

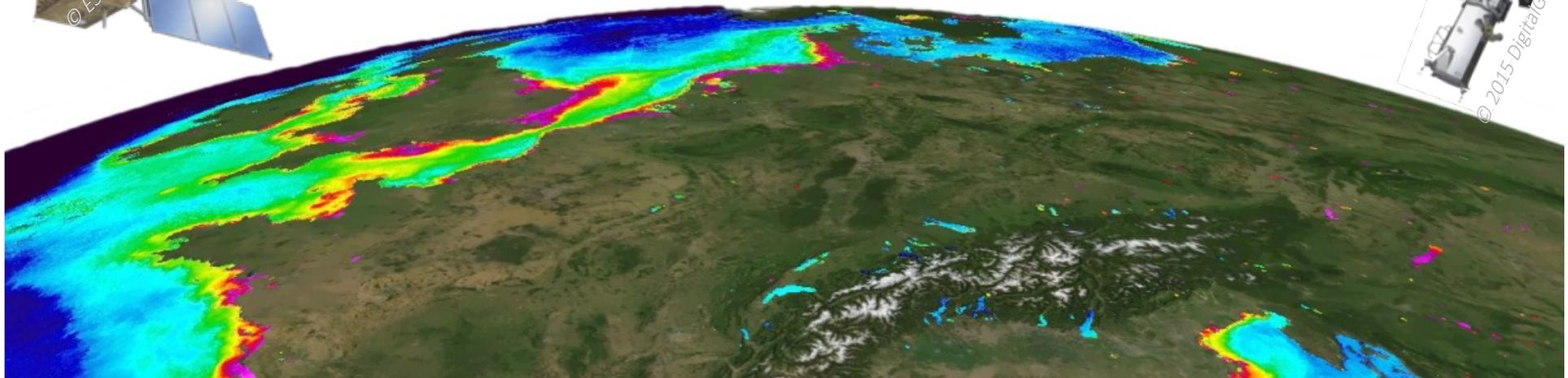
# Harmonized multi-resolution water quality monitoring services for inland and coastal waters

Karin Schenk

EOMAP GmbH & Co.KG  
Germany | Singapore | USA

**EOMAP**

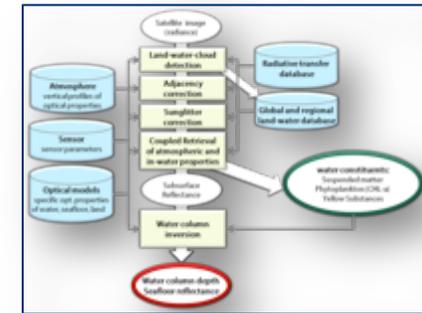
[www.eomap.com](http://www.eomap.com)



# Overview

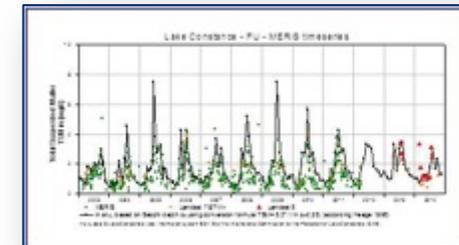
## 1 Harmonized water quality products

Technology and Specifications



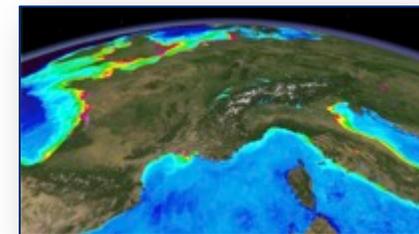
## 2 Application

Use cases and validation



## 3 Access and Integration

Solutions and Customizations



# 1 Harmonized water quality products

- Technology and Specifications -



# Global Perspective on Water Quality

Environmental and economic concerns:

- ✓ Increase pressure caused by land use change, climate change, agri- and aquaculture
- ✓ Emergency response
- ✓ Pollution prevention

Requirements:

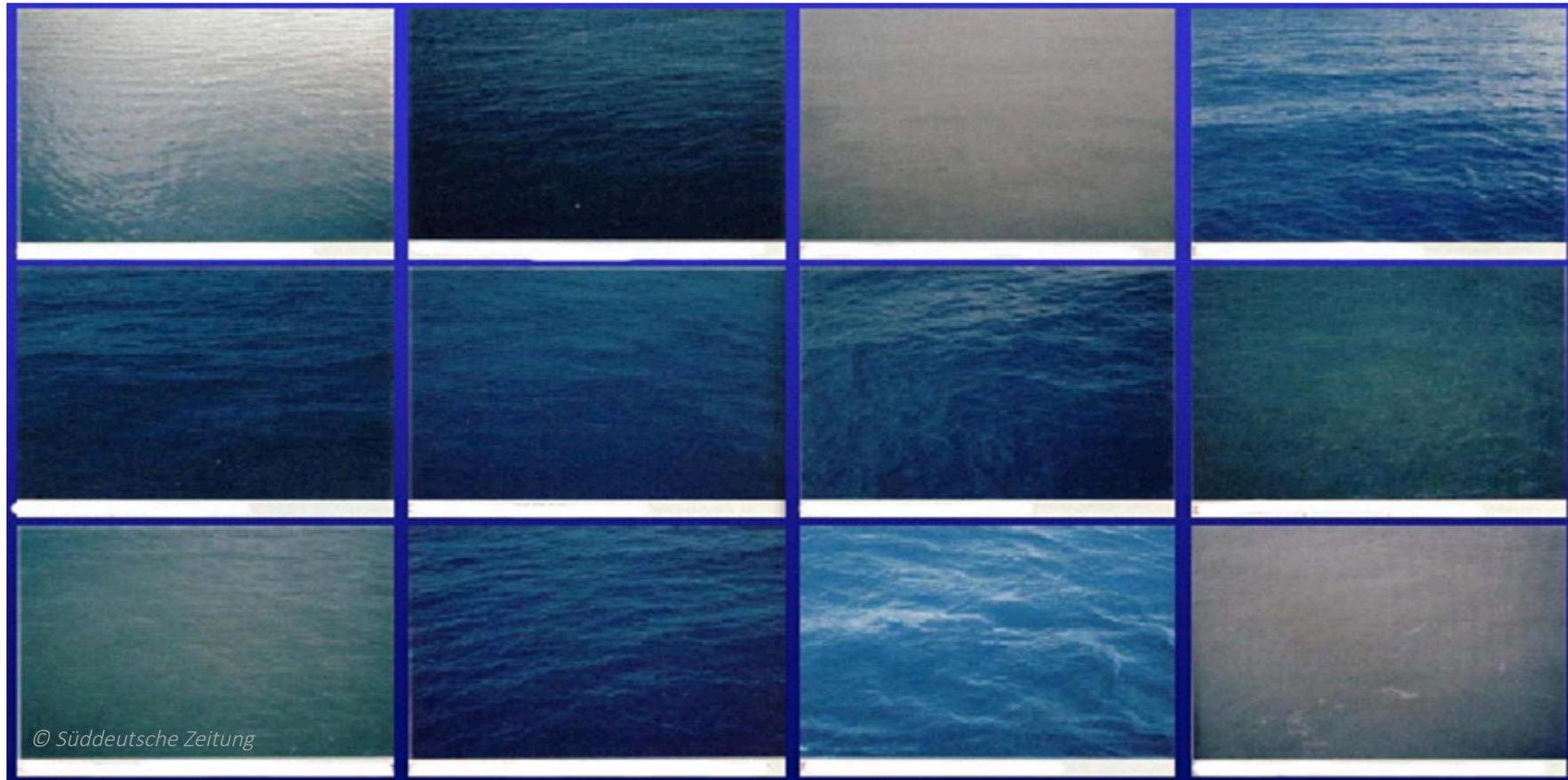
- ✓ Monitoring of temporal and spatial dynamics
- ✓ Reporting obligations



