Surface T/S Data RV "Heincke"
HE530
Data Processing Report

Contents

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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 HE530 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 unproper 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.
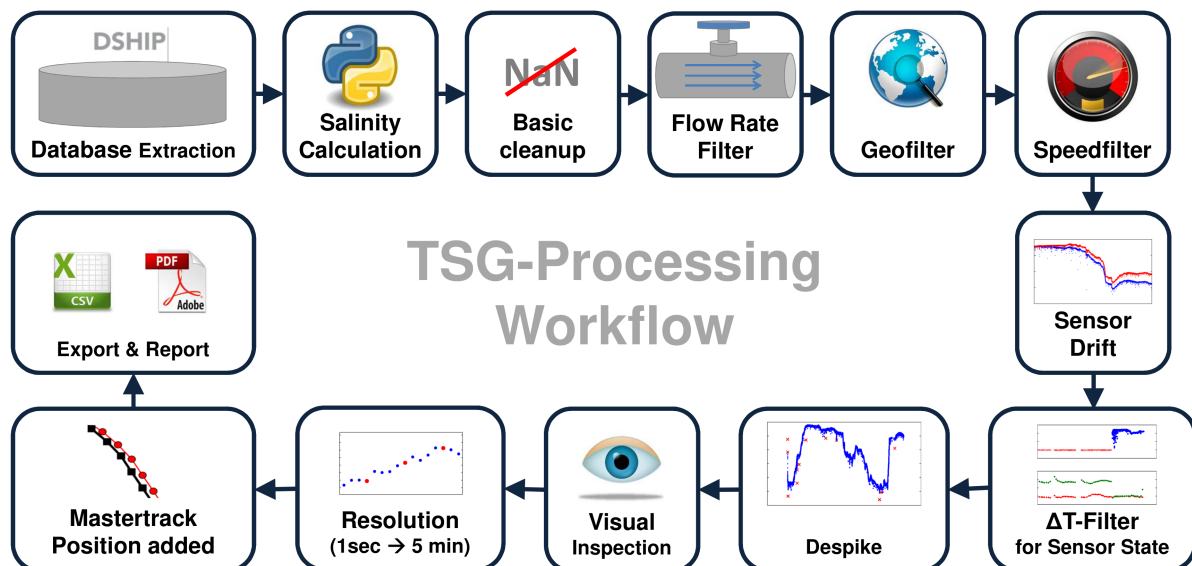

Figure 1: Workflow of TSG data processing

3 Cruise details

Vessel name	RV "Heincke"
Cruise name	HE530
Cruise start	15.04.2019 Bremerhaven
Cruise end	22.04.2019 Bremerhaven
Cruise duration	8 days

4 Sensor

Thermosalinograph:	Seabird SEACAT SBE21 (SN: 3334)
External Temperature:	SBE38
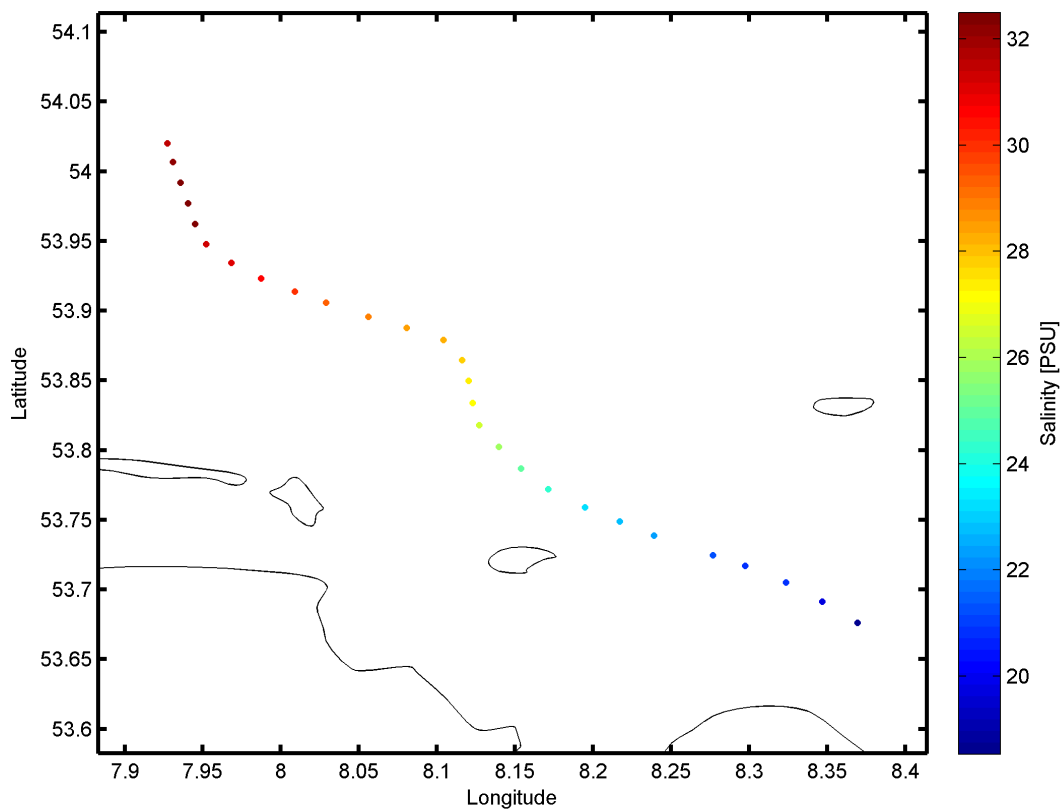
Figure 2: Cruisemap of HE530.

