CTD Data RV Heincke HE545
Data Processing Report

Contents

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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 HE545.

2 Workflow

The different steps of processing and validation are visualized in Figure 1. The CTD raw data are delivered from Andreas Wisotzki (AWI). 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. From the downcast data figures to compare both oxygen sensors are generated. The oxygen sensor choice and the offset between the two oxygen sensors is documented in the processing summary table. 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 second visual inspection of the CTD data allows a comparison with data from other CTD casts from close-by stations to verify the oxygen sensor data. Therefore, potential reference cruise data is downloaded from PANGAEA (http://www.PANGAEA.de). The reference data is converted to *.mat format. In the ManageCTD Final Processing the CTD data is displayed together with the reference data. Bad data points, sensors or casts are interpolated or erased from the data set and filters are applied if necessary. The processed CTD data are written to text files and imported to PANGAEA (http://www.PANGAEA.de) for publication.
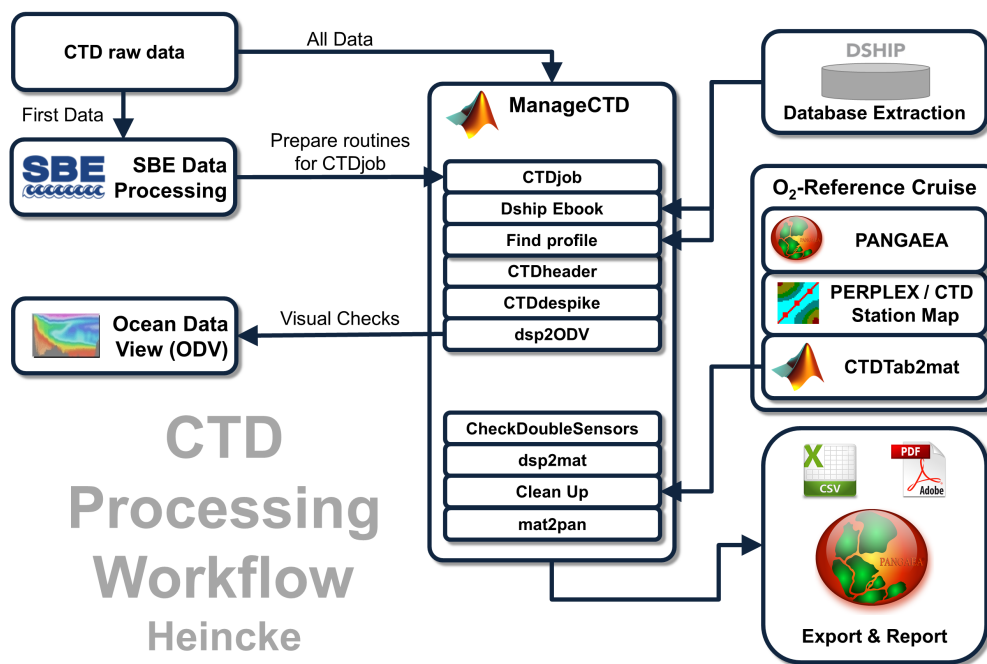
Figure 1: CTD data Processing Workflow

3 Cruise details

Vessel name	RV Heincke
Cruise name	HE545
Cruise start	02.11.2019 Bremerhaven
Cruise end	13.11.2019 Bremerhaven
Cruise duration	12 days
No. of CTD casts	129

4 Sensor Layout

This chapter describes the CTD sensors mounted during this cruise:

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

ID	Sensor Name	Serial No.	Calibration Date
55	TemperatureSensor	5354	30-Nov-18
3	ConductivitySensor	2470	04-Dec-18
45	PressureSensor	1015	26-Jan-17
55	TemperatureSensor	5375	30-Nov-18
3	ConductivitySensor	3573	04-Dec-18
0	AltimeterSensor	46466	23-Mar-09
71	WET_LabsCStar	1348DR	28-Jan-2016
20	FluoroWetlabECO_AFL_FL_Sensor	1365	15-Jan-2016
38	OxygenSensor	2292	28-Dec-18
38	OxygenSensor	3654	28-Dec-18

5 Processing

Details of processing procedures and processing parameters are described in *CTD Processing Logbook of RV Heincke* (hdl: 10013/epic.47427).

Density Inversions and Manual Validation

Obvious outliers were removed manually. For the visual check density inversions > 0.005 kg/m^3 and > 0.01 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).

