EO sensor specifications and Planning

A.V Ramani

NDC, NRSC

EO sensor specifications and Planning

Operational IRS satellites for planning

1. Resourcesat 2 , Resourcesat 2A
2. Cartosat 2E
3. CARTOSAT 3
4. EOS 4

IRS Satellites not offered for planning

1. Resourcesat 1
2. Oceansat 2

Operational Non - IRS satellites for planning

1. NOVASAR

Non IRS Satellites not offered for planning

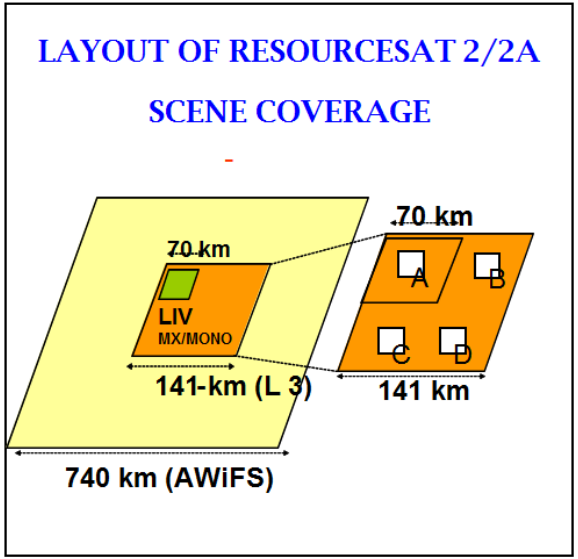
1. Landsat
2. Sentinel

Upcoming Satellite : EOS 6

EO sensor specifications and Planning
Resourcesat - 2/2A

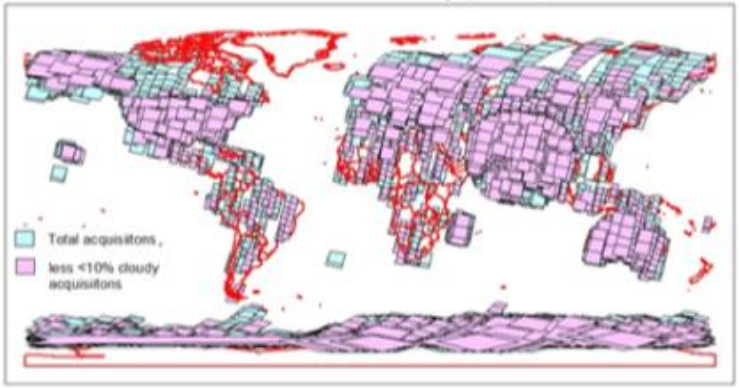
Sensors	AWiFs, LISS-4, LISS-3
Equatorial Crossing Time	10:30 AM ± 10 min (at descending node)

SPECIFICATIONS	LISS-4	LISS-3	AWiFS
Resolution (m)	5.83m	23.5m	56m
Swath (km)	70 / 23	140	740
No. of Bands	1 (Mono); 3 (MX)	4	4
Spectral Bands (μ)	B2: 0.52 – 0.59 B3: 0.62 – 0.68 B4: 0.77 – 0.86 B3-default band for Mono	B2: 0.52 – 0.59 B3: 0.62 – 0.68 B4: 0.77 – 0.86 B5: 1.55 – 1.70	B2: 0.52 – 0.59 B3: 0.62 – 0.68 B4: 0.77 – 0.86 B5: 1.55 – 1.70
Revisit (days)	5	24	5

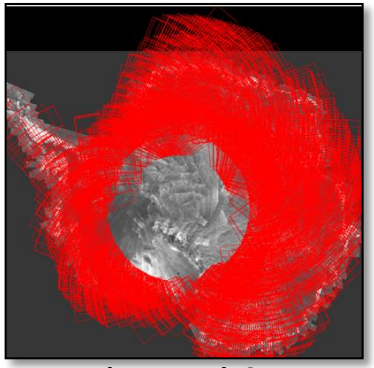


EO sensor specifications and Planning
Resourcesat - 2/2A

- ✓ Resourcesat-2A has been phased with Resourcesat-2 which resulted in improved reptivity
- ✓ Resourcesat-2 and 2A data are being collected over Shadnagar visibility cone in a systematic manner
- ✓ The combined systematic acquisition of Resourcesat-2 and Resourcesat -2A facilitated in covering the Shadnagar visibility region
  - ✓ 24 days using LISS-IV FMx
  - ✓ 12 days with LISS-III
  - ✓ 4 days with AWiFs
- ✓ Systematic collection of global LISS-3, AWiFS and LISS-IV data has been carried out using the two satellites.
- ✓ LISS III and AWiFs are planned over Antarctica every year during October to March
- ✓ User requests globally outside the shadnagar visibility cone will be accepted for all three sensors and planned based on their feasibility



