Delayed mode quality control of MOCCA Argo float 3901886

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Summary

The assessed error of salinity for cycles 1-74, QC=1, error=0.02. For profiles 75-108, there was detected salty drift and the OWC correction was applied, QC=1, error=0.02. Profiles 109-123, strong fresh and salty spikes, QC=4 applied before the OWC.

WMO number	DM correction
3901886	Drift detected

Table 1: Correction applied in delayed mode.

Contents

1 Introduction

Delayed mode analysis was performed for float number 360718i (3901886) 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 360718i (3901886) click on the following link: http://www.ifremer.fr/argoMonitoring/float/3901886

2 Quality Check of Argo Float Data

2.1 Time Series of Vertical Distribution of Data

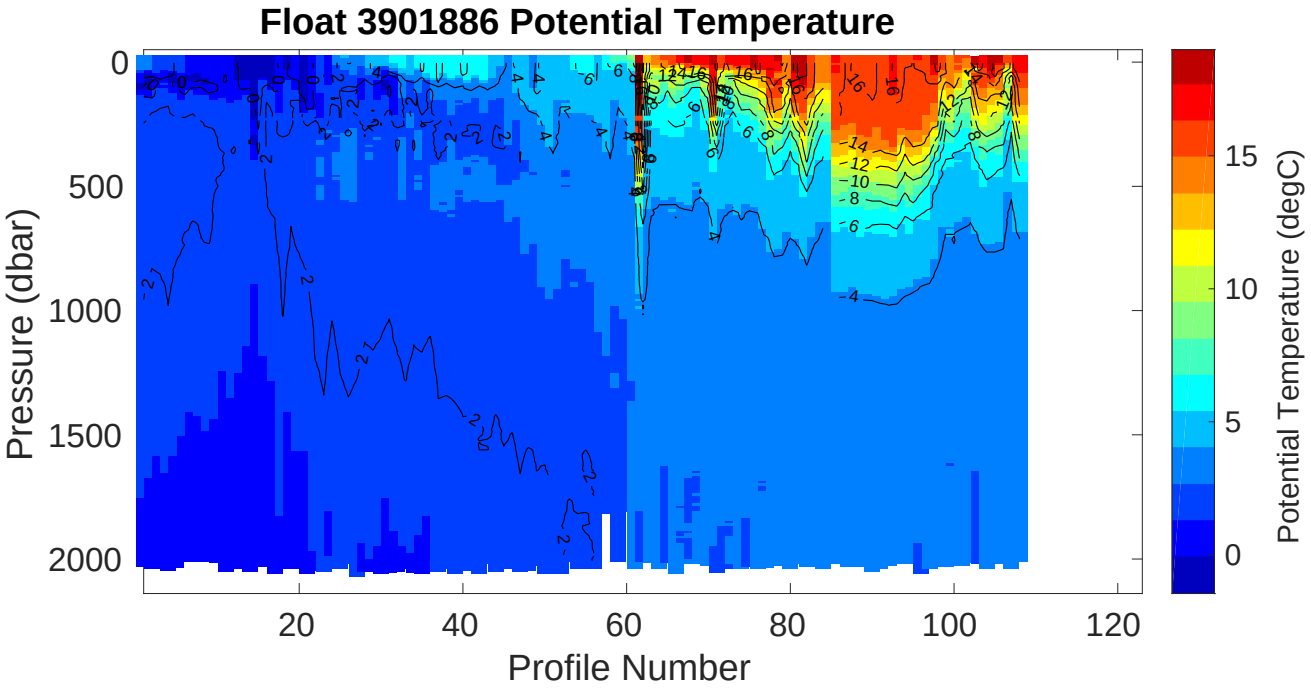

Figure 1: Float 3901886. Time series of the vertical distribution of potential temperature (°C).

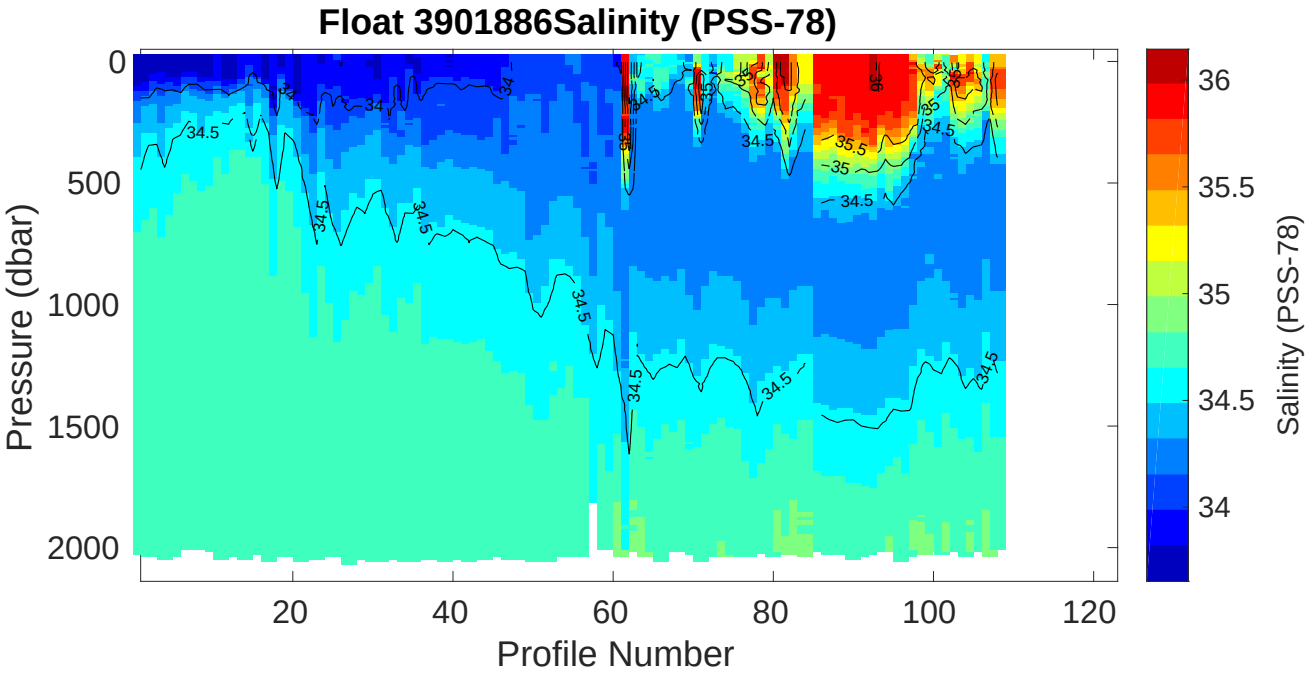

Figure 2: Float 3901886. Time series of the vertical distribution of practical salinity (PSU).

2.2 Comparison between Argo Float and Climatology

The comparison between float 3901886 and data from WMO boxes +/- 10°of latitude and longitude shows that the Argo profiles fit within the expected ranges (Figures 3, 4 and 5). This result confirms that float 3901886 represents relatively stable and consistent with the expected physical conditions in this region.

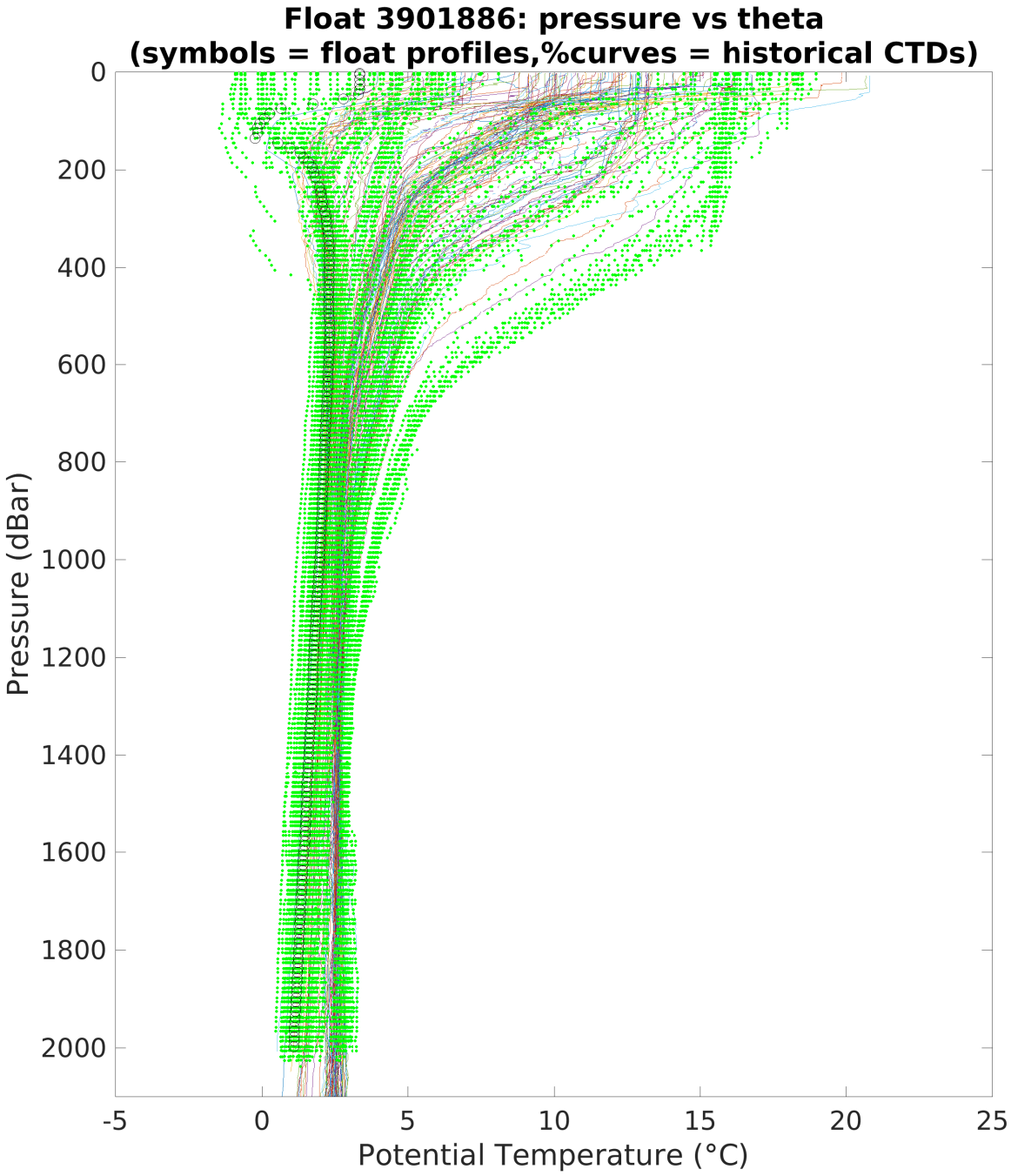

Figure 3: Float 3901886. Float profile of potential temperature (˚C) plotted with climatology from the spatial range of 10 ˚. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

