

Remote sensing of water quality in inland waters

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DENIE AUGUSTIJN

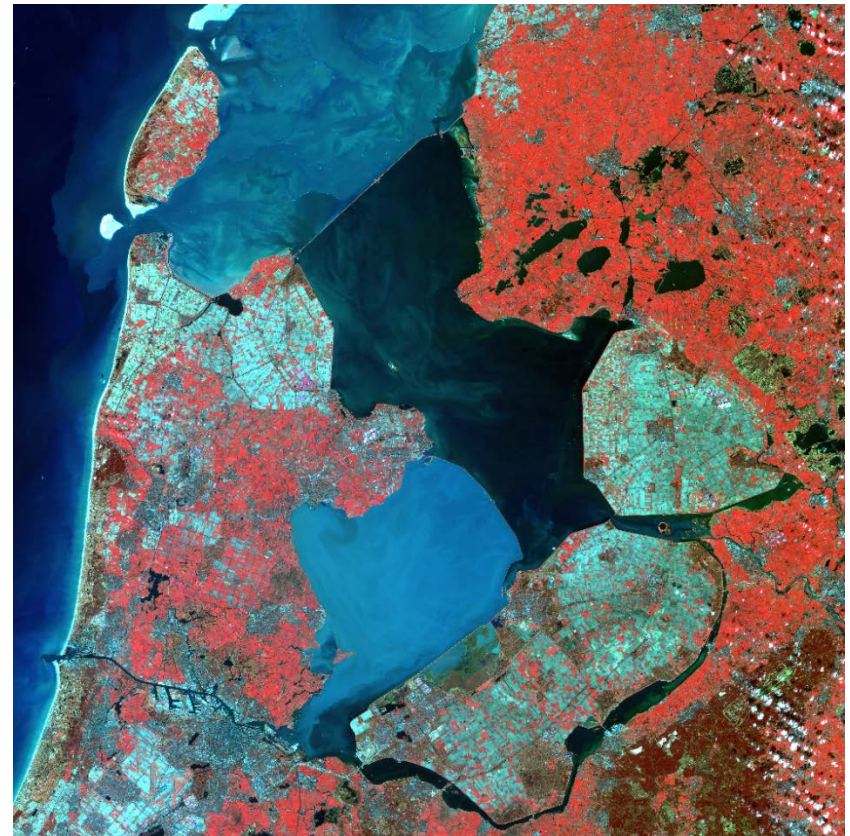
- Why remote sensing of water quality?
- Challenges for inland waters
- Remote sensing of river's quality (example Nile)
- Developments
 - Mobile phone
 - High resolution images (Sentinel 2)

Why remote sensing of water quality?

The aquatic biosphere is uniquely monitored by Earth Observation (EO) sensors as they provide information on key variables at **high frequency** and **large spatial scales**

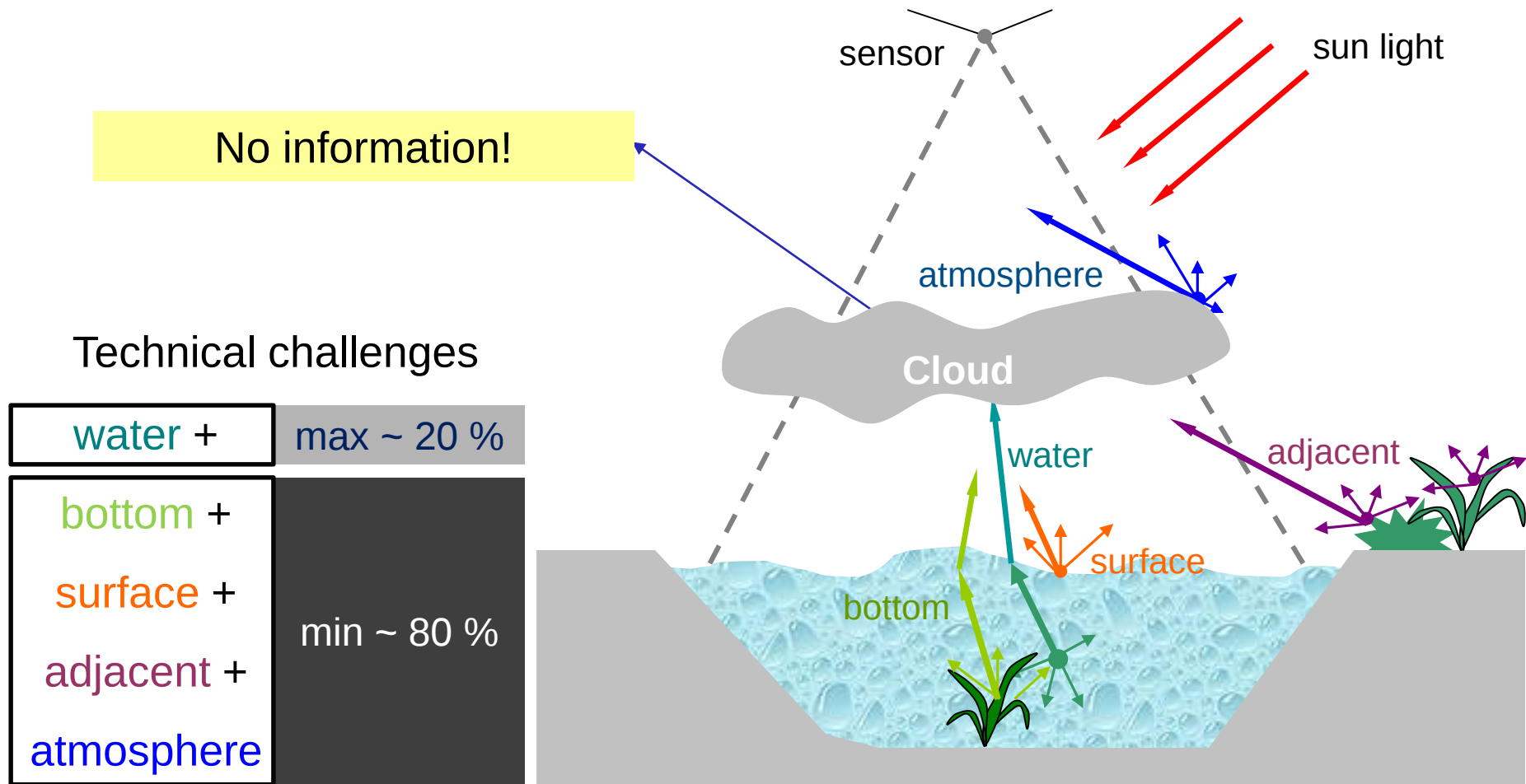
Monitoring of water quality using **remote sensing**, in conjunction with strategic **in situ sampling** and **modeling** can play a crucial role in:

- Determining the current and future status of water quality conditions
- Improve management; mitigate possible catastrophes



Sentinel 2 MSI, 12 March 2016
R(842)G(665)B(490) at 10 m

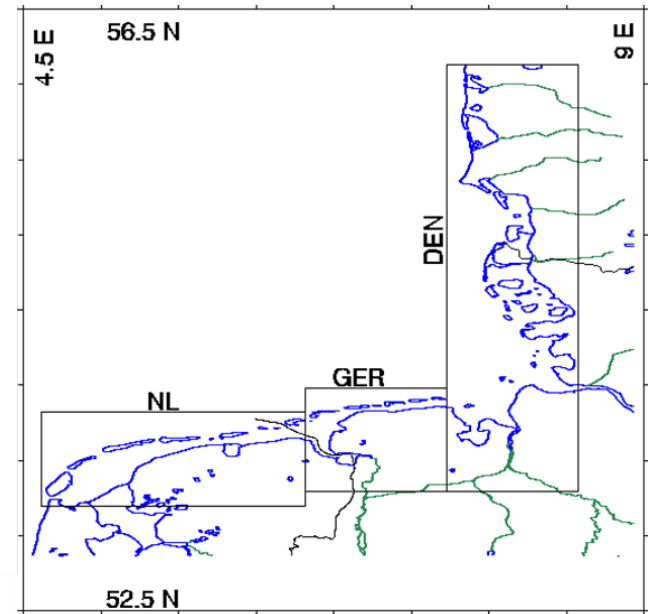
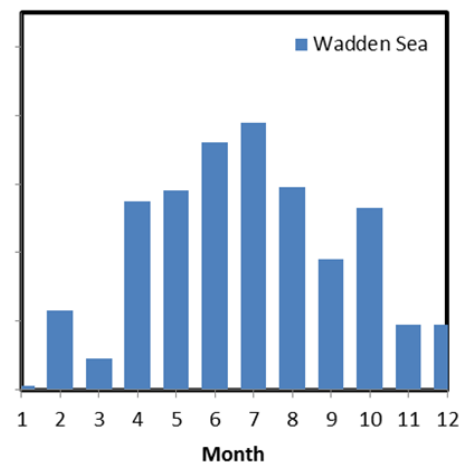
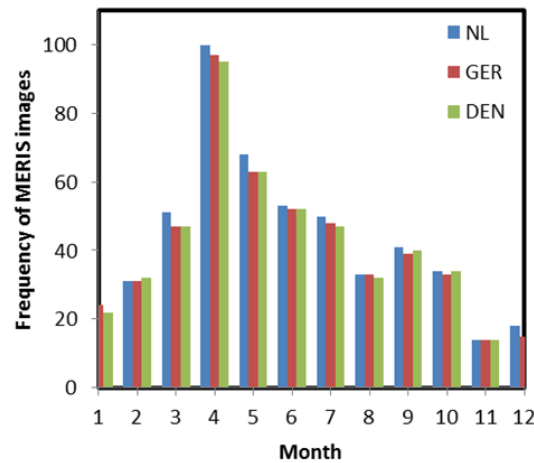
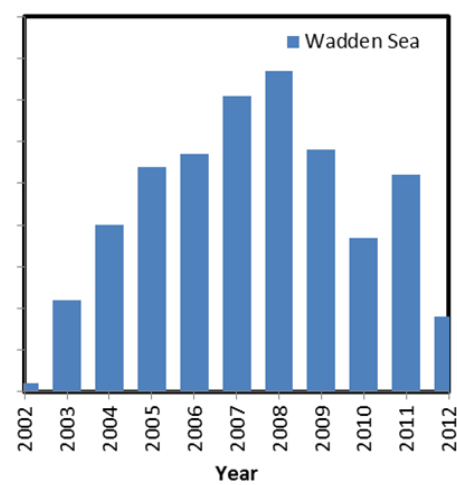
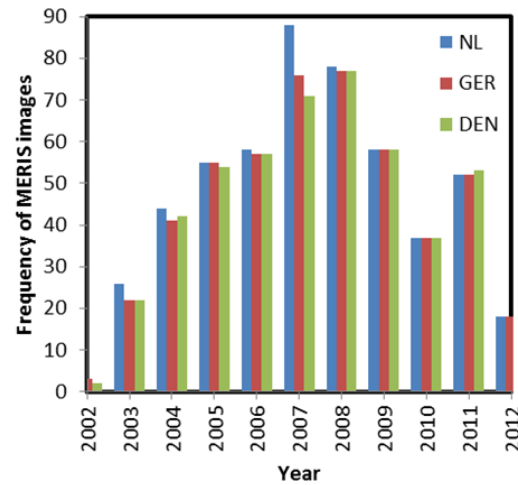
Challenges of EO data in inland waters



Limitations:

- Clouds → no data
- Only surface information
- Small target → no data
- No prediction capability

Clouds in the Netherlands



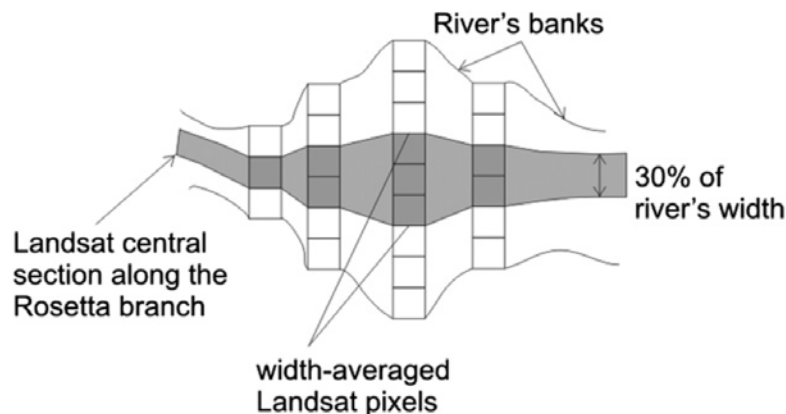
Remote sensing of rivers' water quality

HydroSat (Salama et al., 2012)

Model for Landsat images that performs coupled atmospheric correction and estimation of three water quality variables:

- dissolved organic matter
- algae
- suspended sediments

The model was applied on the Rosetta Branch in Egypt (length: 235 km) and validated with 1D hydrodynamic water quality model (MIKE11)



