



RADAR Imaging Satellite (RISAT) 1

- SAR Mission of ISRO

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RISAT-1 Mission



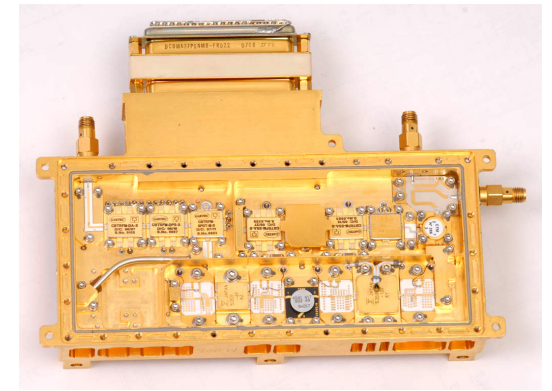
- C band SAR
- Launched on April 26, 2012 from Sriharikota, INDIA
- Satellite Mass: 1851 kg
- Launch Vehicle : PSLV C-19 (XL Version)



RISAT-1 Special Features

- **Selectable**
 - Resolution (3-50 m), Swath (107-659 km)
- **Multi beam and Beam Steer ability**
- **Variable Incidence angles**
- **Right and Left Look Direction**
- **Extended spotlight imaging mode**
- **Miniaturised 576 nos. of TR Modules**
- **314 ASIC-based processors for TR**
- **Only SAR to have Circular polarimetry**

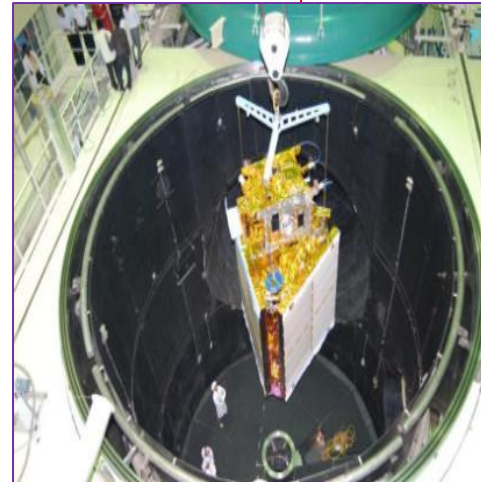
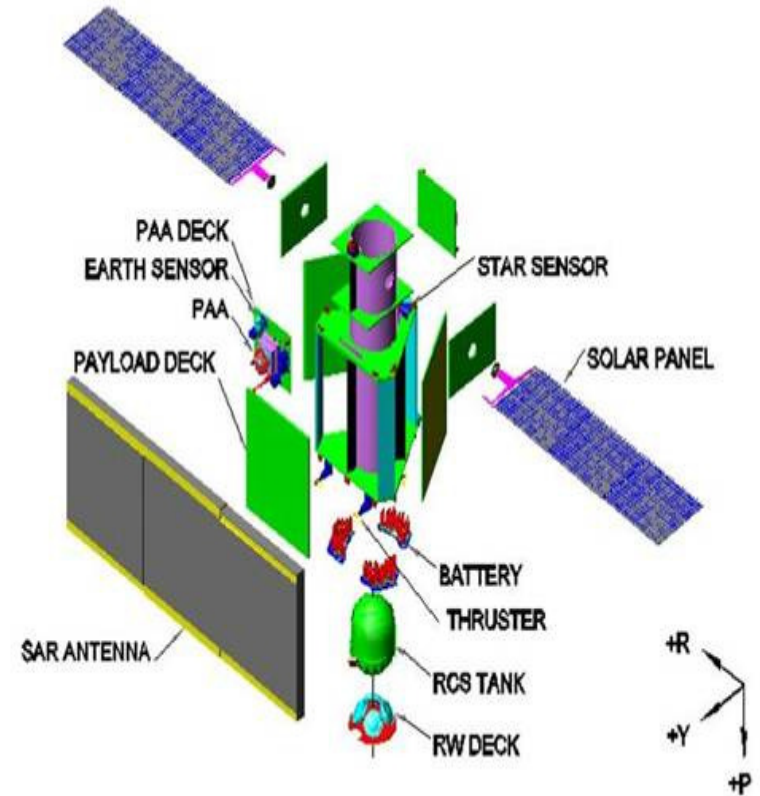
TR MODULE : 170x170x20mm



