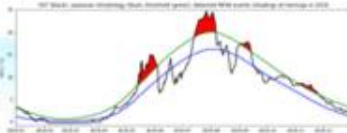
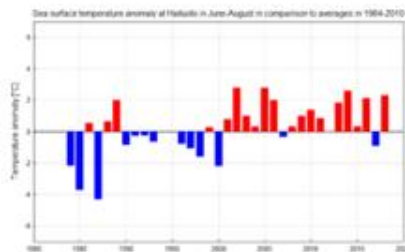


Integrating Argo into the observing system of the Baltic Sea

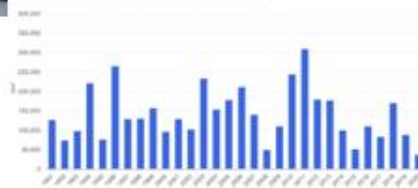
Laura Tuomi
and the Baltic Argo Team

Monitoring and observations

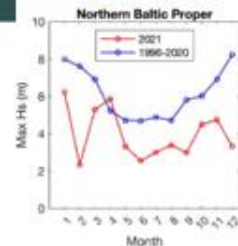
Hydrography



Ice



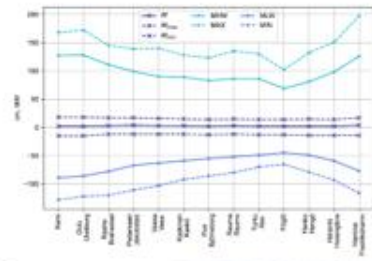
Waves



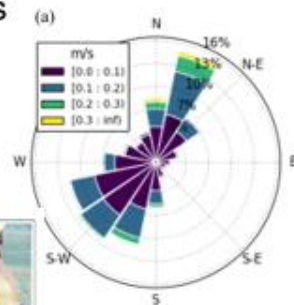
Coastal observatories



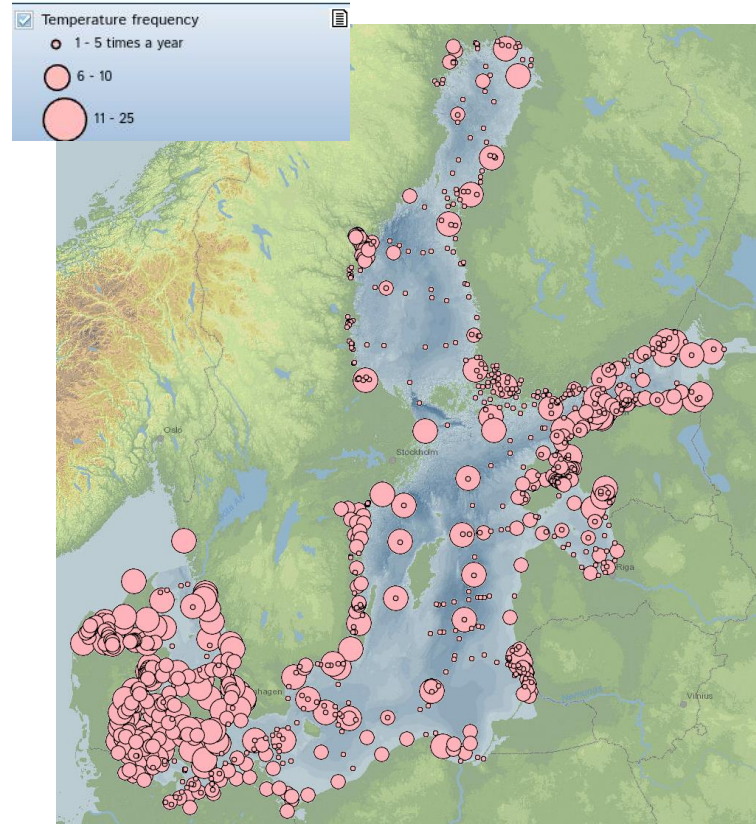
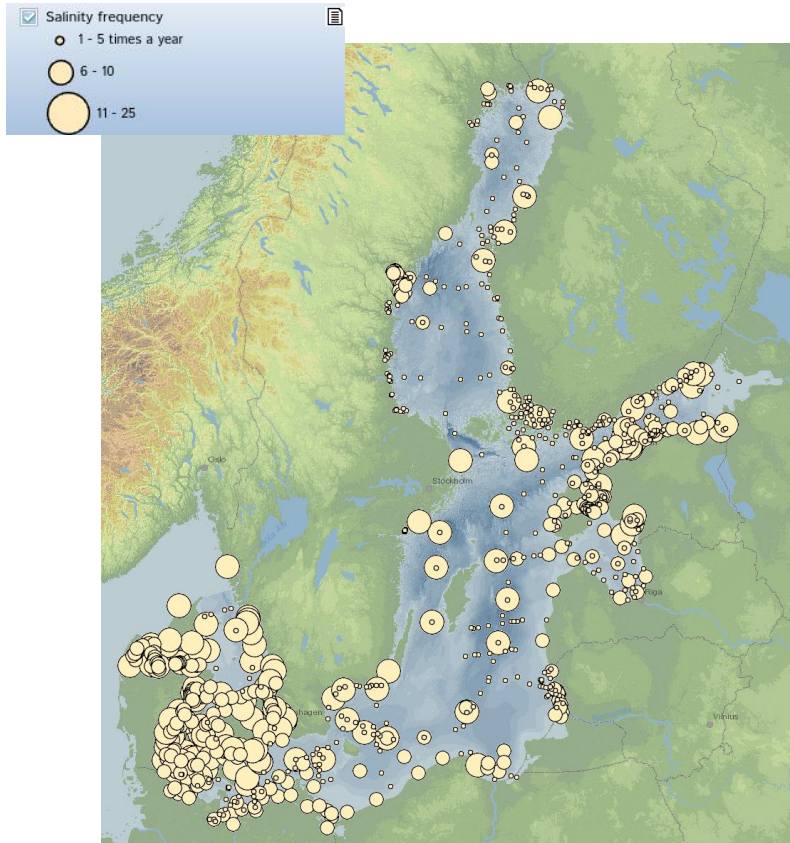
Sealevel



