Delayed Mode Quality Control of Argo float WMO 6903243

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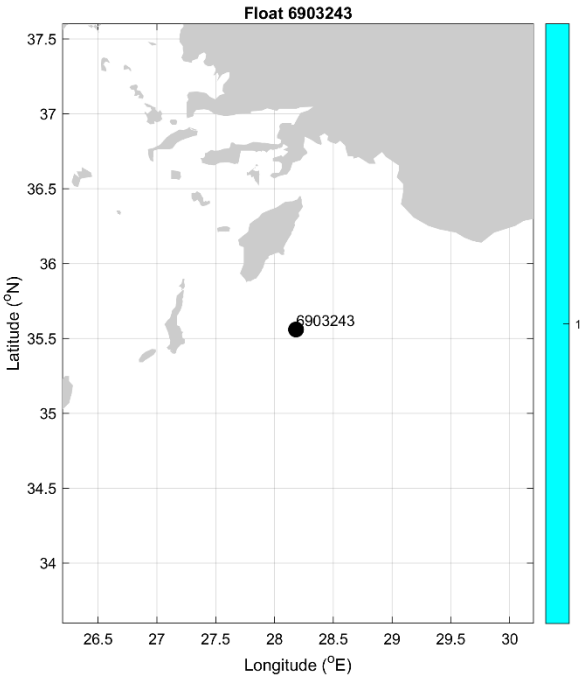

Contents

1 Introduction

This report includes the delayed mode analysis performed for deep float 6903243. It was deployed in Mediterranean Sea (Levantine sub-basin) in October 2018 and performed only 1 cycle. The real time flag applied is QC=1 to all cycles. For this type of floats, the salinity data show a bias that is dependent on pressure. Therefore, is necessary to correct for pressure effects on conductivity (CPcor correction). Plots of salinity plotted against the nearby historical CTD profiles was generated to understand if the sensor was well calibrated at deployment. Also this visual analysis can help in detecting sensor salinity anomalies and spikes.
The reference dataset used is composed of the following CTD and Argo historical datasets:

CTD:

- CMEMS: INSITU_GLO_TS_REP_OBSERVATIONS_013_001_b
- Coriolis: CTD_for_DMQC_2021V01
- Historical CTD profiles provided through personal contact

Argo:

- ARGO_for_DMQC_2020V03

Float 6903243 is the Arvor float, where the pressure sensor is auto corrected and no adjustment is required.
Due to the existence of only 1 profile, the OWC (Cabanes et al., 2016) cannot be applied.

2 Quality Check of Argo Float Data

2.1 Verification of Real-time Mode QC flags

The list of flags applied to the float in real-time mode is as follows.

Cycle number:
1 PSAL QC=1

2.2 Comparison Between Argo Float and Climatology

The salinity float profile is compared (in time and space) with the historical data. In figure 1 the profile is compared with all reference data used in this analysis. The salinity float profile is depicted in black while other colors represent the salinity reference profiles. The red color means that the historical data are more recent with respect to the float ones, while magenta states that the float data are more recent than the historical ones (the maximal difference is 9 years). A time difference between 3 and 6, 6 and 9 and larger than 9 years is depicted in green, cyan and blue, respectively.

