
**Check of DM corrections of NAARC floats (DAC: CORIOLIS)
(Argo Snapshot: 06/2018, DM OPERATOR: B.Klein)**

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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 some floats of the CORIOLIS data center with DM OPERATOR: B.Klein

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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)
4901416	20/07/2012	IF	H.Giese	75(NA)	3.1
6900582	10/08/2010	IF	H.Giese	103(NA)	3.1
6901064	04/07/2011	IF	H.Giese	50(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.

- **4901416**: No correction seems to be necessary.
- **6900582**: No correction seems to be necessary.
- **6901064**: Recently, the salinity correction was set to zero after cycle 50, but the correction before cycle 50 remained the same, resulting in a jump in the correction cycle 50. The OW method (config 129, see Figure 18) proposes a correction smaller than -0.01. I would not probably apply a salinity correction for this float.

2.2 Float 4901416

2.2.1 Sections along the float trajectory - raw data

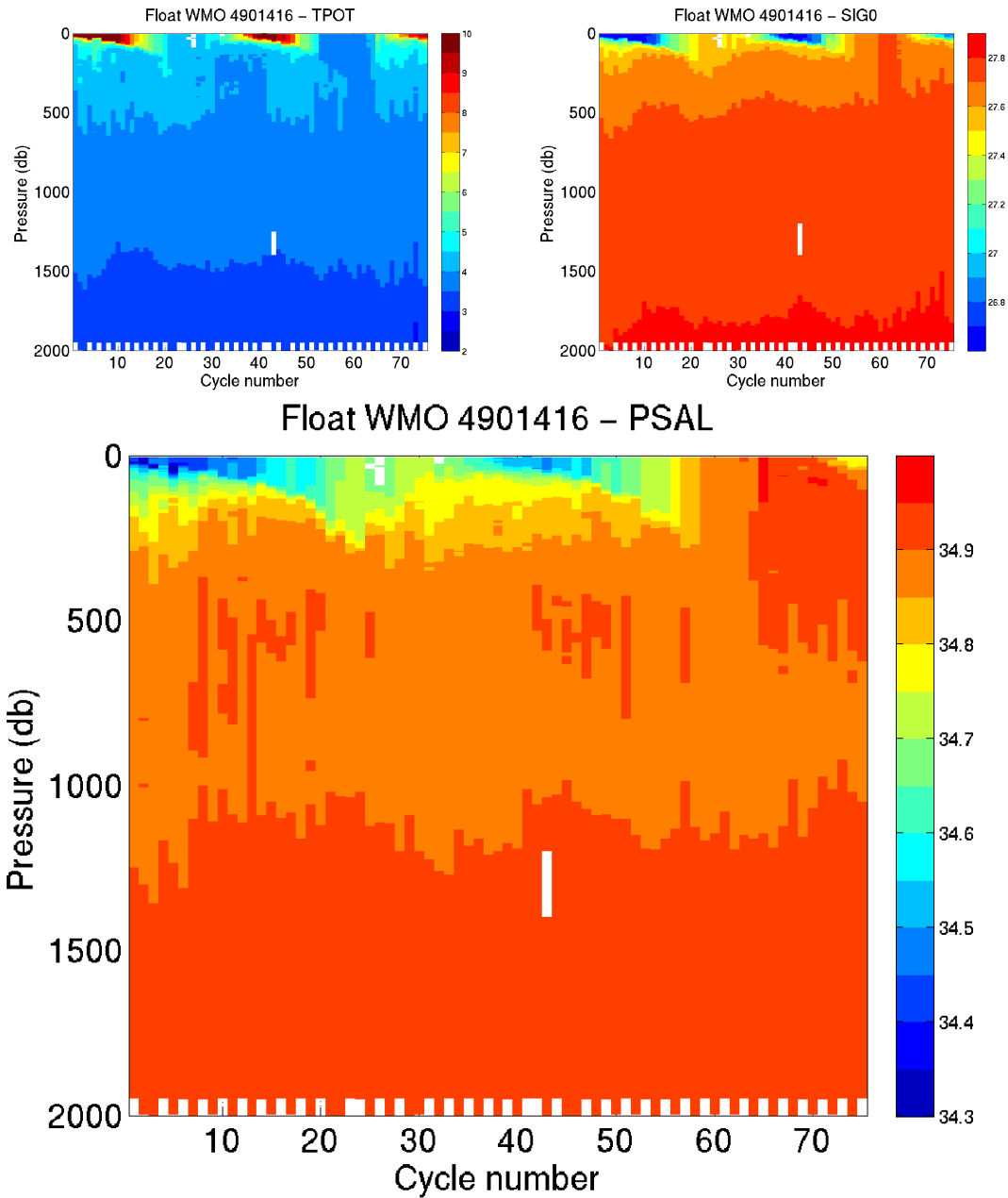


Figure 1: Float 4901416. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, bad data with quality flags > 2 are not plotted)

2.2.2 Theta/S diagrams - raw data

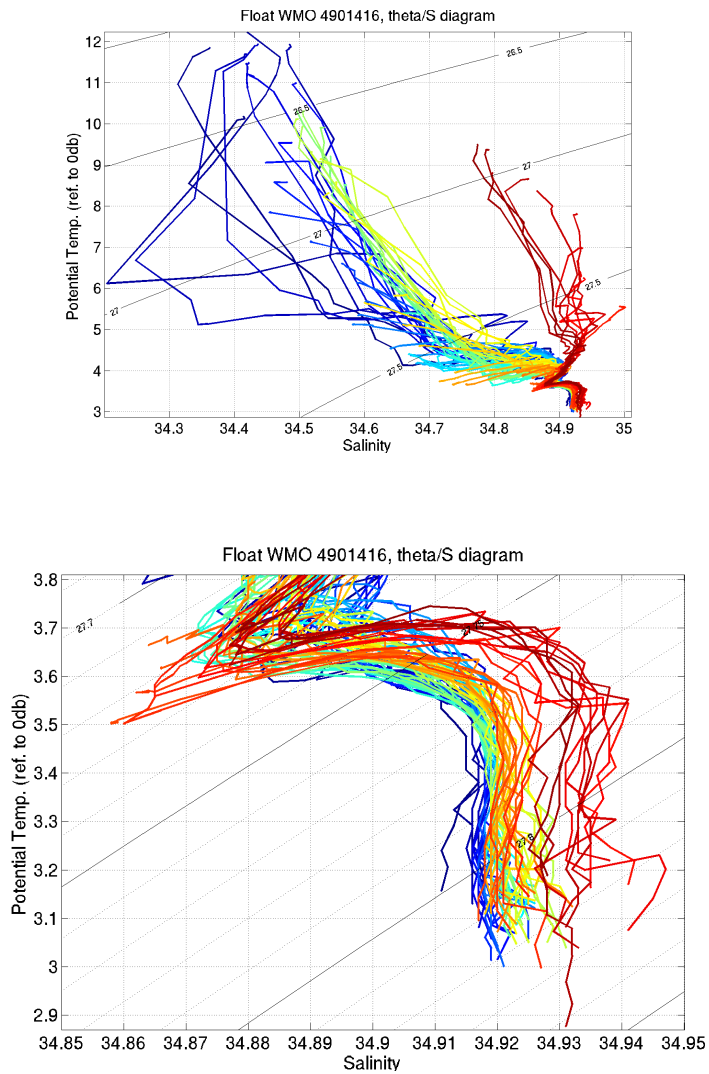


Figure 2: Float 4901416. Theta/S diagrams of the raw data, with the potential temperature referenced to 0db. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.2.3 Comparison to reference Argo profiles

