

Surface T/S Data RV "Heincke"

HE453

Data Processing Report

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1 Introduction

This report describes the processing of raw data acquired by the thermosalinograph on board RV "Heincke" during expedition HE453 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 HE453
 Cruise start 26.10.2015 Bremerhaven
 Cruise end 02.11.2015 Bremerhaven
 Cruise duration 7 days

4 Sensor

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

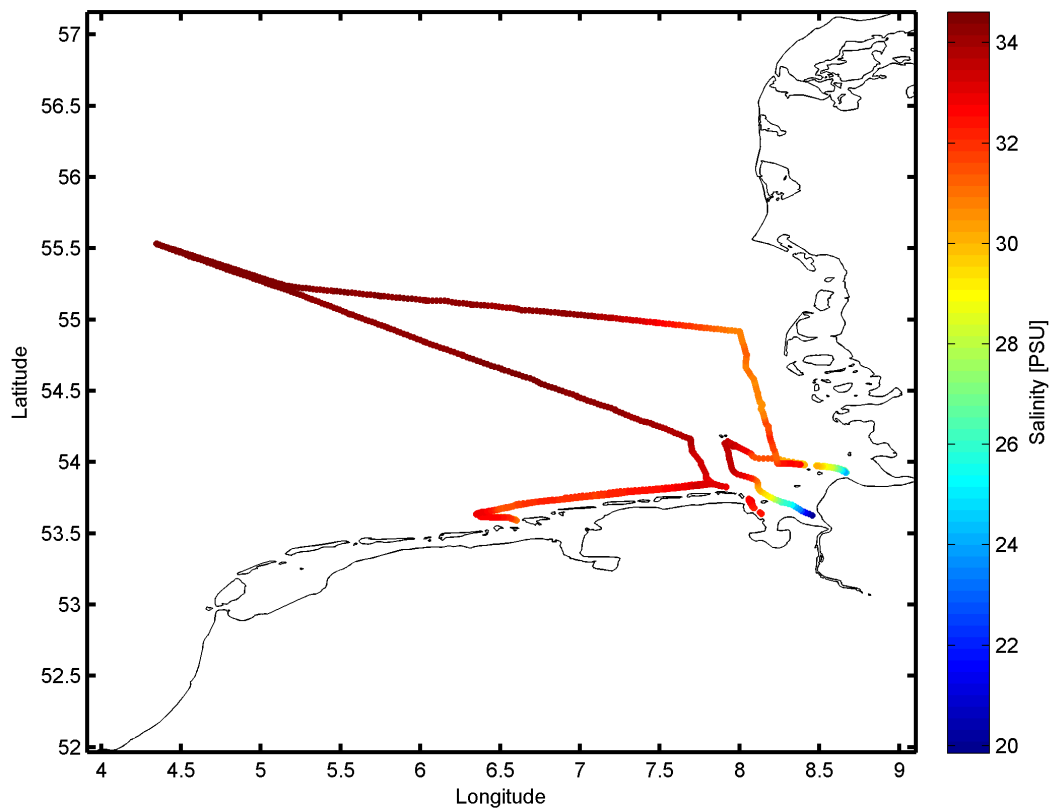


Figure 2: Cruisemap of HE453.

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Database Extraction

| | |
|-----------------|-------------------------------|
| Data source | DSHIP database (dship.awi.de) |
| Exported values | 691201 |
| First dataset | 2015-10-26T00:00:00 UTC |
| Last dataset | 2015-11-03T00:00:00 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 | 691201 | 100 % | — | — |
| Basic | 619956 | 89.69 % | 71245 | 10.31 % |
| Geo | 318522 | 46.08 % | 372679 | 53.92 % |
| Speed | 300379 | 43.46 % | 390822 | 56.54 % |
| Temperature | 300379 | 43.46 % | 390822 | 56.54 % |
| Despike | 300379 | 43.46 % | 390822 | 56.54 % |
| Manual | 298476 | 43.18 % | 392725 | 56.82 % |
| 5-min-Mean | 1073 | 0.16 % | 690128 | 99.84 % |

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 | 1.0966e-003 [PSU] |
| Maximal offset | 1.1316e-003 [PSU] |