ASIC for TRC

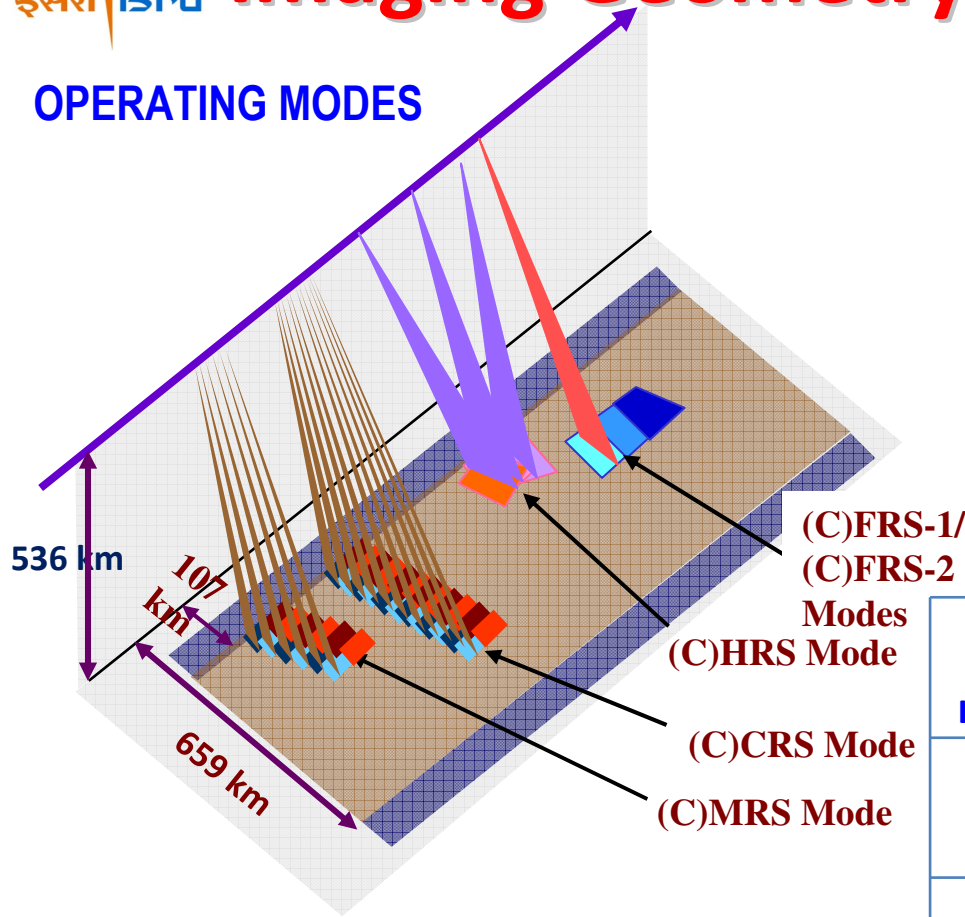
RISAT-1 Satellite

- 3-Axis Stabilized, 1851 kg mass
- 1800w power & 70AH Ni H Battery
- S-Band TTC & X-Band DH
- 640 Mbps Data Rate (320 Mbps RHCP, LHCP) & 240 Gb SSR
- Star Sensors & 0.05 deg pointing
- Truncated Triangular Prism / Cuboid structure

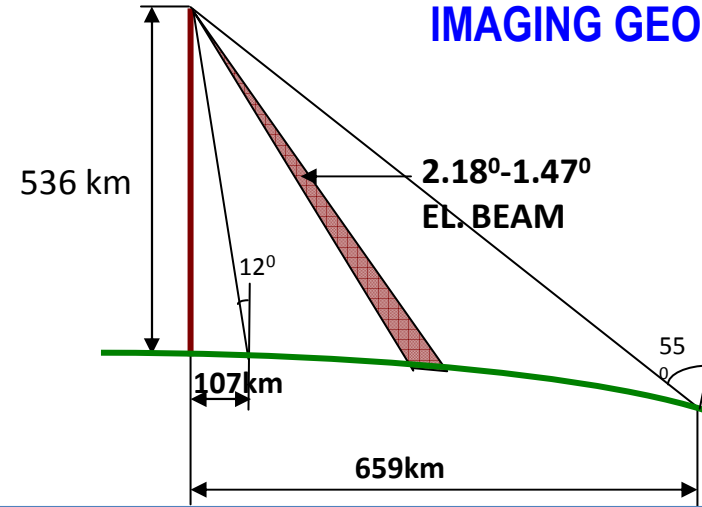


Imaging Geometry, Operation Modes

OPERATING MODES



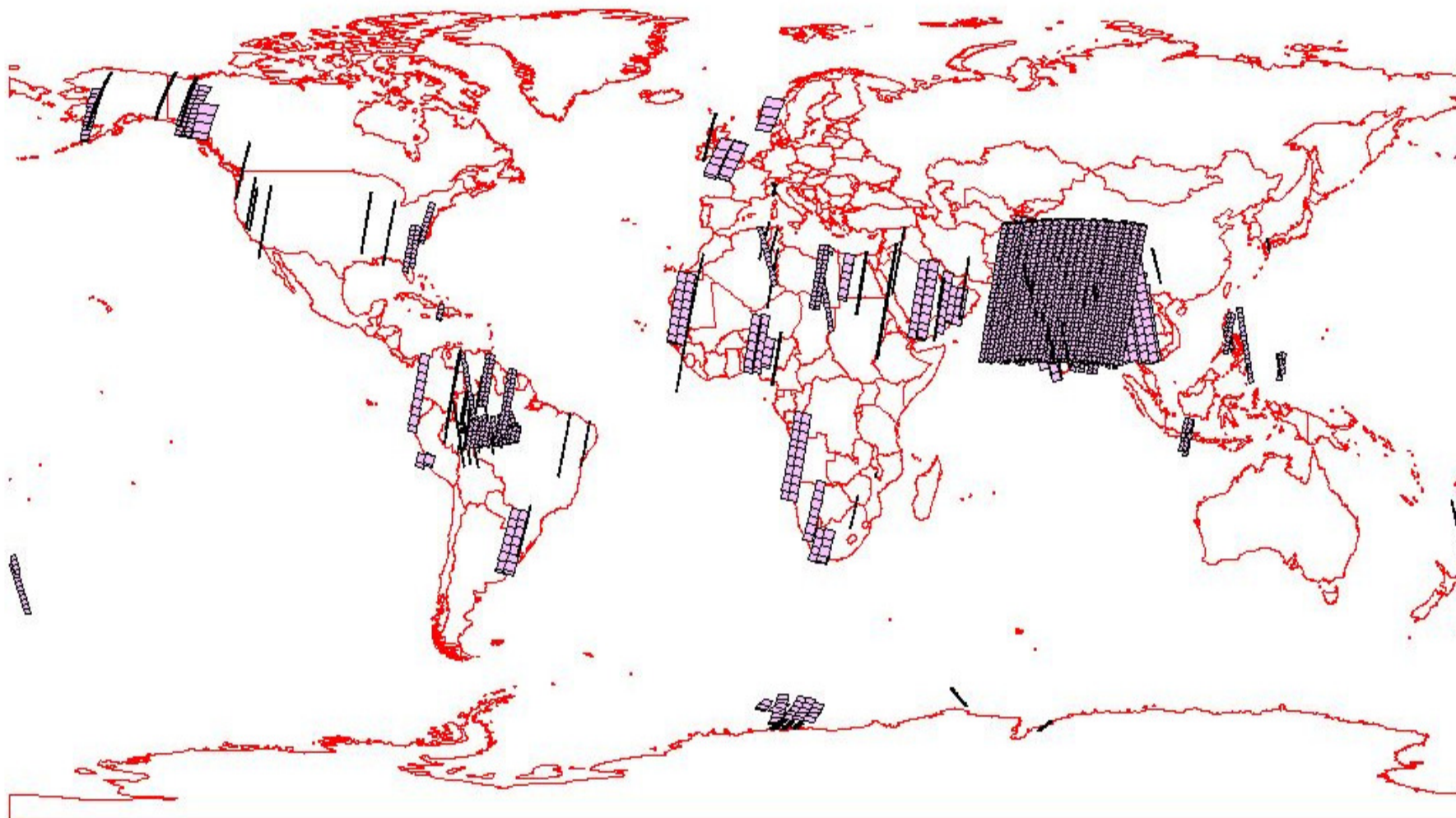
IMAGING GEOMETRY



Imaging modes *	Slant Range Resolution	Swath/ Spot (km)	Polarisation
FRS-1	3m	25	Linear/ Dual/ Polarimetry
FRS-2	6m	25	Polarimetry
FRS-2	9m	25	Quad
MRS	25m	115	Linear/ Dual/ Polarimetry
CRS	50m	223	Linear/ Dual/ Polarimetry

