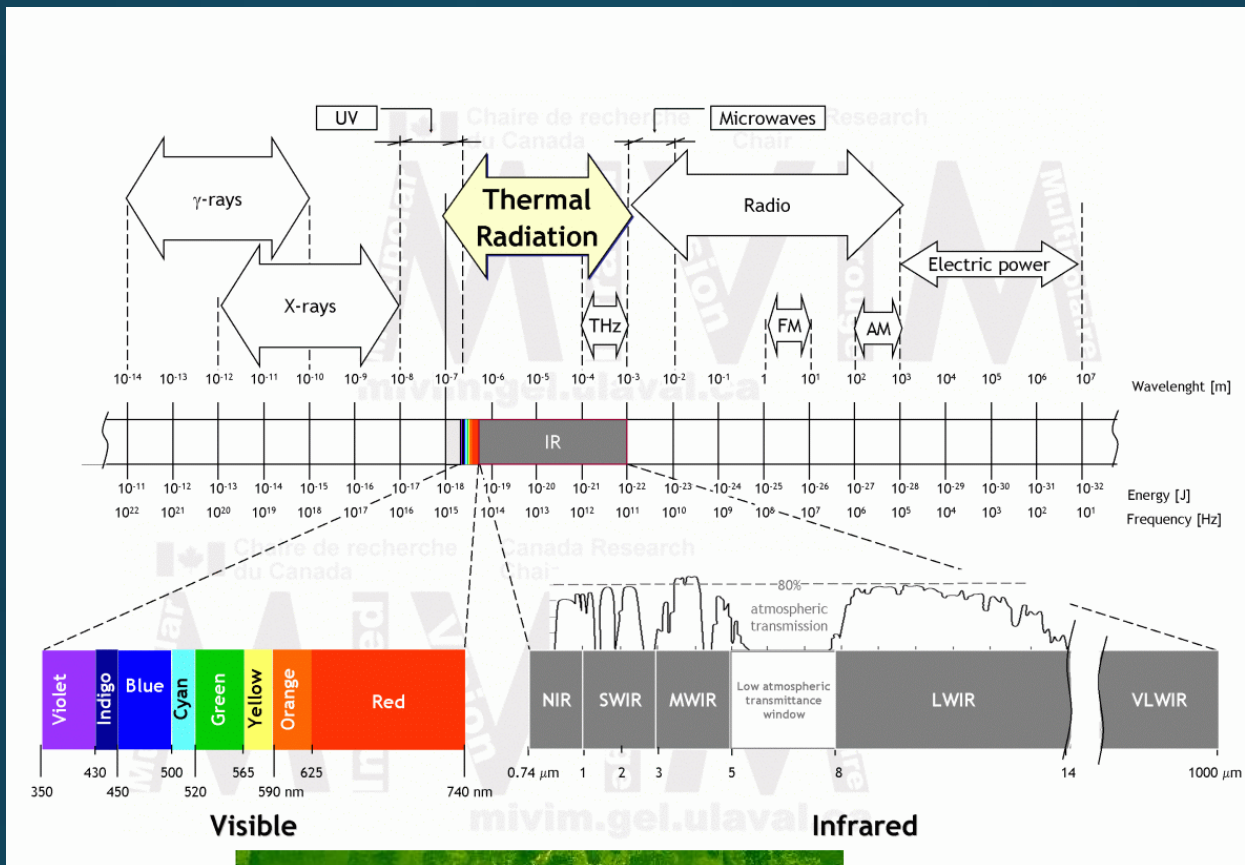
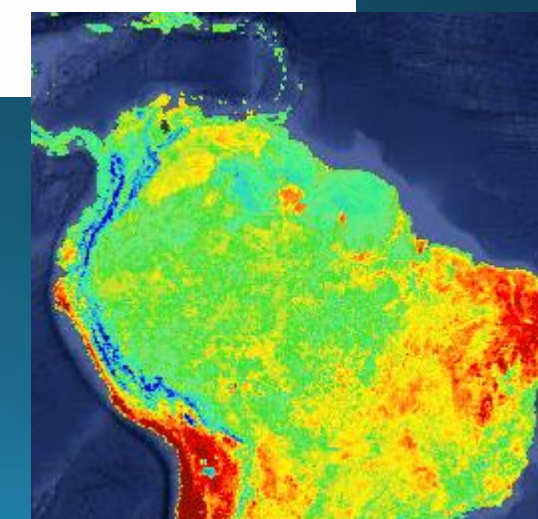


