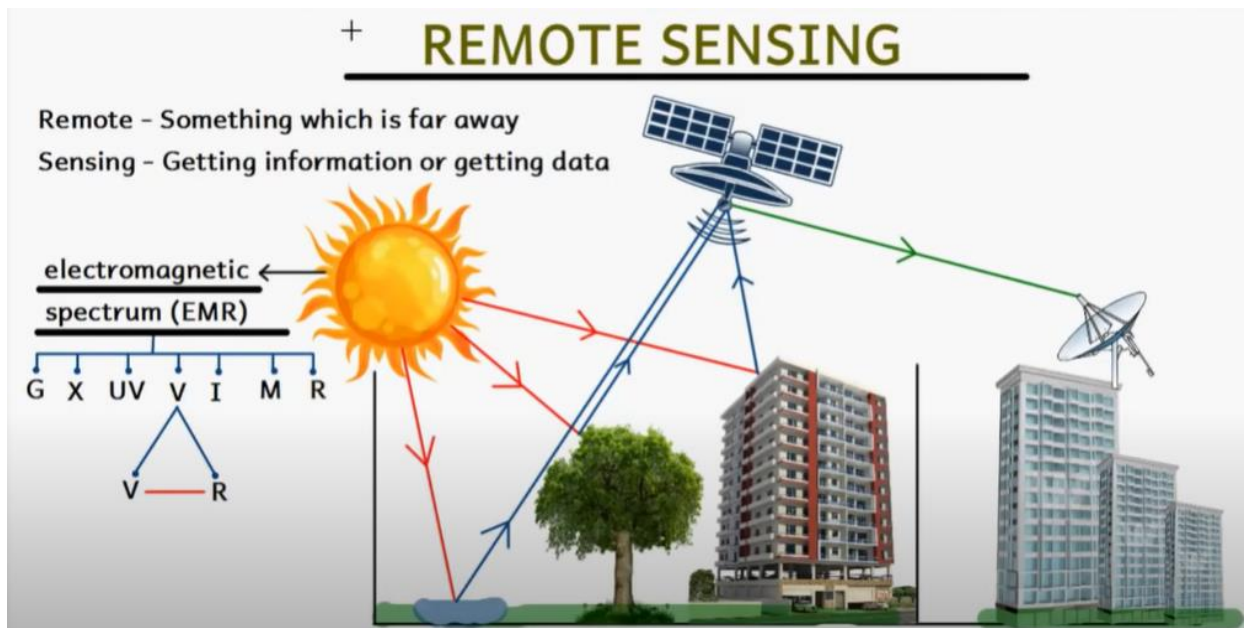
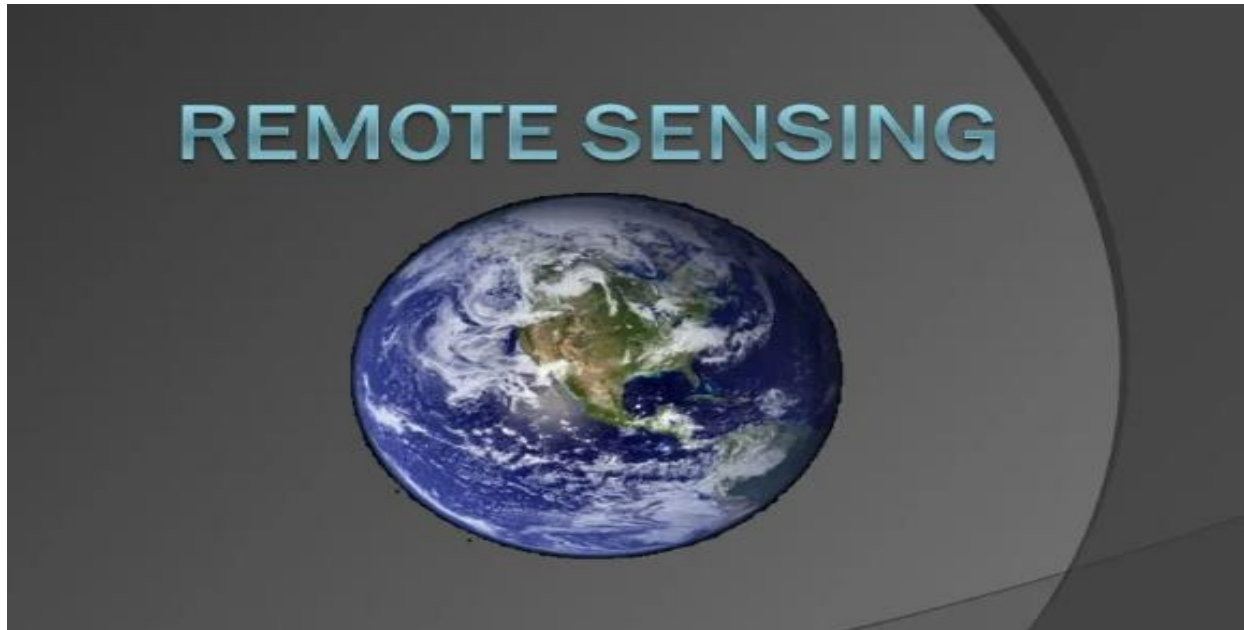


