

Argo-España

Parte de la estrategia global de observación del océano



Report on Delayed Mode for Argo float WMO 6901256

ARGO ESPAÑA - IEO / 21 - 69

**Delayed Mode Quality Control for Argo float
WMO 6901256**

June 30, 2021

A. González-Santana - P. Vélez-Belchí
Instituto Español de Oceanografía

1 Introduction

The Delayed Mode Quality Control (DMQC) has been developed for float WMO 6901256 and delivered on 29/06/2021 to Ifremer. Anomalous profiles were detected from cycle number 51 during its initial analysis of the 112 profiles carried out.

Transmission system	ARGOS
Transmission ID	n/a
Platform Model	ARVOR
Platform ID	6901256
Platform ID	AL2500-17SP005
Controller Board	70-10-444
Data Centre	IF
Project Name	ARGO SPAIN
Format Version	3.1
Float Owner	IEO
PI Name	Pedro Velez
Parking Depth (dbar)	1000
Profile depth (dbar)	2000
Number of Profiles	112
Status	Active
Deployment Date	2018 06 01
Deployment Latitude	25.321
Deployment Longitude	-20.7246
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. The Thermal Mass Error was also calculated in order to avoid possible errors due to the temperature gradients. The Owens and Wong Objective Mapping Analysis (2003) was applied to achieve an optimum calibration of the salinity.

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 po-

tential 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.

Considering the data series of 112 profiles, an anomalous behaviour of high salinity values appeared between profiles 51 and 79. Cycles before profile 51 and after profile 79 didn't show drift or bias evidence. The two fundamental hypotheses considered in the DMQC were (1) the possibility of a sudden change due to the natural variability caused by the Mediterranean water mass, with high salinity values, which frequently appears in the study area, or (2) the possible conductivity sensor failure due to some unknown reason. After updating the data from GDAC, the profile number 116 showed an extremely anomalous data towards fresh waters, leading us to think that the salinity data is not reliable and that the conductivity sensor is probably suffering from a problem.

The cycles developed from profile 51 to the end of the serie have been declared unadjustable. According to Argo Quality Control Manual:

PSAL ADJUSTED = FillValue. PSAL ADJUSTED ERROR =FillValue. PSAL ADJUSTED QC = 4.

The following parameters has been set up for the Owens and Wong Objective Mapping Analysis method:

Config_max_casts	112
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	10
p_delta	250
p_exclude	200

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

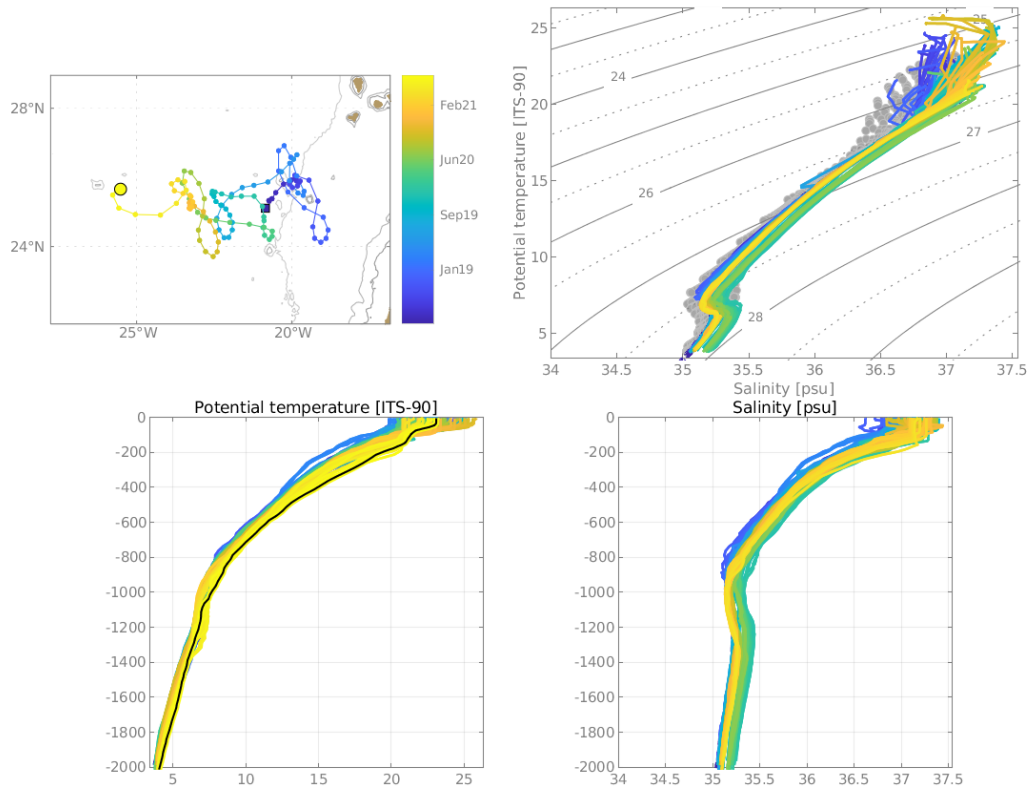


Figure 1: Argo float trajectory (a). T-S Diagram (b). Potential Temperature profiles (c). Salinity profiles (d).

