argo data management

Argo data management
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ARGO USER'S MANUAL

Version 3.2

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ARGO

part of the integrated global observation strategy

Argo data management

Argo User's manual

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History of the document

Version	Date	Comment
0.9	29/12/2001	Thierry Carval : creation of the document
0.9a	18/01/2002	Bob Keeley : general comments and updates
0.9a	24/01/2002	Valérie Harscoat : general comments and updates
0.9a	25/01/2002	Claudia Schmid : general comments and updates
0.9a	24/01/2002	Roger Goldsmith : general comments and updates
0.9b	05/03/2002	Roger Goldsmith, Yasushi Takatsuki and Claudia Schmid comments implemented.
0.9c	24/04/2002	Comments from version 0.9b are implemented
1.0	09/07/2002	Comments from version 0.9c are implemented
1.0a	31/12/2002	Missing values in trajectory and calibration
1.0a	17/01/2003	Description of directory file format
1.0a	24/01/2003	Update of reference tables
1.0a	24/01/2003	Update of "measurements of each profile" to handle corrected values
1.0a	24/01/2003	Increase the size of DC_REFERENCE from STRING16 to STRING32
1.0b	17/03/2003	Replace corrected values with adjusted values
1.0b	29/04/2003	DC_REFERENCE removed from trajectory format general information of the float section
1.0b	30/04/2003	Use blank fill values for character variables
1.0c	30/04/2003	Proposal submitted on 30/04/2003
1.0d	14/08/2003	Proposal submitted on 14/08/2003 (green font)
1.0e	23/10/2003	Proposal submitted on 12/11/2003 (green font)
2.0	12/11/2003	All comments from "Argo user's manual comments" ref ar-dm-02-02 implemented. General agreement from Argo data management meeting in Monterey (Nov. 5-7, 2003)
2.01	15/12/2003	History section updated.
2.01	01/10/2004	Meta-data section : WMO_INST_TYPE added to history section INSTRUMENT_TYPE renamed INST_REFERENCE
2.01	10/11/2004	Reference table 2 quality control flag scale updated by Annie Wong
2.01	10/11/2004	Updates in reference table 3, parameter codes table DOXY, TEMP_DOXY, TEMP (use ITS-90 scale)
2.01	23/11/2004	Reference table 14 : instrument failure mode added by Annie Wong
2.01	25/02/2005	Table 11 updated for frozen profile and deepest pressure tests from Rebecca Macreadie
2.01	28/02/2005	Table 4 updated : CSIO, China Second Institute of Oceanography
2.01	12/04/2005	Mathieu Belbeoch : table 5 updated : argos location classes
2.01	12/06/2005	Change lengths of all parameter name variables to accomodate longer parameter names. Affects: STATION_PARAMETERS (section 2.2.3), PARAMETER (section 2.2.5), and HISTORY_PARAMETER (section 2.2.6) in the profile format; TRAJECTORY_PARAMETERS (section 2.3.3) and HISTORY_PARAMETER (section 2.3.6) in the trajectory format; SENSOR (section 2.4.5) and PARAMETER (section 2.4.6) in the meta-data format
2.01	12/06/2005	Change ":conventions" attribute and description of PROFILE_<PARAM>_QC in section 2.2.3.
2.01	12/06/2005	Add reference table 2a for the redefined PROFILE_<PARAM>_QC variables
2.01	20/06/2005	New long name for TEMP_DOXY in section 3.3
2.01	22/06/2005	Claudia Schmid : general update of trajectory file history section (N_MEASUREMENT dimension removed)
2.01	07/11/2005	Claudia Schmid : create reference table 14 for technical parameter names. Minor typo corrections.
2.01	07/11/2005	Thierry Carval : add a GPS code for position accuracy in ref. Table 5.
2.01	08/11/2005	Ann Thresher : exemple of sensor type in meta-data
2.01	09/11/2005	Annie Wong : §3.2.2 usage of <PARAM_ADJUSTED_QC> and <PARAM_QC> Reference table 2 updated (qc 3 and 4)
2.01	11/11/2005	Thierry Carval : §2.2.4, §2.3.4 accept adjusted parameters in real time files
2.01	11/11/2005	Thierry Carval : §2.2.6 history section for multi-profile files is empty
2.01	11/11/2005	Thierry Carval : §1.3, §2.2.3, §2.3.4 real-time adjusted data
2.01	11/11/2005	Thierry Carval : §2.4.8 highly desirable meta-data description
2.1	30/11/2005	Annie Wong : §3.2.1 update on flag 4 real time comment
2.1	20/12/2005	Thierry Carval : remove erroneous blanks (ex : "Argo reference table 3")
2.1	01/03/2006	Mark Ignaszewski: §2.3.6 Change HISTORY_*_INDEX to "int", Change HISTORY_REFERENCE to STRING64. Change to "dependent" in all sections. Remove PLATFORM_SERIAL_NO from desirable parameter table. Add "No QC performed" to Table 2a. Change FORMAT_VERSION to 2.2 in all sections.
2.1	26/09/2006	Thierry Carval §2.4.3 : TRANS_SYSTEM_ID : use N/A when not applicable (eg : Iridium or Orbcomm)
2.1	27/11/2006	Thierry Carval §2.4.8 : highly desirable metadata; PARKING_PRESSURE may be empty for floats drifting

		along a selected density level.
2.1	09/06/2008	Claudia Schmid §3.3: use DOXY2 for floats equipped with 2 oxygen sensors.
2.2	12/02/2009	Claudia Schmid §4.1 : file naming convention, multi-profiles cycle
2.2	03/03/2009	Thierry Carval §6.1 : greylist file collection §2.2.2 : move date_creation and date_update to "general information on profile file section".
2.2	21/08/2009	§1.2 : new graphic for float cycles description §2.2.3 : add a firmware version to general information for profile §2.3.4 : add a "CYCLE_STAGE" in trajectory file §2.3.5 : add "CYCLE_PHASE" and "cycle" in trajectory file §2.4.3 : general review of float characteristics §2.4.5 : configuration parameters §2.4.8. : metadata file version 2.3 §2.6 : technical data format 2.3 §2.8.2 : profile directory file format version 2.1 §3.3 : add BPHASE_DOXY §3.3 : remark on unit conversion of oxygen §6.2 : GDAC files removal add a RAFOS positioning system add a note on qc flag and qc manual add a description of greylist use for users trajectory format : move date_creation and date_update in the file information section
2.2	27/11/2009	§1.1: "Notice on file format change" chapter added §1.2: "User Obligations" chapter added §1.3: "Disclaimer" chapter added §1.4: "Further information sources and contact information" chapter added §2.3.1 and §2.3.6: remove N_HISTORY2 dimension from trajectory format §2.3.2: move DATE_CREATION and DATE_UPDATE to "General information on the trajectory file" chapter §2.3.4: revisit PARAM and PARAM_QC policy in real-time/delayed mode §2.5.4: CONFIGURATION_PHASE_REPETITION is removed from the configuration parameter chapter. §2.5.4: new example with a graphic §2.8.2: Profile directory file format statement transition added. §3.2.1: add a reference to quality control manual. §3.11: add a descripion of table11. Add a new column in the table to explain the link between QC test binary ID and test number. §3.14: table 14 "technical parameter names" revision, links to naming convention and list of technical parameters added. §6.1.1: "Greylist definition" chapter added §6.1.1: Who/when/how to add a float in the greylist §6.1.1: Who/when/how to remove floats from the greylist §6.1.1: How users should use the greylist
2.2	31/12/2009	§1.3: Disclaimer; argo data are continuously managed and updated §2.3.4: Trajectory locations and measurements Remove DC_REFERENCE Do not report DATA_MODE in this section report CYCLE_NUMBER in this section §2.3.5: Trajectory cycle information from the float Missing cycle management Report DATA_MODE in this section §3.2.1: Reference table 2: measurement flag scale For flag 2 comment is "Treat as good data" instead of "Probably good data" §3.3.2: Oxygen data management §3.14 Reference table 14: technical parameter names How to require new technical parameters
2.2	08/01/2010	Address the following messages listed and commented in argo-user-manual-comment-toulouse.doc : 04/01/2010 22:32 Annie Wong 31/12/2009 22:49 Claudia Schmid 31/12/2009 20:35 Claudia Schmid 31/12/2009 19:12 Annie Wong
2.31	08/09/2010	T. Carval : CONCENT_DOXY is renamed MOLAR_DOXY to be compliant with the document "Processing Argo OXYGEN data at the DAC level", version 1.0
2.31	14/06/2011	T. Carval : Add a NMDIS Chinese DAC
2.4	19/11/2011	Thierry Carval : general revision of the document presentation
2.4	19/11/2011	§2.3 Megan Scanderberg : update of trajectory format following Seoul trajectory & ADMT12

		meeting
2.4	19/11/2011	§3.3 Thierry Carval : CNDC (conductivity) valid min is set to 8.5 instead of 60.0
2.4	10/02/2012	§2.2.3 Thierry Carval : vertical sampling scheme to manage profiles performed on different vertical axes
2.4	10/02/2012	§2.4 Esmee Vanwijk : meta-data format version 2.4
2.4	10/02/2012	§2.2.3 Thierry Carval : global attributes and parameter attributes for CF compatibility
2.4	13/02/0212	§2.5 Thierry Carval : remove chapter "technical information format version 2.2"; keep "technical information format version 2.3"
2.4	20/02/2012	Feedbacks from the draft "User's manual" sent on 13/02/2012. The changes are highlighted in green. The comments are available in argo-dm-user-manual-seoul-update-comment.docx
2.4	14/03/2012	Feedbacks from the draft "User's manual" sent on 14/03/2012. The changes are highlighted in grey. The comments are available in argo-dm-user-manual-seoul-update-comment.docx
2.4	30/03/2012	The version 2.4 of Argo user's manual is officially released.
2.41	19/06/2012	§2.4.6: CONFIGURATION_MISSION_COMMENT: FillValue is equal to " ";
2.41	07/11/2012	§2.4 : metadata format, additions from Esmee
2.41	10/11/2012	§6.4 : compressed files distribution
2.41	10/11/2012	§6.6 : compressed files data submission
2.41	07/01/2013	§2.2 §2.3 §2.4 §2.4 all format versions renamed as 3.0
3.0	03/05/2013	§2.3 : trajectory format entirely revisited by Megan Scanderbeg, Jean-Philippe Rannou and John Gilson
3.01	06/05/2013	§3.15 : move reference table 15 from §2.3 to §3.15 and replace the previous version.
3.01	06/05/2013	§3.20 : reference table 20 "grounded flags" updated
3.01	06/05/2013	§3.21 : reference table 21 added, "representative park pressure status"
3.01	06/05/2013	§4.1 : file naming convention, update on trajectory file names
3.01	06/05/2013	§2.3.6 : table n_cycle revisited, 2 variables added
3.01	19/06/2013	§2.2 : more information to describe the relations between profiles – vertical sampling scheme – cycle
3.01	19/06/2013	§2.2.4 : Replace INST_REFERENCE with FLOAT_SERIAL_NO
3.01	19/06/2013	§2.2.4 : FIRMWARE_VERSION : dimension set to STRING16, remove attribute "conventions"
3.01	19/06/2013	§2.2.4 : add a CONFIG_MISSION_NUMBER variable in the profile file
3.01	19/06/2013	§2.4.4 : remove IMEI number
3.01	19/06/2013	§2.4.4 : TRANS_FREQUENCY dimension set to (N_TRANS_SYSTEM ,STRING16)
3.01	19/06/2013	§2.4.4: PLATFORM_TYPE, STANDARD_FORMAT_ID, DAC_FORMAT_ID : add a link to the draft reference table (an Internet spread sheet)
3.01	19/06/2013	§2.4.4: remove variable SAMPLING_MODE
3.01	19/06/2013	§2.4.4: remove variable ARGO_GROUP
3.01	19/06/2013	§2.4.4: BATTERY_PACKS moved from mandatory metadata to highly desirable metadata
3.01	19/06/2013	§3.3: reference table 3: parameter code table, oxygen related parameters . Remove pres_doxy . Update long names . Add TPHASE_DOXY, C1PHASE_DOXY, C2PHASE_DOXY, MLPL_DOXY Resolution is mandatory but its content is sensor dependent.
3.01	19/06/2013	§3.8 : reference table 8: instrument types Add 10 new instruments types
3.01	19/06/2013	§3.17 : reference table 17: obsolete Remove reference table 17.
3.01	19/06/2013	§4.1 : trajectory : new file naming convention
3.01	20/06/2013	§2.2.4 : Add the PLATFORM_TYPE variable Add an N_PROF dimension in FLOAT_SERIAL_NO.
3.01	20/06/2013	§2.3.4 : add the PLATFORM_TYPE variable
3.01	26/06/2013	§2.2.4 : CONFIG_MISSION_NUMBER long name updated
3.01	26/06/2013	Remarks from Megan Scanderbeg §2.3.1 : add a global attribute in the profile file : :comment_on_resolution = "PRES variable resolution depends on measurement code"; §2.3.4 : remove the STRING2 dimension from SATELLITE_NAME char SATELLITE_NAME(N_MEASUREMENT, STRING2); §3.15 : remove the old reference table 15 (but keep the new one)
3.01	27/06/2013	§**Erreur ! Source du renvoi introuvable.** : configuration_mission_number graphic updated
3.01	28/06/2013	§2.3.2 : add a STRING32 dimension
3.02	18/07/2013	§3.3 : remove the sensor names from oxygen related parameter's long name attributes
3.03	28/08/2013	§2.4.2: add a STRING64 dimension §2.4.4: CONTROLLER_BOARD_SERIAL_NO_PRIMARY long_name : remove "The " §2.4.1: //global attributes:user_manual_version="3.03"

3.03	30/08/2013	§2.4.2 : add a STRING32 dimension in definition column
3.1	30/11/2013	§1.2 : use DOI for data and document citation §1.6 : update cycle definition §2.2.4 §2.3.4 §2.4.4 :FLOAT_SERIAL_NO dimension extended to 32 instead of 16 §2.2.4, §2.3.4, §2.4.4 : add a "conventions" attribute to PLATFORM_TYPE §2.3.5 : add a "resolution attribute" to JULD and JULD_ADJUSTED §2.3.5.1 How to report unusual Pressure resolutions in the N_MEASUREMENT variable group of the TRAJ file §2.4 : general revision of metadata format; §2.4.6 adding launch configuration parameters; §2.4.7 discriminate float sensor and float parameter information §2.4.4 : add a "conventions" attribute to PLATFORM_FAMILY and PLATFORM_MAKER §2.4.5 : add STARTUP_DATE and STARTUP_DATE_QC §2.4.7.1 : add a "conventions" attribute to SENSOR_MAKER and SENSOR_MODEL §2.6 : B-Argo profile additional format features §3.22, §3.23, §3.24, §3.25, §3.26, §3.27 : new reference tables §3.3 : separation of core-Argo and B-Argo parameters in reference table 3 §4.1.2 : separation of core-Argo data files and B-Argo data files §7 : add a glossary
3.1	19/12/2013	§3.1 : add the B-Argo profile and B-Argo trajectory data types in reference table 1.
3.1	21/02/2014	§2.6.1 : manage pressure axis between core-argo and b-argo files
3.1	18/04/2014	§3.3 : revision of valid_min and valid max on TEMP, PSAL, DOXY to be compliant with Argo quality control manual. §2.3.6: add a "conventions" attribute to each cycle timing §2.2.3, §2.3.3: add a FILE_TYPE variable to discriminate C, B or M files. §2.2.6: list parameter names in the PARAMETER variables even if no calibration is performed yet. Page 1 : add a DOI to the manual Page 2 : add a "How to cite this document" chapter §6.5: add a chapter on Argo DOIs
3.1	22/04/2014	§4 : change the usgodae ftp server
3.1	06/05/2014	§2.2.4 : add "JULD:resolution = X;" and "JULD_LOCATION:resolution = X;"
3.1	21/05/2014	§1.6 : improve end cycle definition (John) §2.2.5.1 : do not report resolution attribute if not known §2.2, 2.3, 2.4, 2.5 : a proper definition replaces "eponymous" : "The version number of the user manual" §3.22….3.27 : add a link to Matthieu's tiny url reference tables §2.2, §2.3 : no need for a file_type variable §**Erreur ! Source du renvoi introuvable.** : precisions for use of array N_VALUES##
3.1	31/05/2014	§2.6.1 : core-Argo b-Argo parameters separation, improvement of the chapter, add an example §2.6.3 : management of spectral parameters, revision of the chapter name §3.11 : reference table 11, addition of the new QC tests 21 and 22 §2.3.6 : JULD_DEEP_PARK_START typo correction in long name
3.1	03/06/2014	§2.3 : update REPRESENTATIVE_PARK_PRESSURE:long_name §2.3 : add a long_name attribute to all *_STATUS variable §2.3 : JULD_ASCENT_END:long_name...remove the word "float's" §2.3 : replace any "0..N" with "0...N"
3.1	23/06/2014	§2.4 : update config_parameter_value and launch_config_parameter_value fill values §2.3 : update/create long name attributes in trajectory section General : replace all "as part of day" with "as parts of day" §2.6.9 : extend data_type dimension from 16 to 32 in b-argo and merged files
3.1	09/07/2014	§2.4.7.2 : PARAMETER_UNITS dimension set to 32 instead of 16 §2.2.6 : SCIENTIFIC_CALIB_DATE:conventions = "YYYYMMDDHHMISS"; §2.3.6 JULD_DEEP_DESCENT_END:long_name = "Deep descent end date of the cycle"; §2.6.1.2 : Pressure axis management in core-Argo and b-Argo trajectory files §2.6.2 Cycle timings management in core-Argo and b-Argo trajectory files
3.1	11/07/2014	§2.2.4 : CONFIG_MISSION_NUMBER:long_name updated to be consistent with trajectory and metadata formats. §2.3.6 : typo error corrected in JULD_FIRST_LOCATION:long_name and JULD_FIRST_LOCATION_STATUS:long_name §2.2.5 : *_ADJUSTED_ERROR:long_name updated to be consistent with trajectory format. §3.25 §3.26 §3.27 : update reference tables 25, 26 and 27 (new sensors and platforms)
3.1	15/07/2014	§2.4.6.2 : config_mission_number dimension in prof and traj files §2.3.6 : update long name JULD_LAST_LOCATION_STATUS:long_name = "Status of date of latest location"; §3.3 : update of B-Argo parameters and I-Argo parameters
3.1	18/07/2014	§2.2.4 §2.3.4 §2.4.4 : extend FIRMWARE_VERSION from STRING16 to STRING32
3.1	15/09/2014	§2.3.5.1 : clarification on how to report unusual pressure resolutions in the N_MEASUREMENT variable group of the TRAJ file §2.2.5.1 : how to report unusual parameter resolutions in a profile

3.1	07/11/2014	§2.6 : the variables PROFILE_PRES_QC, PRES_QC, PRES_ADJUSTED, PRES_ADJUSTED_ERROR are not duplicated in the b-Argo profile files.
3.1	18/03/2015	§2.2.5: <PARAM>_ADJUSTED_ERROR:long_name updated to be consistent between profile and trajectory.
3.2	10/11/2015	§2.2.5 clarification on DATA_MODE §2.6.8 clarification on PARAMETER_DATA_MODE §2.6.7 clarification on QC and ADJUSTED variables in b-Argo profile files §6.2.2: the GDAC greylist operation is transferred in the GDAC cookbook §6.3 : the "GDAC file removal" chapter is transferred to the GDAC cookbook
3.2	29/12/2015	§3.4: add MBARI in reference table 4 from Annie Wong All chapters: various corrections from Jean-Philippe Rannou (typo, unit names in examples) §2.6.6: N_PARAM management in b-Argo profile files from Annie Wong §2.3 : trajectory format revision from Megan Scanderbeg

1 Introduction

This document is the Argo data user's manual.

It contains the description of the formats and files produced by the Argo DACs.

1.1 Notice on file format change transition

This version of the "User's manual" is adjusting the file formats to the growing variety of floats and user needs. It introduces a complete revision of metadata and technical files. To cope with this radical change, during a transition period the version 2.2 and 3.1 of the technical and metadata file will be valid among Argo data system.

1.2 User Obligations

A user of Argo data is expected to read and understand this manual and the documentation about the data contained in the "attributes" of the NetCDF data files, as these contain essential information about data quality and accuracy.

A user should acknowledge use of Argo data in all publications and products where such data are used, preferably with the following standard sentence:

"These data were collected and made freely available by the international Argo project and the national programs that contribute to it."

We recommend the use of Argo DOI (Digital Object Identifier) for Argo documents and data citations. See:

- http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier

1.3 Disclaimer

Argo data are published without any warranty, express or implied.

The user assumes all risk arising from his/her use of Argo data.

Argo data are intended to be research-quality and include estimates of data quality and accuracy, but it is possible that these estimates or the data themselves may contain errors.

It is the sole responsibility of the user to assess if the data are appropriate for his/her use, and to interpret the data, data quality, and data accuracy accordingly.

Argo welcomes users to ask questions and report problems to the contact addresses listed on the Argo internet page.

Argo data are continuously managed; the user should be aware that after he downloaded data, those data may have been updated on Argo data server.

1.4 Further information sources and contact information

- Argo website: http://www.argo.net/
- If you detect any problem in the Argo data set, please give us your feedback via support@argo.net

1.5 Argo program, data management context

The objective of Argo program is to operate and manage a set of 3000 floats distributed in all oceans, with the vision that the network will be a permanent and operational system.

The Argo data management group is creating a unique data format for internet distribution to users and for data exchange between national data centres (DACs) and global data centres (GDACs).

Profile data, metadata, trajectories and technical data are included in this standardization effort.

The Argo data formats are based on NetCDF because:

- It is a widely accepted data format by the user community,
- It is a self-describing format for which tools are widely available,
- It is a reliable and efficient format for data exchange.

1.6 Argo float cycles

A typical Argo float drifts for three years or more in the ocean. It continuously performs measurement cycles.

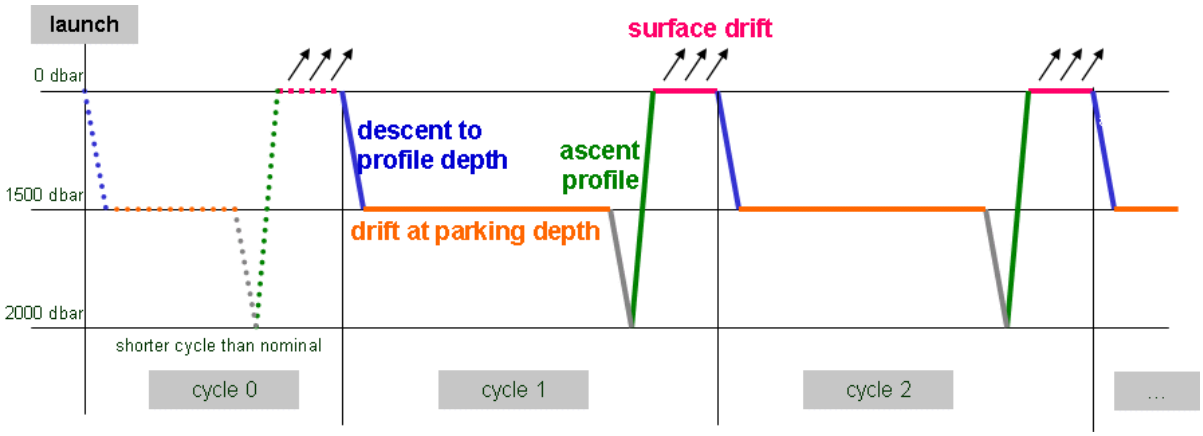
A cycle is defined as a series of actions made by a float and includes either a descending profile or an ascending profile (or, rarely, both); it may also include immersion drift or surface drift.

An Argo cycle starts with a descent toward deep water, usually from the surface.

It ends after the next programmed ascent to the surface, and if begun, after the full surface interval has been completed. During the surface interval, data transmission typically occurs but it is not a requirement for a cycle to have occurred

Each cycle of a float has a unique number, increased by one after each ascent to shallow water. For most floats, this will be the cycle number transmitted by the float. In some cases, this number will need to be calculated by the operator.

Profile measurements (e.g. pressure, temperature, salinity) are performed during ascent, occasionally during descent. Subsurface measurements during parking are sometime performed (e.g. every 12 hours).



A typical Argo float performs continuously measurement cycle during 3 years or more in the ocean.

A more detailed cycle description is available in reference table 15, chapter §3.15.

Cycle naming convention

Float cycle numbers usually start at 1. The next cycles are increasing numbers (e.g. 2, 3,…N). If the float reports cycle number, this is what should be used in all Argo files.

Very conveniently some floats transmit their configuration during the transmissions before they descent for profile 1.

Cycle 0 contains the first surface drift with technical data transmission or configuration information. This data is reported in the technical data files.

Cycle 0 may contain subsurface measurements if a descending/ascending profile is performed <u>before</u> any data transmission. The time length of this cycle is usually shorter than the next nominal cycles. The cycle time is therefore regular only for later profiles and may be variable if the float is reprogrammed during its mission.

1.7 Real-time and Delayed mode data

Data from Argo floats are transmitted from the float, passed through processing and automatic quality control procedures as quickly as possible after the float begins reporting at the surface. The target is to issue the data to the GTS and Global Data servers within 24 hours of surfacing, or as quickly thereafter as possible. These are called real-time data (RT).

The data are also issued to the Principle Investigators on the same schedule as they are sent to the Global servers. These scientists apply other procedures to check data quality and the target is for these data to be returned to the global data centres within 6 to 12 months. These constitute the delayed mode data (DM).

The adjustments applied to delayed-data may also be applied to real-time data, to correct sensor drifts for real-time users. However, these real-time adjustments will be recalculated by the delayed mode quality control.

2 Formats description

2.1 Overview of the formats

Argo data formats are based on NetCDF from UNIDATA.

NetCDF (network Common Data Form) is an interface for array-oriented data access and a library that provides an implementation of the interface. The NetCDF library also defines a machine-independent format for representing scientific data. Together, the interface, library, and format support the creation, access, and sharing of scientific data. The NetCDF software was developed at the Unidata Program Centre in Boulder, Colorado. The freely available source can be obtained as a compressed tar file or a zip file from Unidata or from other mirror sites.

- Ucar web site address : http://www.ucar.edu/ucar
- NetCDF documentation : http://www.unidata.ucar.edu/packages/netcdf/index.html

Argo formats are divided in 4 sections:

- Dimensions and definitions
- General information
- Data section
- History section

Argo date and time: all date and time have to be given either in Universal Time (UTC) or in float's time.

2.2 Core-Argo profile format version 3.1

An Argo single-cycle profile file contains a set of profiles from a single cycle. The minimum number is one profile per cycle. There is no defined maximum number of profiles per cycle.

core-Argo profile contains the CTD sensor parameters (pressure, temperature, salinity, conductivity) that are measured with the same vertical sampling scheme and at the same location and time. Additional parameters from other sensors are stored in a B-Argo profile file. The B-profile file is very similar to core-Argo profile file; its additional features are listed in §2.6

Some speciality floats collect additional profiles per cycle. These speciality profiles contain parameters measured at pressure levels that are different from the CTD levels, and can be at locations and time that are different from the primary profile. When multiple profiles exist in a single cycle, users are urged to check the information associated with each profile in order to determine their spatial and temporal relations. Some examples of speciality profiles with different vertical sampling schemes are:

- Bouncing profiles: a series of shallow profiles performed during one cycle.
- High resolution near-surface observations: higher resolution vertical sampling near the surface from unpumped CTD.

For single-cycle profile file naming conventions, see §4.1.

2.2.1 Global attributes

The global attributes section is used for data discovery. The following global attributes should appear in the global section. The NetCDF Climate and Forecast (CF) Metadata Conventions (version 1.6, 5 December, 2011) are available from:

- http://cf-pcmdi.llnl.gov/documents/cf-conventions/1.6/cf-conventions.pdf

```
// global attributes:
        :title = "Argo float vertical profile";
        :institution = "CSIRO";
        :source = "Argo float";
        :history = "2011-04-22T06:00:00Z creation";
        :references = "http://www.argodatamgt.org/Documentation";
        :comment = "free text";
        :user_manual_version = "3.2";
        :Conventions = "Argo-3.2 CF-1.6";
        :featureType = "trajectoryProfile";
```

Global attribute name	Definition
title	A succinct description of what is in the dataset.
institution	Specifies where the original data was produced.
source	The method of production of the original data. If it was model-generated, source should name the model and its version, as specifically as could be useful. If it is observational, source should characterize it (e.g., "surface observation" or "radiosonde").
history	Provides an audit trail for modifications to the original data. Well-behaved generic NetCDF filters will automatically append their name and the parameters with which they were invoked to the global history attribute of an input NetCDF file. We recommend that each line begin with a timestamp indicating the date and time of day that the program was executed.
references	Published or web-based references that describe the data or methods used to produce it.
comment	Miscellaneous information about the data or methods used to produce it.
user_manual_version	The version number of the user manual
Conventions	The conventions supported by this file, blank separated

featureType	The NetCDF CF feature type.
comment_on_resolution	Optional comment on parameter resolution

2.2.2 Dimensions

Name	Value	Definition
DATE_TIME	DATE_TIME = 14;	This dimension is the length of an ASCII date and time value. Date_time convention is : YYYYMMDDHHMISS YYYY : year MM : month DD : day HH : hour of the day (as 0 to 23) MI : minutes (as 0 to 59) SS : seconds (as 0 to 59) Date and time values are always in universal time coordinates (UTC). Examples : 20010105172834 : January 5th 2001 17:28:34 19971217000000 : December 17th 1997 00:00:00
STRING256 STRING64 STRING32 STRING16 STRING8 STRING4 STRING2	STRING256 = 256; STRING64 = 64; STRING32 = 32; STRING16 = 16; STRING8 = 8; STRING4 = 4; STRING2 = 2;	String dimensions from 2 to 256.
N_PROF	N_PROF = <int value>;	Number of profiles contained in the file. This dimension depends on the data set. A file contains at least one profile. There is no defined limit on the maximum number of profiles in a file. Example : N_PROF = 100
N_PARAM	N_PARAM = <int value>;	Maximum number of parameters measured or calculated for a pressure sample. This dimension depends on the data set. Examples : (pressure, temperature) : N_PARAM = 2 (pressure, temperature, salinity) : N_PARAM = 3 (pressure, temperature, conductivity, salinity) : N_PARAM = 4
N_LEVELS	N_LEVELS = <int value>;	Maximum number of pressure levels contained in a profile. This dimension depends on the data set. Example : N_LEVELS = 100
N_CALIB	N_CALIB = <int value>;	Maximum number of calibrations performed on a profile. This dimension depends on the data set. Example : N_CALIB = 10
N_HISTORY	N_HISTORY = UNLIMITED;	Number of history records.

2.2.3 General information on the profile file

This section contains information about the whole file.

Name	Definition	Comment
DATA_TYPE	char DATA_TYPE(STRING16); DATA_TYPE:long_name = "Data type"; DATA_TYPE:conventions = "Argo reference table 1"; DATA_TYPE:_FillValue = " ";	This field contains the type of data contained in the file. The list of acceptable data types is in the reference table 1. Example : Argo profile
FORMAT_VERSION	char FORMAT_VERSION(STRING4); FORMAT_VERSION:long_name = "File format version"; FORMAT_VERSION:_FillValue = " ";	File format version Example : "3.1"
HANDBOOK_VERSION	char HANDBOOK_VERSION(STRING4); HANDBOOK_VERSION:long_name = "Data handbook version"; HANDBOOK_VERSION:_FillValue = " ";	Version number of the data handbook. This field indicates that the data contained in this file are managed according to the policy described in the Argo data management handbook. Example : "1.0"
REFERENCE_DATE_TIME	char REFERENCE_DATE_TIME(DATE_TIME); REFERENCE_DATE_TIME:long_name = "Date of reference for Julian days"; REFERENCE_DATE_TIME:conventions = "YYYYMMDDHHMISS"; REFERENCE_DATE_TIME:_FillValue = " ";	Date of reference for julian days. The recommended reference date time is "19500101000000" : January 1st 1950 00:00:00
DATE_CREATION	char DATE_CREATION(DATE_TIME); DATE_CREATION:long_name = "Date of file creation"; DATE_CREATION:conventions = "YYYYMMDDHHMISS"; DATE_CREATION:_FillValue = " ";	Date and time (UTC) of creation of this file. Format : YYYYMMDDHHMISS Example : 20011229161700 : December 29th 2001 16 :17 :00
DATE_UPDATE	char DATE_UPDATE(DATE_TIME); DATE_UPDATE:long_name = "Date of update of this file"; DATE_UPDATE:conventions = "YYYYMMDDHHMISS"; DATE_UPDATE:_FillValue = " ";	Date and time (UTC) of update of this file. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 09 :05 :00

2.2.4 General information for each profile

This section contains general information on each profile.

Each item of this section has a N_PROF (number of profiles) dimension.

