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DELAYED MODE QUALITY CONTROL AND OXYGEN CORRECTION OF OVIDE ARGO DATA FLOAT WMO 1901211

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Internal Report LPO 17-18

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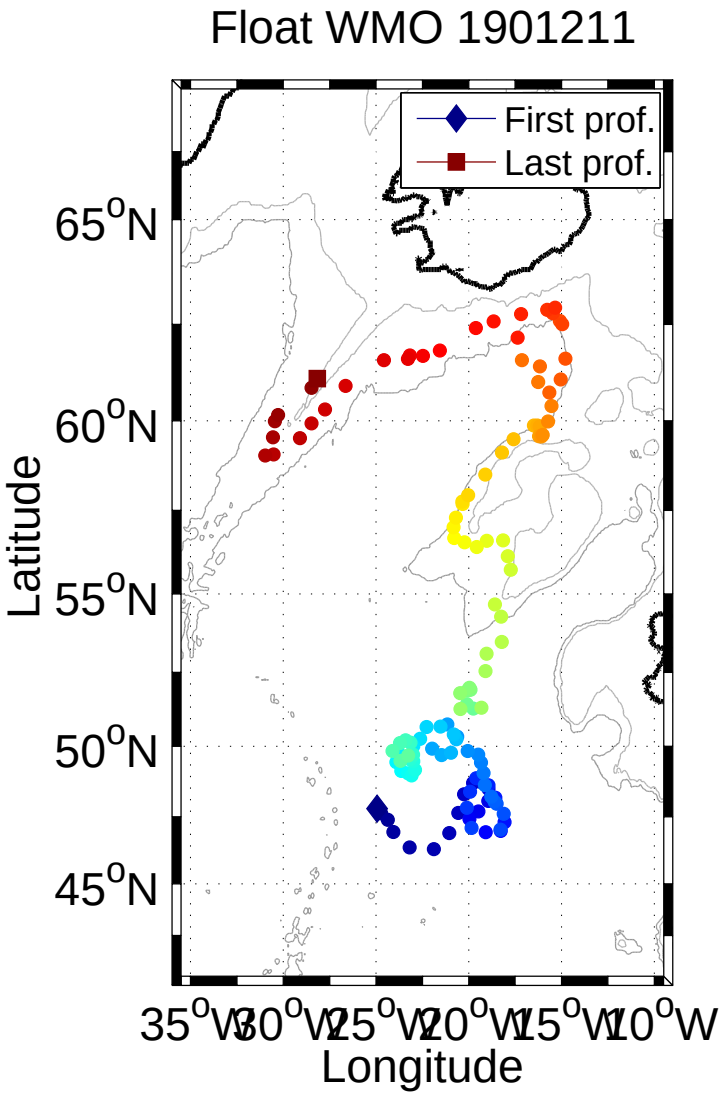
October 20, 2017



1 Presentation and DMQC summary

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

1.1 QC flag checks and interesting profiles

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.

1.2 Salinity correction from the OW method

According to the results from the OW method and to the comparison between the first profile and shipboard CTD measurements done during the float deployment, the float salinity is obviously biaised. There is a constant offset in salinity around of 0.015 PSU.

Number	Deployment (cycle OD) cycle OD	Last cycle 129A
Provor WMO 1901211	29/06/2011 14h	
CTS3 DO	N 47.797632 W 25.021	
Pcutoff	5	
Soft version	sup. to 5816A00	
Date of control	Float status	Last cycle
September 2013	Active	08/09/2013
Coriolis transmission		20/11/2013
Date of last control	Float status	Last cycle
October 2015	DEAD	31/12/2014
Coriolis transmission		15/10/2015

Table 1: Status of the float

Cycle	Para-meter	Vertical level	Old flag	New flag	Comments	Coriolis transmission
13A	PSAL	entire profile	3	1		19/11/13
24A					ice	19/11/13
60A	PSAL	entire profile	1	4		6/10/15

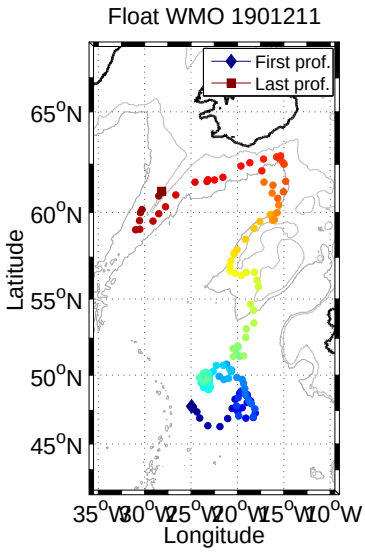
Table 2: Float 1901211. Summary of the modifications of the real-time QC flags and of the interesting or suspicous data.

It is thus necessary to correct the data of all cycles. Corrections are deduced from the configuration 129 of the OW method.

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 3: Parameters of the OW method.



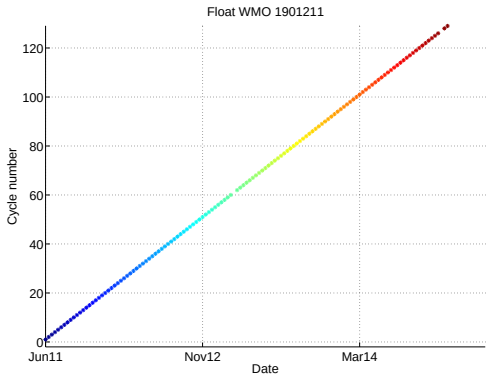


Figure 1: Profiles position and relationship between cycle number, date and color.

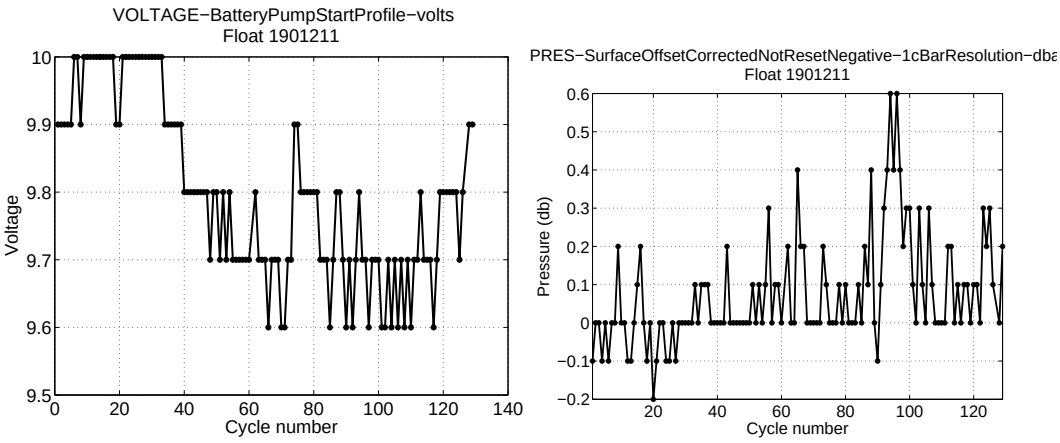


Figure 2: Battery Voltage and Surface Pressure

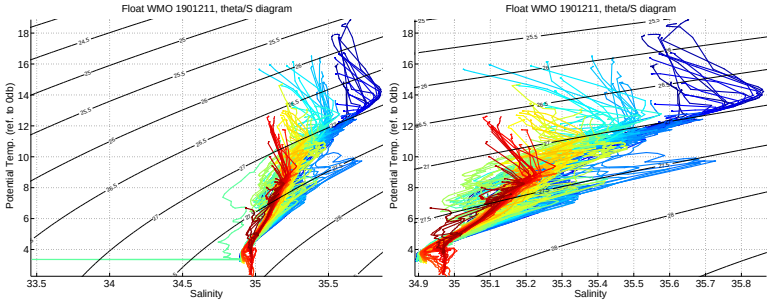


Figure 3: θ/S diagrams. (Left panel) Flags are not taken into account. (Right panel) Quality flags are taken into account.

