

# Surface T/S Data RV "Heincke"

## HE311

### Data Processing Report

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Ref.: HE311_TSG.pdf	Vers.: 1	Date: 2016/04/11	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 HE311 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      HE311  
 Cruise start      06.09.2009 Bremerhaven  
 Cruise end        09.09.2009 Cuxhaven  
 Cruise duration   3 days

### 4 Sensor

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

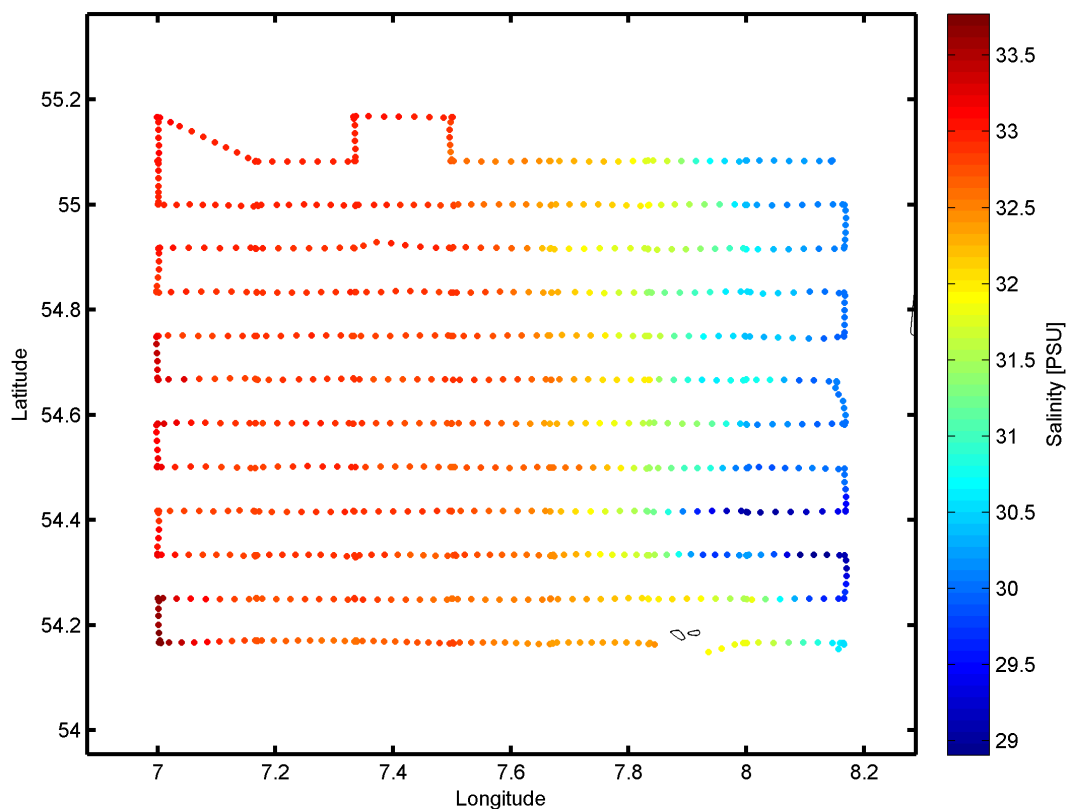


Figure 2: Cruisemap of HE311.

## 5 Processing Report

### Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	432001
First dataset	2009-09-06T00:00:03 UTC
Last dataset	2009-09-11T00:00:00 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	432001	100 %	—	—
Basic	337578	78.14 %	94423	21.86 %
Geo	299545	69.34 %	132456	30.66 %
Speed	284098	65.76 %	147903	34.24 %
Temperature	282302	65.35 %	149699	34.65 %
Despike	274586	63.56 %	157415	36.44 %
Manual	242533	56.14 %	189468	43.86 %
5-min-Mean	908	0.21 %	431093	99.79 %

### Sensordrift

Last calibration	07.01.2009
Current calibration	19.05.2011
Start of deployment	09.03.2009
End of deployment	03.05.2011
Scaled drift	-5.4904e-004 [PSU/month]
Minimal offset	3.2802e-003 [PSU]
Maximal offset	3.3448e-003 [PSU]

## Process evolution

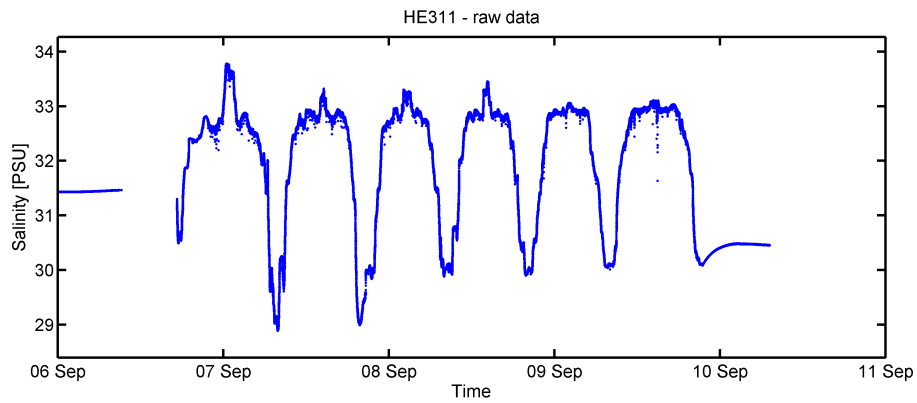


Figure 3: Raw salinity data.

