UK ARGO PROGRAMME

REPORT FOR 19TH ARGO STEERING TEAM MEETING, MARCH 2018

1 Introduction

The UK Argo programme is undertaken by a partnership between the Met Office, the National Oceanography Centre Southampton (NOC), the British Oceanographic Data Centre (BODC) and Plymouth Marine Laboratory (PML). The Met Office are responsible for programme management and coordination, organizing float deployments, preparation of floats for deployment, telecommunications (costs) and international contributions. NOC and BODC have responsibility for Argo science and data management respectively. PML play a leading role in the recent expansion of the UK programme into BGC-Argo.

The most pressing issue for the UK programme remains on securing ongoing funding for UK Argo, in particular for core Argo floats, and ensuring that data is delivered (in real-time and delayed-mode) from both our core and non-core (e.g. floats with additional sensors) to the WMO GTS and GDACs.

Internationally, it is imperative to the UK that the core Argo array is complemented by the Argo extensions into deeper profiling, bio-geochemistry and high latitudes, such that these do not lead to a reduction in core Argo below its target density or its ability to deliver core data to users.

2 Status of implementation

2.1 Floats deployed and their performance

Figure 1 shows the number of UK floats procured and deployed each year since 2000. The number purchased each year has been somewhat variable as it has largely been reliant on the release of additional in-year or year-end (under-spend) funding. As a result, the number of deployments each year has also been variable, with 53 floats deployed in 2017 (a new UK record!), with over the last five years an average of 42 floats/year having been deployed. Since 2012, the number of non-core floats deployed has increased. In 2017, 18 of the 53 UK floats deployed were deep, bio or core floats deployed at high latitude (> 60S).

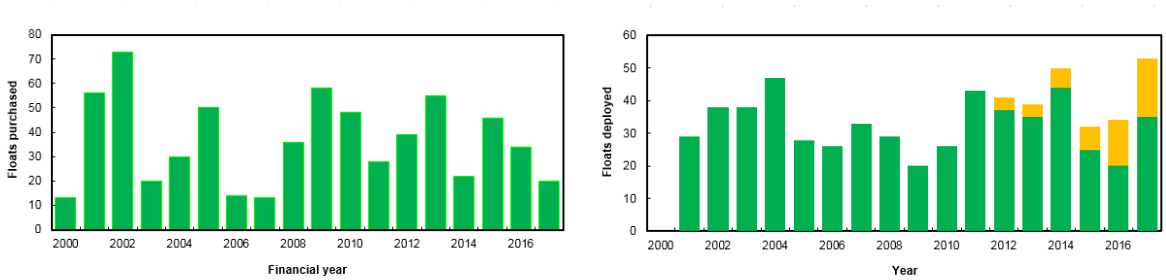

Figure 1. Showing (left) the number of floats procured each financial year (Apr-Mar) and (right) the number deployed in each calendar year. Yellow bars indicate non-core float deployments.

In 2017, float deployments have been made in the North Atlantic, South Atlantic, Southern Ocean, and Indian Ocean (Mozambique Channel and Bay of Bengal). The 53 floats deployed include: 33 core Argo floats, two core Argo floats (with RBR sensor), four deep floats, six T/S/O2 floats, and six T/S/O2/pH floats. Of these, three failed immediately (the core with RBR float deployed in Bay Of Bengal on 10/02/17; two Deep Apex in Drake Passage in December 2017). At present only data from

the core floats are being processed by BODC and delivering data to the GTS and GDACs. Coriolis is presently processing our 11 PML-funded BGC Provor floats.

With the floats deployed the number of UK floats presently contributing data to Argo (including those provided to and deployed by Mauritius) is 164 (*as at 21/02/18, JCOMMOps query for UK & Mauritius 'operational' floats*), as shown in Figure 2, with their geographic distribution shown by Figure 3. Of the 164 operational floats, the majority are TWR Apex floats using Argos communications (139). The remaining 25 use Iridium communications and comprise: 7 Apex core floats, 11 PROVOR BGC floats and 7 NAVIS core floats.

Figure 2. Number of UK (including Mauritius) floats with data on Coriolis GDAC by month (164).

