Argo-España

Parte de la estrategia global de observación del océano

Report on Delayed Mode for Argo float WMO 6901248

ARGO ESPAÑA - IEO / 22 - 77

Delayed Mode Quality Control for Argo float WMO 6901248

September 22, 2022

A. González-Santana - P. Vélez-Belchí
L. Díaz-Barroso - J. Tintoré

Instituto Español de Oceanografía (IEO) - Consejo Superior de Inv. Científicas (CSIC)
Sistema de Observación Costero de las Illes Balears (SOCIB)

1 Introduction

The Delayed Mode Quality Control (DMQC) has been developed for float WMO 6901248 and delivered on 08/09/2022 to Ifremer. Some anomalous data were detected during the analysis of the 82 profiles performed by the float, specially the salinity dataset.

Transmision system	IRIDIUM
Transmission ID	n/a
Platform Model	ARVORD
Platform ID	6901248
Platform ID	OIN 14SP DP 01
Controller Board	n/a
Data Centre	IF
Project Name	Euro-Argo
Format Version	3.1
Float Owner	
PI Name	VELEZ BELCHI Pedro
Parking Depth (dbar)	1000
Profile depth (dbar)	2000
Number of Profiles	85
Status	Active
Deployment Date	2016 11 01
Deployment Latitude	29.1667
Deployment Longitude	-18.4963
Sensors	CTD-PRES,CTD-TEMP,CTD-CNDC

Table 1. Technical information of the float.

Several checks were performed: Pressure values were studied to avoid possible TNDP anomalies. Thermal Mass Error was also calculated in order to avoid possible errors due to the temperature gradients. Taking in account the nominal CPcor value used by Sea-Bird CPcorSBE = –9.57e-08 dbar–1, a new CPcor value was calculated to re-compute salinity CPcornew = -1.8941e-07 by comparing to a reference profile (CTD cast). Salinity calibration optimization was based on Owens and Wong Objective Mapping Analysis (2003).

After manual evaluation and inspection, some issues were identified: An offset of -0.011 in salinity was detected after comparison with CTD cast at deployment location. A small drift in salinity was also detected from profile number 1 to profile number 82. Although the entire signal was affected, it was decided to correct it as it was a sustained drift over time. Owens and Wong calibration has been applied with a break point adjustment = 3 to achieve an optimum salinity calibration.

2 Salinity correction from the OW method

Owens and Wong Objective Mapping Analysis (2003):

This calibration model assumes that salinity measurements drifts slowly over time. To correct possible salinity drifts, the model makes use of adjacent profiles (a time series) to estimate a time-varying multiplicative correction term "r" by fitting to the estimated climatological potential conductivities on theta surfaces. The inclusion of contemporary high quality calibrated hydrographic data with regional temperature - salinity relationships (by using nearby historical hydrographic data) helps to determine whether a measured trend is due to sensor drift or due to natural variability. According to the Argo Quality Control Manual v 3.6.1, some considerations must be taken into account when dealing with a Deep Argo float:

PSAL QC = '3' for pres > 2000

PSAL ADJUSTED QC = '3' for pres > 2000

The Argo_for_DMQC reference database has not been used in OWC, since it consists of almost all 2K Argo profiles. Instead, the CTD_for_DMQC reference database has been selected. The following parameters has been set up for the Owens and Wong Objective Mapping Analysis method:

Config_max_casts	82
use_pv	0
scale_long_large	2
scale_lat_large	2
scale_long_small	1
scale_lat_small	1
scale_phi_small	0
scale_phi_large	0
scale_age	2
p_delta	250
p_exclude	200

Table 2. Owens and Wong Objective Mapping Analysis method parameters .