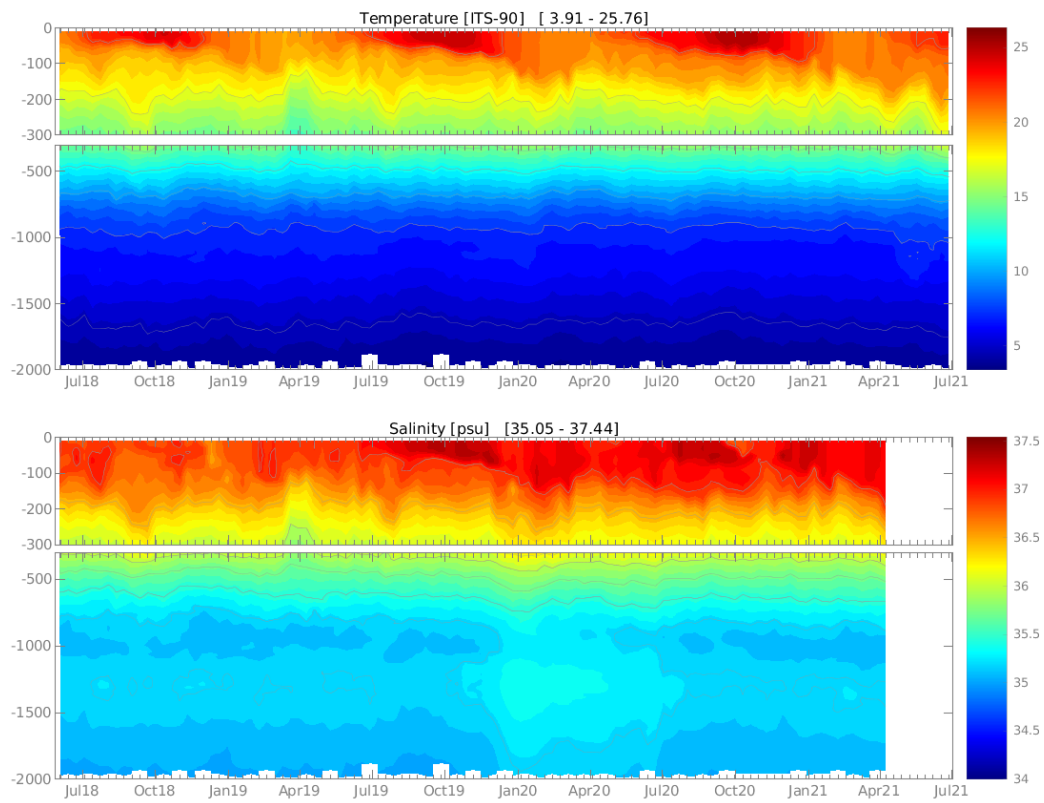


Figure 2: Potential temperature and salinity sections.

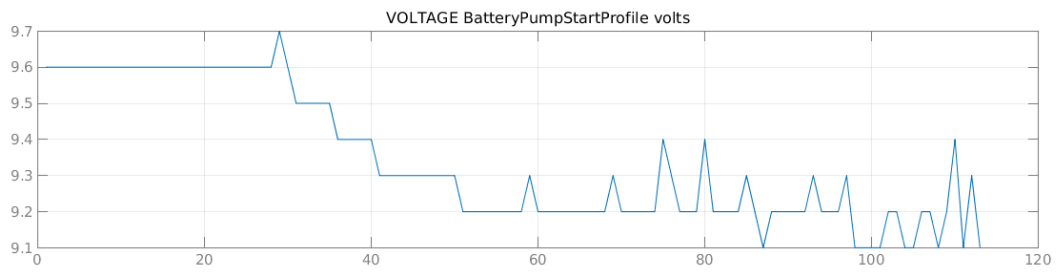


Figure 3: Pressure record (a). Voltage record (b).

