The Major Components Of Remote-sensing Technology

1. **ENERGY SOURCE** (PASSIVE SYSTEM: sun, irradiance from earth's materials; ACTIVE SYSTEM: irradiance from artificially-generated energy sources such as radar)

2. **PLATFORMS** (Vehicle to carry the sensor) (truck, aircraft, space shuttle, satellite, etc.)

3. **SENSORS** (Device to detect electro-magnetic radiation) (camera, scanner, etc)

4. **DETECTORS** (To convert electro-magnetic radiation into recorded signals) (film, silicon detectors, etc)

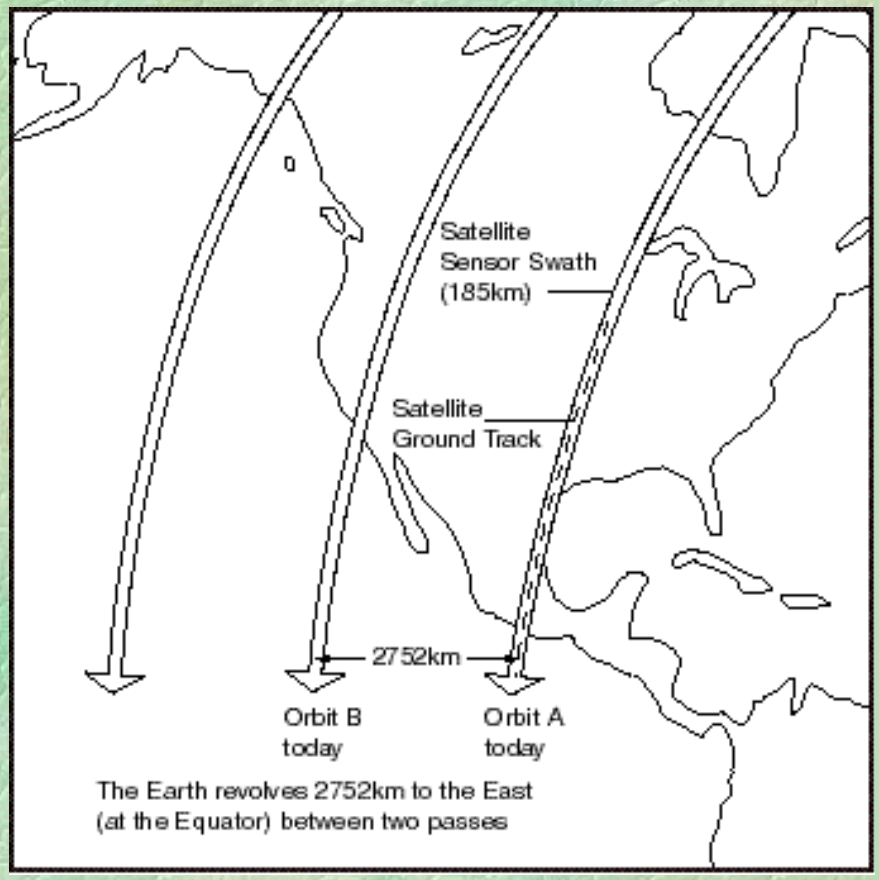
5. **PROCESSING** (Handling signal data) (photographic, digital, etc)

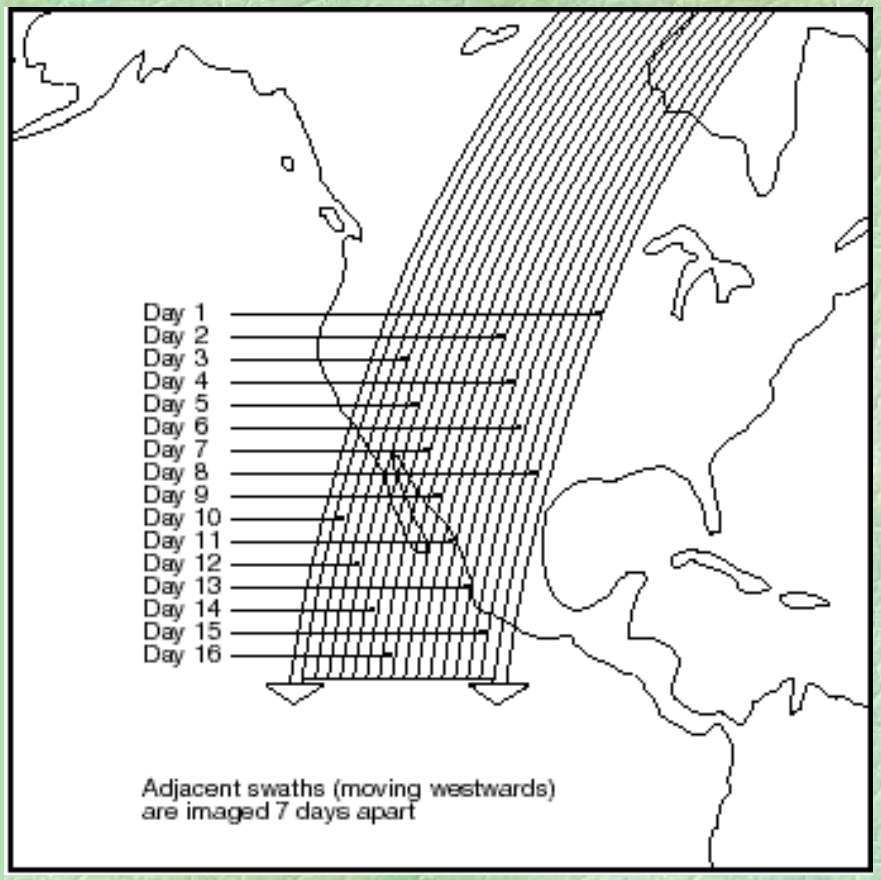
6. **INSTITUTIONALISATION** (Organization for execution at all stages of remote-sensing technology: international and national organizations, centers, universities, etc

