

# Note of Delayed Mode Quality Control of Argo float WMO 6902875

For more detailed: Antonella Gallo [agallo@ogs.it](mailto:agallo@ogs.it)

This note includes the results of OWC performed for the WMO 6902875 float. 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\_2021V02
- Historical CTD profiles provided through personal contact

Argo:

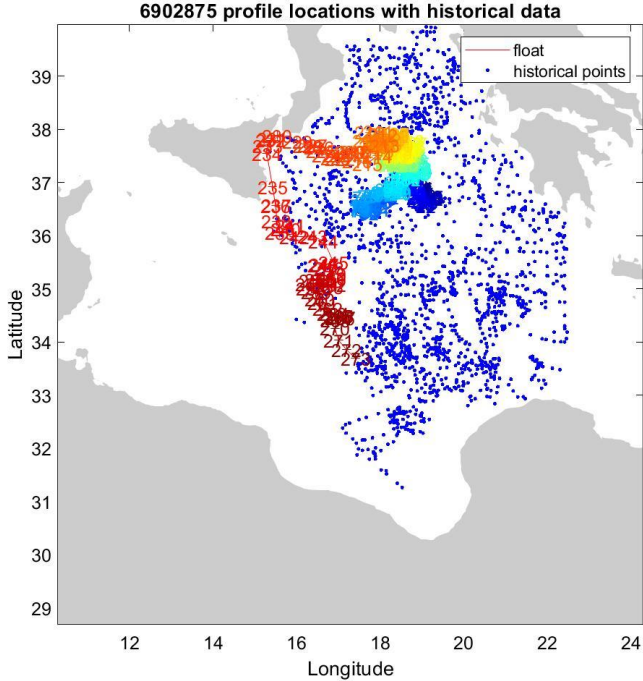
- ARGO\_for\_DMQC\_2020V03

Float 6902875 is the Arvor float, where the pressure sensor is auto corrected and no adjustment is required. The OWC was run to estimate a salinity offset and a salinity drift (Cabanes et al., 2016).

