

*Synergies between Argo, GRACE, and Altimetry
&
Updates on Argo data access*

Nathalie Zilberman, William Llovel, and Megan Scanderbeg

Synergies between Argo, GRACE, and Altimetry

Our focus is

Fostering the integration of *in situ* and remote observing systems to better understand the sampling limitations and technical issues that impact estimates of sea level change and halter our ability to assess and predict contributions from ocean mass, and thermosteric and halosteric fluctuations.

The objectives of this session are

- (1) Developing synergies between *in situ* and remote observing systems to close the sea level budget at regional-to-global and interannual-to-decadal scales
- (2) Stimulating collaborative projects between observationalists and modelers to decrease the spread in predicted fluctuations of sea level, ocean heat and salt content and ice melt from ocean-climate models and ocean reanalysis, and improve agreement between model predictions and observations

How to access Argo data?



Real time data: basic quality control (QC) applied to remove large errors



Delayed mode data: reviewed by scientist and highest quality data with errors assigned to parameter



Time frame of data updates:

- Hour means on the scale of hours (i.e., not strictly every hour, but can range from 30 min to 6 hours)
- Month means once a month



DOI means that either a Digital Object Identifier (DOI) is assigned to the dataset or the dataset is traceable over time



QC means that additional QC was done on top of Argo data management. It can mean selecting the best quality data and applying Argo QC flags and errors or more extensive QC.

Argo on the GTS (Global Telecommunication System)

Approved BUFR sequences available for Argo data:

- 3 15 003 – Temperature and Salinity data
 - 3 06 037 or 3 06 044 – DOXY data
 - 3 06 045 – Chlorophyll-A
 - 3 06 046 – Nitrate
 - 3 06 047 – PH
 - 3 06 048 – BBP700
-
- Only ADJUSTED data to be sent for BGC parameters



Argo netCDF files from the GDACs (Global Data Assembly Centers)

- HTTP & FTP access:

- <ftp://ftp.ifremer.fr/ifremer/argo>
- <https://data-argo.ifremer.fr>
- <https://nrlgodae1.nrlmry.navy.mil/pub/outgoing/argo>



- Amazon Simple Storage Service (S3): <https://registry.opendata.aws/argo-gdac-marinedata>

- Rsync:

- <https://www.argodatamgt.org/DataAccess.html#ifremer-rsync>
- <https://www.argodatamgt.org/DataAccess.html#aws-s3-sync>



- Monthly DOI tarball: <https://doi.org/10.17882/42182>

Official Argo Selection interfaces



- EuroArgo selection tool: <https://dataselection.euro-argo.eu>
- US GDAC data browser: https://nrlgodae1.nrlmry.navy.mil/cgi-bin/argo_select.pl
- ERDDAP: <https://erddap.ifremer.fr/erddap/tabledap/ArgoFloats.html>
- Argo Online School is a great introduction to the Argo GDACs and how to access and use Argo data from them (<https://euroargodev.github.io/argoonlineschool/intro.html>)

Community tools to select, access and visualize OneArgo data

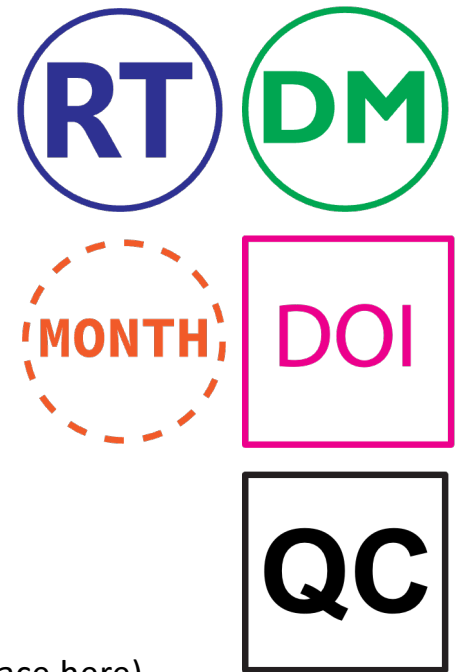
- Argopy (python library: <https://github.com/euroargodev/argopy>)
- Argovis (API database with jupyter notebook examples: <https://argovis.colorado.edu/>)
- argoFloats (R package: <https://github.com/ArgoCanada/argoFloats>)
- OneArgo float toolboxes in Matlab (<https://github.com/NOAA-PMEL/OneArgo-Mat>), Python (<https://github.com/NOAA-PMEL/OneArgoPy>), and R (<https://github.com/NOAA-PMEL/OneArgo-R>)

