

NOAA and USGS Big Island, Hawaii Lidar

Airborne Lidar Report

December 2020



	Contract #	Task Order #
NOAA	EA133C33CQ0010	75271
USGS	G16PC00022	78014



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1. Overview

About

This project contains a comprehensive outline of the G17PD01221-MODP00001 NOAA/USGS Big Island, Hawaii Lidar task order issued by the United States Geological Survey's National Geospatial Technical Operations Center (USGS-NGTOC). This task order called for the acquisition and processing of single-photon QL1 data covering approximately 4,028 square miles over the Big Island of Hawaii.

Purpose

This data is intended for use in coastal management decision making, including applications such as support for local hydrologists and watershed managers in their decision-making processes and for formulating a sediment budget and identifying soil erosion hotspots.

Specifications

Data for this task order was acquired and produced to meet USGS Lidar Base Specification 2020 revision A standards and the American Society of Photogrammetry and Remote Sensing (ASPRS) Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0).

Spatial Reference

Geospatial data products were produced using the following horizontal and vertical spatial data reference system.

Table 1-1. Spatial Reference System

Horizontal	EPSG Code	6635
	Datum	NAD83 (PA11)
	Projection	UTM Zone 5
	Units	Meters
Vertical	Datum	NAVD88
	Geoid	GEOID12B
	Units	Meters
	Height Type	Orthometric

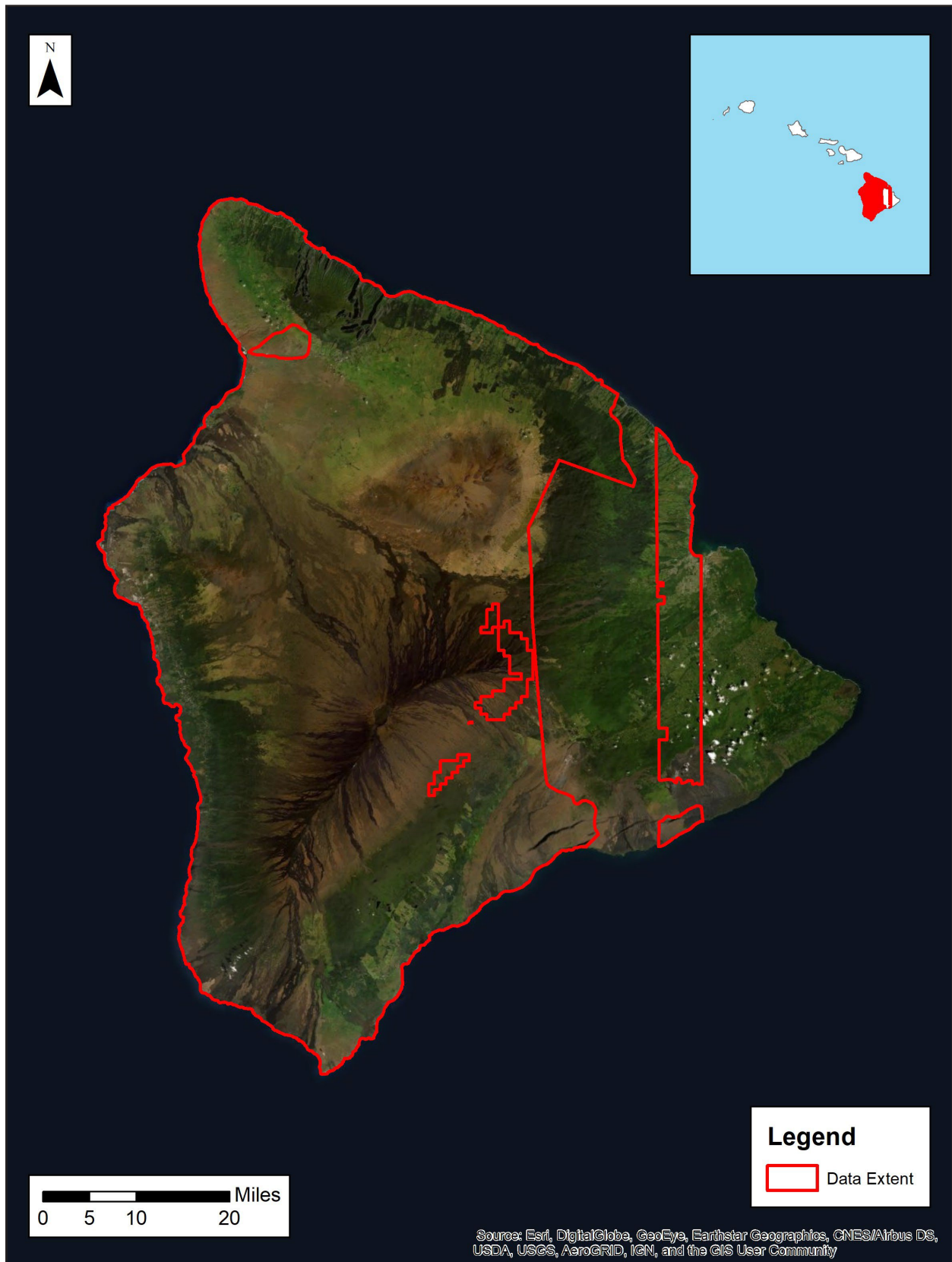
Task Order Deliverables

All data products produced as part of this task order are listed below. All tiled deliverables had a tile size of 1,000-meters x 1,000-meters. Tile names are derived from the USG National grid.

Table 1-2. Deliverables

Lidar Data	
Classified lidar point cloud data	8,629 files Tiles in .las v1.4 format Classes <ul style="list-style-type: none"> • 1 – Processed, not Classified • 2 – Ground • 3 – Vegetation • 7 – Noise • 9 – Water • 10 – Ignored Ground • 17 – Bridge Decks • 18 – High Noise
Breaklines used for hydro-flattening	<ul style="list-style-type: none"> • Lake, river, coast, and bridge features as feature classes in an Esri file geodatabase <ul style="list-style-type: none"> • Water bodies greater than 2 acres as polygon features • Rivers 30.5 meters / 100 feet and greater in width as polyline features
Hydro-flattened bare earth digital elevation model (DEM)	8,629 files 1-meter pixel size, 32-bit floating-point; no bridges or overpass structures GeoTIFF format
Intensity Imagery	8,629 files 1-meter pixel size, 8-bit gray-scale (linear rescaling from 16-bit intensity) GeoTIFF format
Spatial Metadata	
Swath separation images	8,629 files 1.5-meter pixel size, 8-bit, GeoTIFF format
Swath polygons	Georeferenced, polygonal representation of the detailed extents of each lidar swath Polygon feature class in an Esri file geodatabase
Data Extent	Esri shapefile format
Tile Index	Esri shapefile format
Metadata and Reports	
Metadata	Deliverable-level FGDC CSDGM/USGS MetaParser Compliant metadata in .xml format
Lidar Project Report	Project report with flight logs in .pdf format

Figure 1-1. Project Area



2. Acquisition

Flight Planning

Aerial lidar data for this project was collected using the specifications listed below.

The Single Photon Lidar (SPL) data acquisition was acquired at a density greater than the task order specified density of QL1 or 8 points per square meter. USGS and NOAA agreed the density of the data should be reduced to provide a more manageable data set. The data was decimated to provide a density not less than 8 points per square meter, however due to significant overlap of acquisition flight lines in some areas of the project, the density in some cases exceeds 8 points per square meter.

Table 2-1. Acquisition Requirements

Specification	Target
Resolution	<ul style="list-style-type: none"> • 8 points per square meter • 0.35-meter nominal point spacing
Overlap	At contractor's discretion, but enough to ensure there are no data gaps between usable portions of the swath and nominal point density is achieved
Acquisition Window	Acquisition window shall be at a period of annual minimal water level in the winter 2018 acquisition window starting in January
Data Voids	Not allowed except <ul style="list-style-type: none"> • Where caused by water bodies • Where caused by areas of low near infra-red (NIR) reflectivity (i.e. asphalt or composition roofing) • Where appropriately filled-in by another swath
Acquisition Conditions	<ul style="list-style-type: none"> • Cloud and fog-free between the aircraft and ground • Ground is snow free • Ground has no unusual flooding or inundation, except in cases where the goal of the collection is to map the inundation • Intermittent streams must be dry at the time of collection • Leaf-off is not a requirement for this task order; however the USGS National Geospatial Program (NGP) only requires that penetration to the ground must be adequate to produce an accurate and reliable bare-earth surface suitable for incorporation into the 1 meter 3DEP National Map data layers • Time of day is not of concern; however night time acquisitions are likely preferable

Flight Planning

Flight plans using the following.

Software

- Leica Mission Pro v12.1 / 12.3

Equipment

- SPL100 SN7, with uIRS IMU
- RCD30 camera with 80mm lens
(SN CAMERAHEAD-82573-E-798528_LENSSYSTEM80132-A-785423)
- Novatel DL5 GPS base station receiver
- Aircraft: Mission 1 - Dynamic Aviation King Air A90 N96Y and N95S

On February 28, 2018 Woolpert modified the Task Order and provided approval to change the flight plan to 20% overlap. This change was implemented to improve data acquisition progress in terms of area coverage within the 60-day best effort window. New flight plans were computed for the areas yet to be acquired as of February 28, 2018.

The caveat was provided that density of > 8 points per meter may not be achieved on dark surfaces such as lava and in vegetation. This was stated in the amendment and communicated to the end user client.

Table 2-2. Planned Settings

	Initial	Feb 2018
Flying Height (AGL)	10,500 - 14,000 ft	10,500 - 14,000 ft
Line-to-Line Overlap	50%	20%
Flying Speed	180 knots	180 knots
Swath Width	~2,000 m (15° ½ angle/30° full FOV scanner)	~2,000 m (15° ½ angle/30° full FOV scanner)

Due to the complexity of the terrain of the Island of Hawaii, the AOI was broken up into 900 meter terrain bands. Within each terrain band sub-blocks were created to parallel the slope of the volcano.

Due to the terrain variability of the island some flight lines were planned to target a specific AOI, but in doing crossed another AOI. As the impact to the point cloud could vary from terrain dropouts to low point density outside the AOI, these flight lines were only used to populate the intended AOIs for which they are respectively planned.

Lidar Sensor Information

Aerial lidar data was acquired for this project using the Leica Single Photon Lidar (SPL100) sensor system.

Table 2-3. Leica Single Photon Lidar (SPL100) Sensor Info

Lidar Unit	
Beam configuration	10 x 10 array
Laser wavelength	532 nm
Laser divergence	0.08 mrad (1/e ² per beam, nominal)
Laser pulse width	400 psec
Laser optical output	5 W average
Eye safety	NOHD <300 m
Pulse repetition frequency	60 kHz (6.0 MHz effective pulse rate)
Return pulses	Up to 10 returns per channel per laser shot including intensity
Operation altitude (1)	2,000 - 4,500 m AGL
Scanner pattern	Oblique scanner
Scan speed	Programmable up to 25 Hz (1,500 RPM)
Field of view	20°, 30°, 40° or 60° fixed
Point density (2)	Typically 20 points / sqm at 4,000 m AGL
Vertical accuracy (2, 3, 4)	< 10 cm 1 σ
Horizontal accuracy (2, 3, 4)	< 40 cm 1 σ
System Electronics	
Components	1 x LiDAR Controller, 1 x Camera Controller CC33
Dimensions	597.0 L x 508.0 W x 454.1 H mm
Weight	21.8 kg
Environmental	
Pressure	Non-pressurized cabin up to ICAO 18,000 ft
Humidity	0% to 95% RH according ISO7137 (non-condensating)
Operating temperature	-0 °C to 40 °C
Electrical	
Avg. power consumption of complete system	600 W / 28 VDC
Max. peak power consumption of complete system	1,000 W / 28 VDC
Fuse on aircraft power outlet	1 x 40 A

1 Max. operating altitude is achieved at $\geq 10\%$ reflectivity (e.g. dry asphalt) and 100% laser output

2 Accuracy and point density stated in the table is acquired @4,000 m AGL, 100 m/s aircraft speed

3 The 1 σ value represents the 68% confidence interval. Typically, the RMSE value is equal to 1 accuracy value

4 Vertical and horizontal accuracy estimations are based on the integrated SPAN system and a GPS error of 5 cm

Source: Leica SPL100 Single Photon LiDAR Sensor Data Sheet

https://leica-geosystems.com/-/media/files/leicageosystems/products/datasheets/leica_spl100_ds.ashx?la=en-us&hash=FDABDAFAB-63C650F291836095F0841EF

Lidar Sensor Specification

Acquisition specifications are listed in the table below. An initial quality control process was immediately performed on to review the data coverage, airborne GPS data, and trajectory solution.

Table 2-4. Project Acquisition Specifications

Settings	Leica SPL100
Max. Number of Returns	2,000
Nominal Point Spacing	0.35 m
Nominal Point Density	8 ppsm
Flying Height Above Ground Level	3,200 - 4,420 m
Flight Speed	180 knots
Scan Angle	30°
Scan Rate Used	21 Hz
Pulse Rate Used	50 kHz
Multi-Pulse in Air	Disabled
Swath Width	2,000 m
Swath Overlap	20%

Timeline

Lidar data was collected from January 30, 2018 through January 6, 2020. Figure 2-1 shows aerial lidar coverage by lift. A total of 362 individual flight lines were collected.

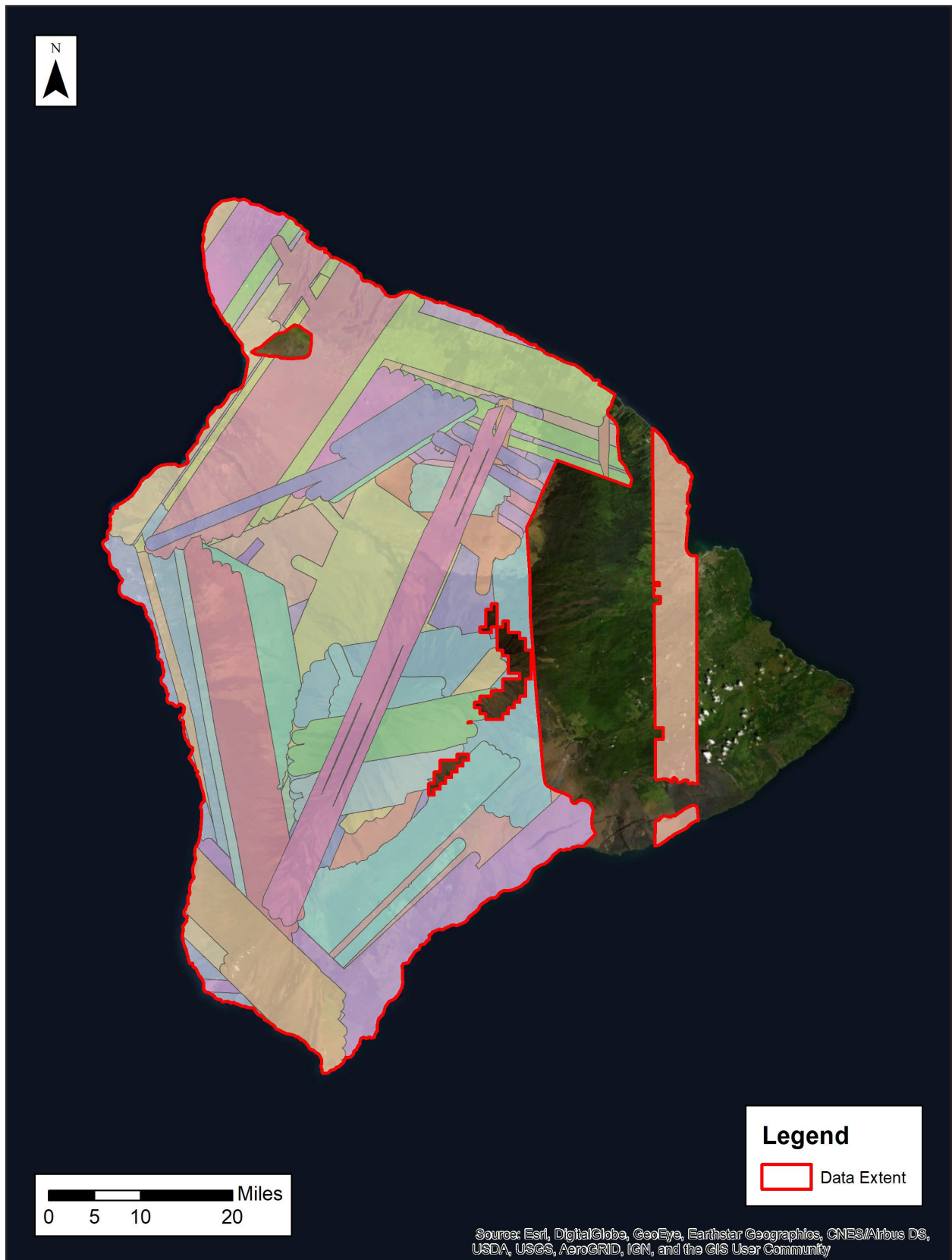
Operators identified the AOIs on the Island of Hawaii and studied the weather conditions daily to determine which areas were most suitable for data acquisition. Weather conditions proved extremely challenging during the collection window. Due to very challenging weather conditions complete acquisition of the Island of Hawaii was unable to be completed during the contractual collection windows.

Approximately 38% of the AOI was collected during the 2018 collection window.

In the 2019/2020 collection window, approximately 61% of the targeted AOI had been collected.

For more information, see the Flight Logs in Appendix 1 and the Acquisition GPS Times in Appendix 2.

Figure 2-1. Flight Coverage



GNSS and IMU Equipment

Prior to mobilizing to the project site, flight crews coordinated with the necessary air traffic control personnel to ensure airspace access. Crews were on-site, operating a Global Navigation Satellite System (GNSS) Base Station for the airborne GPS support.

Leica Airborne Sensor Operators established a survey monument at Kona International Airport (KOA) and set up Novatel DL5 GPS base station receiver prior to each data acquisition flight.

The survey monument established for Mission 1 (KOA GPS) was not accessible to the flight crews due to increase aircraft activity during the data acquisition period.

Flight navigation during acquisition was performed using IGI CCNS (Computer Controlled Navigation System). The pilots are skilled at maintaining their planned trajectory, while holding the aircraft steady and level. If atmospheric conditions are such that the trajectory, ground speed, roll, pitch and/or heading cannot be properly maintained, the mission is aborted until suitable conditions occur.

Base stations were set by acquisition staff and was used to support the aerial data acquisition. CORS stations were used in post-processing to aid in GPS/IMU solution quality when necessary. See the table below for stations operated during acquisition.

For more information, see the GNSS / IMU Report in Appendix 3.

Table 2-5. GNSS Base Stations

Projected Coordinates in NAD83 (PA11) UTM Zone 5 meters, NAVD88 (GEOID12B - Hawaii) meters

Station Name	Easting (Meters)	Northing (Meters)	Ellipsoid Height L1 Phase Center (Meters)	Orthometric Height (Meters)
KOA GPS	181138.790	2183742.105	33.904	15.715
KOA GPS2	181120.252	2183899.855	33.525	15.536
MKEA	242674.343	2191367.901	3754.485	3728.033
MLO1	229665.109	2162159.911	3429.348	3401.413

Acquisition Quality Assurance

Woolpert developed a quality assurance and validation plan to ensure the acquired lidar data meets the USGS Base Specification Version 2020 revision A. For quality assurance purposes, the lidar data was processed immediately following acquisition to verify the coverage has appropriate density, distribution, and no unacceptable data voids. Accompanying GPS data was post processed using differential and Kalman filter algorithms to derive a best estimate of trajectory. The quality of the solution was verified to be consistent with the accuracy requirements of the task order. Any required re-flights were scheduled at the earliest opportunity.

The spatial distribution of the geometrically usable first return lidar points was reviewed for density requirements as well as regular and uniform point distribution - verifying the lidar data is spaced so that 90% of the cells in a 2*NPS grid placed over the data contain at least one lidar point. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath. Additionally, the data was reviewed for unacceptable data voids – verifying no area greater than or equal to $(4 \times \text{ANPS})^2$ exhibited data coverage gaps.

3. Processing

Processing Summary

Once the lidar data passed initial QC, the dataset was corrected for aircraft orientation and movement. This process used airborne inertial, orientation, and GPS data collected during acquisition along with ground-based GPS data. The data went through a geometric calibration that further corrected each laser point. This calibrated data set was used to create the LAS point cloud. The LAS point data was initially classified into “ground” and “non-ground”, then further refined using the classes specified in this task order. Breaklines were drawn to denote hydrological features. After the hydro-flattening process, the final deliverables products were created.

GNSS-IMU Trajectory Processing

Kinematic corrections for the aircraft position were resolved using aircraft GPS and static ground GPS (1-Hz) for each geodetic control (base station) for three subsystems: inertial measurement unit (IMU), sensor orientation information, and airborne GPS data.

Post-processing of the IMU system data and aircraft position with attitude data was completed to compute an optimally accurate, blended navigation solution based on Kalman filtering technology, or the smoothed best estimate of trajectory (SBET).

Differential GPS solutions were computed for all lifts. The Leica established base station and supplemental CORS stations were used to ensure high quality GPS solutions were computed. Novatel Inertial Explorer 8.70.4517 was used for GPS post processing.

Software: POSPac Software v. 5.3, IPAS Pro v.1.35., Novatel Inertial Explorer v8.60.6129

Trajectory Quality

The GNSS trajectory and high-quality IMU data are key factors in determining the overall positional accuracy of the final sensor data. Within the trajectory processing, there are many factors that affect the overall quality, but the most indicative are the combined separation, the estimated positional accuracy, and the positional dilution of precision (PDOP).

Combination Separation

Combined separation is a measure of the difference between the forward-run and the backward-run solution of the trajectory. The Kalman filter was processed in both directions to remove the combined directional anomalies. In general, when these two solutions match closely, an optimally accurate and reliable solution is achieved.

The data for this task order was processed with a goal to maintain a combined separation difference of less than ten (10) centimeters.

Estimated Positional Accuracy

Estimated positional accuracy plots the standard deviations of the east, north, and vertical directions along a time scale of the trajectory. It illustrates loss of satellite lock issues, as well as issues arising from long baselines, noise, and/or other atmospheric interference.

PDOP

The PDOP measures the precision of the GPS solution in regard to the geometry of the satellites acquired and used for the solution.

The data for this task order was processed with a goal to maintain an average PDOP value below 3.0. Brief periods of PDOP over 3.0 are acceptable due to the calibration and control process if other metrics are within specification.

Geometric Calibration

After the initial phase was complete, a formal reduction process was performed on the data. Laser point position was calculated by associating the SBET position to each laser point return time, scan angle, intensity, etc. Raw laser point cloud data was created for the whole project area in LAS format. Automated line-to-line calibrations were then performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift. Statistical reports were generated for comparison and used to make the necessary adjustments to remove any residual systematic error.

Raw data from the SPL100 system was loaded into HxMAP processing software. Lidar calibration was computed on a flight-by-flight basis. Full data extraction is run on the raw TOF data and de-noised, georeferenced point clouds were output in WGS84 z5, ellipsoid heights. All lifts were combined into a block, and HxMAP proprietary line registration tool was ran. Final point clouds were output in NAD83 (PA11) UTM Zone 5 meters, NAVD88 (GEOID12B) meters.

Software: Proprietary Software, TerraMatch v20, Leica CloudPro 1.2.4; HxMAP LiDAR Survey Studio

Quality Control Report

Lidar technicians processed the data in the HxMAP processing platform to extract georeferenced point clouds. Quality Control coverage checks included an assessment of calibration quality, point cloud coverage, potential sensor anomalies to ensure the data met the specification of the project. Any quality issues identified in a line were flagged, investigated and planned for reflight if necessary.

After the data set passed QC, blocks were assembled in the HxMAP processing platform. Point clouds were run through HxMAP proprietary line-to-line registration tool. This step adjusted line-to-line fit to an optimal correction of each point. This provided a best-fit point cloud of the entire data set.

The data was then exported to the desired projection: NAD83 (PA11) UTM Zone 5 meters, NAVD88 (GEOID12B) meters.

Lidar Data Classification

The Single Photon Lidar (SPL) data acquisition occurred between multiple acquisition seasons creating significant data overlap between seasons. To reduce excessive density, the data was processed to eliminate excess overlap in these areas.

LAS data was classified as ground and non-ground points with additional filters created to meet the task order classification specifications. Statistical absolute accuracy was assessed via direct comparisons of ground classified points to ground RTK survey data. Based on the statistical analysis, the lidar data was then adjusted to reduce the vertical bias when compared to the survey ground control of higher accuracy.

Calibrated LAS files were imported into the task order tiles and initially filtered to create a ground and non-ground class.

Then additional classes were filtered as necessary to meet the following client-specified classes. See Table 3-1 for all classes used and the total number of points within each class.

Classified LAS files were evaluated through a series of manual QA/QC steps as well as a peer-based review to eliminate remaining artifacts from the ground class. This included a review of the DEM surface to remove artifacts and ensure topographic quality.

Software: Proprietary Software, TerraScan v20

Table 3-1. Classified Point Breakdown

Class Number	Class Name	Points
Class 1	Processed, but unclassified	75,670,312,647
Class 2	Bare earth	16,311,842,934
Class 3	Vegetation	20,803,867,245
Class 7	Low noise	208,048,310
Class 9	Water	92,162,699
Class 10	Ignored Ground	571,699
Class 17	Bridge deck	642,348
Class 18	High noise	34,820,347

Hydrologic Flattening

The lidar task order required compilation of breaklines defining the following types of water body features:

Lakes, reservoirs, ponds	Minimum of 2-acres or greater Compiled as closed polygons, collected at a constant elevation
Rivers, streams	Nominal width of 30.5 meters / 100 feet Compiled in direction of flow, with both sides maintaining an equal elevation gradient
Bridge breaklines	Breaklines used to enforce a logical terrain surface below a bridge

Woolpert utilized the following steps to hydrologically flatten the water bodies and for gradient hydrologic flattening of the double line streams within the existing lidar data:

1. The newly acquired lidar data was utilized to manually compile the hydrologic features in a 2D environment using the lidar intensity and bare earth surface. Open Source imagery was used as reference when necessary.
2. An integrated software approach was applied to combine the lidar data and 2D breaklines. This process “drapes” the 2D breaklines onto the 3D lidar surface model to assign an elevation. A monotonic process is performed to ensure the streams are consistently flowing in a gradient manner. A secondary step within the program verifies an equally matching elevation of both stream edges. The breaklines that characterize the closed water bodies are draped onto the 3D lidar surface and assigned a constant elevation at or just below ground elevation.
3. All classified ground points from inside the hydrologic feature polygons were reclassified to water, class nine (9).
4. All classified ground points were reclassified from within a buffer along the hydrologic feature breaklines to buffered ground, class ten (10). The buffer distance was approximately the task order designed nominal pulse spacing distance.
5. Breaklines used for bridge removal during the hydrologic flattening were included with the hydrologic breakline geodatabase deliverable. The purpose of these breaklines is for a more aesthetically pleasing DEM appearance.
6. The lidar ground points and breaklines were used to generate a digital elevation model (DEM).
7. QA/QC for this task was performed by reviewing the hydrologically flattened DEM and hydrologic breakline features. Additionally, a combined approach utilizing commercial off the shelf software and proprietary methods were used to review the overall connectivity of the hydrologic breaklines.

TerraScan was used to add the hydrologic breakline vertices and export the lattice models.

Breaklines defining the water bodies greater than 2-acres were provided as polygon features. Rivers and streams with a nominal minimum width of 30.5 meters (100 feet) were provided as polyline features. Bridges were provided as point features. All lake, river, coast, and bridge breaklines compiled as part of

the flattening process were provided in an Esri file geodatabase.

Software: TerraScan v20, TerraModeler v20, Esri ArcMap v10.7, LP360 v2019.1.30.4

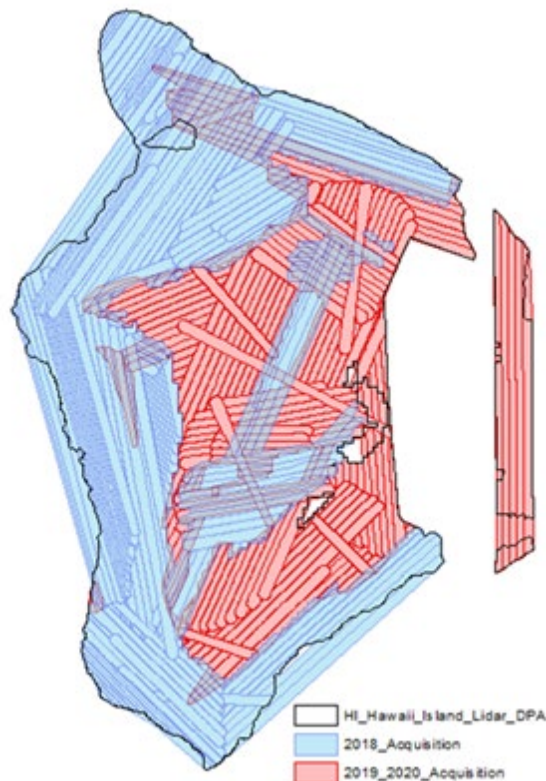
Digital Elevation Model

TerraScan was used to add the hydrologic breakline vertices and export the lattice models. Class 2 (ground) lidar points in conjunction with the hydro breaklines and bridge breaklines were used to create 1-meter hydro-flattened bare-earth raster DEM files. Using automated scripting routines within ArcMap, a 32-bit floating point raster GeoTIFF file was created for each tile. Files were clipped to the data extent. GDAL was used to apply the Each surface is reviewed using Global Mapper to check for any surface anomalies or incorrect elevations found within the surface.

Software: TerraScan v20, Esri ArcMap v10.7, GDAL 2.4.0, Global Mapper v20.0

Low Confidence Polygons

The single photon lidar data acquisition for this award occurred across two separate deployments. The approximate date range of the first acquisition window was from January 2018 to March 2018 and second window was from November 2019 to January 2020. Given the complexity of the terrain, the flight plan for the project included significant overlapping and off-angle lines between the 2018 and 2019/2020 collection which can create more opportunity to notice differences than is normally seen in a lidar collection where lines tend to follow a single direction and acquisition across years is cut into more complete blocks.



For each acquisition season, the acquired data was processed and geometrically calibrated by Woolpert's teaming and data acquisition partner Hexagon. During the calibration, the data was processed to meet the required accuracy specifications per each mission as well as between adjacent missions of the differing flight dates within a given acquisition season. Once the calibration was complete and the data entered full processing, Woolpert made the best efforts to populate delivery tiles containing flights from different acquisition seasons with data acquired from a single season. In these tiles preference was given to the points acquired during the 2018 season because of the significant data processing had occurred within these tiles prior to the second acquisition season. In some areas pieces of lines from the different acquisitions created the edge artifacts. Low confidence polygons were generated around these areas to make the user aware of the discrepancy.

Software: Esri ArcMap v10.7, Global Mapper v20.0

Intensity Imagery

Lidar intensity data derived from the acquired lidar data was linearly rescaled from 16-bit intensity and provided as 1-meter pixel, 8-bit, 256 gray scale GeoTIFF format intensity imagery files. Files were clipped to the data extent.

Software: TerraScan v20, Esri ArcMap v10.7

Metadata

FGDC CSDGM/USGS MetaParser-compliant metadata was produced in XML format. The metadata includes a complete description of the task order client information, contractor information, project purpose, lidar acquisition and ground survey collection parameters, lidar acquisition and ground survey collection dates, spatial reference system information, data processing including acquisition quality assurance procedures, GPS and base station processing, geometric calibration, lidar classification, hydrologic flattening, intensity imagery development, and final product development.

Other metadata deliverables included swath separation images in GeoTIFF format. The data extent and delivery tile index were provided as Polygon features in and Esri file geodatabase. A georeferenced, polygonal representation of the detailed extents of each acquired lidar swath was produced as a polygon feature class in an Esri file geodatabase.

4. Accuracy Assessment

Horizontal Accuracy

The data sets was produced to meet ASPRS “Positional Accuracy Standards for Digital Geospatial Data” (2014) for a 0.27 cm RMSE_x / RMSE_y Horizontal Accuracy Class which equates to Positional Horizontal Accuracy = +/- 0.67 cm at a 95% confidence level.

Raw Lidar Swath Testing

NOAA collected independent checkpoints located in non-vegetated and vegetated land cover classes in order to perform independent vertical accuracy testing on the lidar point cloud swath and DEM data.

This project required the lidar point cloud swath to be produced to meet a Non-Vegetated Vertical Accuracy (NVA) value of 19.6 cm at a 95% confidence level using an RMSE_z target value of 10 cm x 1.9600.

Digital Elevation Model Testing

NOAA collected independent checkpoints located in non-vegetated and vegetated land cover classes in order to perform independent vertical accuracy testing on the lidar point cloud swath and DEM data.

This project required DEM data to be produced to meet a Non-Vegetated Vertical Accuracy (NVA) value of 19.6 cm at a 95% confidence level using an RMSE_z target value of 10 cm x 1.9600 and a Vegetated Vertical Accuracy (VVA) value of 0.30 cm at the 95th percentile error.

Appendix 1: Flight Logs

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	4.6 Hrs.	Ramp	Activity
1	PHKO	19:05	PHKO	23:42	4:37	4.6		Production
2								
3								
4								

SPL 100 FlightLog

NWG Job #		Client's Job #		Lidar S/N		Gate Delay	Gate Dur	IMU Start		Shipping Track Number		Operator		Wx.	Start	End		
S18-010				7				185151				TJ Smith						
Project Name				IMU S/N		Scan Angle		IMU Stop		Airport ID		Pilot		GND Temp	Start	End		
WOOLPERT HAWAII						15				PHKU		Miguel Bisono / Matt Heuser			27	28		
Mission ID (DaySensorJobLift)				AMT		Range Gate		Scan Frequency		Base GPS Reciver ID		Scan Angle		Aircraft		Alt Temp	Start	End
180201_00007_S18-010_03				VAR.		ARG				34		15		N96Y			1	2
Date	GPS Date	UTC Offset		Flight Plan		Laser Pwr	Pulse Rate	Download "Firewire"		Base Point ID		Base GPS Ant. Ht.		UTM Zone	KPA	Start	End	
01-Feb-18	18-032					5 W				KOA1		2.0 m				29.87	29.85	
Flight Plan	NWG Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions				SVs	PDOP				
					185151	185651			IMU STATIC				26	1.0				
					192000	192200			S-TURN				25	1.2				
A-B6	169	024	10		192900	193200	14000	180					26	1.1				
	170	204		10	193800	194100	14000	175					26	1.1				
	171	024	11		194700	195000	14000	176	FEW THIN CLOUD				27	1.1				
	172	204		11	195500	195900	14000	175	FEW THIN CLOUD				26	1.2				
	173	024	12		200500	200900	14000	180	FEW CLOUD				26	1.2				
	174	204		12	201400	201800	14000	172	FEW CLOUD				24	1.4				
Cross Line	506	090		38	202500	203800	13800	180	CLOUD				25	1.2				
	237	205		14	204500	205000	16700	175	TEMP -1				25	1.1				
	236	025	22		205800	210400	16500	182	FEW CLOUD				21	1.1				
	235	205		23	211000	211700	16300	180	FEW CLOUD				23	1.0				
	234	025	24		212300	213000	16100	180	FEW CLOUD				20	1.0				
	233	205		25	213600	214500	15900	175	FEW MORE CLOUD				19	1.0				
	232	025	26		215000	215900	15400	180	FEW TOO MANY CLOUD				18	1.1				
	203	205		36	220300	221500	14000	175	CLOUD				15	1.5				
A-B5	158	154		39	222300	223600	13600	175					17	1.3				
	159	334	38		224100	225400	13600	180	FEW THIN CLOUD				17	1.3				
	160	154		38	225900	231100	13700	175	FEW THIN CLOUD				16	1.3				
	161	334	37		231600	232900	13700	180	MORE THIN CLOUD				17	1.2				
					232900	233000			S-TURN				18	1.3				
					235050	235250			IMU STATIC				18	1.3				

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	1.4 Hrs.	Ramp	Activity
1	PHKO	20:37	PHKO	22:03	1:26	1.4		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End	
S18-010		7			201855		TJ Smith				
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot	GND Temp	24 C	27 C	
WOOLPERT HAWAII			15			PHKO	Dynamic Pilot				
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp		
180206_007_S18010_06		VAR.						N96Y	-3 C	-3 C	
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	
06-Feb-18	18-037	HST -10					KOA1	2.0m			
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP
					20:18:55	20:23:55			IMU STATIC	22	1.3
					20:57:00	21:00:00			S-TURN	23	1.0
A-B6	189	025	17		21:03:00	21:08:00	14000	182	FEW CLOUD	23	1.0
	188	205		16	21:13:00	21:19:00	14000	180	FEW CLOUD	23	1.0
	187	025	16		21:24:00	21:29:00	14000	180	FEW CLOUD	21	1.2
	186	205		16	21:34:00	21:39:00	14000	178	FEW CLOUD	20	1.3
									S-TURN	20	1.3
					22:10:10	22:12:10			IMU STATIC	19	1.4
									ATC UNABLE/UNWILLING TO WORK WITH US		
									NO OTHER AREAS CLEAR / END FLIGHT		
									BASE STATION - KOA1		
									KOA1 START @ 19:25 / 06Feb18		
									KOA1 STOP @ 22:20 / 06Feb18		

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	3.4 Hrs.	Ramp	Activity
1	PHKO	19:06	PHKO	22:29	3:23	3.4		Production
2								
3								
4								

SPL 100 FlightLog

Job #		Client's Job #		Lidar S/N		Gate Delay	Gate Dur	IMU Start		Shipping Track Number		Operator		Wx.	Start	End	
S18-010				7								Troy Sentner					
Project Name				IMU S/N		Scan Angle		IMU Stop		Airport ID		Pilot		GND Temp	Start	End	
WOOLPERT HAWAII						15				PHKO		Dynamic Pilot			19 C	25	
Mission ID (DaySensorJobLift)				AMT		Range Gate		Scan Frequency		Base GPS Reciver ID		Scan Angle		Aircraft		Alt Temp	
180209_007_S18010_07				VAR.								15 deg Wedge		N96Y		-2 C	
Date	GPS Date	UTC Offset		Flight Plan		Laser Pwr	Pulse Rate	Download "Firewire"		Base Point ID		Base GPS Ant. Ht.		UTM Zone	KPA	Start	End
09-Feb-18	18-040	HST -10								KOA1		2.0m				29.95	29.90
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions				SVs	PDOP			
					18:53:00	18:59:00			IMU STATIC				24	1.1			
					19:20:00	19:25:00			S-TURN				24	1.2			
A-B5	162	154	36		19:27:00	19:37:00	13900	200	Gating Errors first 4 nmi. Pitch 5 mount out of limit				24	1.2			
	163	334		35	19:42:00	19:54:00	14100	160	Gating Errors first 3 nmi.				22	1.4			
	164	154	34		19:59:00	20:09:00	14300	200	Gating Errors first 3 nmi.				23	1.1			
	165	334		33	20:14:00	20:26:00	14500	160	Gating Errors first 1 nmi.				23	1.2			
	166	154	32		20:30:00	20:40:00	14700	200	Gating Errors first 3 nmi.				23	1.1			
	167	334		31	20:44:00	20:55:00	14900	160	Gating Errors first 1 nmi.				22	1.0			
	168	154	30		21:00:00	21:09:00	15400	200	Gating Errors first 3 nmi.				20	1.0			
B-B4	328			42	21:17:00	21:34:00	17000	160	Gating Errors first 7 nmi. Manual ARG Recovery				19	1.1			
	329	159	42		21:40:00	21:52:00	17000	200	Gating Errors first 3 nmi.				16	1.4			
	330			43	21:56:00	22:12:00	17000	160	Gating Errors first 7 nmi. Manual ARG Recovery				17	1.3			
					22:12:00	22:16:00	17000		S-TURN				17	1.3			
					22:35:00	22:40:00			IMU STATIC				16	1.3			
									50 Kts wind from the North causing Pitch to 5								
									Causing PAV limit to hit on Southbound Lines								
									BASE STATION - KOA1								
									KOA1 START @ Approx 18:30 / 09Feb18								
									KOA1 STOP @ Approx 22:50 / 09Feb18								

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	2.4 Hrs.	Ramp	Activity
1	PHKO	18:35	PHKO	19:18	0:43	0.7		Production
2	PHKO	0:12	PHKO	1:53	1:41	1.7		Production
3								
4								

SPL 100 FlightLog

Job #		Client's Job #		Lidar S/N		Gate Delay	Gate Dur	IMU Start		Shipping Track Number		Operator		Wx.	Start	End		
S18-010				7				20180212182059		MM SPL001		Troy Sentner						
Project Name				IMU S/N		Scan Angle		IMU Stop		Airport ID		Pilot		GND Temp	Start	End		
WOOLPERT HAWAII						15				PHKO		Dynamic Pilot			27			
Mission ID (DaySensorJobLift)				AMT		Range Gate		Scan Frequency		Base GPS Reciver ID		Scan Angle		Aircraft		Alt Temp	Start	End
180212_007_S18010_8				VAR.						NBV07080011		15 deg Wedge		N96Y			6	6
Date	GPS Date	UTC Offset		Flight Plan		Laser Pwr	Pulse Rate	Download "Firewire"		Base Point ID		Base GPS Ant. Ht.		UTM Zone	KPA	Start	End	
12- Feb- 18	18-043	HST -10								KOA1		2.0m				29.89		
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions				SVs	PDOP				
					18:21:00	18:27:00			IMU STATIC				21	1.4				
					18:46:00	18:50:00			S-TURN				25	1.1				
AOI A BIK 6	175	025		13	18:52:00	18:55:00	14000	180	Stuck at "Opening Detector Shutter"				24	1.2				
	176	205	13		18:59:00	19:03:00	14:00	180	Next Line Same thing ABORT									
									Nick noted Connection to LIDAR Lost									
									Closed SPL100 Gui attempted to Reconnect on de									
									No Connection									
					0:03:00	0:06:00			STATIC				20	1.2				
					0:25:00	0:28:00			S-TURN				19	1.3				
AOI A BIK 6	203	025		36	0:31:00	0:42:00			Gate Errors 5nmi online Man ARG Set (Cloud)				20	1.2				
	205	205	36		0:46:00	0:58:00			Gate Errors 13nmi online Man ARG Set (Cloud)				20	1.4				
	206	025		36	1:02:00	1:15:00			Gate Errors 5nmi online Man ARG Set (Cloud)				21	1.5				
	207	205	36		1:18:00	1:31:00			ARG Found Ground OK after Cloud				21	1.3				
	204	025		15	1:35:00	1:39:00			For Calibration if this helps 6nmi Man ARG				20	1.3				
					1:40:00	1:45:00			STURN				21	1.3				
					1:57:00	2:05:00			STATIC									
									Let System Control Laser And Shutter at start									
									BASE STATION - KOA1									
									KOA1 START @ Approx 17:40 FEB 12									
									KOA1 STOP @ Approx 02:20 FEB 13									

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	3.1 Hrs.	Ramp	Activity
1	PHKO	22:22	PHKO	1:26	3:04	3.1		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End		
S18-010		7			20180216220714	MM No Number	Troy Sentner					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot		GND Temp	Start	End	
WOOLPERT HAWAII			30			PHKO	Dynamic Pilots			27	27	
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	Start	End	
180216_007_S18010_9		VAR.				NBV07080011	15 Deg Wedge	N96Y		-20	-20	
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	Start	End
16- Feb- 18	18-047	HST -10					KOA1	2.0m			29.90	29.85
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions		SVs	PDOP
					22:07:00	22:12:00			IMU STATIC		18	1.3
					22:45:00	22:49:00			S-TURN		18	1.3
AOI Ds Bk 2	546	032	24		22:52:00	22:30:00	22900	190	pitch limit no fire, Alot of Cloud, goto AOI Es		24	1.2
									Tried Laser Override			
									Says Enabeling Laser OverRide			
									Reset OBD But TOF cards would not Reset			
									Full SPL Power Cycle			
AOI Es Bk 1	559	264	9				24900		Laser Started then Stopped ?		19	1.3
	560	084		9			24900		No Laser Fire, Shutter Working		17	1.5
	559	264	9		23:39:00	23:43:00	24900		Attempted Laser OverRide and Laser Fire, No Go		18	1.3
	560	84		9	23:48:00	23:50:00	24900		Full SPL Restart AGAIN		21	1.3
	559	264	9		23:56:00	0:00:00	24900	170	Good Run		22	1.2
	560	84		9	0:04:00	0:07:00	24900	205	Good Run Cloud on Ends		21	1.2
	561	264	10		0:12:00	0:16:00	24900	170	Good Run Cloud on Ends		22	1.2
	562	84		10	0:20:00	0:23:00	24900	205	Good Run Cloud on Ends		23	1.2
	563	264	9		0:28:00	0:31:00	24900	170	Good Run Cloud on Ends		23	1.2
	564	84		9	0:36:00	0:38:00	24900	205	Good Run Cloud on Ends		22	1.2
	565	264	9		0:43:00	0:46:00	24900	170	Good Run Cloud on Ends		21	1.3
	566	84		9	0:51:00	0:53:00	24900	205	Good Run Cloud on Ends, Roll at Start MOA		22	1.2
					0:53:00	0:56:00	24900	200	S-TURN		22	1.2
					1:31:00	1:36:00			IMU STATIC		21	1.1
									BASE STATION - KOA1			
									KOA1 START @ Approx 21:30 FEB 16			
									KOA1 STOP @ Approx 01:45 FEB 17			

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	1.9 Hrs.	Ramp	Activity
1	PHKO	18:54	PHKO	20:48	1:54	1.9		Production
2								
3								
4								

SPL 100 FlightLog

Job #		Client's Job #		Lidar S/N		Gate Delay	Gate Dur	IMU Start		Shipping Track Number		Operator		Wx.	Start	End
S18-010				7				201802191842		MM No Number		Troy Sentner				
Project Name				IMU S/N		Scan Angle		IMU Stop		Airport ID		Pilot		GND Temp	20	
WOOLPERT HAWAII						30				PHKO		Dynamic Pilots				
Mission ID (DaySensorJobLift)				AMT		Range Gate		Scan Frequency		Base GPS Reciver ID		Scan Angle		Aircraft	Alt Temp	-14
180219_007_S18010_10				VAR.						NBV07080011		15 Deg Wedge		N96Y		
Date	GPS Date	UTC Offset		Flight Plan		Laser Pwr	Pulse Rate	Download "Firewire"		Base Point ID		Base GPS Ant. Ht.		UTM Zone	KPA	29.91
19- Feb- 18	18-050	HST -10								KOA1		2.0m				
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions		SVs	PDOP				
					18:42:00	18:48:00			IMU STATIC		25	1.2				
					19:15:00	19:19:00			S-TURN		24	1.2				
AOI C BIK 2	515	212		8	19:22:00	19:27:00	18900	180	Good Run		24	1.2				
	463	288	10		19:34:00	19:37:00	19500	180	PAV Out of Drift Warning at start of line		24	1.1				
	462	108		11	19:42:00	19:45:00	19500	180	PAV Out of Drift Warning on line		22	1.1				
	461	288	12		19:50:00	19:54:00	19500	180	Good Run		22	1.1				
	460	108		12	19:59:00	20:02:00	19500	180	PAV Out of Drift Warning at start of line		23	1.0				
	459	288	12		20:07:00	20:11:00	19500	185	PAV Out of Drift Warning at start of line		23	1.0				
	458	108		12	20:17:00	20:20:00	19500	180	Laser No Fire ??? Touch nothing and try next line		21	1.0				
	457	288	11		20:25:00	20:29:00	19500	180	No Laser Again. ABORT And Send Files		20	1.0				
					20:29:00	20:35:00	19500		S-TURN		22	1.2				
					20:52:00	20:57:00			IMU STATIC		21	1.1				
									USB shook loose of OC on taxi, ? extended logging							
									BASE STATION - KOA1							
									KOA1 START @ Approx 17:30 FEB 19							
									KOA1 STOP @ Approx 01:30 FEB 20							

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	3.1 Hrs.	Ramp	Activity
1	PHKO	18:41	PHKO	21:47	3:06	3.1		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End		
S18-010		7			20180220	MM No Number	Troy Sentner					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot		GND Temp	Start	End	
WOOLPERT HAWAII			30			PHKO	Dynamic Pilots			24	26	
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	Start	End	
180220_007_S18010_11		VAR.				NBV07080011	15 Deg Wedge	N96Y		-8	-7	
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	Start	End
20-Feb-18	18-051	HST -10					KOA1	2.0m			29.96	29.96
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP	
					18:27:00	18:33:00			IMU STATIC	24	1.3	
					19:03:00	19:06:00			S-TURN	24	1.2	
AOI C Blk 2	458	108		12	19:09:00	19:13:00	19500	195	VOG in Lower Areas	24	1.2	
	457	288	11		19:18:00	19:22:00	19500	170	couple small clouds	24	1.2	
AOI B Blk 4	355	159		10	19:27:00	19:31:00	19300	180	Mount Drift Out of Limit Warning	23	1.1	
	354	339	11		19:35:00	19:39:00	19300	175	Mount Drift Out of Limit Warning	21	1.1	
	353	159		13	19:44:00	19:47:00	19200	180	Mount Drift Out of Limit Warning	22	1.1	
	352	339	14		19:52:00	19:56:00	19200	180	Mount Drift Out of Limit Warning	22	1.0	
	351	159		15	20:01:00	20:06:00	19100	180	Mount Drift Out of Limit Warning	21	1.0	
	350	339	17		20:10:00	20:15:00	19100	175	Mount Drift Out of Limit Warning	20	1.0	
	349	159		18	20:19:00	20:25:00	19000	180	Mount Drift Out of Limit Warning	20	1.0	
	348	339	20		20:30:00	20:36:00	18900	180	Mount Drift Out of Limit Warning	18	1.2	
	347	159		20	20:41:00	20:48:00	18800	180	Mount Drift Out of Limit Warning	17	1.4	
	346	339	21		20:52:00	20:59:00	18700	180	cloud on longer lines, move to blk 6	15	1.5	
AOI B Blk 6	399	048		17	21:03:00	21:08:00	17900	180	cloud north end	19	1.3	
	398	228	17		21:13:00	21:18:00	17400	170	cloud north half CU filling in all areas Abort	19	1.3	
					21:20:00	21:26:00			S-TURN	19	1.3	
					21:52:00	21:57:00			IMU STATIC	18	1.2	
									BASE STATION - KOA1			
									KOA1 START @ Approx 17:30 Feb 20			
									KOA1 STOP @ Approx 22:30 FEB 20			

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	2.1 Hrs.	Ramp	Activity
1	PHKO	18:46	PHKO	20:54	2:08	2.1		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End		
S18-010		7			20180306183005	Drive SPL004	Troy Sentner					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot	GND Temp	24	27		
WOOLPERT HAWAII			30			PHKO	Dynamic Pilots					
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp			
180306_007_S18010_15		VAR.				NBV07080011	15 Deg Wedge	N96Y	-18	-18		
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	29.95	29.96
06-Mar-18	18-065	HST -10					KOA1	2.0m				
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP	
					18:32:00	18:38:00			IMU STATIC	24	1.2	
					19:12:00	19:16:00	22900		S-TURN (South Point was in VOG goto AOI D 2)	18	1.1	
AOI D BIK 2	1216	250	18		19:21:00	19:26:00	22900	180	Man AGR Reset needed no cloud at start	20	1.2	
	1215	70		18	19:31:00	19:37:00	22900	195	Mount not parked at end of prev line Mount Error on line	18	1.1	
	1214	250	19		19:43:00	19:49:00	22900	180	Man AGR Reset needed no cloud at start	17	1.2	
	1213	70		19	19:54:00	20:00:00	22900	195	Man AGR Reset needed no cloud at start	15	1.5	
	1212	250	19		20:05:00	20:11:00	22900	180	Man AGR Reset needed no cloud at start	17	1.3	
	1211	70		20	20:17:00	20:23:00	22900	195	ARG worked at start. Clouds on East Side	17	1.3	
					20:23:00	20:27:00	22900	195	S-TURN Looked at southpoint again nogo abort	17	1.3	
					20:57:00	21:03:00			IMU STATIC			
									BASE STATION - KOA1			
									KOA1 START @ Approx 17:40 Mar 6			
									KOA1 STOP @ Approx 21:16 Mar 6			
									Mount Log Uploaded to FTP			

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	2.1 Hrs.	Ramp	Activity
1	PHKO	18:41	PHKO	20:48	2:07	2.1		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End		
S18-010		7			20180308182750	Drive SPL005	Troy Sentner					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot	GND Temp	21	25		
WOOLPERT HAWAII			30			PHKO	Dynamic Pilots					
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	-1		
180308_007_S18010_17		VAR.				NBV07080011	15 Deg Wedge	N96Y		-1		
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	29.96	29.98
08-Mar-18	18-067	HST -10					KOA1	2.0m				
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP	
					18:29:00	18:35:00			IMU STATIC	24	1.1	
					18:55:00	18:58:00	13700		S-TURN	25	1.0	
AOI A BIK 4	1057	124		23	19:01:00	19:09:00	13700	180	in thin VOG and few fly it anyway	24	1.0	
	1058	304	23	9	19:13:00	19:19:00	13600	175	East 14nmi	22	1.0	
	1059	124	9	23	19:24:00	19:29:00	13600	180	East 14nmi *Mount restarted online error	20	1.2	
	1056	304	23		19:33:00	19:40:00	13700	175	Few	20	1.2	
	1055	124		23	19:45:00	19:53:00	13700	180	Man ARG at start of line, Few CU mid line	18	1.4	
	1054	304	23		19:57:00	20:05:00	13600	175	Man ARG at start of line, Few CU mid line *	19	1.3	
	1053	124		22	20:10:00	20:17:00	13700	180	Man ARG at start of line, Scat CU end in ovlap	19	1.3	
	1052	304	21		20:21:00	20:28:00	13800	175	Scat CU east end in ovlap, few on rest of line	19	1.3	
					20:29:00	20:34:00	14700	180	S-TURN gone to Broken Next lines	17	1.3	
					20:53:00	20:58:00			IMU STATIC	18	1.1	
									BASE STATION - KOA1			
									KOA1 START @ Approx 18:10 Mar 8			
									KOA1 STOP @ Approx 21:10 Mar 8			
									MOUNT LOG UPLOADED TO FTP			

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	3.4 Hrs.	Ramp	Activity
1	PHKO	18:45	PHKO	22:07	3:22	3.4		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End		
S18-010		7			20180310182752	Drive SPL006	Troy Sentner					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot		GND Temp	Start	End	
WOOLPERT HAWAII			30			PHKO	Dynamic Pilots			21	25	
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	Start	End	
180310_007_S18010_18		VAR.				NBV07080011	15 Deg Wedge	N96Y		1	0	
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	Start	End
10-Mar-18	18-069	HST -10					KOA1	2.0m			29.96	29.98
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP	
					18:30:00	18:35:00			IMU STATIC	20	1.1	
					19:01:00	19:04:00	14000		S-TURN	18	1.1	
AOI A BIK 6	1060	205		13	19:07:00	19:12:00	14000	180	Auto IT Init Errors Refly Line, Few off shore	19	1.0	
	1060	025	13		19:19:00	19:23:00	14000	180	Reloaded Flightplan on OC60 no error	17	1.2	
	1061	205		14	19:27:00	19:32:00	14000	180	Mount Restarted Online Error, continue	14	1.3	
	1062	025	15		19:38:00	19:43:00	14000	180	Good Line	15	1.6	
	1063	205		16	19:47:00	19:52:00	14000	175	Man ARG no cloud	15	1.4	
	1064	025	16		19:57:00	20:02:00	14000	180	Man ARG no cloud	16	1.4	
	1065	205		16	20:07:00	20:12:00	14000	180	North 16 Nmi only, with Few, north shore ok	15	1.4	
	1066	025	16		20:17:00	20:23:00	14000	175	North 16 Nmi only, with Few, north shore ok	14	1.4	
	1067	205		16	20:27:00	20:33:00	14000	180	North 16 Nmi only, with Few, north shore few	14	1.4	
	1068	025	16		20:37:00	20:44:00	14000	175	North 16 Nmi only, with Few, north shore few	16	1.3	
AOI B BIK 6	1146	228	6		20:49:00	20:53:00	16100	180	Good Line with Few N end	15	1.3	
	1147	48		8	20:58:00	21:01:00	16100	180	Good Line with Few N end	16	1.3	
	1148	228	13		21:05:00	21:09:00	16100	180	Good Line with Few N end	16	1.3	
	1149	48		15	21:14:00	21:19:00	16100	185	Mount Restarted Online Error, continue	16	1.3	
	1150	228	17		21:23:00	21:29:00	16100	180	Good Line with Few N end	16	1.5	
	1151	48		18	21:33:00	21:39:00	16100	185	Good Line with Few N end	15	1.5	
	1152	228	18		21:45:00	21:51:00	16300	180	Good Line with Few N to Mid	18	1.4	
					21:51:00	21:55:00	16000	195	S-TURN	18	1.4	
					22:10:00	22:15:00			IMU STATIC	17	1.4	
									BASE STATION - KOA1			
									KOA1 START @ Approx 17:50 Mar 10			
									KOA1 STOP @ Approx 22:20 Mar 10			

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	3.8 Hrs.	Ramp	Activity
1	PHKO	18:22	PHKO	22:08	3:46	3.8		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End	
S18-010		7			20180311180726	Drive SPL001	Troy Sentner				
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot	GND Temp	22		
WOOLPERT HAWAII			30			PHKO	Dynamic Pilots				
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	4 5	
180311_007_S18010_19		VAR.				NBV07080011	15 Deg Wedge	N96Y			
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	29.99 30.01
11-Mar-18	18-070	HST -10					KOA1	2.0m			
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP
					18:09:00	18:18:00			IMU STATIC	22	1.1
					18:37:00	18:43:00	15500		S-TURN	22	1.1
AOI A Bik 4	1050	124		19	18:44:00	18:50:00	15500	180	Man ARG req no cloud, Good Line	20	1.1
	1051	304	20		18:55:00	19:01:00	14700	175	2 x Mount Restart Online	20	1.1
	1052	124		21	19:06:00	19:13:00	13800	180	Mount Restart Online	18	1.3
	1053	304	22	11	19:18:00	19:22:00	13700	180	SE 11 Nmi Only	17	1.4
AOI A Bik 3	1049	038		38	19:30:00	19:43:00	13800	180	Good Line	15	1.6
	1048	218	39		19:47:00	20:00:00	13800	175	Lost ground over Water, Man ARG reset	16	1.4
	1047	038		39	20:04:00	20:17:00	13800	180	Few SW Ovlap, Few at 6 Nmi to NE end	16	1.4
	1046	218	39		20:21:00	20:33:00	13800	180	Mount Restart Online, PAV Init. Failed Online	15	1.6
	1045	038		39	20:37:00	20:50:00	13800	180	Mount Restart Online	17	1.2
	1044	218	38		20:54:00	21:06:00	13900	180	2 x Mount Restart Online	18	1.2
	1043	038		22	21:10:00	21:17:00	14100	180	SW 22 Nmi Only	18	1.3
	1042	218	22		21:22:00	21:29:00	14500	175	SW 22 Nmi Only Mount Restart	17	1.5
	1234	038	23	3	21:37:00	21:45:00	13200	180	Cloud 7 Nmi of West Side	19	1.4
					21:45:00	21:07:00	13000	180	S-TURN	19	1.5
					22:13:00	22:18:00			IMU STATIC	19	1.3
									BASE STATION - KOA1		
									KOA1 START @ Approx 17:30 Mar 11		
									KOA1 STOP @ Approx 22:30 Mar 11		

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	1.4 Hrs.	Ramp	Activity
1	PHKO	18:38	PHKO	20:00	1:22	1.4		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator		Wx.	Start	End	
S18-010		7					TJ Smith					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot		GND Temp	24 C	25 C	
WOOLPERT HAWAII			15			PHKO	Dynamic Pilot					
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	5 C	5 C	
180327_007_S18010_23		VAR.						N96Y				
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	29.90	29.94
27-Mar-18	18-086	HST -10	V 5.2				KOA1	2.0m				
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions		SVs	PDOP
					18:25:26	18:30:26			IMU STATIC		14	1.6
					18:54:00	18:57:00			S-TURN		15	1.4
A 4	1056	124	9	23	18:58:00	19:03:00	13700	180	SOME CLOUD		15	1.5
	1055	304	23	0	19:07:00	19:15:00	13700	180	SOME CLOUD		14	1.5
	1054	124	0	23	19:20:00	19:28:00	13600	180	SOME CLOUD		14	1.4
	1053	304	8	0	19:34:00	19:37:00	13700	180	CLOUD		15	1.2
					19:37:00	19:40:00			S-TURN		15	1.2
					20:04:20	20:09:20			IMU STATIC		15	1.4
									END FLIGHT DUE TO CLOUD			
									BASE STATION - KOA1			
									KOA1 START @ 17:44 / 27Mar18			
									KOA1 STOP @ 20:14 / 27Mar18			

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	3.8 Hrs.	Ramp	Activity
1	PHKO	17:34	PHKO	21:25	3:51	3.8		Production
2								
3								
4								

SPL 100 FlightLog

Job #		Client's Job #		Lidar S/N		Gate Delay	Gate Dur	IMU Start		Shipping Track Number		Operator		Wx.	Start	End	
S18-010				007								TJ Smith					
Project Name				IMU S/N		Scan Angle		IMU Stop		Airport ID		Pilot		GND Temp	22 C	27 C	
WOOLPERT HAWAII						15				PHKO		Dynamic Pilot					
Mission ID (DaySensorJobLift)				AMT		Range Gate		Scan Frequency		Base GPS Reciver ID		Scan Angle		Aircraft	Alt Temp	5 C	5 C
180329_007_S18010_25				VAR.										N96Y			
Date	GPS Date	UTC Offset		Flight Plan		Laser Pwr	Pulse Rate	Download "Firewire"		Base Point ID		Base GPS Ant. Ht.		UTM Zone	KPA	29.98	30.01
29-Mar-18	18-088	HST -10		V 5.2						KOA1		2.0m					
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions		SVs	PDOP					
					17:21:27	17:26:27			IMU STATIC		21	1.1					
					17:50:00	17:53:00			S-TURN		20	1.1					
R 2	1244	320	10	0	17:55:00	17:59:00	15300	175			20	1.1					
	1245	121	0	6	18:05:00	18:07:00	14500	180			19	1.2					
A 6	1065	025	9	3	19:18:15	18:19:00	14000	172	R/F COMPLETE		17	1.5					
	1066	205	2	9	18:24:00	18:28:00	14000	172	R/F COMPLETE		19	1.3					
	1067	025	9	2	18:32:00	18:35:00	14000	180	R/F COMPLETE		19	1.3					
	1068	205	2	10	18:39:00	18:43:00	14000	170	R/F COMPLETE / FEW SMALL CLOUD		19	1.3					
	1069	205	0	35	18:52:00	19:05:00	14000	176			19	1.3					
	1070	025	35	0	19:09:00	19:21:00	14000	175	CLOUD 6-0nmi		17	1.3					
	1071	205	0	35	19:25:00	19:37:00	14000	177	CLOUD 0-7nmi, 30-35nmi		18	1.2					
	1072	025	34	0	19:41:00	19:52:00	14000	178	CLOUD 34-28nmi, 6-0nmi		18	1.2					
	1073	205	0	34	19:57:00	20:08:00	14000	176	CLOUD 0-7nmi, 28-34nmi		18	1.4					
	1074	025	33	0	20:13:00	20:24:00	14000	175	CLOUD 33-25nmi, 5-0nmi		18	1.4					
	1075	205	0	32	20:29:00	20:40:00	14000	176	CLOUD 0-6nmi, 25-32nmi		19	1.3					
	1076	025	32	0	20:44:00	20:55:00	14000	175	CLOUD 32-25nmi, 6-0nmi		19	1.3					
	1077	205	0	30	21:00:00	21:10:00	14000	180	CLOUD 0-8nmi, 23-30nmi		18	1.4					
					21:11:00	21:14:00			S-TURN		18	1.2					
					21:31:40	21:36:40			IMU STATIC		20	1.2					
									END FLIGHT DUE TO CLOUD IN ALL AOI's								
									BASE STATION - KOA1								
									KOA1 START @ 16:54 / 29Mar18								
									KOA1 STOP @ 21:44 / 29Mar18								

- when it has to be right



Lift	Airport	Chocks Out	Airport	Chocks In	Duration	2.3 Hrs.	Ramp	Activity
1	PHKO	17:19	PHKO	19:35	2:16	2.3		Production
2								
3								
4								

SPL 100 FlightLog

Job #	Client's Job #	Lidar S/N	Gate Delay	Gate Dur	IMU Start	Shipping Track Number	Operator	Wx.	Start	End		
S18-010		007					TJ Smith					
Project Name		IMU S/N	Scan Angle		IMU Stop	Airport ID	Pilot	GND Temp	22 C	27 C		
WOOLPERT HAWAII			15			PHKO	Dynamic Pilot					
Mission ID (DaySensorJobLift)		AMT	Range Gate		Scan Frequency	Base GPS Reciver ID	Scan Angle	Aircraft	Alt Temp	0 C - 13 C		
180330_007_S18010_26		VAR.						N96Y				
Date	GPS Date	UTC Offset	Flight Plan	Laser Pwr	Pulse Rate	Download "Firewire"	Base Point ID	Base GPS Ant. Ht.	UTM Zone	KPA	29.98	30.00
30-Mar-18	18-089	HST -10	V 5.2				KOA1	2.0m				
Flight Plan	Line #	Directo	From WPT	To WPT	Beginning GPS Time	Ending GPS Time	Altitude (feet)	Speed (Kts)	Comments / Conditions	SVs	PDOP	
					17:10:57	17:15:57			IMU STATIC	21	1.0	
					17:37:00	17:40:00			S-TURN	19	1.0	
B 6	1154	228	17	0	17:44:00	17:50:00	17400	174	FEW CLOUD WEST END OF LINE	19	1.0	
	1153	048	0	18	17:54:00	18:00:00	16700	165		18	1.1	
	1152	228	18	10	18:05:00	18:09:00	16300	175	R/F COMPLETE	15	1.4	
	1151	048	8	18	18:13:00	18:17:00	16100	174	R/F COMPLETE	15	1.5	
	1150	228	17	8	18:21:00	18:25:00	16100	172	R/F COMPLETE	16	1.3	
D 2	1191	110	0	10	18:38:00	18:40:00	23000	180	UNABLE TO CONTROLL GATE	16	1.3	
	1192	290	12	0	18:45:00	18:48:00	23000	175	WRONG GATE RANGE ENTERED	16	1.3	
	1193	110	0	13	18:54:00	18:58:00	23000	180	DETECTOR OVERPOWERED	16	1.3	
B 5	1130	238	21	0	19:07:00	19:14:00	16700	180	CLOUD / DETECTOR NOT WORKING	15	1.3	
					19:14:00	19:17:00			S-TURN	15	1.3	
					19:40:50	19:45:50			IMU STATIC	16	1.2	
									BASE STATION - KOA1			
									KOA1 START @ 16:33 / 30Mar18			
									KOA1 STOP @ 21:22 / 30Mar18			

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	18:01		PHKO	22:18		4:17	4.30		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount			MM Mode	MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7					Single	SPL006						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)		MM-2	Download-2					
25-Nov-19	19-329	3	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	mi/WPT	Compression	Shipping Track			
191125_007_S19010_03			N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7770 8074 6123			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163290.PDC		Mark Doll						
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							17:44:00	17:49:00					static					
							18:18:00	18:20:00					s-turn					
A6	2047				0	14	18:24:00	18:27:00	E	13,800	180		complete			20	1.1	20
	2048				14	0	18:31:00	18:34:00	W	13,800	180		complete			19	1.2	23
	2049				0	12	18:38:00	18:40:00	E	13,800	180		complete			18	1.3	24
	2050				7	0	18:46:00	18:47:00	W	13,800	180		complete			17	1.6	26
													delay for ATC					
B1	2051				20	0	18:59:00	19:03:00	W	16,600	180		complete			17	1.6	28
	2052				0	25	19:09:00	19:14:00	E	16,600	180		complete			17	1.6	30
	2053				24	0	19:20:00	19:25:00	W	16,600	180		complete			17	1.6	32
	2054				0	63	19:28:00	19:40:00	E	16,600	180		28-33km small cu, complete			18	1.4	33
	2055				69	0	19:47:00	20:01:00	W	16,600	180		cu on e.end, check small cu 20-0km, complete			21	1.1	37
													cu rapidly developing, moving south					
B1	2059				0	52	20:07:00	20:17:00	E	16,600	180		43-e.end cu, complete			21	1.1	40
	2060				55	0	20:23:00	20:34:00	W	16,600	180		e.end - 41km cu, w.end cu, complete			21	1.1	42
	2061				0	55	20:39:00	20:49:00	E	16,800	180		scattered cu throughout entire line --- relocating south			18	1.3	44
							21:05:00	21:09:00					s-turn					
B5	2116				7	0	21:17:00	21:19:00	W	19,200	180		complete			24	1.1	48
	2115				0	10	21:28:00	21:30:00	E	19,000	180		complete			27	1.0	48
	2114				13	0	21:34:00	21:37:00	W	18800	180		complete			25	1.1	49
	2113				0	16	21:40:00	21:43:00	E	18500	180		complete			25	1.1	49
	2112				25	0	21:47:00	21:53:00	W	18500	180		complete scattered cu on line			24	1.3	49
													cu'ed out -- s-turn, return to base, static					

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	18:12		PHKO	21:58		3:46	3.80		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount		MM Mode		MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7				Single		SPL010						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)	MM-2		Download-2					
26-Nov-19	19-330	4	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)		Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	mi/WPT	Compression	Shipping Track				
191126_007_S19010_04		N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7770 9356 7652				
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163300.PDC		Mark Doll						
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							18:03:00	18:08:00					static					
							18:25:00	18:30:00					s-turn					
B1	2206				0	30	18:34:00	18:39:00	NE	15,700	180		complete, good (diagonal line)			21	1.2	23
	2056				0	69	18:49:00	19:02:00	E	16,600	180		complete, cu @ 63km- east end			20	1.6	26
	2057				69	0	19:05:00	19:19:00	W	16,600	180		complete, cu @ east end - 58km			20	1.8	30
	2058				0	68	19:23:00	19:36:00	E	16,600	180		complete, cu @ 55km-east end			20	1.8	32
							19:37:00	19:39:00					s-turn					
B5	2111				31	0	19:53:00	19:59:00	W	18,500	180		complete, good			22	1.3	38
	2110				0	34	20:04:00	20:10:00	E	18,400	180		complete, good			22	1.2	39
	2109				34	0	20:15:00	20:21:00	W	18,200	180		complete, good			23	1.1	41
	2108				0	33	20:25:00	20:31:00	E	18,000	180		complete, good			20	1.2	42
	2107				31	0	20:35:00	20:41:00	W	17,800	180		complete, good			20	1.2	43
	2106				0	32	22:44:00	20:50:00	E	17,700	180		complete, good			20	1.2	44
	2105				32	0	20:55:00	21:01:00	W	17,500	180		complete, good			21	1.1	45
	2104				0	32	21:06:00	21:12:00	E	17,300	180		complete, good			22	1.1	46
	2103				36	0	21:17:00	21:25:00	W	17,100	180		complete, cu @ western edge of line			25	1.1	47
	2102				0	39	21:29:00	21:36:00	E	16,900	180		complete, cu @ w.end -15km			25	1.0	48
													cu rapidly developing --- returning to base					
							21:38:00	21:40:00					s-turn					
							22:03:00	22:08:00					static					

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	17:47		PHKO	22:09		4:22	4.40		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount			MM Mode	MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7					Single	SPL002						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)		MM-2	Download-2					
9-Dec-19	19-343	8	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	km/WPT	Compression	Shipping Track			
191209_007_S19010_08			N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7771 9436 5399			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163430.PDC		Mark Doll						
Area	Line ID	Client's	Wpt	From	To	Distance	UTC	Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°	
							Start	End	Dir	(GPS)	(knots)	Time						
							17:41:00	17:46:00					static - no valid GPS time on SPL GUI -- power cycle system -- resolved					
							18:00:00	18:05:00					s-turn					
B3	2084				0	19	18:09:00	18:13:00	N	16,700	180		complete			19	1.8	17
	2085				21	0	18:17:00	18:21:00	S	16,600	180		complete			19	1.9	18
	2086				0	23	18:25:00	18:29:00	N	16,500	180		complete			19	2.0	20
	2087				53	0	18:38:00	18:48:00	S	16,500	180		complete			20	1.6	22
	2088				0	53	18:53:00	19:03:00	N	16,500	180		complete			20	1.9	25
	2089				53	0	19:07:00	19:17:00	S	16,500	180		complete			18	1.8	28
	2090				0	52	19:21:00	19:31:00	N	16,500	180		complete			21	1.1	30
	2091				51	0	19:35:00	19:44:00	S	16,500	180		complete, ground level estimate adjusted			20	1.2	33
	2092				0	50	19:48:00	19:59:00	N	16,500	180		complete, cu at 20-32km, 40-end			19	1.2	35
	2093				30	0	20:03:00	20:09:00	S	16,500	180		complete, cu at 20-9km			21	1.2	37
	2083				10	0	20:15:00	20:16:00		18,800	180		complete			24	1.1	39
							20:17:00	20:20:00					s-turn					
E2	2212				26	0	20:29:00	20:33:00	N	23,600	180		complete			26	1.1	41
	2195				0	16	20:38:00	20:41:00	E	24,700	180		complete			23	1.2	41
	2196				17	0	20:44:00	20:47:00	W	24,700	180		complete			23	1.2	41
	2197				0	18	20:51:00	20:54:00	E	24,700	180		complete			22	1.4	43
	2198				18	0	20:58:00	21:01:00	W	24,700	180		complete			23	1.3	44
	2199				0	18	21:05:00	21:08:00	E	24,700	180		complete			24	1.2	44
	2200				18	0	21:12:00	21:16:00	W	24,700	180		complete			24	1.2	45
	2201				0	17	21:19:00	21:23:00	E	24,700	180		complete			23	1.3	46
	2202				17	0	21:27:00	21:30:00	W	24,700	180		complete			25	1.4	46
	2203				0	15	21:34:00	21:36:00	E	24,700	180		complete			25	1.2	47

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	17:52		PHKO	22:32		4:40	4.70		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount			MM Mode	MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7					Single	SPL009						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)		MM-2	Download-2					
10-Dec-19	19-344	9	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	km/WPT	Compression	Shipping Track			
191210_007_S19010_09			N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7772 0796 7564			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163440.PDC		Mark Doll						
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							17:40:00	17:45:00					static					
							18:00:00	18:12:00					s-turn					
B5	2113				0	12	18:15:00	18:18:00	E	18,500	180		reflight complete			20	1.6	18
	2112				13	0	18:23:00	18:26:00	W	18,500	180		reflight complete			20	1.6	19
	2111				0	5	18:30:00	18:32:00	E	18,500	180		3rd parallel line collected for SPL calibration			22	1.6	20
	2102				0	17	18:40:00	18:44:00	E	16,900	180		reflight complete			23	1.3	22
	2101				0	40	18:52:00	19:00:00	E	16,600	180		complete			22	1.4	24
	2100				38	0	19:04:00	19:12:00	W	15,900	180		complete			24	1.2	27
	2099				0	35	19:16:00	19:23:00	E	15,600	180		complete			25	1.2	28
	2098				31	0	19:27:00	19:33:00	W	15,600	180		complete			22	1.2	31
							19:35:00	19:38:00					s-turn					
C1	2117				0	45	19:48:00	19:57:00	S	19,600			partial (access granted into Bradshaw MOA -- will attempt to collect as many lines before airspace goes hot)			24	1.1	34
	2118				45	0	20:01:00	20:09:00	N	19,600			partial			24	1.1	36
	2119				0	48	20:12:00	20:21:00	S	19,600			partial			24	1.1	38
	2120				50	0	20:25:00	20:35:00	N	19,600			partial			25	1.1	40
	2121				0	53	20:38:00	20:48:00	S	19,600			partial			25	1.1	41
	2123				39	0	20:52:00	21:00:00	N	19,600			partial			24	1.4	43
	2125				0	39	21:03:00	21:10:00	S	19,600			full line			25	1.2	44
	2128				35	0	21:14:00	21:21:00	N	19,700			full line, check cu at 4-0km (north end)			24	1.3	45
	2131				0	35	21:24:00	21:30:00	S	19,800			full line, check cu at 4-0km			26	1.2	46
	2134				31	0	21:34:00	21:39:00	N	20,000			full line, check cu at 4-0km			26	1.3	46
	2143				0	26	21:43:00	21:47:00	S	24,000			full line, check cu at 4-0km			26	1.3	47
	2211				0	52	21:55:00	22:05:00	E	19,700			full line, check cu at 45-52km (east end)			27	1.2	47
	2207				32	0	22:11:00	22:18:00	W	17,900			full line			26	1.2	47

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	17:36		PHKO	19:59		2:23	2.40		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount		MM Mode		MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7				Single		SPL001						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)		MM-2	Download-2					
11-Dec-19	19-345	10	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	km/WPT	Compression	Shipping Track			
191211_007_S19010_10			N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7772 1807 9560			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163450.PDC		Mark Doll						
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							17:30:00	17:35:00					static					
							17:57:00	18:00:00					s-turn					
C1	2122				0	15	18:01:00	18:04:00	S	19,600	180		complete			19	1.6	14
	2130				12	0	18:06:00	18:08:00	N	19,600	180		complete			19	1.6	16
	2124				0	14	18:12:00	18:14:00	S	19,600	180		complete			19	1.6	17
													SPL roll error - in flight restart sequence carried out - resolved					
	2127				0	13	18:24:00	18:27:00	S	19,600	180		complete			20	1.3	19
	2136				12	0	18:30:00	18:32:00	N	19,600	180		complete			20	1.3	20
	2133				0	12	18:36:00	18:38:00	S	19,600	180		complete			21	1.3	21
	2140				12	0	18:41:00	18:44:00	N	19,600	180		complete			23	1.1	23
	2138				0	12	18:47:00	18:50:00	S	19,600	180		complete			22	1.2	24
	2142				12	0	18:53:00	18:56:00	N	19,600	180		complete			22	1.2	25
	2145				0	12	18:59:00	19:02:00	S	19,600	180		complete			23	1.1	26
	2148				13	0	19:05:00	19:08:00	N	19,600	180		complete			24	1.1	27
	2151				0	16	19:12:00	19:15:00	S	19,600	180		complete			25	1.1	28
							19:16:00	19:19:00					s-turn					
D1	2178				25	0	19:25:00	19:29:00	W	22,900	180		reflight complete			21	1.3	30
	2177				0	5	19:32:00	19:34:00	E	22,900	180		5km parallel line flown for SPL calibration			21	1.3	32
	2176				5	0	19:37:00	19:38:00	W	22,900	180		5km parallel line flown for SPL calibration			22	1.3	32
							19:40:00	19:42:00					s-turn					
							20:04:00	20:09:00										

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	18:29		PHKO	21:54		3:25	3.40		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount		MM Mode		MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7				Single		SPL014						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)	MM-2		Download-2					
16-Dec-19	19-350	12	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	km/WPT	Compression	Shipping Track			
191216_007_S19010_12			N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7772 6321 6689			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163500.PDC		Mark Doll						
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							18:24:00	18:29:00					static					
							18:51:00	18:53:00					s-turn					
A3	2035				0	47	18:55:00	19:05:00	S	15,300	180		complete			20	1.2	25
	2036				56	0	19:09:00	19:19:00	N	14,500	180		complete			20	1.1	27
	2037				0	59	19:23:00	19:34:00	S	14,100	180		complete			20	1.1	30
	2038				59	0	19:39:00	19:49:00	N	13,900	180		red SPL ROLL ERROR at n.end of line. Re-boot&Refly			22	1.1	33
	2038				59	0	20:07:00	20:17:00	N	13,700	180		complete without SPL error			23	1.1	37
	2039				0	59	20:21:00	21:31:00	S	13,700	180		complete			21	1.5	39
	2044				7	0	20:36:00	20:38:00	N	13,100	180		complete			24	1.2	41
	2040				24	0	20:43:00	20:49:00	N	14,200	180		complete			24	1.2	42
	2041				0	24	20:51:00	20:56:00	S	14,100	180		complete			24	1.2	43
	2042				11	0	21:00:00	21:02:00	N	14,100	180		complete			27	1.2	43
	2043				0	11	21:05:00	21:08:00	S	13,500	180		complete			27	1.2	44
	2213				27	0	21:14:00	21:19:00	E	16,100	180		complete			27	1.2	45
	2208				44	0	21:28:00	21:36:00	W	15,800	180		complete, dense cu at 17km-0km			27	1.3	46
							21:38:00	21:40:00					s-turn					
							22:00:00	22:05:00					static					
												*NWG base station 1321 was found NOT logging 1.5hrs after wheels down.						
												IF there is a gap in 00163500.PDC data, please use CORS MLO1 or HILR						

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	19:12		PHKO	23:42		4:30	4.50		
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount			MM Mode	MM-1	Download-1					
S19-010	Hawaii SPL			Mark Doll		7					Single	SPL025						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)		MM-2	Download-2					
17-Dec-19	19-351	13	SPL007	Derek Malone		≥30°												
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	km/WPT	Compression	Shipping Track			
191217_007_S19010_13			N95S	PHKO	FCMS	-10		180kts	Auto	Auto	Hi-Res All				7772 7836 1275			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
1321	Kona, HI				1.5					00163510.PDC		Mark Doll						
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							19:05:00	19:10:00					static					
							19:32:00	19:35:00					s-turn					
B2	2062				11	0	19:39:00	19:41:00	N	18,800	180		complete			24	1.1	32
	2063				0	14	19:45:00	19:47:00	S	18,100	180		complete			25	1.1	33
	2064				16	0	19:52:00	19:55:00	N	17,600	180		complete			25	1.1	34
	2065				0	18	19:58:00	20:02:00	S	17,000	180		complete			26	1.0	35
	2066				19	0	20:05:00	20:09:00	N	16,600	180		complete			25	1.1	37
	2067				47	0	20:19:00	20:27:00	N	16,500	180		complete			23	1.5	39
	2068				0	49	20:31:00	20:40:00	S	16,600	180		complete			24	1.2	40
	2069				50	0	20:44:00	20:53:00	N	16,600	180		complete			24	1.3	42
	2070				0	52	20:57:00	21:07:00	S	16,600	180		complete			26	1.2	43
	2071				54	0	21:11:00	21:20:00	N	16,500	180		complete, cu at 19-13km			26	1.2	44
													cu to the east, heading to D2					
													s-turn					
D2	2183				22	0	21:30:00	21:34:00	W	22,500	180		complete			27	1.1	45
	2184				0	30	21:37:00	21:43:00	E	22,500	180		complete			27	1.2	46
	2185				33	0	21:50:00	21:56:00	W	22,500	180		complete			26	1.2	47
	2186				0	35	22:00:00	22:06:00	E	22,500	180		complete			26	1.1	47
	2187				36	0	22:11:00	22:17:00	W	22,500	180		complete, check for cu at western extent of line (0-5km) <i>overlap?</i>			21	1.2	47
	2188				0	36	22:20:00	22:27:00	E	22,500	180		complete, check for cu at western extent of line (0-5km)			20	1.1	47
	2189				36	0	22:31:00	22:38:00	W	22,500	180		complete, check for cu at western extent of line (0-5km)			22	1.0	47
	2190				0	36	22:42:00	22:49:00	E	22,500	180		complete, check for cu at western extent of line (0-7km)			19	1.1	47
	2191				11	0	22:55:00	22:57:00	W	22,500	180		complete			19	1.1	46
	2192				0	29	23:00:00	23:05:00	E	22,500	180		complete			19	1.1	46

- when it has to be right



14.6

Lift	Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	PHKO	18:32		PHKO	22:06		3:34	3.60		Calibration
2										
3										

Flight Log

NWG Job #	Project Name			Operator		SH	CU	Mount		MM Mode		MM-1	Download-1					
S19-010	Hawaii SPL			Peter Hrabak		SPL007	33565	18917		Single		SPL021						
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Wind Dir°	Wind (knts)		MM-2	Download-2					
2-Jan-20	20-002	16	SPL	Dynamic Crew								SPL021						
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	IT	CT	Configuration	GSD	mi/WPT	Compression	Shipping Track			
200102_SPL007_S19010_16			N95S	PHKO	FCMS	-10	variable	≤180							7773 8317 0931			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data				
PHKO FBO	Signature Flight parking		1321	1321	1.75	~17:30		~23:00		00160020.PCD		Peter Hrabak		FTP				
Area	Line ID		Wpt		Distance		UTC		Flight	Altitude	Speed	Integ	Comments and Conditions			SVs	PDOP	Sun°
	NWG	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Time						
							18:25:00	18:31:00	<----	-----	-----	-----	--(static @PHKO) (S-turns @18:59 to 19:03z)					
C1	2146				0	28	19:09:00	19:14:00	S	20400'	180	19.3	skc, great vis, smooth (COMPLETE)			22	1.2	26
C1	2149				28	0	19:21:00	19:27:00	N	20300'	175	19.5	skc, great vis, smooth (COMPLETE)			22	1.3	28
C1	2152				0	29	19:33:00	19:39:00	S	20200'	175	19.7	skc, great vis, smooth (COMPLETE)			22	1.2	30
C1	2154				46	0	19:47:00	19:56:00	N	19600'	175	20.6	skc, great vis, smooth (COMPLETE)			23	1.3	33
C1	2156				0	45	20:02:00	20:11:00	S	19600'	175	20.7	skc, great vis, smooth (COMPLETE)			23	1.2	35
C1	2158				44	0	20:17:00	20:26:00	N	19600'	175	20.6	skc, great vis, smooth (COMPLETE)			24	1.2	37
C1	2160				0	43	20:32:00	20:40:00	S	19600'	180	20.6	skc, great vis, smooth (COMPLETE)			23	1.2	39
C1	2162				42	0	20:46:00	20:54:00	N	19600'	175	20.6	skc, great vis, smooth (COMPLETE)			23	1.2	41
													RESTARTED SPL DUE TO LASER NOT STOPPING FIRING					
C1	2164				0	75	21:09:00	21:23:00	S	19600'	180	20.6	very few below, great vis, smooth (clouds 53-58km) (COMPLETE)			22	1.2	44
C1	2165				50	0	21:28:00	21:29:00	N	19600'	175	20.7	LASER DID NOT FIRE/COLLECT			20	1.2	46
C1	2165				50	0	21:??	21:38:00	N	19600'			LASER DID NOT FIRE/COLLECT					
							22:10:00	22:15:00	<----	-----	-----	-----	--(static @PHKO) (S-turns @21:39 to 21:42z)					

Appendix 2: Acquisition GPS Times

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
204	1/30/2018	201384385	201385076
205	1/30/2018	201385389	201386109
206	1/30/2018	201386395	201387080
207	1/30/2018	201387372	201388081
208	1/30/2018	201388433	201388815
210	1/30/2018	201389901	201390280
211	1/30/2018	201390614	201391004
148	1/31/2018	201462249	201462352
147	1/31/2018	201462820	201462929
146	1/31/2018	201463258	201463372
145	1/31/2018	201463962	201464091
144	1/31/2018	201464427	201464542
143	1/31/2018	201465303	201465413
142	1/31/2018	201465744	201465856
141	1/31/2018	201466780	201466886
151	1/31/2018	201467753	201467999
150	1/31/2018	201468345	201468544
149	1/31/2018	201468884	201469077
152	1/31/2018	201469429	201469695
153	1/31/2018	201470965	201471214
155	1/31/2018	201472654	201473254
157	1/31/2018	201475408	201475411
282	1/31/2018	201476140	201476320
169	2/1/2018	201548606	201548784
170	2/1/2018	201549121	201549303
171	2/1/2018	201549656	201549836
172	2/1/2018	201550172	201550379
173	2/1/2018	201550739	201550957
174	2/1/2018	201551289	201551521
237	2/1/2018	201553165	201553428
236	2/1/2018	201553889	201554303

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
235	2/1/2018	201554628	201555074
234	2/1/2018	201555413	201555873
232	2/1/2018	201557063	201557571
203	2/1/2018	201557866	201558560
159	2/1/2018	201560153	201560844
160	2/1/2018	201561182	201561890
161	2/1/2018	201562249	201562856
202	2/2/2018	201634338	201635031
193	2/2/2018	201635329	201635651
192	2/2/2018	201636006	201636313
191	2/2/2018	201636625	201636939
190	2/2/2018	201637268	201637578
1	2/2/2018	201637912	201638248
2	2/2/2018	201638663	201639035
3	2/2/2018	201639350	201639786
4	2/2/2018	201640060	201640514
558	2/3/2018	201729796	201730062
557	2/3/2018	201730431	201730806
556	2/3/2018	201731131	201731554
555	2/3/2018	201731883	201732321
189	2/6/2018	201986235	201986516
188	2/6/2018	201986857	201987157
187	2/6/2018	201987494	201987790
186	2/6/2018	201988090	201988394
162	2/9/2018	202239615	202240238
163	2/9/2018	202240573	202241301
164	2/9/2018	202241594	202242154
165	2/9/2018	202242518	202243161
166	2/9/2018	202243512	202243995
167	2/9/2018	202244328	202244957
168	2/9/2018	202245271	202245746
328	2/9/2018	202246398	202247281
329	2/9/2018	202247655	202248325
330	2/9/2018	202248647	202249587

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
10203	2/13/2018	202517063	202517751
10205	2/13/2018	202518016	202518717
10206	2/13/2018	202518990	202519686
10207	2/13/2018	202519950	202520641
559	2/16/2018	202860670	202860818
560	2/17/2018	202861144	202861282
561	2/17/2018	202861606	202861773
562	2/17/2018	202862065	202862205
563	2/17/2018	202862543	202862713
564	2/17/2018	202863024	202863137
565	2/17/2018	202863429	202863581
566	2/17/2018	202863904	202864029
515	2/19/2018	203103494	203103660
463	2/19/2018	203104063	203104241
462	2/19/2018	203104579	203104774
461	2/19/2018	203105048	203105254
460	2/19/2018	203105576	203105780
459	2/19/2018	203106085	203106293
458	2/20/2018	203188992	203189181
355	2/20/2018	203190122	203190233
354	2/20/2018	203190583	203190762
353	2/20/2018	203191061	203191213
352	2/20/2018	203191586	203191759
351	2/20/2018	203192131	203192366
350	2/20/2018	203192689	203192929
349	2/20/2018	203193194	203193495
348	2/20/2018	203193855	203194155
347	2/20/2018	203194543	203194843
345	2/20/2018	203195225	203195521
346	2/20/2018	203195958	203196127
398	2/20/2018	203196404	203196579
1121	3/2/2018	204053722	204054493
1122	3/2/2018	204054820	204055597
1221	3/2/2018	204056664	204056847

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
1220	3/2/2018	204057241	204057496
1219	3/2/2018	204057805	204058040
1218	3/2/2018	204058348	204058661
1217	3/2/2018	204058951	204059233
1059	3/4/2018	204224239	204224511
1058	3/4/2018	204225094	204225454
1065	3/4/2018	204226319	204226875
1066	3/4/2018	204227459	204228023
1067	3/4/2018	204228250	204228760
1068	3/4/2018	204228998	204229500
1216	3/6/2018	204399280	204399616
1215	3/6/2018	204399928	204400238
1214	3/6/2018	204400605	204400957
1213	3/6/2018	204401296	204401608
1212	3/6/2018	204401951	204402315
1211	3/6/2018	204402653	204403001
1171	3/7/2018	204488182	204489262
1169	3/7/2018	204490976	204492026
1168	3/7/2018	204492280	204493329
1167	3/7/2018	204493995	204494454
1166	3/7/2018	204495031	204495975
1057	3/8/2018	204570903	204571301
11058	3/8/2018	204571732	204571745
11059	3/8/2018	204572300	204572488
1056	3/8/2018	204572832	204573240
1055	3/8/2018	204573559	204573999
1054	3/8/2018	204574306	204574733
1053	3/8/2018	204575025	204575441
1052	3/8/2018	204575727	204576120
1060	3/10/2018	204744792	204745022
1061	3/10/2018	204745328	204745580
1062	3/10/2018	204745941	204746209
1063	3/10/2018	204746493	204746764
1064	3/10/2018	204747081	204747373

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
11065	3/10/2018	204747664	204747981
11066	3/10/2018	204748284	204748603
11067	3/10/2018	204748886	204749201
11068	3/10/2018	204749485	204749778
1146	3/10/2018	204750296	204750396
1147	3/10/2018	204750725	204750866
1148	3/10/2018	204751144	204751388
1149	3/10/2018	204751702	204751968
1150	3/10/2018	204752246	204752560
1151	3/10/2018	204752867	204753185
1152	3/10/2018	204753574	204753900
1050	3/11/2018	204829098	204829447
1051	3/11/2018	204829745	204830115
11052	3/11/2018	204830422	204830832
11053	3/11/2018	204831131	204831333
1049	3/11/2018	204831876	204832616
1048	3/11/2018	204832886	204833639
1047	3/11/2018	204833914	204834664
1046	3/11/2018	204834891	204835470
1045	3/11/2018	204835887	204836605
1044	3/11/2018	204836862	204837556
1043	3/11/2018	204837827	204838271
1042	3/11/2018	204838539	204838983
1234	3/11/2018	204839509	204839911
1243	3/15/2018	205175791	205175929
1242	3/15/2018	205176208	205176346
1000	3/15/2018	205177181	202863581
1001	3/15/2018	205177467	205177939
1002	3/15/2018	205178248	205178710
1003	3/15/2018	205179033	205179489
1004	3/15/2018	205179769	205180210
1005	3/15/2018	205180498	205180928
1079	3/15/2018	205181377	205181873
1078	3/15/2018	205182203	205182747

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
11056	3/27/2018	206212338	206212644
11055	3/27/2018	206212937	206213368
11054	3/27/2018	206213703	206214129
893	3/28/2018	206297943	206298723
1123	3/28/2018	206299162	206299942
1124	3/28/2018	206300357	206301016
1126	3/28/2018	206302415	206303072
1127	3/28/2018	206303422	206304027
11125	3/28/2018	206304460	206305105
1244	3/29/2018	206381432	206381572
1245	3/29/2018	206381961	206382046
21065	3/29/2018	206382597	206382797
21066	3/29/2018	206383118	206383306
21067	3/29/2018	206383590	206383752
21068	3/29/2018	206384049	206384227
1069	3/29/2018	206384820	206385518
1070	3/29/2018	206385801	206386496
1071	3/29/2018	206386794	206387484
1072	3/29/2018	206387738	206388390
1073	3/29/2018	206388698	206389338
1074	3/29/2018	206389625	206390264
1075	3/29/2018	206390591	206391195
1076	3/29/2018	206391527	206392142
1077	3/29/2018	206392454	206393042
1154	3/30/2018	206467094	206467261
1153	3/30/2018	206467729	206468067
11152	3/30/2018	206468365	206468583
11151	3/30/2018	206468864	206469071
11150	3/30/2018	206469349	206469559
1191	3/30/2018	206470352	206470388
1193	3/30/2018	206471333	206471371
1130	3/30/2018	206472096	206472492
2046	11/23/2019	258574619	258575450
2045	11/23/2019	258575026	258575090

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
2097	11/24/2019	258658003	258658199
2096	11/24/2019	258658543	258658745
2095	11/24/2019	258659120	258659187
2094	11/24/2019	258659754	258659791
2047	11/25/2019	258741494	258741599
2048	11/25/2019	258741944	258742035
2049	11/25/2019	258742341	258742426
2050	11/25/2019	258742862	258742863
2051	11/25/2019	258743616	258743837
2052	11/25/2019	258744210	258744475
2053	11/25/2019	258744841	258745119
2054	11/25/2019	258745352	258745615
2055	11/25/2019	258746624	258747241
2060	11/25/2019	258748808	258749215
2116	11/25/2019	258751871	258751950
2115	11/25/2019	258752543	258752650
2114	11/25/2019	258752915	258753054
2113	11/25/2019	258753241	258753421
2112	11/25/2019	258753712	258753998
2206	11/26/2019	258828458	258828789
2056	11/26/2019	258829414	258830004
2057	11/26/2019	258830580	258831168
2111	11/26/2019	258833252	258833590
2110	11/26/2019	258833887	258834252
2109	11/26/2019	258834529	258834911
2108	11/26/2019	258835125	258835488
2107	11/26/2019	258835736	258836088
2106	11/26/2019	258836309	258836662
2105	11/26/2019	258836968	258837318
2104	11/26/2019	258837613	258837974
2103	11/26/2019	258838274	258838685
2102	11/26/2019	258838977	258839402
2172	11/27/2019	258921636	258921681
2173	11/27/2019	258922219	258922233

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
2174	11/27/2019	258922678	258922692
2175	11/27/2019	258923272	258923294
2058	12/7/2019	259780145	258831427
2059	12/7/2019	259780394	258747686
2061	12/7/2019	259781588	258749605
2017	12/8/2019	259867836	259867857
2016	12/8/2019	259868891	259868937
2015	12/8/2019	259870000	259870071
2014	12/8/2019	259870989	259871085
2013	12/8/2019	259872237	259873040
2006	12/8/2019	259873529	259874392
2182	12/8/2019	259875220	259875394
2181	12/8/2019	259875705	259875973
2180	12/8/2019	259876246	259876536
2179	12/8/2019	259876802	259877062
2210	12/8/2019	259877742	259877943
2084	12/9/2019	259950173	259950383
2085	12/9/2019	259950645	259950874
2086	12/9/2019	259951128	259951381
2087	12/9/2019	259951929	259952505
2088	12/9/2019	259952794	259953418
2089	12/9/2019	259953655	259954228
2090	12/9/2019	259954486	259955090
2091	12/9/2019	259955330	259955875
2093	12/9/2019	259957050	259957380
2083	12/9/2019	259957729	259957831
2212	12/9/2019	259958548	259958693
2195	12/9/2019	259959100	259959276
2196	12/9/2019	259959493	259959673
2197	12/9/2019	259960066	259960085
2198	12/9/2019	259960347	259960379
2199	12/9/2019	259960725	259960844
2200	12/9/2019	259961274	259961391
2201	12/9/2019	259961616	259961734

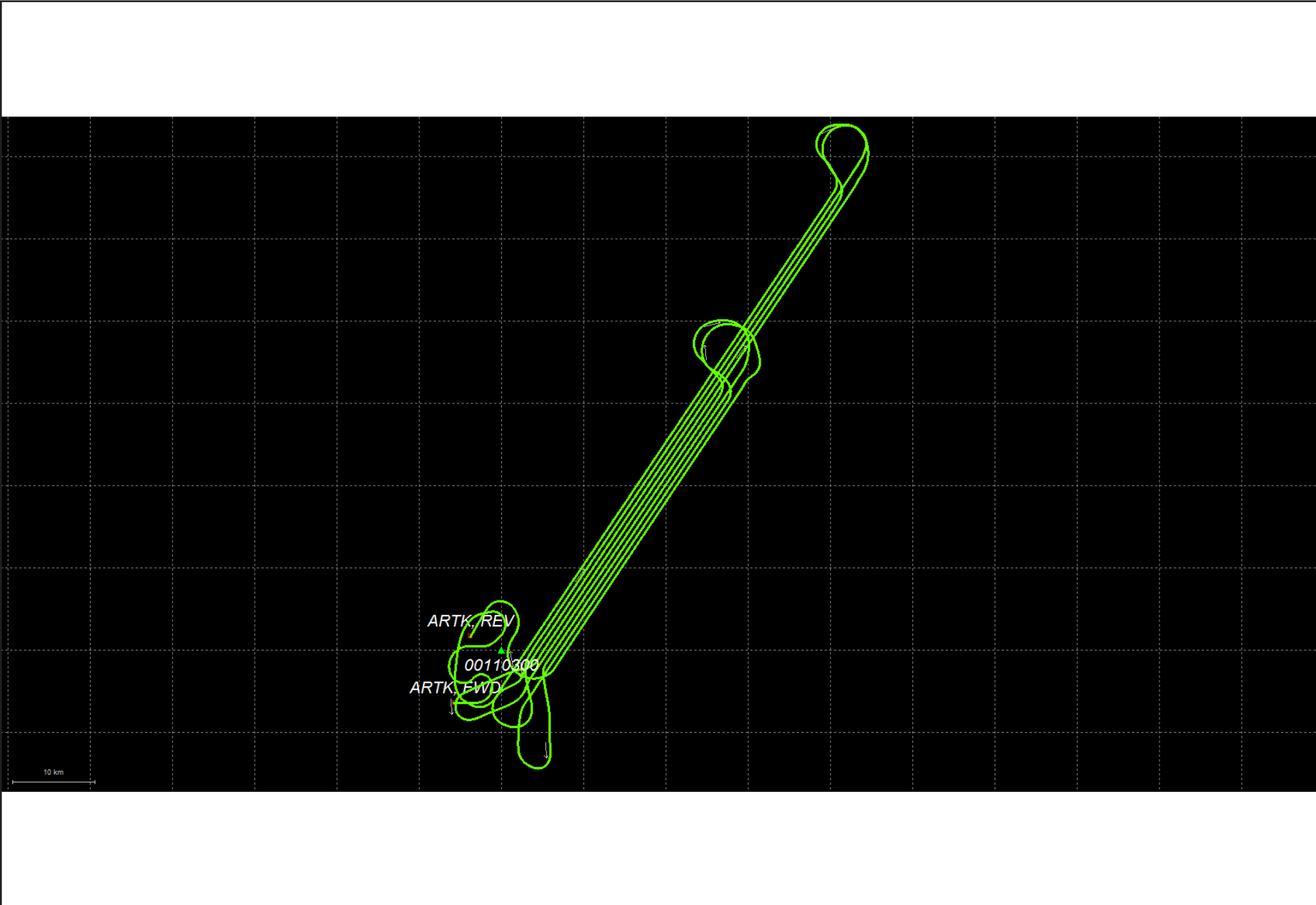
Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
2202	12/9/2019	259962224	259962232
2203	12/9/2019	259962467	259962475
2204	12/9/2019	259963017	259963017
2101	12/10/2019	260039185	260039629
2100	12/10/2019	260040022	258660600
2099	12/10/2019	260040601	260040817
2098	12/10/2019	260041456	260041632
2125	12/10/2019	260047063	260047069
2128	12/10/2019	260048039	260048051
2131	12/10/2019	260048314	260048349
2134	12/10/2019	260048888	260049176
2143	12/10/2019	260049434	260049684
2211	12/10/2019	260050367	260050724
2207	12/10/2019	260051168	260051499
2117	12/10/2019	260209724	260042610
2118	12/10/2019	260210458	260043740
2119	12/10/2019	260210874	260044046
2120	12/10/2019	260211859	260045279
2121	12/10/2019	260212918	260045541
2123	12/10/2019	260213990	260046805
2122	12/11/2019	260122488	260122655
2130	12/11/2019	260122797	260122923
2127	12/11/2019	260123927	260124066
2136	12/11/2019	260124255	260124379
2133	12/11/2019	260124604	260124737
2140	12/11/2019	260124926	260125057
2138	12/11/2019	260125306	260125446
2142	12/11/2019	260125668	260125796
2145	12/11/2019	260126008	260126157
2148	12/11/2019	260126363	260126504
2151	12/11/2019	260126740	260126898
2177	12/11/2019	260128020	258924384
2176	12/11/2019	260128273	258923660
2129	12/12/2019	260214616	260214994

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
2126	12/12/2019	260215185	260215551
2132	12/12/2019	260215816	260216113
2035	12/16/2019	260557804	260558323
2036	12/16/2019	260558590	260559204
2037	12/16/2019	260559417	260560065
2038	12/16/2019	260562036	260562677
2039	12/16/2019	260562913	260563558
2044	12/16/2019	260563856	260563938
2040	12/16/2019	260564257	260564530
2041	12/16/2019	260564746	260565012
2042	12/16/2019	260565268	260565382
2043	12/16/2019	260565591	260565702
2213	12/16/2019	260566080	260566162
2208	12/16/2019	260566950	260567323
2062	12/17/2019	260646874	260646874
2063	12/17/2019	260647149	260647227
2064	12/17/2019	260647586	260647727
2065	12/17/2019	260647962	260648091
2066	12/17/2019	260648501	260648512
2067	12/17/2019	260649237	260649537
2068	12/17/2019	260650139	260650343
2069	12/17/2019	260650678	260650696
2070	12/17/2019	260651976	260652049
2071	12/17/2019	260652287	260652418
2183	12/17/2019	260653427	260653581
2184	12/17/2019	260654021	260654214
2185	12/17/2019	260654674	260655018
2186	12/17/2019	260655598	260655626
2187	12/17/2019	260655881	260655018
2188	12/17/2019	260656814	260656886
2189	12/17/2019	260657111	260657205
2190	12/17/2019	260657819	260658178
2191	12/17/2019	260658583	260658662
2192	12/17/2019	260658883	260659193

Lift Name	Lift Date	Start Time (GPS seconds)	End Time (GPS)
2193	12/17/2019	260659414	260659414
2194	12/17/2019	260659981	260660021
2135	12/18/2019	260729672	260729958
2137	12/18/2019	260731561	260731751
2139	12/18/2019	260732025	260732178
2141	12/18/2019	260732413	260732511
2147	12/18/2019	260733595	260733829
2144	12/18/2019	260734074	260734322
2178	12/24/2019	260127763	261252153
2146	1/2/2020	262027402	262027658
2149	1/2/2020	262028125	262028438
2152	1/2/2020	262028836	262029159
2154	1/2/2020	262030078	262030197
2156	1/2/2020	262030621	262030724
2158	1/2/2020	262031864	262031947
2160	1/2/2020	262032374	262032807
2164	1/2/2020	262034572	262035168
2092	1/6/2020	259956151	262376381
2163	1/6/2020	262378059	262378238
2161	1/6/2020	262378569	262378626
2159	1/6/2020	262379412	262379480
2157	1/6/2020	262379903	262379950
2155	1/6/2020	262380703	262380771
2153	1/6/2020	262381091	262381186
2150	1/6/2020	262381883	262381889

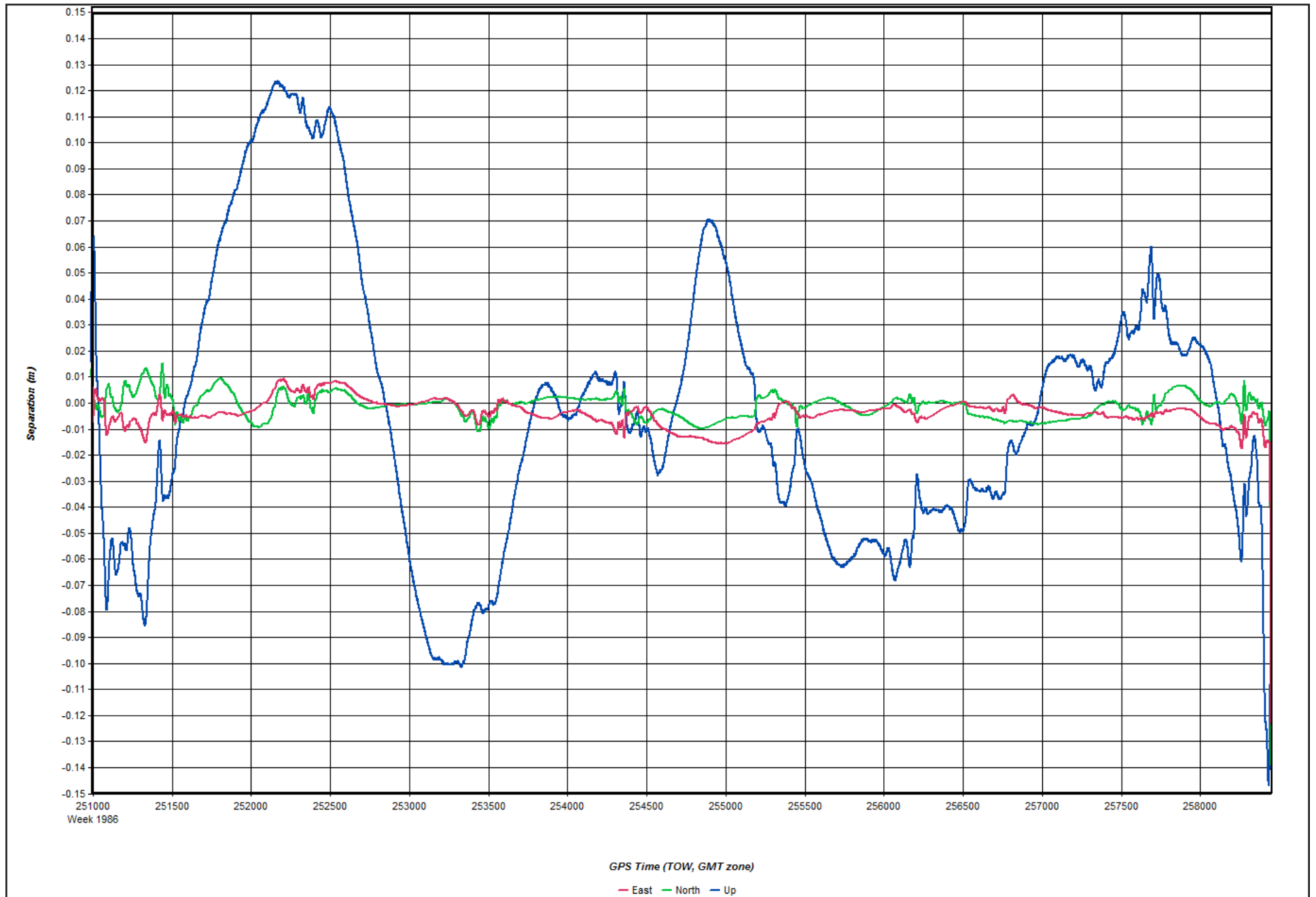
Appendix 3: GPS / IMU Report

Figure 1: Map



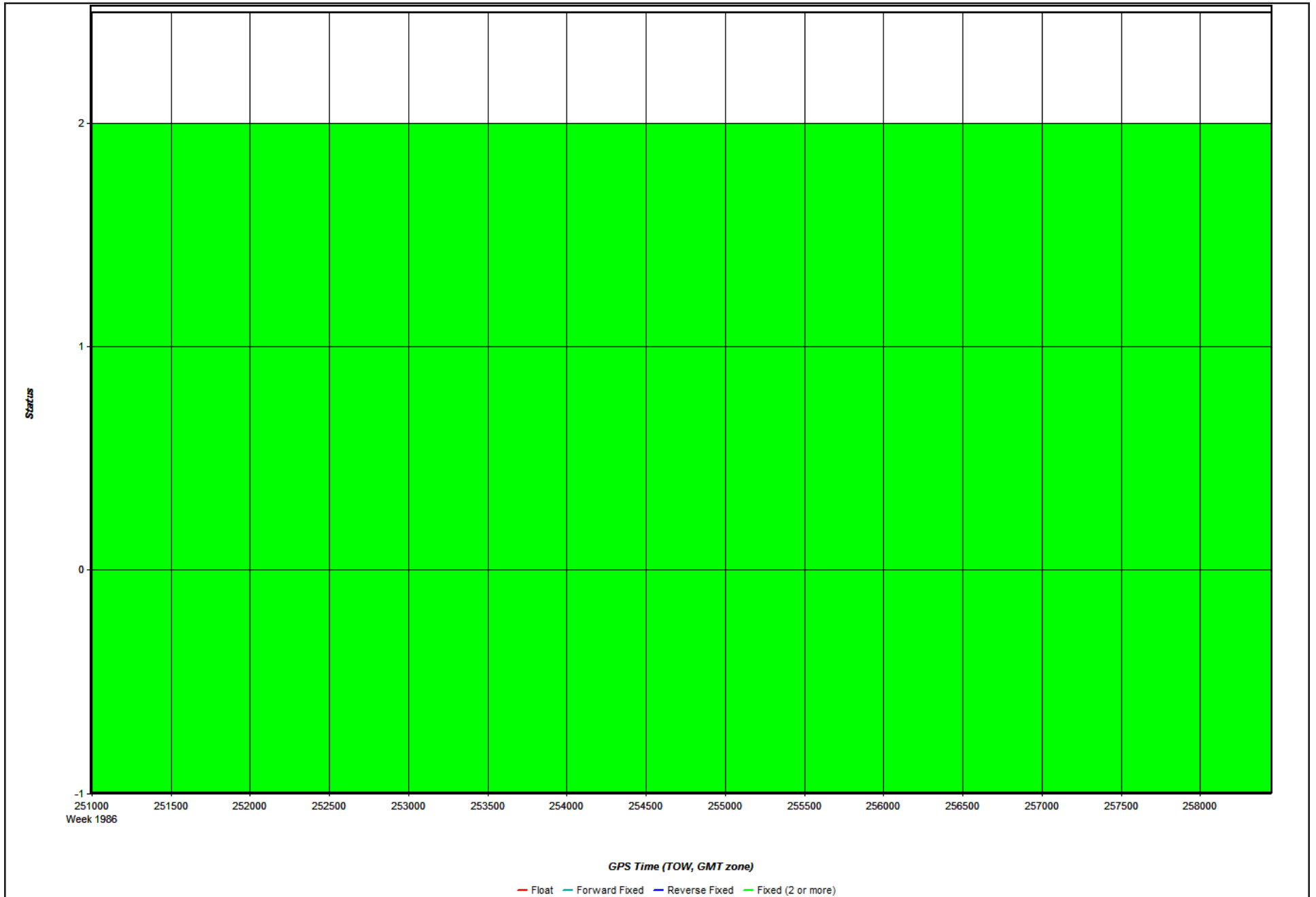
2018-01-30_Day030_7 - 20180130205831

Figure 2: Forward/Reverse or Combined Separation Plot



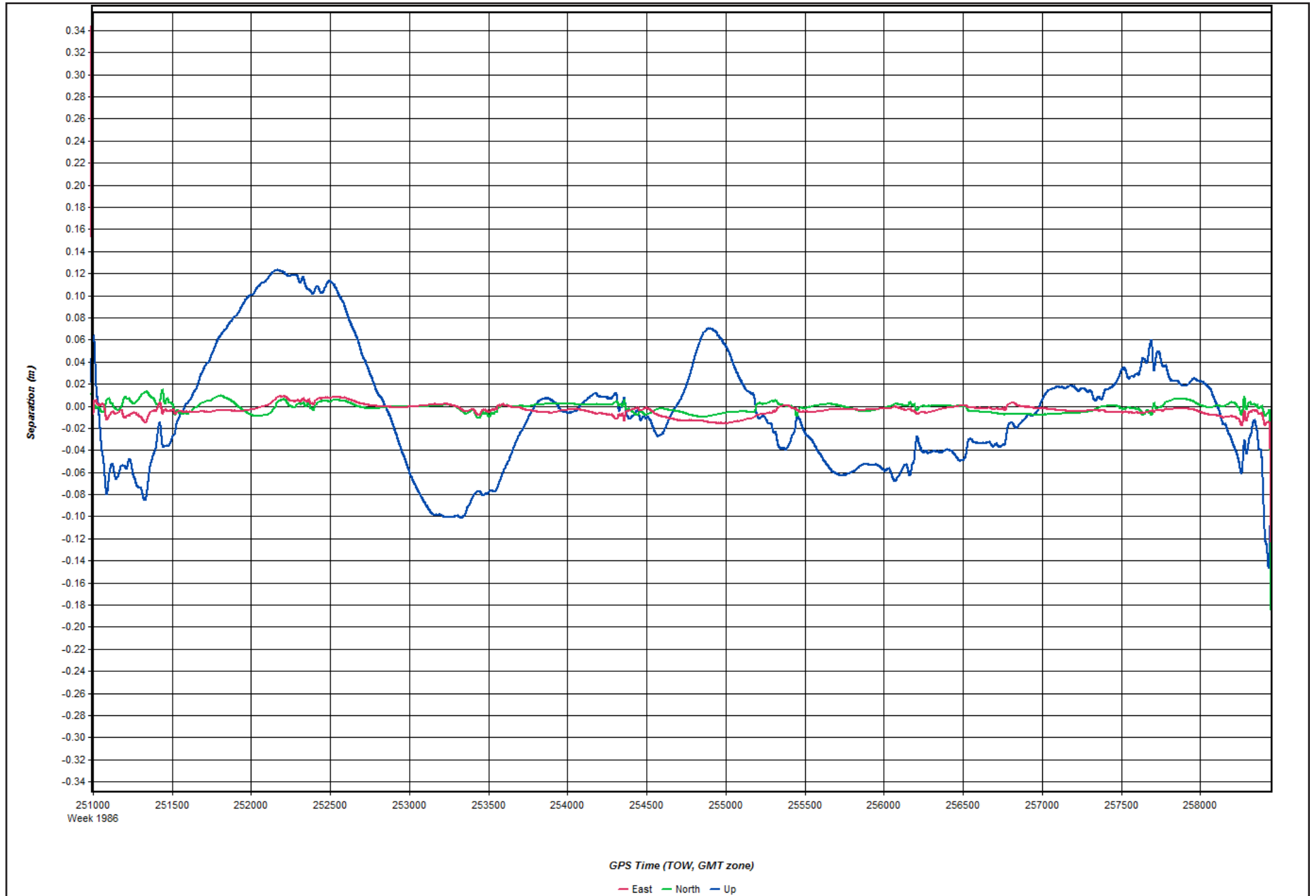
2018-01-30_Day030_7 - 20180130205831

Figure 3: Float or Fixed Ambiguity



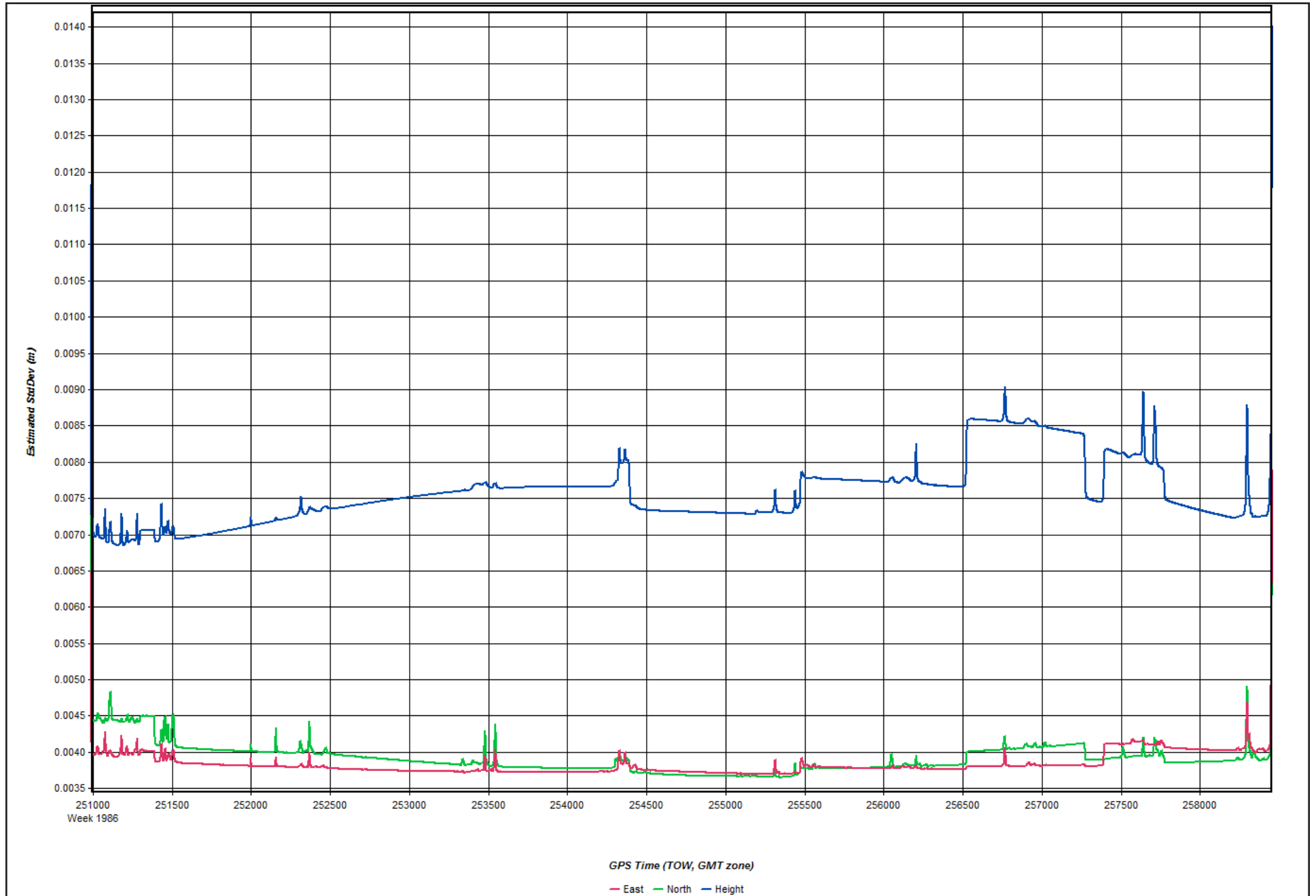
2018-01-30_Day030_7 - 20180130205831

Figure 4: Forward/Reverse Separation Plot (Fixed)



