

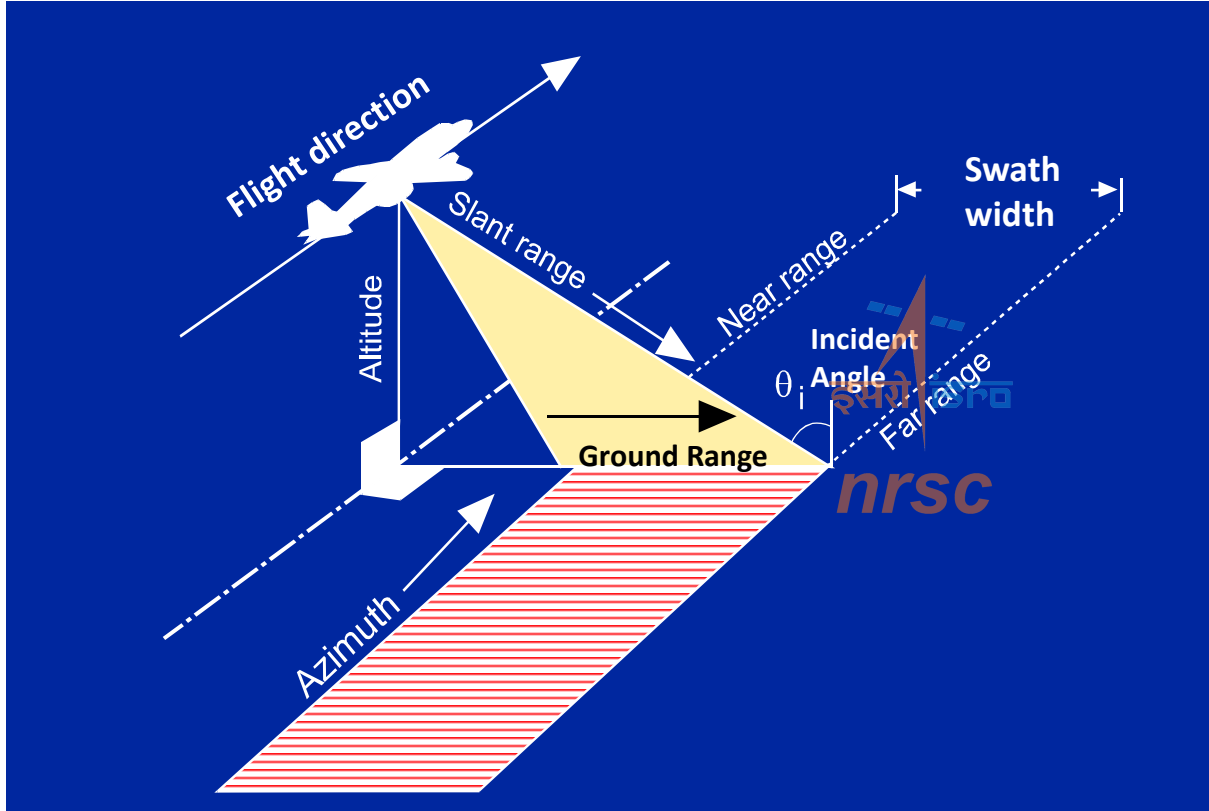
Data Products @ Bhoonidhi - Microwave



K. Niharika

SAR-DPD/MDPG/DPA/NRSC

Imaging Radar Geometry



Being an Active Imaging RADAR, SAR is having the capabilities.

- Day and Night Imaging
- All weather Imaging with penetration through clouds, smoke, fog etc.
(Supporting even during monsoon season)

Microwave Data Products at Bhoonidhi

- RISAT-1 (C-Band SAR)
- EOS-04 (C-Band SAR)
- NovaSAR (S-Band SAR)
- Sentinel-1 (C-Band SAR)
- SCATSAT (Ku Band Scatterometer)

➤ Radar Imaging Satellite (RISAT-1), India's first microwave satellite having state-of-the-art technology having SAR system configuration:

- Multimode SAR (Stripmap, ScanSAR, Spotlight) – FRS-1, FRS-2, MRS, CRS & HRS
- Orbit: Sun Synchronous Polar Orbit (SSPO) of 536 km Altitude
- Frequency: C-band (5.35 GHz)
- Polarization: Single, Dual, Hybrid and Quad
- Active phased array antenna Technology (electronic Beam Steering)
- Left and Right Looking
- Incident Angle Independent Swath (107 - 659 km)

➤ RISAT-1 was launched in April 2012 and operational up to September 2016 with a mission life of 4 ½ years.

➤ It has served many applications including Agriculture, Forestry, Flood mapping, damage assessment, Oil spill studies etc.