Name	Definition	Comment
PLATFORM_NUMBER	char PLATFORM_NUMBER(N_PROF, STRING8); PLATFORM_NUMBER:long_name = "Float unique identifier"; PLATFORM_NUMBER:conventions = "WMO float identifier : A9IIIII"; PLATFORM_NUMBER:_FillValue = " ";	WMO float identifier. WMO is the World Meteorological Organization. This platform number is unique. Example : 6900045
PROJECT_NAME	char PROJECT_NAME(N_PROF, STRING64); PROJECT_NAME:long_name = "Name of the project"; PROJECT_NAME:_FillValue = " ";	Name of the project which operates the profiling float that performed the profile. Example : "GYROSCOPE" (EU project for ARGO program)
PI_NAME	char PI_NAME (N_PROF, STRING64); PI_NAME:long_name = "Name of the principal investigator"; PI_NAME:_FillValue = " ";	Name of the principal investigator in charge of the profiling float. Example : Yves Desaubies
STATION_PARAMETERS	char STATION_PARAMETERS(N_PROF, N_PARAM, STRING16); STATION_PARAMETERS:long_name = "List of available parameters for the station"; STATION_PARAMETERS:conventions = "Argo reference table 3"; STATION_PARAMETERS:_FillValue = " ";	List of parameters contained in this profile. The parameter names are listed in reference table 3. Examples : TEMP, PSAL, CNDC TEMP : temperature PSAL : practical salinity CNDC : conductvity

CYCLE_NUMBER	int CYCLE_NUMBER(N_PROF); CYCLE_NUMBER:long_name = "Float cycle number"; CYCLE_NUMBER:conventions = "0...N, 0 : launch cycle (if exists), 1 : first complete cycle"; CYCLE_NUMBER:_FillValue = 99999;	Float cycle number. See §1.6: float cycle definition.
DIRECTION	char DIRECTION(N_PROF); DIRECTION:long_name = "Direction of the station profiles"; DIRECTION:conventions = "A: ascending profiles, D: descending profiles"; DIRECTION:_FillValue = " ";	Type of profile on which measurement occurs. A : ascending profile D : descending profile
DATA_CENTRE	char DATA_CENTRE(N_PROF, STRING2); DATA_CENTRE:long_name = "Data centre in charge of float data processing"; DATA_CENTRE:conventions = "Argo reference table 4"; DATA_CENTRE:_FillValue = " ";	Code for the data centre in charge of the float data management. The data centre codes are described in the reference table 4. Example : "ME" for MEDS
DC_REFERENCE	char DC_REFERENCE(N_PROF, STRING32); DC_REFERENCE:long_name = "Station unique identifier in data centre"; DC_REFERENCE:conventions = "Data centre convention"; DC_REFERENCE:_FillValue = " ";	Unique identifier of the profile in the data centre. Data centres may have different identifier schemes. DC_REFERENCE is therefore not unique across data centres.
DATA_STATE_INDICATOR	char DATA_STATE_INDICATOR(N_PROF, STRING4); DATA_STATE_INDICATOR:long_name = "Degree of processing the data have passed through"; DATA_STATE_INDICATOR:conventions = "Argo reference table 6"; DATA_STATE_INDICATOR:_FillValue = " ";	Degree of processing the data has passed through. The data state indicator is described in the reference table 6.
DATA_MODE	char DATA_MODE(N_PROF); DATA_MODE:long_name = "Delayed mode or real time data"; DATA_MODE:conventions = "R : real time; D : delayed mode; A : real time with adjustment"; DATA_MODE:_FillValue = " ";	Indicates if the profile contains real time, delayed mode or adjusted data. R : real time data D : delayed mode data A : real time data with adjusted values
PLATFORM_TYPE	char PLATFORM_TYPE(N_PROF, STRING32); PLATFORM_TYPE:long_name = "Type of float"; PLATFORM_TYPE:conventions = "Argo reference table 23"; PLATFORM_TYPE:_FillValue = " ";	Type of float listed in reference table 23. Example: SOLO, APEX, PROVOR, ARVOR, NINJA
FLOAT_SERIAL_NO	char FLOAT_SERIAL_NO(N_PROF, STRING32); FLOAT_SERIAL_NO:long_name = "Serial number of the float"; FLOAT_SERIAL_NO:_FillValue = " ";	Serial number of the float. Example 1679
FIRMWARE_VERSION	char FIRMWARE_VERSION(N_PROF, STRING32); FIRMWARE_VERSION:long_name = "Instrument firmware version"; FIRMWARE_VERSION:_FillValue = " ";	Firmware version of the float. Example : "013108"
WMO_INST_TYPE	char WMO_INST_TYPE(N_PROF, STRING4); WMO_INST_TYPE:long_name = "Coded instrument type"; WMO_INST_TYPE:conventions = "Argo reference table 8"; WMO_INST_TYPE:_FillValue = " ";	Instrument type from WMO code table 1770. A subset of WMO table 1770 is documented in the reference table 8. Example : 846 : Webb Research float, Seabird sensor
JULD	double JULD(N_PROF); JULD:long_name = "Julian day (UTC) of the station relative to REFERENCE_DATE_TIME"; JULD:standard_name = "time"; JULD:units = "days since 1950-01-01 00:00:00 UTC"; JULD:conventions = "Relative julian days with decimal part (as parts of day)"; JULD:resolution = X;	Julian day of the profile. The integer part represents the day, the decimal part represents the time of the profile. Date and time are in Universal Time. The julian day is relative to REFERENCE_DATE_TIME. Example : 18833.8013889885 : July 25 2001 19:14:00

	JULD:_FillValue = 999999.; JULD:axis = "T";	
JULD_QC	char JULD_QC(N_PROF); JULD_QC:long_name = "Quality on date and time"; JULD_QC:conventions = "Argo reference table 2"; JULD_QC:_FillValue = " ";	Quality flag on JULD date and time. The flag scale is described in the reference table 2. Example : 1: the date and time seems correct.
JULD_LOCATION	double JULD_LOCATION(N_PROF); JULD_LOCATION:long_name = "Julian day (UTC) of the location relative to REFERENCE_DATE_TIME"; JULD_LOCATION:units = "days since 1950-01-01 00:00:00 UTC"; JULD_LOCATION:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_LOCATION:resolution = X; JULD_LOCATION:_FillValue = 999999.;	Julian day of the location of the profile. The integer part represents the day, the decimal part represents the time of the profile. Date and time are in Universal Time. The julian day is relative to REFERENCE_DATE_TIME. Example : 18833.8013889885 : July 25 2001 19:14:00
LATITUDE	double LATITUDE(N_PROF); LATITUDE:long_name = "Latitude of the station, best estimate"; LATITUDE:standard_name = "latitude"; LATITUDE:units = "degree_north"; LATITUDE:_FillValue = 99999.; LATITUDE:valid_min = -90.; LATITUDE:valid_max = 90.; LATITUDE:axis = "Y";	Latitude of the profile. Unit : degree north This field contains the best estimated latitude. The latitude value may be improved in delayed mode. The measured locations of the float are located in the trajectory file. Example : 44.4991 : 44° 29′ 56.76″ N
LONGITUDE	double LONGITUDE(N_PROF); LONGITUDE:long_name = "Longitude of the station, best estimate"; LONGITUDE:standard_name = "longitude"; LONGITUDE:units = "degree_east"; LONGITUDE:_FillValue = 99999.; LONGITUDE:valid_min = -180.; LONGITUDE:valid_max = 180.; LONGITUDE:axis = "X";	Longitude of the profile. Unit : degree east This field contains the best estimated longitude. The longitude value may be improved in delayed mode. The measured locations of the float are located in the trajectory file. Example : 16.7222 : 16° 43′ 19.92″ E
POSITION_QC	char POSITION_QC(N_PROF); POSITION_QC:long_name = "Quality on position (latitude and longitude)"; POSITION_QC:conventions = "Argo reference table 2"; POSITION_QC:_FillValue = " ";	Quality flag on position. The flag on position is set according to (LATITUDE, LONGITUDE) quality. The flag scale is described in the reference table 2. Example: 1: position seems correct.
POSITIONING_SYSTEM	char POSITIONING_SYSTEM(N_PROF, STRING8); POSITIONING_SYSTEM:long_name = "Positioning system"; POSITIONING_SYSTEM:_FillValue = " ";	Name of the system in charge of positioning the float locations from reference table 9. Examples : ARGOS
PROFILE_<PARAM>_QC	char PROFILE_<PARAM>_QC(N_PROF); PROFILE_<PARAM>_QC:long_name = "Global quality flag of <PARAM> profile"; PROFILE_<PARAM>_QC:conventions = "Argo reference table 2a"; PROFILE_<PARAM>_QC:_FillValue = " ";	Global quality flag on the PARAM profile. PARAM is among the STATION_PARAMETERS. The overall flag is set to indicate the percentage of good data in the profile as described in reference table 2a. Example : PROFILE_TEMP_QC = A : the temperature profile contains only good values PROFILE_PSAL_QC = C : the salinity profile contains 50% to 75% good values
VERTICAL_SAMPLING_SCHEME	char VERTICAL_SAMPLING_SCHEME(N_PROF, STRING256); VERTICAL_SAMPLING_SCHEME:long_name = "Vertical sampling scheme"; VERTICAL_SAMPLING_SCHEME:conventions = "Argo reference table 16"; VERTICAL_SAMPLING_SCHEME:_FillValue = " ";	**This variable is mandatory**. Use vertical sampling scheme to differentiate and identify profiles from a single-cycle with different vertical sampling schemes. See reference table 16.
CONFIG_MISSION_NUMBER	int CONFIG_MISSION_NUMBER(N_PROF); CONFIG_MISSION_NUMBER:long_name = " Unique number denoting the missions performed by the float";	Unique number of the mission to which this profile belongs. See note on floats with multiple configurations §2.4.6.1.

	CONFIG_MISSION_NUMBER:conventions = "1...N, 1 : first complete mission"; CONFIG_MISSION_NUMBER:_FillValue = 99999;	Example : 1

Note: how to sort STATION_PARAMETERS variable

The parameters listed in STATION_PARAMETERS should be sorted in the same order within a given data file.

2.2.5 Measurements for each profile

This section contains information on each level of each profile.
Each variable in this section has a N_PROF (number of profiles), N_LEVELS (number of pressure levels) dimension.

<PARAM> contains the raw values telemetered from the floats.

The values in <PARAM> should never be altered. <PARAM>_QC contains QC flags that pertain to the values in <PARAM>. Values in <PARAM>_QC are set initially in 'R' and 'A' modes by the automatic real-time tests.

They are later modified in 'D' mode at levels where the QC flags are set incorrectly by the real-time procedures, and where erroneous data are not detected by the real-time procedures.

Each parameter can be adjusted (in delayed-mode, but also in real-time if appropriate). In that case, <PARAM>_ADJUSTED contains the adjusted values, <PARAM>_ADJUSTED_QC contains the QC flags set by the adjustment process, and <PARAM>_ADJUSTED_ERROR contains the adjustment uncertainties.

When a profile has DATA_MODE = 'R', no adjusted data are available. Hence the adjusted section (<PARAM>_ADJUSTED, <PARAM>_ADJUSTED_QC and <PARAM>_ADJUSTED_ERROR) should be filled with FillValues.

When N_PROF > 1, DATA_MODE for each profile can be assigned differently. This is because when there are multiple profiles, delayed-mode or near real-time adjustments can become available at different times.

The adjusted section for each N_PROF should then be filled independently according to its DATA_MODE.

For example, in a profile file with 2 profiles, it is possible that

- DATA_MODE = 'D' in N_PROF = 1, and
- DATA_MODE = 'R' in N_PROF = 2.

In this case:

- the adjusted section in N_PROF=1 with DATA_MODE='D' should be filled with their adjusted values;
- the adjusted section in N_PROF=2 with DATA_MODE='R' should be filled with FillValues.

The Argo profile delayed mode QC is described in "Argo quality control manual" by Annie Wong et Al (see http://www.argodatamgt.org/Documentation).

Name	Definition	Comment
<PARAM>	float <PARAM>(N_PROF, N_LEVELS); <PARAM>:long_name = "<X>";	<PARAM> contains the original values of a parameter listed in reference table

	<PARAM>:standard_name = "<X>"; <PARAM>:_FillValue = <X>; <PARAM>:units = "<X>"; <PARAM>:valid_min = <X>; <PARAM>:valid_max = <X>; <PARAM>:C_format = "<X>"; <PARAM>:FORTRAN_format = "<X>"; <PARAM>:resolution = <X>;	3. <X> : this field is specified in the reference table 3.
<PARAM>_QC	char <PARAM>_QC(N_PROF, N_LEVELS); <PARAM>_QC:long_name = "quality flag"; <PARAM>_QC:conventions = "Argo reference table 2"; <PARAM>_QC:_FillValue = " ";	Quality flag applied on each <PARAM> values. The flag scale is specified in table 2.
<PARAM>_ADJUSTED	float <PARAM>_ADJUSTED(N_PROF, N_LEVELS); <PARAM>_ADJUSTED:long_name = "<X>"; <PARAM>_ADJUSTED:standard_name = "<X>"; <PARAM>_ADJUSTED:_FillValue = <X>; <PARAM>_ADJUSTED:units = "<X>"; <PARAM>_ADJUSTED:valid_min = <X>; <PARAM>_ADJUSTED:valid_max = <X>; <PARAM>_ADJUSTED:C_format = "<X>"; <PARAM>_ADJUSTED:FORTRAN_format = "<X>"; <PARAM>_ADJUSTED:resolution= <X>;	<PARAM>_ADJUSTED contains the adjusted values derived from the original values of the parameter. <X> : this field is specified in the reference table 3. **<PARAM>_ADJUSTED is mandatory.** When no adjustment is performed, the FillValue is inserted.
<PARAM>_ADJUSTED_QC	char <PARAM>_ADJUSTED_QC(N_PROF, N_LEVELS); <PARAM>_ADJUSTED_QC:long_name = "quality flag"; <PARAM>_ADJUSTED_QC:conventions = "Argo reference table 2"; <PARAM>_ADJUSTED_QC:_FillValue = " ";	Quality flag applied on each <PARAM>_ADJUSTED values. The flag scale is specified in reference table 2. **<PARAM>_ADJUSTED_QC is mandatory.** When no adjustment is performed, the FillValue is inserted.
<PARAM>_ADJUSTED_ERROR	float <PARAM>_ADJUSTED_ERROR(N_PROF, N_LEVELS); <PARAM>_ADJUSTED_ERROR:long_name = "Contains the error on the adjusted values as determined by the delayed mode QC process"; <PARAM>_ADJUSTED_ERROR:_FillValue = <X>; <PARAM>_ADJUSTED_ERROR:units = "<X>"; <PARAM>_ADJUSTED_ERROR:C_format = "<X>"; <PARAM>_ADJUSTED_ERROR:FORTRAN_format = "<X>"; <PARAM>_ADJUSTED_ERROR:resolution= <X>;	<PARAM>_ADJUSTED_ERROR Contains the error on the adjusted values as determined by the delayed mode QC process. <X> : this field is specified in the reference table 3. **<PARAM>_ADJUSTED_ERROR is mandatory.** When no adjustment is performed, the FillValue is inserted.

Note on vertical axis associated to PRES

The variable PRES (pressure) is the vertical axis. The PRES declaration contains the variable attribute

PRES:axis = "Z";

Example of a profiling float performing temperature measurements with adjusted values of temperature

Parameter definition : PRES, TEMP, TEMP_ADJUSTED

float TEMP(N_PROF, N_LEVELS);
TEMP:long_name = "sea temperature in-situ ITS-90 scale";
TEMP:standard_name = "sea_water_temperature";
TEMP:_FillValue = 99999.f;
TEMP:units = "degree_Celsius";
TEMP:valid_min = -2.f;
TEMP:valid_max = 40.f;
TEMP:C_format = "%9.3f";
TEMP:FORTRAN_format = "F9.3";
TEMP:resolution = 0.001f;
 	
char TEMP_QC(N_PROF, N_LEVELS);
TEMP_QC:long_name = "quality flag";
TEMP_QC:conventions = "Argo reference table 2";
TEMP_QC:_FillValue = " ";

```
float TEMP_ADJUSTED(N_PROF, N_LEVELS);
TEMP_ADJUSTED:long_name = "adjusted sea temperature in-situ ITS-90 scale";
TEMP:standard_name = "sea_water_temperature";
TEMP_ADJUSTED:_FillValue = 99999.f;
TEMP_ADJUSTED:units = "degree_Celsius";
TEMP_ADJUSTED:valid_min = -2.f;
TEMP_ADJUSTED:valid_max = 40.f;
TEMP_ADJUSTED:C_format = "%9.3f";
TEMP_ADJUSTED:FORTRAN_format= "F9.3";
TEMP_ADJUSTED:resolution= 0.001f;

char TEMP_ADJUSTED_QC(N_PROF, N_LEVELS);
TEMP_ADJUSTED QC:long_name = "quality flag";
TEMP_ADJUSTED QC:conventions = "Argo reference table 2";
TEMP_ADJUSTED_QC:_FillValue = " ";

float TEMP_ADJUSTED_ERROR(N_PROF, N_LEVELS);
TEMP_ADJUSTED_ERROR:long_name = "error on sea temperature in-situ ITS-90
scale ";
TEMP_ADJUSTED_ERROR:_FillValue = 99999.f;
TEMP_ADJUSTED_ERROR:units = "degree_Celsius";
TEMP_ADJUSTED_ERROR :C_format = "%9.3f";
TEMP_ADJUSTED_ERROR :FORTRAN_format= "F9.3";
TEMP_ADJUSTED_ERROR:resolution= 0.001f;
```

2.2.5.1 How to report unusual parameter resolutions in a profile

The resolution of a parameter is reported in “resolution” attribute.

For specific floats, the resolution of a parameter may depend on the profile level.

How to keep the information in the file?

- add a "comment_on_resolution" attribute on the variable to inform the user,

2.2.6 Calibration information for each profile

Calibrations are applied to parameters to create adjusted parameters. Different calibration methods will be used by groups processing Argo data. When a method is applied, its description is stored in the following fields.

This section contains calibration information for each parameter of each profile.

Each item of this section has a N_PROF (number of profiles), N_CALIB (number of calibrations), N_PARAM (number of parameters) dimension.

If no calibration is available, N_CALIB is set to 1, PARAMETER is filled with the list of parameter names, and all values of calibration section are set to fill values.

Name	Definition	Comment
PARAMETER	char PARAMETER(N_PROF, N_CALIB, N_PARAM, STRING16); PARAMETER:long_name = "List of parameters with calibration information"; PARAMETER:conventions = "Argo reference table 3"; PARAMETER:_FillValue = " ";	Name of the calibrated parameter. The list of parameters is in reference table 3. Example : PSAL
SCIENTIFIC_CALIB_EQUATION	char SCIENTIFIC_CALIB_EQUATION(N_PROF, N_CALIB, N_PARAM, STRING256); SCIENTIFIC_CALIB_EQUATION:long_name = "Calibration equation for this	Calibration equation applied to the parameter. Example : Tc = a1 * T + a0

	parameter"; SCIENTIFIC_CALIB_EQUATION:_FillValue = " ";	
SCIENTIFIC_CALIB_COEFFICIENT	char SCIENTIFIC_CALIB_COEFFICIENT(N_PROF, N_CALIB, N_PARAM, STRING256); SCIENTIFIC_CALIB_COEFFICIENT:long_name = "Calibration coefficients for this equation"; SCIENTIFIC_CALIB_COEFFICIENT:_FillValue = " ";	Calibration coefficients for this equation. Example : a1=0.99997 , a0=0.0021
SCIENTIFIC_CALIB_COMMENT	char SCIENTIFIC_CALIB_COMMENT(N_PROF, N_CALIB, N_PARAM, STRING256); SCIENTIFIC_CALIB_COMMENT:long_name = "Comment applying to this parameter calibration"; SCIENTIFIC_CALIB_COMMENT:_FillValue = " ";	Comment about this calibration Example : The sensor is not stable
SCIENTIFIC_CALIB_DATE	char SCIENTIFIC_CALIB_DATE (N_PROF N_CALIB, N_PARAM, DATE_TIME) SCIENTIFIC_CALIB_DATE:long_name = "Date of calibration"; SCIENTIFIC_CALIB_DATE:conventions = "YYYYMMDDHHMISS"; SCIENTIFIC_CALIB_DATE:_FillValue = " ";	Date of the calibration. Example : 20011217161700

2.2.7 History information for each profile

This section contains history information for each action performed on each profile by a data centre.

Each item of this section has a N_HISTORY (number of history records), N_PROF (number of profiles) dimension.

A history record is created whenever an action is performed on a profile.

The recorded actions are coded and described in the history code table from the reference table 7.

On the GDAC, multi-profile history section is empty to reduce the size of the file. History section is available on mono-profile files, or in multi-profile files distributed from the web data selection.

Name	Definition	Comment
HISTORY_INSTITUTION	char HISTORY_INSTITUTION(N_HISTORY, N_PROF, STRING4); HISTORY_INSTITUTION:long_name = "Institution which performed action"; HISTORY_INSTITUTION:conventions = "Argo reference table 4"; HISTORY_INSTITUTION:_FillValue = " ";	Institution that performed the action. Institution codes are described in reference table 4. Example : ME for MEDS
HISTORY_STEP	char HISTORY_STEP(N_HISTORY, N_PROF, STRING4); HISTORY_STEP:long_name = "Step in data processing"; HISTORY_STEP:conventions = "Argo reference table 12"; HISTORY_STEP:_FillValue = " ";	Code of the step in data processing for this history record. The step codes are described in reference table 12. Example : ARGQ : Automatic QC of data reported in real-time has been performed
HISTORY_SOFTWARE	char HISTORY_SOFTWARE (N_HISTORY, N_PROF, STRING4); HISTORY_SOFTWARE:long_name = "Name of software which performed	Name of the software that performed the action. This code is institution dependent. Example : WJO

	action"; HISTORY_SOFTWARE:conventions = "Institution dependent"; HISTORY_SOFTWARE:_FillValue = " ";	
HISTORY_SOFTWARE_RELEASE	char HISTORY_SOFTWARE_RELEASE(N_HISTORY, N_PROF, STRING4); HISTORY_SOFTWARE_RELEASE:long_name = "Version/release of software which performed action"; HISTORY_SOFTWARE_RELEASE:conventions = "Institution dependent"; HISTORY_SOFTWARE_RELEASE:_FillValue = " ";	Version of the software. This name is institution dependent. Example : «1.0»
HISTORY_REFERENCE	char HISTORY_REFERENCE (N_HISTORY, N_PROF, STRING64); HISTORY_REFERENCE:long_name = "Reference of database"; HISTORY_REFERENCE:conventions = "Institution dependent"; HISTORY_REFERENCE:_FillValue = " ";	Code of the reference database used for quality control in conjunction with the software. This code is institution dependent. Example : WOD2001
HISTORY_DATE	char HISTORY_DATE(N_HISTORY, N_PROF, DATE_TIME); HISTORY_DATE:long_name = "Date the history record was created"; HISTORY_DATE:conventions = "YYYYMMDDHHMISS"; HISTORY_DATE:_FillValue = " ";	Date of the action. Example : 20011217160057
HISTORY_ACTION	char HISTORY_ACTION(N_HISTORY, N_PROF, STRING4); HISTORY_ACTION:long_name = "Action performed on data"; HISTORY_ACTION:conventions = "Argo reference table 7"; HISTORY_ACTION:_FillValue = " ";	Name of the action. The action codes are described in reference table 7. Example : QCF$ for QC failed
HISTORY_PARAMETER	char HISTORY_PARAMETER(N_HISTORY, N_PROF, STRING16); HISTORY_PARAMETER:long_name = "Station parameter action is performed on"; HISTORY_PARAMETER:conventions = "Argo reference table 3"; HISTORY_PARAMETER:_FillValue = " ";	Name of the parameter on which the action is performed. Example : PSAL
HISTORY_START_PRES	float HISTORY_START_PRES(N_HISTORY, N_PROF); HISTORY_START_PRES:long_name = "Start pressure action applied on"; HISTORY_START_PRES:_FillValue = 99999.f; HISTORY_START_PRES:units = "decibar";	Start pressure the action is applied to. Example : 1500.0
HISTORY_STOP_PRES	float HISTORY_STOP_PRES(N_HISTORY, N_PROF); HISTORY_STOP_PRES:long_name = "Stop pressure action applied on"; HISTORY_STOP_PRES:_FillValue = 99999.f; HISTORY_STOP_PRES:units = "decibar";	Stop pressure the action is applied to. **This should be greater than START_PRES.** Example : 1757.0
HISTORY_PREVIOUS_VALUE	float HISTORY_PREVIOUS_VALUE(N_HISTORY, N_PROF); HISTORY_PREVIOUS_VALUE:long_name = "Parameter/Flag previous	Parameter or flag of the previous value before action. Example : 2 (probably good) for a flag that was changed to 1 (good)

	value before action"; HISTORY_PREVIOUS_VALUE:_FillValue = 99999.f;	
HISTORY_QCTEST	char HISTORY_QCTEST(N_HISTORY, N_PROF, STRING16); HISTORY_QCTEST:long_name = "Documentation of tests performed, tests failed (in hex form)"; HISTORY_QCTEST:conventions = "Write tests performed when ACTION=QCP$; tests failed when ACTION=QCF$"; HISTORY_QCTEST:_FillValue = " ";	This field records the tests performed when ACTION is set to QCP$ (QC performed), the test failed when ACTION is set to QCF$ (QC failed). The QCTEST codes are describe in reference table 11. Example : 0A (in hexadecimal form)

The usage of the History section is described in §5 "Using the History section of the Argo netCDF Structure".

2.3 Core-Argo trajectory format version 3.1

Core-Argo trajectory files contain all received Argos and GPS locations of Argo floats. The trajectory file also contains cycle timing information important for making velocity calculations. These times may come directly from the float in real time, from calculations based on float information in real time, from the satellite system in real time, or from estimations done in delayed mode.

In addition to locations and cycle timing information, a trajectory file often contains measurements such as pressure, temperature, salinity or conductivity performed at various intermediate times during the cycle. The full pressure, temperature and salinity profile collected upon ascent is not included in the trajectory file. This is stored in the profile file.

A core-Argo trajectory contains the CTD sensor parameters (pressure, temperature, salinity, conductivity) that are measured outside the vertical profiles. Additional parameters from other sensors are stored in a B-Argo trajectory file. The B-trajectory file is very similar to core-Argo trajectory file; its additional features are listed in §2.6

There may be two possible Core-Argo trajectory files at one time for a float - a real time trajectory file ("R") and a delayed mode trajectory file ("D"). For naming conventions, see §4.1.3. The real time trajectory file will contain all the data obtained in real time for all the cycles the float has performed. The "R" file will exist until the float dies and DMQC is finalized. A delayed mode trajectory file exists for the entire float lifetime.

The delayed mode trajectory file will contain both real time and delayed mode data. The delayed mode data will be the highest quality data available for each cycle that has been delayed mode quality controlled. However, delayed mode quality control may not be performed on all the float's cycles. In this case, the "D" file will contain both the real time and delayed mode data only for the cycles for which delayed mode quality control has been performed. Therefore, if both an "R" and "D" trajectory file exist, to obtain the best quality data for the entire float record, it might be necessary to look at the "D" file for the cycles that have been delayed mode quality controlled and then in the "R" file for the rest of the cycles which have not yet been delayed mode quality controlled. Once a float dies and the entire float record has been quality controlled, the "D" file will be the only file available on the GDAC and will contain both adjusted and not adjusted data.

The trajectory file contains two groups of data variables. In this document the groups are differentiated by their dimension.

The variable group described in §2.3.5 which includes the locations, cycle timing information, and measurements from the float is N_MEASUREMENT long. It includes all the data from the float. If filled, the best timing information is kept in the JULD_ADJUSTED variable. If this is filled in real time, that means either clock drift has been determined and adjustment has been applied (inclusive of adjustment of zero) or another timing estimate has been done based on typical float behavior. Simultaneously, the DATA_MODE should be marked as "A" indicating an adjusted float, and the CLOCK_OFFSET variable should be appropriately filled.

The variable group described in §2.3.6 which includes the cycle timing information and other cycle descriptive variables is N_CYCLE long. The cycle timing information is a subset of the information found in the N_MEASUREMENT array. This array includes the best timing information which matches the JULD_ADJUSTED times if filled, else JULD times from the N_MEASUREMENT array., The times can be corrected for float clock drift or estimated. The JULD*STATUS variables provide information on the state of the timing information. The N_CYCLE array also includes several variables that pertain only to the entire cycle such as GROUNDED, CONFIG_MISSION_NUMBER, etc.

In the N_MEASUREMENT group, the MEASUREMENT_CODE variable must be correctly understood. This variable is designed to indicate where in the cycle the location, times and important

float timing events (see Argo User's manual for the 30 suggested events to report). The Measurement Code Table (Reference Table 15) contains all the flags and their meanings for the MEASUREMENT_CODE variable. This table is comprised of two parts - a) Absolute codes: measurement code (MC) values can be primary (mandatory) or secondary (highly desirable), and b) Relative codes: measurement code values are relative to an absolute code and are further divided into two parts: generic codes that can be used by a wide variety of floats and specific codes that are directly important to a specific float/measurement.

All Primary and Secondary MC events that are experienced by the float are required to be present in the N_MEASUREMENT array and redundantly in the N_CYCLE variables. Secondary codes are codes that not as crucial as the primary codes, but it is still recommended they be filled. All other codes are voluntary. Please note the term 'experienced by the float'. It is not necessary, nor best practice, to include measurement codes including primary or secondary codes, if the float is not programmed to activate an action described by the measurement code. For example a float alternates cycle missions. In even cycles n, the float does not enter a drift phase, but instead rises directly back to the surface after falling to depth. In odd cycles n+1, the float enters a drift phase. In the N_MEASUREMENT array the even cycles n would not include measurement codes indicative of drift, such as MC250 or MC300. But these codes would be included in odd cycles n+1.

If the float experiences an event but the time is not able to be determined, then most JULD variables are set to fill value and a *_STATUS = '9' is used in both the N_MEASUREMENT and N_CYCLE arrays. This indicates that it might be possible to estimate the timing of the event in the future and acts as a placeholder.

If a float does not experience an event, then the fill values are used for all N_CYCLE variables. These non-events do not get a placeholder in the N_MEASUREMENT arrays as described above.

For file naming conventions, see §4.1.3.

2.3.1 Global attributes

The global attributes section is used for data discovery. The following global attributes should appear in the global section. The NetCDF Climate and Forecast (CF) Metadata Conventions (version 1.6, 5 December, 2011) are available from:

- http://cf-pcmdi.llnl.gov/documents/cf-conventions/1.6/cf-conventions.pdf

```
// global attributes:
        :title = "Argo float trajectory file";
        :institution = "CORIOLIS";
        :source = "Argo float";
        :history = "2011-04-22T06:00:00Z creation";
        :references = "http://www.argodatamgt.org/Documentation";
        :comment = "free text";
        :user_manual_version = "3.2";
        :Conventions = “Argo-3.1 CF-1.6";
        :featureType = "trajectory";
        :comment_on_resolution = "PRES variable resolution depends on measurement code";
```

Global attribute name	Definition
title	A succinct description of what is in the dataset.
institution	Specifies where the original data was produced.

source	The method of production of the original data. If it was model-generated, source should name the model and its version, as specifically as could be useful. If it is observational, source should characterize it (e.g., "surface observation" or "radiosonde").
history	Provides an audit trail for modifications to the original data. Well-behaved generic NetCDF filters will automatically append their name and the parameters with which they were invoked to the global history attribute of an input NetCDF file. We recommend that each line begin with a timestamp indicating the date and time of day that the program was executed.
references	Published or web-based references that describe the data or methods used to produce it.
comment	Miscellaneous information about the data or methods used to produce it.
user_manual_version	The version number of the user manual
Conventions	The conventions supported by this file, blank separated
featureType	The NetCDF CF feature type.
comment_on_resolution	Optional comment on parameter resolution

2.3.2 Dimensions and definitions

Name	Definition	Comment
DATE_TIME	DATE_TIME = 14;	This dimension is the length of an ASCII date and time value. Date_time convention is : YYYYMMDDHHMISS YYYY : year MM : month DD : day HH : hour of the day MI : minutes SS : seconds Date and time values are either in Universal Time (UTC) or float's time. Examples : 20010105172834 : January 5th 2001 17:28:34 19971217000000 : December 17th 1997 00:00:00
STRING64 STRING32 STRING16 STRING8 STRING4 STRING2	STRING64 = 64; STRING32 = 32; STRING16 = 16; STRING8 = 8; STRING4 = 4; STRING2 = 2;	String dimensions from 2 to 64.
N_PARAM	N_PARAM = <int value>;	Maximum number of parameters measured or calculated for a pressure sample. Examples : (pressure, temperature) : N_PARAM = 2 (pressure, temperature, salinity) : N_PARAM = 3 (pressure, temperature, conductivity, salinity) : N_PARAM = 4
N_MEASUREMENT	N_MEASUREMENT = unlimited;	This dimension is the number of recorded locations, cycle timings and measurements of the file.
N_CYCLE	N_CYCLE = <int value>;	Number of collected float cycles. If all the cycles have been collected (i.e. if there are no missing cycles), it is the number of cycles performed by the float. In this particular case, as some floats begin cycle numbering at 0, others at 1, in the former, N_CYCLE = max(CYCLE_NUMBER) +1. In the latter, N_CYCLE = max(CYCLE_NUMBER) Example : N_CYCLE = 100
N_HISTORY	N_HISTORY = <int value>;	Maximum number of history records for a location. This dimension depends on the data set Example : N_HISTORY = 10

2.3.3 General information on the trajectory file

This section contains information about the whole file.

Name	Definition	Comment
DATA_TYPE	char DATA_TYPE(STRING16); DATA_TYPE:long_name = "Data type"; DATA_TYPE:conventions = "Argo reference table 1"; DATA_TYPE:_FillValue = " ";	This field contains the type of data contained in the file. The list of acceptable data types is in the reference table 1. Example : Argo trajectory
FORMAT_VERSION	char FORMAT_VERSION(STRING4);	File format version

	FORMAT_VERSION:long_name = "File format version"; FORMAT_VERSION:_FillValue = " ";	Example : "3.1"
HANDBOOK_VERSION	char HANDBOOK_VERSION(STRING4); HANDBOOK_VERSION:long_name = "Data handbook version"; HANDBOOK_VERSION:_FillValue = " ";	Version number of the data handbook. This field indicates that the data contained in this file are managed according to the policy described in the Argo data management handbook. Example : "1.2"
REFERENCE_DATE_TIME	char REFERENCE_DATE_TIME(DATE_TIME); REFERENCE_DATE_TIME:long_name = "Date of reference for Julian days"; REFERENCE_DATE_TIME:conventions = "YYYYMMDDHHMISS"; REFERENCE_DATE_TIME:_FillValue = " ";	Date of reference for julian days. The recommended reference date time is "19500101000000" : January 1st 1950 00:00:00
DATE_CREATION	char DATE_CREATION(DATE_TIME); DATE_CREATION:long_name = "Date of file creation "; DATE_CREATION:conventions = "YYYYMMDDHHMISS"; DATE_CREATION:_FillValue = " ";	Date and time (UTC) of creation of this file. Format : YYYYMMDDHHMISS Example : 20011229161700 : December 29th 2001 16 :17 :00
DATE_UPDATE	char DATE_UPDATE(DATE_TIME); DATE_UPDATE:long_name = "Date of update of this file"; DATE_UPDATE:conventions = "YYYYMMDDHHMISS"; DATE_UPDATE:_FillValue = " ";	Date and time (UTC) of update of this file. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 09 :05 :00

2.3.4 General information on the float

This section contains general information on the float.

