

EGM310 – Remote Sensing and GIS

Week 9, Part 1: What is Remote Sensing?

1. What is (terrestrial) remote sensing?
2. Electromagnetic radiation (EMR)
3. EMR Interaction with the atmosphere
4. EMR Interaction with Earth's surface
5. Spectral properties of objects

Think: how do we acquire data/information?



Laboratory



Surveys



Fieldwork

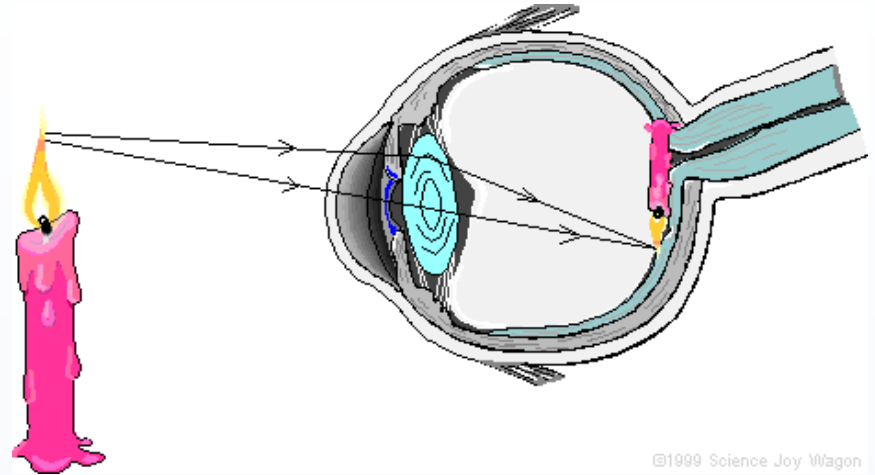
- Each of these methods:
 - Provide detailed, accurate, fine-grain information
 - Allow us to study small-scale processes
 - Can be very **difficult** to scale to regional or global scales
- Field work can be: dangerous, difficult, expensive
- Sometimes, travel isn't possible...
- So: how can we gather information **without having** to touch/travel to the thing we're studying?

What is remote sensing?

- “Remote sensing is the acquiring of data about an object without touching it.” (Jensen)
- “Photogrammetry and Remote Sensing is the art, science, and technology of obtaining reliable information from non-contact imaging and other sensor systems about the Earth and its environment, and other physical objects and processes through recording, measuring, analysing, and representation.” (Int. Soc. For Photogrammetry and Remote Sensing)
- In other words: studying something without having to touch/travel to it directly.

What is remote sensing?

- In a way, you've already been doing this for years
- Our eyes (and ears! and nose!) are **sensors** that collect information about the world, process it in our brains
- Normally, our eyes/ears/nose are not in contact with the object they are sensing – they are **remote** sensors

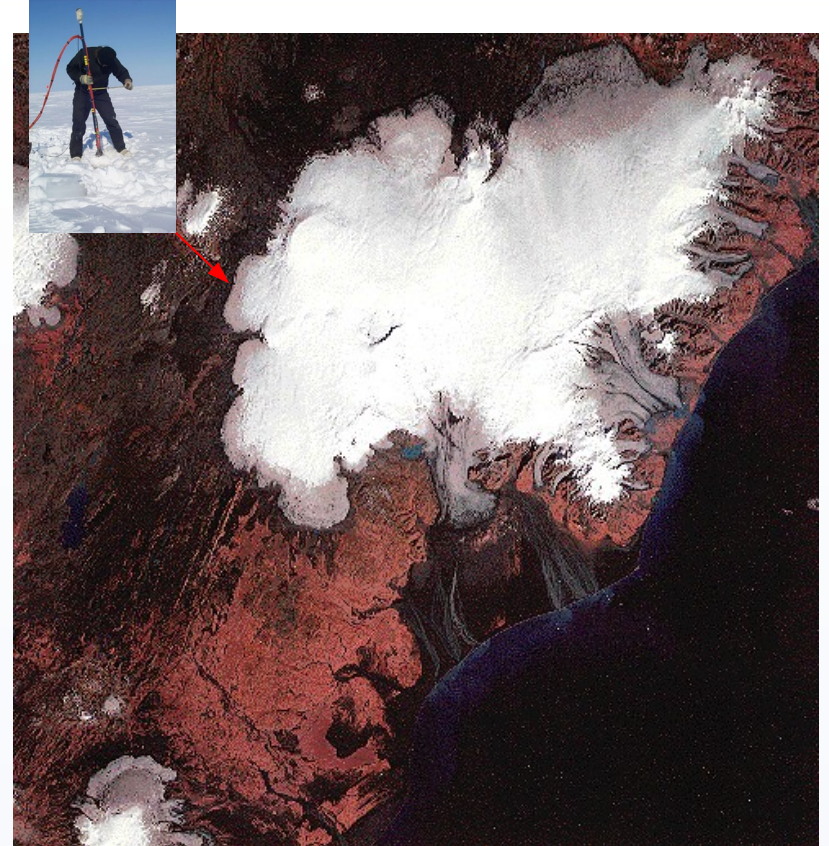


Advantages of remote sensing

- Gives a **unique perspective** of the Earth, environment
- Can discern **patterns, relationships** not apparent at ground level
- Observe/study areas too **dangerous/costly** to travel to
- Analyse change over **time** with multiple images
- Map **large areas** quickly, cheaply
- Map environmental system on the scale it operates

