

Surface T/S Data RV "Heincke"

HE456

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 HE456 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 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.

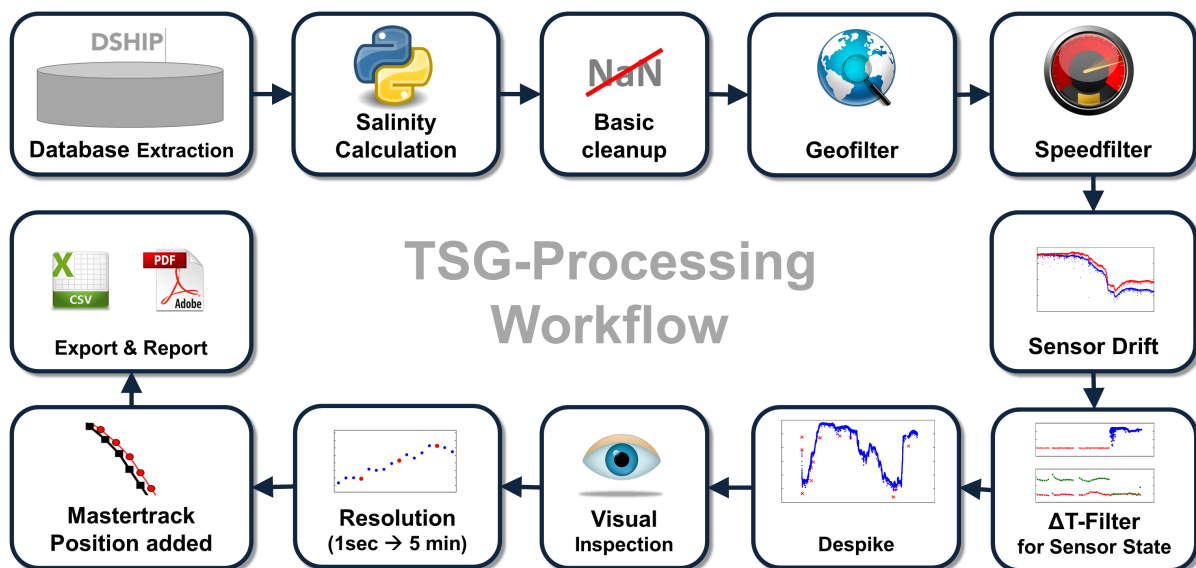


Figure 1: Workflow of TSG data processing

3 Cruise details

Vessel name RV "Heincke"
 Cruise name HE456
 Cruise start 08.02.2016 Bremerhaven
 Cruise end 22.02.2016 Bremerhaven
 Cruise duration 15 days