Sensor Differences
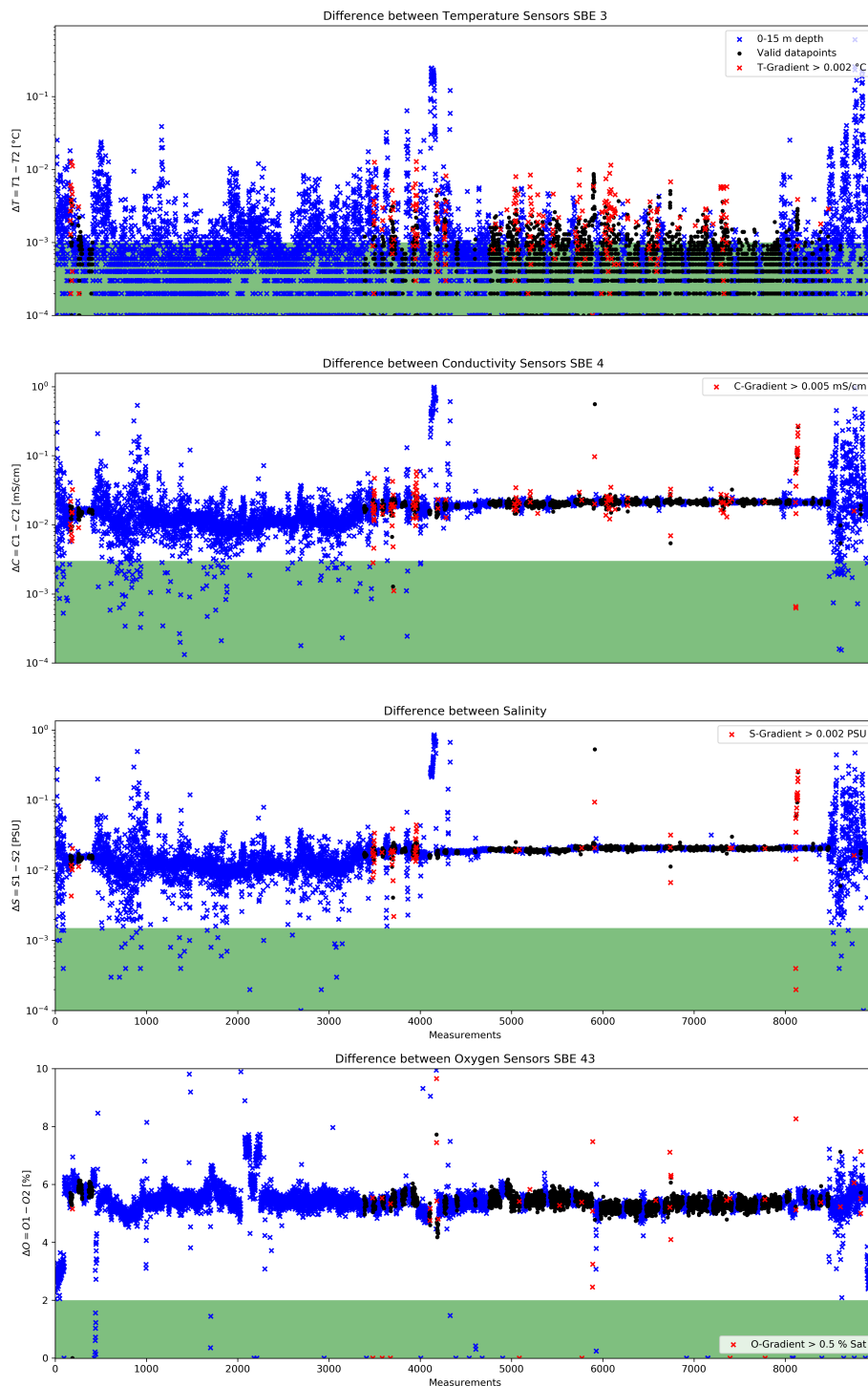
Figure 2: Data accuracy of sensor pairs HE545

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* and the measured parameter *Oxygen*. 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	$\pm 0.001\,^{\circ}C$	68.51%	84.28%
Conductivity	$\pm 0.003\,mS/cm$	67.33%	0.07%
Salinity	$\pm 0.0015\,PSU$	66.67%	0.03%
Oxygen	$\pm 2.0\,\%\,of\,saturation$	66.66%	0.03%

Comments

- The difference is too high between the two conductivity sensors. This continues in salinity and consequently also in oxygen.

- 55 CTD/RO 'max depth/on ground' entries in DShip station book

- For 74 station book entries, the action was manually set to 'max depth/on ground'.

- 132 CTD raw data sets delivered

- 1 CTD cast was from a previous cruise (537_02CTD.hex)

- 4 CTD casts were tests (HE545p000a01.hex, HE545p000a02.hex, HE545p000a03.hex, and HE545p000a04.hex)

- At four stations numerous repetitions took place, each with its own cast number (HE435/018, HE435/032, HE435/033, and HE435/034)

- 38 CTD casts had a wrong filename.

- At 4 stations no matching file was found (HE435/001-05, HE435/010-01, HE435/025-02, and HE435/025-03).

- No matching station was found for 2 files (HE545p031a05.hex and HE545p061a02.hex).

- 125 CTD casts processed and uploaded

- of these 125 processed CTD casts:
    - 3 oxygen profiles deleted (spiky and not matching to reference casts)
    - 132 data points interpolated
    - 38 data points erased

Result files

Text File (HE545_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-HE545-report.pdf):

This PDF document.