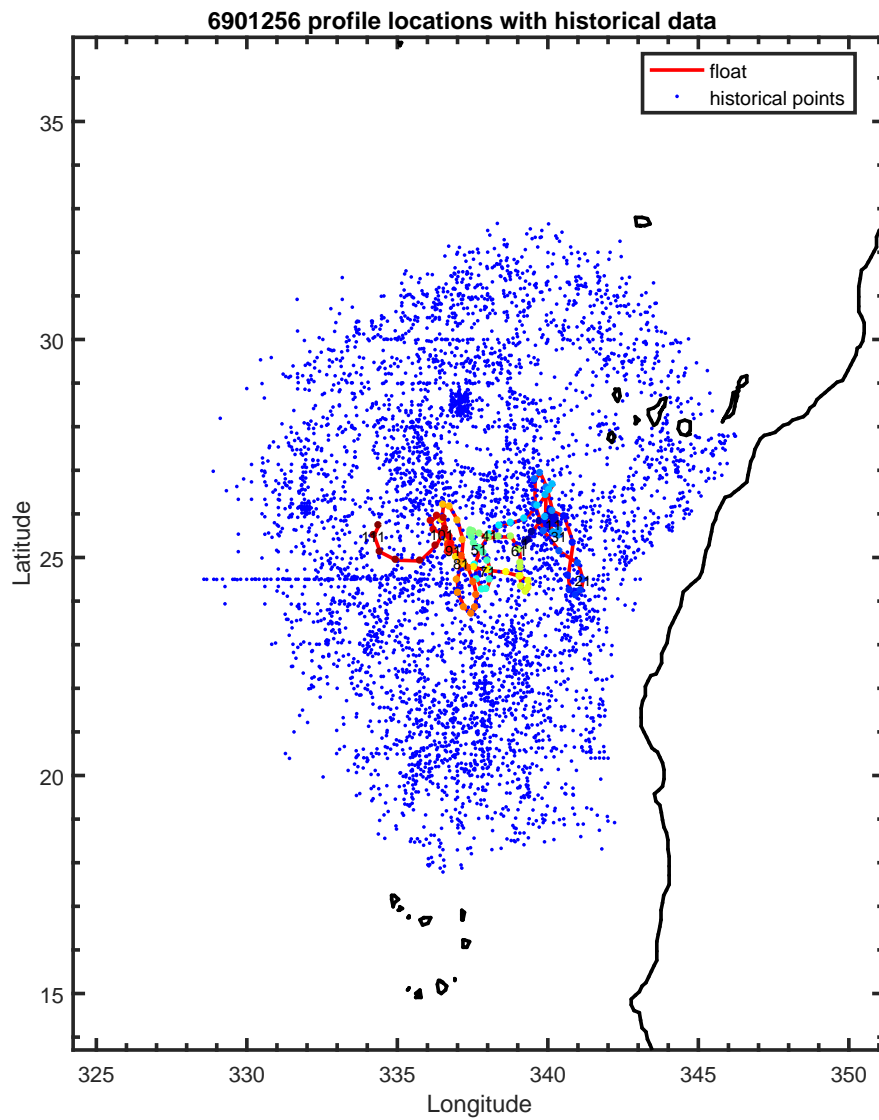


Figure 4: Historical points around the current ARGO float trajectory. These historical points are used by Owens and Wong Objective Mapping Analysis to make a model for an ARGO float data calibration.

6901256 uncalibrated float data (-) and mapped salinity (o) with objective errors