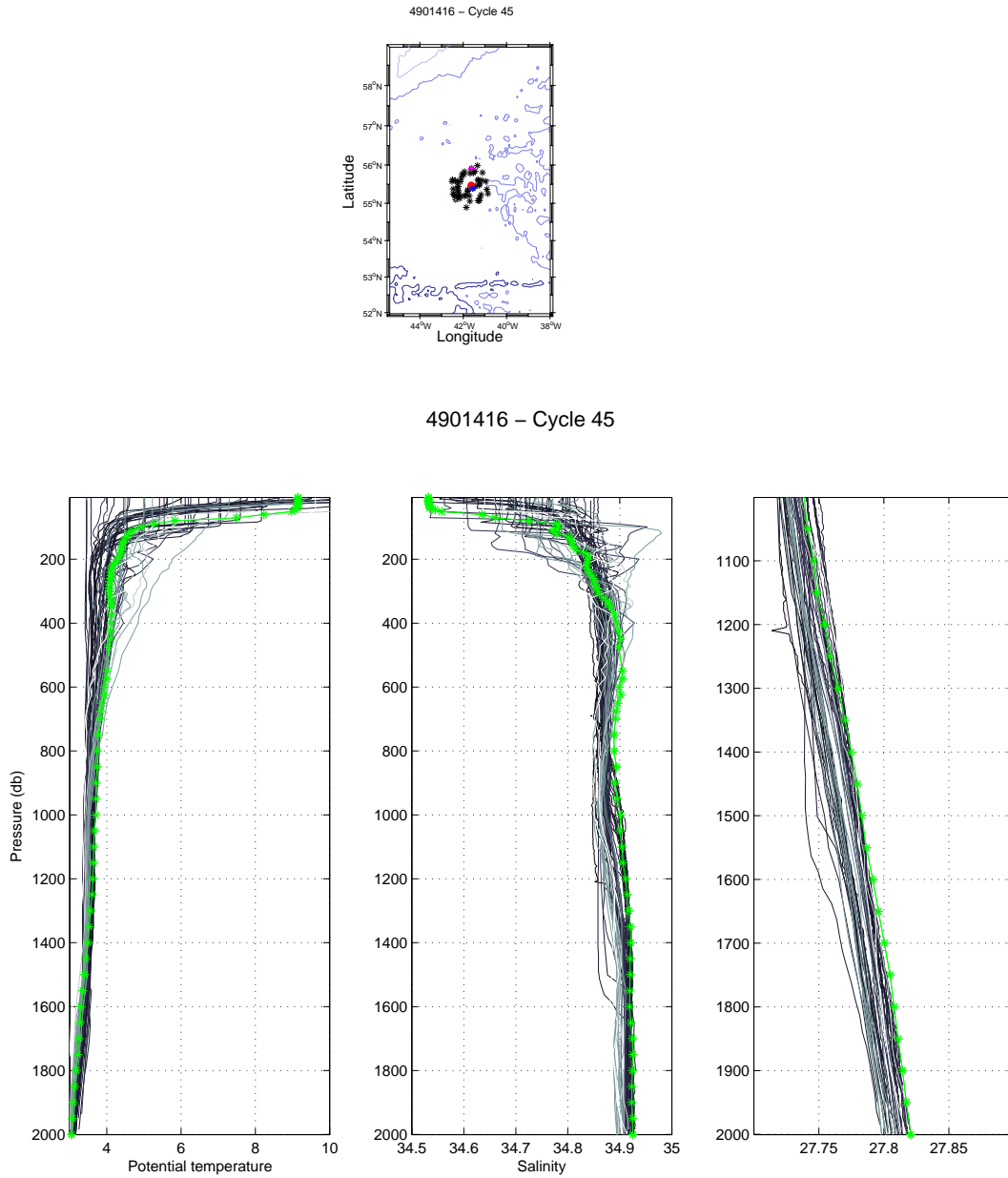


Figure 3: Float 4901416 Cycle 45. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

4901416 – Cycle 45 – Date Argo profile 04–Oct–2013 08:57:59
 Dates historical profiles 23–Oct–2003 (blue) and 29–May–2013 (magenta)

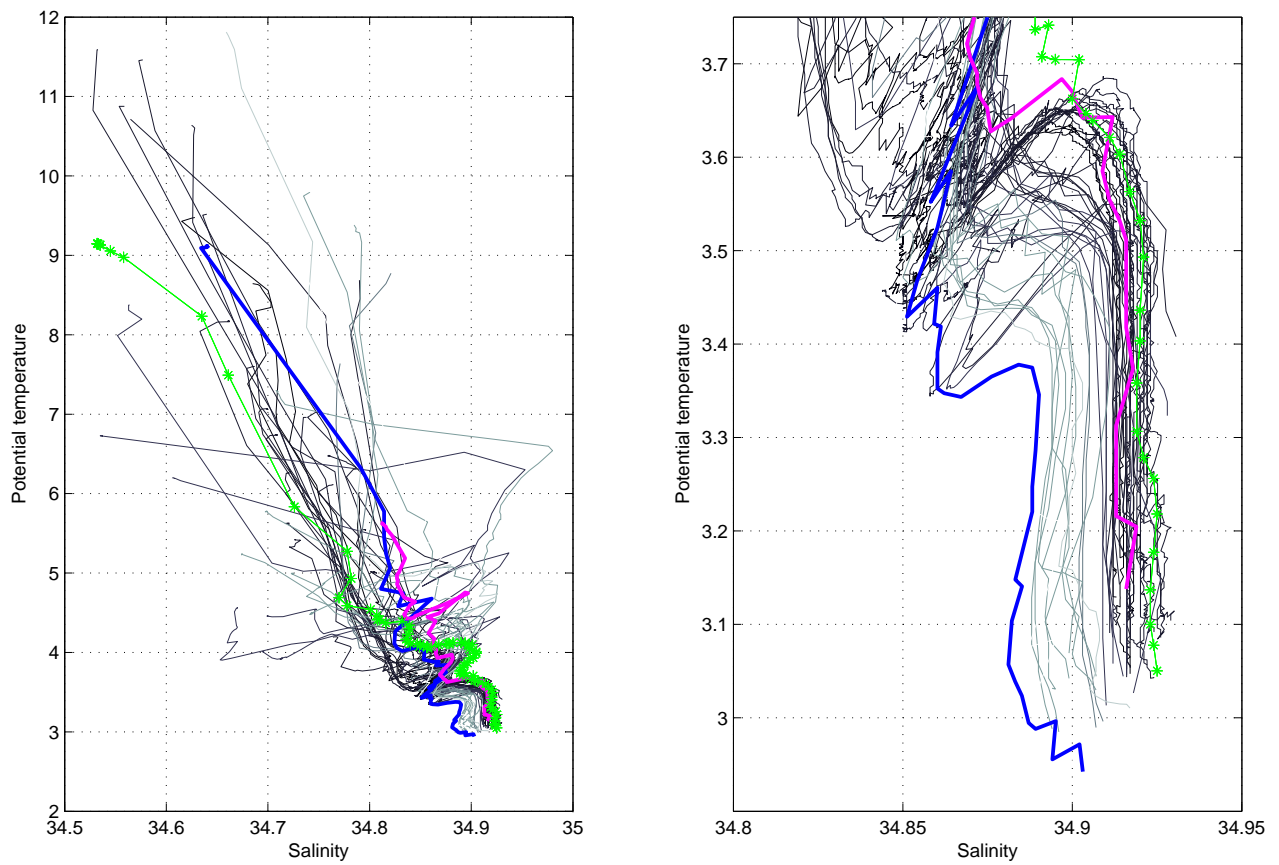


Figure 4: Float 4901416 Cycle 45. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile 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