Currents

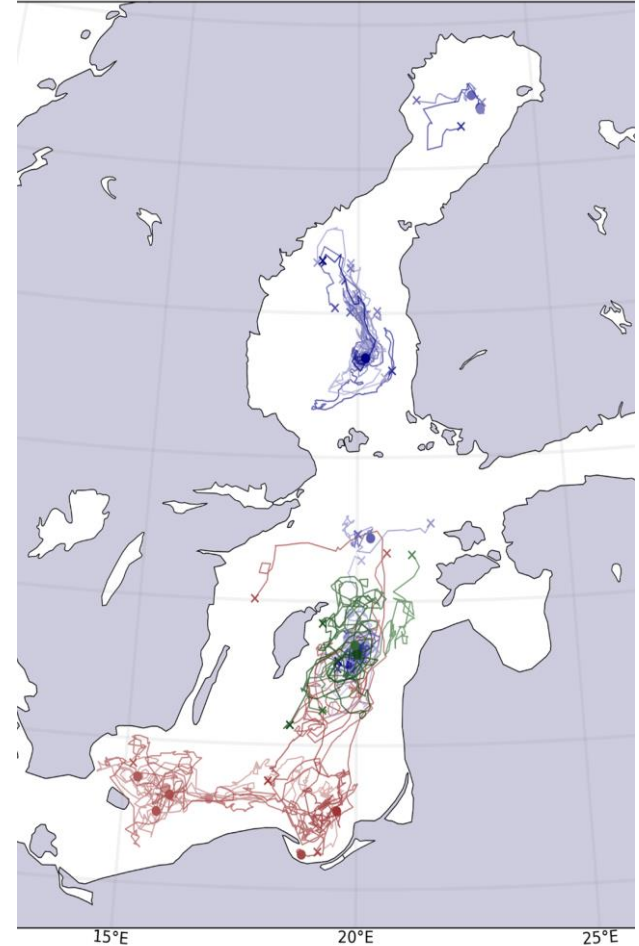


HELCOM hydrography data

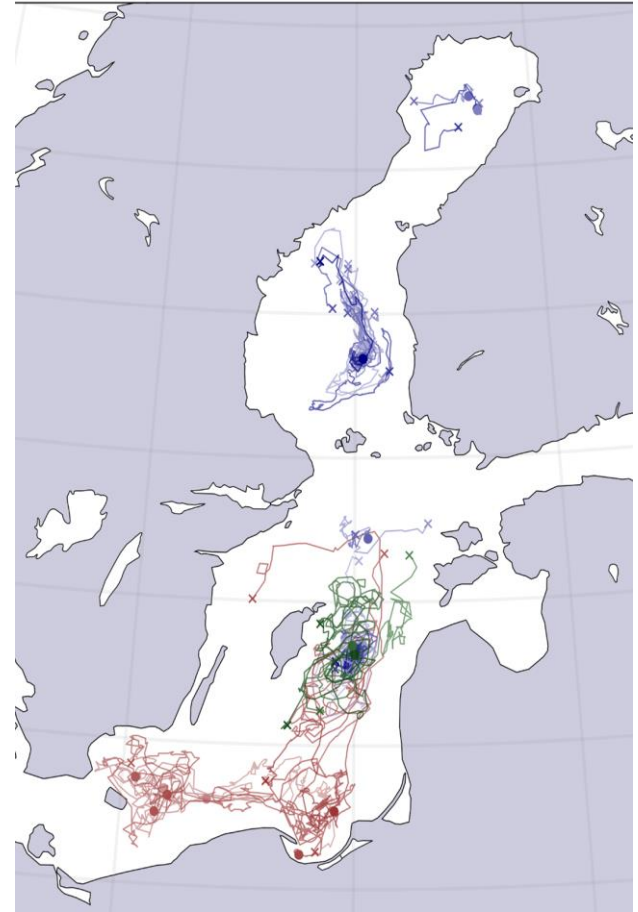
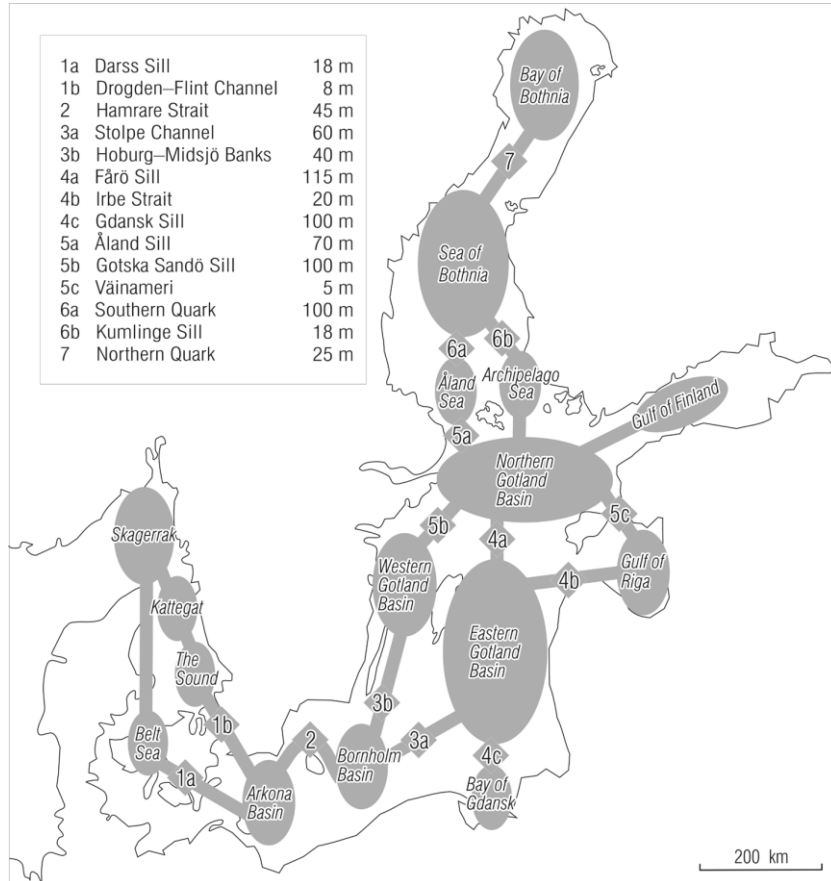


Argo floats provide

- Temporally & spatially dense data from open sea areas
 - complements existing observation network
 - new information of temperature and salinity changes
- Longest time series from the first Baltic deployment areas
 - Bothnian Sea 2012 ->
 - Eastern Baltic Proper/Gotlandland Deep 2013->
 - Variables: Temperature & Salinity → Stratification