Platforms

The vehicles or carriers for remote sensors are called the platforms. Typical examples of platforms are satellites and aircraft, but they can also include radio-controlled aeroplanes, balloons, kits for low altitude remote sensing, as well as ladder trucks or ‘cherry pickers’ for ground investigations. The key factor for the selection of a platform is the altitude that determines the ground resolution and which is also dependent on the instantaneous field of view (IFOV) of the sensor on board the platform.

Landsat 4/5 Swathing Pattern





Push-broom Scanner (fig. 10)

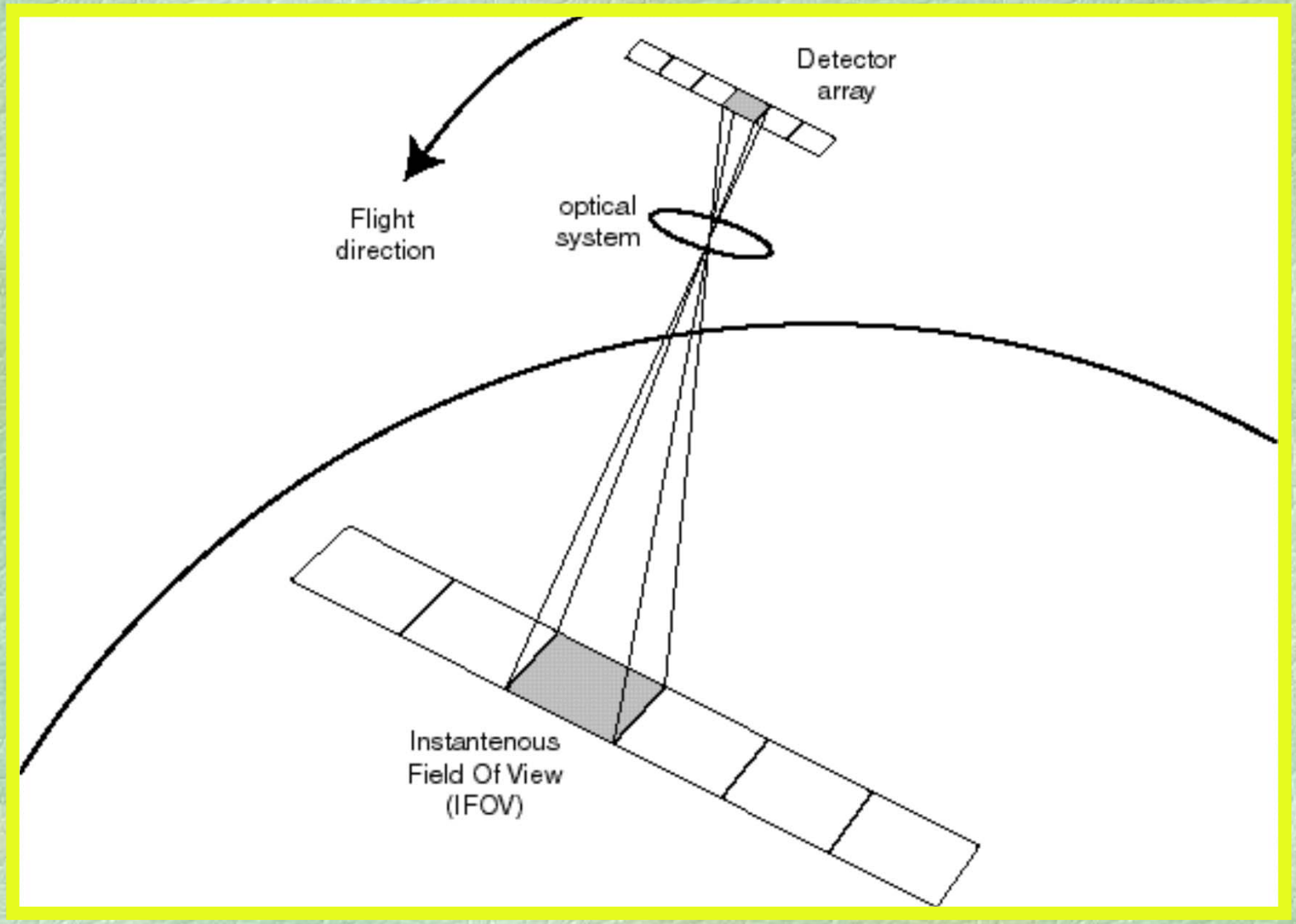
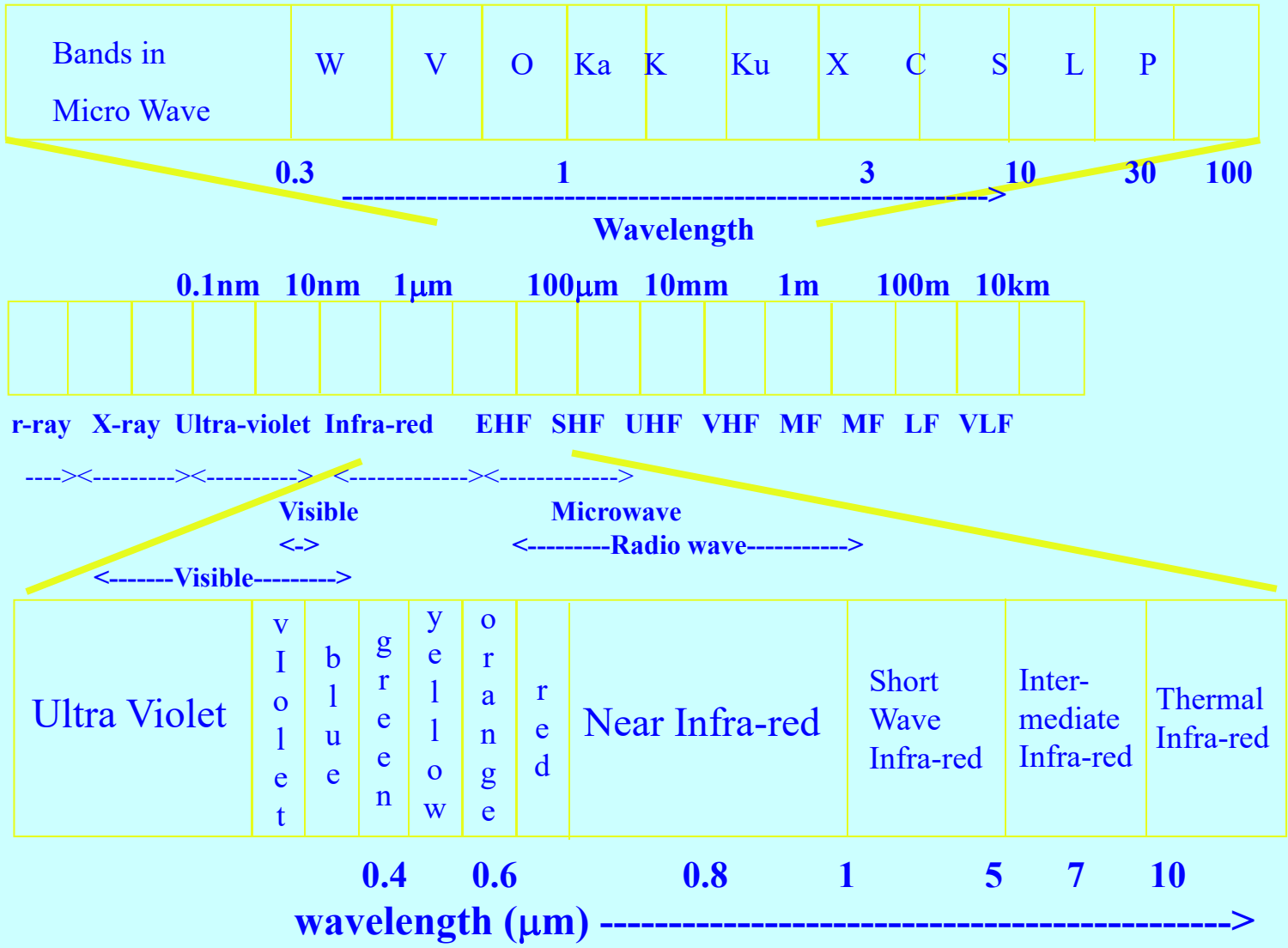


