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Coriolis data centre

Coriolis-données

In-situ data quality control
Contrôle qualité des données in-situ

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In-situ data quality control procedures Contrôle qualité des données in-situ

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Résumé :

Ce document décrit l'ensemble des tests de contrôle qualité appliqués aux données gérées par le centre de données Coriolis

Abstract :

This document describes the quality control tests applied on the in situ data processed at the Coriolis Data Centre

Mots-clés :

Contrôle qualité. Flotteurs Argo, XBT. Thermosalinomètres.

Keywords :

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1. Coriolis data centre quality control procedures

The role of Coriolis data centre is to collect, control and distribute in-situ data for operational oceanography. The data controlled are mainly :

- Temperature and salinity profiles from XBT, CTD, Argo floats, buoys and moorings,
- Sea surface temperature and salinity from thermosalinographs, Argo floats and buoys.

1.1. Quality control flag scale

Quality control flags are applied by Coriolis data centre. Final users should read and use carefully those flags be sure that only good quality data are used (ie only flag 1 data should be assimilated in models).

Code	Meaning
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	Not used
7	Not used
8	Interpolated value
9	Missing value

The quality flags are applied following procedures described in this document.

1.2. Guidance to users

- Data with QC flag=0 should not be used without a quality control made by the user
- Data with QC flag \neq 1 on either position or date should not be used without additional control from the user
- If Data and position QC flag=1
 - only measurements r with QC flag=1 can be used safely.
 - If QC Flag=4 measurements should be rejected
 - If QC flag =2 the data may be good for some applications but the user should verify
 - If QC Flag=3 the data are not usable but the data center has some hope to be able to correct them in delay mode .

2. Argo floats quality control

Coriolis data center is a data assembly center (DAC) for French and Europeans Argo floats. The detailed description of Argo data management and QC procedures described in Argo user's manual is available at : <http://www.coriolis.eu.org/coriolis/cdc/argo/argo-dm-user-manual.pdf> .

The following steps are performed to process Coriolis Argo floats data :

- Decoding
- Automatic QC (2.1)
- Automatic GTS distribution (2.2)
- Visual QC (2.3)
- Objective analysis, residual analysis (2.6)
- Distribution to the Argo community (GDAC) (2.4)
- Distribution to modelers (2.5 & 2.7)

2.1. Argo real-time QC

The Argo project defined a series of automated tests that are applied in real-time :

- test 1: Platform Identification
- test 2: Impossible Date Test
- test 3: Impossible Location Test
- test 4: Position on Land Test
- test 5: Impossible Speed Test
- test 6: Global Range Test
- test 7: Regional Global Parameter Test for Red Sea and Mediterranean Sea
- test 8: Pressure Increasing Test
- test 9: Spike Test
- test 10: Top and Bottom Spike Test
- test 11: Gradient Test
- test 12: Digit Rollover Test
- test 13: Stuck Value Test
- test 14: Density Inversion
- test 15: Grey List
- test 16: Gross salinity or temperature sensor drift

Argo real-time qc procedures are available at : <http://www.coriolis.eu.org/coriolis/cdc/argo/argo-real-time-qc.pdf>

2.2. Automated GTS distribution

Every 2 hours, the measurements with QC Flag=1 are inserted on the GTS.

2.3. Visual QC

A visual quality control is performed by an operator on all profiles with bad or probably bad data.

The main functions performed Coriolis Visual Quality Control (CVQC) are :

