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<http://www.umr-lops.fr>**

**DELAYED MODE QUALITY CONTROL
AND OXYGEN CORRECTION
OF OVIDE ARGO DATA
FLOAT WMO 1901208**

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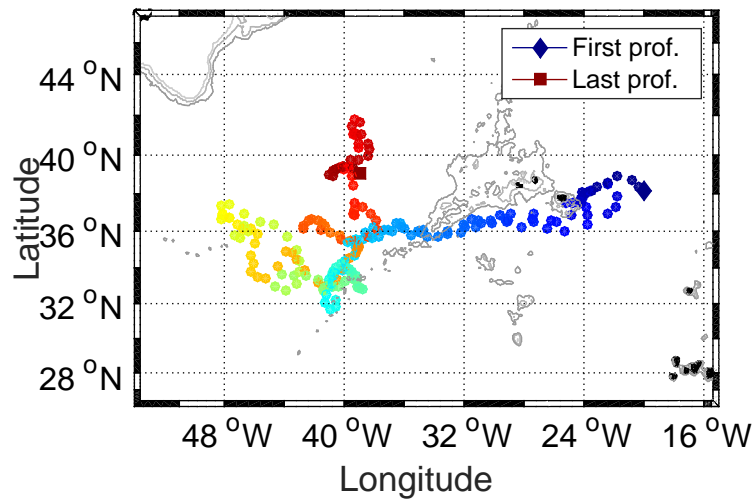
DELAYED MODE QUALITY CONTROL OF OVIDE ARGO DATA FLOAT WMO 1901208

Internal Report LPO 17-25

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November 9, 2017

Float WMO 1901208



1 Presentation and DMQC summary

Number	Deployment (cycle OD) cycle OD	Last cycle 209A
Provor WMO 1901208	24/07/2011 23h30	
CTS3 DO	N 38.275 W 19.997	
Pcutoff	5	
Soft version	sup. to 5816A00	
Date of control	Float status	Last cycle
September 2013	Active	14/09/2013
Coriolis transmission		19/11/2013
Date of last control	Float status	Last cycle
October 2017	DEAD	05/04/2017
Coriolis transmission		10/10/2017

Table 1: Status of the float

Warning : Note that all the figures are plotted with the latest QC flag values (the modifications mentioned table 2 are taken into account).

Warning : the resolution is equal to 10 dbar from the surface to 500 dbar, then 25 dbar from 500 to 2000 dbar. Salinity data between 0 and 5 dbar are suspicious because they are acquired when the pump of the CTD is turned off.

1.1 Salinity correction from the OW method

We cannot see any evidence of a drift or bias in the salinity measurement. We thus conclude that it is not necessary to correct the salinity data. Errors bars are maximum value between 0.01 and those determined from the OW method with parameters from the OW configuration 129.

2 Data

OW CONFIGURATION	129
CONFIG_MAX_CASTS	250
MAP_USE_PV	1
MAP_USE_PV_ELLIPSE	1
MAP_USE_FACTEUR	1
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
MAP_P_EXCLUDE	500
MAP_P_DELTA	250
Reference data base	CTD and ARGO

Table 2: Parameters of the OW method.

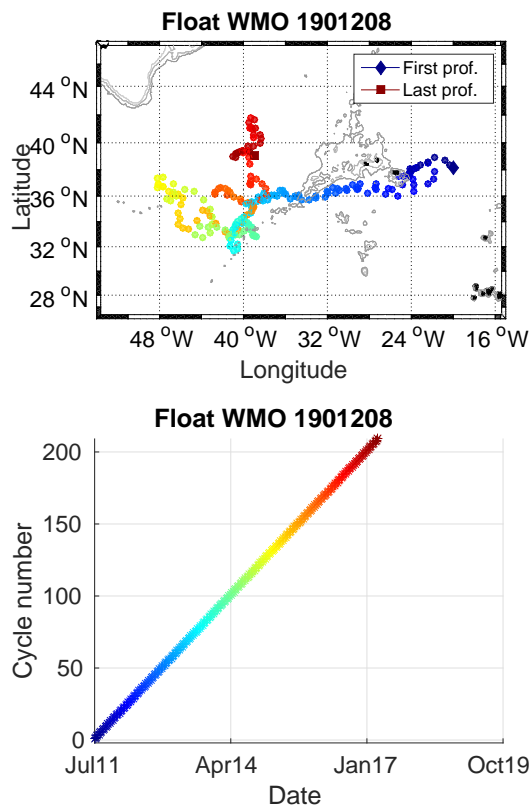


Figure 1: Profiles position and relationship between cycle number, date and color.

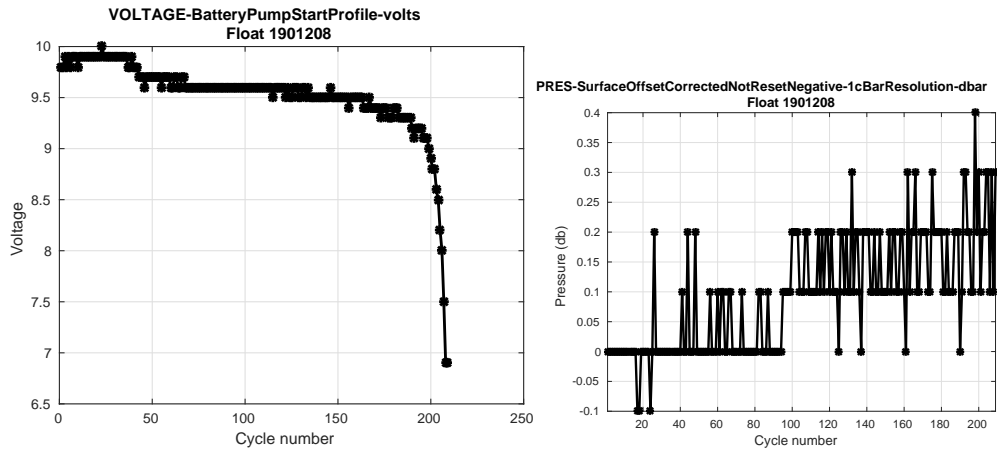


Figure 2: Battery Voltage and Surface Pressure

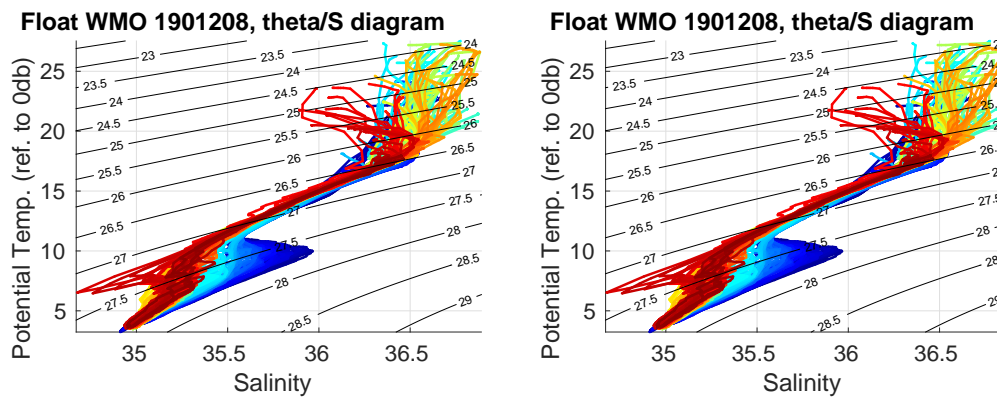


Figure 3: θ/S diagrams. (Left panel) Flags are not taken into account. (Right panel) Quality flags are taken into account.

