

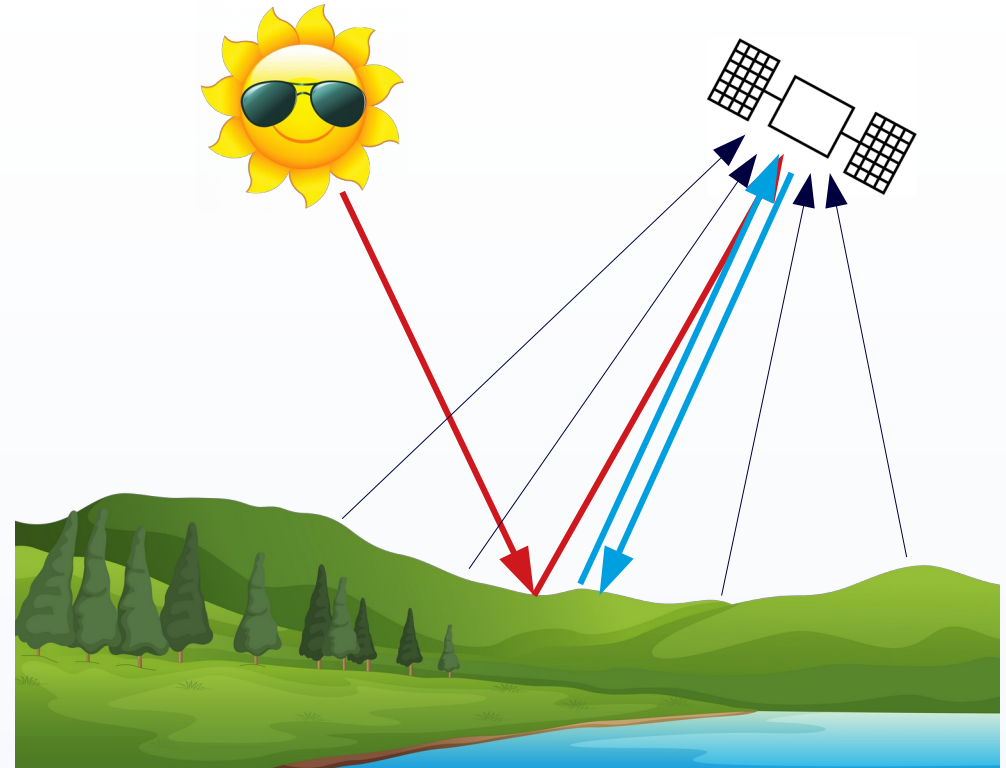
# EGM310: GIS and Remote Sensing

Week 10, Part 3: Passive Sensors

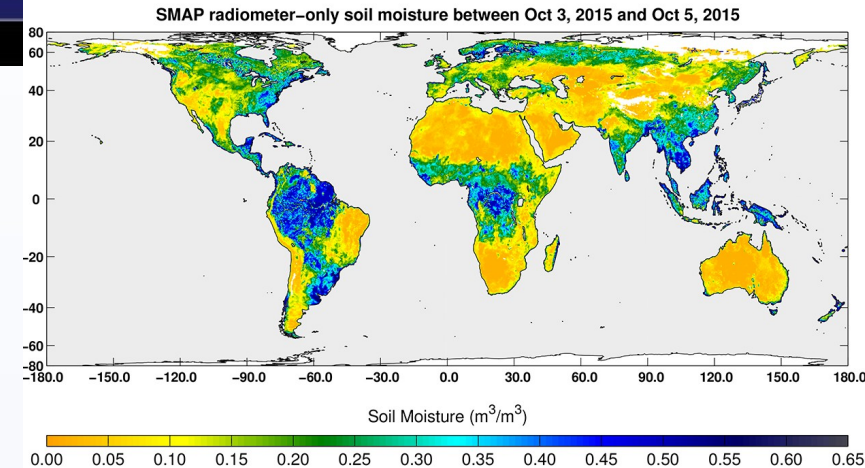
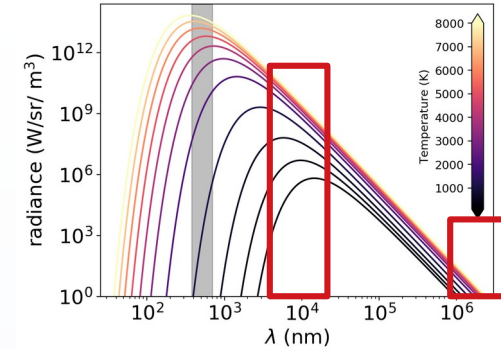
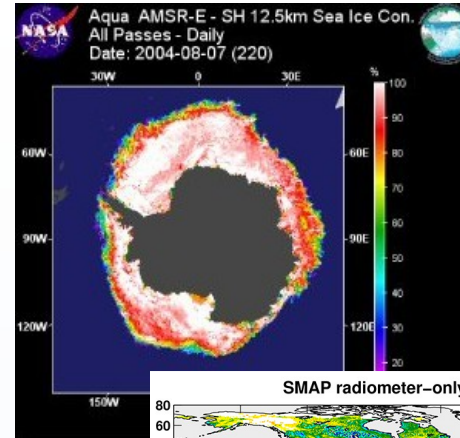
- Remote sensing involves measuring electromagnetic radiation