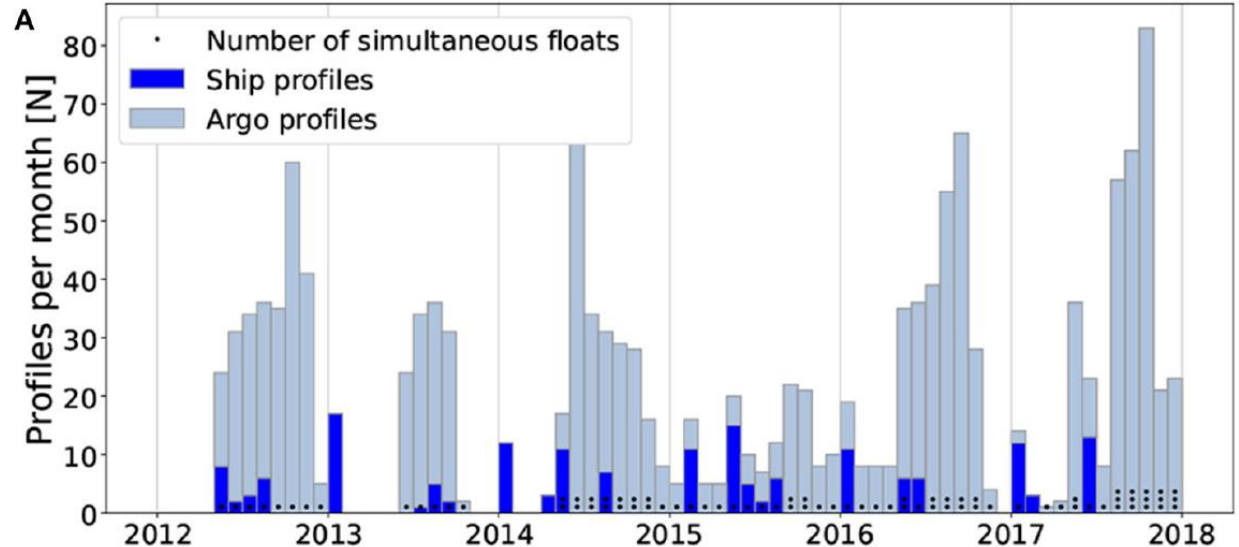
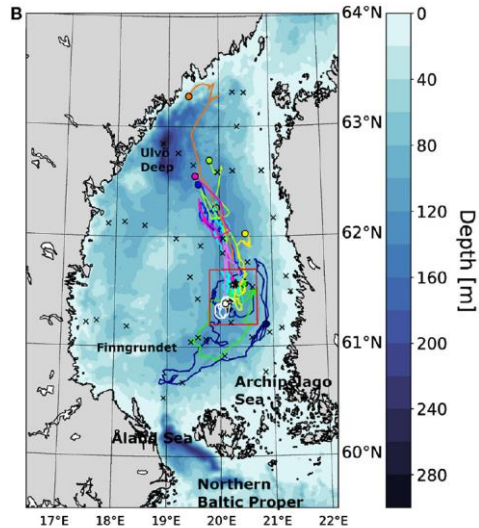