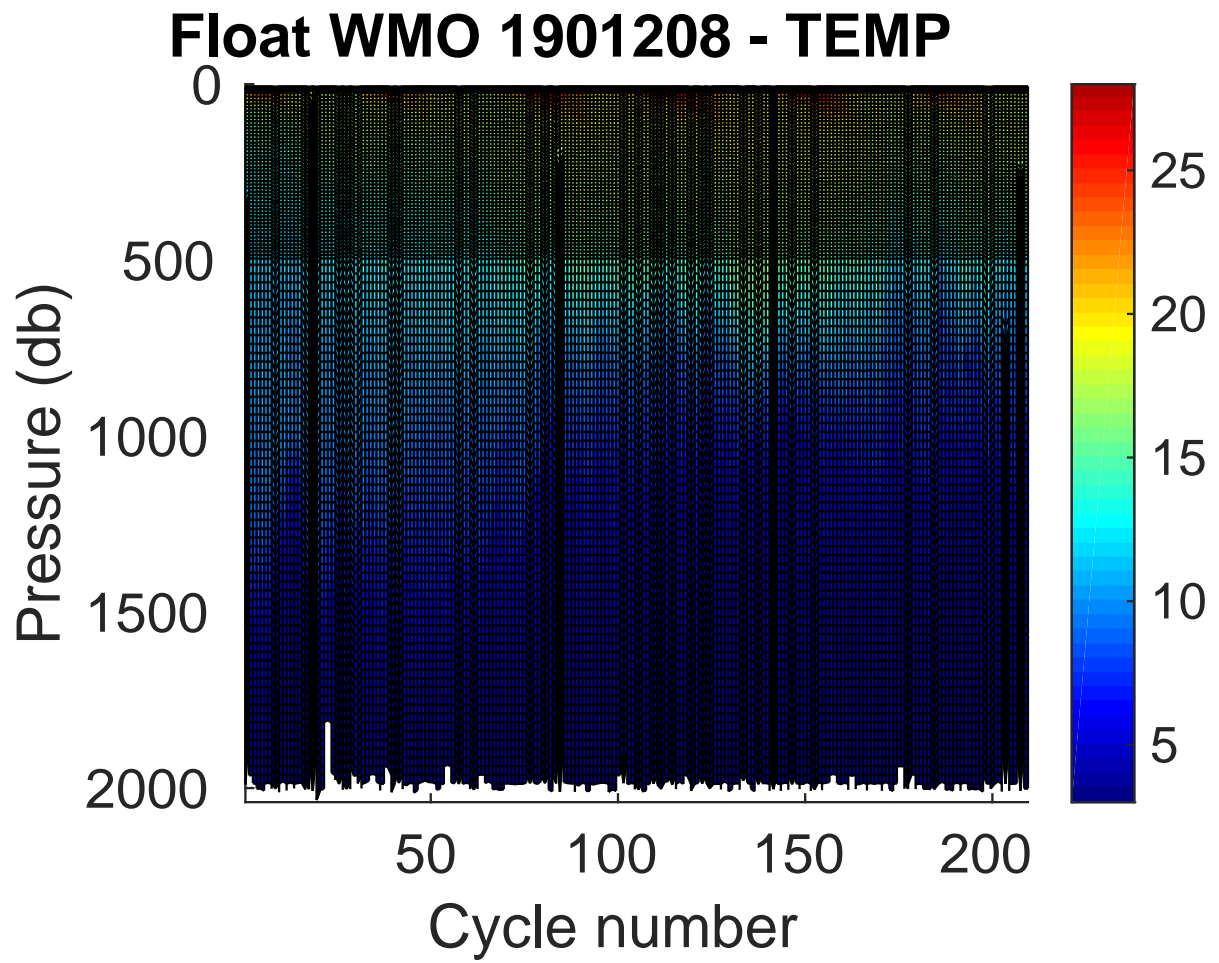


Figure 4: Temperature section along the float trajectory. Quality flags are not taken into account.

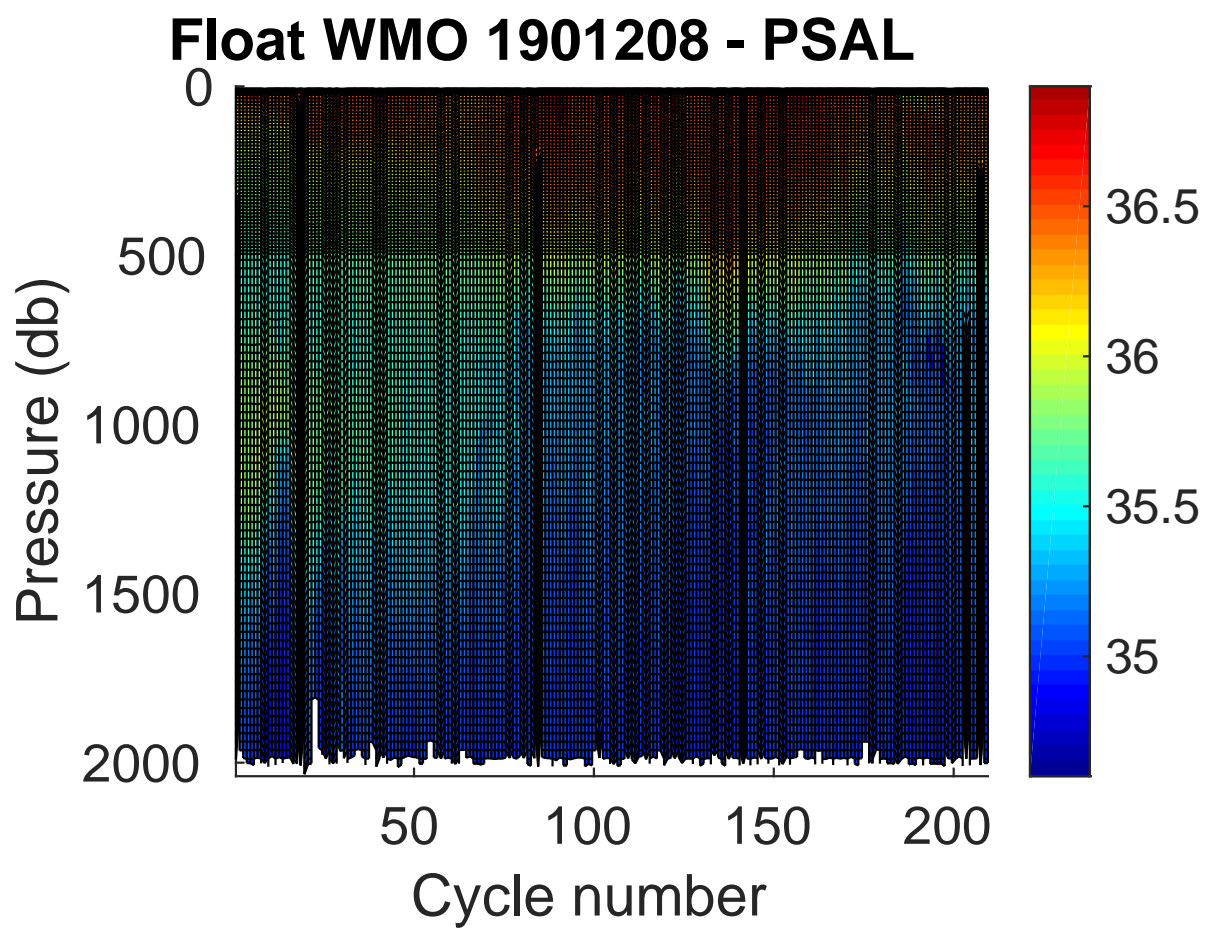


Figure 5: Salinity section along the float trajectory. Quality flags are not taken into account.

