

Argo Canada Data Management Report for ADMT-25

1. Real Time Status

Between September 2023 and September 2024, Canada deployed a total of 53 floats manufactured by NKE. The Department of Fisheries and Oceans Canada (DFO), Ocean Networks Canada, Dalhousie University, and other government departments contributed to the acquisition of new Argo floats. As of the end of September 2024, Argo Canada has 192 active floats. The data processing system runs every 3 hours. The profile, technical trajectory, and meta files of core Argo floats are transmitted to the GDAC in NetCDF format. For BGC and Deep Argo floats, all NetCDF files are available at the GDAC, except for the trajectory NetCDF files. All temperature, salinity, and chlorophyll-A data are issued to the GTS in BUFR format.

The table below listed the different kinds of float that MEDS is currently processing.

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

Float family	Number of versions	Number of floats* (*approximate)
APEX		
ARVOR	2	147
PROVOR	2	23
Navis		
BGC Navis		
SOLO/S2A		
Deep SOLO		
Deep Arvor	1	12
ARVOR(with RBR sensor)	1	9
NOVA	1	1

- How many different sensors are you currently processing?

Parameters	Type(s) of sensor for that parameter
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Temperature/Salinity	SBE41CP and RBR
oxygen	Aanderaa Oxygen Optodes 4330
NO3	SUNA_V2
pH	SBE PH
Chla	ECO Chlorophyll Fluorometer(FLBBRT2K)
bbp	ECO Chlorophyll Fluorometer(FLBBRT2K)
irradiance	Ocean Radiator Color Radiometer 504

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)
SUNA	Yes

- 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 \(argodatamgt.org\)](https://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	Ver 2.3.1 Jun 13, 2018	Ver 2.1 Feb 24, 2021	
NO3	Ver 1.2.2 Mar 4, 2024	N/I	Current QC manual being tested, implemented by end of year (EOY)
pH	Ver 1.0 Apr 9, 2018	Ver 1.0, Dec 2023	

Chla	Ver 1.0, Sep 30, 2015	Ver. 2.1, July 2021	Update to dark count calculation by EOY. Code for slope LUT written/tested and ready to be implemented.
bbp	Ver 1.4 Mar 7, 2018	Ver 1.0, Sept 2023	BBP_ADJUSTED not populated at this time.
irradiance	Ver 1.1 Oct 9, 2017	Ver 1.0, July 2019	

- 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 \(github.com\)](#)

Argo Canada deployed a total of 13 floats equipped with RBR sensors. Seven floats were calibrated before April 2021, and their salinity data are flagged as '3'. Six floats were calibrated after April 2021, and their salinity data are flagged as '1' and sent to the GTS. The codes to process pre-April 2021 data have been developed, and currently being tested and to be implemented in the current system by end of year.

RBRargo3 2K model	Are you filling Adjusted data (A mode) following User Manual 3.8 instructions?	Notes or additional information
pre-April 2021	None	The code is already developed, currently being test before implementing it in the current process.
post-April 2021	None	

- Are you regularly applying real time adjustments for the following items:
 - **Salinity adjustments:** Salinity of core Argo are adjusted in real-time where it's applicable. For deep Argo floats, the salinity data are also adjusted in real-time
 - **Cpcor for deep floats:** Deep Argo floats data are quality control as described in the Argo Quality Control Manual for CTD and Trajectory data version 3.6.1. Pressure, temperature and salinity from Deep Argo float are adjusted in real-time using new $Cpcor_new = -13.5e-8 \text{ dbar}^{-1}$

- **BGC parameters (if so, which ones):** Only Chlorophyll-A are adjusted in real-time. Backscatter adjusted data will be populated with a 1:1 copy of the raw data with the next update of our RTQC code.

	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	Yes	No	Due to backlog of floats to DMQC, we mostly only perform DMQC on inactive floats. Hence, this situation hasn't arose yet.
Cpcor adjustment for Deep floats	Yes	N/A	All the profiles of deep Argo floats are adjusted in real-time and we don't have any DMQC Argo floats yet.
oxygen	No		MEDS hasn't worked on the DMQC of active oxygen floats.
NO3	No	N/A	Our float is still less than one year old.
pH	No	N/A	Our float is still less than one year old.
Chla	Yes	N/A	Our float is still less than one year old.
bbp	No		Our float is still less than one year old.
irradiance	No		Our float is still less than one year old.

- What data are you sending onto the GTS?
 - We currently only send temperature, salinity and chlorophyll-A on the GTS in BUFR format since other BGC variables are not real-time adjusted.
- What data is going to the aux directory? UVP, FL2BB, etc
 - We don't have any data in the aux directory

- Are you automatically greylisting questionable floats detected by min/max test?
 - Yes, we're regularly greylisting questionable floats when the situation arises.
- 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?
 - We haven't had a chance to complete the transition to trajectory files V3.2 due to other priorities. We might be able to complete the transition of trajectory to V3.2 by ADMT 26.
- Do you have any code to share with other DACs? If so, where is that available?
 - We completed the development of BUFR encoder for BGC variables. The code is available on <https://github.com/trana99/ArgoBufrEncoder>
 - Additionally, python software for performing RTQC on CHLA and BBP was developed this year (medsrtqc). While the package is currently specific to the MEDS DAC, the code was written in a modular way, and there is strong interest in contributing to a "system-agnostic" python package for RTQC. This code is also publicly available on the ArgoCanada github page, <https://github.com/argocanada> .

