

Indian Remote Sensing Satellites Resourcesat-1 (IRS P6) & Cartosat-1 (IRS P5) Data Availability

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GeoEye – ANTRIX Partnership

- **Long-standing Partnership**
 - For the last Ten years, ISRO, ANTRIX and Space Imaging have worked as partners to market India's remote sensing program internationally.
- **17 International IRS Ground Stations**
 - Commercial and government ground stations collecting, processing and distributing IRS 1C and 1D imagery products for world-wide coverage
- **Resourcesat-1 Ground Stations**
 - 5 stations Receiving data: Norman & Alaska USA, Germany, China, UAE (Under implementation).
- **Cartosat-1 Ground Stations:**
 - Taiwan, Upgrade to two Cartosat Ground Stations under implementation
- **GeoEye Antrix Agreement:**
 - GeoEye is negotiating with Antrix a new Joint Marketing Agreement.



IRS 1C & 1D International Ground Station Coverage

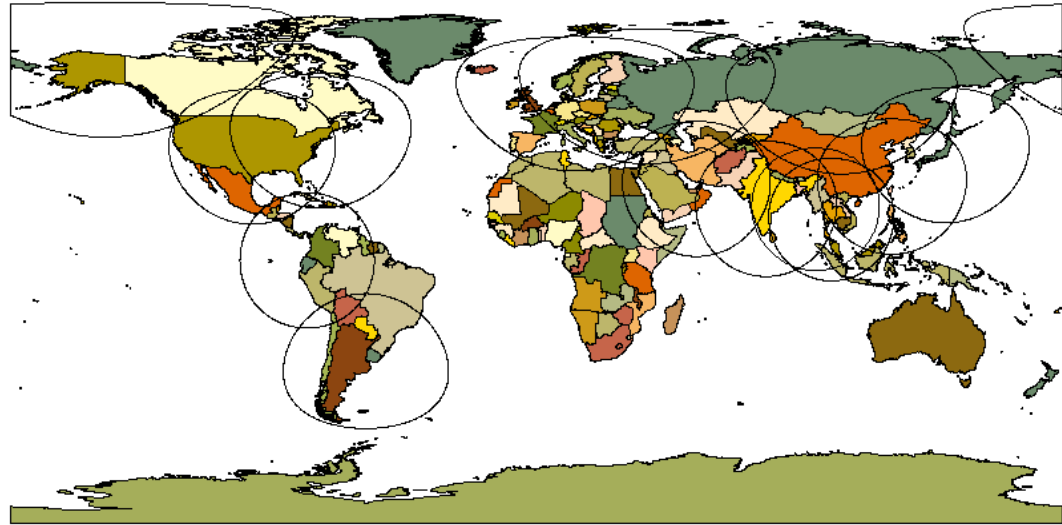
CURRENTLY OPERATING

- United Arab Emirates
- Union of Myanmar
- Eagle Vision 1, 2 & 5
- United States (Geo Eye)
 - Norman
 - Alaska
- Scannex (Russia)
 - Moscow
 - Eastern Siberia
 - Kazakhstan

Recently Discontinued

- Zorro, Taiwan
- Germany (NSG)
- Thailand (GISTDA)
- Japan (RESTEC)
- Argentina (CONAE)
- Ecuador (Clirson)

17 IRS 1C/1D ground stations throughout life of missions



Expected Life of Satellites: IRS 1C until end of 2006 and IRS 1D until end of 2007



IRS Resourcesat-1

Launched on October 17, 2003

817 km orbit, following IRS 1-C ground track

Spacecraft lift-off mass: 1360kg

5 year mission

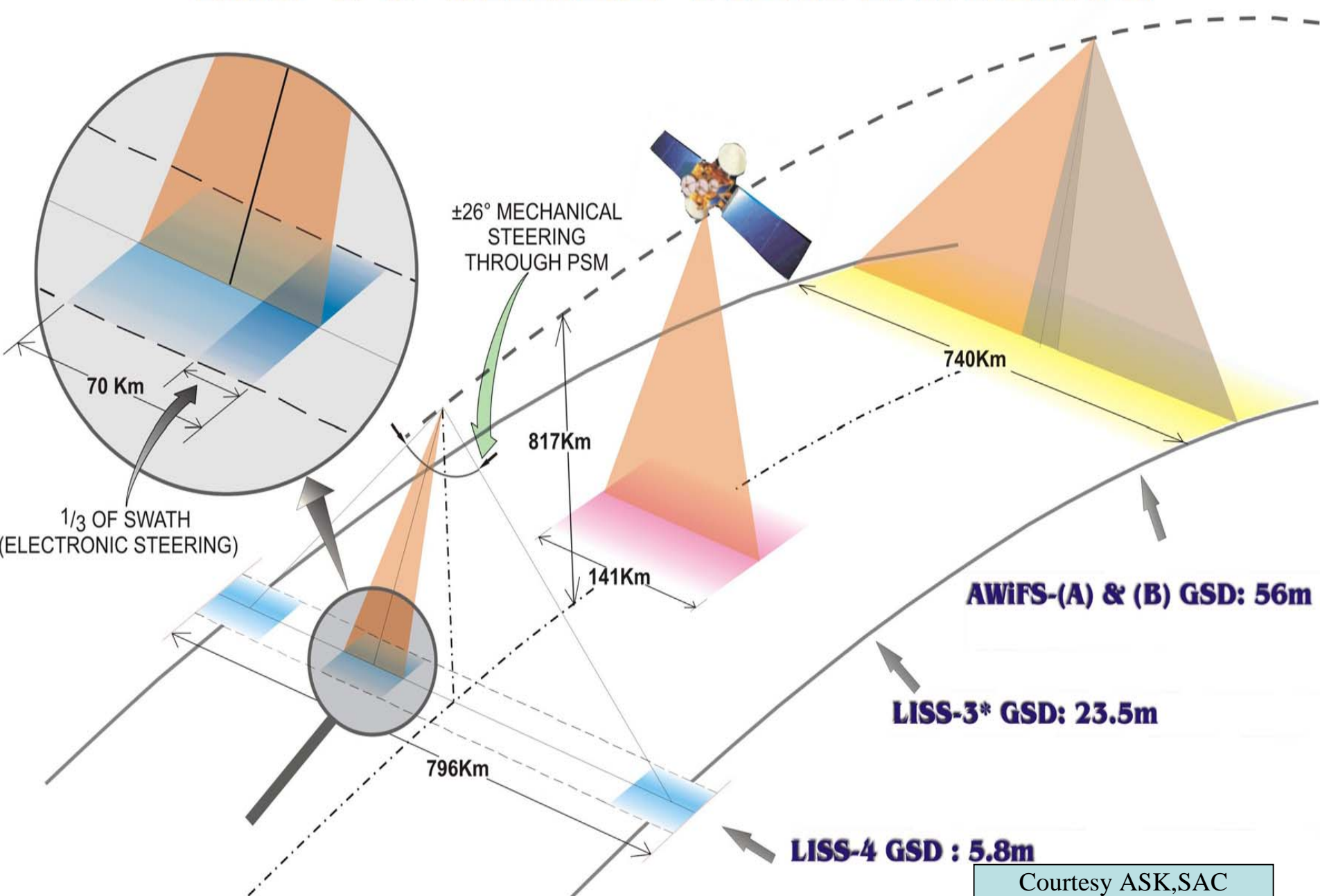
Local time: 10:30 +/- 5 minutes

12 Orbits per day, 101.35 minutes

On-board memory: 152 GB (BOL), 120 GB (EOL)