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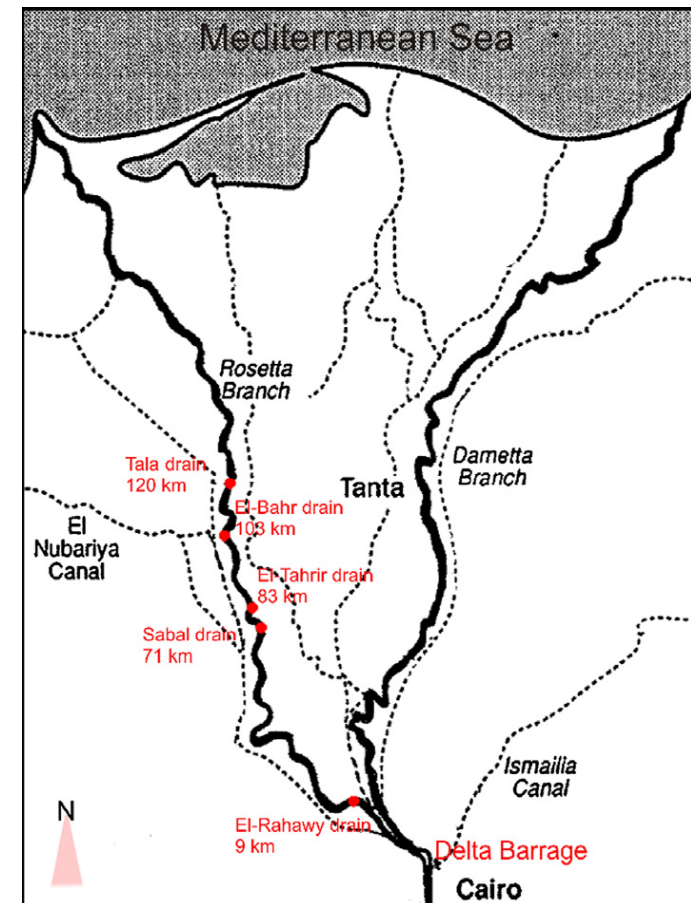
A hydro-optical model for deriving water quality variables from satellite images (HydroSat): A case study of the Nile River demonstrating the future Sentinel-2 capabilities

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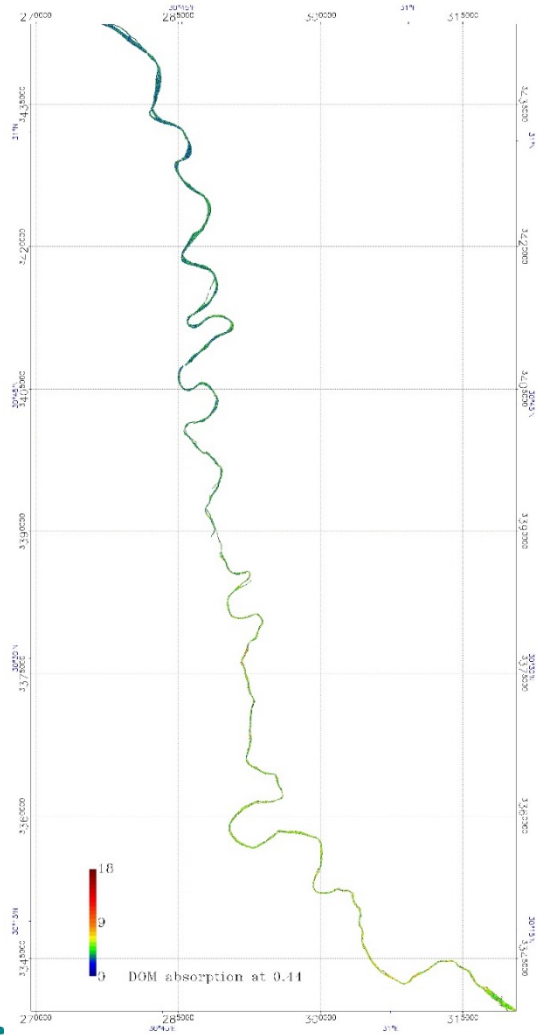
^b Nile Research Institute, National Water Research Center, Cairo, Egypt

