Master Track RV Polarstern ANT-V/4

Data Processing Report

Contents

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1 Introduction

This report describes the processing of raw data acquired by position sensors on board RV Polarstern during expedition ANT-V/4 to receive a validated master track which is used as reference of further expedition data.

2 Workflow

The different steps of processing and validation are visualized in figure 1. Unvalidated data of up to three sensors are extracted from the DAVIS SHIP data base (https://dship.awi.de) in a 1-second interval or 5-second interval for cruises earlier than ARK-IX/2. They are converted to ESRI point shapefiles and imported to ArcGIS. A visual screening is performed to evaluate data quality and remove outliers manually. For all resulting position tracks, a quality check is performed using a ship's speed filter, an acceleration filter and a course-change filter. Filtered positions are flagged. In addition, a manual check is performed to flag obvious outliers. Those position tracks are combined to a single master track depending on a sensor priority list (by accuracy, reliability) and availability / applied exclusion of automatically or manually flagged of data. Missing data up to a time span of 60 seconds are linearly interpolated to achieve a master track with 1-second resolution. To reduce the amount of points for overview maps the master track is generalized by using the Ramer-Douglas-Peucker algorithm. This algorithm returns only the most significant points from the track. Full master track and generalized master track are written to text files and imported to PANGAEA (http://www.pangaea.de) for publication.

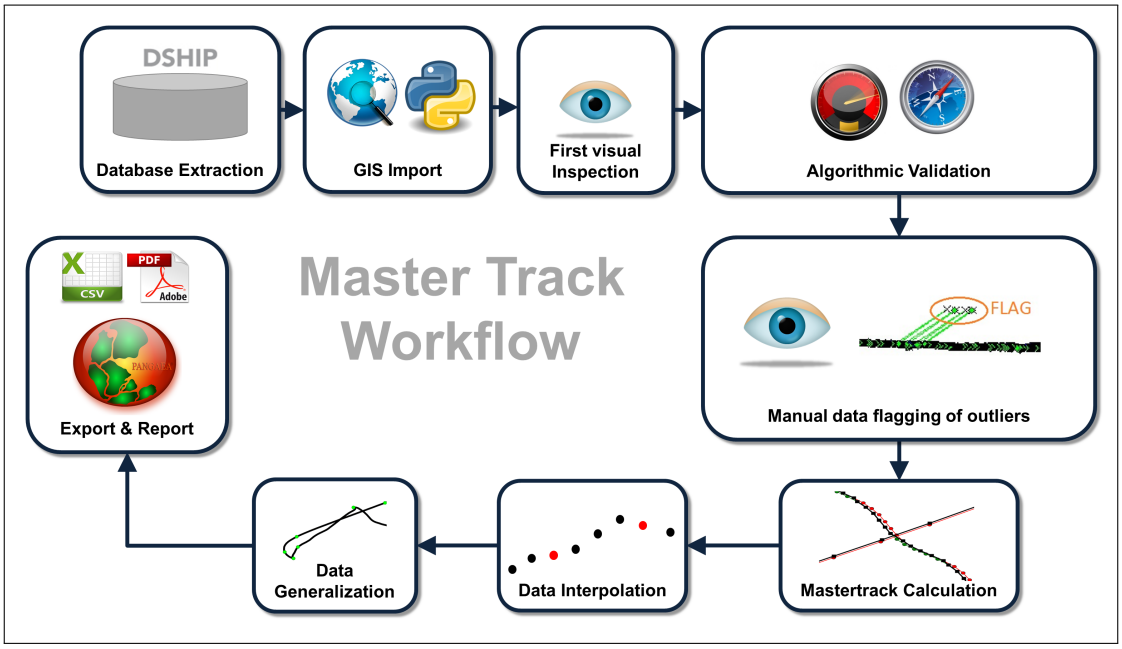

Figure 1: Workflow of master track data processing

3 Cruise details

Vessel name	RV Polarstern
Cruise name	ANT-V/4
Cruise start	26.12.1986 Cape Town
Cruise end	17.03.1987 Puerto Madryn
Cruise duration	82 days

4 Sensor Layout

This chapter describes the position sensors mounted during this cruise.

Position sensors

Sensor name	**System Position Information**, short: System
Description	Position information delivered to the System

Sensor name	**Navigation Automation Control System**, short: NACOS
Description	Navigation system of the ship

Sensor name	**Ashtech Z-12**, short: Ashtech
Description	GPS-Receiver

Position data from Parasound-surveys

Additionally to the up to three position sensors mounted, there are positions available extracted from the header-information of Parasound-surveys which are already processed and checked for quality and validity. If those data exist for this cruise, these data will be used instead of the derived master track. These data are identified as follows.

Sensor name	**Corrected Parasound-Navigation**, short: Parasound-NAV
Description	Already processed Position information from Parasound navigation

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Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	1379708
First dataset	1986-12-26T13:32:18 UTC
Last dataset	1987-03-16T09:47:53 UTC

Automatic Validation

The following thresholds were applied for the automatic flagging of the position data:

Speed	Maximum 20 kn between two datapoints.
Acceleration	Maximum 1 m/s^2 between two datapoints.
Change of course	Maximum 5° between two datapoints.

Manual Validation

Obvious outliers were removed manually. For details see Processing Logbook of RV Polarstern (hdl:10013/epic.45909).

Flagging result

	System		NACOS		Ashtech	
Missing	34085	2.470%	1379708	100.000%	1379708	100.000%
Speed	4120	0.299%	0	0.000%	0	0.000%
Acceleration	726730	52.673%	0	0.000%	0	0.000%
Course	729542	52.877%	0	0.000%	0	0.000%
Manually	36158	2.621%	0	0.000%	0	0.000%

Master Track Generation

The master track is derived from the position sensors' data selected by priority.

