

# Surface T/S Data RV "Heincke"

## HE441

### Data Processing Report

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Ref.: HE441_TSG.pdf	Vers.: 1	Date: 2016/07/26	Status: final
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# 1 Introduction

This report describes the processing of raw data acquired by the thermosalinograph on board RV "Heincke" during expedition HE441 to receive cleaned up and drift corrected salinity data.

# 2 Workflow

The different steps of processing are visualized in Figure 2. Unvalidated data of sensor, internal and external temperature are extracted from the DAVIS SHIP data base (<https://dship.awi.de>) in a 1-second interval for cruises from 2009 to 2014. The Salinity was calculated by applying the Practical Salinity Scale 1978 (PSS-78). Furthermore the sound velocity was derived by using the Del Grosso equation.

As first step, a basic cleanup was performed to remove missing or flagged data. Since the salinity measurements in coastal areas (e.g. rivers and ports) are less reliable, measurements in a buffer of 2 nautical miles (NM) along the coast are filtered. In the norwegian area (fjords) the buffer is set to 200 meters (0.108 NM). After the exclusion of data outside the speed interval of 0.5 kn to 15 kn, the salinity is driftcorrected with lab calibration data. In the next processing step the difference between the external and internal temperature is taken to identify an improper usage of the thermosalinograph. This filter is ignored if more than 90% of the data would get removed. After despiking, a visual screening is performed to enhance the data quality. In the last step the temporal resolution is reduced to 5-minutes-means.



Figure 1: Workflow of TSG data processing

### 3 Cruise details

Vessel name      RV "Heincke"  
 Cruise name      HE441  
 Cruise start      20.03.2015 Bremerhaven  
 Cruise end        31.03.2015 Bremerhaven  
 Cruise duration   11 days

### 4 Sensor

Thermosalinograph:    Seabird SEACAT SBE21 (SN: 3333)  
 External Temperature:   SBE38

