Surface T/S Data RV "Heincke"

HE459
Data Processing Report

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Contact:
Gerd Rohardt
Alfred-Wegener-Institute
Am Handelshafen 12, D-27570 Bremerhaven, GERMANY
Mail: info@awi.de

Processing Agency:
FIELAX
Schleusenstr. 14, D-27568 Bremerhaven, GERMANY
Mail: info@fielax.de

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1 Introduction

This report describes the processing of raw data acquired by the thermosalinograph on board RV "Heincke" during expedition HE459 to receive cleaned up and drift corrected salinity data.

2 Workflow

The different steps of processing are visualized in Figure 1. 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. 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 unproper 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       HE459
Cruise start      28.03.2016 Bremerhaven
Cruise end        04.04.2016 Bremerhaven
Cruise duration   8 days

4 Sensor

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

Database Extraction

<table>
<thead>
<tr>
<th>Data source</th>
<th>DSHIP database (dship.awi.de)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exported values</td>
<td>691201</td>
</tr>
<tr>
<td>First dataset</td>
<td>2016-03-28T00:00:00 UTC</td>
</tr>
<tr>
<td>Last dataset</td>
<td>2016-04-05T00:00:00 UTC</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Filter</th>
<th>Data left (abs.)</th>
<th>Data left (rel.)</th>
<th>Data removed (abs.)</th>
<th>Data removed (rel.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data</td>
<td>691201</td>
<td>100 %</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Basic</td>
<td>688950</td>
<td>99.67 %</td>
<td>2251</td>
<td>0.33 %</td>
</tr>
<tr>
<td>Geo</td>
<td>579545</td>
<td>83.85 %</td>
<td>111656</td>
<td>16.15 %</td>
</tr>
<tr>
<td>Speed</td>
<td>553720</td>
<td>80.11 %</td>
<td>137481</td>
<td>19.89 %</td>
</tr>
<tr>
<td>Temperature</td>
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<td>0.00 %</td>
<td>691201</td>
<td>100.00 %</td>
</tr>
<tr>
<td>Despike</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Manual</td>
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<td>—</td>
</tr>
<tr>
<td>5-min-Mean</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Sensor drift

| Last calibration | 27.03.2014       |
| Current calibration | 31.05.2016   |
| Start of deployment | 18.02.2015  |
| End of deployment | 10.05.2016     |
| Scaled drift      | -1.3308e-004 [PSU/month] |
| Minimal offset    | 1.7676e-003 [PSU]      |
| Maximal offset    | 1.8026e-003 [PSU]      |

Comments

Unrealistic salinity values: Difference between internal and external temperature values between approx. 5 K and 10 K.
Process evolution

Figure 2: Raw salinity data.

Figure 3: Salinity after basic filter.

Figure 4: Salinity after geofilter.
Figure 5: Salinity after speed filter.

**Result file**

Processing Report (HE459_TSG.pdf):
This PDF document.