
**Check of DM corrections of NAARC floats (DAC: MEDS)
(Argo Snapshot: 06/2018)**

C.Cabanes, V. Thierry, C.Lagadec

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As part of North Atlantic ARC activities, the floats processed in delayed mode in the NAARC region have been checked again. Here we present the results for the floats of the MEDS data center

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1 Method

In the snapshot of May 2018, 1903 floats have been processed in DM in the NAARC region (North of 20°S). Among them, we found 321 floats for which the PI applied a salinity correction and 1553 floats for which no salinity correction was necessary (i.e. the adjusted salinity profile is equal to the raw salinity profile). For each 1903 floats, we run a modified OW method using four sets of configuration parameters given in table 1, namely configurations 129, 1291, 1292, 1293. Compared to the OW original method (Owens and Wong, 2009), our modified method better take into account the interannual variability and provide more realistic error bars (see Cabanes et al., 2016). Particularly, a Gaussian decay was added to compute the covariance matrix that is used to estimate the large scale field at the float profile position, allowing to give more weight to contemporary reference data.

We further checked the DM salinity correction of a float only if the results get for all of the four configurations differ significantly from the result obtained by the PI of the float. Note that we used an additional run (configuration 124, see table 1) for floats that sample Mediterranean Water masses. We were then able to isolate a small number of floats for which salinity profiles were further checked: sections along the float trajectory, comparison of some profiles with the closest reference data or with the closest real-time argo data available, if needed. Finally, when we thought it was necessary, we suggested to modify the salinity corrections.

OW CONFIGURATION	129	1291	1292	1293	1294
CONFIG_MAX_CASTS	250	250	250	250	250
MAP_USE_PV	1	1	1	1	1
MAP_USE_SAF	0	0	0	0	0
MAPSCALE_LONGITUDE_LARGE	3.2	1	3.2	3.2	3.2
MAPSCALE_LONGITUDE_SMALL	0.8	0.5	0.8	0.8	0.8
MAPSCALE_LATITUDE_LARGE	2	0.5	2	2	2
MAPSCALE_LATITUDE_SMALL	0.5	0.25	0.5	0.5	0.5
MAPSCALE_PHI_LARGE	0.1	0.5	0.1	0.1	0.1
MAPSCALE_PHI_SMALL	0.02	0.1	0.02	0.02	0.02
MAPSCALE_AGE	0.69	0.69	0.69	0.69	0.69
MAPSCALE_AGE_LARGE	2	2	10	2	2
MAP_P_EXCLUDE	0	0	0	0	0
MAP_P_DELTA	250	250	250	250	250
Constraint on chosen levels	none	none	none	> 1000m	< 1000m
Reference data base	ARGO (2018v01) and CTD (2018v01)				

Table 1: Parameters of the OW method for different configurations used in this study. Compared to the original OW method, the large scale mapping use a Gaussian decay - MAPSCALE_AGE_LARGE -, the calculation of the mapping error is modified and the horizontal covariance is taken into account for the computation of the error on the fit.

2 Results

2.1 Summary and suggestions

It may be necessary to revise the correction for 3 floats listed in table 2.

WMO Number	Launch date	Centre	PI	Last cycle analysed (Active/NotActive)	netcdf files version (prof files)
4900406	01/12/2003	ME	H.F.	91(NA)	3.1
4900417	29/09/2003	ME	H.F.	95(NA)	3.1
4900502	17/09/2005	ME	H.F.	204(NA)	3.1

Table 2: Floats for which it may be necessary to revise the DM correction

Here, we summarize our suggestions for DM salinity correction for each float.

- **4900406**: no correction seems necessary cycles 85-91.
- **4900417**: no correction seems necessary cycles 92-95.
- **4900502**: no correction seems necessary cycles 157-164.

2.2 Float 4900406

2.2.1 Sections along the float trajectory - raw data

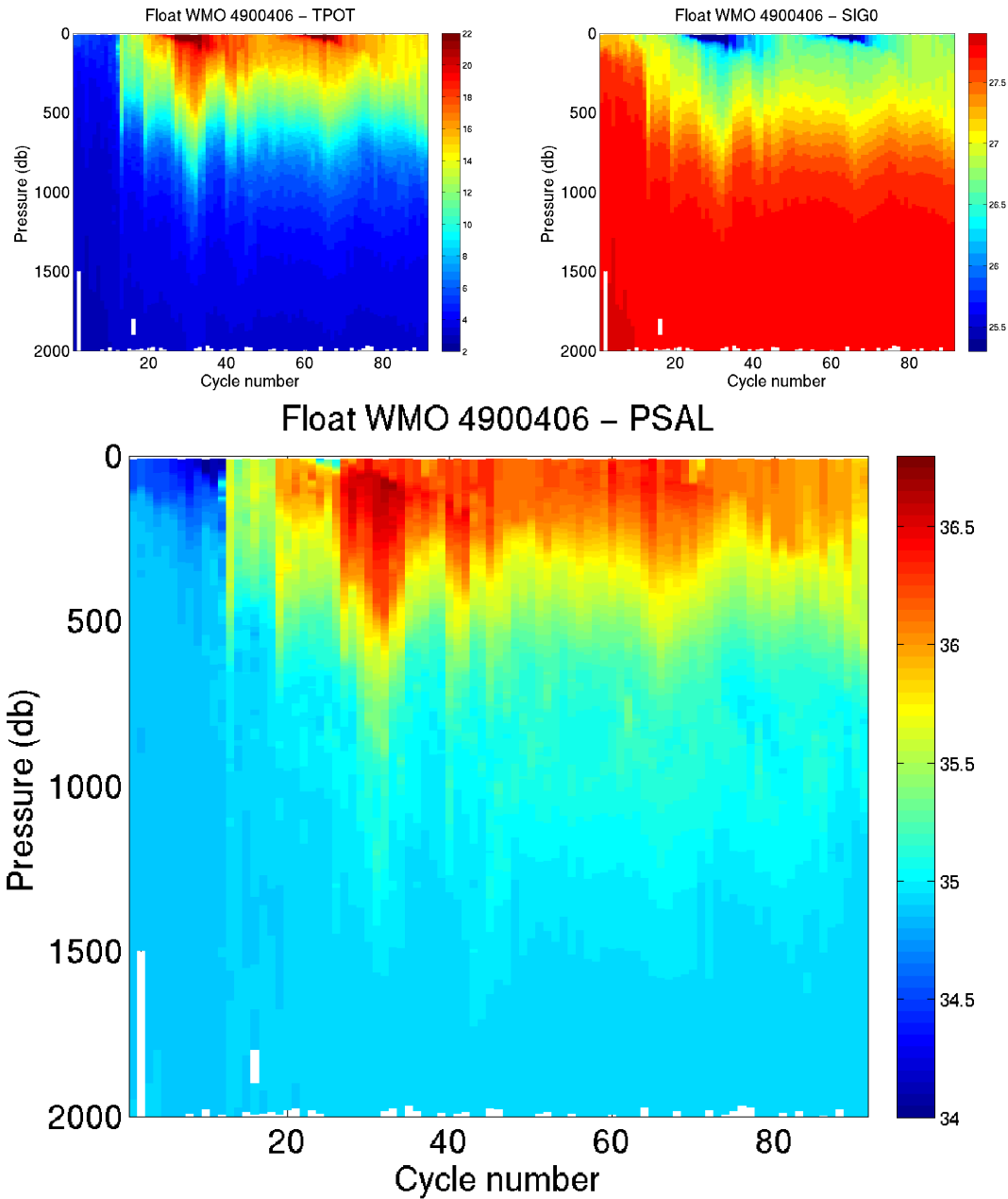


Figure 1: Float 4900406. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, bad data with quality flags > 2 are not plotted)

