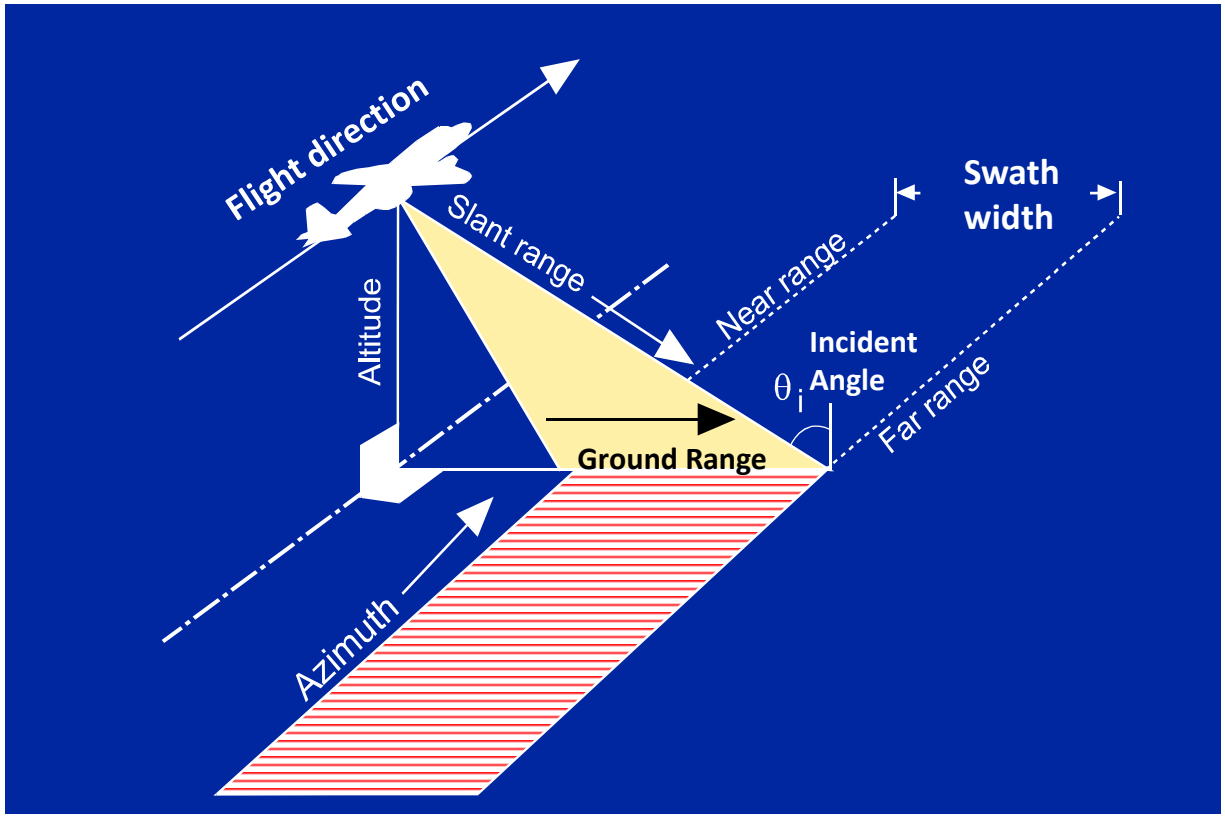
Data Products @ Bhoonidhi - Microwave

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)