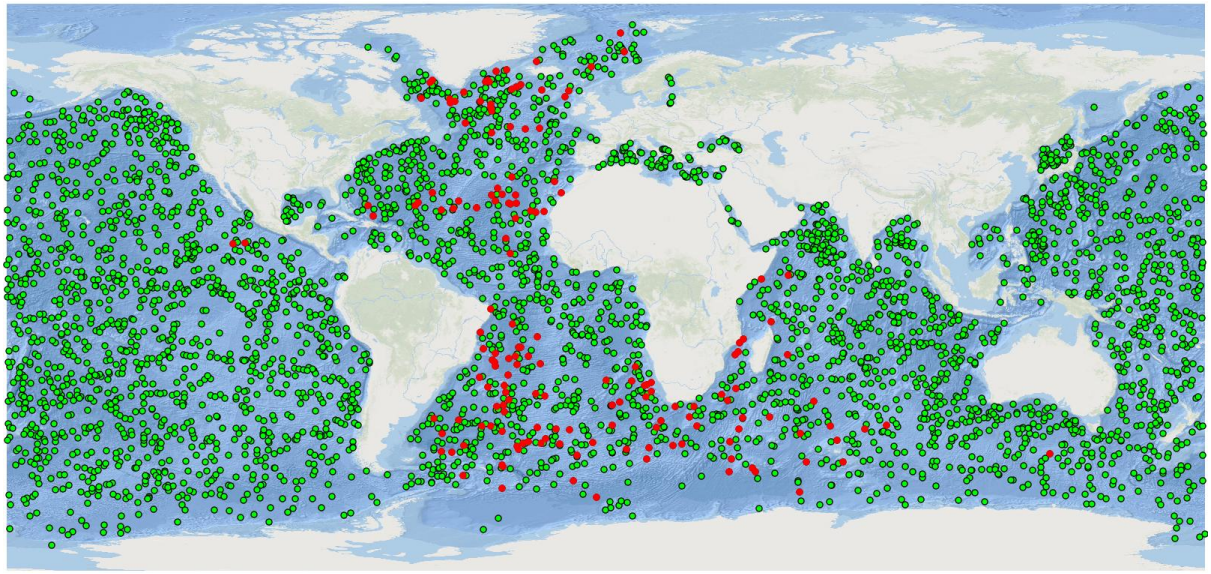

Figure 3. Showing the locations of reporting UK (and Mauritius) floats (in red) with the global network (in green), as at 21st February 2018 (164).

However, there are a number of active floats (additional sensors, deep, RBR CTD) deployed in recent years for which data processing has not yet been set up (so are not included in Figures 2 and 3). At 21 February 2018, we have a further 31 floats in operation for which the data are not yet being processed:

- 6 Apex with T/S/O2/pH (all deployed in South Atlantic near South Georgia, Nov 2017)

- 3 Apex with RBR (2 at 60N in Atlantic, Jun/Jul 2016; 1 at 28N in Atlantic, Oct 2017)
- 4 Apex with STS (all deployed in Bay of Bengal, Jun 2016)
- 6 Apex Deep (2 T/S at 24N in Atlantic, Dec 2015; 4 with T/S/O2 in Drake Passage, Dec 2017)
- 1 Arvor Deep (at 24N in Atlantic, Jan 2016)
- 3 Navis with radiometer (Bay Of Bengal, Jun 2016)
- 8 Navis T/S with Iridium (45S in Atlantic, Jul 2016; 34S in Atlantic, Jan 2017)

The UK's total number of floats in the water is 195, with 164 of these presently reporting data in real time. A priority for the coming year will be to ensure that the data (at least for T/S) are processed and delivered to the GTS and GDACs.

At this time, we have eight floats with NOAA for deployment during the IO7N section, plus the following floats in storage in the UK: 30 core floats, four deep T/S floats, four deep with T/S/O2, three bio-geochemical floats, two Apex oxygen floats, two Navis oxygen floats and one with the RBR CTD. We also have 20 core T/S floats on order, due to be delivered in March 2018. PML plan to buy a further 2 BGC floats for PICCOLO[1] during 2018. This will give a total 'stock' of 50 core and 18 non-core floats.

