

Delayed mode quality control of Argo float 3901880

Kamila Walicka

British National Data Centre (BODC), National Oceanography Centre
Joseph Proudman Building, 6, Brownlow St, Liverpool L3 5DA

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Summary

Float showed a positive drift of the salinity data. Float is drifting due to a conductivity cell 1-29, QC=1, err=0.01; 30-63 apply correction qc=2, err 0.016; 64-101- 4; gray list.

WMO number	DM correction
3901880	Drift reported

Table 1: Correction applied in delayed mode.

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1 Introduction

Delayed mode analysis was performed for float number 360021i (3901880) 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 360021i (3901880) click on the following link: <http://www.ifremer.fr/argoMonitoring/float/3901880>

2 Quality Check of Argo Float Data

2.1 Time Series of Vertical Distribution of Data

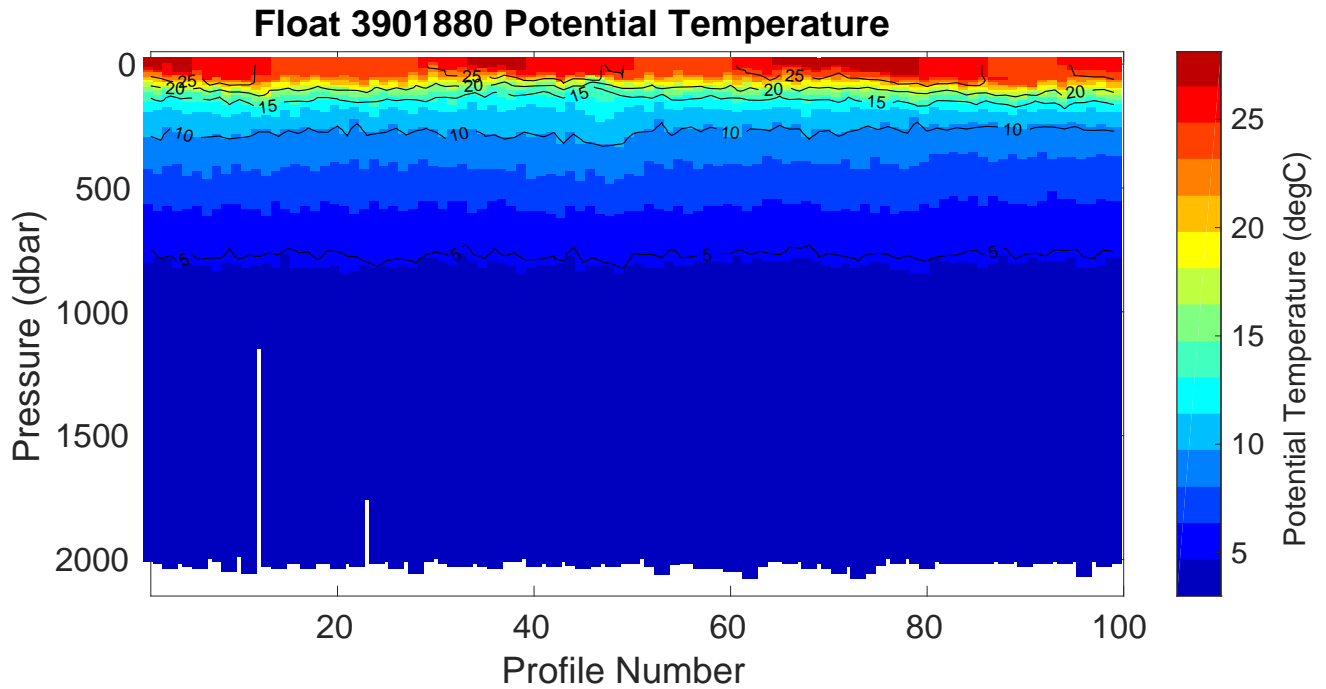


Figure 1: Float 3901880. Time series of the vertical distribution of potential temperature ($^{\circ}\text{C}$).

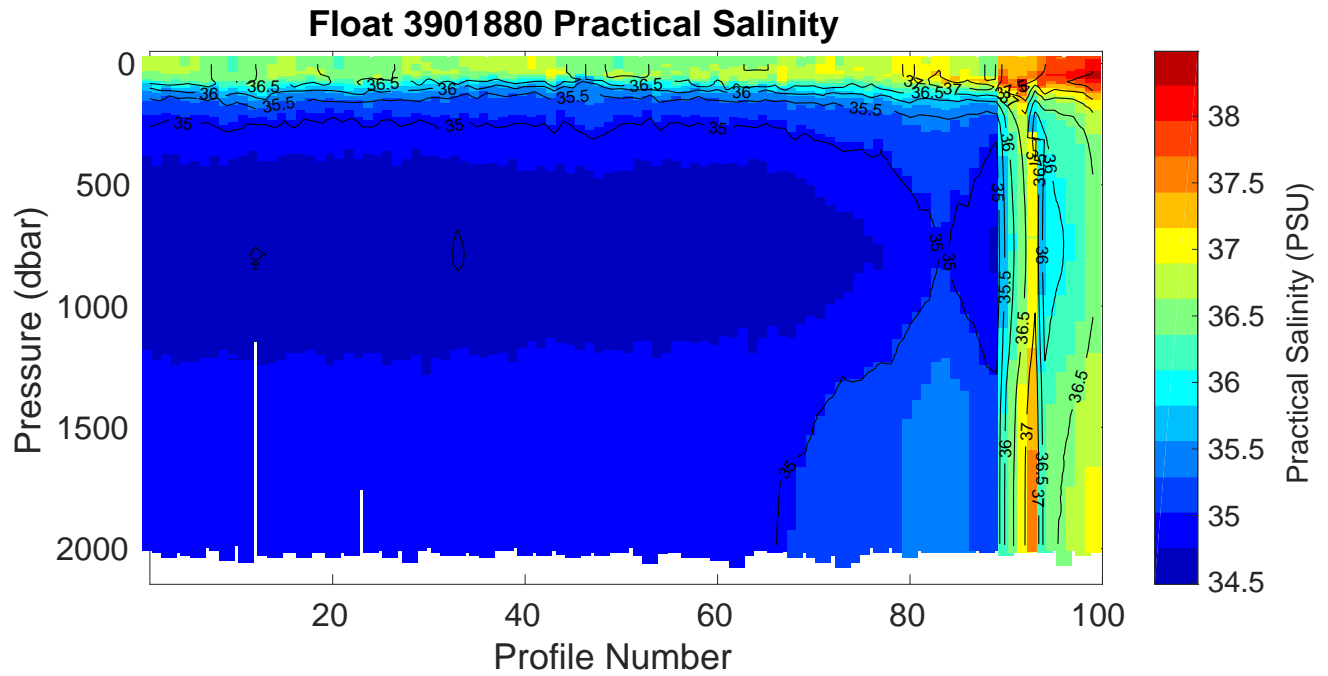


Figure 2: Float 3901880. Time series of the vertical distribution of practical salinity (PSU).

2.2 Comparison between Argo Float and Climatology

The comparison between float 3901880 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 3901880 represents relatively stable and consistent with the expected physical conditions in this region.

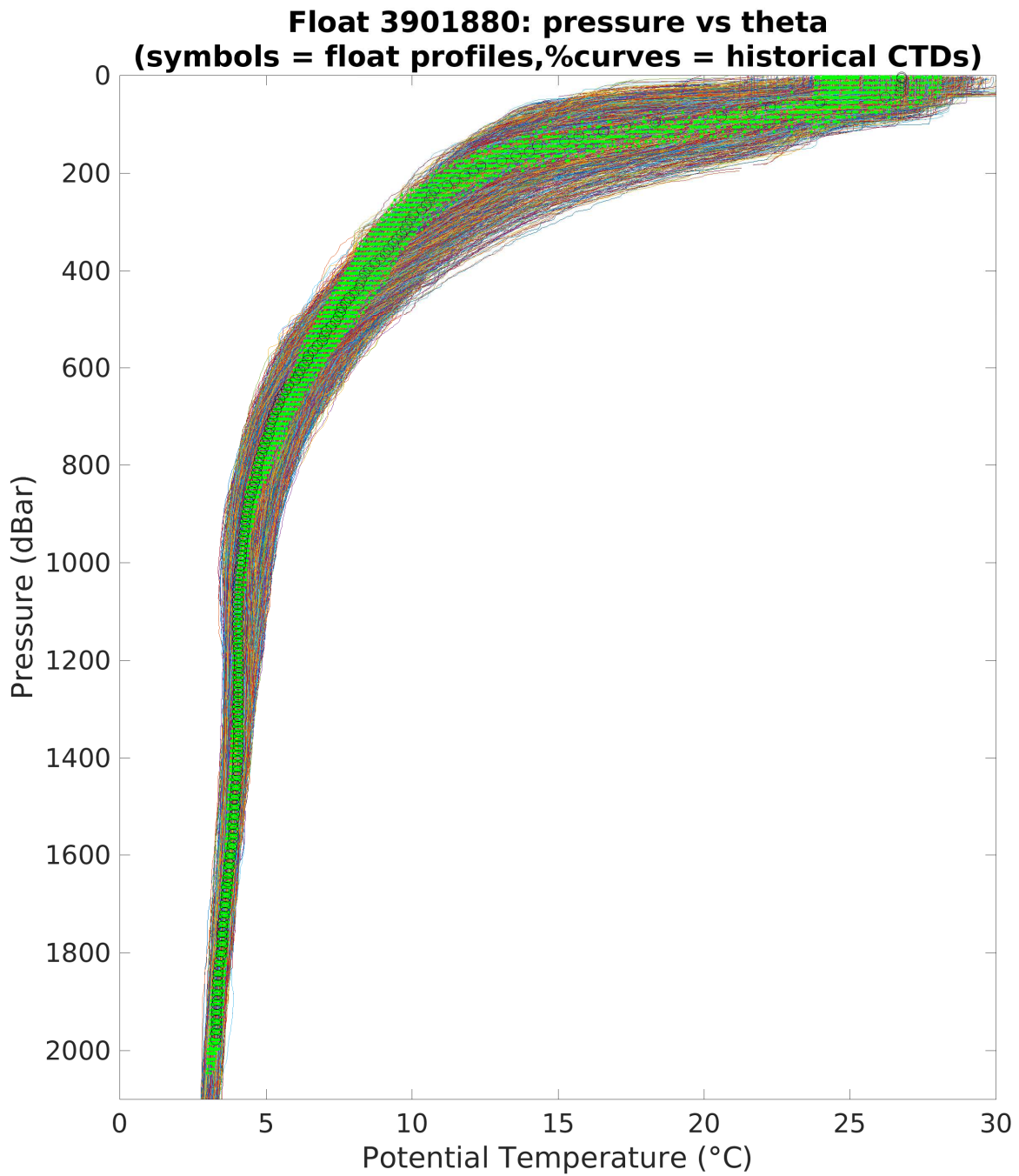


Figure 3: Float 3901880. Float profile of potential temperature (°C) plotted with climatology from the spatial range of 10 °. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

