**WP15**

# Real Time Quality Control and Validation of Current Measurements inferred from Drifter Data

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# 1. INTRODUCTION

## 1.1 Overview

This scientific document describes the method developed in order to perform the real time quality control (RTQC) and the validation procedure on current measurements derived from surface drifters.

The RTQC and the validation procedure are some of the fundamental functions (summarized in Figure 1) to be implemented by the In-Situ TAC (Thematic Assembly Centres) component within the MyOcean project - Work Package (WP) 15.

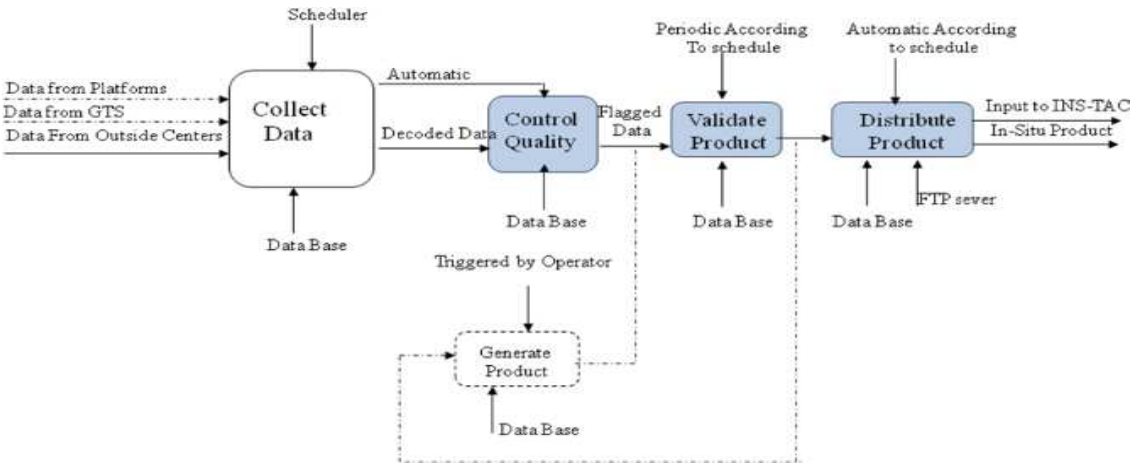


Figure 1. Functions to be implemented by the In-Situ Tac component.

The methods of RTQC of current data given within this document are based on IOC/IODE (1993), Mersea (2005) and SeaDataNet (2007) QC procedures. As an example of how the drifter data will be processed, the RTQC and validation scheme for the Mediterranean and Black Sea area is schematized in Figure 2.

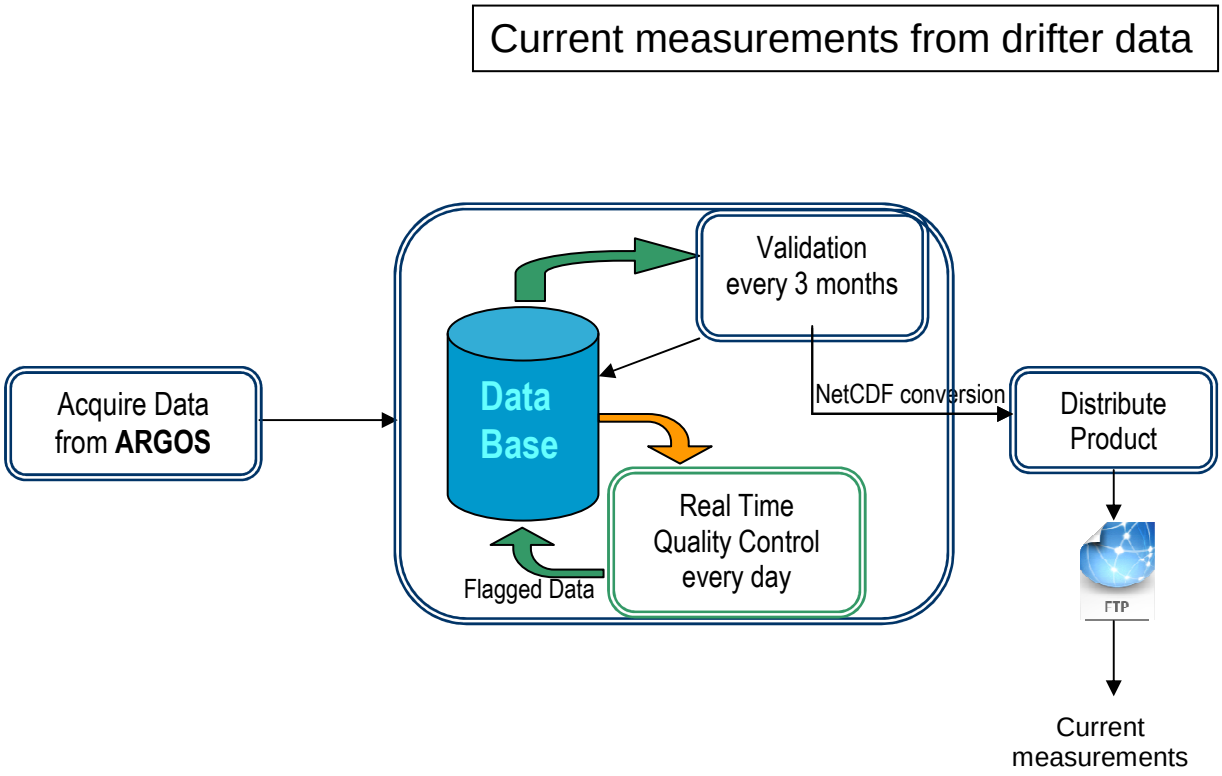


Figure 2. Production Line for current data as inferred from drifters. Data are acquired from Argos, real-time quality control and validation of the product are performed before distribution to users.