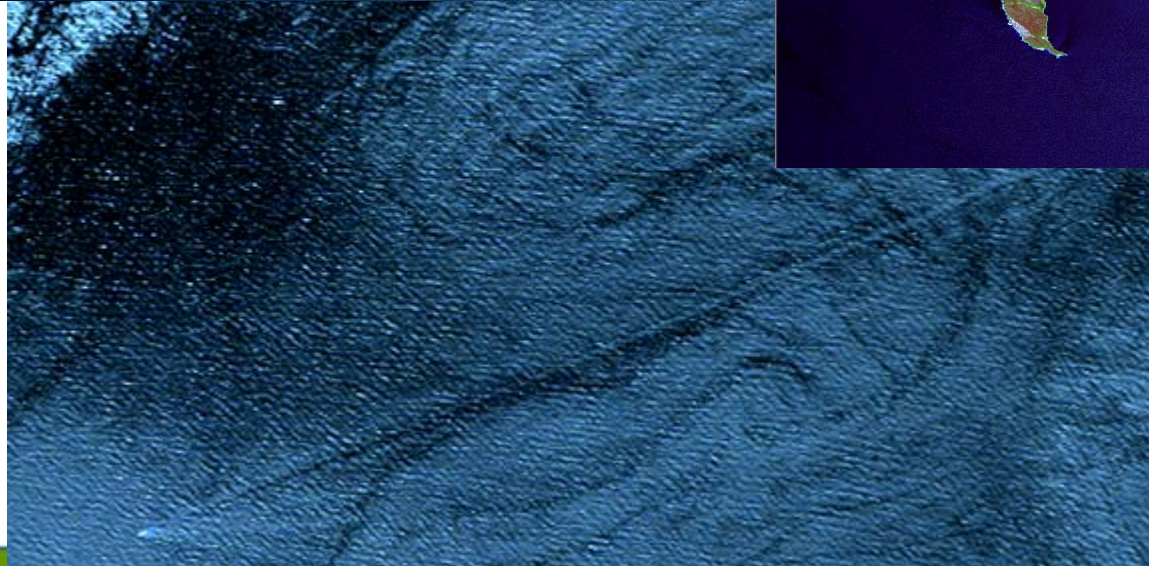
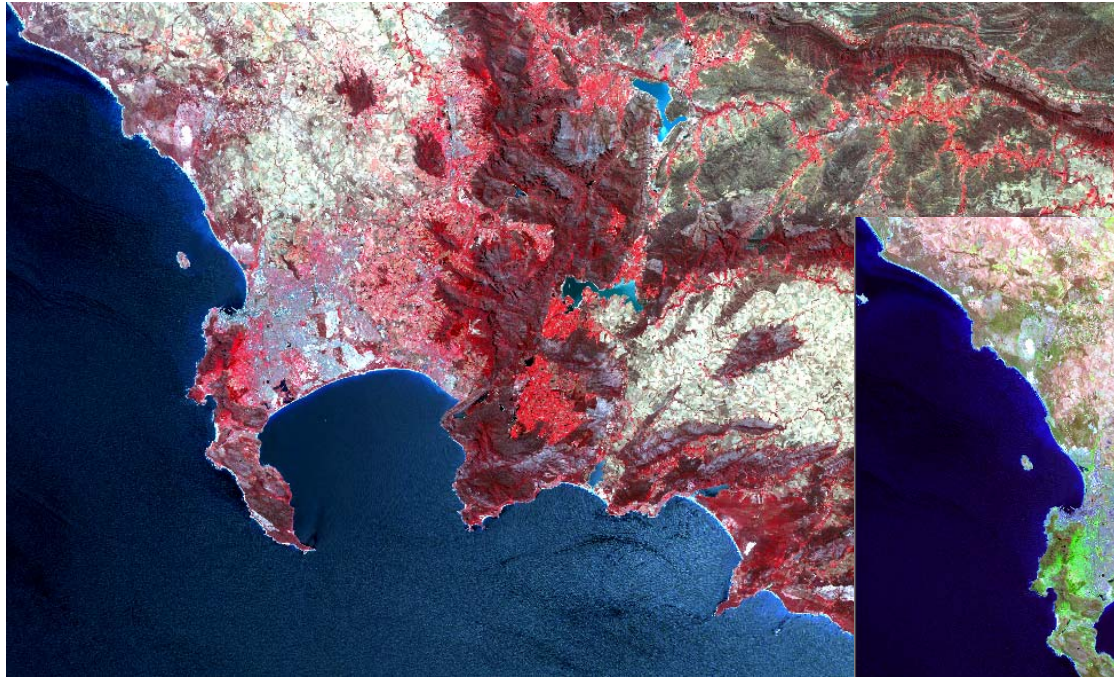
- LISS-3: 141 km swath, 23.5 m resolution (all bands).
 - B2: 0.52 - 0.59
 - B3: 0.62 - 0.68
 - B4: 0.76 - 0.86
 - B5: 1.55 - 1.70
- LISS-4: 23.5 km (Mx mode) & 70.3 km (mono) swath, 5.8 m resolution (all bands).
 - B2: 0.52 - 0.59
 - B3: 0.62 - 0.68
 - B4: 0.76 - 0.86
- AWiFS: 737 km combined swath, 56 m resolution at nadir, 70 m resolution at field edges.
 - B2: 0.52 - 0.59
 - B3: 0.62 - 0.68
 - B4: 0.76 - 0.86
 - B5: 1.55 - 1.70

IRS-P6 THREE TIER IMAGING



Advanced WiFS Camera (AWiFS)

- **Sensor:** 6 K CCD
- **Spectral bands:** 4bands (0.52 - 0.59, 0.62 - 0.68, 0.77 - 0.86 and 1.5 - 1.7 μ)
- **Swath:** 740 Km
- **Ground Resolution:** 56 m at Nadir, 70 m at edge (Average 60m).
- **Radiometric Resolution:** 10 Bits
- **SNR:** > 512
- **BBR:** < 0.25 pixel
- **Repetivity:** 5 days



LISS-3 Sensor

Sensor: 6 K CCD per band
Spectral bands: 4
Swath: 140 Km
Ground Resolution: 23.5 meter pixel in all 4 Bands



- **Radiometric Resolution:** 7 bits selected over 10 bits
- **BBR:** < 0.25 pixel
- **Repetivity:** 24 days