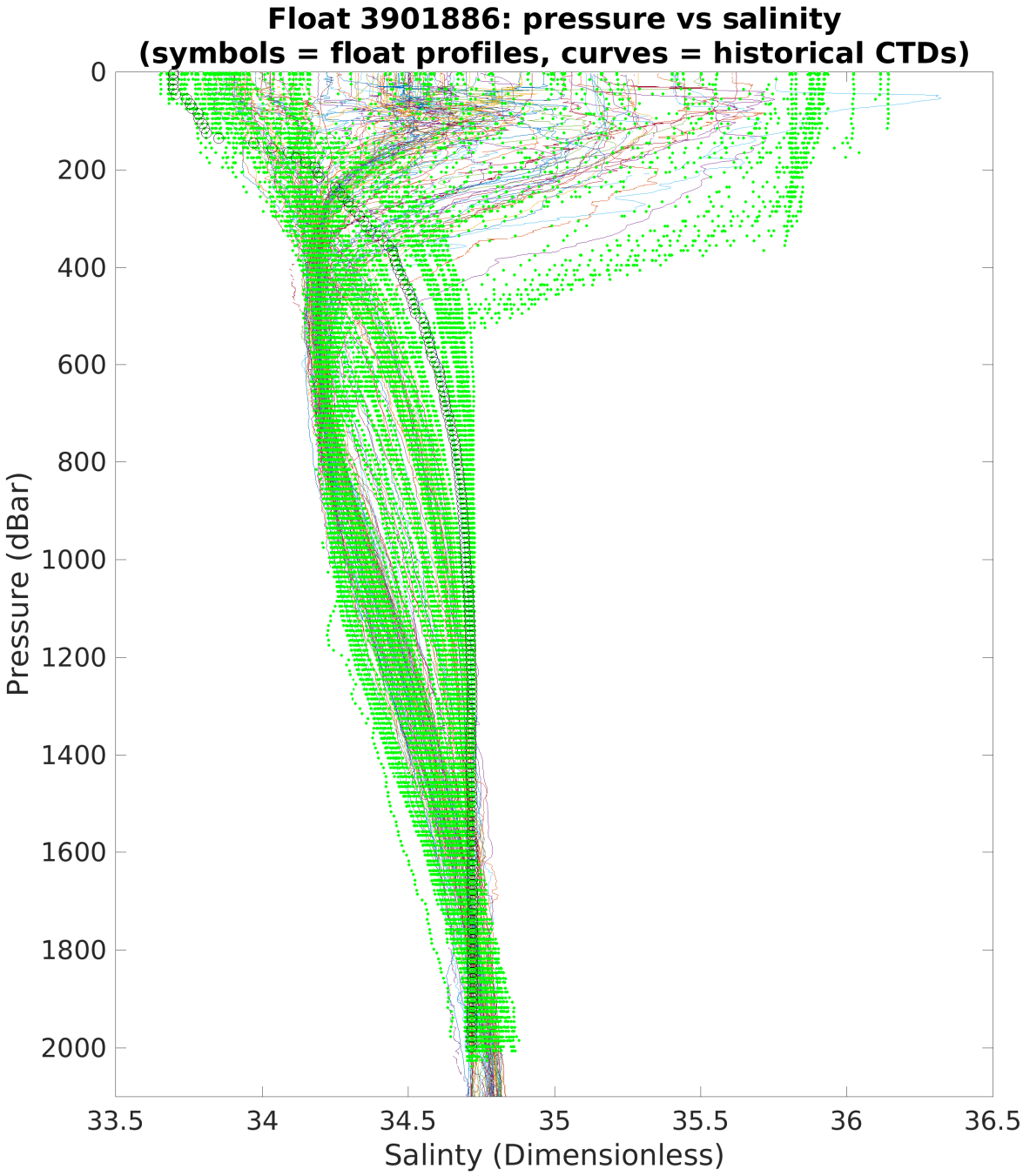

Figure 4: Float 3901886. Float profile of salinity (dimensionless) plotted with climatology from the spatial range of 10 ˚. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

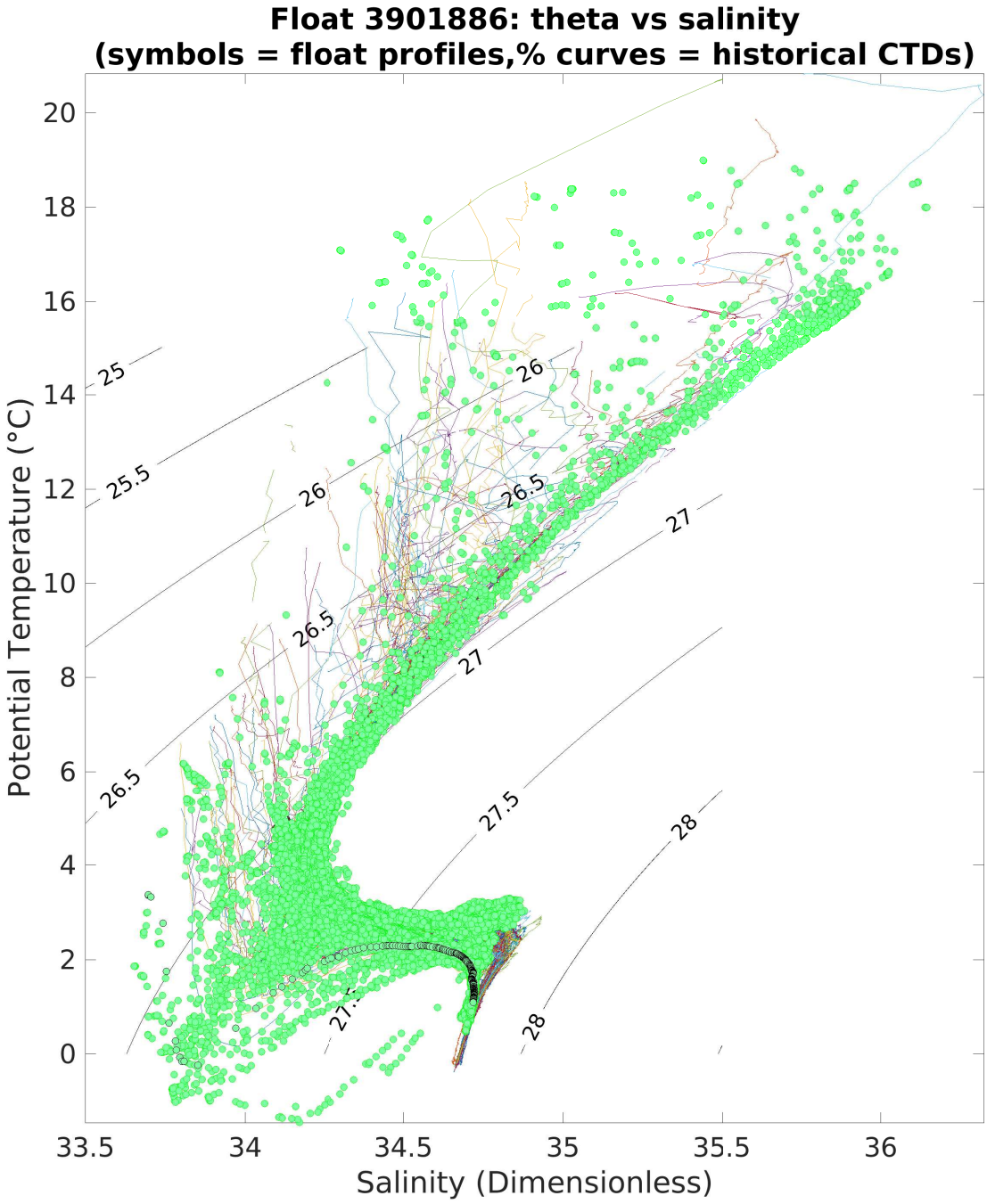

Figure 5: Float 3901886. Theta/S plotted with climatology from the spatial range of 10 °. The black and blue cycles indicates the first and the last Argo profile, respectively. Green symbols represent other Argo profiles.

2.3 Satellite Altimeter comparison

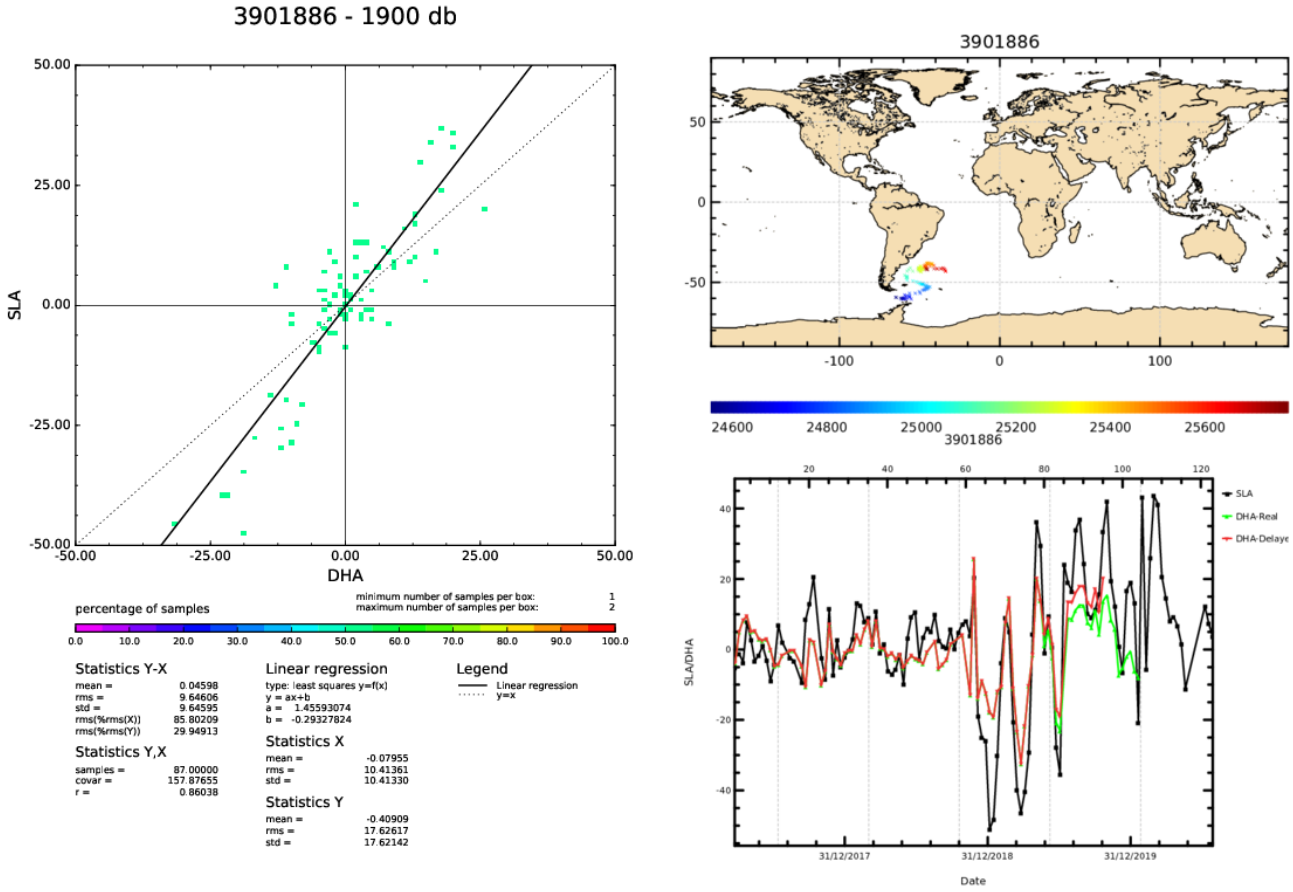

Figure 6: Float 3901886. The comparison betweeen the Sea Surface Height(SSH) from the satellite altimetry and Dynamic Height Anomaly(DHA)extracted from the Argo float temperature and salinity data

3 Correction of Salinity Data

3.1 Comparison between Argo floats and CTD Climatlogy

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_2020V01/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