Figure 1: The Bands Used in Remote Sensing



Spectral characteristics of

(a) energy source,
(b) atmospheric transmittance,
(c) remote-sensing systems

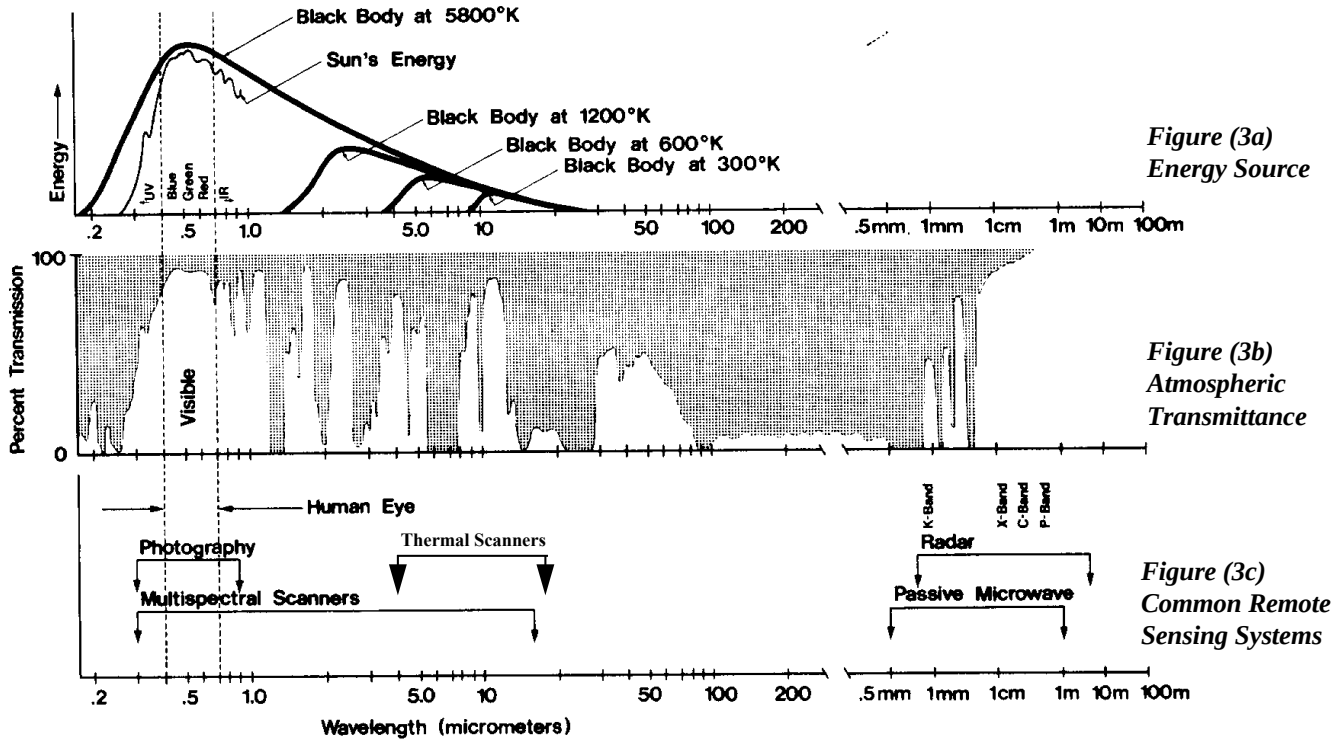
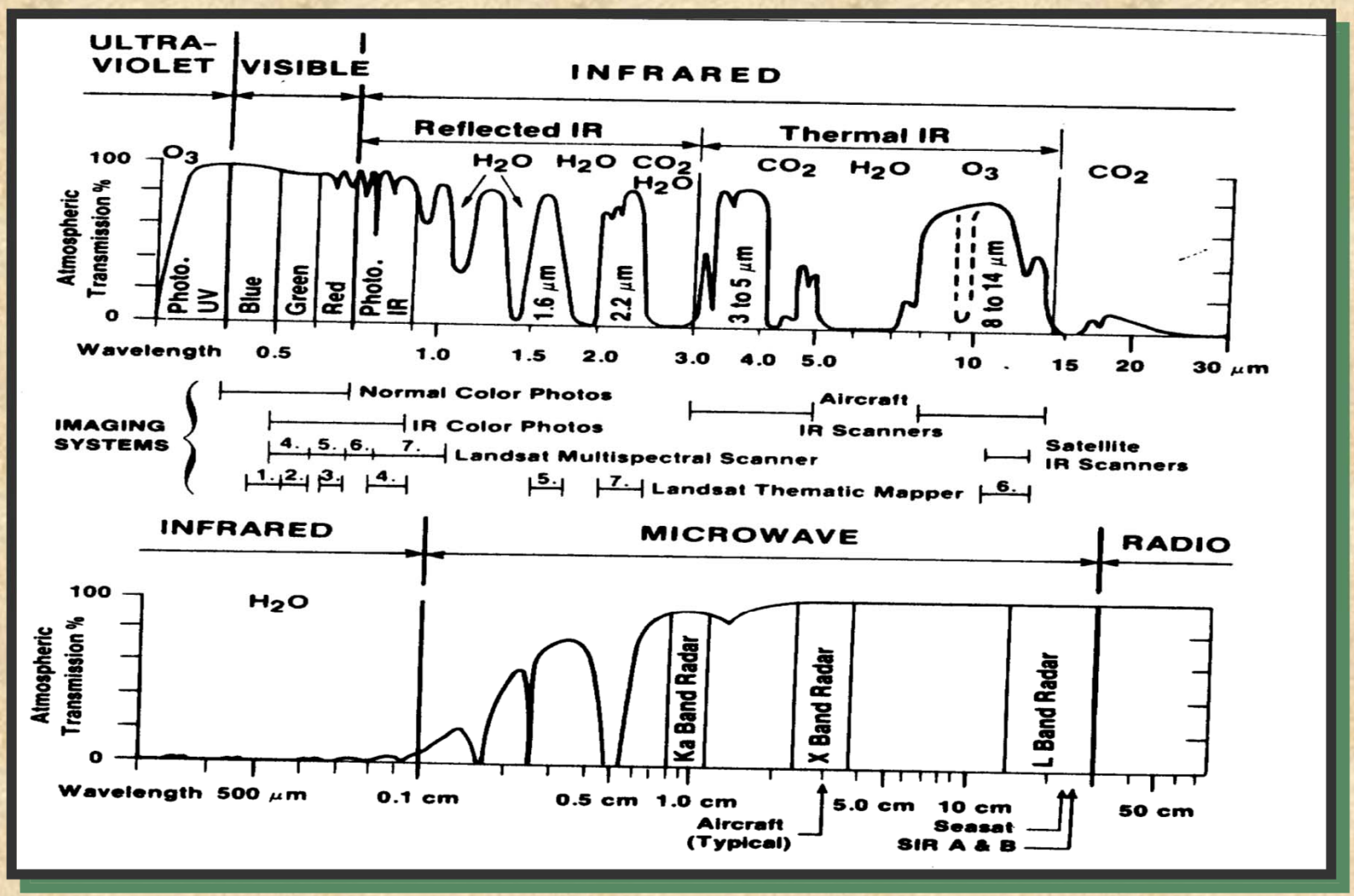


