

UK Argo National Data Management Report for ADMT-25

Each country is asked to send a National Report using this document as a guide for the material to be reported. As we take steps to modernize the real time processing chain, we have changed the format for the Real Time Status to help better understand the current status at each DAC. We also updated several other sections prompts and ask that you use this updated template when writing your report.

Reports are DUE: 10 October 2024

1. Real Time Status

Please report the status of your real time data processing for all Argo Missions, including pilots. If you have not yet implemented the tasks, please give us an estimate of when you expect the task to be completed. Here are some questions to answer:

- How many floats are you currently processing & what type are they?

Float family	Number of versions	Number of floats* (*approximate)
APEX		53 Argos, 98 Iridium
ARVOR		56
PROVOR		27
Navis		1
BGC Navis		2
SOLO/S2A		0
Deep SOLO		1
Deep Arvor		0
Other (customize additional rows as needed)		

- How many different sensors are you currently processing?

Parameters	Type(s) of sensor for that parameter
Temperature/Salinity	SBE41, SBE61, RBR
oxygen	AANDERAA_OPTODE_4330
NO3	SATLANTIC SUNA_V2
pH	SBE SEAFET - -- processing for NKE floats need development for Navis floats
Chla	Wetlabs ECO FLBBBCD – processing for NKE floats need development for Navis floats
bbp	WETLABS ECO_FLBBBCD
irradiance	SATLANTIC_OCR504_ICSW

New Sensors you have begun processing (either deployed in past 12 months or expected in the next few months)	Have all the Argo vocabularies been implemented to accommodate the sensor? (Yes, No, In progress)
Floatrider Turbulence sensor which will be processed through the Coriolis processing chain	Yes – new parameters will need to be requested

- What is the status of BGC processing and RTQC test implementation? See here to get the version of manuals you are using to process and qc the BGC variables or : [Documentation - Argo Data Management \(argodatamgt.org\)](http://argodatamgt.org) If your floats **do not** include a listed parameter, please enter 'N/A' (Not Applicable); if your floats **do** include the listed parameter, but you have not yet implemented processing for this parameter, please enter 'N/I' (Not Implemented).

parameter	Processing cookbook version you are using (ie, current or version 2.0 Oct 2018)	QC manual version you are using (ie, current or version 2.0 Oct 2018)	Notes on when changes will be made to update to latest version

oxygen	Current	Current	For NKE floats only via Coriolis processing chain. Not implemented at BODC processing chain (Apex, NAVIS)
NO3	Current	Current	For NKE floats only via Coriolis processing chain. Not implemented at BODC processing chain (Apex, NAVIS)
pH	Current	Current	For NKE floats only via Coriolis processing chain. Not implemented at BODC processing chain (Apex, NAVIS)
Chla	Current	Current	For NKE floats only via Coriolis processing chain. Not implemented at BODC processing chain (Apex, NAVIS)
bbp	Current	Current	For NKE floats only via Coriolis processing chain. Not implemented at BODC processing chain (Apex, NAVIS)
irradiance	Current	Current	For NKE floats only via Coriolis processing chain. Not implemented at BODC processing chain (Apex, NAVIS)

- What is the status of RBR data processing (if applicable)? Are you adjusting salinity in real time? See [DACs with floats with RBR CTDs to implement real-time salinity adjustment as per QC Manual, and flag PSAL_ADJUSTED_QC = '1' in 'A' mode. Real time adjusted data can be distributed onto GTS · Issue #55 · OneArgo/ADMT \(github.com\)](#)

RBRargo3 2K model	Are you filling Adjusted data (A mode) following User Manual 3.8 instructions?	Notes or additional information
pre-April 2021	no	Lack of funding for software update
post-April 2021	no	Lack of funding for software update

- Are you regularly applying real time adjustments for the following items:
 - Salinity adjustments
 - Cpcor for deep floats
 - BGC parameters (if so, which ones)