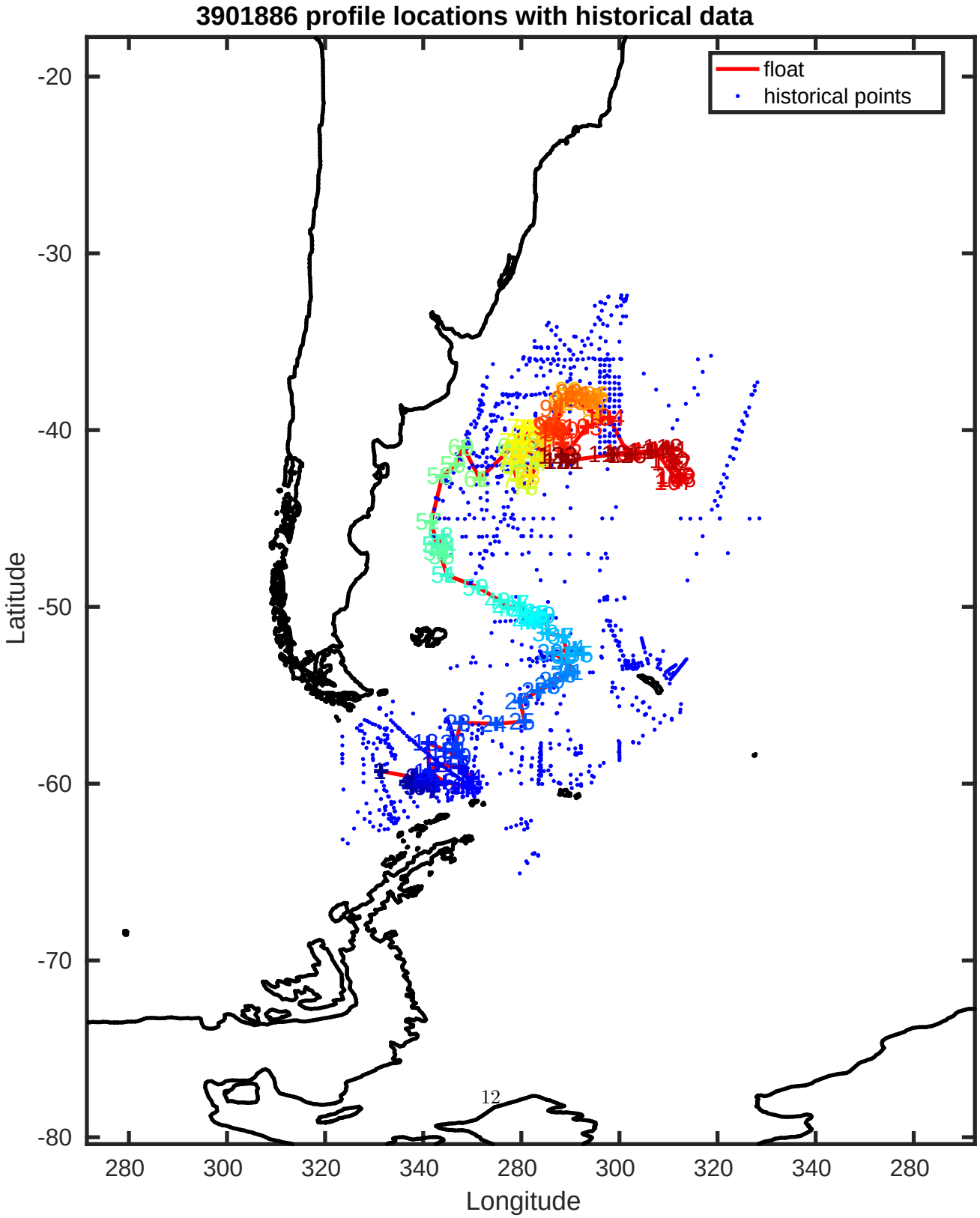

Figure 7: Float 3901886. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

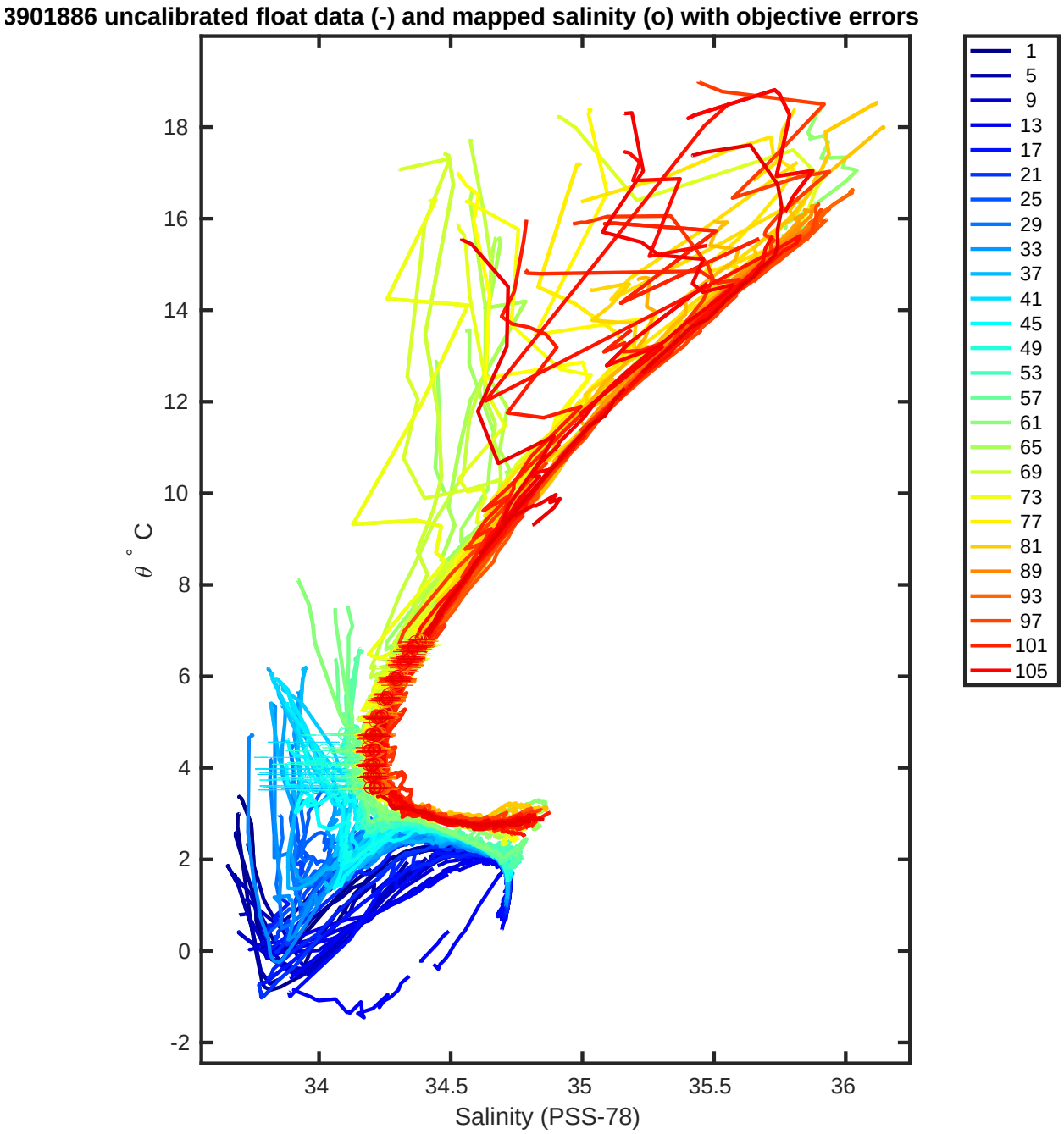

Figure 8: Float 3901886. Uncalibrated float data and mapped salinity.

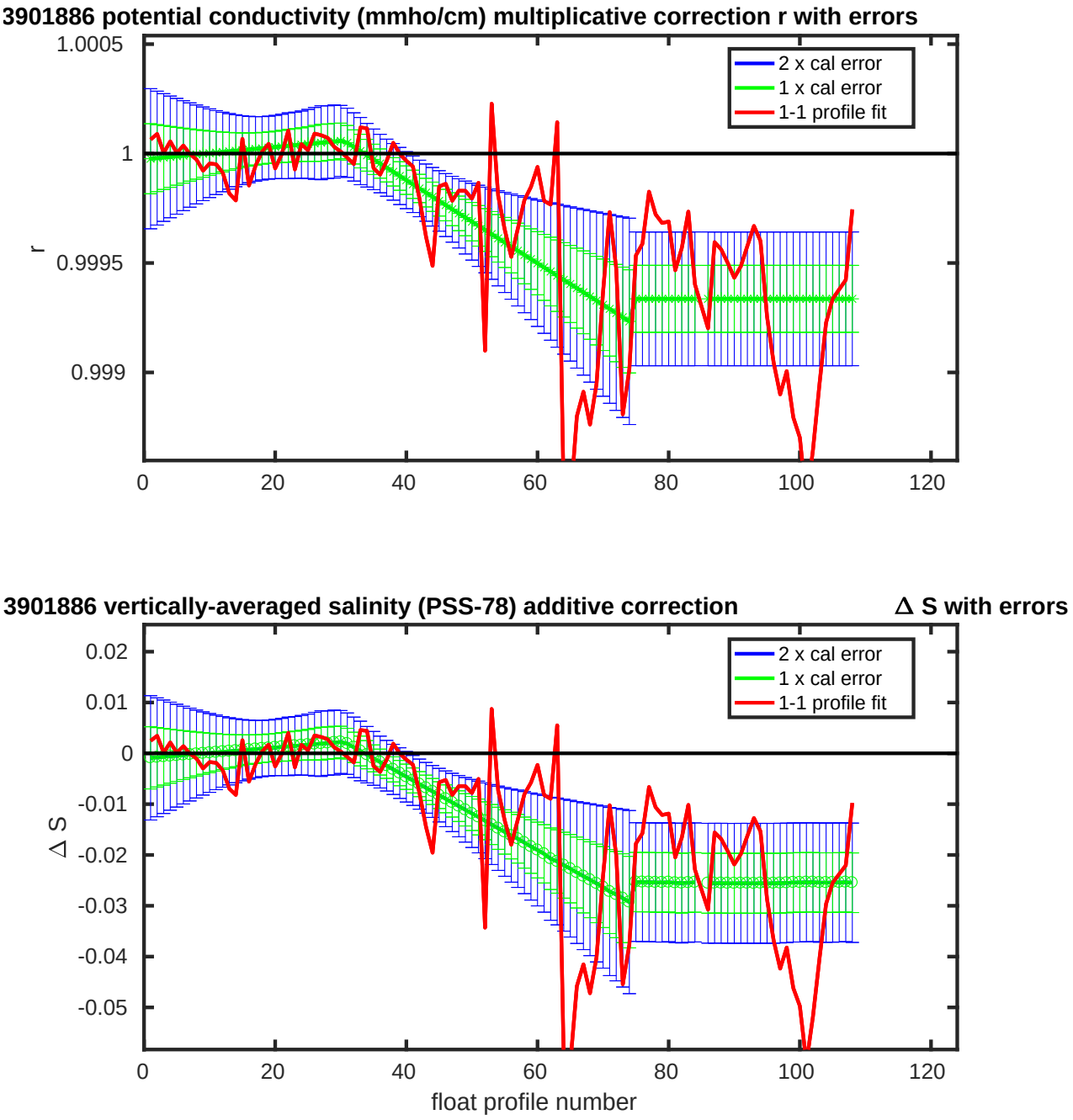

Figure 9: Float 3901886. Potential conductivity (top) and vertically averaged salinity (bottom) with errors. Theta levels selected between 6 and 10 degrees C.

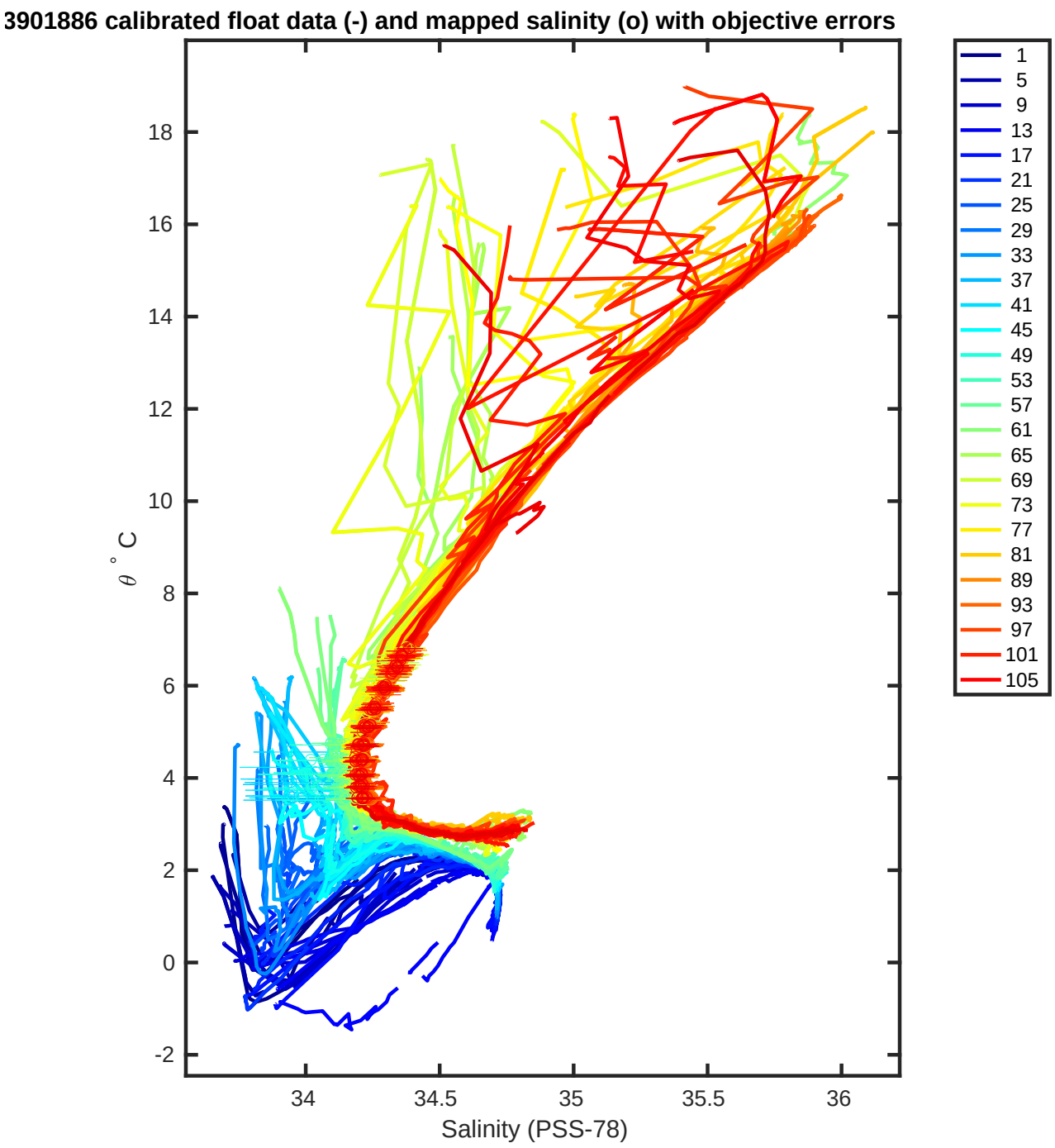

Figure 10: Float 3901886. Calibrated float data and mapped salinity.

