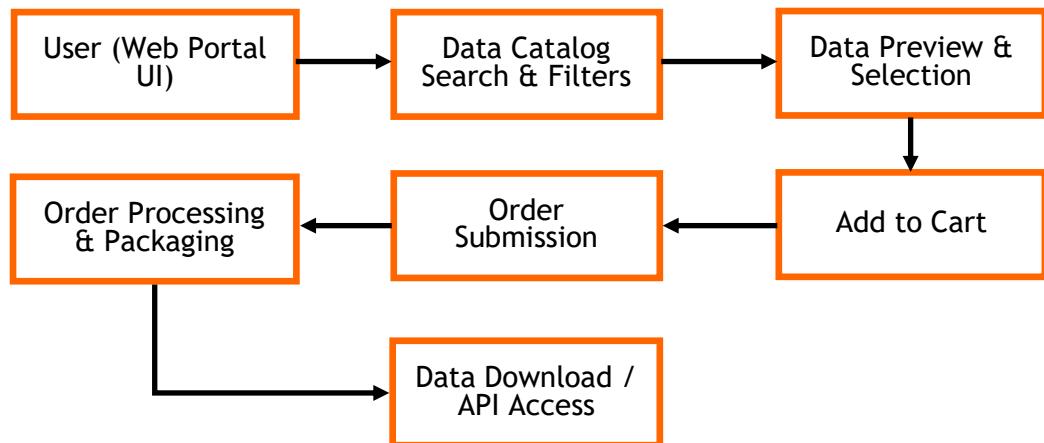
Sr.No	Product / Acq Calendar/Version	Product Description	Processing Level	Temporal Resolution	Start Date	End Date	Processing Status	DOI
1	3SIMG_L1B_STD	Level1 data for imager 6 channels at half hour interval	L1B	HALF HOURLY	2024-05-17	2025-10-08	Active	
2	3SIMG_L1C_ASIA_MER	IMAGER- 6 channel Level1 data in Mercator projection for Asian Sector	L1C	HALF HOURLY	2024-05-17	2025-10-08	Active	
3	3SIMG_L1C_SGP	Level1 IMAGER 6 channel data of TIR1, TIR2, WV, VIS, SWIR, MIR Bands in Mercator projection	L1C	HALF HOURLY	2024-05-17	2025-10-08	Active	
4	3SIMG_L2B_CMK	INSAT-3S VHRR measures radiances in one visible and one SWIR band at 1 km spatial resolution, one MIR and two TIR bands at 4 km resolution, and one WV band at 8 km resolution. Radiances from 3 IR spectral bands TIR-1, TIR-2 and MIR which are of same resolution of 4km are used in the INSAT cloud mask algorithm to estimate whether a given view of the earth surface is unobstructed by clouds	L2B	HALF HOURLY	2024-06-11	2025-10-08	Active	
5	3SIMG_L2B_CTP	Cloud top properties derived using INSAT3S IMAGER	L2B	HALF HOURLY	2024-07-13	2025-10-08	Active	
6	3SIMG_L2B_HEM	This product is derived on the basis of Hydro-Estimator method. It measures precipitation over Indian Region	L2B	HALF HOURLY	2024-05-17	2025-10-08	Active	

INSAT 3DS Satellite Data Catalog at MOSDAC

INSAT-3DS generates a variety of data products categorized into different processing levels:

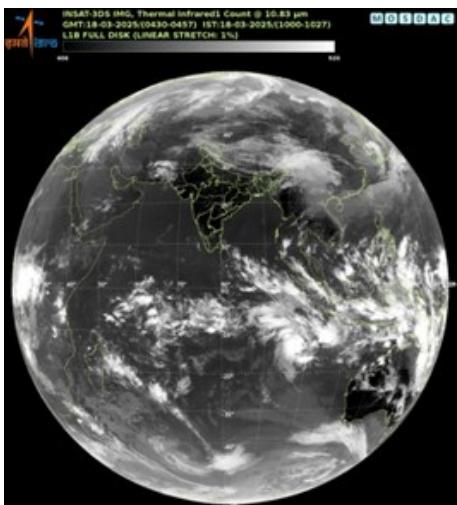
Data Product	Description	Usage
Level-0 Raw Data	Unprocessed satellite telemetry	Archival & reprocessing
Level-1B Calibrated Data	Calibrated & geo-located sensor data	General analysis & applications
Level-2 Geophysical Products	Derived parameters like cloud, SST, humidity etc.	Detailed atmospheric & ocean studies
Level-3 Aggregated Products	Spatially/temporally binned data	Climate monitoring & trend analysis