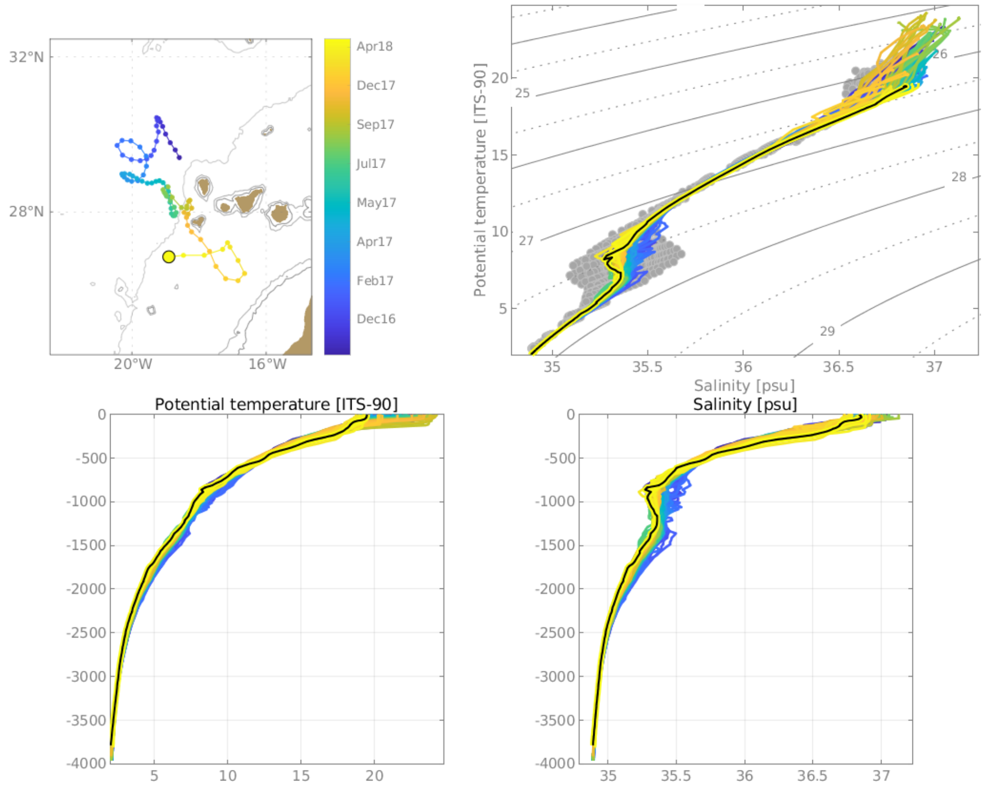

Figure 1: Argo float trajectory (a). T-S Diagram (b). Potential Temperature profiles (c). Salinity profiles (d).

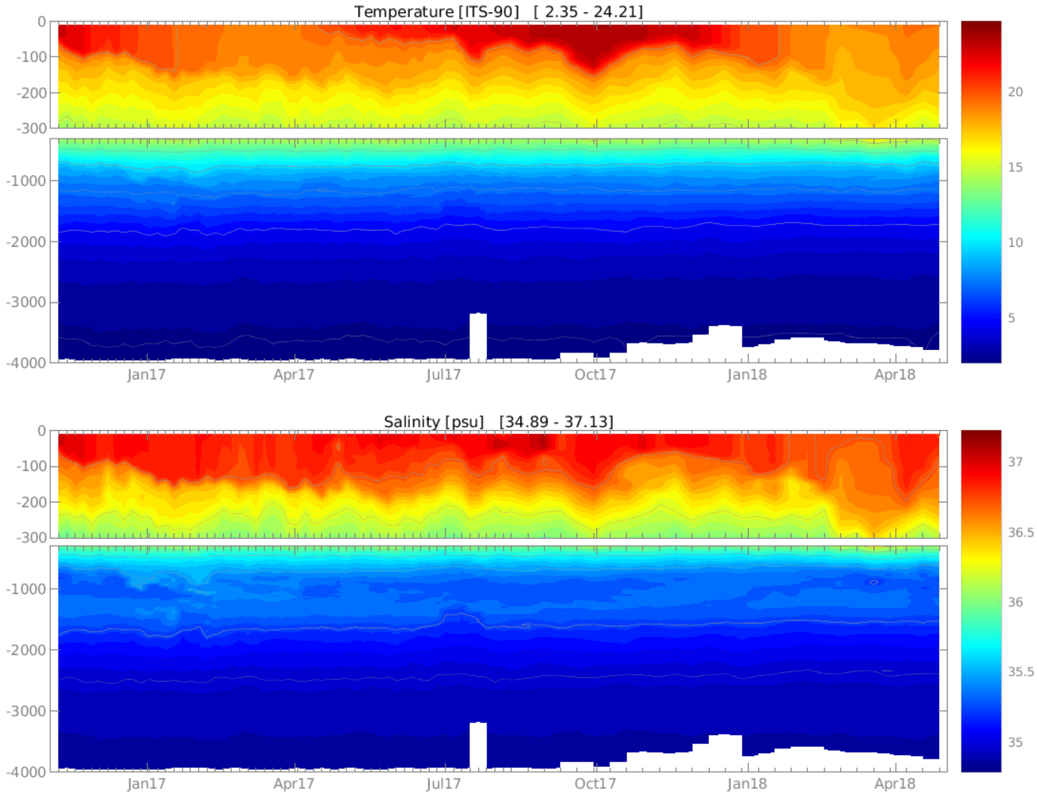

Figure 2: Potential temperature and salinity sections.

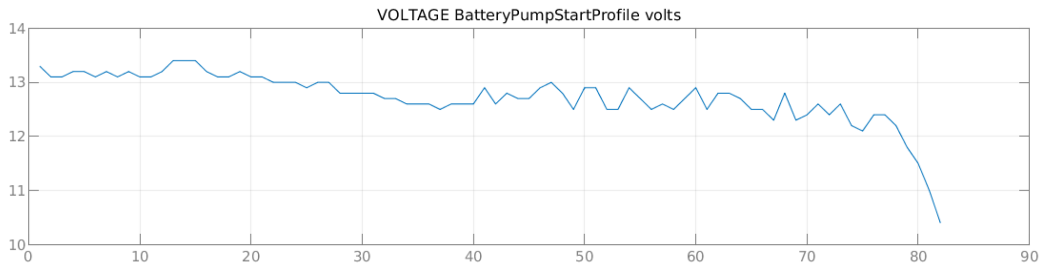

Figure 3: Pressure record (a). Voltage record (b).