Chapter 8

Remote Sensing

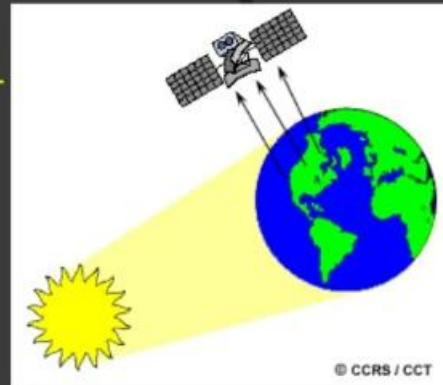
Introduction



Introduction



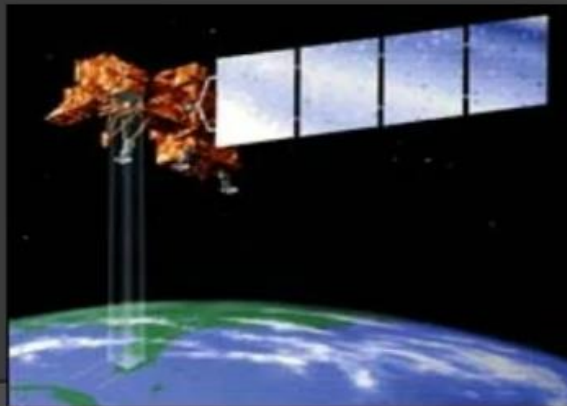
What is Remote Sensing?



Remote sensing is a method of obtaining information about the properties of an object without coming into physical contact with it.

Remote Sensing is a technology for sampling electromagnetic radiation to acquire and interpret non-immediate geospatial data from which to extract information about features and objects on the Earth's land surface, oceans, and atmosphere

- **Dr. Nicholas Short**



Remote Sensing

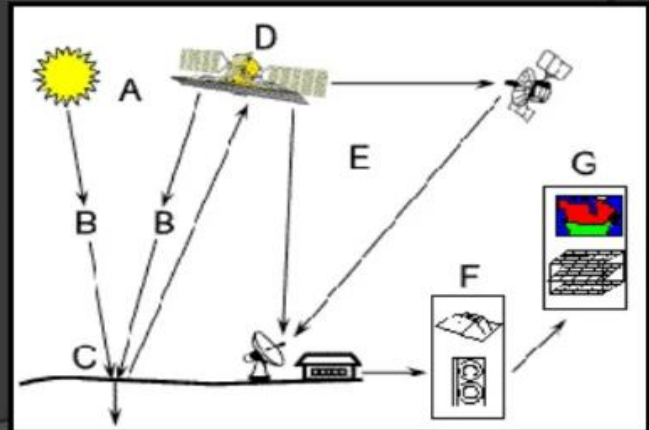
- ▮ RS System capture radiation in different wavelength reflected/ emitted by the earth's surface features and recorded it either directly on the film as in case of aerial photography or in digital medium used for generating the images
- ▮ RS provides valuable data over vast area in a short time about resources, meteorology and environment leading to better resource management and accelerating national development