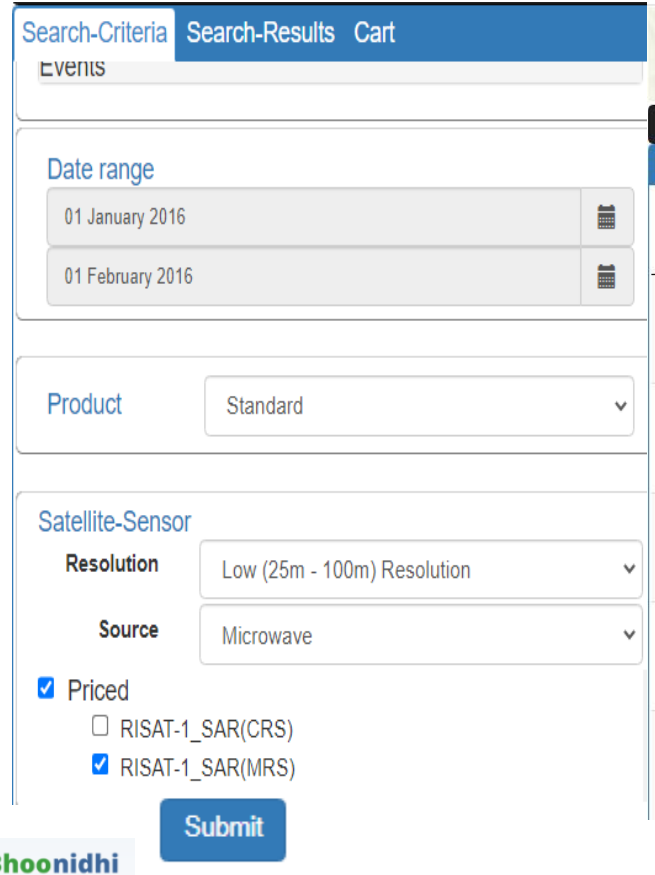
Microwave Data Products at Bhoonidhi

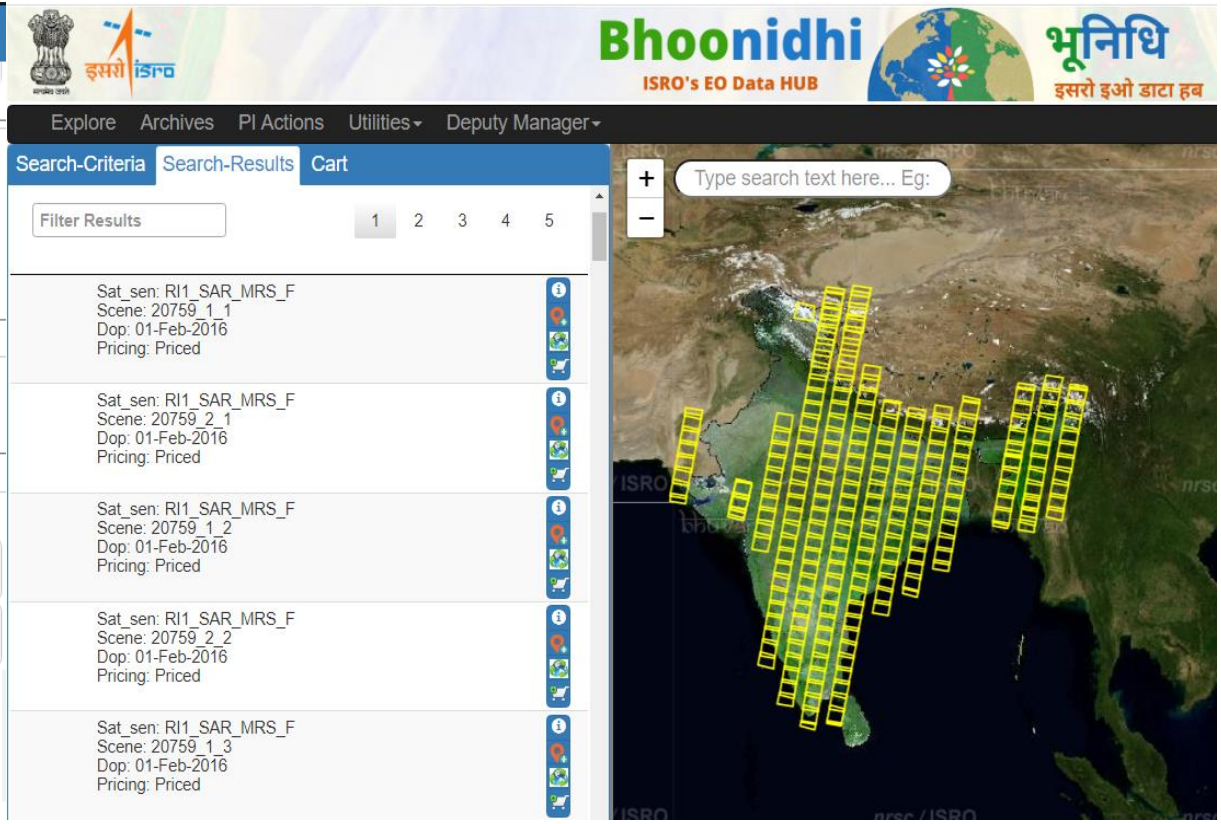
- RISAT-1 (C-Band SAR)
- EOS-04 (C-Band SAR)
- NovaSAR (S-Band SAR)
- Sentinel-1 (C-Band SAR)
- SCATSAT (Ku Band Scatterometer)

RISAT-1

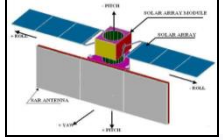
- Radar Imaging Satellite (RISAT-1), India's first microwave satellite having state- of-the-art technology having SAR system configuration:
  - Multimode SAR (Stripmap, ScanSAR, Spotlight) – FRS-1, FRS-2, MRS, CRS & HRS
  - Orbit: Sun Synchronous Polar Orbit (SSPO) of 536 km Altitude
  - Frequency: C-band (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