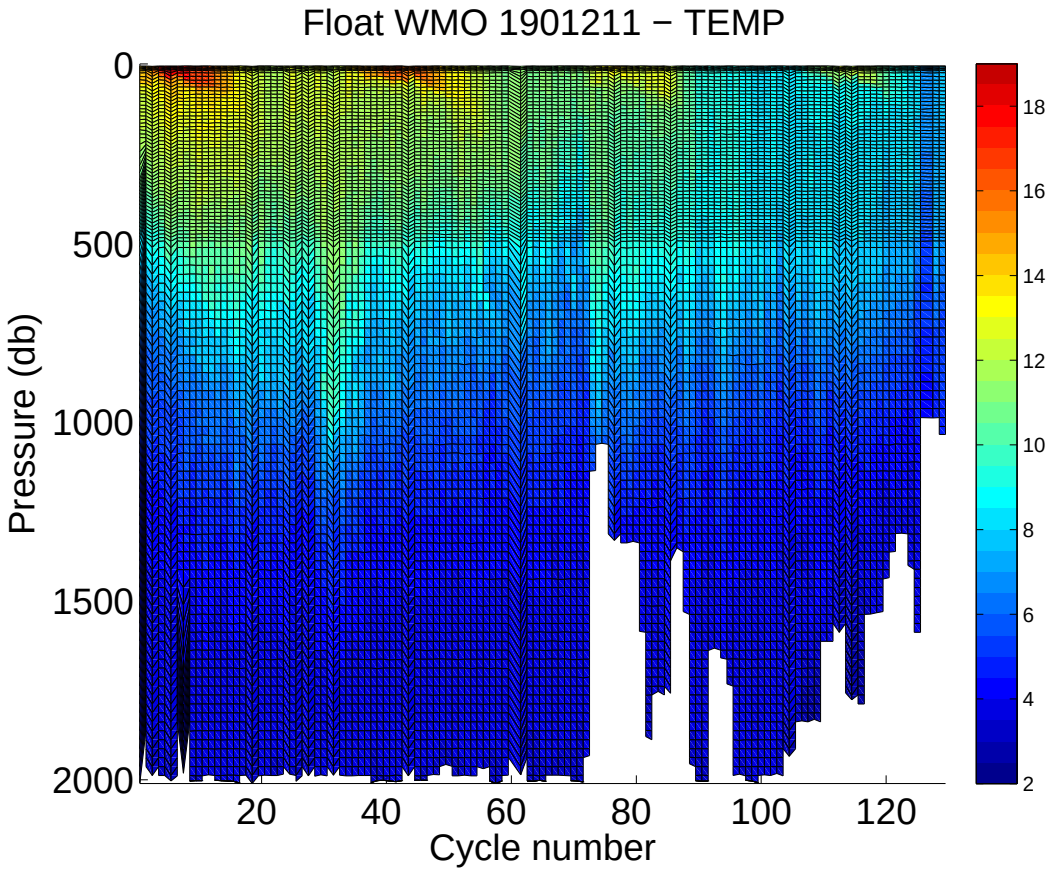


Figure 4: Temperature section along the float trajectory. Quality flags are not taken into account.

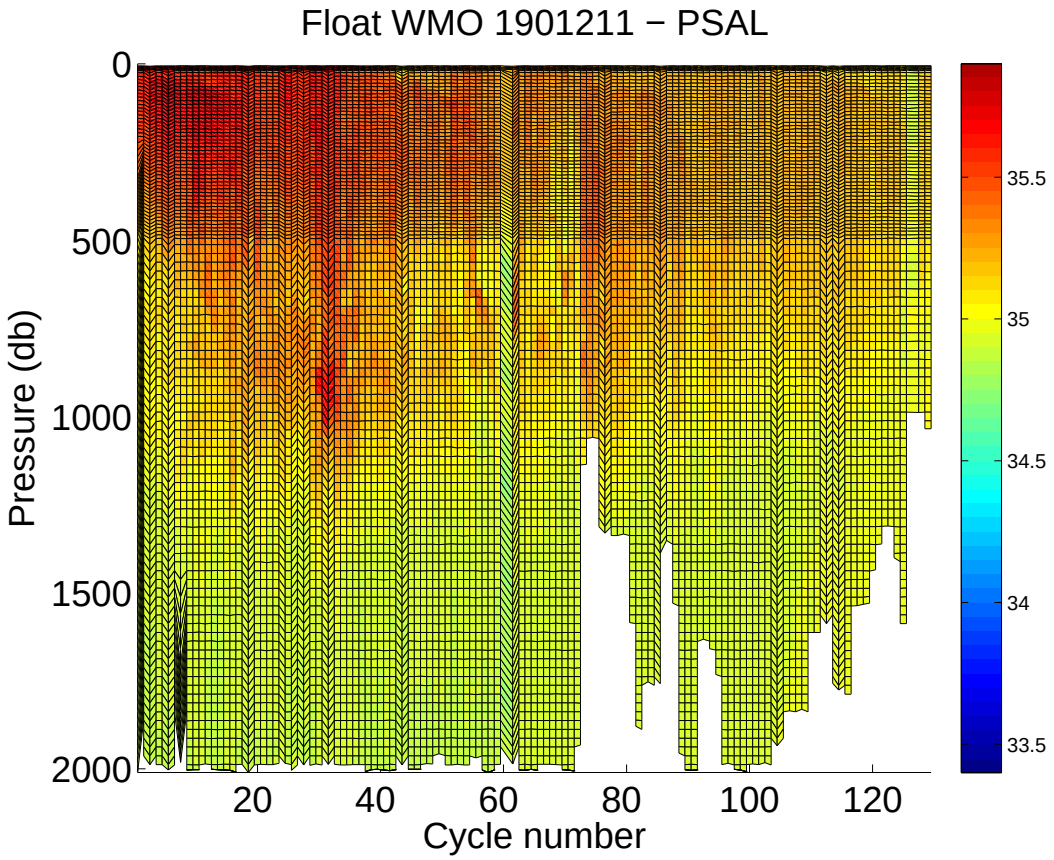


Figure 5: Salinity section along the float trajectory. Quality flags are not taken into account.

