# PrimeWater

Water - ForCE

Water-ForCe Webinar on Public-Private partnerships for Copernicus water services

Wednesday April 27, 2022 16:00 - 17:00 CET

# EO for supporting freshwater reservoirs management: moving towards operational services based on PrimeWater experience

**Mariano Bresciani**, Claudia Giardino, Alice Fabbretto, Andrea Pellegrino (CNR-IREA)

European Commission

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EMVIS S.A. · National Research Council of Italy · Swedish Meteorological and Hydrological Institute · EOMAP GmbH & Co.KG · International Water Association · Burgundy School of Business · Ente Acque della Sardegna · US Environmental Protection Agency · Commonwealth Scientific and Industrial Research Organization · Melbourne Water · SatDek

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# Water quality has always been important but never more than today

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## Global and local challenges to water quality

**EXTREME WEATHER**
Intensive rainfall events can lead to changes in the physical properties of water including its temperature, taste, odour, colour and excessive turbidity.

**WATER POLLUTION**
such as nitrogen, phosphorus, salts, toxic chemicals (pesticides) can lead to deterioration of biological status of a water body, and can produce Harmful Algal Blooms (HABs).

**WATER SCARCITY**
Increased demands, changing climate and pollution is impacting water availability. While low flows and reduced water levels can increase the concentration of pollutants and nutrients.

**INCREASED SEDIMENT LOAD IMPACTS**
the aquatic environment including aquaculture production, and recreational use of water bodies. It can increase the cost of treating drinking water, lead to reduced storage in reservoirs and can damage electromechanical equipment in hydropower plants.

**WATER POLLUTION**
HABs can produce extremely dangerous toxins that can sicken or kill people and animals, create dead zones in the water, raise treatment costs for drinking water, disrupt supply, affect cultural and spiritual values of water, and hurt industries that depend on clean water.

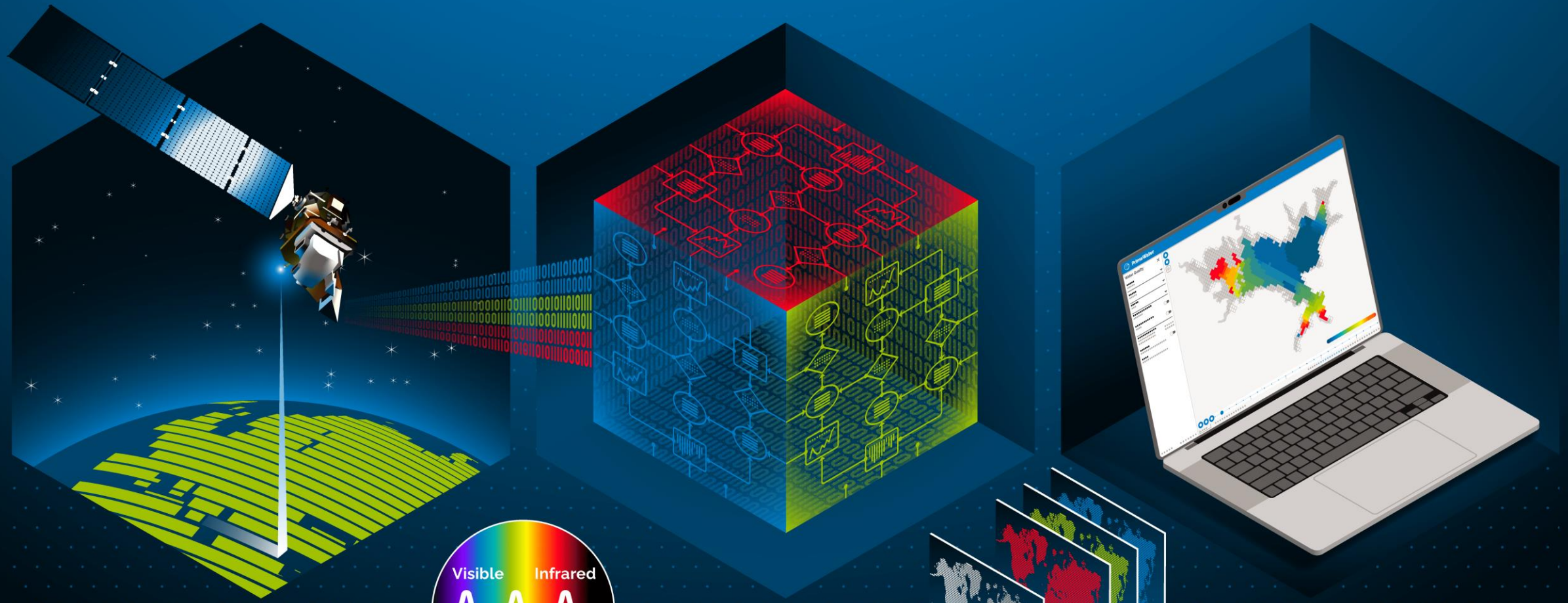
**WATER SCARCITY**
Deteriorating water quality is a contributing factor to water scarcity, which could impact GDP in some regions, spur migration, and spark conflict

## Impacts of water quality threats

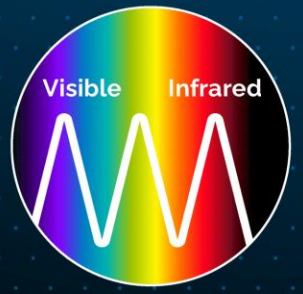
**Space technology for Earth Observation** provides an opportunity for improved monitoring and forecasting of water quality issues such as algal blooms and turbidity. This can help with better planning, preparedness and response.

