



## Argo-Poland National Report 2020

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1. The status of implementation of the new global, full-depth, multidisciplinary Argo array (major achievements and problems in 2020)
  - a. floats deployed and their performance

In 2020 Poland launched 4 floats from the board of Institute of Oceanology Polish Academy of Sciences (IO PAN) vessel *r/v Oceania*. Three floats were deployed under the Argo-Poland program, which is Polish contribution to the Euro-Argo ERIC infrastructure, one Baltic Sea float were deployed under the H2020 Euro-Argo Research Infrastructure Sustainability and Enhancement (E-A RISE) EU project.

Two Argo floats (WMO 3902111, 3902112) were deployed in the Nordic Seas at the end of June 2020 at positions 75.36N, 15.36E and 75.01N, 08.47E respectively (Fig. 1). Both instruments are the NKE manufactured ARVOR floats with Iridium transmission system, ice avoidance algorithms. The parking depth was set at 1000 dbars and the profiling depth at 2000 dbars. Floats have cycles of 10 days. One float (WMO3902112) was operated for the whole of 2020 and has sent 18 complete sets of hydrographic data by the end of the year. In addition to standard CTD measurements, second of the float (WMO 3902111), also has taken measurements of dissolved oxygen. Unfortunately, the float drifted north through the Fram Strait into the Arctic Ocean. In early October, the float stopped sending the data. Most likely the cause was that the float drifted under the sea ice.

Two floats deployed in Nordic Seas in June 2016 (WMO 3901850, 3901851), one in June 2017 (WMO 3901911), one in June 2018 (WMO 3902102) and one in June 2019 (WMO 3902108), were also active during the whole 2020 year.

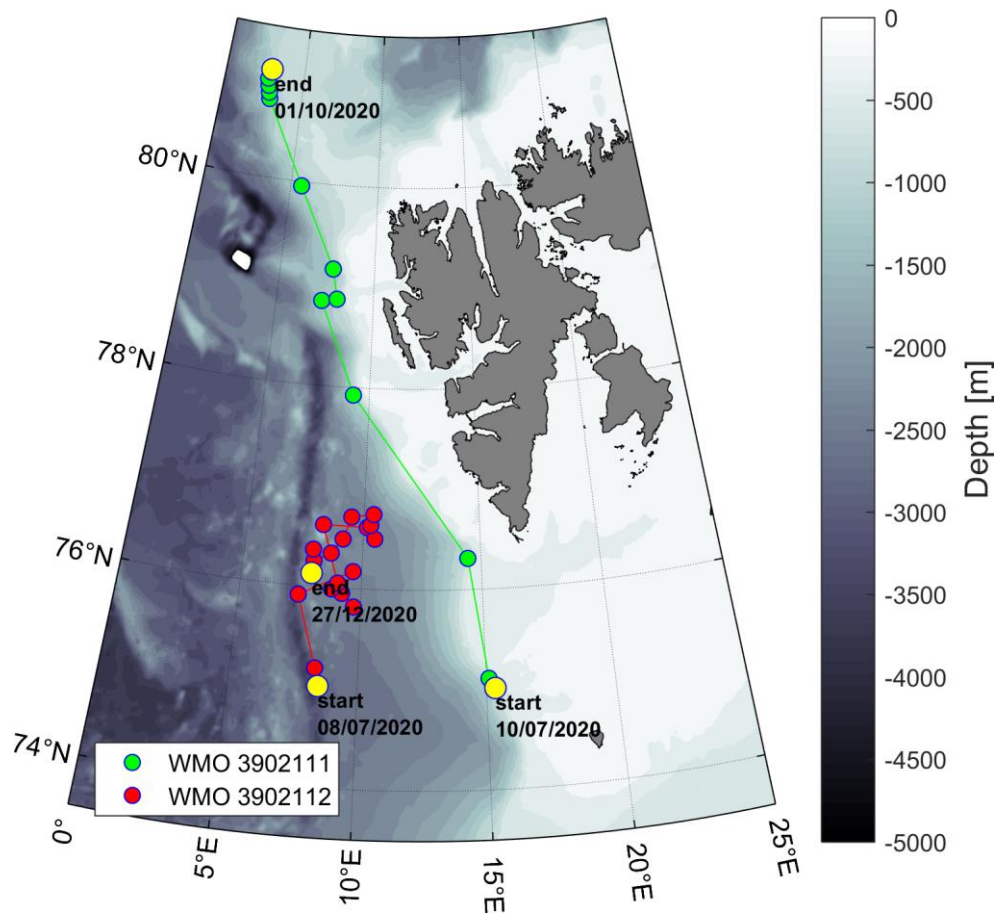


Fig. 1. Positions of deployment and trajectories of two Argo floats deployed in the Nordic Seas by Argo-Poland program in June 2020.