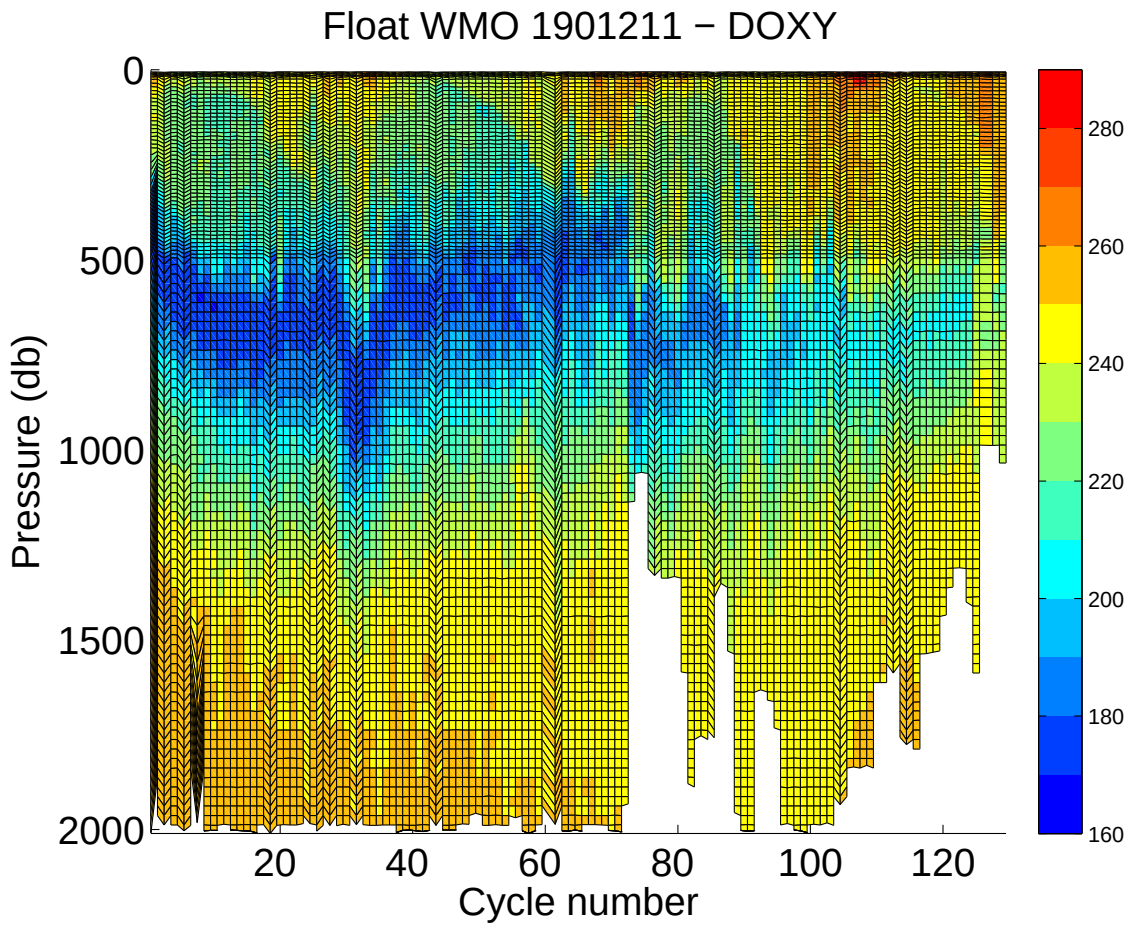


Figure 6: Oxygen section along the float trajectory. Quality flags are not taken into account.

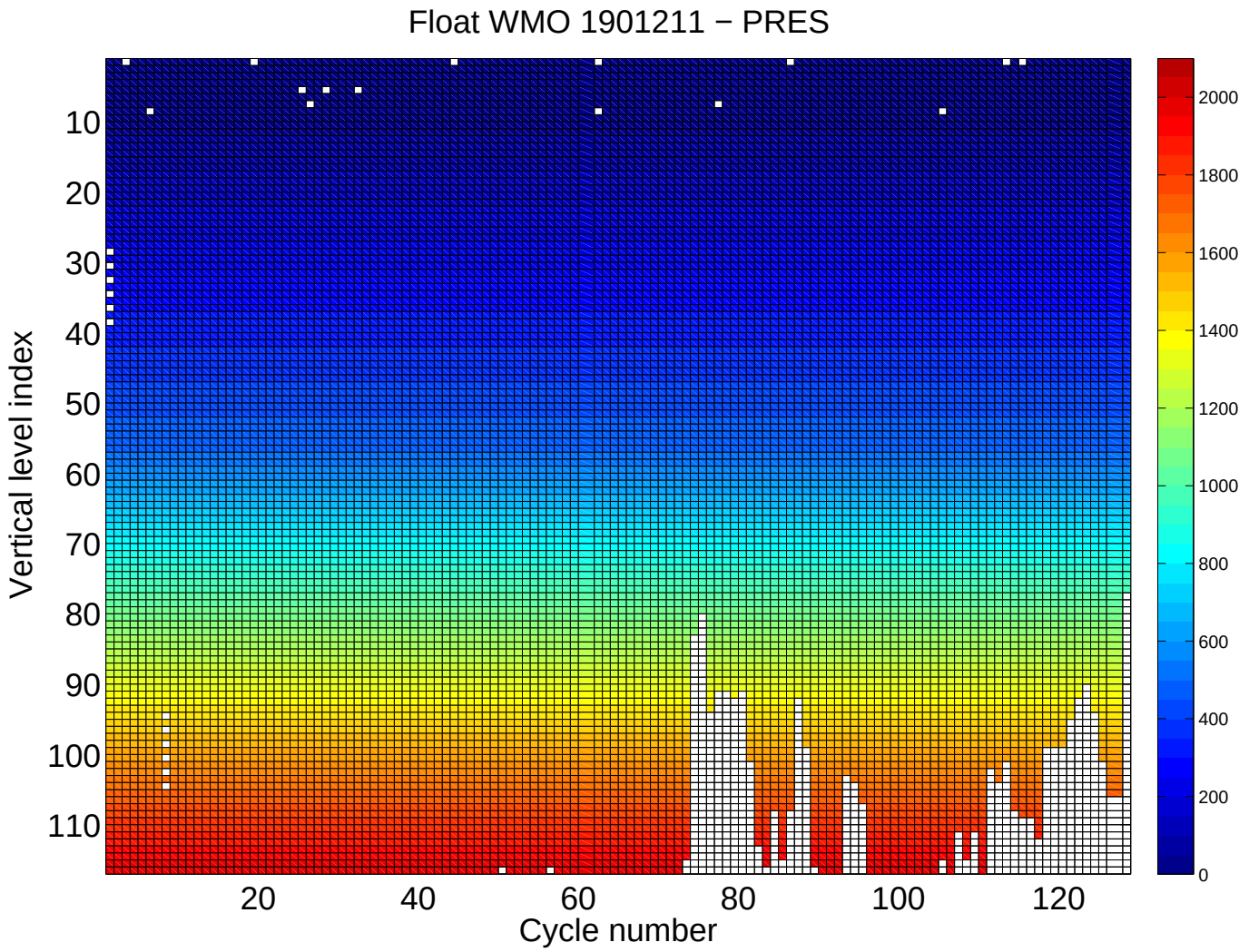


Figure 7: Pression as fonction of cycle number and vertical level index along the float trajectory. Quality flags are taken into account.