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Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	486580
First dataset	2019-04-14T06:50:21 UTC
Last dataset	2019-04-19T22:00:00 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	486580	100 %	—	—
Basic	2574	0.53 %	484006	99.47 %
Flow rate	2187	0.45 %	484393	99.55 %
Geo	2187	0.45 %	484393	99.55 %
Speed	2187	0.45 %	484393	99.55 %
Temperature	2171	0.45 %	484409	99.55 %
Despike	2171	0.45 %	484409	99.55 %
Manual	2171	0.45 %	484409	99.55 %
5-min-Mean	28	0.01 %	486552	99.99 %

Sensordrift

Last calibration	06.03.2018
Current calibration	16.05.2019
Start of deployment	14.11.2018
End of deployment	24.04.2019
Scaled drift	-1.8335e-004 [PSU/month]
Minimal offset	9.1196e-004 [PSU]
Maximal offset	9.4590e-004 [PSU]

Comments

The thermosalinograph broke during cruise HE530 and could only be replaced after the cruise.
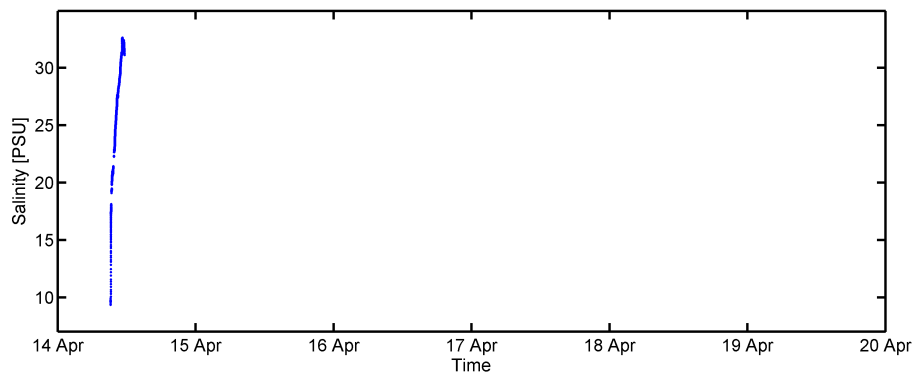
Process evolution
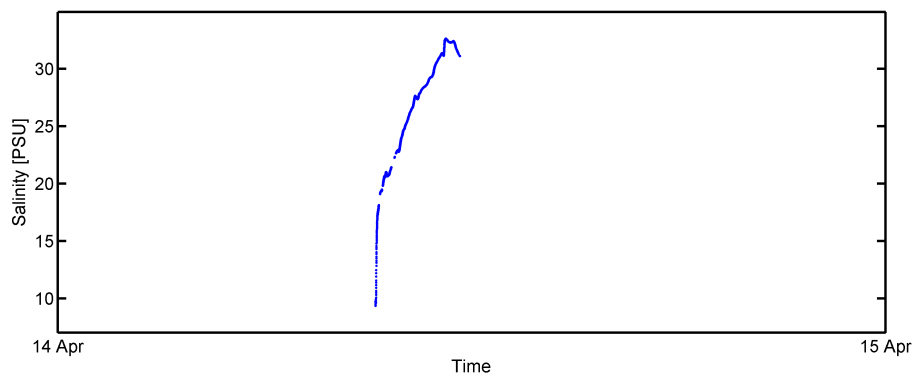