Name	Definition	Comment
PLATFORM_NUMBER	char PLATFORM_NUMBER(STRING8); PLATFORM_NUMBER:long_name = "Float unique identifier"; PLATFORM_NUMBER:conventions = "WMO float identifier : A9IIIII"; PLATFORM_NUMBER:_FillValue = " ";	WMO float identifier. WMO is the World Meteorological Organization. This platform number is unique. Example : "6900045"
PROJECT_NAME	char PROJECT_NAME(STRING64); PROJECT_NAME:long_name = "Name of the project"; PROJECT_NAME:_FillValue = " ";	Name of the project which operates the float that performed the trajectory. Example : "GYROSCOPE" (EU project for ARGO program)
PI_NAME	char PI_NAME (STRING64); PI_NAME:long_name = "Name of the principal investigator"; PI_NAME:_FillValue = " ";	Name of the principal investigator in charge of the float. Example : Yves Desaubies
TRAJECTORY_PARAMETERS	char TRAJECTORY_PARAMETERS(N_PARAM,STRING16); TRAJECTORY_PARAMETERS:long_name = "List of available parameters for the station"; TRAJECTORY_PARAMETERS:conventions = "Argo reference table 3"; TRAJECTORY_PARAMETERS:_FillValue = " ";	List of parameters contained in this trajectory file. The parameter names are listed in reference table 3. Examples : "PRES"," TEMP", "PSAL", "CNDC", "DOXY", etc "PRES": pressure "TEMP" : temperature "PSAL" : practical salinity "CNDC" :electrical conductivity "DOXY" : dissolved oxygen
DATA_CENTRE	char DATA_CENTRE(STRING2); DATA_CENTRE:long_name = "Data centre in charge of float data processing"; DATA_CENTRE:conventions = "Argo reference table 4"; DATA_CENTRE:_FillValue = " ";	Code for the data centre in charge of the float data management. The data centre codes are described in the reference table 4. Example : "ME" for MEDS
DATA_STATE_INDICATOR	char DATA_STATE_INDICATOR(STRING4); DATA_STATE_INDICATOR:long_name = "Degree of processing the data have passed through";	Degree of processing the data has passed through. The data state indicator is described in the reference table 6.

	DATA_STATE_INDICATOR:conventions = "Argo reference table 6"; DATA_STATE_INDICATOR:_FillValue = " ";	
PLATFORM_TYPE	char PLATFORM_TYPE(STRING32); PLATFORM_TYPE:long_name = "Type of float"; PLATFORM_TYPE:conventions = "Argo reference table 23"; PLATFORM_TYPE:_FillValue = " ";	Type of float listed in reference table 23. Example: SOLO, APEX, PROVOR, ARVOR, NINJA.
FLOAT_SERIAL_NO	char FLOAT_SERIAL_NO(STRING32); FLOAT_SERIAL_NO:long_name = "Serial number of the float"; FLOAT_SERIAL_NO:_FillValue = " ";	This field should contain only the serial number of the float. Example : 1679
FIRMWARE_VERSION	char FIRMWARE_VERSION(STRING32); FIRMWARE_VERSION:long_name = "Instrument firmware version"; FIRMWARE_VERSION:_FillValue = " ";	Firmware version of the float. Example : "013108"
WMO_INST_TYPE	char WMO_INST_TYPE(STRING4); WMO_INST_TYPE:long_name = "Coded instrument type"; WMO_INST_TYPE:conventions = "Argo reference table 8"; WMO_INST_TYPE:_FillValue = " ";	Instrument type from WMO code table 1770. A subset of WMO table 1770 is documented in the reference table 8. Example : 831
POSITIONING_SYSTEM	char POSITIONING_SYSTEM(STRING8); POSITIONING_SYSTEM:long_name = "Positioning system"; POSITIONING_SYSTEM:_FillValue = " ";	Name of the system used to derive the float locations, see reference table 9. Example : ARGOS

2.3.5 N_MEASUREMENT dimension variable group

This section describes the variables found in the N_MEASUREMENT dimension variable group. In this variable group you find the unadjusted data as reported by the float, adjusted timing, the reported locations, as well as measurements performed along the surface and subsurface trajectory.

N_MEASUREMENT is the number of locations, cycle timings, and measurements received or estimated from information sent by the float. If a cycle is missed, nothing is entered into the N_MEASUREMENT array - e.g. no fill values are allowed to indicate a missing cycle.

The N_MEASURMENT array should be arranged first by CYCLE_NUMBER and then by the order the events for that cycle occurred. Some data within the netCDF may not have a time attached to it, but it should still be placed as close as possible to its origination time. Because the order of the N_MEASUREMENT array is based on time, MEASUREMENT_CODE will not be ascending for every cycle, but JULD is usually ascending (unless a clock offset has been applied and then the JULD variable may have an inversion) and JULD_ADJUSTED is always ascending. To construct the trajectory netCDF a full understanding of when the float data was gathered within the cycle is necessary.

JULD contains the raw timing values either from the satellite system or from the float. The values in JULD cannot be estimated, nor altered such as for clock drift.

JULD_ADJUSTED contains the best estimate of float timing available for this float. If necessary, it contains adjusted timing variables due to clock drift. The times can be adjusted either in real time or in delayed mode due to clock drift or estimation of times based on float behaviour by a float expert. The JULD_ADJUSTED_STATUS variable indicates how the JULD_ADJUSTED value was filled and indicates whether the time is estimated or measured. The JULD_ADJUSTED_QC contain the QC flags for the adjusted times. This may lead to times where JULD_ADJUSTED is filled, but JULD contains 'FillValue'. That is because the time is estimated rather than measured.

In R-mode, no times are adjusted, but times may be estimated and placed within JULD_ADJUSTED with the JULD_ADJUSTED_STATUS flag set to ‘1’ indicating an estimated value. Non-adjusted times do not need to be carried down to the JULD_ADJUSTED array, so this array may be sparse or even empty. No estimated times are allowed in the JULD variable.

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In A-mode, adjustments are made, typically to PSAL and PRES, but others may be adjusted as well such as JULD if real-time correction of clock drift is applied. If an adjustment is made, all values must be carried down to the ADJUSTED variables with the appropriate adjustment applied. Real time estimates will also be present in ‘A’ files. Non-zero adjustments will need to be applied to the any present estimates.

In D-mode, all adjustments and estimations are complete. Similar to the ‘A’ file, there must be correspondence between the ADJUSTED and non-ADJUSTED fields. This means that all values must be carried down to the ADJUSTED field. ADJUSTED variables may have a value while the corresponding non-ADJUSTED variable is fillvalue due to the presence of an estimated value. The oppposite is not allowed. There cannot be a non-ADJUSTED value and fillvalue in the corresponding ADJUSTED variable.

CYCLE_NUMBER contains the cycle number of the cycle that is assigned in real time. This cycle number must match the profile cycle number, which is the number recorded in the CYCLE_NUMBER(N_PROF) variable in profile files.

CYCLE_NUMBER_INDEX indicates which cycle number information is contained in that index of the N_CYCLE array. For example, CYCLE_NUMBER_INDEX(4)=3 means the 4th element of all 34 Argo data management User’s manual N_CYCLE variables is associated with the WMO_003.nc profile file. This might happen if the float's first cycle has a cycle number of zero rather than one. Additionally, all the elements of the N_MEASUREMENT variables for which CYCLE_NUMBER = 3 are likewise associated with the 4th N_CYCLE elements and with the WMO_003.nc profile file. This clearly links the index in the N_CYCLE array to the cycle number in the N_MEASUREMENT array.

Additionally, CYCLE_NUMBER = -1 indicates the float's launch and the JULD and LATITUDE and LONGITUDE variables should contain the float's launch time and location.

CYCLE_NUMBER_ADJUSTED contains a cycle numbering which has been assessed and adjusted to be correct, especially for the purposes of trajectory calculations. If a cycle is recovered during delayed mode and no profile file is created, the cycle must be added into the CYCLE_NUMBER_ADJUSTED and CYCLE_NUMBER_ADJUSTED_INDEX variables. Two examples recovered cycles are below.

The first example is where cycle number 5 is recovered in delayed mode. The cycle number variables must be rewritten as follows:

CYCLE_NUMBER	1, 2, 3, 4, _, 6, 7, 8, 9, 10, 11,…,
CYCLE_NUMBER_INDEX	1, 2, 3, 4, _, 6, 7, 8, 9, 10, 11,…,
CYCLE_NUMBER_ADJUSTED	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, _
CYCLE_NUMBER_ADJUSTED_INDEX	1, 2, 3, 4, 5, 6, 7, 8 9, 10, _

Here, FillValue is added to CYCLE_NUMBER and CYCLE_NUMBER_INDEX to indicate that no profile file exists with cycle number 5.

A second example of an error that might be discovered in cycle number in delayed mode involves floats that do not send cycle number and for which cycle number must be calculated. Here, cycle number 5 was incorrectly skipped in real time and is introduced in delayed mode:

CYCLE_NUMBER	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12,…
CYCLE_NUMBER_INDEX	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12,…
CYCLE_NUMBER_ADJUSTED	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, _, _
CYCLE_NUMBER_ADJUSTED_INDEX	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, _, _

Here, CYCLE_NUMBER = 6 which was assigned in real time, should actually be assigned cycle number = 5 as reflected by the CYCLE_NUMBER_ADJUSTED variable.

CYCLE_NUMBER always corresponds to the profile cycle number. To look for the cycle that matches the profile cycle number, users must look in the CYCLE_NUMBER variable for the cycle number they are interested in. If the CYCLE_NUMBER_ADJUSTED variable is 'FillValue', then this cycle is in real time mode and no corrected cycle number exists. If the CYCLE_NUMBER_ADJUSTED variable is filled, this is the correct cycle number as determined during delayed mode. For the previous example, profile cycle number 6 corresponds to CYCLE_NUMBER = 6 and CYCLE_NUMBER_ADJUSTED = 5.

<PARAM> contains the uncorrected real-time data transmitted by the floats.

The values in <PARAM> should never be altered. <PARAM>_QC contains QC flags that pertain to the values in <PARAM>. Values in <PARAM>_QC are set initially in real time by the automatic realtime tests.

They are later modified in 'D' mode at levels where the QC flags are set incorrectly by the real-time procedures, and where erroneous data are not detected by the real-time procedures.

Each parameter can be adjusted. In that case, <PARAM>_ADJUSTED contains the adjusted values, <PARAM>_ADJUSTED_QC contains the QC flags set by the delayed-mode process, and <PARAM>_ADJUSTED_ERROR contains the adjustment uncertainties.

A file A-mode processing contains adjusted sections with fill values (<PARAM>_ADJUSTED, <PARAM>_ADJUSTED_QC and <PARAM>_ADJUSTED_ERROR) . This is the same for all other ADJUSTED files (e.g. JULD_ADJUSTED).

When no parameter is measured along the trajectory, N_PARAM (number of parameters) and any fields relative to parameter are not in the file : <PARAM>, <PARAM>_QC, <PARAM>_ADJUSTED, <PARAM>_ADJUSTED_QC, <PARAM>_ADJUSTED_ERROR and TRAJECTORY_PARAMETERS.

Name	definition	comment
JULD	double JULD(N_MEASUREMENT); JULD:long_name = "Julian day (UTC) of each measurement relative to REFERENCE_DATE_TIME"; JULD:standard_name = "time"; JULD:units = "days since 1950-01-01 00:00:00 UTC"; JULD:conventions = "Relative julian days with decimal part (as parts of day)"; JULD:resolution = X; JULD:_FillValue = 999999.; JULD:axis = "T";	Julian day of the location (or measurement). The integer part represents the day, the decimal part represents the time of the measurement. Date and time are in universal time coordinates. The julian day is relative to REFERENCE_DATE_TIME. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_STATUS	char JULD_STATUS(N_MEASUREMENT); JULD_STATUS:long_name="Status of the	Status flag on JULD date and time. The flag scale is described in reference table 19.

	date and time” JULD_STATUS:conventions = “Argo reference table 19"; JULD_STATUS:_FillValue = " ";	Example: 2 : Value is transmitted by the float
JULD_QC	char JULD_QC(N_MEASUREMENT); JULD_QC:long_name = "Quality on date and time"; JULD_QC:conventions = "Argo reference table 2"; JULD_QC:_FillValue = " ";	Quality flag on JULD date and time. The flag scale is described in the reference table 2. Example : 1: the date and time seems correct.
JULD_ADJUSTED	double JULD_ADJUSTED(N_MEASUREMENT); JULD_ADJUSTED:long_name = "Adjusted julian day (UTC) of each measurement relative to REFERENCE_DATE_TIME"; JULD_ADJUSTED:standard_name = "time"; JULD_ADJUSTED:units = "days since 1950-01-01 00:00:00 UTC"; JULD_ADJUSTED:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_ADJUSTED:resolution = X; JULD_ADJUSTED:_FillValue = 999999.; JULD:axis = "T";	Adjusted julian day of the location (or measurement). The integer part represents the day, the decimal part represents the time of the measurement. Date and time are in universal time coordinates. The julian day is relative to REFERENCE_DATE_TIME. The date may be adjusted due to float clock drift or expert review. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_ADJUSTED_STATUS	char JULD_ADJUSTED_STATUS(N_MEASUREMENT); JULD_ADJUSTED_STATUS:long_name=”Status of the JULD_ADJUSTED date” JULD_ADJUSTED_STATUS:conventions = “Argo reference table 19"; JULD_ADJUSTED_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: 2 : Value is transmitted by the float
JULD_ADJUSTED_QC	char JULD_ADJUSTED_QC(N_MEASUREMENT); JULD_ADJUSTED_QC:long_name = "Quality on adjusted date and time"; JULD_ADJUSTED_QC:conventions = "Argo reference table 2"; JULD_ADJUSTED_QC:_FillValue = " ";	Quality flag on JULD_ADJUSTED date and time. The flag scale is described in the reference table 2. Example : 1 : the date and time seems correct.
LATITUDE	double LATITUDE(N_MEASUREMENT); LATITUDE:long_name = "Latitude of each location"; LATITUDE:standard_name = "latitude"; LATITUDE:units = "degree_north"; LATITUDE:_FillValue = 99999.; LATITUDE:valid_min = -90.; LATITUDE:valid_max = 90.; LATITUDE:axis = "Y";	Latitude of the location (or measurement). Unit : degree north Example : 44.4991 for 44° 29’ 56.76” N
LONGITUDE	double LONGITUDE(N_MEASUREMENT); LONGITUDE:long_name = "Longitude of each location"; LONGITUDE:standard_name = "longitude"; LONGITUDE:units = "degree_east"; LONGITUDE:_FillValue = 99999.; LONGITUDE:valid_min = -180.; LONGITUDE:valid_max = 180.; LONGITUDE:axis = "X";	Longitude of the location (or measurement). Unit : degree east Example : 16.7222 for 16° 43’ 19.92” E
POSITION_ACCURACY	char POSITION_ACCURACY(N_MEASUREMENT); POSITION_ACCURACY:long_name = "Estimated accuracy in latitude and longitude"; POSITION_ACCURACY:conventions = "Argo reference table 5"; POSITION_ACCURACY:_FillValue = " ";	Position accuracy received from the positioning system. The location classes from ARGOS are described in the reference table 5. A "G" indicates the GPS positioning sytem. Examples : 3 for a latitude and longitude accuracy < 250 m. G for GPS accuracy
POSITION_QC	char POSITION_QC(N_MEASUREMENT); POSITION_QC:long_name = "Quality on position"; POSITION_QC:conventions = "Argo reference table 2"; POSITION_QC:_FillValue = " ";	Quality flag on position. The flag on position is set according to (LATITUDE, LONGITUDE, JULD) quality. The flag scale is described in the reference table 2. Example : 1 : position seems correct.
CYCLE_NUMBER	int CYCLE_NUMBER(N_MEASUREMENT);	Cycle number of the float for this series of measurements,

	CYCLE_NUMBER:long_name = "Float cycle number of the measurement"; CYCLE_NUMBER:conventions = "0...N, 0 : launch cycle, 1 : first complete cycle"; CYCLE_NUMBER:_FillValue = 99999;	locations and timings. Some floats begin with a cycle 0 and some begin at cycle number 1. Cycle number is -1 for the float's launch and includes the time and location. For one cycle number, there are usually several locations/measurement received. This cycle number must match the profile cycle number. Example : 17 for measurements performed during the 17th cycle of the float.
CYCLE_NUMBER_ADJUSTED	int CYCLE_NUMBER_ADJUSTED (N_MEASUREMENT); CYCLE_NUMBER_ADJUSTED:long_name = "Adjusted float cycle number of the measurement"; CYCLE_NUMBER_ADJUSTED:conventions = "0...N, 0 : launch cycle, 1 : first complete cycle"; CYCLE_NUMBER_ADJUSTED:_FillValue = 99999;	Adjusted cycle number of the float for this series of measurements, locations and timings. Some floats begin with a cycle 0 and some begin at cycle number 1. For one cycle number, there are usually several locations/measurement received. Sometimes cycle numbers are assigned erroneously and need to be corrected. This variable contains the corrected cycle numbers. Example : 17 for measurements performed during the 17th cycle of the float.
MEASUREMENT_CODE	int MEASUREMENT_CODE (N_MEASUREMENT); MEASUREMENT_CODE:long_name = "Flag referring to a measurement event in the cycle"; MEASUREMENT_CODE:conventions = "Argo reference table 15"; MEASUREMENT_CODE:_FillValue = 99999;	Flag for each event in the cycle which corresponds to Argo reference table 15. Example: 100 : All measurements made at start of descent to drift pressure . Could be time, location, surface pressure, etc.
<PARAM>	float <PARAM>(N_MEASUREMENT); <PARAM>:long_name = "<X>"; <PARAM>:standard_name = "<X>"; <PARAM>:_FillValue = <X>; <PARAM>:units = "<X>"; <PARAM>:valid_min = <X>; <PARAM>:valid_max = <X>; <PARAM>:C_format = "<X>"; <PARAM>:FORTRAN_format = "<X>";	<PARAM> contains the original values of a parameter listed in the "code" column of reference table 3. <X> : these fields are specified in the columns of the reference table 3.
<PARAM>_QC	char <PARAM>_QC(N_MEASUREMENT); <PARAM>_QC:long_name = "quality flag"; <PARAM>_QC:conventions = "Argo reference table 2"; <PARAM>_QC:_FillValue = " ";	Quality flag applied on each <PARAM> values. The flag scale is specified in table 2.
<PARAM>_ADJUSTED	float <PARAM>_ADJUSTED(N_MEASUREMENT); <PARAM>_ADJUSTED:long_name = "<X>"; <PARAM>_ADJUSTED:standard_name = "<X>"; <PARAM>_ADJUSTED:_FillValue = <X>; <PARAM>_ADJUSTED:units = "<X>"; <PARAM>_ADJUSTED:valid_min = <X>; <PARAM>_ADJUSTED:valid_max = <X>; <PARAM>_ADJUSTED:comment = "<X>"; <PARAM>_ADJUSTED:C_format = "<X>"; <PARAM>_ADJUSTED:FORTRAN_format = "<X>"; <PARAM>_ADJUSTED:resolution= <X>;	<PARAM>_ADJUSTED contains the adjusted values derived from the original values of the parameter. <X> : these fields are specified in the columns of the reference table 3. **<PARAM>_ADJUSTED is mandatory.** When no adjustment is performed, the FillValue is inserted.
<PARAM>_ADJUSTED_QC	char <PARAM>_ADJUSTED_QC(N_MEASUREMENT); <PARAM>_ADJUSTED_QC:long_name = "quality flag"; <PARAM>_ADJUSTED_QC:conventions = "Argo reference table 2"; <PARAM>_ADJUSTED_QC:_FillValue = " ";	Quality flag applied on each <PARAM>_ADJUSTED values. The flag scale is specified in reference table 2. **<PARAM>_ADJUSTED_QC is mandatory.** When no adjustment is performed, the FillValue is inserted.
<PARAM>_ADJUSTED_ERROR	float <PARAM>_ADJUSTED_ERROR(N_MEASUREMENT); <PARAM>_ADJUSTED_ERROR:long_name = "Contains the error on the adjusted values as determined by the delayed mode QC process."; <PARAM>_ADJUSTED_ERROR:_FillValue = <X>;	<PARAM>_ADJUSTED_ERROR contains the error on the adjusted values of the parameter. <X> : these fields are specified in the columns of the reference table 3. **<PARAM>_ADJUSTED_ERROR is mandatory.** When no adjustment is performed, the FillValue is inserted.

	<PARAM>_ADJUSTED_ERROR:units = "<X>"; <PARAM>_ADJUSTED_ERROR:C_format = "<X>"; <PARAM>_ADJUSTED_ERROR:FORTRAN_format = "<X>"; <PARAM>_ADJUSTED_ERROR:resolution= <X>;	
AXES_ERROR_ELLIPSE_MAJOR	float AXES_ERROR_ELLIPSE_MAJOR(N_MEASUREMENT); AXES_ERROR_ELLIPSE_MAJOR.long_name = "Major axis of error ellipse from positioning system"; AXES_ERROR_ELLIPSE_MAJOR:units = "meters"; AXES_ERROR_ELLIPSE_MAJOR:_FillValue = 99999.;	Major axis of error ellipse reported by the positioning system.
AXES_ERROR_ELLIPSE_MINOR	float AXES_ERROR_ELLIPSE_MINOR(N_MEASUREMENT); AXES_ERROR_ELLIPSE_MINOR.long_name = "Minor axis of error ellipse from positioning system"; AXES_ERROR_ELLIPSE_MINOR:units = "meters"; AXES_ERROR_ELLIPSE_MINOR:_FillValue = 99999.;	Minor axis of error ellipse reported by the positioning system.
AXES_ERROR_ELLIPSE_ANGLE	float AXES_ERROR_ELLIPSE_ANGLE(N_MEASUREENT); AXES_ERROR_ELLIPSE_ANGLE.long_name = "Angle of error ellipse from positioning system"; AXES_ERROR_ELLIPSE_ANGLE:units = "Degrees (from North when heading East)"; AXES_ERROR_ELLIPSE_ANGLE:_FillValue = 99999.;	Angle of error ellipse reported by the positioning system.
SATELLITE_NAME	char SATELLITE_NAME(N_MEASUREMENT); SATELLITE_NAME.long_name = "Satellite name from positioning system"; SATELLITE_NAME.FillValue = " ";	Satellite name from positioning system.

2.3.5.1 How to report unusual Pressure resolutions in the N_MEASUREMENT variable group of the TRAJ file

In the N_MEASUREMENT array of the TRAJ file, the pressure resolution may differs according to the MEASUREMENT_CODE.

How to keep the information in the file?

- add a "comment_on_resolution" attribute to the variable to inform the user,
- add a "comment_on_resolution" global attribute to the file

For example, for APEX and PROVOR floats some pressures are provided in bars whereas most of them are in dbars. Thus, in this case:

- PRES:resolution = 0.1f;
- PRES:comment_on_resolution = "PRES resolution is 0.1 dbar, except for measurement codes [150 189 198 289 297 298 389 398 489 497 498 589 901] for which PRES resolution is 1 bar";

You may add a comment_on_resolution global attribute

- :comment_on_resolution = "PRES variable resolution may be lower than nominal depending on measurement codes"

2.3.6 N_CYCLE dimension variable group

This section contains information on the variables with dimension N_CYCLE. They include variables that contain the best estimate of float timing.

Each field in this section has a N_CYCLE dimension.

N_CYCLE is the number of collected cycles performed by the float. It is a dimension, thus it may not equal the maximum cycle number within the file.

The N_CYCLE array should be ordered by CYCLE_NUMBER_INDEX.

The cycle definition is available at §1.6. cycle is defined as a series of actions, including collection of data, made by a float that ends with transmission of data. If the float fails to collect nor transmit data, a cycle has not occurred and CYCLE_NUMBER_INDEX should not be incremented.

Floats begin with different cycle numbers depending on float type. To understand how the N_CYCLE dimension variable group relates to the N_MEASUREMENT variable group, the user must consult the CYCLE_NUMBER_INDEX variable. This variable indicates the cycle number of the float information that is contained in that particular N_CYCLE index. For example, to find the N_CYCLE information that corresponds to CYCLE_NUMBER = 1, look for CYCLE_NUMBER_INDEX = 1.

Additionally, CYCLE_NUMBER_INDEX is the number of the profile cycle associated with the trajectory cycle in that index of the N_CYCLE array.

If any errors are discovered in how the cycle numbers were assigned, or if additional cycles are recovered in delayed mode, the CYCLE_NUMBER_INDEX_ADJUSTED variable is adjusted accordingly.

CYCLE_NUMBER_INDEX always corresponds to the profile cycle number. To look for the cycle that matches the profile cycle number, users must look in the CYCLE_NUMBER_INDEX variable for the cycle number they are interested in. If the CYCLE_NUMBER_INDEX_ADJUSTED variable contains 'FillValue', then this cycle is in real time mode and no corrected cycle number exists. If the CYCLE_NUMBER_INDEX_ADJUSTED variable is filled, this is the correct cycle number as determined during delayed mode.

When a cycle is missing (e.g. no data received), no fill values are used to indicate a missing cycle.

Name	Definition	Comment
JULD_DESCENT_START	double JULD_DESCENT_START(N_CYCLE); JULD_DESCENT_START:long_name = "Descent start date of the cycle"; JULD_DESCENT_START:standard_name = "time"; JULD_DESCENT_START:units = "days since 1950-01-01 00:00:00 UTC"; JULD_DESCENT_START:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_DESCENT_START:resolution = X;	Julian day (UTC) when float leaves the surface and begins descent Example : 18833.8013889885 : July 25 2001 19:14:00

	JULD_DESCENT_START:_FillValue = 999999.;	
JULD_DESCENT_START_STATUS	char JULD_DESCENT_START_STATUS(N_CYCLE); JULD_DESCENT_START_STATUS:long_name = "Status of descent start date of the cycle"; JULD_DESCENT_START_STATUS:conventions = "Argo reference table 19"; JULD_DESCENT_START_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_FIRST_STABILIZATION	double JULD_FIRST_STABILIZATION(N_CYCLE); JULD_FIRST_STABILIZATION:long_name = "Time when a float first becomes water-neutral"; JULD_FIRST_STABILIZATION:standard_name = "time"; JULD_FIRST_STABILIZATION:units = days since 1950-01-01 00:00:00 UTC"; JULD_FIRST_STABILIZATION: conventions = "Relative julian days with decimal part (as parts of day)"; JULD_FIRST_STABILIZATION:resolution = X; JULD_FIRST_STABILIZATION:_FillValue = 999999.	Julian day (UTC) of time when a float first becomes water-neutral. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_FIRST_STABILIZATION_STATUS	char JULD_FIRST_STABILIZATION_STATUS(N_CYCLE); JULD_FIRST_STABILIZATION_STATUS: long_name = "Status of time when a float first becomes water-neutral"; JULD_FIRST_STABILIZATION_STATUS: conventions = "Argo reference table 19"; JULD_STABILIZATION_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_DESCENT_END	double JULD_DESCENT_END(N_CYCLE); JULD_DESCENT_END:long_name = "Descent end date of the cycle"; JULD_DESCENT_END:standard_name = "time"; JULD_DESCENT_END:units = "days since 1950-01-01 00:00:00 UTC"; JULD_DESCENT_END:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_DESCENT_END:resolution = X; JULD_DESCENT_END:_FillValue = 999999.;	Julian day (UTC) when float first approaches within 3% of the eventual drift pressure. Float may be transitioning from the surface or from a deep profile. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_DESCENT_END_STATUS	char JULD_DESCENT_END_STATUS(N_CYCLE); JULD_DESCENT_END_STATUS:long_name = "Status of descent end date of the cycle"; JULD_DESCENT_END_STATUS:conventions = "Argo reference table 19"; JULD_DESCENT_END_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_PARK_START	double JULD_PARK_START(N_CYCLE); JULD_PARK_START:long_name = "Drift start date of the cycle"; JULD_PARK_START:standard_name = "time"; JULD_PARK_START:units = "days since	Julian day (UTC) when float transitions to its Park or Drift mission. This variable is based on float logic based on a descent timer (i.e. SOLO), or be based on measurements of pressure (i.e. Provor).Example : 18833.8013889885 : July 25 2001 19:14:00

	1950-01-01 00:00:00 UTC"; JULD_PARK_START:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_PARK_START:resolution = X; JULD_PARK_START:_FillValue = 999999.;	
JULD_PARK_START_STATUS	char JULD_PARK_START_STATUS(N_CYCLE); JULD_PARK_START_STATUS:long_name = "Status of drift start date of the cycle"; JULD_PARK_START_STATUS:conventions = "Argo reference table 19"; JULD_PARK_START_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_PARK_END	double JULD_PARK_END(N_CYCLE); JULD_PARK_END:long_name = "Drift end date of the cycle"; JULD_PARK_END:standard_name = "time"; JULD_PARK_END:units = "days since 1950-01-01 00:00:00 UTC"; JULD_PARK_END:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_PARK_END:resolution = X; JULD_PARK_END:_FillValue = 999999.;	Julian day (UTC) when float exits from its Park or Drift mission. It may next rise to the surface (AST) or sink to profile depth (DDET)Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_PARK_END_STATUS	char JULD_PARK_END_STATUS(N_CYCLE); JULD_PARK_END_STATUS:long_name = "Status of drift end date of the cycle"; JULD_PARK_END_STATUS:conventions = "Argo reference table 19"; JULD_PARK_END_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_DEEP_DESCENT_END	double JULD_DEEP_DESCENT_END(N_CYCLE); JULD_DEEP_DESCENT_END:long_name = "Deep descent end date of the cycle"; JULD_DEEP_DESCENT_END:standard_name = "time"; JULD_DEEP_DESCENT_END:units = "days since 1950-01-01 00:00:00 UTC"; JULD_DEEP_DESCENT_END:conventions = "Relative julian days with decimal part (as parts of day)»; JULD_DEEP_DESCENT_END:resolution = X; JULD_DEEP_DESCENT_END:_FillValue = 999999.;	Julian day (UTC)when float first approaches within 3% of the eventual deep drift/profile pressure. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_DEEP_DESCENT_END_STATUS	char JULD_DEEP_DESCENT_END_STATUS(N_CYCLE); JULD_DEEP_DESCENT_END_STATUS:long_name = "Status of deep descent end date of the cycle"; JULD_DEEP_DESCENT_END_STATUS:conventions = "Argo reference table 19"; JULD_DEEP_DESCENT_END_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_DEEP_PARK_START	double JULD_DEEP_PARK_START(N_CYCLE); JULD_DEEP_PARK_START:long_name = "Deep park start date of the cycle"; JULD_DEEP_PARK_START:standard_name = "time";	Julian day (UTC) when float transitions to its Deep Park or Deep Drift mission. This variable is based on float logic based on a descent timer (i.e. SOLO), or be based on measurements of pressure (i.e. Provor). Example : 18833.8013889885 : July 25 2001 19:14:00

	JULD_DEEP_PARK_START:units = "days since 1950-01-01 00:00:00 UTC"; JULD_DEEP_PARK_START:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_DEEP_PARK_START:resolution = X; JULD_DEEP_PARK_START:_FillValue = 999999.;	
JULD_DEEP_PARK_START _STATUS	char JULD_DEEP_PARK_START _STATUS(N_CYCLE); JULD_DEEP_PARK_START_STATUS:long_name = "Status of deep park start date of the cycle "; JULD_DEEP_PARK_START _STATUS:conventions = "Argo reference table 19"; JULD_DEEP_PARK_START _STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_ASCENT_START	double JULD_ASCENT_START(N_CYCLE); JULD_ASCENT_START:long_name = "Start date of the ascent to the surface"; JULD_ASCENT_START:standard_name = "time"; JULD_ASCENT_START:units = "days since 1950-01-01 00:00:00 UTC"; JULD_ASCENT_START:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_ASCENT_START:resolution = X; JULD_ASCENT_START:_FillValue = 999999.;	Julian day (UTC) of the beginning of the float's ascent to the surface Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_ASCENT_START_ STATUS	char JULD_ASCENT_START_STATUS(N_CYCLE); JULD_ASCENT_START_STATUS:long_name = "Status of start date of the ascent to the surface"; JULD_ASCENT_START_STATUS:conventions = "Argo reference table 19"; JULD_ASCENT_START_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_DEEP_ASCENT_S TART	double JULD_DEEP_ASCENT_START(N_CYCLE); JULD_DEEP_ASCENT_START:long_name = "Deep ascent start date of the cycle"; JULD_DEEP_ASCENT_START:standard_name = "time"; JULD_DEEP_ASCENT_START:units = "days since 1950-01-01 00:00:00 UTC"; JULD_DEEP_ASCENT_START:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_DEEP_ASCENT_START:resolution = X; JULD_DEEP_ASCENT_START:_FillValue = 999999.;	Julian day (UTC) when float begins its rise to drift pressure. Typical for profile-on-descent floats.. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_DEEP_ASCENT_S TART_STATUS	char JULD_DEEP_ASCENT_START_STATUS(N_CYCLE); JULD_DEEP_ASCENT_START_STATUS:long_name = "Status of deep ascent start date of the cycle"; JULD_DEEP_ASCENT_START_STATUS:conventions = "Argo reference table 19"; JULD_DEEP_ASCENT_START_STATUS:	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float