Figure 3: CTD data Processing Summary HE545

Station HE545	Gear Abbr.	Date	Time	Position Latitude	Position Longitude	Depth [m]	File HE545p	Sensor pair	Temp interp	Temp erased	Sal interp	Sal erased	Trans interp	Trans erased	Fluor interp	Fluor erased	Oxy interp	Oxy erased	complete interp	complete erased	2 Oxy Sensors Sensor	2 Oxy Sensors Offset	Oxygen reference cruise/sss-cc	Oxygen reference dist. (km)	Offset	Comments
1-1	CTD	02.11.2019	12:08	53°31.008'N	8°32.919'E	8.3	001a01	1	1								1		0	0	2292	-0.20	HE453/001-01	1.11	0.80	
1-3	CTD	02.11.2019	13:20	53°31.079'N	8°33.266'E	9.7	001a02	2	1		1		1		1				5	0	2292	-0.21	HE453/001-01	0.73	0.60	wrong filename
1-5	CTD	02.11.2019	13:32	53°30.951'N	8°32.820'E	9.3													0	0						no matching file found
2-1	CTD	02.11.2019	17:02	53°50.917'N	7°56.463'E	17	002a01	2		1		1		1		1		1		5	2292	-0.34	HE453/025-01	3.04	0.70	
4-1	CTD	03.11.2019	7:08	53°41.353'N	6°24.347'E	22.2	004a01	2											0	0	2292	-0.34	HE453/012-01	6.91	0.35	
6-1	CTD	03.11.2019	13:52	53°44.002'N	6°29.296'E	21.9	006a01	2											0	0	2292	-0.35	HE453/013-01	8.22	0.35	
7-1	CTD	03.11.2019	15:02	53°36.738'N	6°24.911'E	12.4	007a01	1	1		1		1		1		1		5	0	2292	-0.09	HE453/004-01	4.68	0.30	
8-1	CTD	03.11.2019	16:10	53°36.822'N	6°33.931'E	13.4	008a01	1											0	0	2292	-0.34	HE453/008-01	0.99	0.25	no bottle closed
9-1	CTD	03.11.2019	16:46	53°35.510'N	6°35.687'E	12.4	009a01	2											0	0	2292	-0.36	HE453/005-01	2.4	0.20	no bottle closed
10-1	CTD	03.11.2019	17:46	53°32.596'N	6°42.188'E	12.6													0	0						no matching file found
11-1	CTD	03.11.2019	18:39	53°30.244'N	6°47.638'E	12.4	010a01	1											0	0	2292	-0.34	HE453/011-40	1.5	0.90	wrong filename
12-1	CTD	03.11.2019	19:25	53°27.607'N	6°52.030'E	9.6	012a01	2											0	0	2292	-0.34	HE453/007-01	3.81	0.25	no bottle closed
13-1	CTD	03.11.2019	20:10	53°26.221'N	6°54.585'E	9.2	013a01	1											0	0	2292	-0.34	HE453/008-01	3.6	0.45	no bottle closed
14-1	CTD	03.11.2019	20:51	53°23.864'N	6°57.135'E	6.9	014a01	2											0	0	2292	-0.33	HE453/008-01	1.6	0.35	no bottle closed
15-1	CTD	03.11.2019	21:47	53°19.819'N	6°59.866'E	12.9	015a01	2											0	0	2292	-0.35	HE453/009-01	0.45	0.40	no bottle closed
16-1	CTD	03.11.2019	22:18	53°19.445'N	7°03.158'E	6.9	016a01	1											0	0	2292	-0.35	HE453/009-01	3.43	0.50	no bottle closed
17-1	CTD	03.11.2019	22:54	53°19.900'N	7°06.905'E	8	017a01	1											0	0	2292	-0.36	HE453/010-01	2.57	0.60	
18-1	CTD	04.11.2019	1:39	53°29.549'N	6°46.841'E	11.7	018a01	2		3		3						3	0	9	3654	-0.62	HE453/011-42	0.39	0.10	no bottle closed
18-2	CTD	04.11.2019	2:15	53°29.545'N	6°46.843'E	11.8	018a02	2											0	0	2292	-0.35	HE453/011-42	0.39	0.25	no bottle closed
18-3	CTD	04.11.2019	2:45	53°29.545'N	6°46.842'E	11.7	018a03	2											0	0	2292	-0.35	HE453/011-42	0.39	0.30	no bottle closed
18-4	CTD	04.11.2019	3:18	53°29.554'N	6°46.843'E	11.7	018a04	1											0	0	2292	-0.35	HE453/011-42	0.4	0.30	no bottle closed
18-5	CTD	04.11.2019	3:48	53°29.559'N	6°46.836'E	11.4	018a05	1											0	0	2292	-0.37	HE453/011-42	0.42	0.30	no bottle closed
18-6	CTD	04.11.2019	4:17	53°29.553'N	6°46.787'E	11.1	018a06	1											0	0	2292	-0.35	HE453/011-42	0.45	0.30	no bottle closed
18-7	CTD	04.11.2019	4:47	53°29.551'N	6°46.784'E	10.9	018a07	1											0	0	2292	-0.35	HE453/011-42	0.45	0.30	no bottle closed
18-8	CTD	04.11.2019	5:17	53°29.551'N	6°46.783'E	10.7	018a08	1											0	0	2292	-0.35	HE453/011-42	0.45	0.25	no bottle closed
18-9	CTD	04.11.2019	5:47	53°29.550'N	6°46.782'E	10.3	018a09	2											0	0	3654	-0.54	HE453/011-42	0.45	0.15	no bottle closed
18-10	CTD	04.11.2019	6:17	53°29.550'N	6°46.781'E	10.1	018a10	2											0	0	2292	-0.35	HE453/011-42	0.45	0.30	no bottle closed
18-11	CTD	04.11.2019	6:45	53°29.551'N	6°46.781'E	9.9	018a11	2											0	0	2292	-0.35	HE453/011-42	0.45	0.35	no bottle closed
18-12	CTD	04.11.2019	7:18	53°29.551'N	6°46.781'E	9.7	018a12	2											0	0	2292	-0.36	HE453/011-42	0.45	0.35	no bottle closed