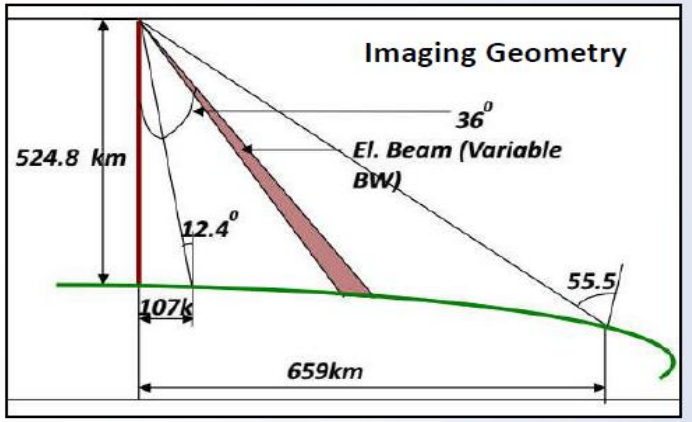


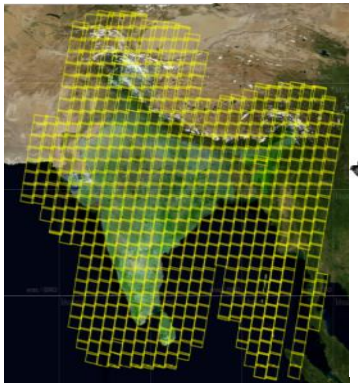
EOS-04 MISSION



EOS-04 is Follow on Mission of RISAT-1

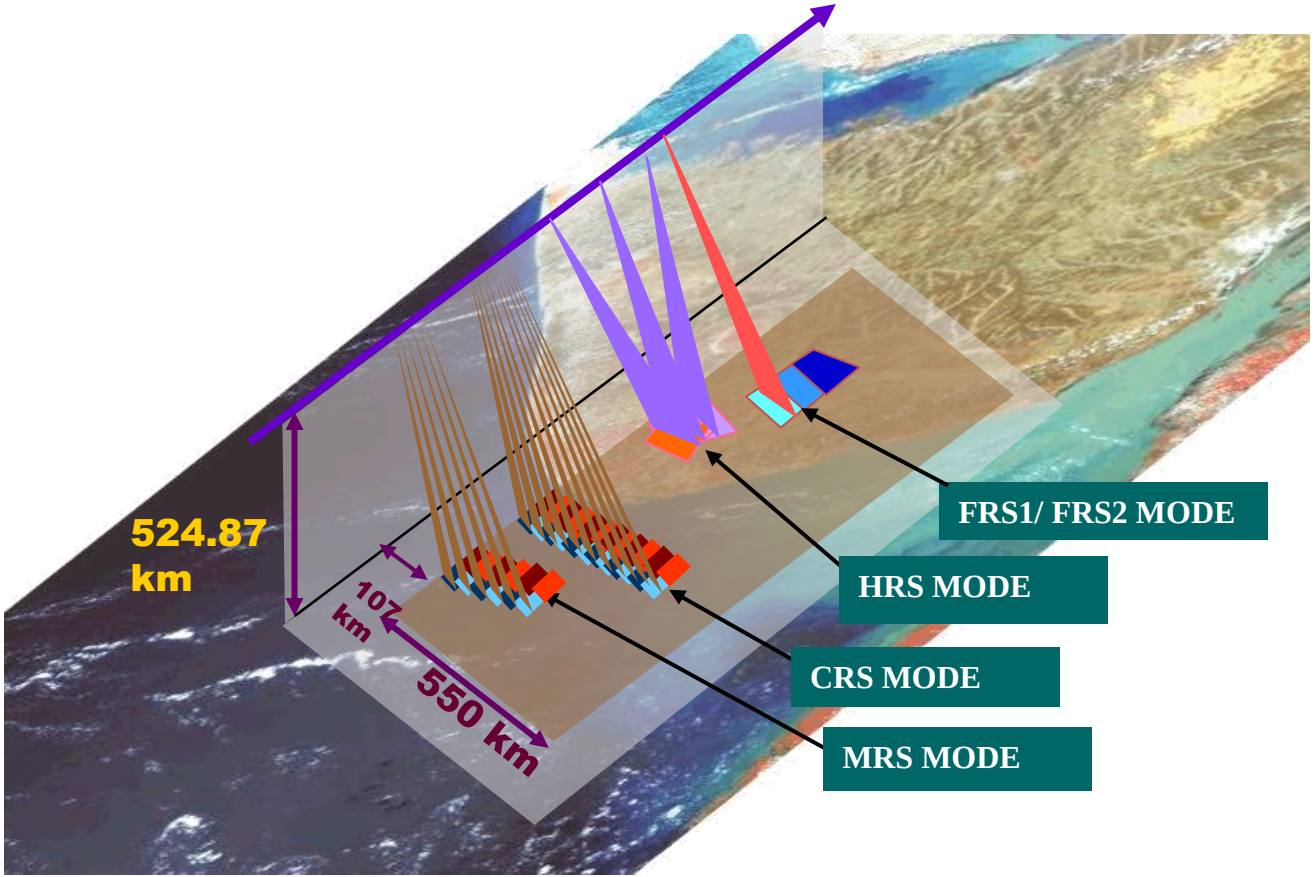
- Launched on 14-February 2022 by PSLV C-52 Launch Vehicle.
- Frequency: C-band (5.4 GHz).
- Imaging Modes: Stripmap, ScanSAR and Sliding-Spotlight (FRS-1, FRS-2, MRS, CRS and HRS)
- Polarizations: Single, Dual, Compact (CP) & Full (FP)
- Swath Coverage: 10 Km to 223 Km
- Spatial Resolutions: 1m to 50m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





Systematic Collections in ScanSAR mode

OPERATION MODES OF EOS-04 SAR



EOS-04 Data Products

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

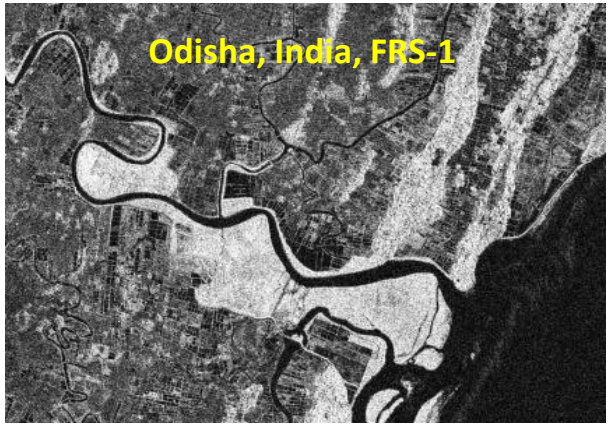
Source: MRS Systematic coverage Data.