	_FillValue = " ";	
JULD_ASCENT_END	double JULD_ASCENT_END(N_CYCLE); JULD_ASCENT_END:long_name = "End date of ascent to the surface"; JULD_ASCENT_END:standard_name = "time"; JULD_ASCENT_END:units = "days since 1950-01-01 00:00:00 UTC"; JULD_ASCENT_END:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_ASCENT_END:resolution = X; JULD_ASCENT_END:_FillValue = 999999.;	Julian day (UTC) of the end of the ascent to the surface . Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_ASCENT_END_STATUS	char JULD_ASCENT_END_STATUS(N_CYCLE); JULD_ASCENT_END_STATUS:long_name = "Status of end date of ascent to the surface"; JULD_ASCENT_END_STATUS:conventions = "Argo reference table 19"; JULD_ASCENT_END_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_TRANSMISSION_START	double JULD_TRANSMISSION_START(N_CYCLE); JULD_TRANSMISSION_START:long_name = "Start date of transmssion"; JULD_TRANSMISSION_START:standard_name = "time"; JULD_TRANSMISSION_START:units = "days since 1950-01-01 00:00:00 UTC"; JULD_TRANSMISSION_START:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_TRANSMISSION_START:resolution = X; JULD_TRANSMISSION_START:_FillValue = 999999.;	Julian day (UTC) of the beginning of data transmission. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_TRANSMISSION_START_STATUS	char JULD_TRANSMISSION_START_STATUS(N_CYCLE); JULD_TRANSMISSION_START_STATUS:long_name = "Status of start date of transmssion"; JULD_TRANSMISSION_START_STATUS:conventions = "Argo reference table 19"; JULD_TRANSMISSION_START_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_FIRST_MESSAGE	double JULD_FIRST_MESSAGE(N_CYCLE); JULD_FIRST_MESSAGE:long_name = "Date of earliest float message received"; JULD_FIRST_MESSAGE:standard_name = "time"; JULD_FIRST_MESSAGE:units = "days since 1950-01-01 00:00:00 UTC"; JULD_FIRST_MESSAGE:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_FIRST_MESSAGE:resolution = X; JULD_FIRST_MESSAGE:_FillValue = 999999.;	Julian day (UTC) of the earliest float message received. May or may not have a position associated with it. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_FIRST_MESSAGE_STATUS	char JULD_FIRST_MESSAGE_STATUS(N_CYCLE); JULD_FIRST_MESSAGE_STATUS:long_name = "Status of date of earliest float	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float

	message received"; JULD_FIRST)MESSAGE_STATUS:conventions = "Argo reference table 19"; JULD_FIRST_MESSAGE_STATUS:_FillValue = " ";	
JULD_FIRST_LOCATION	double JULD_FIRST_LOCATION(N_CYCLE); JULD_FIRST_LOCATION:long_name = "Date of earliest location"; JULD_FIRST_LOCATION:standard_name = "time"; JULD_FIRST_LOCATION:units = "days since 1950-01-01 00:00:00 UTC"; JULD_FIRST_LOCATION:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_FIRST_LOCATION:resolution = X; JULD_FIRST_LOCATION:_FillValue = 999999.;	Julian day (UTC) of the earliest position Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_FIRST_LOCATION_STATUS	char JULD_FIRST_LOCATION_STATUS(N_CYCLE); JULD_FIRST_LOCATION_STATUS:long_name = "Status of date of earliest location"; JULD_FIRST_LOCATION_STATUS:conventions = "Argo reference table 19"; JULD_FIRST_LOCATION_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_LAST_LOCATION	double JULD_LAST_LOCATION(N_CYCLE); JULD_LAST_LOCATION:long_name = "Date of latest location"; JULD_LAST_LOCATION:standard_name = "time"; JULD_LAST_LOCATION:units = "days since 1950-01-01 00:00:00 UTC"; JULD_LAST_LOCATION:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_LAST_LOCATION:resolution = X; JULD_LAST_LOCATION:_FillValue = 999999.;	Julian day (UTC) of the latest position Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_LAST_LOCATION_STATUS	char JULD_LAST_LOCATION_STATUS(N_CYCLE); JULD_LAST_LOCATION_STATUS:long_name = "Status of date of latest location"; JULD_LAST_LOCATION_STATUS:conventions = "Argo reference table 19"; JULD_LAST_LOCATION_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
JULD_LAST_MESSAGE	double JULD_LAST_MESSAGE(N_CYCLE); JULD_LAST_MESSAGE:long_name = "Date of latest float message received"; JULD_LAST_MESSAGE:standard_name = "time"; JULD_LAST_MESSAGE:units = "days since 1950-01-01 00:00:00 UTC"; JULD_LAST_MESSAGE:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_LAST_MESSAGE:resolution = X; JULD_LAST_MESSAGE:_FillValue = 999999.;	Julian day (UTC) of the latest float message received. May or may not have a position associated with it. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_LAST_MESSAGE_STATUS	char JULD_LAST_MESSAGE_STATUS(N_CYCLE);	Status flag on JULD date and time. The flag scale is described in reference table 19. Example:

	JULD_LAST_MESSAGE_STATUS:long_name = "Status of date of latest float message received"; JULD_LAST_MESSAGE_STATUS:conventions = "Argo reference table 19"; JULD_LAST_MESSAGE_STATUS:_FillValue = " ";	'2' : Value is transmitted by the float
JULD_TRANSMISSION_END	double JULD_TRANSMISSION_END(N_CYCLE); JULD_TRANSMISSION_END:long_name = "Transmission end date"; JULD_TRANSMISSION_END:standard_name = "time"; JULD_TRANSMISSION_END:units = "days since 1950-01-01 00:00:00 UTC"; JULD_TRANSMISSION_END:conventions = "Relative julian days with decimal part (as parts of day)"; JULD_TRANSMISSION_END:resolution = X; JULD_TRANSMISSION_END:_FillValue = 999999.;	Julian day (UTC) of the end of transmission. Example : 18833.8013889885 : July 25 2001 19:14:00
JULD_TRANSMISSION_END_STATUS	char JULD_TRANSMISSION_END_STATUS(N_CYCLE); JULD_TRANSMISSION_END_STATUS:long_name = "Status of transmission end date"; JULD_TRANSMISSION_END_STATUS:conventions = "Argo reference table 19"; JULD_TRANSMISSION_END_STATUS:_FillValue = " ";	Status flag on JULD date and time. The flag scale is described in reference table 19. Example: '2' : Value is transmitted by the float
CLOCK_OFFSET	double CLOCK_OFFSET(N_CYCLE); CLOCK_OFFSET:long_name = "Time of float clock drift"; CLOCK_OFFSET:units = "days"; CLOCK_OFFSET:conventions = "Days with decimal part (as parts of day)"; CLOCK_OFFSET:_FillValue = 999999.;	Decimal part of day that float clock has drifted. Float clock drift is defined as Float time (provided by the inboard Real Time Clock (RTC) of the float) – UT time. This makes the clock drift is < 0 if float RTC is before UT time. Float clock drift can be corrected in real time or in delayed mode. Real time corrections correspond to a data mode of "A". For "A" mode files, JULD_ADJUSTED = JULD - CLOCK_OFFSET "D" mode files may have corrections for clock drift only or additional time corrections based on expert review. Example : -1.08546: the clock drift is estimated to be equal to – 1 day 2 hours 3 minutes and 4 seconds at the time of the corresponding cycle surfacing
GROUNDED	char GROUNDED(N_CYCLE); GROUNDED:long_name = "Did the profiler touch the ground for that cycle?"; GROUNDED:conventions = "Argo reference table 20"; GROUNDED:_FillValue = " ";	GROUNDED indicates the best estimate of whether the float touched the ground for that cycle. The conventions are described in Argo reference table 20. Examples : Y : yes, the float touched the ground B : yes, the float touched the ground after a bathymetry check
REPRESENTATIVE_PARK_PRESSURE	float REPRESENTATIVE_PARK_PRESSURE (N_CYCLE); REPRESENTATIVE_PARK_PRESSURE:long_name = "Best pressure value during park phase"; REPRESENTATIVE_PARK_PRESSURE:units = "<X>"; REPRESENTATIVE_PARK_PRESSURE:_FillValue = <X>;	The Representative Park Pressure (RPP) is the best pressure value assigned to the drift phase. See the REPRESENTATIVE_PARK_PRESSURE_STATUS variable to understand how this pressure was evaluated. It should match the PRES(N_MEASUREMENT) values with MC = 301. <X> : these fields are specified in the columns of the reference table 3. Example: 1025
REPRESENTATIVE_PARK_PRESSURE_STATUS	char REPRESENTATIVE_PARK_PRESSURE_STATUS (N_CYCLE); REPRESENTATIVE_PARK_PRESSURE_STATUS:long_name = "Status of best pressure value during park phase";	Status flag on the Representative Park Pressure (RPP). The flag scale is described in reference table 21. Example: '2' : mean value, directly provided by the float, of pressure measurements regularly sampled during the drift phase

	REPRESENTATIVE_PARK_PRESSURE_STATUS:conventions = "Argo reference table 21"; REPRESENTATIVE_PARK_PRESSURE_STATUS:_FillValue = " ";	
CONFIG_MISSION_NUMBER	int CONFIG_MISSION_NUMBER (N_CYCLE); CONFIG_MISSION_NUMBER:long_name = "Unique number denoting the missions performed by the float"; CONFIG_MISSION_NUMBER:conventions = "1...N, 1 : first complete mission"; CONFIG_MISSION_NUMBER:_FillValue = 99999;	Unique number of the mission to which this cycle belongs. See note on floats with multiple configurations §2.4.6.1. Example : 1
CYCLE_NUMBER_INDEX	int CYCLE_NUMBER_INDEX(N_CYCLE); CYCLE_NUMBER_INDEX:long_name = "Cycle number that corresponds to the current index"; CYCLE_NUMBER_INDEX:conventions = "0...N, 0 : launch cycle, 1 : first complete cycle"; CYCLE_NUMBER_INDEX:FillValue = 99999;	Cycle number of the float that corresponds to the information contained in the current index. This cycle number must match the profile cycle number, ensuring that the trajectory and profile with the same cycle number contain data from the same cycle. Example: 17 means information for the 17th cycle of the float is contained in this index.
CYCLE_NUMBER_INDEX_ADJUSTED	int CYCLE_NUMBER_INDEX_ADJUSTED (N_CYCLE); CYCLE_NUMBER_INDEX_ADJUSTED:long_name = "Adjusted cycle number that corresponds to the current index"; CYCLE_NUMBER_INDEX_ADJUSTED:conventions = "0...N, 0 : launch cycle, 1 : first complete cycle"; CYCLE_NUMBER_INDEX_ADJUSTED:FillValue = 99999;	Corrected cycle number of the float that corresponds to the information contained in the current index. Errors may be found in CYCLE_NUMBER_INDEX variable which are corrected and contained in this variable. Example: 17 means information for the 17th cycle of the float is contained in this index.
DATA_MODE	char DATA_MODE(N_ CYCLE); DATA_MODE:long_name = "Delayed mode or real time data"; DATA_MODE:conventions = "R : real time; D : delayed mode; A : real time with adjustment"; DATA_MODE:_FillValue = " ";	Indicates if the trajectory cycle contains real time, adjusted or delayed mode data. A delayed mode cycle means the positions, times, cycle number, pressure, temperature, and salinity (if measured) have been quality controlled. Additional parameters like oxygen may not be quality controlled. Floats often have delayed mode data only after they die, but can have both delayed mode and real time data. When this occurs, two trajectory files exist - a real time file ("R") with only real time data for all the cycles in the float record and a delayed mode file ("D") with both real time and delayed mode data for all the cycles that have been delayed mode quality controlled. Floats can be adjusted in real time with adjusted time values only in the JULD_ADJUSTED variable and its associated _STATUS and _QC variables. This occurs when floats are corrected in real time for clock drift. Examles : 'R' : real time data 'D' : delayed mode data 'A' : real time data with JULD_ADJUSTED values

2.3.7 History information

This section contains history information for each action performed on each measurement.

Each item of this section has a N_HISTORY (number of history records) dimension.

Name	Definition	Comment

HISTORY_INSTITUTION	char HISTORY_INSTITUTION (N_HISTORY, STRING4); HISTORY_INSTITUTION:long_name = "Institution which performed action"; HISTORY_INSTITUTION:conventions = "Argo reference table 4"; HISTORY_INSTITUTION:_FillValue = " ";	Institution that performed the action. Institution codes are described in reference table 4. Example : "ME" for MEDS
HISTORY_STEP	char HISTORY_STEP (N_HISTORY, STRING4); HISTORY_STEP:long_name = "Step in data processing"; HISTORY_STEP:conventions = "Argo reference table 12"; HISTORY_STEP:_FillValue = " ";	Code of the step in data processing for this history record. The step codes are described in reference table 12. Example : "ARGQ" : Automatic QC of data reported in real-time has been performed
HISTORY_SOFTWARE	char HISTORY_SOFTWARE (N_HISTORY, STRING4); HISTORY_SOFTWARE:long_name = "Name of software which performed action"; HISTORY_SOFTWARE:conventions = "Institution dependent"; HISTORY_SOFTWARE:_FillValue = " ";	Name of the software that performed the action. This code is institution dependent. Example : "OW"
HISTORY_SOFTWARE_RELEASE	char HISTORY_SOFTWARE_RELEASE (N_HISTORY, STRING4); HISTORY_SOFTWARE_RELEASE:long_name = "Version/release of software which performed action"; HISTORY_SOFTWARE_RELEASE:conventions = "Institution dependent"; HISTORY_SOFTWARE_RELEASE:_FillValue = " ";	Version of the software. This name is institution dependent. Example : "1.0"
HISTORY_REFERENCE	char HISTORY_REFERENCE (N_HISTORY, STRING64); HISTORY_REFERENCE:long_name = "Reference of database"; HISTORY_REFERENCE:conventions = "Institution dependent"; HISTORY_REFERENCE:_FillValue = " ";	Code of the reference database used for quality control in conjunction with the software. This code is institution dependent. Example : "WOD2001"
HISTORY_DATE	char HISTORY_DATE(N_HISTORY, DATE_TIME); HISTORY_DATE:long_name = "Date the history record was created"; HISTORY_DATE:conventions = "YYYYMMDDHHMISS"; HISTORY_DATE:_FillValue = " ";	Date of the action. Example : "20011217160057"
HISTORY_ACTION	char HISTORY_ACTION (N_HISTORY, STRING4); HISTORY_ACTION:long_name = "Action performed on data"; HISTORY_ACTION:conventions = "Argo reference table 7"; HISTORY_ACTION:_FillValue = " ";	Name of the action. The action codes are described in reference table 7. Example : "QCF$" for QC failed
HISTORY_PARAMETER	char HISTORY_PARAMETER(N_HISTORY, STRING16); HISTORY_PARAMETER:long_name = "Station parameter action is performed on"; HISTORY_PARAMETER:conventions = "Argo reference table 3"; HISTORY_PARAMETER:_FillValue = " ";	Name of the parameter on which the action is performed. Example : "PSAL"

HISTORY_PREVIOUS_VALUE	float HISTORY_PREVIOUS_VALUE(N_HISTORY); HISTORY_PREVIOUS_VALUE:long_name = "Parameter/Flag previous value before action"; HISTORY_PREVIOUS_VALUE:_FillValue = 99999.;	Parameter or flag of the previous value before action. Example :' 2' (probably good) for a flag that was changed to '1' (good)
HISTORY_INDEX_DIMENSION	char HISTORY_INDEX_DIMENSION(N_HISTORY); HISTORY_INDEX_DIMENSION:long_name = "Name of dimension to which HISTORY_START_INDEX and HISTORY_STOP_INDEX correspond"; HISTORY_INDEX_DIMENSION:conventions = "C: N_CYCLE, M: N_MEASUREMENT"; HISTORY_INDEX_DIMENSION:_FillValue = " ";	Name of dimension to which HISTORY_START_INDEX and HISORY_STOP_INDEX correspond. 'C': N_CYCLE 'M': N_MEASUREMENT
HISTORY_START_INDEX	int HISTORY_ START_INDEX (N_HISTORY); HISTORY_START_INDEX:long_name = "Start index action applied on"; HISTORY_START_INDEX:_FillValue = 99999;	Start index the action is applied to. This index corresponds to N_MEASUREMENT or N_CYCLE, depending on the corrected parameter Example : 100
HISTORY_STOP_INDEX	int HISTORY_ STOP_INDEX (N_HISTORY); HISTORY_STOP_INDEX:long_name = "Stop index action applied on"; HISTORY_STOP_INDEX:_FillValue = 99999;	Stop index the action is applied to. This index corresponds to N_MEASUREMENT or N_CYCLE, depending on the corrected parameter Example : 150
HISTORY_QCTEST	char HISTORY_QCTEST(N_HISTORY, STRING16); HISTORY_QCTEST:long_name = "Documentation of tests performed, tests failed (in hex form)"; HISTORY_QCTEST:conventions = "Write tests performed when ACTION=QCP$; tests failed when ACTION=QCF$"; HISTORY_QCTEST:_FillValue = " ";	This field records the tests performed when ACTION is set to QCP$ (QC performed), the test failed when ACTION is set to QCF$ (QC failed). The QCTEST codes are describe in reference table 11. Example : "0A" (in hexadecimal form)

The usage of history section is described in §5 "Using the History section of the Argo netCDF Structure".

2.4 Metadata format version 3.1

The format version 3.1 of Argo metadata will replace versions 2.2 and 2.4 gradually. During the transition period, all formats will be valid. However, when a Data Assembly Center (DAC) produces metadata files with the new 3.1 format, all its metadata files must be provided in version 3.1.

An Argo meta-data file contains information about an Argo float.

For file naming conventions, see §4.1.

2.4.1 Global attributes

The global attributes section is used for data discovery. The following global attributes should appear in the global section. The NetCDF Climate and Forecast (CF) Metadata Conventions (version 1.6, 5 December, 2011) are available from:

- http://cf-pcmdi.llnl.gov/documents/cf-conventions/1.6/cf-conventions.pdf

```
// global attributes:
        :title = "Argo float metadata file";
        :institution = "CSIRO";
        :source = "Argo float";
        :history = "2011-04-22T06:00:00Z creation";
        :references = "http://www.argodatamgt.org/Documentation";
        :comment = "free text";
        :user_manual_version = "3.2";
        :Conventions = “Argo-3.1 CF-1.6";
```

Global attribute name	Definition
title	A succinct description of what is in the dataset.
institution	Specifies where the original data was produced.
source	The method of production of the original data. If it was model-generated, source should name the model and its version, as specifically as could be useful. If it is observational, source should characterize it (e.g., "surface observation" or "radiosonde").
history	Provides an audit trail for modifications to the original data. Well-behaved generic NetCDF filters will automatically append their name and the parameters with which they were invoked to the global history attribute of an input NetCDF file. We recommend that each line begin with a timestamp indicating the date and time of day that the program was executed.
references	Published or web-based references that describe the data or methods used to produce it.
comment	Miscellaneous information about the data or methods used to produce it.
user_manual_version	The version number of the user manual
Conventions	The conventions supported by this file, blank separated

2.4.2 Dimensions and definitions

Name	Definition	Comment
DATE_TIME	DATE_TIME = 14;	This dimension is the length of an ASCII date and time value. Date_time convention is : YYYYMMDDHHMISS YYYY : year MM : month DD : day HH : hour of the day MI : minutes SS : seconds Date and time values are always in universal time

		coordinates (UTC). Examples : 20010105172834 : January 5th 2001 17:28:34 19971217000000 : December 17th 1997 00:00:00
STRING1024 STRING256 STRING128 STRING64 STRING32 STRING16 STRING8 STRING4 STRING2	STRING1024 = 1024; STRING256 = 256; STRING128 = 128; STRING64 = 64; STRING32 = 32; STRING16 = 16; STRING8 = 8; STRING4 = 4; STRING2 = 2;	String dimensions from 2 to 1024.
N_PARAM	N_PARAM = <int value>;	Number of parameters measured or calculated for a pressure sample. Examples : (pressure, temperature) : N_PARAM = 2 (pressure, temperature, salinity) : N_PARAM = 3 (pressure, temperature, conductivity, salinity) : N_PARAM = 4
N_SENSOR	N_SENSOR = <int value>;	Number of sensors mounted on the float and used to measure the parameters.
N_CONFIG_PARAM	N_CONFIG_PARAM=<int value>;	Number of configuration parameters.
N_LAUNCH_CONFIG_PARAM	N_LAUNCH_CONFIG_PARAM=<int value>;	Number of pre-deployment or launch configuration parameters.
N_MISSIONS	N_MISSIONS=<unlimited>;	Number of missions.
N_POSITIONING_SYSTEM	N_POSITIONING_SYSTEM=<int value>;	Number of positioning systems.
N_TRANS_SYSTEM	N_TRANS_SYSTEM=<int value>;	Number of transmission systems.

2.4.3 General information on the meta-data file

This section contains information about the whole file.

Name	Definition	Comment
DATA_TYPE	char DATA_TYPE(STRING16); DATA_TYPE:long_name = "Data type"; DATA_TYPE:conventions = "Argo reference table 1"; DATA_TYPE:_FillValue = " ";	This field contains the type of data contained in the file. The list of acceptable data types is in the reference table 1. Example : Argo meta-data
FORMAT_VERSION	char FORMAT_VERSION(STRING4); FORMAT_VERSION:long_name = "File format version"; FORMAT_VERSION:_FillValue = " ";	File format version. Example : «3.1»
HANDBOOK_VERSION	char HANDBOOK_VERSION(STRING4); HANDBOOK_VERSION:long_name = "Data handbook version"; HANDBOOK_VERSION:_FillValue = " ";	Version number of the data handbook. This field indicates that the data contained in this file are managed according to the policy described in the Argo data management handbook. Example : «1.0»
DATE_CREATION	char DATE_CREATION(DATE_TIME); DATE_CREATION:long_name = "Date of file creation"; DATE_CREATION:conventions = "YYYYMMDDHHMISS"; DATE_CREATION:_FillValue = " ";	Date and time (UTC) of creation of this file. Format : YYYYMMDDHHMISS Example : 20011229161700 : December 29th 2001 16:17:00
DATE_UPDATE	char DATE_UPDATE(DATE_TIME); DATE_UPDATE:long_name = "Date of update of this file"; DATE_UPDATE:conventions = "YYYYMMDDHHMISS"; DATE_UPDATE:_FillValue = " ";	Date and time (UTC) of update of this file. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 09:05:00

2.4.4 Float characteristics

This section contains the main characteristics of the float.

Name	Definition	Comment
PLATFORM_NUMBER	char PLATFORM_NUMBER(STRING8); PLATFORM_NUMBER:long_name = "Float unique identifier"; PLATFORM_NUMBER:conventions = "WMO float identifier : A9IIIII"; PLATFORM_NUMBER:_FillValue = " ";	WMO float identifier. WMO is the World Meteorological Organization. This platform number is unique. Example : 6900045
PTT	char PTT(STRING256); PTT:long_name = "Transmission identifier (ARGOS, ORBCOMM, etc.)"; PTT:_FillValue = " ";	Transmission identifier of the float. Comma separated list for multi-beacon transmission. Example : "22507": the float is equipped with one ARGOS beacon. "22598, 22768" : the float is equipped with 2 ARGOS beacons.
TRANS_SYSTEM	char TRANS_SYSTEM(N_TRANS_SYSTEM, STRING16); TRANS_SYSTEM:long_name = "Telecommunication system used"; TRANS_SYSTEM:_FillValue = " ";	Name of the telecommunication system from reference table 10. Example : ARGOS
TRANS_SYSTEM_ID	char TRANS_SYSTEM_ID(N_TRANS_SYSTEM, STRING32); TRANS_SYSTEM_ID:long_name = "Program identifier used by the transmission system"; TRANS_SYSTEM_ID:_FillValue = " ";	Program identifier of the telecommunication subscription. DACS can use N/A or alternative of their choice when not applicable (e.g. : Iridium or Orbcomm) Example: 38511 is a program number for all the beacons of an ARGOS customer.
TRANS_FREQUENCY	char TRANS_FREQUENCY(N_TRANS_SYSTEM, STRING16); TRANS_FREQUENCY:long_name = "Frequency of transmission from the float"; TRANS_FREQUENCY:units = "hertz"; TRANS_FREQUENCY:_FillValue = " ";	Frequency of transmission from the float. Unit : hertz Example : 1/44
POSITIONING_SYSTEM	char POSITIONING_SYSTEM(N_POSITIONING_SYSTEM, STRING8); POSITIONING_SYSTEM:long_name = "Positioning system"; POSITIONING_SYSTEM:_FillValue = " ";	Position system from reference table 9. ARGOS or GPS are 2 positioning systems. Example : ARGOS
PLATFORM_FAMILY	char PLATFORM_FAMILY(STRING256); PLATFORM_FAMILY:long_name = "Category of instrument"; PLATFORM_FAMILY:conventions = "Argo reference table 22"; PLATFORM_FAMILY:_FillValue = " ";	Category of instrument. See Argo reference table 22 Example: FLOAT, ICE_TETHERED_PROFILER, FLOAT_DEEP. Regular updates are made to an online version of this table available at: http://tinyurl.com/nwpqvp2
PLATFORM_TYPE	char PLATFORM_TYPE(STRING32); PLATFORM_TYPE:long_name = "Type of float"; PLATFORM_TYPE:conventions = "Argo reference table 23"; PLATFORM_TYPE:_FillValue = " ";	Type of float. See Argo reference table 23. Example: SOLO, APEX, PROVOR, ARVOR, NINJA Regular updates are made to an online version of this table available at: http://tinyurl.com/nwpqvp2
PLATFORM_MAKER	char PLATFORM_MAKER(STRING256); PLATFORM_MAKER:long_name = "Name of the manufacturer"; PLATFORM_MAKER:conventions = "Argo reference table 24"; PLATFORM_MAKER:_FillValue = " ";	Name of the manufacturer. Example: MARTEC, MRV, TWR. See Argo reference Table 24. Regular updates are made to an online version of this table available at: http://tinyurl.com/nwpqvp2
FIRMWARE_VERSION	char FIRMWARE_VERSION(STRING32); FIRMWARE_VERSION:long_name = "Firmware version for the float"; FIRMWARE_VERSION:_FillValue = " ";	The firmware version. This is specified as per the format on the manufacturer's manual. Example: 072804
MANUAL_VERSION	char MANUAL_VERSION(STRING16); MANUAL_VERSION:long_name = "Manual version for the float"; MANUAL_VERSION:_FillValue = " ";	The version date or number for the manual for each float. Example 110610 or 004

FLOAT_SERIAL_NO	char FLOAT_SERIAL_NO(STRING32); FLOAT_SERIAL_NO:long_name = "Serial number of the float"; FLOAT_SERIAL_NO:_FillValue = " ";	This field should contain only the serial number of the float. Example 1679
STANDARD_FORMAT_ID	char STANDARD_FORMAT_ID(STRING16); STANDARD_FORMAT_ID:long_name = "Standard format number to describe the data format type for each float"; STANDARD_FORMAT_ID:_FillValue = " ";	Standardised format number as described in the online reference table: http://tinyurl.com/qy7fdqc This table cross references to individual DAC format numbers. Example: 1010151
DAC_FORMAT_ID	char DAC_FORMAT_ID(STRING16); DAC_FORMAT_ID:long_name = "Format number used by the DAC to describe the data format type for each float"; DAC_FORMAT_ID:_FillValue = " ";	Format numbers used by individual DACs to describe each float type. This is cross-referenced to a standard format id as outlined in the online reference table: http://tinyurl.com/qy7fdqc Example: A9.
WMO_INST_TYPE	char WMO_INST_TYPE(STRING4); WMO_INST_TYPE:long_name = "Coded instrument type"; WMO_INST_TYPE:conventions = "Argo reference table 8"; WMO_INST_TYPE:_FillValue = " ";	Instrument type from WMO code table 1770. A subset of WMO table 1770 is documented in the reference table 8. Example : 846 : Webb Research float, Seabird sensor
PROJECT_NAME	char PROJECT_NAME(STRING64); PROJECT_NAME:long_name = "Program under which the float was deployed"; PROJECT_NAME:_FillValue = " ";	Name of the project which operates the profiling float that performed the profile. Example : GYROSCOPE (EU project for Argo program)
DATA_CENTRE	char DATA_CENTRE(STRING2); DATA_CENTRE:long_name = "Data centre in charge of float real-time processing"; DATA_CENTRE:conventions = "Argo reference table 4"; DATA_CENTRE:_FillValue = " ";	Code of the data centre in charge of the float data management. The data centre codes are described in the reference table 4. Example: ME for MEDS
PI_NAME	char PI_NAME (STRING64); PI_NAME:long_name = "Name of the principal investigator"; PI_NAME:_FillValue = " ";	Name of the principal investigator in charge of the profiling float. Example: Yves Desaubies
ANOMALY	char ANOMALY(STRING256); ANOMALY:long_name = "Describe any anomalies or problems the float may have had"; ANOMALY:_FillValue = " ";	This field describes any anomaly or problem the float may have had. Example: "the immersion drift is not stable."
BATTERY_TYPE	char BATTERY_TYPE(STRING64); BATTERY_TYPE:long_name = "Type of battery packs in the float"; BATTERY_TYPE:_FillValue = " ";	Describes the type of battery packs in the float. Example: "Alkaline", "Lithium" or "Alkaline and Lithium"
BATTERY_PACKS	char BATTERY_PACKS(STRING64); BATTERY_PACKS:long_name = "Configuration of battery packs in the float"; BATTERY_PACKS:_FillValue = " ";	Describes the configuration of battery packs in the float, number and type. Example: "4DD Li + 1C Alk"
CONTROLLER_BOARD_TYPE_PRIMARY	char CONTROLLER_BOARD_TYPE_PRIMARY(STRING32); CONTROLLER_BOARD_TYPE_PRIMARY:long_name = "Type of primary controller board"; CONTROLLER_BOARD_TYPE_PRIMARY:_FillValue = " ";	Describes the type of controller board. Example: APF8, APF9i
CONTROLLER_BOARD_TYPE_SECONDARY	char CONTROLLER_BOARD_TYPE_SECONDARY(STRING32); CONTROLLER_BOARD_TYPE_SECONDARY:long_name = "Type of secondary controller board"; CONTROLLER_BOARD_TYPE_SECONDARY:_FillValue = " ";	Only applicable if there is more than one controller board in the float. Describes the second type of controller board.
CONTROLLER_BOARD_SERIAL_NO_PRIMARY	char CONTROLLER_BOARD_SERIAL_NO_PRIMARY(STRING32); CONTROLLER_BOARD_SERIAL_NO_PRIMARY:long_name = "Serial number of the primary controller board"; CONTROLLER_BOARD_SERIAL_NO_PRIMARY:_F	The serial number for the primary controller board. Example: 4567

	illValue = " ";	
CONTROLLER_BOARD_SERIAL_NO_SECONDARY	char CONTROLLER_BOARD_SERIAL_NO_SECONDARY (STRING32); CONTROLLER_BOARD_SERIAL_NO_SECONDARY :long_name = "Serial number of the secondary controller board"; CONTROLLER_BOARD_SERIAL_NO_SECONDARY :_FillValue = " ";	Only applicable if there is more than one controller board in the float. The serial number for the secondary controller board. Example: 4571
SPECIAL_FEATURES	char SPECIAL_FEATURES(STRING1024); SPECIAL_FEATURES:long_name = "Extra features of the float (algorithms, compressee etc.)"; SPECIAL_FEATURES:_FillValue = " ";	Additional float features can be specified here such as algorithms used by the float. Example: Ice Sensing Algorithm, Interim Storage Algorithm, grounding avoidance or additional hardware such as a compressee (buoyancy compensator).
FLOAT_OWNER	char FLOAT_OWNER (STRING64); FLOAT_OWNER:long_name = "Float owner"; FLOAT_OWNER:_FillValue = " ";	The owner of the float (may be different from the data centre and operating institution). Example: Joe Blogg
OPERATING_INSTITUTION	char OPERATING_INSTITUTION(STRING64); OPERATING_INSTITUTION:long_name = "Operating institution of the float"; OPERATING_INSTITUTION:_FillValue = " ";	The operating institution of the float (may be different from the float owner and data centre). Example: ACE CRC
CUSTOMISATION	char CUSTOMISATION(STRING1024); CUSTOMISATION:long_name = "Float customisation, i.e. (institution and modifications)"; CUSTOMISATION:_FillValue = " ";	Free form field to record changes made to the float after manufacture and before deployment, i.e. this could be the customisation institution plus a list of modifications. Example: Float stability collar removed for deployment in ice.

2.4.5 Float deployment and mission information

Name	Definition	Comment
LAUNCH_DATE	char LAUNCH_DATE(DATE_TIME); LAUNCH_DATE:long_name = "Date (UTC) of the deployment"; LAUNCH_DATE:conventions = "YYYYMMDDHHMISS"; LAUNCH_DATE:_FillValue = " ";	Date and time (UTC) of launch of the float. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 03:05:00
LAUNCH_LATITUDE	double LAUNCH_LATITUDE; LAUNCH_LATITUDE:long_name = "Latitude of the float when deployed"; LAUNCH_LATITUDE:units = "degree_north"; LAUNCH_LATITUDE:_FillValue = 99999.; LAUNCH_LATITUDE:valid_min = -90.; LAUNCH_LATITUDE:valid_max = 90.;	Latitude of the launch. Unit : degree north. Example : 44.4991 : 44° 29' 56.76" N
LAUNCH_LONGITUDE	double LAUNCH_LONGITUDE; LAUNCH_LONGITUDE:long_name = "Longitude of the float when deployed"; LAUNCH_LONGITUDE:units = "degree_east"; LAUNCH_LONGITUDE:_FillValue = 99999.; LAUNCH_LONGITUDE:valid_min = -180.; LAUNCH_LONGITUDE:valid_max = 180.;	Longitude of the launch. Unit : degree east. Example : 16.7222 : 16° 43' 19.92" E
LAUNCH_QC	char LAUNCH_QC; LAUNCH_QC:long_name = "Quality on launch date, time and location"; LAUNCH_QC:conventions = "Argo reference table 2"; LAUNCH_QC:_FillValue = " ";	Quality flag on launch date, time and location. The flag scale is described in the reference table 2. Example :

		'1' : launch location seems correct.
START_DATE	char START_DATE(DATE_TIME); START_DATE:long_name = "Date (UTC) of the first descent of the float"; START_DATE:conventions = "YYYYMMDDHHMISS"; START_DATE:_FillValue = " ";	Date and time (UTC) of the first descent of the float. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 06 :05 :00
START_DATE_QC	char START_DATE_QC; START_DATE_QC:long_name = "Quality on start date"; START_DATE_QC:conventions = "Argo reference table 2"; START_DATE_QC:_FillValue = " ";	Quality flag on start date. The flag scale is described in the reference table 2. Example : '1' : start date seems correct.
STARTUP_DATE	char STARTUP_DATE(DATE_TIME); STARTUP_DATE:long_name = "Date (UTC) of the activation of the float"; STARTUP_DATE:conventions = "YYYYMMDDHHMISS"; STARTUP_DATE:_FillValue = " ";	Date and time (UTC) of the activation of the float before or just after deployment. This may include automatic startup during pressure activation. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 06 :05 :00
STARTUP_DATE_QC	char STARTUP_DATE_QC; STARTUP_DATE_QC:long_name = "Quality on startup date"; STARTUP_DATE_QC:conventions = "Argo reference table 2"; STARTUP_DATE_QC:_FillValue = " ";	Quality flag on startup date. The flag scale is described in the reference table 2. Example : '1' : start date seems correct.
DEPLOYMENT_PLATFORM	char DEPLOYMENT_PLATFORM(STRING32); DEPLOYMENT_PLATFORM:long_name = "Identifier of the deployment platform"; DEPLOYMENT_PLATFORM:_FillValue = " ";	Identifier of the deployment platform, i.e. vessel or ship name. Example : L'ATALANTE
DEPLOYMENT_CRUISE_ID	char DEPLOYMENT_CRUISE_ID(STRING32); DEPLOYMENT_CRUISE_ID:long_name = "Identification number or reference number of the cruise used to deploy the float"; DEPLOYMENT_CRUISE_ID:_FillValue = " ";	Identification number or reference number of the cruise used to deploy the platform. Example : POMME2
DEPLOYMENT_REFERENCE_STATION_ID	char DEPLOYMENT_REFERENCE_STATION_ID(STRING256); DEPLOYMENT_REFERENCE_STATION_ID:long_name = "Identifier or reference number of co-located stations used to verify the first profile"; DEPLOYMENT_REFERENCE_STATION_ID:_FillValue = " ";	Identifier or reference number of co-located CTD or XBT stations used to verify the first profile. Example : 58776, 58777
END_MISSION_DATE	char END_MISSION_DATE(DATE_TIME); END_MISSION_DATE:long_name = "Date (UTC) of the end of mission of the float"; END_MISSION_DATE:conventions = "YYYYMMDDHHMISS"; END_MISSION_DATE:_FillValue = " ";	Date (UTC) of the end of mission of the float. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 03:05:00
END_MISSION_STATUS	char END_MISSION_STATUS; END_MISSION_STATUS:long_name = "Status of the end of mission of the float"; END_MISSION_STATUS:conventions = "T:No more transmission received, R:Retrieved"; END_MISSION_STATUS:_FillValue = " ";	Status of the end of mission of the float. 'T':No more transmission received, 'R':Retrieved

2.4.6 Configuration parameters

This section describes the configuration parameters for a float. It is important to note that configuration parameters are float settings, not measurements reported by the float.