18-13	CTD	04.11.2019	7:46	53°29.550'N	6°46.781'E	9.5	018a13	2											0	0	2292	-0.34	HE453/011-42	0.45	0.35	no bottle closed
18-14	CTD	04.11.2019	8:16	53°29.553'N	6°46.782'E	9.4	018a14	2											0	0	2292	-0.40	HE453/011-42	0.45	0.50	no bottle closed
18-15	CTD	04.11.2019	8:47	53°29.558'N	6°46.789'E	9.2	018a15	2											0	0	2292	-0.37	HE453/011-42	0.45	0.35	no bottle closed
18-16	CTD	04.11.2019	9:16	53°29.562'N	6°46.807'E	9	018a16	2											0	0	2292	-0.37	HE453/011-42	0.44	0.40	no bottle closed
18-17	CTD	04.11.2019	9:45	53°29.563'N	6°46.824'E	9.5	018a17	1											0	0	2292	-0.37	HE453/011-42	0.42	0.40	no bottle closed
18-18	CTD	04.11.2019	10:17	53°29.534'N	6°46.836'E	9.8	018a18	1											0	0	2292	-0.35	HE453/011-42	0.39	0.35	no bottle closed
18-19	CTD	04.11.2019	10:46	53°29.530'N	6°46.832'E	10	018a19	1											0	0	2292	-0.34	HE453/011-42	0.39	0.40	no bottle closed
18-21	CTD	04.11.2019	11:22	53°29.528'N	6°46.831'E	10.4	018a21	1		2		2		2		2		2		10	3654	-1.39	HE453/011-42	0.39	0.10	no bottle closed
18-22	CTD	04.11.2019	11:51	53°29.528'N	6°46.832'E	10.6	018a22	1											0	0	2292	-0.47	HE453/011-42	0.39	0.40	no bottle closed
18-23	CTD	04.11.2019	12:19	53°29.528'N	6°46.833'E	10.6	018a23	2	1		1		1		1				5	0	2292	-0.38	HE453/011-42	0.39	0.40	no bottle closed
18-24	CTD	04.11.2019	12:49	53°29.530'N	6°46.839'E	10.9	018a24	2	1		1		1		1				5	0	2292	-0.46	HE453/011-42	0.39	0.45	no bottle closed
18-25	CTD	04.11.2019	13:17	53°29.528'N	6°46.834'E	11	018a25	1											0	0	3654	-0.47	HE453/011-42	0.38	0.20	no bottle closed
18-26	CTD	04.11.2019	13:48	53°29.529'N	6°46.833'E	11.1	018a26	2											0	0	2292	-0.35	HE453/011-42	0.39	0.30	no bottle closed
18-27	CTD	04.11.2019	14:17	53°29.529'N	6°46.831'E	11.2	018a27	2											0	0	3654	-0.36	HE453/011-42	0.39	0.10	no bottle closed
18-29	CTD	04.11.2019	14:45	53°29.540'N	6°46.840'E	11.3	018a29	2											0	0	2292	-0.35	HE453/011-42	0.38	0.35	no bottle closed
18-30	CTD	04.11.2019	15:17	53°29.545'N	6°46.836'E	11.3	018a30	1									1		5	0	2292	-0.34	HE453/011-42	0.39	0.35	no bottle closed
18-31	CTD	04.11.2019	15:47	53°29.551'N	6°46.818'E	11	018a31	1											0	0	2292	-0.35	HE453/011-42	0.42	0.35	no bottle closed
18-32	CTD	04.11.2019	16:17	53°29.550'N	6°46.804'E	11	018a32	1											0	0	2292	-0.35	HE453/011-42	0.43	0.40	no bottle closed
18-33	CTD	04.11.2019	16:46	53°29.550'N	6°46.792'E	10.8	018a33	1											0	0	2292	-0.36	HE453/011-42	0.44	0.40	no bottle closed
18-34	CTD	04.11.2019	17:13	53°29.549'N	6°46.790'E	10.6	018a34	2											0	0	2292	-0.35	HE453/011-42	0.45	0.30	
18-35	CTD	04.11.2019	17:47	53°29.557'N	6°46.800'E	10.3	018a35	2											0	0	2292	-0.36	HE453/011-42	0.44	0.30	no bottle closed
18-36	CTD	04.11.2019	18:17	53°29.555'N	6°46.787'E	10.1	018a36	2											0	0	2292	-0.34	HE453/011-42	0.45	0.35	no bottle closed
18-37	CTD	04.11.2019	18:47	53°29.561'N	6°46.799'E	9.8	018a37	2											0	0	2292	-0.35	HE453/011-42	0.44	0.40	no bottle closed
18-38	CTD	04.11.2019	19:16	53°29.560'N	6°46.795'E	9.7	018a38	2											0	0	2292	-0.35	HE453/011-42	0.45	0.40	no bottle closed
18-39	CTD	04.11.2019	19:46	53°29.560'N	6°46.794'E	9.6	018a39	2									1		5	0	2292	-0.36	HE453/011-42	0.45	0.40	no bottle closed
18-40	CTD	04.11.2019	20:18	53°29.559'N	6°46.791'E	9.4	018a40	2											0	0	3654	-0.36	HE453/011-42	0.46	0.10	no bottle closed
18-41	CTD	04.11.2019	20:48	53°29.558'N	6°46.792'E	9.5	018a41	2											0	0	2292	-0.36	HE453/011-42	0.44	0.40	no bottle closed
18-42	CTD	04.11.2019	21:16	53°29.555'N	6°46.787'E	9.5	018a42	2											0	0	2292	-0.34	HE453/011-42	0.45	0.40	no bottle closed
18-43	CTD	04.11.2019	21:45	53°29.550'N	6°46.786'E	9.8	018a43	1											0	0	2292	-0.35	HE453/011-42	0.45	0.40	no bottle closed
20-1	CTD	05.11.2019	7:07	53°42.725'N	6°36.277'E	13.6	020a01	1											0	0	2292	-0.33	HE453/013-01	0.79	0.40	
21-1	CTD	05.11.2019	11:06	53°44.426'N	6°33.401'E	17.8	021a01	1											0	0	2292	-0.32	HE453/013-01	5.01	0.40	