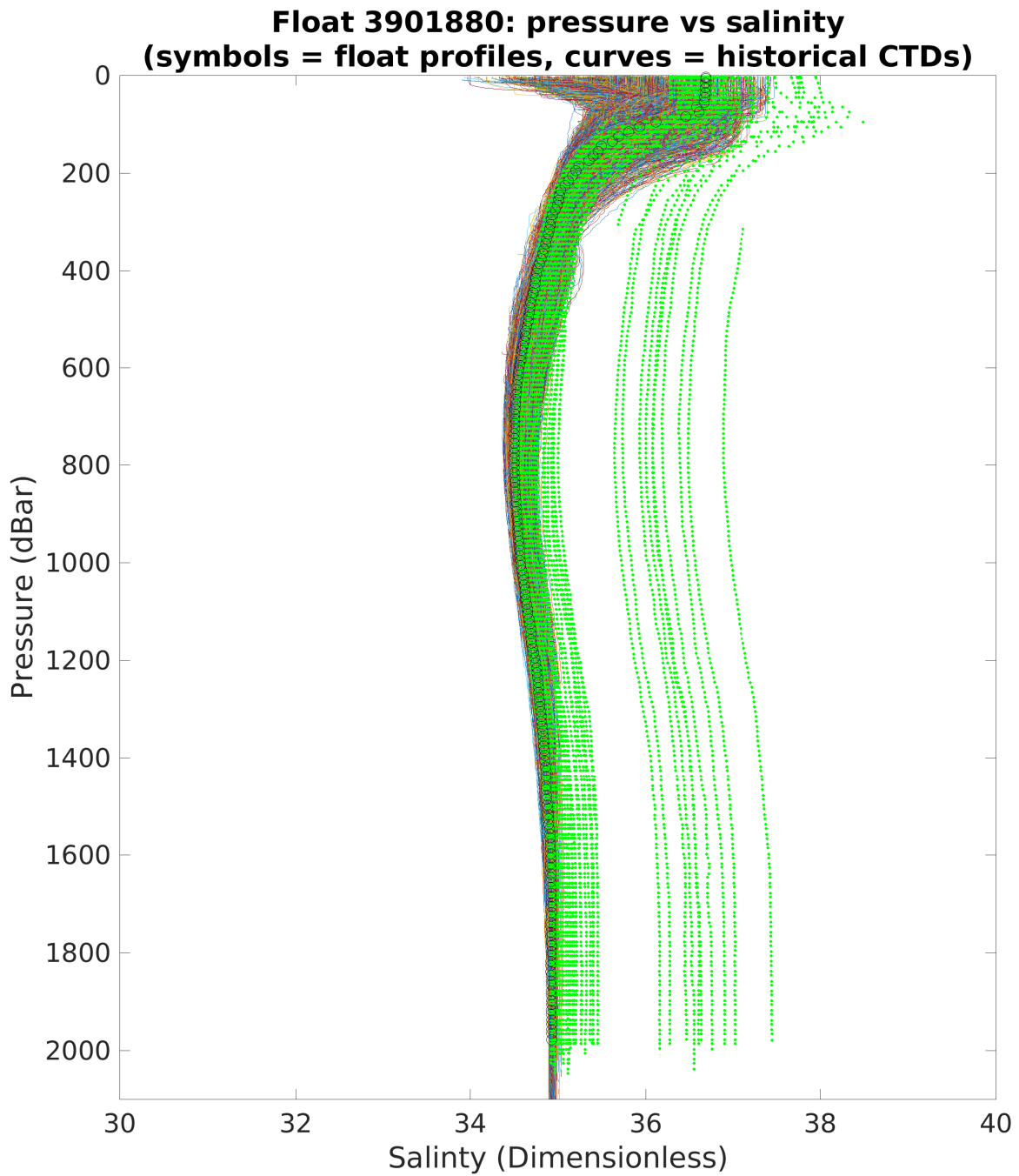


Figure 4: Float 3901880. Float profile of salinity (dimensionless) plotted with climatology from the spatial range of 10° . The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

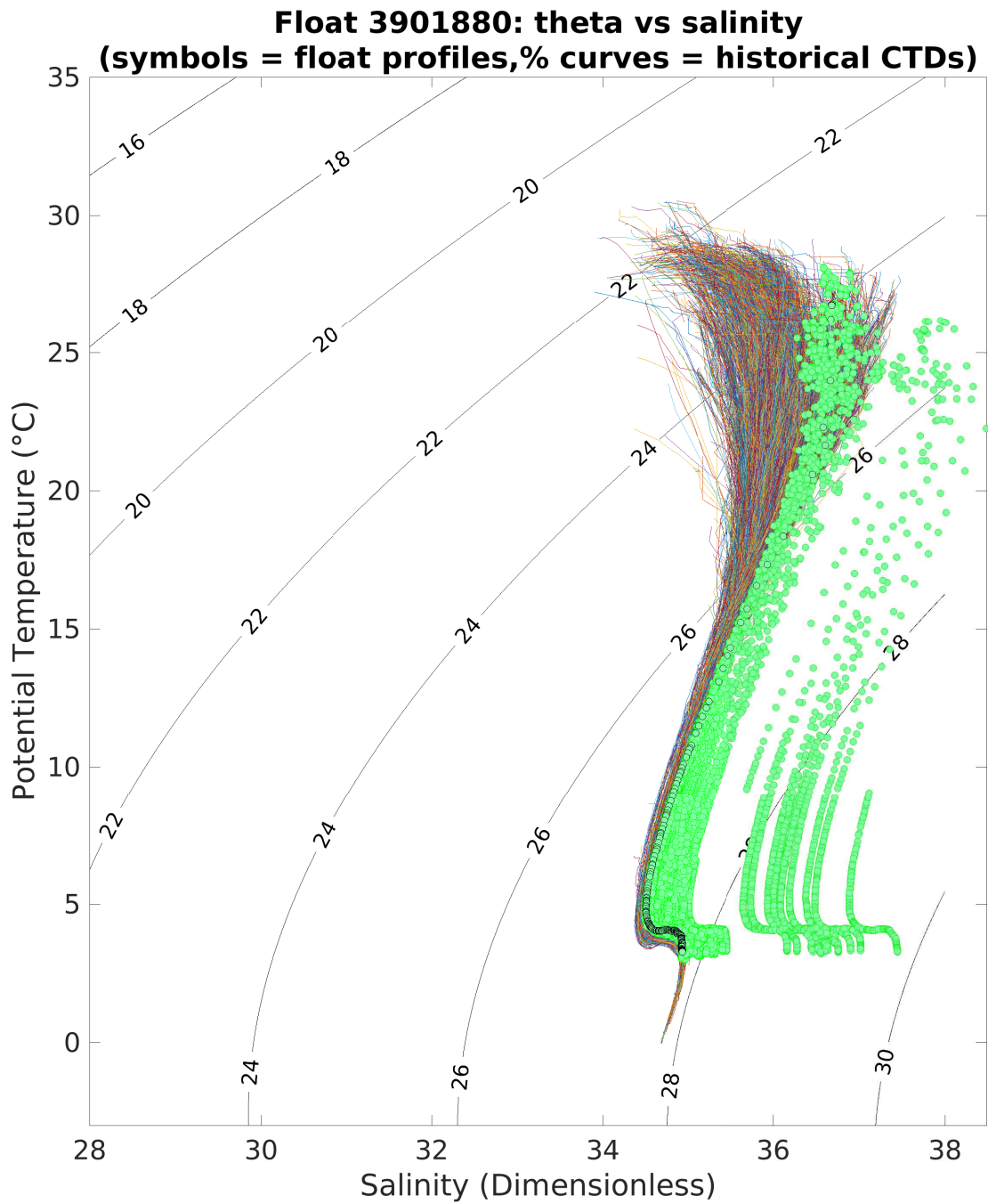


Figure 5: Float 3901880. Theta/S plotted with climatology from the spatial range of 10°. The black and blue circles indicate the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

2.3 Satellite Altimeter comparison

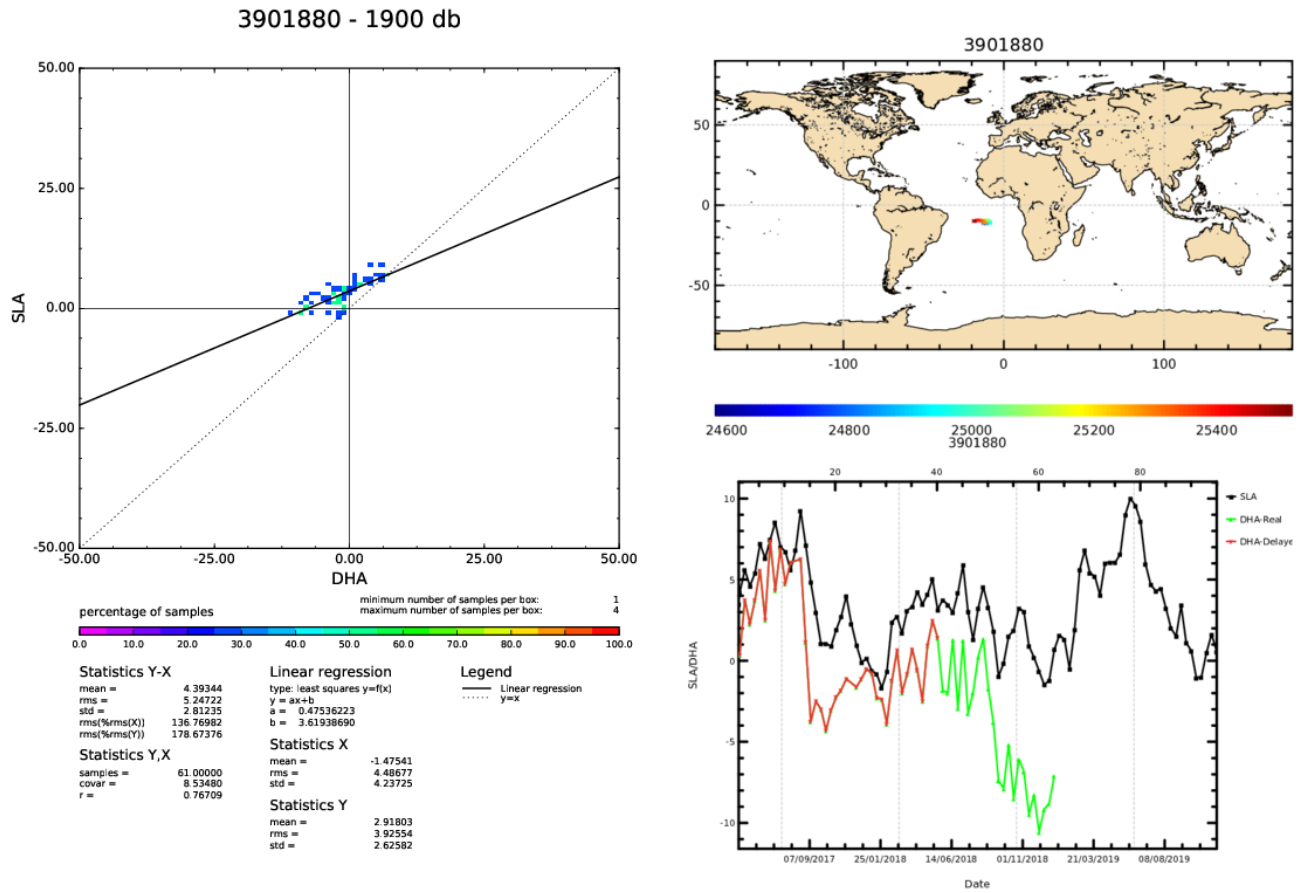


Figure 6: Float 3901880. The comparison between the Sea Surface Height (SSH) from the satellite altimetry and Dynamic Height Anomaly (DHA) extracted from the Argo float temperature and salinity data

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_2019V01/ctd_
HISTORICAL_BOTTLE_PREFIX=/historical_bot/WOD2001_v2/bot_
HISTORICAL_ARGO_PREFIX=/argo_profiles/ARGO_for_DMQC_2019V03/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

% =====
%
% max number of historical casts used in objective mapping
CONFIG_MAX_CASTS=310

% 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=1

% spatial decorrelation scales, in degrees
MAPSCALE_LONGITUDE_LARGE=6
MAPSCALE_LONGITUDE_SMALL=3
MAPSCALE_LATITUDE_LARGE=4
MAPSCALE_LATITUDE_SMALL=2