RISAT-1 Data Acquisition

RISAT 1 - GLOBAL COVERAGE
(July 01st 2012- 08th Feb 2013)



Data Processing

MODE	SCENE ACQUISITION TIME	SCENE PROCESSING TIME (Raw data to L2 GeoTiff)
FRS-1 (30 km)	4.6 sec	15
FRS-2 (30 Km)	4.6 sec	45
MRS (115 Km)	17.5 sec	55
CRS (230 Km)	32.8 sec	120

Product Levels

Level-0 RAW Level-1 SLC

Level-1 Ground Range

Level-2 Terrain corrected
Geocoded

Polarisation

HH, HV, VV, VH, RV, RH

Data products availability for various modes

Imaging Mode	RAW (CEOS)	L1-SLC (CEOS)	L1-Ground Range (CEOS)	L2-Geo Referenced (CEOS & GeoTIFF) (Proj: UTM & Polycon.)
FRS-1	Available	Available	Available	Available
FRS-2	Available	Available	NA	Not Applicable (NA)
MRS	Available	Available	Available	Available
CRS	Available	Under Evaluation	Available	Available

RISAT-1 PRODUCT SPECIFICATIONS

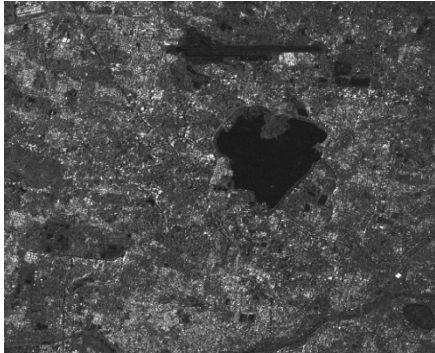
Beam Mode	Level of Processing	Look Angle (Deg)	Nominal Scene Size (km)	Azimuth/Range No of Looks	Azimuth/Range Resolution (m)	Azimuth/Range Sampling (m)
FRS1	L1SLC	11-49	25*25	1/1	3.3/2.2	2.3/1.8
	L1GR	11-24	25*25	4/2	13/22 – 10.6	9.2/9
		24-49	25*25	4/2	13/10.3 – 5.6	4.6/4.5
	L2	11-24	25*25	4/2	13/22 – 10.6	9.2/9
		24-49	25*25	4/2	13/10.3 – 5.6	4.6/4.5
FRS2	L1SLC	11-49	25*25	1/1	10/4.68	4.6/3.6
MRS	L1SLC	11-49	115*115	1/1	23-25/8.8	14.2/7.2
	L1GR	11-22	115*115	1/1	24/45-22	13.8/18
		23-49	115*115	1/2	24/43-22	13.8/18
	L2	11-22	115*115	1/1	24/45-22	18/18
		23-49	115*115	1/2	24/43-22	18/18
CRS	L1GR	11-34	223*223	1/3	48/135-46	27.6/36
		34-49	223*223	1/4	48/60-45	27.6/36
	L2	11-34	223*223	1/3	48/135-46	36/36
		34-49	223*223	1/4	48/60-45	36/36



RISAT-1 Mission Status

- Initial characterization completed including coverage over Amazon for calibration
- Data being regularly received at Shadnagar GS of NRSC & successful test download at Tromso
- Early valuation studies completed, users have demonstrated polarimetry applications with RISAT-1
- FRS, MRS & CRS Mode data released to users
- Operational projects like flood inundation mapping and rice mapping have been given multi-date data sets
- Users can order data from NRSC (www.nrsc.gov.in) or ANTRIX

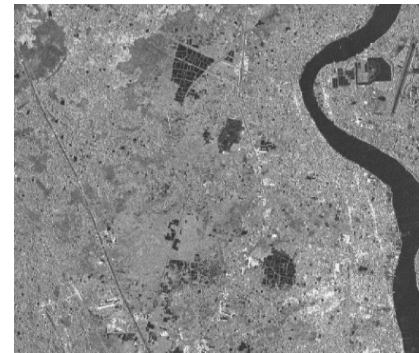
Sample Images



**FRS-1, Orbit: 424.VV+VH
Des, R. look, Hyderabad**



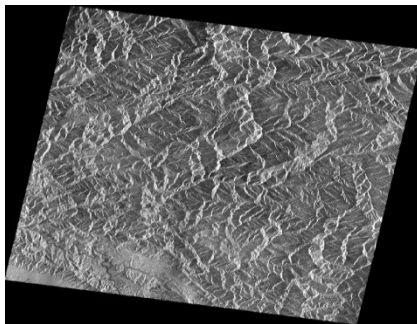
**FRS-1, Orbit: 2317, C-Pol,
Asc. Look Ahmedabad**



**FRS-1, Orbit: 2437,
C-pol, Asc, Left look, Kolkata**



**FRS-1, Orbit: 2435, HH+HV,
Asc. Right look, Amazon**



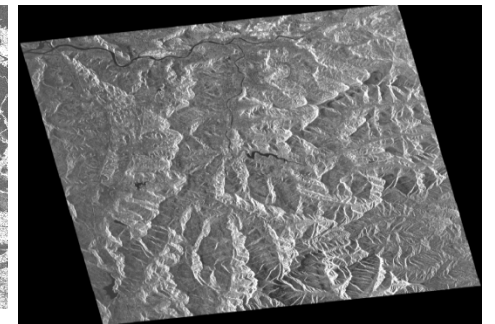
**MRS, Orbit: 2173, HH, Asc
Left, Siwalik Hills**



