

# Surface T/S Data RV "Heincke"

## HE501

### Data Processing Report

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|                     |            |                  |               |
|---------------------|------------|------------------|---------------|
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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 HE501 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.

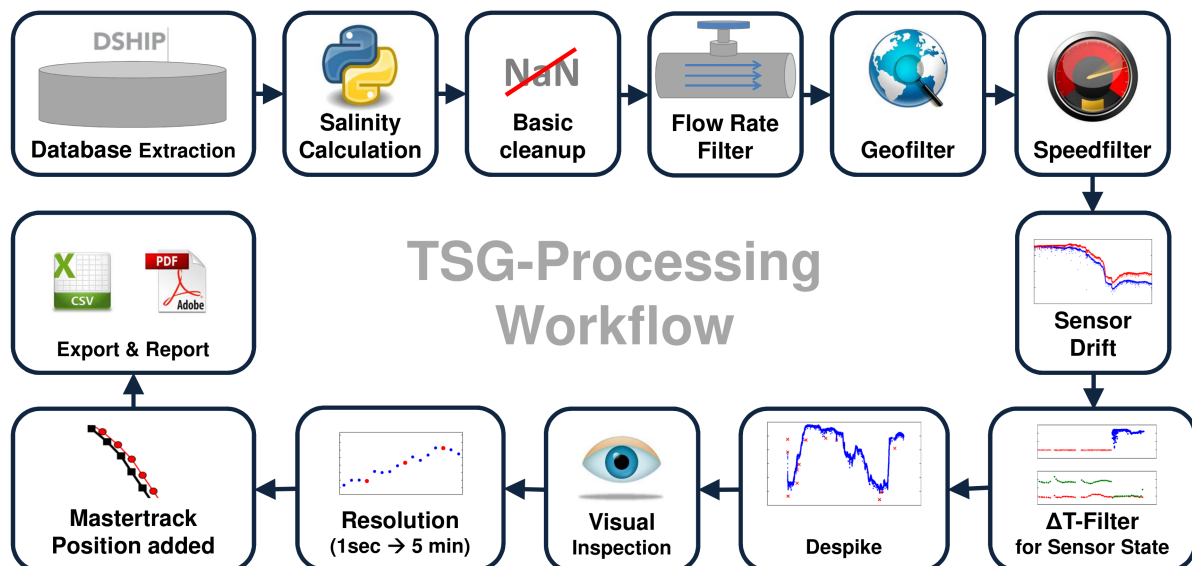


Figure 1: Workflow of TSG data processing

### 3 Cruise details

Vessel name      RV "Heincke"  
 Cruise name      HE501  
 Cruise start      15.11.2017 Bremerhaven  
 Cruise end        28.11.2017 Bremerhaven  
 Cruise duration   14 days

### 4 Sensor

Thermosalinograph:    Seabird SEACAT SBE21 (SN: 3334)  
 External Temperature:   SBE38

