UK Argo Report for Argo Steering Team meeting (March 2024)

1. One Argo implementation status

a. Floats deployed and their performance

During 2023 we deployed 58 floats; of these 46 were core floats and 12 were BGC floats. No deep floats were deployed.

From 1 January 2024 to 27 February 2024, we deployed a further 11 floats: five core APEX, five core ARVOR (four of the ARVORs were purchased by BAS and have been adopted by UK Argo) and one PROV-BIO (CTS5).

Figure 1 shows UK floats deployed since the start of 2023.

As of 6 March 2024, the UK has 145 operational floats (i.e. for which real-time data have been made available during the previous month), as shown in Figure 2.

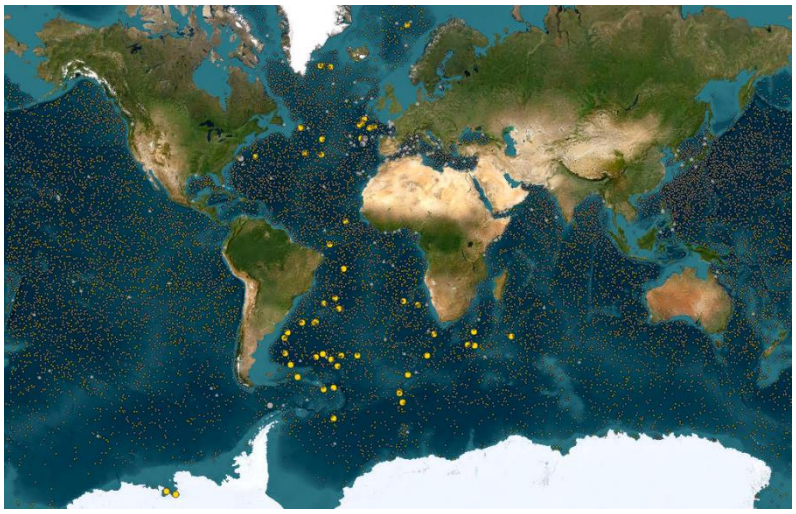

Figure 1. Showing the latest reported locations of the 69 UK Argo floats deployed between 1 January 2023 and 28 February 2023.

The 145 operational floats returning data include:

- 98 core APEX with SBE CTD
- 17 core APEX with RBR CTD
- 7 core ARVOR with SBE CTD
- 1 core NAVIS
- 2 NAVIS with oxygen
- 3 NAVIS BGCi
- 11 6-parameter PROV-BIO CTS4
- 2 5-parameter PROV-BIO CTS5
- 4 APEX DEEP

In addition, we have one float that is active, but the real time data processing is not fully set up:

- Deep SOLO float in the South Atlantic, Argentine Basin (WMO ID 2903791)

