TRACKING ALGAL BLOOMS ON THE CURONIAN LAGOON

Satellite data are leading to better water management, water quality assessment and cyanobacterial bloom tracking.

The challenge

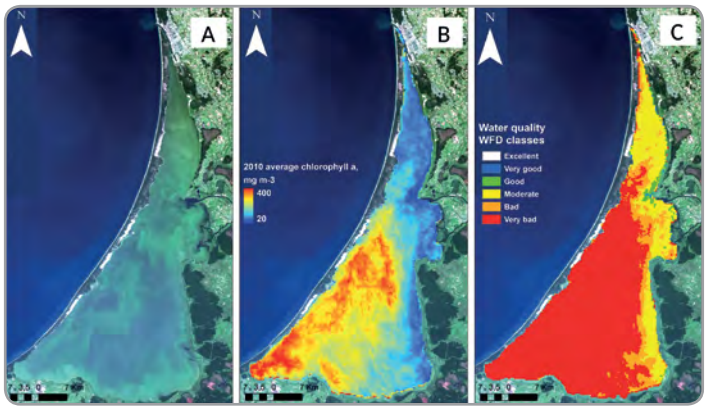
The Curonian Lagoon – the largest in Europe – is very important water body in the western region of Lithuania for recreation, tourism, fishery and industry. The Curonian Spit divides the lagoon from the Baltic Sea. This area comprises a number of protected territories including National Parks on both the Russian and Lithuanian parts of the spit (also declared a UNESCO World Heritage site), Regional Parks, and Natura 2000 territories. The freshwater lagoon is shallow (mean depth of 3.5 m), with a single and small opening to the Baltic Sea which limits water exchange and circulation. The Nemunas River entering the central part of the lagoon is the main source of nutrients. The Curonian Lagoon is a highly turbid water body and seriously threatened by high concentrations of organic material as well as by harmful blooms of cyanobacteria. Therefore, sustainable water quality and resource management of the lagoon is a priority for national and regional authorities who require regular information on its ecological status.

The space based solution

The Curonian Lagoon has been monitored from space since 2009, when the first attempt to map the severe summer algal blooms took place. The MEdium Resolution Imaging Spectrometer (MERIS), on-board the Envisat satellite, combined moderately high spatial resolution (300 m) with a high revisit time (2-3 days) and an appropriate spectral resolution. Using data from this sensor, comprehensive algorithms for water quality retrieval were developed. The birds-eye view from Space enabled a better understanding of the huge cyanobacterial blooms, which develop on the Curonian Lagoon, and can often cover almost its entire surface (~1500 km2). These blooms can be extremely harmful to human, animal and plant life. Building on the legacy of Envisat (and other Earth Observation satellites), the Copernicus Sentinels have ushered in a new era of satellite Earth Observation, making huge amounts of data available on a free and open basis and guaranteeing their long-term sustainability. With both its satellites now in orbit, Sentinel-2 provides optical data at 10 m spatial resolution for the same location every 5 days. The successor of MERIS, Sentinel-3 (with two satellites in orbit) provides optical data each day with spatial resolution at 300 m. It opens the opportunity to build services for water quality. The EOMORES (H2020) and TODAY (national/ESA PECS) projects are working towards this goal.

Benefits to Citizens

Operational water quality monitoring services support more informed decision-making on the part of water resource managers, resulting overall in better safeguarding and stewardship of natural assets. This leads to better preservation of the ecosystem services from which citizens benefit, such as the recreational value in the lagoon and lakes. There are also some clear public health benefits from monitoring inland water quality. For example, monitoring and



The Curonian Lagoon: true colour view from space as seen by Landsat-8 on 04/08/2015 (A), annual summer mean Chl-a concentration during 2010 derived from MERIS images (B) and MERIS Chl-a-based water quality according to the Water Framework Directive, 2000/60/EC (C).

