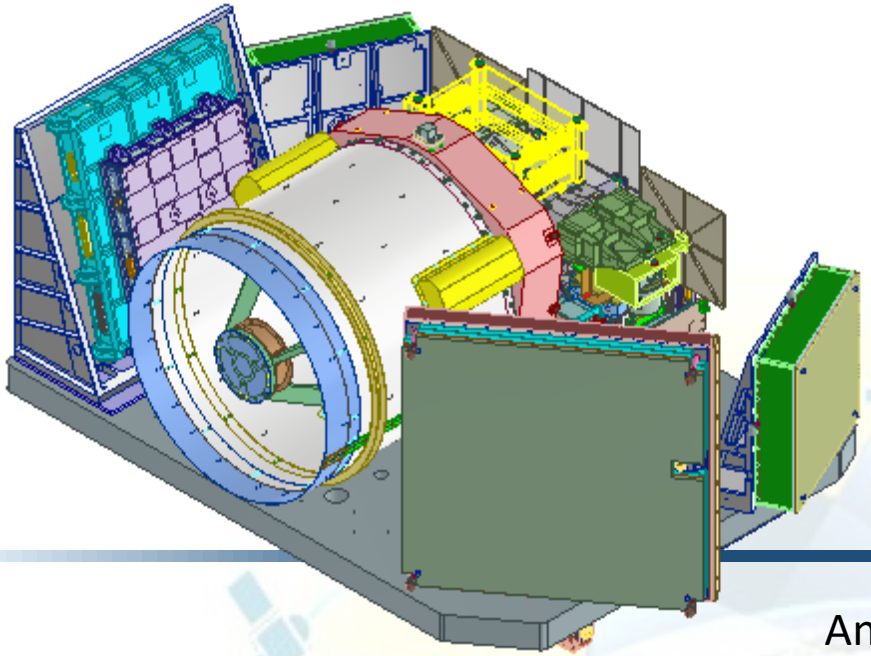


India's MicroSat Mission for GNSS Reflectometry Applications

Ananya Ray
Space Applications Centre/ISRO

GNSS Reflectometry

Receive only systems

Salient Features

Receiver Only

High Temporal resolution

Bistatic Radar

Low cost

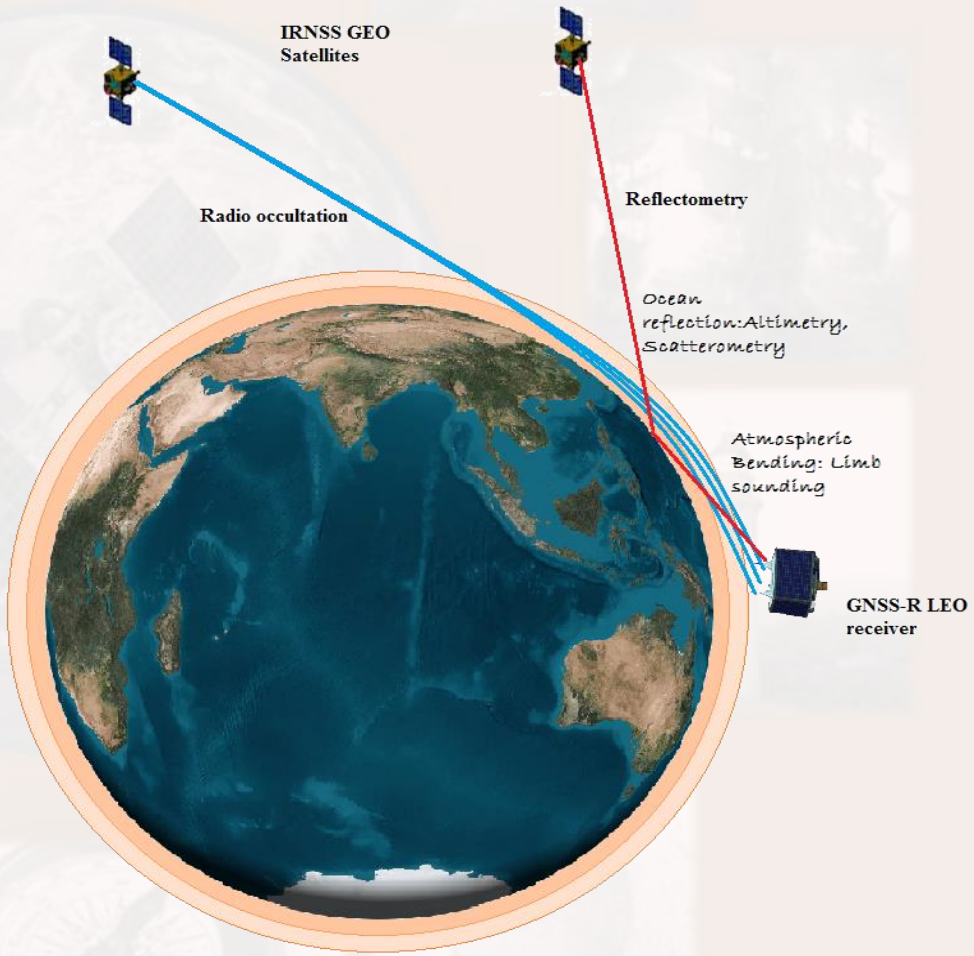
Comparable Resolution

Wind data over Cyclone Eye

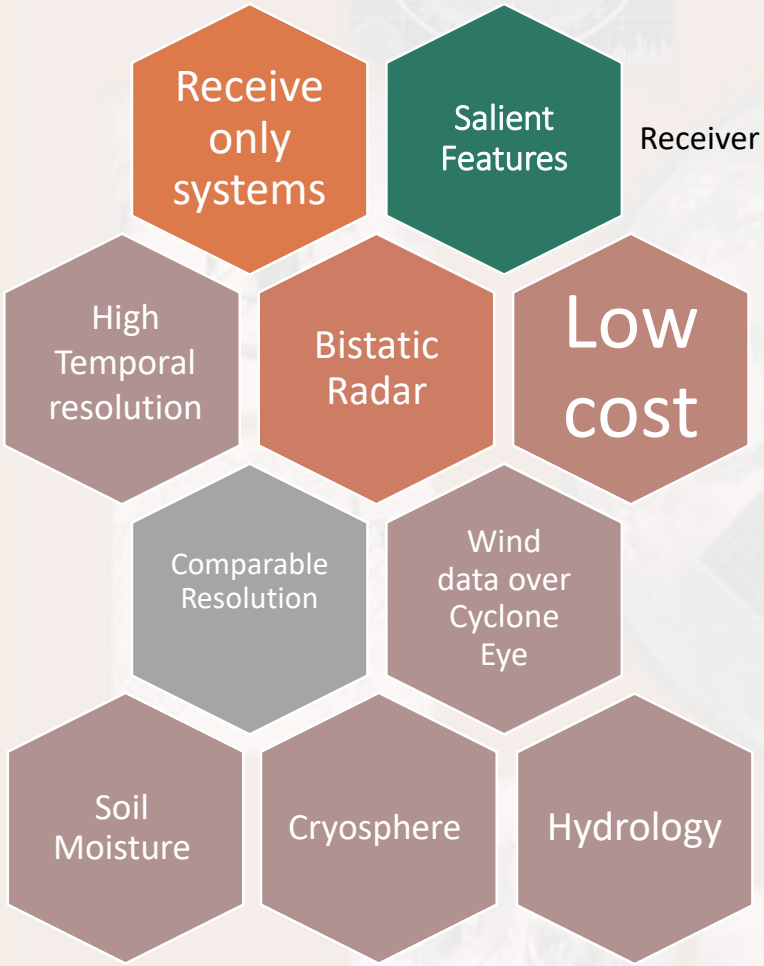
Soil Moisture

Cryosphere

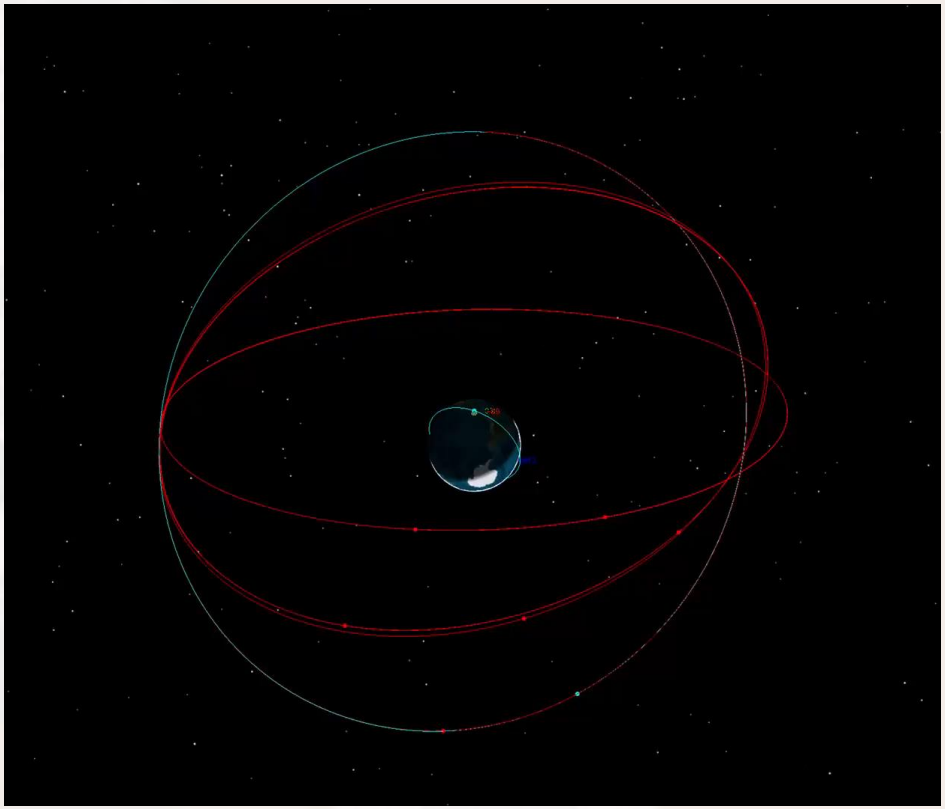
Hydrology



GNSS Reflectometry



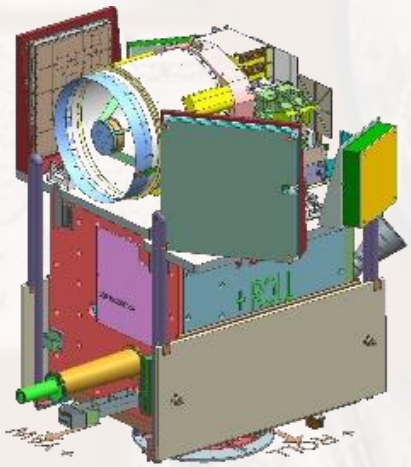
Receiver Only



MicroSAT 2C Satellite

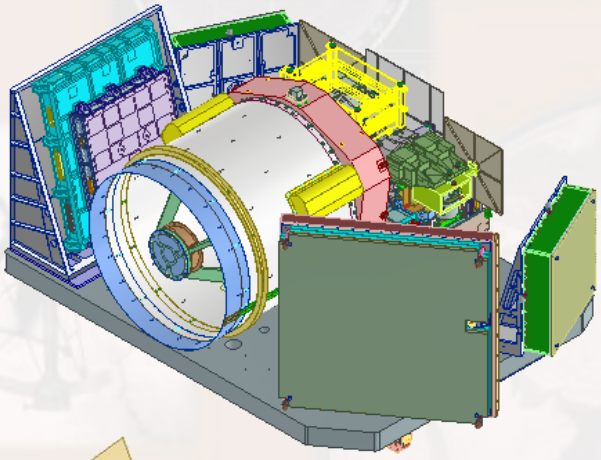
Goal

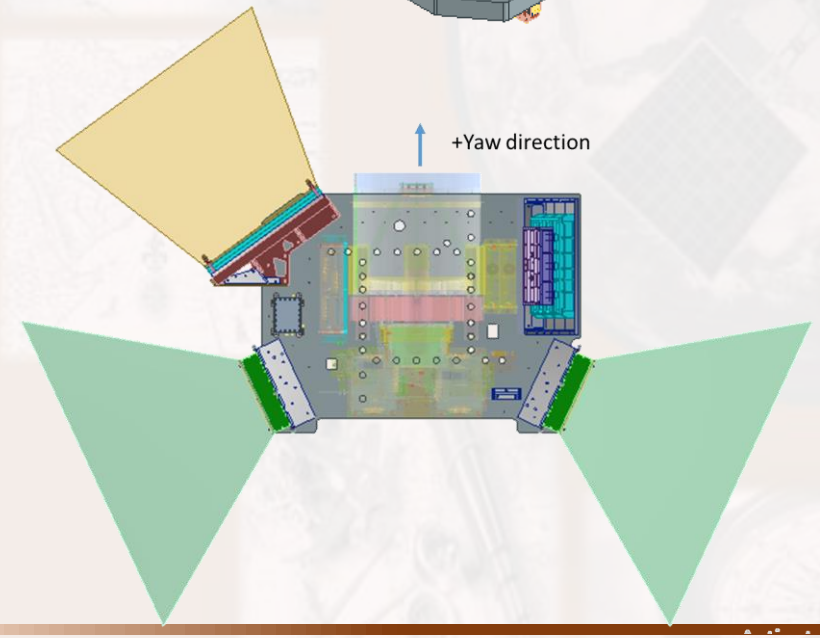
New Technology demonstration in Payloads and satellite bus configurations



Parameter	Specifications
Spacecraft Mass	~165 kg.
