

**REMOTE SENSING
PLATFORMS
AND
SENSORS**

ORBITS OF REMOTE SENSING

SATELLITE:

Satellite is any object man made or natural that revolves around the earth

TYPES OF ORBITS:

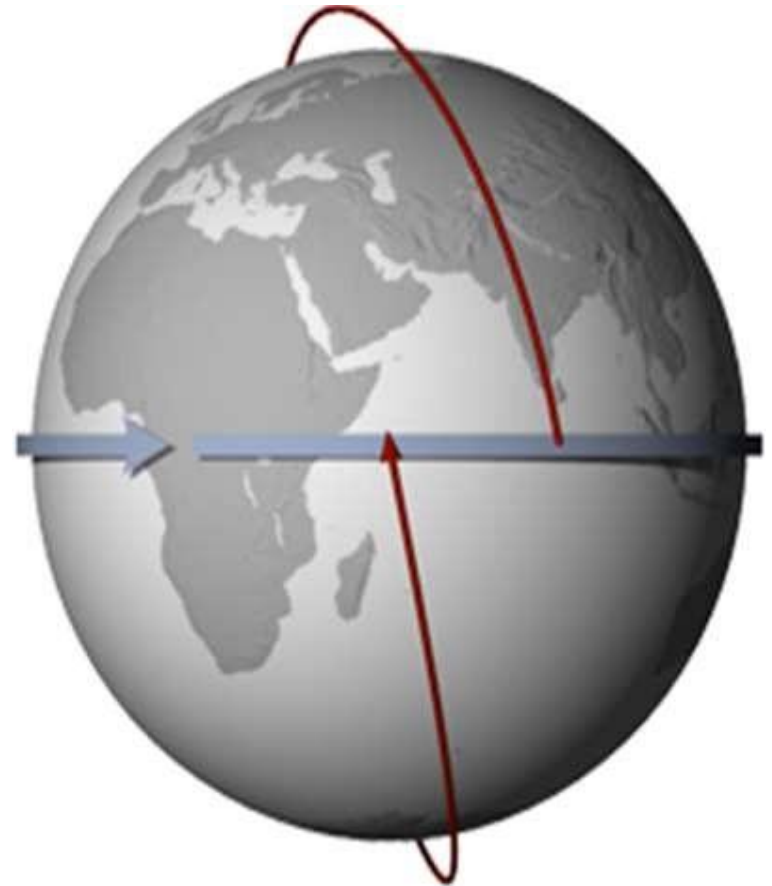
- Low Earth Orbit (LEO) < 2000 km
- Medium Earth Orbit (MEO) 2000-35786 km
- High Earth Orbit (HEO) > 35786 km

ORBITS OF REMOTE SENSING

Low Earth Orbit:

Polar orbiting satellites:

- Satellite is pass above the earth poles
- High resolution of images is possible
- Crosses the equator at 90°

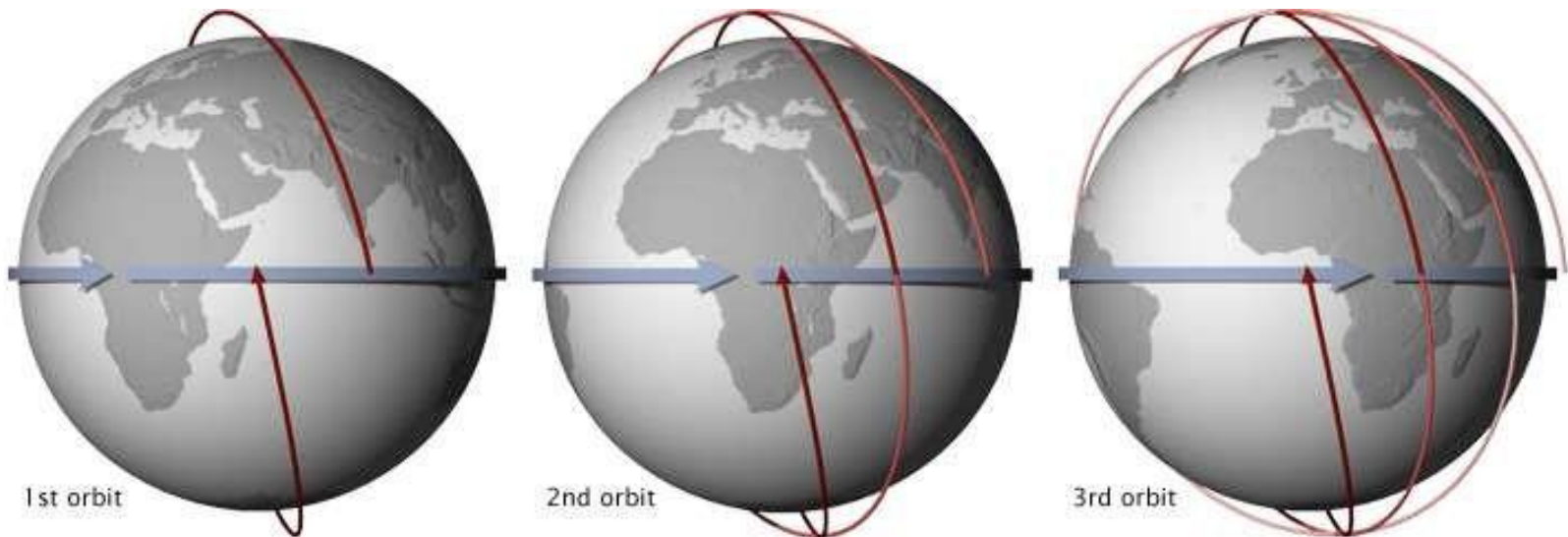


ORBITS OF REMOTE SENSING

Low Earth Orbit:

Polar orbiting satellites:

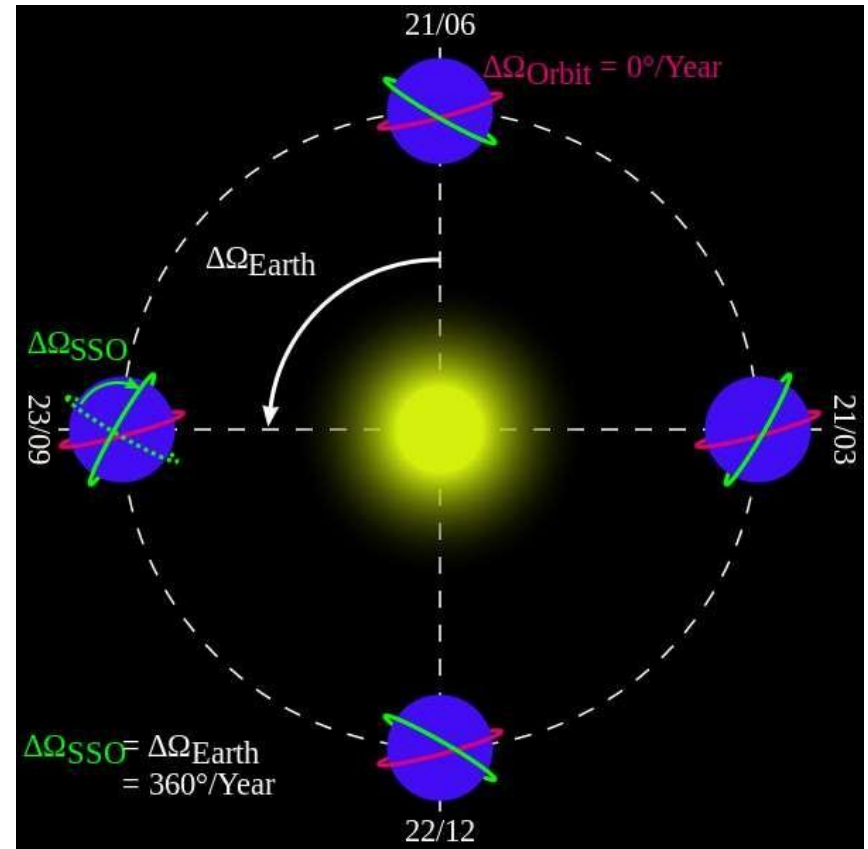
- The advantage is every time the satellite view the newer segment on the earth surface because of earth's rotation