Data flow chain for User Order Processing System (UOPS) at MOSDAC portal

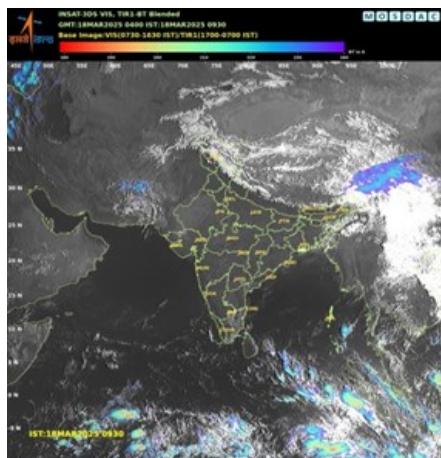


INSAT 3DS Sample Images

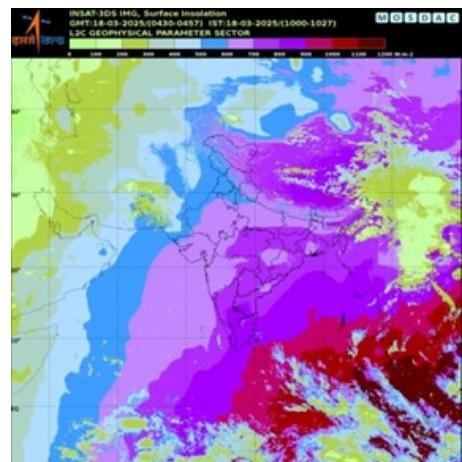
Thermal Imagery



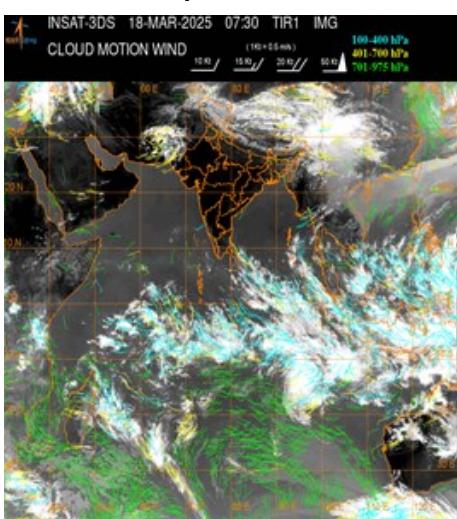
Blended Product



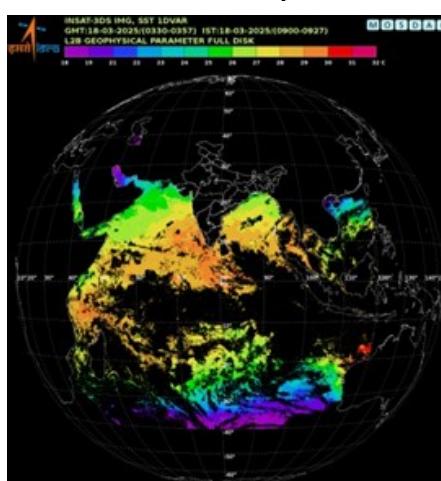
Solar Insolation



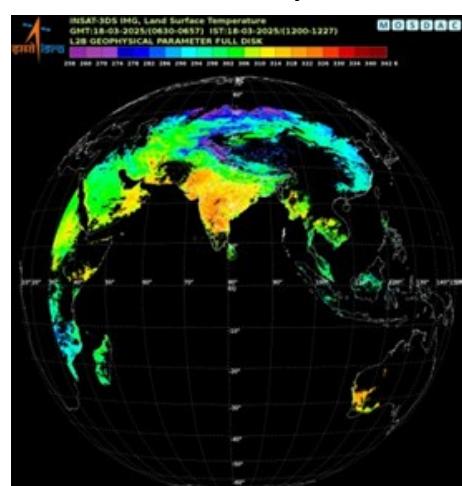
Atmospheric Winds



Sea Surface Temperature



Land Surface Temperature



Region-specific Application on VEDAS:

LAMA: Ladakh-specific Modelling and Space Applications

LAMA (LAdakh-specific Modelling and space Applications) is SAC-ISRO's end-to-end decision-support stack for Ladakh, delivered via VEDAS WebGIS portal. It fuses satellite observations (INSAT-3D/3DS, EOS-06 OCM-3, Sentinel-5P TROPOMI, Cartosat-3, Resourcesat-2/2A LISS-4, Sentinel-2) with process models and field instrumentation to track the region's most critical systems in near-real time. Flagship layers include cryosphere and hydrology (snow/glacier melt, SPHY-based discharge with NEWLG water-level sensors on the Indus), urban analytics for Leh (AI-extracted built-up growth 2016-2025, 3D city model and rooftop solar potential), air-quality intelligence (satellite trace gases & AOD with in-situ ozone/PM2.5 at University of Ladakh), and hybrid weather (WRF + AI/ML) with satellite-driven heavy-rain nowcasts. Outputs are interactive maps, time-series probes, and grid summaries

tailored for administrators, community and researchers in a data-sparse environment.