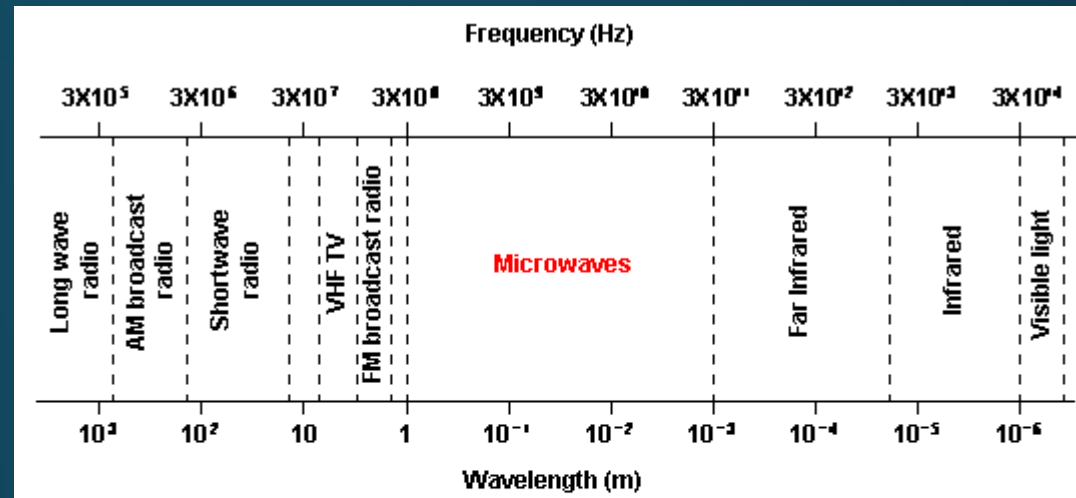
# A very quick review of three basic concepts in Satellite Remote Sensing for Earth Observation (users perspective)



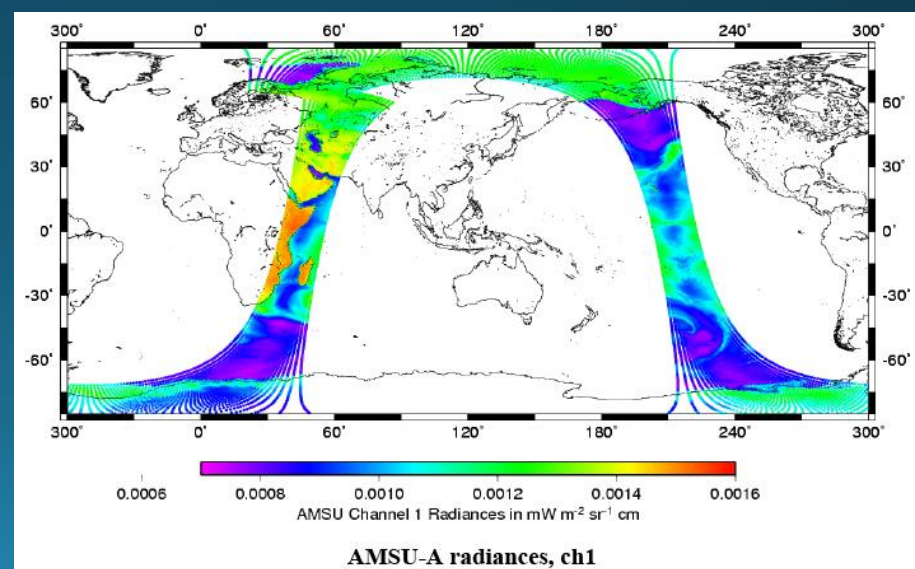
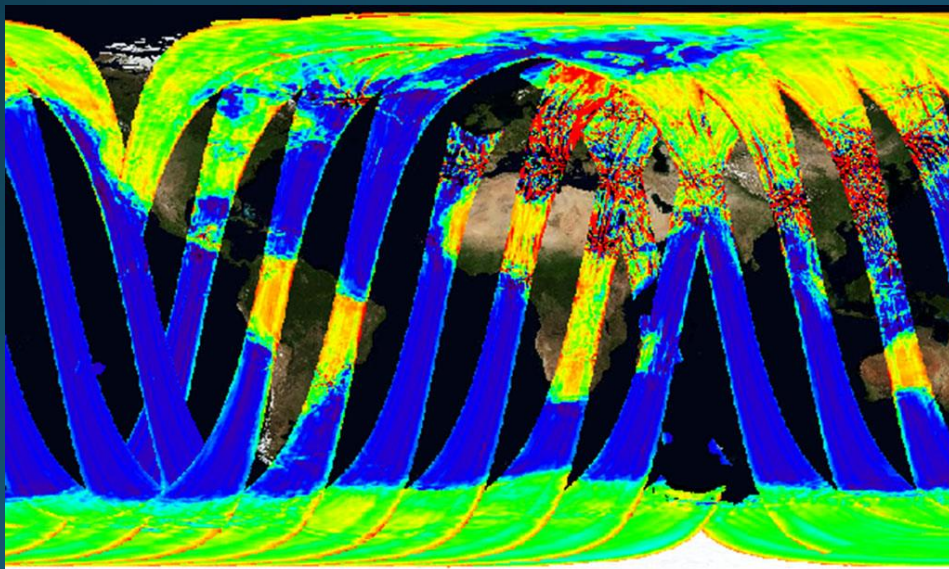


