Delayed mode analysis of salinity data acquired by Argo floats Float 6902882 (OVIDE 2018)

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Summary

WMO Number	DM Salinity Correction
6902882	No correction

Table 1: Salinity Correction applied in delayed mode for each float.

Contents

1 Presentation

Delayed Mode analysis was performed float 6902882. First, salinity and temperature profiles were visually checked and compared to nearby reference profiles using verif_flag programs when necessary. Real time QC flags were verified and modified if necessary (see table 3). The OWC method was then run to estimate a salinity offset or/and a salinity drift, using, if possible, historical CTD or Argo profiles as reference databases. Finally, corrections were applied in the netcdf files when we though it was necessary(see table 4).

WMO Number	Launch date	Centre	PI	Last cycle analysed (Active/NotActive)	Cycle Duration
6902882	08/07/2018	IF	V.Thierry	151(A)	cy.1-151: 10 days

Table 2: Information on the floats analysed

2 DMQC Summary

2.1 Verification of RT QC flags

Real Time QC flags were verified and modified if necessary. Table 3 gives the list of flags that have been modified during the delayed mode process.

WMO Number	Cycle	Param	Old flag	New flag	Levels	Date of modification
6902882	043A	PSAL	1	4	49.6 : 49.6	23/03/2021
	047A	TEMP	4	1	76.2 : 77.2	23/03/2021
	054A	PSAL	1	4	131.2 : 662.5	23/03/2021
	069A	TEMP	4	1	32.3 : 33.1	23/03/2021
	082A	TEMP	4	1	53.9 : 55	23/03/2021
	098A	TEMP	4	1	306.1 : 307	23/03/2021
	106A	TEMP	4	1	215.6 : 216.5	26/08/2022
	117A	PSAL	4	1	76.1 : 76.1	26/08/2022
		PSAL	1	4	78.3 : 78.3	26/08/2022
		TEMP	4	1	76.1 : 77.3	26/08/2022
	135A	PSAL	1	4	313.2 : 313.2	26/08/2022
	138A	TEMP	4	1	45.4 : 46.3	26/08/2022
	143A	TEMP	4	1	10.8 : 13	26/08/2022
	144A	TEMP	4	1	111.9 : 113	26/08/2022

Table 3: Modified flags during DM analysis

For each float, we report here the list of cycles for which a density inversion was detected in real time (with a treshold value of 0.03). This sometimes reveals a problem with the conductivity sensor and it is necessary to particularly check these profiles in delayed time. Moreover, when density inversion are flagged in RT, it is often necessary to modified flags in DM: often, the temperature does not need to be flagged at 4 and not all the salinity measurements flagged in RT need a flag 4. We also report here some anomalies e.g. a float that did not dive for a given cycle or missing cycles.

- 6902882 - Density inversions are found cycles: 47, 69, 82, 98, 106, 117, 138, 143, 144. Missing cycles :57, 89.

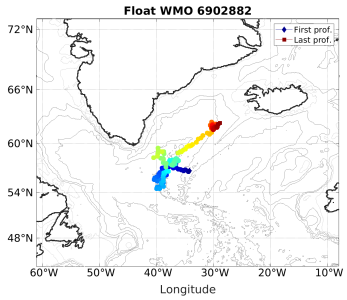
2.2 Salinity corrections applied

WMO Number	new CPcorr	Calibration (with new CPcorr value applied)		
		Comparison with the reference CTD cast	Correction from OWC method	Correction applied in the D files
6902882	-13.5e-8	0	-0.004 ± 0.001 0.002 ± 0.007 after cycle 100 (config. 393)	No correction

Table 4: Salinity corrections for the floats proposed by the OWC method or by comparison with a shipboard CTD reference profile once the new Cpcorr value has been applied to the conductivity data. Uncertainties are the statistical uncertainties from the OWC method.

3 Float 6902882

3.1 Trajectory



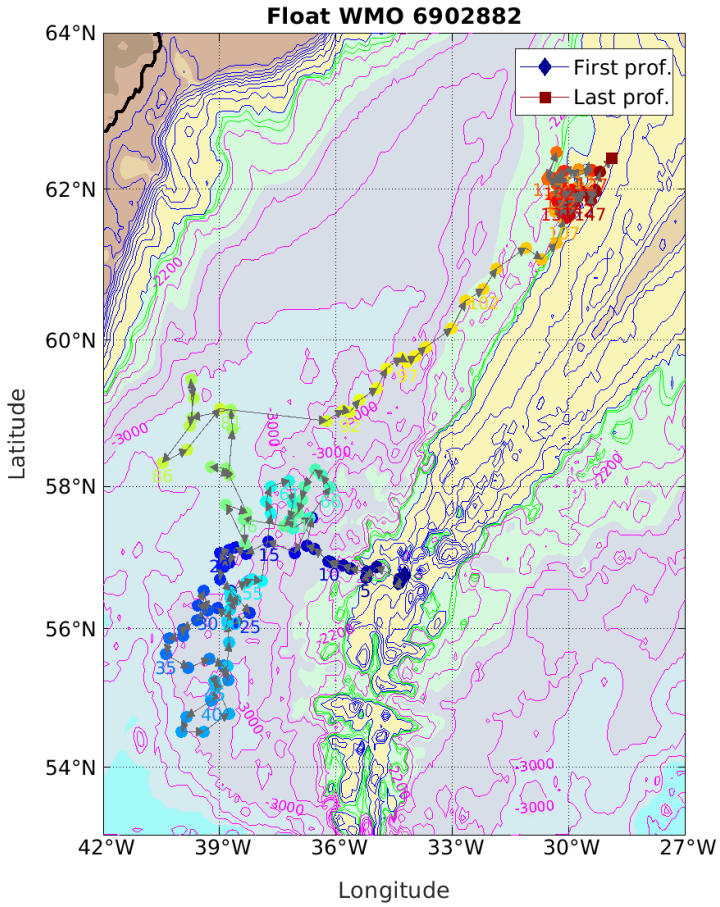


Figure 1: Float 6902882. Trajectory of the float and bathymetry. Parking depth is: 2100m and profile depth is: 4000m. Bathymetric contours at float's parking depth ± 30m are plotted in green, bathymetric contours at float's profile depth ± 30m are plotted in red, bathymetric contours between profile depth and parking depth are plotted every 200m in magenta and bathymetric contours between parking depth and surface are plotted every 200m in blue.

