



Argo-Poland National Report 2021

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1. The status of implementation of the new global, full-depth, multidisciplinary Argo array

a. floats deployed and their performance

In 2021, during the AREX 2021 summer cruise, seven floats were launched from the board of Institute of Oceanology Polish Academy of Sciences (IO PAN) vessel *r/v Oceania*. Four floats belong to Germany, three to Argo-Poland. One float was launched on the way in the Baltic Sea, five floats were deployed in the Norwegian and Greenland Sea and one in the Barents Sea (Fig. 1).

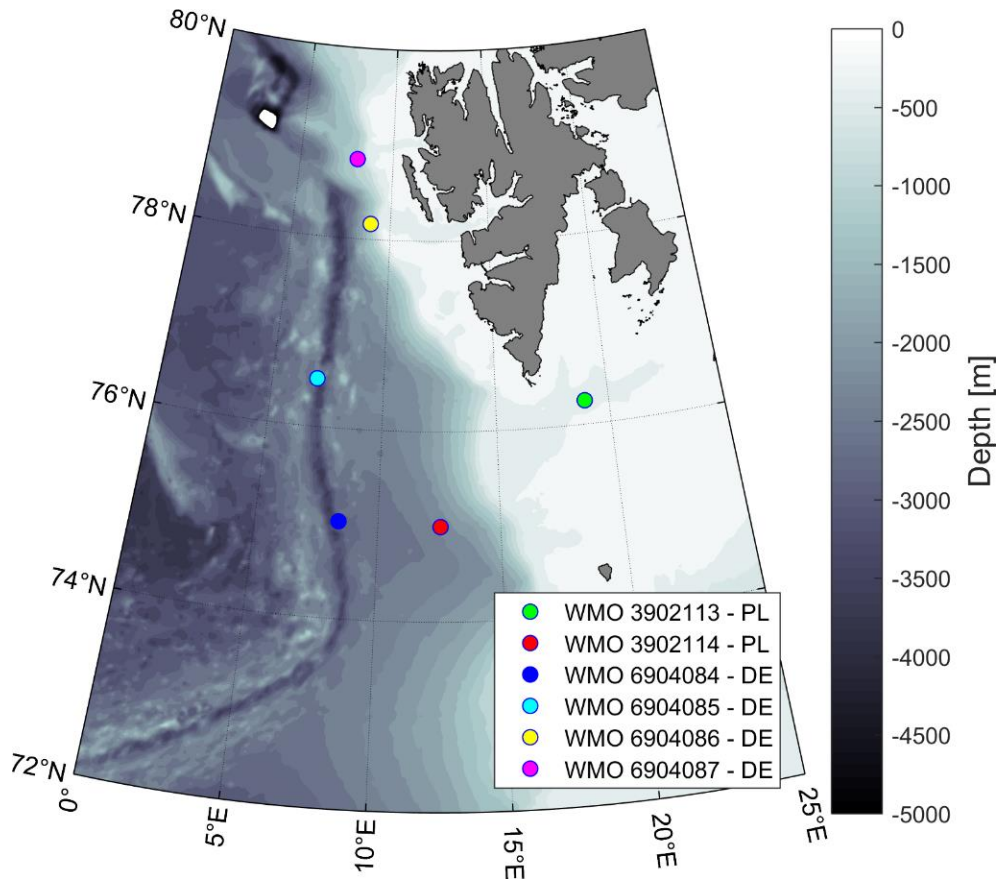


Figure 1. Argo floats launching positions during the AREX 2021 cruise.

The first Polish float (WMO 3902115) was deployed in mid-June in the Bornholm Basin at the position 55.25 °N, 16.03 °E. The parking depth was set at 300 dbars and the profiling depth at 350 dbars, both deeper than the bottom depth. The goal of the mission was to keep the float on a limited area and use it as a virtual mooring (Fig. 2). The float works in 2-days cycles. The float was operated for the whole of 2021 and has sent 98 complete sets of hydrographic data (CTD, O₂) by the end of the year.

