

# Delayed mode quality control of MOCCA Argo float 3901912

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## Summary

For the profiles 1 to 113, float is very variable, however, is within the variability of reference data, QC=1 error=0.02. Float is drifting from cycle 113 to 134, QC=4.

WMO number	DM correction
3901912	Drift detected

Table 1: Correction applied in delayed mode.

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# 1 Introduction

Delayed mode analysis was performed for float number 360222i (3901912) 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 360222i (3901912) click on the following link: <http://www.ifremer.fr/argoMonitoring/float/3901912>

## 2 Quality Check of Argo Float Data

### 2.1 Time Series of Vertical Distribution of Data

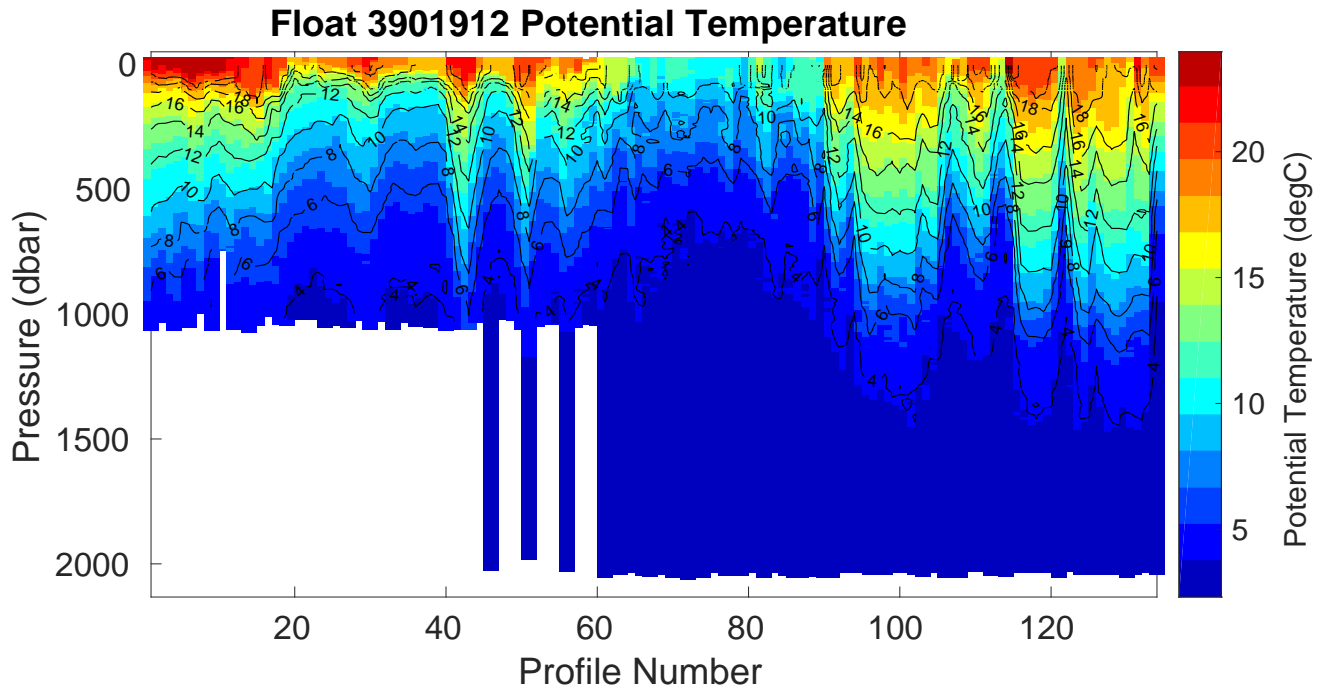


Figure 1: Float 3901912. Time series of the vertical distribution of potential temperature ( $^{\circ}\text{C}$ ).

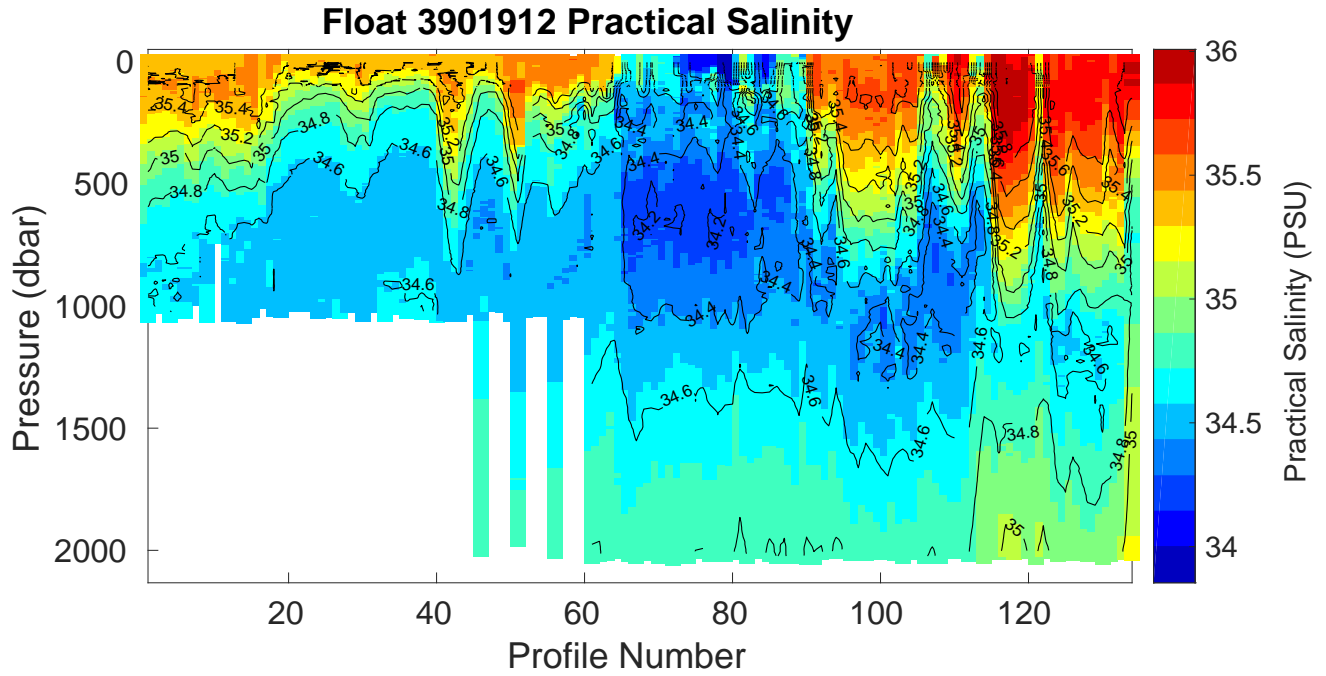


Figure 2: Float 3901912. Time series of the vertical distribution of practical salinity (PSU).

## 2.2 Comparison between Argo Float and Climatology

The comparison between float 3901912 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 3901912 represents relatively stable and consistent with the expected physical conditions in this region.

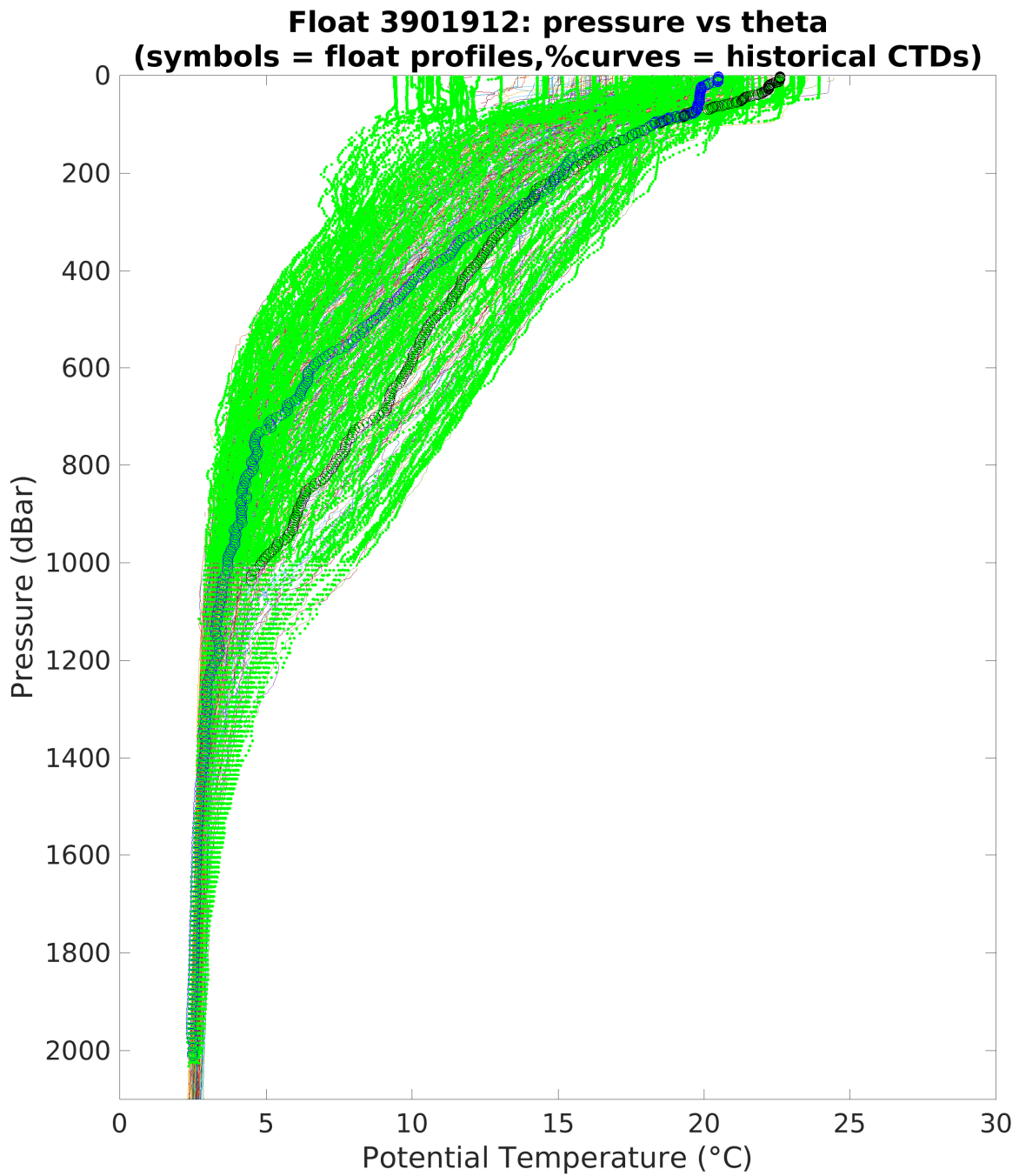


Figure 3: Float 3901912. Float profile of potential temperature (°C) plotted with climatology from the spatial range of 10°. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles from this float.