	Yes/No for current R files	Are you going back to make adjustments on all available R files when new adjustment comes in?	Notes or additional information
Salinity adjustment	No	No	Lack of funding for software update
Cpcor adjustment for Deep floats	No	No	Lack of funding for software update

oxygen	Yes	No	via Coriolis processing chain for NKE floats only Lack of funding for software update to non NKE floats
NO3	Yes	No	via Coriolis processing chain for NKE floats only
pH	No	No	
Chla	Yes	No	via Coriolis processing chain for NKE floats only
bbp	Yes	No	via Coriolis processing chain for NKE floats only
irradiance	No	No	

- What data are you sending onto the GTS?
- What data is going to the aux directory? UVP, FL2BB, etc
- Are you automatically greylisting questionable floats detected by min/max test?
- What is the status of the transition to v3.2 trajectory files? When do you think you will be ready to stop acceptance of v3.1 Btraj files?
- Do you have any code to share with other DACs? If so, where is that available?

Data which are sent to GTS are:

Temperature and salinity profiles and their RT QC flags, from all UK Argo floats (including BGC and Deep). These are sent by the Met Office in BUFR format, template 3-15-003. The Met Office are in the process of re-writing the netCDF-to-BUFR code to include the BGC PARAM_ADJUSTED sequences and their QC flags. We expect to complete this work later in 2024.

BODC is manually updating the greylist of questionable floats as soon as they arrive via email. After this, the next incoming profiles are automatically updated at GDAC.

BODC stopped sending v3.1 from early January 2024 although some old versions remain on the GDAC – these should probably be removed. All currently produced trajectory files in BODC are in v3.2.

BODC does not have any additional software to share with other DACs.

DAC Argo Challenges

The key limitation is insufficient funding and people allocation to cover the basic Argo activities. Currently, the BODC Argo data management group has only 1.5 FTE separated into 4 people, where there is a need for a minimum of 3.5 FTE.

To try to improve our poor funding situation BODC has re-evaluated the outdated and underestimated cost of Argo activities which is used for budgeting of UK Argo projects. Additionally, after improving the visibility of BODC Argo across NOC and other UK research institutes, UK Argo DAC has been included in new funding proposals.

Another key challenge is that BODC Argo has been operating with a single point of failure where one person has been mostly responsible for managing the real-time processing of Argo floats, which presents a potential risk. To address this, BODC has started training an additional 2 employees to support daily activities. However, this has been done without increasing the overall FTE allocation to the BODC Argo DAC, which is limiting our ability to fully mitigate the risk.

Over the past year, various parts of the BODC infrastructure have undergone mandatory updates to ensure the security and integrity of the systems and maintenance activities (Oracle database patching, server updates and migrations, Matlab 2022b version upgrades, and Linux outages), which have impacted the Argo software's performance and data delivery. The system updates have affected the timeliness of BODC Argo's real-time data delivery to the GDAC.

To mitigate the challenge of future software upgrade complications, BODC took the initiative to prepare a software strategy plan to look at improved coordination, better implementation of best practice in software development and testing environments, developing better and more robust contingency and proposing automation and monitoring solutions. Some of the ideas being looked at are ways to deliver a better test environment for the current Argo workflow; developing a testing framework to allow each data stream to be tested independently; develop the ability of more automatic software management procedures with the appropriate linting/unit tests; deliver an improved logging system to facilitate the monitoring and de-bugging of the system.

BODC Argo software requires continuous maintenance and improvements to be more adaptable to the new technologies and new different types of floats. Due to limited software development funding for the BODC Argo system over the last few years BODC Argo software is not keeping up with recent tasks requested by the ADMT.

BODC Argo runs a local version of the Coriolis processing chain to process core and bgc NKE floats and installs regular updates from Coriolis. However, the remaining challenge for BODC is

keeping up with required improvements for RT non-NKE BGC Argo floats. BODC is currently testing accessing the Coriolis chain via the docker.

BODC has discovered an issue with the raw sea surface pressure data delivered from 40 APF11 Argos floats. The recorded values once decoded from hex are mostly 0 dbar or -1000 dbar. BODC has contacted Teledyne for advice and further investigation of this issue and has forwarded affected firmware versions and copies of the BODC decoder scripts for affected floats. If other DACs have experienced similar issue, BODC would appreciate some discussion.

