Integrated Maritime and Territorial Spatial Planning for the Baltic Sea (BalticAIMS)

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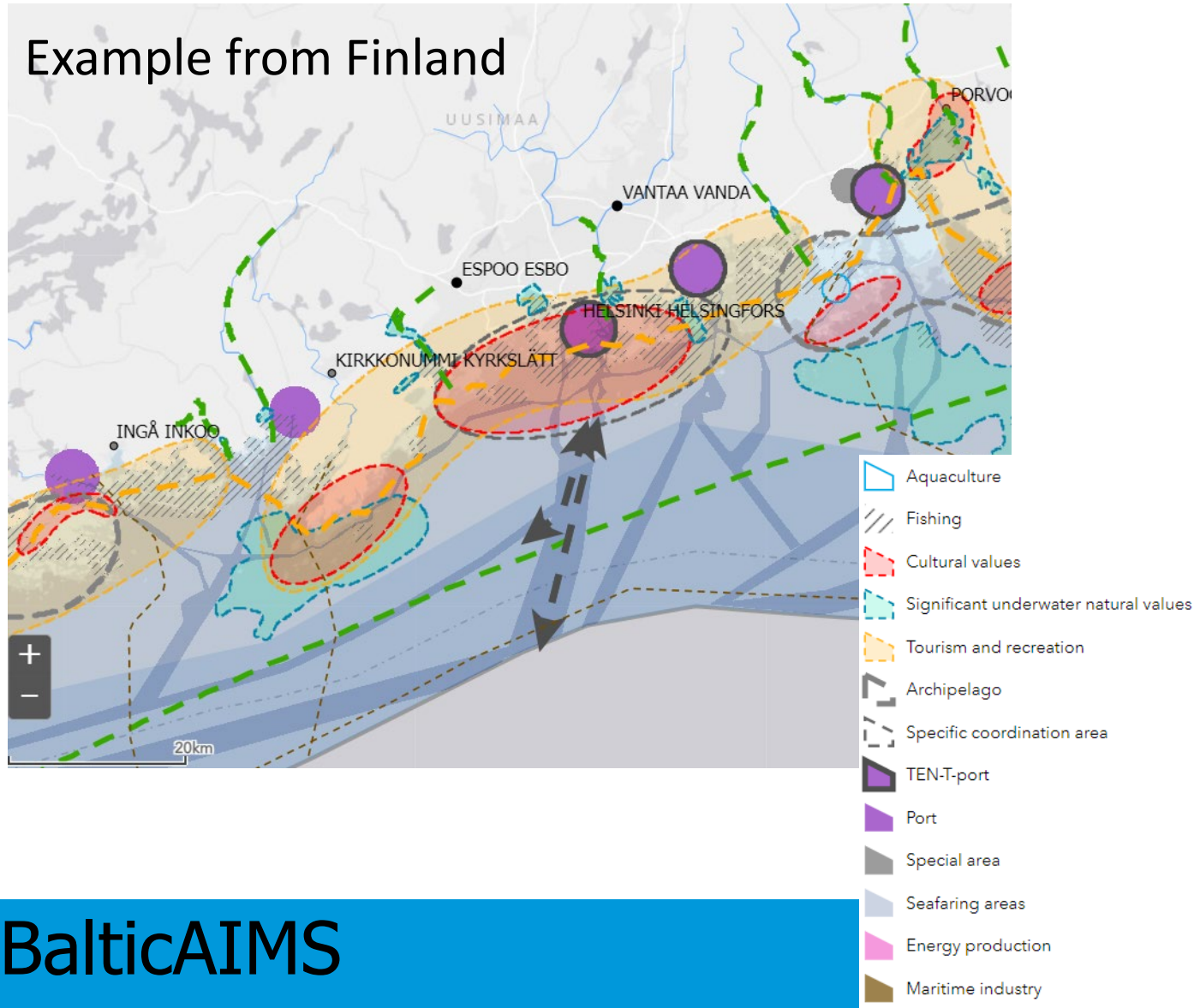
Maritime and Territorial Spatial Planning

- Many areas in the Baltic Sea are not in Good Ecological State
- MSP seeks to improve of the state of the environment by mitigating human impact on sea health
- Coordination and implementation of various practices and policies
  - Defining areas where certain activities could be practiced to minimize overall impacts
  - Monitor the effects of these activities



Our motivation

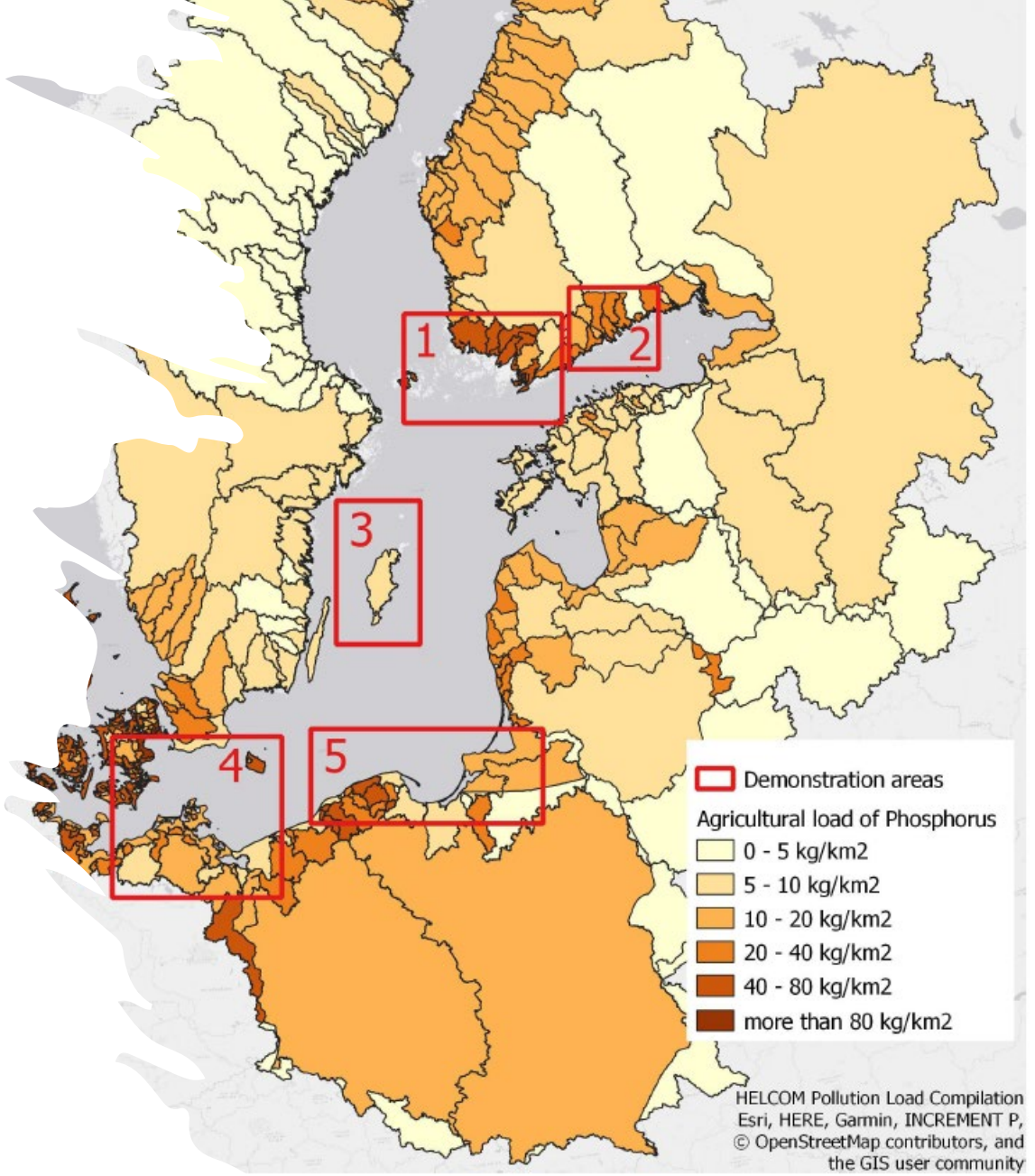
- For MSP, large information gaps exist
- EO can help by providing information on
  - State of the coastal environment
  - Activities in the catchment areas
- Access to EO data is not convenient for non-expert users and MSP experts. Combining EO observation with GIS and other material is laborious

