Check of the delayed Mode corrections for the Argo floats in the North Atlantic

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SO ARGO - LPO report LPO/14-xx - Update October 16, 2014

Contents

1 Introduction

We have checked 578 floats processed in delayed mode (DM) in the North Atlantic, North of 30°N. Among the 578 floats, 392 do not show a significant salinity drift or bias according to the PI decision and were not corrected in DM, the other 186 floats have been corrected.

For each float, we have run a slightly modified OW method (configuration 129, see table 1). Compared to the OW original method, our configuration better take into account the interannual variability, that was shown to induce spurious corrections with the standard OW method settings. Particularly, a Gaussian decay was added with a time scale of 2 years when computing the covariance matrix that is used to estimate the large scale field at the float profile position. Thus it is given greater weight to contemporary reference data. The

original OW method takes into account the temporal variability but only when the small scale field is estimated and the large scale field is assumed to be constant. For more details on the modified OW method, see http://www.mercator-ocean.fr/content/download/2058/15810/version/1/file/Newsletter%2350-final.pdf

For each float, we have compared the original correction made by the PI and the result of the slightly modified OW method.We found 26 floats among 578 (see table 2) for which the salinity correction proposed by the PI differs significantly from our results. For those floats, we think it may be necessary to revise the original correction.

http://www.mercator-ocean.fr/content/download/2058/15810/version/1/file/Newsletter

OW CONFIGURATION	129
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_PHI_LARGE	0.1
MAPSCALE_PHI_SMALL	0.02
MAPSCALE_AGE	0.69
MAPSCALE_AGE_LARGE	2
MAP_P_EXCLUDE	500
MAP_P_DELTA	250
Reference data base	CTD (2013v01)+ ARGO (2013V01)

Table 1: Parameters of the OW method, config 129 (i.e. 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)

WMO $N°$	Float type	Deployment date	Last cycle	DAC	PI
1900076	PROVOR CTF2	11/09/2002	15/06/2004	IF	Virginie THIERRY
1900078	PROVOR CTF2	15/09/2002	18/08/2004	IF	Virginie THIERRY
4900211	PROVOR CTF2	17/03/2002	10/12/2003	IF	Virginie THIERRY
4900215	PROVOR CTF2	11/05/2002	12/07/2002	IF	Virginie THIERRY
4900223	PROVOR CTF2	17/06/2002	17/09/2004	IF	Virginie THIERRY
4900225	PROVOR CTF2	18/06/2002	18/09/2004	IF	Virginie THIERRY
6900045	PROVOR CTF2	25/07/2001	15/07/2003	IF	Virginie THIERRY
6900166	APEX SBE APF7	07/05/2002	27/09/2005	IF	Virginie THIERRY
6900162	PROVOR CTF2	13/10/2001	21/05/2004	IF	Virginie THIERRY
6900176	PROVOR CTF2	26/06/2002	18/06/2004	IF	Virginie THIERRY
6900395	PROVOR CTS3	13/06/2006	02/09/2012	IF	Virginie THIERRY
69032	PROVOR CT	23/04/2000	22/06/2001	IF	Christine COATANOAN
69039	PROVOR CT	25/09/2000	18/02/2002	IF	Christine COATANOAN
69043	PROVOR CT	05/04/2001	14/01/2003	IF	Christine COATANOAN
4900350	APEX SBE APF7	19/09/2003	30/04/2007	IF	Juergen FISCHER
4900352	APEX SBE APF7	24/09/2003	08/09/2006	IF	Juergen FISCHER
6900160	APEX SBE APF7	02/08/2001	31/10/2003	IF	Walter ZENK
6900515	APEX SBE APF8 SN	05/06/2007	29/11/2013	IF	Birgit KLEIN
6900560	APEX APF9A F/W	27/08/2008	30/11/2013	IF	Birgit KLEIN
6901064	APEX-APF9A	04/07/2011	20/04/2013	IF	Holger GIESE
4900412	PROVOR-SBE	10/11/2003	22/06/2005	ME	Howard Freeland
4900627	APEX-SBE	22/10/2005	27/07/2010	ME	Howard Freeland
4900635	APEX-SBE	19/05/2006	09/11/2011	ME	Howard Freeland
4900681	APEX-SBE	23/09/2005	26/12/2010	ME	Howard Freeland
4900682	APEX-SBE	27/05/2006	20/06/2011	ME	Howard Freeland
6900614	APEX-SBE	16/05/2010	26/03/2014	BO	Jon Turton

Table 2: List of the floats for which it may be necessary to revise the delayed mode correction (October 2013)

2 Salinity correction from our OW method when it differs significantly from the correction available on the GDAC files

2.1 IF French floats

2.1.1 Float 1900076

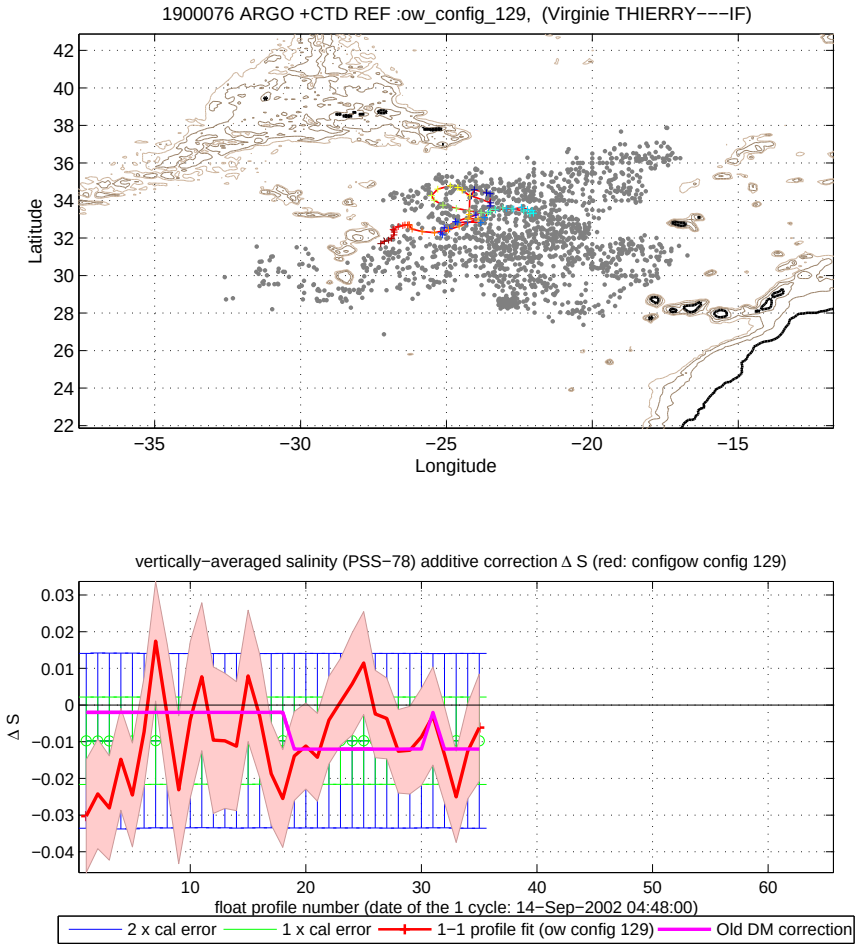

Figure 1: Results of the slightly modified OW method (configuration 129) for the float 1900076. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.2 Float 1900078

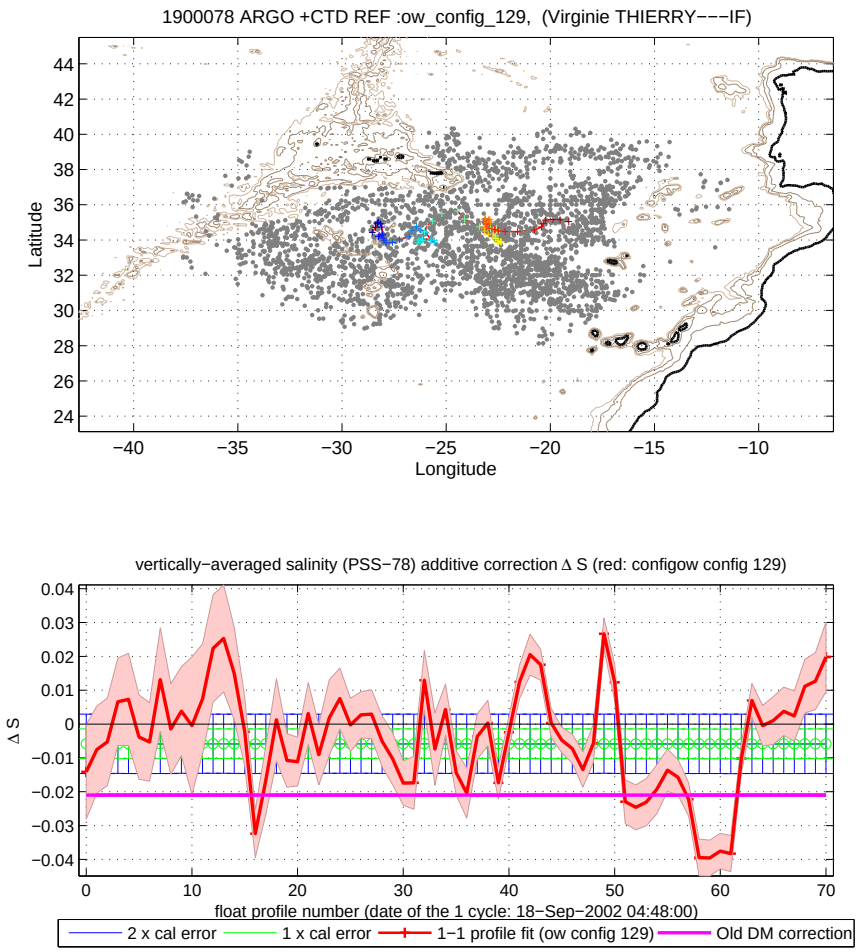

Figure 2: Results of the OW method 129 for the float 1900078. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.3 Float 4900211