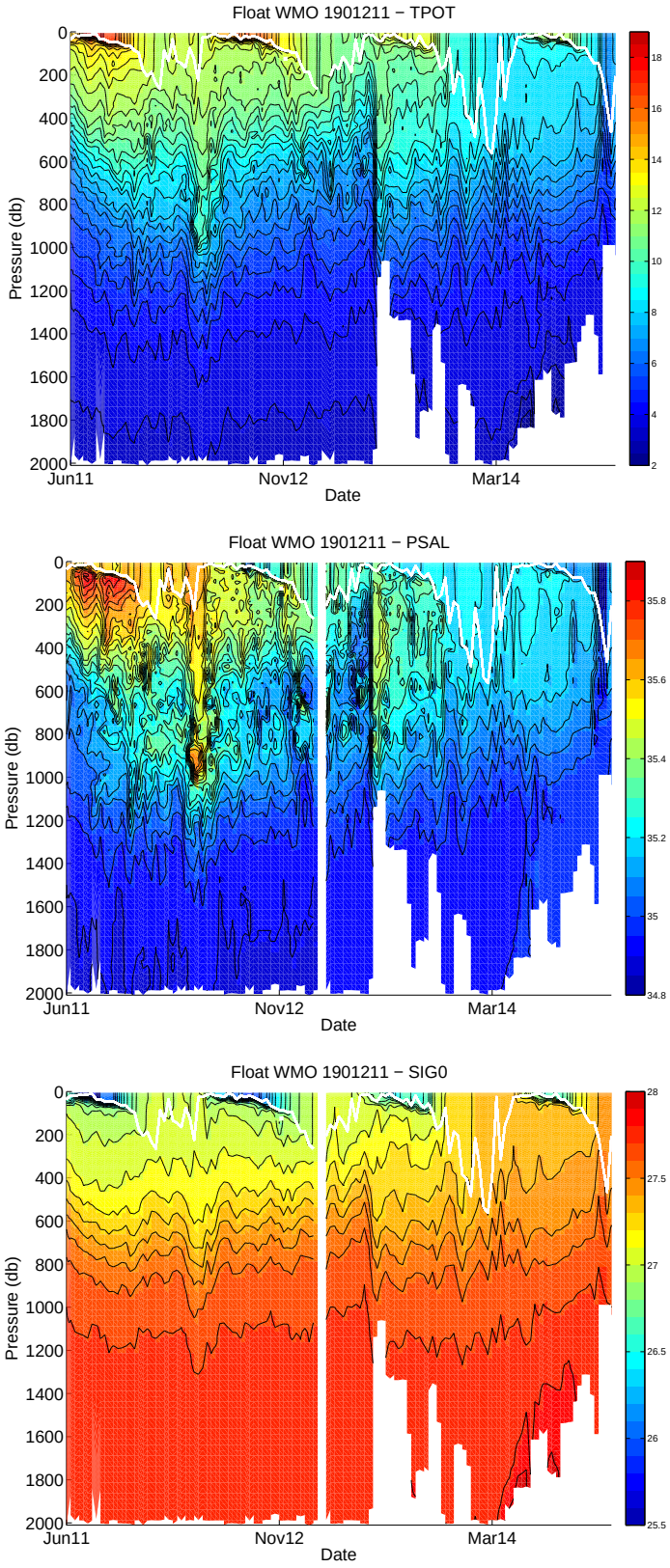


Figure 8: Potential temperature, salinity and potential density sections along the float trajectory (interpolated on standard levels). Quality flags are taken into account.

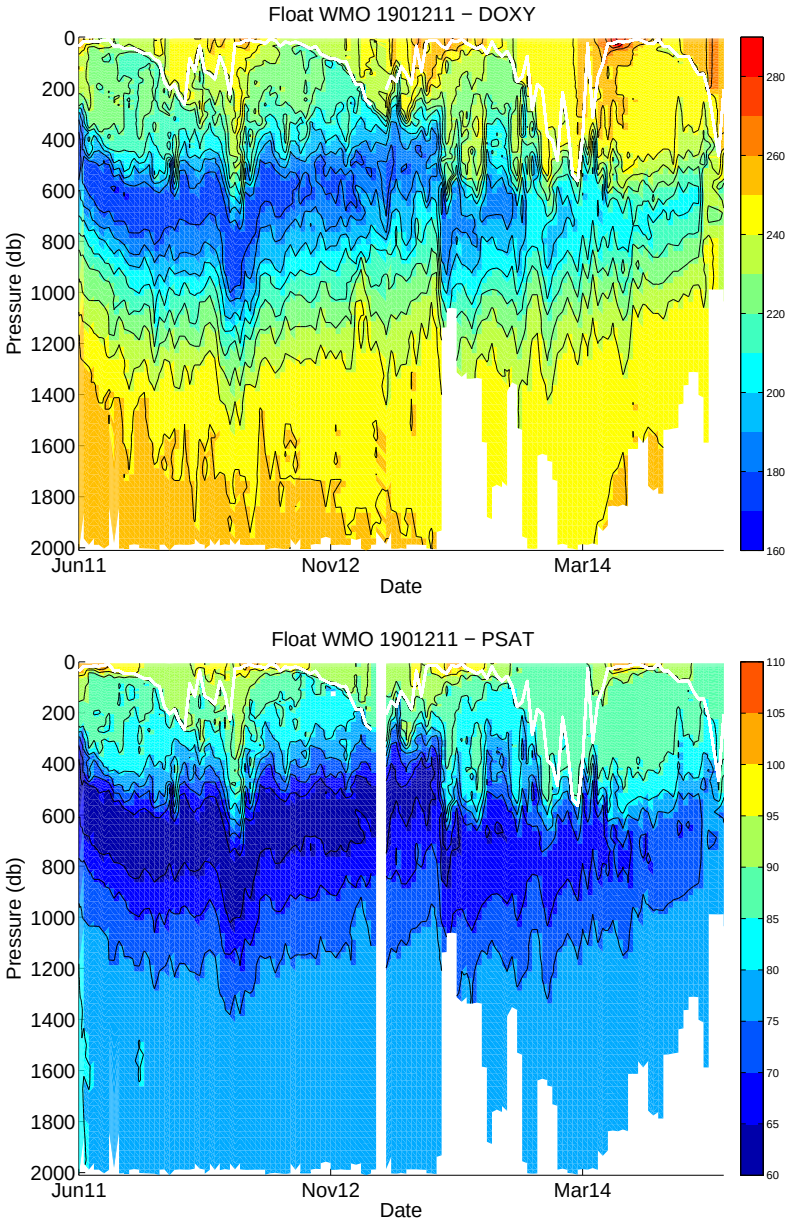


Figure 9: Oxygen and Saturation Oxygen sections along the float trajectory (interpolated on standard levels). Quality flags are taken into account.