→ Our objective is to help MSP: **demonstrate** an *integrated data approach for essential processes of land and coastal water areas to better analyse and visualise the interactions.*

In practice

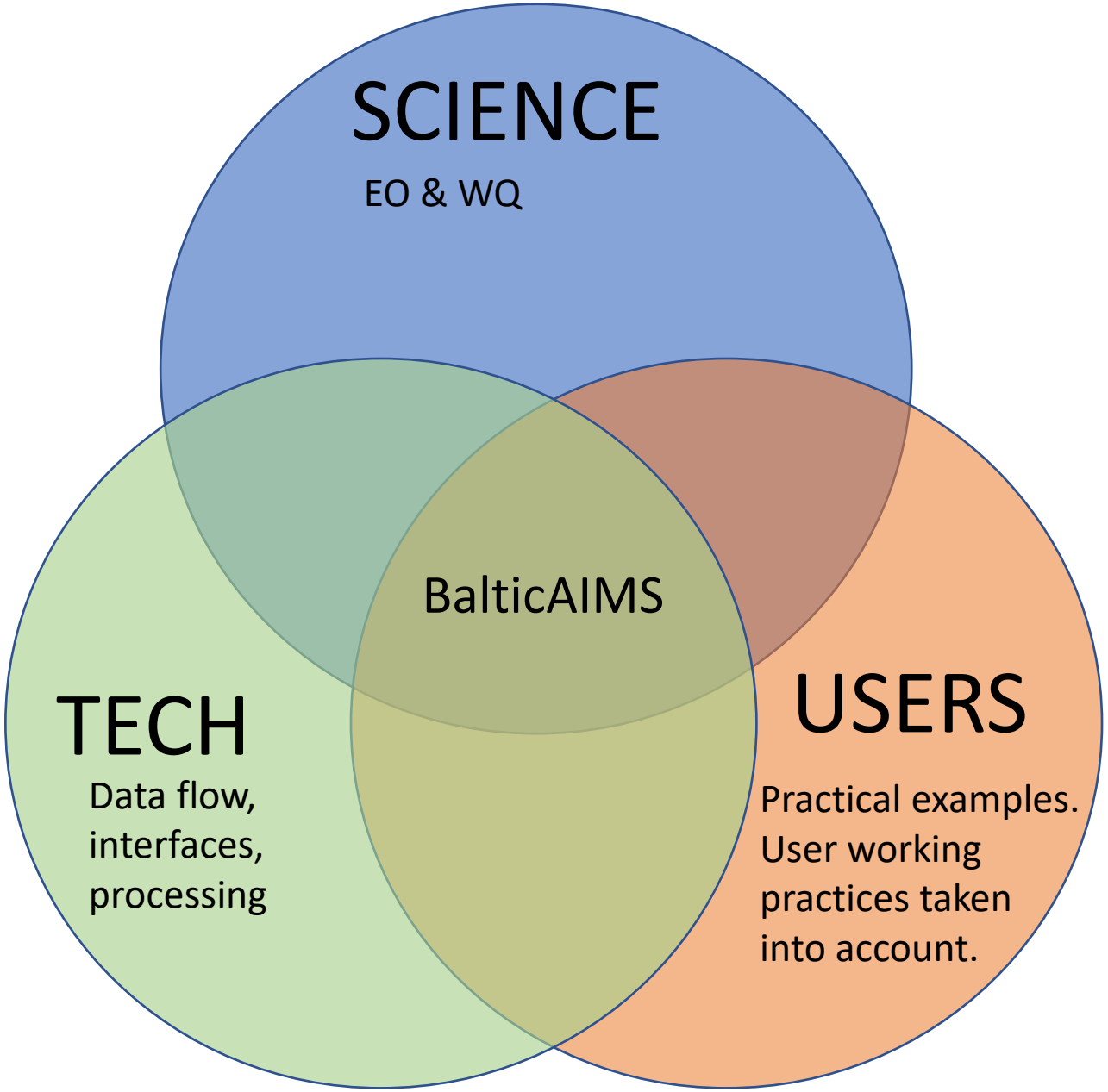
- Create data access, visualization and analysis systems and tools for demo areas in the Baltic Sea
  - GIS material relevant for MSP, human impacts and pressures
  - In situ water quality (monitoring stations, Alg@line ferrybox, automated stations)
  - EO and model datasets

- A parallel project led by Tiit Kutser, Estonia



How do we differ from other platforms?