ORBITS OF REMOTE SENSING

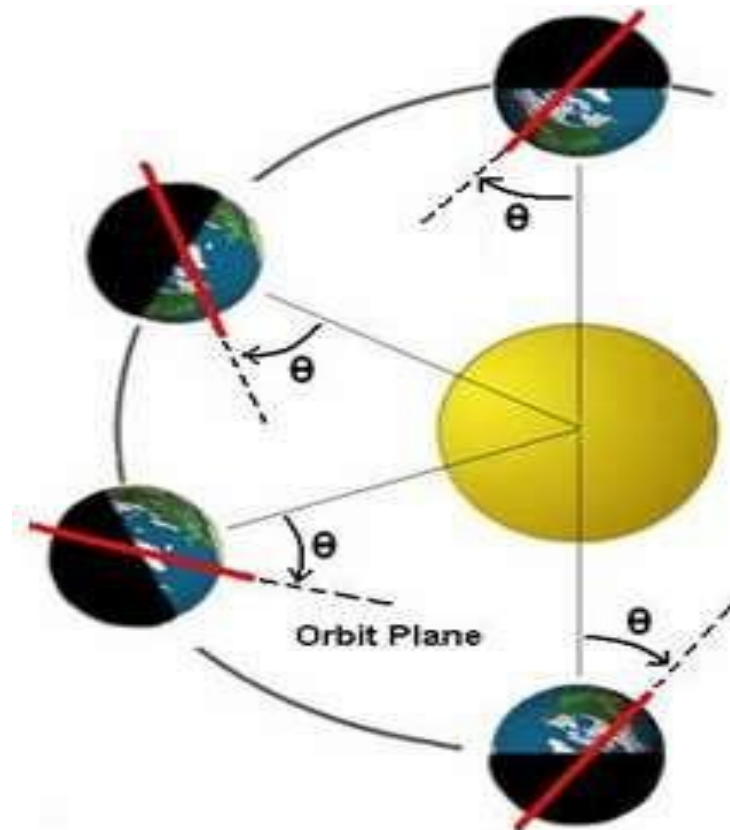
Sun Synchronous Orbit

- Angle of inclination of the orbit with respect to the sun through out the year is same
- Always crosses the equator precisely the same local sun time
- Mostly used for remote sensing



ORBITS OF REMOTE SENSING

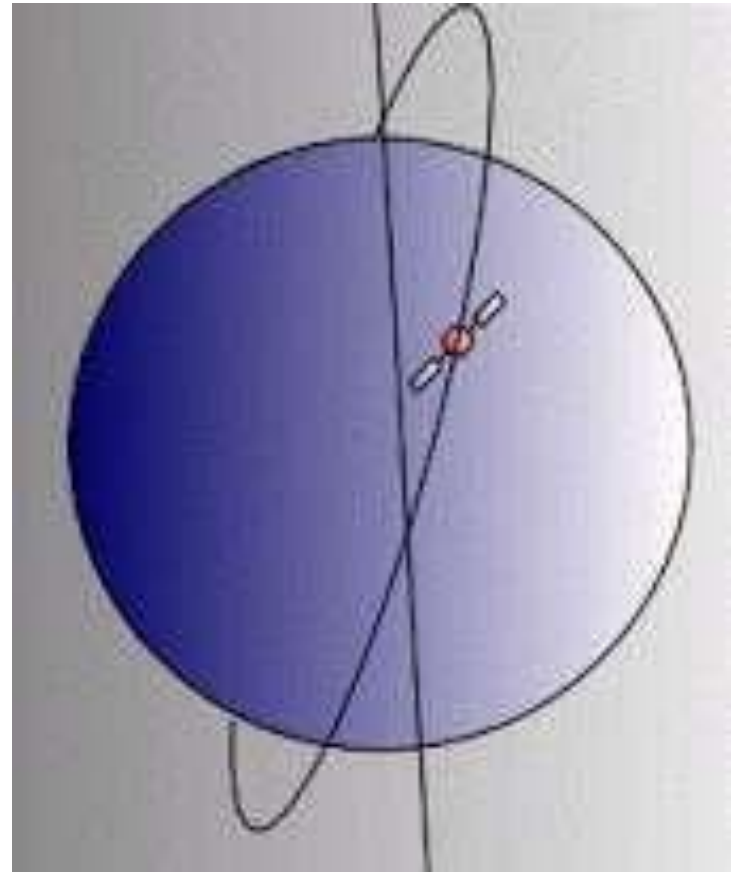
Sun Synchronous Orbit



ORBITS OF REMOTE SENSING

Near polar orbit

- **Orbital plane inclined at small angle with respect to the earth rotational axis**

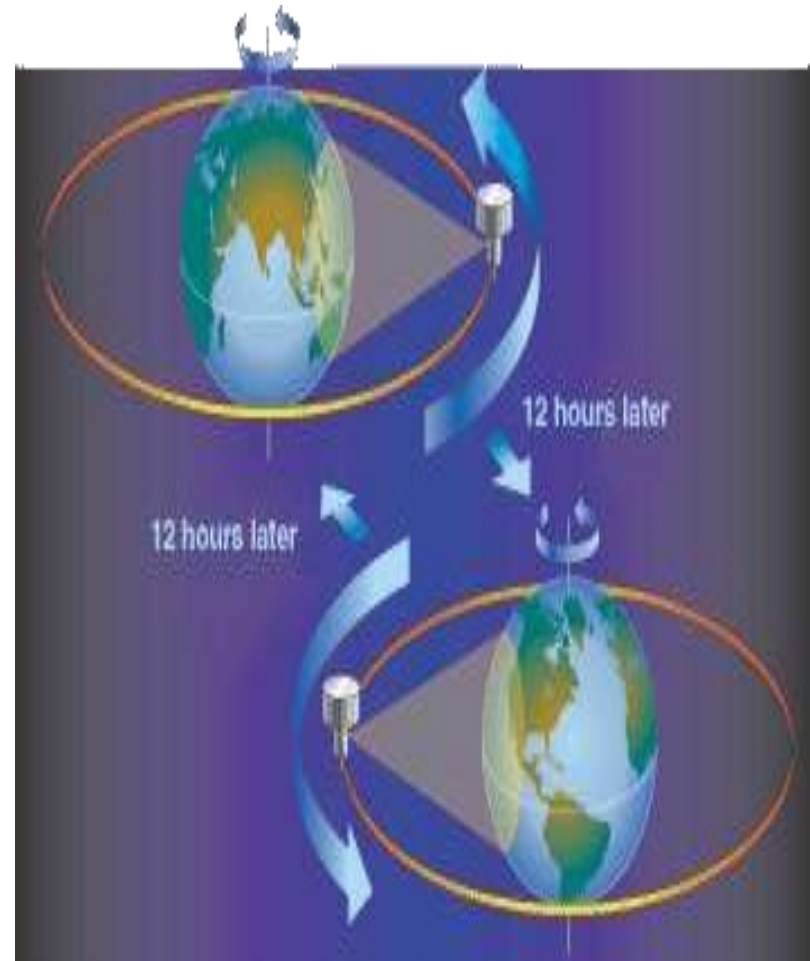


ORBITS OF REMOTE SENSING

High Earth Orbit

Geo stationary orbit

- The satellite placed in this orbit is stationary with respect to the earth
- View the same area of the earth at all times
- View 50% of global surface (60°N to 60°S)
- Orbital period is 24 hours



ORBITS OF REMOTE SENSING

High Earth Orbit

Geo stationary orbit

Advantages :

- Useful for meteorological observation
- And also for commercial broadcast and communication purpose



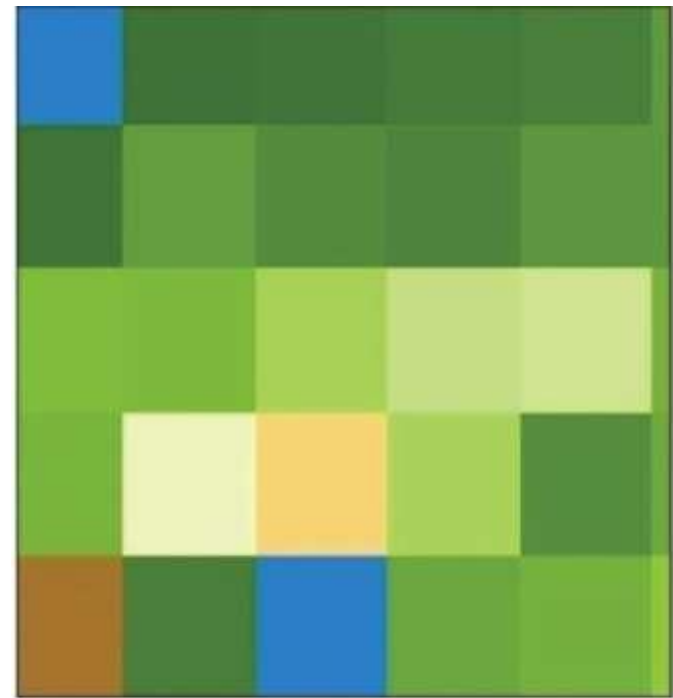
ORBITS OF REMOTE SENSING

High Earth Orbit

Geo stationary orbit

Dis-Advantages:

- Low resolution
- Approximately a pixel size of 2.5 km on the ground
- Less information is obtained



2.5 km

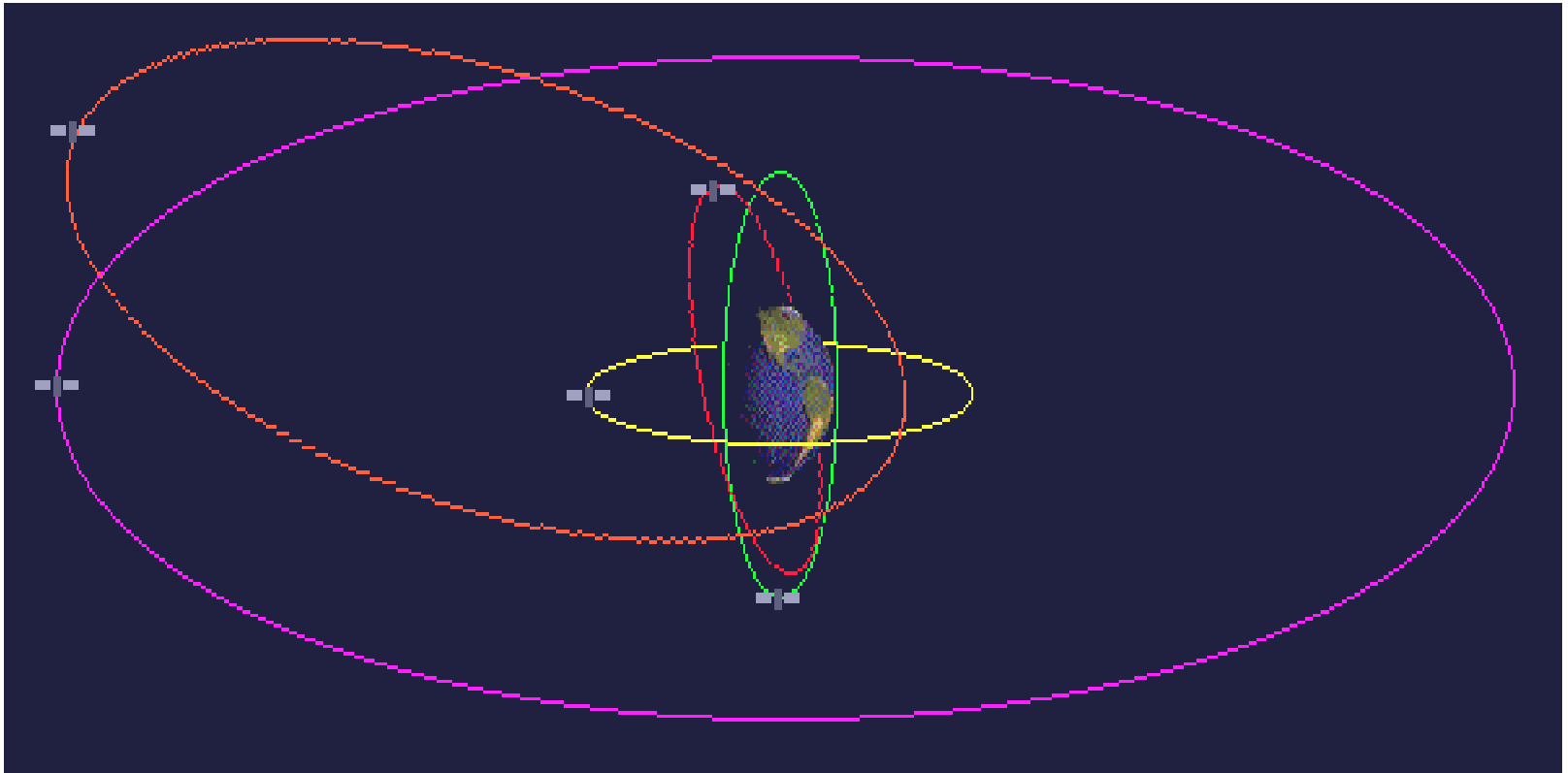
ORBITS OF REMOTE SENSING

Choice of orbit:

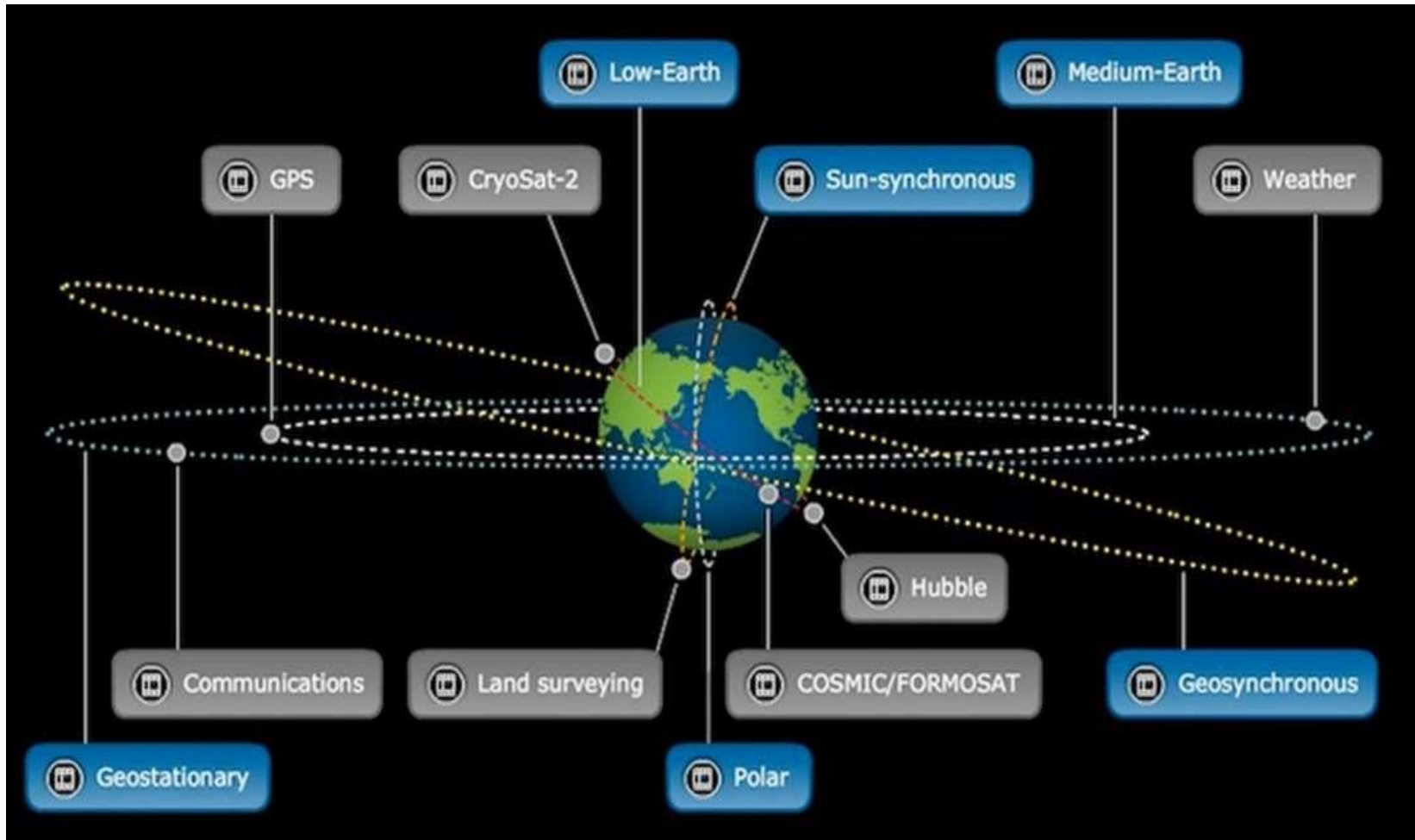
- It is dependent on the its mission
- Remote sensing satellites placed in LEO because it needs high resolution
- Commercial broadcast or Communication satellites are provided in HEO because it should receive and send signals from large geographical are

ORBITS OF REMOTE SENSING

Shapes of orbits:



ORBITS OF REMOTE SENSING



REMOTE SENSING PLATFORMS

Types of platforms :

➤ Ground based platforms

Short range systems(50-100 m)

Medium Range Systems (150-250 m)

Long range Systems (up to 1 km)

➤ Airborne platforms

➤ Space-borne platforms

REMOTE SENSING PLATFORMS

Types of platforms :

Ground Based Platforms:

Mobile hydraulic platforms (up to 15 m height)



REMOTE SENSING PLATFORMS

Types of platforms :