Advantages of remote sensing

- ▮ Provides a regional view (large areas)
- ▮ Provides repetitive looks at the same area
- ▮ Remote sensors "see" over a broader portion of the spectrum than the human eye
- ▮ Sensors can focus in on a very specific bandwidth in an image or a number of bandwidths simultaneously
- ▮ Provides geo-referenced, digital, data
- ▮ Some remote sensors operate in all seasons, at night, and in bad weather

Elements involved in Remote sensing

1. Energy Source or Illumination (A)
2. Radiation and the Atmosphere (B)
3. Interaction with the Object (C)
4. Recording of Energy by the Sensor (D)
5. Transmission, Reception and Processing (E)
6. Interpretation and Analysis (F)
7. Application (G)



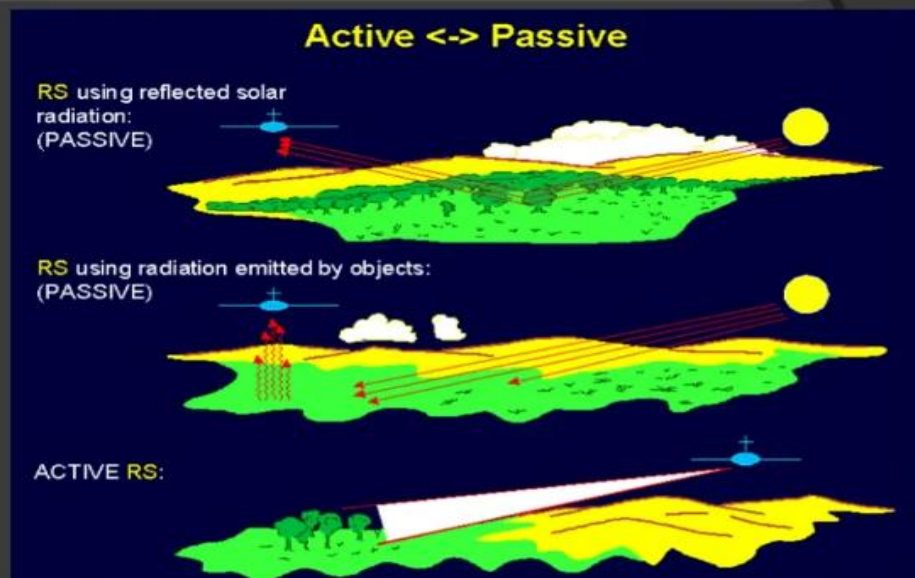
Sensors

Passive sensors

- Landsat
- ASTER
- Quickbird
- Ikonos

Active Sensors

- LIDAR
- RADAR



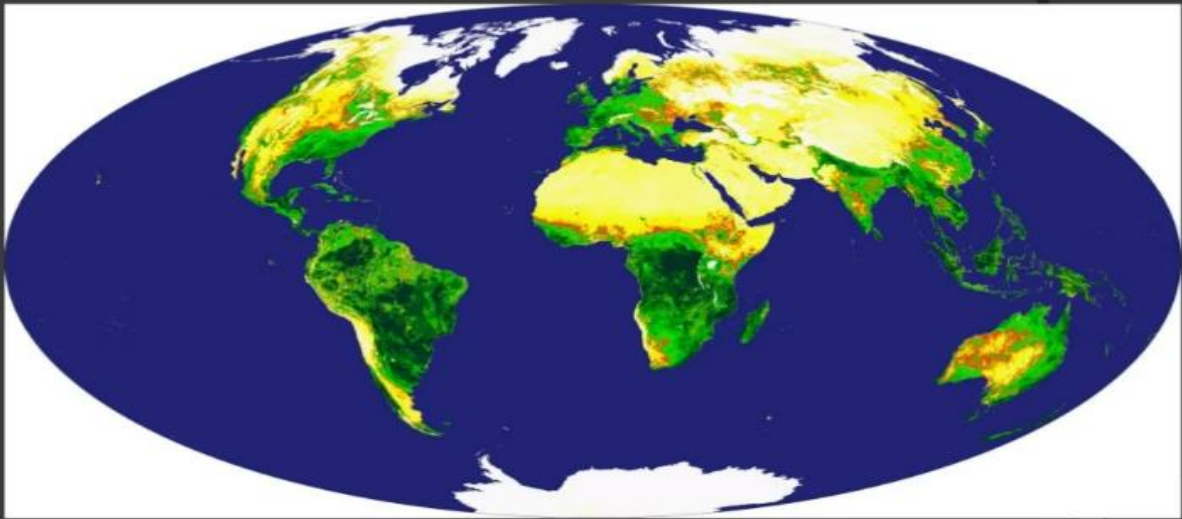


Why use Satellites to Study the Earth?

