

Australian Argo National Data Management Report

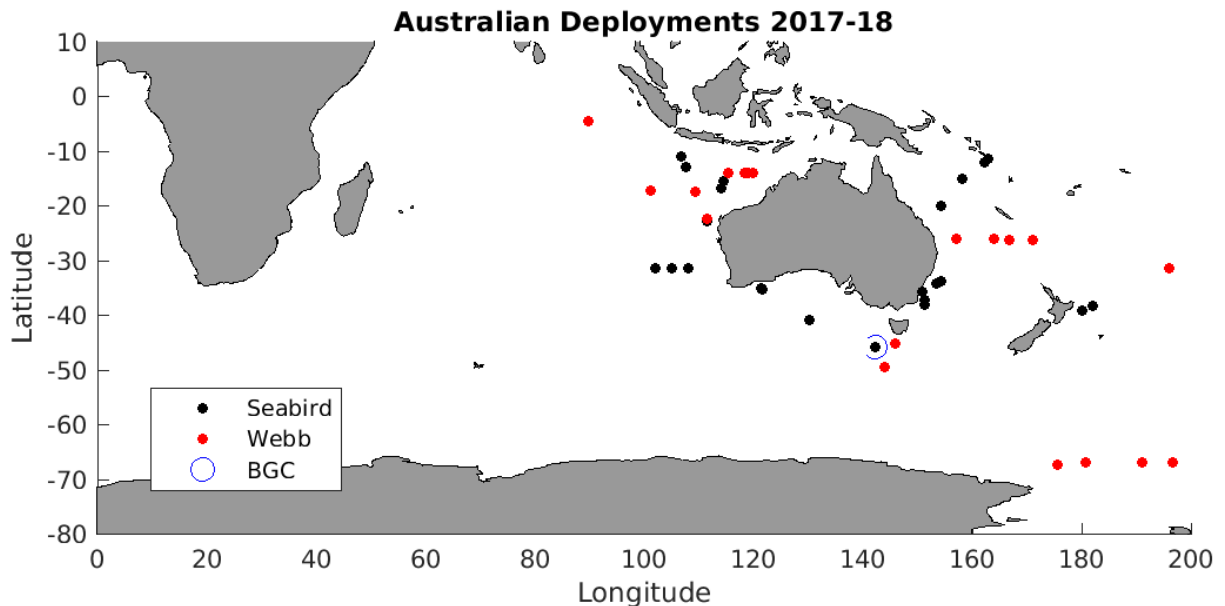
ADMT19

Scripps, San Diego, USA, 6-7 December, 2018

Rebecca Cowley, Lisa Krummel, Jenny Lovell and Catriona Johnson for the Argo Australia Team

Status of Array

Australian deployments in 2017-18



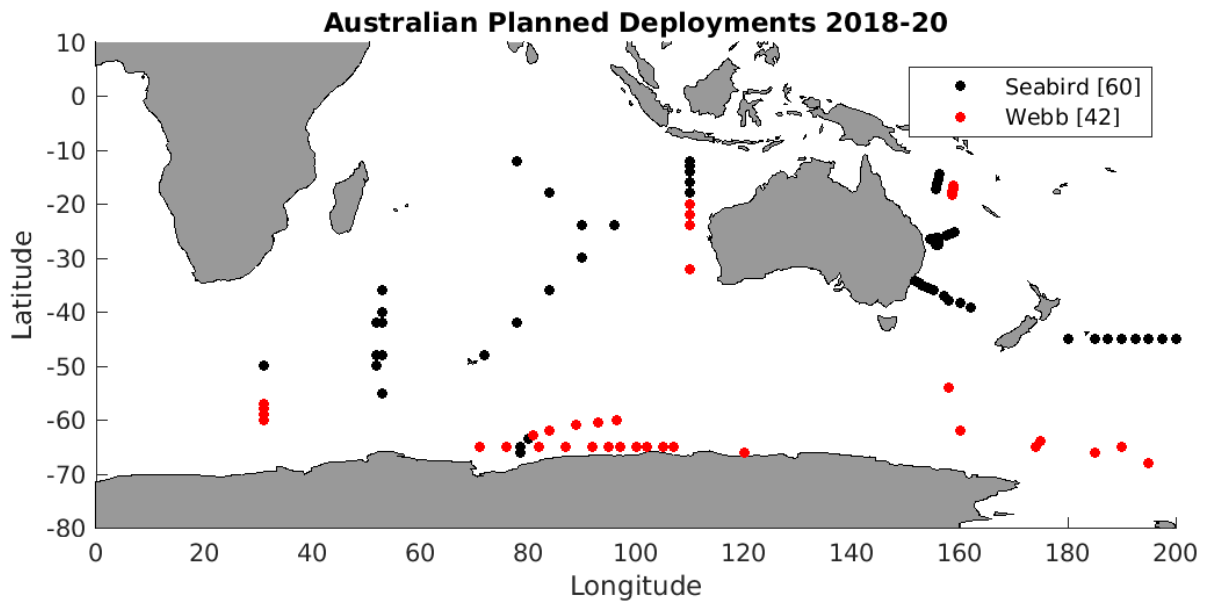
Australian Argo deployments between November 2017 and November 2018.