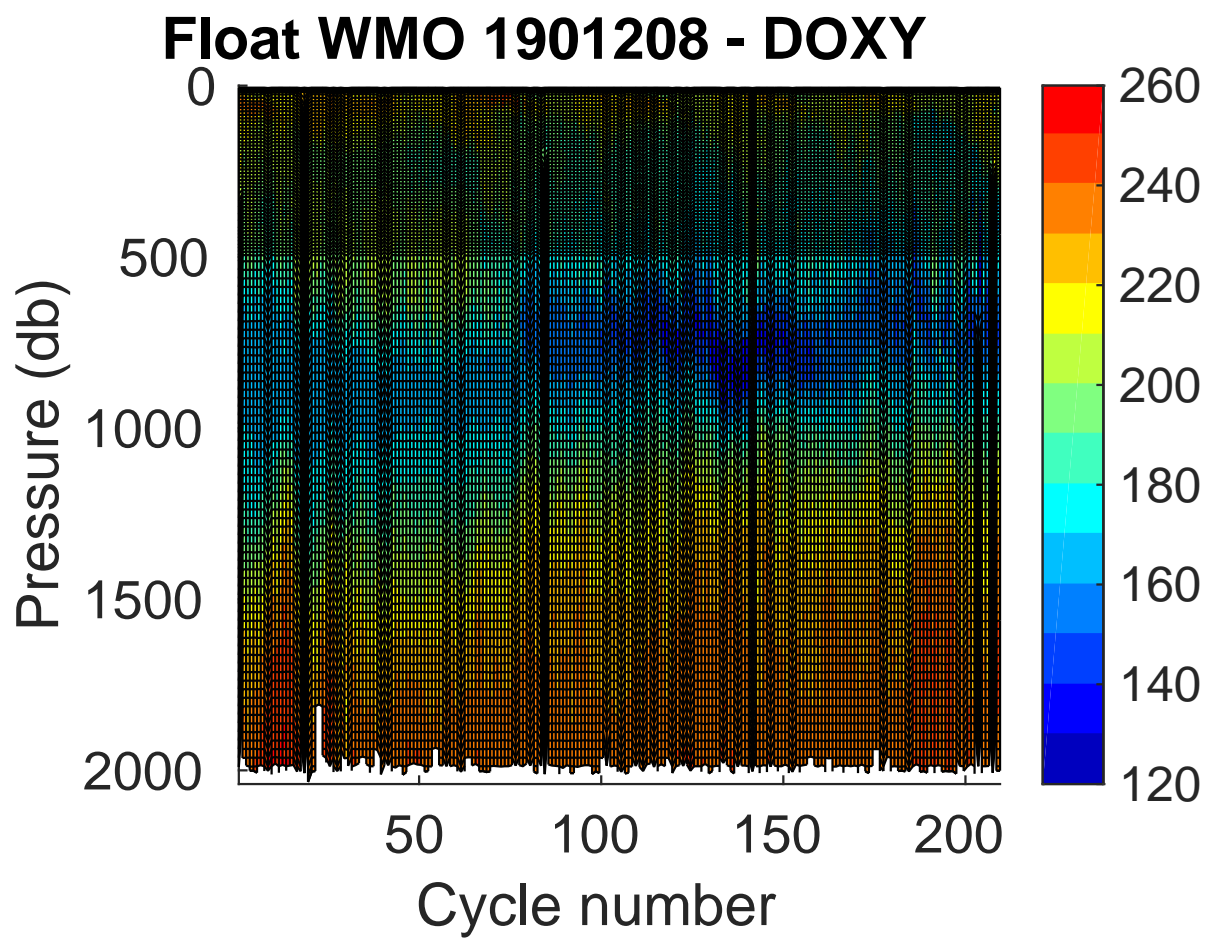


Figure 6: Oxygen section along the float trajectory. Quality flags are not taken into account.

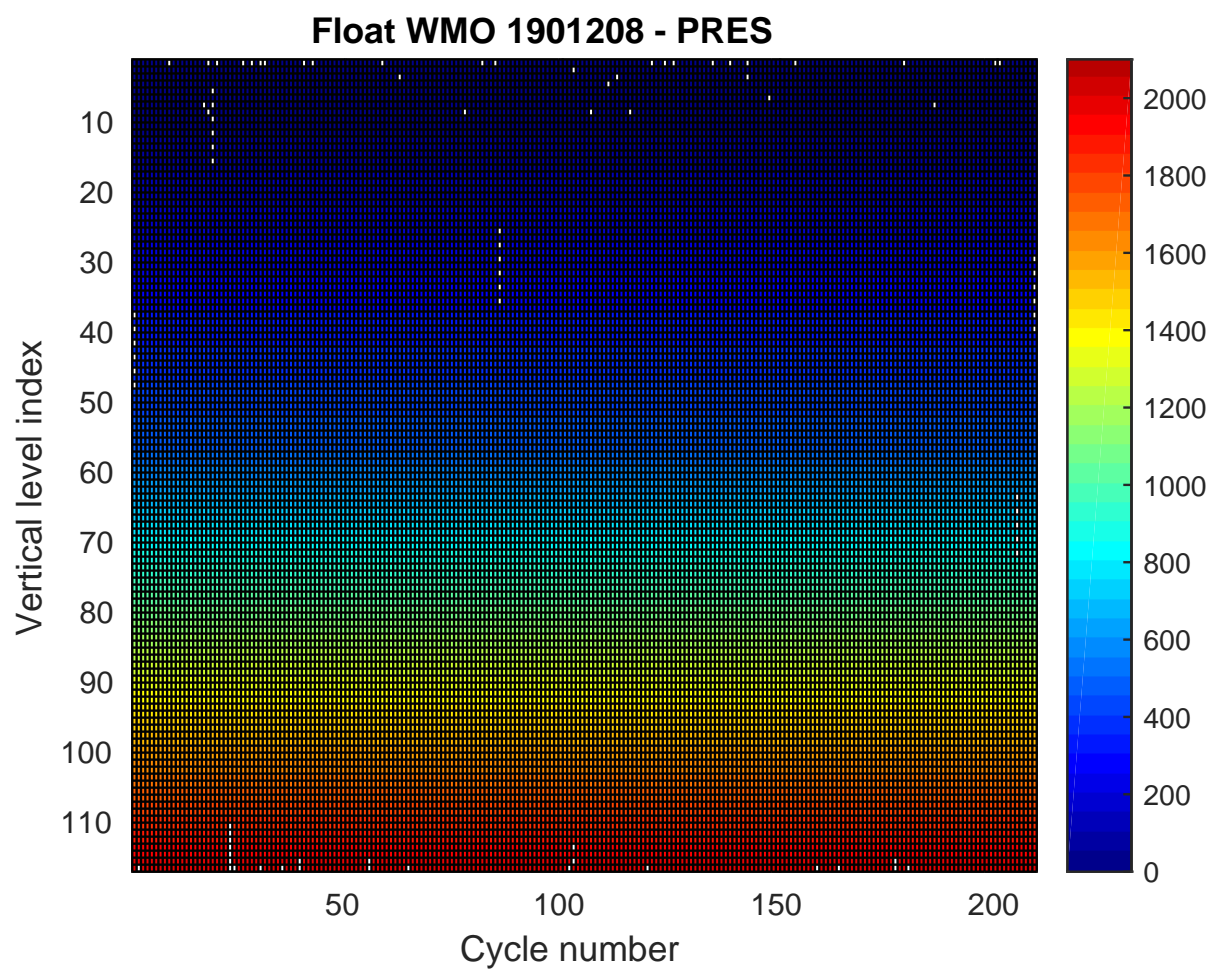


Figure 7: Pression as fonction of cycle number and vertical level index along the float trajectory. Quality flags are taken into account.