LISS-4 Sensor

- **Sensor:** 12 K CCD per band
- **Spectral bands:** 3 bands (0.52-0.59, 0.62- 0.68 and 0.77- 0.86 μ)
- **Swath, MSS Mode:** 23.9 km, selectable over 70 Km
- **Swath, Pan Mode:** 70 km in red band
- **Ground Resolution:** 5.8 meter pixel in all 3 bands
- **Radiometric Resolution:** 7 Bits selectable over 10bits
- **Steering Capability:** \pm 26 degrees
- **BBR:** < 0.25 pixel
- **Revisit Capability:** 5 days

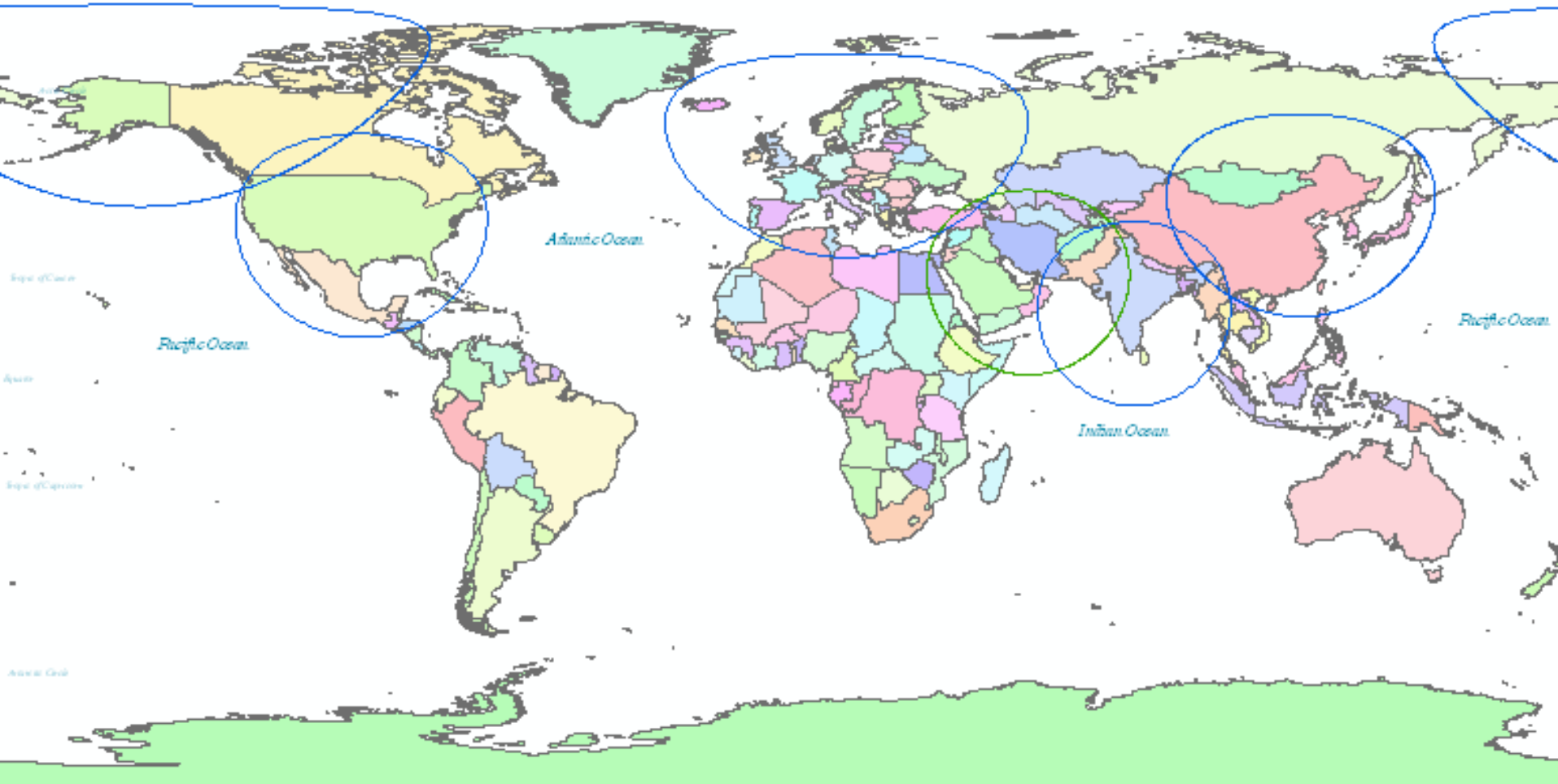


Kuwait City



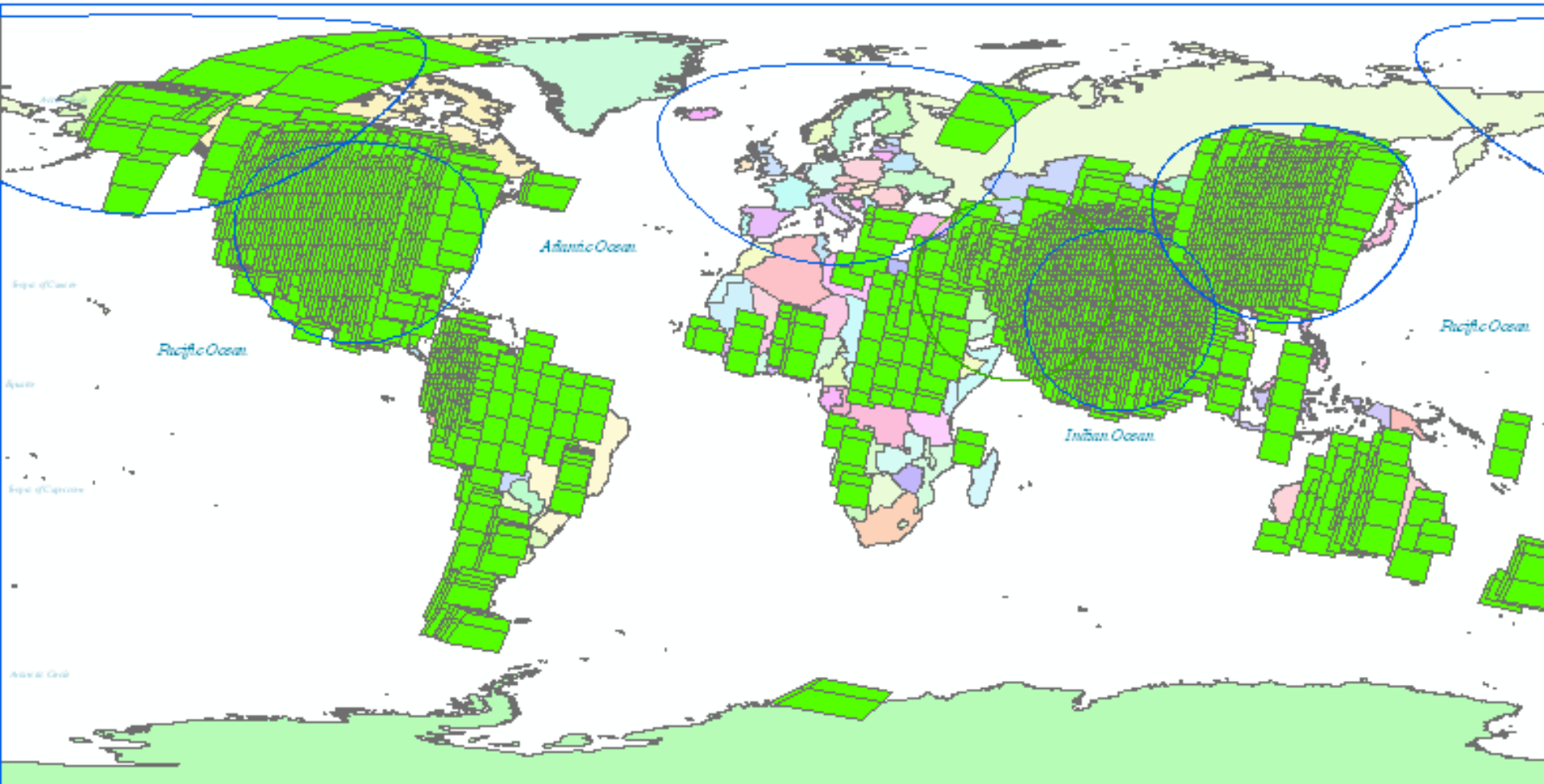
Palm Island Dubai

Resourcesat Ground Stations



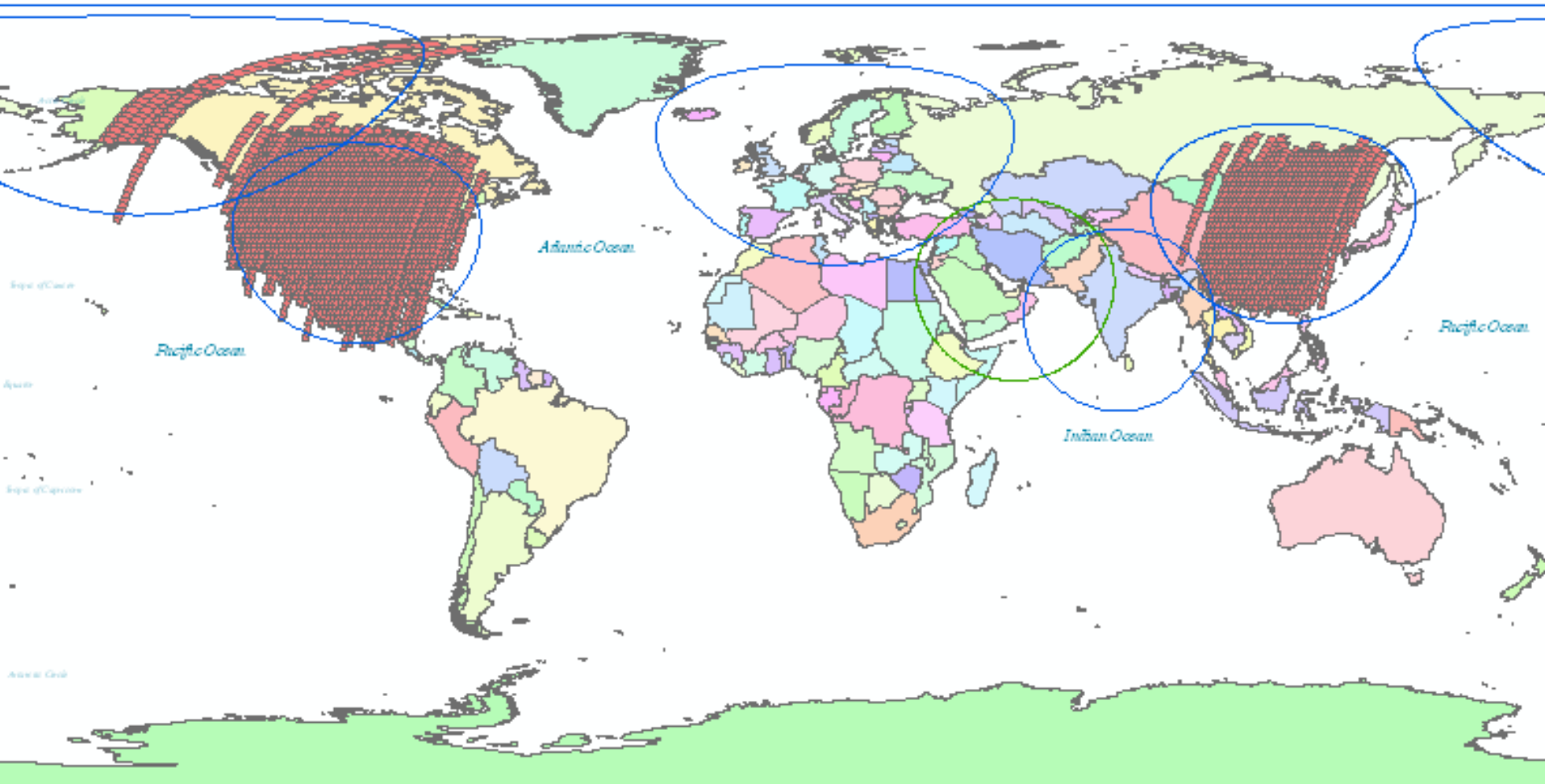
AWiFs Data Coverage

Germany station coverage to be added