- ▢ Consistent, routine, global measurements
- ▢ Overview of information on the hemispheric, regional, national, and local scales – the “big picture”
- ▢ Provide information in areas where there are no ground-based measurements
- ▢ Advance warning of impending environmental events and disasters
- ▢ Visual appeal: a picture is worth a thousand words



Satellites Provide a Global View



Satellite data are used for many applications, including monitoring global weather, studying climate change, and observing the environment.

A Picture is Worth a Thousand Words!



Satellites provide consistent, routine, global coverage of environmental events

Satellite Images

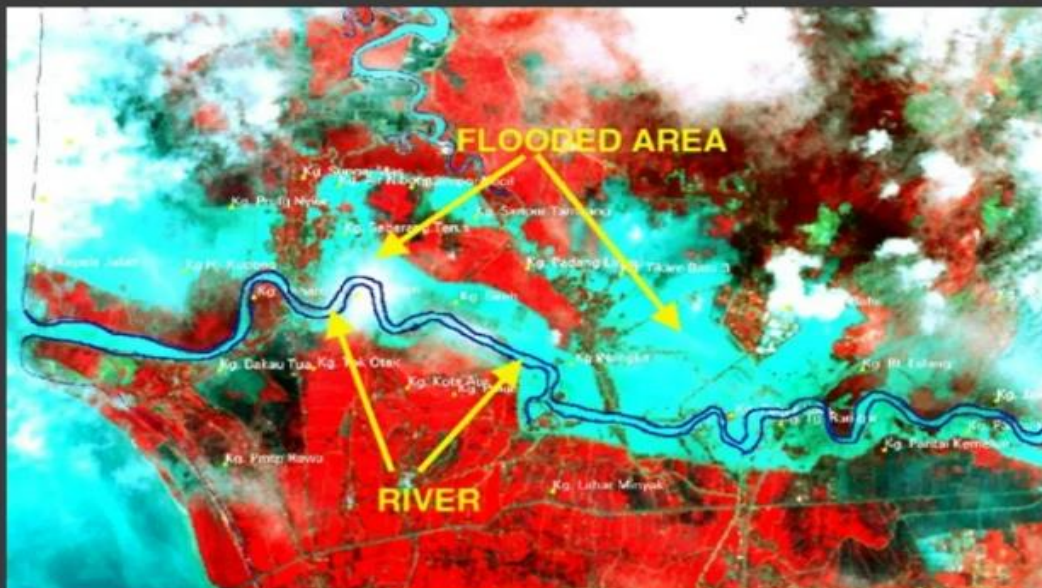
Advantages

- Covers large areas
- Cost effective
- Time efficient
- Multi-temporal
- Multi-sensor
- Multi-spectral
- Overcomes inaccessibility
- Faster extraction of GIS-ready data

Disadvantages

- Needs ground verification
- Doesn't offer details
- Not the best tool for small areas
- Needs expert system to extract data

Application of Remote sensing



Application of Remote sensing

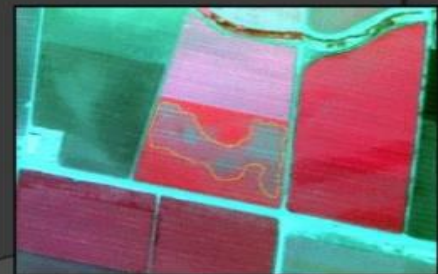
❖ Urbanization & Transportation

- ❖ Updating road maps
- ❖ Asphalt conditions
- ❖ Wetland delineation
- ❖ Urban Planning