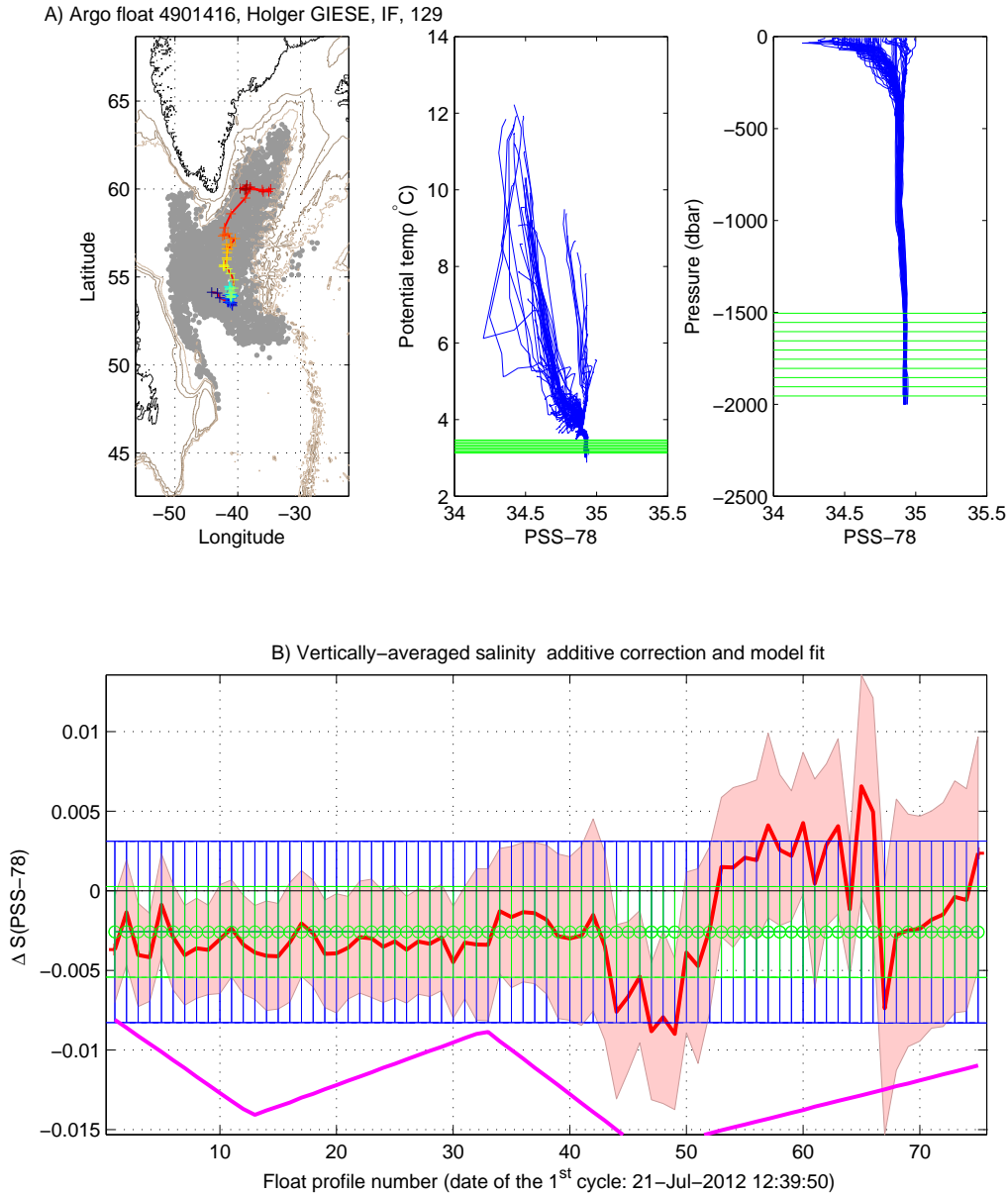


Figure 5: Float 4901416. Results of the OW method (configuration 129). Upper panels: Reference profiles used for the mapping (grey dots) are shown on a map along with the float trajectory. On the two most right-handed figures are displayed in green the ten most stable θ levels used to compute the fit. 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.

2.3 Float 6900582

2.3.1 Sections along the float trajectory - raw data

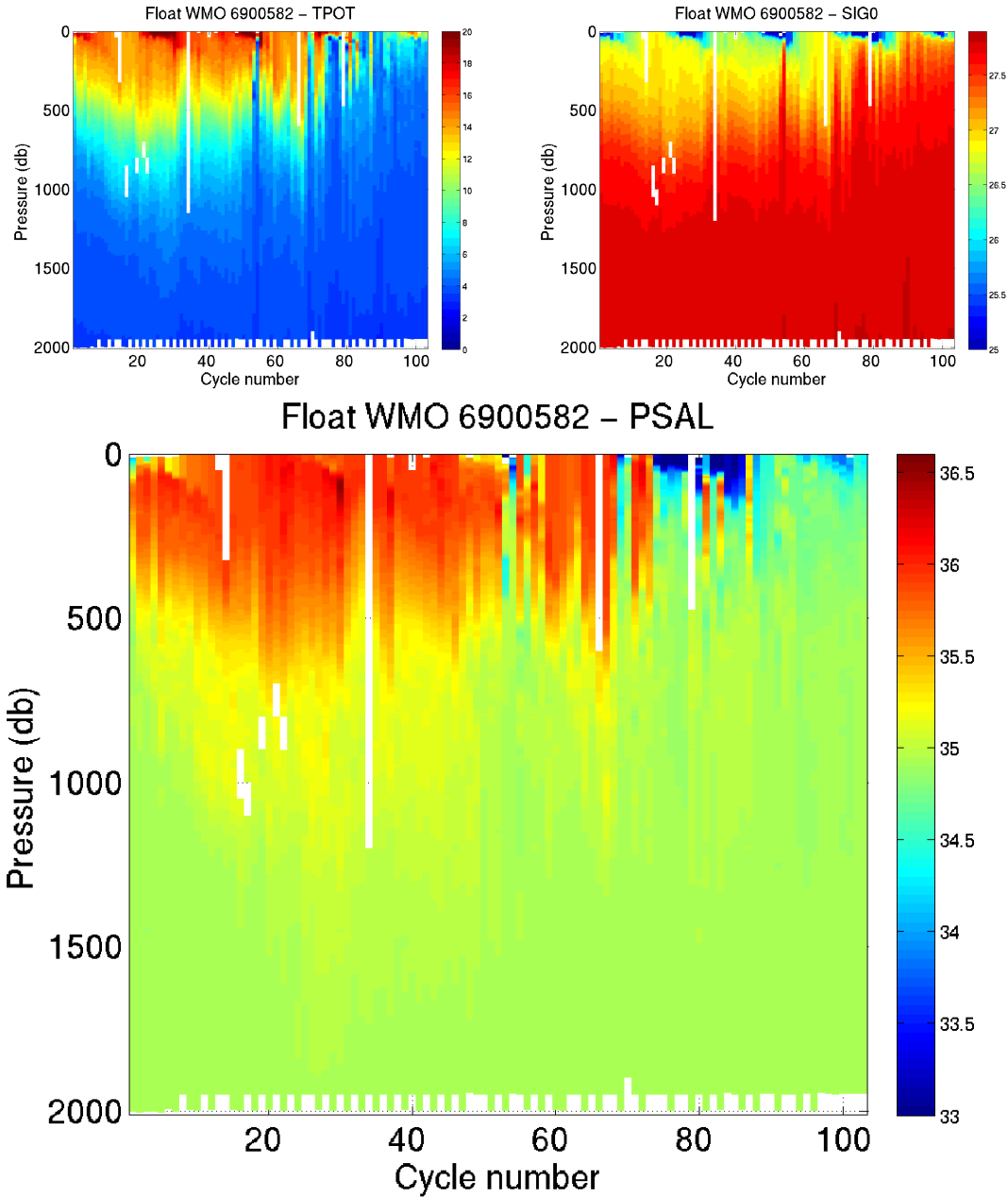


Figure 6: Float 6900582. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, bad data with quality flags > 2 are not plotted)

2.3.2 Theta/S diagrams - raw data

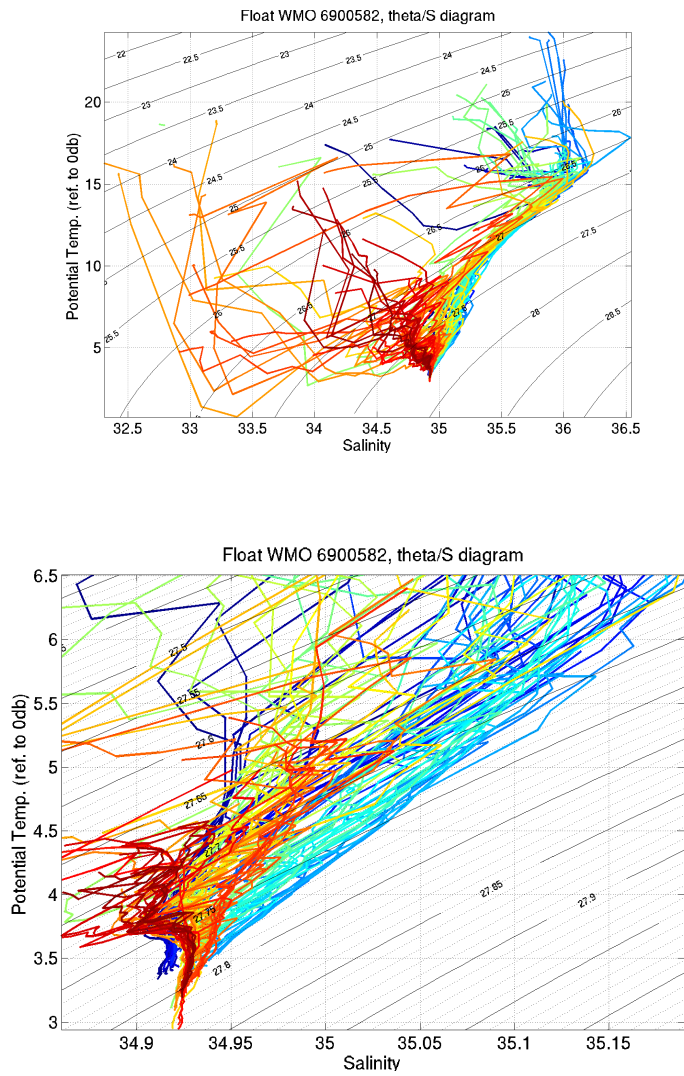


Figure 7: Float 6900582. Theta/S diagrams of the raw data, with the potential temperature referenced to 0db. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.3.3 Comparison to reference Argo profiles