4 Sensor

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

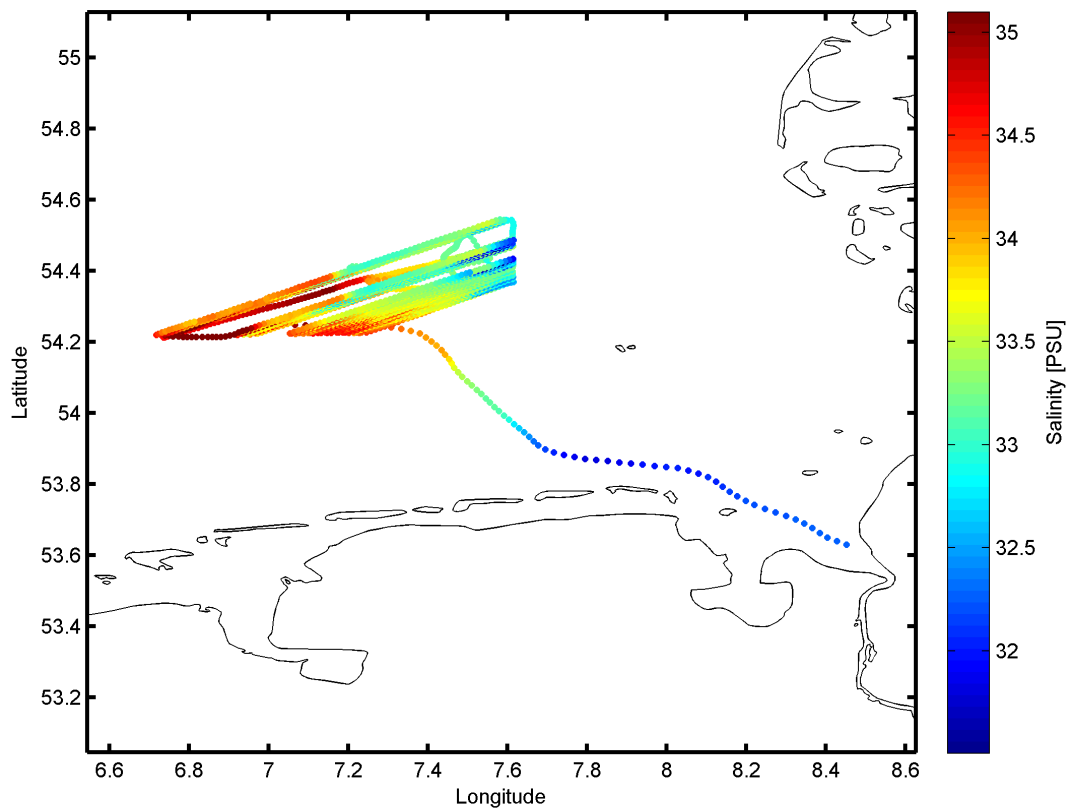


Figure 2: Cruisemap of HE456.

5 Processing Report

Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	1296001
First dataset	2016-02-08T00:00:00 UTC
Last dataset	2016-02-23T00:00:00 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	1296001	100 %	—	—
Basic	1293029	99.77 %	2972	0.23 %
Geo	1078714	83.23 %	217287	16.77 %
Speed	1071691	82.69 %	224310	17.31 %
Temperature	857601	66.17 %	438400	33.83 %
Despike	857539	66.17 %	438462	33.83 %
Manual	812906	62.72 %	483095	37.28 %
5-min-Mean	2742	0.21 %	1293259	99.79 %

Sensordrift

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	1.5532e-003 [PSU]
Maximal offset	1.6188e-003 [PSU]

Comments

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Process evolution

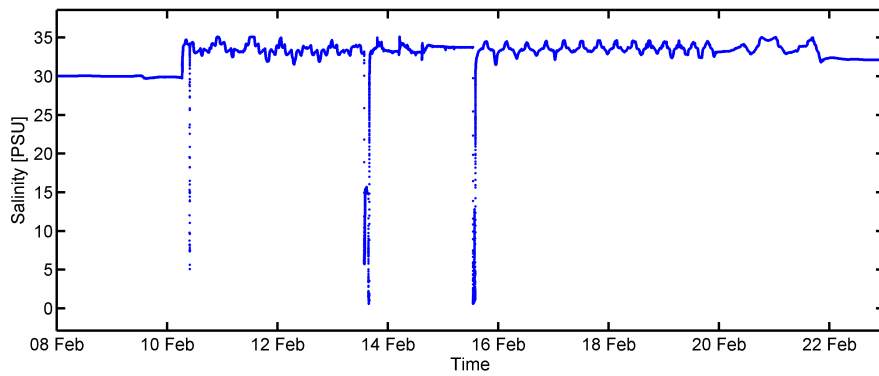


Figure 3: Raw salinity data.