From these floats we plan to deploy 41 to 43 during 2018:

24 T/S Core:
- 8 Apex (IO7N, with NOAA, exact dates tbc, Apr-Jun 2018)
- 2 Apex (North Atlantic OSNAP moorings cruise, Stuart Cunningham, Jun 2018)
- 2 Apex (SW Indian / Mozambique Channel, Tammy Morris, Jun 2018)
- 2 Apex (SE Atlantic, Tristan da Cunha line, Tammy Morris, Sep 2018)
- 4 Apex (Atlantic, AMT28 cruise, Glen Tarran, Sep-Oct 2018)
- 4 Apex (26N RAPID cruise, David Smeed, Oct-Nov 2018)
- 2 Apex (Mauritius)

4 T/S core deployed at High Latitude:
- 4 Apex with Ice avoidance (PICCOLO cruise, Weddell Sea, Dec 2018)

4 T/S/O2:
- 2 Apex with O2
- 2 NAVIS with O2
- (all 4 on South Atlantic, 24S line, Brian King, March-April 2018)

4 deep with O2:
- Apex Deep (South Atlantic, 24S line, Brian King, March-April 2018).

5 BGC:
- 3 Seabird NAVIS.
- 2 type to be confirmed, awaiting outcome of UK Framework tendering process.
- (all 5 on PICCOLO cruise, Weddell Sea, December 2018)

Possible but not definite:
- 1 RBR paired with 1 Apex Iridium float (not yet purchased), in North Atlantic sub-tropical gyre.

This will leave around 26 core and 4-5 non-core 'in stock' going into 2019, plus around 20 core floats expected to be purchased in 2018, which should allow for continuity of deployments for around one year if there is a funding shortfall in future.

2.2 Technical problems encountered and solved

2.2.1 Non-core float technology

Bio-geochemical Argo. Eleven UK PROVOR BGC floats are being processed at Coriolis until BODC are able to take over the code.

[1] PICCOLO: Processes Influencing Carbon Cycling: Observations of the Lower limb of the Antarctic Overturning (

Oxygen & pH. Six Apex floats with T/S/O2/pH were deployed at one site near South Georgia during November 2017 (COMICS cruise). CTD stations were performed simultaneously, to aid calibration and QC.

Deep Argo. In December 2015 and January 2016 we deployed two Apex Deep and two Deep Arvor floats in the North Atlantic. The Deep Apexs performed 50 profiles and 127 profiles, lasting until June 2016 and April 2017 respectively. One of the Deep Arvors failed after one cycle, the other failed sometime before September 2017 (Fiona/Jon can't be more specific on the fail date, because we cannot look any further back than this in the CLS mydata application).

Three Deep Apexs with O2 (deployed and recovered during December 2016 after leaking at 2-7 cycles) were shipped back to Teledyne Webb for investigation, to find out the cause of the leak. These have been repaired and were deployed with one other Apex Deep in Drake Passage during December 2017. Of these four, one never transmitted, one transmitted on its day of deployment but never again, and two are transmitting well but the data has serious quality problems (Yvonne Firing, *pers. comm.* 8th March 2018).

Apex floats with RBR CTD: Two RBR floats were meant to be deployed during the BoBBLE (Bay of Bengal Boundary Layer Experiment) cruise in June 2016. The first one failed immediately after deployment so the second was returned to India for a firmware upgrade. This float was subsequently deployed in February 2017 but failed (in spite of passing all pre-deployment checks). The two floats have not been recovered. The UK has three other RBR floats operating in the North Atlantic without problems in the network (see 2.1).

2.2.2 Core float performance

Float lifetime. At the 2016 Argo Steering Team meeting it was reported that float longevity had improved up to 2005, but since then there have been dips in longevity. There was also great diversity in performance across programs, some achieving long life (50% reaching 200 profiles) and others short lifetimes (50% only reaching 100 profiles). This behaviour is clearly evident in the UK's floats, the vast majority of which have been Webb Apex floats, as shown in Figure 4. For floats deployed 2004-2006 50% of floats exceeded 160 cycles, for 2007-2009 floats 48% reached 170 cycles but for floats deployed 2010-2012 only 47% of floats reached 160 cycles. Since 2007 we have fitted lithium batteries in over 50% of Apex floats deployed, so those floats deployed 2007-2009 are showing the greatest longevity.