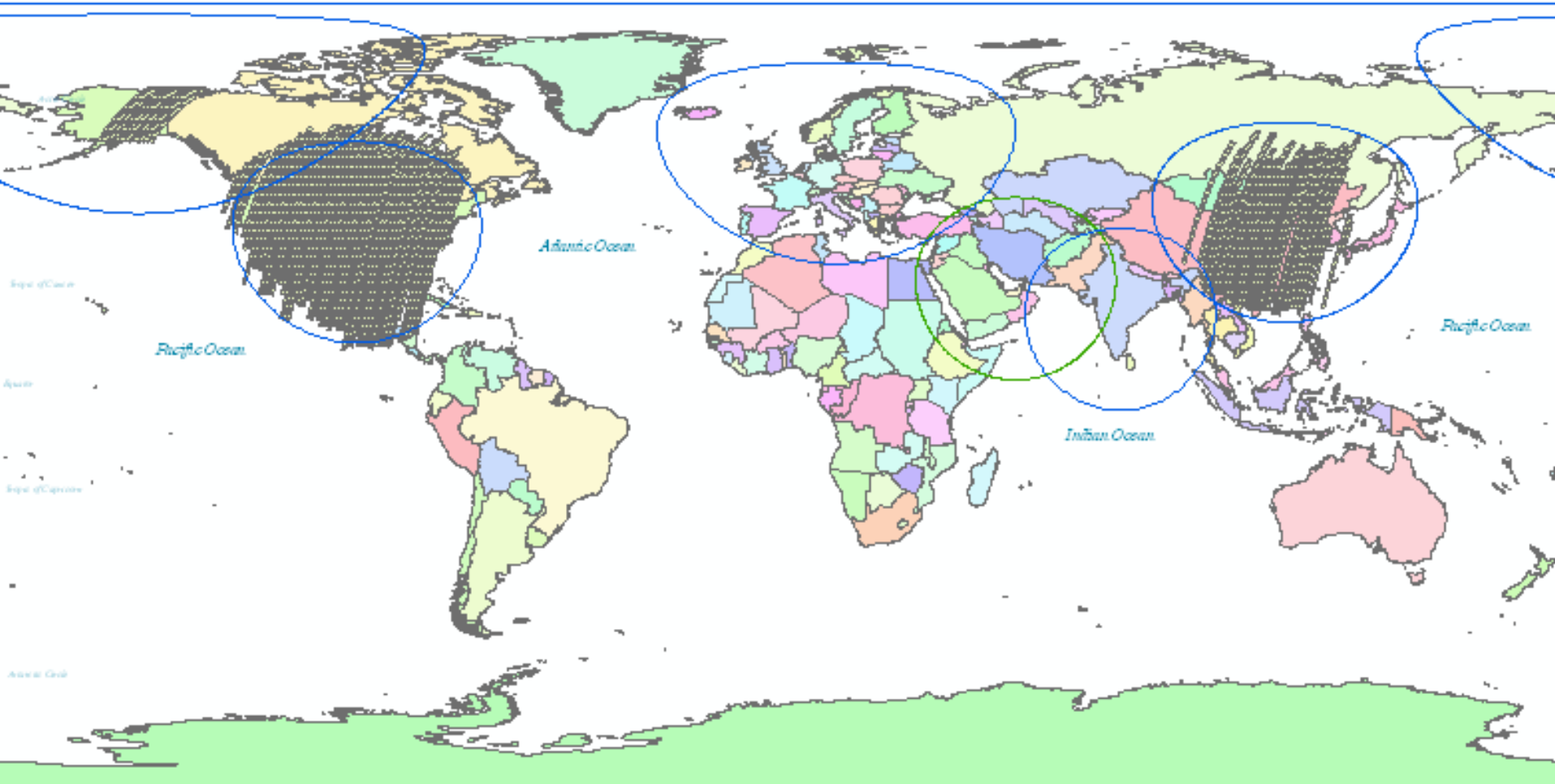
LISS III Data Coverage

Germany, India and OBSSR to be added

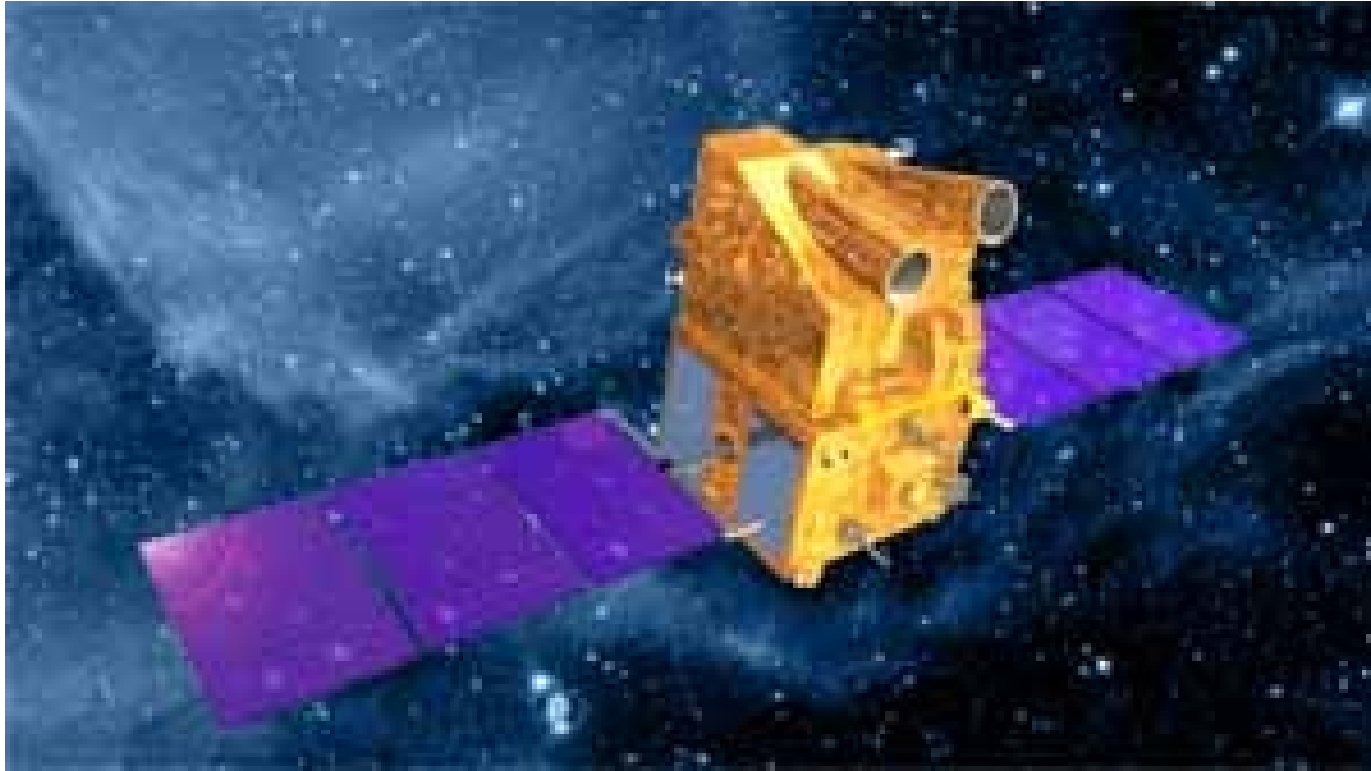


LISS IV Data Coverage

Germany, India and OBSSR data to be added

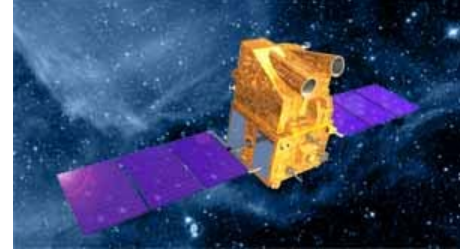


CARTOSAT-1 was Launched on 5/5/05

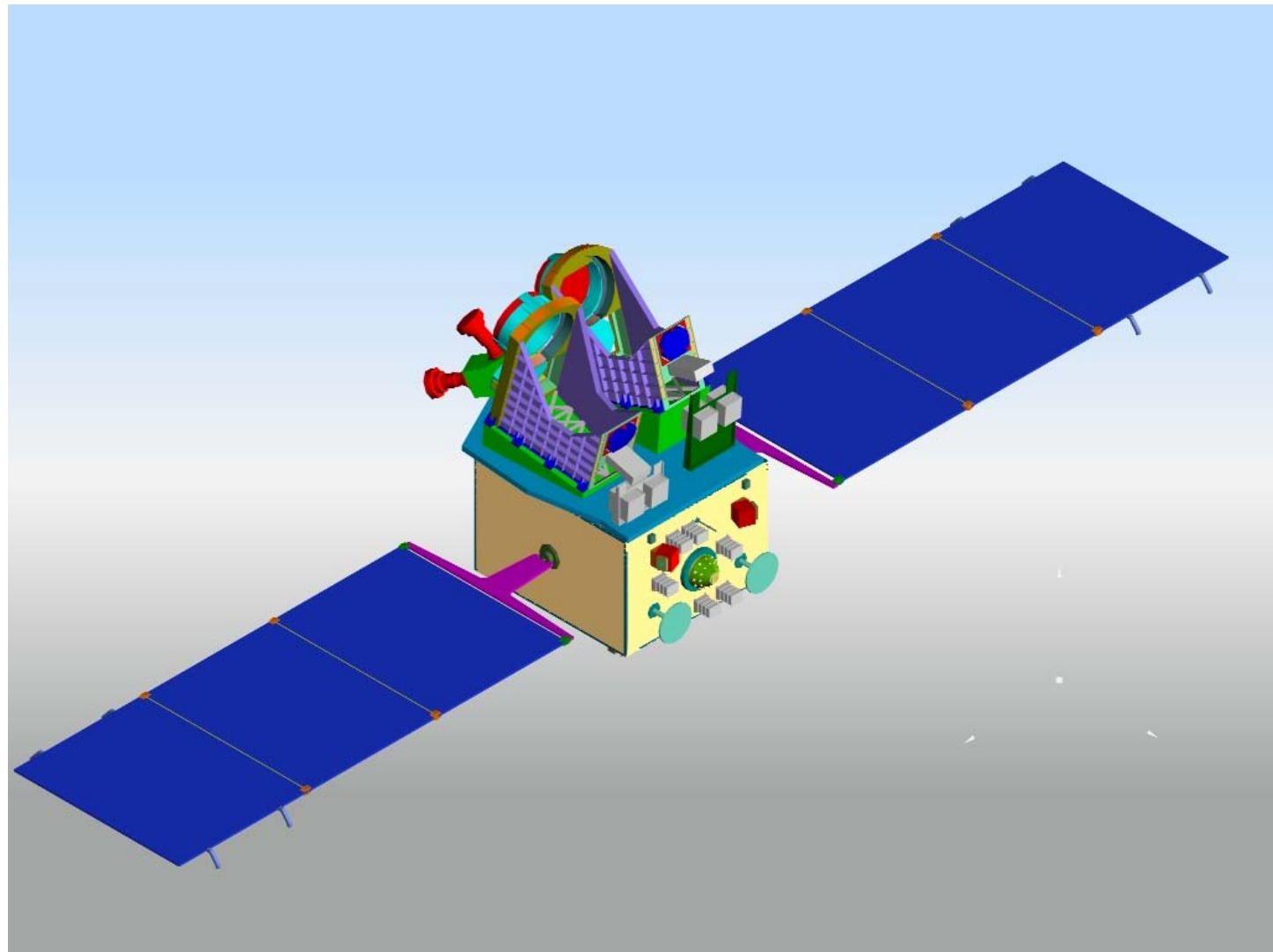


