Harmonisation of QC and validation procedures of data collected through observation systems

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EXECUTIVE SUMMARY / ABSTRACT

The archive, availability and distribution of the ocean data collected within the framework of PERSEUS is a key issue for the success of the project, and the exchange, archiving and cataloguing of such data is therefore an important component of the research project.

For ocean data management non specialists, it is important to have some guidelines which help data producers to submit their data to existing systems.

This handbook first highlights the importance to submit data in existing systems in order to share them to a wider community.

The European ocean data management infrastructures are described and the link with the Perseus DataBase, which is the final repository for the Perseus data, is made.

Two main ocean data management have been developed at European level:

The SeaDataNet data exchange network of NODCs which make the data circulate in delayed mode

The Copernicus INSTAC (Insitu Thematic Assembling centre) – former MyOcean- which is the main gateway to provide ocean data to modelers and forecasting systems

and this document covers the protocols for submitting and retrieving data either in SeaDatanet and Copernicus or in the Perseus Database

SCOPE

The objective of this « In situ ocean data management handbook » document is to give practical information to an in situ data provider to answer the following questions: "How do I submit my in situ data in near real time and in delayed mode and what are the quality control test to perform?"

This document will be updated on a regular basis and hopefully will be applied for other projects than Perseus

Introduction

The objective of this in situ ocean data management handbook is to provide a simple guide that will enable PERSEUS ocean data providers to upload their in situ ocean data to the existing SES data management system, with the data acknowledged as a PERSEUS data contribution.

The archive, availability and distribution of the ocean data collected within the framework of PERSEUS is a key issue for the success of the project, and the exchange, archiving and cataloguing of such data is therefore an important component of the research project. All PERSEUS partners have committed to the PERSEUS aim of a truly open data access policy with the goal of maximising the exploitation and impact of data collected for both the generation of new knowledge and sustained operations and downstream services. The PERSEUS data policy is intended to increase the success of the project, ensuring that the valuable data collected by researchers are properly archived so they can be effectively analysed, referenced and re-used in future research projects. For further details on the PERSEUS data policy see 'PERSEUS Intellectual Property Rights, Use and Dissemination Rules and Data Policy " (see PERSEUS Description of Work 3.2).

A key focus of the PERSEUS Data policy is the sharing of data and metadata, and the responsible archiving of data and metadata inventories. In this context "metadata" is defined as descriptive information that characterises a set of measurements, distinguishing that dataset from other similar measurement sets. As described within this document, the data collected under specific programs with associated funds, in this case PERSEUS, are identified at a European and Global Ocean data management level as a contribution from a specific program through the allocation to the PERSEUS Project within the metadata.

This handbook covers the protocols for the submission or sharing of both near Real Time (nRT) and Delayed Mode (DM) data, across the range of ocean observing platforms within the PERSEUS Project. Although this handbook is produced within the framework of PERSEUS, the data submission and sharing protocols are based on existing European infrastructure. Thus, this handbook can also act as a general guide for the submission of nRT and DM in situ ocean data across Europe for regional, national or EU projects.

The handbook also covers the protocols for retrieving the available PERSEUS data from the PERSEUS data archive, either through the nRT or DM data management systems, or directly from the PERSEUS web site (www.perseus-fp7.eu).

The handbook is organized as follows: Section 2 contains an overview of ocean data management systems within Europe, Section 3 describes the protocols for nRT data submission and access across the different observing platforms, Section 4 describes the protocols for DM data submission and access across the different observing platforms, Section 5 describes the links between the two data systems, and finally Section 6 contains a summary table for the nRT and DM data submission procedures.

