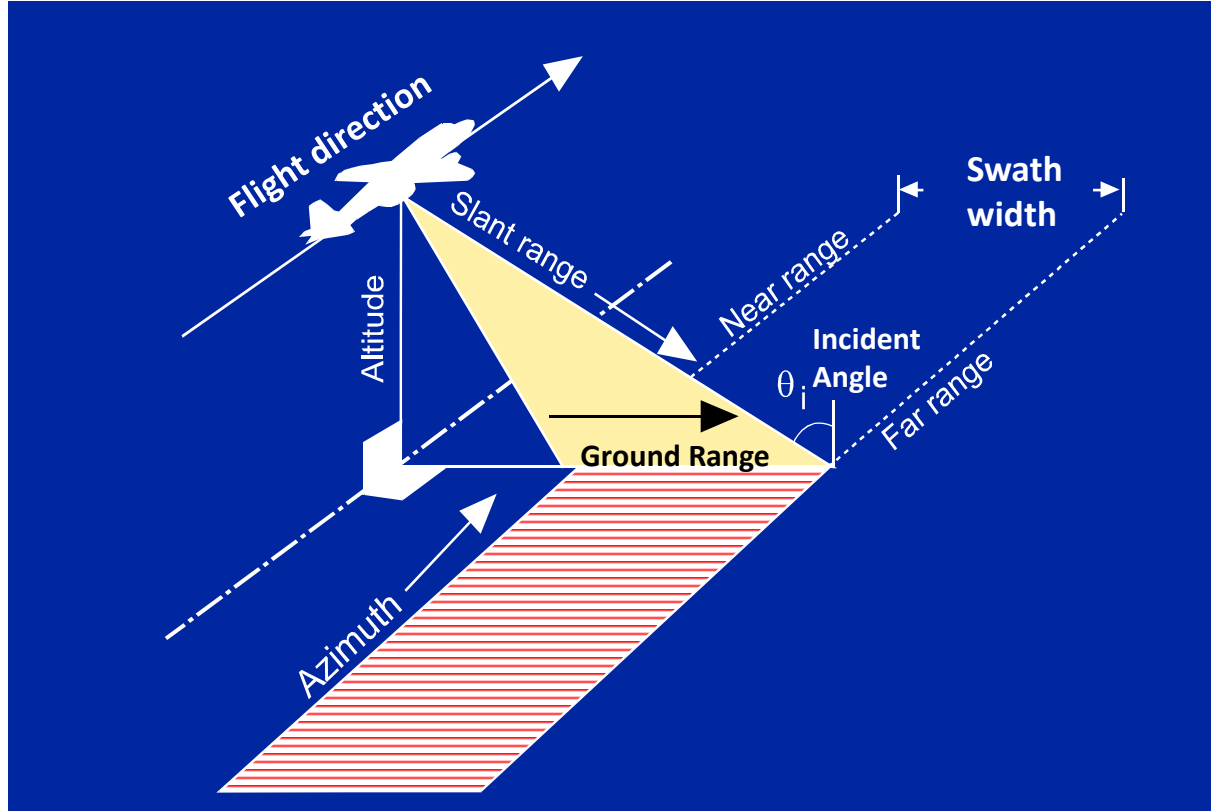


# Data Products @ Bhoonidhi - Microwave

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

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Date range

01 January 2016

01 February 2016

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Product Standard

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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

