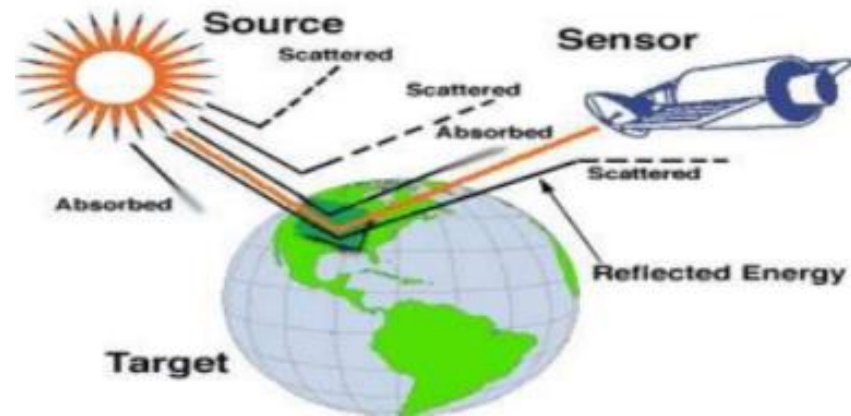


# **REMOTE SENCESING**

- **Remote** – something which is far away
- **Sensing**- getting information or getting data

## Remote Sensing



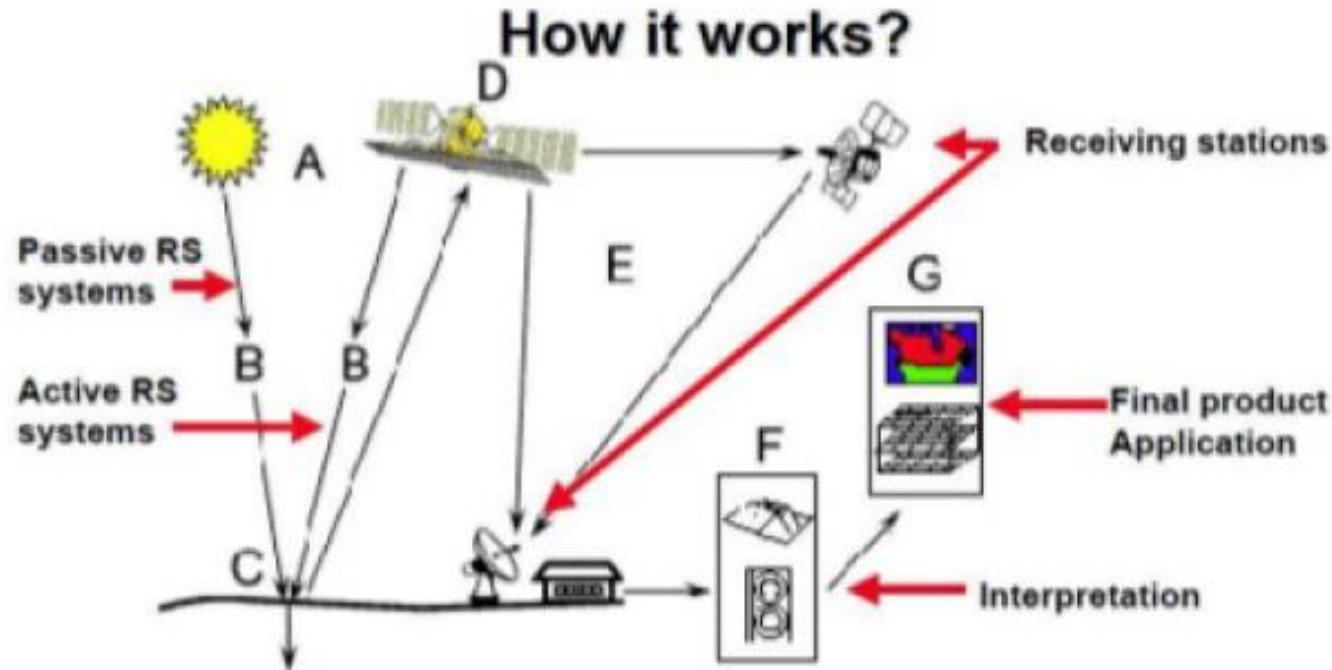
# What is remote sensing ?

