

CyanoAlert-Space Based Cyanobacteria Services for Danube Delta

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ABSTRACT Over the past 20 years, in-depth studies on the presence and distribution of risk areas exposed to algal blooms have been carried out in the Danube Delta. Using this wealth of information, the H2020 Innovation Action CyanoAlert project (2016-2020) is developing a fully automated application for assessing potentially toxin-producing cyanobacteria blooms in water resources in the Danube Delta Biosphere Reserve (DDBR), wider Danube Delta and globally. The on-going project exploits satellite data (mainly Sentinel-3 OLCI and Sentinel-2 MSI) provided by the Copernicus space component to deliver an innovative service of satellite-based assessments of cyanobacteria blooms, aiming to **support, complement** and **add value** to existing water monitoring activities in Romania and around the world.

INTRODUCTION

The project consortium consists of three service development and implementation partners (IPs) and three user partners (UPs).

The IPs are private companies with expertise in Earth Observation applications: Brockmann Geomatics (Sweden), Brockmann Consult (Germany) and Odermatt & Brockmann (Switzerland).

The UPs, who are potential customers of the service after the project period, include a public government authority (The Information Office for the Baltic Sea, InfoBaltic (Sweden)), and two research institutes linked to routine monitoring programmes and laboratory analyses (Istituto Superiore di Sanità, ISS (Italy) and Danube Delta National Institute for Research and Development INCDDD (Romania)).

RESULTS

The CyanoAlert viewer enables visualisation of the satellite products in both map and graph format. Functionalities of the viewer include spatial maps of chl-a concentrations (Figure 1) and the extent of immersed cyanobacteria (Figure 2), if detected in the water. The user can also choose data points in the lake to display the water quality information (e.g. chl-a) on a graph as time series for one or more points in each lake to enable comparisons between lakes or different locations within the same lake (Figure 3).

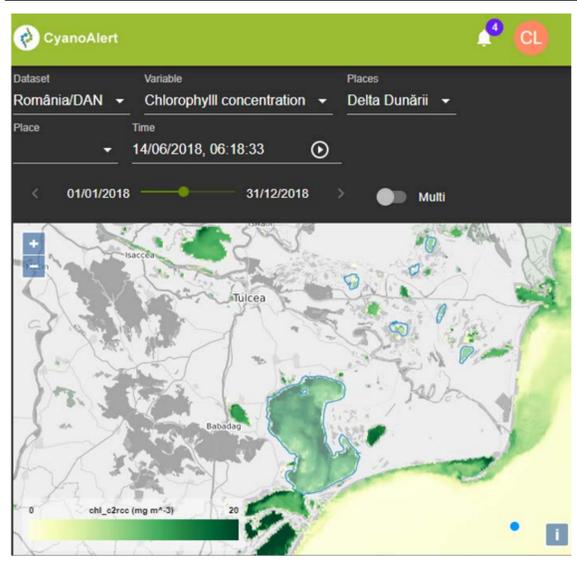


Figure 1: CyanoAlert Service Viewer, showing the Danube Delta area. Satellite-based estimates of chl-a are shown on the map on 14-06-2018.

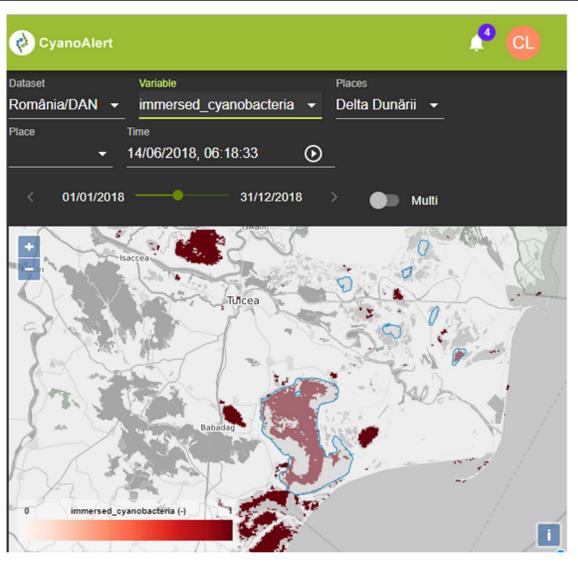


Figure 2: CyanoAlert Service Viewer, showing the Danube Delta area. A satellite-based flag on the presence (red) or absence (no data) of immersed cyanobacteria is shown for each lake on 14/06/2018, to indicate potential cyanobacterial blooms.