3.2 Sections along the float trajectory - raw data

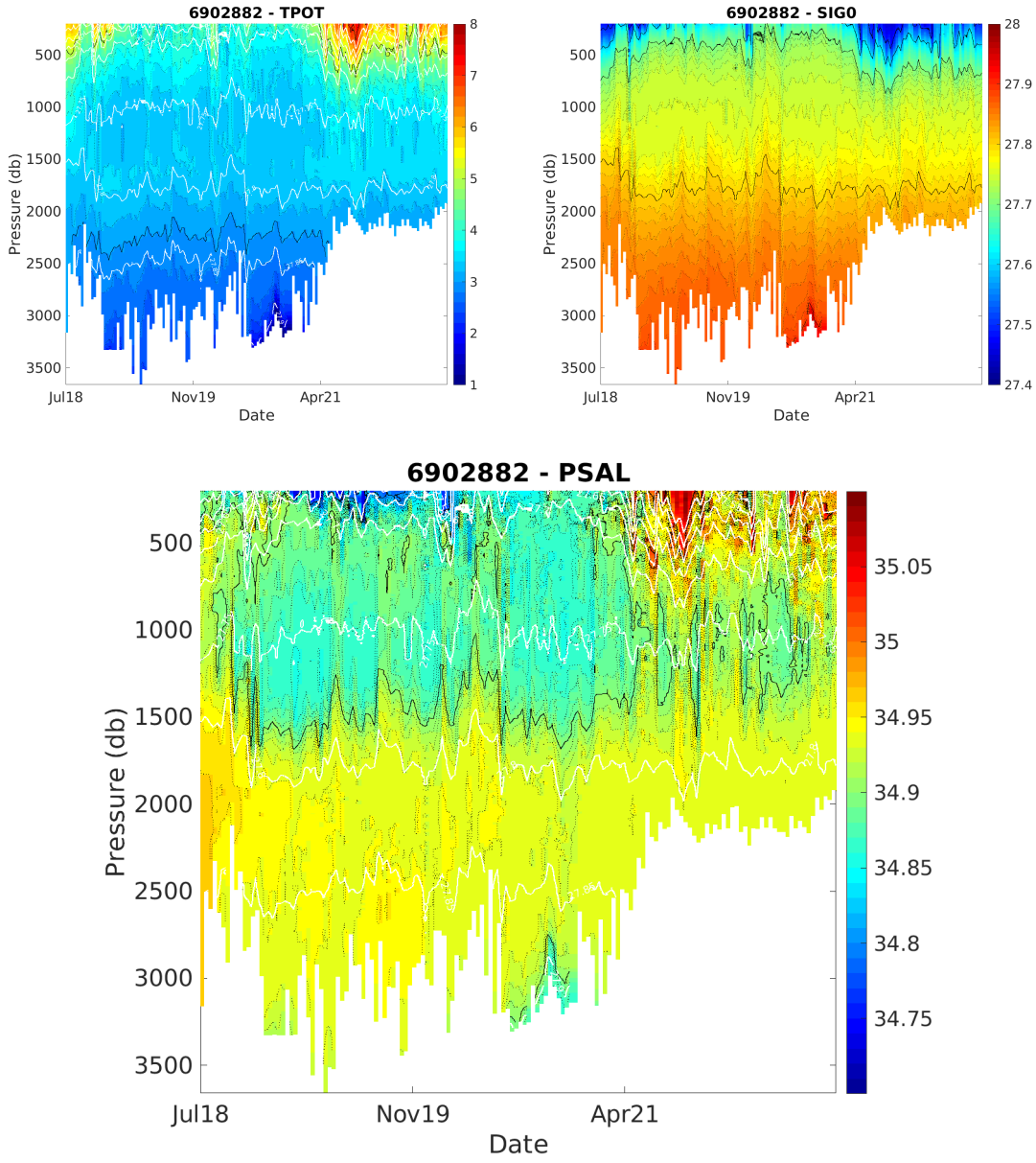


Figure 2: Float 6902882. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, flags not used)

3.3 Theta/S diagrams - raw data

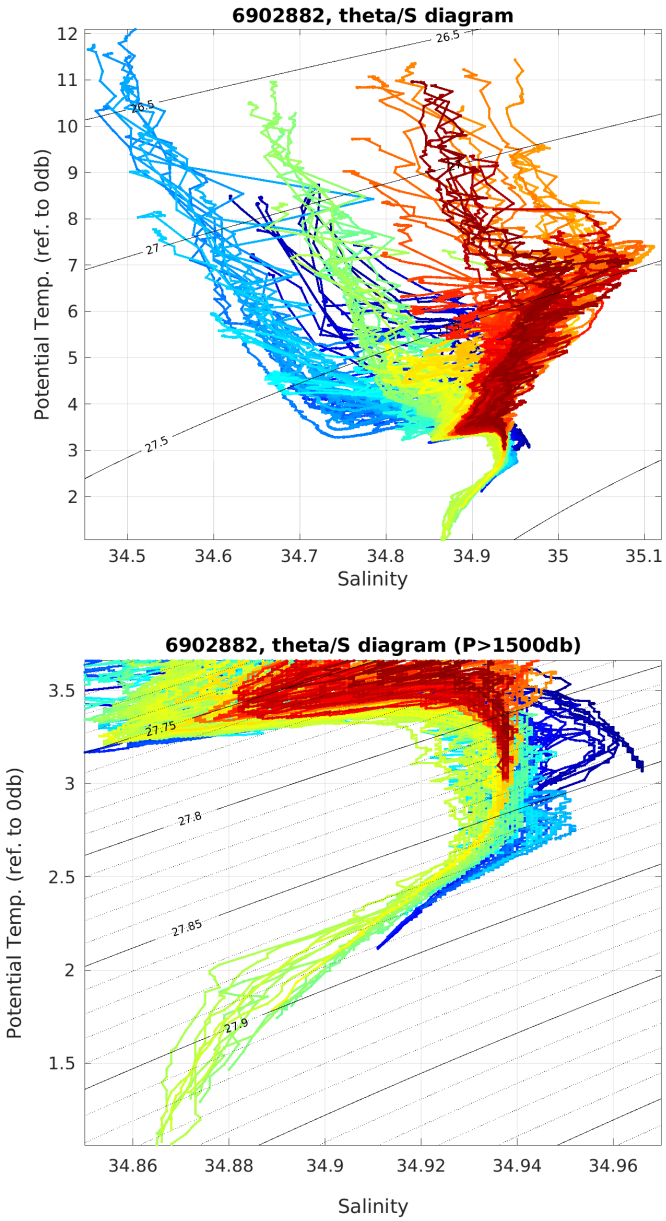


Figure 3: Float 6902882. Theta/S diagrams of the raw data, with the potential temperature referenced to 0db. Full profiles (upper panel) and zoom below 1500m (lower panel). Flags are not used