AWiFS coverage



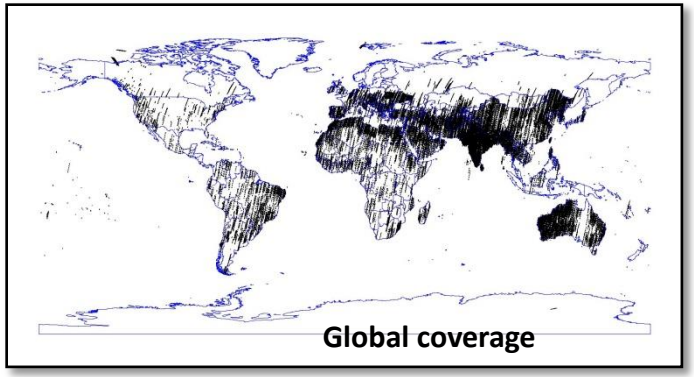
Antarctica – AWiFS coverage

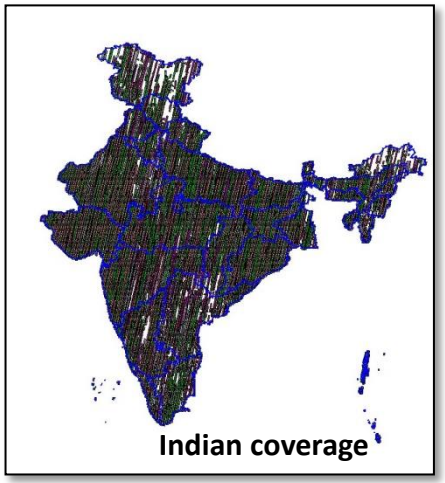
EO sensor specifications and Planning

Cartosat – 2E

Orbit Type	Polar, Sun Synchronous (SSO)
Orbit Height (Km)	505 Km
Orbit Inclination (deg.)	97.44 deg.
Local Time of Equator Crossing	9:30 am

PARAMETERS	PAN	MULTISPECTRAL
Ground Sampling Distance (GSD)	0.65 m	better than 2m
Swath	9.6 Km	9.6 Km
Spectral Bandwidth (µm)	0.45 - 0.9	B1:0.45 - 0.52 B2:0.52 - 0.59 B3:0.62 - 0.68 B4:0.77 - 0.86
Quantisation	11 Bits	11 Bits





EO sensor specifications and Planning
Cartosat – 2E

Request based planning:

User need to specify the following

Area of interest

- ✓ Point – 70 Km will be acquired on the either side of the given point (NS /AT)
- ✓ Strip
  - ✓ a maximum of 800 km strip length will be acquired.(Along track)
  - ✓ a maximum of 200 km strip length will be acquired.(NS)
- ✓ Polygon and shape file request (internally converted to point or strip request).

Period of interest

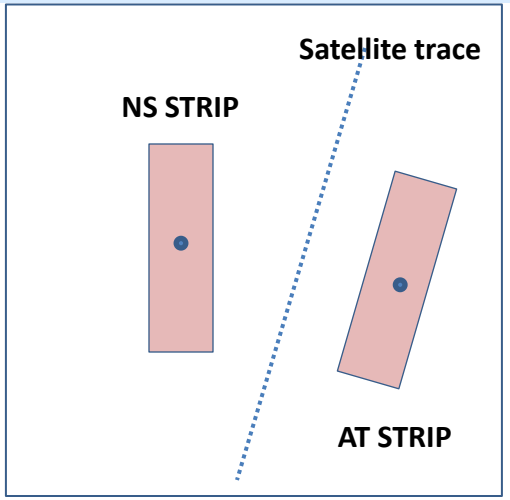
- ✓ Required period of interest
- ✓ Preferable cloud free period

Accepted Roll tilt

(+/- 23° is possible)

Possibilities :

- ✓ Every 5/6 day possibility
- ✓ Repitivity is 93 days
- ✓ AOI coverage (with proper side laps between strips) – 279 days

