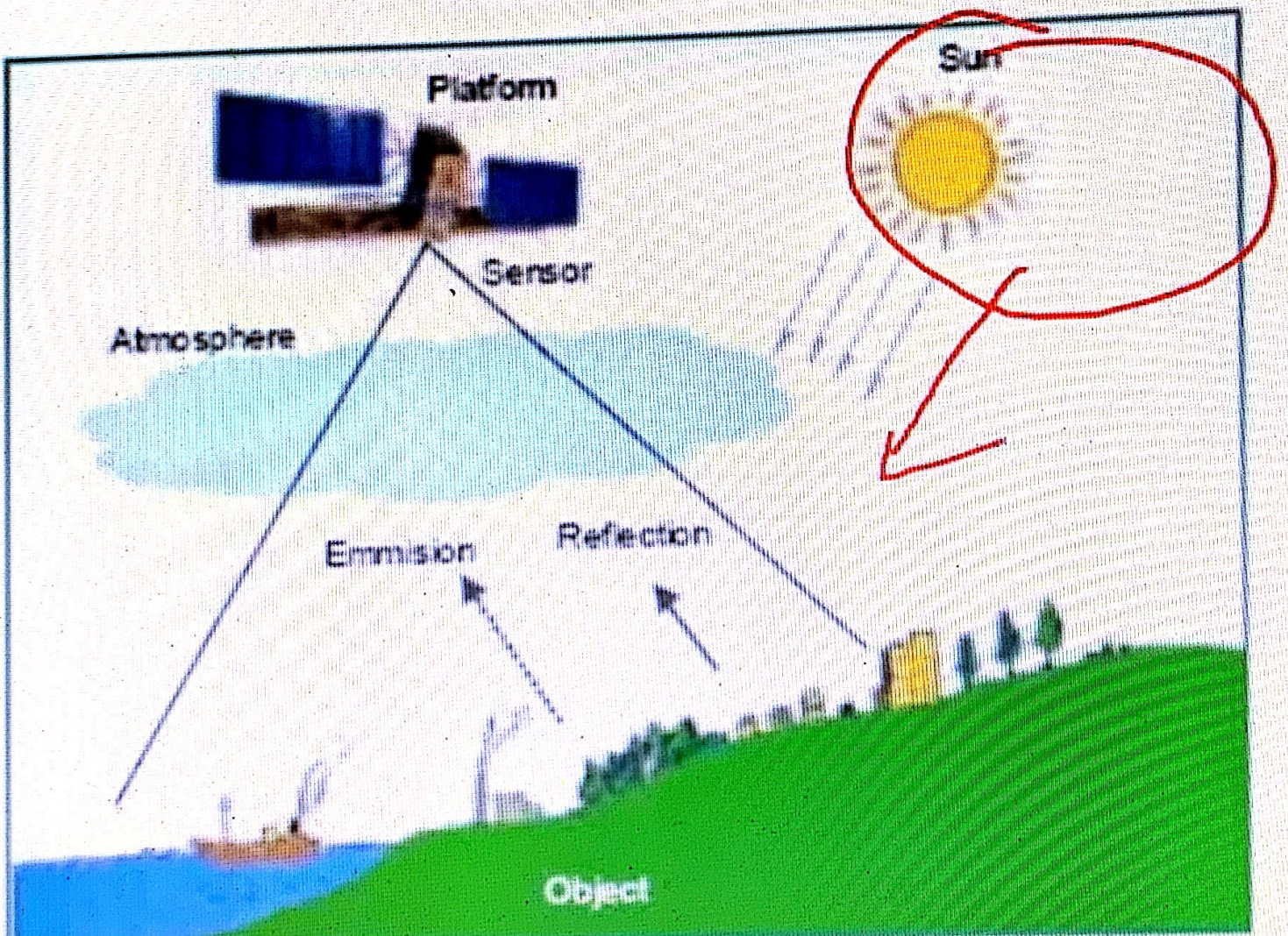


REMOTE SENSING-DEFINITION

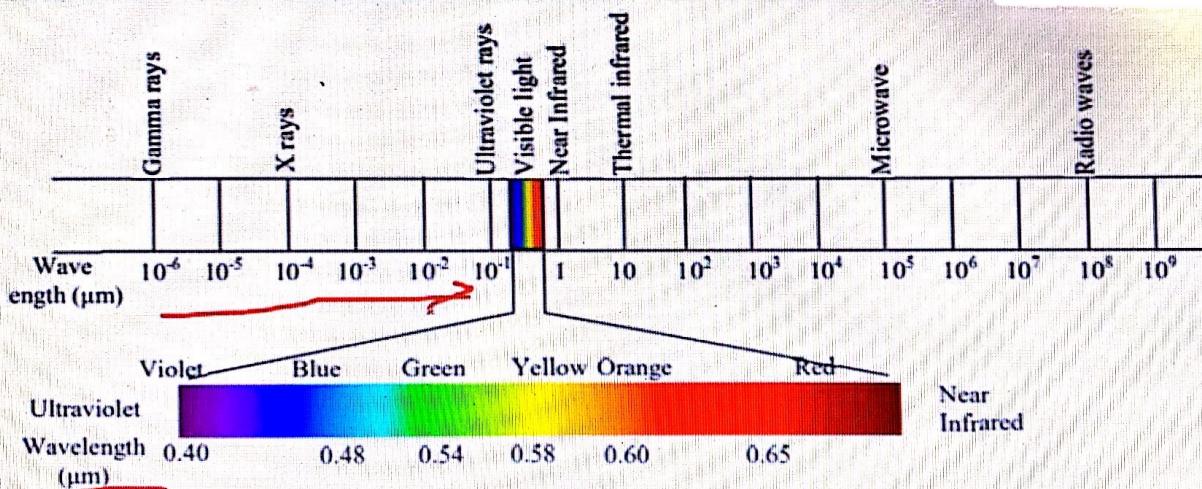
- Remote sensing is an art and science of obtaining information about an object or feature without physical coming in contact with that object or feature.
- Humans apply remote sensing in their day-to-day business, through vision, hearing and sense of smell.
- It is the science of making measurements of the Earth's surface by using sensors.