2.2.2 Theta/S diagrams - raw data

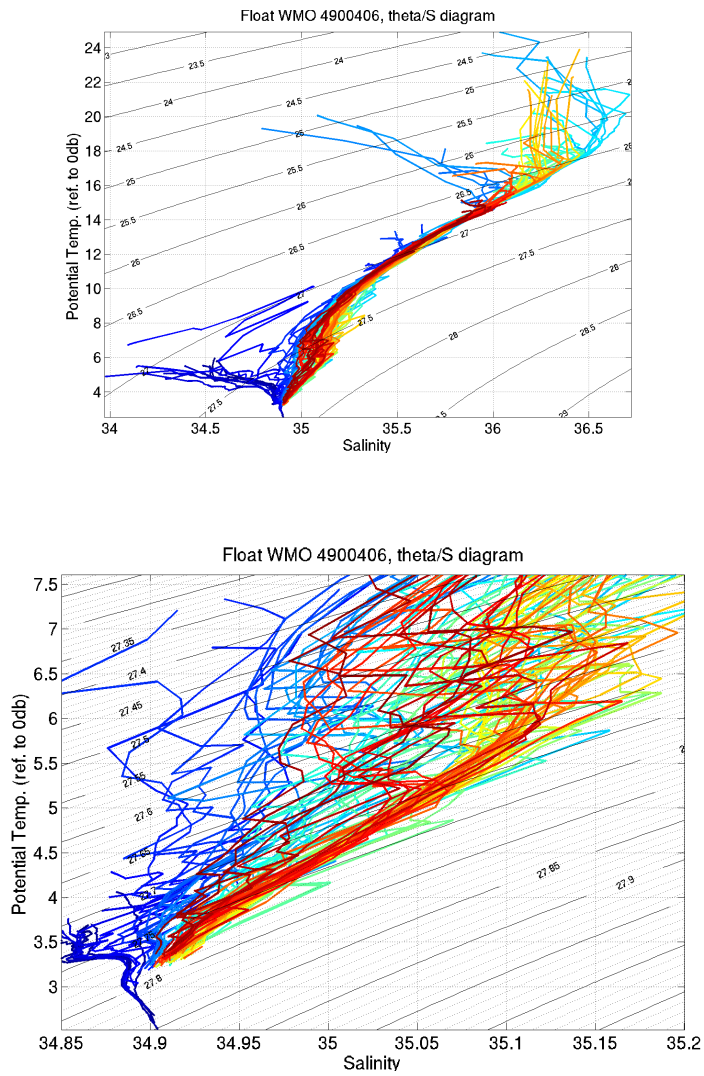


Figure 2: Float 4900406. Theta/S diagrams of the raw data, with the potential temperature referenced to 0db. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.2.3 Comparison to reference Argo profiles

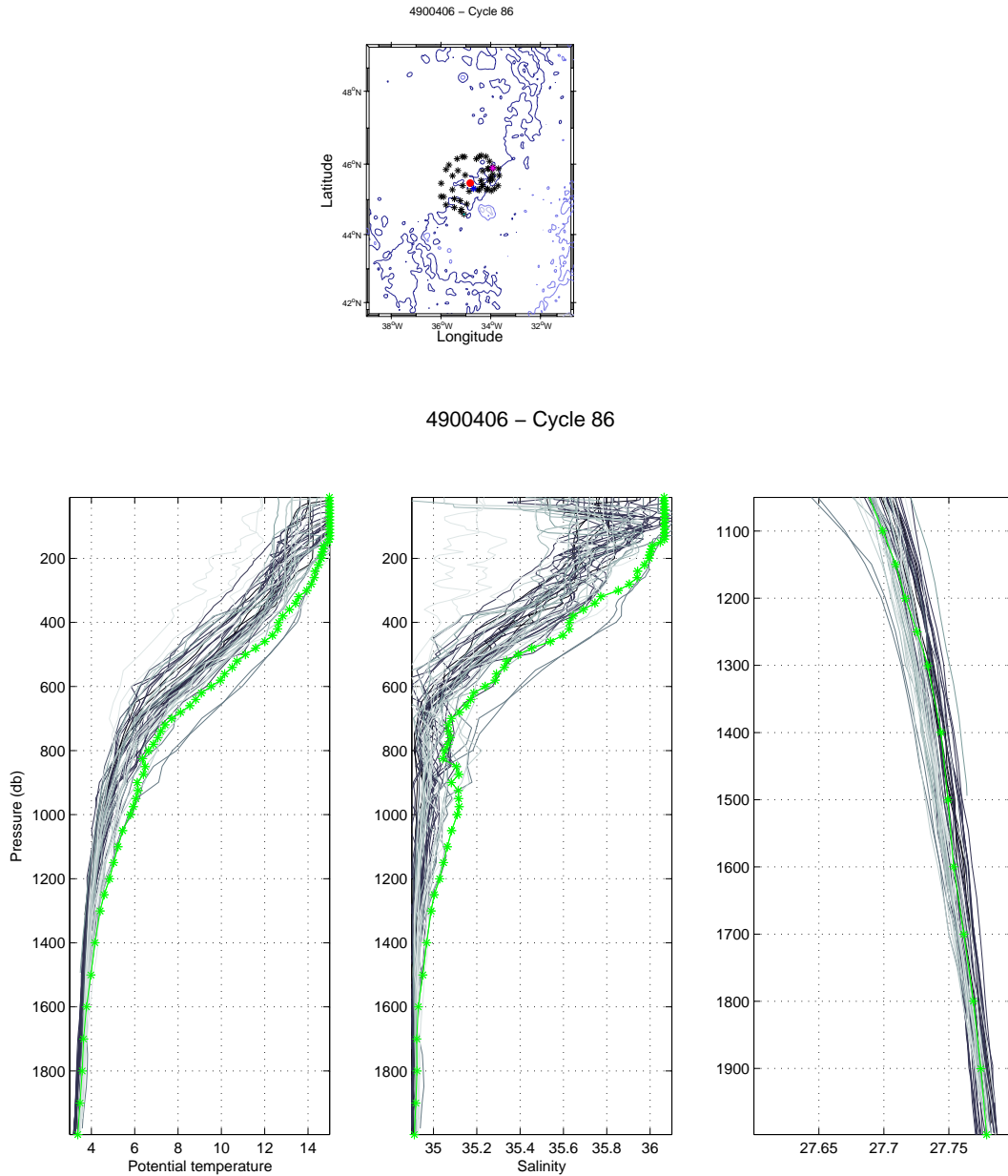


Figure 3: Float 4900406 Cycle 86. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

4900406 – Cycle 86 – Date Argo profile 09–Apr–2006 08:14:00
Dates historical profiles 30–Aug–2003 (blue) and 22–Dec–2005 (magenta)