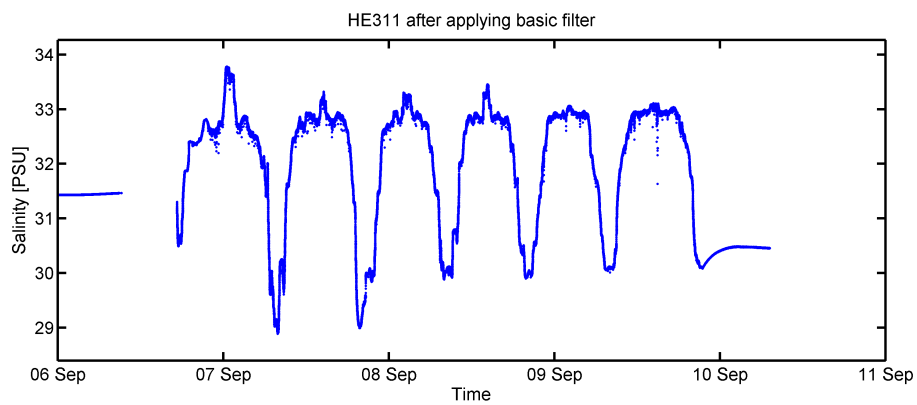


Figure 4: Salinity after basic filter.

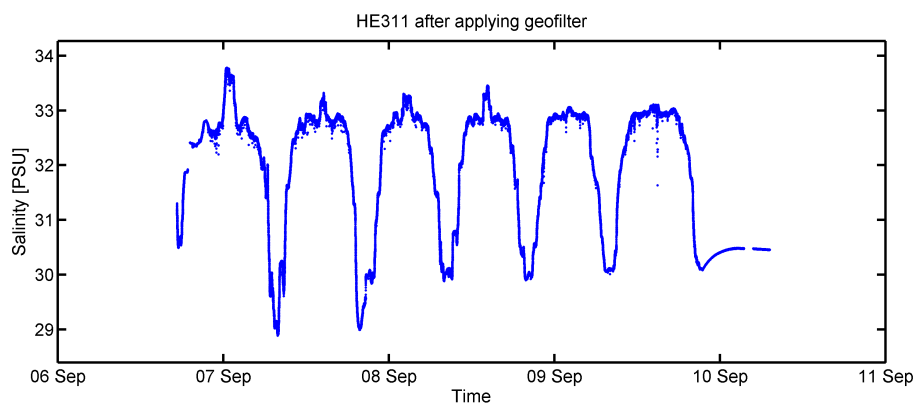


Figure 5: Salinity after geofilter.

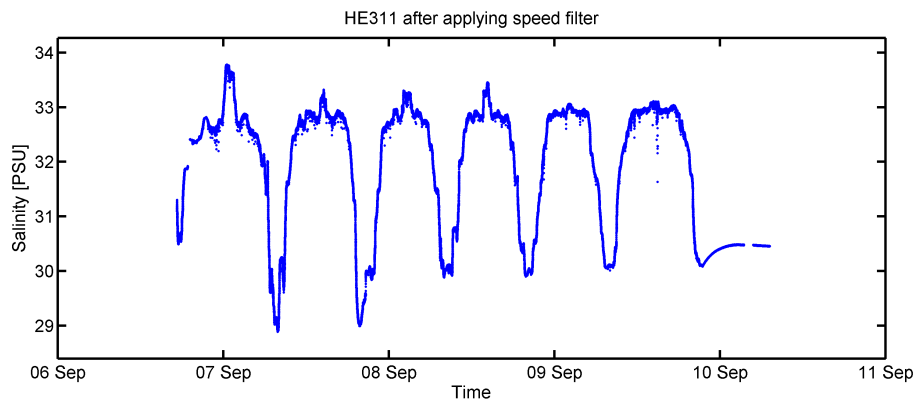


Figure 6: Salinity after speed filter.