### 1.2 MyOcean Parameter Codes

The following list (Table 1) of parameter names for current measurements derived from drifter measurements has been adopted:

| parameter | units | valid_min | valid_max | standard_name | long_name |
|---|---|---|---|---|---|
| UCUR | m/s | -10 | 10 | eastward_sea_water_velocity | zonal component of sea surface water velocity |
| VCUR | m/s | -10 | 10 | northward_sea_water_velocity | vertical component of sea surface water velocity |

Table 1. The parameters presently included in the MyOcean parameter dictionary which relate to current measurements. They are compliant with SeaDataNet vocabulary and CF convention.

### 1.3 Quality Control Flags

The quality control flags are applied by the Production Unit (PU) during the RTQC procedure in order to indicate the data quality. The list in Table 2 represents the official flag scale adopted within the MyOcean project.

| 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 | Below detection limit |
| 7 | In excess of quoted value |
| 8 | Interpolated value |
| 9 | Missing value |
| A | Incomplete information |

Table 2: Quality flag scale.

## 2. REAL TIME QUALITY CONTROL: AUTOMATIC CHECKS

All the RTQC tests for current measurements from drifters are run automatically (recommended daily) and they are described hereafter.

### 2.1 Platform identification

Each transmission received must contain information identifying the source of the data.

Action: Any part of a transmission which is not identified to be from a source known to the processing centre will be rejected.

### 2.2 Impossible date test

The test requires that the observation date and time from the drifter data be sensible.

- Year greater than 1997
- Month in range 1 to 12
- Day in range expected for month
- Hour in range 0 to 23
- Minute in range 0 to 59

Action: If any one of the conditions is failed, the data are rejected.

### 2.3. Impossible location test

A location class is part of the data transmission. The five location classes (from 1 to 3 correspond to Argos positions, while classes 4 or 5 correspond to GPS positions) are as follows:

- Class 1: accuracy is between 1000 and 350 meters.
- Class 2: accuracy is between 350 and 150 meters.
- Class 3: accuracy is better than 150 meters.
- Class 4: bad.
- Class 5: good.

In addition to these location classes, the impossible location test is performed and it requires that the latitude and longitude observations be sensible.

• Latitude in range −90 to 90

• Longitude in range −180 to 180

Action: If either latitude or longitude fails, the data are rejected.

### 2.4. Position on land test

The test requires that the observed latitude and longitude from a drifter measurement be located in an ocean. An automatic procedure has been set to check if data are located on land.

Action: If the data cannot be located in an ocean, the data are rejected.

### 2.5. Spike test

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 with 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.

Action: Values that fail the spike test are removed.

### 2.6. 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.

Action: Data should be flagged appropriately (see paragraph 4) to indicate the presence/absence of the drogue.

## 3. DATA INTERPOLATION

The despiked and edited data are interpolated onto regular 1-hour intervals using an optimum analysis technique known as kriging. The kriging used here employed an analytic function fit to the empirical structure function computed from the entire despiked data set (Hansen and Poulain, 1996). Both the interpolated value and an estimate of its accuracy are computed.
The velocity is computed by finite centered differencing the 1-hourly interpolated position data. The interpolated positions and velocities are subsequently subsampled every 3 hours

## 4. DATA FLAGGING

A similar flag scale as for temperature and salinity and sea level is applied to the drifter data. Taking into account the fact that MFCs mainly use data with flag 1 (good data), and that interpolation is only done on good data, it was agreed that the final interpolated data will have flag 1 (good data) instead of 8 (interpolated data) . The information on the interpolation will be included in the attribute section of the NetDCF file. Hence, the flag scale applied is the following:

- Flag on the position (latitude and longitude) : 1 (good data)

- Flag on the velocity components: 1 (good data)
- Flag on the drogue: 1 (the drogue is on), 4 (the drogue is off), 2 (unknown drogue presence)

## 5. VALIDATION

For the assessment activity of the drifter data in the Mediterranean and Black Seas, if there is the need and at least every three months, a manual editing procedure is done to eliminate the remaining residual outliers visualized on the drifter tracks and to split the drifter trajectory, if needed. A software to visualize the drifter tracks has been built. The screening-view for a time series allow the operator to plot the parameters (latitude and longitude) measured over the time of the record. This is very useful as the operator can get an immediate idea on the data quality. Anomalous values are those which are out of line with the rest of the series (i.e., a drifter could be trapped for a while near the shore) and therefore unlikely to be a true representation. Hence, any possible bad data is removed, the interpolation procedure is run again and the flag scale is applied.

## 6. REFERENCES

IOC/IODE, 1993: IOC Manuals and guides No.26: Manual of quality control procedures for validation of oceanographic data

Mersea, 2005: In-situ real-time data quality control.

Hansen, D. V., Poulain, P.-M., 1996: Processing of WOCE/TOGA drifter data. J. Atmos. Oceanic Technol. 13, 900-909.

SeaDataNet, 2007: Data quality control procedures, Version 0.1, 6th Framework of EC DG Research.