Figure 4: CTD data Processing Summary HE545 Continued — table (landscape orientation)

Station HE545	Gear Abbr.	Date	Time	Position Latitude	Position Longitude	Depth [m]	File HE545p	Sensor pair	Temp interp	Temp erased	Sal interp	Sal erased	Trans interp	Trans erased	Fluor interp	Fluor erased	Oxy interp	Oxy erased	complete interp	complete erased	2 Oxy Sensors Sensor	2 Oxy Sensors Offset	Oxygen reference cruise/sss-cc	Oxygen reference dist. (km)	Oxygen reference Offset	Comments
22-1	CTD	05.11.2019	14:04	53°46.315N	6°30.741E	18.9	022a01	2	2		2		2		2		2		10	0	2292	-0.32	HE453/013-01	9.56	0.40	
24-2	CTD	06.11.2019	7:40	53°44.140N	6°31.956E	19	024a01	1	1		1		1		1		1		5	0	2292	-0.32	HE453/013-01	5.79	0.50	wrong filename
25-1	CTD	06.11.2019	11:08	53°59.123N	6°20.979E	23.7	025a01	2	1		1		1		1		1		5	0	2292	-0.32	HE453/013-01	35.35	0.40	
25-2	CTD	06.11.2019	11:10	53°59.137N	6°20.960E	24.4													0	0						no matching file found
25-3	CTD	06.11.2019	11:11	53°59.149N	6°20.944E	24.7													0	0						no matching file found
26-1	CTD	06.11.2019	12:44	53°53.544N	6°28.342E	21.3	026a01	1											0	0	2292	-0.33	HE453/013-01	22.55	0.45	
27-1	CTD	06.11.2019	13:55	53°55.107N	6°36.834E	25.6	027a01	1											0	0	2292	-0.34	HE453/013-01	23.74	0.40	
29-1	CTD	07.11.2019	9:30	53°39.120N	8°06.535E	11.7	028a01	2	1		1		1		1		1		5	0	2292	-0.31	HE453/022-01	3.67	0.25	wrong filename
30-1	CTD	07.11.2019	11:42	53°35.648N	8°10.158E	16.3	029a01	2											0	0	2292	-0.33	HE453/019-01	2.23	0.25	wrong filename
31-1	CTD	07.11.2019	12:51	53°32.537N	8°10.748E	17.8	030a01	1											0	0	2292	1.09	HE453/021-01	0.29	0.30	wrong filename
32-1	CTD	08.11.2019	7:44	54°12.148N	7°58.132E	18.2	031a01	2											0	0	2292	-0.32	HE453/078-01	7.76	0.40	wrong filename, no bottle closed
32-2	CTD	08.11.2019	7:51	54°12.234N	7°58.227E	17	031a02	2										5	0	5	2292	-0.31	HE453/078-01	7.95		wrong filename, left at depth, no bottle closed, 5 bins, oxygen profile deleted
32-3	CTD	08.11.2019	8:03	54°12.398N	7°58.438E	13.7	031a03	2											0	0	2292	-0.31	HE453/078-01	8.33	0.40	wrong filename, left at depth, no bottle closed, 7 bins
32-4	CTD	08.11.2019	8:09	54°12.453N	7°58.440E	13.4	031a04	2											0	0	3654	-1.24	HE453/078-01	8.42	0.90	wrong filename, left at depth, no bottle closed, 4 bins
	CTD	08.11.2019	8:18				031a05	2											0	0	2292	-0.34				station missing, 14 bins
32-5	CTD	08.11.2019	8:22	54°12.425N	7°58.231E	15.1	031a06	2											0	0	2292	-0.31	HE453/078-01	8.25	0.40	wrong filename, left at depth, no bottle closed, 13 bins
32-6	CTD	08.11.2019	8:30	54°12.511N	7°58.251E	13.4	031a07	2											0	0	2292	-0.32	HE453/078-01	8.39	0.40	wrong filename, left at depth, no bottle closed, 5 bins
32-7	CTD	08.11.2019	8:58	54°12.241N	7°58.145E	17.1	031a08	2										2	0	2	2292	-0.27	HE453/078-01	7.91		wrong filename, left at depth, no bottle closed, 2 bins, oxygen profile deleted
33-1	CTD	08.11.2019	9:10	54°12.274N	7°58.140E	17	031a09	2	1		1		1		1		1		5	0	2292	-0.31	HE453/078-01	7.96	0.40	wrong filename, no bottle closed
33-2	CTD	08.11.2019	9:15	54°12.316N	7°58.160E	16.2	031a11	2											0	0	2292	-0.33	HE453/078-01	7.95	0.40	wrong filename, left at depth, no bottle closed, 3 bins
33-3	CTD	08.11.2019	9:22	54°12.414N	7°58.294E	14.7	031a12	2											0	0	2292	-0.31	HE453/078-01	8.27	0.40	wrong filename, left at depth, no bottle closed, 3 bins
33-4	CTD	08.11.2019	9:24	54°12.419N	7°58.279E	14.2	031a13	2											0	0	2292	-0.32	HE453/078-01	8.27	0.40	wrong filename, left at depth, no bottle closed, 4 bins
33-5	CTD	08.11.2019	9:27	54°12.439N	7°58.250E	14.8	031a14	2											0	0	2292	-0.32	HE453/078-01	8.28	0.40	wrong filename, left at depth, no bottle closed, 3 bins
33-6	CTD	08.11.2019	9:32	54°12.504N	7°58.299E	13.7	031a15	2											0	0	2292	-0.32	HE453/078-01	8.41	0.40	wrong filename, left at depth, no bottle closed, 5 bins
33-7	CTD	08.11.2019	9:38	54°12.575N	7°58.330E	12.3	031a16	2											0	0	2292	-0.33	HE453/078-01	8.54	0.40	wrong filename, left at depth, no bottle closed, 7 bins
33-8	CTD	08.11.2019	9:41	54°12.571N	7°58.277E	12.2	031a17	2											0	0	2292	-0.33	HE453/078-01	8.5	0.40	wrong filename, left at depth, no bottle closed, 4 bins