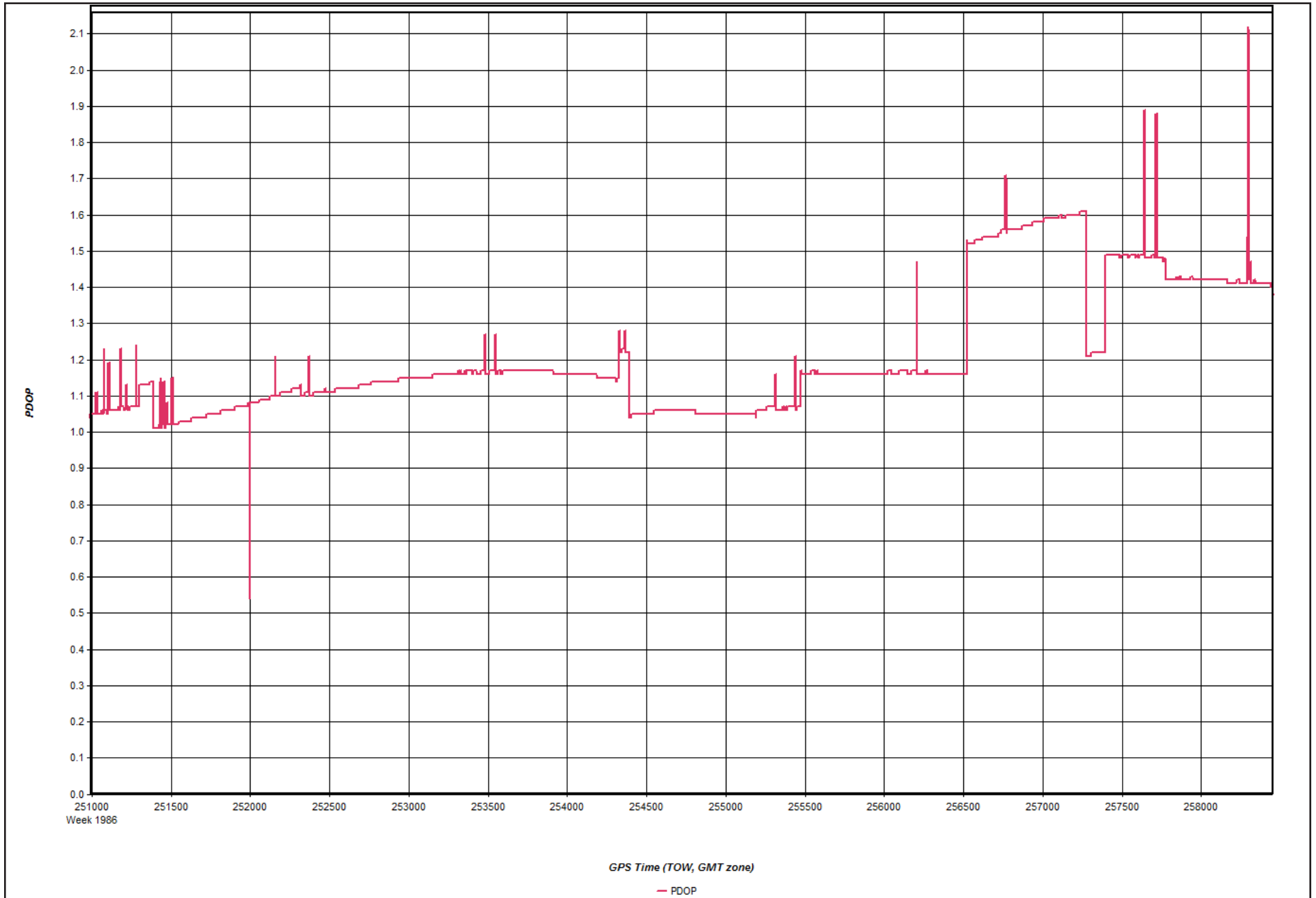
2018-01-30_Day030_7 - 20180130205831

Figure 5: Estimated Position Accuracy Plot



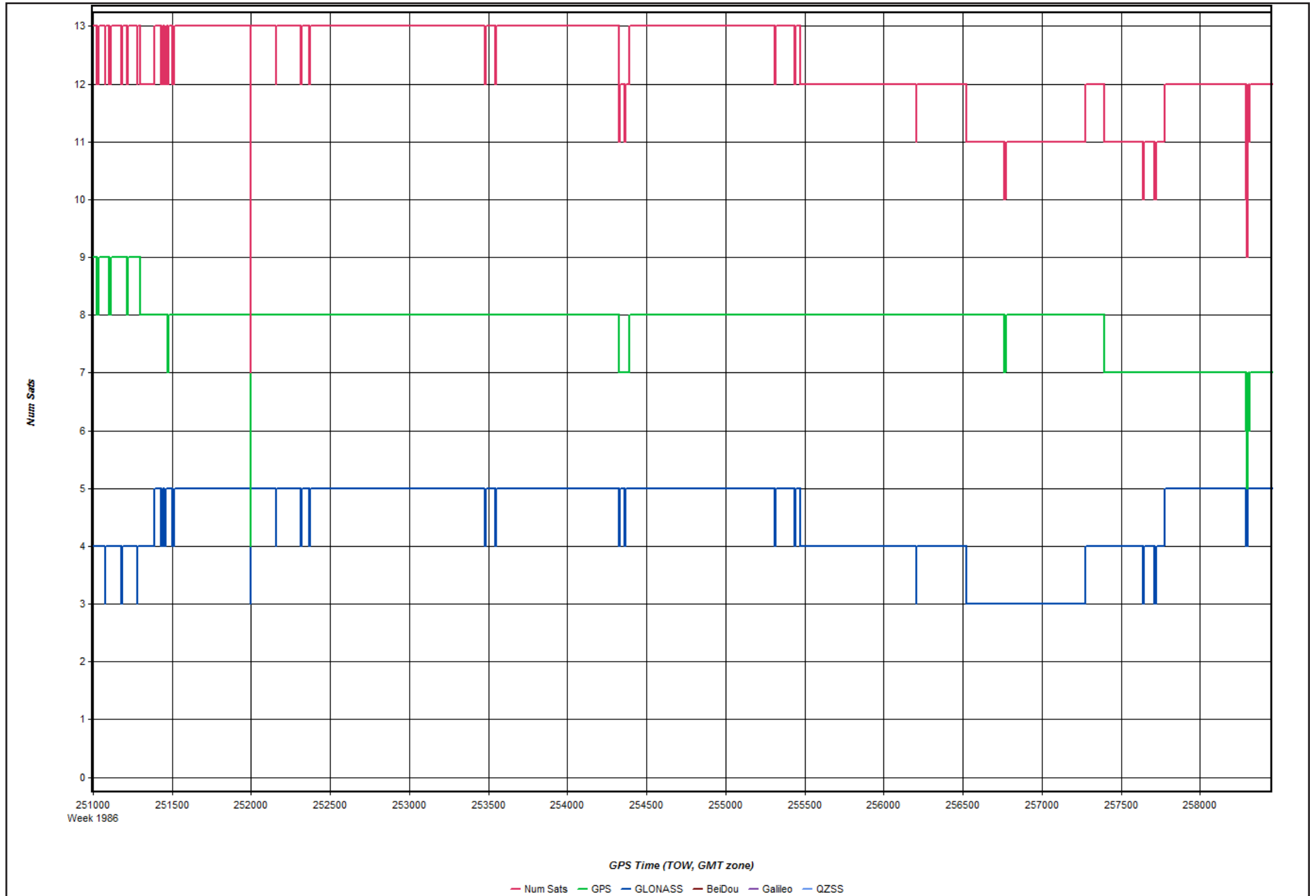
2018-01-30_Day030_7 - 20180130205831

Figure 6: PDOP Plot



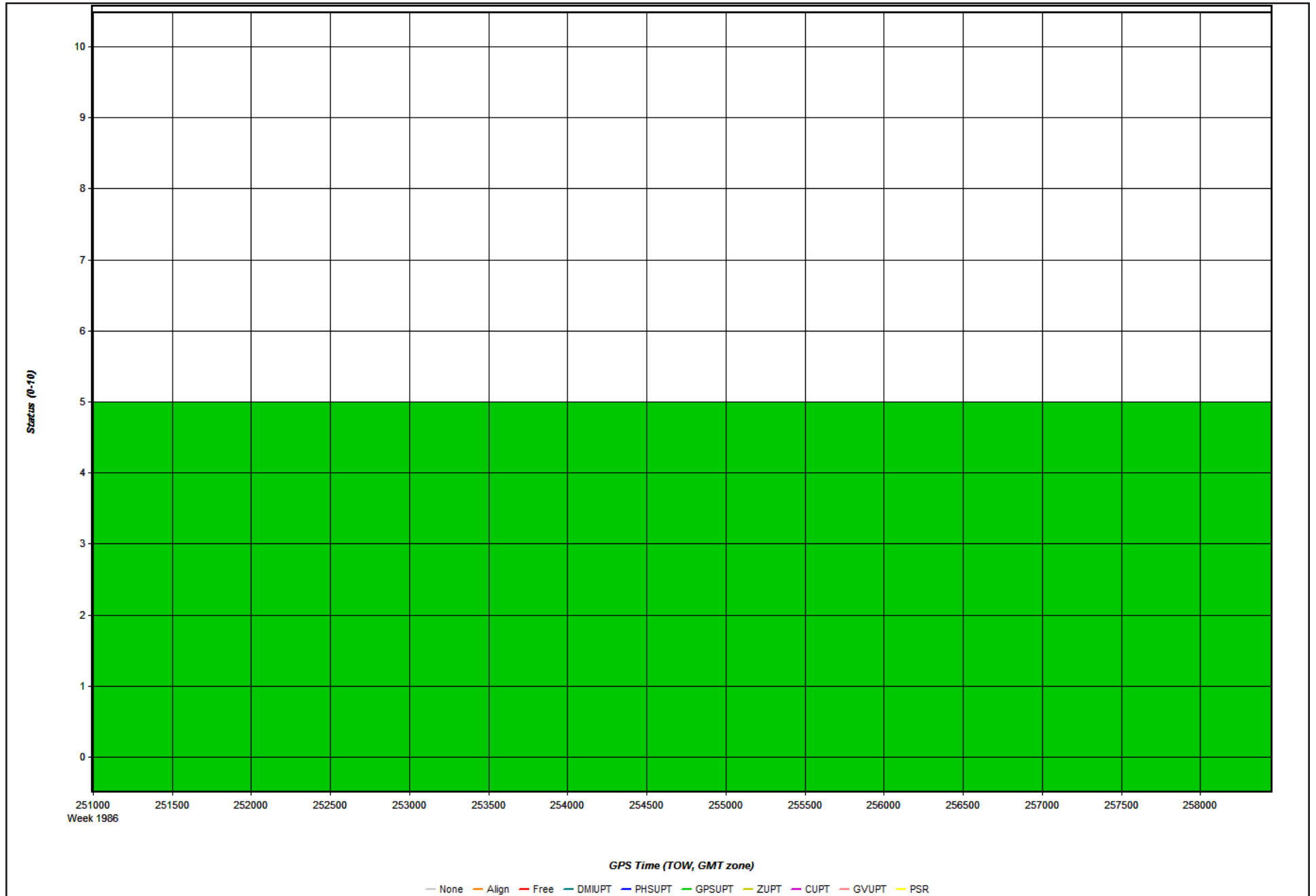
2018-01-30_Day030_7 - 20180130205831

Figure 7: Number of Satellites Line Plot



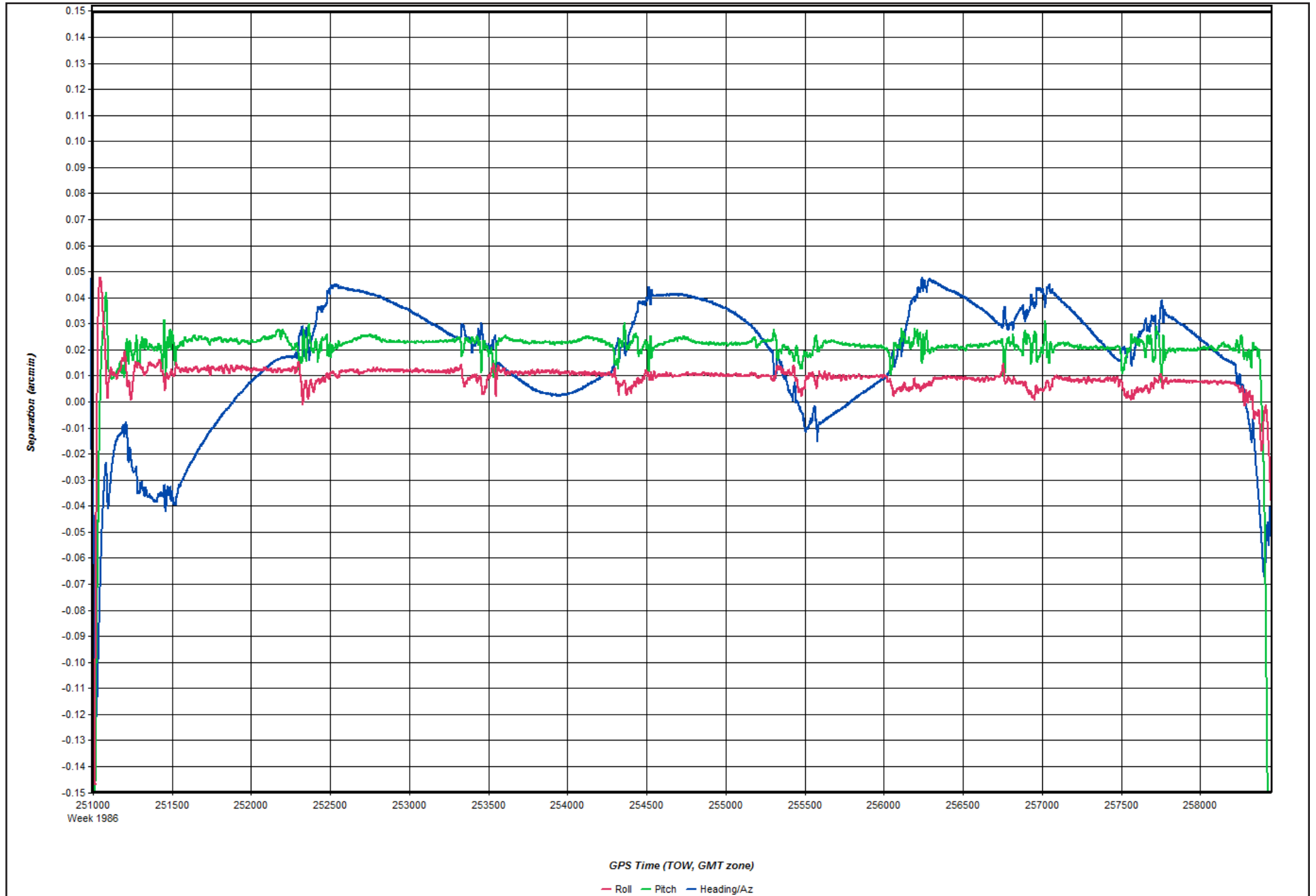
2018-01-30_Day030_7 - 20180130205831

Figure 8: Status flag for IMU processing



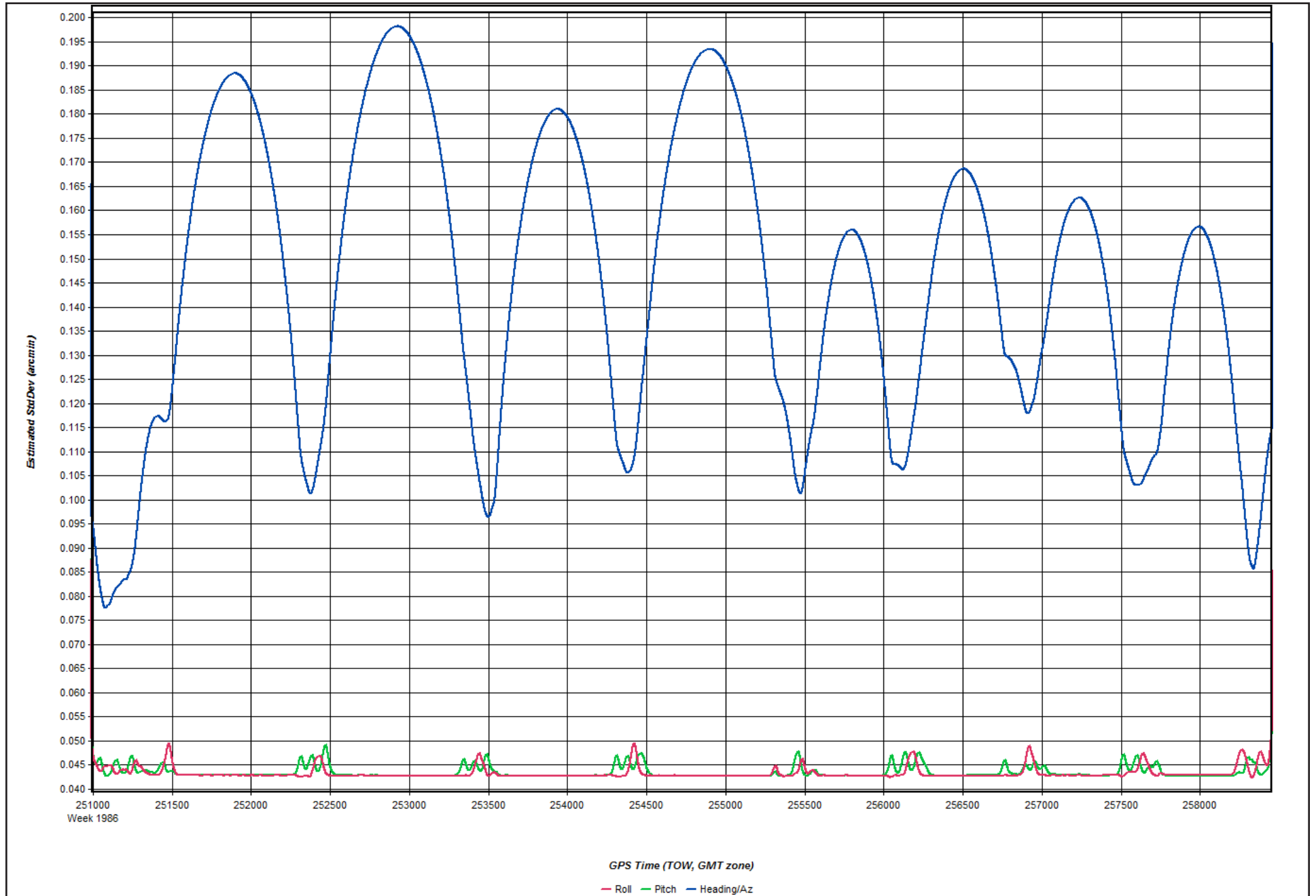
2018-01-30_Day030_7 - 20180130205831

Figure 9: Fwd/Rev Attitude Separation Plot



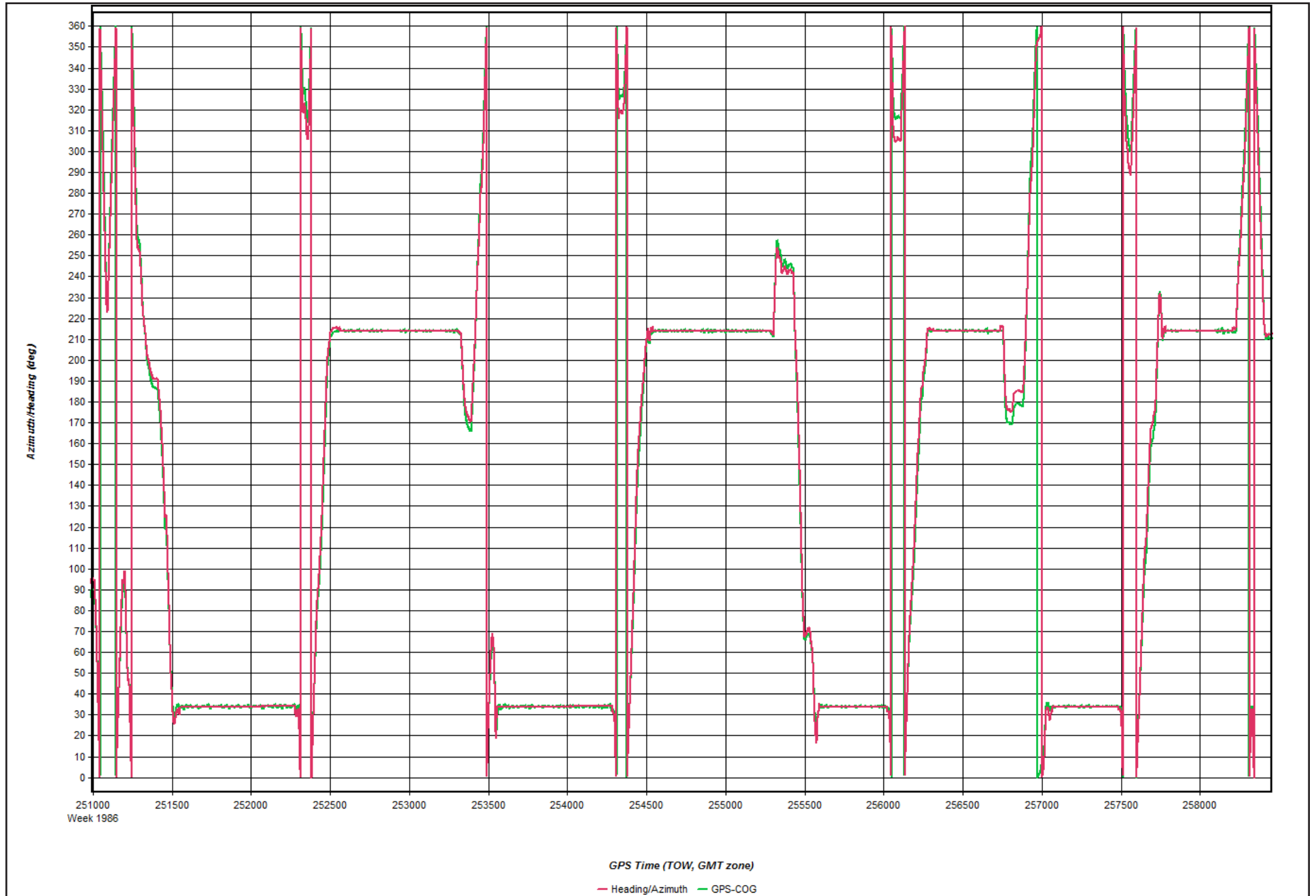
2018-01-30_Day030_7 - 20180130205831

Figure 10: Estimated Attitude Accuracy Plot



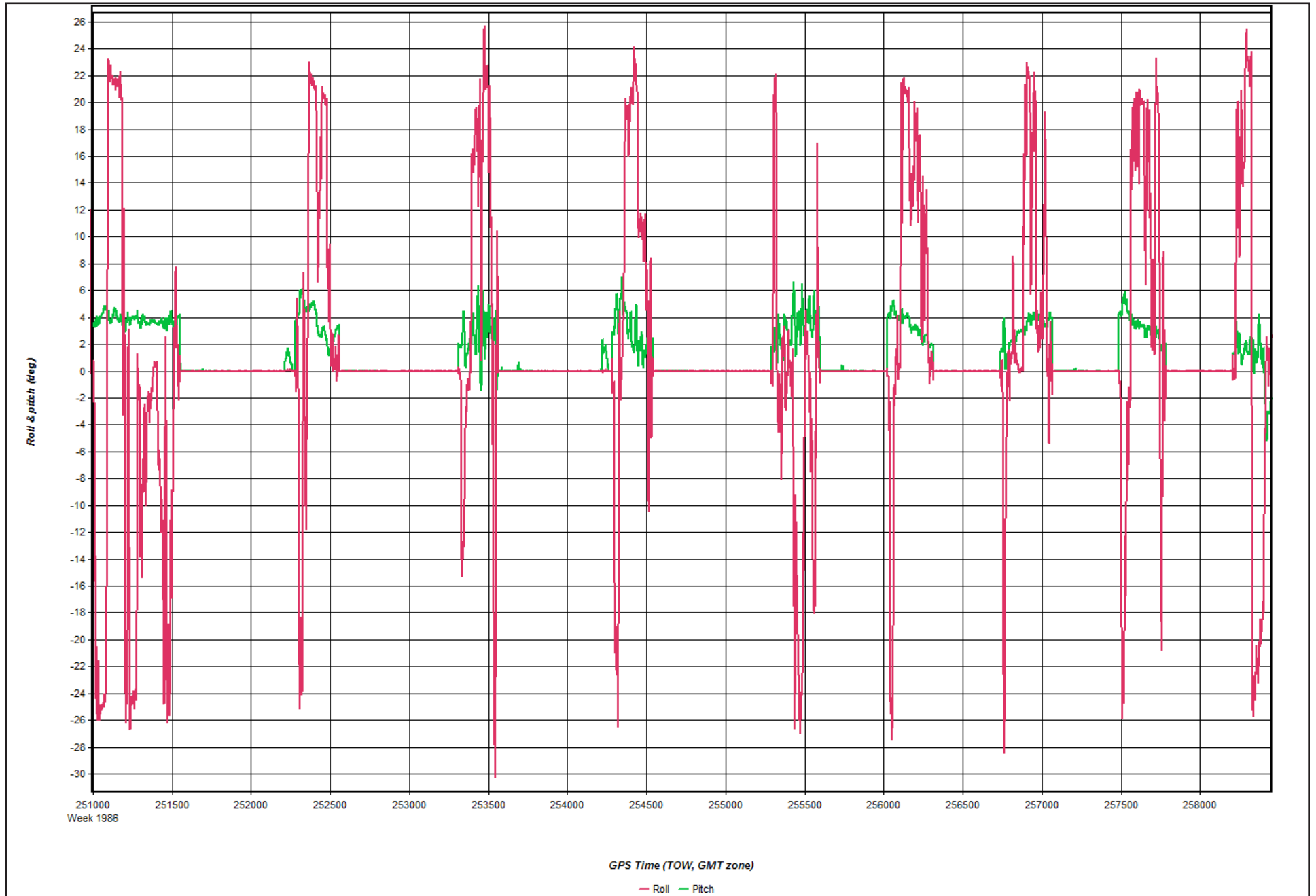
2018-01-30_Day030_7 - 20180130205831

Figure 11: Azimuth Plot



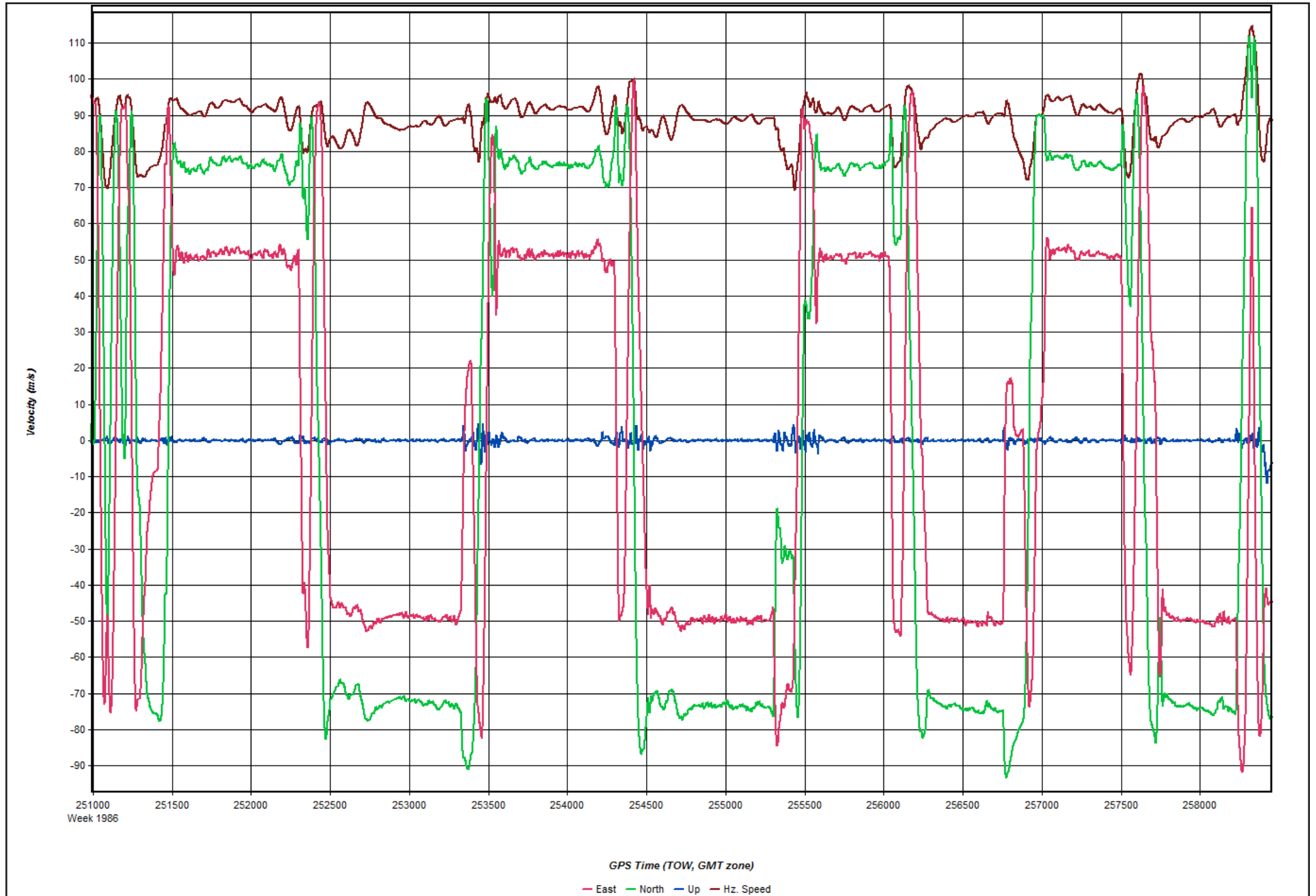
2018-01-30_Day030_7 - 20180130205831

Figure 12: Roll & Pitch Plot



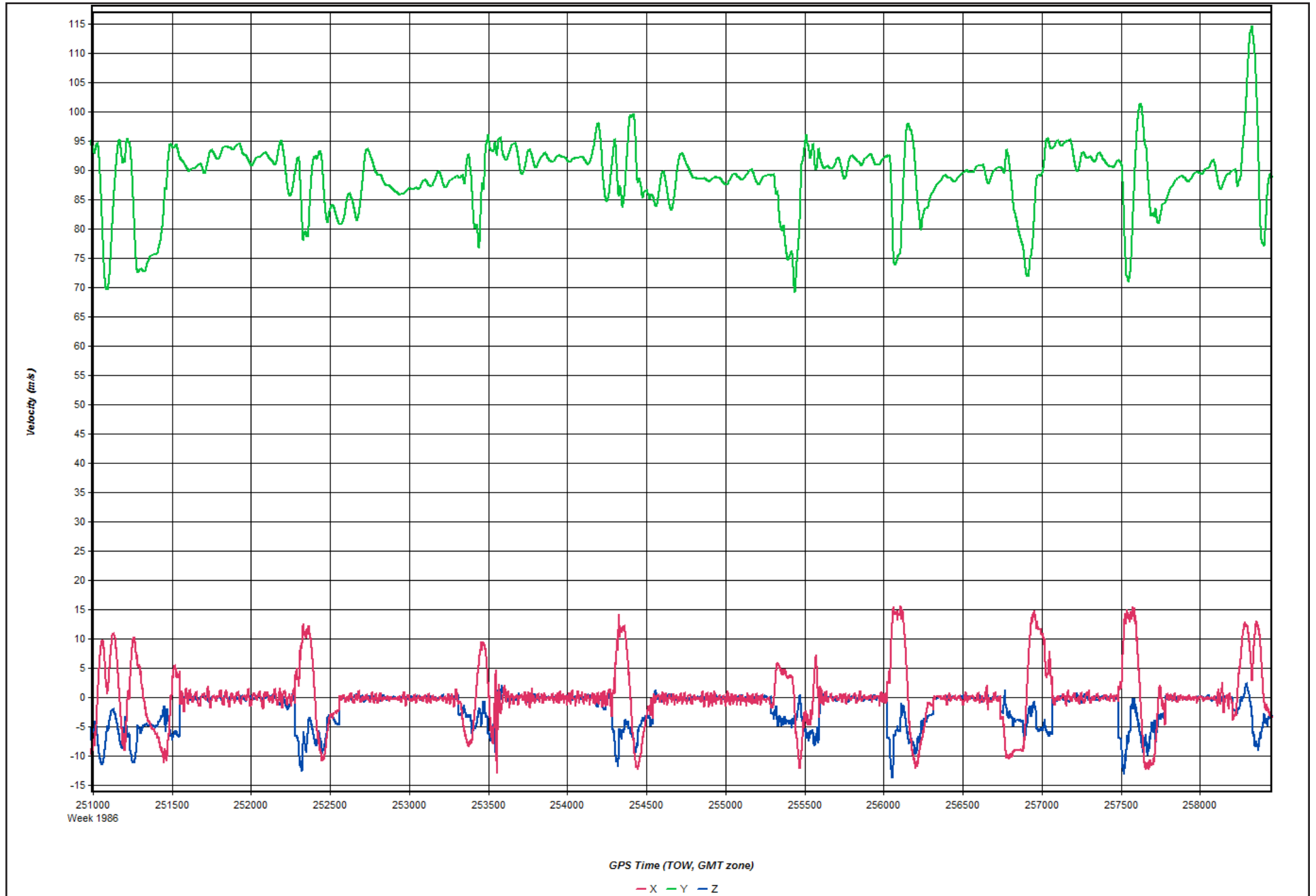
2018-01-30_Day030_7 - 20180130205831

Figure 13: Velocity Profile Plot



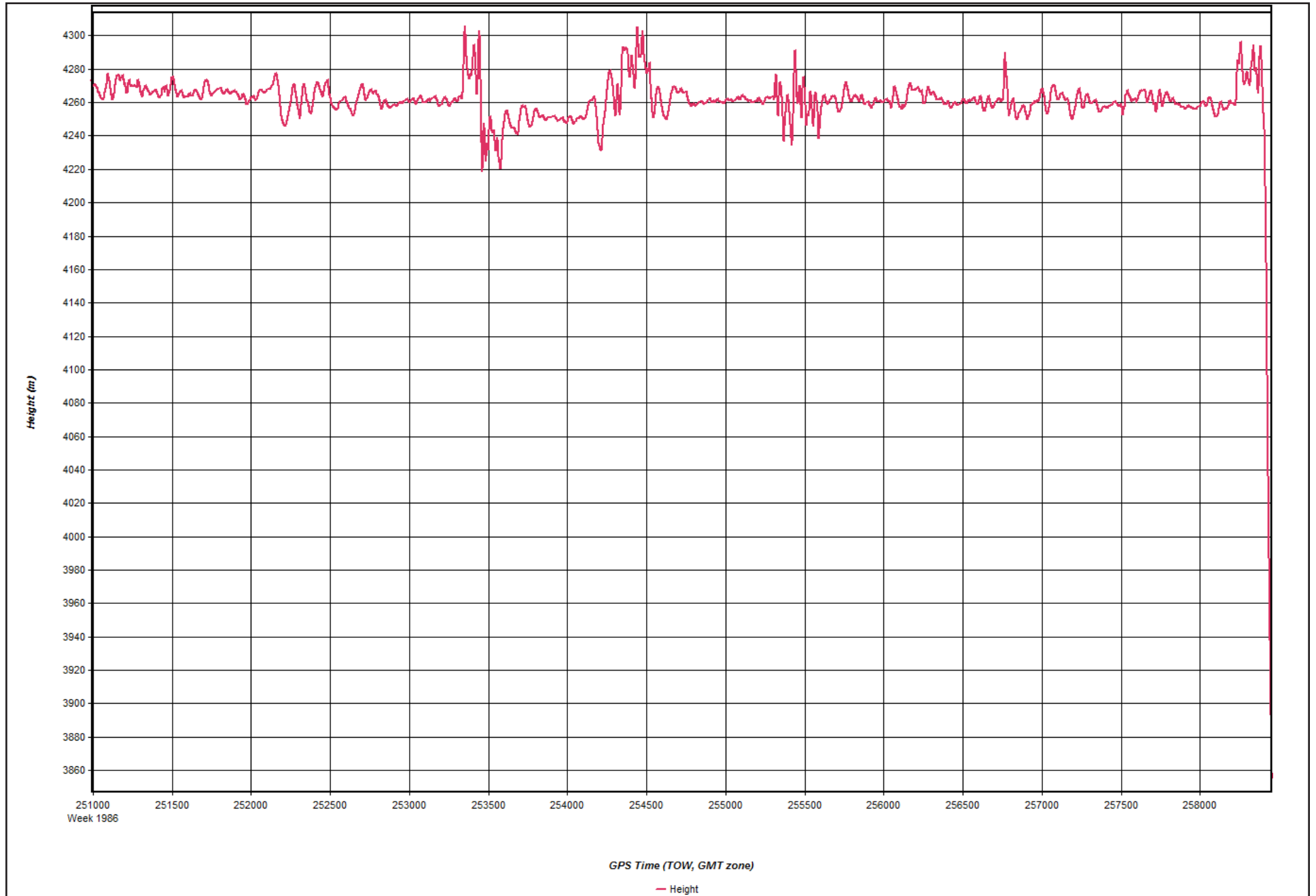
2018-01-30_Day030_7 - 20180130205831

Figure 14: Body Frame Velocity Plot



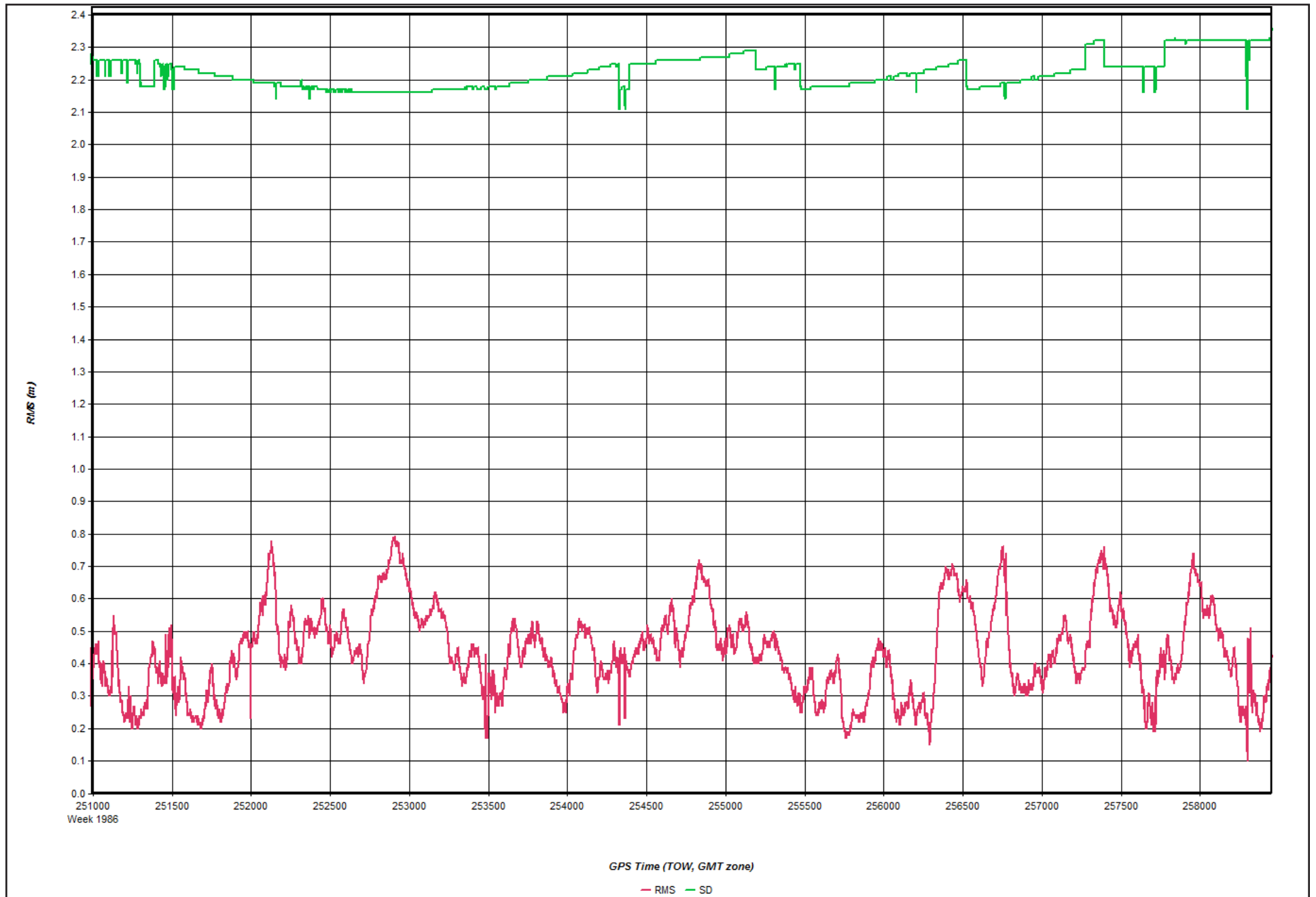
2018-01-30_Day030_7 - 20180130205831

Figure 15: Height Profile Plot



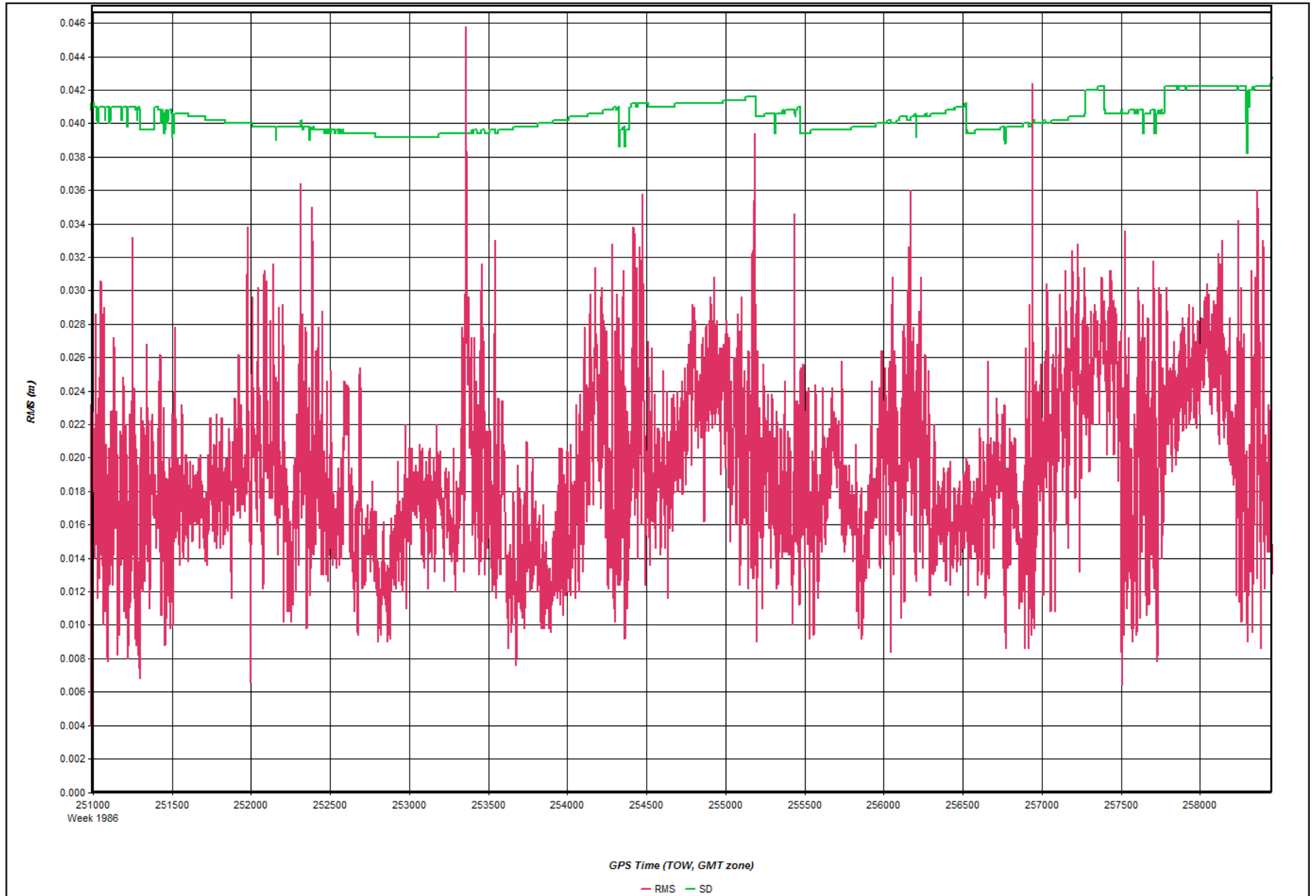
2018-01-30_Day030_7 - 20180130205831

Figure 16: C/A Code Residual RMS Plot



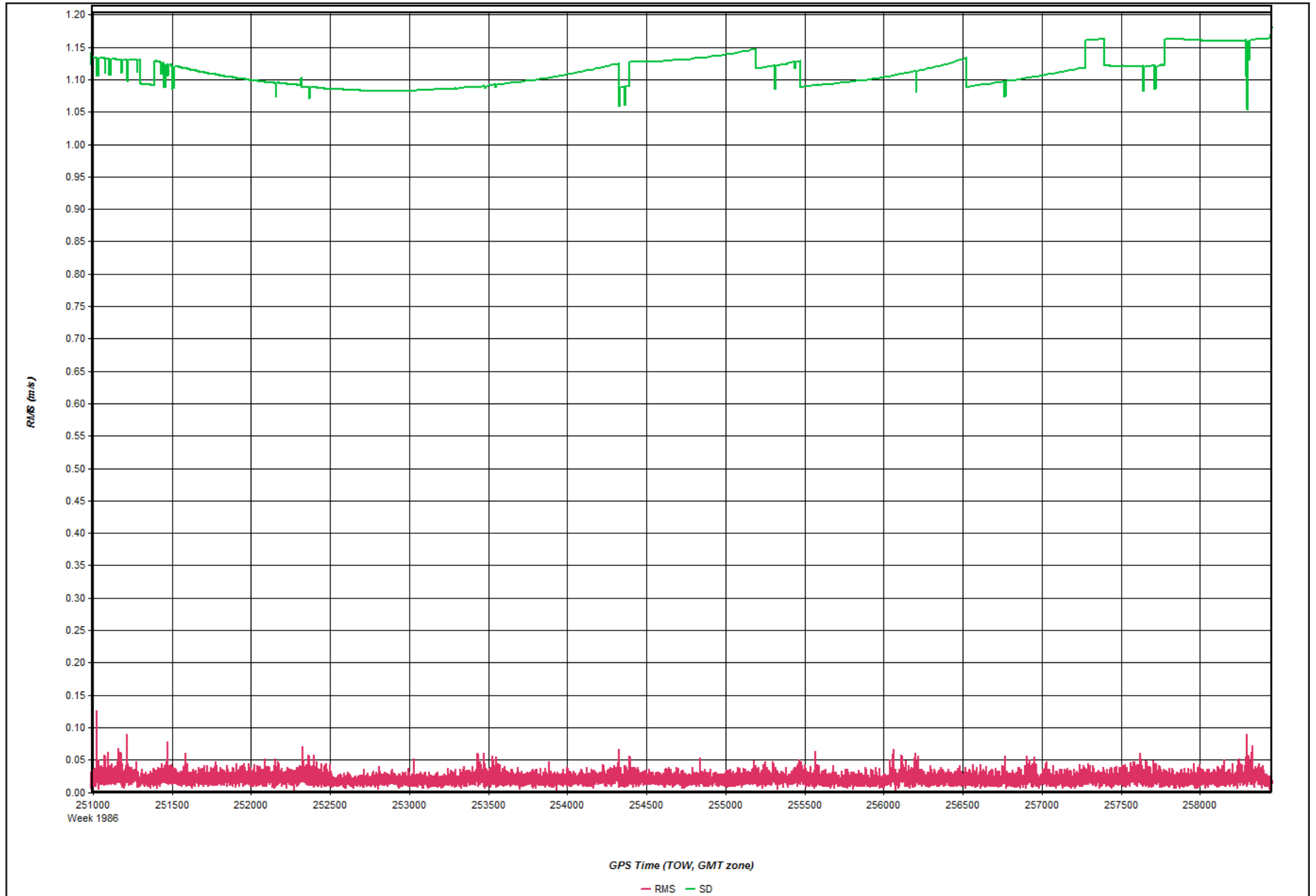
2018-01-30_Day030_7 - 20180130205831

Figure 17: Carrier Residual RMS Plot



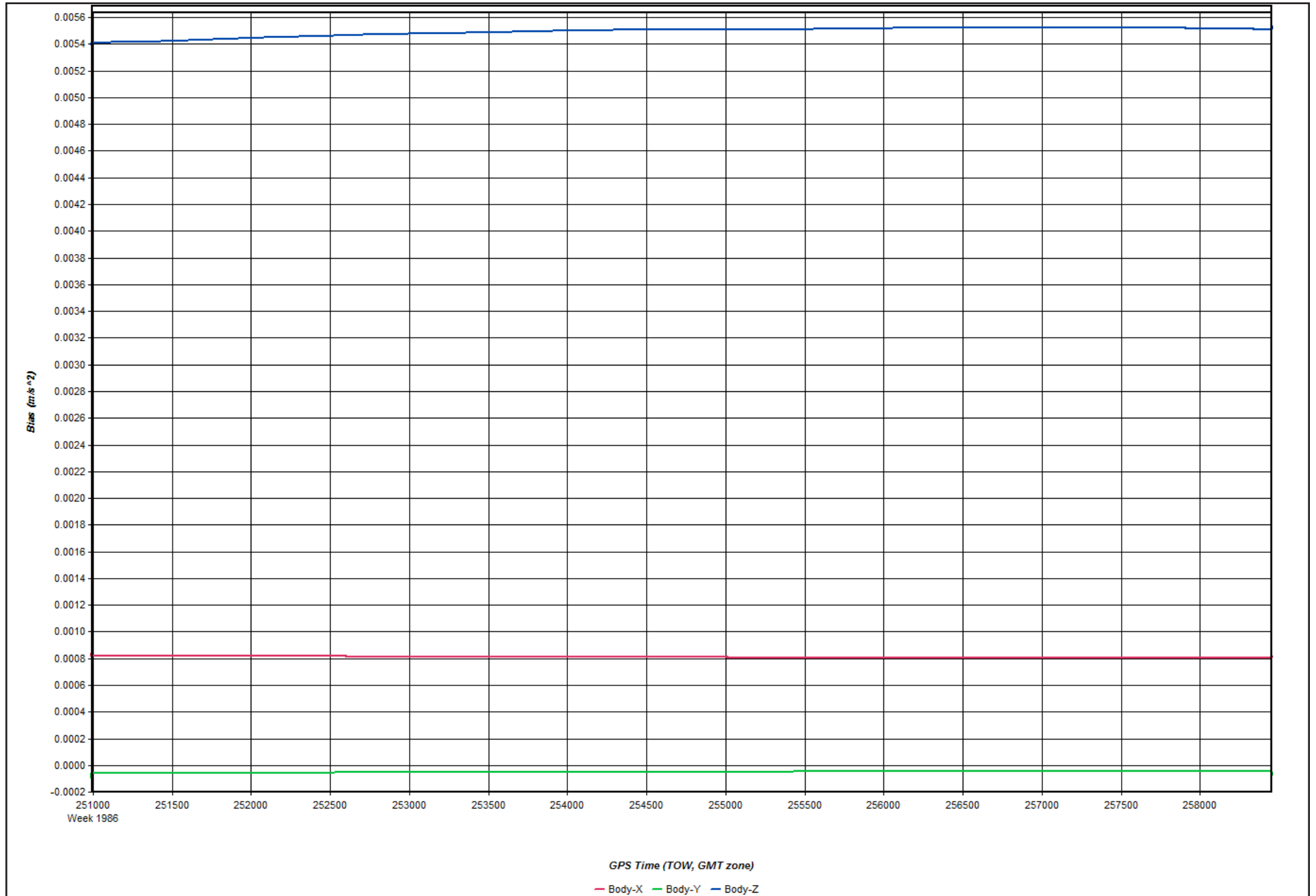
2018-01-30_Day030_7 - 20180130205831

Figure 18: L1 Doppler Residual RMS Plot



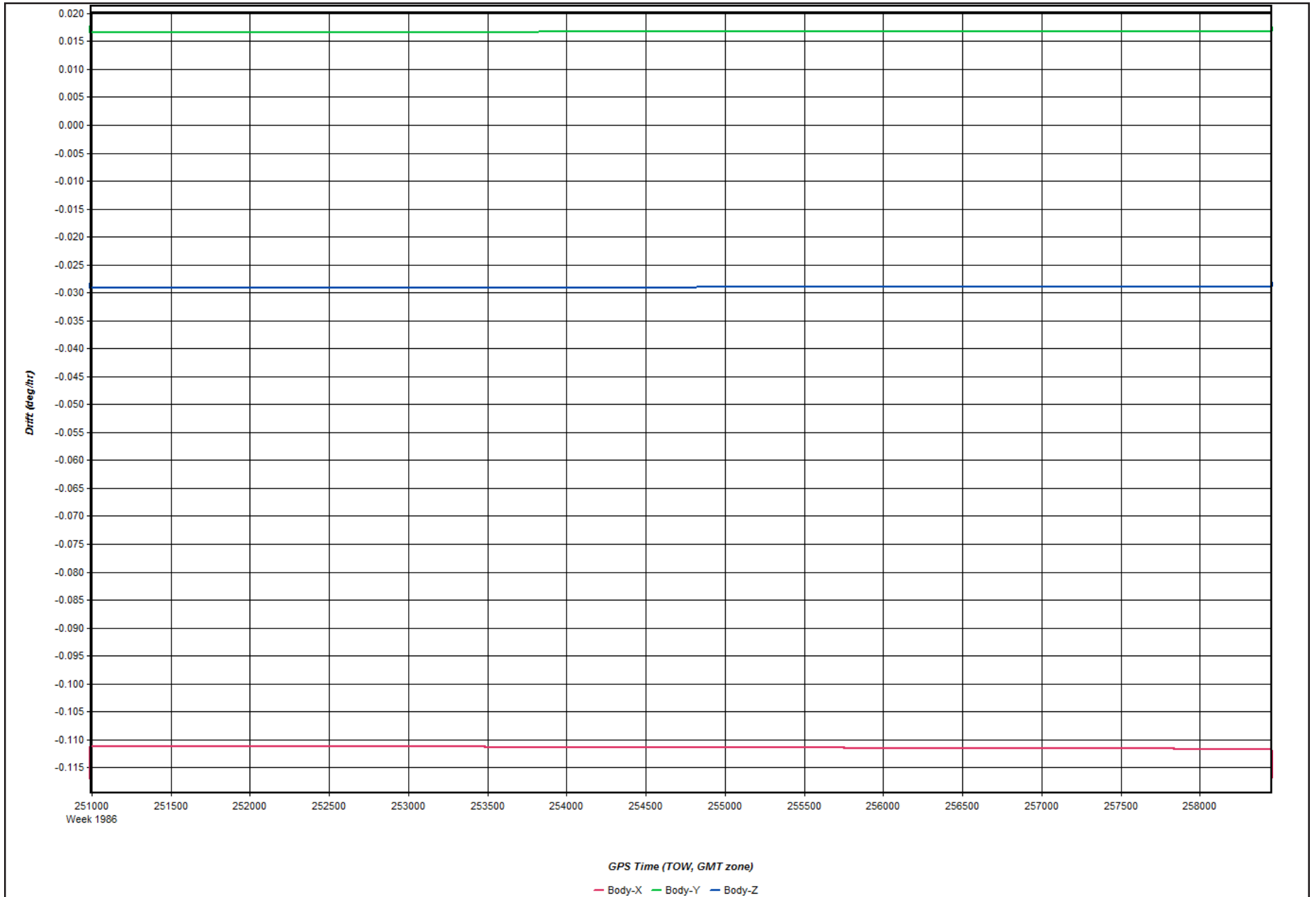
2018-01-30_Day030_7 - 20180130205831

Figure 19: Accelerometer Bias Plot



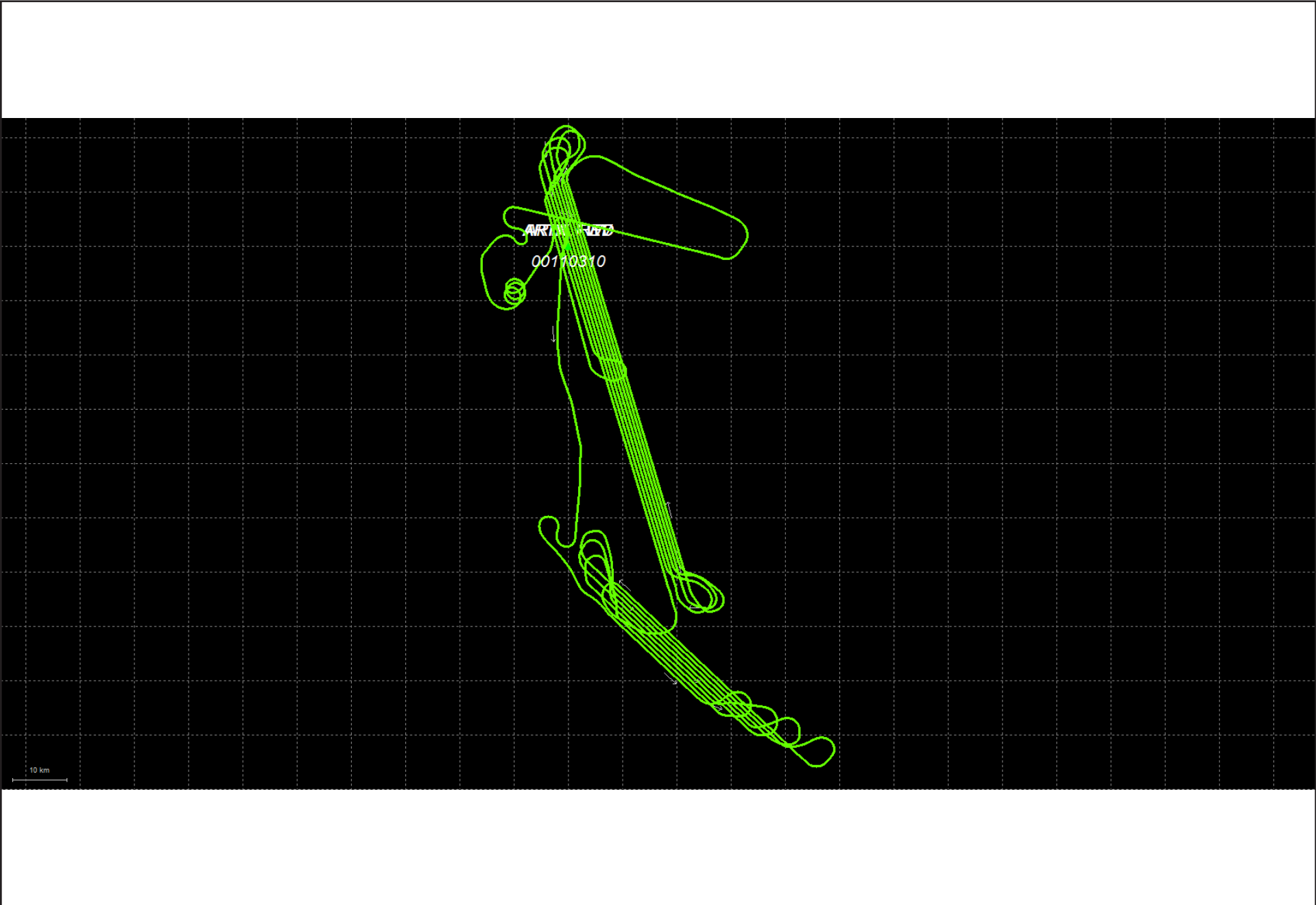
2018-01-30_Day030_7 - 20180130205831

Figure 20: Gyro Drift Plot



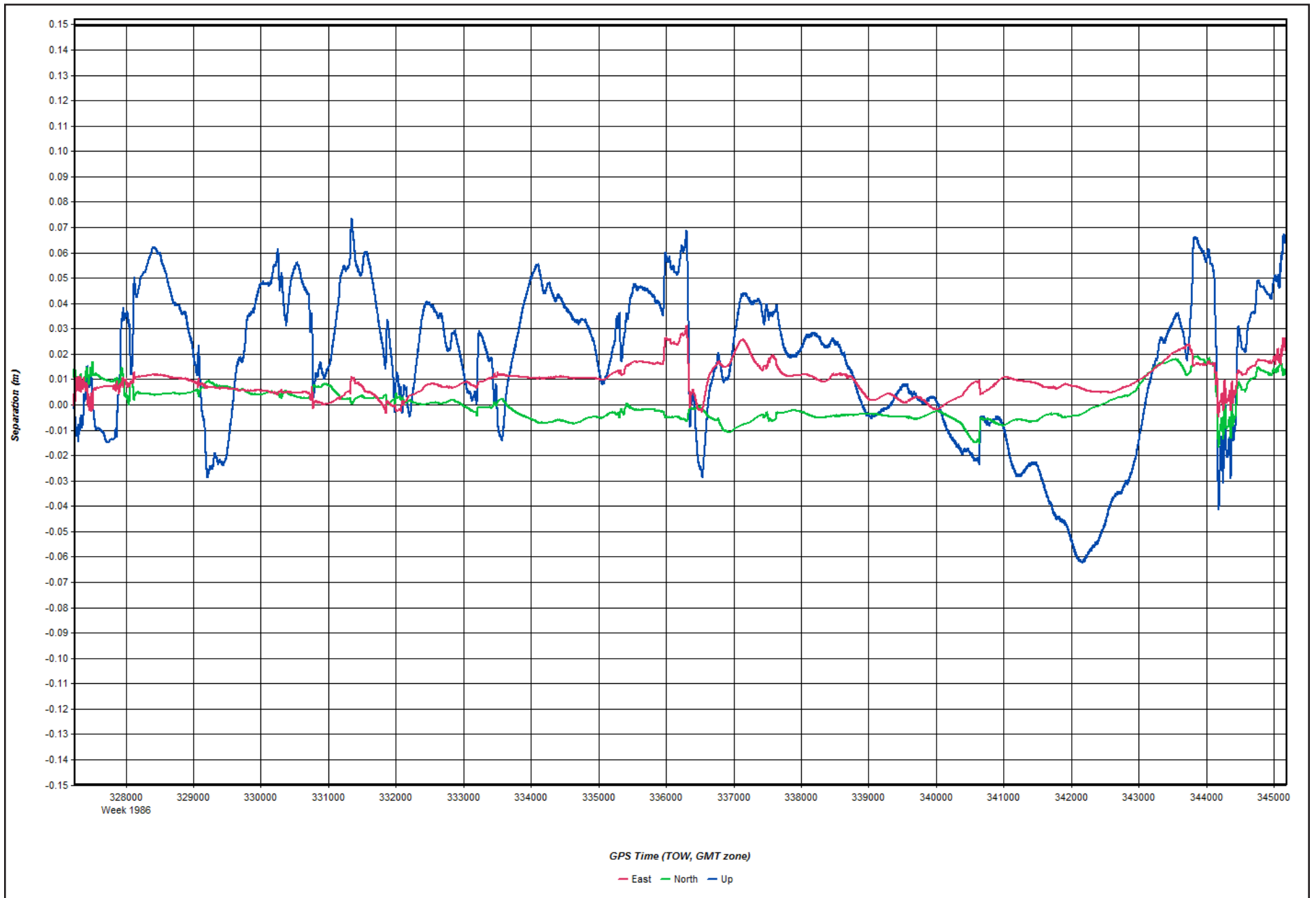
2018-01-31_Day031_7 - 20180131185129

Figure 1: Map



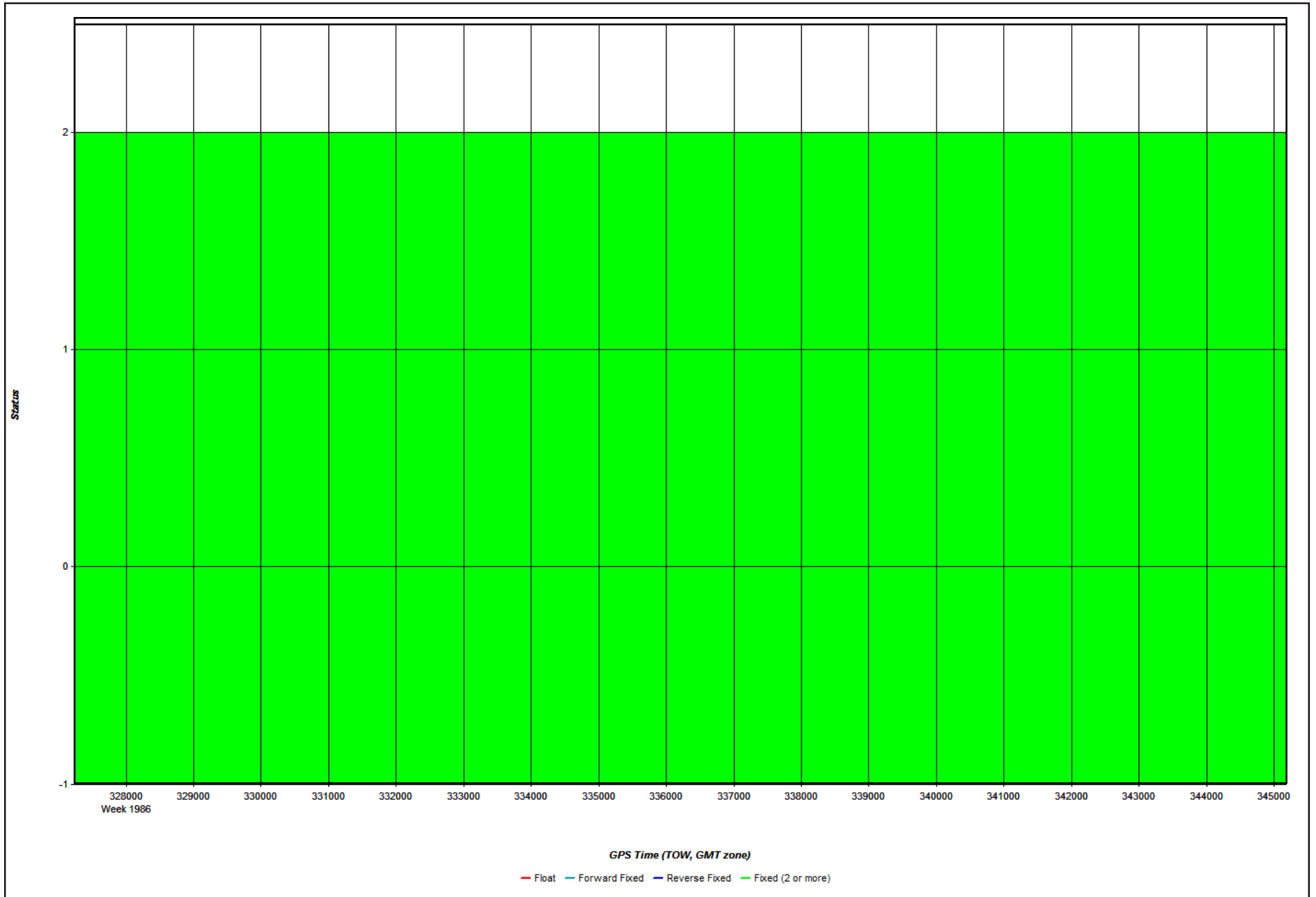
2018-01-31_Day031_7 - 20180131185129

Figure 2: Forward/Reverse or Combined Separation Plot



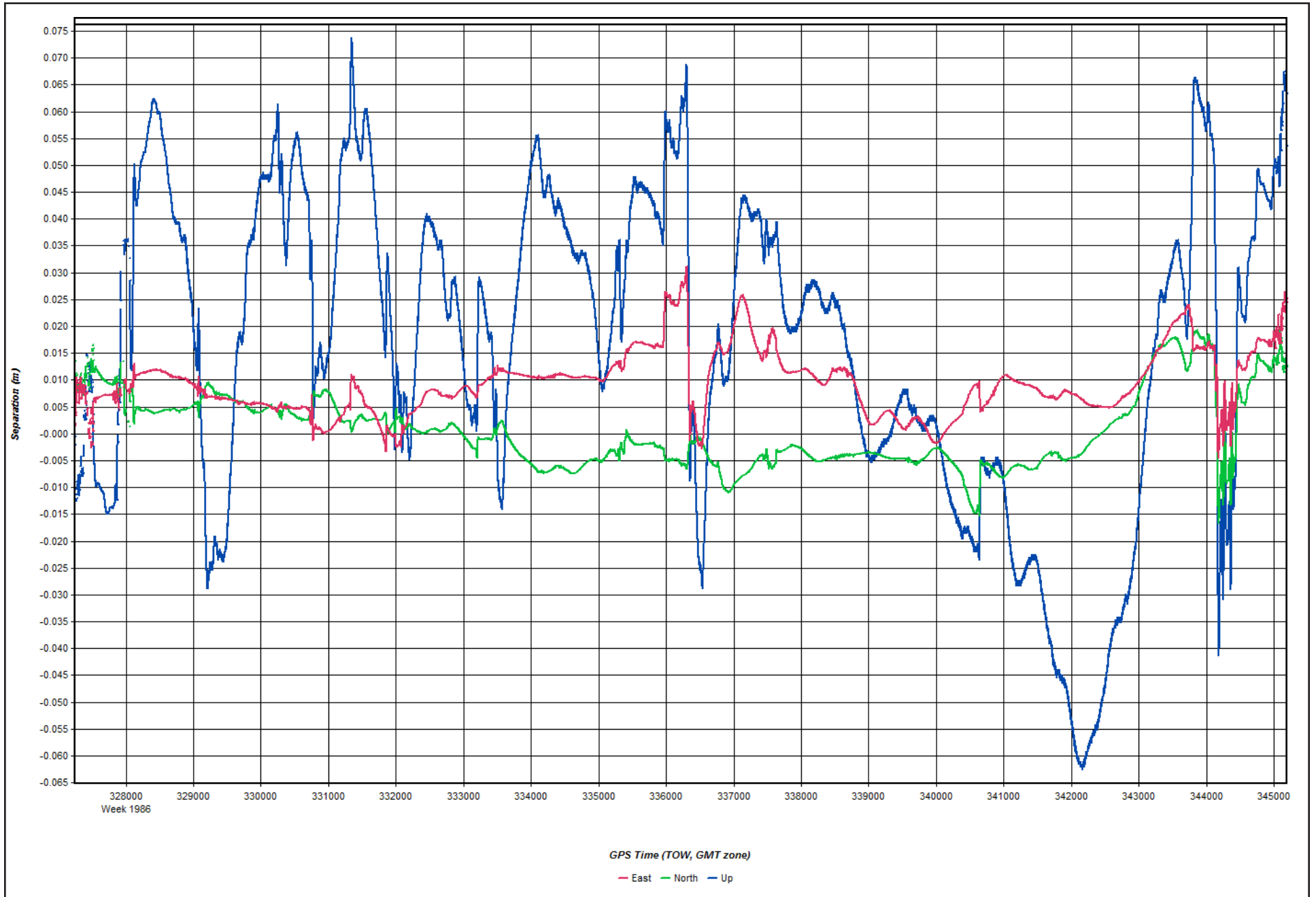
2018-01-31_Day031_7 - 20180131185129

Figure 3: Float or Fixed Ambiguity



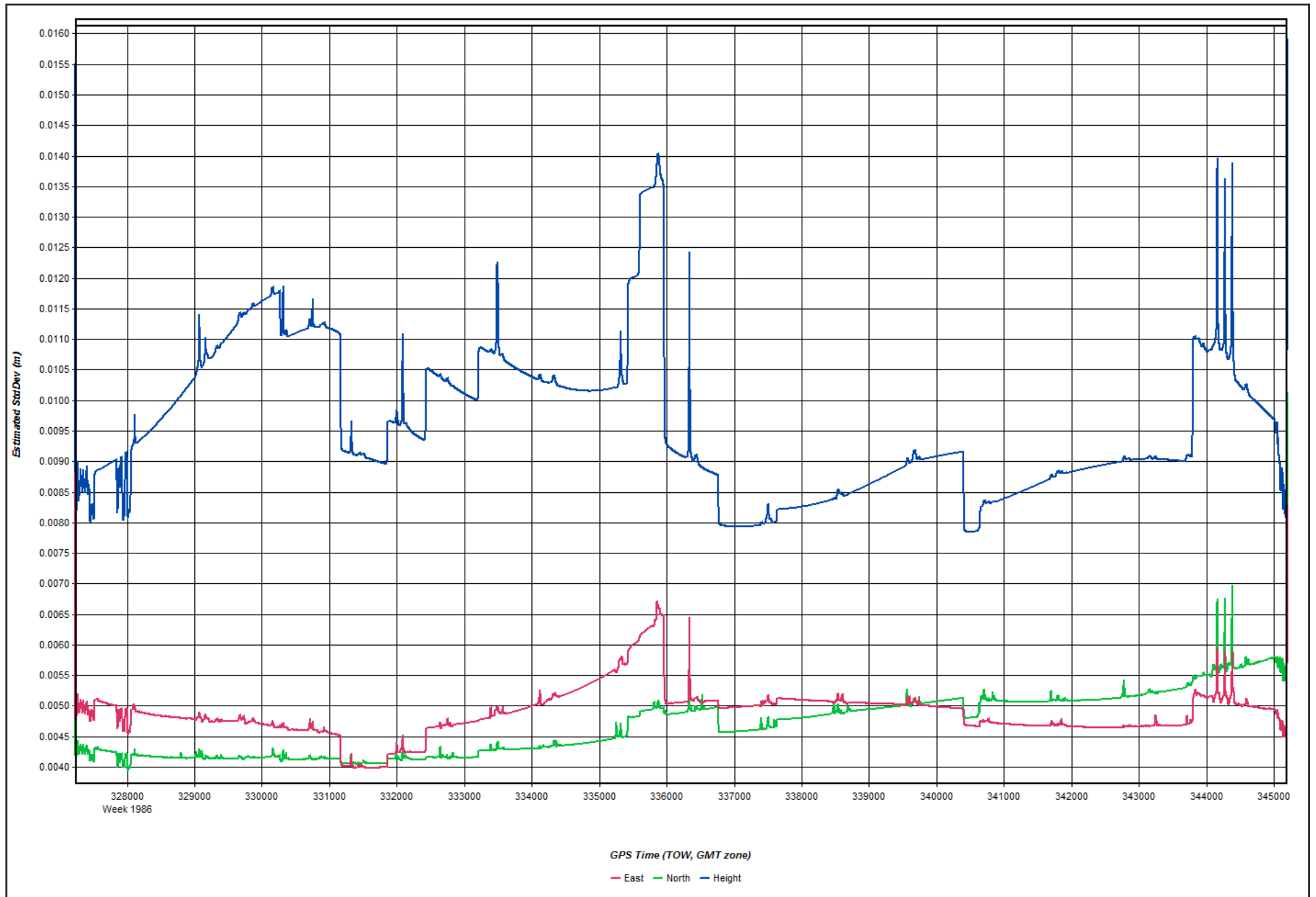
2018-01-31_Day031_7 - 20180131185129

Figure 4: Forward/Reverse Separation Plot (Fixed)



