

CTD Data RV Heincke HE549

Data Processing Report

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1 Introduction

This report describes the processing of CTD raw data acquired by Seabird SBE 911plus CTD on board RV Heincke during expedition HE549.

2 Workflow

The different steps of processing and validation are visualized in Figure 1. The CTD raw data are delivered from AWI by Gerd Rohardt or Sandra Tippenhauer. The station book of the RV Heincke cruise is extracted from the DAVIS SHIP data base (<https://dship.awi.de>). The first CTD station and cast is processed manually in SBE Data Processing to configure the *.psa Seabird routines *Data Conversion, Wild Edit, Bottle Summary, Split, Translate, Cell Thermal Mass, Loop Edit* and *Bin Average*. The Seabird routines are then run in a batch job *CTDjob* in ManageCTD to process the complete CTD data set. The downcast of each CTD station/cast is used for further processing. In *CTDjob* the start record and the lowest altimeter point of the downcast is selected. With the *Utilities* → *Dship Ebook* function of ManageCTD the DAVIS SHIP station book extraction is used for getting the header information of all CTD stations/casts of the cruise. ManageCTD *Utilities* → *Find Profile* function compares station times of the header with the entries in the station book to find out the correct naming of the stations and casts. In *CTDheader* in ManageCTD the header information of each CTD station/cast is displayed, controlled and corrected if necessary. *CTDdespike* in ManageCTD is used for a visual check of the data and to erase/interpolate spikes in the data if necessary. Additionally, a sensor pair (Temp1/Sal1 or Temp2/Sal2) is chosen for each station/cast of the RV Heincke cruise in *CTDdespike*.

ManageCTD *Utilities* → *CheckDoubleSensors* controls the quality of temperature and conductivity sensors. For this purpose outliers of too high sensor pair differences could be removed. The data is then converted to spreadsheet format with *dsp2odv* for visualization of the data in Ocean Data View (ODV). The processed CTD data are written to text files and imported to PANGAEA (<http://www.PANGAEA.de>) for publication.

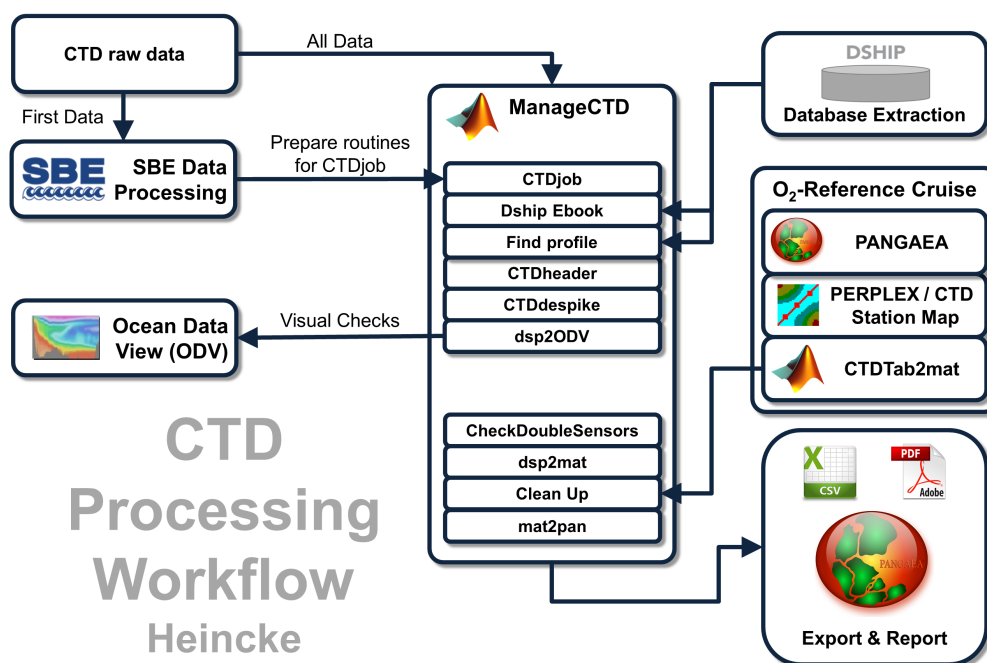


Figure 1: CTD data Processing Workflow

3 Cruise details

Vessel name RV Heincke
 Cruise name HE549
 Cruise start 19.03.2020 Bremerhaven
 Cruise end 21.03.2020 Bremerhaven
 Cruise duration 3 days
 No. of CTD casts 13

4 Sensor Layout

This chapter describes the CTD sensors mounted during this cruise. No oxygen sensors were deployed during HE549.