For floats deployed 2013-2015, the statistics put them in 'second place' behind the 2007-2009 batch, with over 70% of floats performing 120 cycles. At the time of the 2017 AST meeting, it appeared the UK was experiencing a downturn in longevity of our core Apex floats. This year, the picture is more encouraging.

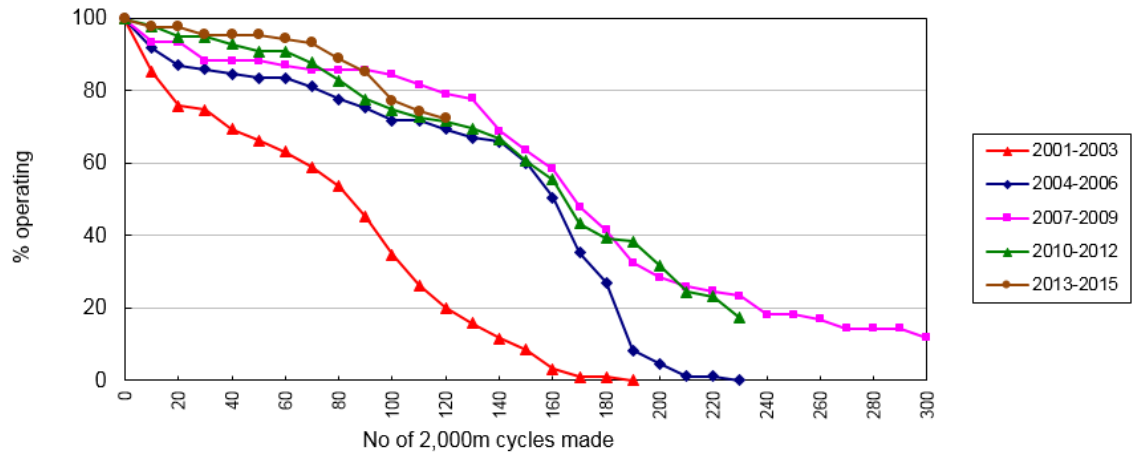

Figure 4. Number of (normalised to 2,000m) cycles made by UK standard Apex floats deployed in 2001-2003, 2004-2006, 2007-2009, 2010-2012 and 2013-2015 (updated 22 February 2018).

2.3 Status of contributions to Argo data management

2.3.1 DAC functions and real-time data processing

BODC retrieves data for all UK, Irish, Mauritius and EU MOCCA floats from a number of sources and archives these for further processing. Where possible, processing of arriving data is normally setup within one week of float deployment, and during the past year this has typically been achieved much more quickly.

During the past year, BODC has transitioned to retrieving all Iridium Rudics float data from the new CLS SFTP server, providing greater security and file integrity, and allowing us to terminate the FTP-push of data to our FTP by CLS. BODC has been working with CLS to address issues that arose during this migration and these have been resolved. BODC has also established a robust method for handling SBD Iridium messages received via email.

All core data received for currently processed floats are distributed to the GDACs within one hour of the data arriving at BODC, with the real-time quality control tests applied. Any file that fails to be transferred is queued for the next transfer attempt. BODC has not yet completed the conversion to v3.1 for all file types, although great improvement has been made (> 60% of core profiles are now delivered in v3 netCDF format as at November 2017, compared with ~ 30% at Nov 2016).

Processing of floats for the EU MOCCA project began at BODC in December 2016, increasing the total of core floats being processed by 46 at November 2017. This included the deployment of decoder software provided by Coriolis to augment the BODC Argo System. During 2017, BODC uprated automated data processing such that data are now submitted to the GTS four times a day, rather than twice a day as was previously the case. An issue identified with the application of the BODC greylist to a small subset of floats has now been resolved.

Distribution of all core data to the GTS from all BODC managed floats is a priority, including core data from floats with any type of Argo extension (deep, BGC or auxiliary data). BODC's current focus is to ensure all floats with an APF9I controller board are effectively managed within the BODC Argo System, and attention will then turn to floats with other controller boards such as the APF11. BODC is seeking to collaborate with other DACs in the development of APF11 decoders.