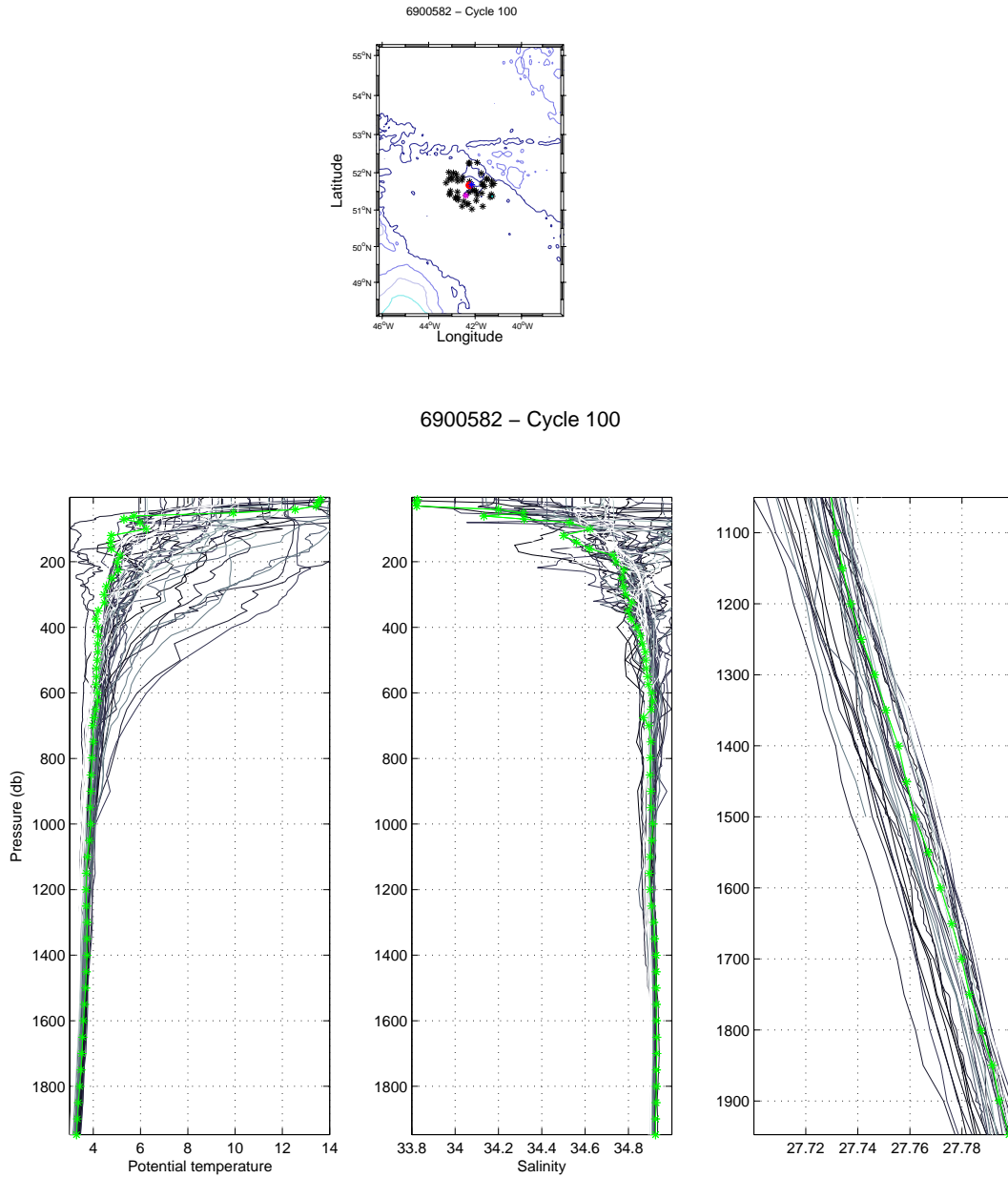


Figure 8: Float 6900582 Cycle 100. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

6900582 – Cycle 100 – Date Argo profile 06–Sep–2014 17:51:56
Dates historical profiles 02–Mar–2013 (blue) and 23–Aug–2014 (magenta)

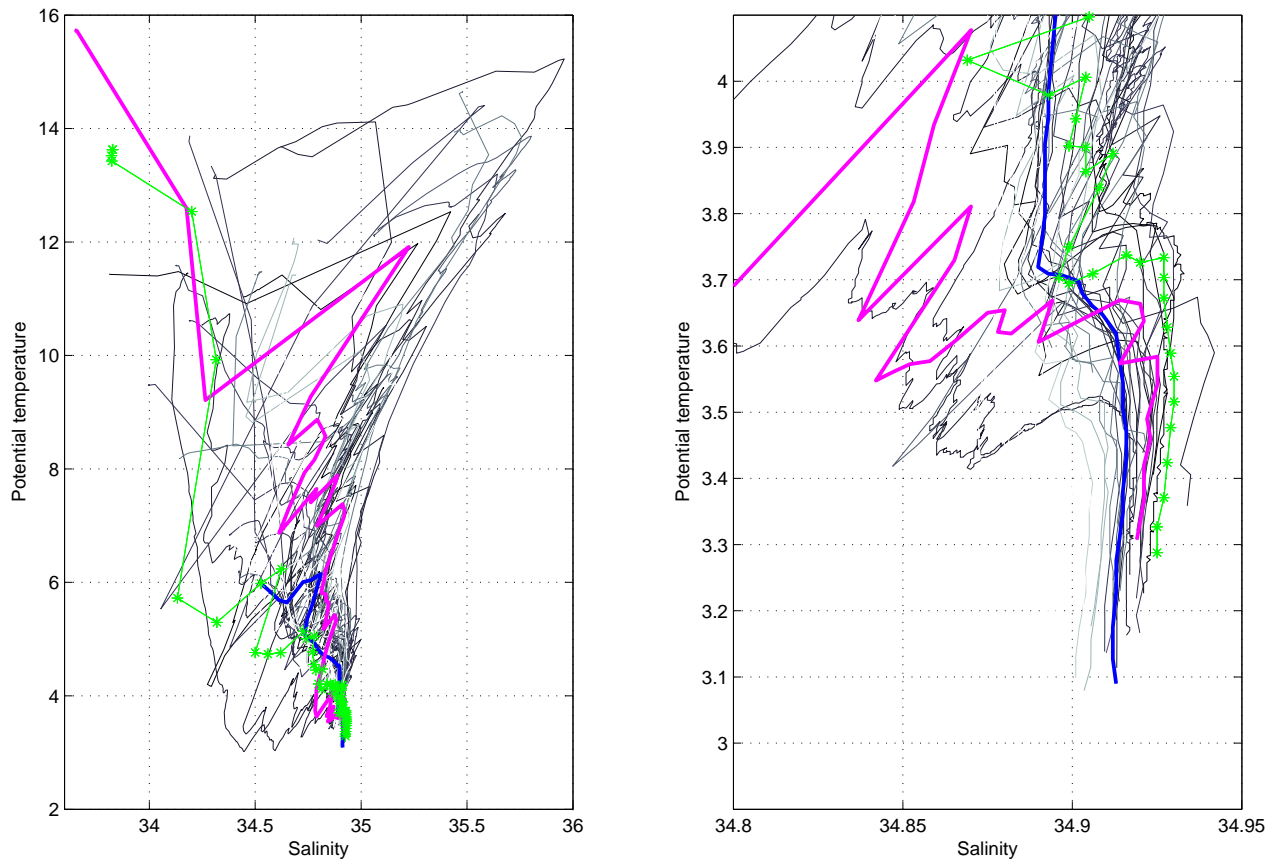


Figure 9: Float 6900582 Cycle 100. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile 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