**FRS-1, Orbit: 1578, Asc Left
Kottavam in HH Pol**

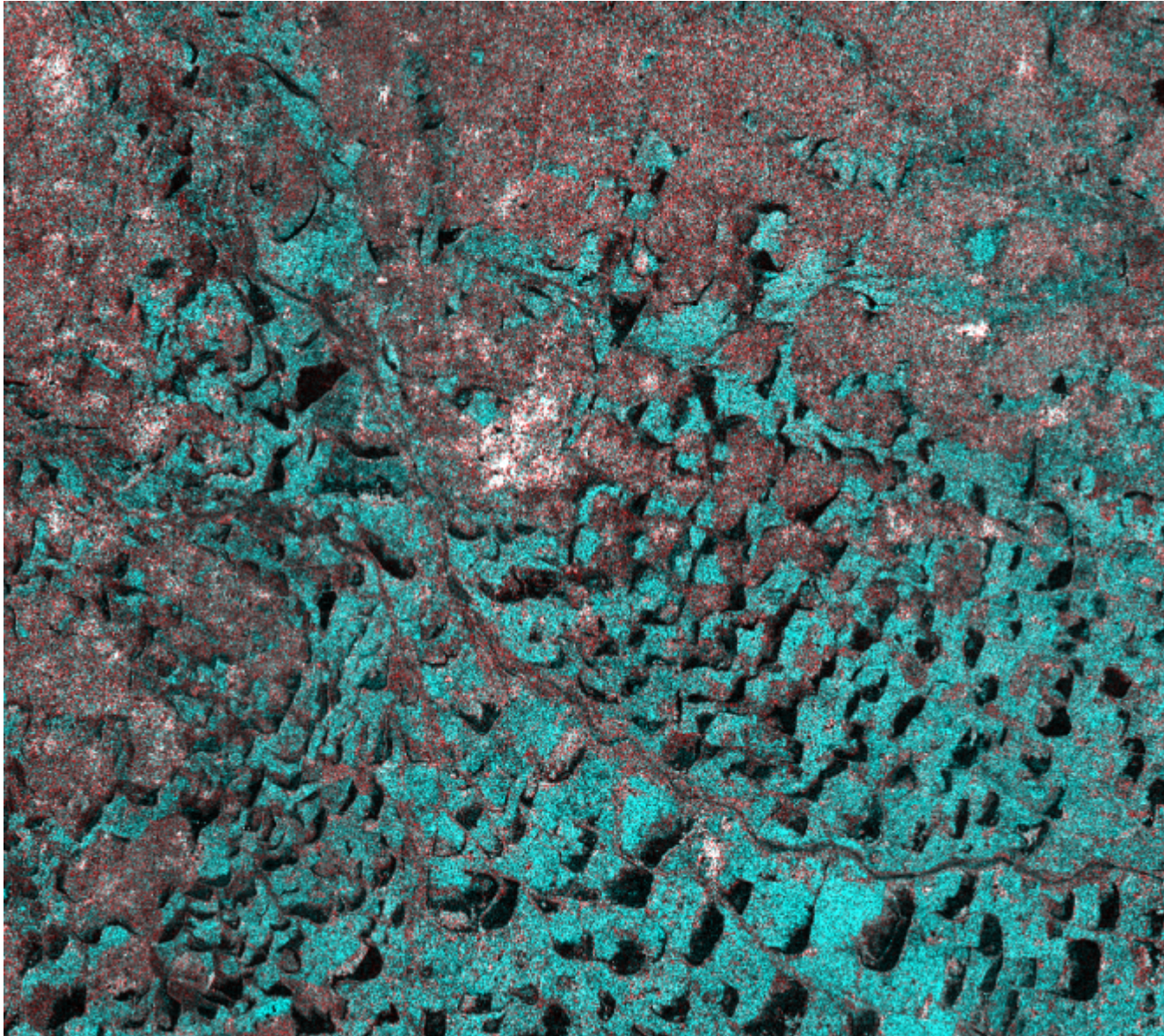


***FRS-1, Orbit: 1578, Asc
Left, Kottavam in HV
Pol***



**FRS-1, Orbit: 1186, RV, Asc
Left, Western Ghats**

Rice Mapping

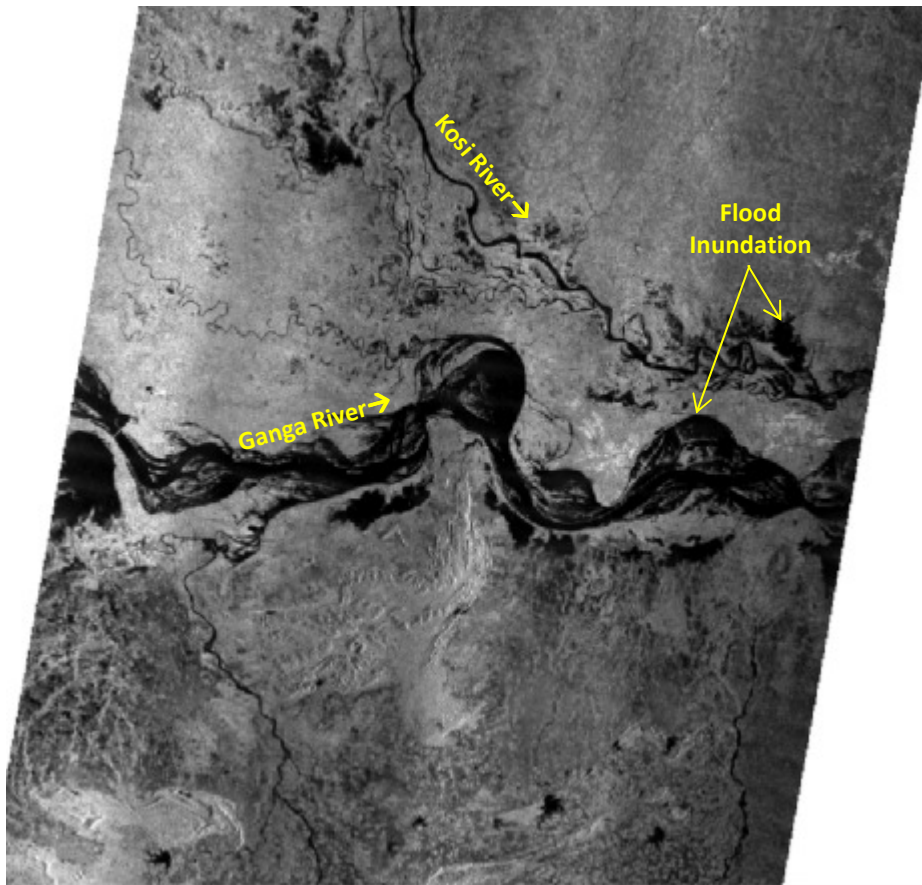


RISAT-1/ MRS
2 date composite
Oct 25, Nov 19, 2012