- Display the profiles of a station
- Change profile quality flags

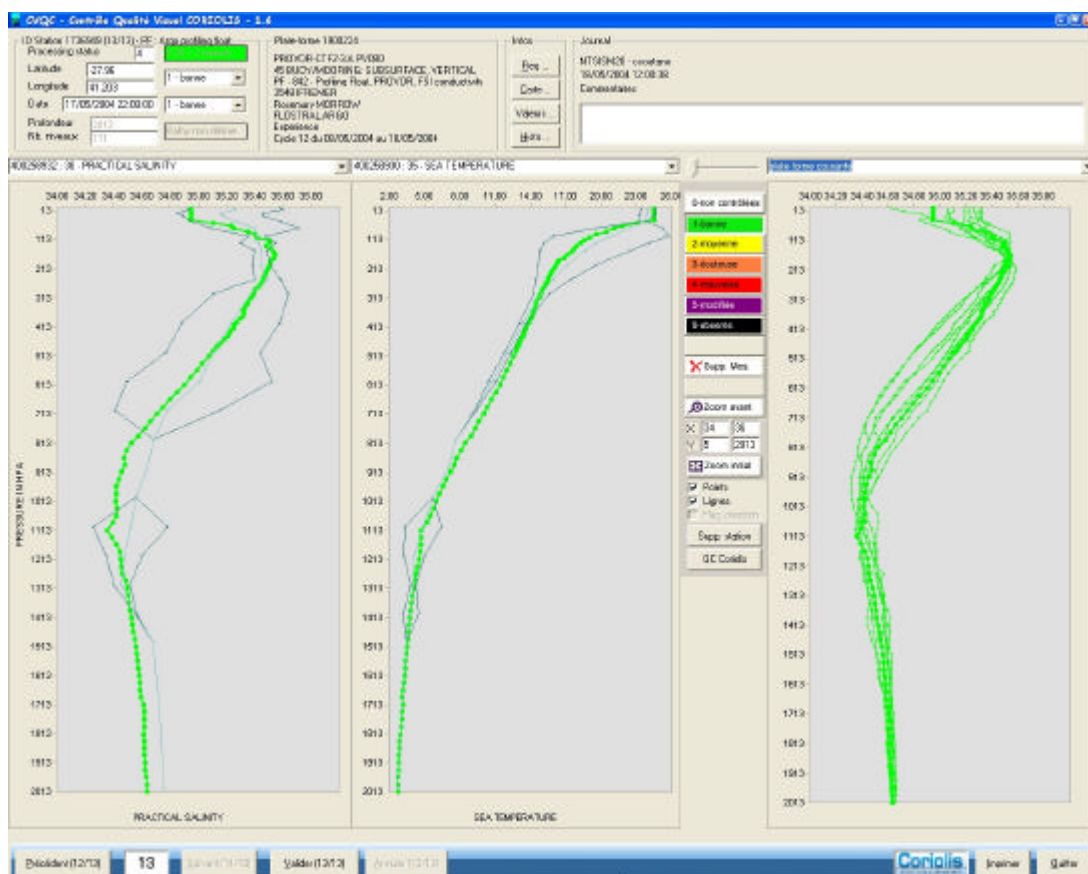
- ❑ Compare current profile to neighbouring profiles
- ❑ Display ancillary information of a station, meta-data
- ❑ Apply automatic quality control on a station (for no-controlled data)

CVQC provides additional information :

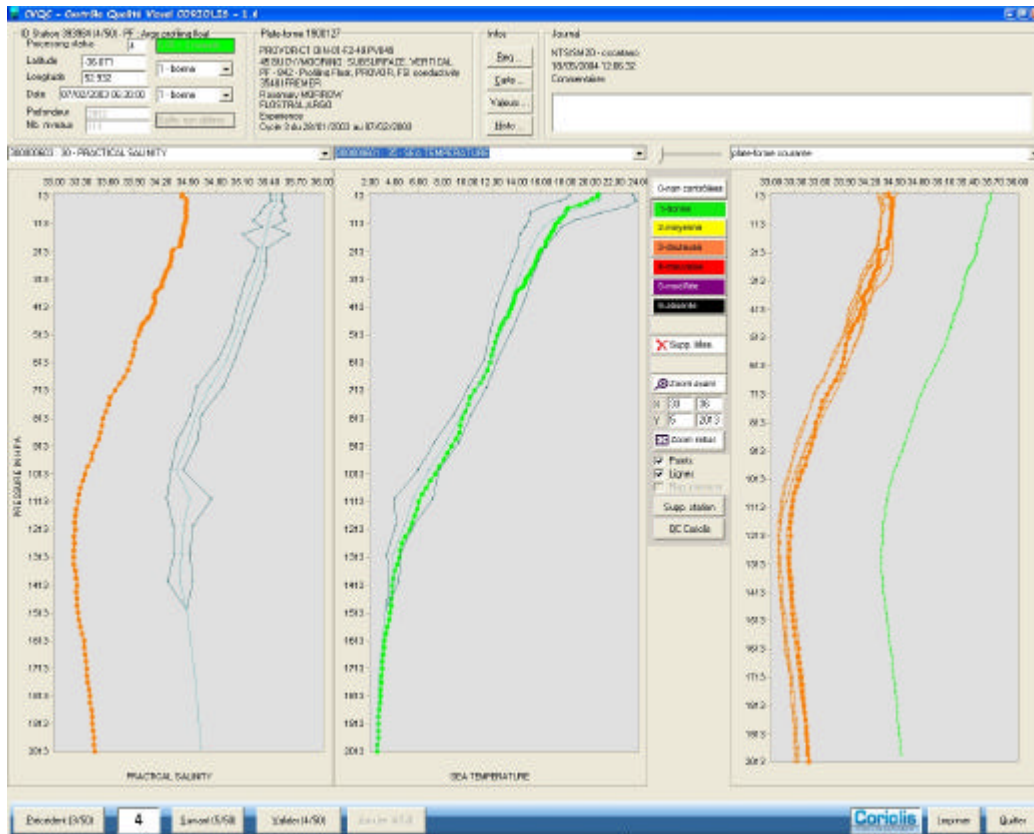
- ❑ Control of the platform speed
- ❑ Control of the density profile
- ❑ Display of T/S diagrams