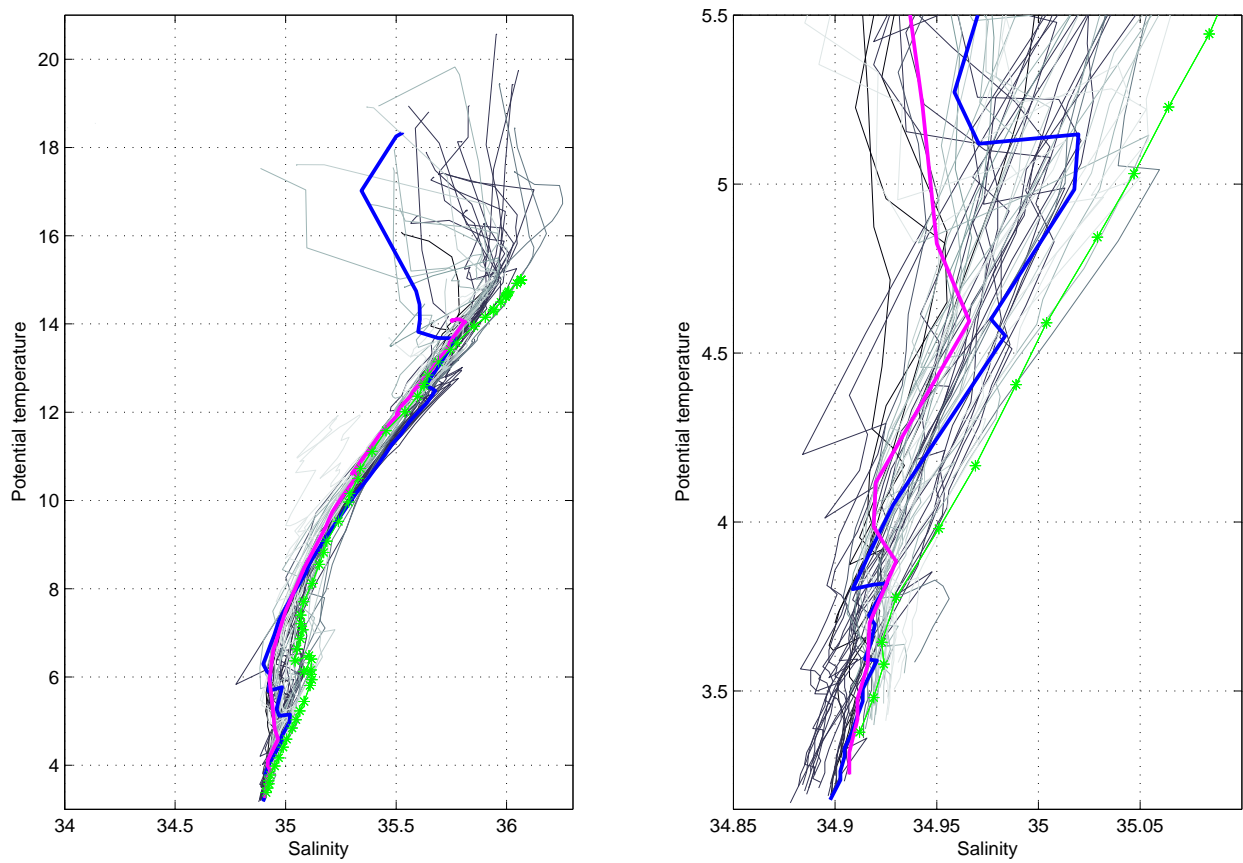


Figure 4: Float 4900406 Cycle 86. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). θ/S diagram (left panel) and a zoom on the deepest layers (right panel).

2.2.4 Results of the OW method

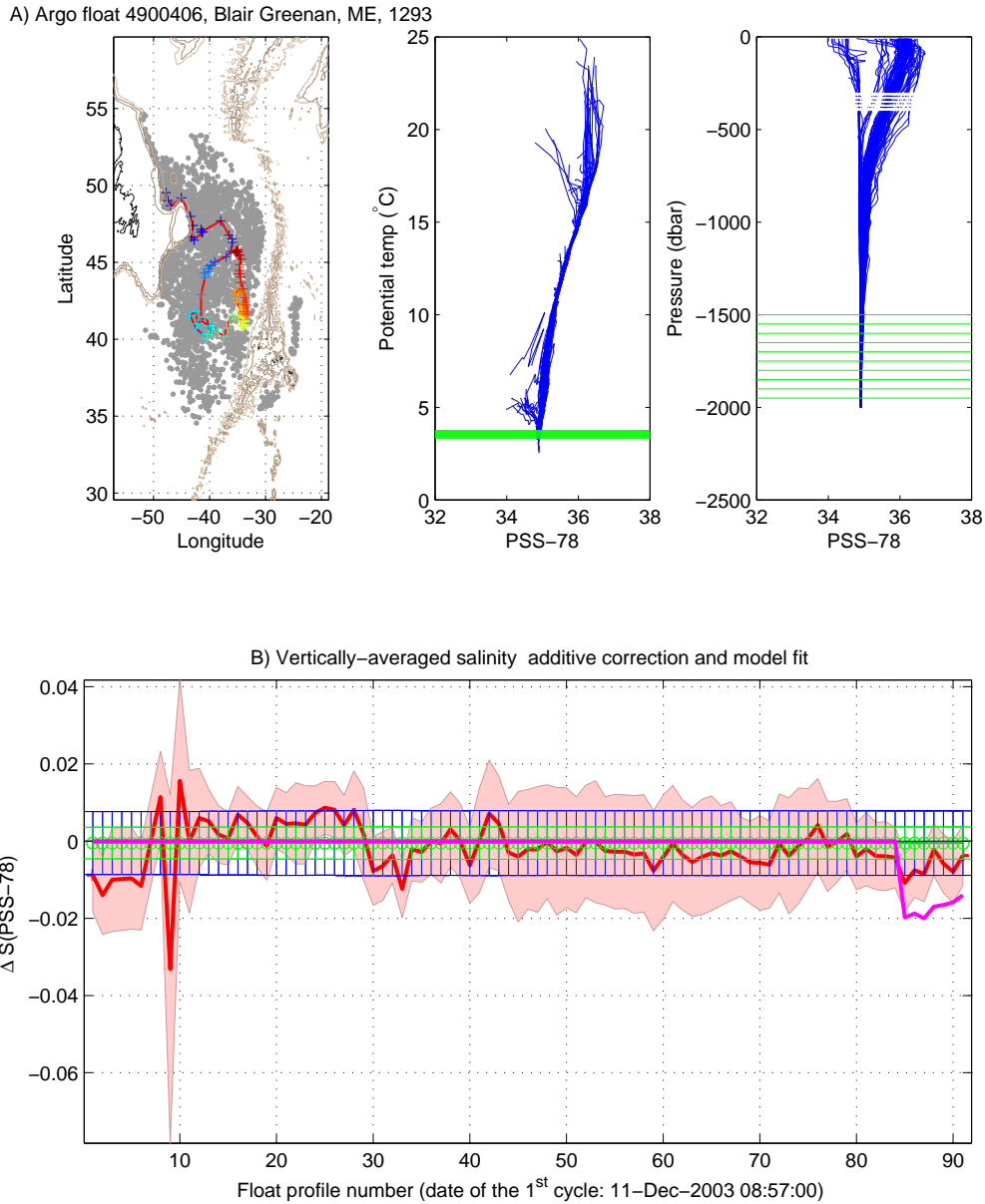


Figure 5: Float 4900406. Results of the OW method (configuration 1293). Upper panels: Reference profiles used for the mapping (grey dots) are shown on a map along with the float trajectory. On the two most right-handed figures are displayed in green the ten most stable θ levels used to compute the fit. Lower panel: vertically-averaged mapped salinities minus float salinities on the 10 most stable θ levels (red line) and the offset obtained by a linear fit (green circles). The mapping errors are shaded in red. Green error bars show the fit error and blue error bars show the doubled fit error. The **salinity correction currently available on the GDAC** is displayed in magenta.