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

% temporal decorrelation scale, in years
MAPSCALE_AGE=5
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=200
```


3.1.2 Results

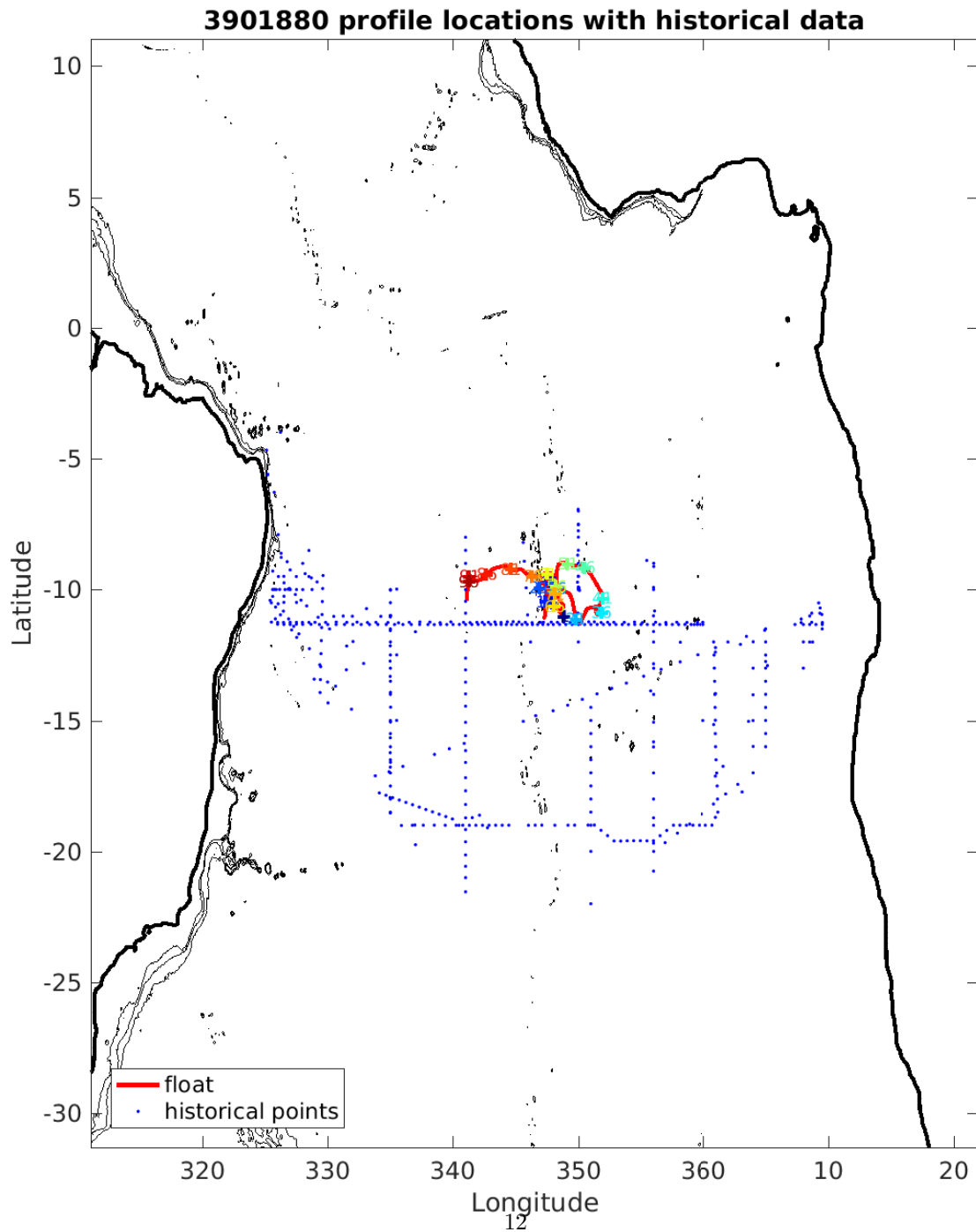


Figure 7: Float 3901880. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

3901880 uncalibrated float data (-) and mapped salinity (o) with objective errors

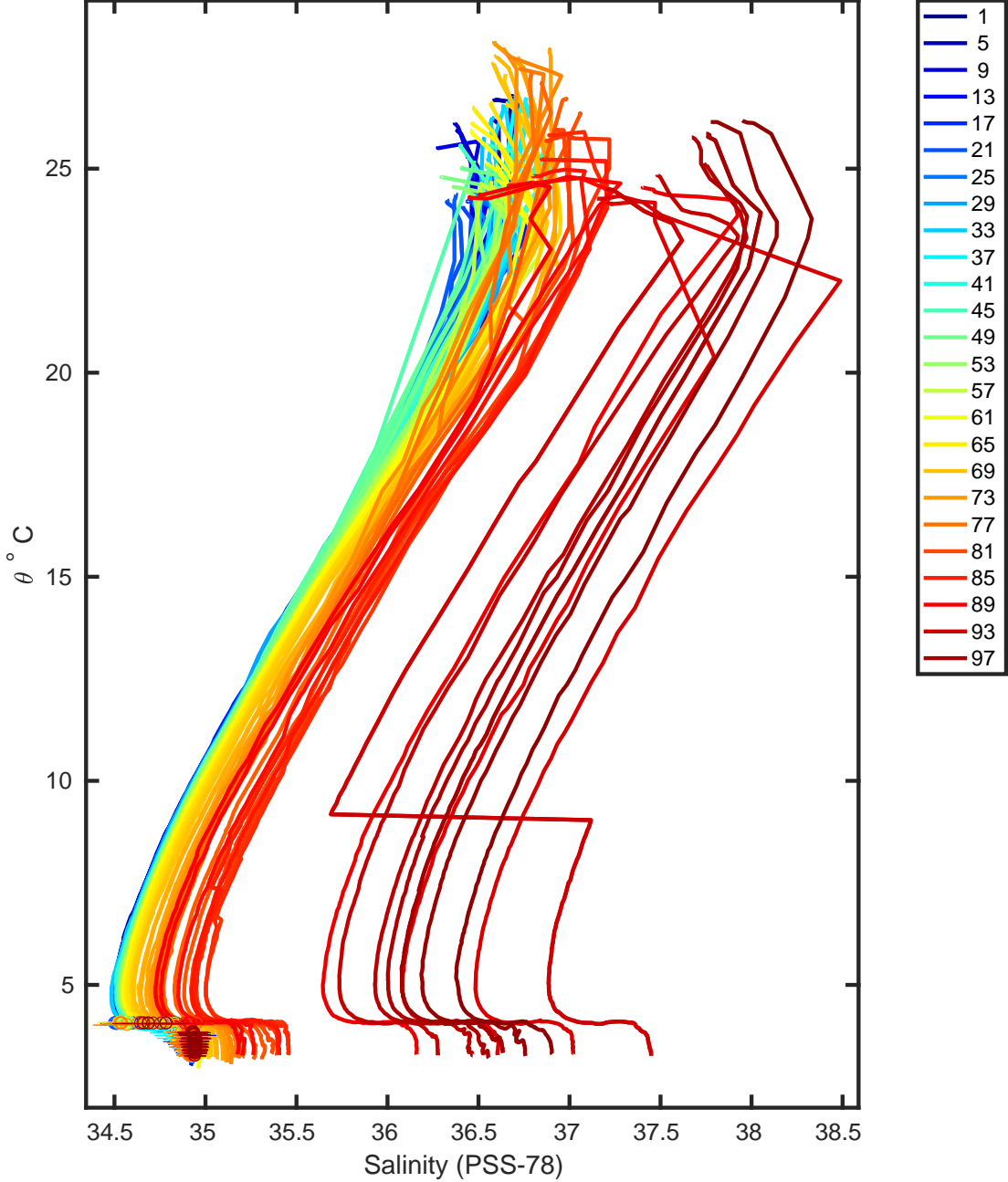
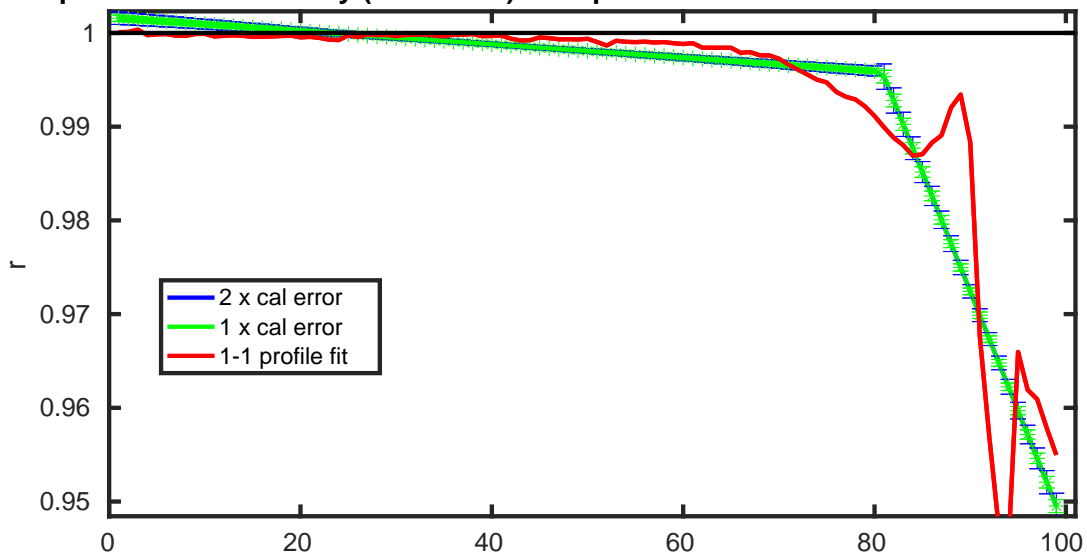


Figure 8: Float 3901880. Uncalibrated float data and mapped salinity.

3901880 potential conductivity (mmho/cm) multiplicative correction r with errors



3901880 vertically-averaged salinity (PSS-78) additive correction

ΔS with errors

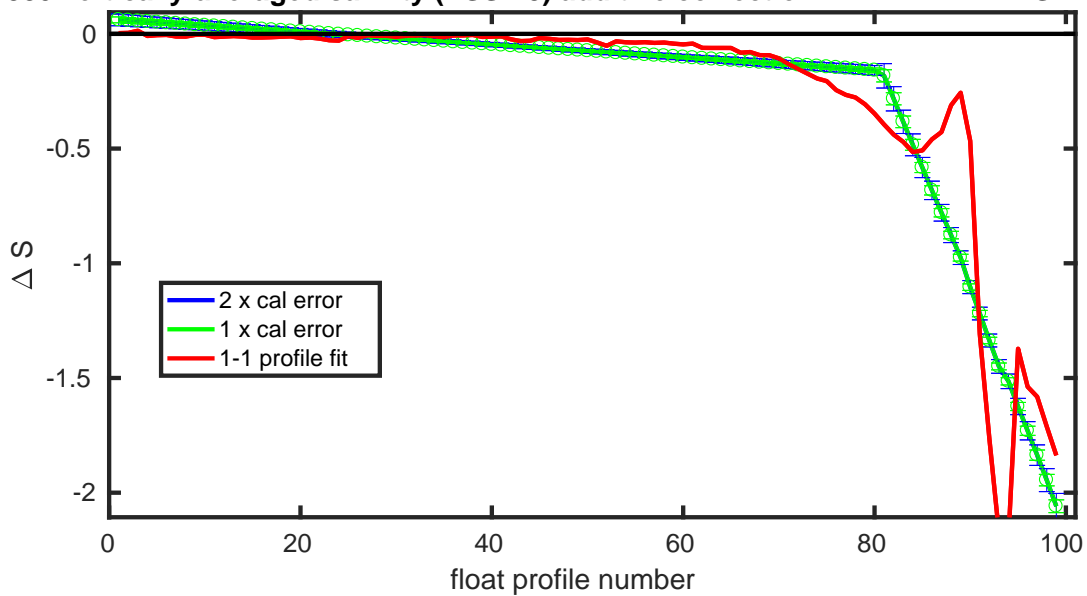


Figure 9: Float 3901880. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

3901880 calibrated float data (-) and mapped salinity (o) with objective errors

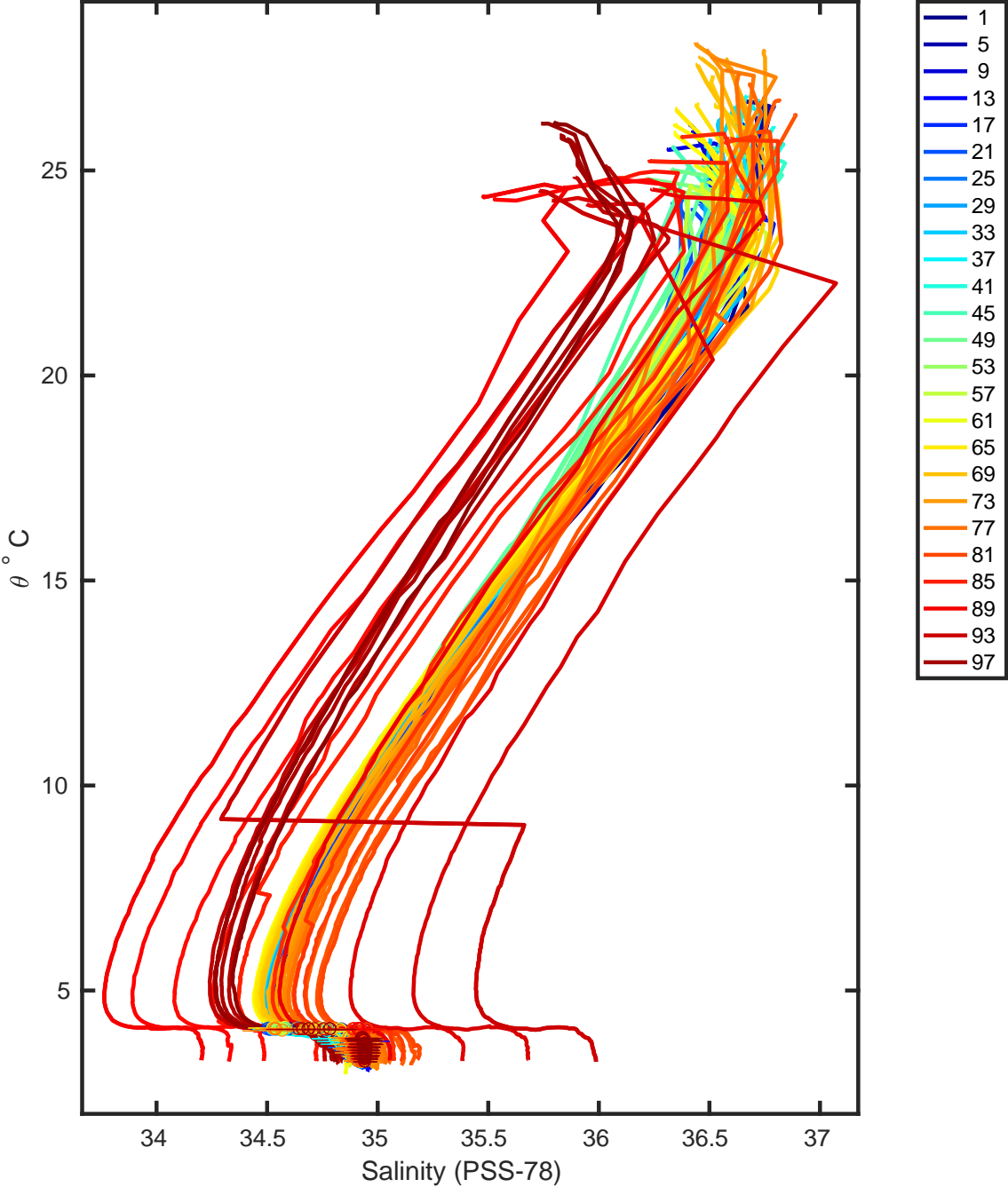


Figure 10: Float 3901880. Calibrated float data and mapped salinity.

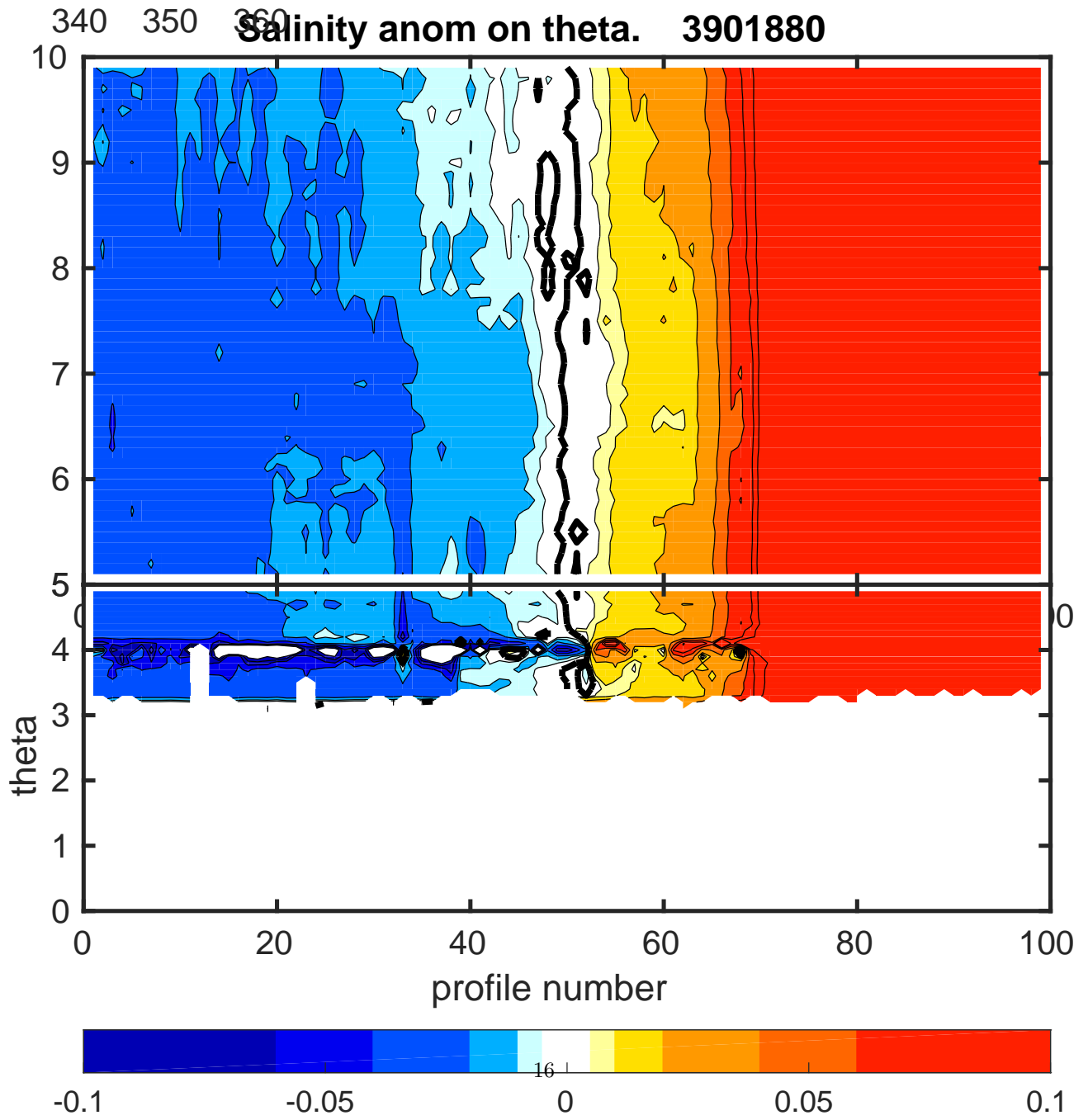