Figure (3a) Energy Source

Figure (3b) Atmospheric Transmittance

Figure (3c) Common Remote Sensing Systems

An example of atmospheric transmission characteristics



Atmospheric Windows Useful in Remote Sensing

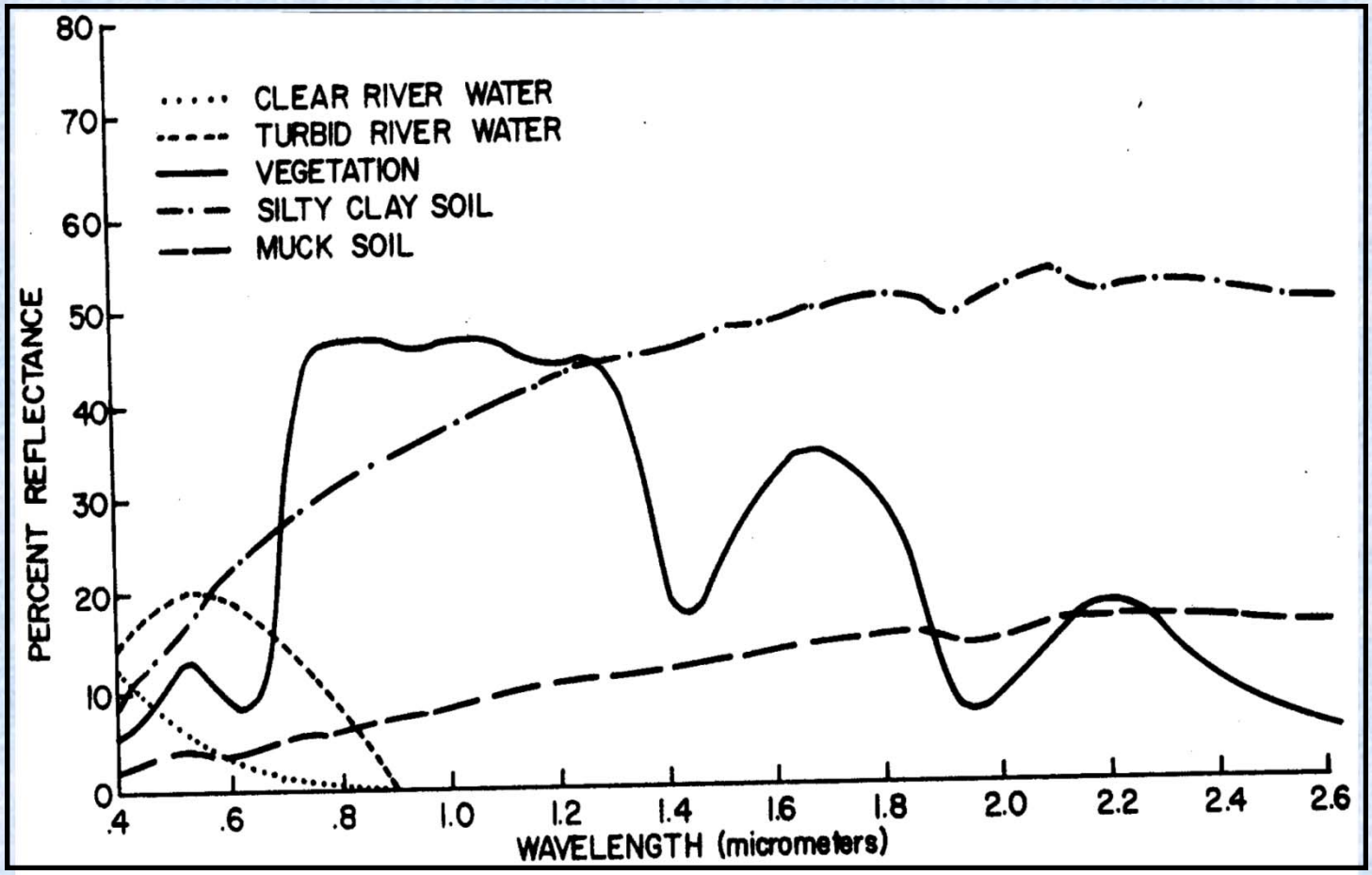
ATMOSPHERIC WINDOWS
useful in Remote Sensing