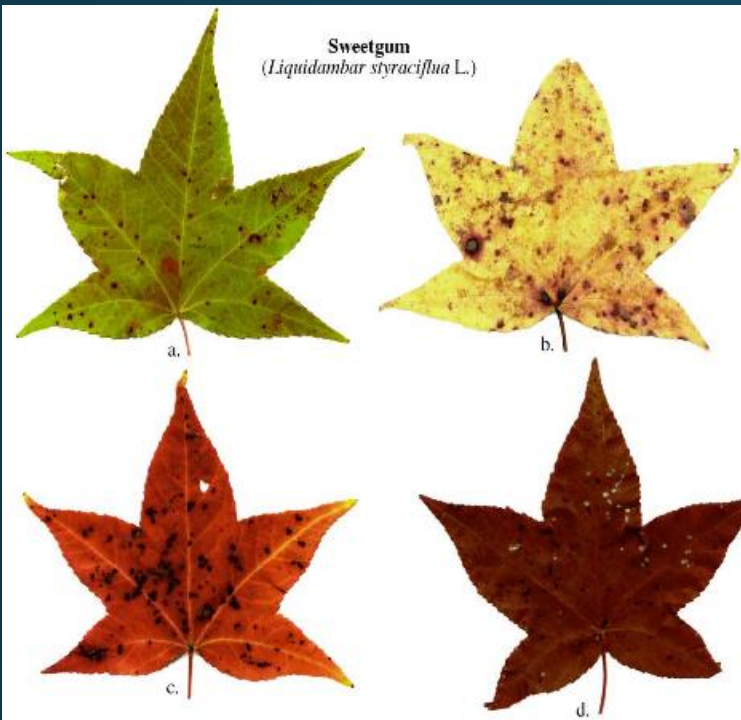
1. Satellite Remote Sensing is not (just) taking pictures from space!