RISAT-1 Data selection – Bhoonidhi

Search-Criteria Search-Results Cart

VENIS

Date range

01 January 2016

01 February 2016

Product

Standard

Satellite-Sensor

Resolution

Low (25m - 100m) Resolution

Source

Microwave

Priced

RISAT-1_SAR(CRS)

RISAT-1_SAR(MRS)

Submit

Explore Archives PI Actions Utilities Deputy Manager

Search-Criteria Search-Results Cart

Filter Results

1 2 3 4 5

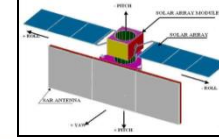
Sat_sen: RI1_SAR_MRS_F Scene: 20759_1_1 Dop: 01-Feb-2016 Pricing: Priced			
Sat_sen: RI1_SAR_MRS_F Scene: 20759_2_1 Dop: 01-Feb-2016 Pricing: Priced			
Sat_sen: RI1_SAR_MRS_F Scene: 20759_1_2 Dop: 01-Feb-2016 Pricing: Priced			
Sat_sen: RI1_SAR_MRS_F Scene: 20759_2_2 Dop: 01-Feb-2016 Pricing: Priced			
Sat_sen: RI1_SAR_MRS_F Scene: 20759_1_3 Dop: 01-Feb-2016 Pricing: Priced			

Bhoonidhi ISRO's EO Data HUB

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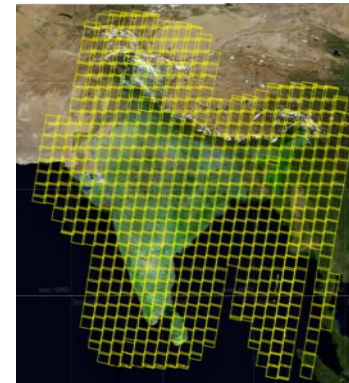
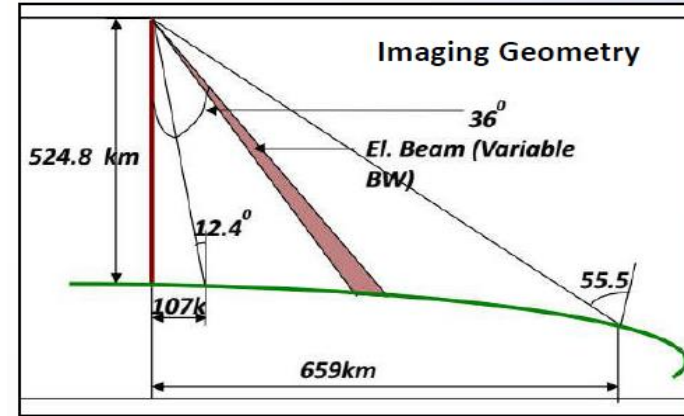
Type search text here... Eg:

