

Remote sensing of lake water quality:

Space-based information for management decisions and science

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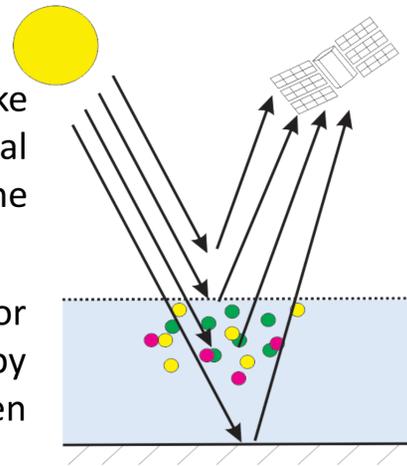
Context

Certain substances found in lake water can affect the signal received by satellites imaging the Earth.

This includes *phytoplankton*, or *algae*, which can be “seen” by satellites because of their green pigment, *chlorophyll-a* (chl-a).

Algal blooms can threaten lake water quality, and are important to monitor.

My research aims to develop and integrate satellite imagery as a tool in monitoring and scientific research of Lake Balaton algal blooms.



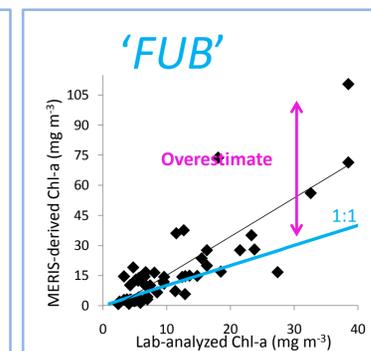
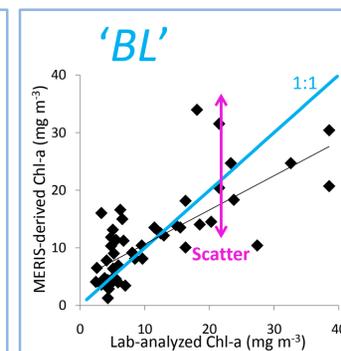
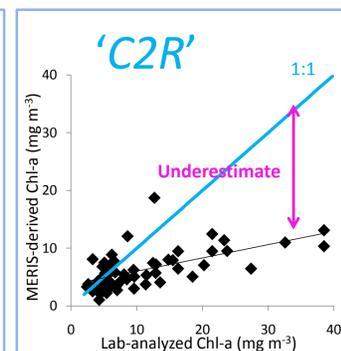
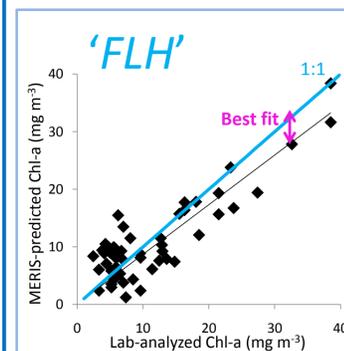
Data

Lake water samples taken by boat are analyzed in the laboratory for chlorophyll-a concentration, a measure of algae in the water.

Satellite Images from the European Space Agency's *MERIS* satellite sensor in space, transmitted to receiving stations on Earth, provided images of the lake every 2-3 days.

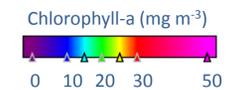
Satellite water quality mapping

The relationships between laboratory measured chlorophyll-a and lake reflectance (colour) in satellite imagery need to be established and the best chosen to then map these parameters.



Comparison of different possible algorithms to map chlorophyll-a using MERIS satellite imagery. ‘FLH’ algorithm is selected as best.

Maps show chlorophyll-a mapping for the same date (same satellite image) using the different algorithms, and again demonstrate the over- and underestimates of chlorophyll-a relative to the best fit.



Study site

The largest lake in Central Europe, **Lake Balaton** has a surface area of almost 600 km².

Historical **problems with algal blooms** continue to face Balaton.

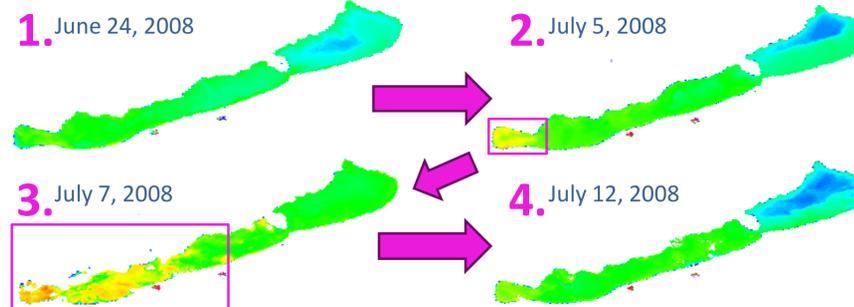
Location of study site in western Hungary.



Lake Balaton, Hungary, seen from space through MERIS satellite imagery.

Traditional monitoring of Balaton is four samples taken once per month. **Satellite mapping** is proposed to extend this to cover the full lake surface, every 2-3 days.

Early detection and development of algal blooms



The start and spread of an algal bloom is detected using MERIS imagery. This event would not be detected by conventional sampling, done once per month.

Conclusions

Satellite imagery can greatly improve lake monitoring. The relationship between the satellite signal and chlorophyll-a is complex and must first be accurately determined.

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