

# Note of Delayed Mode Quality Control of Argo float WMO 3901853

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This note includes the results of OWC performed for the WMO 3901853 float. The reference dataset used is composed of the following CTD and Argo historical datasets:

CTD:

CMEMS:

- INSITU\_MED\_PHYBGCWAV\_DISCRETE\_MYNRT\_013\_035
- Coriolis: CTD\_for\_DMQC\_2024V01
- Historical CTD profiles provided through personal contact

Argo:

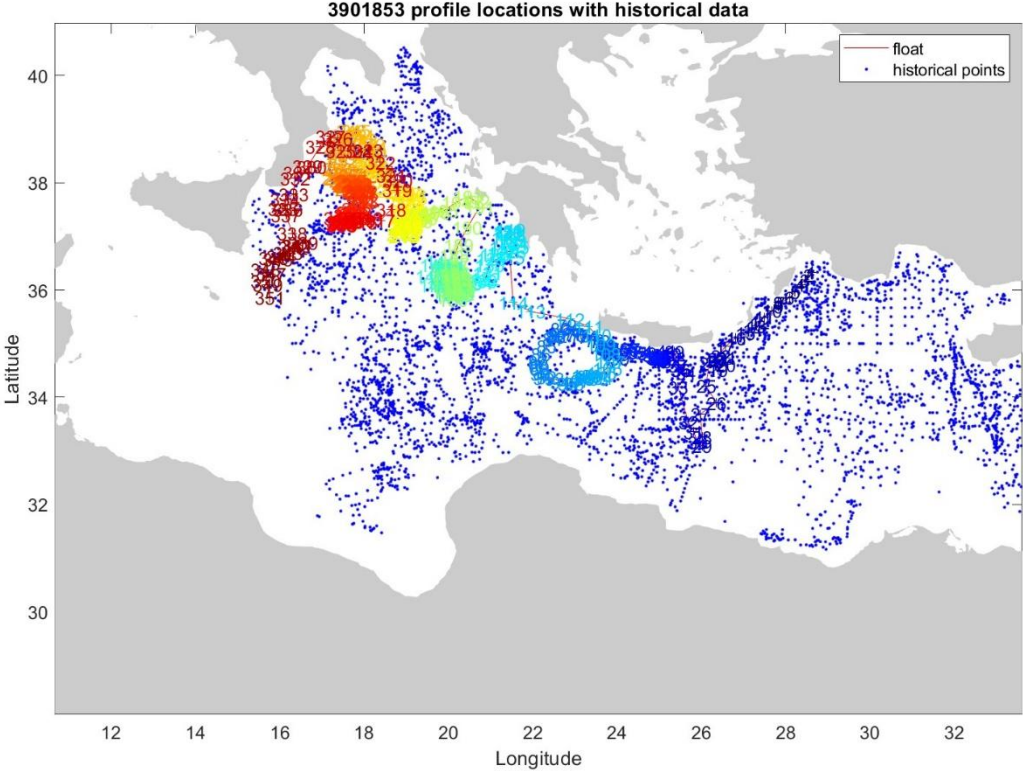
- ARGO\_for\_DMQC\_2025V03

Float 3901853 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   |

**OWC Results**



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

3901853 uncalibrated float data (-) and mapped salinity (o) with objective errors