Sivaganga Area of Tamil Nadu showing Samba rice area (cyan colour)

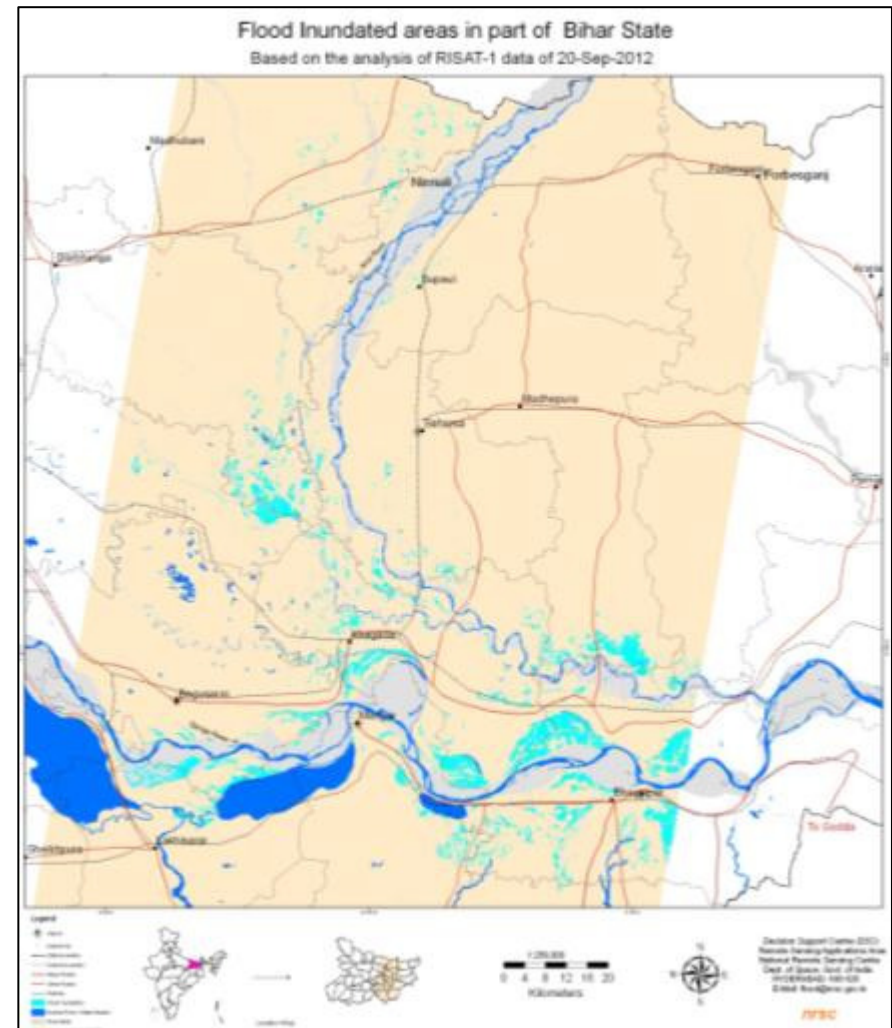
Flood Mapping (Bihar, 2012)

RISAT-1; Bihar- 20 Sep 2012



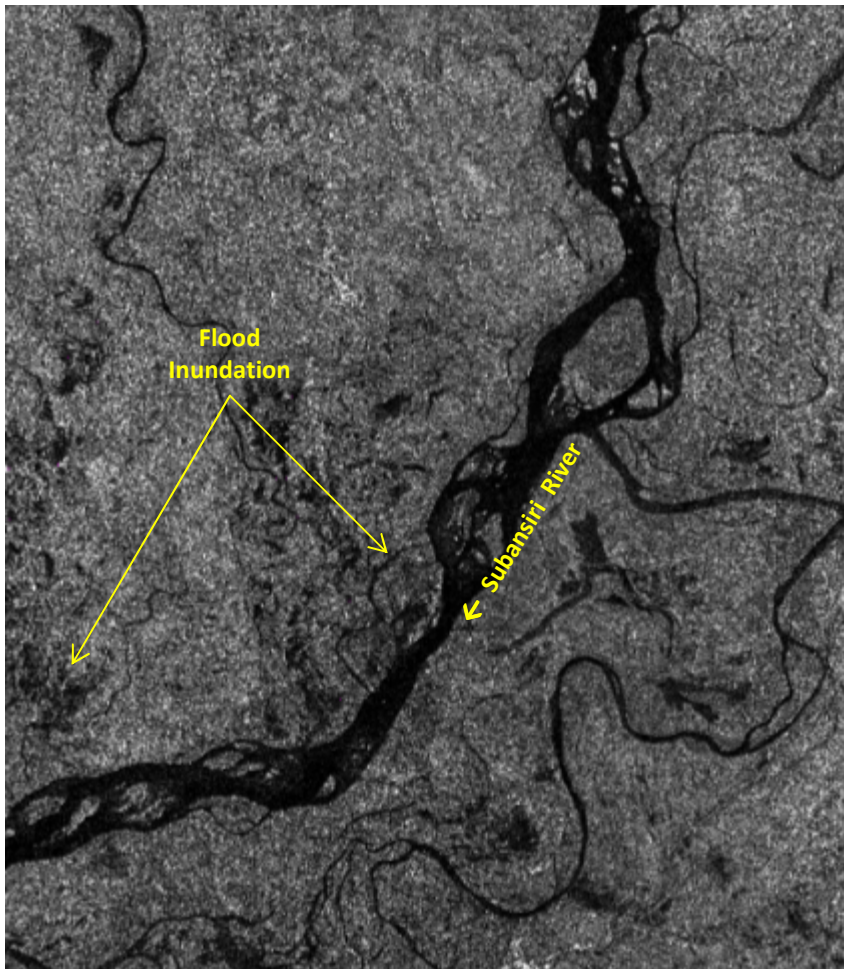
- RISAT-1 ScanSAR-MRS mode - 18 m.
- HH & HV polarized images acquired .
- Speckle removal by Median Filter .