- is the science of acquiring information about the earth surface without actual being in contact with it
- This is done by the *sensing and recording* reflecting or emit energy and **processing analyzing and applying** that information
- **Remote sensing is the means of observing object and their physical, optical and geometrical properties without touching object**

## **PRINCIPLES OF REMOTE SENSING**

- Remote sensing is a technique to observe the earth surface or the atmosphere from out of **space using satellites**
- Remote sensing uses a part or several parts of the electromagnetic spectrum. **It records the electromagnetic energy reflected or emitted by the earth's surface.**
- The amount of radiation from an object (called radiance) is influenced by both the properties of the object and the radiation hitting the object .
- The information gather through electromagnetic wave or light of different wave length
- Light falls on the object and scatters back to the sensor which is sensitive to the radiation
- The sensor is photosensitive and as soon as the light reflect back to the sensor a voltage is create which produced signal that save in the storage device

# Remote sensing how it work



- Energy source: Passive/Active
- Atmosphere
- Target
- Recording devices
- Transmission/reception/processing
- Interpretation
- Application

## *Stages in Remote Sensing stages*

- Emission of electromagnetic radiation, or EMR (sun/self- emission)
- Transmission of energy from the source to the surface of the earth, as well as absorption and scattering
- Interaction of EMR with the earth's surface: reflection and emission
  - Transmission of energy from the surface to the remote sensor
  - Sensor data output
- Data transmission, processing and analysis

- Different objects return different amount of energy in different bands of the electromagnetic spectrum, incident upon it. This depends on the property of material (structural, chemical, and physical), surface roughness, angle of incidence, intensity, and wavelength of radiant energy.
- The Remote Sensing is basically a **multi-disciplinary science** which includes a combination of various disciplines such as optics, **spectroscopy**, **photography**, **computer**, **electronics** and **telecommunication**, **satellite launching** etc. All these technologies are integrated to act as one complete system in itself, known as Remote Sensing System.

**1. Energy Source or Illumination (A)** – the first requirement for remote sensing is to have an energy source which illuminates or provides electromagnetic energy to the target of interest.

**2. Radiation and the Atmosphere (B)** – as the energy travels from its source to the target, it will come in contact with and interact with the atmosphere it passes through. This interaction may take place a second time as the energy travels from the target to the sensor.

**3. Interaction with the Target (C)** - once the energy makes its way to the target through the atmosphere, it interacts with the target depending on the properties of both the target and the radiation.

**4. Recording of Energy by the Sensor (D)** - after the energy has been scattered by, or emitted from the target, we require a sensor (remote - not in contact with the target) to collect and record the electromagnetic radiation.



**5. Transmission, Reception, and Processing (E)** - the energy recorded by the sensor has to be transmitted, often in electronic form, to a receiving and processing station where the data are processed into an image (hardcopy and/or digital).

**6. Interpretation and Analysis (F)** - the processed image is interpreted, visually and/or digitally or electronically, to extract information about the target which was illuminated.

**7. Application (G)** - the final element of the remote sensing process is achieved when we apply the information we have been able to extract from the imagery about the target in order to better understand it, reveal some new information, or assist in solving a particular problem.

## ***Need for remote sensing***

- Systematic data collection
- Repeatability
- global coverage
- Multipurpose information

- A **satellite** is an object in space that orbits or circles around a bigger object.
- There are two kinds of **satellites**: natural (such as the moon orbiting the Earth) or artificial (such as the International Space Station orbiting the Earth).
- An **orbit** is a regular, repeating path that one object in space takes around another one. An object in an **orbit** is called a **satellite**.