Comments

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Process evolution

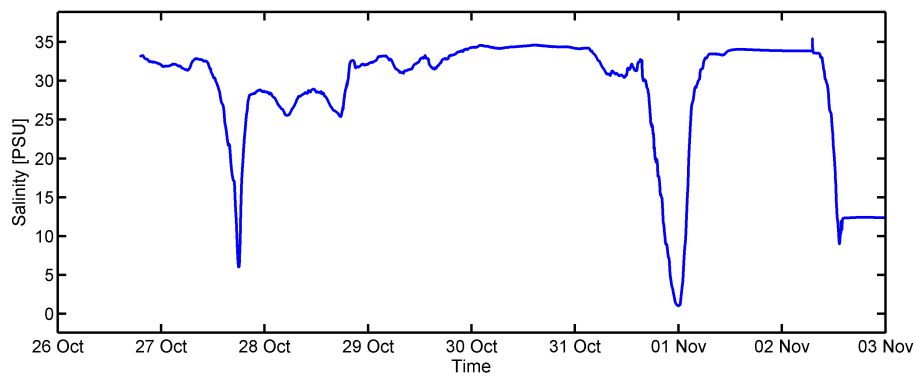


Figure 3: Raw salinity data.

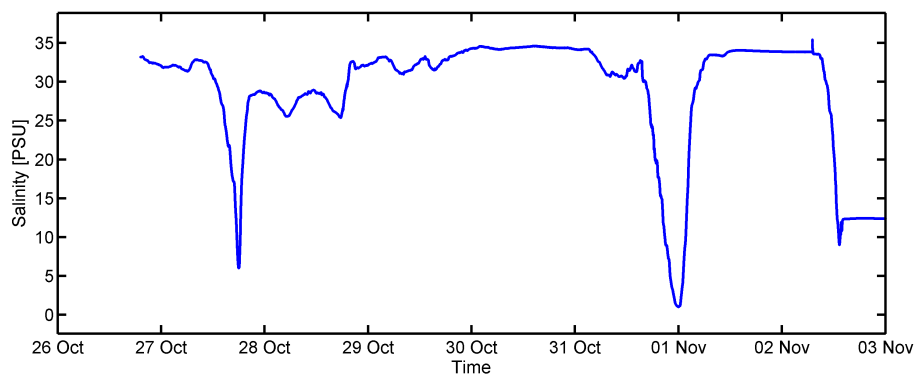


Figure 4: Salinity after basic filter.

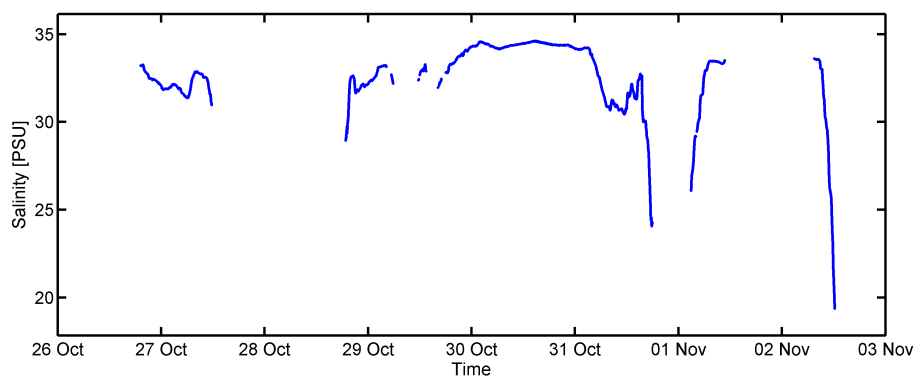


Figure 5: Salinity after geofilter.

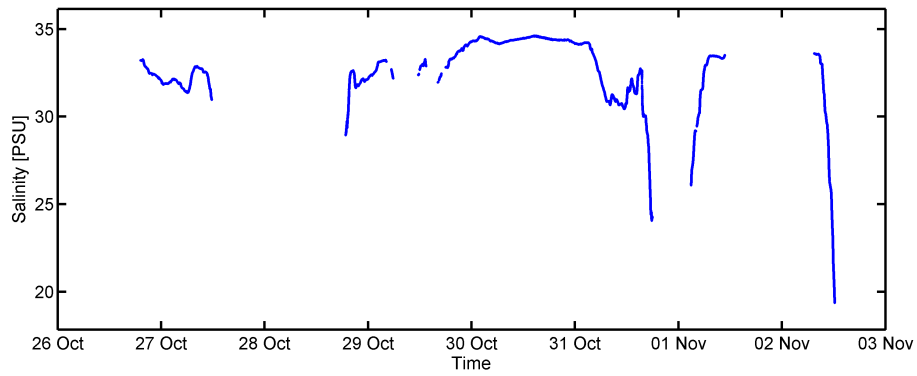


Figure 6: Salinity after speed filter.