Flood Map



Flood Mapping *(Lakhimpur, Assam, 2012)*

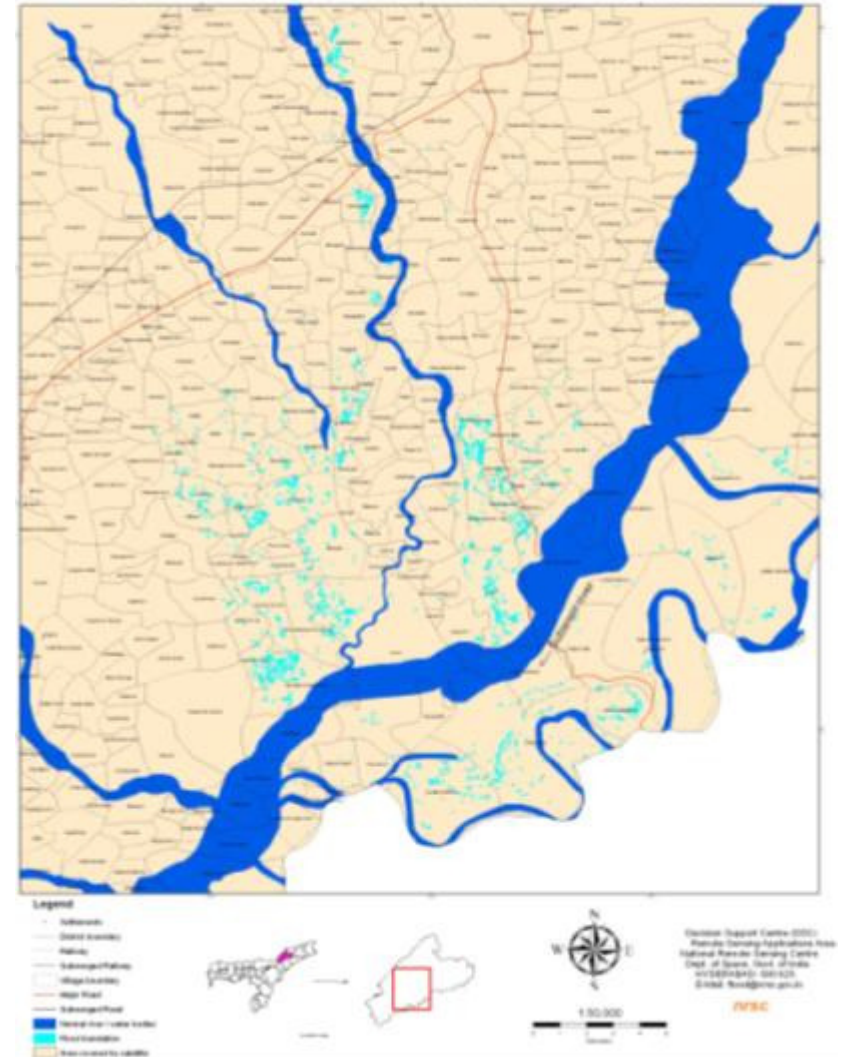
RISAT-1 Image of Assam-16 September 2012



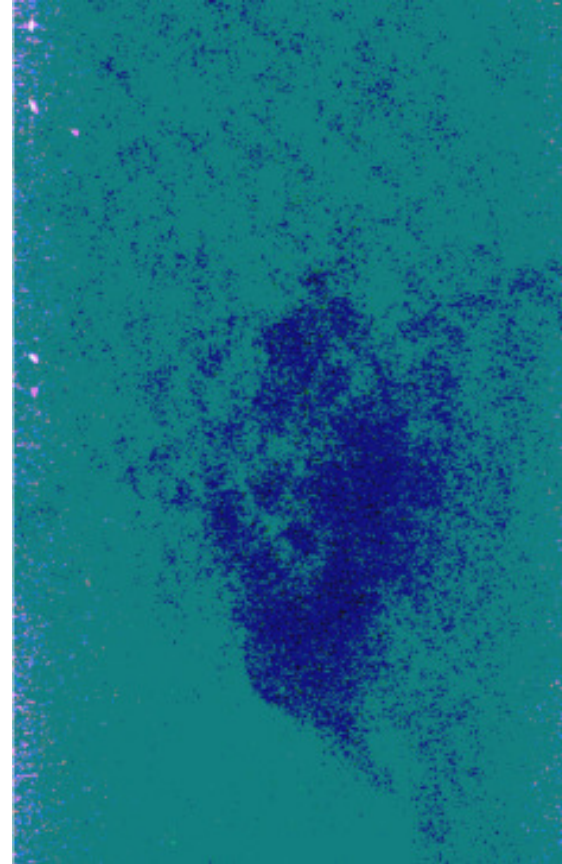
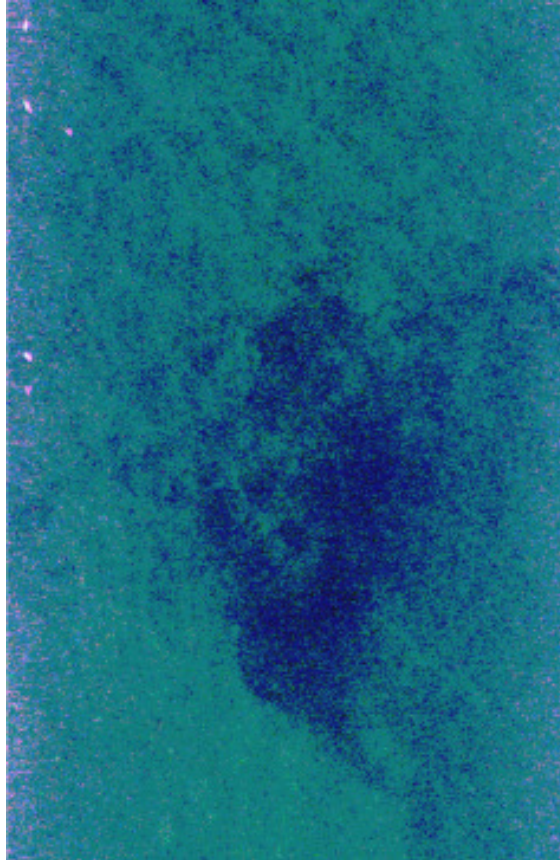
RISAT-1 MRS mode - 16th September 2012