Figure 3: Raw salinity data.
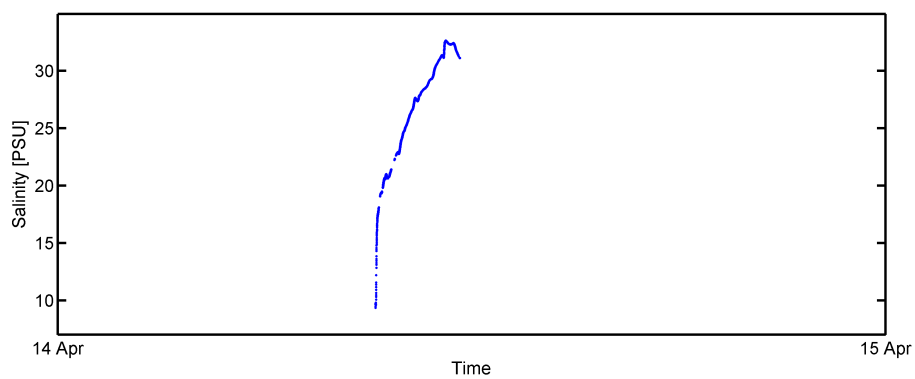

Figure 4: Salinity after basic filter.

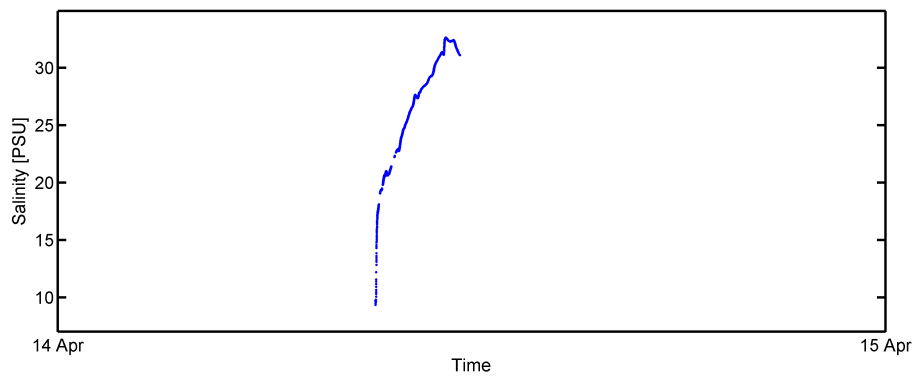Figure 5: Salinity after flow rate filter.
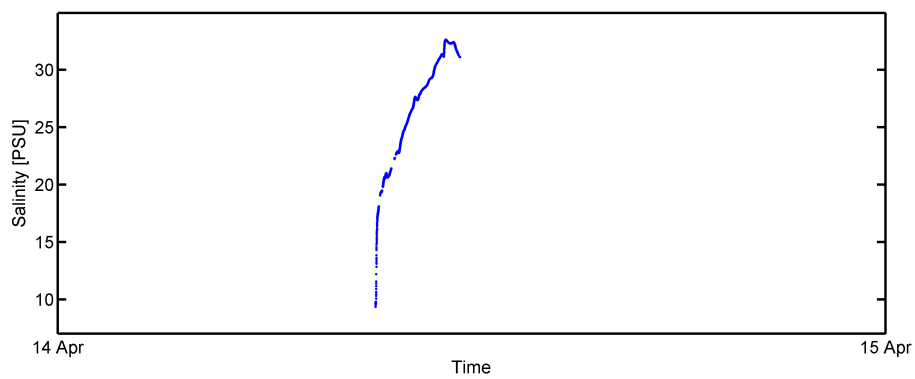
Figure 6: Salinity after geofilter.