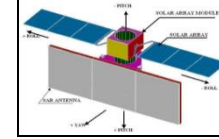
Sat_sen: RI1_SAR_MRS_F Scene: 20759_1_1 Dop: 01-Feb-2016 Pricing: Priced	  
Sat_sen: RI1_SAR_MRS_F Scene: 20759_2_1 Dop: 01-Feb-2016 Pricing: Priced	  
Sat_sen: RI1_SAR_MRS_F Scene: 20759_1_2 Dop: 01-Feb-2016 Pricing: Priced	  
Sat_sen: RI1_SAR_MRS_F Scene: 20759_2_2 Dop: 01-Feb-2016 Pricing: Priced	  
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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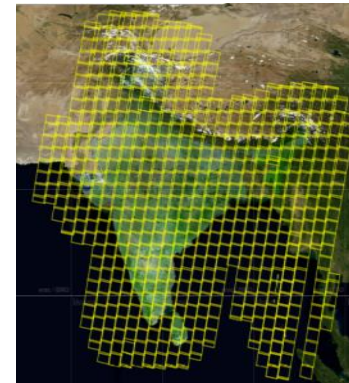
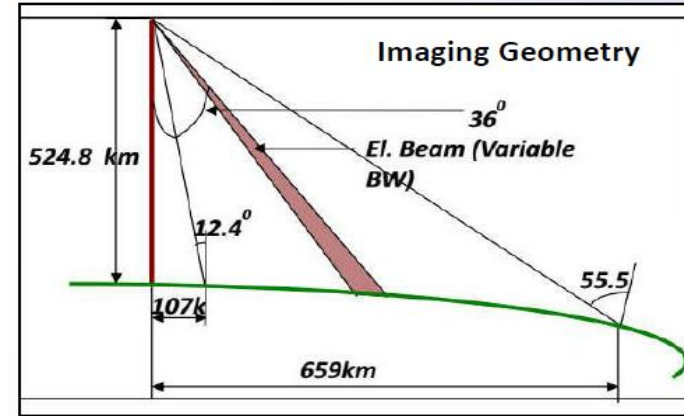
Search: Type search text here... Eg:

# EOS-04 MISSION



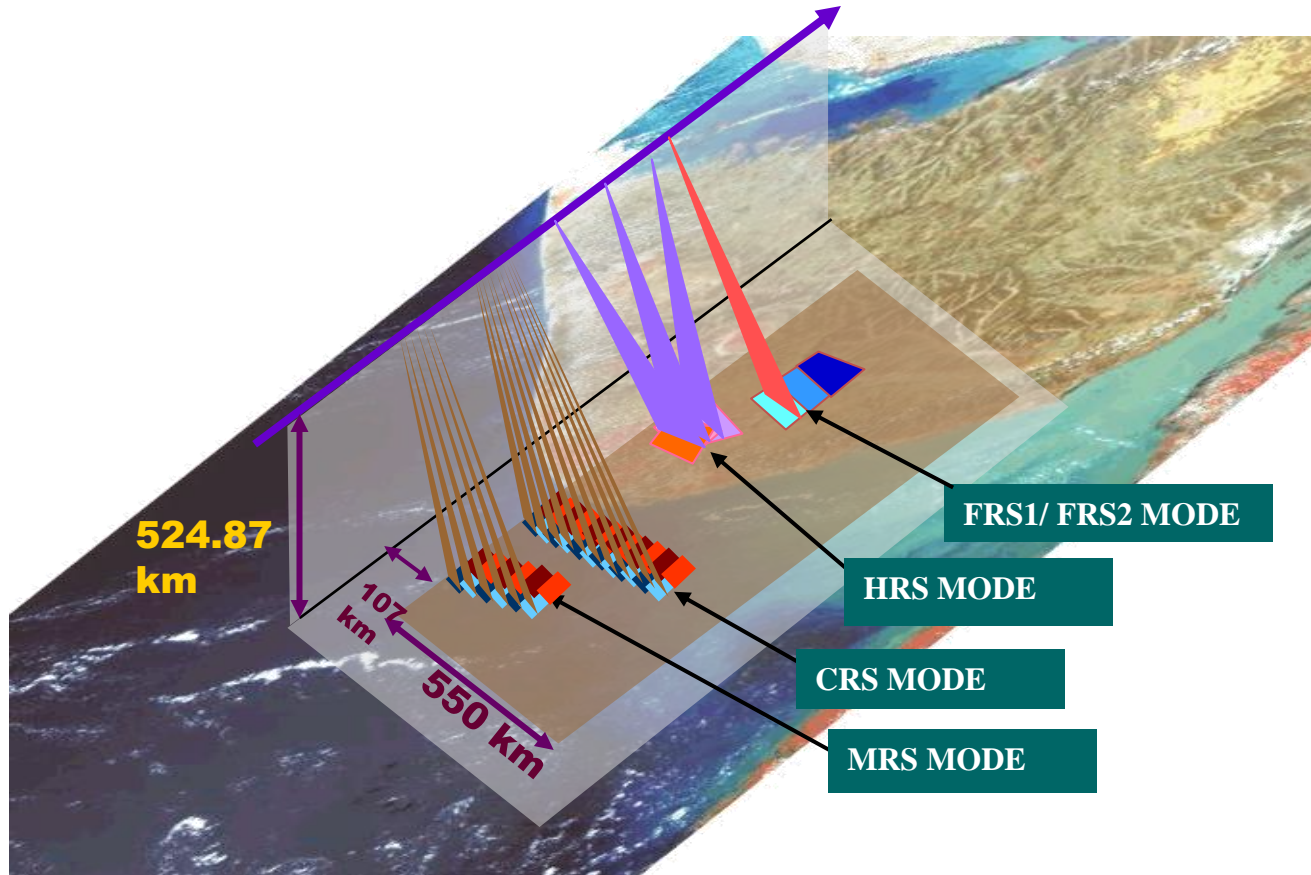
## EOS-04 is Follow on Mission of RISAT-1

