

**BMS** INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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Department of Electronics and Telecommunication Engineering

Satellite Communication

Presentation

on

**"Remote Sensing"**

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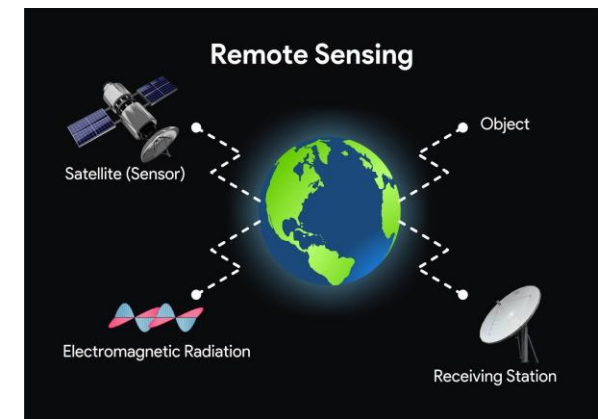
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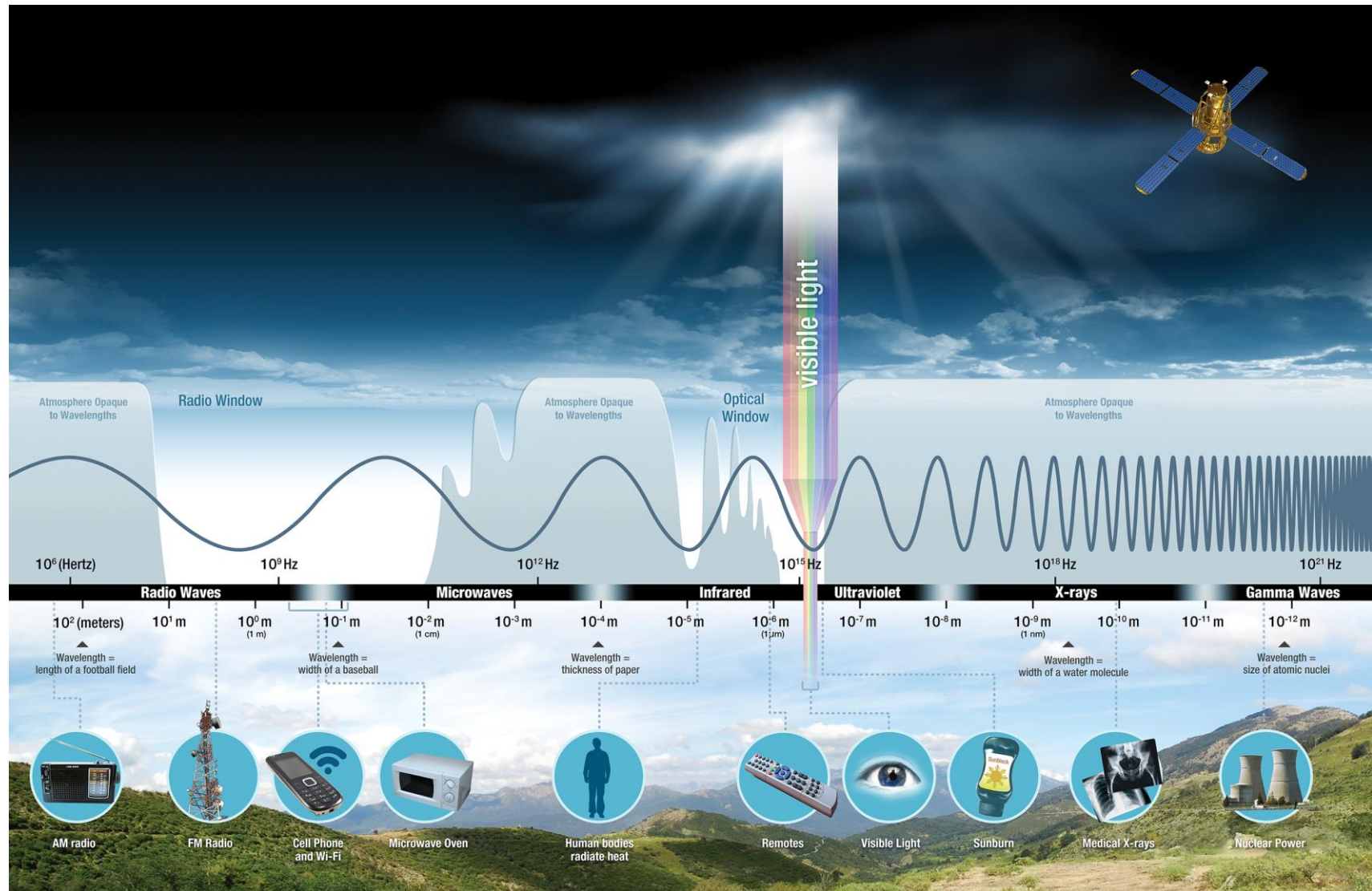
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# Remote sensing