EOS-04 MISSION



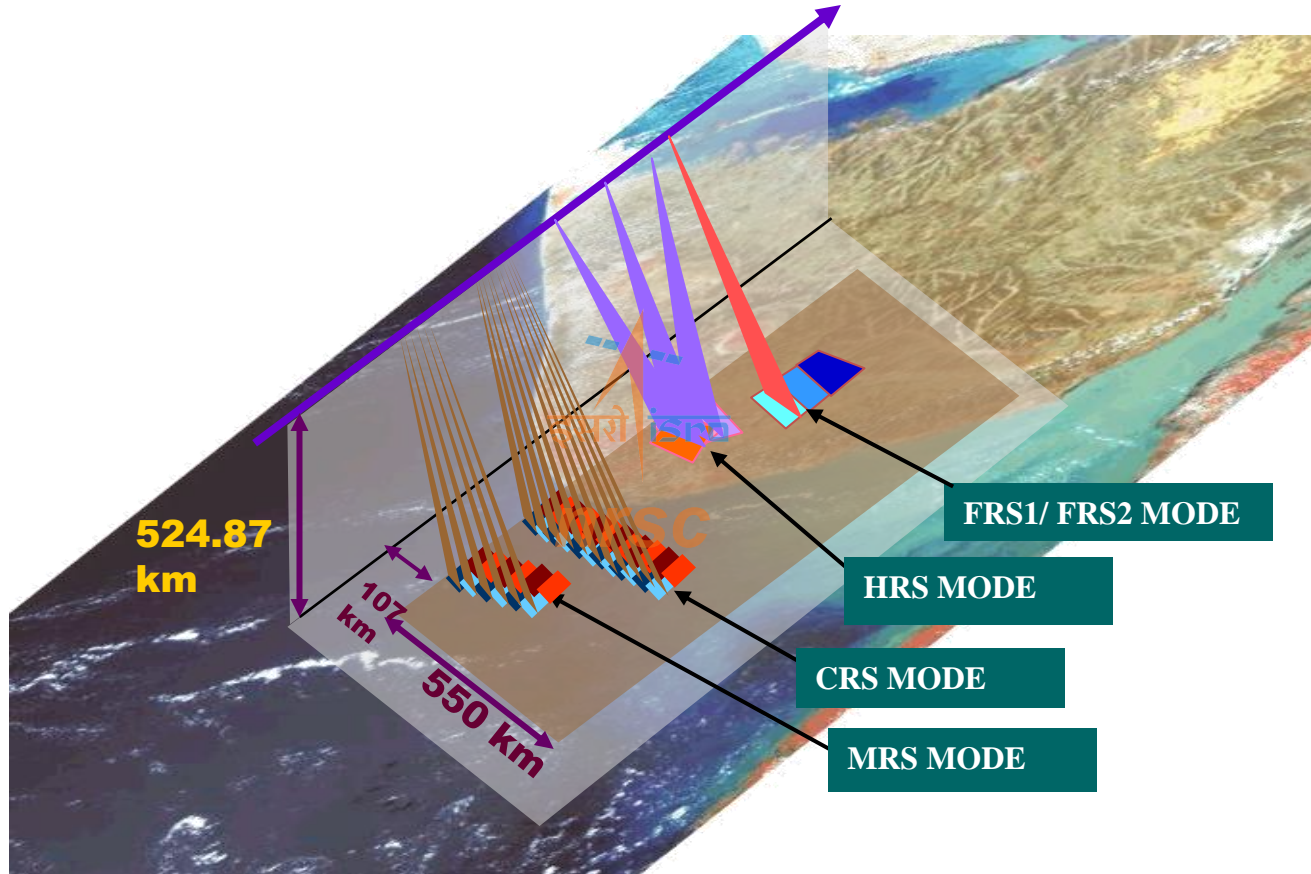
EOS-04 is Follow on Mission of RISAT-1

- Launched on 14-February 2022 by PSLV C-52 Launch Vehicle.
- Frequency: C-band (5.4 GHz).
- Imaging Modes: Stripmap, ScanSAR and Sliding-Spotlight (FRS-1, FRS-2, MRS, CRS and HRS)
- Polarizations: Single, Dual, Compact (CP) & Full (FP)
- Swath Coverage: 10 Km to 223 Km
- Spatial Resolutions: 1m to 50m
- Data availability: 23rd March 2022 onwards



Systematic Collections in ScanSAR mode

OPERATION MODES OF EOS-04 SAR



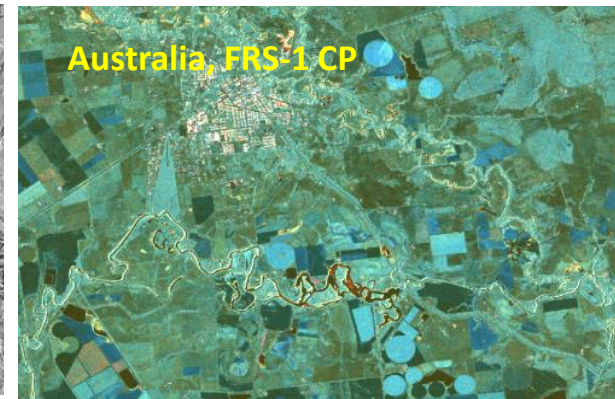
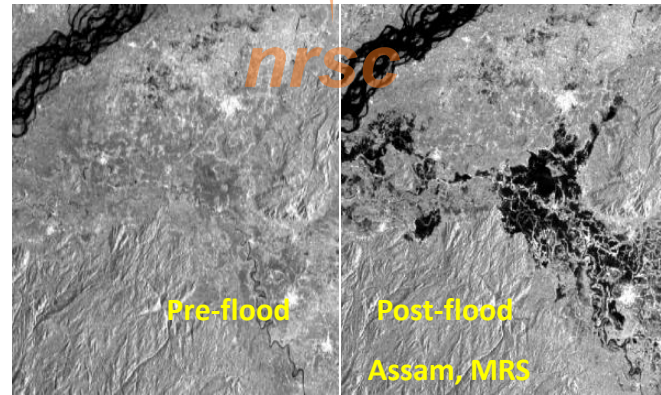
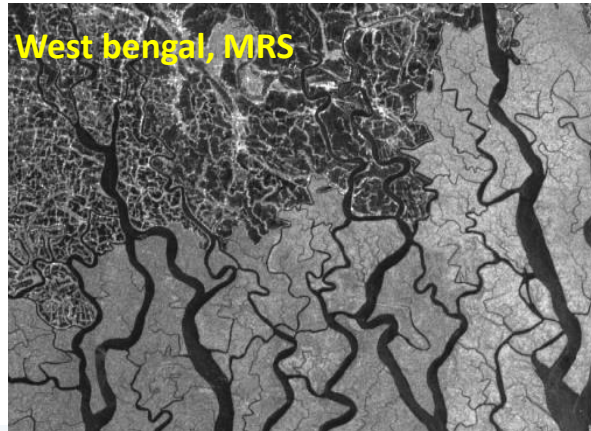
Levels of Data Products	
Level -0	Raw Signal Product (Generic Binary)
Level-1	Slant Range Geo-Tagged Product Ground Range Products (CEOS/GeoTiff)
Level-2 Georef	Enhanced Terrain corrected Geo Referenced Product (GeoTiff)
Value Added Products	
Level-1C	Geo-tagged Polarimetric products
Level-3A	Geo-referenced Polarimetric products
Mosaic	India Mosaic (for systematic coverage) Large Area Mosaic
Projection: UTM (Level-2) Datum : WGS84 (Level-2) Resampling : CC (Level-2)	