Argo floats - only some basins are covered



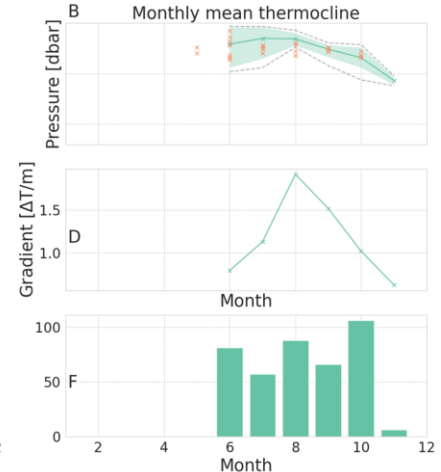
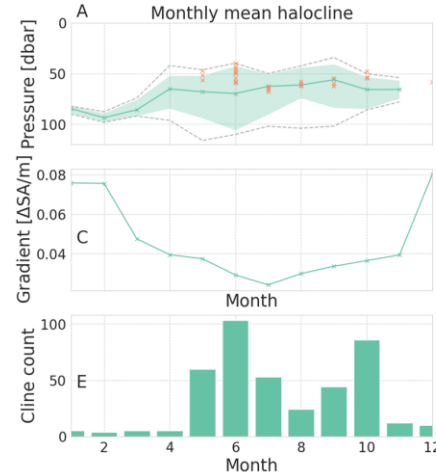
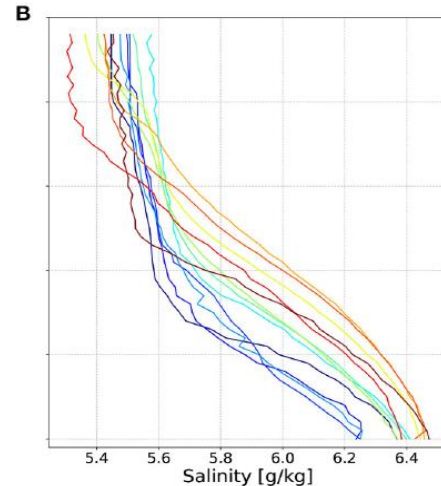
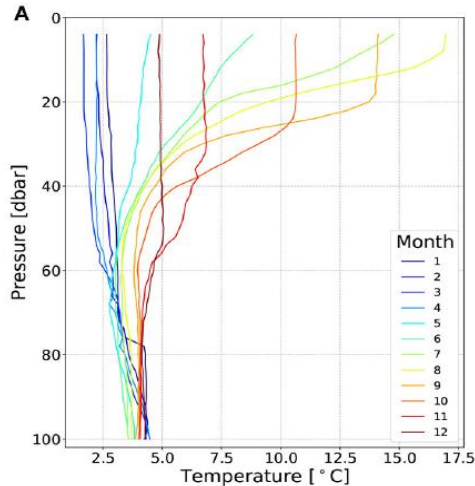
Argo floats compliment the information provided by traditional monitoring

In Bothnian Sea monitoring cruises are done 3-4 times a year and the number of additional T/S+O-profiles provided by Argo floats is considerable.



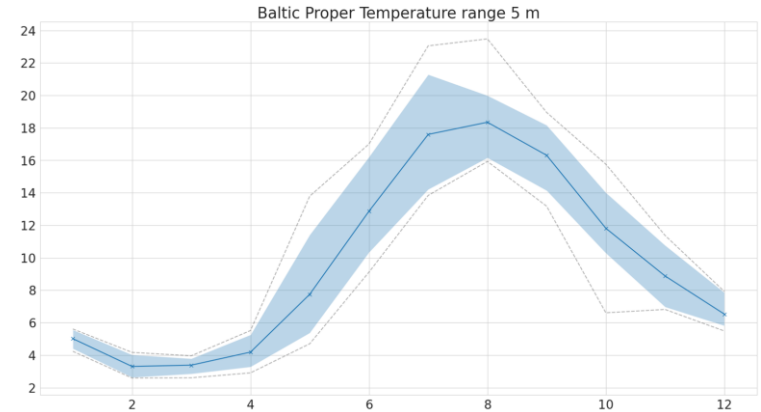
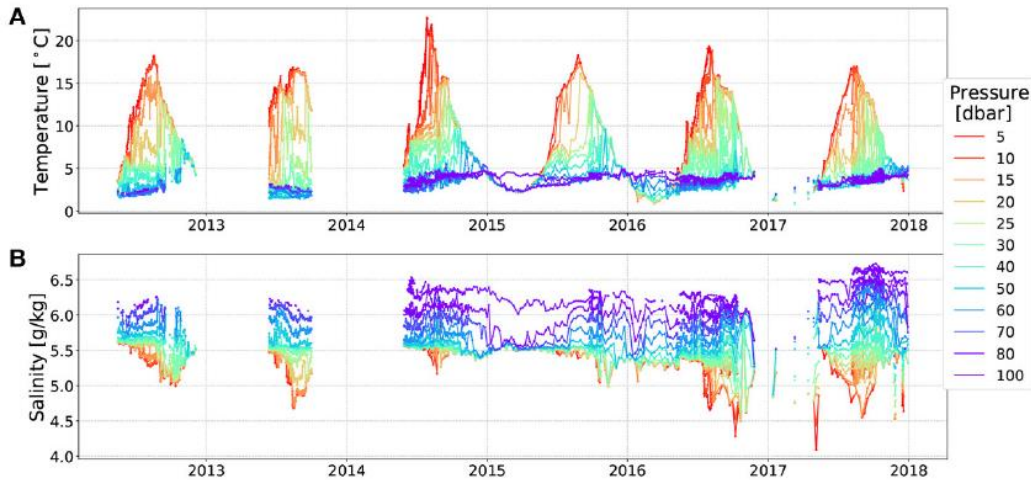
Added value of Argo data

With Argo floats we get more frequent measurements compared to ship data allowing us to **capture the seasonal cycles**: changes in halocline depth due to mixing and forming of seasonal thermocline. With increased number of floats with oxygen sensor, also oxycline.