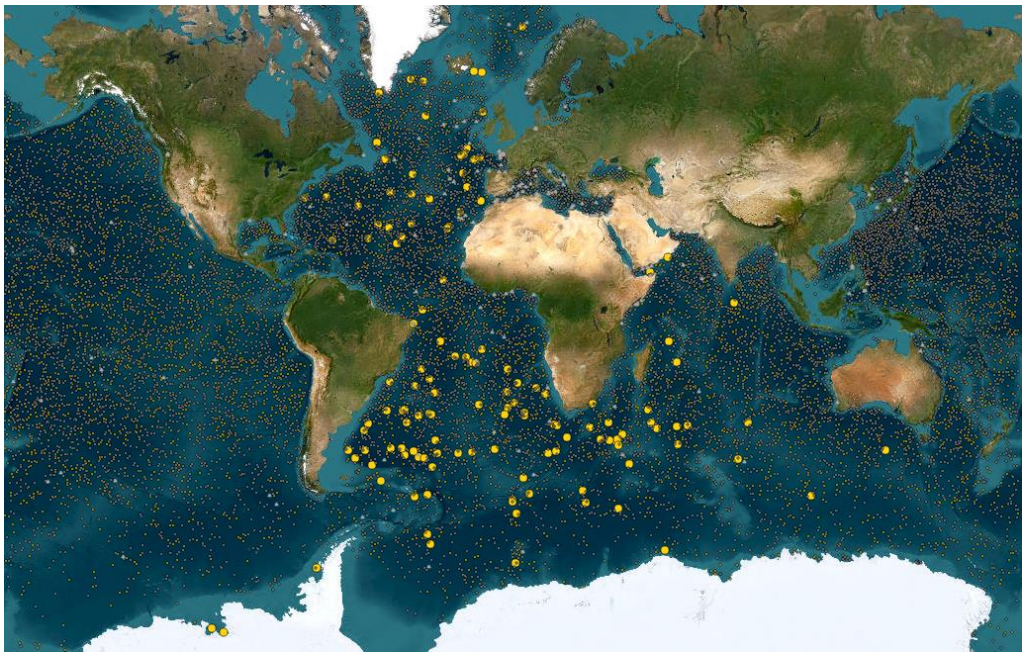

Figure 2. Showing the locations of all 145 UK floats delivering data in yellow as of 6 March 2024.

b. Technical problems encountered and solved

Float failures

Of the 56 standard core floats deployed between 1 January 2023 and end February 2024 we have had 2 float failures:

- Core APEX-RBR 9622 (1902098) deployed in Drake Passage in March 2023 transmitted near empty science files that did not contain any profile data.
- Core APEX-RBR 9626 (1902093), deployed in Drake Passage in February 2023 has been inactive since 09/03/23 having performed 4 cycles. It is assumed to have died.

Also, ARVOR 22UK006 (6990631) that was deployed in January 2024 appears to be stuck in 'end of life' mode and we have not yet been able to put that float into mission mode.

During the period we also deployed 12 BGC floats, comprising nine 6-parameter CTS4 PROV-BIO, two 5-parameter CTS5 PROV-BIO and one 4-parameter NAVIS BGCi. Of these the following have failed:

- CTS4 deployed in Florida Straits failed to surface (WMO 6990515)
- CTS4 near Portugal stuck at surface (WMO 3901579)
- CTS5 (WMO 6990516) deployed during PICCOLO cruise in Weddell Sea during February 2023 is assumed to have failed, the last profile received in March 2023.

APEX Core

We had deployed 16 APEX floats that are at risk of a fast salty drift, these were deployed before the problem was known. Of these 16, nine are no longer operating (as at 6 March 2024). Of the surviving seven, three are on the grey list for PSAL drift, and five are mostly passing real time QC with flags of 1. We had five undeployed APEX floats that were at risk of the fast salty drift problem, these have since been returned after repair but have not yet been deployed. We have also received two free CTDs under SeaBird's ASD warranty, which have been offset against our recent order with Teledyne Webb.

For some time, we've noticed that some of our APF11i floats often fail to make a GPS fix when delivering the profile data, but have the second fix, taken prior to diving, reported in the following cycle in 10 days' time. We retrieve this fix to enable us to process the previous profile's data, but it always means that the profile is 10 days late on the GDAC and at the GTS impacting timeliness. At least 22 recently deployed APF11i floats are regularly affected, a significant increase since our report in March 2023, when this number was 12. This appears to be an ongoing problem with Apex core floats. The table below shows Apex serial number, WMO ID and deployment date of the affected floats.

SN	WMO	Deployed
8571	1901920	18/01/2020
8572	1901921	19/01/2020
8977	3901563	03/01/2021
8979	3901568	19/05/2022
8980	1902094	22/02/2023
8981	1901924	08/10/2020
8982	1901933	08/10/2020
8983	3901573	13/12/2022
8985	6903726	21/10/2020
8988	3901569	19/05/2022
9007	1901928	21/02/2021
9189	6904180	03/03/2022
9196	6903761	14/10/2021
9197	1901934	06/12/2021
9198	1901935	07/12/2021
9199	3901570	20/05/2022
9200	3901571	21/05/2022
9201	1902081	17/05/2022
9203	1901936	13/02/2022
9204	1901937	13/02/2022

9205	1901938	14/02/2022
9469	5906967	28/03/2023

It has been noticed that there has been a new aerial design on APF11i floats, and that some APEX-deploying groups have found a 'sticky bladder' problem, resulting in insufficient buoyancy to obtain a surfacing GPS fix. We asked CLS whether they can provide a separate 'Iridium fix' position that we could use instead, but they are unable to do so for RUDICs floats. Unfortunately, all the affected floats use RUDICs communications. CLS proposed a solution, involving adding an Argos back up system to the float (a small Linkit device) but this does not help where floats are already deployed.

