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)

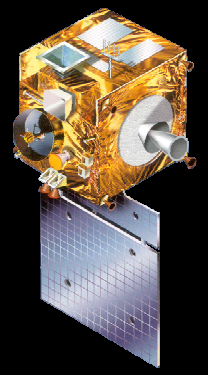
PSLV

GSLV

Indian Missions for Weather & Climate Studies : Current & Future

GEO

Kalpana-1
2002



VHRR

CMV, OLR, UTH,Rain

INSAT-3A
(2003)

VHRR, CCD

CMV, OLR, UTH,
Rain, Aerosol

INSAT-3D
(2010)

6-Ch VHRR
19-Ch Sounder

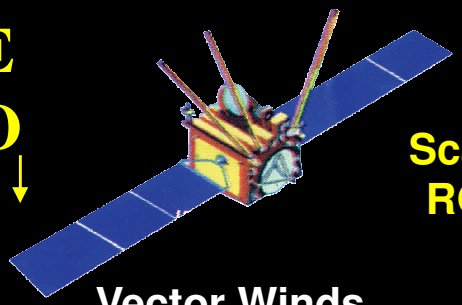
SST, CMV, OLR, UTH,
Rain, T-q Profile, O_3

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

- Follow-up
(~2015)

LEO

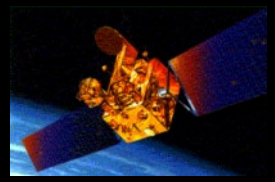
OCEANSAT–1/2
(1999/2009)



MSMR,
OCM,
Scatterometer
ROSA (GPS)

Vector Winds,
Aerosol, T&h Profile

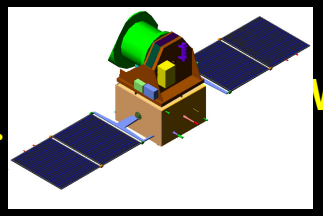
SARAL
(2011)



Altimeter

SSH, Waves, Winds

MEGHA-TROPIQUES
(2011)



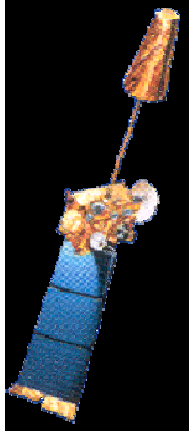
MW Imager,
WV Sounder,
ScaRaB
ROSA

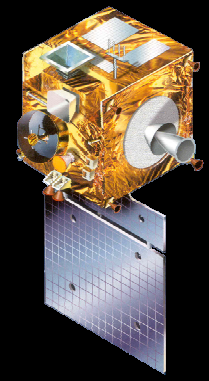
SS Wind, TWV, Rainfall
T, h Profile,
Radiation Budget