2. Delayed Mode QC status

- What is the status of delayed mode trajectory files? Have you created any dmode trajectory files? If not, what are the reasons? If you have, would you be interested in sharing your experiences with others?
 - Unfortunately, we have not performed DMQC for the trajectory files and currently lack an operator delegated for delayed mode quality control for these files. Due to staff shortage, we are behind on DMQC overall and our current priority is to clean the backlog for CORE Argo DMQC.
- How are you implementing BGC dmode - by parameter or one expert does all parameters?
 - For the moment, DOXY is the only BGC variable being DMQCed. As our floats with additional sensors (FLBB, pH) have begun to age, there will be a priority to DMQC those variables in the coming year. This will likely be handled by the same operator performing DOXY DMQC.
 - At the time of writing this report, 2034 of 9575 (21.2%) eligible DOXY profiles are in D-mode. An additional 1374 (14.4%) are in A-mode.
- What challenges have you encountered and how have you dealt with them?
 - One of the significant challenges we have faced at MEDS DMQC is managing the backlog of CORE Argo DMQC tasks from the past few years, primarily due to a shortage of staff. To tackle this issue, we hired a new DMQC operator in August 2024. This new staff member is

dedicated to addressing the backlog, maintaining our DMQC code and tools, standardizing our procedures, and enhancing documentation.

- We are actively educating the newly-hired operator and updating the existing MATLAB package. Additionally, we are clarifying and summarizing our current backlog. For example, we have compiled a list of active MEDS floats, detailing total cycle numbers for each float compared to DMQC cycle numbers (Figure 1), based on the records from `ar_index_global_prof.txt` on the Ifremer FTP. We prioritize our DMQC operations based on the results from Min/Max checks, allowing us to address the most critical issues first. Through these efforts, we are working diligently to overcome our challenges and improve our DMQC processes.
- For DOXY floats, there are 3 floats that remain in the DOXY audit produced by MBARI. These float have been a challenge to process, but we are currently seeking support from MBARI on how to proceed with these floats and they should be resolved shortly.

- Do you have any code or tools you'd like to share with other DM operators? If so, where is that available?
 - As for the tools for core variables DMQC, we have developed a MATLAB package named Argo_DMQC. This package facilitates the downloading of Argo data from the Ifremer FTP, conduct pressure adjustments using surface pressure measurements, and perform visual quality control assessments. It also supports OWC analysis, updates QC flags accordingly, and generates D-mode NetCDF files that are ready for upload to the MEDS FTP.

The majority of the scripts within this package were developed between 2017 and 2019. In February 2023, we reorganized the code and published the first stable release in the private DFO-MEDS repository on GitHub. In April 2023, we integrated new features for thermal mass correction, though a stable release for this update is still pending.

Currently, the package is primarily intended for internal use at MEDS. Since hiring a new DMQC operator in August 2024, we have been actively updating the MATLAB package to align with evolving NetCDF file formats, including variable name updates and profile number modifications, while also addressing existing bugs. Our ultimate goal is to prepare the package for public use in the future.

- For BGC DMQC, the python package bgcArgoDMQC provides code to load in BGC-Argo oxygen data, calculate gain via comparison to WOA climatology data in the water column or NCEP data using in-air measurements, update QC flags and DOXY_ADJUSTED values, and export them to a D-mode netCDF file. The software is under active development, but a stable release is available that has been shown to closely agree with the analogous matlab software, SAGE-O2, for WOA gains. This release can be installed via Anaconda or pip, and to code can be found on the ArgoCanada github page, <https://github.com/argocanada>.

DMQC procedures for additional variables are being considered for development in the near future.

- Do you have any concerns you'd like to bring to the ADMT?
 - We appreciate the sharing of the OWC analysis Python package available on the Euro-Argo GitHub. And we realize that the package is currently compatible with Python versions 3.6 to 3.8, as indicated in the setup.py file [here](#). However, since Python 3.8 is reaching its end of life at the end of October 2024, we anticipate that there will be no further bug fixes or security patches for this version. Given these circumstances, it would be beneficial to understand the compatibility of the OWC Python package with higher versions of Python and any potential development plans.

3. Value Added items

- List of current national Argo web pages, especially data specific ones

- Argo data have been used to generate monthly maps and anomaly maps of temperature and salinity along line P in the Gulf of Alaska. Line-P has been sampled for 50 years and has a reliable monthly climatology. For more information on the Line-P products and other uses of Argo to monitor the N.E. Pacific go to: <http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/argo/canadian-products/index-eng.html>.
- 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)
Environmental and Climate Change Canada		Core, BGC data via the GTS data stream.

- Products generated from Argo data that can be shared
- Publicly available software tools to access

4. GDAC Functions

Canada has no Argo GDAC function. However, Canada forwards TESAC data to the GDACs in Ifremer (France) and USGODAE (USA) three times a week. Canada also monitors the timeliness of Argo data on the GTS in BUFR format.

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) ...*

5. Regional Centre Functions

Canada has no regional center function.

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

6. Other Issues

There was no other issue to report during the compilation of this report.

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.