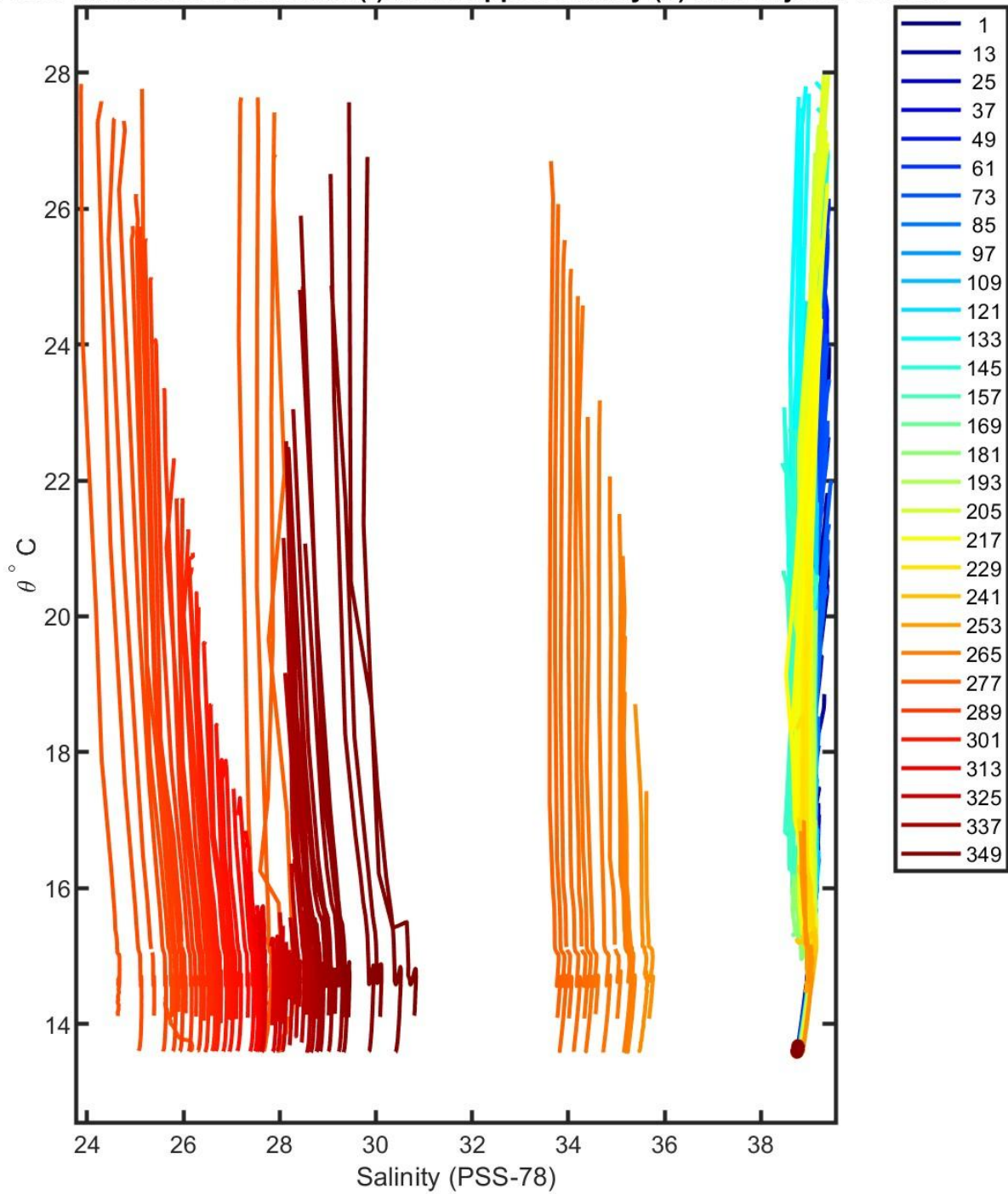