3.4 Technical data : surface pressure - battery - pump or valve actions

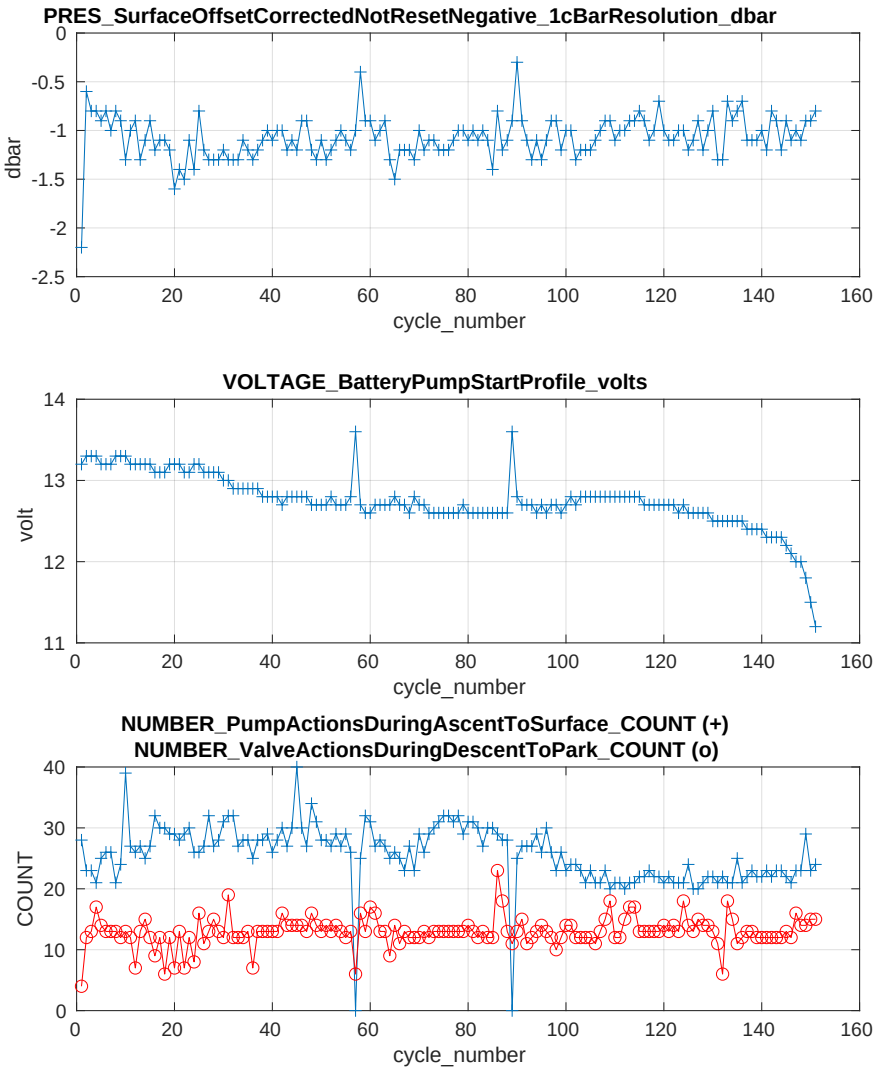


Figure 4: Float 6902882: Some technical data as read in the technical file

3.5 Modification of RT flags : selection of some profiles

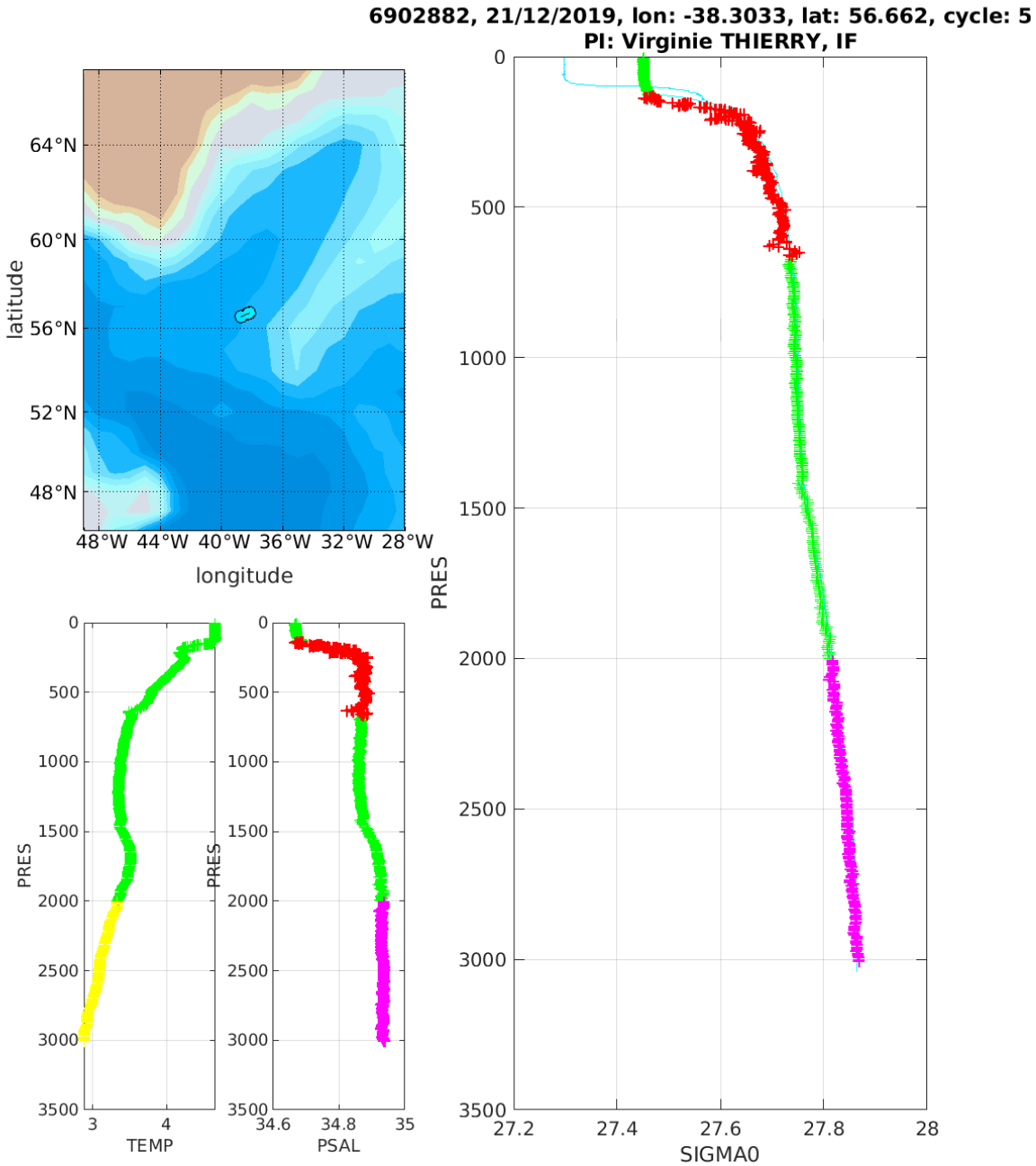


Figure 5: Float 6902882 Comparison of Cycles 54

3.6 Cpcor Analyse

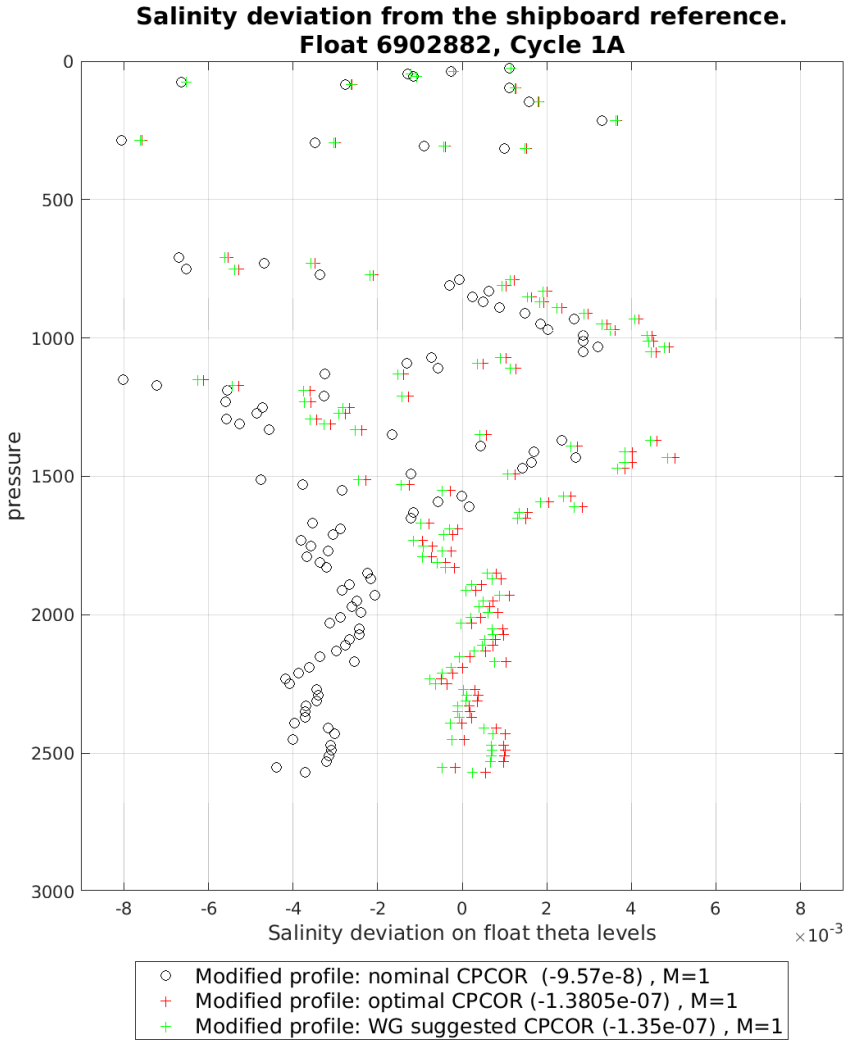