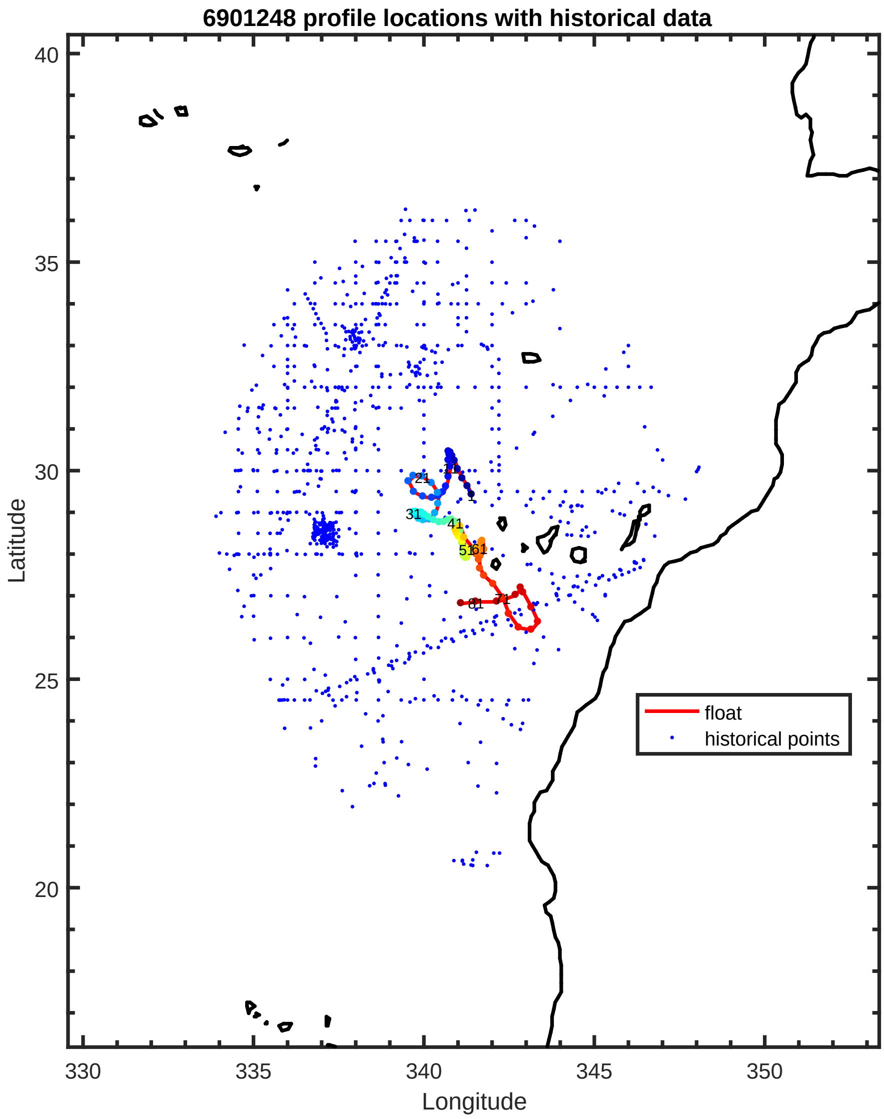

Figure 4: Historical data around the current ARGO float trajectory. These historical data are used by Owens and Wong Objective Mapping Analysis to perform a model for an ARGO float data calibration.