# What can help address water quality challenges?

# How is satellite information made available?



The Satellite sensor measures the spectrum of sun light reflected from Earth



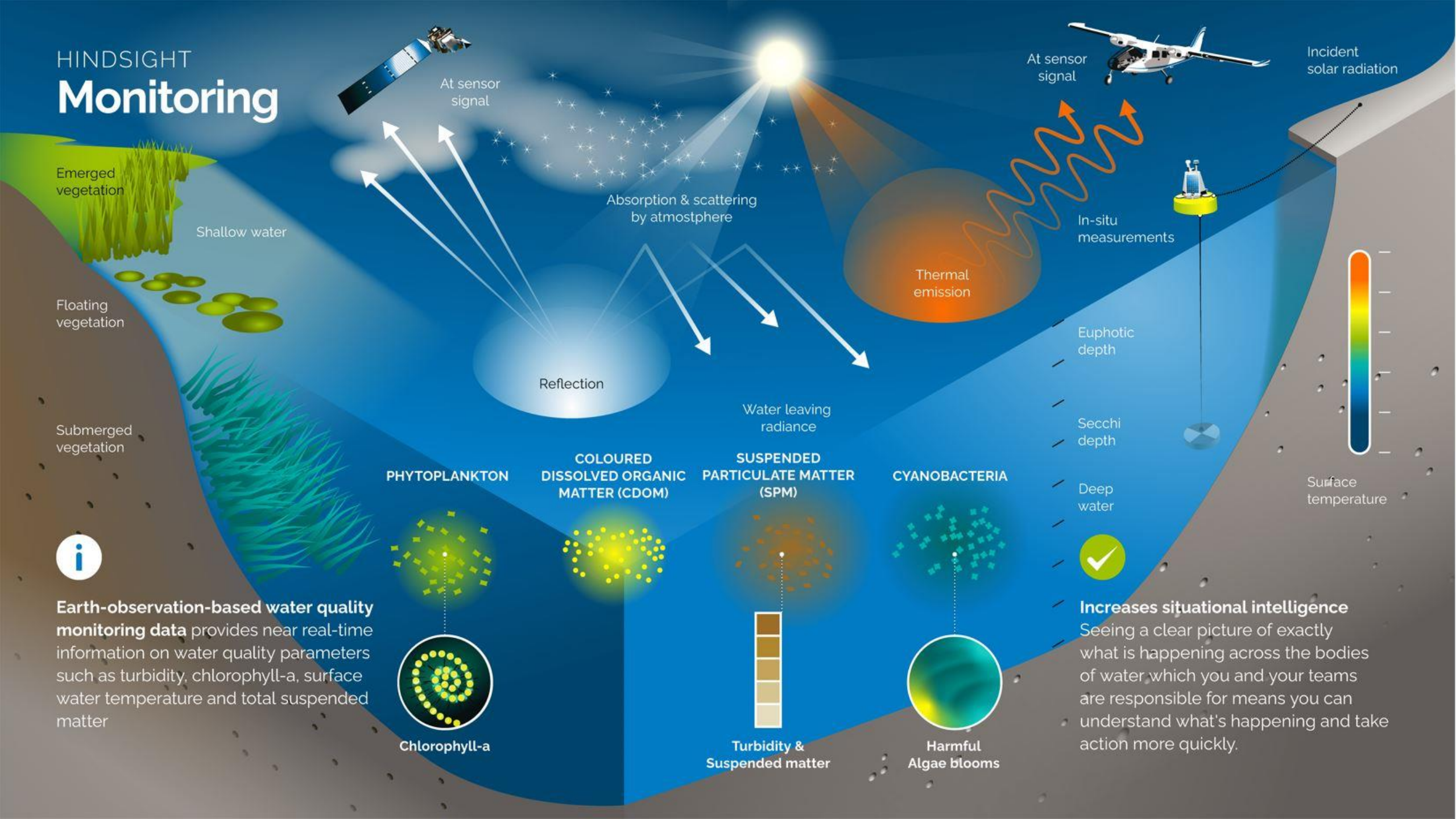

The spectrum of reflected light is processed through mathematical algorithms



The algorithms quantify the various water quality measures

HINDSIGHT

# Monitoring




**Earth-observation-based water quality monitoring data** provides near real-time information on water quality parameters such as turbidity, chlorophyll-a, surface water temperature and total suspended matter

**Increases situational intelligence**
Seeing a clear picture of exactly what is happening across the bodies of water which you and your teams are responsible for means you can understand what's happening and take action more quickly.

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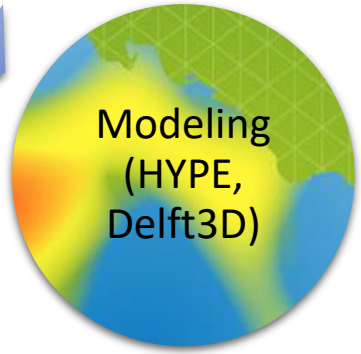
Freshwater reservoirs mangement

In situ data




Lake Mulargia

Sardinia/Italy

39°37'14.9"N, 09°14'34.6"E

Lake Hume

Australia

36°02'48.6"S, 147°05'47.9"E

Lake Harsha

USA

39°00'43.6"N, 84°07'25.3"W

Melbourne Western Water Treatment plant

Australia

37°57'55.1"S, 144°38'02.3"E

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# PrimeWater use cases

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http://app.primewater.eu/

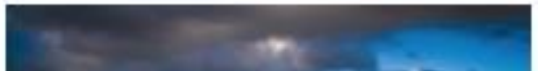
# PrimeWater use cases - challenges

## Lake Mulargia

**Challenge**: Algae blooms are the most relevant problem in the Reservoir and can impede with public health since it serves as a drinking water source, as well as for including agricultural and industrial uses.

