Continuous thermosalinograph oceanography along RV POLARSTERN cruise track PS122_2

Data Processing Report

Contents

Contact:

Gerd Rohardt

Alfred-Wegener-Institute

Am Handelshafen 12, D-27570 Bremerhaven, GERMANY

Mail: info@awi.de

Processing Agency:

FIELAX

Gesellschaft für wissenschaftliche Datenverarbeitung mbH

Schleusenstr. 14, D-27568 Bremerhaven, GERMANY

Tel: +49 (0) 471 30015 0

Fax: +49 (0) 471 30015 22

Mail: info@fielax.de

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1 Introduction

This report describes the processing of raw data acquired by the thermosalinographs on board RV Polarstern during expedition PS122_2 to receive cleaned up and corrected salinity data. Detailed description of the processing of the data and the workflow is given in the general report: "General processing report of continuous thermosalinograph oceanography from RV POLARSTERN cruises: PS121, PS122_1, PS122_2, PS122_3, PS122_4, PS122_5 " .

Cruise details

Vessel name:	RV Polarstern
Cruise name:	PS122_2
Cruise start:	2019-12-13
Cruise end:	2020-02-24
Cruise duration:	73 days
Working area:	Arctic Ocean

2 Sensor Details

Following sensors were installed during cruise PS122_2. Only data from **TSG1** are uploaded to PANGAEA for cruise PS122_2 and are furthermore considered in this report (for reasoning see General Processing Report).

	TSG1	**TSG2**
Serial number	SBE21-3189	SBE21-3354
Installation	2019-06-28	2019-06-28
Deinstallation	2020-10-30	2020-10-30
Days installed	490	490
External temperature sensor	SBE38-0136	SBE38-0154

3 Processing Report

Database Extraction

Data source	DSHIP database (dship.awi.de)
Start of raw file	2019-12-13T09:04:00
End of raw file	2020-02-24T08:59:59
Number of lines in hexadecimal raw file	6306960
First dataset	2019-12-13T09:04:02
Last dataset	2020-02-24T08:59:58
TSG1 valid data	1576674

Calculation of 10min means

The calculation of 10min means included the removal of outliers outside a 2-times standard deviation for each data interval. The number of outliers for each parameter are given here.

Number of outliers >2*std	
Internal temperature	60449
Conductivity	54703
External temperature	63430
Salinity	73636
Result after outlier removal	
Number 10-min-means	10512

Manual flagging

After processing the data were visually inspected. The whole data from a specific timestamp were deleted if there was only one parameter to be manually flagged. **0** data points were manually removed from the TSG1 dataset of PS122_2.