In addition to launching Argo floats in the Arctic, since 2016 IO PAN has been researching the Baltic Sea using Argo floats. At the end of May and the beginning of June 2020, two Argo floats (WMO 3902110, 3902109) were deployed in the Baltic Sea from the board of *r/v Oceania* (Figs 2, 3). The first float was launched in the Bornholm Basin. The parking depth is 50 m, float profiles water column from surface to bottom, with two days frequency. In addition to standard CTD measurements, it also take measurements of dissolved oxygen. The second float was launched within the E-A RISE project in the Gulf of Gdansk. The target of the mission is to keep the float in limited area and use it as a ‘virtual mooring’. Float parks at the bottom, profiles water column with frequency one day. Both floats are NKE ARVOR instruments.

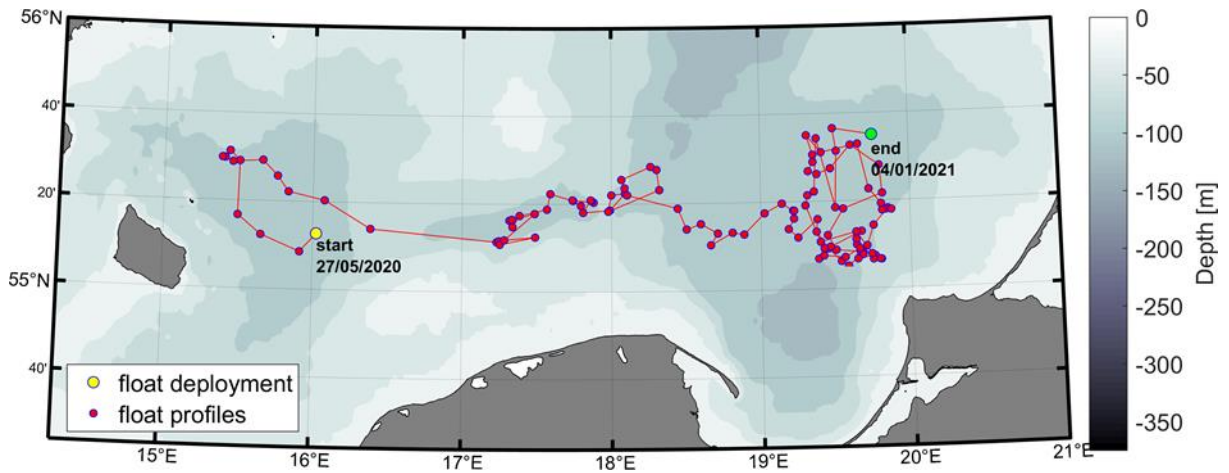


Fig. 2. Position of deployment and trajectory of the Argo float (WMO 3902110) deployed in the Baltic Sea (Bornholm Basin) by Argo-Poland program in May 2020.