APEX floats with RBR CTD

We procured our first six APEX-RBR floats in 2015 and since then have deployed 26 APEX-RBR, 15 of these in 2023 and 2024. As of 6 March 2024, there are 17 APEX-RBR delivering data to the GDACs and GTS. One of the APEX-RBR deployed in 2023 failed to report any profiles: APEX-RBR 9622 (1902098) transmitted nearly empty science files that did not contain any profile data.

We presently have 13 APEX-RBR floats in stores with some of them scheduled for deployment later in 2024.

APEX Deep

We presently have five deep floats operating in the Argentine Basin region of the SW Atlantic, comprising three APEX Deep deployed in 2021, one APEX Deep deployed in 2020 and one Deep SOLO, deployed in December 2022.

Data processing for our Deep SOLO has recently been set up at BODC, with some data now available at the GDAC and on the GTS. Full automation of this processing will be completed soon. There are no firm plans to buy more deep floats at present. However, we aspire to buy and deploy 15 deep floats (without oxygen sensors) between 2026 and 2030.

Bio-geochemical Argo

We presently have 13 active BGC floats. Real-time data processing is fully set up for all BGC float types.

The Navis BGCi (F0660, 6903751) that was deployed in November 2020 near the Porcupine Abyssal Plain (PAP) mooring appears to be working well. However, the NAVIS BGCi F1241 (6903756) deployed near PAP in April 2021 failed to report, despite SeaBird engineers clearing the float for deployment. An identical Navis BGCi float (F1242, 4903670) was deployed near PAP in May 2022 but was recovered as the nitrate sensor was not working and redeployed in May 2023 during the May 2023 cruise. Two other Navis BGCi floats were deployed in July 2022, both working normally, for which the data processing has recently been set up (F1101, 6904191; F1102, 6904192).

We have now deployed 13 ASBAN six-parameter CTS4 floats (9 in 2023). Two of the floats have failed post deployment: one is drifting at the surface after repeatedly aborting its descents; another, deployed

in shallow water in the Florida Straits, failed to surface. An additional float failed checkout prior to deployment due to a sim card connection issue, and has now been repaired. We have two remaining ASBAN CTS4 floats in stock and, in March 2024, received a delivery of 11 additional ASBAN CTS5 6-parameter floats. The ASBAN floats are all performing well so far, except for the pH sensors, which have had a high failure rate. As part of the NERC-funded PICCOLO project, we attempted to deploy two PROV-BIO Jumbo CTS5 floats in the Weddell Sea in February 2023. One failed whilst still on deck and was returned to the UK and later repaired by NKE. It was subsequently deployed in February 2024 and is operating well.

c. Status of contributions to Argo data management

BODC has enabled several software developments this year to allow for the data delivery of recent core Arvor, Provor CTS5 and the core data from BGC Navis floats. BODC also delivers real-time data for 50 remaining MOCCA floats. Several RTQC test updates have been implemented.

BODC endeavors to address any QC changes needs identified by the Objective Analysis reports and Altimetry QC issued by Ifremer and OceanOps on a regular basis and made updates to the meta files following reports from the GDAC file checker. Additionally, BODC is undertaking visual inspection of the core Argo parameters from core, deep and BGC float types of all profiles which then undergo further DMQC analysis.

BODC actively contributed to activities related to the Abrupt Salty Drift (ASD) group, focusing on estimating the best practices, guidance and examples on how to treat salinity data that are affected by sensor drift to produce optimal adjustment in d-mode. This involved actively contributing to updating the shared list of floats affected by the salty drift and reviewing best practices and procedures for DMQC operators of core Argo floats.

The UK core Argo fleet data went through the international DMQC audit run by external partners from the DMQC core Argo group. The audit was motivated by the fact that a higher percentage of SBE CTDs are now experiencing sensor drifts, which may not be easily identifiable by only examining individual time series. All identified BODC profiles with some issues were reviewed and any additional corrections have been completed and re-submitted to the GDACs.

