

## A beginners' guide to accessing Argo data

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Argo collects salinity/temperature profiles from a sparse (average 3° x 3° spacing) array of robotic floats that populate the ice-free oceans that are deeper than about 2000m. They also give information on the surface and subsurface currents. Each profile is made up of about 200 data points. The first Argo floats were deployed in 2000 and the array will be complete in 2006/7. Argo data are made available to users quickly and free of restriction

The following document is a first draft for a brief user guide to the Argo data system. This is intended to describe to Argo users

- (i) what they should expect from Argo data (real-time and delayed mode streams) and
- (ii) how to find it.

Complete documentation of the Argo data system is contained in the "Argo Data Management Handbook" and "Argo Real-time Quality Control Tests Procedures", both available at [http://www.coriolis.eu.org/cdc/argo\\_rfc.htm](http://www.coriolis.eu.org/cdc/argo_rfc.htm) .

Feedback from Argo users will be very valuable as we implement and test the remaining parts of Argo's data management system. Specifically, comments in the following areas are especially appreciated and should be sent to [argo@ucsd.edu](mailto:argo@ucsd.edu) :

1. For users requiring real-time data (within about ~24 hours of measurement):
  - Are there inconsistencies between Argo's specified real-time QC tests and what is found in the data files (GTS or Global data Centres)?
  - Are there formatting problems in the GDAC netcdf files, with respect to the specifications in the Argo Data Management Handbook.
  - Are there additional or better (fully automated) real-time QC tests that should be applied ? (For example it has been noted that a range check on pressure is needed).
  - Is an automated estimate of salinity sensor drift (presently only in delayed mode data) needed?
2. For users requiring near real-time data, but on a time scale of several days or longer:
  - Some DACS (e.g. US Argo DAC) are presently implementing visual profile inspection in near real-time. It is unlikely that this will be done by all national DACS unless there is a strong requirement expressed for an intermediate quality dataset (better quality than real-time, faster than delayed-mode). Is there such a requirement?
3. For users requiring scientific quality data (delayed-mode).
  - At present, only about 20% of Argo profiles are available as delayed mode data (i.e. netcdf filename begins with D), and the delayed-mode system is still under

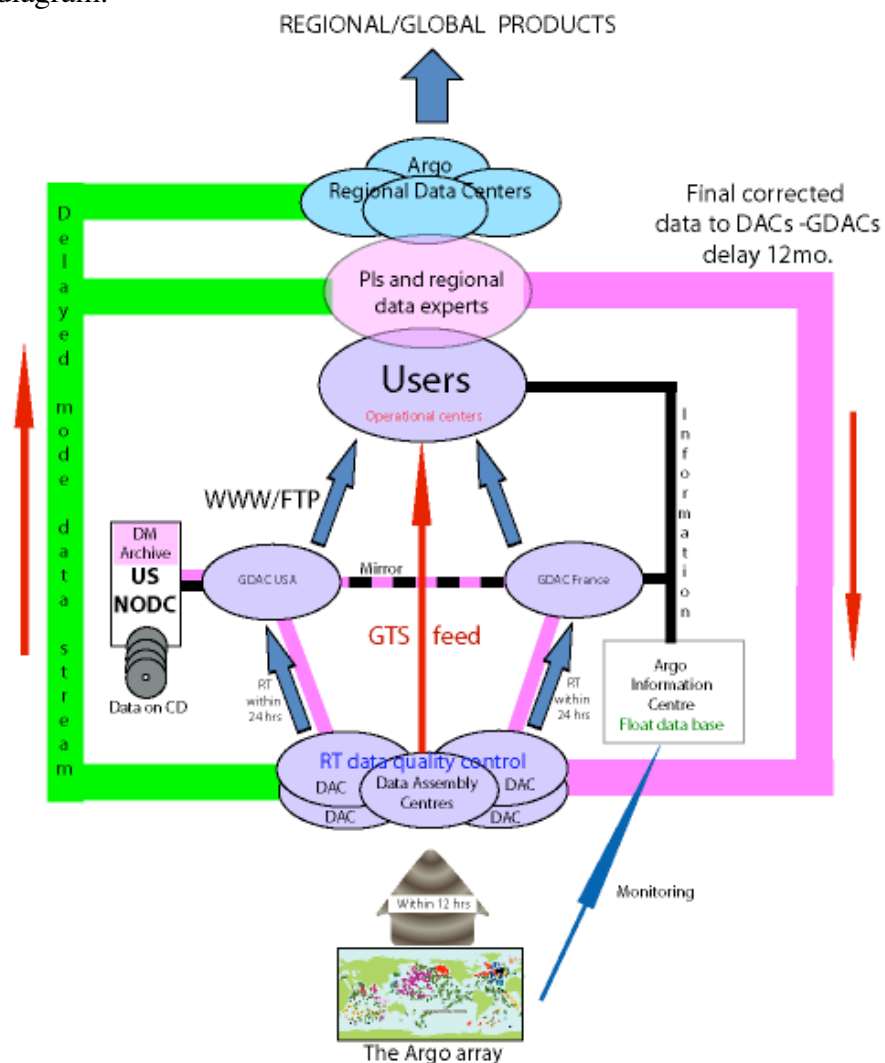
development for the next 6 - 12 months. However, if problems are seen in delayed mode data, please let us know.