Figure 6: Float 6902882. Estimation of the optimal Cpcor and offset. Comparison with the Working Group (WG) suggested value for Cpcor.

In what follows, the salinity has been adjusted using the Working Group (WG) suggested value for Cpcor. No offset has been applied yet.

3.7 Comparison with the reference CTD cast

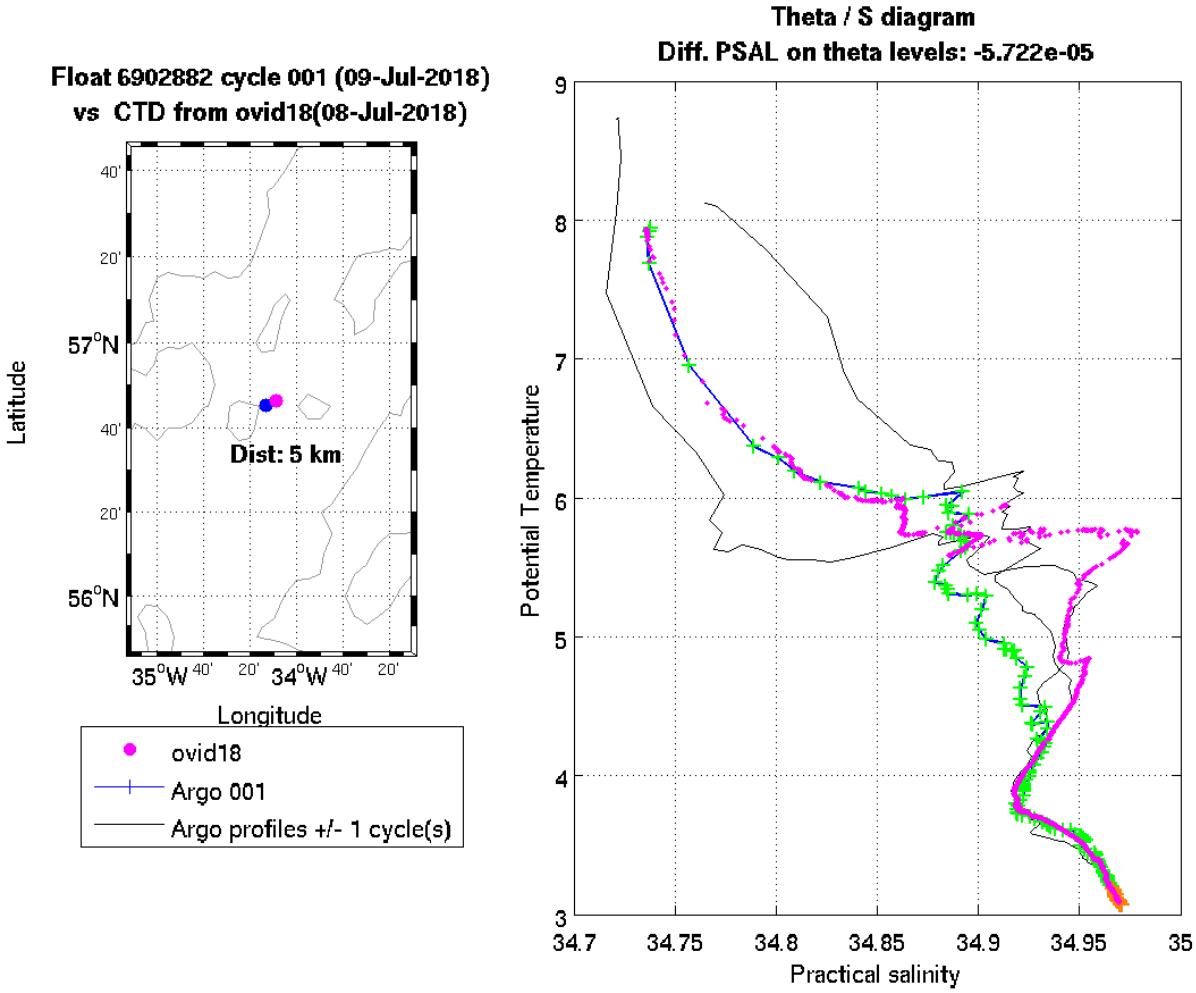


Figure 7: Float 6902882. Comparaison of the first descending (or ascending) argo profile with the CTD made at float deployement. Difference is PSAL(argo) -PSAL(ref cast).