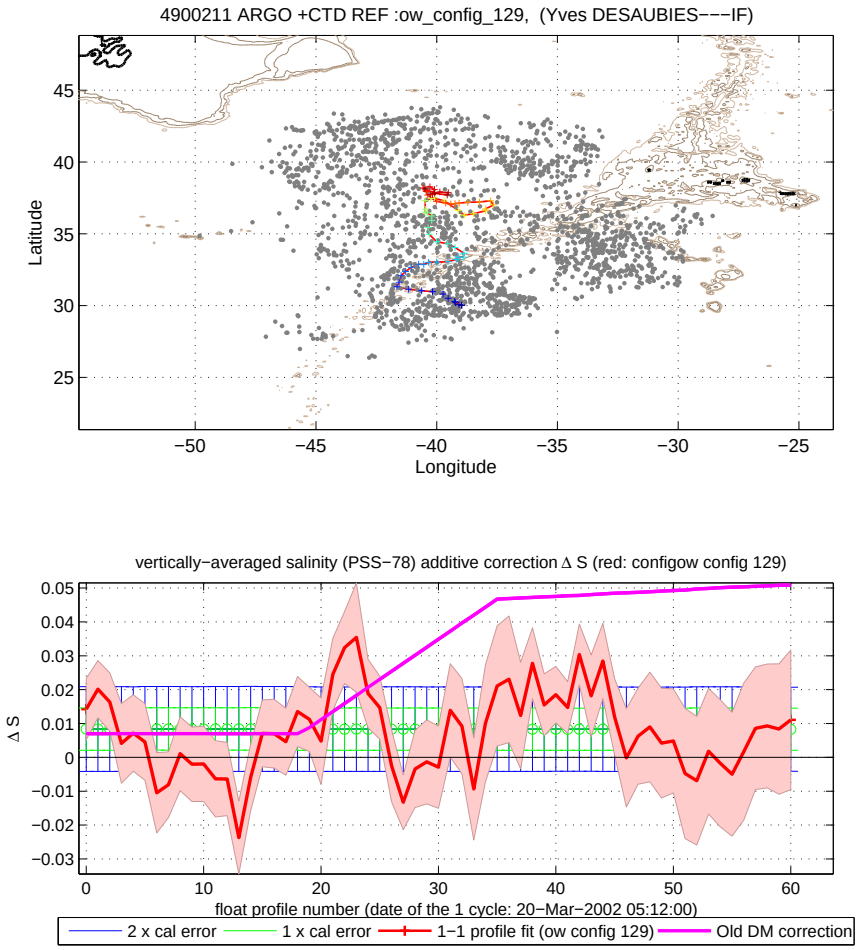

Figure 3: Results of the OW method 129 for the float 4900211. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.4 Float 4900215

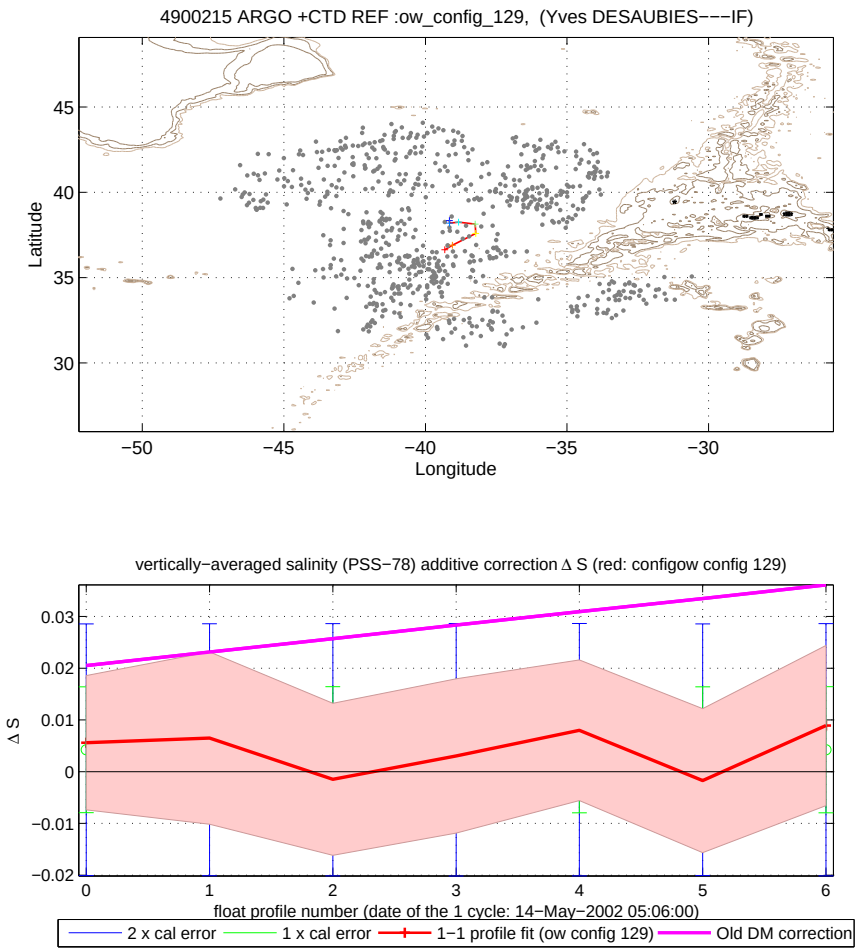

Figure 4: Results of the OW method 129 for the float 4900215.Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.5 Float 4900223

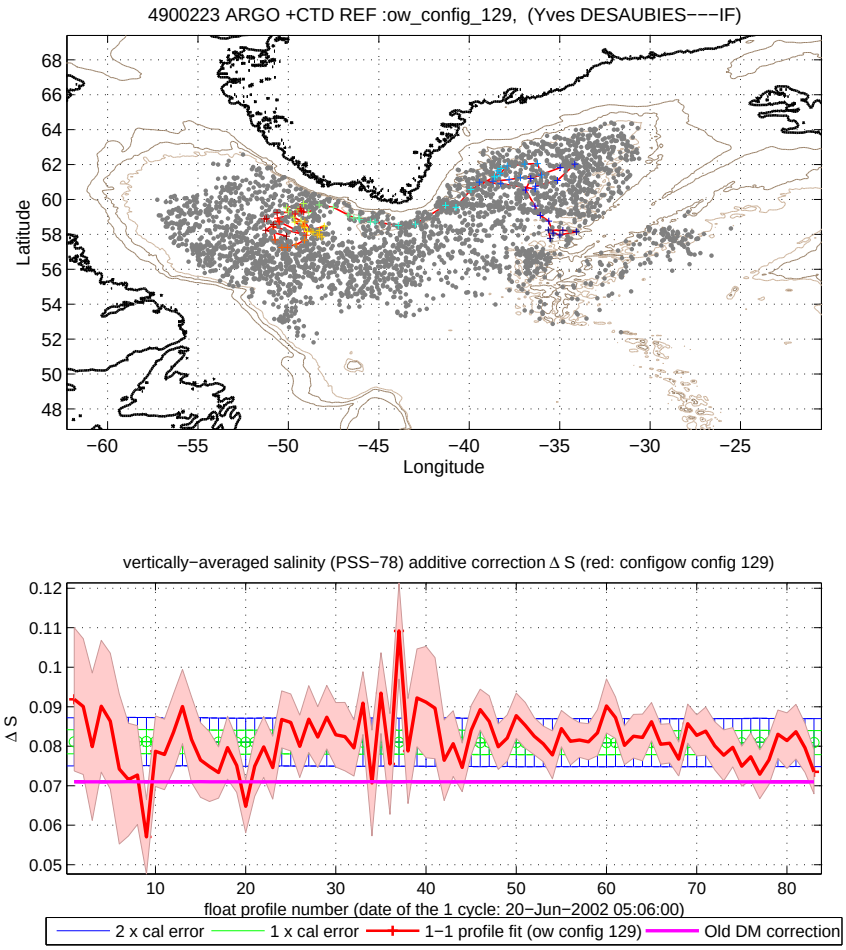

Figure 5: Results of the OW method 129 for the float 4900223. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.6 Float 4900225