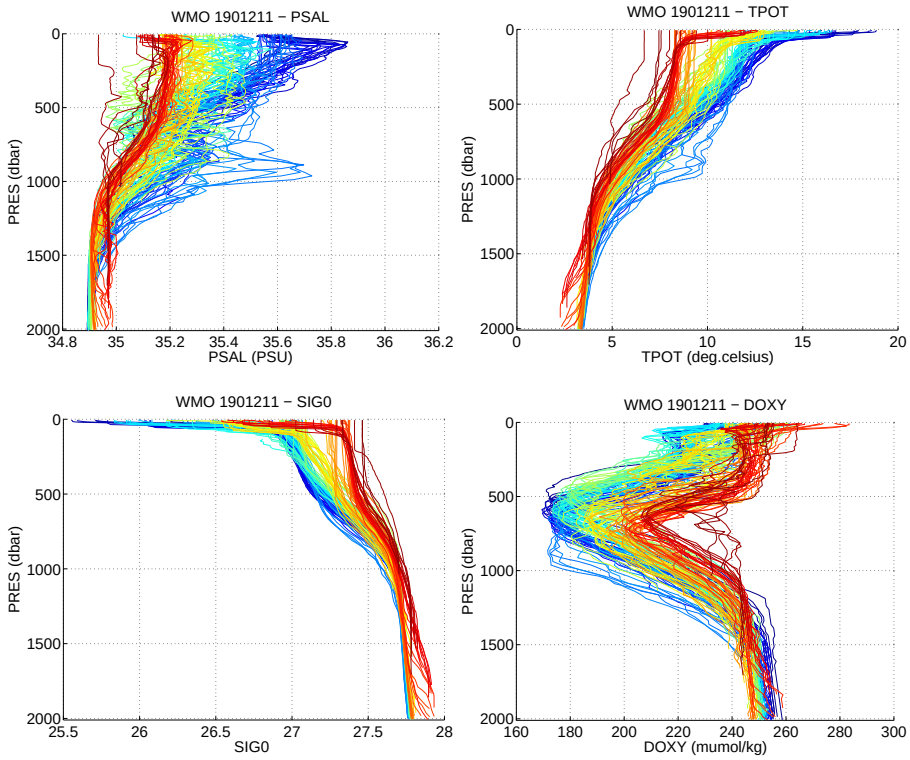


Figure 10: Salinity, Potential Temperature, Potential Density and Oxygen profiles. Quality flags are taken into account.

3 Comparison to the OVIDE 2011 nearest CTD profile

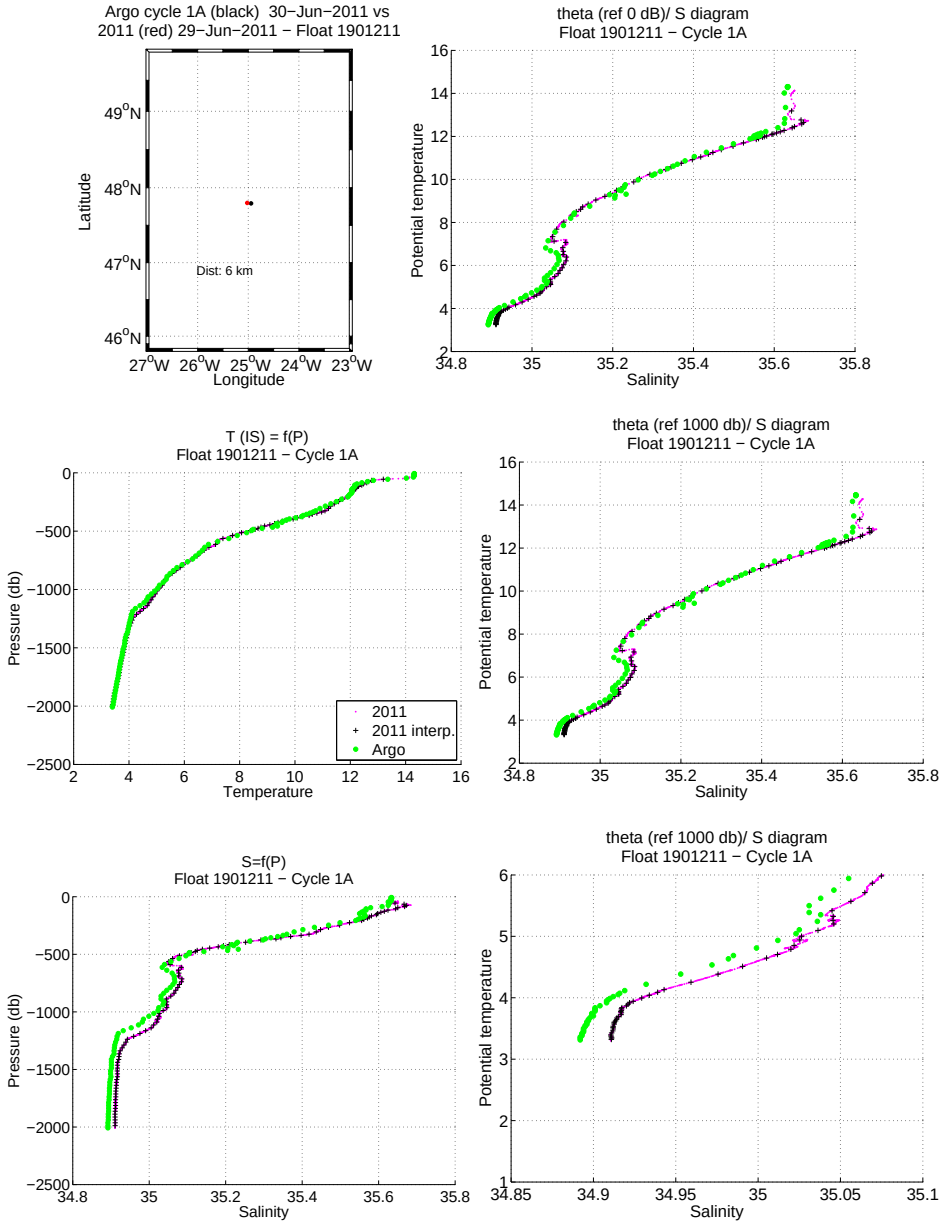


Figure 11: Comparison of the cycle 0A with the nearest CTD profile done after the float deployment.

4 OW method, CONFIGURATION # 129

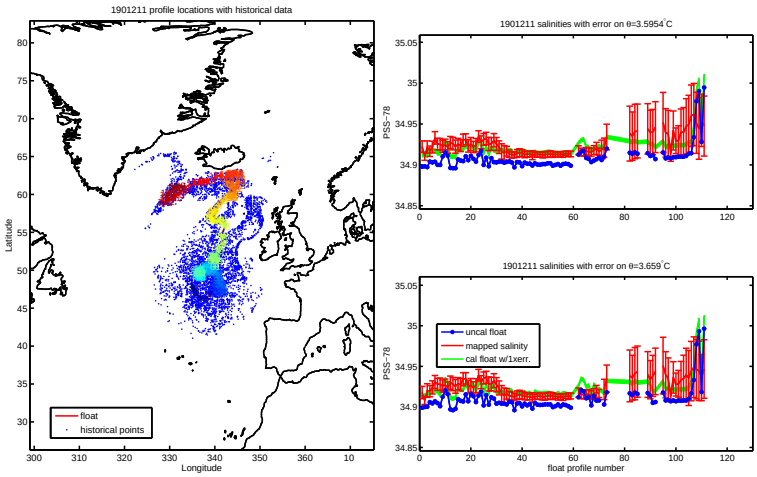


Figure 12: Figures from the OW method. (Left) Position of the historical and float data. (Right) Comparison, on various θ levels, between the float data and the historical data interpolated at the float position.