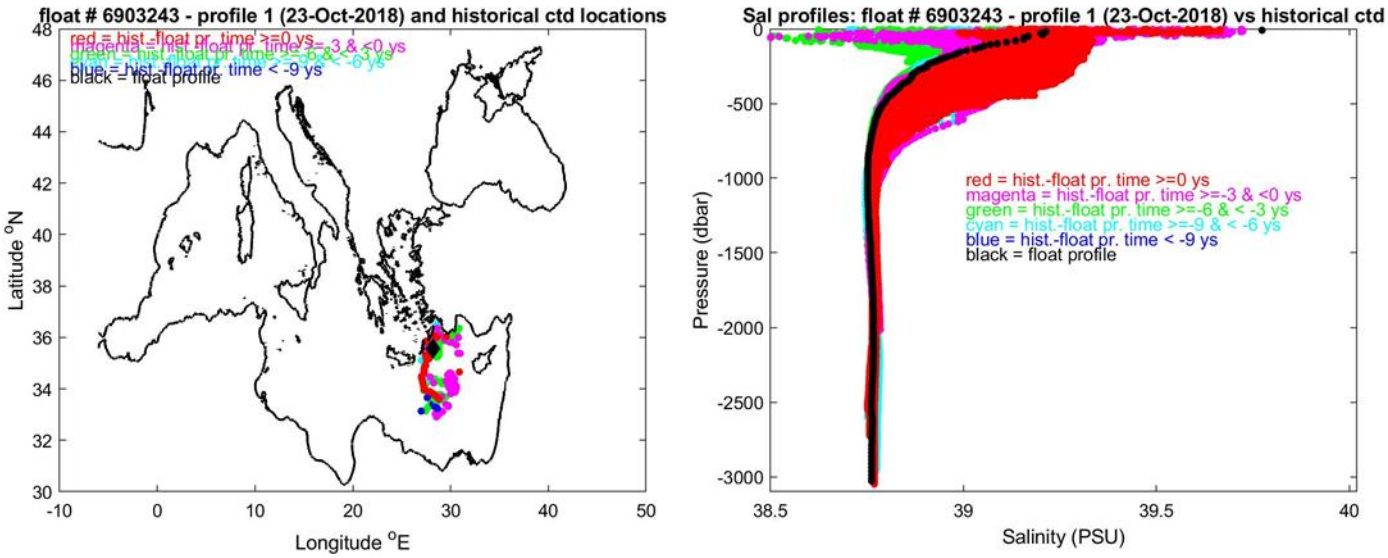

Figure 1: Float 6903243. Locations of the salinity float profile number 1 and historical CTD data (right panel) and the respective salinity profiles (left panel).

The comparison of this salinity float profiles with the closest (in space and time) salinity reference profile in shown in Figure 2. The agreement between the selected float salinity profiles and the historical salinity profiles is good in the intermediate and deeper layers, where the water column is more stable.