The strategy adopted to deliver the support to national programs focused on ensuring a high-quality approach and the progressive enhancement of expertise. This supports OGS in implementing the DMQC-PCM software, contribution to the working groups.

d. Status of delayed mode QC process

<u>Core Argo</u>

From March 2023 to March 2024 BODC Argo submitted to GDAC 28 core Argo floats with ~6230 core profiles in D-mode. This includes 8 Argo floats (with ~380 new D-mode profiles) DMQC-ed and received from the external European partner - BSH.

BGC Argo

BODC has adopted the procedures and SAGE_O2Argo software for estimates of the Gain of the DOXY parameters of Argo floats. Additionally, we also implemented the procedures from https://github.com/catsch/DM_FILLER allowing applying corrections in D-mode BGC floats, generation and population of the D-mode NetCDF files.

The BODC Argo team has greatly expanded their knowledge of the QC analysis of BGC Argo floats. Through the updates of the Coriolis processing chains in BODC, we have started delivery of automatic RTQC adjustments of Chlorophyll A, Nitrate and BBP to the UK active PROVOR floats. Additionally, BODC is regularly providing the RTQC adjustments to DOXY for UK active PROVOR floats.

From March 2023 to March 2024 BODC Argo undertake the DMQC analysis of 2 Argo BGC floats with ~249 profiles of DOXY parameter and submitted to GDAC. The DMQC analysis for DOXY and Nitrate BGC Argo floats for Argo PROVOR is planned to be undertaken in March 2023.

2. Funding levels

The UK Argo programme is undertaken through a partnership between the Met Office (which is an Executive Agency owned by the Department for Science, Innovation and Technology, DSIT) and the National Oceanography Centre (NOC, which includes BODC, is an independent self-governing organisation). The Met Office are responsible for programme management and coordination, procurement of core floats, organizing float deployments, preparation of floats for deployment, telecommunications (costs) and international funding contributions (OceanOPS and Euro-Argo). NOC and BODC have responsibility for Argo science and data management respectively. NOC have the lead on deep Argo and play a leading role in the expansion of the UK programme into BGC-Argo.

Met Office

Argo funding to the Met Office is mainly provided from the Department for Energy Security and Net Zero (DESNZ) through the Hadley Centre Climate Programme (HCCP), but with an additional contribution from the Department for Science, Innovation and Technology (DSIT) through the Public Weather Service Programme. The HCCP workplan and funding for 2021 to 2024, which was approved by BEIS and Defra (Department for Environment, Food and Rural Affairs) includes UK Argo funding for the period April 2021 to March 2024. In FY2023 this funding was supplemented by some additional end-of-year monies sufficient to order 19 floats (11 APEX-RBR-L3, four APEX-SBE and four NKE ARVOR-SBE). We had originally intended to procure more ARVOR but a delay in providing the order to NKE meant this had to

be reduced due to delivery constraints. The regular Argo budget for FY2024 is expected to remain level and should allow for a similar number of floats to be procured as we would expect to procure mainly ARVORs.

NOC

NOC funding for Argo is primarily from NERC (Natural Environment Research Council) under National Capability (NC) lines which cover Argo data management (through NC Environmental Data Services funding) and Argo science. Core BODC Argo national capability funding from NERC remains static for 2022-23 and is therefore decreasing in real terms. The current level of funding cannot cover all the increasing, mandatory demands for One Argo.

In March 2021, NERC and NOC announced a capital investment of £3.7 million to begin building the UK Atlantic Sector BGC Argo Network (ASBAN-UK) where NOC will deploy six-parameter BGC floats in the Atlantic Ocean over three years as part of UK Argo. The first fifteen were delivered in 2021 and 2022, and six have been deployed, with plans to deploy another seven this year. A second order of ~11 floats was placed during 2023, with delivery in early March 2024. BODC secured funding to develop the data infrastructure for NKE BGC floats (ASBAN-UK). The ASBAN funding finishes on 31/03/24, with no further BGC funding in the pipeline at present. Efforts have continued to establish a clear plan for future funding to develop a more sustainable model of UK funding to support the UK contribution to the full-depth multi-disciplinary Argo array, but the funding situation remains challenging.