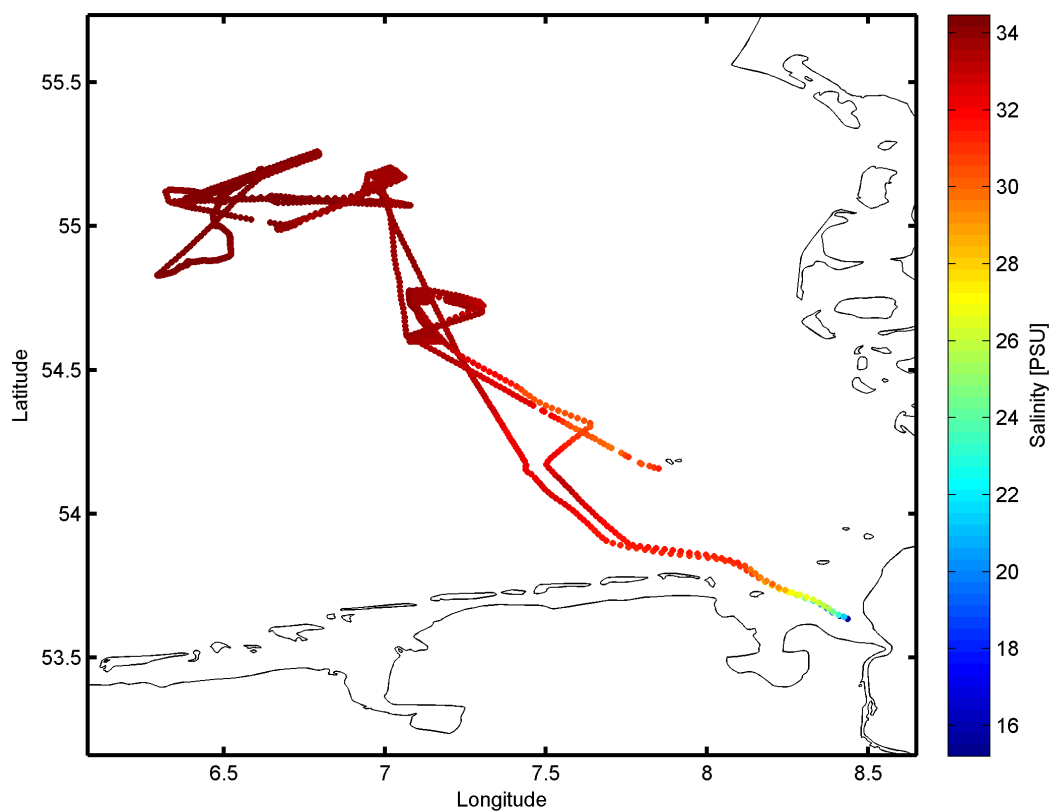


Figure 2: Cruisemap of HE501.

## 5 Processing Report

### Database Extraction

|                 |                               |
|-----------------|-------------------------------|
| Data source     | DSHIP database (dship.awi.de) |
| Exported values | 1123200                       |
| First dataset   | 2017-11-15T00:00:00 UTC       |
| Last dataset    | 2017-11-27T23:59:59 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    | 1123200          | 100 %            | —                   | —                   |
| Basic       | 277025           | 24.66 %          | 846175              | 75.34 %             |
| Flow rate   | 277018           | 24.66 %          | 846182              | 75.34 %             |
| Geo         | 272384           | 24.25 %          | 850816              | 75.75 %             |
| Speed       | 255509           | 22.75 %          | 867691              | 77.25 %             |
| Temperature | 255485           | 22.75 %          | 867715              | 77.25 %             |
| Despike     | 251971           | 22.43 %          | 871229              | 77.57 %             |
| Manual      | 215763           | 19.21 %          | 907437              | 80.79 %             |
| 5-min-Mean  | 2547             | 0.23 %           | 1120653             | 99.77 %             |

### Sensordrift

|                     |                          |
|---------------------|--------------------------|
| Last calibration    | 15.12.2016               |
| Current calibration | 15.02.2018               |
| Start of deployment | 06.07.2017               |
| End of deployment   | 11.01.2018               |
| Scaled drift        | -8.1315e-004 [PSU/month] |
| Minimal offset      | 3.5289e-003 [PSU]        |
| Maximal offset      | 3.8764e-003 [PSU]        |

### Comments

The cruise ended on 2017-11-27.

## Process evolution

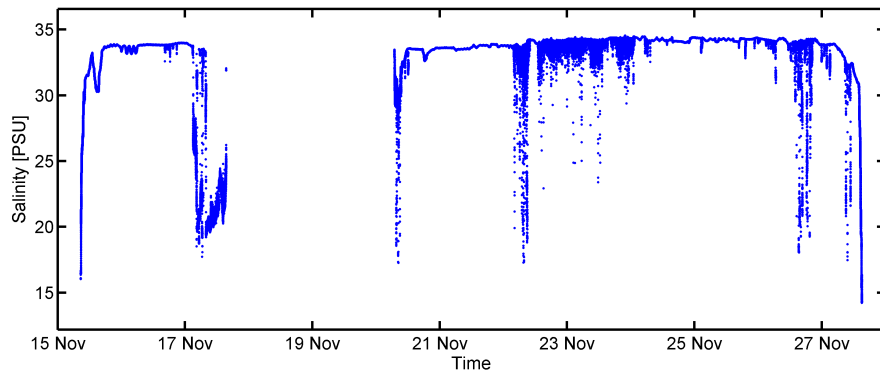


Figure 3: Raw salinity data.