**Satellite orbits-** An **orbit** is a regular, repeating path

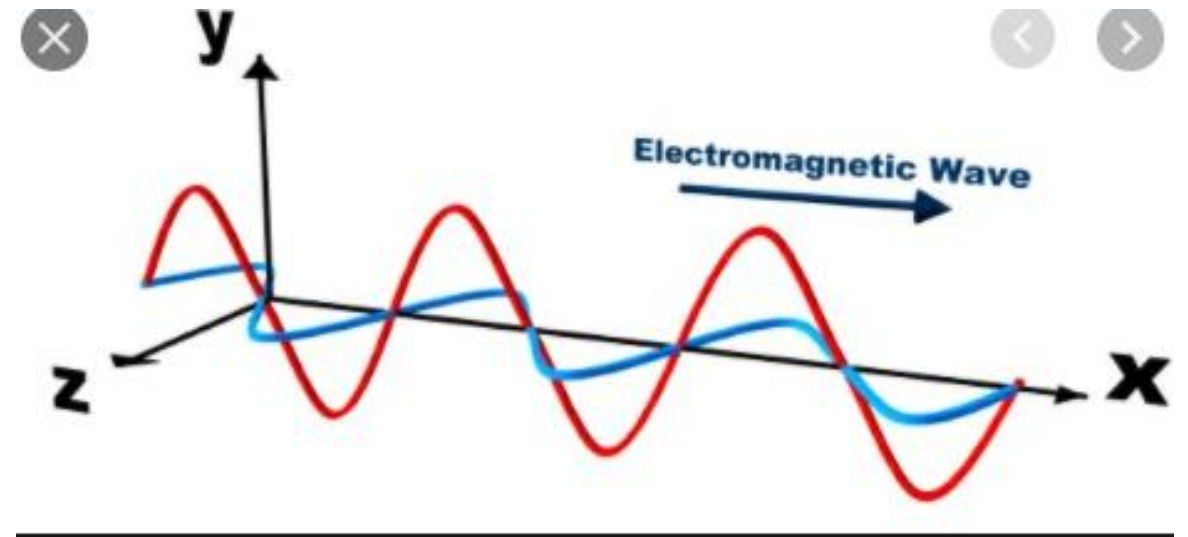
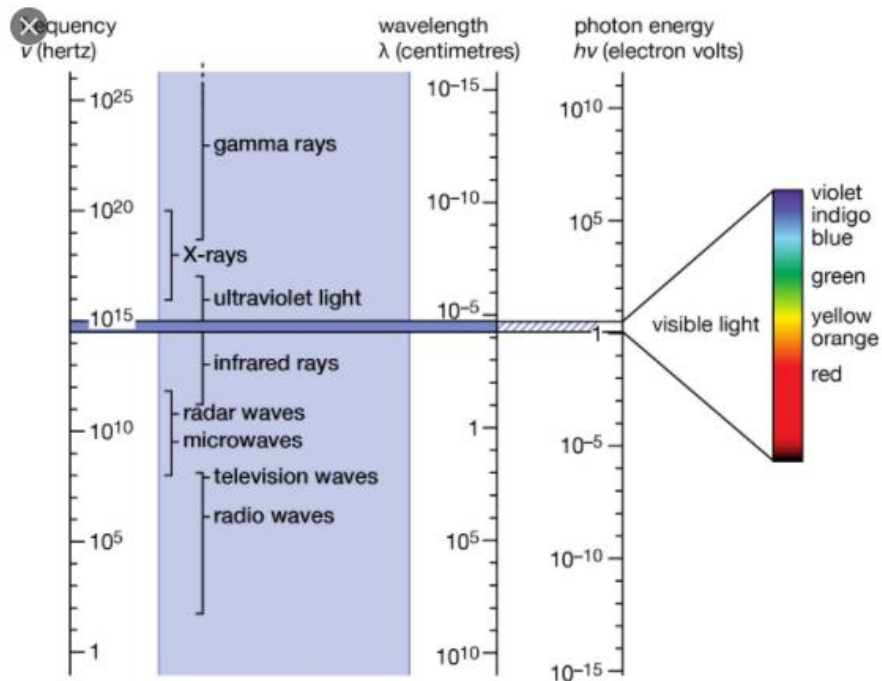
- A satellite follows a generally elliptical orbit around the earth. The time taken to complete one revolution of the orbit is called the orbital **period**.
- The satellite traces out a path on the earth surface, called its **ground track**, as it moves across the sky. As the earth below is rotating, the satellite traces out a different path on the ground in each subsequent cycle.
- Remote sensing satellites are often launched into special orbits such that the satellite repeats its path after a fixed time interval. This time interval is called the **repeat cycle** of the satellite.