BODC was funded under the EU H2020 project ENVRI-FAIR to introduce the NVS vocabulary server to support Argo vocabulary management. The ENVRI-FAIR funding was available until June 2023.

The UK Argo contributed to the Euro Argo One proposal which will be submitted in March 2024. The Euro Aro One funding will allows to UK Argo to contribute to developing more automatic and modular software for real-time processing of Argo system and improve the FAIRness of Argo (meta) data workflows and system. This project will allow to enhance and deploy in BODC the QC procedures for trajectory files and deep Argo data not available before in BODC and increase the availability of high-quality Argo data in high latitudes by implementing software to improve data quality control. Moreover, this project will improve the Argo structuration by helping BODC to maintain the existing Argo data stream tools and software at the open-source platform, improve organisation and coordination of BGC DMQC and update UK Argo national programme website. For the first time, BODC Argo will be able to much broader contribute to Argo outreach in the local UK schools and share the knowledge about the significance of OneArgo program for the study of the global ocean and its role in the climate system.

BODC has been unable to source sustainable funding to support SOARC functions, so the ARC remains unfunded in the UK to date.

Our aspirations are to contribute 10% of each of the BGC and Deep Argo arrays, and to continue to provide 5% of the Core floats deployed. This could be achieved by deploying 25 BGC floats per year, with a projected lifetime of four years this would lead to a sustained fleet of 100 BGC floats. Deployment of 25 each of Deep and Core floats per year, with a five-year lifetime would ramp up to a sustained fleet of

125 of each float type. The UK would then maintain a fleet of 350 floats (100 BGC, 125 each Core and Deep), about 8% of the total anticipated global fleet. However, funding for this, at around five times the present level, is not in place and would require significant additional investment.

Human resources

Staff members working on UK Argo, their institution and effort on Argo during 2023 are given below.

Met Office – 0.93 FTE (calendar year 2023)
Jon Turton, Fiona Carse, John Hankins

NOC, Southampton – 0.7 FTE (March 2023 - March 2024)
Brian King, Nathan Briggs, Darren Rayner

NOC, BODC – 1.5 FTE (March 2023 – March 2024)
Emma Gardner, Kamila Walicka, Clare Bellingham, Katy Baldwin, Roseanna Wright and Violetta Paba.

The BODC development team also provides support.

3. Deployment plans

The Met Office aims to buy and deploy around 25 core floats per year, based on our sustained but flat government funding. For BGC and deep floats, the amounts of floats bought and deployed remain dependent on project-based research funding. We have submitted the spreadsheet showing expected deployments out to 2030, as requested.

As noted earlier, as of 28th February 2023, UK Argo has deployed 11 floats during 2024: five core APEX, five core Arvor, and one Prov-Bio (CTS5).

We aim to deploy a total of 22-26 core and five BGC floats later in 2024 and in early 2025, including:

Core floats

NE Atlantic, DY174 Discovery RAPID East mooring cruise, April 2024:
    2 core APEX-SBE
European Shelf / NE Atlantic, JC264 James Cook Met Buoy Servicing cruise, June 2024:
    2 core Arvor-SBE *[set to rapid cycling]*
North Atlantic Ellett Line ~ 60 N, DY181 Discovery, June 2024:
    2 core APEX-SBE
NW Atlantic near Iceland/Greenland, DY183 Discovery passage leg, August 2024:
    0 - 2 core APEX-SBE
Atlantic at 20 S, AMT[1], JC272 James Cook, November 2024:
    2 core APEX-SBE
Brazil Basin, JC273 James Cook, December 2024:

[1]It is not yet clear if the 2024 AMT will be a science cruise or a passage leg

2 core APEX-SBE
Atlantic at 20 N, DY189 Discovery passage leg (Guadeloupe to Greece), February 2025:
2 core Arvor-RBR
Atlantic at 25 S, JC275 James Cook, February 2025:
2 core APEX-RBR-L3
SW Atlantic, Argentine Basin, Sir David Attenborough, November 2024:
2 core APEX-SBE
2 core APEX-RBR
Southern Ocean / Drake Passage, Sir David Attenborough, December 2024:
4 core APEX-SBE

In addition, we aim to send 4-6 core floats to Tammy Morris in Cape Town, if she has suitable opportunities.