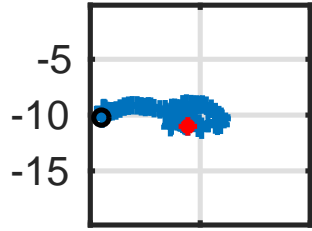


Figure 11: Float 3901880. Salinity anomaly on θ levels.

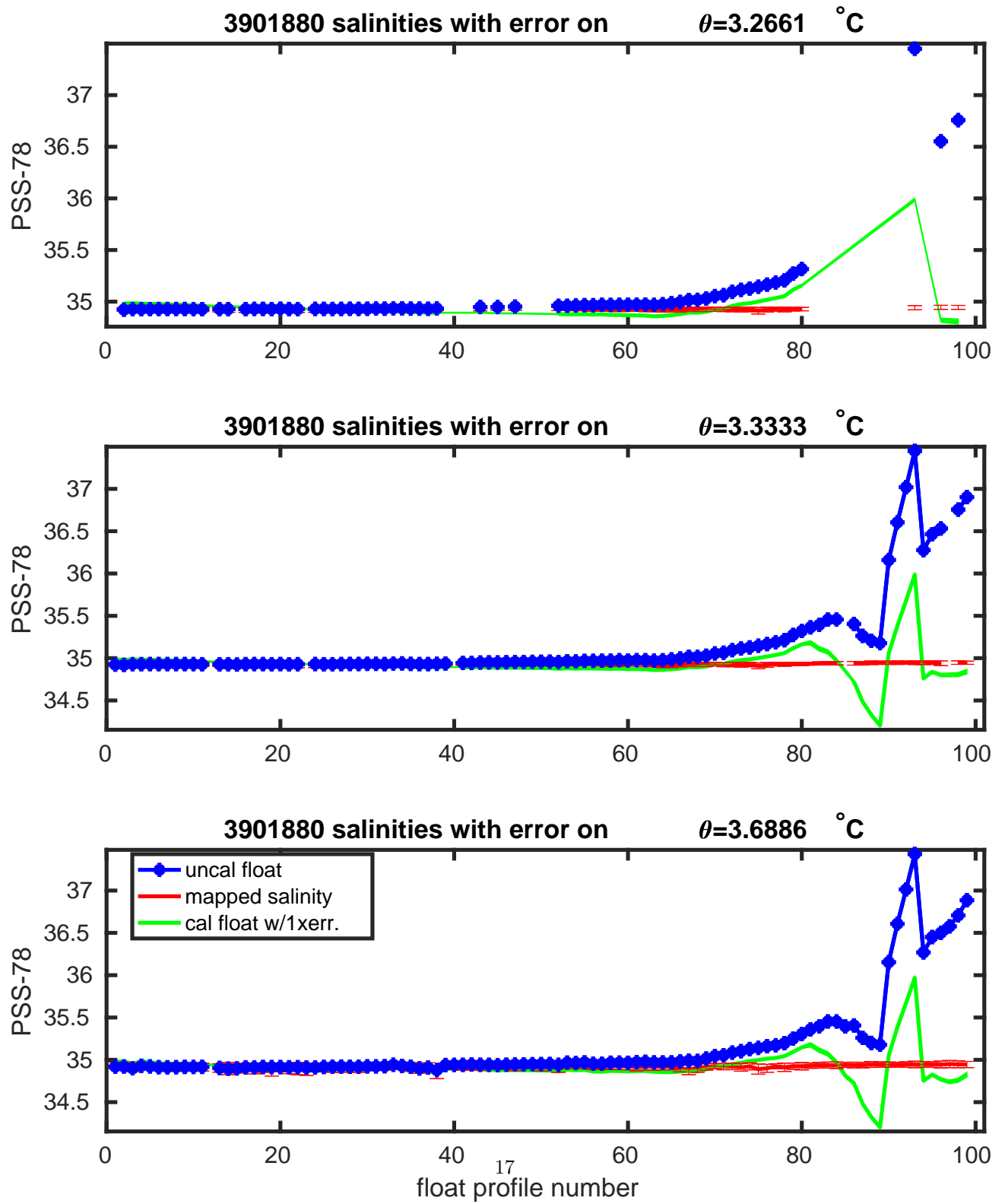


Figure 12: Float 3901880. Salinities with errors on θ levels.

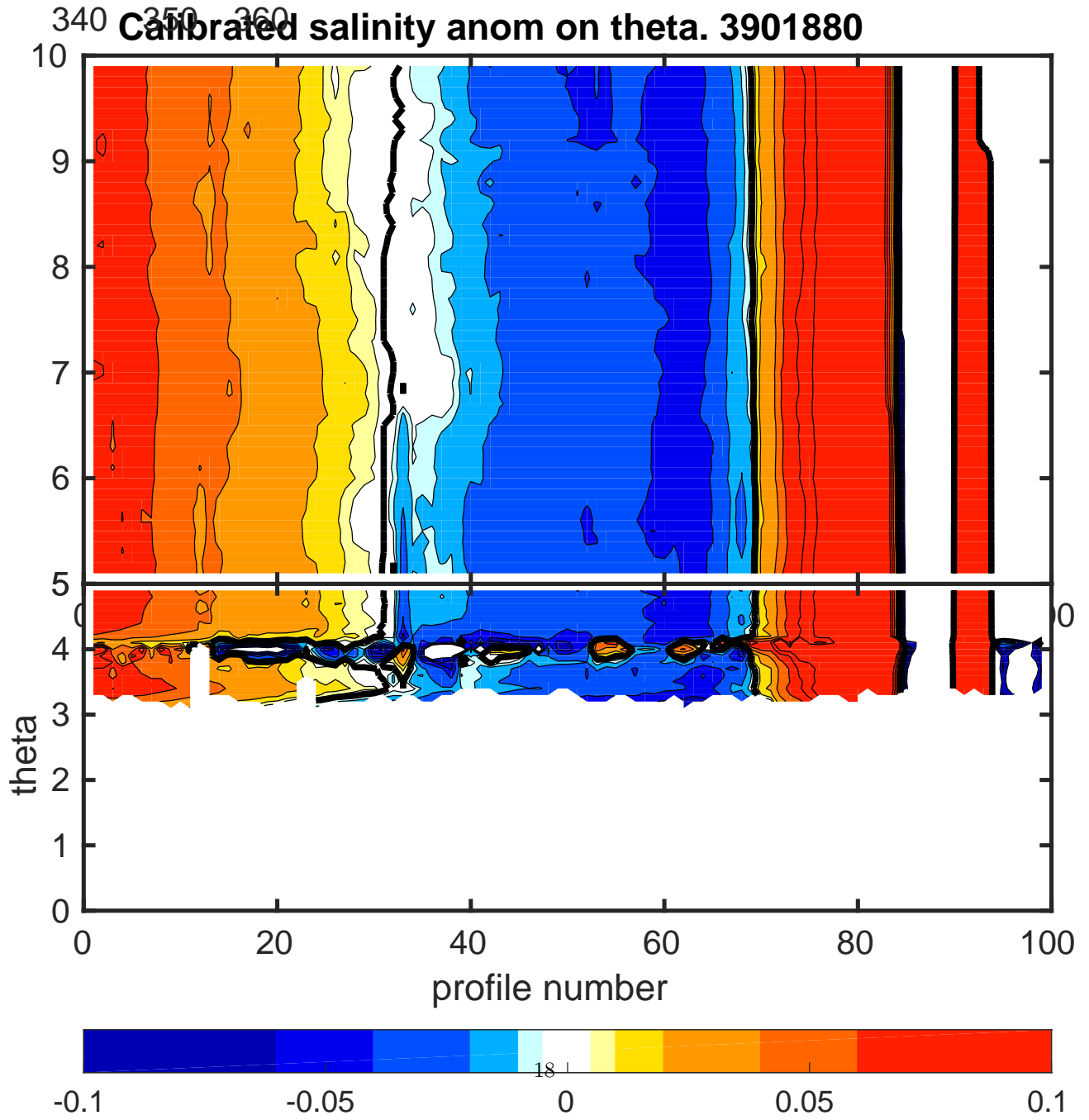
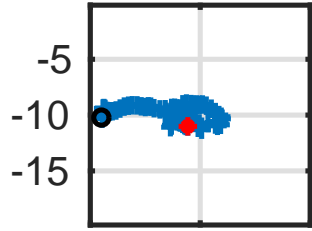


Figure 13: Float 3901880. Calibrated salinity anomaly on θ levels.

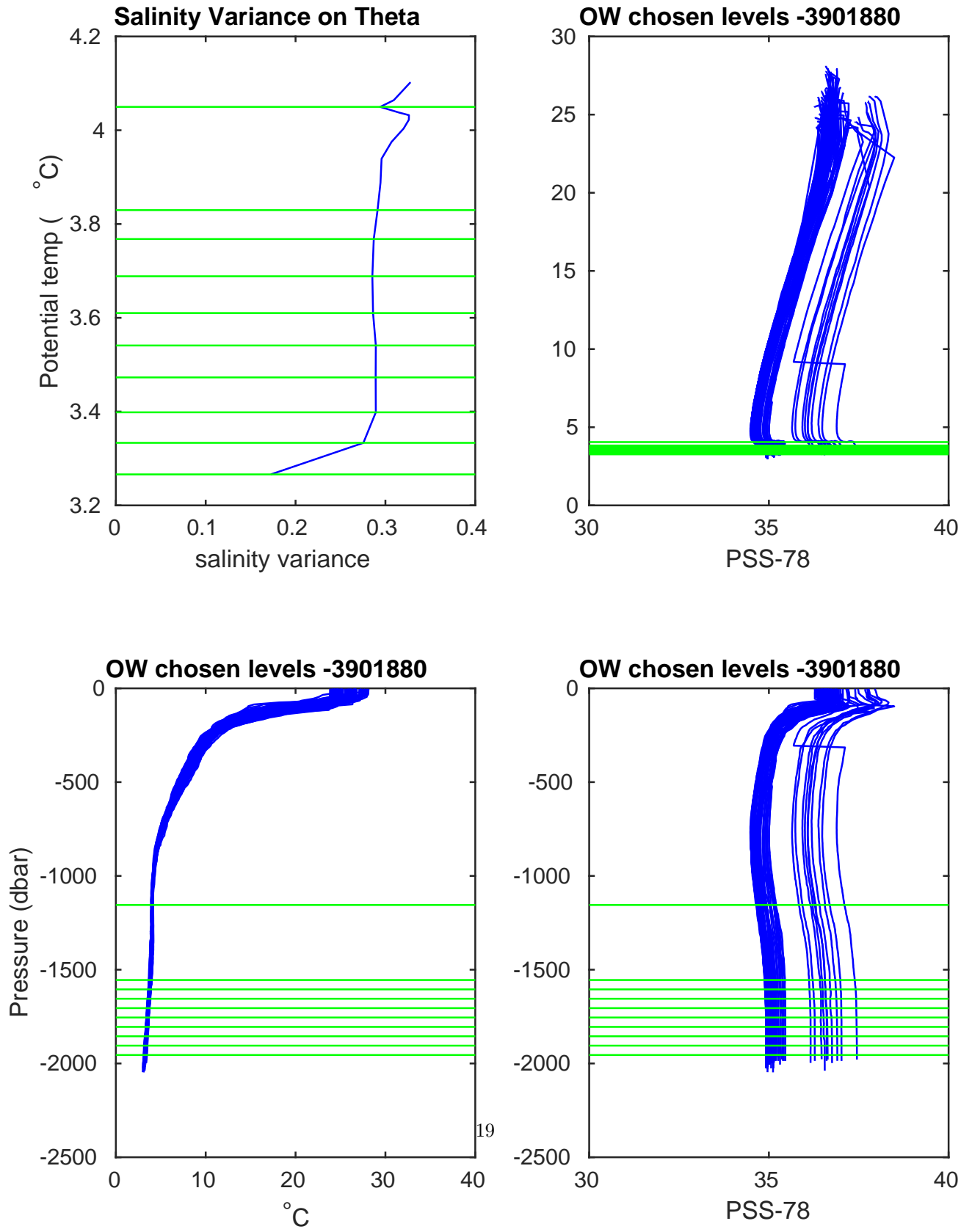


Figure 14: Float 3901880. Salinity, salinity variance on theta and OW chosen levels.

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_2019V01/ctd_  
HISTORICAL_BOTTLE_PREFIX=/historical_bot/bot_  
HISTORICAL_ARGO_PREFIX=/argo_profiles/ARGO_for_DMQC_2019V03/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=310

% 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=1

% spatial decorrelation scales, in degrees
MAPSCALE_LONGITUDE_LARGE=6
MAPSCALE_LONGITUDE_SMALL=3
MAPSCALE_LATITUDE_LARGE=4
MAPSCALE_LATITUDE_SMALL=2

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

% temporal decorrelation scale, in years
MAPSCALE_AGE=5
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=200