## Configurations

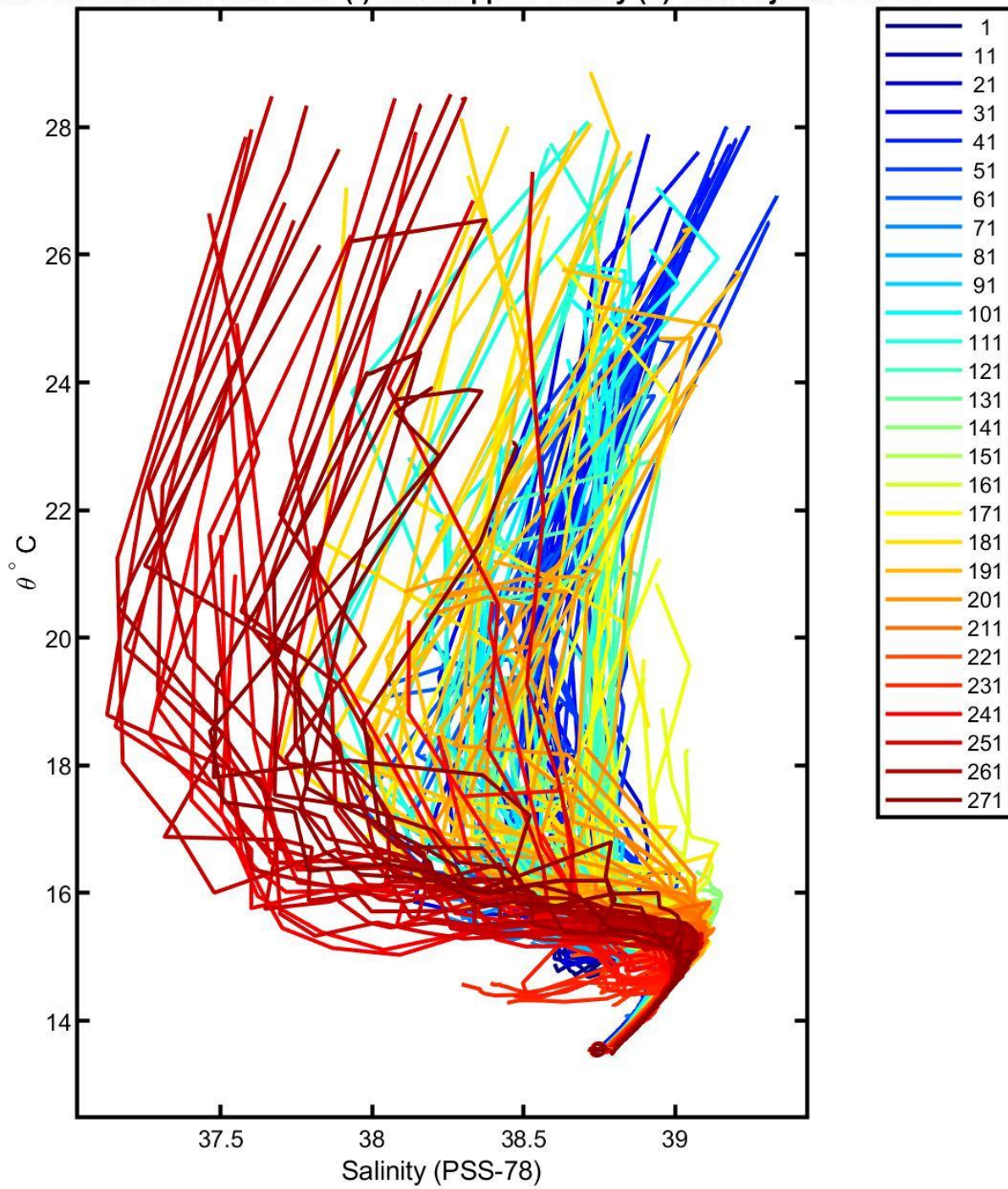
| Parameters               | Value |
|--------------------------|-------|
| CONFIG_MAX_CASTS         | 300   |
| MAP_USE_PV               | 1     |
| MAP_USE_SAF              | 0     |
| MAPSCALE_LONGITUDE_LARGE | 4     |
| MAPSCALE_LONGITUDE_SMALL | 1.33  |
| MAPSCALE_LATITUDE_LARGE  | 4     |
| MAPSCALE_LATITUDE_SMALL  | 1.33  |
| MAPSCALE_PHI_LARGE       | 0.5   |
| MAPSCALE_PHI_SMALL       | 0.1   |
| MAPSCALE_AGE             | 10    |
| MAP_P_EXCLUDE            | 700   |
| MAP_P_DELTA              | 250   |
| Break                    | 229   |