There remains further work to complete the conversion of the remaining core profile files, with the conversion to v3.1 for technical and trajectory files due after this work has been completed. We are not currently issuing any BGC-Argo files for UK floats due to the current focus on core profile data. The exception to this is the dozen PROVOR floats kindly hosted for BODC by Coriolis until such time as BODC can take over the real-time processing.

2.3.2 BUFR TM 3-15-003 for GTS data distribution

BODC has begun making all netCDFs available directly to the Met Office via SFTP and this is now occurring on a routine basis four times a day. Upon receipt of the netCDF files, the Met Office runs Python 2.7 software that converts netCDF to BUFR. The Met Office issues BUFR to the GTS four times per day. We are in the final stages of testing this system, and the intention is to switch off BODC's BUFR generating software very soon. After this switch-off, the Met Office will assume responsibility for the BUFR generation and distribution on the GTS. In the near future, the Met Office will make the BUFR converter freely available for use. The code has been designed to be extensible, where capability for secondary temperature/temperature and salinity, and oxygen profiles will be added plus other BGC variables when required. The Met Office plans to begin work to extend the Python code to include secondary T/S and oxygen profiles during 2018.

2.3.3 GDAC activity

The UK does not currently make a direct contribution to GDAC functions, although BODC has contributed to the development of the Argo DOI and has begun suppling some auxiliary data files to the new auxiliary directories at Ifremer for floats funded by the EU MOCCA project.

BODC-NOC and Ifremer won a small 15 k Euro grant to progress the Argo DOI from Research Data Alliance (RDA) Europe. Ifremer migrated the Argo snapshots to a single DOI (http://doi.org/10.17882/42182) in March 2016. A '#' key is used to identify the monthly snapshots within the archive on SEANOE, e.g. http://www.seanoe.org/data/00311/42182/#45420 . The '#' means that the identification of the snapshot is evaluated on the browser rather than the DOI resolving server making it possible to use a single DOI without a change to the DOI system.

2.4 Status of delayed mode quality control process

All delayed-mode QC on BODC hosted floats is performed within BODC, with the exception of some floats funded under the Euro-Argo MOCCA project. Currently BODC is only capable of providing data for delayed mode QC for core data, with work required to finish the delivery of biogeochemical parameters in v3.1. Again, the exception to this are a dozen PROVOR floats that Coriolis is kindly hosting on BODC's behalf.

During 2017, BODC has regenerated delayed mode QC capability though a software and procedural review, accompanied by knowledge transfer primarily from Justin Buck to Matt Donnelly. BODC use OW software for delayed mode quality control with the latest reference data available from Coriolis (CTD climatology and Argo profile climatology for guidance). Following advice from the wider UK Argo team, and particularly from Brian King, we are currently working to the following prioritisation:

- To facilitate increasing knowledge/experience of regional oceanography we are addressing DMQC on an ocean basin-by-ocean basin basis. DMQC has started with the Indian Ocean, and will move onto the South Atlantic next, followed by the Southern Ocean and North Atlantic.
- To facilitate increasing knowledge/experience of the use of the OW software and to avoid applying excessive corrections, we are tackling floats with simple pathologies first, then moving onto floats with increasingly complex pathologies as DMQC skills improve within BODC.

During October/November 2017 we have performed our first significant batch of DMQC since 2013, totalling c. 1700 profiles. At the time of writing, 49% of BODC hosted floats profiles eligible for delayed mode QC have been processed and submitted to the GDACs in delayed mode. BODC expects to continue improving this situation in the coming year, with an additional uplift in capacity expected from additional team members undertaking DMQC training in the coming months.

3 Funding and human resources

Over the last five years funding for the UK Argo Programme has been provided by DECC, NERC and (since 2012) the Met Office. The Met Office and DECC-funded element of the UK Argo Programme supports the Met Office's activities and includes: programme management and coordination, float procurement, preparation of floats for deployment, organisation of float deployments and representation in the international Argo Steering Team and Euro-Argo. Argo science and data management aspects are funded by NERC and led by NOCS and BODC respectively. NERC has also provided ad-hoc funding for floats, which has been directed through NOC, PML and other delivery partners.