0.3 μm to 1.3 μm
1.5 μm to 1.8 μm
2.0 μm to 2.6 μm
3.0 μm to 3.6 μm
4.2 μm to m 5.0 μ
8.0 μm to 14.0 μm

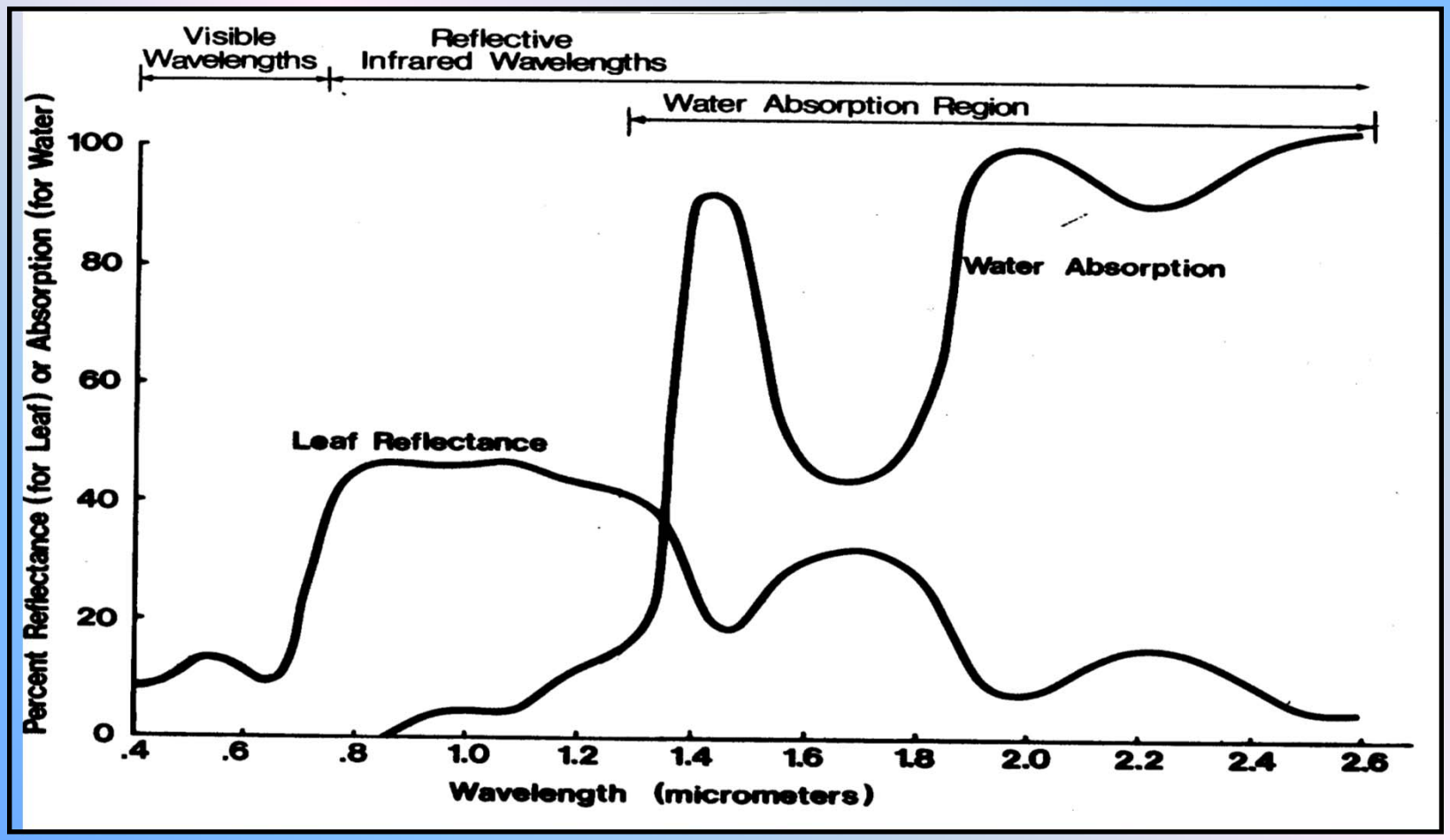
Platform Types And Observation Objects

Platform	Altitude	Observation
geostationary satellite	36,000km	fixed point observation
circular orbit satellite (earth observation)	500km - 1,000km	regular observation
space shuttle	240km - 350km	irregular observation space experiment
radio - sound	100m - 100km	various investigations (meteorological, etc)
high altitude jet-plane	10km -12km	reconnaissance wide area investigations