Specific focus on the Baltic Sea and MSP



BalticAims Schedule

Spring 2021

User requirement specification

- Regional (e.g. HELCOM) & national authorities, ~30 persons interviewed

Summer 2021 – Spring 2022

System definition and development of information services based on user needs

Summer – Fall 2022

Demonstrations:

- Examples by the team
- Users can access the data

Jun. 2022 – Feb. 2023

User comments and further recommendations

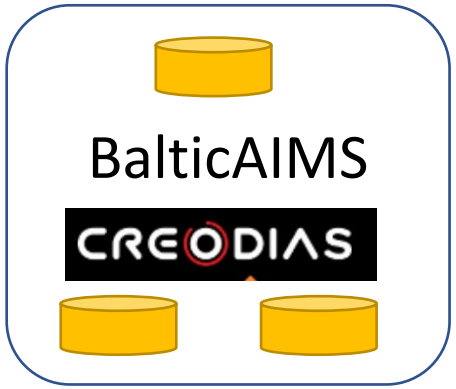
Baltic Workshop (Oct 2022)

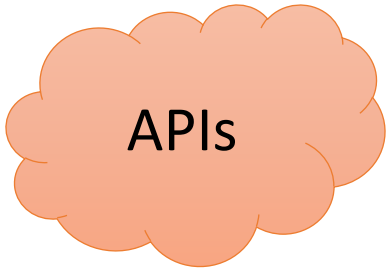
2023/2024? →

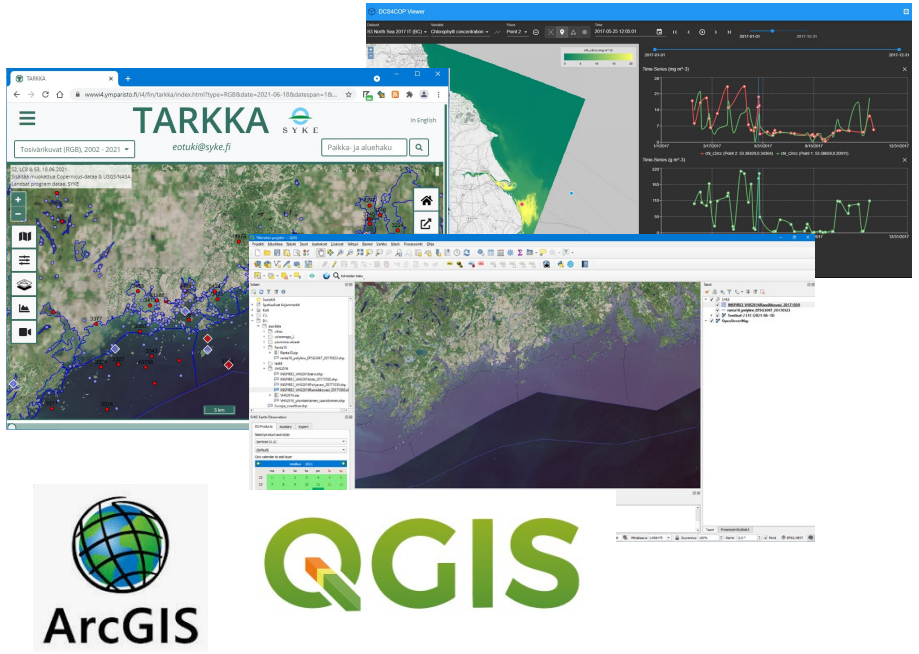
Next step: A larger scale project

BalticAIMS data flow

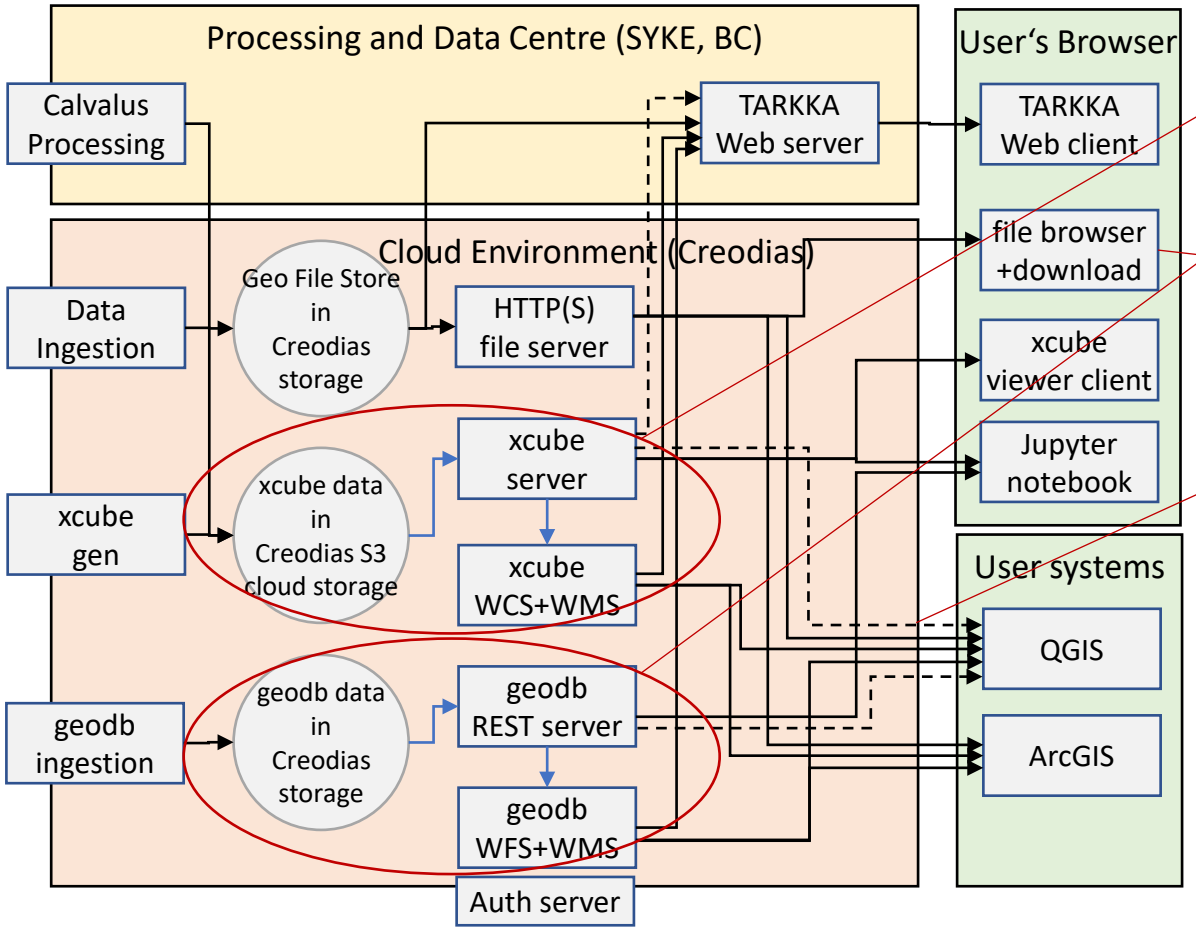
- Demonstration system utilizes a backend (data sources) connected to three different data exploration interfaces through APIs