The Coriolis Visual Quality Control manual is available at :

<http://www.coriolis.eu.org/coriolis/cdc/documents/cordo-dsf-02-122.pdf>



CVQC : visual quality control for an Argo float (temperature and salinity vertical profile)
The profile is compared with the climatology and associated standard deviation.



CVQC : visual quality control for an Argo float with a salinity sensor error (profile rejected on test 16 : Jump Test)

2.4. Daily distribution : GDAC and models

An automated distribution of data to Argo Global Data Center (GDAC) is performed on a daily basis. All measurements qualified by flags are available together with metadata, surface and drift measurements and history comments.

All these data are available from Coriolis ftp site :

<http://ftp.ifremer.fr/ifremer/argo/>

2.5. Objective analysis

An objective analysis is performed on Atlantic ocean with all data available including Argo floats, XBT, CTD, drifters and fixed point stations. The data analysis system is based on optimal estimation methods (Bretherton et al., 1975). The residuals computed by the analysis are screened to detect gross errors and set the quality flag associated to the data. This methods combines the advantage of a collocation method since it takes into account all neighbouring sensors, and the comparison with a climatology (introduced as a priori statistics).

Each day (except week-end), a daily procedure of the bad QC alert is applied by an operator. In addition, the alert procedure is also applied before weekly distribution(10 profiles among 1200 are screened each day).

The operational version is planned to operate daily over the world ocean and include more data types such as surface data from thermosalinometers and SVP drifters.

2.6. Weekly distribution : models and GDAC

A distribution of in-situ data for Mercator model is performed once a week. All measurements qualified by flags are available together with metadata, surface and drift measurements and history comments. These data are available for other operational centers at <ftp://ftp.ifremer.fr/ifremer/coriolis/mercator/>.

The distributed data passed all the previously described quality control procedures (automated qc, visual qc, objective analyses).

The Argo data with flags updated by the objective analysis are re-distributed to GDAC once a week.

3. XBT, CTD quality control

Coriolis receive in real-time temperature and salinity vertical profiles from XBT, XCTD and CTD launched from various ships (research vessels, commercial vessels).

The same steps of quality controls are applied on these data and Argo data. However, the grey list automatic test is not applied on moorings or buoys. Only T and S parameters are qualified by Coriolis.

XBT and CTD data flow :

- Decoding
- Automatic QC
- Automatic GTS distribution
- Visual QC
- Objective analysis, residual analysis
- Distribution to modelers

4. Glider quality control

Glider data received by Coriolis are processed as vertical profiles.
The quality controls is identical to XBT and CTD QC.

Glider data flow :

- Decoding
- Automatic QC
- Automatic GTS distribution
- Visual QC
- Objective analysis, residual analysis
- Distribution to modelers

5. Times series quality control

Coriolis receives data from moorings or buoys (OceanSites, TAO/Triton/Pirata, DBCP).

When time series data are controlled by the project provider (ex : Animate, M3A), no additional quality control is performed by Coriolis.

When time series data are collected without QC, Coriolis applies automatic and visual quality control.

Coriolis automatic quality controls from time-series :