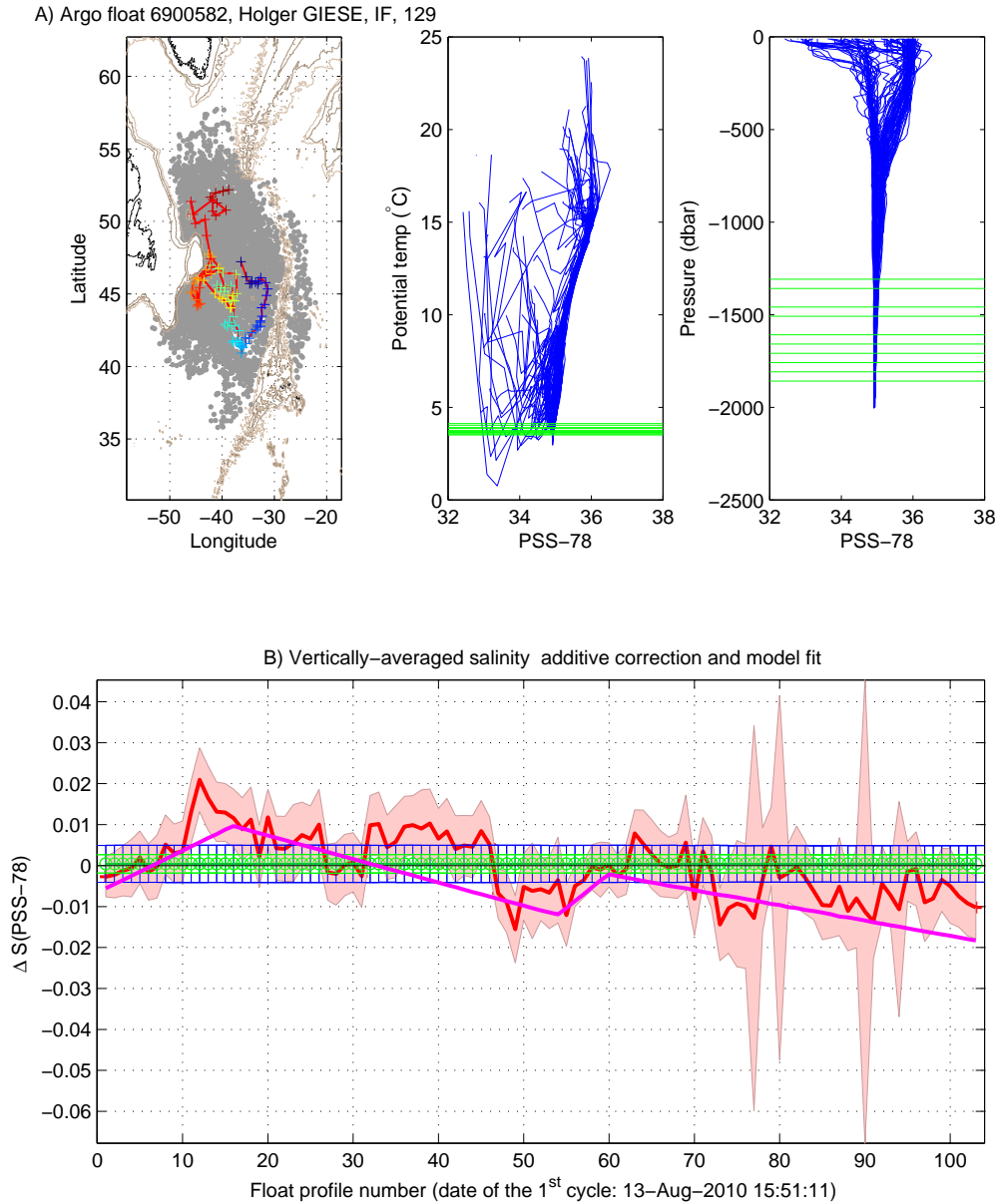


Figure 10: Float 6900582. Results of the OW method (configuration 129). Upper panels: Reference profiles used for the mapping (grey dots) are shown on a map along with the float trajectory. On the two most right-handed figures are displayed in green the ten most stable θ levels used to compute the fit. 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.

2.4 Float 6901064

2.4.1 Sections along the float trajectory - raw data

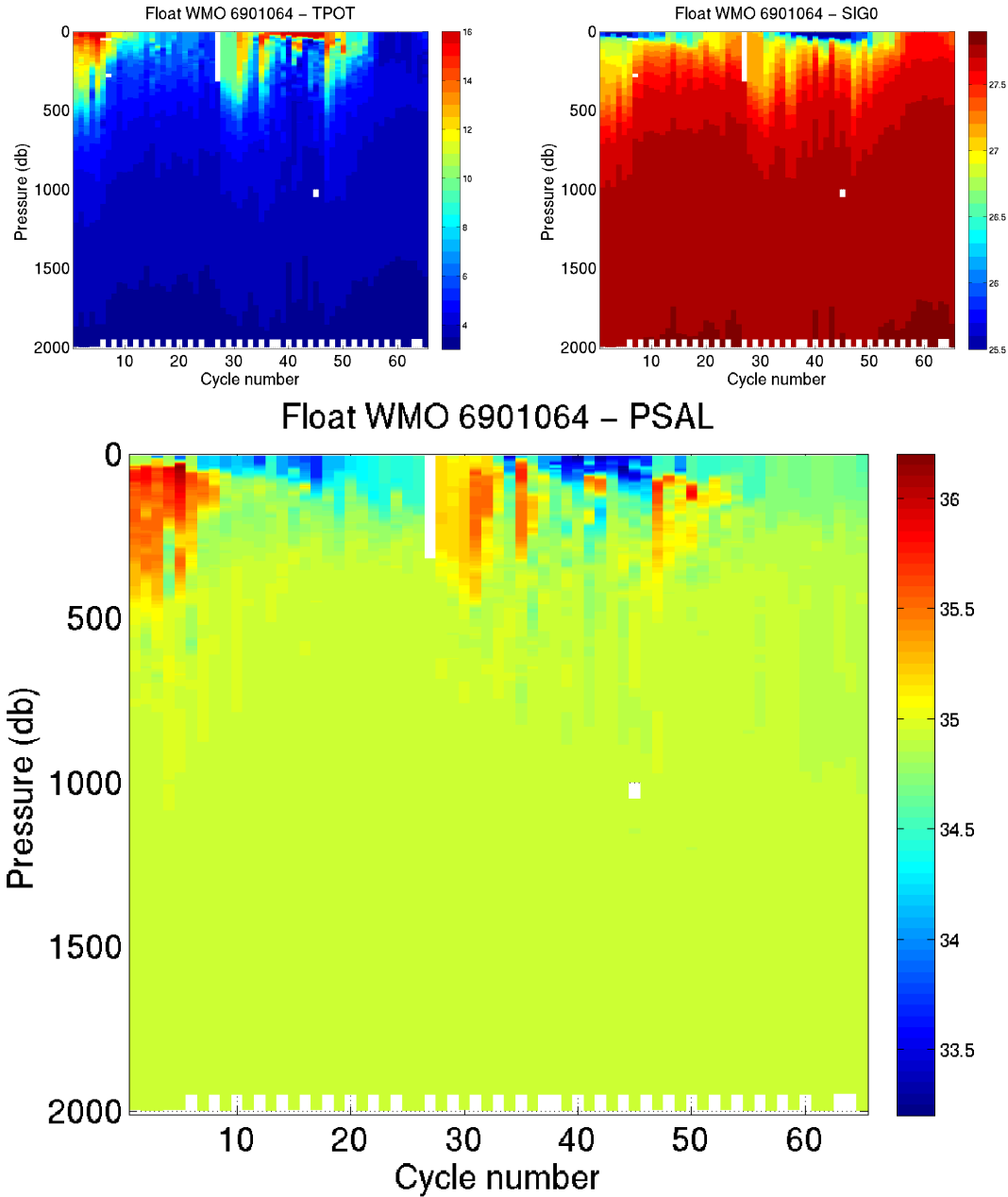


Figure 11: Float 6901064. Potential temperature, Sig0 and salinity sections along the float trajectory (raw data, bad data with quality flags > 2 are not plotted)