^c Netherlands Institute for Sea Research (NIOZ), Yerseke, The Netherlands

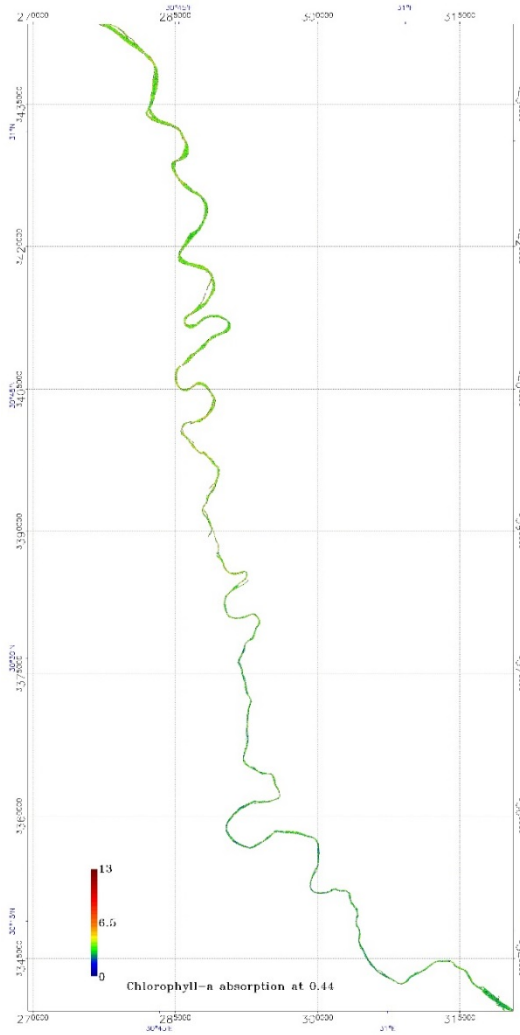


Water quality parameters

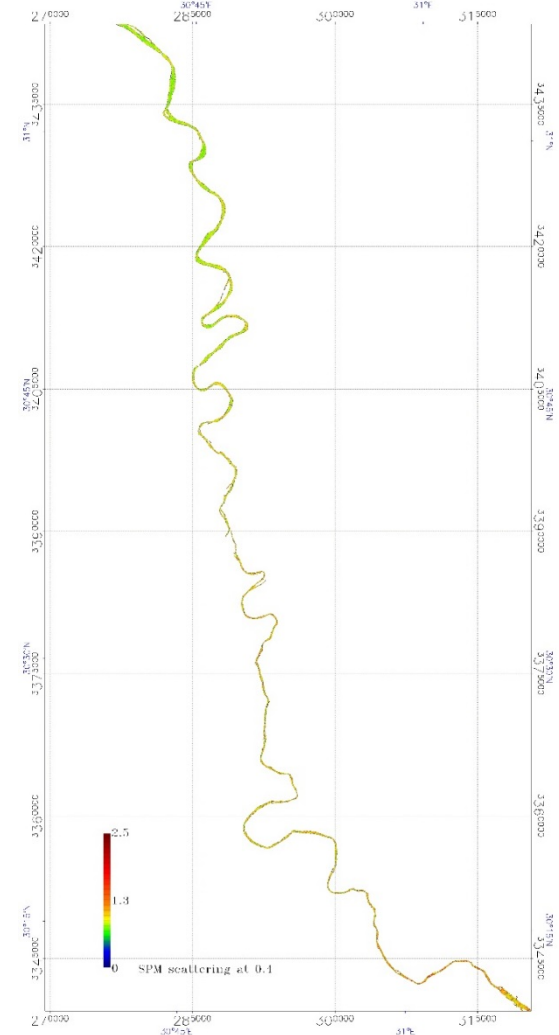
Dissolved organic matter



Algae

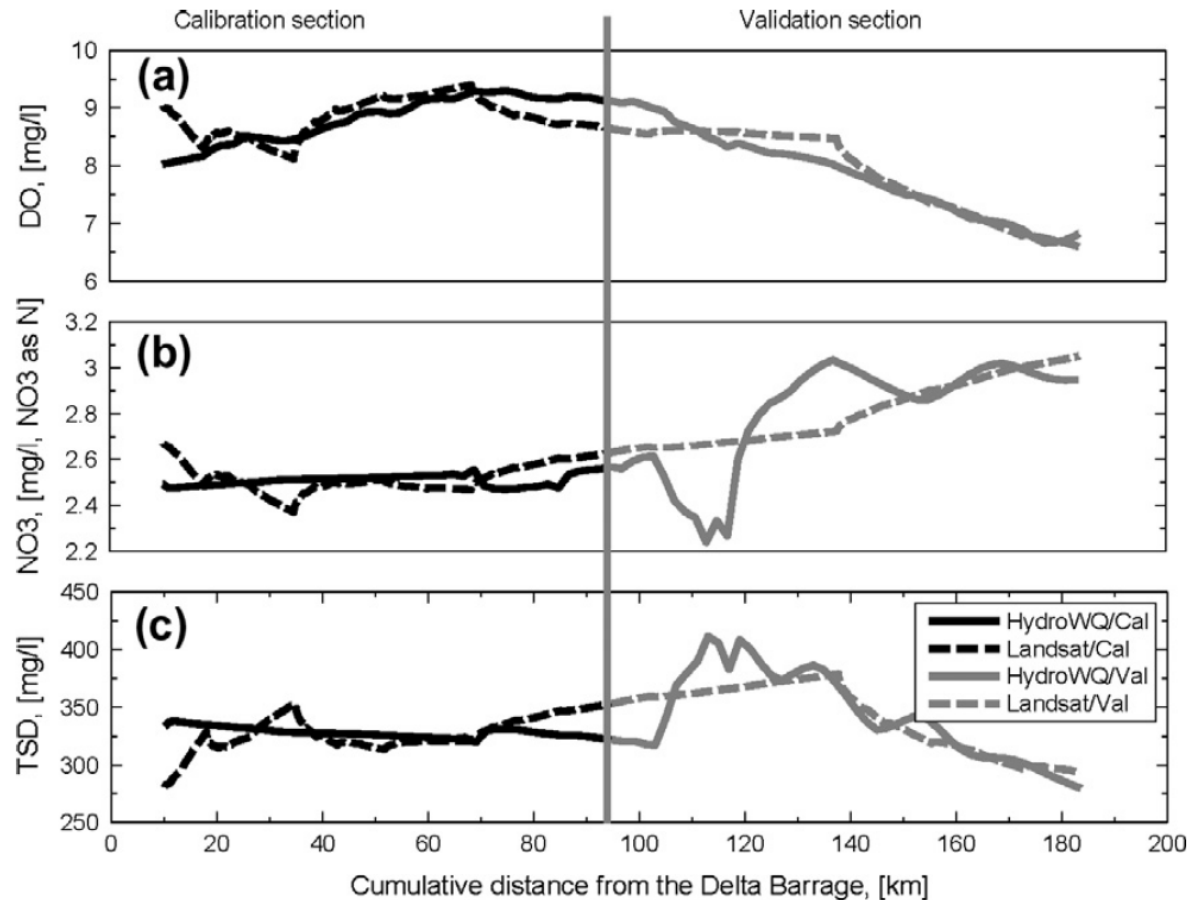


Suspended particulate matter (SPM)



Calibration and validation

Correlation of other, not remotely sensible variables with model (MIKE11) results