2. Delayed Mode QC status

This section of the report is for reporting on the status of DMQC in your country and is the place to share your progress, your challenges, your concerns and any links to shareable tools or code. The following questions to help guide you:

- What is the status of delayed mode trajectory files? Have you created any d-mode trajectory files? If not, what are the reasons? If you have, would you be interested in sharing your experiences with others?
- How are you implementing BGC d-mode - by parameter or one expert does all parameters?
- What challenges have you encountered and how have you dealt with them?
- Do you have any code or tools you'd like to share with other DM operators? If so, where is that available?
- Do you have any concerns you'd like to bring to the ADMT?

DMQC progress

From January 2024 BODC Argo submitted to GDAC of 42 core Argo floats with around 13 000 profiles in D-mode. The DMQC analysis has focused on processing the suspected salty drifting floats on processing the Argo grey list.

Additionally, in 2024 some of the BODC Argo floats coming from the MOCCA project have been continuously DMQC-ed by external European partners. We have received and submitted to the GDAC 3 analysed core Argo floats (with 660 D-mode profiles) from BSH.

The BODC Argo team has greatly expanded their knowledge of the DMQC analysis of BGC Argo floats. BODC has started implementing the workflow of the DMQC BGC procedures of the Nitrate and pH parameter for the BGC Argo floats.

From January 2024 BODC Argo submitted to GDAC of 15 DOXY Argo floats with around 1442 profiles in d-mode; 10 Nitrate Argo floats with around 1022 profiles in d-mode and 10 pH Argo floats with around 1022 profiles in d-mode.

Overall, BODC DMQC-ed 92.8% DOXY profiles, 84.8% of Nitrate profiles and 76.7% of pH profiles of available UK Argo BGC profiles.

NOC is actively involved in the DMQC core discussion meetings sessions and provides DMQC support to other national programs (Argo Poland, Argo Ireland).

DMQC Challenges

BODC DAC is only producing the trajectory files in RT for NKE BGC floats. This is possible thanks to the adoption of the Coriolis processing chain in BODC. We are not producing the trajectory files for our other floats (e.g. Apex, NAVIS) due to limited software development resources to update the codebase. None of the BODC's trajectory data went through DMQC analysis yet. The current BODC Argo team does not have enough knowledge, software and experience to work with this data.

In BODC, we conduct the DMQC analysis of DOXY, Nitrate and pH. The challenge we are facing is to gain more knowledge and experience in processing other BGC parameters. In the following year, we are also planning to improve our capability by starting to process in D-mode the radiometry data.

BODC can process only the NKE floats via the Coriolis processing chain in D-mode. There are remaining 47 legacy BGC Argo floats which are still not available in R-time in BODC, hence the DMQC for these floats is also blocked. These require additional development work in the BODC Argo processing chain.

The BODC software for D-mode corrections to deep and RBR Argo floats also requires significant development. However, over the past few years, these efforts have been delayed due to other priorities, such as real-time data delivery. Limited resources have made it difficult to allocate time and staff to develop the DMQC component of the software, causing further postponements in addressing these needs.

At BODC, we face funding resource constraints for conducting DMQC analysis, limiting our ability to cover all necessary activities. Currently, the UK Argo program has over 300 floats eligible for DMQC analysis, all awaiting processing. A key challenge is that only one person, Kamila Walicka, is qualified to perform both core and BGC DMQC analysis for Argo floats at BODC. This creates a significant risk due to the potential single point of failure. To mitigate this risk, we have initiated a series of training courses for core Argo analysis within BODC. We also plan to expand our capacity by training an additional operator for BGC DMQC analysis. However, a major hurdle is the limited funding available for DMQC analysis, which restricts our ability to provide hands-on experience and fully develop the skills of new operators.