## Remote Sensing Satellites

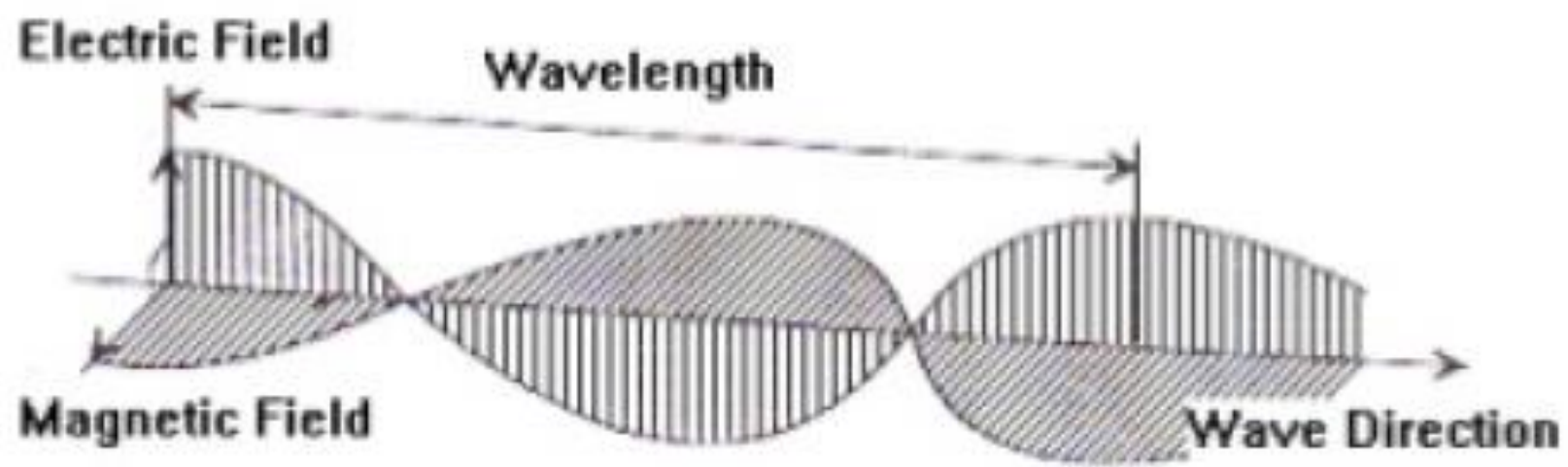
- Several remote sensing satellites are currently available, providing imagery suitable for various types of applications.
- Each of these satellite-sensor platform is characterized by the **wavelength bands** employed in image acquisition, **spatial resolution** of the sensor, the **coverage area** and the **temporal coverage**,

# Electromagnetic radiation

- **electromagnetic radiation (EM radiation or EMR)** refers to the **waves** (or their quanta, photons) of the **electromagnetic** field, propagating (radiating) through space, carrying **electromagnetic** radiant energy. It includes radio **waves**, microwaves, infrared, (visible) light, ultraviolet, X-**rays**, and gamma **rays**.



## Description of Electromagnetic Waves



- Electromagnetic wave are energy transported through space in the form of periodic disturbance of electric and magnetic field
- The wave are constitute by both electric and magnetic vectors
- Electromagnetic wave are travel through space at the same speed commonly known as speed of light ( $3 \times 10^8$  metre /sec)



# Electro-optical

- Is a device
- The electro optic effect is a change in the optical properties of an optically active ,material due to interaction with light
- This interaction usually results in a change in the birefringence(optical properties) and not simply the refractive index of the medium