Product Specifications	Value
Geo-location Accuracy(RMSE)	<50 m
Radiometric Resolution (SLC)	3.1 dB
PSLR	-17 dB
Relative Radiometric Accuracy	1 dB
Absolute Radiometric Accuracy	± 1 dB

MOSAIC Data Products
Source: MRS Systematic coverage Data.
Gamma0 image for HH/HV Polarizations
Geographic Projection
1 deg x 1 deg Tiles

EOS-04 Images

nrsc



Bhoonidhi



Bhoonidhi Workshop#1

Events

Date range

01 September 2022

21 October 2022

Product

Standard

Satellite-Sensor

Resolution

High (1m - 5m) Resolution

Source

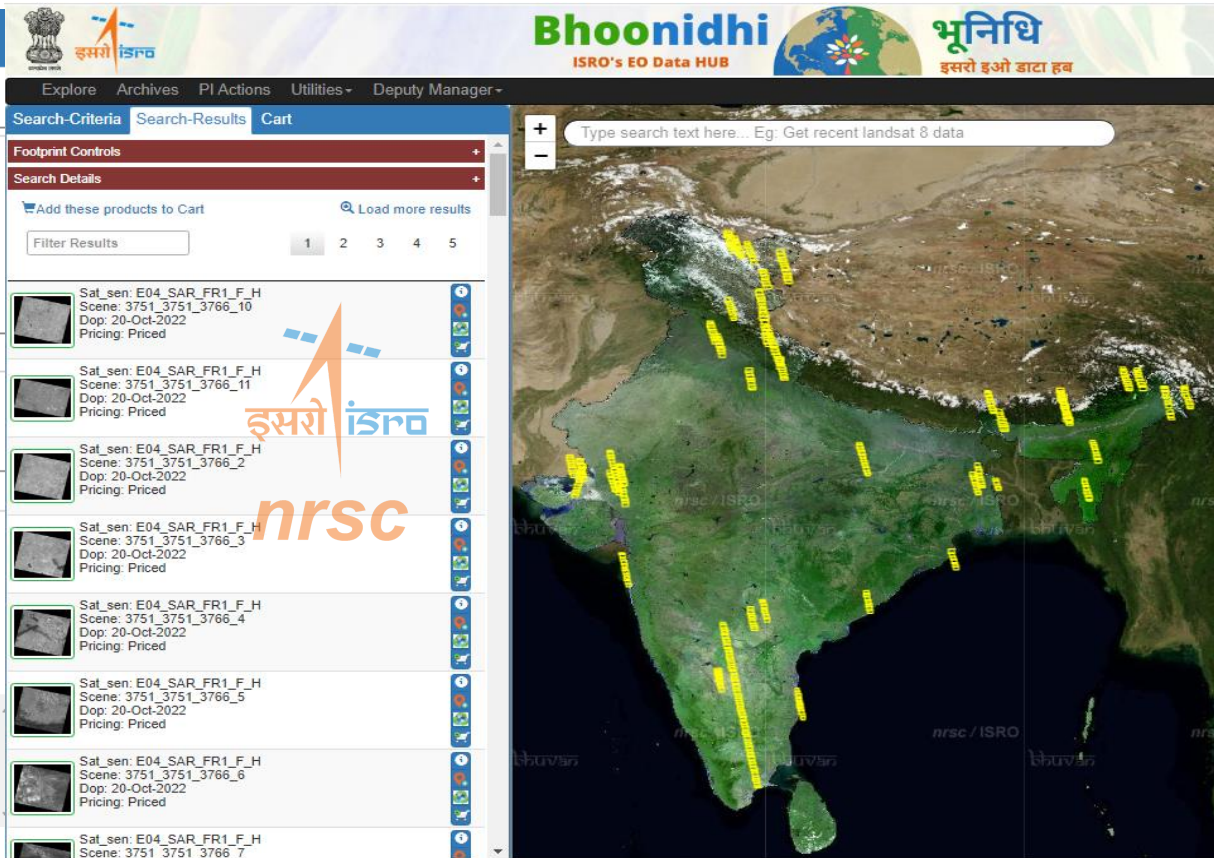
Microwave

Priced

EOS-04_SAR(FRS1)


EOS-04_SAR(FRS2)

Submit




The screenshot shows the Bhoonidhi web application interface. At the top, there are logos for ISRO and Bhoonidhi, along with the text "ISRO's EO Data HUB" and "भूनिधि इसरो द्वारा डाटा हब". The navigation bar includes "Explore", "Archives", "PI Actions", "Utilities", and "Deputy Manager". The main content area is divided into three tabs: "Search-Criteria", "Search-Results", and "Cart". The "Search-Criteria" tab is active, showing a list of search results. Each result includes a thumbnail image, the satellite sensor (Sat_sen: E04_SAR_FR1_F_H), the scene ID (Scene: 3751_3751_3766_10 to 3766_7), the date of acquisition (Dop: 20-Oct-2022), and the pricing status (Pricing: Priced). A "Filter Results" box is visible, showing a count of 1 result. To the right of the search results is a satellite map of India with yellow footprint markers overlaid on the landmass. The map is titled "Type search text here... Eg. Get recent landsat 8 data".





Bhoonidhi

ISRO's EO Data HUB