❖ Agriculture

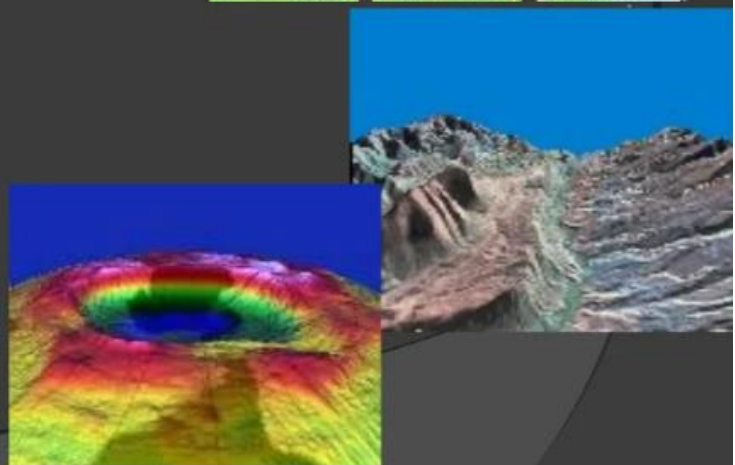
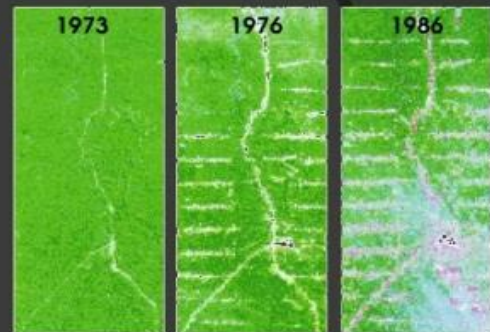
- ❖ Crop health analysis
- ❖ Precision agriculture
- ❖ Compliance mapping
- ❖ Yield estimation
- ❖ Forest application



Application of Remote sensing

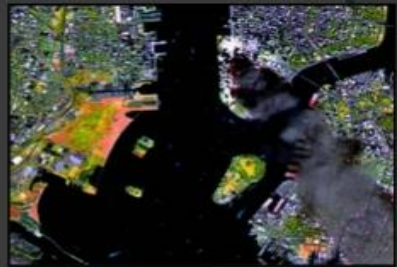
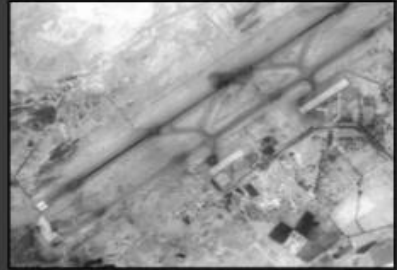
▮ Natural Resource Management

- Habitat analysis
- Environmental assessment
- Pest/disease outbreaks
- Impervious surface mapping
- Lake monitoring
- Hydrology
- Landuse-Landcover monitoring
- Mineral province
- Geomorphology
- Geology



Application of Remote sensing

- National Security
 - Targeting
 - Disaster mapping and monitoring
 - Damage assessment
 - Weapons monitoring
 - Homeland security
 - Navigation
 - Policy
 - Telecommunication planning
 - Coastal mapping