During 2016 DECC advised that as a consequence of savings to be made under the Government's Comprehensive Spending Review their funding for Argo will cease from April 2018. Since then the majority of the activities previously delivered by DECC have been moved into the new Department for Business, Energy and Industrial Strategy (BEIS) which is also the owning department for the Met Office and NERC. The Met Office are actively pursuing the issue to see if there is a way to recover the position, as the DECC funding provided for the majority of our core Argo floats. As at 27 February 2018, we have received positive indications that funding for the Met Office management costs, plus

funding for around 20 core floats, will be available for UK financial year 2018/9. However, we have not received written confirmation of this situation.

From April 2018 it is expected that NERC will continue to fund deep and bio-geochemical floats through projects (e.g. ORCHESTRA, BoBBLE, ACSIS, RoSES), but they are unlikely to fund many (if any) core Argo floats.

BODC NERC National Capability funding, which funds Argo data management, was reviewed during 2017 and for the coming year we expect funding to remain at the same cash amount as it has been for the previous few years, which, when inflation is taken into account, is a net reduction in real terms. In addition, it is expected that the NERC projects BoBBLE, ORCHESTRA, ACSIS and RoSES will provide some funding for data management. The European funded MOCCA project supports real time processing of 75 Euro-Argo ERIC floats and delayed mode quality control for 38 ERIC floats for 4 years (2017-2021). AtlantOS will support delayed-mode QC of bio-geochemical Argo data during the period 2017-2019.

Staff members working on UK Argo, their institution and an estimate of their fraction of full time equivalent time spent on Argo during FY2017/8 (April 2017 – March 2018) are listed below:

Jon Turton, Met Office (0.25)
Fiona Carse, Met Office (0.4)
Brian King, NOCS (0.25) *[estimated on BK's behalf]*
Giorgio Dall'Olmo, PML (0.2) *[estimated on GD's behalf]*
Matt Donnelly, BODC (0.56)
Clare Bellingham, BODC (0.52)
Katie Gowers, BODC (0.35)
Violetta Paba, BODC (0.36)
Paul McGarrigle, BODC (0.02)
Elizabeth Bradshaw, BODC (0.02)
Justin Buck, BODC (0.11)
Robin McCandliss, BODC (0.11)

Total: 3.15 FTE.

Projections for FY 2018/9 show an additional 1.0 FTE staff time at BODC.

4 Uses of Argo data in the UK

4.1 Research Uses

4.1.1 National Oceanography Centre

Argo data are used widely within NOC science with the following regional leads for float deployment and science:

- Alex Sanchez Franks (Indian Ocean)
- Yvonne Firing (Southern Ocean)
- Penny Holiday (Sub-polar N Atlantic)
- Brian King (everywhere else)

Elaine McDonagh is also engaged in using Argo data, bidding for float funds, planning strategies, leading analyses and mapped products.

The applications of Argo data at NOC 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).

4.1.2 Plymouth Marine Laboratory

Giorgio Dall'Olmo is the lead PI for BGC data in the UK. Bio-Argo data from 13 Provor floats are now available from the GDACs, thanks to processing courtesy of Coriolis. Core-Argo data are used at PML for:

- providing a description of the physical environment in the framework of biological (e.g. mapping eel migration routes) and biogeochemical studies;
- developing techniques to generate 3D fields of biogeochemical variables by merging ocean-colour and in-situ data;
- investigating mesoscale structures by combining altimetry and in-situ profiles with a special focus on Agulhas rings.

BGC-Argo data focuses on investigating new methods to:

- efficiently monitor the ocean biological carbon pump;
- quantify particle flux attenuation;
- vertically-resolve seasonal remineralisation rates;
- and to better understand the nitrogen cycle in oxygen minim zones.

