

Video 4:

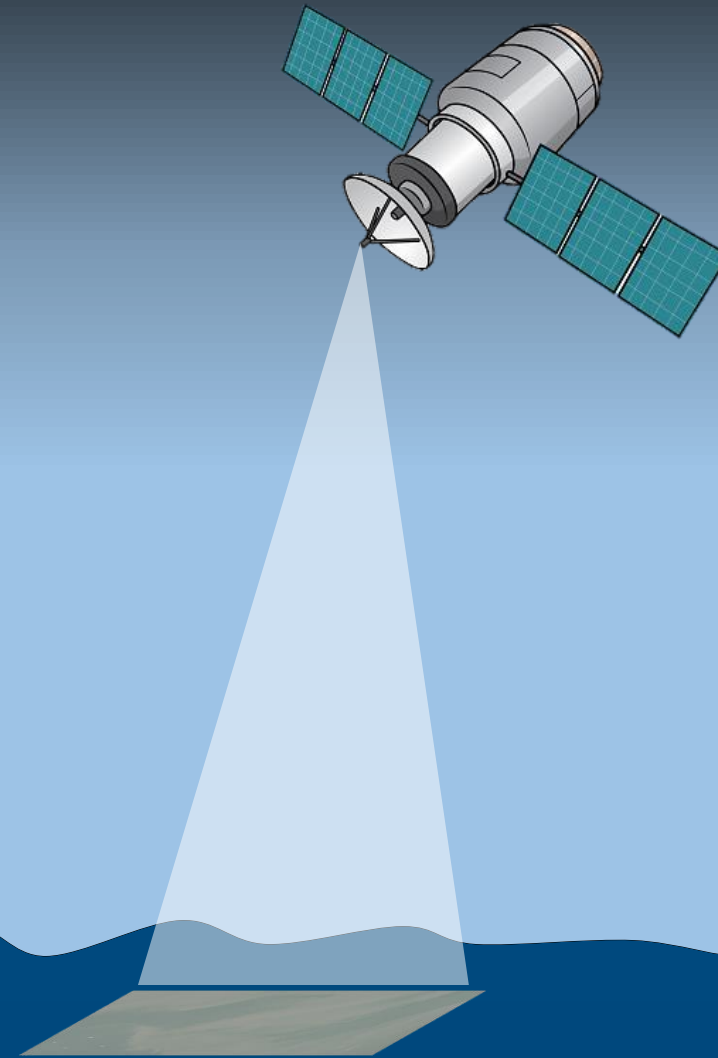
Image Data Processing

Video Objective:

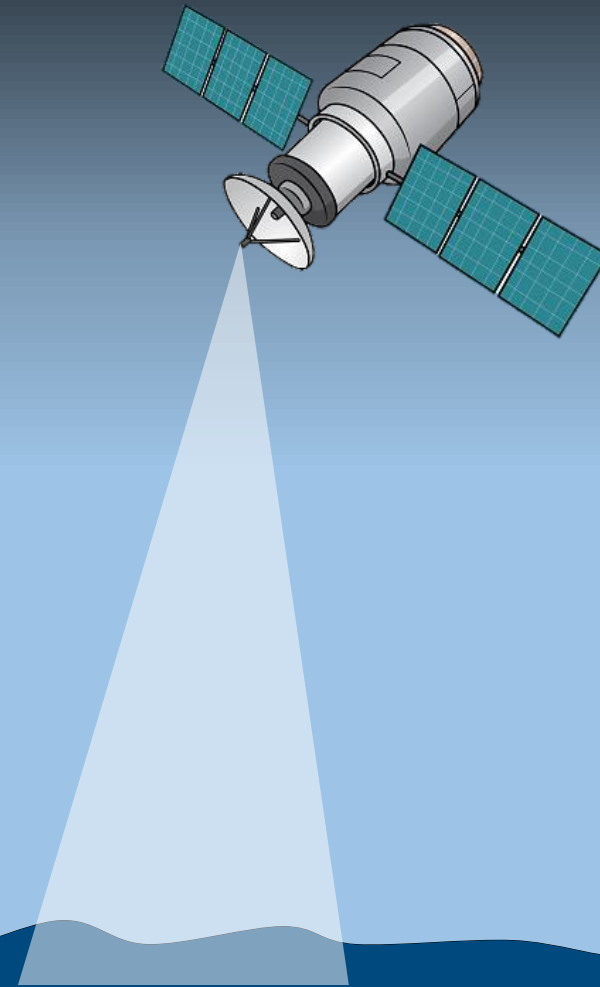
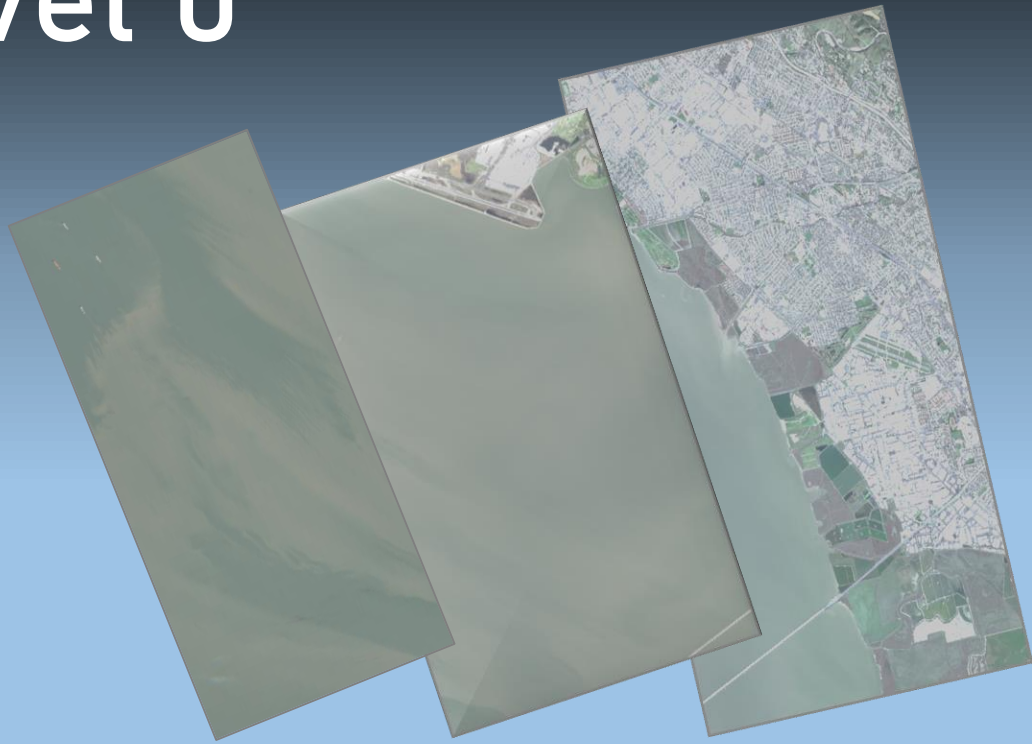
- Go through image processing steps
- Talk about types of retrieval algorithms

Data Processing “Levels”

- Level 0 – raw data
- Level 1 – radiance data
- Level 2 – reflectance data
- Level 3 – data products