Backend



xcube serves time series of image data

geodb serves features and their time series

File server for pragmatic file access

OGC and REST interfaces
for integration into user clients

Tarkka, viewer, notebooks as generic clients

Processing and ingestion to add collections
and to extend the time series

[links at www.balticaims.eu/](www.balticaims.eu/)

Frontends

Public viewer to familiarize with the datasets:

Browser-based, ready to use Graphical User interface

BALTIC AIMS interface

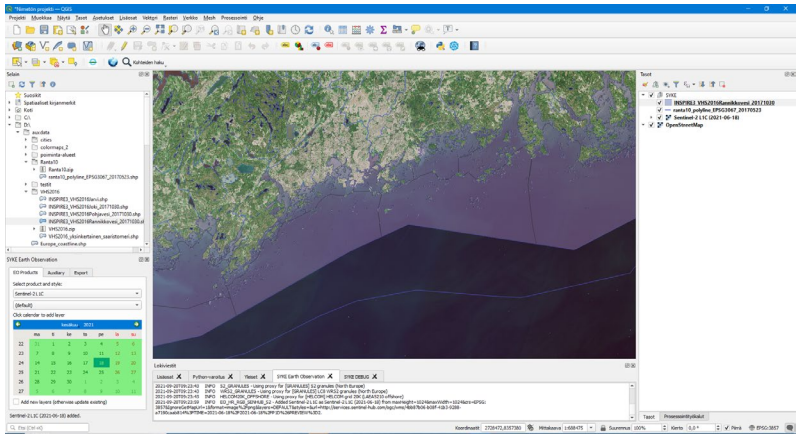
EO
- RGB
- EO turbidity
- Cases, where human impact are clear
- Seasonal (summer, spring turbidity, chl-a)
- Algae blooms
- Wintertime RGBs

GIS
- Available GIS material on coastal activity
- GIS material, where human impacts identified from EO material are identified (TBD)

Stations
- Coastal stations (WQ)
- Automated temperature network

www.syke.fi/TARKKA/en

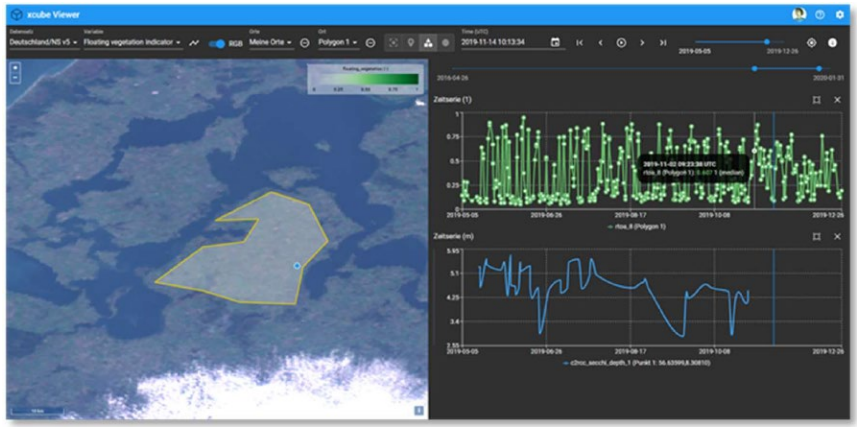
Access the data in GIS applications



QGIS

ArcGIS

XCube viewer (browser based)



Showcases and user stories

A: EO based information to be used in user **legacy systems** for spatial planning

B: Monitor the effects of **nutrient flow** from the drainage basin to the coastal waters

C: Monitoring the impacts of **coastal activities**

D: Combination of Coastal Zone mapping and CMEMS coastal water quality material

E: Monitoring of **temperature anomalies** → upwelling & input of heat

- A1: Material to support the review of MSP Plans
- A2: Human impact
- A3: Hotspots

- B1: Impact of agriculture
- B2: PLC subgroup
- B3: Monitoring of nutrient reduction measure

- C1: Dredging Helsinki
- C3: HELCOM dredging & dumping
- C2: Water quality coastal Finland
- C4: HELCOM human pressures

- D1: Wind park
- D2: Aquaculture footprint
- D3: Coastal land use

- E1: Helsinki city coastal water temperature
- E2: Climate change

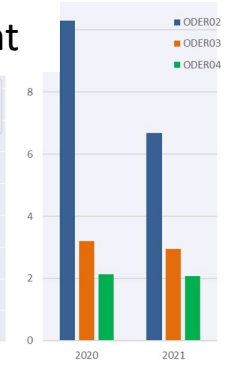
PLC subgroup use case (Germany)

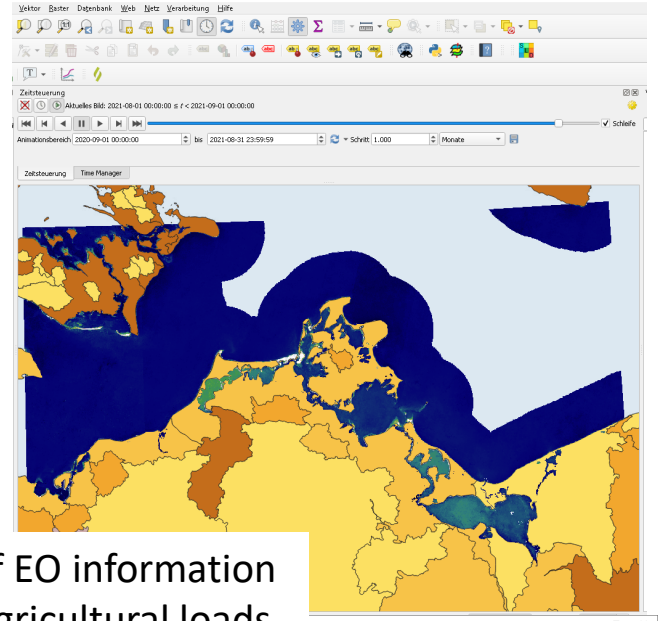
Interests are in the influence of nutrients on coastal water. Users want to combine model results and nutrient information from point sources with EO water quality information