## Lake Harsha

**Challenge**: One of the challenges that Lake Harsha faces is the toxin- producing algae, which includes a diverse group of cyanobacteria that can harm public health.



## Lake Hume

**Challenge**: In the last decades blue-green algal blooms became more frequent in the Murray River downstream of Lake Hume. In the last 17 years 5 mega-blooms occurred (2003, 2005, 2007, 2009, and 2010) compared to at most four in the preceding 67 years.

## Melbourne Western Water Treatment plant

**Challenge**: Since cyanobacteria blooms are a yearly occurrence in WTP's treatment lagoons, often interrupt the supply of recycled water and reduce the efficiency of lagoon treatment processes.

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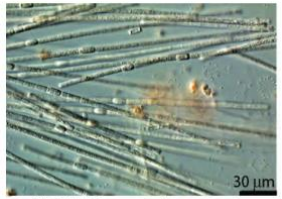
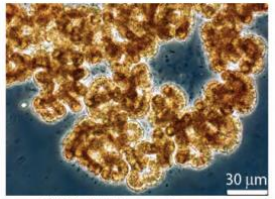
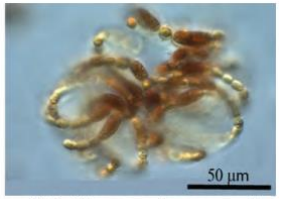
# A common challenge



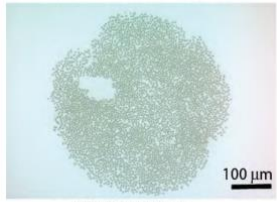
(a) *Aphanizomenon flos-aquae*



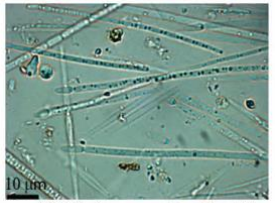
(b) *Nodularia spumigena*



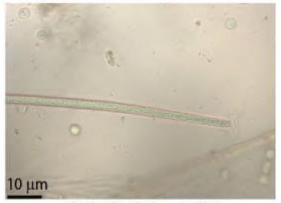
(c) *Dolichospermum lemmermannii*



(d) *Microcystis* sp.