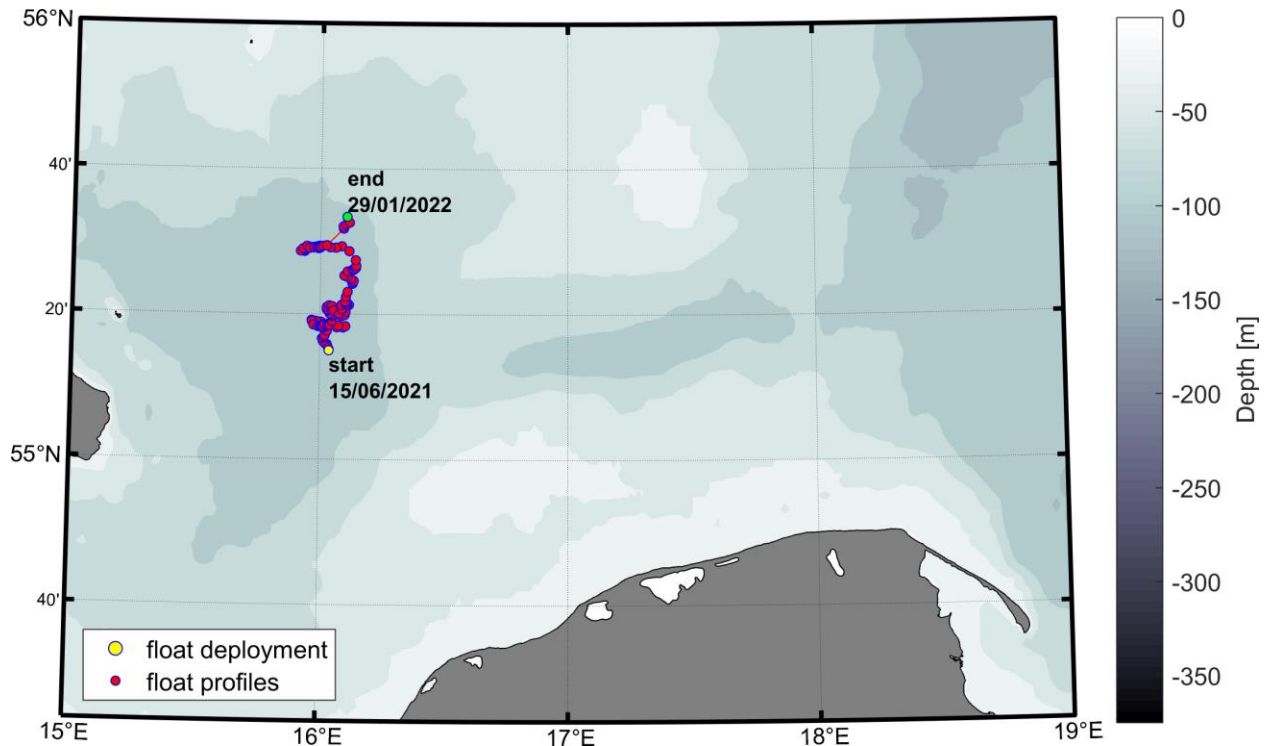


Figure 2. Position of deployment and trajectory of the Argo float WMO 3902115 deployed in the Baltic Sea (Bornholm Basin) by the Argo-Poland program in June 2021.

The second float (WMO 3902113), belonging to Argo-Poland, was experimentally launched in a shallow region south of Svalbard, Storfjordenna at the end of June (76.25 °N, 18.94 °E). This area is important for dense, cold bottom water production, that inflow from the Storfjord to the Norwegian Sea. Due to the unusual conditions, the float profiled with a frequency of 48 hours. The float worked very well until it was trawled by a Norwegian fishing vessel. The captain of the ship contacted IOPAN, it was decided to deliver the float to Tromsø. Courtesy of the Norwegian Polar Institute, in October the float was taken from the fishing vessel and loaded onto the Norwegian vessel *r/v Kronprins Haakon*. Polish oceanographers participated in the October-November cruise of this modern oceanographic vessel. During the cruise, attempts were made

to re-deploy the float, but it was impossible as it failed the tests. The float will be thoroughly inspected and launched in 2022. A series of 49 profiles, which were obtained, show great potential in the exploration of even such difficult waters by Argo floats (Fig. 3).

