

# CTD Data RV Heincke HE560

## Data Processing Report

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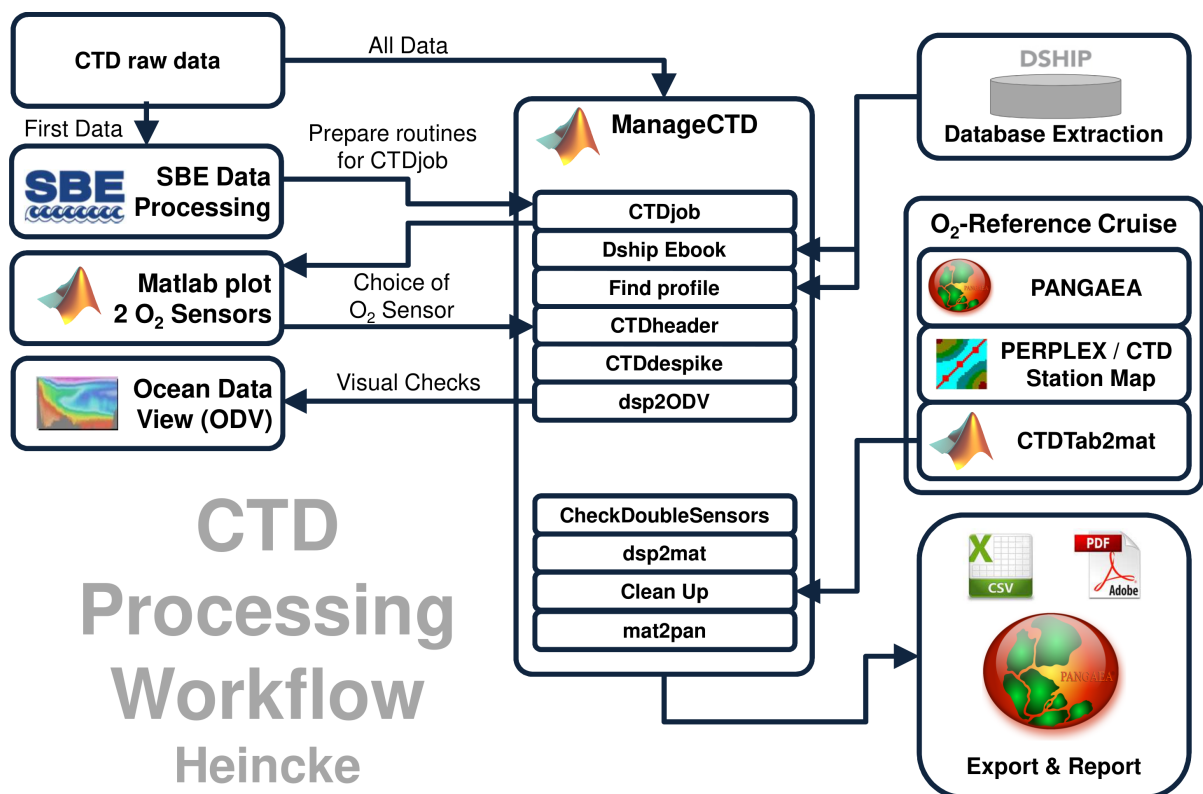
## 1 Introduction

This report describes the processing of CTD raw data acquired by Seabird SBE 911plus CTD on board RV Heincke during expedition HE560.

## 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.



# CTD Processing Workflow

Heincke

Figure 1: CTD data Processing Workflow

### 3 Cruise details

Vessel name       RV Heincke  
 Cruise name       HE560  
 Cruise start       28.07.2020 Bremerhaven  
 Cruise end         11.09.2020 Bremerhaven  
 Cruise duration   15 days  
 No. of CTD casts  25

### 4 Sensor Layout

This chapter describes the CTD sensors mounted during this cruise. No oxygen sensors were deployed during HE560.

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:5:1-63868-p0013-9)).