Year-to-year variability

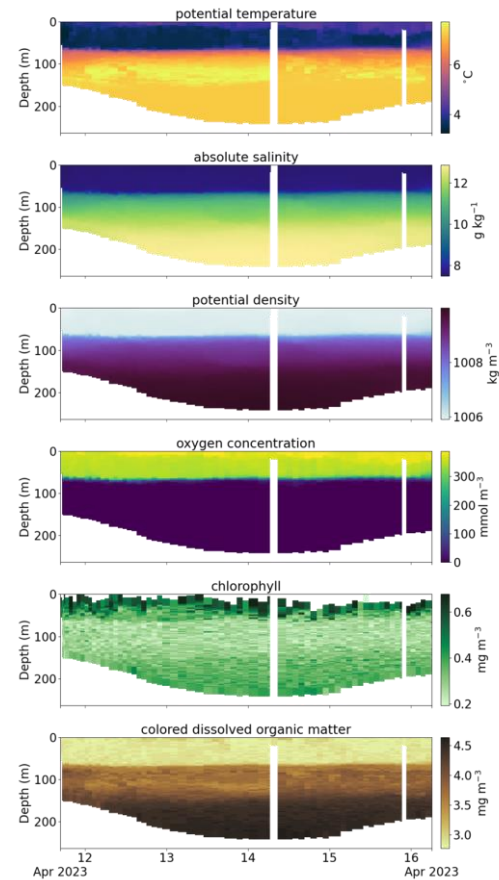
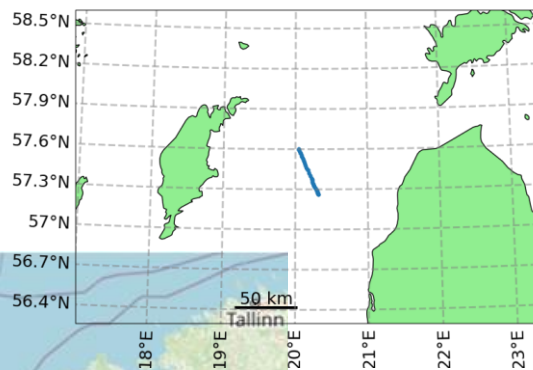
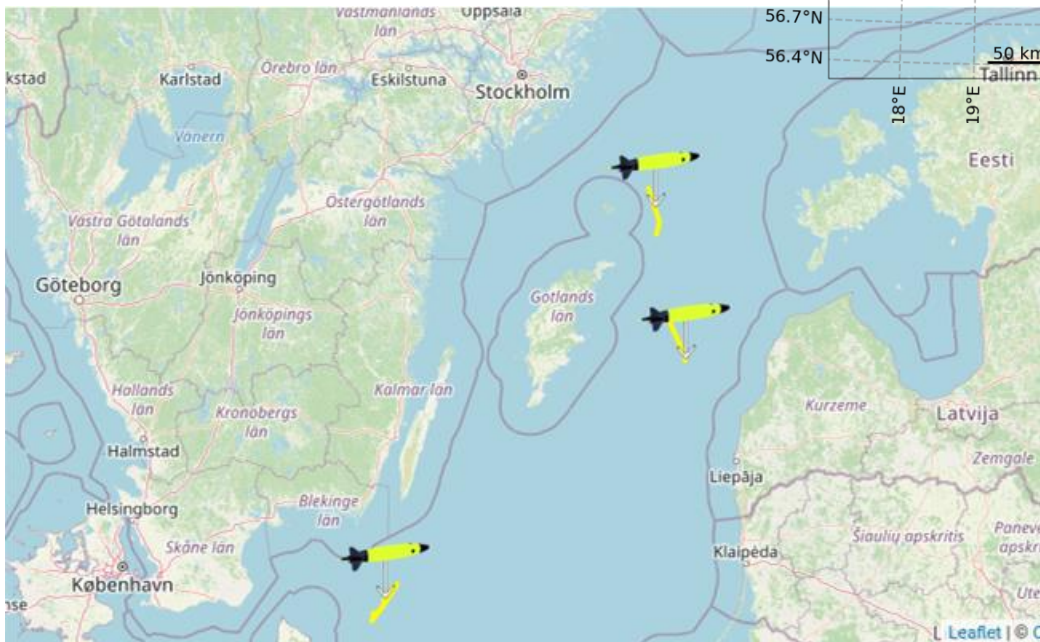
With more frequent measurements in the open sea areas of the Baltic Sea basin we also **capture better the extremes**.