⇒ Need a **source** of EMR

- Sun
  - Object
  - Sensor (active)
- } **passive**

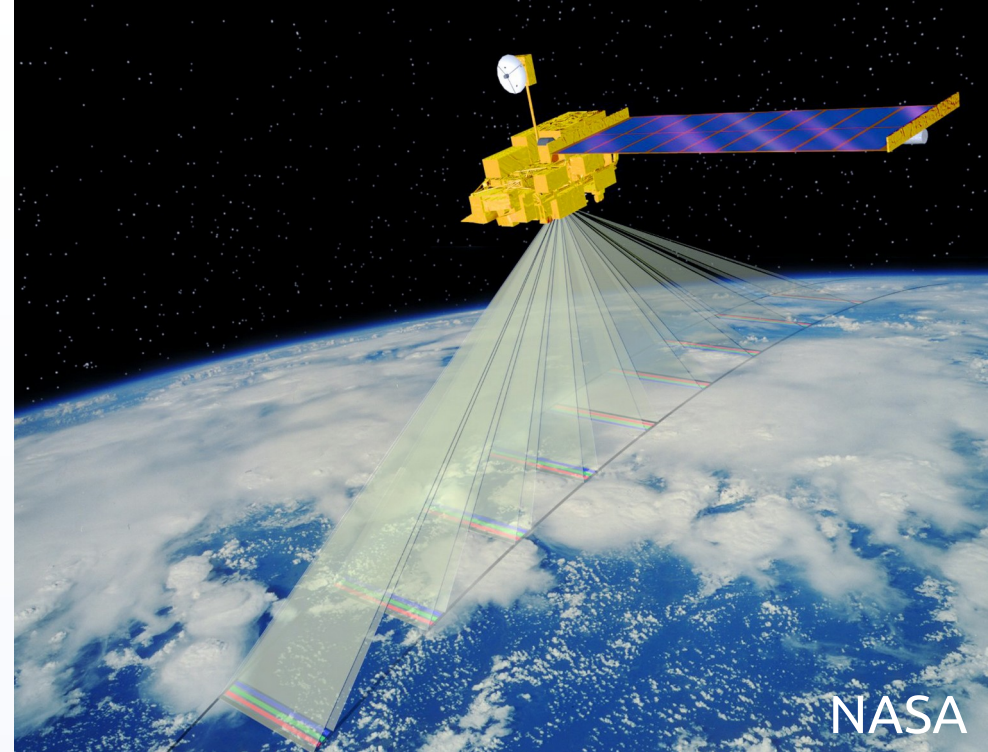


- Recall: the energy emitted by an object depends on  $\lambda$ ,  $T$ 
  - Mostly low energy  $\rightarrow$  More difficult to detect
  - Sensor footprint is quite large
- At low  $T$ , difference in emitted energy more due to physical properties for longer  $\lambda$
- Applications:
  - Soil moisture
  - Sea ice concentration