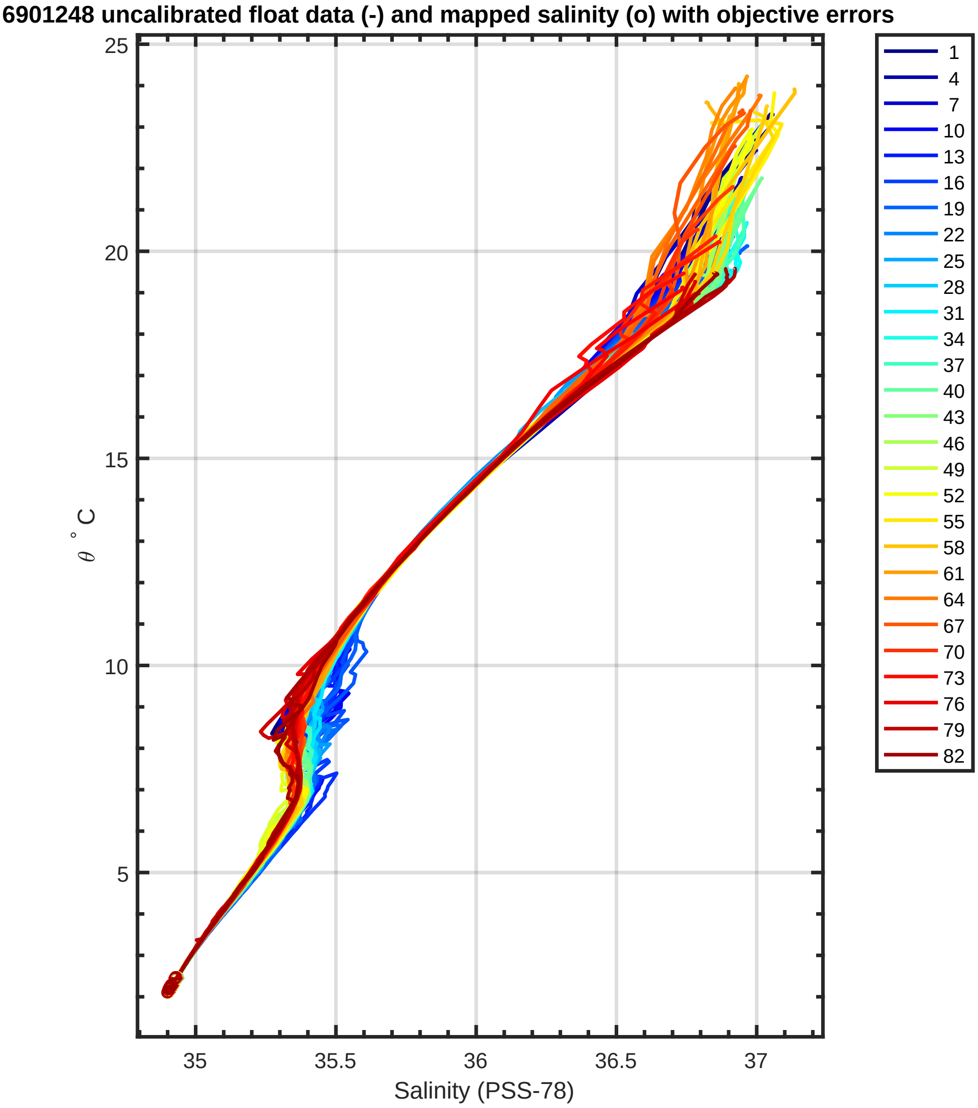

Figure 5: T-S Diagram before the potential calibration.

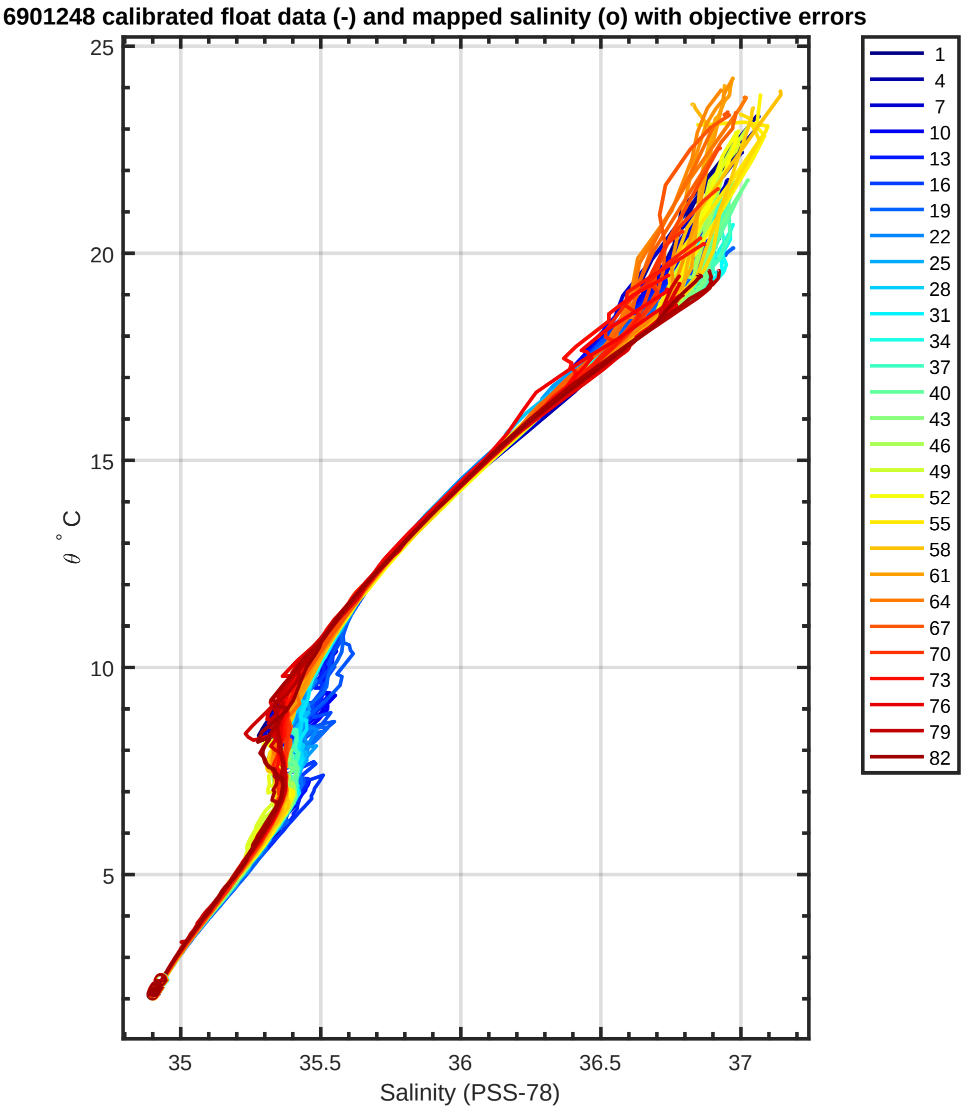

Figure 6: T-S diagram after the potential calibration. This is useful to identify water masses, to detect some possible offsets or to identify some anomalous profiles.

