

An Overview of Indian Space Program



**Vikram Sarabhai Space Exhibition
(VSSE)**

Space Applications Centre (ISRO)

Microwave Remote Sensing: Principles and Applications

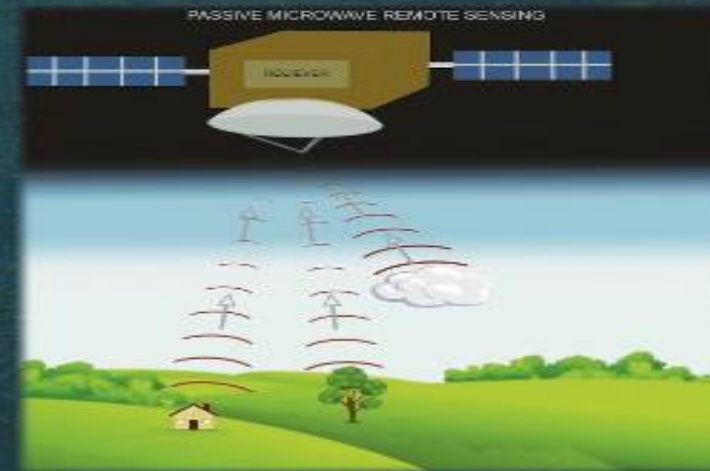
- Passive Microwave Sensors
 - Radiometers
 - Traditional
 - Interferometer
 - Polarimetric Radiometer
- Application of Passive Microwave Sensors
 - Sea ice.
 - Glacial ice
 - Soil Moisture.
 - Atmospheric sounding
 - Snow.
 - Vegetation.
 - Precipitation

Microwave Remote Sensing: Principles and Applications

MICROWAVE REMOTE SENSING

Microwave : WHAT IS COOKING?

Used a microwave oven for cooking or heating food? Microwaves are actually radio waves of smaller wavelength than used for radio. They can be used for many purposes including remote sensing or getting information about the earth's surface, atmosphere, and in some cases what's below the earth's surface too!



Microwave Remote Sensing: Principles and Applications

Why microwave Remote Sensing?

Microwaves can penetrate clouds and rain (light can't - can you tell why?)

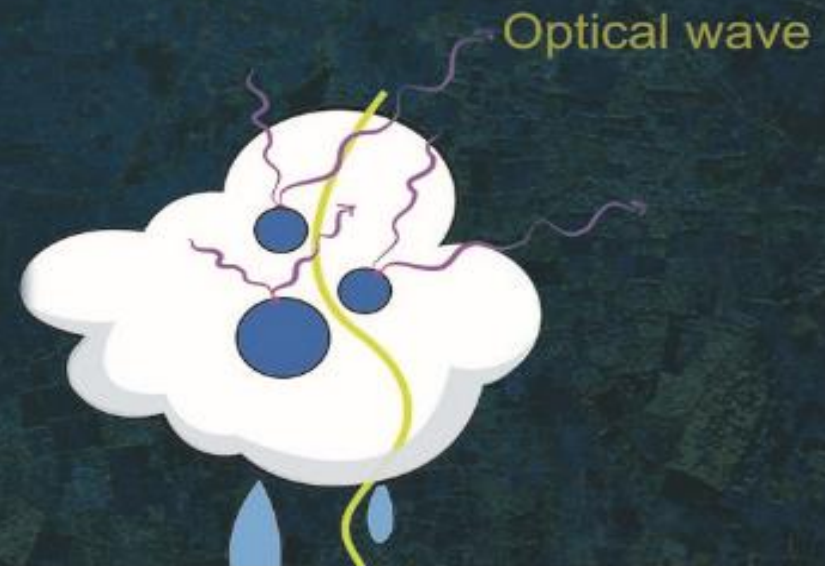
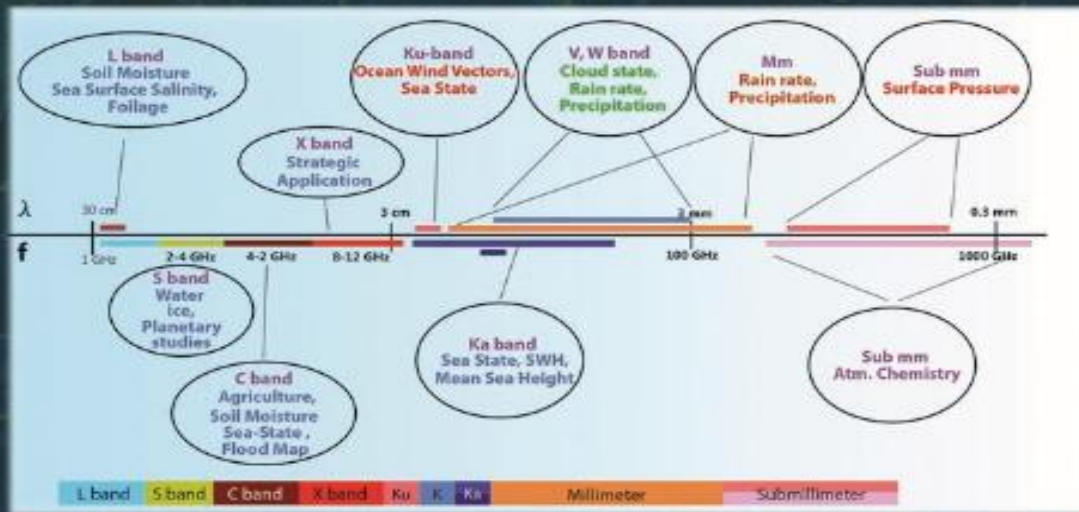
All Weather, Day/Night