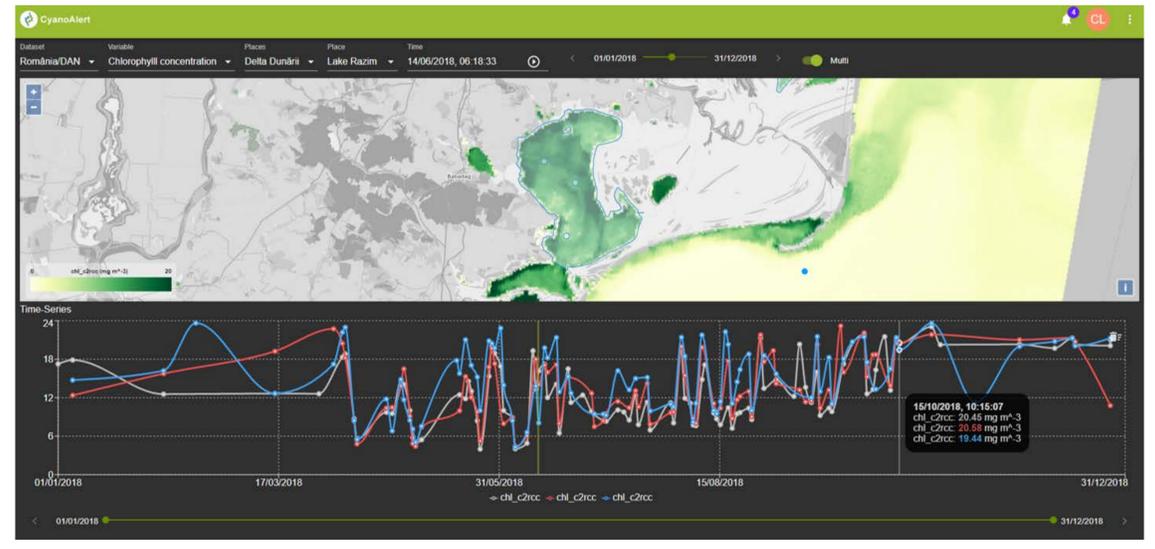
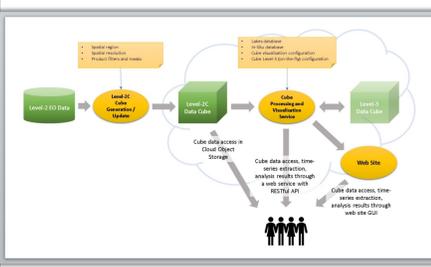


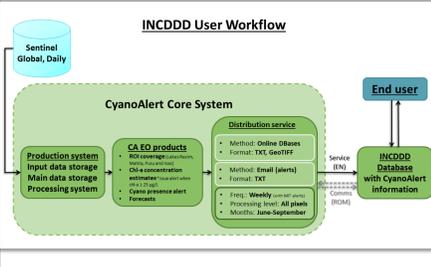
Figure 3: CyanoAlert Service Viewer, showing the Danube Delta area. The graph below the chl-a maps shows the 2018 time series of satellite-based chl-a concentrations for each of the points selected in seven Danube Delta lakes. Moving the cursor along the graph, the chl-a values are also shown for each lake point along with the date and time of the satellite overpass.

MATERIALS & METHODS

By combining field datasets based on routine monitoring programmes and satellite data, the CyanoAlert Service offers specialised, regionally-calibrated products on the presence of cyanobacterial and algal blooms in lake waters, as well as other water quality parameters, including chlorophyll-a (chl-a) concentrations in the water.



Tailored user workflows aim to efficiently cover the needs of each CyanoAlert Service user, while maximising the potential for automation of the data production and dissemination. The INCDDD user workflow is shown below:



CONCLUSIONS & FINAL REMARKS

Harmful algal blooms (HABs) pose a global health problem, impacting not only the availability of clean water for human and animal consumption, fisheries and recreation but also causing economic losses due to environmental issues related to the presence of HABs. As the changing climate is causing changes in air temperature and rainfall, and with increasing human pressures on freshwater systems such as intensified agriculture, it is of upmost importance to provide continuous monitoring of freshwater resources for effective management purposes. Remote sensing, and the new, cutting-edge CyanoAlert Service, can now **support, complement** and **add value** to existing water monitoring activities in Romania and around the world.