```


3.2.2 Results

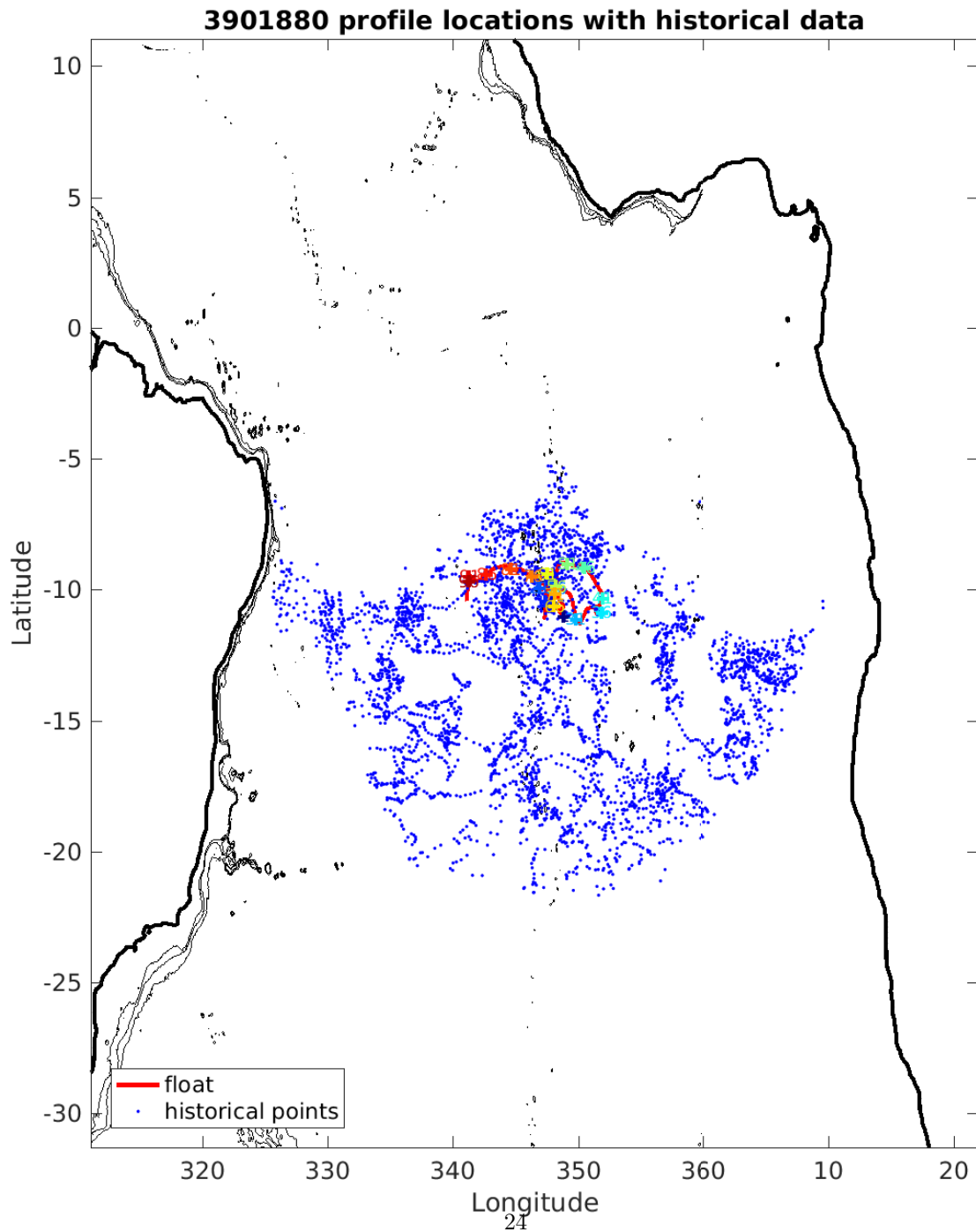


Figure 15: Float 3901880. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

3901880 uncalibrated float data (-) and mapped salinity (o) with objective errors

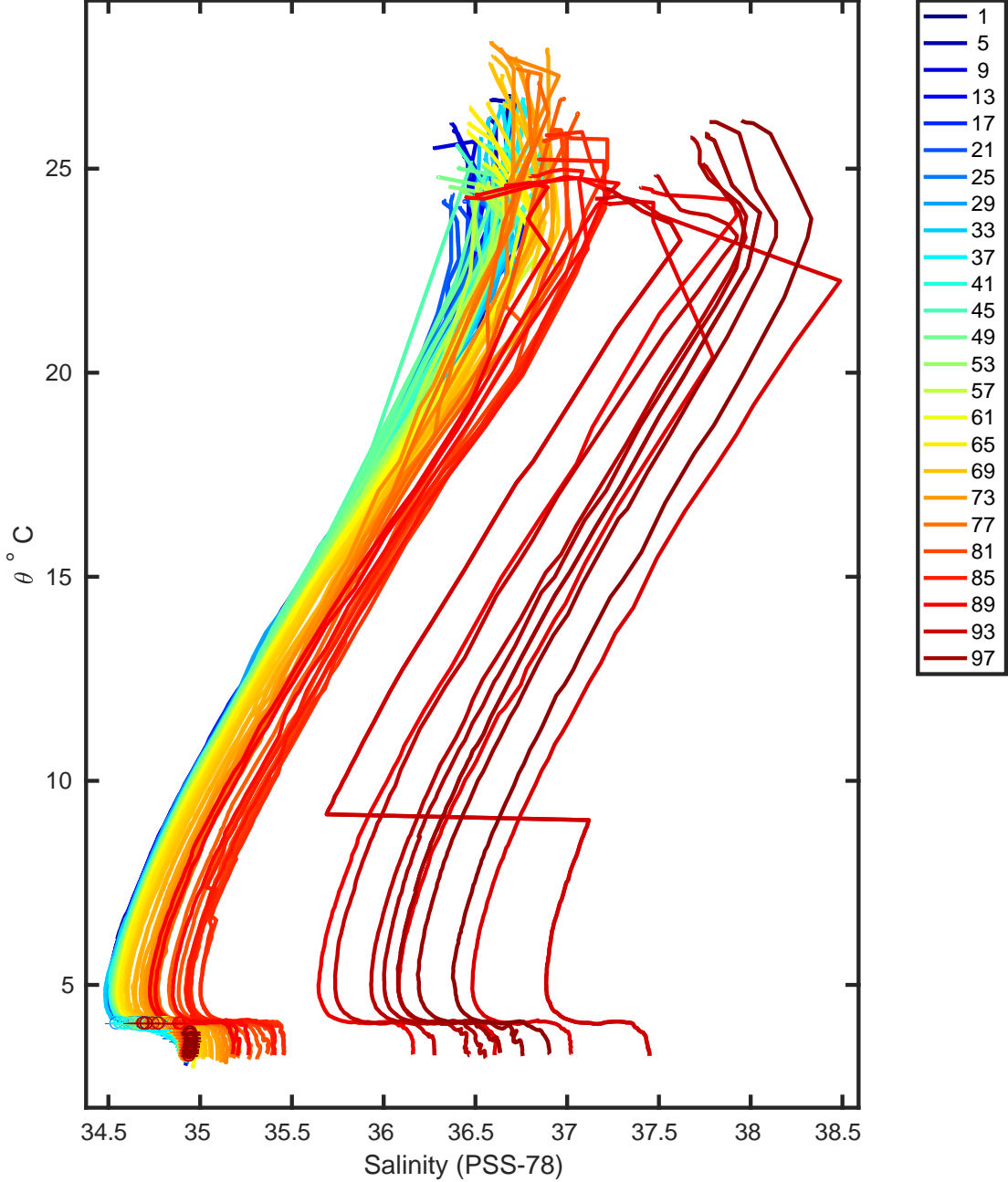
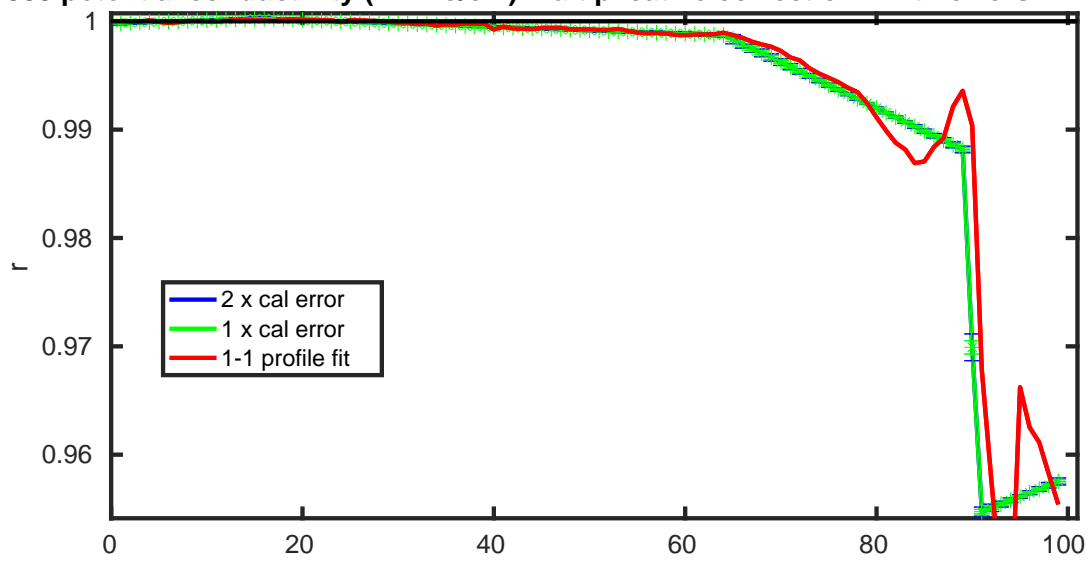


