

Master Track RV Polarstern ANT-VI/3

Data Processing Report

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|------------------------|----------|------------------|---------------|
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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-VI/3 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.

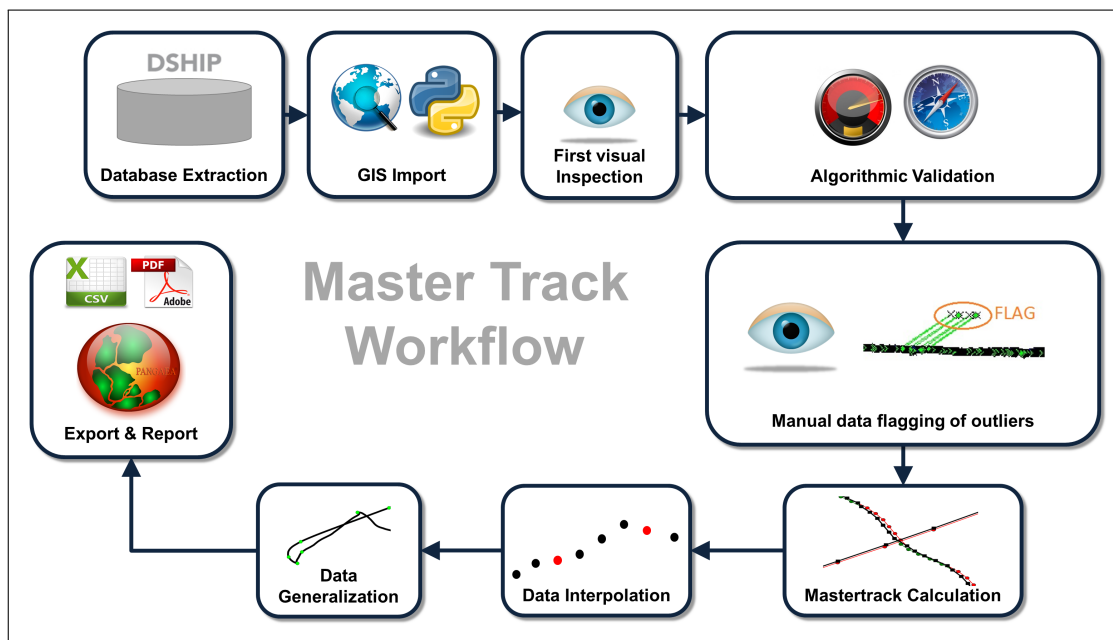


Figure 1: Workflow of master track data processing

3 Cruise details

| | |
|-----------------|----------------------|
| Vessel name | RV Polarstern |
| Cruise name | ANT-VI/3 |
| Cruise start | 21.12.1987 Ushuaia |
| Cruise end | 18.03.1988 Cape Town |
| Cruise duration | 89 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 | 1347734 |
| First dataset | 1988-01-01T00:08:38 UTC |
| Last dataset | 1988-03-18T23:59:43 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 | 164443 | 12.201% | 1347734 | 100.000% | 1347734 | 100.000% |
| Speed | 5199 | 0.386% | 0 | 0.000% | 0 | 0.000% |
| Acceleration | 623595 | 46.270% | 0 | 0.000% | 0 | 0.000% |
| Course | 658836 | 48.885% | 0 | 0.000% | 0 | 0.000% |
| Manually | 28570 | 2.120% | 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 | 6602707 | 100.000 % |
| Parasound-NAV | 0 | 0.000 % |
| System | 1149619 | 17.411 % |
| NACOS | 0 | 0.000 % |
| Ashtech | 0 | 0.000 % |
| Interpolated | 4802787 | 72.740 % |
| Gaps | 650301 | 9.849 % |

Remarks

Data only available from 1988-01-01T00:08:38 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-VI/3 is 63.