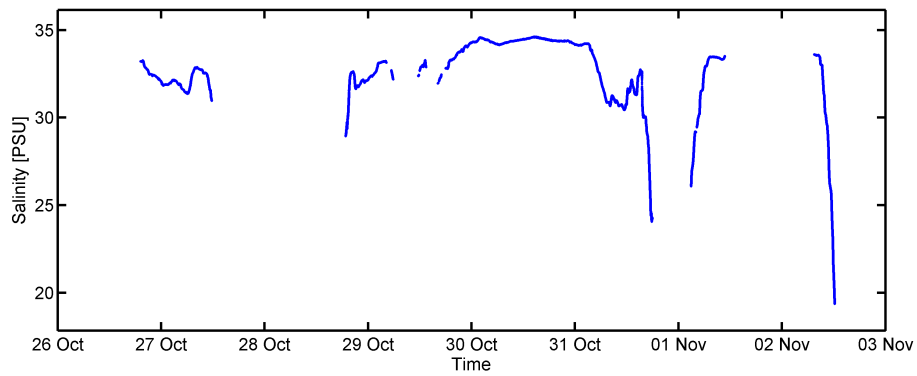


Figure 7: Salinity after temperature filter.

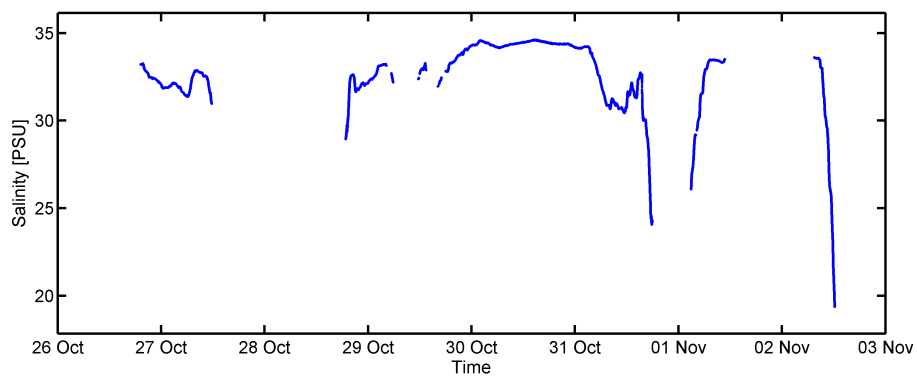


Figure 8: Salinity after despiking.

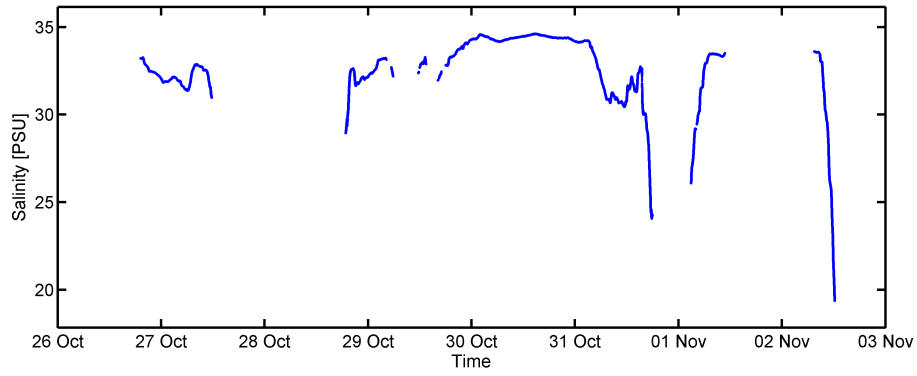


Figure 9: Salinity after manual filter.

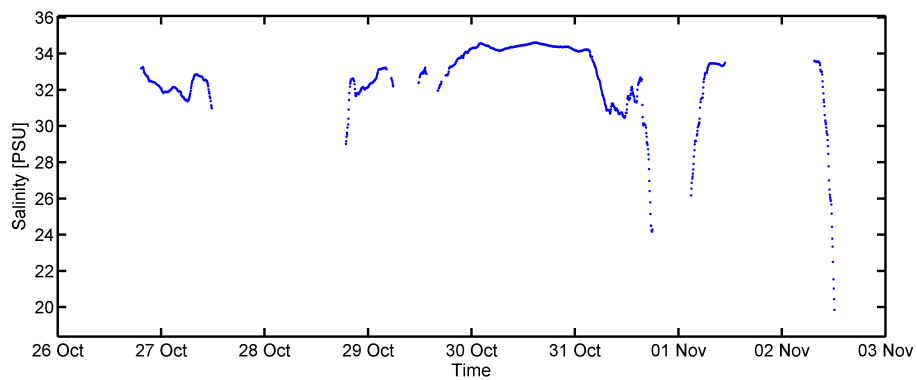


Figure 10: Salinity in 5-min-mean values.

Result file

Text File (HE453_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 (HE453_TSG.pdf):

This PDF document.