- 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: 23<sup>rd</sup> March 2022 onwards



Systematic Collections in ScanSAR mode

# OPERATION MODES OF EOS-04 SAR

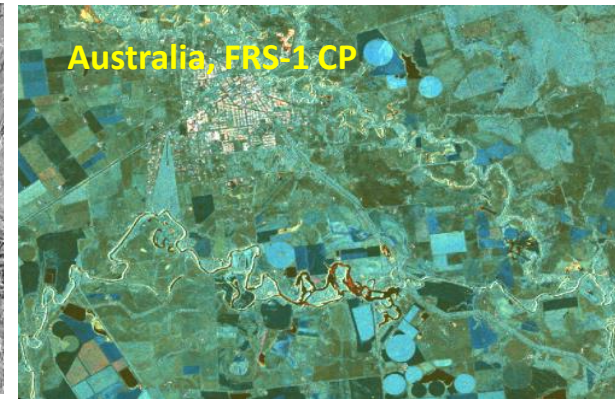
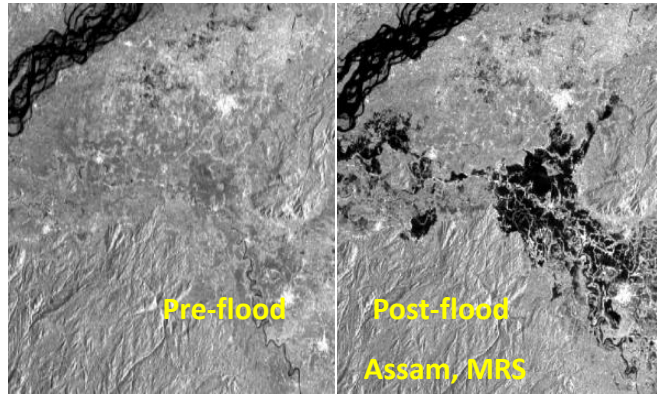
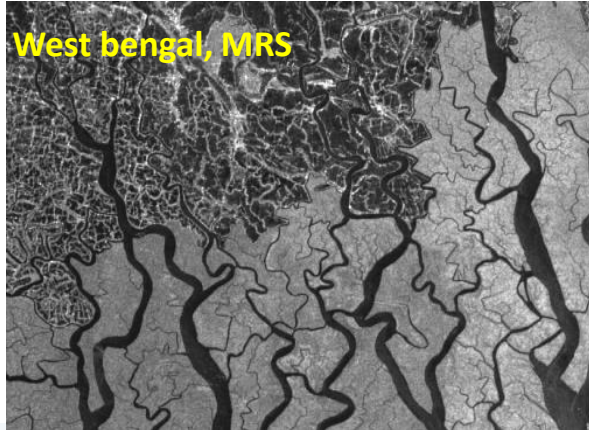
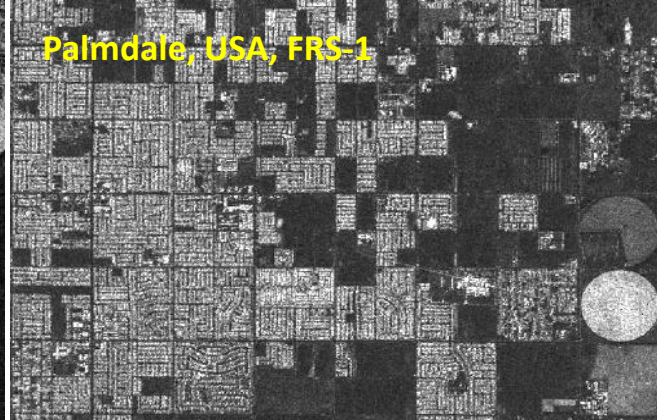