Figure 4: CTD data Processing Summary HE545 Continued

Figure 5: CTD data Processing Summary HE545 Continued

Station HE545	Gear Abbr.	Date	Time	Latitude	Longitude	Depth [m]	File HE545p	Sensor pair	Temp interp	Temp erased	Sal interp	Sal erased	Trans interp	Trans erased	Fluor interp	Fluor erased	Oxy interp	Oxy erased	complete interp	complete erased	2 Oxy Sensor	2 Oxy Offset	cruise/sss-cc	dist. (km)	Offset	Comments
32-8	CTD	08.11.2019	9:44	54°12.597'N	7°58.259'E	12.5	031a18	2											0	0	2292	-0.32	HE453/078-01	8.54	0.40	wrong filename, left at depth, no bottle closed, 4 bins
34-1	CTD	08.11.2019	9:50	54°12.619'N	7°58.190'E	12.3	031a19	1											0	0	2292	-0.32	HE453/078-01	8.52	0.40	wrong filename, no bottle closed
34-2	CTD	08.11.2019	9:56	54°12.681'N	7°58.246'E	11.2	031a20	2											0	0	2292	-0.32	HE453/078-01	8.85	0.40	wrong filename, left at depth, no bottle closed, 4 bins
34-3	CTD	08.11.2019	10:03	54°12.756'N	7°58.307'E	10.5	031a21	2											0	0	2292	-0.31	HE453/078-01	8.81	0.40	wrong filename, left at depth, no bottle closed, 4 bins
34-4	CTD	08.11.2019	10:06	54°12.781'N	7°58.272'E	11	031a22	2											0	0	2292	-0.32	HE453/078-01	8.83	0.40	wrong filename, left at depth, no bottle closed, 3 bins
34-5	CTD	08.11.2019	10:10	54°12.812'N	7°58.226'E	11.4	031a23	2											0	0	2292	-0.32	HE453/078-01	8.85	0.40	wrong filename, left at depth, no bottle closed, 3 bins
34-6	CTD	08.11.2019	10:17	54°12.930'N	7°58.203'E	12.3	031a24	2											0	0	2292	-0.32	HE453/078-01	9.03	0.40	wrong filename, left at depth, no bottle closed, 2 bins
34-7	CTD	08.11.2019	10:22	54°12.963'N	7°58.210'E	11.9	031a25	2											0	0	2292	-0.34	HE453/078-01	9.08	0.40	wrong filename, left at depth, no bottle closed, 5 bins
34-8	CTD	08.11.2019	10:25	54°12.959'N	7°58.159'E	11.7	031a26	2											0	0	2292	-0.33	HE453/078-01	9.05	0.40	wrong filename, left at depth, no bottle closed, 4 bins
35-1	CTD	08.11.2019	11:10	54°12.291'N	7°58.020'E	15.3	032a01	2	1		1		1		1		1		5	0	2292	-0.32	HE453/078-01	7.92	0.40	wrong filename
35-3	CTD	08.11.2019	11:37	54°12.288'N	7°58.031'E	15.3	032a02	2										2	0	2	2292	-0.17	HE453/078-01	7.92	0.40	wrong filename, left at depth, no bottle closed, 4 bins, oxygen profile deleted
35-4	CTD	08.11.2019	11:42	54°12.284'N	7°58.029'E	15.2	032a03	2											0	0	2292	-0.32	HE453/078-01	7.91	0.40	wrong filename, left at depth, no bottle closed
35-5	CTD	08.11.2019	11:46	54°12.269'N	7°58.044'E	14.9	032a04	2											0	0	2292	-0.32	HE453/078-01	7.9	0.40	wrong filename, left at depth, no bottle closed, 6 bins
35-6	CTD	08.11.2019	11:51	54°12.258'N	7°58.020'E	15.4	032a05	2											0	0	2292	-0.33	HE453/078-01	7.86	0.40	wrong filename, left at depth, no bottle closed, 3 bins
35-7	CTD	08.11.2019	11:58	54°12.281'N	7°58.031'E	15	032a06	2											0	0	2292	-0.33	HE453/078-01	7.91	0.40	wrong filename, left at depth, no bottle closed, 4 bins
35-8	CTD	08.11.2019	12:04	54°12.270'N	7°58.047'E	15.1	032a07	2											0	0	2292	-0.32	HE453/078-01	7.9	0.40	wrong filename, left at depth, no bottle closed, 3 bins
35-9	CTD	08.11.2019	12:13	54°12.249'N	7°58.039'E	15.6	032a08	2											0	0	2292	-0.33	HE453/078-01	7.85	0.40	wrong filename, left at depth, no bottle closed, 4 bins
38-1	CTD	08.11.2019	16:55	54°12.990'N	7°57.779'E	10.8	038a01	2	1		1		1		1		1		5	0	2292	-0.32	HE453/078-01	8.91	0.45	no bottle closed
40-1	CTD	09.11.2019	14:05	54°07.393'N	7°55.504'E	37.4	040a01	2											5	0	2292	-0.32	HE453/076-01	2.39	0.45	
41-1	CTD	09.11.2019	14:39	54°07.830'N	7°55.339'E	42.2	041a01	1	2		2		2		2		2		10	0	2292	-0.33	HE453/078-01	2.12	0.40	
42-1	CTD	09.11.2019	15:13	54°08.276'N	7°54.650'E	53.9	042a01	1											0	0	2292	-0.32	HE453/078-01	1.01	0.35	
43-1	CTD	09.11.2019	15:44	54°08.484'N	7°54.196'E	54.9	043a01	2											0	0	2292	-0.33	HE453/078-01	0.42	0.30	
44-1	CTD	10.11.2019	8:46	54°08.508'N	7°54.231'E	57.2	044a01	1	1		1		1		1		1		5	0	2292	-0.20	HE453/078-01	0.4	0.35	no bottle closed
45-1	CTD	10.11.2019	9:13	54°08.273'N	7°54.795'E	55.6	045a01	1											0	0	2292	-0.30	HE453/078-01	1.12	0.40	no bottle closed
46-1	CTD	10.11.2019	9:32	54°07.898'N	7°55.473'E	44.7	046a01	1											0	0	2292	-0.31	HE453/078-01	2.13	0.40	no bottle closed
47-1	CTD	10.11.2019	9:49	54°07.580'N	7°56.060'E	39.9	047a01	1											0	0	3654	-0.31	HE453/076-01	2.13	0.80	no bottle closed
48-1	CTD	10.11.2019	11:34	54°08.560'N	7°54.239'E	54.6	048a01	2											0	0	3654	-0.34	HE453/078-01	0.31	0.70	no bottle closed
48-5	CTD	10.11.2019	12:40	54°08.489'N	7°53.976'E	56.4	048a05	2	1		1		1		1		1		5	0	2292	-0.32	HE453/078-01	0.4	0.45	