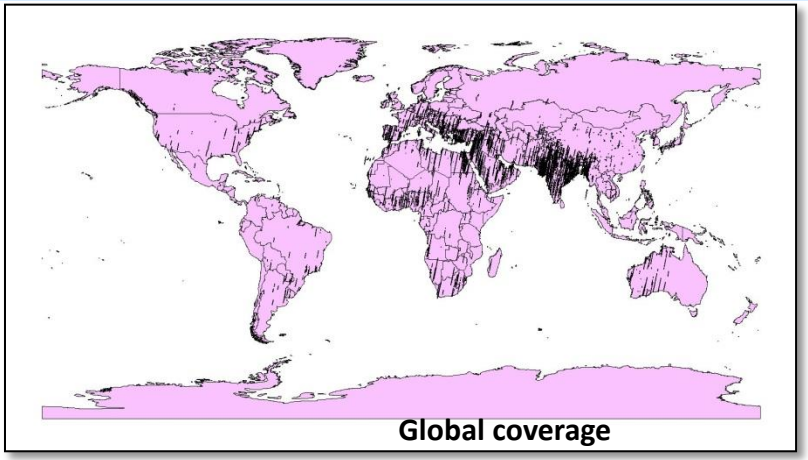


5 days advance request will be accepted

EO sensor specifications and Planning
Cartosat – 3

Orbit Type	Polar, Sun Synchronous (SSO)
Orbit Height (Km)	505 Km
Orbit Inclination (deg.)	97.42 deg.
Local Time of Equator Crossing	9:30 am

PARAMETERS	PAN	MULTISPECTRAL
Ground Sampling Distance (GSD)	0.28 m	1.12 m
Swath	~17 Km	~17 Km
Spectral Bandwidth (µm)	0.45 - 0.9	B1:0.45 - 0.52 B2:0.52 - 0.59 B3:0.62 - 0.68 B4:0.77 - 0.86
Quantisation	11 Bits	11 Bits


Global coverage


Indian coverage

EO sensor specifications and Planning
Cartosat – 3

Request based planning:

User need to specify the following

Area of interest

- ✓ Point – 27 Km will be acquired on the either side of the given point (AT)
- ✓ Strip
  - ✓ a maximum of 2000 km strip length will be acquired.(Along track)
- ✓ Polygon and shape file request (internally converted to point or strip request).

Period of interest

- ✓ Required period of interest
- ✓ Preferable cloud free period

Accepted Roll tilt

(+/- 23° is possible)

Possibilities :

- ✓ Every 5/6 day possibility
- ✓ Repitivity is 93 days
- ✓ AOI coverage (with proper side laps between strips) – 186 days

EO sensor specifications and Planning
EOS -4

Salient Features of EOS - 04					
Sl.No.	Parameters	Coarse Resolution mode (12 beam)	Medium Resolution Mode(8-beam)	Fine Resolution Mode (FRS-1)	High Resolution Mode (Spot mode)
1	Altitude (Km)	524.87			
2	Inclination (Deg)	97.5 °			
3	Repeativity (days)	17	17	139	--
4	Orbit period (minutes)	95			
5	Swath (Km)	223	160	25	10
6	Azimuth Resolution (metres)	50	33	3	1
7	Local Time (IST)	6:00 AM/PM (±10 min)			

EO sensor specifications and Planning
EOS -4

Payload Modes, Specifications

Imaging Modes	Swath in Km	Polarization	Resolution (Azi. x Sl Rng.) (metres)
FRS-1	25	Single, Dual, Circular	3 x 2
FRS-2	20	Full Pol	3 x 4
MRS 6-Beam	115	Single, Dual, Circular	25 x 8
MRS 8-Beam	160	Single, Dual, Circular	33 x 8
CRS	223	Single, Dual, Circular	50 x 8
HRS	15	Single, Dual, Circular	1 x 2

Descending mode :

Systematic coverage over India

- ✓ MRS mode
- ✓ 8 beam
- ✓ 17 day reptevity
- ✓ Dual Polarization
- ✓ Right look

Ascending mode :

User Requests

- ✓ Any mode
- ✓ Any look
- ✓ India/Globe
- ✓ Poles upto 80°
- ✓ Any polarization

EO sensor specifications and Planning
NOVASAR

- Operating Modes :

Modes	ScanSAR	Maritime Surveillance	Stripmap	ScanSAR (Wide)
Swath (km)	100	>400	15-20	140
Spatial Resolution (m)	20	6 X 13.7	6	30
Revisit frequency for SSPO (Days)	4	1.8	3.6	3.1
Incidence Angle (Deg)	16-30	34.5-57.3	16-31	14-32

First Microwave satellite with s-Band

Polarization :