2.3 Float 4900417

2.3.1 Sections along the float trajectory - raw data

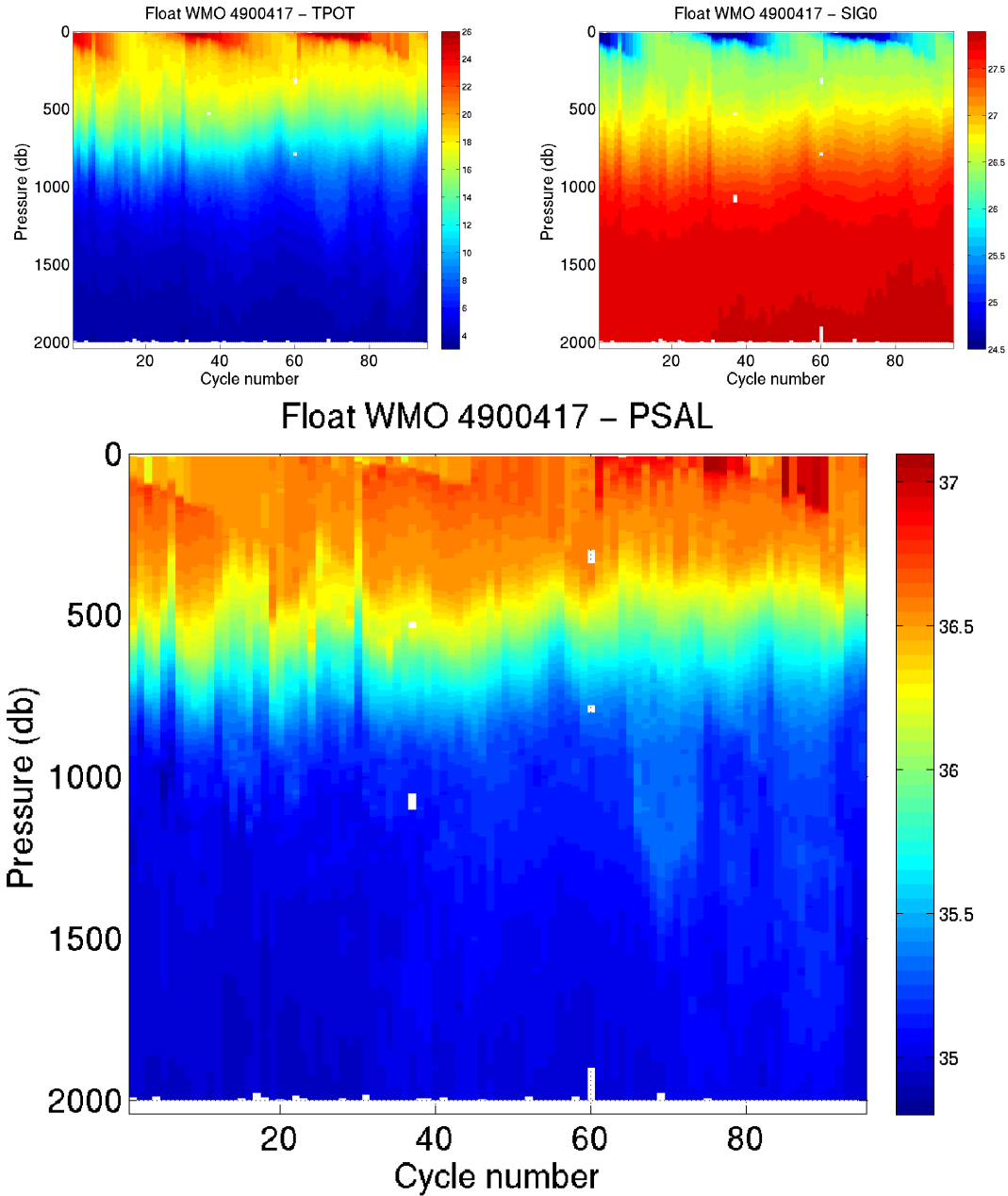


Figure 6: Float 4900417. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, bad data with quality flags > 2 are not plotted)

2.3.2 Theta/S diagrams - raw data

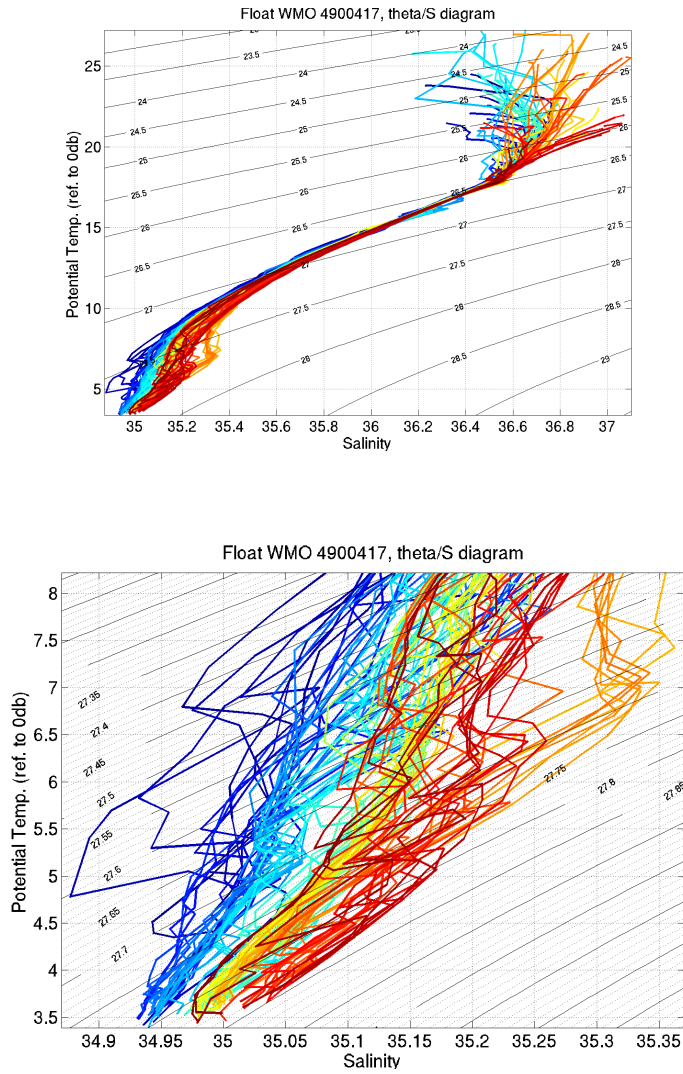


Figure 7: Float 4900417. Theta/S diagrams of the raw data, with the potential temperature referenced to 0db. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.3.3 Comparison to reference Argo profiles