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 | 8744 points |
| Data reduction | 99.8676 % |

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

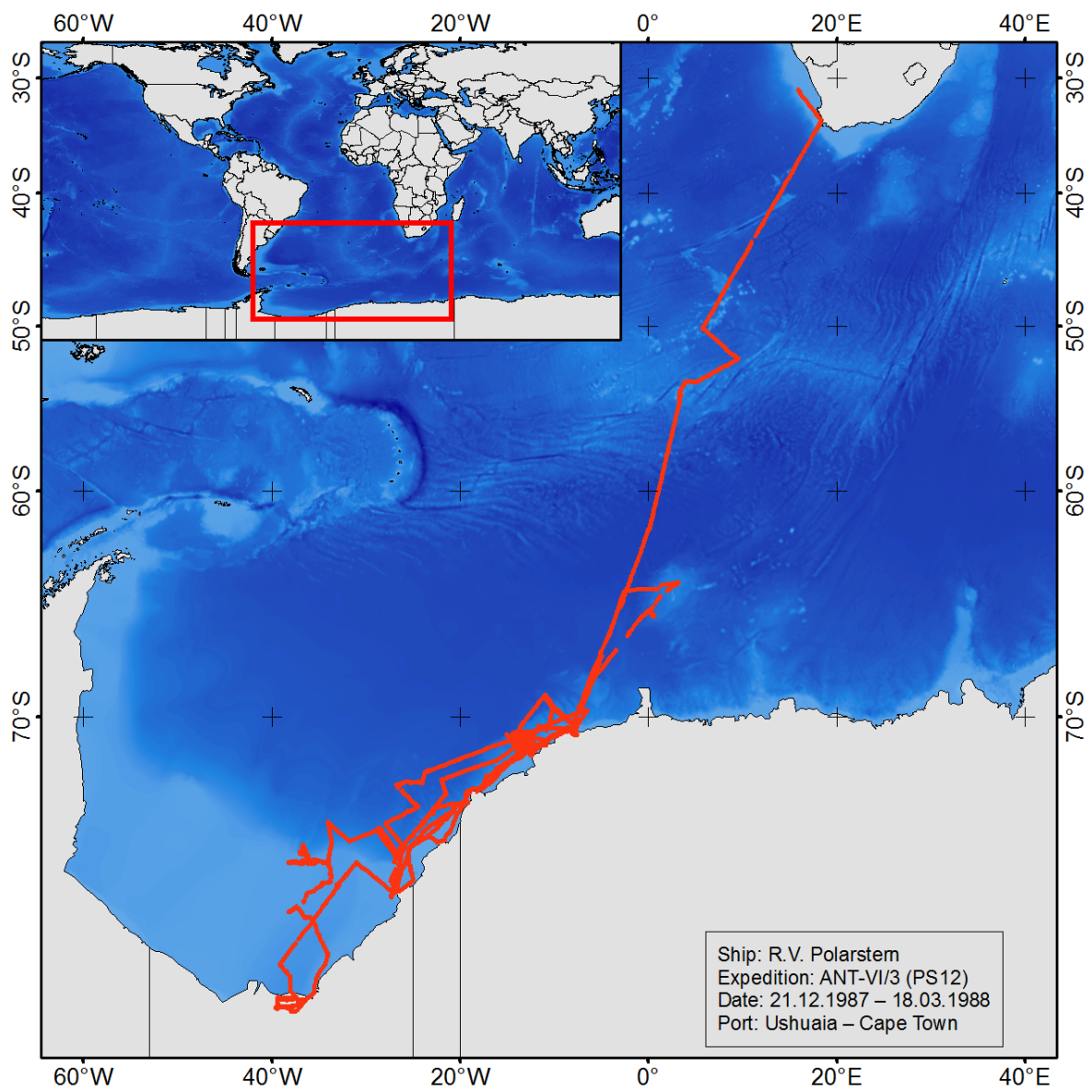


Figure 2: Map of the generalized master track