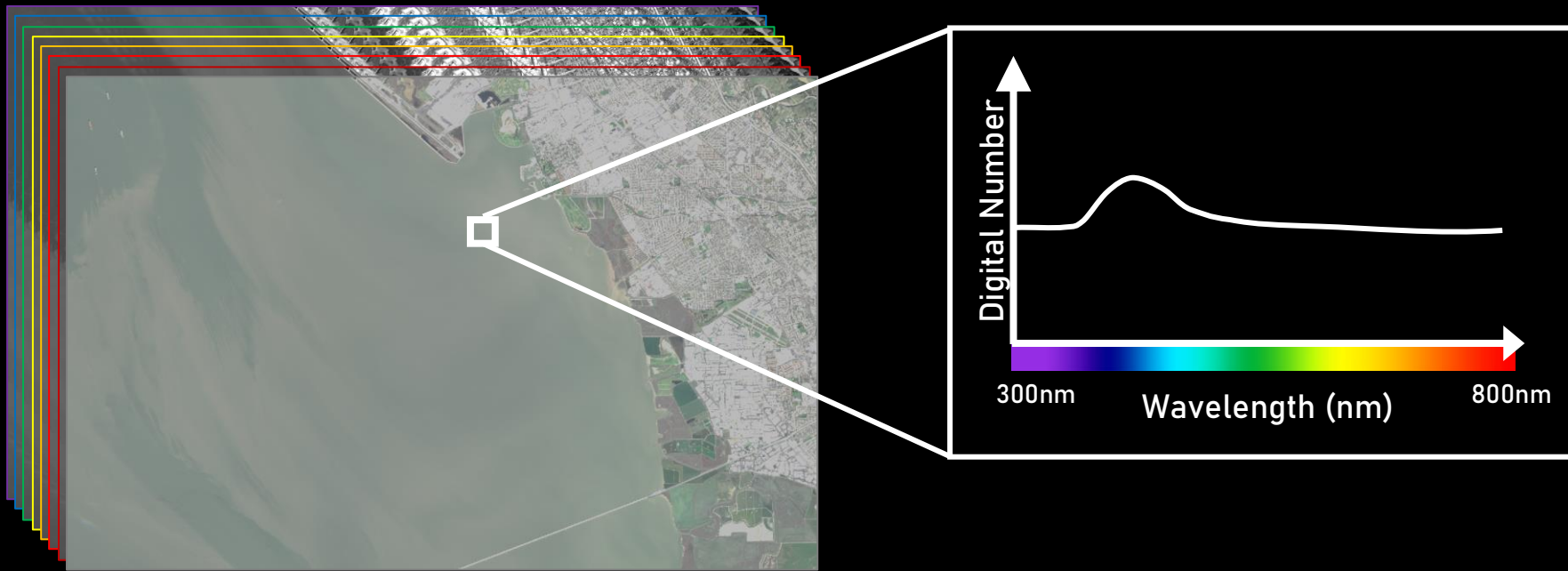


Level 0



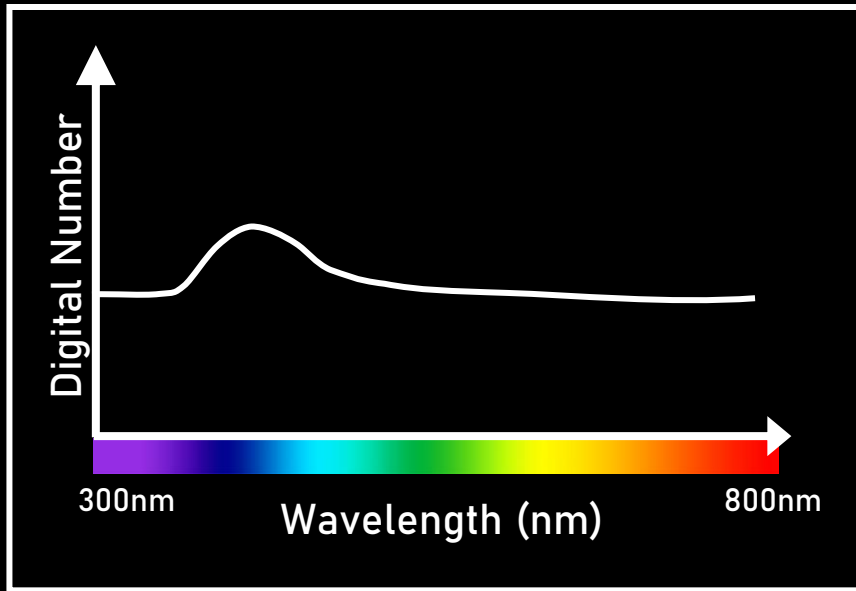
Level 0

Digital Number (DN)



Level 0

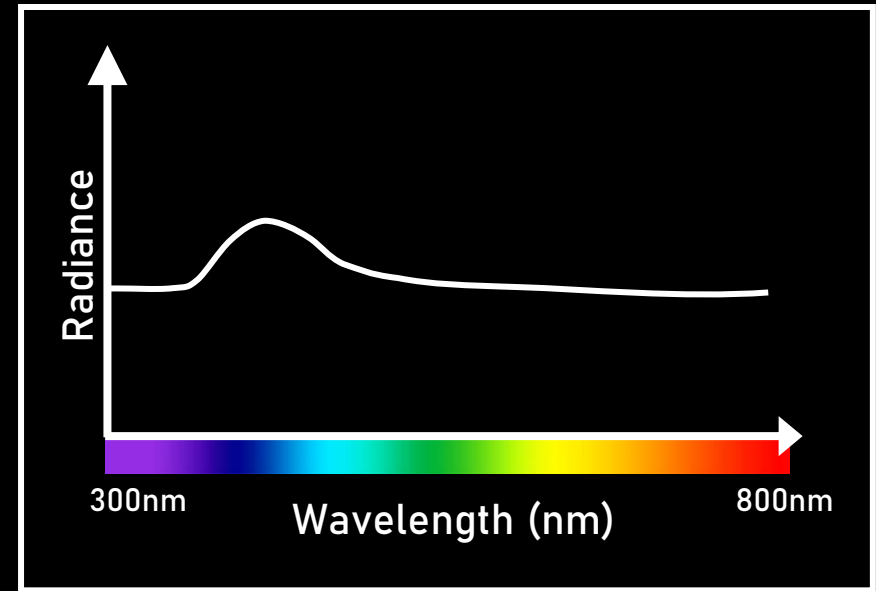
Digital Number (DN)