**OWC Results**

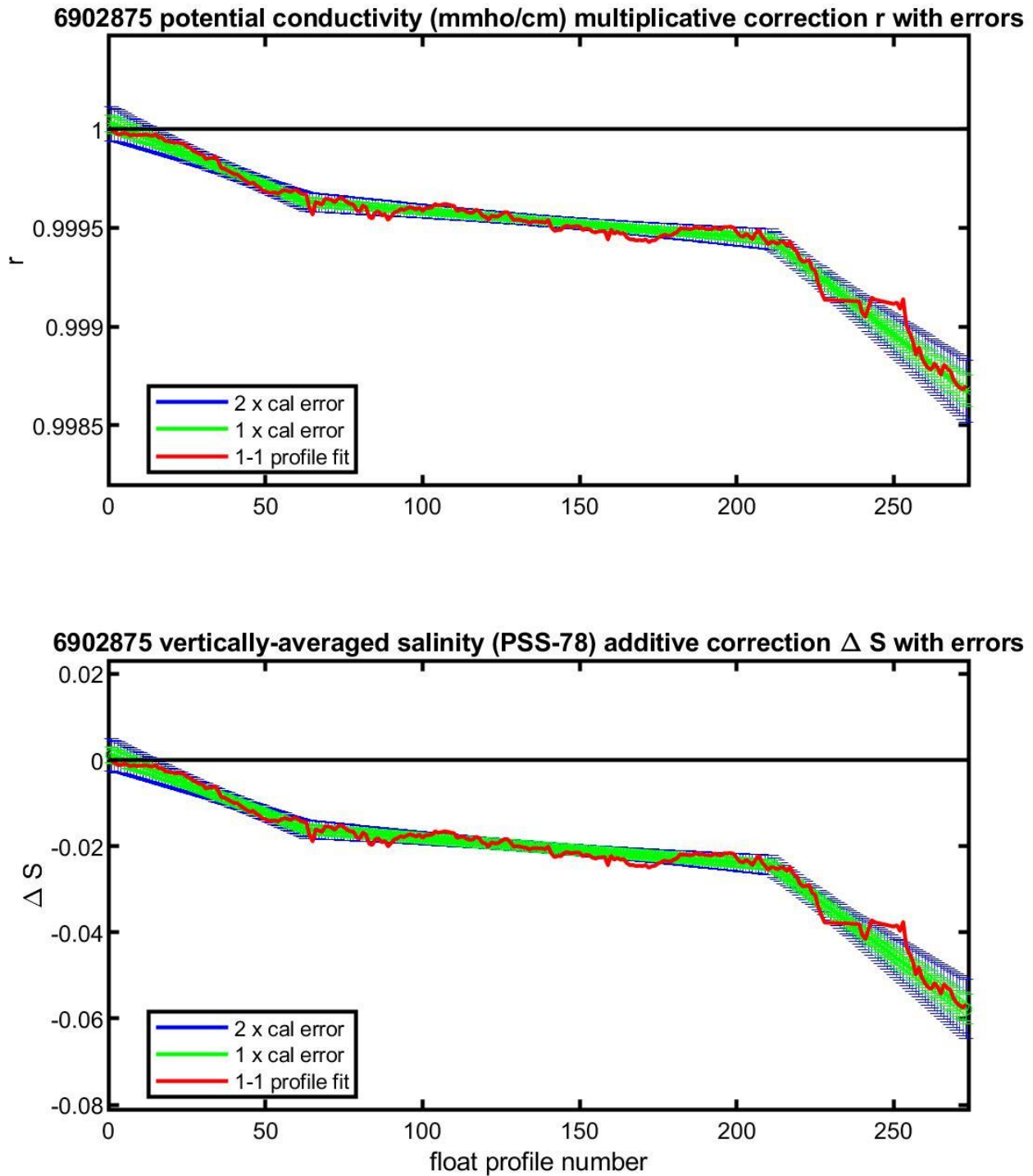


**Figure 1:** Location of the float profiles (red line with colored numbers) and the reference data selected for mapping (blue dots).

3902875 uncalibrated float data (-) and mapped salinity (o) with objective errors



**Figure 2:** Plot the original float salinity and the objectively estimated reference salinity at the 10 float theta levels that are used in calibration.



**Figure 3:** Evolution of the suggested adjustment with time. The top panel plots the potential conductivity multiplicative adjustment. The bottom panel plots the equivalent salinity additive adjustment. The red line denotes one-to-one profile fit that uses the vertically weighted mean of each profile. The red line can be used to check for anomalous profiles relative to the optimal fit.