Assigning navigation data

Data from the corrected mastertrack of cruise PS122_2 were assigned to the 10min means of TSG1. Normally, a speed filter of 0.5 knots minimum speed is applied to the TSG data in order to avoid redundant data. The speed filter was NOT applied to the data of PS122_2 because of the slow drifting speeds during expedition. See Figure 1 and Figure 2 for the processed and corrected data of TSG1.
Number of speed flags: 10345 (data maintained in final output file)
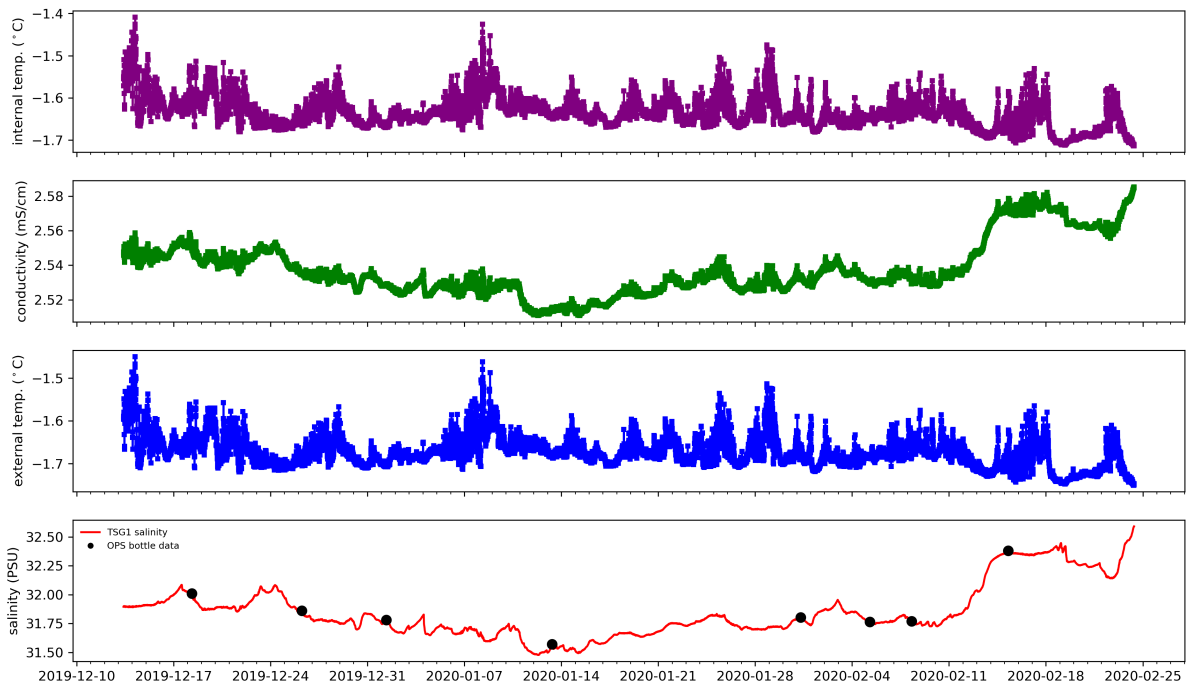**Number of data in final output file**: 10511