Configuration parameters may or may not be reported by a float.

Configuration parameter names are identified by the “CONFIG” prefix.

For each configuration parameter, the name of the parameter and the value of the parameter are recorded.

Name	Definition	Comment
LAUNCH_CONFIG_PARAMETER_NAME	char LAUNCH_CONFIG_PARAMETER_NAME(N_LAUNCH_CONFIG_PARAM, STRING128) LAUNCH_CONFIG_PARAMETER_NAME:long_name = ”Name of configuration parameter at launch”; LAUNCH_CONFIG_PARAMETER_NAME:_FillValue = " ";	Name of the configuration parameter; pre-deployment or launch settings. See reference tables 18a and 18b for standard configuraton parameter names. Example : “CONFIG_ParkPressure_dbar”
LAUNCH_CONFIG_PARAMETER_VALUE	float (for standard Argo floats) or can use double if applicable (e.g. Bio Argo float) LAUNCH_CONFIG_PARAMETER_VALUE(N_LAUNCH_CONFIG_PARAM) LAUNCH_CONFIG_ PARAMETER_VALUE:long_name = ”Value of configuration parameter at launch”; LAUNCH_CONFIG_ PARAMETER_VALUE:_FillValue = 99999.f;	Value of the configuration parameter; either pre-deployment or launch settings. Example : 1500
CONFIG_PARAMETER_NAME	char CONFIG_PARAMETER_NAME(N_CONFIG_PARAM, STRING128) CONFIG_PARAMETER_NAME:long_name = ”Name of configuration parameter”; CONFIG_PARAMETER_NAME:_FillValue = " ";	Name of the configuration parameter; mission settings. See reference tables 18a and 18b for standard configuraton parameter names. Example : “CONFIG_ParkPressure_dbar”
CONFIG_PARAMETER_VALUE	float (for standard Argo floats) or can use double if applicable (e.g. Bio Argo float) CONFIG_PARAMETER_VALUE(N_MISSIONS, N_CONFIG_PARAM) CONFIG_ PARAMETER_VALUE:long_name = ”Value of configuration parameter”; CONFIG_ PARAMETER_VALUE:_FillValue = 99999.f;	Value of the configuration parameter; mission settings. Example : 1500
CONFIG_MISSION_NUMBER	int CONFIG_MISSION_NUMBER(N_MISSIONS); CONFIG_MISSION_NUMBER:long_name = "Unique number denoting the missions performed by the float"; CONFIG_MISSION_NUMBER:conventions = "1...N, 1 : first complete mission"; CONFIG_MISSION_NUMBER:_FillValue = 99999;	Unique number of the mission to which this parameter belongs. See note on floats with multiple configurations §2.4.6.1. Example : 1
CONFIG_MISSION_COMMENT	char CONFIG_MISSION_COMMENT(N_MISSIONS, STRING256) CONFIG_MISSION_COMMENT:long_name = ”Comment on configuration”; CONFIG_MISSION_COMMENT:_FillValue = " ";	Comment on this configuration mission. Example : “This mission follows a 1000 dbar meddie during parking”

The mission settings or parameter values are recorded as numbers. In this scheme, strings will need to be converted to numbers and will require measurement codes for the relevant parameters. The numeric codes for the affected parameters are defined in the “Explanation” section of the Configuration parameter names table (please see reference tables 18a and 18b). Only a few existing parameters are affected. If new floats with new configuration parameters (as strings) are introduced, then equivalent numeric flags must also be added to the table by the proposer of the new configuration parameter.

All parameter names are standardized and are available in the online reference tables18a and 18b: http://www.argodatamgt.org/Documentation

There are two configuration tables; one for Core Argo configuration parameters (reference table 18a) and one for floats with Bio Argo sensors (reference table 18b). If you are a new user or have only standard Argo floats you should first check table 18a which has the basic set of configuration parameters that caters for most of the standard float types. If your float carries additional Bio Argo

sensors you will also need to refer to table 18b. Please send requests for new configuration parameter names for Core Argo floats to: Esmee.vanWijk@csiro.au. Requests for configuration parameter names for Bio Argo variables should be sent to Catherine Schmechtig: smechtig@obs-vlfr.fr

The mission is used to record information that changes from cycle to cycle, for instance when a float changes its mission from 3 shallow profiles to 1 deep profile. The shallow and deep profiles will have different mission numbers. The value of the mission number is recorded in CONFIG_MISSION_NUMBER.

Configuration parameters are separated into two types.

1). Pre-deployment or launch configuration parameters that are the 'configured' start settings of the float and the initial mission configuration parameters for the first cycle. These parameters dimensioned by N_LAUNCH_CONFIG_PARAM, are stored in LAUNCH_CONFIG_PARAMETER_NAME and LAUNCH_CONFIG_PARAMETER_VALUE.

2). Configuration parameters that define float behavior for each mission, including all applicable mandatory and highly-desirable parameters and any other parameters that change during the life of the float are reported as mission settings. These parameters, dimensioned by N_CONFIG_PARAM, need to be reported in the CONFIG_PARAMETER_NAME and CONFIG_PARAMETER_VALUE variables. The mission parameters for the first cycle must also be reported in the launch section.

The parameter CONFIG_MISSION _COMMENT can be used to store information about the mission or whether the mission was set pre-deployment or transmitted by the float (free form field).

2.4.6.1 Note on floats with multiple configurations

Typically, an Argo float configuration is valid for the whole life of the float. Each cycle is repeated with the same behaviour (one configuration).

However, some floats may be configured to change their behaviour from cycle to cycle (multiple configurations).

When there is only one configuration, CONFIG_MISSION_NUMBER is set to 1: all the cycles are programmed to be the same. Note that in this case; floats will still have a set of pre-deployment/launch configuration information that contains all the start settings for the float. So for a float with one basic mission, it will have launch configuration parameters and mission 1 configuration parameters (typically just the mission critical subset).

When there are multiple configurations, the configuration from the first cycle has CONFIG_MISSION_NUMBER set to 1. Each subsequent configuration change will be recorded as additional entries in CONFIG_MISSION_NUMBER, with the value increased sequentially by the integer one. All variables from mission 1 must be repeated in subsequent missions. Floats with multiple configurations still record pre-deployment or launch information in: LAUNCH_CONFIG_PARAMETER_NAME and LAUNCH_CONFIG_PARAMETER_VALUE.

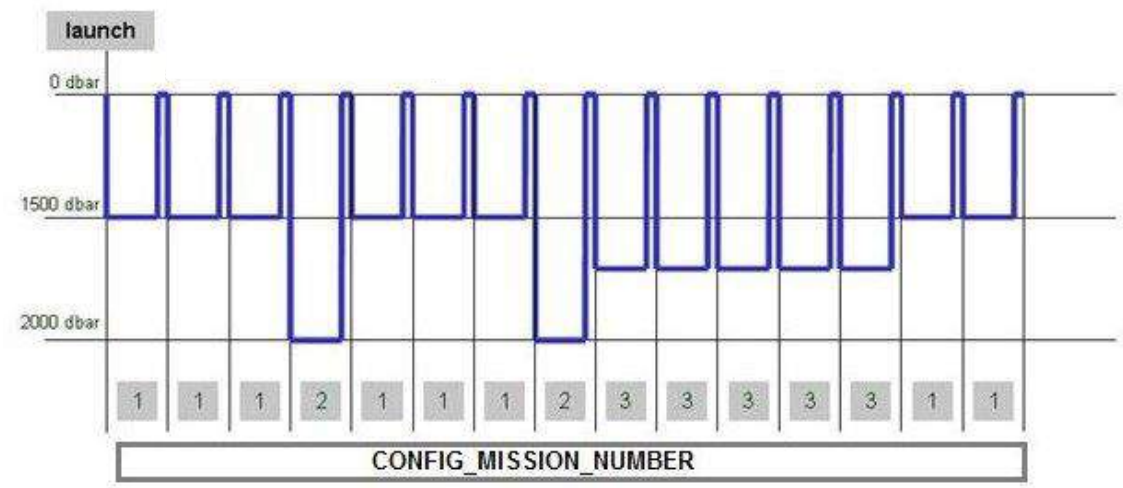
Argo best practice, and our recommendation to users, is a minimum of configuration missions. If there is a change to one or more of the configuration parameters that does not repeat a previous configuration then a new mission number must be used. If the configuration parameters change, but mirror a previous mission then that mission number should be re-used.In extremely complex cases where mission changes are unclear, then a new mission number can be used for each cycle. Users should be aware that the metafile will need to be rewritten each time a new mission number is added.

Some floats conduct a pressure-activated test mission after deployment (i.e. some SOLO floats) where they essentially 'wake-up' at depth and return to the surface. This is not a normal mission in any way, and the floats do not use their configuration parameters in this first 'test' cycle. In this case you would assign a fill value to CONFIG_MISSION_NUMBER.

2.4.6.2 Determining which mission applies to a particular float cycle

Users are able to determine which mission applies to each cycle by looking at the CONFIG_MISSION_NUMBER(N_CYCLE) variable in the trajectory files, and the CONFIG_MISSION_NUMBER(N_PROF) variable in the profile files.
See section "§2.2.4 General information for each profile" and "§2.3.6 N_CYCLE dimension variable group").

Example



In the above example, there are 3 different float behaviours to record, (with park depth varying between 1500, 2000 and 1700 db). Each of these new behaviours requires a new mission number. This is in addition to the pre-deployment or launch information:

CONFIG_PARAMETER_NAME = "CONFIG_ParkPressure_dbar"
CONFIG_PARAMETER_VALUE = "1500"
CONFIG_MISSION_NUMBER = 1

CONFIG_PARAMETER_NAME = "CONFIG_ParkPressure_dbar"
CONFIG_PARAMETER_VALUE = "2000"
CONFIG_MISSION_NUMBER = 2

CONFIG_PARAMETER_NAME = "CONFIG _ParkPressure_dbar"
CONFIG_PARAMETER_VALUE = "1700"
CONFIG_MISSION_NUMBER = 3

A further example for a float with multiple missions is shown below.

In this example there are 11 pre-deployment/launch configuration parameters for this float which are set before launch. Of this set, the last four are mission critical parameters that change and control float behavior; these are reported in subsequent missions (missions 1 to n). For this float, the depth at which the float parks, changes in missions 2 and 3 (with changes in two configuration parameters). For mission 4, the park depth stays the same as for mission 3 but now the park sampling period has

changed. For mission 5, the park sampling period changes again. All configuration parameters from mission 1 must still be reported for each subsequent mission, even those that do not change.

Configuration parameter names from reference table 18a or 18b LAUNCH_CONFIG_PARAMETER_NAME(N_LAUNCH_CONFIG_PARAM,STRING128) * N_LAUNCH_CONFIG_PARAM = int value	Pre-deployment or launch configuration settings LAUNCH_CONFIG_PARAMETER_VALUE(N_LAUNCH_CONFIG_PARAM) * float or double depending on data type
CONFIG_PistonPositionPressureActivation_COUNT	100
CONFIG_Direction_NUMBER	1*
CONFIG_AscentToSurfaceTimeout_hours	3
CONFIG_MissionPreludeTime_hours	3
CONFIG_MeasureBattery_LOGICAL	0**
CONFIG_IceDetection_DegC	-1.78
CONFIG_CycleTime_hours	240
CONFIG_ParkPressure_dbar	1000
CONFIG_ProfilePressure_dbar	2000
CONFIG_ParkSamplingPeriod_hours	10
CONFIG_PistonPark_COUNT	111
…	…

(*): 1 = Ascending, 2 = Descending
(**): 0 = No, 1 = Yes

Configuration parameter names (from reference table 18a or 18b) CONFIG_PARAMETER_NAME(N_CONFIG_PARAM,STRING128)	Mission configuration settings at sea CONFIG_PARAMETER_VALUE(N_MISSIONS,N_CONFIG_PARAM)					
CONFIG_MISSION_NUMBER	1	2	3	4	5	…
CONFIG_ParkPressure_dbar	1000	1500	1700	1700	1000	…
CONFIG_ProfilePressure_dbar	2000	2000	2000	2000	2000	…
CONFIG_ParkSamplingPeriod_hours	10	10	10	15	17	…
CONFIG_PistonPark_COUNT	111	75	53	53	45	…
…	…	…	…	…	…	…

2.4.7 Float sensor and parameter information

A **sensor** is a device used to measure a physical parameter. Sensor outputs are provided in parameter counts and need to be converted in parameter physical units using a calibration equation. This conversion can be done onboard the float or during the decoding process.

A **parameter** is a measurement of a physical phenomenon; it can be provided by a sensor (in sensor counts or in physical units) or computed (derived) from other parameters.

A sensor can measure 1 to N parameter(s). A parameter can be measured by 1 or N sensor(s).

2.4.7.1 Float sensor information

This section contains information about the sensors of the profiler.

A list of standardised Argo sensor names is given in reference table 25.

Each ocean state variable to be recorded in an Argo profile or trajectory file, must be considered its own sensor in this context. This is necessary to record the sensors serial numbers, etc. Thus a CTD which records PRES, TEMP, and PSAL should be considered 3 separate sensors (CTD_PRES, CTD_TEMP, CTD_CNDC respectively), as all 3 parameters are reported in the Argo profile and trajectory files. In comparison, an OPTODE only has DOXY reported in Argo netcdf files, thus it should be considered a single sensor (OXYGEN_OPTODE or OXYGEN_ELECTROCHEMICAL) even though the sensor also reports TEMP_DOXY. All intermediate variables, that do not appear in the core Argo files, even though they may appear in the 'raw' form (i.e. in the Bio Argo B-file), do not have to be listed as a separate sensor. This is especially true if there is not a unique serial number for the sensor.

Name	Definition	Comment
SENSOR	char SENSOR(N_SENSOR, STRING32); SENSOR:long_name = "Name of the sensor mounted on the float"; SENSOR:conventions = "Argo reference table 25"; SENSOR:_FillValue = " ";	Names of the sensors mounted on the float Example: CTD_PRES, CTD_TEMP, CTD_CNDC, OXYGEN_OPTODE. See Argo reference table 25. Regular updates are made to an online version of this table available at: http://tinyurl.com/nwpqvp2
SENSOR_MAKER	char SENSOR_MAKER(N_SENSOR, STRING256); SENSOR_MAKER:long_name = "Name of the sensor manufacturer"; SENSOR_MAKER:conventions = "Argo reference table 26"; SENSOR_MAKER:_FillValue = " ";	Name of the manufacturer of the sensor. Example : DRUCK, SBE, AANDERAA. See Argo reference table 26. Regular updates are made to an online version of this table available at: http://tinyurl.com/nwpqvp2
SENSOR_MODEL	char SENSOR_MODEL(N_SENSOR, STRING256); SENSOR_MODEL:long_name = "Type of sensor"; SENSOR_MODEL:conventions = "Argo reference table 27"; SENSOR_MODEL:_FillValue = " ";	Model of sensor. Example: DRUCK, SBE41CP, AANDERAA_OPTODE_3930. This field is now standardised. See Argo reference table 27. Regular updates are made to an online version of this table available at: http://tinyurl.com/nwpqvp2
SENSOR_SERIAL_NO	char SENSOR_SERIAL_NO(N_SENSOR, STRING16); SENSOR_SERIAL_NO:long_name = "Serial number of the sensor"; SENSOR_SERIAL_NO:_FillValue = " ";	Serial number of the sensor. Example : 2646 036 073

2.4.7.2 Float parameter information

This section contains information about the parameters measured by the profiler or derived from profiler measurements.

Name	Definition	Comment
PARAMETER	char PARAMETER(N_PARAM, STRING64); PARAMETER:long_name = "Name of parameter computed from float measurements"; PARAMETER:conventions = "Argo reference table 3"; PARAMETER:_FillValue = " ";	Names of the parameters measured by float sensors or derived from float measurements. The parameter names are listed in reference table 3. Examples : TEMP, PSAL, CNDC TEMP : temperature in Celsius PSAL : practical salinity in psu CNDC : conductvity in mhos/m
PARAMETER_SENSOR	char PARAMETER_SENSOR(N_PARAM, STRING128); PARAMETER:long_name = "Name of the sensor that measures this parameter"; PARAMETER:conventions = "Argo reference table 25"; PARAMETER:_FillValue = " ";	Names of the sensors that measured the float parameters. See Argo reference table 25. Example: CTD_PRES, CTD_TEMP, CTD_CNDC, OXYGEN_OPTODE.

PARAMETER_UNITS	char PARAMETER_UNITS(N_PARAM, STRING32); PARAMETER_UNITS:long_name = "Units of accuracy and resolution of the parameter"; PARAMETER_UNITS:_FillValue = " ";	Units of accuracy and resolution of the parameter. Example : psu
PARAMETER_ACCURACY	char PARAMETERACCURACY(N_PARAM, STRING32); PARAMETER_ACCURACY:long_name = "Accuracy of the parameter"; PARAMETER_ACCURACY:_FillValue = " ";	Accuracy of the parameter. Example: "8 micromole/l or 5%"
PARAMETER_RESOLUTION	char PARAMETER_RESOLUTION(N_PARAM, STRING32); PARAMETER_RESOLUTION:long_name = "Resolution of the parameter"; PARAMETER_RESOLUTION:_FillValue =" ";	Resolution of the parameter returned by the sensor (note that this is not necessarily equivalent to the resolution of the parameter returned by the float through telemetry). Example : 0.001 micromole/l

2.4.8 Float calibration information

This section contains information about the calibration of the profiler. The calibration described in this section is an instrumental calibration. The delayed mode calibration, based on a data analysis is described in the profile format.

The PREDEPLOYMENT_CALIB_* parameters in the table below link to the PARAMETER variable listed in 1.1.7.2. It is critical that these are ordered in the same way so that calibration information is assigned to the correct parameter.

Name	Definition	Comment
PREDEPLOYMENT_CALIB _EQUATION	char PREDEPLOYMENT_CALIB_EQUATION(N_PARAM, STRING1024); PREDEPLOYMENT_CALIB_EQUATION:long_name = "Calibration equation for this parameter"; PREDEPLOYMENT_CALIB_EQUATION:_FillValue = " ";	Calibration equation for this parameter. Example : Tc = a1 * T + a0
PREDEPLOYMENT_CALIB_COEFFICIENT	char PREDEPLOYMENT_CALIB_COEFFICIENT(N_PARAM, STRING1024); PREDEPLOYMENT_CALIB_COEFFICIENT:long_name = "Calibration coefficients for this equation"; PREDEPLOYMENT_CALIB_COEFFICIENT:_FillValue = " ";	Calibration coefficients for this equation. Example : a1=0.99997 , a0=0.0021
PREDEPLOYMENT_CALIB_COMMENT	char PREDEPLOYMENT_CALIB_COMMENT(N_PARAM, STRING1024); PREDEPLOYMENT_CALIB_COMMENT:long_name = "Comment applying to this parameter calibration"; PREDEPLOYMENT_CALIB_COMMENT:_FillValue = " ";	Comments applying to this parameter calibration. Example : The sensor is not stable

2.4.9 Mandatory meta-data parameters

Mandatory (formerly known as highly desirable) meta-data parameters should be correctly filled according to the following table.

Mandatory meta-data	Mandatory format	Example
BATTERY_TYPE	not empty	BATTERY_TYPE = “Alkaline” or “Lithium” or “Alkaline and Lithium”;
CONTROLLER_BOARD_SERIAL_NO_PRIMARY	not empty	CONTROLLER_BOARD_SERIAL_NO_PRIMARY = “4567”
CONTROLLER_BOARD_TYPE_PRIMARY	not empty	CONTROLLER_BOARD_TYPE_PRIMARY = “APF9”;
DAC_FORMAT_ID	not empty	DAC_FORMAT_ID = "11”;
DATA_CENTRE	see reference table 4	DATA_CENTRE = "AO”;
DATA_TYPE	"Argo meta-data";	DATA_TYPE = "Argo meta-data";
DATE_CREATION	YYYYMMDDHHMISS	DATE_CREATION = "20040210124422";
DATE_UPDATE	YYYYMMDDHHMISS	DATE_UPDATE = "20040210124422";
FIRMWARE_VERSION	if exists then not empty otherwise default value = "n/a"	FIRMWARE_ VERSION = “042606”;
FLOAT_SERIAL_NO	not empty	FLOAT_SERIAL_NO = “1679”
FORMAT_VERSION	"2.2";	FORMAT_VERSION = "2.2";
HANDBOOK_VERSION	"1.2";	HANDBOOK_VERSION = "1.2";
LAUNCH_DATE	YYYYMMDDHHMISS	LAUNCH_DATE = "20010717000100";
LAUNCH_LATITUDE	not empty, -90 <= real <= 90	LAUNCH_LATITUDE = -7.91400003433228;
LAUNCH_LONGITUDE	not empty, -180 <= real <= 180	LAUNCH_LONGITUDE = -179.828338623047;
LAUNCH_QC	see reference table 2	LAUNCH_QC = "1";
MANUAL_ VERSION	if exists then not empty otherwise default value = "n/a"	MANUAL_ VERSION = “004” or “041708”
PARAMETER	see reference table 3	PARAMETER ="PRES","TEMP","PSAL";
PI_NAME	not empty	PI_NAME = “Susan Wijffels”;
PLATFORM_FAMILY	see reference table 22	PLATFORM_FAMILY = “subsurface profiling float”, “ITP”, “POPS”;
PLATFORM_MAKER	see reference table 24	PLATFORM_MAKER = “Optimare”;
PLATFORM_NUMBER	IIIII or A9IIIII	PLATFORM_NUMBER = "5900077";
PLATFORM_TYPE	see reference table 23	PLATFORM_TYPE = “SOLO” or “APEX” or “PROVOR”;
POSITIONING_SYSTEM	see reference table 9	POSITIONING_SYSTEM = "ARGOS";
PREDEPLOYMENT_CALIB_COEFFICIENT	if exists then not empty otherwise default value = "n/a"	PREDEPLOYMENT_CALIB_COEFFICIENT = “ser# = 3016 temperature coeffs: A0 = -0.0000 A1 = 0.0003 A2 = -0.0000 A3 = 0.0000”;
PREDEPLOYMENT_CALIB_EQUATION	if exists then not empty otherwise default value = "n/a"	PREDEPLOYMENT_CALIB_EQUATION = “Temperature ITS-90 = 1/ { a0 + a1[lambda nu (n)] + a2 [lambda nu^2 (n)] + a3 [lambda nu^3 (n)]} - 273.15 (deg C)”;
PTT	if exists then not empty otherwise default value = "n/a"	PTT = "23978";
SENSOR	see reference table 25	SENSOR = “CTD_TEMP”, “CTD_PRES”, “CTD_CNDC”, “OXYGEN_OPTODE”;
SENSOR_MAKER	see reference table 26	SENSOR_MAKER = “SEABIRD”;
SENSOR_MODEL	see reference table 27	SENSOR_MODEL = “SBE41”
SENSOR_SERIAL_NO	not empty	SENSOR_SERIAL_NO = “6785”;
PARAMETER	not empty	PARAMETER = “TEMP”, “PRES”, ”CNDC”;
PARAMETER_UNITS	not empty	PARAMETER _UNITS = “degree_Celsius”, “decibar”, “mhos/m”;
PARAMETER_SENSOR	not empty	PARAMETER_SENSOR = “CTD_TEMP”, “OXYGEN_OPTODE”;
STANDARD_FORMAT_ID	reference table available online http://tinyurl.com/qy7fdqc	STANDARD_FORMAT_ID = “1010151”;

TRANS_FREQUENCY	if exists then not empty otherwise default value = "n/a"	TRANS_FREQUENCY = “1/44”;
TRANS_SYSTEM	see reference table 10	TRANS_SYSTEM = "ARGOS";
TRANS_SYSTEM_ID	If exists not empty, otherwise = “n/a”	TRANS_SYSTEM_ID = "14281";
WMO_INST_TYPE	not empty	WMO_INST_TYPE = “846”;

2.4.10 Highly desirable metadata parameters

Highly desirable metadata parameters should be correctly filled according to the following table.

Highly desirable meta-data	Format	Example
BATTERY_PACKS	Please populate this field with the number and configuration of the cell types. Please use standard abbreviations, i.e. Li for Lithium and Alk for Alkaline (See example). If unknown, fill with FillValue = " ";	BATTERY_PACKS = “4DD Li + 1C Alk”;

2.5 Technical information format version 3.1

The format version 3.1 of Argo technical data will replace versions 2.3 and 2.2 gradually. During the transition period, both formats will be valid. However, when a Data Assembly Center (DAC) produces technical files with the new 3.1 format, all its technical files must be provided in version 3.1.

An Argo technical file contains technical information from an Argo float. This information is registered for each cycle performed by the float.

The number and the type of technical information is different from one float model to an other. To be flexible, for each cycle, the name of the parameters and their values are recorded. The name of the parameters recorded may therefore change from one model of float to another. See Argo reference table 14.

For file naming conventions, see §4.1.6.

2.5.1 Global attributes

The global attributes section is used for data discovery. The following global attributes should appear in the global section. The NetCDF Climate and Forecast (CF) Metadata Conventions (version 1.6, 5 December, 2011) are available from:

- http://cf-pcmdi.llnl.gov/documents/cf-conventions/1.6/cf-conventions.pdf

```
// global attributes:
        :title = "Argo float technical data file";
        :institution = "CSIRO";
        :source = "Argo float";
        :history = "2011-04-22T06:00:00Z creation";
        :references = "http://www.argodatamgt.org/Documentation";
        :comment = "free text";
        :user_manual_version = "3.2";
        :Conventions = “Argo-3.1 CF-1.6";
```

Global attribute name	Definition
title	A succinct description of what is in the dataset.
institution	Specifies where the original data was produced.
source	The method of production of the original data. If it was model-generated, source should name the model and its version, as specifically as could be useful. If it is observational, source should characterize it (e.g., "surface observation" or "radiosonde").
history	Provides an audit trail for modifications to the original data. Well-behaved generic NetCDF filters will automatically append their name and the parameters with which they were invoked to the global history attribute of an input NetCDF file. We recommend that each line begin with a timestamp indicating the date and time of day that the program was executed.
references	Published or web-based references that describe the data or methods used to produce it.
comment	Miscellaneous information about the data or methods used to produce it.
user_manual_version	The version number of the user manual
Conventions	The conventions supported by this file, blank separated

2.5.2 Dimensions and definitions

Name	Definition	Comment
DATE_TIME	DATE_TIME = 14;	This dimension is the length of an ASCII date and time value. Date and time values are always in universal time coordinates (UTC). Date_time convention is : YYYYMMDDHHMISS YYYY : year MM : month DD : day HH : hour of the day MI : minutes SS : seconds Examples : 20010105172834 : January 5th 2001 17:28:34 19971217000000 : December 17th 1997 00:00:00
STRING128, STRING32 STRING8 STRING4 STRING2	STRING128 = 128; STRING32 = 32; STRING8 = 8; STRING4 = 4; STRING2 = 2;	String dimensions from 2 to 128.
N_TECH_PARAM	N_TECH_PARAM = UNLIMITED;	Number of technical parameters.

2.5.3 General information on the technical data file

This section contains information about the technical data file itself.

Name	Definition	Comment
PLATFORM_NUMBER	char PLATFORM_NUMBER(STRING8); PLATFORM_NUMBER:long_name = "Float unique identifier"; PLATFORM_NUMBER:conventions = "WMO float identifier : A9IIIII"; PLATFORM_NUMBER:_FillValue = " ";	WMO float identifier. WMO is the World Meteorological Organization. This platform number is unique. Example : 6900045
DATA_TYPE	char DATA_TYPE(STRING32); DATA_TYPE:long_name = "Data type"; DATA_TYPE:conventions = "Argo reference table 1"; DATA_TYPE:_FillValue = " ";	This field contains the type of data contained in the file. The list of acceptable data types is in the reference table 1. Example : "Argo technical data"
FORMAT_VERSION	char FORMAT_VERSION(STRING4); FORMAT_VERSION:long_name = "File format version"; FORMAT_VERSION:_FillValue = " ";	File format version Example : «3.1»
HANDBOOK_VERSION	char HANDBOOK_VERSION(STRING4); HANDBOOK_VERSION:long_name = "Data handbook version"; HANDBOOK_VERSION:_FillValue = " ";	Version number of the data handbook. This field indicates that the data contained in this file are managed according to the policy described in the Argo data management handbook. Example : «1.0»
DATA_CENTRE	char DATA_CENTRE(STRING2); DATA_CENTRE:long_name = "Data centre in charge of float data processing"; DATA_CENTRE:conventions = "Argo reference table 4"; DATA_CENTRE:_FillValue = " ";	Code of the data centre in charge of the float data management. The data centre codes are described in the reference table 4. Example : ME for MEDS
DATE_CREATION	char DATE_CREATION(DATE_TIME); DATE_CREATION:long_name = "Date of file creation"; DATE_CREATION:conventions = "YYYYMMDDHHMISS";	Date and time (UTC) of creation of this file. Format : YYYYMMDDHHMISS Example : 20011229161700 : December 29th 2001 16 :17 :00

	DATE_CREATION:_FillValue = " ";	
DATE_UPDATE	char DATE_UPDATE(DATE_TIME); DATE_UPDATE:long_name = "Date of update of this file"; DATE_UPDATE:conventions = "YYYYMMDDHHMISS"; DATE_UPDATE:_FillValue = " ";	Date and time (UTC) of update of this file. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 09 :05 :00

2.5.4 Technical data

This section contains a set of technical data for each profile.

For each cycle, for each technical parameter, the name of the parameter and the value of the parameter are recorded.

The parameter name and its value are recorded as strings of 128 characters.

All parameter names are standardized and available in reference table 14.

Name	Definition	Comment
TECHNICAL_PARAMETER_NAME	char TECHNICAL_PARAMETER_NAME(N_TECH_PARAM, STRING128) TECHNICAL_PARAMETER_NAME:long_name="Name of technical parameter"; TECHNICAL_PARAMETER_NAME:_FillValue = " ";	Name of the technical parameter. Example : "CLOCK_FloatTime_HHMMSS" See reference table 14a for standard technical parameter names.
TECHNICAL_PARAMETER_VALUE	char TECHNICAL_PARAMETER_VALUE(N_TECH_PARAM, STRING128) TECHNICAL_PARAMETER_VALUE:long_name="Value of technical parameter"; TECHNICAL_PARAMETER_VALUE:_FillValue = " ";	Value of the technical parameter. Example : "125049"
CYCLE_NUMBER	int CYCLE_NUMBER(N_TECH_PARAM); CYCLE_NUMBER:long_name = "Float cycle number"; CYCLE_NUMBER:conventions = "0...N, 0 : launch cycle (if exists), 1 : first complete cycle"; CYCLE_NUMBER:_FillValue = 99999;	Cycle number of the technical parameter. Example : 157

2.6 B-Argo profile and trajectory format additional features

A B-Argo profile/trajectory file contains all the parameters from a float, except the core-Argo parameters temperature, salinity, conductivity (TEMP, PSAL, CNDC). A float that performs only CTD measurements does not have B-Argo data files.

To accommodate non-core parameters, a series of optional addition to core-Argo profile/trajectory formats are listed here.

2.6.1 Pressure axis management in core-Argo and b-Argo profile files

2.6.1.1 Pressure axis management in core-Argo and b-Argo profile files

The vertical pressure levels PRES is the simple and unambiguous link between the parameters in the core- and b- profiles. The same PRES is recorded in the core-Argo and b-Argo profile files.

PRES is the only parameter in Reference Table 3 duplicated in core-Argo and b-Argo profile files.

The adjusted pressure parameter PRES_ADJUSTED is only available in the core-Argo profile files. The variables PROFILE_PRES_QC, PRES_QC, PRES_ADJUSTED and PRES_ADJUSTED_ERROR are not duplicated in the b-Argo profile files.

Some single-cycle profile files will contain multiple profiles with different vertical sampling schemes (N_PROF > 1). In these cases, all parameters in the core-Argo and the b-Argo profile files will have the same N_PROF dimension, listed in the same order. The same set of vertical pressure levels (PRES with N_PROF > 1) is duplicated in the core-Argo and b-Argo profile files. Other parameters (e.g. TEMP, PSAL) that are not measured in all vertical sampling schemes will be filled with FillValue in the respective N_PROF dimension.

Users are reminded that the profile with N_PROF = 1 is required to be the Primary sampling profile. Please refer to Table 16 for detailed descriptions of the various vertical sampling schemes.

Example

Suppose a hypothetical float carries a high-resolution CTD sensor and a low-resolution nitrate sensor. In each single-cycle, this hypothetical float is configured to return a 2-dbar bin-averaged CTD profile to 1000 dbar with no corresponding nitrate measurements, and a discrete 250-dbar interval nitrate profile to 1000 dbar with no corresponding temperature and salinity measurements. The parameters in the resulting core-Argo and b-Argo profile files are formatted as follows:

In the core-Argo profile file, N_PROF = 2, N_LEVELS = 500.