Figure 16: Float 3901880. Uncalibrated float data and mapped salinity.

3901880 potential conductivity (mmho/cm) multiplicative correction r with errors



3901880 vertically-averaged salinity (PSS-78) additive correction ΔS with errors

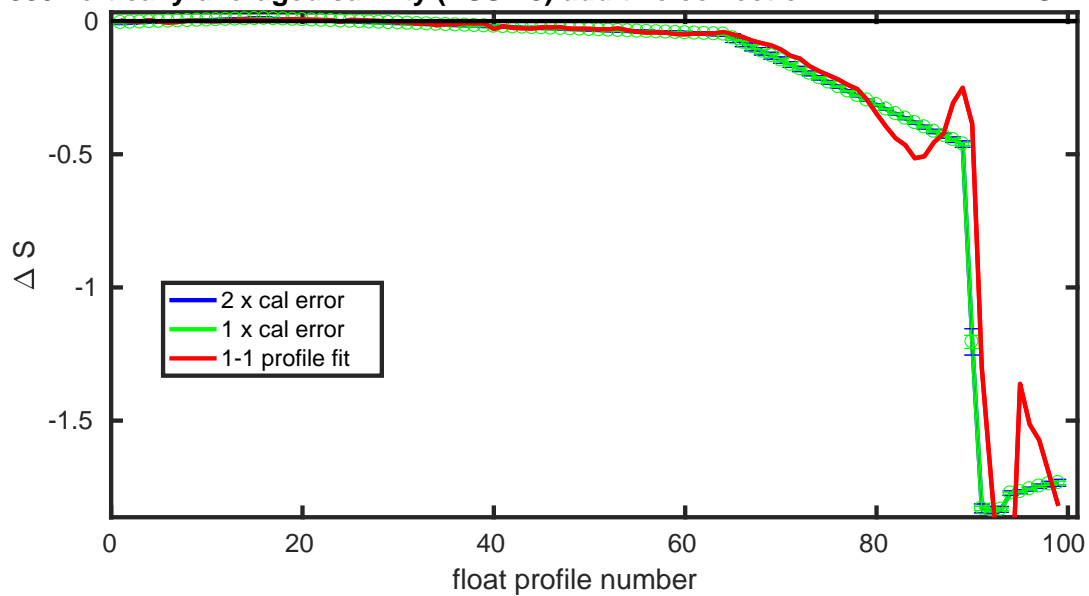


Figure 17: Float 3901880. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

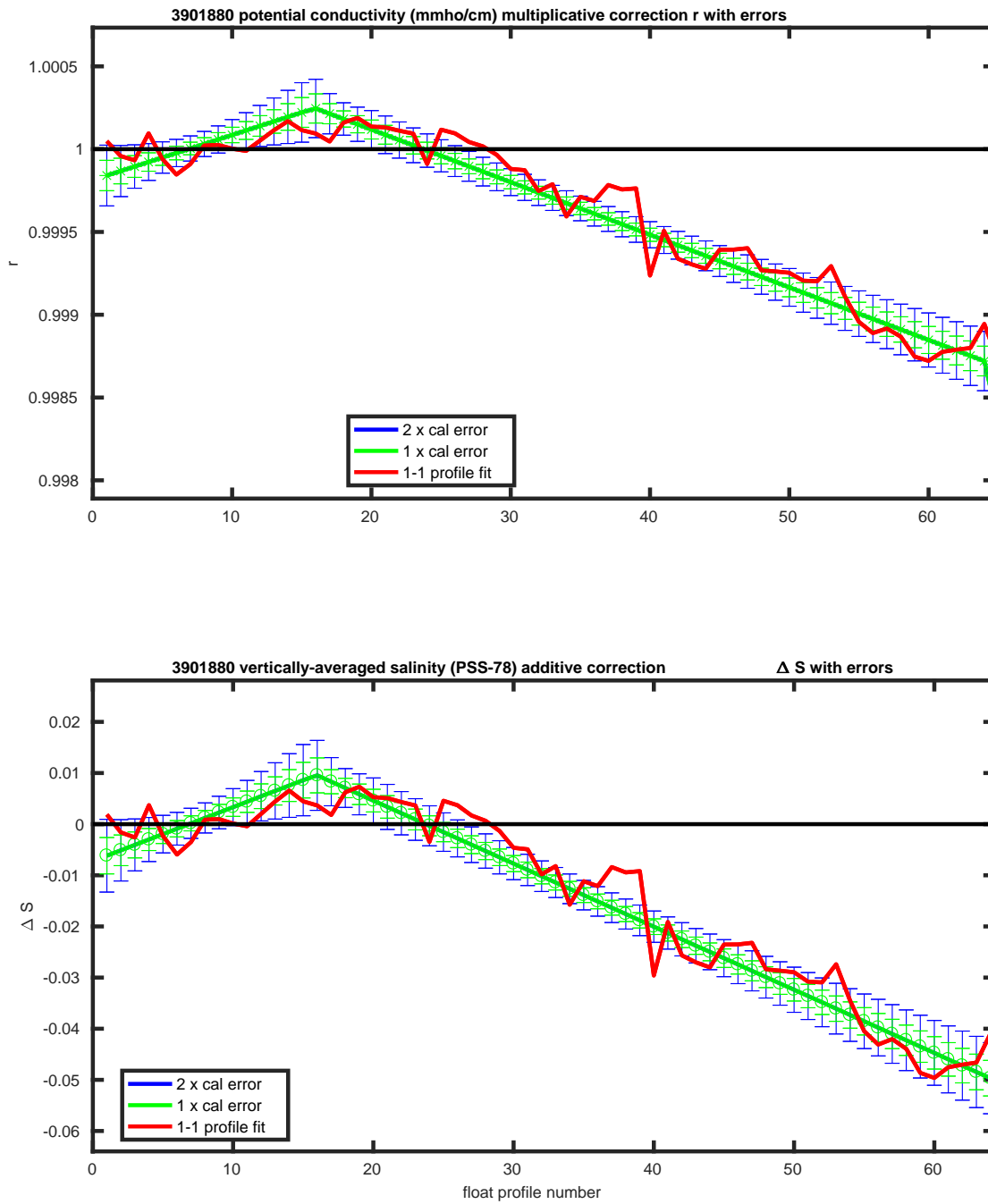


Figure 18: Float 3901880. Potential conductivity (top) and vertically averaged salinity (bottom) with errors with a changed size of axis

3901880 calibrated float data (-) and mapped salinity (o) with objective errors

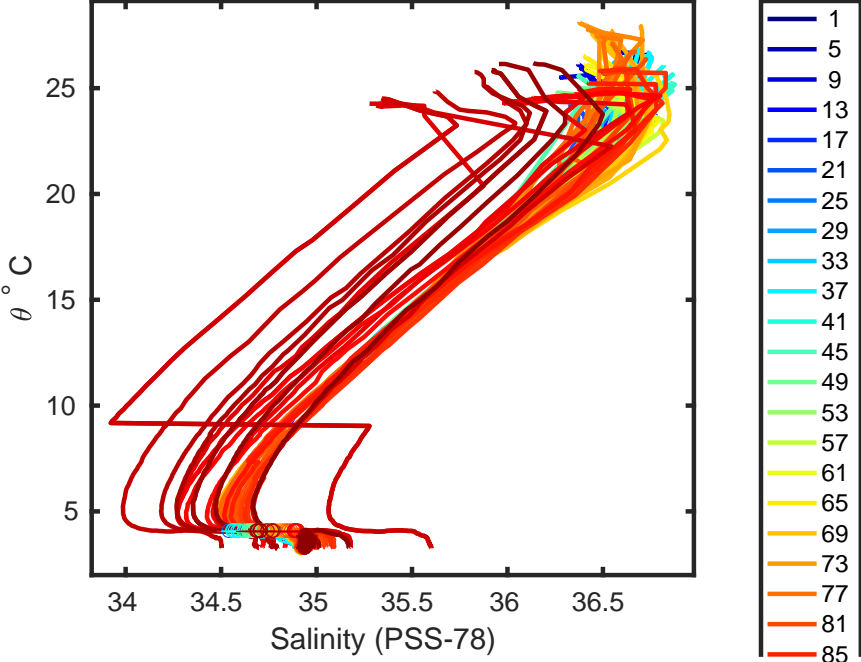


Figure 19: Float 3901880. Calibrated float data and mapped salinity.