#### 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:5:1-63868-p0013-9)).

## Sensor Differences

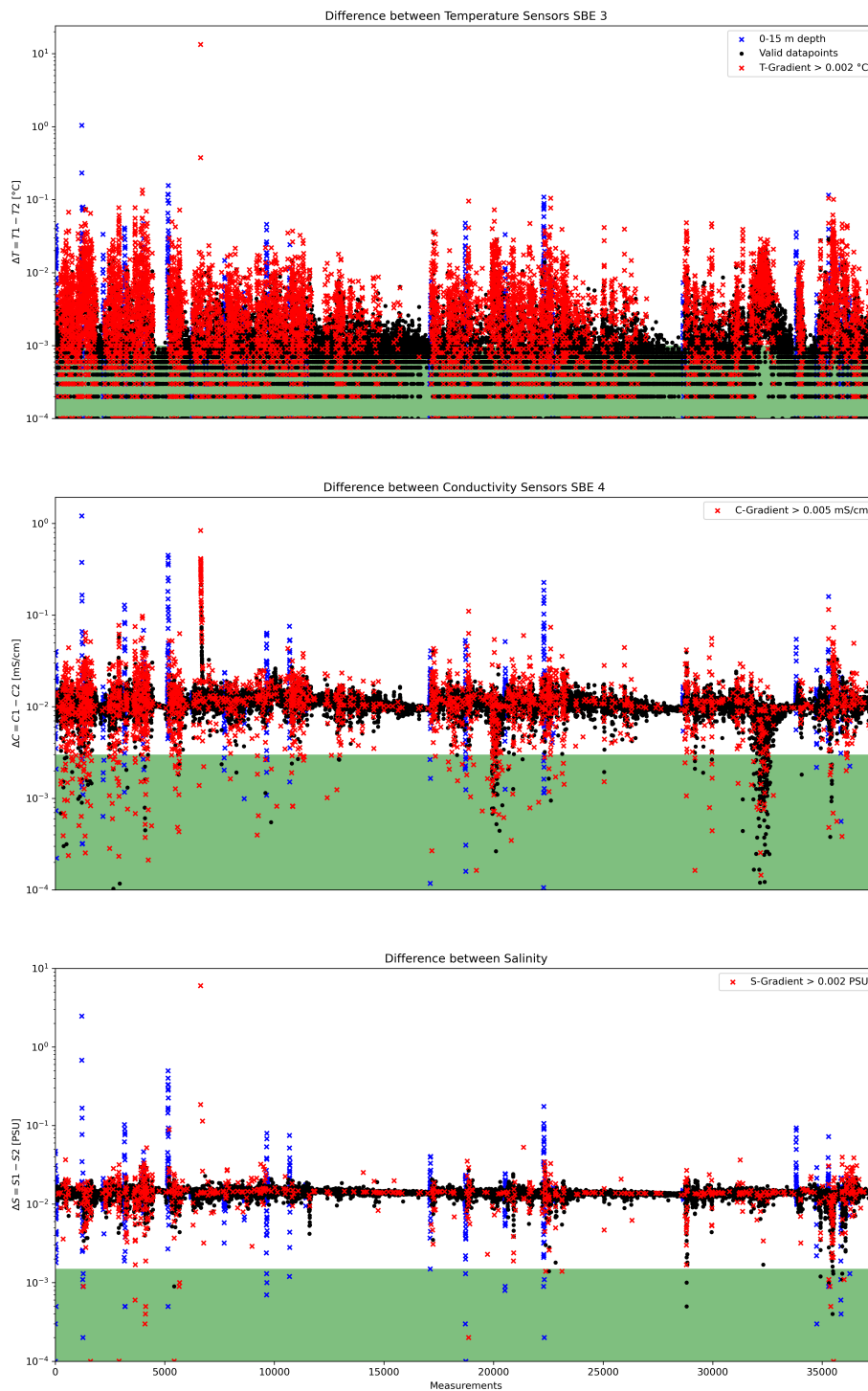


Figure 2: Data accuracy of sensor pairs HE560

## 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	$\pm 0.001 \text{ } ^\circ\text{C}$	21.72%	72.22%
Conductivity	$\pm 0.003 \text{ mS/cm}$	10.92%	0.62%
Salinity	$\pm 0.0015 \text{ PSU}$	6.95%	0.04%

### Comments

- 26 CTD "max depth/on ground" entries in DShip station book
- 25 CTD raw data sets delivered
- 1 CTD "max depth/on ground" entries in DShip station book was named double
- 2 CTD casts had a wrong filename (HE560\_016\_01, HE560\_025\_001)
- 2 CTD casts had no bottle file (HE560\_009\_01, HE560\_010\_01)
- 25 CTD casts processed and uploaded
- of these 25 processed CTD casts:
  - 710 data points interpolated
  - 8 data points erased

## Result files

Text File (HE560\_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-HE560-report.pdf):

This PDF document.

