Delayed mode analysis of salinity data acquired by Argo floats Float 6901601 (ovide18)
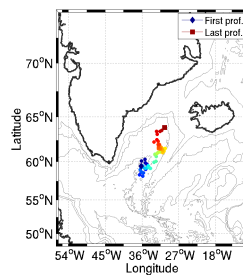
C.Cabanes, V.Thierry

Summary

WMO Number	DM Salinity Correction
6901601	From reference CTD cast (0.0050)

Table 1: Salinity Correction applied in delayed mode.

Contents

1 Presentation

Delayed Mode analysis was performed float 6901601. 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
6901601	04/07/2018	IF	V.Thierry	61(NA)	cy.1-1: 2.2812 days cy.2-61: 10 days

Table 2: Information on the floats analysed

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Pressure sensor maker:  KISTLER
Pressure sensor model:  KISTLER_10153PSIA
Pressure sensor SN: 4703483

Conductivity sensor maker:  SBE
Conductivity sensor model:  SBE41CP_V2
Conductivity sensor SN: 6756
```

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

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.

- 6901601 - No Density inversions. Missing cycles :12, 28.

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
6901601	-1.35e-07	0.0050	0.0027± 0.0051 (config. 39)	From reference CTD cast

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.

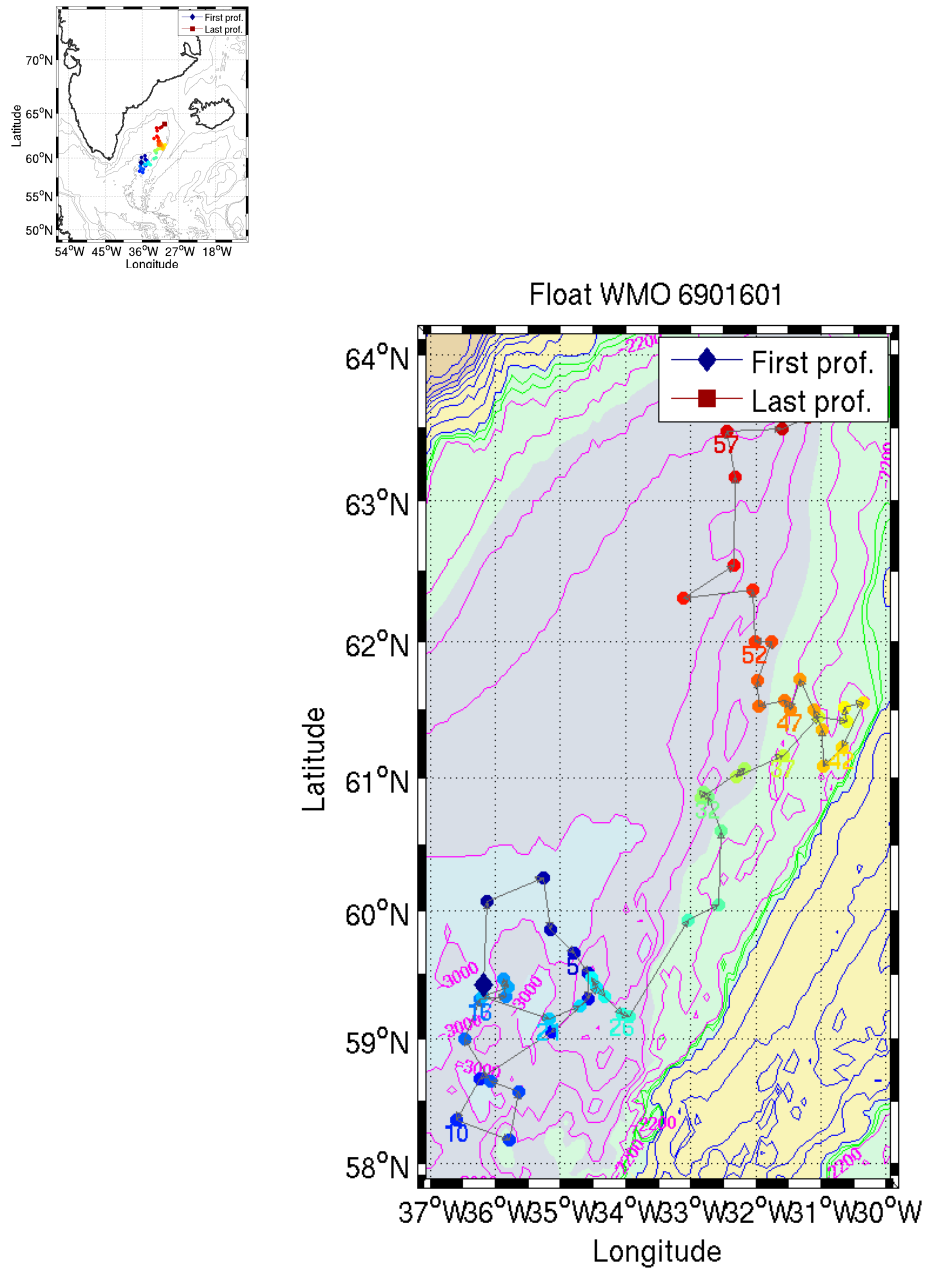# 3 Float 6901601

3.1 Trajectory

Figure 1: Float 6901601. 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.