Beyond operations, LAMA advances frontier studies vital to Ladakh's resilience and growth: mineral diversity mapping from EMIT hyperspectral data (with landslide-relevant mica/serpentine insights), land-degradation status and wind-erosion impacts on rangelands, agriculture monitoring (LAI/chlorophyll inversions, NDVI seasonality, daily PET for irrigation advisories), and THz astronomy site characterisation at Hanle (atmospheric transmittance modelling). A dedicated calibration/validation program (corner reflectors for EOS-04/Sentinel-1, AWS and micromet stations at Khardung La, glacier sites) underpins product accuracy. Co-developed with the Ladakh Administration and University of Ladakh, LAMA is positioned as a living laboratory that turns space-to-ground science into actionable, locally tuned governance.

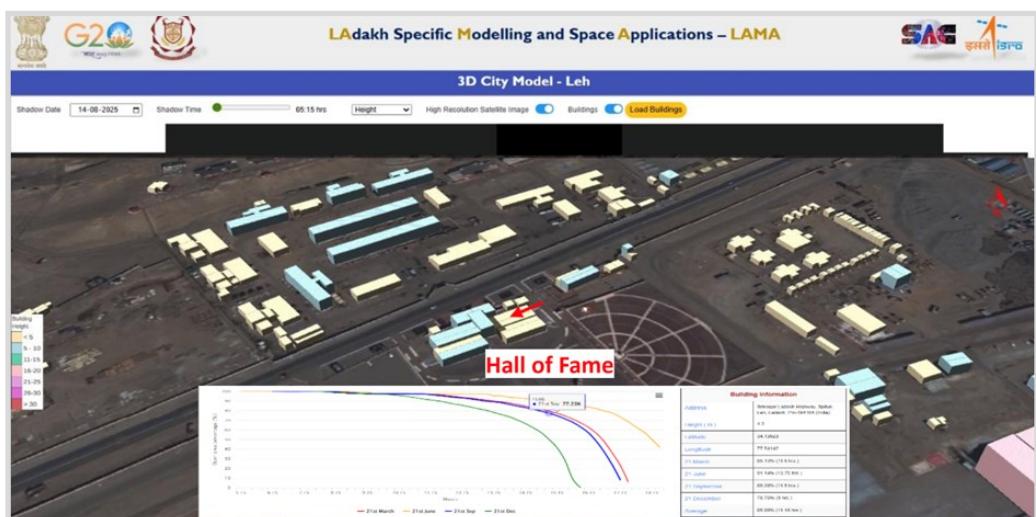


LAMA Landing Page

Available at

<https://vedas.sac.gov.in/vapps/lama/>

3D Visualization and Solar Energy Estimation



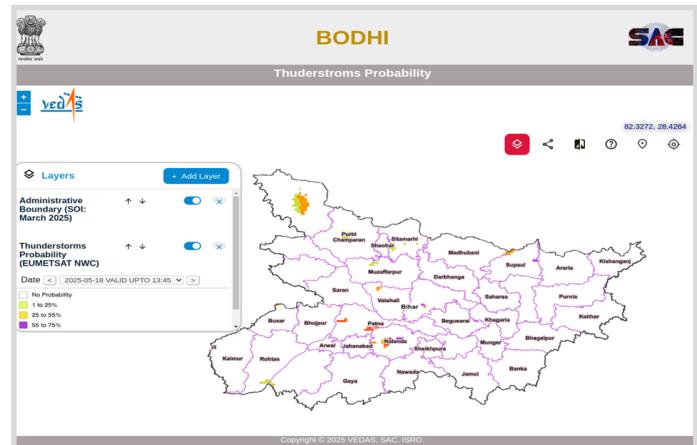
Region-specific Application on VEDAS:

BODHI: Bihar Oriented Spatial Dataset & Hazard Information

BODHI (Bihar Oriented Spatial Dataset & Hazard Information) is a state-focused geo-spatial platform from SAC-ISRO that turns satellite observations and model outputs into actionable decision support for Bihar. It brings together flood forecasting for the Ganga using WRF-Hydro linked with Sentinel-1/EOS-04 SAR inundation libraries, a 90-minute thunderstorm probability nowcast driven by rapid geostationary scans and model fields, and a drought monitoring setup aligned with the Government of India's Drought Manual. The portal also offers near-real-time environment layers—active fires (VIIRS), aerosols and trace gases (OCM-3/TROPOMI)—plus short-range (72-hour) WRF weather forecasts updated every three hours.