Regional statistics along inflows

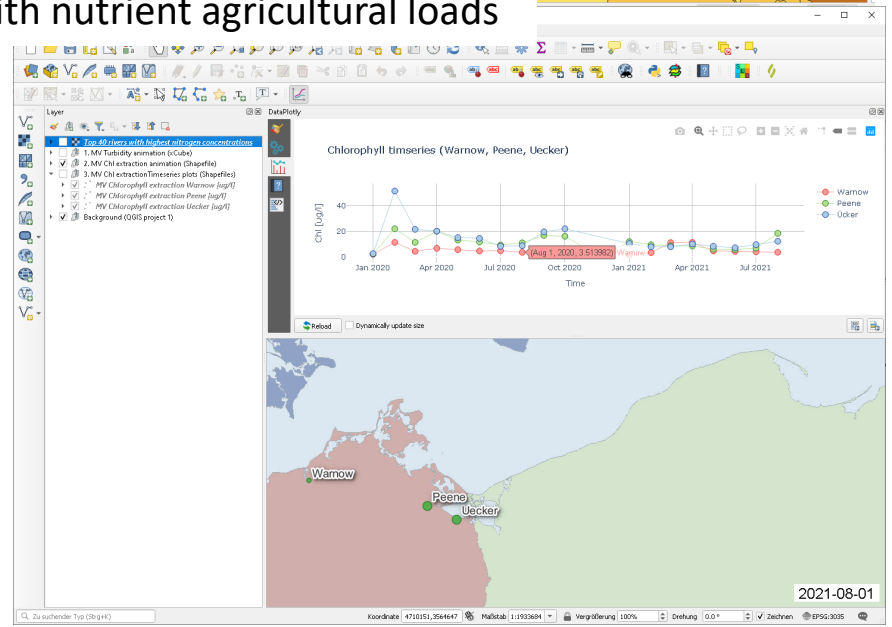
HELCOM Assessment

EO data





Combination of EO information with nutrient agricultural loads



EO

- Demonstrative set of RGB, EO turbidity
- Seasonal, timeseries (summer, spring turbidity, Chl-a)

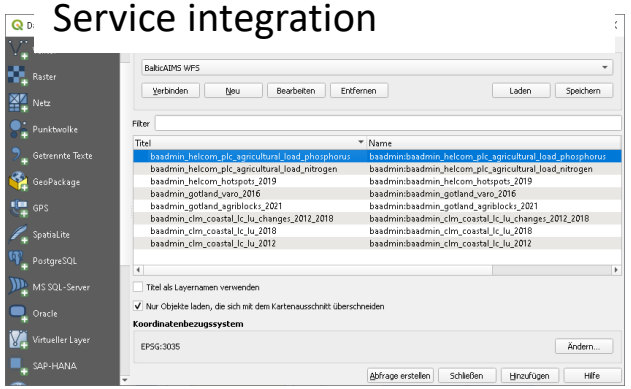
GIS

- Available GIS material on coastal activity (human pressures)
- Link EO information to GIS

Stations

- River/Coastal stations (WQ and nutrient load)

BalticAIMS Web Feature Service integration



Environmental authorities use case - Gotland

Can nutrient reduction measures upstream be observed by EO in the coastal waters?

EO

- RGBs, Chl a and Turbidity
- Daily estimations for analysis of short-term events
- Near shore sites where riverine outlets affect the coastal waters.

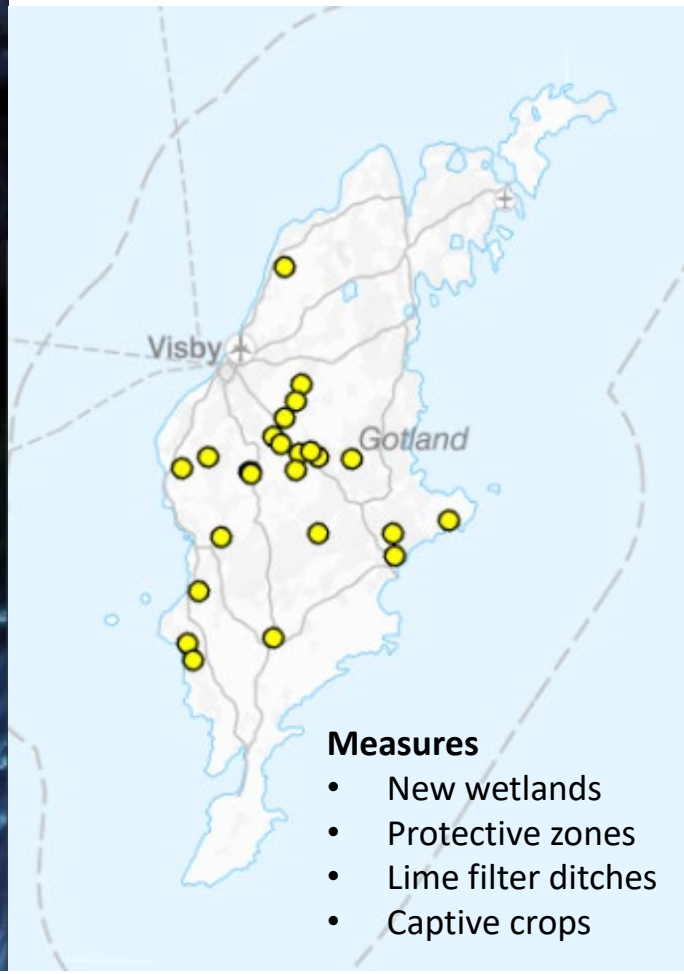
GIS

- GIS material on nutrient reduction measures
- Local information on drainage basins and water ways

Stations

- Coastal stations (WQ)
- Automatic sensor network upstream

Implemented measures against eutrophication



Coastal city use case (Helsinki region)