Portable Masts

- Unstable in wind conditions



REMOTE SENSING PLATFORMS

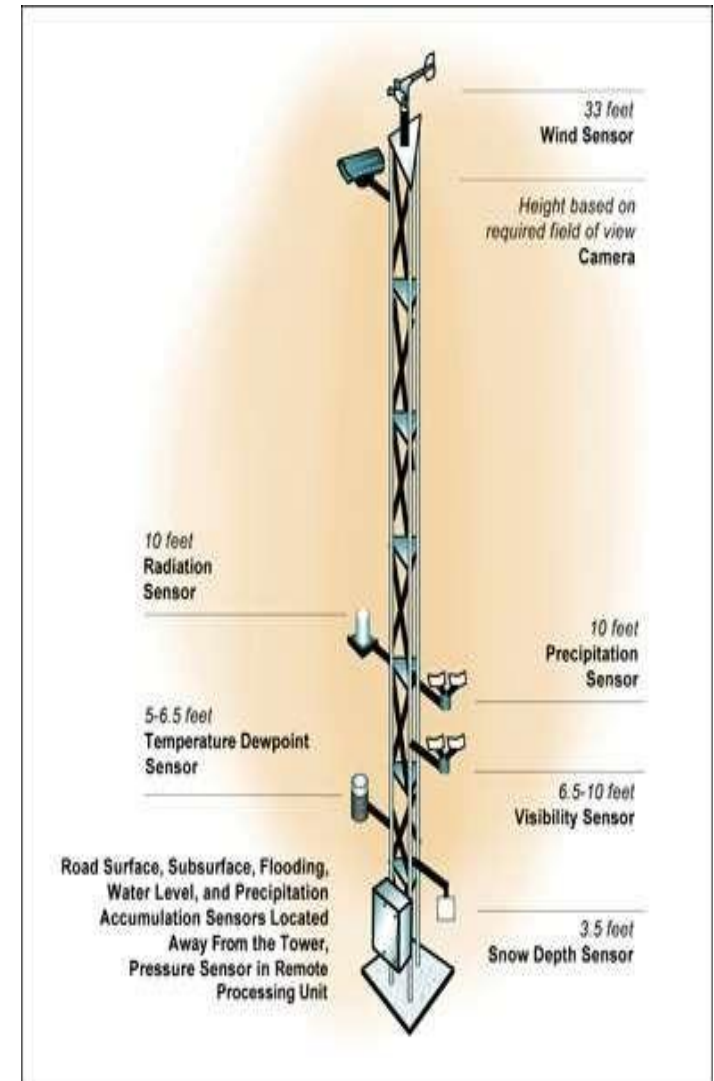
Types of platforms :

Towers:

- Greater rigidity than masts



WisDOT

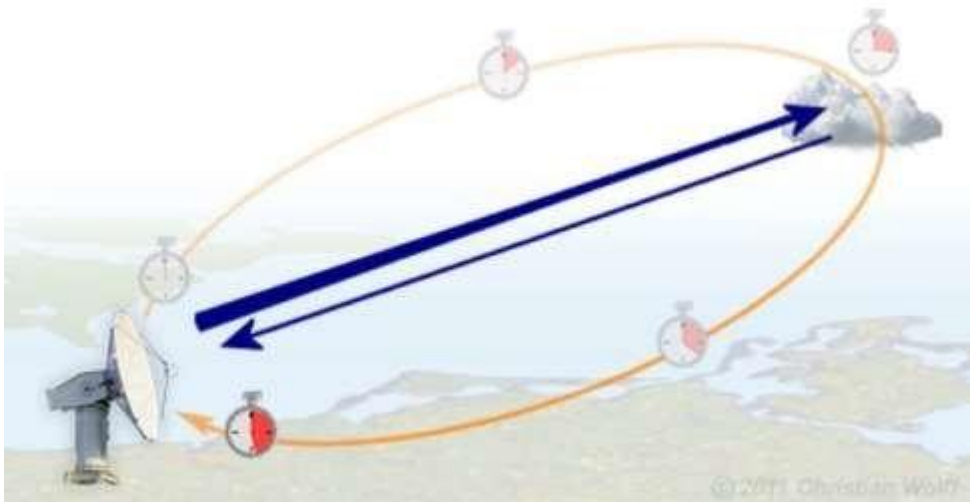


REMOTE SENSING PLATFORMS

Types of platforms :

Weather Surveillance Radar

- Detects and tracks typhoons and cloud masses



REMOTE SENSING PLATFORMS

Types of platforms :

Airborne Platforms:

Balloons based :

- Altitude range is 22-40 km
- Tool to probing the atmosphere
- Useful to test the instruments under development



REMOTE SENSING PLATFORMS

Types of platforms :

Airborne Platforms:

Radiosonde:

Measure pressure, Temperature and Relative humidity in the atmosphere

Rawinsonde:

Measure wind velocity, temperature, pressure and relative humidity



REMOTE SENSING PLATFORMS

Types of platforms :

Aircraft:

Advantages:

- High spatial resolution (20 cm or less)
- Analog photography is possible (analog photo gives high resolution)
- Easily change their schedule to avoid weather problems
- Sensor maintenance and repair is easy



REMOTE SENSING PLATFORMS

Types of platforms :

Aircraft:

Dis Advantages:

- Permission to intrude into foreign airspace is required
- Many passes to cover larger area
- Swath is much less compare to satellite
- High cost per unit area

REMOTE SENSING PLATFORMS

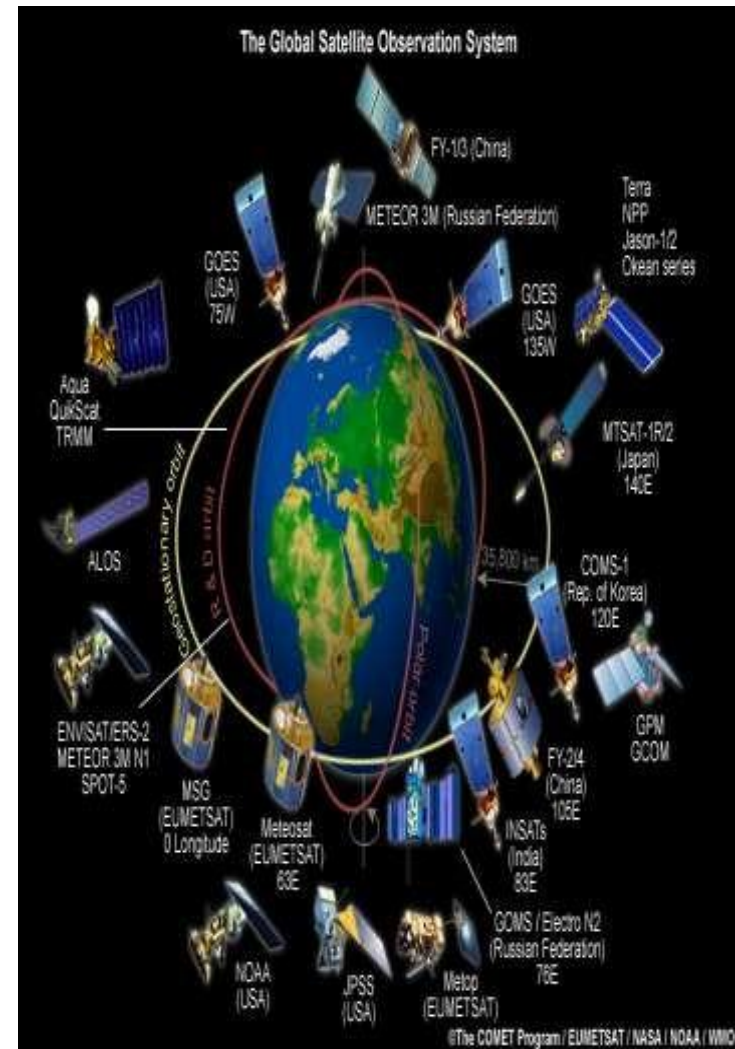
Types of platforms :

Space borne platforms:

- Sensors are mounted on-board a spacecraft
- Rockets , satellites and space shuttles

Advantages :

- Cover large area
- Repetitive coverage of an area of interest



REMOTE SENSING SENSORS

Sensor :

Common Definition :

- **Sensors are Sophisticated devices that are frequently used to detect and respond to electrical or optical signals**
- **A Sensor converts the Physical parameter into a signal which can be measured electrically**