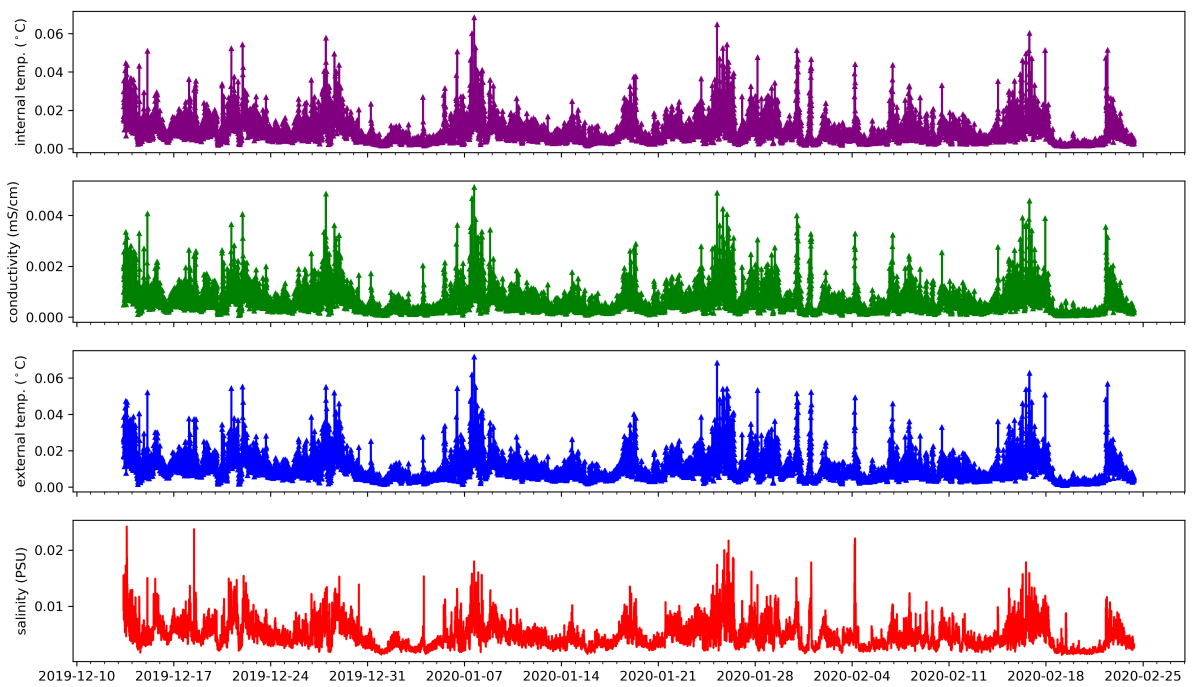Figure 1: 10min means of data from TSG1

Figure 2: Standard deviations of 10min means of data from TSG1

Differences between internal and external temperature of TSG1 temperature sensors

Temperature differences between the internal and the external temperature sensors have to be small under normal circulation conditions. Means and standard deviations for the temperature differences as well as the number of data with a difference larger than 1 °C are given in the following table and are shown in Figure 3.

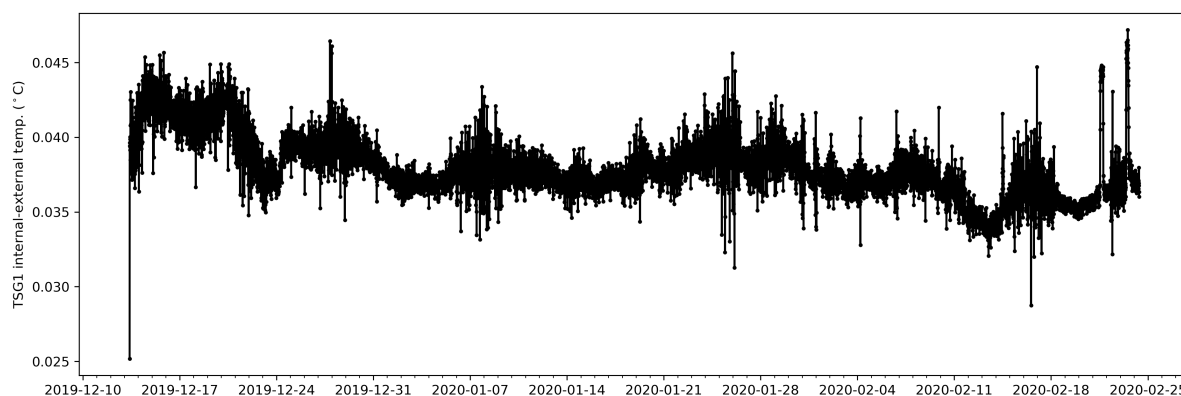|	TSG1 temperature difference	
	mean $\pm$ standard dev.	no. > 1°C
Spot values	$0.0378 \pm 0.0077°C$	0
10-min means	$0.0380 \pm 0.0020°C$	0

Figure 3: Differences between internal and external temperature sensors of TSG1

Result file

The result file is a plain text (tab-delimited values) file named **PS122_2_surf_oce.tab** with one data row in 10-min interval. Salinity values are calculated from the 10min means of conductivity and internal temperature data using a pressure of 11 dbar for the calculations. The pressure refers to the 11m water depth of the water inlet of the TSG system on R.V. Polarstern. Water temperature taken from the TSG external temperature sensor is given for reference.