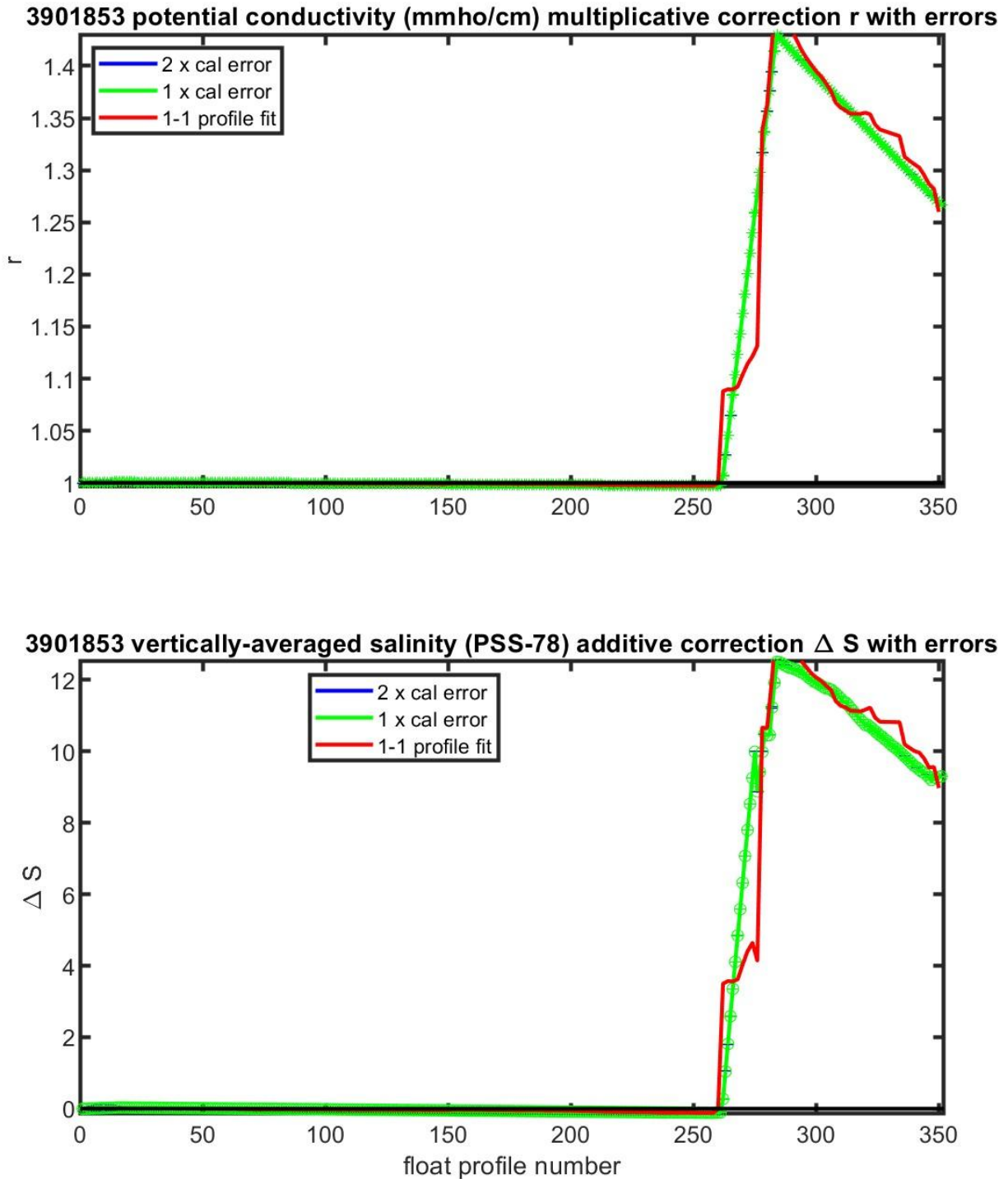