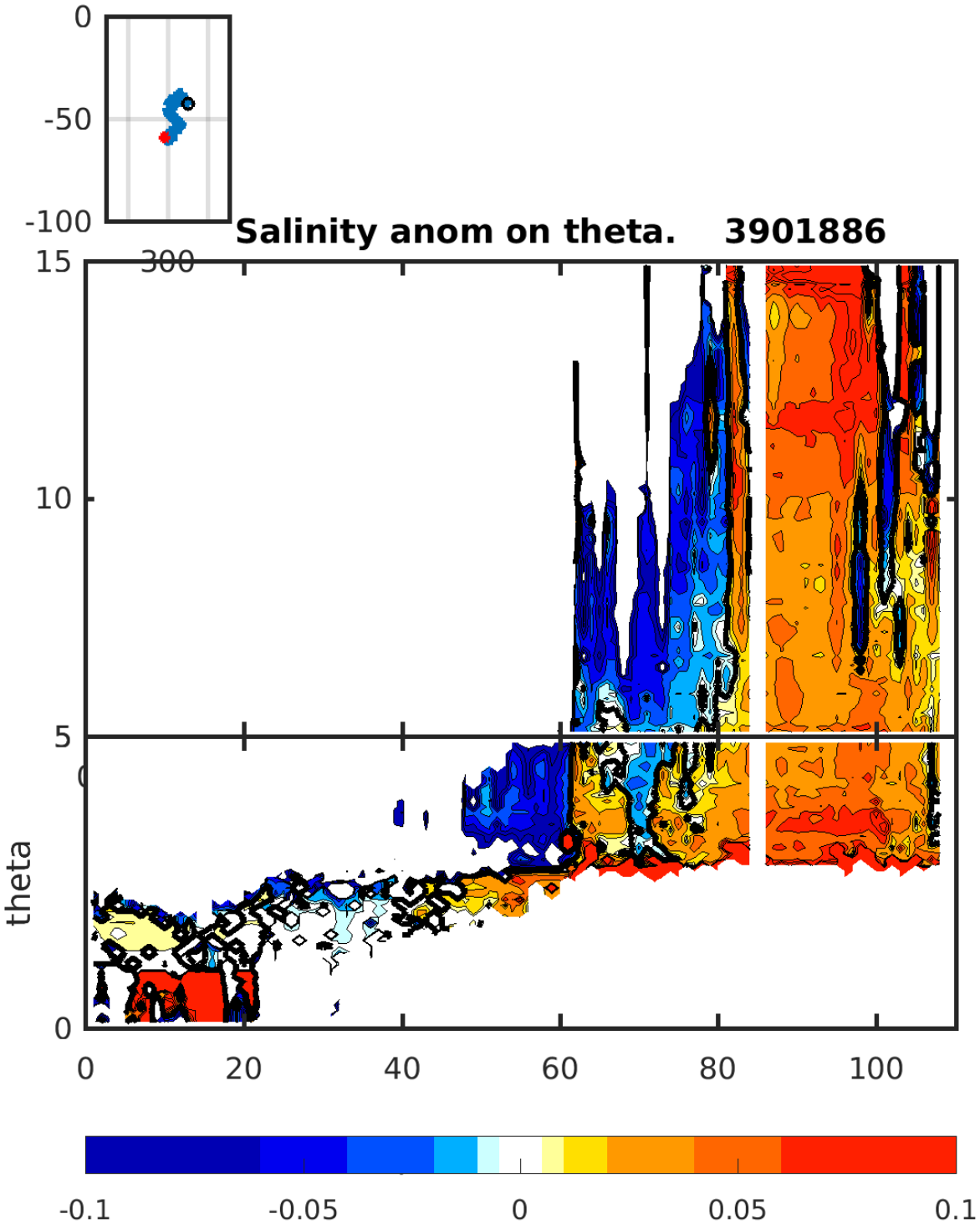

Figure 11: Float 3901886. Salinity anomaly on θ levels.

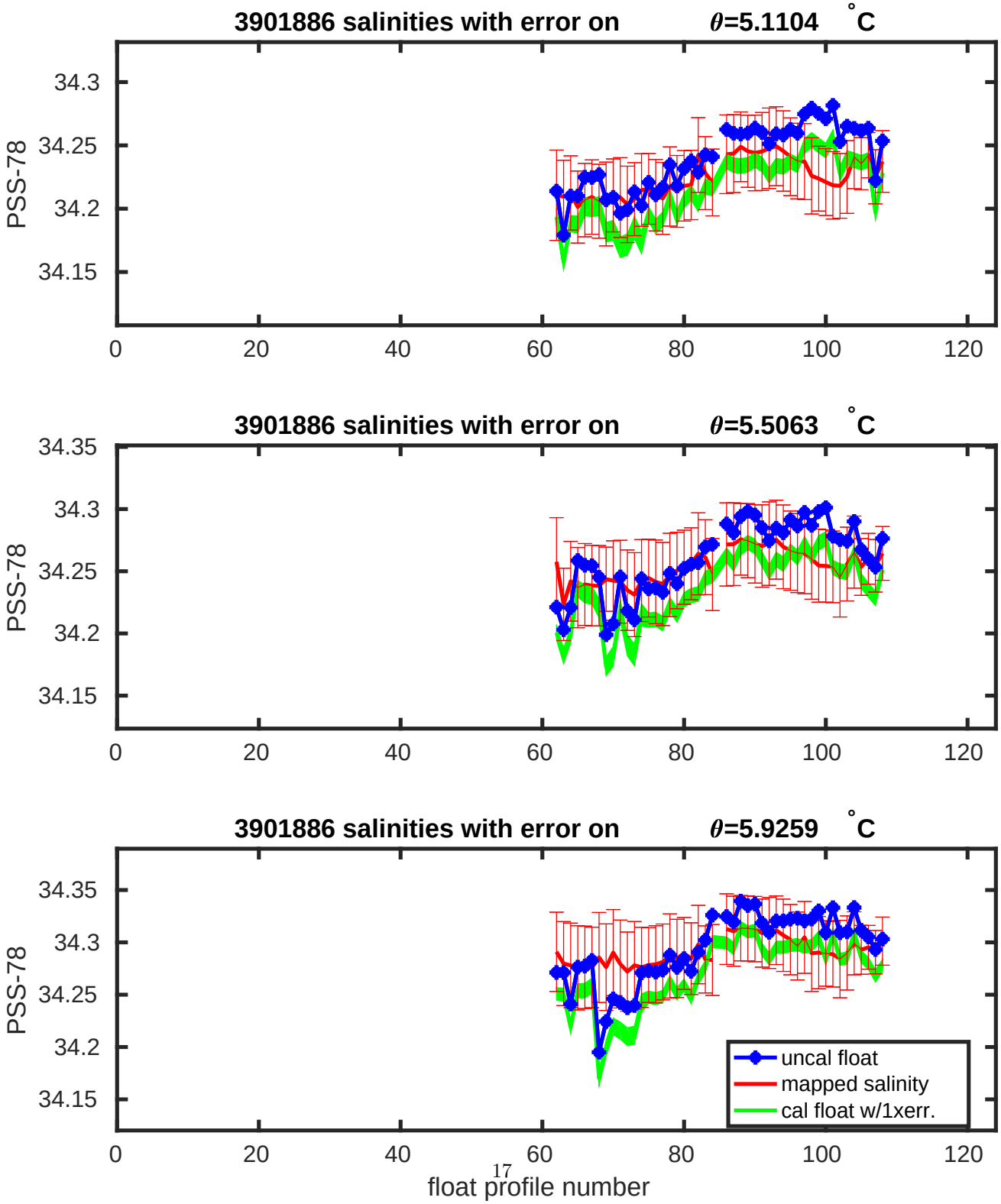

Figure 12: Float 3901886. Salinities with errors on θ levels.

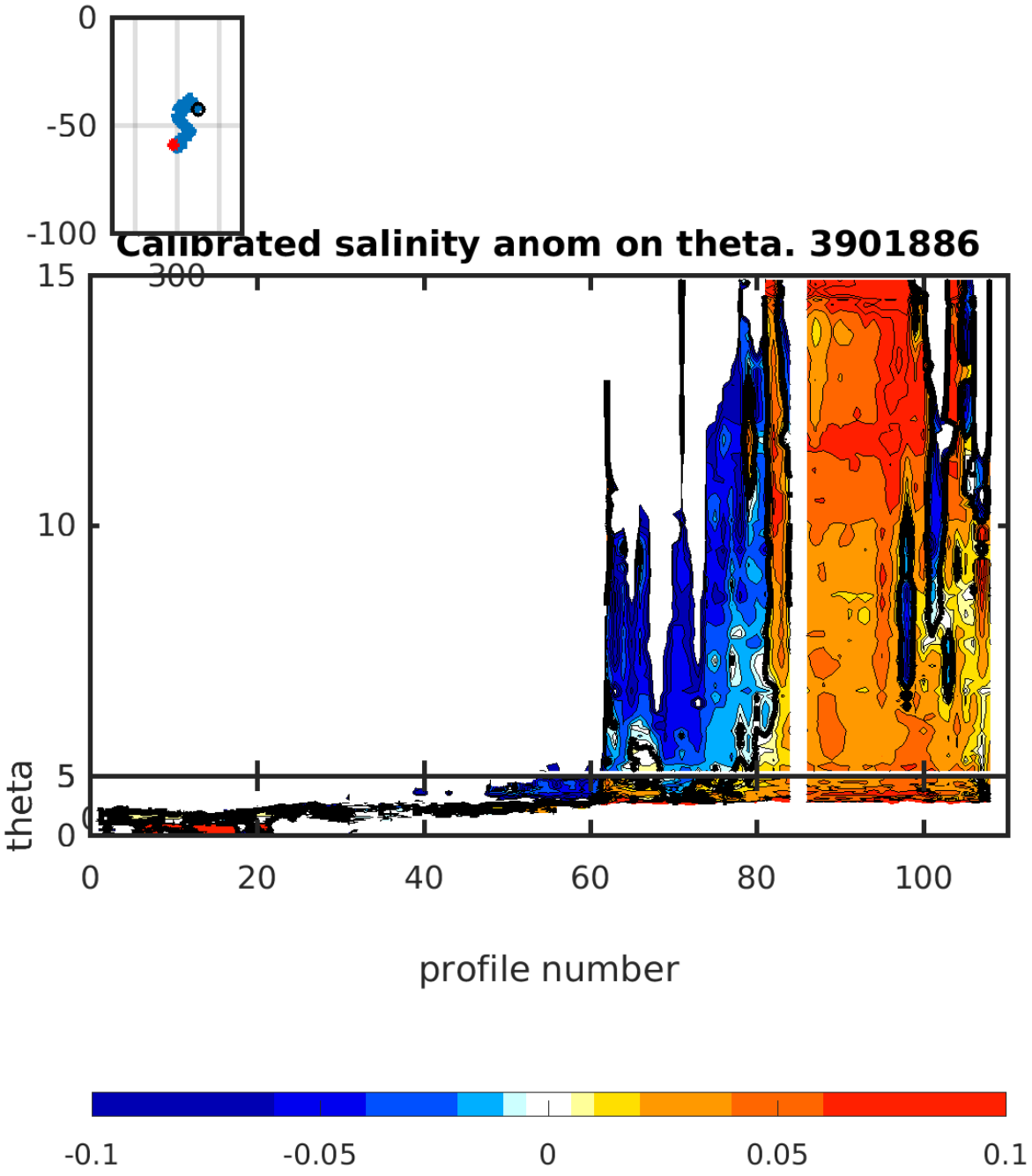

Figure 13: Float 3901886. Calibrated salinity anomaly on θ levels.