REMOTE SENSING SENSORS

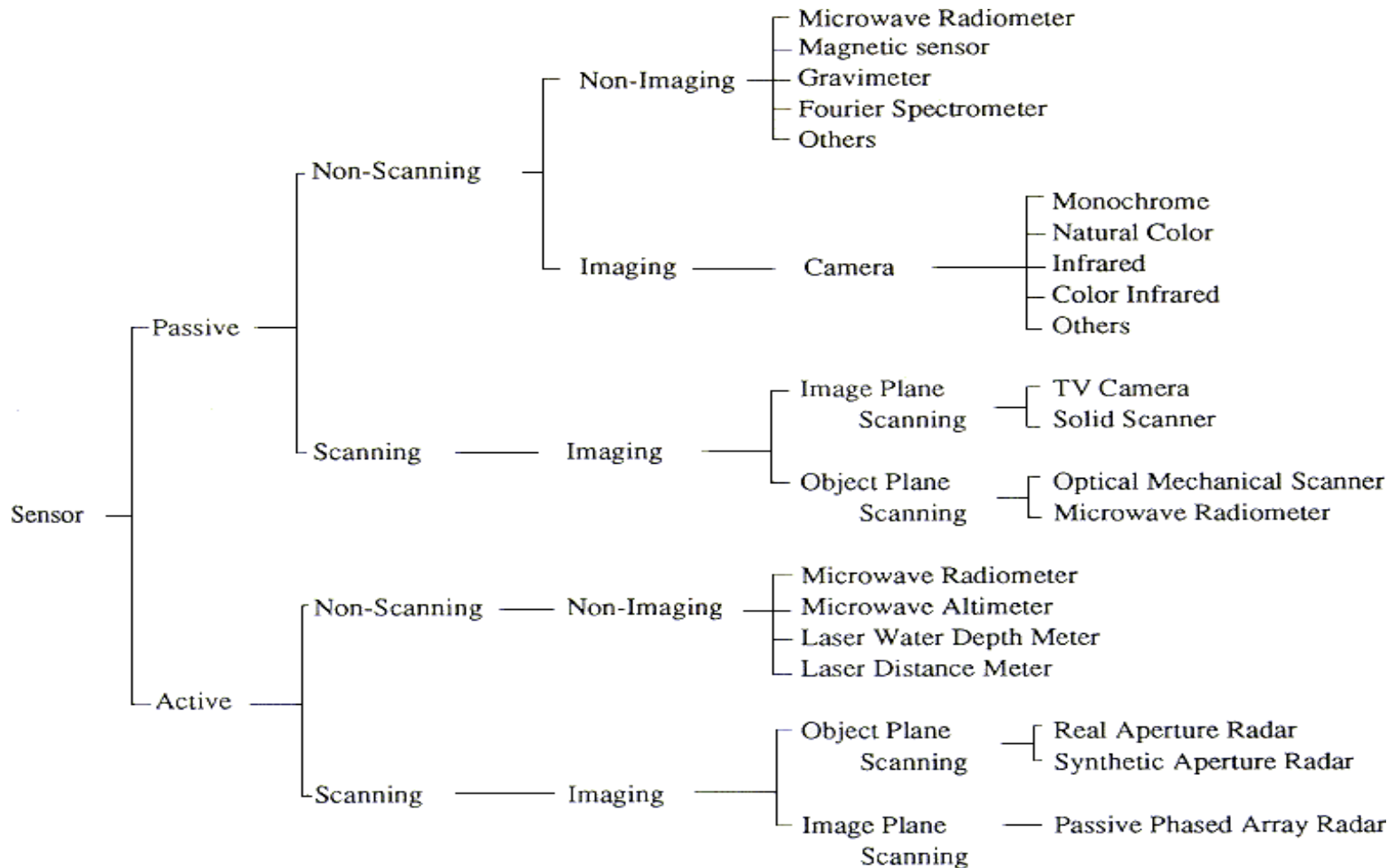
Sensor :

Definition in Remote Sensing :

- **Sensor is a device that gathers energy (EMR) converts into signal and present it into a signal and present it in a form (image) suitable for obtaining information about the objet under investigation**

REMOTE SENSING SENSORS

Types of sensors :



REMOTE SENSING SENSORS

Types of sensors :

Active sensors:

These sensors detect reflected responses from objects which are irradiated from artificially generated energy sources

Ex : Radar, camera with flash light

Passive sensors:

These sensors detect reflected EMR from natural source

Ex : camera without flash light (depends on solar energy), and all RS sensors

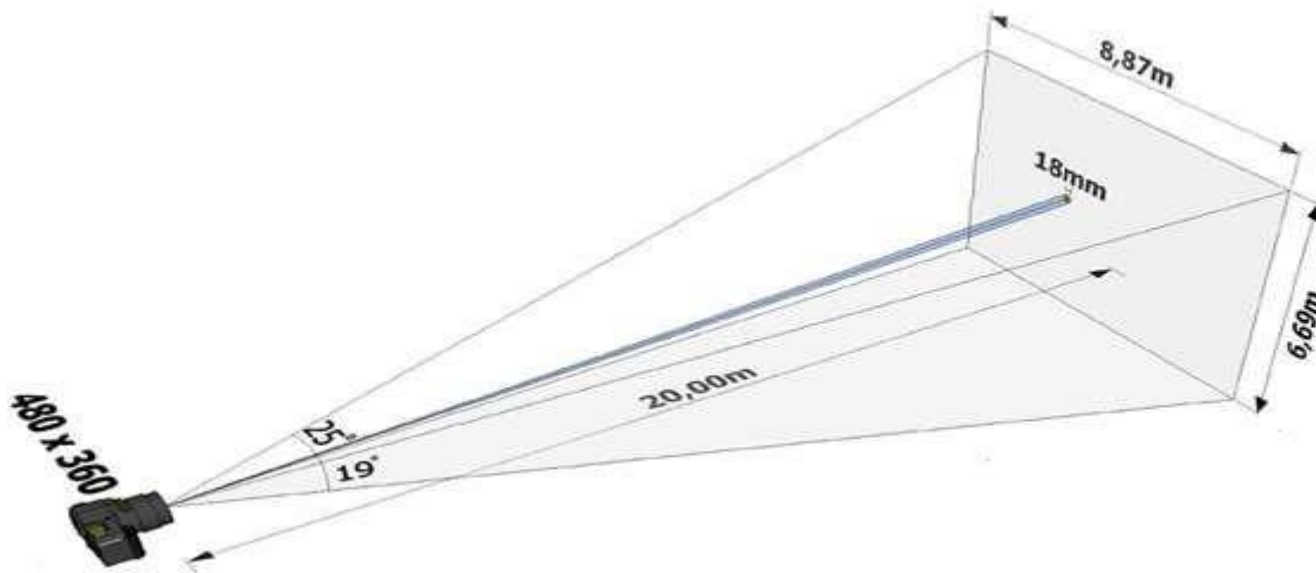
REMOTE SENSING SENSORS

Types of sensors :

Non Scanning or Framing sensors:

Measure the radiation coming from entire scene at once

Ex: Our eyes, Photo cameras



REMOTE SENSING SENSORS

Types of sensors :

Imaging sensors:

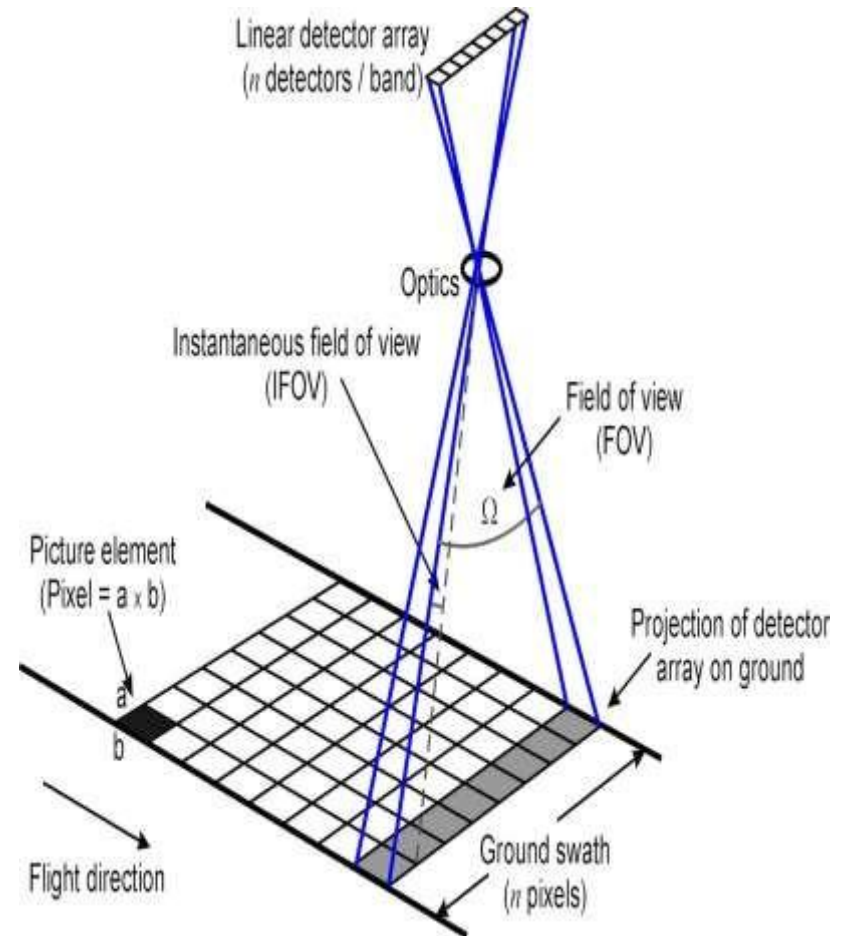
Form image by collected radiation

1. Scanning sensors:

The scene is sensed by point by point or measure the radiation coming from point by point (equivalent to small areas with in the scene)