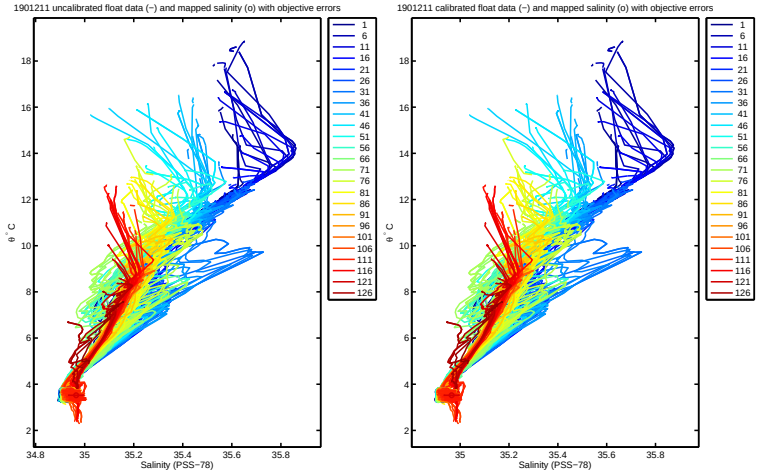


Figure 13: Figures from the OW method. Compararison of the θ/S diagram of the float with the historial database. (left) raw data; (right) corrected data using the OW correction.

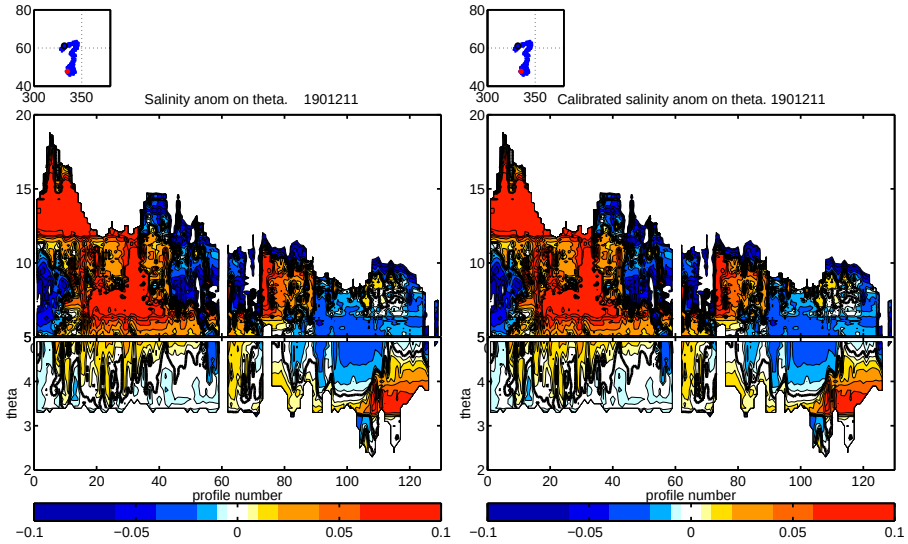


Figure 14: Figures from the OW method. Salinity anomaly:(left) raw data; (right) corrected data using the OW correction.

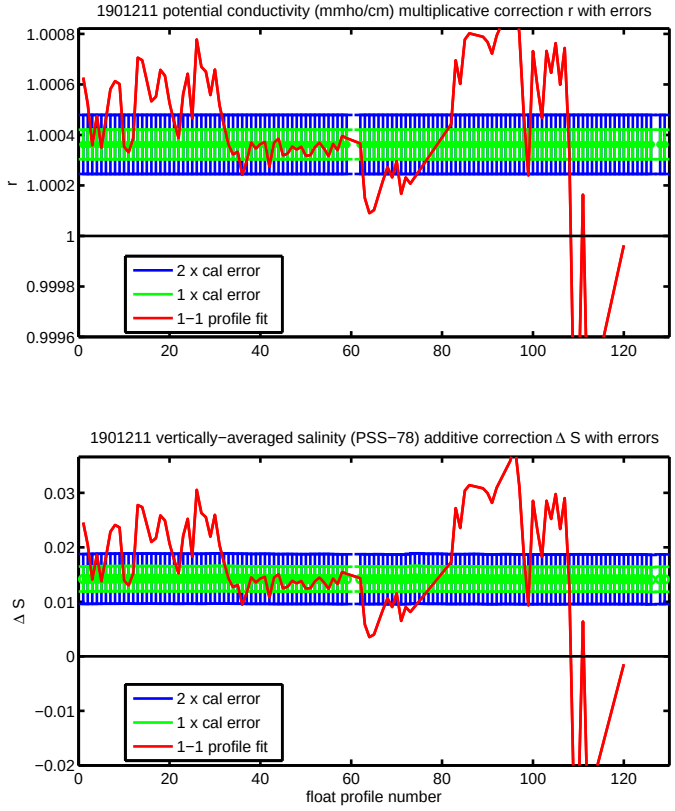


Figure 15: Correction proposed by the OW method.

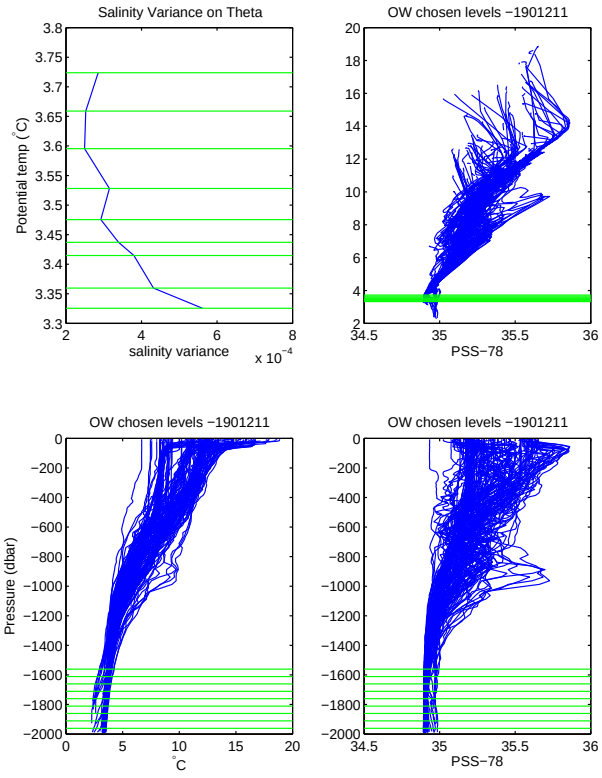


Figure 16: Chosed levels by the OW method.