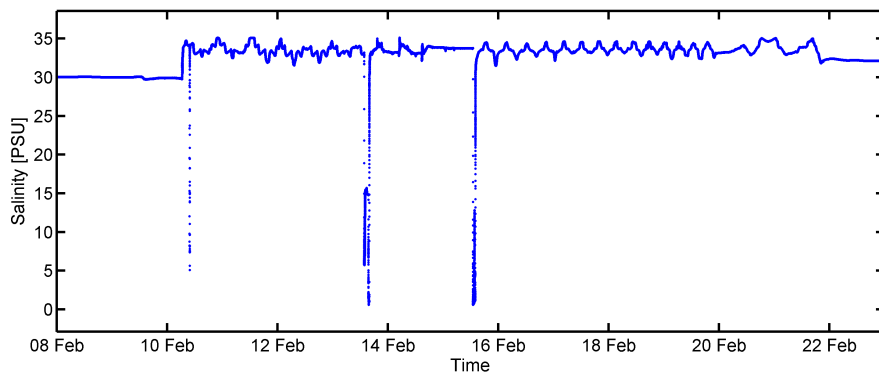


Figure 4: Salinity after basic filter.

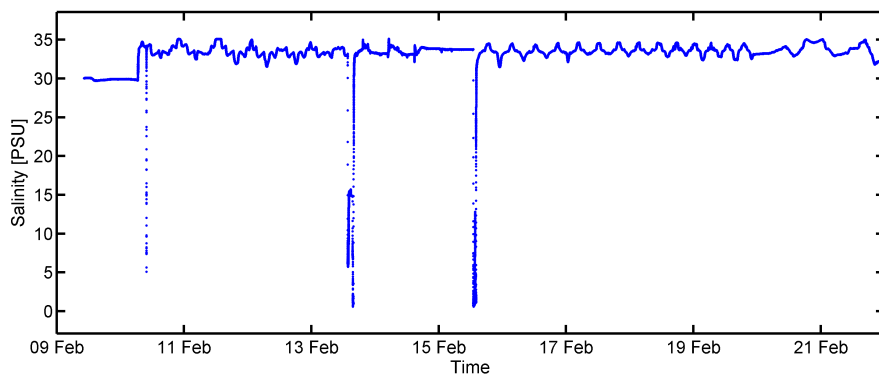


Figure 5: Salinity after geofilter.

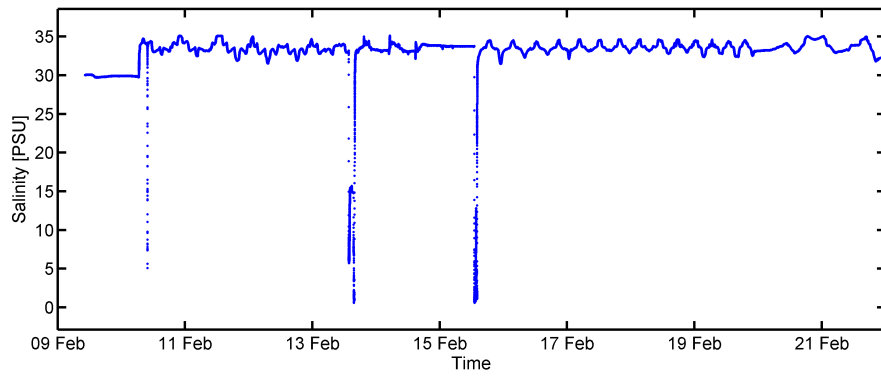


Figure 6: Salinity after speed filter.

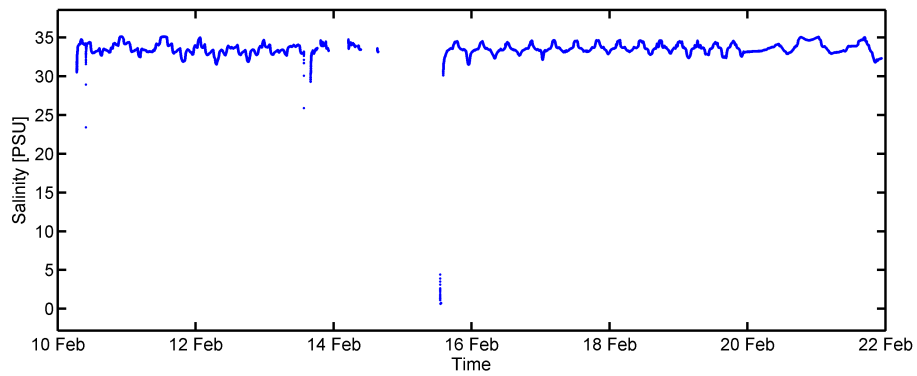


Figure 7: Salinity after temperature filter.