SBE 911plus CTD (SN: 1015), SBE Instrument Configuration Version 7.23.0.1.

ID	Sensor Name	Serial No.	Calibration Date
55	TemperatureSensor	5354	13-Dec-19
3	ConductivitySensor	2470	17-Dec-19
45	PressureSensor	1015	26-Jan-17
55	TemperatureSensor	5375	13-Dec-19
3	ConductivitySensor	3573	17-Dec-19
0	AltimeterSensor	46466	23-Mar-09
71	WET_LabsCStar	1348DR	28-Jan-2016
20	FluoroWetlabECO_AFL_FL_Sensor	1365	15-Jan-2016

5 Processing

Details of processing procedures and processing parameters are described in *CTD Processing Logbook of RV Heincke* (hdl: [10013/epic.47427](https://nbn-resolving.org/urn:nbn:de:hbz:5:1-64868-p0101-9)).

Density Inversions and Manual Validation

Obvious outliers were removed manually. For the visual check density inversions $> 0.005 \text{ kg/m}^3$ and $> 0.01 \text{ kg/m}^3$ were flagged differently for display but not removed automatically. Decisions whether the flagged values were manually removed or not are based on the description in *CTD Processing Logbook of RV Heincke* (hdl: [10013/epic.47427](https://nbn-resolving.org/urn:nbn:de:hbz:5:1-64868-p0101-9)).