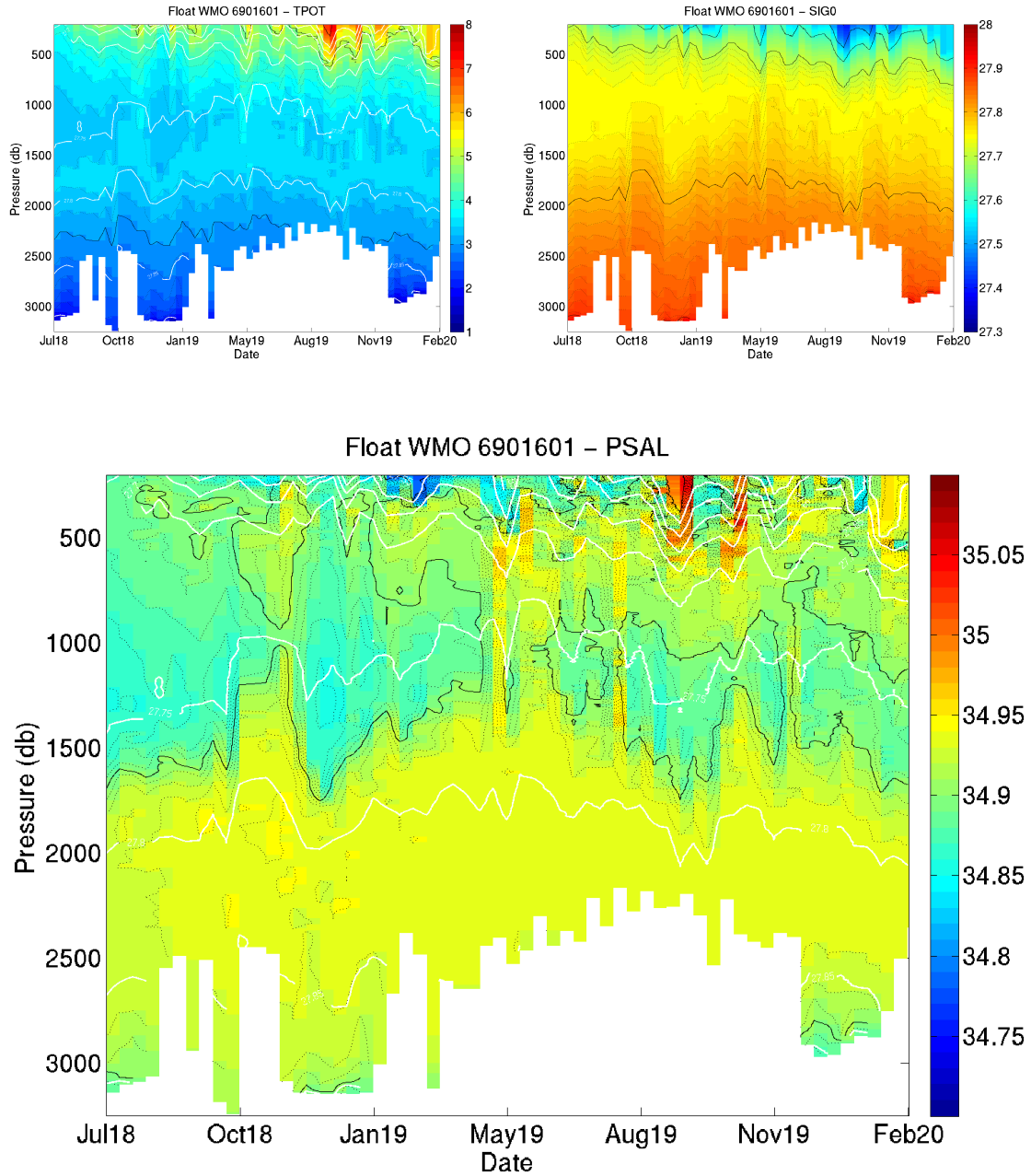## 3.2 Sections along the float trajectory - raw data

Figure 2: Float 6901601. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, flags not used)

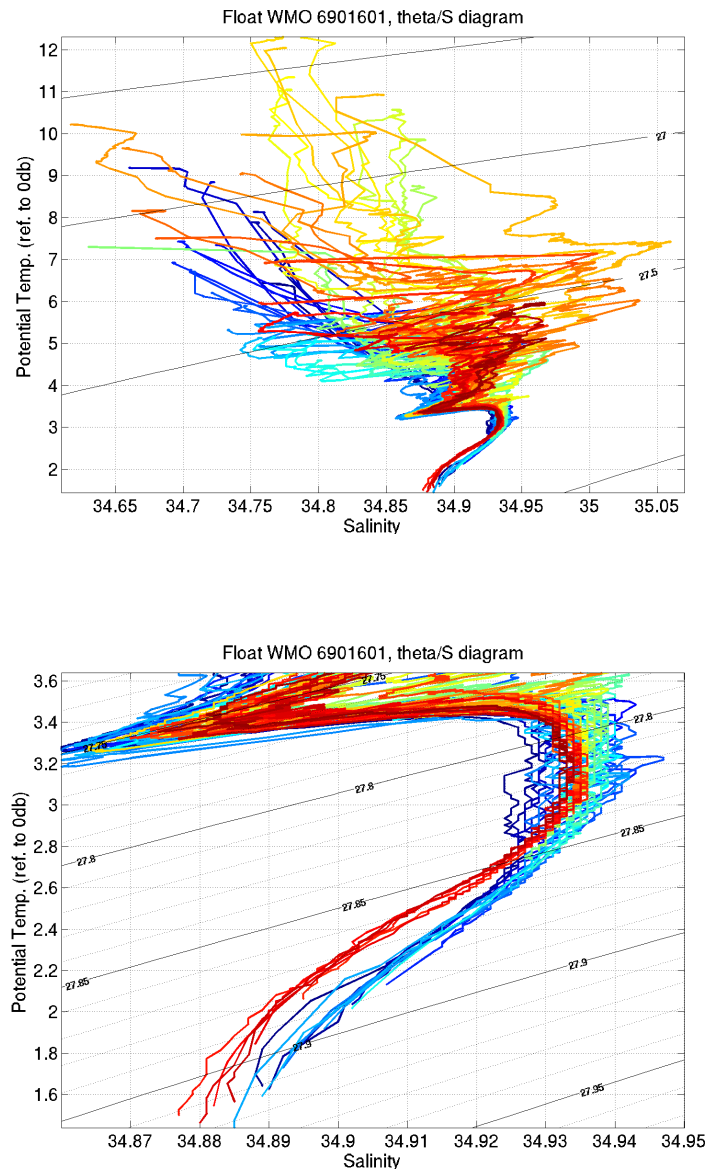## 3.3 Theta/S diagrams - raw data

Figure 3: Float 6901601. 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