Science Of Geology



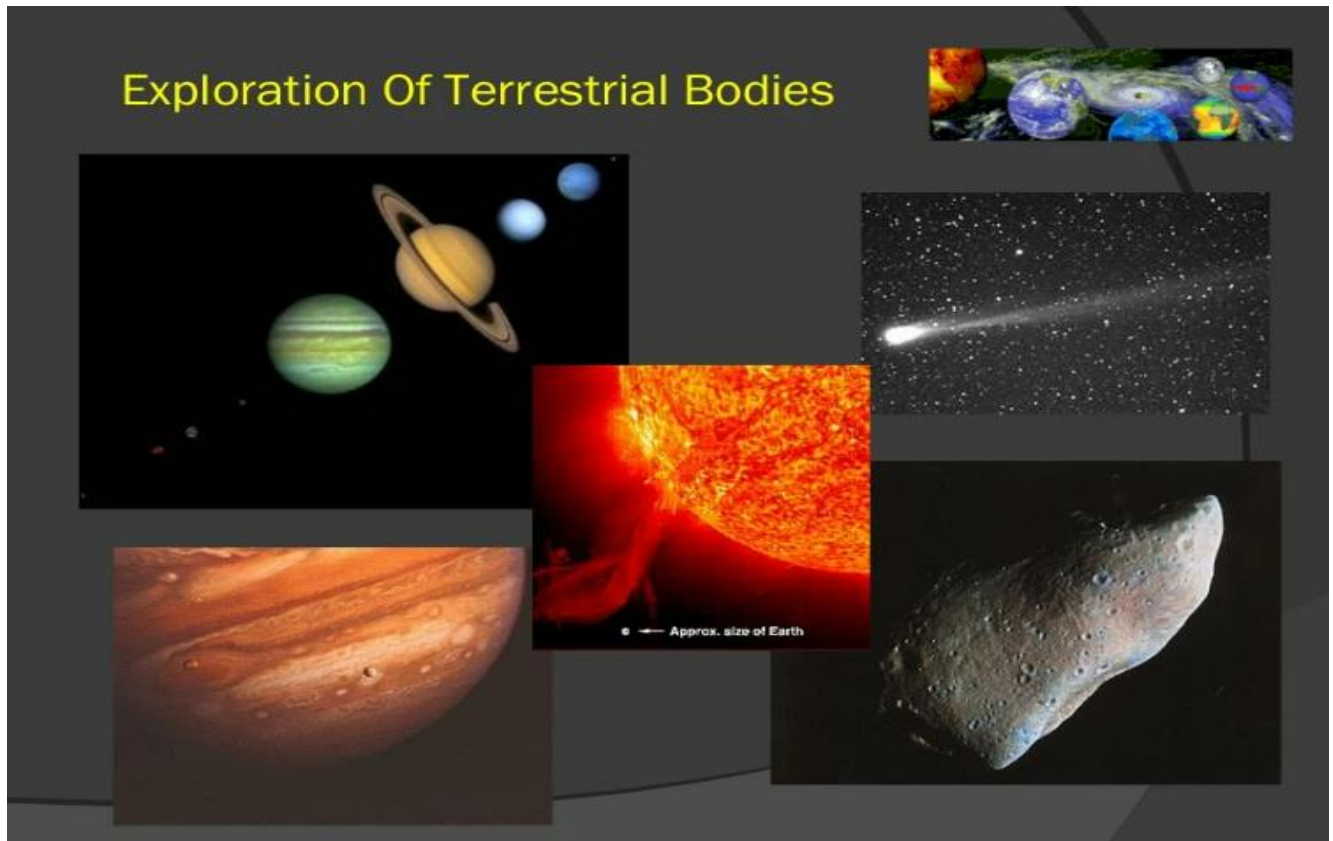
Meteorological Application



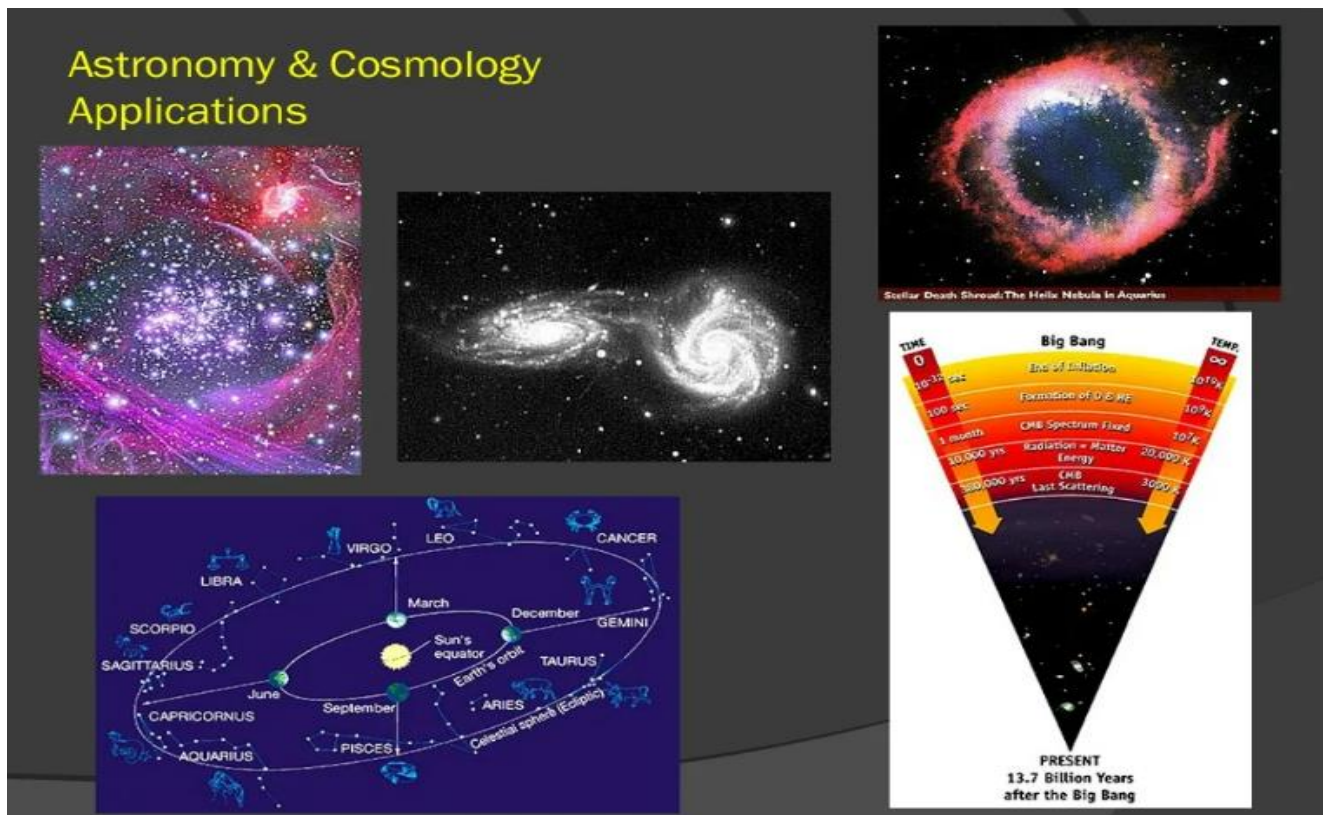
Medical Applications of Remote Sensing



Exploration Of Terrestrial Bodies



Astronomy & Cosmology Applications

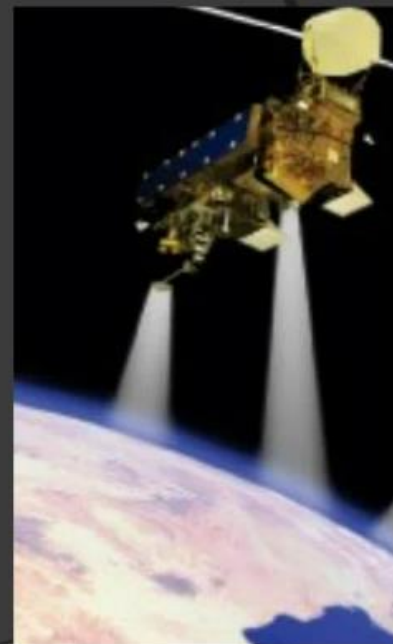


Remote sensing basic processes

- ▢ Data acquisition (energy propagation, platforms)
- ▢ Processing (conversion of energy pattern to images)
- ▢ Analysis (quantitative and qualitative analysis)
- ▢ Accuracy assessment (radiometric and geometric correction)
- ▢ Information distribution to users (hard copy, CCT, CD-ROM, X-BYTE)

How Do Satellites Make Measurements?

- ▢ Satellites do not make *direct* measurements of the Earth's geophysical parameters.
- ▢ Instead, satellites measure solar and/or terrestrial *radiance* (light) in a *vertical column* of the atmosphere.
- ▢ Radiance data are converted into geophysical parameters using science-based algorithms.



Remote Sensing : Challenges

- ▮ Satellites are very expensive to build and launch.
- ▮ No direct measurements – radiance (light) measurements must be converted to geophysical parameters, such as temperature or pollutant concentration.
- ▮ Tradeoffs between spatial and temporal resolution.