Interests are in human impacts on coastal water quality and water temperature

EO

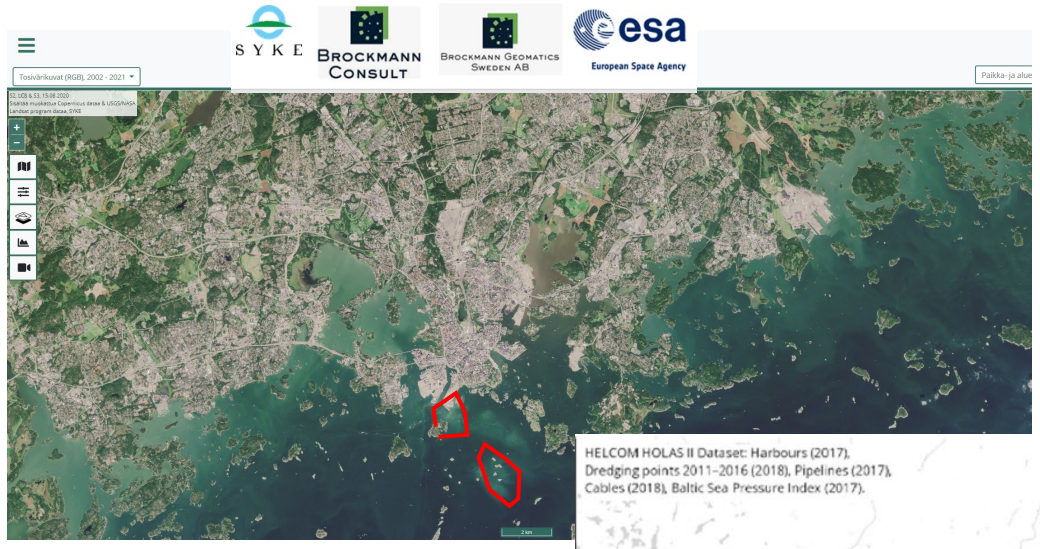
- Demonstrative set of RGB, EO turbidity
- Cases, where human impact are clear
- Seasonal (summer, spring turbidity, Chl-a, ice)

GIS

- Available GIS material on coastal activity (human pressures)
- GIS material, where human impacts identified from EO material are identified

Stations

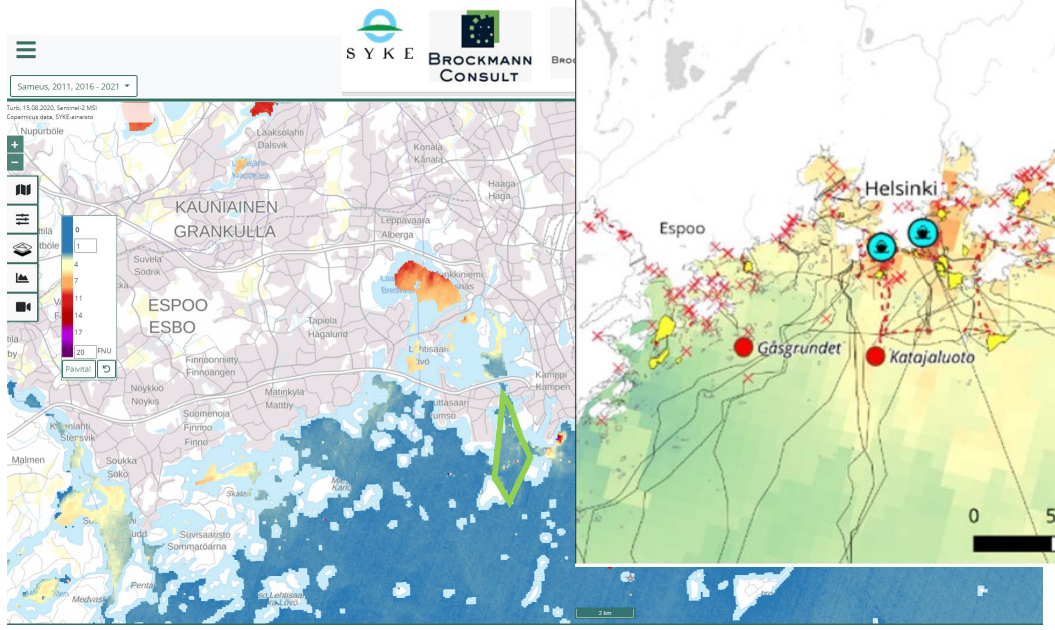
- Coastal stations (WQ)
- Automated temperature network