4.2 Operational uses – Met Office

Argo data (received over the WMO GTS) are routinely assimilated into the Met Office's FOAM (Forecasting Ocean Assimilation Model) which is run daily. The FOAM suite runs daily in an early morning slot and produces 2 analysis days and a 7-day forecast. The 3-D temperature, salinity and current fields from the global model run are used as boundary conditions for the regional models. There are 4 different configurations: ¼ degree global, 1/12 degree North Atlantic, 1/12 degree Mediterranean, 1/12 degree Indian Ocean and ~6km European North West Shelf. More details are at: http://www.oceansci.net/12/217/2016/os-12-217-2016.pdf and http://www.geosci-modeldev.net/7/2613/2014/gmd-7-2613-2014.html . The global FOAM system is used to initialise the ocean component of coupled monthly-to-seasonal forecasts, and so the requirements for Argo for that application are the same as for FOAM.

A coupled ocean/atmosphere prediction system has been developed for weather forecasting timescales, including assimilating Argo data in a coupled data assimilation framework (Lea et al., 2015), and is now being run operationally, delivering ocean forecast information to the Copernicus Marine Environment Monitoring Service (CMEMS). The timeliness constraints on Argo for this application are more stringent (data need to be available within 24 hours of measurement, and preferably within 6 hours). The impact of Argo on this system was assessed as part of the E-AIMS EU project (King et al., 2015).

Near-surface Argo data are used to validate the output from the Met Office's OSTIA (Operational Sea Surface Temperature and Sea Ice Analysis) – the OSTIA fields are in turn used as a lower boundary condition in numerical weather prediction models run by both the Met Office and ECMWF.

Argo data are also used in the initialization of ocean conditions in models run to make decadal predictions, see: http://www.metoffice.gov.uk/research/modellingsystems/unified-model/climate-models .

4.3 Links to websites maintained by the UK Argo program

BODC continues to maintain the UK Argo website (www.ukargo.net) along with a Facebook page (www.facebook.com/UKArgofloats/) and a Twitter account (twitter.com/ukargo). Work has also progressed to split the UK Argo website into separate UK Argo and SOARC websites – providing SOARC with a distinct web presence – and the new SOARC website is now available (www.soarc.aq).

5 Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo.

The UK has no specific issues to raise.

6 Cruise CTD data during float deployments (reference database)

Fiona Carse and Jon Turton always encourage the deployers of UK floats to tell us about CTD casts performed at the time the floats are deployed. We include any information supplied by staff on board deploying vessels in the “Description” (free text) section of the JCOMMOPS float registration form. Cruise information (PI, ship, dates) is also made available through the JCOMMOPS float registration form whenever possible (it is always possible for cruises on UK research vessels). Can CCHDO staff see this field? Do they monitor it and request data from national data centres such as BODC?

CTD data for which there is an agreed Data Management Plan (DMP) in place with BODC (e.g. as for data funded by NERC research projects) will be supplied to BODC for ingestion into the UK National Oceanographic Database (NODB). Data will be forwarded from BODC to relevant partners, such as CCHDO, were this is specified in the DMP. A review of CTD data pathways to the Argo reference database is likely needed. Pathways for CTD data availability from deploying cruises from projects that do not have a DMP with BODC in place are the responsibility of the relevant programme. Further consideration needs to be given to the content of DEPLOYMENT_REFERENCE_STATION_ID across the Argo data system to ensure accessibility and interoperability of CTD data.

7 Argo bibliography

7.1 Papers by UK authors.

Included below is a list of papers published during 2016 to 2018, with at least one author based at a UK institution. There are seven papers in 2016, eleven in 2017, and one in 2018.

Berry, D.I.; Corlett, G.K.; Embury, O.; Merchant, C.J..
Stability Assessment of the (A)ATSR Sea Surface Temperature Climate Dataset from the European Space Agency Climate Change Initiative.
Remote Sens. 2018, 10, 126. doi:10.3390/rs10010126

Xue, Yan; Wen, C.; Kumar, A.; et al.
A real-time ocean reanalyses intercomparison project in the context of tropical pacific observing system and ENSO monitoring.
CLIMATE DYNAMICS. 2017, 49, 11-12, 3647-3672 doi:10.1007/s00382-017-3535-y