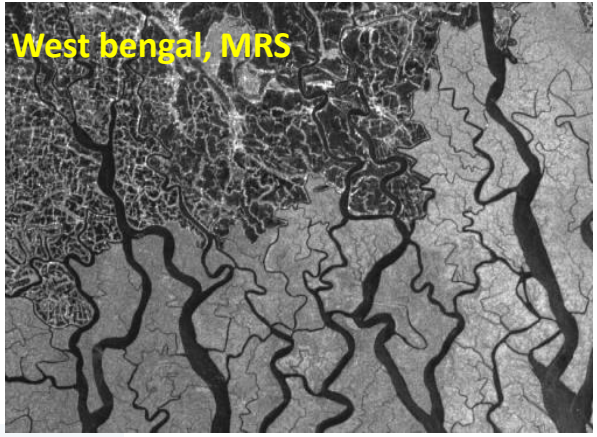
Gamma0 image for HH/HV Polarizations

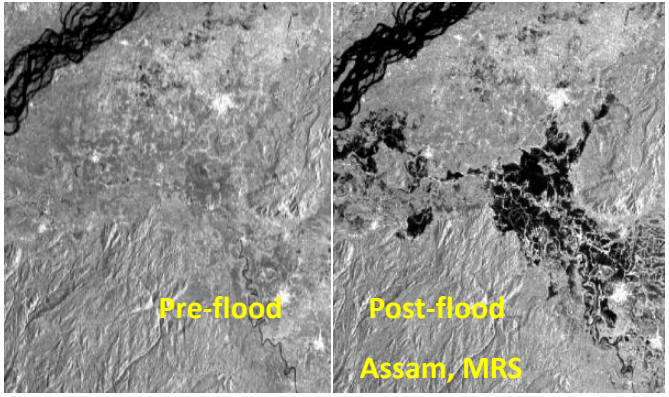
Geographic Projection

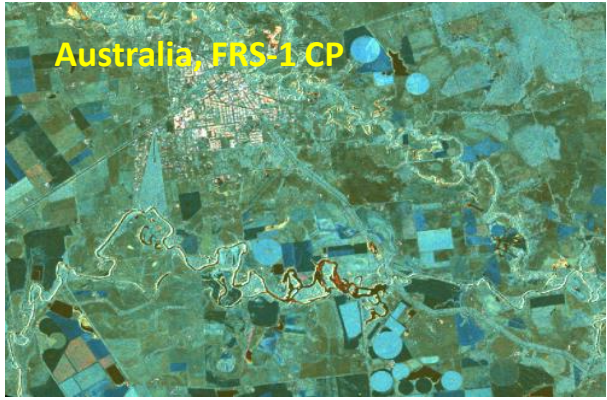
1 deg x 1 deg Tiles

EOS-04 Images

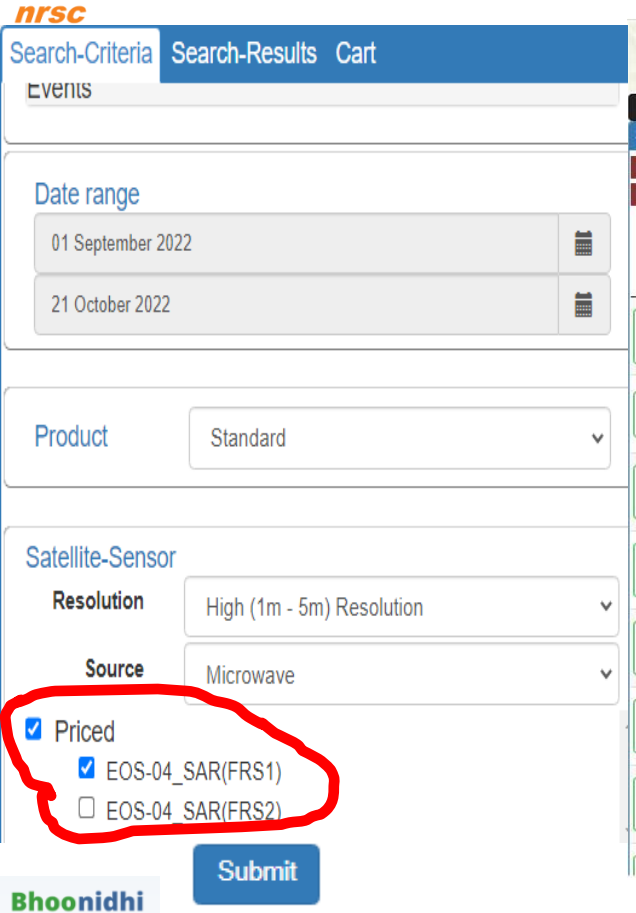


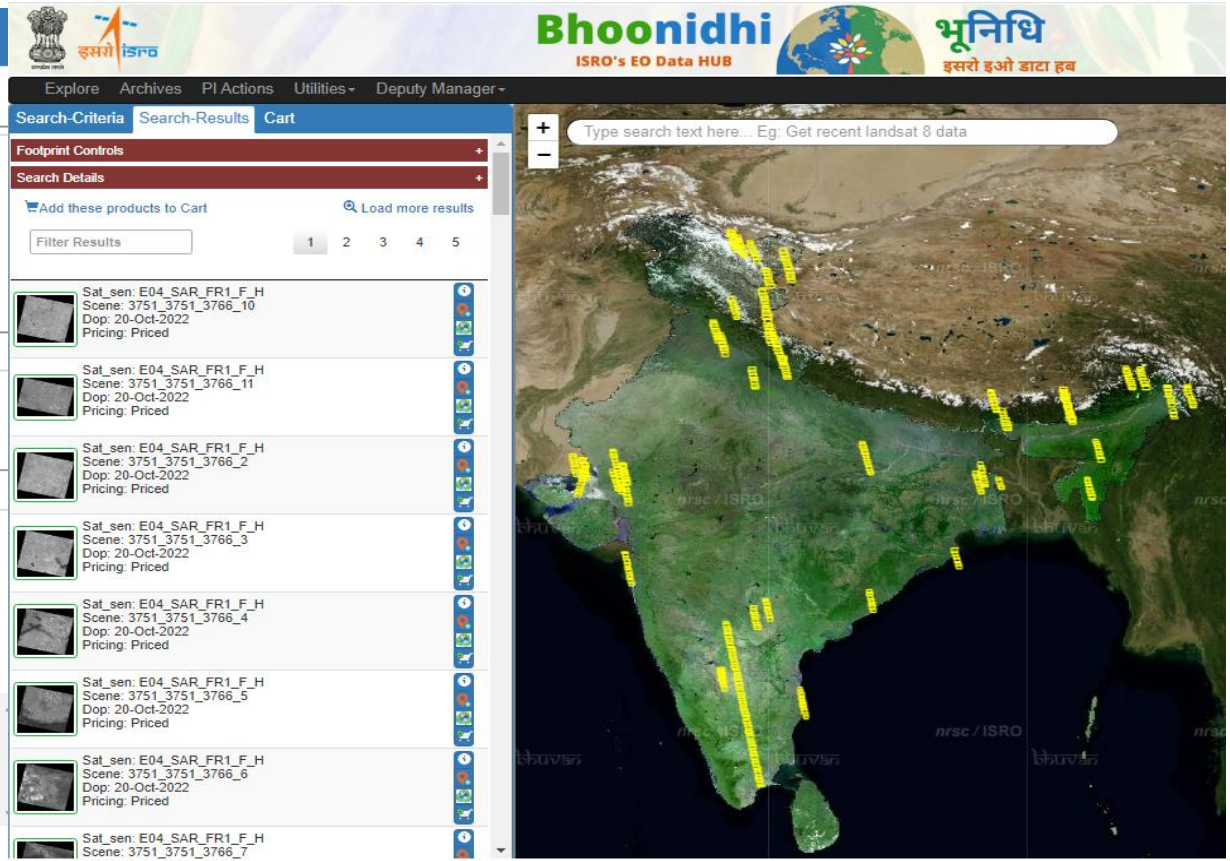




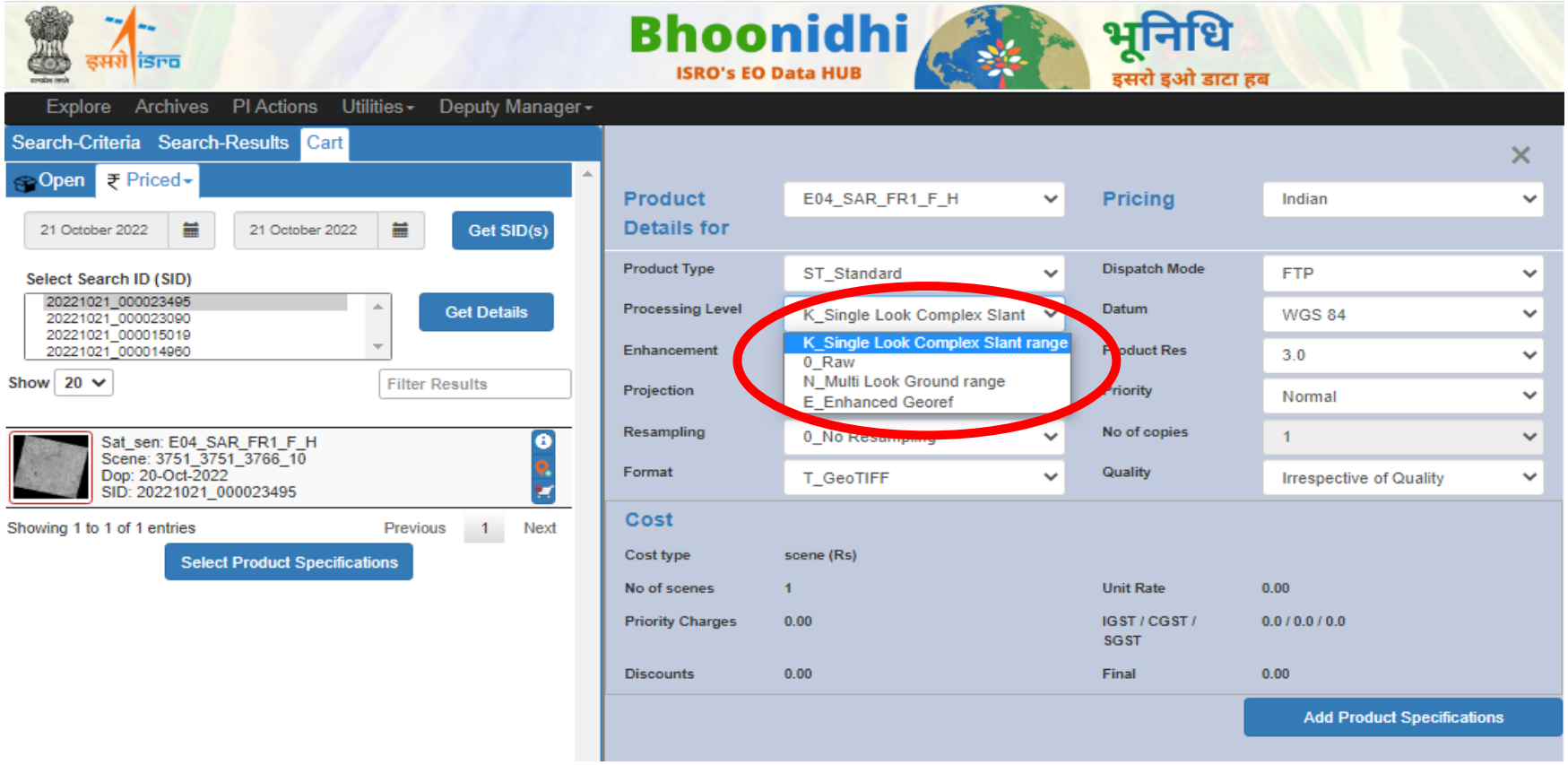


EOS-04 Data Selection – Bhoonidhi





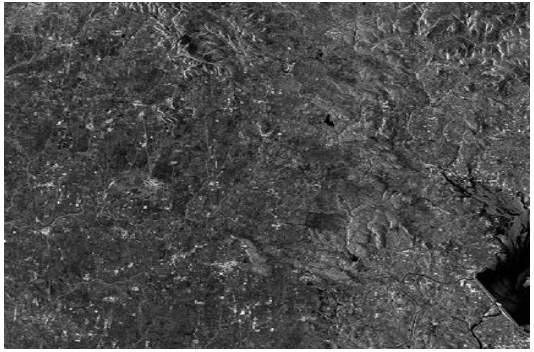
EOS-04 Data Selection – Bhoonidhi



NovaSAR S- Band SAR

- 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	• 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	• imagery files - for each pol • Quick-Look images • Metadata.
Level-2 - Bundled [Georeferenced UTM Projection WGS-84 Datum]	Stripmap/ScanSAR	Single/Dual/Tripol	• 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