- Remotely collected data through various sensors may be analyzed to obtain information about the objects or features under investigation.
- Remote sensing is the process of inferring surface parameters from measurements of the electromagnetic radiation (EMR) from the Earth's surface. This EMR can either be reflected or emitted from the Earth's surface. In other words, remote sensing is detecting and measuring electromagnetic (EM) energy emanating or reflected from distant objects made of various materials, so that we can identify and categorize these objects.



➤ Electromagnetic energy or electromagnetic radiation (EMR) is the energy propagated in the form of an advancing interaction between electric and magnetic fields. It travels with the velocity of light. Visible light, ultraviolet rays, infrared rays, heat, radio waves, X-rays all are different forms of electro-magnetic energy.

ELECTROMAGNETIC ENERGY



All matters reflect, emit or radiate a range of electromagnetic energy, depending upon the material characteristics. In remote sensing, it is the measurement of electromagnetic radiation reflected or emitted from an object, is the used to identify the target and to infer its properties.

PRINCIPLES OF REMOTE SENSING

➤ Different objects reflect or emit different amounts of energy in different bands of the electromagnetic spectrum. The amount of energy reflected or emitted depends on the properties of both the material and the incident energy (angle of incidence, intensity and wavelength).

➤ Detection and discrimination of objects or surface features is done through the uniqueness of the reflected or emitted electromagnetic radiation from the object.

➤ A device to detect this reflected or emitted electro-magnetic radiation from an object is called a “sensor” (e.g., cameras and scanners). A vehicle used to carry the sensor is called a “platform” (e.g., aircrafts and satellites).

STAGES IN REMOTE SENSING

Main stages in remote sensing are the following:-

- A. Emission of electromagnetic radiation .The Sun or an EMR source located on the platform.
- B. Transmission of energy from the source to the object. Absorption and scattering of the EMR while transmission.
- C. Interaction of EMR with the object and subsequent reflection and emission .
- D. Transmission of energy from the object to the sensor.
- E. Recording of energy by the sensor .Photographic or non-photographic sensors.
- F. Transmission of the recorded information to the ground station .
- G. Processing of the data into digital or hard copy image.
- H. Analysis of data .

ACTIVE Vs PASSIVE REMOTE SENSING

- PASSIVE –Sun is the source of energy. Most of the remote sensing systems work in passive mode using solar energy as the source of EMR. Solar energy reflected by the targets at specific wavelength bands are recorded using sensors onboard air-borne or space borne platforms. In order to ensure ample signal strength received at the sensor, wavelength / energy bands capable of traversing through the atmosphere, without significant loss through atmospheric interactions, are generally used in remote sensing.
- ACTIVE -Energy is generated (own source of energy) and sent from the remote sensing platform towards the targets. The energy reflected back from the targets are recorded using sensors onboard the remote sensing platform. Most of the microwave remote sensing is done through active remote sensing.

REMOTE SENSING PLATFORMS

Remote sensing platforms can be classified as follows, based on the elevation from the Earth's surface at which these platforms are placed.

- Ground level remote sensing - Ground level remote sensors are very close to the ground. They are basically used to develop and calibrate sensors for different features on the Earth's surface.
- Aerial remote sensing
 - A) Low altitude aerial remote sensing
 - B) High altitude aerial remote sensing
- Space borne remote sensing
 - A) Space shuttles
 - B) Polar orbiting satellites
 - C) Geo-stationary satellites

Space-borne RS

Satellite



MSS, HCCAT

Airplane - High Altitude



MSS, Radar

Aerial RS

Airplane - Medium Altitude



Camera, Video, MSS

Helicopter



Camera, Video

Balloon



Camera

Hot air balloon



Camera

Radar

AIR-BORNE VS SPACE-BORNE

➤ In airborne remote sensing, downward or sideward looking sensors mounted on aircrafts are used to obtain images of the earth's surface. Very high spatial resolution images (20 cm or less) can be obtained through this. However, it is not suitable to map a large area. Less coverage area and high cost per unit area of ground coverage are the major disadvantages of airborne remote sensing.

➤ In space-borne remote sensing, sensors mounted on space shuttles or satellites orbiting the Earth are used. There are several remote sensing satellites (Geostationary and Polar orbiting) providing imagery for research and operational applications. While Geosynchronous Satellites are used for communication and meteorological purposes, polar orbiting or sun-synchronous satellites are essentially used for remote sensing. The main advantages of space-borne remote sensing are large area coverage, less cost per unit area of coverage, continuous or frequent coverage of an area.

APPLICATIONS

- Land use/Land cover Mapping.
- Agriculture – 1) Crop Condition assessment 2) Crop type Classification 3) Crop Yield estimation.
- Water resources mapping /potential
- Environmental Studies – Pollution / deforestation
- Soil Mapping
- Geological Mapping – Mineral exploration
- Forestry - Cover Mapping / Assessment of change / Density Determination/ Forest fire.
- Climatological Studies – Global warming /Ozone hole
- Disaster Prediction / Management

INDIAN REMOTE SENSING SATELLITES

- IRS series
- CARTOSAT series
- Resource SAT
- RISAT
- Oceansat
- SARAL