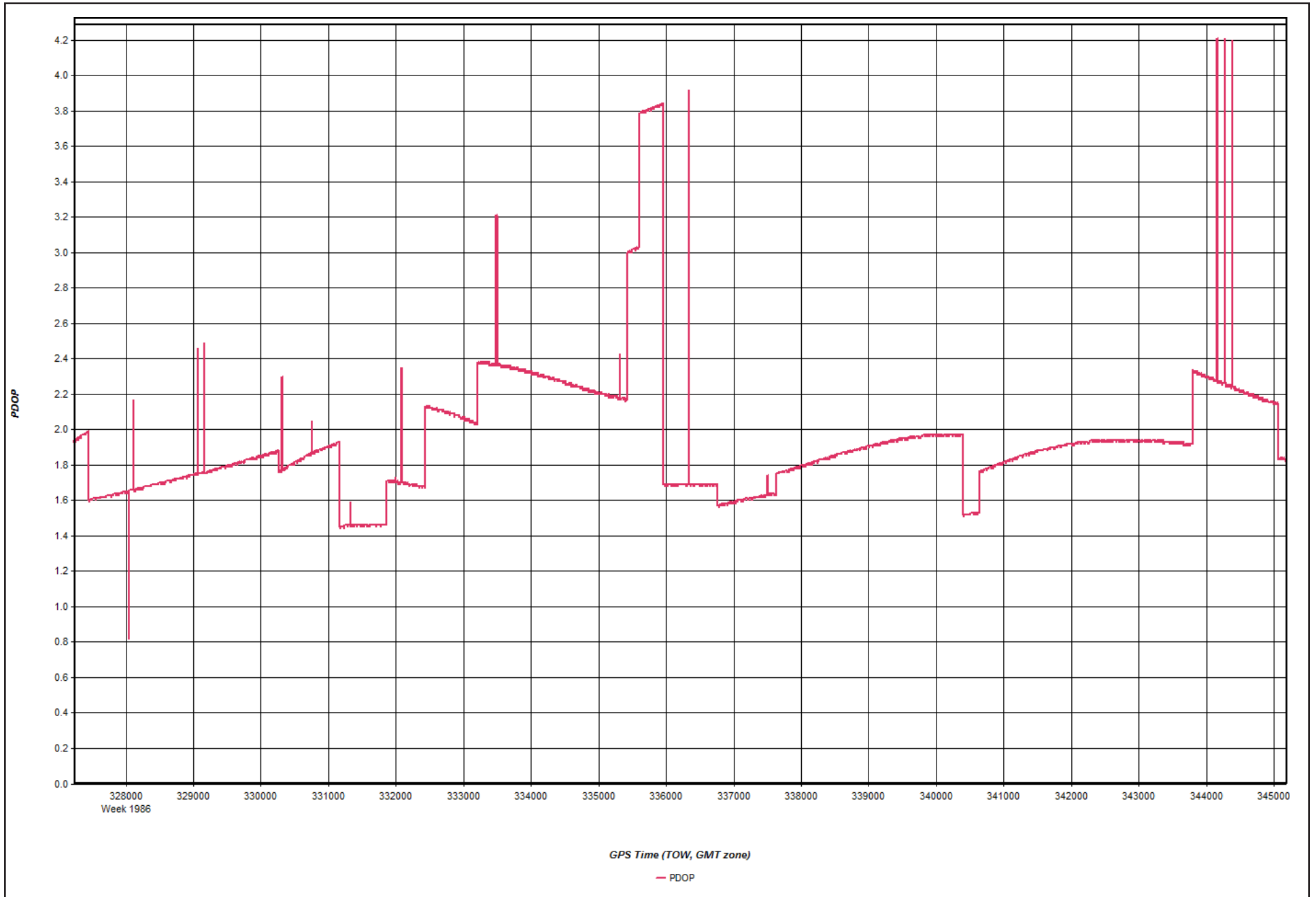
2018-01-31_Day031_7 - 20180131185129

Figure 5: Estimated Position Accuracy Plot



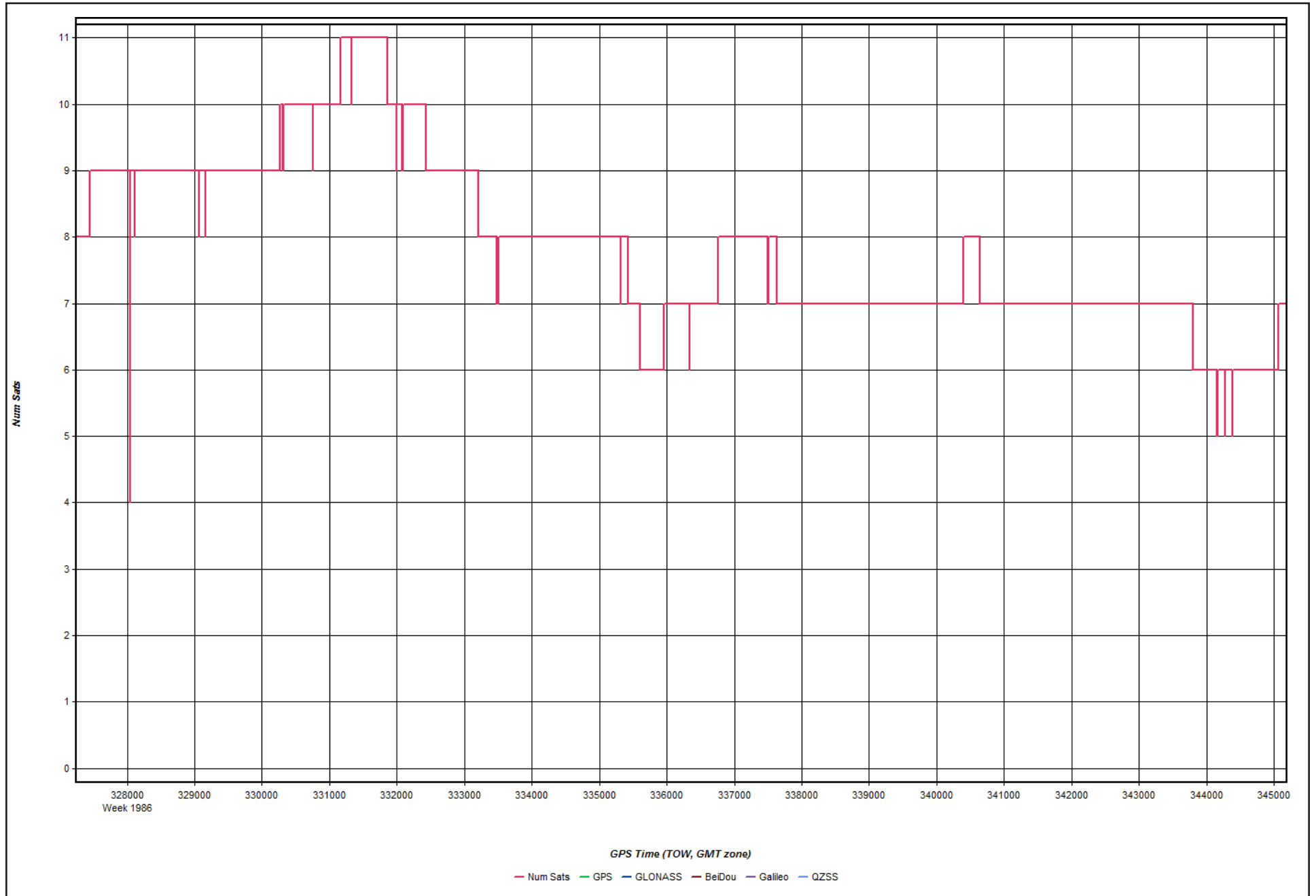
2018-01-31_Day031_7 - 20180131185129

Figure 6: PDOP Plot



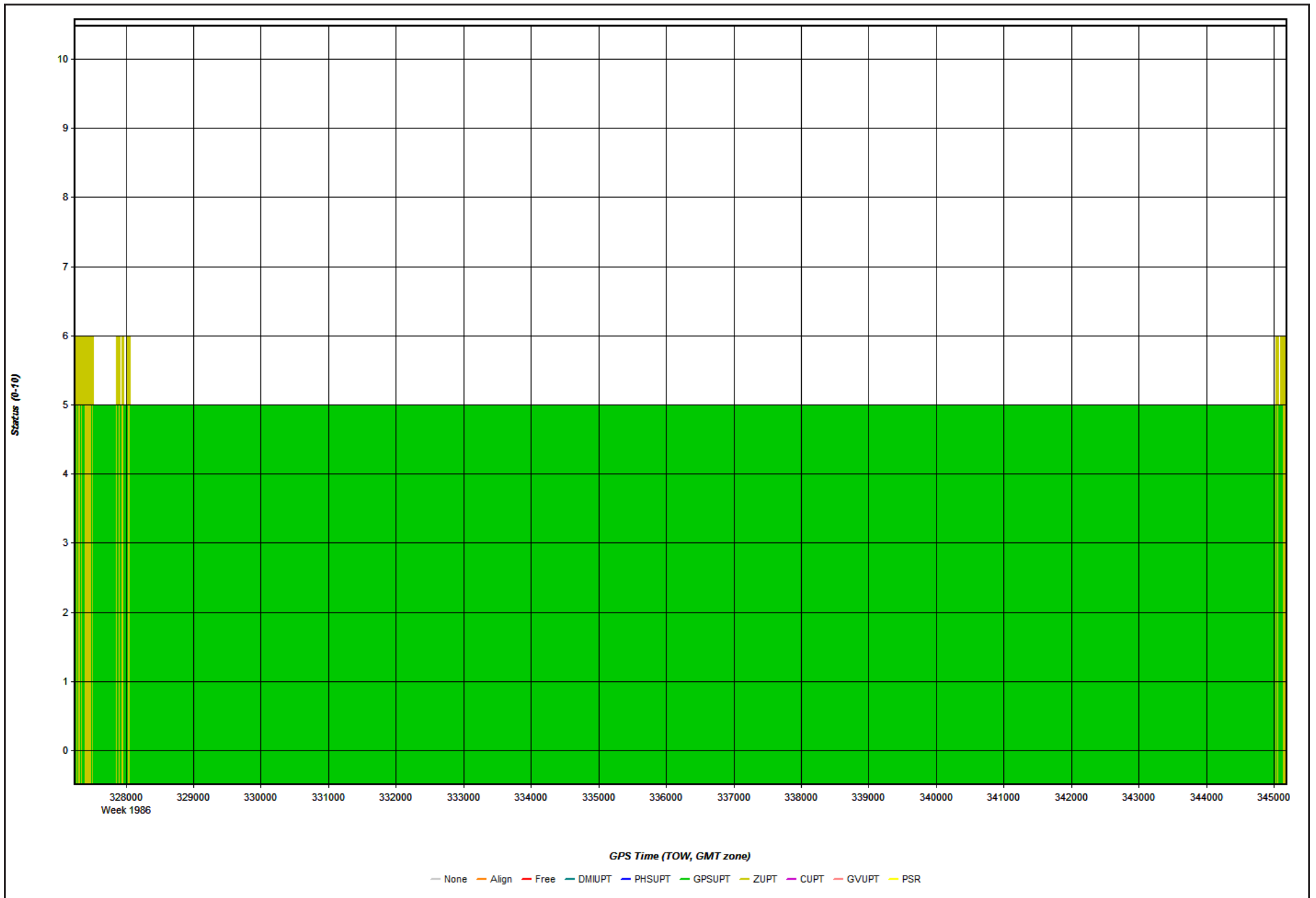
2018-01-31_Day031_7 - 20180131185129

Figure 7: Number of Satellites Line Plot



2018-01-31_Day031_7 - 20180131185129

Figure 8: Status flag for IMU processing



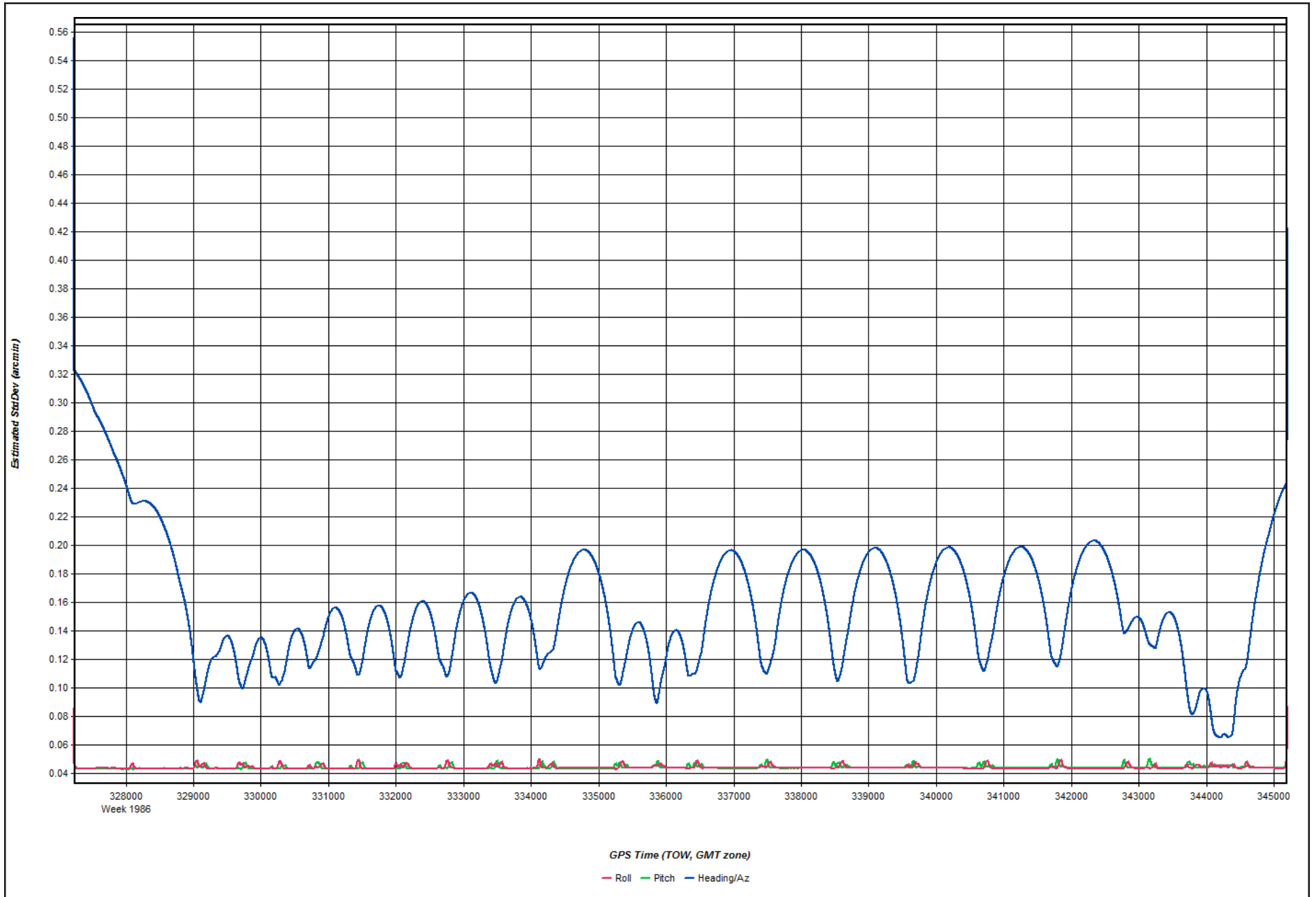
2018-01-31_Day031_7 - 20180131185129

Figure 9: Fwd/Rev Attitude Separation Plot



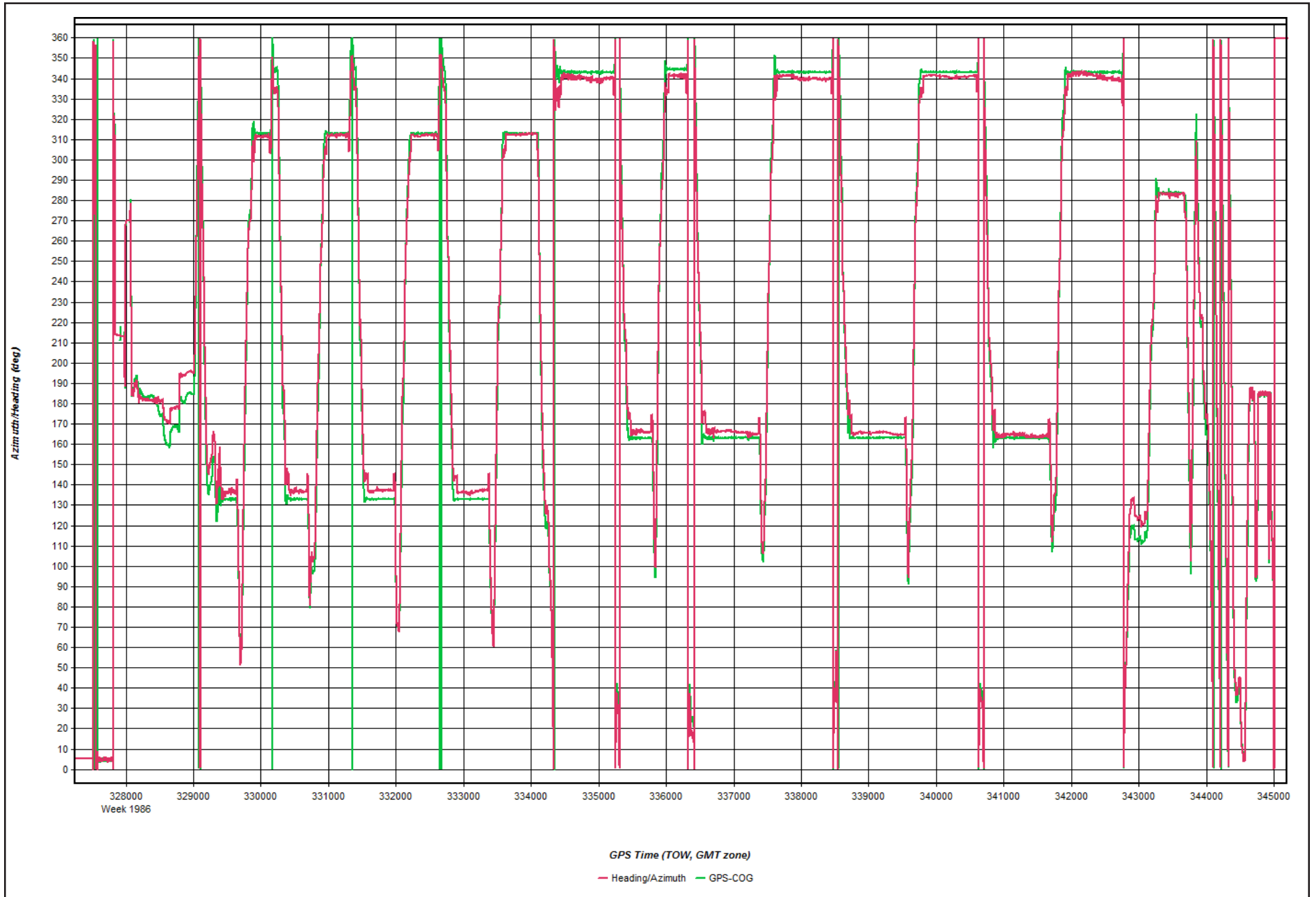
2018-01-31_Day031_7 - 20180131185129

Figure 10: Estimated Attitude Accuracy Plot



2018-01-31_Day031_7 - 20180131185129

Figure 11: Azimuth Plot



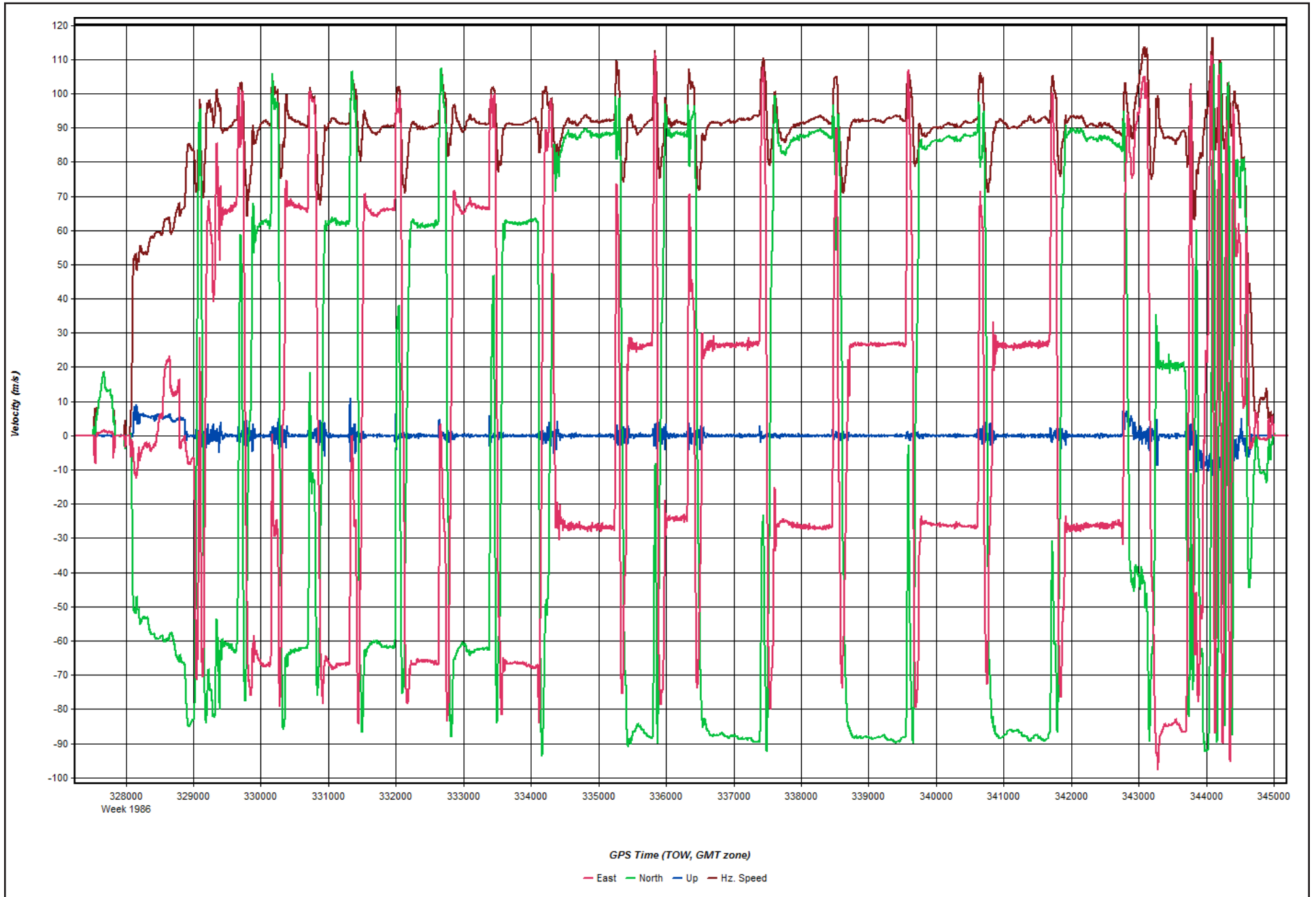
2018-01-31_Day031_7 - 20180131185129

Figure 12: Roll & Pitch Plot



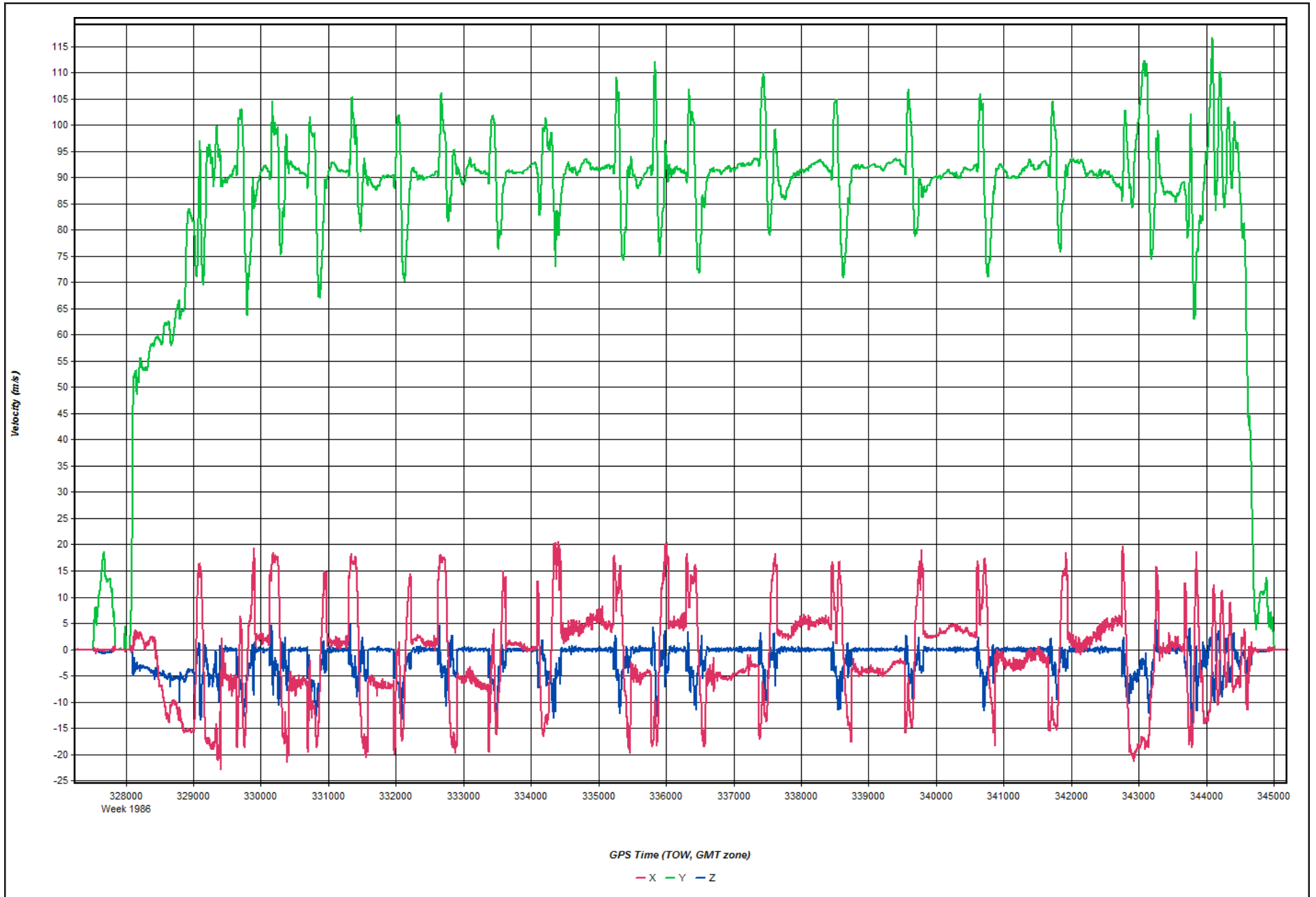
2018-01-31_Day031_7 - 20180131185129

Figure 13: Velocity Profile Plot



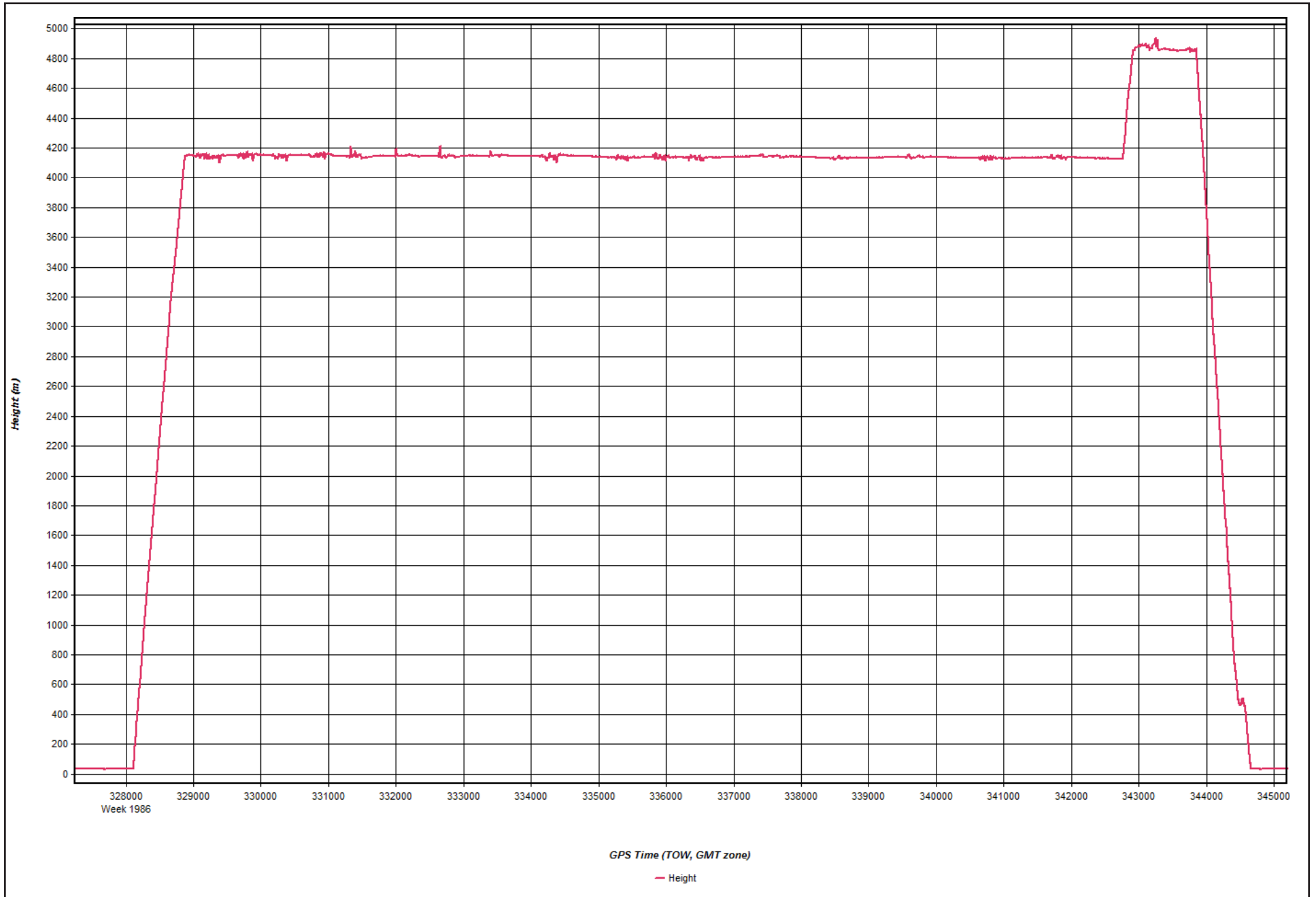
2018-01-31_Day031_7 - 20180131185129

Figure 14: Body Frame Velocity Plot



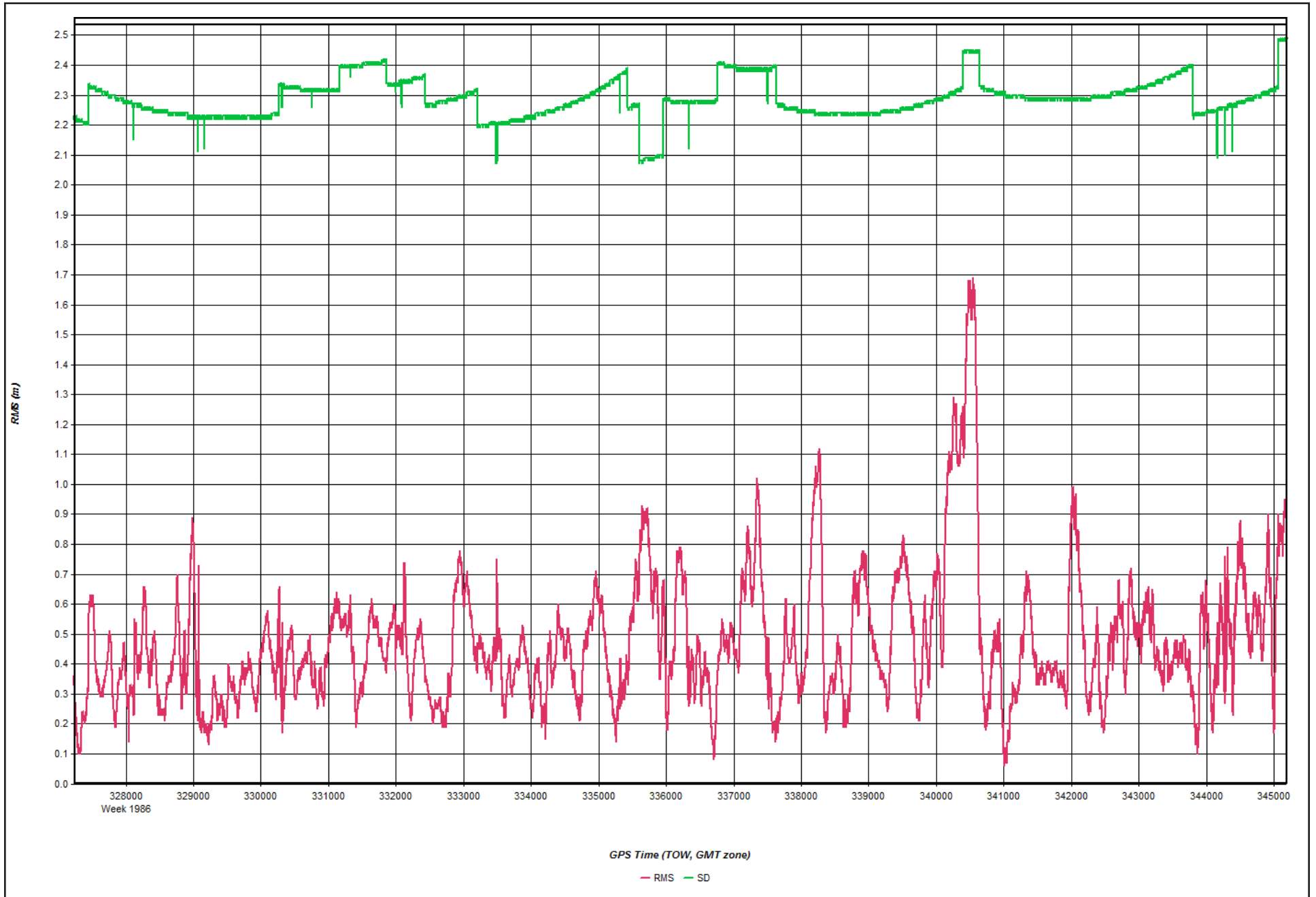
2018-01-31_Day031_7 - 20180131185129

Figure 15: Height Profile Plot



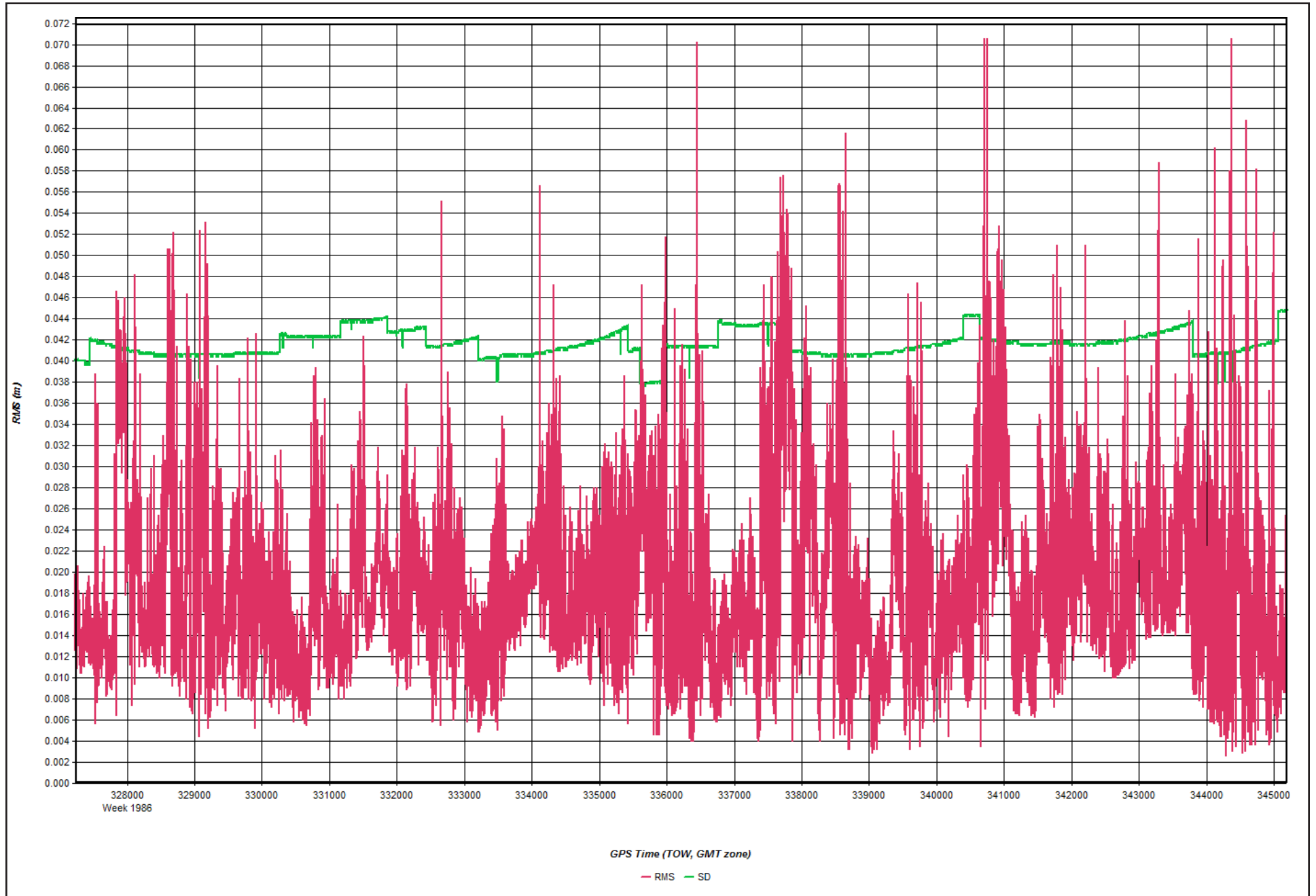
2018-01-31_Day031_7 - 20180131185129

Figure 16: C/A Code Residual RMS Plot



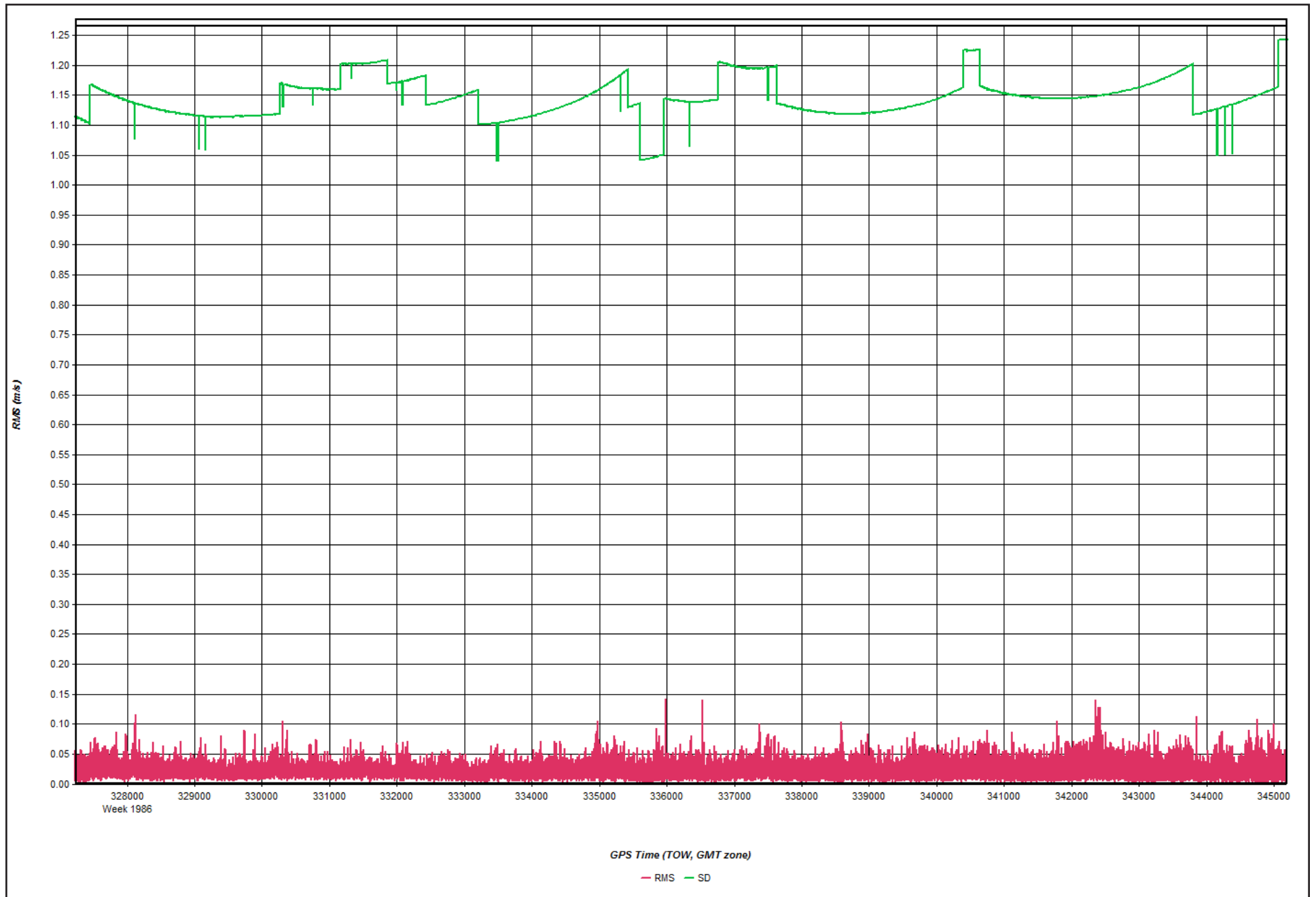
2018-01-31_Day031_7 - 20180131185129

Figure 17: Carrier Residual RMS Plot



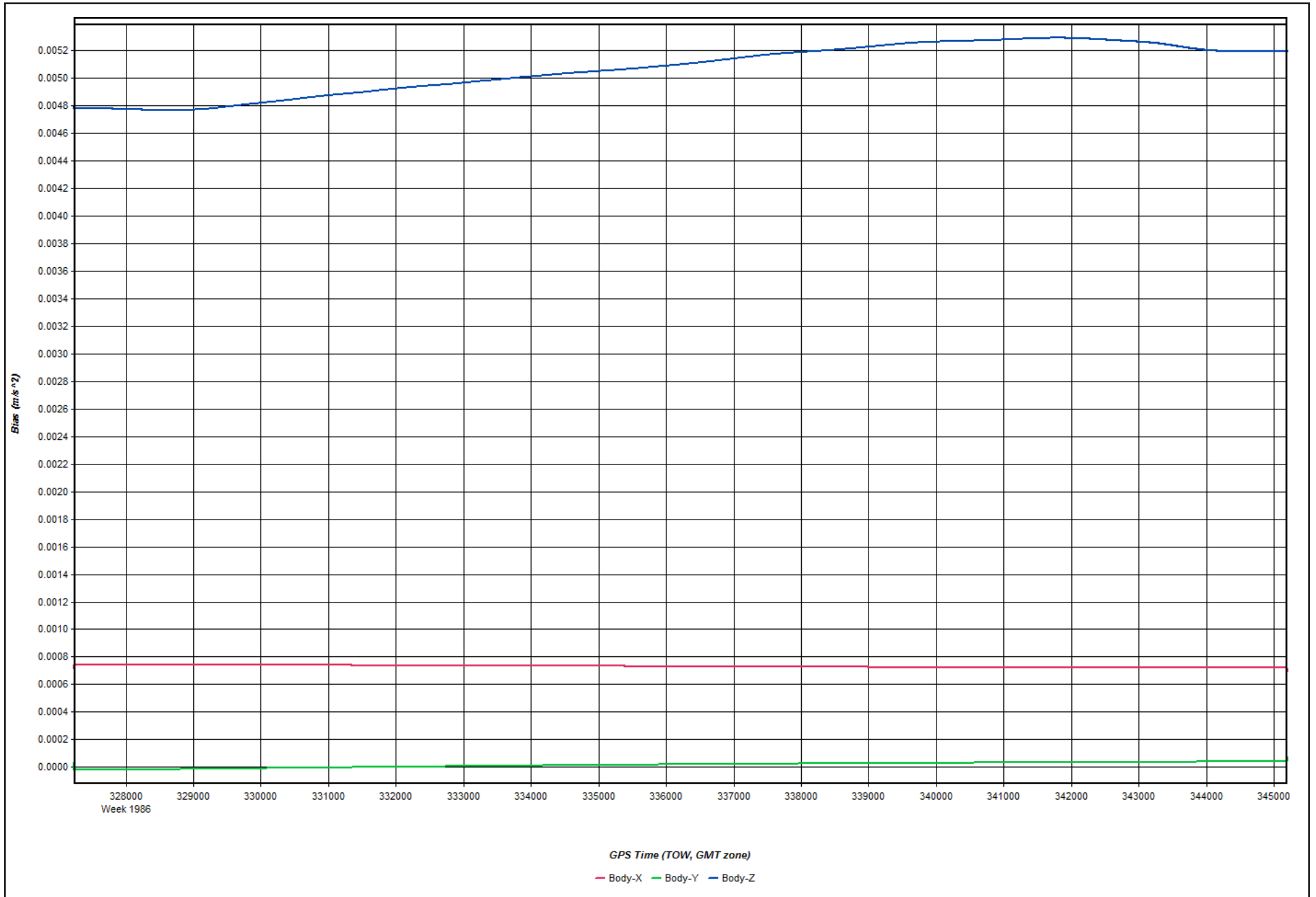
2018-01-31_Day031_7 - 20180131185129

Figure 18: L1 Doppler Residual RMS Plot



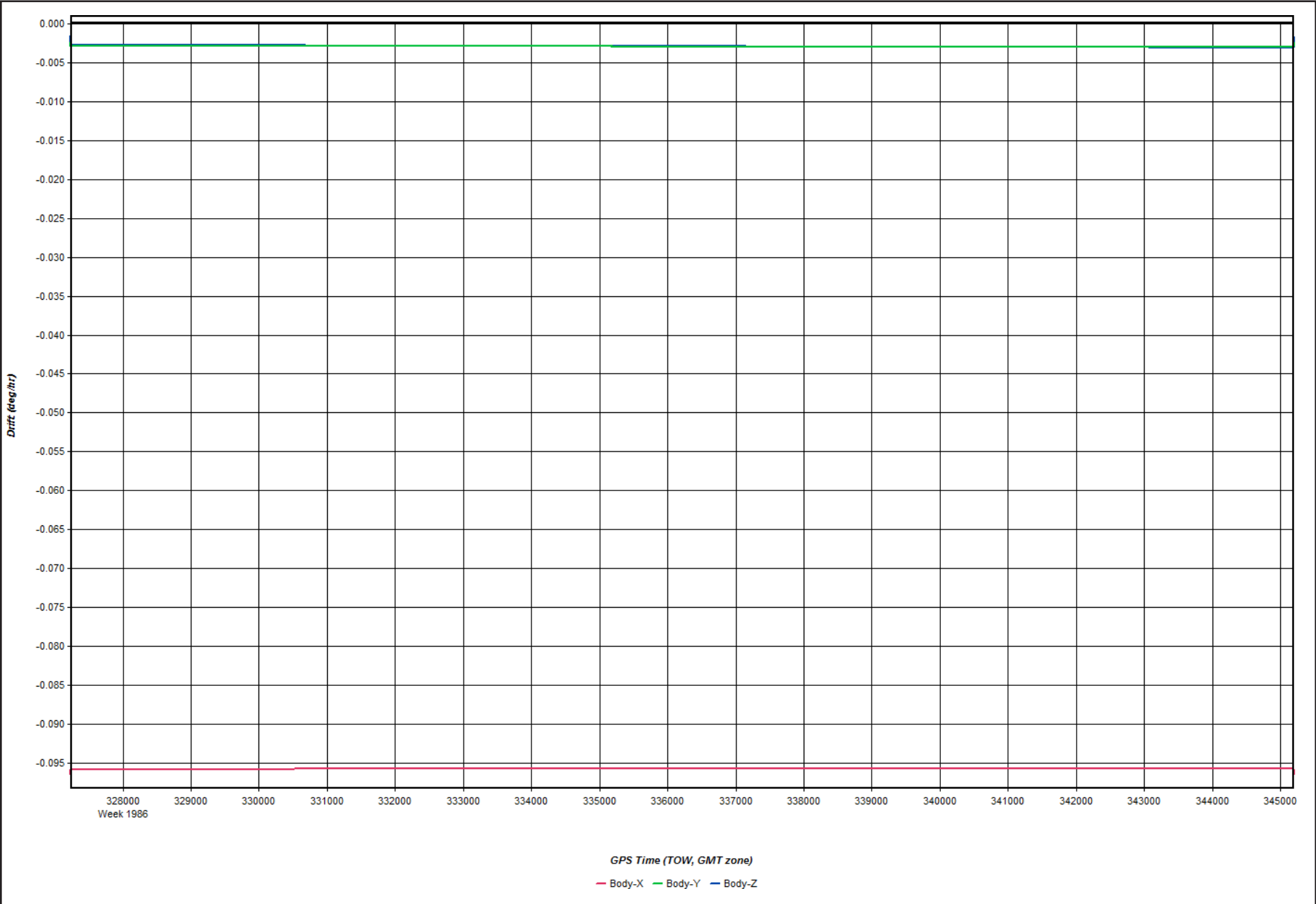
2018-01-31_Day031_7 - 20180131185129

Figure 19: Accelerometer Bias Plot



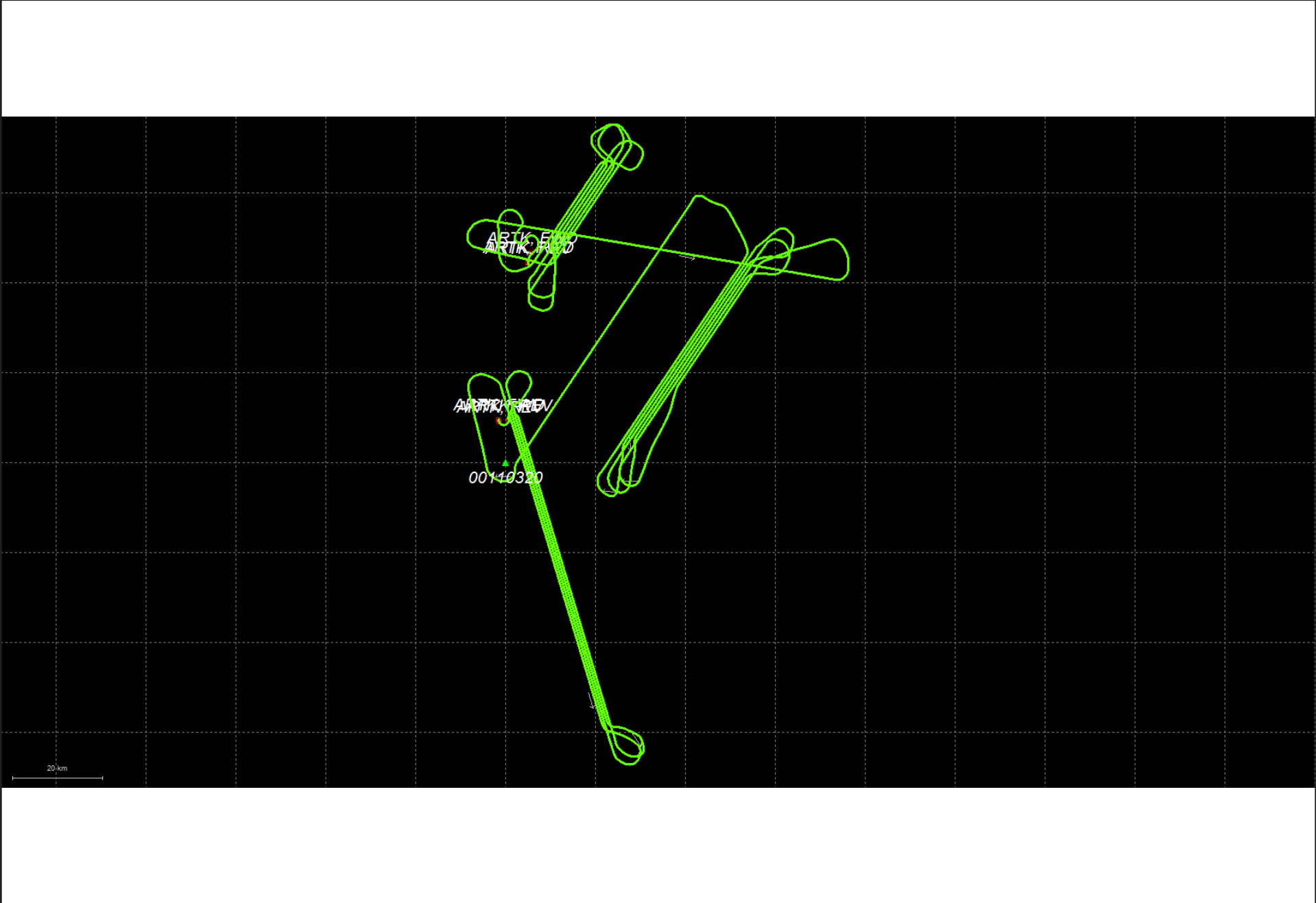
2018-01-31_Day031_7 - 20180131185129

Figure 20: Gyro Drift Plot



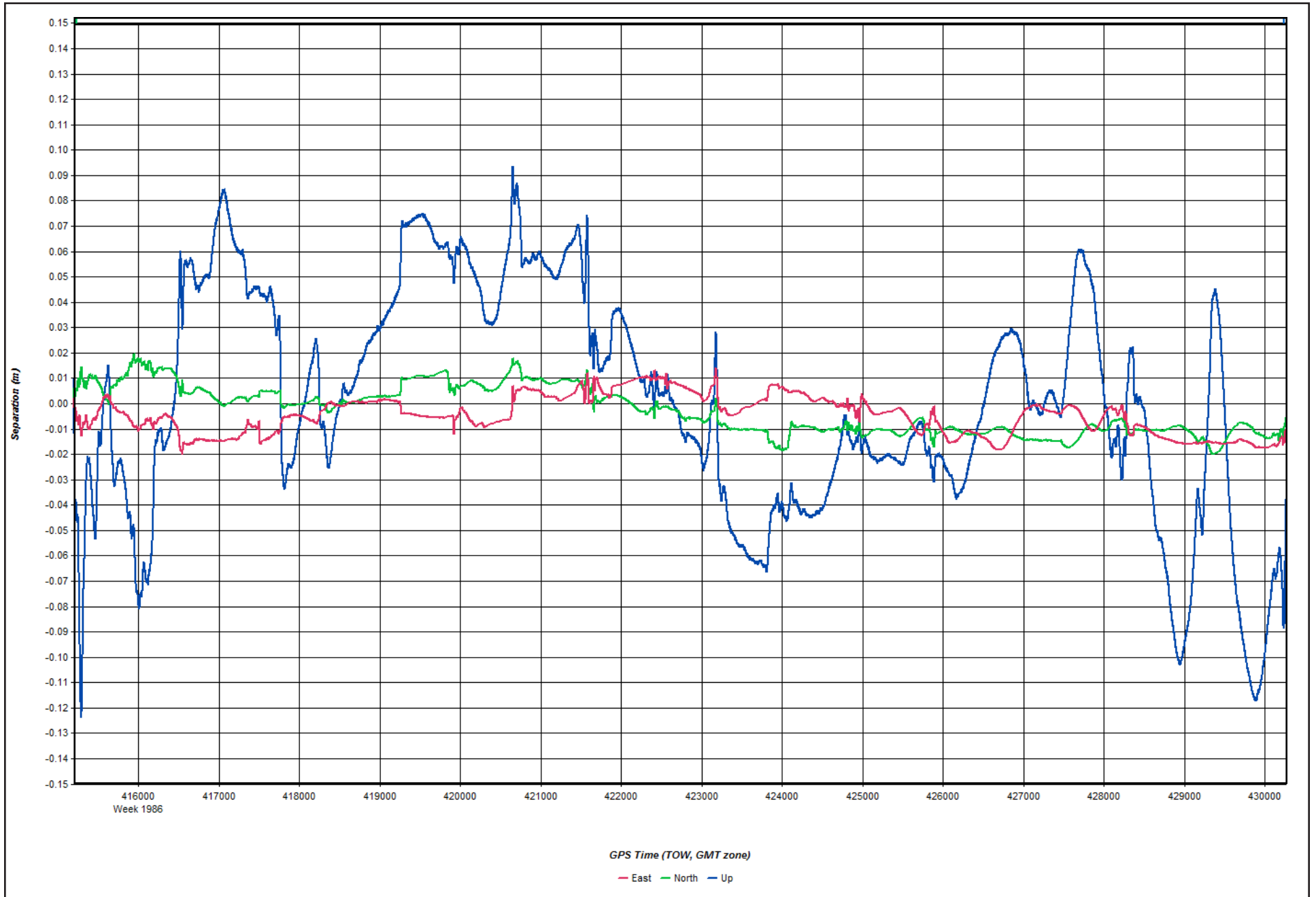
2018-02-01_Day032_7 - 20180201185120

Figure 1: Map



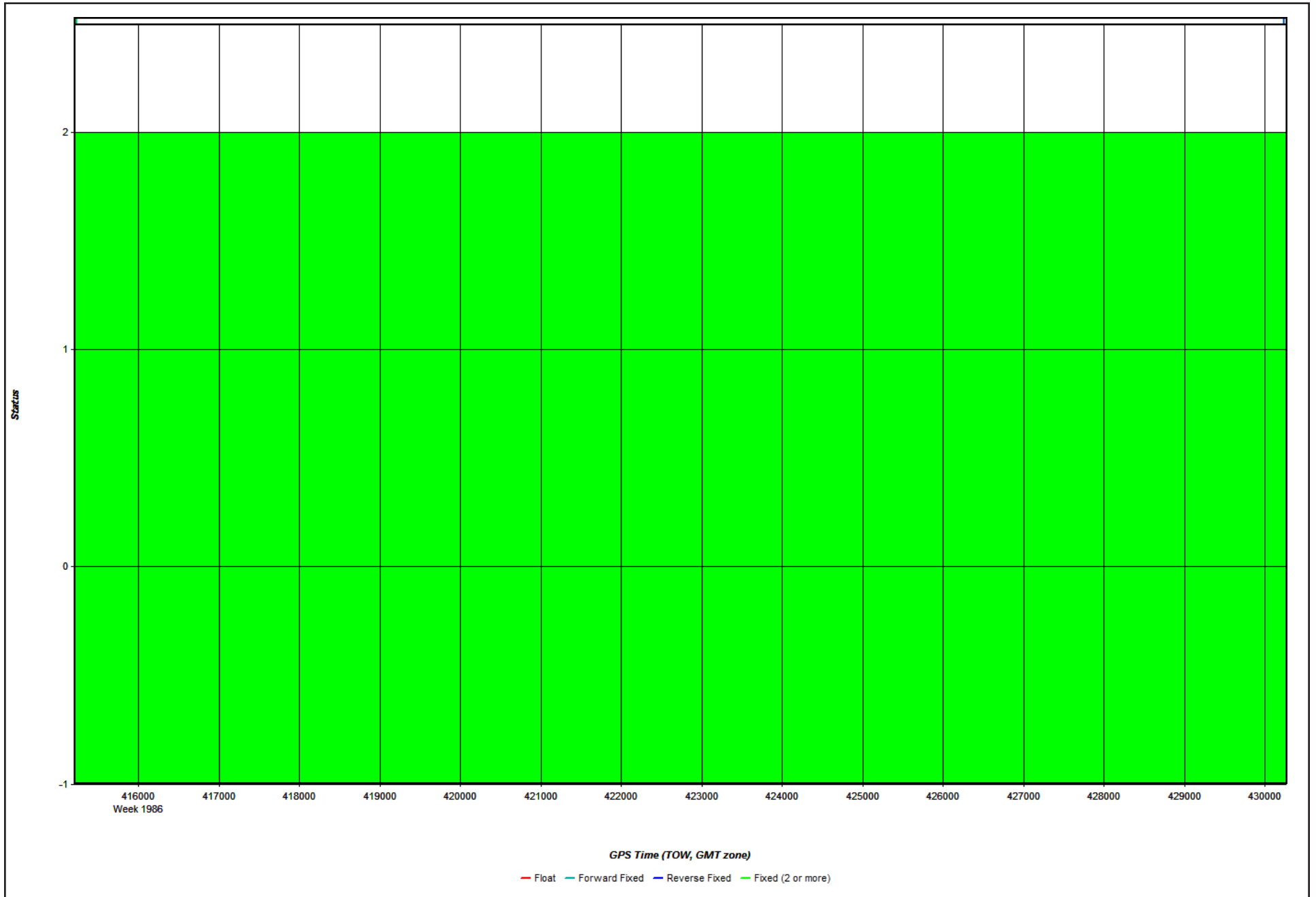
2018-02-01_Day032_7 - 20180201185120

Figure 2: Forward/Reverse or Combined Separation Plot



2018-02-01_Day032_7 - 20180201185120

Figure 3: Float or Fixed Ambiguity



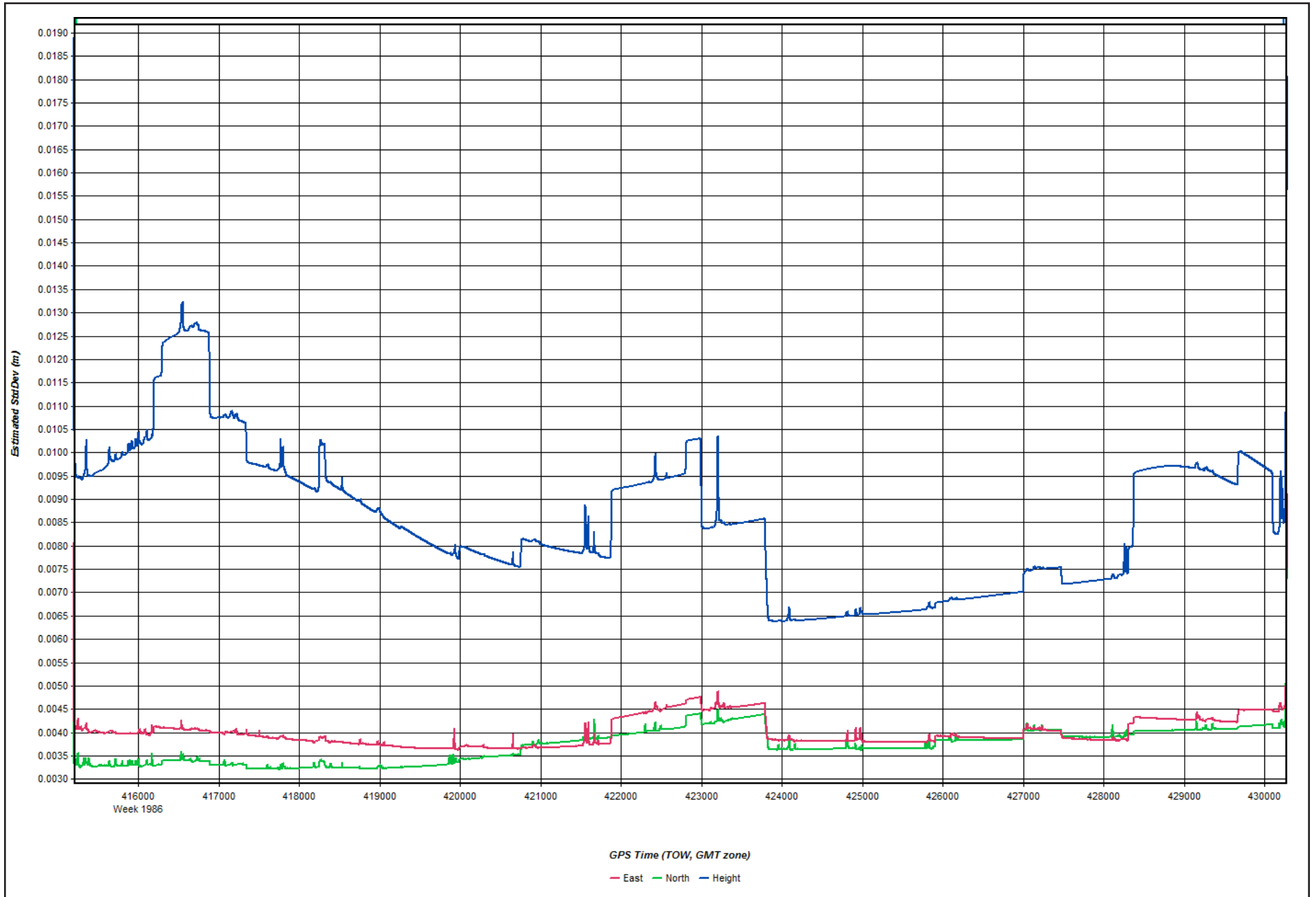
2018-02-01_Day032_7 - 20180201185120

Figure 4: Forward/Reverse Separation Plot (Fixed)



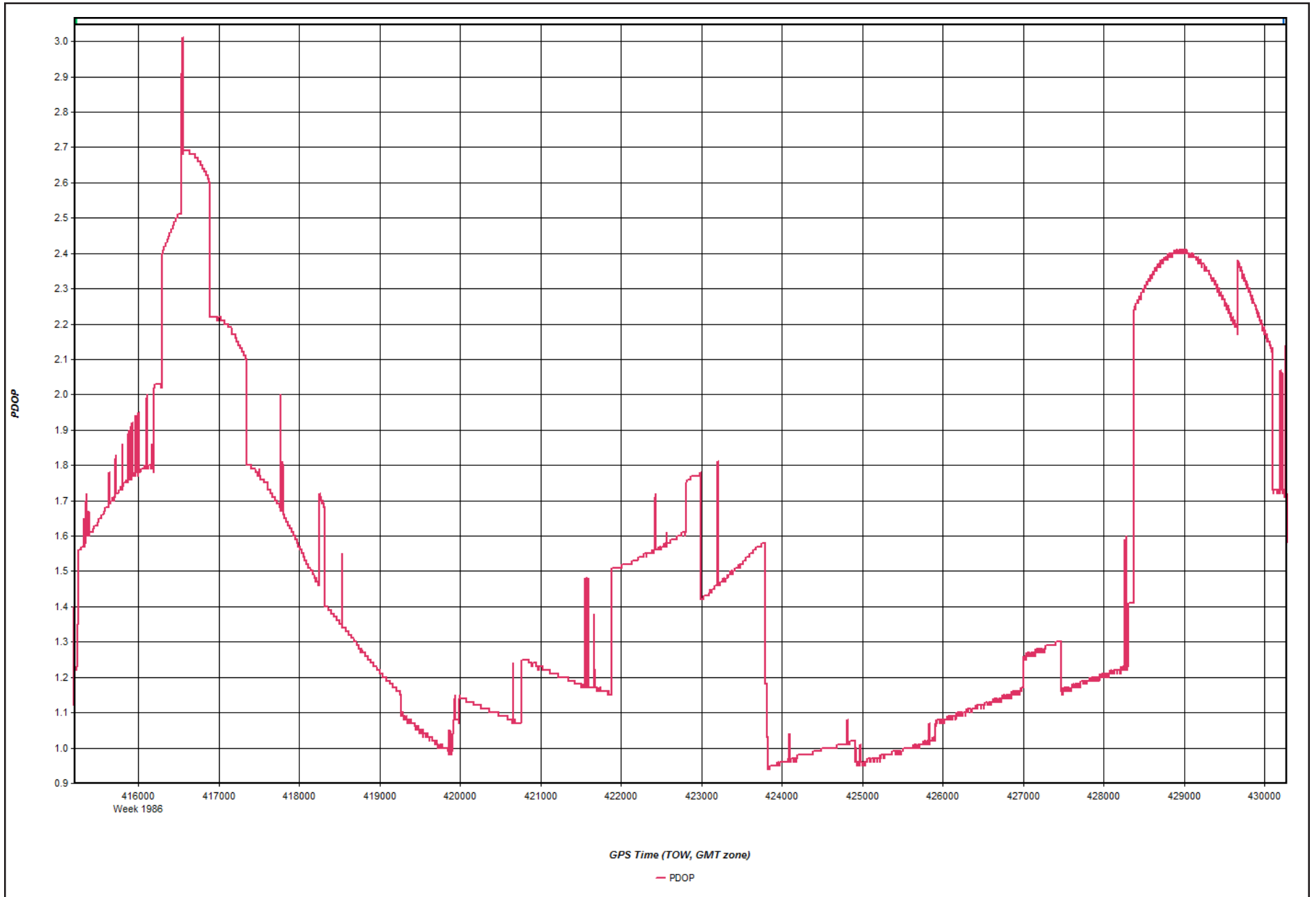
2018-02-01_Day032_7 - 20180201185120

Figure 5: Estimated Position Accuracy Plot



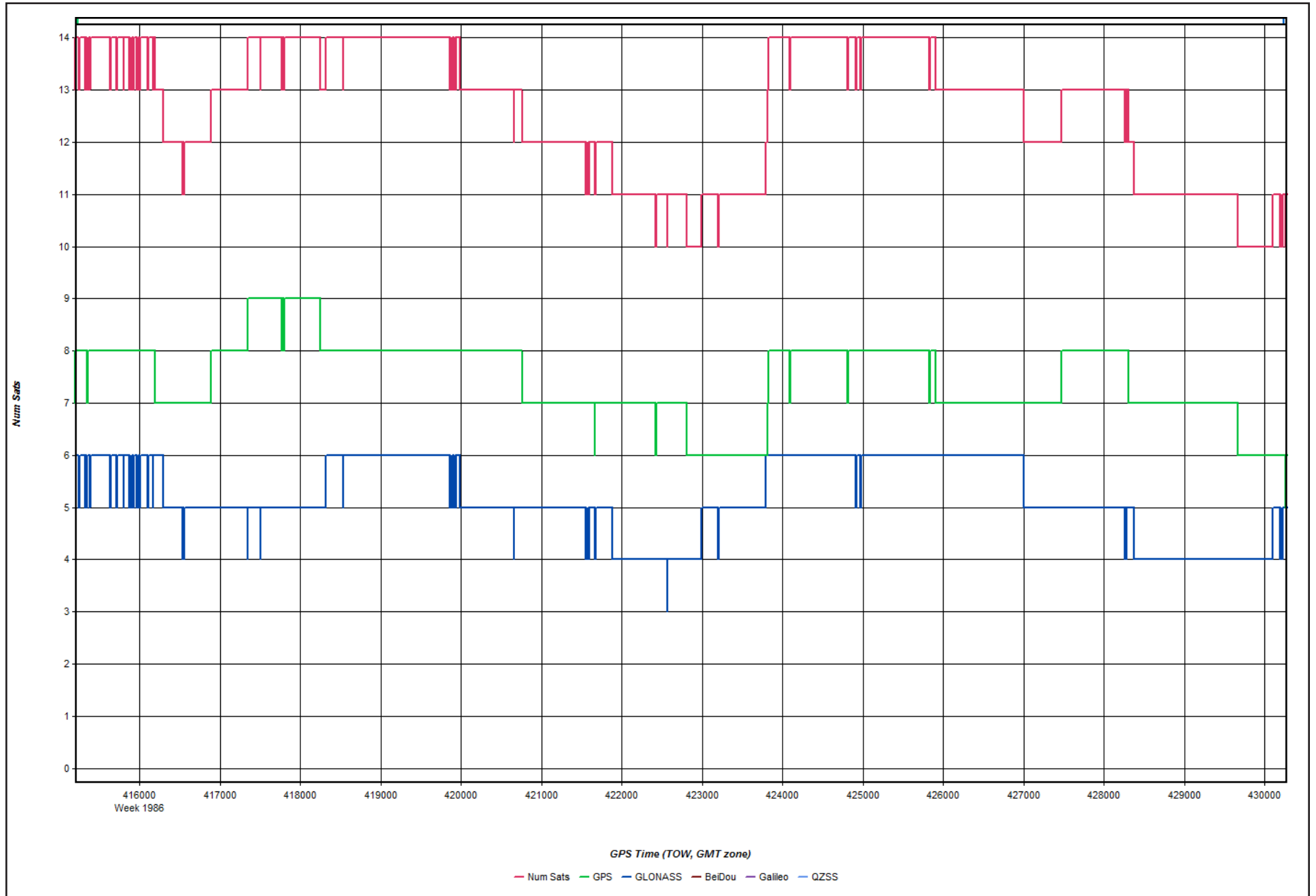
2018-02-01_Day032_7 - 20180201185120

Figure 6: PDOP Plot



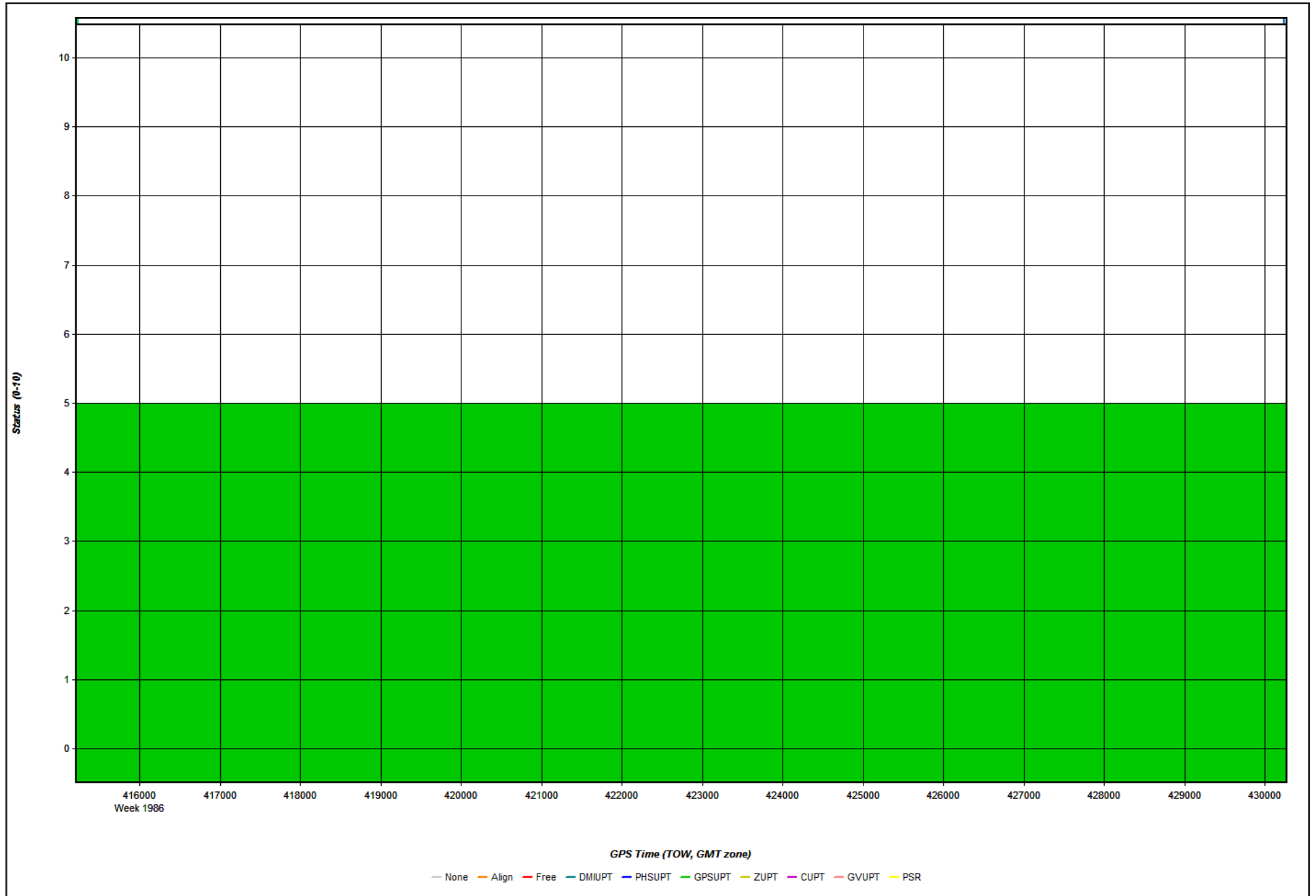
2018-02-01_Day032_7 - 20180201185120

Figure 7: Number of Satellites Line Plot



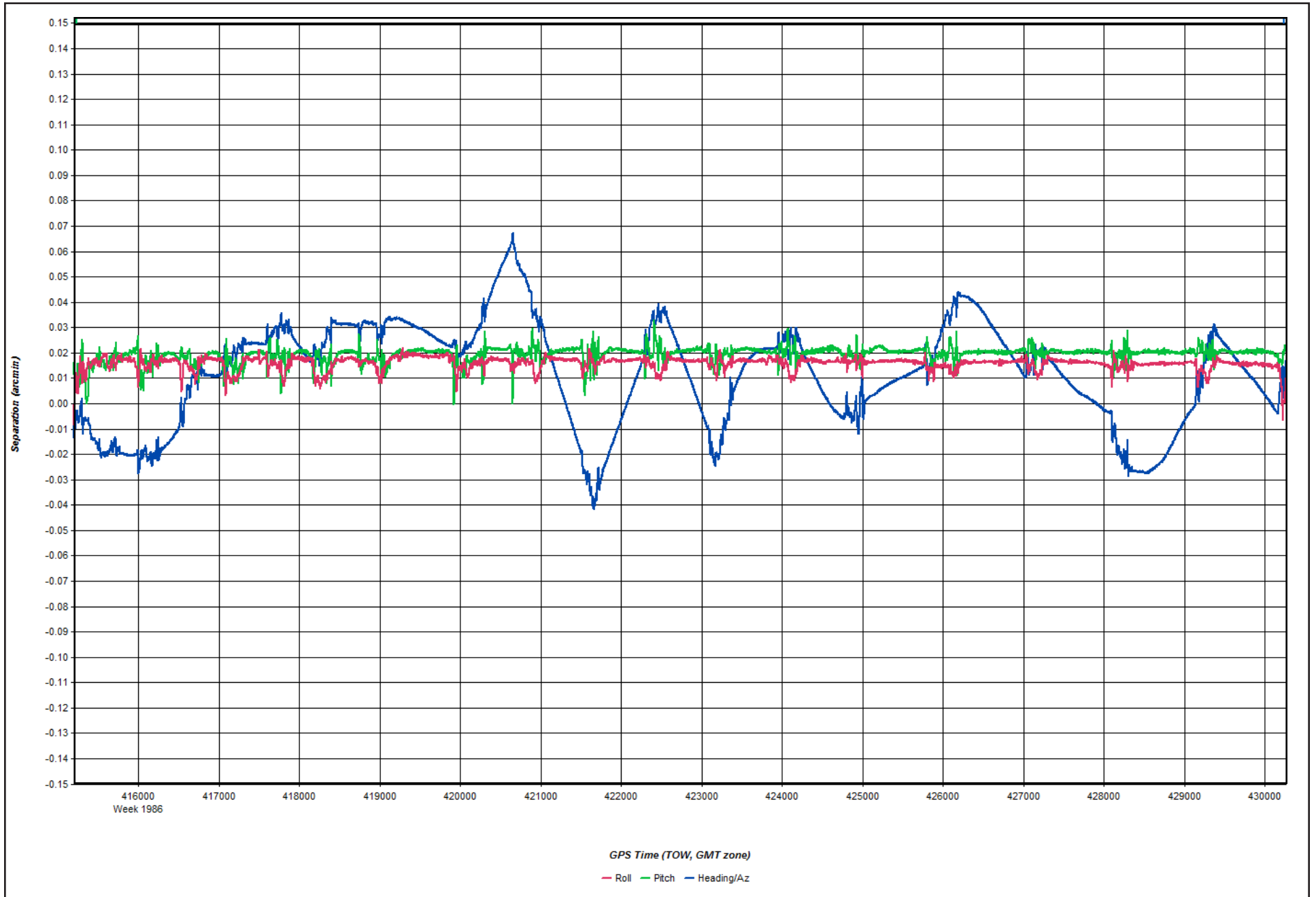
2018-02-01_Day032_7 - 20180201185120

Figure 8: Status flag for IMU processing



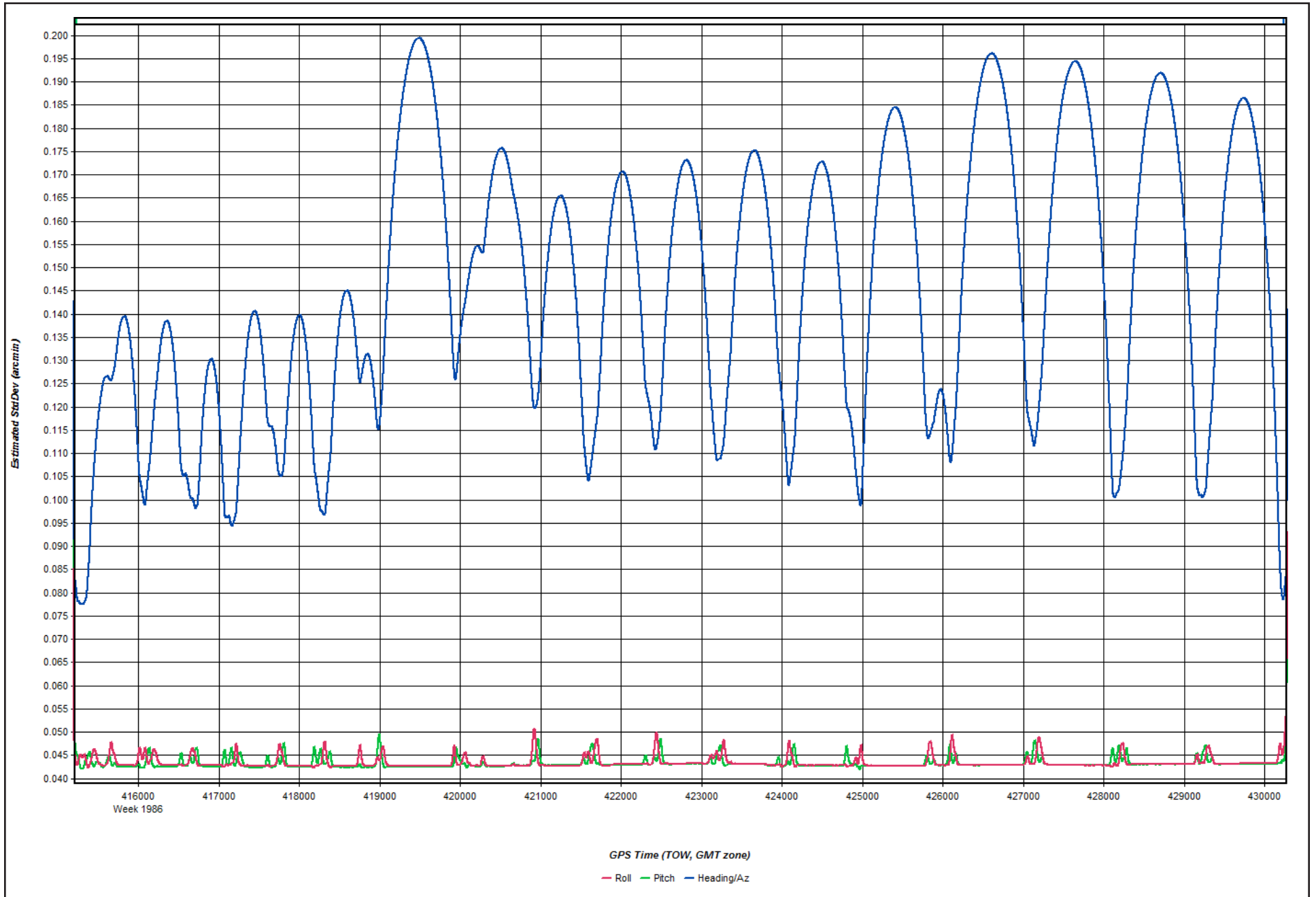
2018-02-01_Day032_7 - 20180201185120

Figure 9: Fwd/Rev Attitude Separation Plot



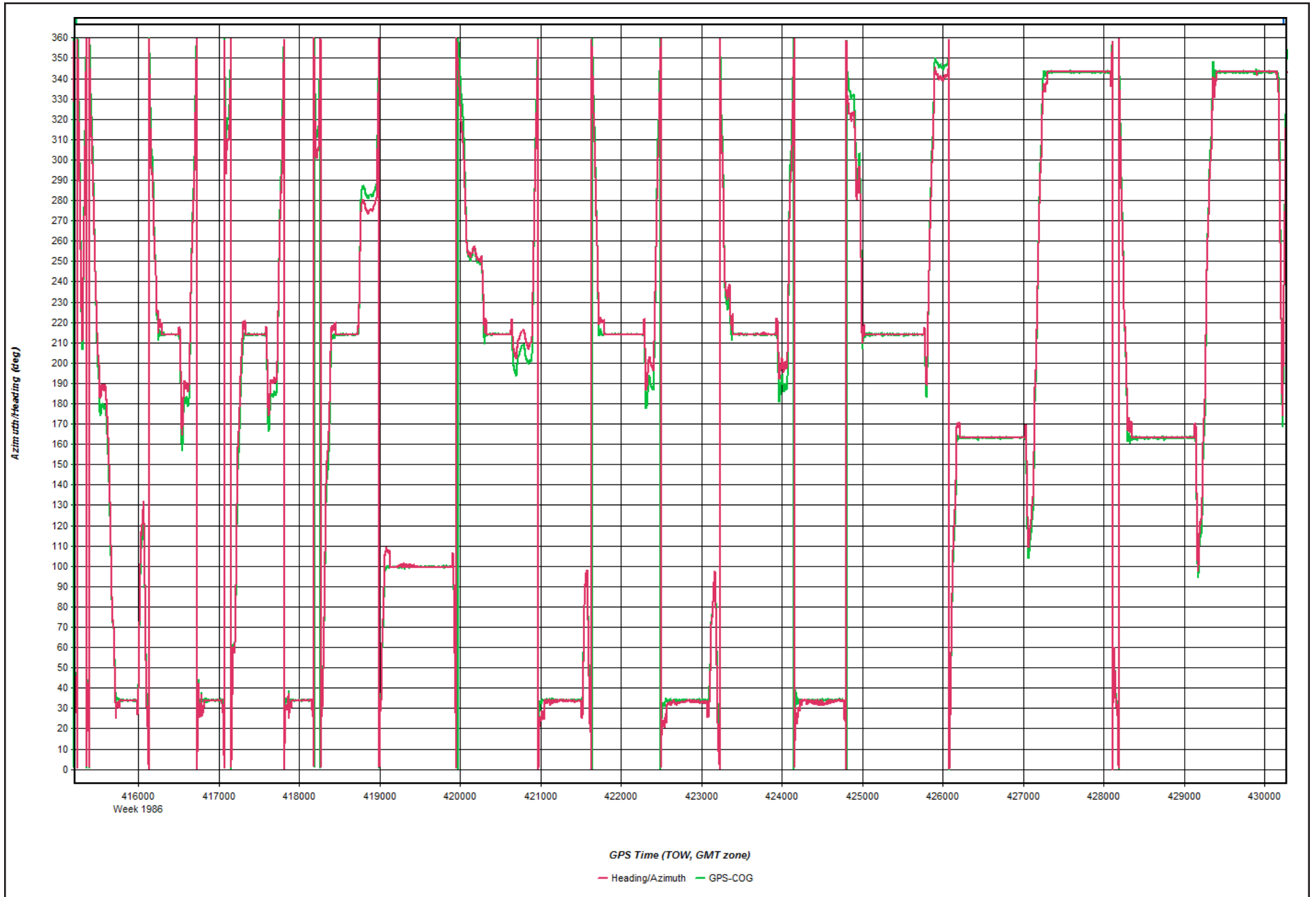
2018-02-01_Day032_7 - 20180201185120

Figure 10: Estimated Attitude Accuracy Plot



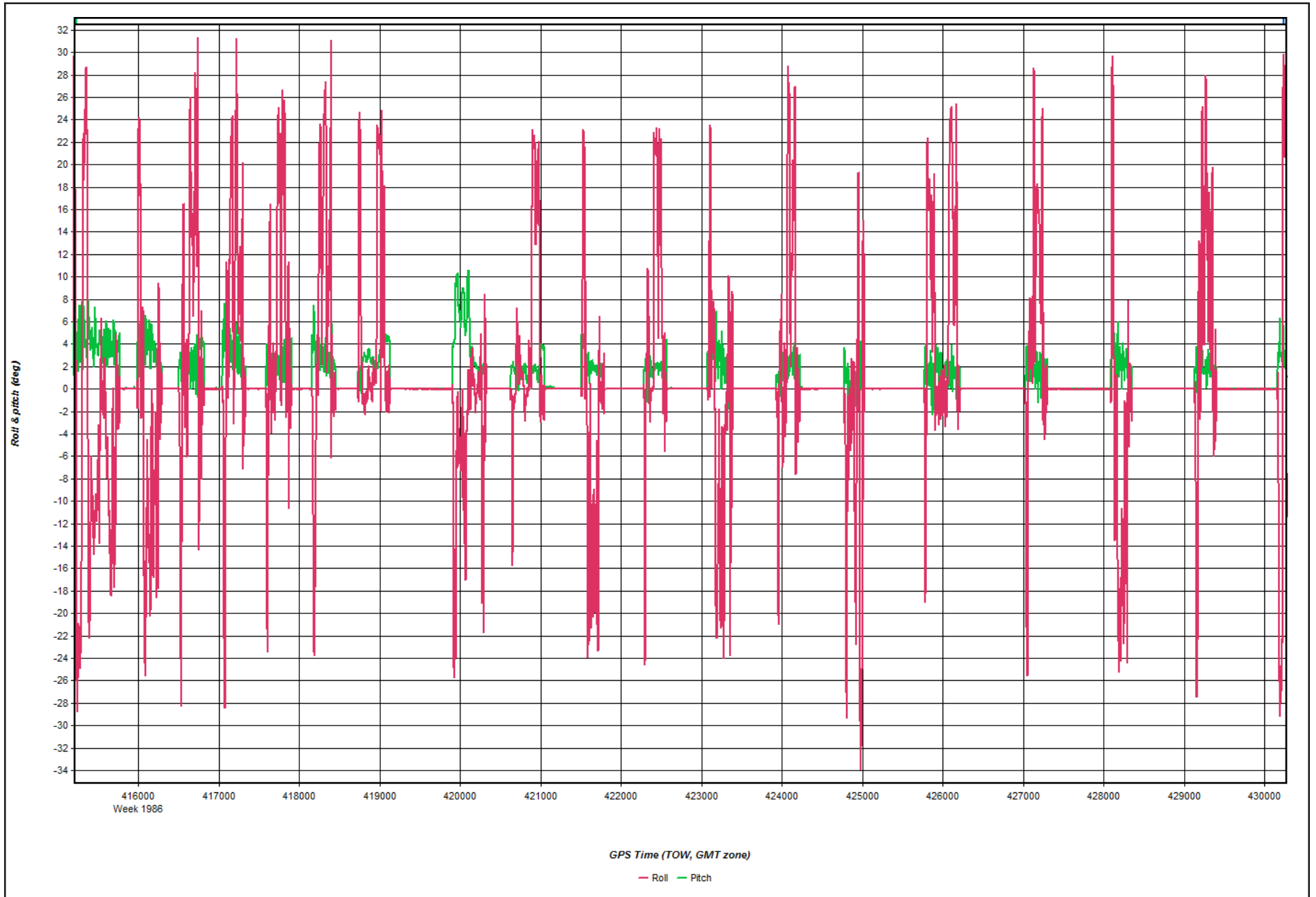
2018-02-01_Day032_7 - 20180201185120

Figure 11: Azimuth Plot



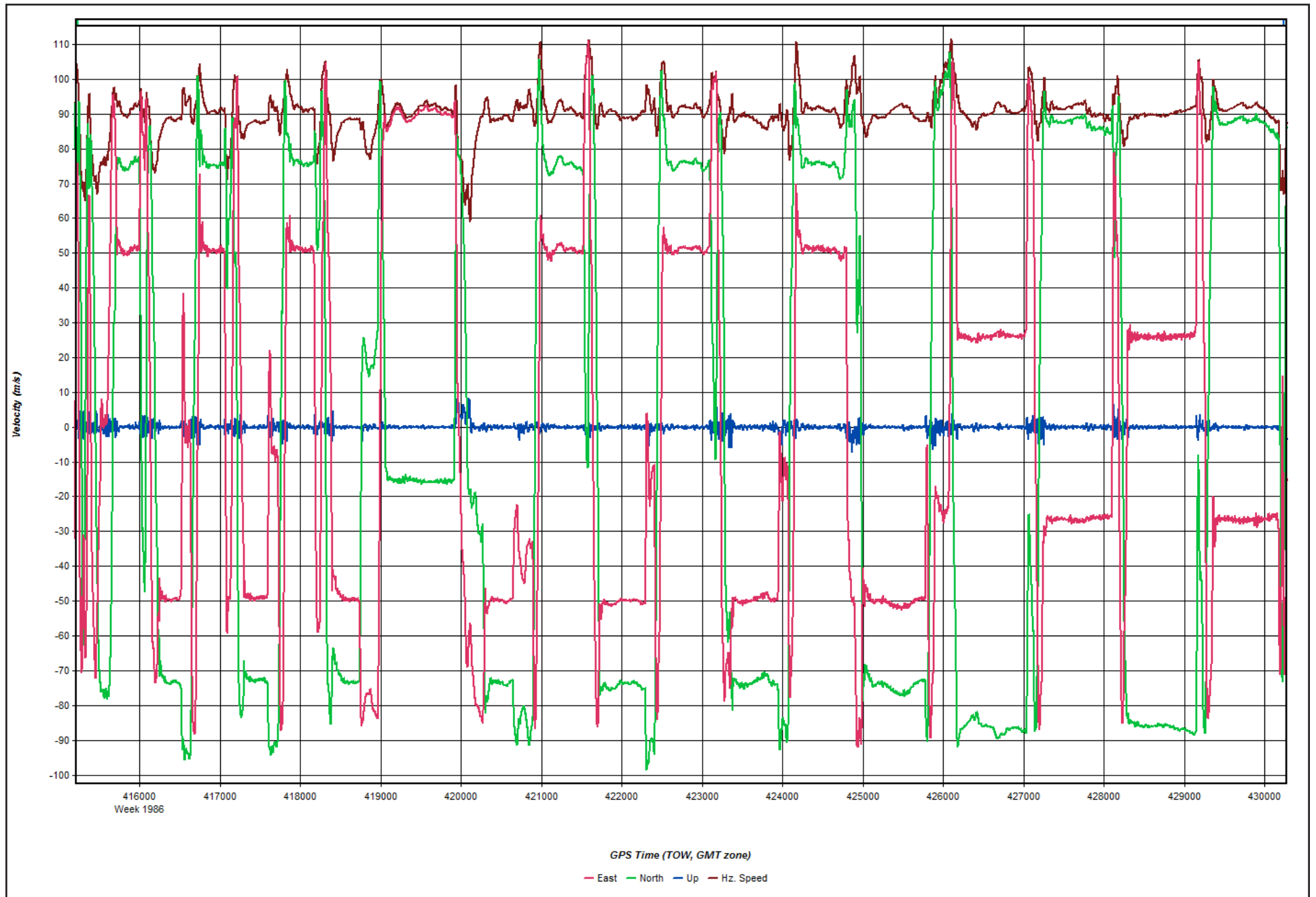
2018-02-01_Day032_7 - 20180201185120

Figure 12: Roll & Pitch Plot



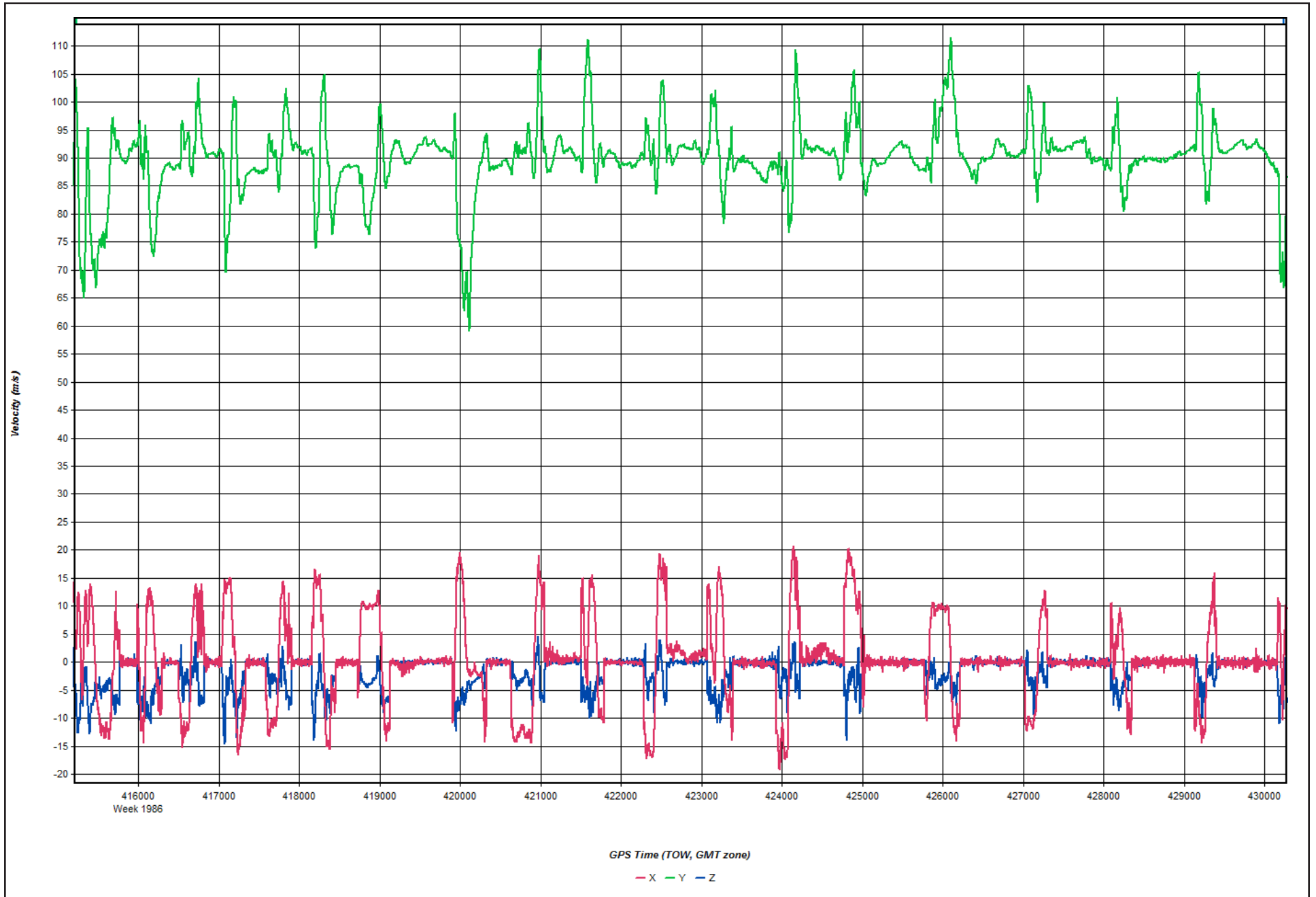
2018-02-01_Day032_7 - 20180201185120

Figure 13: Velocity Profile Plot



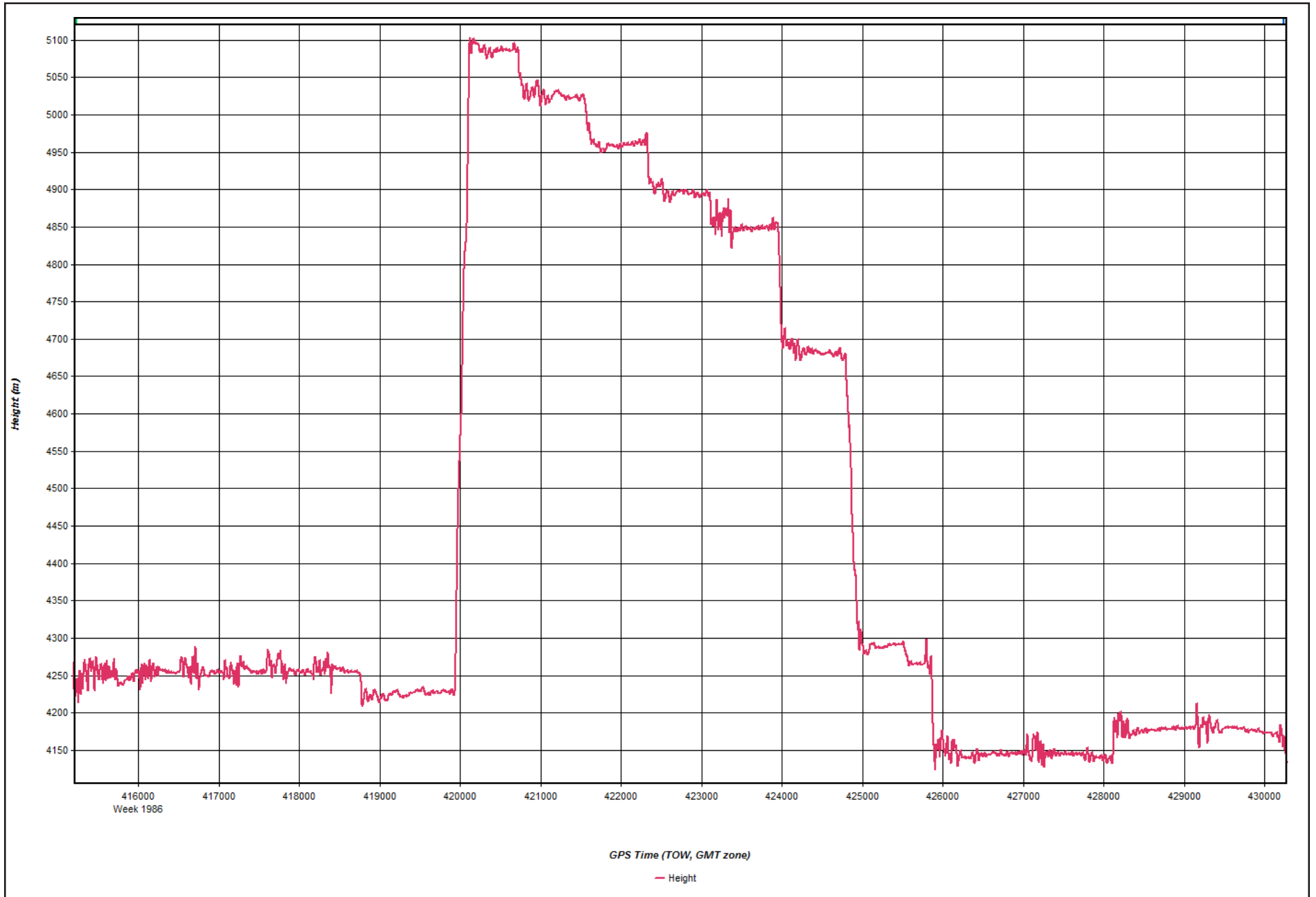
2018-02-01_Day032_7 - 20180201185120

Figure 14: Body Frame Velocity Plot



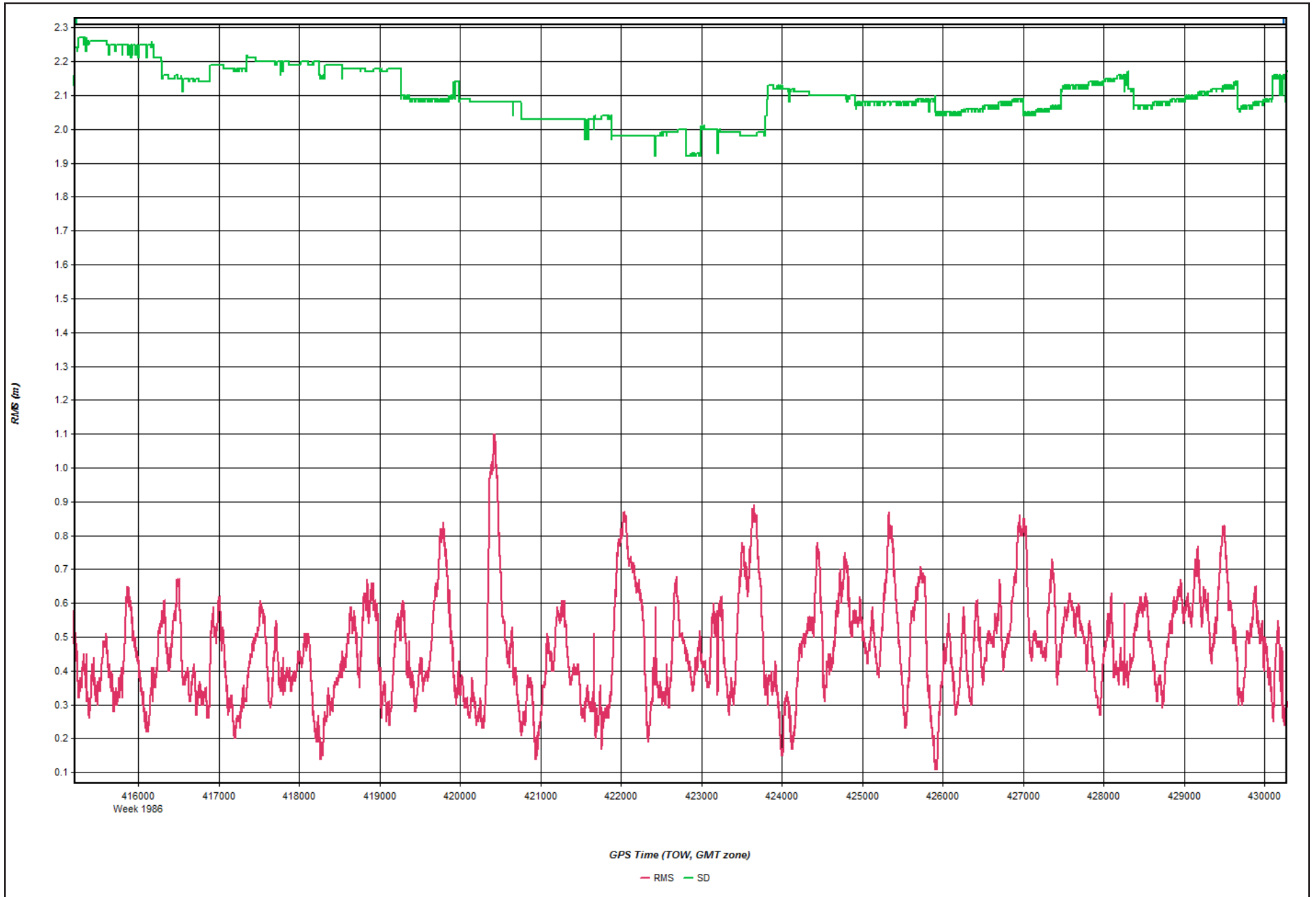
2018-02-01_Day032_7 - 20180201185120

Figure 15: Height Profile Plot



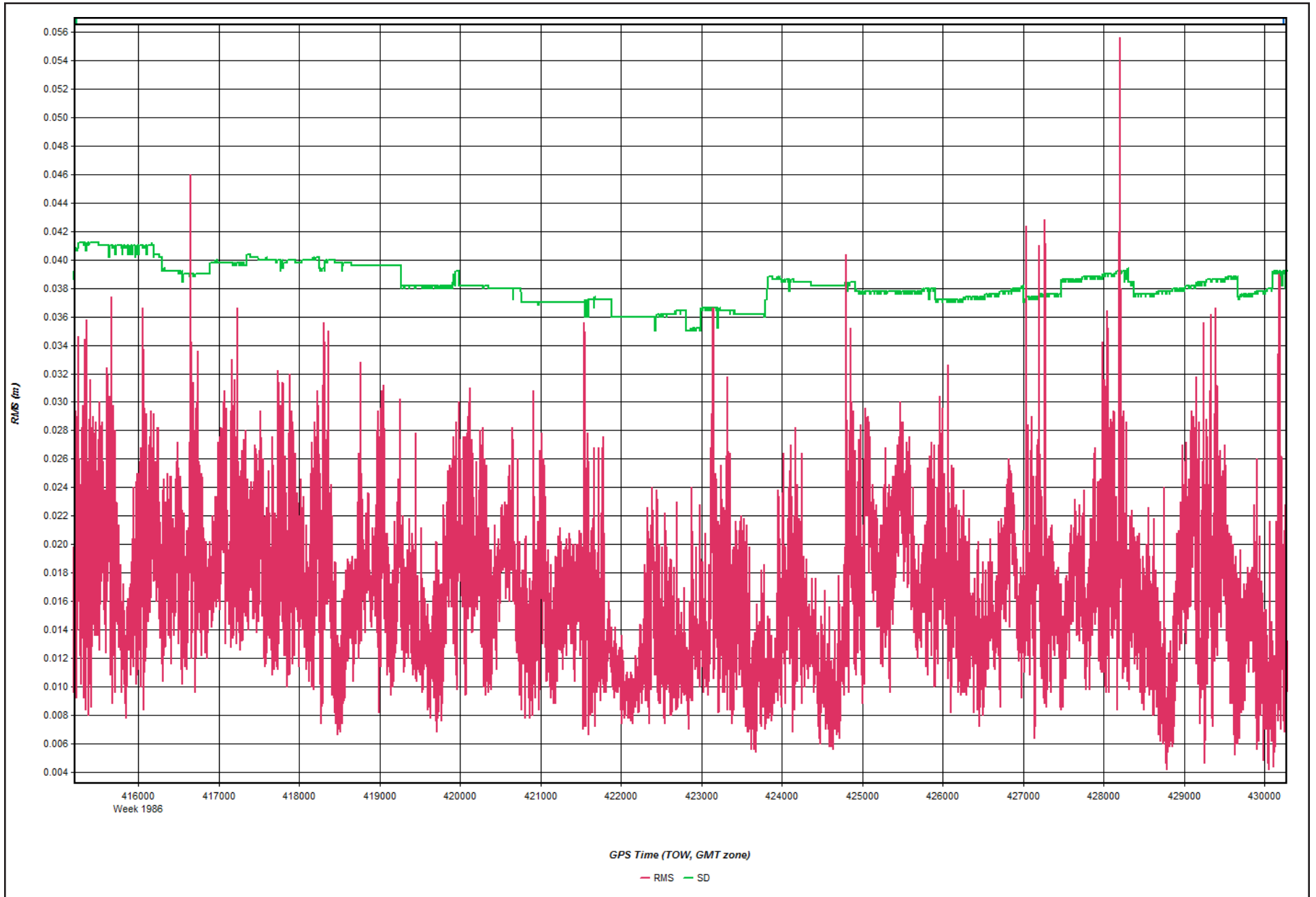
2018-02-01_Day032_7 - 20180201185120

Figure 16: C/A Code Residual RMS Plot



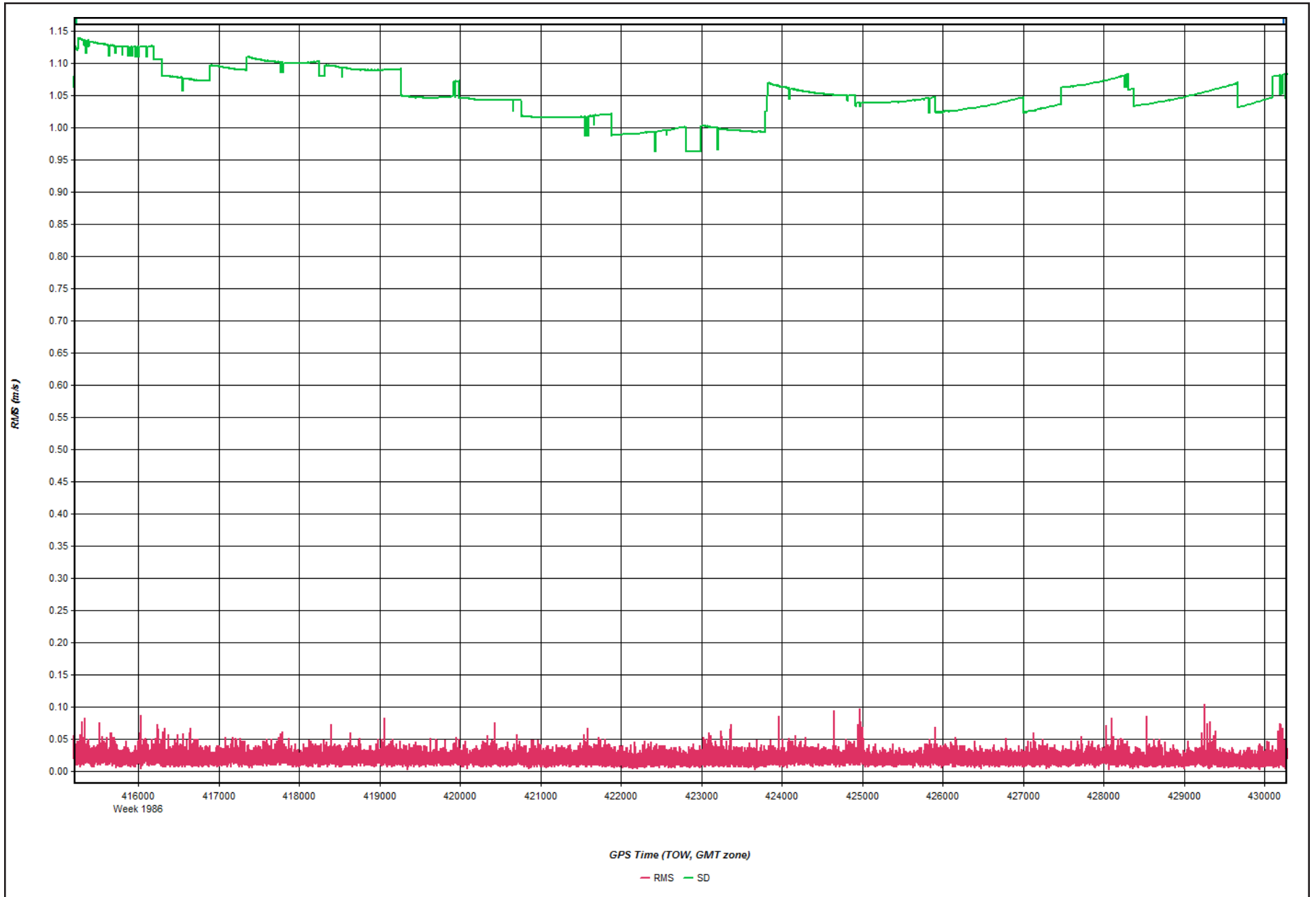
2018-02-01_Day032_7 - 20180201185120

Figure 17: Carrier Residual RMS Plot



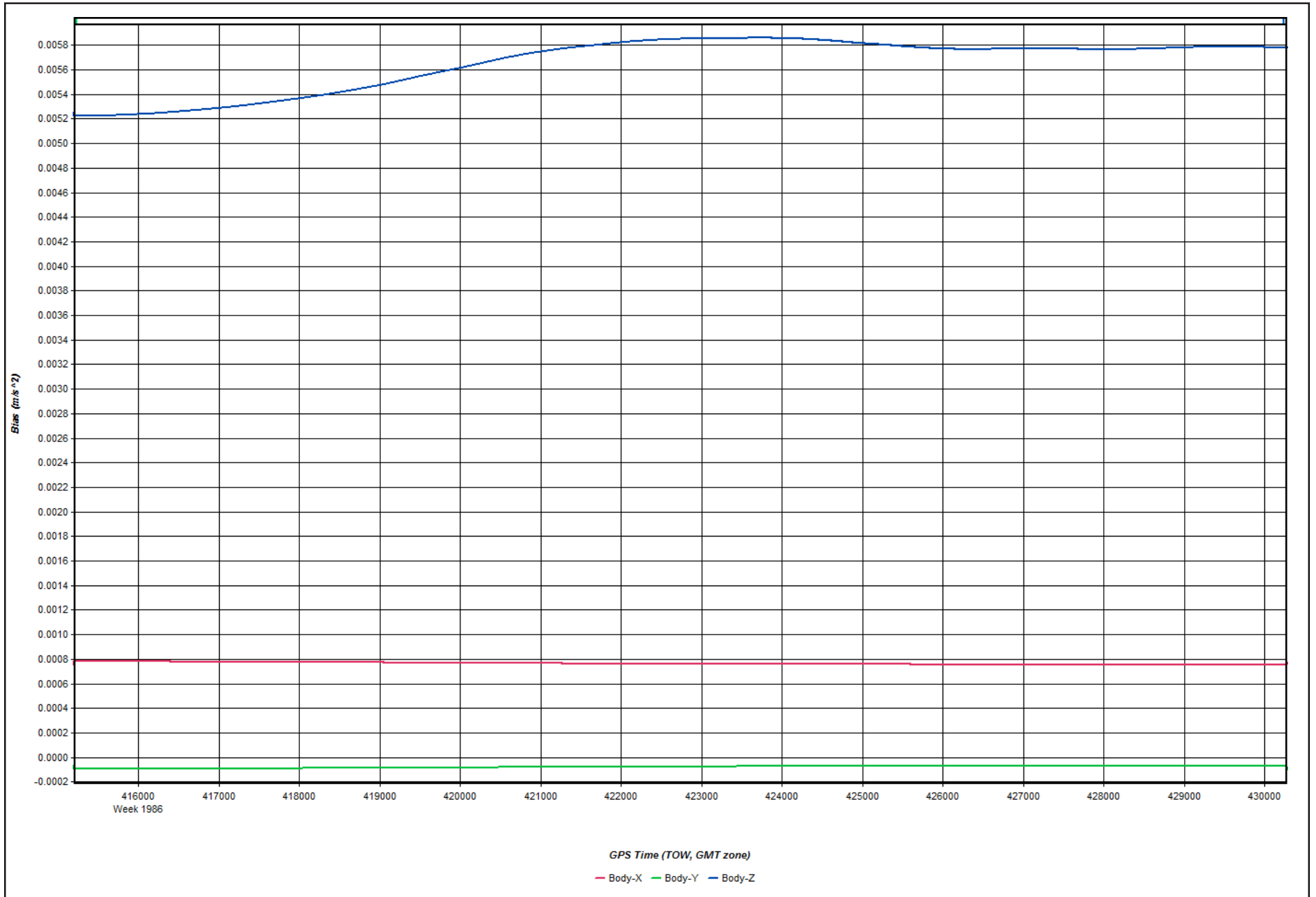
2018-02-01_Day032_7 - 20180201185120

Figure 18: L1 Doppler Residual RMS Plot



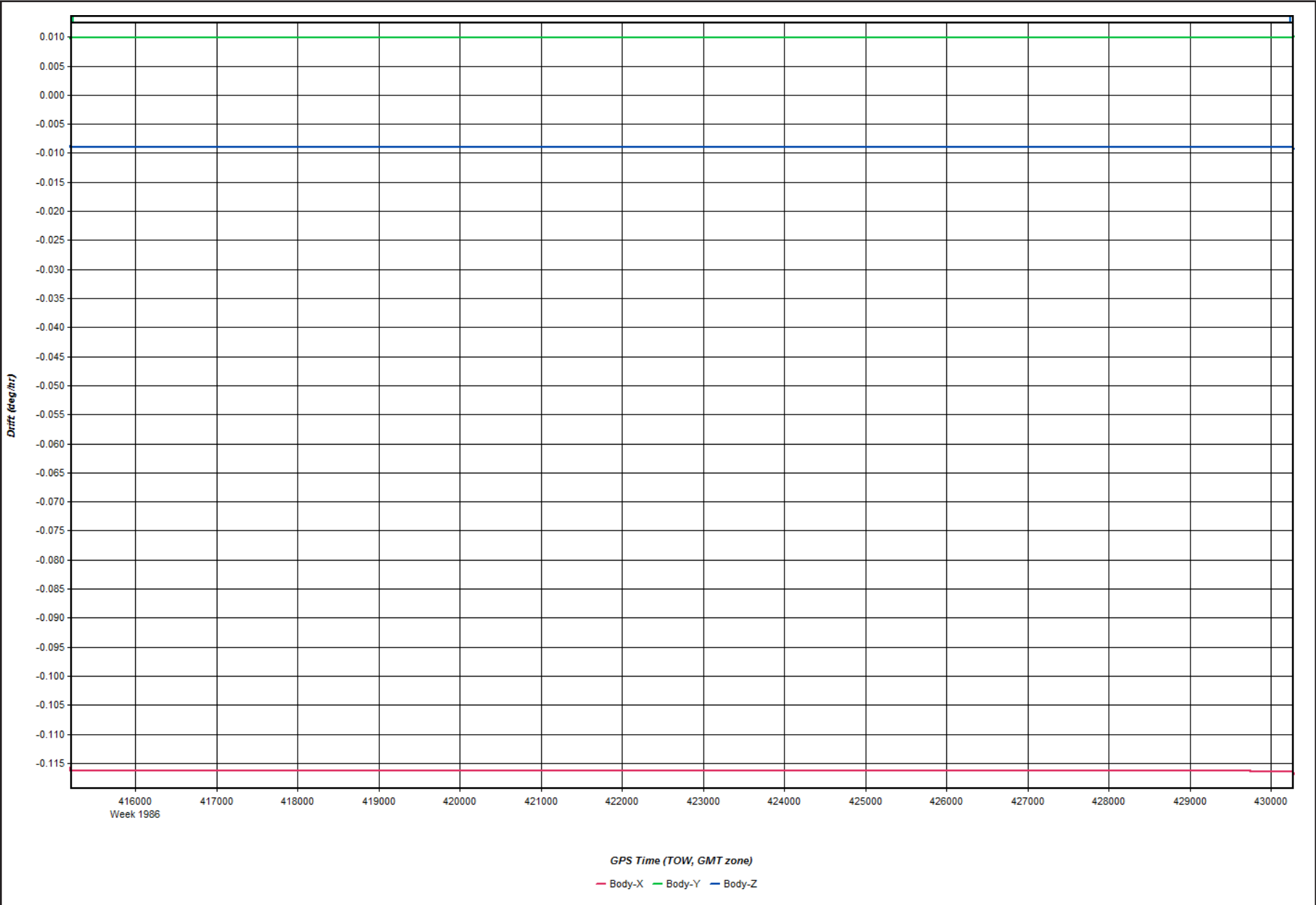
2018-02-01_Day032_7 - 20180201185120

Figure 19: Accelerometer Bias Plot



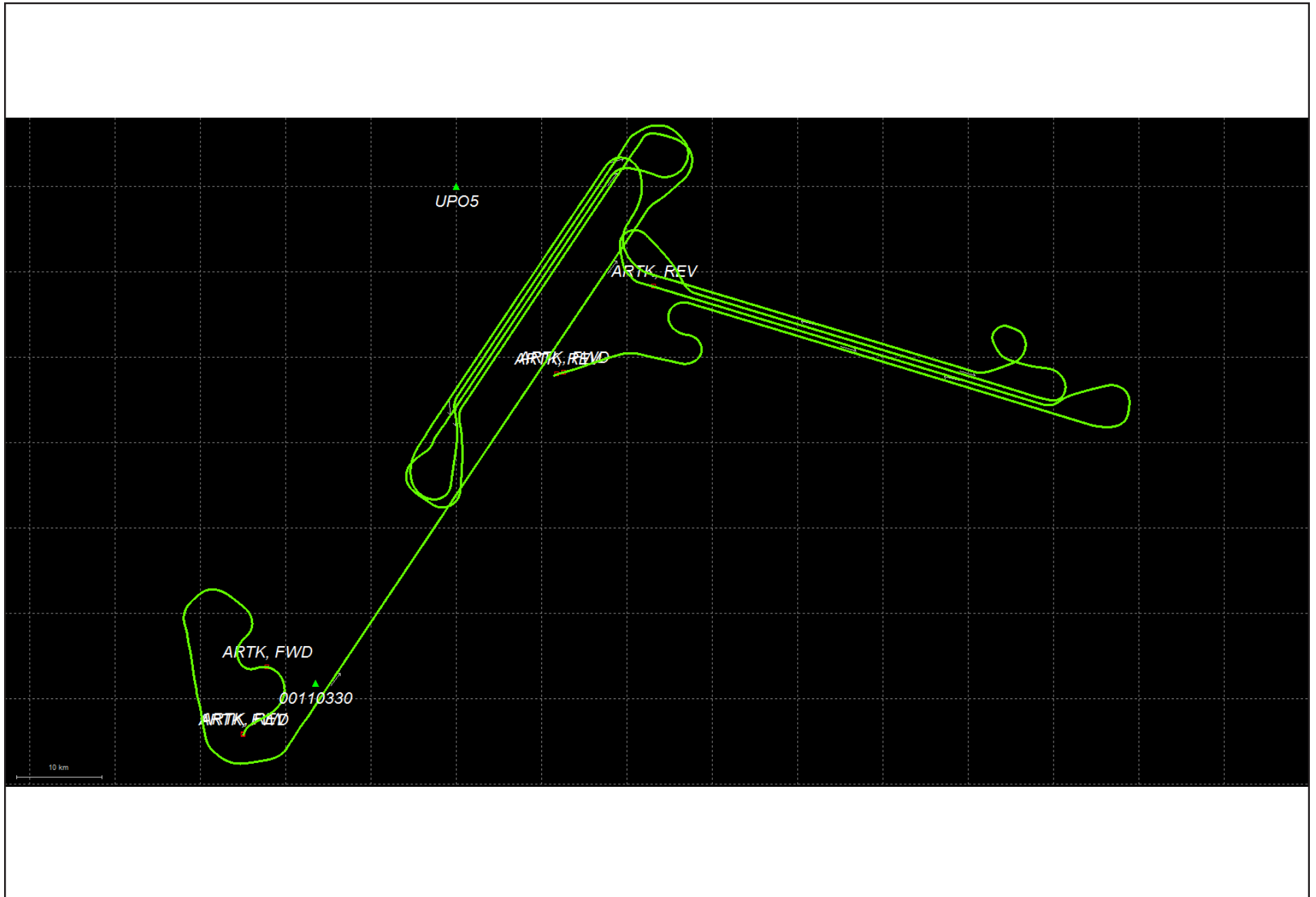
2018-02-01_Day032_7 - 20180201185120

Figure 20: Gyro Drift Plot



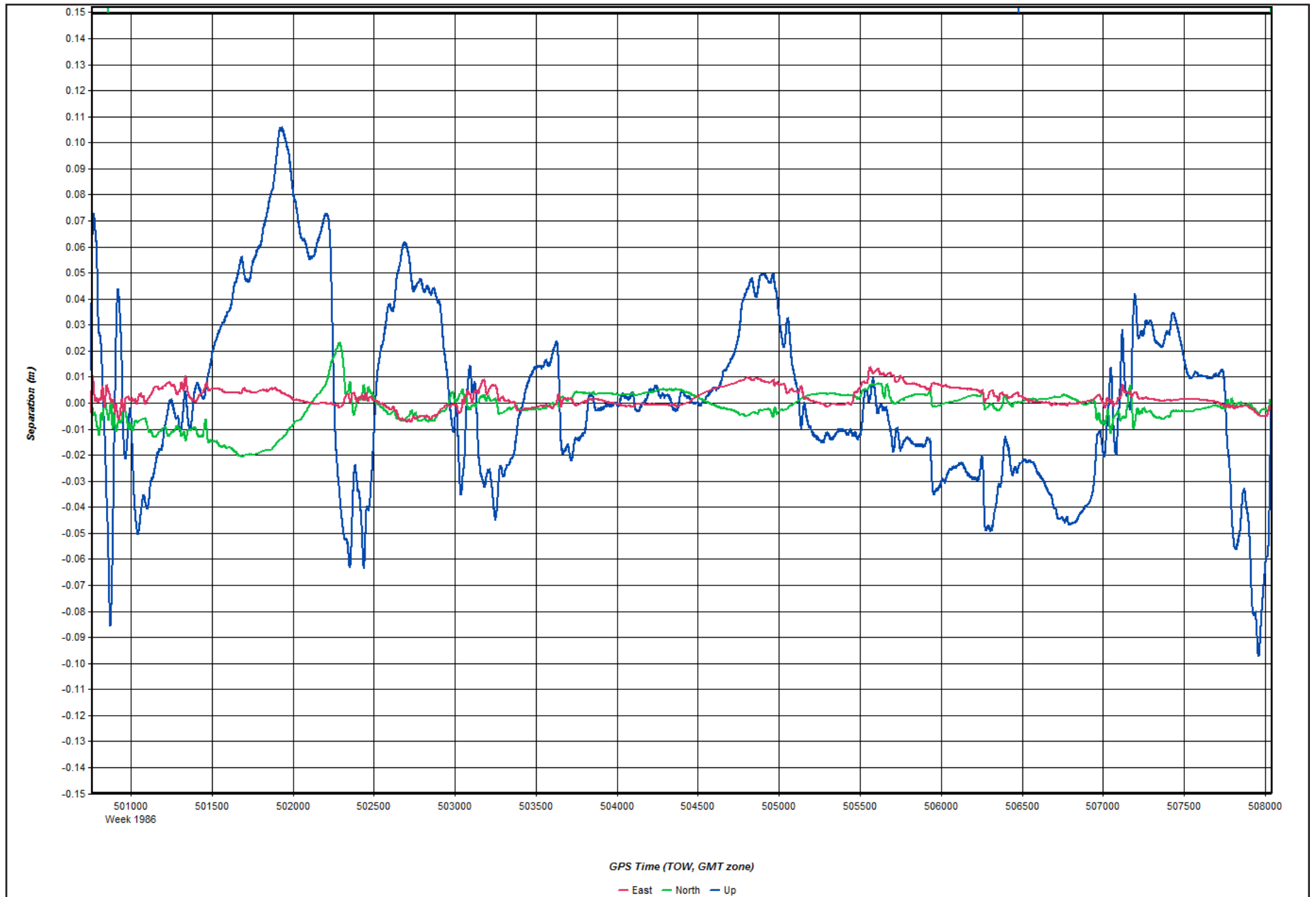
2018-02-02_Day033_7 - 20180202183201

Figure 1: Map



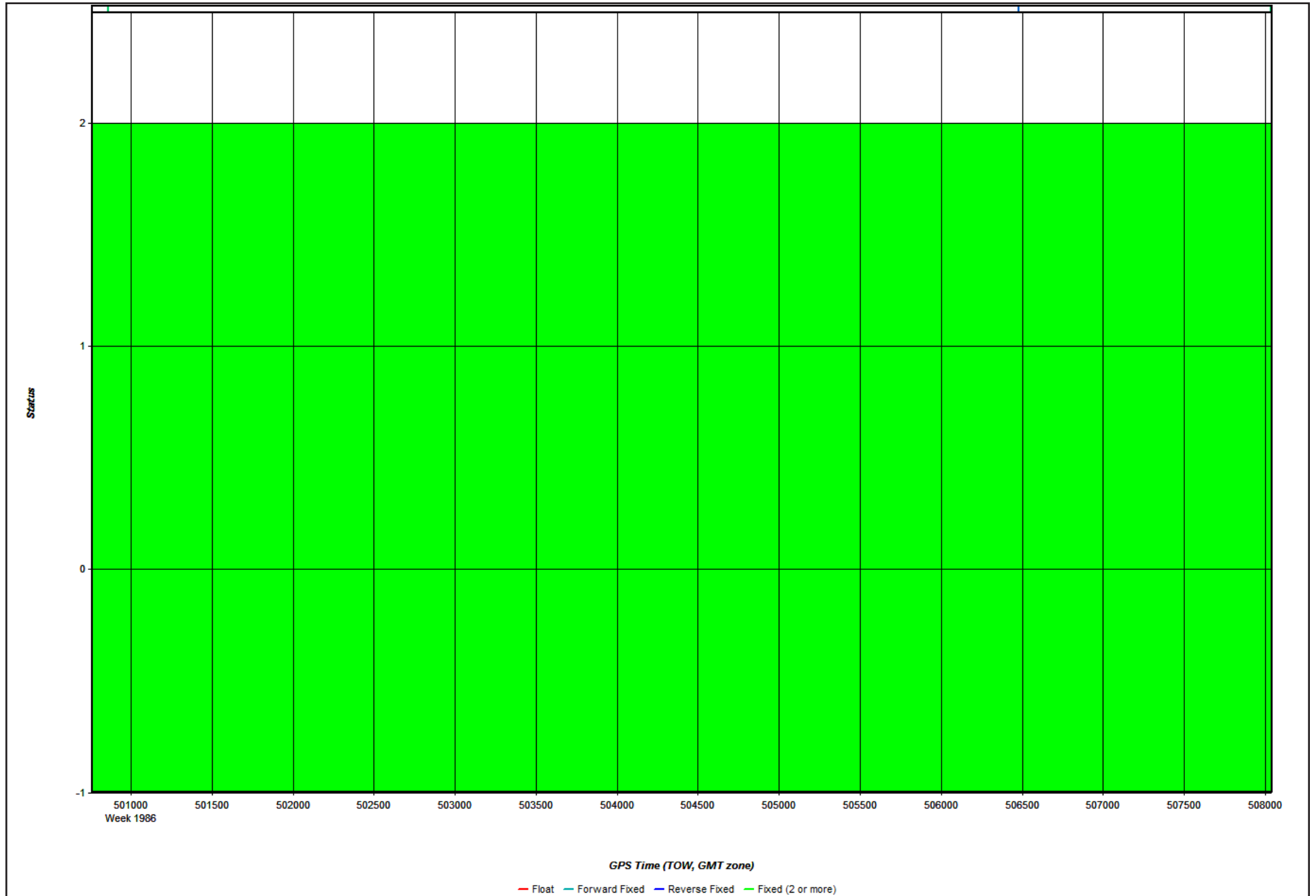
2018-02-02_Day033_7 - 20180202183201

Figure 2: Forward/Reverse or Combined Separation Plot



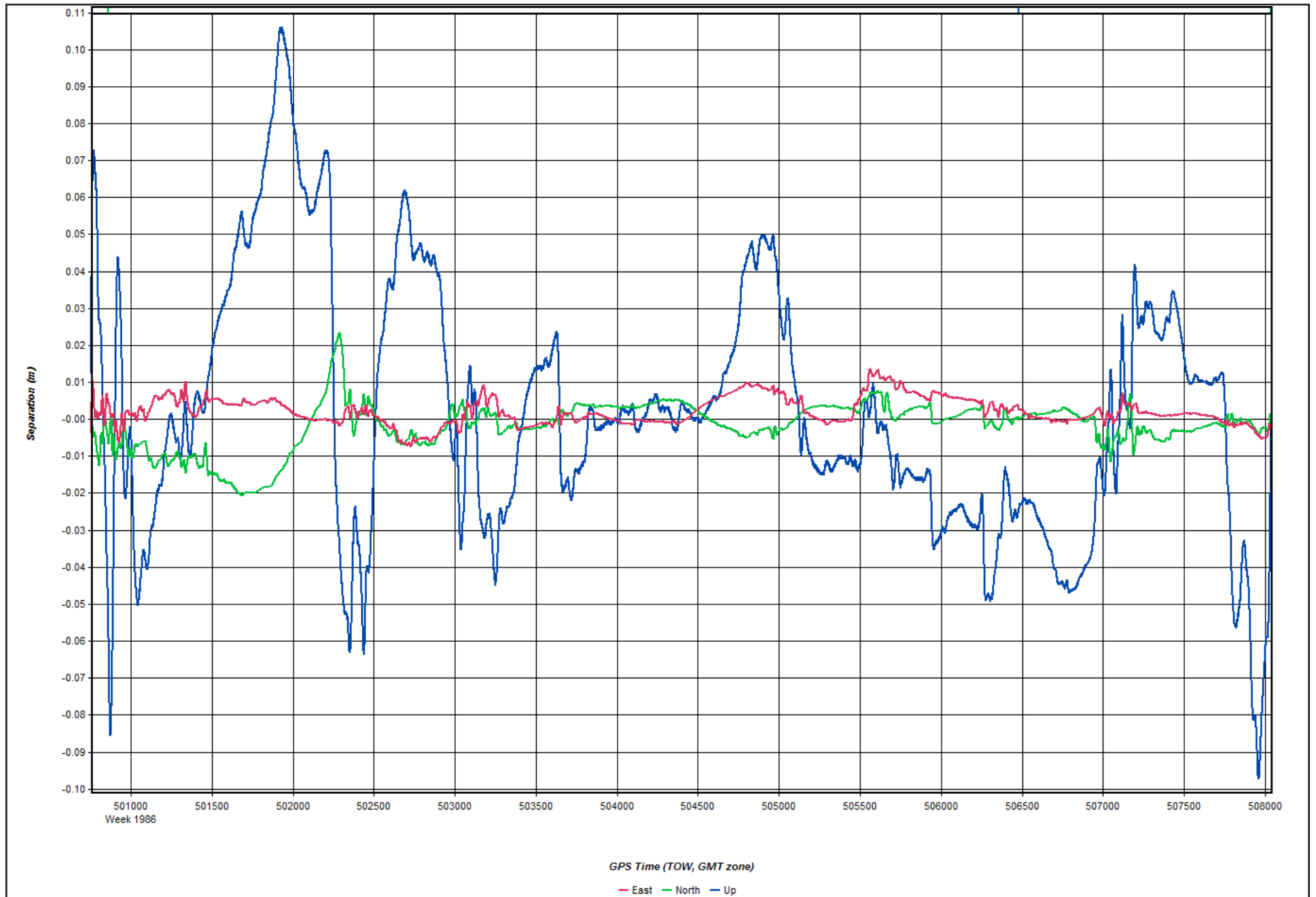
2018-02-02_Day033_7 - 20180202183201

Figure 3: Float or Fixed Ambiguity



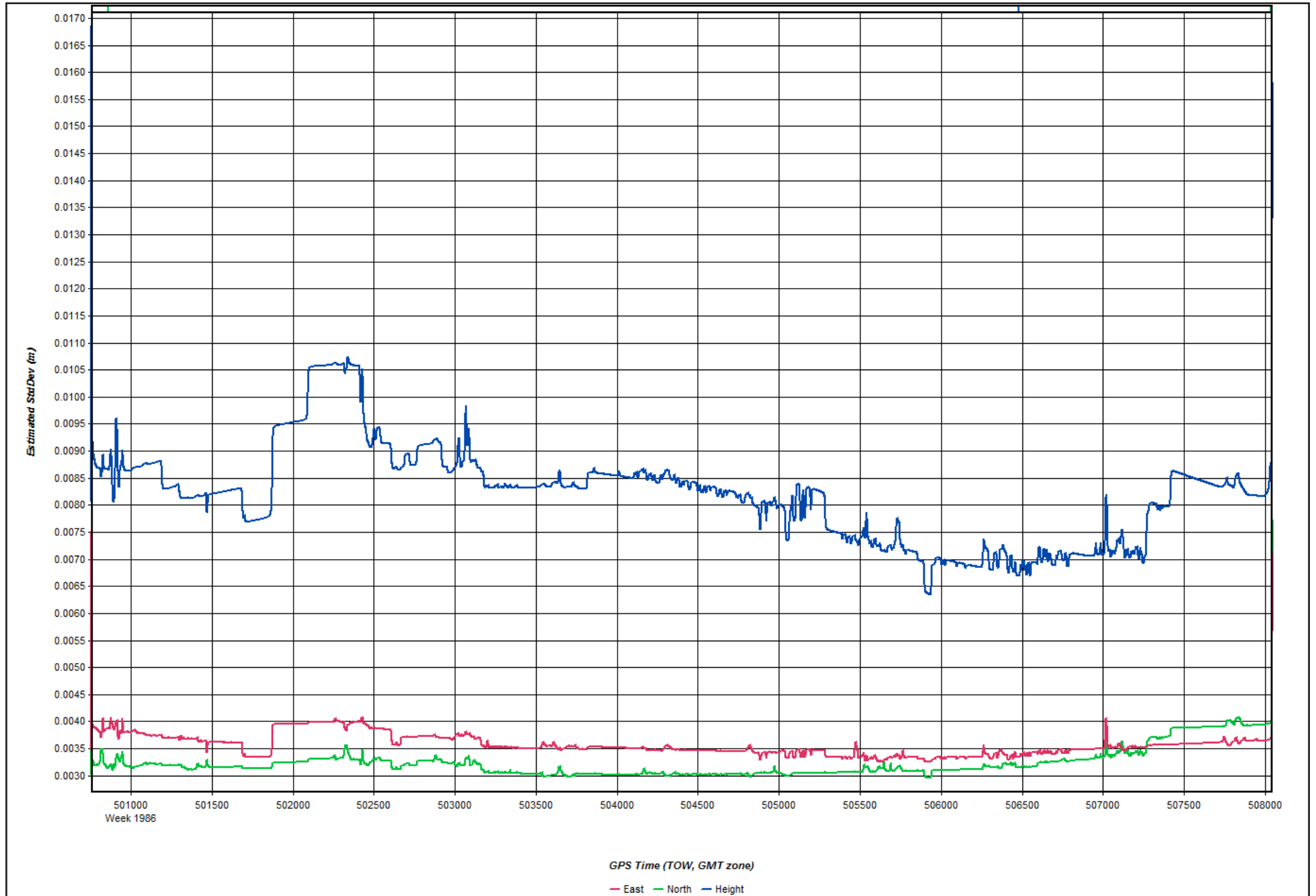
2018-02-02_Day033_7 - 20180202183201

Figure 4: Forward/Reverse Separation Plot (Fixed)