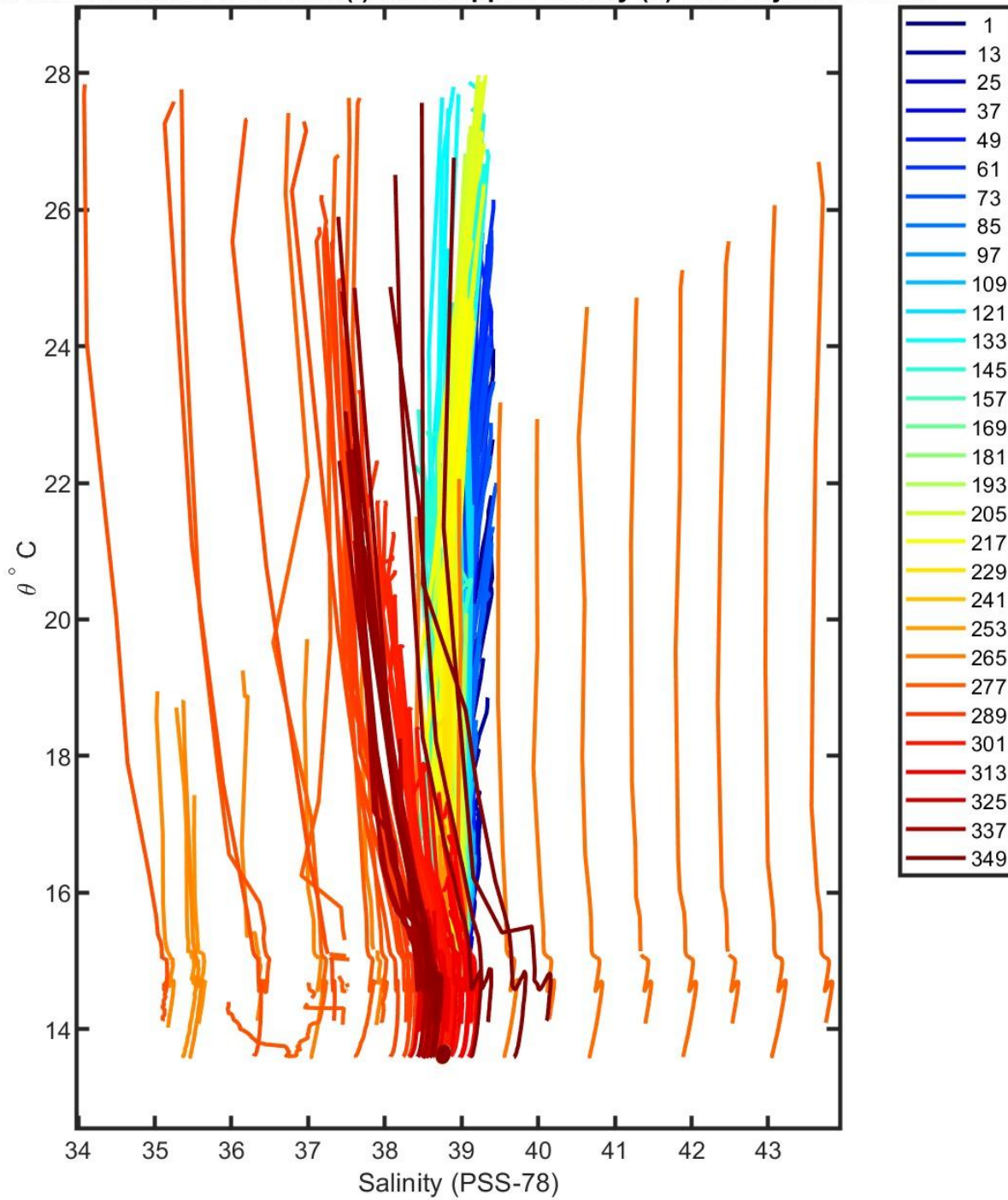