Orbit Altitude	~500-525 km
Orbit Inclination	>37°
Orbit Type	Circular
Orbital Period and ECT	Varies in each orbit
Eclipse Duration	Varies from 25 to 37 mins (varies from Orbit to Orbit)
Mission Life	12 months
Launch Vehicle interface	IBL-298

GNSS-Reflectometry Payload





Parameter	Specification
Orbit	~500 km
Inclination	37˚
Foot print dimensions	515km x 371 km
Bands	GPS- L1(1575.42 MHz ± 1.25 MHz) and IRNSS L5 (1176.45 MHz ± 1.25 MHz)
Reflectometry Polarization	LHCP
Spatial Resolution	~ 15 km x 15 km over ocean to up to 1 km x 1 km over land
Power (Raw Bus)	~ 42.5W max
Weight	~19 kg with 3 (2+1) antennas
Data rate	Raw data mode: 80 Mbps Processed mode: 3-60 Mbps
Min promised detectable NBRCS	12 dB
Min Pormised Reflectivity **Detection Target (over land/ in-land water bodies)**	-20 dB
$\Delta\sigma_0$	< 0.45 dB
Operation Regions	Ocean, Land, Ice

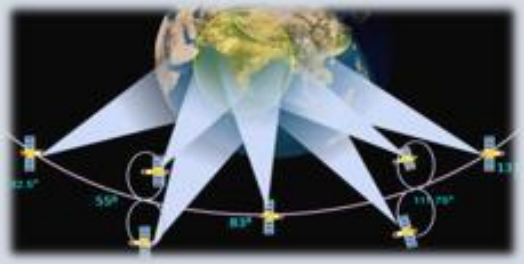
Remote sensing Applications

Objectives :

To demonstrate the capability of using GNSS-R based remote sensing to derive applications as follows:

- **Ocean Surface Winds:**
  - *Baseline product*
    - 0-25 m/s wind speed detection within the accuracy < 1.5 m/sec. **[routine]**
    - Global gridded ocean wind speed with latency as appropriate under mission sampling frequency **[routine]**
  - *R & D products:*
    - Ocean wind speed > 25 m/s with accuracy better than 20% during tropical cyclone ground track only. [opportunity-based]
    - Ocean surface wind direction (0 - 360 degree, uncertainty 30-40 degree; highly experimental product for normal wind speed range) [routine]
- **Soil moisture**
  - *Baseline Product (standalone):*
    - Surface Soil Moisture Product over Indian cropland (ranges from 0.05 to 0.55 m3/m3)
    - SM accuracy better than 0.08 m3/m3 (ubRMSE) over VWC <5kg/m2
  - *R & D Product:*
    - Merged Quasi-Global Surface Soil Moisture product using ISRO's GNSS-R data and CYGNSS datasets with improved spatio-temporal coverage.
    - SM accuracy better than 0.04 m3/m3 (ubRMSE)
- **Other applications:**
  - Cryosphere applications over Himalayan Region
  - Flood inundation detection
  - In-land waterbody detection
  - Above ground Biomass estimation

Being the first mission of its kind from ISRO, and first in global missions to cover L1 and L5 bands simultaneously. The higher EIRP of IRNSS satellites likely to have positive impacts for better sensitivity towards high wind speeds and low soil moistures.








Thank You