2.4.2 Theta/S diagrams - raw data

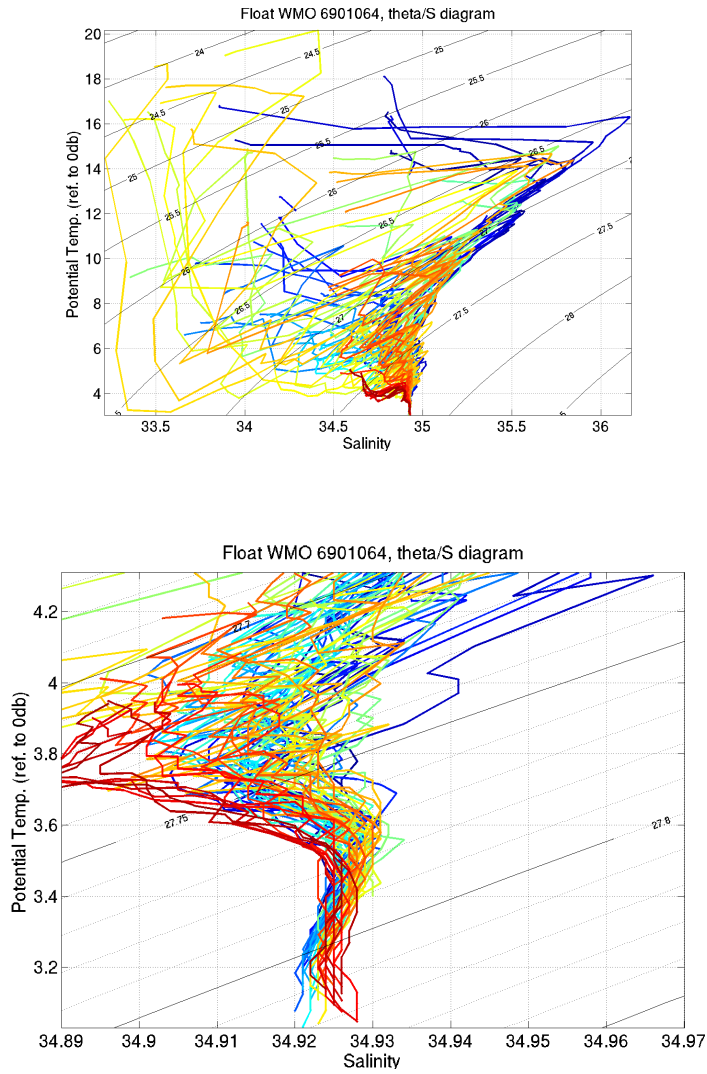


Figure 12: Float 6901064. Theta/S diagrams of the raw data, with the potential temperature referenced to Odb. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.4.3 Theta/S diagrams - adjusted data as currently available on GDAC

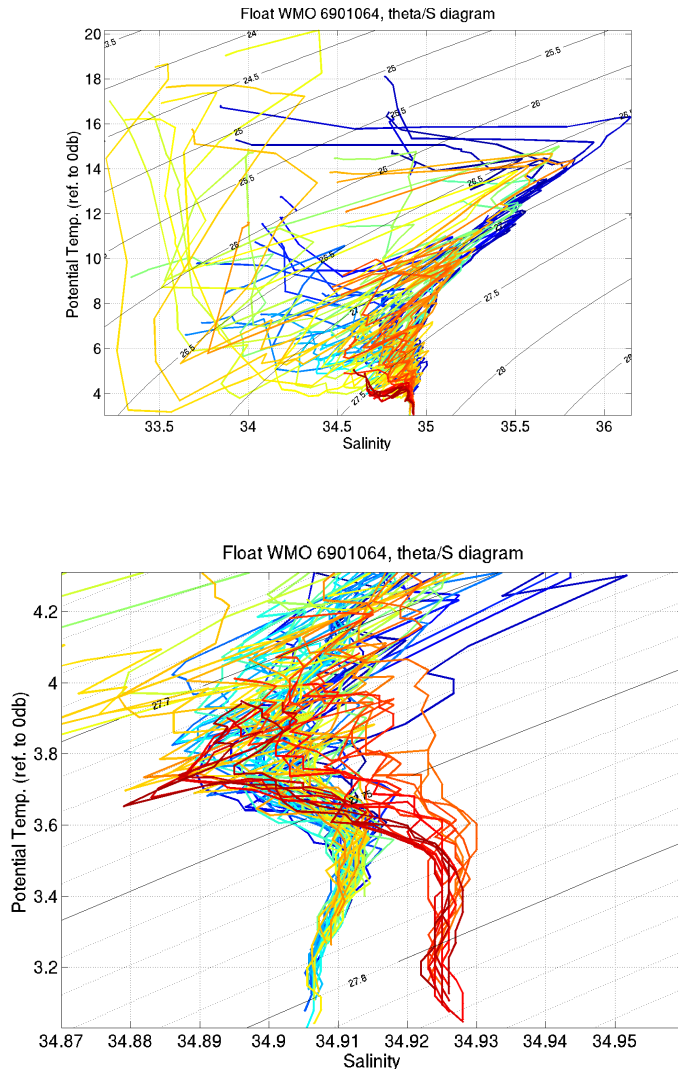


Figure 13: Float 6901064. Theta/S diagrams of the adjusted data **as currently available on GDAC**, with the potential temperature referenced to 0db. Bad data with quality flags > 2 are not plotted. Lower panel is a zoom on the deepest layers

2.4.4 Comparison to reference Argo profiles

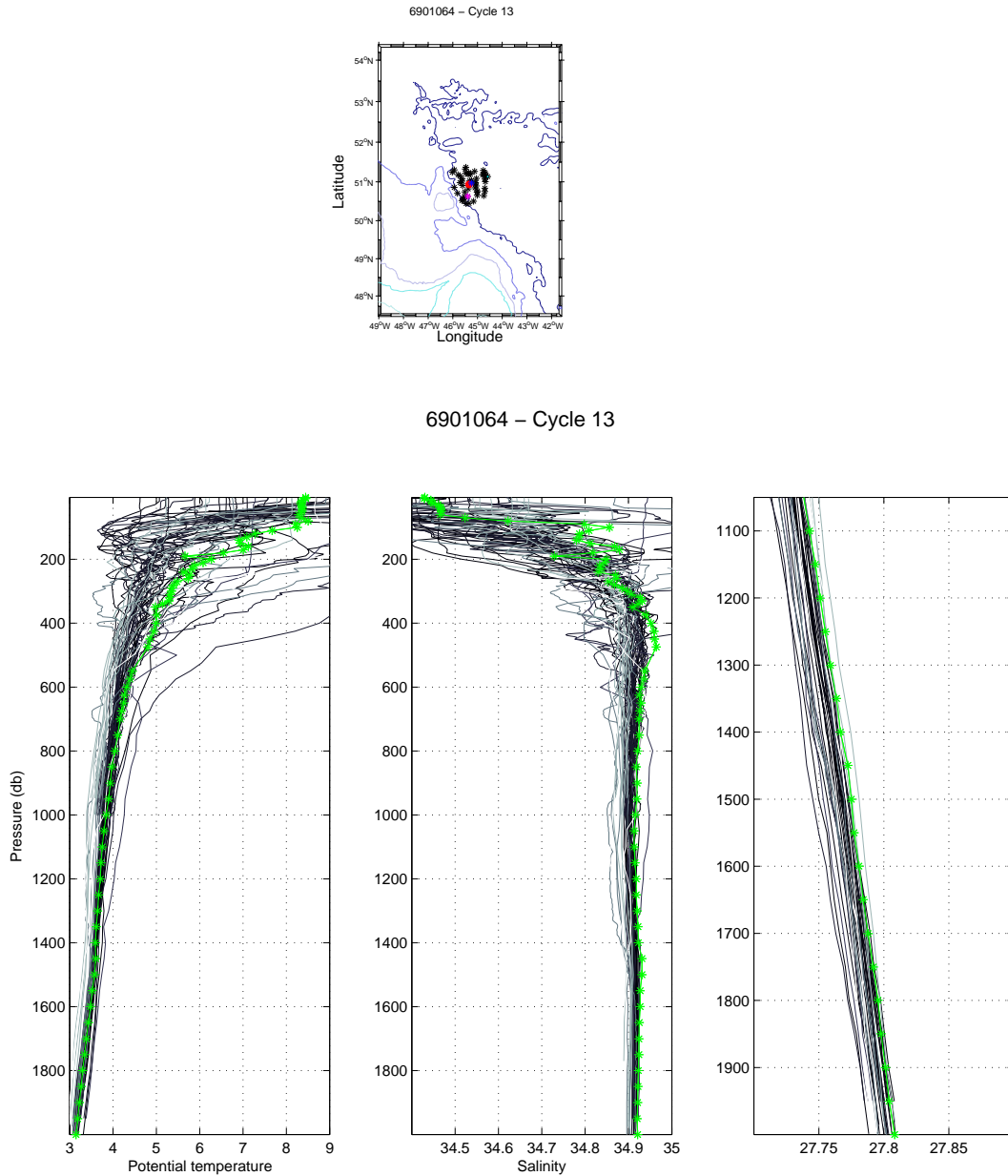


Figure 14: Float 6901064 Cycle 13. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