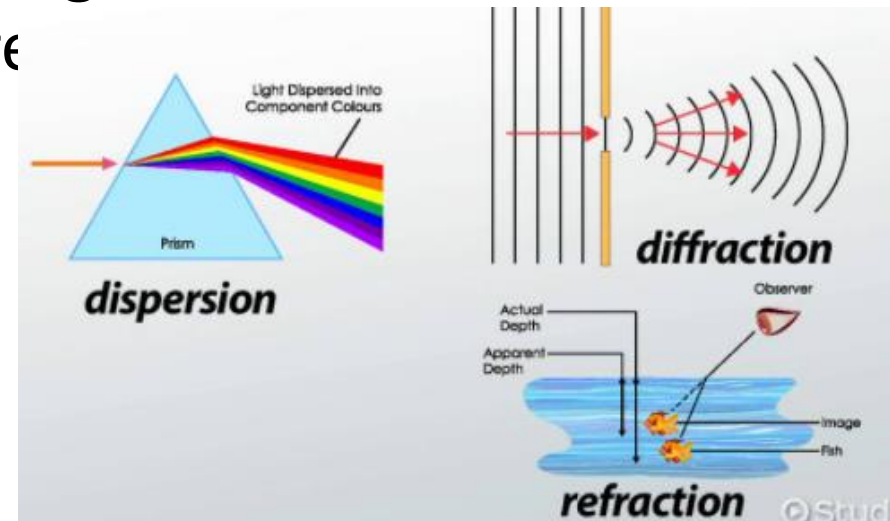
## Micro wave

**Microwave** is a form of electromagnetic radiation with wavelengths ranging from about one meter to one millimeter; with frequencies between 300 MHz (1 m) and 300 GHz (1 mm)

A **microwave system** is a **system** of gear used for **microwave** data transmission

## Diffraction

**Diffraction** refers to various phenomena that occur when a wave encounters an obstacle or opening. It is defined as the bending of waves around the corners of an obstacle or through an aperture into the region of the shadow of the obstacle/aperture.



- **Remote sensing** has been **used in resource development**, the planning and **management** of the **coastal zone**, the monitoring of shoreline changes, and the understanding of physical processes in the **coastal** environment with geographic information systems (GIS)

- The coastal zone of world is under increasing stress due to development of industries, trade and commerce, tourism and resultant human population growth and migration, and deteriorating water quality and marine biodiversity and productivity.
- The coastal zone represents varied and highly productive ecosystems such as mangroves, coral reefs, sea grasses
- Coastal ecosystems harbour wealth of **species and genetic diversity**, store and **cycle nutrients, filter pollutants and help to protect shorelines** from erosion and storms. Marine ecosystems play a vital role in regulating climate and they are a major carbon sink and oxygen source.

- It is necessary to protect these coastal ecosystems to ensure sustainable development.
- This requires information on habitats, landforms, coastal processes, water quality, natural hazards on a repetitive basis
- In India, remote sensing data, especially **Indian Remote Sensing (IRS) data**, having moderate to high spatial resolution have been used to generate database on various components of coastal environment of the entire country.

## **ISSUES FOR COASTAL ZONE MANAGEMENT**

### **Coastal ecosystems and marine living resources**

- i) conservation and restoration of vital and critical habitats such as mangroves, coral reefs, sea-grass beds, etc.
- ii) Renovation of wetland for agricultural and industrial purposes
- iii) Exploration and sustainable use of living resources

## **Shoreline protection**

- i) Identification of vulnerable areas including eroded areas and developmental activities
- ii) Planning and implementation of coastal protection work (erosion, flood protection)
- iv) Impact of engineering structures and dams on coastal processes of erosion, deposition and sediment transport
- v) Suspended sediment dynamics
- vi) Changes in bottom topography

## **Coastal water quality**

- i) Non-point and point pollution
- ii) Phytoplankton blooms

## **Coastal Hazards and Climate Change**

- i) Cyclones, sea-level rise and possible effects
- ii) Emergency response plans for natural disasters such as cyclones, sea level rise, or anthropogenic activities such as oil spills.

## **Coastal development**

- i) Appropriate site selection for industries, landfall points, aquaculture, recreational activities, etc.
- ii) Assessment of conditions in regulation zones, areas under construction



## **COASTAL ECOSYSTEMS AND MARINE RESOURCES**

- Coral Reefs
- SHORELINE PROTECTION
- Marine fisheries
- MARINE WATER QUALITY
- MARINE ENVIRONMENT AND CLIMATE CHANGE
- Brackish Water Aquaculture Site Selection
- COASTAL ZONE MANAGEMENT