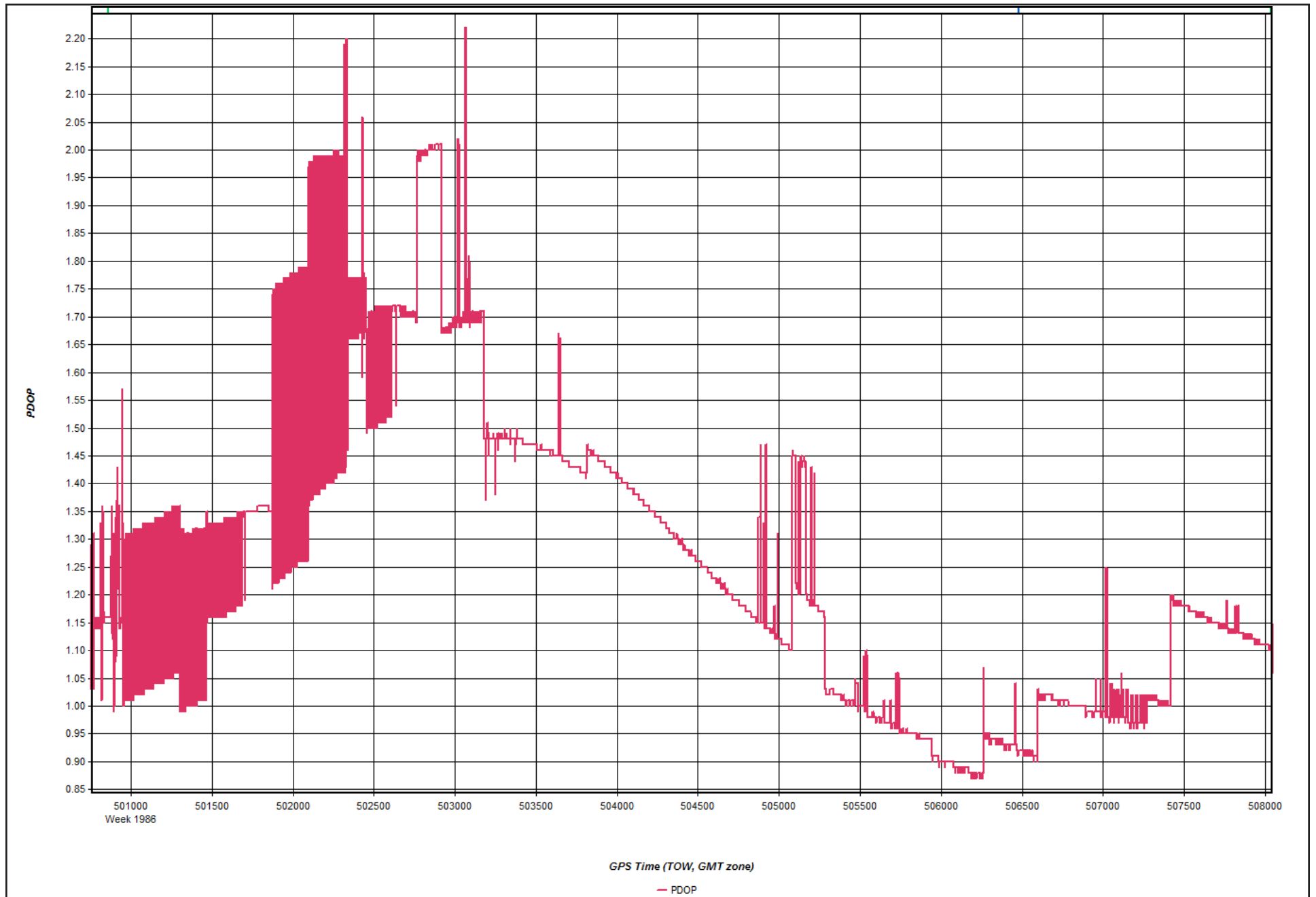
2018-02-02_Day033_7 - 20180202183201

Figure 5: Estimated Position Accuracy Plot



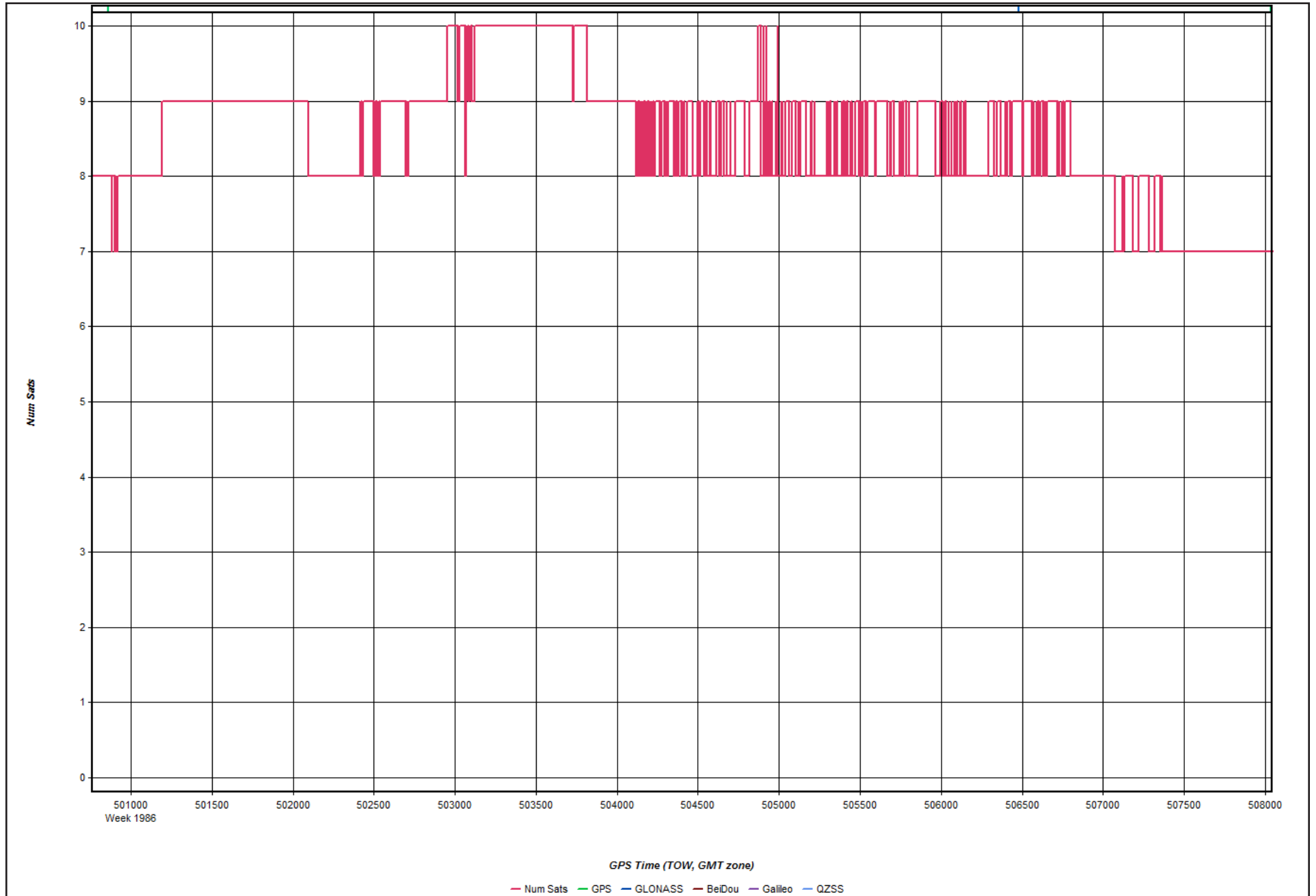
2018-02-02_Day033_7 - 20180202183201

Figure 6: PDOP Plot



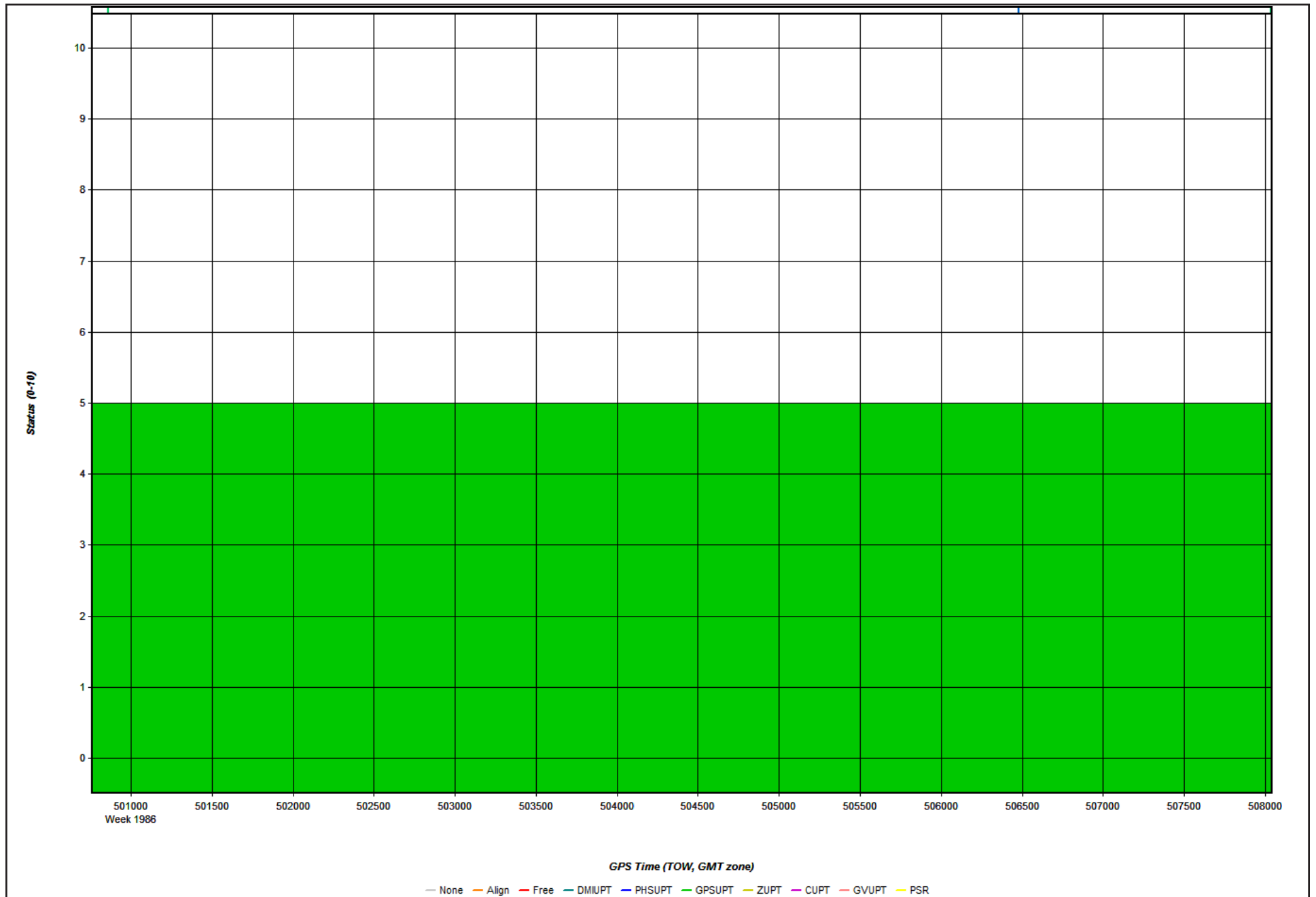
2018-02-02_Day033_7 - 20180202183201

Figure 7: Number of Satellites Line Plot



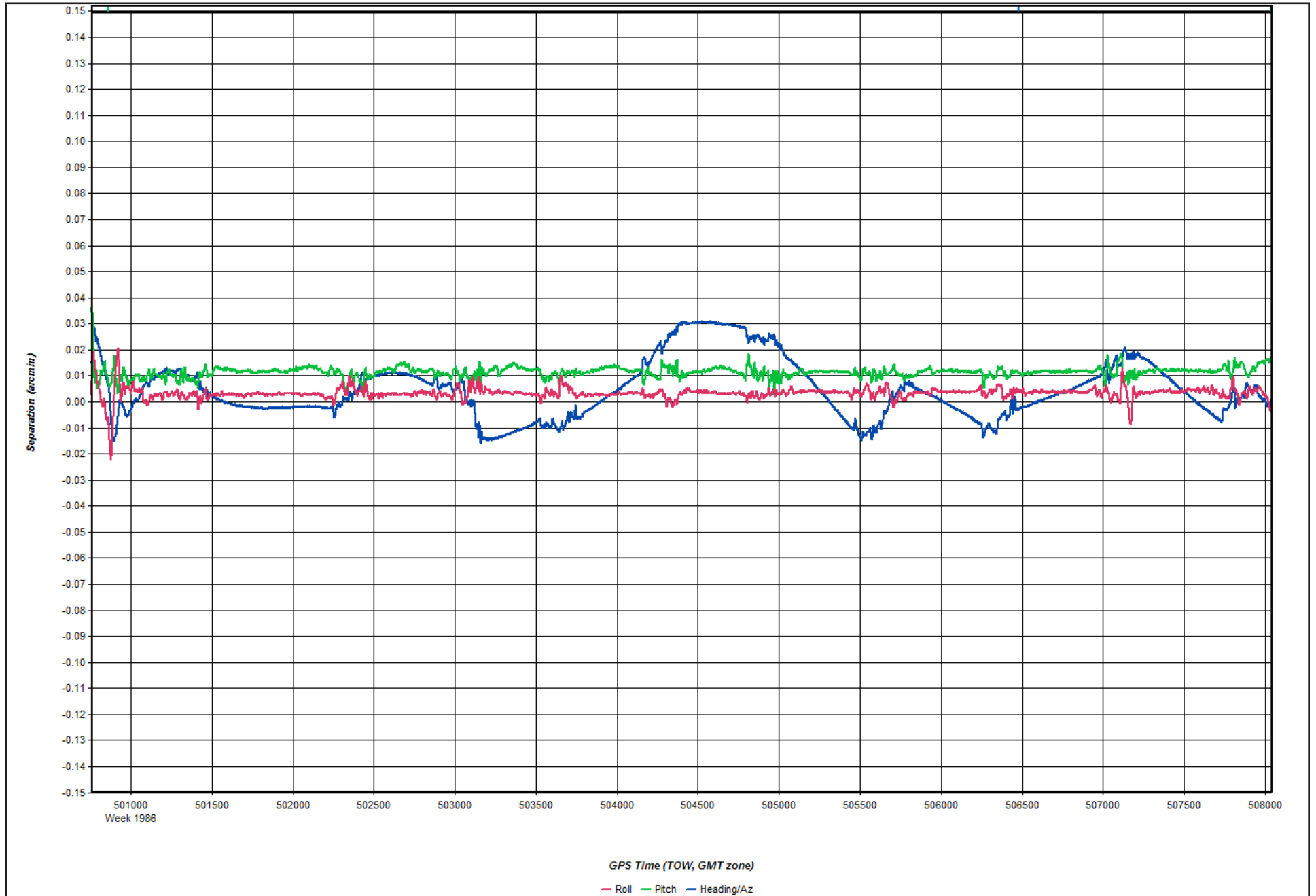
2018-02-02_Day033_7 - 20180202183201

Figure 8: Status flag for IMU processing



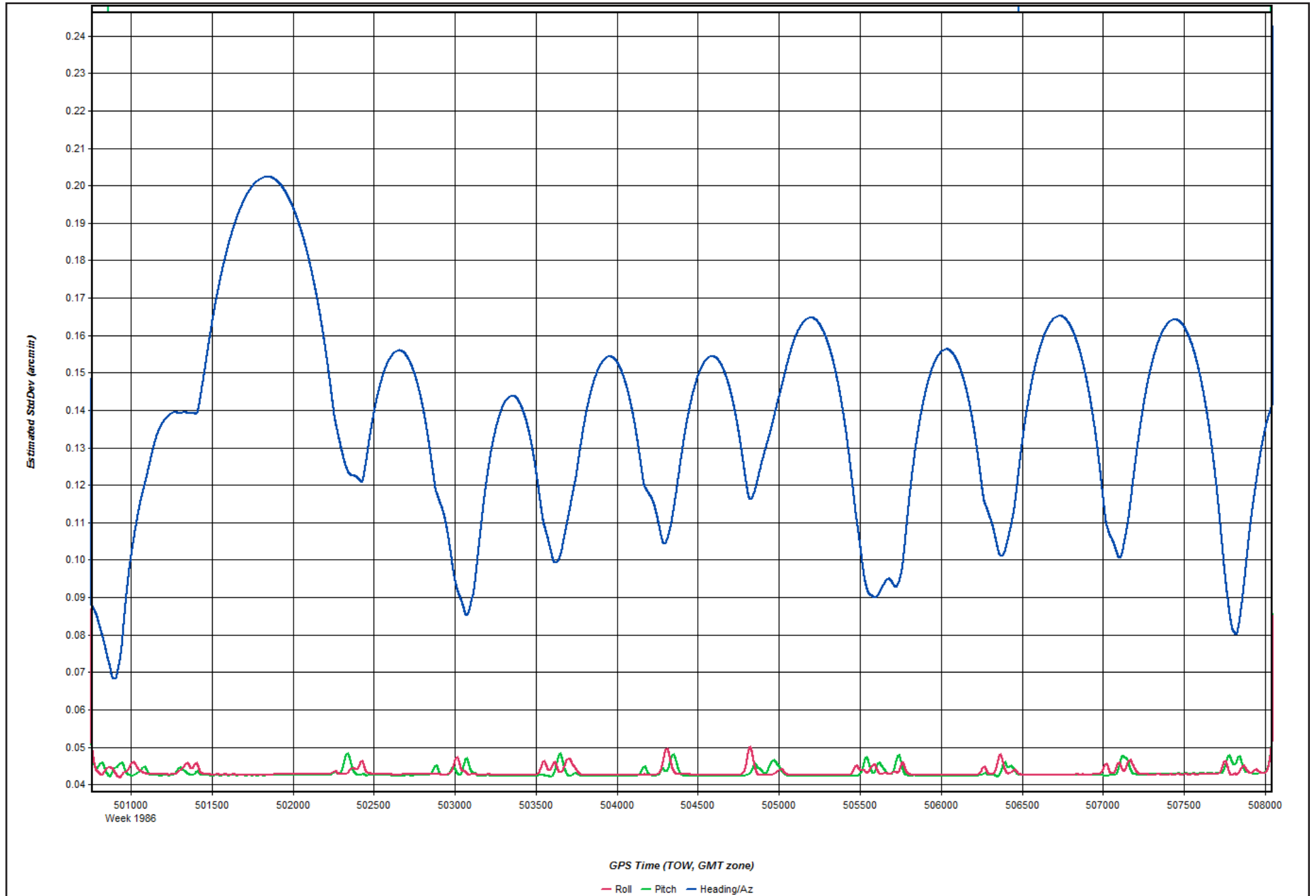
2018-02-02_Day033_7 - 20180202183201

Figure 9: Fwd/Rev Attitude Separation Plot



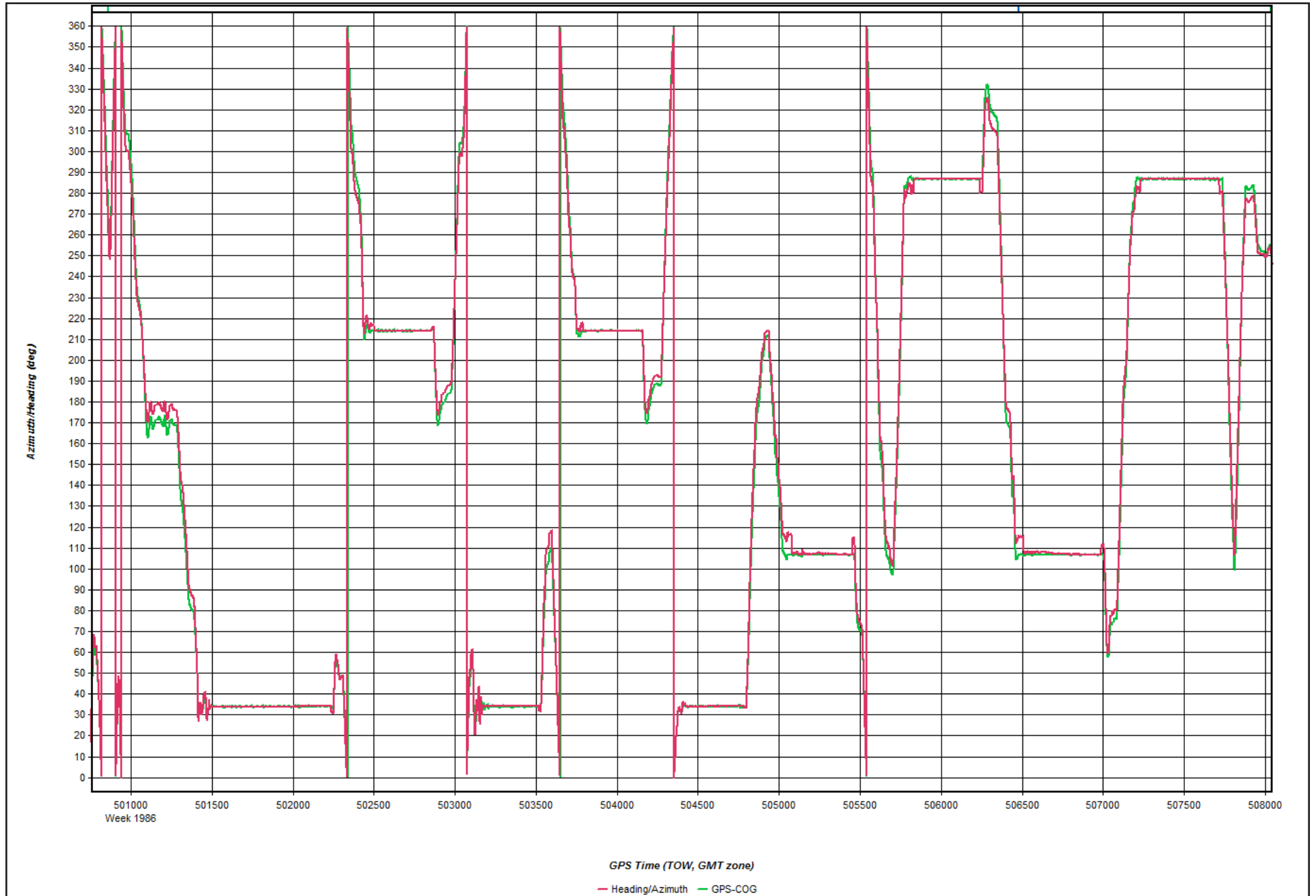
2018-02-02_Day033_7 - 20180202183201

Figure 10: Estimated Attitude Accuracy Plot



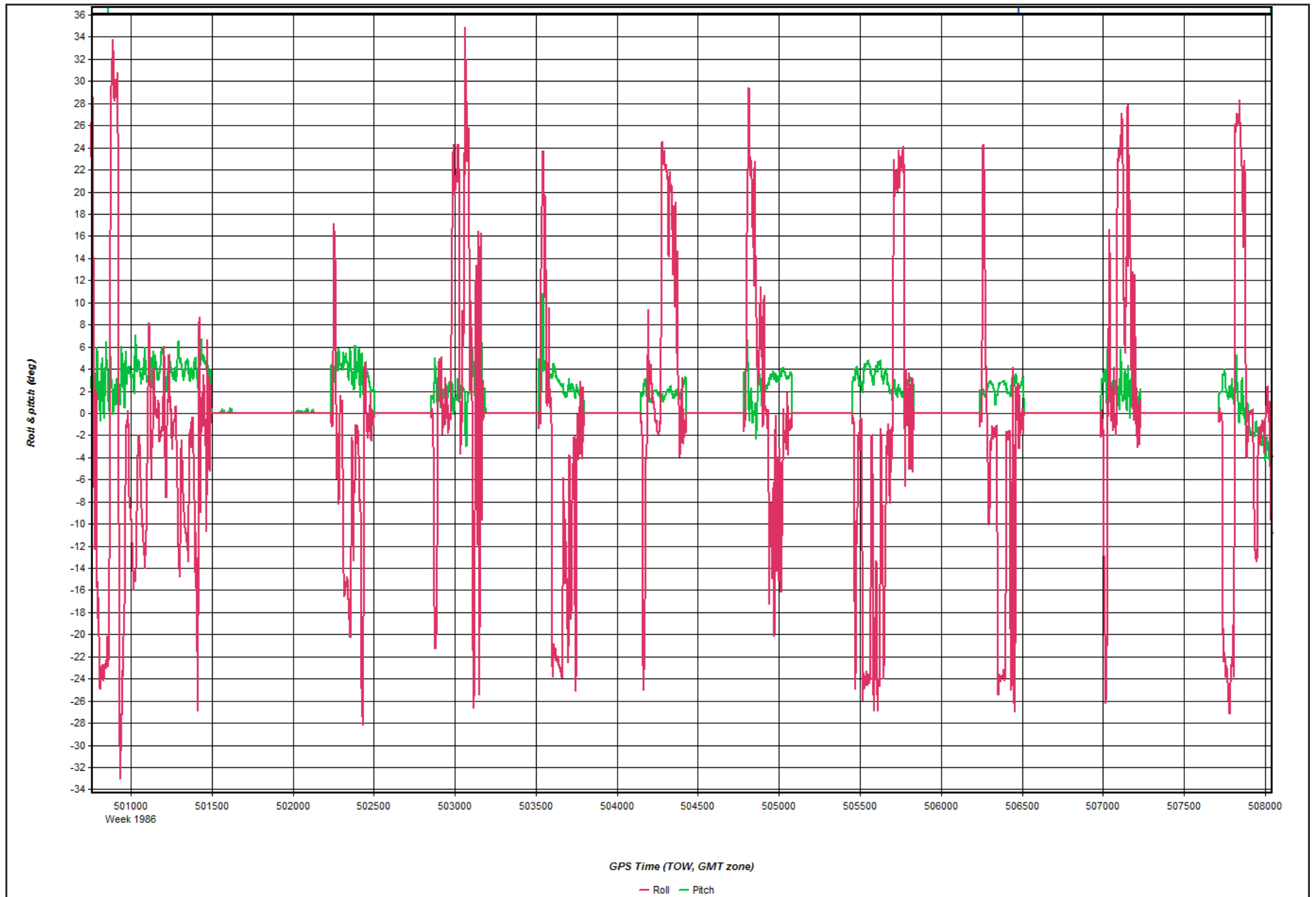
2018-02-02_Day033_7 - 20180202183201

Figure 11: Azimuth Plot



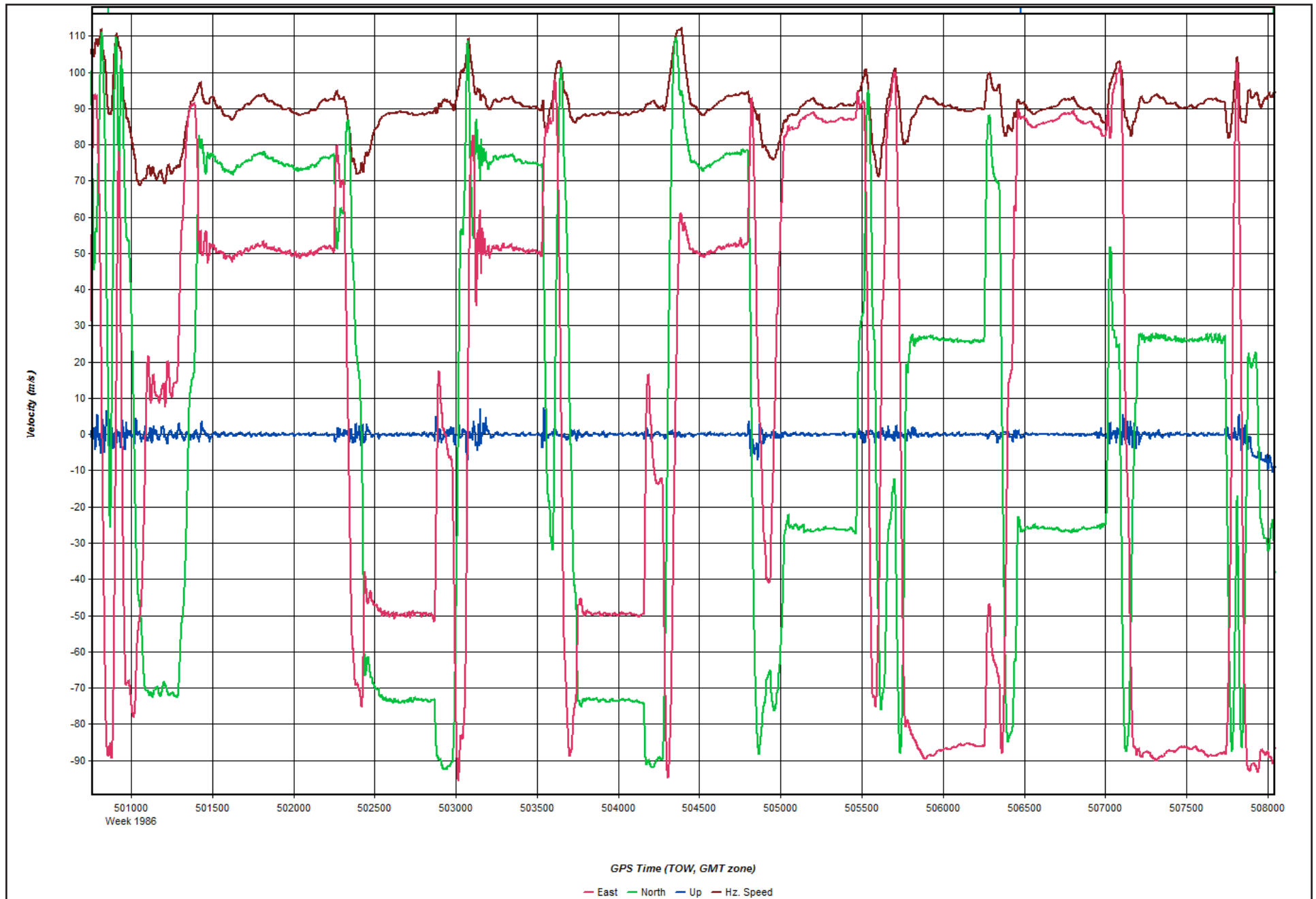
2018-02-02_Day033_7 - 20180202183201

Figure 12: Roll & Pitch Plot



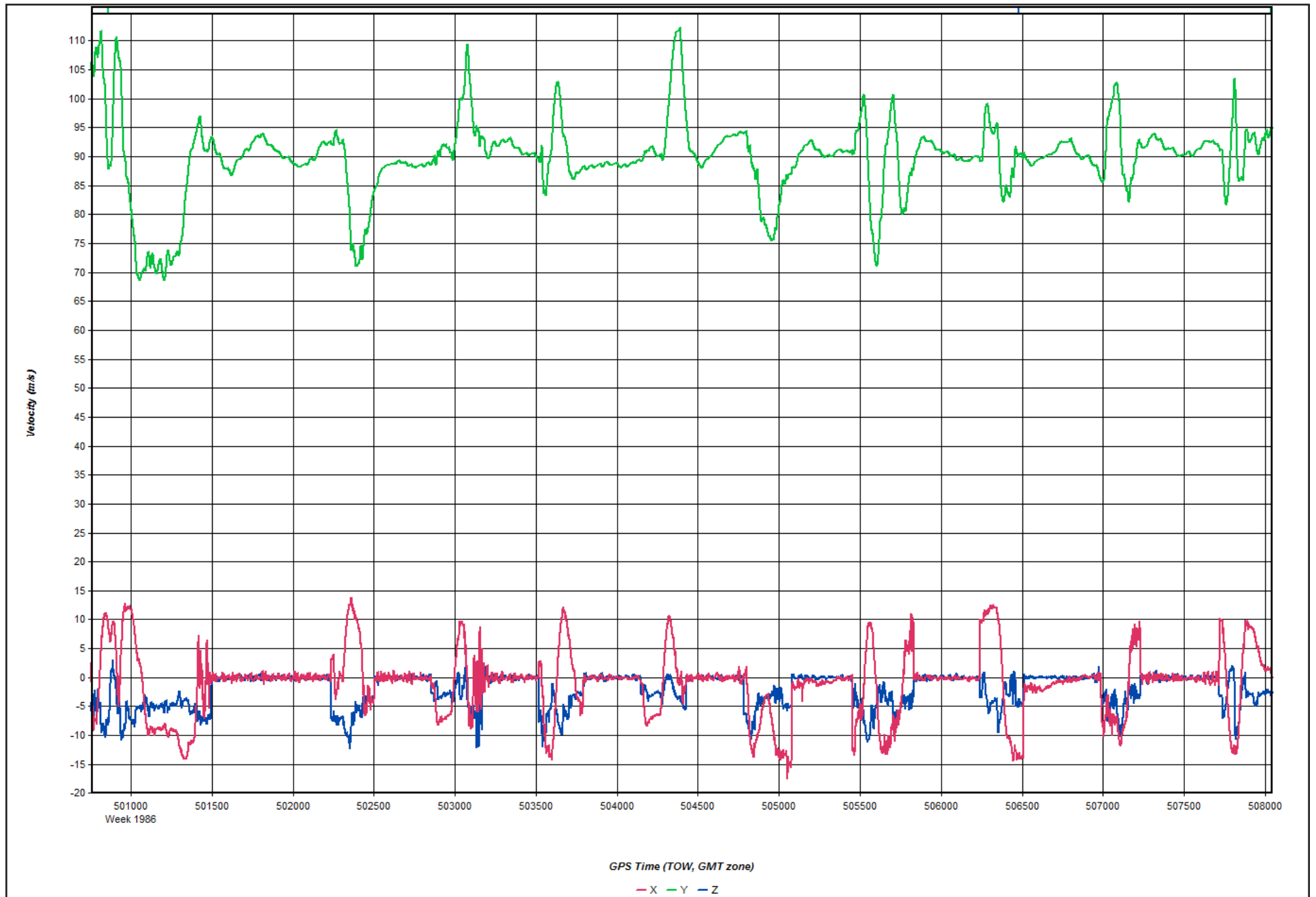
2018-02-02_Day033_7 - 20180202183201

Figure 13: Velocity Profile Plot



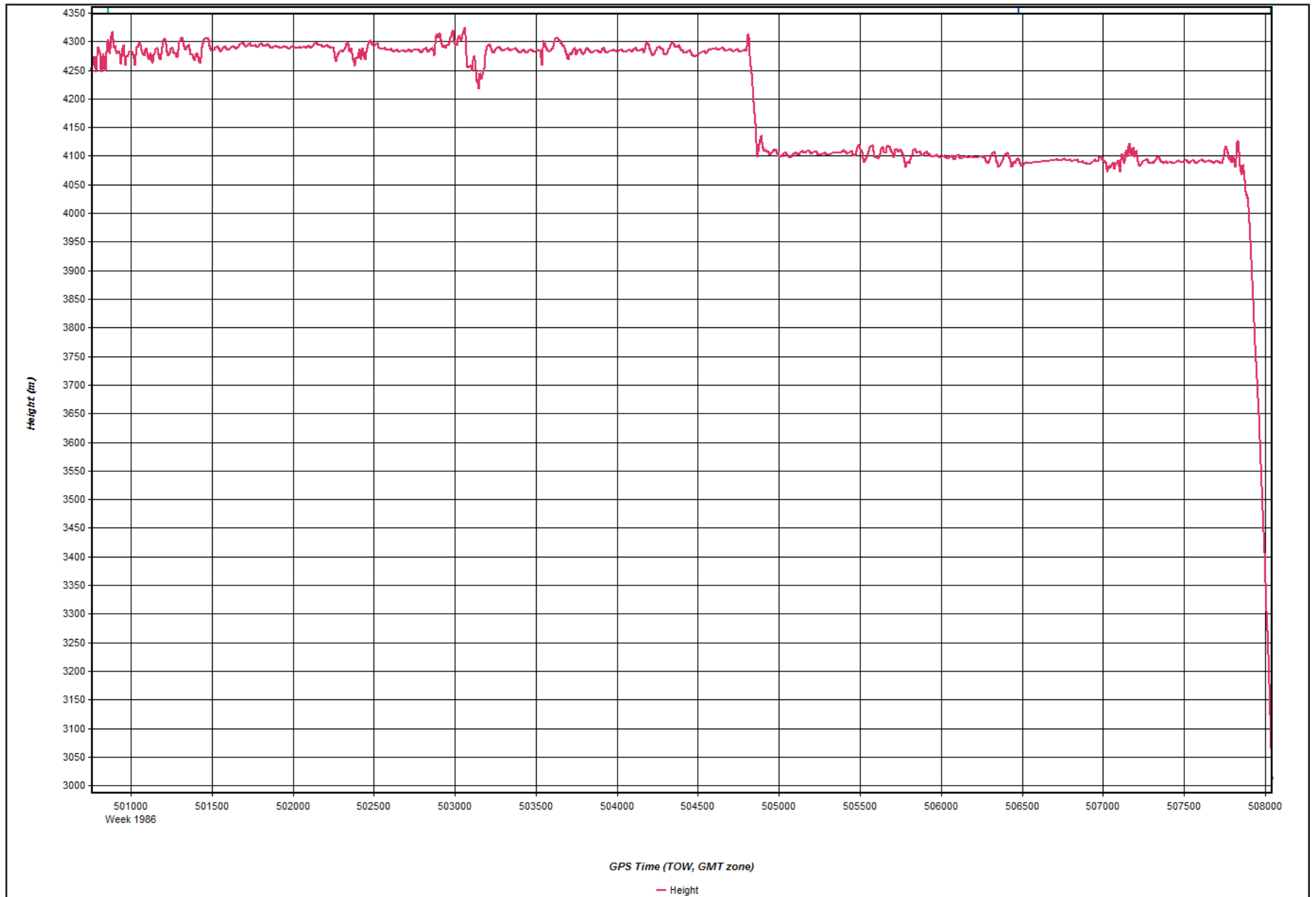
2018-02-02_Day033_7 - 20180202183201

Figure 14: Body Frame Velocity Plot



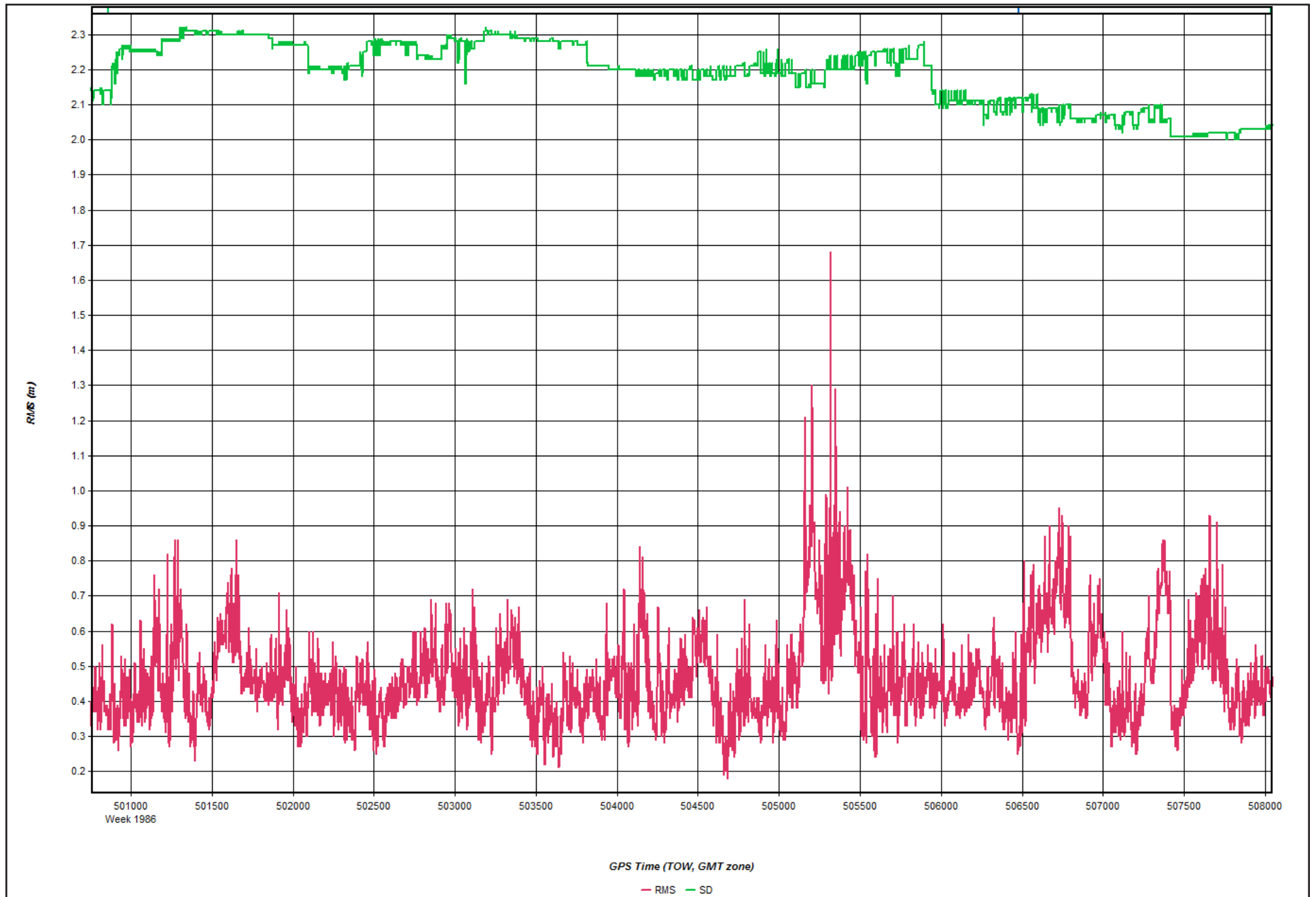
2018-02-02_Day033_7 - 20180202183201

Figure 15: Height Profile Plot



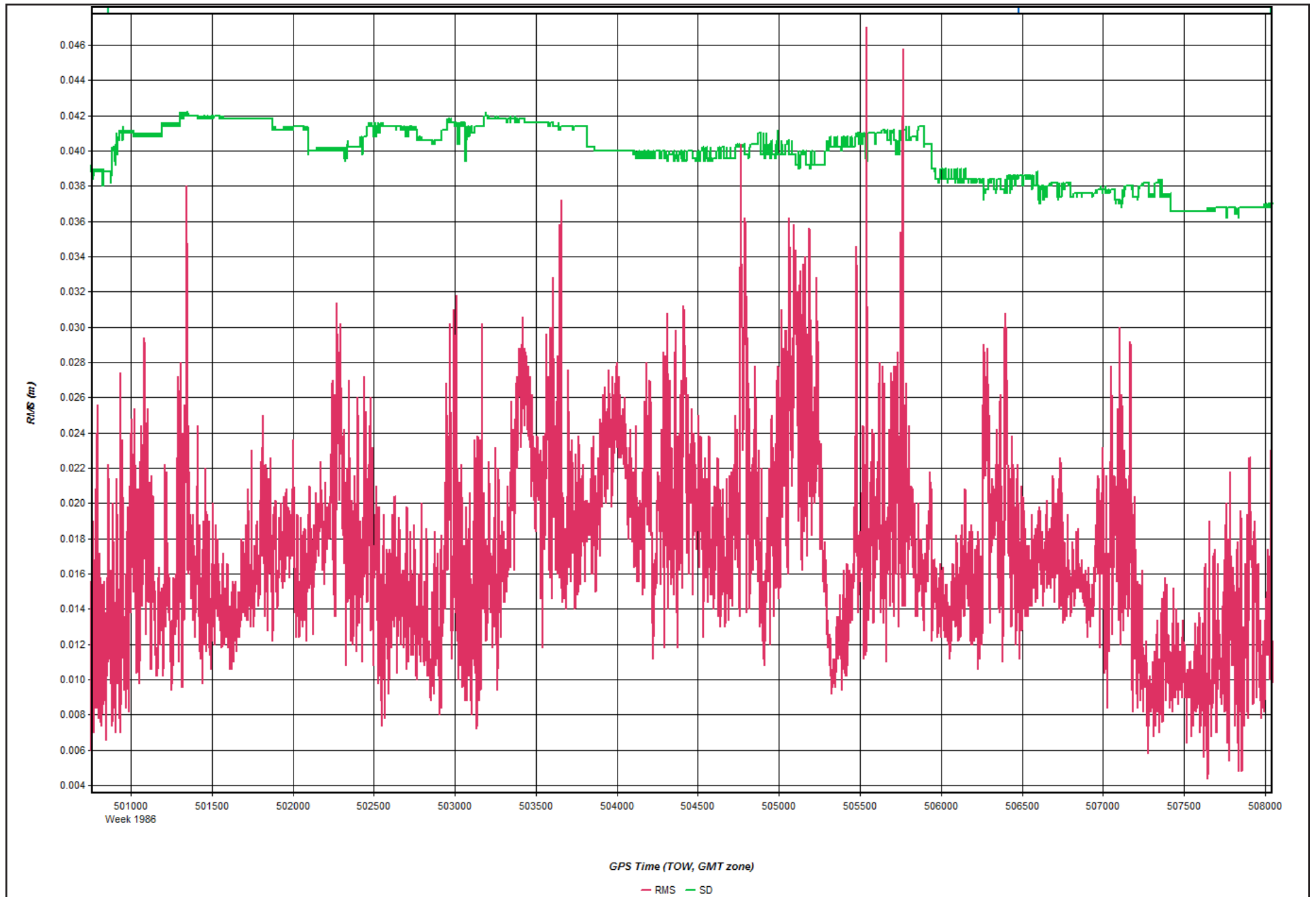
2018-02-02_Day033_7 - 20180202183201

Figure 16: C/A Code Residual RMS Plot



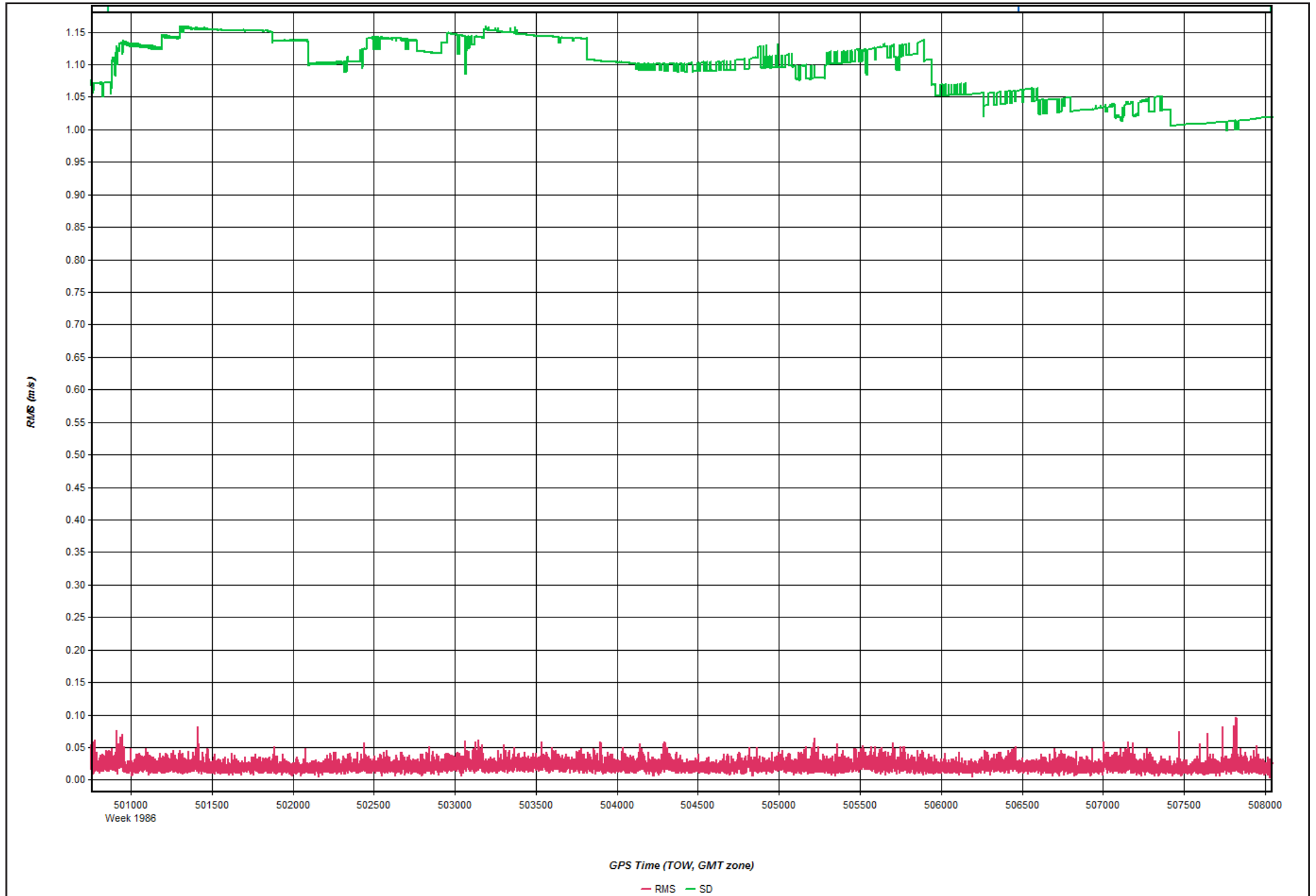
2018-02-02_Day033_7 - 20180202183201

Figure 17: Carrier Residual RMS Plot



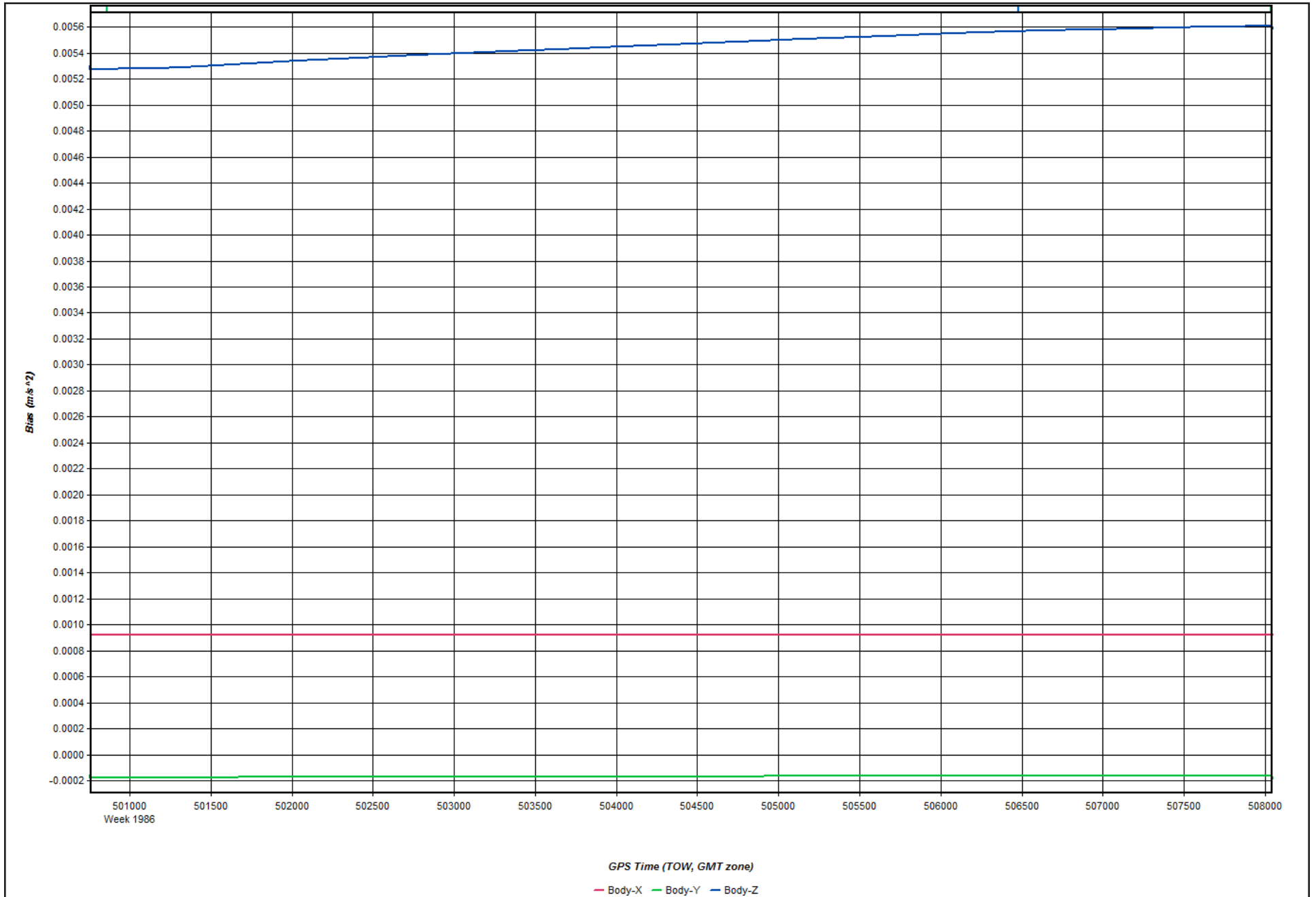
2018-02-02_Day033_7 - 20180202183201

Figure 18: L1 Doppler Residual RMS Plot



2018-02-02_Day033_7 - 20180202183201

Figure 19: Accelerometer Bias Plot



2018-02-02_Day033_7 - 20180202183201

Figure 20: Gyro Drift Plot

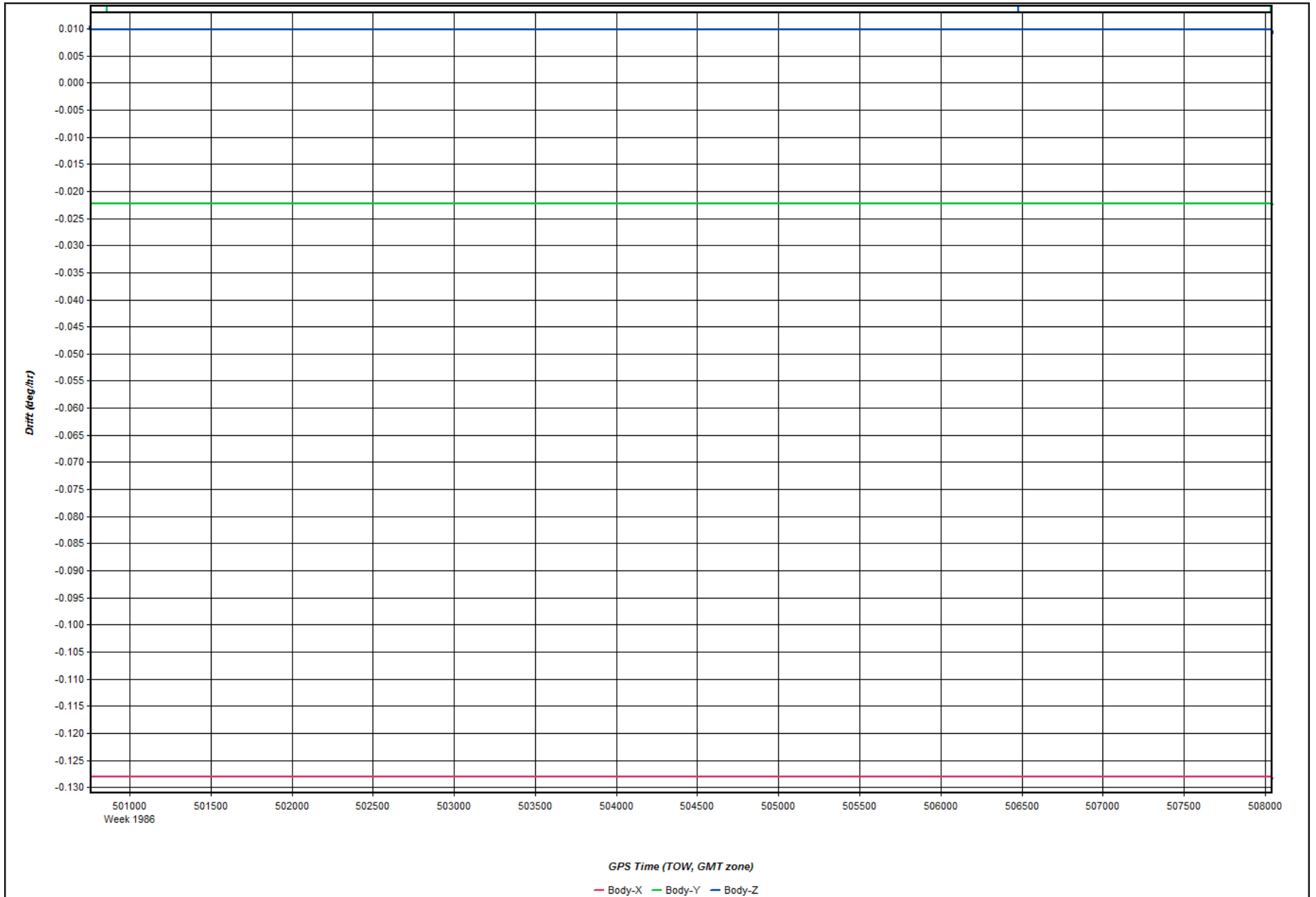
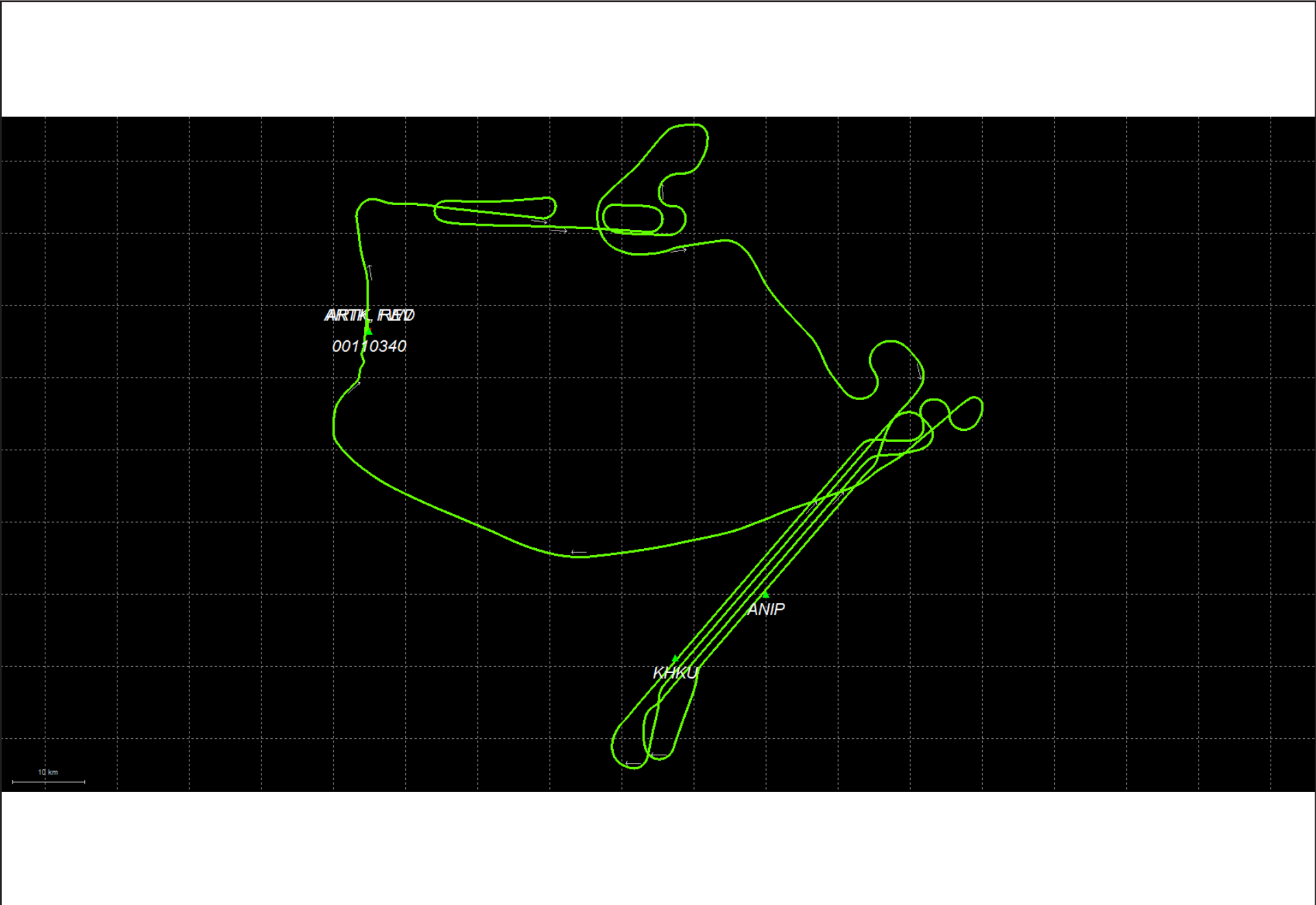
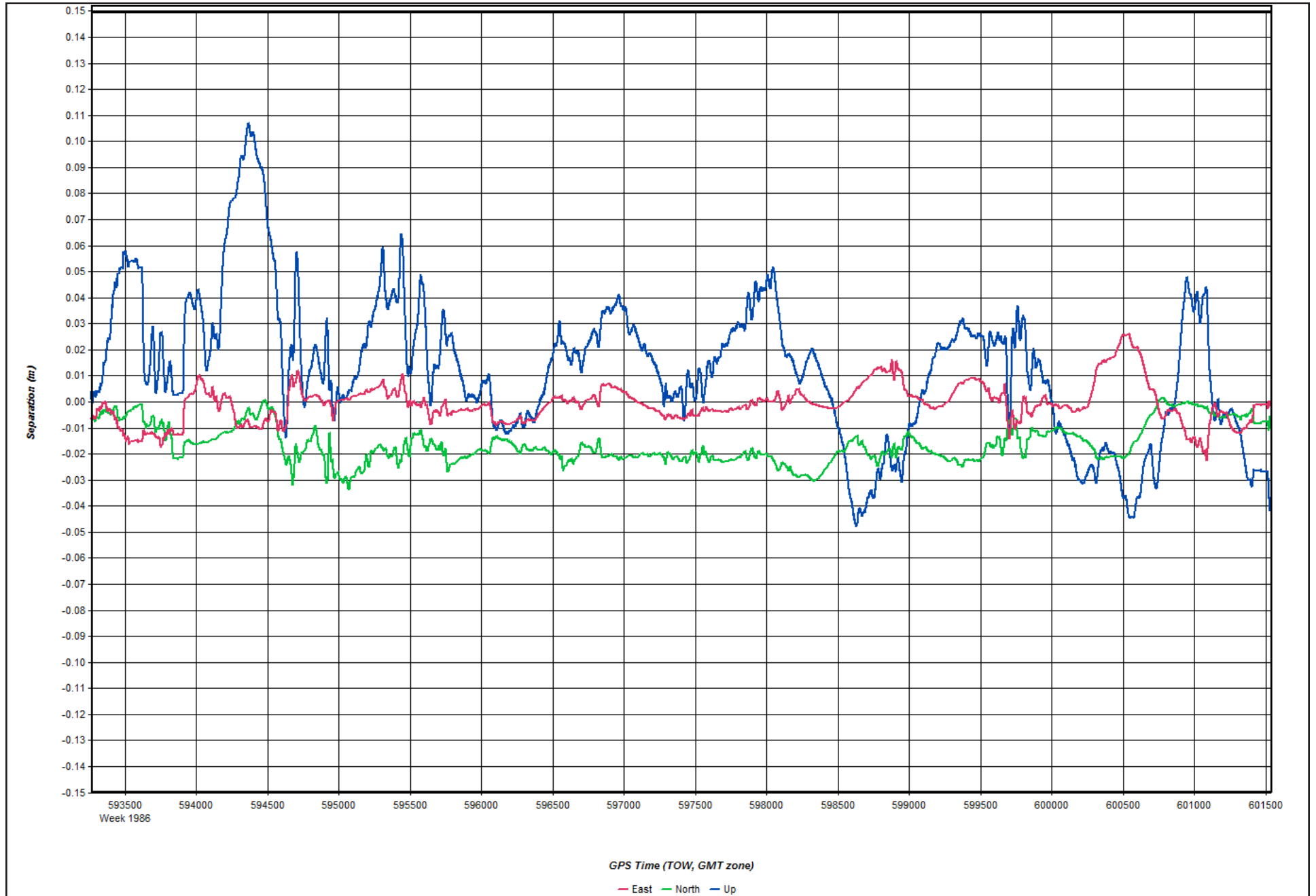


Figure 1: Map



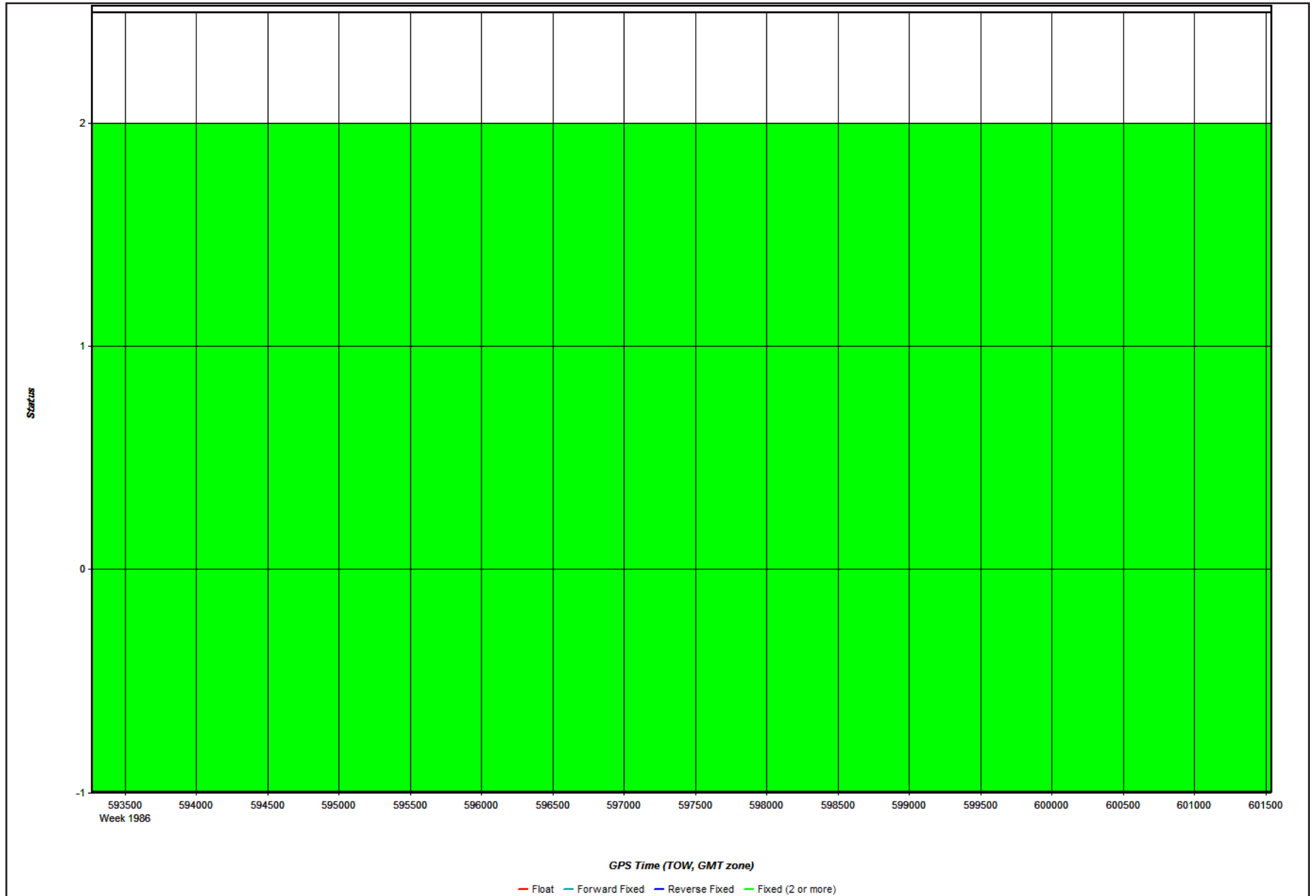
2018-02-03_Day034_7 - 20180203204644

Figure 2: Forward/Reverse or Combined Separation Plot



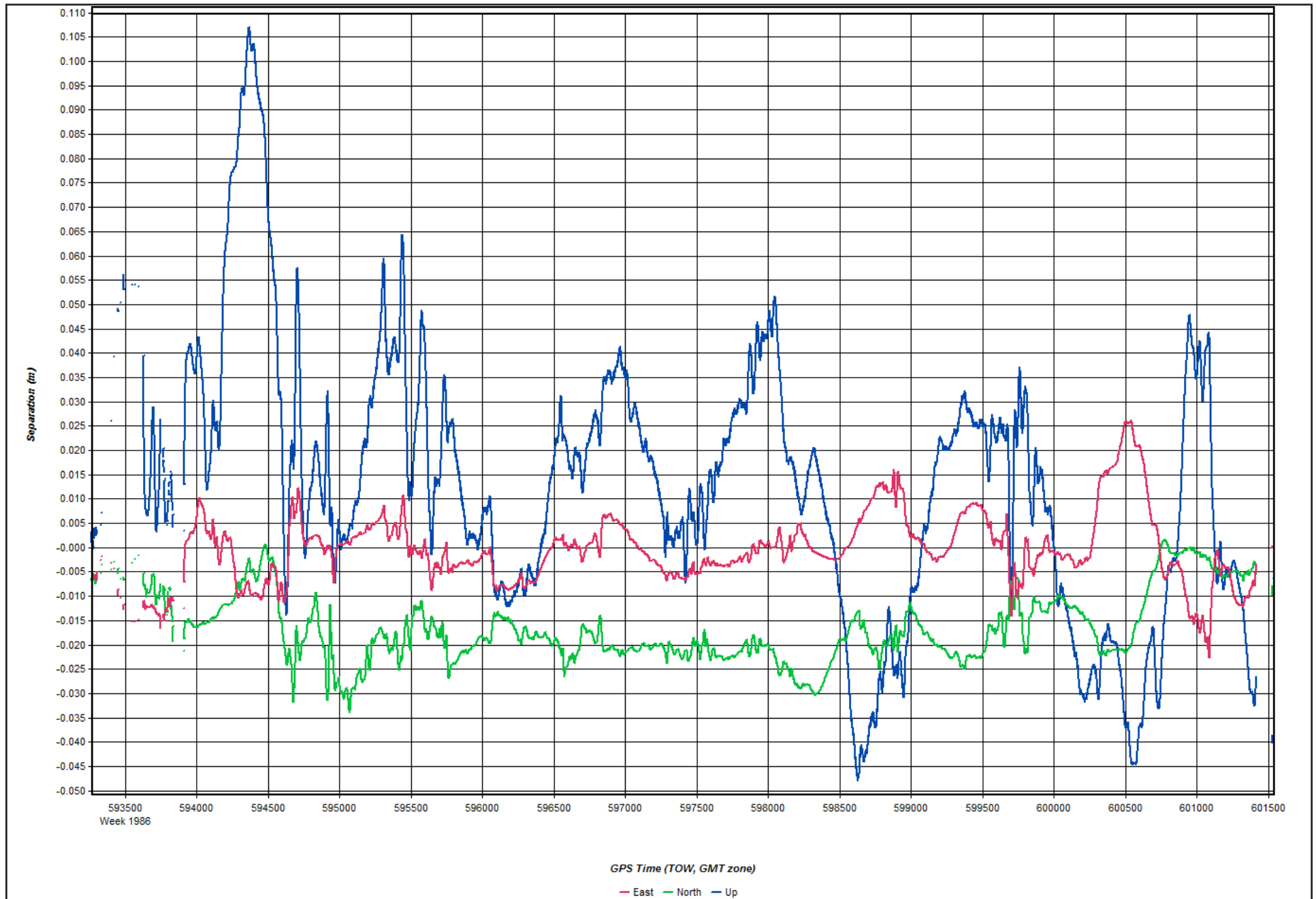
2018-02-03_Day034_7 - 20180203204644

Figure 3: Float or Fixed Ambiguity



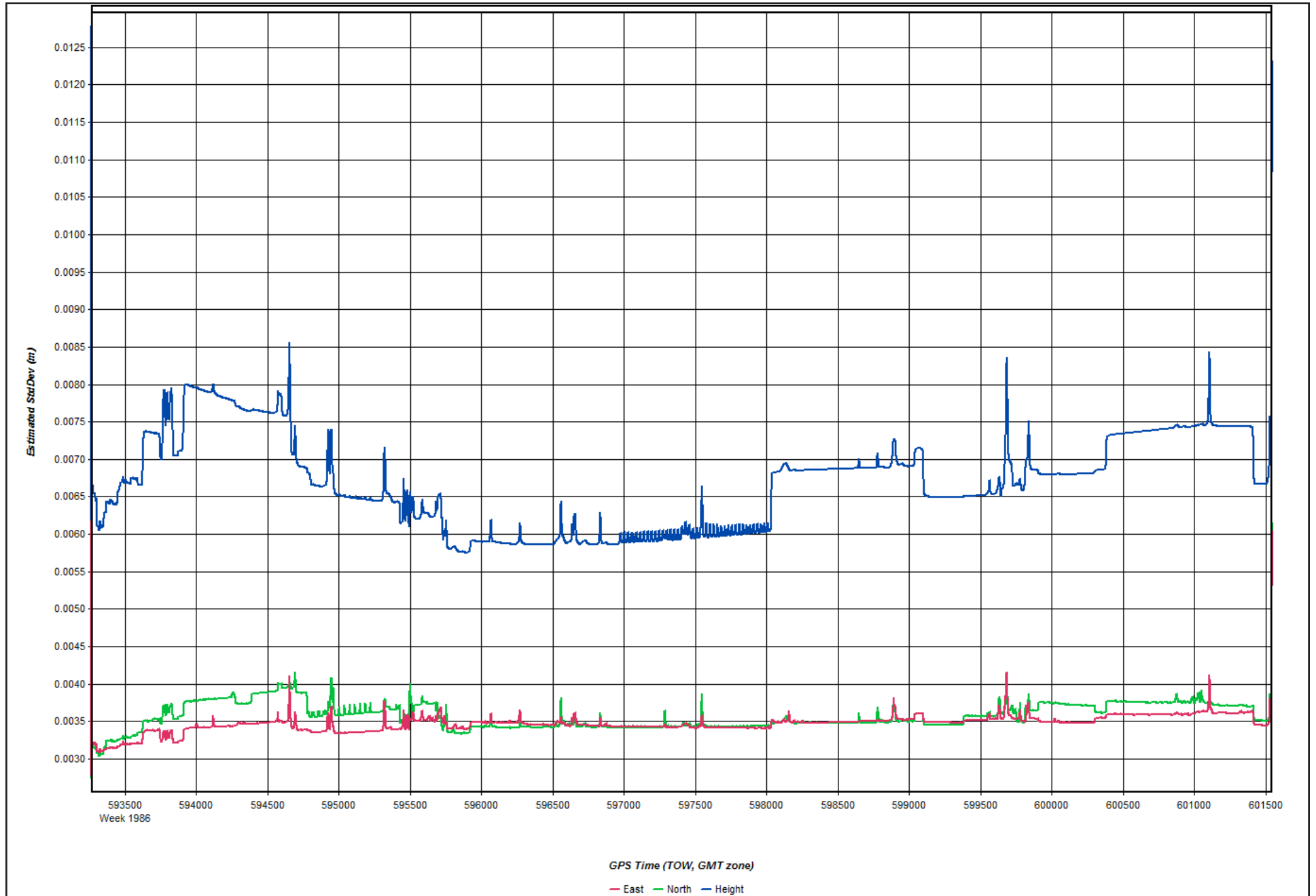
2018-02-03_Day034_7 - 20180203204644

Figure 4: Forward/Reverse Separation Plot (Fixed)



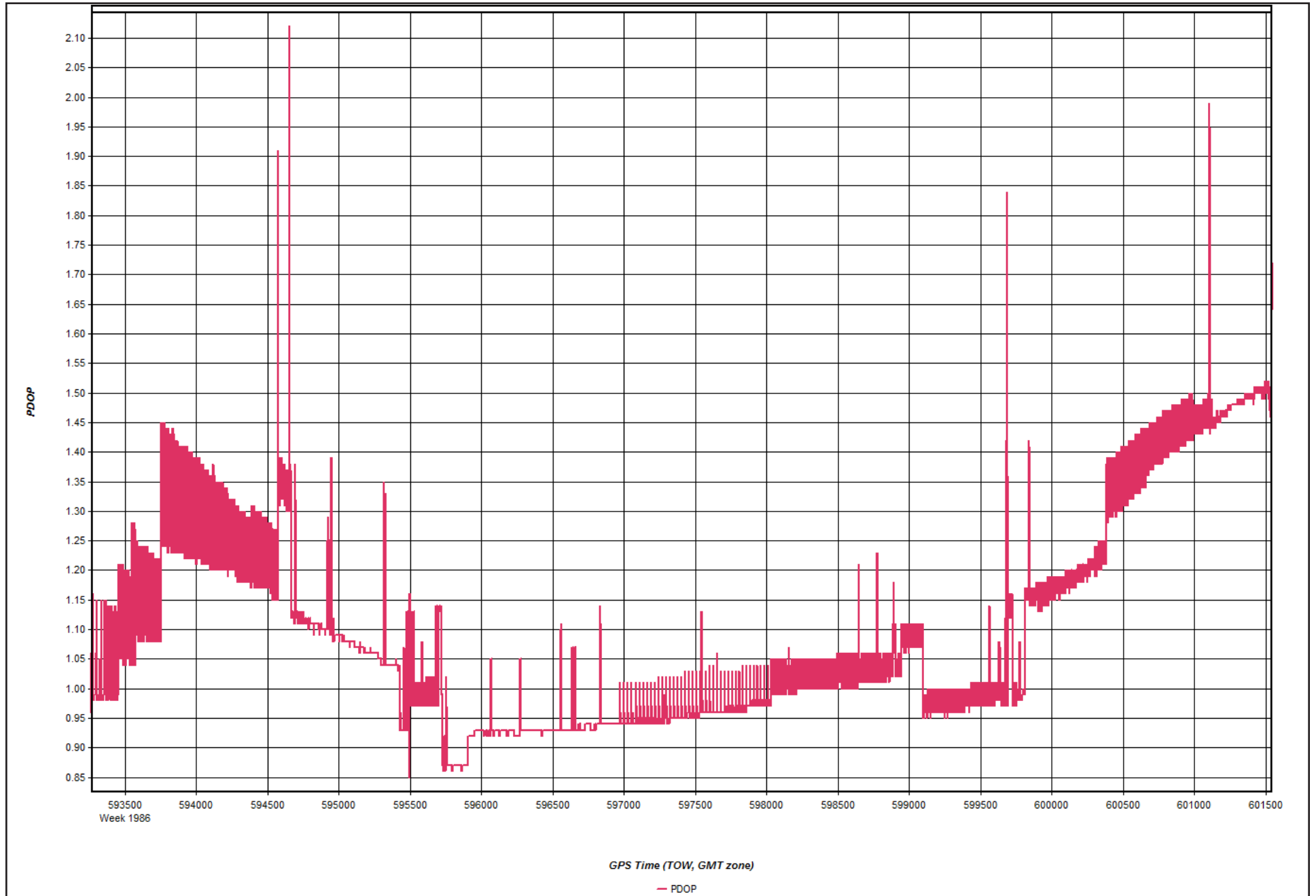
2018-02-03_Day034_7 - 20180203204644

Figure 5: Estimated Position Accuracy Plot



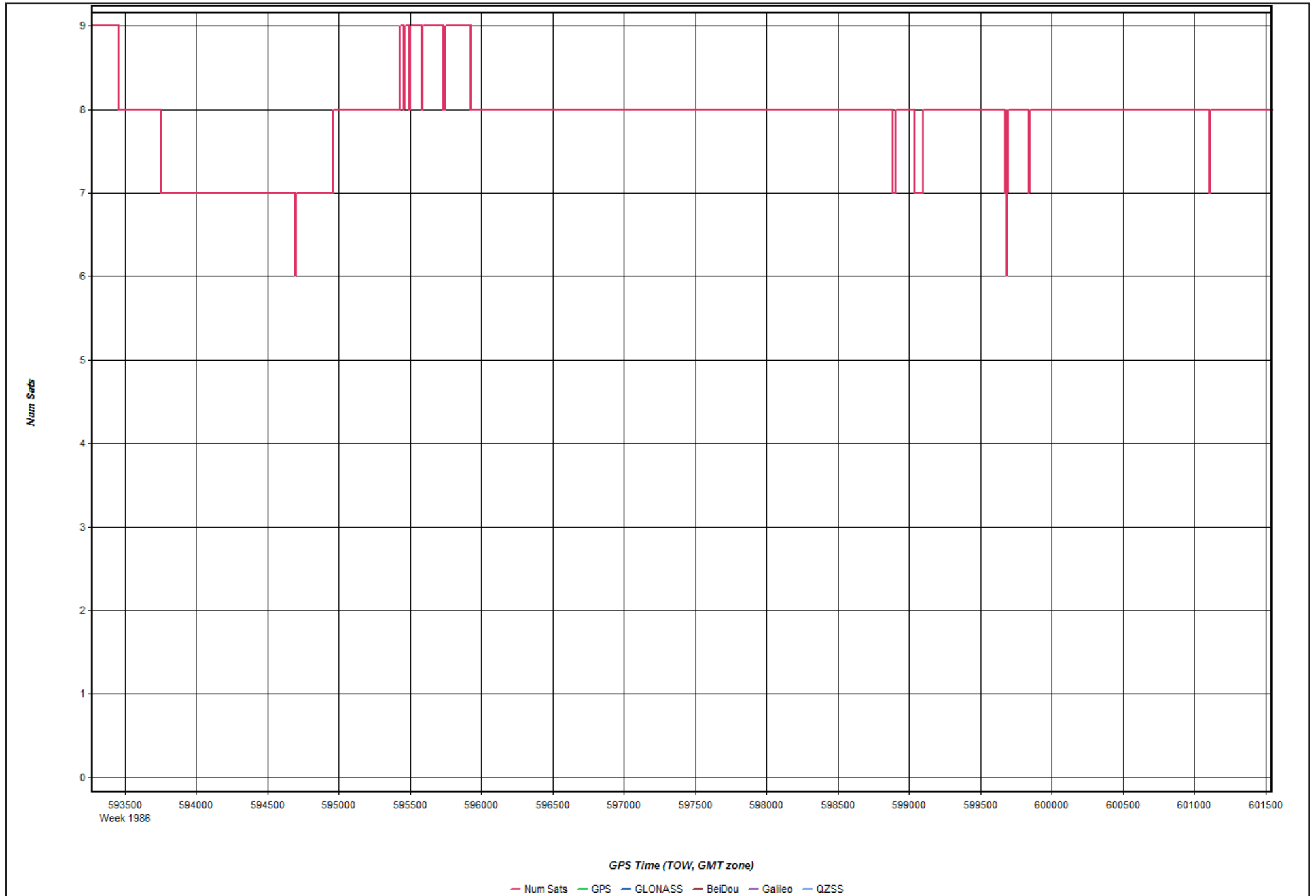
2018-02-03_Day034_7 - 20180203204644

Figure 6: PDOP Plot



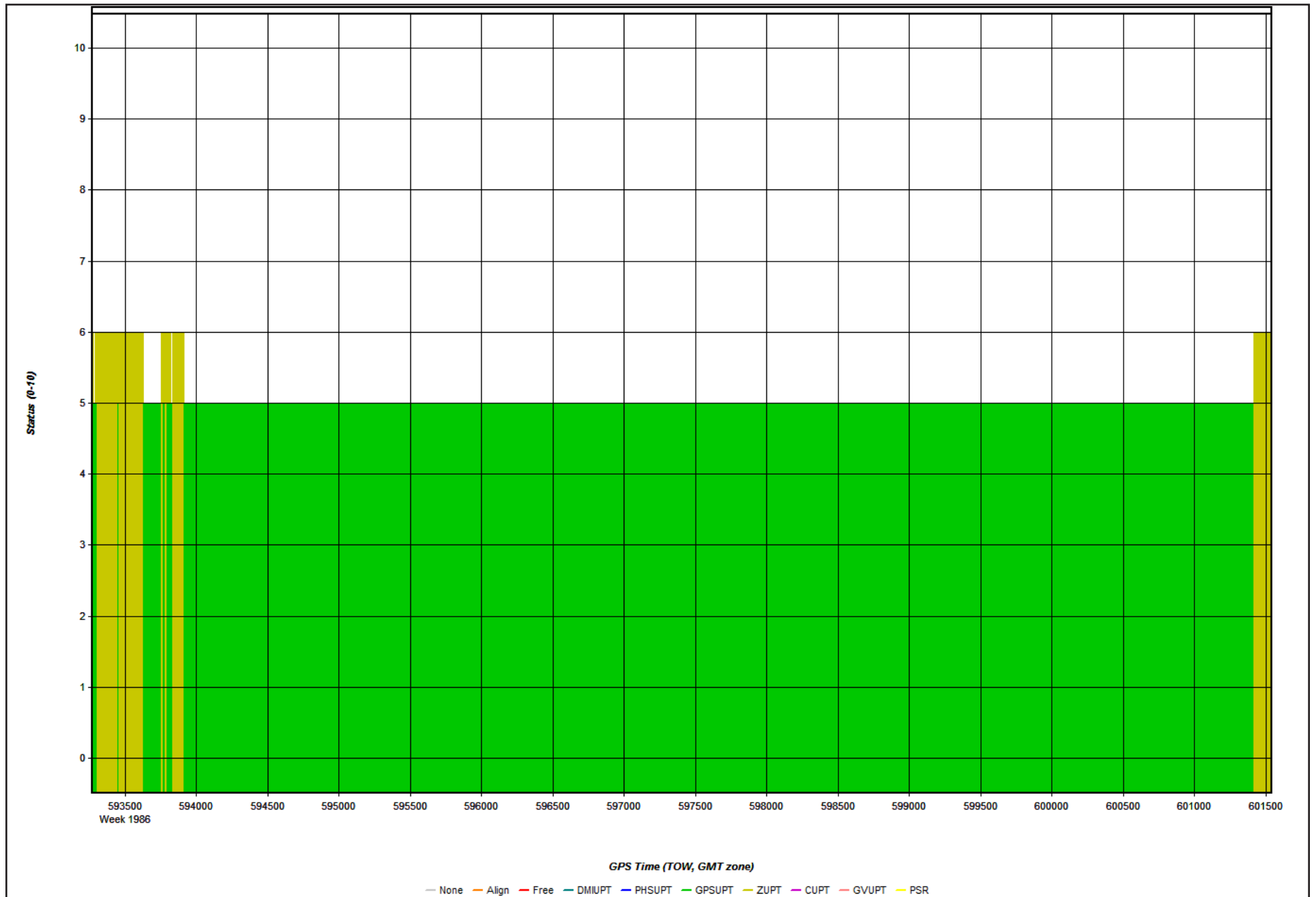
2018-02-03_Day034_7 - 20180203204644

Figure 7: Number of Satellites Line Plot



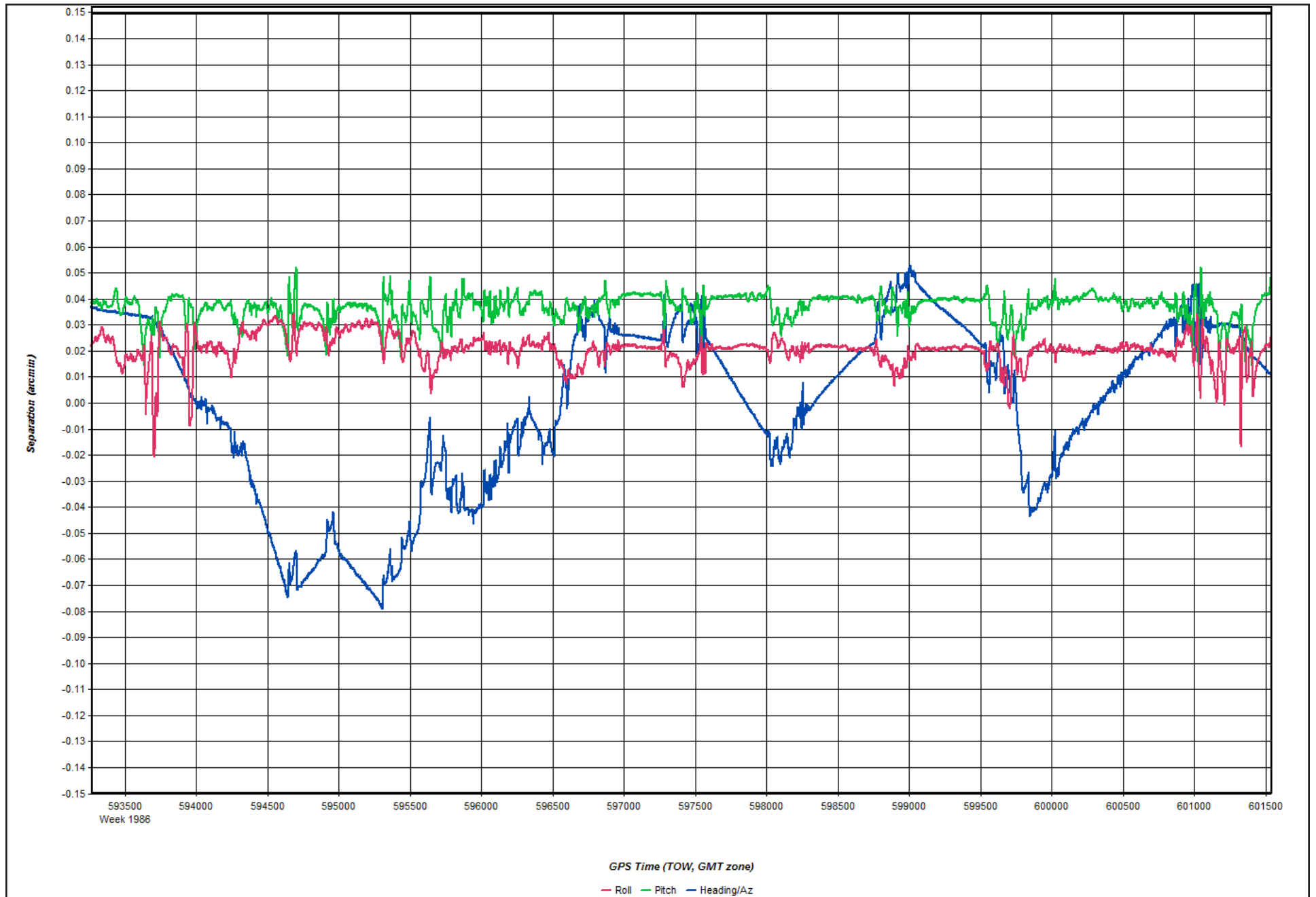
2018-02-03_Day034_7 - 20180203204644

Figure 8: Status flag for IMU processing



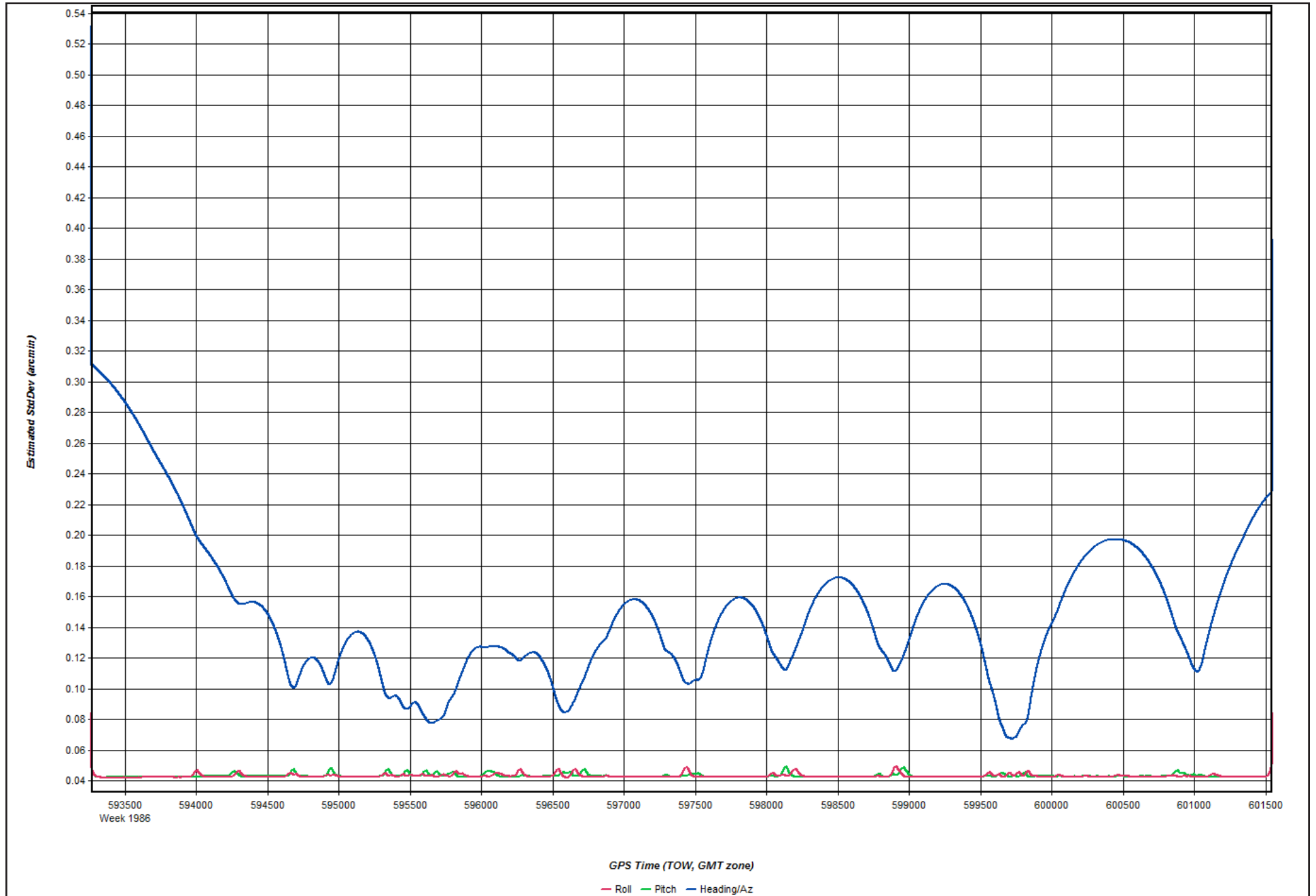
2018-02-03_Day034_7 - 20180203204644

Figure 9: Fwd/Rev Attitude Separation Plot



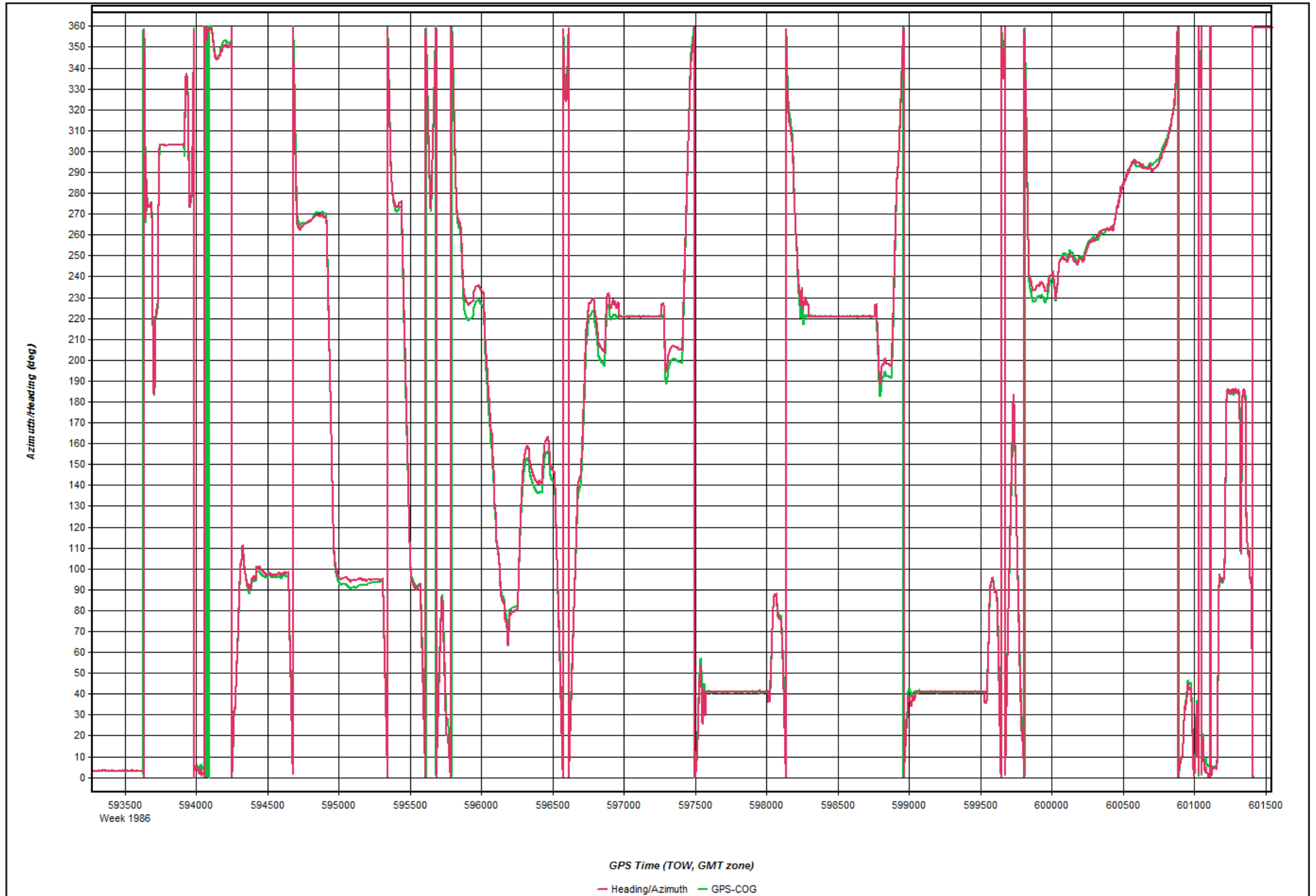
2018-02-03_Day034_7 - 20180203204644

Figure 10: Estimated Attitude Accuracy Plot



2018-02-03_Day034_7 - 20180203204644

Figure 11: Azimuth Plot



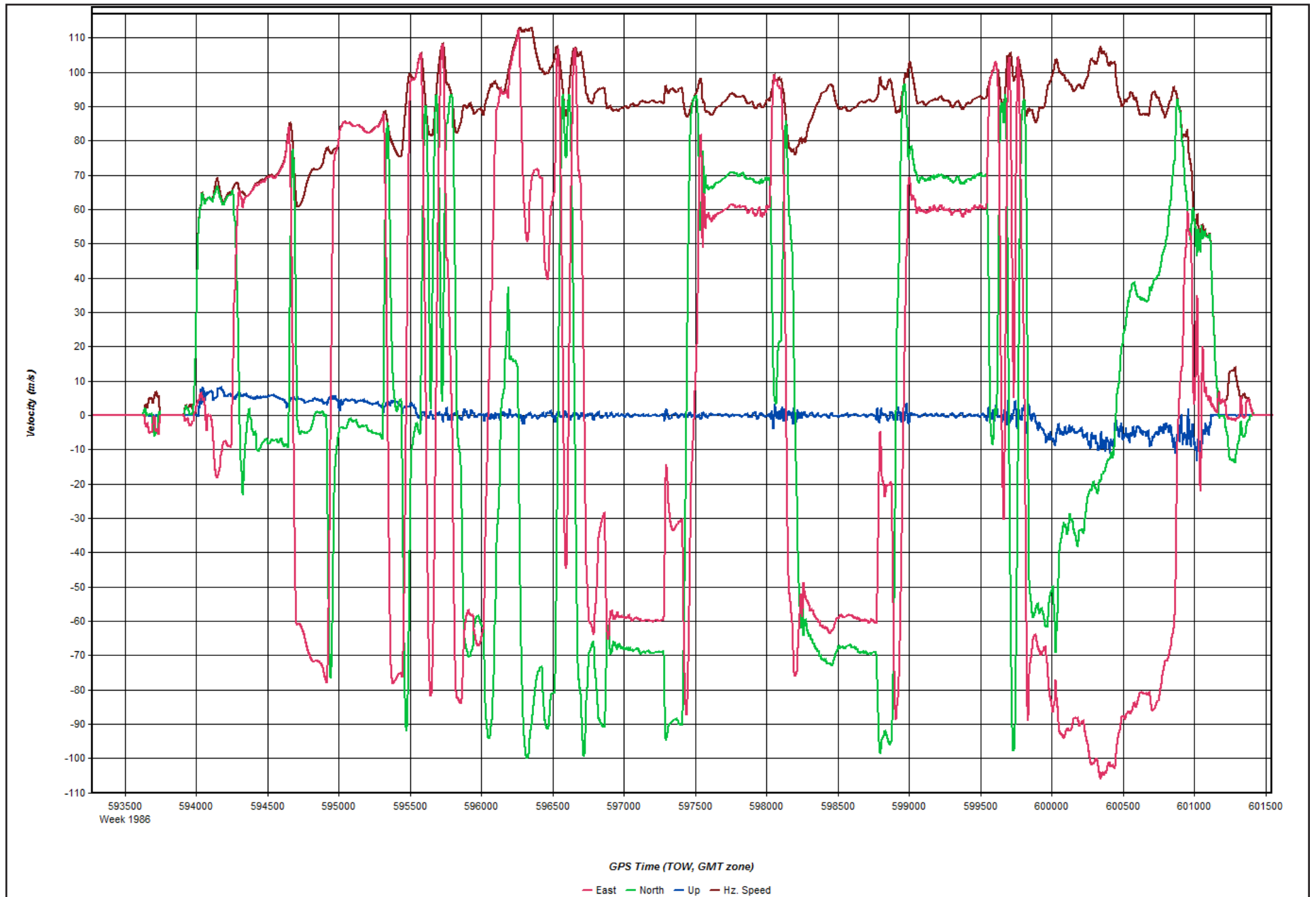
2018-02-03_Day034_7 - 20180203204644

Figure 12: Roll & Pitch Plot



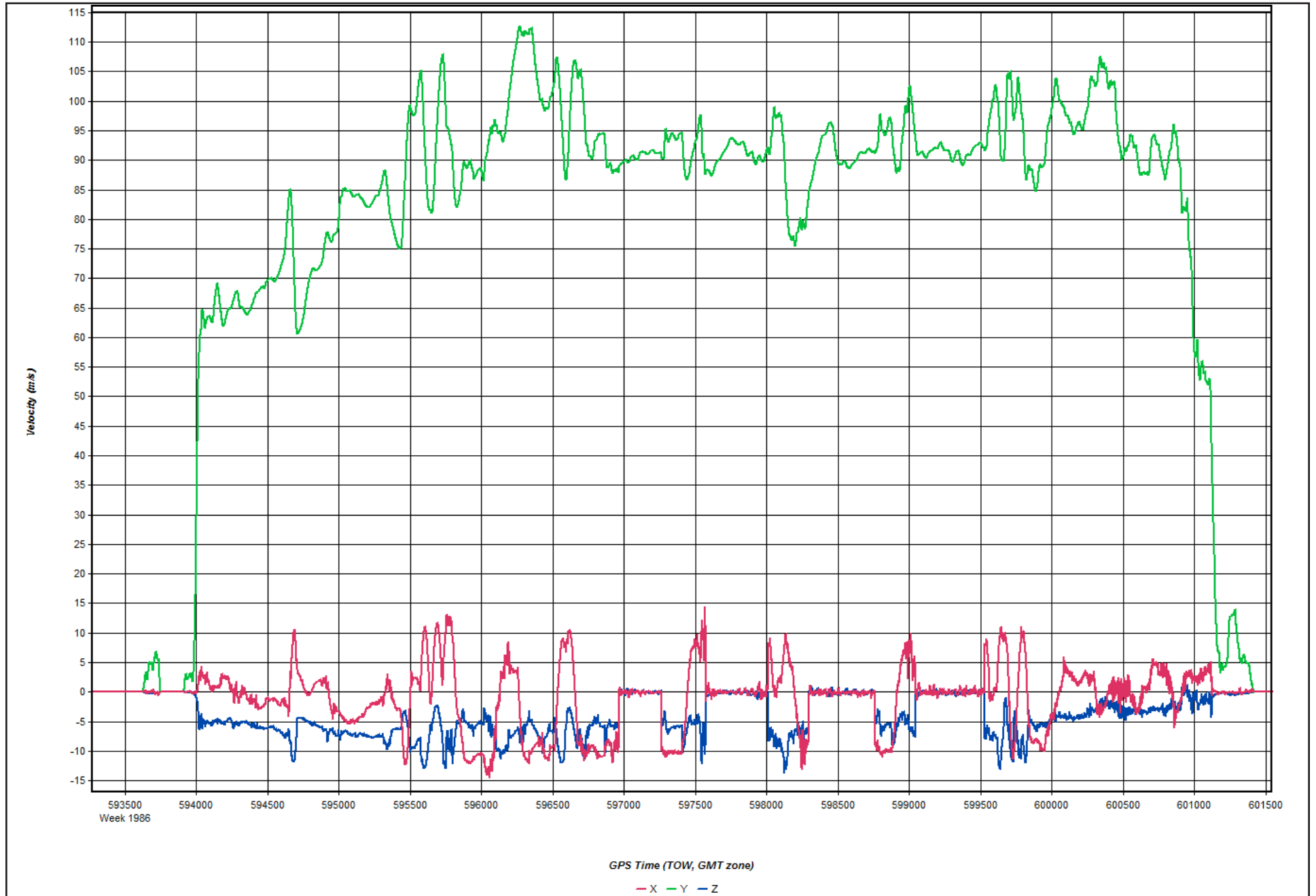
2018-02-03_Day034_7 - 20180203204644

Figure 13: Velocity Profile Plot



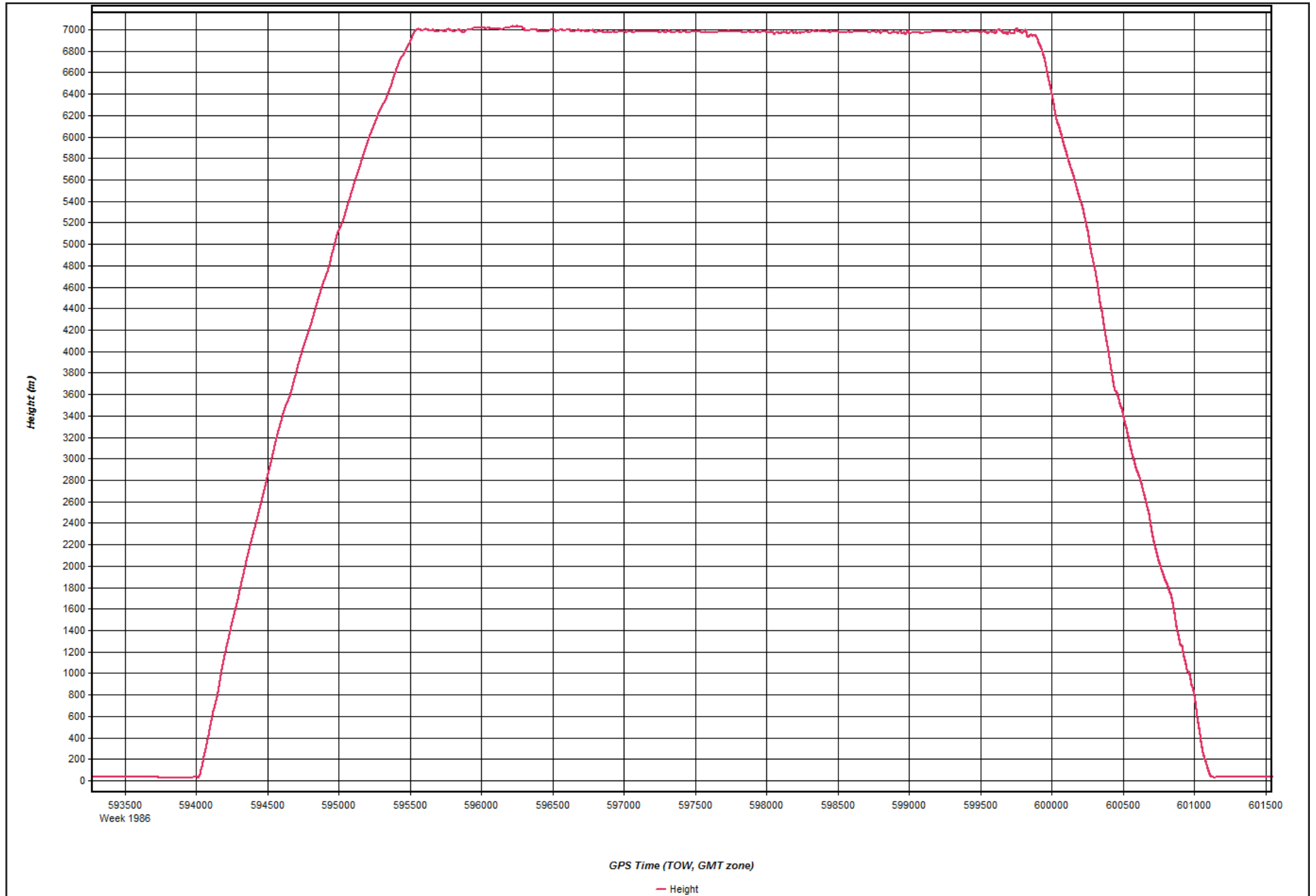
2018-02-03_Day034_7 - 20180203204644

Figure 14: Body Frame Velocity Plot



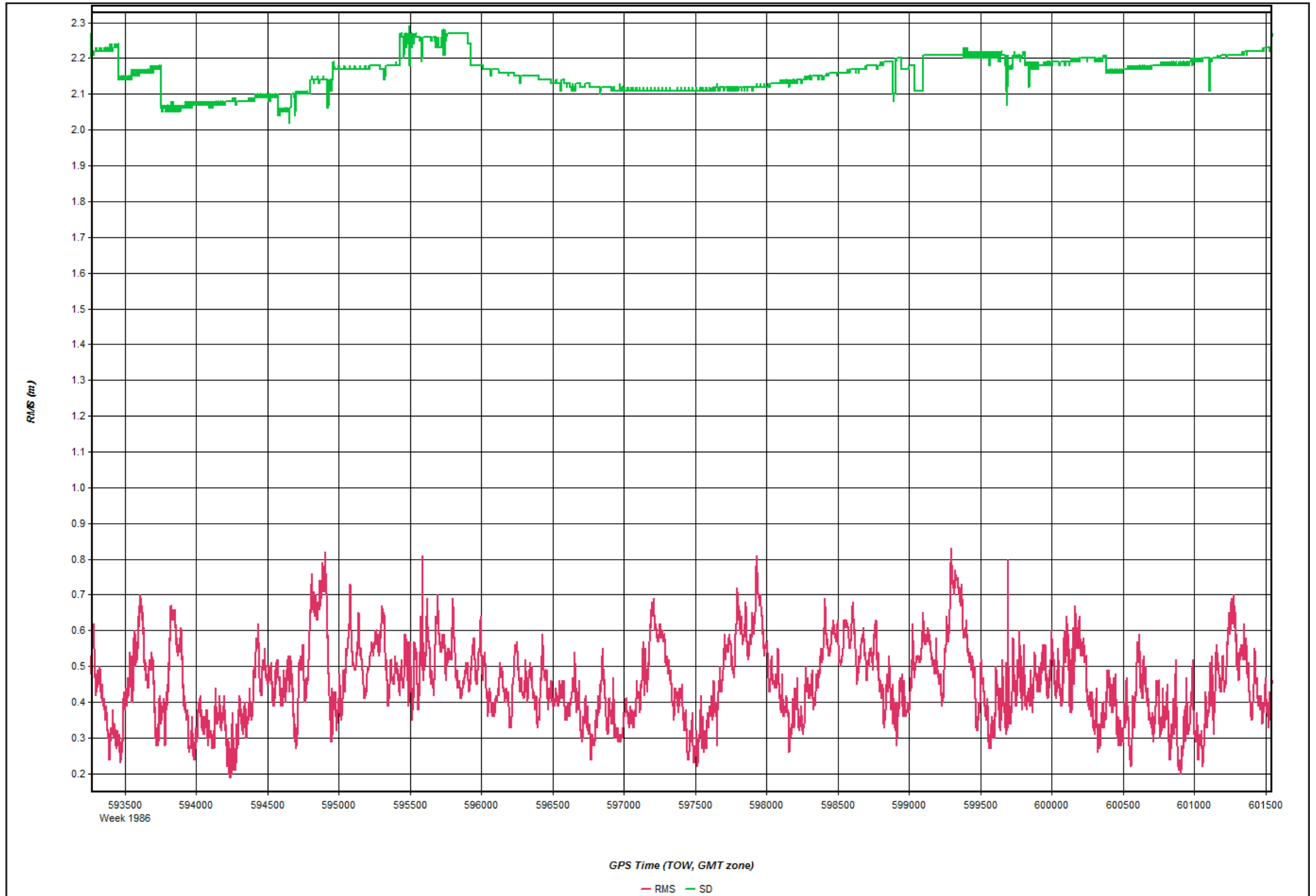
2018-02-03_Day034_7 - 20180203204644

Figure 15: Height Profile Plot



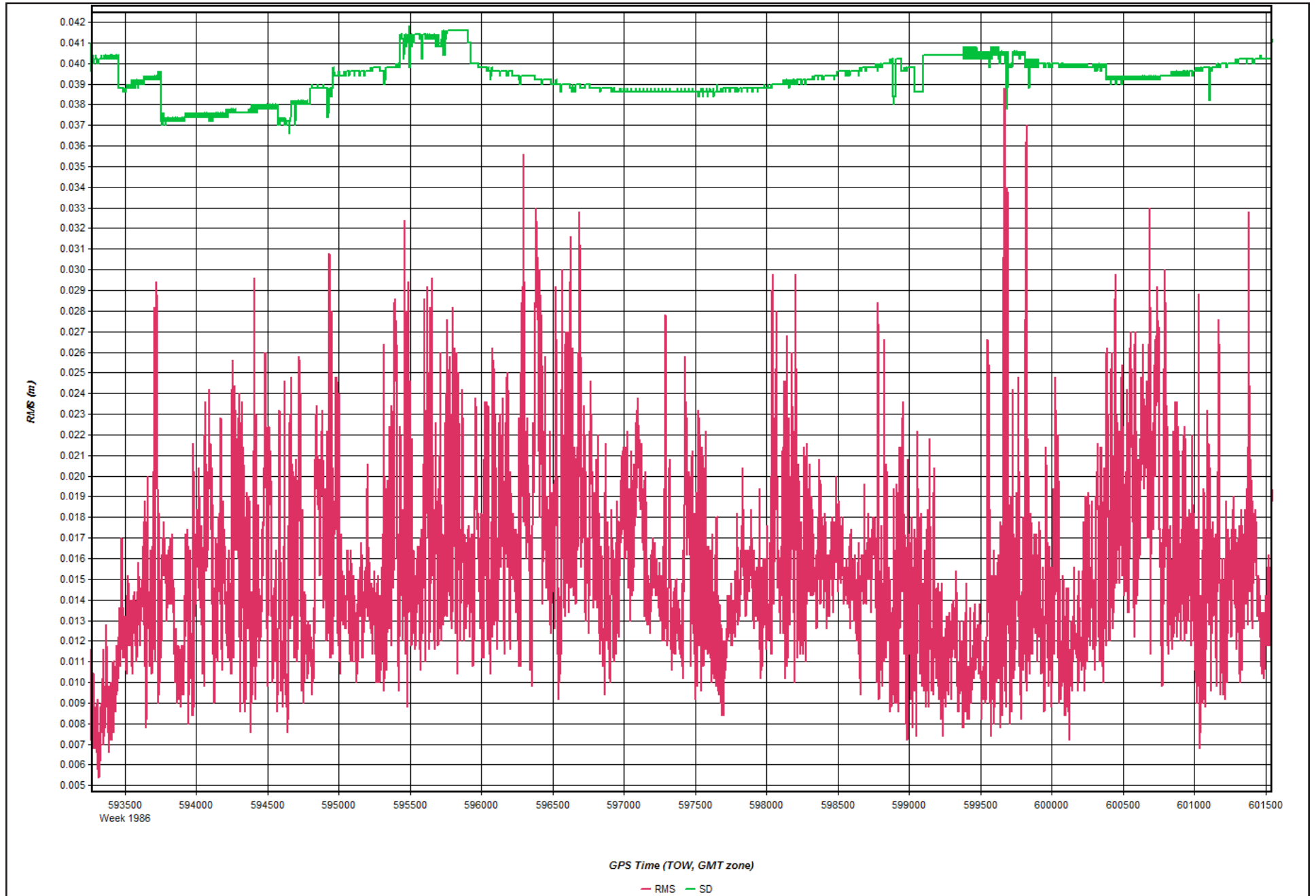
2018-02-03_Day034_7 - 20180203204644

Figure 16: C/A Code Residual RMS Plot



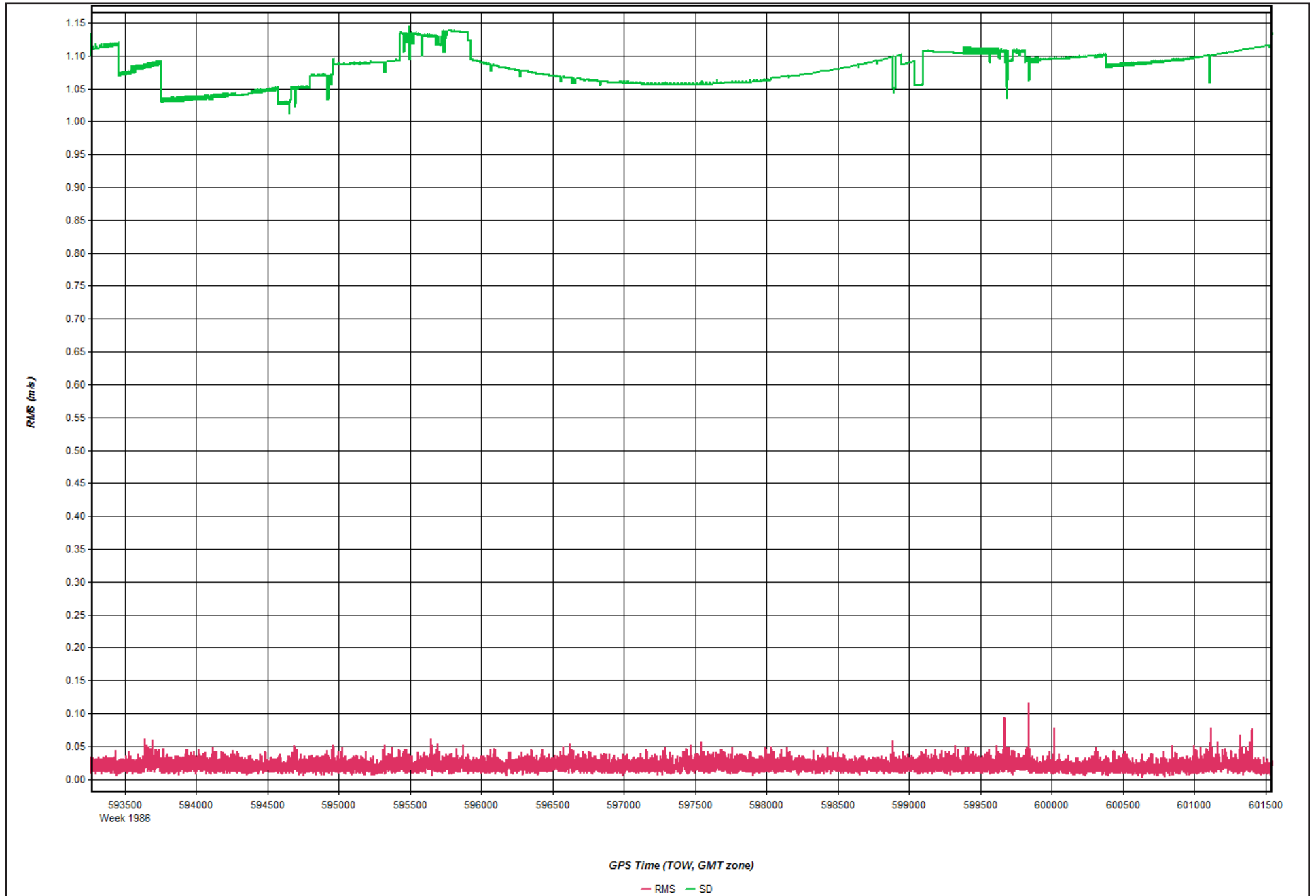
2018-02-03_Day034_7 - 20180203204644

Figure 17: Carrier Residual RMS Plot



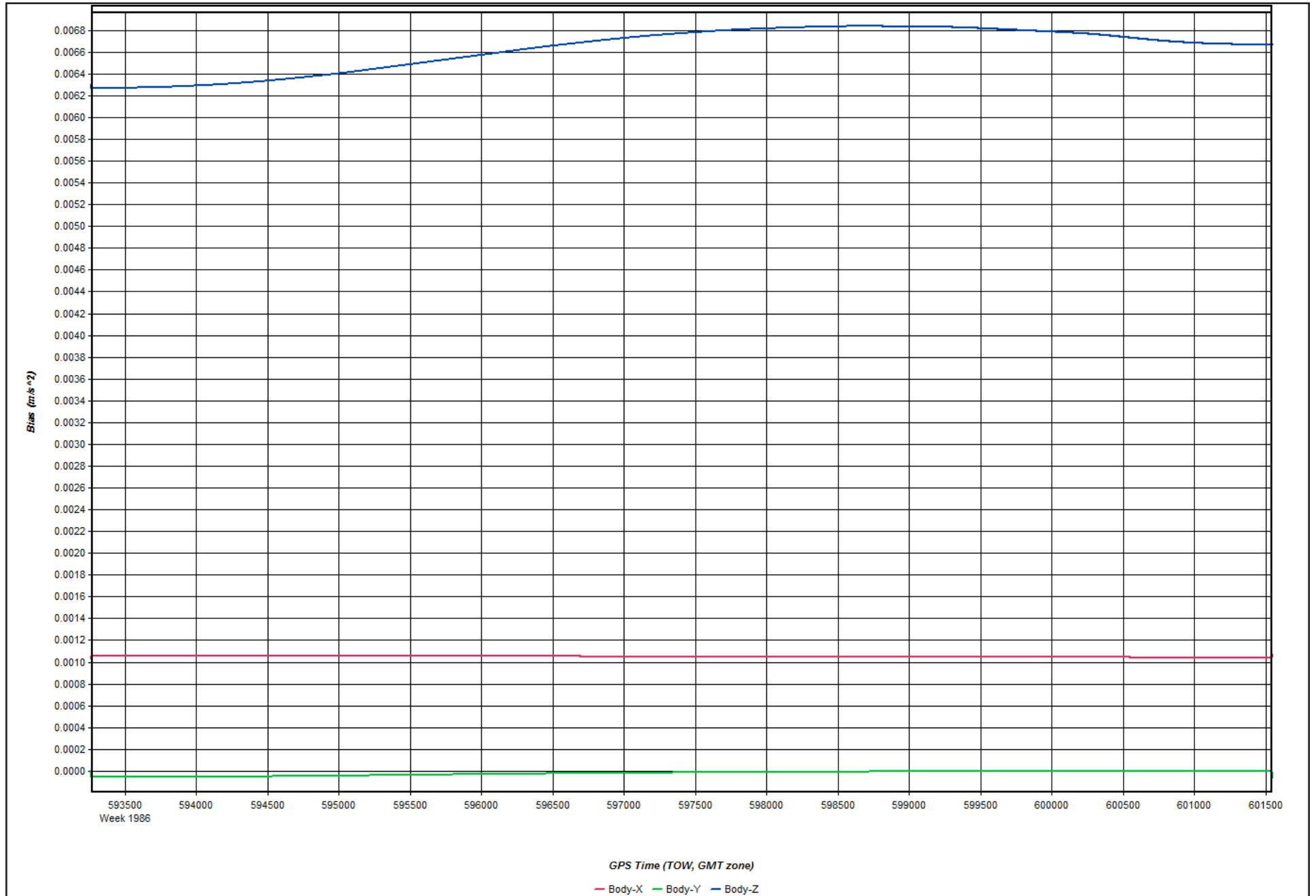
2018-02-03_Day034_7 - 20180203204644

Figure 18: L1 Doppler Residual RMS Plot



2018-02-03_Day034_7 - 20180203204644

Figure 19: Accelerometer Bias Plot



2018-02-03_Day034_7 - 20180203204644

Figure 20: Gyro Drift Plot

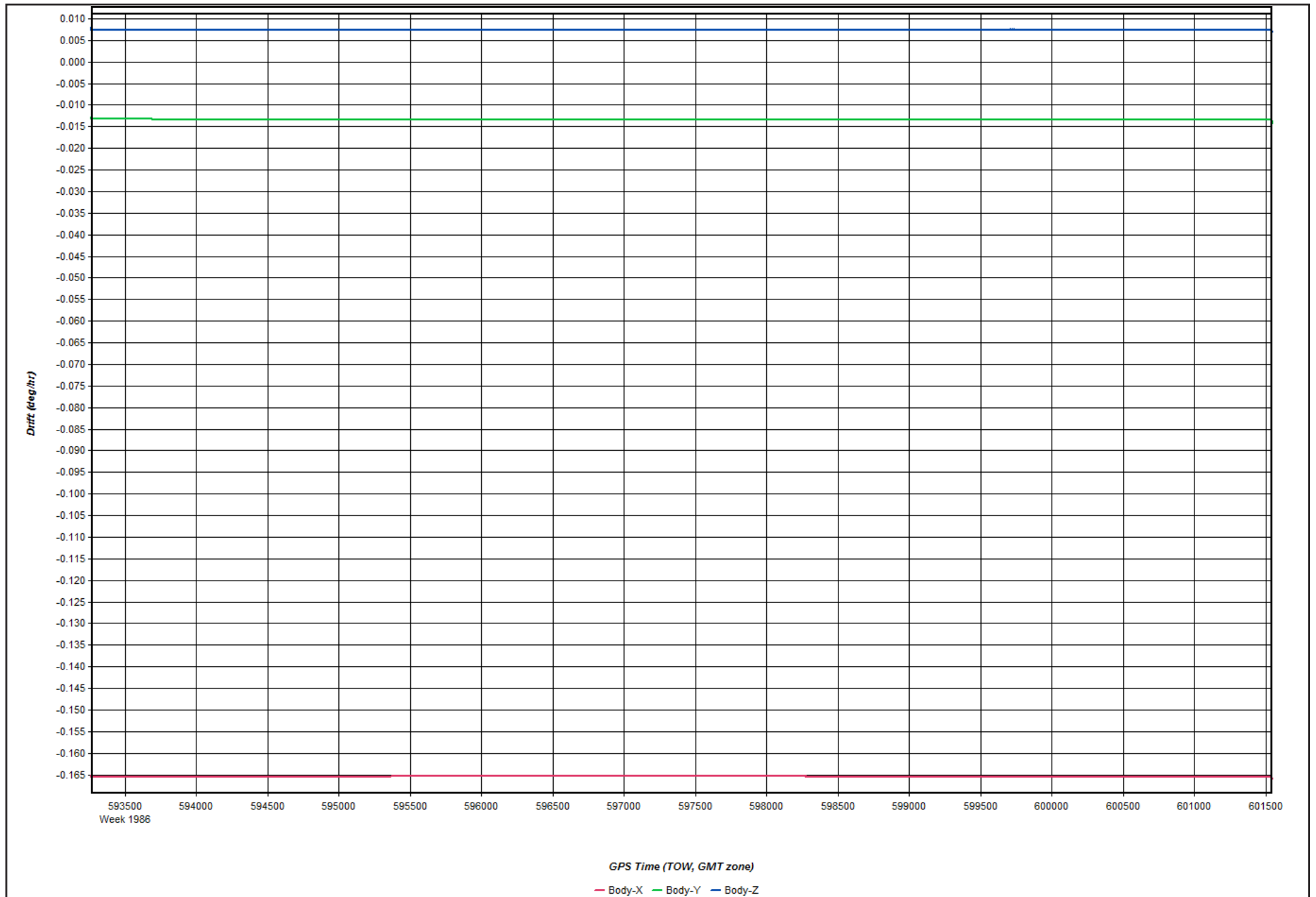
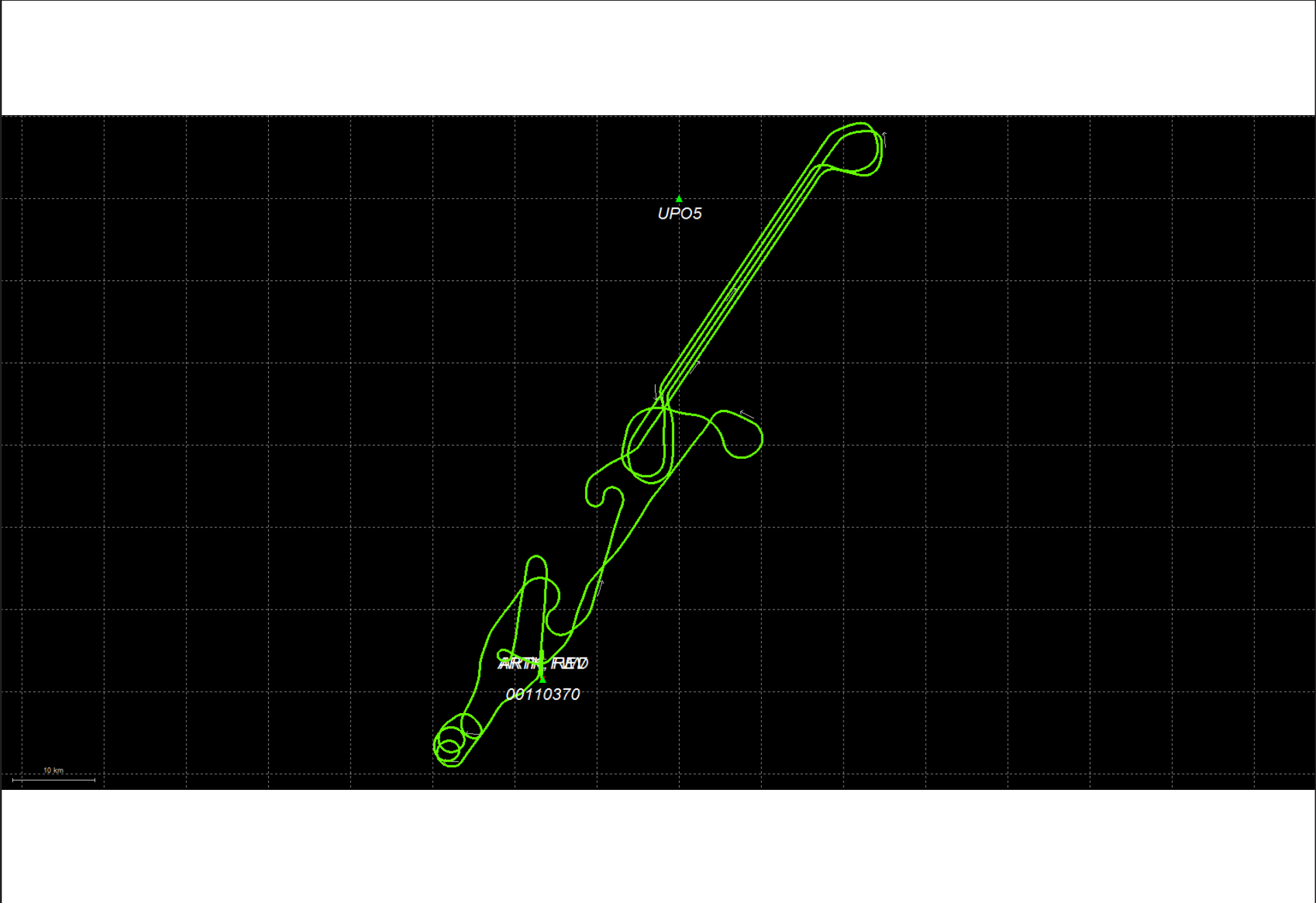
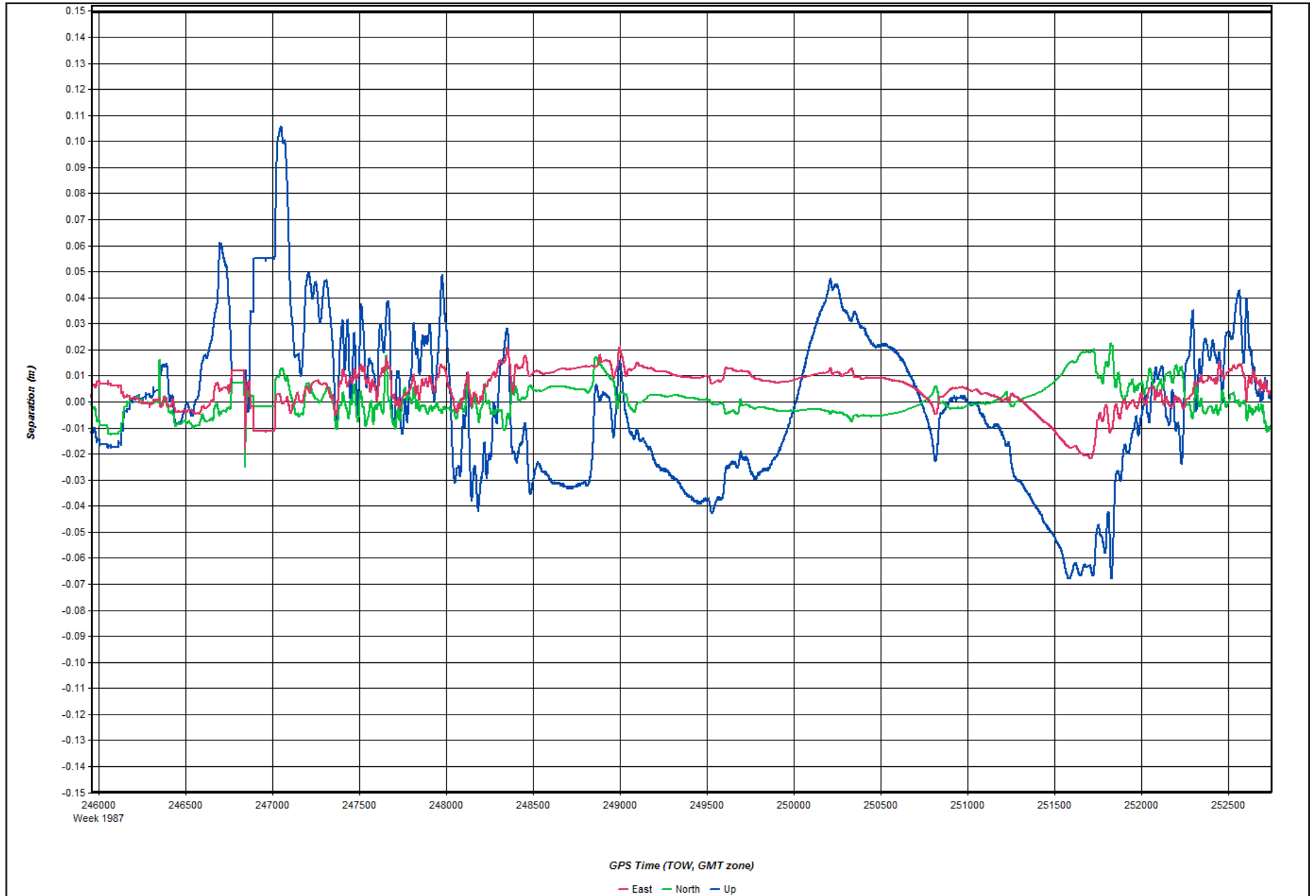


