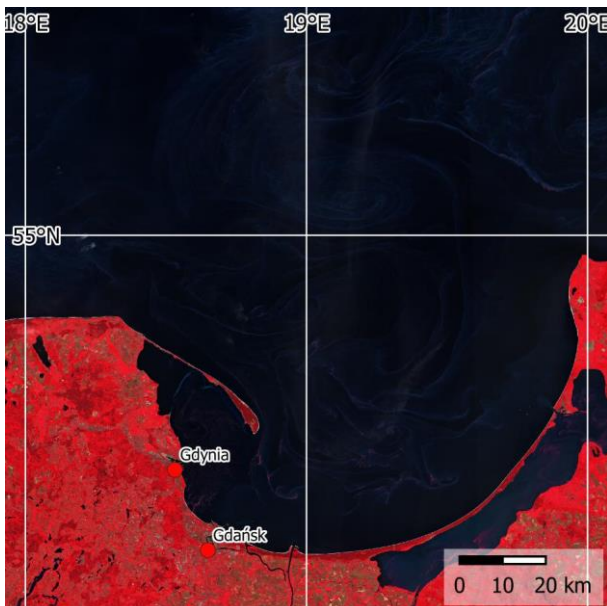


2019-07-20, Sentinel-2 true colours.



2019-07-20, Sentinel-2 false colour infrared.

### Algal Bloom in the Baltic Sea

Algal blooms in the Baltic Sea have been intensifying in recent decades, with surface blooms affecting up to 200,000 square kilometers during peak summer months. These blooms, primarily of cyanobacteria, thrive in the Baltic's nutrient-rich waters. Agricultural runoff contributes about 75% of the nitrogen and phosphorus entering the sea. This nutrient overload, combined with rising sea temperatures, accelerates bloom growth.

Globally, harmful algal blooms (HABs) are increasing at a rate of 3-8% per year in many coastal areas. In the Baltic, these blooms have been observed to last longer and spread wider in recent years, exacerbated by warmer summer temperatures, which have risen by 1.5°C over the past century.

Satellite data from the European Space Agency (ESA) and NASA has been crucial in monitoring these phenomena. Satellites such as Sentinel-3 can detect chlorophyll concentrations at scales as fine as 300 meters, allowing for detailed tracking of bloom development. These satellites can map blooms that cover large areas and detect them at an early stage, providing critical information for regional management and response efforts.

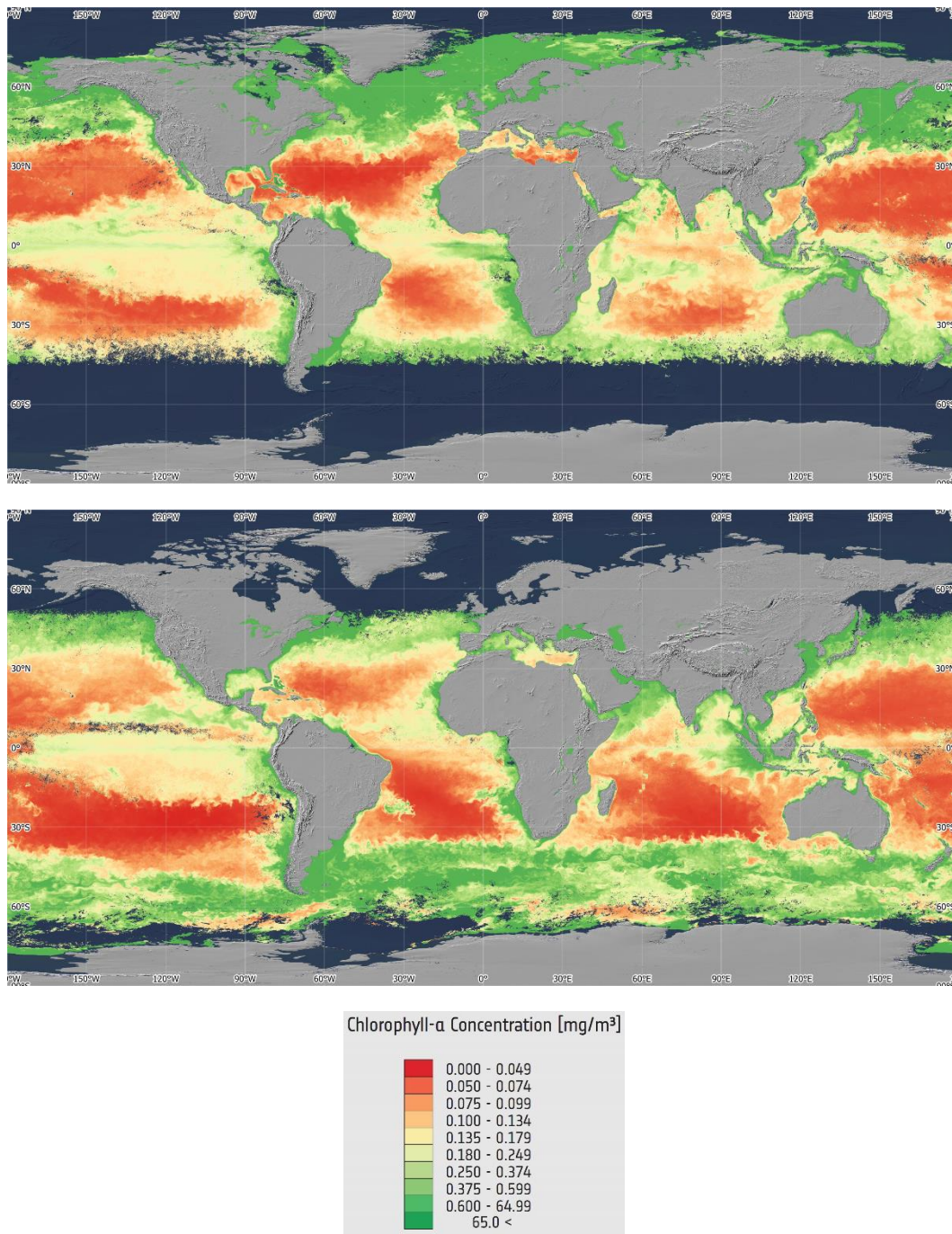
Algal blooms have the potential to threaten ecosystems, fisheries, and tourism. This underlines the urgency of addressing nutrient pollution and climate change as part of global efforts to combat algal blooms.

### Exercises

- Look at the true colours Sentinel-2 satellite image map and focus to the colours of the sea. What is the reason for the different colours?
- Try to estimate the area covered by the swirls with the algal blooms.
- Which reason for the specific structures in the water can you identify? Think about sea currents, winds, and ship traffic.
- Look at the false colour infrared image of the same date. Is the algal bloom well visible also here? Why not? Think about the concentrations of the vegetation on land and in the sea.
- Look at the global maps below, which show the chlorophyll-a concentrations in summer and winter. Where are the concentrations highest? Can you see seasonal changes?



## Additional Material



*Concentration of chlorophyll-a in the oceans in June 2023 (top) and December 2023 (bottom)*

## Links and Sources

- ESA Earth Watching page about algal blooms in the Baltic Sea: <https://earth.esa.int/web/earth-watching/environmental-hazards/content/-/article/algal-blooms-phenomenon-baltic-sea/>
- ESA Video on algal blooms in the Baltic Sea: [https://www.esa.int/ESA\\_Multimedia/Videos/2019/12/Earth\\_from\\_Space\\_Gotland\\_Baltic\\_blooms](https://www.esa.int/ESA_Multimedia/Videos/2019/12/Earth_from_Space_Gotland_Baltic_blooms)