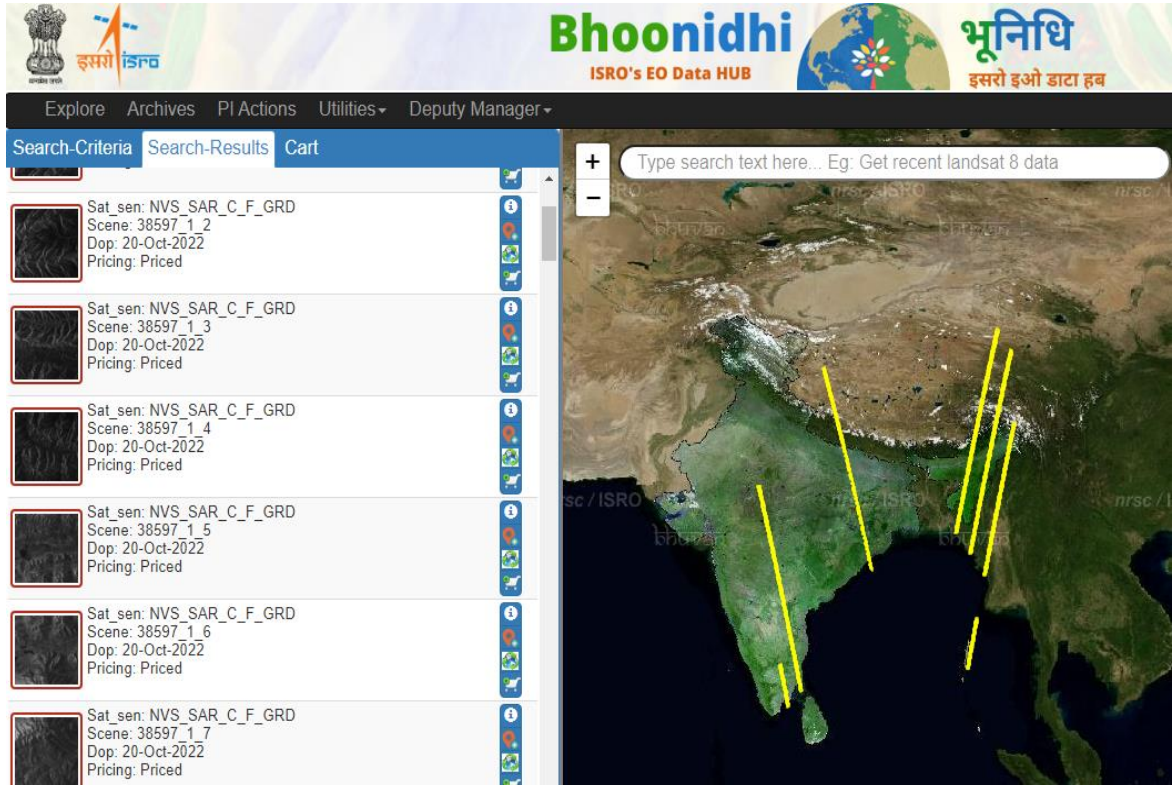
Satellite-Sensor

Resolution: Medium (5m - 25m) Resolution

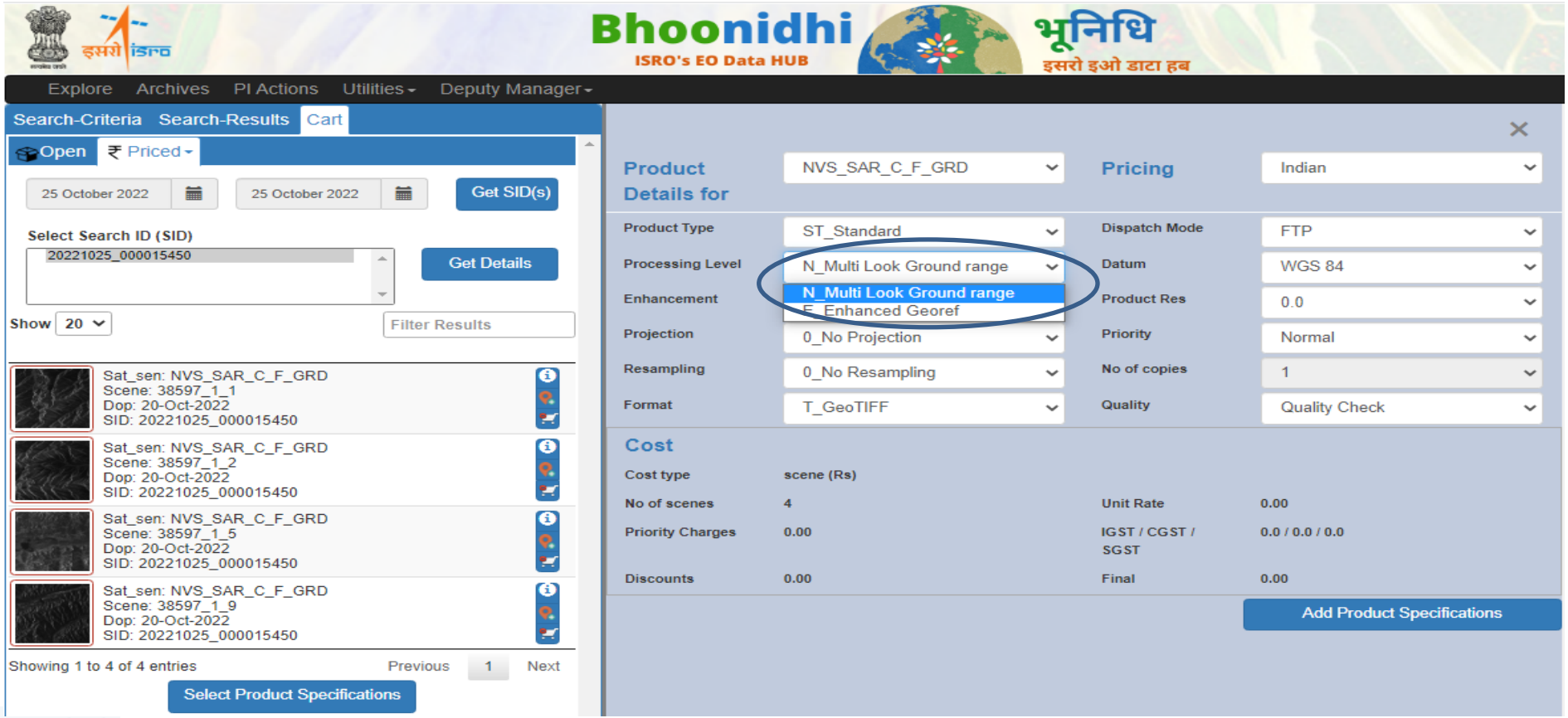
Source: Microwave

- [x] Priced
  - [ ] Novasar-1_SAR(20m-2Pol-ScanSAR)_GRD
  - [ ] Novasar-1_SAR(20m-ScanSAR)_GRD
  - [x] Novasar-1_SAR(6m-Stripmap)_GRD
  - [ ] Novasar-1_SAR(6m-Stripmap)_SLC
  - [ ] Novasar-1_SAR(Maritime)_GRD
- [ ] Open_Data