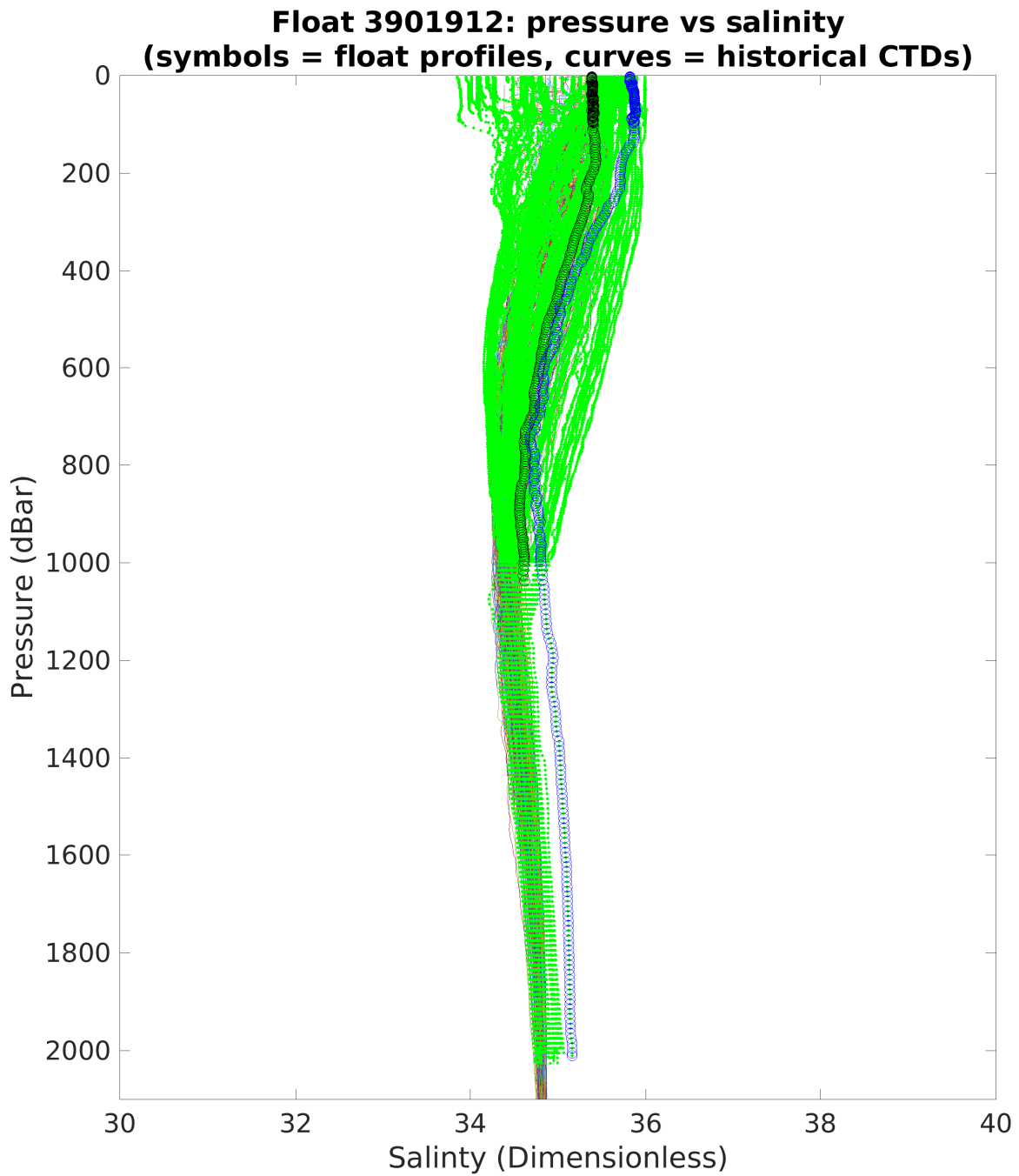


Figure 4: Float 3901912. Float profile of salinity (dimensionless) plotted with climatology from the spatial range of  $10^\circ$ . The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles from this float.

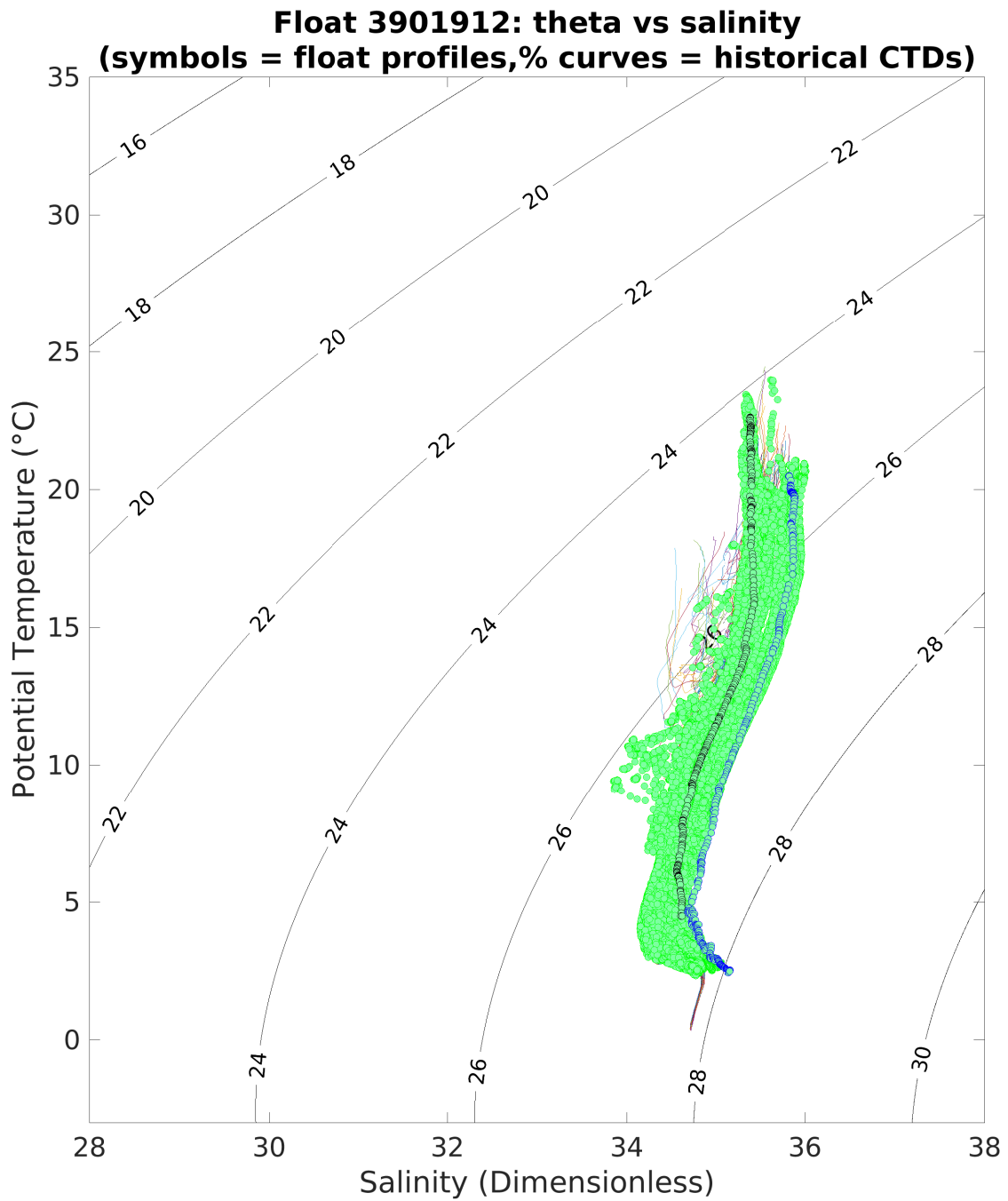


Figure 5: Float 3901912. Theta/S plotted with climatology from the spatial range of 10°. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles from this float.

## 2.3 Satellite Altimeter comparison

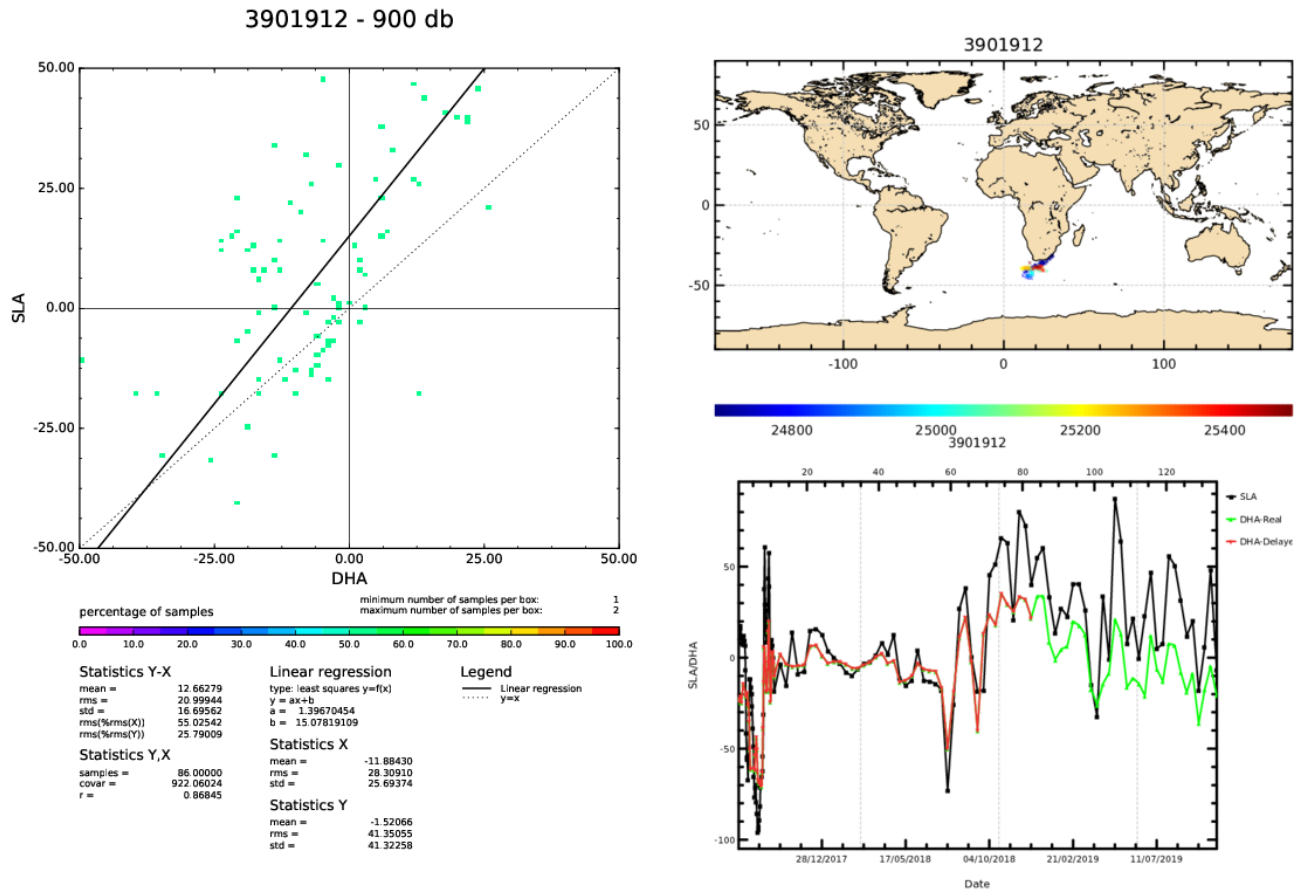


Figure 6: Float 3901912. The comparison between the Sea Surface Height (SSH) from the satellite altimetry and Dynamic Height Anomaly (DHA) extracted from the Argo float temperature and salinity data