Indian Space Research Organization (ISRO)
Launched the Cartosat-1
from Satish Dhawan Space Center, Sriharikota, India
on 5th May 2005

Mission Specifications

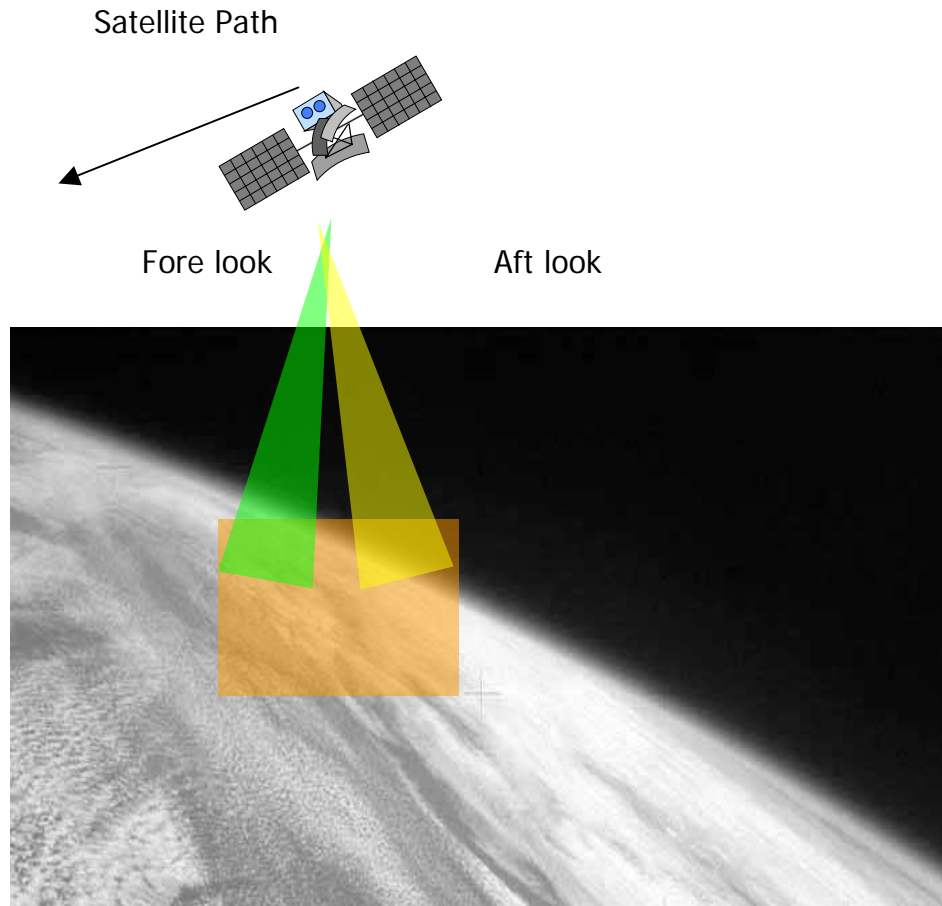


Orbit	Polar sun-synchronous
Orbital Altitude	618 km
Local time	10:30 AM
Revisit	5 days
Repetition	126 days
Orbits/day	14
Period	97 minutes