### Accessing Argo data

The data are available to users through 3 routes

- To operational centres via TESAC messages on the Global Telecommunication System (GTS)
- By ftp, http, LAS downloads from two Global Data Assembly Centres
- From an archived data set at the US NODC.

The pathways of data flow from the floats to the data centres and users are shown in the following diagram.



*Schematic of Argo data flow*

## Preparation, availability and quality of Argo data

**GTS data stream.** These data are subjected to a number of quality checks in national data assembly centres and only those measurements within a profile that pass all tests (see below) are inserted onto the GTS. The checks are also used to set quality flags in the data that go on to enter other data streams detailed below.

In the TESAC format, temperature and salinity are truncated to two decimal places. The vertical co-ordinate is depth not pressure (as measured). No corrections are made to salinities in the GTS data stream.

### Realtime data quality checks (See [Argo RT QC .doc](#))

These checks will be reordered and all DACs will apply tests in same order to the profile data

1. Platform ID	*	11 Gradient test
2 Impossible date	*	12 Digit rollover
3 Impossible location	*	13 Stuck value
4 Position on land	*	14 Density inversion
5 Impossible speed	*	15 Grey list
6 Global range test	*	16 Gross salinity or temperature drift
7 Regional parameter range*		17 Frozen profile
8 Pressure increasing		18 Pressure not greater than Deepest_Pressure +5%
9 Spike test		
10 Top – bottom spike		

Tests 15 and 16 are only carried out by 3 DACs. Test 17 is not yet implemented. Tests marked \* are also applied to trajectory data (see below).

An Argo “Grey list” of floats on which some sensors may have problems is available at the GDACS. Data from floats on the “Grey list” should be treated with caution.

Profile data, data flags (see below) and probably trajectory data will at some stage become available using the BUFR format that is less restricted than TESAC.

### Data from GDACS.

For most users this is their route to access Argo data. National data centres make Argo data available at the same time as on the GTS and to the GDACS

The data on the GDACS are held in NetCDF format that contains profile and trajectory data and associated metadata and quality control flags.

These flags are

0	No QC tests have been performed
1	Observation good
2	Observation probably good (implies some uncertainty)
3	Observation thought to be bad but may be recoverable
4	Observation thought to be bad and irrecoverable

Data are available at the GDACs in two versions

- 1) **Fast mode data** has been subjected to initial quality control at national Data Assembly Centres (DACs). These data should be free from gross errors in position, temperature and pressure. The uncalibrated salinity data values are available and where a salinity offset is known it may appear as an “Adjusted salinity” variable in the same file on GDAC FTP servers. These data are identified with R in the “Data stream” variable and on the GDAC FTP sites. In general these data should be consistent with ocean climatologies even though no climatology tests have been performed.
- 2) **Delayed mode.** These data profiles have been subjected to detailed scrutiny by oceanographic experts and the adjusted salinity has been estimated by comparison with high quality ship-based CTD data and climatologies using the process described by WJO and Böhme and Send<sup>1</sup>. This process is carried out on a 1 year long “data window” and so no “Delayed Mode” observations can be less than 1 year old.

### **Accessing data**

The data are held at the GDACs in NetCDF format and the GDACS provide a number of means of selecting data

- From single floats
- From floats within a range of Latitude/Longitude and time
- Data type (R – Fast mode Data and or D – Delayed mode)

### **Which GDAC should I use?**

This depends on a number of factors but the first issue is location. North American users will likely use the Monterey site and European users the Coriolis site. Beyond this the choice is a matter of which GDAC has a mode of access that best suits the user’s needs.

These access modes are described below

#### USGODAE Monterey (See Annex 1)

Access to the complete Argo data collection, including float metadata, detailed trajectory data, and geographic and float specific Multi-Profile collection is provided via a DODs LAS, HTTP and FTP.

