

# Argo National Report 2021 – Finland

## 1. Status of implementation

The Finnish Argo program is run by the Finnish Meteorological Institute (FMI). Since 2010 FMI has deployed altogether 12 floats in the Nordic Seas, including two on Barents sea 2018 and 2020. In addition of oceanic operations, 26 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.

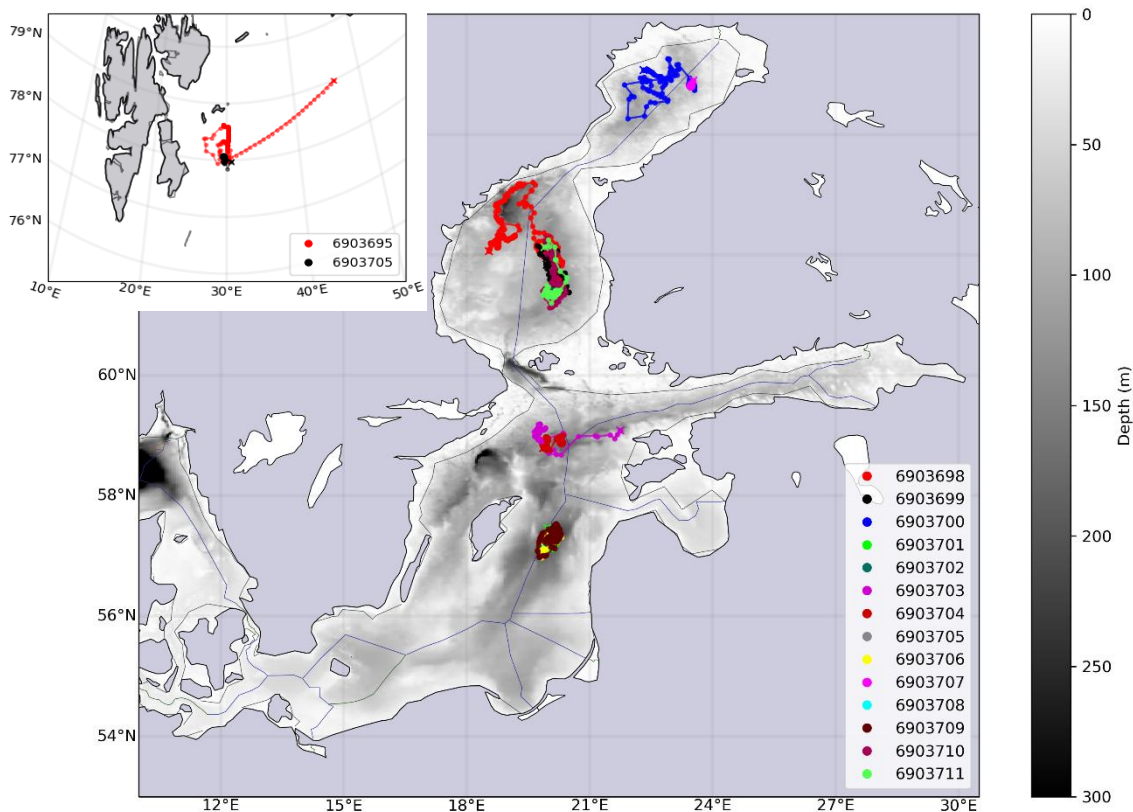


Figure 1, Routes of FMI Argo floats which operated in the Baltic Sea in 2021. Upper left inset shows the trajectories of the Barents Sea floats. The dot indicates the deployment location. Cross indicates the recovery point or latest measurement for each Argo float.

In 2021 FMI deployed total of 3 floats. One Apex float was deployed on Gotland Deep (WMO 6903708), on on Bothnian Sea (WMO 6903711) and one on Bothnian Bay (WMO 6903707).

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

FMI has committed to purchase and deploy three floats in a year, at minimum, and spends roughly 3 person months in Argo operations each year. Euro-Argo Rise project has made it possible to increase the total person months used in Argo activities closer to 12. 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. In 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 one winter and is currently under ice.

### **3. Summary of deployment plans**

FMI plans to deploy total of 3 floats in 2022. One float will be deployed on Bay of Bothnia, and two in Barents Sea.

### **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 Siirä 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. The Euro-Argo could coordinate developments and deployments of ice-tethered Argos.

### **6. CTD data uploaded to CCHDO**

No data uploaded.

### **7. Bibliography**

Haavisto N, Tuomi L, Roiha P, Siirä 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, Siirä 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>

Siirä 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. Effects of COVID-19**

COVID-19 situation forced some cruises to be rescheduled which had caused challenges for deployment planning. The challenges have been manageable.

#### **9. RBR CTD piloting and deployment plans**

Two deployments of Argo floats with RBR sensors were done within the Euro Argo Rise project in 2021. The results of these floats will be used to determine further plans for Finnish Argo operations.