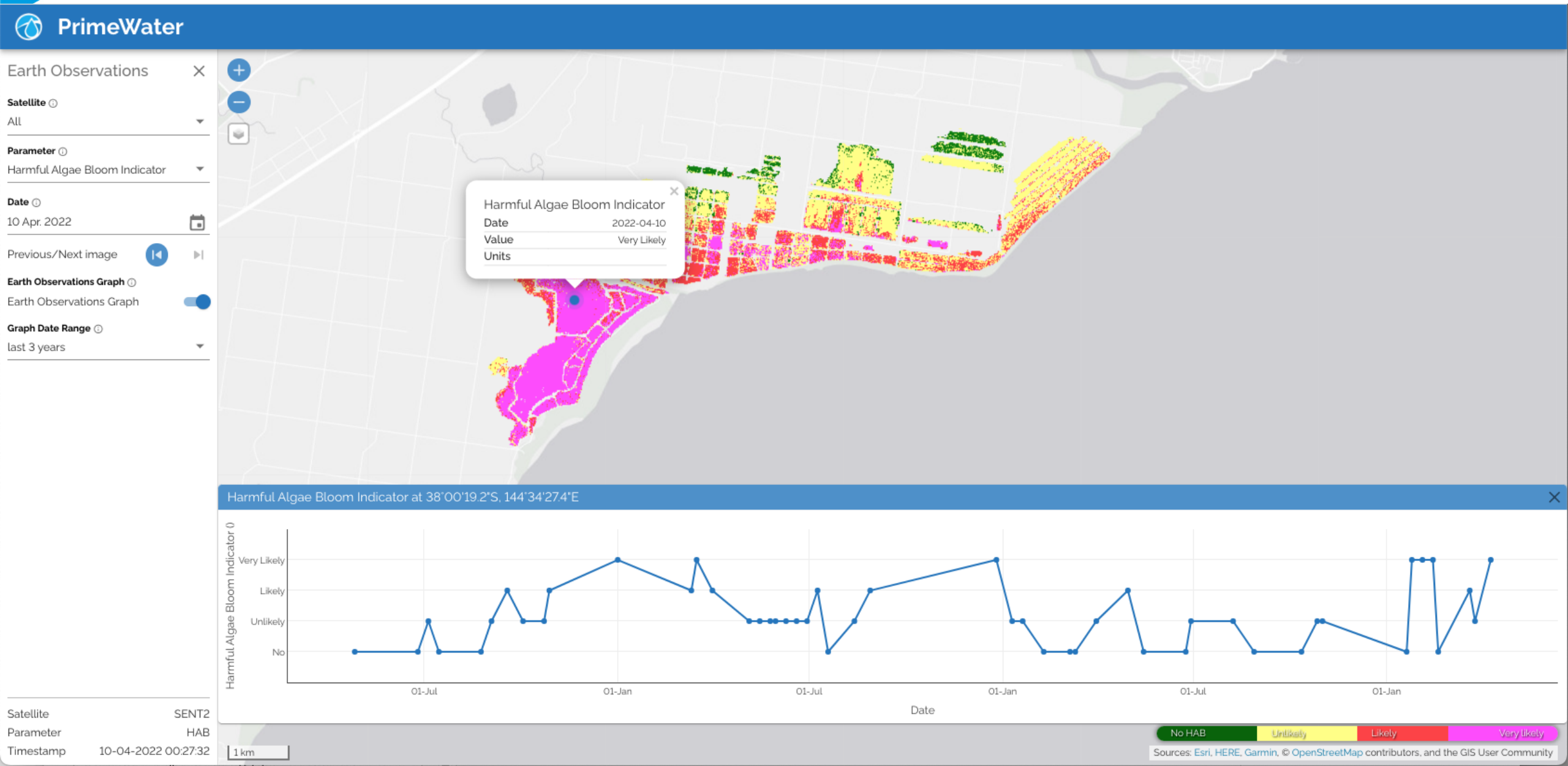


(e) *Cylindrospermopsis raciborskii*

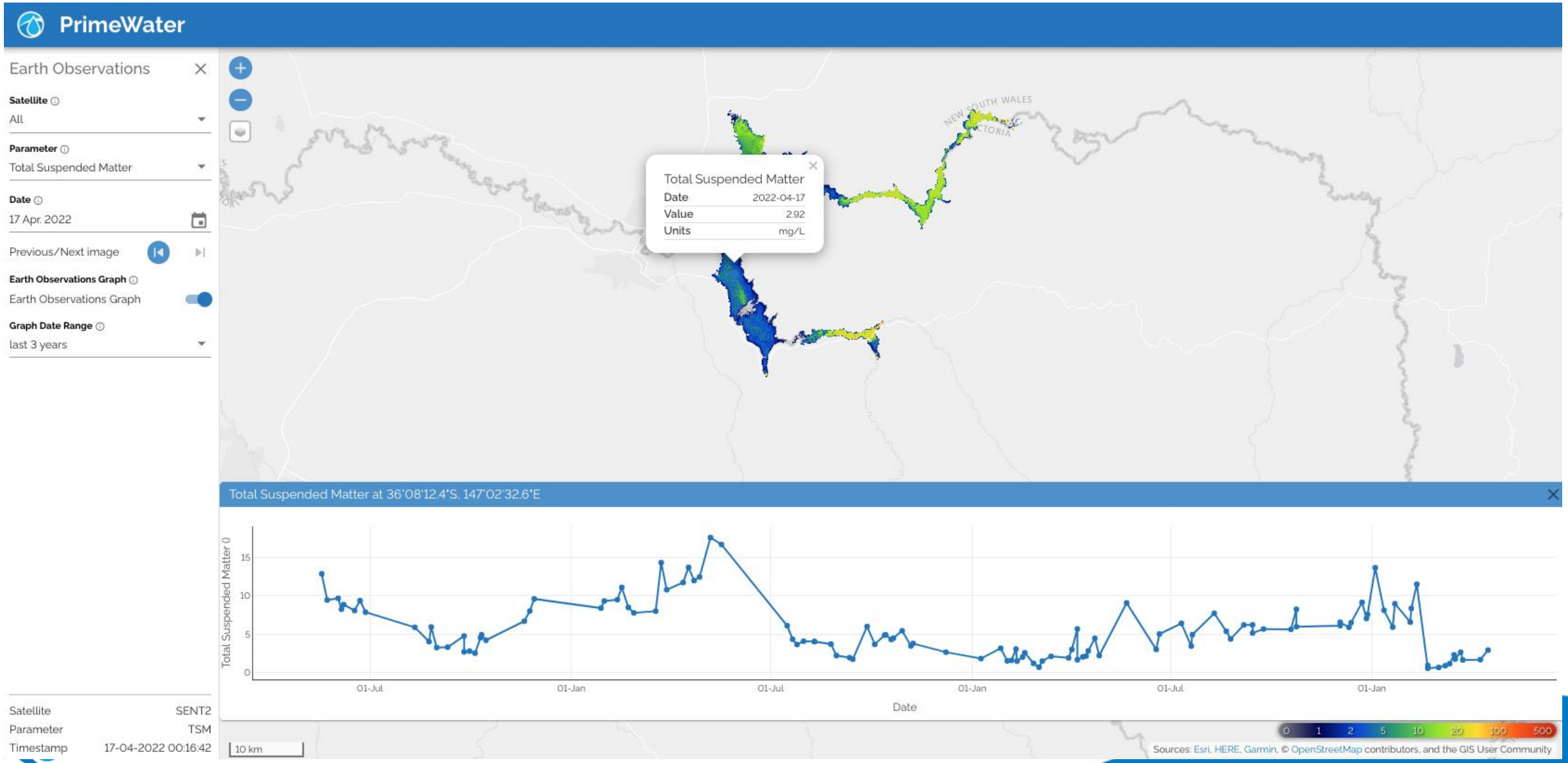


(f) *Planktothrix agardhii*

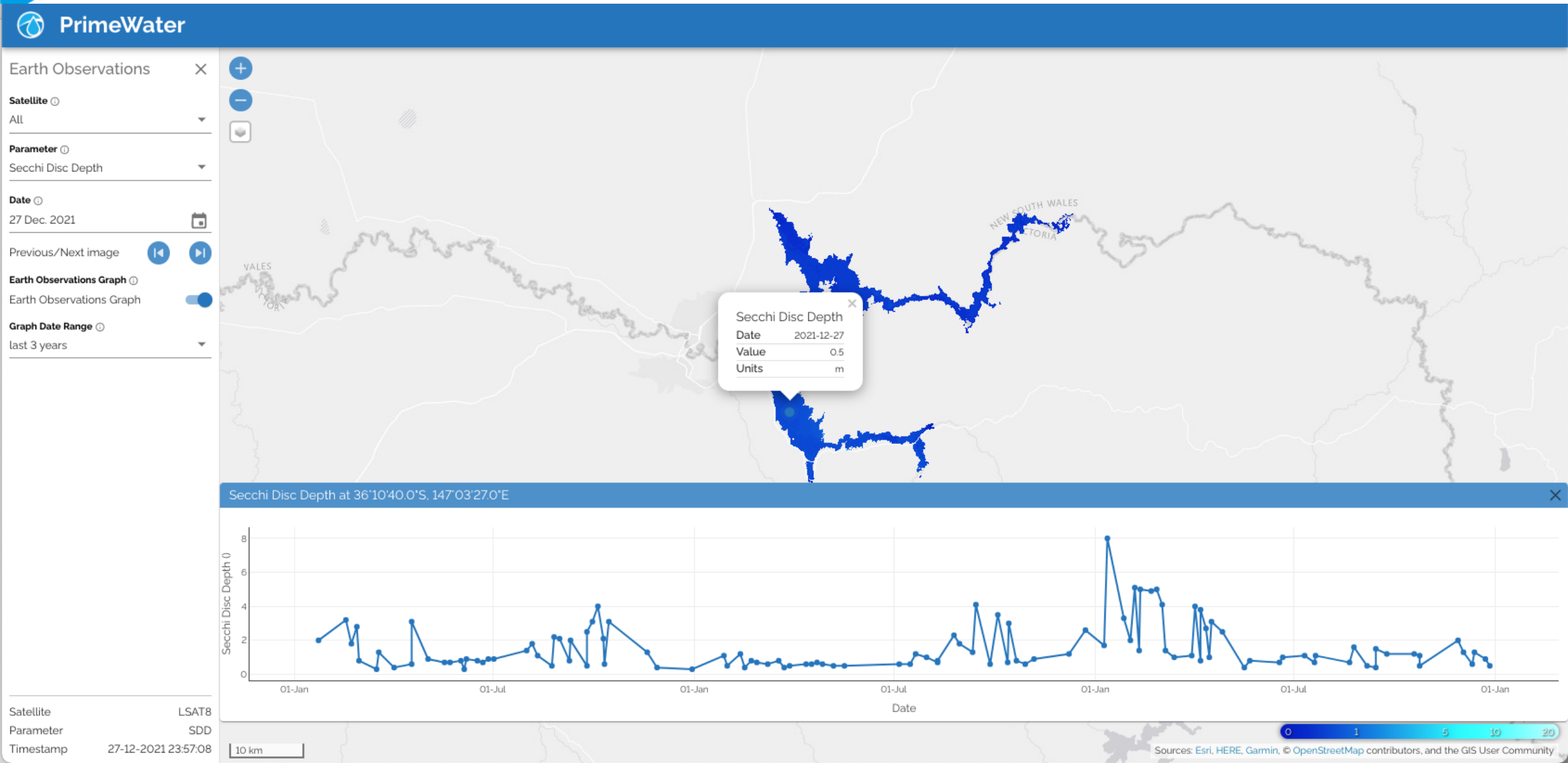
# WTP – Satellite HAB indicator



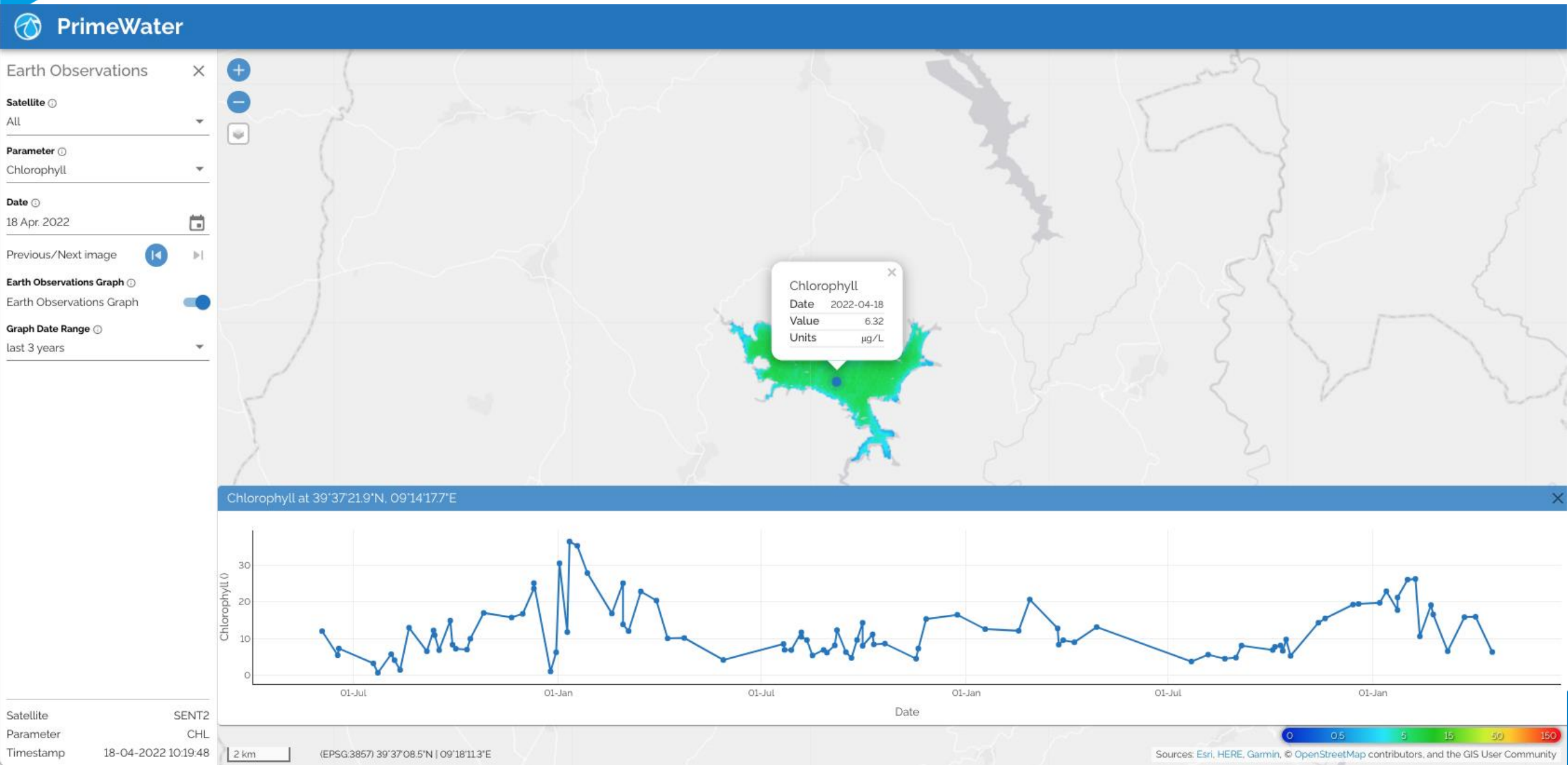