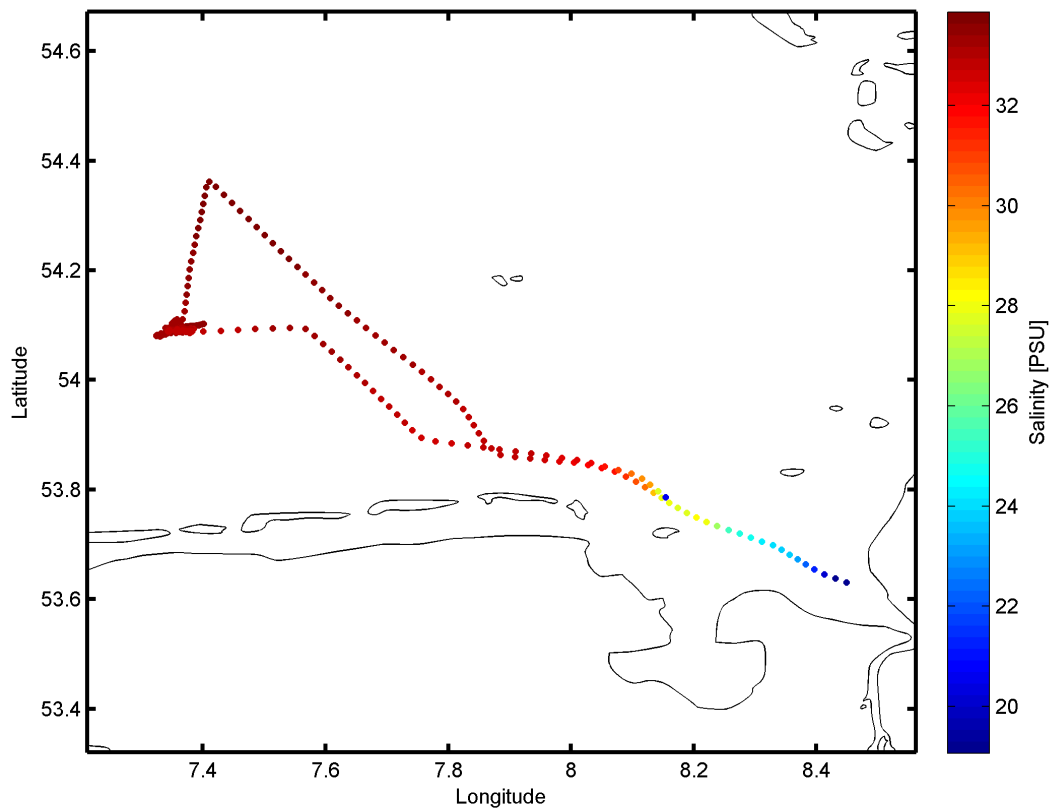


Figure 2: Cruisemap of HE441.

## 5 Processing Report

### Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	1036801
First dataset	2015-03-20T00:00:00 UTC
Last dataset	2015-04-01T00:00:00 UTC

### Automatic Validation

The following thresholds were applied for the automatic flagging of the position data:

Min. speed	Minimum 0.5 kn between two datapoints.
Max. speed	Maximum 15 kn between two datapoints.
GeoBuffer	0.1080 NM around Norway, 2 NM anywhere else
Temperature	Maximum T-difference of 5 K.

### Flagging result

Filter	Data left (abs.)	Data left (rel.)	Data removed (abs.)	Data removed (rel.)
Raw data	1036801	100 %	—	—
Basic	881947	85.06 %	154854	14.94 %
Geo	628602	60.63 %	408199	39.37 %
Speed	448235	43.23 %	588566	56.77 %
Temperature	144539	13.94 %	892262	86.06 %
Despike	144539	13.94 %	892262	86.06 %
Manual	144186	13.91 %	892615	86.09 %
5-min-Mean	648	0.06 %	1036153	99.94 %

### Sensordrift

Last calibration	14.03.2014
Current calibration	16.05.2016
Start of deployment	18.02.2015
End of deployment	10.05.2016
Scaled drift	-1.3341e-004 [PSU/month]
Minimal offset	1.3159e-004 [PSU]
Maximal offset	1.8422e-004 [PSU]

### Comments

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## Process evolution

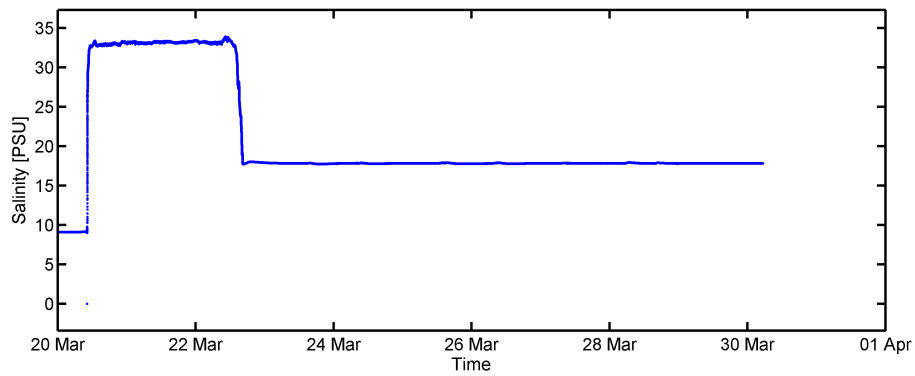


Figure 3: Raw salinity data.

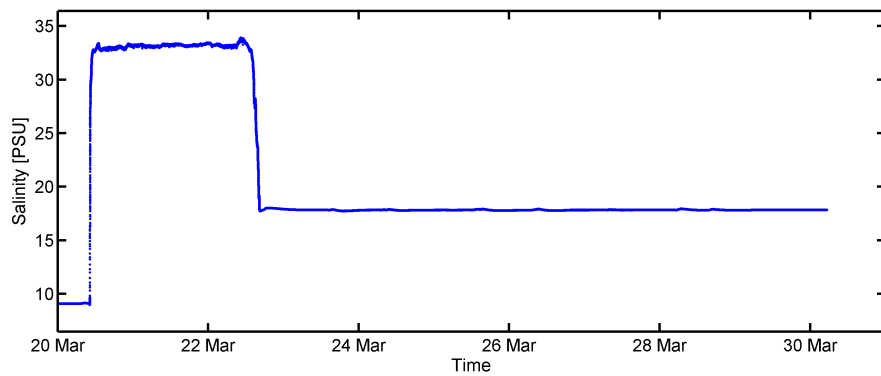


Figure 4: Salinity after basic filter.