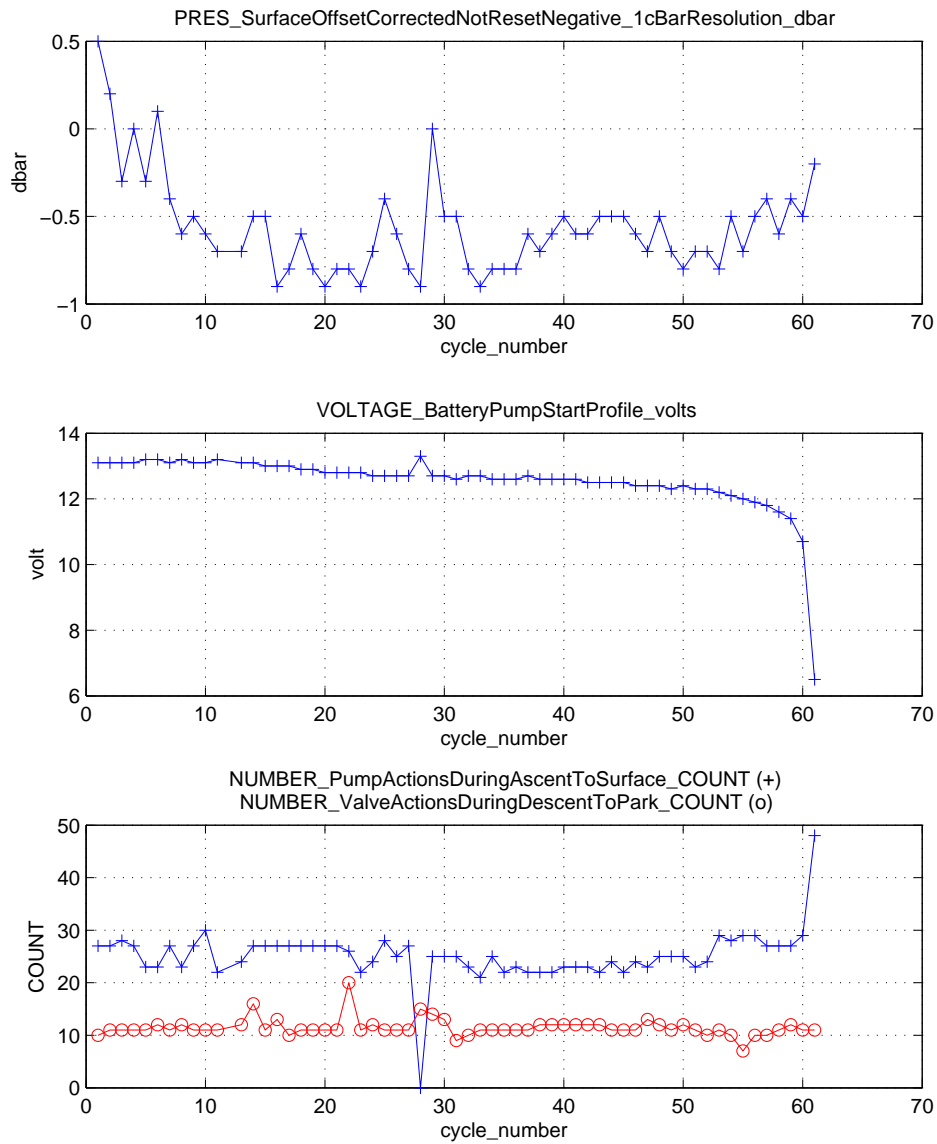## 3.4 Technical data : surface pressure - battery - pump or valve actions

Figure 4: Float 6901601: Some technical data as read in the technical file
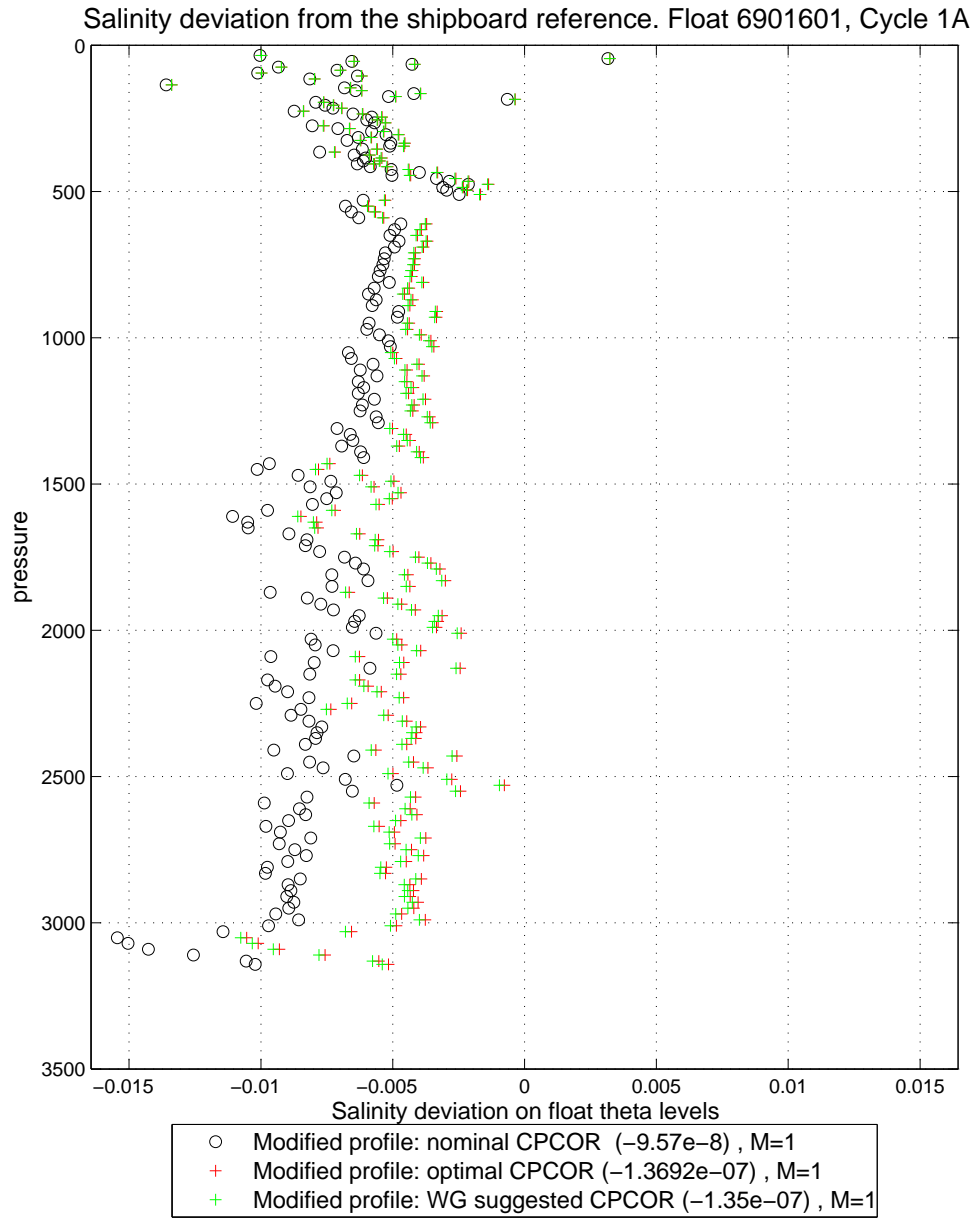
3.5 Cpcor Analyse

Figure 5: Float 6901601. Estimation of the optimal Cpcor (<1000m). 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.