Figure 1: Map



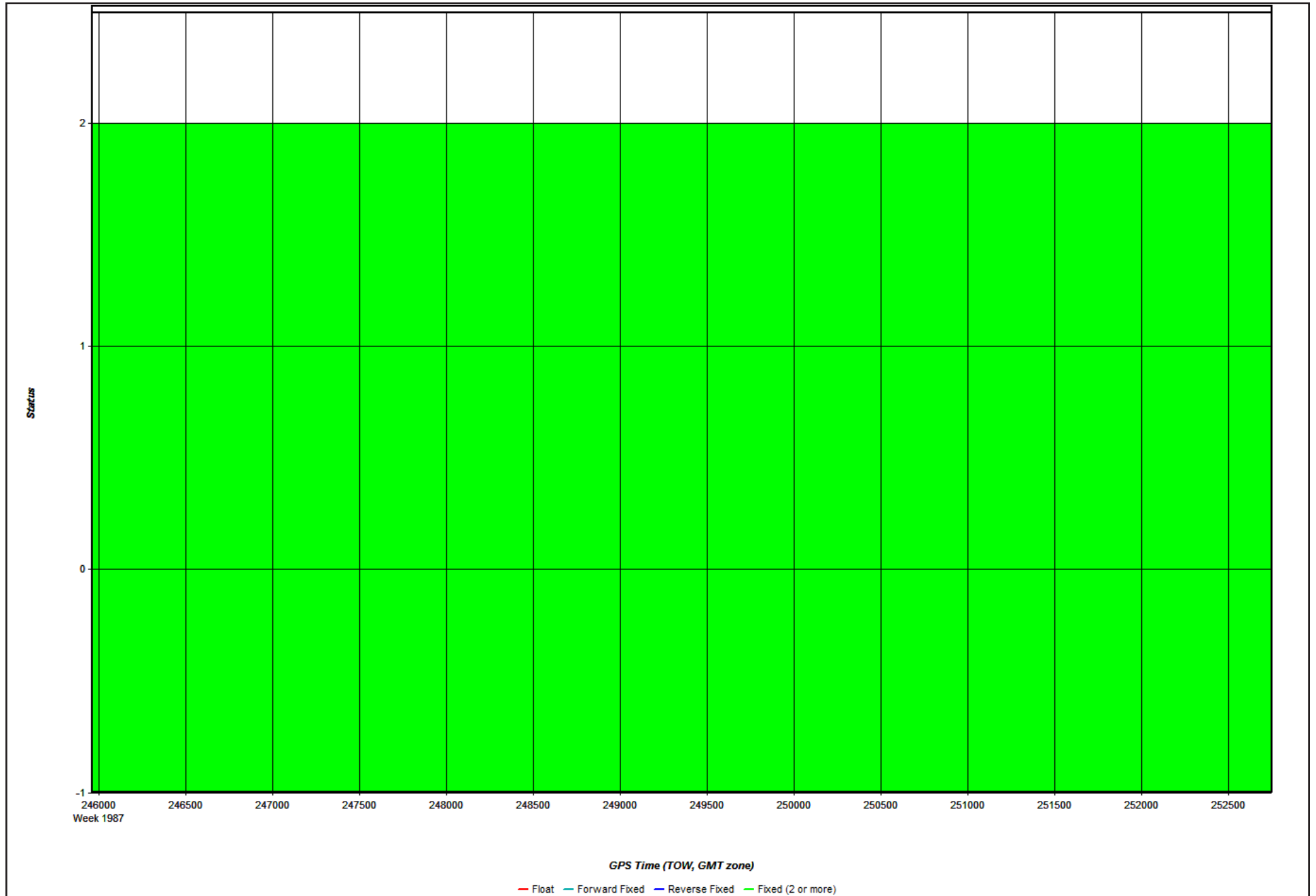
2018-02-06_Day037_7 - 20180206201825

Figure 2: Forward/Reverse or Combined Separation Plot



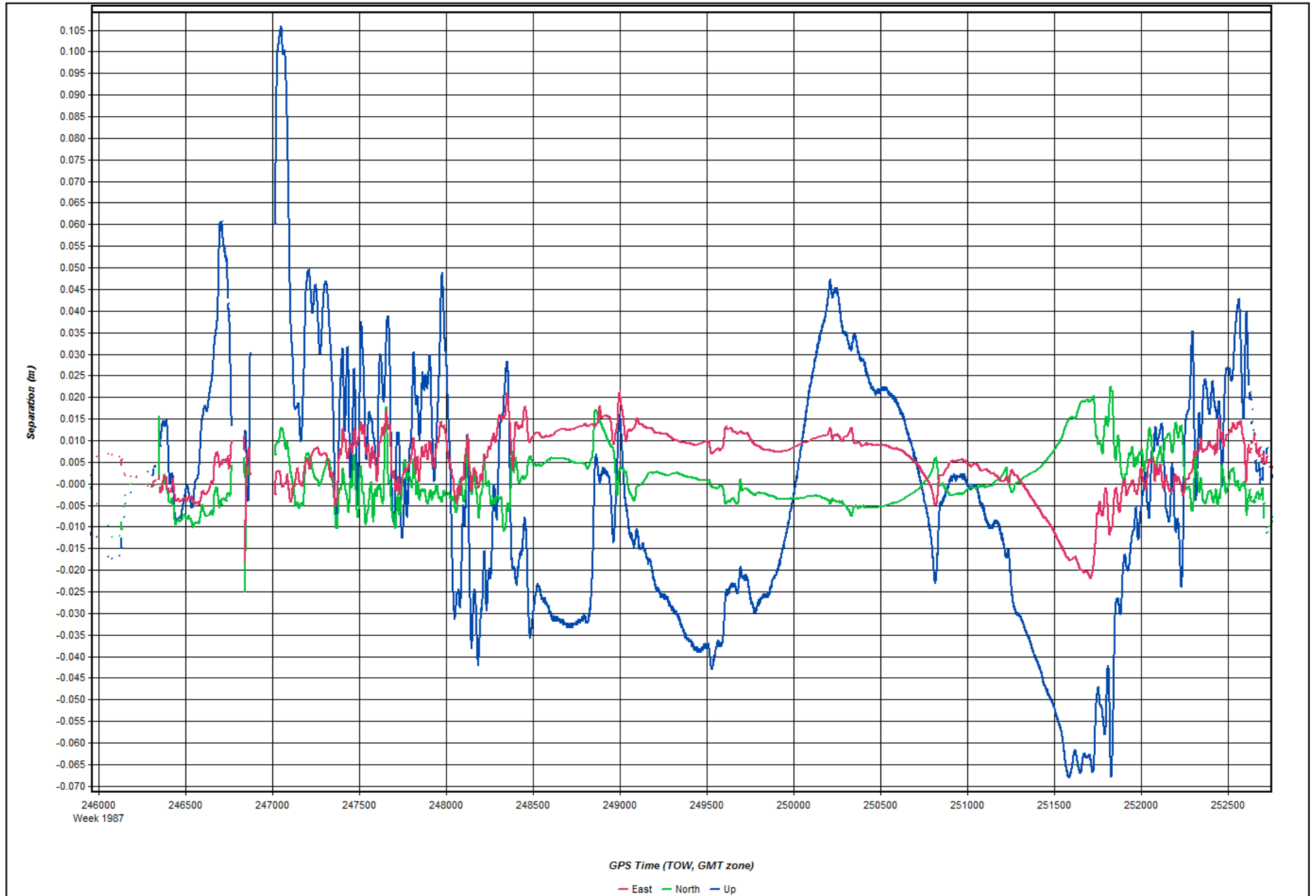
2018-02-06_Day037_7 - 20180206201825

Figure 3: Float or Fixed Ambiguity



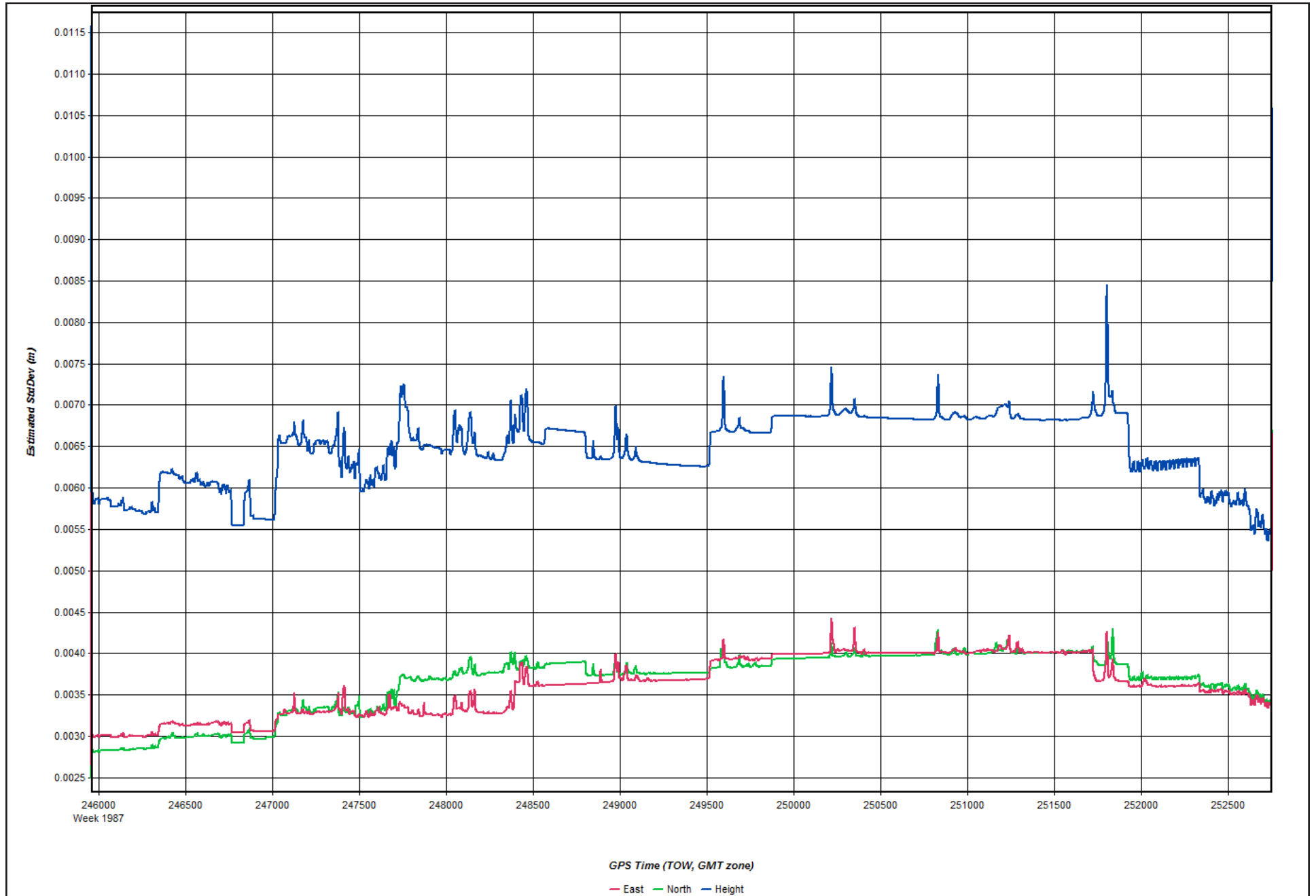
2018-02-06_Day037_7 - 20180206201825

Figure 4: Forward/Reverse Separation Plot (Fixed)



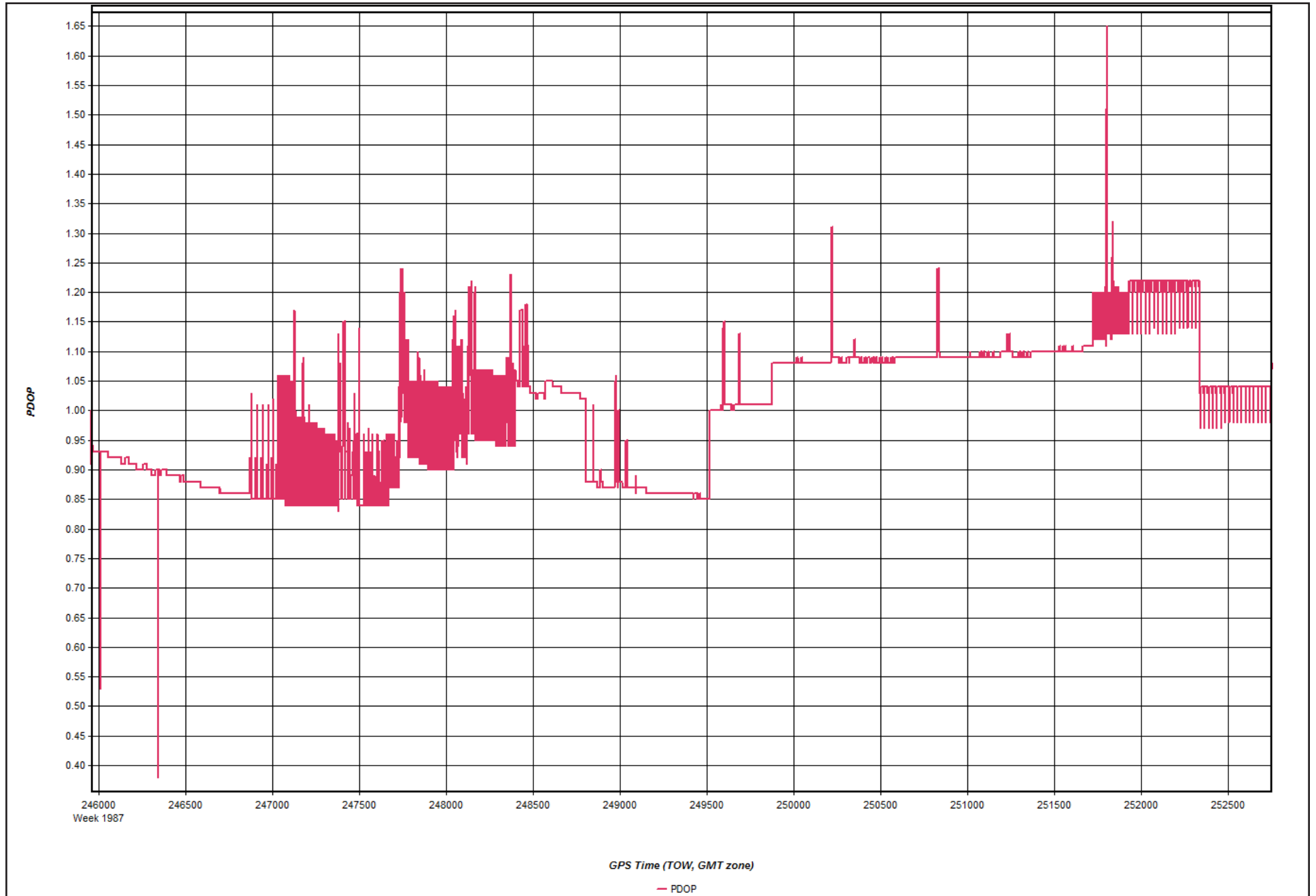
2018-02-06_Day037_7 - 20180206201825

Figure 5: Estimated Position Accuracy Plot



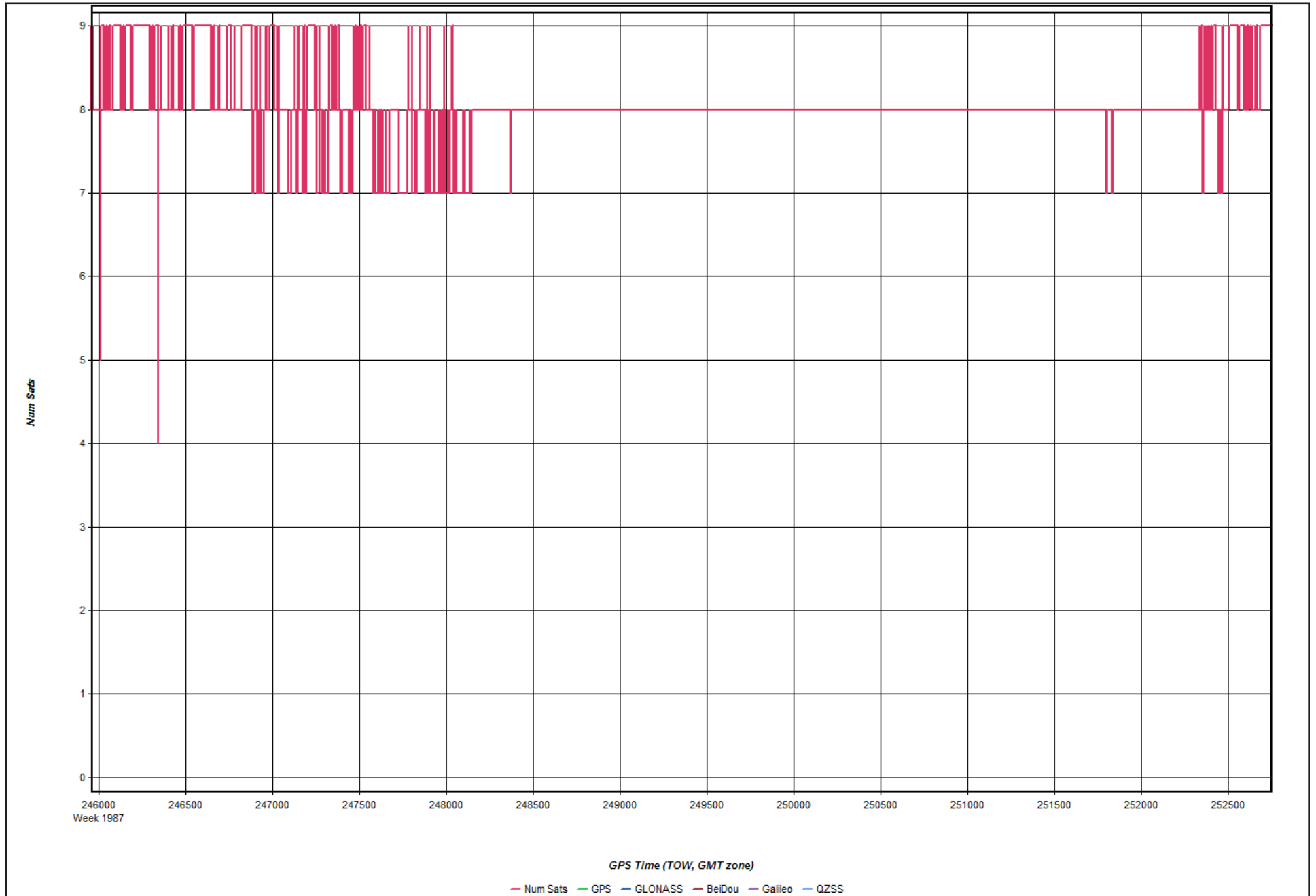
2018-02-06_Day037_7 - 20180206201825

Figure 6: PDOP Plot



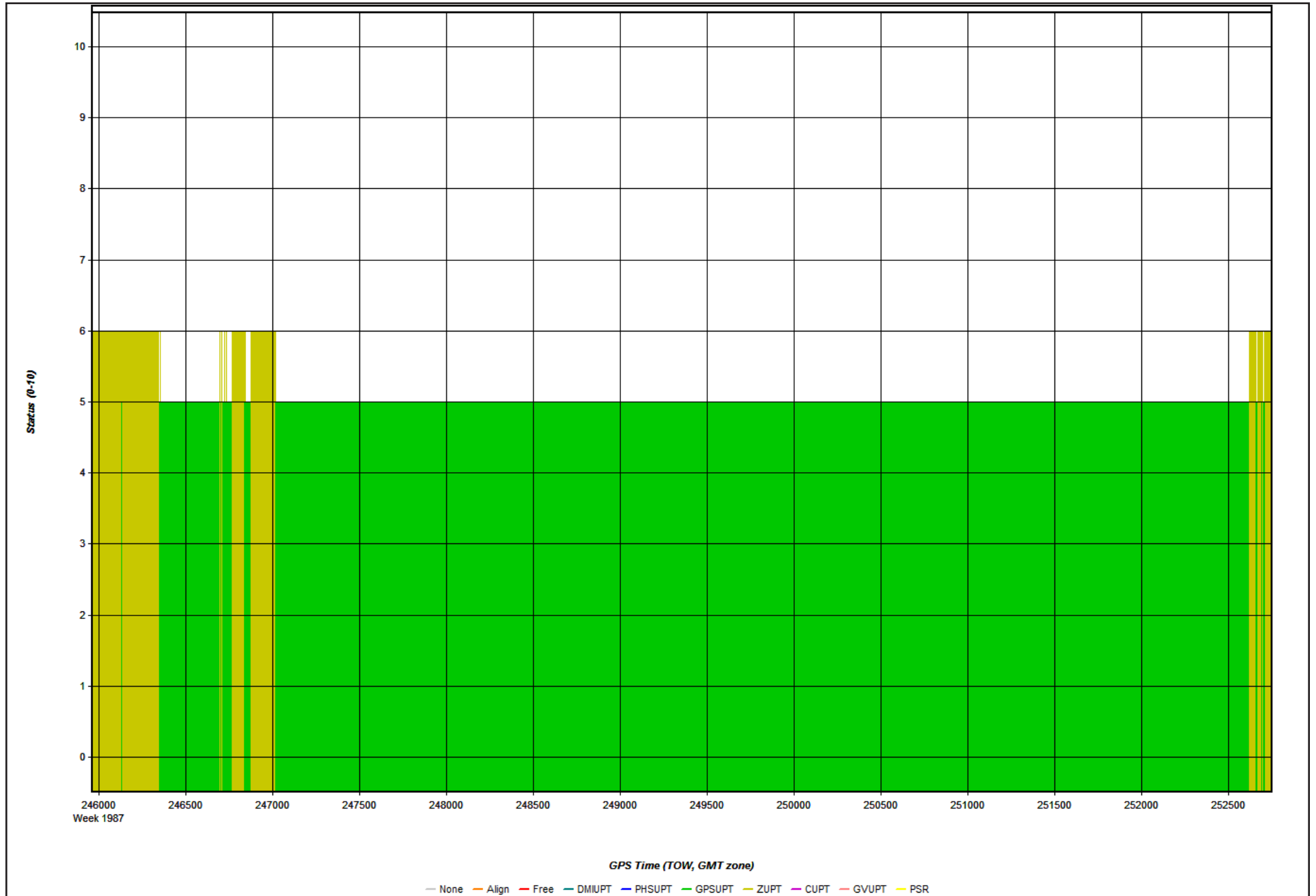
2018-02-06_Day037_7 - 20180206201825

Figure 7: Number of Satellites Line Plot



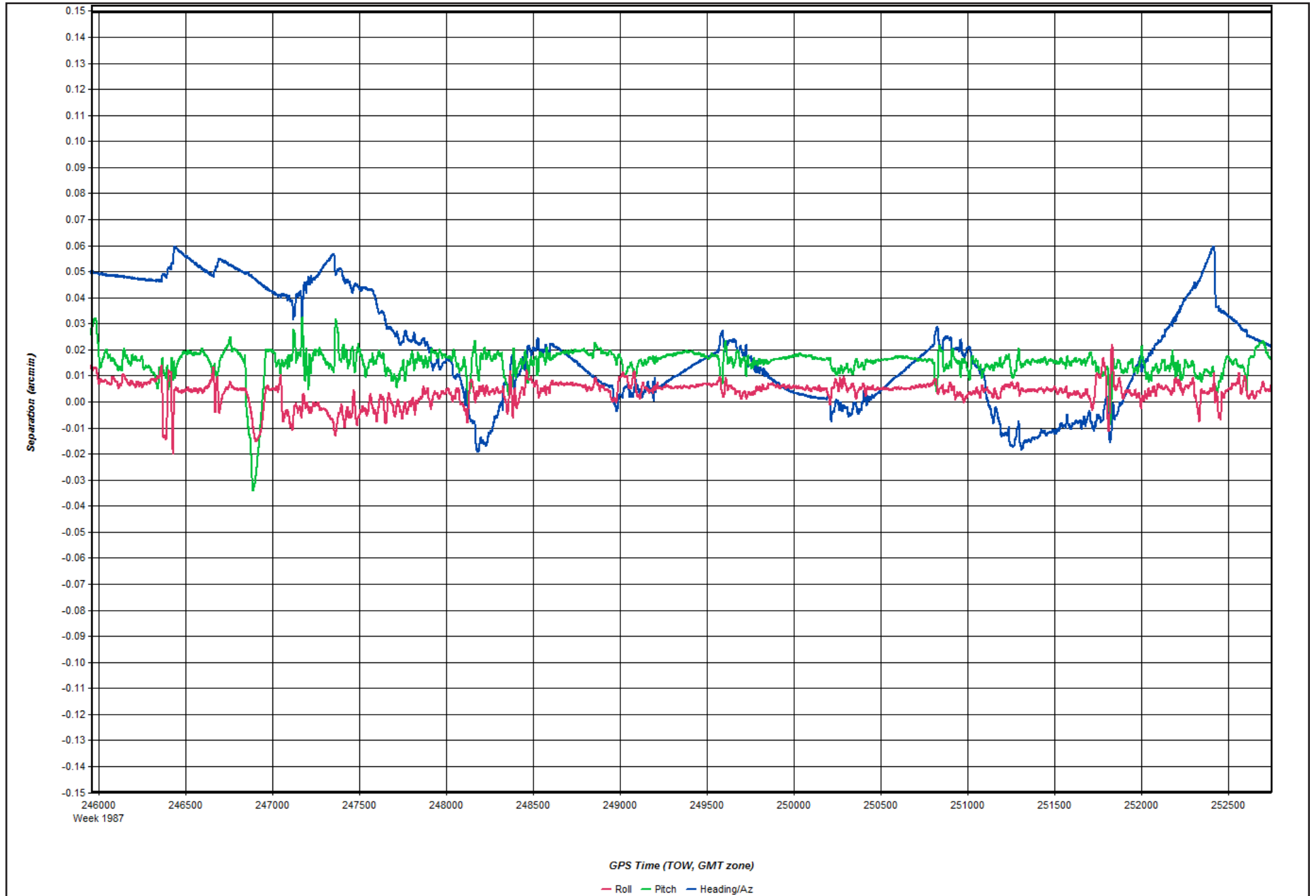
2018-02-06_Day037_7 - 20180206201825

Figure 8: Status flag for IMU processing



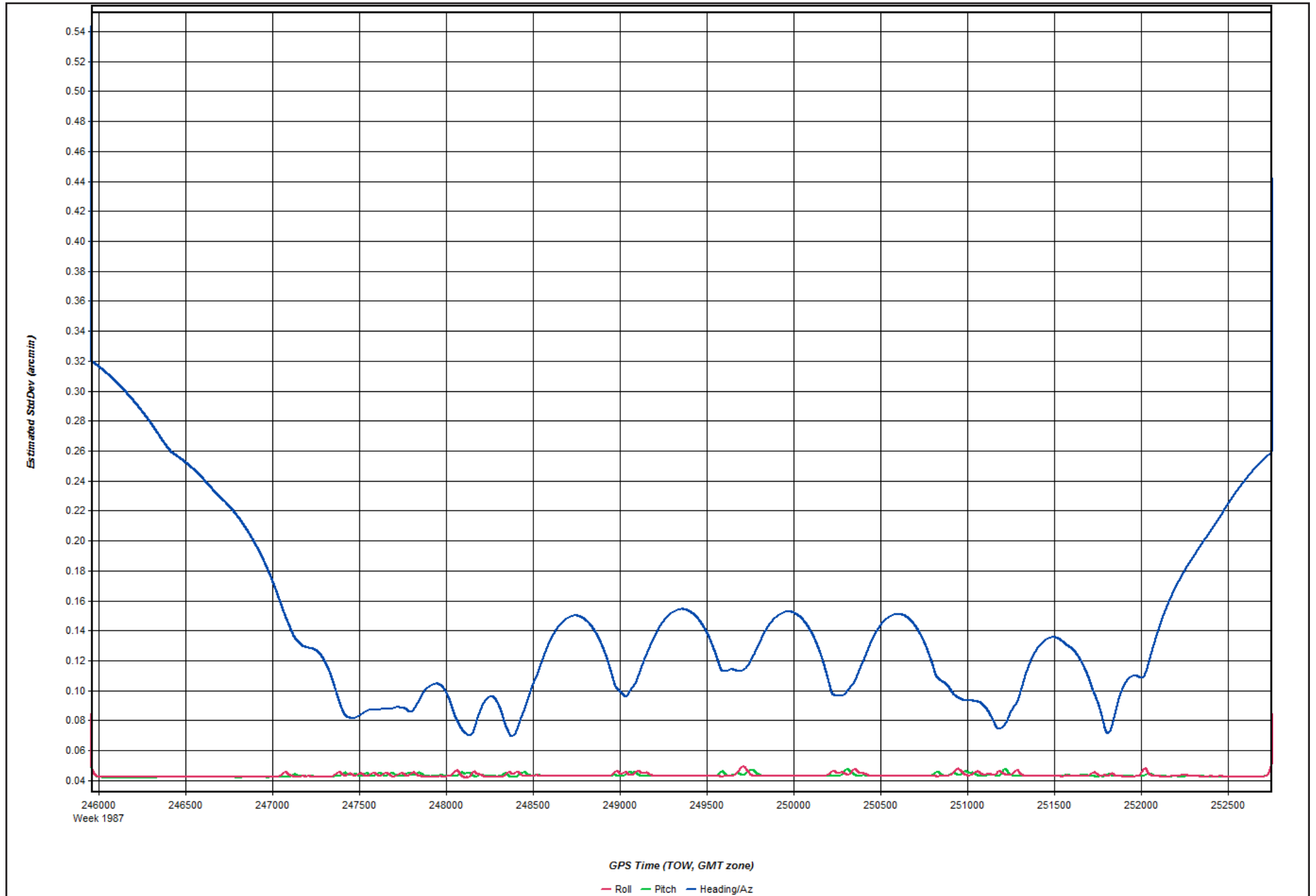
2018-02-06_Day037_7 - 20180206201825

Figure 9: Fwd/Rev Attitude Separation Plot



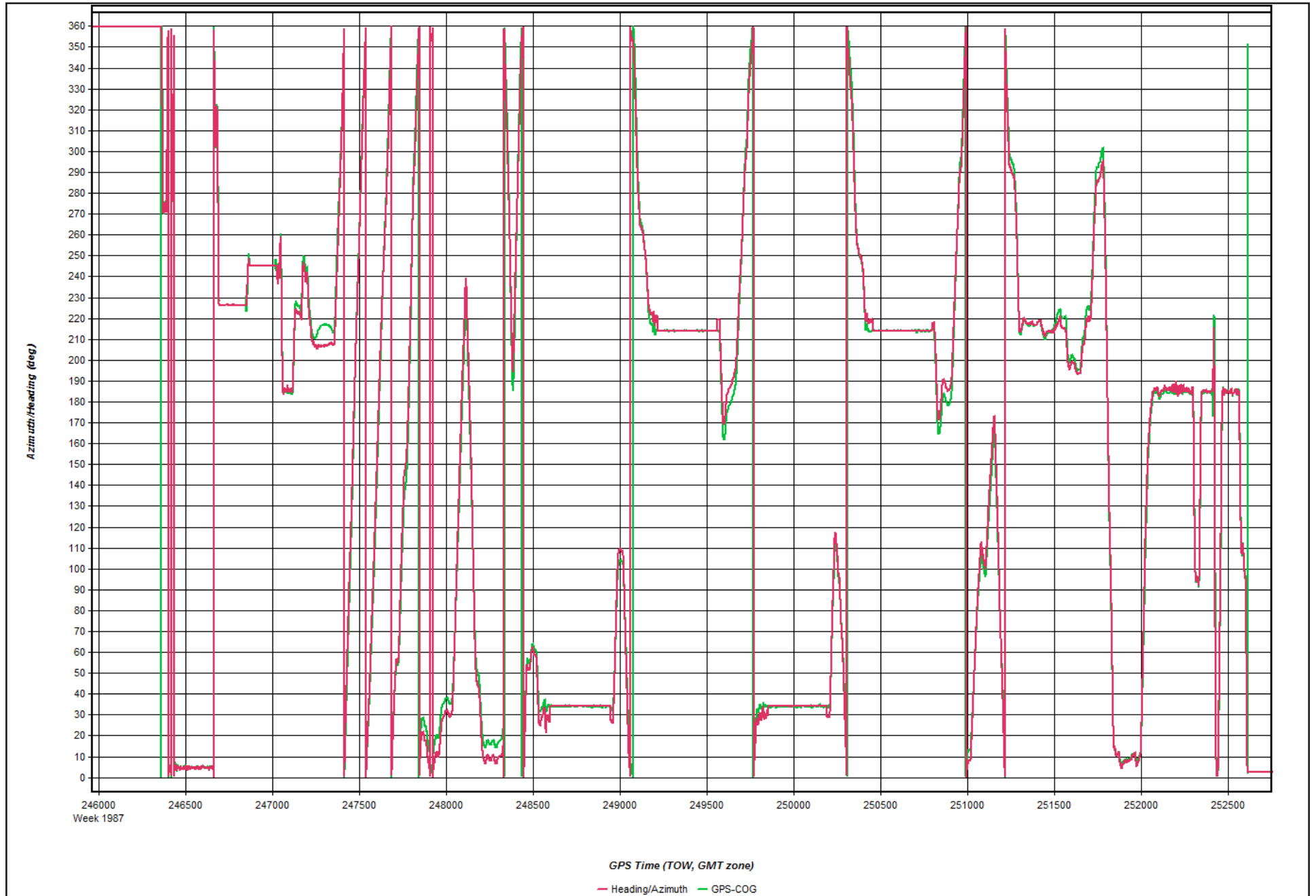
2018-02-06_Day037_7 - 20180206201825

Figure 10: Estimated Attitude Accuracy Plot



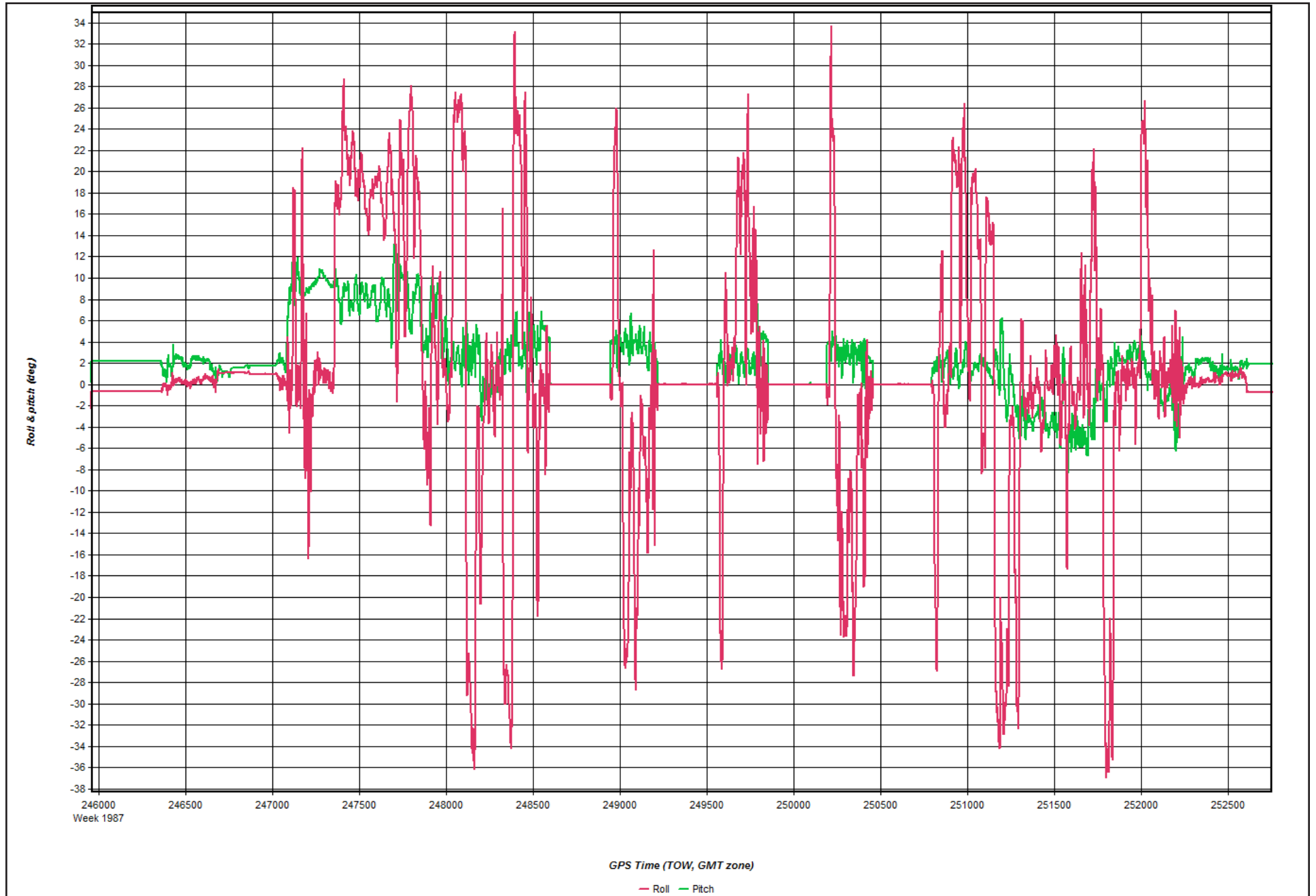
2018-02-06_Day037_7 - 20180206201825

Figure 11: Azimuth Plot



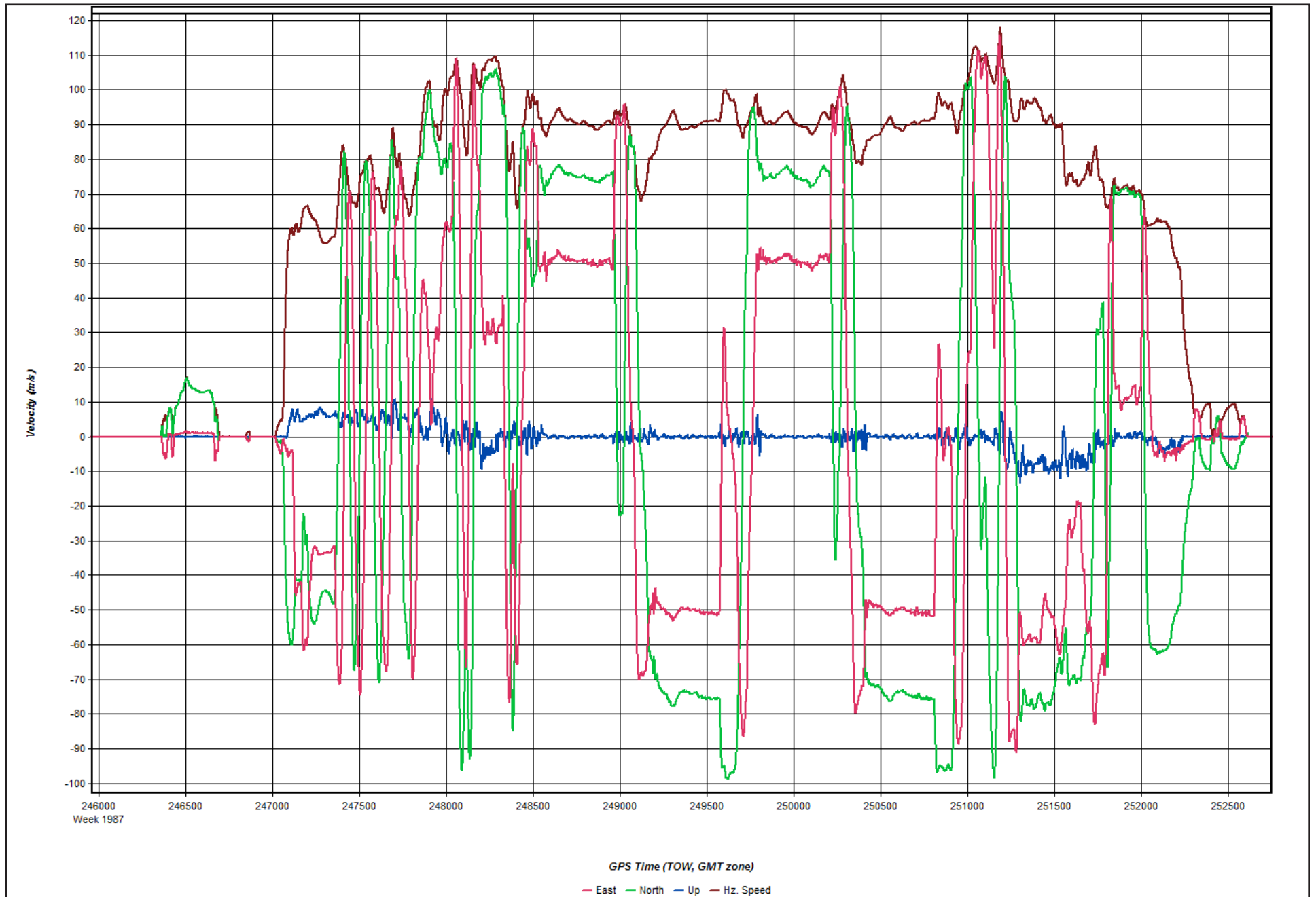
2018-02-06_Day037_7 - 20180206201825

Figure 12: Roll & Pitch Plot



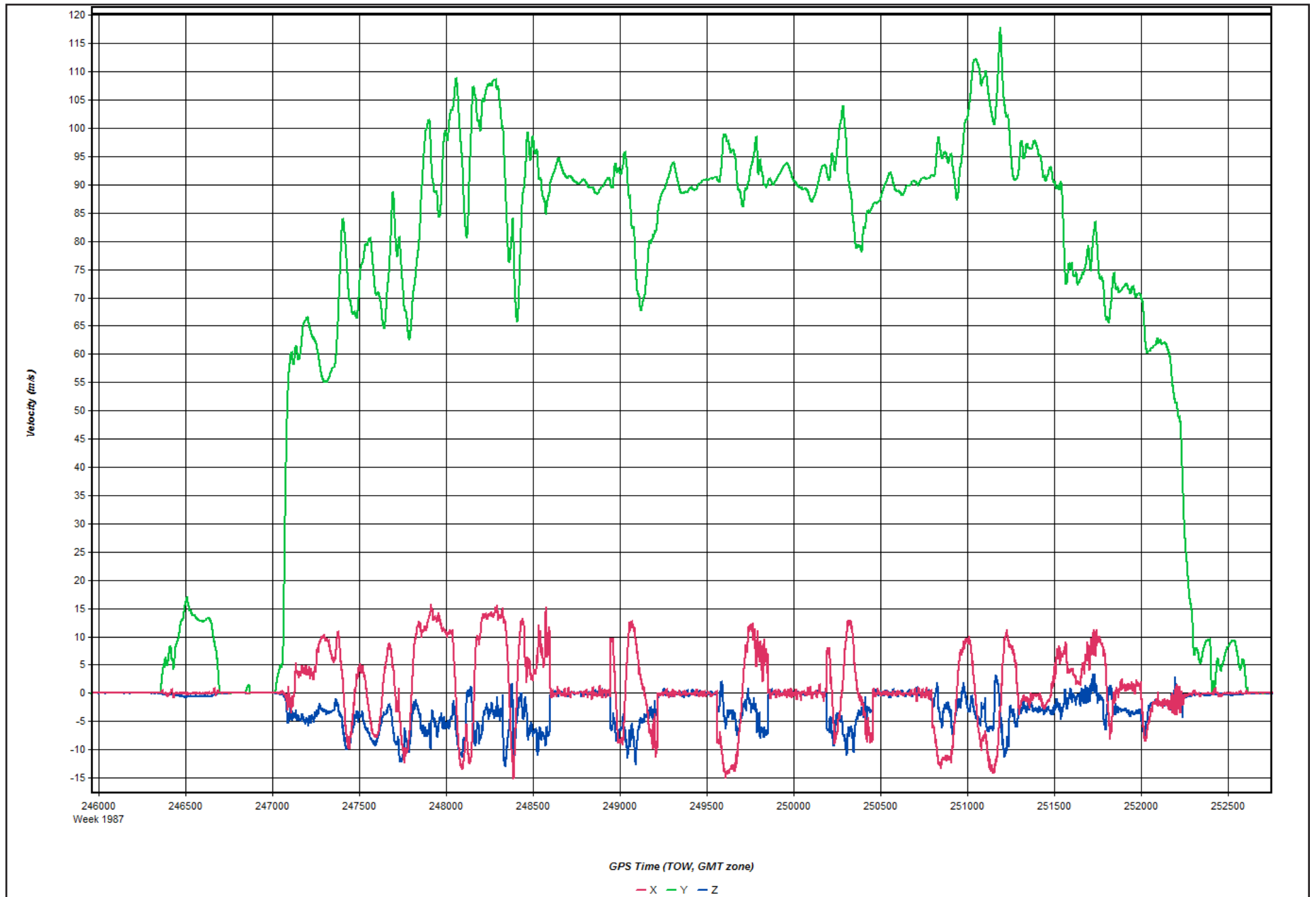
2018-02-06_Day037_7 - 20180206201825

Figure 13: Velocity Profile Plot



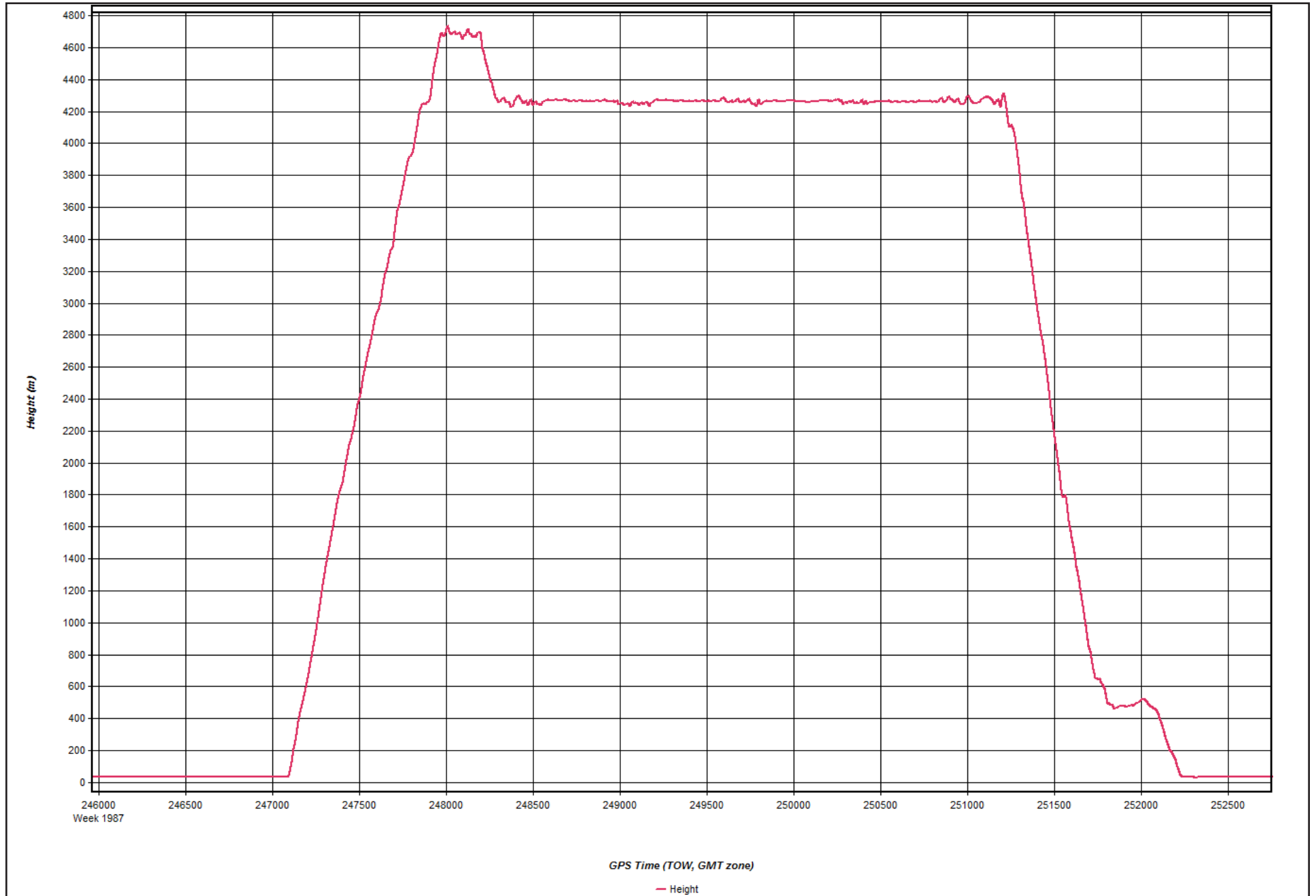
2018-02-06_Day037_7 - 20180206201825

Figure 14: Body Frame Velocity Plot



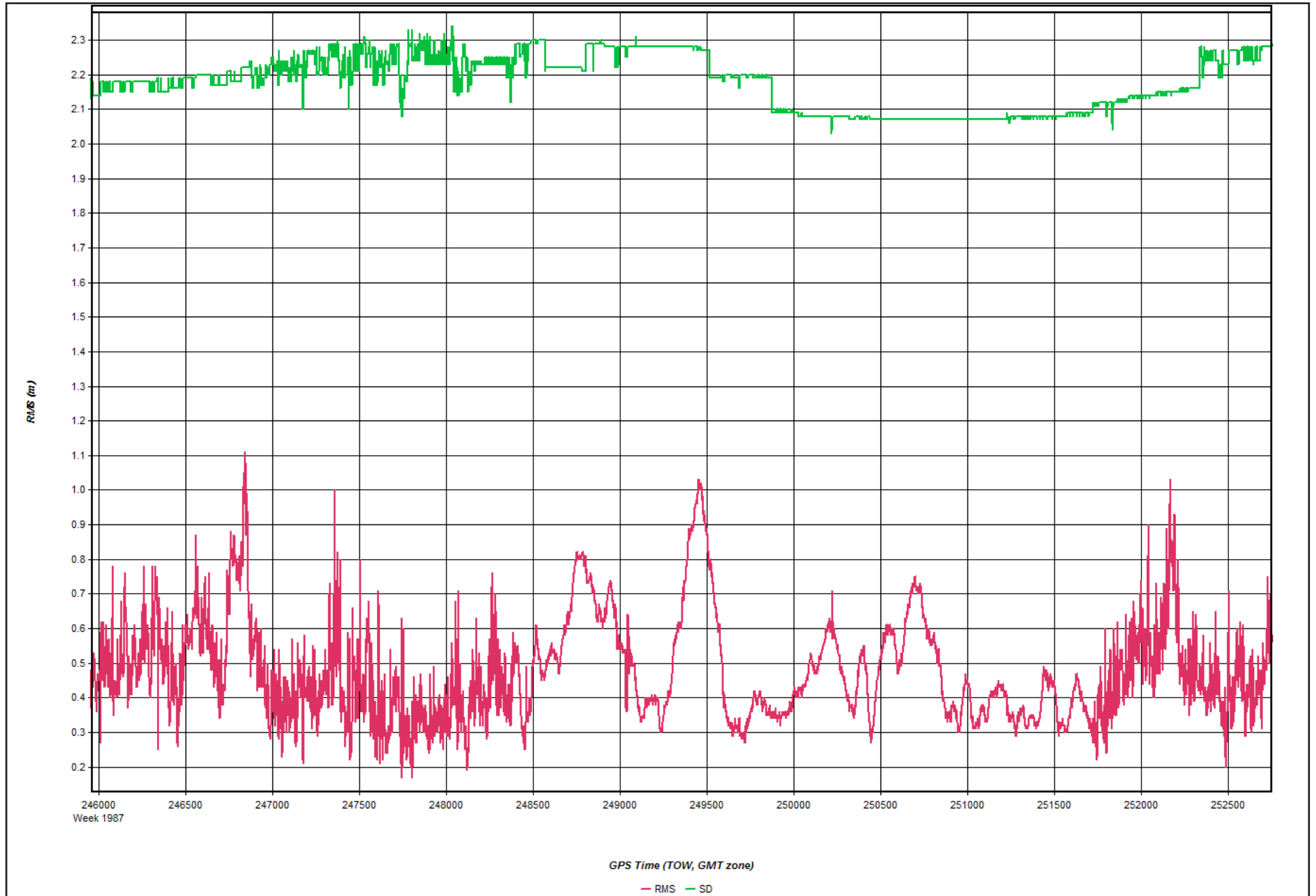
2018-02-06_Day037_7 - 20180206201825

Figure 15: Height Profile Plot



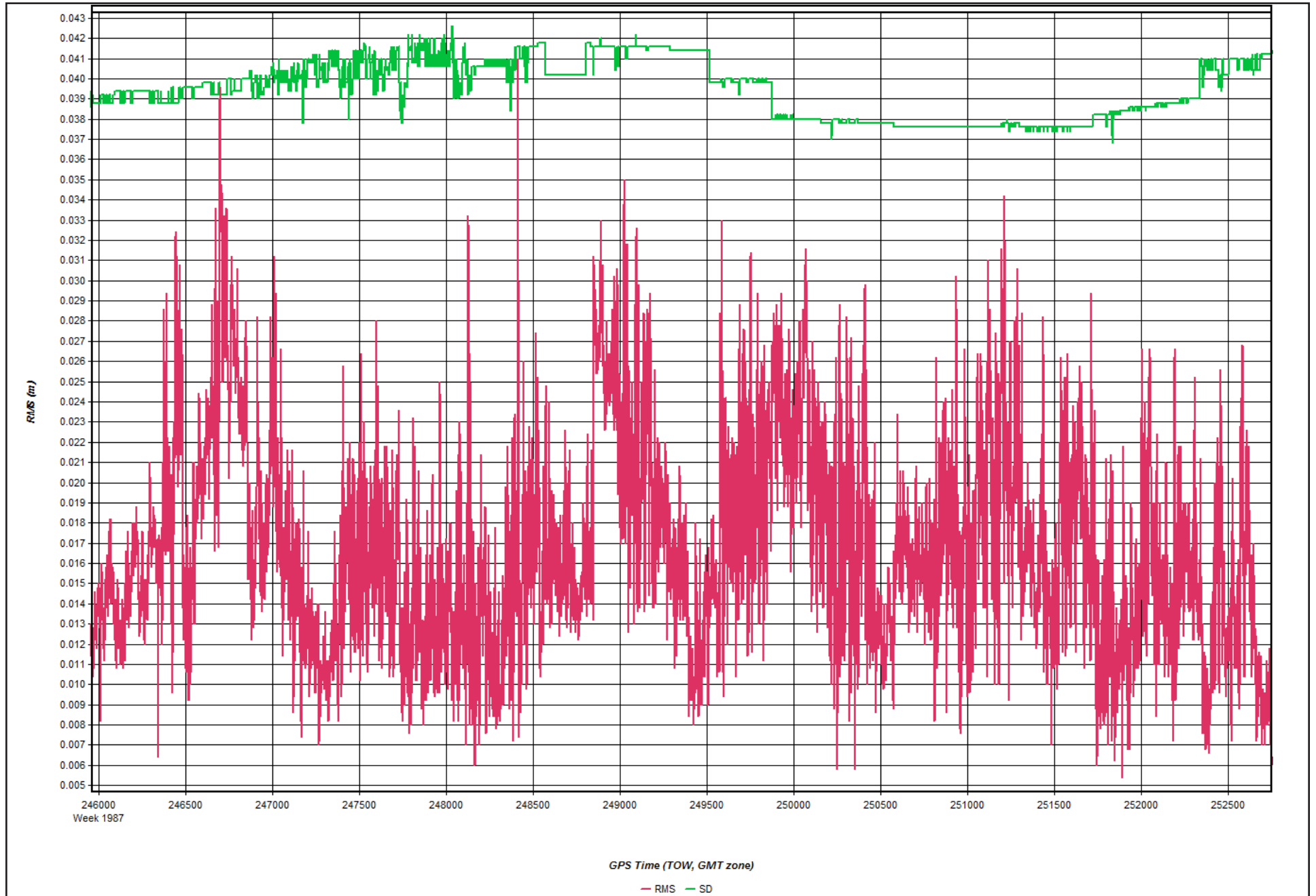
2018-02-06_Day037_7 - 20180206201825

Figure 16: C/A Code Residual RMS Plot



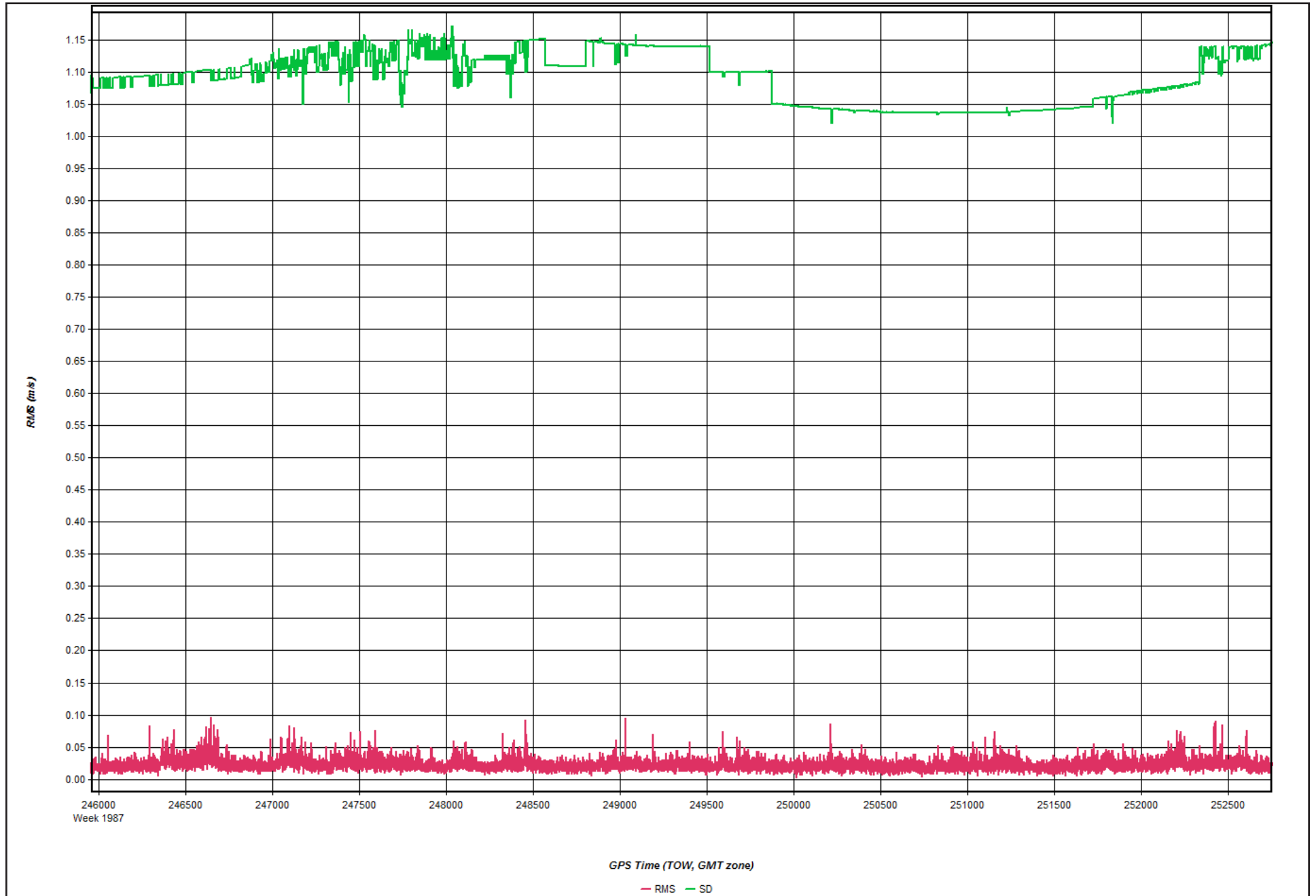
2018-02-06_Day037_7 - 20180206201825

Figure 17: Carrier Residual RMS Plot



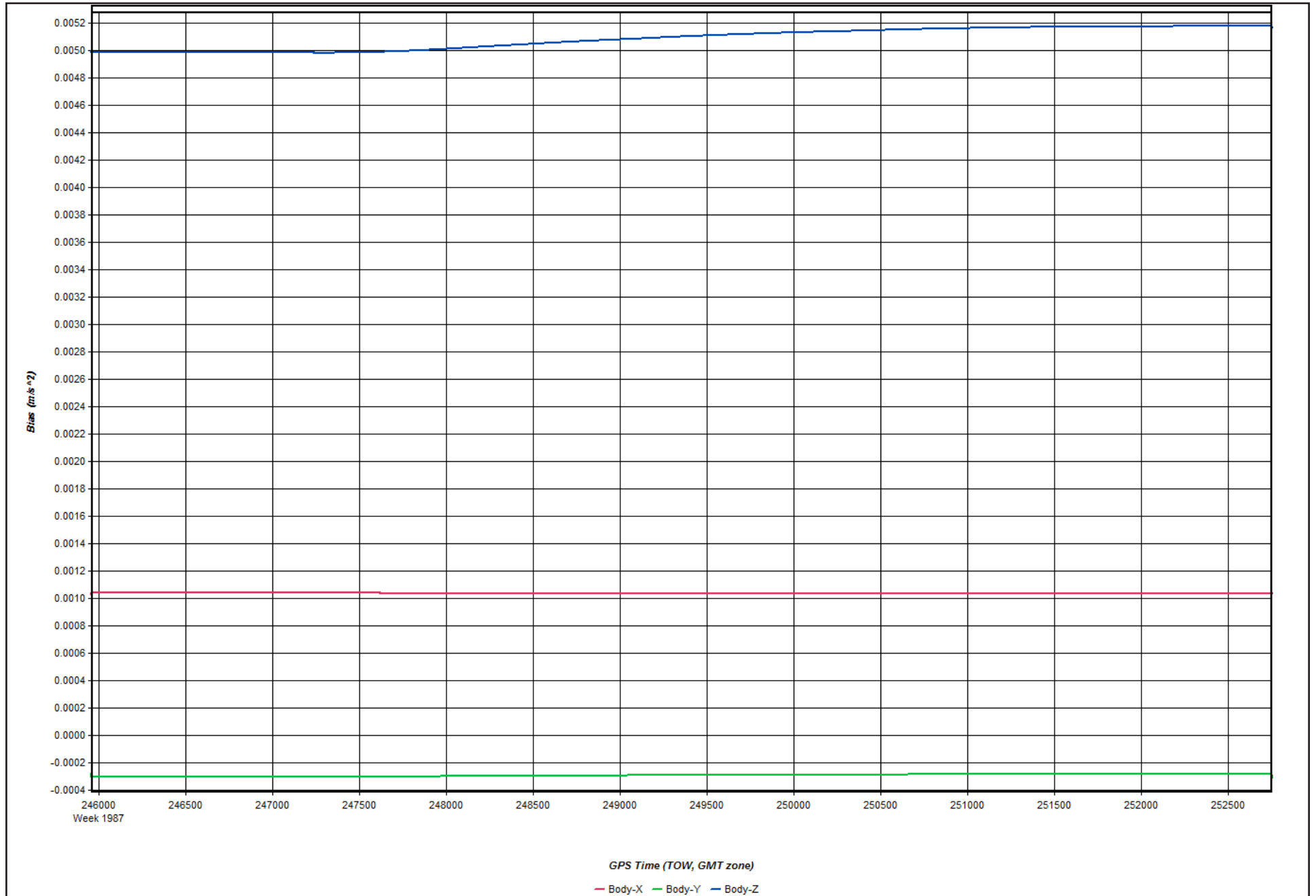
2018-02-06_Day037_7 - 20180206201825

Figure 18: L1 Doppler Residual RMS Plot



2018-02-06_Day037_7 - 20180206201825

Figure 19: Accelerometer Bias Plot



2018-02-06_Day037_7 - 20180206201825

Figure 20: Gyro Drift Plot

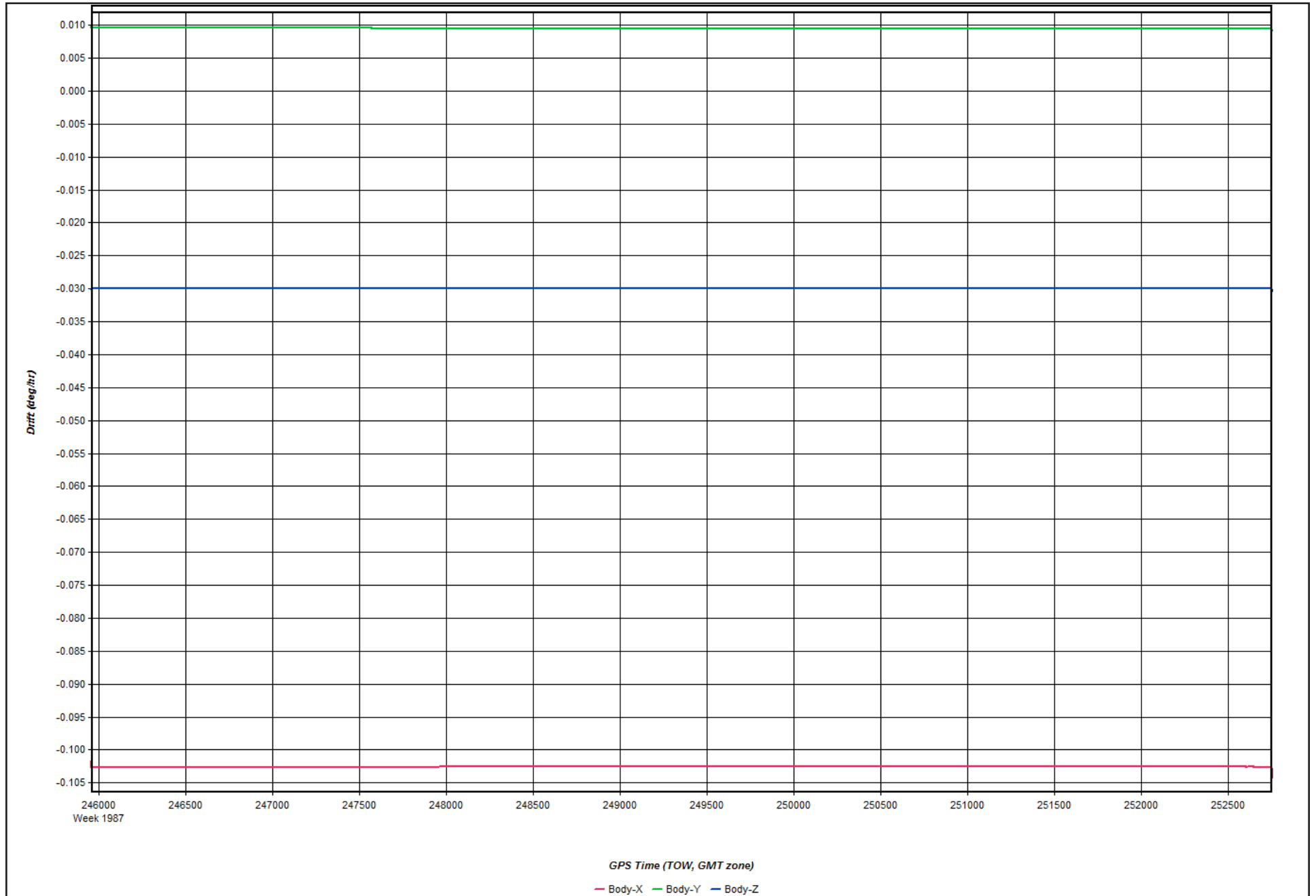
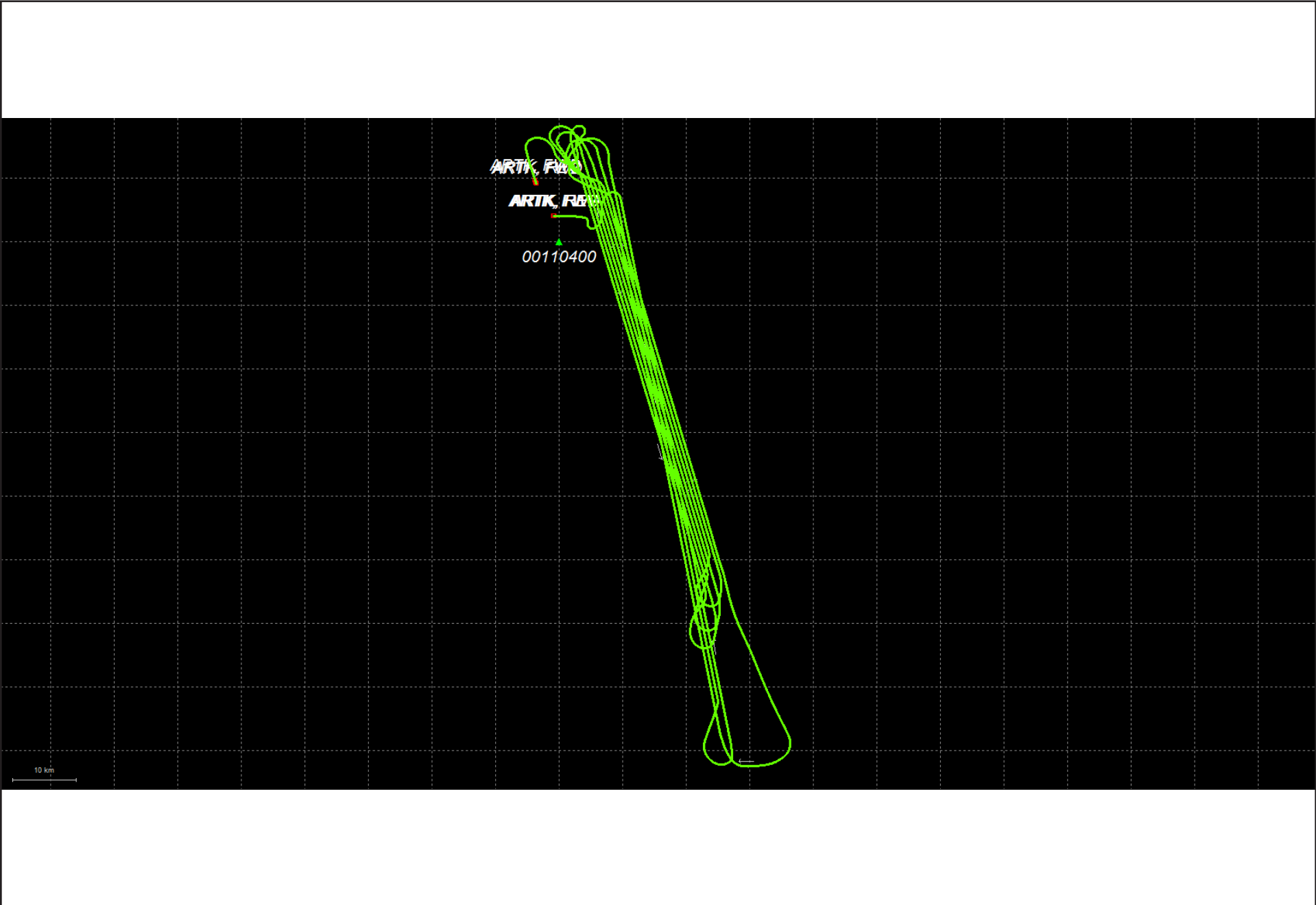
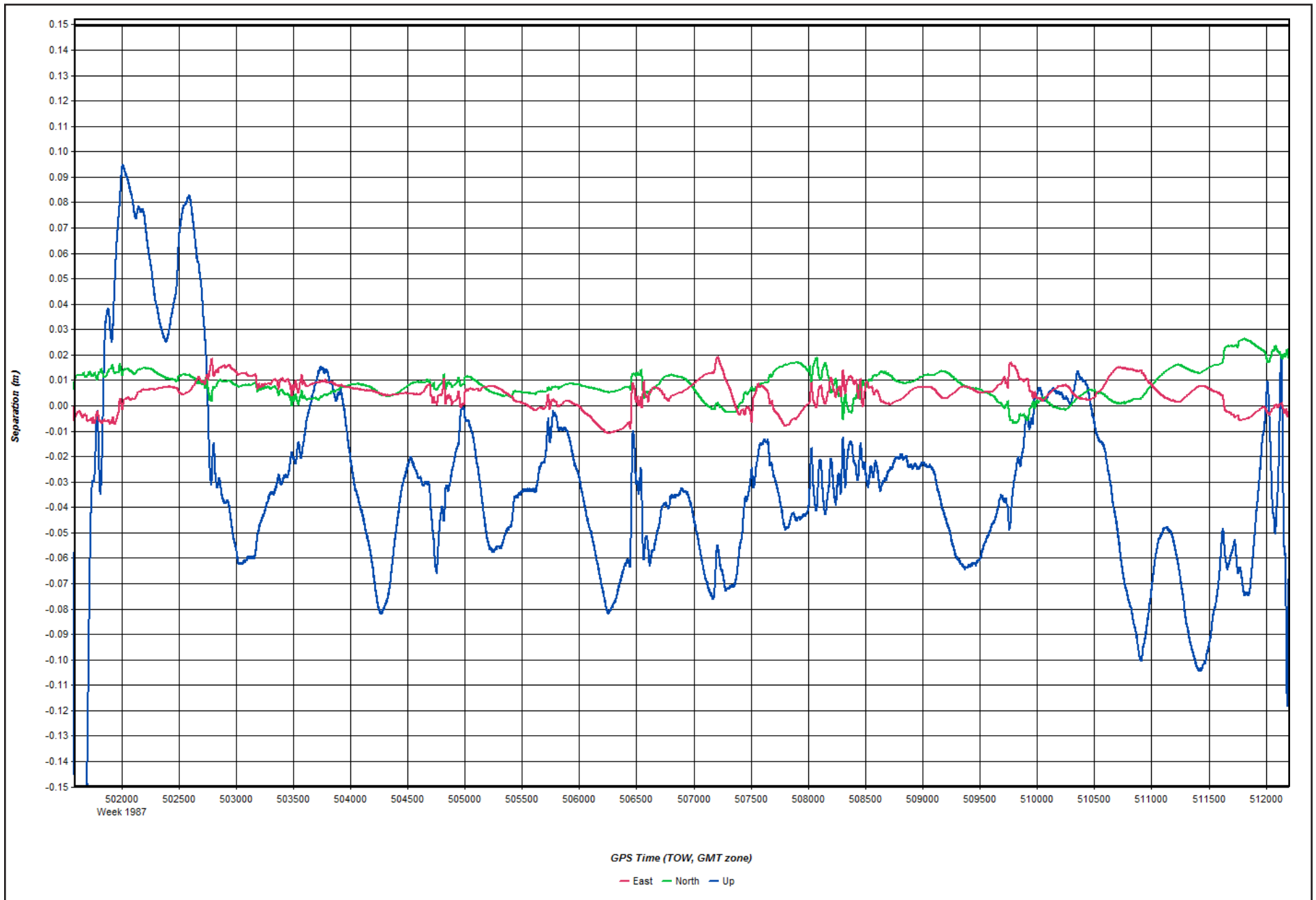


Figure 1: Map



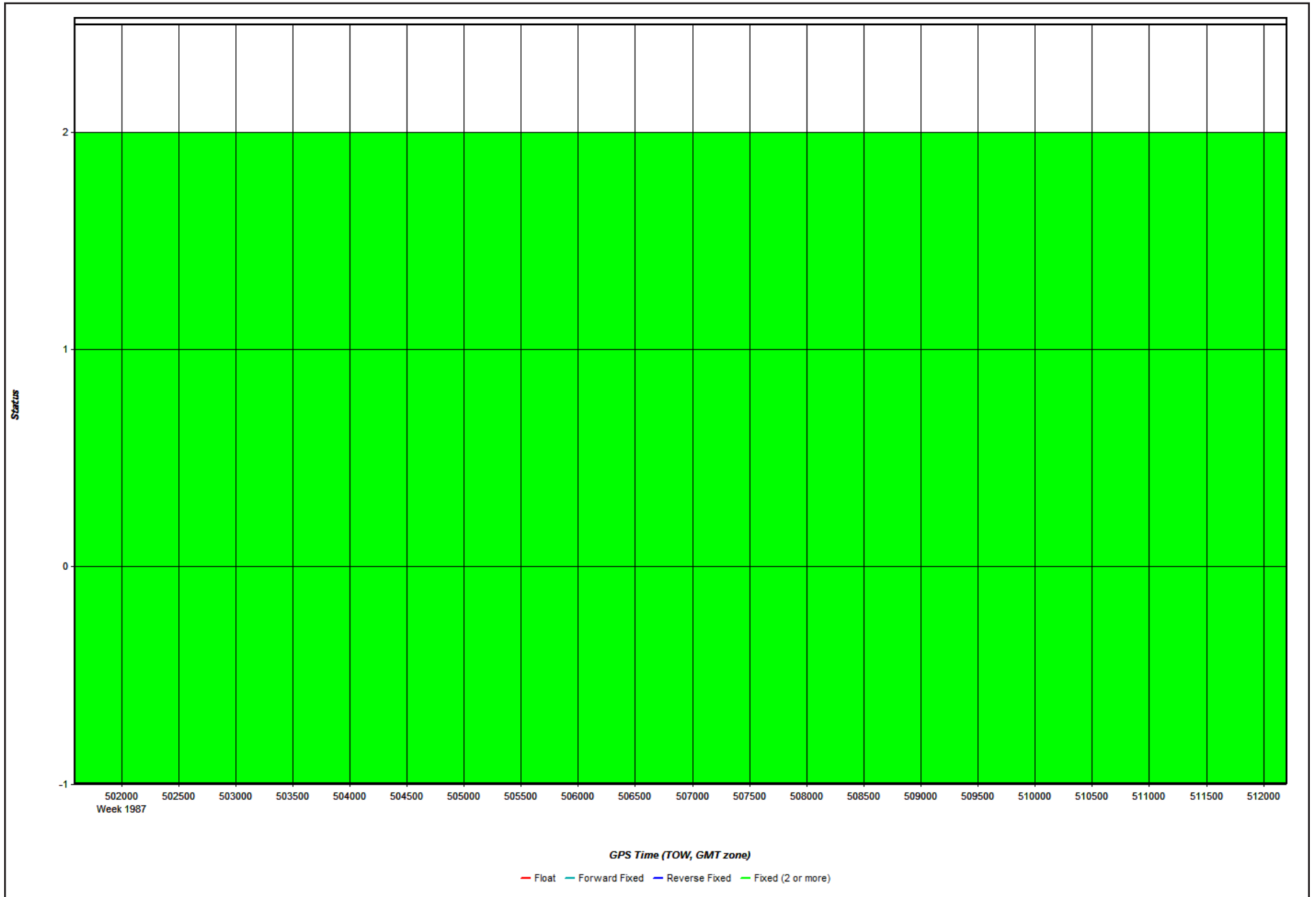
2018-02-09_Day040_7 - 20180209185155

Figure 2: Forward/Reverse or Combined Separation Plot



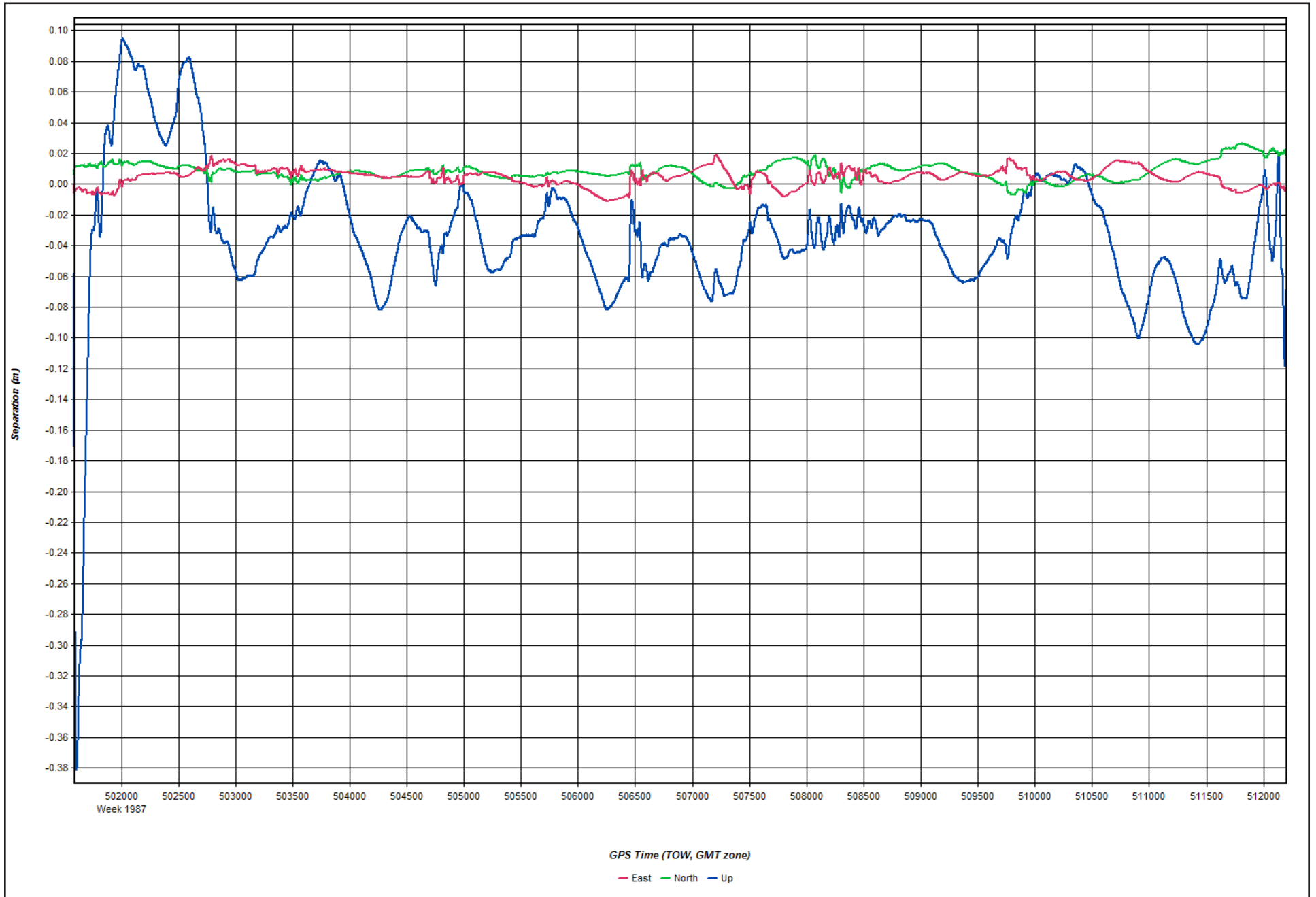
2018-02-09_Day040_7 - 20180209185155

Figure 3: Float or Fixed Ambiguity



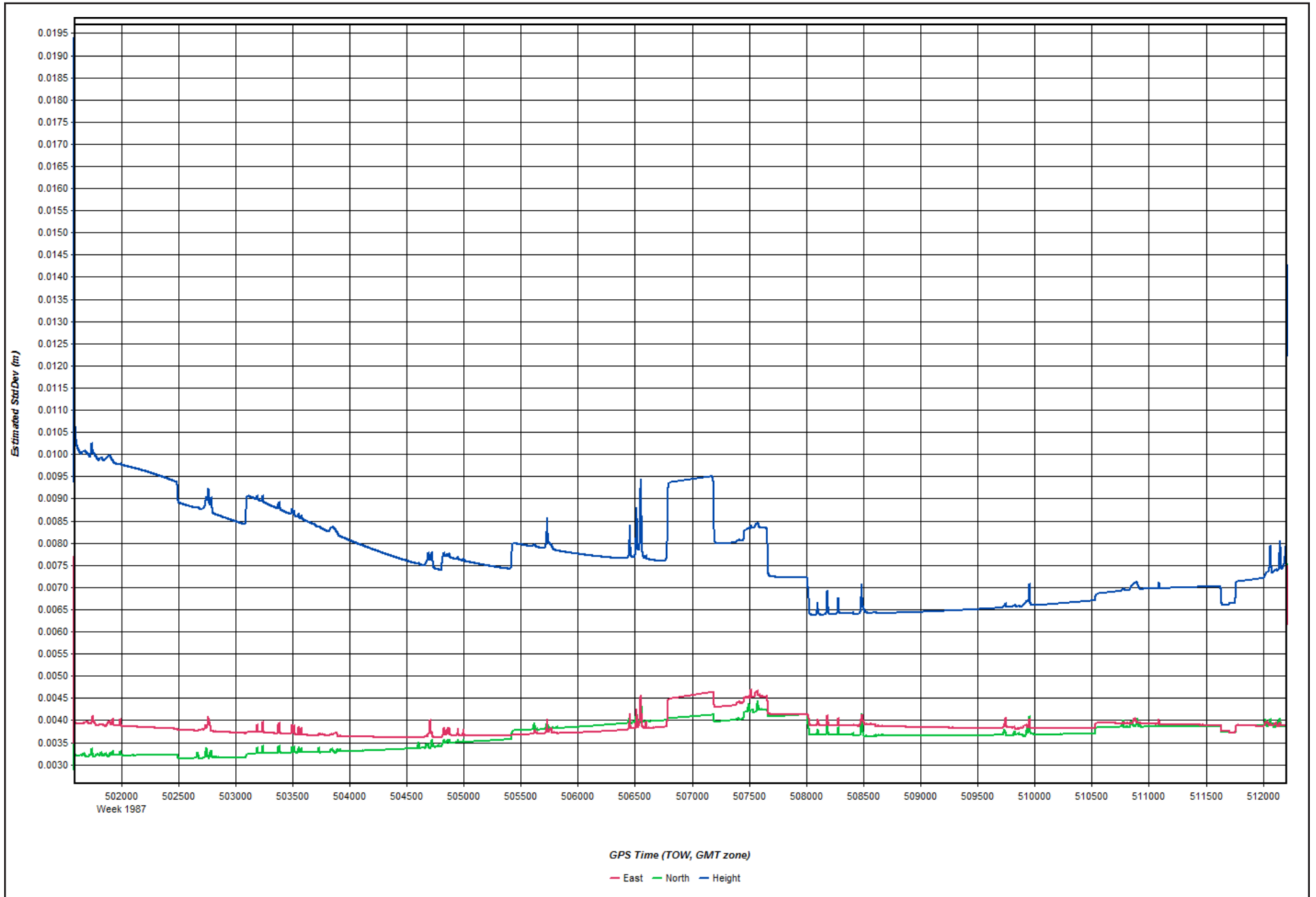
2018-02-09_Day040_7 - 20180209185155

Figure 4: Forward/Reverse Separation Plot (Fixed)