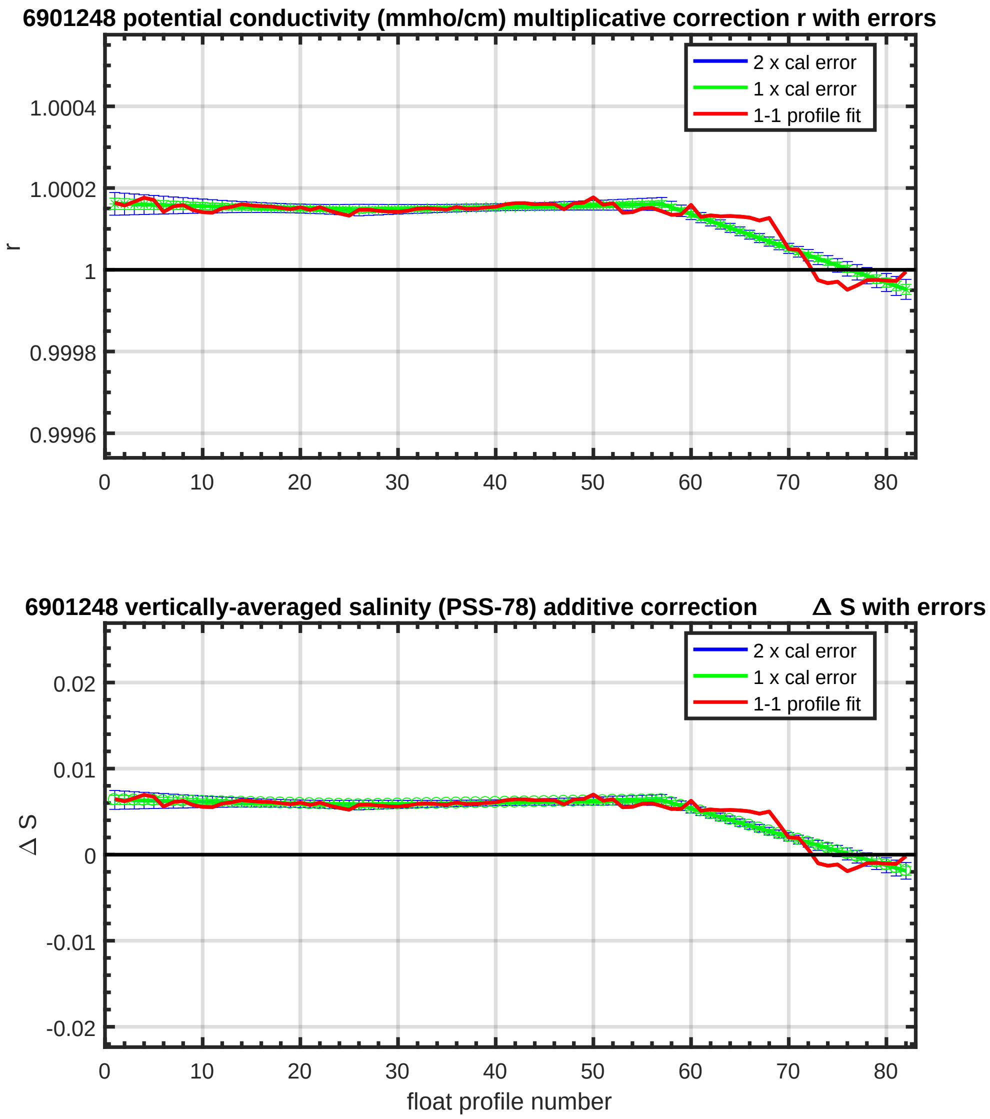

Figure 7: Salinity variation between each profile. Owens and Wong Objective Mapping Analysis builds its model based in a programmed number of break points.