Station HE560_	Gear Abbr.	Date	Time	Position Latitude	Position Longitude	Depth [m]	File Name HE560_	Sensor pair	Temp		Sal		Trans		Fluor		Oxy		2 Oxy Sensors			Oxygen reference			Comments
									interp	erased	interp	erased	interp	erased	interp	erased	interp	erased	interp	erased	Sensor	Offset	sensor	Offset	
1-1	CTD	10.08.2020	11:59	80° 31.187' N	022° 03.449' E	247.0	001_01	1	2		2		2												no oxygen sensors
2-1	CTD	10.08.2020	16:47	80° 10.126' N	022° 08.645' E	195.7	002_01	1	3		3		3												no oxygen sensors
4-1	CTD	12.08.2020	6:14	79° 31.316' N	019° 39.192' E	192.4	004_01	1	2		2		2												no oxygen sensors
5-2	CTD	13.08.2020	10:18	79° 44.224' N	015° 31.790' E	170.4	005_02	1	3	2	3	2	3	2											no oxygen sensors
6-1	CTD	14.08.2020	6:07	79° 07.509' N	016° 01.738' E	228.2	006_01	1	4		4		4												no oxygen sensors
8-1	CTD	15.08.2020	6:12	79° 35.988' N	012° 56.618' E	217.5	008_01	1	8		8		8												no oxygen sensors
9-1	CTD	16.08.2020	6:02	80° 24.955' N	013° 48.133' E	175.2	009_01	1	2		2		2												no bit file, no oxygen sensors
9-4	CTD	16.08.2020	6:42	80° 24.937' N	013° 47.618' E	173.2	009_04	1	8		8		8												no oxygen sensors
10-1	CTD	17.08.2020	6:10	79° 48.405' N	012° 00.040' E	205.3	010_01	1	3		3		3												no bit file, no oxygen sensors
10-10	CTD	17.08.2020	12:30	79° 48.552' N	012° 00.242' E	209.9	010_10	1	6		6		6												no oxygen sensors
11-1	CTD	18.08.2020	6:12	79° 43.780' N	011° 04.694' E	206.3	011_01	1	4		4		4												no oxygen sensors
12-2	CTD	19.08.2020	6:11	79° 27.219' N	008° 42.272' E	153.4	012_01	1	4		4		4												no oxygen sensors
13-1	CTD	20.08.2020	6:32	79° 00.007' N	007° 53.474' E	1124.3	013_01	1	29		29		29												no oxygen sensors
15-1	CTD	21.08.2020	6:16	79° 01.172' N	010° 44.224' E	317.8	015_01	1	10		10		10												no oxygen sensors
17-1	CTD	22.08.2020	6:17	79° 11.754' N	011° 47.322' E	356.9	016_01	1	5		5		5												wrong metadata, no oxygen sensors
18-1	CTD	23.08.2020	6:16	78° 57.623' N	011° 54.267' E	349.5	018_01	1	4		4		4												no oxygen sensors
19-2	CTD	24.08.2020	6:40	78° 55.448' N	012° 09.927' E	83.0	019_01	1	4		4		4												no oxygen sensors
21-1	CTD	26.08.2020	6:35	77° 30.086' N	010° 32.930' E	1181.8	021_01	1	23		23		23												no oxygen sensors
21-6	CTD	26.08.2020	10:30	77° 29.613' N	010° 40.694' E	1085.3	021_06	1	45		45		45												no oxygen sensors
22-2	CTD	27.08.2020	13:45	78° 59.480' N	016° 40.681' E	185.4	022_02	1	9		9		9												no oxygen sensors
24-1	CTD	29.08.2020	6:05	77° 45.740' N	015° 07.317' E	100.3	024_01	1	1		1		1												no oxygen sensors
24-9	CTD	29.08.2020	13:14	77° 49.678' N	016° 37.760' E	73.4	025_001	1	1		1		1												wrong metadata, no oxygen sensors
25-1	CTD	30.08.2020	6:32	76° 59.647' N	016° 25.412' E	120.5	025_01	1	5		5		5												no oxygen sensors
25-6	CTD	30.08.2020	11:19	76° 57.785' N	015° 49.802' E	216.3	025_06	1	5		5		5												no oxygen sensors
26-3	CTD	31.08.2020	7:35	76° 58.524' N	016° 33.910' E	47.2	026_03	1	178	2	178	2	177	2	177	2	177	2	0	0	0	0	710	8	no oxygen sensors