Levels of Data Products	
Level -0	Raw Signal Product (Generic Binary)
Level-1	Slant Range Geo-Tagged Product Ground Range Products (CEOS/GeoTiff)
Level-2 Georef	Enhanced Terrain corrected Geo Referenced Product (GeoTiff)
<b>Value Added Products</b>	
Level-1C	Geo-tagged Polarimetric products
Level-3A	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





Search-Criteria Search-Results Cart

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

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Search-Criteria Search-Results Cart

Footprint Controls

Search Details


Add these products to Cart Load more results

Filter Results 1 2 3 4 5

	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_10 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_11 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_2 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_3 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_4 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_5 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_6 Dop: 20-Oct-2022 Pricing: Priced
	Sat_sen: E04_SAR_FR1_F_H Scene: 3751_3751_3766_7 Dop: 20-Oct-2022 Pricing: Priced


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





## Bhoonidhi

ISRO's EO Data HUB



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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



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** E04\_SAR\_FR1\_F\_H

Product Type: ST\_Standard

Processing Level: **K\_Single Look Complex Slant range**

Enhancement: 0\_Raw

Projection: N\_Multi Look Ground range

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

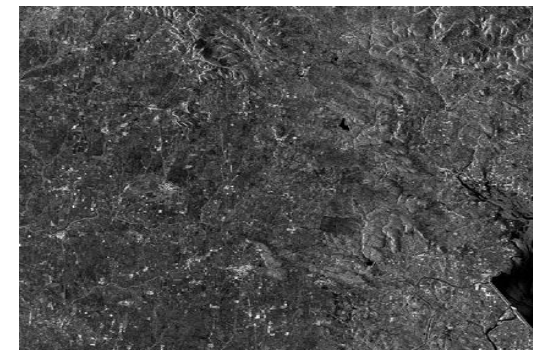
**Cost**

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 16<sup>th</sup> 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"> <li>imagery files - for each pol</li> <li>Quick-Look images</li> <li>Metadata.</li> </ul>
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"> <li>imagery files - for each pol</li> <li>Quick-Look images</li> <li>Metadata.</li> </ul>
Level-2 - Bundled [Georeferenced UTM Projection WGS-84 Datum]	Stripmap/ScanSAR	Single/Dual/Tripol	<ul style="list-style-type: none"> <li>Geo-referenced Imagery files</li> <li>Geo-referenced Sigma Naught files</li> <li>Geo-Referenced Surface Water Layer files for each polarization,</li> <li>IncidenceAngle file, metadata.</li> </ul>

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

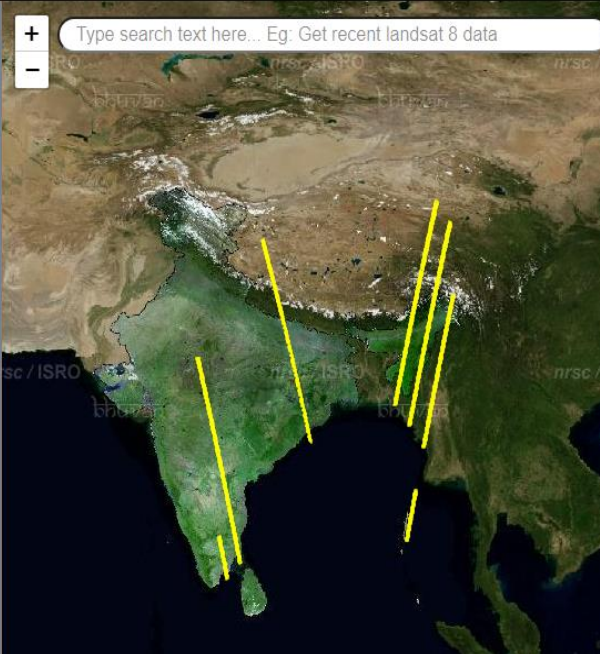
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Explore Archives PI Actions Utilities Deputy Manager