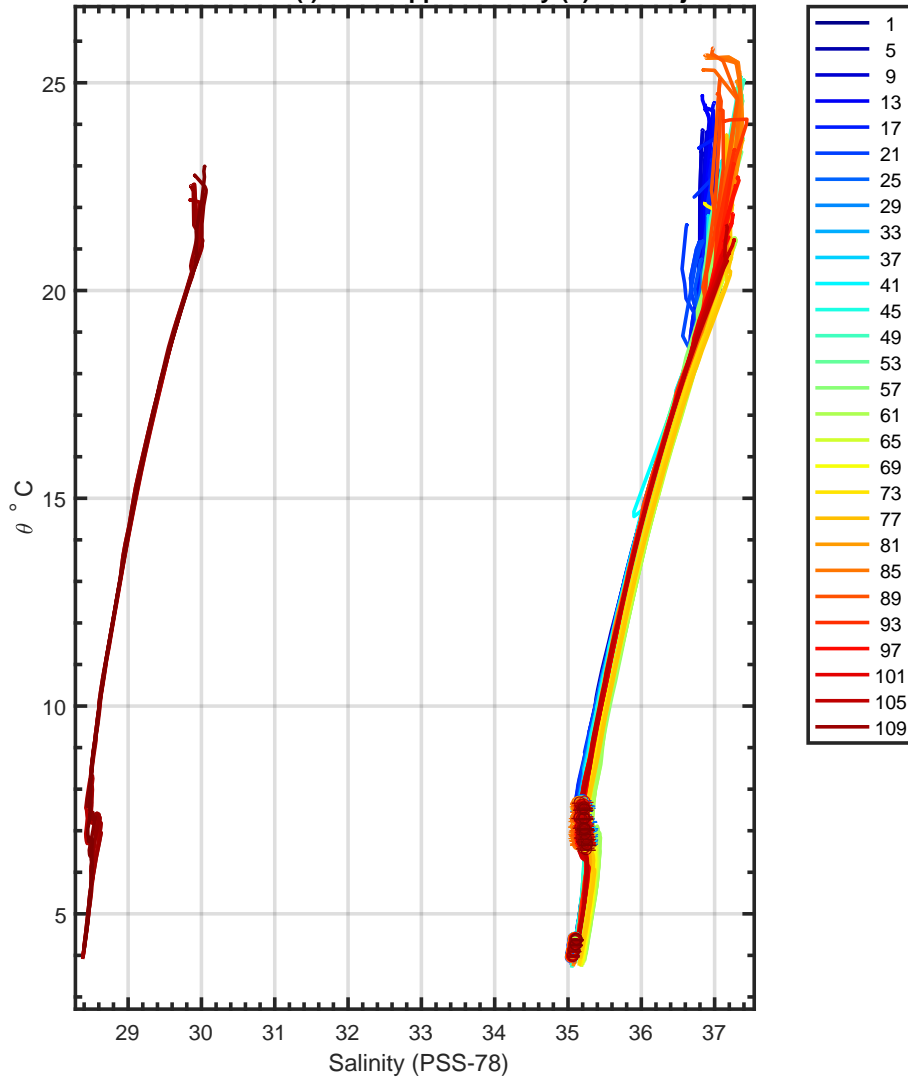


Figure 5: T-S Diagram before the potential calibration.

6901256 calibrated float data (-) and mapped salinity (o) with objective errors

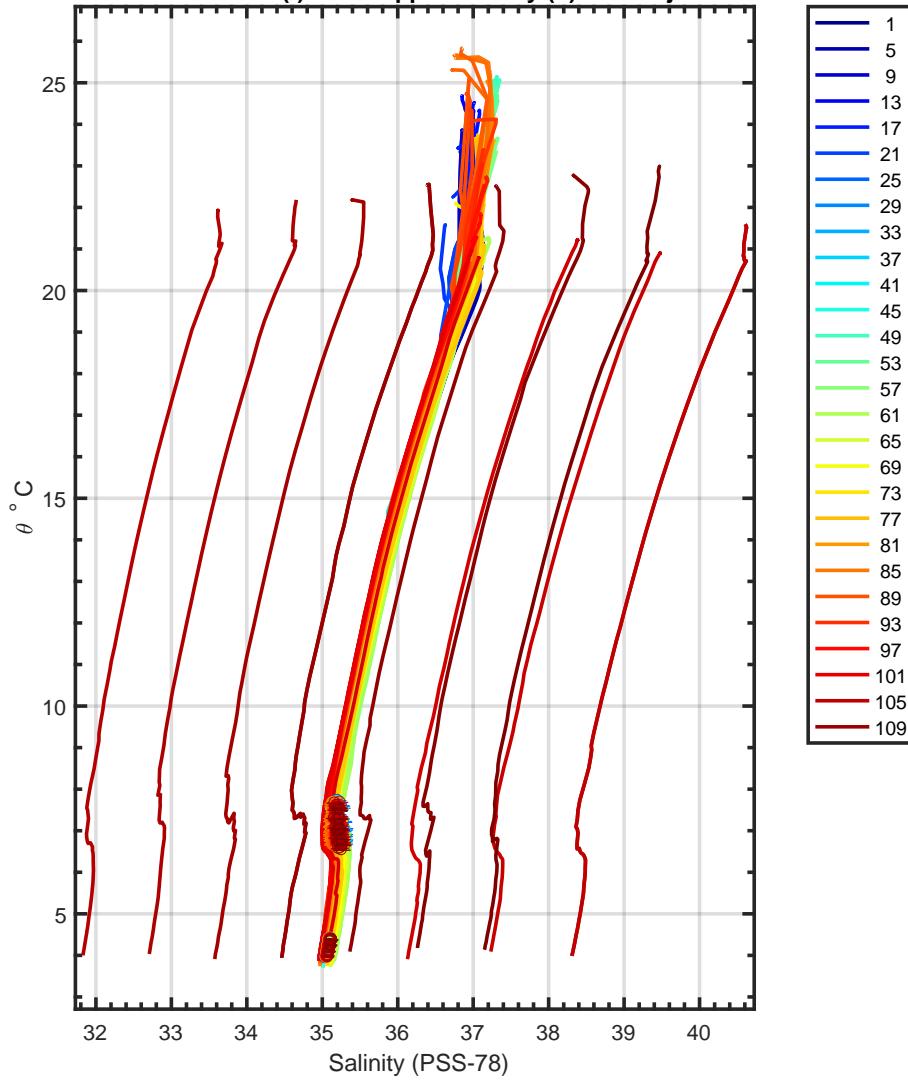
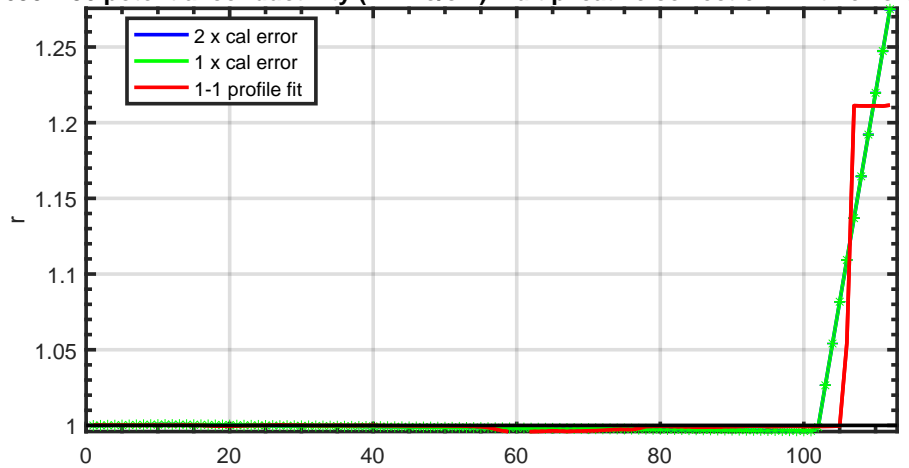