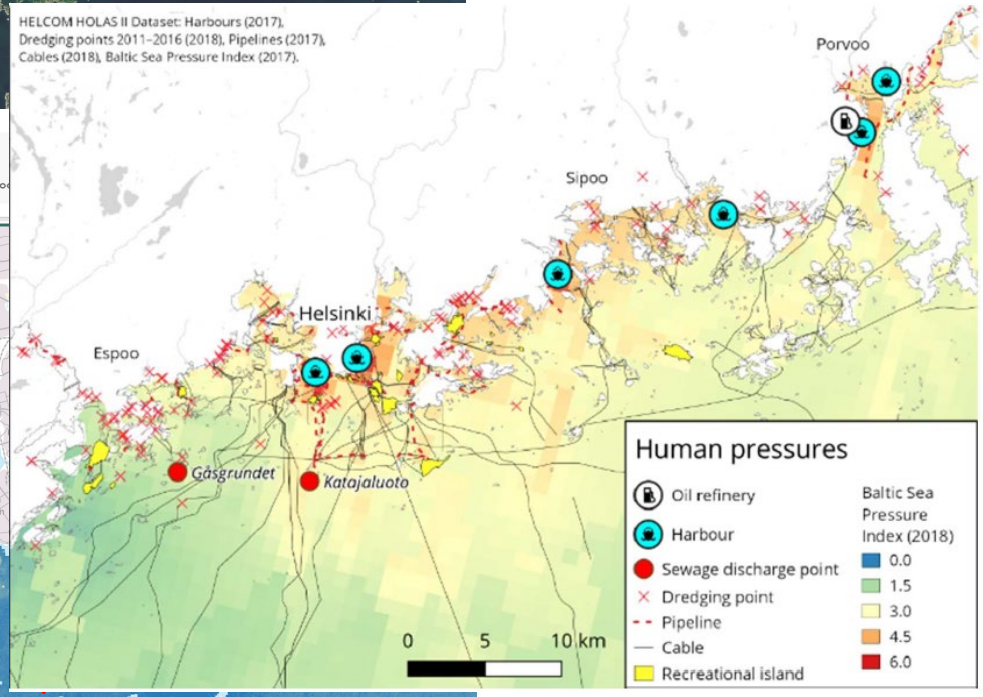


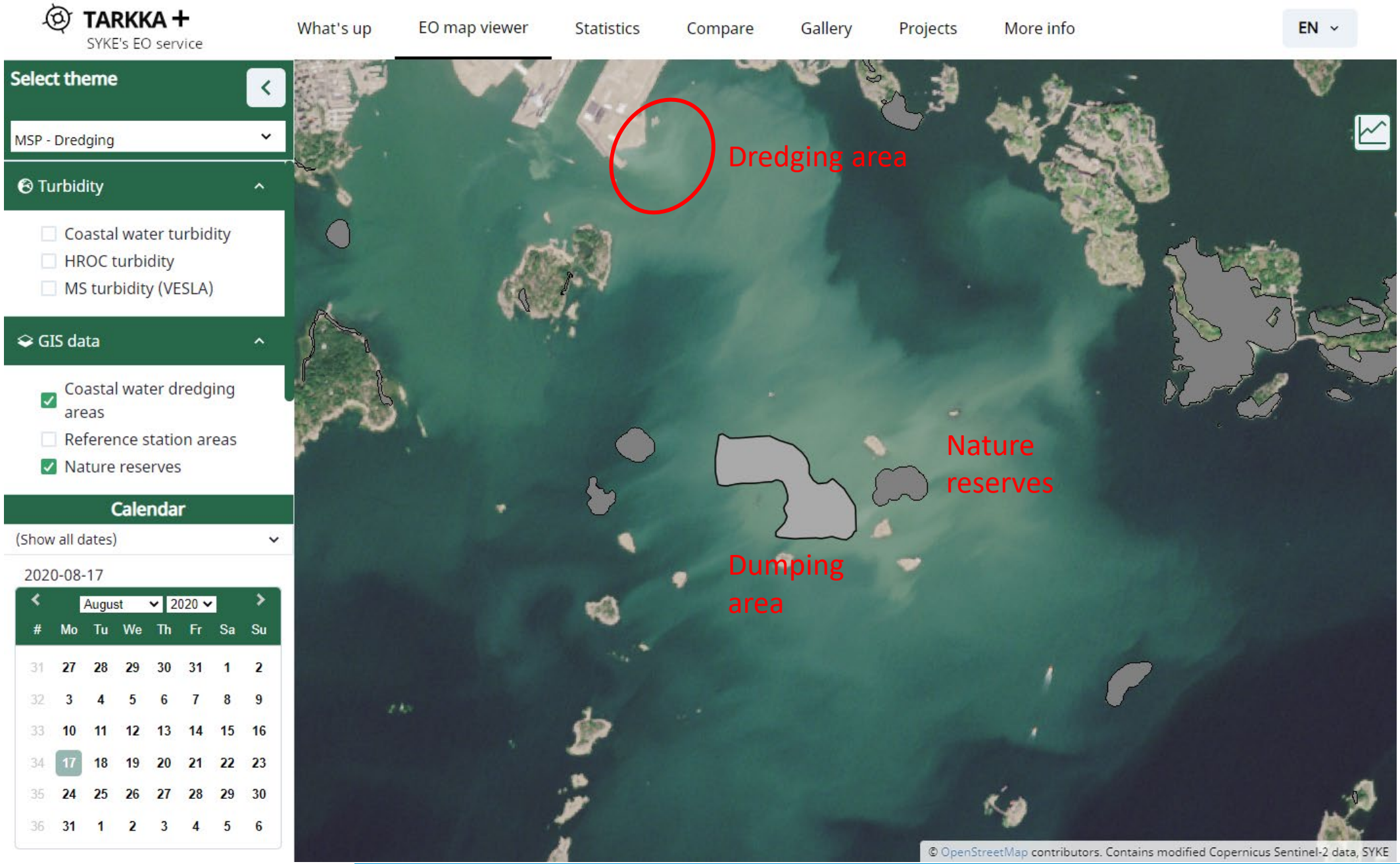
Active dredging and dumping areas identified