Flood

Flood Inundated Areas in part of Lakhimpur District, Assam
Based on the analysis of RISAT-1 SAR data of 16-Sep-2012



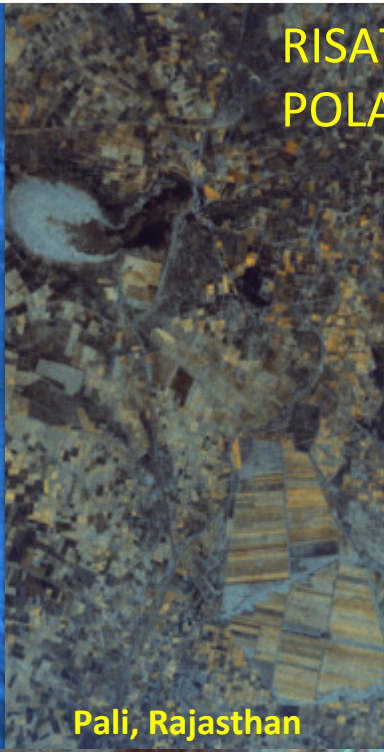
Oil Spill



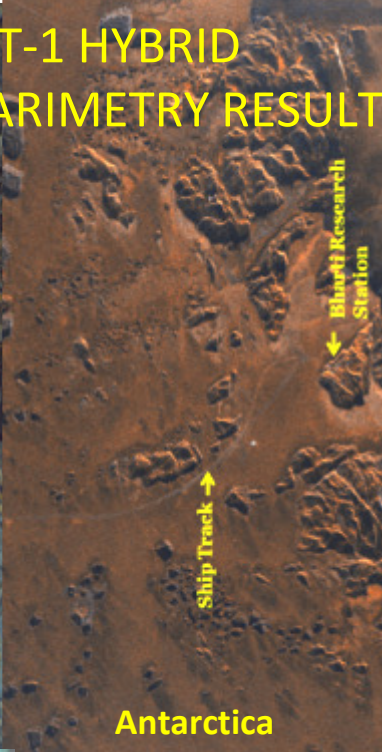
RISAT-1 HYBRID
POLARIMETRY RESULTS



Andaman Sea



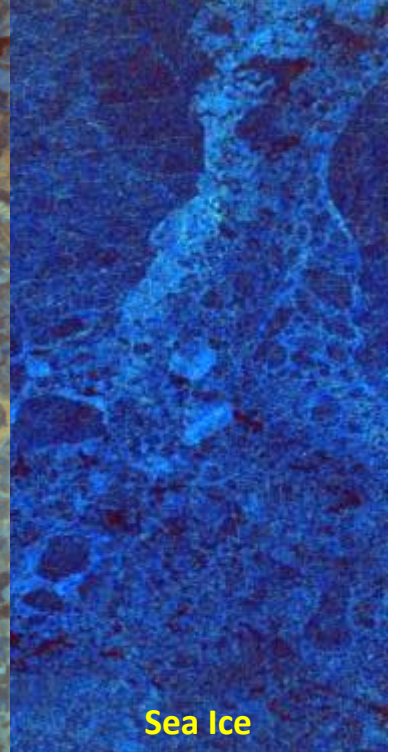