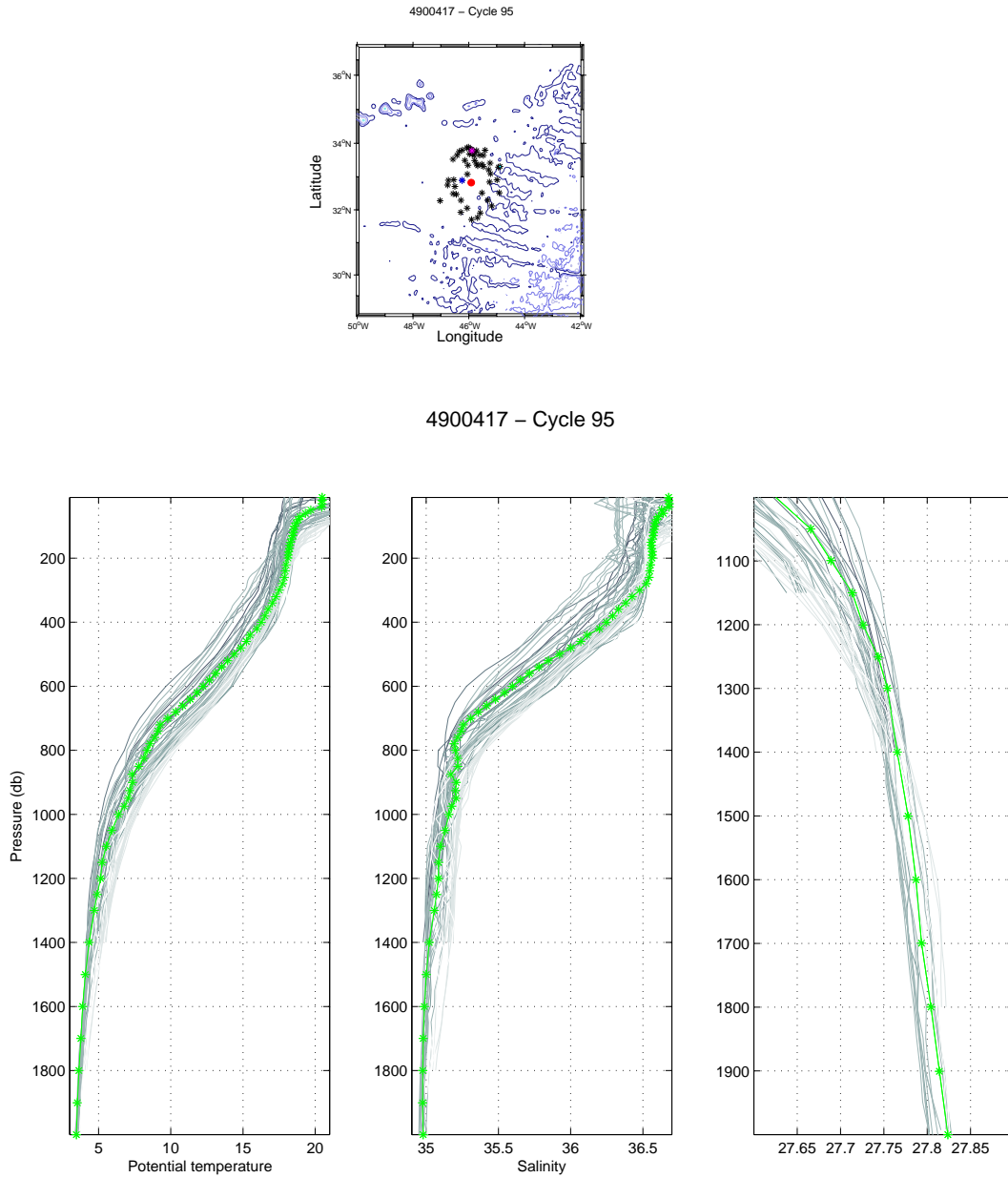


Figure 8: Float 4900417 Cycle 95. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

4900417 – Cycle 95 – Date Argo profile 06-May-2006 11:17:00
Dates historical profiles 29-Aug-2012 (blue) and 24-Apr-2003 (magenta)

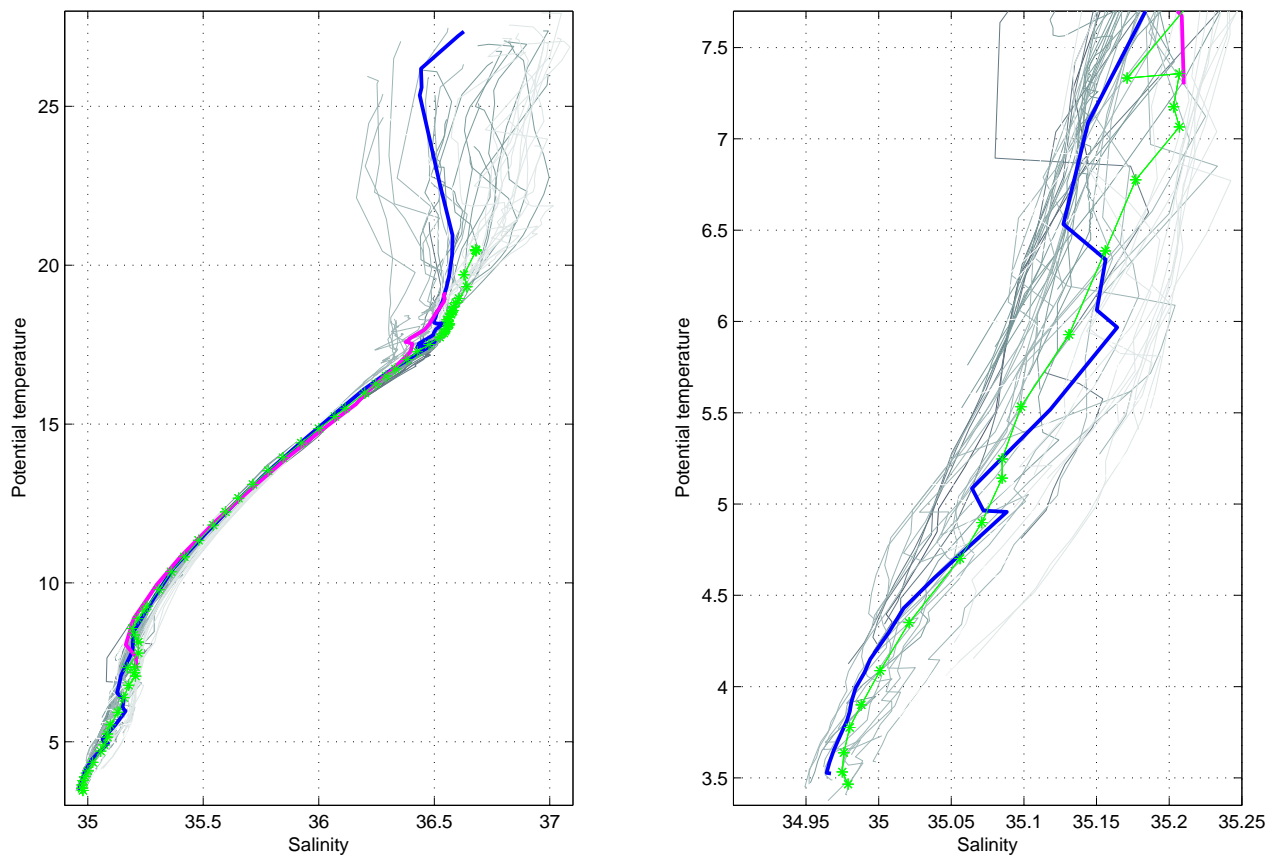


Figure 9: Float 4900417 Cycle 95. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). θ/S diagram (left panel) and a zoom on the deepest layers (right panel).