## 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=10
MAPSCALE_AGE_LARGE=20

% 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

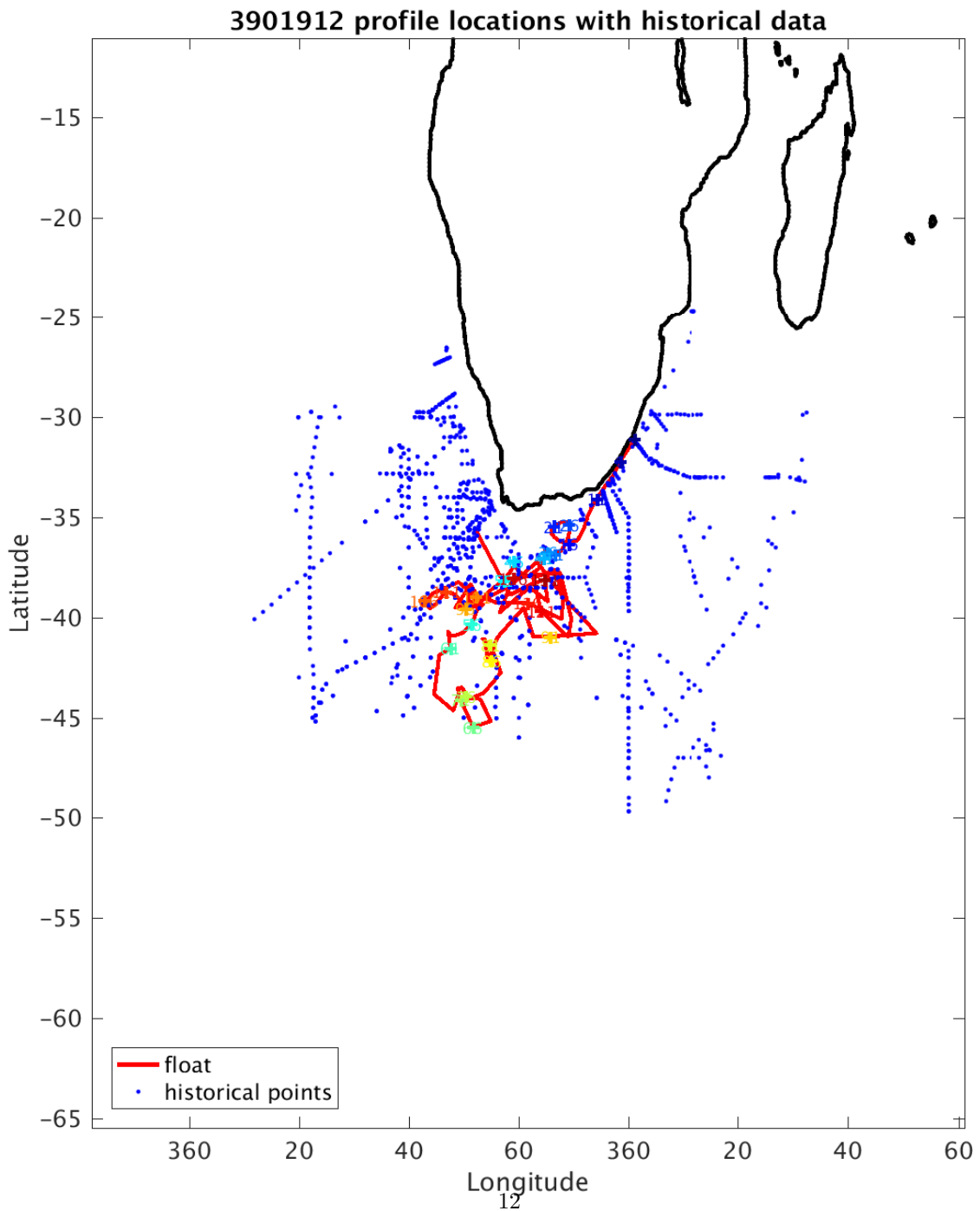


Figure 7: Float 3901912. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

01912 uncalibrated float data (-) and mapped salinity (o) with objective errors

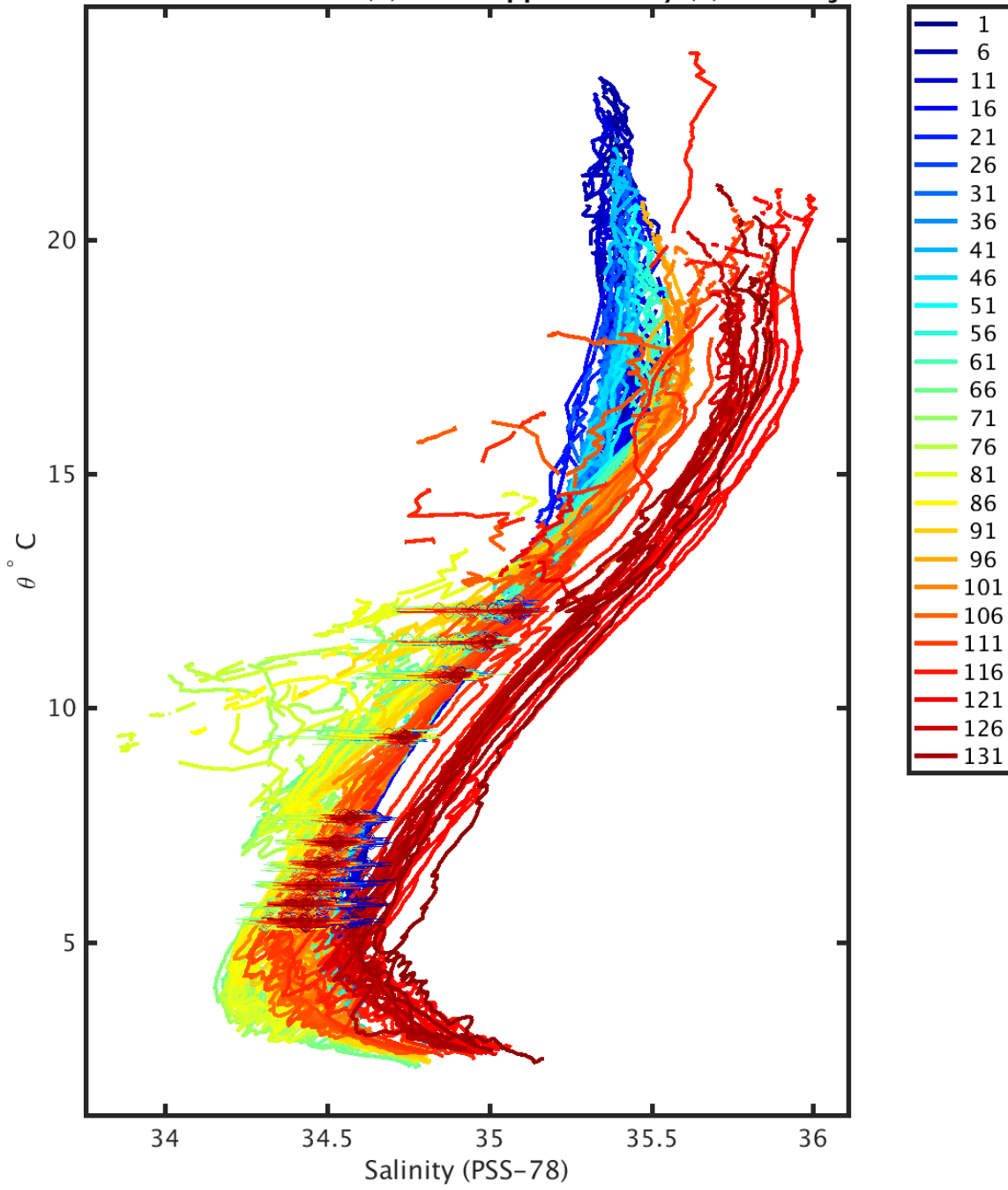
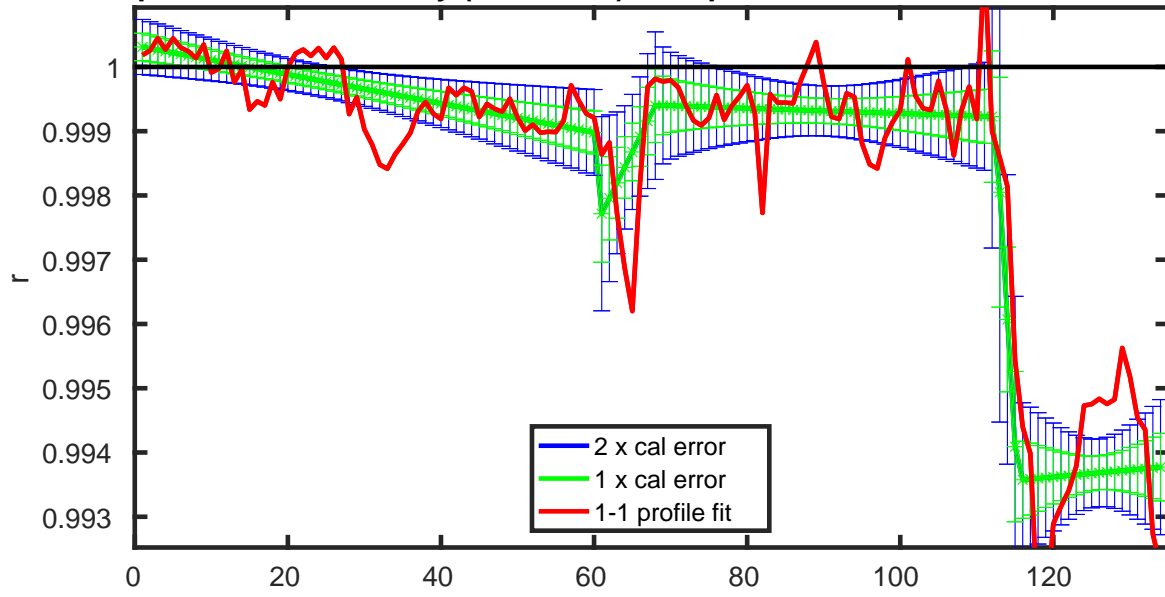


Figure 8: Float 3901912. Uncalibrated float data and mapped salinity.