Any suggestions, changes, improvements or enhancements to this document can be sent to Loic Petit de la Villeon (Loic.Petit.De.La.Villeon@ifremer.fr). The latest version of this handbook will always be available on the PERSEUS web site at the following location:

http://www.perseus-net.eu/site/content.php?locale=1&locale_j=en&sel=449

Ocean Data Management: the European context

Within Europe, high importance has been placed on the collection and distribution of ocean data. Copernicus[1], a programme for the establishment of the European capacity for Earth Observation, promotes the access, use and sharing of information and data on a full, free and open basis. The reasons for this are clear and are embedded in the Copernicus strategy

'Environmental information is of crucial importance. It helps to understand how our planet and its climate are changing, the role played by human activities in these changes and how these will influence our daily lives.

The well-being and security of future generations are more than ever dependent on everyone's actions and on the decisions being made today on environmental policies. To take the right actions, decision makers, businesses and citizens must be provided with reliable and up-to-date information on how our planet and its climate are changing.'

The Copernicus data policy states the following:

- No restriction on use or users (commercial and non-commercial)
- A free of charge version of any dataset is always available
- Worldwide access without limitation in time

PERSEUS Data Policy follows that of Copernicus:

Recommendation of a "truly open data access policy" see PERSEUS WP3 (task 3.4)

"data will be available primarily to the Consortium, as well to any interested parties, upon granted permission following the Perseus Intellectual Property Rights Policy-Data Policy and Publication strategy" see PERSEUS WP9 Description of Work

Several initiatives exist within Europe for ocean data management, which are now coordinated under the umbrella of EuroGOOS (European Global Ocean Observing System). EuroGOOS is committed to developing operational oceanography capacity within Europe, within the context of the intergovernmental Global Ocean Observing System (GOOS). The scope of EuroGOOS is wide and its needs are only partially addressed by the on-going development within Copernicus, SeaDataNet and other EU initiatives. It was therefore agreed at the annual EuroGOOS meeting in 2010 in order to improve the quantity, quality and accessibility of marine information, for decision making and to open up new economic in the marine and maritime sectors of Europe, for the benefit of European citizens and the global community. It is essential that the following needs are met:

- opportunities in the marine and maritime sectors of Europe, for the benefit of European citizens and the global community. It is essential that the following needs are met:
- Easy access to data through standard generic tools: easy means of using the data without having to be concerned about data processing who processes them provide this is done in a coherent way and that adequate metadata are available to provide information on how the data were processed.
- To combine in situ-observation data with other information (e.g. satellite images or model outputs) in order to derive new products, build new services or take decisions.

The ocean data management and exchange process within EuroGOOS is intended to reduce duplication of effort among agencies, improve quality and reduce costs related to geographic information, thus making oceanographic data more accessible to the public and helping to establish key partnerships to increase data availability. In addition an EuroGOOS data management system will deliver a system that will fit European needs, in terms of standards and the structure of the contributing organisations. Elements of this structure will include:

Observation data providers, which can be operational agencies, marine research centres, universities, national oceanographic data centres and satellite data centres.

Integrators of marine data such as the MyOcean in-situ data thematic centre or the SeaDataNet National Data Centres Network SeaDataNet and the new European Marine Observation and Data Network (EMODnet) portals.

These integrators support data providers who are willing to share their observation data and users who want to access a range of oceanographic data, encompassing more than one region, a range of data variables and a range of providers. Theyalso develop new services to facilitate access and increase the use of both existing and new observational data.

EMODnet is an initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) as part of the Marine Knowledge 2020 strategy, a consortium of organisations within Europe that assembles marine data, data products and metadata from diverse sources in a uniform way. Currently it is made up of 6 portals: bathymetry, geology, physics, chemistry, biology, and seabed habitats. An additional portal on Human Activities is under construction. The primary portal for in situ oceanographic data, the EMODnet Physical portal is based on three data infrastructure pillars (see fig. 1):

The **SeaDataNet** infrastructure, for quality controlled, long-term time series acquired by all ocean observation initiatives, missions, or experiments

The **MyOcean in situ Thematic Assembling data Centre (TAC)**, for access to near real-time data acquired by continuous, automatic and permanent observation networks