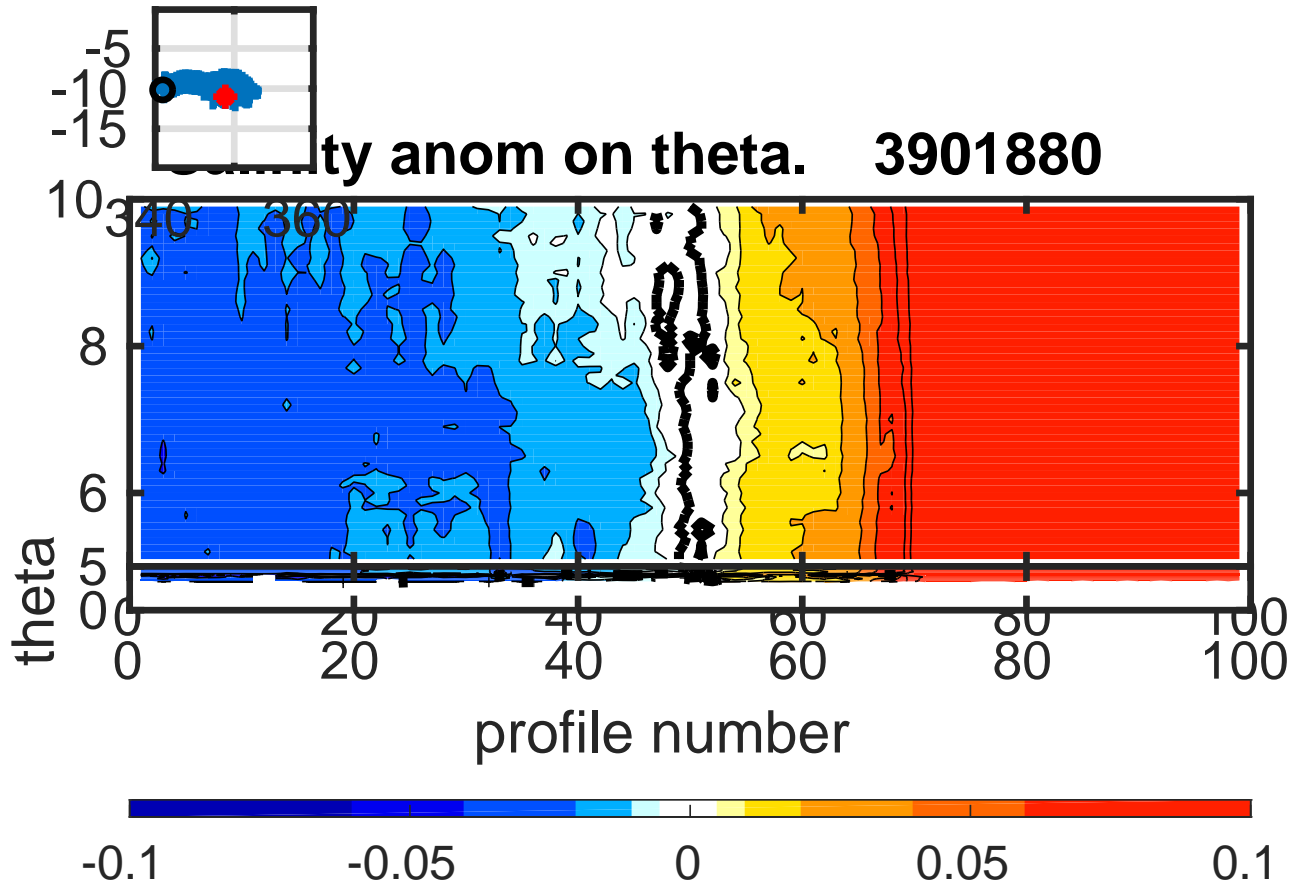


Figure 20: Float 3901880. Salinity anomaly on Theta

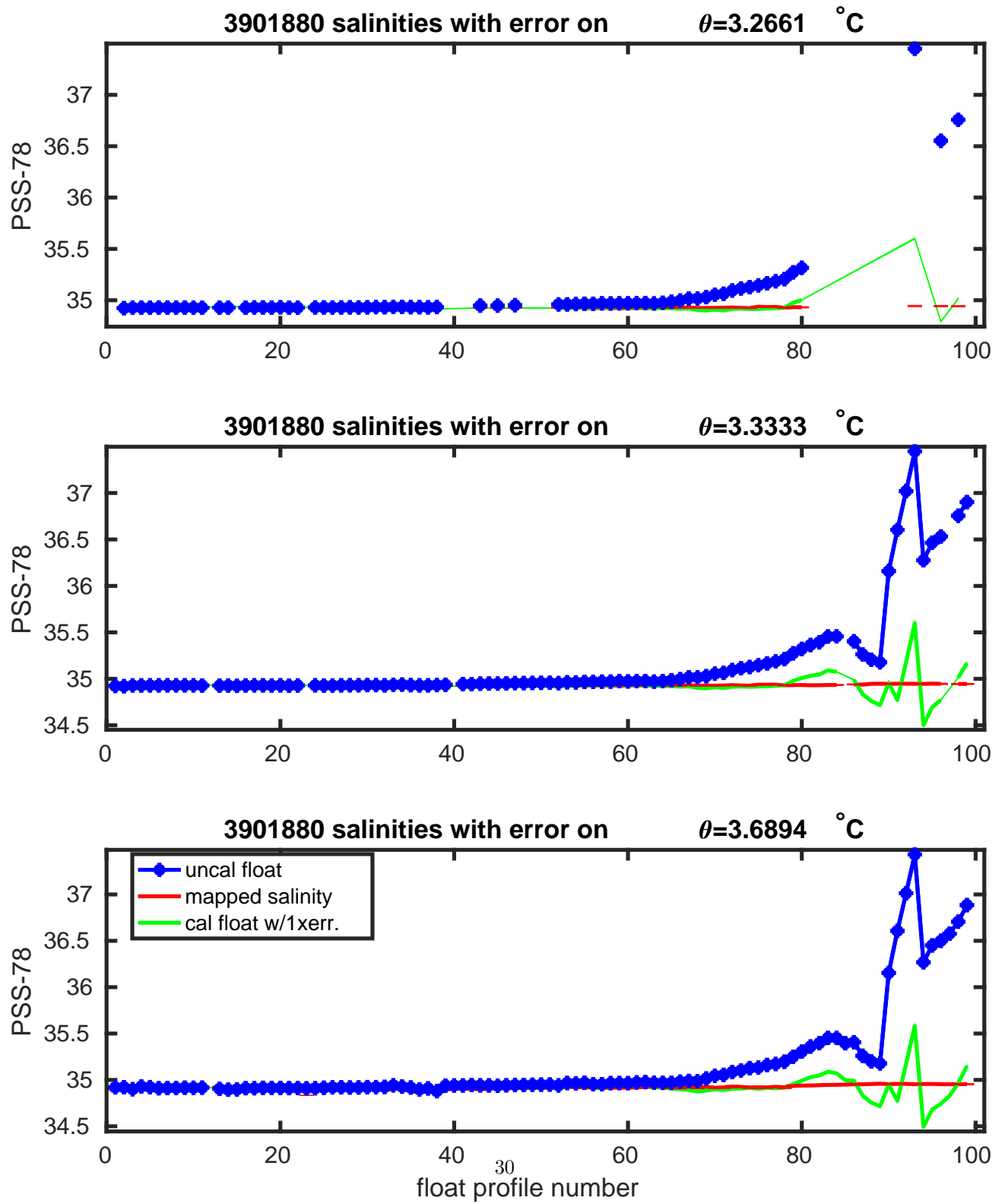


Figure 21: Float 3901880. Salinities with errors on θ .

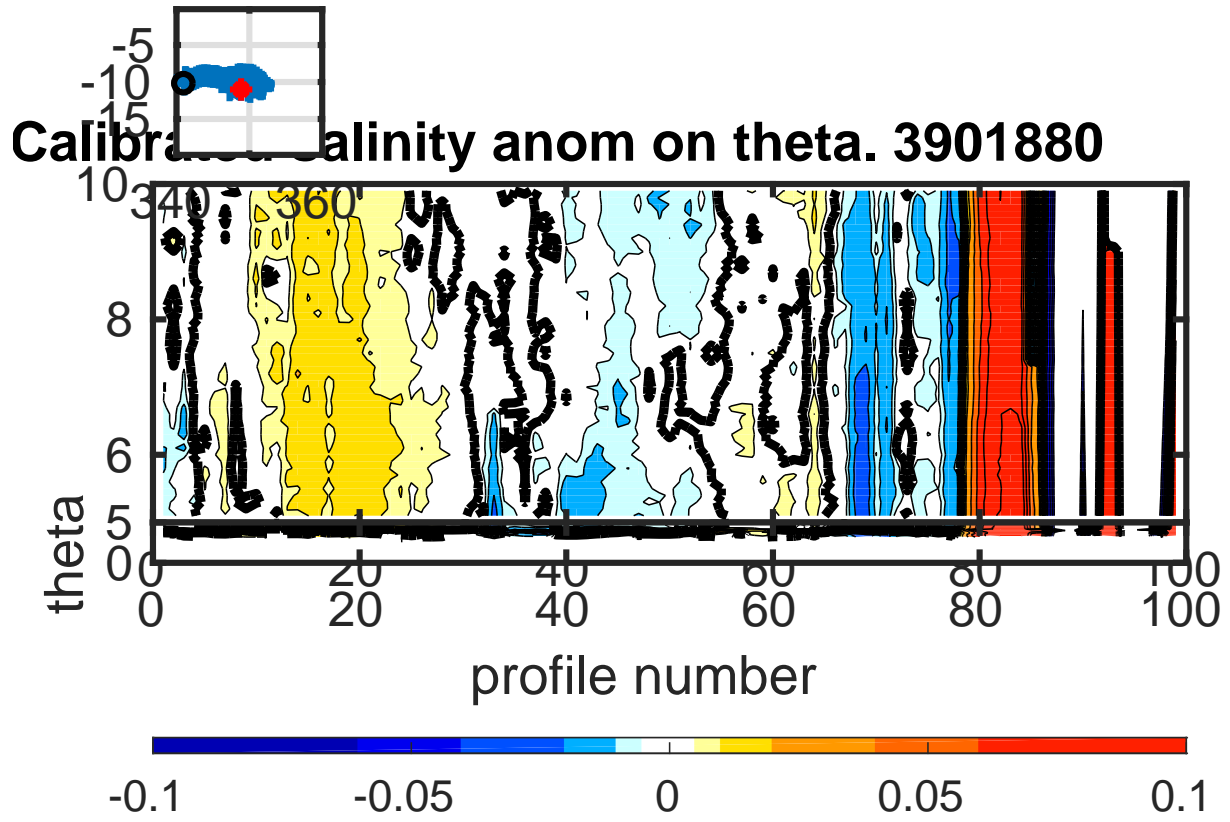


Figure 22: Float 3901880. Calibrated salinity anomaly on θ .

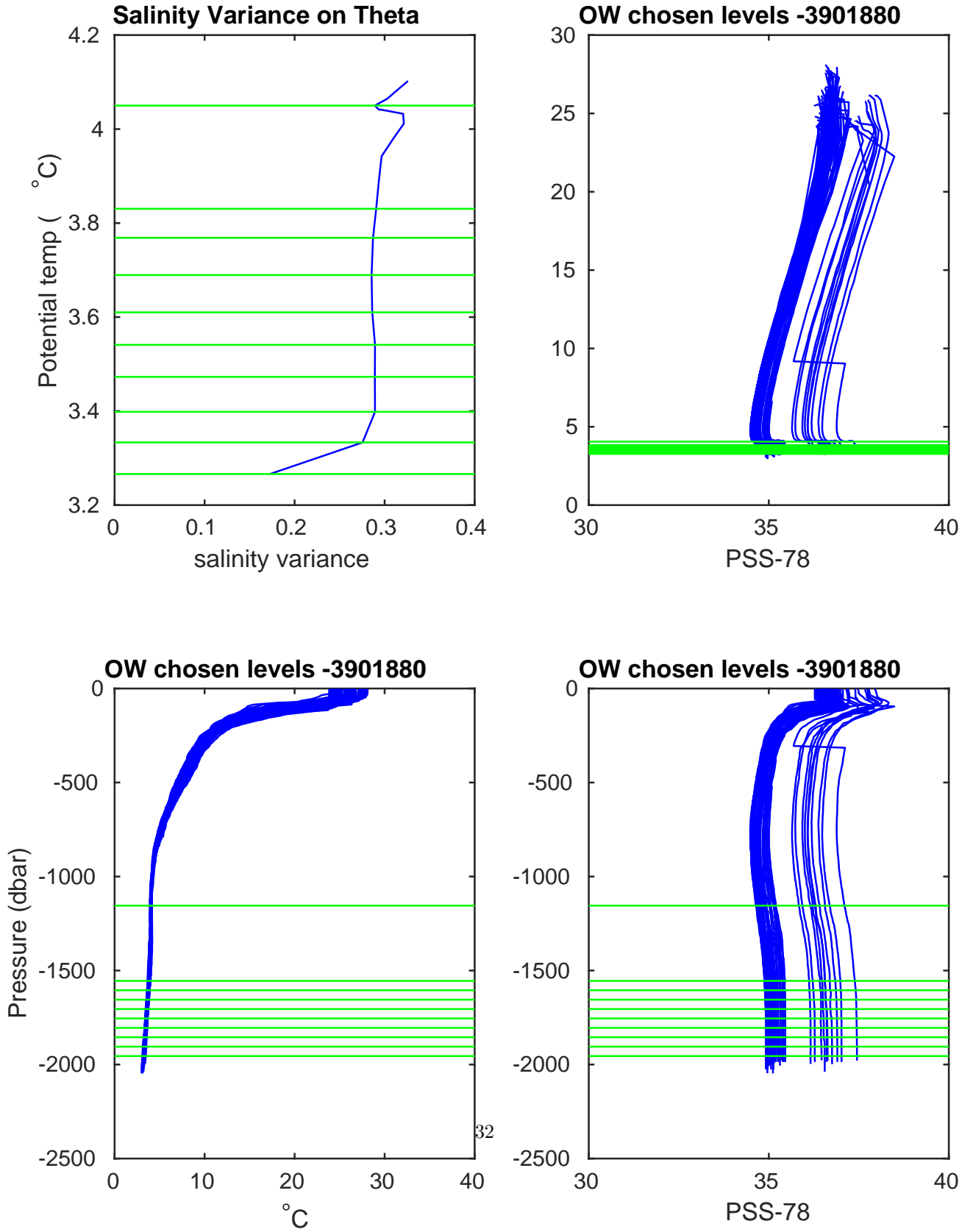


Figure 23: Float 3901880. Salinity, salinity variance on theta and OW chosen levels.

