

# Surface T/S Data RV "Heincke"

## HE509

### Data Processing Report

#### Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Workflow</b>	<b>2</b>
<b>3</b>	<b>Cruise details</b>	<b>3</b>
<b>4</b>	<b>Sensor</b>	<b>3</b>
<b>5</b>	<b>Processing Report</b>	<b>4</b>

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**Report History**

Version No.	Author	Date	Comments or Changes
Vers. 1	FIELAX GmbH	11.04.2016	first edition
Vers. 1.1	FIELAX GmbH	27.02.2018	Flow Rate Filter added; minor text changes

# 1 Introduction

This report describes the processing of raw data acquired by the thermosalinograph on board RV "Heincke" during expedition HE509 to receive cleaned up and drift corrected salinity data.

# 2 Workflow

The different steps of processing are visualized in Figure 1. Unvalidated data of conductivity sensor, internal and external temperature are extracted from the DAVIS SHIP data base (<https://dship.awi.de>) in a 1-second interval. The salinity was calculated using conductivity and internal temperature by applying the Practical Salinity Scale 1978 (PSS-78).

As a first step, a basic cleanup was performed to remove missing or flagged data. Then, too low flow rates are taken as indicator for an improper usage of the thermosalinograph. 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, data with differences between external and internal temperature sensor > 5 K are removed. After despiking, a visual screening is performed to enhance the data quality. Then, the temporal resolution is reduced to 5-minutes-means. In the last step, the 5-minute-means of salinity and external temperature are exported.

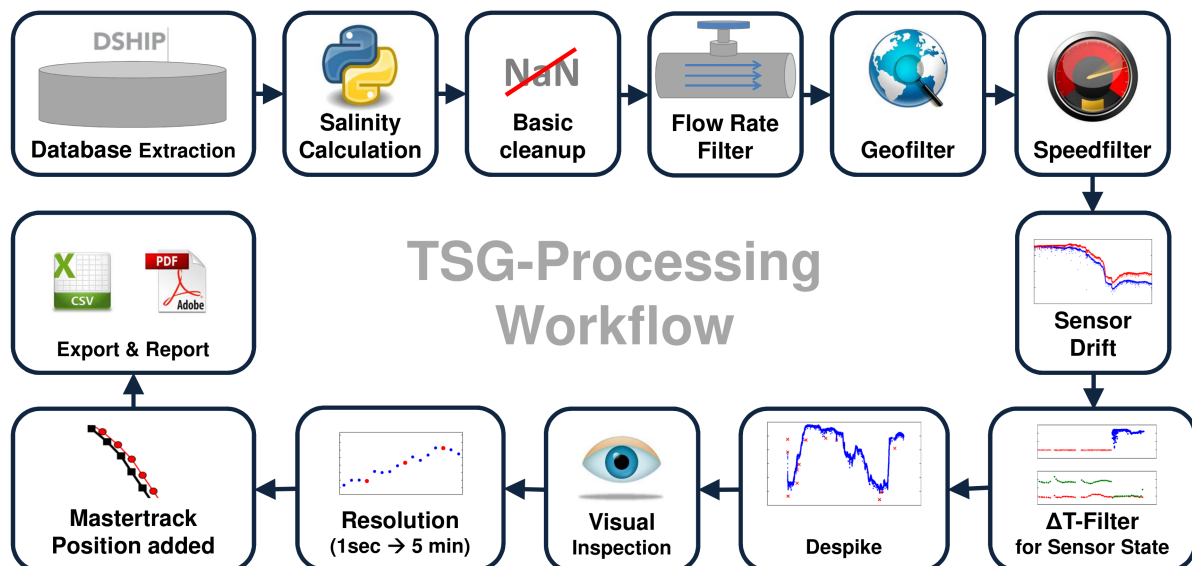


Figure 1: Workflow of TSG data processing

### 3 Cruise details

Vessel name      RV "Heincke"  
 Cruise name      HE509  
 Cruise start      24.04.2018 Helgoland  
 Cruise end        29.04.2018 Bremerhaven  
 Cruise duration   6 days