INSAT-3A & Kalpana-1

Location : INSAT 3A : 93.5ºE
Kalpana-1 : 74ºE

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

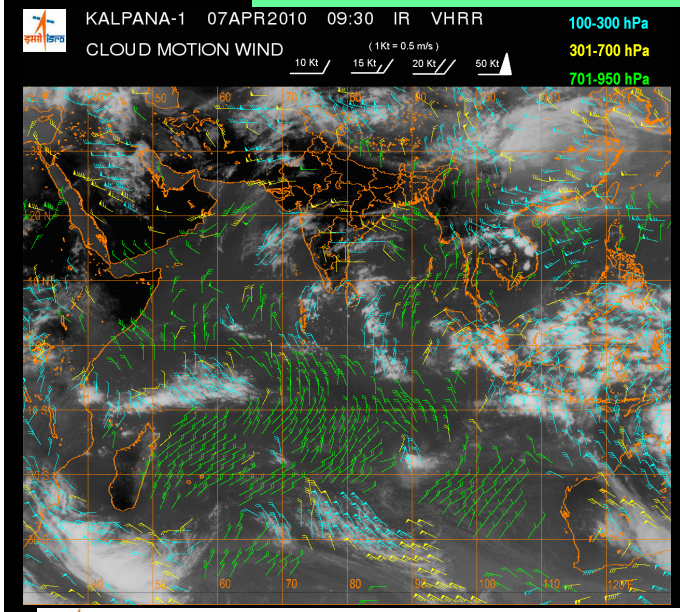


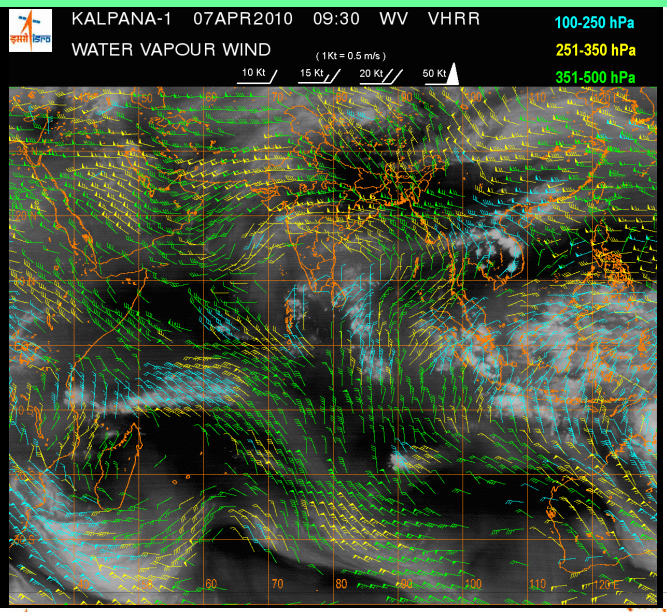


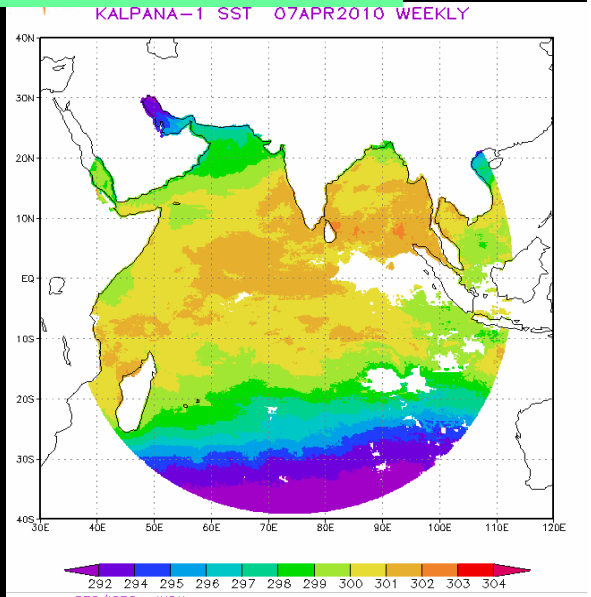
- VHRR Bands (µm)
  - Visible : 0.55 – 0.75
  - Water vapour : 5.70 – 7.10
  - Thermal Infra Red : 10.5 – 12.5
- Resolution (km) : 2 X 2 for Visible
  8 X 8 for TIR and WV

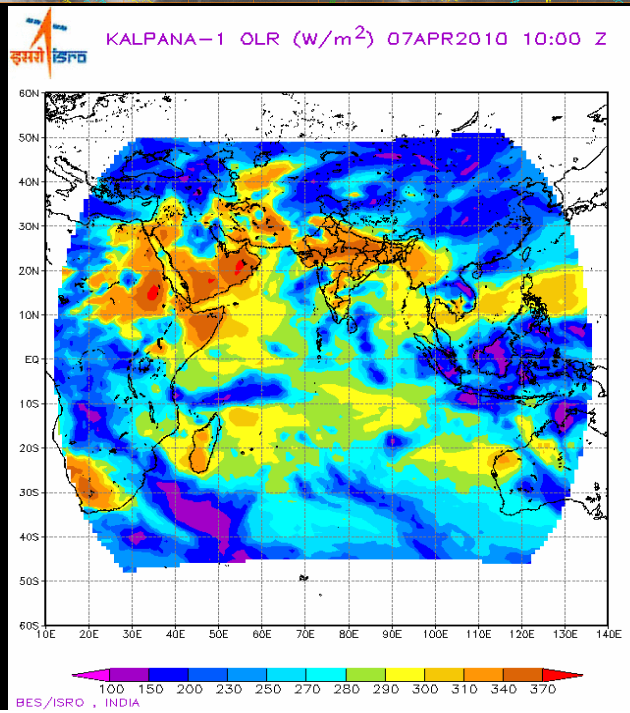
- CCD Camera Bands (µm)
  - Visible : 0.62 – 0.68
  - Near Infra Red : 0.77 – 0.86
  - Short Wave Infra Red : 1.55 – 1.69
- Resolution (km) : 1 X 1 for all bands

