

rs_portfolio_proj

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Introduction to Remote Sensing

What is remote sensing?

Put simply, remote sensing is a method of acquiring information from a distance through sensors mounted on a platform (e.g., satellites, planes, drones).

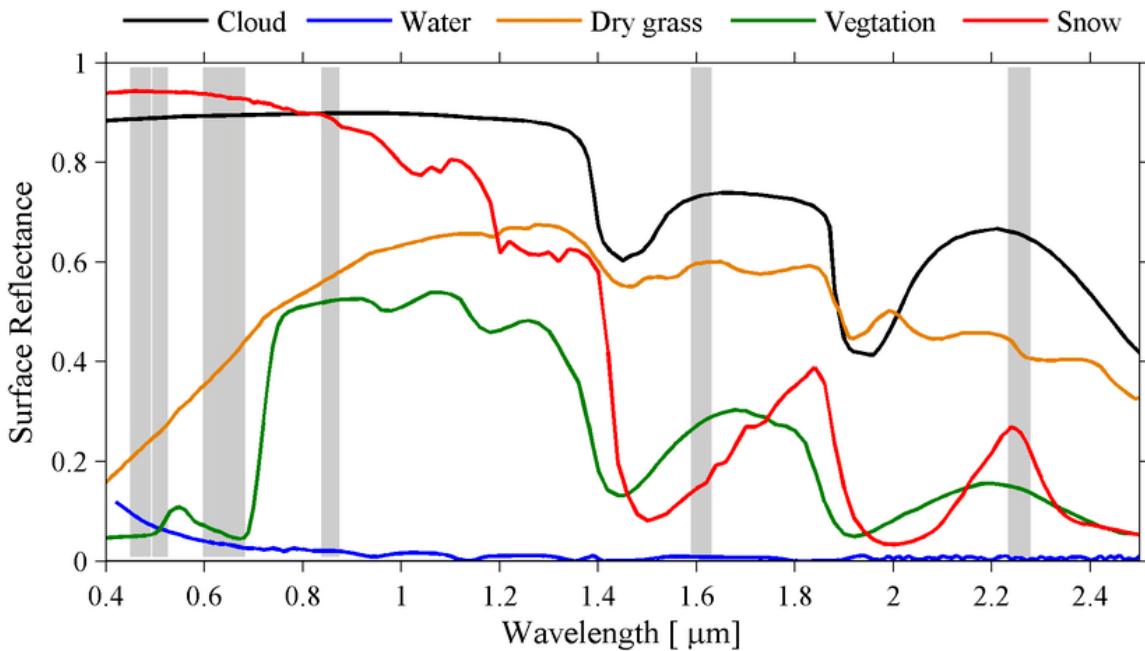
Active vs passive sensors

Passive sensors rely on naturally available energy, primarily sunlight, and do not emit energy themselves. As solar electromagnetic radiation (EMR) travels through the atmosphere and reflects off the Earth's surface, it undergoes several interactions, including absorption, transmission, and scattering. These interactions can significantly reduce the amount of energy that reaches the sensor. Consequently, passive sensors are ineffective in low-light conditions and are unable to penetrate obstacles such as clouds, smoke, or dense vegetation, as these features scatter or absorb the reflected radiation.

Active sensors emit their own EMR and wait to receive the reflected energy. The emitted energy is often in the form of long wavelengths that are able to ‘pass through’ atmospheric obstacles which have smaller particle sizes (rather than being scattered, absorbed or reflected).

Spectral Signatures

Spectral signatures show how different materials reflect or absorb electromagnetic energy across a spectrum of wavelengths on the electromagnetic spectrum. Each feature on Earth has a unique spectral signature that is determined by physical and chemical properties and how it interacts with electromagnetic radiation.



An important feature in the spectral signature is the **red edge** - a sharp increase in reflectance around 700 nm in vegetation's spectral signature, which indicates chlorophyll content and plant health.

Resolutions

The characteristics of remote sensors will determine the level of accuracy and detail of the information about the Earth's surface.

Spectral Resolution

Spectral resolution refers to a sensor's ability to distinguish between different wavelengths of electromagnetic radiation from the received signal. Each spectral band corresponds to a specific wavelength range, and averages its information across this range. Wider spectral bands reflect a lower spectral resolution. A higher number of bands reflects a higher spectral resolution.

Sometimes there are large gaps of wavelength ranges in the EMS in which no information is collected, and this is because the atmosphere does not allow certain wavelengths to pass. Thus, bands are often limited to atmospheric windows where wavelengths can penetrate.

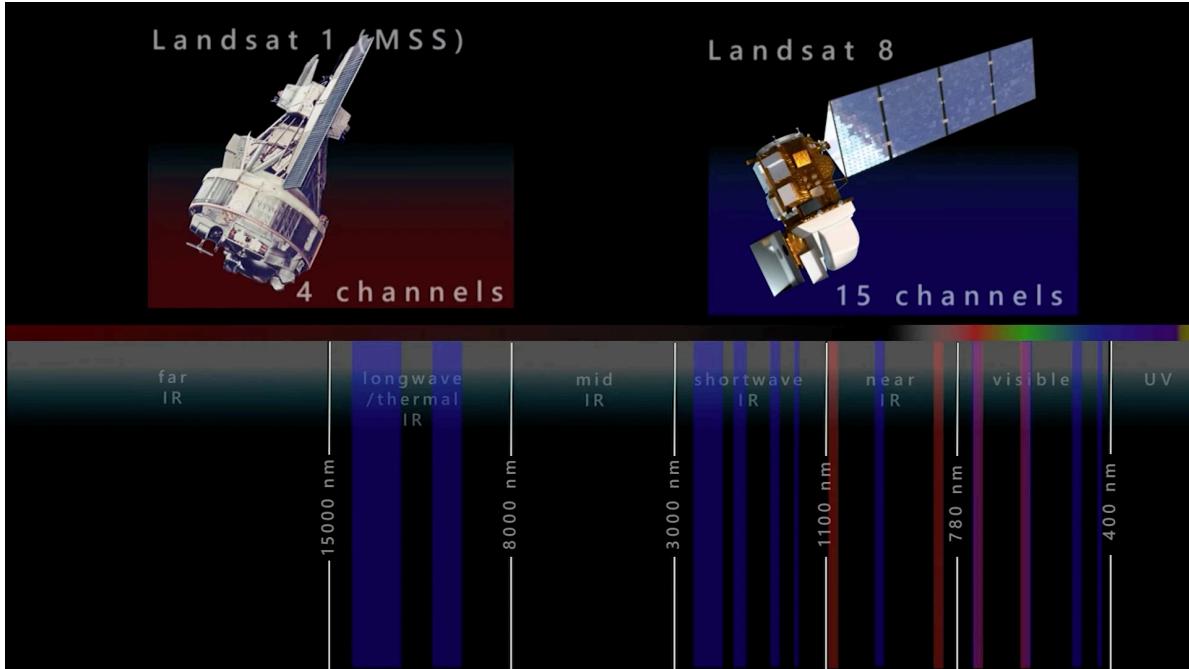


Figure 1: Spectral Resolutions of two satellites. Landsat 1 (MSS) has four spectral bands within the visible and near IR spectra, while Landsat 8 has 15 bands spread across the whole electromagnetic spectrum.

What happens next?

Looking more closely at the Landsat 1 (MSS) satellite...

The information captured by each of the four spectral bands are stored as a greyscale image, which shows the reflection intensity of the Earth's surface within each band. By combining the reflectance information from each band, and then comparing this with spectral signatures, we can distinguish features of the Earth's surface.