3.8 Comparison to reference profiles

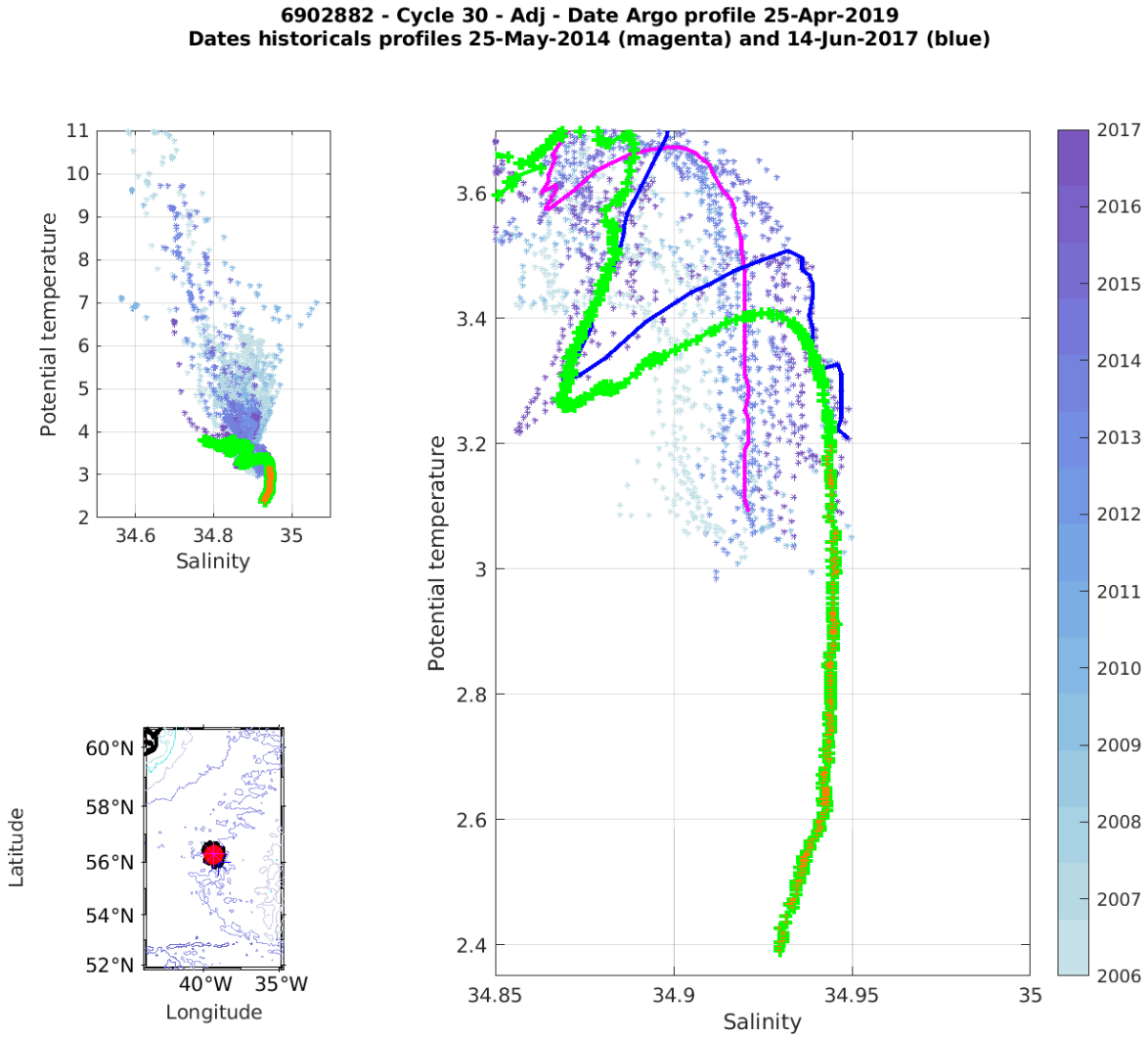


Figure 8: Float 6902882 Cycle 30. The analysed Argo profile (black) is compared to the 50 nearest reference Argo profiles and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of reference profiles represents the year of acquisition. θ/S diagram (left panel) and a zoom on the deepest layers (right panel).

3.9 Results of the OWC method

3.9.1 Configuration

OW CONFIGURATION	393
CONFIG_MAX_CASTS	250
MAP_USE_PV	1
MAP_USE_SAF	0
MAPSCALE_LONGITUDE_LARGE	1.6
MAPSCALE_LONGITUDE_SMALL	0.4
MAPSCALE_LATITUDE_LARGE	1
MAPSCALE_LATITUDE_SMALL	0.25
MAPSCALE_AGE	2
MAPSCALE_AGE_LARGE	10
MAP_P_EXCLUDE	0
MAP_P_DELTA	250
Reference data base	CTD2021V01

3.9.2 Plots

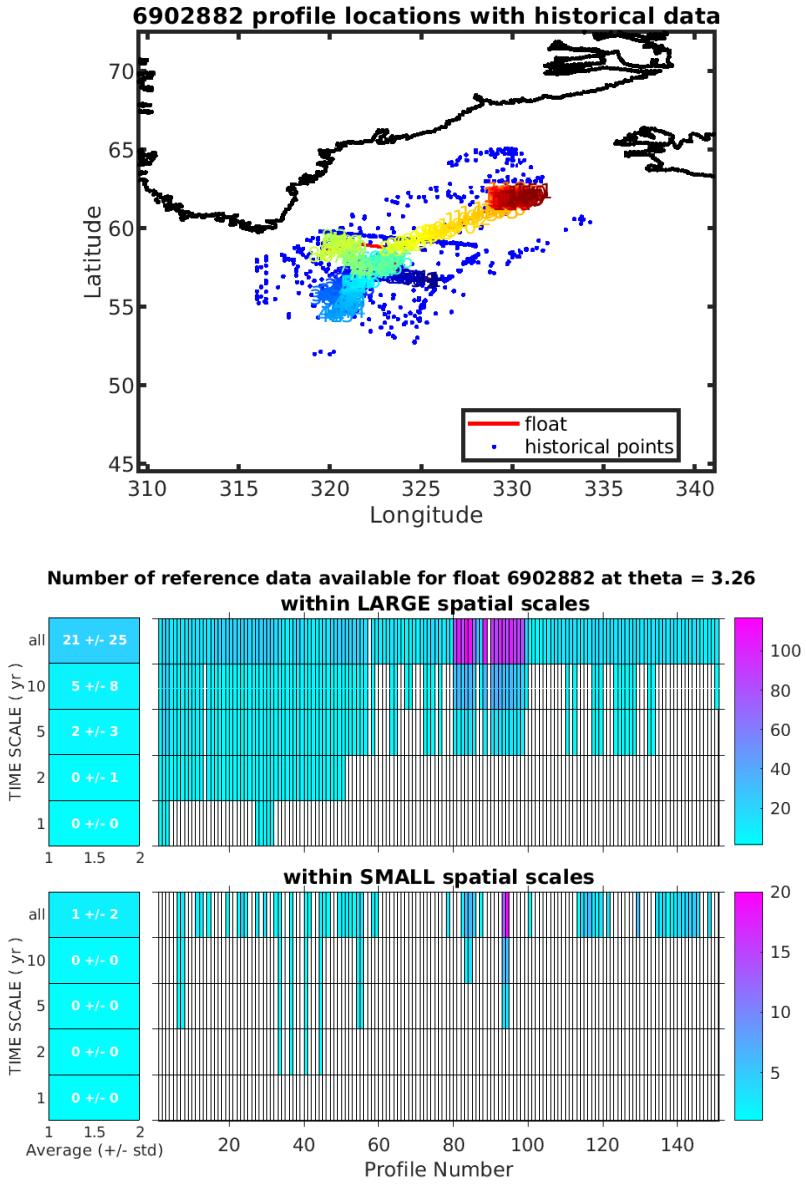


Figure 9: Float 6902882. Upper (left): Configuration parameters used for OWC method. Upper (rigth) : Reference profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower: Number of reference profile available within the defined spatial and temporal scales.