- Remote sensing is the acquiring of information from a distance.
- Earth stations observe Earth and other planetary bodies via remote sensors on satellites and aircraft that detect and record reflected or emitted energy.
- Remote sensors, which provide a global perspective and a wealth of data about Earth systems, enable data-informed decision making based on the current and future state of our planet.
- Satellites can be placed in several types of orbits around Earth. The three common classes of orbits are low-Earth orbit, medium-Earth orbit, and high-Earth orbit.

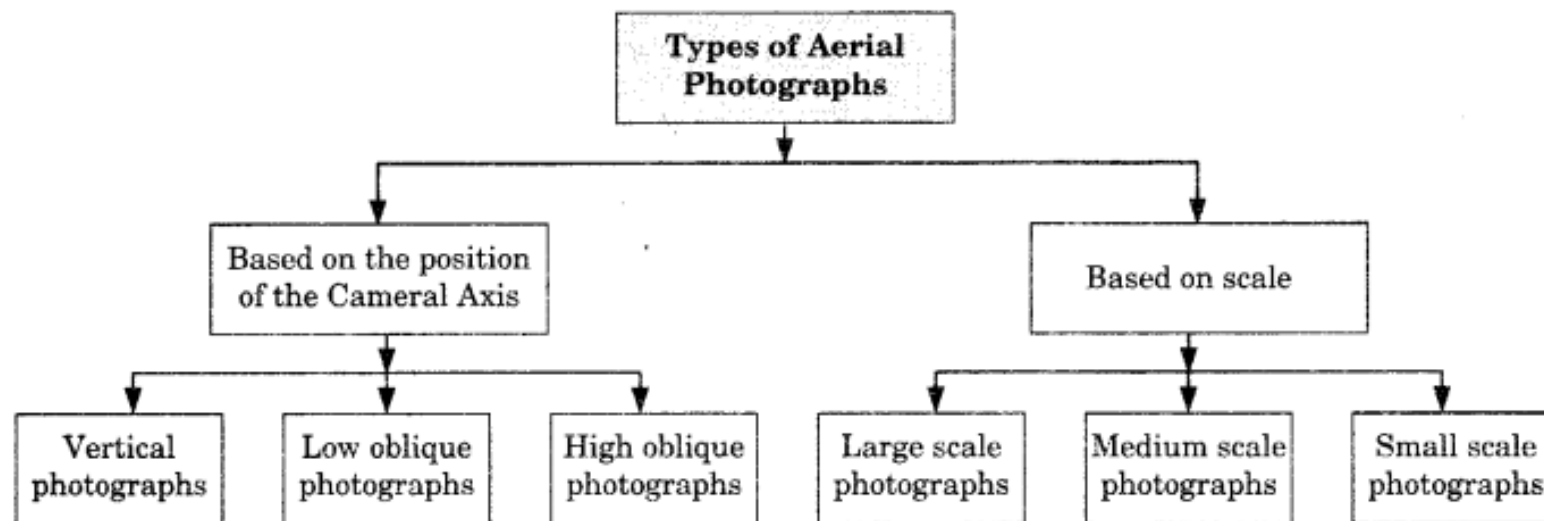


# Remote sensing



# Aerial remote sensing

- It is one of the most common, versatile and economical forms of remote sensing.
- It was the first method of remote sensing and even used today in the era of satellite and electronic scanners.
- Aerial photographs will still remain the most widely used type of remote sensing data.