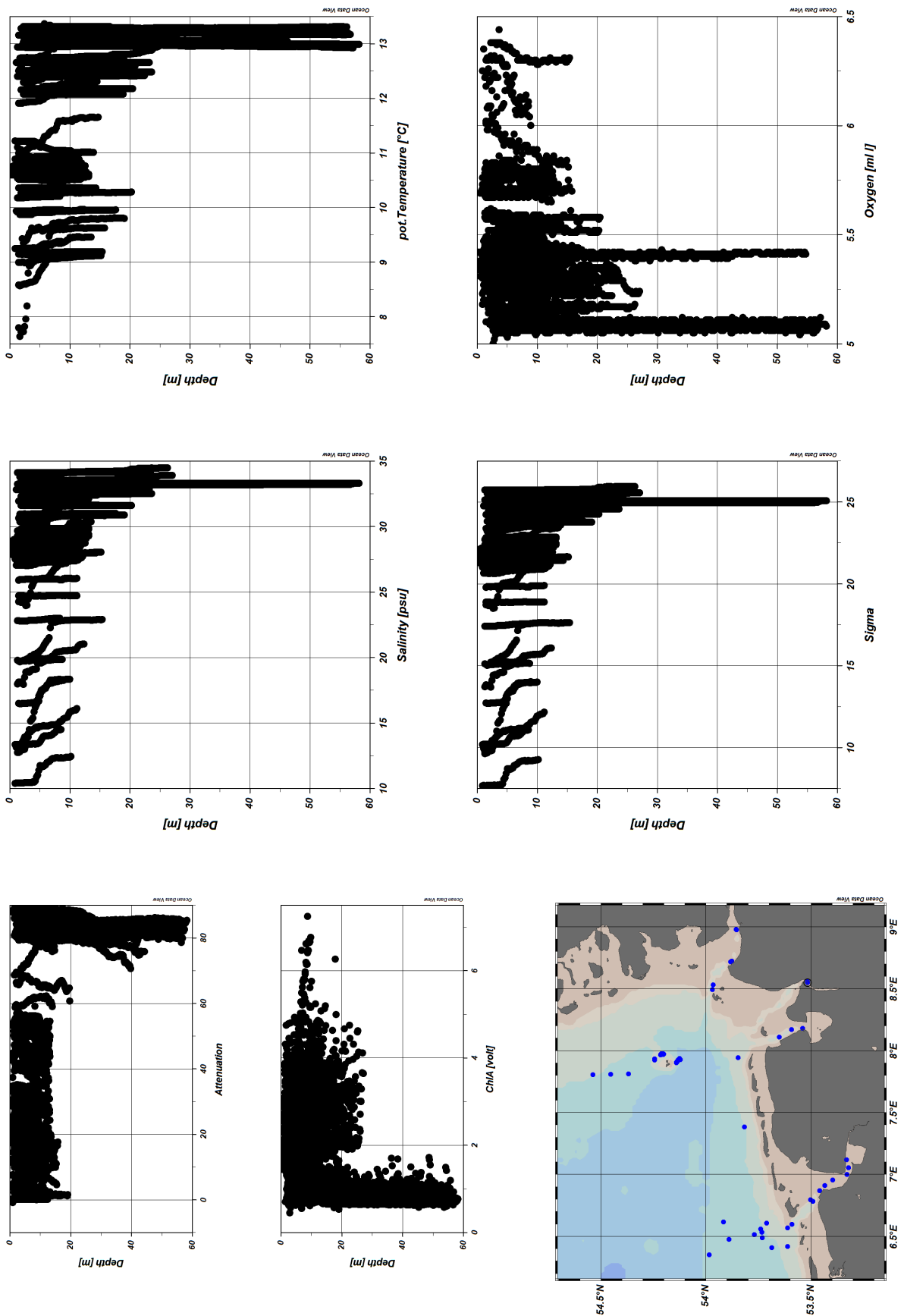	Station HE545	Gear Abbr.	Date	Time	Position Latitude	Position Longitude	Depth [m]	File HE545p	Sensor pair	Temp interp	Temp erased	Sal interp	Sal erased	Trans interp	Trans erased	Fluor interp	Fluor erased	Oxy interp	Oxy erased	complete interp	complete erased	2 Oxy Sensors Sensor	2 Oxy Sensors Offset	Oxygen reference cruise/sss-cc	Oxygen reference dist. (km)	Oxygen reference Offset	Comments
49-1	CTD	10.11.2019	15:16	54°08.478N	7°54.255E	54.5	049a01	1	4		4		4		4		4		20	0	2292	-0.31	HE453/078-01	0.46	0.35	no bottle closed
49-3	CTD	10.11.2019	15:54	54°08.480N	7°54.105E	54.9	049a03	1											0	0	2292	-0.32	HE453/078-01	0.41	0.40	
49-5	CTD	10.11.2019	17:22	54°08.390N	7°54.244E	53.9	049a05	1	1		1		1		1		1		5	0	2292	-0.32	HE453/078-01	0.61	0.40	
51-1	CTD	11.11.2019	7:00	54°22.200N	7°48.716E	20.6	051a01	1											0	0	2292	-0.33	HE453/057-01	21.58	0.40	
52-1	CTD	11.11.2019	8:07	54°27.228N	7°48.500E	19.1	052a01	2	2		2		4		2		2		12	0	3654	-0.59	HE453/057-01	21.71	0.70	
53-1	CTD	11.11.2019	9:18	54°32.282N	7°48.153E	17.1	053a01	1											0	0	2292	-0.34	HE453/056-01	19.02	0.80	
54-1	CTD	11.11.2019	12:44	54°14.717N	7°55.907E	16.9	054a01	1											0	0	2292	-0.33	HE453/078-01	11.33	0.40	no bottle closed