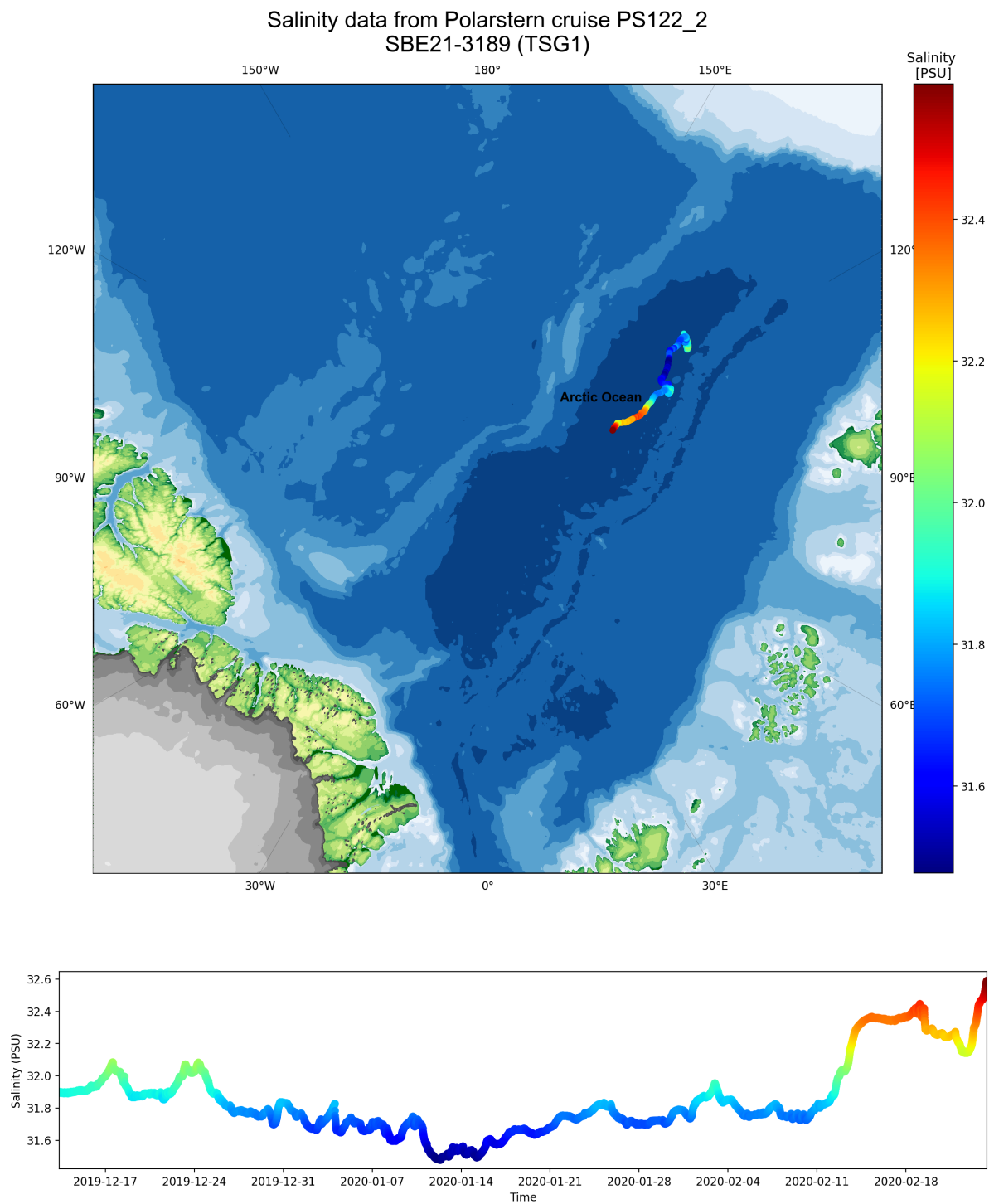| Column separator	Tabulator "\t"
Column 1	Date and time expressed according to ISO 8601
Column 2	Latitude in decimal format, unit degree
Column 3	Longitude in decimal format, unit degree
Column 4	Water Temperature, unit degree celsius
Column 5	TSG Internal Temperature, unit degree celsius
Column 6	Conductivity, unit mS/cm
Column 7	Salinity, PSU

Comments

Data gaps due to system maintenance or system shutdown during harbour time:

- no comments

Apart from this, data gaps are caused by speed flagging or manual removal of outliers.