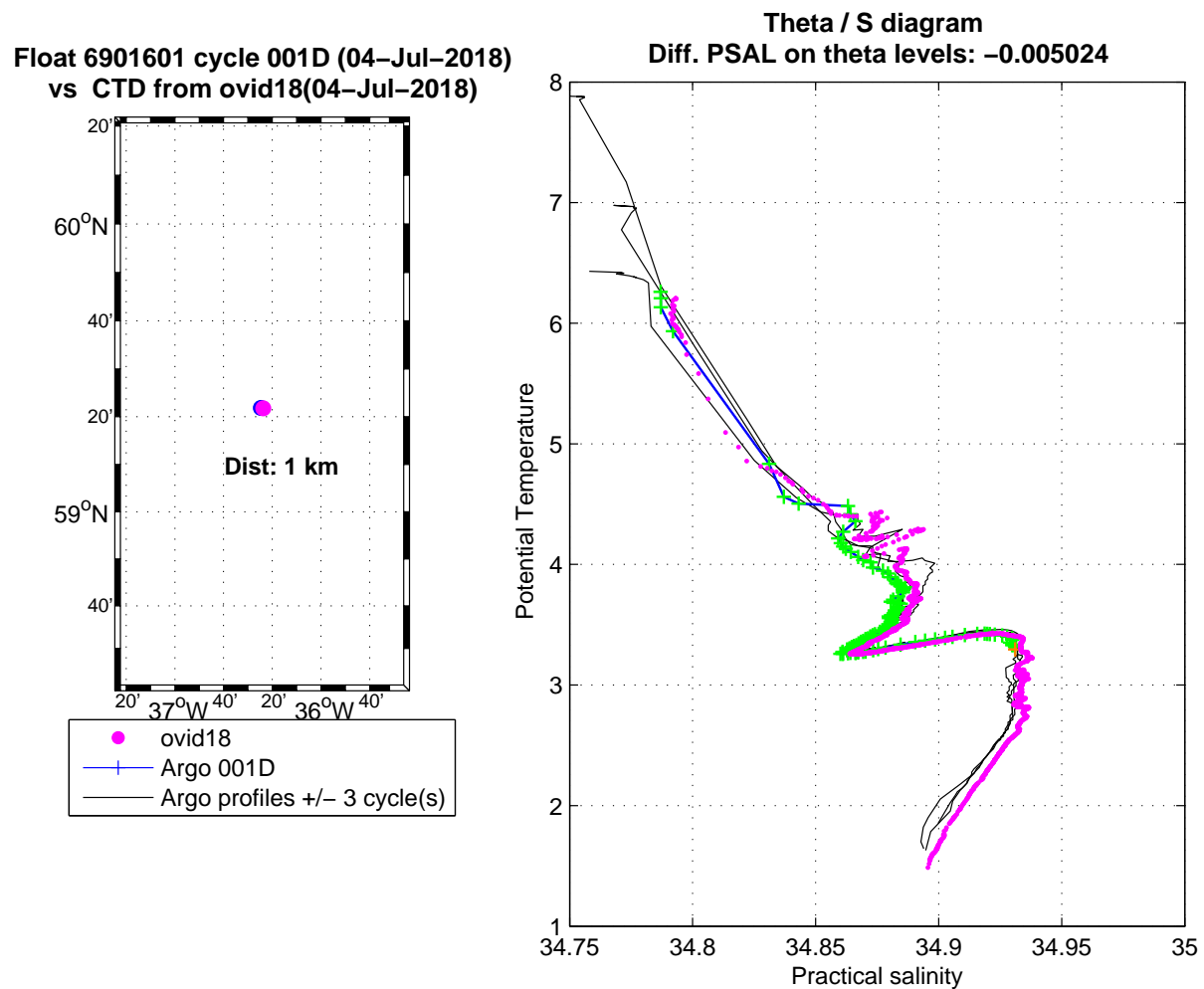
3.6 Comparison with the reference CTD cast

Figure 6: Float 6901601. Comparaison of the first descending (or ascending) argo profile with the CTD made at float deployement. Difference is PSAL(argo) -PSAL(ref cast).