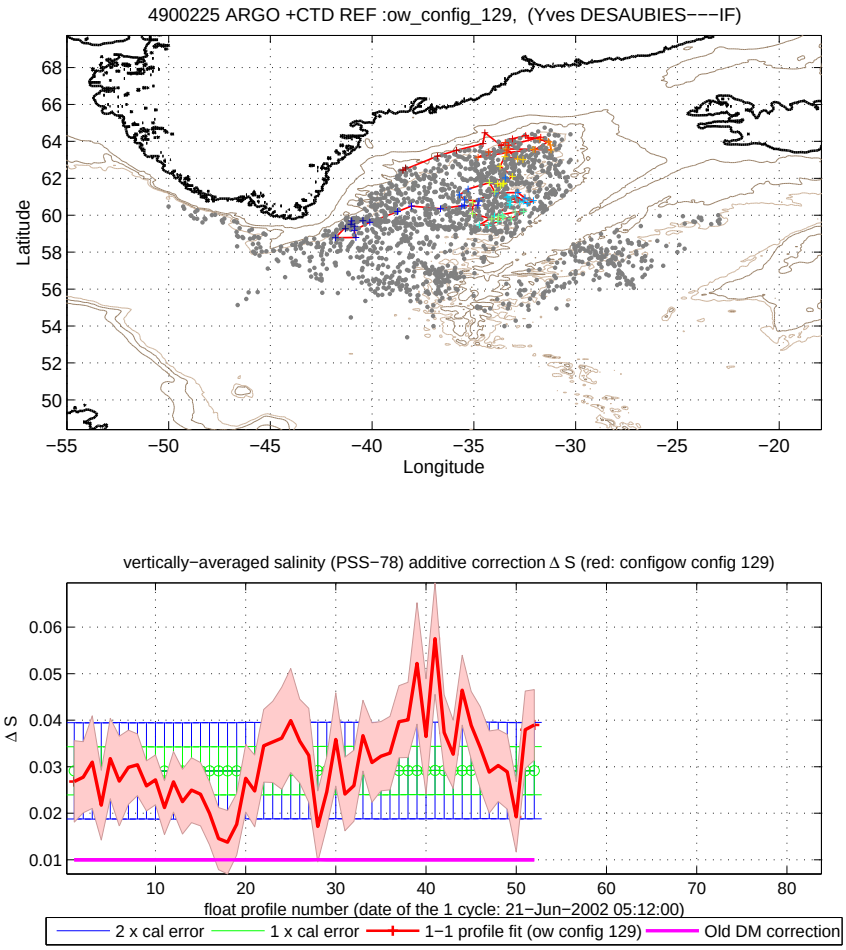

Figure 6: Results of the OW method 129 for the float 4900225. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.7 Float 6900045

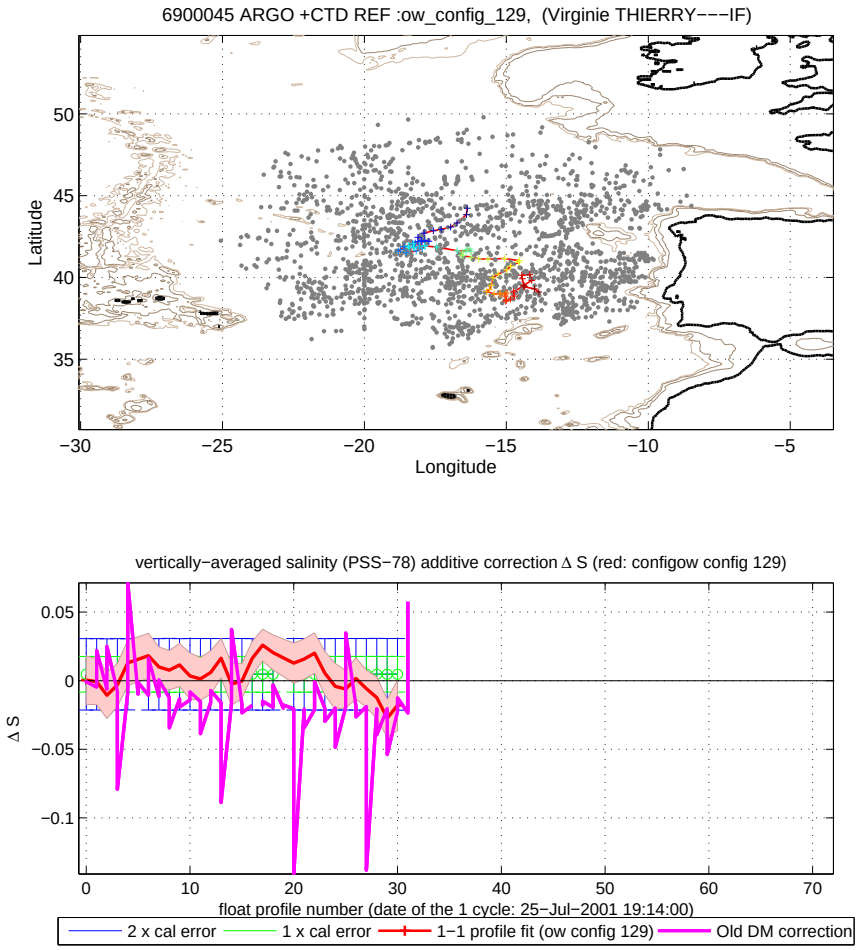

Figure 7: Results of the OW method 129 for the float 6900045. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.8 Float 6900166

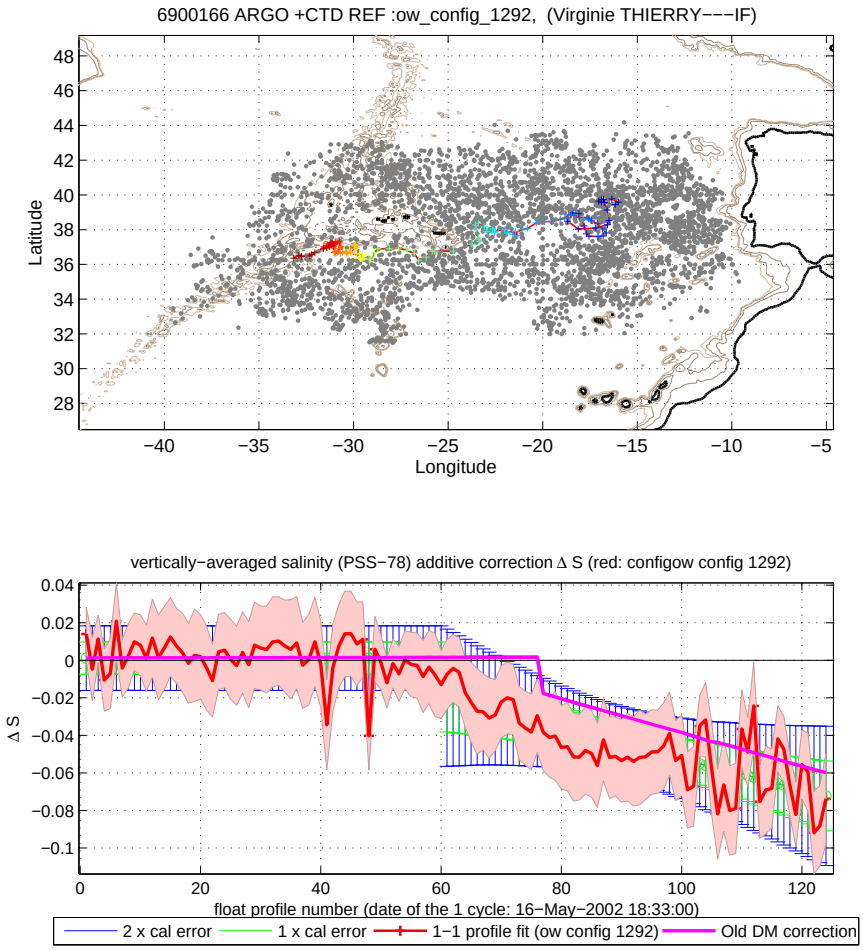

Figure 8: Results of the OW method 1292 (same as 129 but with MAP_P_EXCLUDE=0 instead of 500) for the float 6900166, calibration on θ level $> 12°and < 13.5°$. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.9 Float 6900162

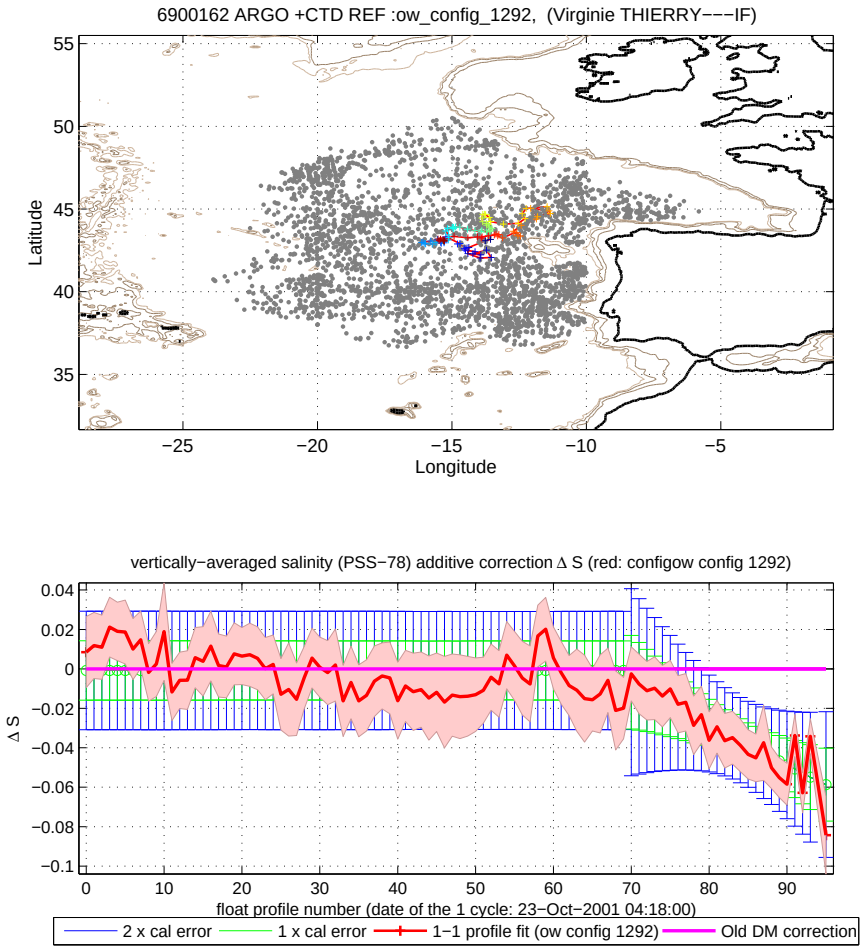

Figure 9: Results of the OW method 1292 for the float 6900162. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.10 Float 6900176