- ✓ Single – Strip map, Maritime & Scansar
- ✓ Dual & Tripol – Scansar

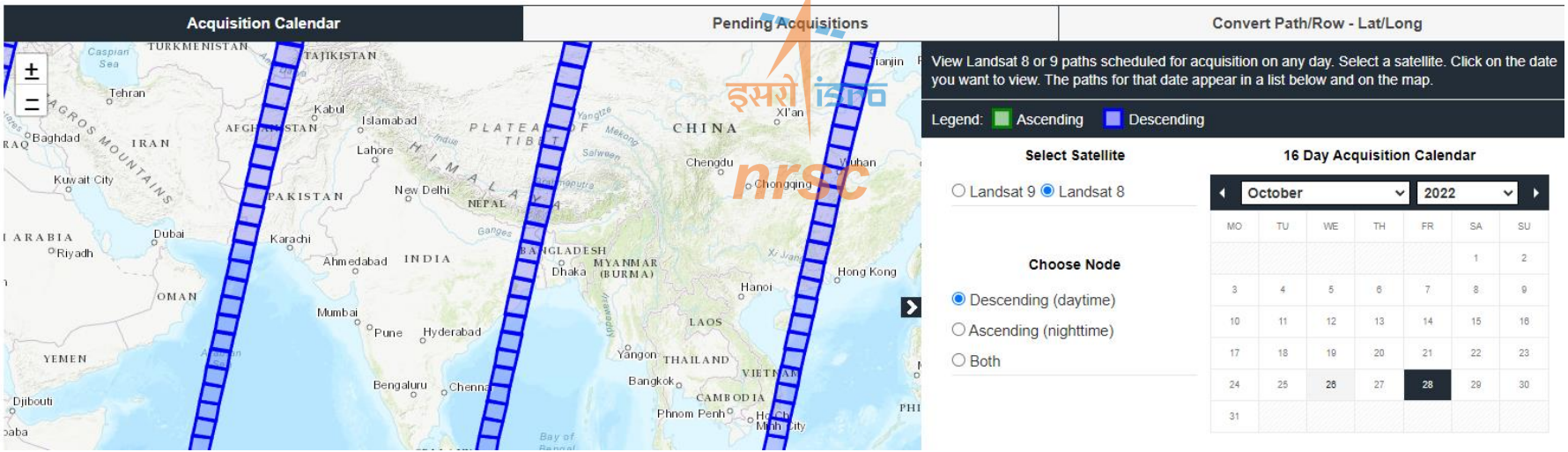
Incidence Angle :

Only discrete Incidence Angles are available for all the modes of operation

User can place the request any where on India by specifying area of interest, Period of interest, mode, I. angle & polarization

EO sensor specifications and Planning
Landsat 8 & 9

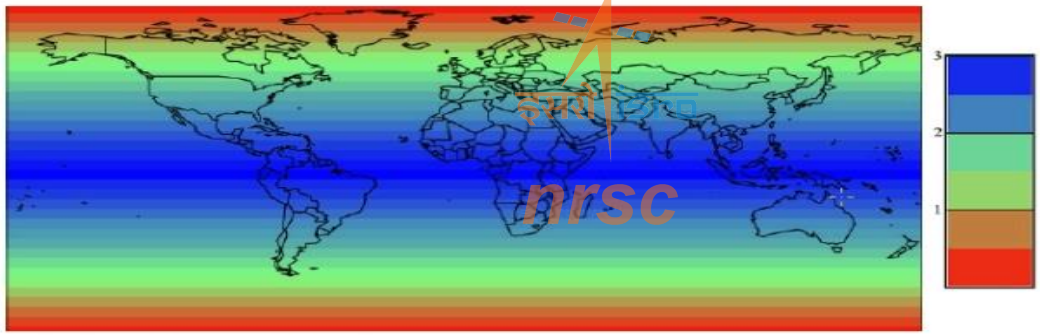
Based on Orbital calendar of Landsat 8 & 9 all possible paths over India will be acquired.



EO sensor specifications and Planning
Sentinel

Each SENTINEL-1 satellite will be in a near-polar, sun-synchronous orbit, with a 12-day repeat cycle and 175 orbits per cycle. Both SENTINEL-1A and SENTINEL-1B share the same orbit plane with a 180° orbital phasing difference.

A single SENTINEL-1 satellite is potentially able to map the global landmasses in the Interferometric Wide swath mode once every 12 days, in a single pass (ascending or descending). The two-satellite constellation offers a 6 day exact repeat cycle at the equator. Since the orbit track spacing varies with latitude, the revisit rate is significantly greater at higher latitudes than at the equator.



- ✓ Two satellites in a 12 day orbit
- ✓ Repeat frequency: 6 days (important for coherence)
- ✓ Revisit frequency: (asc/desc & overlap): 3 days at the equator, <1 day at high latitudes (Europe ~ 2 days)

Based on Orbital calendar of Sentinel 1A & 1B all possible paths over India will be acquired.

Source : https://sentinels.copernicus.eu/

EO sensor specifications and Planning

- ✓ User can give the Satellite wise future planning requirements in ” Tasking Proposal forms for IRS “ Which will be given as a link for download at bhoonidhi
- ✓ After entering the requirements, the same can be download by user and mail to data@nrsc.gov.in for further planning.
- ✓ User can specify the purpose of request / number of days required to place the request)
  - ✓ Normal (T-5 days)
  - ✓ Urgent (T-1 day)
  - ✓ Calibration
  - ✓ Ground truth (Date specific)

- ✓ **No charges for future planning**

EO sensor specifications and Planning