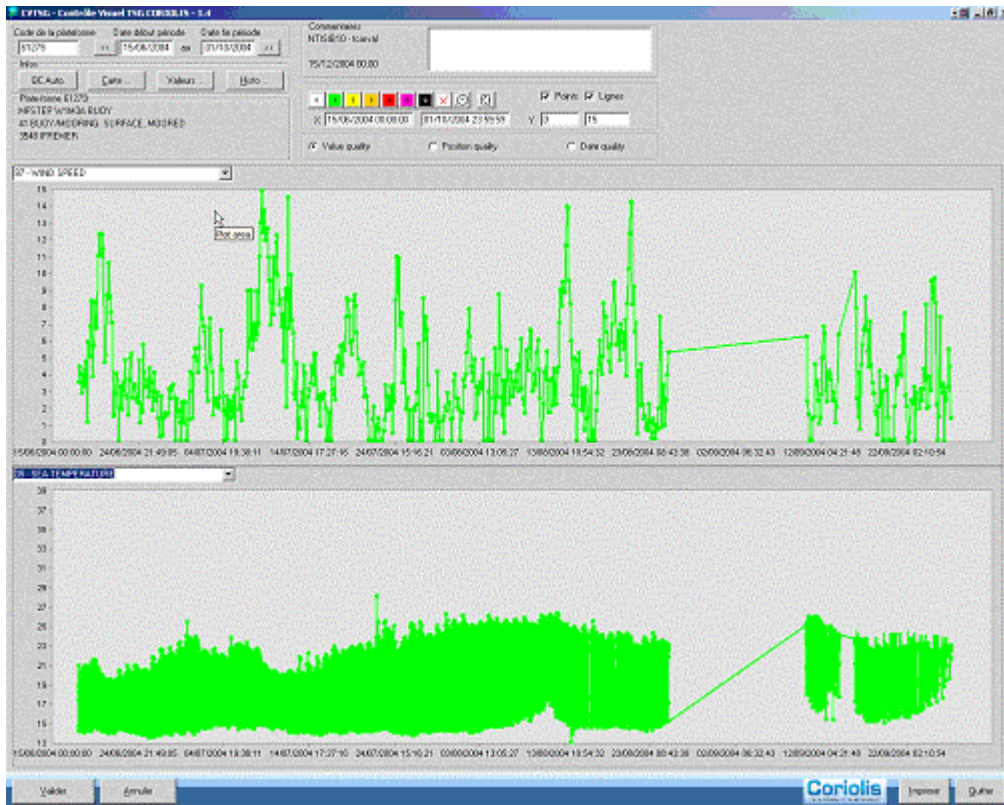
- test 1: Platform Identification
- test 2: Impossible Date Test
- test 3: Impossible Location Test
- test 4: Position on Land Test
- test 5: Impossible Speed Test
- test 6: Global Range Test
- test 7: Regional Global Parameter Test for Red Sea and Mediterranean Sea
- test 8: Spike Test
- test 10: Climatology

Coriolis visual quality control :

Time series and trajectory data are visually controlled by an operator with CVTSG software.

Detailed description of CVTSG software are available at :

http://www.coriolis.eu.org/coriolis/cdc/documents/coriolis_cvtsg_quality_control.pdf



CVTSG software for time series visual QC

Time series data flow :

- Decoding
- Automatic QC
- Automatic GTS distribution
- Visual QC
- Objective analysis, residual analysis
- Distribution to modelers

6. Thermosalinograph quality control

Coriolis receives in real-time sea surface salinity and temperature measurements from thermosalinograph (TSG) operated from research or commercial vessels. The quality control of TSG data is follows the policy of the GOSUD project of IOC (Global Ocean Surface Underway Data).

TSG data flow :

- Data collect
- Automatic QC (5.1)
- Automatic GTS distribution (5.2)
- Visual QC (5.3)

The Gosud data management user's manual is available at :
<http://www.ifremer.fr/sismer/program/gosud/doc/gosud-dm-user-manual.doc>

The Gosud real-time QC manual is available at :
<http://www.ifremer.fr/sismer/program/gosud/doc/gosud-real-time-qc.doc>

6.1. Gosud real-time QC

The Gosud project defined a series of automated tests that are applied in real-time on daily datasets transmitted at shore by the vessels:

- test 1: Platform Identification
- test 2: Impossible Date Test
- test 3: Impossible Location Test
- test 4: Position on Land Test
- test 5: Impossible Speed Test
- test 6: Global Range Test
- test 7: Regional Global Parameter Test for Red Sea and Mediterranean Sea
- test 8: Spike Test
- test 9: Gradient Test
- test 10: Climatology
- test 11 : Instrument comparison

6.2. GTS distribution

Immediately after real-time QC, TSG data with QC Flag=1 are automatically distributed on GTS (World Meteorological Organization network).

6.3. Visual QC

At least once a week, an operator performs a visual quality control. Coriolis Visual TSG (CVTSG) main features are :

- Display the observations performed along the track of the ship
- Change locations and observations quality flags
- Display ancillary information of a track and meta-data,
- Apply automatic quality control on a track of a few days

CVTSG provides additional information :

- Control of the platform speed
- Control of the difference between the water intake temperature and the TSG tank temperature



CVTSG : visual qc performed on TSG data from Marion Dufresne research vessel (Data not colored in green need to be visually checked).