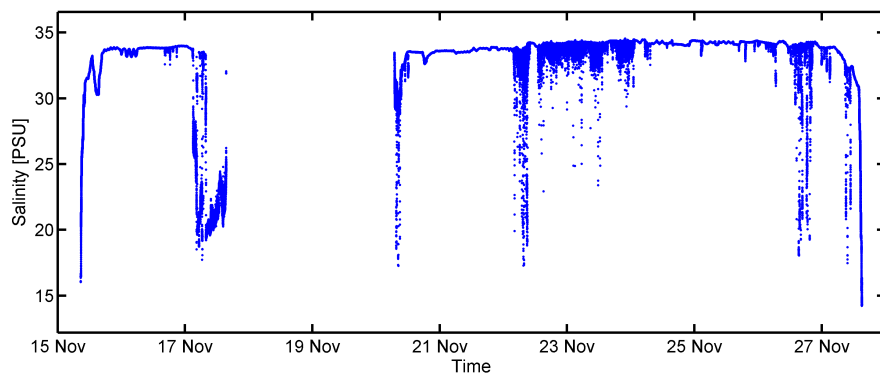


Figure 4: Salinity after basic filter.

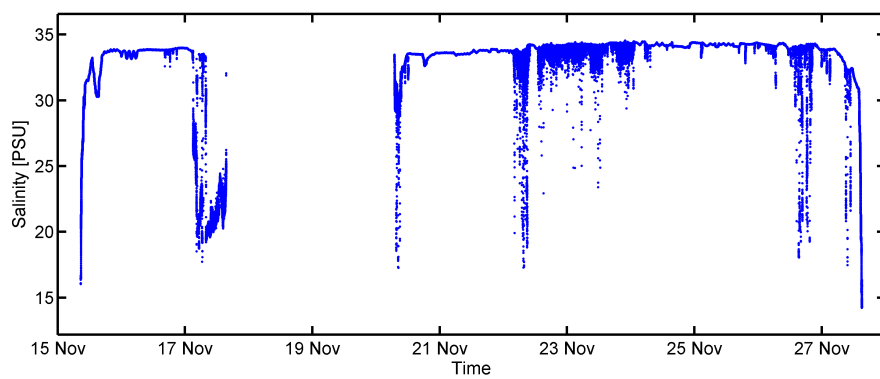


Figure 5: Salinity after flow rate filter.

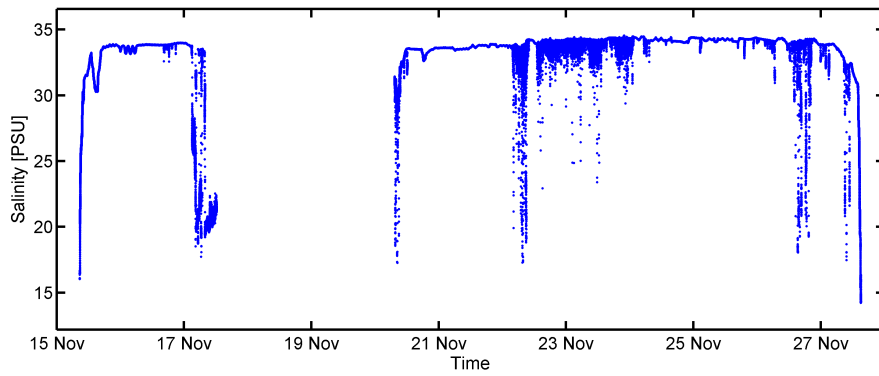


Figure 6: Salinity after geofilter.

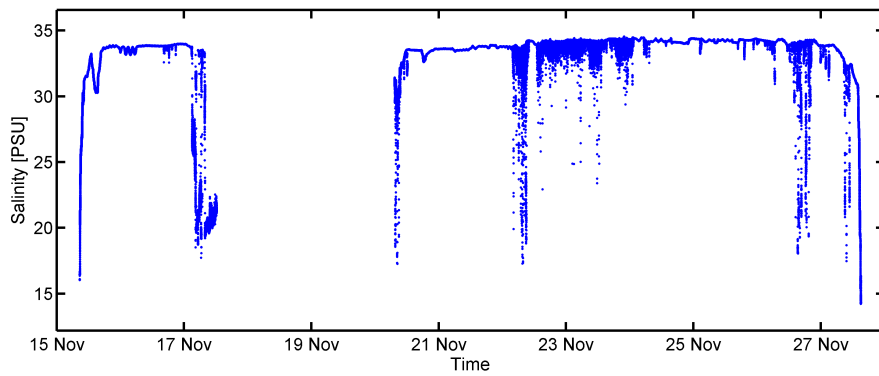


Figure 7: Salinity after speed filter.