Pali, Rajasthan



Antarctica



Tunisia



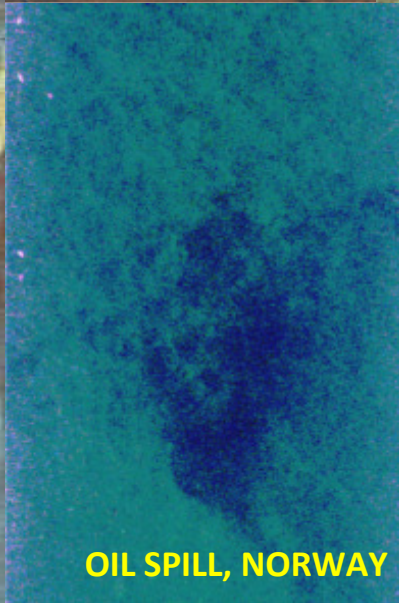
Sea Ice



Andaman Sea



SABARMATI

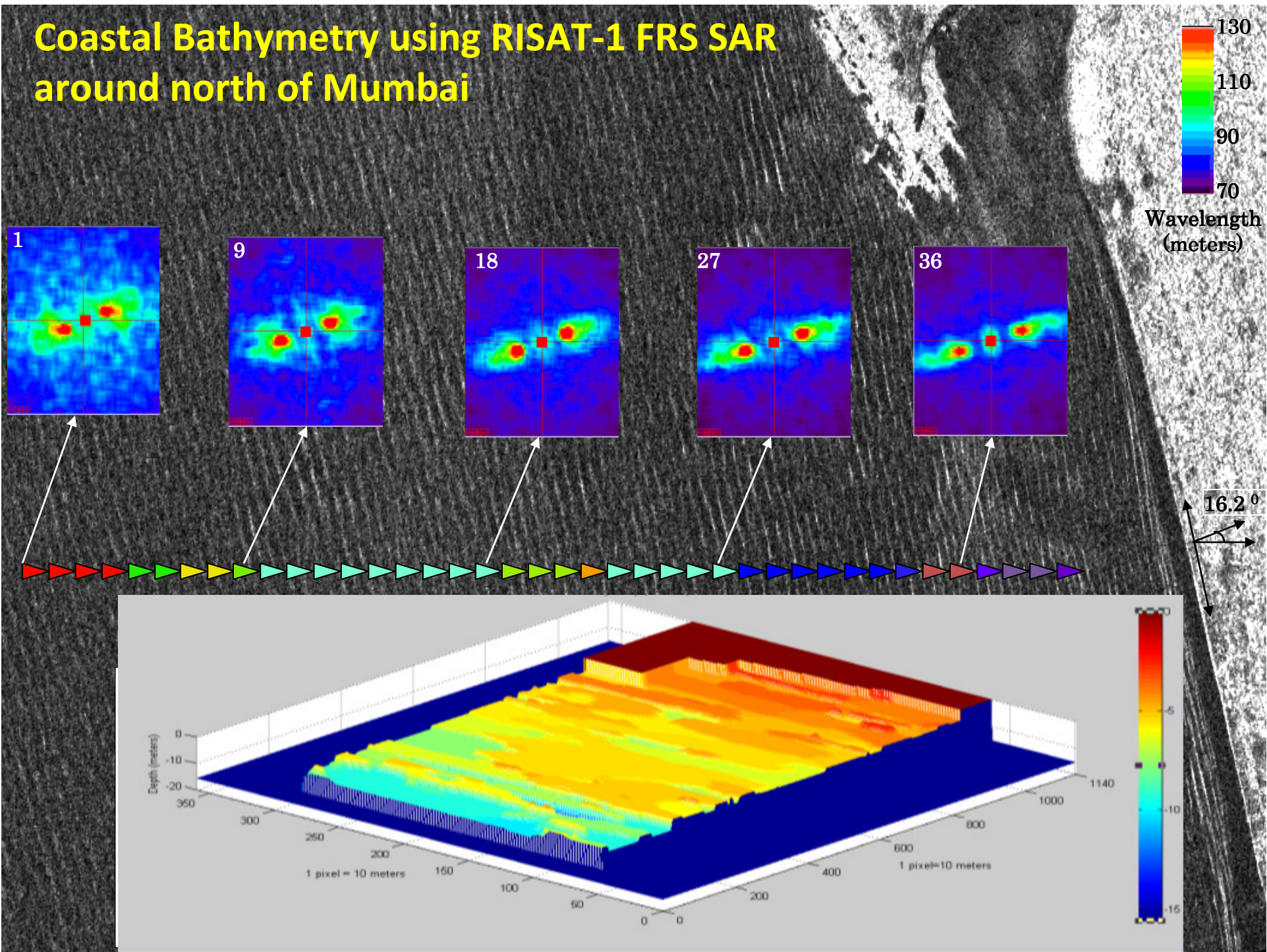


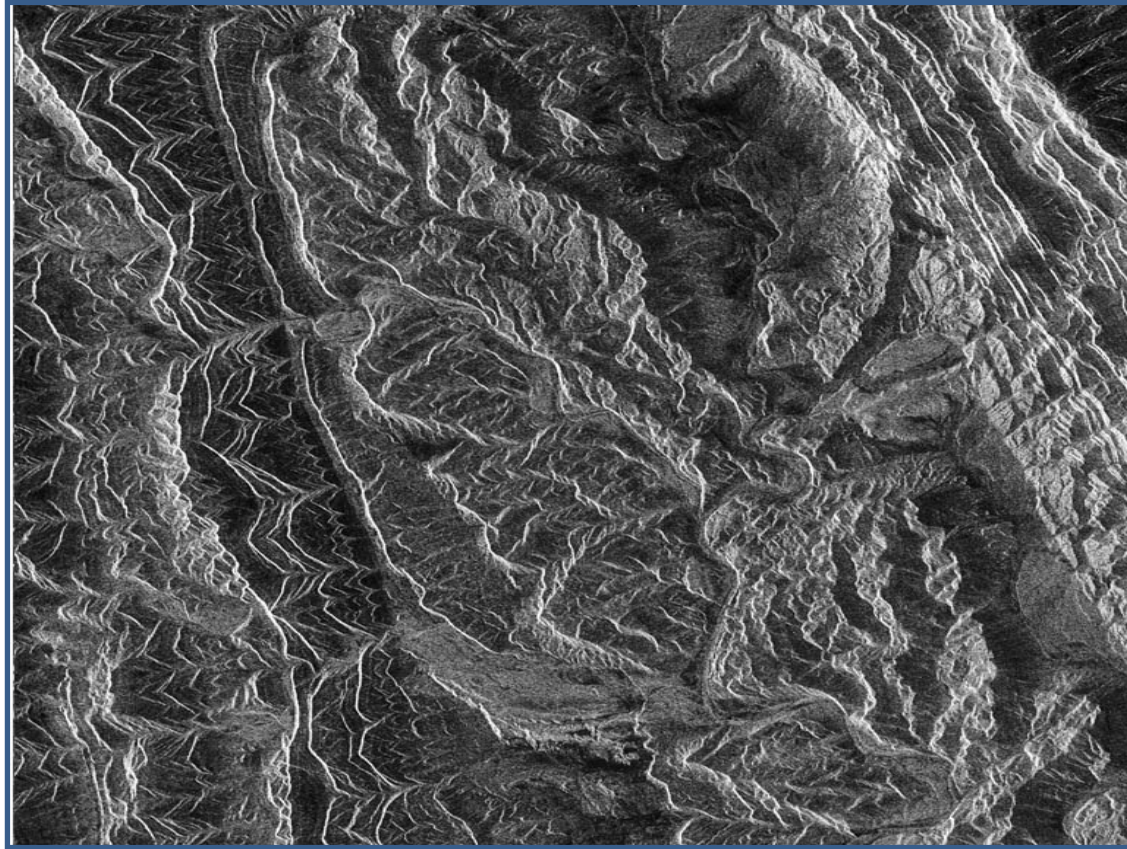
OIL SPILL, NORWAY



AHMEDABAD

Coastal Bathymetry using RISAT-1 FRS SAR around north of Mumbai





Thank you