Figure 6: T-S diagram after the potential calibration. This is useful to identify water masses, to detect some possible offsets or to identify some anomalous profiles.

6901256 potential conductivity (mmho/cm) multiplicative correction r with errors



6901256 vertically-averaged salinity (PSS-78) additive correction ΔS with errors

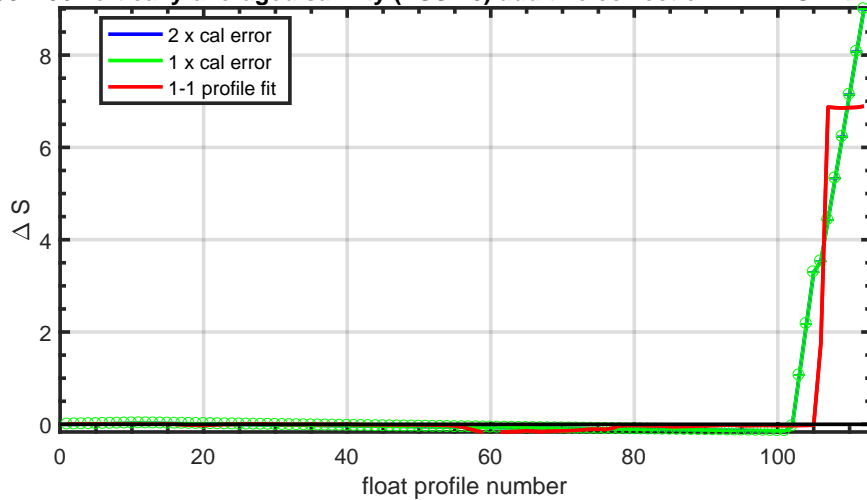


Figure 7: Salinity variation between each profile. Owens and Wong Objective Mapping Analysis builds its model based in a programmed number of break points.