=> Harmonized long-term information system for inland and coastal water bodies

# Satellite derived Water Quality - Methods

Water Color determined by absorption and scattering



# Satellite derived Water Quality - Methods

## Schema of the light signal measured by optical satellites

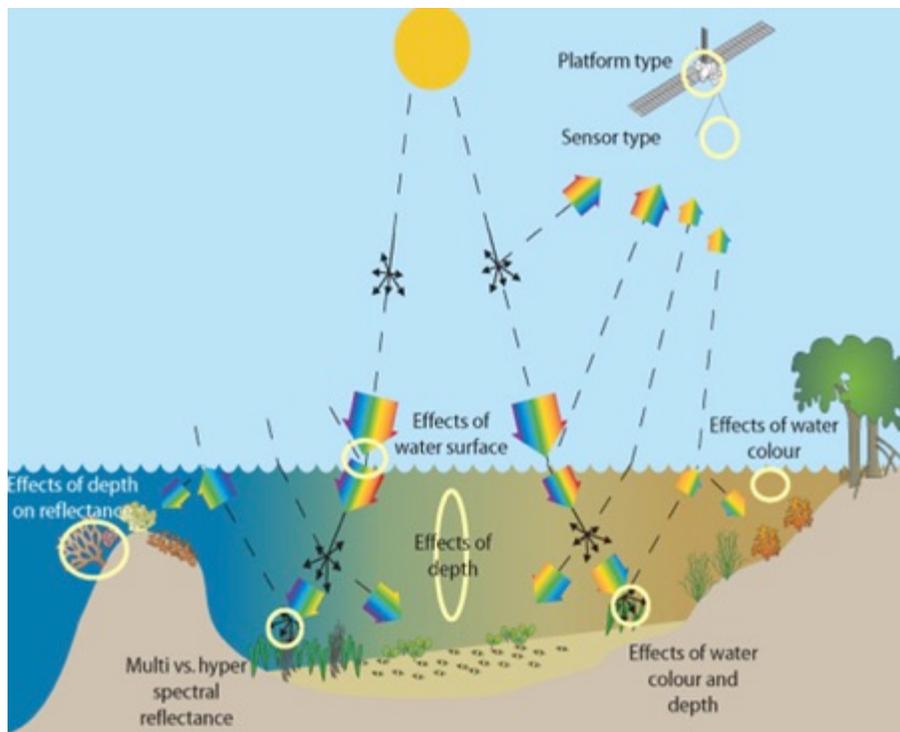
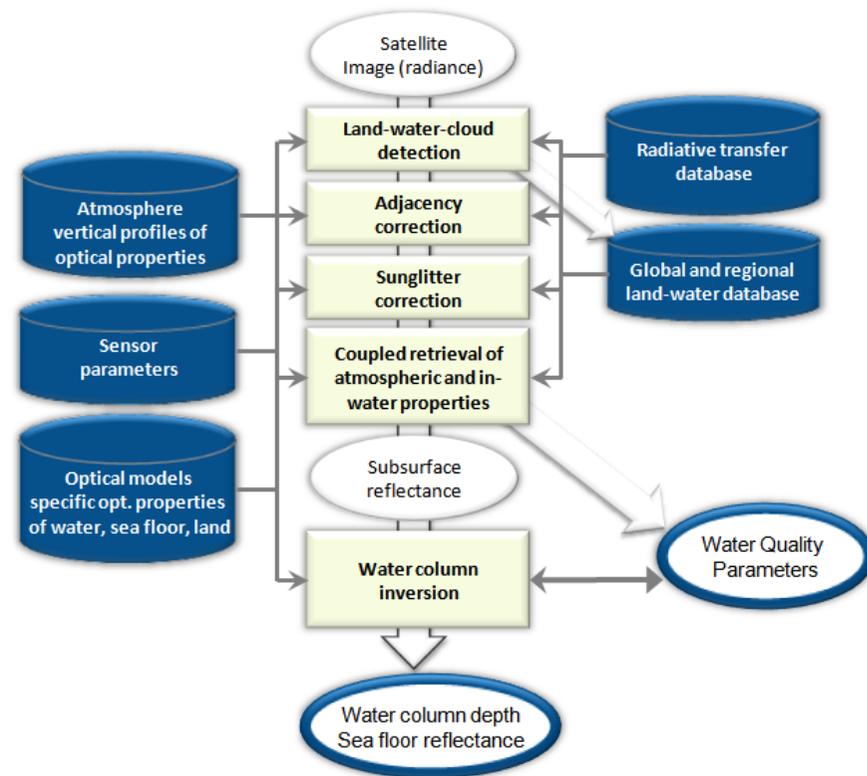
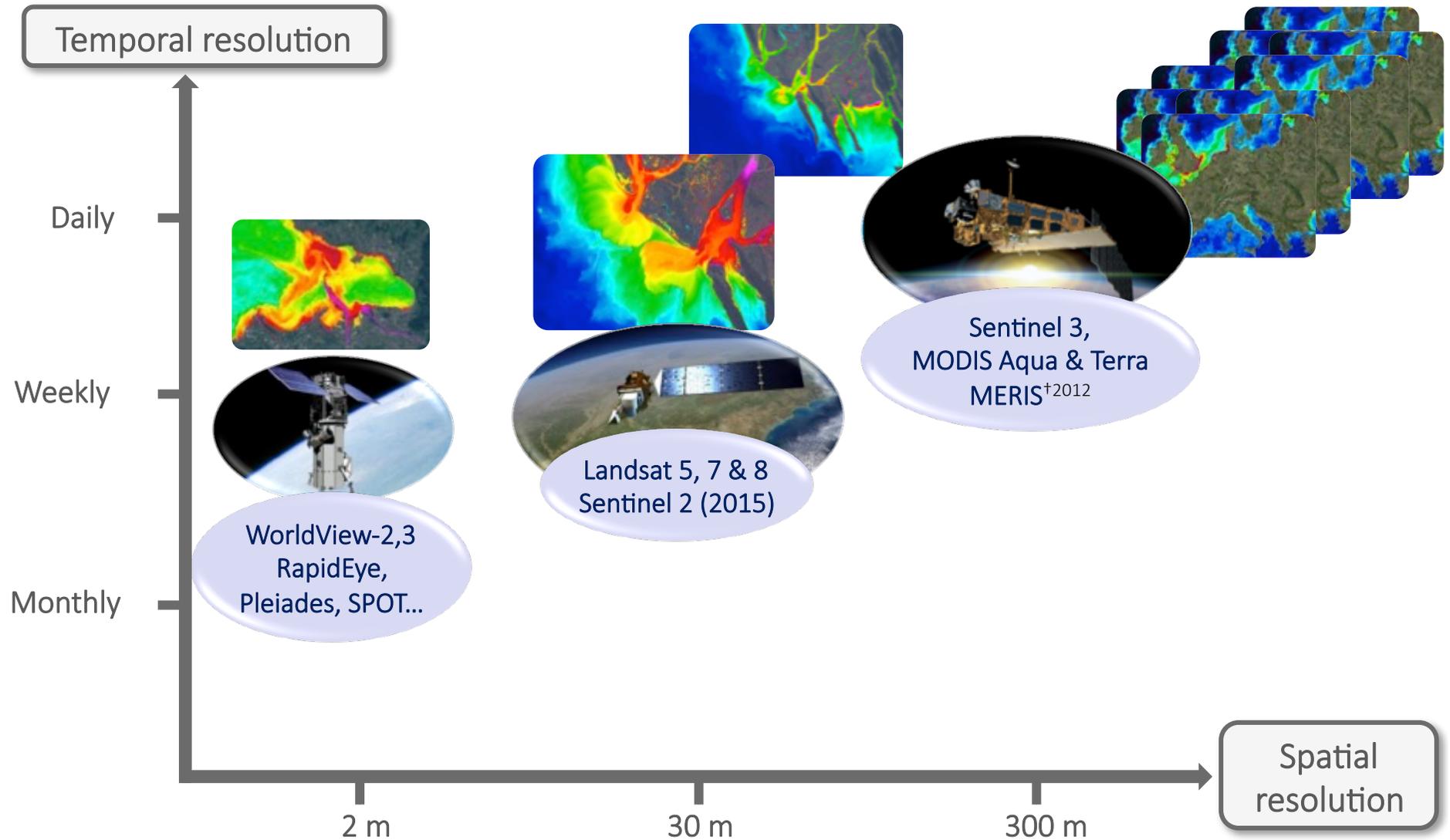


Image courtesy of the Centre for Spatial Environmental Research, University of Queensland