Submit



NOVASAR Data Selection - Bhoonidhi



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

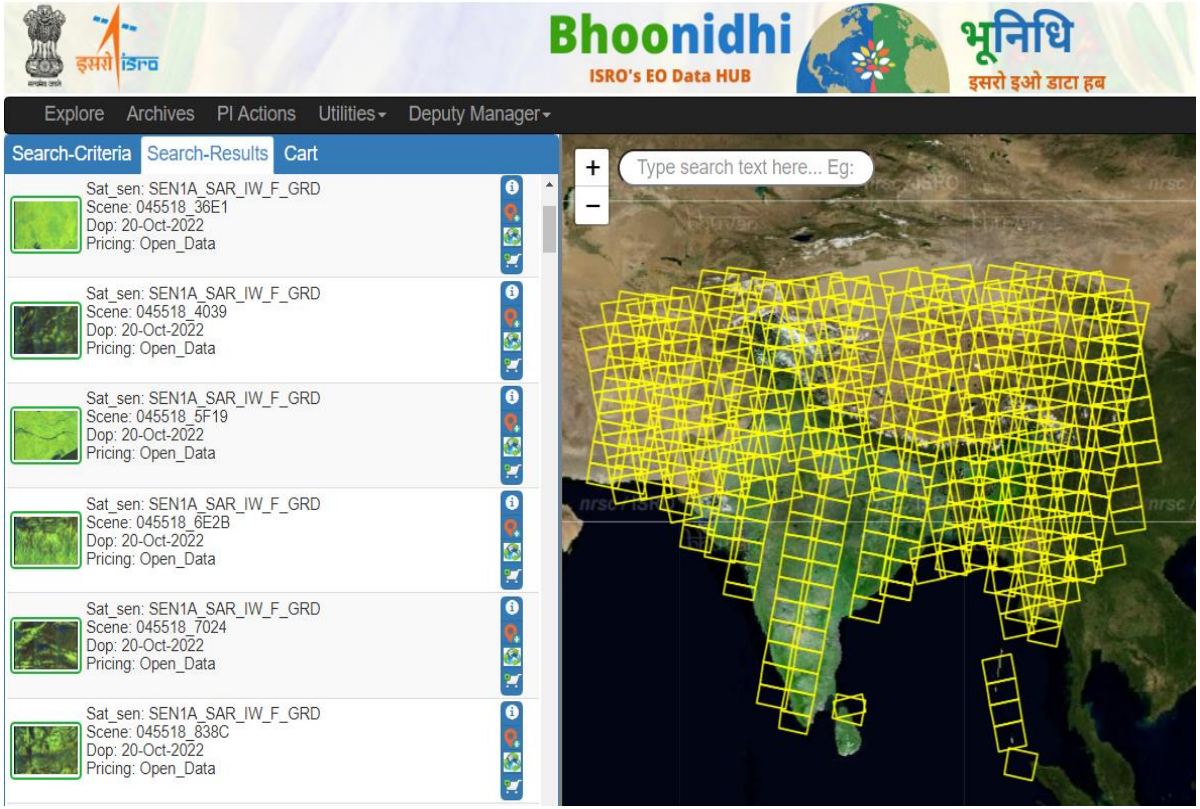
Satellite-Sensor

Resolution: Medium (5m - 25m) Resolution

Source: Microwave

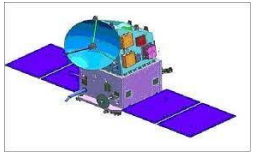
- [ ] Priced
- [x] Open_Data
  - [x] Sentinel-1A_SAR(IW)_GRD
  - [ ] Sentinel-1B_SAR(IW)_GRD

Submit



SCATSAT-1

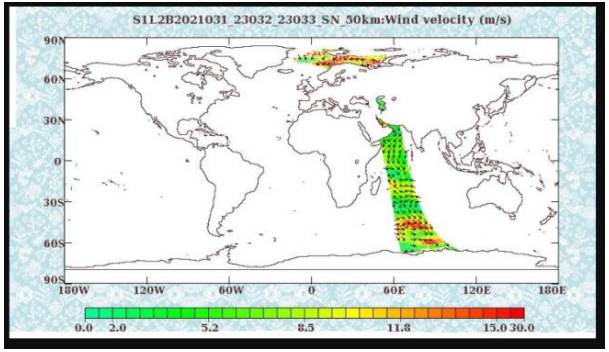
- ScatSat-1 is a follow on mission of Oceansat-2.
- Payload: Scatterometer in Ku Band (13.515 GHz).
- Wind vector cell size (25 km x 25 km).
- Swath width HH: 1400km, VV: 1840km.



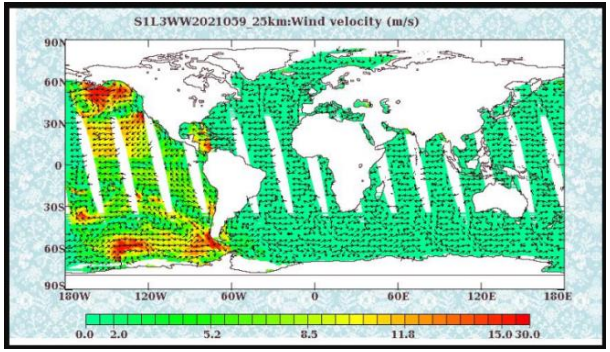
- Products:
  - Level-2B Wind vector products.
