National report of Norway (2020)

Submitted by Kjell Arne Mork, Institute of Marine Research (IMR), on behalf of Argo Norway (26.02.2021)

1. The status of implementation

Argo Norway (NorArgo, https://norargo.hi.no) is the Norwegian contribution to the Euro-Argo European research infrastructure (ERIC) and to the global Argo programme. The main focus area for Argo Norway is the Nordic Seas (Greenland, Iceland and Norwegian Sea) and Arctic.

a. Floats deployed and their performance
In 2020, Norway deployed 12 Argo floats:
- 2 core Arvor floats 🟢
- 1 BGC-Provor CTS4 floats (all six variables) 🔴
- 4 Deep Arvor floats (with DO) ⚫
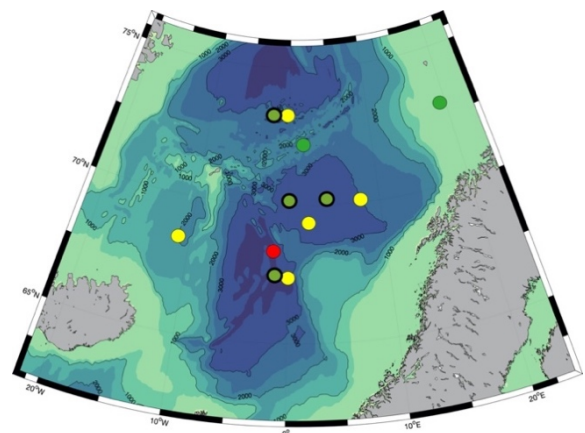- 5 bio floats (APEX floats: DO, fluor., bbp, irrad.) 🟡

Figure 1. Locations of deployed Argo floats in 2020.

The deployment locations are shown in Fig. 1. All 12 floats have so far performed well, but there are some issues with decoding one of the APEX floats (see below) and OCR-calibration of four APEX floats.

At present, Argo Norway has 30 operative Argo floats.

b. **Technical problems encountered and solved**
- WMO 6903552 (APEX float) deployed November 2020. There are some issues with the decoding of the OCR-value (calibration coefficient). Also, the time stamp for the oxygen is missing and is interpolated from other time stamps.

- WMO 6903553 (APEX float) deployed May 2019. Communication problems after about 6 months, and data transmitting occurs irregular. This is not solved.

- WMO 6903567-6903570. Deployed May-August 2020. Some issues with the OCR, and these floats have probably not the standard wave lengths for the Irradiance. It is not solved.

c. **Status of contributions to Argo data management and delayed mode quality control process**
We have recently started to do the DMQC of our floats that were deployed in 2018 and later (Argo Germany have done the DMQC for our "older" floats). We do DMQC

of core, bio, bgc and deep floats. For the Bio and BGC-floats we have done DMQC for oxygen (8 floats) and nitrate (3 floats). DMQC-work of the other variables is ongoing and will be done within 2021. NORCE is responsible for the DMQC of oxygen and pH, while IMR is responsible for the DMQC of T/S, nitrate, chlorophyll, backscatter and irradiance.

Present level of and future prospects for national funding

The funding has been a combination of self-financed (i.e., funded by Institute of Marine Research) and funding from the Norwegian Research Council (NRC, Ministry of Education and Research) during 2012-2015.
For 2018-2023 we received funding from the NRC for the extension of the national Argo infrastructure project (NorArgo2). Within this project we purchase and deploy approximately 13 floats per year in the Nordic Seas and the Arctic that include core, bio, BGC and deep floats. The infrastructure has approximately 36 person months per year. The Norwegian Argo Infrastructure (NorArgo, https://norargo.hi.no) is coordinated by Kjell Arne Mork, Institute of Marine Research, who also is the leader of the NorArgo2 project. To keep the target of having minimum 30 operative Argo floats beyond 2023, submission of a new project proposal to the NRC is needed.

Summary of deployment plans

In 2021, mainly in April/May, we plan to deploy 17 floats including:
- 4 BGC-floats (PROVOR CTS4: 6 BGC-variables)
- 3 Bio-floats (APEX, 4 BGC-variables: DO, CHL, BBP, Irraddiance)
- 2 Deep-floats (Arvor + DO)
- 8 core floats (Arvor, including 3 floats + DO)

These floats will be deployed in the Nordic Seas and Arctic.

In 2022 we plan to deploy about 13 floats each year, including 4-5 core, 3-4 bio, 2-3 bgc and 1-3 deep floats.

Summary of national research and operational uses of Argo data

Argo Norway focuses on both research topics and marine climate monitoring of the Nordic Seas. There is an increasing interest in using Argo data in Norway, and two climate centres are now using the data operationally in climate models. For instance, the operational TOPAZ4 modeling system assimilates Argo data into the ocean model

to provide forecast product for the Nordic Seas and Arctic Ocean under the EUs Copernicus Marine Environment Monitoring Services (CMEMS, http://marine.copernicus.eu/).

The present scientific topics are mainly within the Nordic Seas (Norwegian, Iceland and Greenland Seas) and Arctic, including:
- Heat and fresh water contents in the Nordic Seas are regular updated
- Water mass changes in relation with biological activities. This topic is also one of the reasons that we have included bgc sensors on the Argo floats.
- Studies that involve the mixed layer, primary production and carbon cycle.

Link to Argo Norway (NorArgo): https://norargo.hi.no

Issues we wish to be considered and resolved

Estimates of available battery/energy capacity during the mission would be nice.

Improving the quality and quantity of CTD cruise data

At all deployment locations a CTD station with water samples are taken. The ship CTD-data are sent regular to the ICES, EUs CMEMS, and World Ocean Database. The ship-data will this year also be sent to Argo (Reference Database).

The Argo bibliography

No new articles to add that are not included in the Argo bibliography.

The COVID-19 impact

There were some delays in the BGC-float deliveries. The result of this was that we were not able to deploy BGC-floats in the Greenland Sea in 2020, and instead they will be deployed in 2021.

RBR CTD

We have no deployment plans for RBR floats.