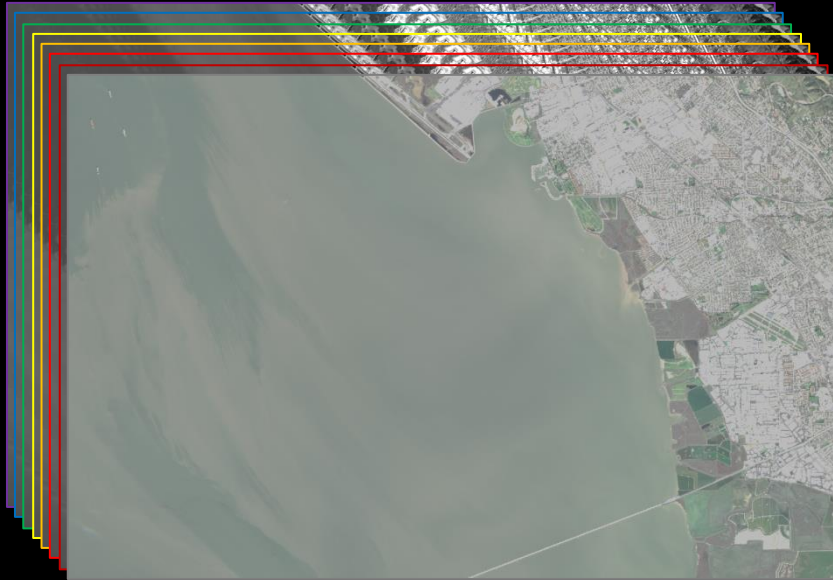
Radiometric Calibration

Level 1

Radiance ($\text{W}/\text{m}^2/\text{sr}^{-1}$)

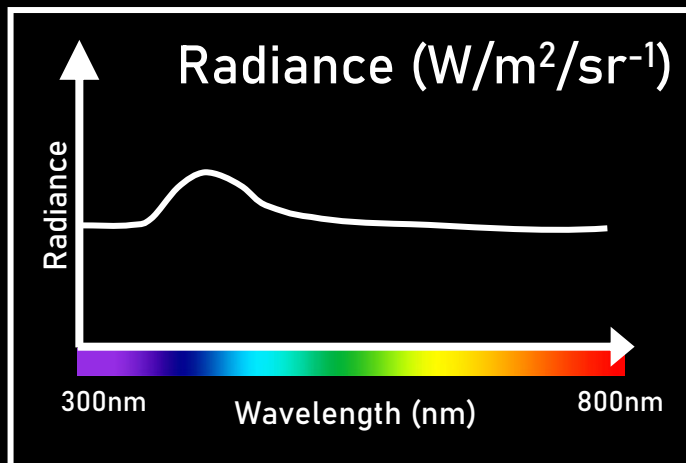
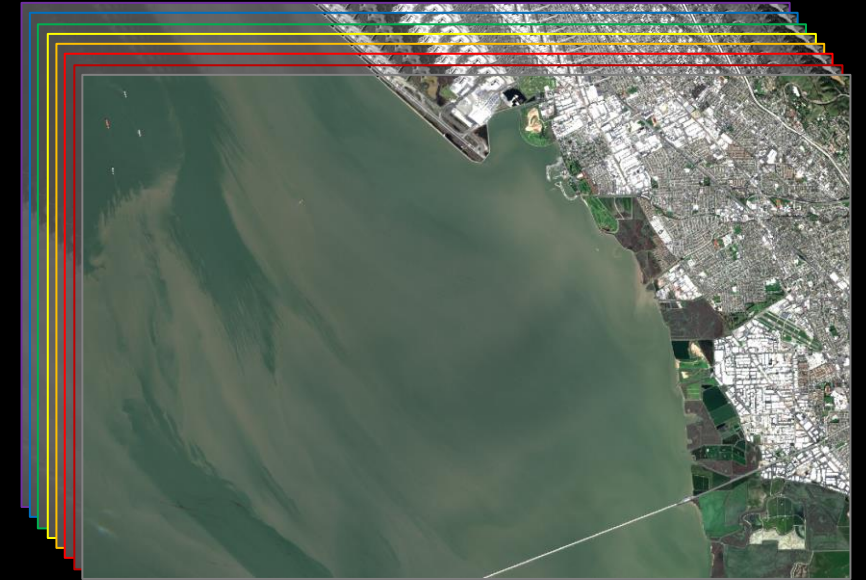