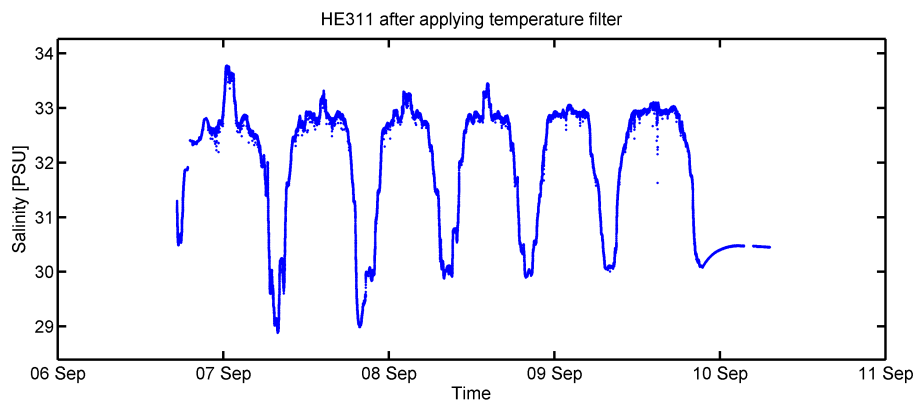


Figure 7: Salinity after temperature filter.

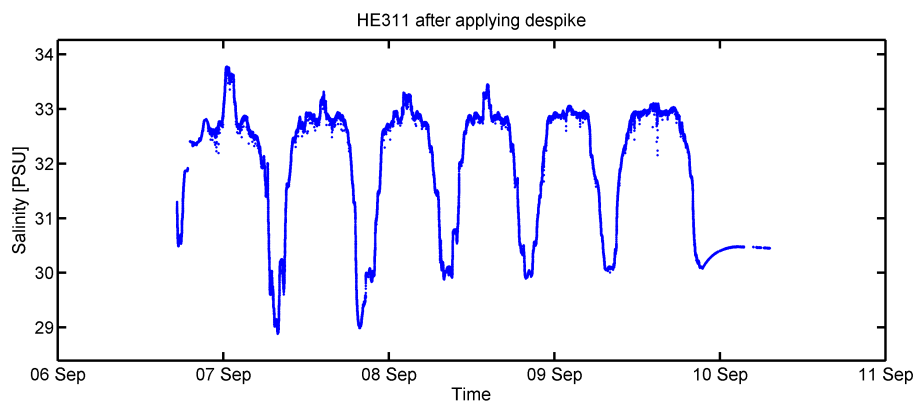


Figure 8: Salinity after despiking.

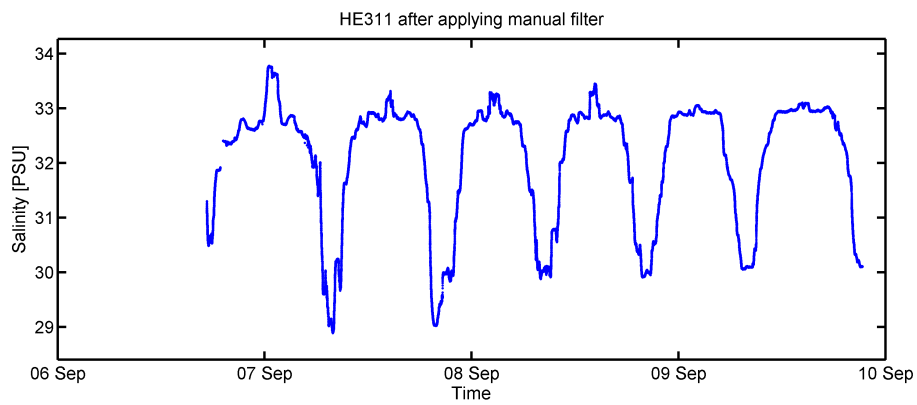


Figure 9: Salinity after manual filter.

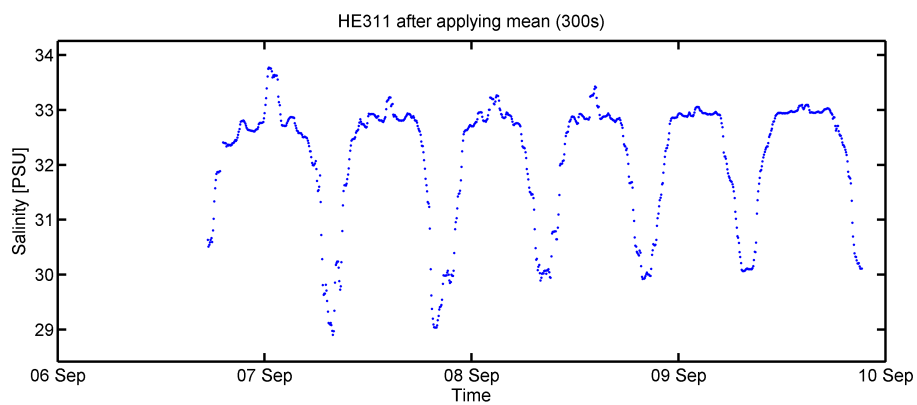


Figure 10: Salinity in 5-min-mean values.

## Result file

Text File (HE311\_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 (HE311\_TSG.pdf):

This PDF document.