2.3.4 Results of the OW method

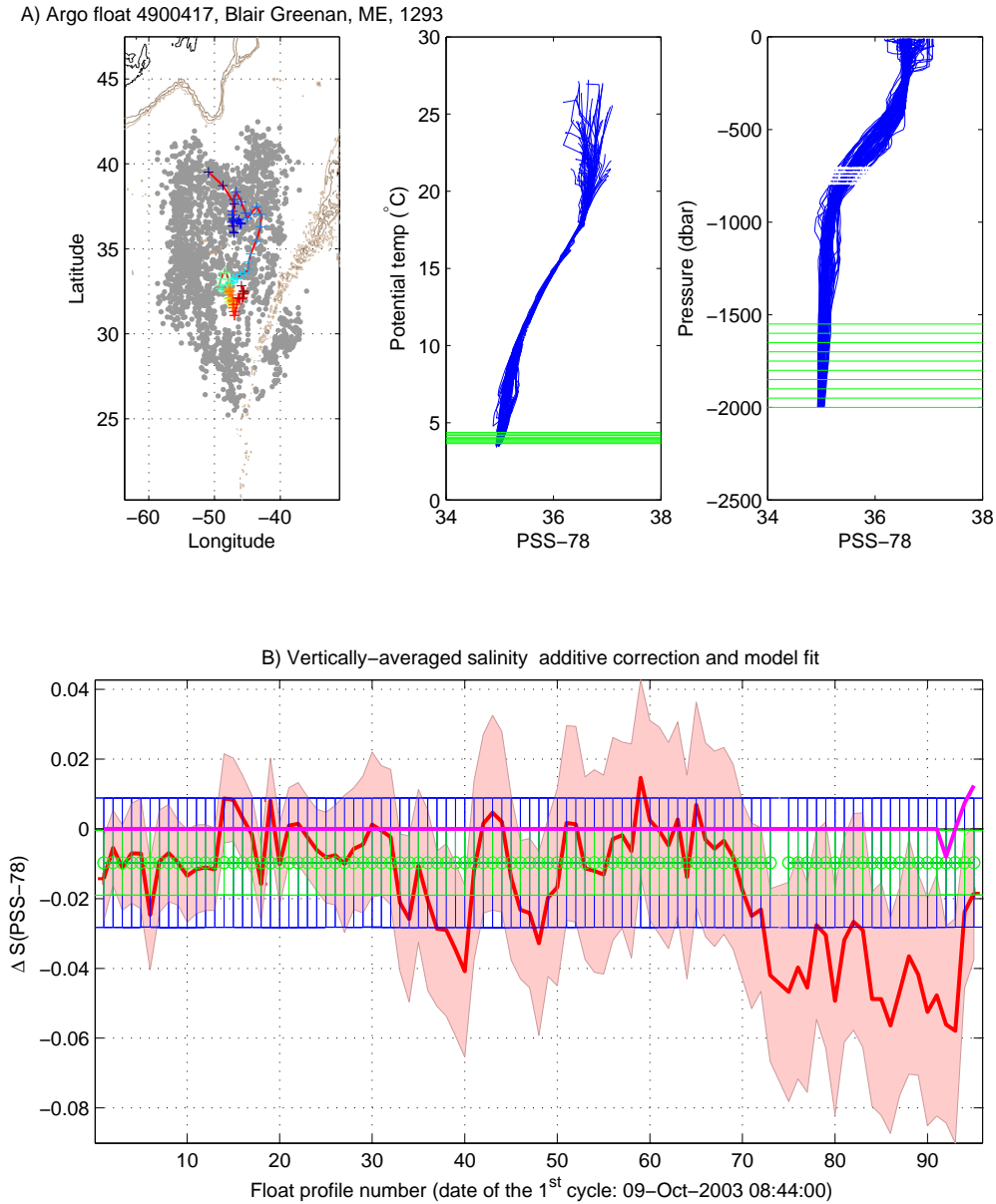


Figure 10: Float 4900417. Results of the OW method (configuration 1293). Upper panels: Reference profiles used for the mapping (grey dots) are shown on a map along with the float trajectory. On the two most right-handed figures are displayed in green the ten most stable θ levels used to compute the fit. Lower panel: vertically-averaged mapped salinities minus float salinities on the 10 most stable θ levels (red line) and the offset obtained by a linear fit (green circles). The mapping errors are shaded in red. Green error bars show the fit error and blue error bars show the doubled fit error. The **salinity correction currently available on the GDAC** is displayed in magenta.

2.4 Float 4900502

2.4.1 Sections along the float trajectory - raw data

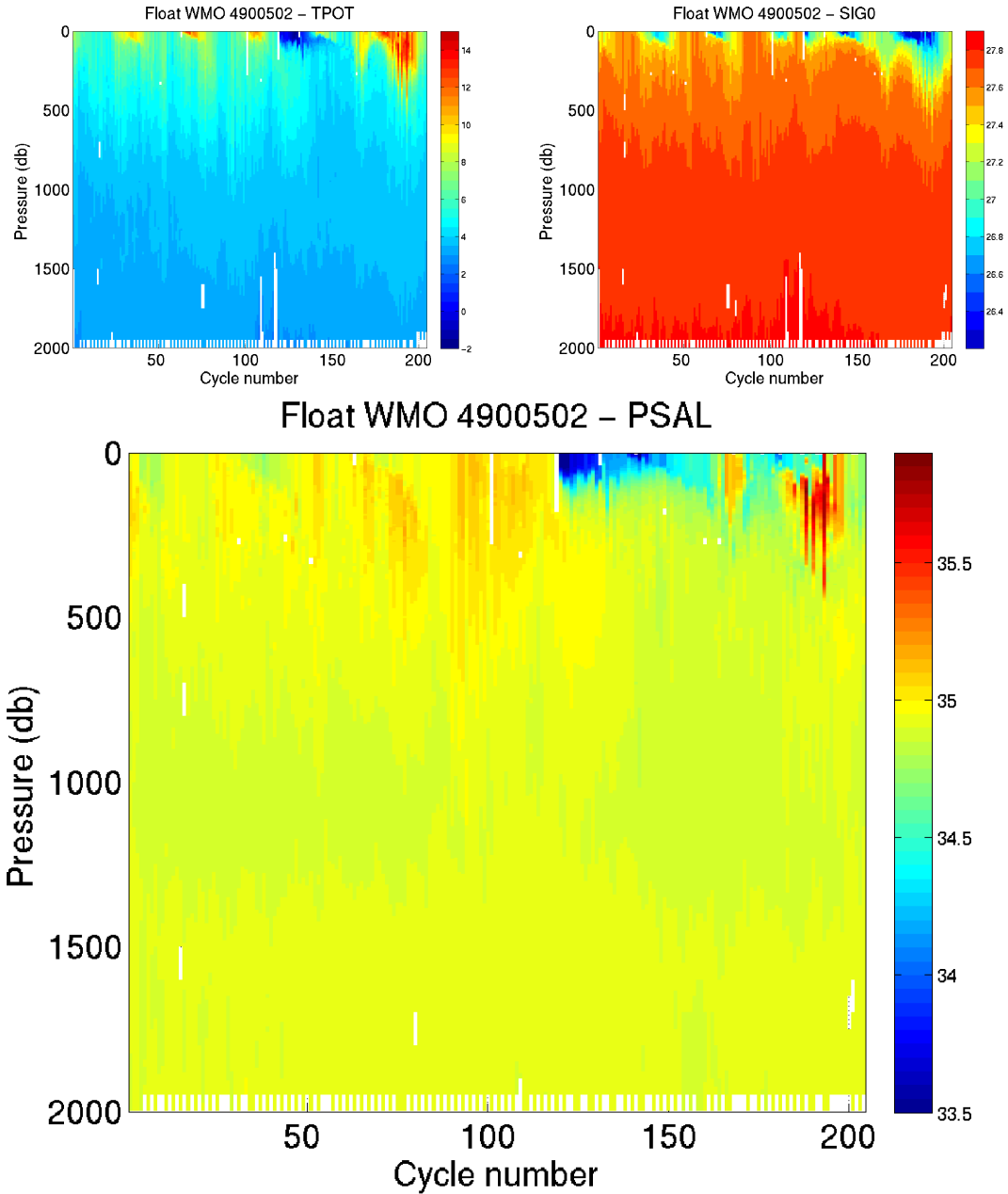


Figure 11: Float 4900502. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, bad data with quality flags > 2 are not plotted)