Gliders - VOTO (observations.voiceoftheocean.org)

SEA79 Loka mission 11

VOTO: “15 gliders have recorded 248,521 profiles during 6 years 301 days at sea, covering 67,441 km”

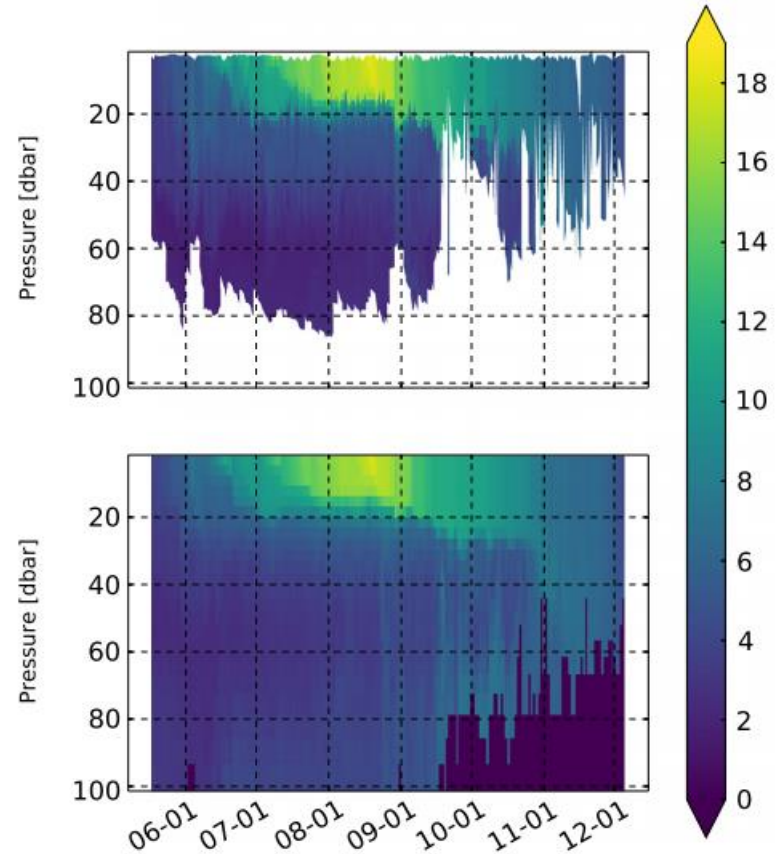


Synergies between Argo and Glider operations and DMQC work?



Improving Baltic Sea model reanalysis and forecasts

- Argo floats increase significantly the number of profile data in Baltic.
- Data is freely available in **near-real-time for assimilation** (e.g. CMEMS BAL MFC)
- In delayed mode, the data can be used to **validate and develop our model system** and improve the reanalyses the future projections made for the Baltic



Summary

1. **Argo floats considerably increase the amount of profile measurements in the Baltic Sea complementing data provided by existing monitoring programs**
1. **More frequent profile data enables studying seasonal cycles and extremes**
1. **The extension of Argo program to high latitudes enables us to get more data from seasonally ice-covered areas such as the northern Baltic Sea**
1. **The number of floats with biogeochemical sensors is increasing in the Baltic enabling environmental monitoring with Argo. Oxygen sensors are available on most Baltic Argo floats and in the Gotland Deep area several floats with new BGC sensor are being tested**
1. **Argo in the Baltic Sea provides possibility to enhance the monitoring of the marine environment and support the existing monitoring programs in the Baltic. Also the vast amount of data provided by Argo floats enables us to improve operational oceanographic services**
1. **Finding synergies between the Baltic Argo and Glider activities might strengthen work of both communities in the Baltic Sea and perhaps also in other shallow seas**