Along track Scanners:

Image is acquired by line by line

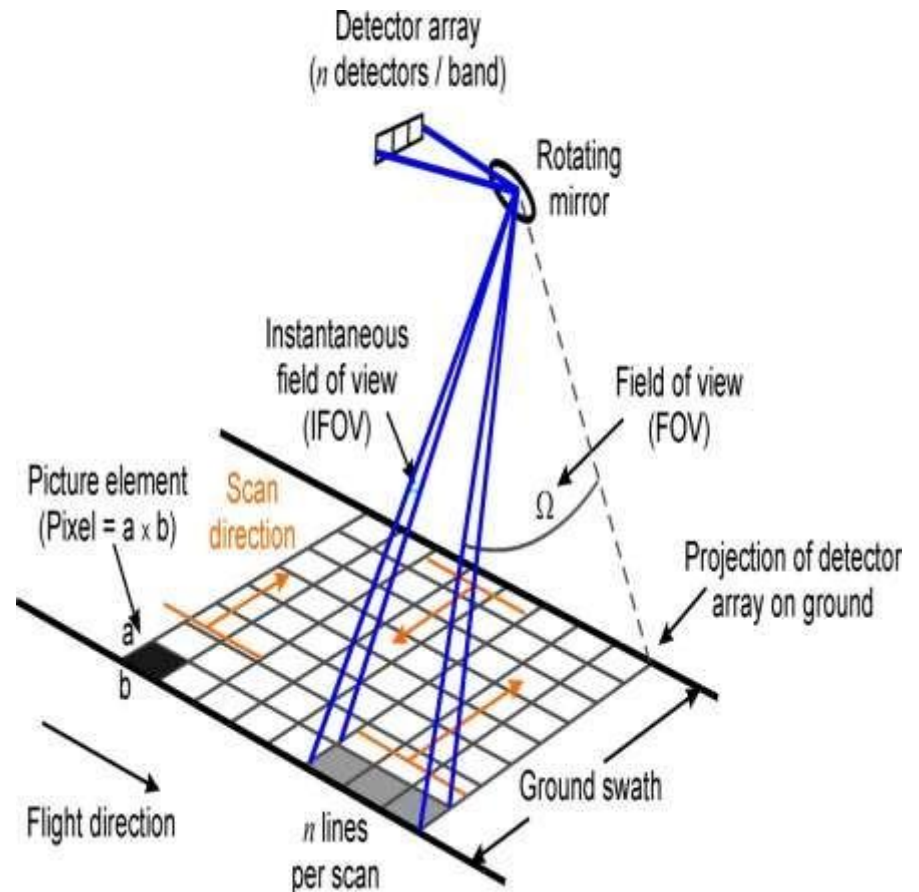
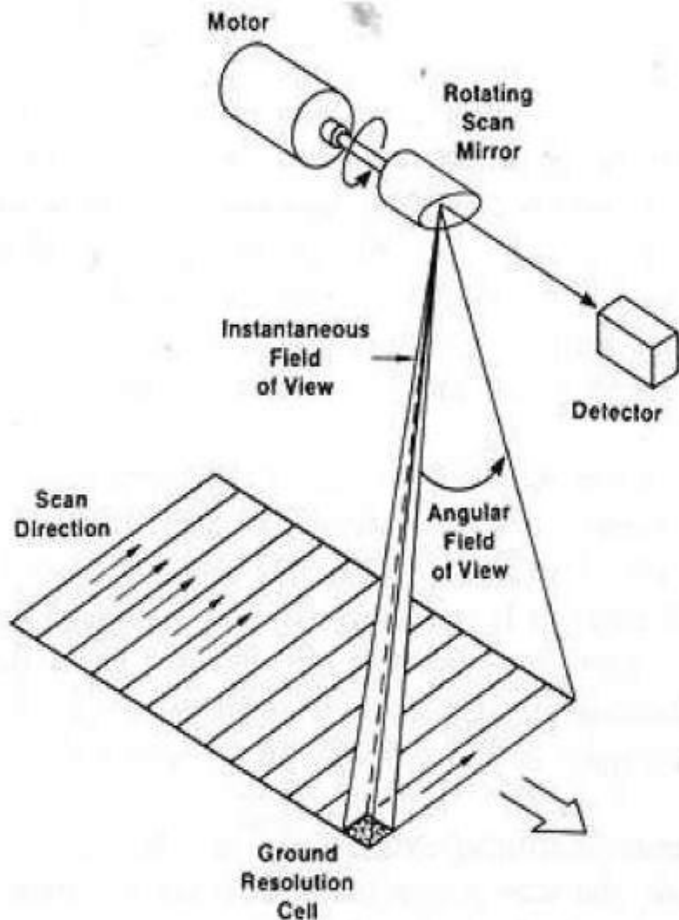


REMOTE SENSING SENSORS

Types of sensors :

Across track Scanners:

Image is acquired by pixel by pixel



REMOTE SENSING SENSORS

Types of sensors :

2. Non imaging sensors:

- These sensors do not form the image
- These are used to record spectral quantity or parameter as a function of time

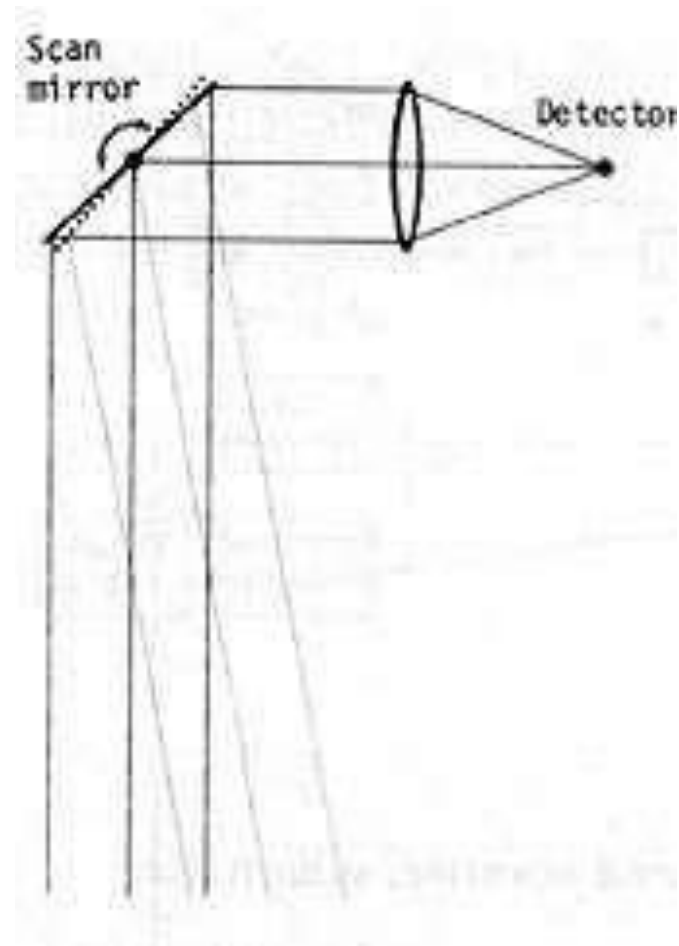
Ex: temperature measurement, study of atmosphere

REMOTE SENSING SENSORS

Types of sensors :

Image Plane Scanning:

Lens is used after the scan mirror to focus the light on the detector

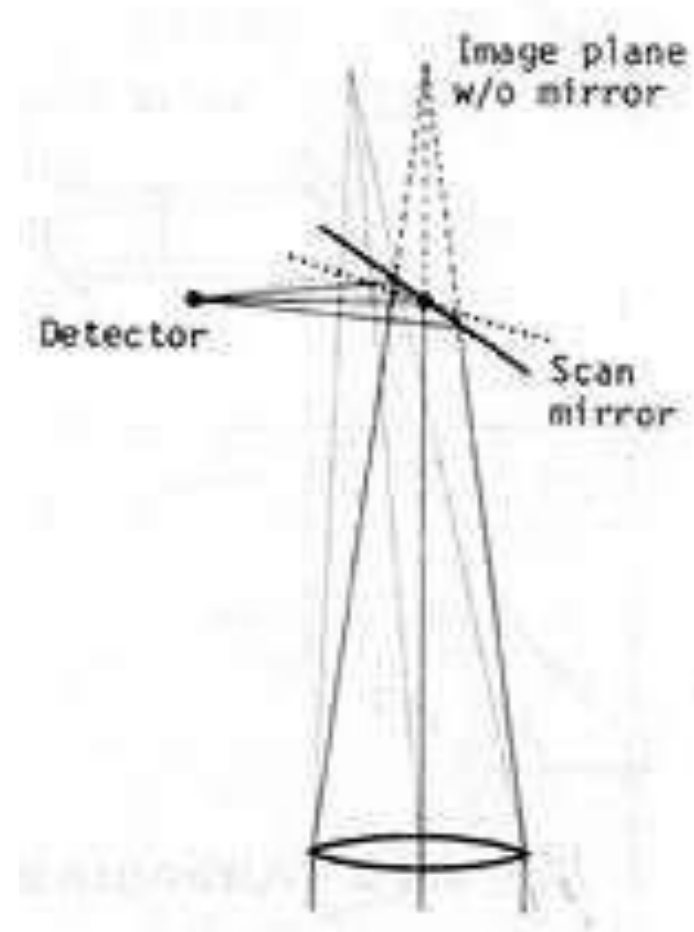


REMOTE SENSING SENSORS

Types of sensors :

Object Plane Scanning:

Lens is placed before the scan mirror to focus the light on the detector



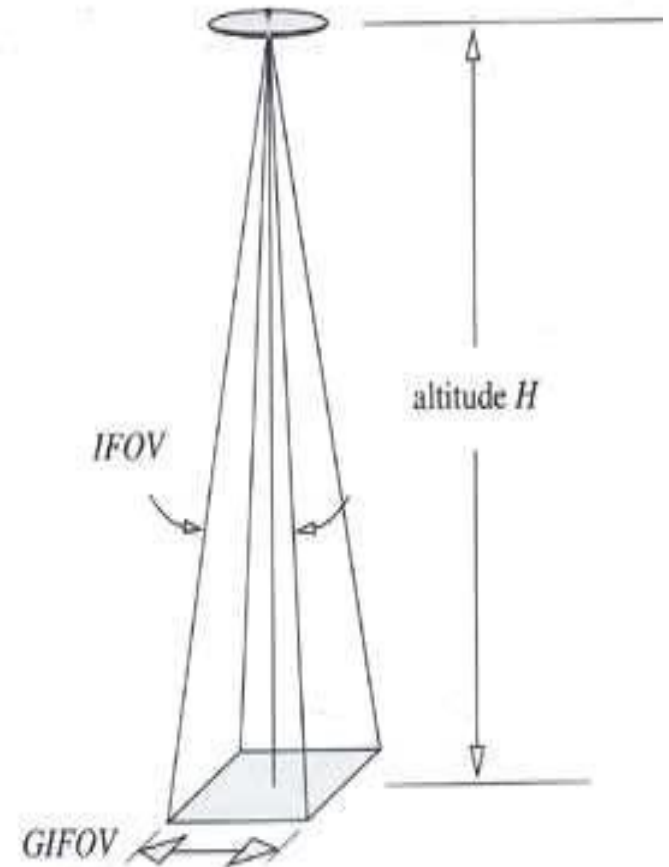
CHARACTERISTICS OF SENSORS

- 1. Spatial resolution**
- 2. Spectral resolution**
- 3. Radiometric resolution**
- 4. Temporal resolution**

CHARACTERISTICS OF SENSORS

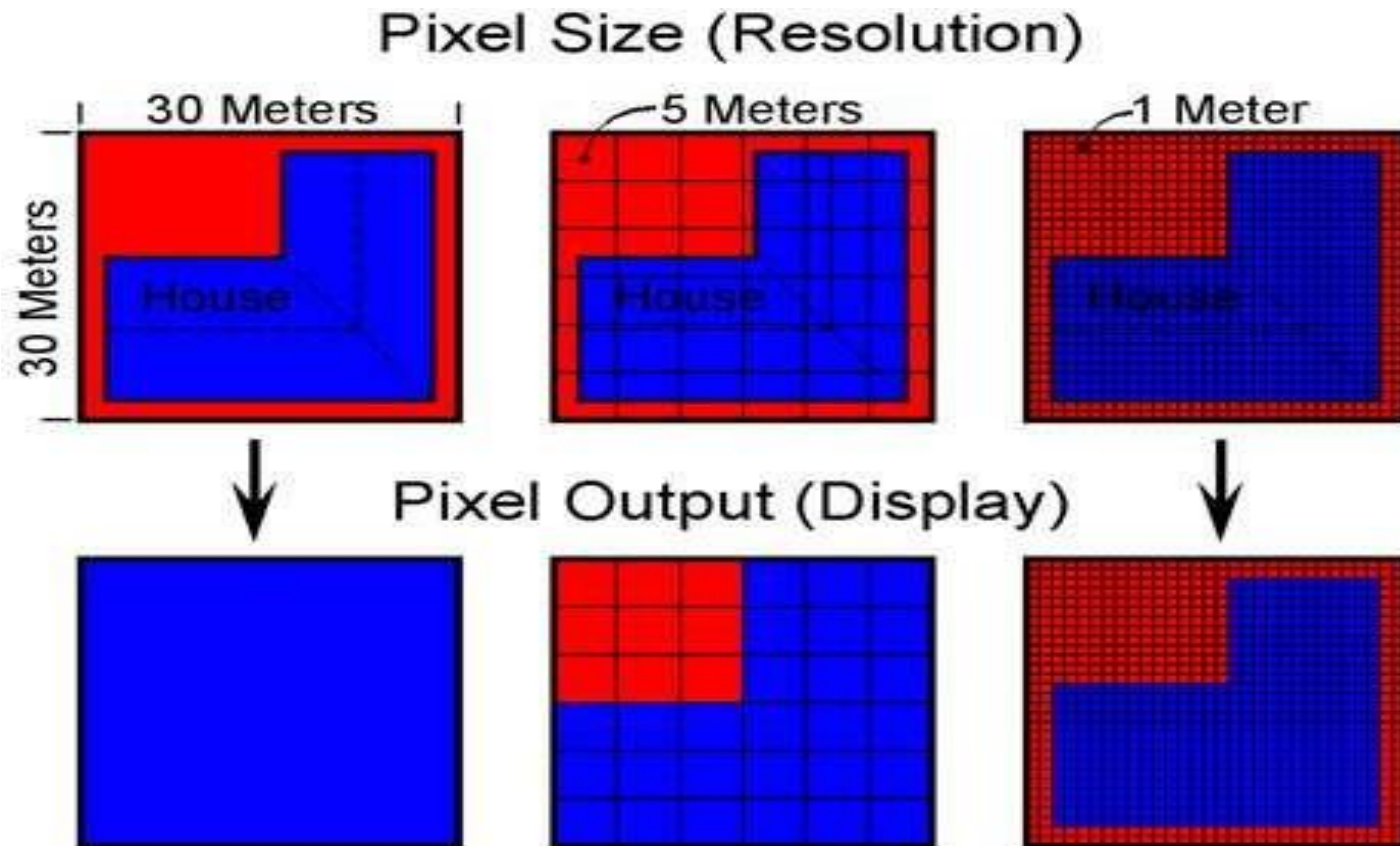
Spatial resolution

- It refers to the size of the smallest possible object that can be detected
- It depends on the Instantaneous Field Of View (IFOV) and the height of the satellite orbit
- It tells the pixel size on the ground surface