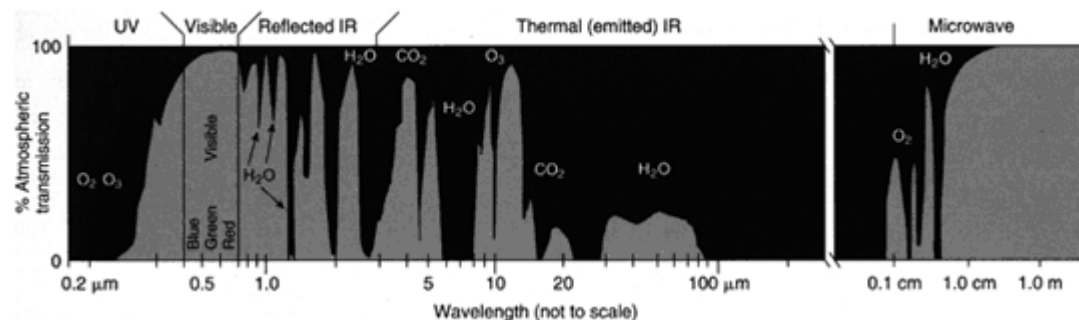


# Satellite remote sensing

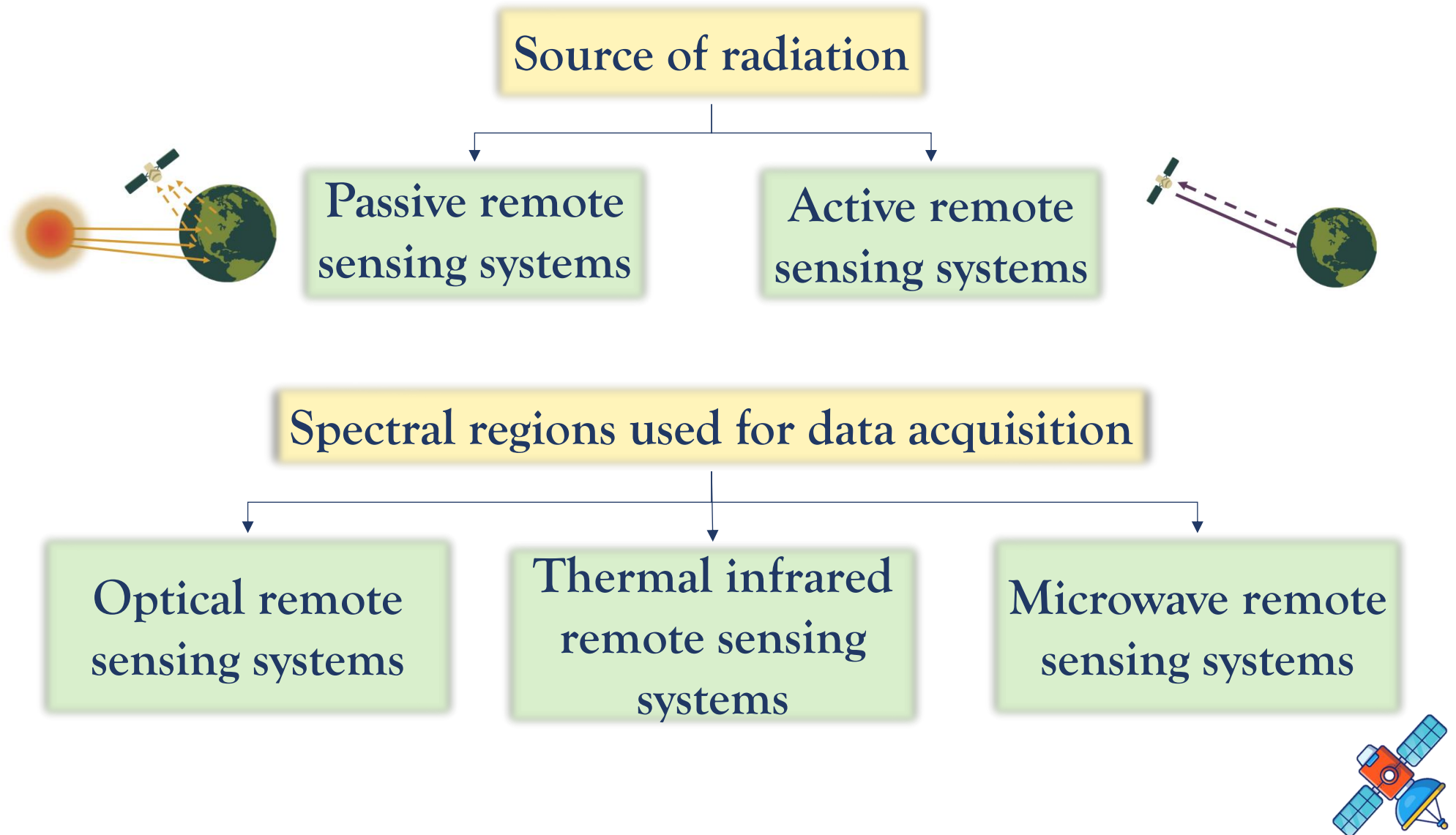
- Referred to as ‘eyes in the sky’.
- Provides information on a continuous basis of vast areas on the earth’s surface.
- Provides minute details of the earth’s surface.
- ‘Atmospheric transmission windows’