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  
E\_Enhanced Georef

Product Res

0.0

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 1<sup>st</sup> Oct 2019 onwards





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

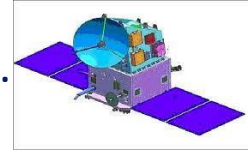
Sentinel-1A\_SAR(IW)\_GRD

Sentinel-1B\_SAR(IW)\_GRD

Submit

# 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.

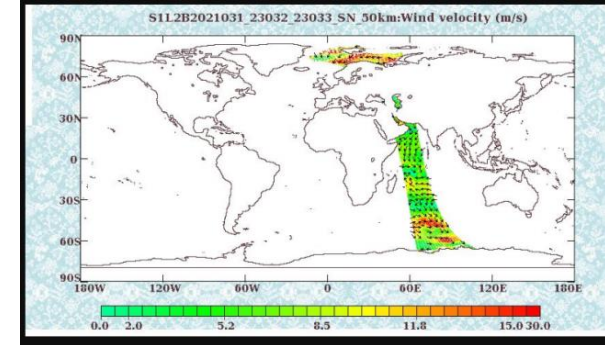


## • Products:

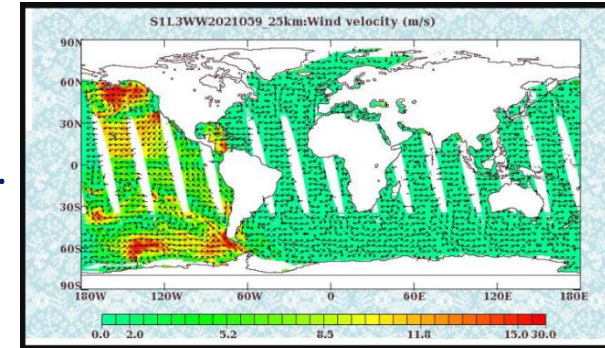
- Level-2B Wind vector products.
- Level-3 Global Sigma0 products.(HH Pol/VV Pol)
- Level-3 Global Wind vector products.

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

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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

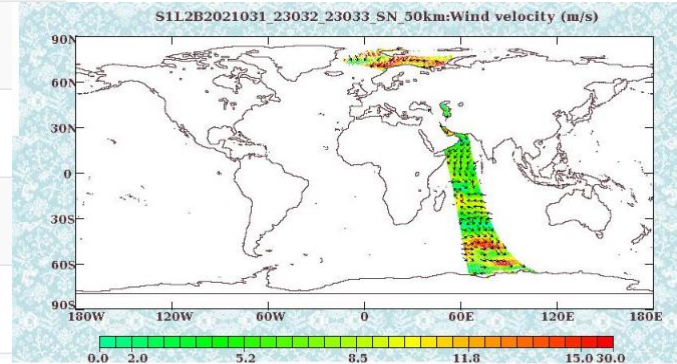
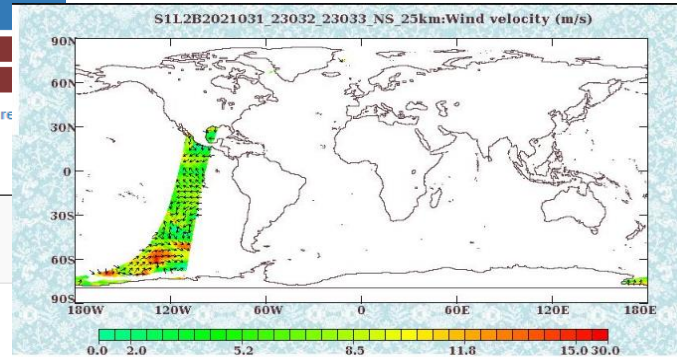
Sat\_sen: SC1\_SCAT\_S1L2B2021031\_F\_2B  
Scene: 23032\_23033\_1  
Dop: 01-Feb-2021  
Pricing: Open\_Data

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