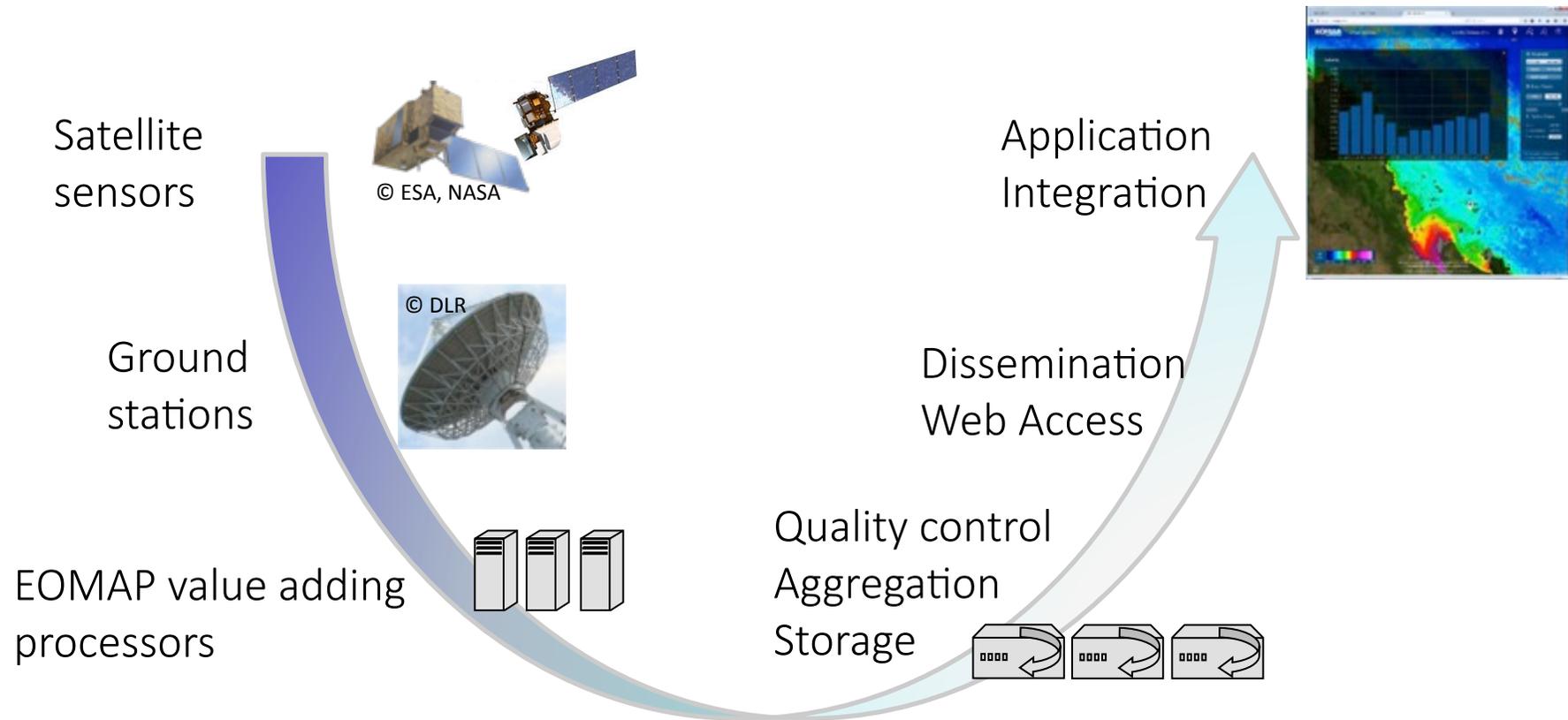
## Physical realization of the system



# Water Quality Products: Spatial and temporal resolution



# Workflow Water Quality Production

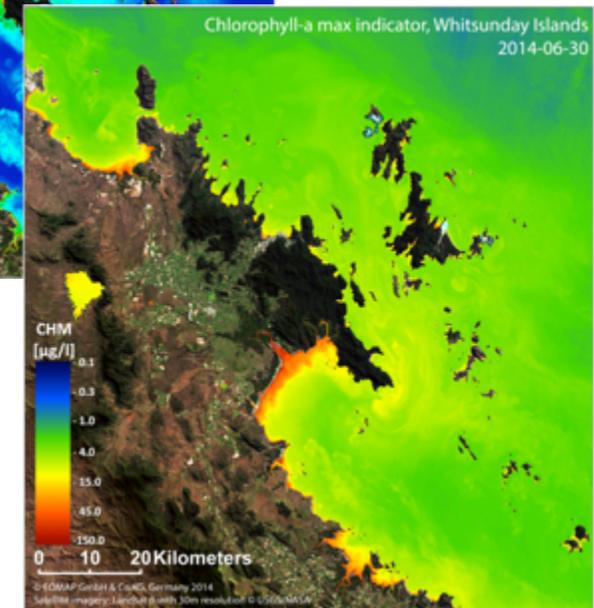
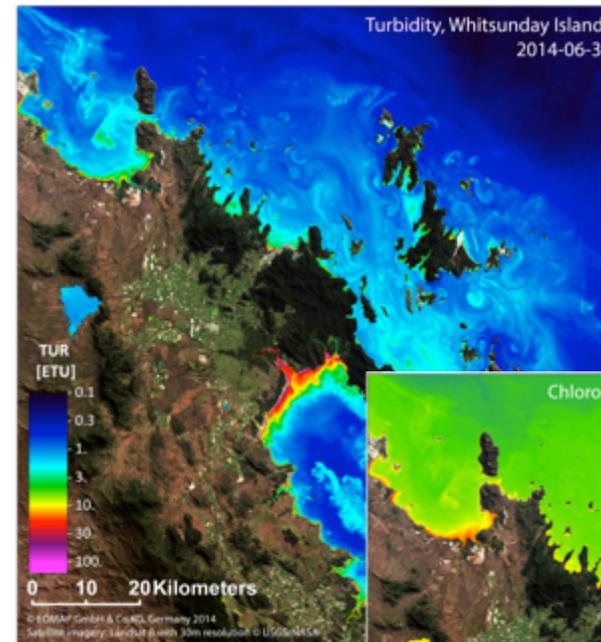


# Water Quality Products

## Australia

### Main parameters:

- ✓ Turbidity (TUR)
- ✓ Total Suspended Matter (TSM)
- ✓ Chlorophyll-a (CHL)
- ✓ Harmful Algae Blooms (HAB)
- ✓ Secchi Depth (SDD)
- ✓ Trophic State Index



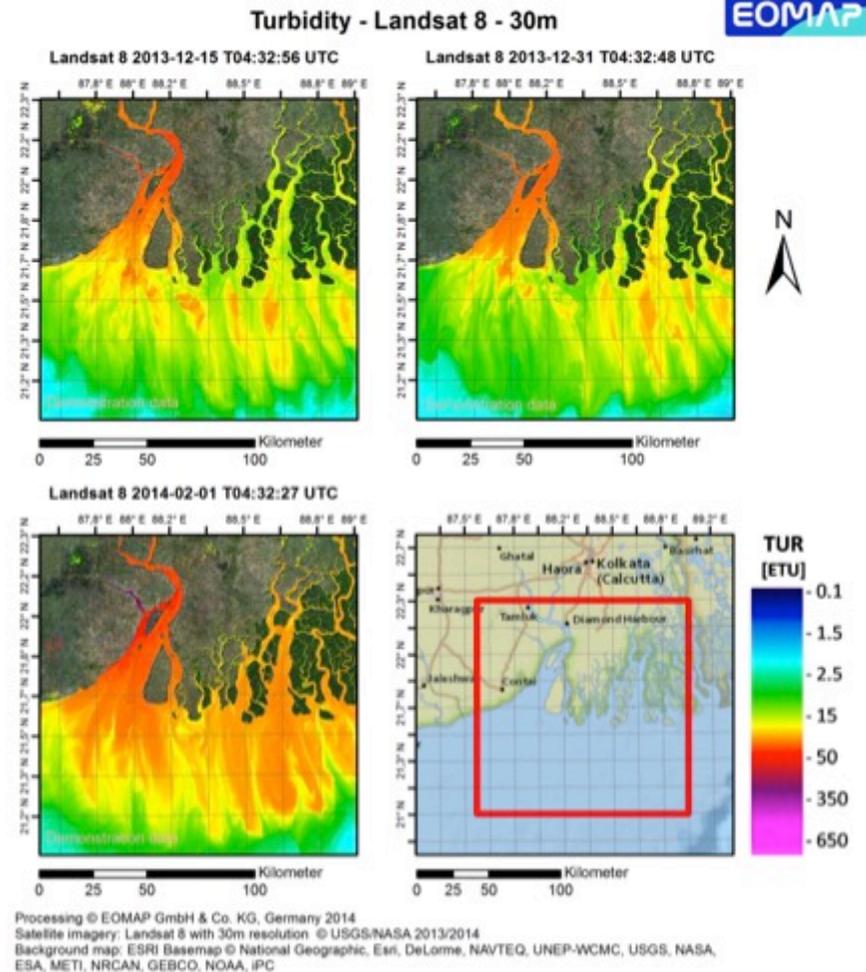
# Water Quality Products Example Turbidity

## Relation of turbidity and water quality

High concentrations effects:

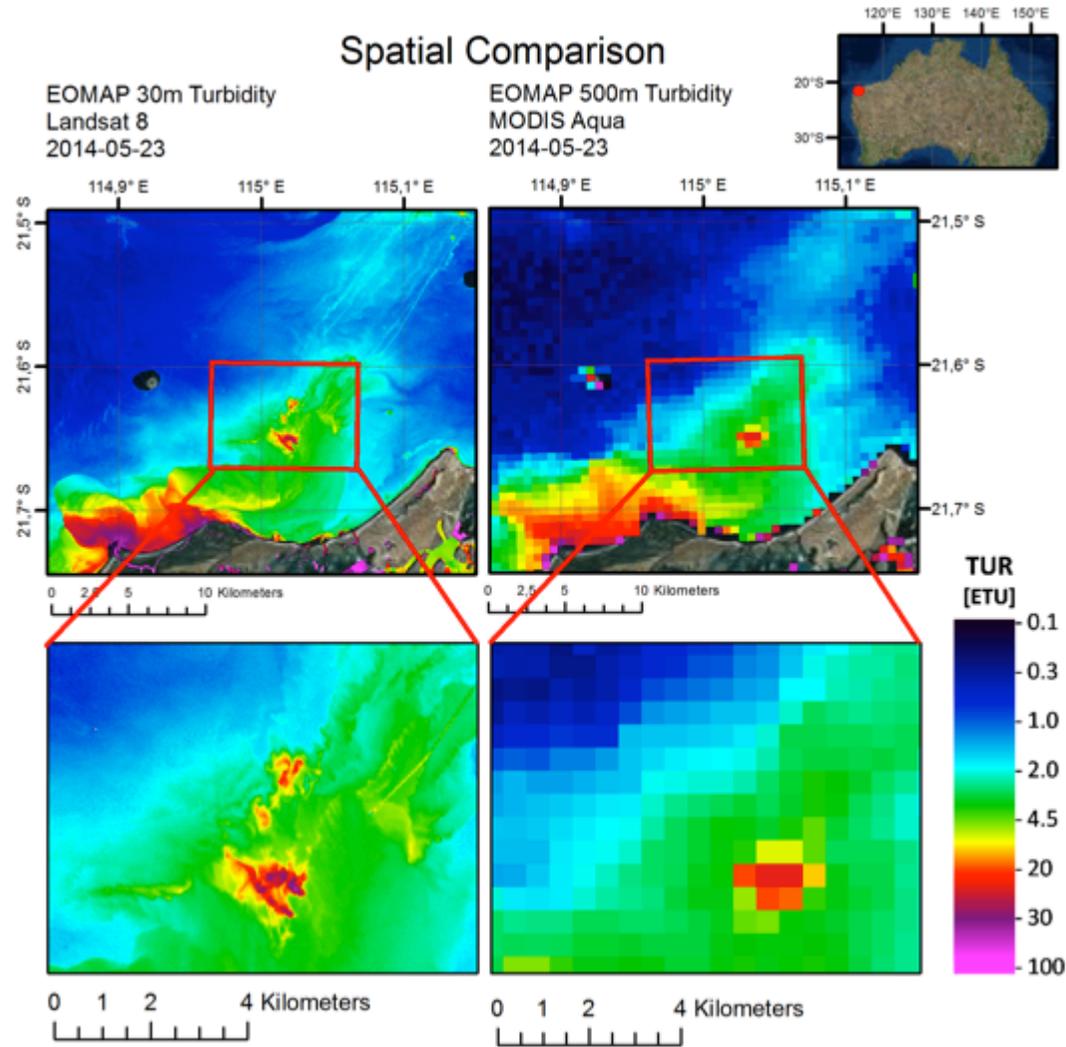
- Reduced **productivity** (light availability)
- Increased **sedimentation/siltation**
- Increase attachment possibilities for **pollutants** as bacteria/heavy metals
- Reduced **drinking water quality**, e.g. WHO\* recommends < 5 NTU
- Deterioration of **bathing** water quality