2018-02-09_Day040_7 - 20180209185155

Figure 5: Estimated Position Accuracy Plot



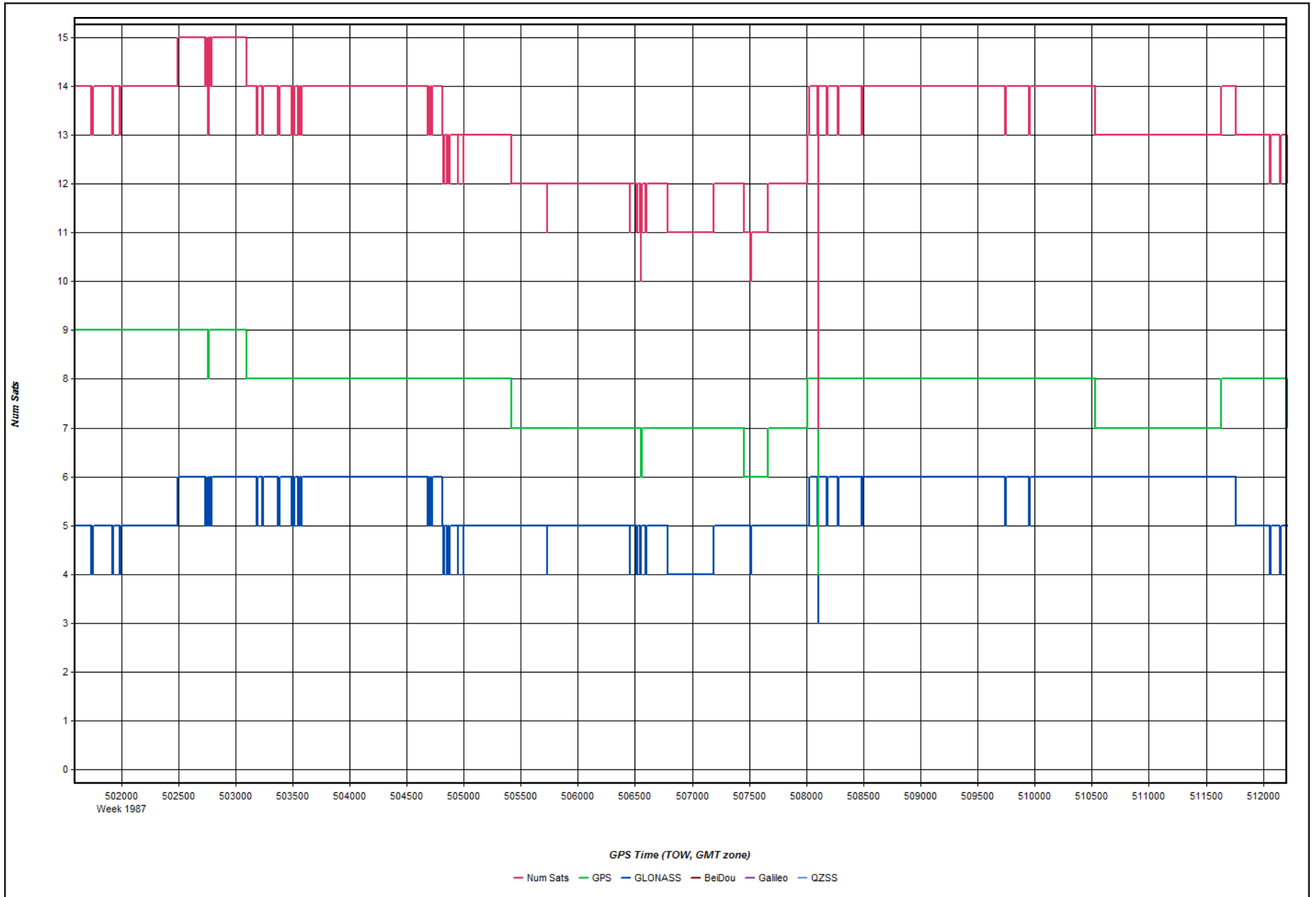
2018-02-09_Day040_7 - 20180209185155

Figure 6: PDOP Plot



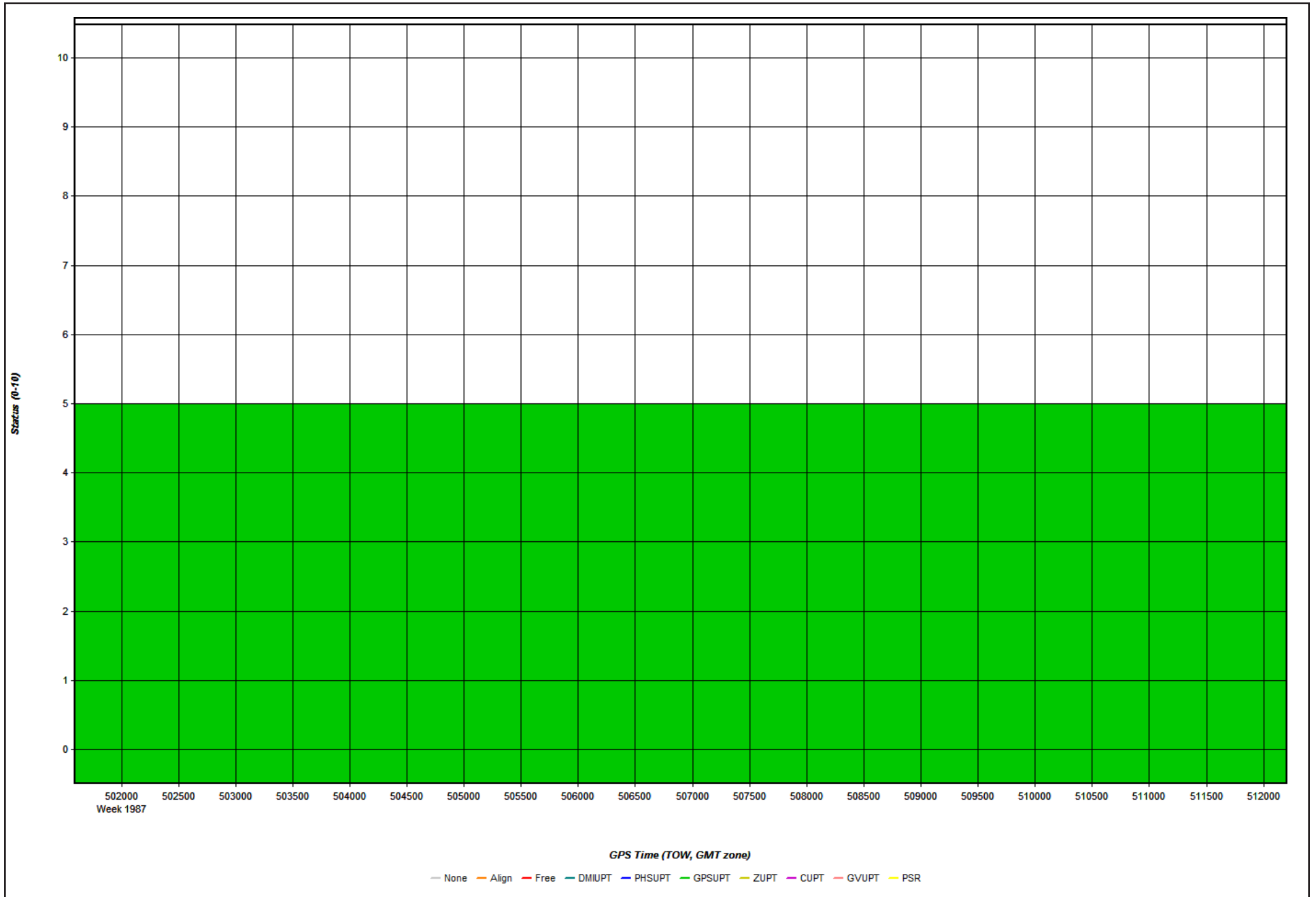
2018-02-09_Day040_7 - 20180209185155

Figure 7: Number of Satellites Line Plot



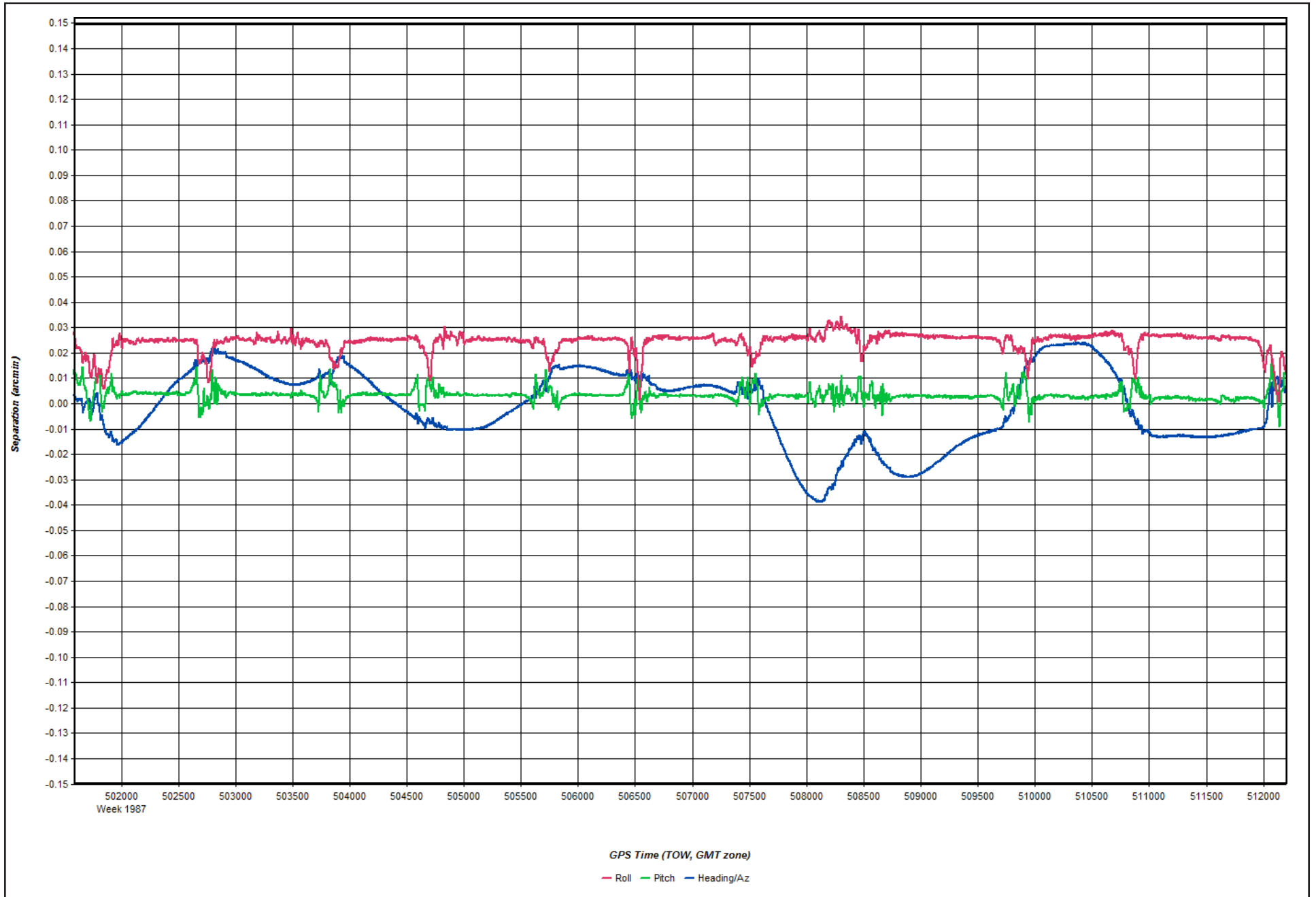
2018-02-09_Day040_7 - 20180209185155

Figure 8: Status flag for IMU processing



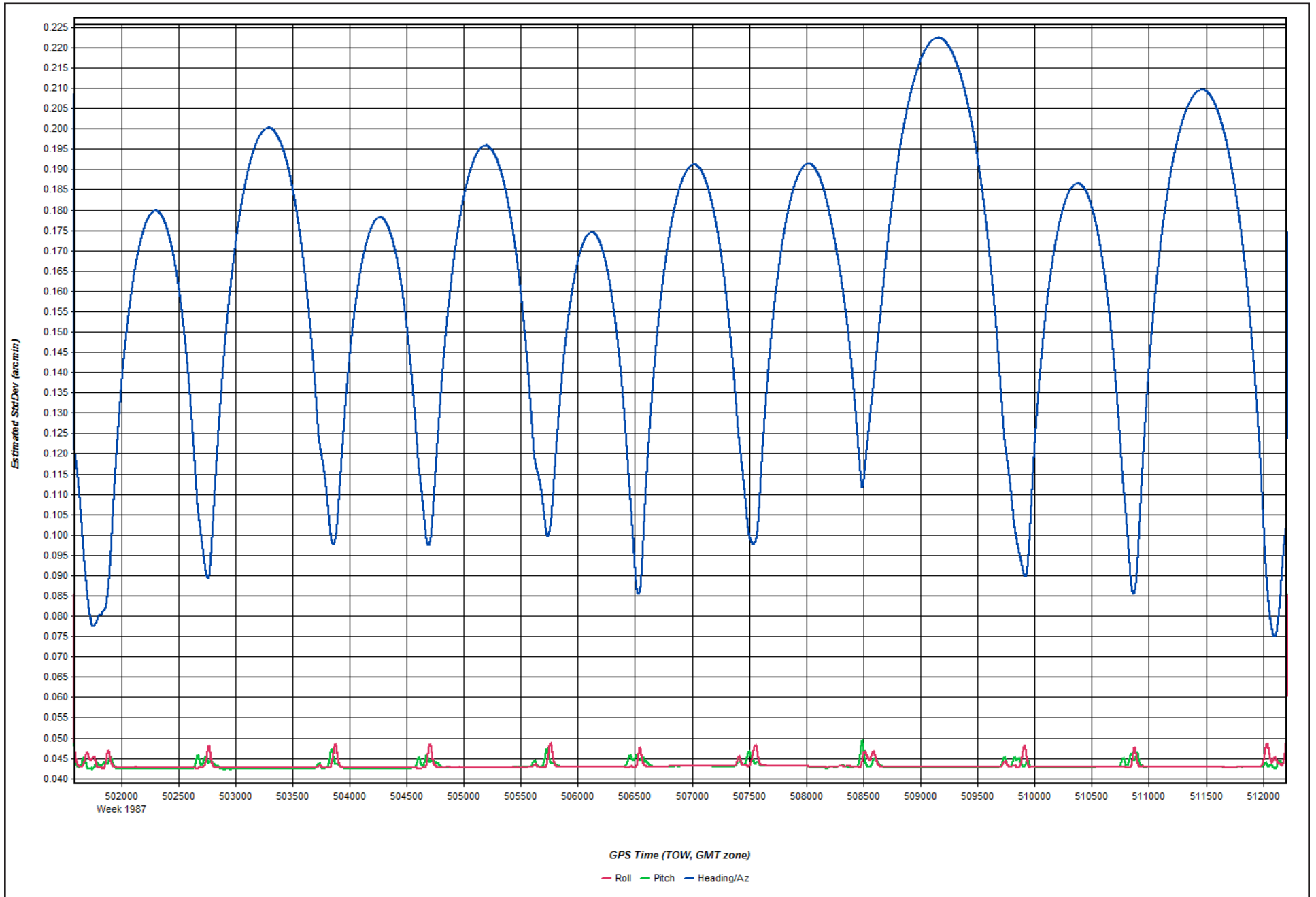
2018-02-09_Day040_7 - 20180209185155

Figure 9: Fwd/Rev Attitude Separation Plot



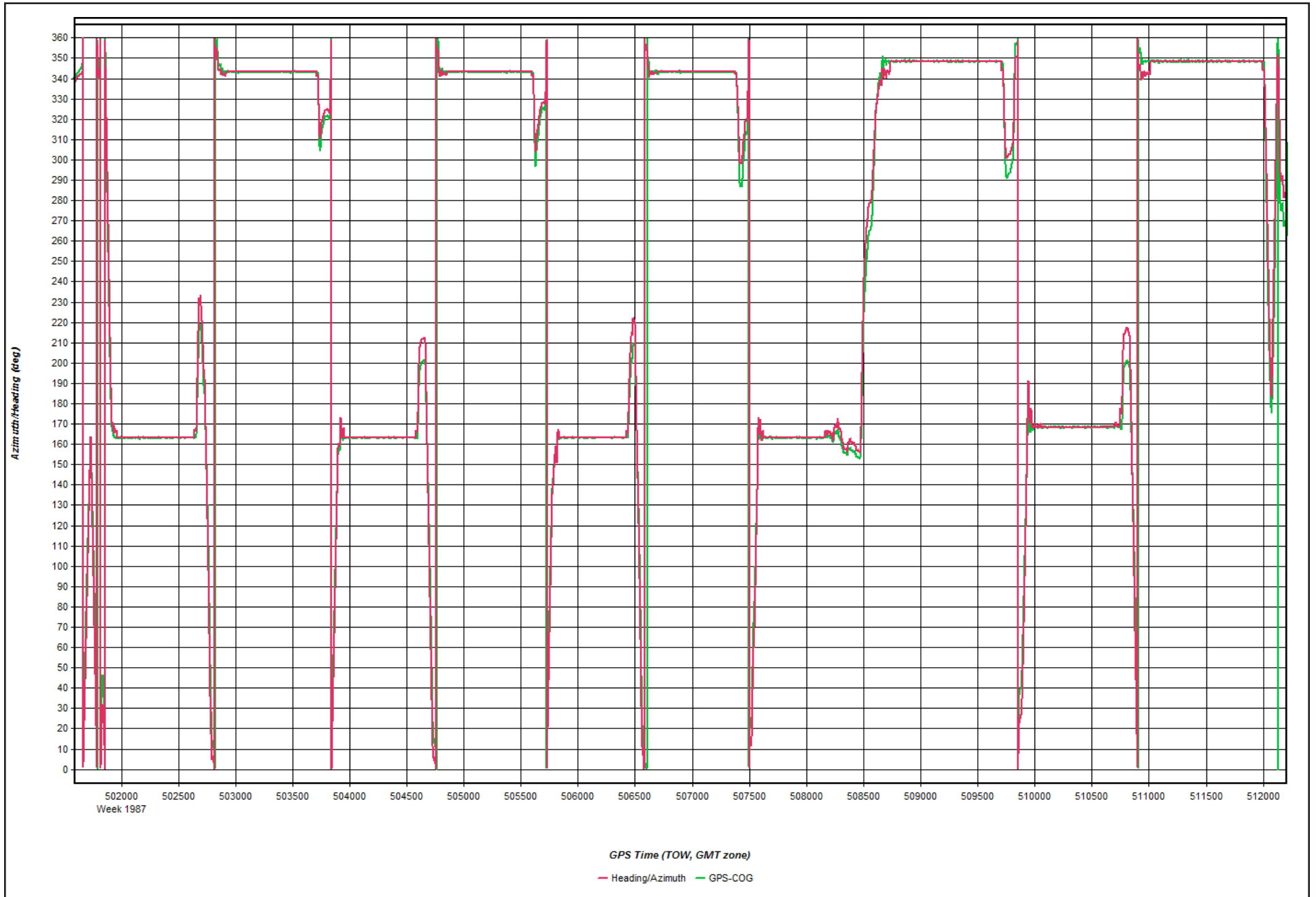
2018-02-09_Day040_7 - 20180209185155

Figure 10: Estimated Attitude Accuracy Plot



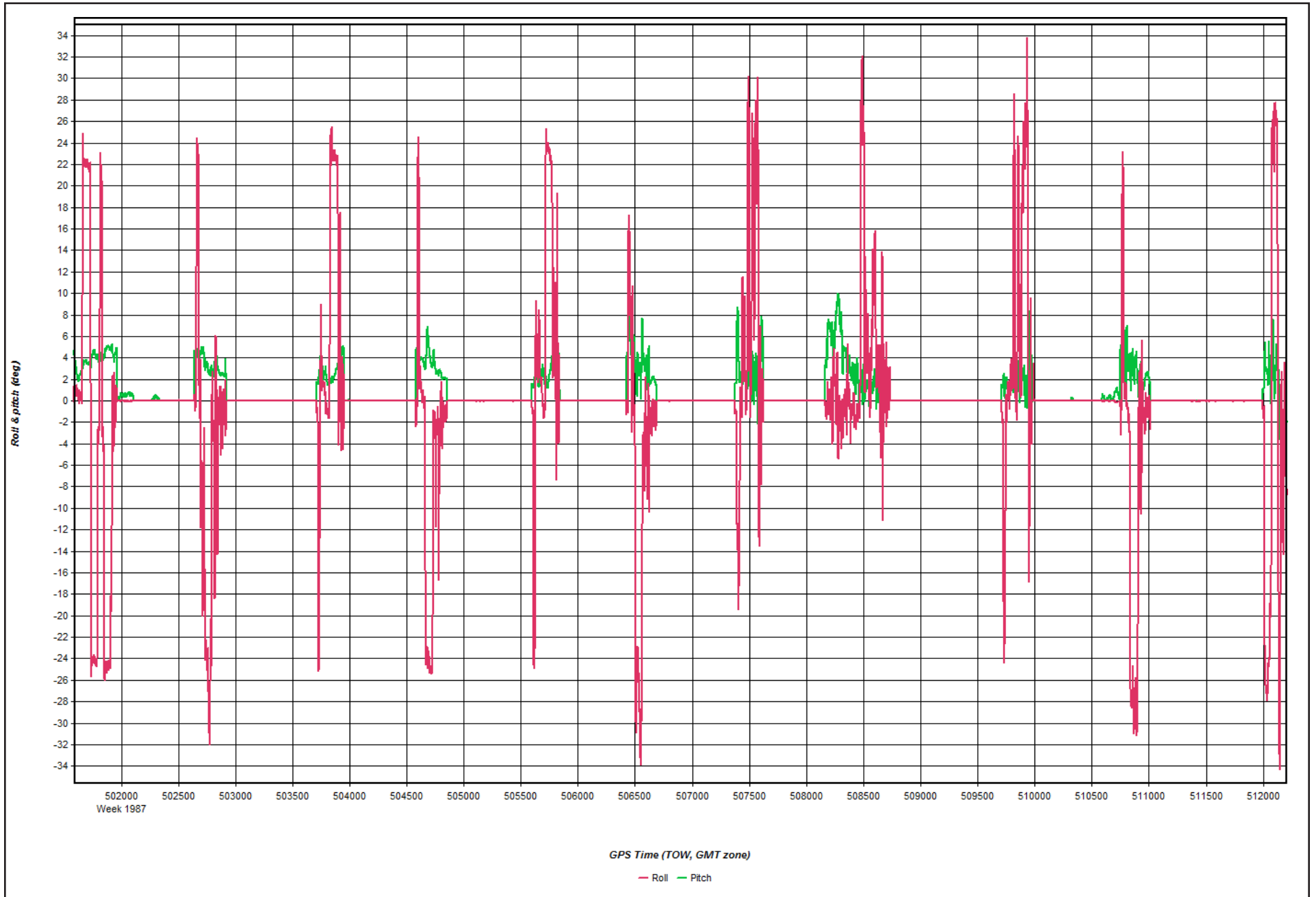
2018-02-09_Day040_7 - 20180209185155

Figure 11: Azimuth Plot



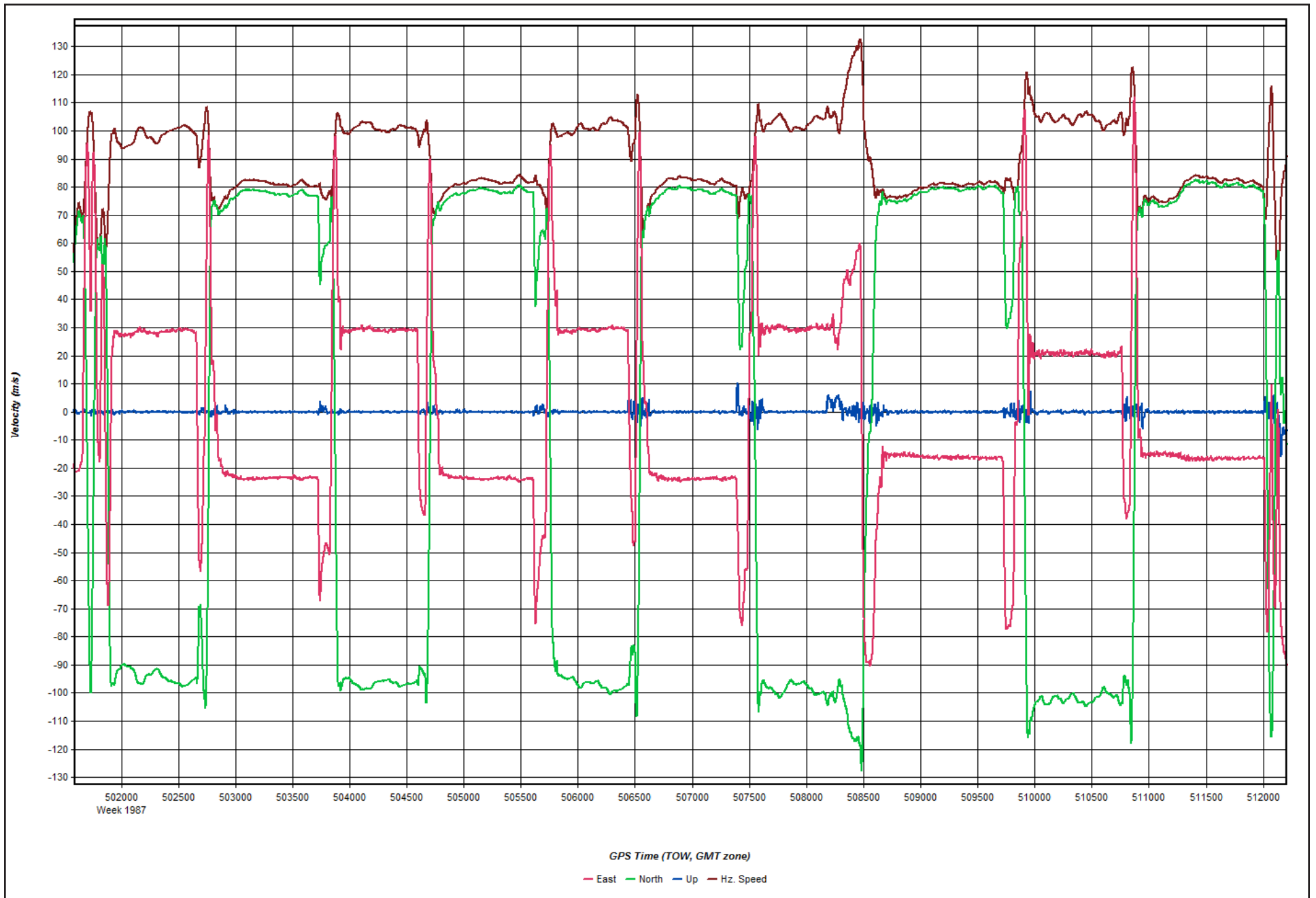
2018-02-09_Day040_7 - 20180209185155

Figure 12: Roll & Pitch Plot



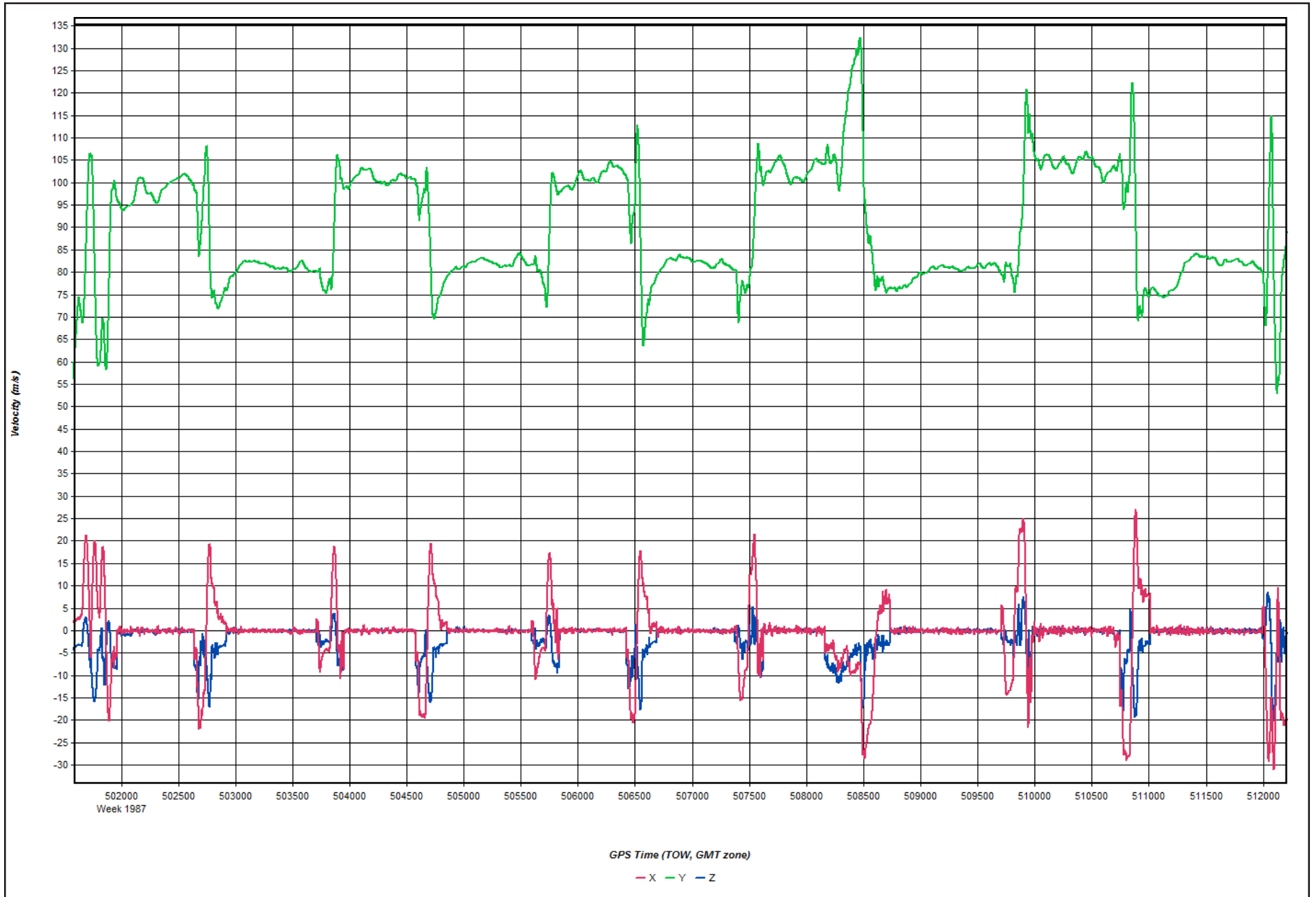
2018-02-09_Day040_7 - 20180209185155

Figure 13: Velocity Profile Plot



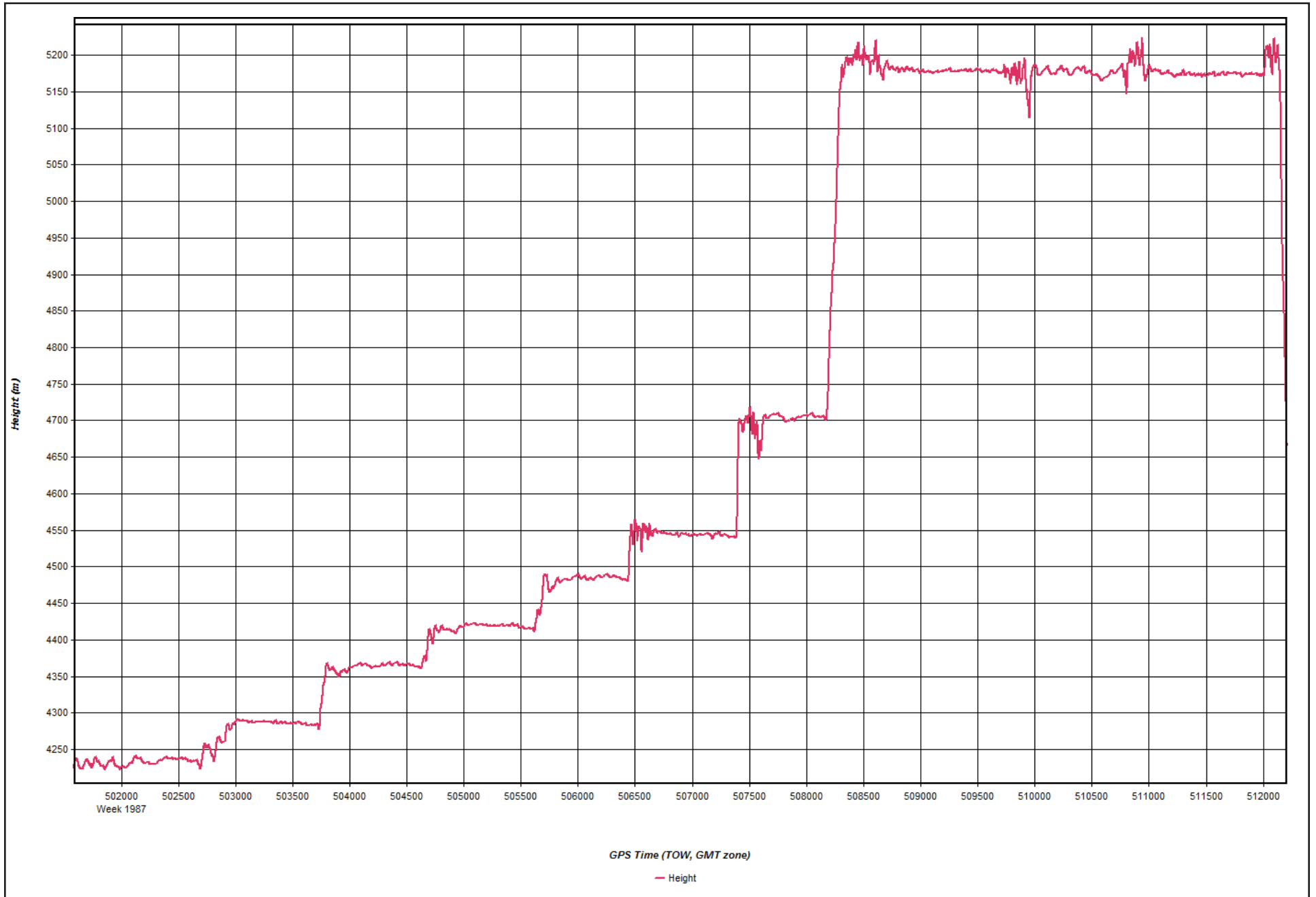
2018-02-09_Day040_7 - 20180209185155

Figure 14: Body Frame Velocity Plot



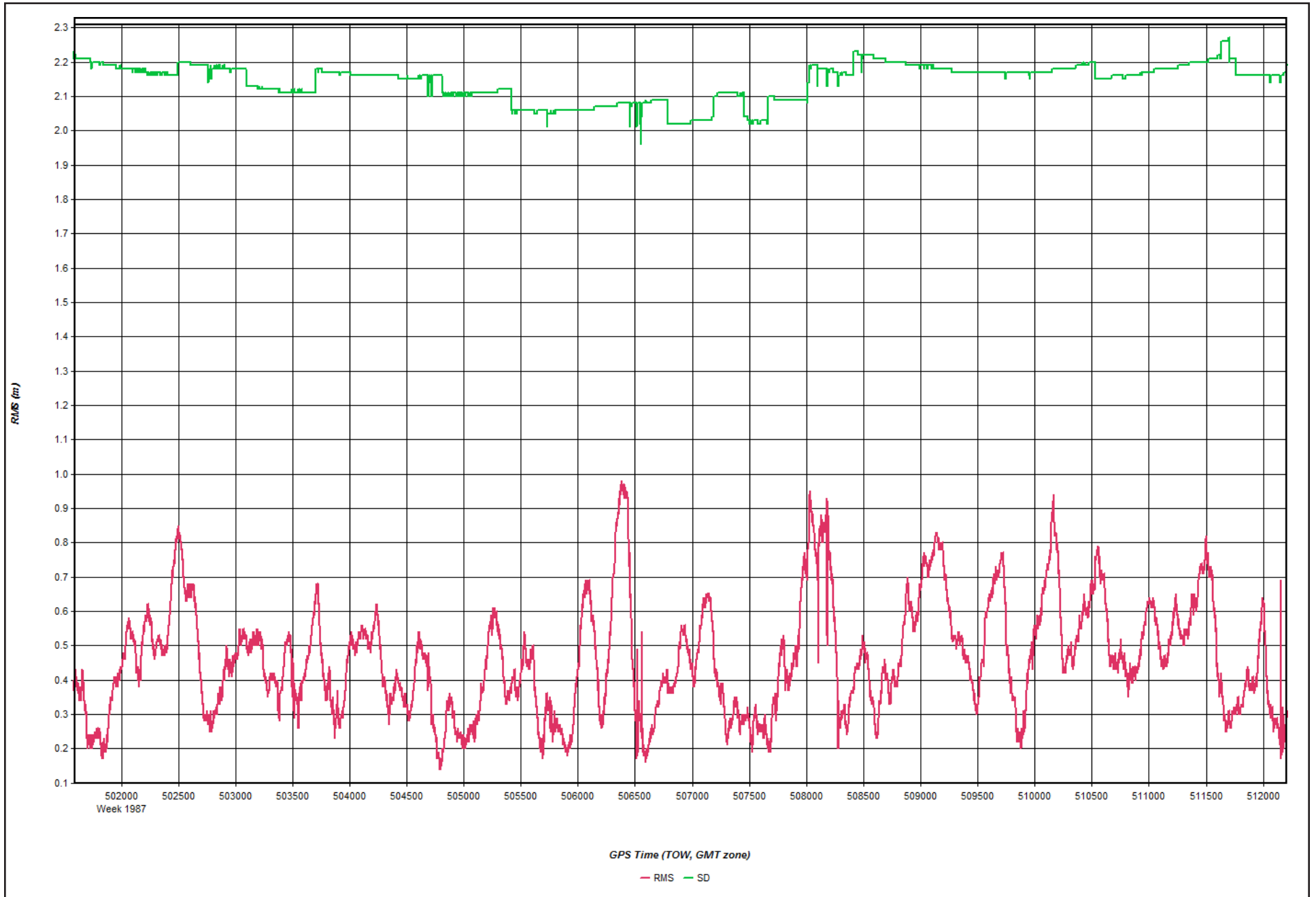
2018-02-09_Day040_7 - 20180209185155

Figure 15: Height Profile Plot



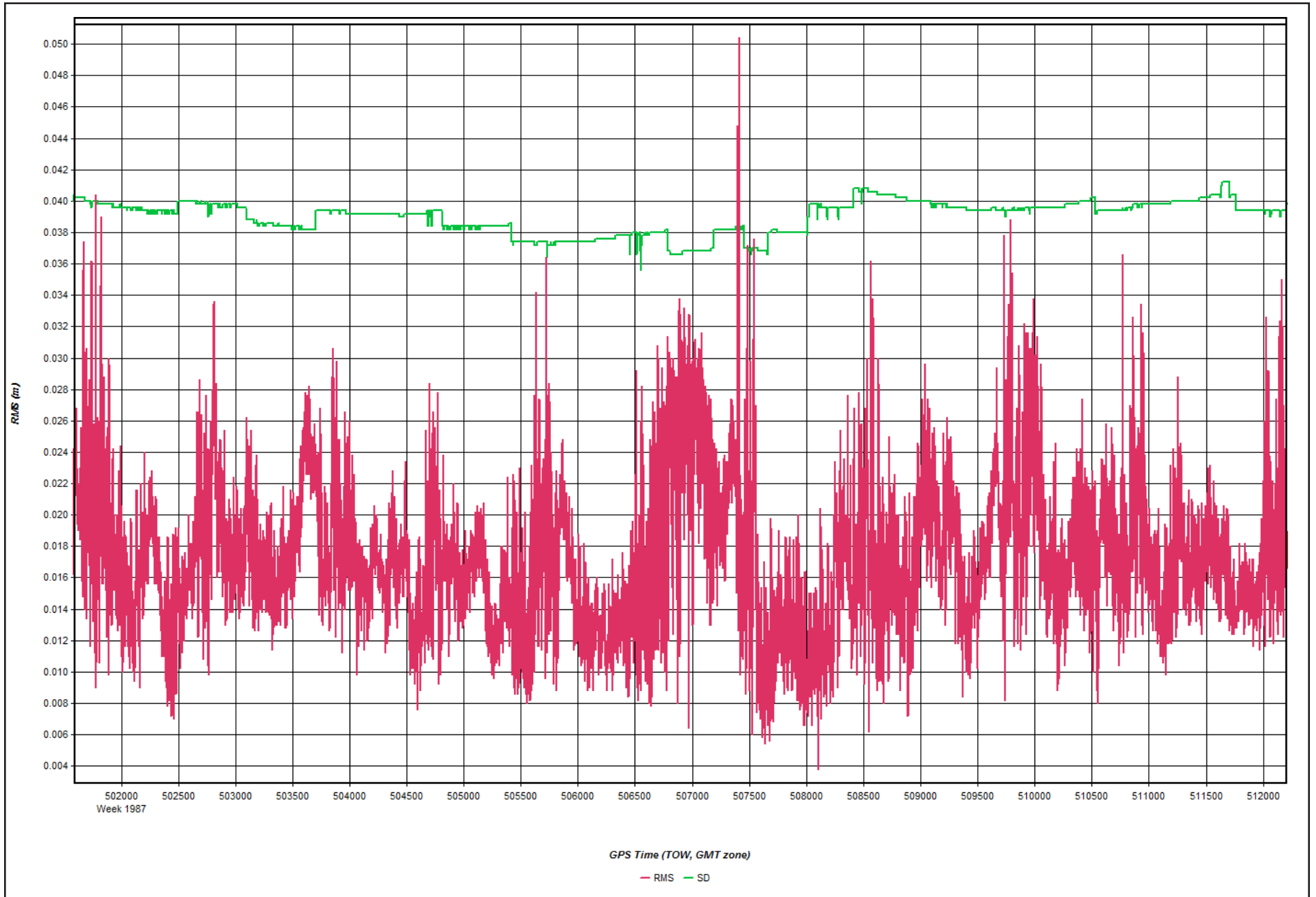
2018-02-09_Day040_7 - 20180209185155

Figure 16: C/A Code Residual RMS Plot



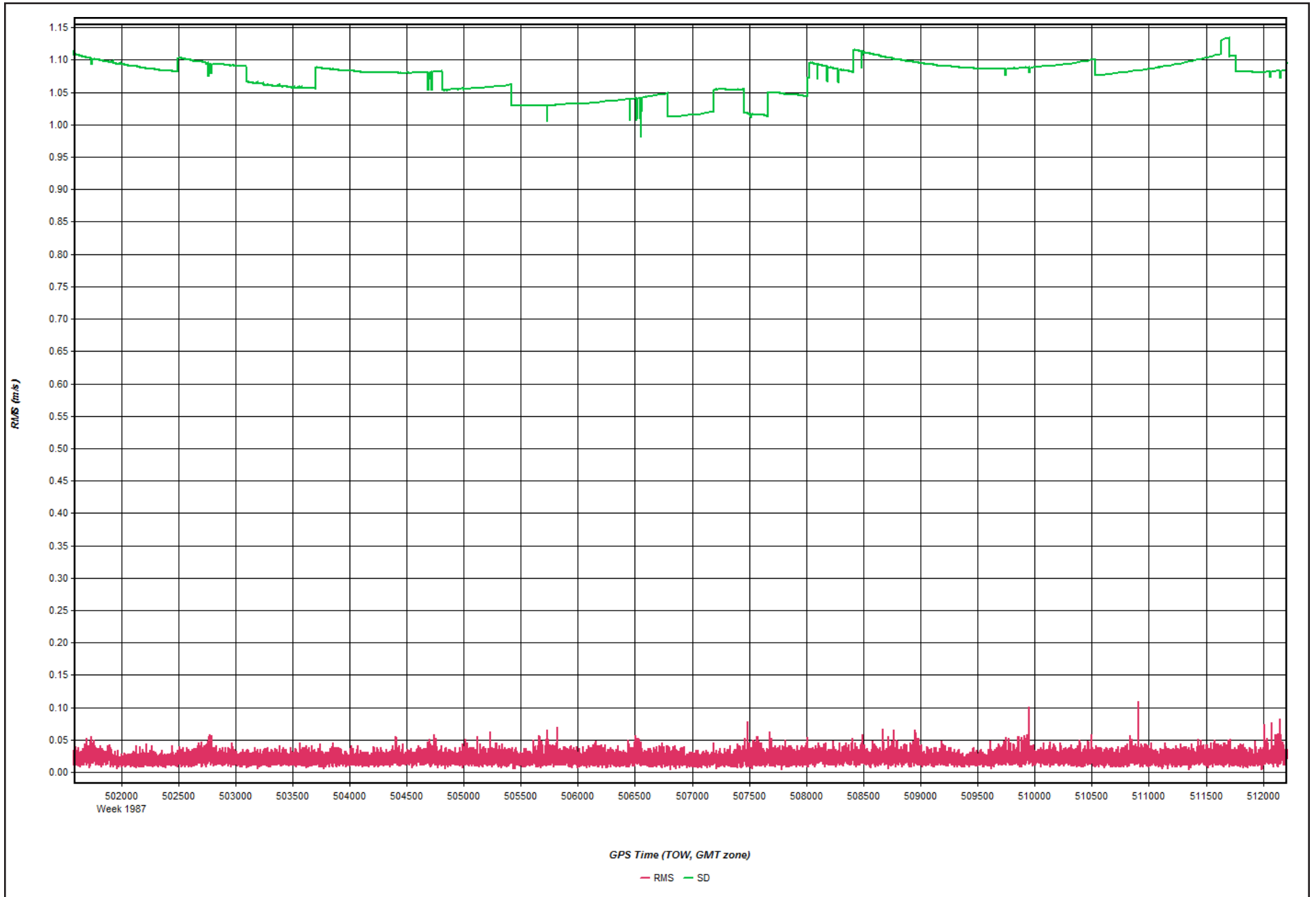
2018-02-09_Day040_7 - 20180209185155

Figure 17: Carrier Residual RMS Plot



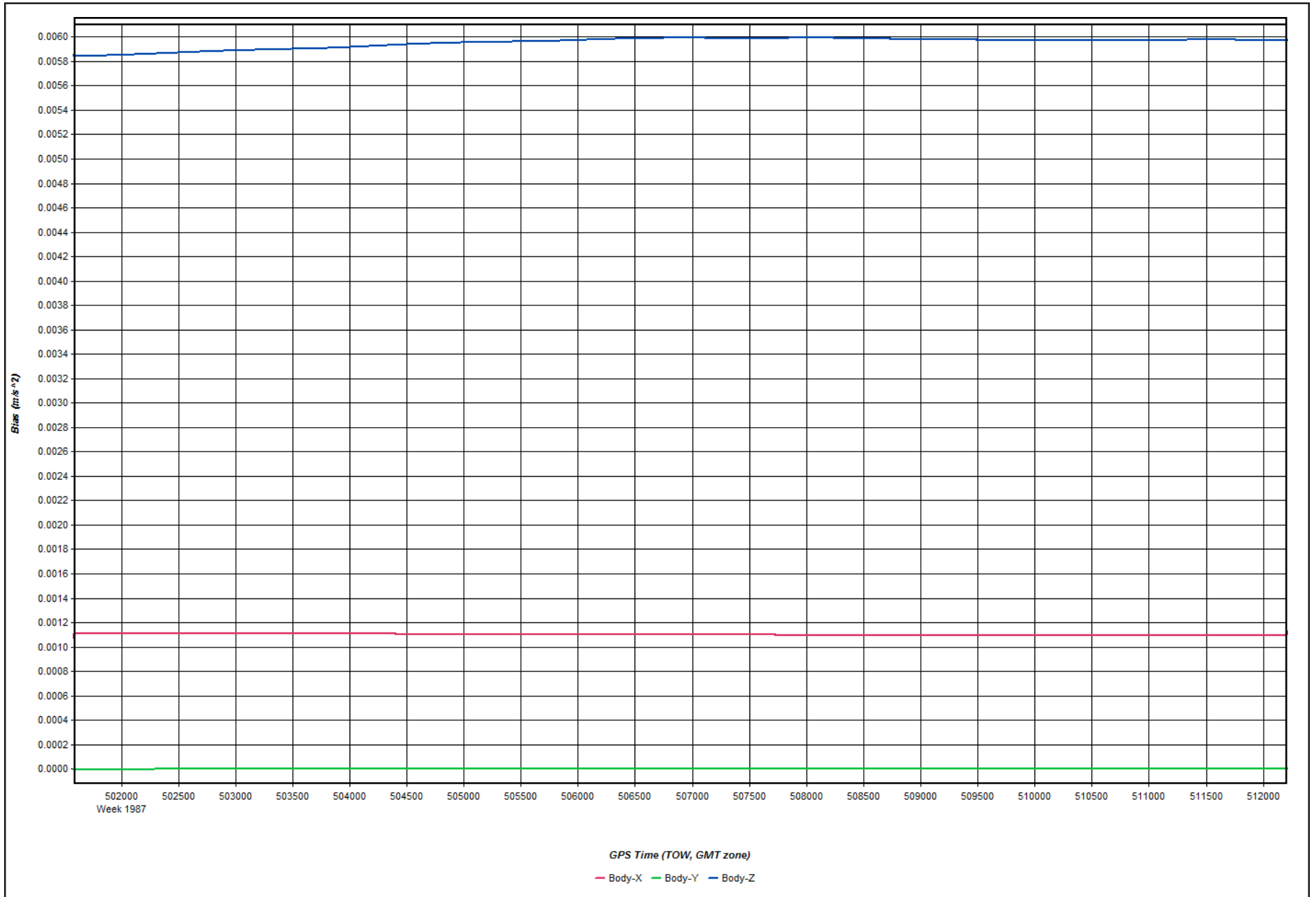
2018-02-09_Day040_7 - 20180209185155

Figure 18: L1 Doppler Residual RMS Plot



2018-02-09_Day040_7 - 20180209185155

Figure 19: Accelerometer Bias Plot



2018-02-09_Day040_7 - 20180209185155

Figure 20: Gyro Drift Plot

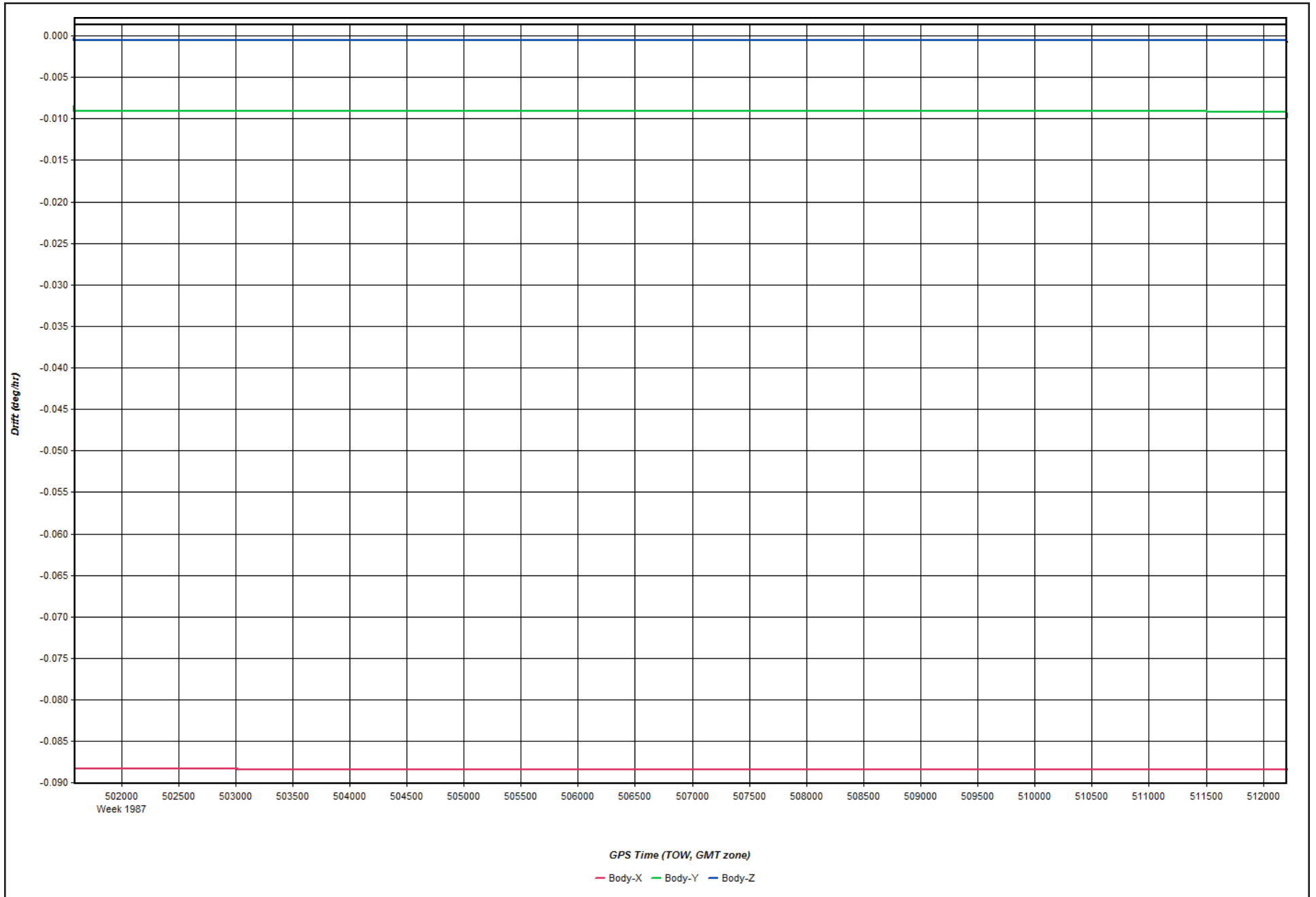
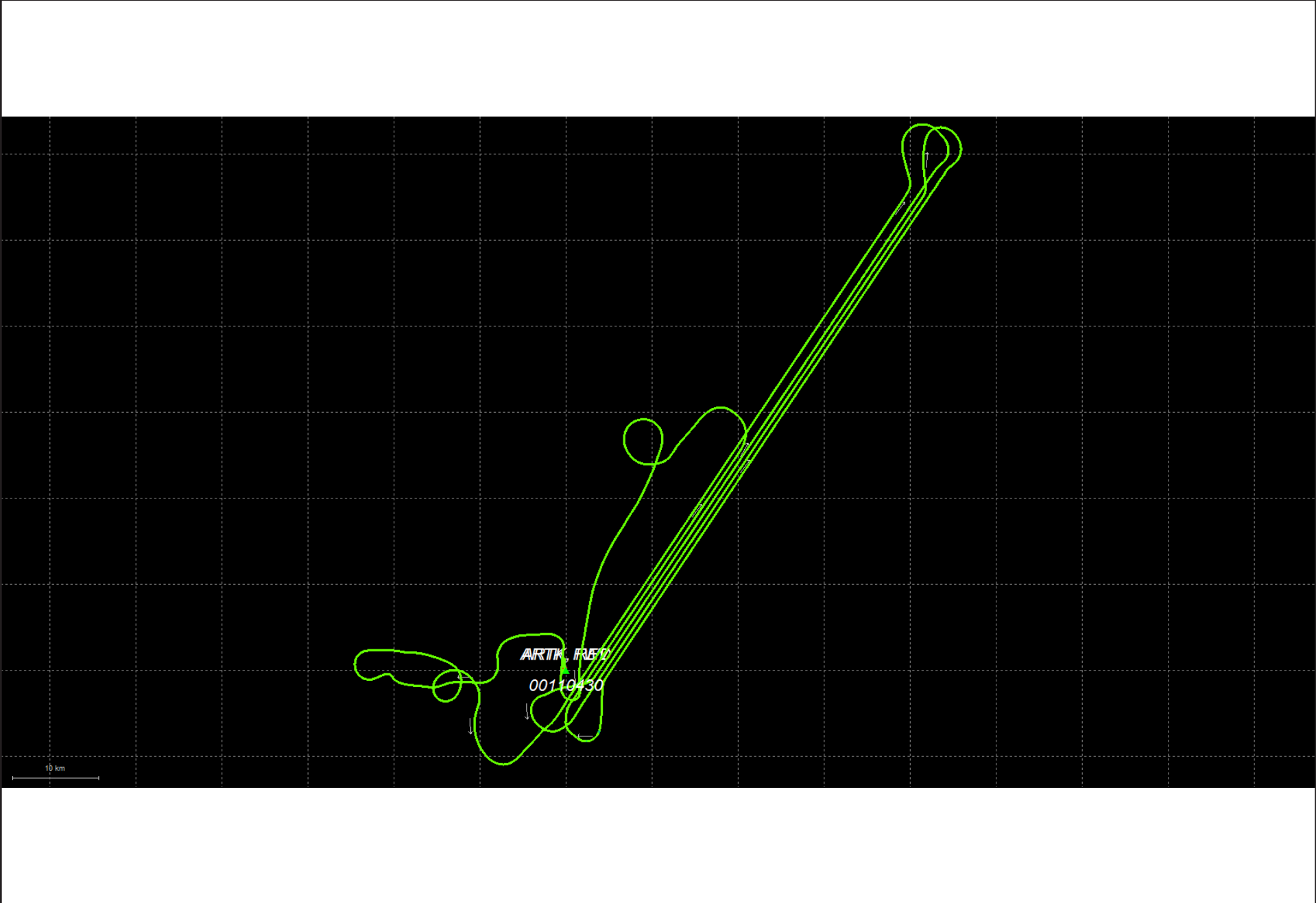
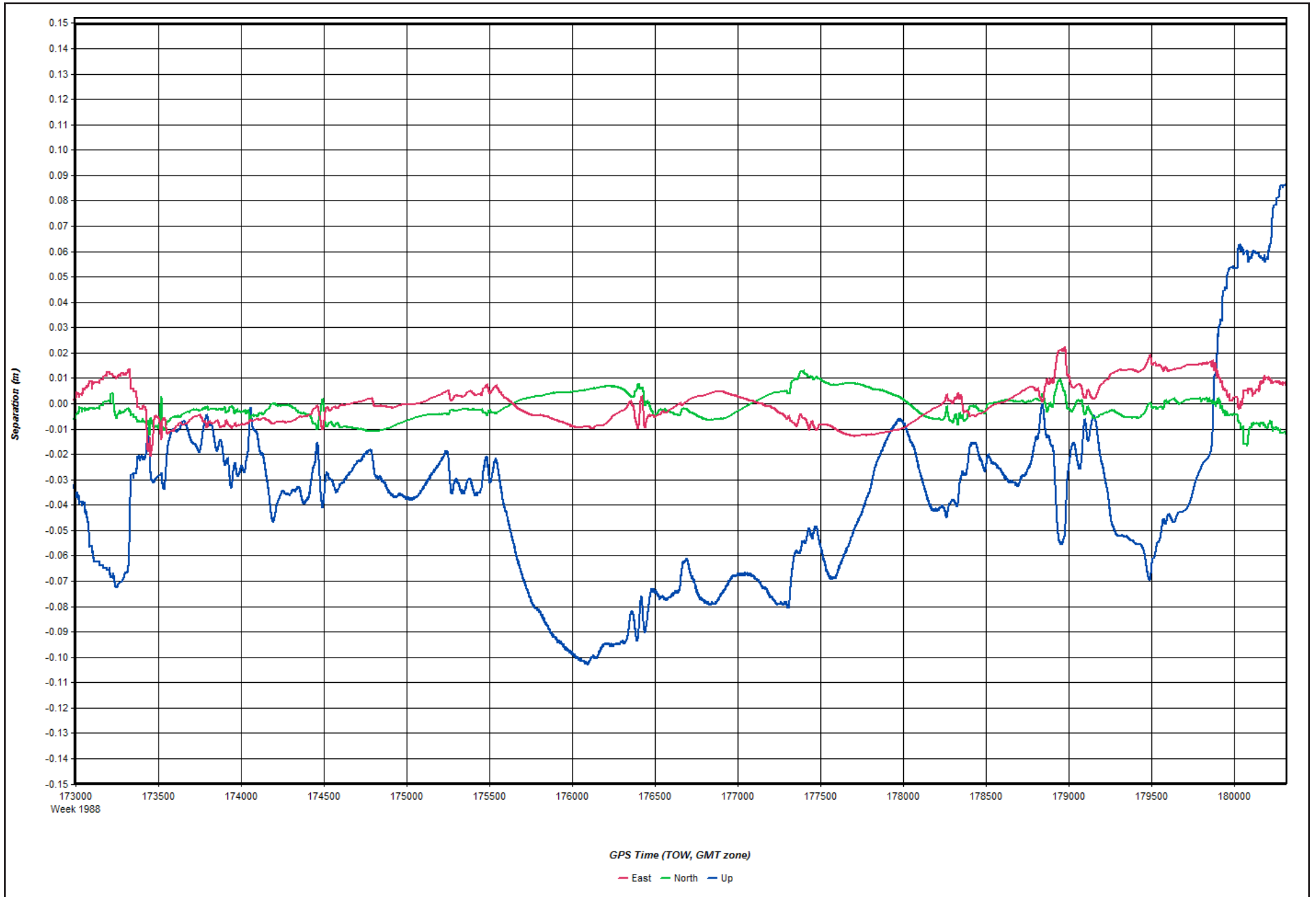


Figure 1: Map



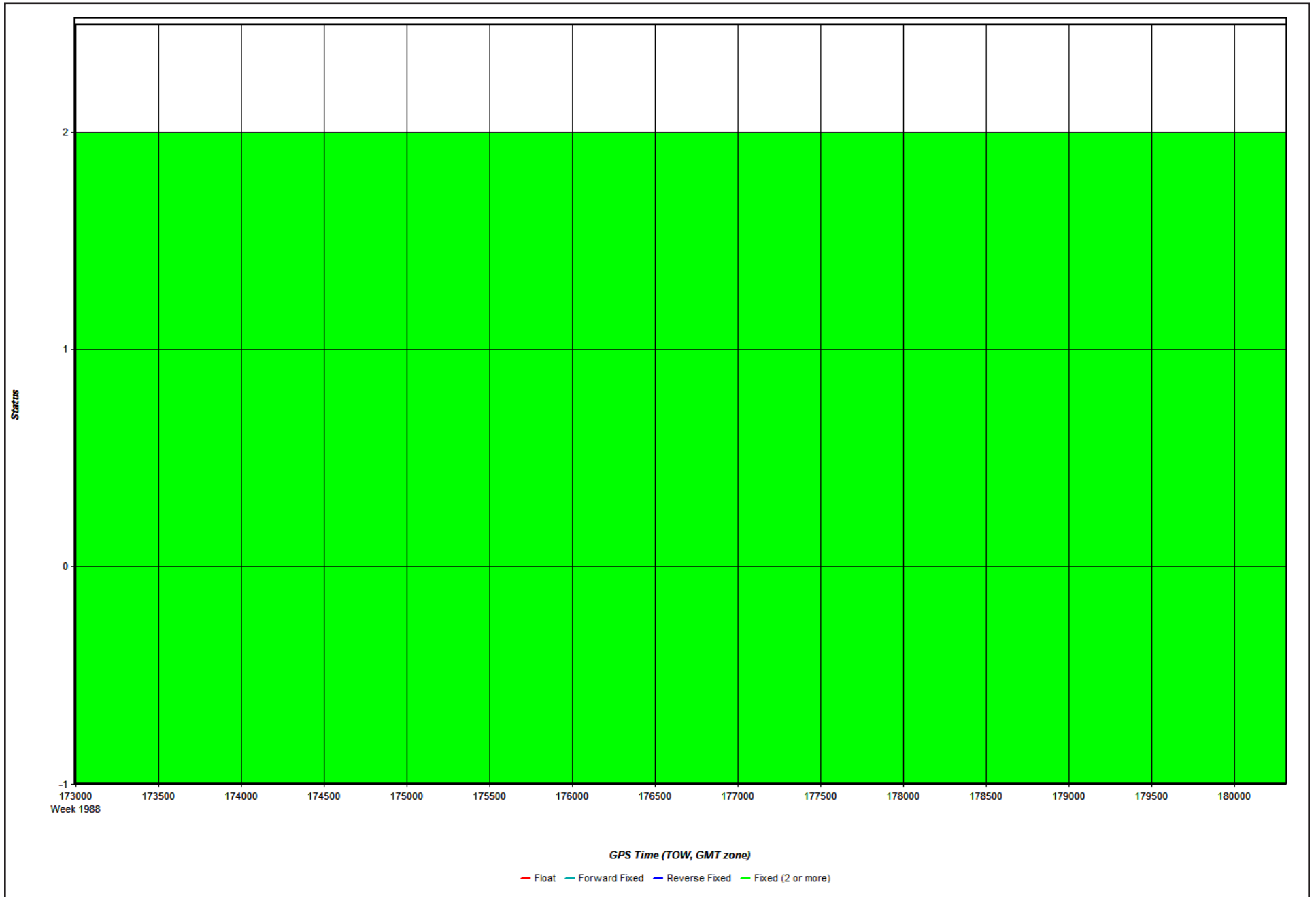
2018-02-12_Day043_7 - 20180213000210

Figure 2: Forward/Reverse or Combined Separation Plot



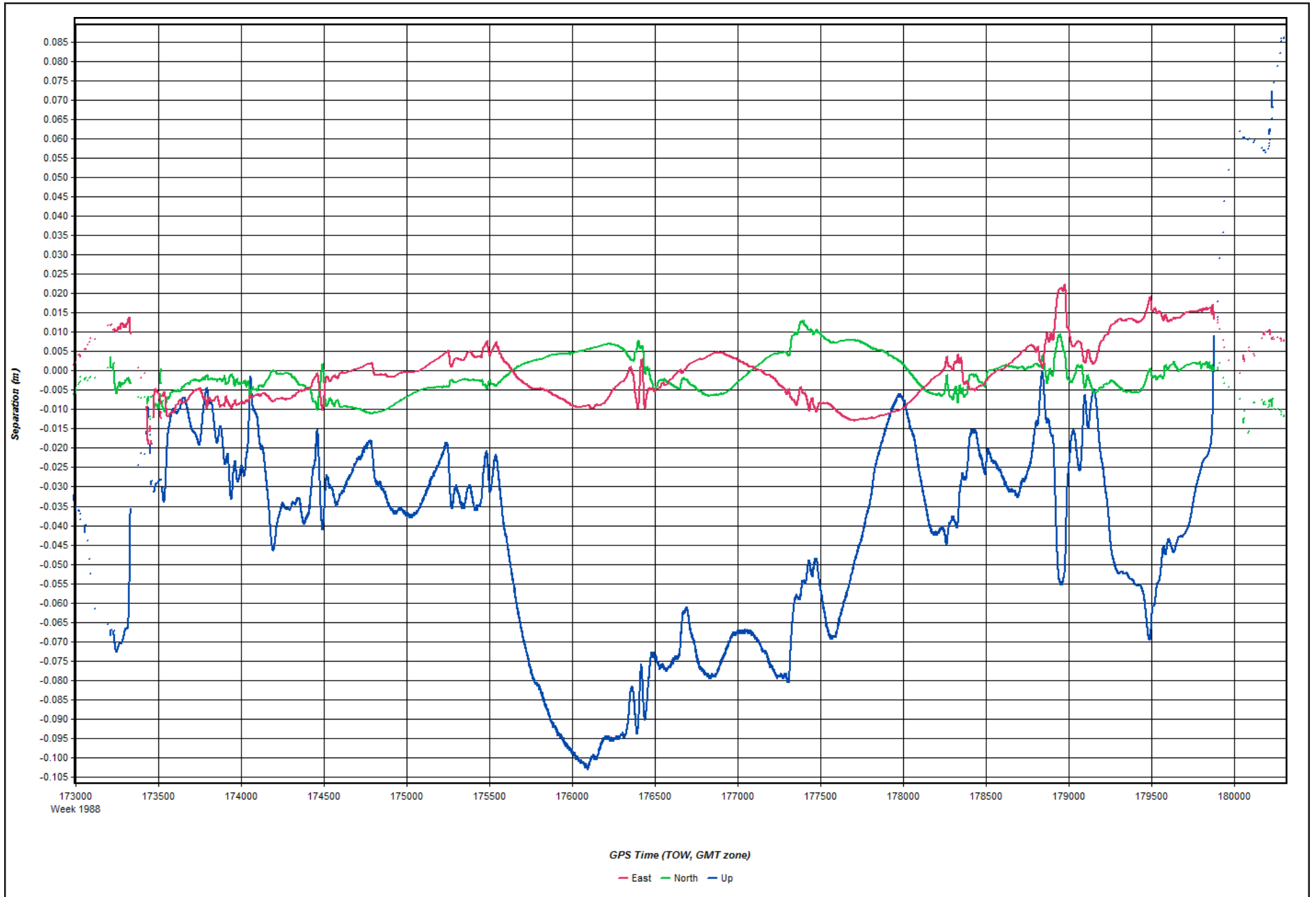
2018-02-12_Day043_7 - 20180213000210

Figure 3: Float or Fixed Ambiguity



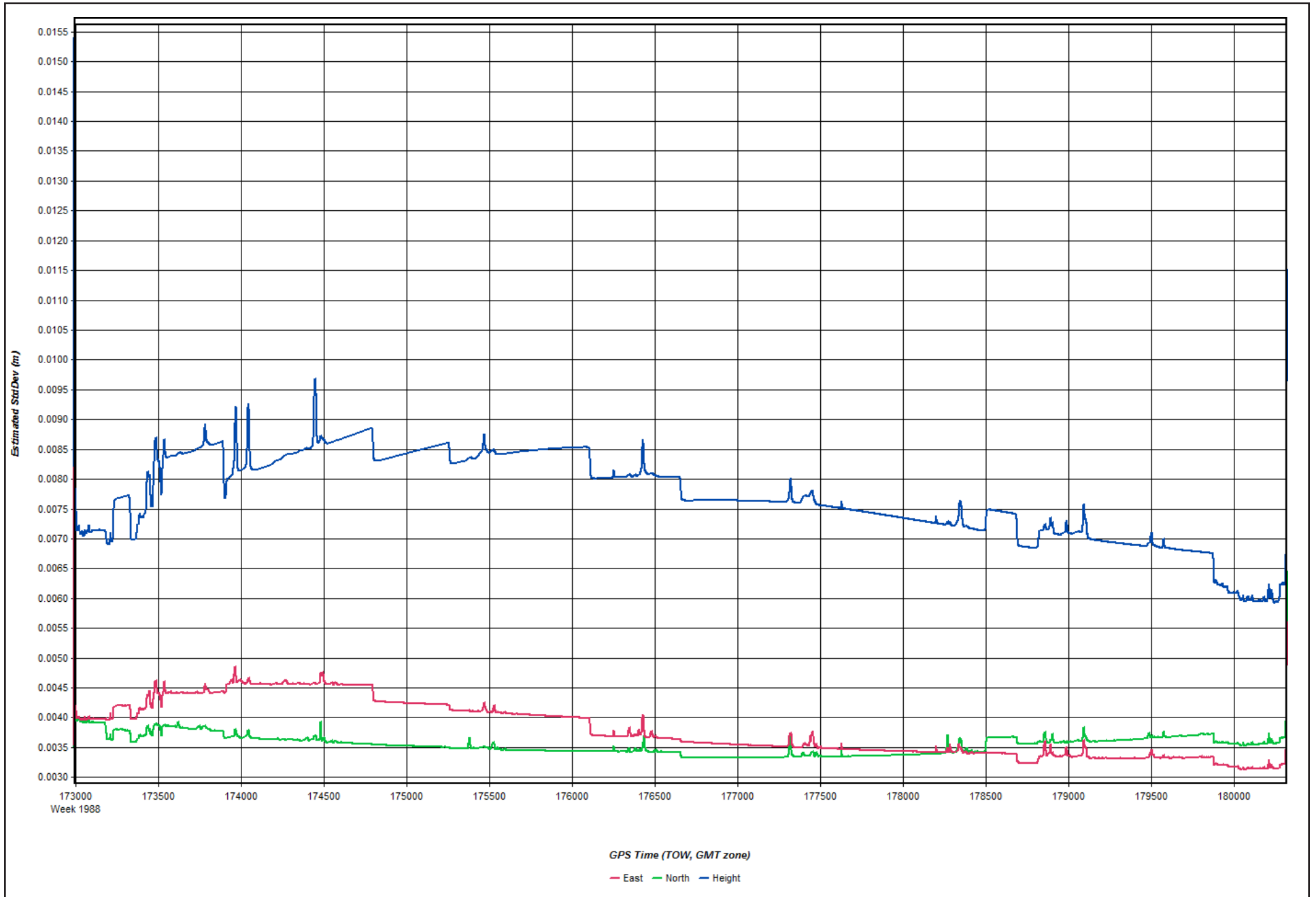
2018-02-12_Day043_7 - 20180213000210

Figure 4: Forward/Reverse Separation Plot (Fixed)



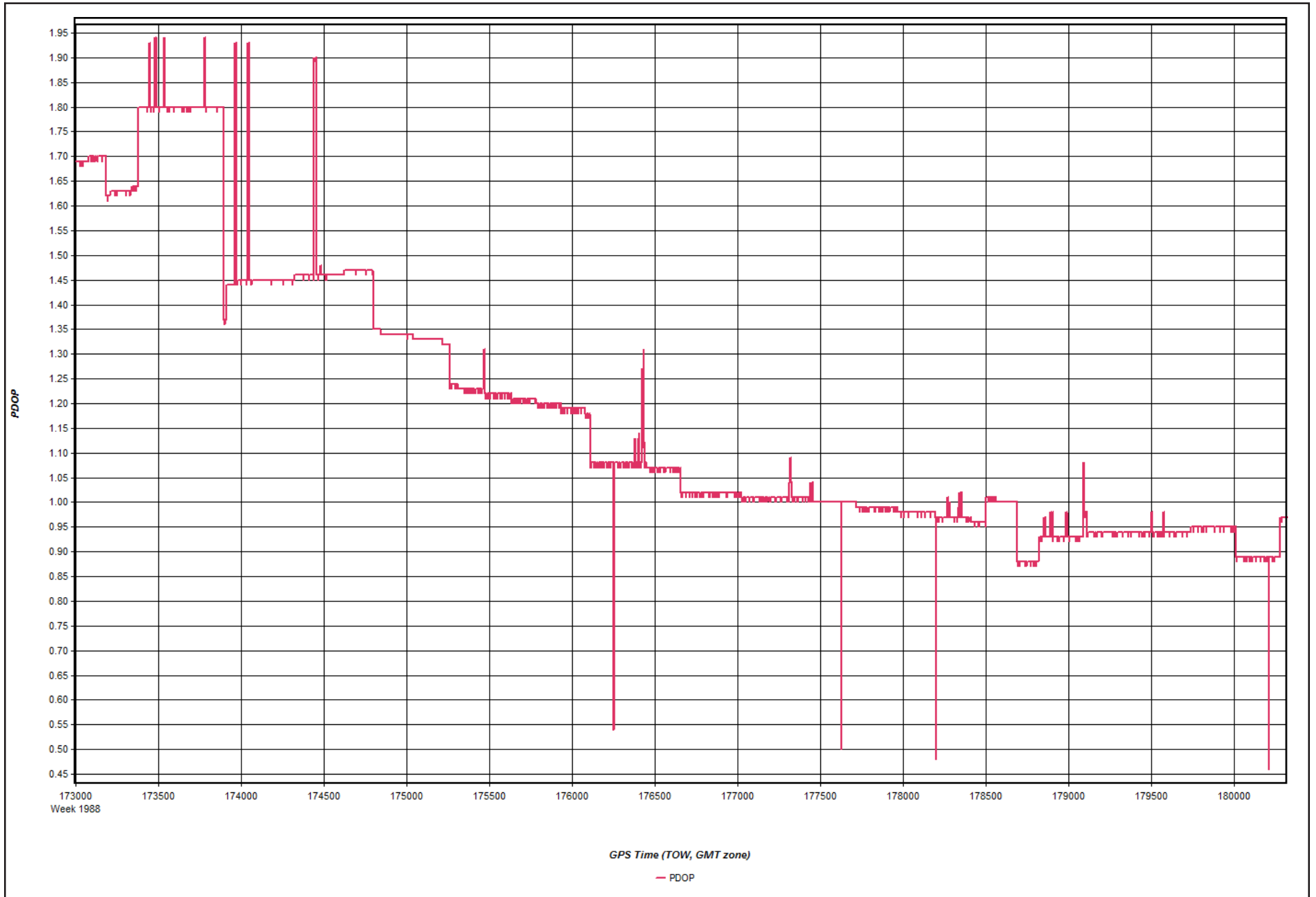
2018-02-12_Day043_7 - 20180213000210

Figure 5: Estimated Position Accuracy Plot



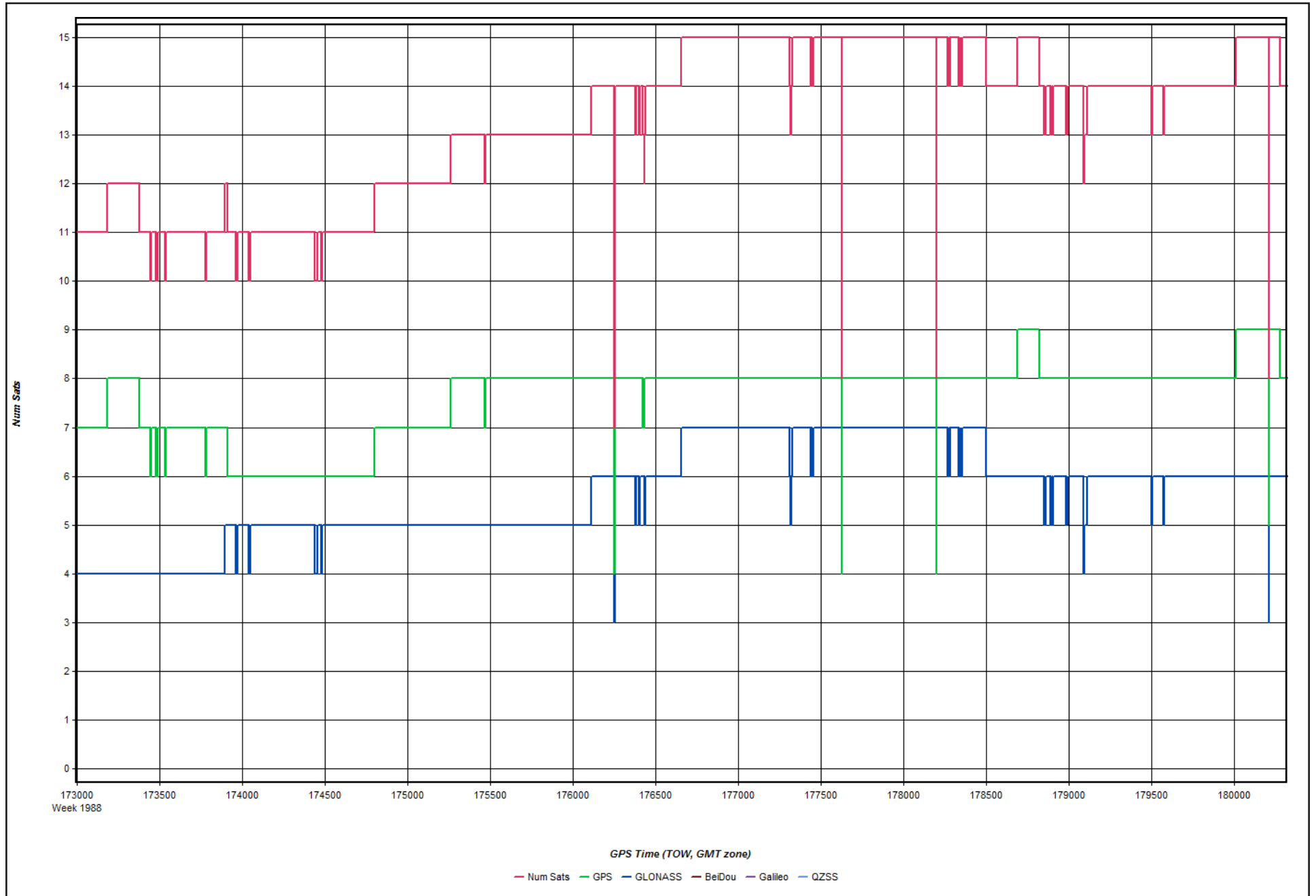
2018-02-12_Day043_7 - 20180213000210

Figure 6: PDOP Plot



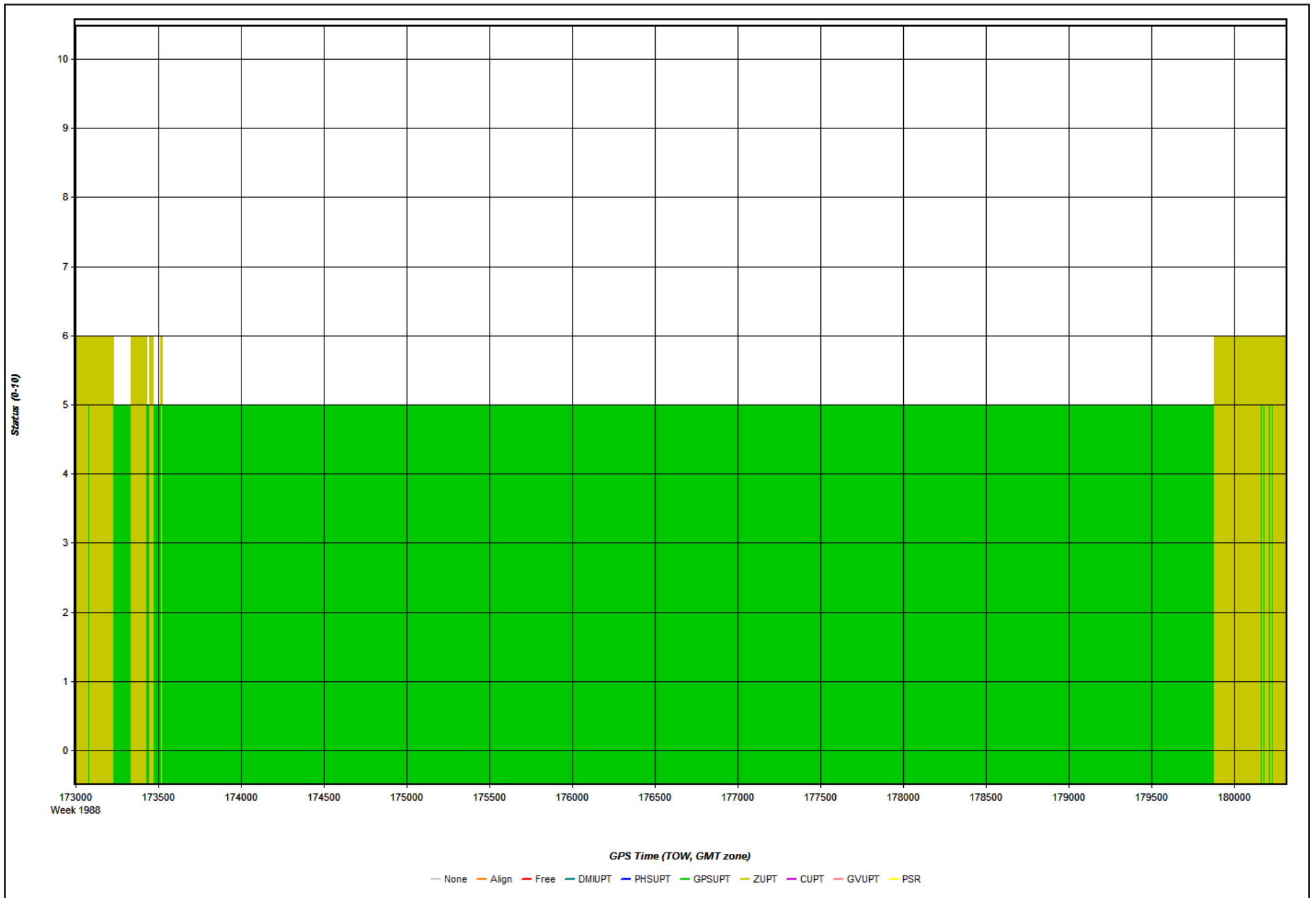
2018-02-12_Day043_7 - 20180213000210

Figure 7: Number of Satellites Line Plot



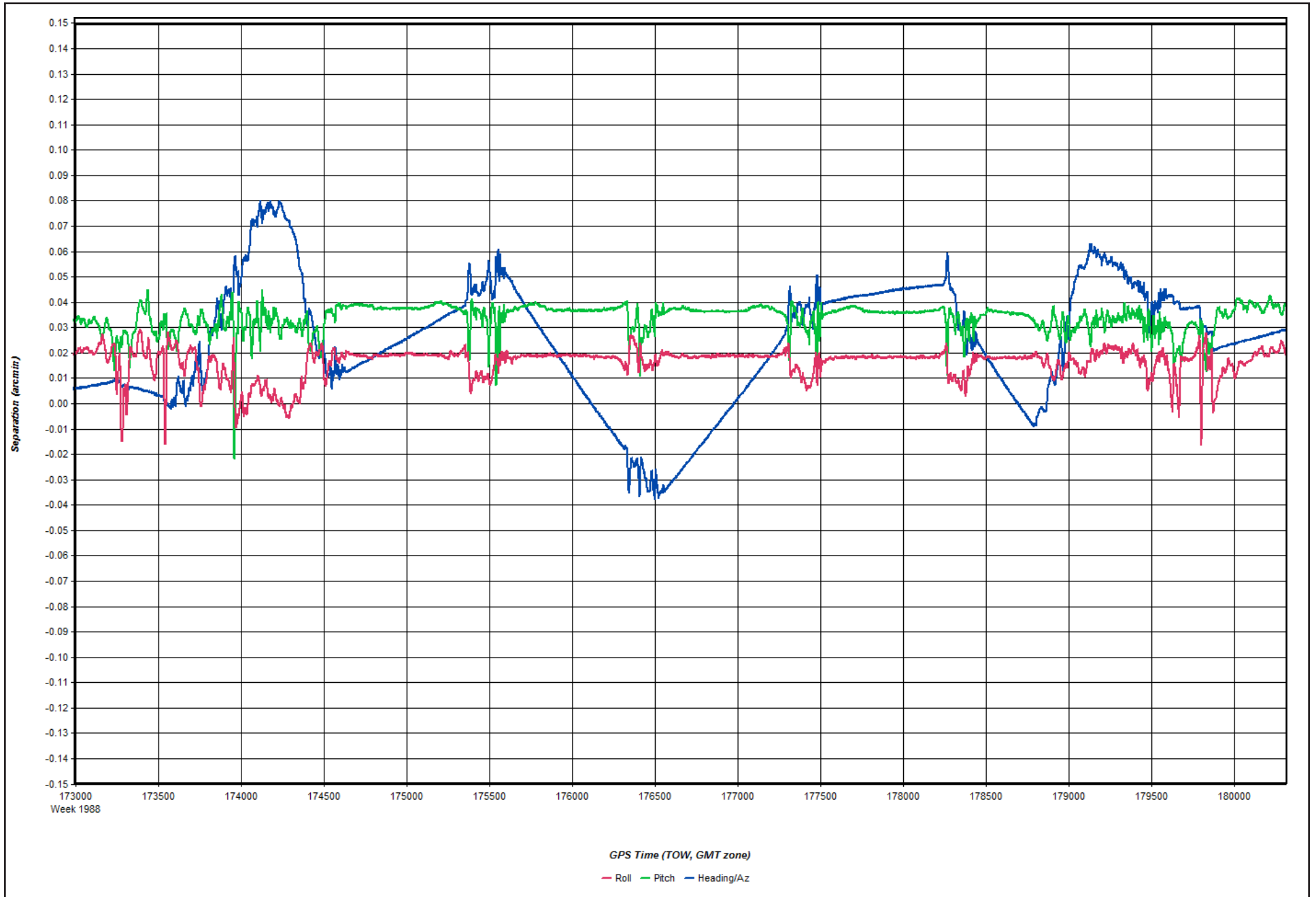
2018-02-12_Day043_7 - 20180213000210

Figure 8: Status flag for IMU processing



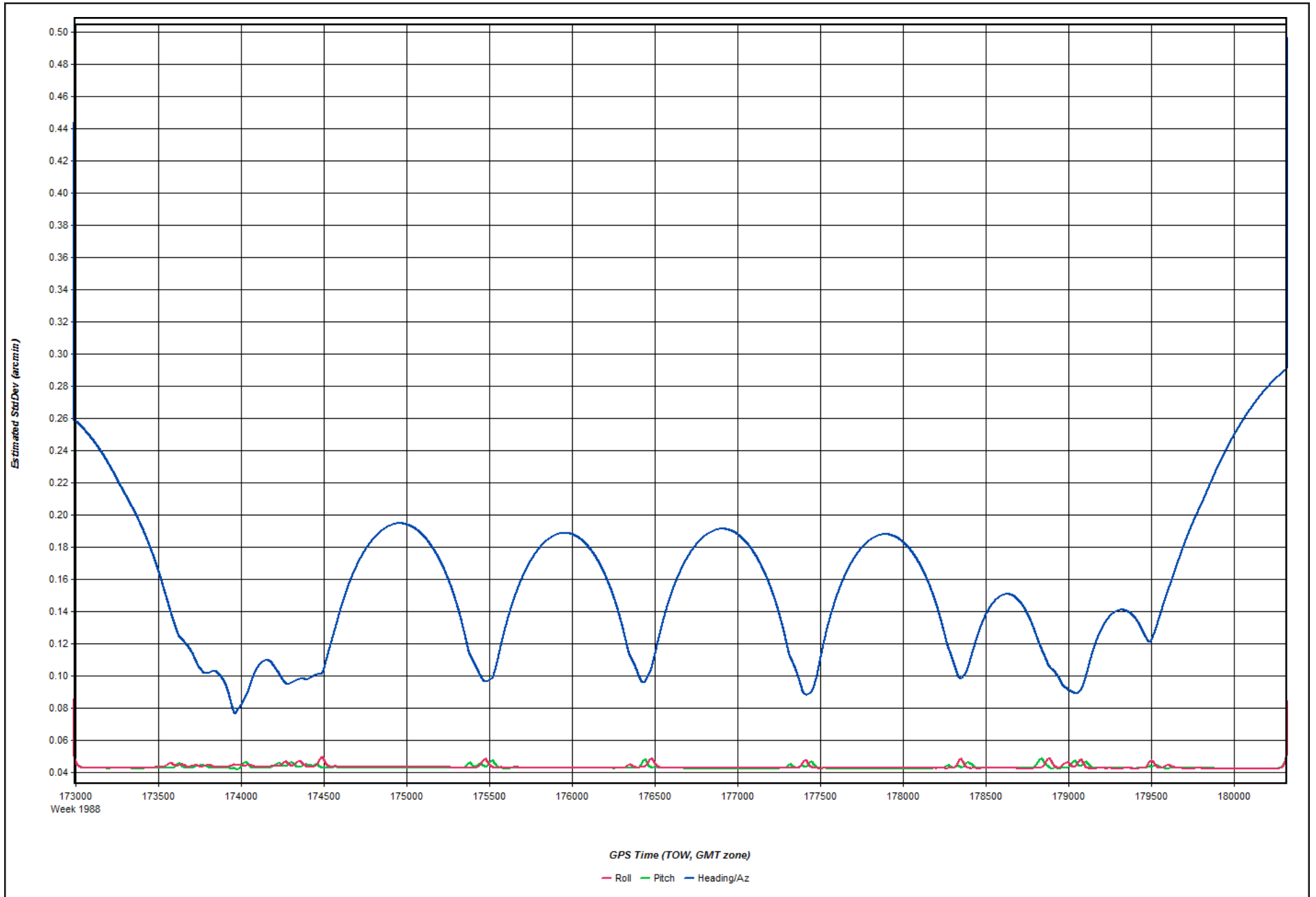
2018-02-12_Day043_7 - 20180213000210

Figure 9: Fwd/Rev Attitude Separation Plot



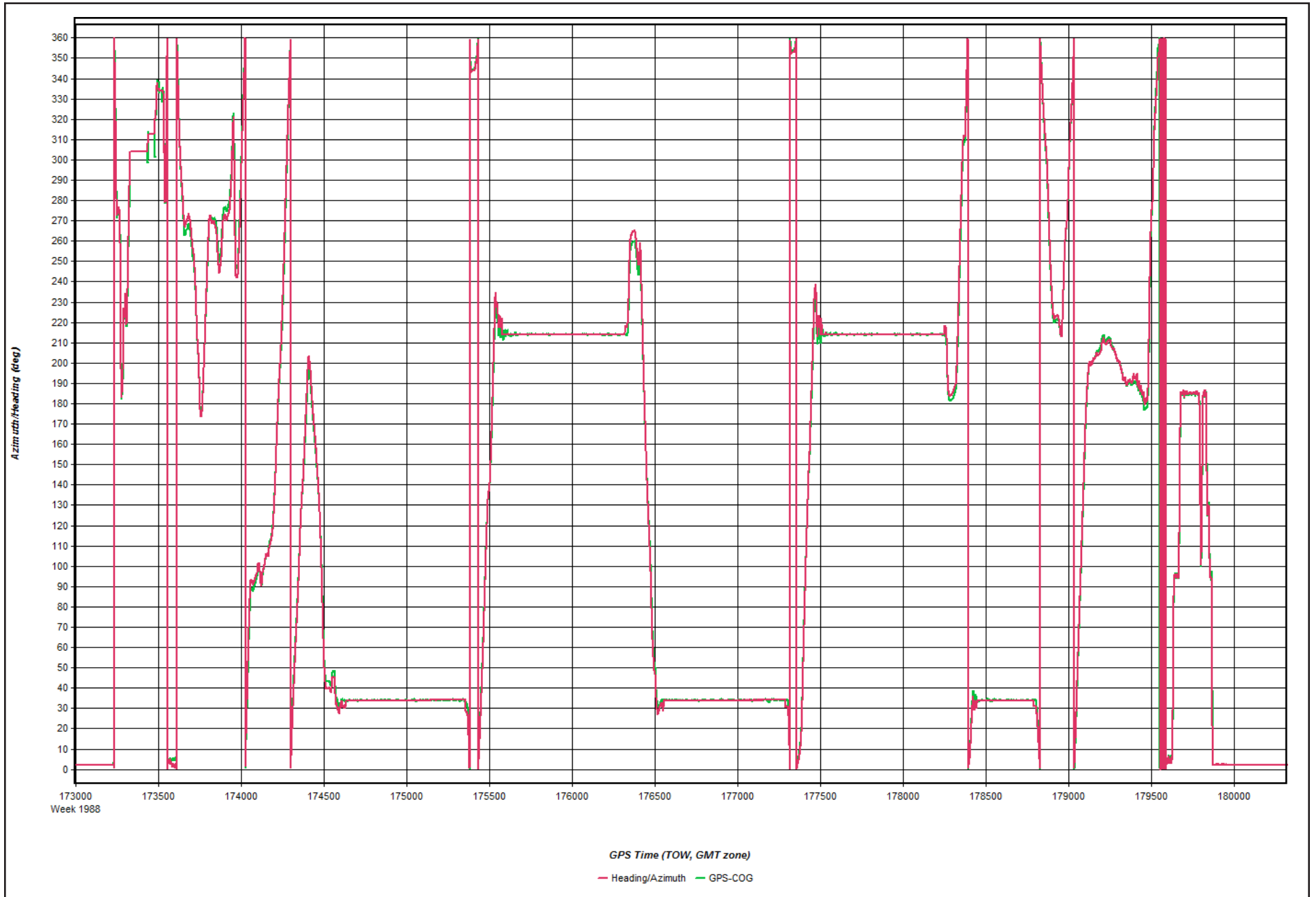
2018-02-12_Day043_7 - 20180213000210

Figure 10: Estimated Attitude Accuracy Plot



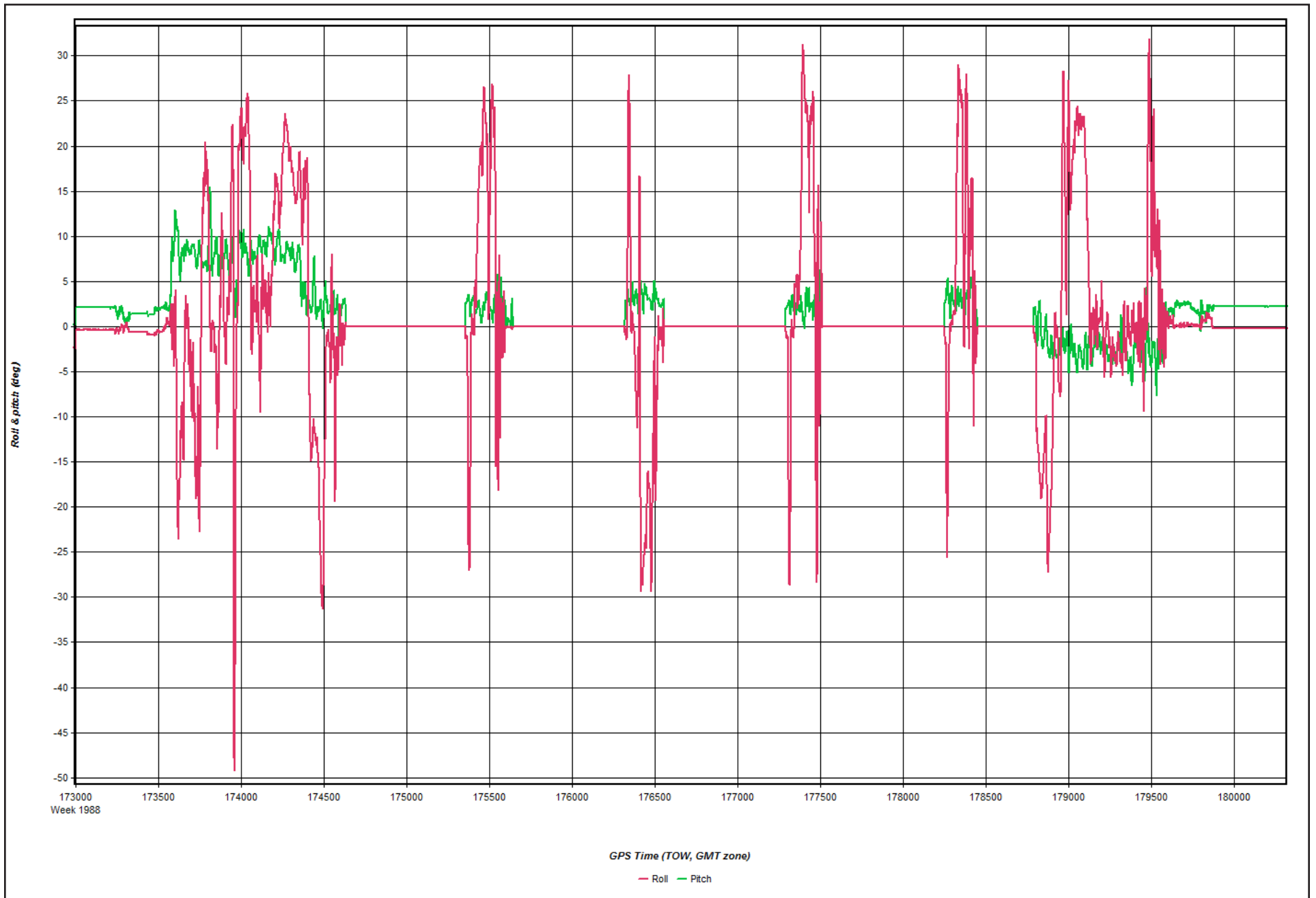
2018-02-12_Day043_7 - 20180213000210

Figure 11: Azimuth Plot



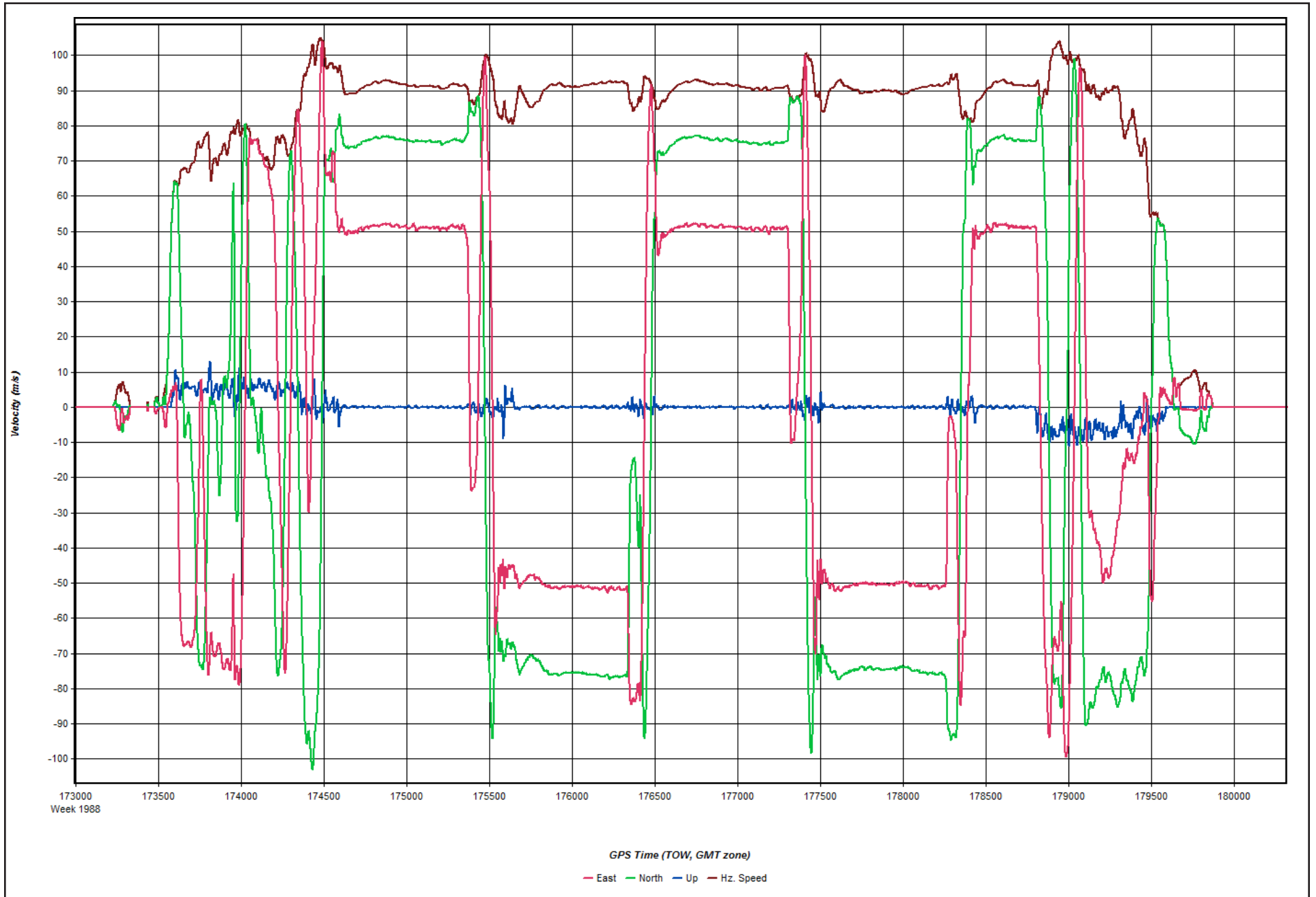
2018-02-12_Day043_7 - 20180213000210

Figure 12: Roll & Pitch Plot



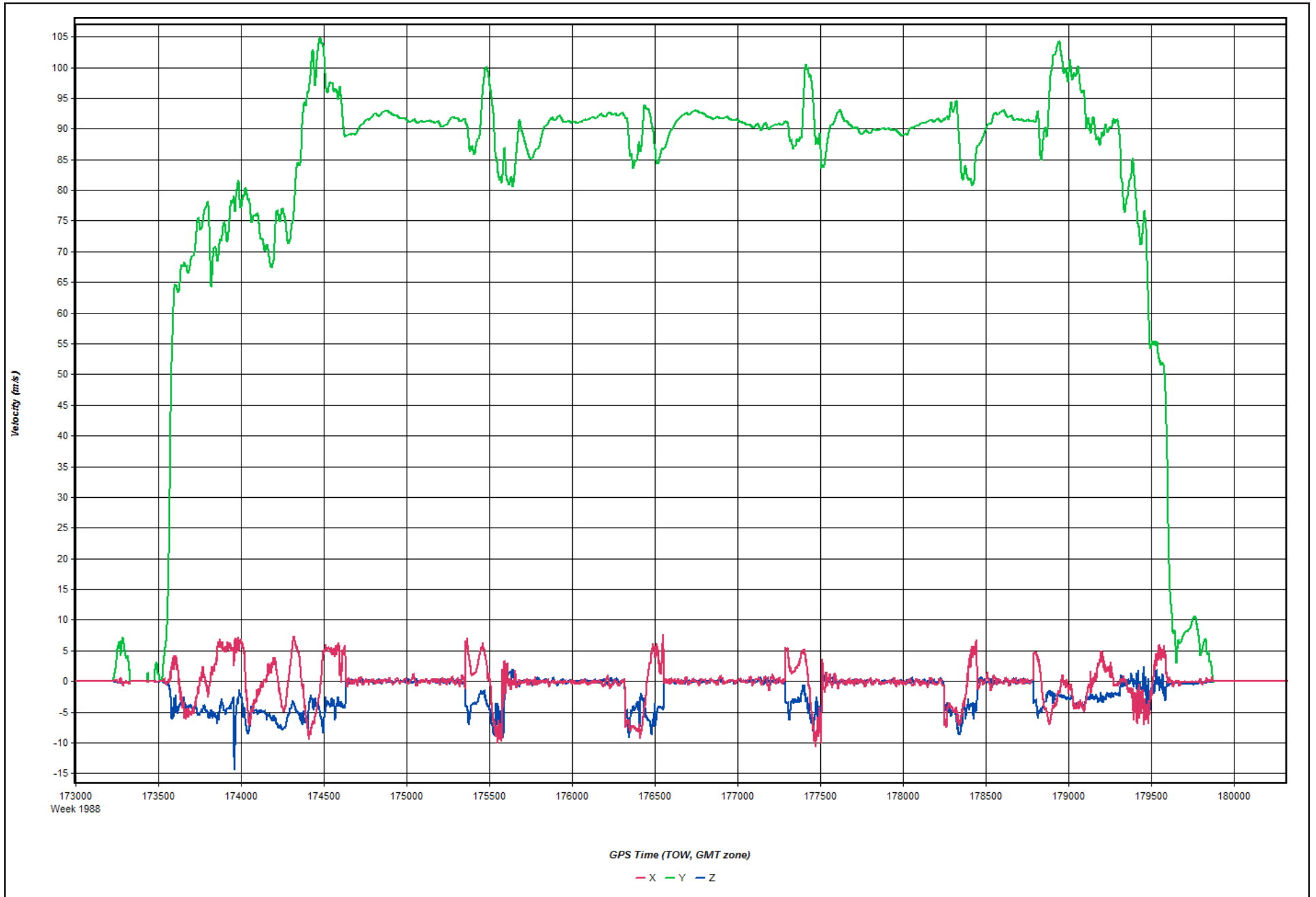
2018-02-12_Day043_7 - 20180213000210

Figure 13: Velocity Profile Plot



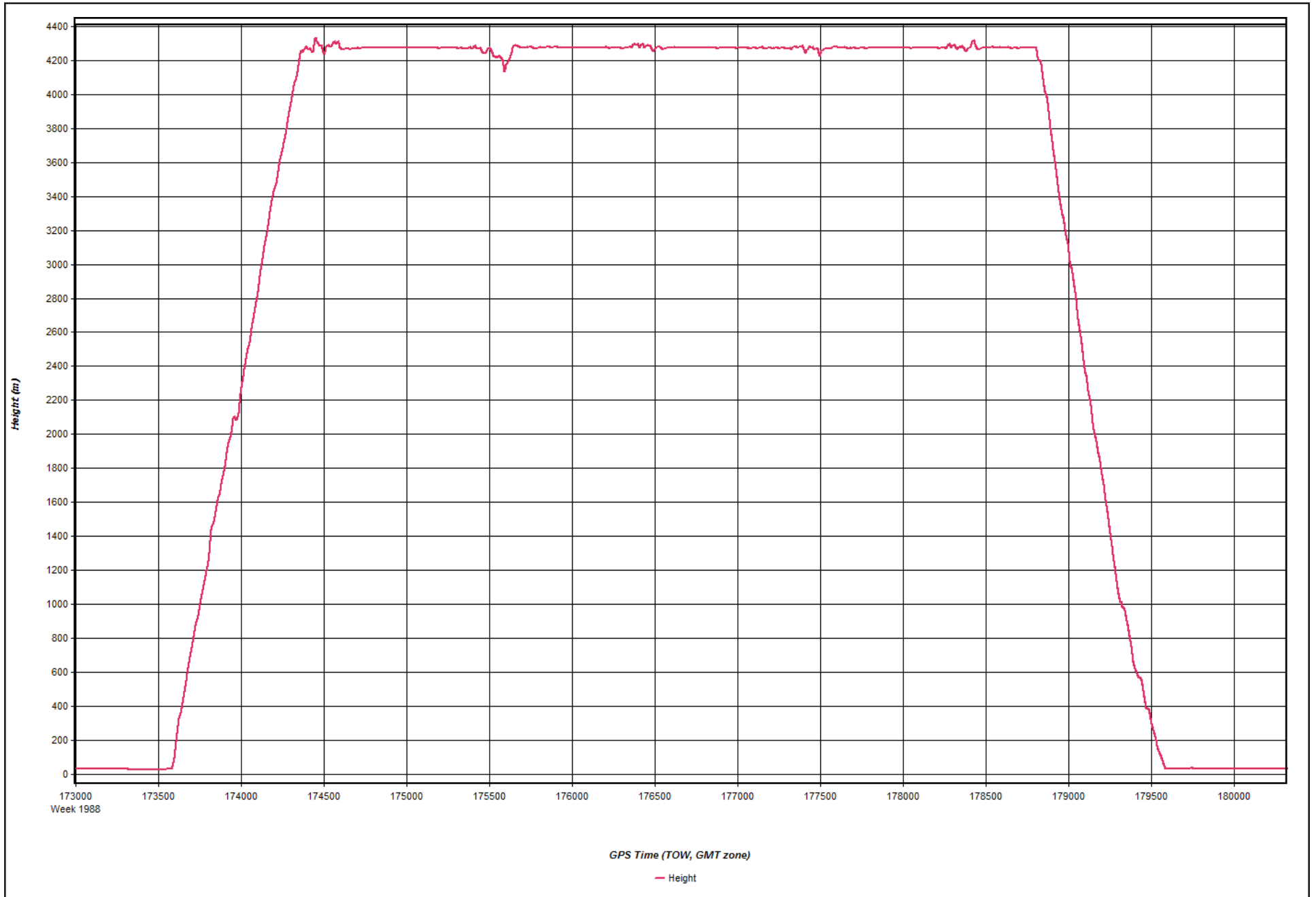
2018-02-12_Day043_7 - 20180213000210

Figure 14: Body Frame Velocity Plot



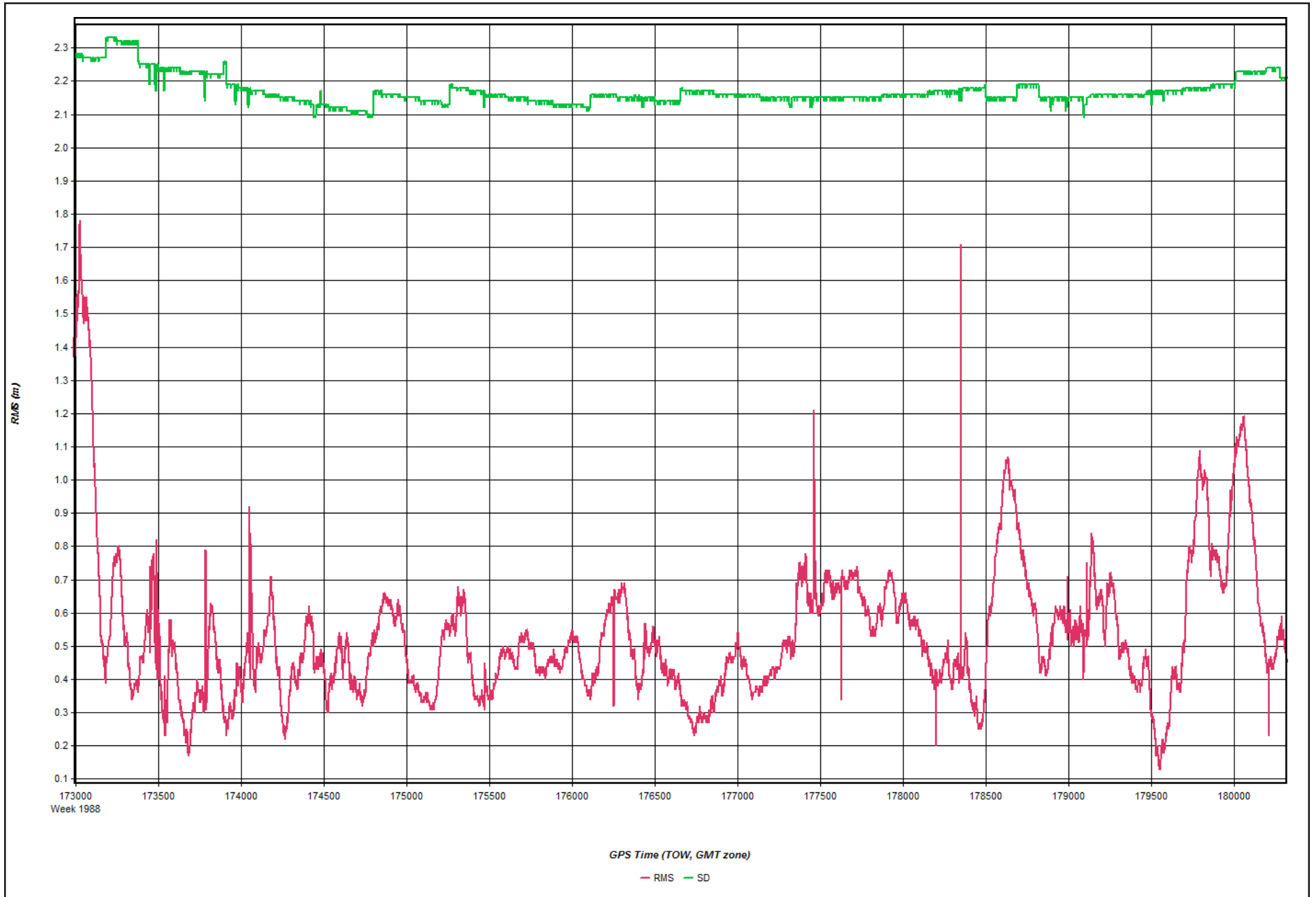
2018-02-12_Day043_7 - 20180213000210

Figure 15: Height Profile Plot



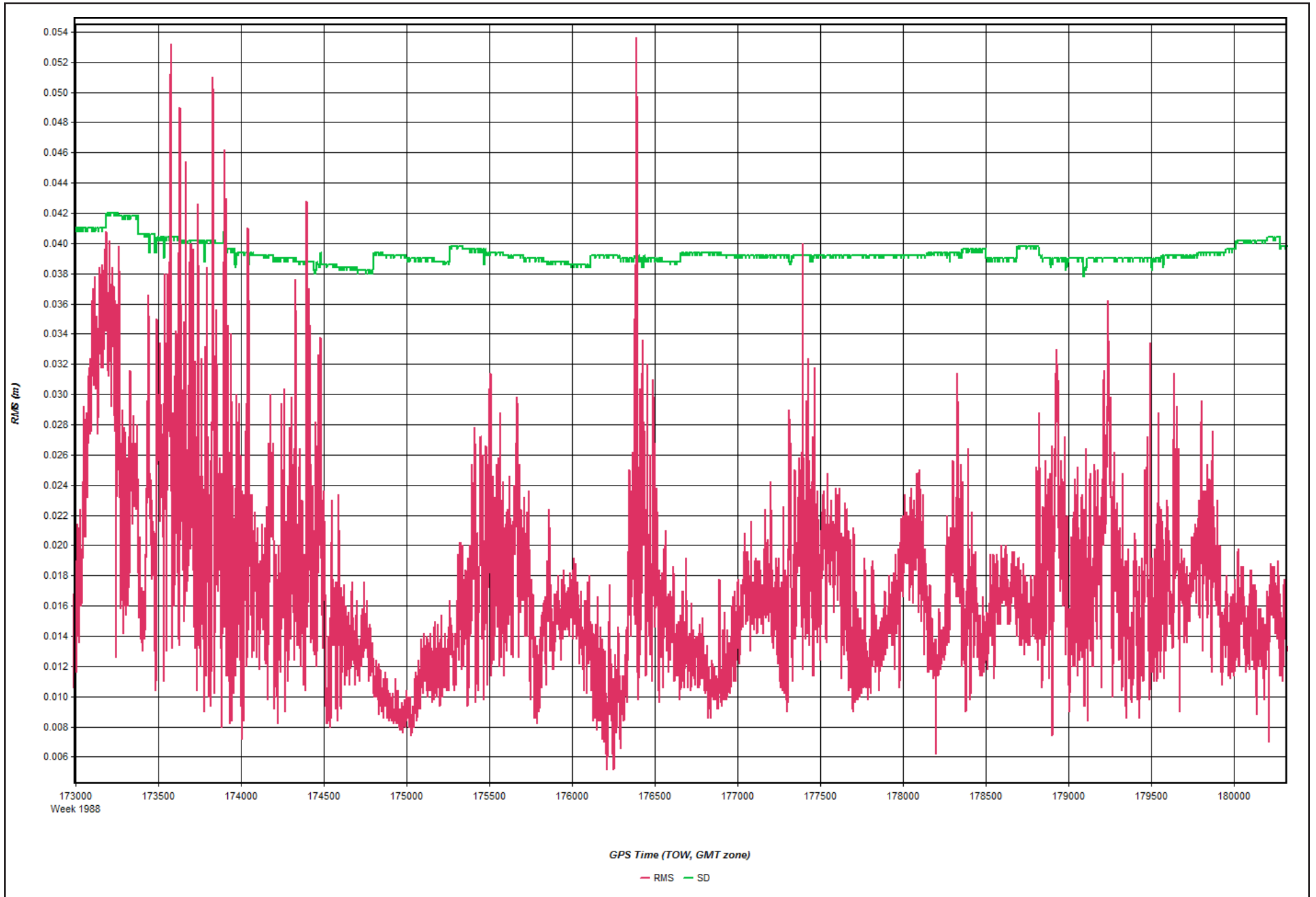
2018-02-12_Day043_7 - 20180213000210

Figure 16: C/A Code Residual RMS Plot



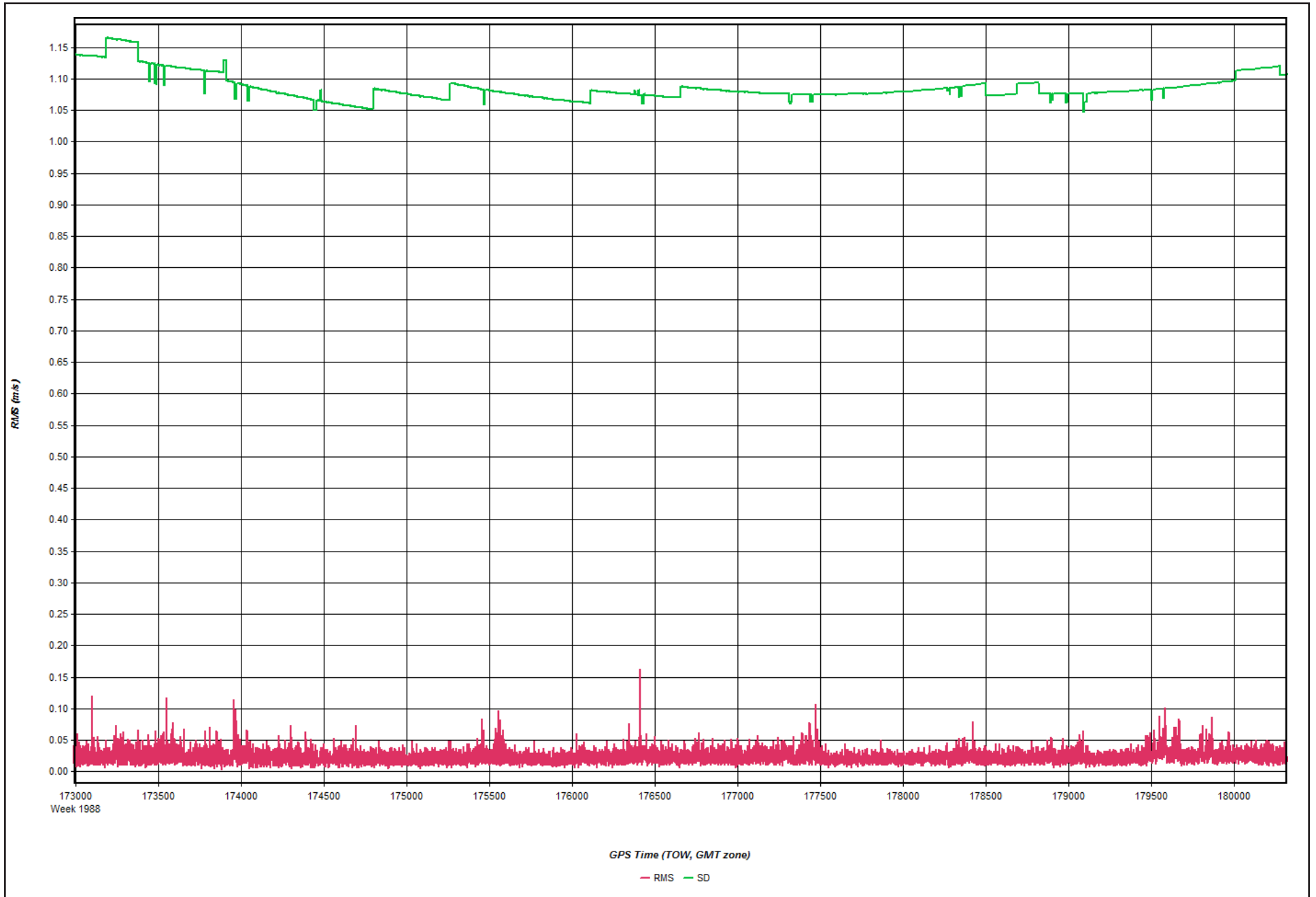
2018-02-12_Day043_7 - 20180213000210

Figure 17: Carrier Residual RMS Plot



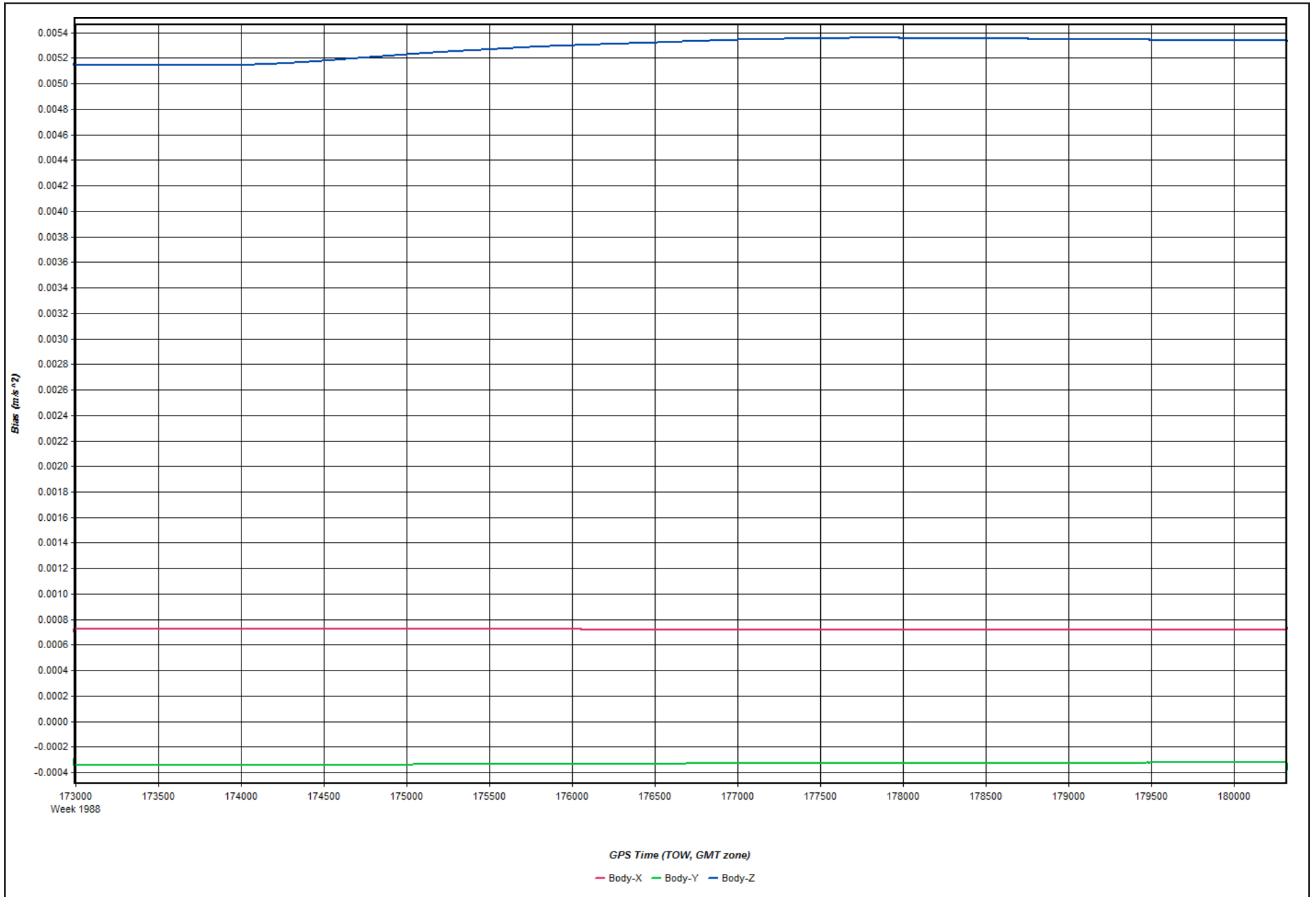
2018-02-12_Day043_7 - 20180213000210

Figure 18: L1 Doppler Residual RMS Plot



2018-02-12_Day043_7 - 20180213000210

Figure 19: Accelerometer Bias Plot



2018-02-12_Day043_7 - 20180213000210

Figure 20: Gyro Drift Plot

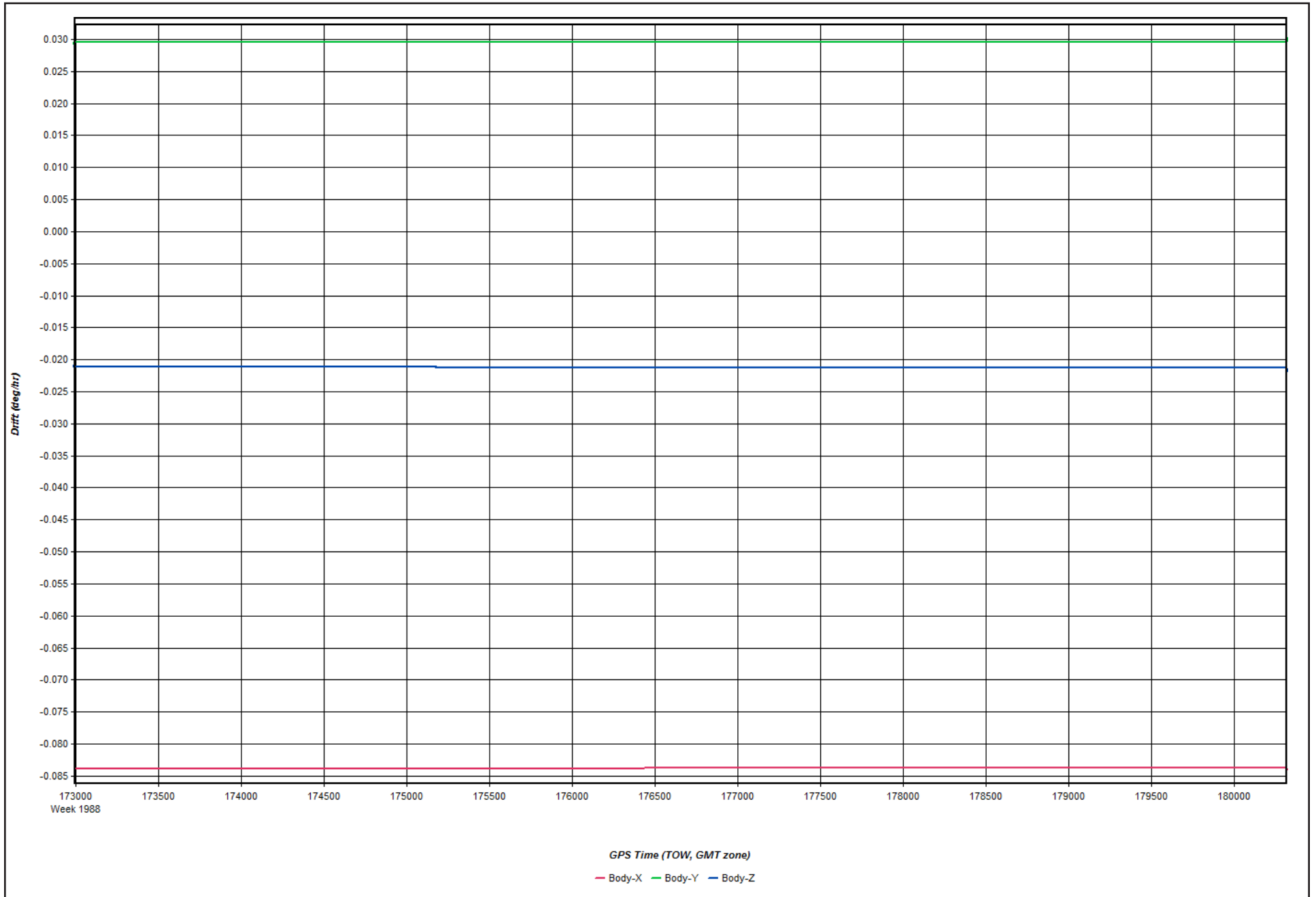
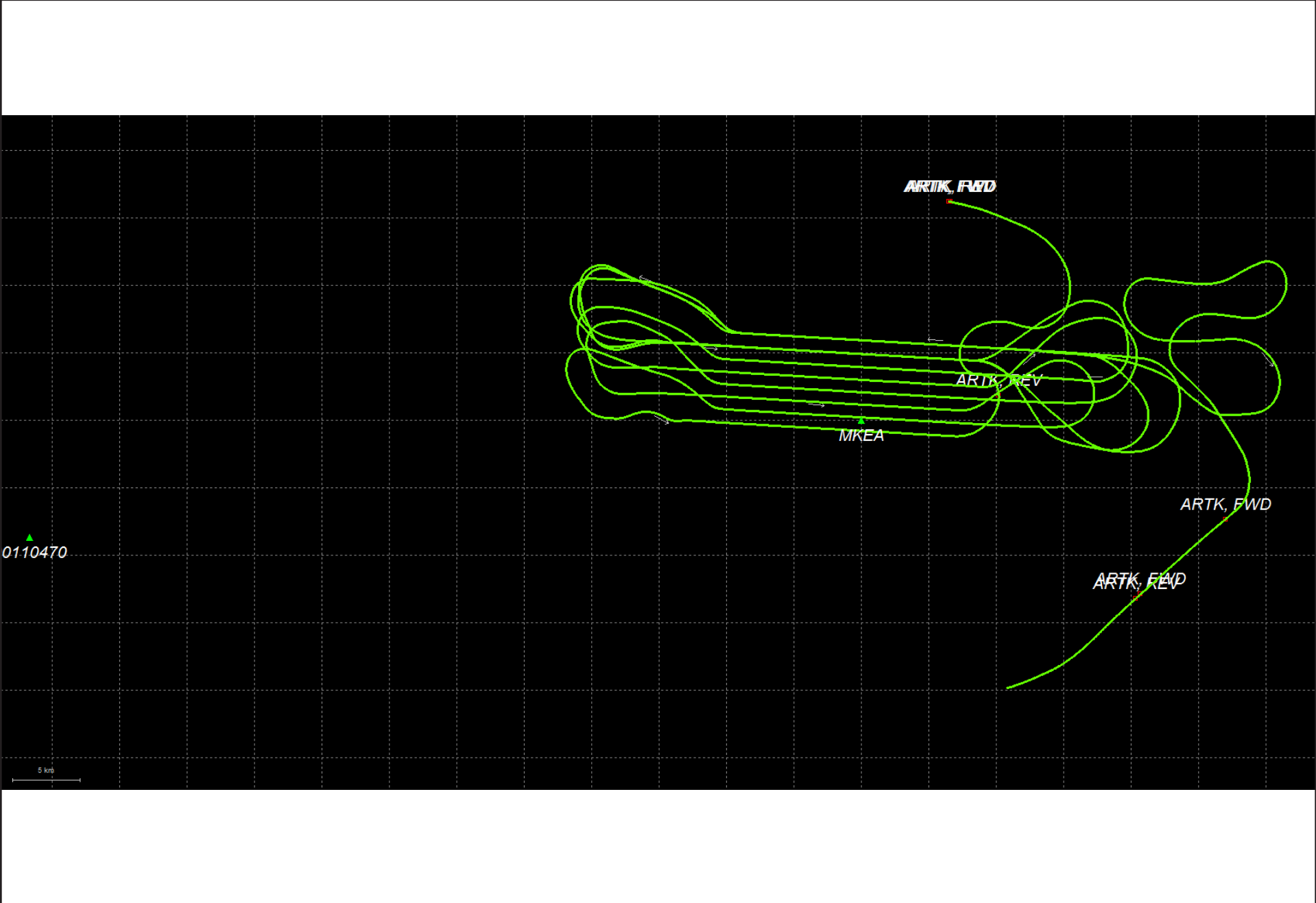
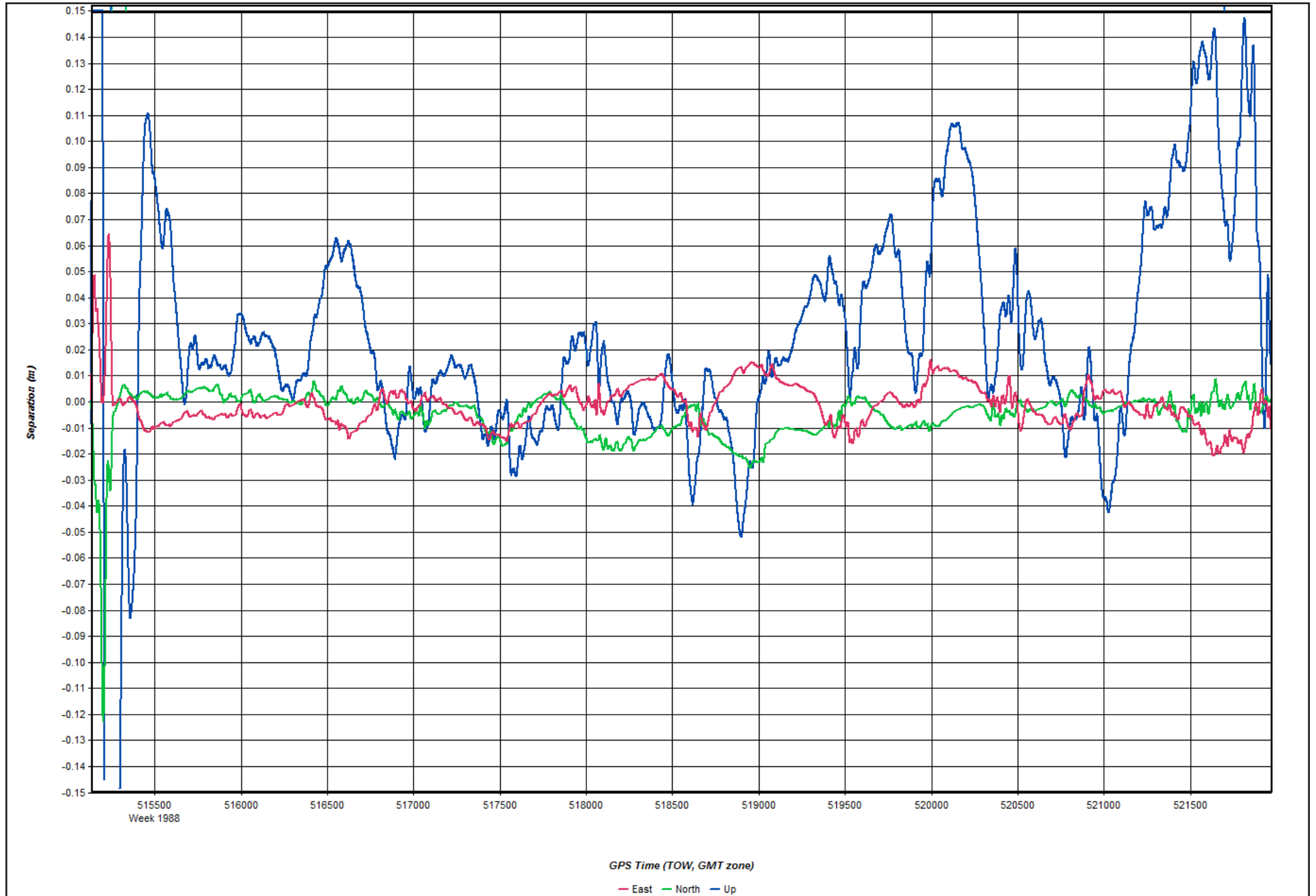


Figure 1: Map



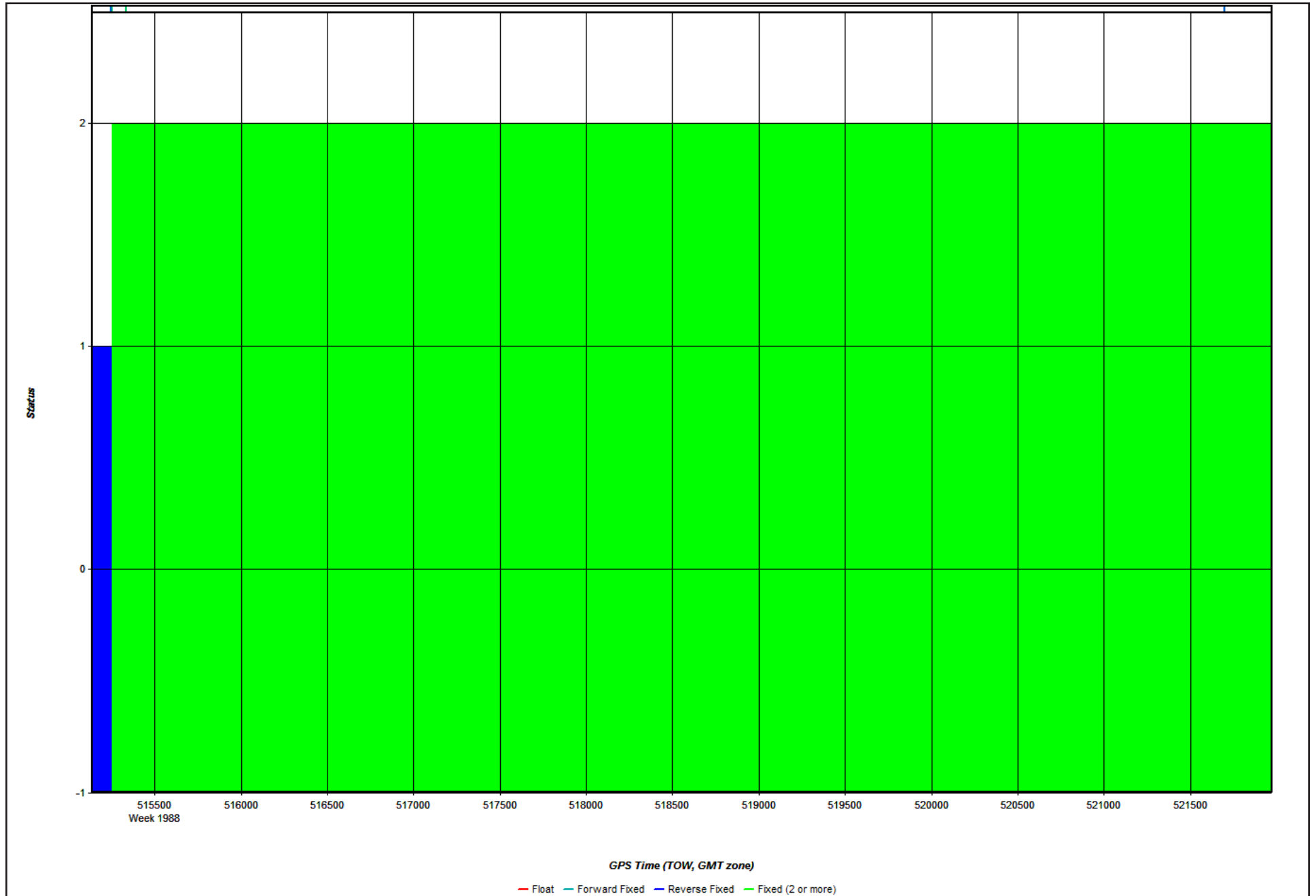
2018-02-16_Day047_7 - 20180216220556

Figure 2: Forward/Reverse or Combined Separation Plot



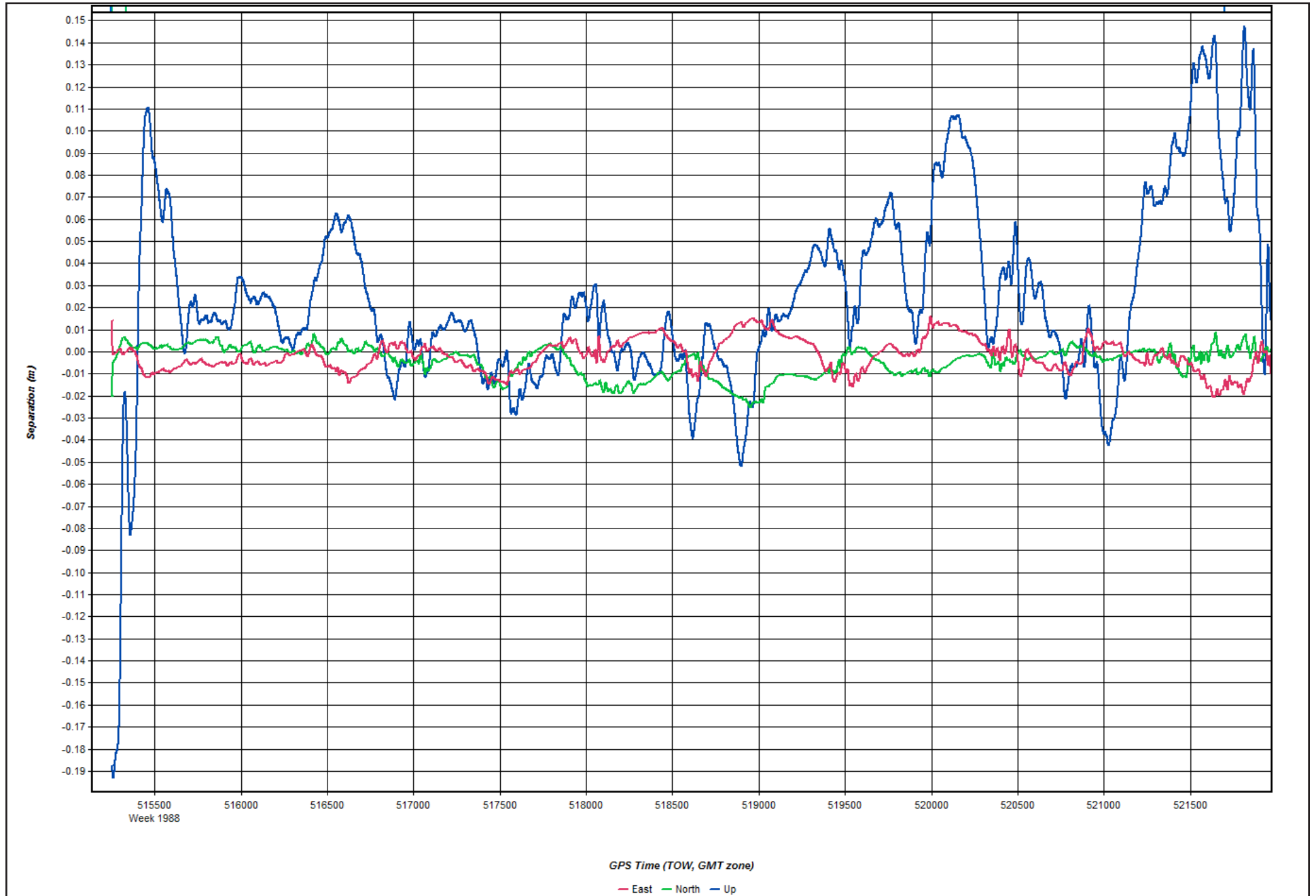
2018-02-16_Day047_7 - 20180216220556

Figure 3: Float or Fixed Ambiguity



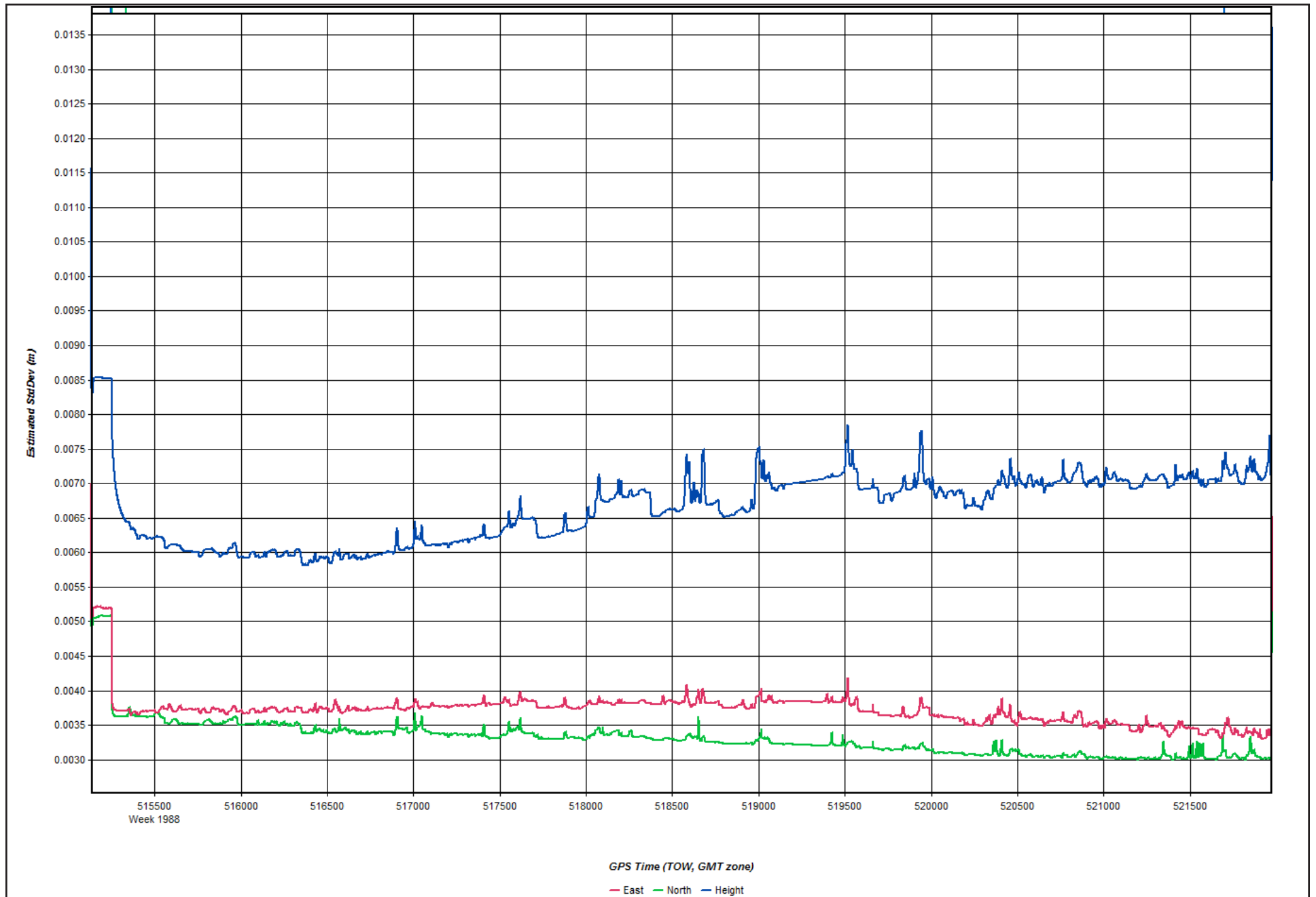
2018-02-16_Day047_7 - 20180216220556

Figure 4: Forward/Reverse Separation Plot (Fixed)