2.4.2 Theta/S diagrams - raw data

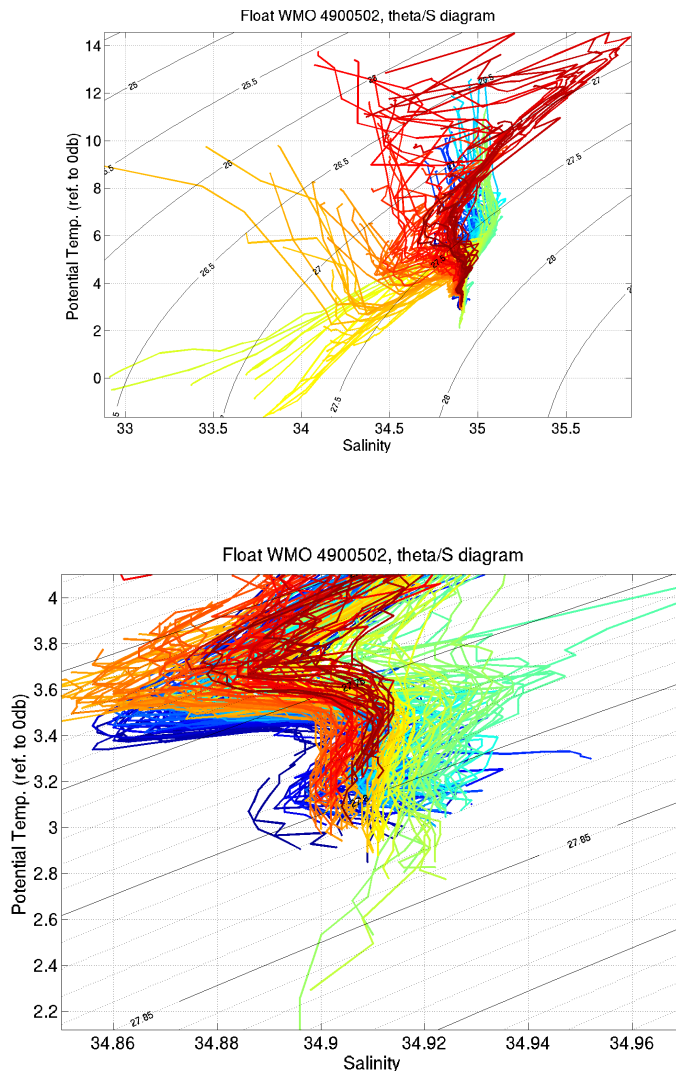


Figure 12: Float 4900502. Theta/S diagrams of the raw data, with the potential temperature referenced to Odb. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.4.3 Comparison to reference Argo profiles

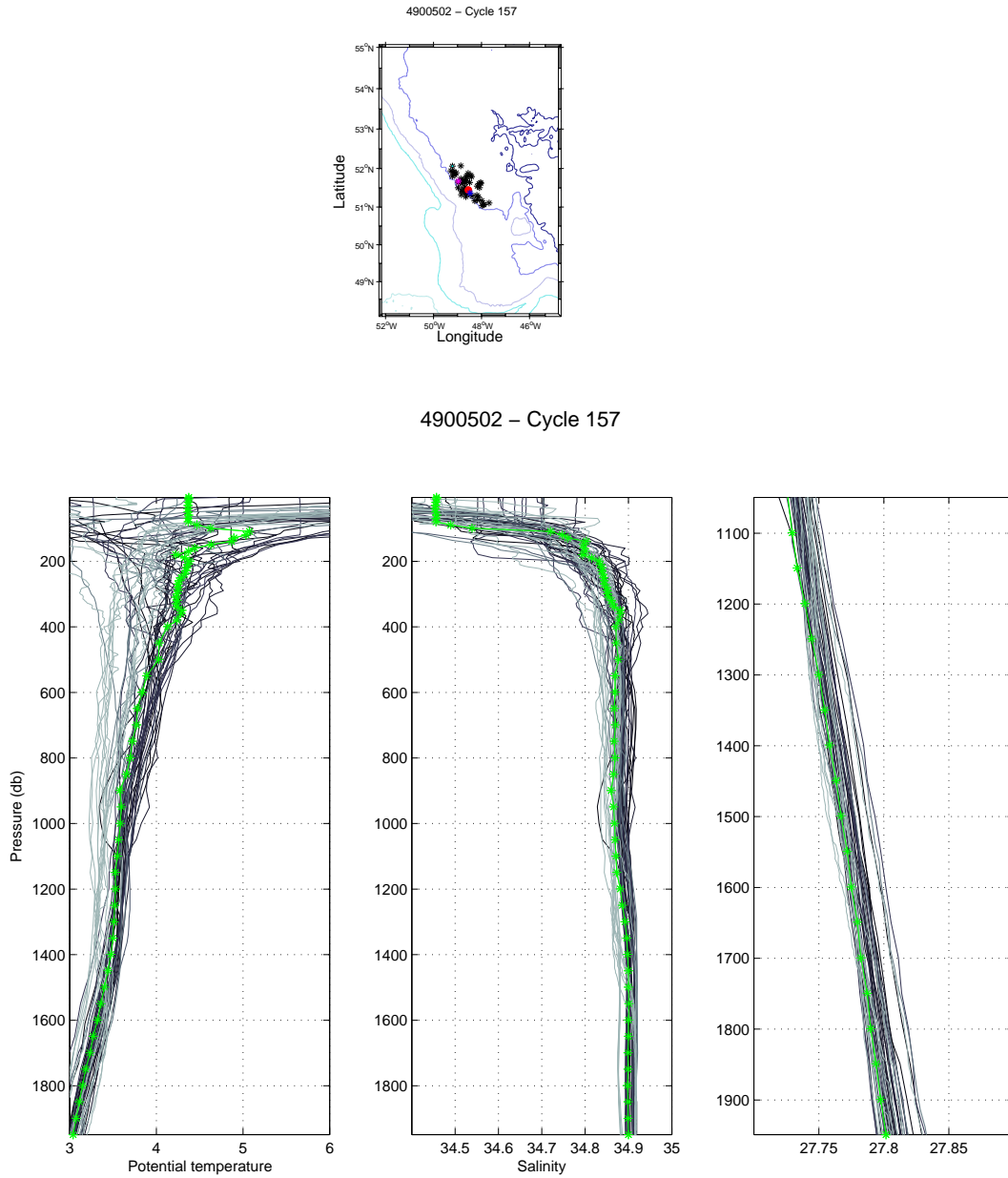


Figure 13: Float 4900502 Cycle 157. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

4900502 – Cycle 157 – Date Argo profile 04–Jan–2010 15:20:00
 Dates historicals profiles 04–Oct–2013 (blue) and 14–Dec–2009 (magenta)