1 Oxygen correction with LOCODOX

Number	Deployment (cycle OD) cycle OD	Last cycle 129A
Provor WMO 1901211	29/06/2011 14h	
CTS3 DO	N 47.797632 W 25.021	
Date of oxygen control	Float status	Last cycle
November 2016	DEAD	31/12/2014
Coriolis transmission		23/11/2016

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). Theorically, 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 3 of Ovide 2011 cruise (ov11me).

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=0.886; B=15.563

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 a bias in salinity for this float, so the DOXY correction has been done with PSAL_ADJUSTED.

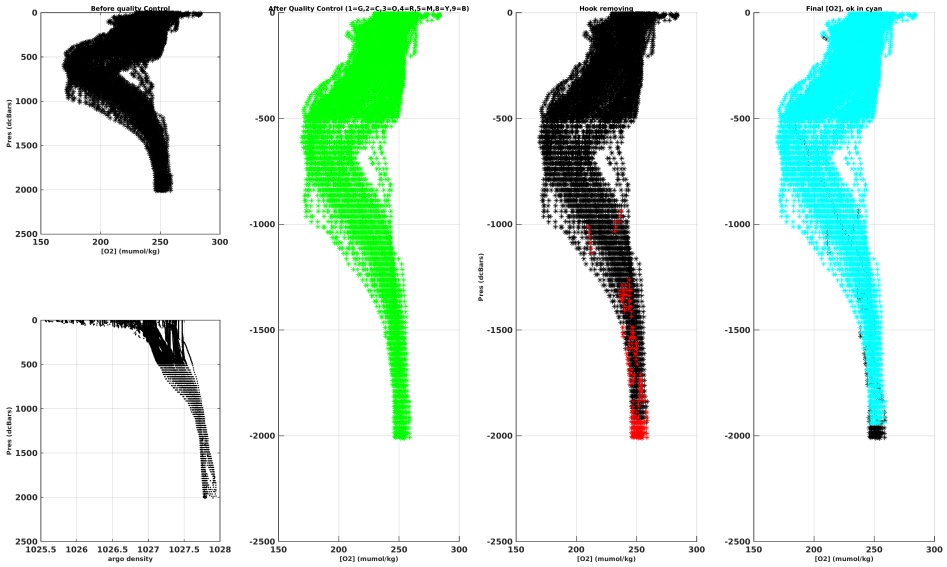


Figure 1: The first 50 meters from the bottom are suppressed because data are incertain; Only data in cyan are taken for the correction.

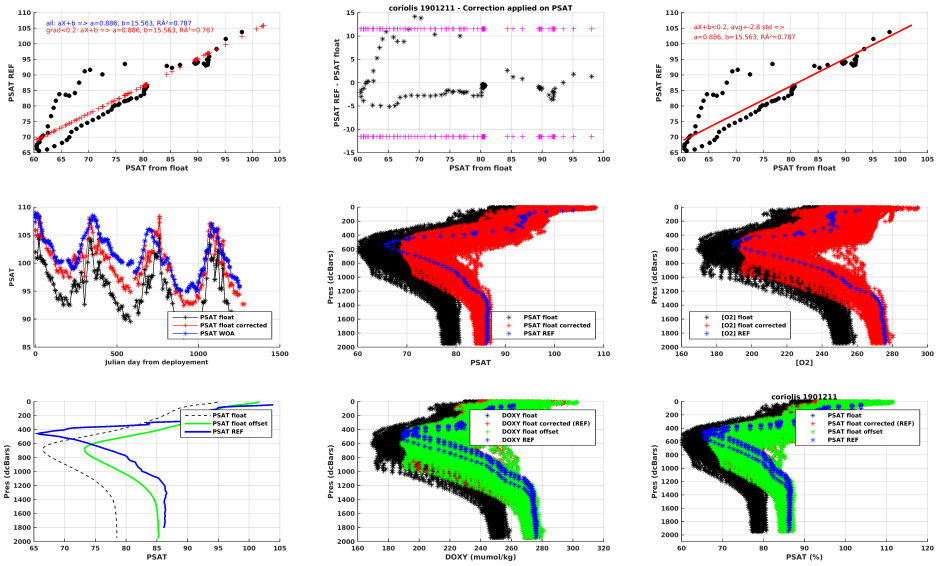


Figure 2: Plots produced by LOCODOX

Float 1901211 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.

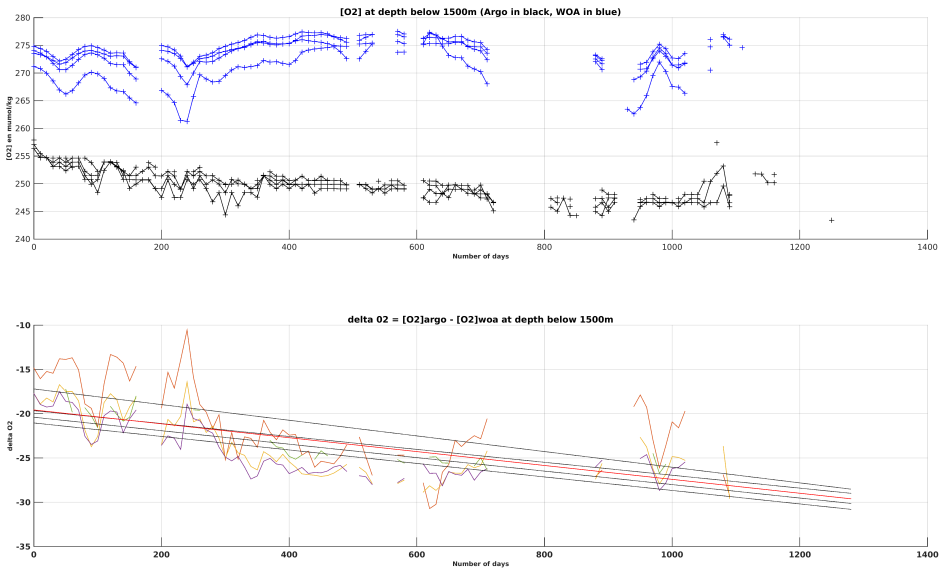


Figure 3: Comparison in the deeper levels (below 1500m) between the float data and WOA data interpolated at the float position (horizontal and vertical). The temporal evolution of the difference is used to estimate a possible sensor drift.