1. Smartphone Images

Binnenschelde



Markiezaatsmeer



Hulsbeek



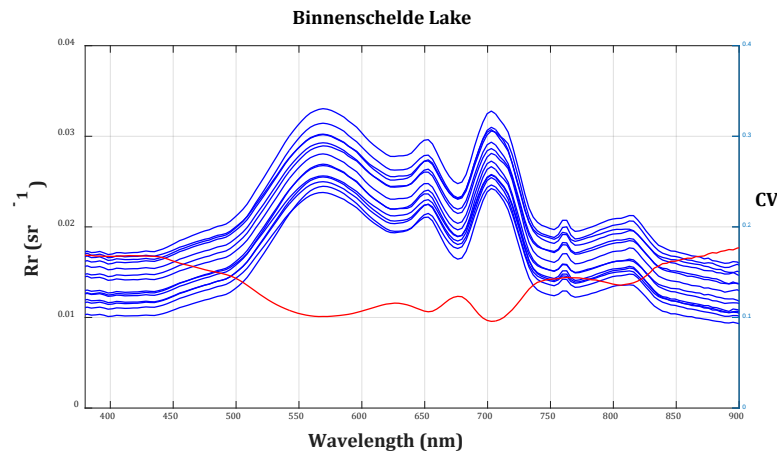
Kristalbad



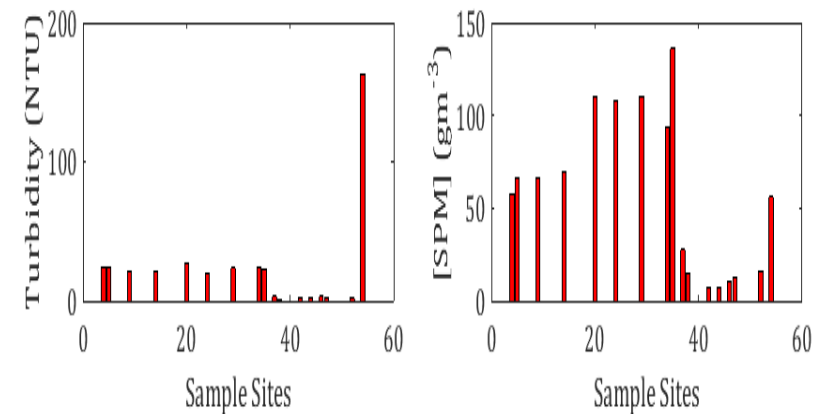
Pit



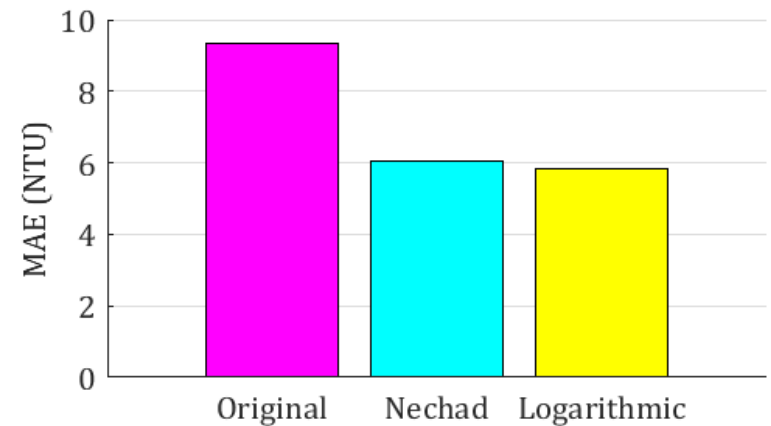
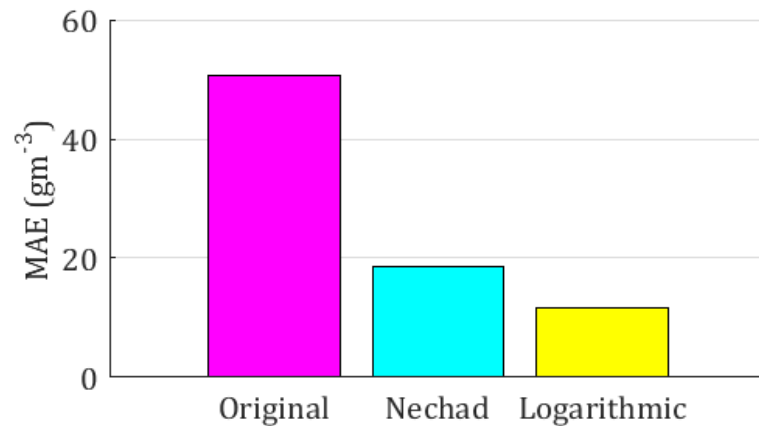
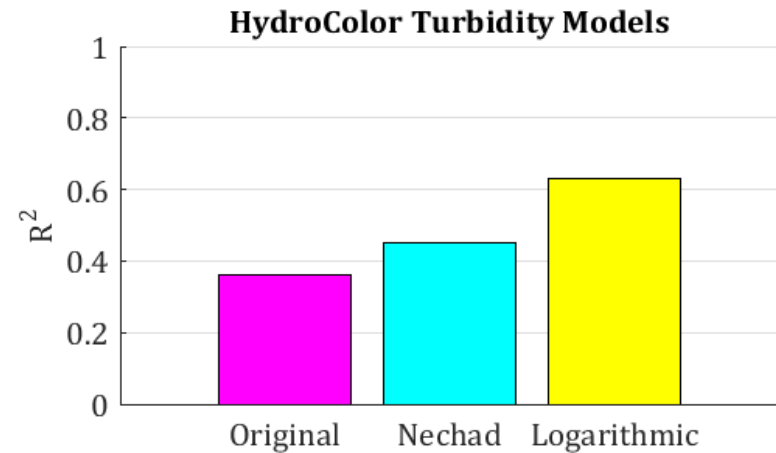
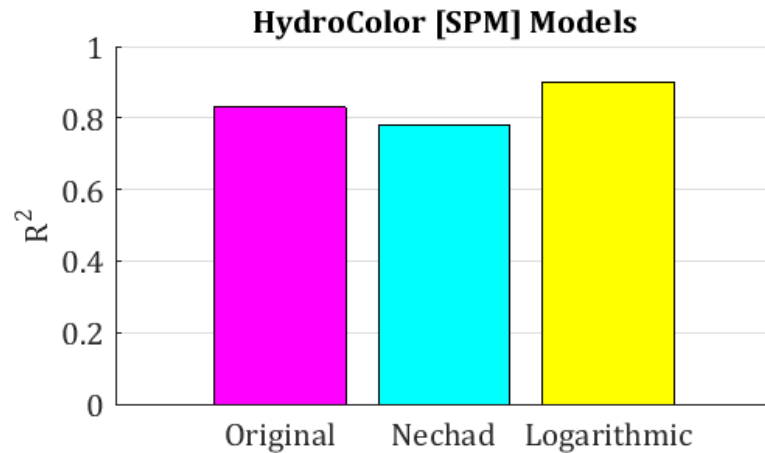
2. Hyperspectral Sensors