**3901912 potential conductivity (mmho/cm) multiplicative correction r with errors**



**3901912 vertically-averaged salinity (PSS-78) additive correction  $\Delta S$  with errors**

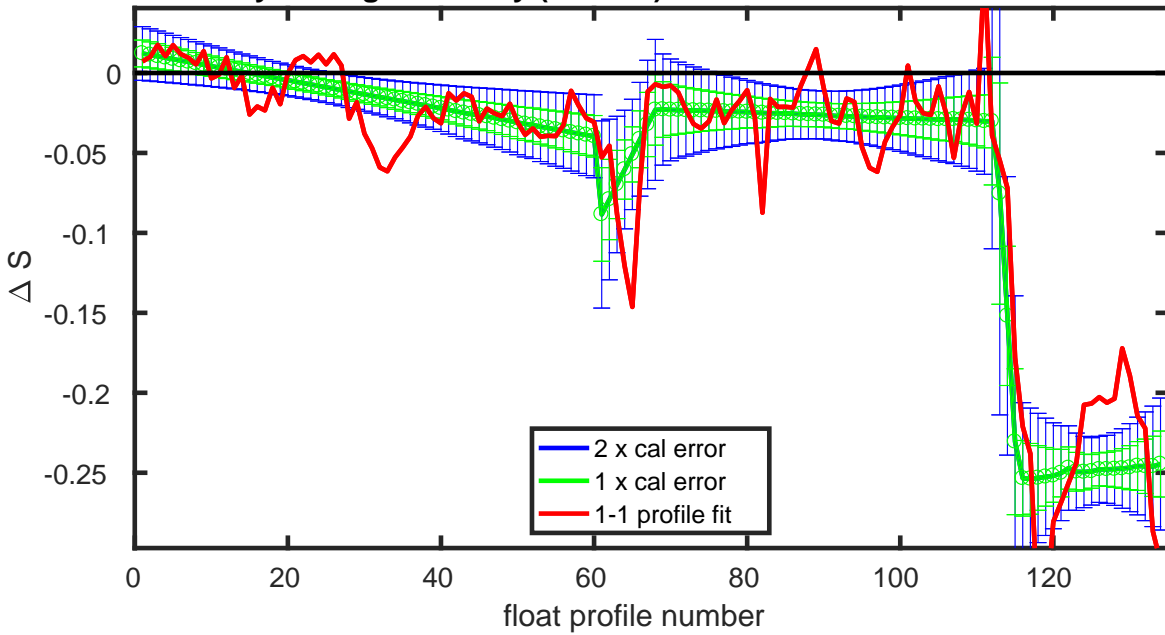


Figure 9: Float 3901912. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

3901912 calibrated float data (-) and mapped salinity (o) with objective errors

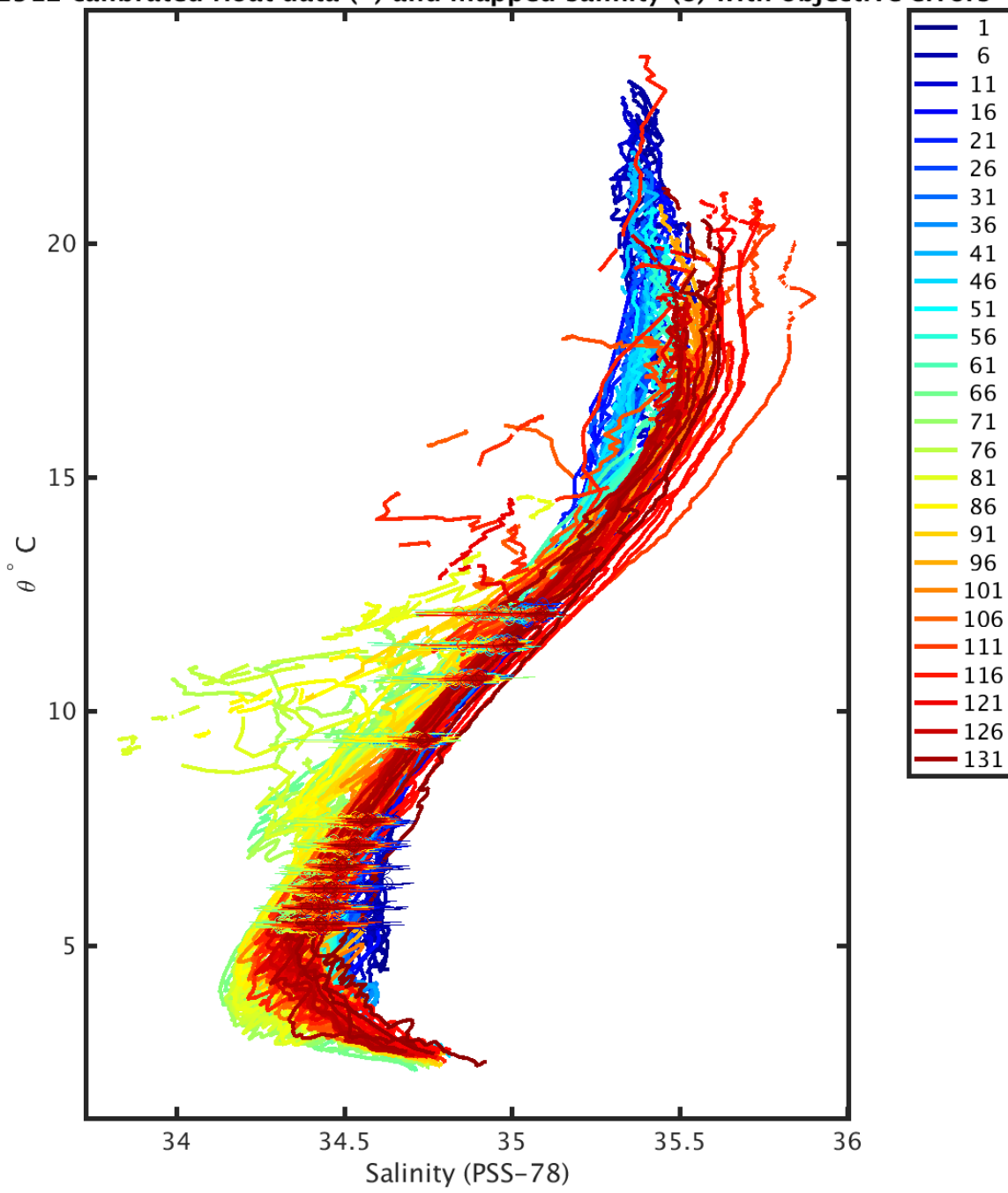


Figure 10: Float 3901912. Calibrated float data and mapped salinity.

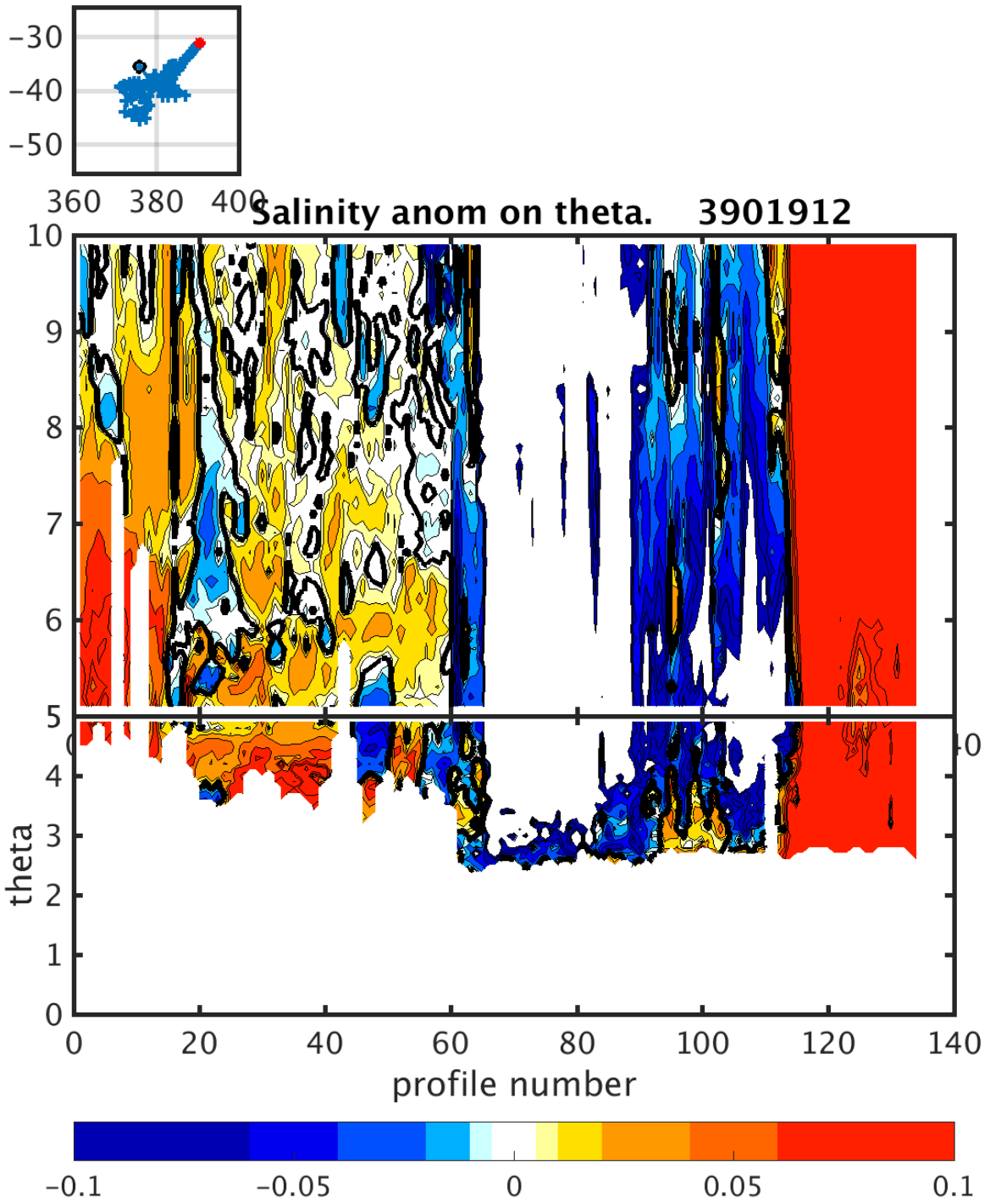


Figure 11: Float 3901912. Salinity anomaly on  $\theta$  levels.



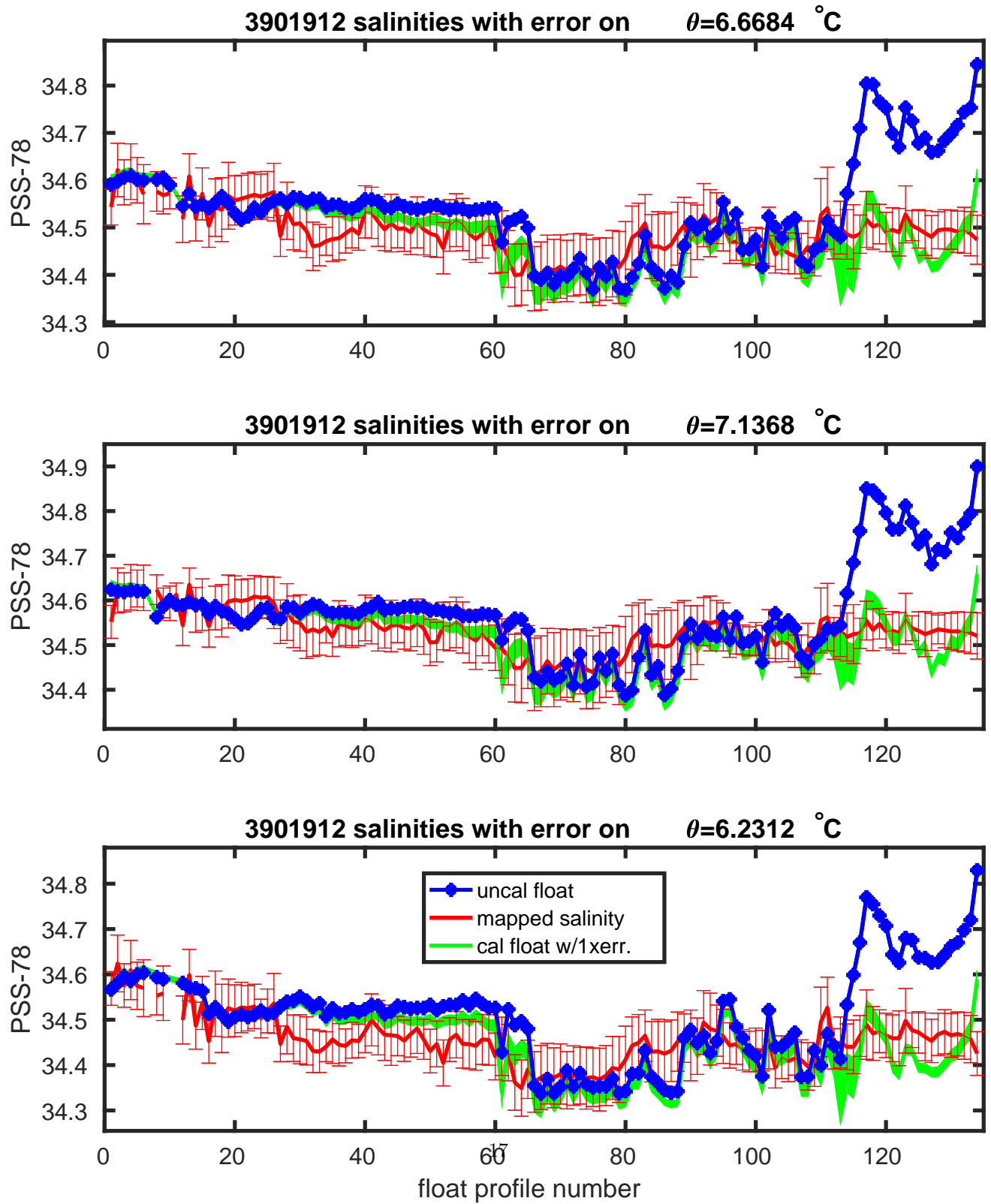


Figure 12: Float 3901912. Salinities with errors on  $\theta$  levels.

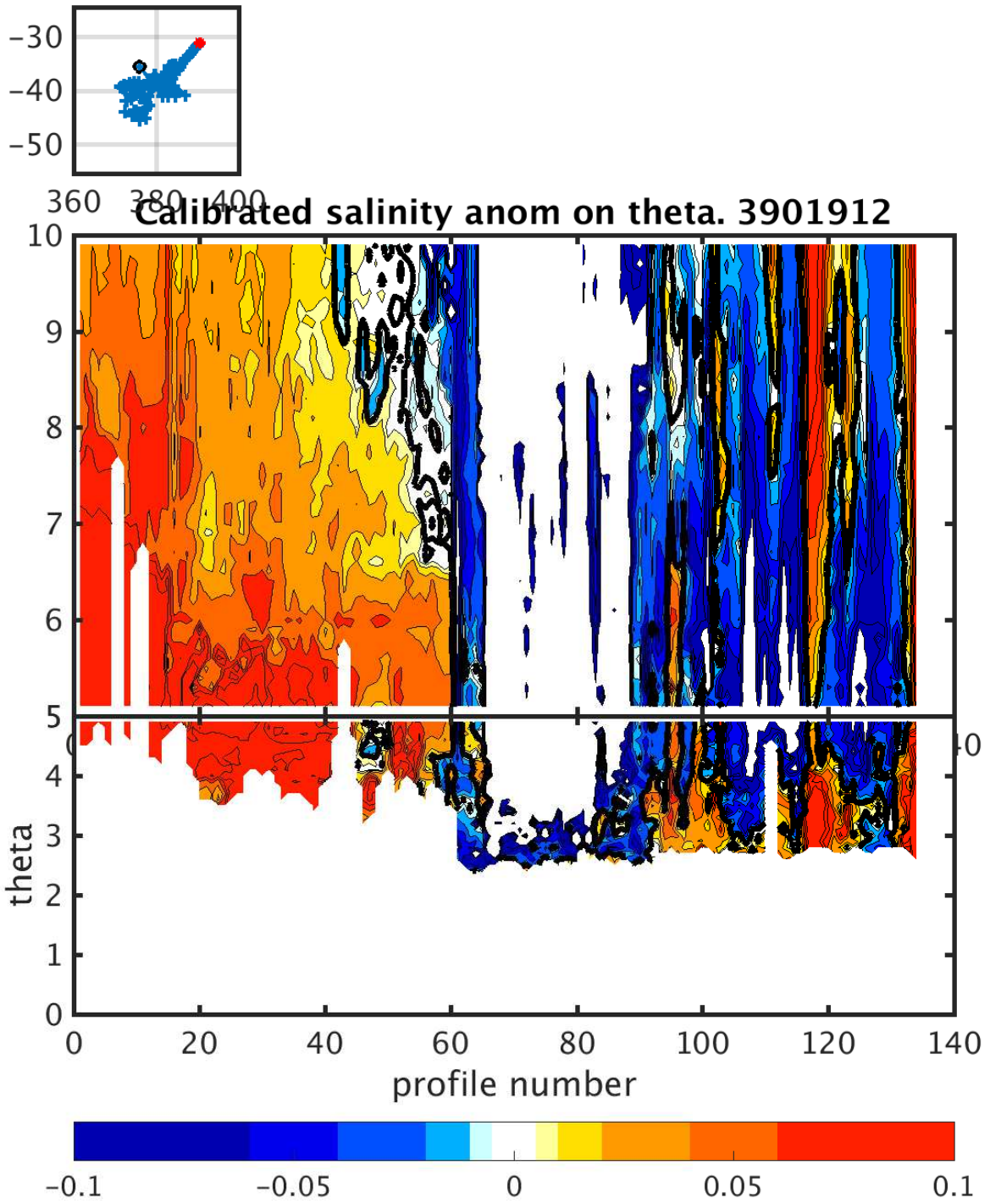


Figure 13: Float 3901912. Calibrated salinity anomaly on  $\theta$  levels.