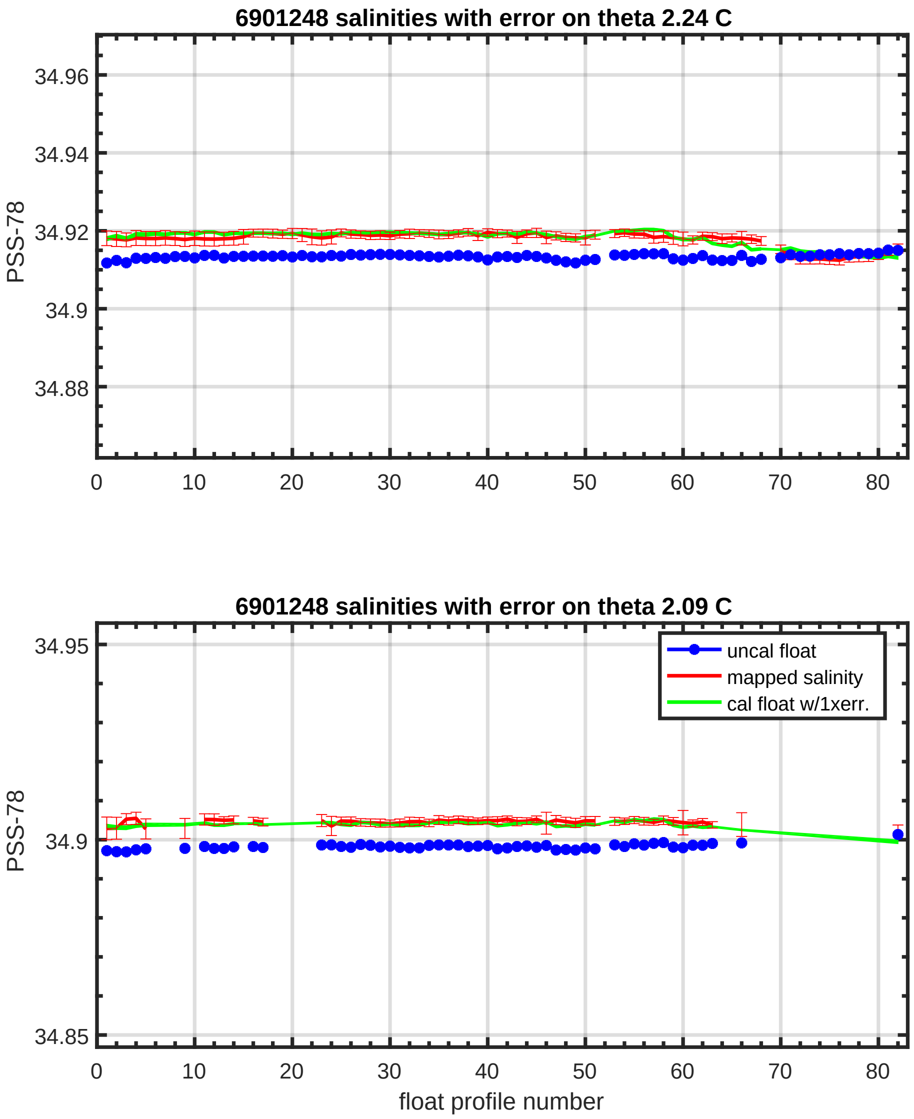

Figure 8: This figure gives a rough idea how uncalibrated (blue line) and calibrated (green line) signals fit each other. Bear in mind that mapped salinity depends on the historical hydrographic points of the area (Figure 1). The less historical points, the less approximated is the model.

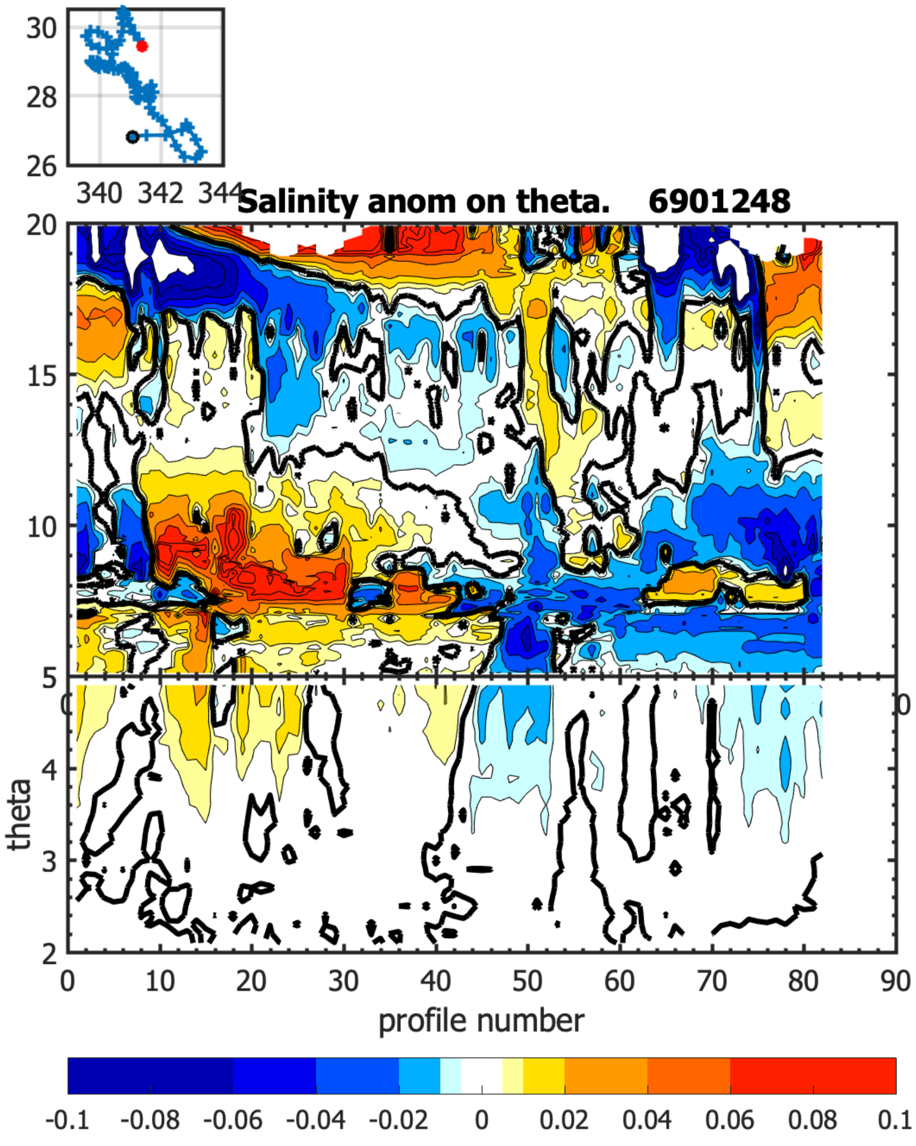

Figure 9: Original salinity variation represented in the Brians King plots. It shows the salinity variation for an each level of theta per profile. A colored scale indicates the salinity variation (white color indicates no variation)