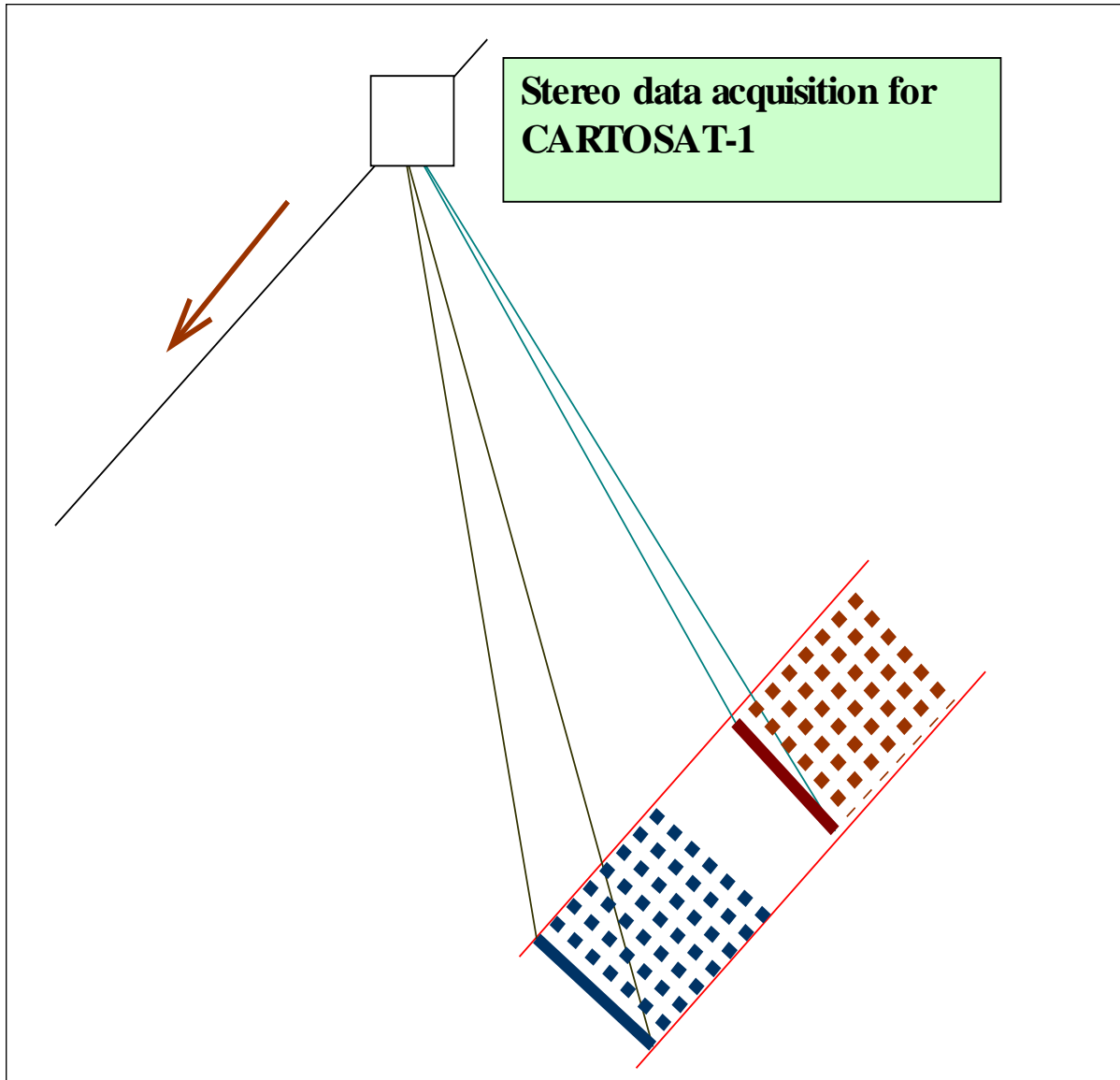


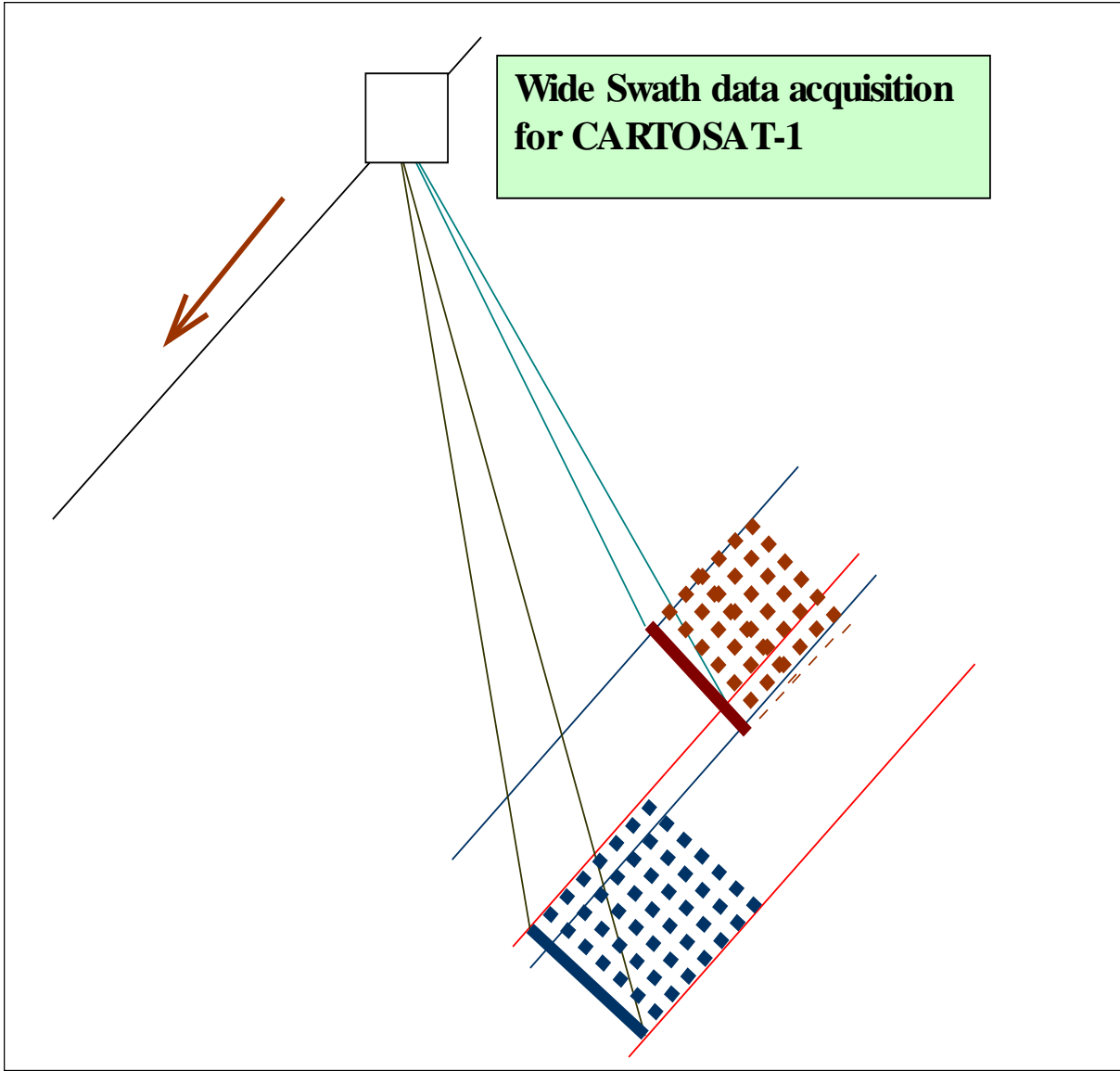
Cartosat-1 PAN Sensor

Real time stereo viewing



- Better than 2.5 m resolution
- Two Pan cameras - fore with 26 deg. and aft with -5 deg. Tilt (500 nm- 850 nm)
- Swath 26 km for stereo and 55 km for monoscopic mode.
- 8 km overlap between adjacent paths
- 10 bits
- Facility for across track tilt to give better revisit