Figure 2: Plot the original float salinity and the objectively estimated reference salinity at the 10 float theta levels that are used in calibration.



**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.

3901853 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.

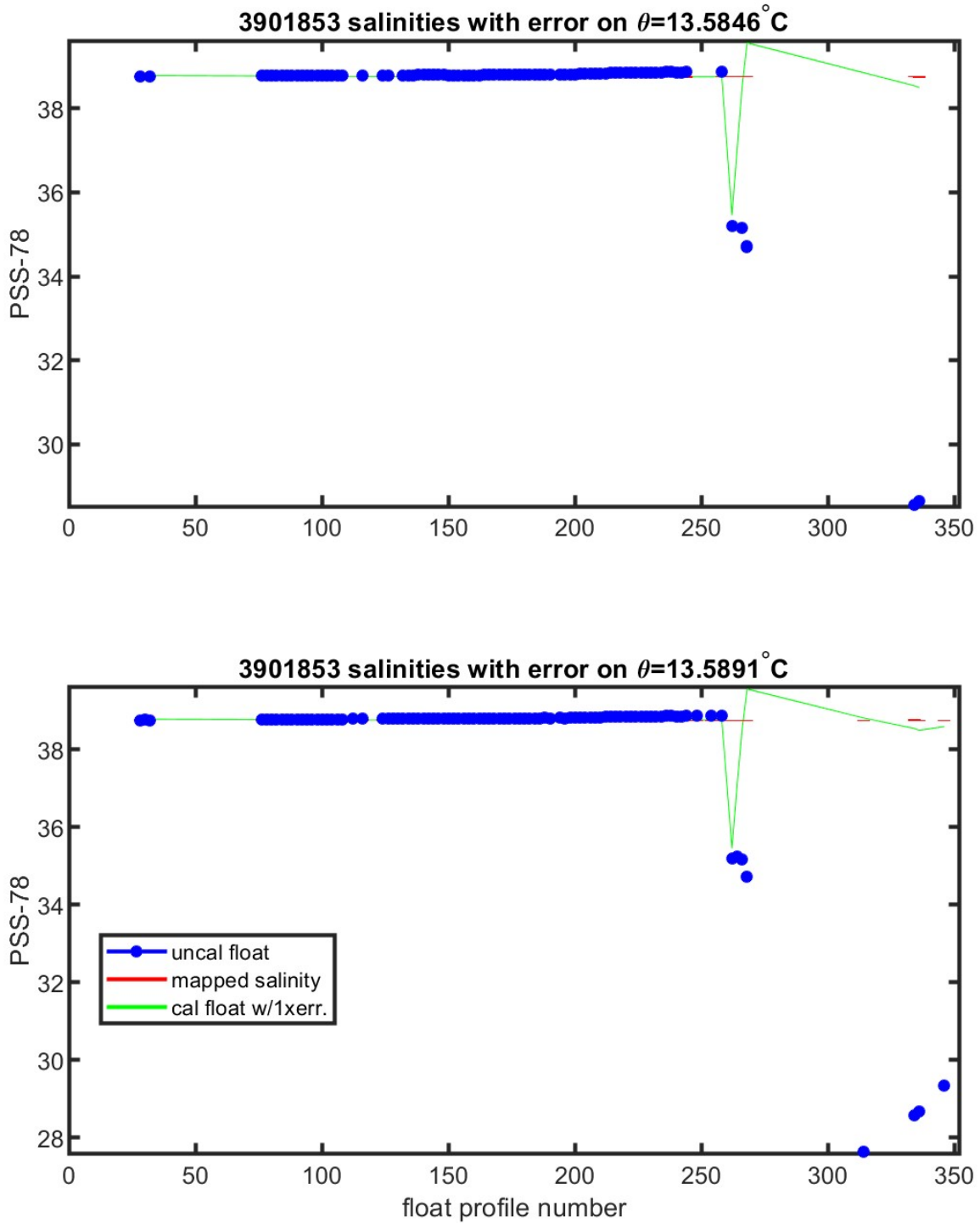
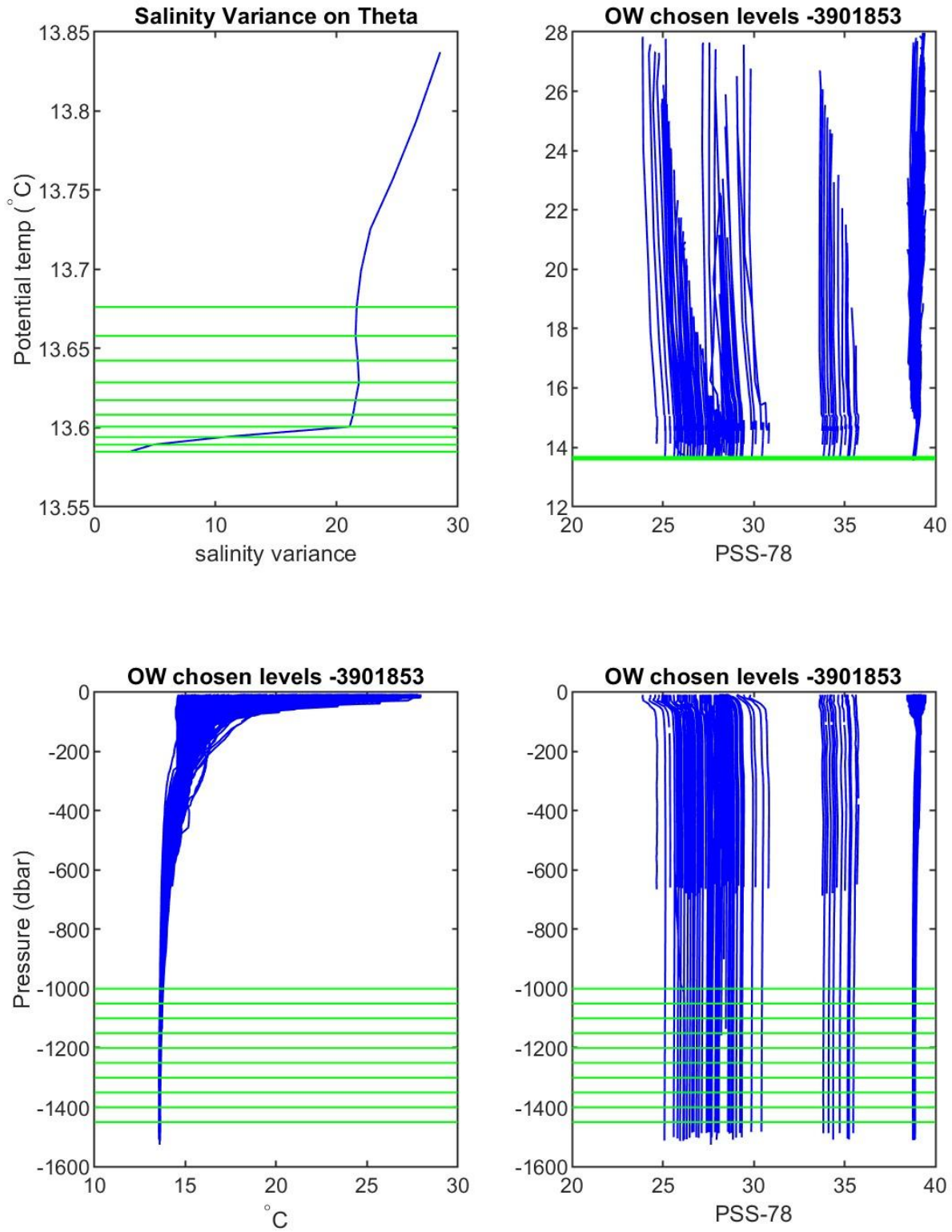
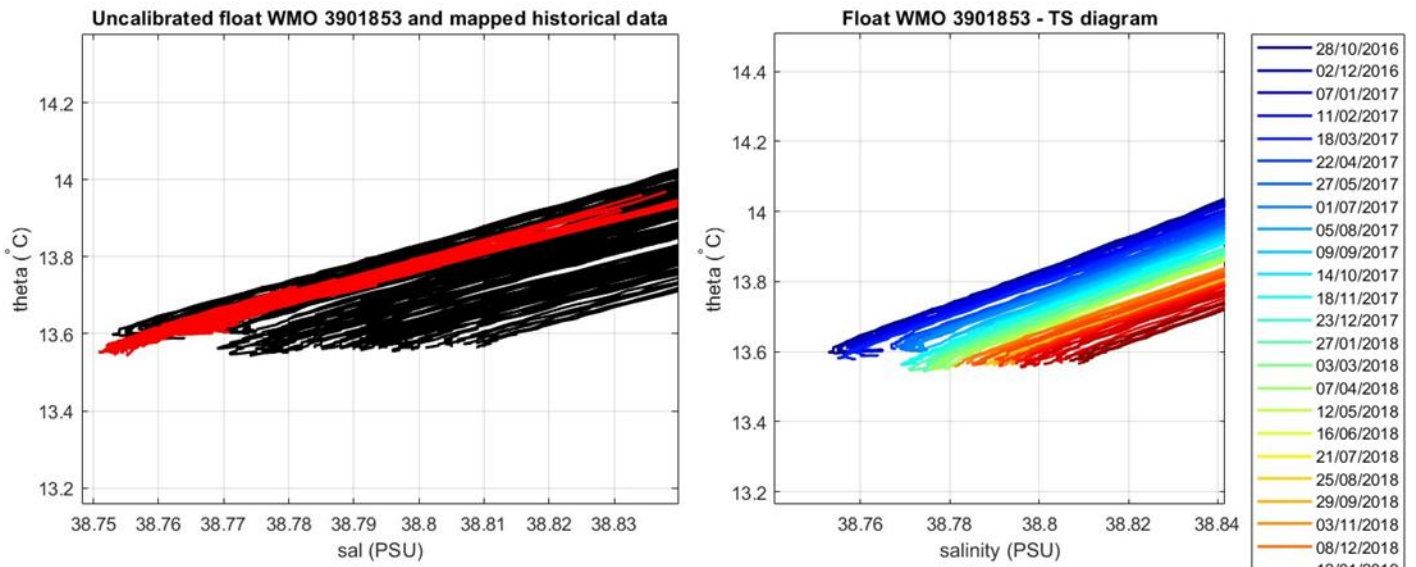