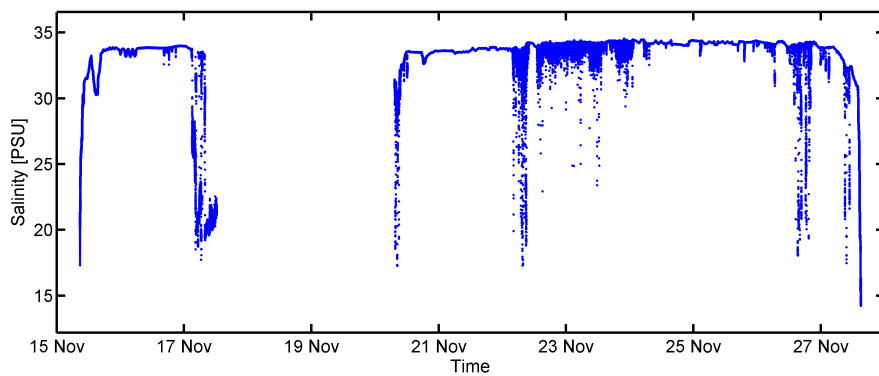


Figure 8: Salinity after temperature filter.

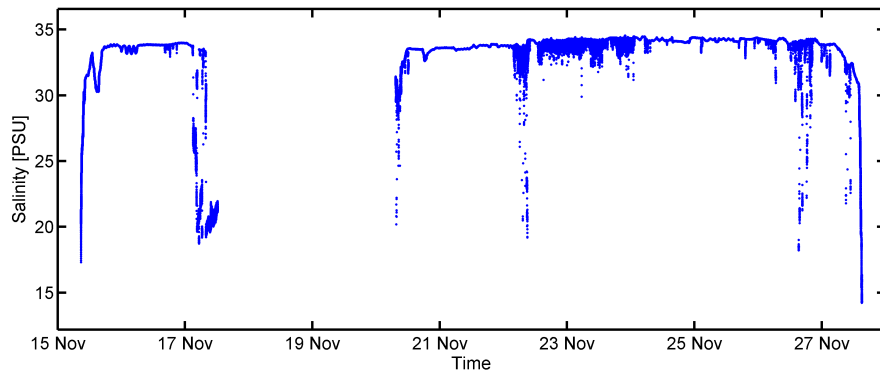


Figure 9: Salinity after despiking.

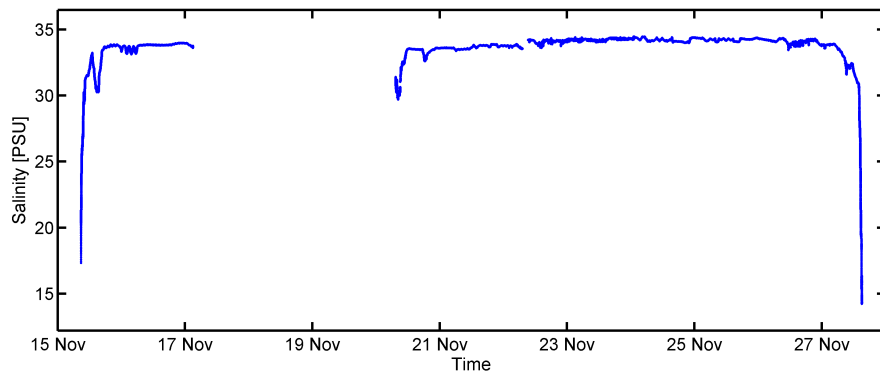


Figure 10: Salinity after manual filter.

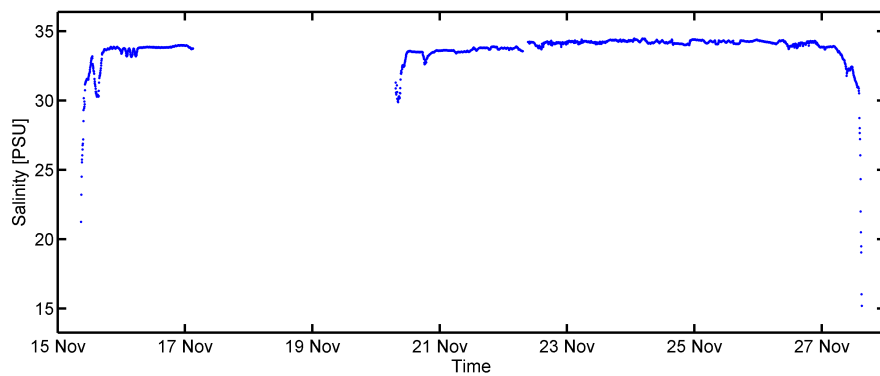


Figure 11: Salinity in 5-min-mean values.



## Result file

Text File (HE501\_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 (HE501\_TSG.pdf):

This PDF document.