3. Laboratory Analysis

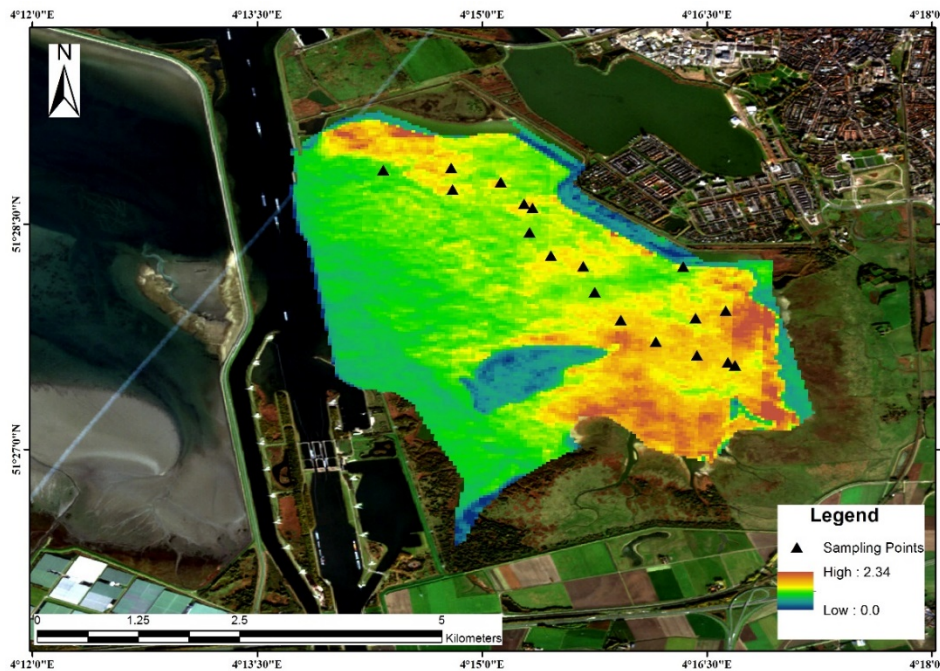


Performance HydroColor app and improvements



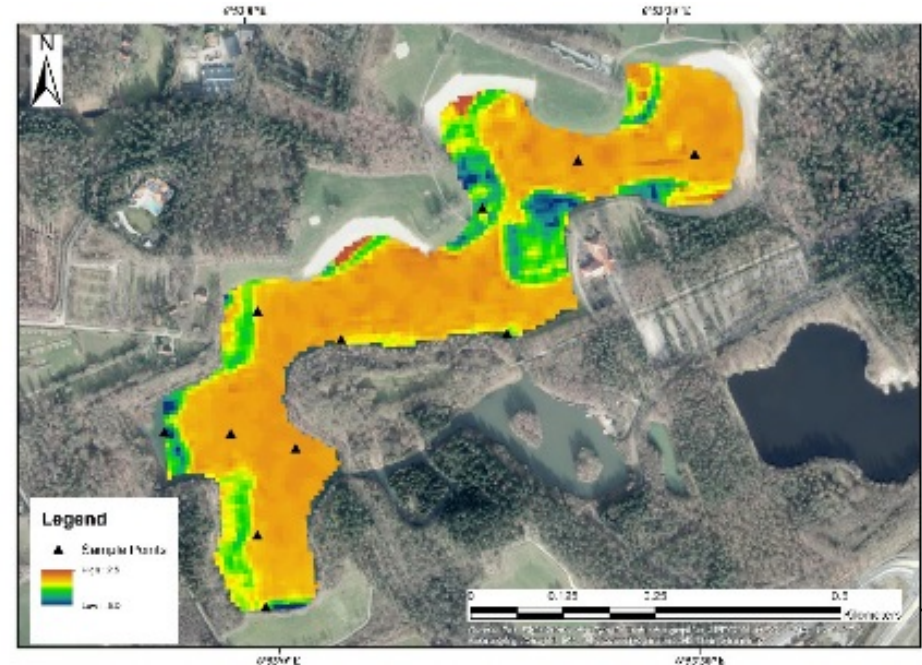
Algae in inland waters (Landsat-8)

Markiezaatsmeer (27/9/2015)



Binnenschelde
(23/9/2015)

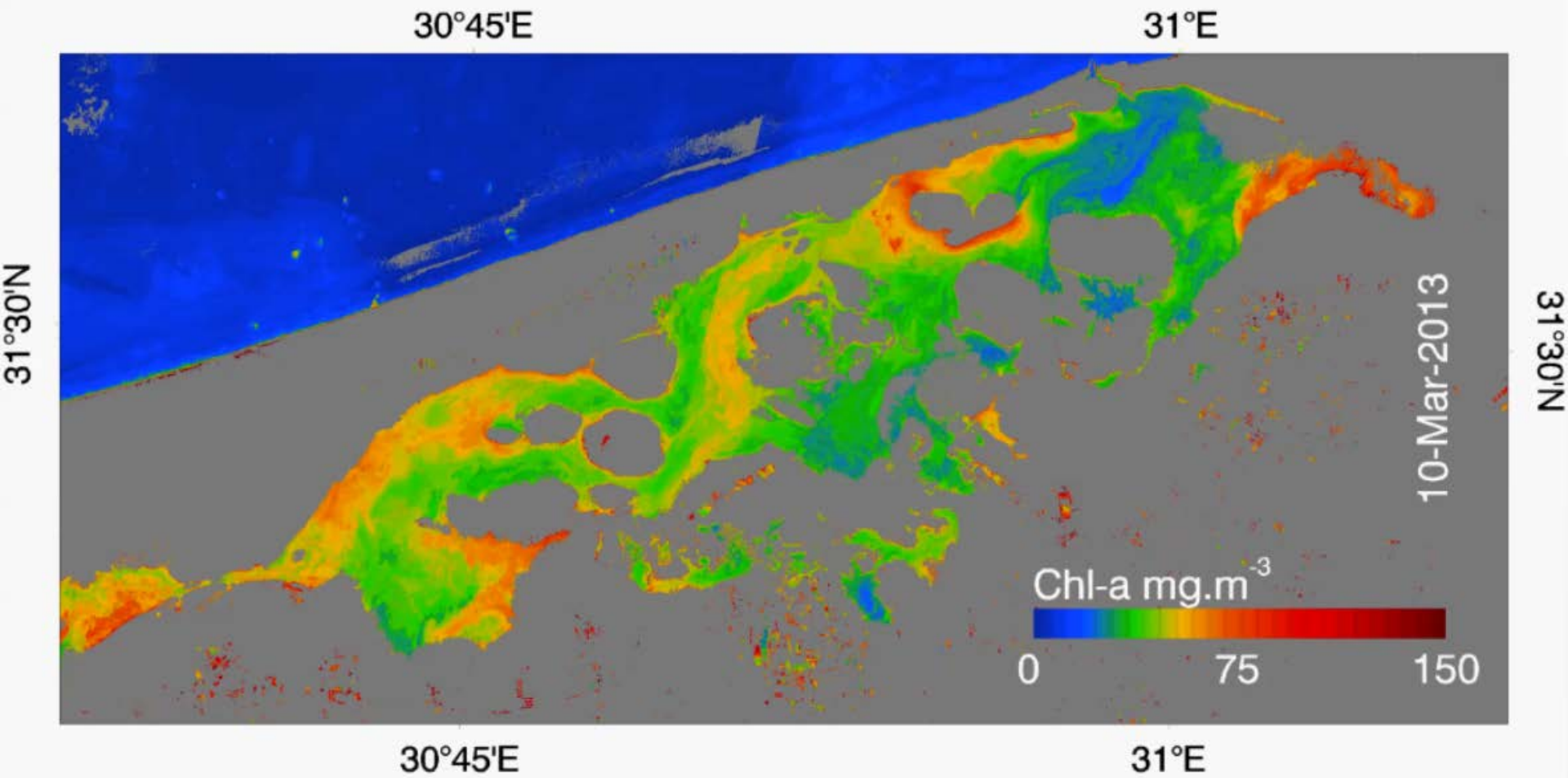
Hulsbeek
(26/9/2015)