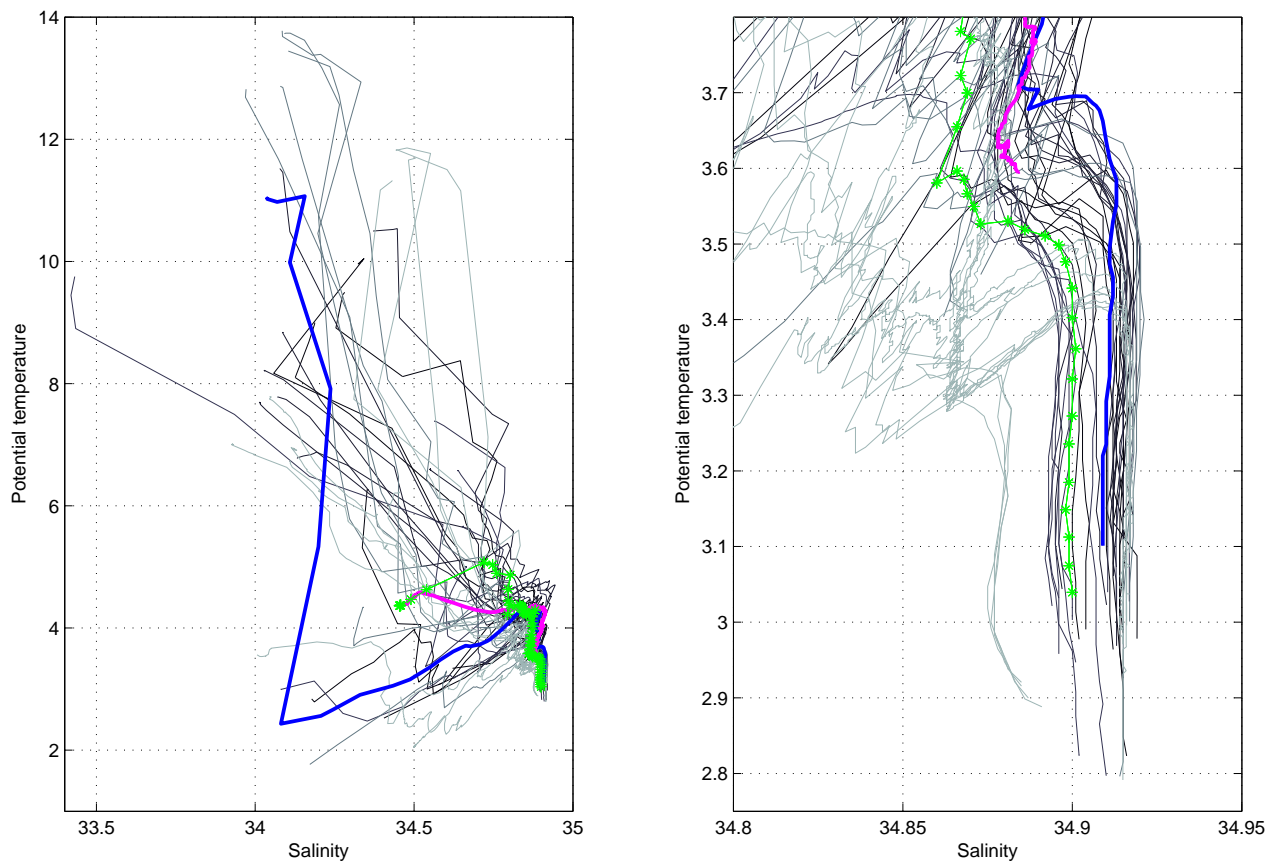


Figure 14: Float 4900502 Cycle 157. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). θ/S diagram (left panel) and a zoom on the deepest layers (right panel).

2.4.4 Results of the OW method

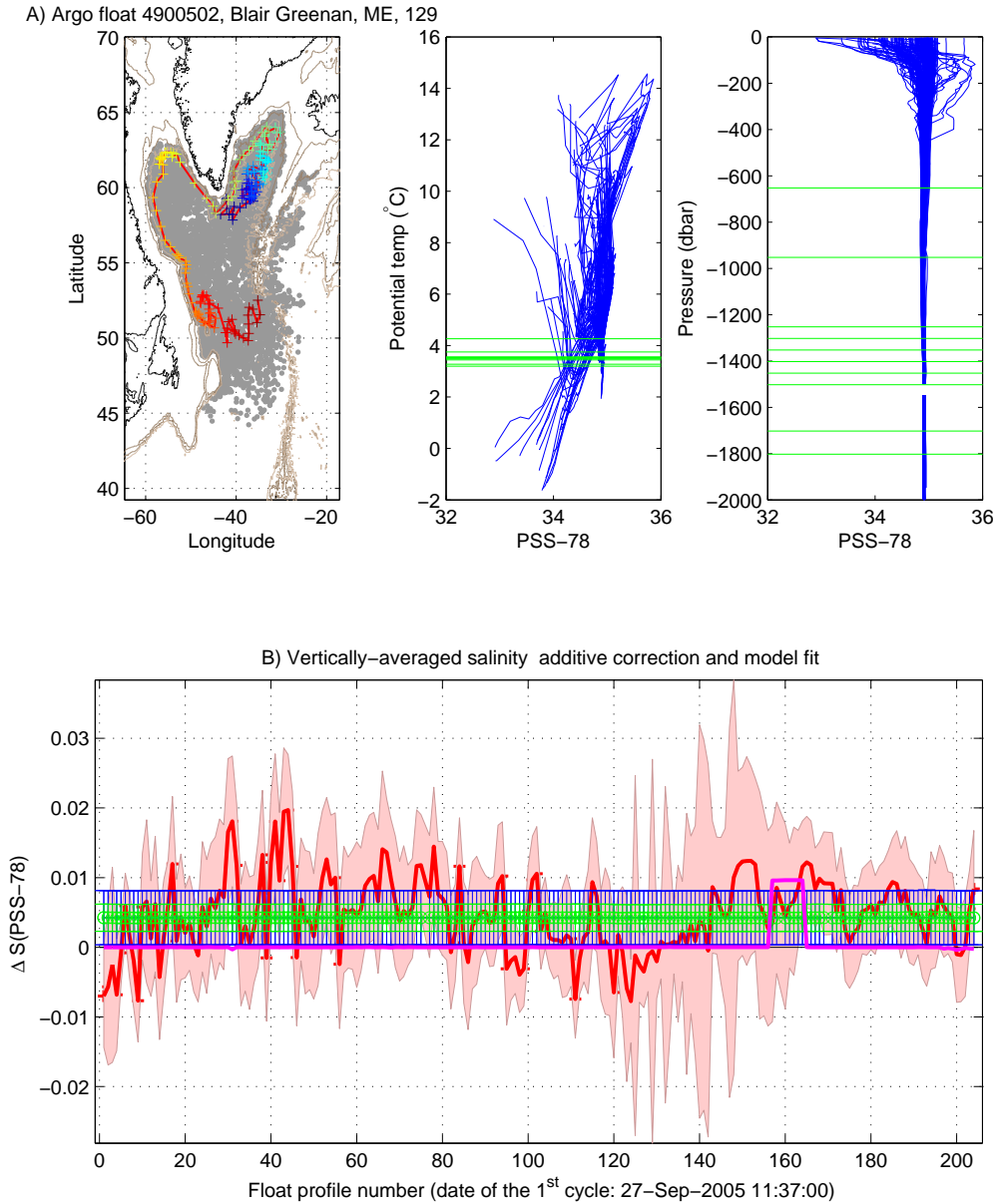


Figure 15: Float 4900502. Results of the OW method (configuration 129). Upper panels: Reference profiles used for the mapping (grey dots) are shown on a map along with the float trajectory. On the two most right-handed figures are displayed in green the ten most stable θ levels used to compute the fit. Lower panel: vertically-averaged mapped salinities minus float salinities on the 10 most stable θ levels (red line) and the offset obtained by a linear fit (green circles). The mapping errors are shaded in red. Green error bars show the fit error and blue error bars show the doubled fit error. The **salinity correction currently available on the GDAC** is displayed in magenta.