Bangladesh



\*[http://www.who.int/water\\_sanitation\\_health/hygiene/emergencies/fs2\\_33.pdf](http://www.who.int/water_sanitation_health/hygiene/emergencies/fs2_33.pdf)

# Water Quality Products: Spatial resolution



Basemap Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community  
Satellite data: Landsat 8 © USGS/NASA, MODIS Aqua © NASA

## 2 Applications

- Use cases and validation -



# Application- Overview

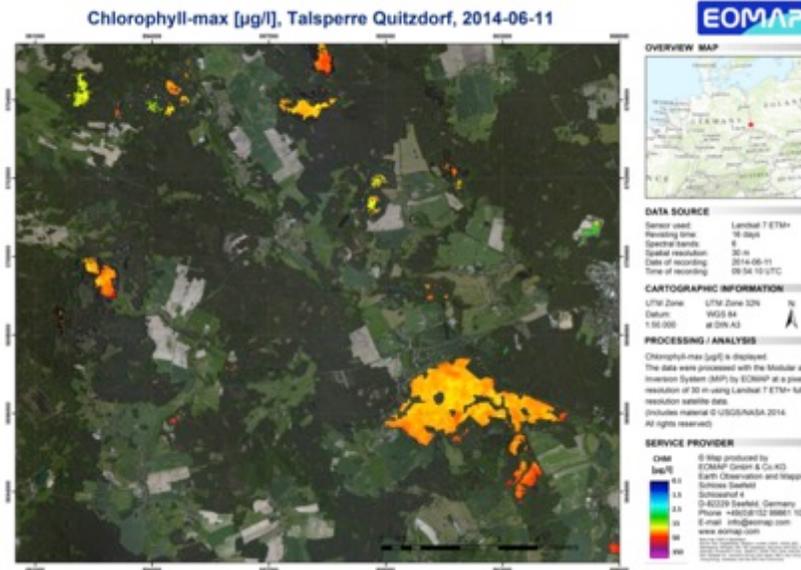
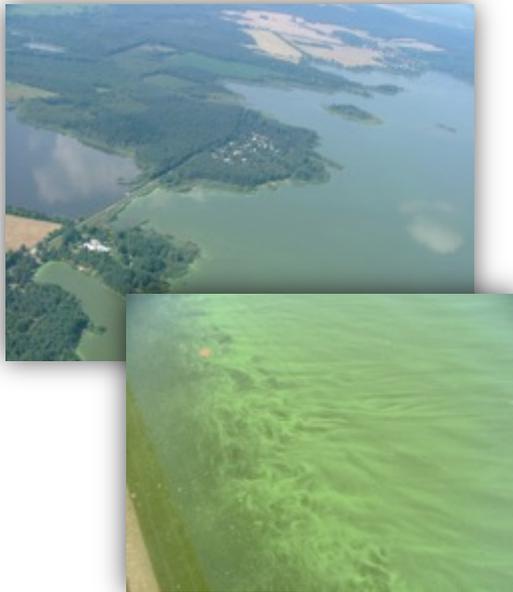
- River and estuary management
  - ⇒ Sediment transport
- Water quality monitoring for regional/governmental authorities
  - ⇒ Water quality status and classification
  - ⇒ Algae bloom monitoring
- Dam monitoring
  - ⇒ Impact Assessment and change monitoring
- Dredge monitoring
  - ⇒ Impact Assessment
  - ⇒ Change monitoring
- Flood monitoring
  - ⇒ Impact Assessment and change monitoring
- Further: Aquaculture and fishery  
Desalination plants,  
Regional information systems...



# Use cases: Dam Monitoring

## Monitoring Dam Quitzdorf, Germany

- Company MOVAB-D, lake restoration
- Subscription service 2014
- Time series analyses
- ✓ *Impact monitoring of water treatment*



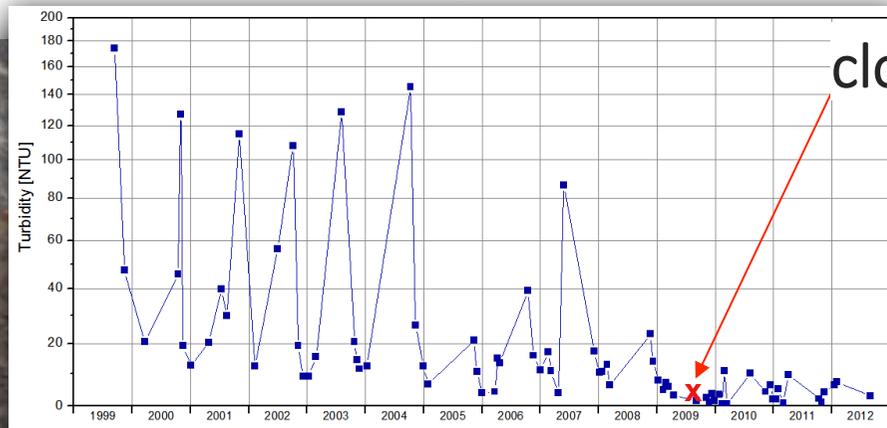
See video about the project on You Tube: <https://www.youtube.com/watch?v=9nbho-d4v7A>  
Images: © Movab-D



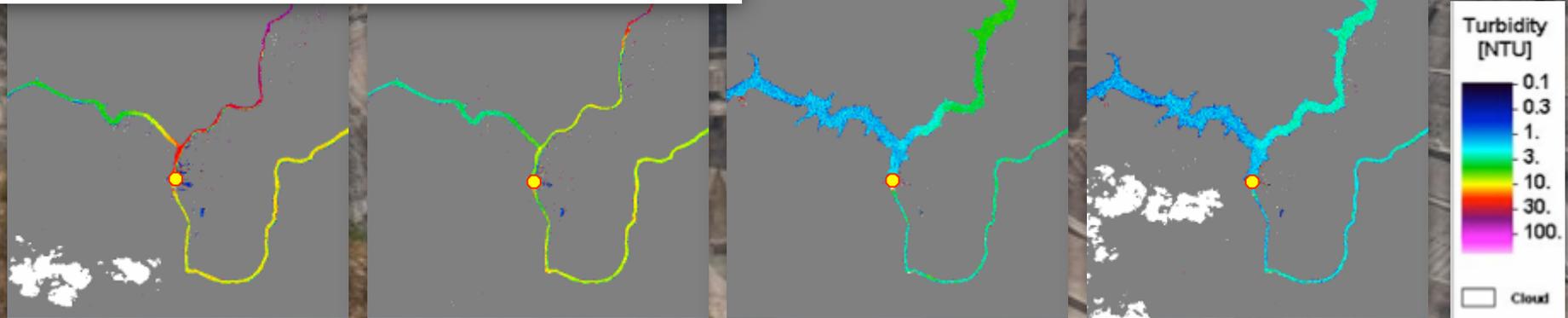
# Use cases: Dam Monitoring

Mekong: transnational river system

- ✓ Requirement on harmonized long-term monitoring of International river commissions governmental authorities, insurers