The available selection and display tools are:-

- A profile location plot for all profiles returned by the query (may be plotted with or without float ID for queries returning many profiles)
- Download of selected profiles (in NetCDF Multi-Profile format) as a TAR file
- Plots of T-P and S-P for individual profiles
- Plots of float tracks for individual floats

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<sup>1</sup> Wong, A.P.S., G.C. Johnson and W.B. Owens, 2003: Delayed-mode calibration of Autonomous CTD profiling float salinity data by Theta-S climatology. *Journal of Atmospheric and Oceanic Technology*, 20(2), 308-318.  
Böhme, L. and U. Send, (**Submitted**), Objective analyses of hydrographic data for referencing profiling float salinities in highly variable environments. *Deep Sea Research* [lboehme@ifm-geomar.de]

### Coriolis, Brest (See Annex 2)

Access to the complete Argo data collection, including float metadata, detailed trajectory data, and geographic and float-specific multi-profile collections is provided via a Distributed Oceanographic Data System Live Access Server (DODS LAS), HTTP and FTP. All float profiles can be visualised using a GIS tool.

A subsetting tool allows selection by

- profile type
- time and lat/long windows,
- measured parameter
- platform type
- realtime or delayed mode QC data

Access to additional non-Argo data (XBT, CTD, drifters, moorings, thermosalinograph, ADCP) is available from Coriolis through the same interface.

At present neither GDAC has the facility to select data from all floats that **have been** within a latitude/longitude box (including profiles from those floats when they are outside the box).

### **Argo data archive at US NODC**

This is not yet fully operational but the NODC has plans to distribute Argo data on CD/DVD to groups without easy access to the internet.

### **Argo Regional Data Centres (RDACs)**

Argo is establishing a number of regional data centres. These will have multiple functions that will include

- The identification and compilation of regional ship-based CTD data for incorporation in the climatologies used for salinity quality control
- Acting as foci and resource centres for the investigation of regional consistency of the Argo data set.
- As the distributors and in some cases generators of regional Argo-based data products.

The centres already identified are

Pacific	IPRC, Hawaii (in collaboration with JAMSTEC (Japan) and CSIRO Hobart (Australia))
Atlantic	Coriolis, Brest France AOML, Miami
Indian	INCOIS, Hyderabad, India
Southern	BODC, Liverpool, UK (in collaboration with CSIRO)

**Tools for assisting with Argo data handling.**

Some people have difficulty working with NetCDF format files on the Argo GDAC servers. To encourage wider use of Argo data the Argo Information Centre has made an inventory of the tools that are available and links to the sources of this information. The links can be found from <http://www.argo.net> → Data System/Misc.

Users are encouraged to share the tools they develop with the rest of the Argo Community.

## Annex 1

### US GODAE Web site

**Global Ocean Data Assimilation Experiment**

Home | Data Sets | L.A.S. | USGODAE | Projects | Links | News | Contacts

START: Year: 2004, Month: 10, Day: 28  
END: Year: 2004, Month: 10, Day: 28

North: 90  
West: -180, East: 180  
South: -90

DAC: ALL, aoml, bodc, csiro, gts  
FloatID: ALL  
Output Type:  Text List Only,  Text List and Location Plot,  Text/Loc Plot with ProfileIDs

Return Delayed Mode Profiles Only

Go Reset

### USGODAE Argog DAC Data Browser

**NOTICE: 20020414. Several changes have been made to the Argog DAC data management. For details see the [USGODAE Main Argog Page](#)**

This page provides access to the global collection of delayed-mode data from the Argog temperature-salinity profiling floats. The query results page provides:

- A profile location plot for all profiles returned by the query (may be plotted with or without float ID for queries returning many profiles)
- Download of selected profiles (in NetCDF Multi-Profile format) as a TAR file
- Plots of T-P and S-P for individual profiles
- Plots of float tracks for individual floats

For access to the complete Argog data collection, including float metadata, detailed trajectory data, and geographic and float specific

**Annex 2**  
Coriolis Web page

**Coriolis**  
OPERATIONAL OCEANOGRAPHY

THE PROJECT  
DATA SERVICE

global ocean profiles

Map selection

Extent

Zone	Lat./Long.
	79.15 N
180 W	180.00 E
	65.44 S

Criteria

Start date	End date
21/10/2004	28/10/2004

Commands

Refresh Map

Platform type

- Argo floats
- XBT, CTD
- Buoys
- Moorings
- Others

Criteria

Platform type	Stations including	Processing level	Meta Data
All	Any parameter	All	All

Update

Periodicity	Quality flags	Output format
None	All flags	netcdf

Download

From 21/10/2004 To 28/10/2004 Total number of stations : 3006

Data type : Argo floats Total number of stations : 883

Year/Week : ALL  
Number of stations : 883

Data type : XBT, CTD Total number of stations : 538

Year/Week : ALL  
Number of stations : 538

Data type : Buoys Total number of stations : 1339

Year/Week : ALL  
Number of stations : 1339

Data type : Others Total number of stations : 246

Year/Week : ALL  
Number of stations : 246

MAP LINK FIND E-MAIL LOGIN

Last update 22/08/2003  
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