It can work night or day !

Can detect moisture and water in the earth's surface

Can see through vegetation and many visual obstacles

Can measure many important things about weather and atmosphere



Microwave Remote Sensing: Principles and Applications

Kinds of Microwave 'Remote Sensors'

Use of microwaves for different purposes need different types of instruments. Here are some of them.

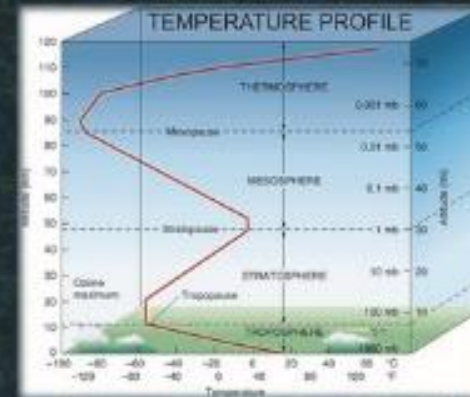
SYNTHETIC APERTURE RADAR



This radar is actually a 'microwave camera' that can take images through clouds and rain, day or night.

Micro wave

RADIOMETER / SOUNDERS



These can find important weather related information about atmosphere like temperature and other properties of different layers.

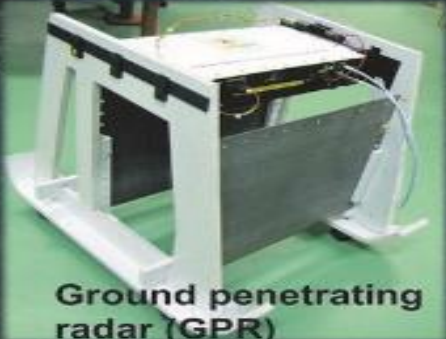
Microwave Remote Sensing: Principles and Applications

DOPPLER WEATHER RADARS



These are used from ground to study atmospheric disturbances and wind movement, useful in weather monitoring.

GROUND PENETRATING RADAR



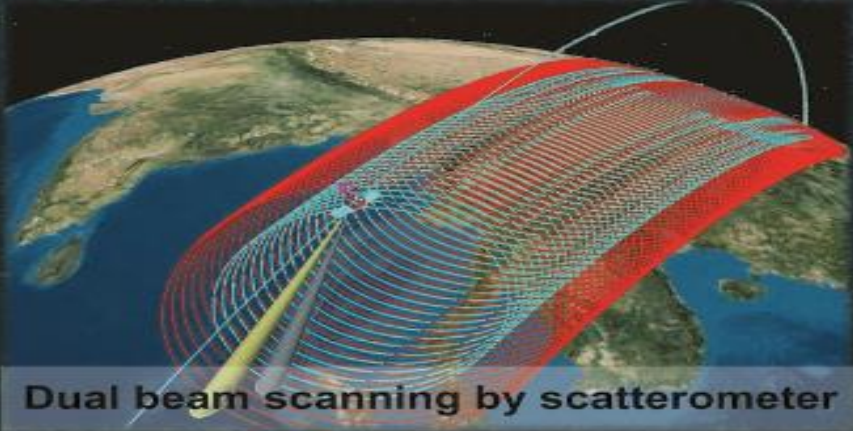
Ground penetrating radar (GPR)