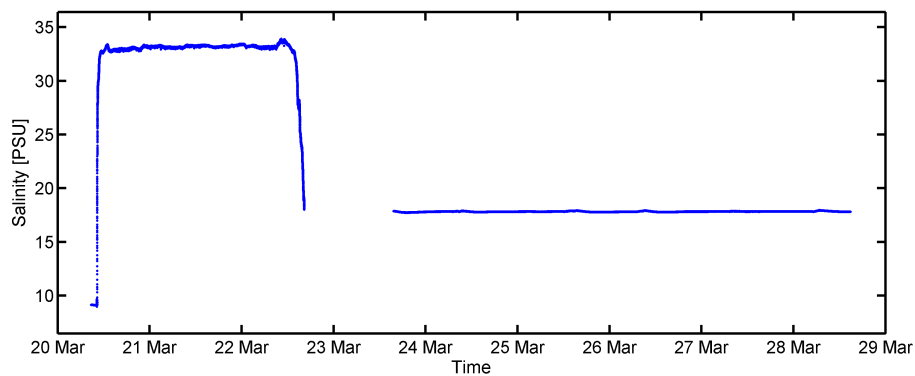


Figure 5: Salinity after geofilter.

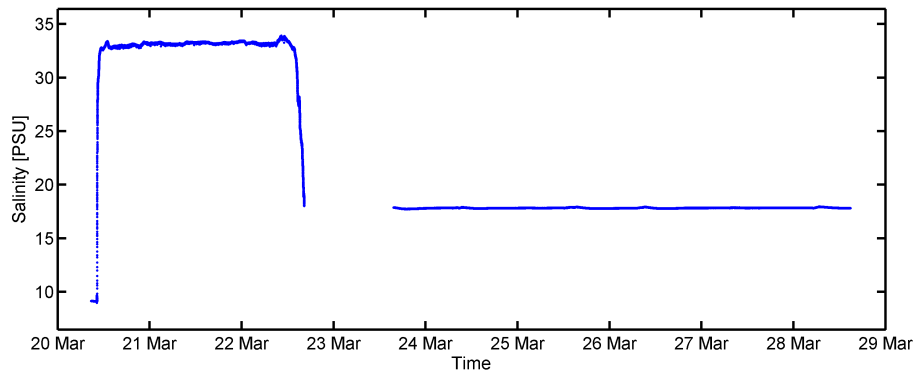


Figure 6: Salinity after speed filter.

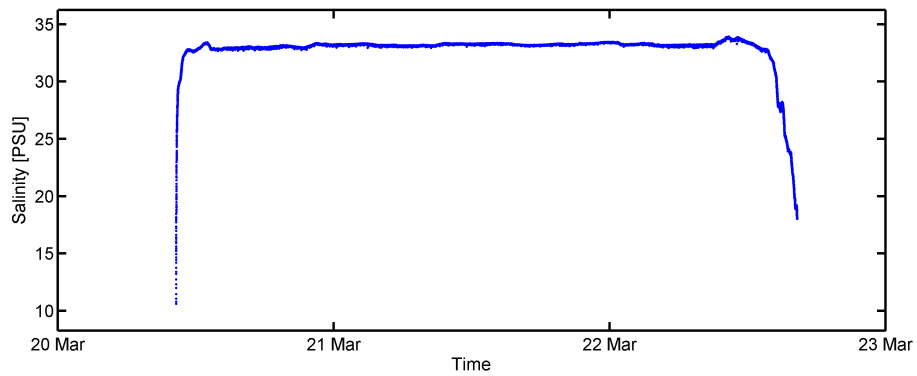


Figure 7: Salinity after temperature filter.

