

Delayed mode quality control of Argo float
6901174 as part of the BioGeoChemical Argo
(BGC-Argo) project

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Summary

The comparison between Argo float 6901174, from cycle 1 to 260, showed relatively good consistency with the reference data, within the errorbars suggested by manufacturer (< 0.01). From cycle 261 to 341 float showed the drift that is the effect of the conductivity sensor drift toward higher salinity. These cycles were set with the QC of 4.

WMO number	DM correction
6901174	No correction

Table 1: Correction applied in delayed mode.

Contents

1	Introduction	3
2	Quality Check of Argo Float Data	3
2.1	Time Series of Vertical Distribution of Data	3
2.2	Comparison between Argo Float and Climatology	5
3	Correction of Salinity Data	7
3.1	Comparison between Argo floats and CTD Climatology	7
3.1.1	Configuration	7
3.1.2	Results	10
3.2	Comparison between Argo floats and Argo Climatology	18
3.2.1	Configuration	18
3.2.2	Results	20
3.3	Summary and Conclusions	28
4	Final Checks	29

1 Introduction

Delayed mode analysis was performed for float number mb004 (6901174) where salinity and temperature values were separately compared to nearby historical CTD profiles and nearby Argo profiles as a reference database. The OWC (Cabanes et al., 2016) method was run to estimate a salinity offset and/or a salinity drift.

For more information about float mb004 (6901174) click on the following link: <http://www.ifremer.fr/argoMonitoring/float/6901174>

2 Quality Check of Argo Float Data

2.1 Time Series of Vertical Distribution of Data

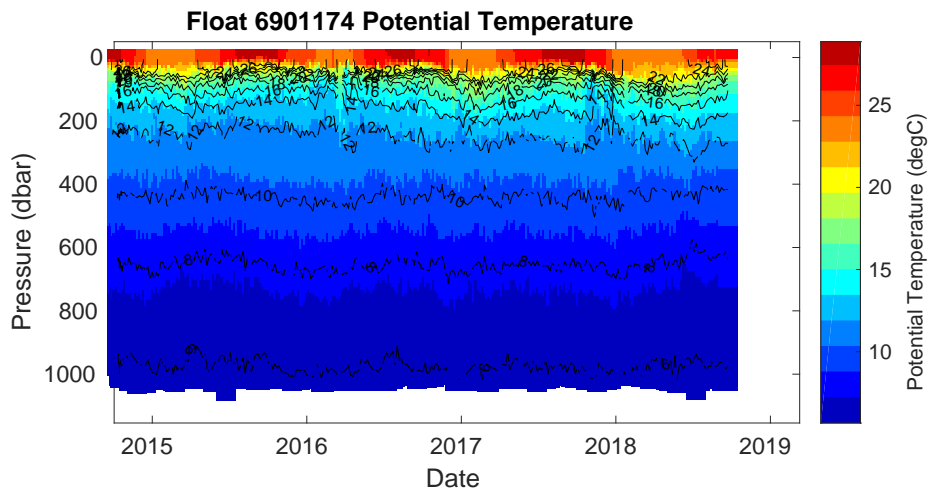


Figure 1: Float 6901174. Time series of the vertical distribution of potential temperature ($^{\circ}\text{C}$).

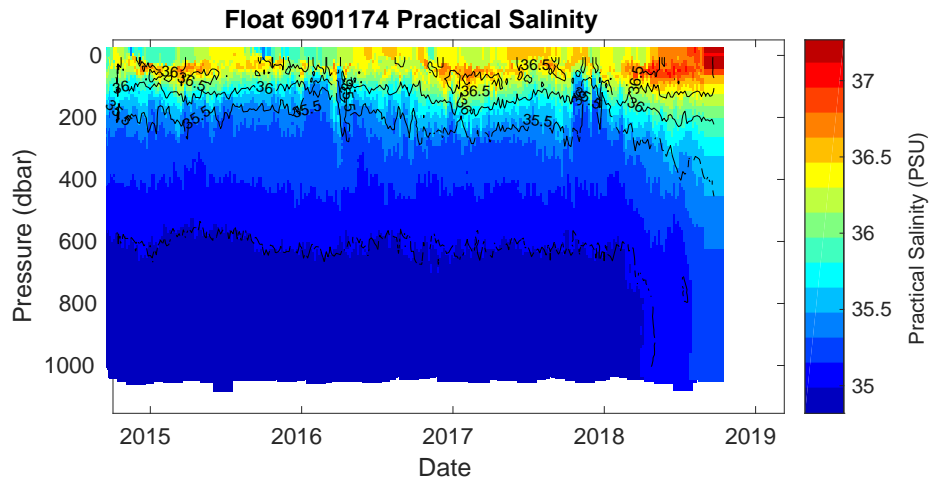


Figure 2: Float 6901174. Time series of the vertical distribution of practical salinity (PSU).

2.2 Comparison between Argo Float and Climatology

The comparison between float 6901174 and data from WMO boxes $\pm 10^\circ$ of latitude and longitude shows that the Argo profiles fit within the expected ranges (Figures 3, 4 and 5). This result confirms that float 6901174 represents relatively stable and consistent with the expected physical conditions in this region.

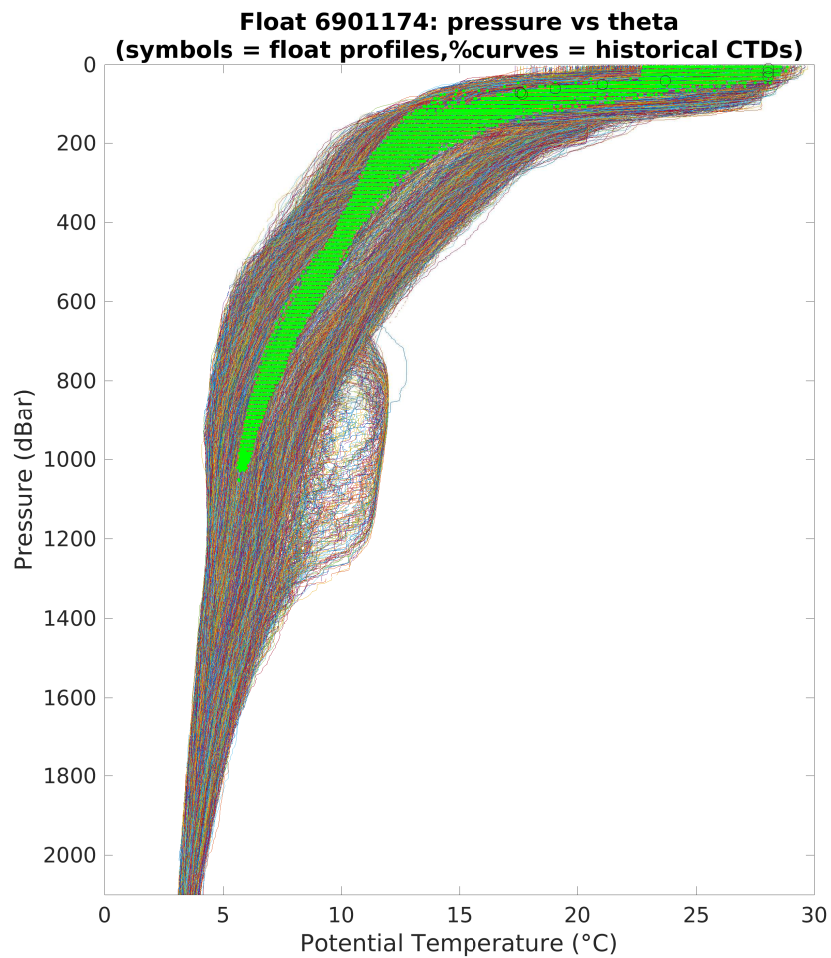


Figure 3: Float 6901174. Float profile of potential temperature ($^\circ\text{C}$) plotted with climatology from the spatial range of 10° . The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