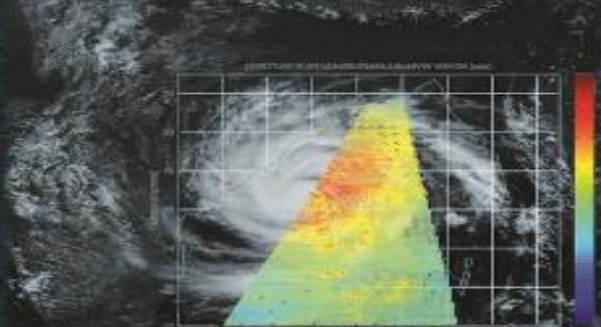
GPR operations in Antarctica

These are curious instruments that can actually see a little into the surface of the earth. Don't forget to take one if you are on a treasure hunt!

SCATTEROMETER



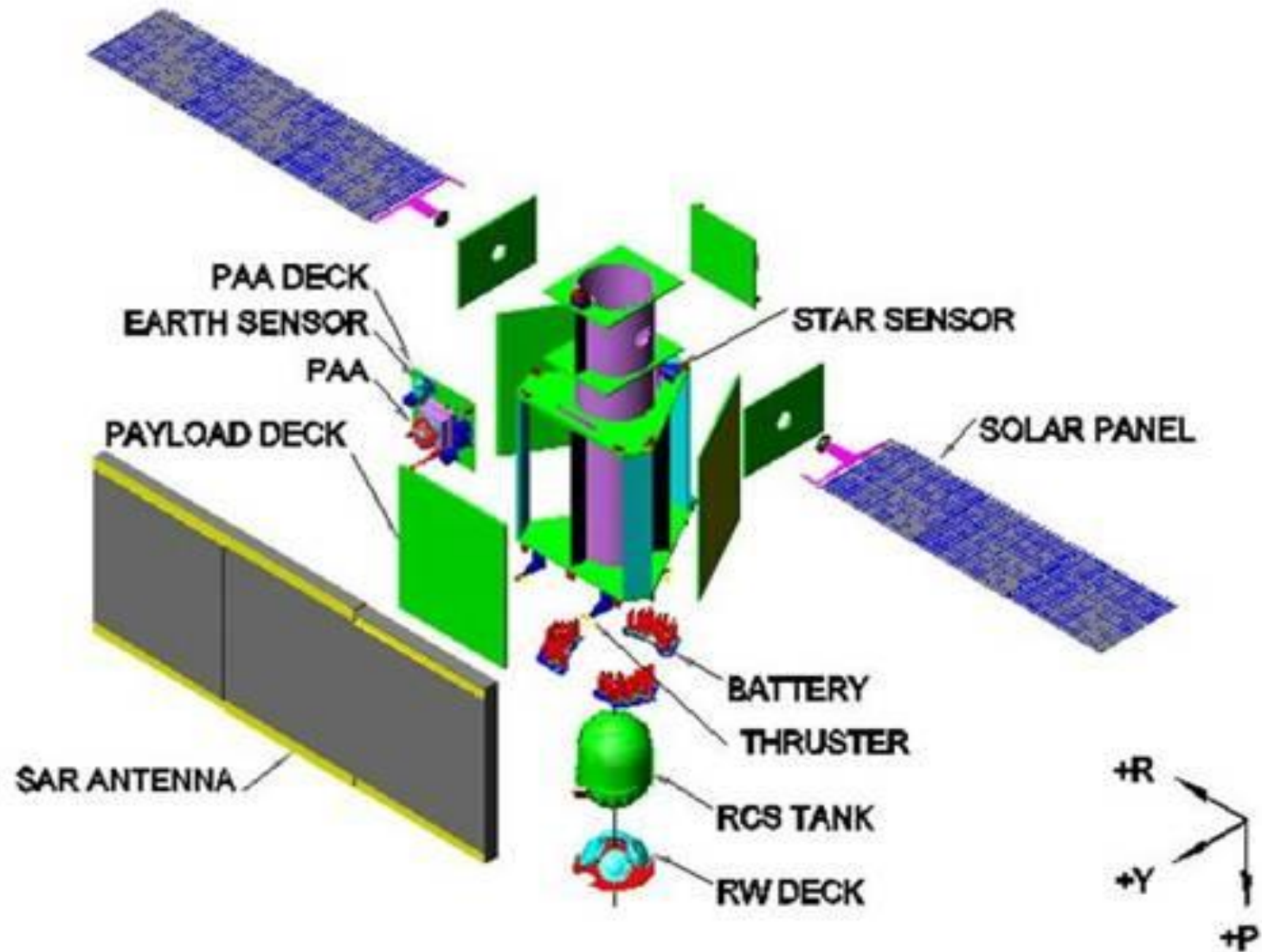
Dual beam scanning by scatterometer



Cyclonic movement observed by scatterometer

Scatterometers measure the wind speed and direction on ocean surfaces from space. Can you name a situation where that will be of use ?