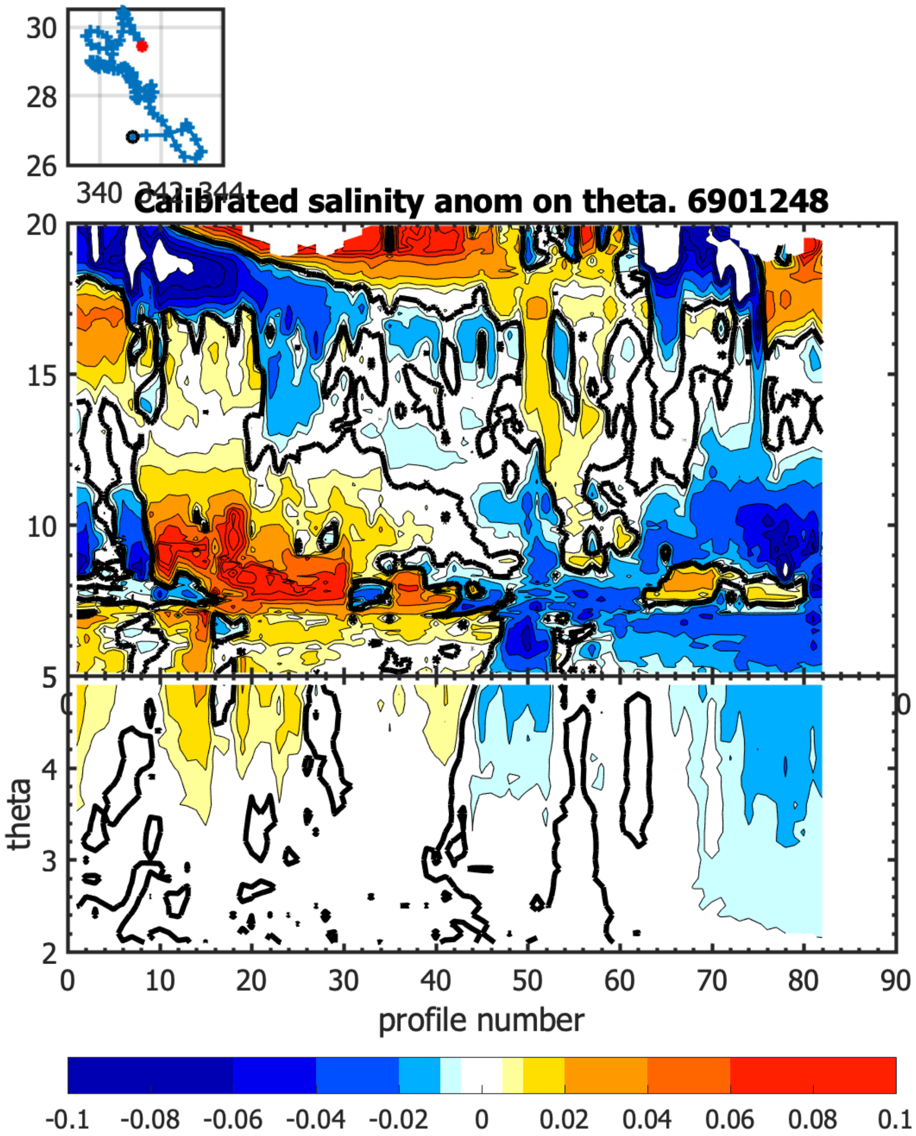

Figure 10: Calibrated salinity variation represented in the Brians King plots. It shows the salinity variation for an each level of theta per profile. Comparing both uncalibrated and calibrated plots, significant salinity variations can be identified.