6902875 calibrated float data (-) and mapped salinity (o) with objective errors

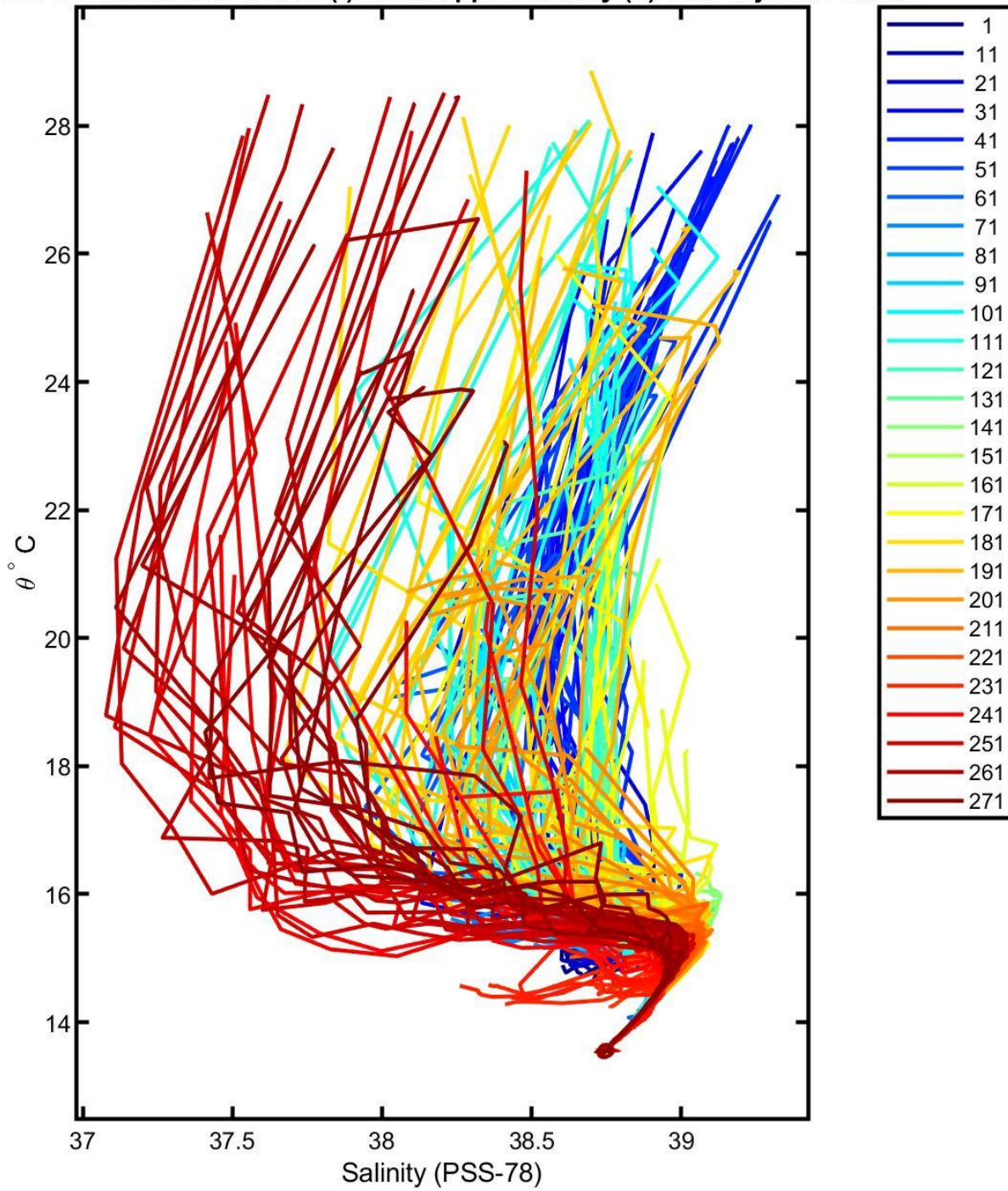


Figure 4: The plot of calibrated float salinity and the objectively estimated reference salinity at the 10 float theta levels that are used in calibration.