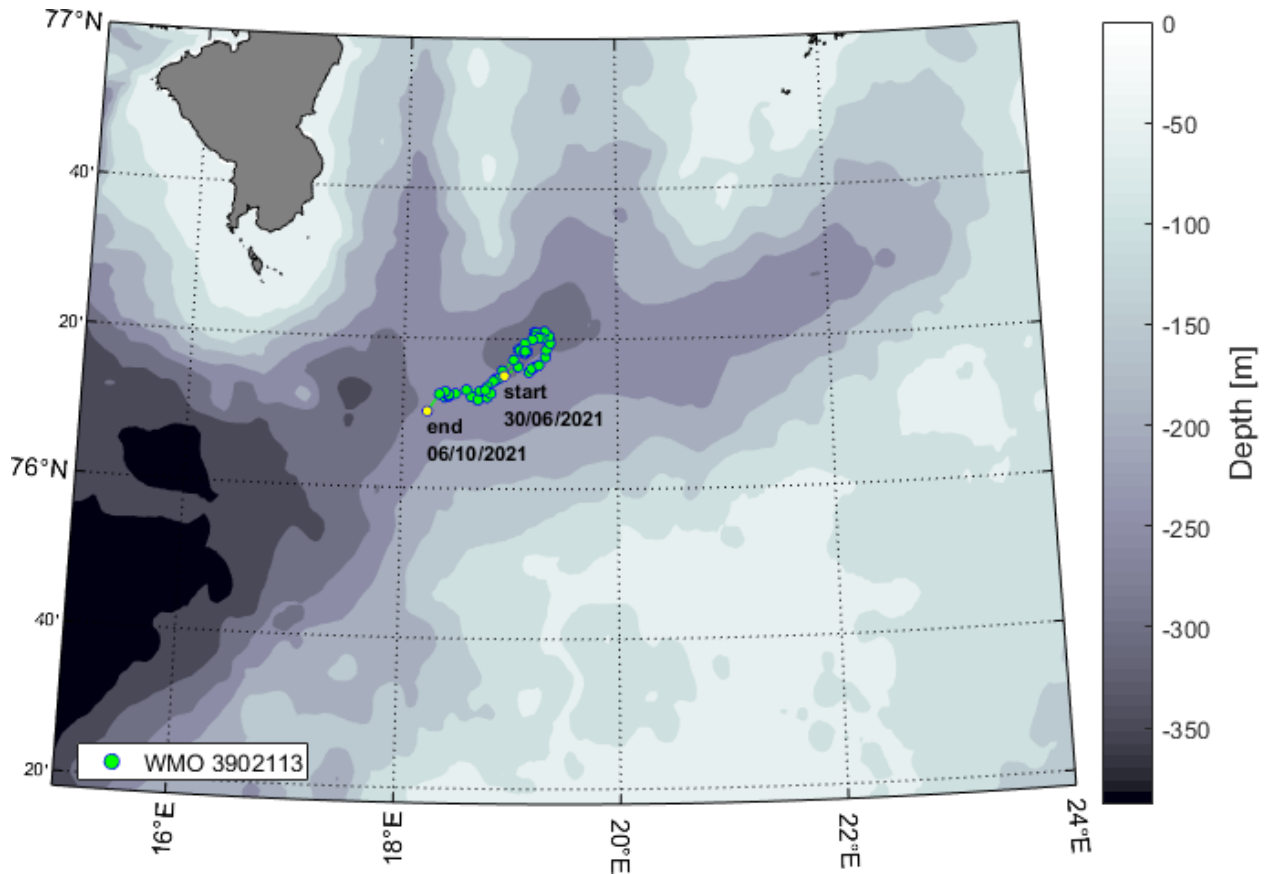


Figure 3. Position of deployment and trajectory of the Argo float WMO 3902113 deployed in the Storfjordrenna by the Argo Poland program in June 2021.

At the beginning of July, the third float (WMO 3902114) was deployed in the Norwegian Sea in the West Spitsbergen Current region (75.00 °N, 12.55 °E). The parking depth was set at 1000 dbars and the profiling depth at 2000 dbars. Float has cycles of 10 days. The float was operated for the whole of 2021 and has sent 18 complete sets of hydrographic data by the end of the year (Fig. 4).