Community created products containing Argo data

<https://argo.ucsd.edu/data/argo-data-products/>

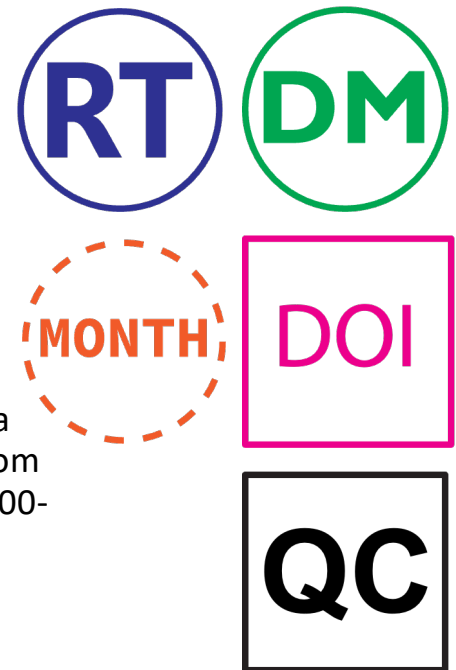
Products are grouped into six categories:

- Gridded fields
- Velocity products
- Profiles interpolated to same pressure levels
- Profiles with additional quality control measures
- Ocean bathymetry products
- BGC Argo products (also included in above categories, as appropriate, but collected in one place here)



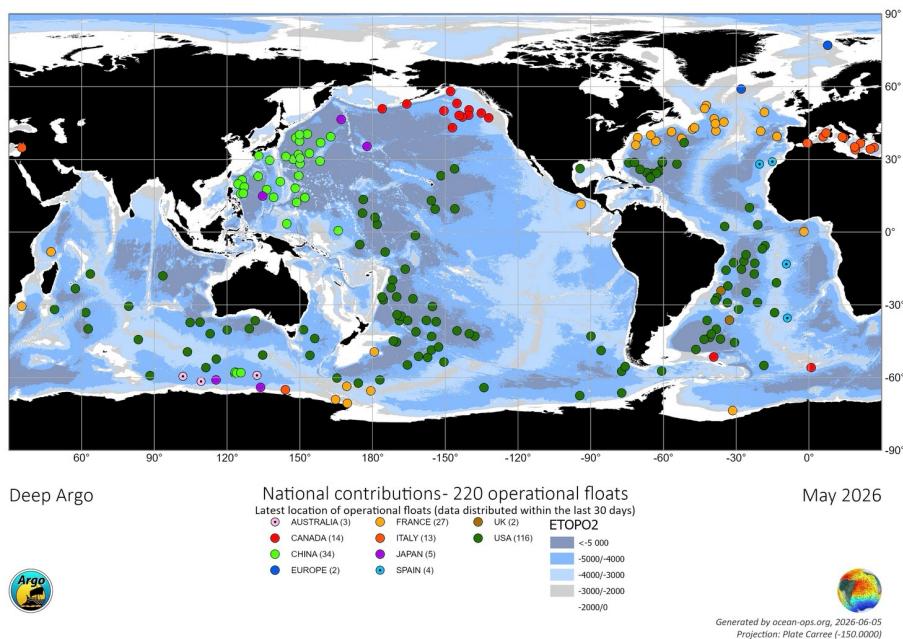
EasyOneArgo

- Data product: <https://doi.org/10.17882/107233>
- Not yet on the Third Party Argo datasets, as it is still under development
- Designed to offer monthly snapshots of “good” QC of 1 (pressure, temperature, salinity) data (EasyOneArgoTS) with option to have it on 107 standard depth levels (EasyOneArgoTSLite) from 2 decibar to 6000 decibar ([2, 5@5-250, 10@250-350, 25@350-500, 50@500-1000, 100@1000-2000, 200@2000-6000])
- Structure is very similar to Argo GDAC structure, but files are csv rather than netCDF
- Documentation: <https://doi.org/10.13155/107206>