Australia has deployed 46 floats since the last meeting, including 3 Seabird Bio-Argo models.

We currently have 402 floats listed as 'live' though this includes some that are under ice or have been missing for over a year, from a total of 859 deployments since 1999. Contributors to the Australian Argo program include the Australian Bureau of Meteorology (BoM), Australian Defence, the Integrated Marine Observing System (IMOS) and the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC).

Australian Deployment plans 2018-20:

CSIRO has extra funding through the Science and Industry Endowment Fund (SIEF) that has allowed us to purchase additional floats for the 2018-2020 years. As a result, we have planned deployments for 102 floats through to 2020 (including existing floats in the lab). Approximate deployment locations for Australian floats currently in the lab and being purchased are shown below. Our focus for the coming years is on the Southern Ocean, Coral Sea and the EAC zone. Gaps in the array in the Indian Ocean will be targeted given the number of research voyages planned for 2019/20 into that region.



Locations identified for new float deployments. Floats will be deployed from December 2018 to January 2020.

Issues impacting data delivery in 2017-8:

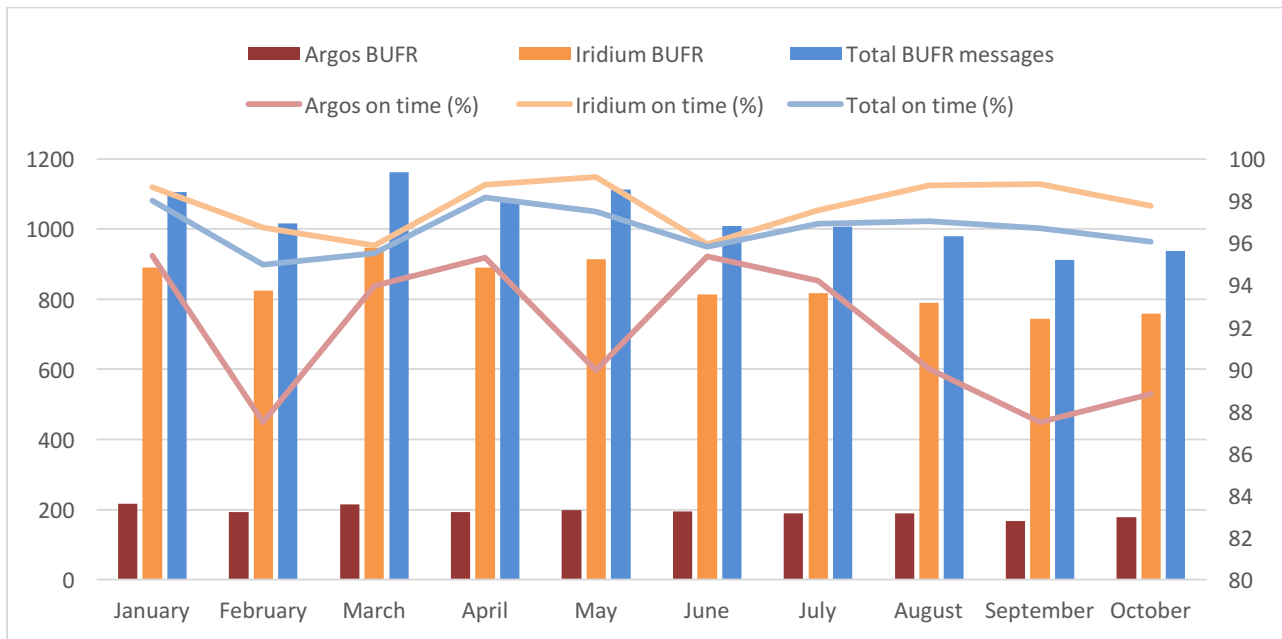
Jenny Lovell has joined the CSIRO Argo RT team and is learning the system. The BoM has recently finalized the upgrade of their new virtual machine to process the RT data in parallel with CSIRO. Some code changes have been made to fix bugs that have impacted on timely delivery of the data to the GTS. During the year, the delivery times have been consistent for Iridium floats and variable for Argos. Mostly delivery times have been >90% within 24hrs.

Software development:

CSIRO has built a new RT system and is currently bug testing and fixing missing/incorrect metadata for the float fleet. The system is built using PostgreSQL for the metadata and profile data handling, with object-oriented code in python interacting with the database. We expect full testing and commissioning prior to the next ADMT meeting. The code will be made available to the community. Four floats (NKE Arvor) are being handled through the new RT system and delivery of data from them to the GTS has just begun mid-November.

Data Acquisition and delivery to the GDACs and GTS:

Our aim is that raw data is processed within a maximum of 24 hours of delivery from either Argos or Iridium. We are achieving this for most of our floats. The data is issued to the GTS in BUFR bulletins only since July, 2018, via the Bureau of Meteorology (AMMC). These messages are generated 8 times daily.