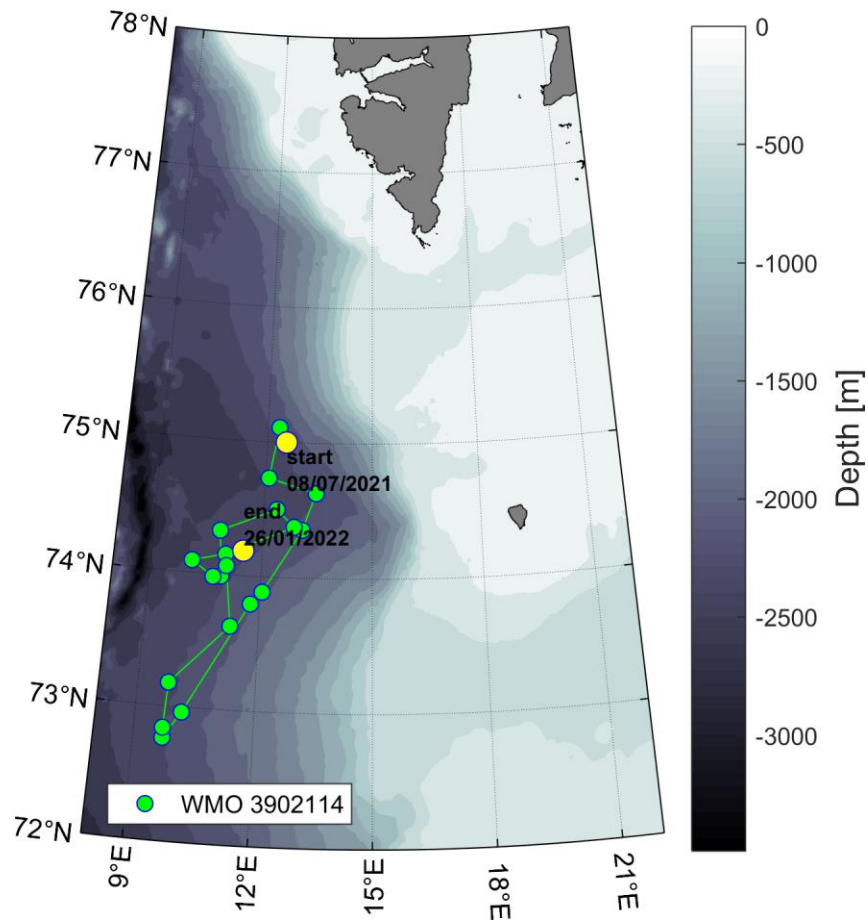


Figure 4. Position of deployment and trajectory of the Argo float (WMO 3902114) deployed in the Norwegian Sea by the Argo Poland program in July 2021.

All three instruments are the NKE manufactured ARVOR floats with an Iridium transmission system and ice avoidance algorithms. In addition to standard CTD measurements, the floats also take measurements of dissolved oxygen.

In June 2020, the Baltic float (WMO 3902109) were deployed in the Gulf of Gdansk under the H2020 Euro-Argo Research Infrastructure Sustainability and Enhancement (E-A RISE) EU project. The goal of the mission was to keep the float on the limited area and use it as a virtual mooring (Fig. 5). At the beginning of August 2021, the float was pulled out by the German Navy vessel in the Gulf of Gdansk. During the mission, the float made 500 profiles and sent a complete set of CTD data.