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Explore Archives PI Actions Utilities Deputy Manager

Search-Criteria Search-Results Cart

Open ₹ Priced

21 October 2022

21 October 2022

Get SID(s)

Select Search ID (SID)

20221021_000023495
 20221021_000023090
 20221021_000015019
 20221021_000014980

Get Details

Show 20 Filter Results

Sat_sen: E04_SAR_FR1_F_H
 Scene: 3751_3751_3766_10
 Dop: 20-Oct-2022
 SID: 20221021_000023495

Showing 1 to 1 of 1 entries Previous 1 Next

Select Product Specifications

Product Details for

Product E04_SAR_FR1_F_H

Product Type ST_Standard

Processing Level K_Single Look Complex Slant

Enhancement K_Single Look Complex Slant range

Projection E_Enhanced Georef

Resampling 0_No Resampling

Format T_GeoTIFF

Pricing

Indian

Dispatch Mode FTP

Datum WGS 84

Product Res 3.0

Priority Normal

No of copies 1

Quality Irrespective of Quality

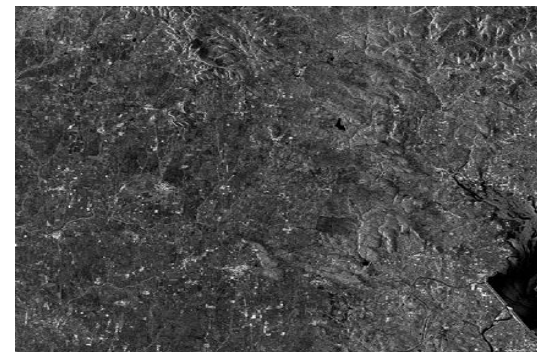
Cost

Cost type	scene (Rs)	Unit Rate	0.00
No of scenes	1	IGST / CGST / SGST	0.0 / 0.0 / 0.0
Priority Charges	0.00	Final	0.00
Discounts	0.00		

Add Product Specifications

- NovaSAR is a joint technology demonstration initiative of SSTL (Surrey Satellite Technology Ltd.), UK, and Airbus DS funded by the UK Government via UK Space Agency.
- NovaSAR was launched on-board PSLV-C42 of ISRO on 16th September 2018.
- NovaSAR has two payloads
 - ❖ Synthetic Aperture Radar (SAR)
 - ❖ Automatic Identification System (AIS).
- SAR is the primary payload operating in S- band frequency band of 3.1 to 3.3 GHz.
 - It provides medium resolution SAR data ranging from **6m-45 m** resolutions in **Stripmap**, **ScanSAR** and **Maritime modes**.
 - Polarization: Single, dual and Tri pol