MSc work at ITC, Owuso 2016

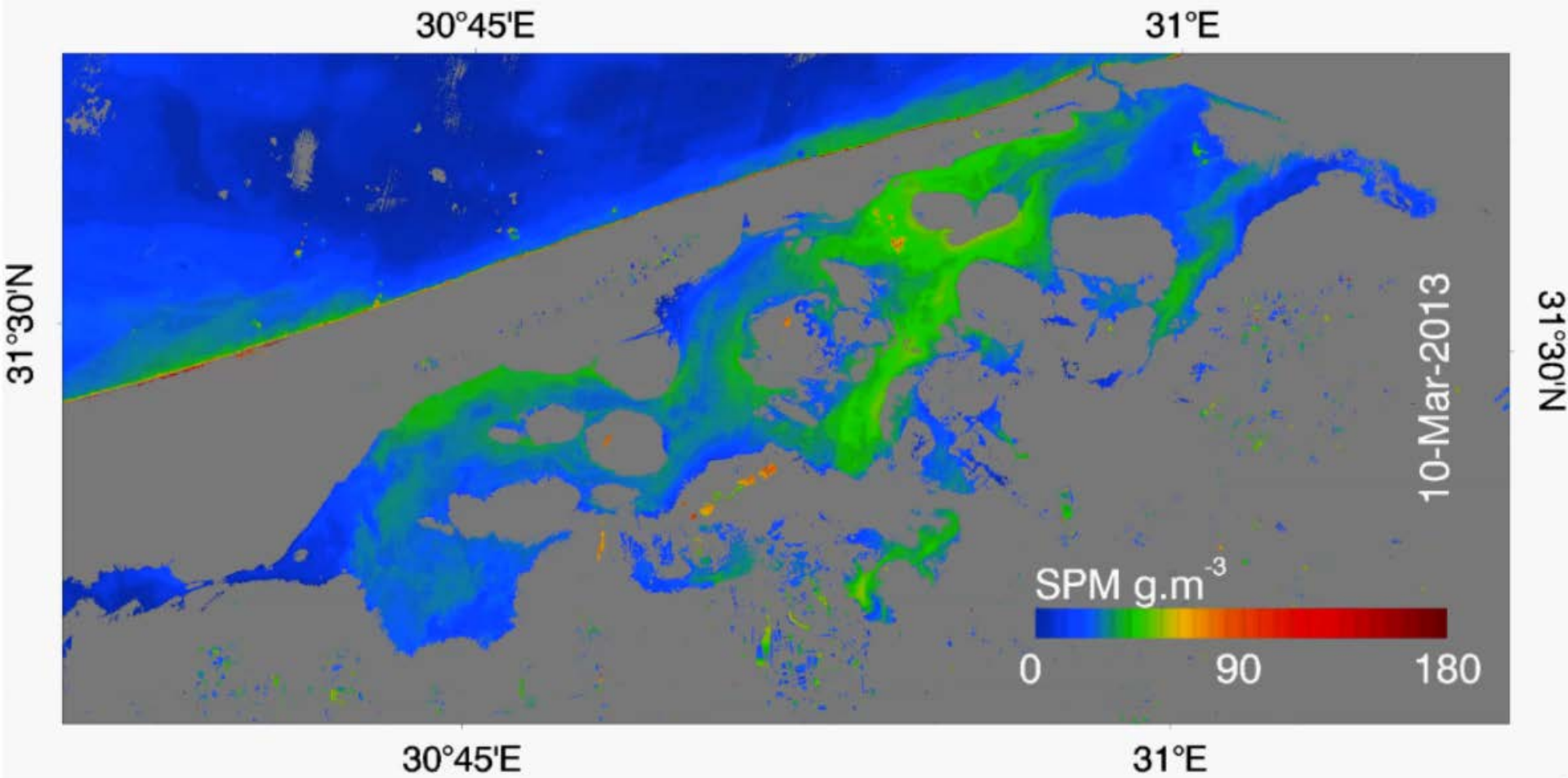
Potential of Sentinel 2

Lake Burullus (Egypt), based on SPOT 6 (6 meter spatial resolution)