### 4 Sensor

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

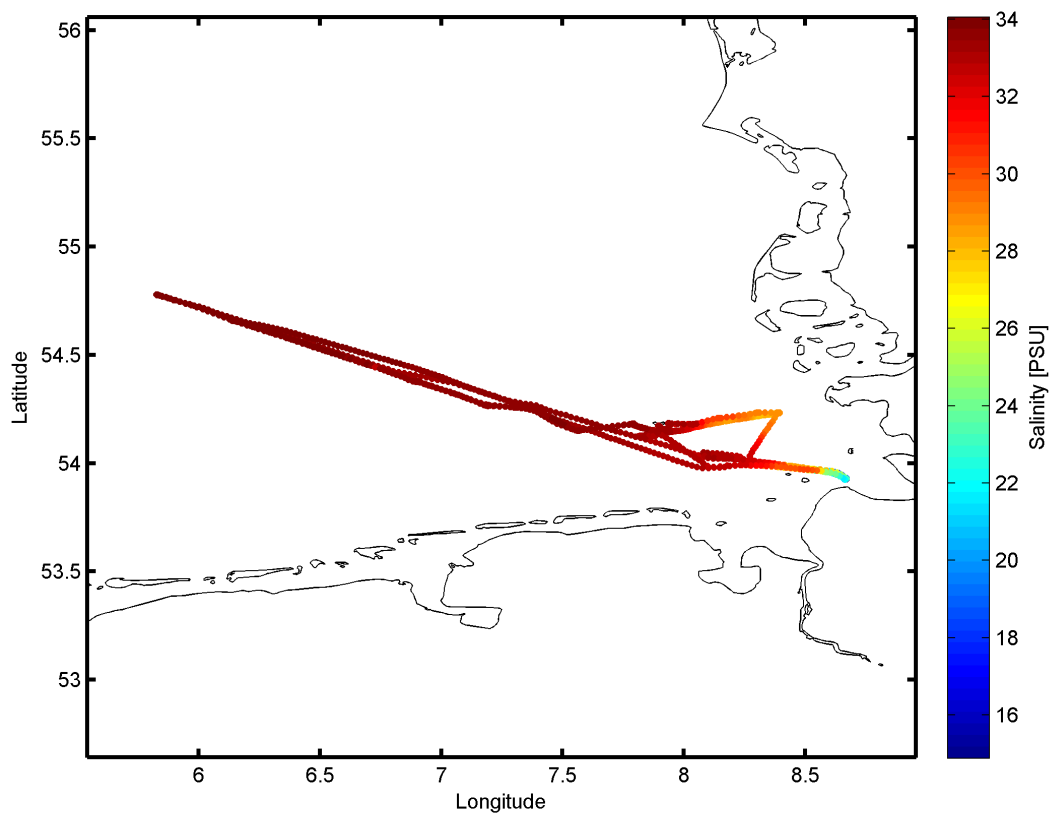


Figure 2: Cruisemap of HE509.

## 5 Processing Report

### Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	608777
First dataset	2018-04-23T06:41:48 UTC
Last dataset	2018-04-30T07:48:04 UTC

### Automatic Validation

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

Min. flow rate	Minimum 2.5
Min. speed	Minimum 0.5 kn between two datapoints.
Max. speed	Maximum 40 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	608777	100 %	—	—
Basic	119827	19.68 %	488950	80.32 %
Flow rate	102180	16.78 %	506597	83.22 %
Geo	82517	13.55 %	526260	86.45 %
Speed	76246	12.52 %	532531	87.48 %
Temperature	76218	12.52 %	532559	87.48 %
Despike	75940	12.47 %	532837	87.53 %
Manual	75799	12.45 %	532978	87.55 %
5-min-Mean	937	0.15 %	607840	99.85 %