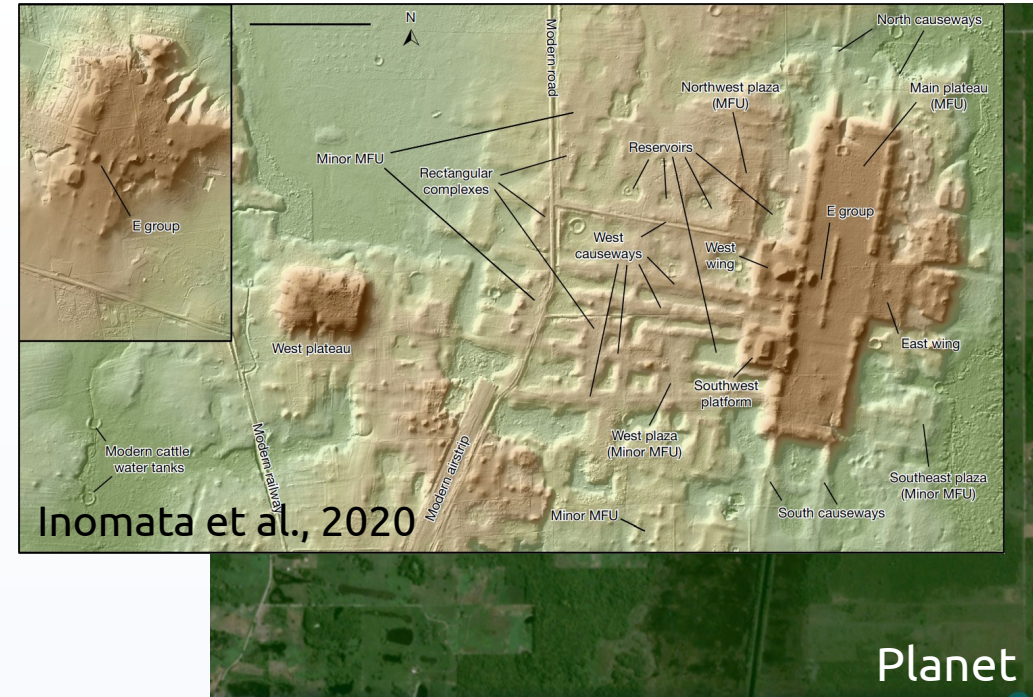
Example – glacier mapping

- Let's say we want to map the extent of Vatnajökull (~8100 km²)
 - We *could* walk (or drive) the perimeter with a GPS
 - Difficult, dangerous terrain
 - Would likely take several days
 - What happens when we want to do it again?
- With a satellite image, we can do this in a few hours (or even faster)



Example – Archaeology

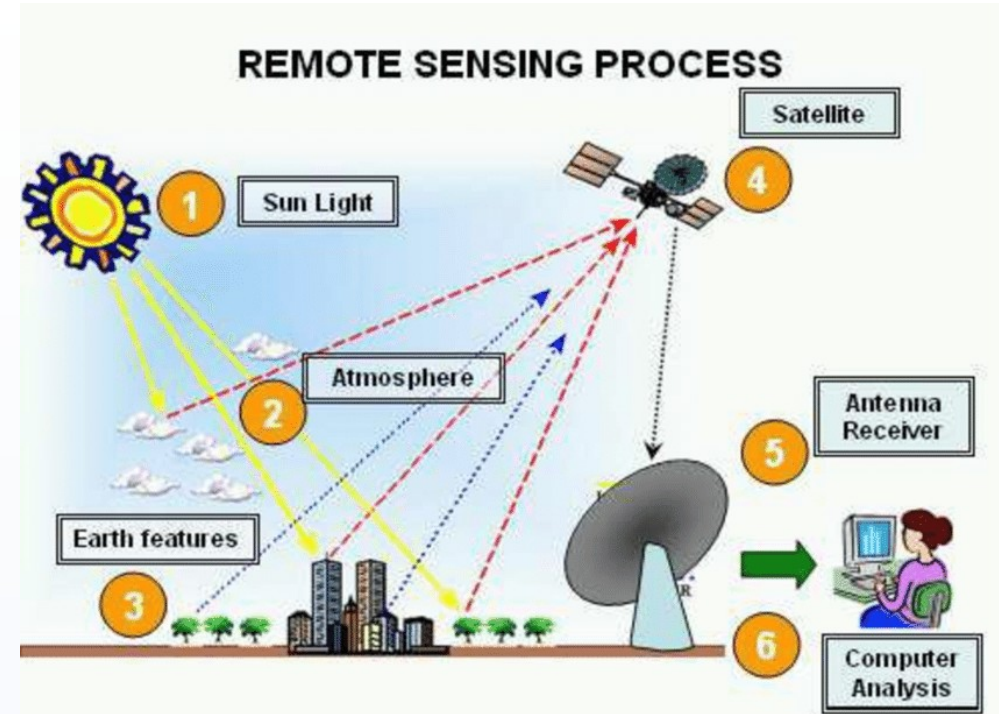
- Excavating full extent of monuments, cities is difficult
- More so in tropical regions with thick vegetation cover
- Remote Sensing can help “see” through vegetation, reveal extent of hidden sites
- Example: recent finds at Aguada Fénix, Mexico (1000 – 800 BC)



- So: remote sensing is virtually anything that captures information from a distance
- Enables us to monitor/analyse changes at a global scale, relatively quickly + easily
- Sensors can be: cameras, laser scanners, radar, other instrumentation...
- In this module, we focus primarily on imaging (optical, visible/infrared)

The remote sensing process/system

- Acquiring remote sensing data depends on:
 - Radiation source (often the Sun)
 - Sensor
 - Atmosphere
 - Ground properties
 - And interaction(s) between them
- Data transfer/storage
- From there, we can analyse the data



- Lillesand, Kiefer & Chipman - Chapter 1
- Campbell & Wynne – Chapter 1
- Natural Resources Canada [Remote Sensing Tutorials](#)
- What is remote sensing? [[ClimaByte](#)]
- What is remote sensing? [[CIRES](#)]