Frequency band	S-Band 3.1 -3.3 GHz
Antenna	Micro strip Phased Array Antenna 3m x 1m
Lifetime	7 years
Altitude	580km
Polarization	Single, dual, tri



NOVASAR Strip map (6m) Date: 13Apr2021

NovaSAR Scene Based Data products

Product Type (Scene-framed)	Imaging Mode	Polarizations	Product Content (Scenes)
Level-1 –SLC (Single look complex) [Geotagged]	Stripmap	Single	<ul style="list-style-type: none"> imagery files - for each pol Quick-Look images Metadata.
Level-1 –GRD (Ground Range detected) [Geotagged, WGS -84 Datum]	Stripmap –GRD GRD- Ground range detected SCD-ScanSAR detected ScanSAR/Maritime –SCD	Single/Dual/Tripol	<ul style="list-style-type: none"> imagery files - for each pol Quick-Look images Metadata.
Level-2 - Bundled [Georeferenced UTM Projection WGS-84 Datum]	Stripmap/ScanSAR	Single/Dual/Tripol	<ul style="list-style-type: none"> Geo-referenced Imagery files Geo-referenced Sigma Naught files Geo-Referenced Surface Water Layer files for each polarization, IncidenceAngle file, metadata.



Data availability: From 1st Oct 2019 onwards

NOVASAR Data Selection - Bhoonidhi

Search-Criteria Search-Results Cart

Date range

01 June 2022

21 October 2022

Product Standard

Satellite-Sensor

Resolution Medium (5m - 25m) Resolution

Source Microwave

Priced

- Novasar-1_SAR(20m-2Pol-ScanSAR)_GRD
- Novasar-1_SAR(20m-ScanSAR)_GRD
- Novasar-1_SAR(6m-Stripmap)_GRD
- Novasar-1_SAR(6m-Stripmap)_SLC
- Novasar-1_SAR(Maritime)_GRD

Open_Data

Submit

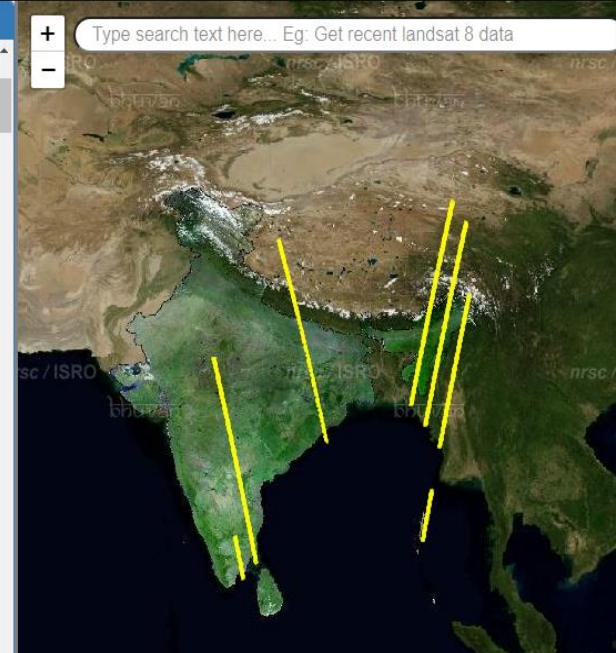
Bhoonidhi ISRO's EO Data HUB भूनिधि इसरो इओ डाटा हब

Explore Archives PI Actions Utilities Deputy Manager

Search-Criteria Search-Results Cart

Type search text here... Eg. Get recent landsat 8 data

- Sat_sen: NVS_SAR_C_F_GRD
Scene: 38597_1_2
Dop: 20-Oct-2022
Pricing: Priced
- Sat_sen: NVS_SAR_C_F_GRD
Scene: 38597_1_3
Dop: 20-Oct-2022
Pricing: Priced
- Sat_sen: NVS_SAR_C_F_GRD
Scene: 38597_1_4
Dop: 20-Oct-2022
Pricing: Priced
- Sat_sen: NVS_SAR_C_F_GRD
Scene: 38597_1_5
Dop: 20-Oct-2022
Pricing: Priced
- Sat_sen: NVS_SAR_C_F_GRD
Scene: 38597_1_6
Dop: 20-Oct-2022
Pricing: Priced
- Sat_sen: NVS_SAR_C_F_GRD
Scene: 38597_1_7
Dop: 20-Oct-2022
Pricing: Priced





Explore Archives PI Actions Utilities Deputy Manager

Search-Criteria Search-Results **Cart**

Open ₹ Priced

25 October 2022 25 October 2022 **Get SID(s)**

Select Search ID (SID)

