Continuous thermosalinograph oceanography along RV POLARSTERN cruise track PS123
Data Processing Report

Contents

Contact:

Dr. Mario Hoppmann

Alfred-Wegener-Institute

Klußmannstr. 3d,

D-27570 Bremerhaven, GERMANY

Mail: Mario.Hoppmann@awi.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 PS123 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 Surface T/S Data RV Polarstern Cruises PS123, PS124 and PS125".

Cruise details

Vessel name:	RV Polarstern
Cruise name:	PS123
Cruise start:	2020-12-20
Cruise end:	2021-02-01
Cruise duration:	43 days
Working area:	

2 Sensor Details

Following sensors were installed during cruise PS123. Only data from **TSG1** are uploaded to PANGAEA for cruise PS123 and are furthermore considered in this report (for reasoning see General Processing Report).

	TSG1	TSG2
Serial number	SBE21-3191	SBE21-3271
Installation	2020-12-20	2020-12-20
Deinstallation	2021-04-29	2021-04-29
Days installed	130	130
External temperature sensor	SBE38-0118	SBE38-0137

3 Processing Report

Database Extraction

Data source	DSHIP database (dship.awi.de)
Start of raw file	2020-12-20T16:00:00
End of raw file	2021-02-01T08:59:59
Number of lines in hexadecimal raw file	3690000
First dataset	2020-12-22T08:31:02
Last dataset	2021-01-31T21:19:44
TSG1 valid data	875159

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	26046
Conductivity	24500
External temperature	27221
Salinity	34656
Result after outlier removal	
Number 10-min-means	5836

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 PS123.

Assigning navigation data

Data from the corrected mastertrack of cruise PS123 were assigned to the 10min means of TSG1. A speed filter of 0.5 knots minimum speed is applied to avoid redundant data. See Figure 1 and Figure 2 for the processed and corrected data of TSG1.
Number of speed flags: 507
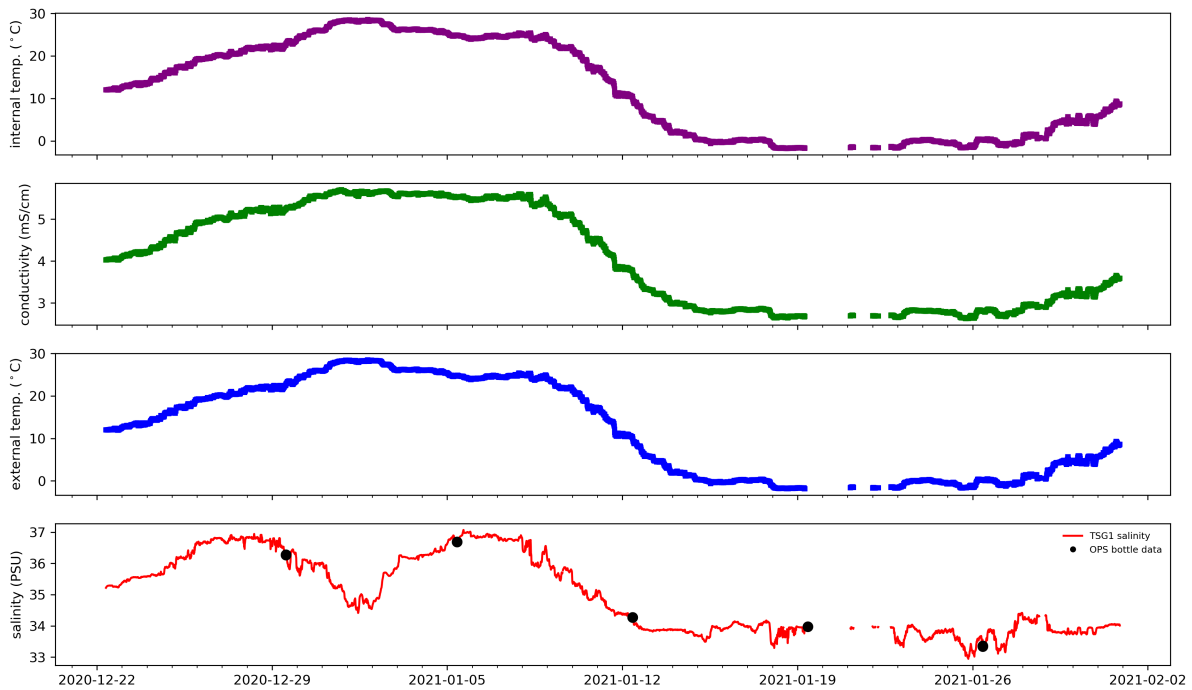**Number of data in final output file**: 5327