CHARACTERISTICS OF SENSORS

Spatial resolution



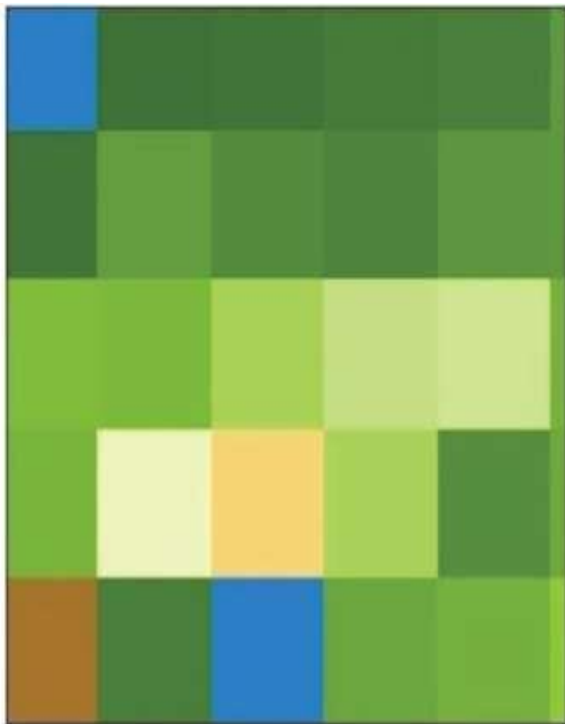
CHARACTERISTICS OF SENSORS

Spatial resolution



CHARACTERISTICS OF SENSORS

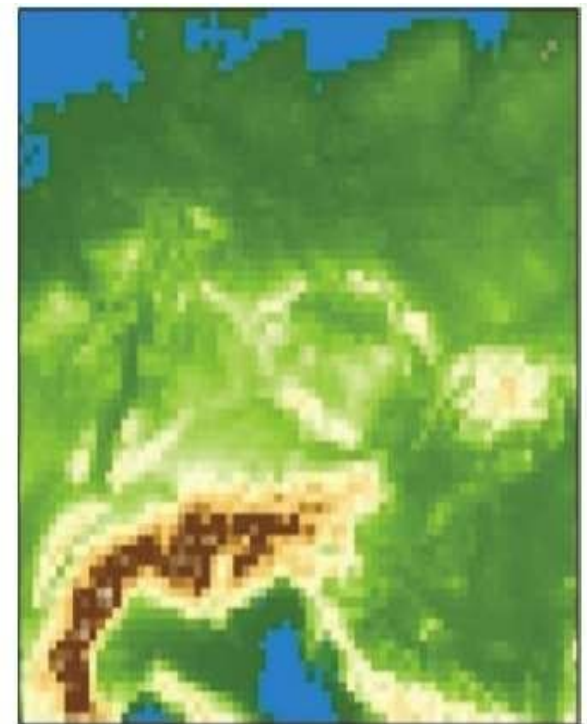
Spatial resolution



250 km



100 km

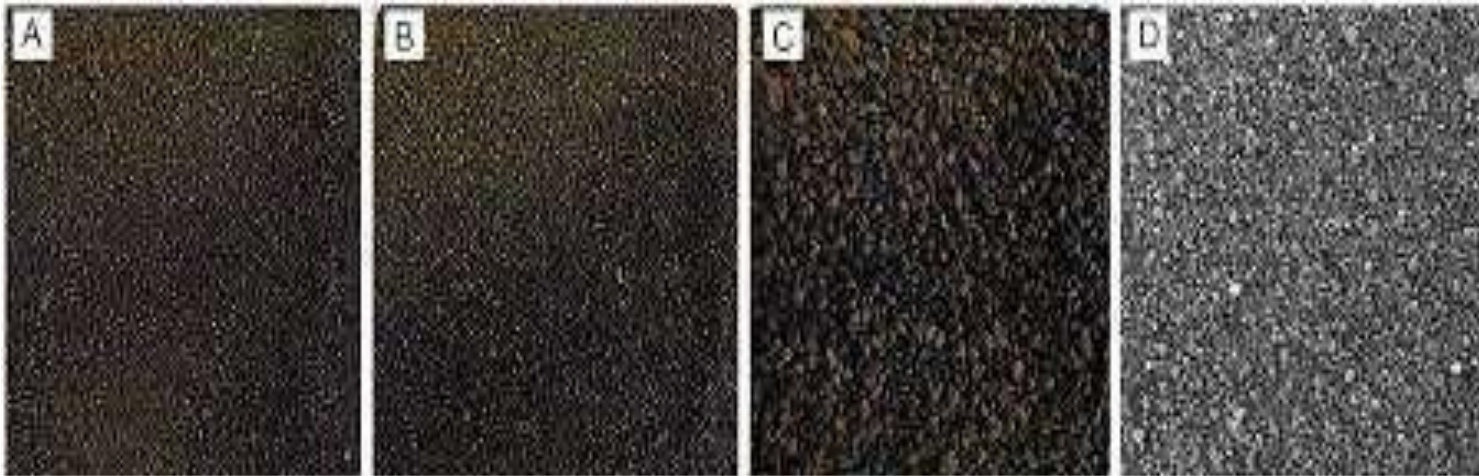


28 km

CHARACTERISTICS OF SENSORS

Spectral resolution

- It describes the ability of a sensor to define fine wavelength ranges
- Sand is appear as coarser in finer wavelength bands



CHARACTERISTICS OF SENSORS

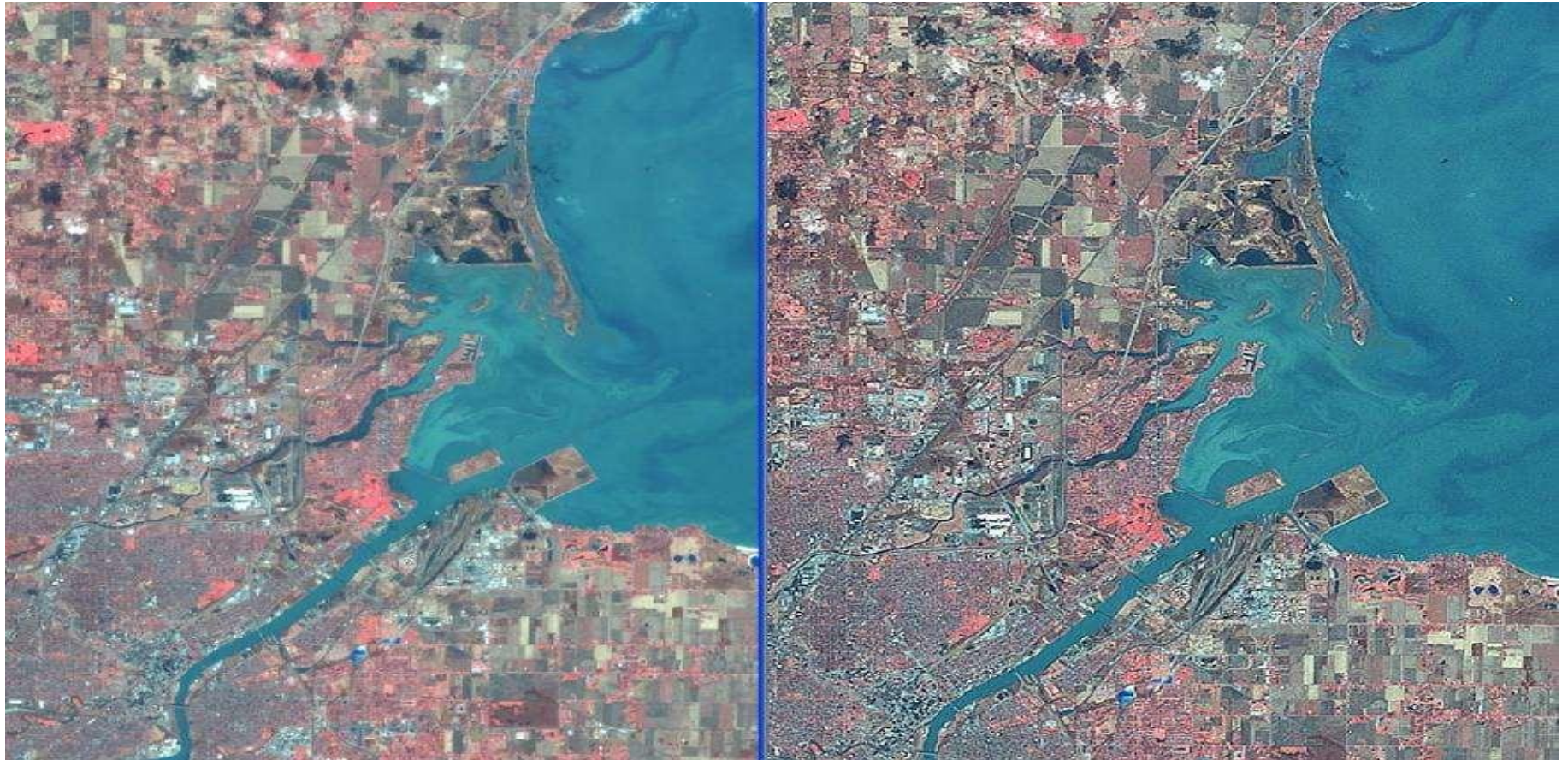
Radiometric resolution

- It describes the ability of sensor to discriminate very slight differences in energy
- The number of brightness levels depends upon the number of bits used



CHARACTERISTICS OF SENSORS

Radiometric resolution



CHARACTERISTICS OF SENSORS

Temporal resolution

It refers to how often it records imagery of a particular area, which means the frequency of repetitive coverage