## Advantages of satellites:

1. Continuous acquisition of data
2. Broad coverage area
3. Good spectral resolution
4. Semi-automated/computerized processing and analysis
5. Ability to manipulate/enhance data
6. Accurate data mapping



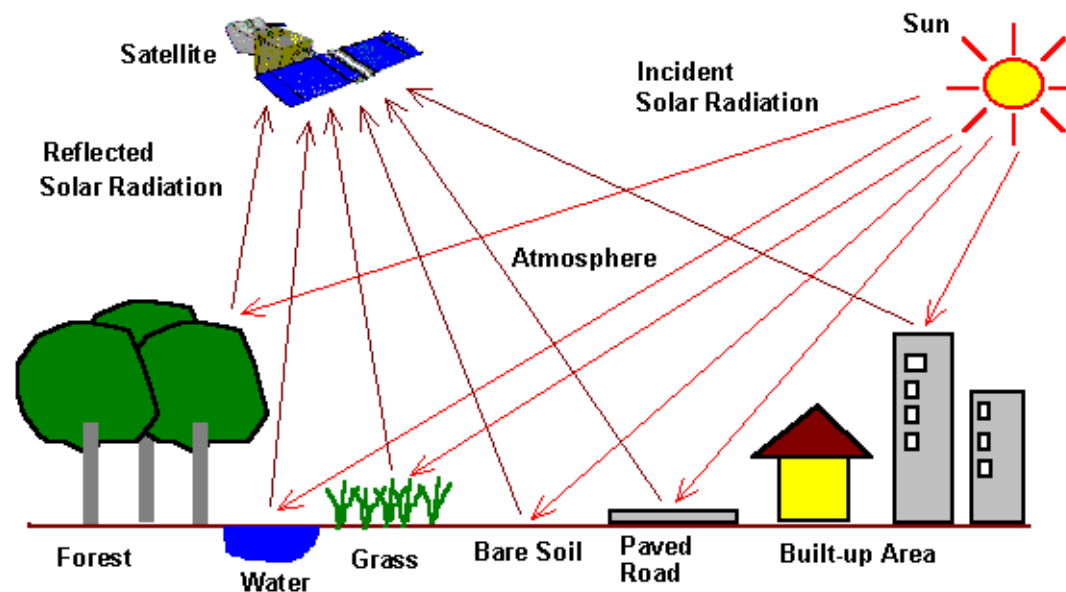
# Classification of satellite remote sensing





# Optical remote sensing

- Optical remote sensing makes use of visible, near infrared and short-wave infrared sensors to form images of the earth's surface by detecting the solar radiation reflected from targets on the ground.
- Different materials reflect and absorb differently at different wavelengths. Thus, the targets can be differentiated by their spectral reflectance signatures in the remotely sensed images.
- Optical remote sensing systems are classified into the following types, depending on the number of spectral bands used in the imaging process:



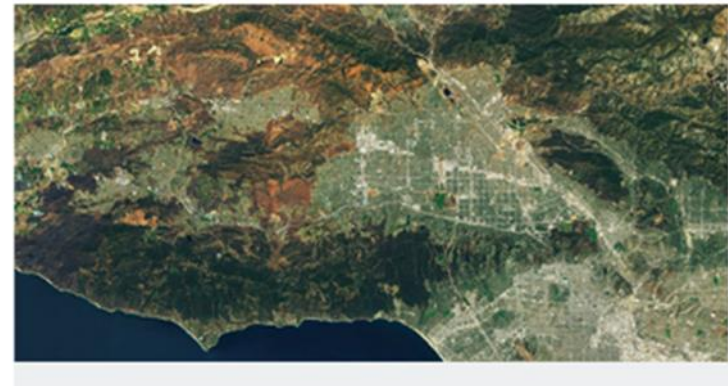
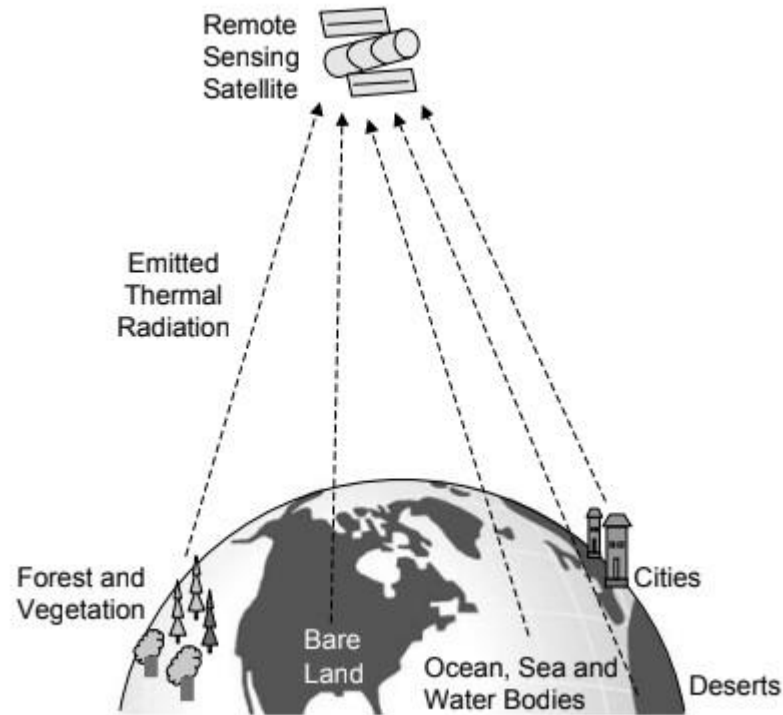
# Types of Optical remote sensing

- **Panchromatic imaging system:** The sensor is a single channel detector sensitive to radiation within a broad wavelength range. If the wavelength range coincide with the visible range, then the resulting image resembles a "black-and-white" photograph taken from space. The physical quantity being measured is the apparent brightness of the targets. The spectral information or "colour" of the targets is lost.
- **Multispectral imaging system:** The sensor is a multichannel detector with a few spectral bands. Each channel is sensitive to radiation within a narrow wavelength band. The resulting image is a multilayer image which contains both the brightness and spectral (colour) information of the targets being observed
- **Super spectral Imaging Systems:** A super spectral imaging sensor has many more spectral channels (typically  $>10$ ) than a multispectral sensor. The bands have narrower bandwidths, enabling the finer spectral characteristics of the targets to be captured by the sensor.
- **Hyperspectral Imaging Systems:** A hyperspectral imaging system is also known as an "imaging spectrometer". it acquires images in about a hundred or more contiguous spectral bands. The precise spectral information contained in a hyperspectral image enables better characterization and identification of targets.