Sensor priority used:
1. System
2. <not used>
3. <not used>

Filters applied: manual, speed.

Distribution of position sensor data in master track:

Sensor	Data points	Percentage
Total	6812132	100.000 %
Parasound-NAV	0	0.000 %
System	1305523	19.165 %
NACOS	0	0.000 %
Ashtech	0	0.000 %
Interpolated	5253185	77.115 %
Gaps	253424	3.720 %

Remarks

Data only available from 1986-12-26T13:32:18 UTC until 1987-03-16T09:47:53 UTC. From ARK-II/2 to ARK-IX/1b, the data are only available in 5-second resolution and only from System-Position.

Score

For each cruise, a score is calculated ranging from 0 (no data) to 100 (only very good data). the score for the cruise ANT-V/4 is 64.

Generalization

The master track is generalized to receive a reduced set of the most significant positions of the track using the Ramer-Douglas-Peucker algorithm and allow a maximum tolerated distance between points and generalized line of 4 arcseconds.

Results:

Number of generalized points	8961 points
Data reduction	99.8685 %

Result files

Report in XML format:

The XML contains all information of the master track generation in a machine-readable format. In addition a XSD schema file is provided.

Master track text file:

The format is a plain text (tab-delimited values) file with one data row in 1 second interval.

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	Flag for data source 0 Parasound-NAV 1 System 2 NACOS 3 Ashtech INTERP Interpolated point GAP Missing data

Text file of the generalized master track:

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

Processing Report:

This PDF document.

Cruise map

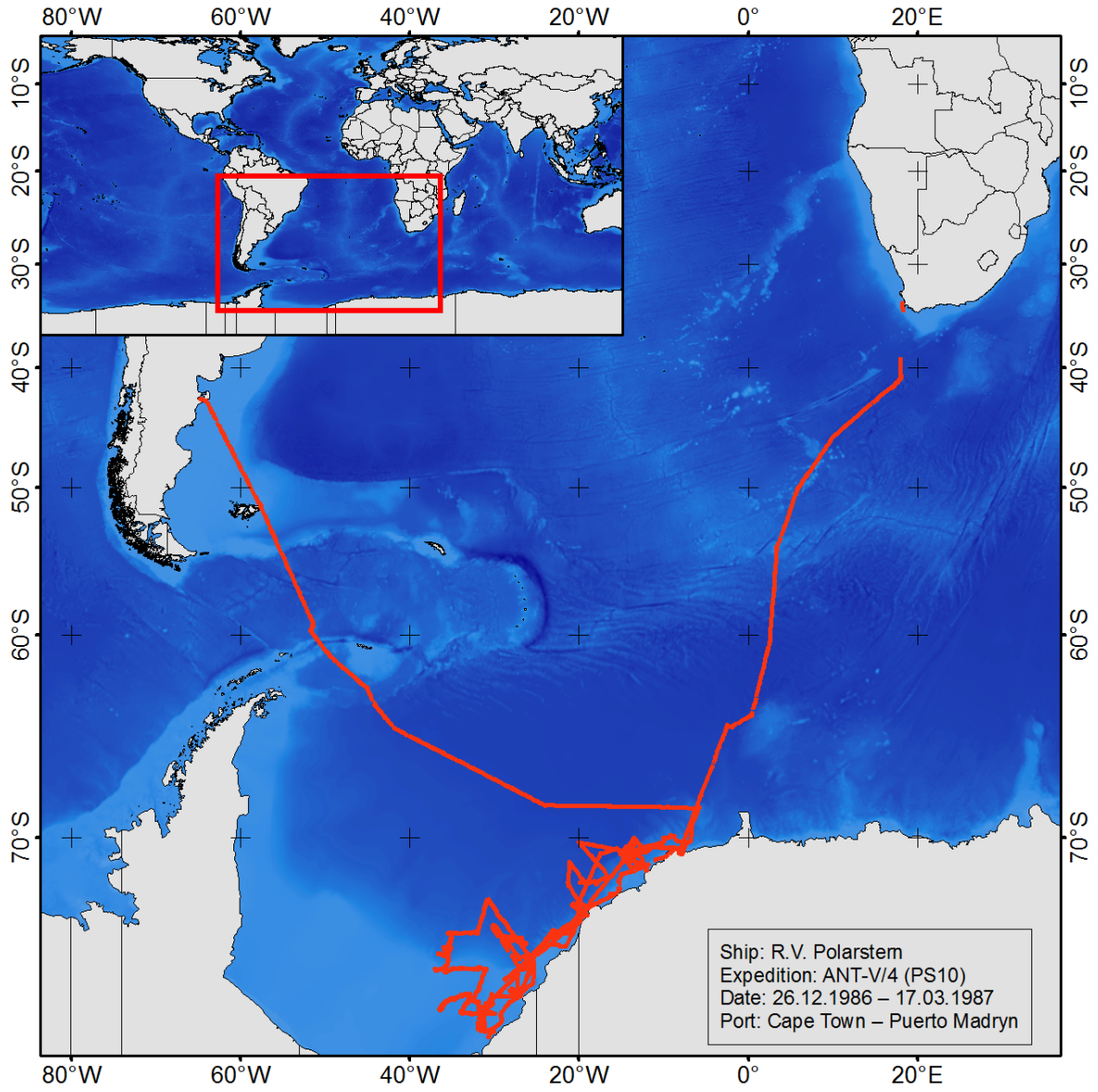

Figure 2: Map of the generalized master track