

Quality Control for PIRATA Hydrography

Version 1.1

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This document describes the quality control procedures for the hydrographic data from the PIRATA cruises, and distributed by CPTEC/INPE. The data is checked against all the steps and flagged adequately. The distributed data is qualified on all the tests described bellow.

1 Tests

Step : Impossible date

The date and time of an observation have to be correct.

- Year on 4 digits
- Month in the range 1 to 12
- Day in a range expected for the corresponding month
- Hour in the range 0 to 23
- Minute in the range 0 to 59
- Second in the range 0 to 59

Bad data: flag F. Good data: T.

Step : Impossible location

This test requires correct latitude and longitude values for the observations.

- Latitude within the range -90 to 90
- Longitude within the range -180 to 180

Bad data: flag F. Good data: T.

Step : Position on Land step

This test requires that the observation latitude and longitude from the profile measurement be located in an ocean. The ETOPO2/TerrainBase file is used to see if each data point is located at sea.

Bad data: flag F. Good data: T.

ETOPO2

Step : 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 within range 2.5 to 45.0 °C.
- Salinity within range 0.0 to 60.

Bad data: flag F. Good data: T.

Step : Spike test

A difference between sequential measurements, where one measurement is quite different than adjacent ones, is a spike in both size and gradient.

Test value=

$$\left| V_2 - \frac{(V_3 + V_1)}{2} \right| - \left| \frac{(V_3 - V_1)}{2} \right| \quad (1)$$

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 as wrong when the test value exceeds 6.0°C for pressures less than 500db or 2.0°C for pressures greater than or equal to 500db
- Salinity: The V2 value is flagged as wrong when the test value exceeds 0.9 for pressures less than 500db or 0.3 for pressures greater or equal to 500 db.

Bad data: flag F. Good data: T.

Step : Gradient test

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

Test value=

$$\left| V_2 - \frac{(V_3 + V_1)}{2} \right| \quad (2)$$

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 as wrong when the test value exceeds 9.0°C for pressures less than 500db or 3.0°C for pressures greater than or equal to 500db
- Salinity: The V2 value is flagged as wrong when the test value exceeds 1.5 for pressures less than 500db or 0.5 for pressures greater or equal to 500db.

Bad data: flag F. Good data: T.

Step : 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 $> 10^{\circ}\text{C}$
- Salinity difference between adjacent depths > 5

Bad data: flag F. Good data: T.

Step : Climatology test

Each measurement is compared against a monthly climatology (

The test fails if $|V1 - V2| > 3 * \text{Sigma}$

V1: value to be controlled,

V2: value of the climatology or NCEP field.

Sigma: standard deviation of the climatology

Bad data: flag F. Good data: T.

2 References

[10 steps from AOML/NOAA](#)

[MyOcean/EuroGOOS recommended procedure for Near Real Time Quality Control](#)

2.1 Secondary references

[Manual of quality control procedures for validation of Oceanographic data by UNESCO](#)

[Quality Control of Marine Current Data suggestions](#)

[International council for the exploration of the sea guidelines](#)

[Seabird](#)

[TAO seabird + qc](#)

[Go-ship guidelines](#)

[NOAA WOA](#)