PRES = [2, 4, 6, …….....1000];
= [250, 500, 750, 1000, FillValue, ……].
TEMP = [T2, T4, T6, ……T1000];
= [FillValue, ……..].
PSAL = [S2, S4, S6, ……..S1000];
= [FillValue, ……..].

In the b-Argo profile file, N_PROF = 2, N_LEVELS = 500.

PRES = [2, 4, 6, …….....1000];
= [250, 500, 750, 1000, FillValue, ……....].

NITRATE = [FillValue, ……..];
= [N250, N500, N750, N1000, FillValue, …].

Other intermediate nitrate variables in the b-file are omitted in this example.

2.6.1.2 Pressure axis management in core-Argo and b-Argo trajectory files

Parameter measurements are reported in the TRAJ file through the N_MEASUREMENT dimension variables. The PRES measurements of the bio data are recorded in the core-Argo and the b-Argo trajectory files.

To unambiguously link the data, the core-Argo and the b-Argo trajectory files must share the same N_MEASUREMENT index.

PRES is the only parameter in Reference Table 3 duplicated in core-Argo and b-Argo trajectory files.

The adjusted pressure parameter PRES_ADJUSTED is only available in the core-Argo trajectory file. PRES_ADJUSTED is not duplicated in the b-Argo trajectory file.

2.6.2 Cycle timings management in core-Argo and b-Argo trajectory files

Adjusted times and adjusted cycle numbers data are present in the core-Argo trajectory file only. Most of the N_CYCLE dimension variables contain the best estimate of float cycle timings, these variables are not preserved in the b-Argo trajectory file. The N_CYCLE dimension variables of the b-Argo trajectory file are: CONFIG_MISSION_NUMBER, CYCLE_NUMBER_INDEX and DATA_MODE.

The N_MEASUREMENT dimension variables contain cycle timings, float specific dated events and parameter measurement times.

The N_MEASUREMENT dimension variables are preserved in the b-Argo trajectory file except for the cyle number and time adjusted following variables: CYCLE_NUMBER_ADJUSTED, JULD_ADJUSTED, JULD_ADJUSTED_STATUS and JULD_ADJUSTED_QC.

The data stored in the N_MEASUREMENT dimension variables of the b-Argo trajectory file concern only b-Argo parameters, i.e cycle timings or dated events without parameter measurement are only in the core-Argo trajectory file; dated parameter measurements are in the b-Argo trajectory file only if a non core-Argo parameter is concerned.

2.6.3 Management of multi-dimensional parameters

Observations are usually one dimension variables, such as temperature or salinity. However, some sensors provide multi-dimensional variables.
For example, an optical sensor for Nitrate reports a spectrum of up to 41 values for each measurement, one per wavelenght.

When needed, an additional dimension is added to report the N sublevels of spectrum observation performed on each level.

- float <PARAM>(N_PROF, N_LEVELS, N_VALUES);

Example of 60 measurements of “RAW_DOWNWELLING_IRRADIANCE” parameter performed at each 41 wavelengths of an individual profile.

- NPROF = 1
- N_LEVELS = 60
- N_VALUES41 = 41

The N_VALUES## dimension is used only when it is necessary: if there is more than one value for each level (N_VALUES > 1) and the ## equals the number of values present for a given variable. You can add more than one of these, with each variable referencing a different N_VALUES## if required.

N_VALUES41	N_VALUES41 = <int value> ;	Maximum number of parameter measurements sampled at a given pressure level. This dimension depends on the data set. Example : N_VALUES41 = 41

To describe wavelengths of the sensor (41 in the example), an attribute of the variable called wave_length_nanometer provides the list

```
double RAW_DOWNWELLING_IRRADIANCE(N_PROF, N_LEVELS, N_VALUES41) ;
        RAW_DOWNWELLING_IRRADIANCE:long_name = "IRRADIANCE COUNTS FROM OCR SENSOR" ;
        RAW_DOWNWELLING_IRRADIANCE:standard_name = "TBD" ;
        RAW_DOWNWELLING_IRRADIANCE:_FillValue = 99999. ;
        RAW_DOWNWELLING_IRRADIANCE:units = "counts" ;
        RAW_DOWNWELLING_IRRADIANCE:valid_min = "TBD" ;
        RAW_DOWNWELLING_IRRADIANCE:valid_max = "TBD" ;
        RAW_DOWNWELLING_IRRADIANCE:C_format = "%10.0f" ;
        RAW_DOWNWELLING_IRRADIANCE:FORTRAN_format = "F10.0" ;
        RAW_DOWNWELLING_IRRADIANCE:resolution = 1. ;
        RAW_DOWNWELLING_IRRADIANCE:wave_length_nanometer = "115 132 149 166 183 200 217 234 251 268 285
302 319 336 353 370 387 404 421 438 455 472 489 506 523 540 557 574 591 608 625 642 659 676 693 710 727 744 761 778
795" ;
```

2.6.4 Parameter values may be float or double

Some sensors provide values that cannot be stored as float, but has to be stored as double. In that case, a variable with the type “double” is used instead of a “float” variable.

These parameters are precursor to calculated parameters. They will not be ajusted or quality controlled (no record in history or calibration sections).

Concerned variables

PROF & TRAJ: <PARAM> and HISTORY_PREVIOUS_VALUE.

Example: RAW_DOWNWELLING_IRRADIANCE: counts provided by the OCR sensor of the ProvBio II Remocean float.

2.6.5 PARAMETER_DATA_MODE

In both the core- and b- profile files, the variable DATA_MODE(N_PROF) is not related to a specific parameter. The value of DATA_MODE(N_PROF) is set to ‘D’ when adjusted values for one or more PARAM in each N_PROF become available.

In b-Argo profile files, there are additional biogeochemical parameters which can receive delayed-mode adjustments at different times. Therefore the variable PARAMETER_DATA_MODE(N_PROF, N_PARAM) is added to b-Argo profile files to indicate the data mode of each PARAM in each N_PROF.

The adjusted section (<PARAM>_ADJUSTED, <PARAM>_ADJUSTED_QC and <PARAM>_ADJUSTED_ERROR) for each PARAM in each N_PROF should then be filled independently according to its PARAMETER_DATA_MODE.

- For example, in a b-Argo profile file with DOXY and NITRATE, it is possible that PARAMETER_DATA_MODE = ’D’ for DOXY, and
- PARAMETER_DATA_MODE = ’R’ for NITRATE.

In this case:

- the adjusted section for DOXY should be filled with their adjusted values;
- the adjusted section for NITRATE should be filled with FillValues.

PARAMETER_DATA_MODE	char PARAMETER_DATA_MODE(N_ PROF, N_PARAM); PARAMETER_DATA_MODE:long_name = "Delayed mode or real time data"; PARAMETER_DATA_MODE:conventions = "R : real time; D : delayed mode; A : real time with adjustment"; PARAMETER_DATA_MODE:_FillValue = " ";	Describe the data mode of the individual parameter : R : real time data D : delayed mode data A : real time data with adjusted values

2.6.6 N_PARAM management in b-Argo profile files

For floats that measure multiple biogeochemical parameters (N_PARAM > 1) with multiple vertical sampling schemes (N_PROF > 1), users are reminded that N_PARAM in the b-Argo profile files does not necessarily equal to the total count of all unique parameters in a single cycle.

The definition of N_PARAM is the “Maximum number of parameters measured or calculated for a pressure sample.”

The same definition applies when N_PROF > 1.

For example, a single-cycle b-Argo profile file has 3 vertical sampling schemes:

- at N_PROF = 1, STATION_PARAMETERS = [PRES]: N_PARAM1 = 1;
- at N_PROF = 2, STATION_PARAMETERS = [PRES, DOXY, NITRATE]: N_PARAM2 = 3;
- at N_PROF = 3, STATION_PARAMETERS = [PRES, CHLA, BBP700, CDOM]: N_PARAM3 = 4.

In this example, there are 6 unique parameters (PRES, DOXY, NITRATE, CHLA, BBP700, CDOM), but:

- N_PARAM = maximum of (N_PARAM1, N_PARAM2, N_PARAM3) = 4.

2.6.7 QC and ADJUSTED variables in b-Argo profile files

In core-Argo profile files, where PARAM = PRES, TEMP, PSAL (and sometimes CNDC), each PARAM has 5 qc and adjusted variables that are used to record real-time qc test results and delayed-mode adjustment information:

PARAM_QC, PROFILE_PARAM_QC, PARAM_ADJUSTED, PARAM_ADJUSTED_QC, and PARAM_ADJUSTED_ERROR.

In b-Argo profile files, PARAM can be classified into 3 groups:

- (a). B-Argo PARAM: these are the ocean state biogeochemical variables that will receive real-time qc tests and delayed-mode adjustments. They are stored in both the b-files and the GDAC merged files.
- (b). I-Argo PARAM: these are the intermediate biogeochemical variables that are only stored in the b-files.
- (c). PRES: this is the stand-alone vertical index that links the core- and b-files.

The following are some clarification on what qc and adjusted variables to include in the b-files:

- (a). B-Argo PARAM: All 5 qc and adjusted variables are mandatory for B-Argo PARAM in the b-files.

- (b). I-Argo PARAM: PARAM_QC and PROFILE_PARAM_QC are mandatory for I-Argo PARAM. PARAM_ADJUSTED, PARAM_ADJUSTED_QC and PARAM_ADJUSTED_ERROR are optional.
- (c). PRES: the b-files do not contain any qc or adjusted variables for PRES. (See Section 2.6.1.)

2.6.8 PARAMETER names on 64 characters

B-Argo parameter variables is extended from 16 to 64 characters.

Applicable variables

In profile files: STATION_PARAMETERS, PARAMETER, HISTORY_PARAMETER

In trajectory files: TRAJECTORY_PARAMETERS, HISTORY_PARAMETER

In metadata files: PARAMETER size is set to 64, PARAMETER_SENSOR size is set to 128

2.6.9 DATA_TYPE dimension extended from 16 to 32 characters

B-Argo and Merged files DATA_TYPE dimension are extended from 16 to 32 characters.

2.7 GDAC FTP directory file format

2.7.1 Profile directory file format

The profile directory file describes all individual profile files of the GDAC ftp site. Its format is an autodescriptive ASCII with comma separated values.

It is located at the root of the GDACs ftp servers.

- ftp://usgodae.org/pub/outgoing/argo/
- ftp://ftp.ifremer.fr/ifremer/argo/

The directory file contains:

- A header with a list of general informations : title, description, project name, format version, date of update, ftp root addresses, GDAC node
- A table with a description of each file of the GDAC ftp site. This table is a comma separated list.

Index file naming convention

- ./ar_index_global_prof.txt
- ./ar_index_global_prof.txt.gz

Profile directory format definition : ar_index_global_prof.txt

Title : Profile directory file of the Argo Global Data Assembly Center
Description : The directory file describes all individual profile files of the argo GDAC ftp site.
Project : ARGO
Format version : 2.0
Date of update : YYYYMMDDHHMISS
FTP root number 1 : ftp://ftp.ifremer.fr/ifremer/argo/dac
FTP root number 2 : ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
GDAC node : CORIOLIS
file,date,latitude,longitude,ocean,profiler_type,institution,date_update

- file : path and file name on the ftp site. The file name contain the float number and the cycle number.
  Fill value : none, this field is mandatory
- date : date of the profile, YYYYMMDDHHMISS
  Fill value : " " (blank)
- latitude, longitude : location of the profile
  Fill value : 99999.
- ocean : code of the ocean of the profile as described in reference table 13
  Fill value : " " (blank)
- profiler_type : type of profiling float as described in reference table 8
  Fill value : " " (blank)
- institution : institution of the profiling float described in reference table 4
  Fill value : " " (blank)
- date_update : : date of last update of the file, YYYYMMDDHHMISS
  Fill value : " " (blank)

Each line describes a file of the gdac ftp site.

Profile directory format example

Title : Profile directory file of the Argo Global Data Assembly Center

```
# Description : The directory file describes all profile files of the argo GDAC ftp site.
# Project : ARGO
# Format version : 2.0
# Date of update : 20031028075500
# FTP root number 1 :  ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 :  ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file,date,latitude,longitude,ocean,profiler_type,institution,date_update
aoml/13857/profiles/R13857_001.nc,199707292003,0.267,-16.032,A,0845,AO,20030214155117
aoml/13857/profiles/R13857_002.nc,199708091921,0.072,-17.659,A,0845,AO,20030214155354
aoml/13857/profiles/R13857_003.nc,199708201845,0.543,-19.622,A,0845,AO,20030214155619
…
jma/29051/profiles/R29051_025.nc,200110250010,30.280,143.238,P,846,JA,20030212125117
jma/29051/profiles/R29051_026.nc,200111040004,30.057,143.206,P,846,JA,20030212125117
```

2.7.2 Profile directory file format version 2.1

The profile directory file describes all individual profile files of the GDAC ftp site. Its format is an auto descriptive ASCII with comma separated values.

This directory file format is more detailed than the previous version 2.0, it will eventually replace it.

The directory file contains:

- A header with a list of general information: title, description, project name, format version, date of update, ftp root addresses, GDAC node
- A table with a description of each file of the GDAC ftp site. This table is a comma-separated list.

The detailed index file is limited to core mission "Argo sampling scheme" : temperature, salinity and oxygen observations.

Compression of the profile directory file

The profile directory file is compressed with gzip.

MD5 signature

For each update of the directory file, an MD5 signature is produced. The MD5 signature file allows user to check that the file he collected through FTP is identical to the original file.

Index file naming convention

- etc/argo_profile_detailled_index.txt.gz
- etc/argo_profile_detailled_index.txt.gz.md5

Detailed profile directory format definition

```
# Title : Profile directory file of the Argo Global Data Assembly Center
# Description : The directory file describes all individual  profile files of the argo GDAC ftp site.
# Project : ARGO
# Format version : 2.1
# Date of update : YYYYMMDDHHMISS
# FTP root number 1 :  ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 :  ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file,date,latitude,longitude,ocean,profiler_type,institution,date_update,profile_temp_qc,profile_psal_qc,profile_doxy_qc,ad_psa
l_adjustment_mean, ad_psal_adjustment_deviation,gdac_date_creation,gdac_date_update,n_levels
```

- file: path and file name on the ftp site. The file name contain the float number and the cycle number.
  Fill value : none, this field is mandatory
- date: date of the profile, YYYYMMDDHHMISS
  Fill value : " " (blank)
- latitude, longitude : location of the profile
  Fill value : 99999.
- ocean: code of the ocean of the profile as described in reference table 13
  Fill value : " " (blank)
- profiler_type : type of profiling float as described in reference table 8
  Fill value : " " (blank)
- institution: institution of the profiling float described in reference table 4
  Fill value : " " (blank)
- date_update: date of last update of the file, YYYYMMDDHHMISS
  Fill value: " " (blank)
- profile_temp_qc,profile_psal_qc,profile_doxy_qc : global quality flag on temperature, salinity and oxygene profile.
  Fill value: " " (blank)
- ad_psal_adjustment_mean : for delayed mode or adjusted mode
  Mean of psal_adjusted – psal on the deepest 500 meters with good psal_adjusted_qc (equal to 1)
  Fill value: " " (blank)
- ad_psal_adjustment_deviation : for delayed mode or adjusted mode
  Standard deviation of psal_adjusted – psal on the deepest 500 meters with good psal_adjusted_qc (equal to 1)
  Fill value: " " (blank)
- gdac_date_creation : création date of the file on GDAC, YYYYMMDDHHMISS
- gdac_date_update : update date of the file on GDAC, YYYYMMDDHHMISS
- n_levels :maximum number of pressure levels contained in a profile

Fill value: " " (blank)

Each line describes a file of the gdac ftp site.

Profile directory format example

```
# Title : Profile directory file of the Argo Global Data Assembly Center
# Description : The directory file describes all individual profile files of the argo GDAC ftp site.
# Project : ARGO
# Format version : 2.1
# Date of update : 20081025220004
# FTP root number 1 : ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 : ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file,date,latitude,longitude,ocean,profiler_type,institution,date_update,profile_temp_qc,profile_psal_qc,profile_doxy_qc,ad_psal_adjustment_mean,ad_psal_adjustment_deviation
aoml/13857/profiles/R13857_001.nc,19970729200300,0.267,-16.032,A,845,AO,20080918131927,A, , , ,
aoml/13857/profiles/R13857_002.nc,19970809192112,0.072,-17.659,A,845,AO,20080918131929,A, , , ,
aoml/13857/profiles/R13857_003.nc,19970820184545,0.543,-19.622,A,845,AO,20080918131931,A, , , ,
…
meds/3900084/profiles/D3900084_099.nc,20050830130800,-45.74,-58.67,A,846,ME,20060509152833,A,A, ,0.029,0.000
meds/3900084/profiles/D3900084_103.nc,20051009125300,-42.867,-56.903,A,846,ME,20060509152833,A,A, ,-0.003,0.000
…
```

2.7.3 Trajectory directory file format 2.0

The trajectory directory file describes all trajectory files of the GDAC ftp site. Its format is an autodescriptive ASCII with comma separated values.

The directory file contains:

- A header with a list of general informations: title, description, project name, format version, date of update, ftp root addresses, GDAC node
- A table with a description of each file of the GDAC ftp site. This table is a comma separated list.

Trajectory directory format definition

```
# Title : Trajectory directory file of the Argo Global Data Assembly Center
# Description : The directory file describes all trajectory files of the argo GDAC ftp site.
```

```
# Project : ARGO
# Format version : 2.0
# Date of update : YYYYMMDDHHMISS
# FTP root number 1 :  ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 :  ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file, latitude_max, latitude_min, longitude_max, longitude_min, profiler_type, institution, date_update

file : path and file name on the ftp site
Fill value : none, this fiel is mandatory

latitude_max, latitude_min, longitude_max, longitude_min : extreme locations of the float
Fill values : 99999.

profiler_type : type of profiling float as described in reference table 8
Fill value : " " (blank)

institution : institution of the profiling float described in reference table 4
Fill value : " " (blank)

date_update : date of last update of the file, YYYYMMDDHHMISS
Fill value : " " (blank)
```

Trajectory directory format example

```
# Title : Trajectory directory file of the Argo Global Data Assembly Center
# Description : The directory file describes all trajectory files of the argo GDAC ftp site.
# Project : ARGO
# Format version : 2.0
# Date of update : 20031028075500
# FTP root number 1 :  ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 :  ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file, latitude_max, latitude_min, longitude_max, longitude_min, profiler_type, institution, date_update
aoml/13857/13857_traj.nc,1.25,0.267,-16.032,-18.5,0845,AO,20030214155117
aoml/13857/13857_traj.nc,0.072,-17.659,A,0845,AO,20030214155354
aoml/13857/13857_traj.nc,0.543,-19.622,A,0845,AO,20030214155619
…
jma/29051/29051_traj.nc,32.280,30.280,143.238,140.238,846,JA,20030212125117
jma/29051/29051_traj.nc,32.352,30.057,143.206,140.115,846,JA,20030212125117
```

2.7.4 Meta-data directory formet format 2.0

The metadata directory file describes all metadata files of the GDAC ftp site. Its format is an autodescriptive ASCII with comma separated values.

The directory file contains:

- A header with a list of general informations : title, description, project name, format version, date of update, ftp root addresses, GDAC node
- A table with a description of each file of the GDAC ftp site. This table is a comma separated list.

Metadata directory format definition

```
# Title : Metadata directory file of the Argo Global Data Assembly Center
# Description : The directory file describes all metadata files of the argo GDAC ftp site.
# Project : ARGO
# Format version : 2.0
# Date of update : YYYYMMDDHHMISS
# FTP root number 1 :  ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 :  ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file, profiler_type, institution, date_update
```

- file : path and file name on the ftp site
  Fill value : none, this field is mandatory
- profiler_type : type of profiling float as described in reference table 8
  Fill value : " " (blank)
- institution : institution of the profiling float described in reference table 4
  Fill value : " " (blank)
- date_update : date of last update of the file, YYYYMMDDHHMISS
  Fill value : " " (blank)

Metadata directory example

```
# Title : Metadata directory file of the Argo Global Data Assembly Center
# Description : The directory file describes all metadata files of the argo GDAC ftp site.
# Project : ARGO
# Format version : 2.0
# Date of update : 20031028075500
# FTP root number 1 :  ftp://ftp.ifremer.fr/ifremer/argo/dac
# FTP root number 2 :  ftp://usgodae.usgodae.org/pub/outgoing/argo/dac
# GDAC node : CORIOLIS
file, profiler_type, institution, date_update
aoml/13857/13857_meta.nc,0845,AO,20030214155117
aoml/13857/13857_meta.nc,0845,AO,20030214155354
aoml/13857/13857_meta.nc,0845,AO,20030214155619
…
jma/29051/29051_meta.nc,846,JA,20030212125117
jma/29051/29051_meta.nc,846,JA,20030212125117
```

3 Reference tables

3.1 Reference table 1: data type

This table contains the list of acceptable values for DATA_TYPE field.

Name
Argo profile
Argo trajectory
Argo meta-data
Argo technical data
B-Argo profile
B-Argo trajectory
Argo profile merged
Argo trajectory merged

3.2 Reference table 2: Argo quality control flag scale

3.2.1 Reference table 2: measurement flag scale

A quality flag indicates the quality of an observation.

The flags are assigned in real-time or delayed mode according to the Argo quality control manual available at:

- http://www.argodatamgt.org/Documentation

n	Meaning	Real-time comment	Delayed-mode comment
0	No QC was performed	No QC was performed.	No QC was performed.
1	Good data	All Argo real-time QC tests passed.	The adjusted value is statistically consistent and a statistical error estimate is supplied.
2	Probably good data	Not used in real-time.	Probably good data.
3	Bad data that are potentially correctable	Test 15 or Test 16 or Test 17 failed and all other real-time QC tests passed. These data are not to be used without scientific correction. A flag '3' may be assigned by an operator during additional visual QC for bad data that may be corrected in delayed mode.	An adjustment has been applied, but the value may still be bad.
4	Bad data	Data have failed one or more of the real-time QC tests, excluding Test 16. A flag '4' may be assigned by an operator during additional visual QC for bad data that are not correctable.	Bad data. Not adjustable.
5	Value changed	Value changed	Value changed
6	Not used	Not used	Not used
7	Not used	Not used	Not used
8	Interpolated value	Interpolated value	Interpolated value
9	Missing value	Missing value	Missing value

A list of real-time QC tests can be found in Table 11.

3.2.2 Reference table 2a: profile quality flag

N is defined as the percentage of levels with good data where:

- QC flag values of 1, 2, 5, or 8 are GOOD data
- QC flag values of 9 (missing) are NOT USED in the computation

All other QC flag values are BAD data

The computation should be taken from <PARAM_ADJUSTED>_QC if available and from <PARAM>_QC otherwise.

n	Meaning
" "	No QC performed
A	***N*** = 100%; All profile levels contain good data.
B	75% <= ***N*** < 100%
C	50% <= ***N*** < 75%
D	25% <= ***N*** < 50%
E	0% < ***N*** < 25%
F	***N*** = 0%; No profile levels have good data.

Example: a TEMP profile has 60 levels (3 levels contain missing values).

- 45 levels are flagged as 1
- 5 levels are flagged as 2
- 7 levels are flagged as 4
- 3 levels are flagged as 9 (missing)

Percentage of good levels = ((45 + 5) / 57) * 100 = 87.7%

- PROFILE_TEMP_QC = “B”;

3.3 Reference table 3: parameter code table

The following table describes the parameter codes used for Argo data management. The detailed parameter codes tables is available on Argo data-management web site:

- http://www.argodatamgt.org/Documentation

Core-Argo parameters

Parameter name	long_name	cf standard_name	unit	valid_min	valid_max
CNDC	Electrical conductivity	sea_water_electrical_conductivity	mhos/m	0.f	8.5f
PRES	Sea water pressure, equals 0 at sea-level	sea_water_pressure	decibar	0.f	12000.f
PSAL	Practical salinity	sea_water_salinity	psu	2.f	41.f
TEMP	Sea temperature in-situ ITS-90 scale	sea_water_temperature	degree_Celsius	-2.5f	40.f

B-Argo parameters

parameter name	long_name	cf_standard_name	cf_standard_name_uri	unit	valid_min	valid_max
DOXY	Dissolved oxygen	moles_of_oxygen_per_unit_mass_in_sea_water		micromole/kg	-5.f	600.f
BBP	Particle backscattering at x nanometers	-		m-1	-	-
BBP470	Particle backscattering at 470 nanometers	-		m-1	-	-
BBP532	Particle backscattering at 532 nanometers	-		m-1	-	-
BBP700	Particle backscattering at 700 nanometers	-		m-1	-	-

TURBIDITY	Sea water turbidity	sea_water_turbidity		ntu	-	-
CP	Particle beam attenuation at x nanometers	-		m-1	-	-
CP660	Particle beam attenuation at 660 nanometers	-		m-1	-	-
CHLA	Chlorophyll-A	mass_concentration_of_chlorophyll_a_in_sea_water		mg/m3	-	-
CDOM	Concentration of coloured dissolved organic matter in sea water	-		ppb	-	-
NITRATE	Nitrate	moles_of_nitrate_per_unit_mass_in_sea_water		micromole/kg	-	-
BISULFIDE	Bisulfide	-		micromole/kg	-	-
PH_IN_SITU_TOTAL	pH	sea_water_ph_reported_on_total_scale		dimensionless	-	-
DOWN_IRRADIANCE	Downwelling irradiance at x nanometers	-		W/m^2/nm	-	-
DOWN_IRRADIANCE380	Downwelling irradiance at 380 nanometers	-		W/m^2/nm	-	-
DOWN_IRRADIANCE412	Downwelling irradiance at 412 nanometers	-		W/m^2/nm	-	-

DOWN_IRRADIANCE443	Downwelling irradiance at 443 nanometers	-		W/m^2/nm	-	-
DOWN_IRRADIANCE490	Downwelling irradiance at 490 nanometers	-		W/m^2/nm	-	-
DOWN_IRRADIANCE555	Downwelling irradiance at 555 nanometers	-		W/m^2/nm	-	-
UP_RADIANCE	Upwelling radiance at x nanometers	upwelling_radiance_in_sea_water		W/m^2/nm/sr	-	-
UP_RADIANCE412	Upwelling radiance at 412 nanometers	upwelling_radiance_in_sea_water		W/m^2/nm/sr	-	-
UP_RADIANCE443	Upwelling radiance at 443 nanometers	upwelling_radiance_in_sea_water		W/m^2/nm/sr	-	-
UP_RADIANCE490	Upwelling radiance at 490 nanometers	upwelling_radiance_in_sea_water		W/m^2/nm/sr	-	-
UP_RADIANCE555	Upwelling radiance at 555 nanometers	upwelling_radiance_in_sea_water		W/m^2/nm/sr	-	-
DOWNWELLING_PAR	Downwelling photosynthetic available radiation	downwelling_photosynthetic_photon_flux_in_sea_water		microMoleQuanta/m^2/sec	-	-

I-Argo intermediate parameters

These parameters are reported in B-Argo data files. They are ignored in the files merged by GDACs.

parameter name	long_name	cf_standard_name	cf_standard_name_uri	unit	valid_min	valid_max	core/bio/intermediate
TEMP_DOXY	Sea temperature from oxygen sensor ITS-90 scale	temperature_of_sensor_for_oxygen_in_sea_water		degree_Celsius	-2.f	40.f	i
TEMP_VOLTAGE_DOXY	Thermistor voltage reported by oxygen sensor	-		volt	-	-	i
VOLTAGE_DOXY	Voltage reported by oxygen sensor	-		volt	0.f	100.f	i
FREQUENCY_DOXY	Frequency reported by oxygen sensor	-		hertz	0.f	25000.f	i
COUNT_DOXY	Count reported by oxygen sensor	-		count	-	-	i
BPHASE_DOXY	Uncalibrated phase shift reported by oxygen sensor	-		degree	10.f	70.f	i
DPHASE_DOXY	Calibrated phase shift reported by oxygen sensor	-		degree	10.f	70.f	i
TPHASE_DOXY	Uncalibrated phase shift reported by oxygen sensor	-		degree	10.f	70.f	i
C1PHASE_DOXY	Uncalibrated phase shift reported by oxygen sensor	-		degree	10.f	70.f	i
C2PHASE_DOXY	Uncalibrated phase shift reported by oxygen sensor	-		degree	0.f	15.f	i

MOLAR_DOXY	Uncompensated (pressure and salinity) oxygen concentration reported by the oxygen sensor	mole_concentration_of_dissolved_molecular_oxygen_in_sea_water		micromole/l	0.f	650.f	i
PHASE_DELAY_DOXY	Phase delay reported by oxygen sensor	-		microsecond	0.f	99999.f	i
MLPL_DOXY	Oxygen concentration reported by the oxygen sensor	-		ml/l	0.f	650.f	i
NB_SAMPLE	Number of samples in bin	-		dimensionless	-	-	i
RPHASE_DOXY	Uncalibrated red phase shift reported by oxygen sensor	-		degree	10.f	70.f	i
TEMP_COUNT_DOXY	Count which is expressive of uncalibrated temperature value reported by oxygen sensor	-		count	-	-	i
LED_FLASHING_COUNT_DOXY	Number of times oxygen sensor flashing to measure oxygen	-		count	-	-	i
PPOX_DOXY	Partial pressure of oxygen	-		millibar	-5.f	600.f	i
BETA_BACKSCATTERING	Total angle specific volume from backscattering sensor at x nanometers	-		count	-	-	i

BETA_BACKSCATTERING470	Total angle specific volume from backscattering sensor at 470 nanometers	-		count	-	-	i
BETA_BACKSCATTERING532	Total angle specific volume from backscattering sensor at 532 nanometers	-		count	-	-	i
BETA_BACKSCATTERING700	Total angle specific volume from backscattering sensor at 700 nanometers	-		count	-	-	i
FLUORESCENCE_CHLA	Chlorophyll-A signal from fluorescence sensor	-		count	-	-	i
TEMP_CPU_CHLA	Thermistor signal from backscattering sensor	-		count	-	-	i
FLUORESCENCE_CDOM	Raw fluorescence from coloured dissolved organic matter sensor	-		count	-	-	i
SIDE_SCATTERING_TURBIDITY	Turbidity signal from side scattering sensor	-		count	-	-	i
TRANSMITTANCE_PARTICLE_BEAM_ATTENUATION	Beam attenuation from transmissometer sensor at x nanometers	-		count	-	-	i
TRANSMITTANCE_PARTICLE_BEAM_ATTENUATION660	Beam attenuation from transmissometer sensor at 660	-		dimensionless	-	-	i

	nanometers						
UV_INTENSITY_NITRATE	Intensity of ultra violet flux from nitrate sensor	-		count	-	-	i
UV_INTENSITY_DARK_NITRATE	Intensity of ultra violet flux dark measurement from nitrate sensor	-		count	-	-	i
UV_INTENSITY_DARK_SEAWATER_NITRATE	Intensity of ultra-violet flux dark sea water from nitrate sensor	-		count	-	-	i
E_NITRATE	E nitrate	-		l/micromol cm	-	-	i
UV_INTENSITY_REF_NITRATE	Ultra-violet intensity reference from nitrate sensor	-		count	-	-	i
E_SWA_NITRATE	E SWA nitrate	-		dimensionless	-	-	i
TEMP_CAL_NITRATE	Temperature calibration from nitrate sensor	-		degree_Celsius	-	-	i

ABSORBANCE_COR_NITRATE	Absorbance cor from nitrate sensor	-		dimensionless	-	-	i
MOLAR_NITRATE	Nitrate	-		micromole/l	-	-	i
FIT_ERROR_NITRATE	Nitrate fit error	-		dimensionless	-	-	i
TEMP_NITRATE	Internal temperature of the SUNA sensor	-		degree_Celsius	-	-	i
TEMP_SPECTROPHOTOMETER_NITRATE	Temperature of the spectrometer	-		degree_Celsius	-	-	i
HUMIDITY_NITRATE	Relative humidity inside the SUNA sensor (If > 50% There is a leak)	-		percent	0.f	100.f	i
VRS_PH	Voltage difference between reference and source from pH sensor	-		volt	-	-	i
PH_IN_SITU_FREE	pH	-		dimensionless	-	-	i
PH_IN_SITU_SEAWATER	pH	-		dimensionless	-	-	i

RAW_DOWNWELLING_IRRADIANCE	Raw downwelling irradiance at x nanometers	-		count	-	-	i
RAW_DOWNWELLING_IRRADIANCE380	Raw downwelling irradiance at 380 nanometers	-		count	-	-	i
RAW_DOWNWELLING_IRRADIANCE412	Raw downwelling irradiance at 412 nanometers	-		count	-	-	i
RAW_DOWNWELLING_IRRADIANCE443	Raw downwelling irradiance at 443 nanometers	-		count	-	-	i
RAW_DOWNWELLING_IRRADIANCE490	Raw downwelling irradiance at 490 nanometers	-		count	-	-	i
RAW_DOWNWELLING_IRRADIANCE555	Raw downwelling irradiance at 555 nanometers	-		count	-	-	i
RAW_UPWELLING_RADIANCE	Raw upwelling radiance at x nanometers	-		count	-	-	i
RAW_UPWELLING_RADIANCE412	Raw upwelling radiance at 412 nanometers	-		count	-	-	i
RAW_UPWELLING_RADIANCE443	Raw upwelling radiance at 443 nanometers	-		count	-	-	i
RAW_UPWELLING_RADIANCE490	Raw upwelling radiance at 490 nanometers	-		count	-	-	i
RAW_UPWELLING_RADIANCE555	Raw upwelling radiance at 555 nanometers	-		count	-	-	i
RAW_DOWNWELLING_PAR	Raw downwelling photosynthetic available radiation	-		count	-	-	i

Parameter attributes

- The Fill_value attribute is set to 99999.f
- The C_Format, Fortran_Format and Format_resolution attributes are float/sensor dependants. They are set by the DAC (Data Assembly Centre).

If new parameters are required, they have to be added to this table before they will be accepted.
A request for new parameters can be sent to argo-dm-chairman@jcommops.org for approval and inclusion.

Note on resolution

For each parameter, the resolution attribute is mandatory. However, the resolution value is sensor dependant.

3.3.1 Parameters from duplicate sensors

Some floats are equipped with 2 different sensors, measuring the same physical parameter. In that case, add the integer "2" at the end of the code of the duplicate parameter (e.g. DOXY2).