Figure 3: CTD data Processing Summary HE560  
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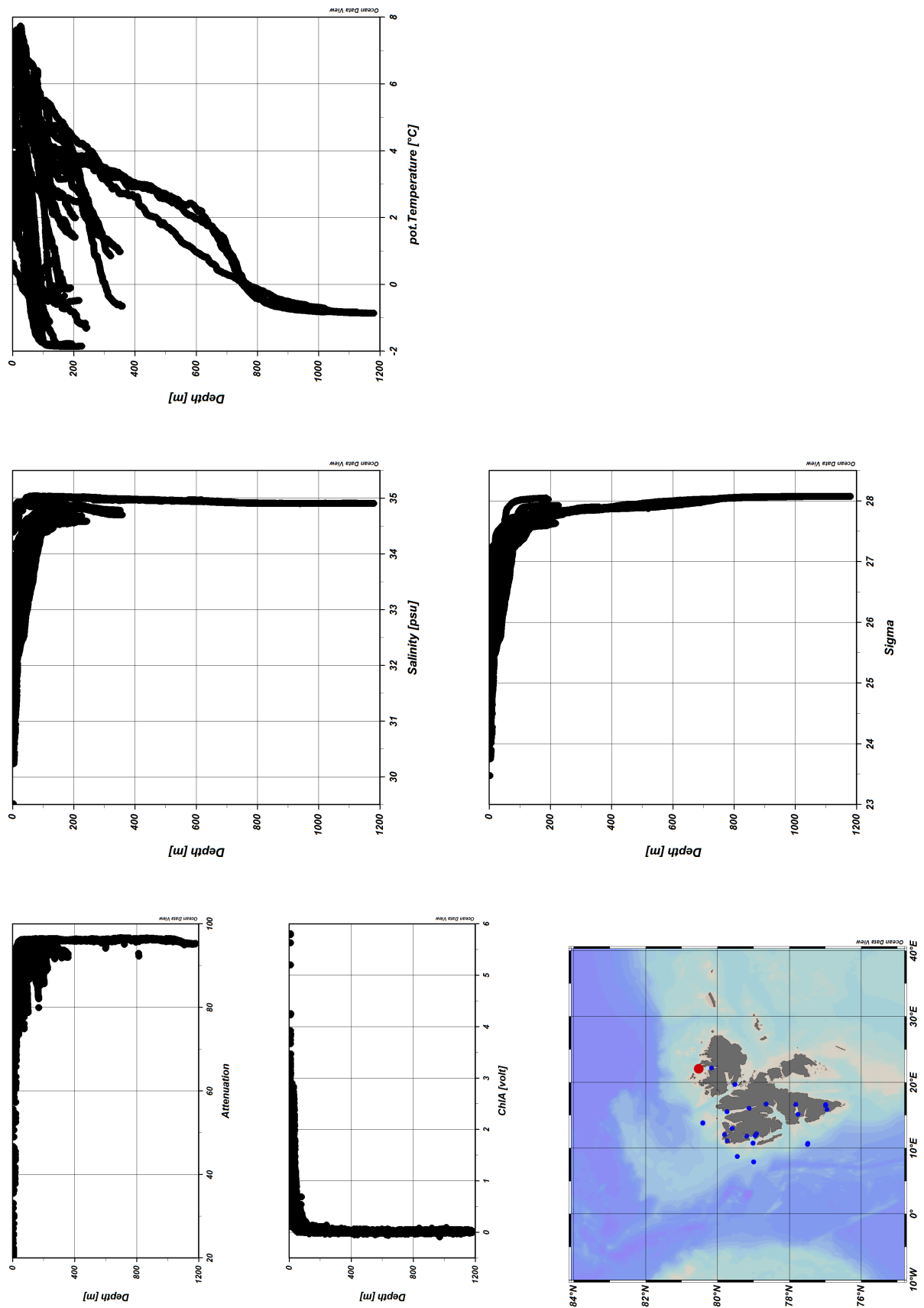


Figure 4: ODV Screenshot of HE560 CTD data