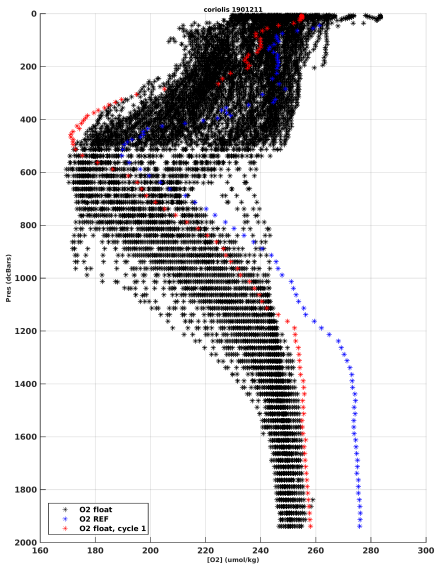


Figure 4: Profiles float 1901211 (black), O2 hydro reference (blue), O2 float cycle 1 (red)

1.1 Corrected data float

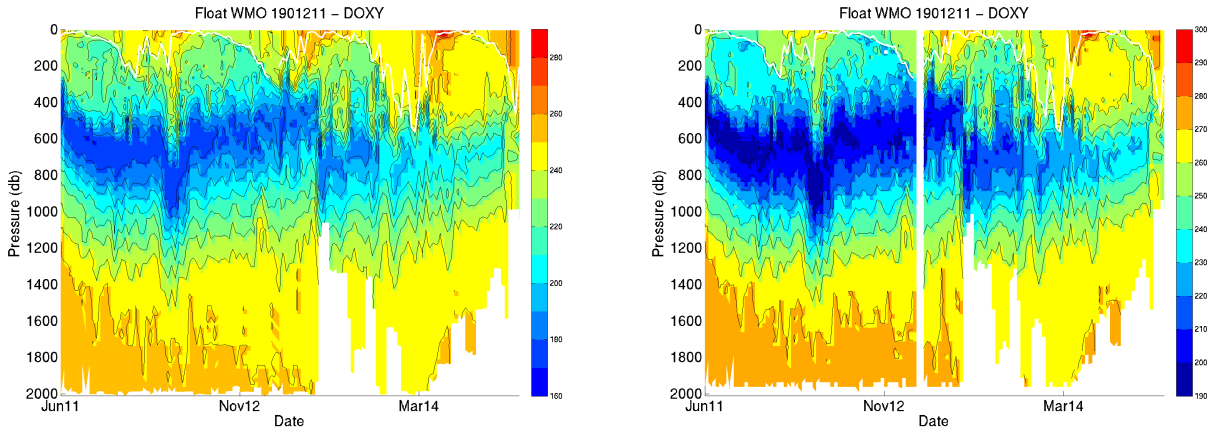


Figure 5: Oxygen section along the float trajectory (interpolated on standard levels). Quality flags are taken into account. Left plot: Raw data - Right plot : corrected data

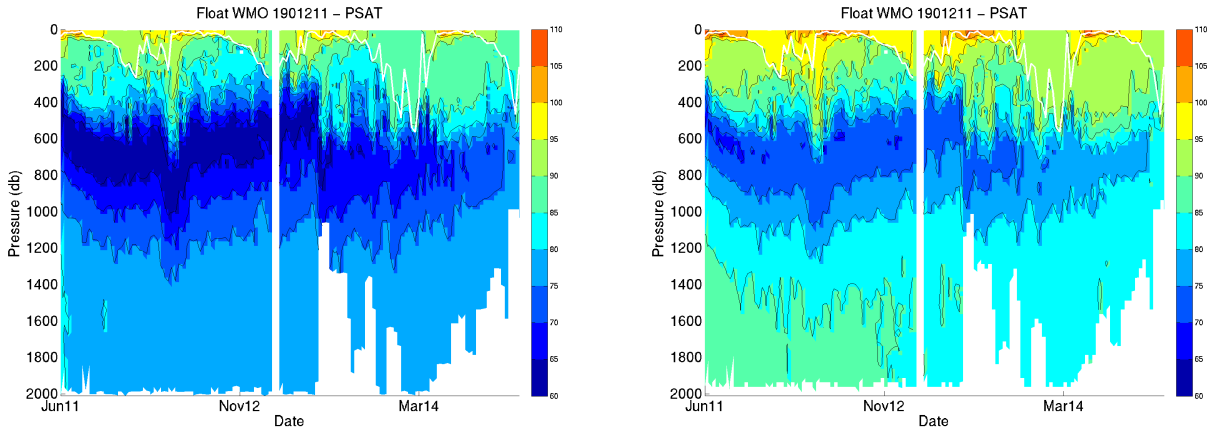


Figure 6: PSAT section along the float trajectory (interpolated on standard levels). Quality flags are taken into account. Left plot: Raw data - Right plot : corrected data

1.2 Examples of corrected profiles with LOCODOX

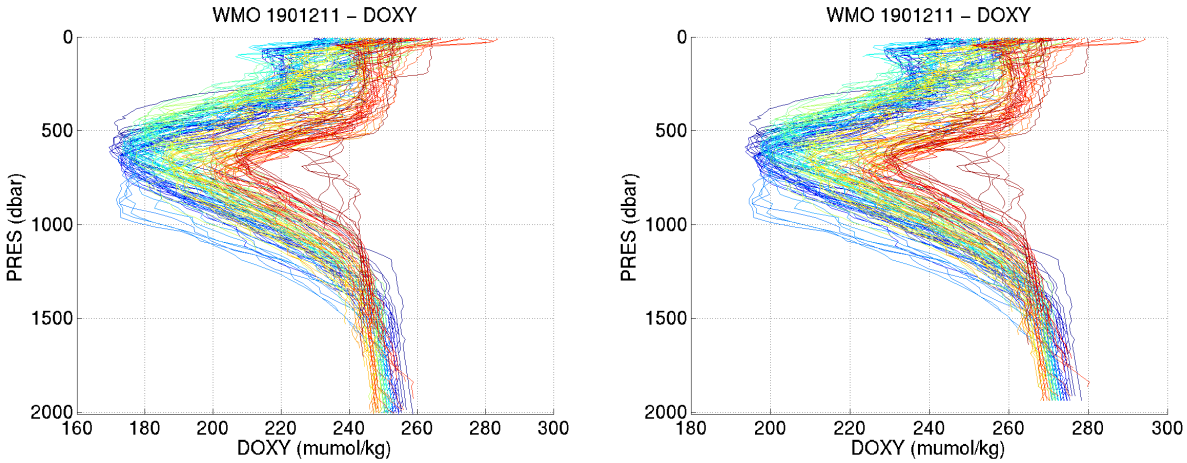


Figure 7: Oxygen profiles. Left plot: Raw data - Right plot : corrected data

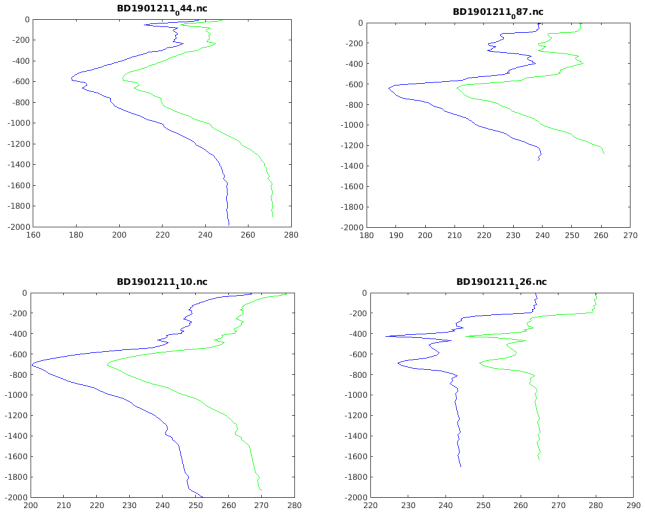


Figure 8: Float 1901211 : Corrected profiles in green.