set_calseries.m	
breaks	[ ]
max_breaks	-1
use_theta_lt	[ ]
use_theta_gt	[ ]
use_pres_lt	[ ]
use_pres_gt	[ ]
use_percent_gt	0.5

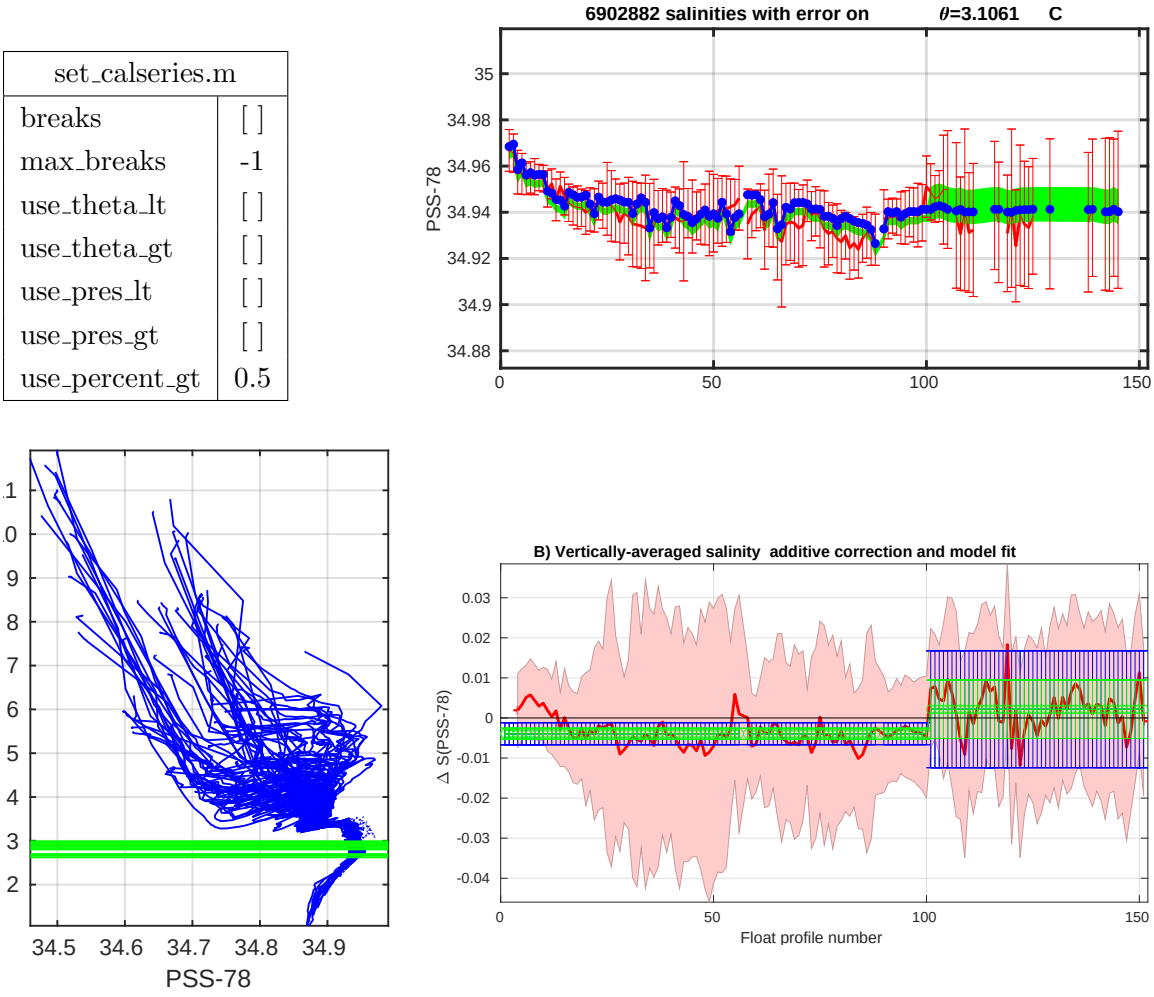


Figure 10: Float 6902882. Results of the OWC method (configuration 393). Upper panel (right): float salinities at one θ level (blue dots) compared to mapped salinities with errors (red). Lower panel (left): The 10 θ levels (green lines) with less salinity variance along the float path that are used for computing the conductivity correction. Lower panel (right): vertically-averaged mapped salinities minus float salinities on the 10 θ levels (red) and the computed offset (green). Omitted profiles: 57 89. Time series cutted at profiles: 101 .

Conclusion

OWC seems to suggest that a small fresh bias exists in the first ten cycles. This is not consistent with the comparison with the reference CTD cast and is probably related to the choice of reference data by the OWC software (both saltier profiles on the reykjanes ridge and cooler profiles towards the west). The reduction of map scales has helped to mitigate this bias. A small salty biais is seen overall cycle 1-100(-0.004) but probably partly due to the reference data variability (see figure 8). After cycle 100 the float is close to the ridge and does not reach the deepest theta levels. Nevertheless, at 3.1Â°C the salinity seems very stable. No correction is therefore applied to this float.