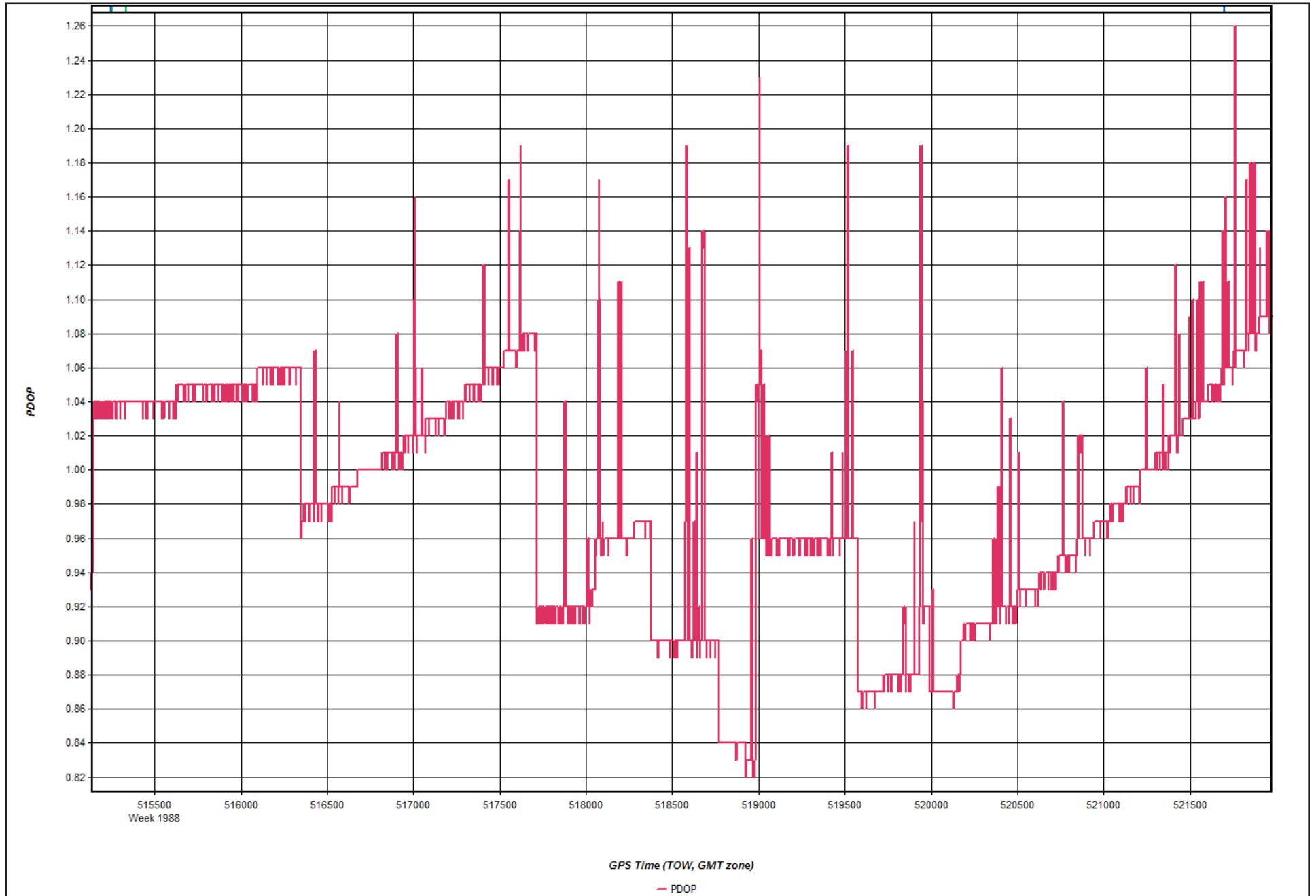
2018-02-16_Day047_7 - 20180216220556

Figure 5: Estimated Position Accuracy Plot



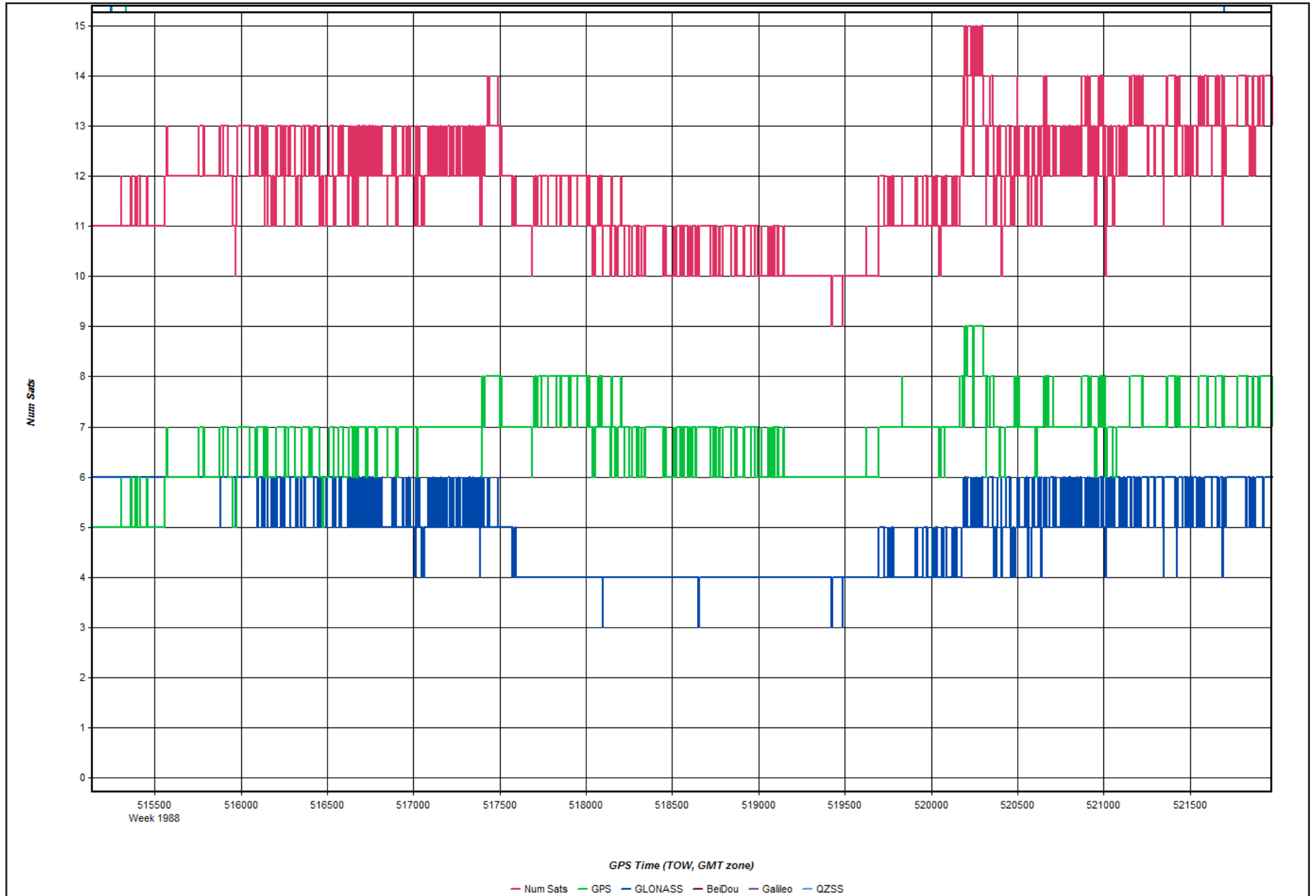
2018-02-16_Day047_7 - 20180216220556

Figure 6: PDOP Plot



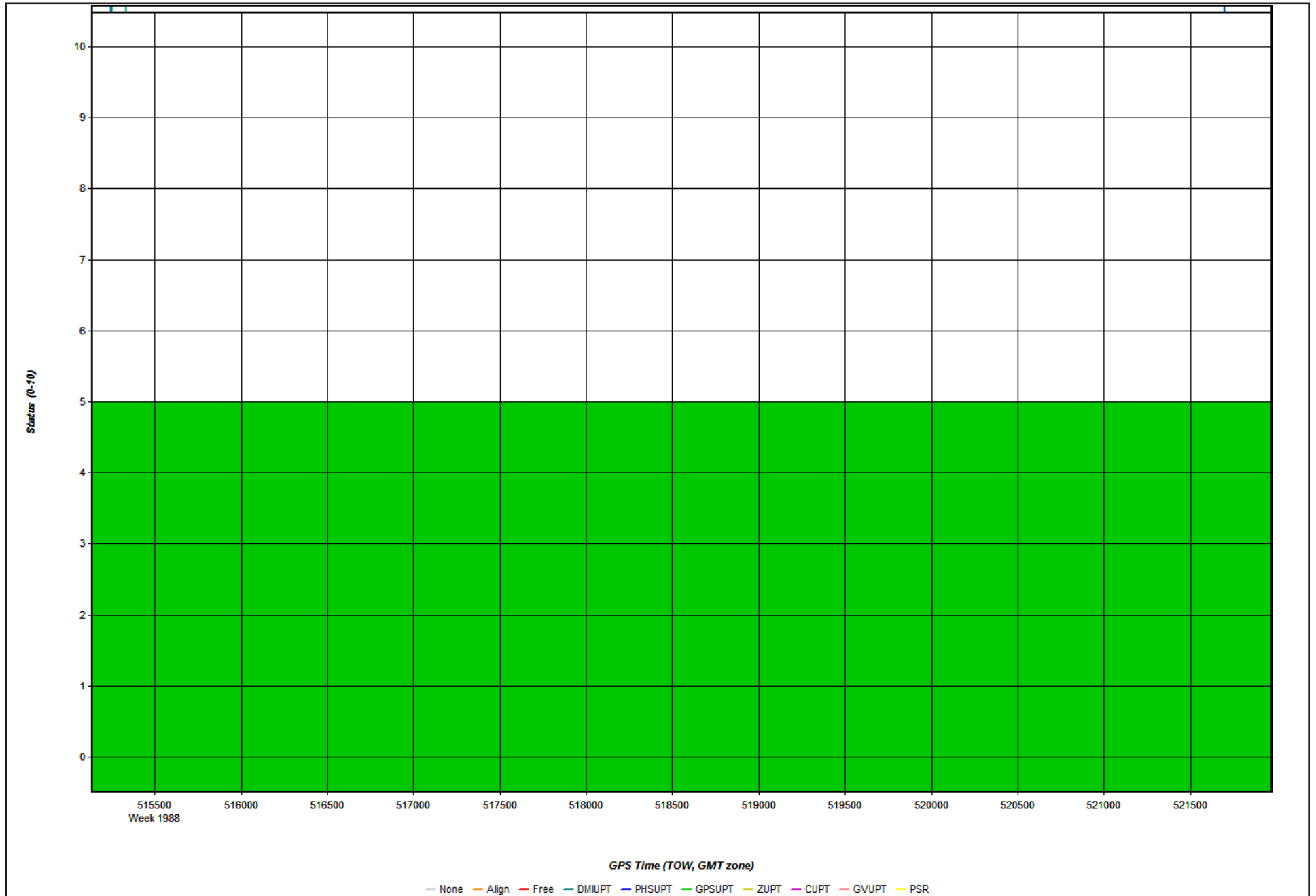
2018-02-16_Day047_7 - 20180216220556

Figure 7: Number of Satellites Line Plot



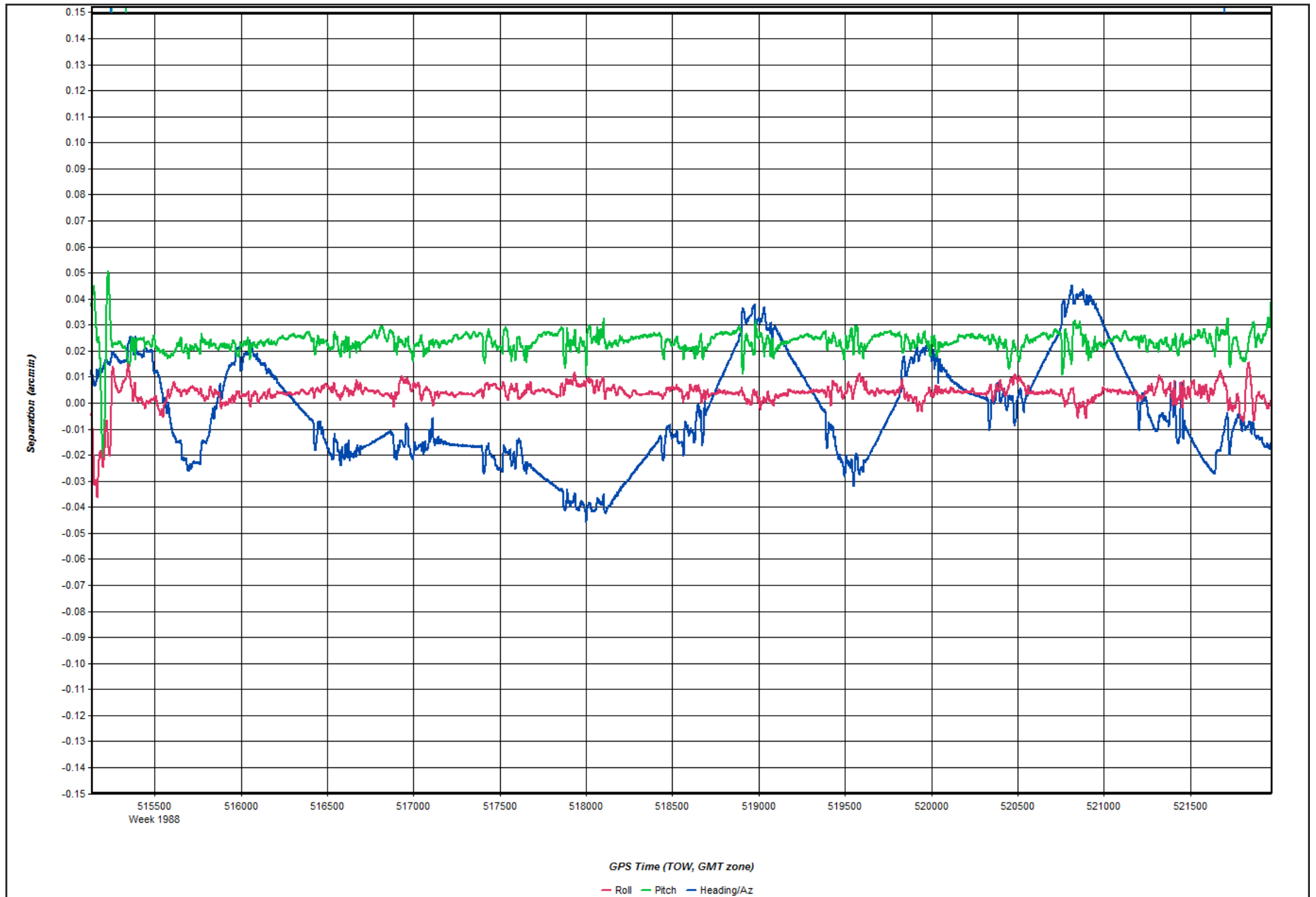
2018-02-16_Day047_7 - 20180216220556

Figure 8: Status flag for IMU processing



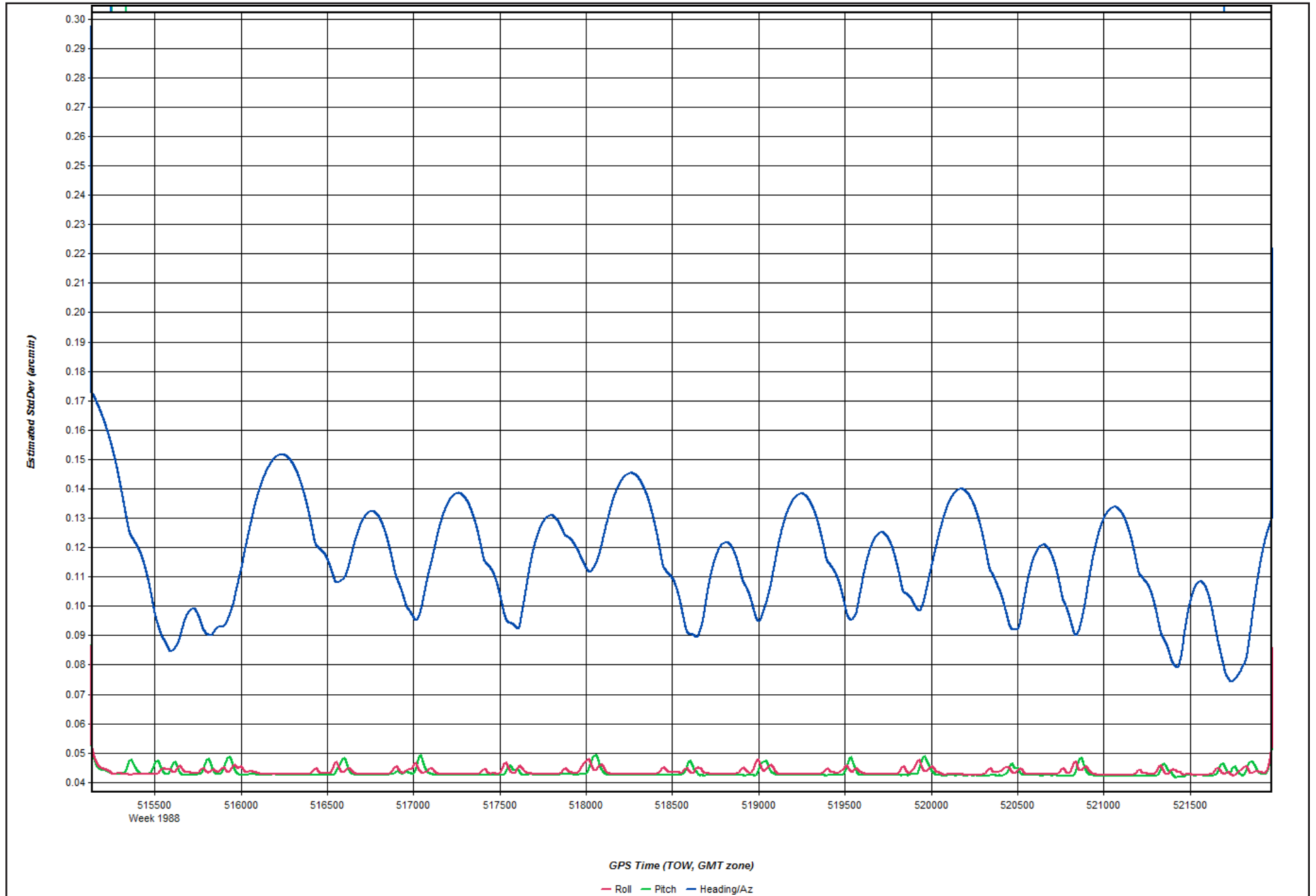
2018-02-16_Day047_7 - 20180216220556

Figure 9: Fwd/Rev Attitude Separation Plot



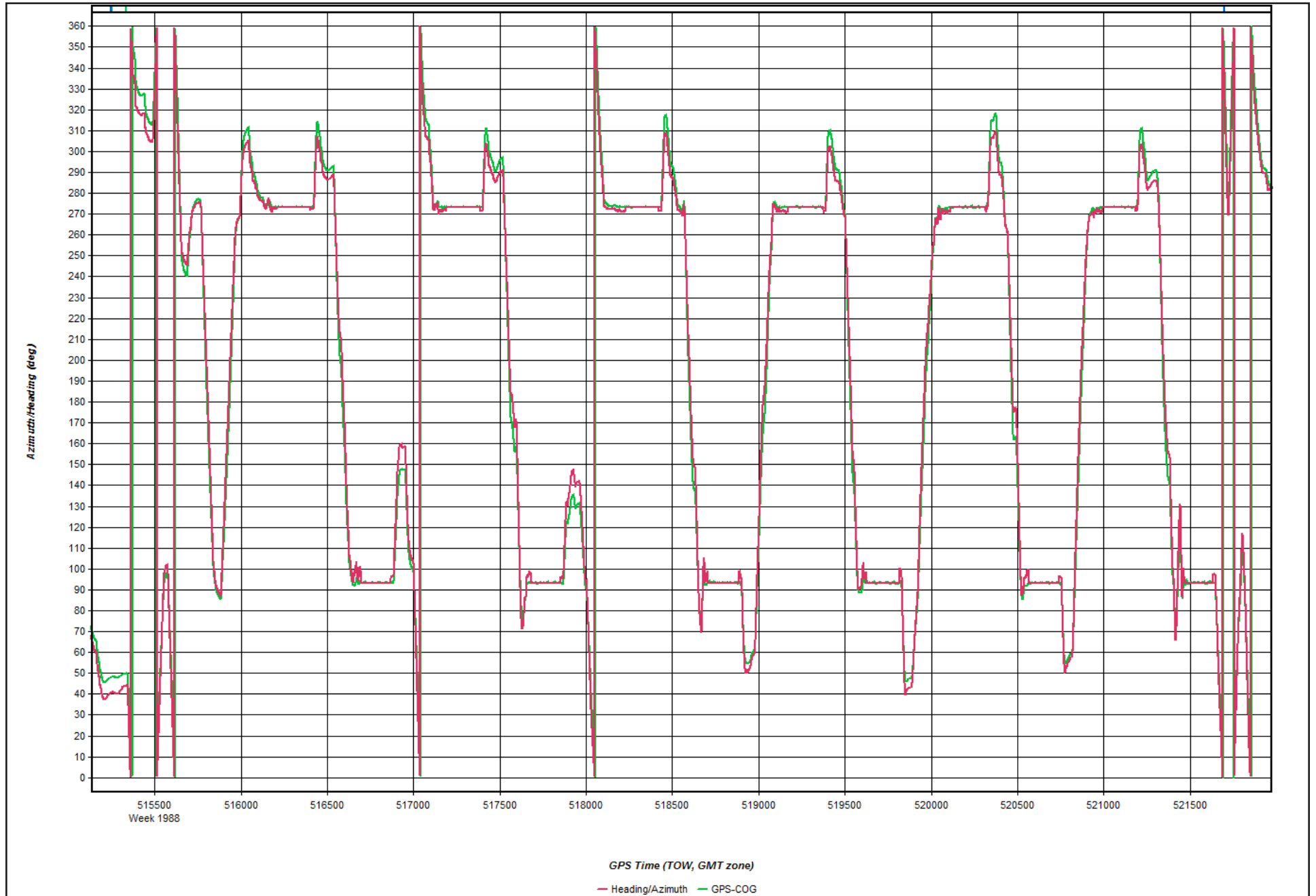
2018-02-16_Day047_7 - 20180216220556

Figure 10: Estimated Attitude Accuracy Plot



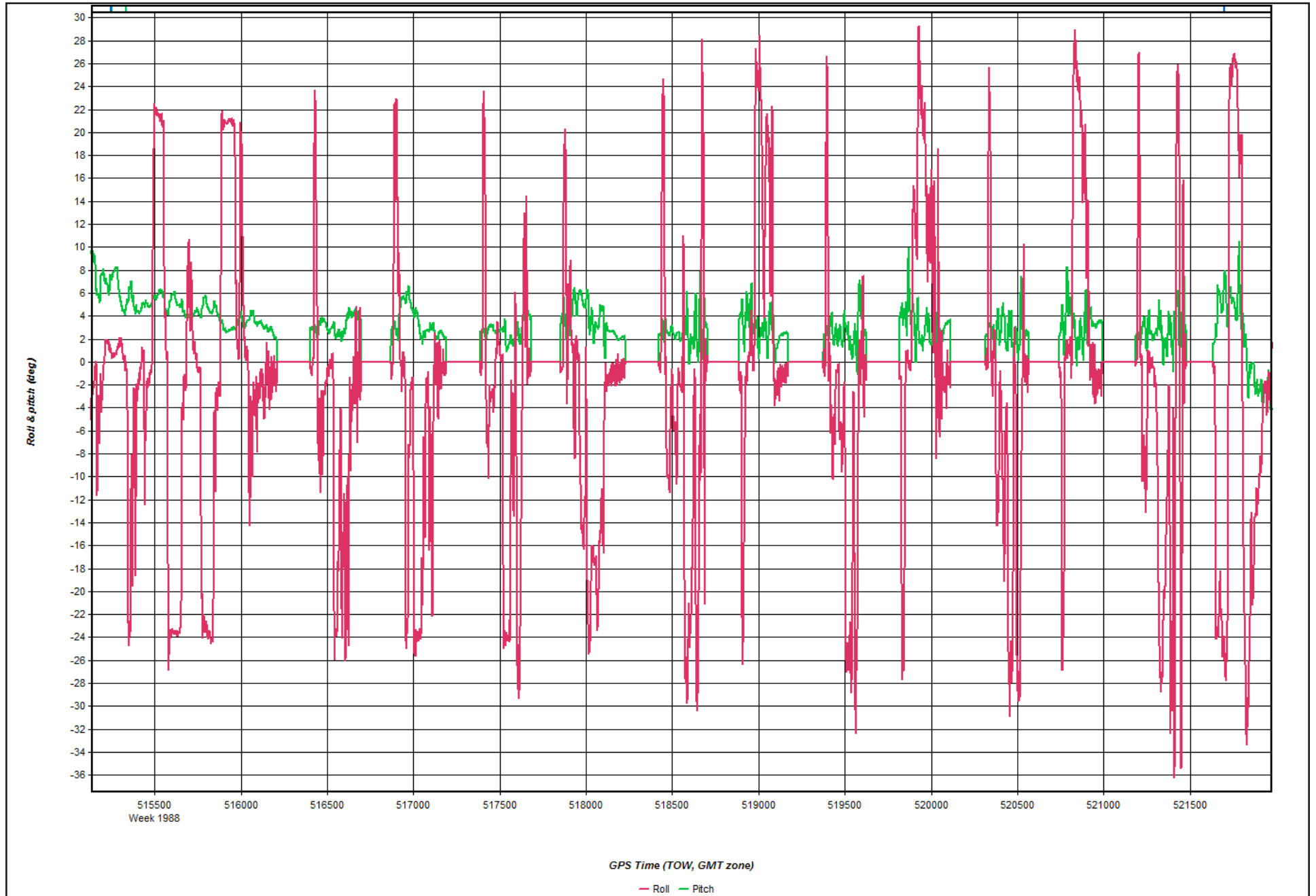
2018-02-16_Day047_7 - 20180216220556

Figure 11: Azimuth Plot



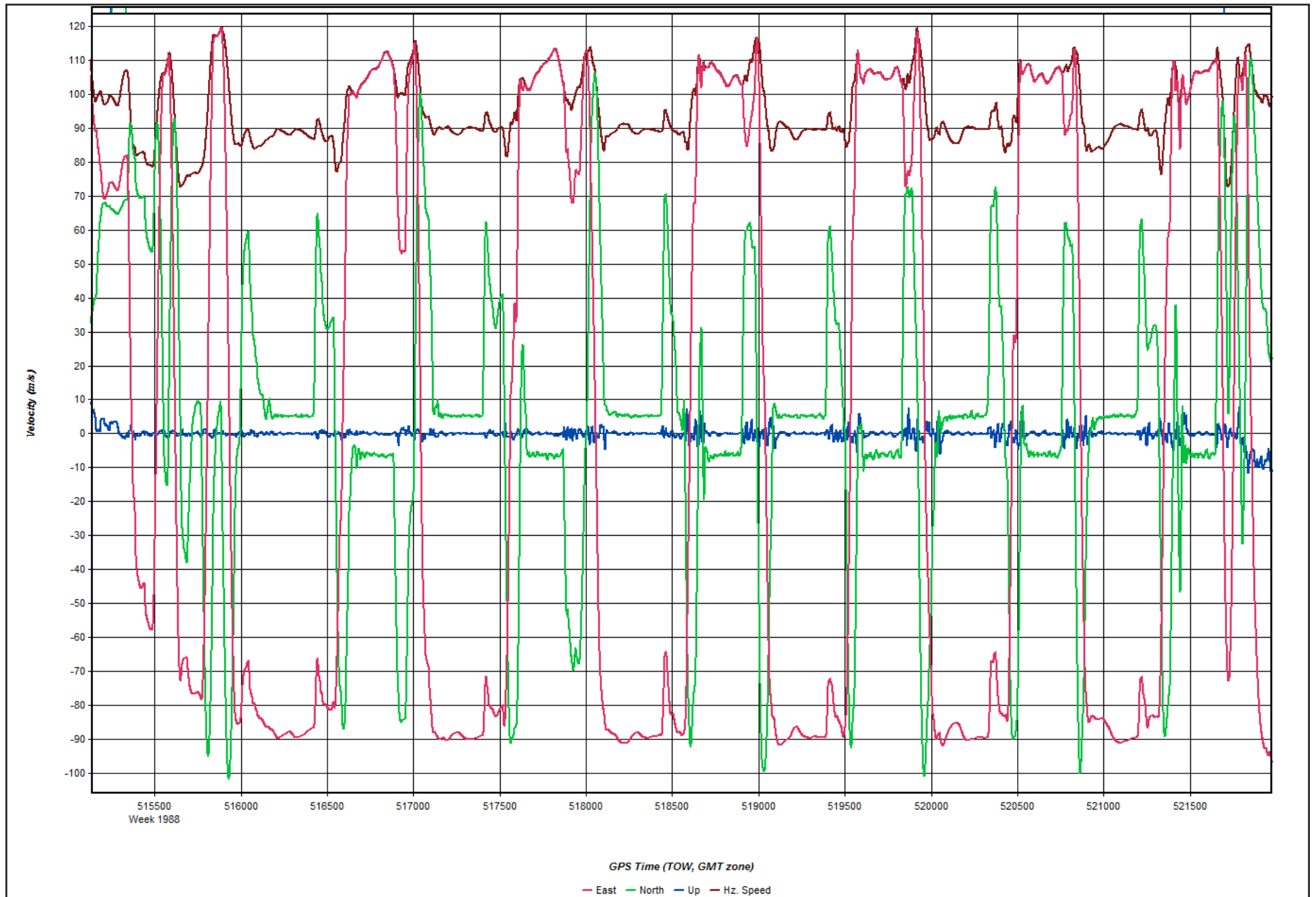
2018-02-16_Day047_7 - 20180216220556

Figure 12: Roll & Pitch Plot



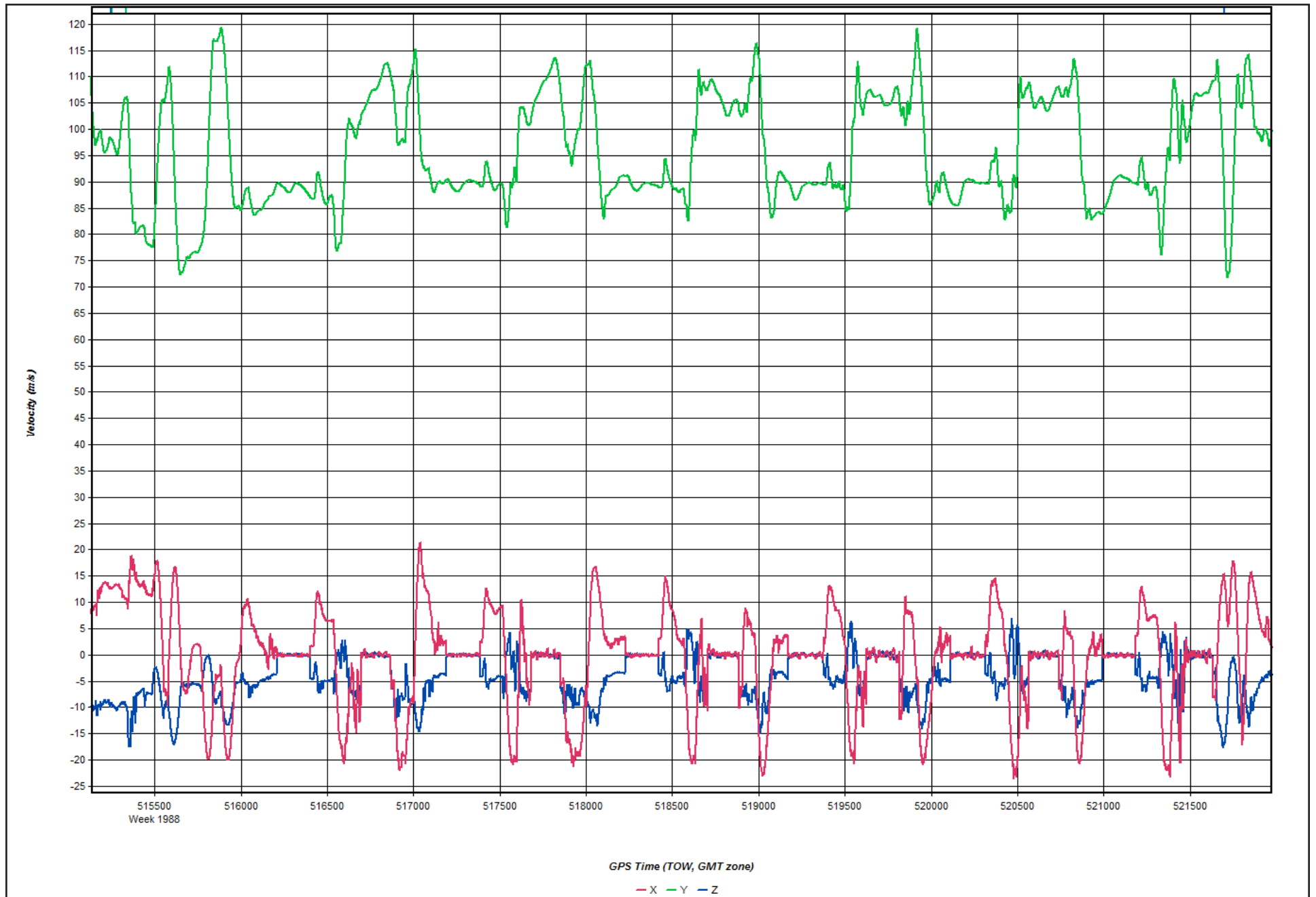
2018-02-16_Day047_7 - 20180216220556

Figure 13: Velocity Profile Plot



2018-02-16_Day047_7 - 20180216220556

Figure 14: Body Frame Velocity Plot



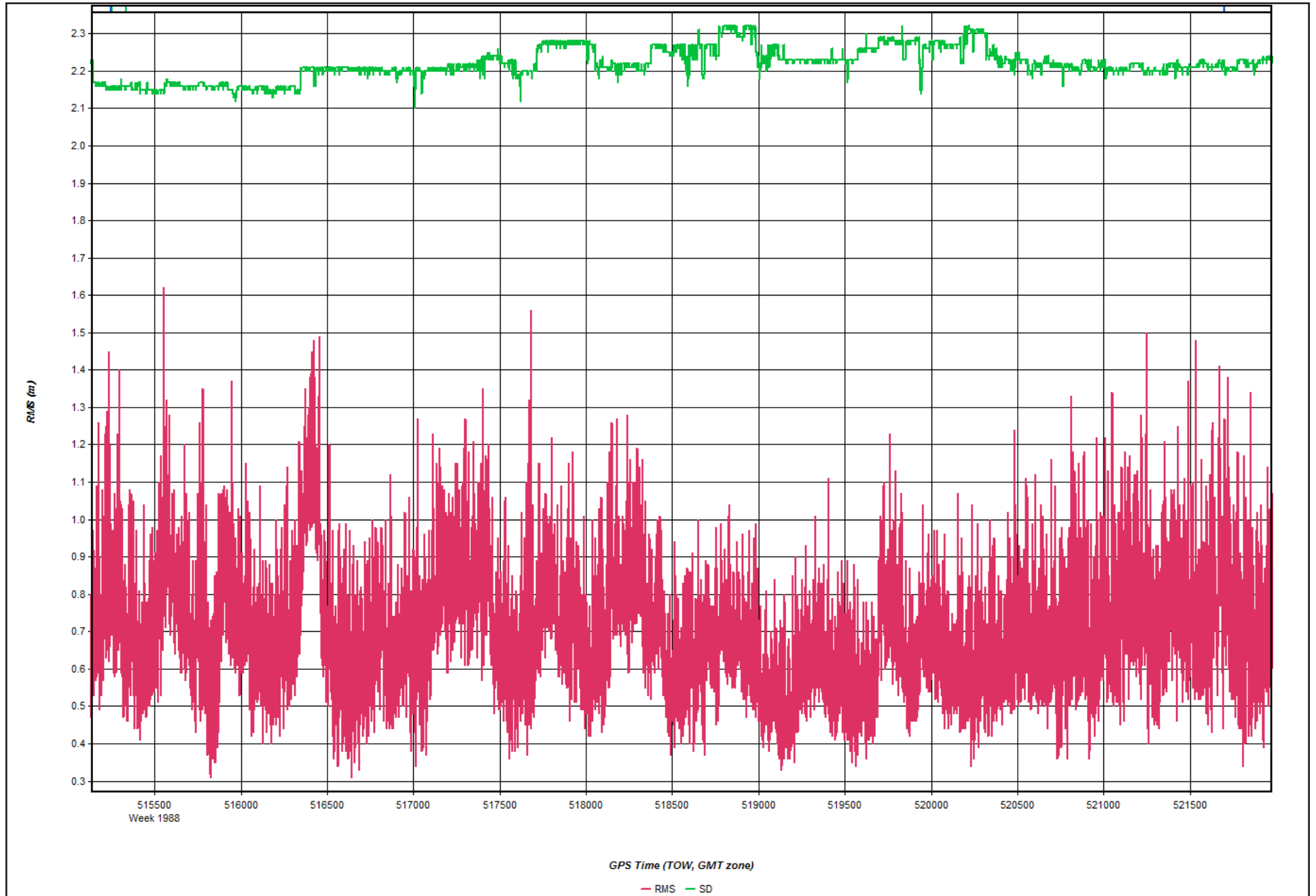
2018-02-16_Day047_7 - 20180216220556

Figure 15: Height Profile Plot



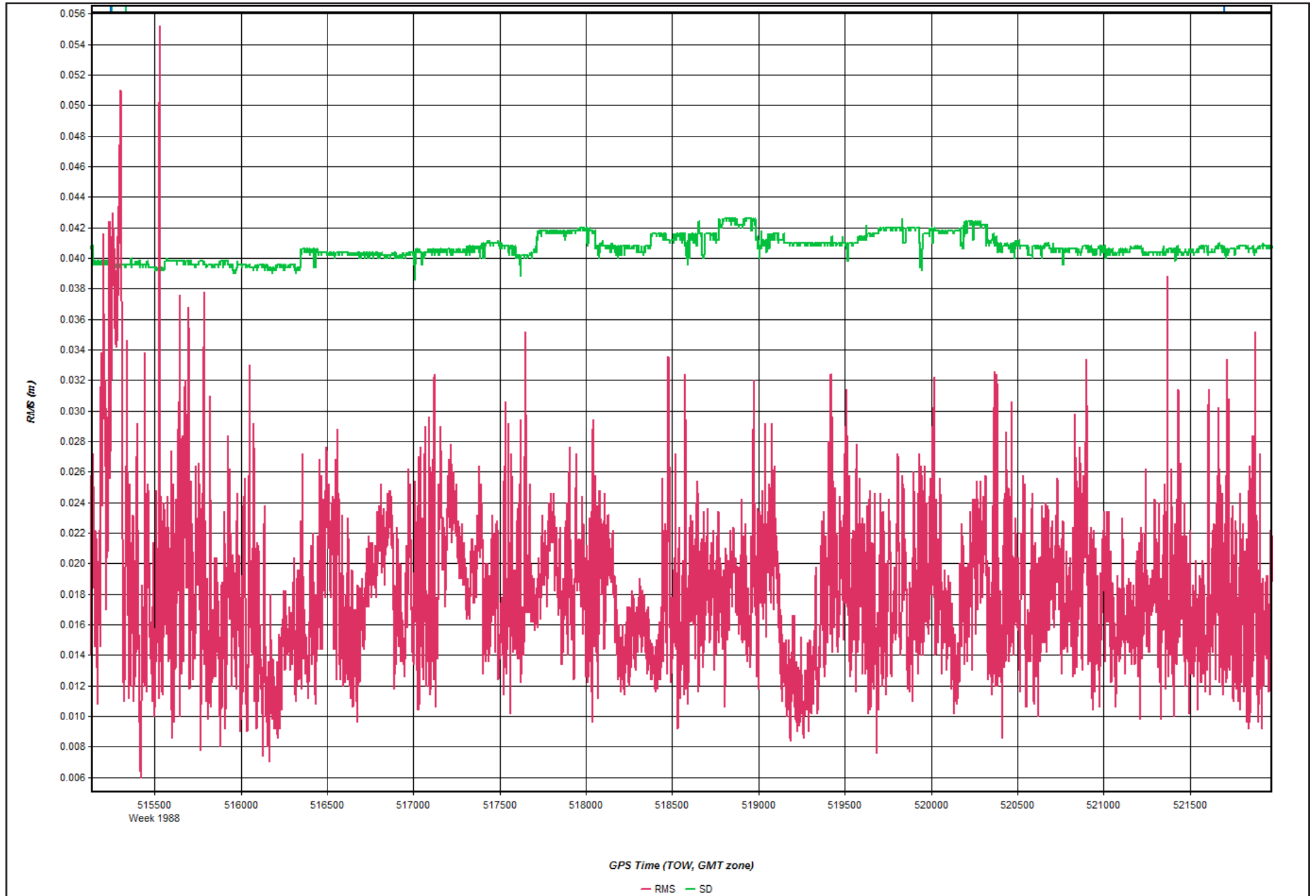
2018-02-16_Day047_7 - 20180216220556

Figure 16: C/A Code Residual RMS Plot



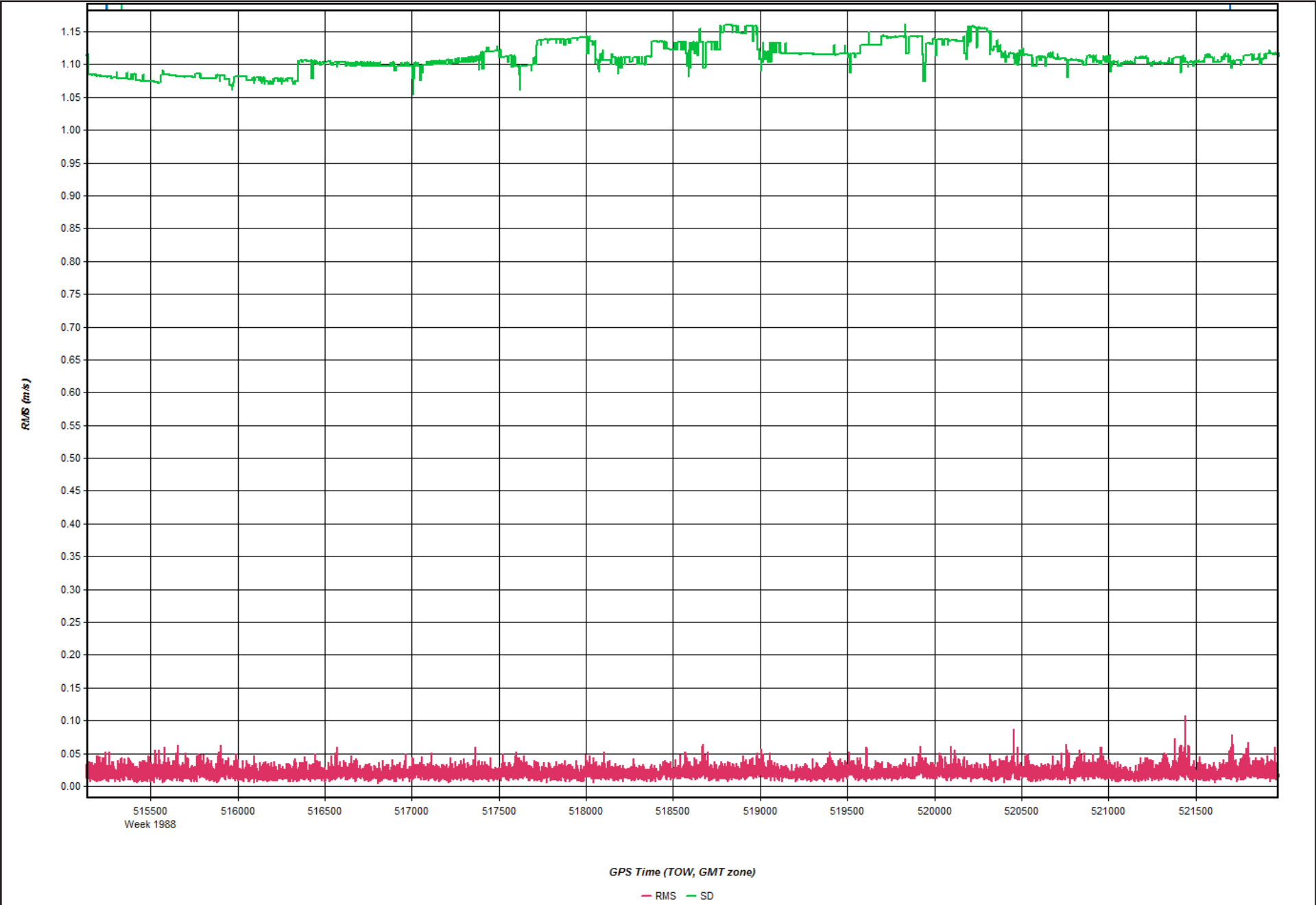
2018-02-16_Day047_7 - 20180216220556

Figure 17: Carrier Residual RMS Plot



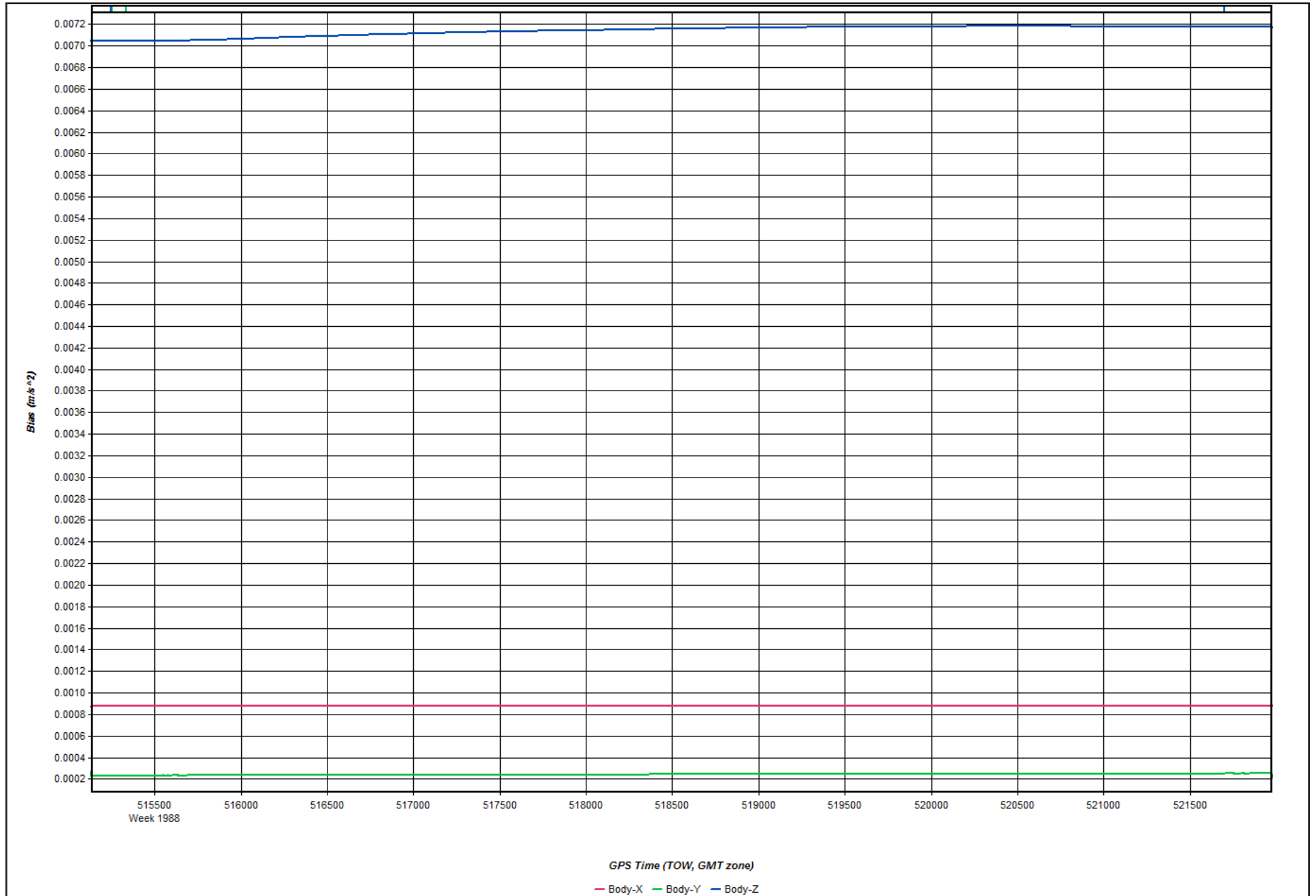
2018-02-16_Day047_7 - 20180216220556

Figure 18: L1 Doppler Residual RMS Plot



2018-02-16_Day047_7 - 20180216220556

Figure 19: Accelerometer Bias Plot



2018-02-16_Day047_7 - 20180216220556

Figure 20: Gyro Drift Plot

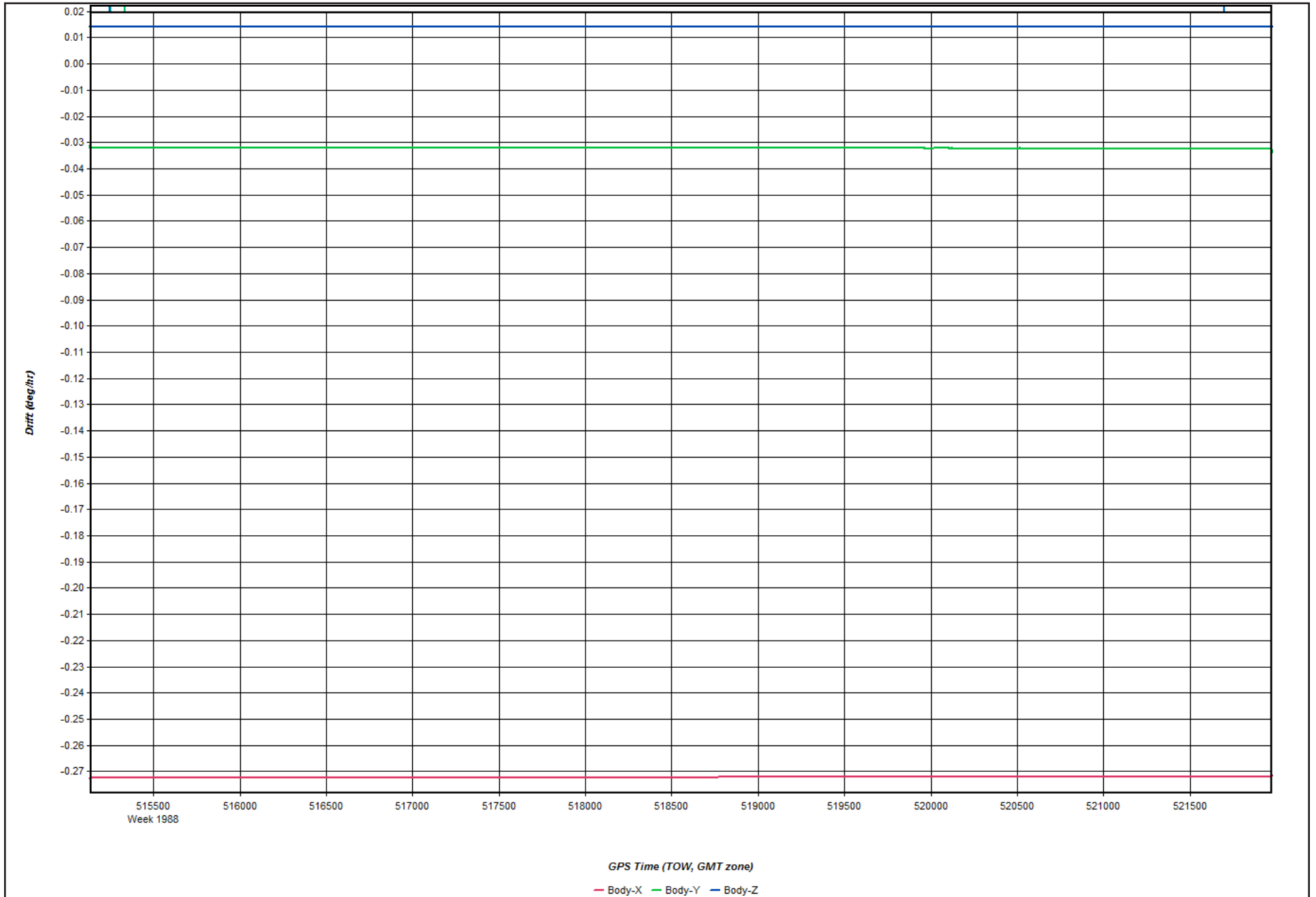
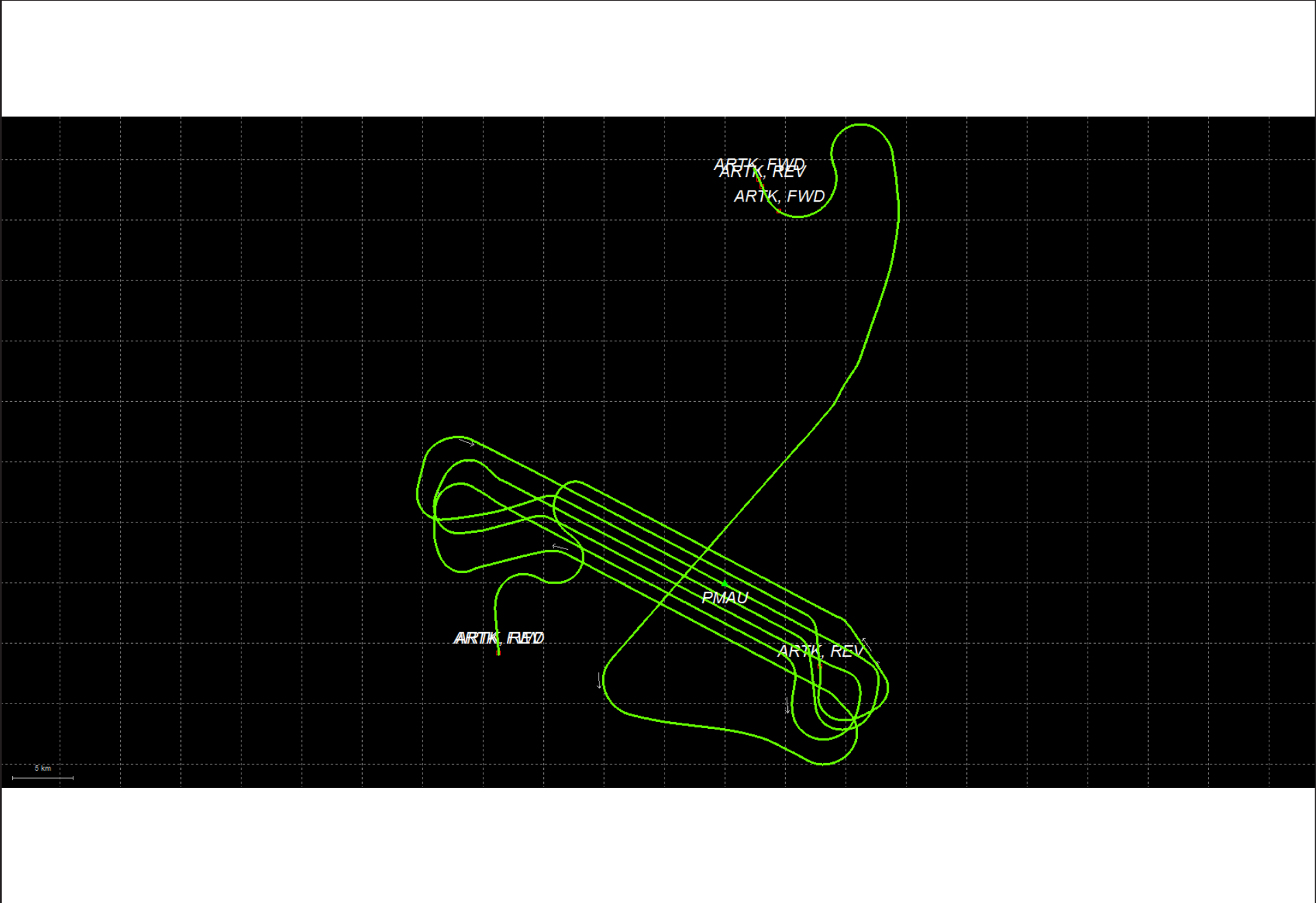
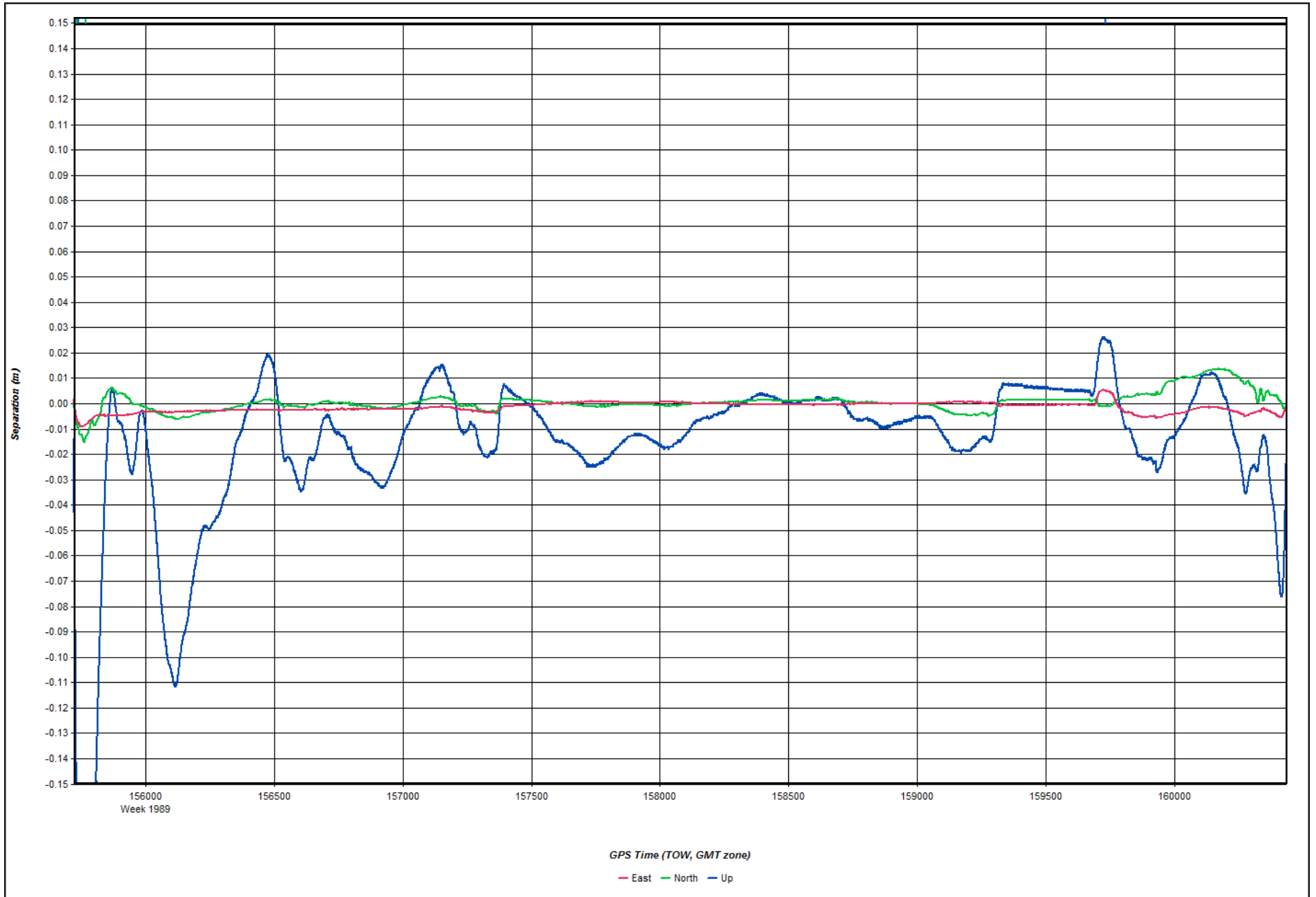


Figure 1: Map



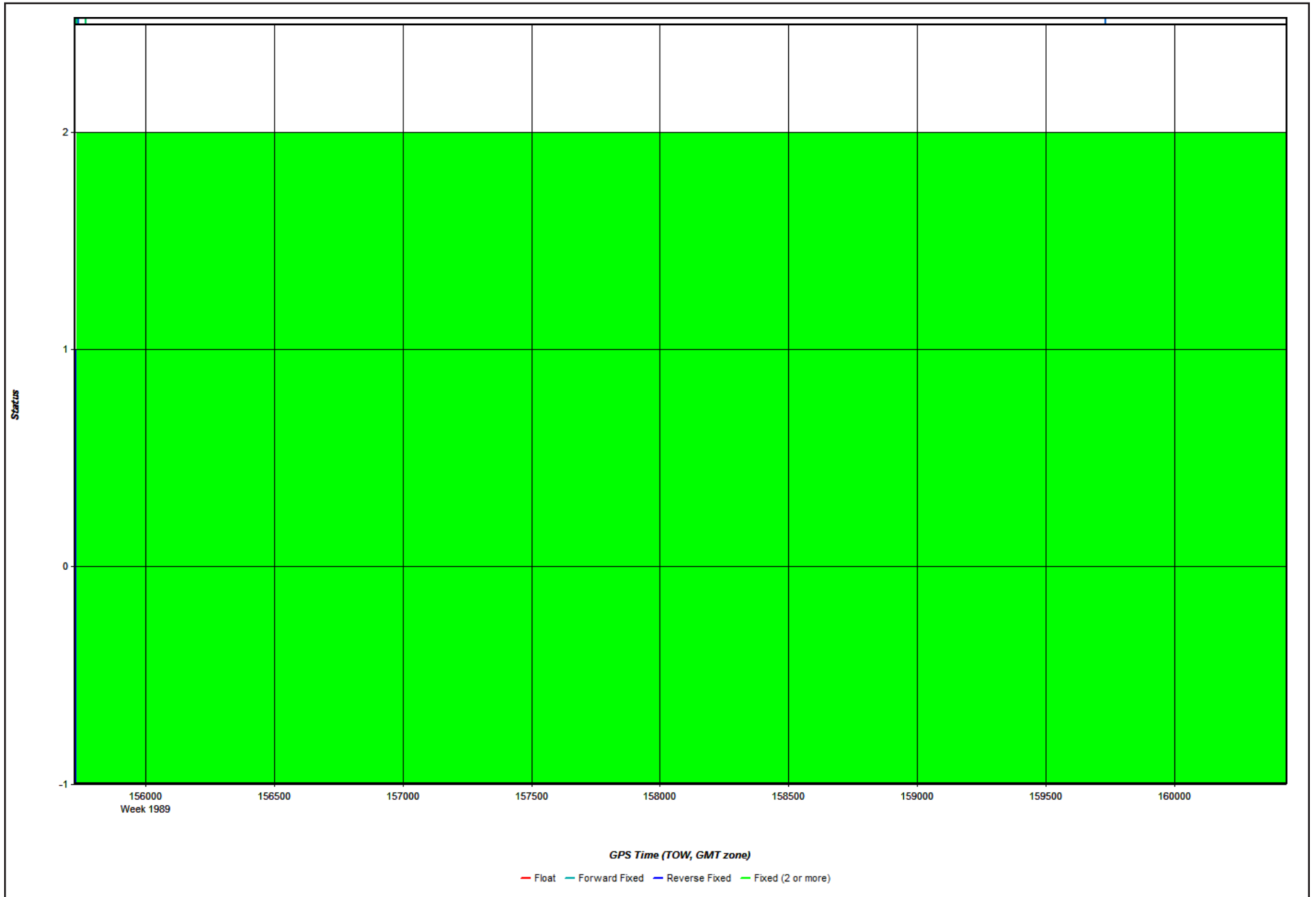
2018-02-19_Day050_7 - 20180219183918

Figure 2: Forward/Reverse or Combined Separation Plot



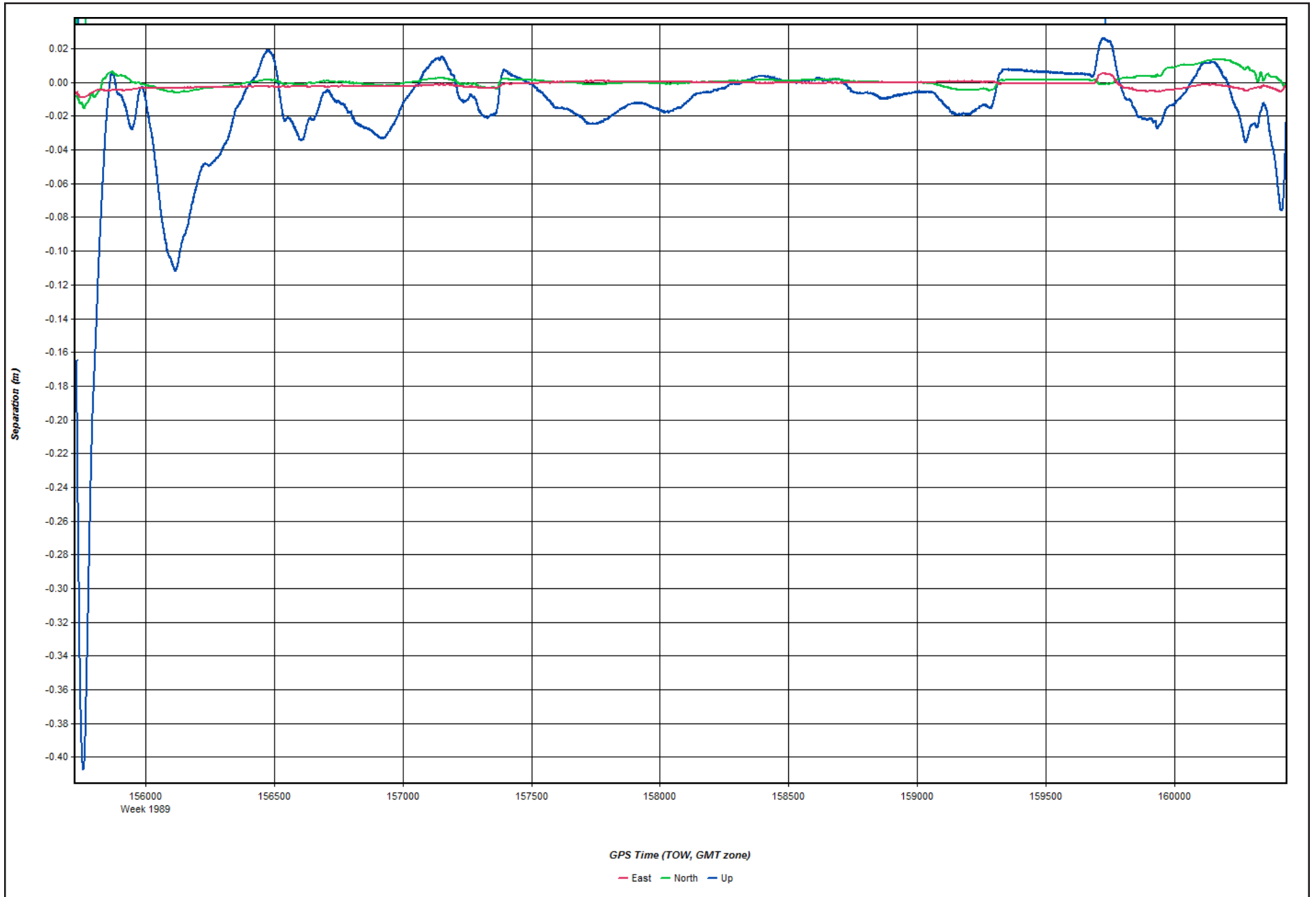
2018-02-19_Day050_7 - 20180219183918

Figure 3: Float or Fixed Ambiguity



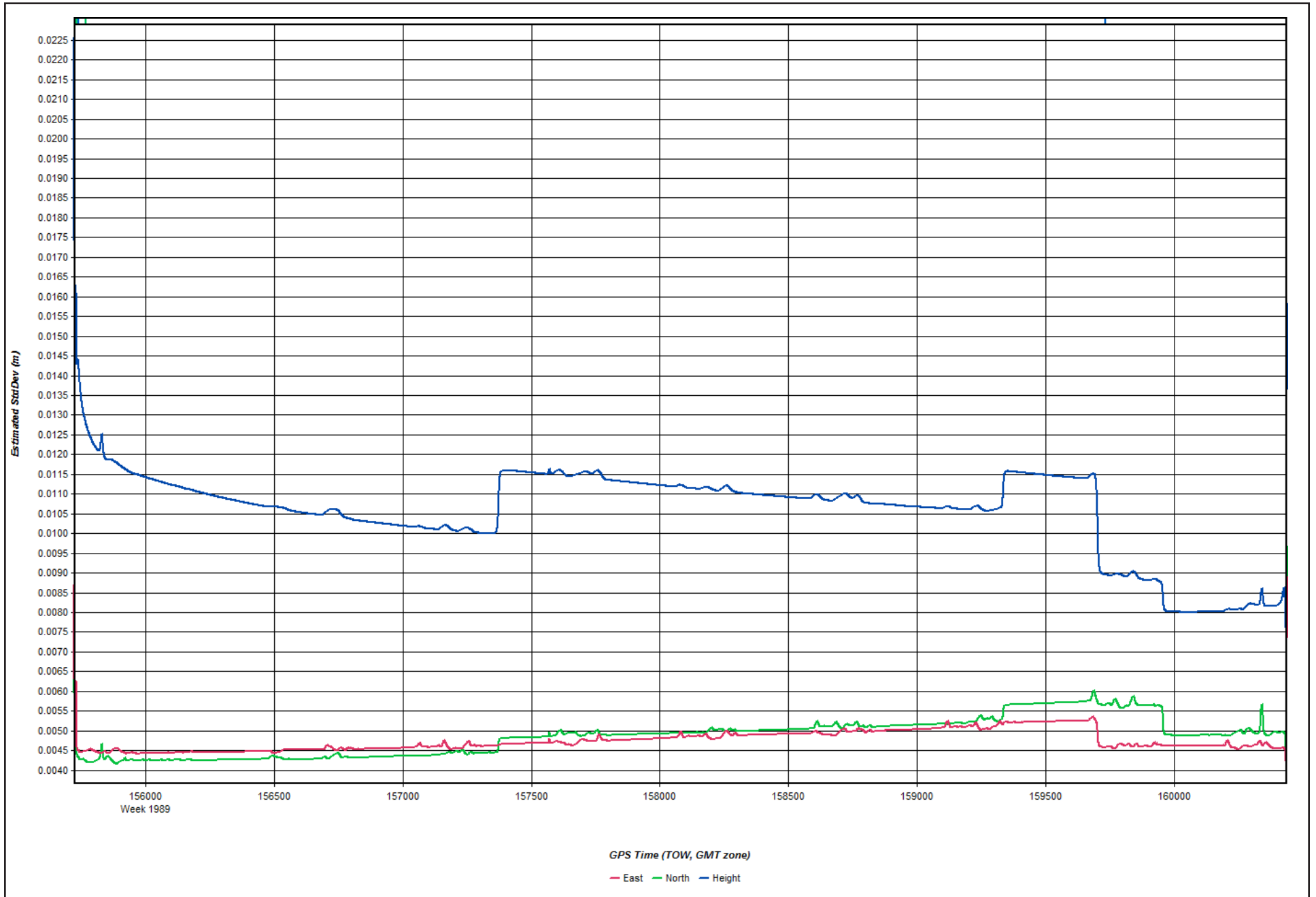
2018-02-19_Day050_7 - 20180219183918

Figure 4: Forward/Reverse Separation Plot (Fixed)



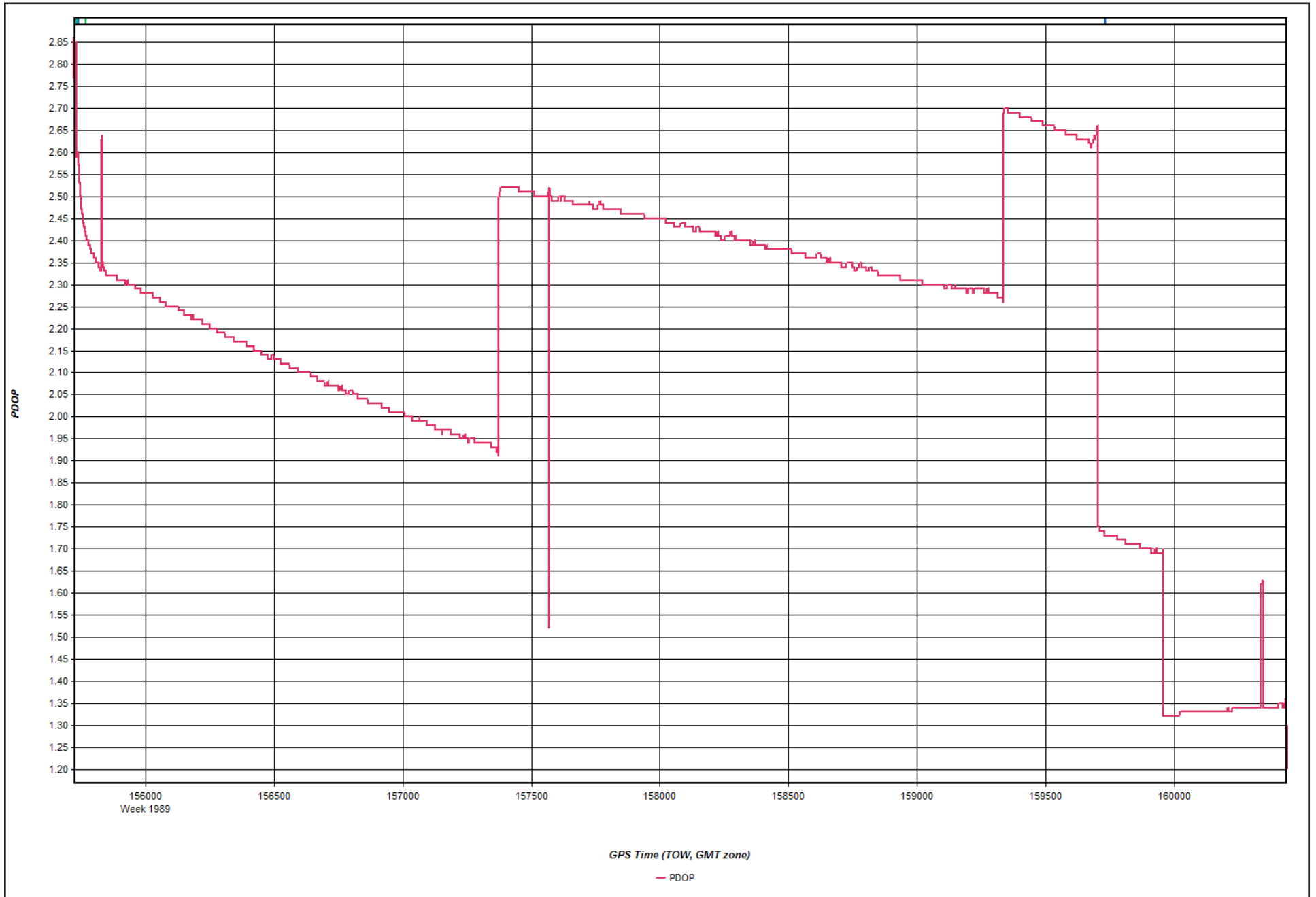
2018-02-19_Day050_7 - 20180219183918

Figure 5: Estimated Position Accuracy Plot



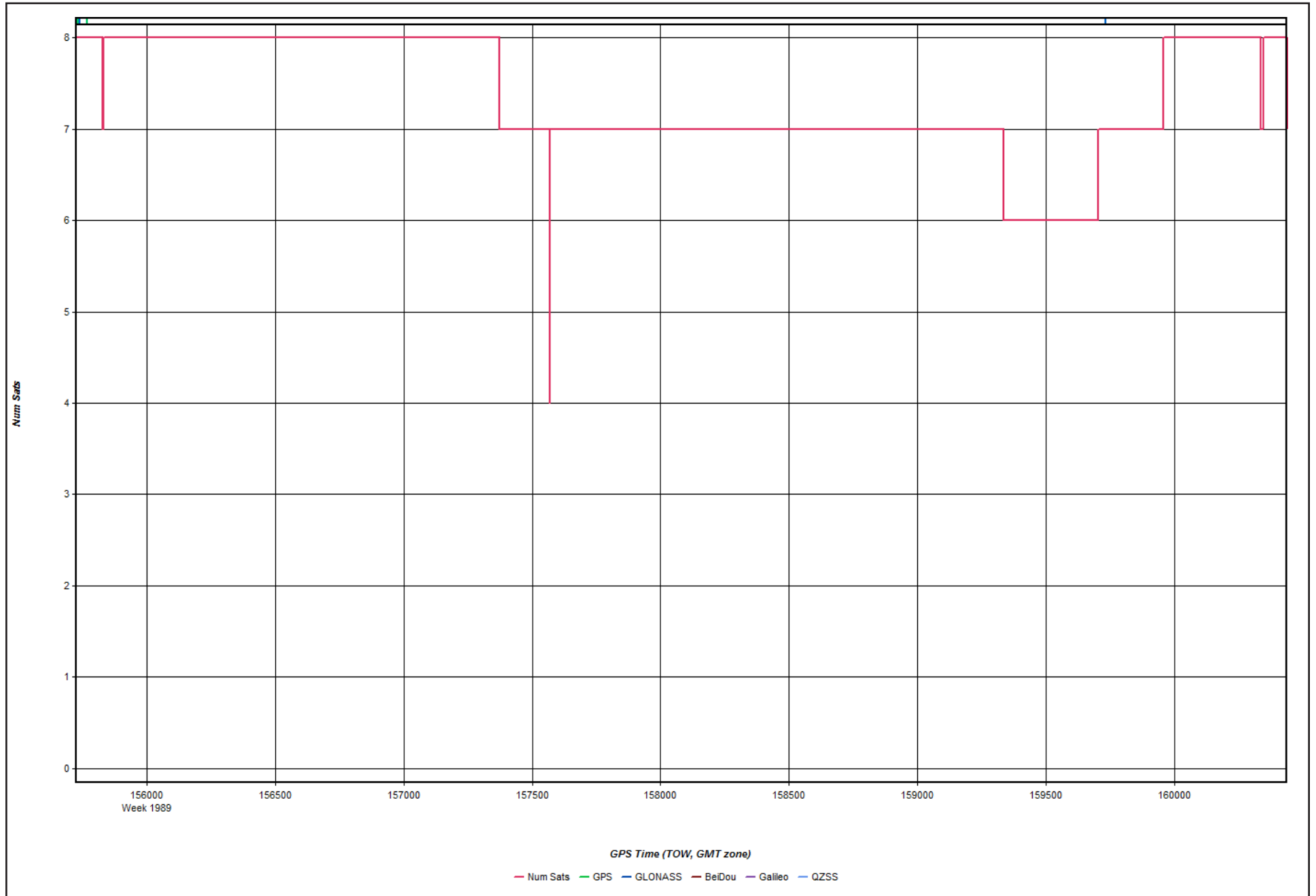
2018-02-19_Day050_7 - 20180219183918

Figure 6: PDOP Plot



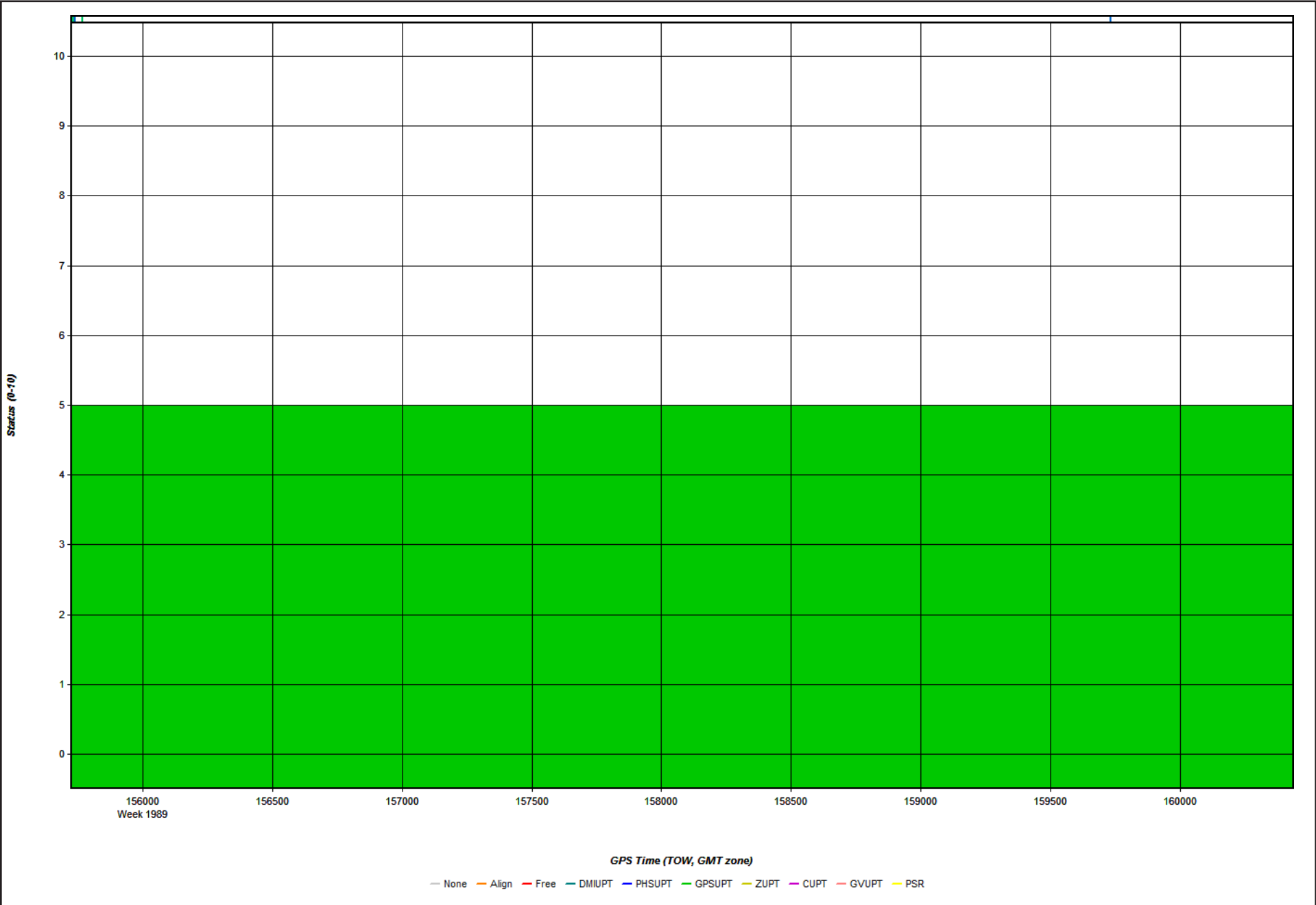
2018-02-19_Day050_7 - 20180219183918

Figure 7: Number of Satellites Line Plot



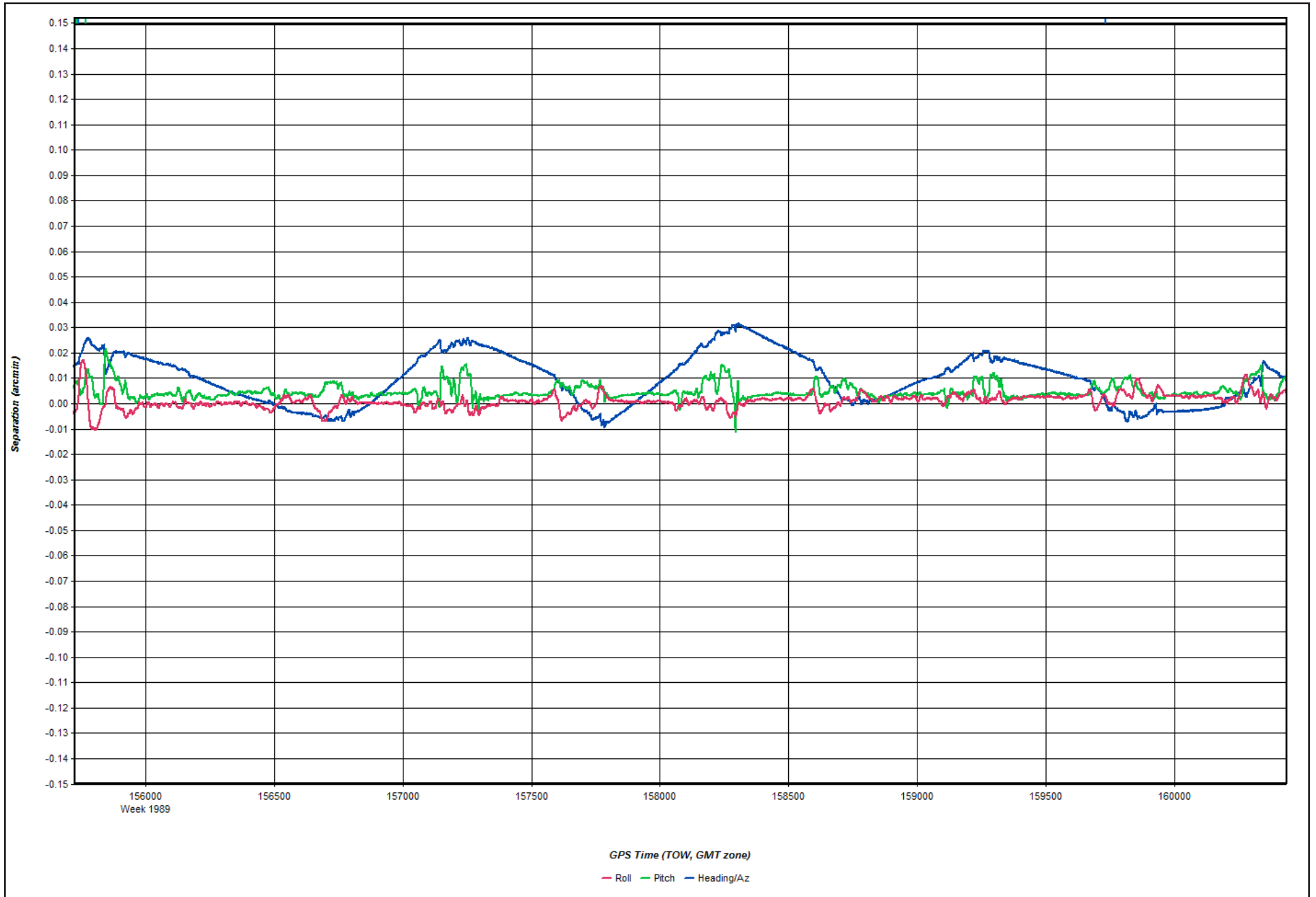
2018-02-19_Day050_7 - 20180219183918

Figure 8: Status flag for IMU processing



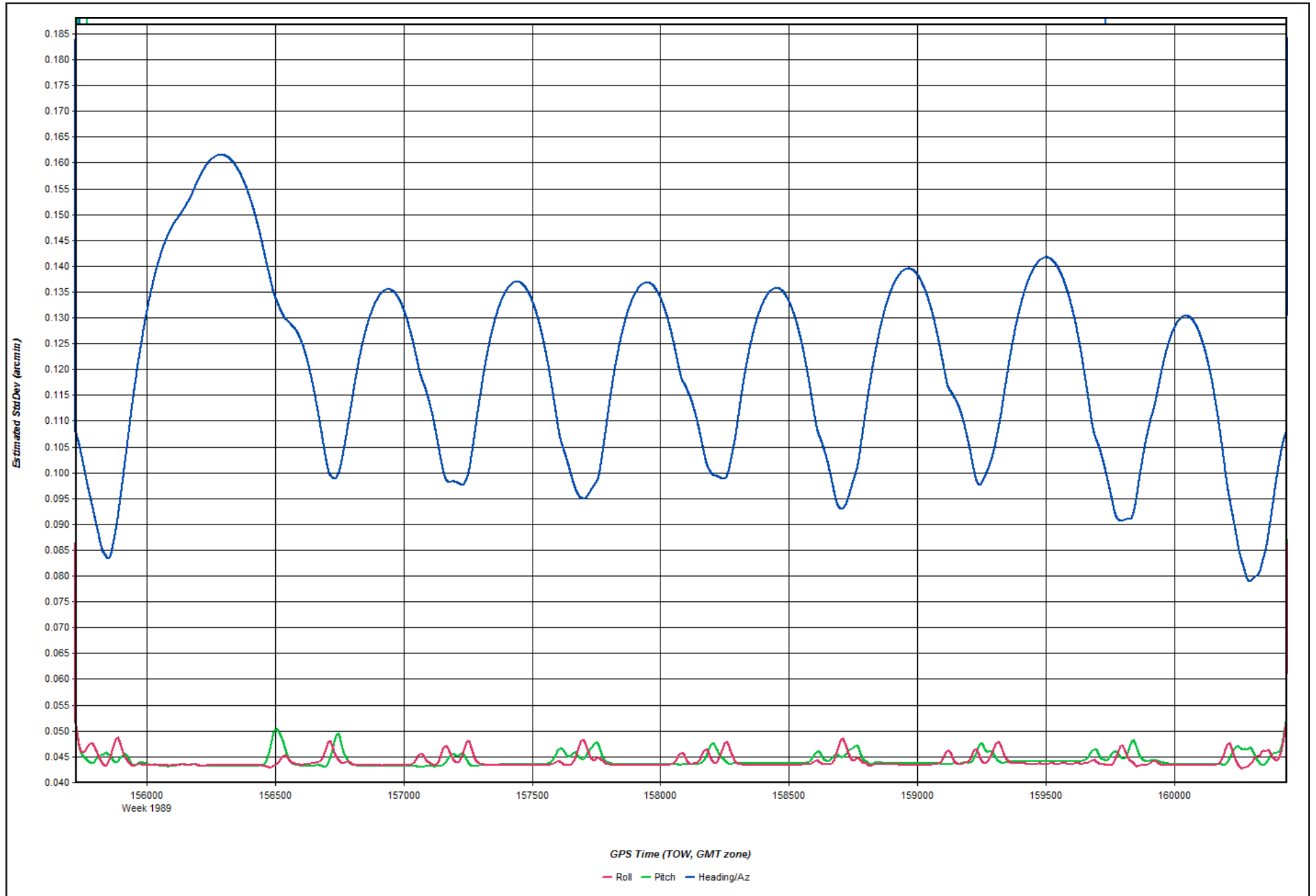
2018-02-19_Day050_7 - 20180219183918

Figure 9: Fwd/Rev Attitude Separation Plot



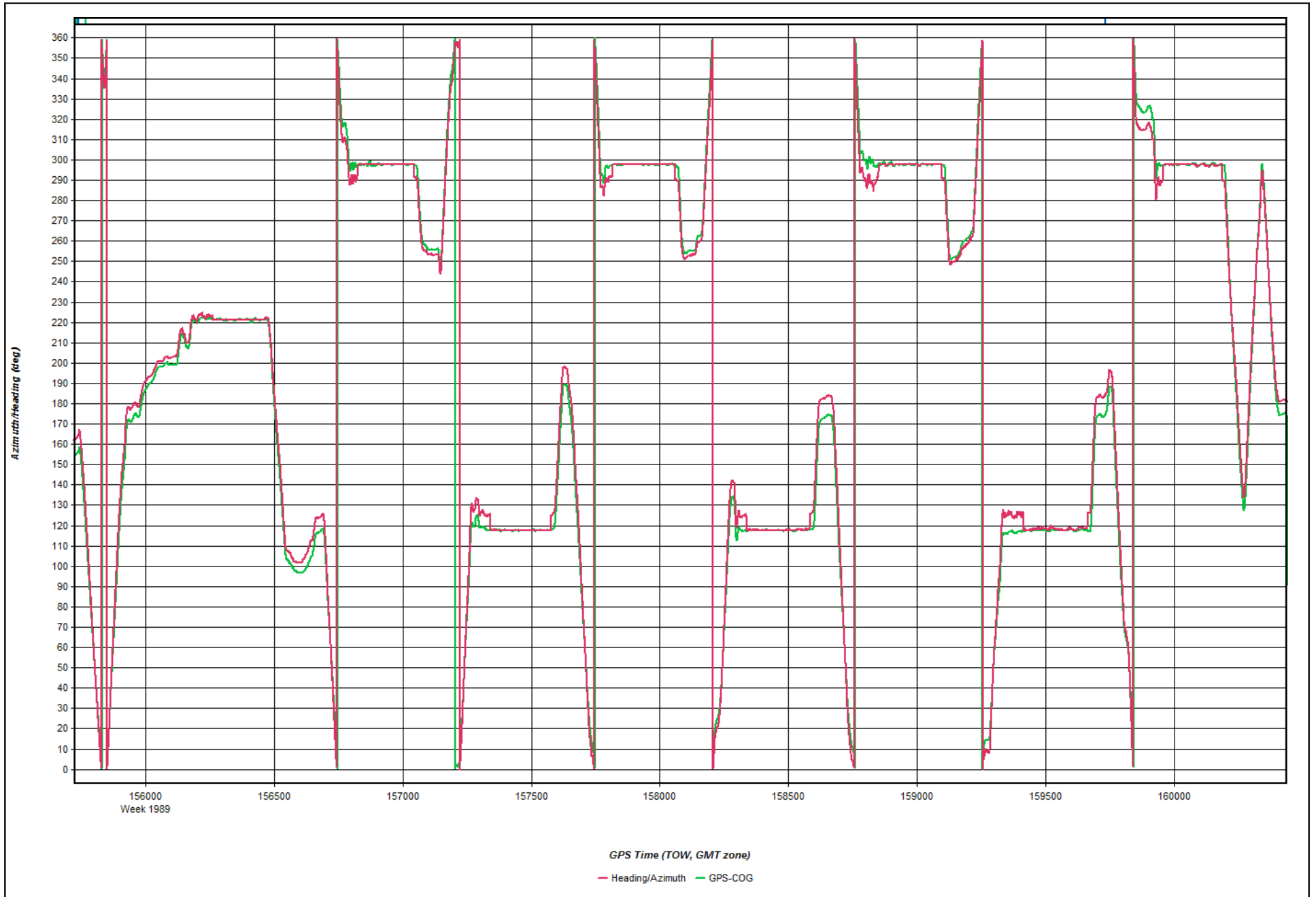
2018-02-19_Day050_7 - 20180219183918

Figure 10: Estimated Attitude Accuracy Plot



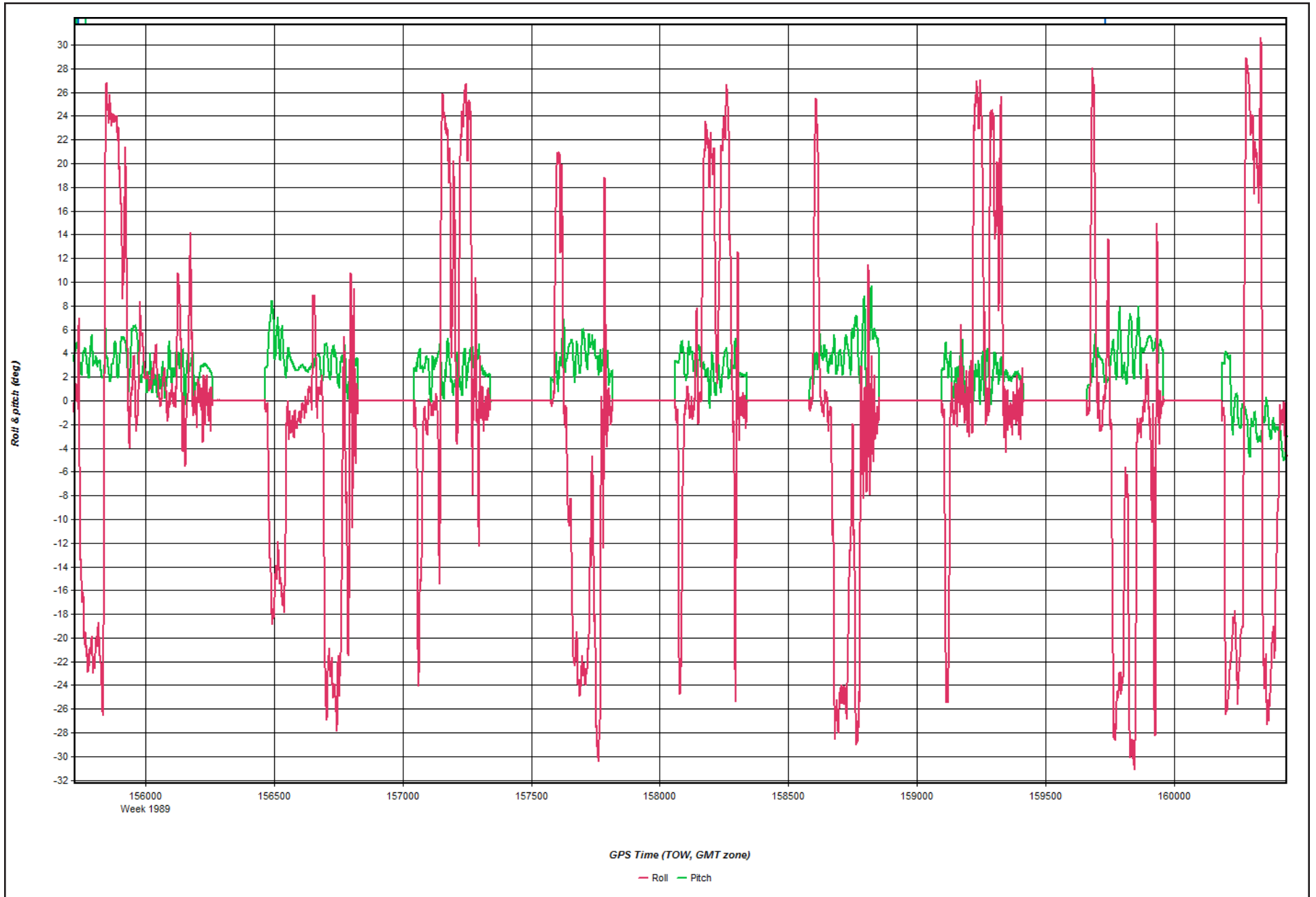
2018-02-19_Day050_7 - 20180219183918

Figure 11: Azimuth Plot



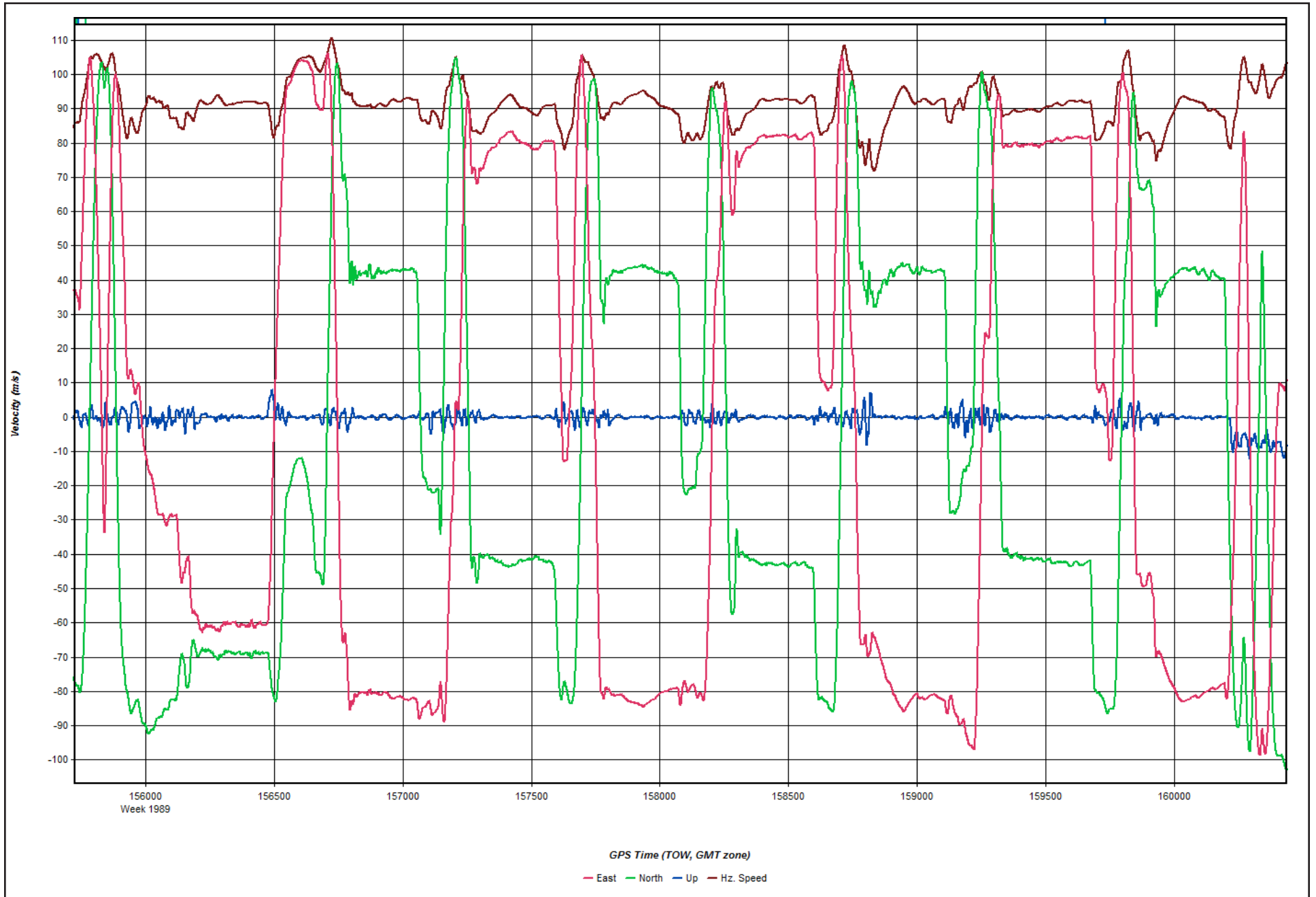
2018-02-19_Day050_7 - 20180219183918

Figure 12: Roll & Pitch Plot



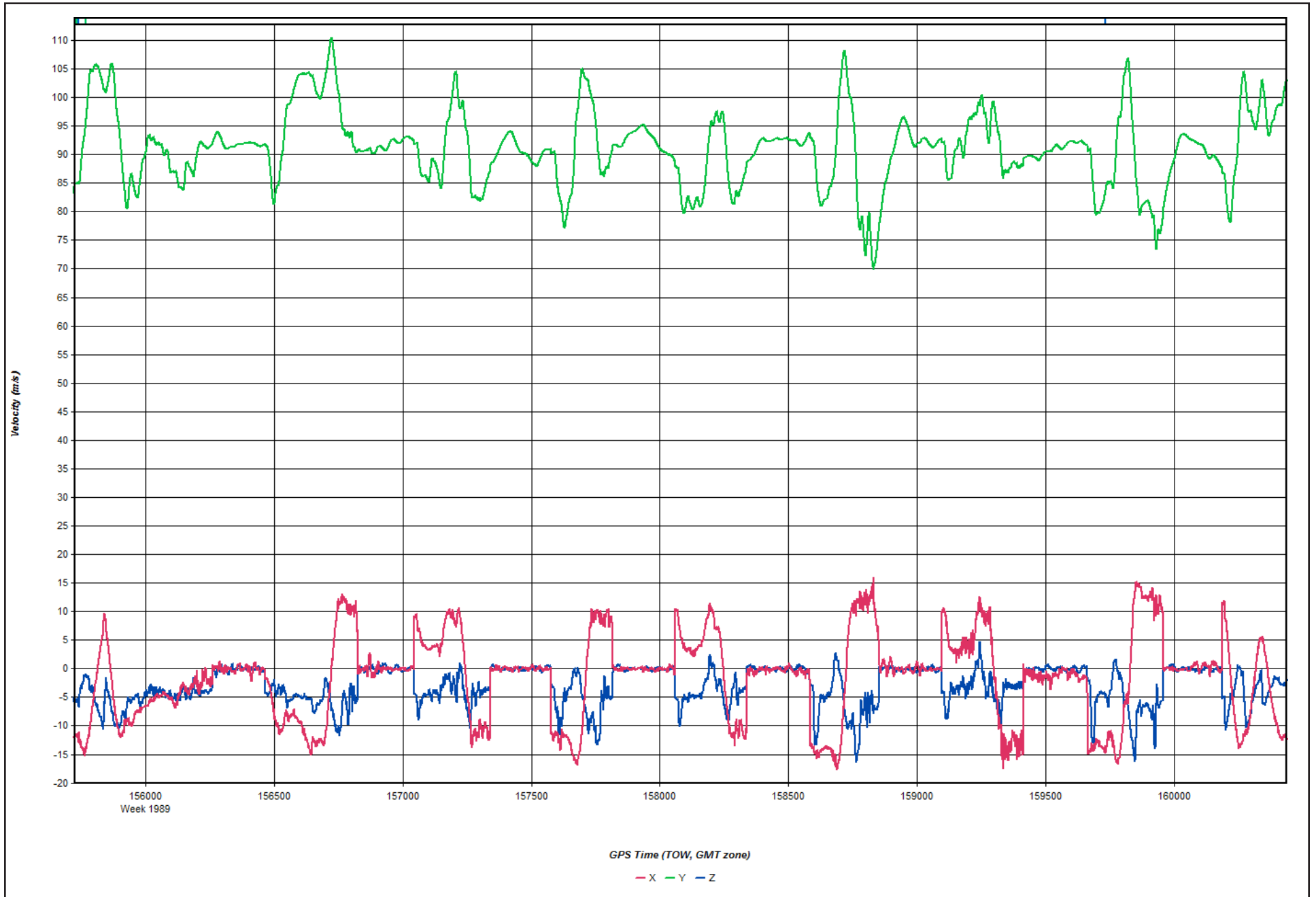
2018-02-19_Day050_7 - 20180219183918

Figure 13: Velocity Profile Plot



2018-02-19_Day050_7 - 20180219183918

Figure 14: Body Frame Velocity Plot



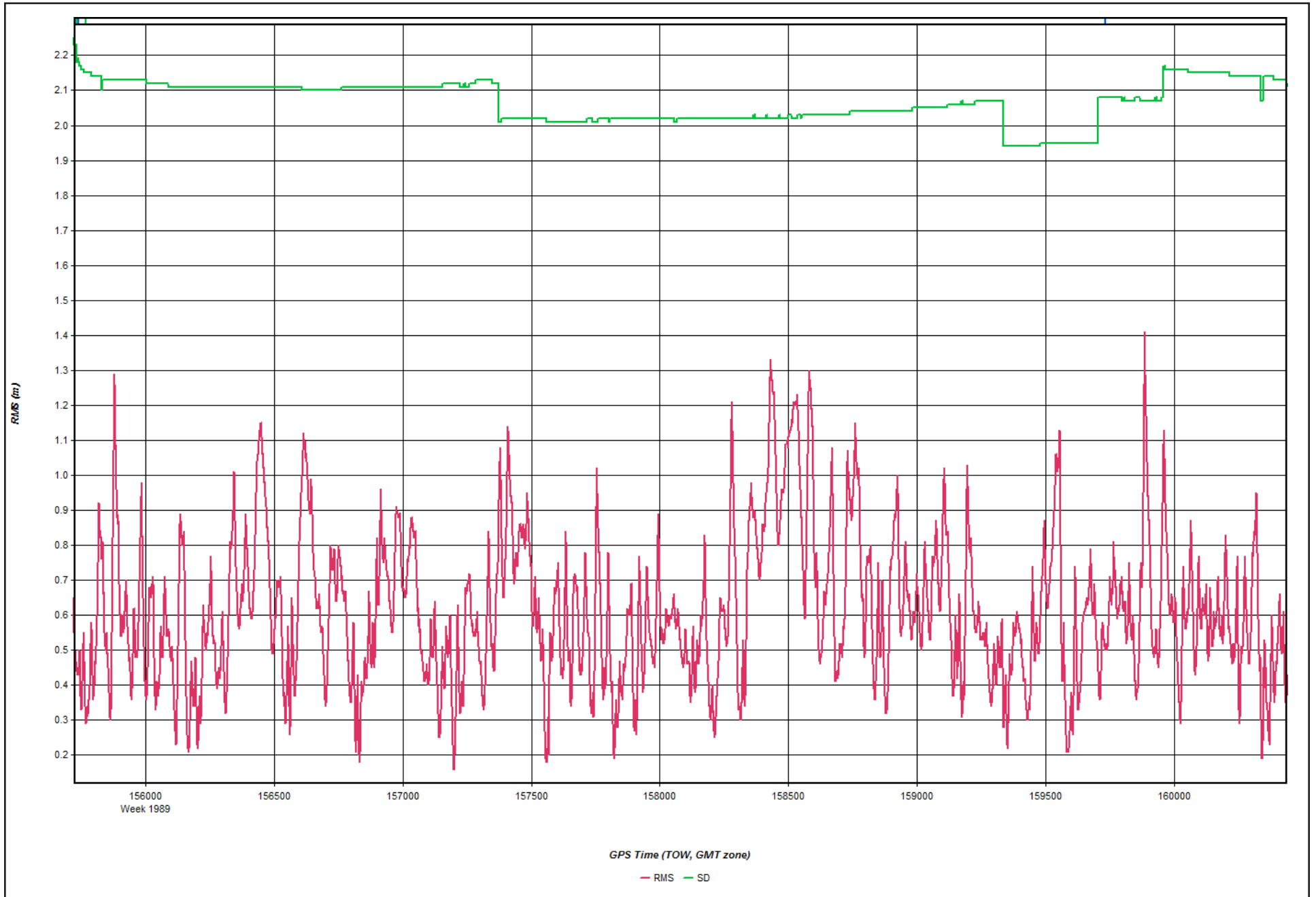
2018-02-19_Day050_7 - 20180219183918

Figure 15: Height Profile Plot



2018-02-19_Day050_7 - 20180219183918

Figure 16: C/A Code Residual RMS Plot



2018-02-19_Day050_7 - 20180219183918

Figure 17: Carrier Residual RMS Plot



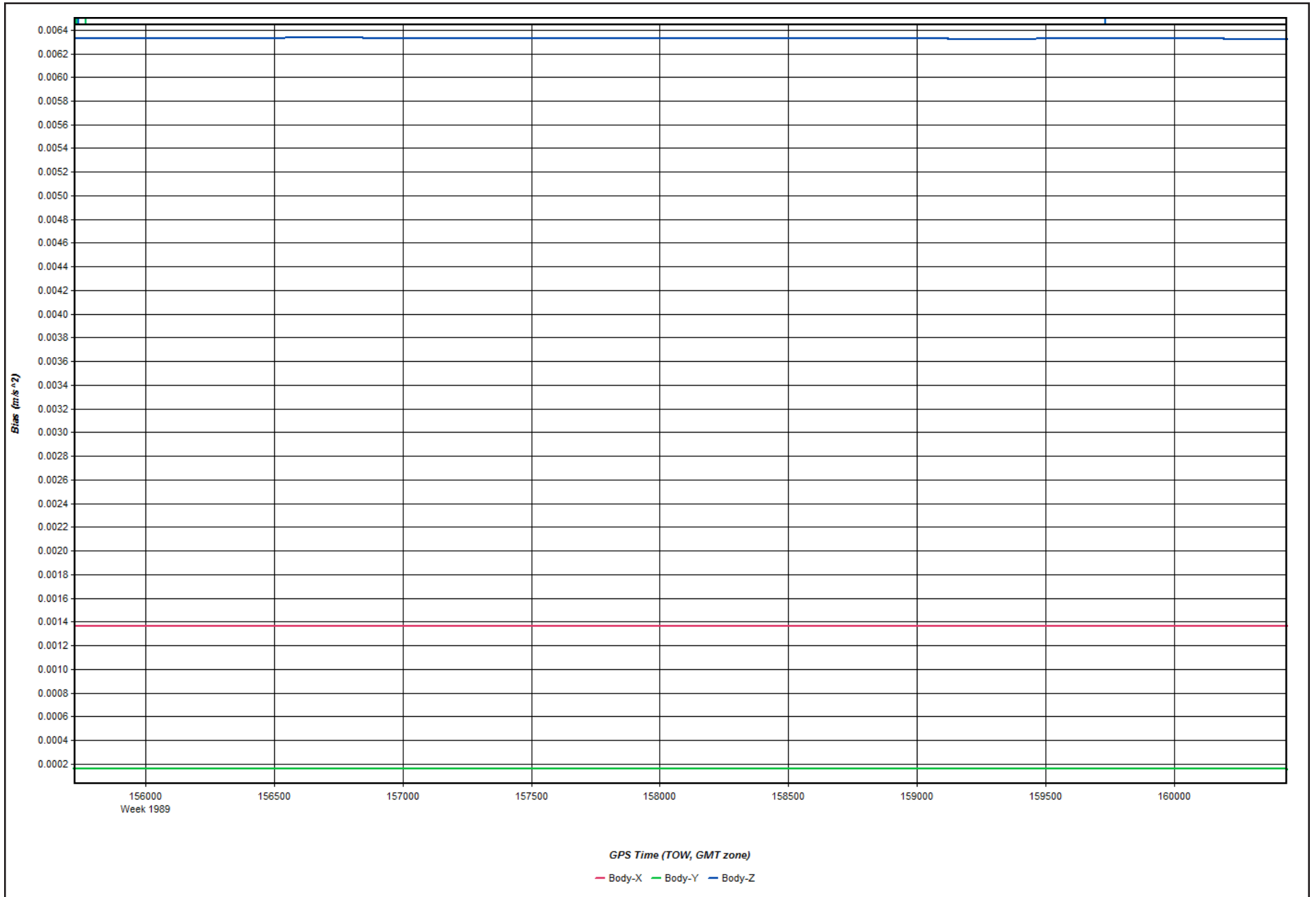
2018-02-19_Day050_7 - 20180219183918

Figure 18: L1 Doppler Residual RMS Plot



2018-02-19_Day050_7 - 20180219183918

Figure 19: Accelerometer Bias Plot



2018-02-19_Day050_7 - 20180219183918

Figure 20: Gyro Drift Plot

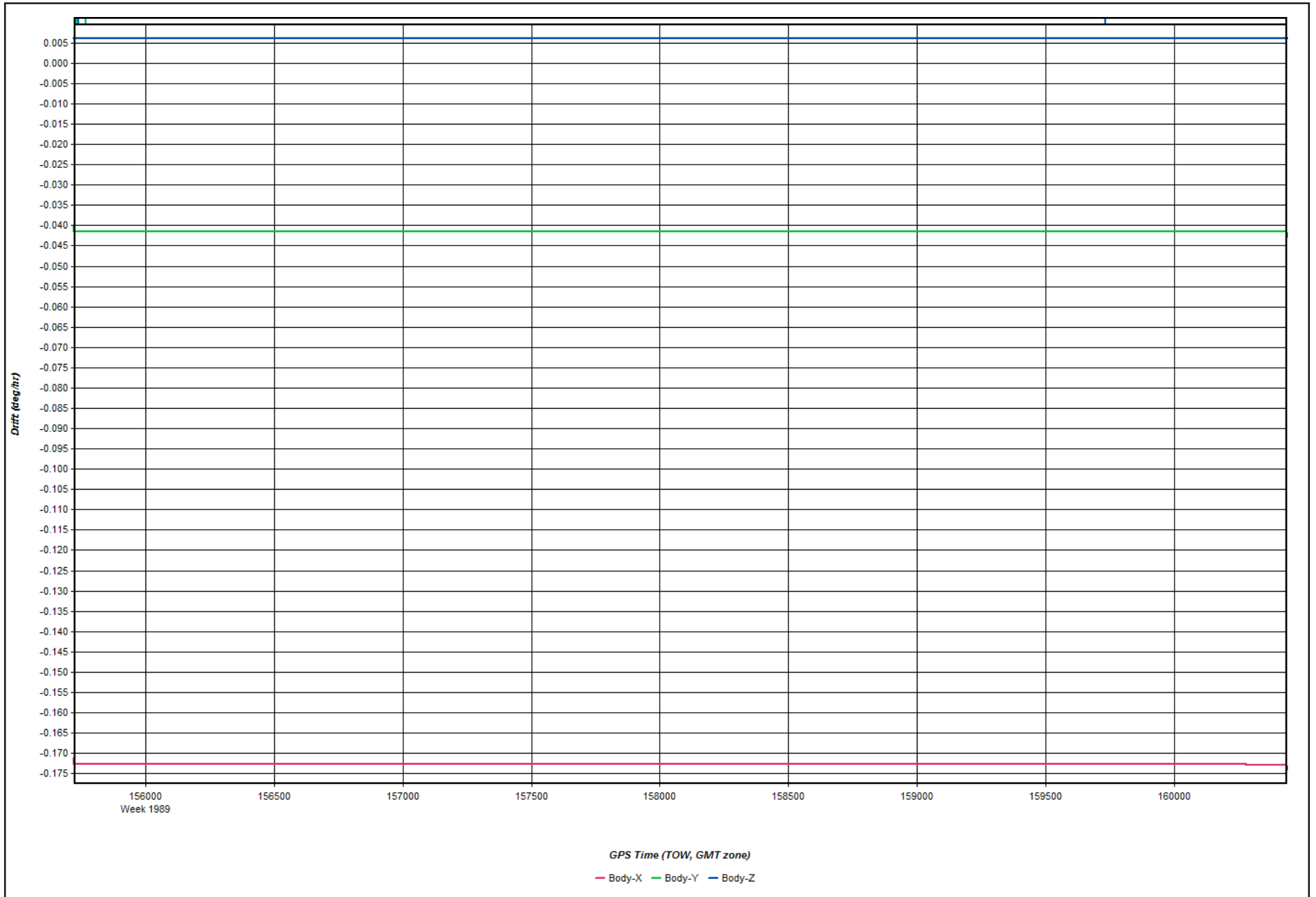
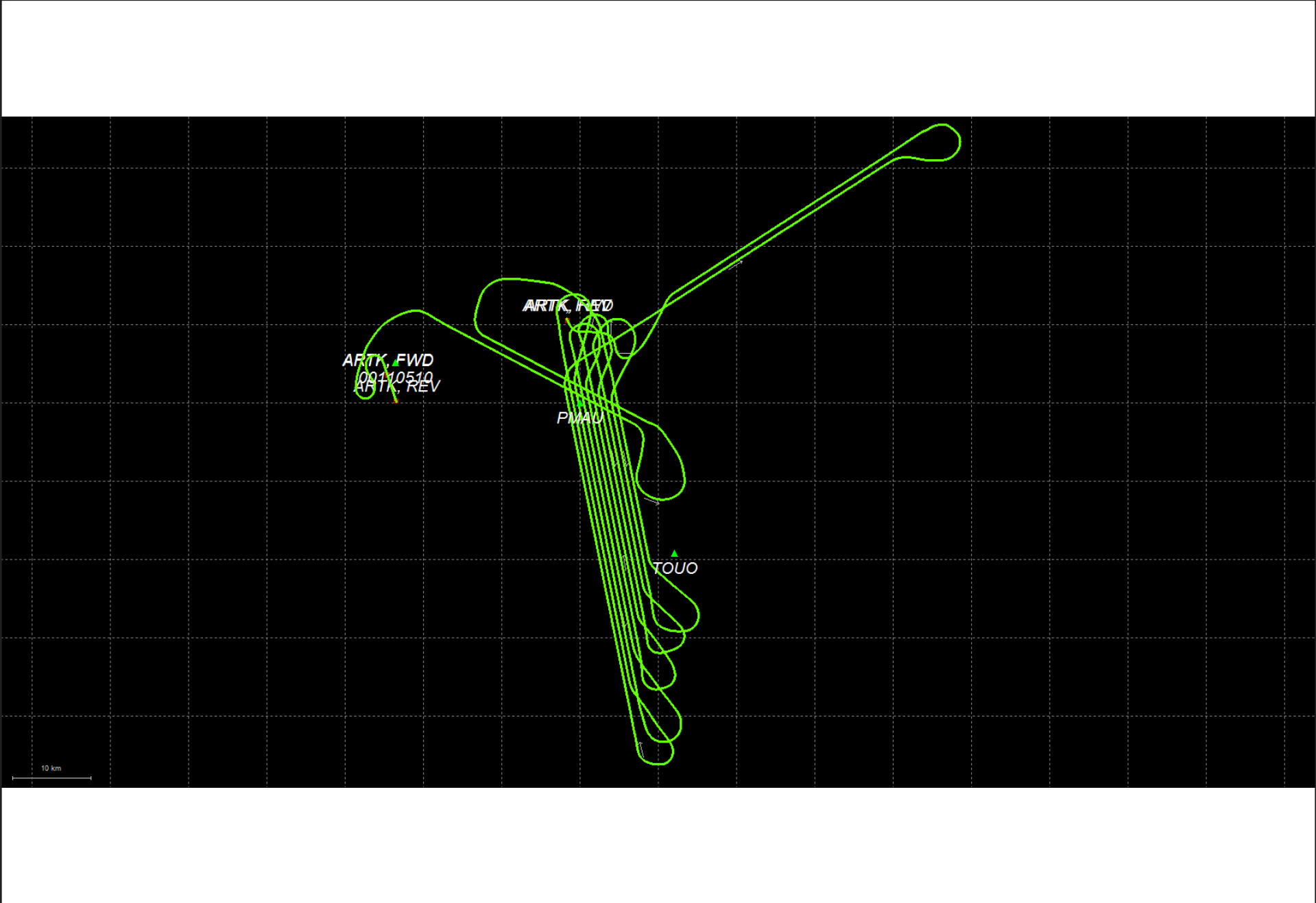
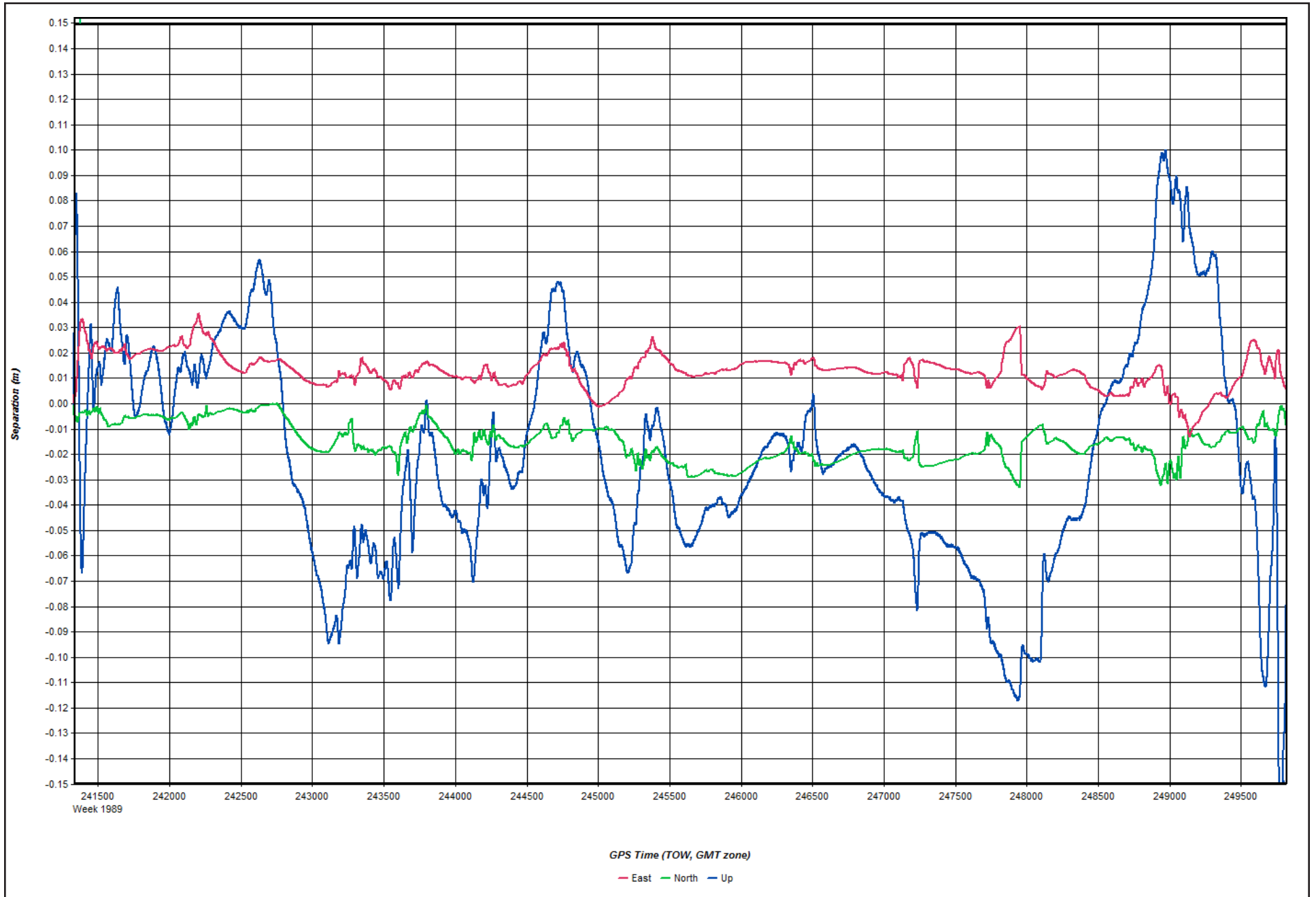