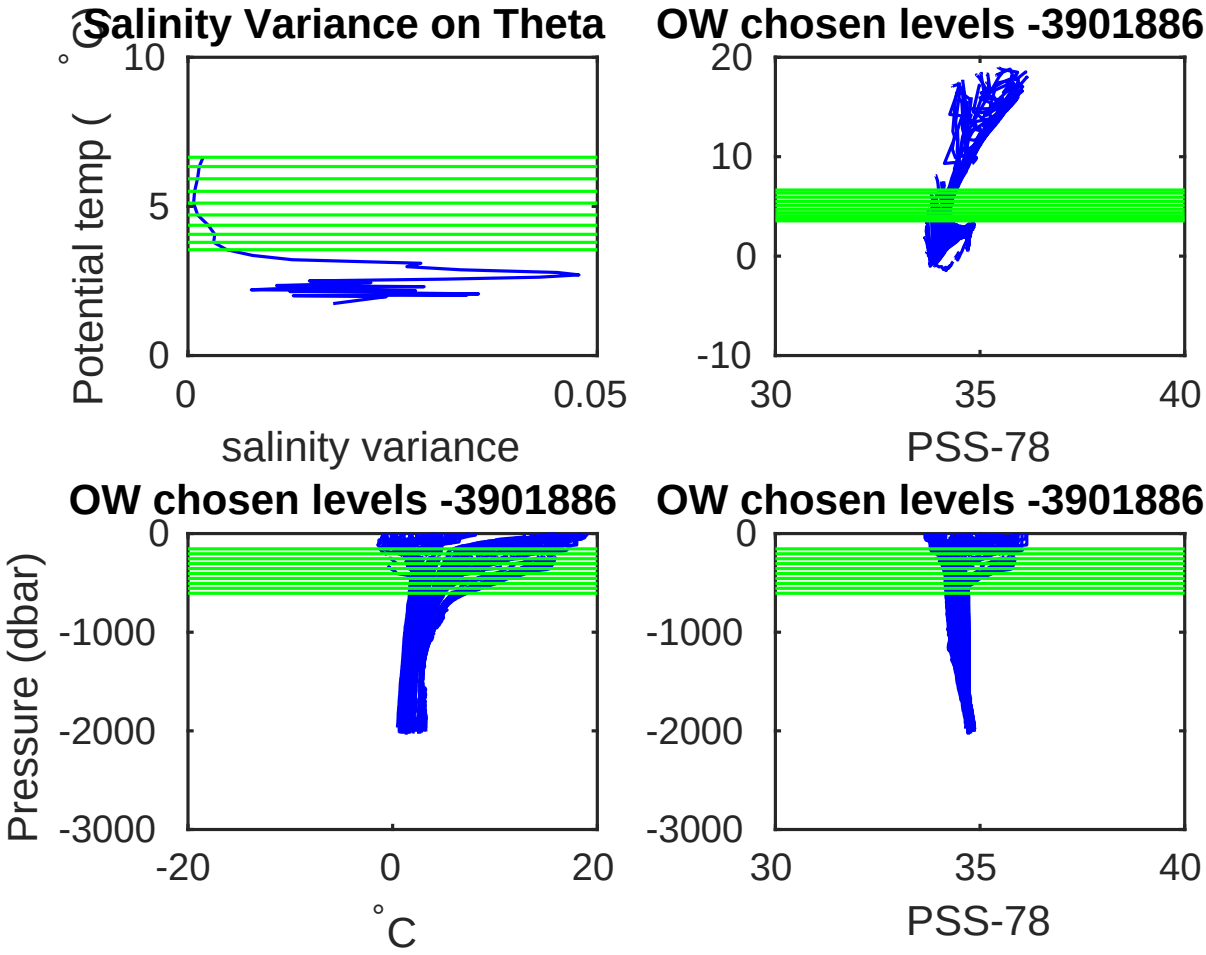

Figure 14: Float 3901886. Salinity, salinity variance on theta and OW chosen levels.

3.2 Comparison between Argo floats and Argo Climatlogy

3.2.1 Configuration

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HISTORICAL_BOTTLE_PREFIX=/historical_bot/bot_
HISTORICAL_ARGO_PREFIX=/argo_profiles/ARGO_for_DMQC_2020V01/argo_

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%    Float Input Path
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FLOAT_SOURCE_POSTFIX=.mat

% ================================
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%    Mapping Output Path
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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
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FLOAT_CALIB_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_calib/argo/
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FLOAT_CALSERIES_PREFIX=calseries_
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```
FLOAT_PLOTS_DIRECTORY=/users/argo/ow/matlabow-2.0.1/data/float_plots/argo/

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CONFIG_COASTLINES=coastdat.mat
CONFIG_WMO_BOXES=wmo_boxes_argo.mat
CONFIG_SAF=TypicalProfileAroundSAF.mat

% ================================
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```

3.2.2 Results

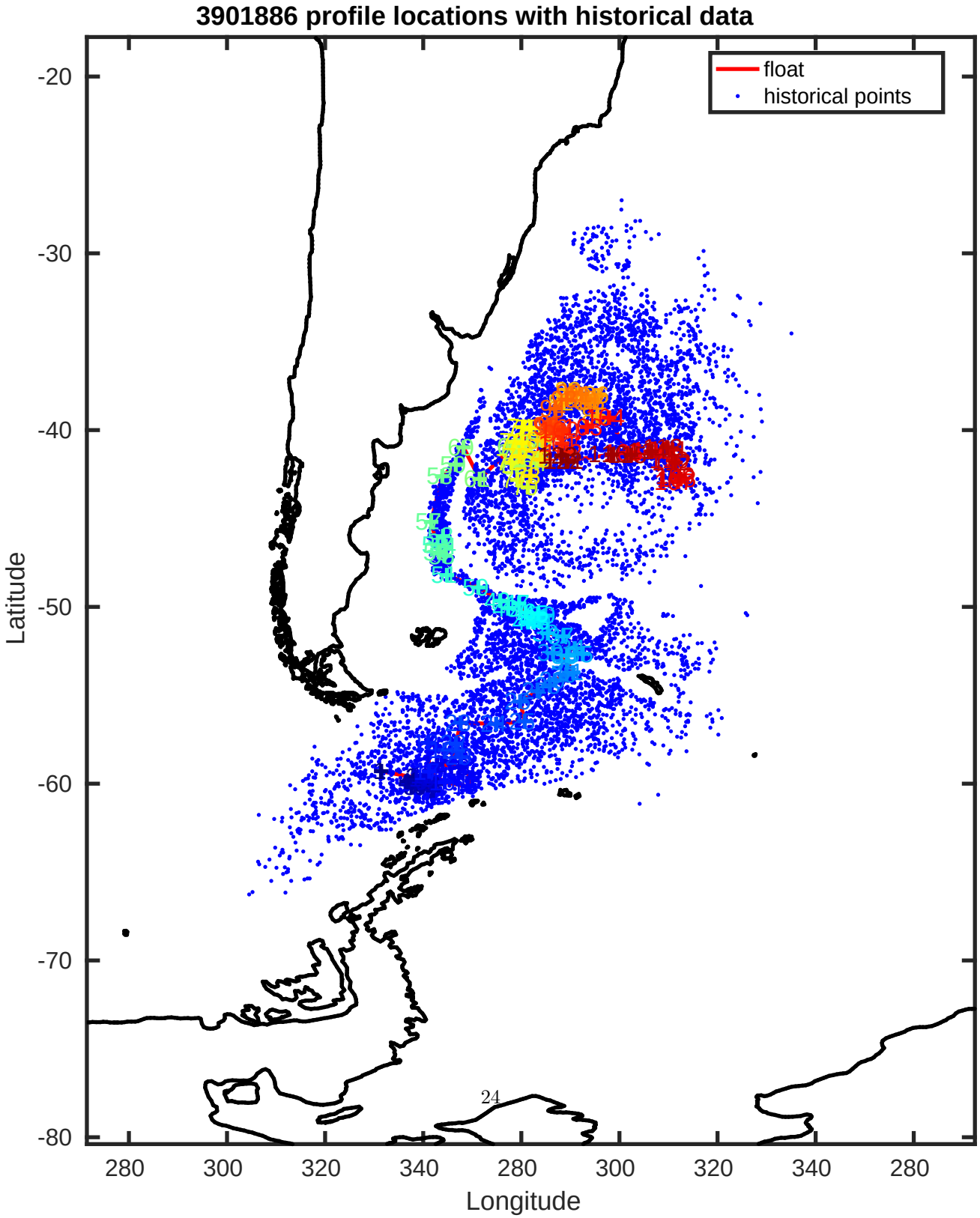

Figure 15: Float 3901886. Trajectory of the float with historical CTD data. The black contours indicate the bathymetry at 0, 200, 1000 and 2000 m.

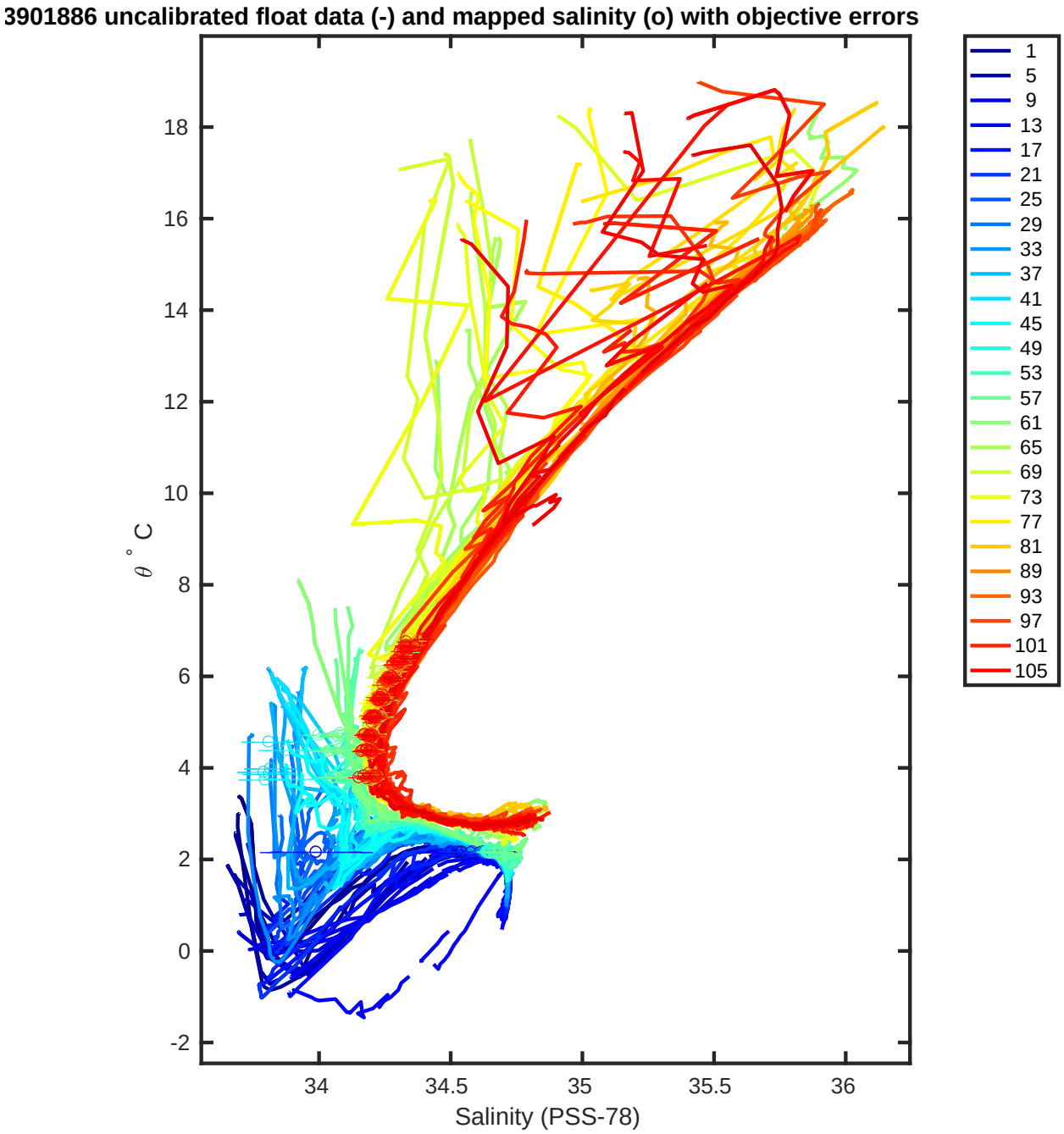

Figure 16: Float 3901886. Uncalibrated float data and mapped salinity.

