Status of Indian Satellite Meteorological Programme

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Indian Meteorological Satellite Missions

- **Payload and Satellite: Design & Fabrication**
  - Geostationary: Optical
  - Polar Orbiting: Thrust on Microwave (Passive/Active)

- **Launch**:
  - Polar: Operational
  - Geostationary: Operational

- **Signal and Data Processing, Retrievals, Validation**

- **Data Archival and Dissemination**
  - Meteorological & Oceanographic Satellite Data Archival Center (MOSDAC)

- **Calibration & Validation (CALVAL)**

- **Applications with Users**
  - Operational
  - R & D (National Institutions and Academia)
Indian Missions for Weather & Climate Studies: Current & Future

Kalpana-1
2002
CMV, OLR, UTH, Rain

INSAT-3A
(2003)
CMV, OLR, UTH, Rain, Aerosol

INSAT-3D
(2010)
SST, CMV, OLR, UTH, Rain, T-q Profile, O3

INSAT-3D R
Geo-HR
(~2012)

Follow-up
(~2015)

OCEANSAT–1/2
(1999/2009)
MSMR, OCM, Scatterometer ROSA (GPS)

Vector Winds, Aerosol, T&h Profile

SARAL
(2011)
Altimeter

MEGHA-TROPIQUES
(2011)
MW Imager, WV Sounder, ScaRaB ROSA

SS Wind, TWV, Rainfall T, h Profile, Radiation Budget

GEO

CMV, OLR, UTH, Rain

VHRR

VHRR, CCD

6-Ch VHRR 19-Ch Sounder

SSH, Waves, Winds

LEO
INSAT-3A & Kalpana-1

Location
- INSAT 3A: 93.5°E
- Kalpana-1: 74°E

Payload
- (i) VHRR & CCD camera in INSAT 3A
- (ii) VHRR in Kalpana-1

- **VHRR Bands (µm)**
  - Visible: 0.55 – 0.75
  - Water vapour: 5.70 – 7.10
  - Thermal Infra Red: 10.5 – 12.5

- **Resolution (km)**
  - 2 X 2 for Visible
  - 8 X 8 for TIR and WV

- **CCD Camera Bands (µm)**
  - Visible: 0.62 – 0.68
  - Near Infra Red: 0.77 – 0.86
  - Short Wave Infra Red: 1.55 – 1.69

- **Resolution (km)**
  - 1 X 1 for all bands
INSAT - 3D

6 Channel IMAGER

- Spectral Bands (µm)
  - Visible: 0.55 - 0.75
  - Short Wave IR: 1.55 - 1.70
  - Mid Wave IR: 3.80 – 4.00
  - Water Vapour: 6.50 - 7.10
  - Thermal IR – 1: 10.30 - 11.30
  - Thermal IR – 2: 11.50 - 12.50
- Resolution: 1 km for VIS, SWIR
  - 4 km for MIR, TIR
  - 8 km for WV

19 Channel SOUNDER

- Spectral Bands (µm)
  - Short Wave IR: Six bands
  - Mid Wave IR: Five Bands
  - Long Wave IR Bands: Seven
  - Visible: One Band
- Resolution (km):
  - 10 X 10 for all bands
- No of simultaneous sounding per band: Four
Oceansat-II

- **Instruments:**
  - Scatterometer Ku band (13.515 GHz)
  - Ocean Colour Monitor (8 bands 0.4-0.885 µm)
  - Radio Occultation ROSA

- **Launched**
  - 23 September 2009

- **Applications:**
  - Sea State Forecast: Waves, Circulation and MLD
  - Monsoon and Cyclone Forecast
  - Antarctic Sea Ice
  - Fisheries and Primary productivity estimation
  - Detection and monitoring of Phytoplankton blooms
  - Sediment dynamics
Megha Tropiques

For studying water cycle and energy exchanges in the tropical belt

Low inclination (20°) for frequent simultaneous observations of tropics

- Water vapour
- Clouds
- Cloud condensed water
- Precipitation
- evaporation

Contribution to GPM and GEWEX

SAPHIR
- 183 GHz WV Sounder
- Six atmospheric layers upto 12 km height
- 10 km Horizontal Resolution

SCARAB
- Outgoing fluxes at TOA
- 40 km Horizontal Resolution

MADRAS
- Precipitation and cloud properties
- 89 & 157 GHz : ice particles in cloud tops
- 18 & 37 GHz: cloud liquid water and precipitation
- 23 GHz : Integrated water vapour
- T & q profile

ROSA
AltiKa Mission: Global altimetry system for the precise and accurate observations of ocean topography, circulation and sea surface monitoring

launch Date: 2011

AltiKa Payload:
- A Ka-band (35.75 GHz, BW 500 MHz) radar altimeter
- A dual-frequency MW radiometer (23.8 and 37 GHz), for tropospheric range correction
- DORIS: For achieving adequate orbitography performances
- LRA: For Orbitography and system calibration

AltiKa/SARAL central objective:
Ocean meso-scale variability: Sea state Monitoring & Now Casting
Data assimilation: Sea state forecasting
Coastal altimetry: Bathymetry, coastal upwelling, Circulations etc.

Satellite Description:
- Sun-synchronous, polar orbiting
- inclination: 98.38 Deg.
- Altitude: ~800 km
- Repeat cycle: 35 days
Future Geostationary Satellites

- **INSAT 3D Repeat (~2012)**
- **Follow-up of INSAT-3D (~2015)**
- **Geo – HR (~2012)** [name yet to be frozen]
  - Visible – 50 m
  - 3 Channel IR – 1.5 Km
  - Visible and SWIR Hyper-spectral – 500 m
    - 50 – 60 channels in VIS
    - 50 – 60 channels in SWIR
  - For general remote sensing, can also be used for meteorological purpose

- **Microwave Temperature Sounder (Definition stage)**