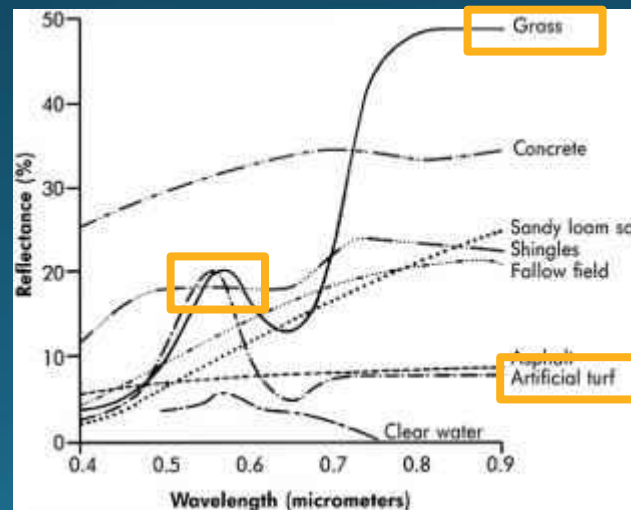
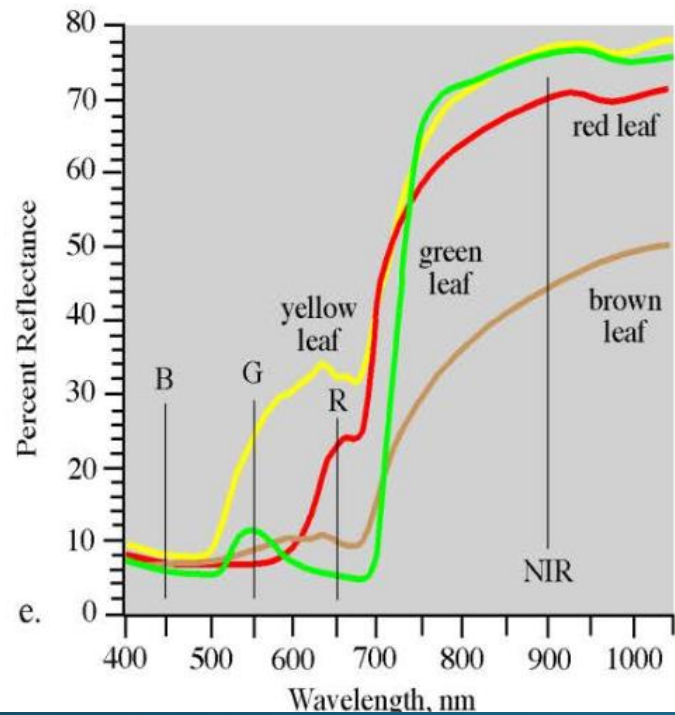
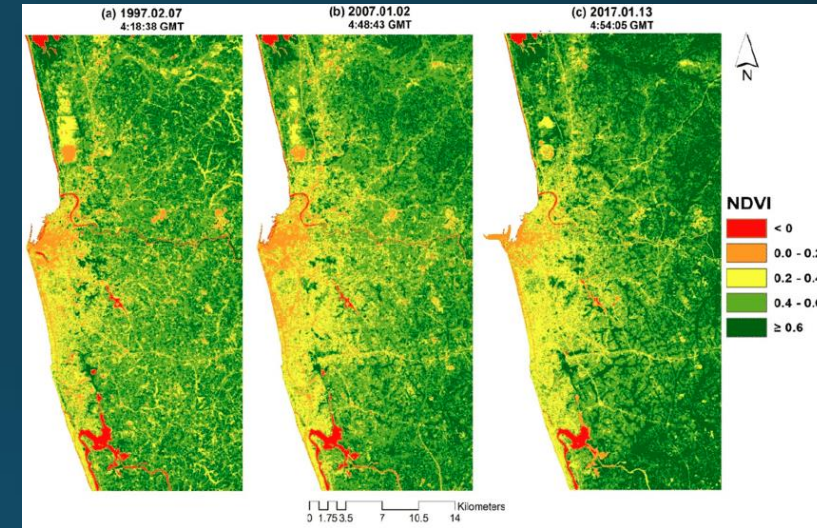
<u>Typical Frequencies</u>		<u>Approximate Band Designations</u>	
AM broadcast band	535 - 1605 kHz	L-band	1 - 2 GHz
Shortwave radio	3 - 30 MHz	S-band	2 - 4 GHz
FM broadcast band	88 - 108 MHz	C-band	4 - 8 GHz
VHF TV (2-4)	54 - 72 MHz	X-band	8 - 12 GHz
VHF TV (5-6)	76 - 88 MHz	Ku-band	12 - 18 GHz
UHF TV (7-13)	174 - 216 MHz	K-band	18 - 26 GHz
UHF TV (14-83)	470 - 890 MHz	Ka-band	26 - 40 GHz
Microwave ovens	2.45 GHz	U-band	40 - 60 GHz





# A simple, widely used, 2-bands Vegetation Index

$$NDVI = \frac{\rho_{NIR} - \rho_{Red}}{\rho_{NIR} + \rho_{Red}}$$



**Grass or  
Artificial Turf?**

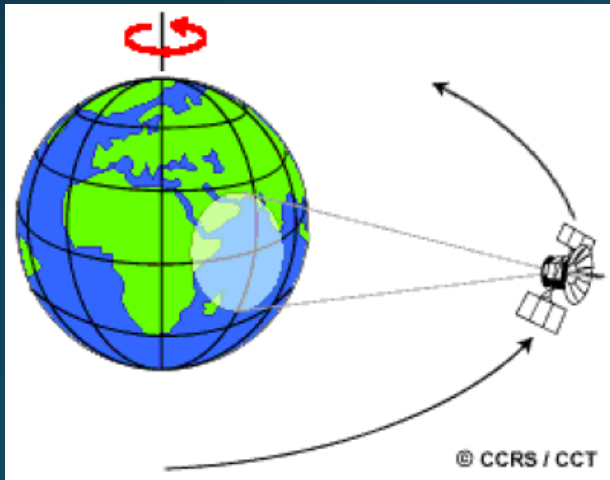
Both Grass and Artificial Turf are green!!  
The difference is in the NIR reflectance