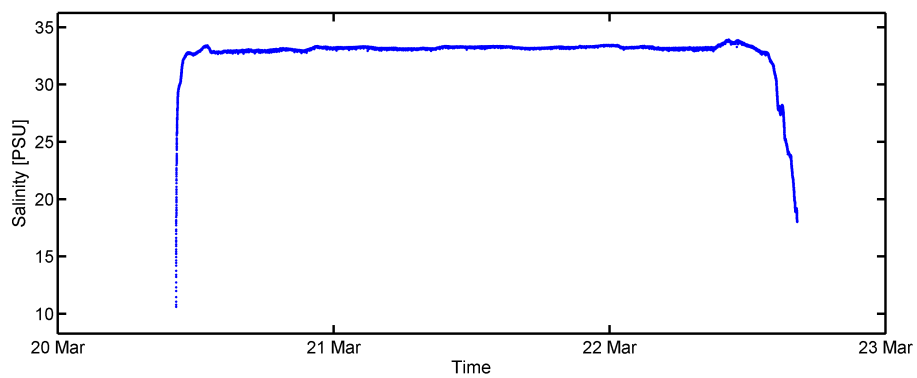


Figure 8: Salinity after despiking.

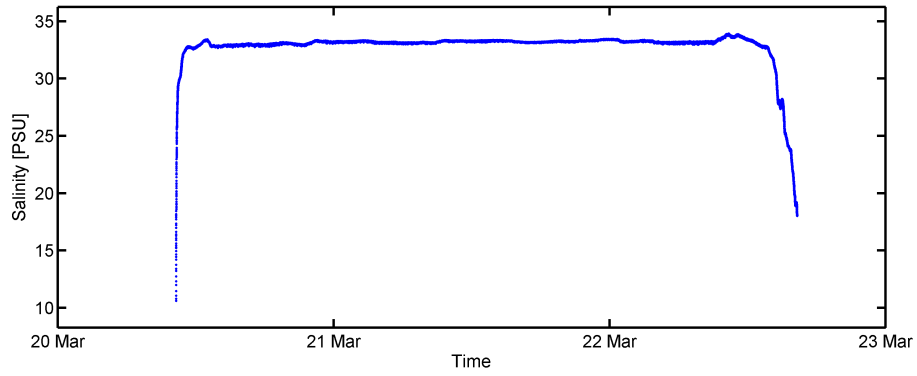


Figure 9: Salinity after manual filter.

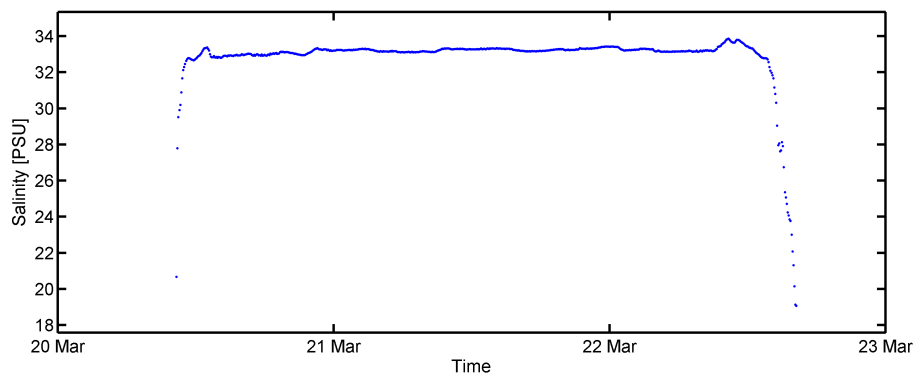


Figure 10: Salinity in 5-min-mean values.

## Result file

Text File (HE441\_surf\_oce.tab):

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

Column separator	Tabulator "\t"
Column 1	Date and time expressed according to ISO 8601
Column 3	Latitude in decimal format, unit degree
Column 4	Longitude in decimal format, unit degree
Column 5	Depth below water surface, unit meter
Column 6	Temperature, unit degree
Column 7	Salinity, unit PSU

Processing Report (HE441\_TSG.pdf):

This PDF document.