Level 1

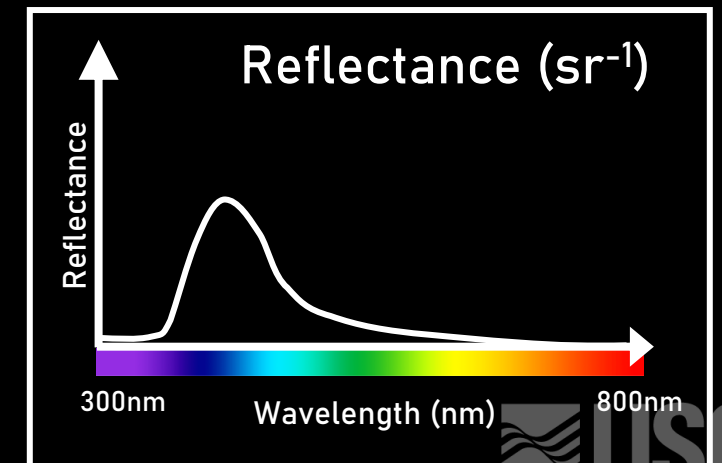


*Atmospheric
Correction*

Level 2



Surface
Atmosphere

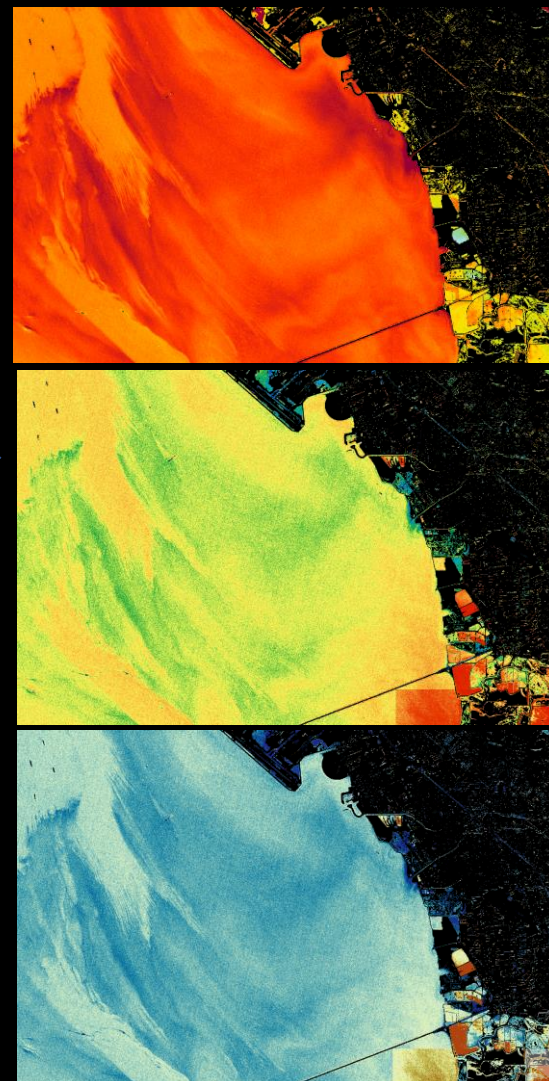


Level 2



Retrieval Algorithms

Level 3



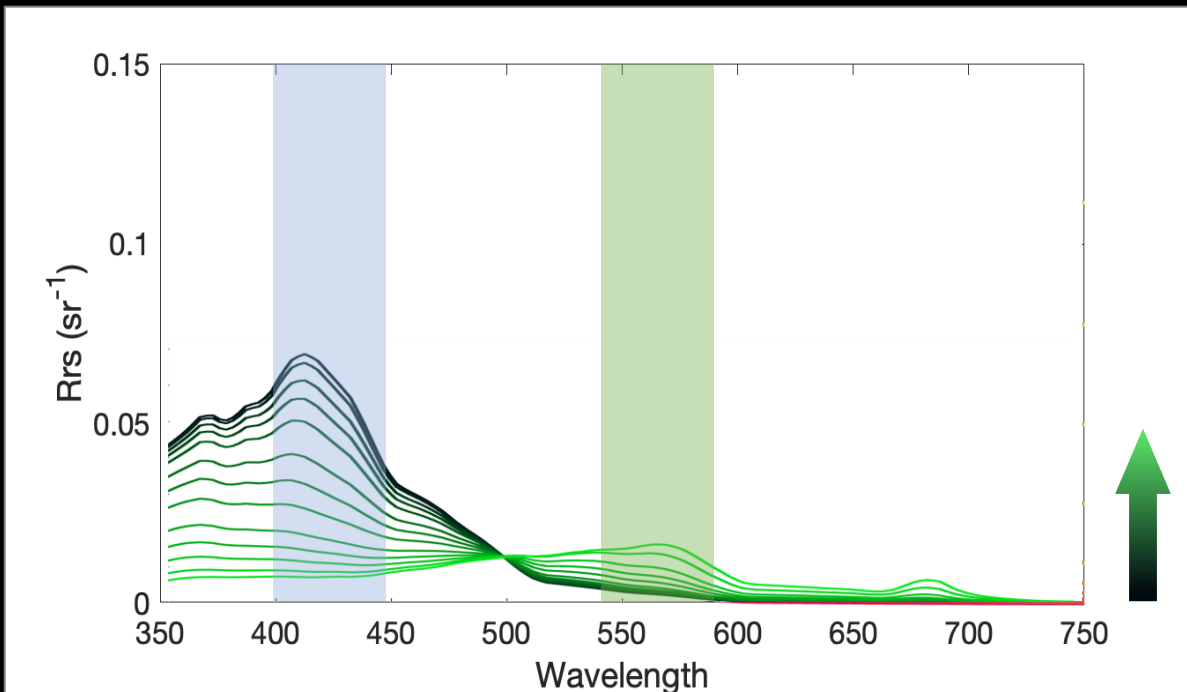
Level 3

Retrieval Algorithms

- Spectral Indices
- Semi-Analytical