Sensor Differences

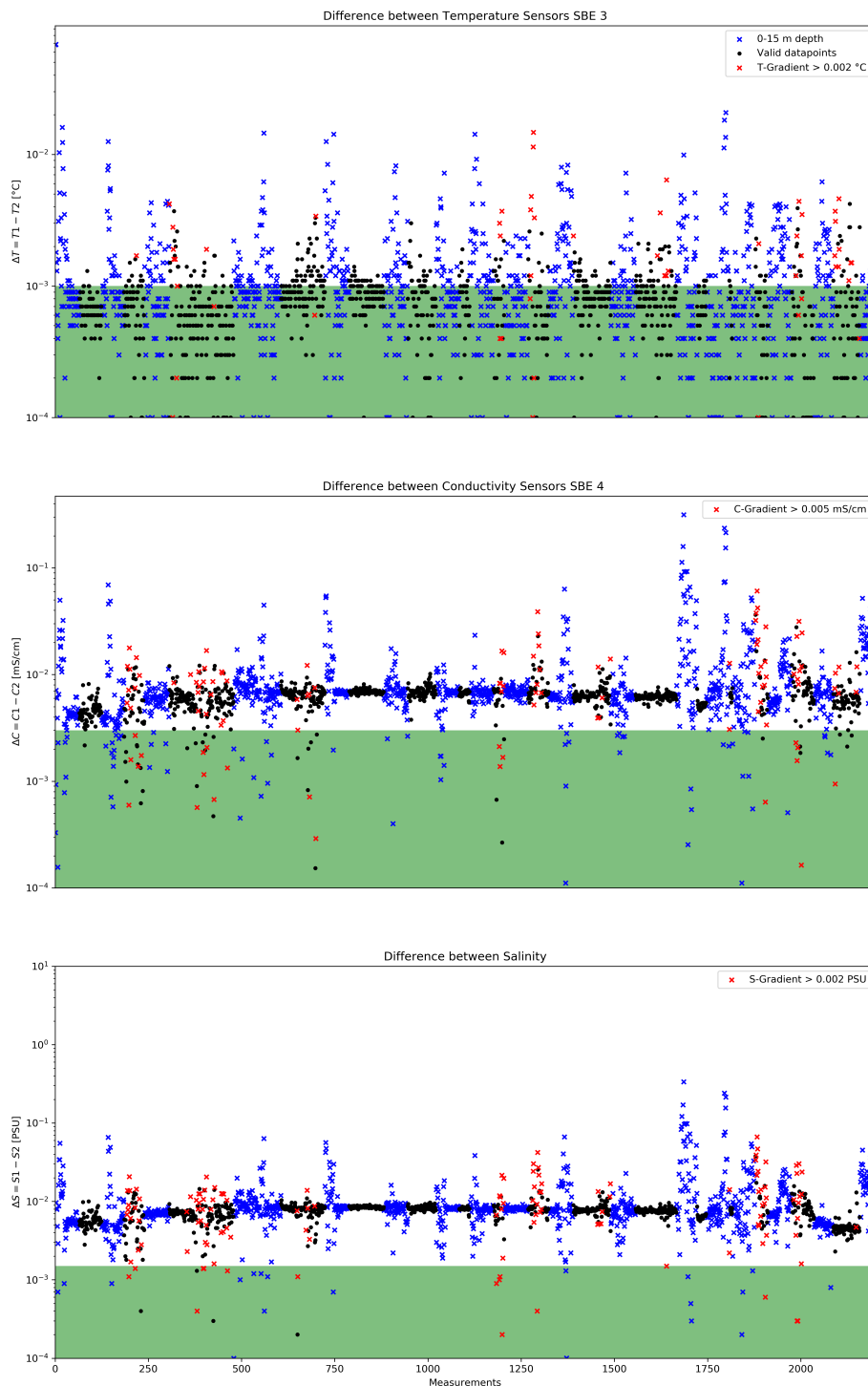


Figure 2: Data accuracy of sensor pairs HE549

6 Results

A complete processing overview for each sensor at each station is summarized in the table in the Appendix (Figure 3).

Double Sensor Check

In Figure 2, the absolute residuals between the sensorpairs are shown for the measured parameters *Temperature* and *Conductivity*, the derived parameter *Salinity*. Measurements in shallow water depths < 15 m (blue crosses) and gradients between two datapoints exceeding a defined threshold (red crosses) were omitted for accuracy calculation.

Parameter	Accuracy given by manufacturer	Measurements removed Surface 0-15m + gradient filter	Remaining measurements within accuracy specifications
Temperature	$\pm 0.001 \text{ } ^\circ\text{C}$	52.59%	75.17%
Conductivity	$\pm 0.003 \text{ mS/cm}$	55.14%	3.65%
Salinity	$\pm 0.0015 \text{ PSU}$	56.00%	0.52%

Comments

- 13 CTD "max depth/on ground" entries in DShip station book
- 13 CTD raw data sets delivered
- All CTD casts had file names different from DShip station book names.
- No oxygen sensors were attached to the CTD during HE549.
- 13 CTD casts processed and uploaded
- of these 13 processed CTD casts:
 - 24 data points interpolated
 - 16 data points erased

Result files

Text File ([HE549_phys_oce.tab](#)):

The format is a plain text (tab-delimited values) file.

Column separator	Tabulator "\t"
Column 1	Event label
Column 2	Date/Time of event
Column 3	Latitude of event
Column 4	Longitude of event
Column 5	Elevation of event
Column 6	DEPTH, water
Column 7	Pressure, water
Column 8	Temperature, water
Column 9	Conductivity
Column 10	Salinity
Column 11	Temperature, water, potential
Column 12	Density, sigma-theta (0)
Column 13	Oxygen
Column 14	Oxygen, saturation
Column 15	Attenuation, optical beam transmission
Column 16	Fluorometer
Column 17	Number of observations

Processing Report ([CTD-HE549-report.pdf](#)):

This PDF document.

Station HE549_	Gear Abbr.	Date	Time	Position Latitude	Position Longitude	Depth [m]	File Name	Sensor pair	Temp		Sal		Trans		Fluor		Oxy		complete		2 Oxy Sensors		Oxygen reference		Comments		
									interp	erased	interp	erased	interp	erased	interp	erased	interp	erased	interp	erased	interp	erased	Sensor	Offset		cruise/sss-cc	dist. (km)
1-1	CTD	19.03.2020	19:24	53° 50.412' N	008° 05.339' E	11.9	S01_DSmp1_1																				
2-1	CTD	20.03.2020	6:33	54° 19.210' N	007° 07.256' E	36.8	S02_DSmp2_1																				
3-1	CTD	20.03.2020	7:45	54° 10.575' N	007° 05.562' E	31.4	S03_DSmp3_1																				
4-1	CTD	20.03.2020	9:05	53° 59.713' N	007° 04.833' E	26.3	S04_DSmp4_1			1	4	1	4	1	4	1	4										
6-1	CTD	20.03.2020	10:40	53° 50.445' N	007° 15.040' E	21.9	S05_DSmp5_1			1		1		1		1											
7-1	CTD	20.03.2020	12:10	53° 53.673' N	007° 31.807' E	19.6	S06_DSmp6_1			2		2		2		2											
8-1	CTD	20.03.2020	13:35	53° 56.207' N	007° 48.160' E	24.2	S07_DSmp7_1																				
9-1	CTD	20.03.2020	14:53	54° 04.634' N	007° 37.723' E	34.9	S08_DSmp8_1																				
10-1	CTD	20.03.2020	16:20	54° 14.218' N	007° 29.652' E	36	S09_DSmp9_1																				
11-1	CTD	21.03.2020	6:29	54° 18.466' N	007° 49.664' E	18.5	S10_DSmp10_1																				
12-1	CTD	21.03.2020	7:53	54° 22.351' N	008° 10.142' E	15.2	S11_DSmp11_1																				
13-1	CTD	21.03.2020	9:16	54° 10.844' N	008° 06.616' E	19.8	S12_DSmp12_1			2		2		2		2											
14-1	CTD	21.03.2020	10:39	53° 58.089' N	008° 03.260' E	25.1	S13_DSmp13_1																				
									6	4	6	4	6	4	6	4	0	0	0	24	16						