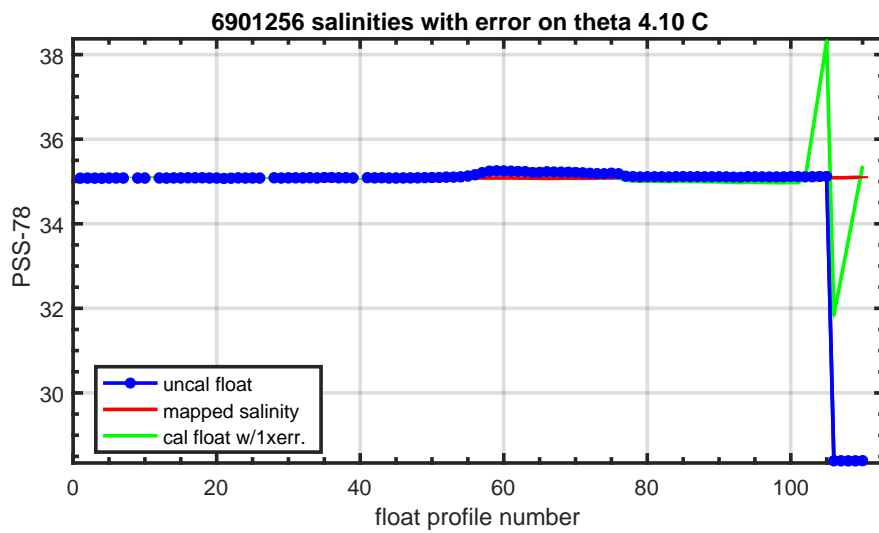
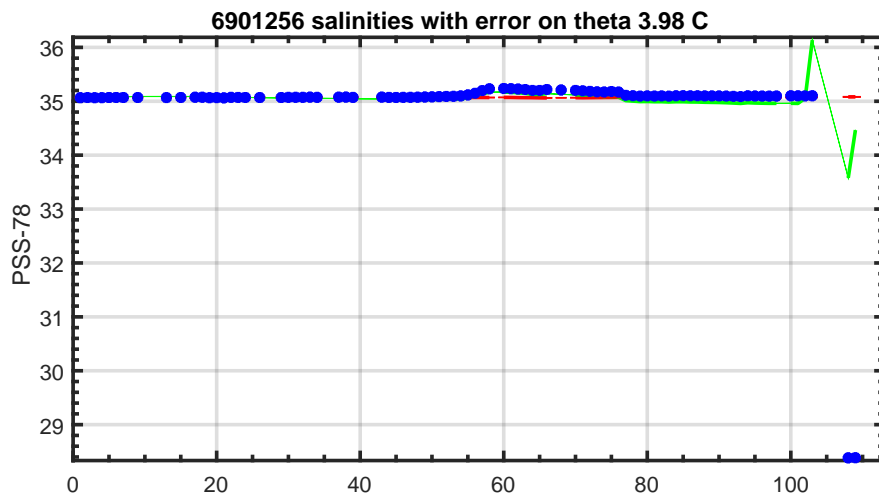


Figure 8: This figure gives a rough idea how uncalibrated (blue line) and calibrated (green line) signals fit each other. Bear in mind that mapped salinity depends on the historical hydrographic points of the area (Figure 1). The less historical points, the less approximated is the model.