# Lake Harsha – Satellite TSM



# Lake Hume – Satellite Secchi disk depth



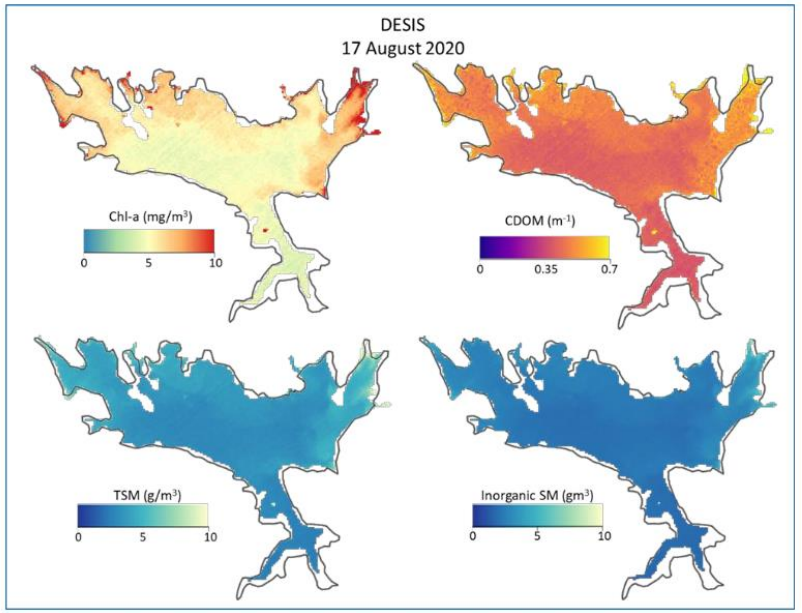
# Lake Mulargia – Satellite Chl-a

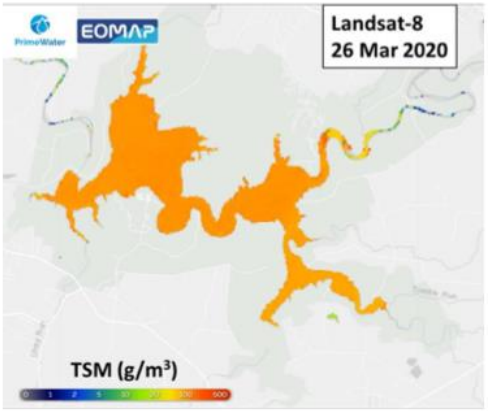


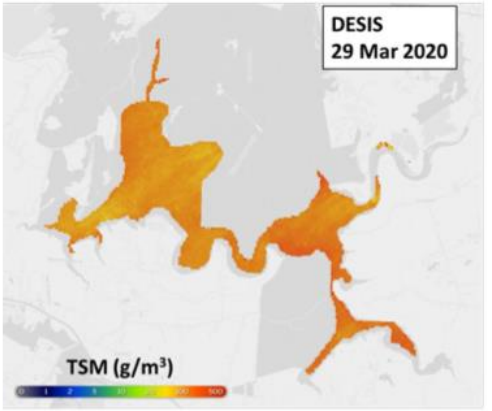
# Spaceborne imaging spectroscopy

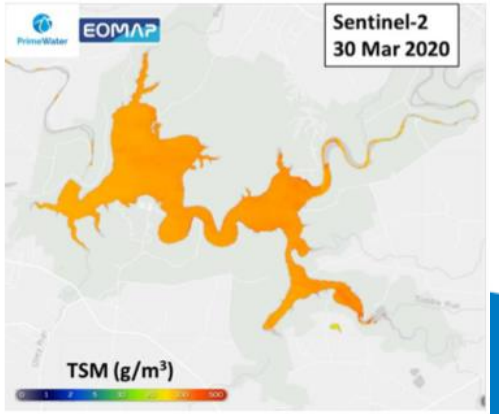
PRISMA & DESIS

- Standard & advanced water quality mapping
- Cooperation with S2-MSI and L8-OLI
- Water colour
- Functional traits of acquatic vegetation