low or middle altitude plane	500m - 8,000m	various aero investigation surveys
helicopter	100m- 2,000m	various aero investigation surveys
radio-controlled plane	below 500m	various aero investigation surveys
hang-plane	50 - 500m	various aero investigation surveys
hang-balloon	800m -	various investigations
cable	10 - 40m	archaeological investigations
crane car	5 - 50m	close range surveys
ground measurement car	0 - 30m	ground truth

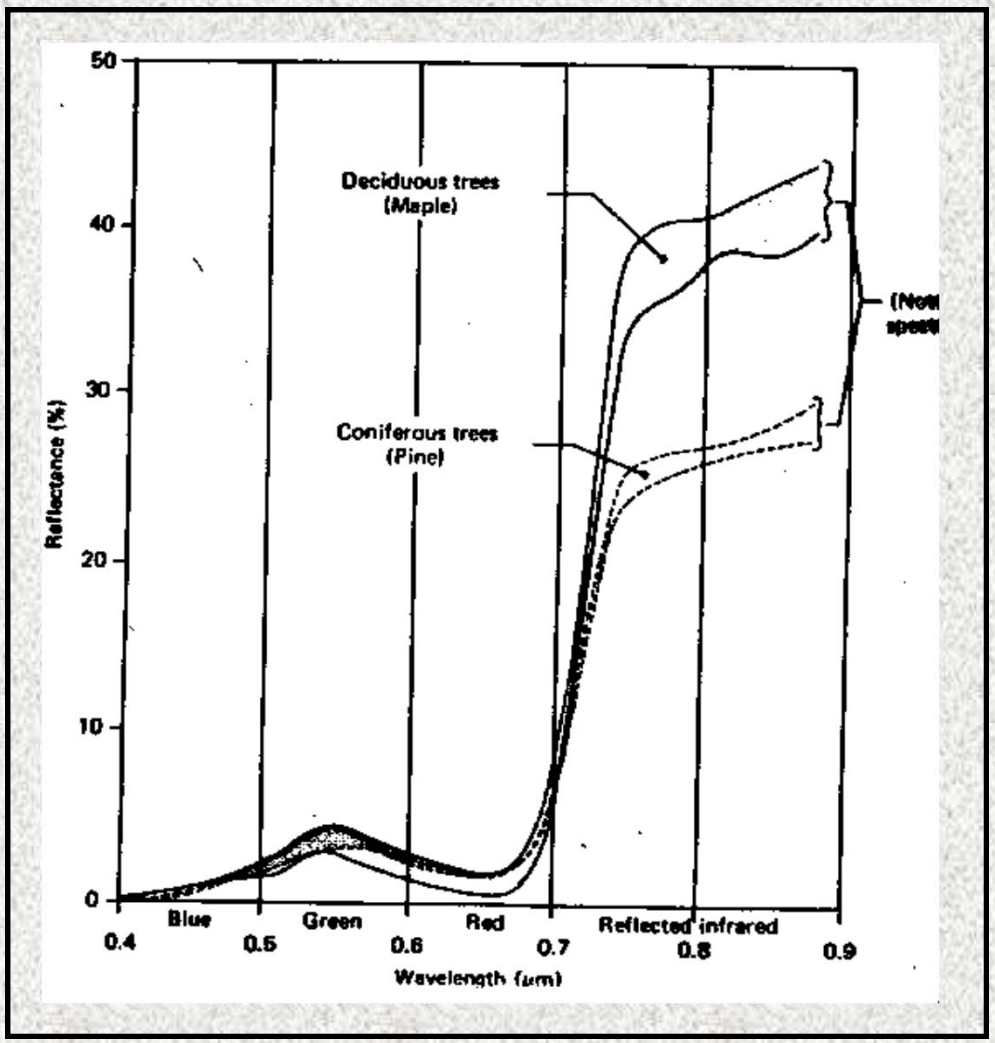
Typical spectral reflectance curve for vegetation, soil and water



Relationship between water absorption and spectral reflectance in the middle - infrared wavelengths