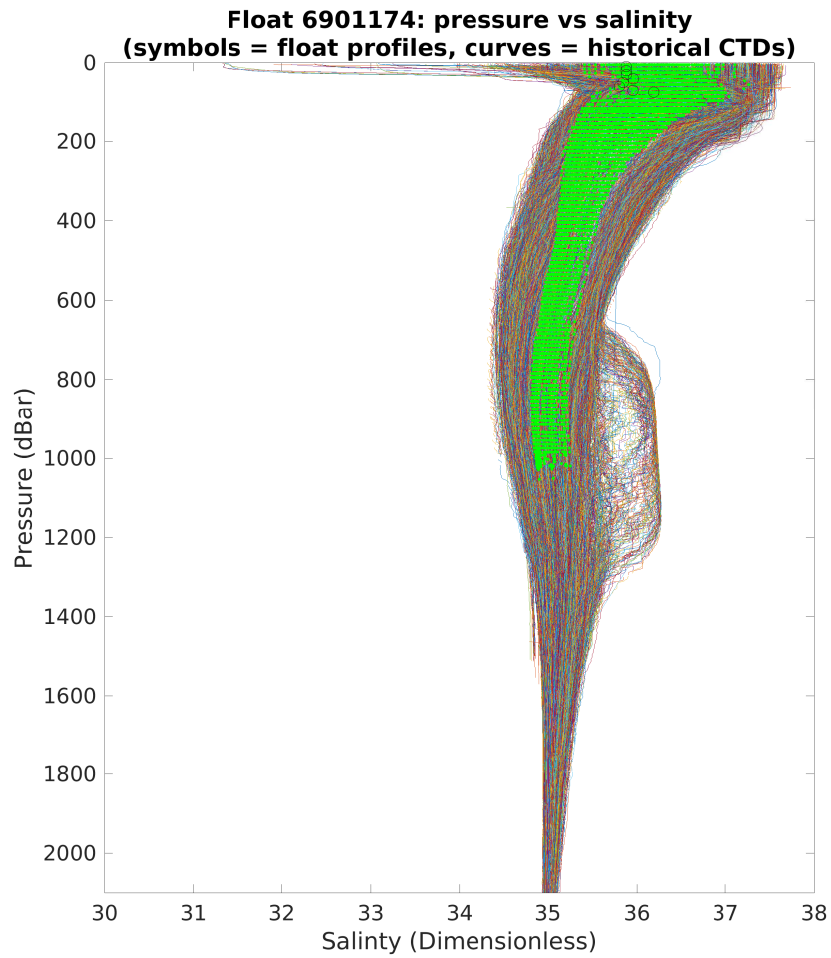


Figure 4: Float 6901174. Float profile of salinity (dimensionless) plotted with climatology from the spatial range of 10° . The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

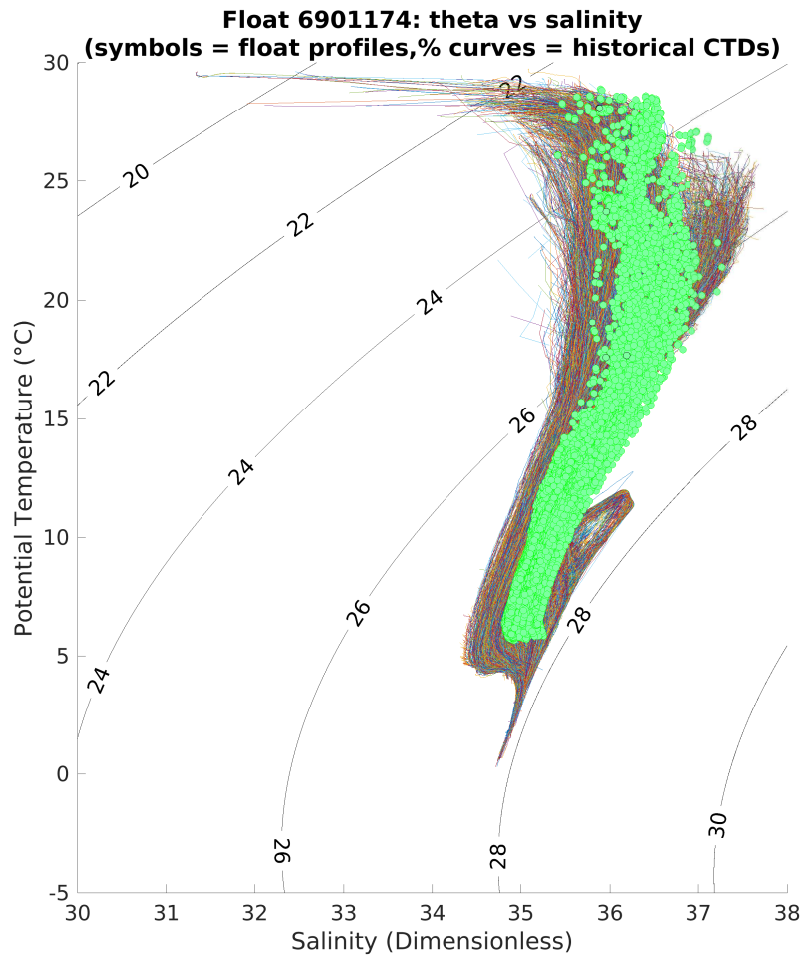


Figure 5: Float 6901174. Theta/S plotted with climatology from the spatial range of 10°. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

3 Correction of Salinity Data

3.1 Comparison between Argo floats and CTD Climatology

3.1.1 Configuration

% =====
 %

```

%   Climatology Data Input Paths
%

HISTORICAL_DIRECTORY=/users/argo/climatology
HISTORICAL_CTD_PREFIX=/historical_ctd/CTD_for_DMQC_2018V01/ctd_
HISTORICAL_BOTTLE_PREFIX=/historical_bot/bot_
HISTORICAL_ARGO_PREFIX=/argo_profiles/ARGO_for_DMQC_2018V01/argo_

% =====
%
%   Float Input Path
%

FLOAT_SOURCE_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_source/
FLOAT_SOURCE_POSTFIX=.mat

% =====
%
%   Mapping Output Path
%

FLOAT_MAPPED_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_mapped/ctd/
FLOAT_MAPPED_PREFIX=map_
FLOAT_MAPPED_POSTFIX=.mat

% =====
%
%   Calibration Output Path
%

FLOAT_CALIB_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_calib/ctd/
FLOAT_CALIB_PREFIX=cal_
FLOAT_CALSERIES_PREFIX=calseries_
FLOAT_CALIB_POSTFIX=.mat

% =====
%
%   Diagnostic Plots Output Path
%

FLOAT_PLOTS_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_plots/ctd/

% =====
%
%   Constants File Path
%

```



```

CONFIG_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/constants/
CONFIG_COASTLINES=coastdat.mat
CONFIG_WMO_BOXES=wmo_boxes_ctd.mat
CONFIG_SAF=TypicalProfileAroundSAF.mat

% =====
%
%   Objective Mapping Parameters
%

% max number of historical casts used in objective mapping
CONFIG_MAX_CASTS=300

% 1=use PV constraint, 0=don't use PV constraint, in objective mapping
MAP_USE_PV=1

% 1=use SAF separation criteria, 0=don't use SAF separation criteria, in objective mapping
MAP_USE_SAF=0

% spatial decorrelation scales, in degrees
MAPSCALE_LONGITUDE_LARGE=5
MAPSCALE_LONGITUDE_SMALL=1
MAPSCALE_LATITUDE_LARGE=4
MAPSCALE_LATITUDE_SMALL=0.8

% cross-isobath scales, dimensionless, see BS(2005)
MAPSCALE_PHI_LARGE=0.1
MAPSCALE_PHI_SMALL=0.02

% temporal decorrelation scale, in years
MAPSCALE_AGE=0.69
MAPSCALE_AGE_LARGE=10

% exclude the top xxx dbar of the water column
MAP_P_EXCLUDE=100

% only use historical data that are within +/- yyy dbar from float data
MAP_P_DELTA=50