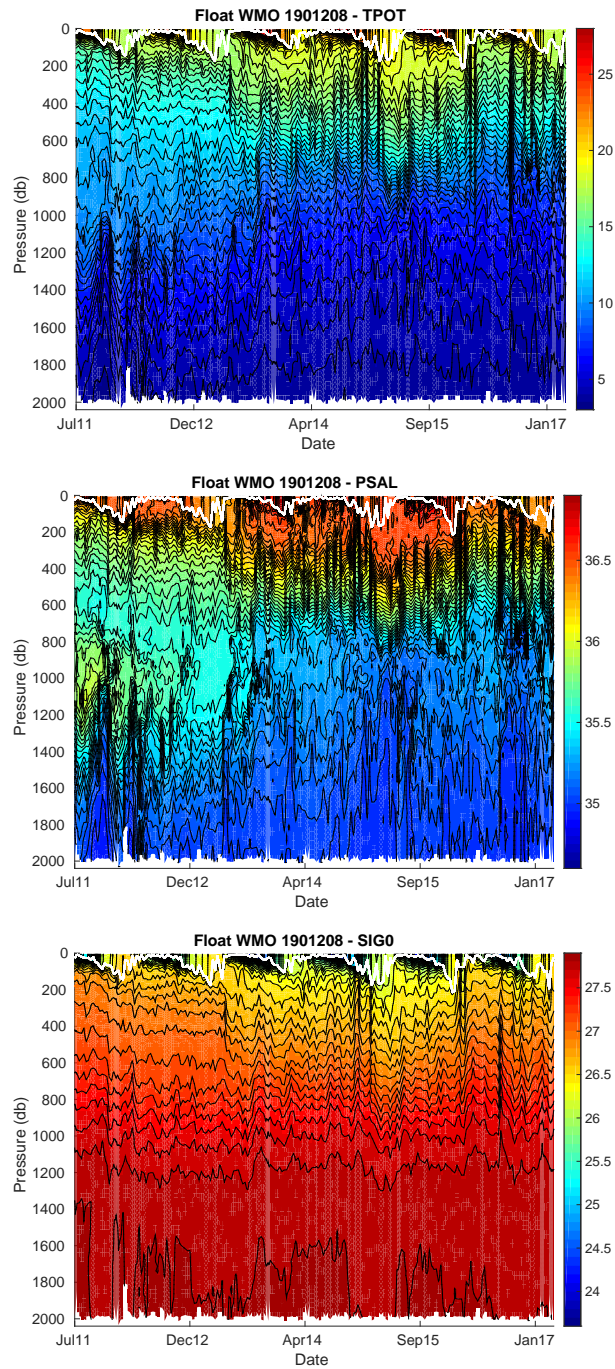


Figure 8: Potential temperature, salinity and potential density sections along the float trajectory (interpolated on standard levels). Quality flags are taken into account.

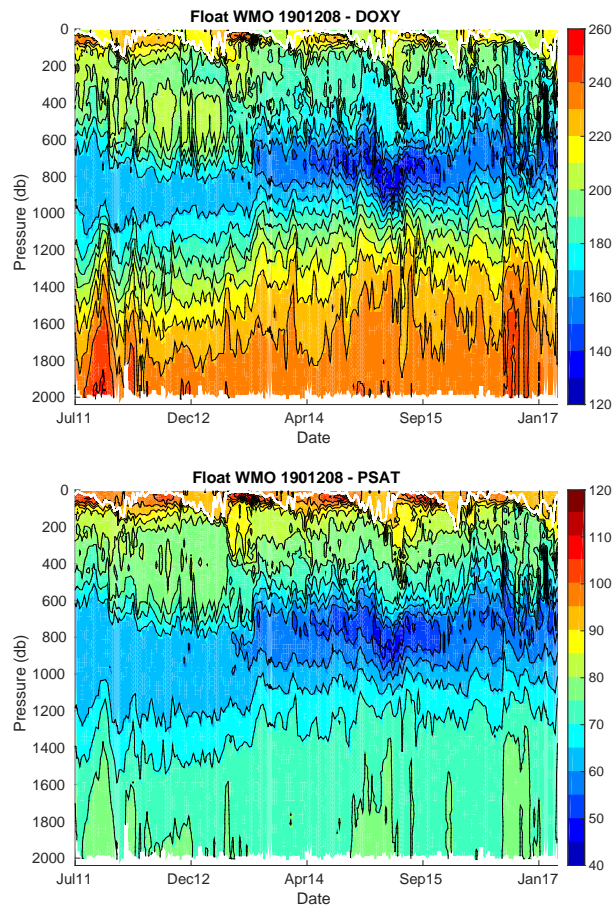


Figure 9: Oxygen and Saturation Oxygen sections along the float trajectory (interpolated on standard levels). Quality flags are taken into account.

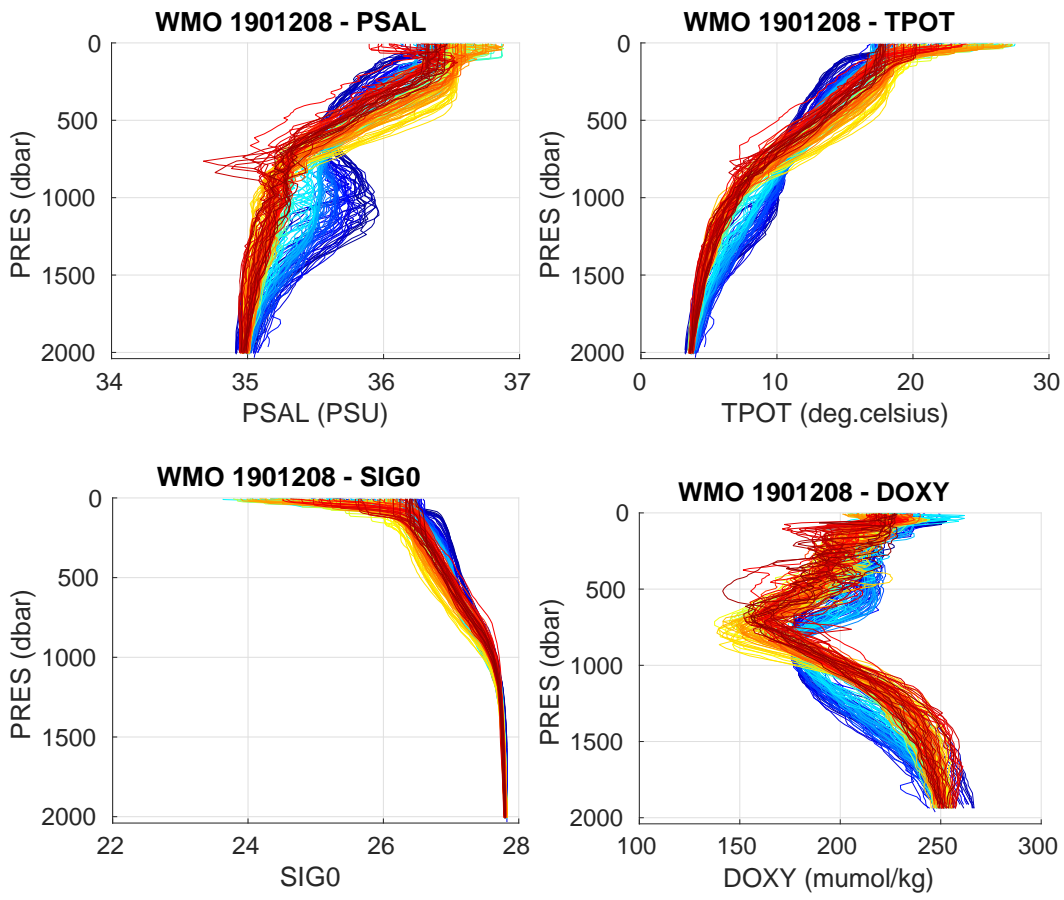


Figure 10: Salinity, Potential Temperature, Potential Density and Oxygen profiles. Quality flags are taken into account.