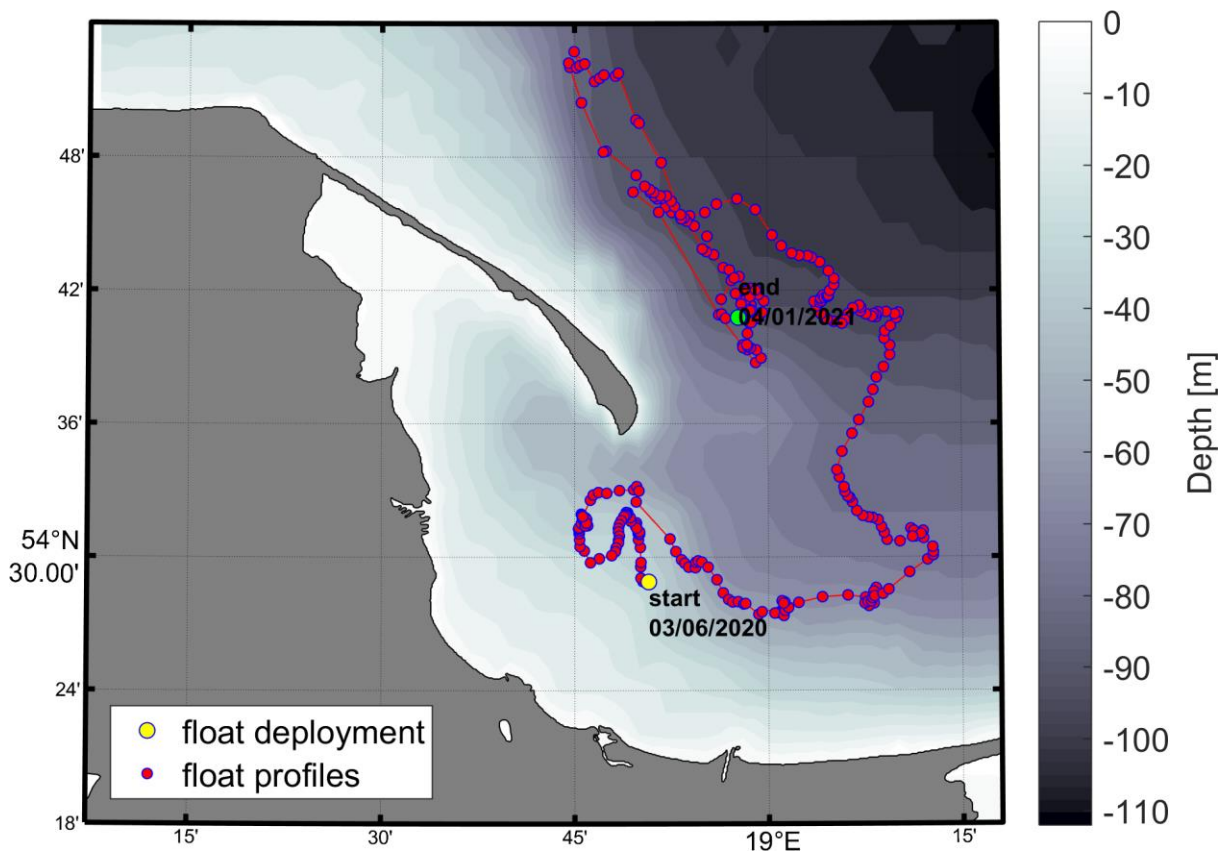


Fig. 3. Position of deployment and trajectory of the Argo float (WMO 3902109) deployed in the Baltic Sea (Gulf of Gdansk) by Argo-Poland program in June 2020.

The small size of the Baltic Sea makes the recovery of floats economically justified. In February 2020, the Baltic float WMO3902101 (Fig. 4) launched by IO PAN in 2018 within the Bornholm Basin, was recovered by IO PAN employees from the deck of the yacht *r/v Magnus Zaremba*. The recovered float will be sent for sensor calibration and it will be used for further missions. During 2 years of work in the Baltic Sea, the float made 373 profiles of temperature, salinity and dissolved oxygen content in sea water. At that time, the float was drifting from the Bornholm Basin to the Western Gotland Basin.