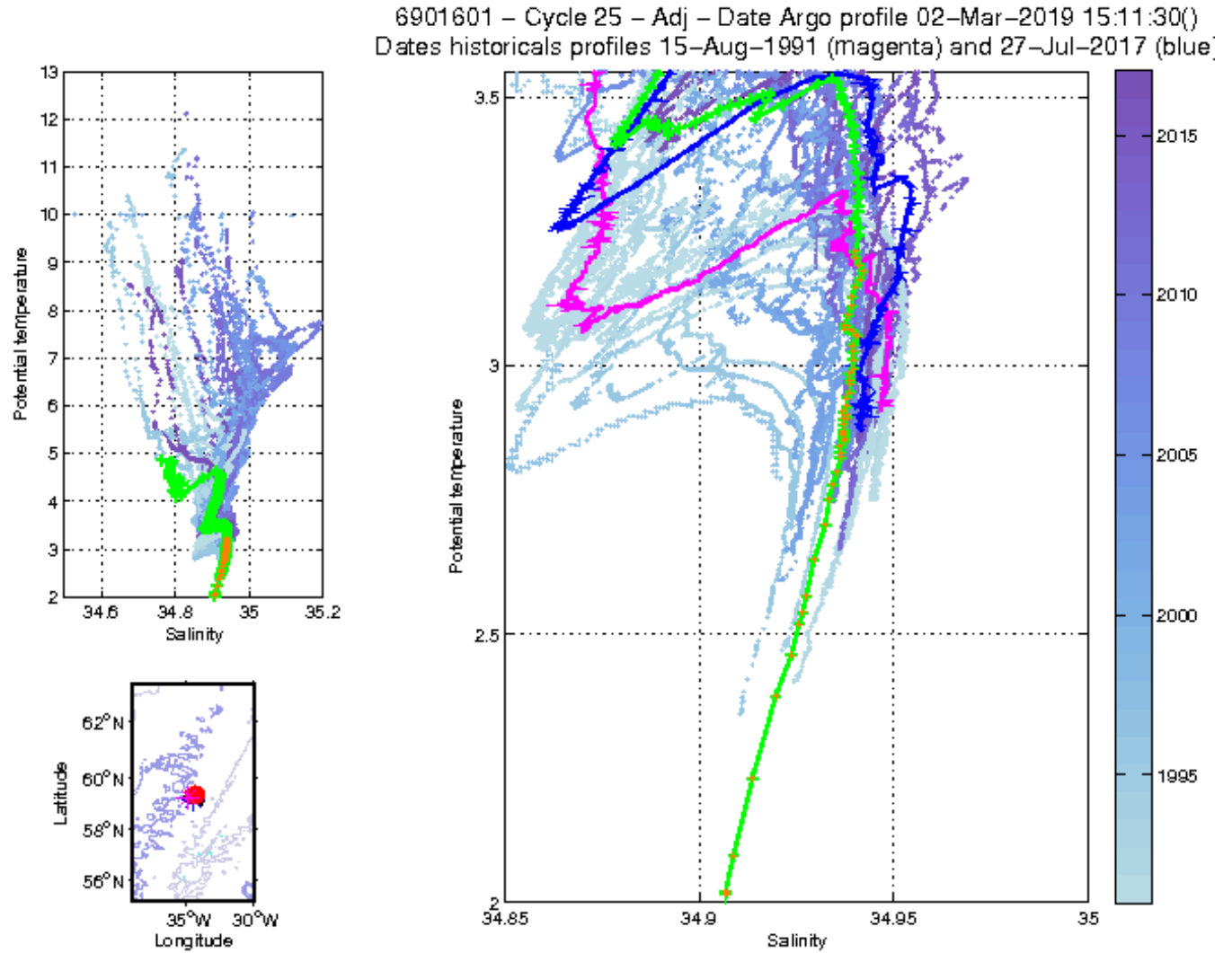
3.7 Comparison to reference profiles

Figure 7: Float 6901601 Cycle 25. The analysed Argo profile (black) is compared to the 50 nearest reference CTD 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).

3.8 Results of the OWC method

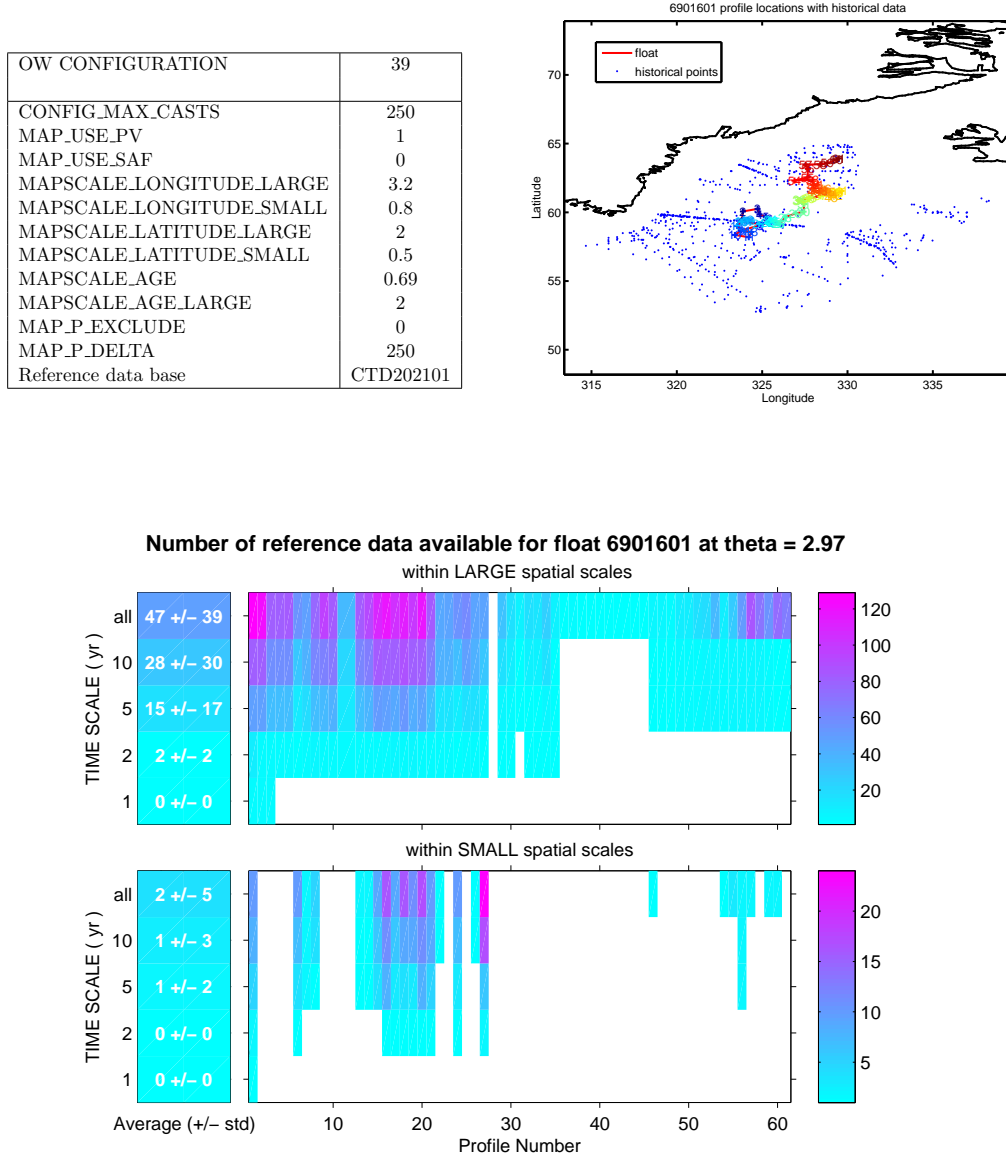| OW CONFIGURATION	39
CONFIG_MAX_CASTS	250
MAP_USE_PV	1
MAP_USE_SAF	0
MAPSCALE_LONGITUDE_LARGE	3.2
MAPSCALE_LONGITUDE_SMALL	0.8
MAPSCALE_LATITUDE_LARGE	2
MAPSCALE_LATITUDE_SMALL	0.5
MAPSCALE_AGE	0.69
MAPSCALE_AGE_LARGE	2
MAP_P_EXCLUDE	0
MAP_P_DELTA	250
Reference data base	CTD202101

Figure 8: Float 6901601. 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.