The **EuroGOOS regional operational observing systems (ROOSES)**

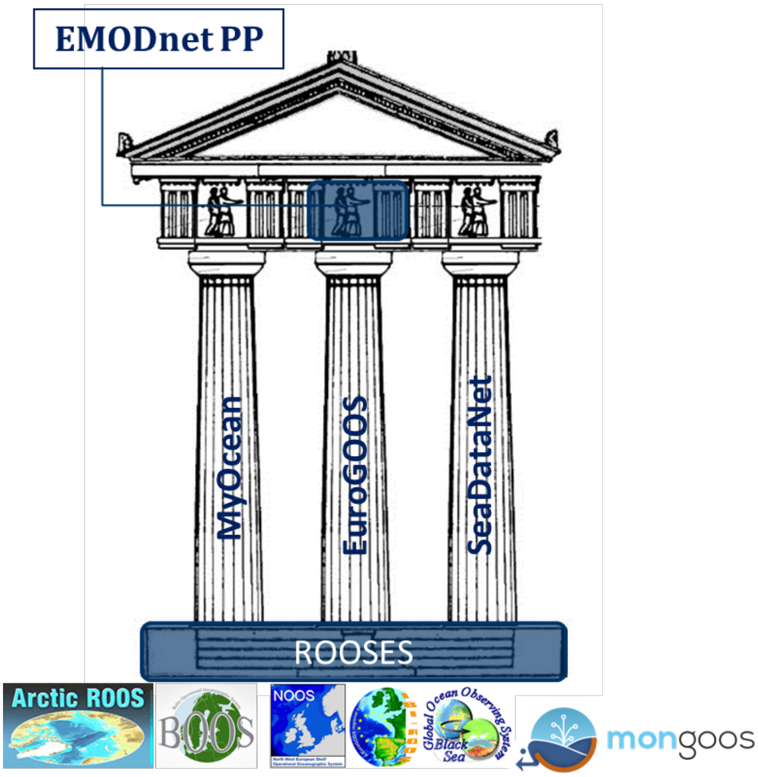

Figure 1: Relationship between SeaDataNet infrastructure, MyOcean in situ TAC, EuroGOOS and EMODnet Physical portal.

The PERSEUS data management system takes advantage of these existing and now cooperating infrastructures for the submission, distribution and access to ocean data collected under the PERSEUS Project. PERSEUS also plays an important role in proving a working model for the coordination of observational oceanographic data submission and access across the SES in nRT and DM:

NRT data will generally be provided to and by the MyOcean/ROOS Thematic Assembly Centres.

DM data will be shared with and through the National Data Centres of the SeaDataNet infrastructure, which has the capability to preserve this data for future use. A cornerstone of this data submission and access model is the identification, as the data is submitted, of the project under which the data is collected. This information travels with the data, in the form of a Metadata field, and enables the identification of data that may have been collected within the framework of specific programs. This data can then be identified at a Global DAC level as a contribution from a specific program. In this manner the data submission process outlined for in situ ocean observations provides a model that is sufficiently general to last beyond the end of PERSEUS project and thus be applicable for future EU projects.

Near Real Time data system

Data description

Near real-time data may have several meanings: 1) data that circulate from the originator to the data centre from a few hours to no later than 30 days after data collection (definition of the WMO –World Meteorological Organization) 2) data acquired by continuous, automatic and permanent observation networks (MyOcean) 3) data that have been passed through an initial quality control check. Their quality can be later enhanced by using more accurate quality checks and and/or calibrations the data may be re-submitted as delayed mode data (see section 4)

QC flags

The QC flag scale described below is applicable for both NRT and DM data.

The quality controlled data are used for various applications in the marine environment. Thus, after the RTQC (Real Time Quality Control) procedure, an extensive use of flags to indicate the data

quality is vital since the end user will select data based on quality flags amongst other criteria.

These flags need to always be included with any data transfer that takes place to maintain standards and to ensure data consistency and reliability. For the QC flags for the parameters described in this

document, an extended scheme is proposed which will be listed below. It is important to note that from this scheme, the codes 0, 1, 4 and 9 are mandatory to apply after the RTQC procedure (marked in red). The same flag scale is recommended by SeaDataNet for delayed mode processing.