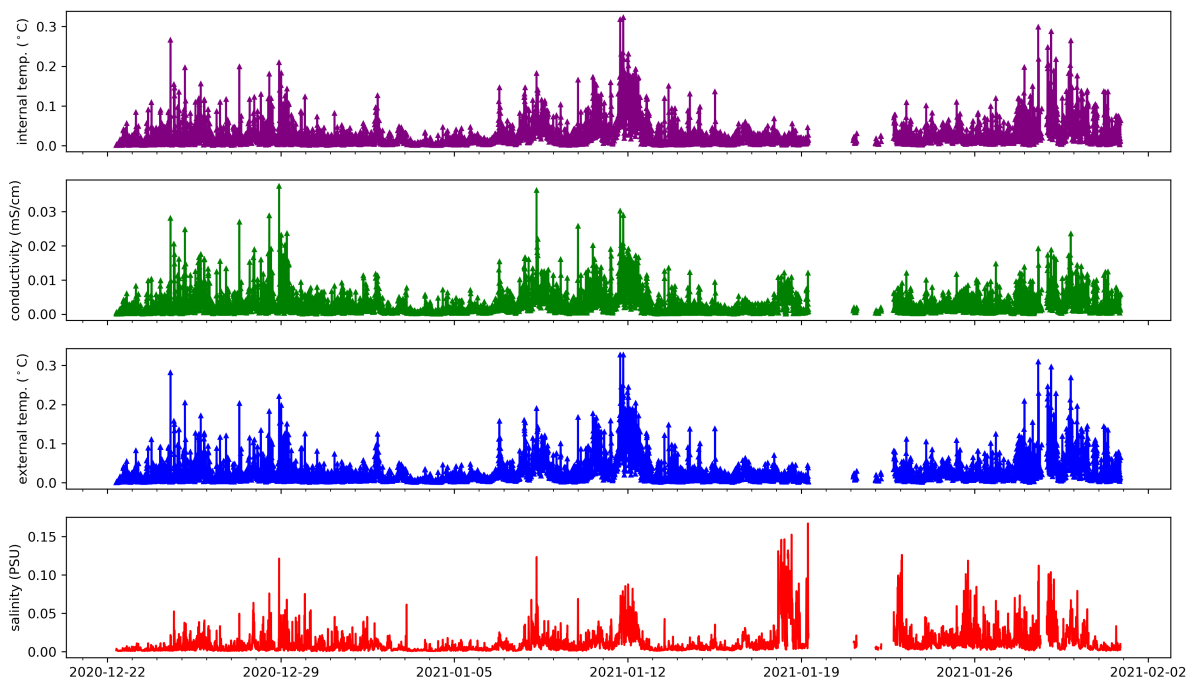Figure 1: 10min means of data from TSG1

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.

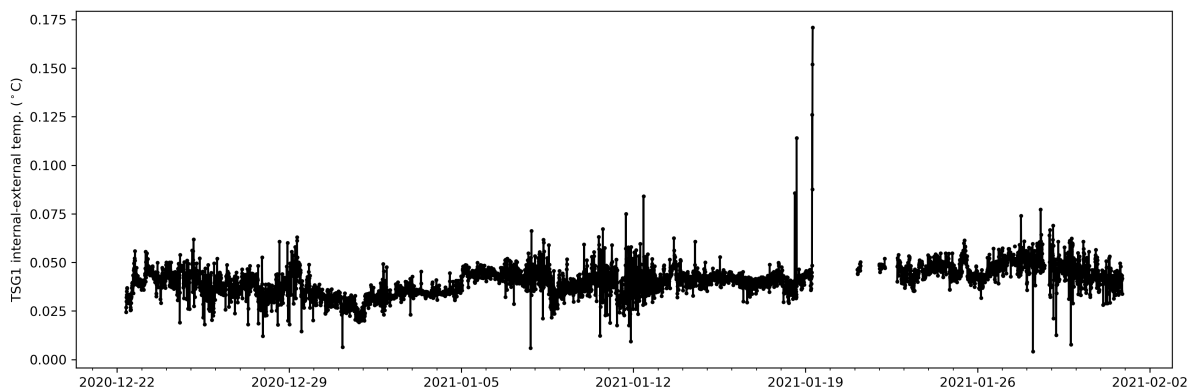|	TSG1 temperature difference	
	mean ± standard dev.	no. > 1°C
Spot values	$0.0411 \pm 0.0171°C$	0
10-min means	$0.0411 \pm 0.0076°C$	0

