July 20, 2006

NOAA AOML TSG data quality control procedures

Step 1 : platform identification
The platform must have a valid call sign number. If the test fails, all measurements remain flagged as 0 (no quality control performed).

Step 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
- Second in range 0 to 59

If any one of the conditions is failed, the date should be flagged as wrong.

Step 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.

Step 4: Position on Land Step
The test requires that the observation latitude and longitude from the platform be located in an ocean. ETOPO5/TerrainBase file is used to see if data are located on land. If the data are cannot be located in an ocean, the position should be flagged as wrong.

Step 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.

Step 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.

Step 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.

Step 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.

Step 9: constant value test
This test is failed when there is no difference between adjacent measurements.

Step 10: gradient test
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.

Step 11: climatology and NCEP weekly analysis
Each measurement is compared to a climatology and NCEP weekly analysis file.
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, 2001, 1°x1°, monthly.
If the test fails, the data is flagged as "out of statistics" (flag 2). However, the data can be distributed.

Step 12: buddy check
Each measurement is compared with floats, XBTs, CTDs, Thermisterchain and drifter other data source within 100 km and ±5 days.
Test value = | V1 – V2 |
where V1 is the value to be controlled and V2 is the value of buddy.

- Temperature: The V1 value is flagged when the test value exceeds 0.5
- Salinity: The V1 value is flagged when the test value exceeds 0.2