ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

FIELAX

Master Track Aeromag_1995 (1995)

Flight No. 01

Polar 2

Data Processing Report

Contents

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1 Introduction

This report describes the processing of raw position data acquired by the GPS sensor for scientific equipment on Polar 2 during Aeromag_1995 (1995) flight number 01 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. Simple text files containing date, time, latitude, longitude and altitude information from the aircraft GPS receiver were provided by AWI for processing. The time information usually included microseconds which were rounded to full seconds producing data files with one second resolution.
The raw data are then converted into an ESRI point shapefile and imported to ESRI ArcGIS. A visual screening is performed to evaluate data quality and remove outliers manually. For the position track, a quality check is performed using a speed filter, course filter and an acceleration filter. Filtered positions are flagged. All automatically or manually flagged data are excluded from the track. Gaps of missing data up to a time span of 60 seconds are linearly interpolated. 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.

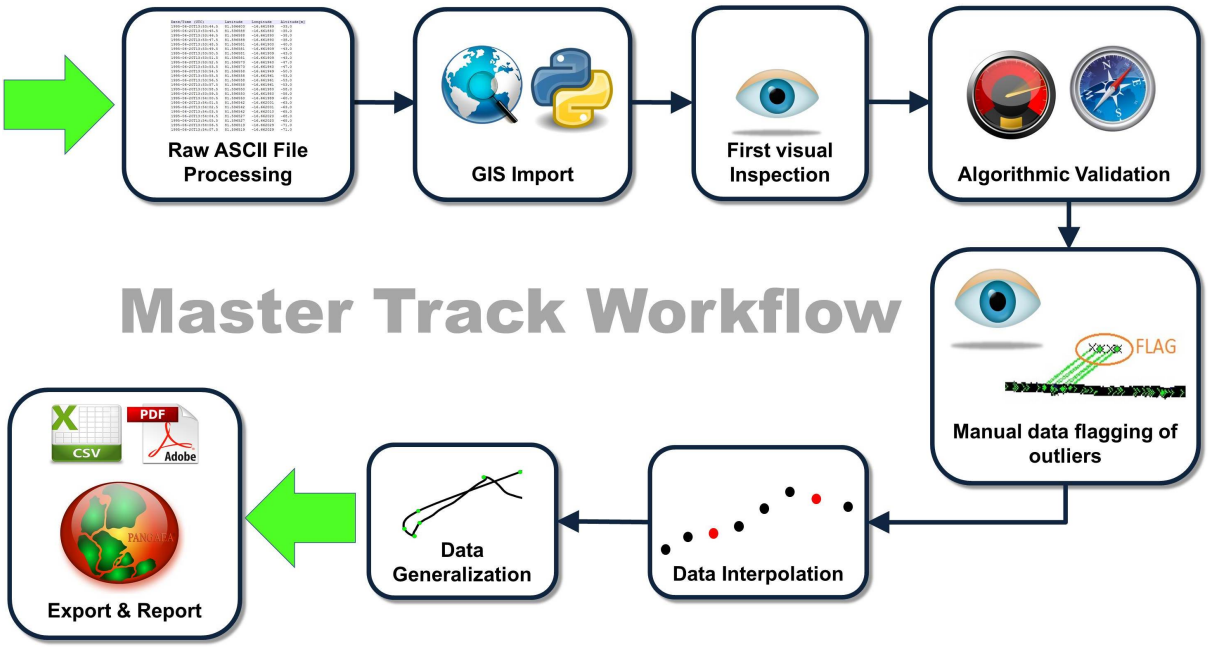

Figure 1: Workflow of master track data processing

3 Flight details

Basic information about the processed flight.

Aircraft name	Polar 2
Flight ID	Aeromag_1995_01
Flight start	1995-06-20T13:53:45 - Station Nord
Flight end	1995-06-20T15:29:01 - Greenland, Hagen Fjord
Flight duration	1 hour 35 minutes

4 Sensor Layout

This chapter describes the position sensor used for the scientific equipment during this flight.

Position sensor

Sensor name	**Trimble 4000 SSI**, short: Trimble
Description	Rear Trimble - GPS-Receiver used as reference for all scientific equipment
Information	The 4000SSi Geodetic System Surveyor is a full featured, dual frequency GPS receiver for survey and mapping applications. It provides millimetre accuracy for geodetic quality measurements. It is supplied with RTCM input for differential corrections, event marker input, 1PPS output and an NMEA navigation interface. To achieve the highest quality measurements possible, the 4000SSi uses full cycle L1/L2 carrier phase, L1/L2 P-code and L1 C/A code for robust performance. Differential accuracy is <1m RMS assuming at least 5 satellites and PDOP<4.
Installation point	Rear GPS antenna on cabin roof

5 Processing Report

Database Extraction

Data source	ASCII file (delivered by AWI)
Exported values	5717
First dataset	1995-06-20T13:53:45
Last dataset	1995-06-20T15:29:01

Automatic Validation

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

Speed	Maximum 300 kn (154 m/s) between two datapoints.
Acceleration	Maximum 20 m/s^2 between two datapoints.
Change of course	Maximum 50° between two datapoints.