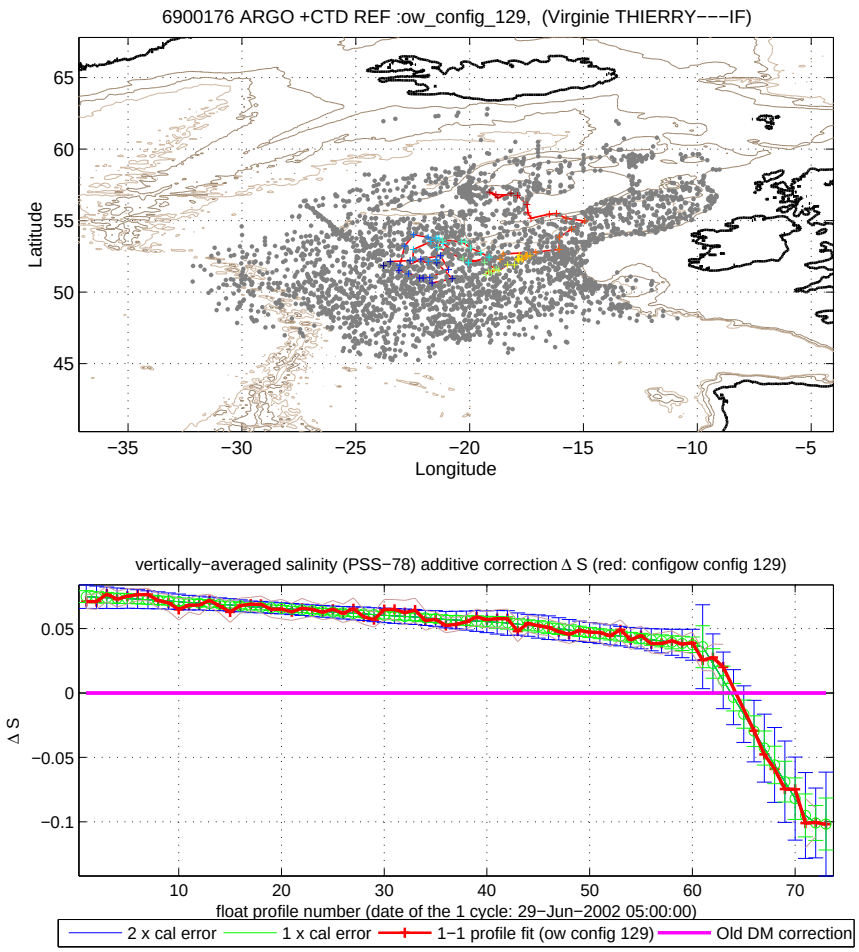

Figure 10: Results of the OW method 129 for the float 6900176. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.11 Float 6900395

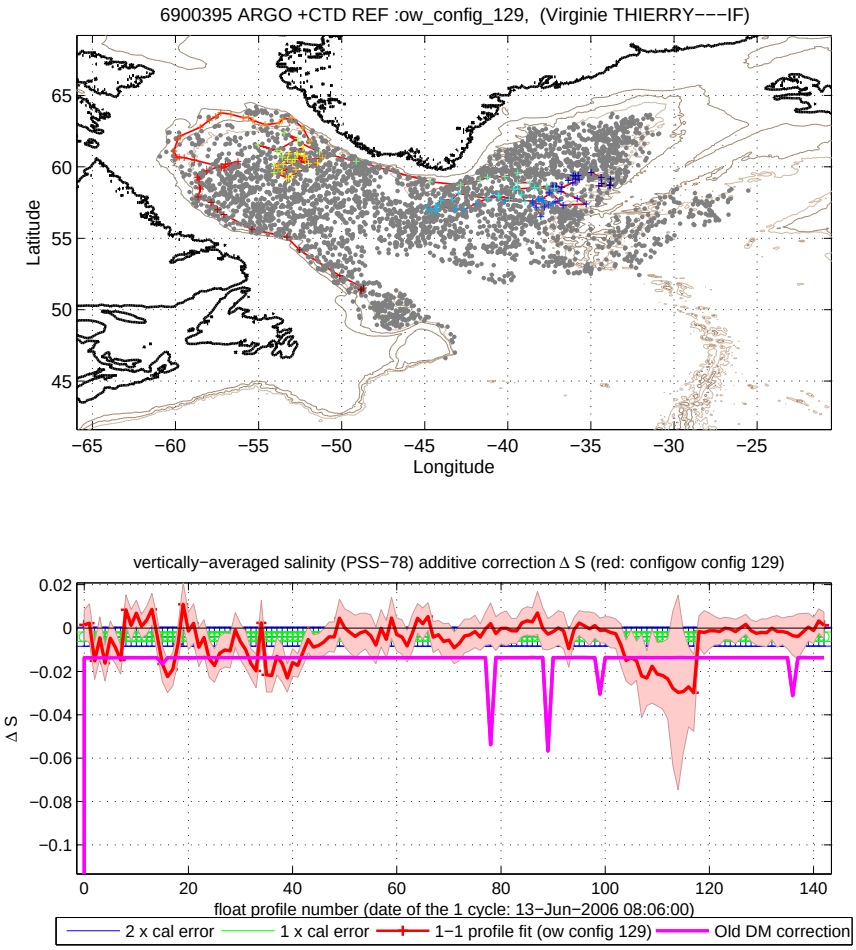

Figure 11: Results of the OW method 129 for the float 6900395. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.12 Float 69032

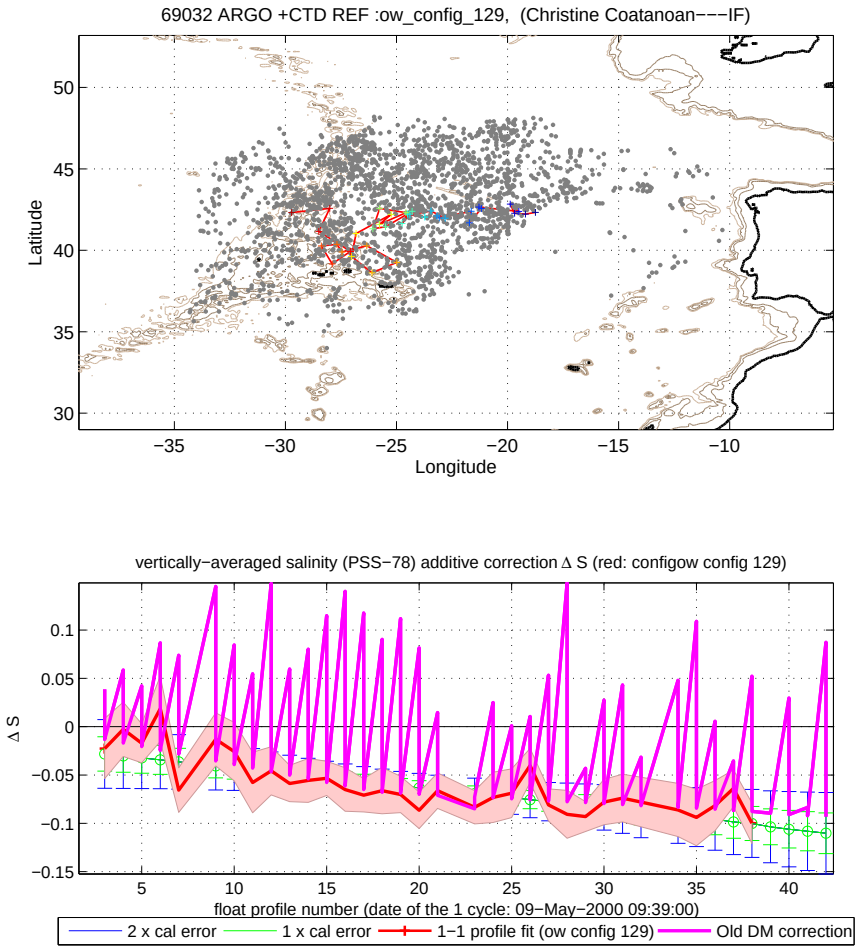

Figure 12: Results of the OW method 129 for the float 69032. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.13 Float 69039