BGC floats

North Atlantic, Iceland Basin, Discovery BIO-Carbon spring cruise, June 2024
1 ProvBio CTS4 six-parameter (ASBAN, NOC floats)
North Atlantic, PAP cruise, James Cook, May 2024:
1 ProvBio CTS4 six-parameter (ASBAN, NOC floats)
North Atlantic, Iceland Basin, Discovery BIO-Carbon autumn cruise, Sept 2024
1 ProvBio CTS5 six-parameter (ASBAN, NOC floats)
Labrador Sea, REBELS cruise, James Cook, August 2024
1 ProvBio CTS5 six-parameter (ASBAN, NOC floats)
Atlantic Ocean (unspecified region and cruise)
1 ProvBio CTS5 six-parameter (ASBAN, NOC floats).

In addition, five ASBAN six-parameter PROVOR BGC floats will be deployed during 2025, and a further three during 2026. All will be deployed in the Atlantic, exact locations are not yet decided.

4. National research and operational uses of Argo data

By NOC

Argo data are used widely within NOC, where the science applications include:

- measurement of evolution and drivers of mixed layer processes in the (Indian Ocean);
- inventory and evolution of heat and freshwater establishing controls on budgets (both regional and global);
- deep heat content (N Atlantic).
- Data product produced using Argo data: At NOC we produce a 4-D global map of Argo T and S data at 2 degree lat and long resolution from 60S to 60N. The data are gridded in 10-day windows using objective mapping on sigma-1 or neutral density levels and then interpolated back to 20 dbar vertical resolution. This is generally updated towards the end of each calendar year. A time series of global heat content is calculated and reduced to annual averages and then incorporated into the synthesis of global heat content calculations led by K von Schuckmann. The full 4-D gridded fields can be made available by contacting Brian King at NOC.

NOC is currently leading BGC Argo deployments on behalf of the broader UK community. Data are being used in recent, current and upcoming projects for:

- Generating 4D fields of particle size in the ocean for an array of applications including biological pump study.
- Investigating global drivers of variability in ocean carbon storage by sinking organic particles.
- Investigating nutrient transport by the Gulf Stream and its variability
- Tracking the transport of Greenland glacial meltwater into the Labrador Sea via its coloured dissolved organic matter signature.
- Quantifying particle sinking rates and rates of particle fragmentation in the ocean.
- investigating export fluxes and efficiency in hypoxic ocean regions.
- GLOBESINK and BIO-CARBON: A two-year NOC-led project called GLOBESINK started in August 2022 to generate a global dataset of particle size and downward particulate organic carbon flux from BGC Argo measurements of optical backscattering. This dataset contributes to the wider NERC BIO-CARBON programme, which aims to improve our ability to predict changes in biological carbon update by the oceans. One output of the project will be a publicly available particle dataset using BGC Argo data through 2022 (to be delivered in 2024). NOC aims to maintain this product in the future through single center NERC bid AtlantiS. New BIO-CARBON projects PARTITRICS and IDAPro, led by NOC and University of Southampton, will deploy two UK BGC Argo floats and fund their data delivery and QC, and also deploy three French BGC Argo floats. The float data will be used for estimates of primary production, net community production, and downward POC flux as part of 2024 BIO-CARBON fieldwork.
- PhD studentships: Currently, three NOC-led PhD projects have a large component utilizing BGC Argo data. One focuses on net community production in the Weddell Gyre, another is exploring methods to optimally interpolate subsurface chlorophyll data, and a third is looking into the drivers of variability in the remineralization depth of sinking organic carbon in the ocean. A fourth NOC-based project led by the University of Southampton will develop methods to QC and correct pH data from BGC Argo.