## 2. Observation and imaging characteristics result from a compromise between:

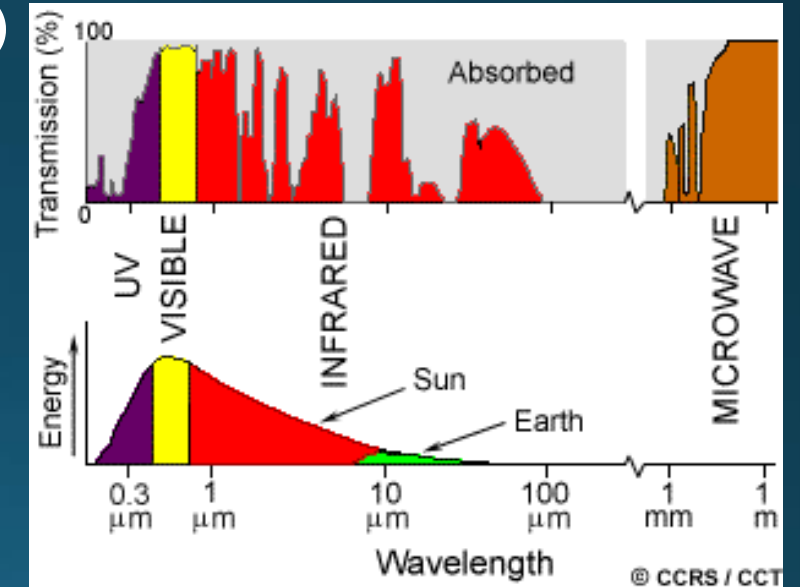
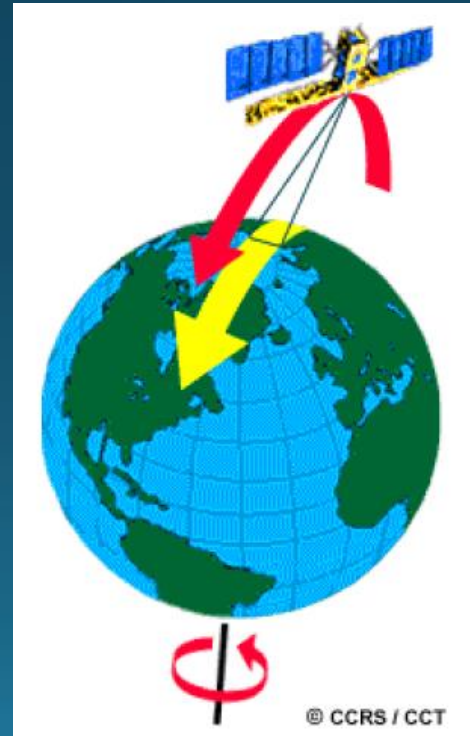
- Ground-projected spatial resolution (from  $m$  to  $km$  scales)
- Swath width & revisit-time (from minutes to weeks)
- # of independently measured bands & their spectral resolution

### Constrained by:

- Amount of measurable radiation (reflected or emitted)
- Satellite position (geostationary or near-polar orbiting)