Thematic Area: CLIMATE, WATER AND ENERGY

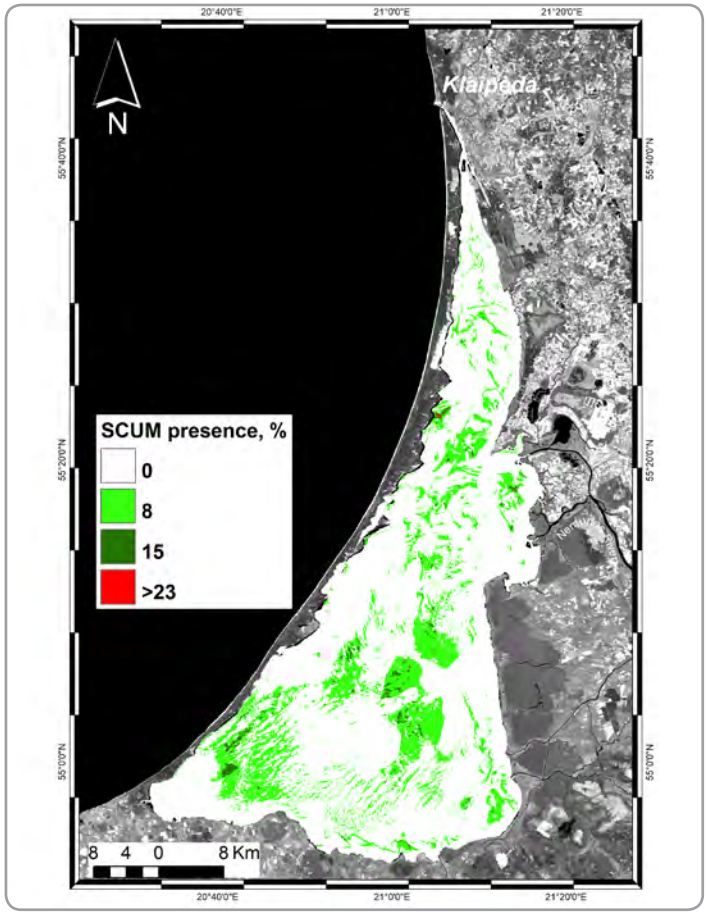
Region of Application: LITHUANIA

Sentinel mission used: S2, S3

Copernicus Service used: –

Usage Maturity Level: 3

forecasts of potentially harmful algal blooms might result in the timely closure of bathing or fishing areas – thus decreasing the risk to public safety.



Cyanobacteria surface accumulations in the Curonian Lagoon as mapped by 13 images of Sentinel-2 and Landsat-8 during summer 2013-2016.
Credit: Contains modified Copernicus Sentinel data

> "The implementation of the WFD was always challenging, relying only on in situ monitoring. We believe satellites will provide us with regular additional information about status of our lagoon, lakes and coastal waters."

Head of the Division Eglė Šupinienė, Environment Research Department, EPA, Lithuania

Outlook to the future

Taking a full advantage of free and open Copernicus Sentinel data, we tested and provided water quality parameters (e.g. chlorophyll-a, total suspended matter, CDOM) for the lagoon. These parameters will be adopted for other Lithuanian water bodies with different bio-optical properties (large lakes and coastal waters), whilst the approach can be reutilised in other geographical regions. Within EOMORES project, an integrated service is being developed combining in situ, Earth observation and modelling data for monitoring inland water bodies.

Acknowledgements

The work is funded by the EU's Horizon 2020 EOMORES project (No 687412) and the TODAY project funded by the Government of Lithuania through an ESA Contract under the PECS (No 4000122960/18/NL/SC).v

D. Vaičiūtė, M. Bučas[1], M. Bresciani, C. Giardino[2], D. Papadakis[3], M. Laanen and A. Hommersom[4]
1. Klaipėda University, Lithuania; 2. CNR IREA, Italy; 3. Evenflow, Belgium; 4. WaterInsight, the Netherlands
Email: diana.vaiciute@jmtc.ku.lt

ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication "**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**", 2018, Edited by NEREUS, the European Space Agency and the European Commission.
The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains.
The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.
Funded by the European Union, in collaboration with NEREUS. Paging, printing and distribution funded by the European Space Agency.