```

3.1.2 Results

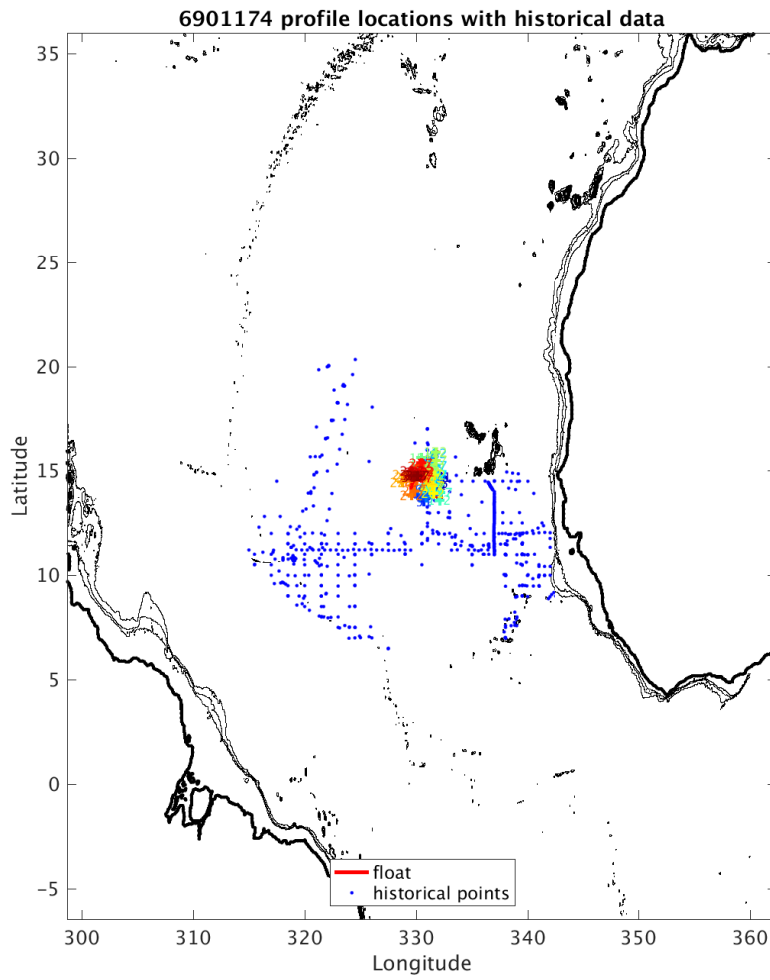


Figure 6: Float 6901174. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

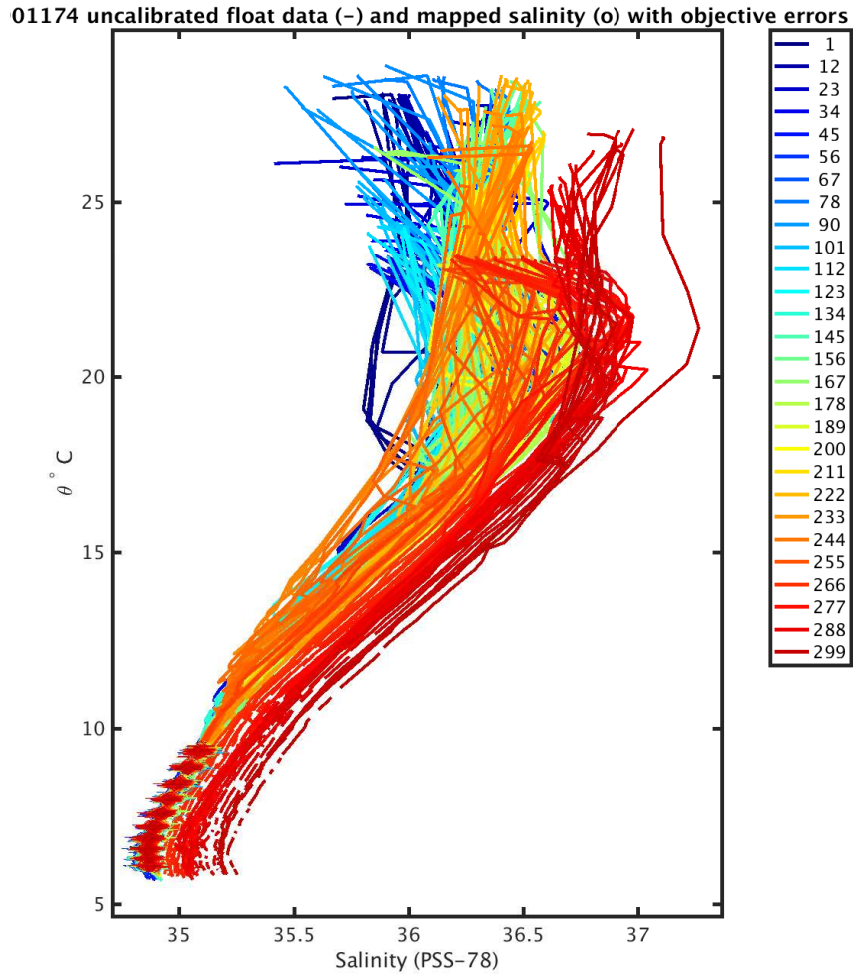
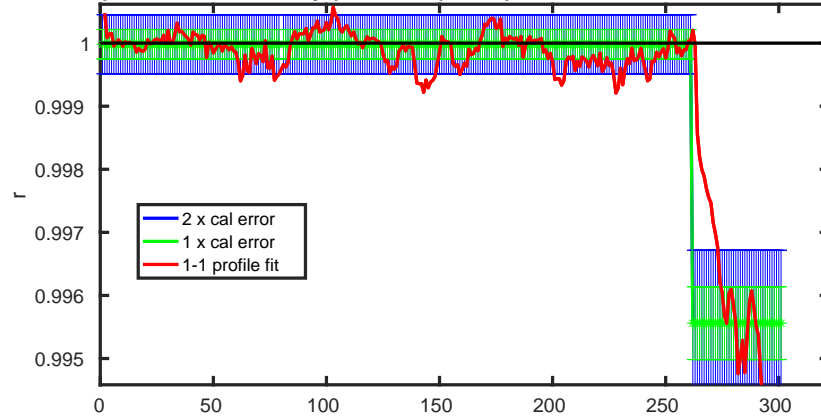


Figure 7: Float 6901174. Uncalibrated float data and mapped salinity.

6901174 potential conductivity (mmho/cm) multiplicative correction r with errors



6901174 vertically-averaged salinity (PSS-78) additive correction ΔS with errors

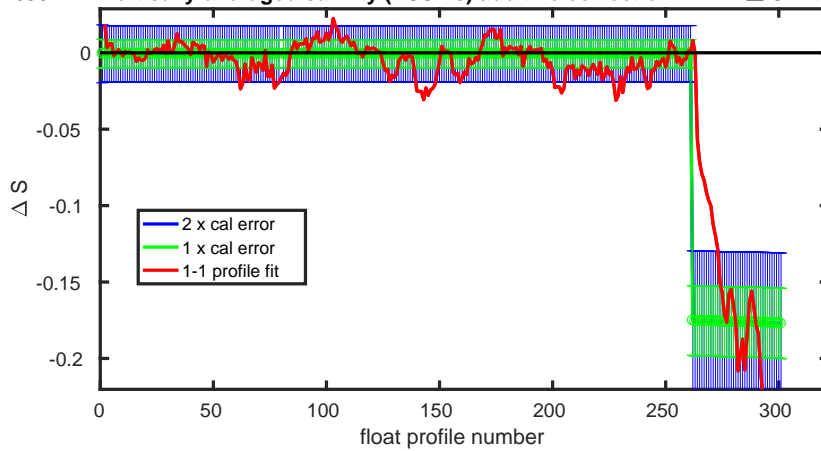


Figure 8: Float 6901174. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

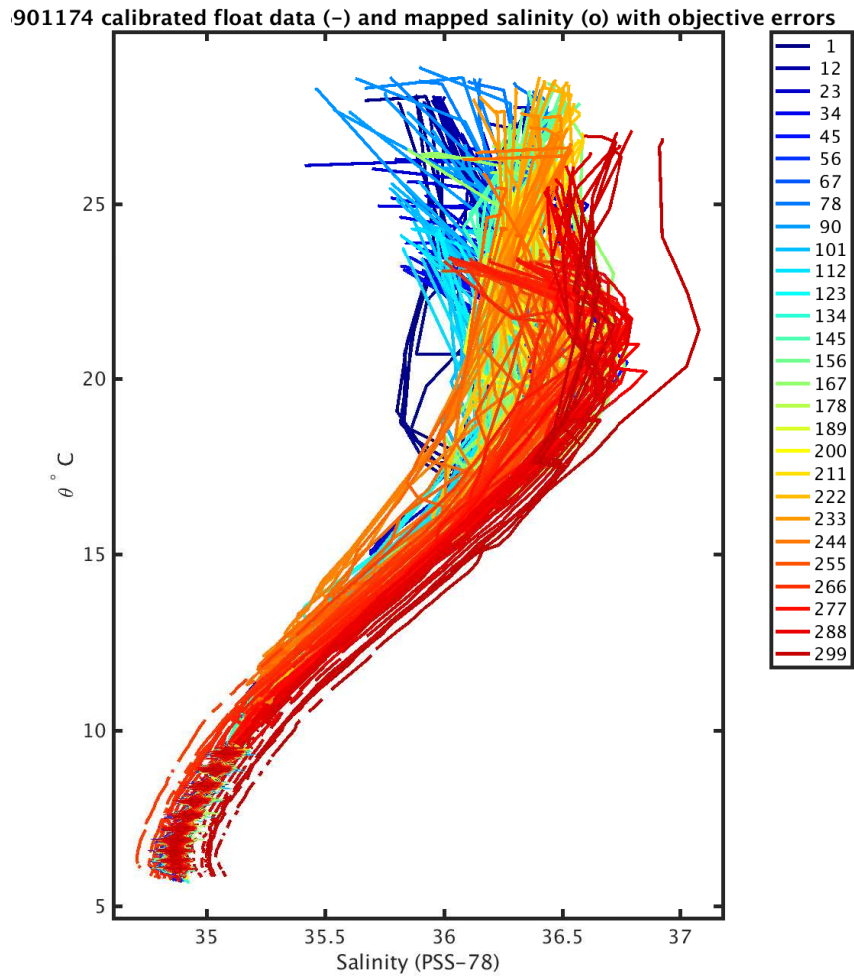


Figure 9: Float 6901174. Calibrated float data and mapped salinity.