6901064 – Cycle 13 – Date Argo profile 17–Nov–2011 21:26:45
 Dates historical profiles 09–Nov–2010 (blue) and 19–Nov–2011 (magenta)

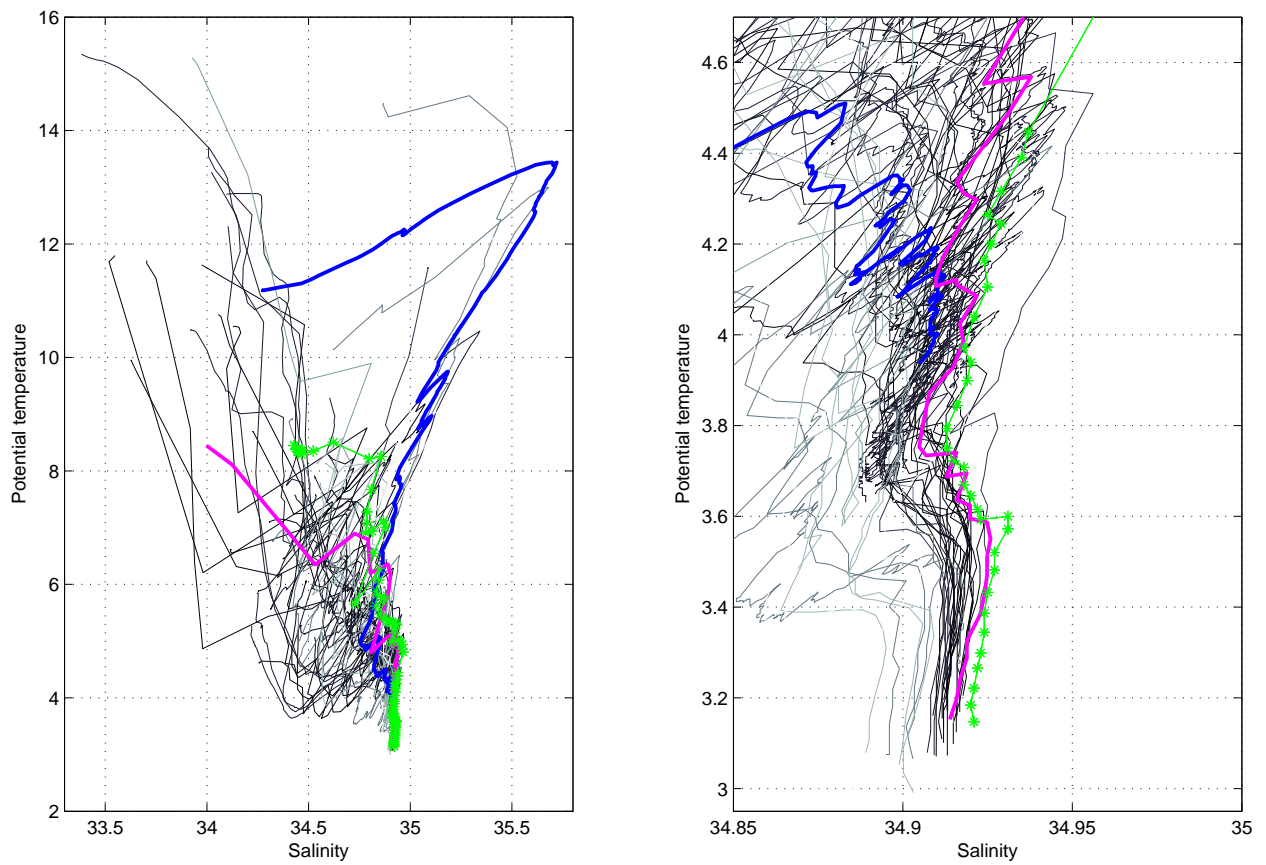


Figure 15: Float 6901064 Cycle 13. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile 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).

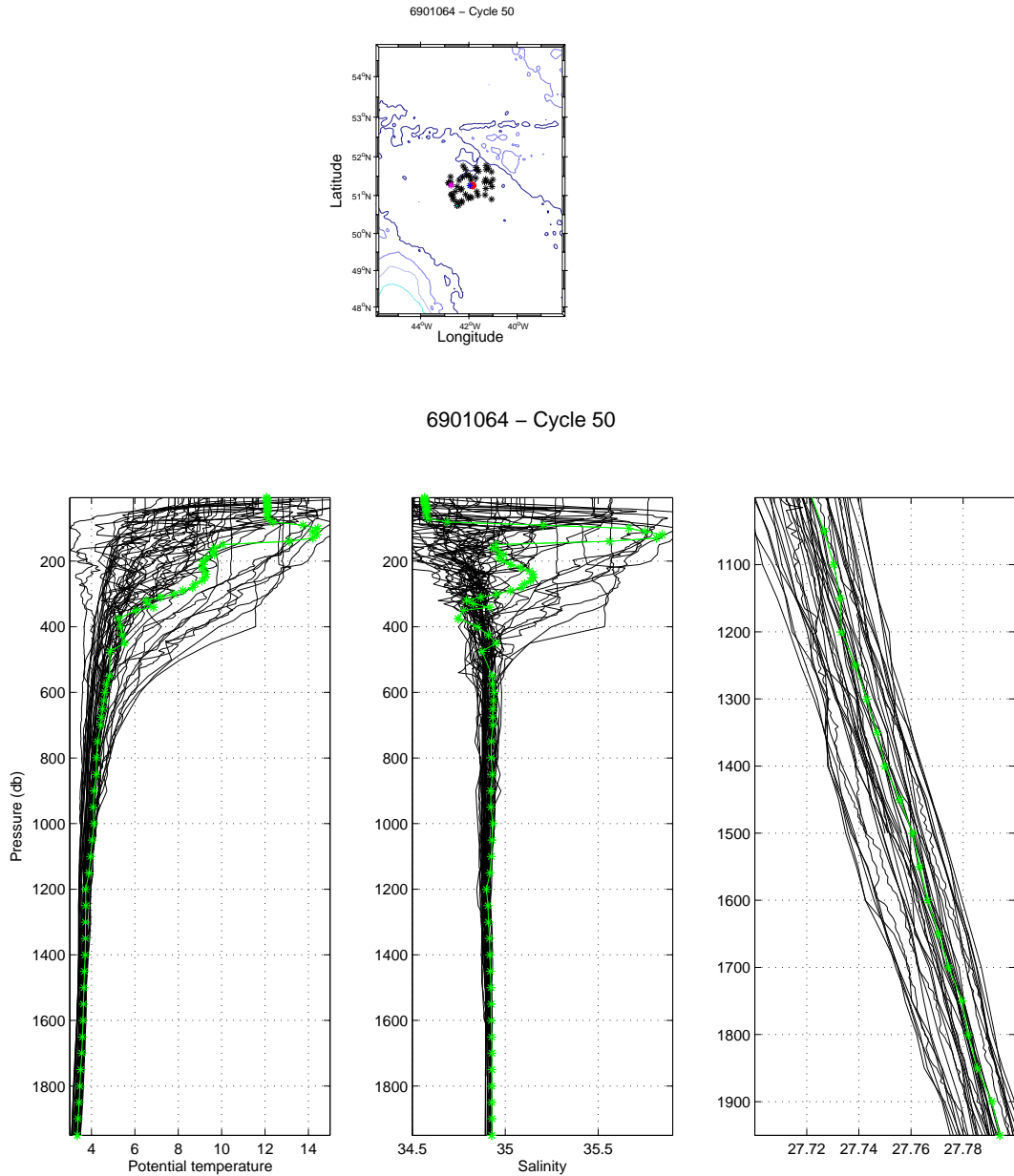


Figure 16: Float 6901064 Cycle 50. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (grey lines). The color of the analysed Argo profile represents the QC flag (green for a QC=1; blue for a QC=2; orange for a QC=3 and red for a QC=4). (left panel) Temperature, (middle panel) salinity and (right panel) potential density with a zoom on the deepest layers, as function of pressure.