Code	Definition
0	No QC was performed
1	Good data
2	Probably good data
3	Bad data that are potentially correctable
4	Bad data
5	Value changed
6	Below detection limit
7	In excess of quoted value
8	Interpolated value
9	Missing value
A	Incomplete information

Table 1: Quality flag scale.
Codes 0-1-4-9 are mandatory after the RTQC procedure.

A clear guidance to the user is necessary:

Data with QC flag = 0 should not be used without a quality control made by the user.

Data with QC flag ≠1 on either position or date should not be used without additional control from the user.

If date and position QC flag = 1

- only measurements with QC flag = 1 can be used safely without further analyses
- if QC flag = 4 then the measurements should be rejected
- if QC flag = 2 the data may be good for some applications but the user should verify this
- if QC flag = 3 the data are not usable but the data centre has some hope to be able to correct them in delayed mode

Quality control flag application policy

The QC flag value assigned by a test cannot override a higher value from a previous test.

Example: a QC flag '4' (bad data) set by Test N (i.e. gradient test) cannot be decreased to QC flag '3' (bad data that are potentially correctable) set by Test N+2 (grey list). A value with QC flag '4' (bad data) or '3' (bad data that are potentially correctable) is ignored by the quality control tests.

(source Eurogoos: Recommendations for *in-situ* data. Near Real time Quality control. DATA-MEQ working group. EG10.19 2010)

Required metadata

Detailed metadata are needed as guidelines to those involved in the collection, processing, QC and exchange of data. The quality controlled data set requires any data type (profiles, time series, trajectories, etc.) to be accompanied by key background information. A detailed metadata
guideline for specific types of data including temperature and salinity measurements can be found in Eaton et al., 2009. Therefore only a short summary of required information is given below:

0. Platform identification. It is highly desirable to be able to identify the observing platform
1. Position of the measurement (latitude, longitude, depth).
2. Date of the measurement (data and time in UTC or clearly specified local time zone).
3. Method of the measurement (e.g. instrument types)
4. Specification of the measurement (e.g. station numbers, cast numbers, platform code, name of the data distribution centre).
5. PI of the measurement (name and institution of the data originator for traceability reasons).
6. Processing of the measurement (e.g. details of processing and calibration already applied, algorithms used to compute derived parameters).
7. Comments on measurement (e.g. problems encountered, comments on data quality, references to applied protocols).

Real time Quality Control for vertical profiles, trajectory files and time series

Source Eurogoos: Recommendations for *in-situ* data. Near Real time Quality control. DATA-MEQ working group. EG10.19 2010.

23 RTQC tests are described below. They are not all applicable to all types of platforms. For each type of platform some, but not all, tests must be applied.

RTQC1: Platform identification

Every centre handling GTS data and posting them to the GTS will need to prepare a metadata file for each platform (float) and in this is the WMO number that matches to each platform (float) ptt (platform transmitter terminal). There is no reason why, except because of a mistake, an unknown float ID should appear on the GTS.

RTQC2: Impossible date test

The test requires that the observation date and time from the profile data are sensible.

- Year greater than 1950
- Month in range 1 to 12
- Day in range expected for month
- Hour in range 0 to 23

- Minute in range 0 to 59

If any one of the conditions fails, the date should be flagged as bad data.

RTQC3: Impossible location test

The test requires that the observation latitude and longitude from the profile data be sensible.

- Latitude in range –90 to 90
- Longitude in range –180 to 180

If either latitude or longitude fails, the position should be flagged as bad data.

RTQC4: Position on land test

The test requires that the observation latitude and longitude from the profile measurement be located in an ocean. Use can be made of any file that allows an automatic test to see if data are located on land. We suggest use of at least the 2-minute bathymetry file that is generally available. This is commonly called and can be downloaded from http://www.ngdc.noaa.gov/mgg/global/etopo2.html

If the data cannot be located in an ocean, the position should be flagged as bad data.