  - Level-3 Global Sigma0 products.(HH Pol/VV Pol)
  - Level-3 Global Wind vector products.

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
ISRO's EO Data HUB
भूनिधि
इसरो इओ डाटा हब

Search-Criteria | Search-Results | Cart

Date range
01 January 2021
01 February 2021

Product: Thematic

Satellite-Sensor
Source: Scatterometer

- [x] Open_Data
  - [x] 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 re

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

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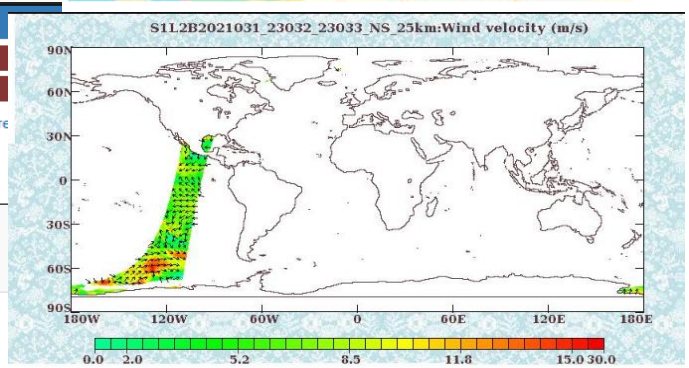
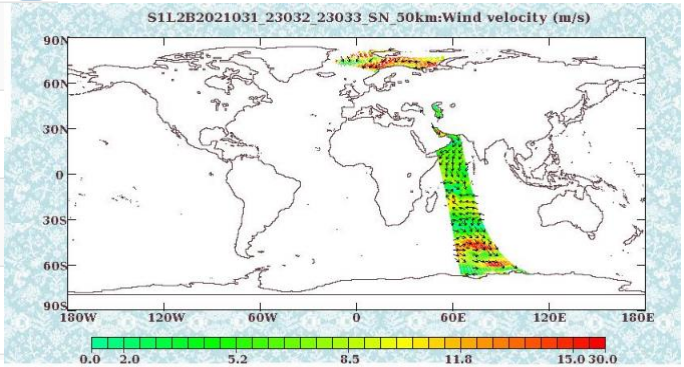
Scene: 23033_23034_1
Dop: 01-Feb-2021
Pricing: Open_Data





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