



Mapping algal bloom dynamics in small reservoirs using Sentinel-2 imagery in Google Earth Engine



Algal Blooms

Toxic algal that can affect human health, animals and ecosystems



Old techniques

Collect data more frequently than once a month per location.

Analyse iit in specialized laboratory.

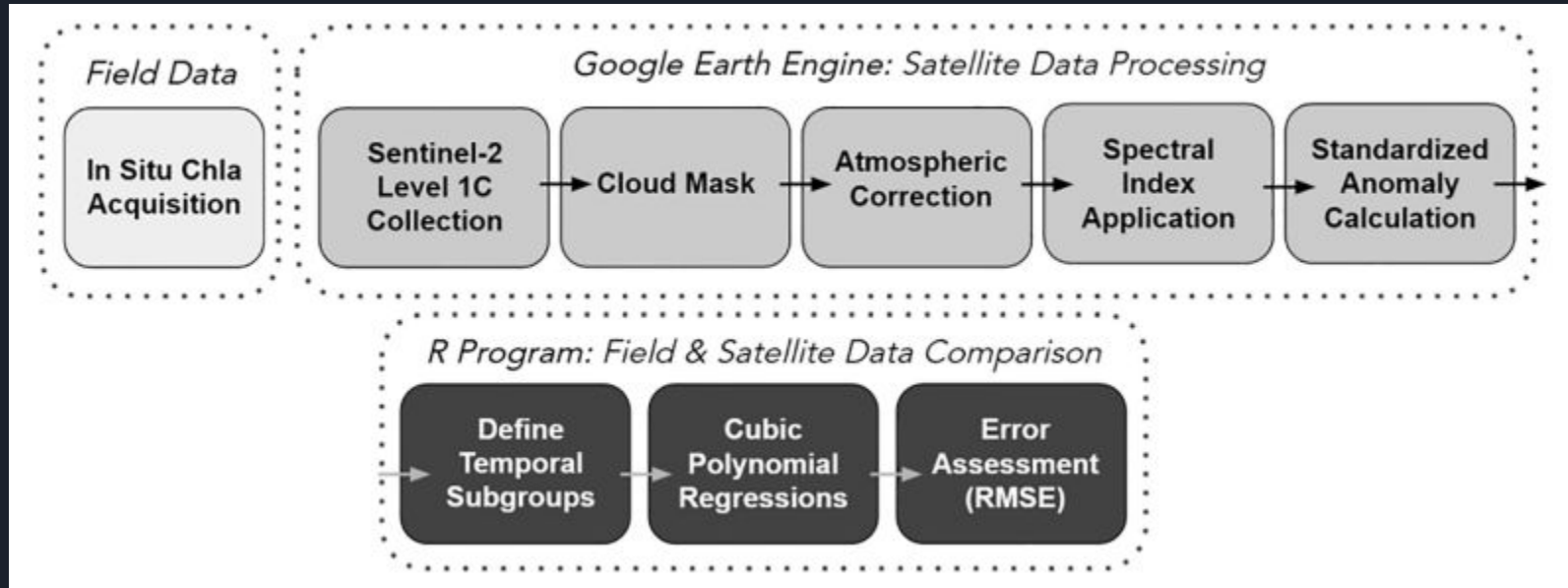


Why Satellite imagery

- algal blooms typically float at the surface
- It has distinct colorations
- Identifiable by red-edge and near-infrared (NIR) wavelengths
- floating algae have peak reflectance in the NIR and red-edge (Hu, 2009)

and high absorption in the red wavelengths, especially compared to surrounding water

Workflow





CLOUD MASK

Remove thick and cirrus clouds from our dataset. We also discarded images in which clouds obscured an in sampling location.



Atmospheric correction

convert imagery from top of atmosphere (TOA) to surface reflectance values. This package applies linear transformations to estimate surface reflectance, incorporating approximations of aerosol optical thickness and total columnar water vapor using Bayesian statistics and the Copernicus Atmospheric Monitoring Service using the Satellite Invariant Atmospheric Correction (SIAC) package

SIAC



RGB composition of TOA reflectance



RGB composition of BOA reflectance

spectral indices applied

Algorithm	Equation	Wavelengths	Sentinel-2 Bands	Reference
NDVI	$\frac{Rrs842 - Rrs665}{Rrs842 + Rrs665}$	NIR,Red	$(B8-B4)/(B8 + B4)$	Ma et al., 2021
NDCI	$\frac{Rrs705 - Rrs665}{Rrs705 + Rrs665}$	Veg red Edge 1, Red	$(b5-b4)/(B5 + B4)$	Caballero et al 2020
B8AB4	$\frac{Rrs865 - Rrs665}{Rrs865 + Rrs665}$	Narro NIR, Red	$(B8A-B4)/(B8A + B4)$	Khalili & Hasanlou 2019
B3B2	$\frac{Rrs560 - Rrs490}{Rrs560 + Rrs490}$	Green, Blue	$(B3-B2)/(B3 + B2)$	Cillero-Castro et al., 2020

Spectral Indices