no oxygen data during
cruise HE549;
all station names differ
from file names

Figure 3: CTD data Processing Summary HE549
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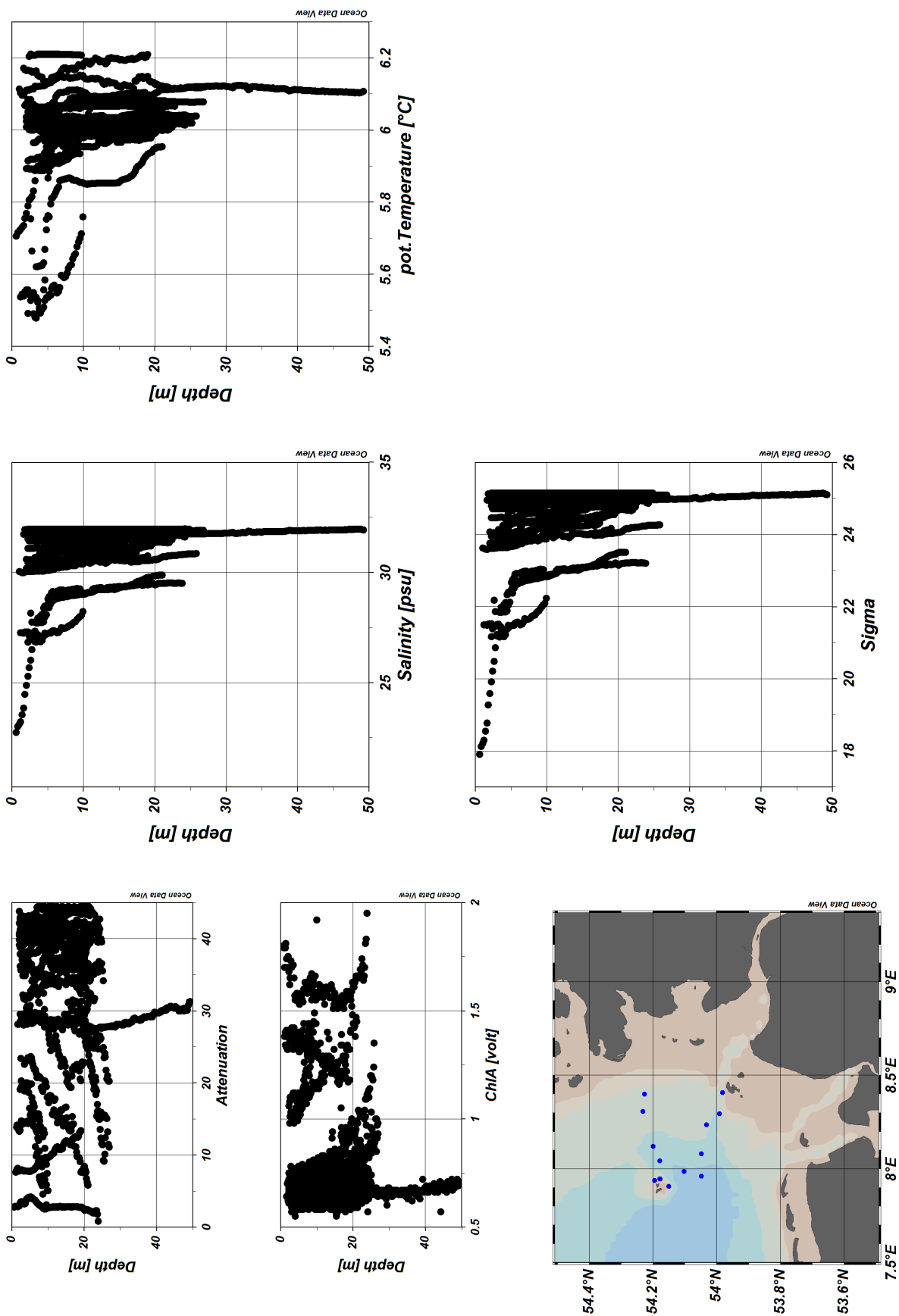


Figure 4: ODV Screenshot of HE549 CTD data
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