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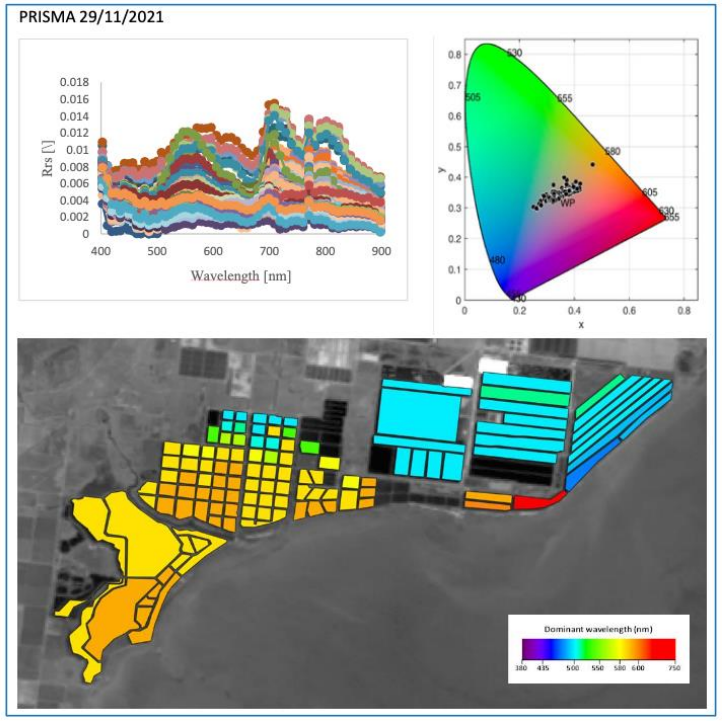