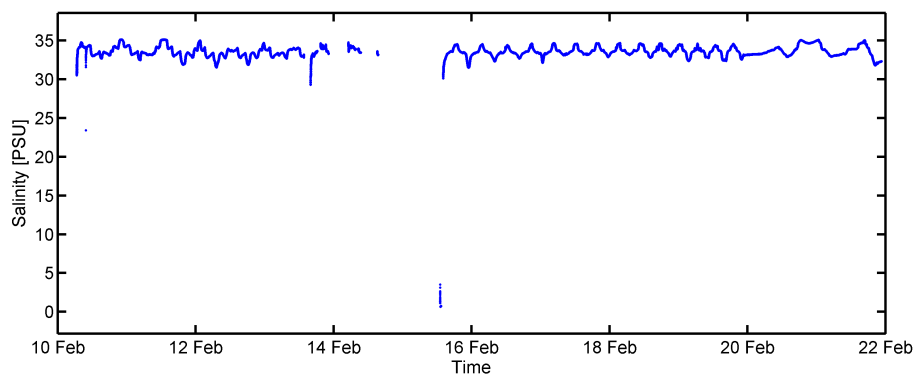


Figure 8: Salinity after despiking.

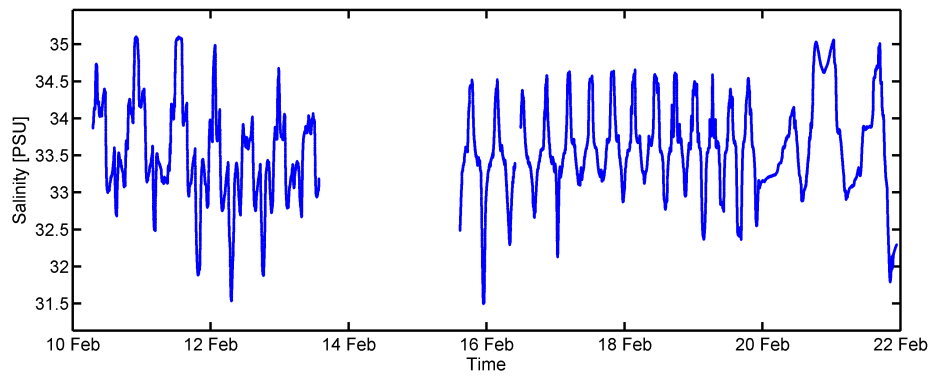


Figure 9: Salinity after manual filter.

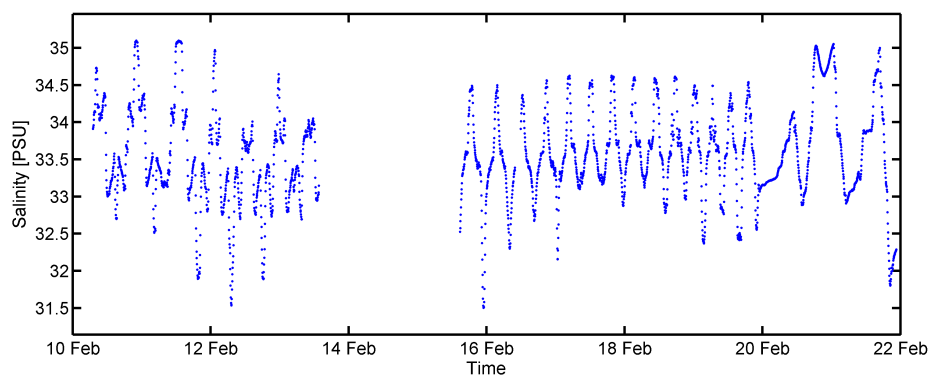


Figure 10: Salinity in 5-min-mean values.

Result file

Text File (HE456_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 (HE456_TSG.pdf):

This PDF document.