Cartosat-1 Data Products Available from NRSA, India

AOI Based products (MONO and Stereo) - Digital data

- User Area Of Interest is given as multiple scenes - different dates of acquisitions,
-which are tiled but not Radiometrically matched
- Minimum area of 25*25 Sq Km.
- Location accuracy will be better than 250m
- These products are supplied as:
 - Radiometrically Corrected- LGSOWG format- CD-ROM/DVD (MONO & Stereo) with RPC File
 - Systematic - GEOTIFF format- CD-ROM/DVD (MONO)
 - Ortho Kit – With Systematic corrections and RPC file- Fast Format- CD-ROM/DVD(MONO)

Cartosat-1 Data Products(Contd.,)

Precision Georeferenced Products

- These are mosaiced Ortho rectified products best Radiometric match is attempted
- Location Accuracy will be better than 25 m

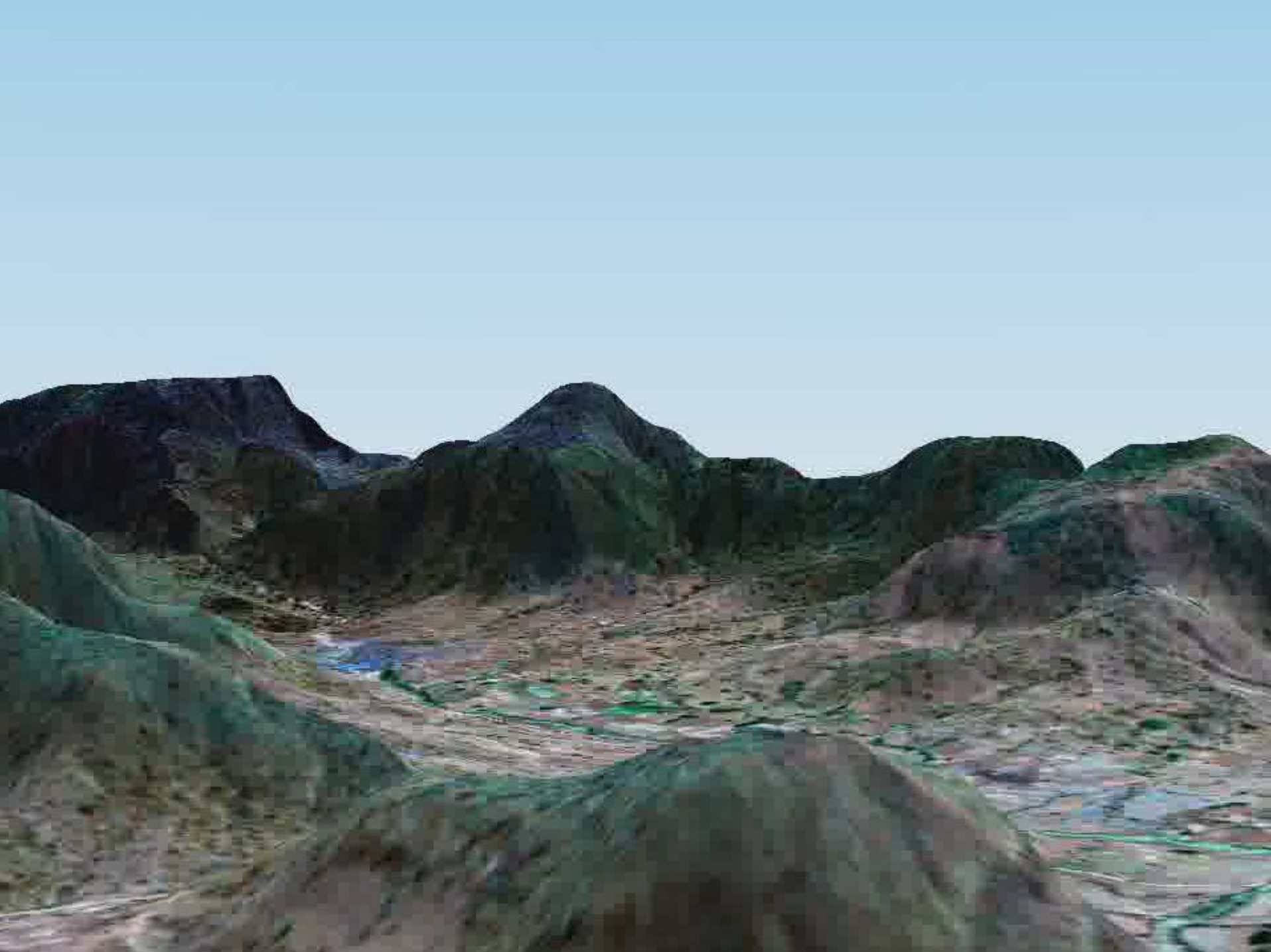
Area Coverage <u>Map sheet based /Float</u>	Level of processing	Photoprints Scale	Digital Data Format/Media
7.5' * 7.5' (14 Km * 14 Km) <u>Float</u>	Ortho	1:25,000	GEOTIFF(RGB)/CDROM
5' * 5' (9 Km * 9 Km)	Ortho	1:12,500	GEOTIFF/CDROM
2.25' * 2.25' (4 Km * 4 Km)	Ortho	1:5,000	GEOTIFF/CDROM
3.75' * 3.75'	Ortho	1:10,000	GEOTIFF/CDROM

Cartosat-1 Data Products (Cont.)

Merged Georeferenced Products

Sensors: IRS-P6(L-IV MX)+ IRS-P5 (2.5 m color)

Area Coverage	Level of processing	Photoprints Scale	Digital Data Format/Media
<u>Float</u> 5' * 5' (9 Km * 9 Km)	Ortho	1:12,500	GEOTIFF/CDROM
2.25' * 2.25' (4 Km * 4 Km)	Ortho	1:5,000	GEOTIFF/CDROM
3.75' * 3.75'	Ortho	1:10,000	GEOTIFF/CDROM



San Diego, Airport, USA



San Diego, USA



Denver, Downtown, USA





Pyongyang, North Korea
Anaglyph

Pyongyang, North Korea
Anaglyph



Thanks