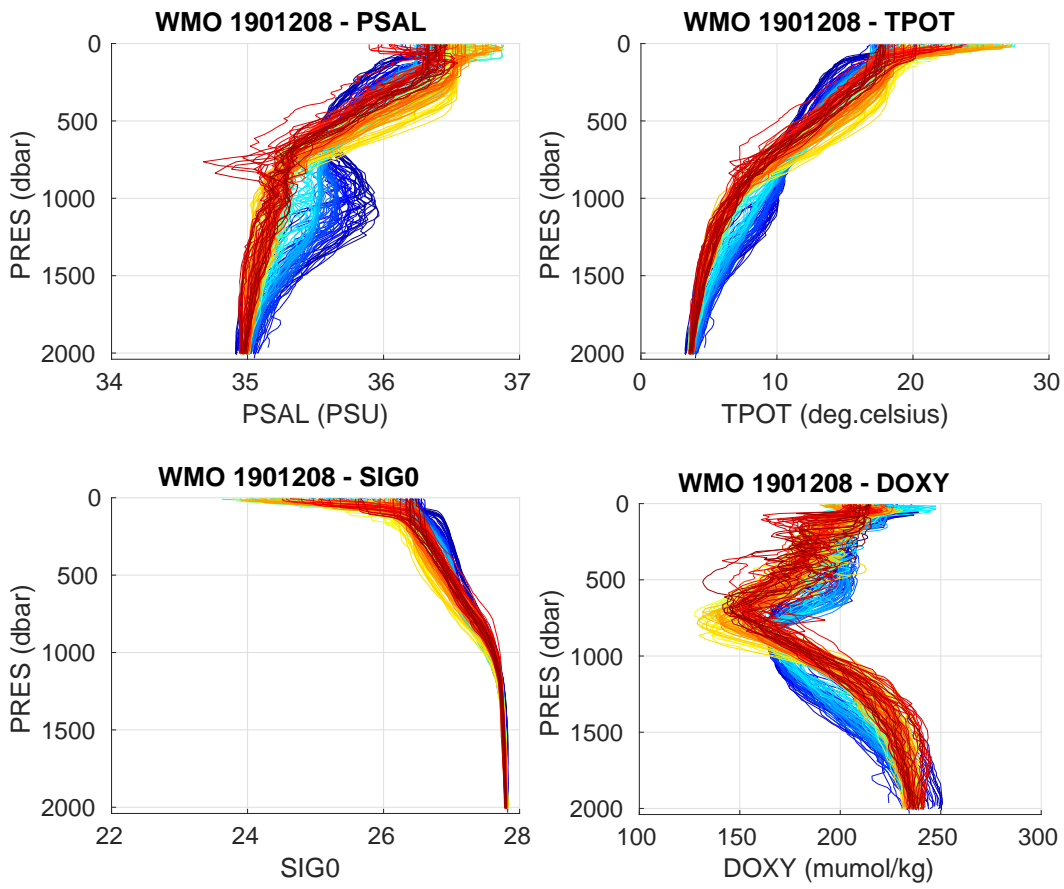


Figure 11: Salinity, Potential Temperature, Potential Density and Oxygen profiles. Quality flags are not taken into account.

3 Comparison cycle 1A to the OVIDE 2011 nearest CTD profile

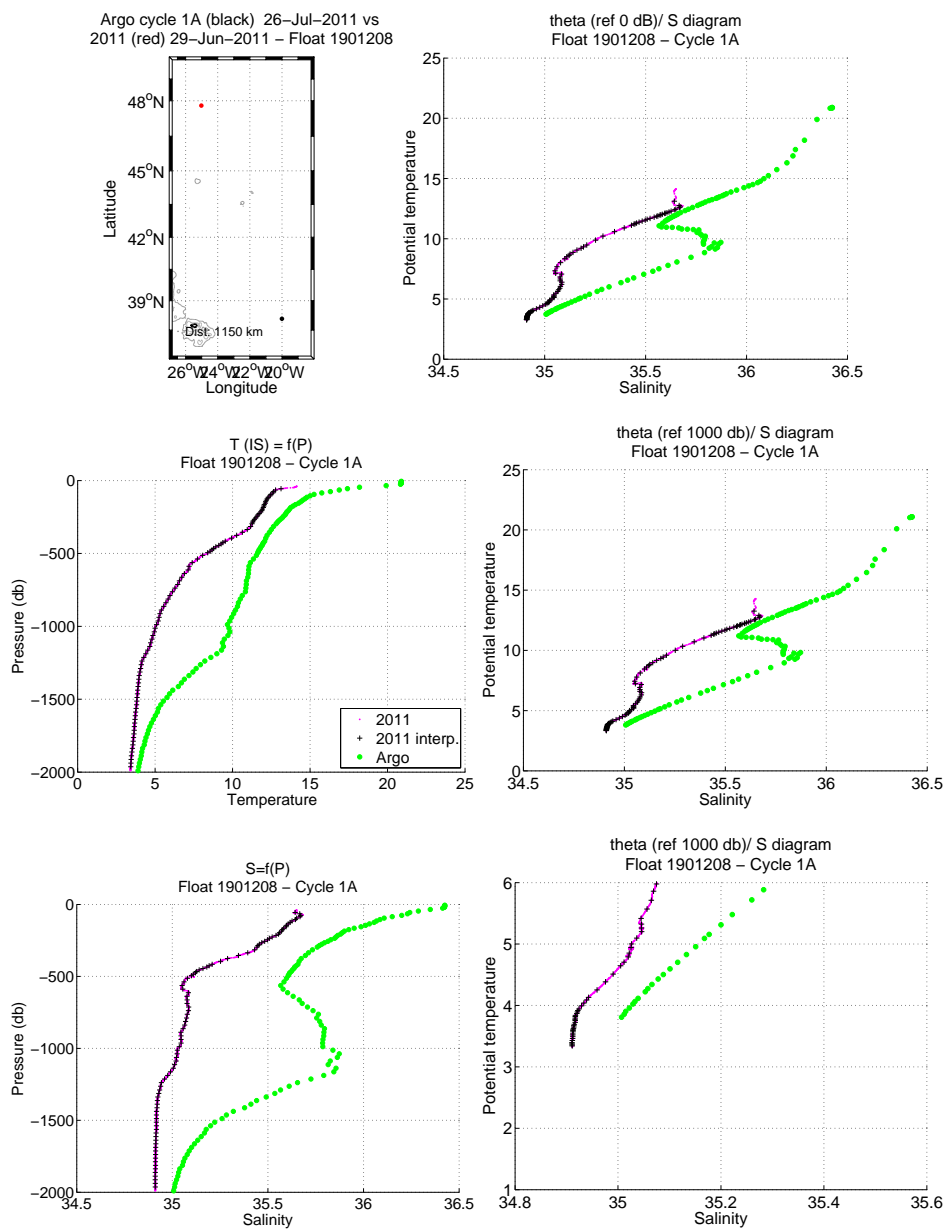


Figure 12: Comparison of the cycle 1A with the nearest CTD profile done after the float deployment.