### Sensordrift

Last calibration	05.09.2017
Current calibration	22.11.2018
Start of deployment	10.01.2018
End of deployment	15.11.2018
Scaled drift	-1.2596e-004 [PSU/month]
Minimal offset	4.2770e-004 [PSU]
Maximal offset	4.5688e-004 [PSU]

### Comments

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## Process evolution

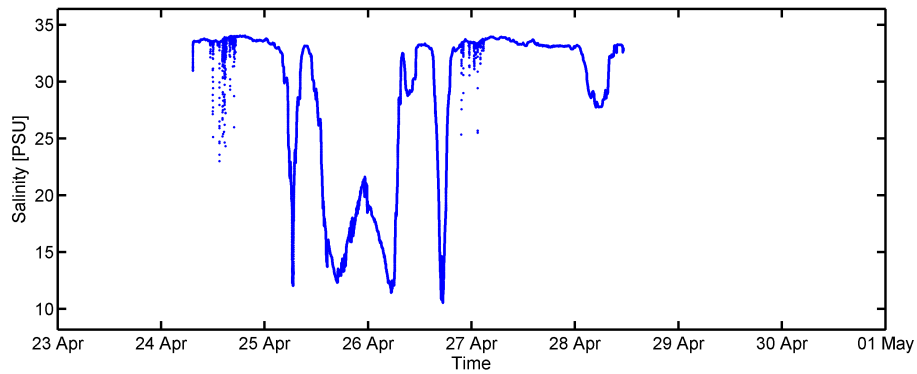


Figure 3: Raw salinity data.

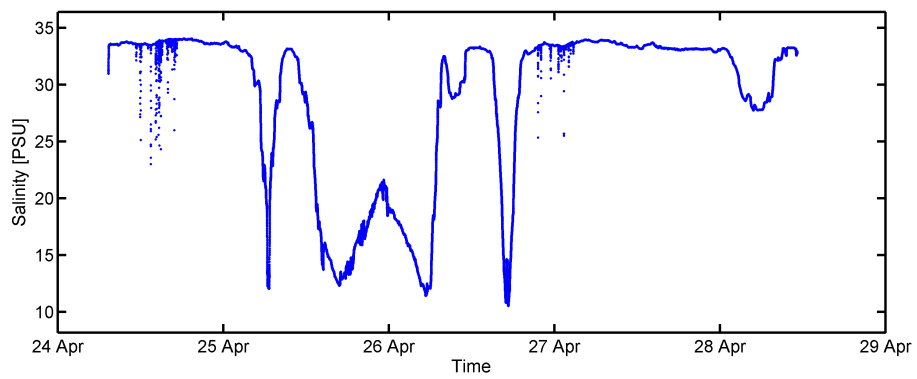


Figure 4: Salinity after basic filter.

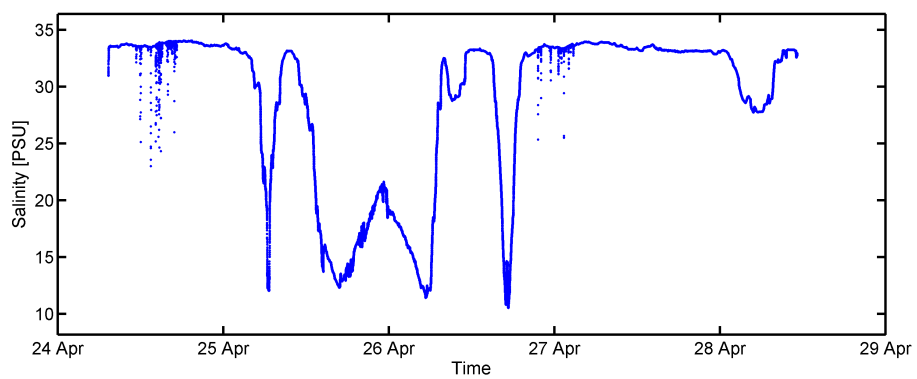


Figure 5: Salinity after flow rate filter.