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 **PS123_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

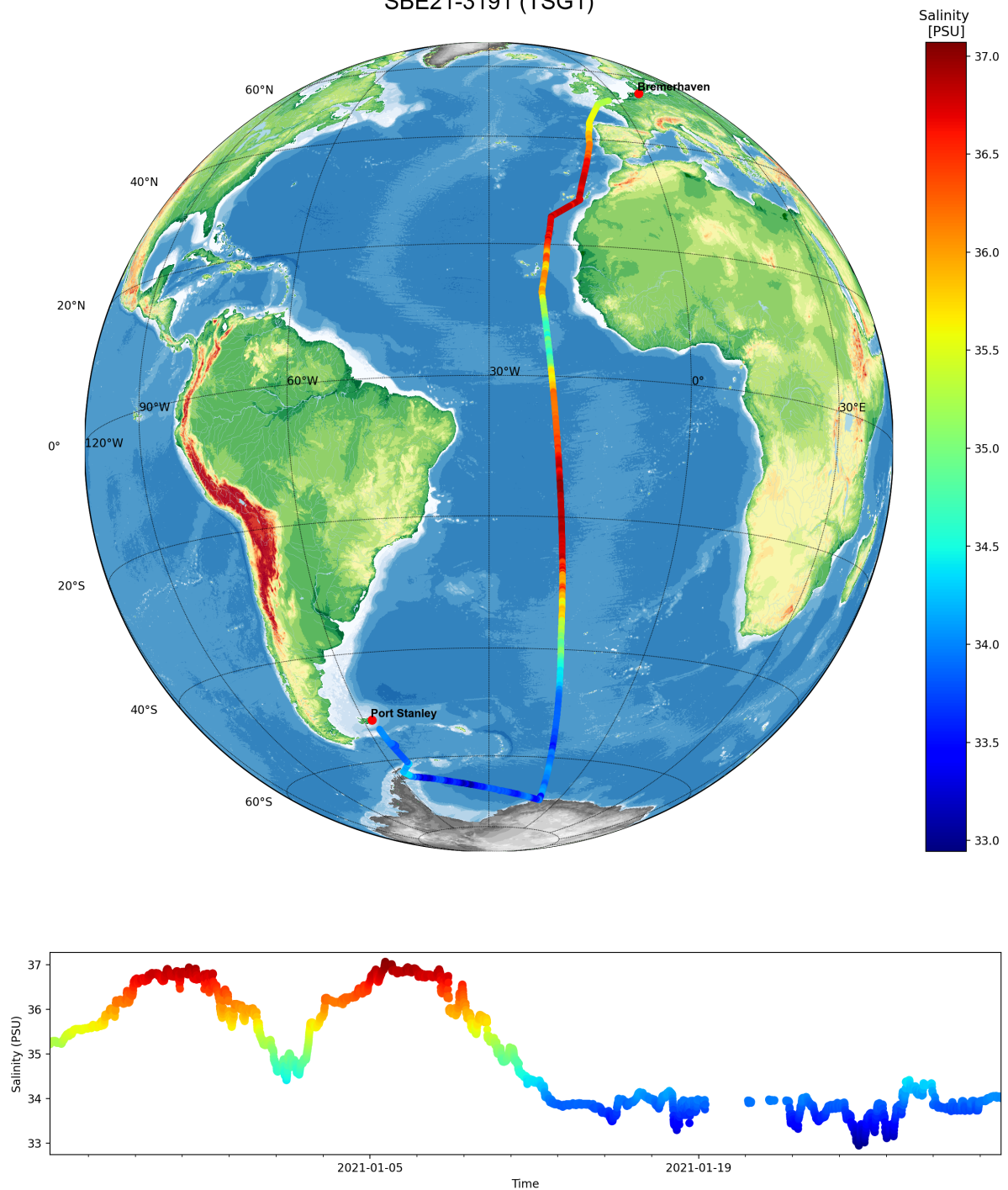