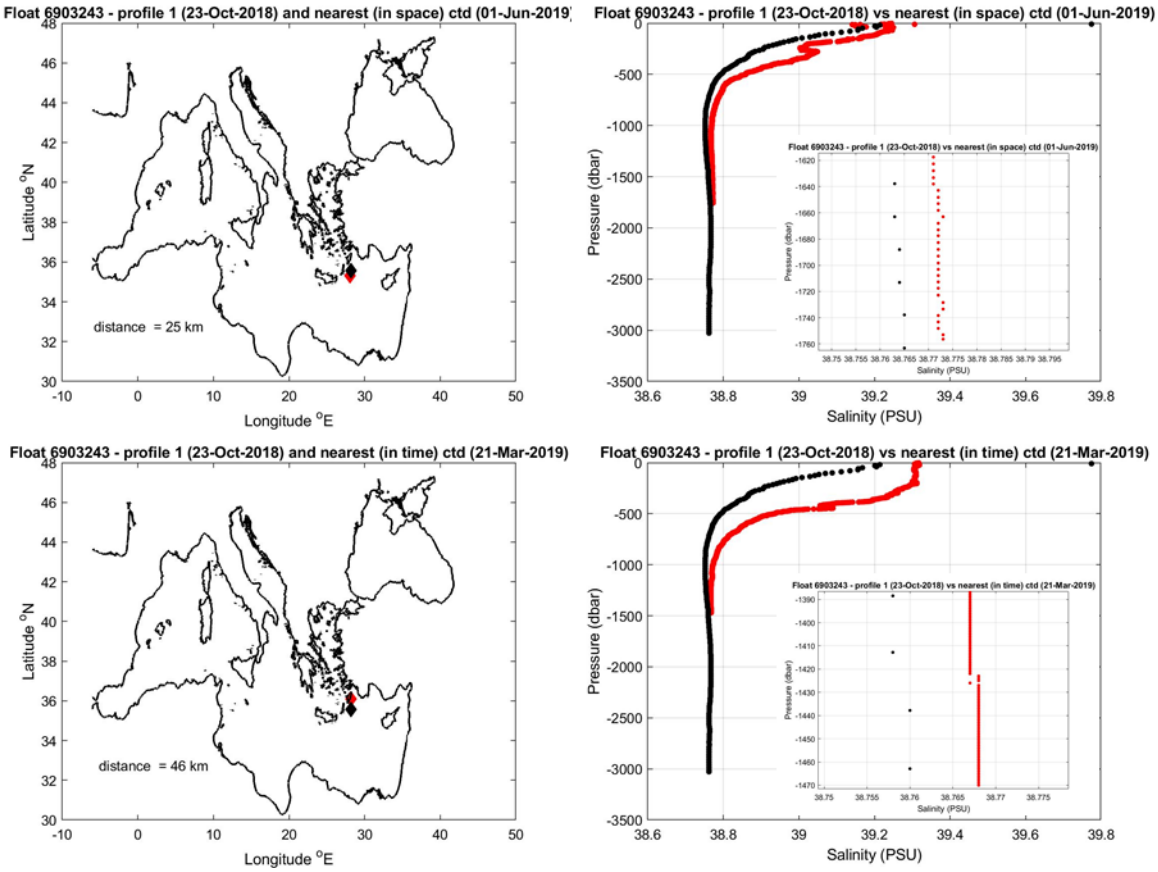

Figure 2: Float 69032243. The salinity float profile number 1 (black dots) are compared to the nearest in space (top) and in time (bottom) reference profile (red dots). The small plots show the comparison in the deeper layers. The locations of the two profiles and their distance is given in the left panel.

3 Cpcor correction

The three CPcor values: the nominal CPcor value used by Sea-Bird, the recommended standard CPcor_new values and the optimized estimate of CPcor_new, are applied. The CTD closest in space and time is used to calculate the optimized CPcor value because there is no CTD at deployment. But this CTD profile does not reach the deepest layers useful for identifying the most robust CPcor value (Fig. 3). The best solution is achieved by using the standard CPcor recommended by CPcor, already applied in real time.

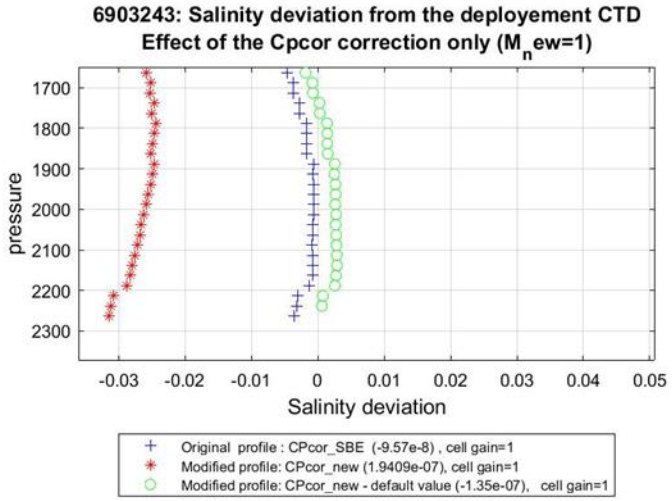

Figure 3: Float 6903243. Effect of the Cpcor correction: salinity deviation using the nominal CPcor (blue), the default value (green), the optimized value (red).

4 Summary

Float was deployed in the Levantine sub-basin, in the Mediterranean Sea. It is a deep float. After only 1 cycle the float died. For this reason, the OWC cannot be applied. To understand if the sensor was well calibrated we compared the first profile with the historical reference profile. The most favorable water masses, which are useful for comparison with climatology is relatively stable intermediate and deep waters from around 700 m. The comparison between Argo float and reference data shows no significant salinity offset/drift. The difference between float and historical salinity profiles is within the required accuracy (0.004 psu). We also applied the three CPcor values to identify the more robust one. This comparison evidences the CPcor default value, already applied in real-time, as the best correction.
The salinity data of float WMO 6903243 is accurate and doesn't need a delayed mode correction:

PSAL_ADJUSTED= PSAL for cycle 1

The quality flag applied is the following:

PSAL_ADJUSTED_QC='1' for cycle 1

The delayed-mode files (Dfiles) have been created accordingly and sent to the Coriolis GDAC.

5 References

Cabanes, C., Thierry, V., & Lagadec, C. (2016). Improvement of bias detection in Argo float conductivity sensors and its application in the North Atlantic. Deep-Sea Research Part I: Oceanographic Research Papers, 114, 128–136. https://doi.org/10.1016/j.dsr.2016.05.007