3.3 Summary and Conclusions

The theta levels were set between 1000 m. The analysis is made based on the Argo reference data. Float is drifting due to a conductivity cell 1-29 QC=1, err=0.1; 30-63 apply correction qc=2, err=0.16; 64-100 QC= 4; Floats with the profile number larger than 100 are gray listed.

4 Final Checks

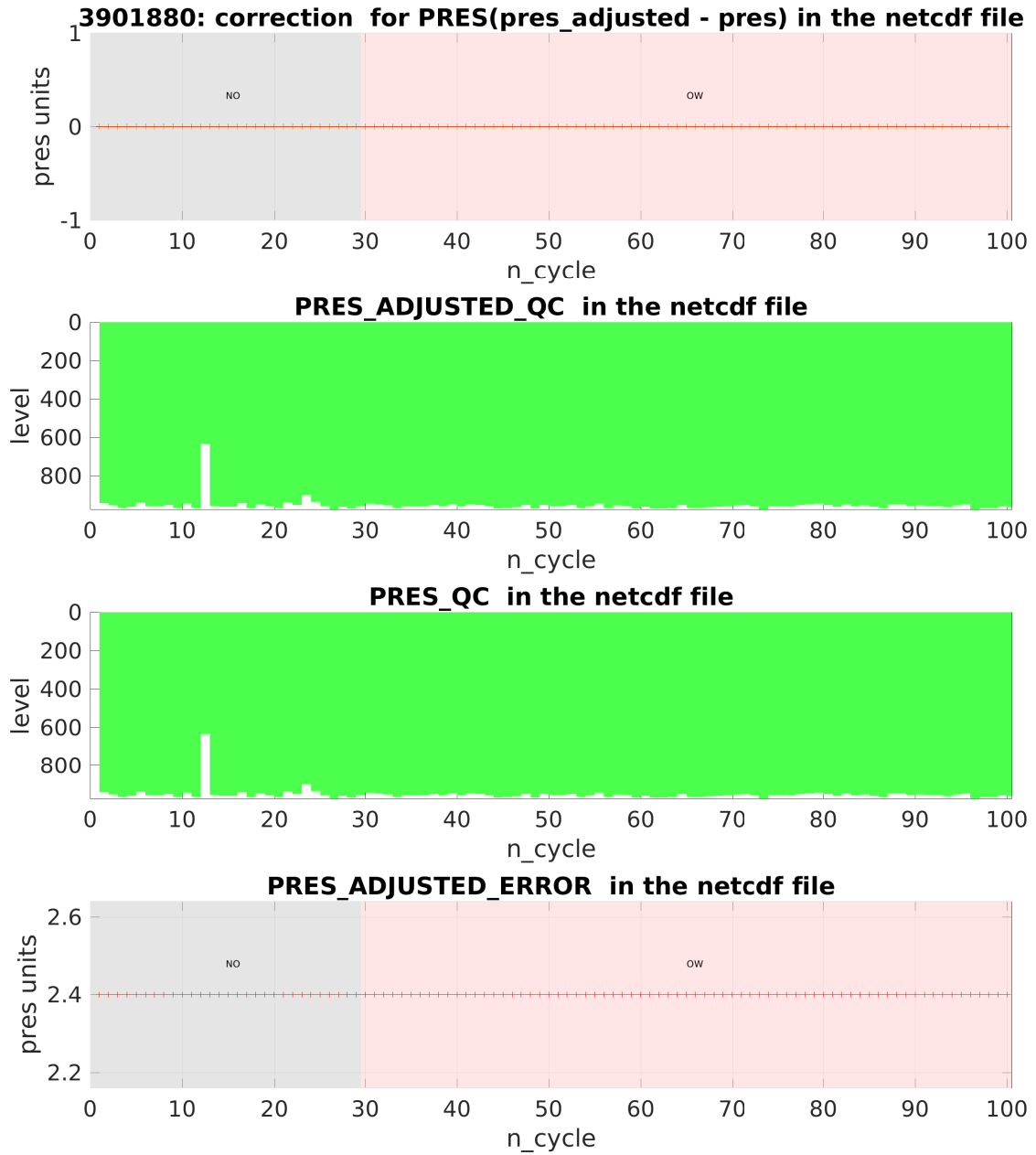


Figure 24: Float 3901880. Time series of applied pressure corrections.

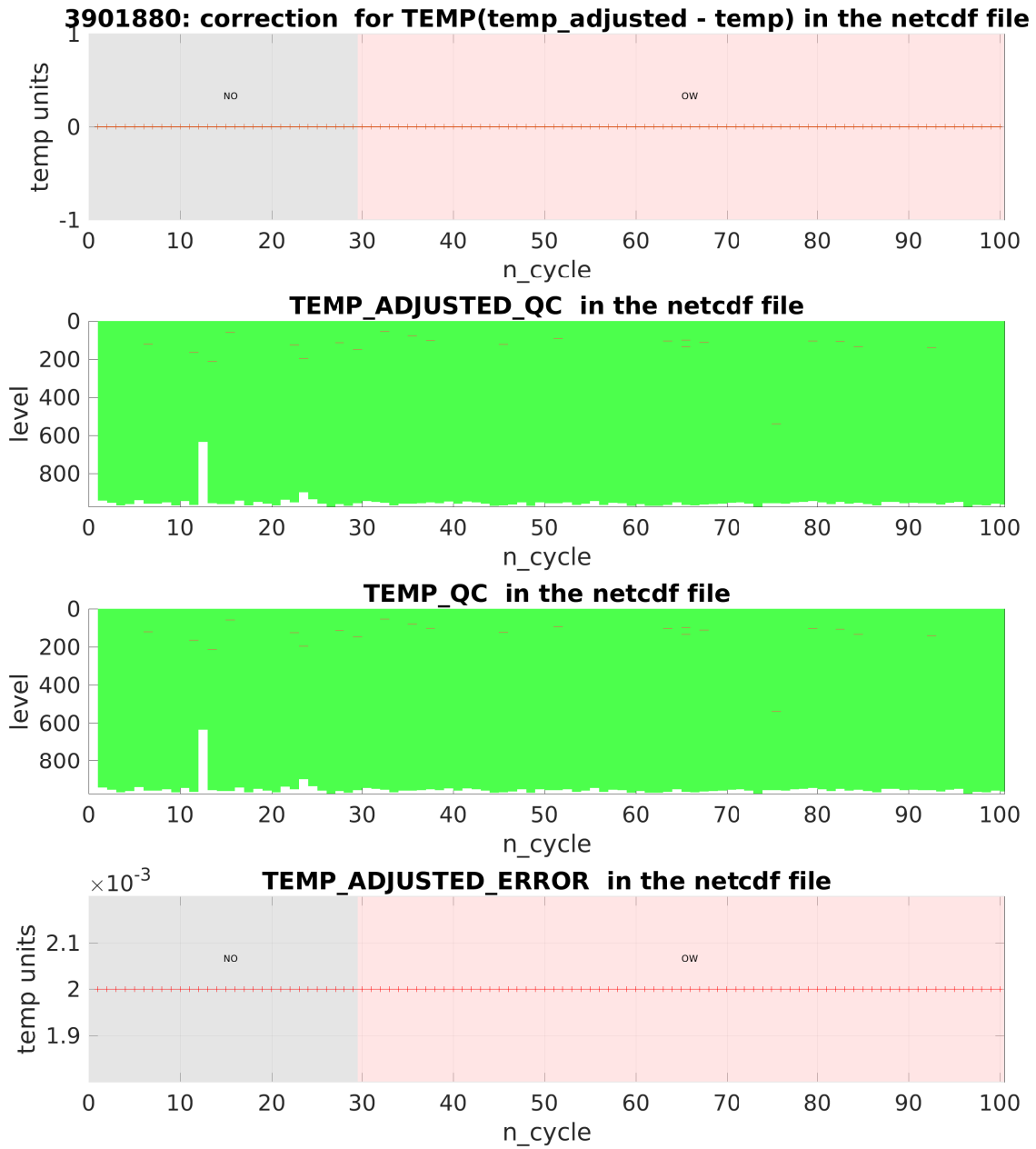


Figure 25: Float 3901880. Time series of applied temperature corrections.

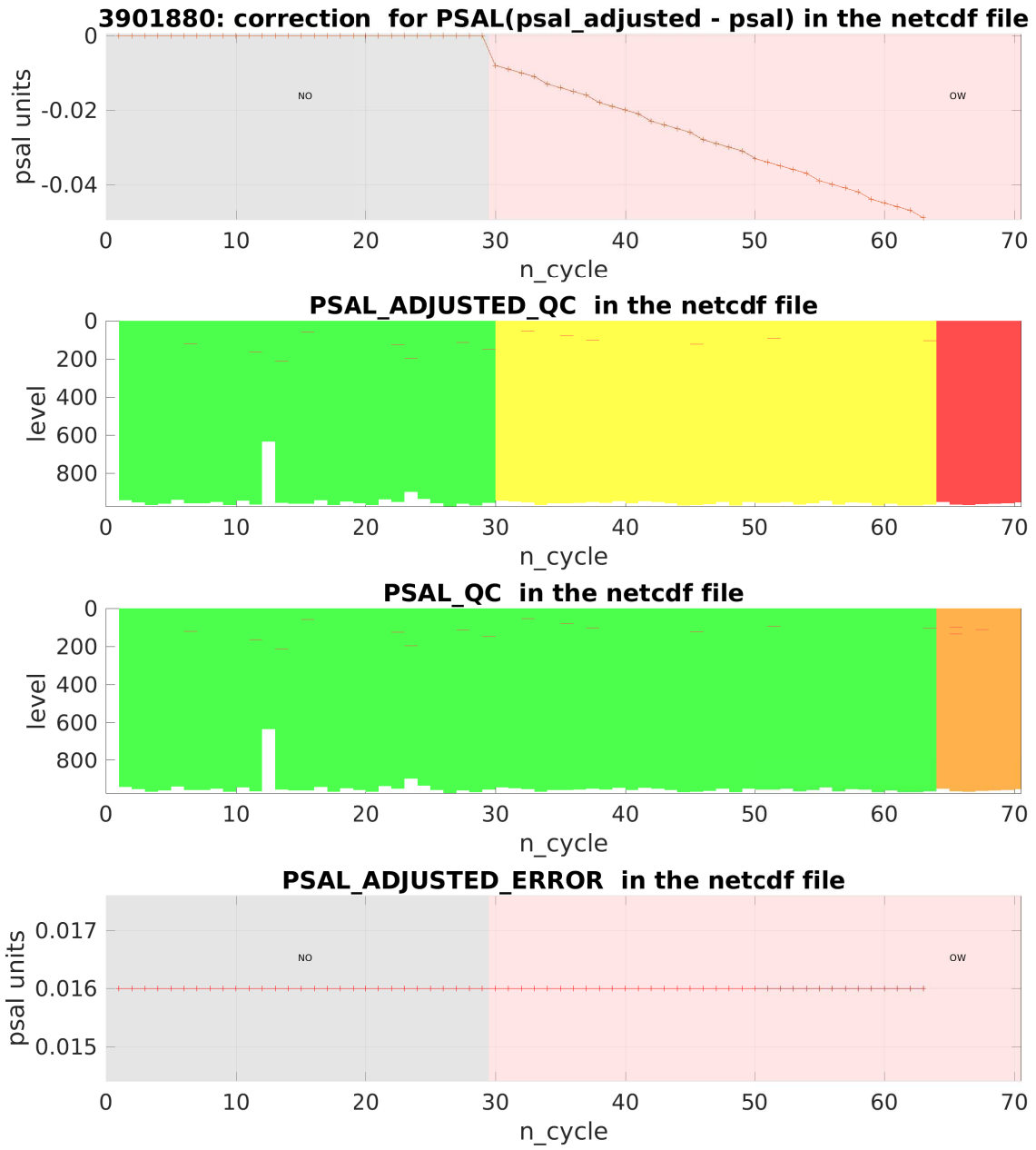


Figure 26: Float 3901880. Time series of applied salinity corrections.