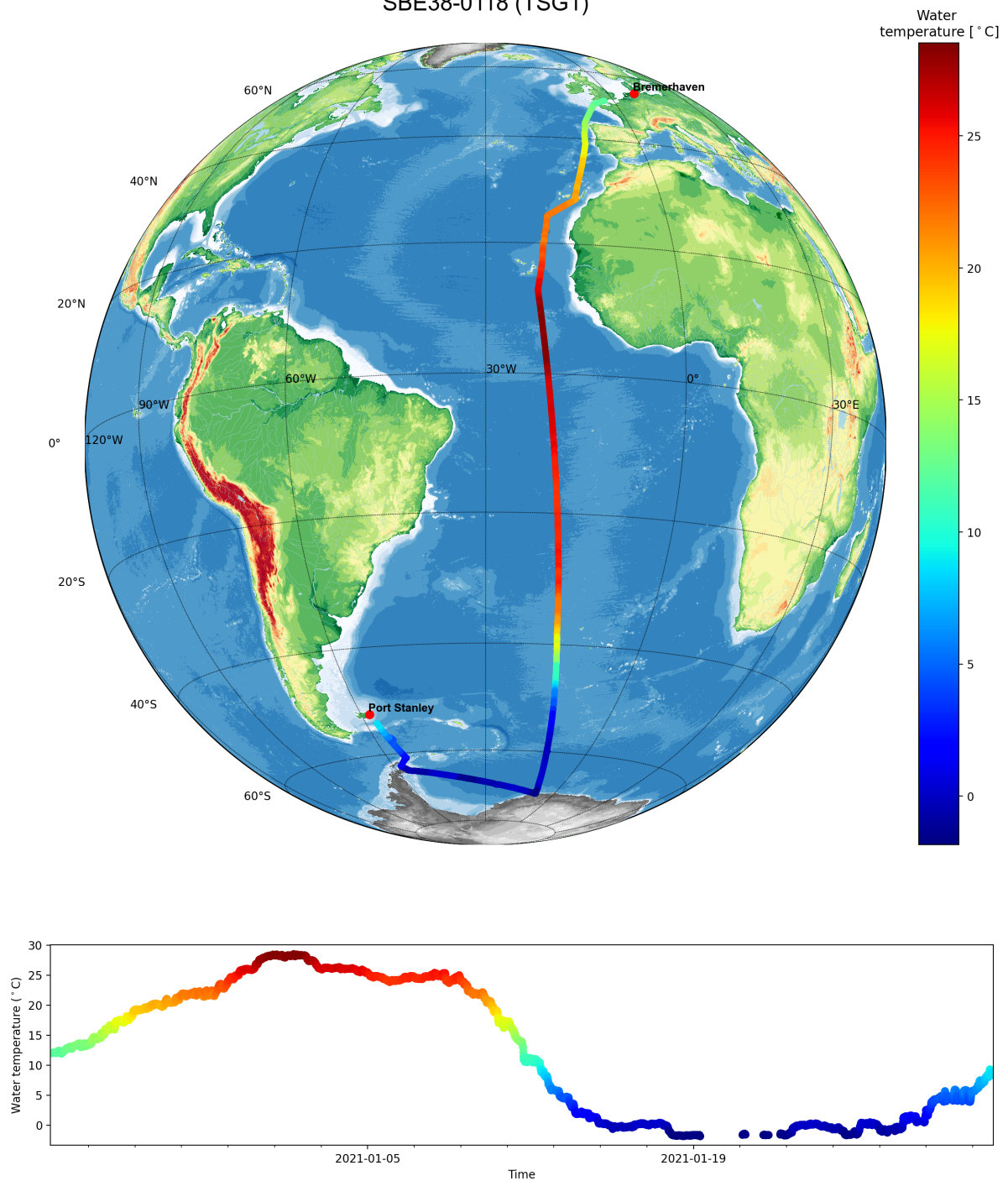Figure 4: Salinity data from TSG1

Water temperature from Polarstern cruise PS123
SBE38-0118 (TSG1)

Figure 5: Temperature data from TSG1