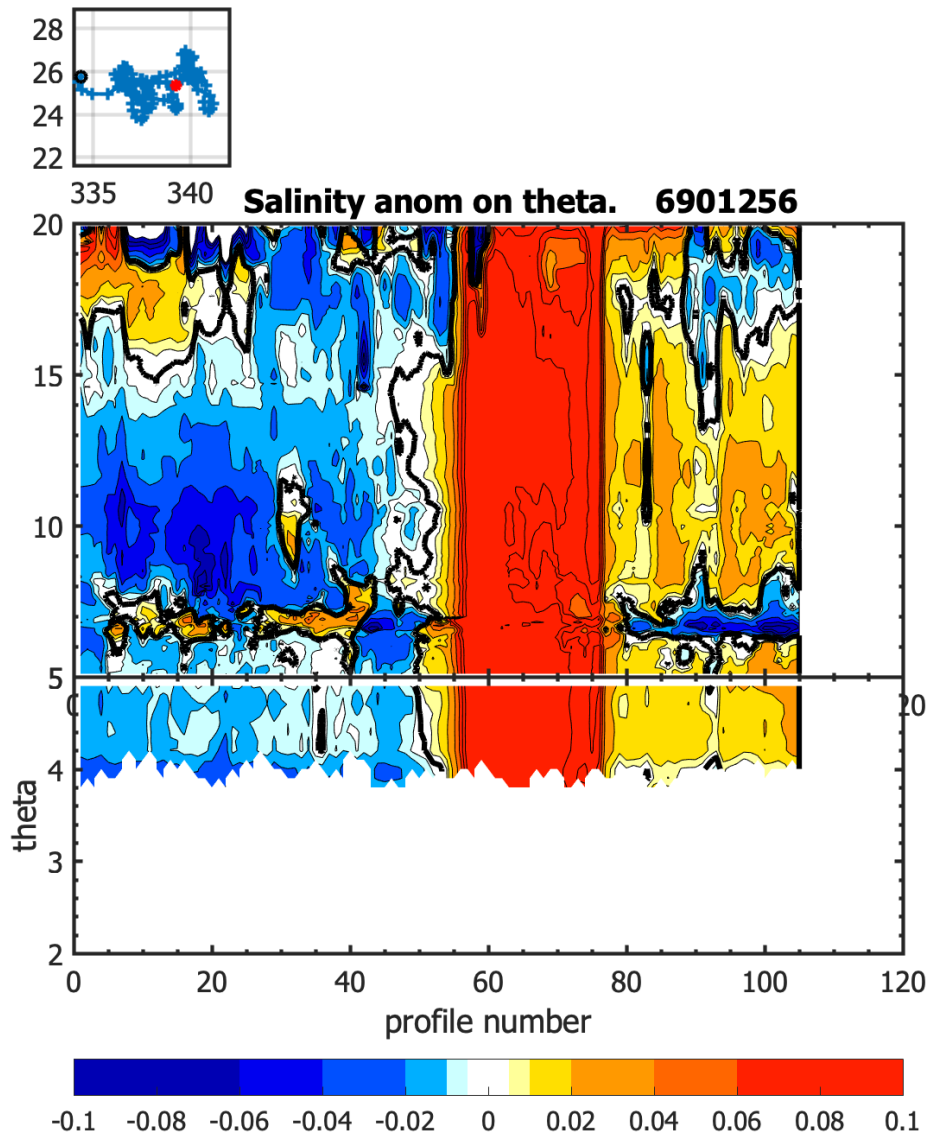


Figure 9: Original salinity variation represented in the Brians King plots. It shows the salinity variation for an each level of theta per profile. A colored scale indicates the salinity variation (white color indicates no variation)