6901064 – Cycle 50 – Date Argo profile 22–Nov–2012 00:25:27
 Dates historicals profiles 27–May–2012 (blue) and 15–Nov–2012 (magenta)

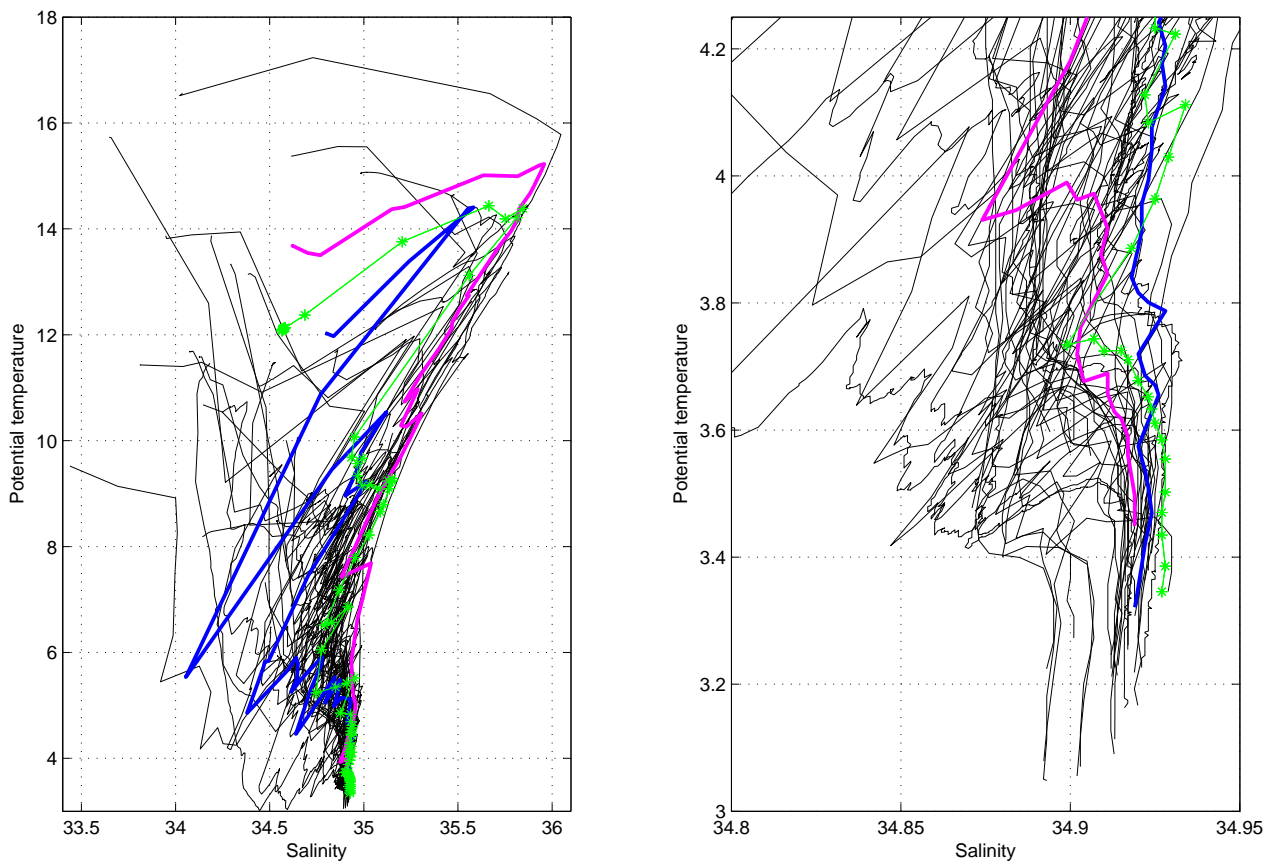


Figure 17: Float 6901064 Cycle 50. The analysed Argo profile (stars) is compared to the 50 nearest reference Argo profiles (black line) and to two specific profiles: the nearest reference profile in time (magenta) and the nearest reference profile in space (blue). The color of the analysed Argo profile 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).

2.4.5 Results of the OW method

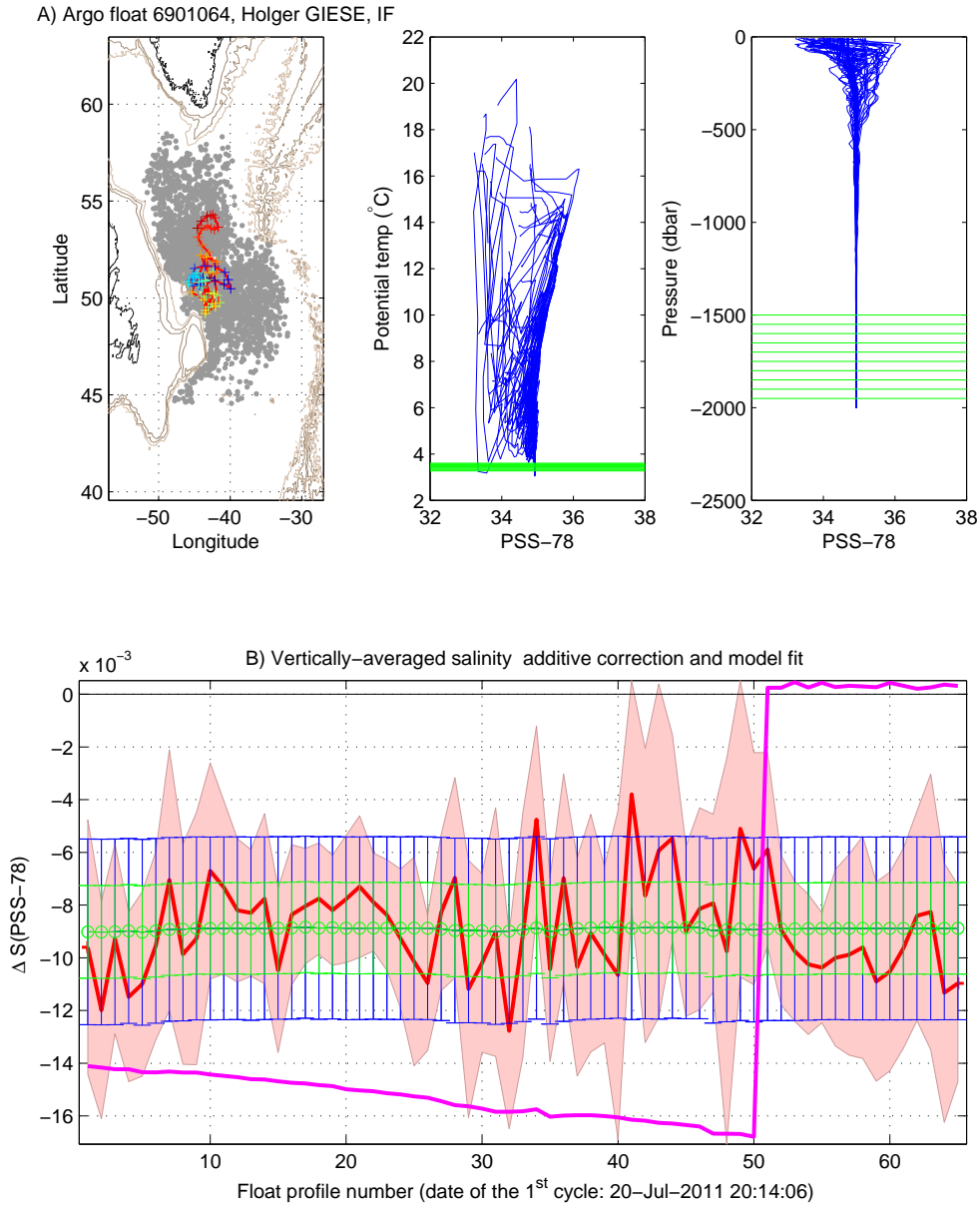


Figure 18: Float 6901064. Results of the OW method (configuration 129). Upper panels: Reference profiles used for the mapping (grey dots) are shown on a map along with the float trajectory. On the two most right-handed figures are displayed in green the ten most stable θ levels used to compute the fit. 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.