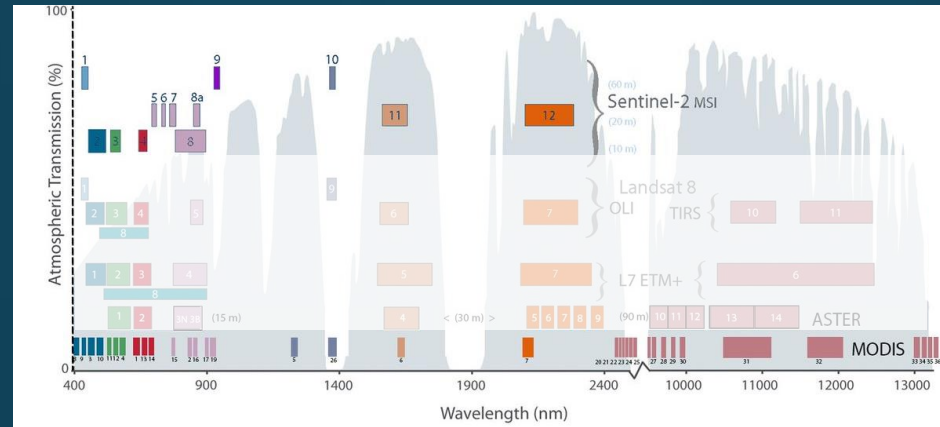


~36,000 km altitude

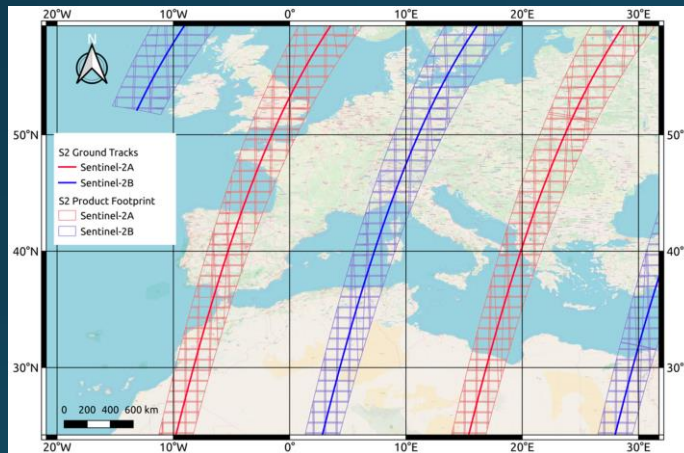


~1,000 km altitude

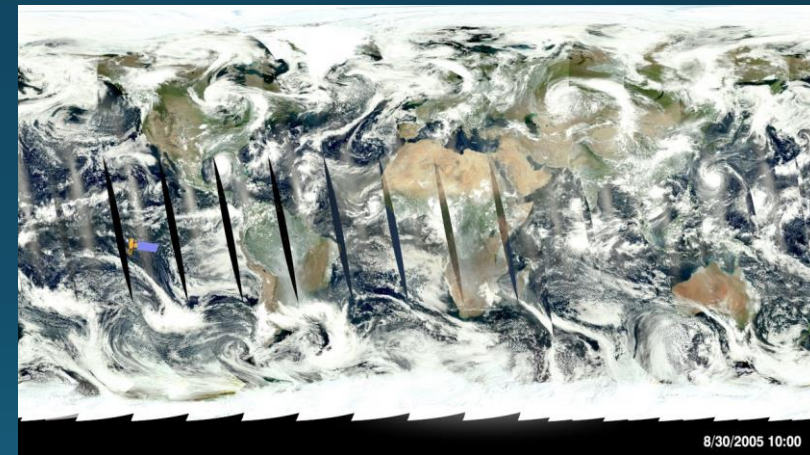
# Sentinel-2 vs. Aqua/TerraMODIS



10-days  
revisit at  
equator



*swat*

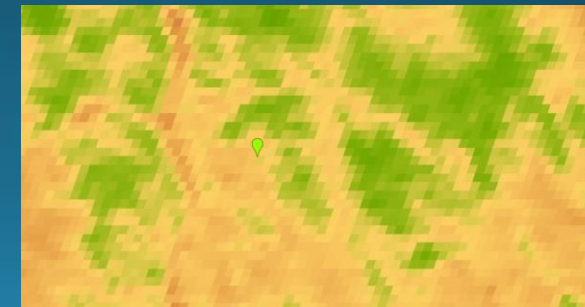


Daily  
revisit

20 m NDVI



*spatial  
resolution*



500 m NDVI

### 3. Satellite EO Products are obtained by various levels of post-processing of the satellite radiometric measurements, eventually using ancillary data and models.

**Level 1** - Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters

**Level 2** - Derived geophysical variables at the same resolution and location as Level 1 source data, mapped on uniform space-time grid scales. Atmospheric correction may be applied.

**Level 3, 4** - Model output or results from analyses of lower-level data (e.g., variables derived from multiple measurements, data assimilation into complex models).