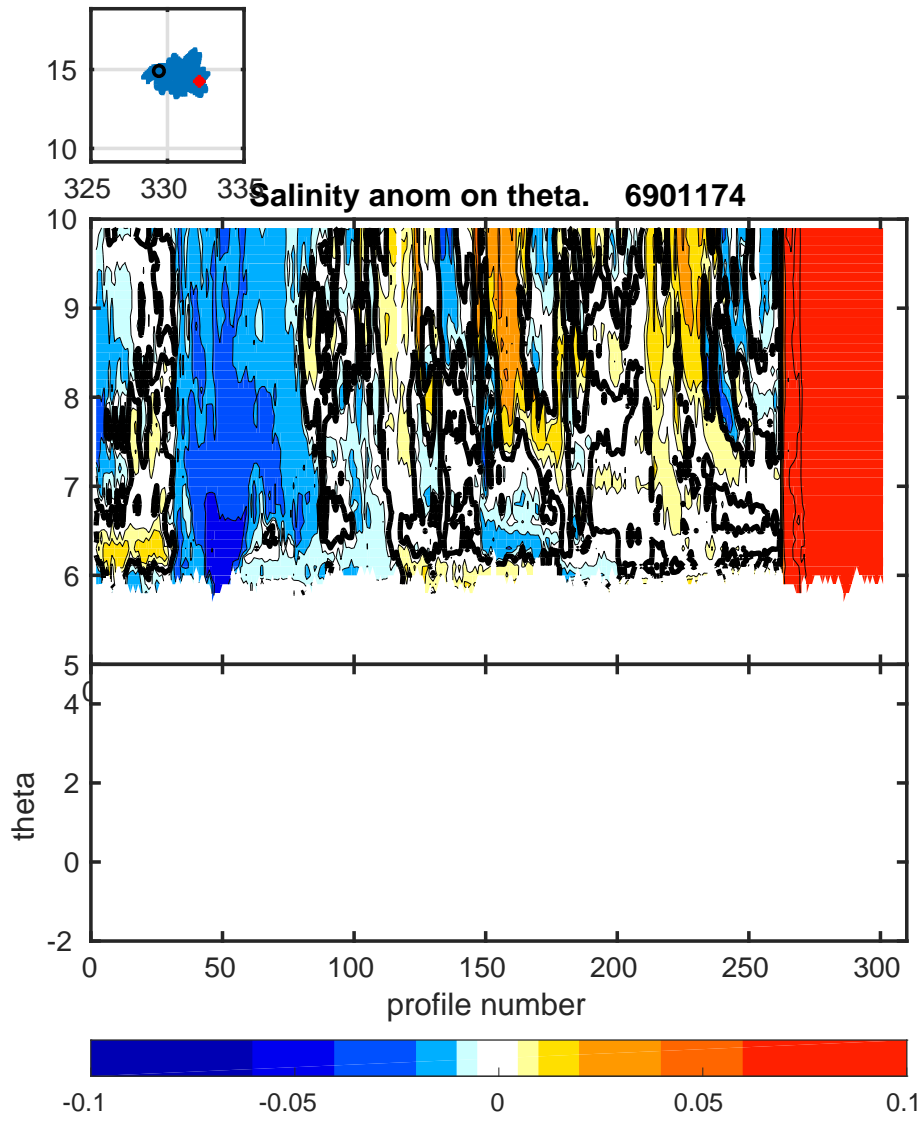


Figure 10: Float 6901174. Salinity anomaly on θ levels.

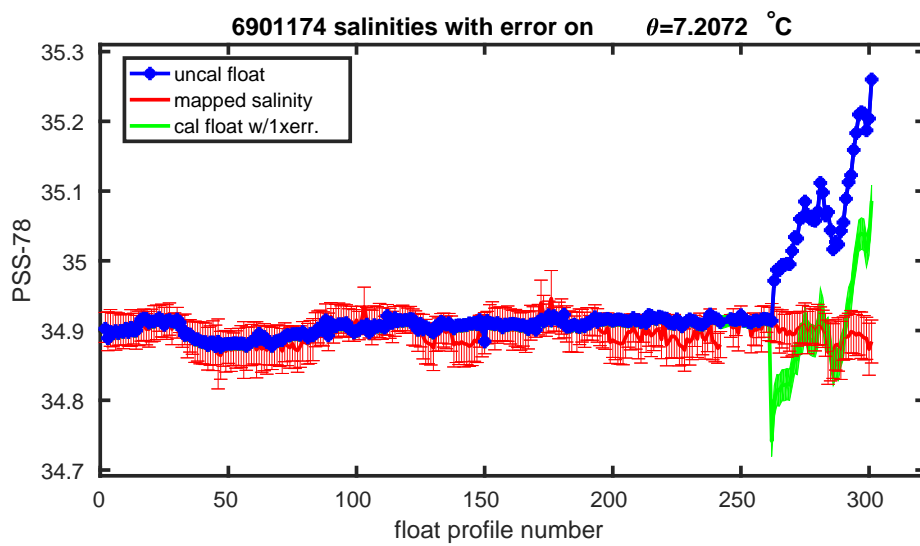
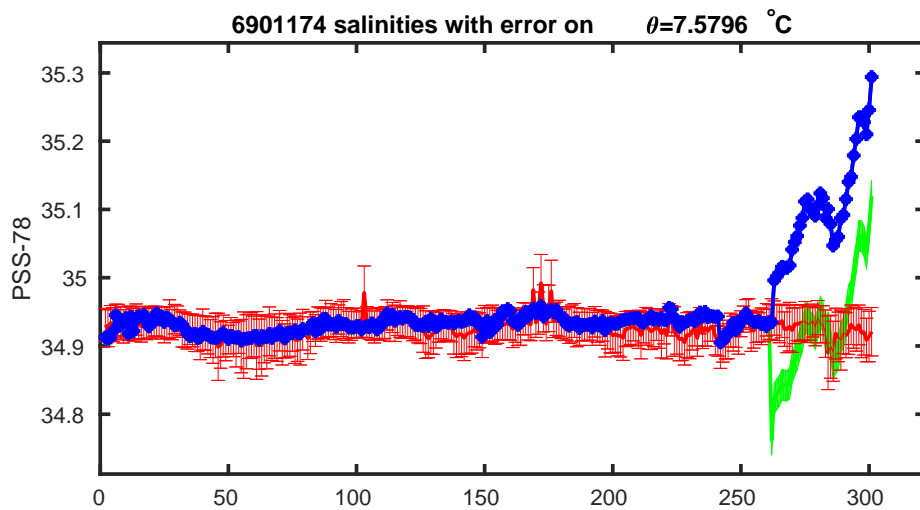


Figure 11: Float 6901174. Salinities with errors on θ levels.

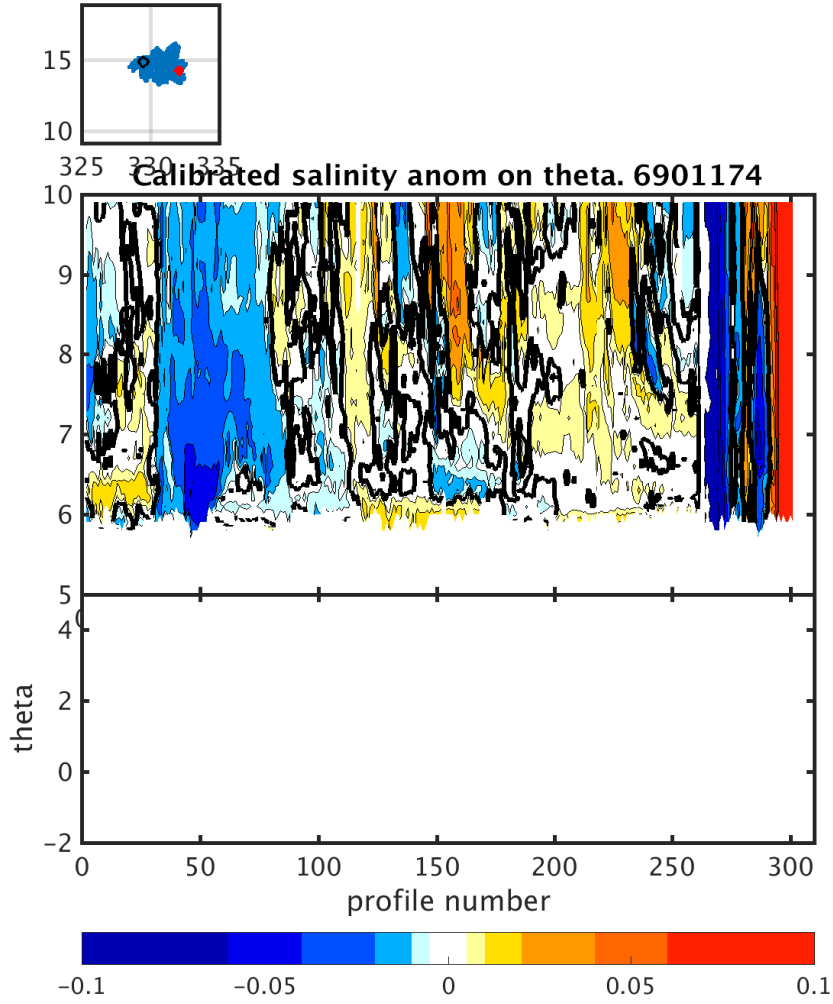


Figure 12: Float 6901174. Calibrated salinity anomaly on θ levels.