If more sensors that measure the same physical parameter are added, then the integer will simply increase by 1 (i.e. DOXY3, DOXY4, and so on).

Example

If a float has one Optode and one SBE oxygen sensor:

- Use DOXY and TEMP_DOXY for Optode
- Use DOXY2 for SBE

If a float has two Optode oxygen sensors:

- Use DOXY and TEMP_DOXY, and DOXY2 and TEMP_DOXY2

If a float has two SBE oxygen sensors:

- Use DOXY and DOXY2

3.3.2 Oxygen related parameters

Some Argo floats perform Oxygen observation from different types of sensors, such as the Aandera Optode or the Seabird SBE 43/IDO.

To provide homogeneous observations from heterogeneous sensors, oxygen measurement should be converted and reported as DOXY.

- DOXY is the dissolved oxygen concentration estimated from the telemetered, calibrations coefficients and CTD values: PRES, TEMP (or TEMP_DOXY) and PSAL.
  Pressure and salinity compensations (e.g. Optode) are taken into account.

- DOXY unit: micromole/kg
- DOXY_ADJUSTED is the dissolved oxygen concentration corrected for any sensor drift and offset. DOXY_ADJUSTED is calculated from the other “ADJUSTED” fields.

Calibration coefficients, equations and references used to convert the telemetered variables in DOXY must be carefully documented in the metadata.

The Argo oxygen data management is described at:

- http://www.argodatamgt.org/Documentation , Cookbook documents, "Processing Argo oxygen data at the DAC level"

3.4 Reference table 4: data centres and institutions codes

Data centres and institutions	
AO	AOML, USA
BO	BODC, United Kingdom
CI	Institute of Ocean Sciences, Canada
CS	CSIRO, Australia
GE	BSH, Germany
GT	GTS : used for data coming from WMO GTS network
HZ	CSIO, China Second Institute of Oceanography
IF	Ifremer, France
IN	INCOIS, India
JA	JMA, Japan
JM	Jamstec, Japan
KM	KMA, Korea
KO	KORDI, Korea
MB	MBARI, USA
ME	MEDS, Canada
NA	NAVO, USA
NM	NMDIS, China
PM	PMEL, USA
RU	Russia
SI	SIO, Scripps, USA
SP	Spain
UW	University of Washington, USA
VL	Far Eastern Regional Hydrometeorological Research Institute of Vladivostock, Russia
WH	Woods Hole Oceanographic Institution, USA

3.5 Reference table 5: location classes

ARGOS location classes	
Value	**Estimated accuracy in latitude and longitude**
0	Argos accuracy estimation over 1500m radius
1	Argos accuracy estimation better than 1500m radius
2	Argos accuracy estimation better than 500 m radius
3	Argos accuracy estimation better than 250 m radius
G	GPS positioning accuracy
I	Iridium accuracy

3.6 Reference table 6: data state indicators

Level	Descriptor
0	Data are the raw output from instruments, without calibration, and not necessarily converted to engineering units. These data are rarely exchanged
1	Data have been converted to values independent of detailed instrument knowledge. Automated calibrations may have been done. Data may not have full geospatial and temporal referencing, but have sufficient information to uniquely reference the data to the point of measurement.
2	Data have complete geospatial and temporal references. Information may have been compressed (e.g. subsampled, averaged, etc.) but no assumptions of scales of variability or thermodynamic relationships have been used in the processing.
3	The data have been processed with assumptions about the scales of variability or thermodynamic relationships. The data are normally reduced to regular space, time intervals with enhanced signal to noise.

Class	Descriptor	Subclass
A	No scrutiny, value judgements or intercomparisons are performed on the data. The records are derived directly from the input with no filtering, or subsampling.	**-** Some reductions or subsampling has been performed, but the original record is available. **+** Geospatial and temporal properties are checked. Geophysical values are validated. If not validated, this is clearly indicated.
B	Data have been scrutinized and evaluated against a defined and documented set of measures. The process is often automated (i.e. has no human intervention) and the measures are published and widely available.	**-** Measures are completely automated, or documentation is not widely available. **+** The measures have been tested on independent data sets for completeness and robustness and are widely accepted.
C	Data have been scrutinized fully including intra-record and intra-dataset comparison and consistency checks. Scientists have been involved in the evaluation and brought latest knowledge to bear. The procedures are published, widely available and widely accepted.	**-** Procedures are not published or widely available. Procedures have not undergone full scrutiny and testing. **+** Data are fully quality controlled, peer reviewed and are widely accepted as valid. Documentation is complete and widely available.

Data state indicator recommended use

The following table describes the processing stage of data and the value to be assigned the data state indicator (DS Indicator). It is the concatenation of level and class described above.

Processing Stage	DS Indicator
1. Data pass through a communications system and arrive at a processing centre. The data resolution is the highest permitted by the technical constraints of the floats and communications system.	0A (note 1)
2. The national centre assembles all of the raw information into a complete profile located in space and time.	1A (note 2)
3. The national centre passes the data through automated QC procedures and prepares the data for distribution on the GTS, to global servers and to PIs.	2B
4. Real-time data are received at global data centres that apply QC including visual inspection of the data. These are then distributed to users in near real-time	2B+ (note 3)
5. Data are reviewed by PIs and returned to processing centres. The processing centres forward the data to the global Argo servers.	2C
6. Scientists accept data from various sources, combine them as they see fit with other data and generate a product. Results of the scientific analysis may be returned to regional centres or global servers. Incorporation of these results improves the quality of the data.	2C+
7. Scientists working as part of GODAE generate fields of gridded products delivered in near real-time for distribution from the global servers. Generally, these products mostly will be based on data having passed through automated QC procedures.	3B (note 4)
8. Scientists working as part of GODAE generate fields of gridded products delivered with some time delay for distribution from the global servers. Generally, these products mostly will be based on data having passed through manual or more sophisticated QC procedures than employed on the real-time data.	3C

Notes

1. We need to have a pragmatic approach to what constitutes "original" or "raw" data. Despite the fact that an instrument may be capable of high sampling rates, what is reported from the instrument defines what is considered "raw". For example, Argo floats can certainly sample at finer scales than every 10 db, but because of communications, all we see for now is data at that (or worse) vertical resolution. Therefore the data "coming from the instrument" is "raw" output at 10db resolution.
2. The conversion of the raw data stream from the communications system into profiles of variables causes the data state indicator to switch from level 0 to 1.
3. Even though the data at global data centres use manual or semi-automated QC procedures, there is often not the intercomparisons to larger data collections and fields that would qualify the data state indicator to be set to class C. This is generally only provided by scientific scrutiny of the data.
4. The transition from class 2 to 3 occurs when assumptions of scales of variability are applied. During the course of normal data processing it is common to carry out some averaging and subsampling. This is usually done to exploit oversampling by the instrument, and to ensure good measurements are achieved. These are considered to be part of the geospatial and temporal referencing process.

3.7 Reference table 7: history action codes

Code	Meaning
CF	Change a quality flag
CR	Create record
CV	Change value
DC	Station was checked by duplicate checking software
ED	Edit a parameter value
IP	This history group operates on the complete input record
NG	No good trace
PE	Position error. Profile position has been erroneously encoded. Corrected if possible.
QC	Quality Control
QCF$	Tests failed
QCP$	Test performed
SV	Set a value
TE	Time error. Profile date/time has been erroneously encoded. Corrected if possible.
UP	Station passed through the update program

3.8 Reference table 8: instrument types

The instrument type codes come from WMO table 1770.

Code number	Instrument
831	P-Alace float
837	Arvor-C float
838	Arvor-D float
839	Provor-II float
840	Provor, no conductivity
841	Provor, Seabird conductivity sensor
842	Provor, FSI conductivity sensor
843	POPS ice Buoy/Float
844	Arvor, Seabird conductivity sensor
845	Webb Research, no conductivity
846	Webb Research, Seabird sensor
847	Webb Research, FSI sensor
848	Apex-EM float
849	Apex-D deep float
850	Solo, no conductivity
851	Solo, Seabird conductivity sensor

852	Solo, FSI conductivity sensor
853	Solo2, Seabird conductivity sensor
854	S2A float
855	Ninja, no conductivity sensor
856	Ninja, SBE conductivity sensor
857	Ninja, FSI conductivity sensor
858	Ninja, TSK conductivity sensor
859	Profiling Float, NEMO, no conductivity
860	Profiling Float, NEMO, SBE conductivity sensor
861	Profiling Float, NEMO, FSI conductivity sensor
862	Solo-D deep float
863	Navis-A Float
864	Ninja-D deep float
865	Nova float

3.9 Reference table 9: positioning system

Code	Description
ARGOS	ARGOS positioning system
GPS	GPS positioning system
RAFOS	RAFOS positioning system
IRIDIUM	Iridium positioning system

3.10 Reference table 10: transmission system

Code	Description
ARGOS	Argos transmission system
IRIDIUM	Iridium transmission system
ORBCOMM	Orbcomm transmission system

3.11 Reference table 11: QC test binary IDs

This table is used to record the result of the quality control tests in the history section.

The binary IDs of the QC tests are used to define the history variable HISTORY_QCTEST, whose value is computed by adding the binary ID together, then translating to a hexadecimal number. An example is given on §5.

The test numbers and the test names are listed in the Argo Quality Control Manual:

- §2.1 "Argo Real-Time Quality Control Test Procedures on Vertical Profiles", and
- §2.2 "Argo Real-Time Quality Control Test Procedures on Trajectories"

See http://www.argodatamgt.org/Documentation .

Test number	QC test binary ID	Test name
1	2	Platform Identification test
2	4	Impossible Date test
3	8	Impossible Location test
4	16	Position on Land test
5	32	Impossible Speed test
6	64	Global Range test
7	128	Regional Global Parameter test
8	256	Pressure Increasing test
9	512	Spike test
10	1024	Top and Bottom Spike test (obsolete)
11	2048	Gradient test
12	4096	Digit Rollover test
13	8192	Stuck Value test
14	16384	Density Inversion test
15	32768	Grey List test
16	65536	Gross Salinity or Temperature Sensor Drift test
17	131072	Visual QC test
18	261144	Frozen profile test
19	524288	Deepest pressure test
20	1048576	Questionable Argos position test
21	2097152	Near-surface unpumped CTD salinity test
22	4194304	Near-surface mixed air/water test

3.12 Reference table 12: history steps codes

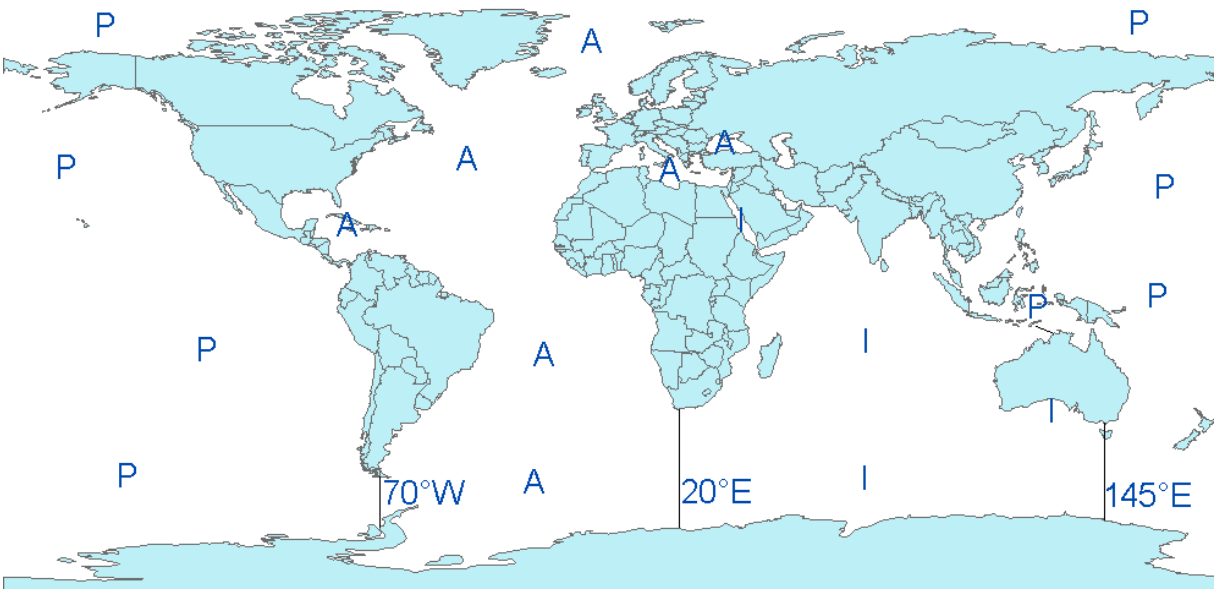
Code	Meaning
ARFM	Convert raw data from telecommunications system to a processing format
ARGQ	Automatic QC of data reported in real-time has been performed
IGO3	Checking for duplicates has been performed
ARSQ	Delayed mode QC has been performed
ARCA	Calibration has been performed
ARUP	Real-time data have been archived locally and sent to GDACs
ARDU	Delayed data have been archived locally and sent to GDACs
RFMT	Reformat software to convert hexadecimal format reported by the buoy to our standard format
COOA	Coriolis objective analysis performed

If individual centres wish to record other codes, they may add to this list as they feel is appropriate.

3.13 Reference table 13: ocean codes

The ocean codes are used in the GDAC ftp directory files. The ocean code is not used in Argo NetCDF files.

Code	Meaning
A	Atlantic ocean area
I	Indian ocean area
P	Pacific ocean area



- The Pacific/Atlantic boundary is 70°W.
- The Pacific/Indian boundary is 145°E.
- The Atlantic/Indian boundary is 20°E.

3.14 Reference table 14: technical parameter names

All technical parameter names are standardized.

The list of technical parameter names (14a) is available at:

- http://www.argodatamgt.org/Media/Argo-Data-Management/Argo-Documentation/General-documentation/Data-format/Argo-technical-parameter-names

The naming convention for technical parameters (14b) is available at:

- http://www.argodatamgt.org/Media/Argo-Data-Management/Argo-Documentation/General-documentation/Data-format/Technical-parameter-naming-convention

If new names are required as new variables are reported by a float, they must be added to this table before they will be accepted.

Request for new names can be sent to argo-dm-chairman@jcommops.org for approval and inclusion.

Older style files will be accepted for a short time and then all technical files must use approved names for standardized variables

3.15 Reference Table 15: codes of trajectory measurements performed within a cycle

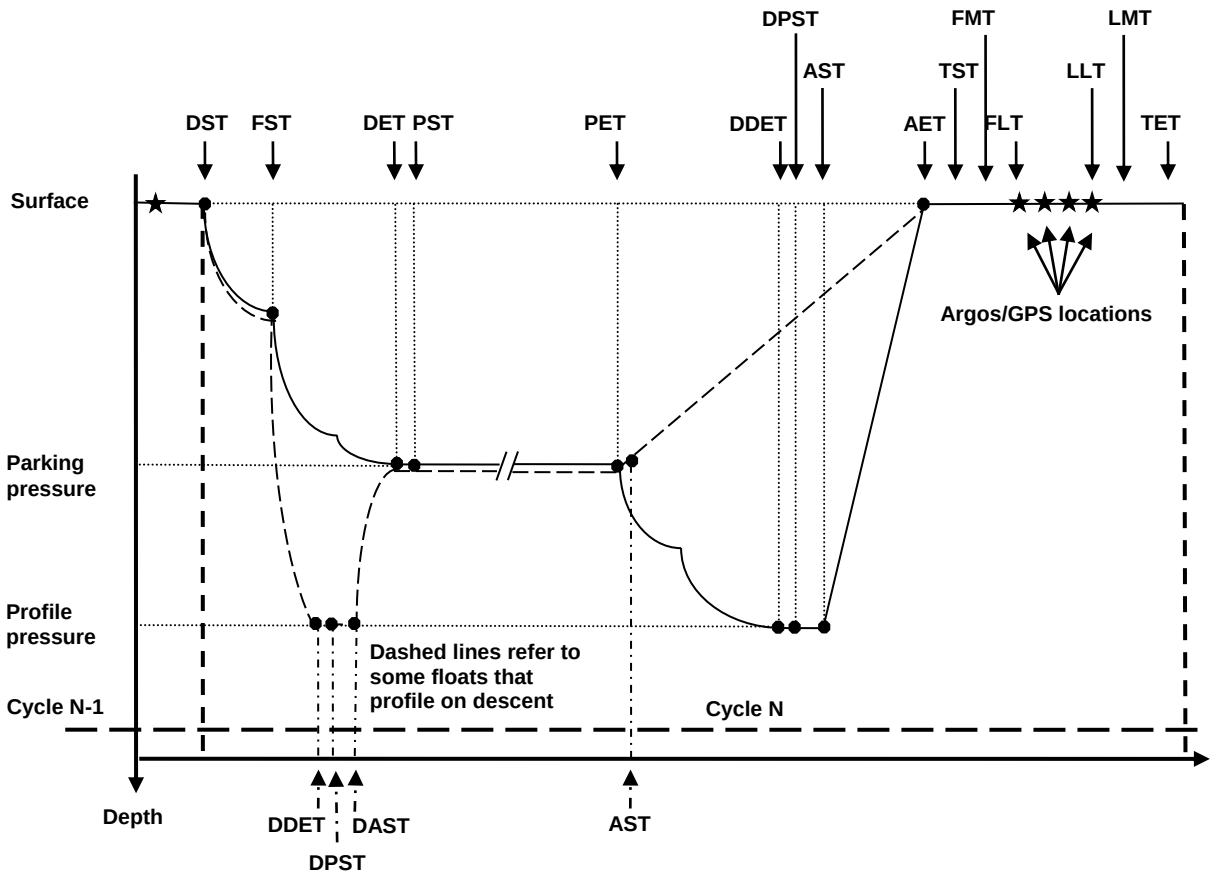


Figure 1: Figure showing float cycle and the cycle timing variables. Floats can profile either on descent or ascent. Most floats profile on ascent. Their float path is shown with a solid black line. Some floats profile on descent. One such float, the new SOLO-II Deep float, has a cycle as shown by the dashed line.

Floats that profile on ascent would have the following mandatory cycle timings:

- DST, DET,PET, DDET, AST, AET and all surface times

Floats that profile on descent might have the following cycle timings:

- DST, DDET, DAST, DET, PET, AST, AET, and all surface times

Time	Long name	Traj data name	Description
DST	Descent Start Time	JULD_DESCENT_START JULD_DESCENT_START_ STATUS	Time when float leaves the surface, beginning descent.
FST	First Stabilization Time	JULD_FIRST_STABILIZATION JULD_FIRST_STABILIZATION_STATUS	Time when a float first becomes water-neutral.
DET	Descent End Time	JULD_DESCENT_END JULD_DESCENT_END_STATUS	Time when float first approaches within 3% of the eventual drift pressure. Float may be transitioning

		Note: Float may approach drift pressure from above or below.	from the surface or from a deep profile. This variable is based on pressure only and can be measured or estimated by fall-rate. In the case of a float that overshoots the drift pressure on descent, DET is the time of the overshoot.
PST	Park Start Time	JULD_PARK_START JULD_PARK_START_STATUS	Time when float transitions to its Park or Drift mission. This variable is based on float logic based on a descent timer (i.e. SOLO), or be based on measurements of pressure (i.e. Provor).
Note on DET and PST: DET and PST might be near in time or hours apart depending on float model and cycle-to-cycle variability. PI has judgment call whether DET~=PST.			
PET	Park End Time	JULD_PARK_END JULD_PARK_END_STATUS	Time when float exits from its Park or Drift mission. It may next rise to the surface (AST) or sink to profile depth.
DDET	Deep Descent End Time	JULD_DEEP_DESCENT_END JULD_DEEP_DESCENT_END_ STATUS	Time when float first approaches within 3% of the eventual deep drift/profile pressure. This variable is based on pressure only and can be measured or estimated by fall-rate.
DPST	Deep Park Start Time	JULD_DEEP_PARK_START JULD_DEEP_PARK_START_ STATUS	Time when float transitions to a deep park drift mission. This variable is only defined if the float enters a deep drift phase (i.e. DPST not defined in cases of constant deep pressure due to bottom hits, or buoyancy issues)
DAST	Deep Ascent Start Time	JULD_DEEP_ASCENT_START JULD_DEEP_ASCENT_START_ STATUS	Time when float begins its rise to drift pressure. Typical for profile-on-descent floats.
AST	Ascent Start Time	JULD_ASCENT_START JULD_ASCENT_START_STATUS	Time when float begins to return to the surface.
AET	Ascent End Time	JULD_ASCENT_END JULD_ASCENT_END_STATUS	Time when float reaches the surface.
TST	Transmission Start Time	JULD_TRANSMISSION_START JULD_TRANSMISSION_START_ STATUS	Time when float begins transmitting.
FMT	First Message Time	JULD_FIRST_MESSAGE JULD_FIRST_MESSAGE_ STATUS	Earliest time of all received float messages.
FLT	First Location Time	JULD_FIRST_LOCATION JULD_FIRST_LOCATION_ STATUS	Earliest location of all float locations.
LLT	Last Location Time	JULD_LAST_LOCATION JULD_LAST_LOCATION_ STATUS	Latest location of all float locations.
LMT	Last Message Time	JULD_LAST_MESSAGE JULD_LAST_MESSAGE_ STATUS	Latest time of all received float messages.
TET	Transmission End Time	JULD_TRANSMISSION_END JULD_TRANSMISSION_END_ STATUS	Time when floats stops transmitting.

General Measurement Code Table Key

Measurement code type	Definition
Any code evenly divisible by 100 (e.g. 100, 200, 300, etc)	**Primary Measurement Codes (MC)**. Each marks a mandatory-to-fill cycle timing variable. These are very important for determining trajectory estimates. All are found in both the N_MEASUREMENT and N_CYCLE data arrays.
Any code evenly divisible by 50 but not evenly divisible by 100 (e.g. 150, 250, 450, etc)	**Secondary Measurement Codes (MC)**. Each marks a suggested-to-fill cycle timing variable. Secondary MC are not always applicable to all floats, but are very useful in determining trajectory estimates.
Any code that falls in between any Primary or Secondary Measurement Code (span of 50 values). These codes describe data that are important cycle timing information but are not as important as the primary or secondary timing variables. The value span is subdivided into two halves. Measurement codes in this section will be described relative to the values of the Primary and Secondary codes.	**Relative Generic Codes**. Values spanning from MC minus 24 to MC minus 1: Measurement codes that have lower value and within 24 of a Primary or Secondary Measurement Code. These code definitions are phrased generally, so can be attached to data from many different floats. These code values (MC minus 24 to MC minus 1) are assigned when a float records a measurement while transitioning TOWARDS the MC. The definitions of the MC from MC minus 24 to MC minus 1 are repeated for all Primary and Secondary MC. An example, most floats record pressure/temperature/salinity during drift. The float is transitioning towards PET (MC=300) during this period. Thus the pressure/temperature/salinity measurements will have an MC between MC minus 24 and MC minus 1 where MC=300 (thus between MC=276 and MC=299). Which value is chosen is determined by the measurement itself (See table below). **Relative Specific Codes**. Values spanning from MC plus 1 to MC plus 25: These are specific measurements that are generally NOT recorded by multiple float types. They are believed to be valuable enough in trajectory estimation that they are defined here, and not within the generically defined MC minus 24 to MC minus 1 span. MC codes in this span will be specific to the MC code, and will NOT be repeated for other Primary and Secondary MCs. An example, APEX floats report the "Down-time end date", which is important in determining the start of ascent (MC=500). The MC for "Down-time end date" is recorded with MC plus 1 (MC=501).

Relative Generic Code Table Key (from MC minus 24 to MC minus 1)

This table pertains to any measurement code that has lower value and within 24 of a Primary or Secondary Measurement Code (see below). These definitions apply relative to every Primary and Secondary code. For example, AST (time of ascent start, MC=500) and AET (time of ascent end, MC=600) are both Primary MCs. There exists a measurement code MC minus 4 for both AST and AET which is assigned to any averaged measurement that is taken while transitioning towards the MC. If an averaged measurement is recorded while transitioning towards AST, the correct MC=496. If an averaged measurement is recorded while transitioning towards AET, the correct MC=596.

Relative	Meaning

Measurement code	
MC minus 1	Any single measurement transitioning towards MC (see MC-10 for a 'series' of measurements)
MC minus 2	Maximum value while float is transitioning towards an MC (e.g. pressure)
MC minus 3	Minimum value while float is transitioning towards an MC (e.g. pressure)
MC minus 4	Any averaged measurements made during transition to MC
MC minus 5	Median value while float is transitioning towards an MC
MC minus 6	Standard deviation of measurements taken during transition towards an MC
MC minus 7 to MC minus 9	currently unassigned
MC minus 10	Any "series" of measurements recorded while transitioning towards MC. (e.g. Provor 'spy' measurements, SOLOII pressure-time pairs, etc).
MC minus 11	Active adjustment to buoyancy made at this time
MC minus 12	Any supporting measurements for the maximum value (MC minus 2)
MC minus 13	Any supporting measurements for the minimum value (MC minus 3)
MC minus 14	Any supporting measurements for the average value (MC minus 4)
MC minus 15	Any supporting measurements for the median value (MC minus 5)
MC minus 16to MC minus 24	currently unassigned

Measure-ment code	Variable	Meaning	Transmitted by listed float type. Value can be estimated in other floats
0		Launch time and location of the float	All float types
76-99	see above table	Any measurement recorded during transition towards DST	
100	**DST**	**All measurements made when float leaves the surface, beginning descent.** Time (JULD_DESCENT_START)	Time: PROVOR, ARVOR, SOLO-II,WHOI SOLOIR, NEMO, NEMOIR, APEX APF9, APEXIR APF9, Deep NINJA
101	DM Traj file only	This MC is used in the DM Traj file when new cycles have been recovered during DM operations (the TECH file, where surface pressure measurements usually belong, is not updated during TRAJ DM). The PRES variable should contain the measurement provided by the float (after 5dbar subtraction when needed). For APEX floats, this measurement is used to compute (see procedure 3.2.1 of Argo QC manual) a pressure offset applied to all pressure measurements. This offset should be stored in the PRES_ADJUSTED variable. No information should be stored with this MC in Real Time.	
102-125	unassigned	Reserved for specific timing events around DST.	
126-149	see above table	Any measurement recorded during transition towards FST	
150	**FST**	**All measurements made at time when a float first becomes water-neutral.** Time (JULD_FIRST_STABILIZATION)	PROVOR, ARVOR
151-175	unassigned	Reserved for specific timing events around FST.	
176-199	see above table	Any measurement recorded during transition towards DET	
200	**DET**	**All measurements made at time when float first approaches within 3% of the eventual drift pressure.** Float may be transitioning from the surface or from a deep profile. This variable is based on measured or estimated pressure only In the case of a float that overshoots the drift pressure on descent, DET is the time of the overshoot.	Time: PROVOR, ARVOR, SOLO-II, NEMO, NEMOIR, DeepNINJA

		Time (JULD_DESCENT_END)	
201-202 & 204-225	unassigned	Reserved for specific timing events around DET.	
203		Deepest bin reached during descending profile	
226-249	see above table	Any measurement recorded during transition towards PST	
250	**PST**	**All measurements made at time when float transitions to its Park or Drift mission**. This variable is based on float logic based on a descent timer (i.e. SOLO), or be based on measurements of pressure (i.e. Provor). Time(JULD_PARK_START)	APEX non APF9, APEX APF9, APEX APF9i, SIO SOLO, SOLO-II, NEMO, NEMOIR CTD: WHOI SOLO NINJA
251-275	unassigned	Reserved for specific timing events around PST.	
276-299	see above table	Any measurement recorded during transition towards PET	
300	**PET**	**All measurements made at time when float exits from its Park or Drift mission.** It may next rise to the surface (AST) or sink to profile depth Time (JULD_PARK_END)	Time: PROVOR (excluding PROVOR MT), ARVOR, SOLO-II, NEMO, NEMOIR, POPS CTD: WHOI SOLO
301		Representative Park <PARAM> found either from measurements taken during drift or from metafile information	
302-325	unassigned	Reserved for specific timing events around PET.	
376-399	see above table	Any measurement recorded during transition towards DDET	
400	**DDET**	**All measurements made at time when float first approaches within 3% of the eventual deep drift/profile pressure**. This variable is based on pressure only and can be measured or estimated. Time (JULD_DEEP_DESCENT_END)	Time: APEX APF9a or APF9t, APF9i, PROVOR CTS3, ARVOR, SOLO-II, POPSm , DeepNINJA
401-425	unassigned	Reserved for specific timing events around DDET.	
426-449	see above table	Any measurement recorded during transition towards DPST	
450	**DPST**	**All measurements made at time when float transitions to a deep park drift mission.** This variable is only defined if the float enters a deep drift phase (i.e. DPST not defined in cases of constant deep pressure due to bottom hits, or buoyancy issues).	
451-475	unassigned	Reserved for specific timing events around DPST.	
476-499	see above table	Any measurement recorded during transition towards AST	
500	**AST**	**All measurements made at the start of the float's ascent to the surface** Time (JULD_ASCENT_START)	Time: APEX APF9, PROVOR, ARVOR, SOLO-II, NEMO, NEMOIR, POPS, DeepNINJA
501		Down-time end time: end date of the down-time parameter reported by APEX floats	APEX
502		Ascent start time directly transmitted by APEX floats	APEX
503		Deepest bin reached during ascending profile	
504-525	unassigned	Reserved for specific timing events around AST.	
526-549	see above table	Any measurement recorded during transition towards DAST	
550	**DAST**	**All measurements made at the start of the float's ascent from profile pressure to drift pressure**. Used for floats that profile on descent and then move back up to drift	Time: Deep SOLO-II

		pressure. Time (JULD_DEEP_ASCENT_START)	
551-575	unassigned	Reserved for specific timing events around DAST.	
576-599	see above table	Any measurement recorded during transition towards AET	
600	**AET**	**All measurements made at the end of ascent.** Time (JULD_ASCENT_END)	PROVOR, ARVOR, SOLO-II, NEMO, NEMOIR, POPS, DeepNINJA
601-625	unassigned	Reserved for specific timing events around AET.	
676-699	see above table	Any measurement recorded during transition towards TST	
700	**TST**	**Time and location of the start of transmission for the float.** Time (JULD_TRANSMISSION_START)	APEX APF9, APEXIR APF9, PROVOR, ARVOR, SOLO-II, NEMO, NEMOIR, POPS, DeepNINJA
701		Transmission start time directly transmitted by APEX float	APEX
702	**FMT**	**Earliest time of all messages received by telecommunications system** – may or may not have a location fix. Time (JULD_FIRST_MESSAGE)	All floats
703		Surface times and locations (if available) during surface drift. Should be listed in chronological order.	All floats
704	**LMT**	**Latest time of all messages received by telecommunications system** – may or may not have a location fix. Time (JULD_LAST_MESSAGE)	All floats
705-725	unassigned	Reserved for specific timing events around TST	
776-799	see above table	Any measurement recorded during transition towards TET	
800	**TET**	**Time and location of the end of transmission for the float.** Time (JULD_TRANSMISSION_END)	PROVOR, ARVOR, SOLO-II, APEXIR APF9, DeepNINJA
801-825	unassigned	Reserved for specific timing events around TET	
901		Grounded flag Configuration phase	
902		Last time before float recovery. For floats that have been recovered, it is important to know when this occurred. This time in the JULD array will be the last time before the float was recovered. Determined by inspection of data	
903		Presure offset used to correct APEX pressure measurements	APEX
1076 - 1099	See table above	Reserved for specific timing events in air	
1100	In Air Measurements	Indicates the float is taking measurements in air. All relative measurement codes apply.	O2 sensors

3.16 Reference table 16: vertical sampling schemes

This variable differentiates the various vertical sampling schemes for multiple profiles from a single cycle. This variable can vary between cycles to accommodate floats with two-way communication capabilities. The profile with N_PROF=1 is required to be the Primary sampling profile. Other profiles will have N_PROF > 1 in any order. There can be only one Primary sampling profile, while other vertical sampling schemes can have more than one profile.

Code (STRING256) FORMAT → name: nominal measurement type [full description] [ ] indicates optional	N_PROF	Code Description
Primary sampling: averaged [description] or Primary sampling: discrete [description] or Primary sampling: mixed [description]	1	Primary CTD measurements and measurements from auxiliary sensors that are taken at the same pressure levels and with the same sampling method as the Primary CTD profile. For auxiliary sensor measurements it is not required that all pressure levels contain data.
Secondary sampling: averaged [description] or Secondary sampling: discrete [description] or Secondary sampling: mixed [description]	>1	Excluding "Primary sampling", this profile includes measurements that are taken at pressure levels different from the Primary CTD profile, or with sampling methods different from the Primary CTD profile. Measurements can be taken by the Primary CTD or by auxiliary sensors.
Near-surface sampling: averaged, pumped/unpumped [description] or Near-surface sampling: discrete, pumped/unpumped [description] or Near-surface sampling: mixed, pumped/unpumped [description]	>1	This profile includes near-surface measurements that are focused on the top 5dbar of the sea surface. (For the purpose of cross-calibration, this profile can extend deeper than the top 5dbar so as to overlap with the Primary sampling profile.) These measurements are taken at pressure levels different from the Primary CTD profile, or with sampling methods different from the Primary CTD profile. If the Primary sampling profile measures above 5dbar in the same manner as deeper data, there is no need to place the near-surface data here.
Bounce sampling: averaged [description] or Bounce sampling: discrete [description] or Bounce sampling: mixed [description]	>1	This scheme contains profiles that are collected on multiple rises/falls during a single cycle. The profiles are temporally offset from each other and/or the Primary sampling profile. They can be sampled with the Primary CTD or with auxiliary sensors.
Use the term 'averaged' if the data in the profile are pressure binned averages using multiple data measurements (pollings) from a sensor. Use the term 'discrete' if the data in the profile are from a single polling from a sensor. If both methods are used in the profile, use the term 'mixed'.		

Example for a SOLOII V1.2 float

N_PROF=1: "Primary sampling: averaged [nominal 2 dbar binned data sampled at 0.5 Hz from a SBE41CP]"

N_PROF=2: "Near-surface sampling: discrete, pumped [shallowest polling of a SBE41CP]"

Note: In this example, by adding a single data point in N_PROF=2, the size of the profile file will double.

Example for a Provor bio 5.0 float

This float is equipped with a Seabird CTD and a Wetlab Satrover optical sensor.