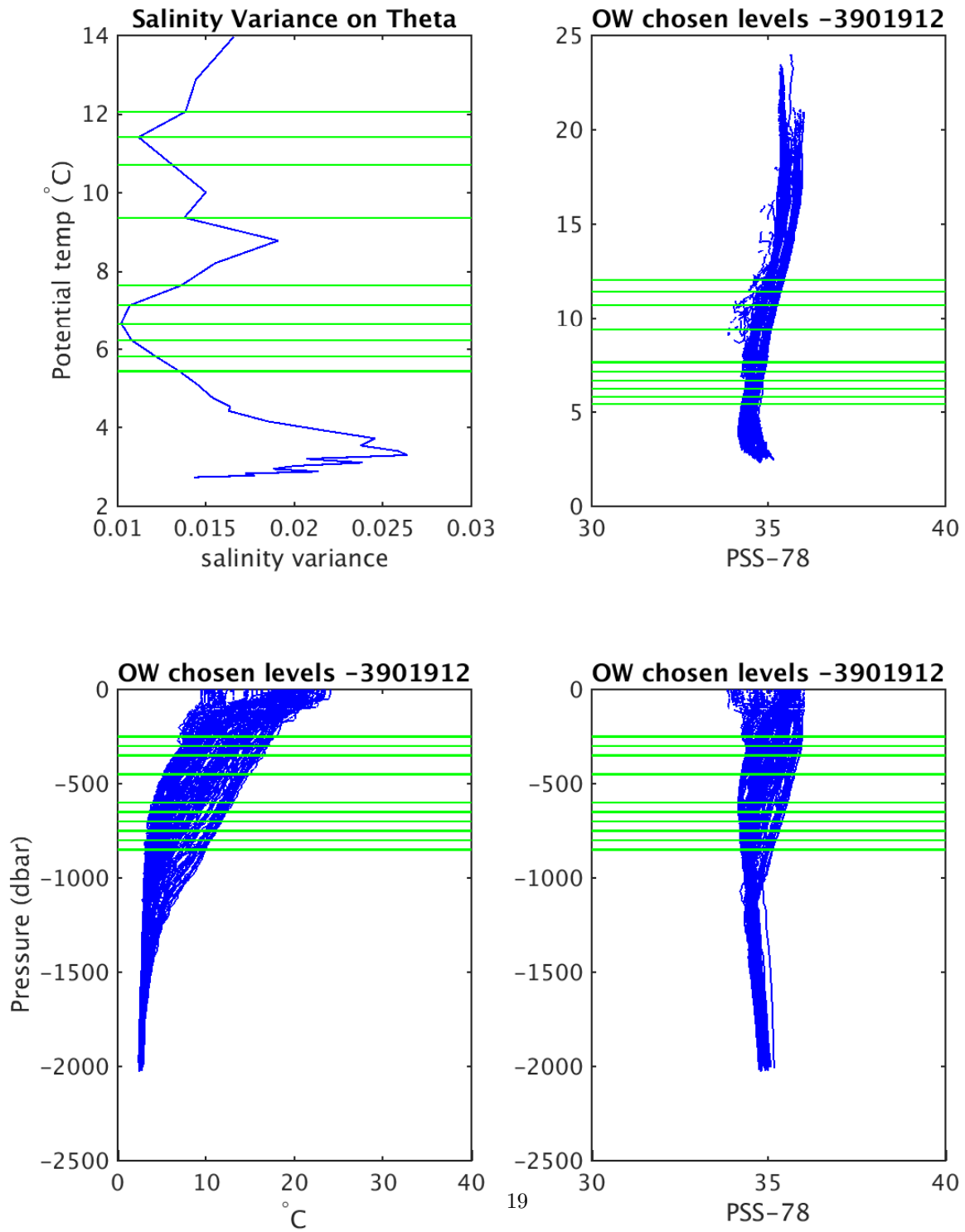


Figure 14: Float 3901912. Salinity, salinity variance on theta and OW chosen levels.

## 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=10
MAPSCALE_AGE_LARGE=20

% 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

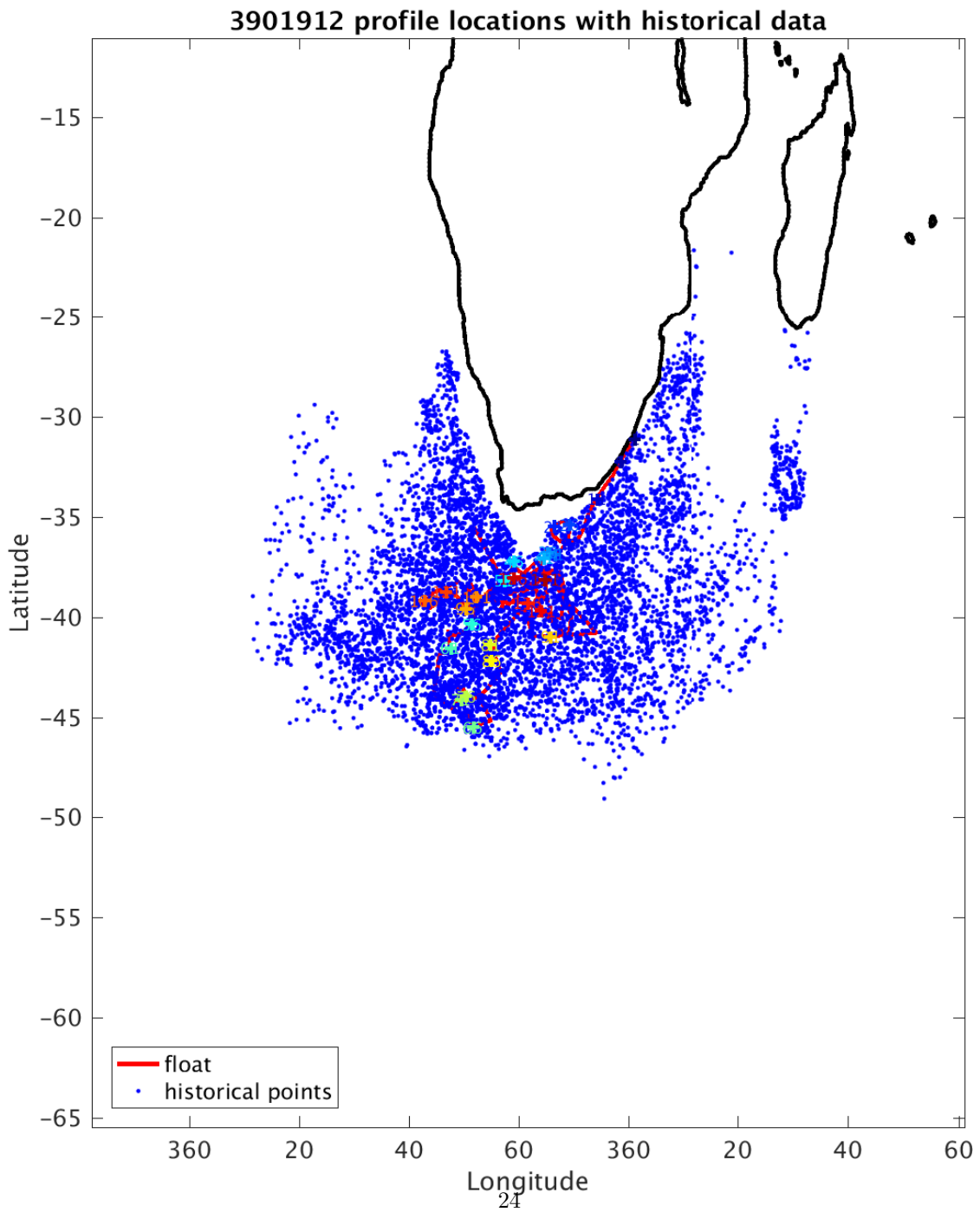


Figure 15: Float 3901912. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.



01912 uncalibrated float data (-) and mapped salinity (o) with objective errors

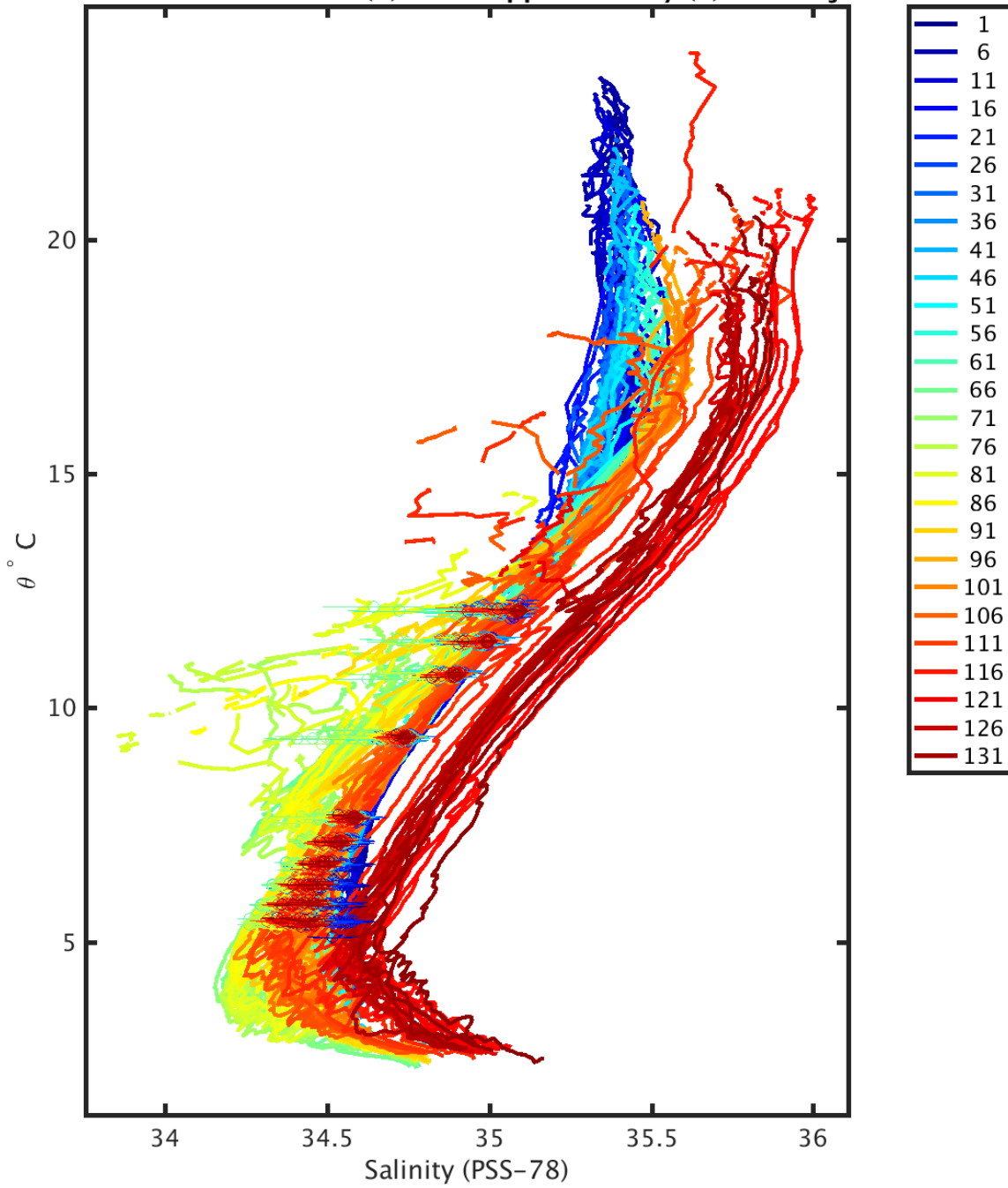
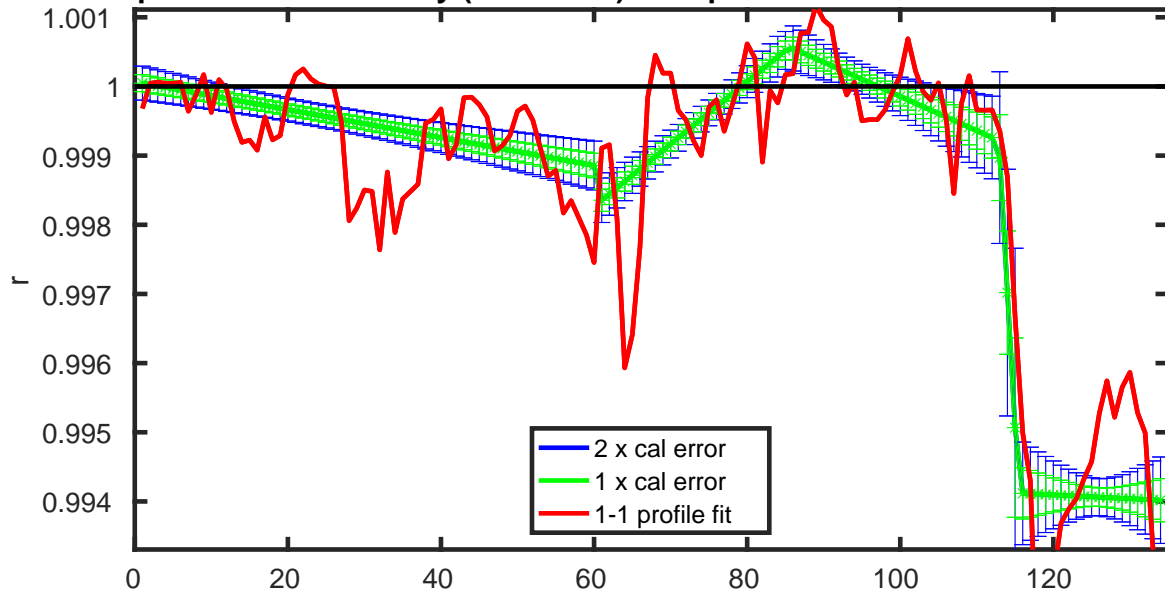