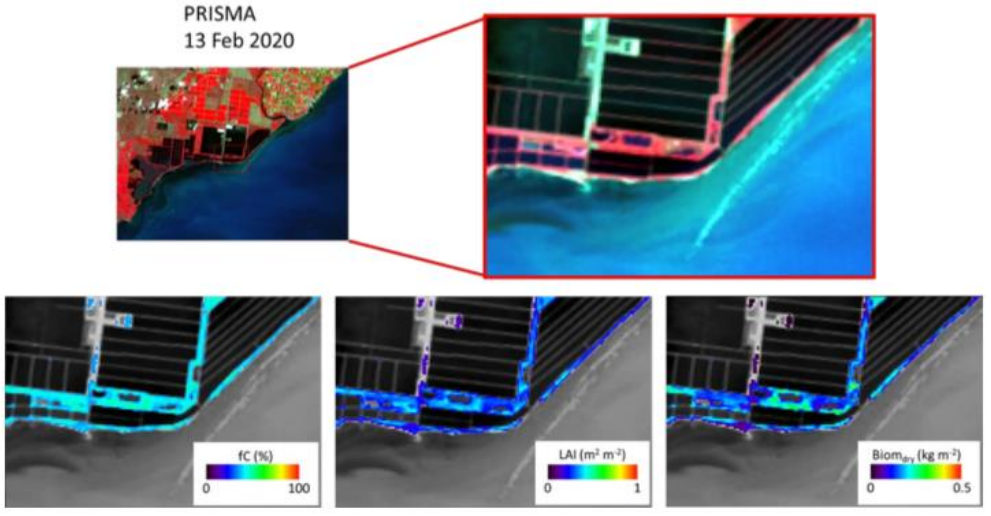


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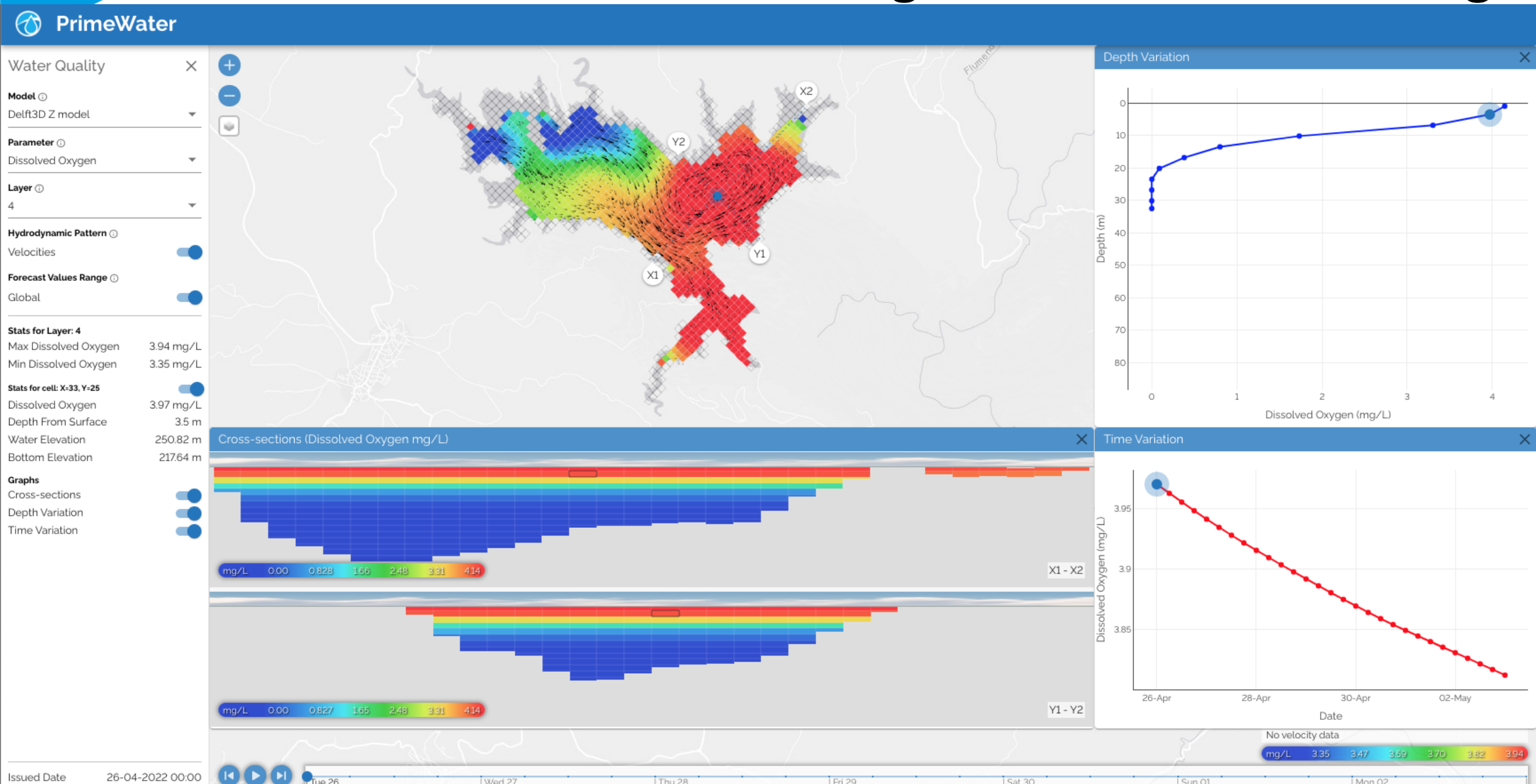
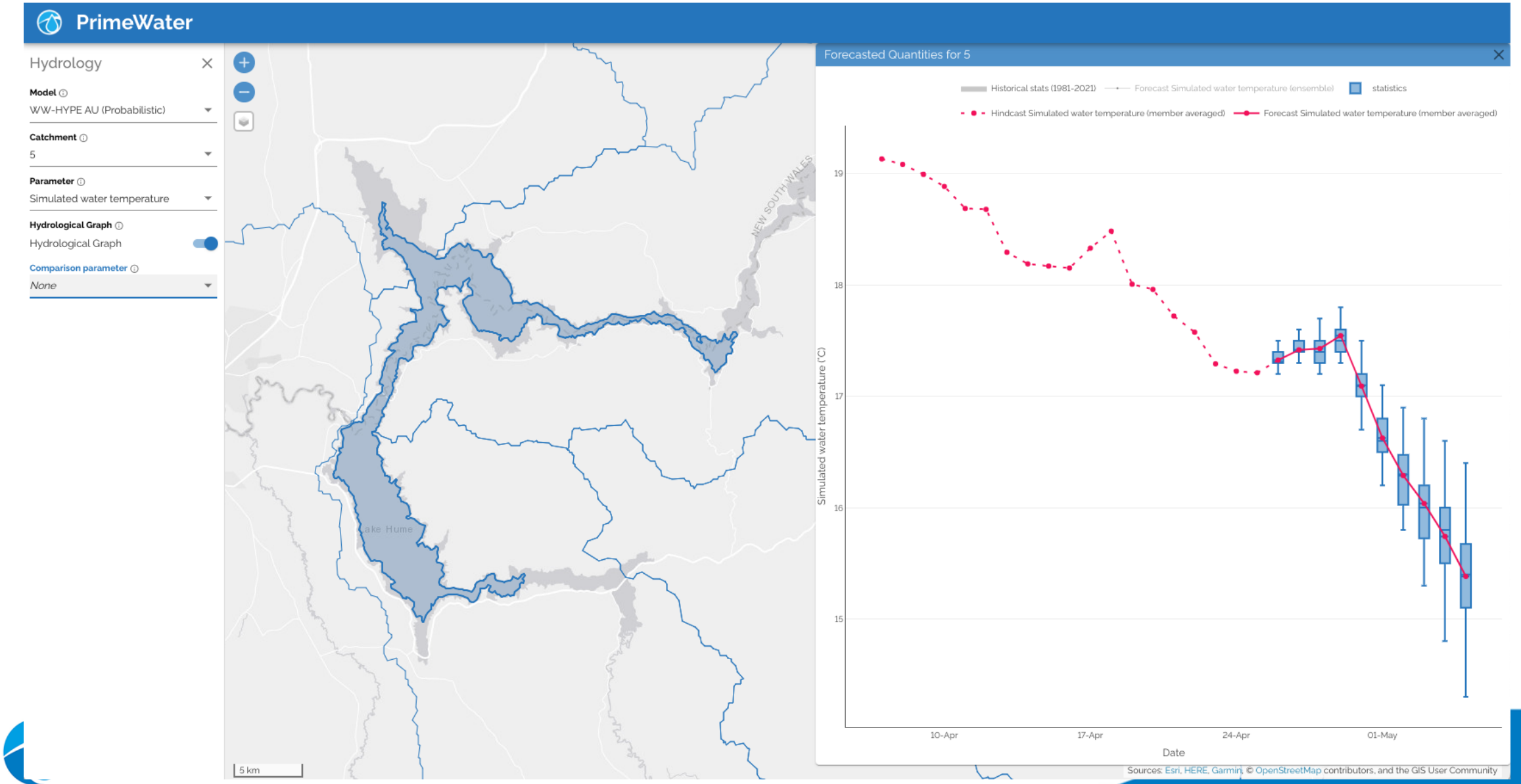
# Lake Mulargia – Delft3D Modelling



# Lake Hume – HYPE Modeling



**Environmental protection** identify and respond to Harmful Algal blooms (HABs) and cyanotoxins

**Potable water supply** Adjust treatment processes with monitoring and forecasting information on algal bloom risks

**Hydropower** Forecasting turbidity can improve sediment management, enable proactive maintenance planning, ensure safety and optimize energy production.

**Aquaculture** Forecasts of water quality characteristics can help improve fish production

**Water resource management** Early warning of algal blooms and aquatic weed growth

**Emergency planning** Forecasting to identify HABs, can mitigate risks in a planned manner

# Who can use this information and how?

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The project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 870497.

# To learn more visit: www.primewater.eu

**Contact**

**Apostolos Tzimas**
EMVIS, Athens (Greece)

Email: atzimas@emvis.gr

Twitter: @PrimeWater_EU

Facebook: PrimeWaterH2020

LinkedIn: space-o-project

Infographic: chris@chris-wells.com