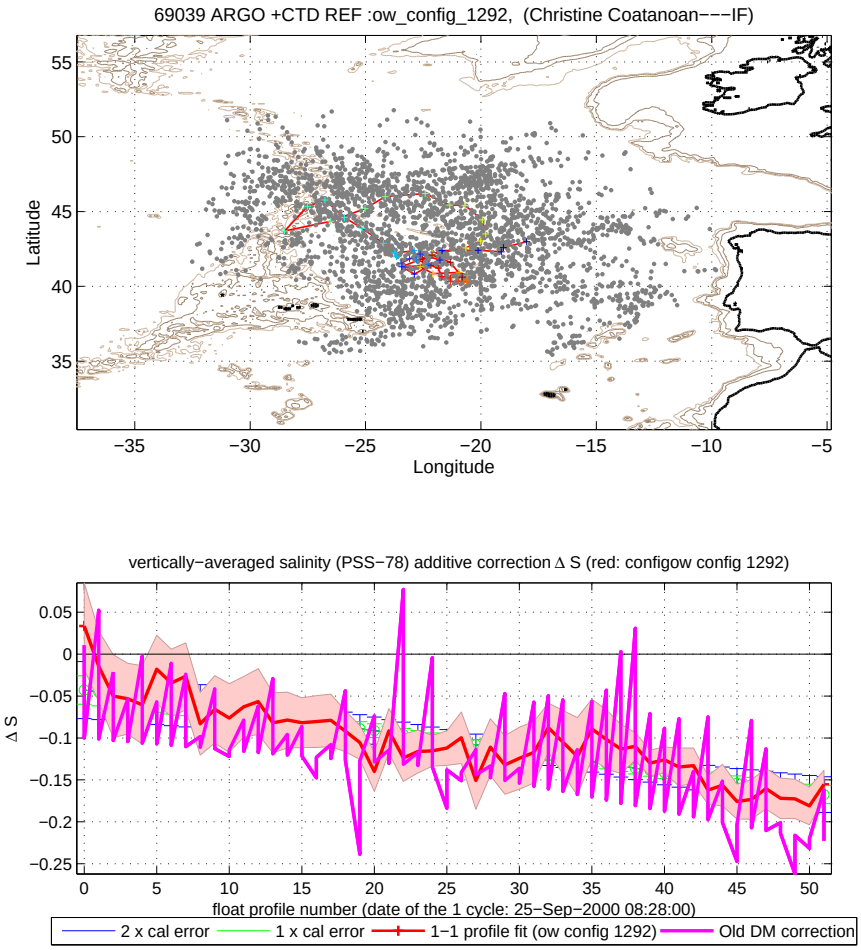

Figure 13: Results of the OW method 1292 for the float 69039, calibration on θ level $> 11.5°$*and* $<$ 13°. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.1.14 Float 69043

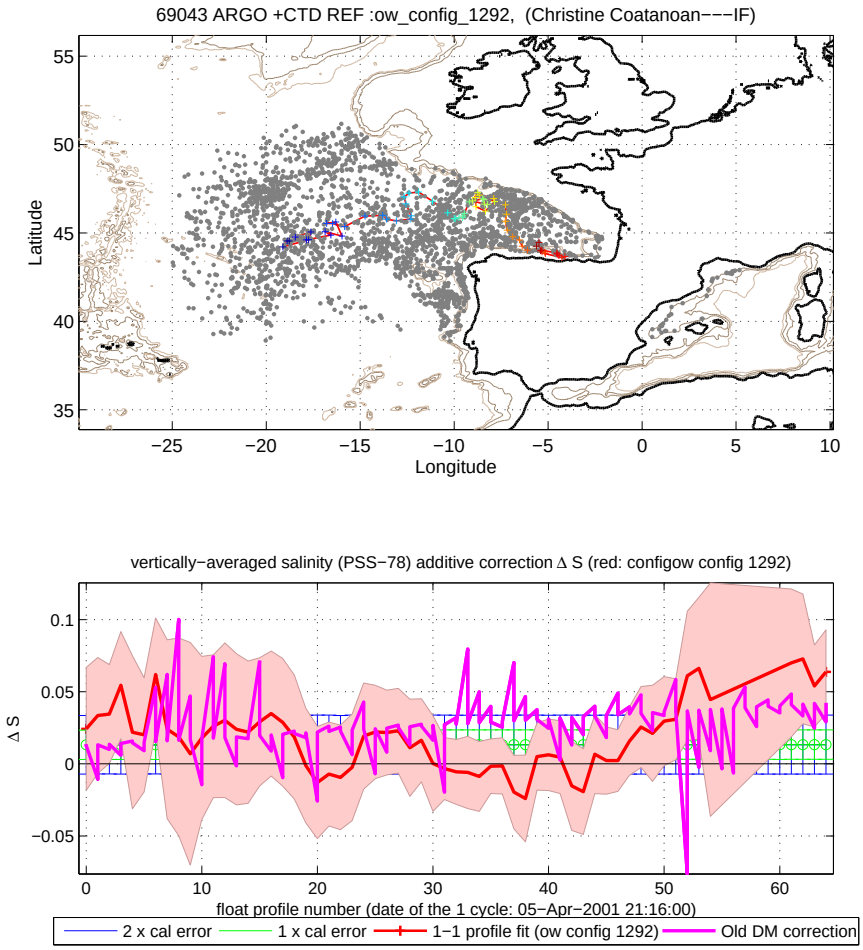

Figure 14: Results of the OW method 1292 for the float 69043, calibration on θ level $> 11°and < 13.5°$. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The offset previously computed by the PI of the float is also shown (magenta).

2.2 IF German floats

2.2.1 Float 4900350

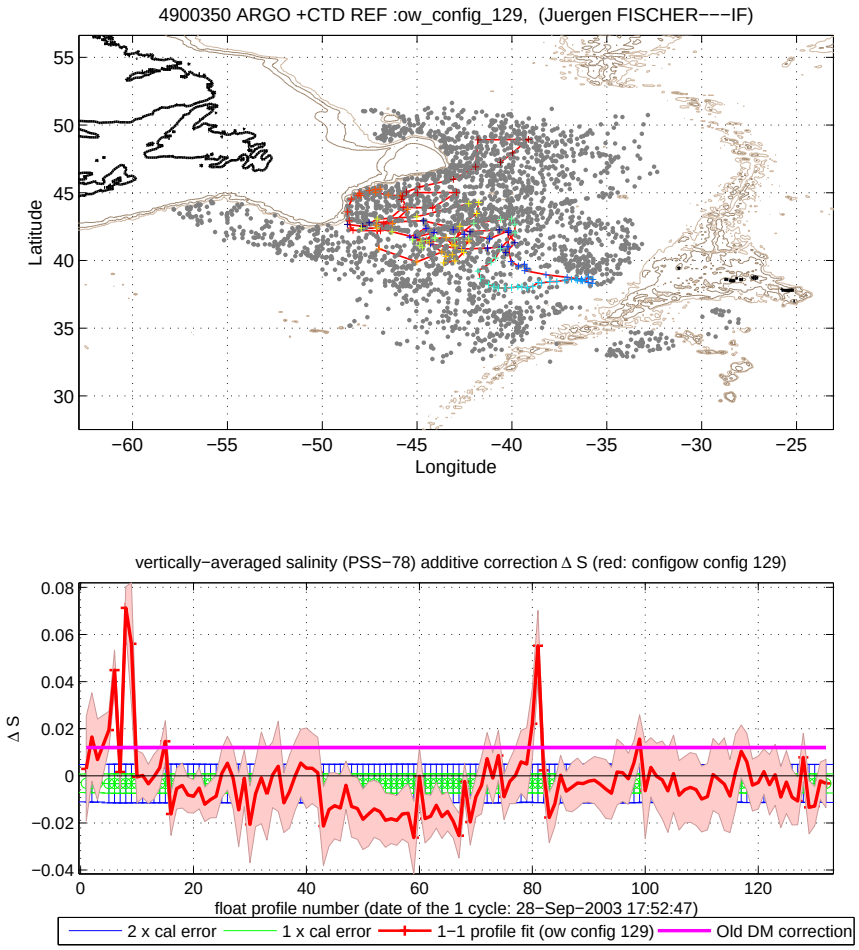

Figure 15: Results of the OW method 129 for the float 4900350. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.2.2 Float 4900352

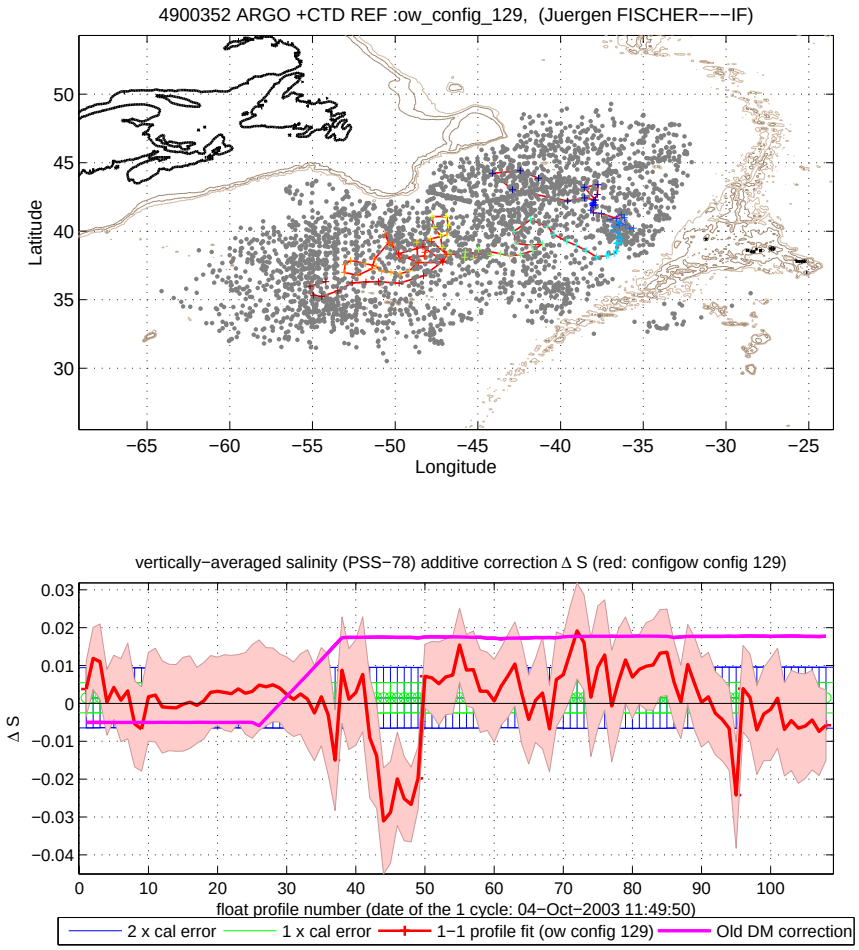

Figure 16: Results of the OW method 129 for the float 4900352. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.2.3 Float 6900160