Figure 16: Float 3901912. Uncalibrated float data and mapped salinity.

3901912 potential conductivity (mmho/cm) multiplicative correction r with errors



3901912 vertically-averaged salinity (PSS-78) additive correction  $\Delta S$  with errors

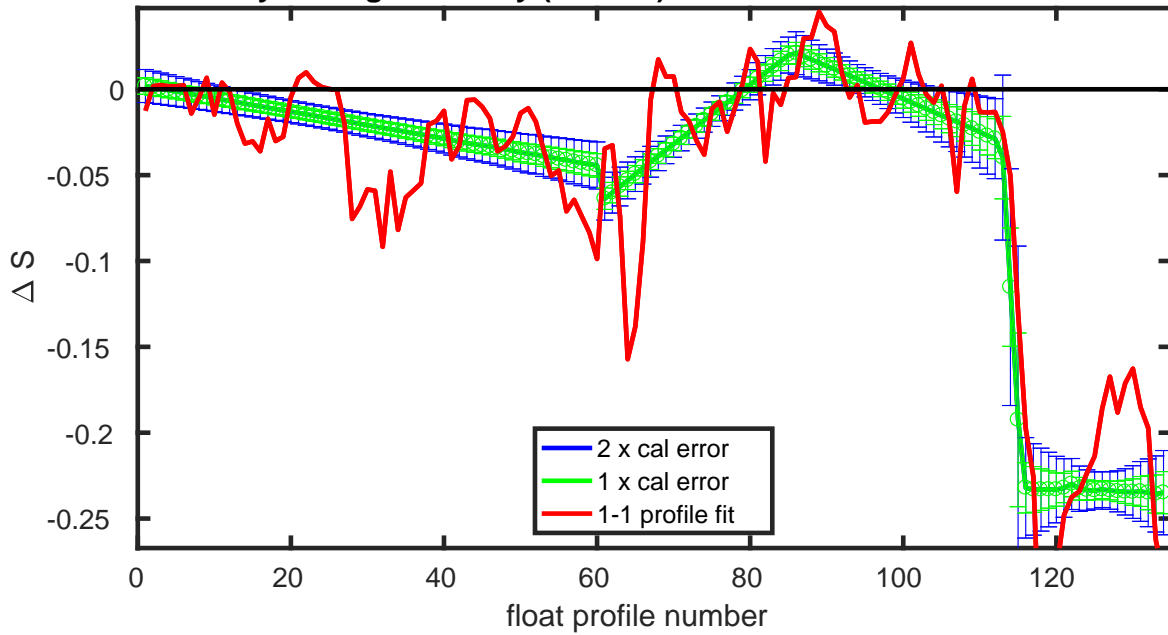


Figure 17: Float 3901912. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

3901912 calibrated float data (-) and mapped salinity (o) with objective errors

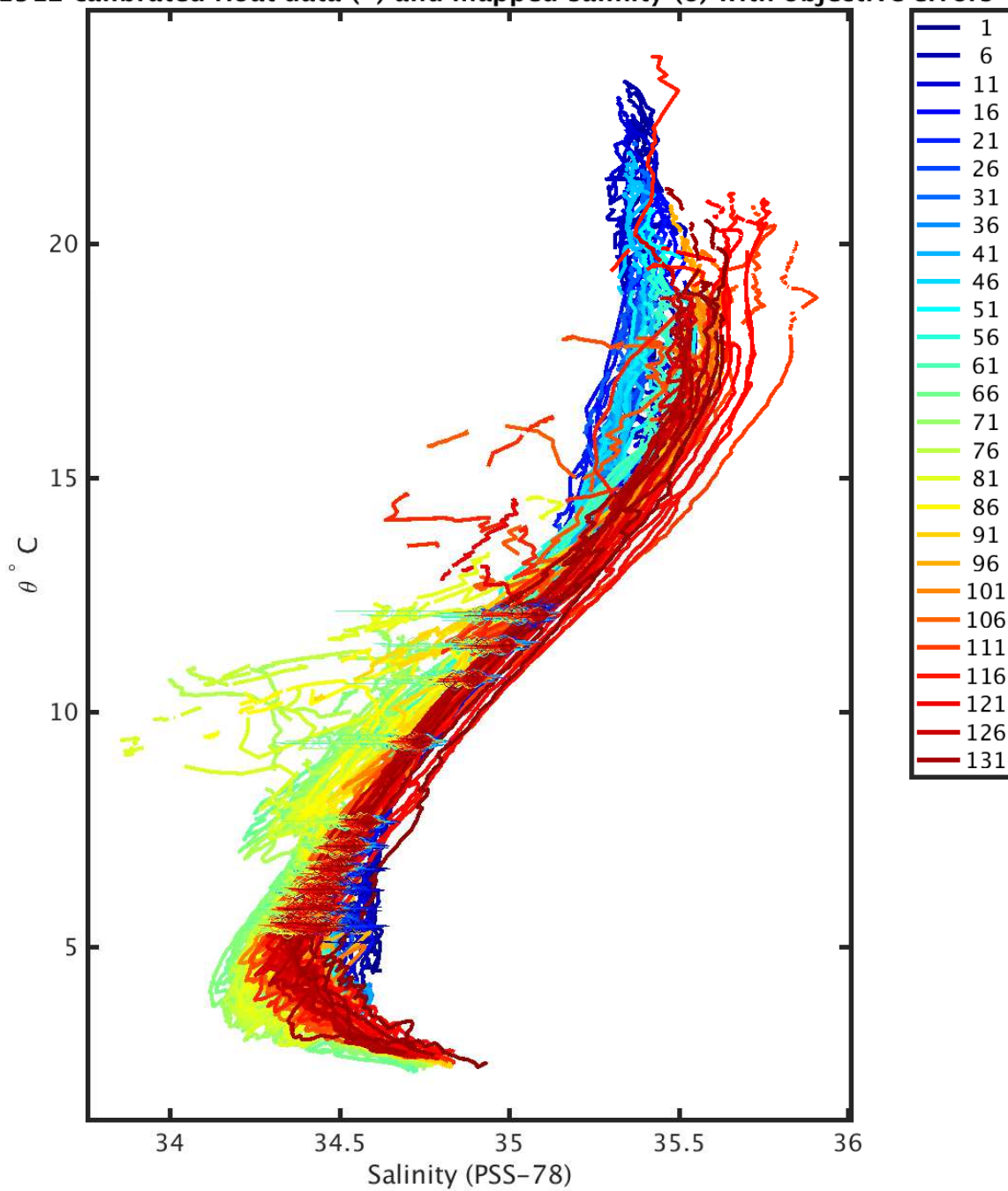


Figure 18: Float 3901912. Calibrated float data and mapped salinity.