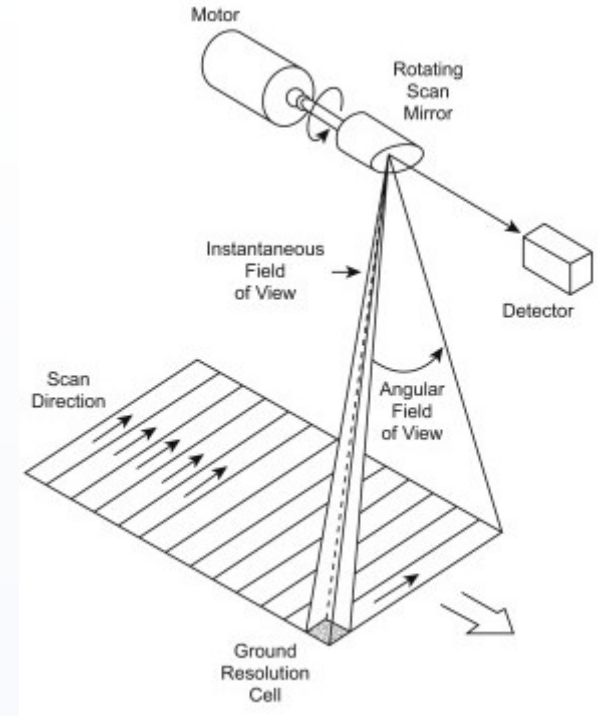
# Visible and Infrared (optical) sensors

- Work on similar principles to cameras
  - Focus/collect incoming radiation using a lens/rotating mirror
  - Split signal into component wavelengths
  - Signal is then recorded on a detector array
- Different scanning geometries



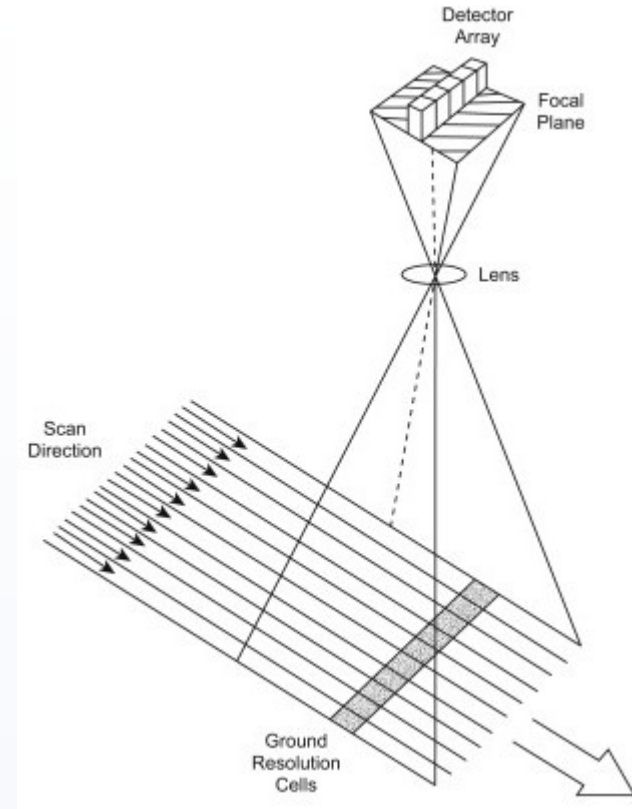
# Optical-mechanical (whiskbroom) sensors

- Rotating mirror scans lines perpendicular to satellite motion
- Good:
  - Can get by with fewer detectors
  - Fewer detectors → fewer to calibrate
- Bad:
  - Moving parts! In space!
  - Image geometry becomes more complicated
  - Each detector gets less time → weaker signal