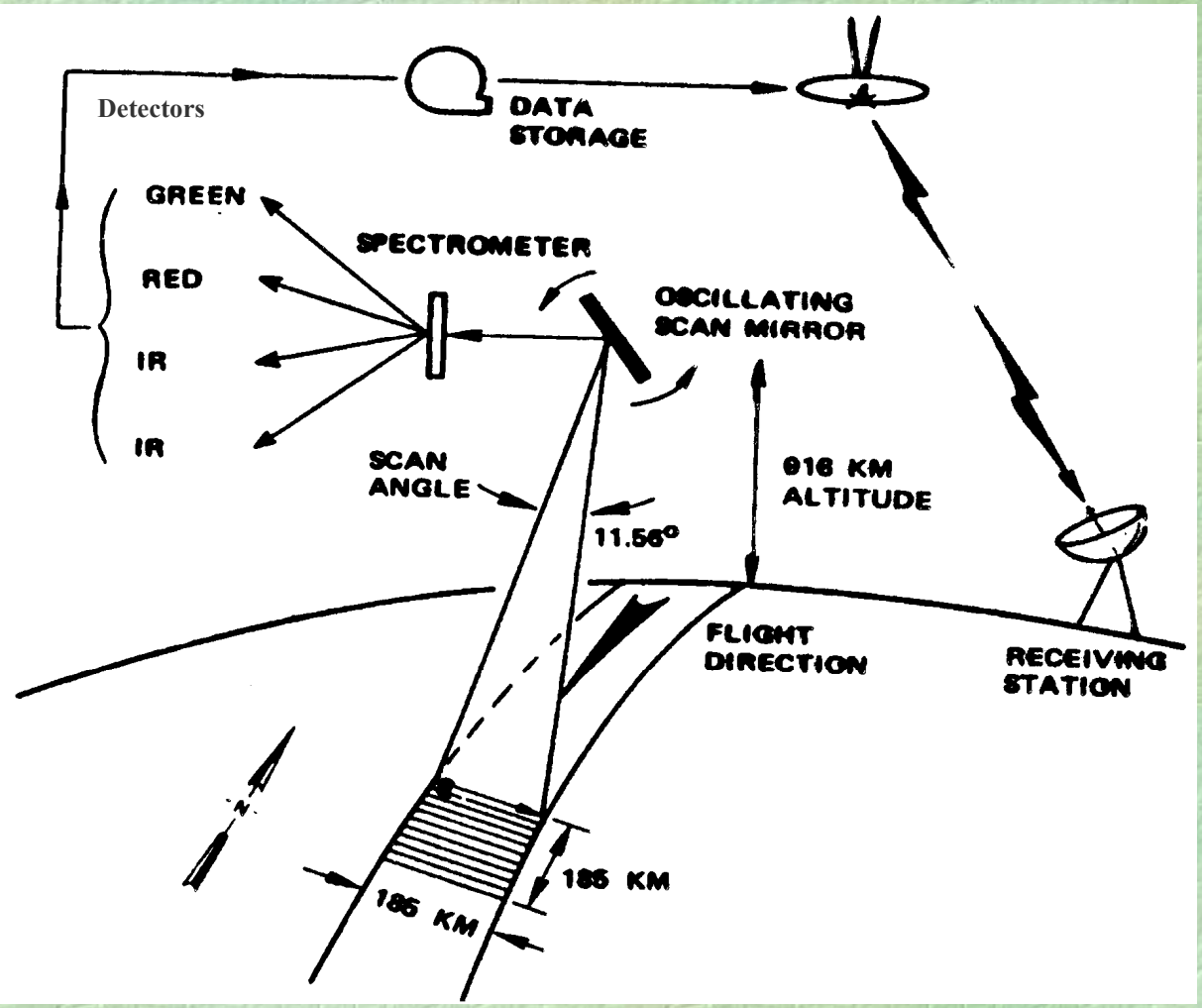
Generalised spectral reflectance envelopes for deciduous (broad-leaved) and coniferous (needle-bearing)



Solid State Scanner

This type of imaging system, sometimes also called "push-broom" scanner is commonly used in optical remote sensing satellites such as SPOT. The imaging system has a linear detector array (usually of the CCD type) consisting of a number of detector elements (6000 elements in SPOTO HRV). Each detector element projects an "instantaneous field of view (IFOV)" on the ground. The signal recorded of a detector element is proportional to the total radiation collected within its IFOV. At any instant, a row of pixels are formed. As the satellite files along its track, the row of pixels sweeps along to generate a two-dimensional image. (Figure 10).

Landsat MSS Operating Configuration (Figure 11)



Opto-Mechanical Scanners

This type of sensor system is found mainly in older satellites such as Landsat or NOAA. An oscillating mirror scans a row of pixels, while single detectors take measurements for each individual pixel. As the satellite moves on in its orbit, a fresh row of pixels will be measured during the next mirror scan.