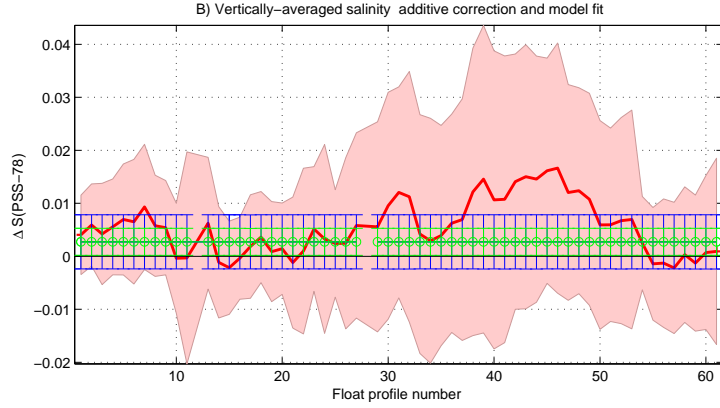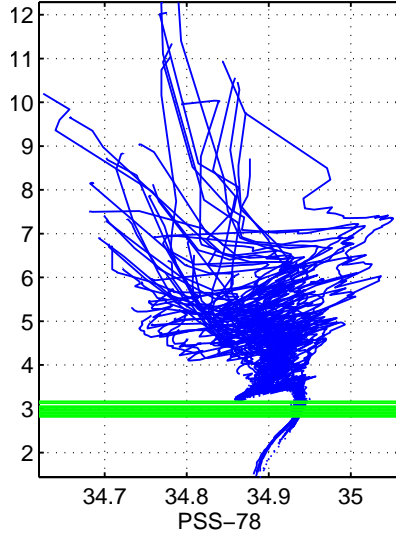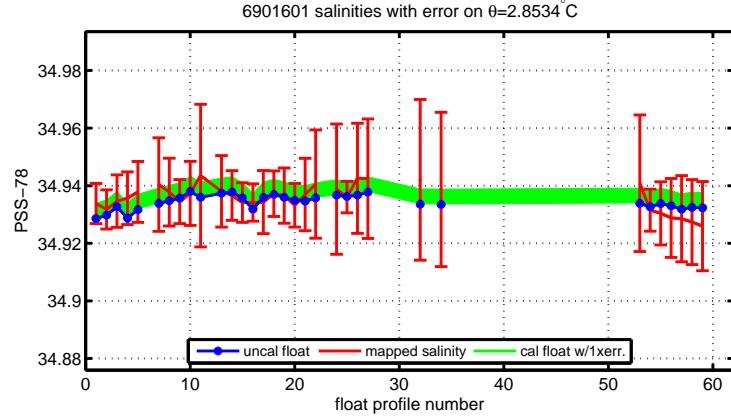| set_calseries.m	
breaks	[ ]
max_breaks	4
use_theta_lt	[ ]
use_theta_gt	[ ]
use_pres_lt	[ ]
use_pres_gt	[ ]
use_percent_gt	0.5

Figure 9: Float 6901601. Results of the OWC method (configuration 39). 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: 27.

Conclusion

Both the comparison to the reference CTD made at float launch and OWC results suggest a small fresh bias. We applied the constant correction based on the reference CTD cast.

