

Argo National Report 2023 – Finland

1. Status of implementation

The Finnish Argo program is run by the Finnish Meteorological Institute (FMI). Since 2010 FMI has deployed altogether 14 floats in the Nordic Seas, including four on Barents Sea 2018, 2020 and two in 2022. In addition to oceanic operations, 37 floats (starting 2012) have also been deployed into the shallow and low salinity Baltic Sea. Six of the Baltic float deployments have bio-optical sensor suite.

In 2023 FMI deployed total of 4 floats. One Apex float was deployed on Gotland Deep (WMO 3902579), one in Northern Baltic Proper (WMO 4903714) and two in Bothnian Sea (WMOs 3902531 and 2903899)

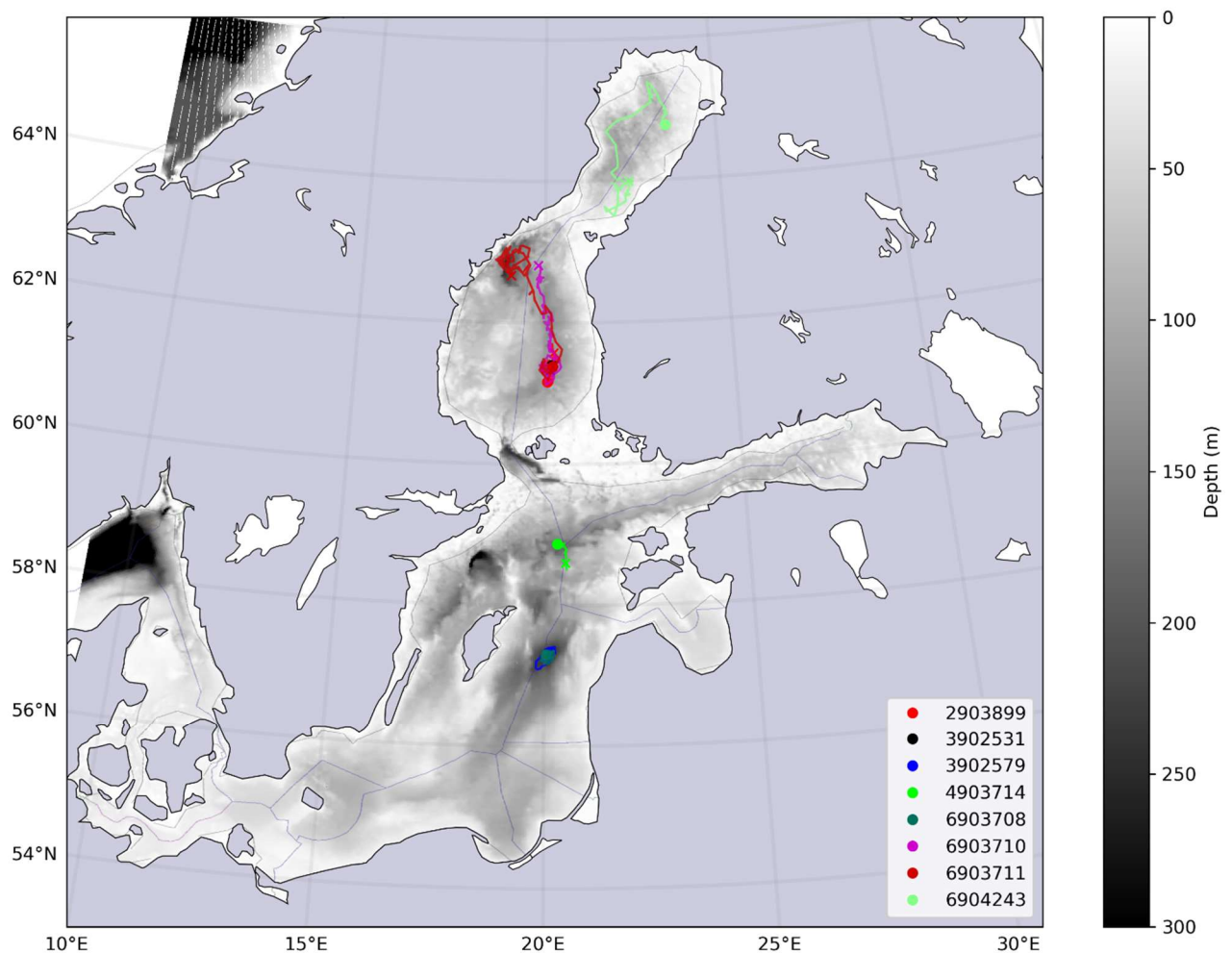


Figure 1, Routes of FMI Argo floats which operated in the Baltic Sea in 2023. Dots indicate the deployment location. Crosses indicate the recovery point or latest measurement for each Argo float. Light blue lines indicate the borders of national EEZ.

2. Present level and future prospects for national funding for Argo including summary of human resources devoted to Argo

FMI has committed to deploy three floats in a year, at minimum, and spends roughly 3 person months in Argo operations each year. Euro-Argo RISE project made it possible to increase the total person months used in Argo activities closer to 12 in earlier years. Our main geographical operation area is the Baltic Sea. Currently we are further developing the operation of Argo floats in shallow, and ice-covered seas. First experiments with ice-avoidance on the Baltic Sea has been performed during winter 2015-2016. 2018 one float (6802026) has been successfully under ice on Bay of Bothnia. In summer 2019 another float (6903700) was deployed in same area. A float deployed on Barents Sea in autumn 2018 (6903695) spent successfully two winters under ice, and another (6903705) was deployed on Barents Sea autumn 2020, which successfully measured for two winters and is currently under ice. The two Barents Sea floats deployed in 2022 are as of writing yet to resurface.

3. Summary of deployment plans

FMI plans to deploy at least 3 floats in 2024. One float will be deployed on Northern Baltic Proper, one or two in Bothnian Sea and one in Bothnian Bay.

4. Summary of national research and operational uses of Argo data

