Gosud data management

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GOSUD REAL-TIME QC

Version 1.0

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History

Version	Date	Comment
0.9	04/11/2003	Thierry Carval : creation of the document, based on Argo real-time QC manual
1.0	04/11/2003	Version 0.9 is adopted as version 1.0 during Gosud Monterey meeting, USA

1. Introduction

This document will be part of the Gosud data user’s manual.

The purpose of the real time quality control is to distribute trajectory data to users who need measurements as "fresh" as possible. This includes modeling centers for assimilation or TSG operators for technical feedback. To guaranty a minimal delay of distribution, without interruptions of the data flow, the real time QC is designed to be entirely automated.

After real-time QC, a visual QC and calibrations are necessary for distribution to users who need a high quality data set such as for climate studies.

2. Real-time QC tests

Gosud real-time quality control tests

Test 1 : platform identification
The platform must have a valid WMO number and has to be described in the meta-data.
If the test fails, all measurements remain flagged as 0 (no quality control performed).

Test 2 : impossible date
The date and time of an observation has to be sensible.
- Year on 4 digits
- 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 is failed, the date should be flagged as wrong and none of the data from the profile should be distributed in real-time.

Test 3 : impossible location
The test requires that the observation latitude and longitude from the platform 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 wrong and none of the data from the float should be distributed.

Test 4 : Position on Land Test
The test requires that the observation latitude and longitude from the platform 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 5-minute bathymetry file that is generally available. This is commonly called ETOPO5/TerrainBase and can be downloaded from http://www.ngdc.noaa.gov/mgg/global/global.html
If the data are cannot be located in an ocean, the position should be flagged as wrong.

Test 5 : impossible speed
The speed between 2 observations cannot exceed a limit fixed per platform. If the speed is higher than permitted, the location, date or identification of the platform may be incorrect. The speed is calculated between an observation and the previous one. If there is no previous observation, the test is correct.
If the test fails, location and date are flagged as wrong.

Test 6 : global ranges
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 to 45.0 degrees C
- Salinity in range 0.0 to 60 PSU

If a value fails, it should be flagged as wrong.

Test 7 : regional ranges
This test applies to only 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.
- Red Sea
  Temperature in range 21.7 to 40.0
  Salinity in range 0.0 to 41.0
- Mediterranean Sea
  Temperature in range 10.0 to 40
  Salinity in range 0.0 to 40.0

Individual values that fail these ranges should be flagged as wrong.

Test 8 : spike test
Differences between sequential measurements, where one measurement is quite different than adjacent ones, is a spike in both size and gradient.
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 previous and next.
- Temperature: The V2 value is flagged when the test value exceeds 6.0 degree C.
- Salinity: The V2 value is flagged when the test value exceeds 0.9 PSU

Values that fail the spike test should be flagged as wrong and should not be distributed.

Test 9 : gradient
This test is failed when the difference between adjacent measurements is too steep.
Test value = $| V2 - (V3 + V1)/2 |$
where V2 is the measurement being tested as a spike, and V1 and V3 are the previous and next values.

- Temperature: The V2 value is flagged when the test value exceeds 9.0 degree C.
- Salinity: The V2 value is flagged when the test value exceeds 1.5 PSU

Values that fail the test (i.e. value V2) should be flagged as wrong.

Test 10 : climatology
Each measurement is compared to a climatology.
The test fails if | V1 – V2 | > 3 * Sigma

- V1 : value to be controlled
- V2 : value of the climatology
- Sigma : standard deviation of the climatology

The climatology is Levitus, 1998, 1°x1°, monthly.
If the test fails, the data is flagged as "out of statistics" (flag 2). However, the data can be distributed.

Test 11 : instrument comparison
If two different sensors measure a same parameter, the difference between 2 measurements should not be greater than a fixed limit.
Example : on research vessels the difference between the temperature of the tank of the TSG and the measurement of the hull monted temperature sensor should be less than 1° Celsius.
If the test fails, the measurements of both sensors are flagged as wrong.