closure of Xiaowan Dam



2009-01-09

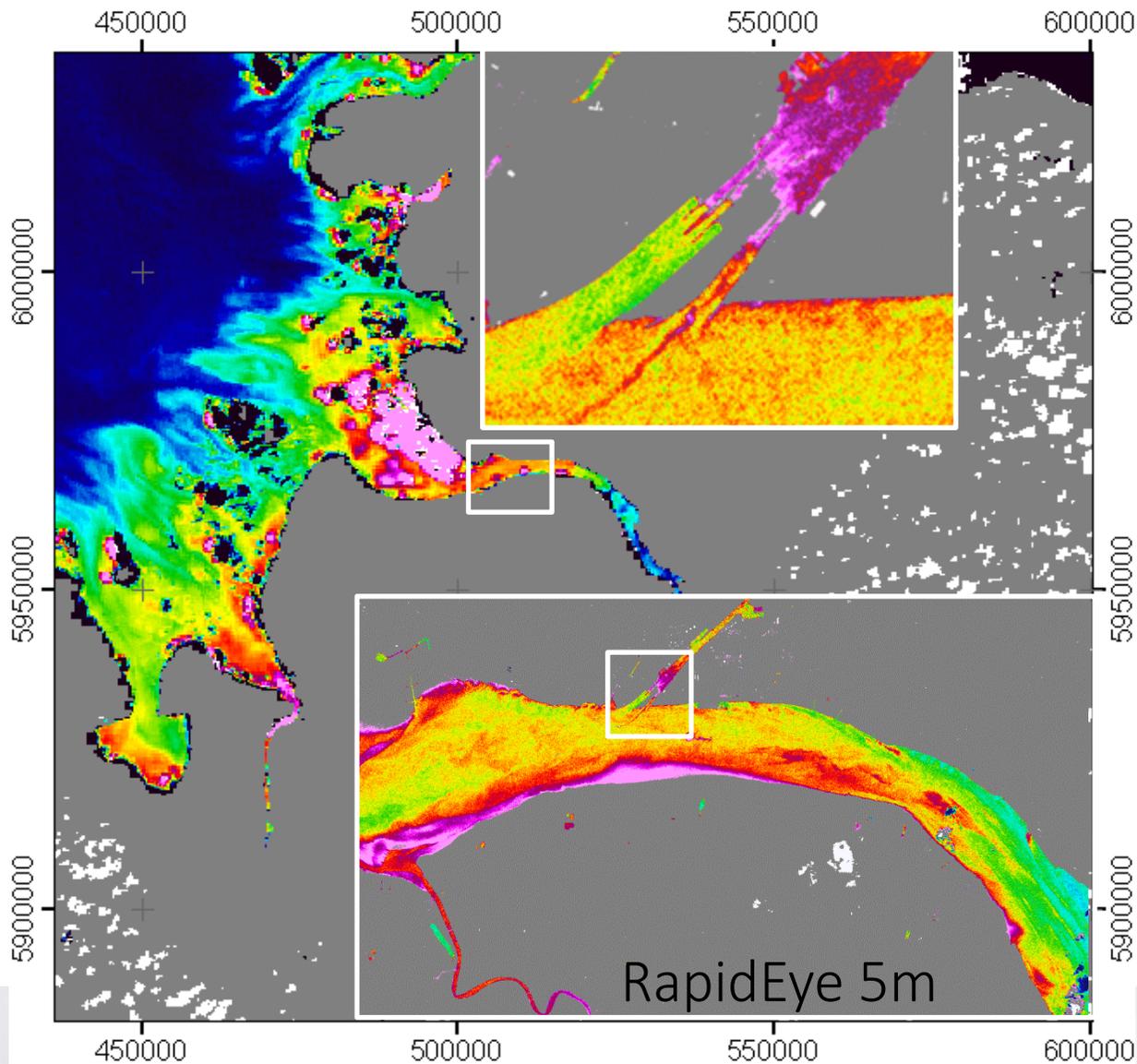
2009-02-10

2009-11-09

2009-11-25

● Location of Xiaowan Dam

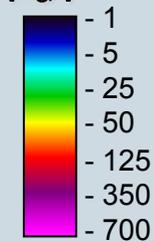
# Use cases: River Monitoring



## River Elbe / Germany

- Suspended matter monitoring
- ✓ *Sediment Monitoring for water construction*

Suspended Matter  
[mg/l]



Land  
Cloud



Bundesanstalt für Wasserbau  
Kompetenz für die Wasserstraßen

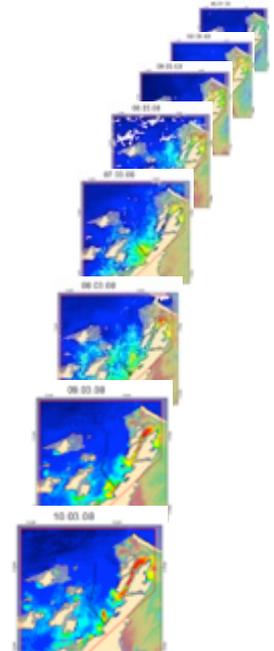
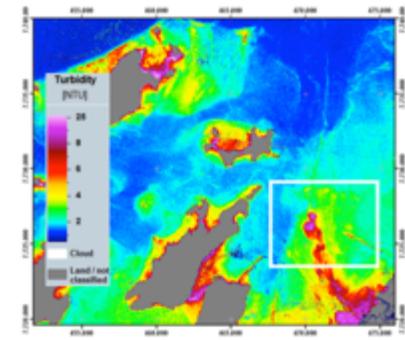
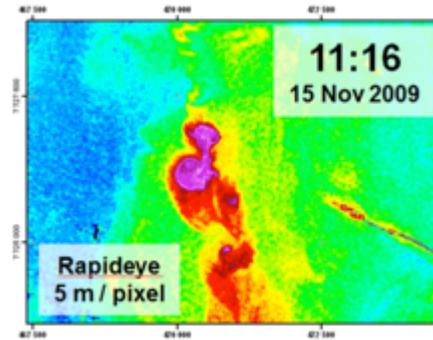
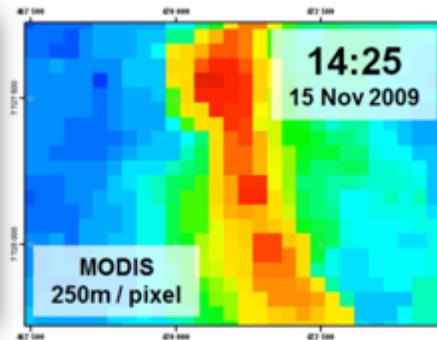


EOMAP

# Use cases: Dredge Monitoring

Dredge plume monitoring for Oil & Gas industries,  
e.g. project for Woodside Energy, North-west Australia:

- Fast delivery, no HSE risks, independent on in situ measures
- Continuous monitoring 2007-2010
- ✓ *Significant cost savings for Woodside Energy: 1 000 000 AUD*