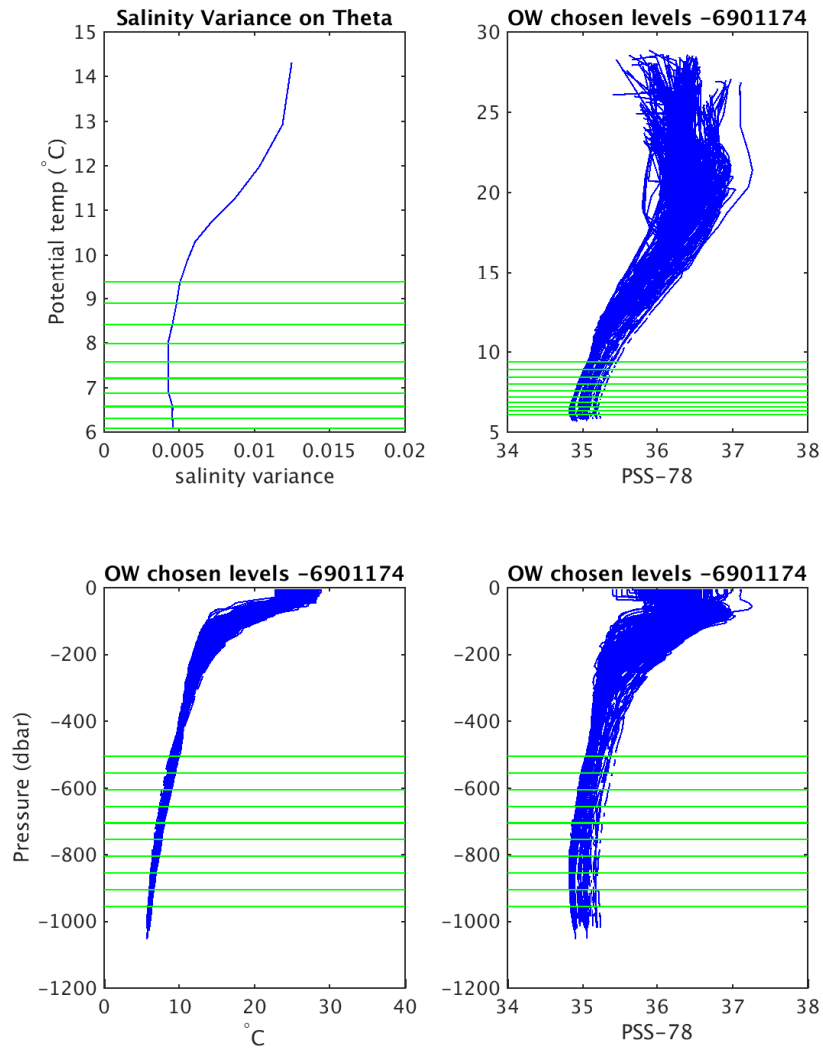


Figure 13: Float 6901174. Salinity, salinity variance on theta and OW chosen levels.

3.2 Comparison between Argo floats and Argo Climatology

3.2.1 Configuration

```
% =====
%
%   Climatology Data Input Paths
%

HISTORICAL_DIRECTORY=/users/argo/climatology
HISTORICAL_CTD_PREFIX=/historical_ctd/CTD_for_DMQC_2018V01/ctd_
HISTORICAL_BOTTLE_PREFIX=/historical_bot/bot_
HISTORICAL_ARGO_PREFIX=/argo_profiles/ARGO_for_DMQC_2018V01/argo_

% =====
%
%   Float Input Path
%

FLOAT_SOURCE_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_source/
FLOAT_SOURCE_POSTFIX=.mat

% =====
%
%   Mapping Output Path
%

FLOAT_MAPPED_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_mapped/argo/
FLOAT_MAPPED_PREFIX=map_
FLOAT_MAPPED_POSTFIX=.mat

% =====
%
%   Calibration Output Path
%

FLOAT_CALIB_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_calib/argo/
FLOAT_CALIB_PREFIX=cal_
FLOAT_CALSERIES_PREFIX=calseries_
FLOAT_CALIB_POSTFIX=.mat

% =====
%
%   Diagnostic Plots Output Path
%
```

```

FLOAT_PLOTS_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_plots/argo/

% =====
%
%   Constants File Path
%
%

CONFIG_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/constants/
CONFIG_COASTLINES=coastdat.mat
CONFIG_WMO_BOXES=wmo_boxes_argo.mat
CONFIG_SAF=TypicalProfileAroundSAF.mat

% =====
%
%   Objective Mapping Parameters
%
%

% max number of historical casts used in objective mapping
CONFIG_MAX_CASTS=300

% 1=use PV constraint, 0=don't use PV constraint, in objective mapping
MAP_USE_PV=1

% 1=use SAF separation criteria, 0=don't use SAF separation criteria, in objective mapping
MAP_USE_SAF=0

% spatial decorrelation scales, in degrees
MAPSCALE_LONGITUDE_LARGE=5
MAPSCALE_LONGITUDE_SMALL=1
MAPSCALE_LATITUDE_LARGE=4
MAPSCALE_LATITUDE_SMALL=0.8

% cross-isobath scales, dimensionless, see BS(2005)
MAPSCALE_PHI_LARGE=0.1
MAPSCALE_PHI_SMALL=0.02

% temporal decorrelation scale, in years
MAPSCALE_AGE=0.69
MAPSCALE_AGE_LARGE=10

% exclude the top xxx dbar of the water column
MAP_P_EXCLUDE=100

% only use historical data that are within +/- yyy dbar from float data
MAP_P_DELTA=50