54-4	CTD	11.11.2019	13:05	54°14.736N	7°55.578E	16.8	054a04	2											0	0	2292	-0.33	HE453/078-01	11.3	0.40	
55-3	CTD	11.11.2019	14:17	54°14.711N	7°55.274E	17.1	055a03	1	1		1		1		1		1		5	0	2292	-0.33	HE453/078-01	11.22	0.40	
56-1	CTD	12.11.2019	7:09	53°58.193N	8°29.514E	15.6	056a01	2											0	0	2292	-0.28	HE453/062-01	1.84	0.50	
57-1	CTD	12.11.2019	8:41	53°52.985N	8°42.941E	15.3	057a01	1											0	0	3654	-0.37	HE453/064-01	2.96	0.20	
58-1	CTD	12.11.2019	11:12	53°51.423N	8°58.609E	7.4	058a01	2	1		1		1		1		1		5	0	2292	-0.37	HE453/066-01	1.44	2.50	
59-1	CTD	12.11.2019	13:05	53°51.352N	8°58.380E	7.4	059a01	1											0	0	2292	-0.39	HE453/066-01	1.59	2.50	
60-1	CTD	12.11.2019	14:31	53°52.726N	8°43.326E	13.1	060a01	2		1		1		1		1		1	0	5	2292	-0.38	HE453/064-01	2.34	0.40	
61-1	CTD	12.11.2019	15:51	53°58.009N	8°31.820E	13.4	061a01	2											0	0	2292	-0.37	HE453/070-01	0.5	0.20	no bottle closed
	CTD	12.11.2019	16:03				061a02												0	0	2292	-0.38				station missing
63-1	CTD	13.11.2019	6:03	53°49.122N	7° 22.997 E	18.9	063a01	2											0	0	2292	-0.22	HE453/016-01	6.68	0.15	no bottle closed
									26	7	26	7	28	4	26	4	26	16	132	38						

Figure 6: CTD data Processing Summary HE545 Continued

Figure 7: ODV Screenshot of HE545 CTD data