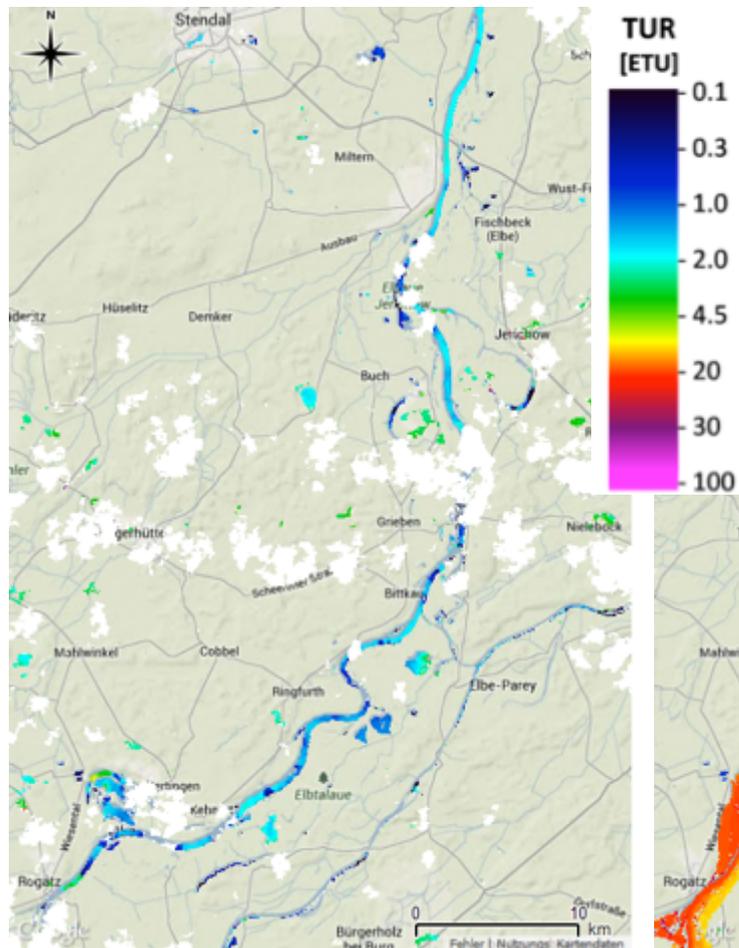


# Flood Monitoring

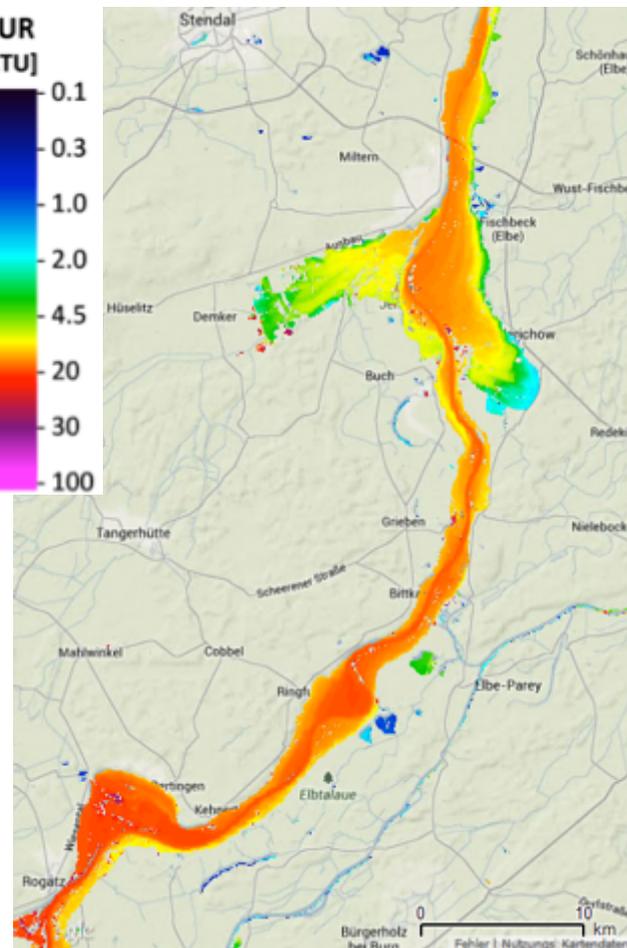
Google Physical Base Map



Landsat-8 2013-05-06



Landsat-8 2013-06-07

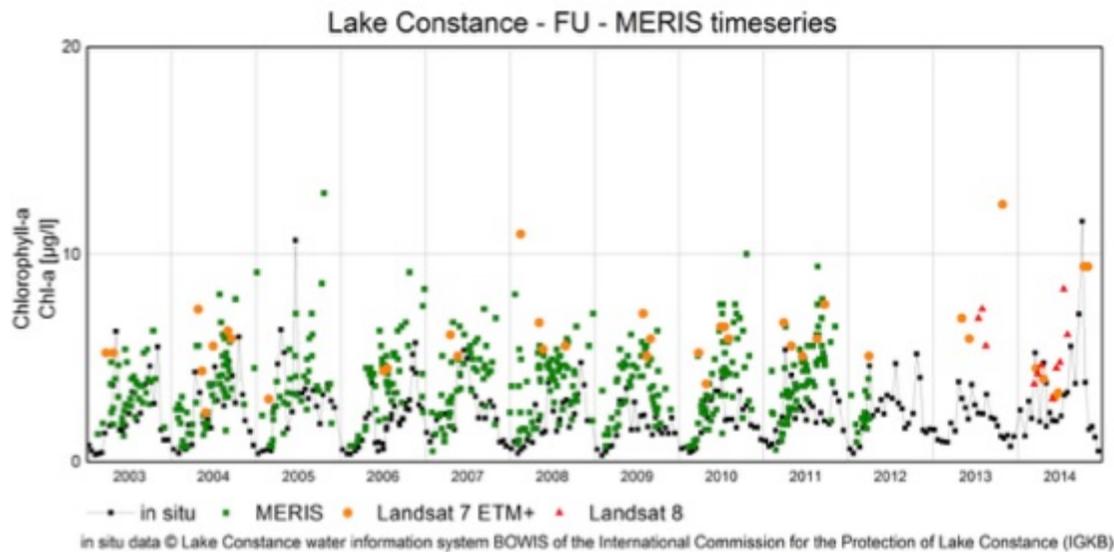


Satellite derived Flood Monitoring, River Elbe, Germany  
Processing by MIP-EWS © EOMAP, data source: Landsat 8 © USGS/NASA 2013

# Validation

Long term time series validation examples:

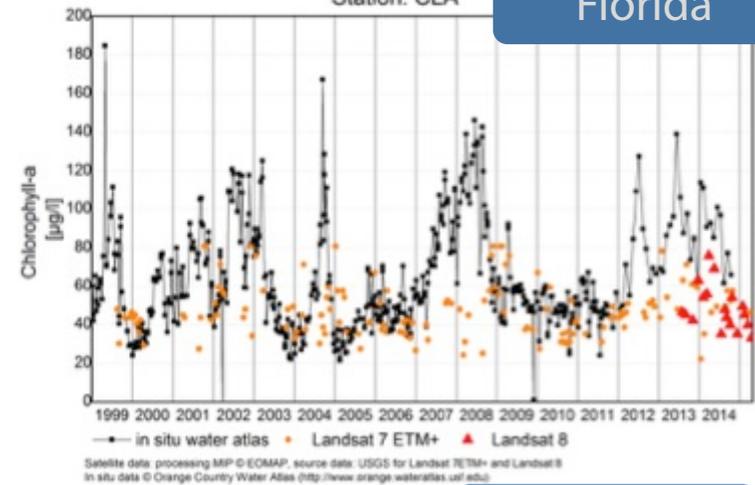
## Lake Constance



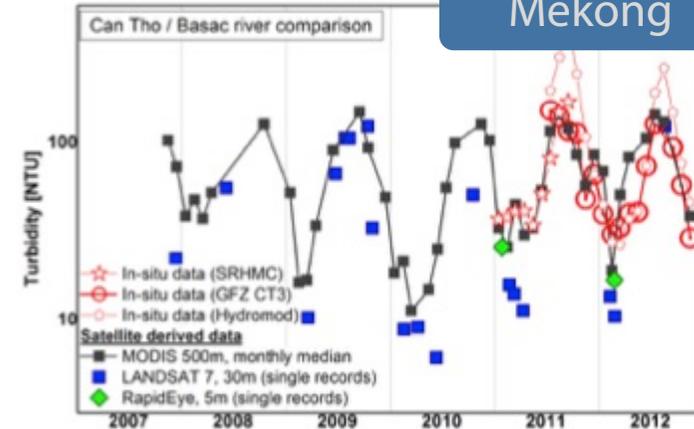
=> Method proven and consistent

Apopka Lake  
Station: CLA

Florida



Mekong



More examples see FRESHMON project (2010-2013): [www.freshmon.eu](http://www.freshmon.eu)

[D54.3 Report on FRESHMON data quality and data comparability](#)

[D54.3 2 Update Report on FRESHMON data quality and data comparability](#)

### 3 Access and Integration

- Solutions and Customizations -

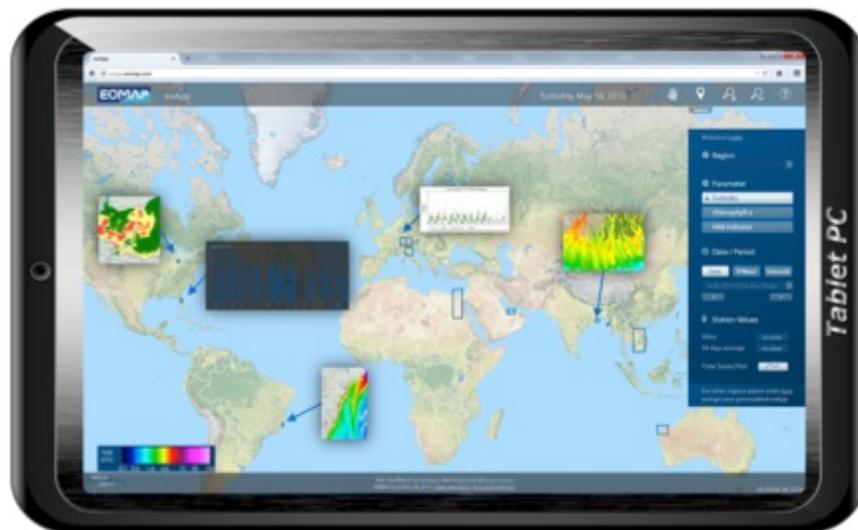


# Access and Integration

Easy access to water quality products through:

- *eoApp*
- *Web shop*
- *WMS, ArcGIS online*
- *Catalogue Server*

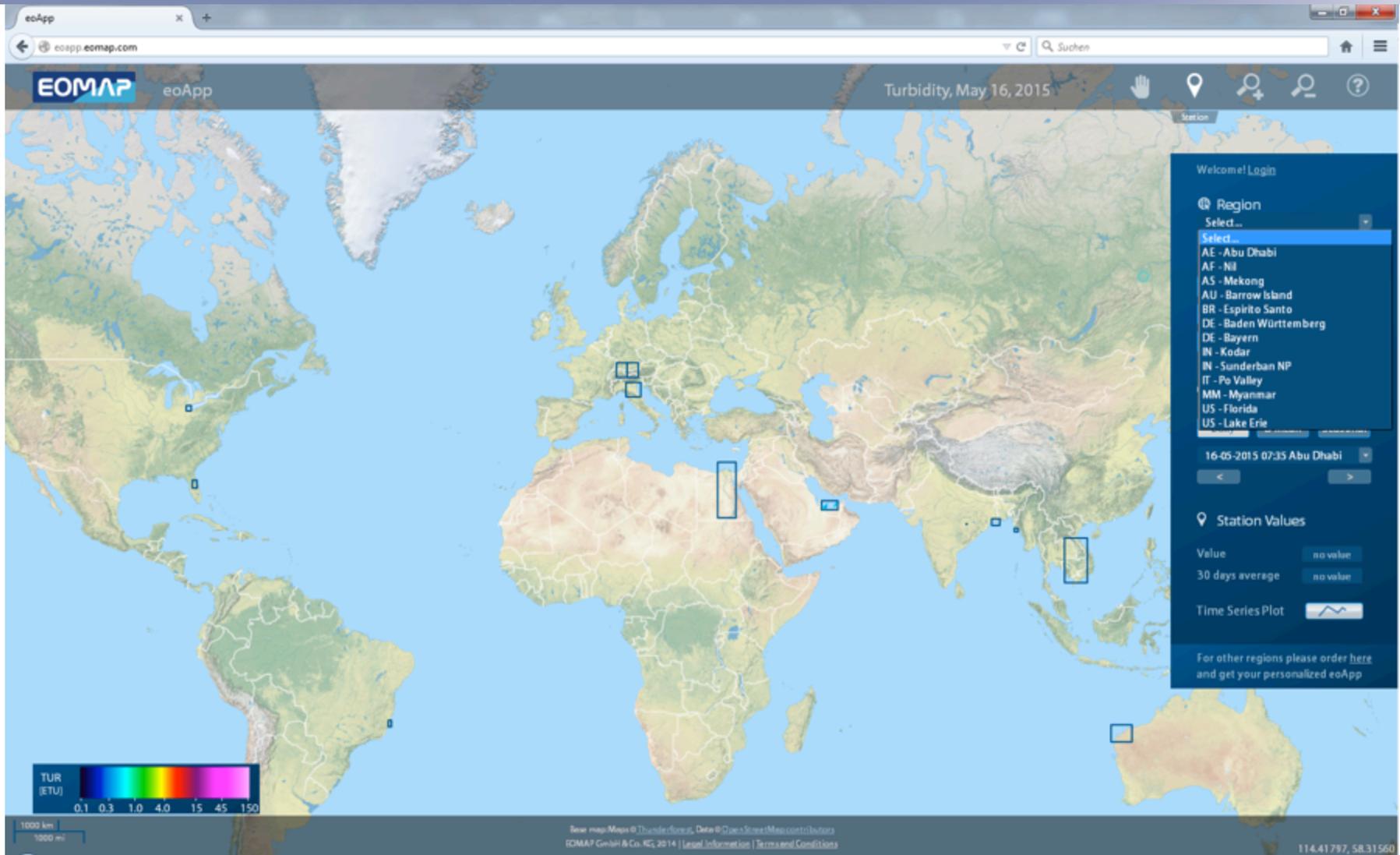
<http://eoapp.eomap.com/>



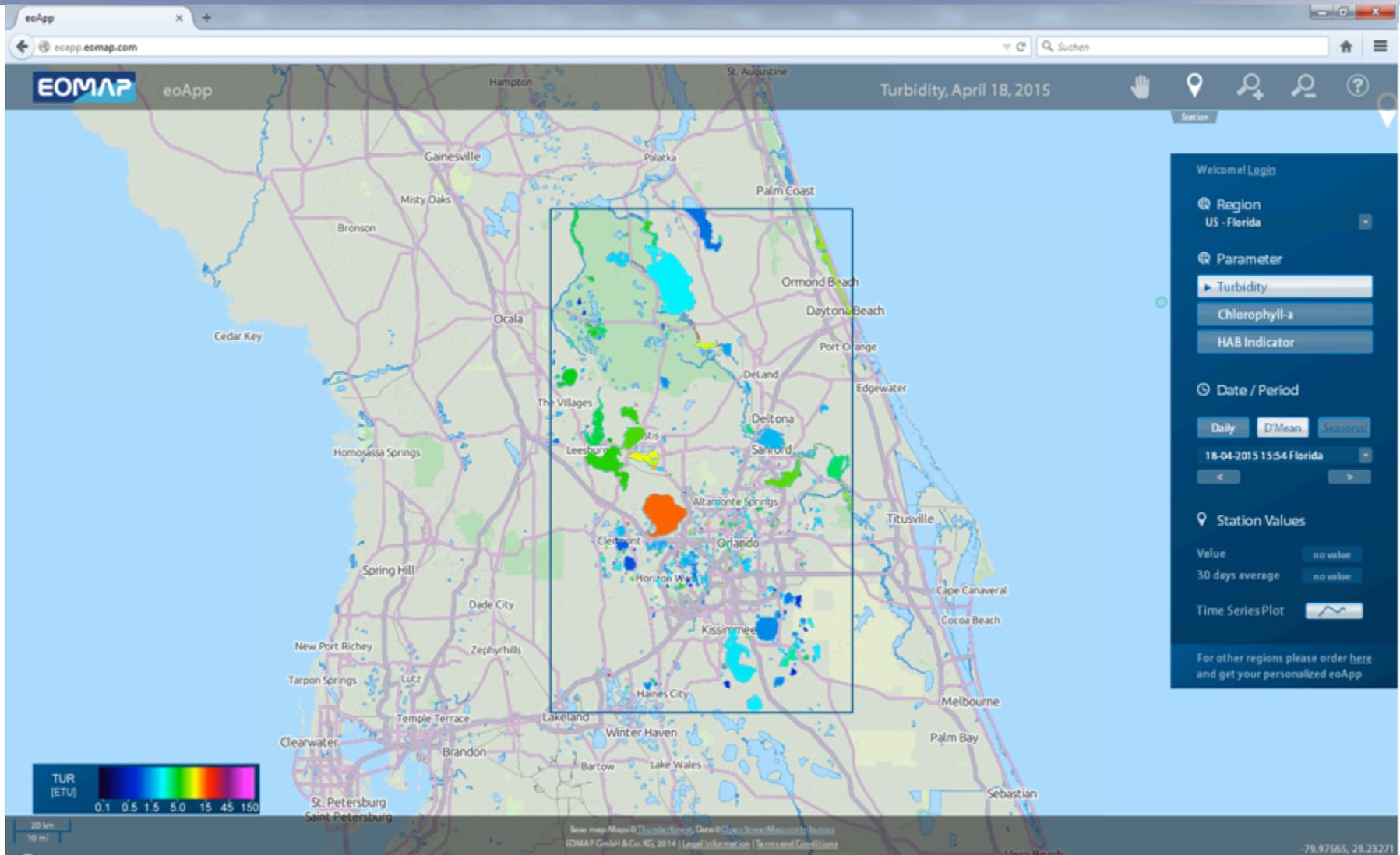
[www.eomap.com/store](http://www.eomap.com/store)