13

3.9 Adjusted data

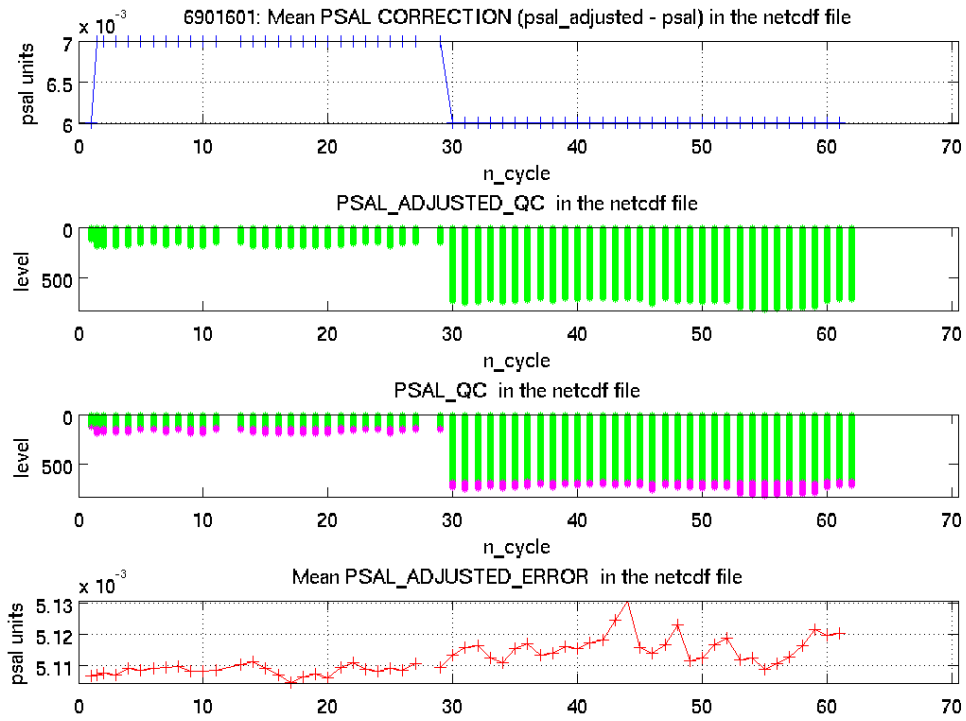### 3.9.1 Salinity flags and correction in D files

Figure 10: Salinity correction and flags in D files (Flag 0: blue, Flag 1: green, Flag 2: yellow, Flag 3: magenta, Flag 4: red)

3.9.2 Sections along the float trajectory

Salinity Correction applied in DM: From reference CTD cast (0.0050)
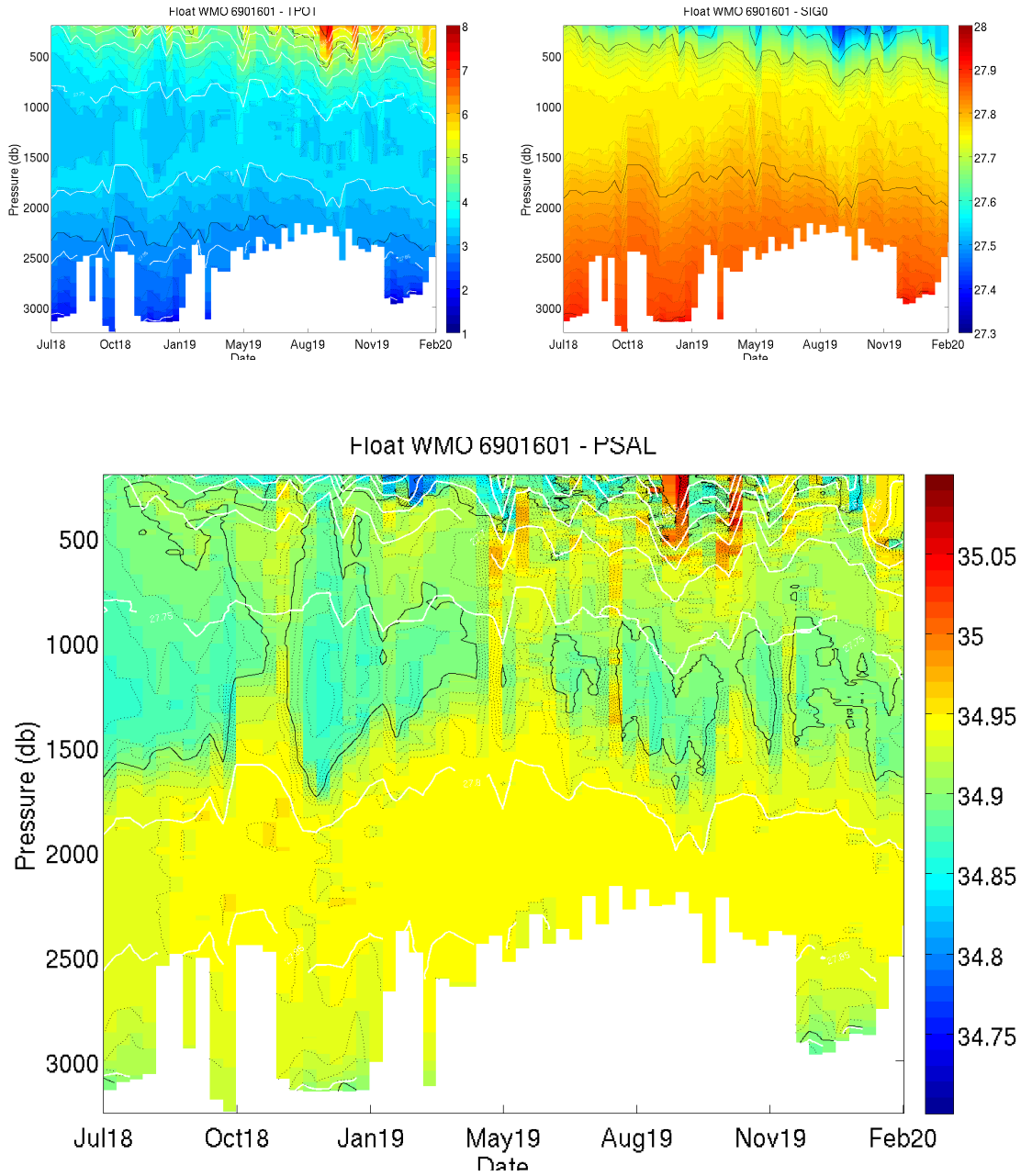

Figure 11: Float 6901601. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, flags not used)