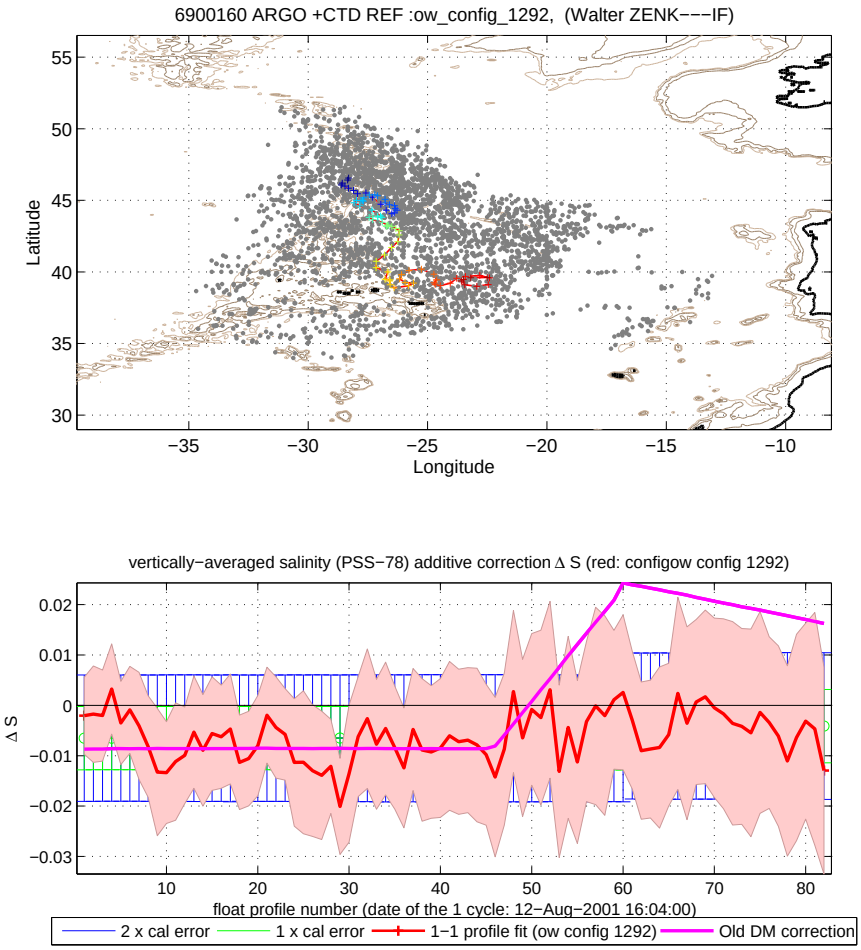

Figure 17: Results of the OW method 1292 for the float 6900160. The analysis is splitted at cycle 60. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.2.4 Float 6900515

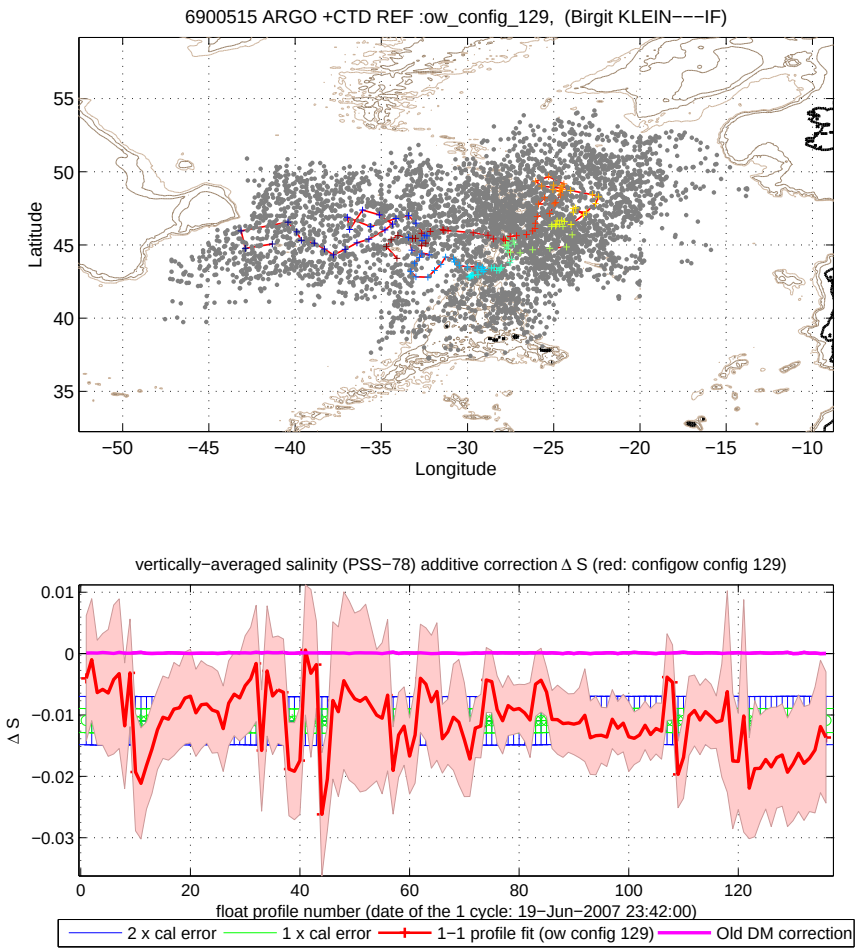

Figure 18: Results of the OW method 129 for the float 6900515. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that a DM correction is necessary for this float (around - 0.01 PSU).

2.2.5 Float 6900560

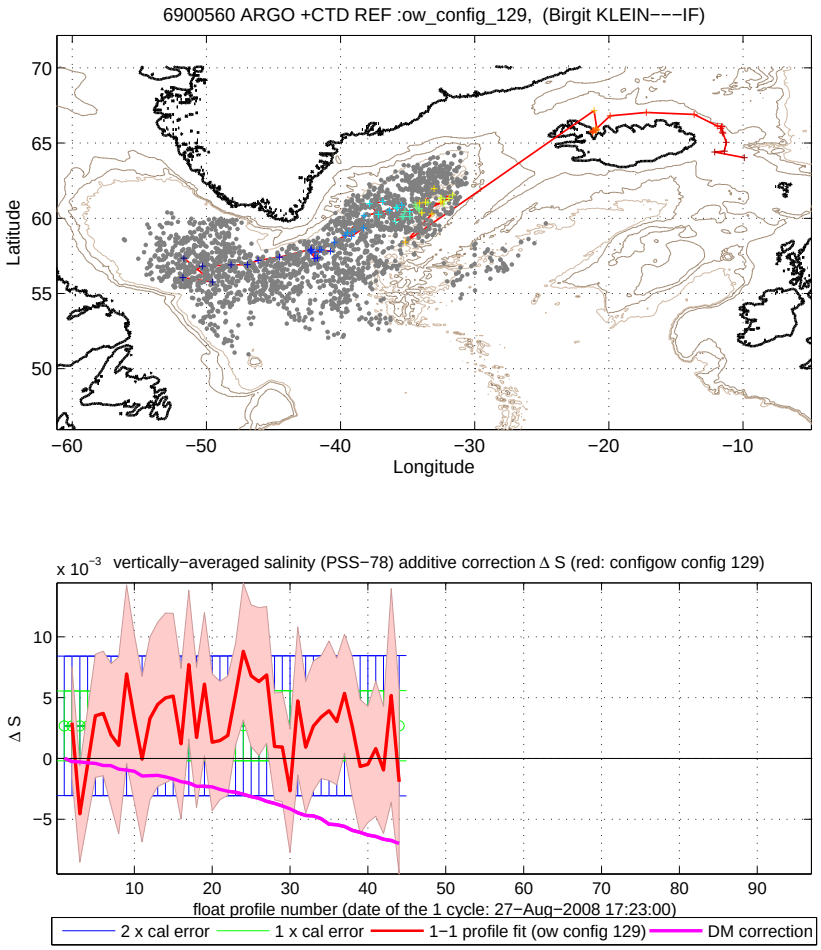

Figure 19: Results of the OW method 129 for the float 6900560. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.2.6 Float 6901064