4 Appendix

Salinity data from Polarstern cruise PS122_2
SBE21-3189 (TSG1)

Figure 4: Salinity data from TSG1
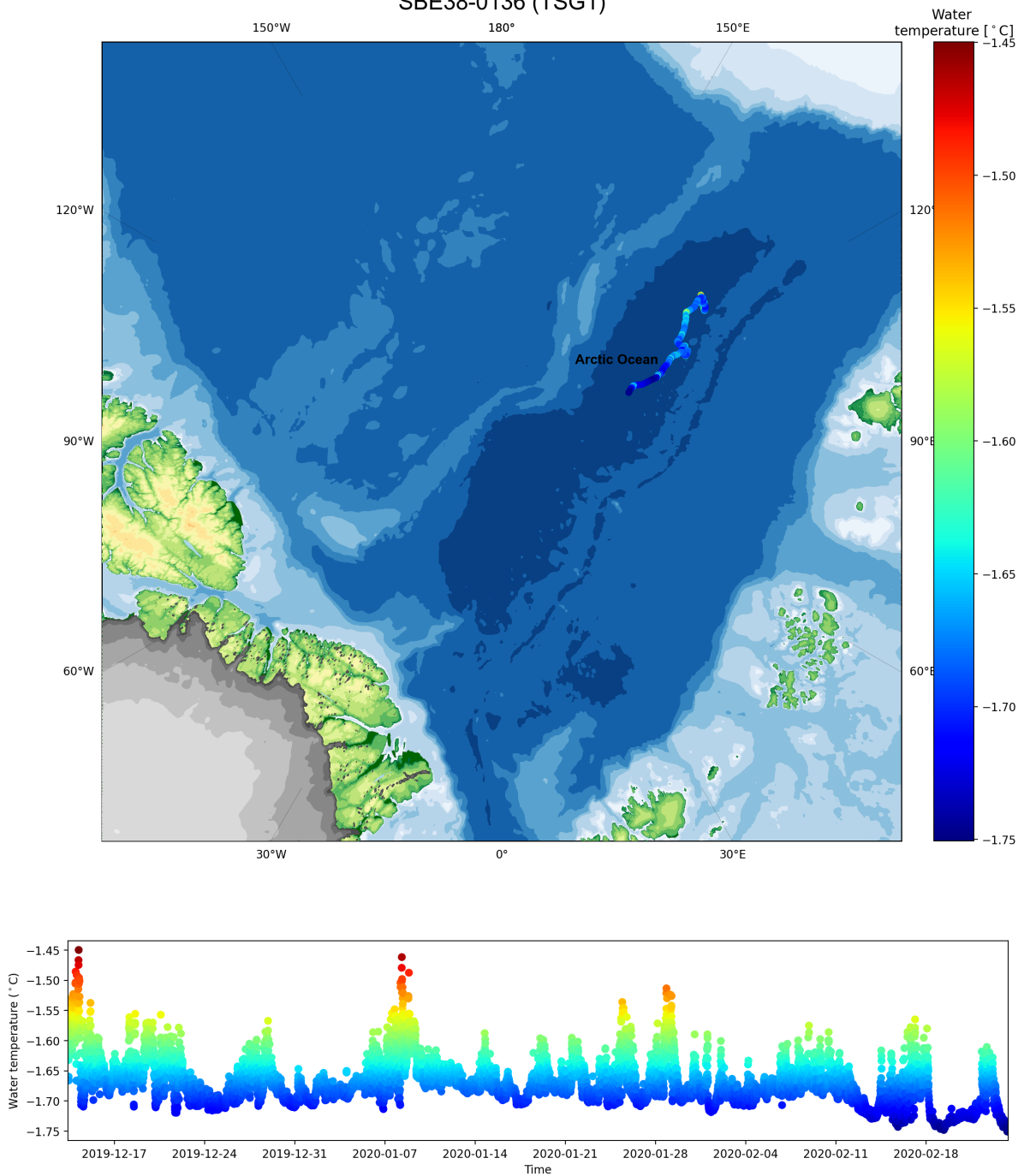
Water temperature from Polarstern cruise PS122_2
SBE38-0136 (TSG1)

Figure 5: Temperature data from TSG1