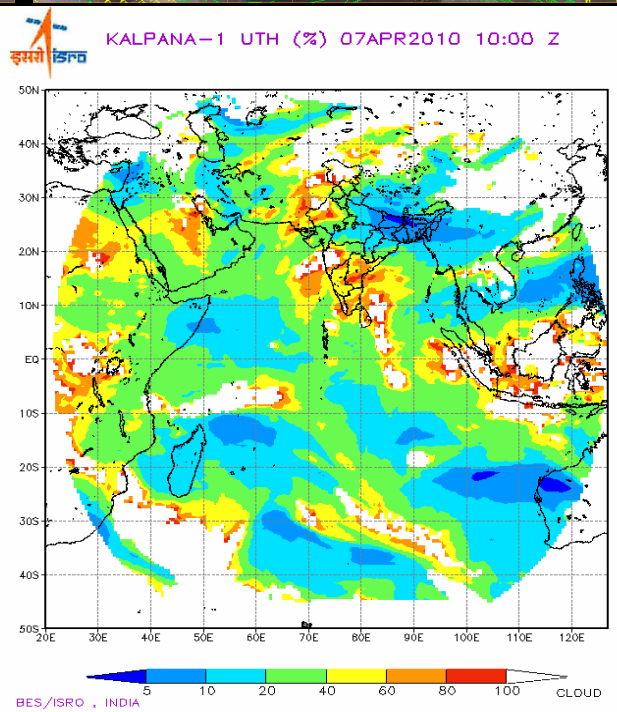
Kalpana-1 Products (IMDPS)

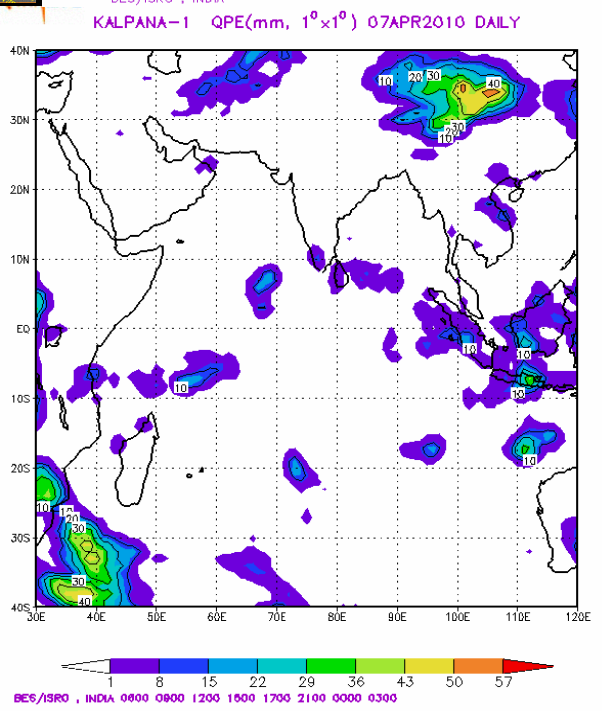












INSAT - 3D

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

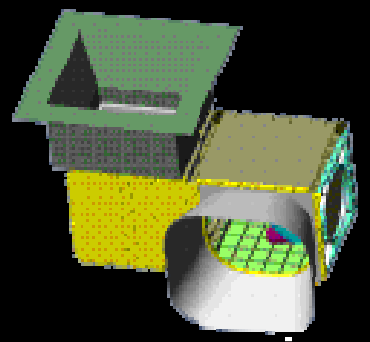
- Resolution : 1 km for VIS, SWIR
  4 km for MIR, TIR
  8 km for WV