```

3.2.2 Results

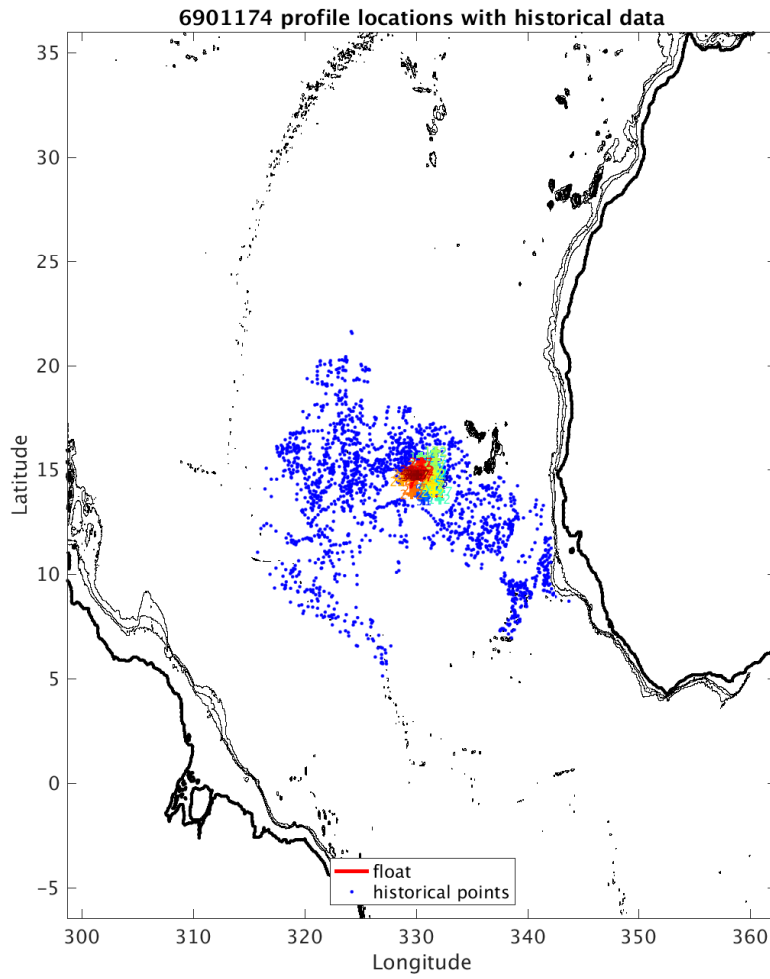


Figure 14: Float 6901174. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

01174 uncalibrated float data (-) and mapped salinity (o) with objective errors

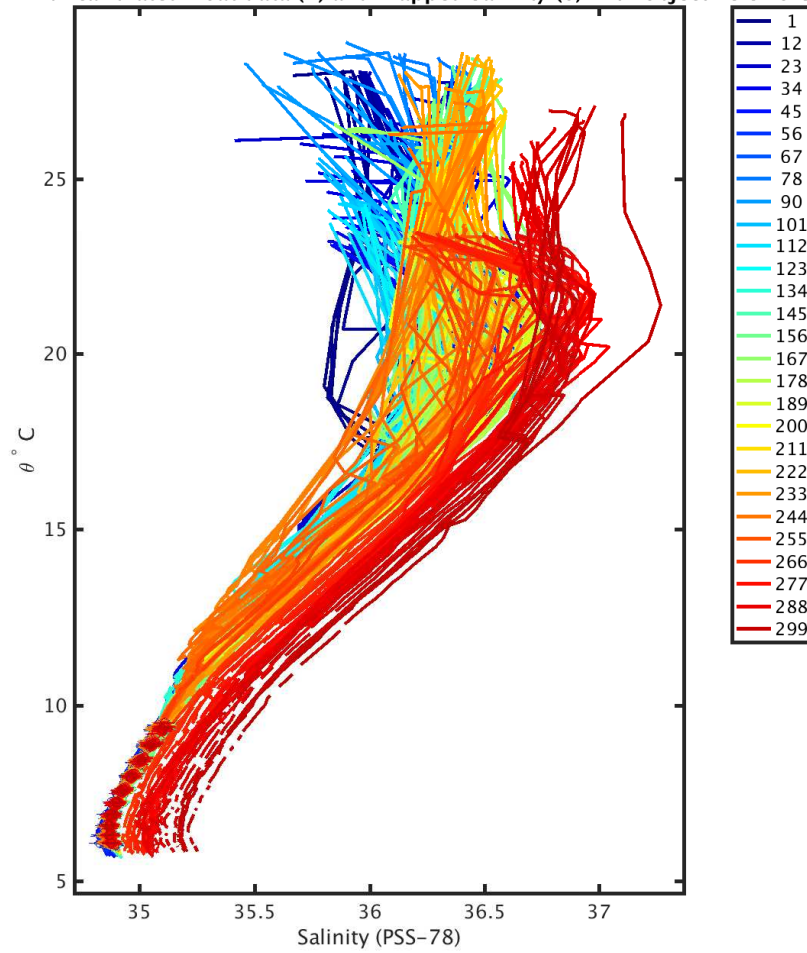
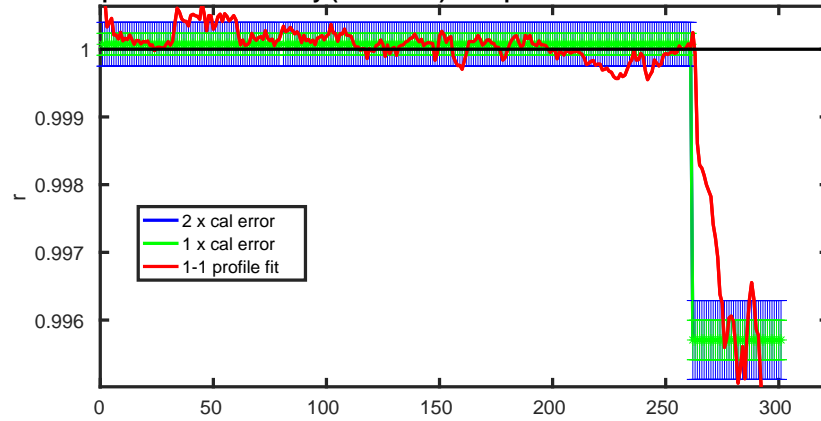


Figure 15: Float 6901174. Uncalibrated float data and mapped salinity.

6901174 potential conductivity (mmho/cm) multiplicative correction r with errors



6901174 vertically-averaged salinity (PSS-78) additive correction ΔS with errors

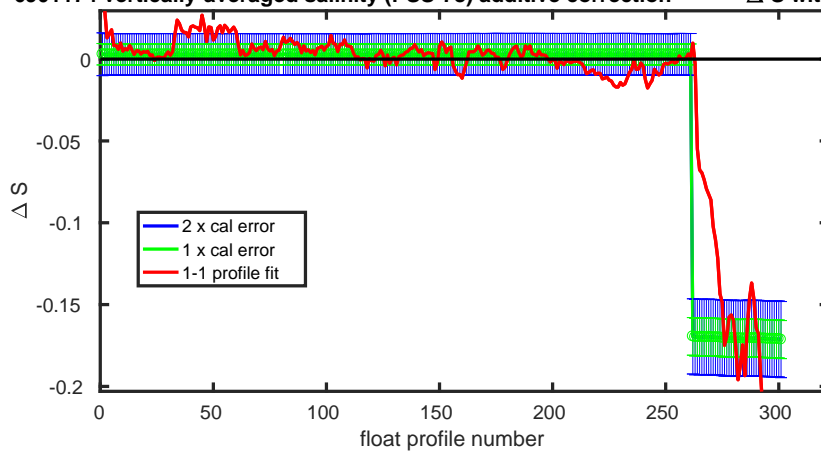


Figure 16: Float 6901174. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

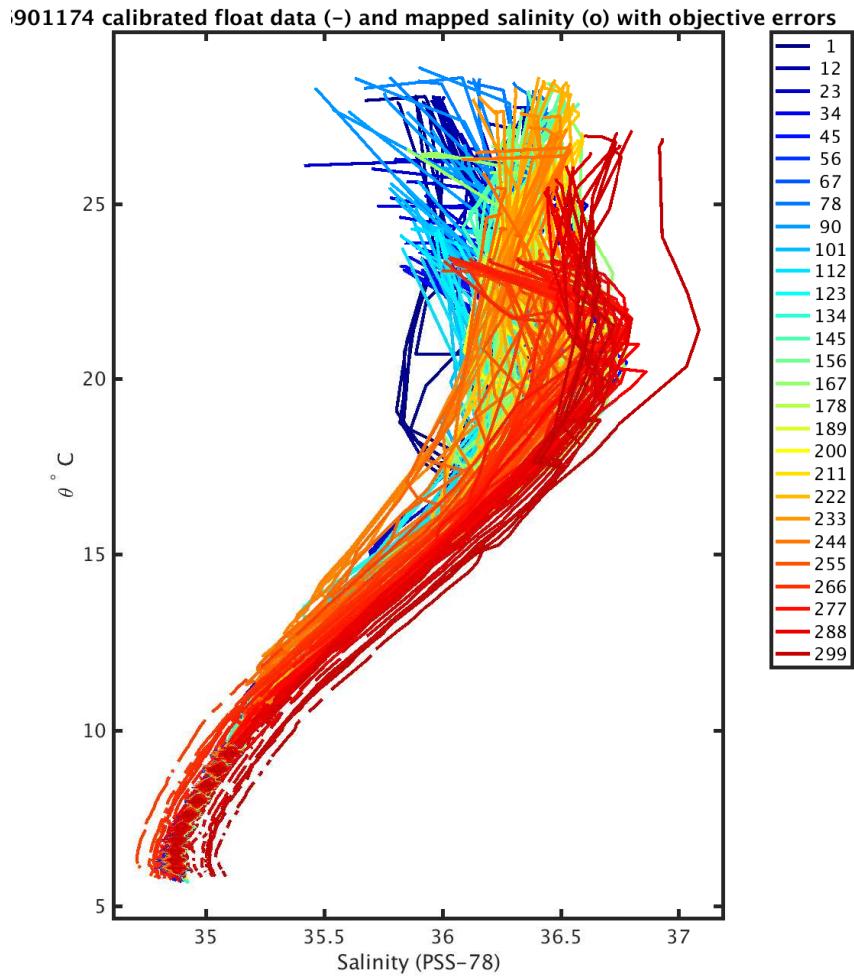


Figure 17: Float 6901174. Calibrated float data and mapped salinity.