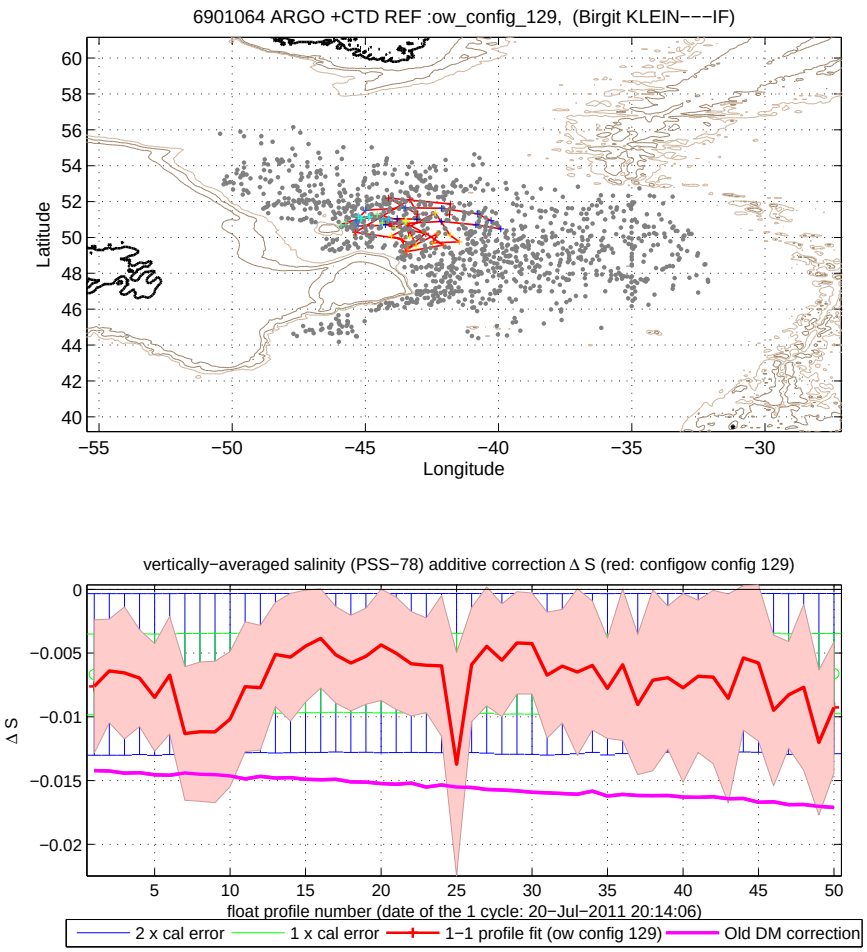

Figure 20: Results of the OW method 129 for the float 6901064. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method found a small offset (< 0.01 PSU). No DM correction seems necessary for this float.

2.3 MEDS floats

2.3.1 Float 4900412

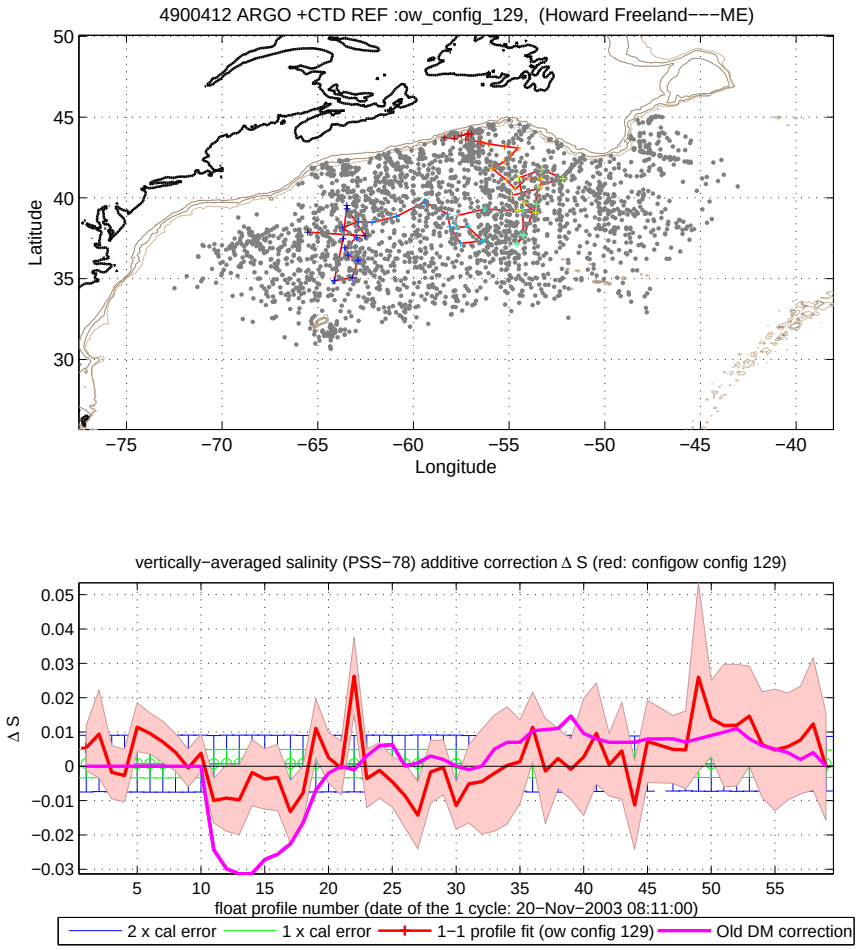

Figure 21: Results of the OW method 129 for the float 4900412. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.3.2 Float 4900627

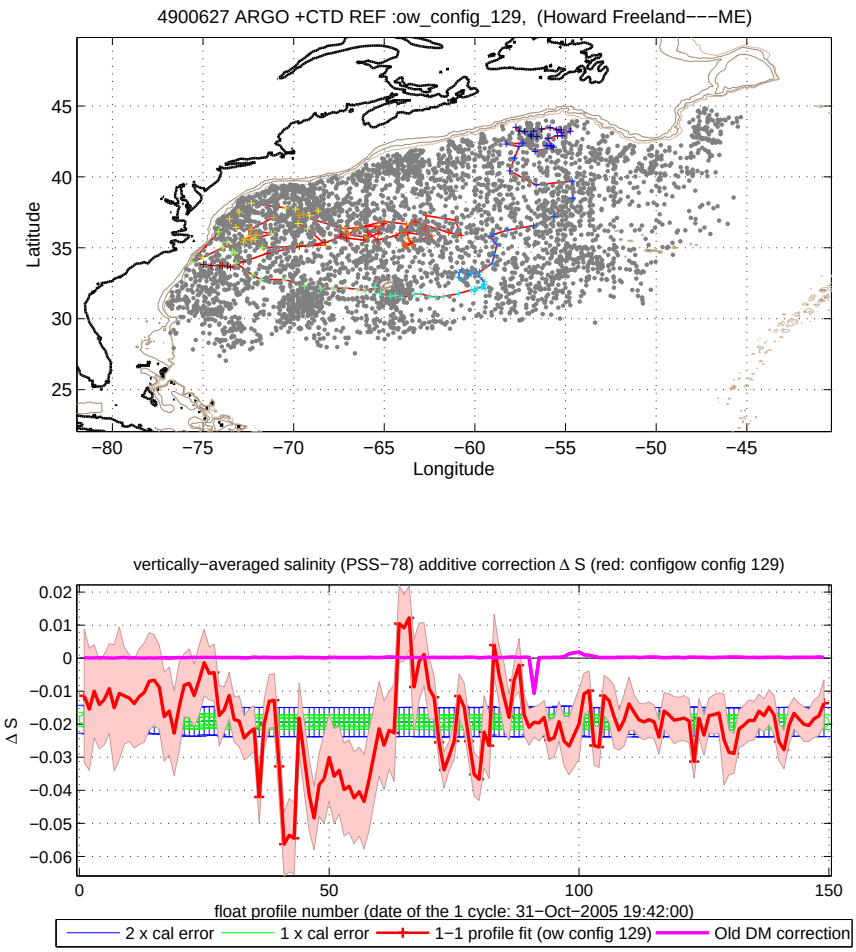

Figure 22: Results of the OW method 129 for the float 4900627. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that a DM correction is necessary for this float (around - 0.02 PSU).

2.3.3 Float 4900635

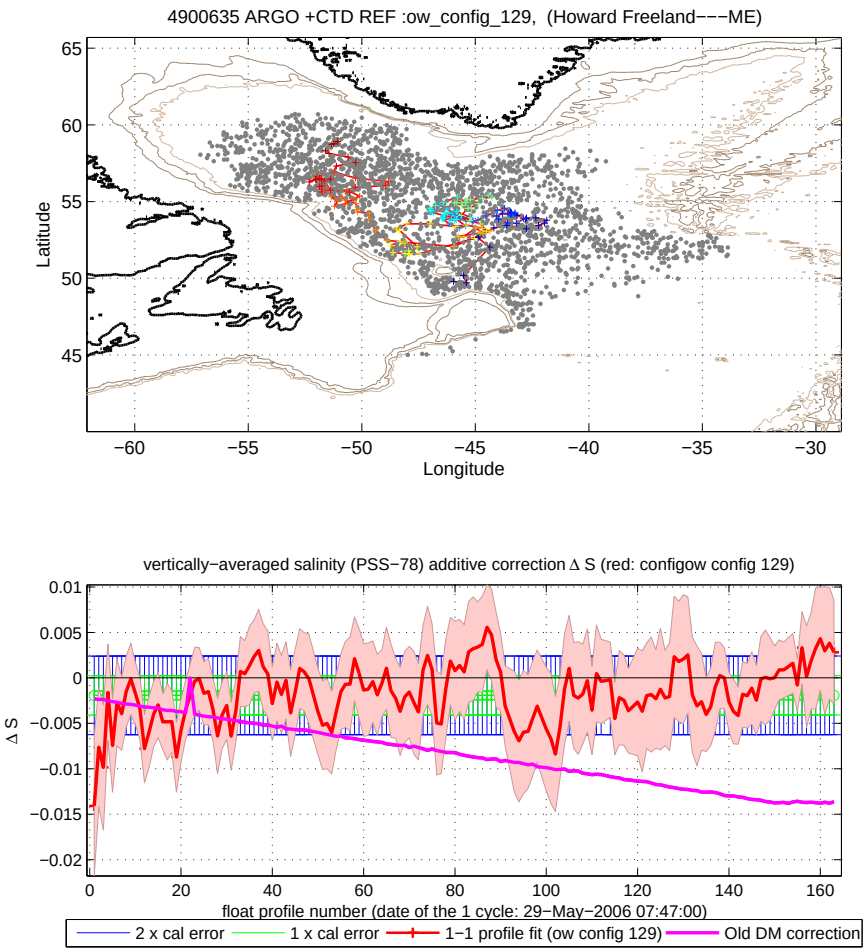

Figure 23: Results of the OW method 129 for the float 4900635. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.3.4 Float 4900681