CTD sampling scheme:

- The threshold between deep sampling and upper sampling is 200 decibars.
- Upper sampling: 10 decibars slice thickness, 10 seconds sampling rate.
- Deep sampling: 25 decibars slice thickness, 10 seconds sampling rate.

Chlorophyll (optical) sampling scheme:

- The threshold between deep sampling and upper sampling is 300 decibars.
- Upper sampling: 1 decibar slice thickness, 1 seconds sampling rate.
- Deep sampling: 10 decibars slice thickness, 10 seconds sampling rate.
- Deepest sampling: 1000 decibars.

Description of the 2 vertical sampling schemes:
N_PROF=1: "Primary sampling: averaged [10 seconds sampling, 25 decibars average from bottom to 200 decibars, 10 seconds sampling, 10 decibars average from 200 decibars to surface]"

N_PROF=2: "Secondary sampling: averaged [10 seconds sampling, 10 decibars average from 1000 decibars to 300 decibars, 1 second sampling, 1 decibar average from 300 decibars to surface]"

Example for an APEX Iridium float with an Optode oxygen sensor and an auxiliary CTD for near-surface measurements

N_PROF=1: "Primary sampling: averaged [2-dbar bin average]"

N_PROF=2: "Secondary sampling: discrete [1.1 Hz CTD data, discrete DOXY]"

N_PROF=3: "Near-surface sampling: discrete, unpumped [auxiliary CTD]"

3.17 Reference table 17: obsolete

This table has been removed.

3.18 Reference table 18: metadata configuration parameter names

All metadata variable names and configuration parameter names are standardized.

The list of metadata variable names (18a) is available at:

- http://www.argodatamgt.org/Documentation under “Argo Metadata Files”, “Metadata variable names”

The list of configuration parameter names (18b) is available at:

- http://www.argodatamgt.org/Documentation under “Argo Metadata Files”, “Configuration parameter names”

If new names are required as new variables are reported by a float, they must be added to this table before they will be accepted.

Please note that in this scheme, configuration parameter values are stored as numerals and therefore any parameters with logical or string input will require an equivalent numeric code to be added to the “Explanation” section of the Configuration parameter names table.

Request for new names can be sent to argo-dm-chairman@jcommops.org for approval and inclusion.

3.19 Reference table 19: STATUS flags

flag	Meaning

0	Value is estimated from pre-deployment information found in the metadata
1	Value is estimated using information not transmitted by the float or by procedures that rely on typical float behavior
2	Value is transmitted by the float
3	Value is directly computed from relevant, transmitted float information
4	Value is determined by satellite
9	Value is not immediately known, but believe it can be estimated later

3.20 Reference table 20: GROUNDED flags

flag	Meaning
Y	Yes, the float touched the ground
B	Yes, the float touched the ground after bathymetry check with an outside database
N	No, the float did not touch the ground
S	Float is known to be drifting at a shallower depth than originally programmed
U	Unknown

3.21 Reference table 21: REPRESENTATIVE_PARK_PRESSURE_STATUS

flag	Meaning
1	Value is the weighted average of pressure measurements regularly sampled during the drift phase and provided by the float
2	Value is the mean value, directly provided by the float, of the pressure measurements regularly sampled during the drift phase
3	Value is the median value, directly provided by the float, of the pressure measurements regularly sampled during the drift phase
4	Value is the pressure measurement sampled at DDST
5	Value is the average of the min and max pressure measurements sampled during the drift phase (the precision is 1 bar)
6	Value is the PARKING_PRESSURE meta-data but the float is programmed to sample measurements during the drift phase (i.e. drift measurement is missing)
7	Value is the PARKING_PRESSURE meta-data for this float which does not achieve any measurement during the drift phase

3.22 Reference Table 22: PLATFORM_FAMILY

Please note that this reference table is frequently updated to include new sensor and float models. You can find the latest version at: http://tinyurl.com/nwpqvp2

Code	Description
FLOAT	Profiling float
FLOAT_COASTAL	Coastal float, i.e. ARVOR-C
FLOAT_DEEP	Profiling Float that is capable of profiling deeper than 2000 dbar
POLAR_OCEAN_PROFILING_SYSTEM	Ice platform that provides meteorological data is paired with a subsurface platform, either a PROVOR CTS-3 or NEMO float tethered along a cable that uses buoyancy to go up and down.
ICE_TETHERED_PROFILER	Surface ice mounted platform that provides meteorological data and subsurface profiler tethered to a cable that uses a motor to go up and down.

3.23 Reference Table 23: PLATFORM_TYPE

Please note that this reference table is frequently updated to include new sensor and float models. You can find the latest version at: http://tinyurl.com/nwpqvp2

PLATFORM_TYPE	PLAFTORM_TYPE_KEY	IXIXIX (1770)	Manufacturer	Description
PALACE	000	831	WRC	Webb Research Corporation – first Argo float model from them
APEX	001	845 846 847	WRC/TWR	Webb Research Corporation/Teledyne Webb APEX float
APEX_EM	005	848	WRC/TWR	Webb Research Corporation/Teledyne Webb APEX ElectroMagnetic float (measures velocity and mixing)
APEX_D	020	849	TWR	Teledyne Webb deep profiling APEX float
APEX_C	010			Not yet manufactured
PROVOR_MT	100	840 841 842	METOCEAN	Metocean PROVOR float
PROVOR	101	840 841 842	MARTEC KANNAD NKE	PROVOR float sold by MARTEC or NKE
ARVOR	102	844	NKE	NKE ARVOR float
PROVOR_II	103	839	NKE	NKE dual board PROVOR float
PROVOR_III	104	?	NKE	NKE dual board PROVOR float new generation
ARVOR_C	110	837	NKE	Coastal ARVOR float
ARVOR_D	120	838	NKE	Deep profiling NKE ARVOR float
SOLO	200	850 851 852	SIO_IDG	Scripps Institution of Oceanography – Instrument Development Group SOLO float
SOLO_W	201	850 851 852	WHOI	Woods Hole Oceanographic Institute SOLO float
SOLO_II	202	853	SIO_IDG	Scripps Institution of Oceanography – Instrument Development Group SOLO-II float
S2A	204	854	MRV	MRV SOLOII float
SOLO_D	220	862	SIO_IDG	Scripps Institution of Oceanography – Instrument Development Group deep SOLO float
NINJA	300	855 856 857 858	TSK	TSK NINJA float
NINJA_D	320	864	TSK	TSK NINJA deep float
NEMO	400	859 860 861	OPTIMARE	OPTIMARE NEMO float
NAVIS_A	500	863	SBE	Seabird NAVIS float
NOVA	600	865	METOCEAN	METOCEAN NOVA float
ALAMO	800	866 867 868	MRV	MRV/WHOI new float
ITP	901	901	WHOI	Ice Tethered Profiler (with modified WHOI moored profiler driven by a traction drive unit)
POPS_PROVOR	130	843	METOCEAN (NKE)	Polar Ocean Profiling System (with PROVOR CTS-3 float)
POPS_NEMO	430	843	OPTIMARE	Polar Ocean Profiling System (with NEMO float)

FLOAT	999			Generic value when unknown

3.24 Reference Table 24: PLATFORM_MAKER

Please note that this reference table is frequently updated to include new sensor and float models. You can find the latest version at: http://tinyurl.com/nwpqvp2

PLATFORM_MAKER	Description
MARTEC	Martec
METOCEAN	MetOcean
MRV	MRV Systems
NKE	NKE Instrumentation
OPTIMARE	Optimare
SBE	Seabird
SIO_IDG	Scripps Institution of Oceanography – Instrument Development Group
TSK	Tsurumi-Seiki Co., Ltd.
TWR	Teledyne Webb Research (formerly Webb Research Corporation)
WHOI	Woods Hole Oceanographic Institution
WRC	Webb Research Corporation

3.25 Reference Table 25: SENSOR

Please note that this reference table is frequently updated to include new sensor and float models. You can find the latest version at: http://tinyurl.com/nwpqvp2

On July 10th 2014, the table 25 content was:

Sensor
ACOUSTIC_GEOLOCATION
ACOUSTIC_PRECIPITATION
CTD_CNDC
CTD_PRES
CTD_TEMP
EM
FLUOROMETER_CDOM
FLUOROMETER_CHLA
IDO_DOXY
OPTODE_DOXY
RADIOMETER_DOWN_IRR
RADIOMETER_PAR
SCATTEROMETER_BBP
SCATTEROMETER_TURBIDITY
SPECTROPHOTOMETER_BISULFIDE
SPECTROPHOTOMETER_NITRATE
STS_CNDC

STS_TEMP
TRANSISTOR_PH
TRANSMISSOMETER_CP

3.26 Reference Table 26: SENSOR_MAKER

Please note that this reference table is frequently updated to include new sensor and float models. You can find the latest version at: http://tinyurl.com/nwpqvp2

SENSOR_MAKER	description
AANDERAA	
AMETEK	
DRUCK	
FSI	
KISTLER	
PAINE	
SBE	
SEASCAN	
WETLABS	Wetlabs Inc.
MBARI	Monterey Bay Aquarium Research Institute
SATLANTIC	
JAC	JFE Advantech Co., Ltd
APL_UW	University of Washington, Applied Pysics Laboratory
TSK	Tsurumi-Seiki Co., Ltd.
RBR	

3.27 Reference Table 27: SENSOR_MODEL

The SENSOR_MODEL variable is standardised, i.e. we expect the manufacturer followed by the standard model number, i.e. SBE41CP or AANDERAA_3830. If there is a version number for a particular model then this is added at the end, i.e. SBE41CP_V1, SBE41CP_V1.2

Please note that this reference table is frequently updated to include new sensor and float models. You can find the latest version at: http://tinyurl.com/nwpqvp2

If your particular sensor model is not in this table please request that it is added: belbeoch@jcommops.org

On July 10th 2014, the table 25 content was:

SENSOR_MODEL	comment
Conductivity/temperature sensors	
FSI	
SBE	
SBE37	

SBE41	
SBE41CP	
SBE41CP_V1	
SBE41CP_V1.2	
SBE41CP_V2	
SBE41CP_V3	
SBE41CP_V3.0a	
SBE41CP_V3.0c	
SBE61CP	new deep Argo "WOCE for life" CTD
CTD_F01	TSK model
RBR	
Oxygen sensors	
SBE43_IDO	Seabird Electrochemical Dissolved Oxygen IDO sensor (volt output)
SBE43I	configuration option
SBE43F_IDO	Seabird Electrochemical Dissolved Oxygen IDO sensor (frequency output)
SBE63_OPTODE	Seabird Optical Dissolved Oxygen Sensor
AANDERAA_OPTODE	
AANDERAA_OPTODE_3830	
AANDERAA_OPTODE_3835	
AANDERAA_OPTODE_3930	
AANDERAA_OPTODE_4330	
AANDERAA_OPTODE_4330F	
ARO_FT	JAC RINKO
Pressure sensors	
DRUCK	
DRUCK_2900PSIA	
PAINE	
PAINE_1500PSIA	
PAINE_1600PSIA	
PAINE_2000PSIA	
PAINE_2900PSIA	
PAINE_3000PSIA	
AMETEK	
KISTLER	
Near Surface conductivity and temperature sensors	
SBE_STS	SBE Near Surface Conductivity and Temperature Module

Biogeochemical sensors	* Note that some biogeochemical sensors have different configurations, i.e. they are either in the pumped stream or not in the pumped stream. Sensor readings from those in the pumped vs unpumped stream can be very different. Some manufacturers do not distinguish this in the sensor model name. In order to capture this information there is a configuration parameter that specifies this, i.e. CONFIG_SensorInPumpedStream_LOGICAL, (Yes =1, No = 0). For the relevant sensors this configuration parameter should be filled in the metadata file for the launch configuration settings.
SUNA	UV absorption to derive nitrate and bisulfide (MBARI)
	UV absorption to derive nitrate and bisulfide (SATLANTIC)
ISUS	Nitrate (MBARI)
SUNA_V2	Nitrate (SATLANTIC)
C_STAR	Transmissometer
C_ROVER	Transmissometer (WETLABS)
DURA	pH (MBARI)
SATLANTIC_OCR500	Multispectral radiometer (SATLANTIC)
SATLANTIC_OCR504	Multispectral radiometer (SATLANTIC)
SATLANTIC_OCR507	Multispectral radiometer (SATLANTIC)
FLBB	Fluoroescence and Backscatter
FLNTU	Fluoroescence and Turbidity
ECO_PUCK	Optical sensor (WETLABS)
ECO_[FL]_[BB]_[BB2]_[TRIPLET]_[CD]_[NTU]_[VSF]	WETLABS optical sensor packages
Other sensors	
RAFOS	Receiver mounted on some floats for geopositioning under ice using RAFOS sound sources in the array in the Weddell Sea (Location derivation is done in Delayed Mode for under ice floats equipped with RAFOS receivers).
PAL_UW	UW Passive acoustic listener
EM	Electromagnetic sensor package to measure velocity

* Note that some biogeochemical sensors have different configurations, i.e. they are either in the pumped stream or not in the pumped stream. Sensor readings from those in the pumped vs unpumped stream can be very different. Some manufacturers do not distinguish this in the sensor model name. In order to capture this information there is a configuration parameter that specifies this, i.e. CONFIG_SensorInPumpedStream_LOGICAL, (Yes =1, No = 0). For the relevant sensors this configuration parameter should be filled in the metadata file for the launch configuration settings.

4 Data access

The whole Argo data set is available in real time and delayed mode from the global data centres (GDACs).
The internet addresses are:

- http://www.usgodae.org/argo/argo.html
- http://www.argodatamgt.org

The FTP addresses are:

- ftp://usgodae.org/pub/outgoing/argo
- ftp://ftp.ifremer.fr/ifremer/argo

The 2 GDACs offer the same data set that is mirrored in real time.
More on GDACs organization:

- http://www.argodatamgt.org/Media/Argo-Data-Management/Argo-Documentation/General-documentation/GDAC-organisation

4.1 File naming convention on GDACs

The GADC ftp sites comply with the following naming conventions.

4.1.1 Core-Argo individual profile files

The individual profile files are provided by the DACs (Data Assembly Centres).

The core-Argo profile files contain the core parameters provided by a float: pressure, temperature, salinity, conductivity (PRES, TEMP, PSAL, CNDC). All additional parameters are managed in B-Argo data files (see §4.1.2).

For floats that collect no more than 1 ascending and 1 descending profile per cycle the file names for individual profiles are <R/D><FloatID>_<XXX><D>.nc where the initial R indicates Real-Time data the initial D indicates Delayed-Mode data XXX is the cycle number the second D indicates a descending profile (profiles without this D are collected during ascent).

4.1.2 B-Argo data file

4.1.2.1 B-Argo individual profile file

A B-Argo profile file contains all the parameters from a float, except the core-Argo parameters temperature, salinity, conductivity (TEMP, PSAL, CNDC). A float that performs only CTD measurements does not have B-Argo data files.

File naming convention

B<R/D><FloatID>_<XXX><D>.nc

- B : B-Argo file prefix
- <R/D><FloatID>_<XXX><D>.nc : identical to Core-Argo file naming convention

Examples: BR1900045_083.nc, BR1900045_083D.nc, BD1900045_003.nc

4.1.2.2 B-Argo individual merged profile file

To facilitate the use of B-Argo data, the GDAC merges each B-Argo file with its corresponding core-Argo data file.

The merged file contains the core-Argo and B-Argo parameters listed on reference table 3. The intermediate parameters are ignored by the merged files.

File naming convention

M<R/D><FloatID>_<XXX><D>.nc

- M : merged B-Argo file prefix
- <R/D><FloatID>_<XXX><D>.nc : identical to Core-Argo file naming convention

Examples: MR1900045_083.nc, MR1900045_083D.nc, MD1900045_003.nc

4.1.3 Core-Argo trajectory data file

The core-Argo trajectory files contain the core parameters provided by a float: pressure, temperature, salinity, conductivity (PRES, TEMP, PSAL, CNDC). All additional parameters are managed in B-Argo data files (see §4.1.2).

<FloatID>_<R/D>traj.nc

- R: real-time data
- D: delayed-mode data

Examples

1900045_Rtraj.nc : real-time trajectory from float 1900045

1900045_Dtraj.nc : delayed-mode trajectory from float 1900045

4.1.4 B-Trajectory data file

4.1.4.1 B-Argo trajectory data file

A B-Argo trajectory file contains all the parameters from a float, except the core-Argo parameters temperature, salinity, conductivity (TEMP, PSAL, CNDC). A float that performs only CTD measurements does not have B-Argo data files.

<FloatID>_B<R/D>traj.nc

- R: real-time data
- D: delayed-mode data

Examples

1900045_BRtraj.nc : real-time trajectory from float 1900045

1900045_BDtraj.nc : delayed-mode trajectory from float 1900045

4.1.4.2 B-Argo trajectory merged data file

To facilitate the use of B-Argo data, the GDAC merges each B-Argo file with its corresponding core-Argo data file. The merged file contains the core-Argo and B-Argo parameters listed on reference table 3. The intermediate parameters are ignored by the merged files.

<FloatID>_M<R/D>traj.nc

- R: real-time data
- D: delayed-mode data

Examples

1900045_MRtraj.nc : real-time trajectory from float 1900045

1900045_MDtraj.nc : delayed-mode trajectory from float 1900045

4.1.5 Metadata file

- <FloatID>_meta.nc
  Example : 1900045_meta.nc

4.1.6 Technical Data file

- <FloatID>_tech.nc
  Example : 1900045_tech.nc

4.2 Other data sources

All Argo data are available from Argo GDACs (Global data centres).

Most Argo data are also available from GTS (Global Telecommunication System), a network operated by WMO (World Meteorological Organization).

On GTS there are 2 formats for Argo profiles:

- TESAC: an Ascii format
- BUFR: a binary format ~~under development~~.

The description of these format is available from the WMO web site:

- http://www.wmo.ch
- http://www.wmo.ch/web/www/DPS/NewCodesTables/WMO306vol-I-1PartA.pdf

5 Using the History section of the Argo netCDF Structure

Within the netCDF format are a number of fields that are used to track the progression of the data through the data system. This section records the processing stages, results of actions that may have altered the original values and information about QC tests performed and failed. The purpose of this document is to describe how to use this section of the format.

The creation of entries in the history section is the same for both profile and trajectory data. The next sections provide examples of what is expected. The information shown in the column labeled "Sample" is what would be written into the associated "Field" name in the netCDF format.

5.1 Recording information about the Delayed Mode QC process

The process of carrying out delayed mode QC may result in adjustments being made to observed variables. The table below shows how to record that the delayed mode QC has been done. Note that the fields HISTORY_SOFTWARE, HISTORY_SOFTWARE_RELEASE and HISTORY_REFERENCE are used together to document the name and version of software used to carry out the delayed QC, and the reference database used in the process. The contents of these three fields are defined locally by the person carrying out the QC.

Example: History entry to record that delayed mode QC has been carried out

Field	Sample	Explanation
HISTORY_INSTITUTION	CI	Selected from the list in reference table 4
HISTORY_STEP	ARSQ	Selected from the list in reference table 12.
HISTORY_SOFTWARE	WJO	This is a locally defined name for the delayed mode QC process employed.
HISTORY_SOFTWARE_RELEASE	1	This is a locally defined indicator that identifies what version of the QC software is being used.
HISTORY_REFERENCE	WOD2001	This is a locally defined name for the reference database used for the delayed mode QC process.
HISTORY_DATE	20030805000000	The year, month, day, hour, minute, second that the process ran
HISTORY_ACTION	IP	Selected from the list in reference table 7
HISTORY_PARAMETER	FillValue	This field does not apply (1)
HISTORY_START_PRES	FillValue	This field does not apply
HISTORY_STOP_PRES	FillValue	This field does not apply
HISTORY_PREVIOUS_VALUE	FillValue	This field does not apply
HISTORY_QCTEST	FillValue	This field does not apply

Note

(1) The present version of delayed mode QC only tests salinity and as such it is tempting to place “PSAL” in the _PARAMETER field. In future, delayed mode QC tests may include tests for temperature, pressure and perhaps other parameters. For this reason, simply addressing the software and version number will tell users what parameters have been tested.

5.2 Recording processing stages

Each entry to record the processing stages has a similar form. An example is provided to show how this is done. Note that reference table 12 contains the present list of processing stages and there should be at least one entry for each of these through which the data have passed. If data pass through one of these steps more than once, an entry for each passage should be written and the variable N_HISTORY updated appropriately.

Some institutions may wish to record more details of what they do. In this case, adding additional "local" entries to table 12 is permissible as long as the meaning is documented and is readily available. These individual additions can be recommended to the wider community for international adoption.

Example: History entry to record decoding of the data.

Field	Sample	Explanation
HISTORY_INSTITUTION	ME	Selected from the list in reference table 4
HISTORY_STEP	ARFM	Selected from the list in reference table 12.
HISTORY_SOFTWARE	FillValue	This field does not apply
HISTORY_SOFTWARE_RELEASE	FillValue	This field does not apply
HISTORY_REFERENCE	FillValue	This field does not apply
HISTORY_DATE	20030805000000	The year, month, day, hour, minute, second that the process ran
HISTORY_ACTION	IP	Selected from the list in reference table 7
HISTORY_PARAMETER	FillValue	This field does not apply
HISTORY_START_PRES	FillValue	This field does not apply
HISTORY_STOP_PRES	FillValue	This field does not apply
HISTORY_PREVIOUS_VALUE	FillValue	This field does not apply
HISTORY_QCTEST	FillValue	This field does not apply

5.3 Recording QC Tests Performed and Failed

The delayed mode QC process is recorded separately from the other QC tests that are performed because of the unique nature of the process and the requirement to record other information about the reference database used. When other tests are performed, such as the automated real-time QC, a group of tests are applied all at once. In this case, instead of recording that each individual test was performed and whether or not the test was failed, it is possible to document all of this in two history records.

The first documents what suite of tests was performed, and the second documents which tests in the suite were failed. A test is failed if the value is considered to be something other than good (i.e. the resulting QC flag is set to anything other than "1"). An example of each is provided. If data pass through QC more than once, an entry for each passage should be written and the variable N_HISTORY updated appropriately.

Example: QC tests performed and failed.

The example shown here records that the data have passed through real-time QC and that two tests failed. The encoding of tests performed is done by adding the ID numbers provided in reference table 11 for all tests performed, then translating this to a hexadecimal number and recording this result.

Record 1: Documenting the tests performed

Field	Sample	Explanation
HISTORY_INSTITUTION	ME	Selected from the list in reference table 4
HISTORY_STEP	ARGQ	Selected from the list in reference table 12.
HISTORY_SOFTWARE	FillValue	This field does not apply
HISTORY_SOFTWARE_RELEASE	FillValue	This field does not apply
HISTORY_REFERENCE	FillValue	This field does not apply
HISTORY_DATE	20030805000000	The year, month, day, hour, minute, second that the process ran
HISTORY_ACTION	QCP$	Selected from the list in reference table 7
HISTORY_PARAMETER	FillValue	This field does not apply
HISTORY_START_PRES	FillValue	This field does not apply
HISTORY_STOP_PRES	FillValue	This field does not apply
HISTORY_PREVIOUS_VALUE	FillValue	This field does not apply
HISTORY_QCTEST	1BE	This is the result of all tests with IDs from 2 to 256 having

		been applied (see reference table 11)

Record 2: Documenting the tests that failed

Field	Sample	Explanation
HISTORY_INSTITUTION	ME	Selected from the list in reference table 4
HISTORY_STEP	ARGQ	Selected from the list in reference table 12.
HISTORY_SOFTWARE	FillValue	This field does not apply
HISTORY_SOFTWARE_RELEASE	FillValue	This field does not apply
HISTORY_REFERENCE	FillValue	This field does not apply
HISTORY_DATE	20030805000000	The year, month, day, hour, minute, second that the process ran
HISTORY_ACTION	QCF$	Selected from the list in reference table 7
HISTORY_PARAMETER	FillValue	This field does not apply
HISTORY_START_PRES	FillValue	This field does not apply
HISTORY_STOP_PRES	FillValue	This field does not apply
HISTORY_PREVIOUS_VALUE	FillValue	This field does not apply
HISTORY_QCTEST	A0	This is the result when data fail tests with IDs of 32 and 128 (see reference table 11)

5.4 Recording changes in values

The PIs have the final word on the content of the data files in the Argo data system. In comparing their data to others there may arise occasions when changes may be required in the data.

We will use the example of recomputation of where the float first surfaced as an example. This computation process can be carried out once all of the messages from a float have been received. Not all real-time processing centres make this computation, but it can be made later on and added to the delayed mode data. If this is the case, we would insert the new position of the profile into the latitude and longitude fields in the profile and we would record the previous values in two history entries. Recording these allows us to return to the original value if we have made an error in the newly computed position. The two history entries would look as follows.

Example: Changed latitude

Field	Sample	Explanation
HISTORY_INSTITUTION	CI	Selected from the list in reference table 4
HISTORY_STEP	ARGQ	Selected from the list in reference table 12.
HISTORY_SOFTWARE	FillValue	This field does not apply
HISTORY_SOFTWARE_RELEASE	FillValue	This field does not apply
HISTORY_REFERENCE	FillValue	This field does not apply
HISTORY_DATE	20030805000000	The year, month, day, hour, minute, second that the process ran
HISTORY_ACTION	CV	Selected from the list in reference table 7
HISTORY_PARAMETER	LAT$	A new entry for reference table 3 created by institution CI to indicate changes have been made in the latitude.
HISTORY_START_PRES	FillValue	This field does not apply
HISTORY_STOP_PRES	FillValue	This field does not apply
HISTORY_PREVIOUS_VALUE	23.456	This is the value of the latitude before the change was made.
HISTORY_QCTEST	FillValue	This field does not apply

Notes

1. Be sure that the new value is recorded in the latitude and longitude of the profile section.
2. Be sure that the POSITION_QC flag is set to “5” to indicate to a user that the value now in the position has been changed from the original one that was there.
3. Be sure to record the previous value in history entries.

It is also sometimes desirable to record changes in quality flags that may arise from reprocessing data through some QC procedures. In this example, assume that whereas prior to the analysis, all temperature values from 75 to 105 dbars were considered correct, after the analysis, they are considered wrong. The history entry to record this would look as follows.

Example: Changed flags

Field	Sample	Explanation
HISTORY_INSTITUTION	CI	Selected from the list in reference table 4
HISTORY_STEP	ARGQ	Selected from the list in reference table 12.
HISTORY_SOFTWARE	FillValue	This field does not apply
HISTORY_SOFTWARE_RELEASE	FillValue	This field does not apply
HISTORY_REFERENCE	FillValue	This field does not apply
HISTORY_DATE	20030805000000	The year, month, day, hour, minute, second that the process ran
HISTORY_ACTION	CF	Selected from the list in reference table 7
HISTORY_PARAMETER	TEMP	Selected from the list in reference table 3
HISTORY_START_PRES	75	Shallowest pressure of action.
HISTORY_STOP_PRES	105	Deepest pressure of action.
HISTORY_PREVIOUS_VALUE	1	This is the value of the quality flag on temperature readings before the change was made.
HISTORY_QCTEST	FillValue	This field does not apply

Notes

1. The new QC flag of “4” (to indicate wrong values) would appear in the <param>_QC field.

6 DAC-GDAC data-management

This chapter describes the data management organization between Argo DACs and GDACS.

6.1 File submission from DAC to GDACs

Each DAC submits regularly all its new files to both USGODAE and Coriolis GDACs.

On both GDACs, each DAC has an ftp account with:

- a submit directory to submit files;
- a reject directory that contains the submitted file that were rejected by GDACs files format checker.

Seven types of files are accepted on GDAC:

- A float metadata file
- A float trajectory file
- A float technical data file
- An float's cycle file
- The DAC's geylist
- A removal file
- A compressed file containing a series of above files

Each GDAC checks the file format. If agreed, the file is pushed on the GDAC ftp server or processed. Otherwise, the file is moved in the reject directory, an error message is sent to the DAC contact point. Rejected files are kept in the reject directory for one month at least.

6.2 Greylist files operations

6.2.1 Greylist definition and management

The greylist is used for real-time operations, to detect a sensor malfunction. It is a list of suspicious or malfunctioning float sensors. It is managed by each DAC and available from both GDAC ftp site at:

- ftp://usgodae.org/pub/outgoing/argo/ar_greylist.txt
- ftp://ftp.ifremer.fr/ifremer/argo/ar_greylist.txt

The greylist is used in real-time QC test 15 to stop the real-time dissemination on the GTS of measurements from a sensor that is not working correctly.

The grey-list test is described in Argo quality control manual:

- http://www.argodatamgt.org/Media/Argo-Data-Management/Argo-Documentation/General-documentation/Argo-Quality-Control-manual-October-2009

Who/when/how to add a float in the greylist

Under the float's PI supervision, a DAC inserts a float in the greylist when a sensor is suspicious or malfunctioning.

For each affected parameter, the start/end date of malfunction is recorded and the value of the real-time QC flag to be applied to each observation of this parameter during that period.

The problem is reported in the ANOMALY field of the meta-data file.

Who/when/how to remove floats from the greylist

In collaboration with the PI of the float, a DAC removes a float from the greylist when delayed mode quality control was performed and the suspicious sensor's observations could be recovered after adjustment.

If the delayed mode quality control decided that the sensor observation cannot be recovered, the float remains in the greylist.

How users should use the greylist

The greylist provides an easy way to get information on suspicious floats.

However, the best information on a float's sensors bad behaviour is recorded in the ANOMALY field of the meta-data file.

~~6.2.2 – Greylist files collection~~

This chapter is transfered in the GDAC cookbook.

~~Each DAC maintains a greylist that is submitted to the GDAC for updates. The DACs greylist are collected by the GDAC and merged into a global Argo greylist.~~

~~Greylist file collection from DAC to GDAC:~~

1. ~~Query xxx_greylist.csv file in each DAC submit directory;~~
   ~~xxx must be identical to the DAC (eg : aoml, coriolis); otherwise the file is rejected.~~
2. ~~Check the format of xxx_greylist.csv . The whole file is rejected is the format check fails.~~
   - ~~Floatid : valid Argo float id; the corresponding meta-data file must exist~~
   - ~~Parameter : PSAL, TEMP, PRES or DOXY~~
   - ~~Start date : YYYYMMDD valid, mandatory~~
   - ~~End date : YYYYMMDD valid, fill value : ','~~
   - ~~Flag : valid argo flag~~
   - ~~Comment : free~~
   - ~~DAC : valid DAC, mandatory~~

3. ~~Remove all the floats of the DAC from the GDAC grey list and add the content of the submitted xxx_greylist.csv file~~

~~Note : after each submission, a copy of the Argo greylist is stored in etc/greylist/ar_greylist.txt_YYYYMMDD~~

~~The global Argo greylist is sorted by DAC, PLATFORM_CODE and START_DATE in alphabetical order.~~

~~6.3 GDAC files removal~~

This chapter is transferred in the "GDAC cookbook"

~~A DAC can ask the GDAC to remove individual profile, trajectory, technical or meta-data files. A "removal file" is submitted to GDAC which will perform the removals.~~

~~The "removal file" contains one line per file to remove.~~

~~"Removal file" collection from DAC to GDAC :~~

- ~~Query xxx_removal.txt file in each DAC submit directory;~~
  ~~xxx must be identical to the DAC (eg : aoml, coriolis); otherwise the file is rejected.~~
- ~~Check the format of xxx_removal.txt . The whole file is rejected is the format check fails.~~
  - ~~File name : valid Argo file name; the corresponding meta-data file must exist for this DAC~~
- ~~Move all the named files from GDAC into a etc/removed directory~~
- ~~The removed files are kept for 3 months in the etc/removed directory and erased after that delay.~~

6.4 Compressed files data distribution

Once a month, a compressed version of dac, geo and latest data directories is distributed on:

- ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-zip/

DAC directory

- One compressed file for each DAC
  Example : ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-zip/dac/aoml.tar.gz
- The compressed index of profile files : ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-zip/dac/ar_index_global_prof.txt.gz

Geo directory

- One compressed file for each ocean
  Example : ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-zip/geo/atlantic_ocean.tar.gz

Latest data directory

- The compressed latest data directory
  ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-zip/latest_data/latest_data.tar.gz

6.5 Archived DOI datasets

A digital object identifier (DOI) is a unique identifier for an electronic document or a dataset. Argo data-management assigns DOIs to its documents and datasets for two main objectives

- Citation: in a publication the DOI is efficiently tracked by bibliographic surveys
- Traceability: the DOI is a direct and permanent link to the document or data set used in a publication

The Argo documents and datasets are listed here:

- http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier

6.6 Compressed files data submission

A DAC can push to GDAC a compressed file containing a series of files. The GDAC will process all its content. This is useful to submit an important batch of files (example : delayed mode data).

The compressed file is a tar-ed file or directory compressed with gzip.

Compressed file naming convention

XXX.tar.gz

- XXX : the compressed file name, with no specific requirement
- tar : tar suffix
- gz : gzip suffix

Example: coriolis-201210-DelayedMode.tar.gz

7 Glossary, definitions

This chapter gives a definition for the items described in this manual.

7.1 Float

An autonomous platform deployed in the sea that performs environmental monitoring.

7.2 Sensor

A sensor is a device used to measure a physical parameter. Sensor outputs are provided in parameter counts and need to be converted in parameter physical units using a calibration equation. This conversion can be done onboard the float or during the decoding process.

7.3 Parameter measured by the sensor

A parameter is a measurement of a physical phenomenon; it can be provided by a sensor (in sensor counts or in physical units) or computed (derived) from other parameters.

7.4 Calibration of the parameter measured by the sensor

Verification of any operation measurement against independent measurements to derive a corrected value or a new parameter.

7.5 Principal Investigator (PI)

The **Principal Investigator (PI)**, typically a scientist at a research institution, maintains the observing platform and the sensors that deliver the data. He or she is responsible for providing the data and all auxiliary information to a **Data Assembly Center (DAC)**.

7.6 Global Data Assembly Centre (GDAC)

The **GDAC** distributes the best copy of the data files. When a higher quality data file (e.g. calibrated data) is available, it replaces the previous version of the data file.

7.7 Data Assembly Centre (DAC)

The **DAC** assembles Argo files and delivers these to the two **Global Data Assembly Centers (GDACs)**.

7.8 GTS

WMO's Global Telecommunication System (GTS) is the communications and data management component that allows the World Weather Watch (WWW) to operate through the collection and distribution of information critical to its processes.

WMO : World Meteorological Organization