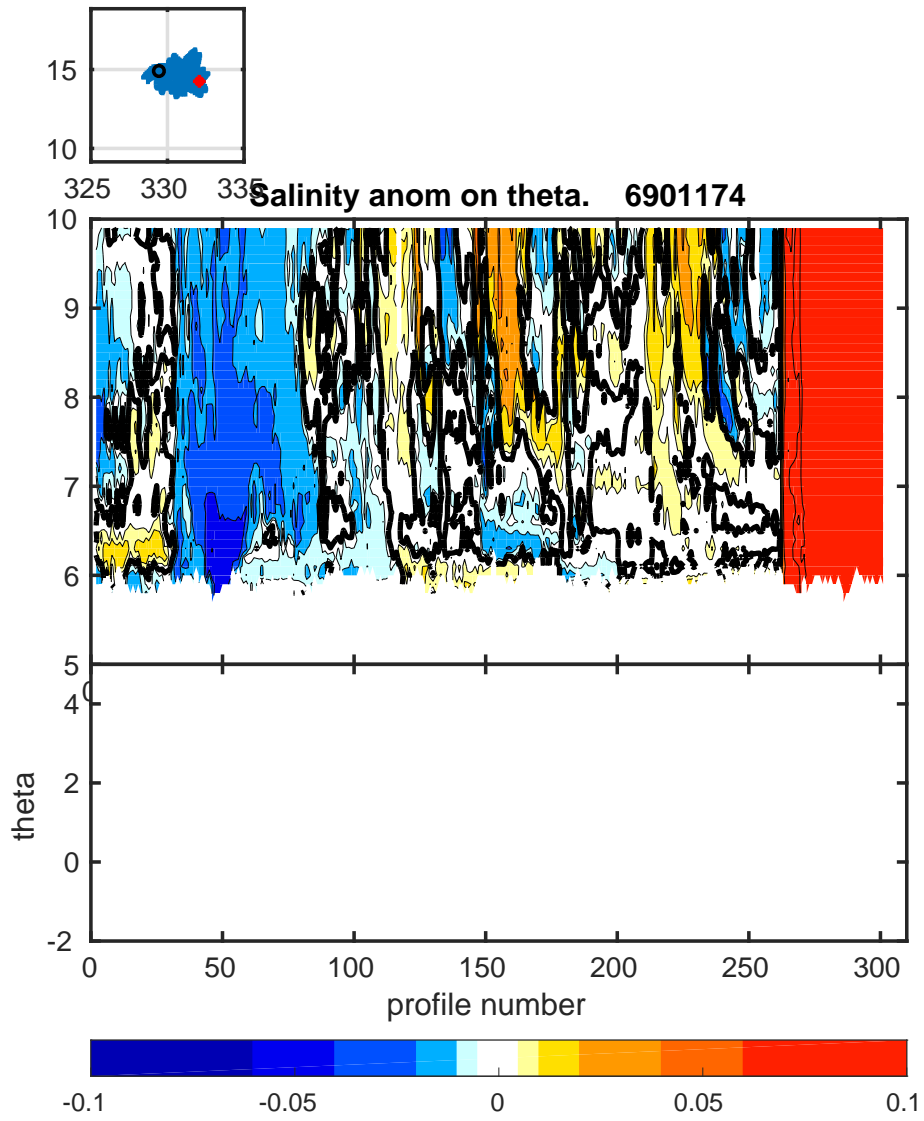


Figure 18: Float 6901174. Salinity anomaly on Theta

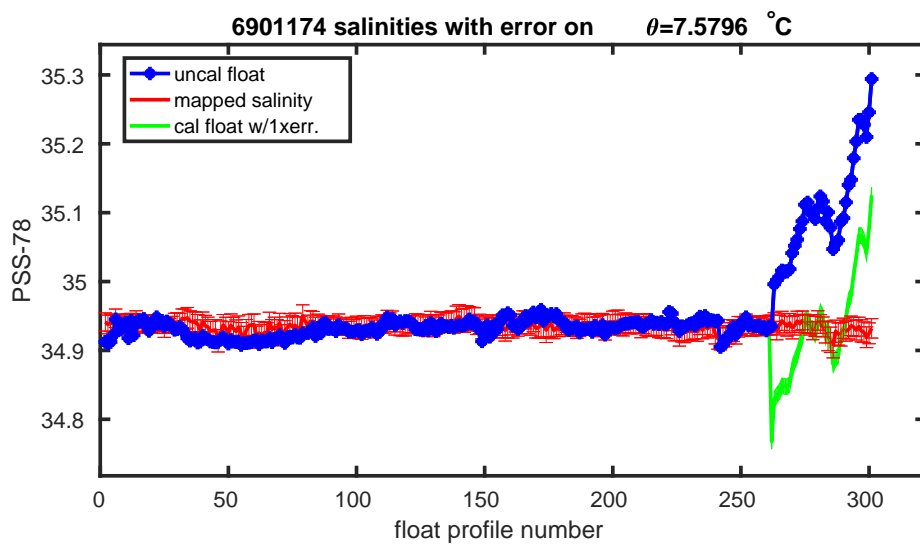
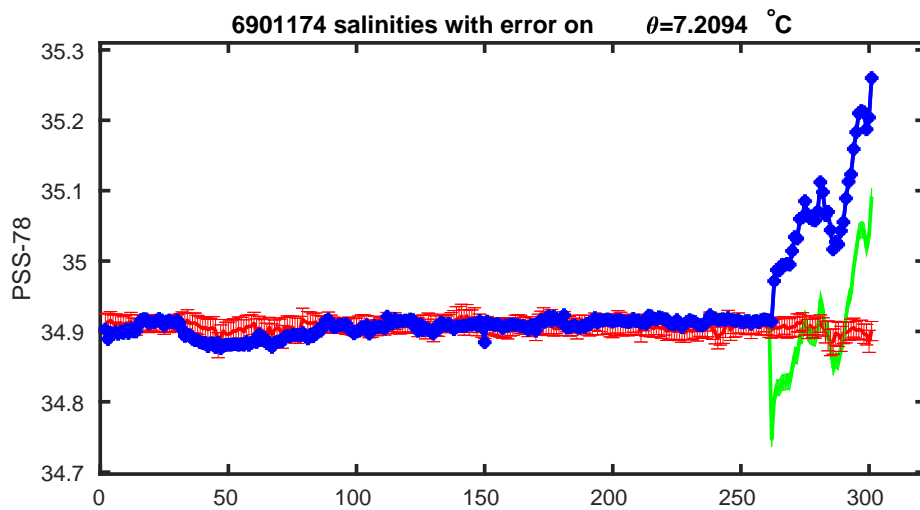


Figure 19: Float 6901174. Salinities with errors on θ .

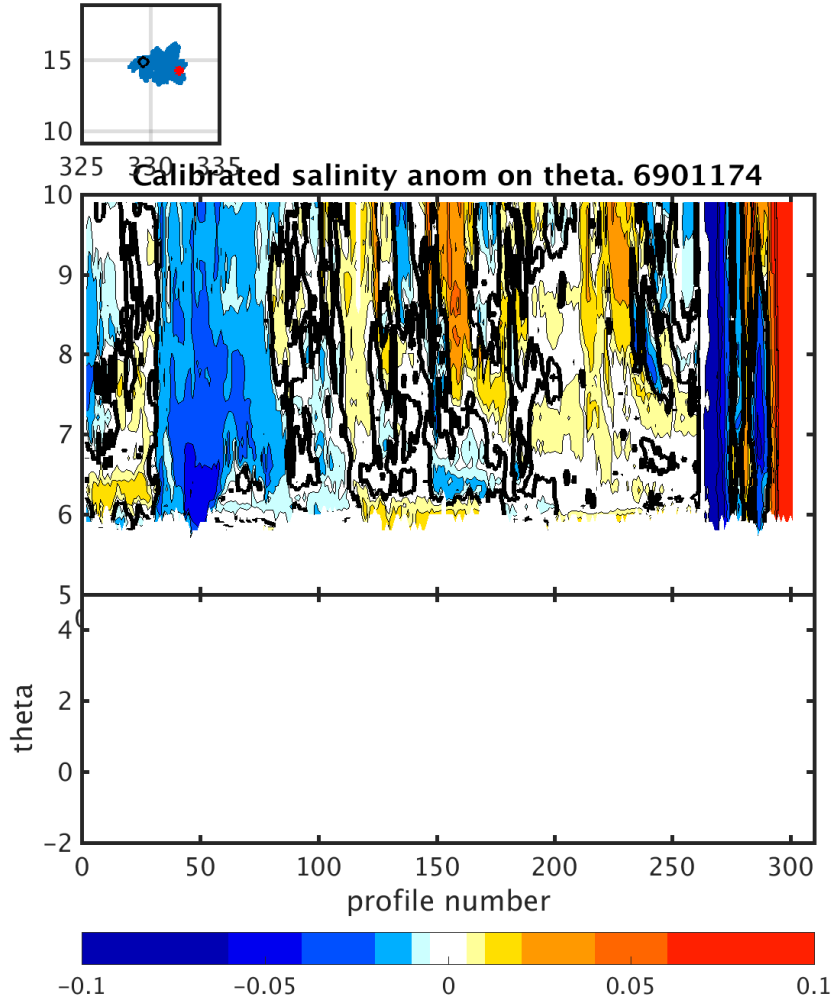


Figure 20: Float 6901174. Calibrated salinity anomaly on θ .

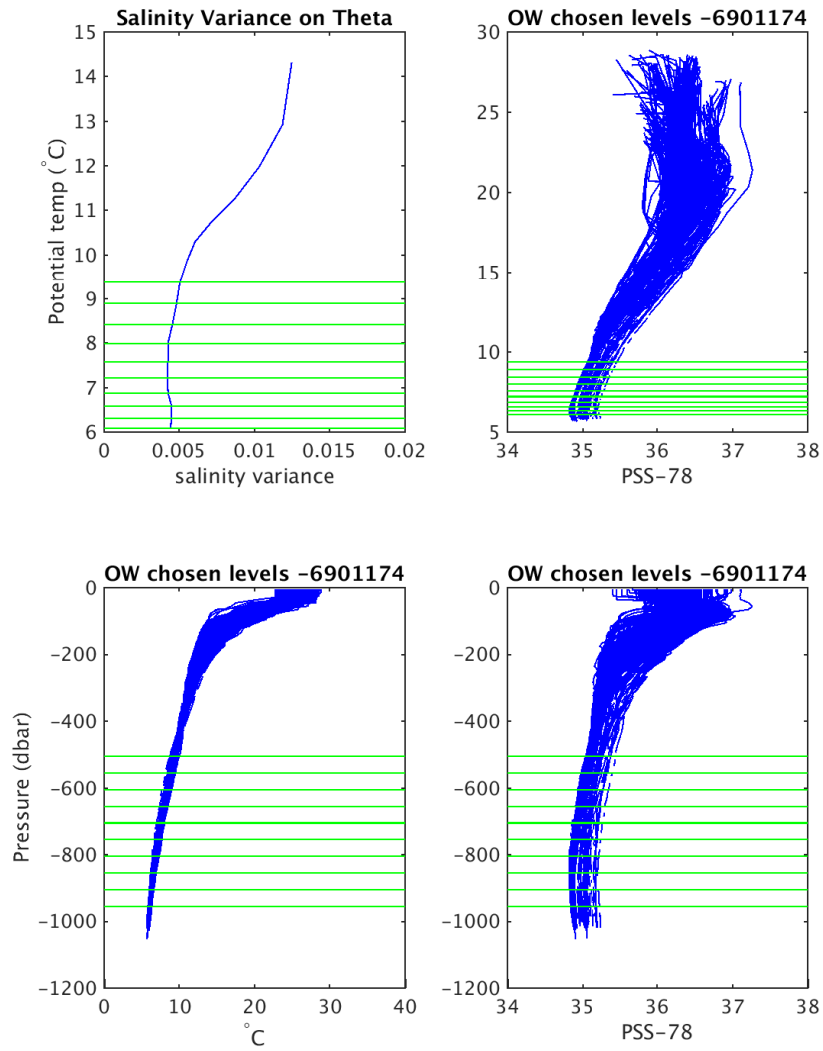


Figure 21: Float 6901174. Salinity, salinity variance on theta and OW chosen levels.