- Data-driven, i.e. Machine Learning

Spectral Indices

An algorithm created with reflectance from two or more bands to recognize a spectral feature associated with some material



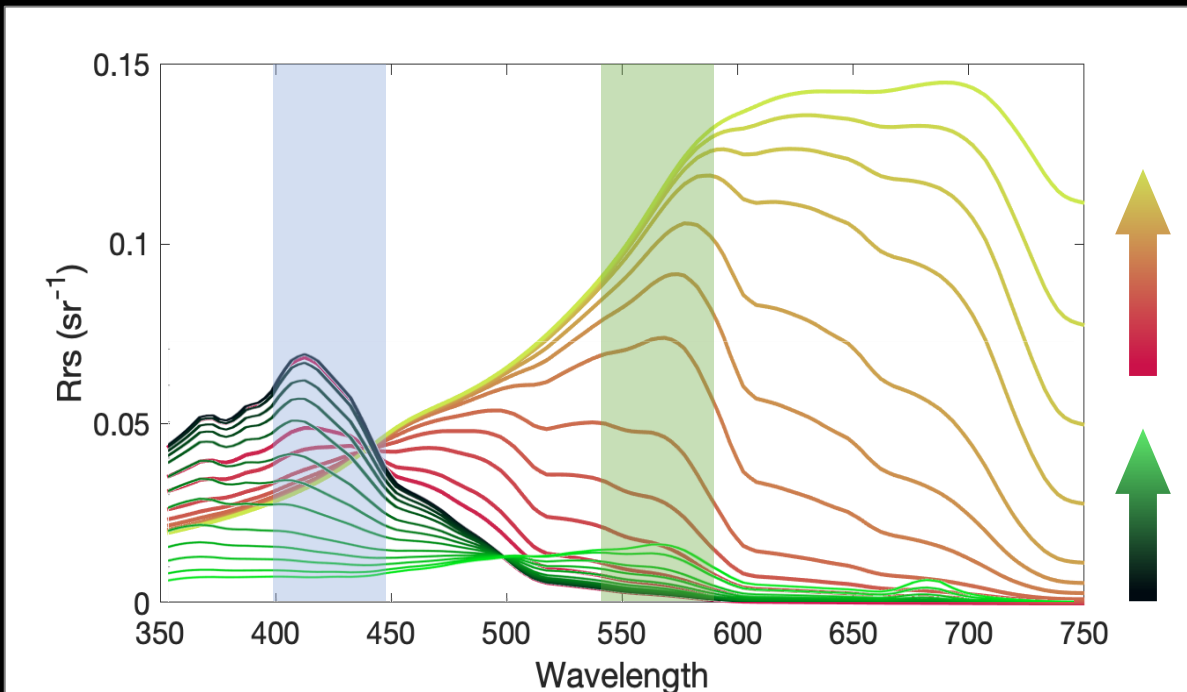
$$\frac{\text{Blue Band}}{\text{Green Band}} = \text{Chl Index}$$