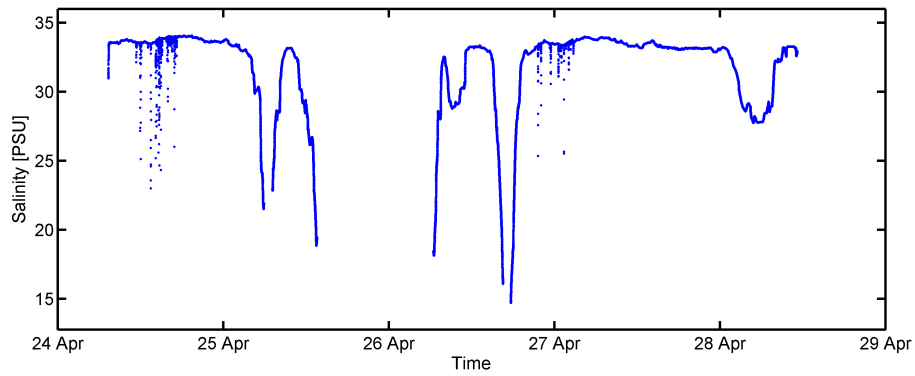


Figure 6: Salinity after geofilter.

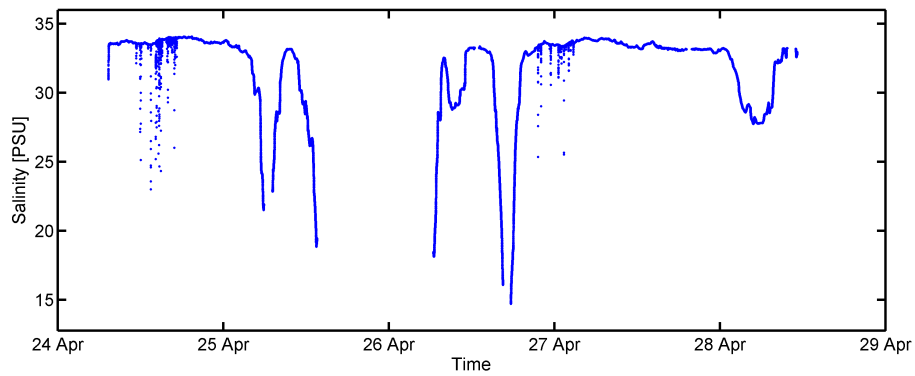


Figure 7: Salinity after speed filter.

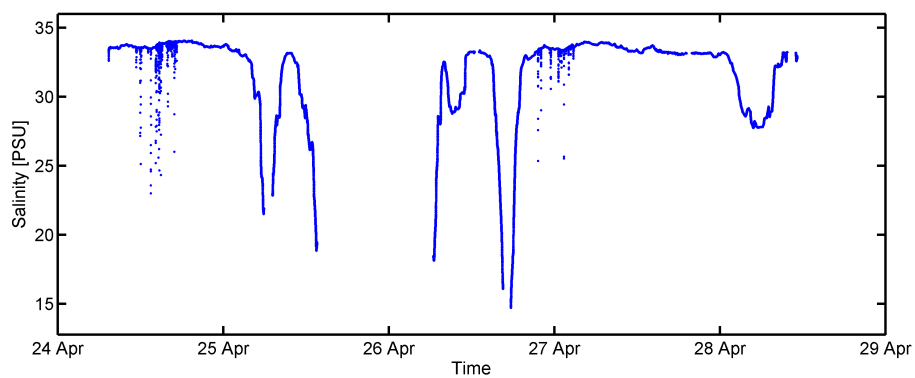


Figure 8: Salinity after temperature filter.