RISAT-1 Spacecraft Configuration



RISAT1: Configuration

- Mission Type : Earth Observation Remote Sensing Satellite
- Launch Date : April 26, 2012
- Mass : 1858 Kg.
- Rocket : PSLV X2 C-19
- Launch Site : SHAR
- Pay-load : C- band Synthetic Aperture Radar (SAR)
- Use : For earth Observation, irrespective of light and weather Conditions
Natural Resource Management

Mission elements of RISAT-1

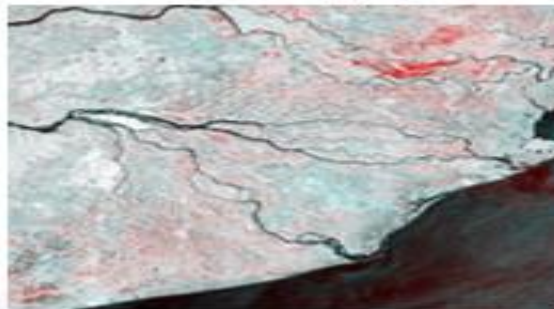


SAR Application in flood monitoring

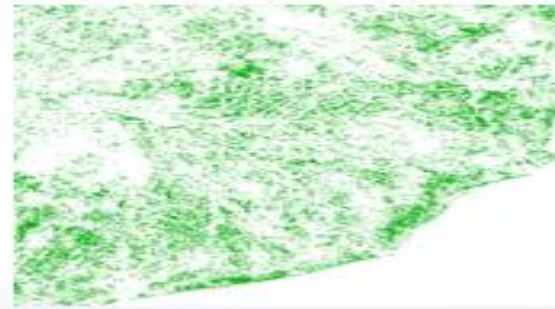
SAR Applications in Flood Disaster Management

- Flood inundation mapping and monitoring
- Rapid and scientific based damage assessment
- Mapping of river configuration and flood control structures
- Detecting changes in the river course
- Identification of chronic flood prone areas
- Flood hazard and risk assessment
- Hydrological and hydraulic modelling
- Inputs for flood forecasting and spatial flood warning
- Higher incidence angles give more reliable results for flood monitoring
- C-HH is superior to C-VV polarization

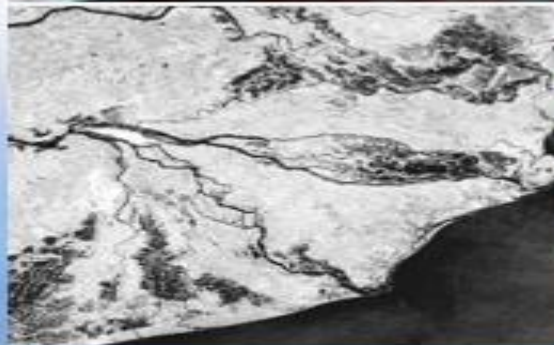
Mapping flood damage to rice crop (Kharif rice, Orissa, 2011)



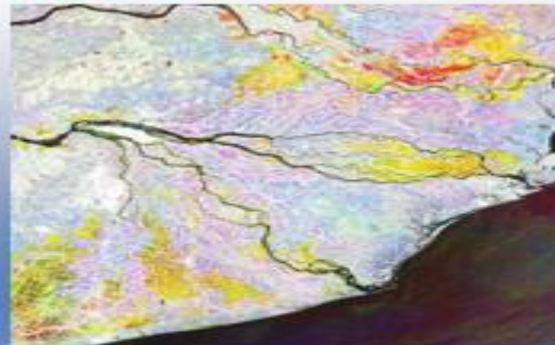
Two date SAR image before flood



Rice crop map before flood



Flood in rice growing areas as on Sep 14, 2011 (dark patches)



Three date color composite using data up to September showing flooded areas in yellow

Thank you