By Met Office

All Argo data are used operationally:

- They are routinely assimilated into its FOAM (Forecasting Ocean Assimilation Model) suite which is run daily and produces 2 analysis days and a 7-day forecast, and into the 1.5 km high-resolution North-west European Shelf Seas model (AMM15).
- Since June 2022 the Met Office has run a global coupled ocean-atmosphere NWP (numerical weather prediction) model that assimilates ocean temperature and salinity profiles. The high-resolution UK area atmospheric NWP model takes time-varying sea surface temperature fields from AMM15. Hence the temperature and salinity profile data impacts both weather forecasts and short-range ocean forecasts.
- Initial conditions for coupled monthly-to-seasonal forecasts are taken from the global coupled NWP system so the Argo data are used to initialise these forecasts and are used in ocean reanalyses.
- Argo data are also used in the initialisation of ocean conditions in climate models run to make decadal predictions.
- Near-surface Argo data are used to validate the output from the Met Office's OSTIA (Operational Sea Surface Temperature and Sea Ice Analysis).

In the Met Office Hadley Centre for Climate Science and Services, Argo data is in the following products:

- EN4 contains in-situ ocean temperature and salinity profiles and objective analyses. It is updated monthly using real-time Argo profiles and GTSPP data, and annually using delayed-mode Argo profiles (and WOD, GTSPP and ASBO data). EN4 is freely available for scientific research use (see http://www.metoffice.gov.uk/hadobs/en4/). The latest version is EN.4.2.2, which includes a fresh download of all the source data and a substantial update to the XBT/MBT correction schemes. EN.4.2.2 contains four ensemble members where previously there was only two. There is also a new product user guide (based on both the Argo Users' Manual and the HadIOD user guide), including FAQs and example code. EN4 is also forming part of a GEWEX EEI project comparing Ocean Heat Content calculated from reanalyses, in situ data and satellite products (the project website is https://sites.google.com/magellium.fr/eeiassessment/dissemination/documents?authuser=0).

- HadIOD (Hadley Centre Integrated Ocean Database) is a database of in situ surface and subsurface ocean temperature and salinity observations supplemented with additional metadata including bias corrections, uncertainties and quality flags. The dataset is global from 1850-present with monthly updates. The current version is HadIOD.1.2.0.0, the chief sources of data are ICOADS.2.5.1, EN4 and CMEMS drifting buoy data. This product has been available to the public since mid-2020 via https://www.metoffice.gov.uk/hadobs/.

Met Office science uses of the EN4 product include Ocean Heat Content (OHC) analysis, contributions to BAMS, Ocean Obs'19 White Paper, an Earth Energy Imbalance paper (von Schuckmann et al., 2020), and an Indicators of Global Climate Change paper (Forster et al., 2023).

References are listed in section 7. Pre-2023 references are listed in the Argo bibliography in the UK's report to AST#24.

5. Issues for AST for consider

The core Argo Best Practices document [link at https://argo.ucsd.edu/float-deployment-best-practices/] recommends an ascent rate of 20 cm/s (0.2 dbar/s) for floats with the RBR sensor. This has been questioned by Teledyne Webb who consulted RBR who responded that they do not believe this should be the recommendation and will be asking to have the document revised. Based on their discussion with RBR they (Teledyne Webb) recommend the default ascent rate of 0.08 dbar/s for APEX-RBR floats. We would like AST clarification on this. We can also ask RBR during their session on Thursday 21st March.

Reference CTD data – with increasing international coordination, how do (should) deployment CTDs reach the national DM operator of the float owner (mostly relevant for core floats).

Sticky Apex bladders… has there been any progress or new advice to Apex float deployers. Perhaps this a question for Tech Workshop in Sepember?

6. CTD data

When the UK notifies float deployments with OceanOPS, we include any information about nearby or simultaneous CTD casts if the scientists on board the deploying ship provide this. It is written in the Description free text box in the notification form. Sometimes our floats are deployed from passage legs or ships of opportunity. In these cases, no matching CTD casts are available. All CTD data from UK cruises is best obtained from BODC, using the enquiries@bodc.ac.uk contact address.

7. Bibliography

UK Argo PIs are Jon Turton, Fiona Carse, Brian King, Nathan Briggs, and Giorgio Dall'Olmo (until 2022). The UK last provided a bibliography for AST#24 (in March 2023).

Included below is a list of 25 papers published since 1st January 2023, with at least one author based at a UK institution. The search was carried out using Web Of Science, using keyword "Argo" and refining by country (England, Scotland, Wales, Northern Ireland). Note there are 25 papers 2023 and none yet in 2024. PhD theses are not included in this list.