3.10 Adjusted data

3.10.1 Salinity flags and correction in D files

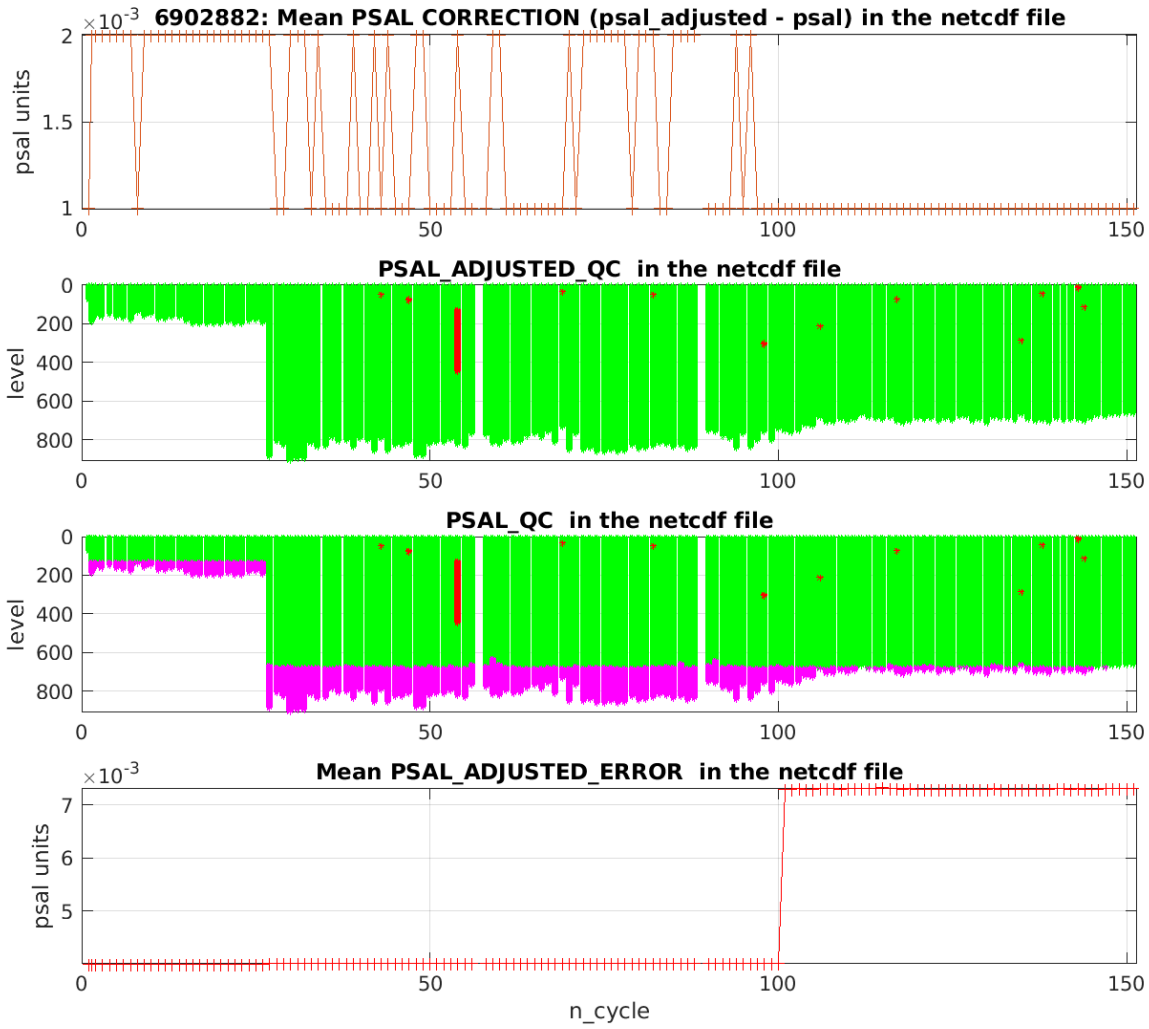


Figure 11: Salinity correction and flags in D files (Flag 0: blue, Flag 1: green, Flag 2: yellow, Flag 3: magenta, Flag 4: red)

3.10.2 Sections along the float trajectory

Salinity Correction applied in DM: No correction

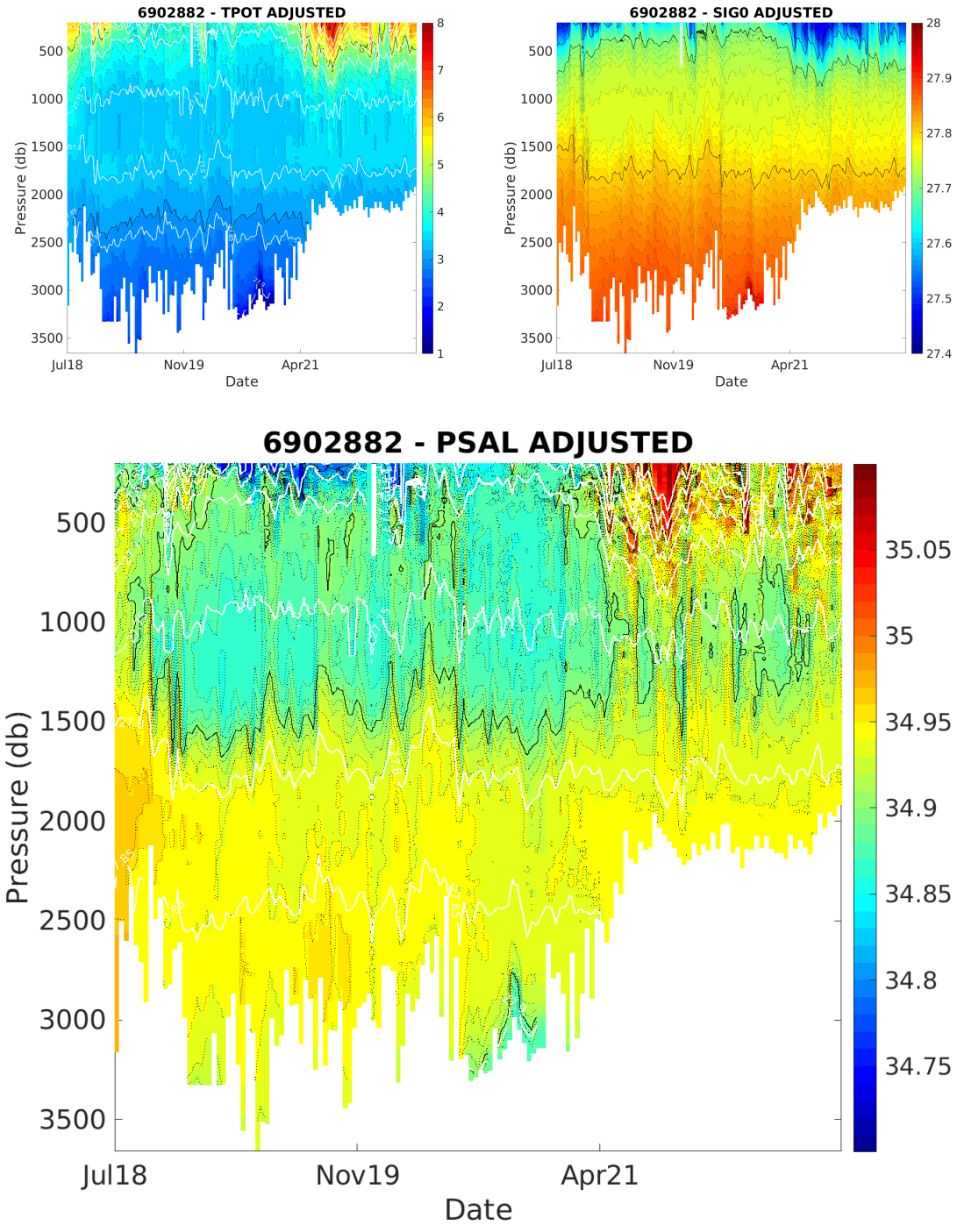


Figure 12: Float 6902882. Potential temperature, salinity and Sig0 sections along the float trajectory (adjusted data, flags used)