Organelli, E., Barbieux, M., Claustre, H., Schmechtig, C., Poteau, A., Bricaud, A., Boss, E., Briggs, N., Dall'Olmo, G., D'Ortenzio, F., Leymarie, E., Mangin, A., Obolensky, G., Penkerc'h, C., Prieur, L., Roesler, C., Serra, R., Uitz, J., and Xing, X.:
Two databases derived from BGC-Argo float measurements for marine biogeochemical and bio-optical applications,
Earth Syst. Sci. Data, 2017, 9, 861-880. doi:10.5194/essd-9-861-2017

Tang, WQ ; Fore, A ; Yueh, S ; Lee, T ; Hayashi, A; Sanchez-Franks, A; Martinez, J; King, B ; Baranowski, D.
Validating SMAP SSS with in situ measurements.
REMOTE SENSING OF ENVIRONMENT, 2017, 200, 326-340 doi:10.1016/j.rse.2017.08.021

Palmer, M.D., Roberts, C.D., Balmaseda, M., Chang, YS; Chepurin, G; Ferry, N; Fujii, Y; Good, SA; Guinehut, S; Haines, K; Hernandez, F; Kohl, A; Lee, T; Martin, MJ; Masina, S; Masuda, S; Peterson, KA; Storto, A; Toyoda,T; Valdivieso, M; Vernieres, G; Wang, O; Xue, Y.
Ocean heat content variability and change in an ensemble of ocean reanalyses.
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Bio-optical anomalies in the world's oceans: An investigation on the diffuse attenuation coefficients for downward irradiance derived from Biogeochemical Argo float measurements,
J. Geophys. Res. Oceans, 2017, 122, 3543–3564, doi:10.1002/2016JC012629

While, J; Mao, C; Martin, MJ; Roberts-Jones, J; Sykes, PA; Good, SA; McLaren, AJ.
An operational analysis system for the global diurnal cycle of sea surface temperature: implementation and validation,
QUARTERLY JOURNAL OF THE ROYAL METEOROLOGICAL SOCIETY, 2017, 143, 705, 1787-1803. doi:10.1002/qj.3036

F.M. Calafat; P. Cipollini; J. Bouffard; H. Snaith; P. Féménias.
Evaluation of new CryoSat-2 products over the ocean.
Remote Sensing Of Environment, 2017, 191, 131-144. doi:10.1016/j.rse.2017.01.009

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Developments in marine pCO2 measurement technology; towards sustained in situ observations.
Trends in Analytical Chemistry 88 (2017) 53-61 doi:10.1016/j.trac.2016.12.008

Xing, XG; Claustre, H; Boss, E; Roesler, C; Organelli, E; Poteau, A; Barbieux, M; D'Ortenzio, F.
Correction of profiles of in-situ chlorophyll fluorometry for the contribution of fluorescence originating from non-algal matter,
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Assessing recent warming using instrumentally homogeneous sea surface temperature records.
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7.2 UK PhD theses using Argo data

Fiona and Jon do not have access to this information at the present time.

7.3 Argo PIs

The UK does not have Argo PIs, except that, nominally, Jon Turton is the PI for core floats, Giorgio Dall'Olmo is the PI for BGC floats, and Brian King is PI for deep and all other non-core floats.

8 Talks and Outreach

BODC maintains UK Argo Facebook and Twitter accounts, the latter of which has been successfully used to highlight the contributions of various contributors to the Argo programme such as the British Antarctic Survey's role in deploying our longest operating float and the RRS James Clark Ross has deployed 171 floats during the course of the Argo programme.

As part of personal outreach activities, Matt Donnelly from BODC has undertaken outreach talks at All Saints High School in Liverpool and to Manchester and Salford University Royal Navy Unit which have included a significant Argo component.

Fiona has sent Megan a file containing some slides that Fiona and Jon use for general talks, for example for new starters at the Met Office [AST19_UK_Argo_slides_for_general_talks.pptx].

In general, I find the IPPC 5th report (Physical Science Basis, Chapter 3 http://www.ipcc.ch/report/ar5/wg1/) useful. Also Lea et al.'s 2014 OSE paper (http://onlinelibrary.wiley.com/doi/10.1002/qj.2281/full). And the Riser et al. (2016) paper (https://www.nature.com/articles/nclimate2872).

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