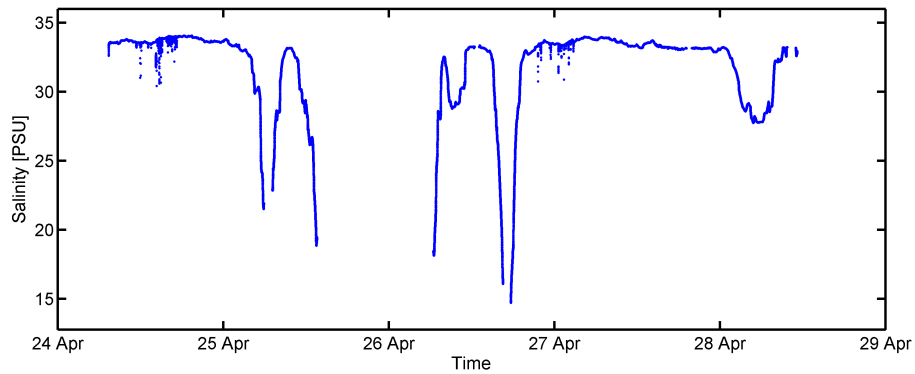


Figure 9: Salinity after despiking.

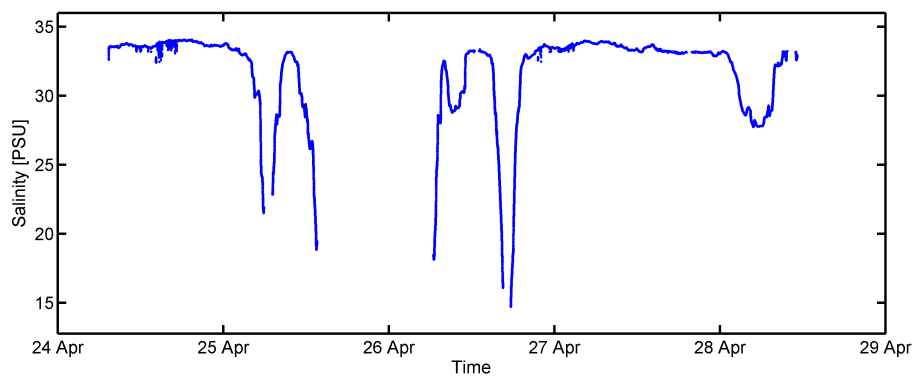


Figure 10: Salinity after manual filter.

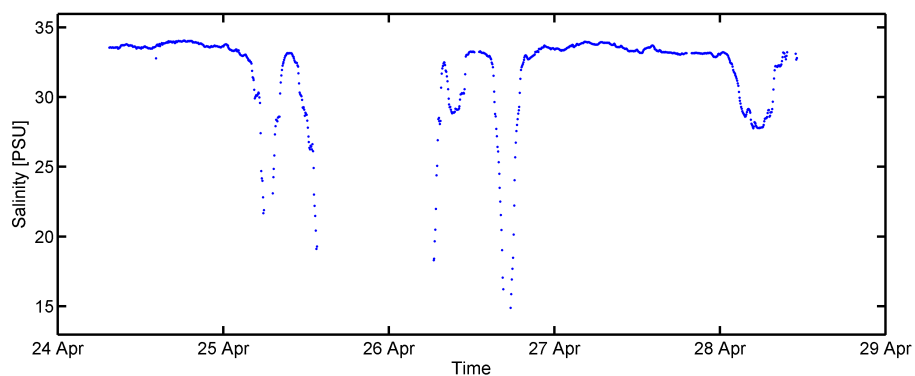


Figure 11: Salinity in 5-min-mean values.



## Result file

Text File (HE509\_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 2	Latitude in decimal format, unit degree
Column 3	Longitude in decimal format, unit degree
Column 4	Depth below water surface, unit meter
Column 5	Temperature, unit degree
Column 6	Salinity, unit PSU

Processing Report (HE509\_TSG.pdf):

This PDF document.