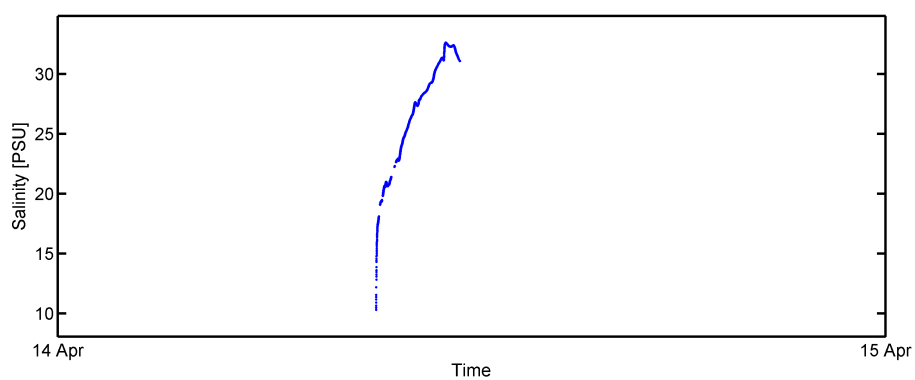Figure 7: Salinity after speed filter.

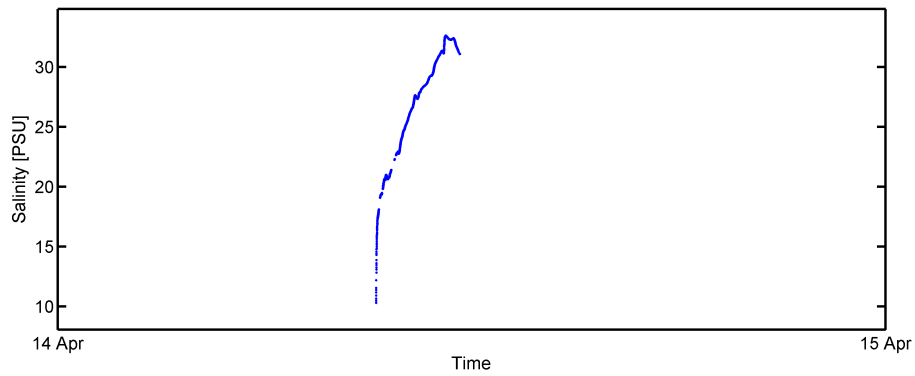Figure 8: Salinity after temperature filter.
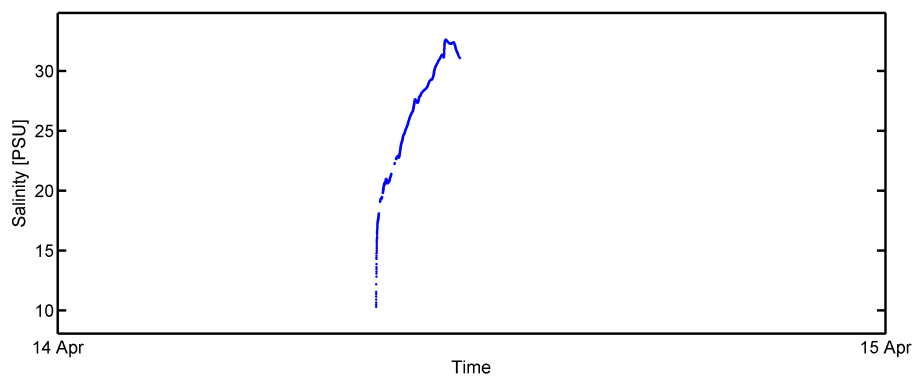
Figure 9: Salinity after despike.

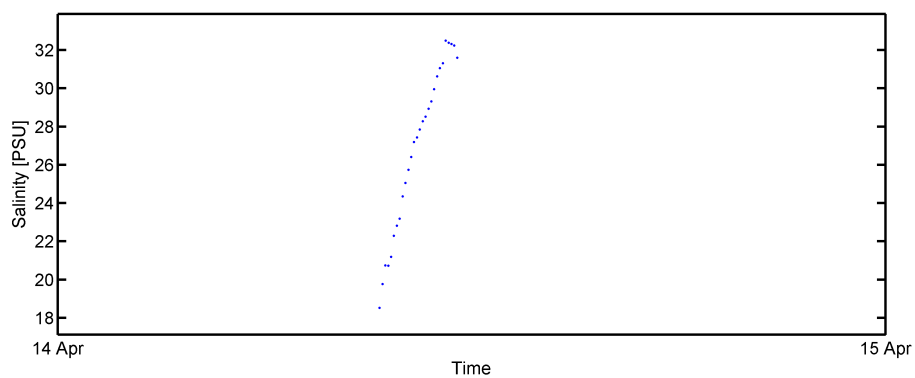Figure 10: Salinity after manual filter.

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

Result file

Text File (HE530_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 (HE530_TSG.pdf):
This PDF document.