3.10.3 Theta/S diagrams

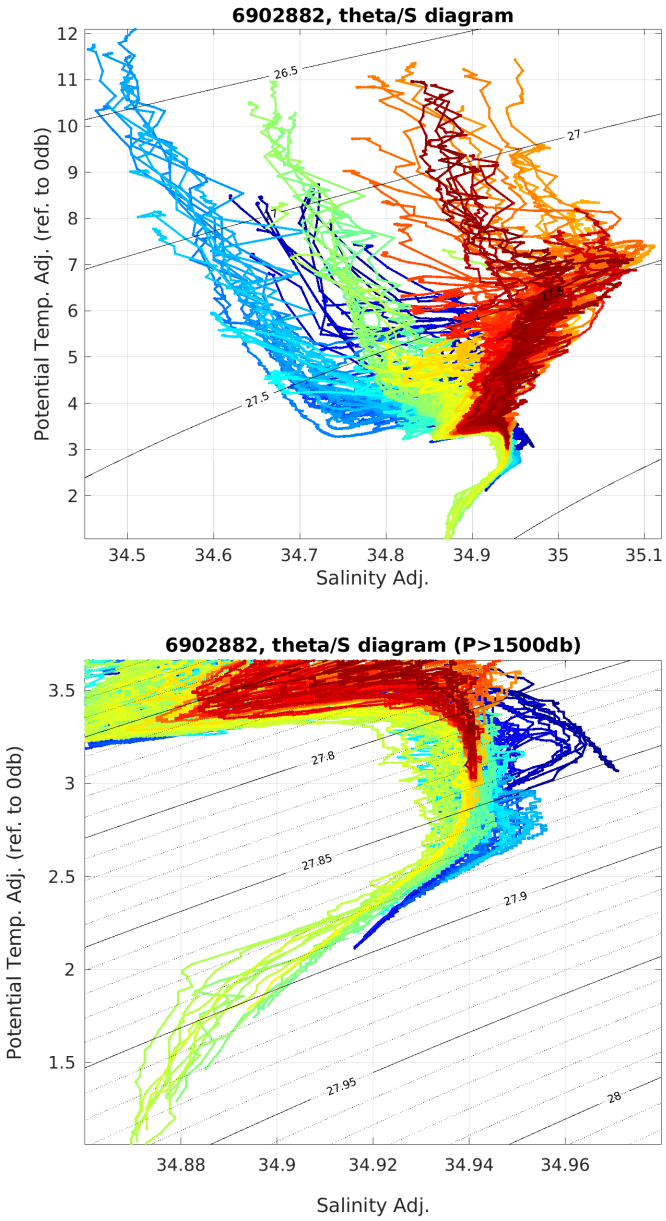


Figure 13: Float 6902882. Theta/S diagrams of the adjusted data, with the potential temperature referenced to 0db. Full profiles (upper panel) and zoom below 1500m (lower panel). Flags are used

3.10.4 Comparison with the reference CTD cast, adjusted profiles

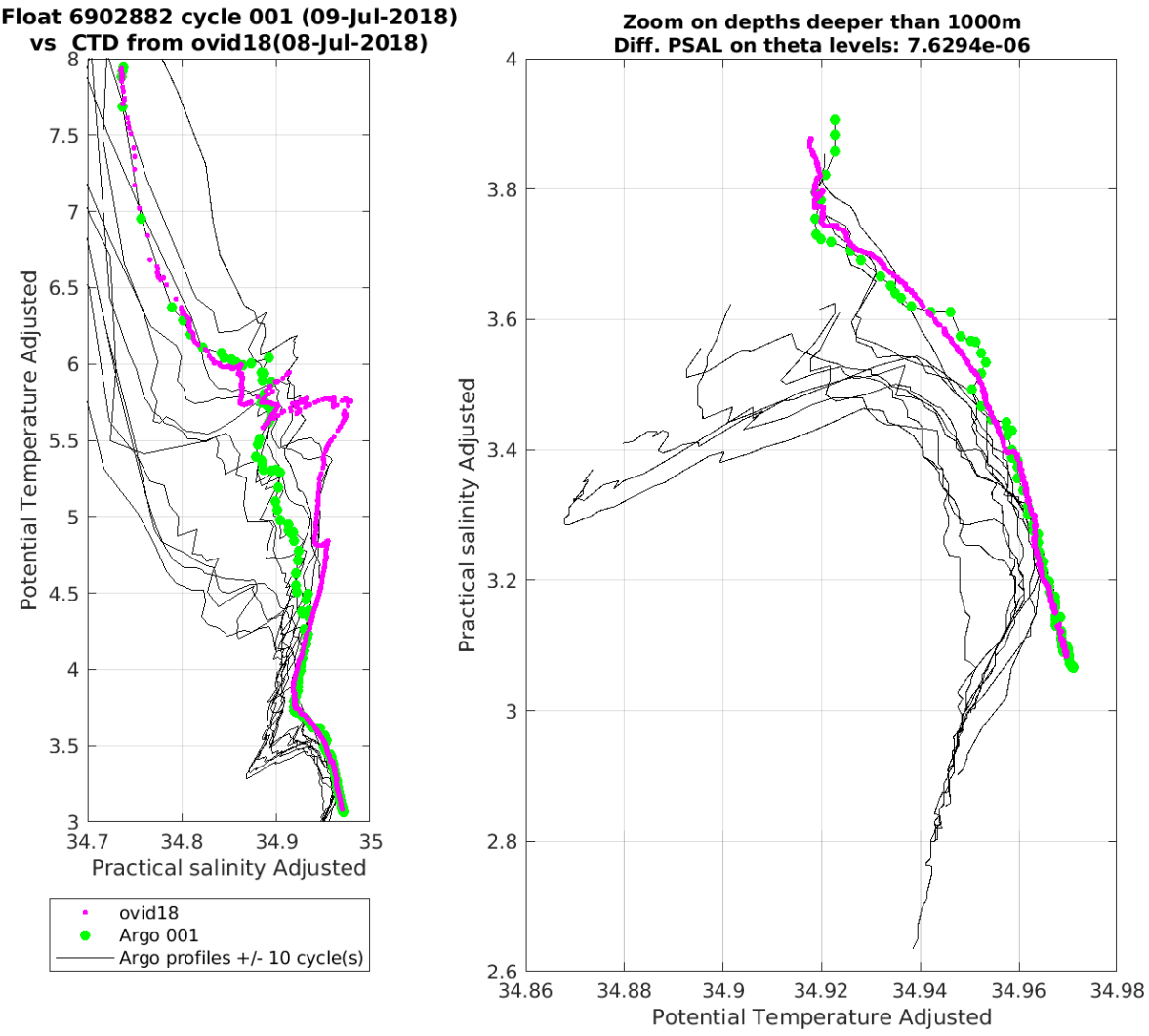


Figure 14: Float 6902882. Comparaison of the first descending (or ascending) argo profile with the CTD made at float deployement. Difference is PSAL_ADJUSTED(argo) -PSAL(ref cast).