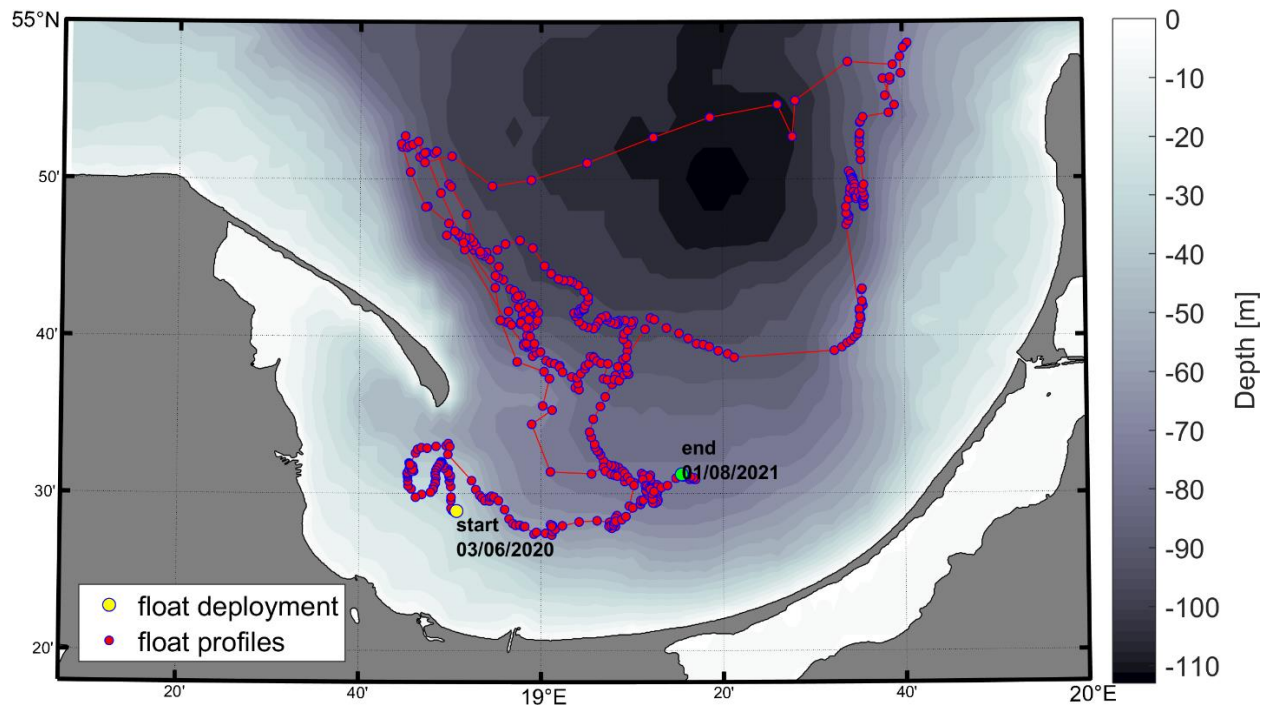


Figure 5. Position of deployment and trajectory of the Argo float WMO 3902109 deployed in the Baltic Sea (Gulf of Gdansk) by the Argo Poland program in June 2020.

b. technical problems encountered and solved

All floats were deployed by the Institute of Oceanology Polish Academy of Sciences (IO PAN) from the board of the Institute research vessel 'Oceania'. There were no technical problems with floats.

c. status of contributions to Argo data management.

Data from floats were provided to the Ifremer Argo Center and processed in the Center. All data are available online. IO PAN provided CTD data collected by r/v Oceania during AREX cruises in the Nordic Seas (2000-2018) and the Baltic Sea (2016-2019) to the Argo references database.

d. status of delayed mode quality control process

Standard DMQC procedures have been used by DMQC operator from IOPAN for the following Arctic floats:

3902102 – Salinity correction was needed.

3902103 – Salinity correction was needed.

3902105 - It is fine and needs no correction.
3902107 – It is fine and needs no correction.
3902108 – It is fine and needs no correction.
3902111 – It is fine and needs no correction.
3902112 – Salinity correction was needed.

D-files were submitted on GDAC.

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

Argo-Polska was funded until May 2021 by the Ministry of Science and Education. After the announcement of a new call for funding, the Institute of Oceanology of the Polish Academy of Sciences applied to the Polish Ministry for funding the Argo-Poland consortium. The members of the consortium are the Institute of Oceanology PAN, Institute of Geophysics PAN and Polish Naval Academy. We are currently waiting for a decision regarding further funding.

3. Summary of deployment plans.

Argo-Poland plans to launch one float a year in the Baltic Sea and at least two in the European Arctic. The financing decision for 2022, however, is still under consideration.

4. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers.

IO PAN runs the long-term Nordic Seas observation program AREX. Argo floats are a valuable source of data complementing the measurement data obtained by *r/v Oceania*. This applies in particular to the seasonal variability of the water masses properties (cruises are conducted only in summer) and sea currents pathways in the Svalbard region.

<https://old.iopan.pl/hydrodynamics/po/Argo/argo.html>

At the Baltic Sea Argo floats data are used to monitor the inflow of salty waters from the North Sea. Also, data on the oxygen content in the Baltic Sea deep basins and current pathways are especially valuable. Argo data are also used for the modelling in the SatBaltyk project.

<http://www.satbaltyk.pl/en/>

Project SufMix (Turbulent Mixing in the Slupsk Furrow) uses Argo data as well.

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

No issues.

6. CTD stations.

Table 1. List of CTD stations performed during floats deployment during IOPAN cruise AREX2021.

Float WMO	Date of deployment	Region	Vessel	Cruise	CTD/O ₂ cast	Float owner
3902113	30.06.2021	Barents Sea	r/v Oceania	AREX2021	AR21_055	PL
3902114	07.07.2021	Norwegian Sea	r/v Oceania	AREX2021	AR21_094	PL
3902115	15.06.2021	Baltic Sea	r/v Oceania	AREX2021	AR21_001	PL
6904084	07.07.2021	Norwegian Sea	r/v Oceania	AREX2021	AR21_090	DE
6904085	04.07.2021	Greenland Sea	r/v Oceania	AREX2021	AR21_075	DE
6904086	16.07.2021	Greenland Sea	r/v Oceania	AREX2021	AR21_138	DE
6904087	16.07.2021	Greenland Sea	r/v Oceania	AREX2021	AR21_143	DE

Data will be submitted.

7. Argo bibliography

Merchel M., Variability of properties and spatial distribution of deep and intermediate waters in the Nordic Seas in the years 1998–2017, PhD thesis, defended on 25 October 2021.

8. How has COVID-19 impacted your National Program's

No problems with floats deployment and recovery.