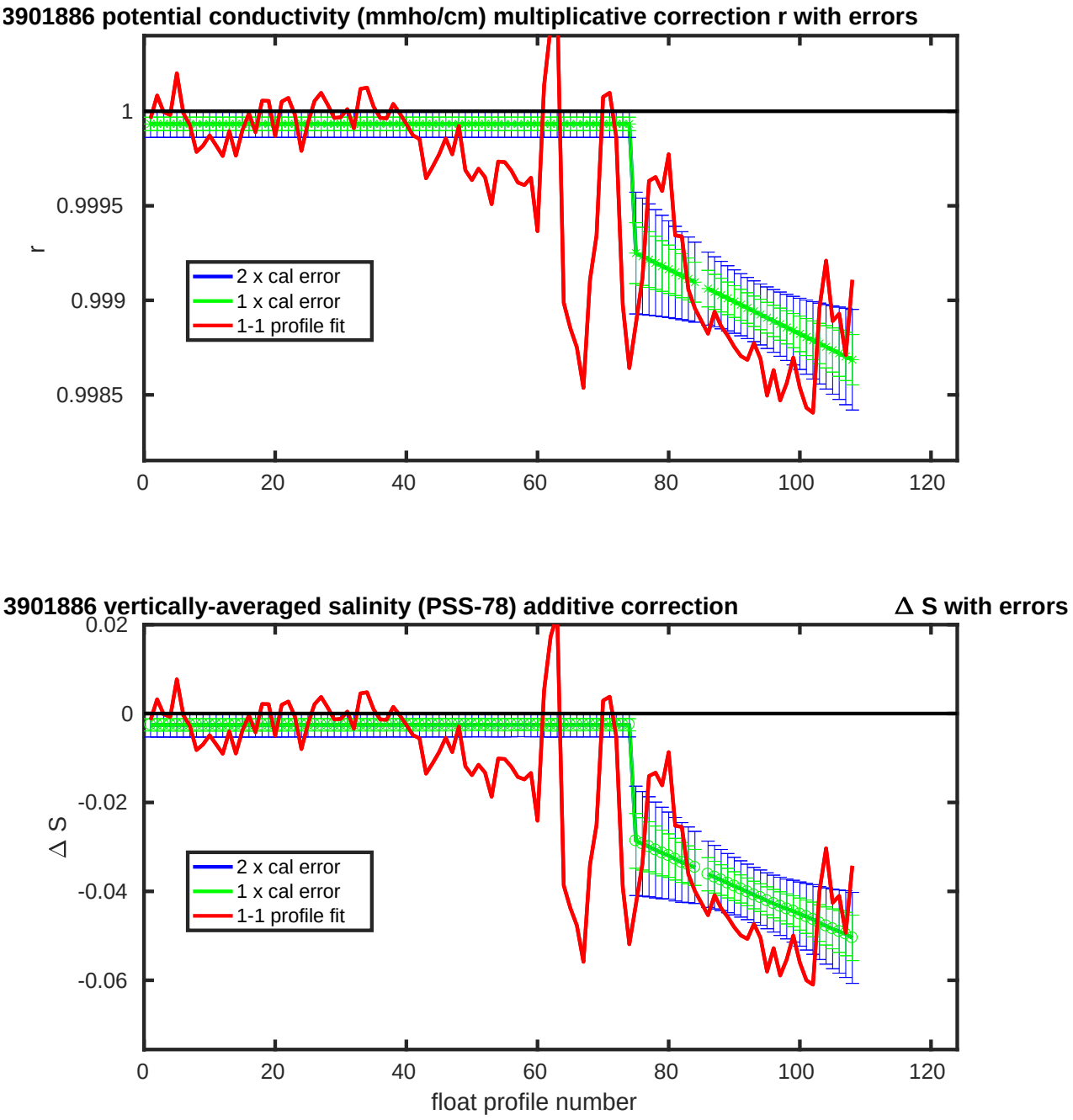

Figure 17: Float 3901886. Potential conductivity (top) and vertically averaged salinity (bottom) with errors.

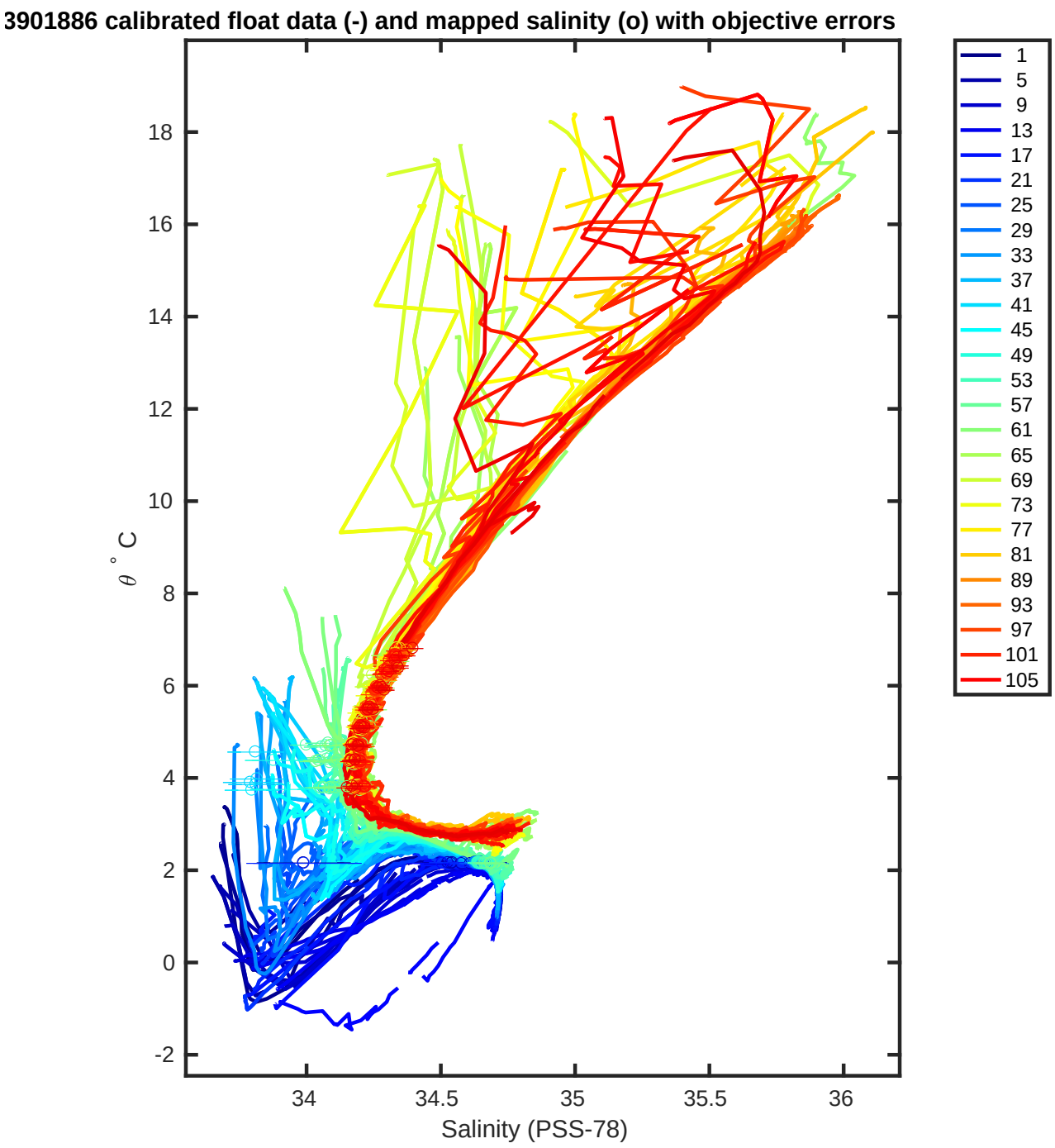

Figure 18: Float 3901886. Calibrated float data and mapped salinity.