4 OW method, CONFIGURATION # 129

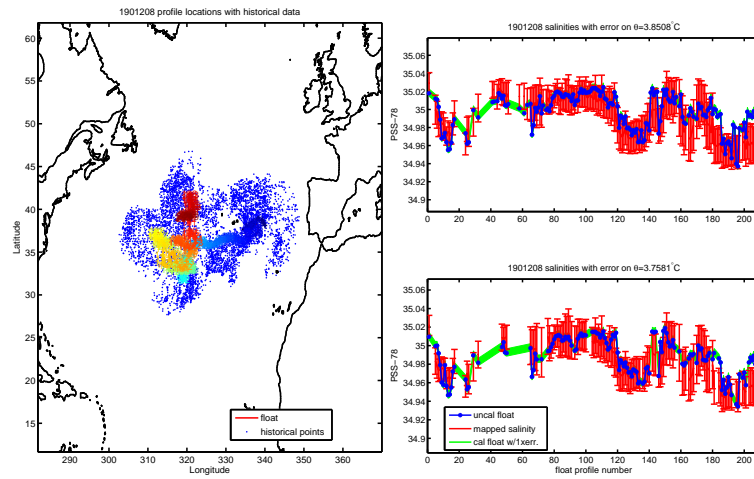


Figure 13: Figures from the OW method. (Left) Position of the historical and float data. (Right) Comparison, on various θ levels, between the float data and the historical data interpolated at the float position.

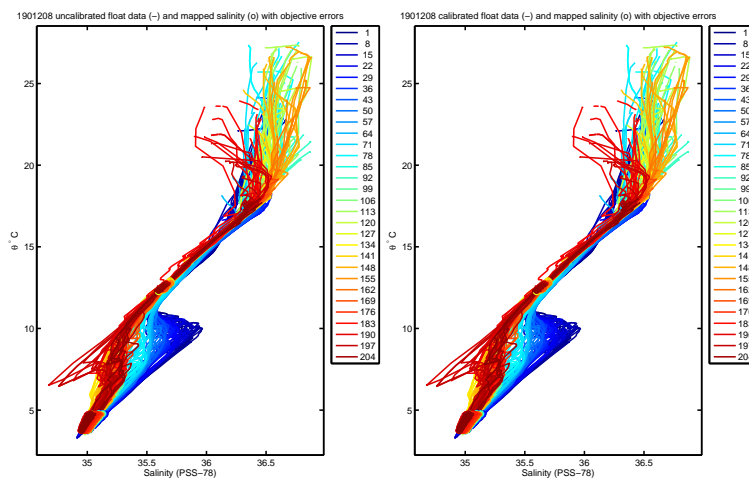


Figure 14: Figures from the OW method. Comparison of the θ/S diagram of the float with the historical database. (left) raw data; (right) corrected data using the OW correction.

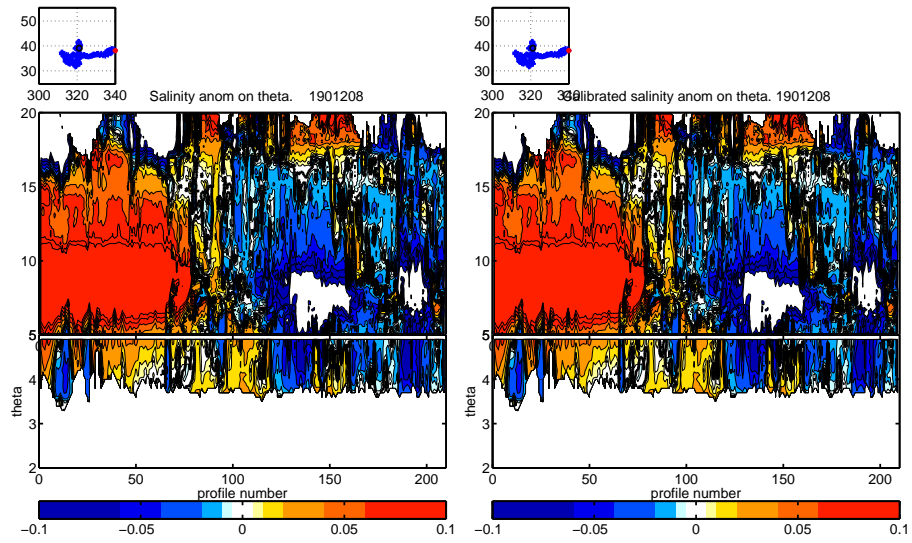


Figure 15: Figures from the OW method. Salinity anomaly:(left) raw data; (right) corrected data using the OW correction.

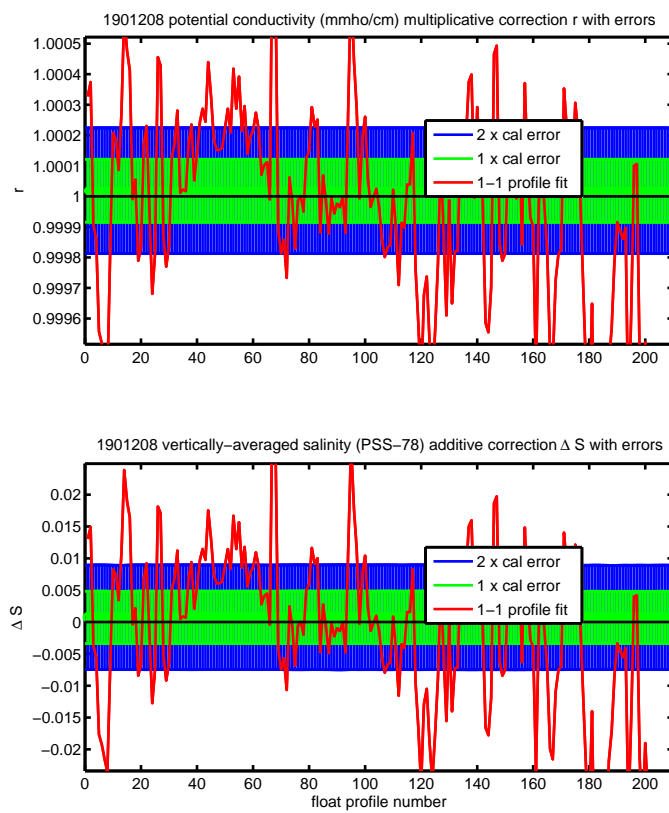


Figure 16: Correction proposed by the OW method.

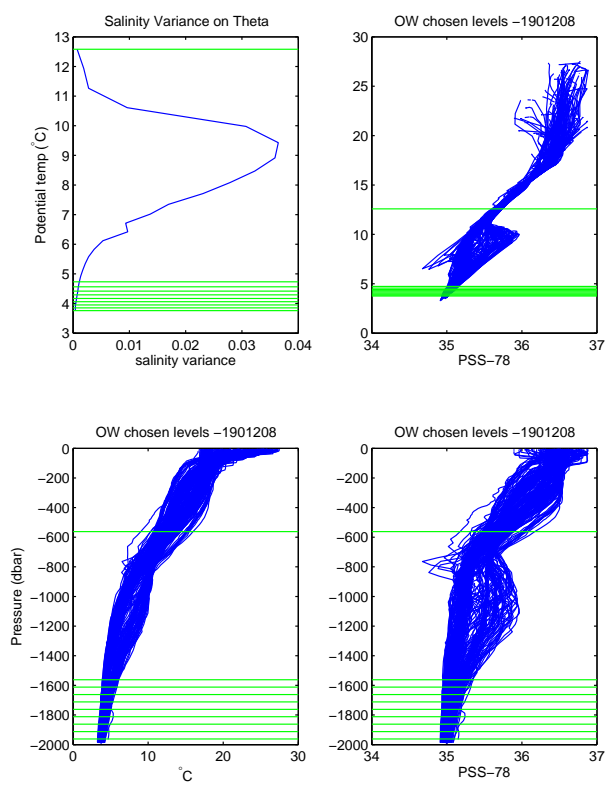


Figure 17: Chosed levels by the OW method.