3.3 Summary and Conclusions

The configurations of the objective mapping parameters, set for float 6901174, were applied separately for CTD and Argo reference data. The chosen theta levels lie above 1000 m due to a limited number of deep Argo float cycles.

In Section 3.2.2, from cycle 1 to 260, the salinity error obtained by comparing the Argo float to reference data of both CTD and Argo data was relatively low, below 0.01. From cycle 261 there was detected drift of conductivity sensor towards higher salinities. The drift was not adjustable using the OW method. The quality rank of *PRESARJUSTEDQC* and *PRESARJUSTEDQC* and *PRESARJUSTEDQC* between cycles 261 and 341 were set as 4.

4 Final Checks

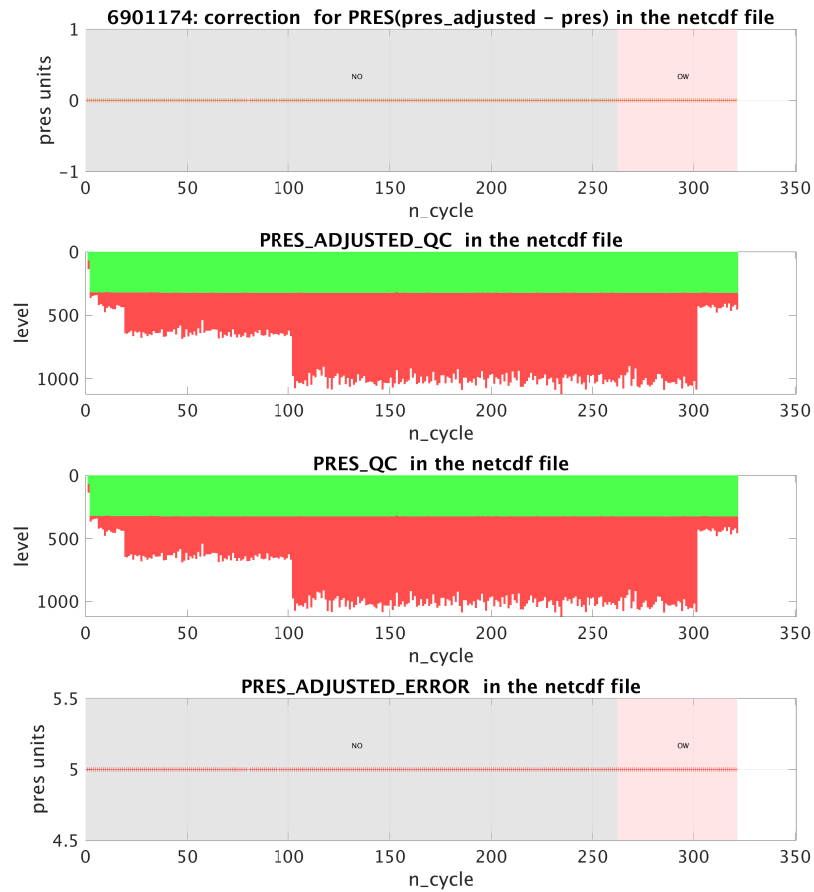


Figure 22: Float 6901174. Time series of applied pressure corrections.

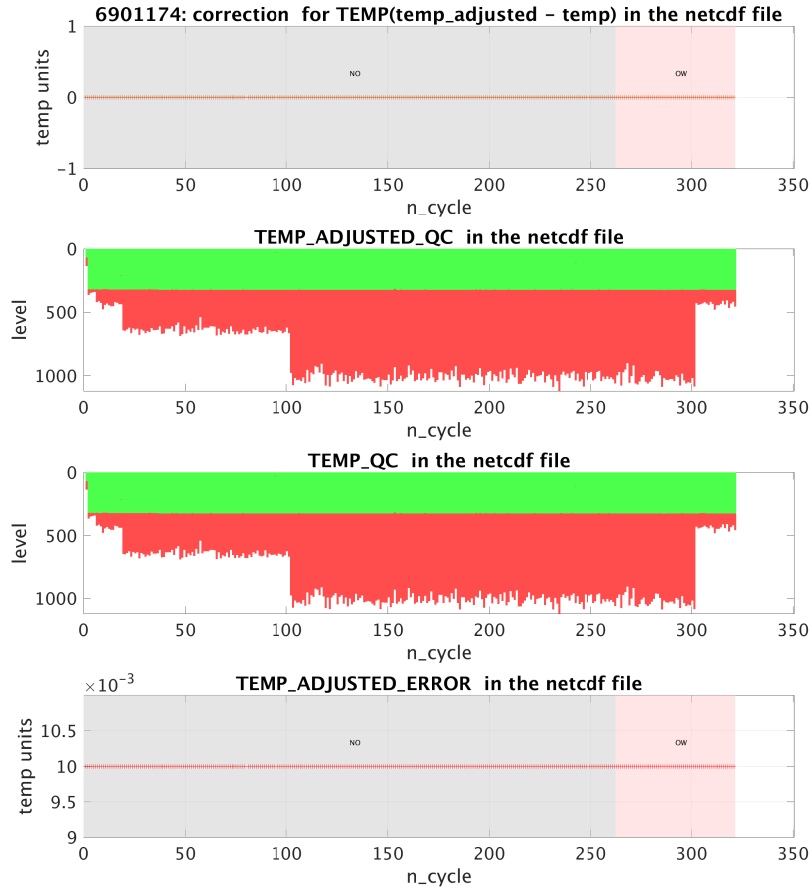


Figure 23: Float 6901174. Time series of applied temperature corrections.

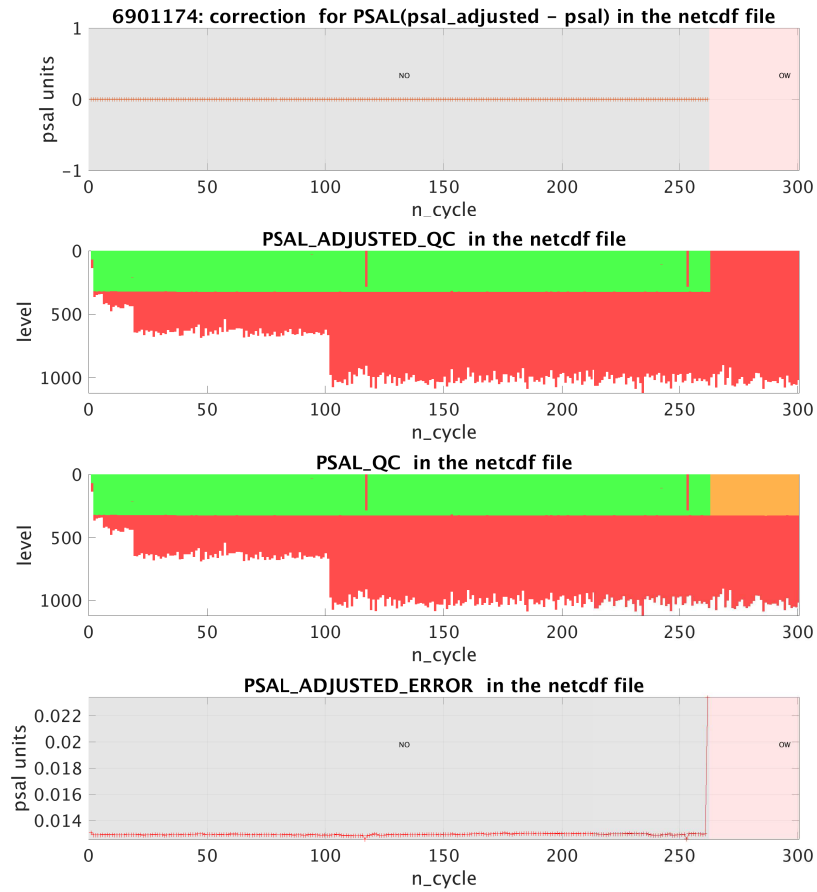


Figure 24: Float 6901174. Time series of applied salinity corrections.