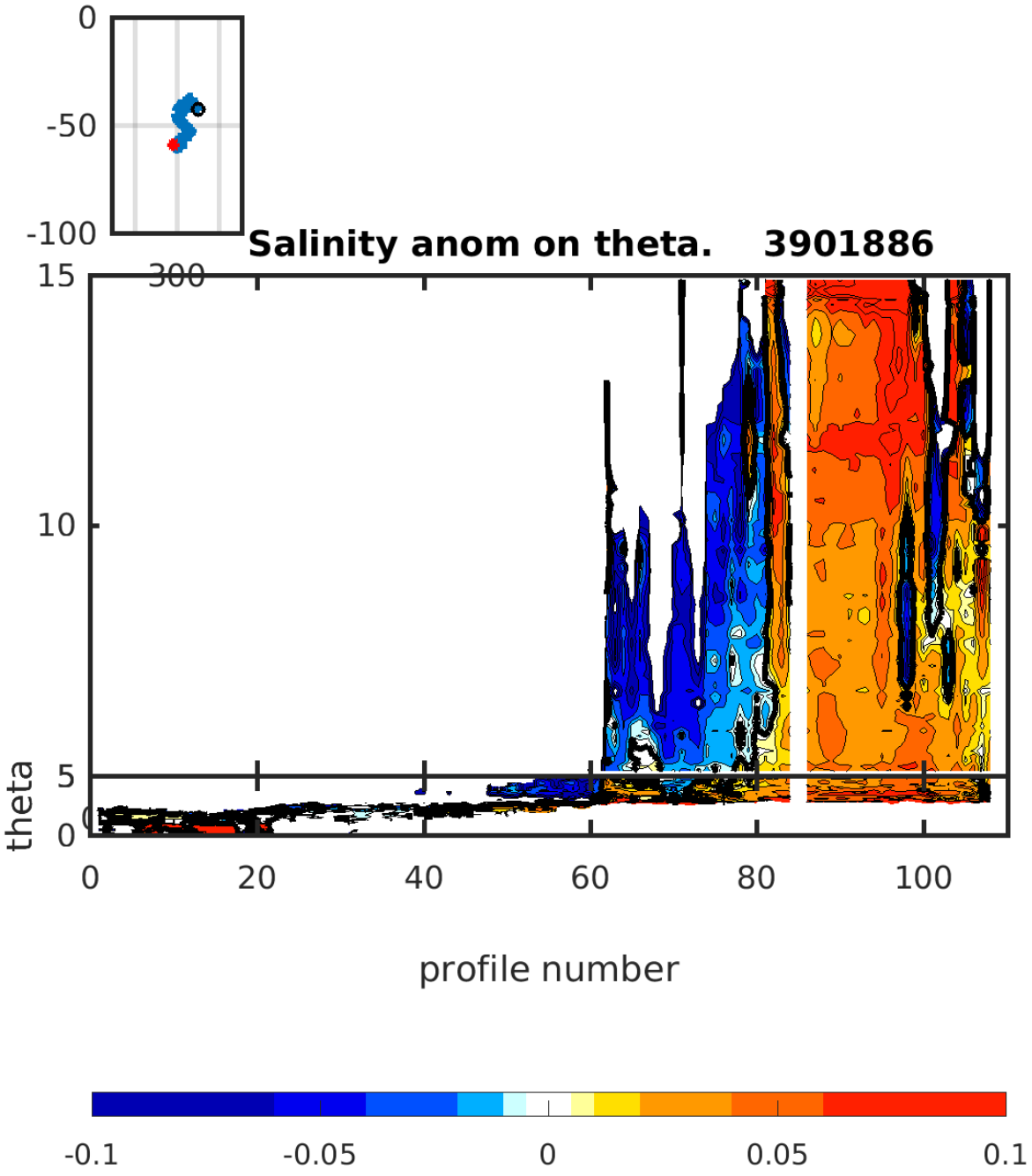

Figure 19: Float 3901886. Salinity anomaly on Theta

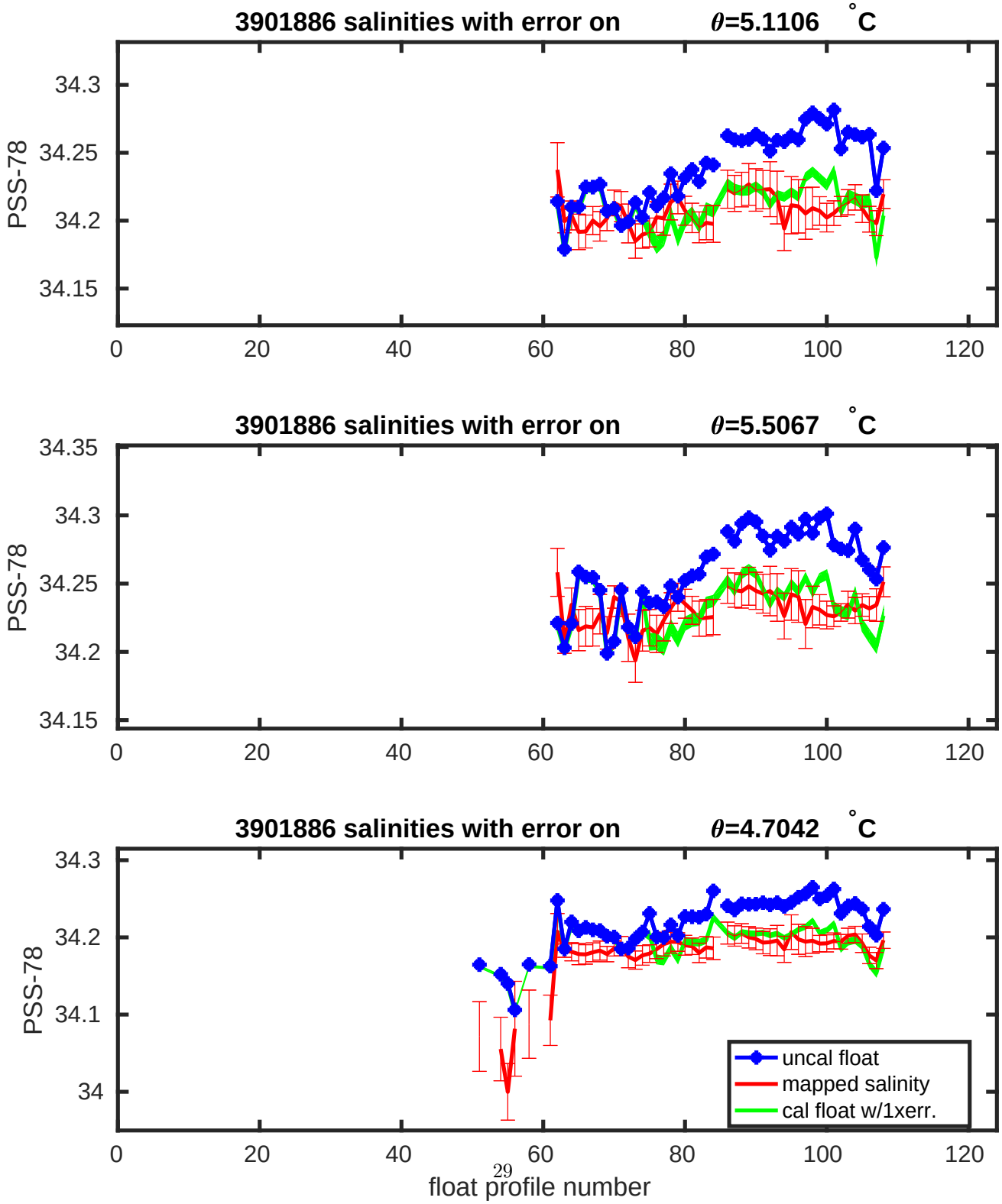

Figure 20: Float 3901886. Salinities with errors on θ.

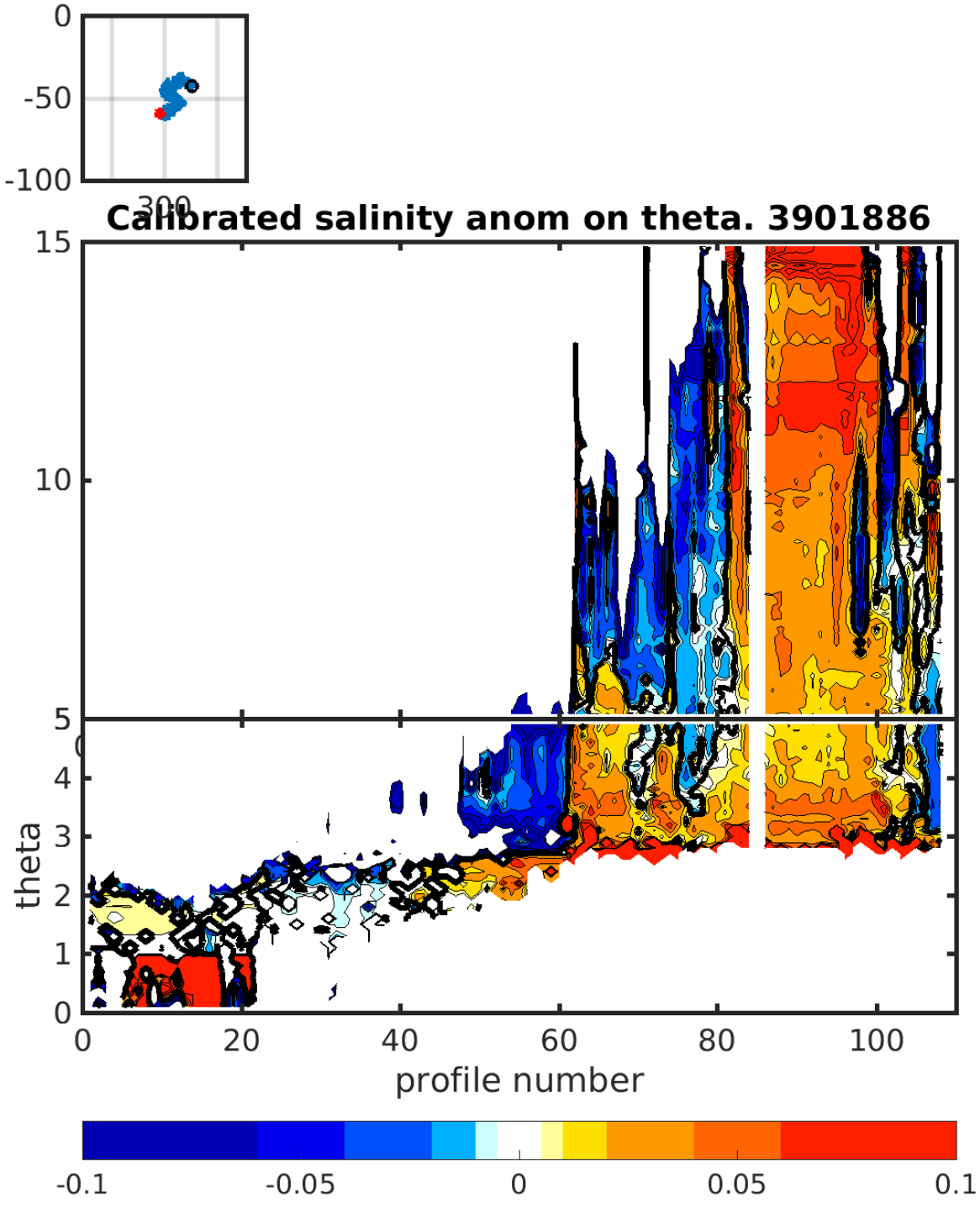

Figure 21: Float 3901886. Calibrated salinity anomaly on θ.

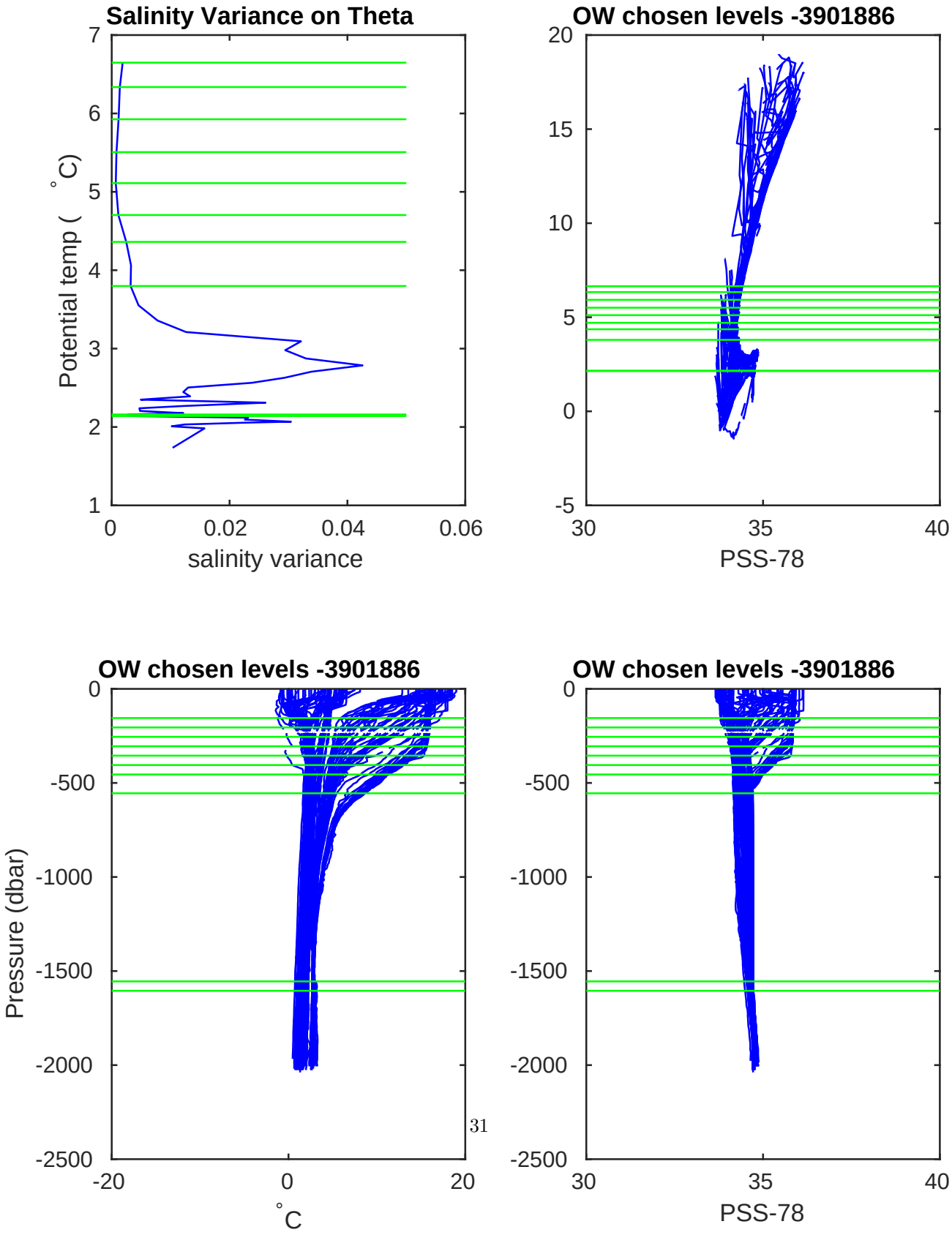

Figure 22: Float 3901886. Salinity, salinity variance on theta and OW chosen levels.

3.3 Summary and Conclusions

In the analysis the OWC method has been run few times including different water mass regimes where float was flowing through. The time series was splited onto few ranges: profiles 1-74, 75-108 and 109-123. From profiles 1 to 49 float was in the Drake Passage region. To best compare this data with climatology. The OWC analysis for this range of profiles showed a very good match to climatology from both CTD and Argo reference data. However, at particular theta levels showed some singular spikes. This is expected due to strong water mass inversion in salinity data in this region.