20221025_000015450

Get Details

Show 20

Filter Results

	Sat_sen: NVS_SAR_C_F_GRD Scene: 38597_1_1 Dop: 20-Oct-2022 SID: 20221025_000015450	
	Sat_sen: NVS_SAR_C_F_GRD Scene: 38597_1_2 Dop: 20-Oct-2022 SID: 20221025_000015450	
	Sat_sen: NVS_SAR_C_F_GRD Scene: 38597_1_5 Dop: 20-Oct-2022 SID: 20221025_000015450	
	Sat_sen: NVS_SAR_C_F_GRD Scene: 38597_1_9 Dop: 20-Oct-2022 SID: 20221025_000015450	

Showing 1 to 4 of 4 entries

Previous 1 Next

Select Product Specifications

Product Details for

NVS_SAR_C_F_GRD

Pricing

Indian

Product Type

ST_Standard

Dispatch Mode

FTP

Processing Level

N_Multi Look Ground range

Datum

WGS 84

Enhancement

N_Multi Look Ground range

Product Res

0.0

E_Enhanced Georef

Projection

0_No Projection

Priority

Normal

Resampling

0_No Resampling

No of copies

1

Format

T_GeoTIFF

Quality

Quality Check

Cost

Cost type

scene (Rs)

No of scenes

4

Unit Rate

0.00

Priority Charges

0.00

IGST / CGST / SGST

0.0 / 0.0 / 0.0

Discounts

0.00

Final

0.00

Add Product Specifications



Sentinel-1

- Sentinel-1 is satellite constellation of European Space Agency with Sentinel-1A & Sentinel-1B
- Frequency: C-Band (5.405 GHz)
- Bhoonidhi is hosting the products of Sentinel-1 with below specifications.
 - Imaging Mode: Interferometric wide swath Mode (IW mode)
 - Repetivity: 12 days
 - Polarization: VV+VH
 - Level of Product: Level-1 Ground Range
 - Swath: 250 km
 - Data availability: From 1st Oct 2019 onwards



Sentinel-1 Data Selection – Bhoonidhi

Search-Criteria Search-Results Cart

Date range

01 June 2022

21 October 2022

Product

Standard

Satellite-Sensor

Resolution

Medium (5m - 25m) Resolution

Source

Microwave

Priced

Open_Data

Sentinel-1A_SAR(IW)_GRD

Sentinel-1B_SAR(IW)_GRD

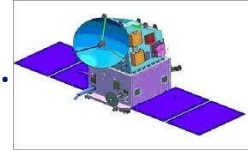
Submit

The screenshot shows the Bhoonidhi web application interface. At the top, there are logos for ISRO and the 75th anniversary of India. The main header includes the text "Bhoonidhi ISRO's EO Data HUB" and "भूनिधि इसरो ईओ डाटा हब". Below the header, there are navigation tabs: "Explore", "Archives", "PI Actions", "Utilities", and "Deputy Manager". The main content area is divided into three sections: "Search-Criteria", "Search-Results", and "Cart". The "Search-Results" section displays a list of search results, each with a small satellite image thumbnail and the following details: "Sat_sen: SEN1A_SAR_IW_F_GRD", "Scene: 045518_36E1", "Dop: 20-Oct-2022", and "Pricing: Open_Data". The "Cart" section is currently empty. On the right side of the interface, there is a satellite map of India with numerous yellow rectangular bounding boxes overlaid on it, indicating the search area. A search bar is visible above the map with the placeholder text "Type search text here... Eg:". The "nrsc" logo is also visible in the center of the interface.



SCATSAT-1

- ScatSat-1 is a follow on mission of Oceansat-2.
- Payload: Scatterometer in Ku Band (13.515 GHz).
- Wind vector cell size (25 km x 25 km).
- Swath width HH: 1400km, VV: 1840km.

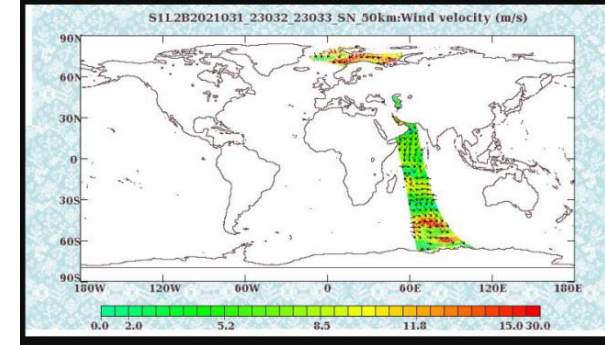


- Products:

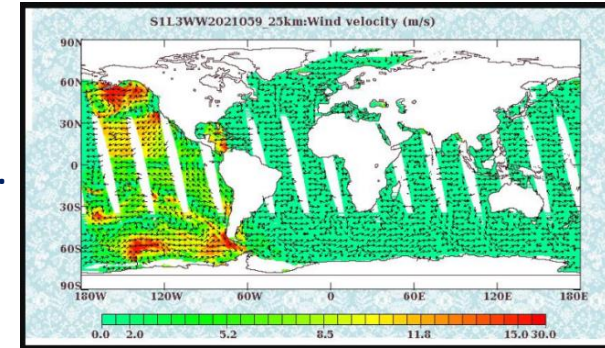
- Level-2B Wind vector products.
- Level-3 Global Sigma0 products.(HH Pol/VV Pol)
- Level-3 Global Wind vector products.