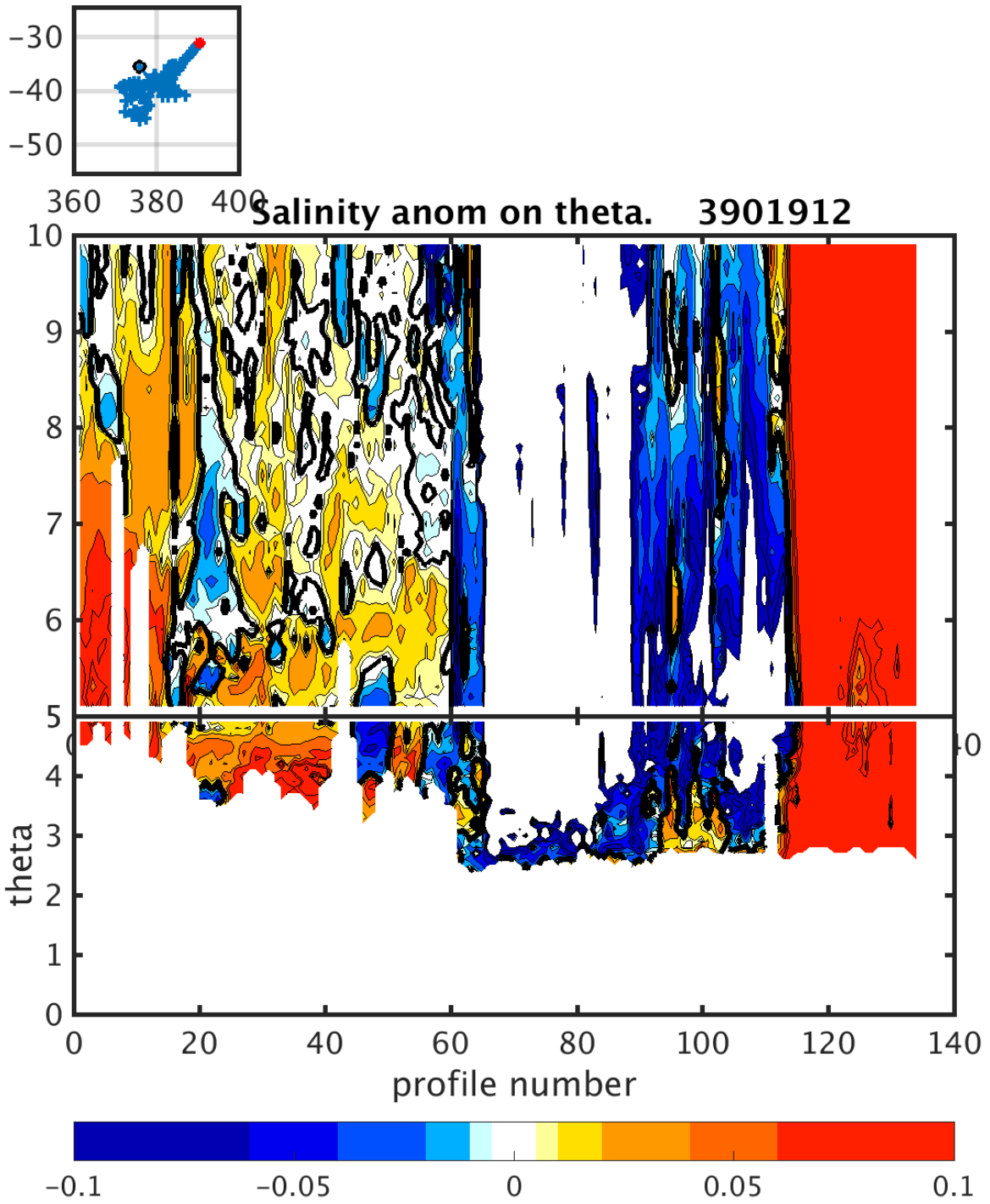


Figure 19: Float 3901912. Salinity anomaly on Theta

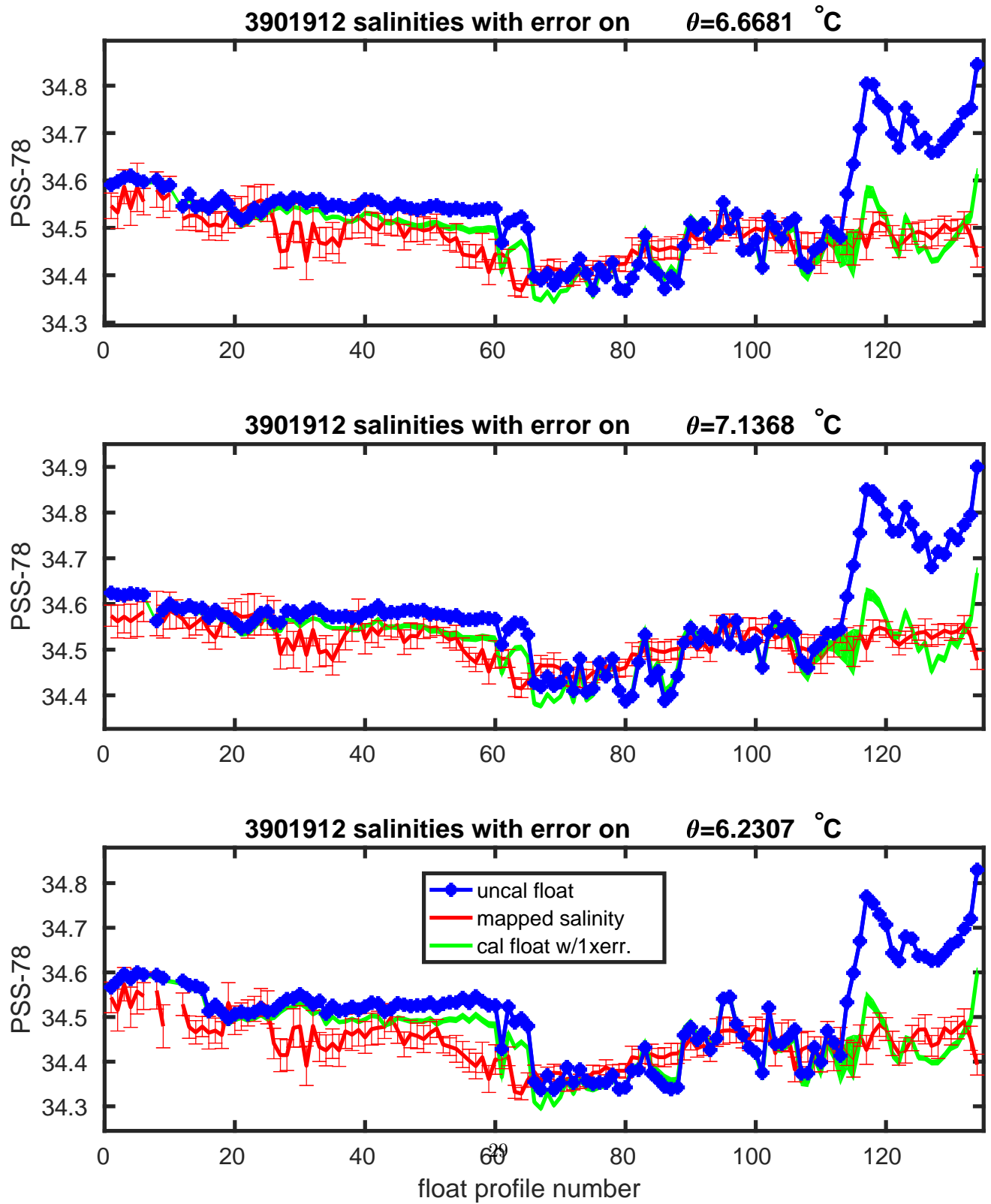


Figure 20: Float 3901912. Salinities with errors on  $\theta$ .

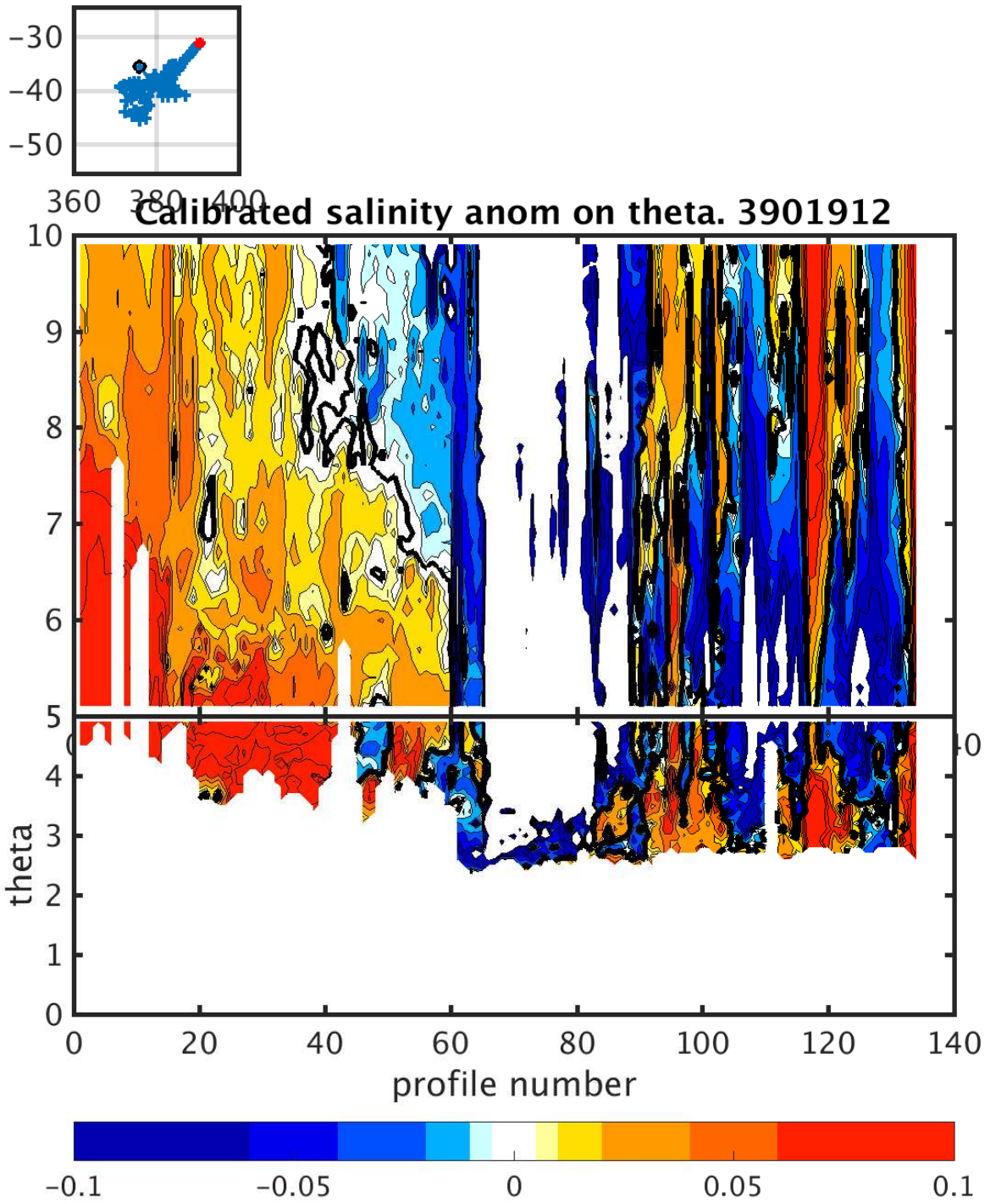


Figure 21: Float 3901912. Calibrated salinity anomaly on  $\theta$ .

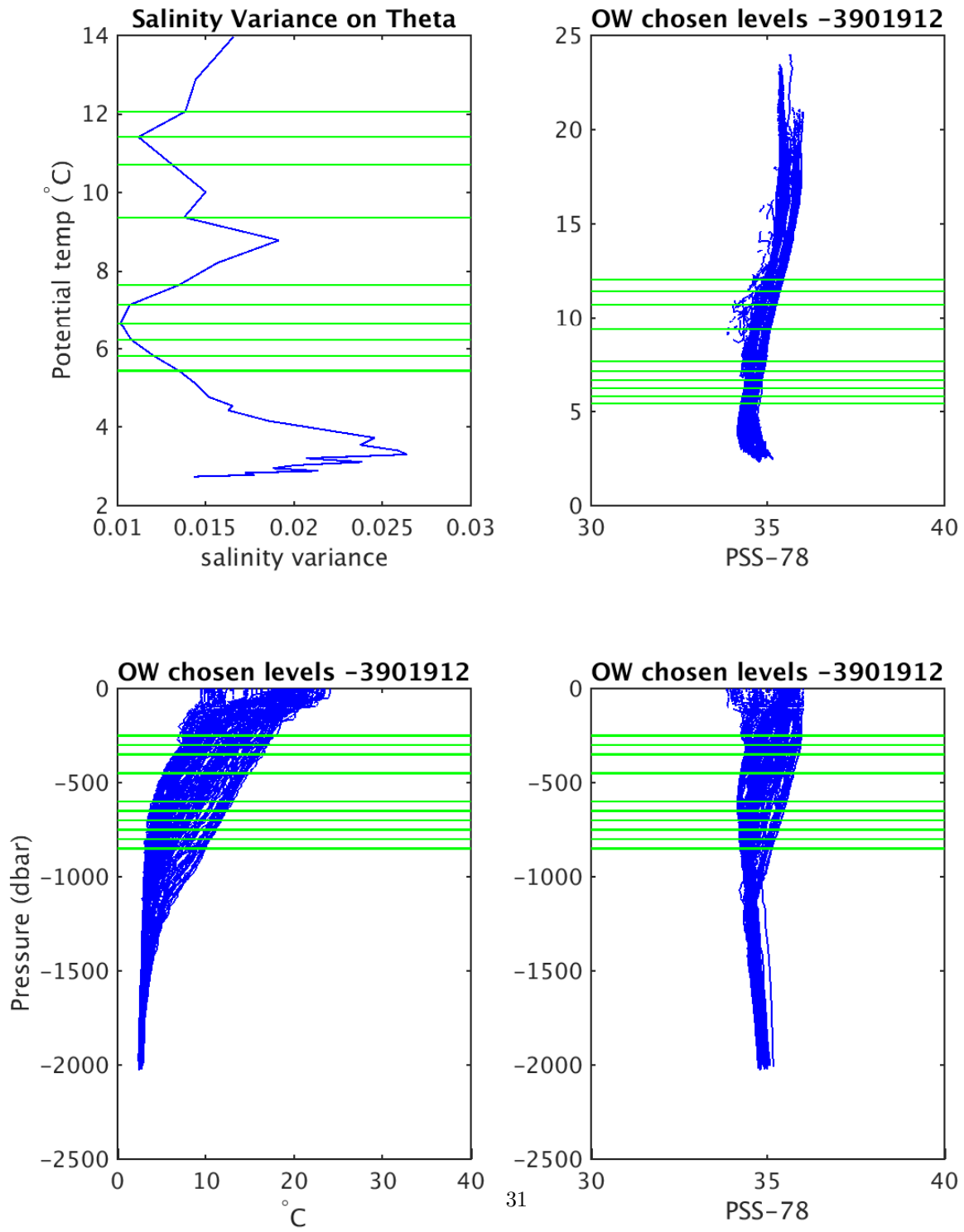


Figure 22: Float 3901912. Salinity, salinity variance on theta and OW chosen levels.