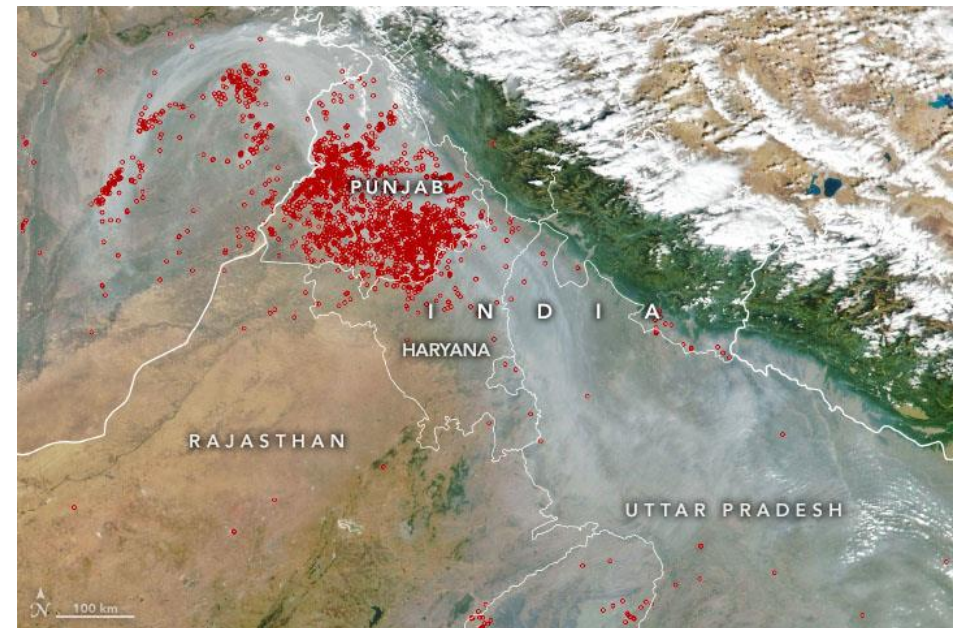
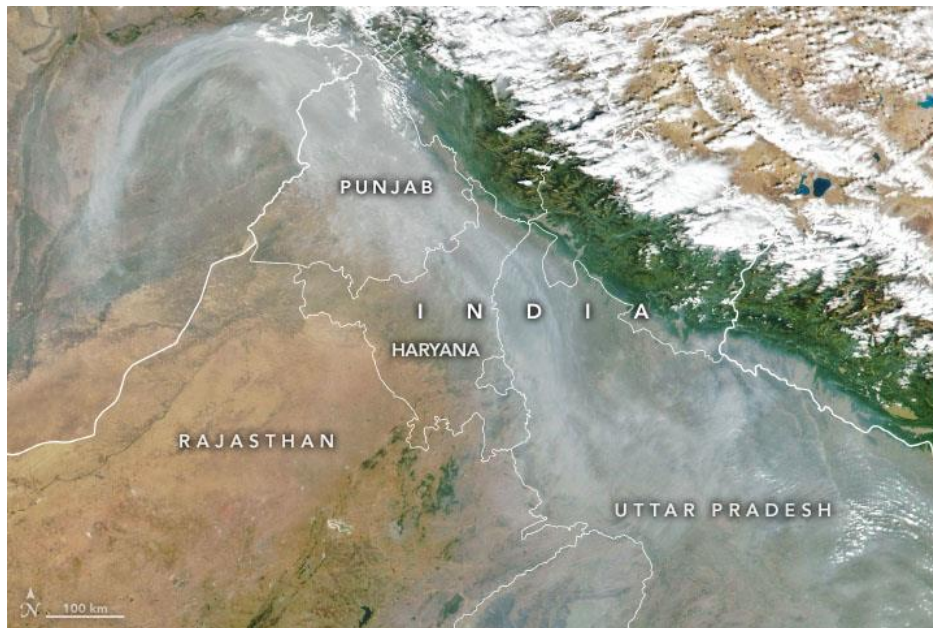
# Thermal infrared remote sensing



- Employs the mid wave IR ( $3-5\mu\text{m}$ ) and the long wave IR ( $8-14\mu\text{m}$ ) wavelength bands.
- Commonly employed
  - $10\mu\text{m}$  (300K)
  - $3.8\mu\text{m}$  (500 K-1000 K)