Applications: Weather forecasting, Cyclone detection & Tracking.

Data availability at Bhoonidhi: From 01/01/2020 to 31/12/2021.



Level-2B wind vector product



Level-3 Global wind vector product

SCATSAT-1 Data Selection – Bhoonidhi



Bhoonidhi

ISRO's EO Data HUB



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Search-Criteria Search-Results Cart

Date range

01 January 2021

01 February 2021

Product

Thematic

Satellite-Sensor

Source

Scatterometer

Open Data

- ScatSat-1_SCAT_2B
- ScatSat-1_SCAT_3SH
- ScatSat-1_SCAT_3SV
- ScatSat-1_SCAT_3WW

Submit

Search-Criteria Search-Results Cart

Footprint Controls

Search Details

Add these products to Cart

Load more results

Filter Results

1 2 3 4

Sat_sen: SC1_SCAT_S1L2B2021031_F_2B
Scene: 23032_23033_1
Dop: 01-Feb-2021
Pricing: Open_Data

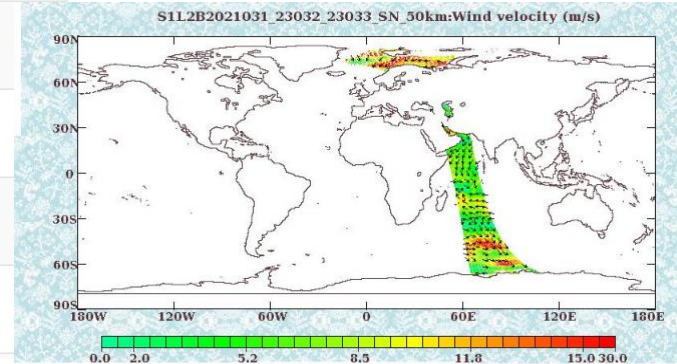
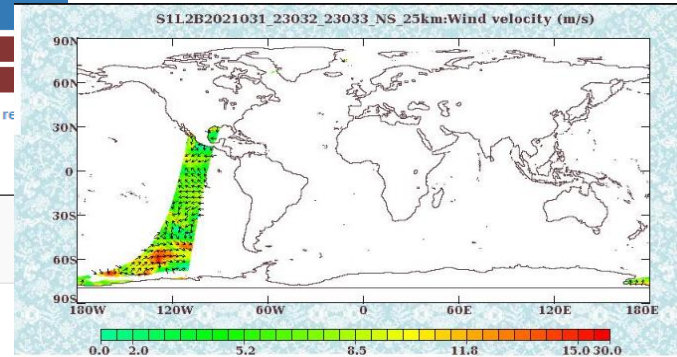
Sat_sen: SC1_SCAT_S1L2B2021031_F_2B
Scene: 23032_23033_1
Dop: 01-Feb-2021
Pricing: Open_Data

Sat_sen: SC1_SCAT_S1L2B2021031_F_2B
Scene: 23032_23033_1
Dop: 01-Feb-2021
Pricing: Open_Data

Sat_sen: SC1_SCAT_S1L2B2021031_F_2B
Scene: 23032_23033_1
Dop: 01-Feb-2021
Pricing: Open_Data

Sat_sen: SC1_SCAT_S1L2B2021031_F_2B
Scene: 23033_23034_1
Dop: 01-Feb-2021
Pricing: Open_Data

Sat_sen: SC1_SCAT_S1L2B2021031_F_2B
Scene: 23033_23034_1
Dop: 01-Feb-2021
Pricing: Open_Data



Levels of products - Applications

Level of Product	Applications
Level-1 Single look complex product	For Interferometry & Polarimetric Applications
Level-1 Ground range product	All thematic Applications
Level-2 Georeferenced terrain corrected product	All thematic Applications
Level-1C covariance product	For performing user-selected polarimetric decompositions
Level-3A polarimetric decomposed product	For target classification
Mosaic data product	For time series analysis.

Thank You
इसरो isro
nrsc