Fundamentals of remote sensing

ARSNET → Applied Remote Sensing Training Program

Remote sensing → obtaining information about an object from a distance.
eg:- a photograph

different types:-
- ground based
- airborne
- spaceborne

difference between satellite and sensor?
→ satellites carry instruments or sensors that measure electromagnetic radiation coming from the earth-atmosphere system.

Healthy vegetation reflects energy in what parts of EM spectrum?
→ In general, healthy vegetation is a very good absorber of EM energy in visible region.

Chlorophyll —strongly absorbs (in terms of λ wavelength)→ blue (0.45) and red (0.67 μm)

—strongly reflects→ green light and IR (∵ our eyes perceive leaves as green (vegetation) → healthy)

EM Spectrum

G X U V I M R

V I B G Y O R

wavelength increases →

small — large

"The energy earth receives from the sun is called electromagnetic radiation."

that energy is → reflected, absorbed, emitted } by earth's atmosphere

Water reflects radiation in the blue-green spectrum (our eyes mostly perceive water in this color range!)

Satellite characteristics

- orbits:- low earth orbit vs. geostationary
- energy source:- passive vs. active
- solar and terrestrial spectra: visible, UV, IR, microwave
- measuring technique: Scanning, non-scanning
- resolution type: spatial, temporal, spectral, radiometric
- application: weather, ocean color, air quality, land mapping, etc.

Geostationary:- satellites typically ~36000 km over the equator with same rotation period as Earth

Limited Spatial coverage
↳ as observations are always of same area

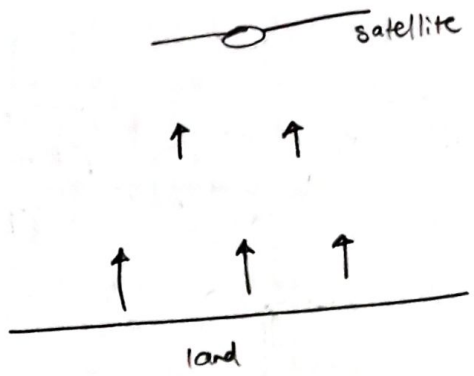
Low earth orbit:- Circular orbit moving relative to earth at 160-2000 km
(Can be polar or non polar)

Less frequent measurements but large spatial coverage

Polar orbiting → provides global coverage and measurement frequency can vary from 1 measurement per day to 1 per month.

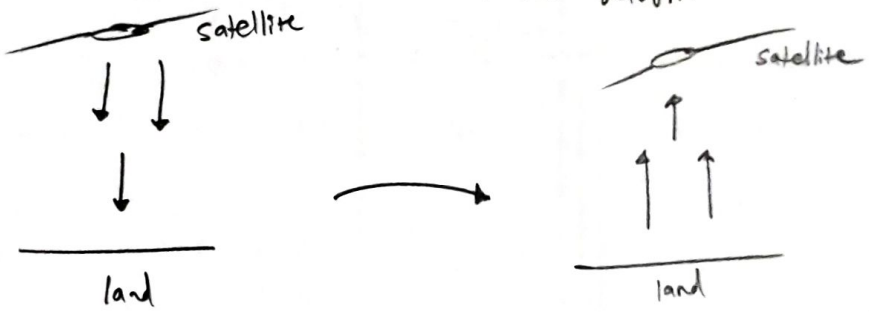
Non polar orbiting → No global coverage
Measurement frequency → few hours to few weeks

Passive remote sensing → depends on reflected and emitting radiation from the earth or change in gravity.



eg:- spectrometer, reflected sunlight

Active remote sensing → instrument sends beams of radiation and measures its return.



eg:- SONAR and RADAR

Spatial resolution → geographical area covered by a pixel in a satellite's image.

↑ Spatial resolution → ↓ less area is covered by a single pixel.

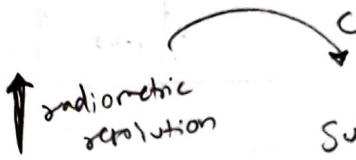
Temporal resolution → Revisit period of a satellite

Time taken by a satellite to image the same area at the same viewing angle a second time.

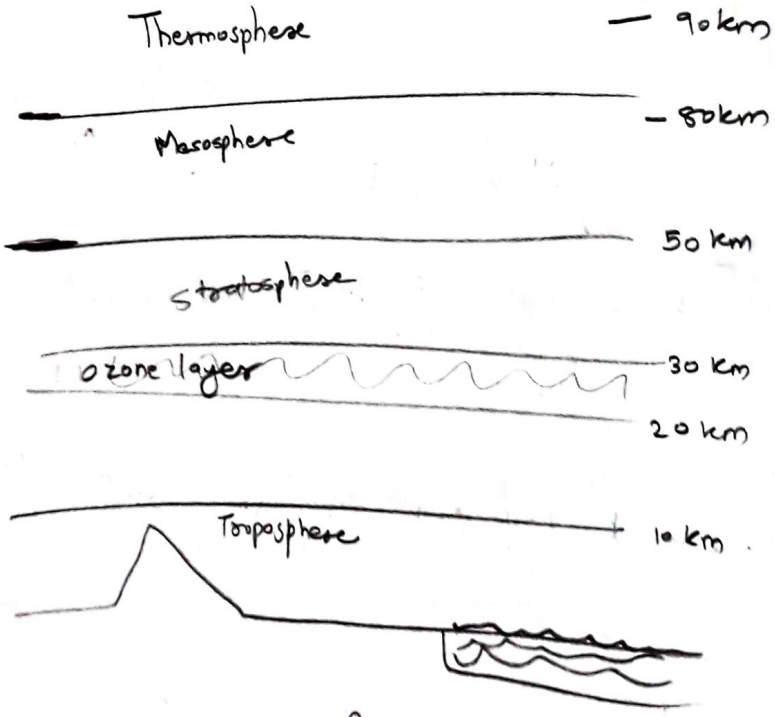
Increase overlaps at high latitudes and maneuvering the sensors → increase temporal resolution

Spectral resolution → ability of satellites to detect fine wavelength intervals.

Radiometric resolution → sensor's ability to discriminate differences in energy (or radiance).



types:-
(2 bit, 4 bit, 8 bit, 12 bit sensors)



layers of atmosphere