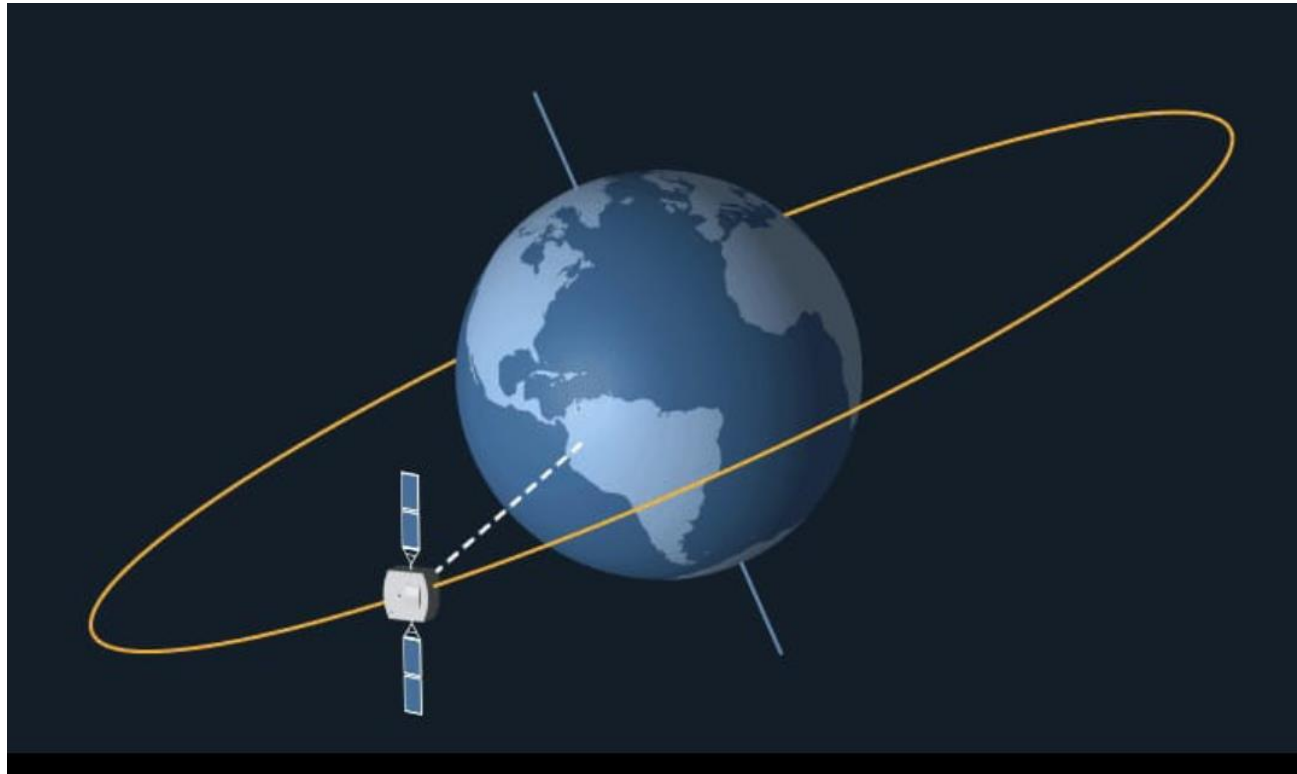


# Smoky Skies in Northern India



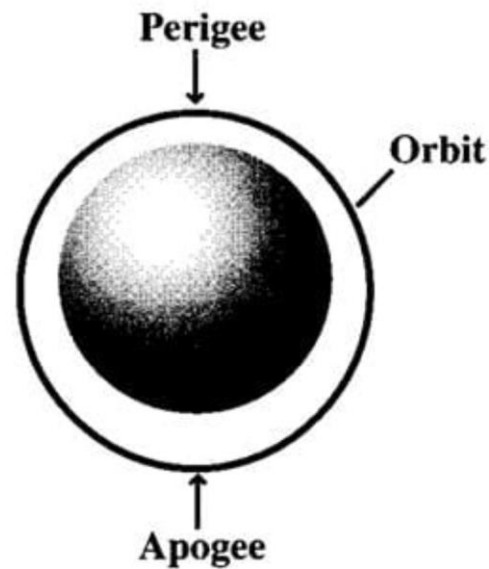
# Remote Sensing Satellite Orbits

- **Orbital period:** Time taken by a satellite to complete one revolution in its orbit around the earth is called orbital period



# Remote Sensing Satellite Orbits

- **Altitude:** Altitude of a satellite is its height with respect to the surface immediately below it. Depending on the designed purpose of the satellite, the orbit may be located at low (160-2000 km), moderate, and high (~36000km) altitude.
- **Apogee and perigee:** Apogee is the point in the orbit where the satellite is at maximum distance from the Earth. Perigee is the point in the orbit where the satellite is nearest to the Earth.





# Microwave remote sensing

- Microwave remote sensing covers EM spectrum in the range from approximately 1mm to 1m
- Because of their long wavelengths, compared to the visible and infrared, microwaves have special properties that are important for remote sensing.
- Longer wavelength microwave radiation can penetrate through cloud cover, haze, dust, and all but the heaviest rainfall as the longer wavelengths are not susceptible to atmospheric scattering which affects shorter optical wavelengths.
- This property allows detection of microwave energy under almost all weather and environmental conditions so that data can be collected at any time



Thank You!