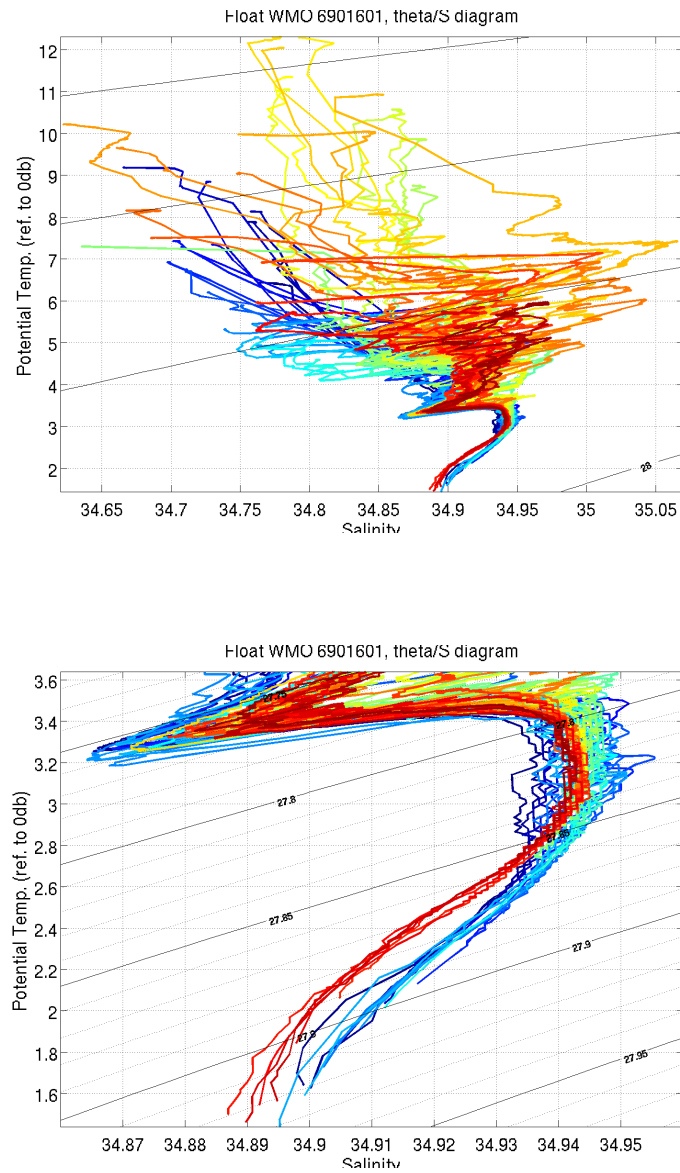
3.9.3 Theta/S diagrams

Figure 12: Float 6901601. 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

3.9.4 Comparison with the reference CTD cast, adjusted profiles
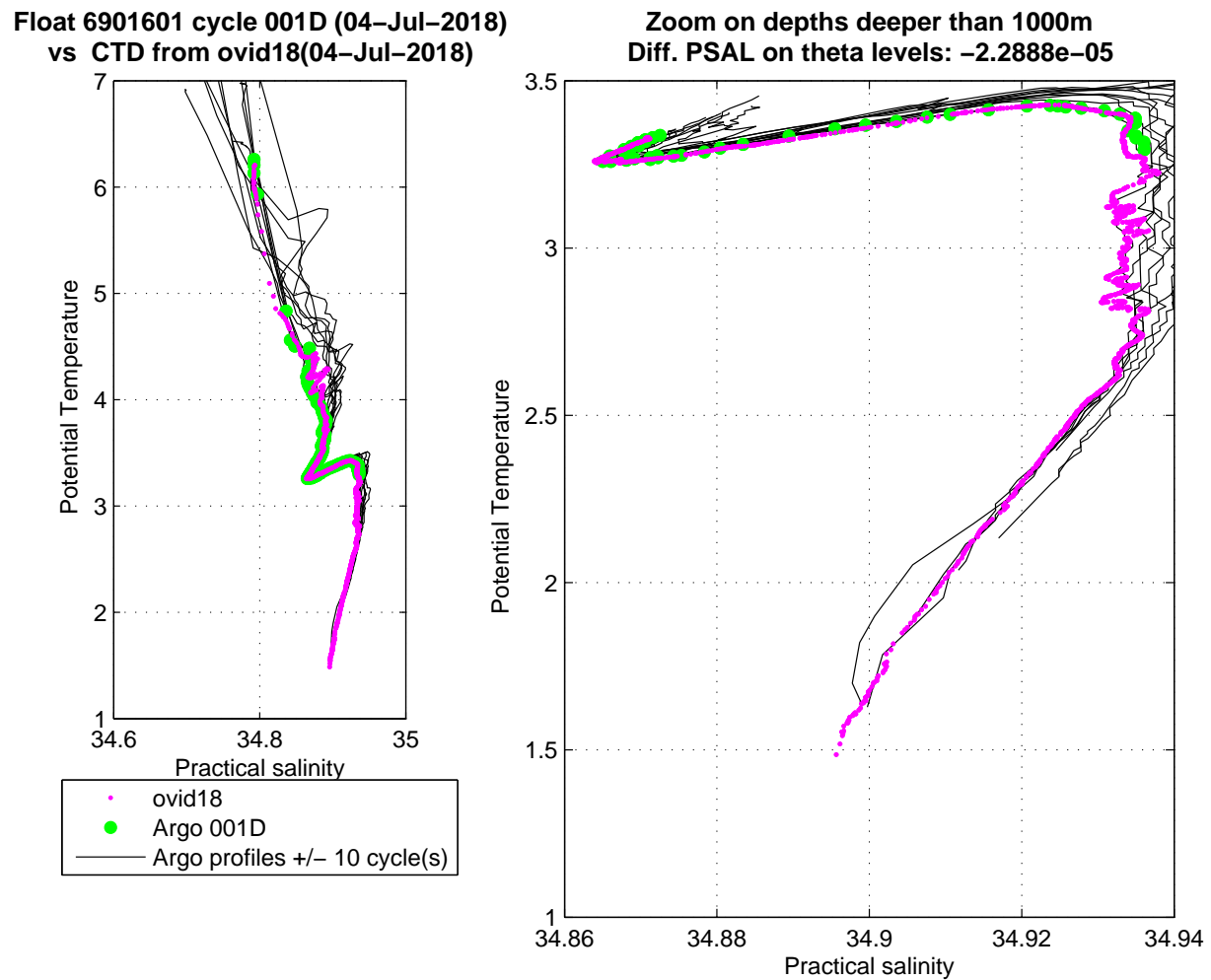

Figure 13: Float 6901601. Comparaison of the first descending (or ascending) argo profile with the CTD made at float deployement. Difference is PSAL_ADJUSTED(argo) -PSAL(ref cast).