Beyond hazards, BODHI provides AI-extracted built-up area mapping for Class-1 cities from Resourcesat-2/2A (LISS-4), desertification/land-degradation status maps (multi-epoch AWIFS), and a WebGIS solar energy application that includes a solar calculator and site-selection tool using INSAT-derived insolation with terrain and infrastructure filters. Outputs are delivered in an opera-

tional WebGIS on VEDAS with tehsil/district aggregations, panchayat-scale estimates, time-series probes, APIs, and overlay tools—so administrators, planners, and communities can move quickly from satellite data to ground action.



Thunderstorm Probability Alert on Bodhi Portal for 18 May 2025 12:15 to 13:45 Hrs

Available at: <https://vedas.sac.gov.in/vapps/bodhi/>

National Space Science Meet - SAMHITA

The National Space Science meeting - SAMHITA was held at SAC during May 5-6, 2025. The meeting was inaugurated by the Chairman ISRO and Director SAC. It was attended by around 150 participants across various ISRO/DoS centres and national experts from academia. Delegates from SAC, PRL, URSC, SPL, NARL & SPO, ISRO HQ attended the meeting along with experts from academic institutions including IIST, TIFR, IIT-M, IIT-

K, NISER, ARIES, IIG, SP University, CVM University, NIRMA University and Ahmedabad University.

Deliberations focused towards initiatives and research outcome of studies being carried out by SAC scientists/engineers for ISRO's current and future space science missions covering Aditya L1, DISHA, ExoWorlds, THz telescope and proposed microgravity experiments on POEM platforms as well as on upcoming Gaganyaan and BAS missions.



NISAR Awareness Workshop for Indian Non-Governmental Entities (NGEi)

One-day workshop on NISAR awareness for the Non-Governmental Entities of India (NGEi) was organised at Space Applications Centre (SAC), Ahmedabad on April 29, 2025, to enable and engage the NGEi in various activities since the early phase of satellite mission. The workshop was supported by IN-SPACe and NSIL. The primary objectives of the workshop were to involve NGEi for development of value-added products & services and upscaling of downstream applications developed using NISAR data. About 80 professionals representing NGEi from diversified domains joined by about 100 scientists and engineers from ISRO representing NISAR project and science teams participated in the workshop.

Major outcomes from the workshop:

- The first of its kind workshop, notably prior to spacecraft launch, has been found to be stimulating for a wide cross-section of NGEi. The NGEi were apprised of various aspects and updates on NISAR mission including NISAR science plan and applications potential, observation plan, data products, data dissemination plan and possible roles of NGEi in the utilisation of NISAR data.
- Deliberations by IN-SPACe and NSIL with

regard to the commercial aspects of NGEi engagement in NISAR have been found to be extremely helpful.

- An extensive interactive session between the representatives of NISAR science & project teams, IN-SPACe, NSIL, ISRO Headquarters and the NGEi helped to assess the interests and requirements of NGEi towards NISAR data utilisation.
- NGEi showed keen interest in several areas, with the major being in agriculture, crop insurance, water resource management and land deformation monitoring. Some of the NGEi showed interest in the NISAR science products such as soil moisture and vegetation biomass.
- As a way forward, the NGEi were advised to send proposals to SAC stating their interests and plans for utilisation of NISAR data and products. The proposals will be evaluated for technical collaboration with ISRO, while IN-SPACe and NSIL will look into the commercial aspects of the proposals.

The workshop concluded with resolve to hold next stage of focussed discussions with the NGEi to formulate plans for NISAR data utilisation.



Guidance:

Rashmi Sharma (ddepsa@sac.isro.gov.in), Shashikant Sharma, Pradeep Thaplilyal, Bimal Bhattacharya, Mehul Pandya, Deepak Putrevu, Rajesh Upadhyaya, Praveen Gupta, Shivani Shah, Pankaj Bodani

Editorial Team:

Arvind Sahay, Gaurav Jain, Hrishikesh Kumar, Mukesh Kumar, Nimisha Singh, Ruchi Modi, Shard Chander, SVV Arun Kumar



Space Applications Centre
Indian Space Research Organisation (ISRO)
Ahmedabad 380015