Argo data sets gathered from Baltic Sea are used for validating the operational and research circulation models, studies in hydrography and currents. Operating Argo floats in the Baltic Sea has been a research on the limits of usability of Argos in shallow seas. On this work three papers and one doctoral thesis were published on 2018-2019. (Haavisto et al. 2018, Roiha et al. 2018 and Siiriä et al. 2018, Roiha 2019) Ongoing research is done on assimilating Argo data in the operational Baltic Sea circulation models for enhancing their forecasting skills, further developing the operations in both shallow, and icy conditions, as well as quality control of the Baltic Sea Argo data.

5. Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo

Finland considers that more resources should be allocated for the environmental monitoring of the Arctic Ocean. Also, extension of the Argo program to the marginal seas, where Argo floats are an important addition in monitoring of these areas should be continued.

6. CTD data uploaded to CCHDO

No data uploaded.

7. Bibliography

- Haavisto N, Tuomi L, Roiha P, Siiria SM, Alenius P, Purokoski T. 2018. Argo floats as a novel part of the monitoring the hydrography of the Bothnian Sea. *Frontiers in Marine Science*. 5:324. <https://www.frontiersin.org/article/10.3389/fmars.2018.00324>.
- Roiha P, Siiria SM, Haavisto N, Alenius P, Westerlund A, Purokoski T. 2018. Estimating currents from Argo trajectories in the Bothnian Sea, Baltic Sea. *Frontiers in Marine Science*. 5:308. Available from: <https://www.frontiersin.org/article/10.3389/fmars.2018.00308>.
- Roiha P 2019 Dissertation, Advancements of operational oceanography in the Baltic Sea, Finnish Meteorological Institute Contributions 157, <http://hdl.handle.net/10138/308506>
- Siiria S, Roiha P, Tuomi L, Purokoski T, Haavisto N, Alenius P. 2018. Applying area-locked, shallow water argo floats in baltic sea monitoring. *Journal of Operational Oceanography*. 0(0):1–15. Available from: <https://doi.org/10.1080/1755876X.2018.1544783>.

8. RBR CTD piloting and deployment plans

Two deployments of Argo floats with RBR sensors were done within the EuroArgo RISE project in 2021. The results of these floats were promising, and FMI is considering to acquire more floats with RBR sensors to further continue operations with RBR sensors in addition to the SeaBird models, when manufacturers can provide models with both Oxygen sensor and RBR.