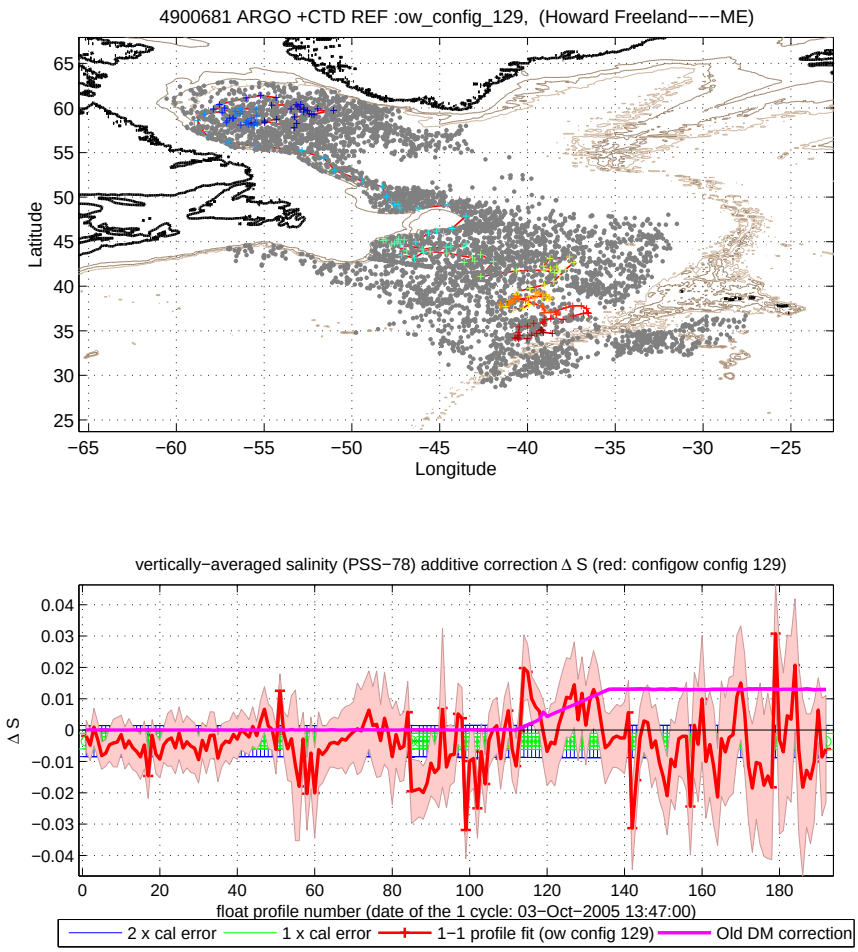

Figure 24: Results of the OW method 129 for the float 4900681. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.3.5 Float 4900682

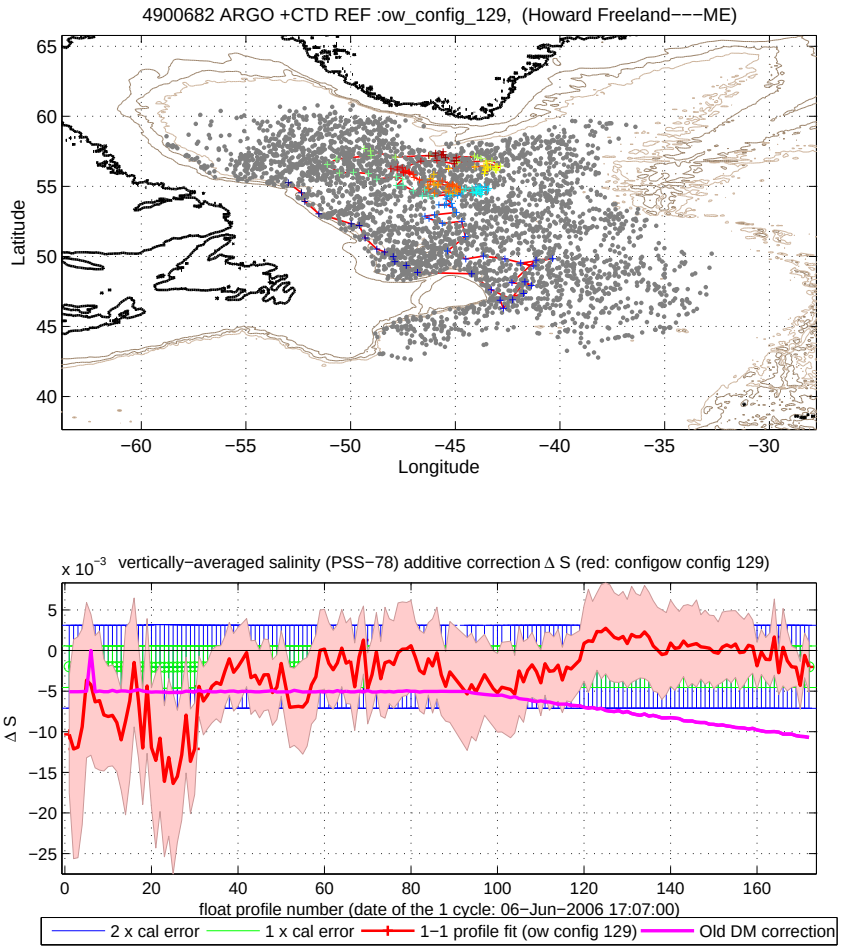

Figure 25: Results of the OW method 129 for the float 4900682. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that no DM correction is necessary for this float.

2.4 BODC floats

2.4.1 Float 6900614

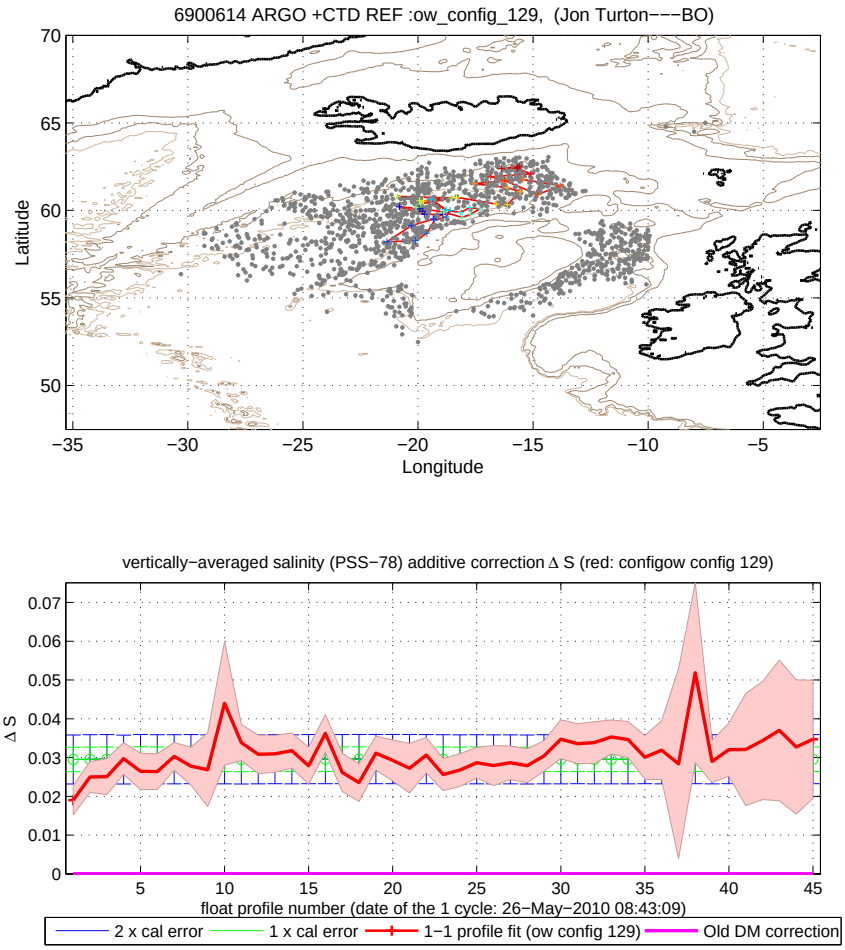

Figure 26: Results of the OW method 129 for the float 6900614. Upper panel: Reference CTD and ARGO profiles used for the mapping (grey dots) are shown on the map along with the float trajectory. Lower panel: vertically-averaged mapped salinities minus float salinities on 10 θ levels (red) and the computed offset (green) from our slightly modified OW method (configuration 129).The salinity corection currently available on the GDAC files is also shown in magenta.

Our slightly modified OW method suggests that a DM correction is necessary for this float (around + 0.03 PSU).