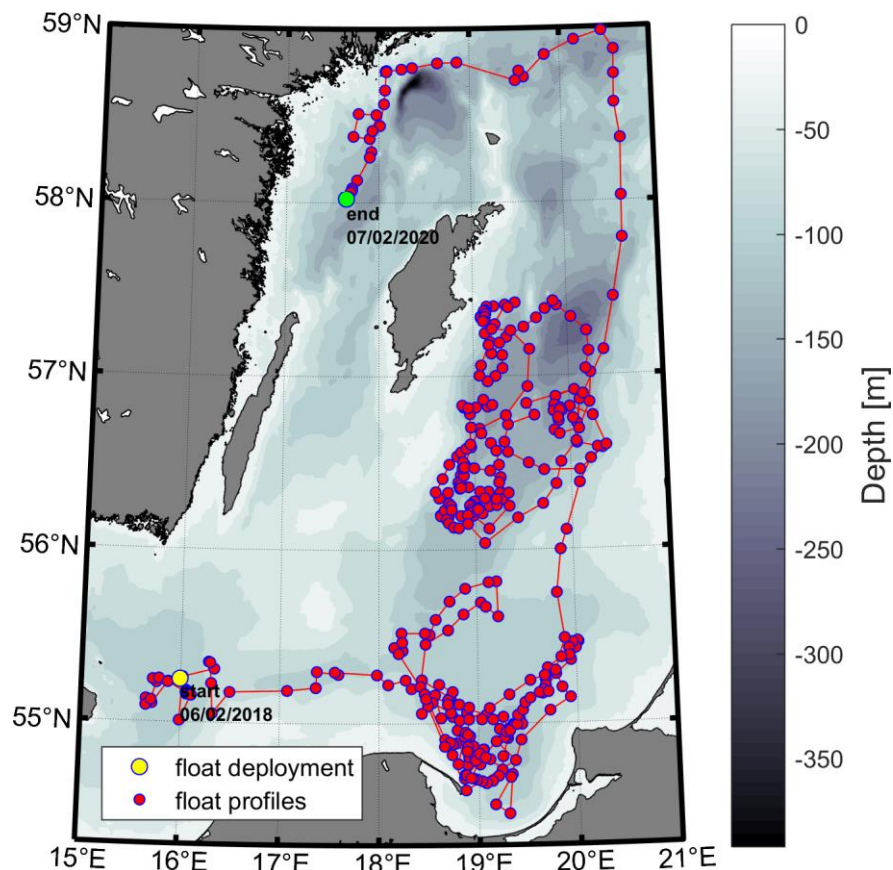


Fig. 4. Position of deployment and trajectory of the Argo float (WMO 3902101) deployed in the Baltic Sea (Bornholm Basin) by Argo-Poland program in February 2018.

In December 2020, the Baltic float WMO3902106 (Fig. 5) deployed by IO PAN in 2018 in the Bornholm Basin was recovered by the Estonian vessel *r/v Salme* north of the Hiiumaa Island. We thank Estonian friends for their help in this difficult operation. This is the next, important stage of cooperation in the Baltic Sea. The float has been taking measurements for over two years, since September 11, 2018. During this time, it made 418 profiles, providing valuable CTD/O<sub>2</sub> data. Also, examining the condition of the float (batteries, sensors) will certainly be a valuable contribution to the EA RISE program.