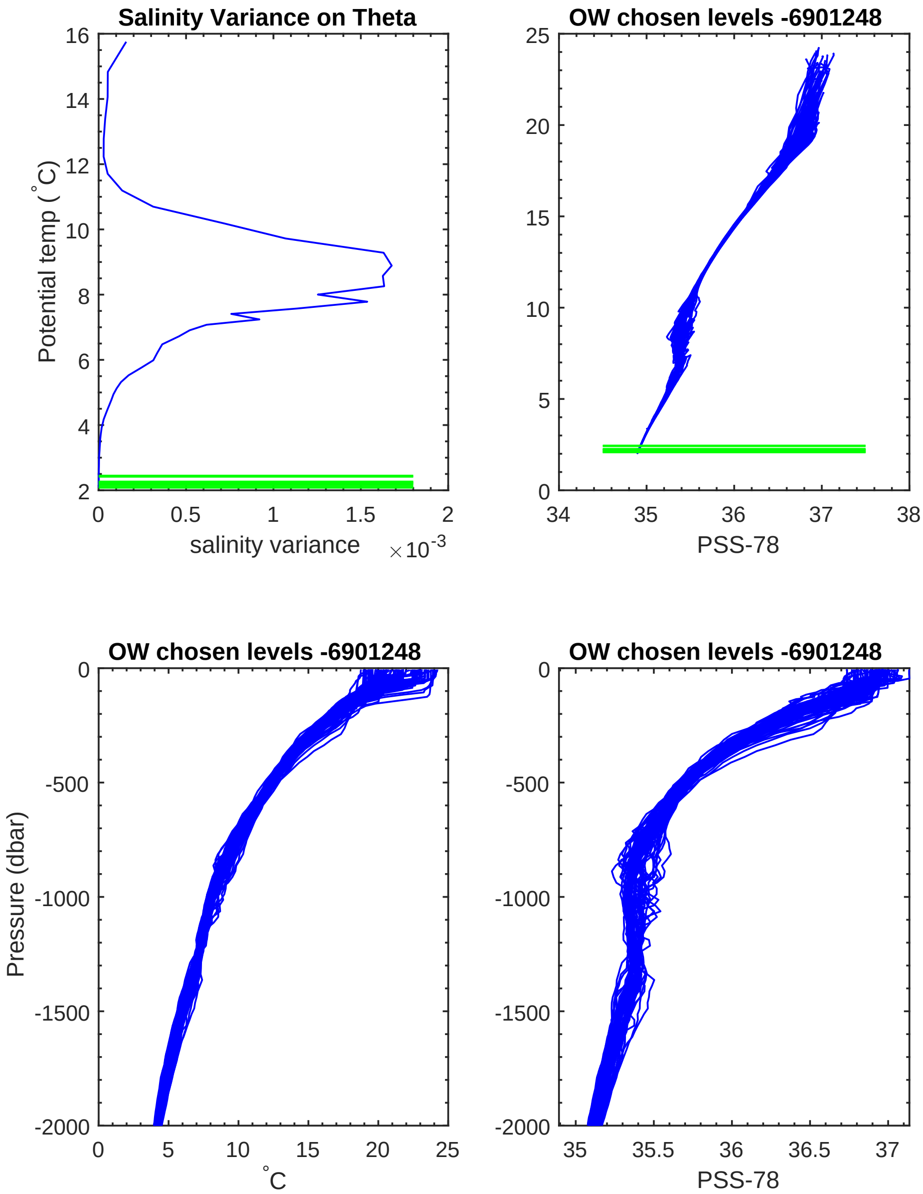

Figure 11: Theta levels are chosen by Owens and Wong Objective Mapping Analysis. The model identifies automatically the theta levels where the salinity variations are smaller.

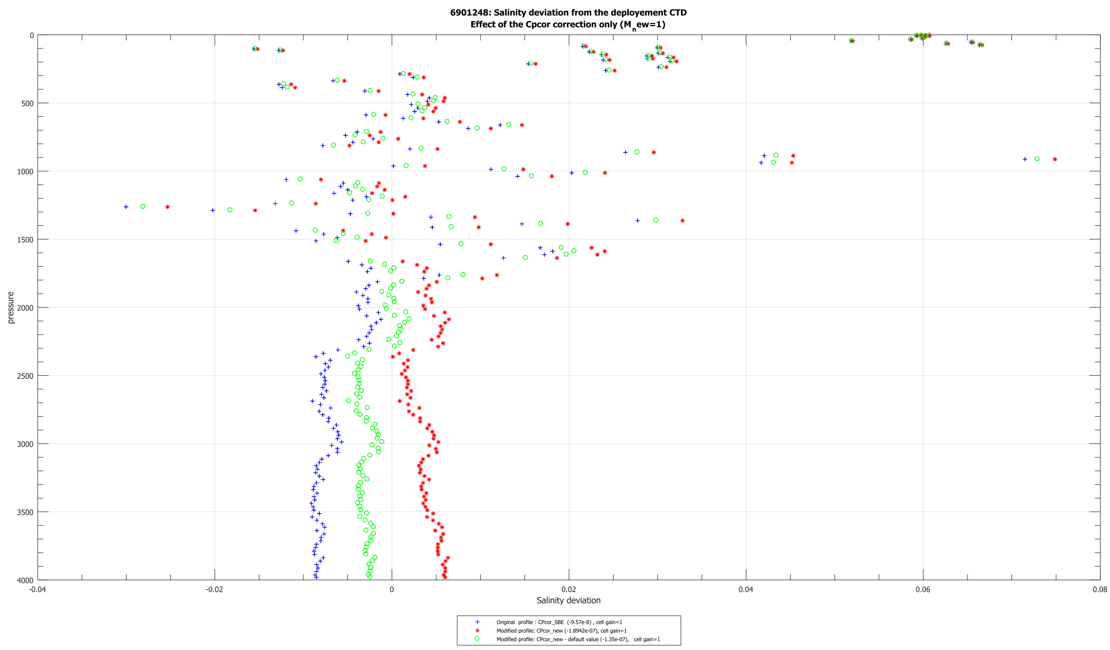

Figure 12: New CPcorr calculation.