Summary of the timeliness of the Argo Australia GTS delivery for 2018.

Web Pages:

The Australian Argo Real Time web pages are updated with the most recent data during the processing of the reports from the floats. They are therefore up to date as soon as float data is received.

Home page for Argo Australia (IMOS)

<http://imos.aodn.org.au/webportal/>

<http://imos.org.au/argo.html>

Information on individual floats can be found at:

<http://www.marine.csiro.au/~gronell/ArgoRT/> ;

Statistics of Argo data usage:

Argo data for the global dataset is downloaded from the GDACs to a local mirror daily using the rsync capability.

Argo usage is a difficult list to compile, as Argo data are now being used routinely by many researchers nationally and globally. In addition to the information below, there are numerous publications from Australian researchers which have used Argo data and have appeared in the last year.

Argo data uploaded to the GTS is accessed and exploited by many operational forecast centres, including:

- Australian Bureau of Meteorology (BoM);
- UK MetOffice;

- Mercator Ocean (French operational ocean organisation);
- Naval Research Laboratory and NAVOCEANO (US Defence);
- Japan Meteorological Agency (JMA);
- Nansen Environmental and Remote Sensing Center (NERSC; Norway's operational ocean forecasting organisation);
- and others.

Most operational ocean forecast centres – a sub-set of which is listed above – use Argo data, together with other publically available data (e.g., satellite sea surface temperature, satellite altimetry, XBT, TAO) to initialize ocean forecasts. Within Australia, Argo data is used to initialise multiple ocean and ocean-atmosphere forecast systems, including:

- OceanMAPS – BoM's operational Ocean Modelling, Analysis and prediction System (www.bom.gov.au/oceanography/forecasts/index.shtml) – producing daily, 7-day, publically-available, global ocean forecasts;
- POAMA – BoM's operational Predictive Ocean Atmosphere Model for Australia (www.bom.gov.au/oceanography/analysis.shtml) – producing weekly, 9-month, publically-available 14-member ensemble forecasts of the climate;
- eReefs – CSIRO's 4-km resolution forecast/hindcast model for the Great Barrier Reef – producing daily, 4-day forecasts for project partners;
- SAROMS – South Australian Research and Development Institute (SARDI) 1-4 km resolution forecast/hindcast model for waters off Southern Australia – producing regular forecasts and scenarios for project partners;
- ROAM – Royal Australian Navy (RAN) Relocatable Ocean Atmosphere Model – producing multiple (typically 5-10, depending on need) regional, high-resolution (2-5 km) forecasts in regions of interest;
- BRAN – CSIRO's Bluelink ReANalysis system – producing annually-updated 5-25 year, global ocean reanalyses, using Argo R- and D-files;
- BRAN-NRT – CSIRO's Near-Real-Time version of BRAN – producing monthly updates of BRAN, using Argo R- and D-files;
- CARS – CSIRO Atlas of Regional Seas (www.marine.csiro.au/~dunn/cars2009/) – a publically-available, global ocean climatology (an updated version of CARS is in production).

Argo data also underpins other activities in real-time monitoring of the ocean, including:

- CARS, and other climatologies, are heavily used for quality-control systems, including Argo and SOOP XBT;
- OceanCurrent (oceancurrent.imos.org.au/profiles/) – primarily delivering ocean products based on satellite observations (SST and altimetry), but also displaying Argo profiles through an interactive web portal;

We report usage to our funders IMOS – the Argo report can be found at: imos.org.au/imospublications.html

Delayed Mode QC (DMQC) Report:

We have made good progress towards our DMQC targets this year (Table 1). Currently, the DMQC percentage stands at 90% of eligible core Argo profiles. Core Argo is defined here as floats

with the standard P, T and S sensors including floats in the seasonal ice zone. Our software is now at a stable stage of development also allows us to DMQC the floats with dissolved oxygen sensors using a calibration approach based on Takeshita *et al.* (2013). We are currently revisiting all our Oxygen floats to ensure they have all been processed with the latest version of the DMQC software and RT processing.

Australian Delayed Mode Statistics (to 20 Nov 2018)

	Core Argo	BGC Argo (Oxygen) **
D files at GDAC	151966	18242
R files at GDAC	22758	2818
eligible R files	16188	1954
Total eligible files *	168154	20196
Total files at GDAC	174724	20820
DMQC % eligible	90	90

* eligible files have a 12 mth lag

** All Oxygen floats are being re-DMQCD to ensure consistency with the latest version of our processing.

We aim to assess each float once per year and profiles are considered eligible when they are 12 months old to ensure there is an adequate time series to assess for sensor drift or offset. If a float is dead, then we process the entire record as long as profiles are more than 6 months old.

A challenge for our program is the significant increase in data volumes not only of the standard P, T and S floats but those with Bio or BGC sensors. Both our RT and DM software only allow for QC of Oxygen and not other BGC parameters and we are currently assessing a way to progress this.