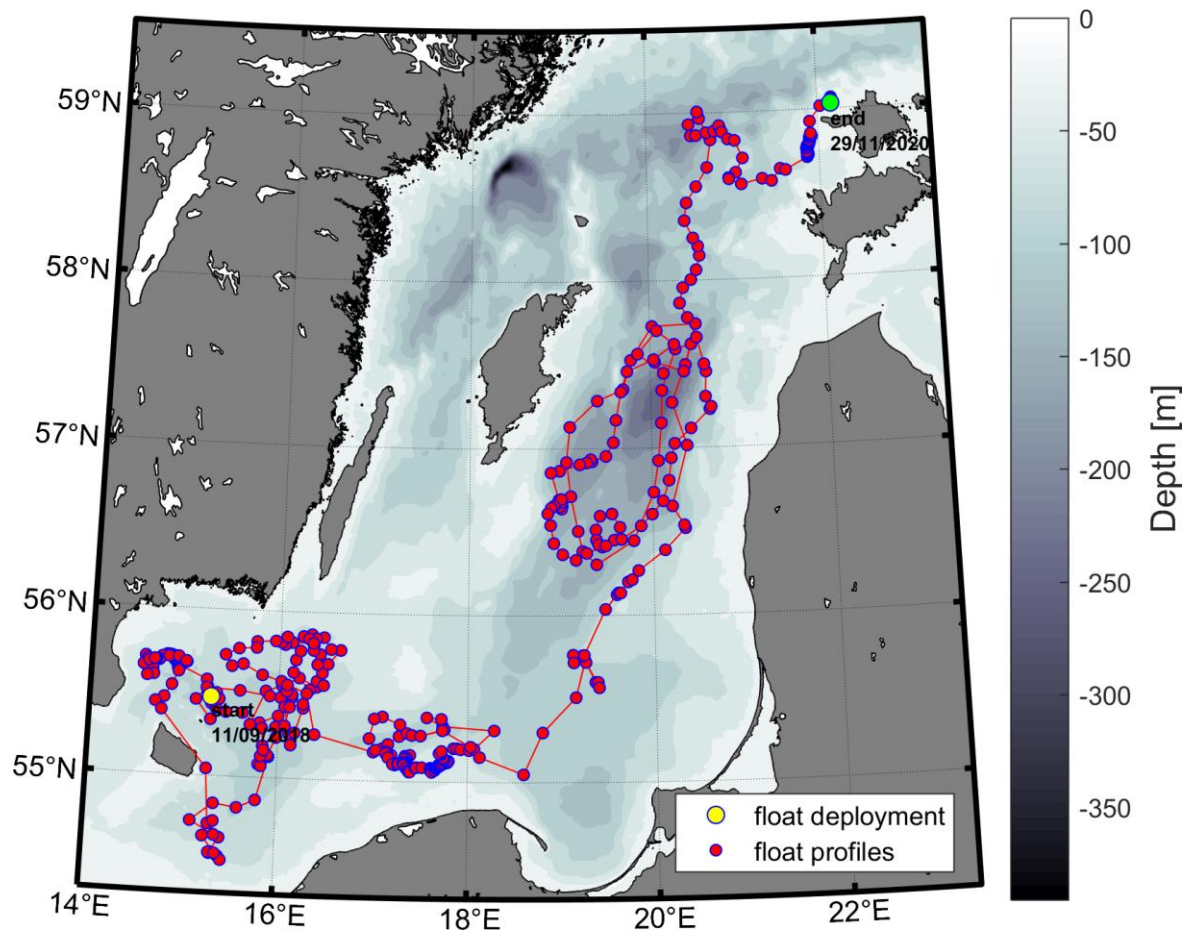


Fig. 5. Position of deployment and trajectory of the Argo float (WMO 3902101) deployed in the Baltic Sea (Bornholm Basin) by Argo-Poland program in September 2018.

b. technical problems encountered and solved

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

c. status of contributions to Argo data management (including status of high salinity drift floats, decoding difficulties, ramping up to include BGC or Deep floats, etc)

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

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.

3902107 – No salinity correction was needed.

3902108 – No salinity correction was needed.

2. Present level of and future prospects for national funding for Argo including a summary of the level of human resources devoted to Argo, and funding for sustaining the core mission and the enhancements: BGC, Deep, Spatial (Polar, equator, WBCs)

Present level of national funding for Argo-Poland is about 560 000 PLN (125 000 Euros). We are currently waiting for a decision regarding further funding.

3. Summary of deployment plans (level of commitment, areas of float deployment, Argo missions and extensions) and other commitments to Argo (data management) for the upcoming year and beyond where possible.

Argo - Poland has not yet received a decision on funding in the following years.

4. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers. Please also include any links to national program Argo web pages to update links on the AST and AIC websites.

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 variability of the seasonal properties of water masses (cruises are conducted only in summer) and sea currents pathways in the Svalbard region.

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

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

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

Also project SufMix (Turbulent Mixing in the Slupsk Furrow) uses Argo data.

5. Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo. These might include tasks performed by the AIC, the coordination of activities at an international level and the performance of the Argo data system. If you have specific comments, please include them in your national report.
  
6. To continue improving the quality and quantity of CTD cruise data being added to the reference database by Argo PIs, it is requested that you include any CTD station data that was taken at the time of float deployments this year. Additionally, please list CTD data (calibrated with bottle data) taken by your country in the past year that may be added to the reference database. These cruises could be ones designated for Argo calibration purposes only or could be cruises that are open to the public. To help CCHDO track down this data, please list the dates of the cruise and the PI to contact about the data.
  
7. Keeping the Argo bibliography ([Bibliography | Argo \(ucsd.edu\)](#)) up to date and accurate is an important part of the Argo website. This document helps demonstrate the value of Argo and can possibly help countries when applying for continued Argo funding. To help me with this effort, please include a list of all papers published by scientists within your country in the past year using Argo data, including non-English publications.  
There is also the thesis citation list ([Thesis Citations | Argo \(ucsd.edu\)](#)). If you know of any doctorate theses published in your country that are missing from the list, please let me know. Finally, if you haven't already sent me a list of Argo PIs in your country, please do so to help improve the statistics on how many papers are published including an Argo PI vs no Argo PIs.

Papers:

- Walczowski W., Merchel M., Rak D., Wieczorek P., Goszczko I., Argo floats in the southern Baltic Sea. *Oceanologia*, 2020, 62 (4), 478-488, <https://doi.org/10.1016/j.oceano.2020.07.001> ;
  
- Merchel M., W. Walczowski, 2020. Increases in the temperature and salinity of deep and intermediate waters in the West Spitsbergen Current region in 1997–2016, *Oceanologia*, 62/4, <https://doi.org/10.1016/j.oceano.2020.08.001>.
  
- Rak Daniel, Walczowski Waldemar, Dzierzbicka-Głowacka Lidia, Shchuka Sergey. Dissolved oxygen variability in the southern Baltic Sea in 2013–2018. *Oceanologia*, 2020, 62(4), 525-537. <https://doi.org/10.1016/j.oceano.2020.08.005>

8. How has COVID-19 impacted your National Program's ability to implement Argo in the past year? This can include impacts on deployments, procurements, data processing, budgets, etc.

No problems with floats deployment and recovery. There are delays in the delivery of BGC float due to cooperation problems with sensor manufacturers.

9. Argo is still interested in piloting the RBR CTD. Does your National Program have any deployment plans for RBR floats in the next couple years? If so, please indicate how many floats will you be buying in 2021 and 2022 (if known) and where they might be deployed.

We are planning to buy a float with a RBR CTD sensor for the Baltic Sea.