RTQC5: Impossible speed test (applies only to GTS data and Argo)

Drift speeds for floats can be generated given the positions and times of the floats when they are at the surface and between profiles. In all cases we would not expect the drift speed to exceed 3 m/s. If

it does, it means either a position or time is bad data, or a float is mislabelled. Using the multiple positions that are normally available for a float while at the surface, it is often possible to isolate

the one position or time that is in error.

If an acceptable position and time can be used from the available suite, then the data can be distributed. Otherwise, flag the position, the time, or both as bad data.

Platform_type	MAX_SPEED (knots)
GLIDER	10
SEA MAMMAL, ANIMAL	10
SUBMERSIBLE	10
SHIP OF OPPORTUNITY	25
RESEARCH SHIP	25
BUOY/MOORING: SURFACE, MOORED	2
BUOY/MOORING: SURFACE, DRIFTING	3
Argo floats	2
Profiling float, prototype	2

Table 2: Example. Max speed applied at Coriolis for speed tests

RTQC5a: Speed range test

This test includes both a test for maximum speed and another one for minimum speed (some ferrybox systems are turned off at lower ship speed in order to avoid pumping of particles in harbours). Threshold values will depend on the ship capabilities and the area of navigation. This test replaces the impossible speed test.

RTQC6: Global range test

This test applies a gross filter on observed values for temperature and salinity. It needs to accommodate all of the expected extremes encountered in the oceans.

- Temperature in range –2.5°C to 40.0°C
- Salinity in range 2 to 41.0

If a value fails, it should be flagged as bad data. If temperature and salinity values at the same depth both fail, both values should be flagged as bad.

RTQC7: Regional range test

This test applies only to certain regions of the world where conditions can be further qualified. In

this case, specific ranges for observations from the Mediterranean and Red Seas further restrict what are considered sensible values.

The Red Sea is defined by the region 10N, 40E; 20N, 50E;
30N, 30E; 10N, 40E and the Mediterranean Sea by the region 30N, 6W; 30N, 40E; 40N, 35E; 42N, 20E; 50N, 15E; 40N, 5E; 30N, 6W.
Individual values that fail these ranges should be flagged as bad data.
Red Sea

- Temperature in range 21.7°C to 40.0°C
- Salinity in range 2.0 to 41.0

Mediterranean Sea
- Temperature in range 10.0°C to 40.0°C
- Salinity in range 2.0 to 40.0

North Western Shelves (from 60N to 50N and 20W to 10E)
- Temperature in range –2.0°C to 24.0°C
- Salinity in range 0.0 to 37.0

South West Shelves (From 25N to 50N and 30W to 0W)
- Temperature in range –2.0°C to 30.0°C
- Salinity in range 0.0 to 38.0

Arctic Sea (above 60N)
- Temperature in range –1.92°C to 25.0°C
- Salinity in range 2.0 to 40.0

RTQC8: Pressure increasing test

This test requires that the profile has pressures that are monotonically increasing (assuming the pressures are ordered from smallest to largest).

If there is a region of constant pressure, all but the first of a consecutive set of constant pressures should be flagged as bad data. If there is a region where pressure reverses, all of the pressures in the reversed part of the profile should be flagged as bad data.

RTQC8a: Instrument sensor range test

Previous tests have checked if the measurements lie inside the oceanographic limits. This test requires that the profile lies inside the instrument sensor limits.
- Temperature in range -2.5°C to 40.0°C
- Salinity in range 2.0 to 41.0
- Conductivity in range 1.9 mS/cm to 79.7 mS/cm

If a value fails this test, it should be flagged as bad data.

RTQC9: Spike test

A large difference between sequential measurements, where one measurement is quite different from adjacent ones, is a spike in both size and gradient. The test does not consider the differences in depth, but assumes a sampling that dequately reproduces the temperature and salinity

changes with depth. The algorithm is used on both the temperature and salinity profiles:

Test value = | V2 – (V3 + V1)/2 | – | (V3 – V1) / 2 |

where V2 is the measurement being tested as a spike, and V1 and V3 are the values above and below.