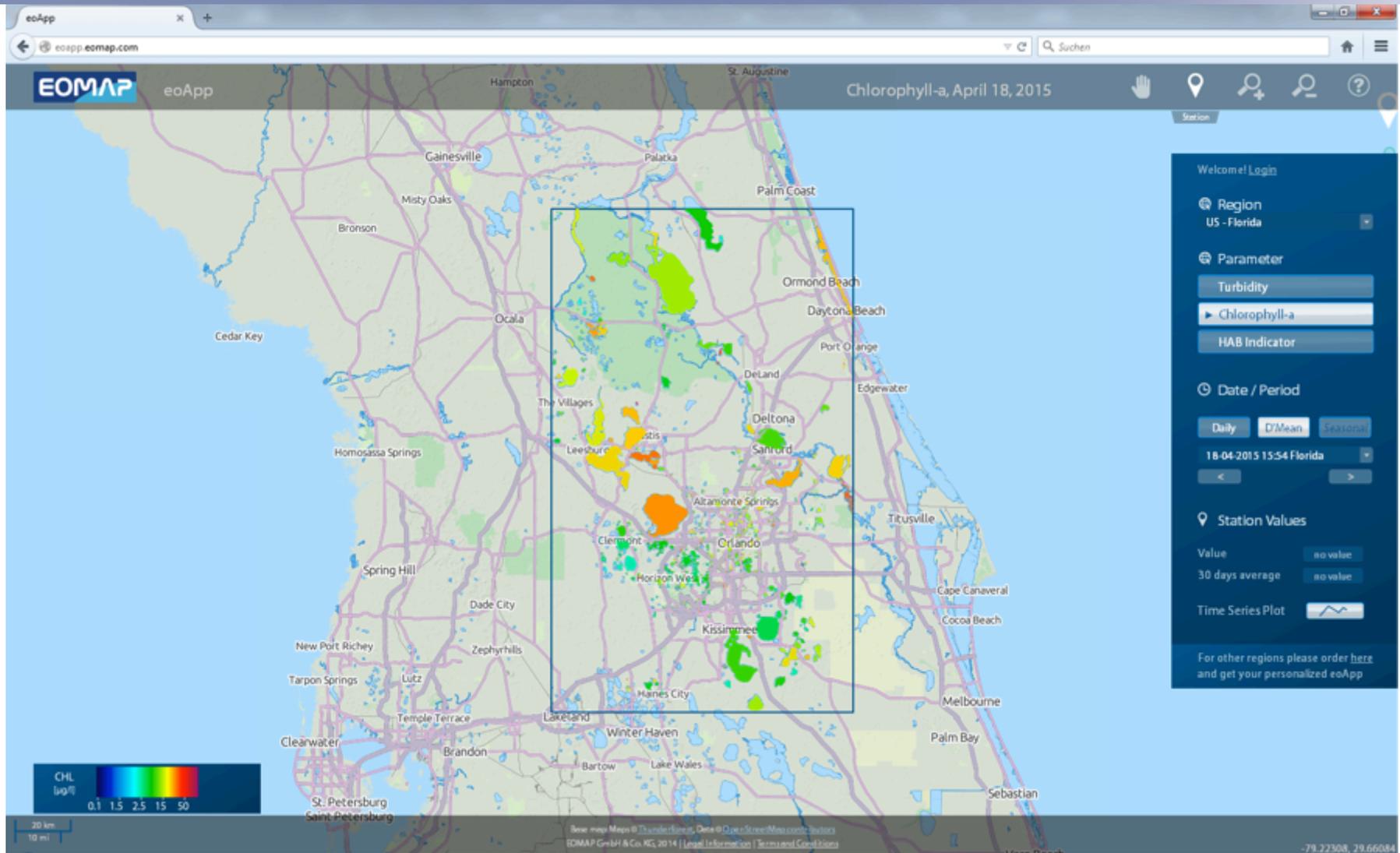
# eoApp



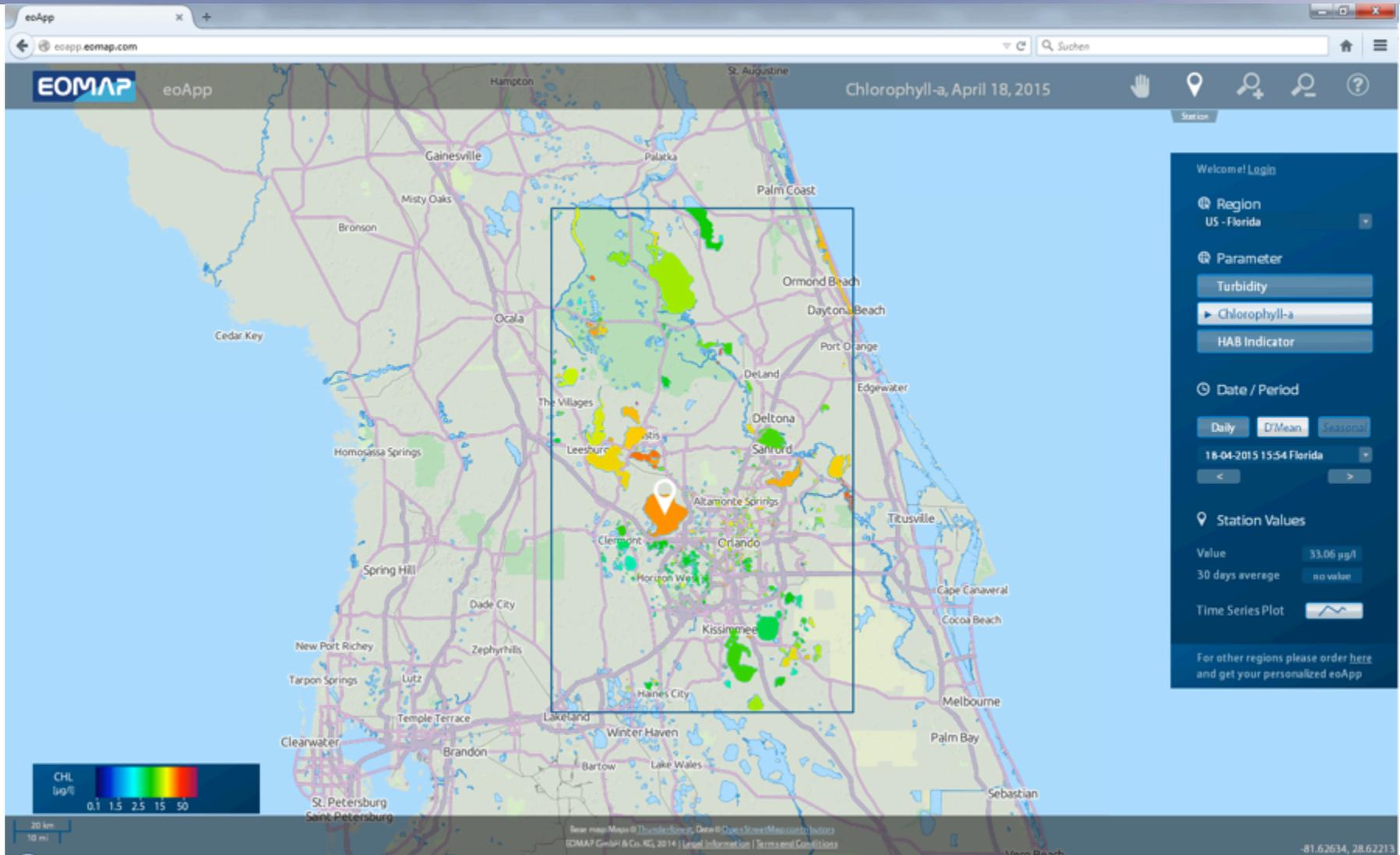
# eoApp



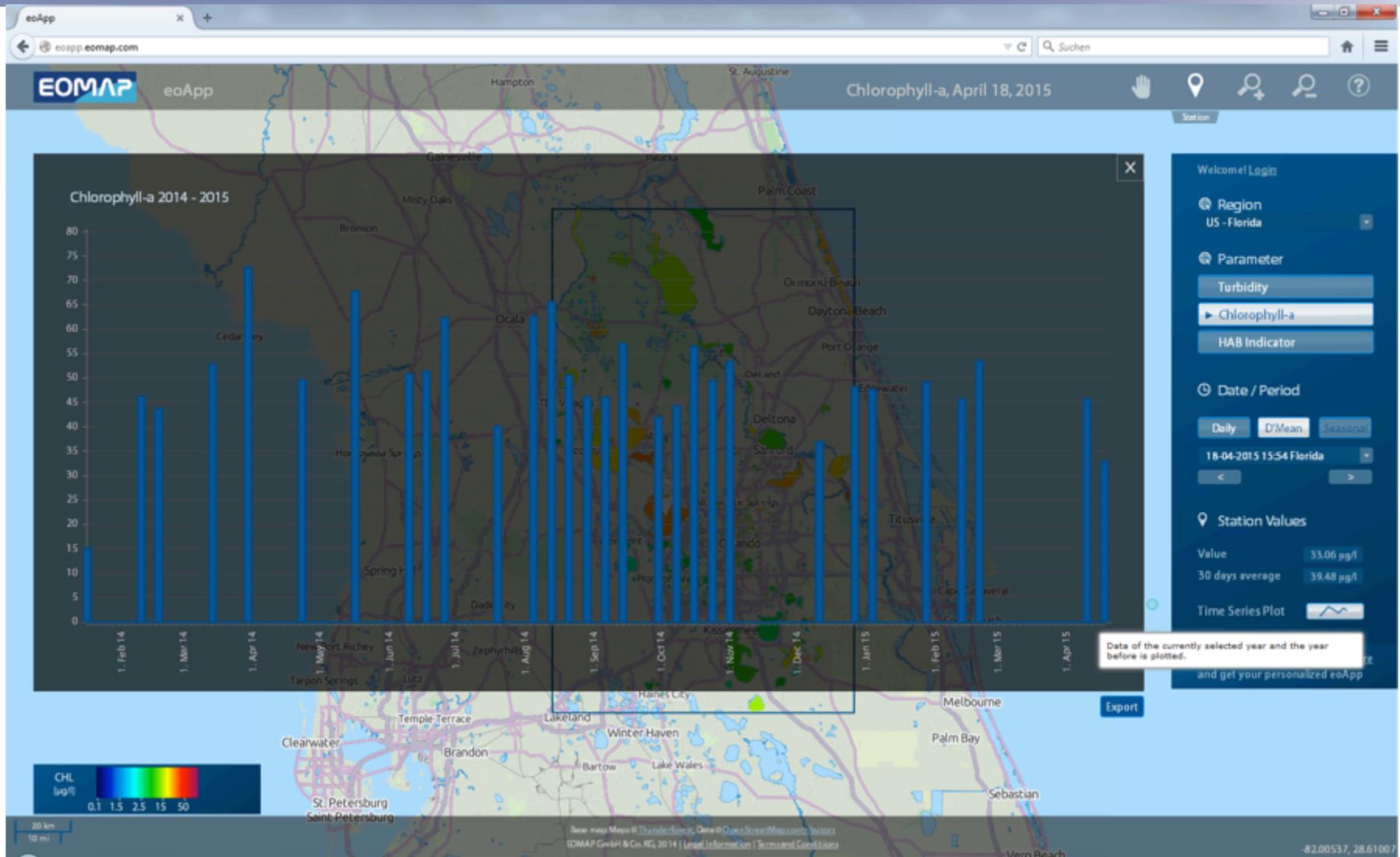
# eoApp



# eoApp

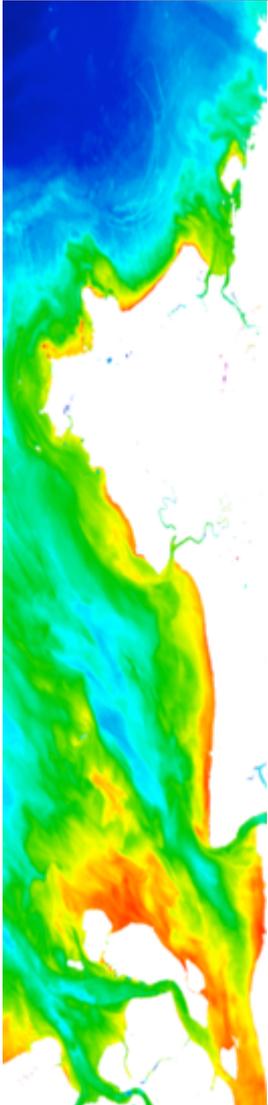


# eoApp



# Water quality monitoring

Satellite based solutions for inland and coastal waters



## Applications and benefits

- ✓ Actual and historic status information for lakes, rivers and coastal zones
- ✓ Impact monitoring for agencies, water construction and industries
- ✓ Various water properties: turbidity, suspended matter, chlorophyll, harmfully blooms, coverage
- ✓ Harmonized and consistent measures, independent and reproducible
- ✓ Cost effective

## Service specifications

-  Easy access through online portal and applications, for worldwide waters bodies
-  Operational, validated and awarded processing technology
-  Integration of various satellite resources to deliver the best spatial-temporal resolution
-  Rapid delivery
-  Safe, no mobilization, environmental friendly

Thank you very much  
for your attention

Questions?!

Global Water Quality Service:  
Is there a benefit for UNEP?  
Supporting SDG's?!

For further information:  
[www.eomap.com](http://www.eomap.com)  
or  
[schenk@eomap.de](mailto:schenk@eomap.de)

# About EOMAP

- Founded in 2006 as Spin-Off from the DLR with HQ close to Munich, DE
- Since 2013 offices in Singapore, India, USA and representatives for Australia.
- Approx. 20 employees (physicist, mathematics, geoinformatics, ecologist)
- Core services are mapping and monitoring of inland, coastal and marine environments



Headquarter in Castle Seefeld  
(30min distance to Munich)