19 Channel SOUNDER

- Spectral Bands (µm)

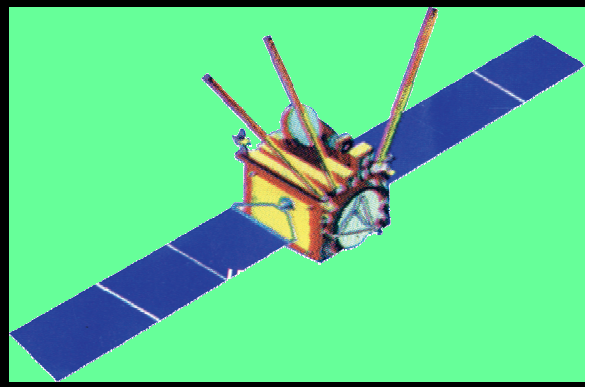
Short Wave IR	: Six bands
Mid Wave IR	: Five Bands
Long Wave IR Bands	: Seven
Visible	: One Band

- Resolution (km) : 10 X 10 for all bands
- No of simultaneous sounding per band : Four



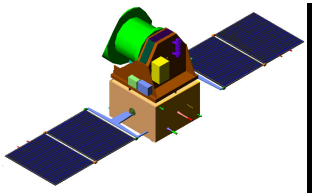
Oceansat -II

- **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



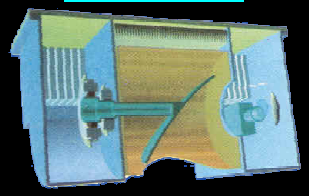
Megha Tropiques

For studying water cycle and energy exchanges in the tropical belt

Low inclination (20º) for **frequent simultaneous** observations of tropics

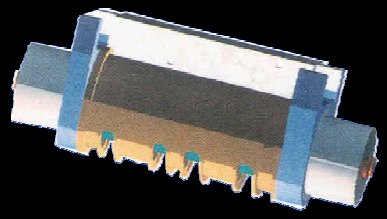
- Water vapour
- Clouds
- Cloud condensed water
- Precipitation
- evaporation

SAPHIR



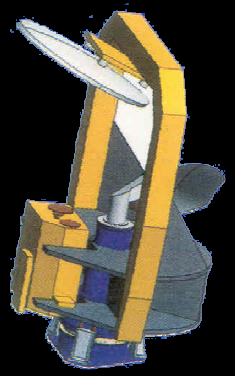
- 183 GHz WV Sounder
- Six atmospheric layers upto 12 km height
- 10 km Horizontal Resolution

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

Contributing to GPM and GEWEX

SARAL-AltiKa (ISRO-CNES)

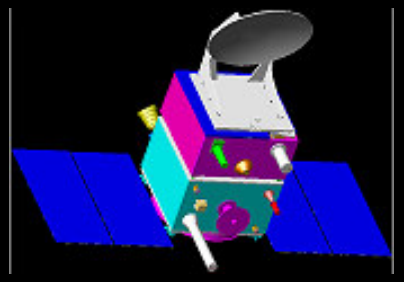
- **AltiKa Mission:** Global altimetry system for the precise and accurate observations of ocean topography, circulation and sea surface monitoring
- **launch Date: 2011**
- **AltiKa Payload :**
  - A Ka-band (35.75 GHz, BW 500 MHz) radar altimeter
  - A dual-frequency MW radiometer (23.8 and 37 GHz), 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)

International TOVS Study Conference, 17th, ITSC-17, Monterey, CA, 14-20 April 2010. Madison, WI, University of Wisconsin-Madison, Space Science and Engineering Center, Cooperative Institute for Meteorological Satellite Studies, 2011.