Temperature
The V2 value is flagged when
- the test value exceeds 6.0°C for pressures less than 500 db or
- the test value exceeds 2.0°C for pressures greater than or equal to 500 db
Salinity
The V2 value is flagged when
- the test value exceeds 0.9 for pressures less than 500 db or
- the test value exceeds 0.3 for pressures greater than or equal to 500 db
Values that fail the spike test should be flagged as bad data. If temperature and salinity values at the same depth both fail, they should be flagged as bad data.

RTQC9a: Spike test (drifters)

The position data are edited through an automatic procedure. The criteria are based on a maximum

distance of 1000 m, a maximum speed of 150 cm/s and a maximum angle of 45 degrees, between

successive points. This means that the longitude and latitude of a point are removed if

i) the distances to the previous and successive points are greater than the limit

ii) the previous or the successive velocities are greater than the limit and

iii) the angles formed with the previous and successive points are both within 180+/−45 degrees.

This procedure is iterated twice.

Values that fail the spike test are rejected

RTQC10: Bottom Spike test (XBT only)

This is a special version of the spike test, which compares the measurements at the end of the profile to the adjacent measurement.

Temperature at the bottom should not differ from the adjacent measurement by more than 1°C.

Values that fail the test should be flagged as bad data.

RTQC11: Gradient test

This test is failed when the difference between vertically adjacent measurements is too steep. The

test does not consider the differences in depth, but assumes a sampling that adequately reproduces the temperature and salinity changes with depth. The algorithm is used on both the temperature and

salinity profiles:

Test value = | V2 – (V3 + V1)/2 | where V2 is the measurement being tested as a spike, and V1 and V3 are the values above and below.

Temperature

The V2 value is flagged when

- the test value exceeds 9.0°C for pressures less than 500 db or
- the test value exceeds 3.0°C for pressures greater than or equal to 500 db

Salinity

The V2 value is flagged when

- the test value exceeds 1.5 for pressures less than 500 db or
- the test value exceeds 0.5 for pressures greater than or equal to 500 db

Values that fail the test (i.e. value V2) should be flagged as bad data. If temperature and salinity values at the same depth both fail, they should both be flagged as bad data.

RTQC11a: Horizontal gradient test

Horizontal gradient tests must take into account the distance between adjacent measurements. This will depend on ship speed and data logging frequency.

Moreover, only adjacent data measured at expected intervals should be taken into account in the test. This test includes testing of spikes. Threshold values are likely to depend very much on regional specifications.

RTQC12: Digit rollover test

Only so many bits are allowed to store temperature and salinity values in a sensor. This range is not always large enough to accommodate conditions that are encountered in the ocean. When the range is exceeded, stored values roll over to the lower end of the range. This rollover should be detected and compensated for when profiles are constructed from the data stream from the instrument. This test is used to ensure the rollover was properly detected.

- Temperature difference between adjacent depths > 10°C
- Salinity difference between adjacent depths >0. 5

Values that fail the test should be flagged as bad data. If temperature and salinity values at the same depth both fail, both values should be flagged as bad data.

RTQC13: Stuck value test

This test looks for all measurements of temperature or salinity in a profile being identical.

If this occurs, all of the values of the affected variable should be flagged as bad data. If temperature and salinity are affected, all observed values are flagged as bad data.

RTQC14: Density inversion

This test uses values of temperature and salinity at the same pressure level and computes the density (sigma0). The algorithm published in UNESCO Technical Papers in Marine Science #44, 1983 should be used. Densities (sigma0) are compared at consecutive levels in a profile, in both directions, i.e. from top to bottom profile, and from bottom to top. Small inversion, below a threshold that can be region dependant, is allowed.