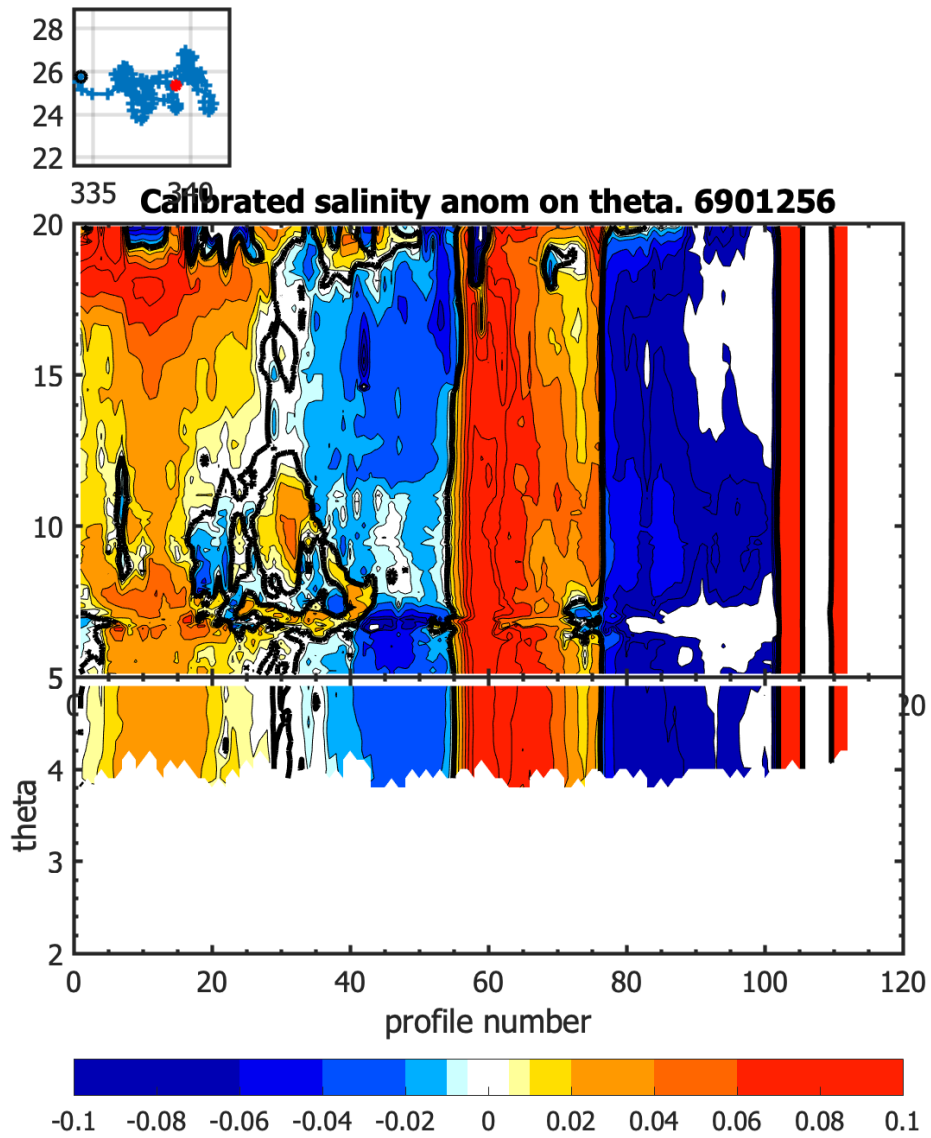


Figure 10: Calibrated salinity variation represented in the Brians King plots. It shows the salinity variation for an each level of theta per profile. Comparing both uncalibrated and calibrated plots, significant salinity variations can be identified.

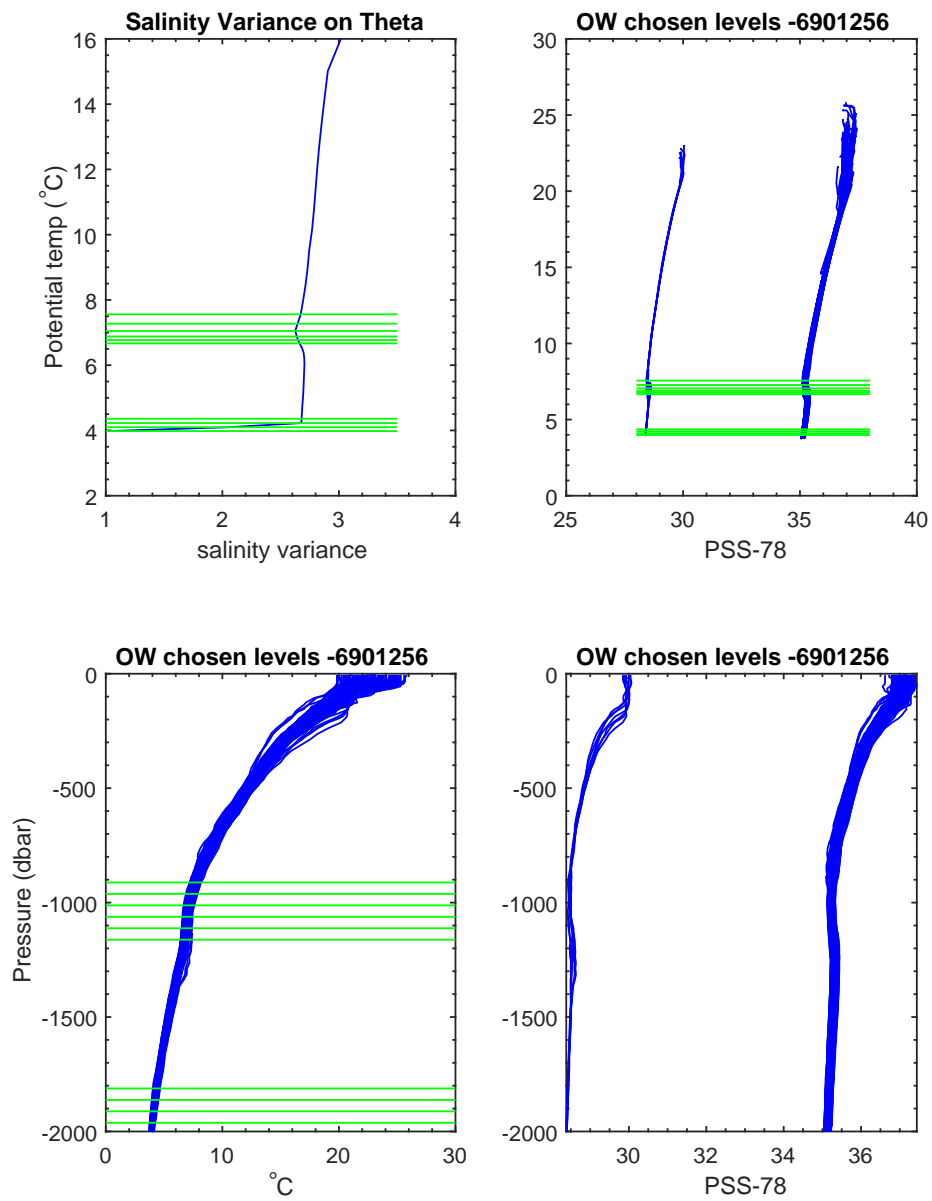


Figure 11: Theta levels are chosen by Owens and Wong Objective Mapping Analysis. The model identifies automatically the theta levels where the salinity variations are smaller.