A MULTI-DEVICE TOOL FOR HARMFUL ALGAE BLOOM MONITORING IN INLAND WATERS: STUDY CASE LAKE ÉRIE

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Context

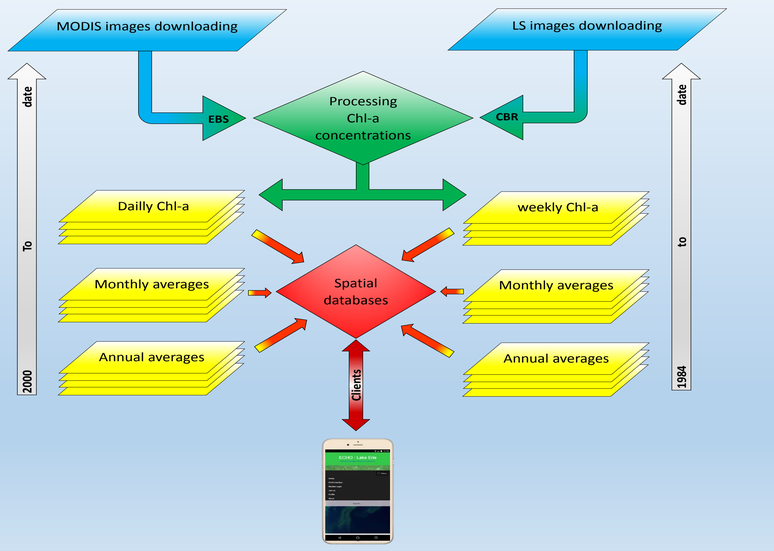
The occurrence and ampleness of harmful algae bloom (HAB) over Lake Érie, threatening human and animal health, is increasing from one year to another. Traditional network sampling programs, based on some punctual stations, are costly, labor intensive and with low temporal and spatial coverage, especially for water bodies of large area such as Lake Érie.

Objective

Development of the ÉCHO (Érie CHlorOphyll) application, which is compatible with android phones, tablets and computers, based on MODIS imagery downscaled to 250 m spatial resolution and on Landsat (TM, ETM+ and OLI) data.

Methodology

1. Retrieving the latest MODIS images of Lake Erie
2. Using the algorithm for image processing to retrieve Chl-a maps
3. Updating statistics and models based on new data
4. Transferring updated information to the database
5. Issuing early warning notifications to clients (Stakeholders, riverine, and interested people)

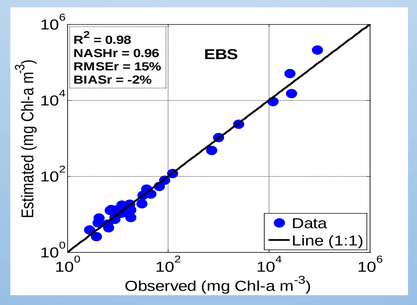


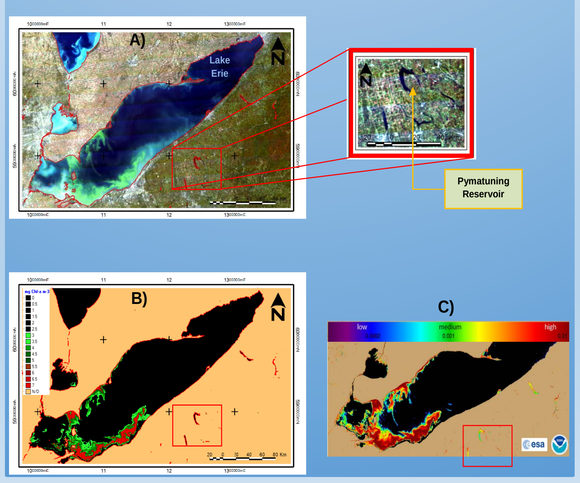
Models calibration and accuracy

MODIS

Calibration: Using an Ensemble based system (EBS) (R^2 adjustment = 0.98)

Validation: Cross-validation

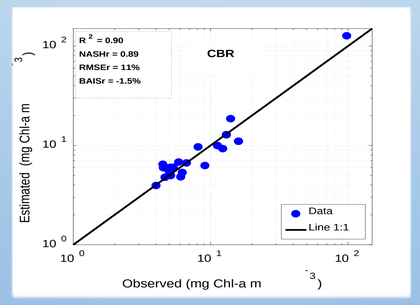


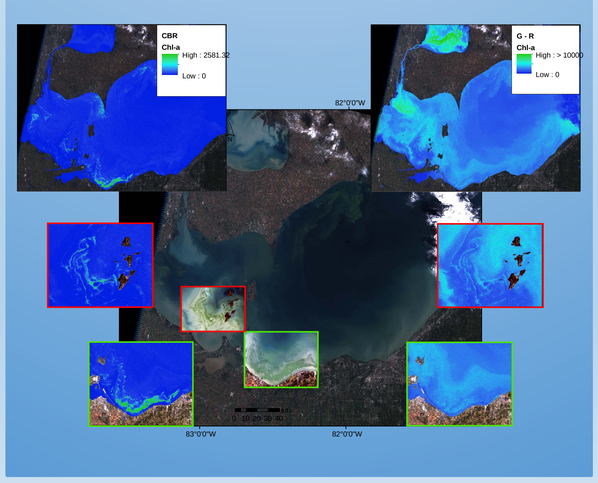


Landsat

Calibration: Using a Combined bands ratios (CBR) (R^2 adjustment = 0.90)

Validation: Cross-validation





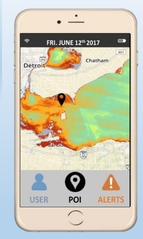
The ÉCHO application allows to:

Assist stakeholders making decisions:

- Easily
- Affordably
- Timely

Put satellite technology directly into the hands of the society

Monitor water quality, in NRT, for the entire Lake

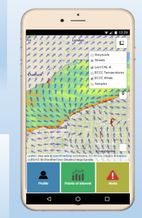


Define points of interest (POI) and alert thresholds

Upload pictures, field data, and personal remarks

Share information in social media and/or with other users

Forecast Chl-a concentrations and issue alerts



Usage plans

BASIC (FREE)

- Latest Chl-a maps
- Social media sharing

REGULAR ($)

- Lastest and current Chl-a maps
- Three user-defined POI
- Access to current time series data and statistics
- Social media sharing

ADVANCED ($$)

- All archived, lastest and current Chl-a maps
- Unlimited user-defined POI
- Access to all time series data and statistics available
- Access to short-term Chl-a forecasts
- Social media sharing

What next?

Development of more robust forecasting models to estimate Chl-a concentrations;
Development of a model to estimate Chl-a based on Sentinel-2 (A and B) data at 20m spatial resolution;
Development of models to estimates suspended matters based on the MODIS, Landsat and Sentinel data.

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