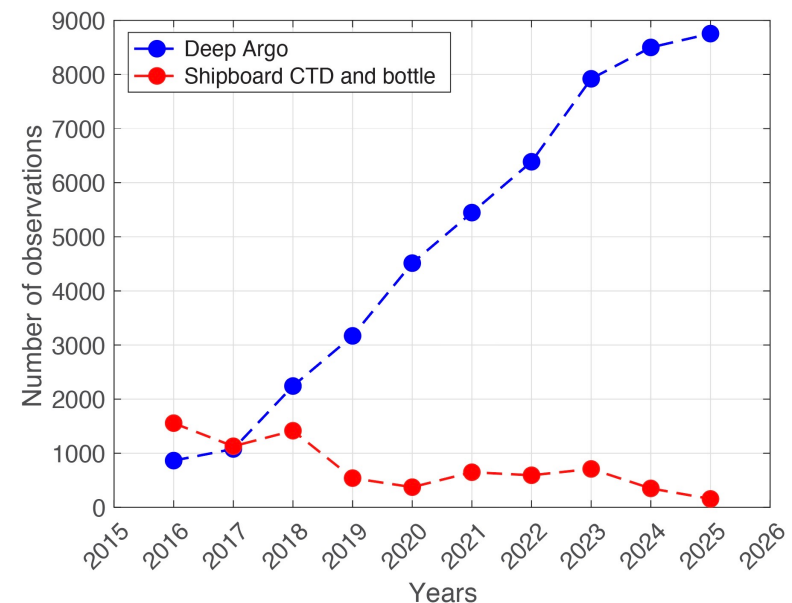
Milestone: Deep Argo has become the main source of deep ocean temperature and salinity data

National contributions to Deep Argo



- **The transition from Deep Argo regional pilot arrays to global distribution (prioritize homogeneous deployment and parking at 1000-m) started in 2025**

Deep ocean profiles ($z \geq 3000$ m)



- The deep ocean observing system has transitioned from dataset collected mainly from ships to autonomous platforms. In 2025, Deep Argo has collected 8,755 profiles, **about 56 times the amount from shipboard CTD and bottle data in the deep ocean**



Conclusion

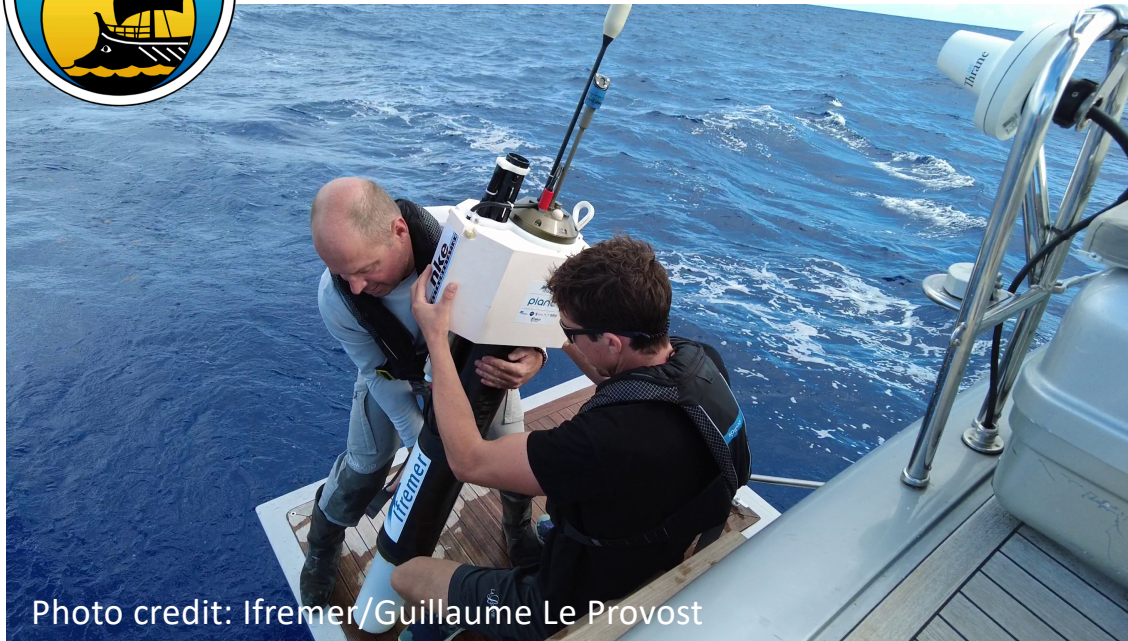


Photo credit: Ifremer/Guillaume Le Provost

- The Argo dataset is a living dataset. The quality control processing of “older” profiles may change over time. **Please remember to refresh your data holdings at least every 6 months**
- On-line tools and trainings are available for easy data access, selection and visualization
- Gridded products facilitate usage but have embedded limitations e.g. data smoothing associated with mapping, Argo data refresh up-to-date? When in doubt, seek feedback from product creators
- Visit our Data FAQ for all things Argo data related: <https://argo.ucsd.edu/data/data-faq/>
- Find the latest announcements via the Argo email lists: <https://argo.ucsd.edu/stay-connected/> and the OneArgo data bytes: <https://argo.ucsd.edu/oneargo-data-bytes/>
- Technical updates on the Argo data stream are posted here: <https://argo.ucsd.edu/category/status/>
- How to cite Argo data: <https://argo.ucsd.edu/data/acknowledging-argo/>
- Email us at argo@ucsd.edu with your questions or feedback