1 Oxygen correction with LOCODOX

Number	Deployment (cycle OD) cycle OD	Last cycle 209A
Provov WMO 1901208	24/07/2011 23h30	
CTS3 DO	N 38.275 W 19.997	
Date of Oxygen control	Float status	Last cycle
October 2017	DEAD	05/04/2017
Coriolis transmission		23/10/2017

Table 1: Status of the float

This software is used to correct Oxygen data (parameter DOXY) contained in the files BR(real time) and/or BD(Delayed Mode) associated to files R (Real Time T/S) and/or D(Delayed Mode T/S).

PI suggests : The Oxygen corrections have been done only when Salinity and Temperature were available in Delayed Mode (D files). Theoretically, the corrections should be done from adjusted values (TEMP and PSAL). However, when there is a few bad values in salinity (of about few tens of PSU), and if there is no bias in salinity (OW method), PSAL data can be used instead of PSAL_ADJUSTED, because the impact of those values on the oxygen correction is not significant.

To correct Oxygen data, LOCODOX software gives 3 choices to work :

- from a reference profile
- from WOA climatology
- from in air measurements

The reference profile for this float is the station 13 of Ovide 2011 Discovery cruise (ov11di).

LOPS options are :

Options	Choice
Unit DOXY	Mumol/kg
Suppress hooks	YES
Drift correction with	PRES
Vertical scale	PRES
Apply drift correction	NO
Correction using : PSAT/DOXY	PSAT
kind of error	RELATIVE

Table 2: LOCODOX Options

Applied DOXY correction

$PSAT=f(DOXY)$; $PSAT_ADJUSTED=A*PSAT+B$; $DOXY_ADJUSTED=f(PSAT_ADJUSTED)$
with $A=1.042$; $B=1.654$

Percent saturation corrected as a linear function of PSAT; Comparison to a single reference profile (isobaric match as in Takeshita et al. (2013)) on cycle 1; PSAT converted from DOXY and DOXY_ADJUSTED converted from PSAT_ADJUSTED.

There is no QC flag superior to 2 in PRES, TEMP, PSAL. There is no bias in salinity for this float. Correction done with PSAL(flags = 1 to 4) and TEMP_ADJUSTED .

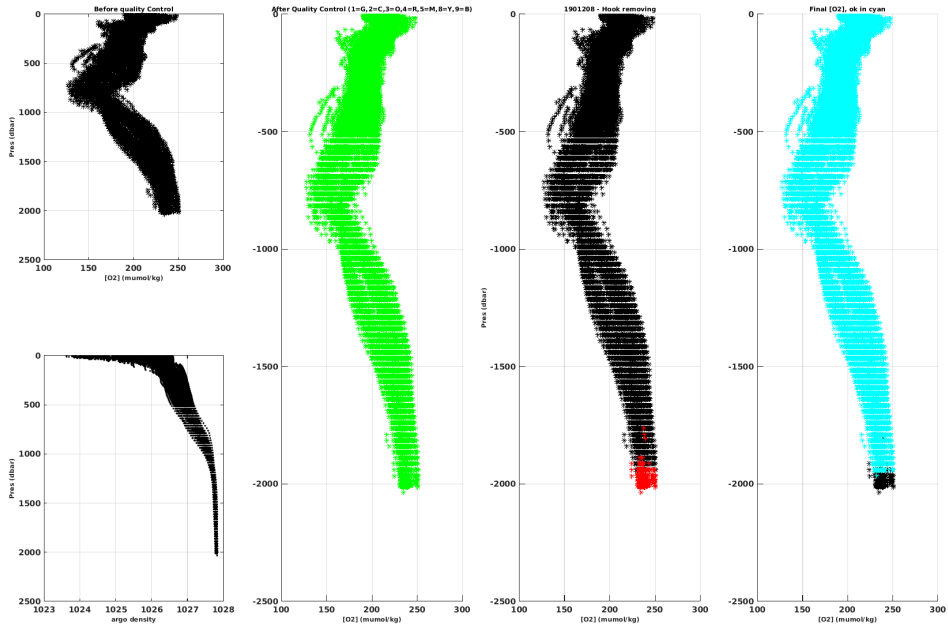


Figure 1: The first 50 meters from the bottom are suppressed because data are uncertain; Only data in cyan are taken for the correction.

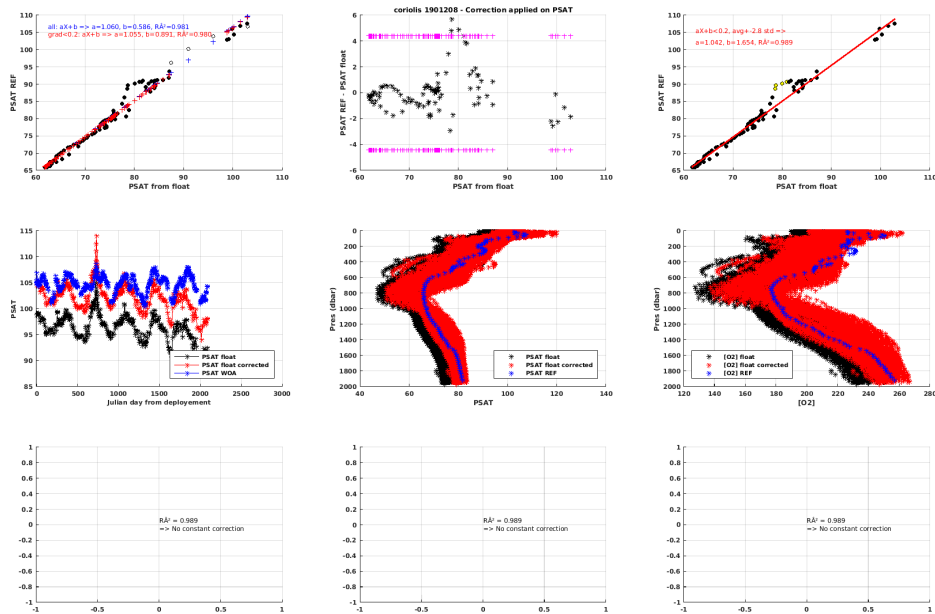


Figure 2: Plots produced by LOCODOX

Float 1901208 was corrected based on a comparison of the first ascending profile of the float with an in situ reference profile acquired at float deployment. The correction is done in considering the percentage of saturation (PSAT).

Upper panels : The three panels show the regression between the Argo profile and the reference profile.

Middle left panels : PSAT in the upper 10m from the raw data (black curve) and the corrected data (red curves). PSAT estimated from the World Ocean Atlas at the float position is also provided for comparison (blue curves).

Middle center panel : PSAT values from the raw data (black curves), the adjusted data (red curves) and the reference profile (blue curve).

Middle right panel : Same as the center panel but for dissolved oxygen concentration value (DOXY et DOXY_ADJUSTED) in mumol/kg.

Lower panels : Same as the middle panels but when LOCODOX proposes a constant correction.