↓ Empirical relationship

$$\text{Chl (mg/L)}$$

Spectral Indices

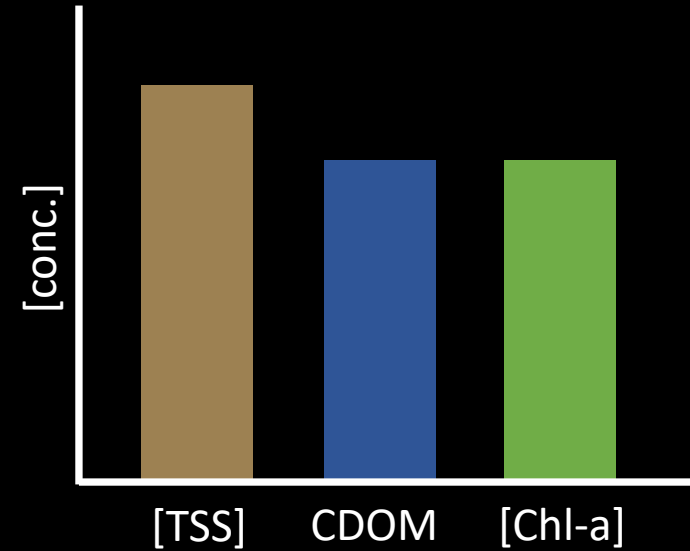
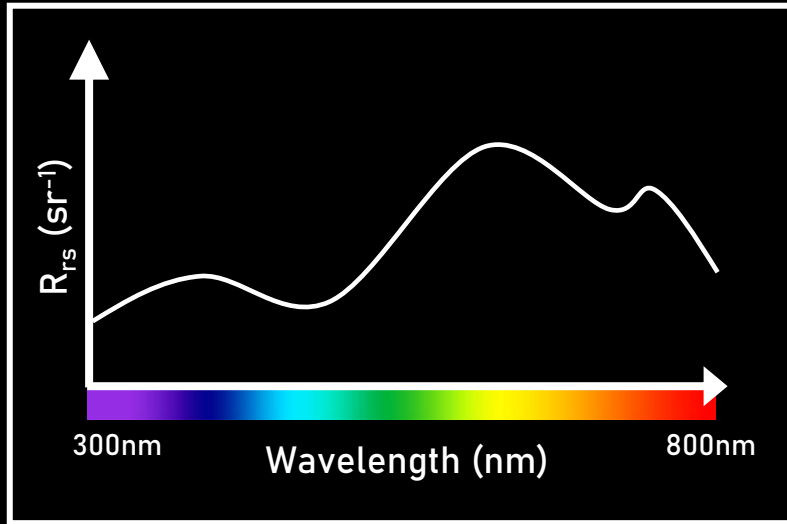
An algorithm created with reflectance from two or more bands to recognize a spectral feature associated with some material



Blue Band
Green Band
= Chl Index
Empirical relationship
Chl (mg/m^3)

Sediments and other stuff!