Coggins, A; Watson, AJ; Schuster, U; Mackay, N; King, B; McDonagh, E; Poulton, AJ
Surface ocean carbon budget in the 2017 South Georgia diatom bloom: Observations and validation of profiling biogeochemical argo floats

DEEP-SEA RESEARCH PART II-TOPICAL STUDIES IN OCEANOGRAPHY, 209, doi: 10.1016/j.dsr2.2023.105275

Cox, I; Brewin, RJW; Dall'Olmo, G; Sheen, K; Sathyendranath, S; Rasse, R; Ulloa, O
Distinct habitat and biogeochemical properties of low-oxygen-adapted tropical oceanic phytoplankton
LIMNOLOGY AND OCEANOGRAPHY, 68, 9, doi: 10.1002/lno.12404

Forster, P. M., Smith, C. J., Walsh, T., Lamb, W. F., Lamboll, R., Hauser, M., Ribes, A., Rosen, D., Gillett, N., Palmer, M. D., Rogelj, J., von Schuckmann, K., Seneviratne, S. I., Trewin, B., Zhang, X., Allen, M., Andrew, R., Birt, A., Borger, A., Boyer, T., Broersma, J. A., Cheng, L., Dentener, F., Friedlingstein, P., Gutiérrez, J. M., Gütschow, J., Hall, B., Ishii, M., Jenkins, S., Lan, X., Lee, J.-Y., Morice, C., Kadow, C., Kennedy, J., Killick, R., Minx, J. C., Naik, V., Peters, G. P., Pirani, A., Pongratz, J., Schleussner, C.-F., Szopa, S., Thorne, P., Rohde, R., Rojas Corradi, M., Schumacher, D., Vose, R., Zickfeld, K., Masson-Delmotte, V., and Zhai, P. (2023)
Indicators of Global Climate Change 2022: annual update of large-scale indicators of the state of the climate system and human influence
Earth Syst. Sci. Data, 15, 2295–2327, https://doi.org/10.5194/essd-15-2295-2023, 2023.

Fu, Y; Lozier, MS; Biló, TC; Bower, AS; Cunningham, SA; Cyr, F; de Jong, MF; deYoung, B; Drysdale, L; Fraser, N; Fried, N; Furey, HH; Han, GQ; Handmann, P; Holliday, NP; Holte, J; Inall, ME; Johns, WE; Jones, S; Karstensen, J; Li, FL; Pacini, A; Pickart, RS; Rayner, D; Straneo, F; Yashayaev, I
Seasonality of the Meridional Overturning Circulation in the subpolar North Atlantic
COMMUNICATIONS EARTH & ENVIRONMENT, 4, 1, doi: 10.1038/s43247-023-00848-9

Ghosh, R; Putrasahan, D; Manzini, E; Lohmann, K; Keil, P; Hand, R; Bader, J; Matei, D; Jungclaus, JH
Two Distinct Phases of North Atlantic Eastern Subpolar Gyre and Warming Hole Evolution under Global Warming
JOURNAL OF CLIMATE, 36, 6, doi: 10.1175/JCLI-D-22-0222.1

Good, S; Mills, B; Boyer, T; Bringas, F; Castelao, G; Cowley, R; Goni, G; Gouretski, V; Domingues, CM
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8. COVID-19 impacts

Nothing to report.

As for the year 2022, impacts of COVID-19 have no discernable effects on UK deployments or data processing activities during 2023. There has been no impact on our core floats budget from central government. However, we have been able to buy fewer floats than previous years. This is due to increasing costs being passed on by manufacturers, and an unfavorable USD / GBP exchange rate. We assume the former affects all national programmes.

9. RBR deployment plans

The Met Office received delivery of eleven APEX-RBR-L3 floats from Teledyne Webb in early March 2024 and expects to receive four Arvor-RBR-L3 floats from NKE before the end of March 2024. Many of these floats will be deployed during 2024. Our current plans for deploying core floats with RBR CTDs are detailed in section 3, above. We do not yet have deployment plans beyond February 2025.