Figure 3: Comparison in the deeper levels (below 1500m) between the float data and WOA data interpolated at the float position (horizontal and vertical). The temporal evolution of the difference is used to estimate a possible sensor drift.

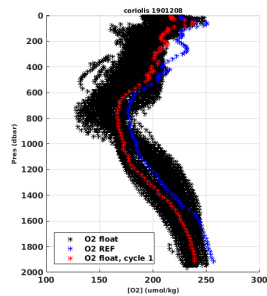


Figure 4: Profiles float 1901208 (black), O2 hydro reference (blue), O2 float cycle 1 (red)

1.1 Corrected data float

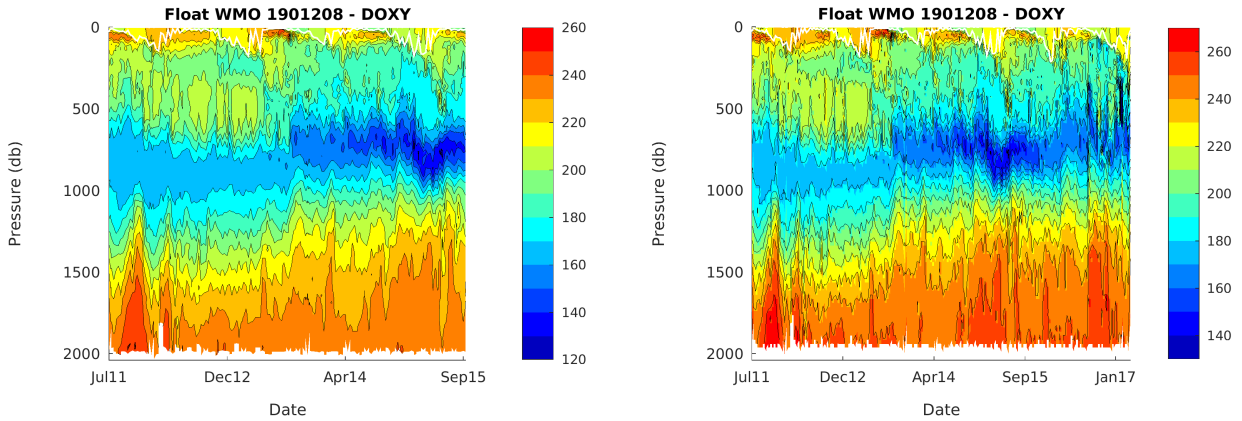


Figure 5: Oxygen section along the float trajectory (interpolated on standard levels). Quality flags are taken into account. Left plot: Raw data - Right plot : corrected data

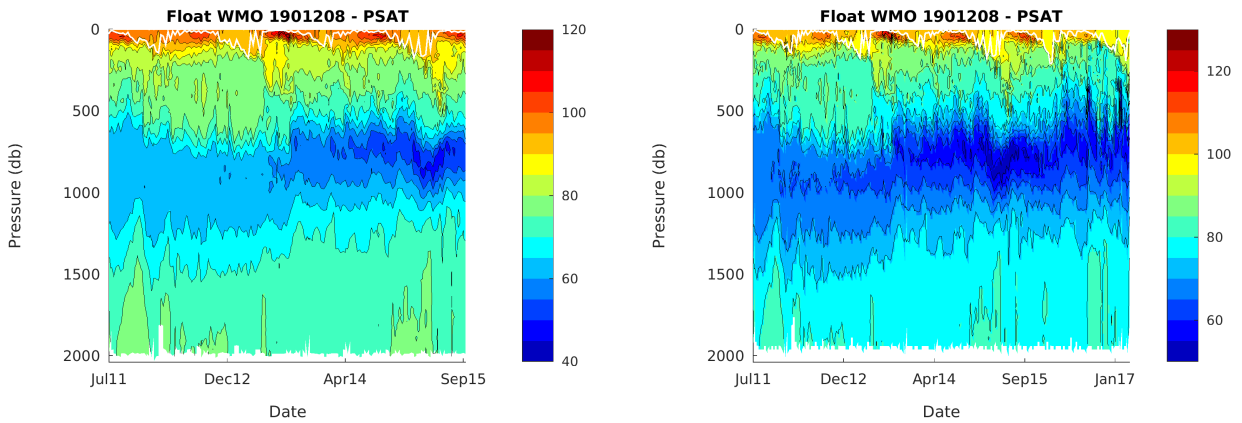


Figure 6: PSAT section along the float trajectory (interpolated on standard levels). Quality flags are taken into account. Left plot: Raw data - Right plot : corrected data

1.2 Examples of corrected profiles with LOCODOX

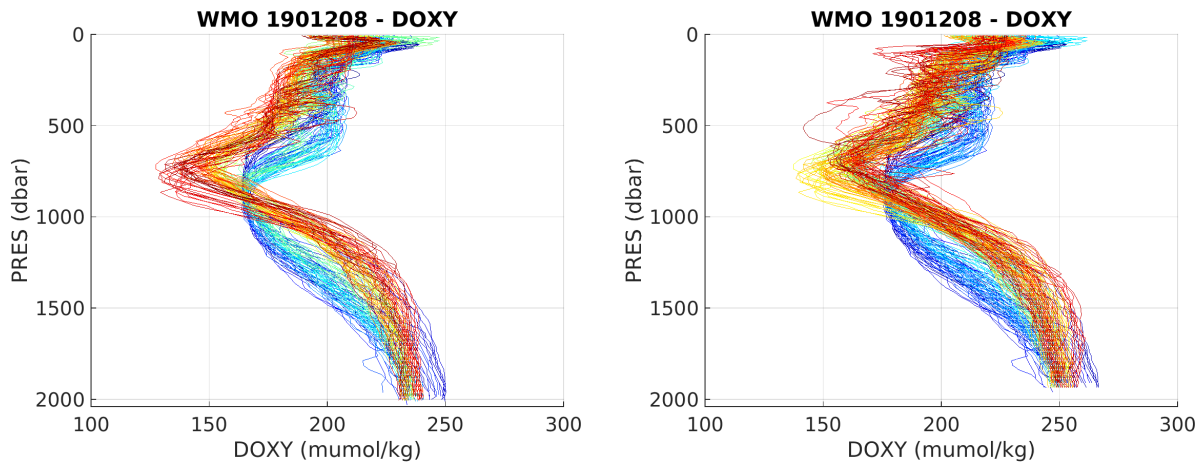


Figure 7: Oxygen profiles. Left plot: Raw data - Right plot : corrected data

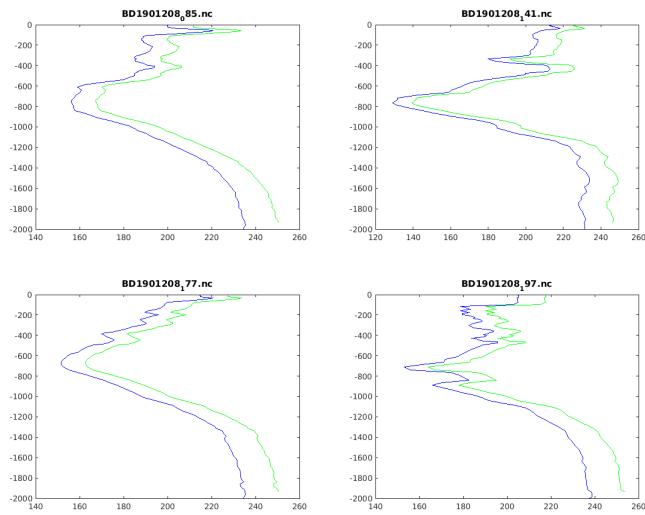


Figure 8: Float 1901208 : Corrected profiles in green.