Riverine impact areas

Regular ship route in harbor

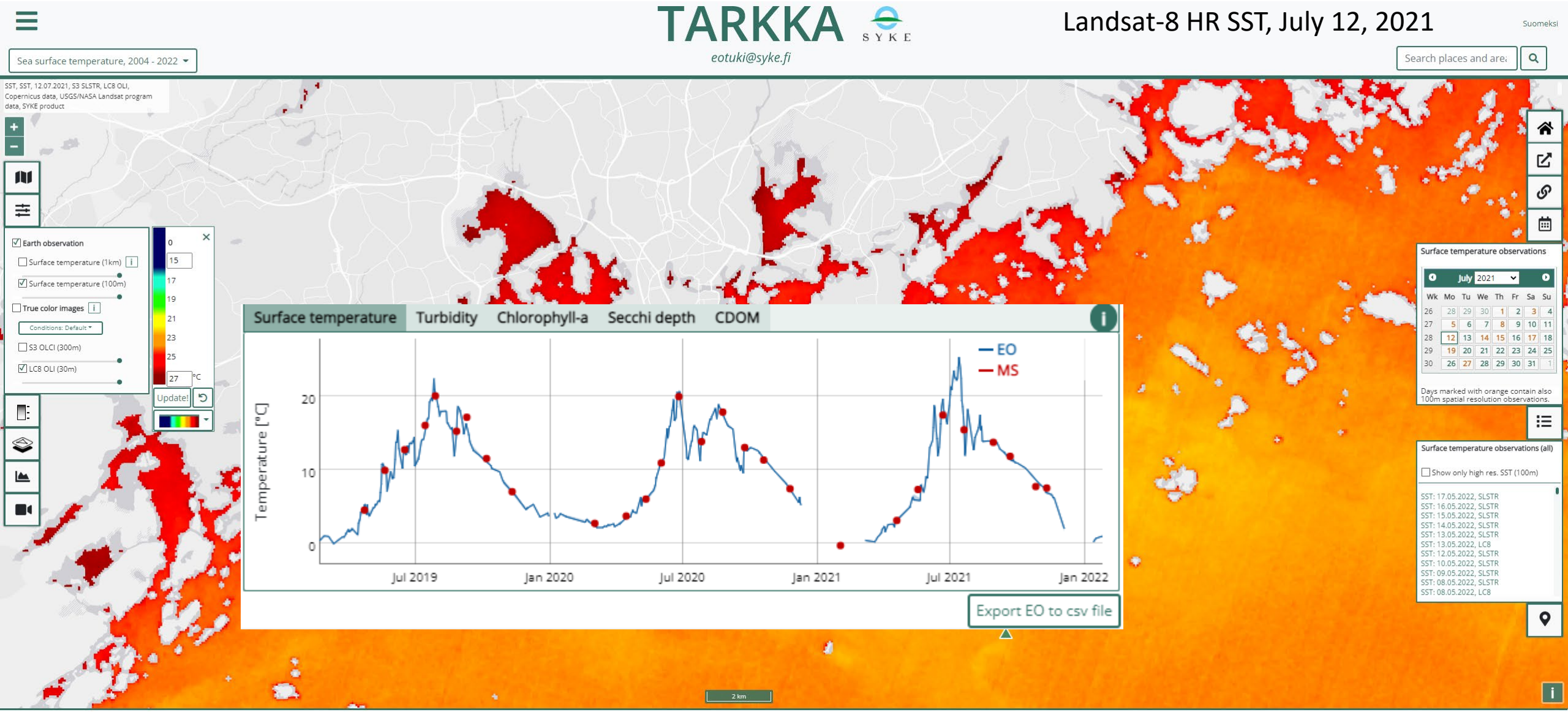






SYKE Brockmann Consult Brockmann Geomatics Sweden AB esa European Space Agency

Coastal temperature anomaly monitoring



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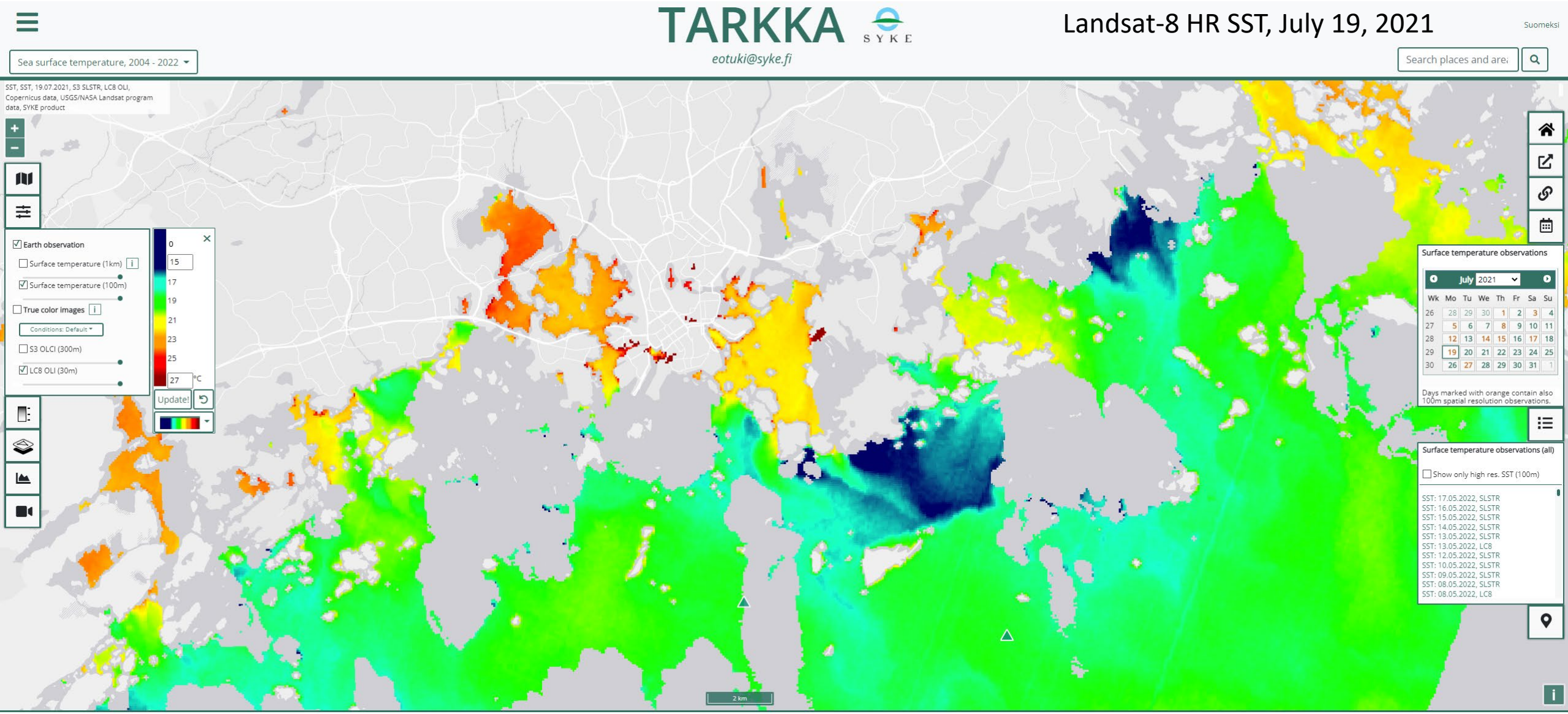

Summary

- Service demonstration phase ongoing (until Oct 2022)
  - More examples, data and functionalities on the way
- Website: www.syke.fi/projects/BalticAIMS
- Baltic Workshop coming in Oct 2022 (Helsinki & online)
- Additional info about open TARKKA service and demo possibilities at a poster by Hanna Alasalmi (E3.04 today) or at the Brockmann Consult booth
- Contact & more info: sampsa.koponen@syke.fi

Main requirements by large group of national authorities and HELCOM group experts

- Main interest was on receiving more observations on coastal processes related to
  - Separating human impacts from natural background changes
  - More information on water quality & human impact on coastal waters
  - Data gaps particularly in spring and wintertime
- How much of this can be achieved with satellite observations?
  - Many of the requirements can be met by combining satellite observations of turbidity, chl-a, temperature, ice cover to available GIS material & monitoring information

    -> EO can be utilized to complement the existing coastal GIS material for MSP
  - BalticAims-project works on the demonstration areas, but most cases can be expanded to Baltic Sea wide material later.