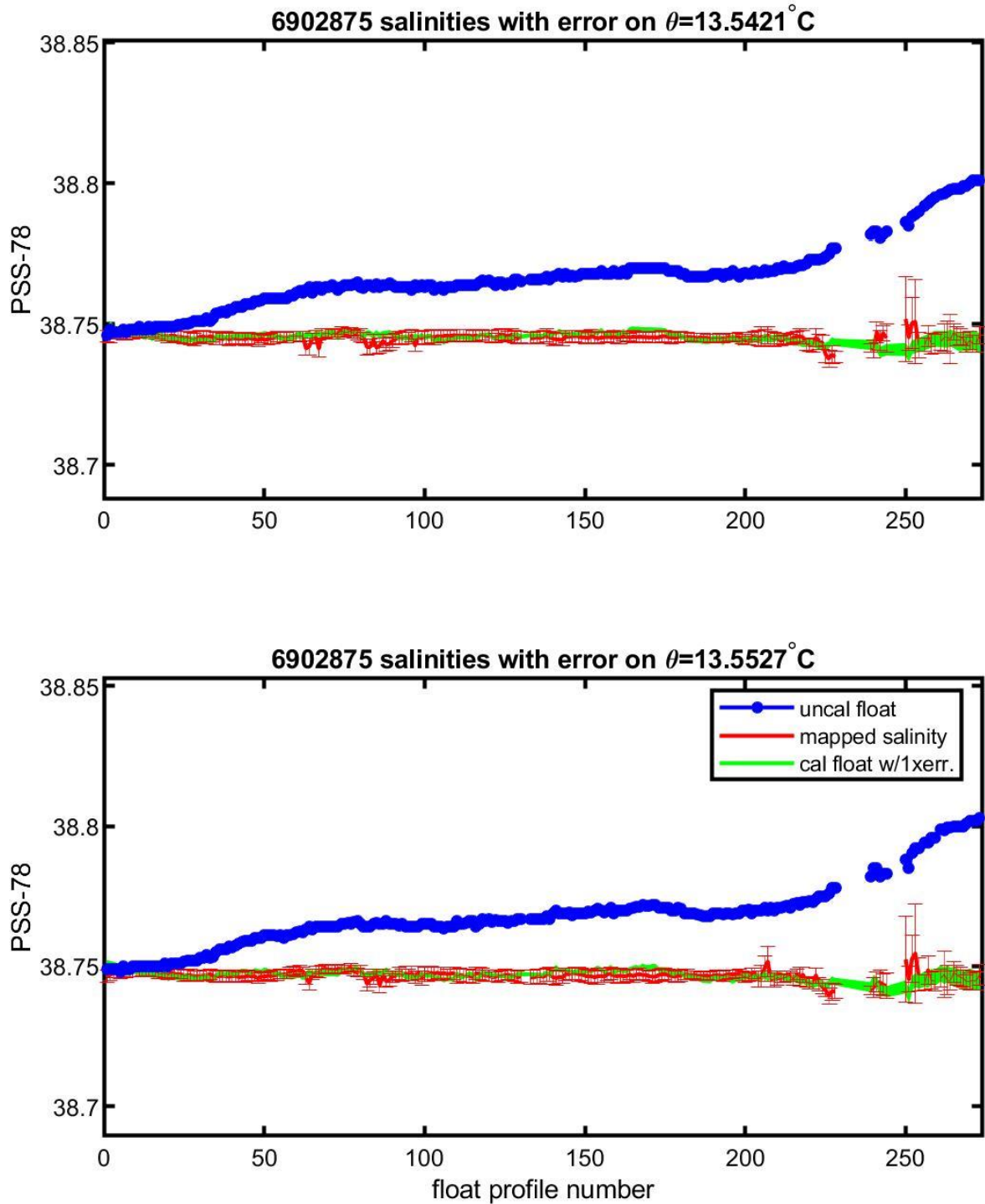
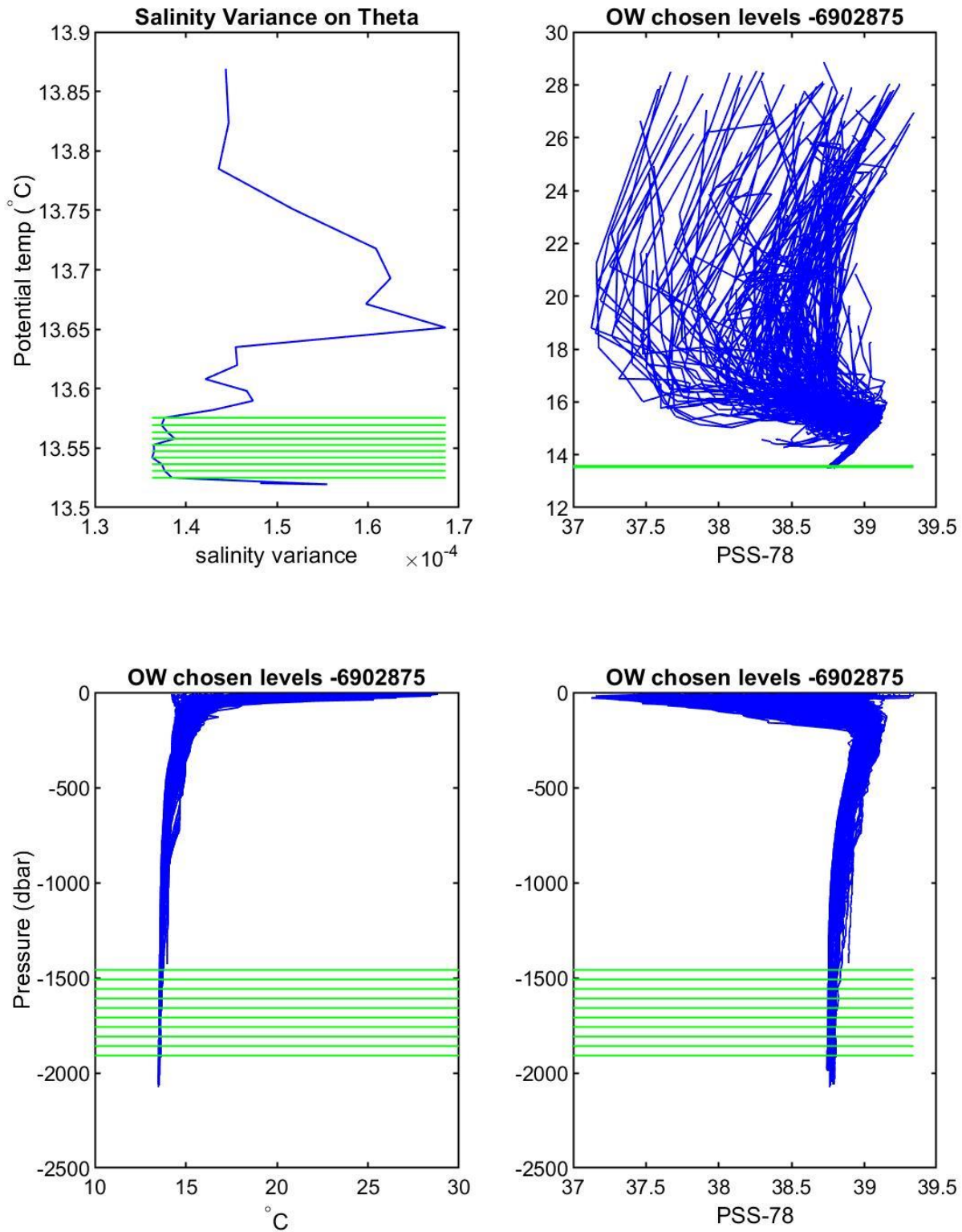