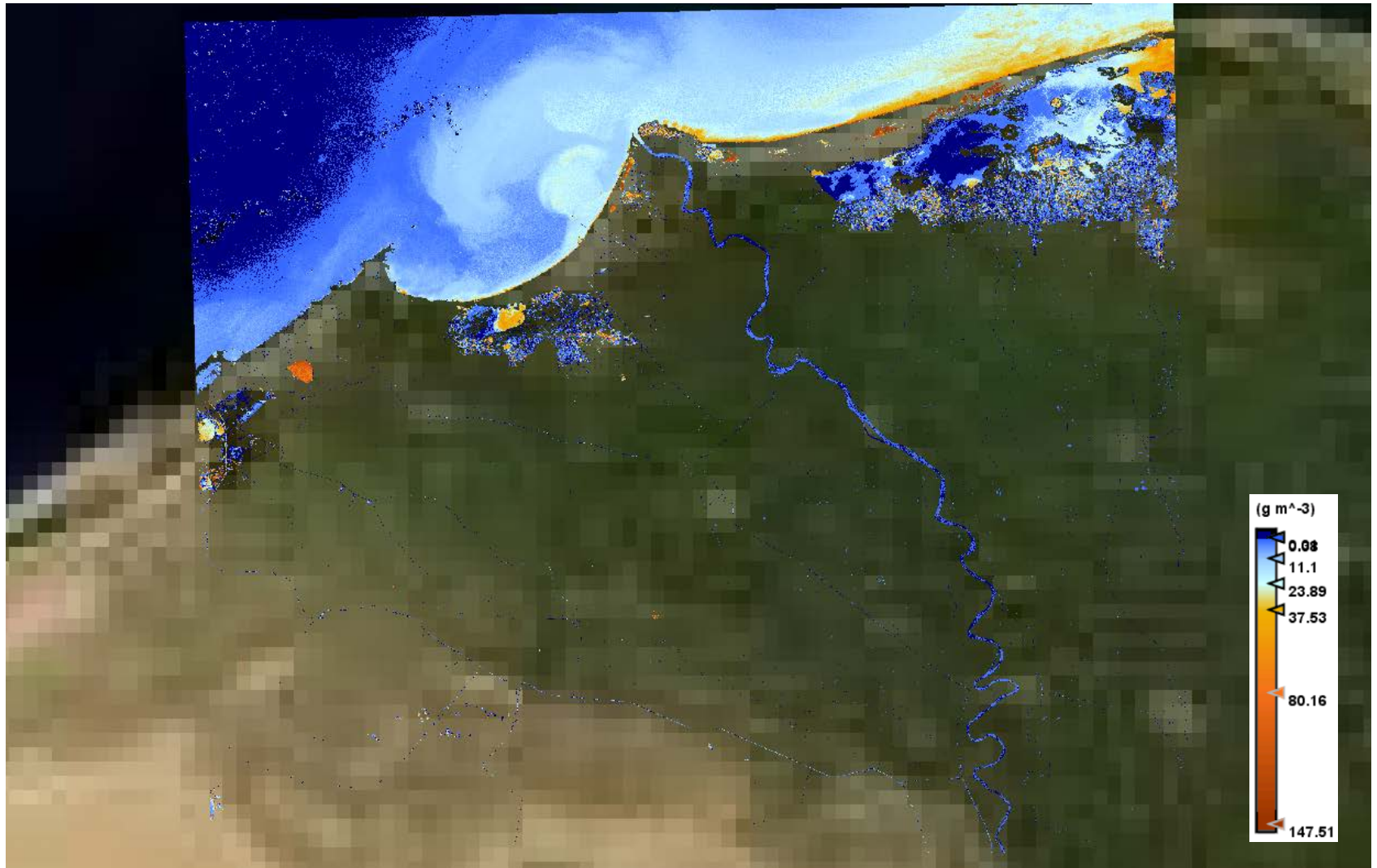
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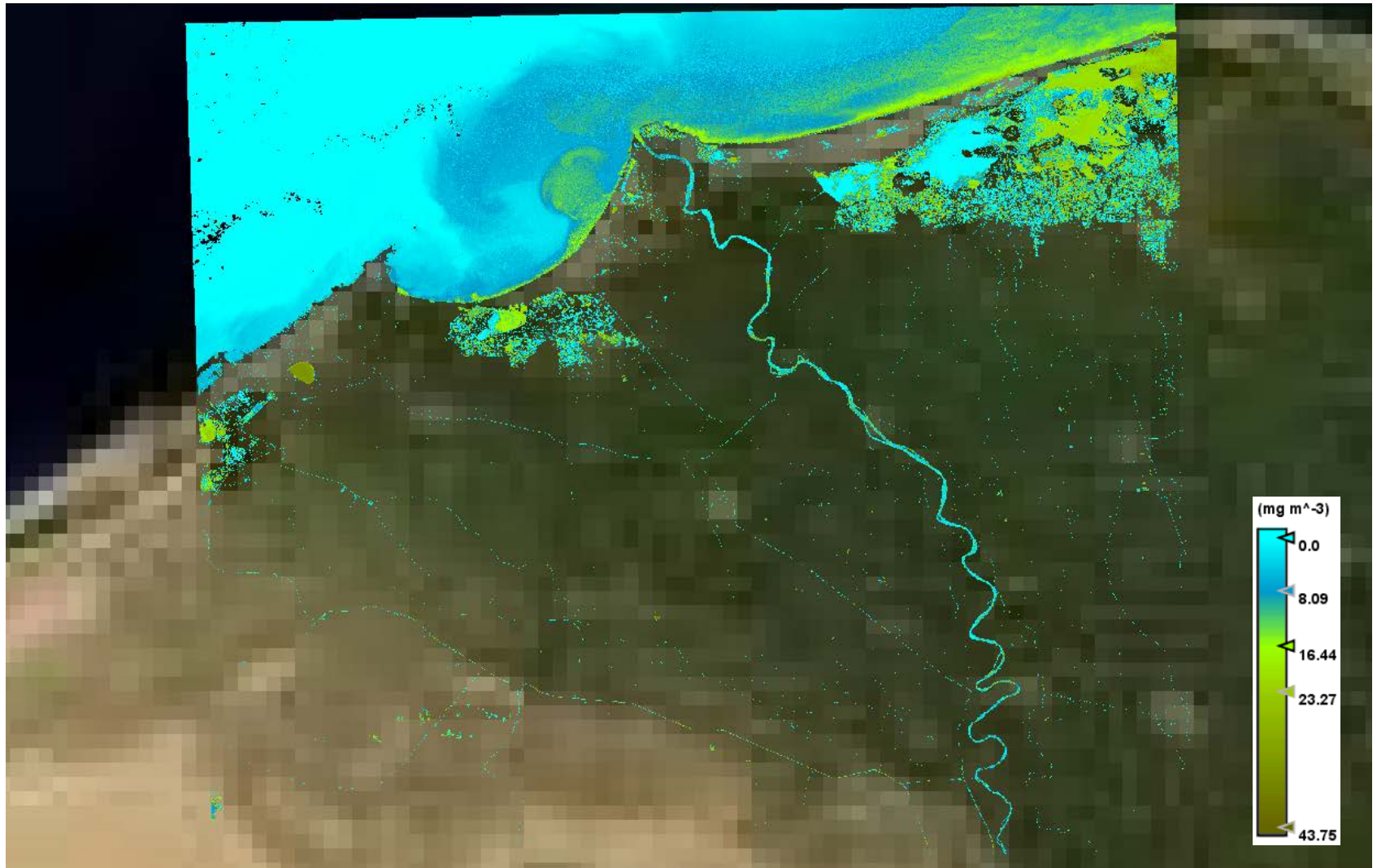


Lake Burullus (Egypt)





Chl-a Sentinel 2 18-03-2019



Chl-a Sentinel 2 18-03-2019