3. Value Added items

- List of current national Argo web pages, especially data specific ones
 - NOC continues to maintain the UK Argo website (www.ukargo.net)
 - BODC Argo website (https://www.bodc.ac.uk/data/hosted_data_systems/argo_floats/)
 - NVS VocPrez website (<http://vocab.nerc.ac.uk/>)
 - Facebook page (www.facebook.com/UKArgofloats/)
 - Twitter account (twitter.com/ukargo)

- NOC maintains the SOARC website (www.soarc.aq)
- Known National Argo data usage
 - Please list known operational centers using Argo data in your country in this table:

Operational center	Contact (name, email), if known	What data do they use? (for example, core, BGC, all profile data, trajectory data)
Met Office	Fiona Carse (fiona.carse@metoffice.gov.uk)	Assimilation of real-time temperature and salinity profiles into the operational ocean forecasting (FOAM) and coupled Numerical Weather Prediction models
Met Office Hadley Centre for Climate Science and Services	Rachel Killick (rachel.killick@metoffice.gov.uk), Fiona Carse (fiona.carse@metoffice.gov.uk)	Ingestion of temperature and salinity profiles into several marine climate data sets (EN4 and HadIOD), (see http://www.metoffice.gov.uk/hadobs/en4/).

- Products generated from Argo data that can be shared
 - 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.
 - In the Hadley Centre for Climate Science and Services, Argo data is used 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 GTSP data, and annually using delayed-mode Argo profiles (and WOD, GTSP 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/>.

- ARGO NVS server

- BODC hosts all 32 Argo vocabulary collections on the NVS. There is ongoing discussion around the addition of new collections owned by OceanOPS for populating PROGRAM_NAME (<https://github.com/OneArgo/ArgoVocabs/issues/80>) and DEPLOYMENT_PLATFORM (<https://github.com/OneArgo/ArgoVocabs/issues/2>). Discussion is also ongoing regarding the population of PROJECT_NAME (<https://github.com/OneArgo/ArgoVocabs/issues/5>). The current recommendation is that EDMERP (<https://edmerp.seadatanet.org/>) could be used. Open for feedback.
- ADMT action #35 <https://github.com/OneArgo/ADMT/issues/65> SPARQL demo code can be found in the ArgoVocabs Github repository which can be used to help users pull vocabulary information from the NVS; issue is open for specific feedback and requests. We will also be looking to develop the JSON template further from 2025: https://github.com/nvs-vocabs/ArgoVocabs_Meetings/issues/13
- ADMT action #36 <https://github.com/OneArgo/ADMT/issues/66> relates to https://github.com/nvs-vocabs/ArgoVocabs_Meetings/issues/10. This can be addressed by implementation of 'SYN' sameAs mappings between R27 concepts and the manufacturer, allowing identification of identical sensors that have changed manufacturer.

- In the last year, 13 new concepts and 186 new mappings have been created within 8 existing collections.
- Publicly available software tools to access
 - A Python implementation of the "OWC" salinity calibration method traditionally available for Matlab used in Argo floats Delayed Mode Quality Control https://github.com/euroargodev/argodmqc_owc
 - A software for an infrastructure agnostic set of common BGC parameter derivation equation functions https://github.com/euroargodev/bgc_derivation
 - Real time QC automated tests for Argo data. <https://github.com/euroargodev/argortqcpy>
 - The quality assessment method in the Southern Ocean (SO) uses the pre-classified core Argo float and climatological data belonging to similar water mass regimes using the Profile Characterization Model (PCM). https://github.com/euroargodev/DMQC-PCM/tree/SO_assesment
 - This repository includes the report template and Matlab codes used to generate plots required in the DMQC report for core Argo parameters. <https://github.com/euroargodev/dm-report-template>
 - BODC has provided the material to update the 'Argo vocabulary server' web page on the Argo data management website: <http://www.argodatamgt.org/Documentation/Argo-vocabulary-server>

4. GDAC Functions

If your centre operates a GDAC, report the progress made on the following tasks:

- Operations of the ftp server
- Operations of the https server
- Operations of a user-friendly interface to access data
- Data synchronization
- Statistics of Argo data usage: Ftp and https access, characterization of users (countries, field of interest: operational models, scientific applications) ...

N/A

5. Regional Centre Functions

If your Nation operates a regional centre, report the functions performed and any future plans.

BODC is a member of the Southern Ocean Argo Regional Centre (SOARC). However, due to limited funding in BODC the activity of this group has been put on hold. Some of the SOARC group activities has been undertaken by newly formed Argo Polar working group.

6. Other Issues

Please include any specific comments on issues you wish to be considered by the Argo Data Management Team. These might include tasks performed by OceanOPS, the coordination of activities at an international level and the performance of the Argo data system.