Figure 5: Plots of the evolution of salinity with time along with selected theta levels with minimum salinity variance.



**Figure 6:** Plots include the theta levels chosen for calibration: Top left: Salinity variance at theta levels. Top right: T/S diagram of all profiles of Argo float. Bottom left: potential temperature plotted against pressure. Bottom right: salinity plotted against pressure.

## Summary

Float WMO 6902875 was deployed in the Ionian sub-basin, in the Mediterranean Sea. This float was DMQC-ed before. The result of the DMQC analysis is: OWC correction is applied with QC 1 to cycles from 1 to 228 and QC 2 to cycles from 229 to 270. The list of flags applied to the float in real-time mode is: QC=1 for cycle from 1 to 264, QC 4 from cycle 265 to 273.

The OWC analysis showed a significant salinity drift. Figure 3 reveals that the least square fit is quite reliable. The correction proposed by OWC suggests a correction over the Argo requested accuracy (0.01). Figure 5 shows a significant sensor drift on selected  $\theta$ -levels. Additional analyses (the visual inspection of the deepest portion of the  $\theta$ -S diagram, the comparison of selected float salinity profiles with the nearby historical CTD profiles) are applied in complement of the OWC method, to provide the best quality control analysis.

After several investigation, the last decision is that the salinity data of float WMO 6902875 need a delayed mode correction from cycle 1 to 264. QC 1 is applied. Data of cycle from 265 to 273 are bad and unadjustable. QC 4 is applied.

PSAL\_ADJUSTED= PSAL +  $\Delta$ S from cycle 1 to 264

PSAL\_ADJUSTED= PSAL from cycle 265 to 273

The quality flags applied are the following:

PSAL\_ADJUSTED\_QC='1' from cycle 1 to 264

PSAL\_ADJUSTED\_QC='4' from cycle 265 to 273

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

## 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>