Manual Validation

Obvious outliers were removed manually. For details see Processing Logbook (hdl:10013/epic.46890).

Flagging result

	Trimble	
Missing	0	0.00 %
Speed	46	0.80 %
Acceleration	3424	59.89 %
Course	0	0.00 %
Manually	3997	69.91 %

Master Track Generation

The master track is derived from the position sensor data.

Filters applied: manual & speed

Distribution of position sensor data in master track:

Sensor	Data points	Percentage
Total	5717	100.00 %
Trimble	1700	29.74 %
Interpolated	3938	68.88 %
Gaps	79	1.38 %

Remarks

None.

Score

For each flight, a score is calculated ranging from 0 (no data) to 100 (very good data). the score for the flight Aeromag_1995_01 is 66.

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	131 points
Data reduction	97.71 %

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 2	Latitude in decimal format, unit degree	
Column 3	Longitude in decimal format, unit degree	
Column 4	Flag for data source	
	1	Trimble
	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.

Flight map

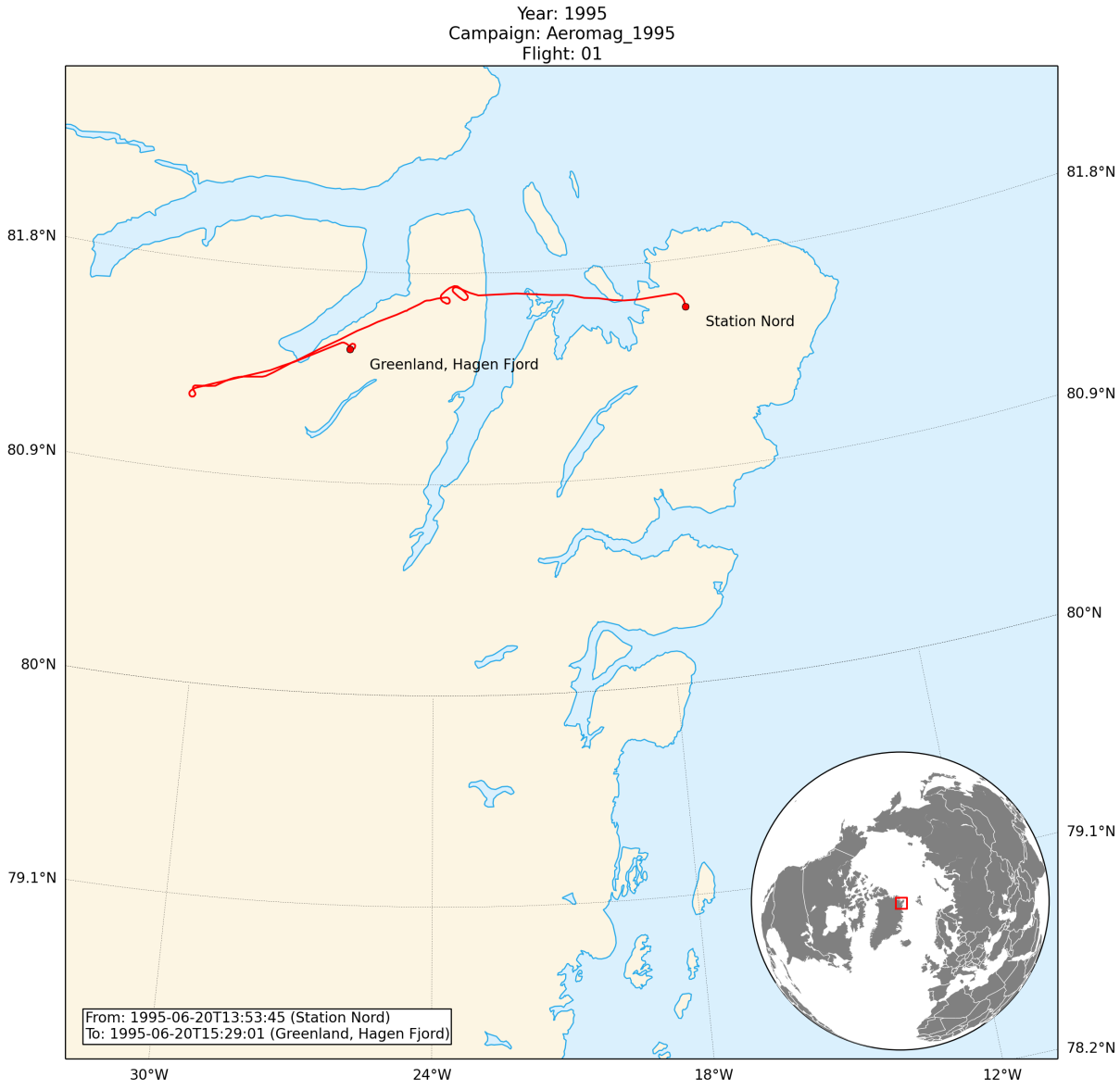

Figure 2: Map of the generalized master track