Furthermore, float was carried northward by Malvinas Current, strongly driven by the Subantarctic, where further moved eastward where it died in the Argentina Basin. By mowing northward float turned to relatively fresher and warmer water masses. There was also observed very strong variability of salinity and potential salty drift following by the dead of float. For profiles 50-74 float crossed the Falkland Plateau and flow northward driven by Subantarctic front along the south-eastern South America shelf. For this range, the OWC result showed very strong variability of salinity data compared to reference data. The profiles between 1 and 74 does not show any indication of drift, QC=1, error = 0.02.

From profile around 75 to 108 float was circulated in the system of eddies in the Argentina Basin. The OWC showed evidences of relatively strong salty drift. The OWC corrections were applied to this profiles with QC=1 and error 0.02.

Rest of the profiles from 109 to 123 showed strong fresh and salty spikes that is caused probably by some issues with the sensor that lead to dead of the float. These profiles were flagged QC=4 before the OWC analysis.

4 Final Checks

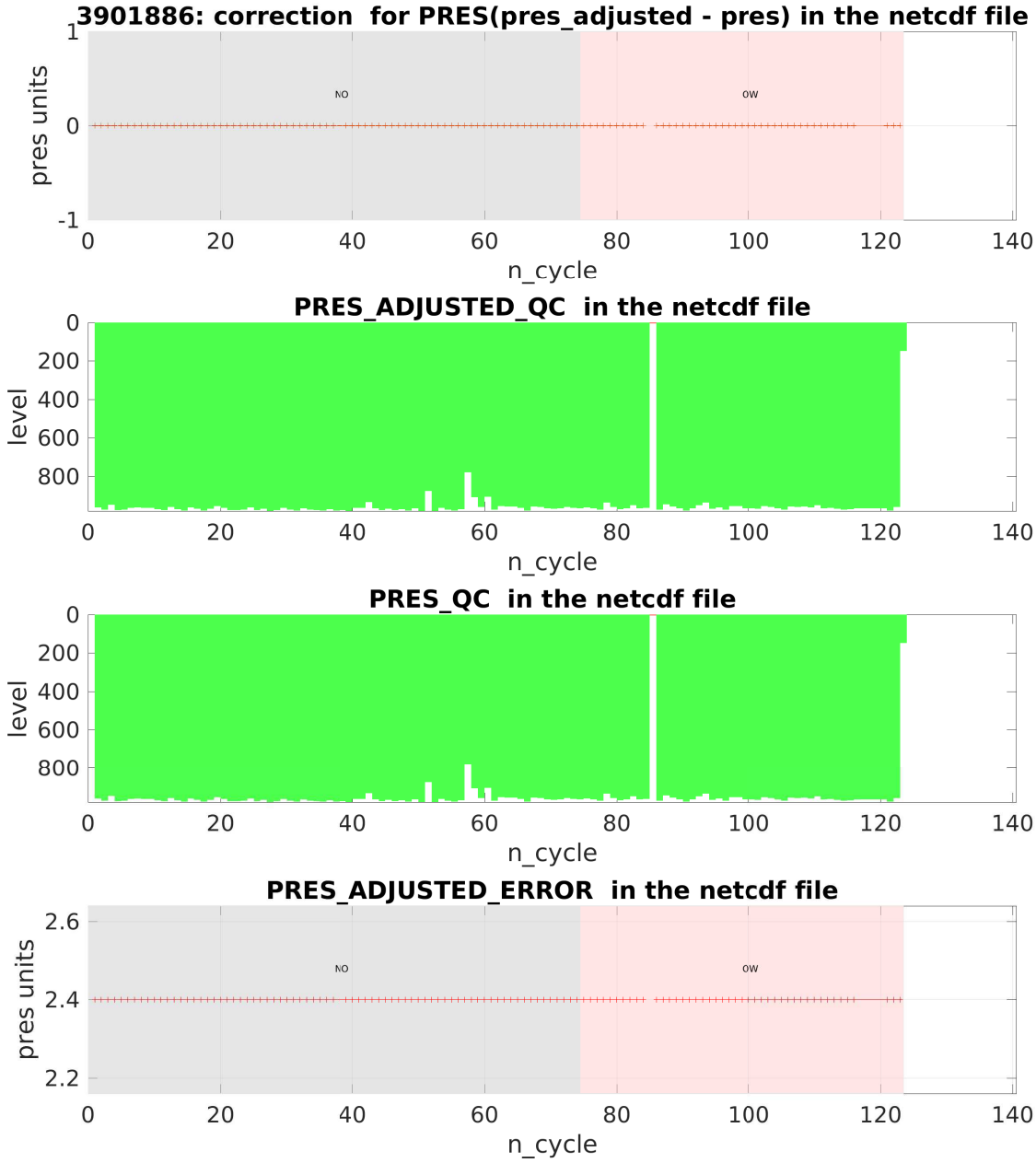

Figure 23: Float 3901886. Time series of applied pressure corrections.

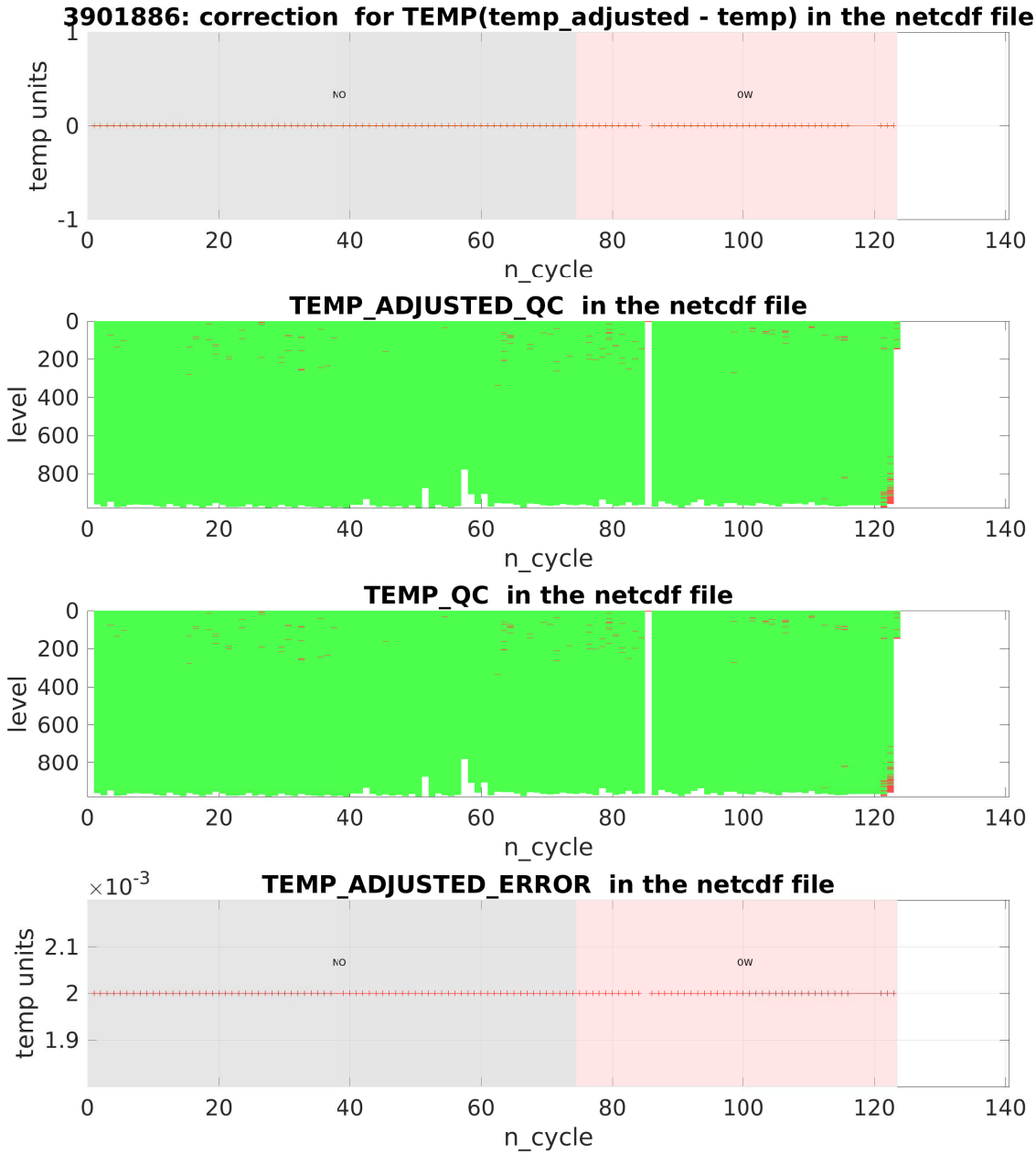

Figure 24: Float 3901886. Time series of applied temperature corrections.

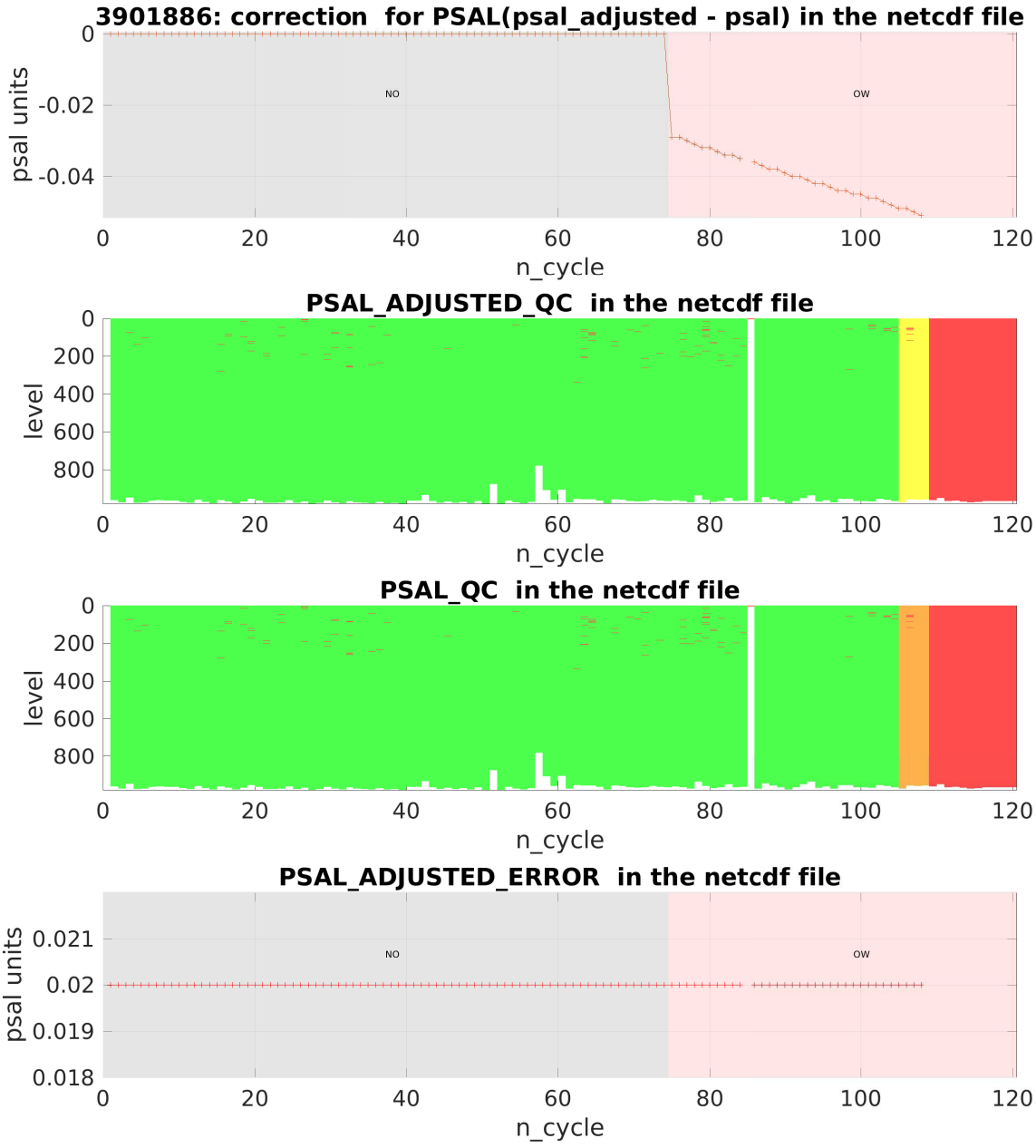

Figure 25: Float 3901886. Time series of applied salinity corrections.