### 3.3 Summary and Conclusions

The OWC output showed a high variability of Argo data compare with CTD and Argo reference data between cycle 1 and 113, QC=1, error 0.02. After cycle 113 to 134 there has been detected a strong drift. The drifted data are not adjustable and flag 4 to the QC of these profiles was applied.





## 4 Final Checks

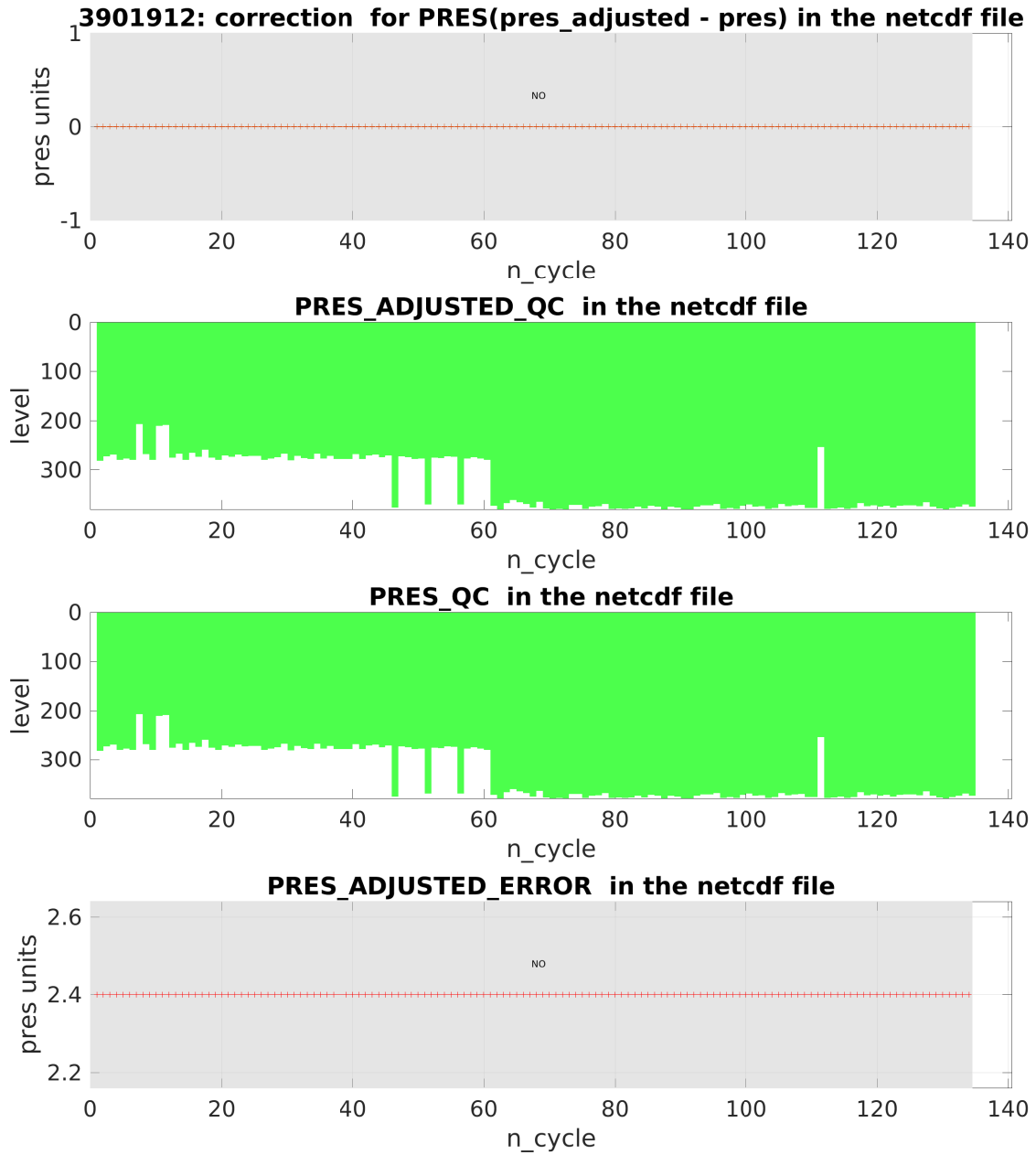


Figure 23: Float 3901912. Time series of applied pressure corrections.

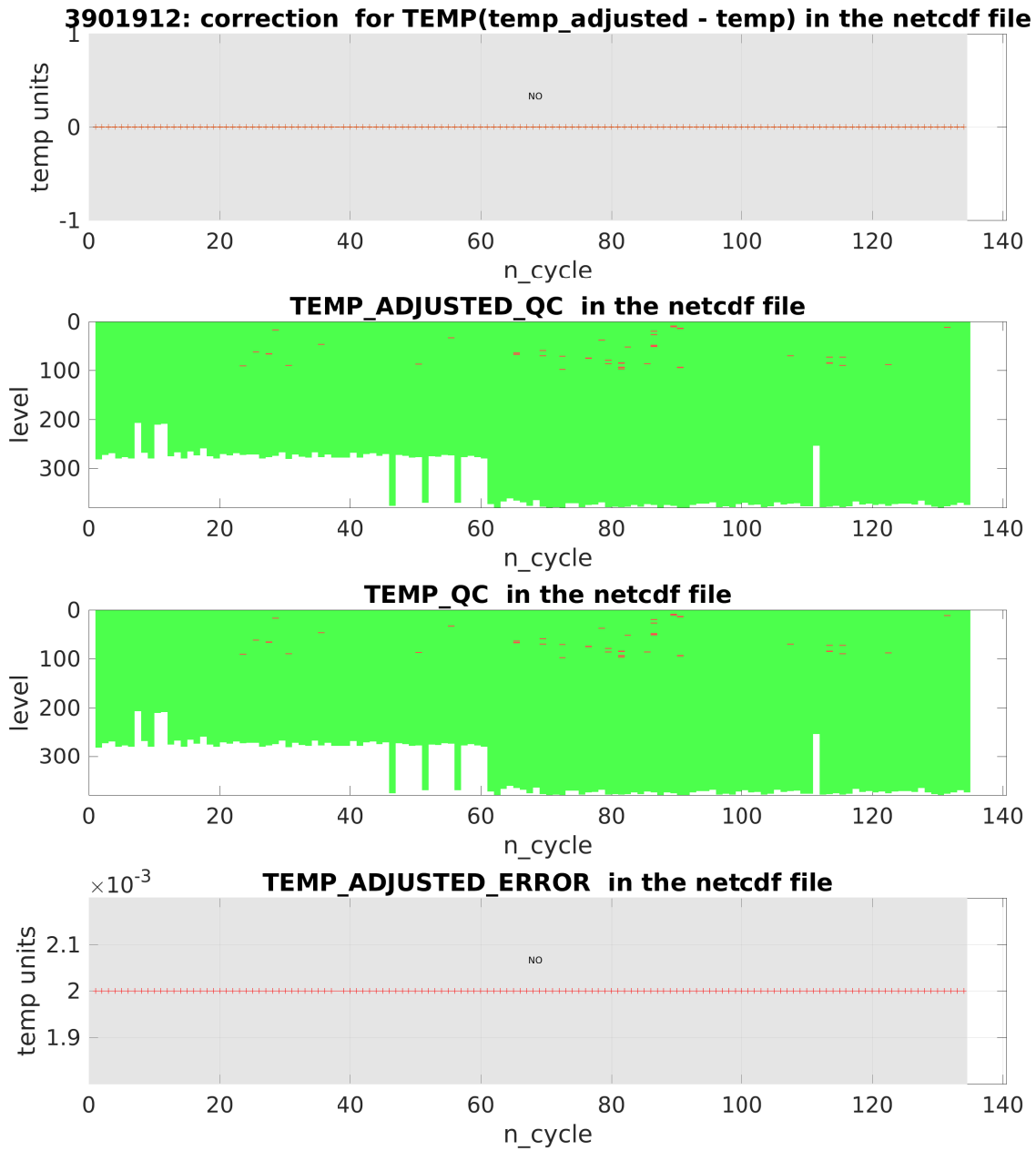


Figure 24: Float 3901912. Time series of applied temperature corrections.

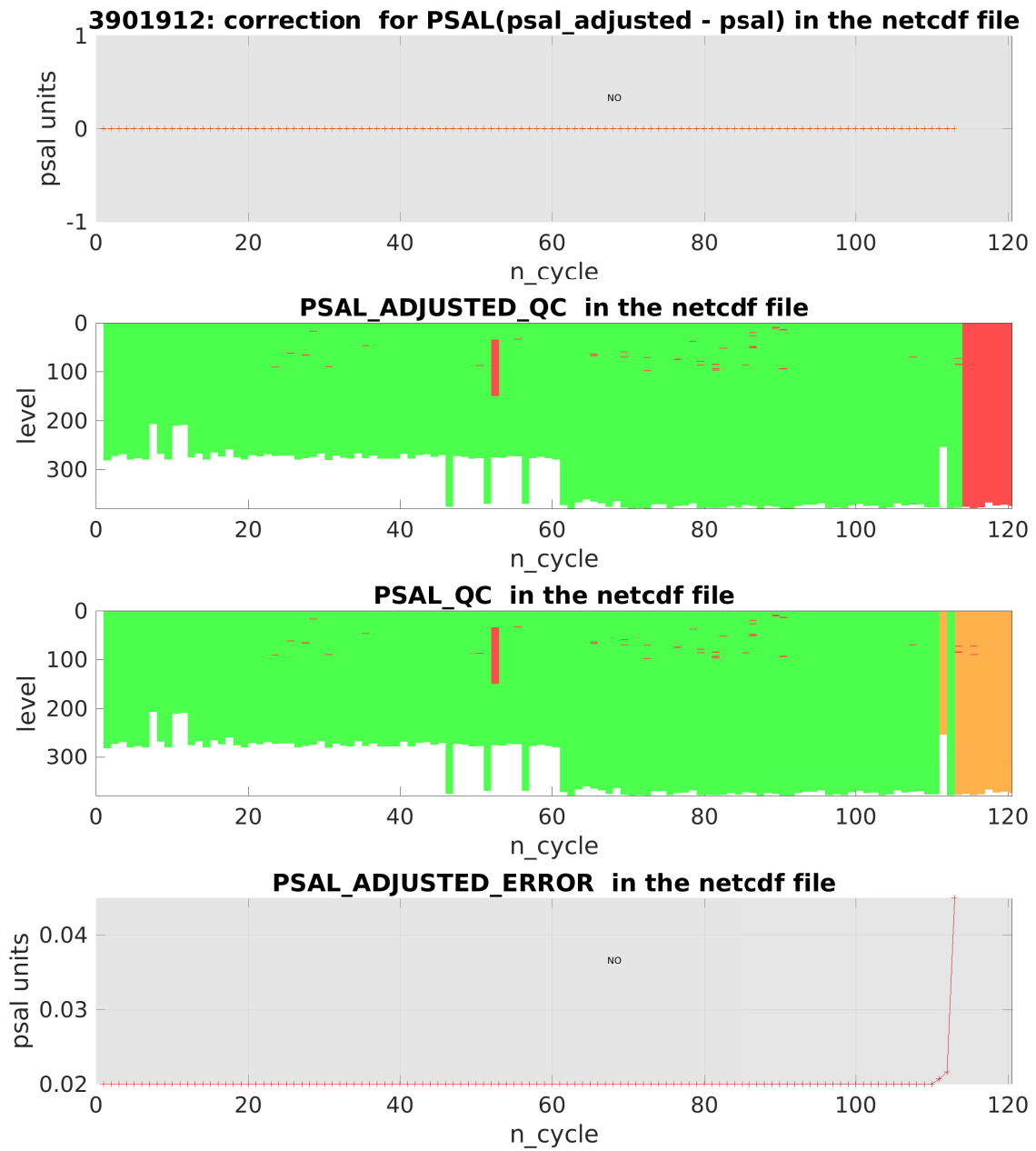


Figure 25: Float 3901912. Time series of applied salinity corrections.