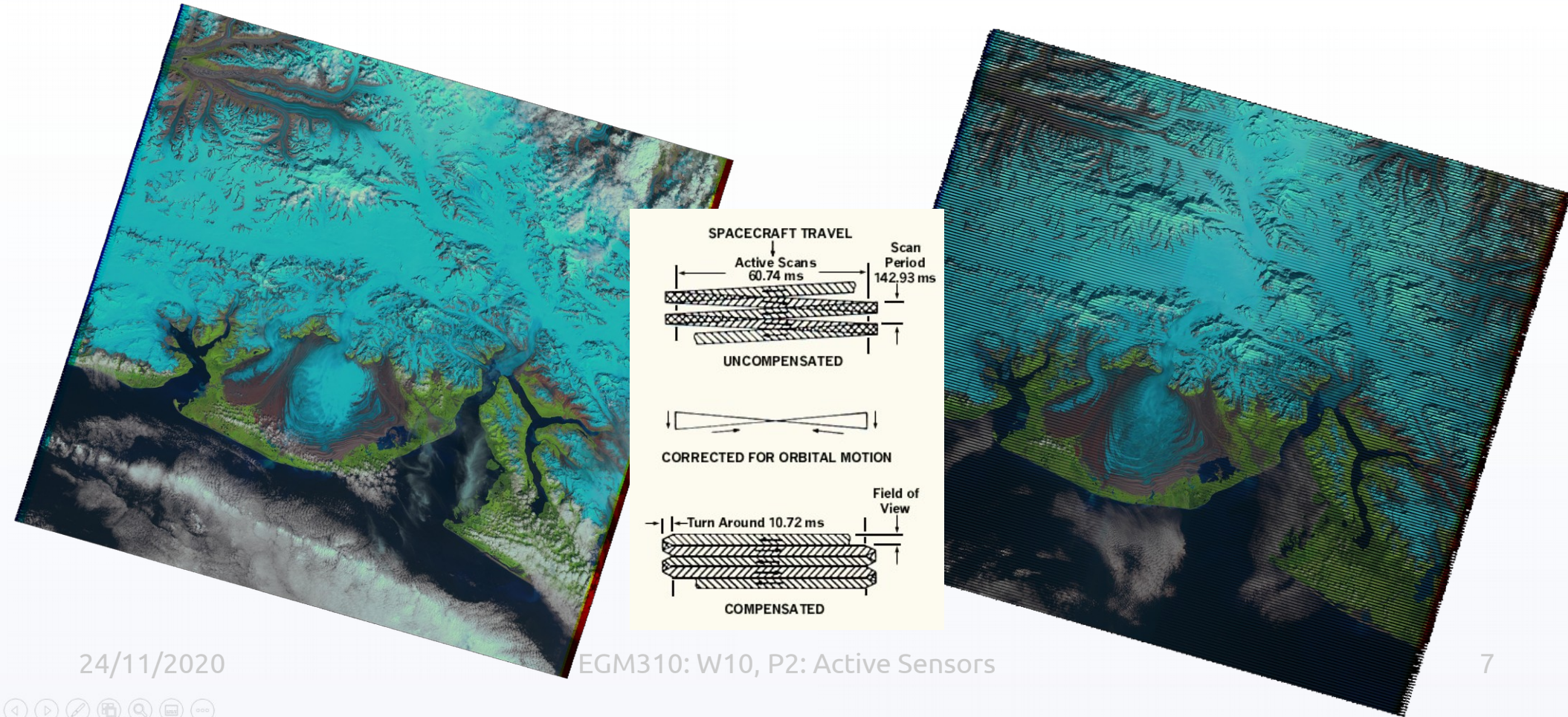
# Linear array (pushbroom) sensors

- Sample perpendicular to satellite motion
- Array of detectors located on focal plane
- Good:
  - No moving parts!
  - Each detector has longer to record → stronger signal
  - Simpler image construction
- Bad:
  - More detectors needed (expensive)
  - More detectors to calibrate





# Moving parts are not ideal



- Passive sensors rely on external energy sources
- Visible and infrared (optical) sensors come in 2 main types:
  - Optical-mechanical/whiskbroom
  - Linear array/pushbroom
- Moving parts are not ideal



- Lillesand, Kiefer & Chipman – Chapter 4
- Campbell & Wynne – Chapter 6
- Natural Resources Canada [Remote Sensing Tutorials](#)
- Passive Microwave RS for Studying Climate [[CU](#)]