Figure 5: Plots of the evolution of salinity with time along with selected theta levels with minimum salinity variance.



**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.



**Figure 7:** Comparison between float 3901853 (cycles from 1 to 200) and historical CTD on the left and  $\theta$ -S diagram color-coded per cycle number on the right, in the most uniform part of the  $\theta$ -S curve.

## Summary

Float WMO 3901853 was deployed in the Levantine sub-basin of the Mediterranean Sea. During its life passed in Cretan and Ionian sub basins. This float was DMQC-ed before: no correction to cycles 1-26; correction for cycles 27-238. QC1 was applied until cycle 186, then QC 4. We applied the OWC method taking into account the deepest profiles. The OWC analysis showed a significant salinity drift. The correction proposed by OWC exceeds the Argo required accuracy (0.01) and starting from profile 187 is greater than 0.05. Additional analyses (visual inspection of the deepest portion of the  $\theta$ -S diagram and comparison of selected float salinity profiles with nearby historical CTD profiles) were performed to complement the OWC method and provide the best possible quality control assessment. The last decision is that the salinity data of float WMO 3901853 needs a delayed mode correction for cycles 1-186. QC 1 is applied. Profiles 187-351 are bad, no correction is made and QC 4 is applied.

$PSAL\_ADJUSTED = PSAL + \Delta S$  from cycle 1 to 186

$PSAL\_ADJUSTED = PSAL$  from cycle 187 to 351

The quality flags applied are the following:

$PSAL\_ADJUSTED\_QC = '1'$  from cycle 1 to 186

$PSAL\_ADJUSTED\_QC = '4'$  from cycle 187 to 351

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>