RTQC15: Grey list(Argo only)

This test is implemented to stop the real-time dissemination of measurements from a sensor that is not working correctly. The grey list contains the following 7 items:

- Float Id
- Parameter: name of the grey listed parameter
- Start date: from that date, all measurements for this parameter are flagged as bad or probably bad
- End date: from that date, measurements are not flagged as bad or probably bad
- Flag: value of the flag to be applied to all measurements of the parameter
- Comment: comment from the PI on the problem
- DAC: data assembly centre for this float. Each DAC manages a black list, sent to the GDACs. The merged black-list is available from the GDACs. The decision to insert a float parameter in the grey list comes from the PI.

RTQC16: Gross salinity or temperature sensor drift (Argo only)

This test is implemented to detect a sudden and significant sensor drift. It calculates the average salinity on the last 100 dbar on a profile and the previous good profile. Only measurements with good QC are used.

If the difference between the two average values is more than 0.5 psu then all measurements for this parameter are flagged as probably bad data (flag '3'). The same test is applied for temperature: if the difference between the two average values is more than 1°C then all measurements for this parameter are flagged as probably bad data (flag '3').

RTQC17: Frozen profile test

This test can detect an instrument that reproduces the same profile (with very small deviations) over and over again. Typically the differences between two profiles are of the order of 0.001 for salinity and of the order of 0.01 for temperature.

A. Derive temperature and salinity profiles by averaging the original profiles to get mean values for each profile in 50 dbar slabs (Tprof, T_previous_prof and Sprof, S_previous_prof).

This is necessary because the instruments do not sample at the same level for each profile.

B. Subtract the two resulting profiles for temperature and salinity to get absolute difference profiles:

- deltaT = abs(Tprof – T_previous_prof)
- deltaS = abs(Sprof – S_previous_prof)

C. Derive the maximum, minimum and mean of the absolute differences for temperature and salinity:

- mean(deltaT), max(deltaT), min(deltaT)
- mean(deltaS), max(deltaS), min(deltaS)

D. To fail the test requires that:

- max(deltaT) < 0.3 °C
- min(deltaT) < 0.001 °C
- mean(deltaT) < 0.02 °C
- max(deltaS) < 0.3 psu
- min(deltaS) < 0.001 psu
- mean(deltaS) < 0.004 psu

If a profile fails this test, all measurements for this profile are flagged as bad data (flag '4'). If the float fails the test on 5 consecutive cycles, it is inserted in the grey-list.

RTQC17a: Frozen trajectory test

RTQC18: Deepest pressure test

This test requires that the profile has pressures that are not higher than DEEPEST_PRESSURE plus

10%. The DEEPEST_PRESSURE value comes from the meta-data file of the instrument.

If there is a region of incorrect pressures, all pressures and corresponding measurements should be flagged as bad data.

RTQC19: Rate of change in time

The aim of the check is to verify the rate of the change in time. It is based on the difference between the current value with the previous and next ones. Failure of a rate of the change test is ascribed to the current data point of the set.

Temperature and salinity values are flagged if

$|V_i - V_{i-1}| + |V_i - V_{i+1}| \leq 2\times(2\times\sigma V)$

where V iis the current value of the parameter, V_{i-1} is the previous and V_{i+1} the next one. σVis the standard deviation of the examined parameter. If the one parameter is missing, the relative part of the formula is omitted and the comparison term reduces to 2×σV. The standard deviation is calculated from the first month of significant data of the time series.

RTQC20: Frozen date/location/speed test

This tests checks whether the navigation system is updating.

RTQC21: Pump or flow-meter test

The state of the pump should be tested, or alternatively a test of the flow-rate measured by the flow-meter, when available on the ferrybox system, should be performed.

RTQC22: Pump history test

The pump should be working during a minimal period after it has been stopped in order to make sure water in the system has been renewed. The correct threshold value will depend on the pump capacity and system design.

RTQC23: Drogue test

Drifters are equipped with a submergence sensor or a tether strain sensor to verify the presence of the drogue. Each transmission received must contain information about the presence/absence of the drogue.

Data should be flagged appropriately (see drifter paragraph) to indicate the presence/absence of the drogue.