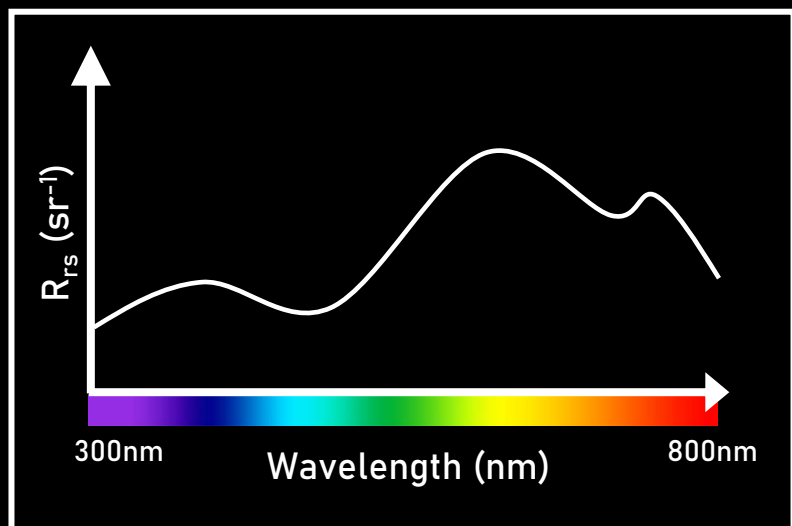
Semi-Analytical



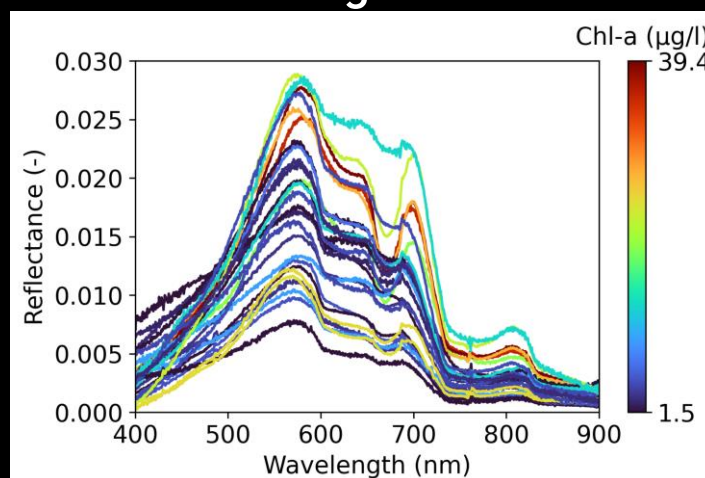
Empirical relationships



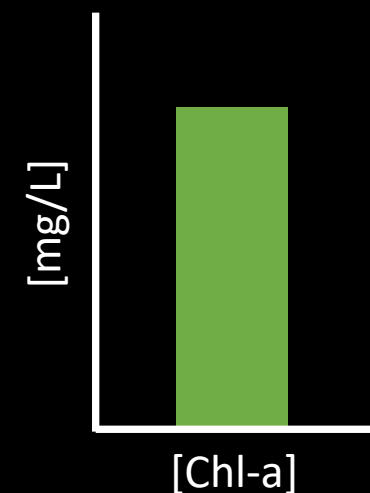
Data-driven



Training Dataset

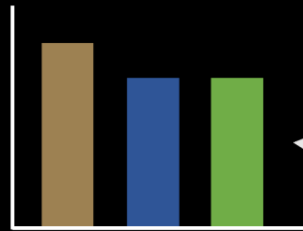
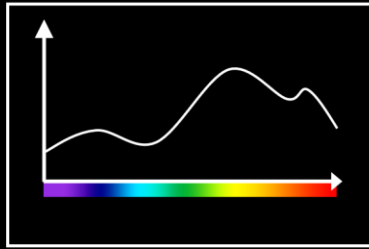


Retrievals



- Global
- Local/Regional
- Synthetic

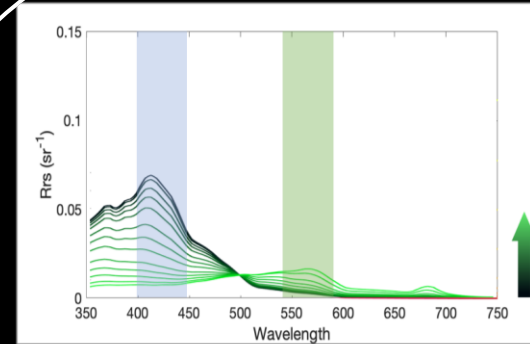
Semi-Analytical



Absorption

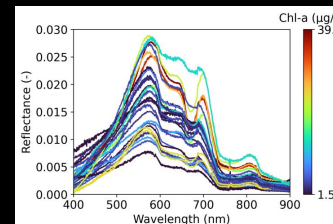
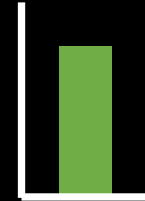
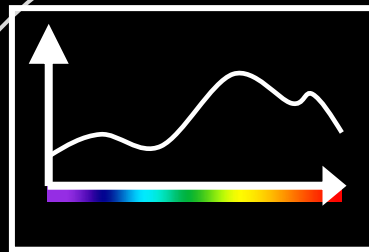
Scattering

Spectral Indices



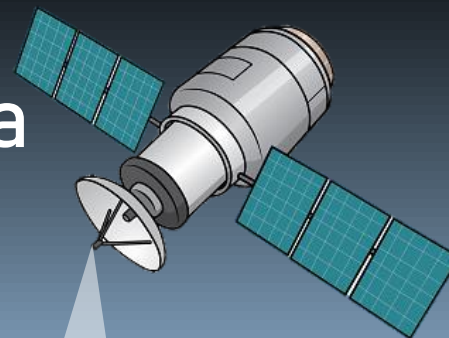
$\frac{\text{Blue Band}}{\text{Green Band}} = \text{Chl Index}$
↓
Chl (mg/L)

Data-driven



Remote Sensing Data

To view the surface



To validate atmospheric correction
Surface-level Radiometry

In-water optics

To validate/understand IOP's

In-water samples

To create empirical relationships
and validate final retrievals

Available Data Products

See the “Resources” section of the Tech Guide

- Where to download Level 1-3 data products
- Online tools for creating your own maps
- Free software for working with spectral remote sensing data
- Further learning resources

Conclusions

- Data is processed from Level 0 (raw) to Level 3 (retrieval products)
- Algorithms can be spectral indices, semi-analytical, data-driven, or a mix
- Empirical data is needed to fine tune retrieval algorithms