Figure 1: Map



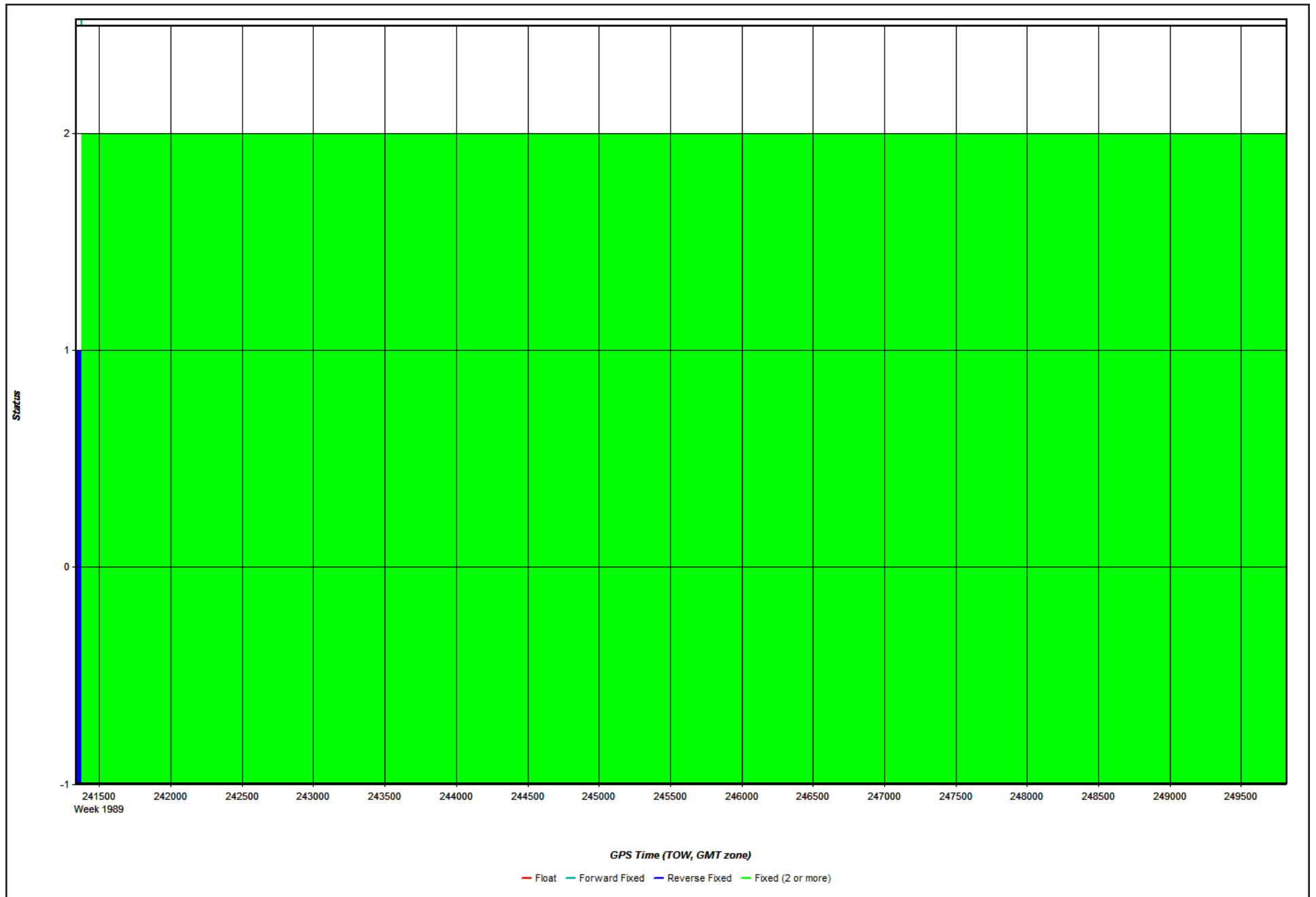
2018-02-20_Day051_7 - 20180220182610

Figure 2: Forward/Reverse or Combined Separation Plot



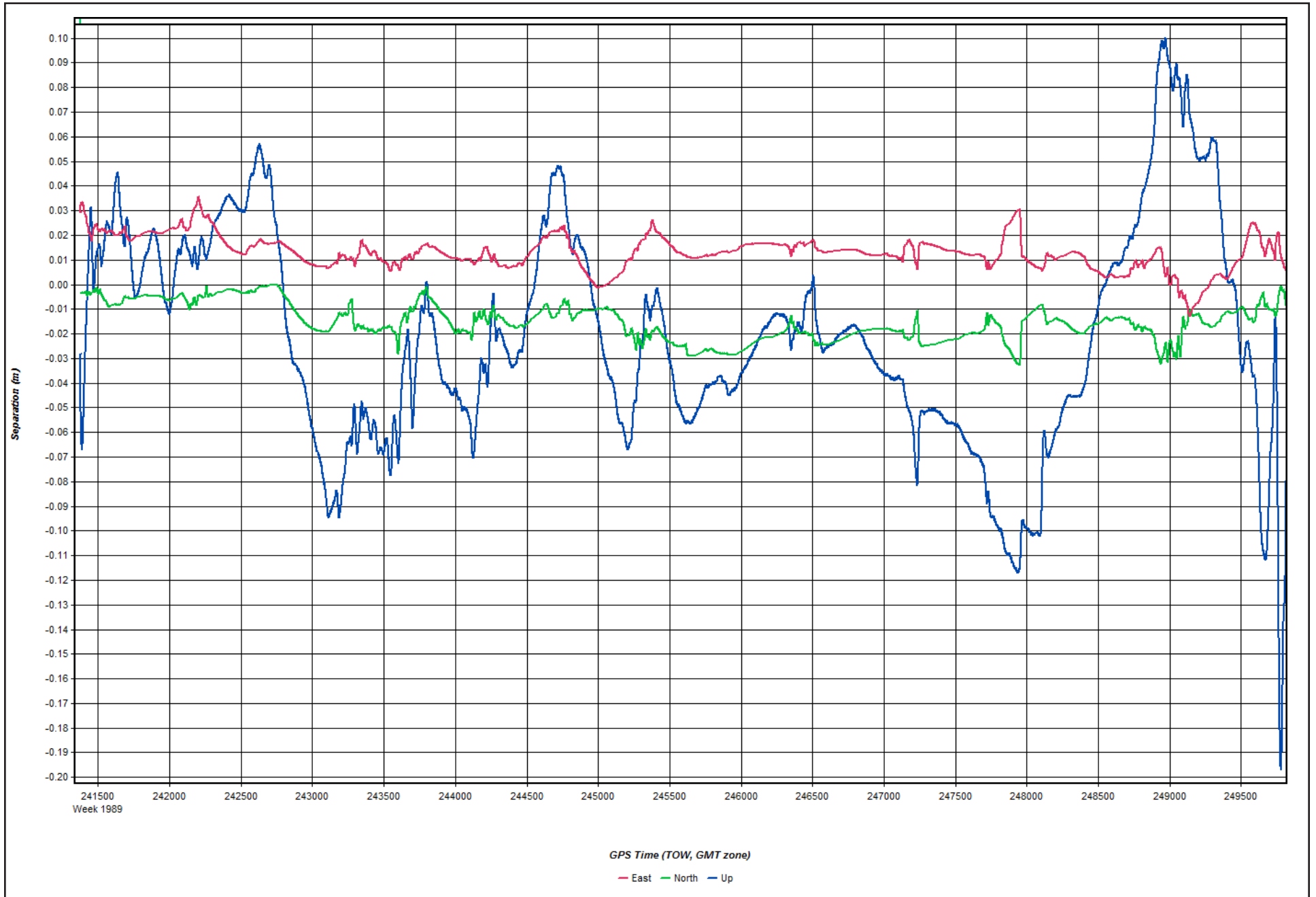
2018-02-20_Day051_7 - 20180220182610

Figure 3: Float or Fixed Ambiguity



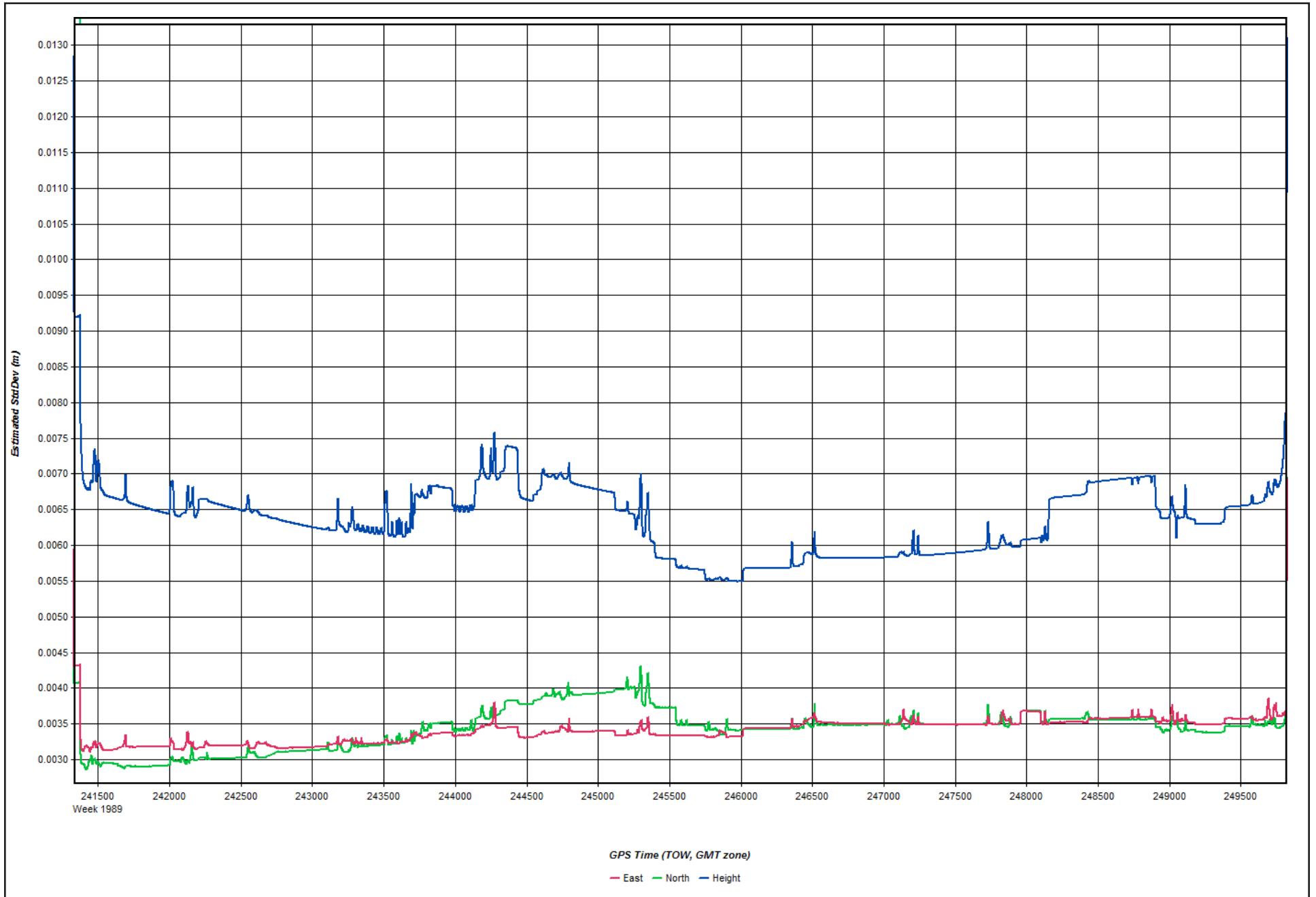
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Figure 4: Forward/Reverse Separation Plot (Fixed)



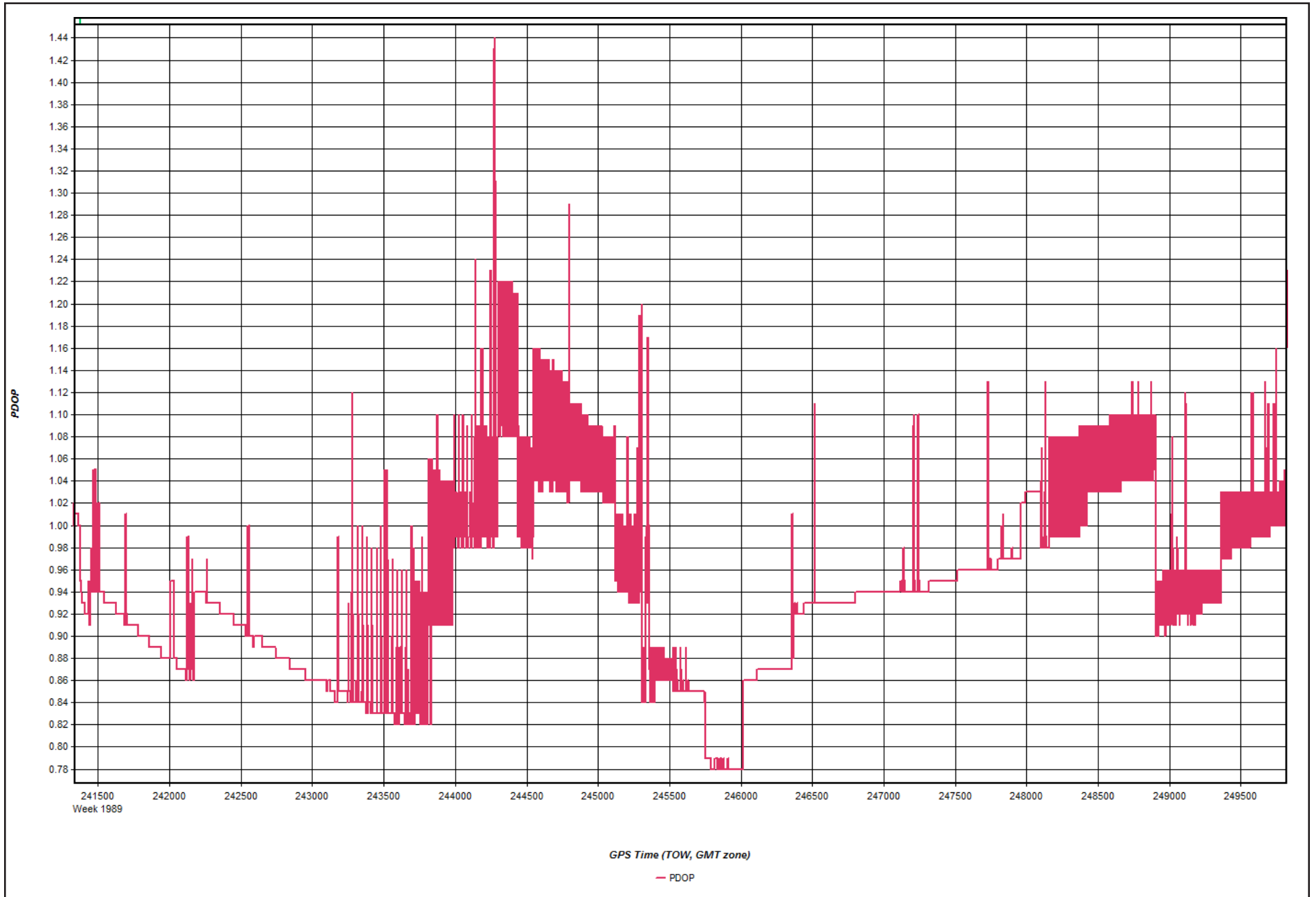
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Figure 5: Estimated Position Accuracy Plot



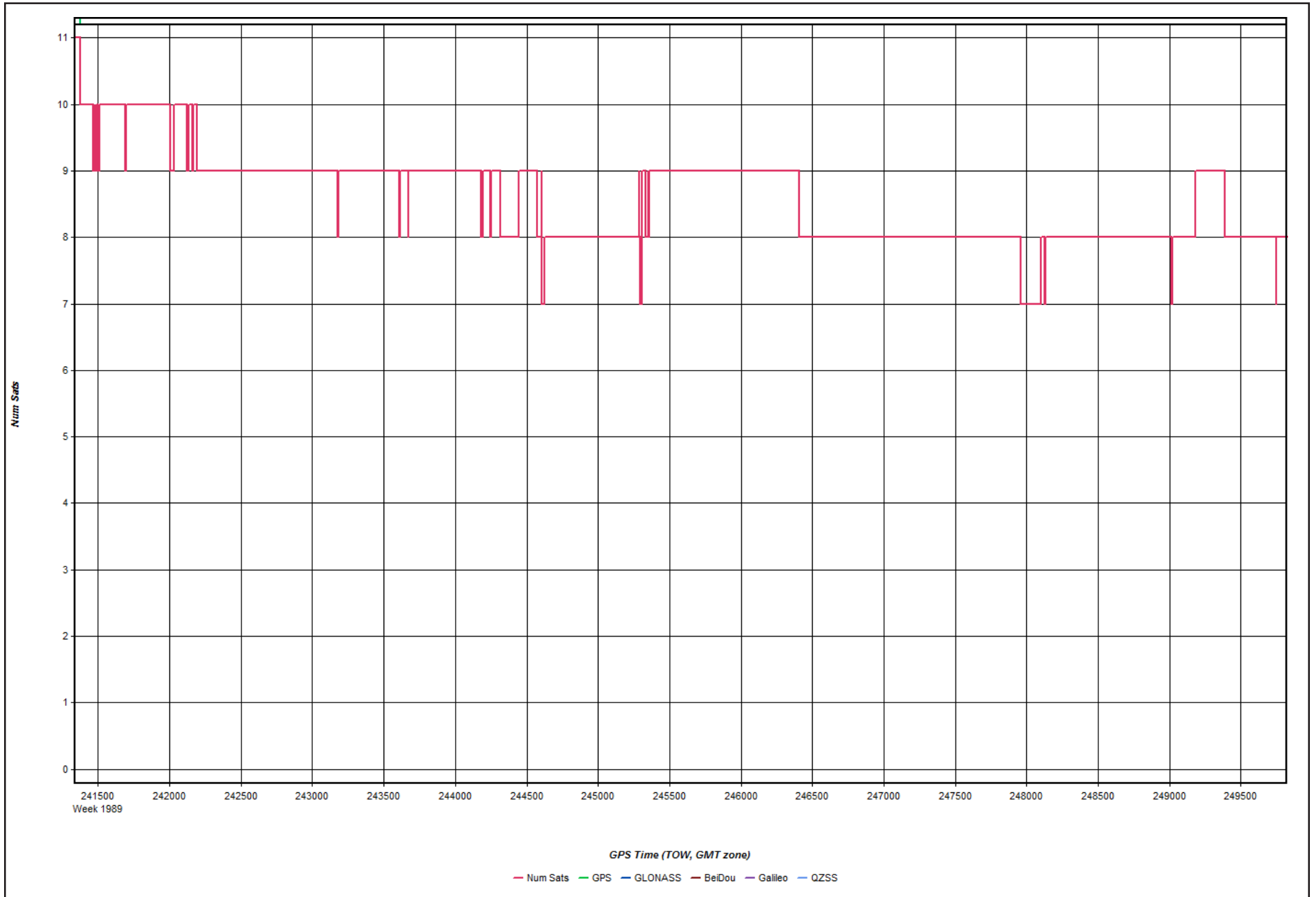
2018-02-20_Day051_7 - 20180220182610

Figure 6: PDOP Plot



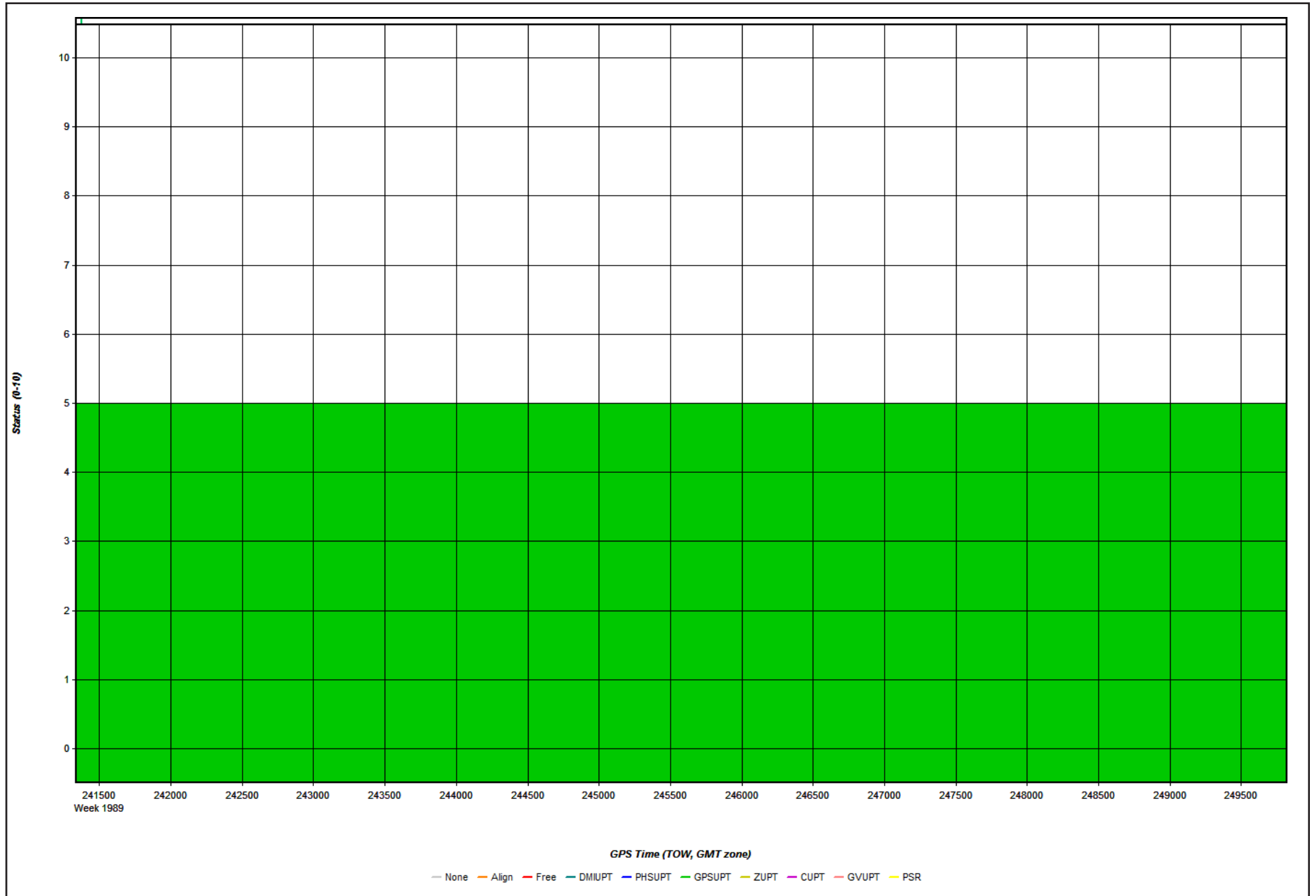
2018-02-20_Day051_7 - 20180220182610

Figure 7: Number of Satellites Line Plot



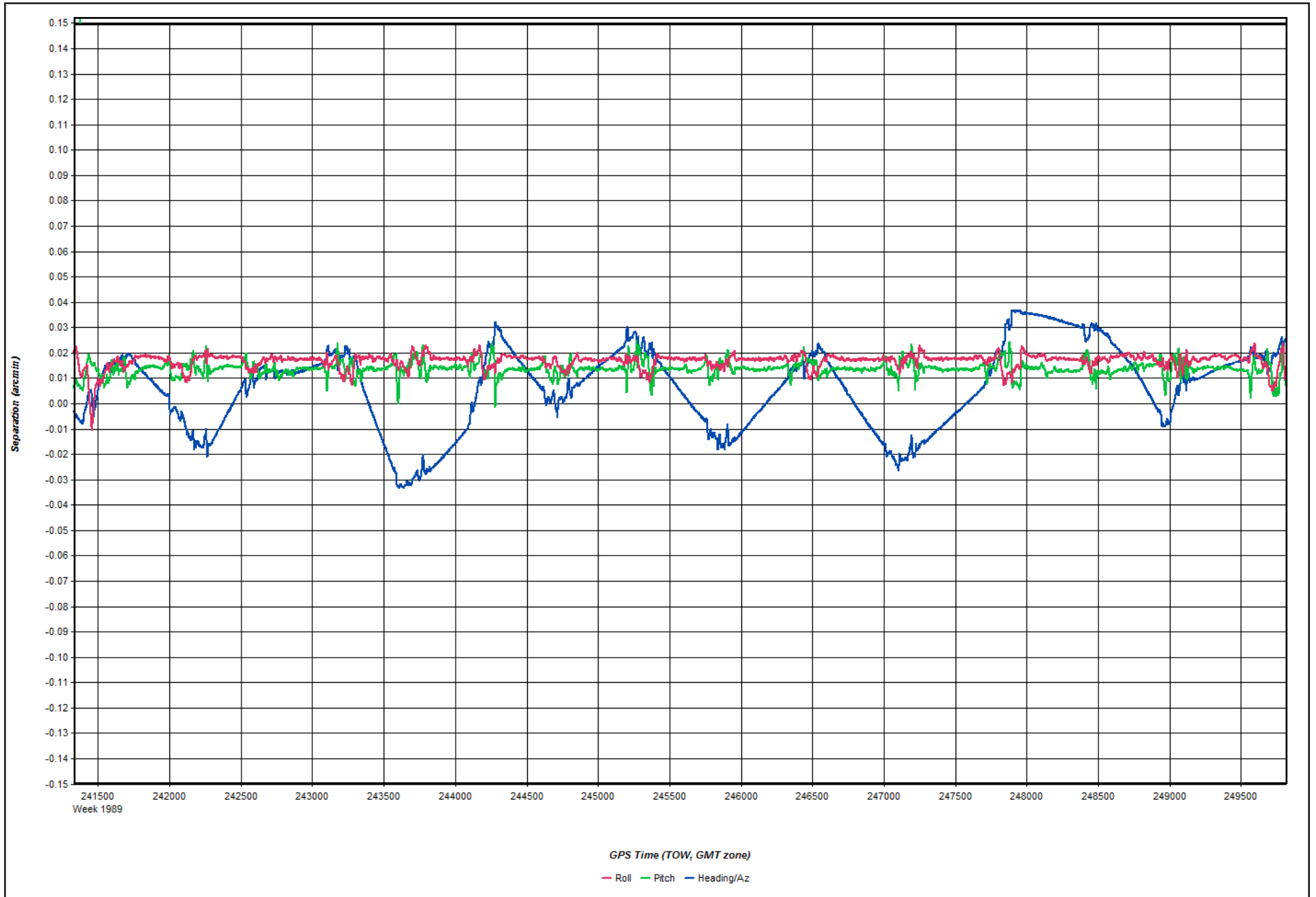
2018-02-20_Day051_7 - 20180220182610

Figure 8: Status flag for IMU processing



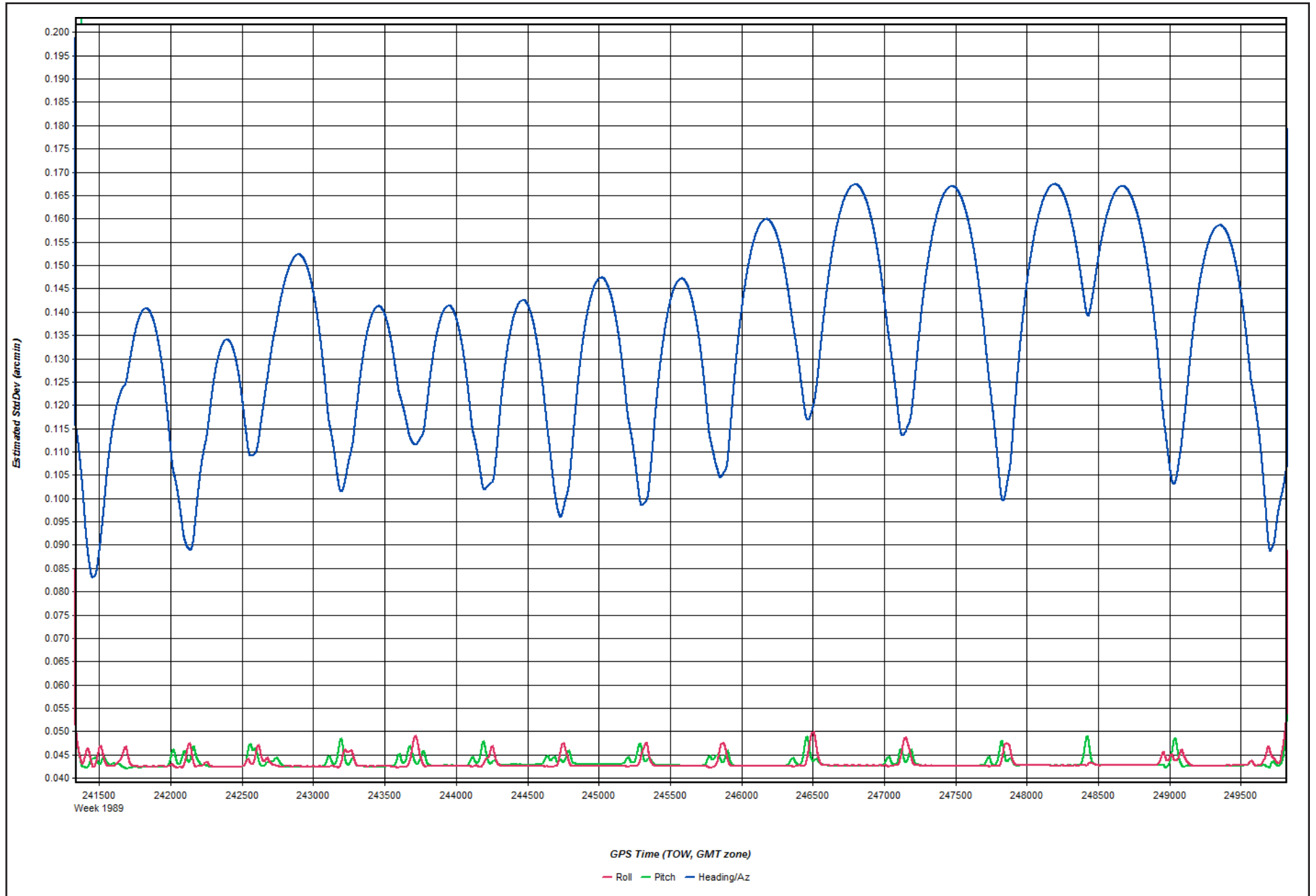
2018-02-20_Day051_7 - 20180220182610

Figure 9: Fwd/Rev Attitude Separation Plot



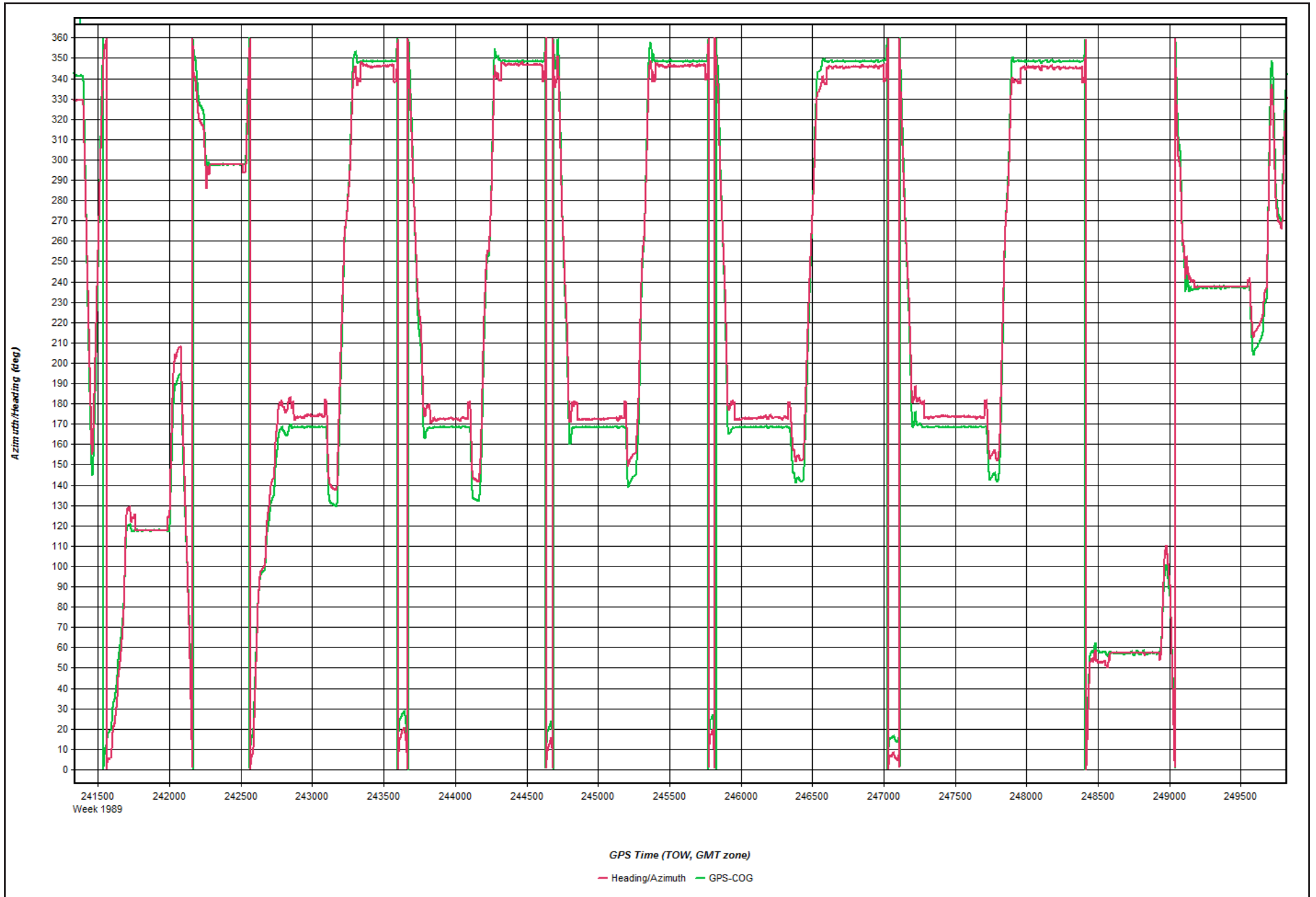
2018-02-20_Day051_7 - 20180220182610

Figure 10: Estimated Attitude Accuracy Plot



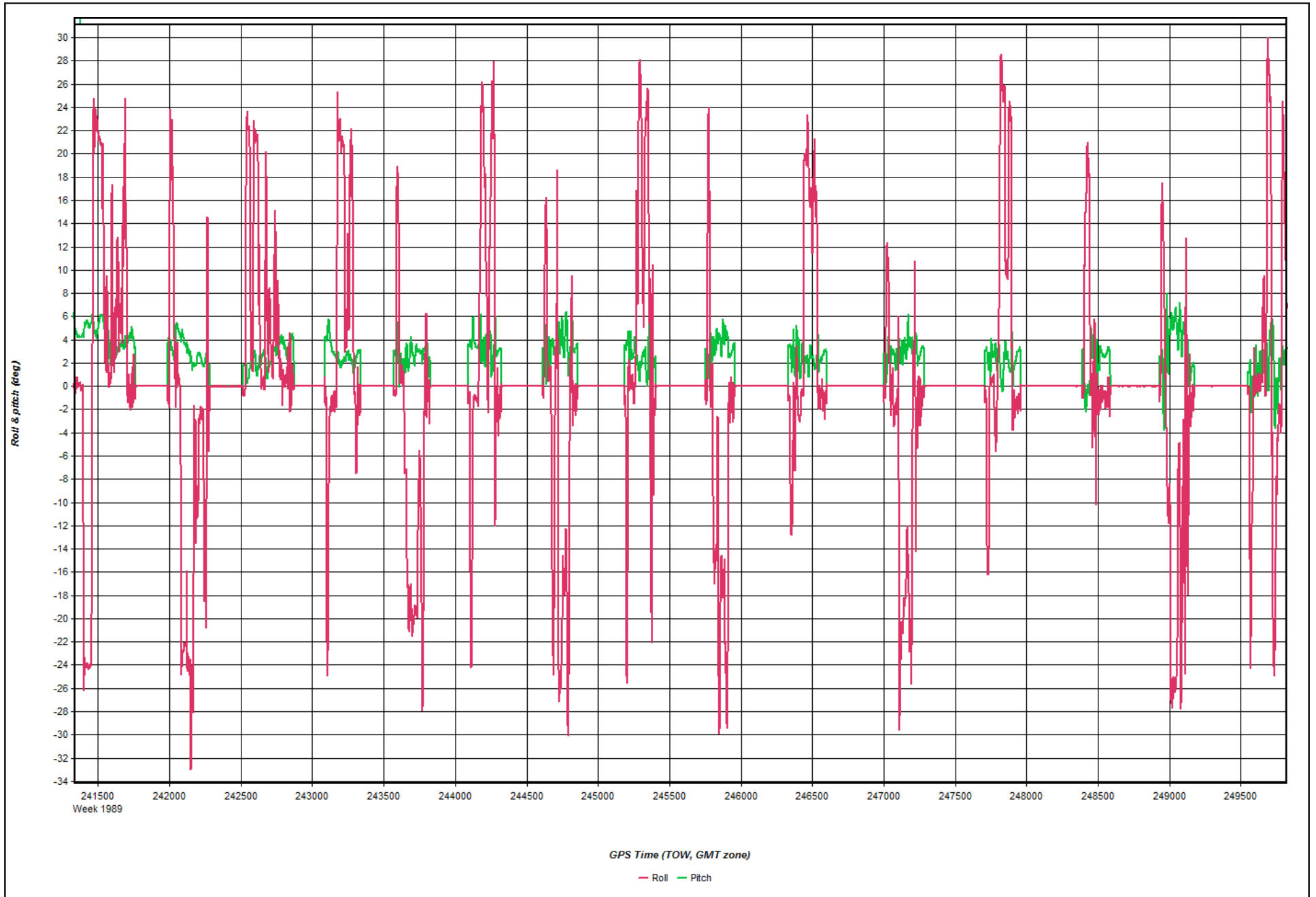
2018-02-20_Day051_7 - 20180220182610

Figure 11: Azimuth Plot



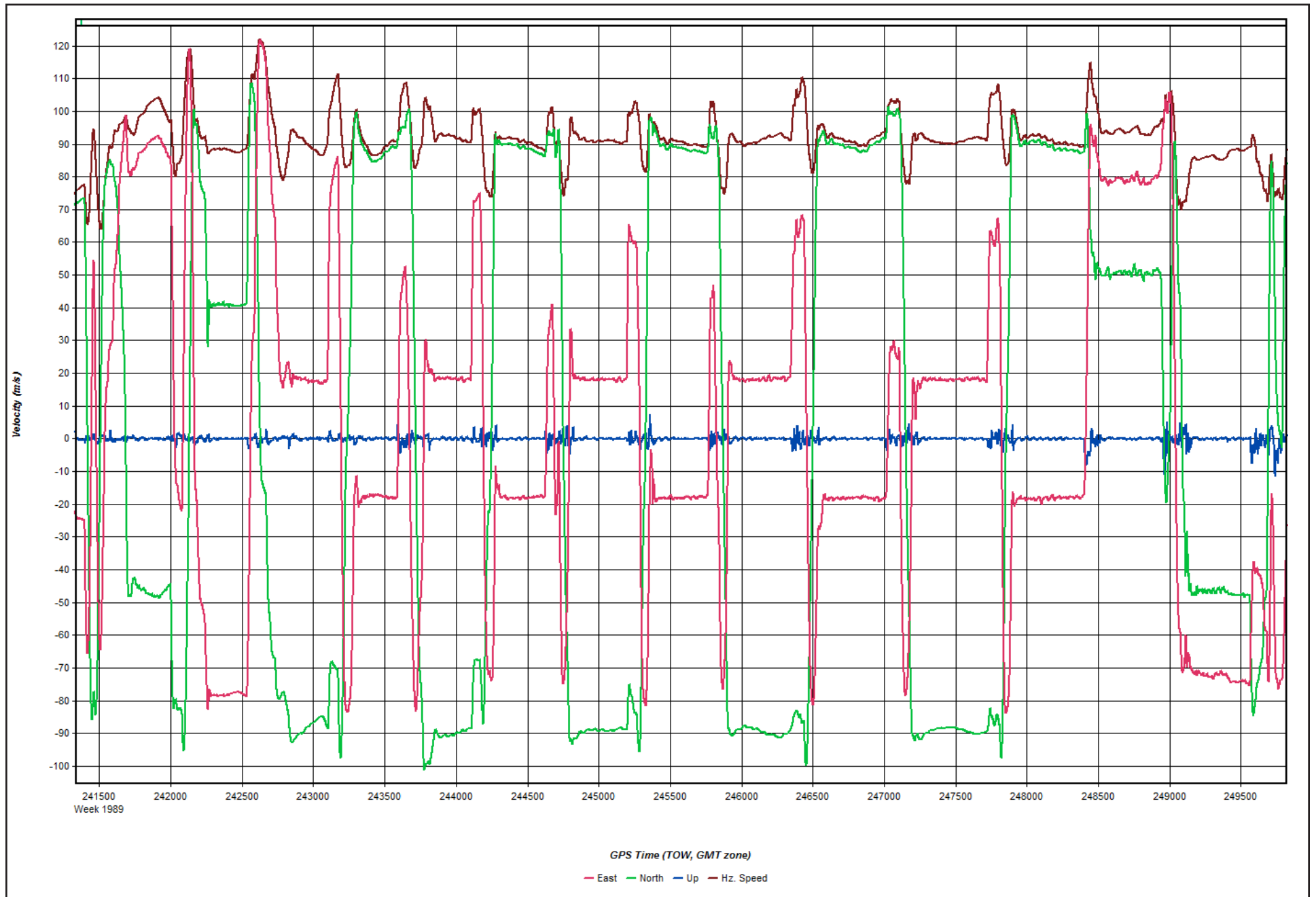
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Figure 12: Roll & Pitch Plot



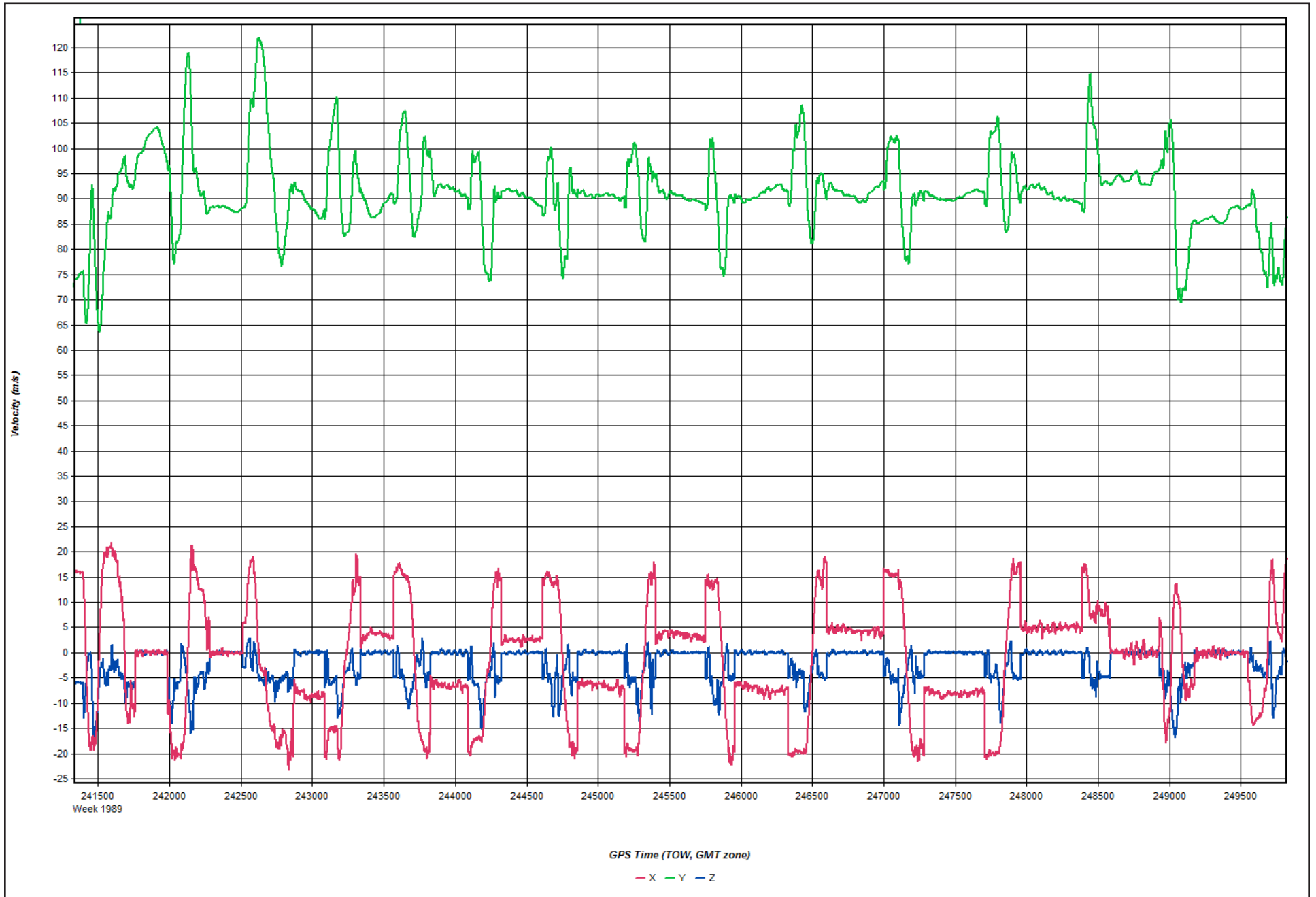
2018-02-20_Day051_7 - 20180220182610

Figure 13: Velocity Profile Plot



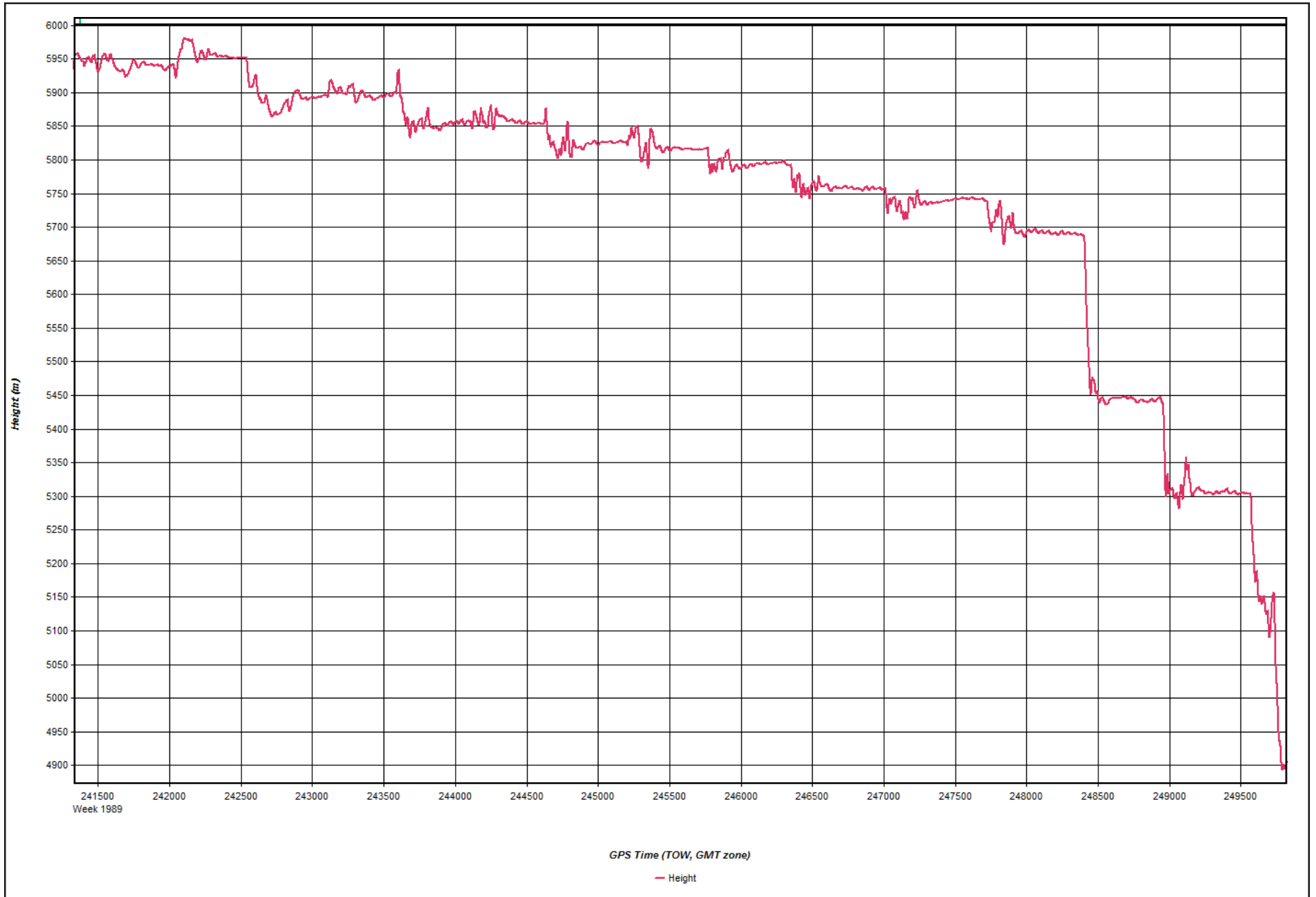
2018-02-20_Day051_7 - 20180220182610

Figure 14: Body Frame Velocity Plot



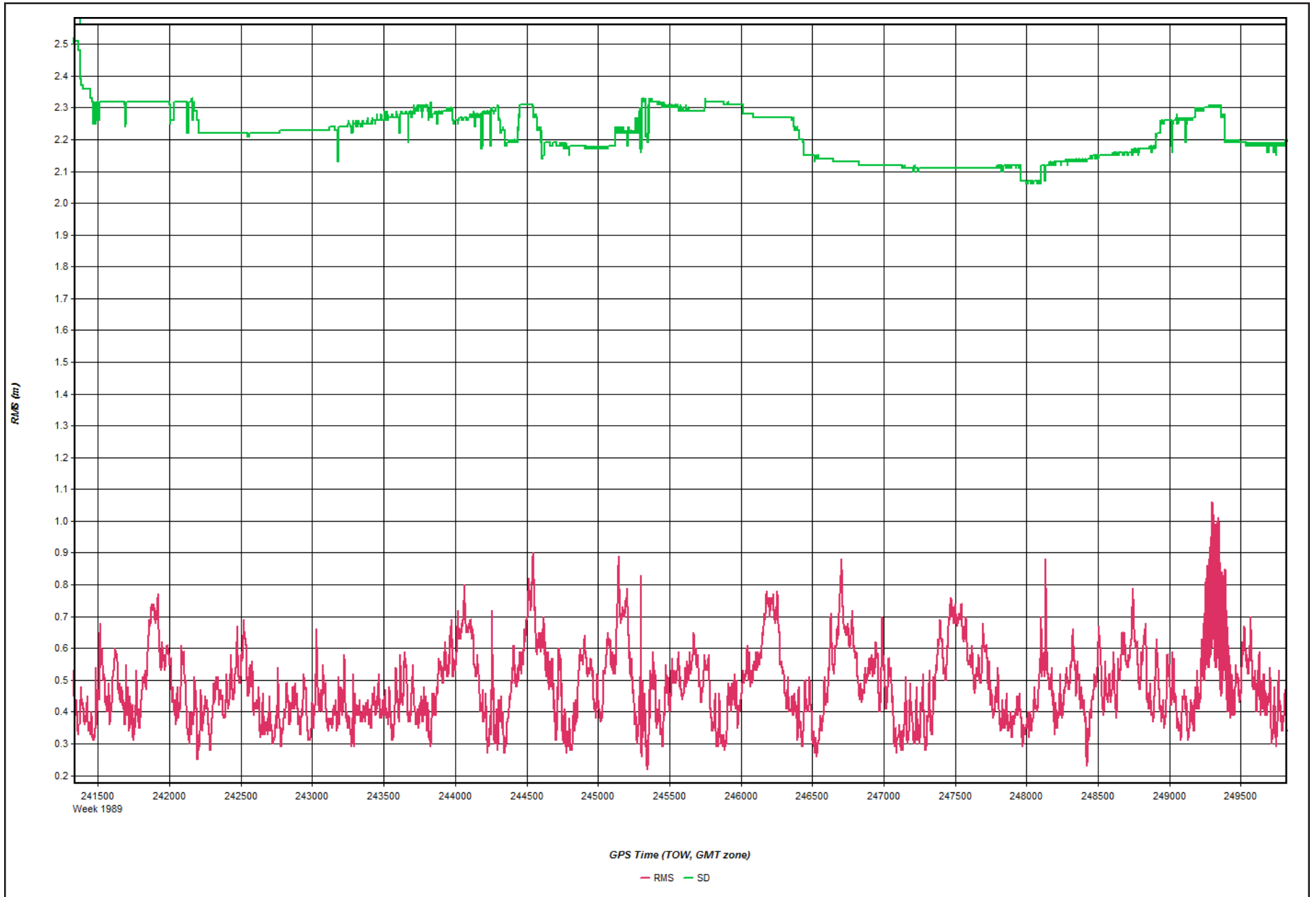
2018-02-20_Day051_7 - 20180220182610

Figure 15: Height Profile Plot



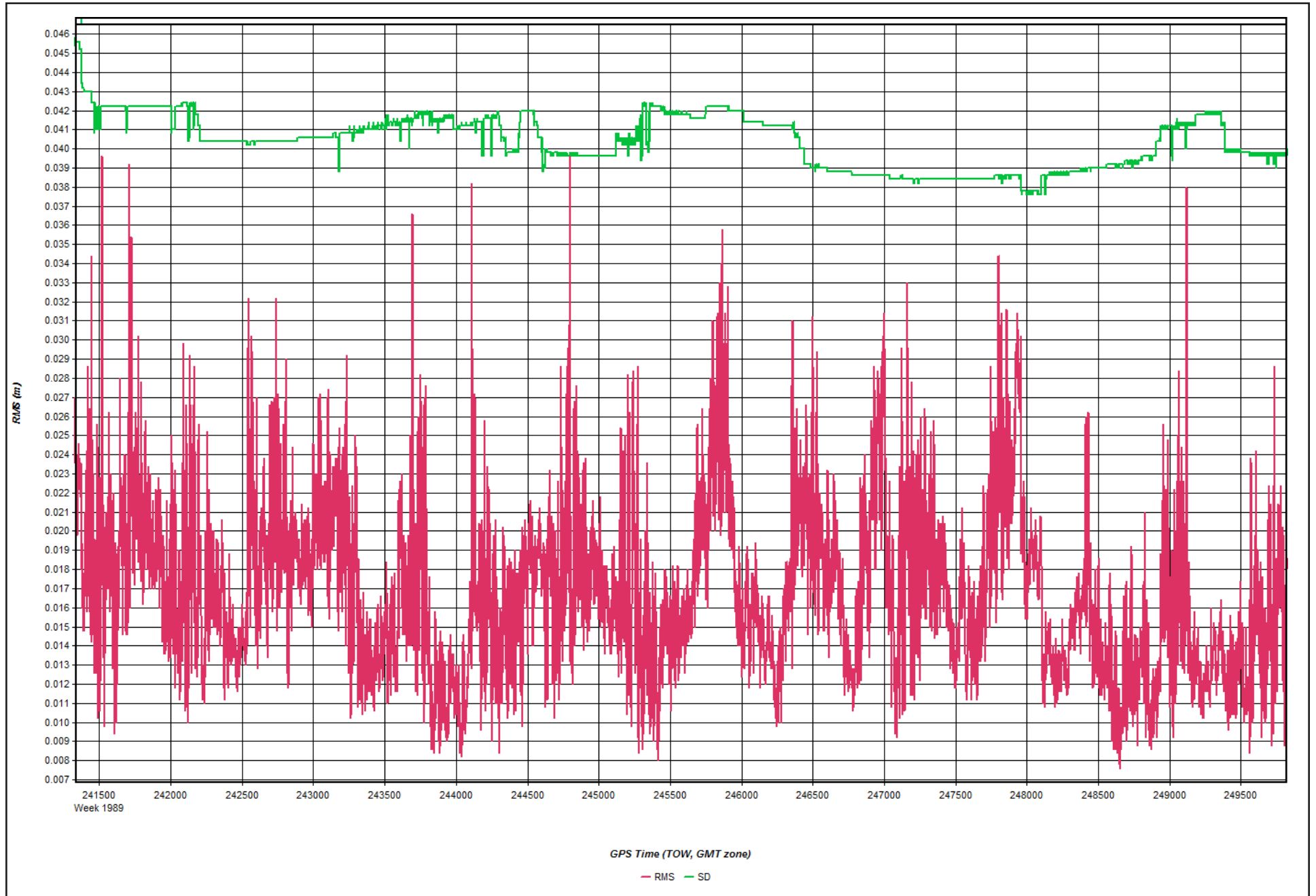
2018-02-20_Day051_7 - 20180220182610

Figure 16: C/A Code Residual RMS Plot



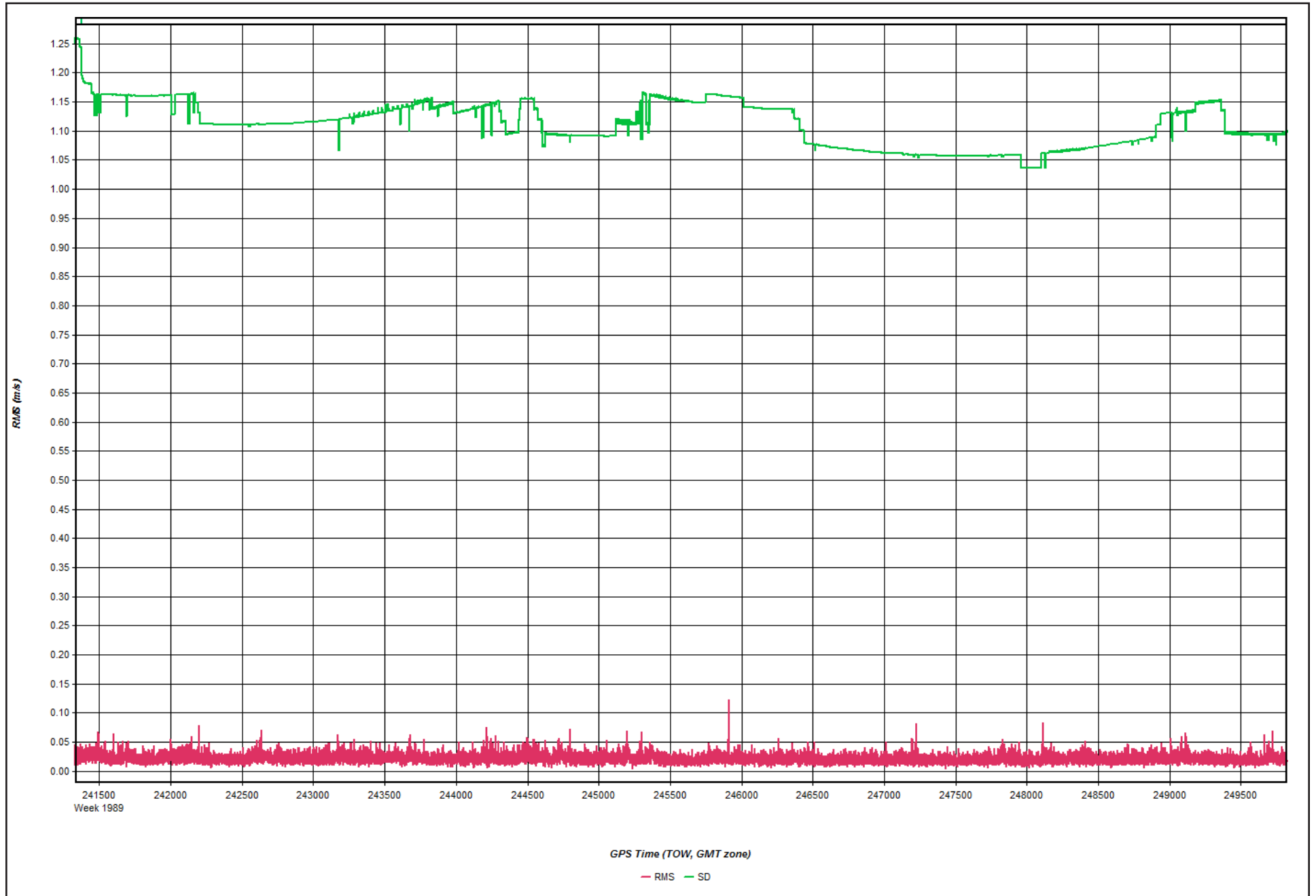
2018-02-20_Day051_7 - 20180220182610

Figure 17: Carrier Residual RMS Plot



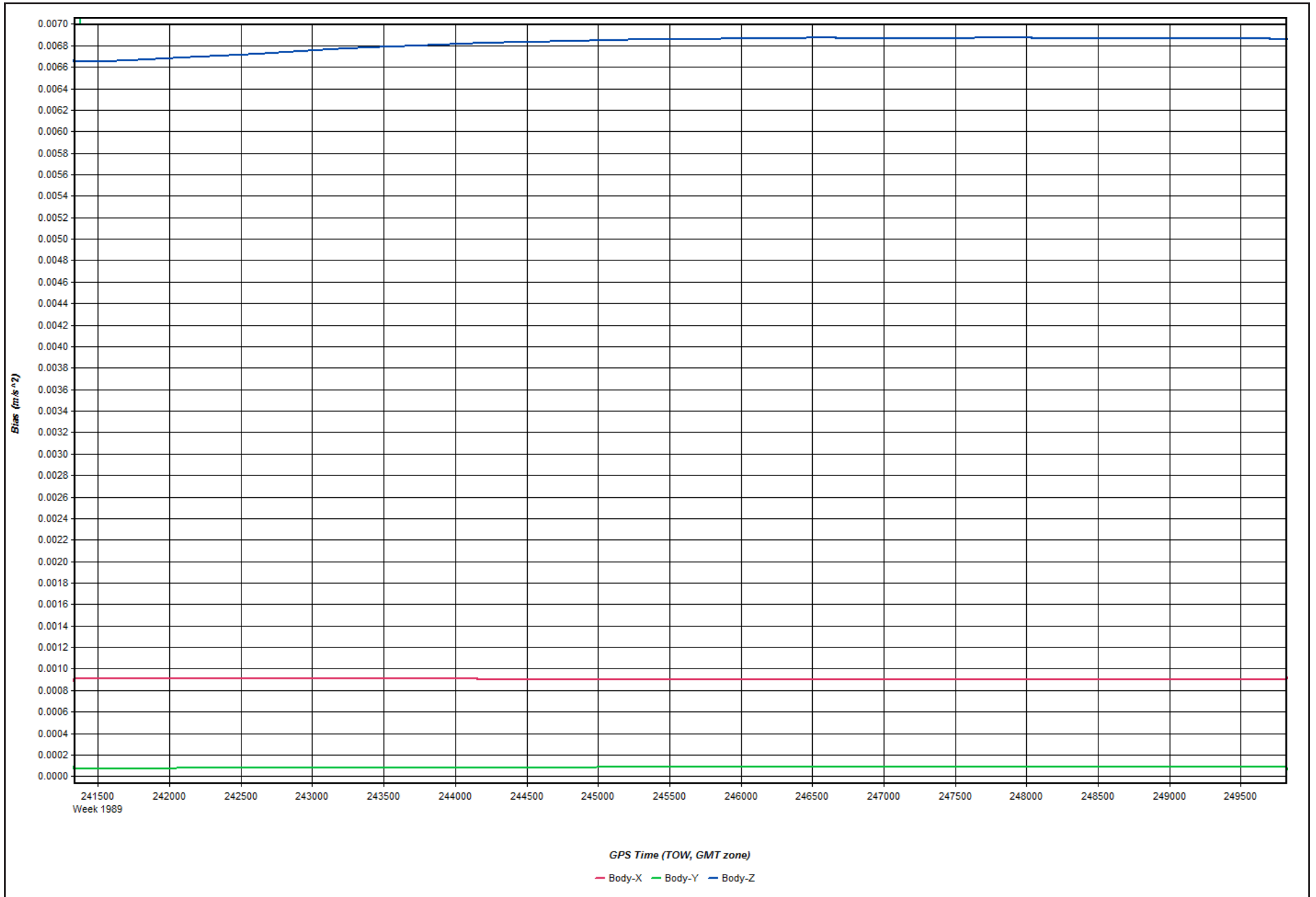
2018-02-20_Day051_7 - 20180220182610

Figure 18: L1 Doppler Residual RMS Plot



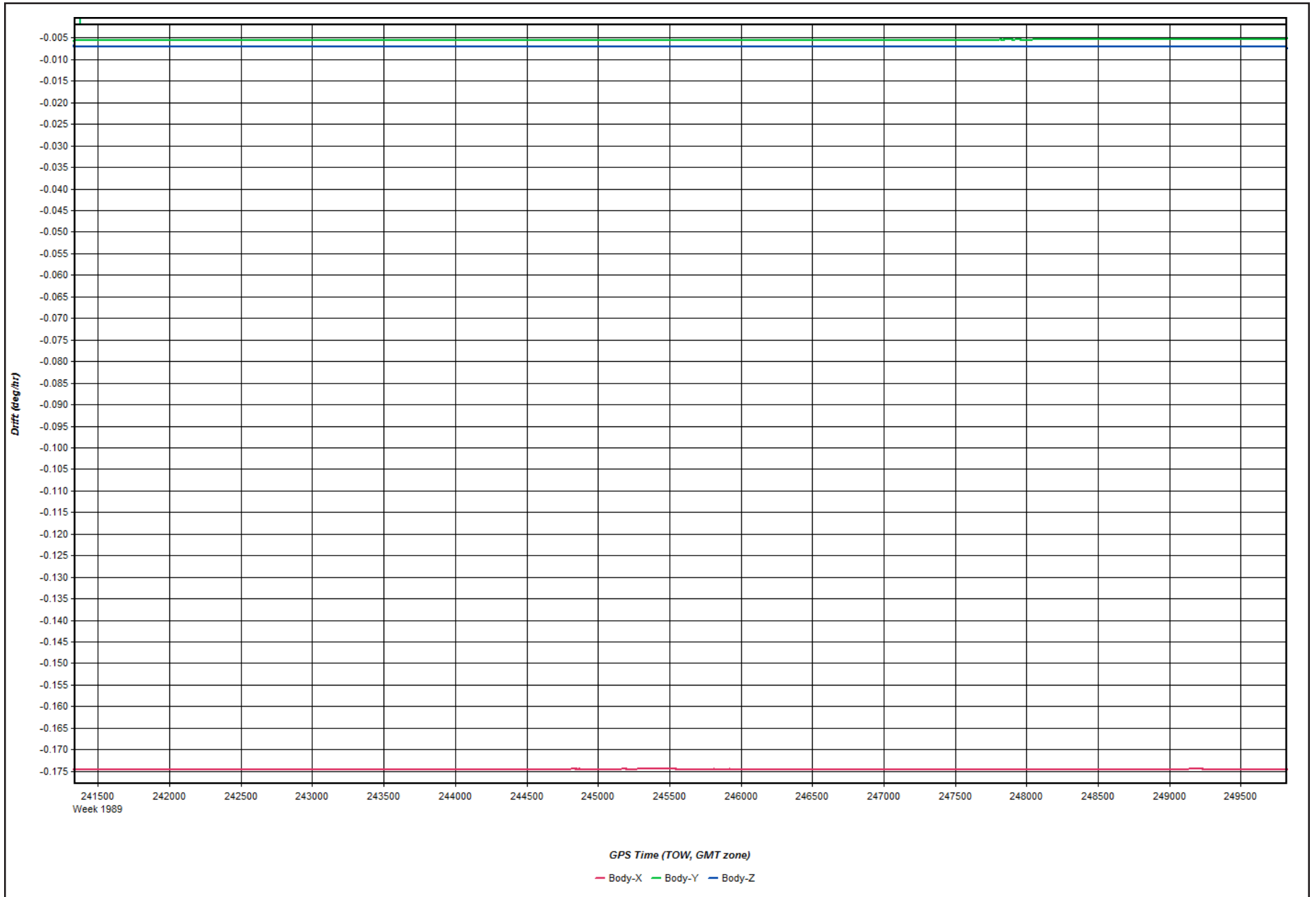
2018-02-20_Day051_7 - 20180220182610

Figure 19: Accelerometer Bias Plot



2018-02-20_Day051_7 - 20180220182610

Figure 20: Gyro Drift Plot



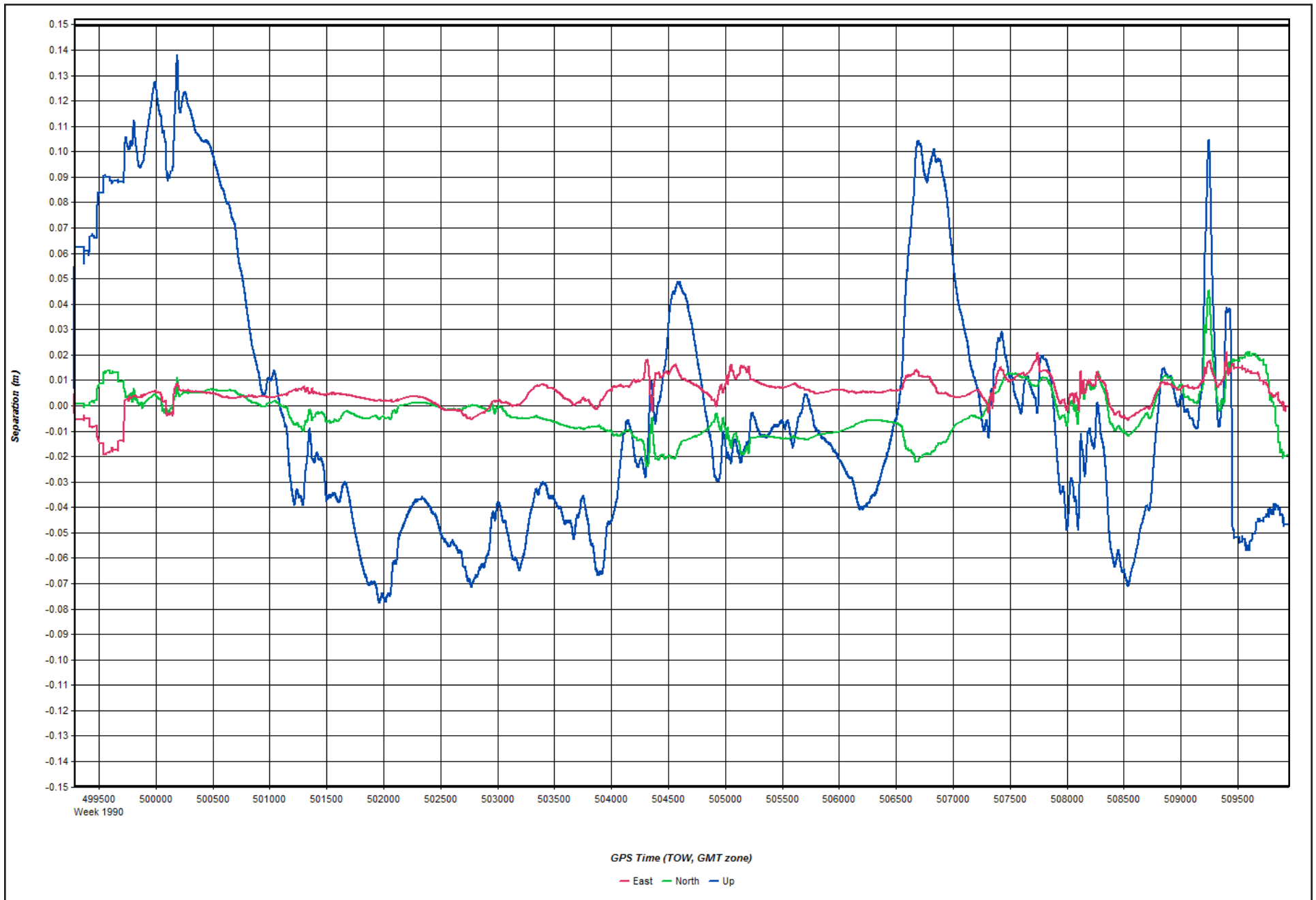
2018-03-02_Day061_7 - 20180302184020

Figure 1: Map



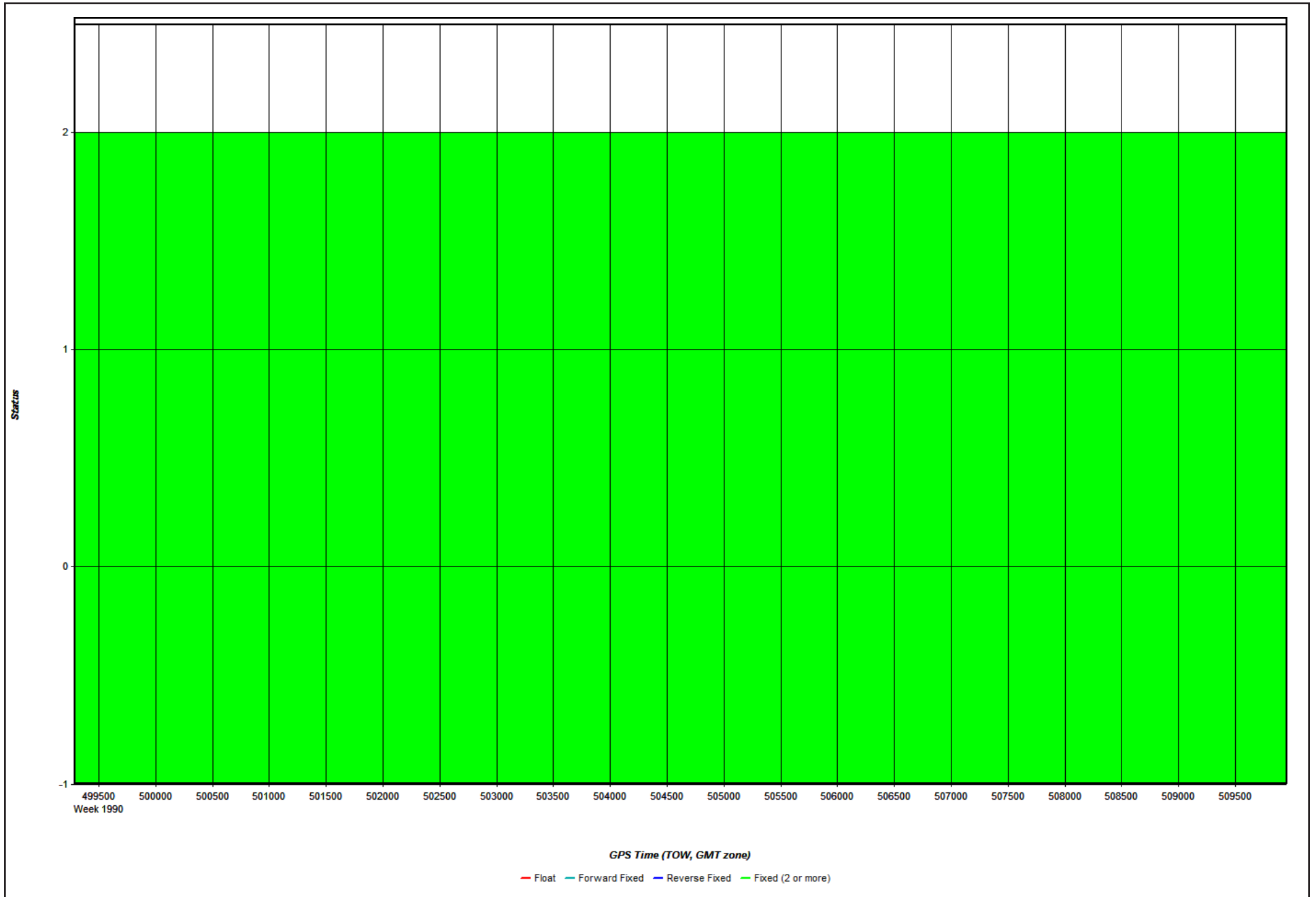
2018-03-02_Day061_7 - 20180302184020

Figure 2: Forward/Reverse or Combined Separation Plot



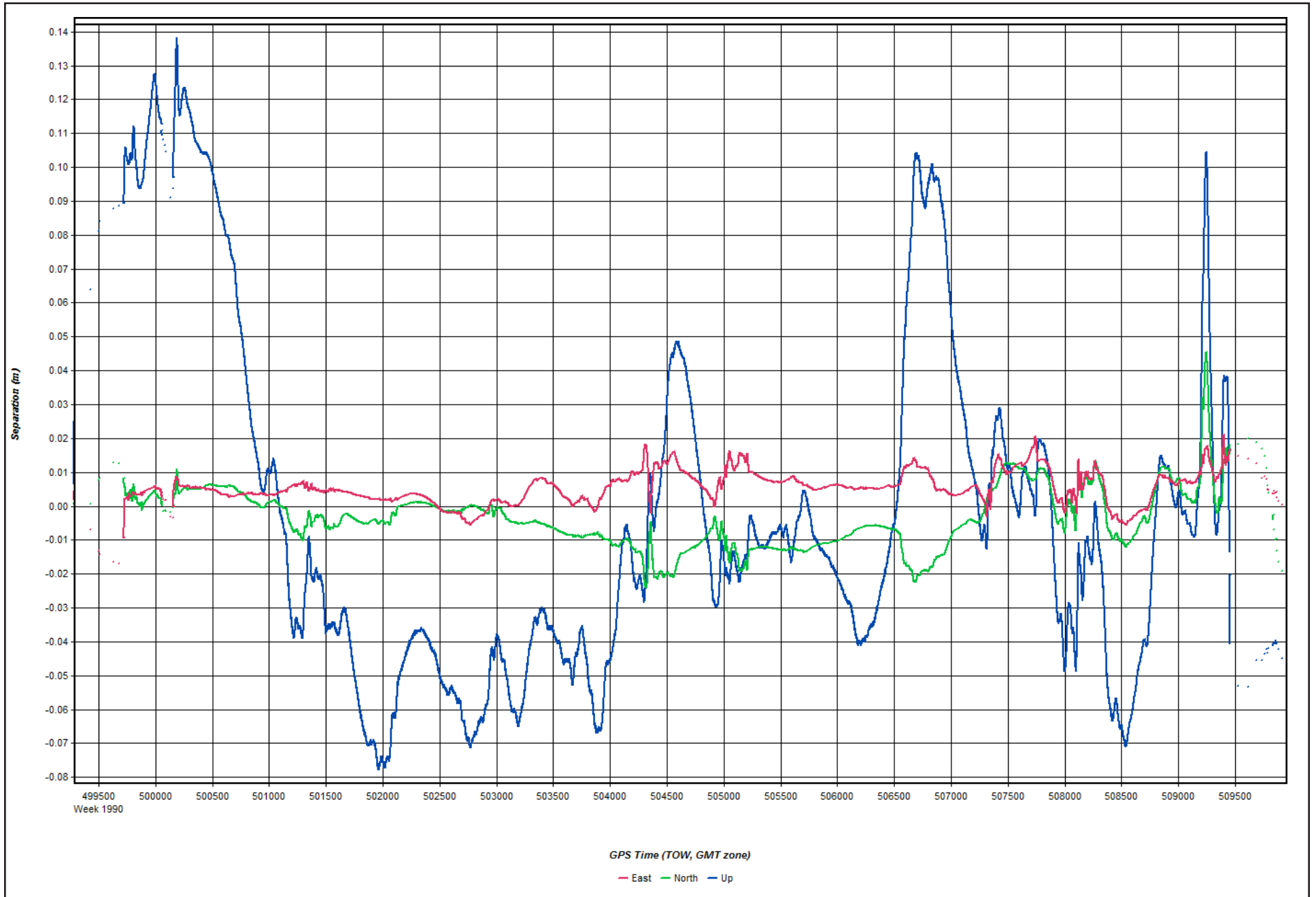
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Figure 3: Float or Fixed Ambiguity



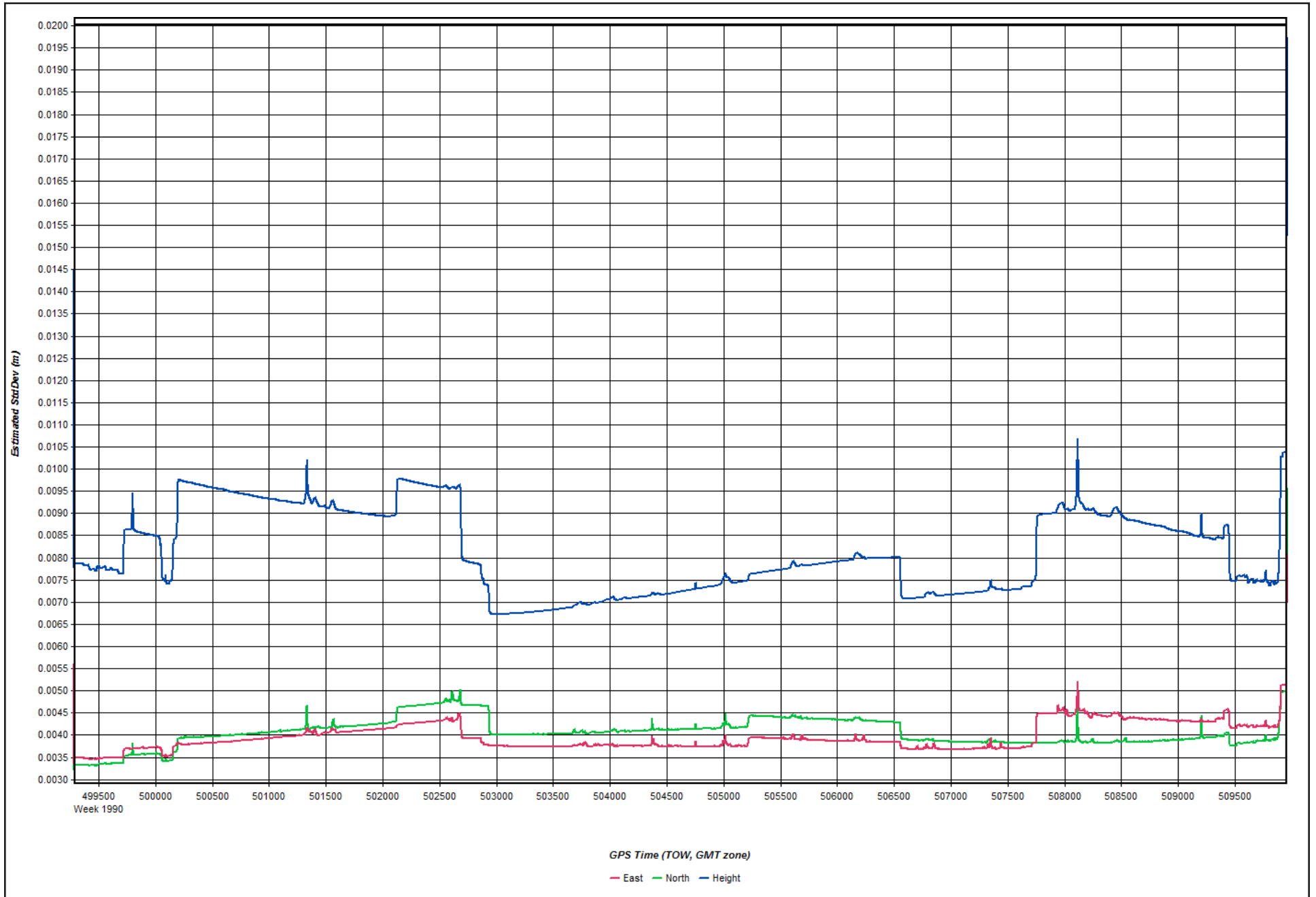
2018-03-02_Day061_7 - 20180302184020

Figure 4: Forward/Reverse Separation Plot (Fixed)



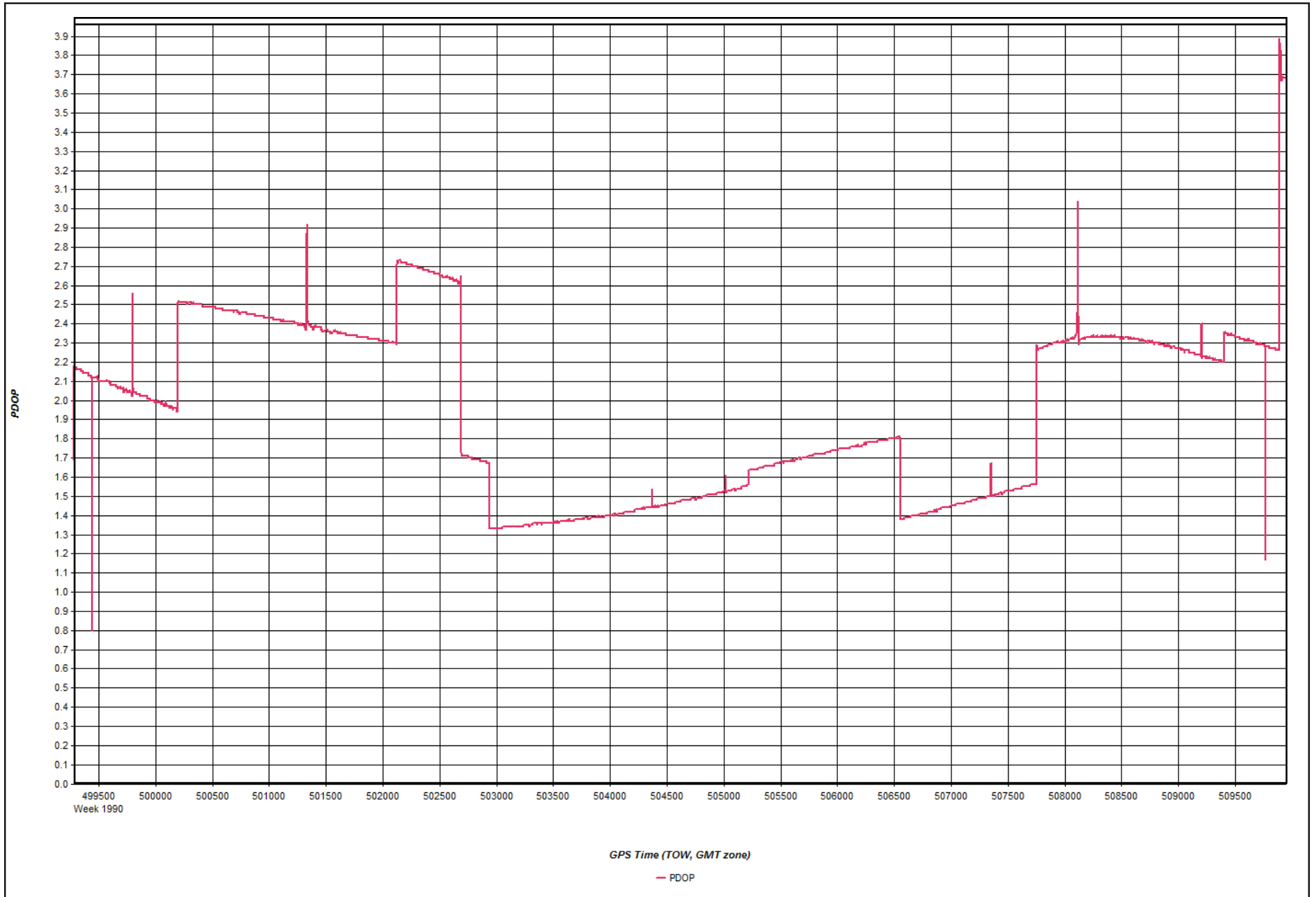
2018-03-02_Day061_7 - 20180302184020

Figure 5: Estimated Position Accuracy Plot



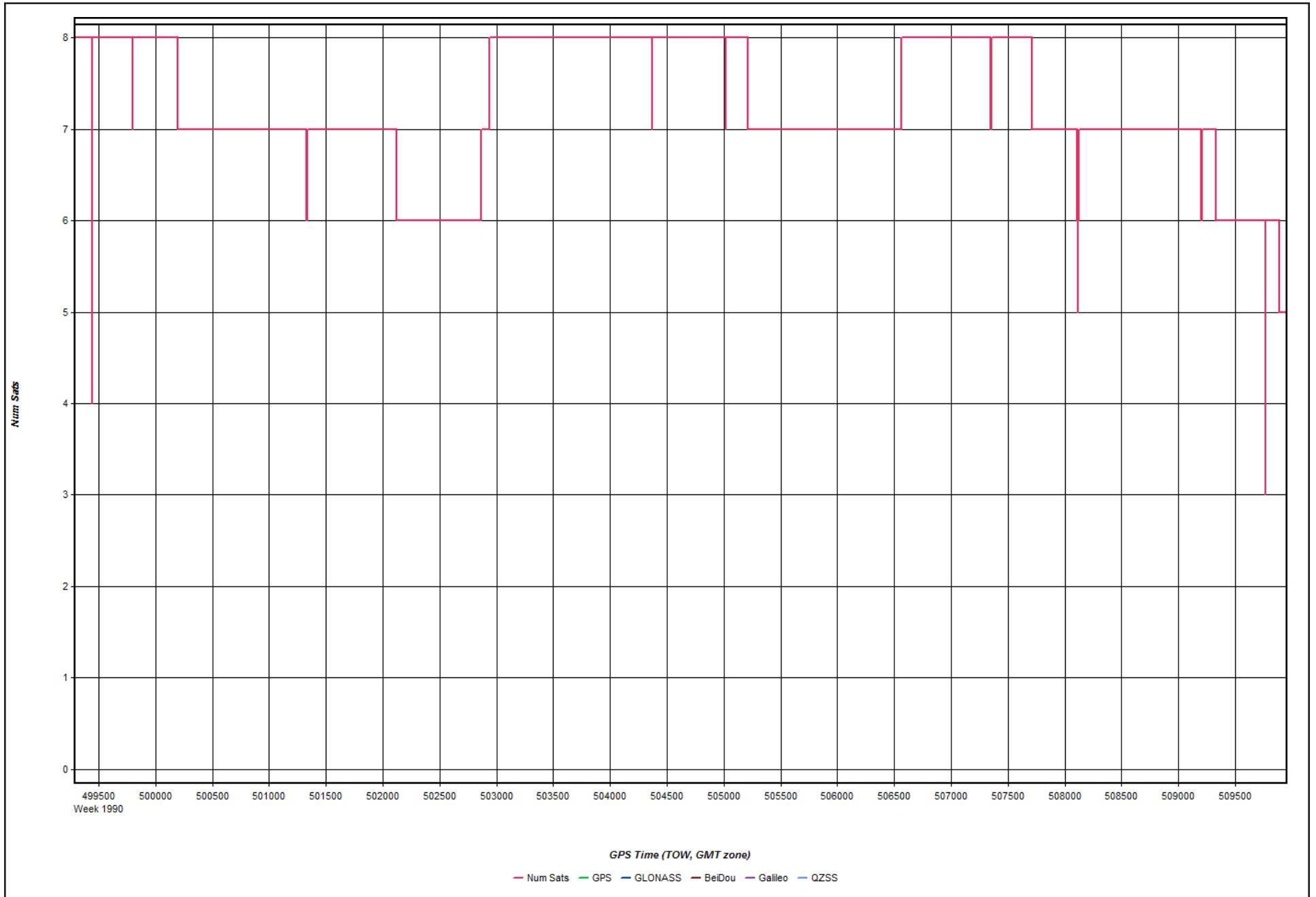
2018-03-02_Day061_7 - 20180302184020

Figure 6: PDOP Plot



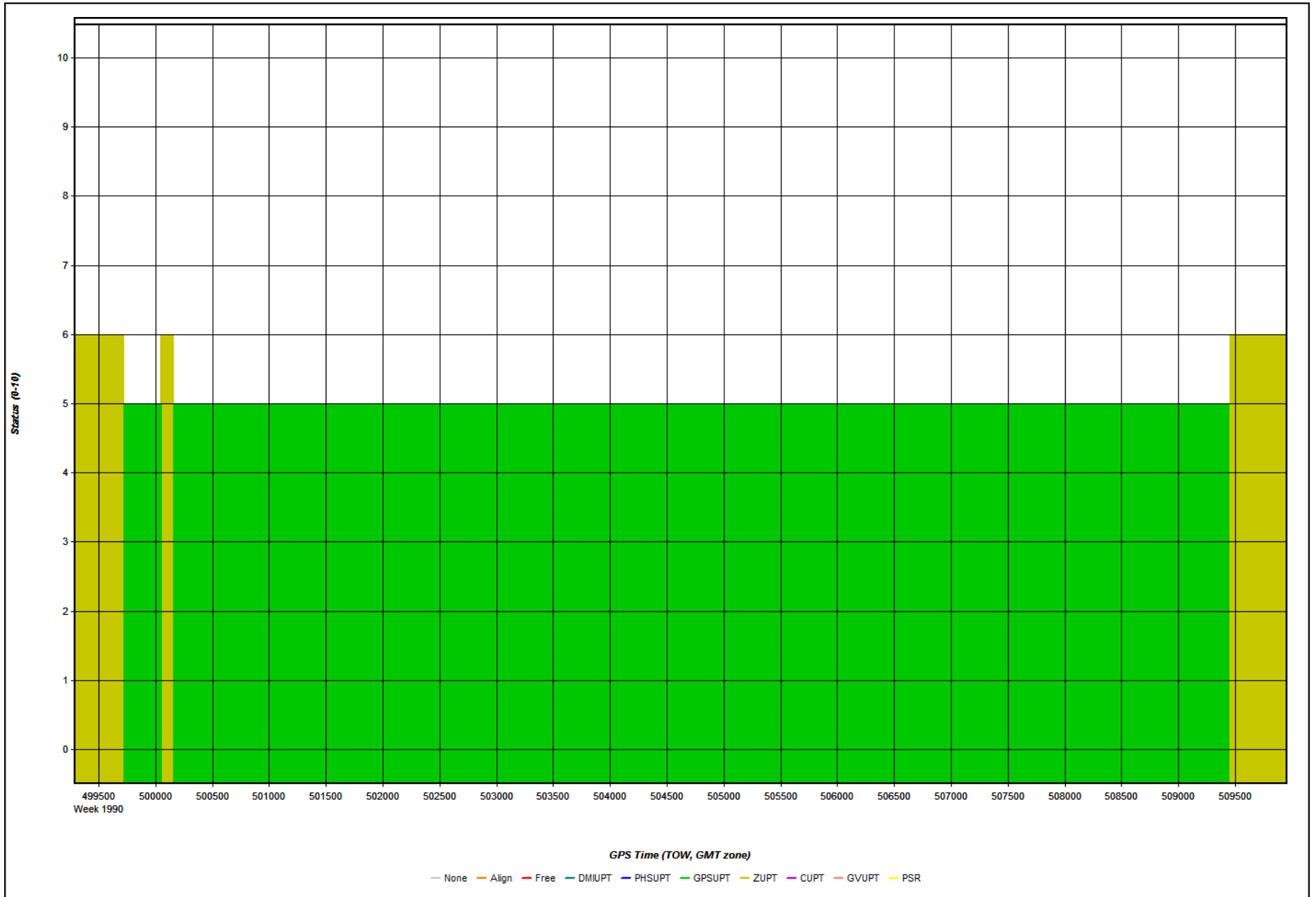
2018-03-02_Day061_7 - 20180302184020

Figure 7: Number of Satellites Line Plot



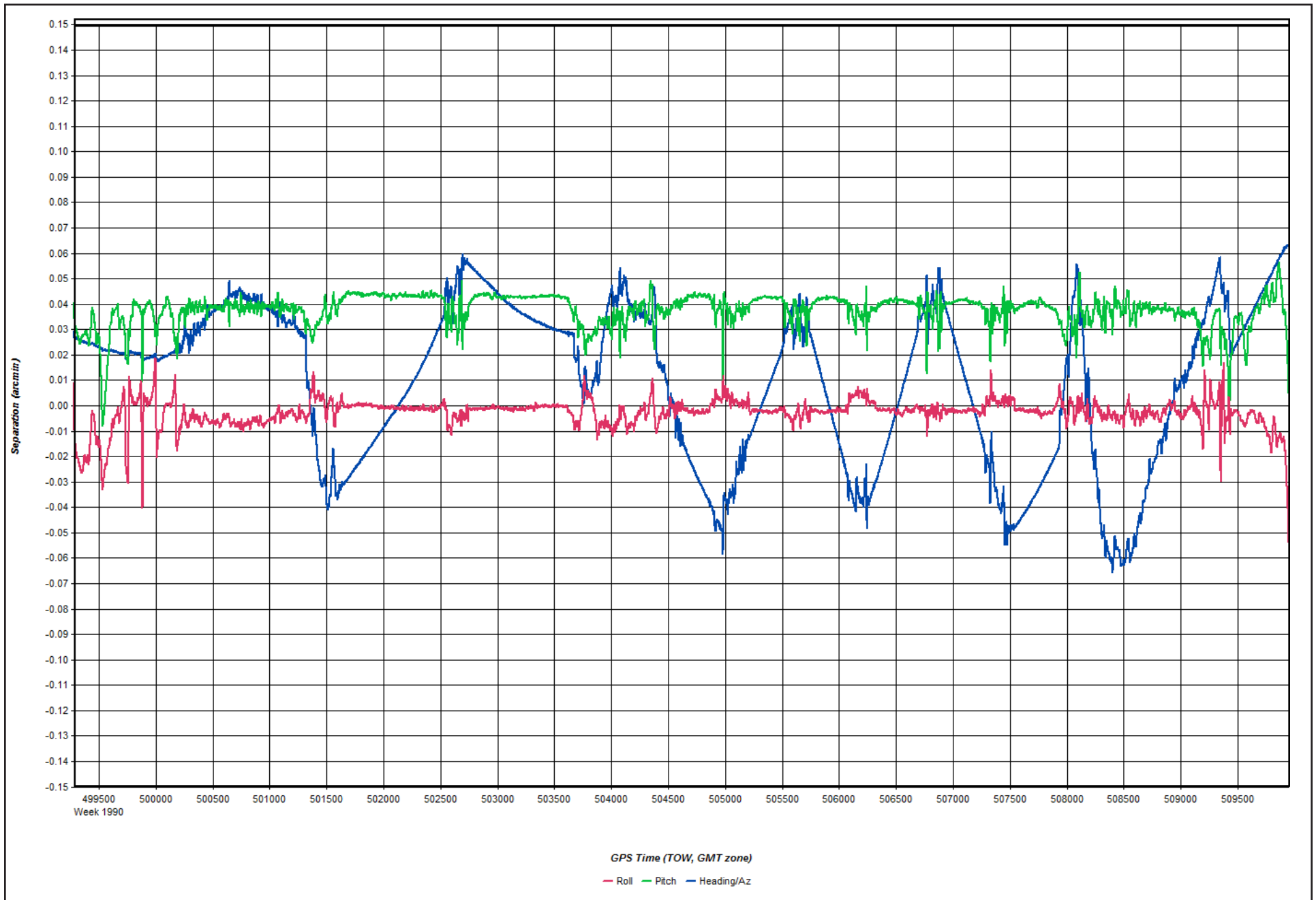
2018-03-02_Day061_7 - 20180302184020

Figure 8: Status flag for IMU processing



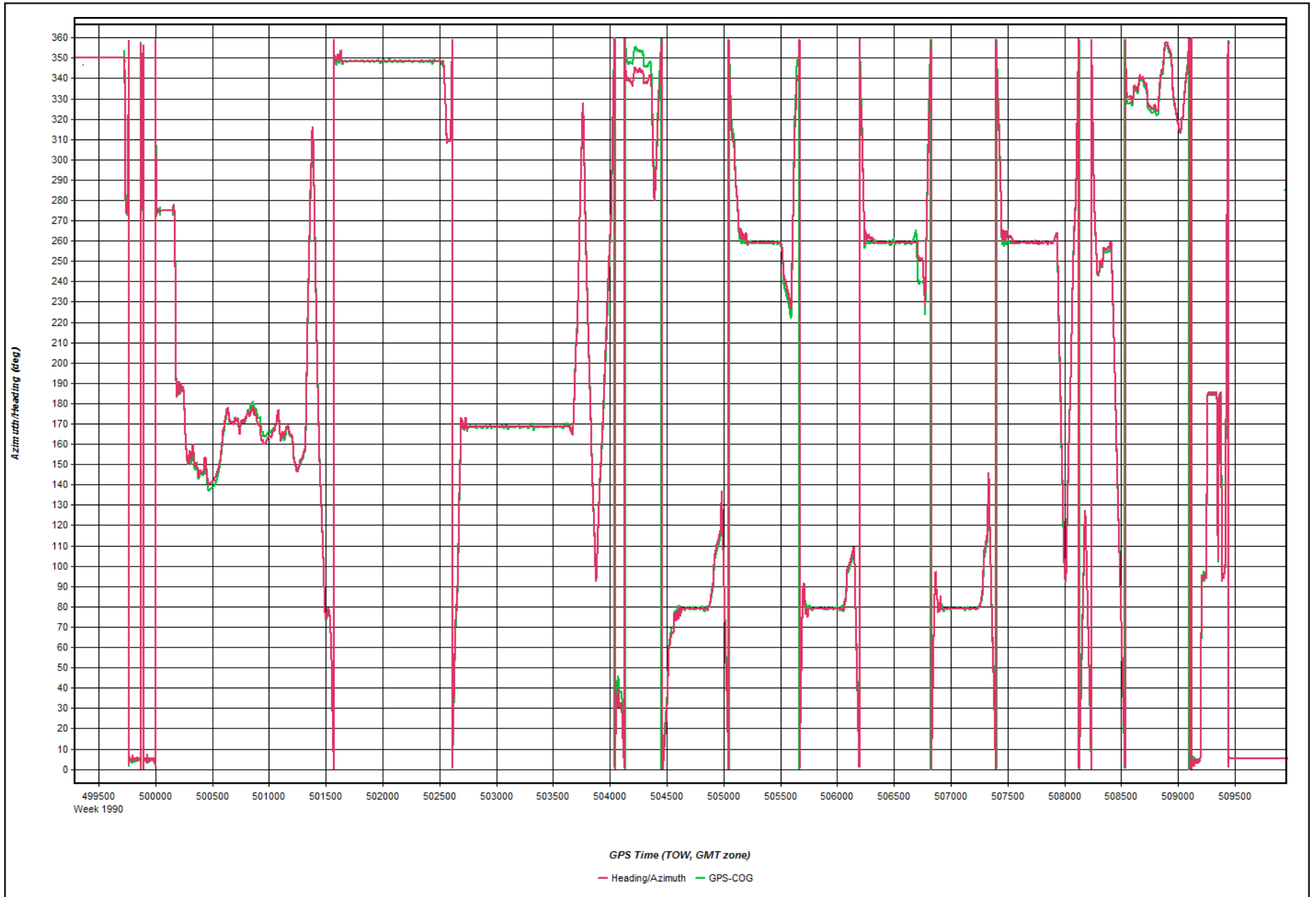
2018-03-02_Day061_7 - 20180302184020

Figure 9: Fwd/Rev Attitude Separation Plot



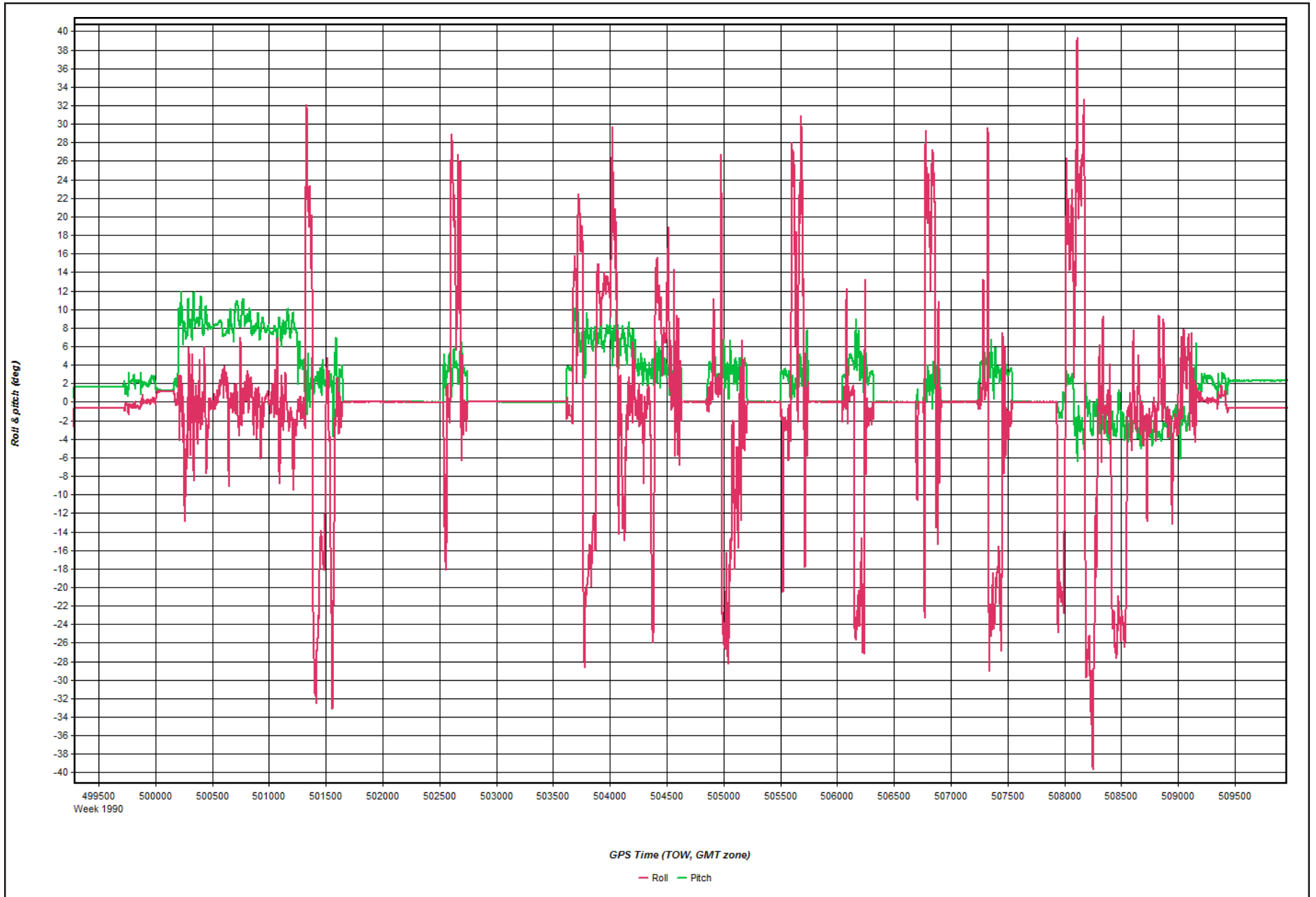
2018-03-02_Day061_7 - 20180302184020

Figure 11: Azimuth Plot



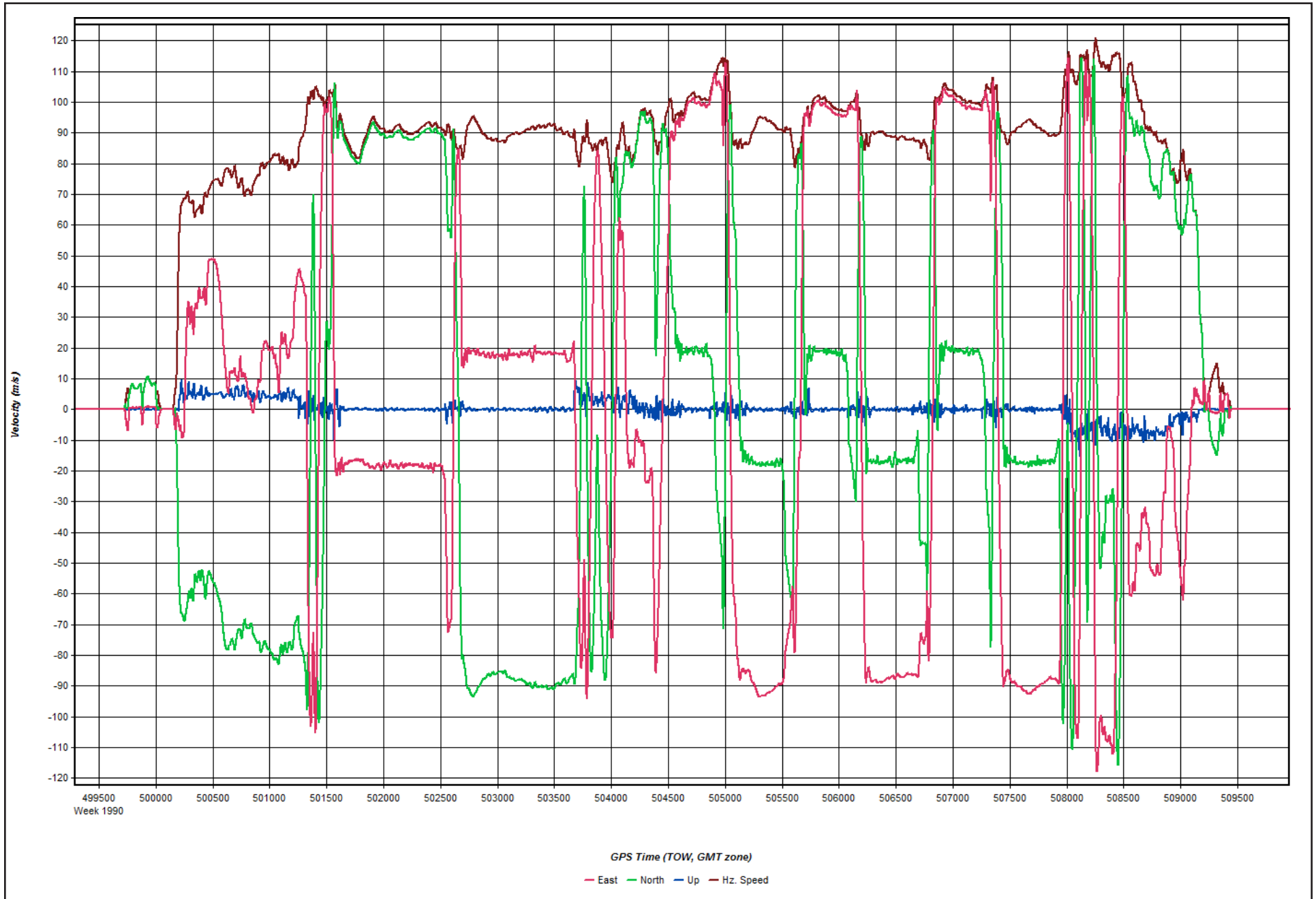
2018-03-02_Day061_7 - 20180302184020

Figure 12: Roll & Pitch Plot



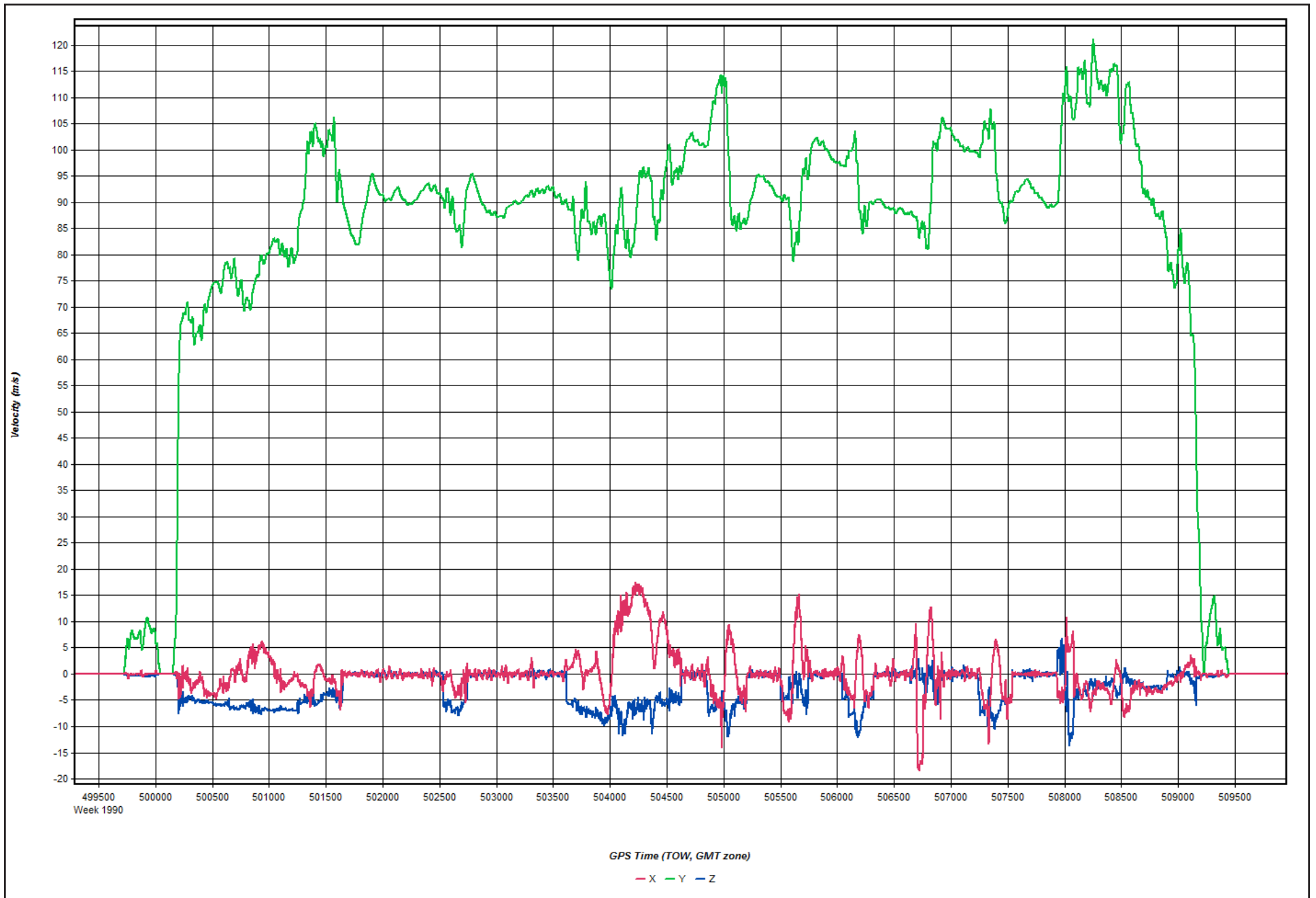
2018-03-02_Day061_7 - 20180302184020

Figure 13: Velocity Profile Plot



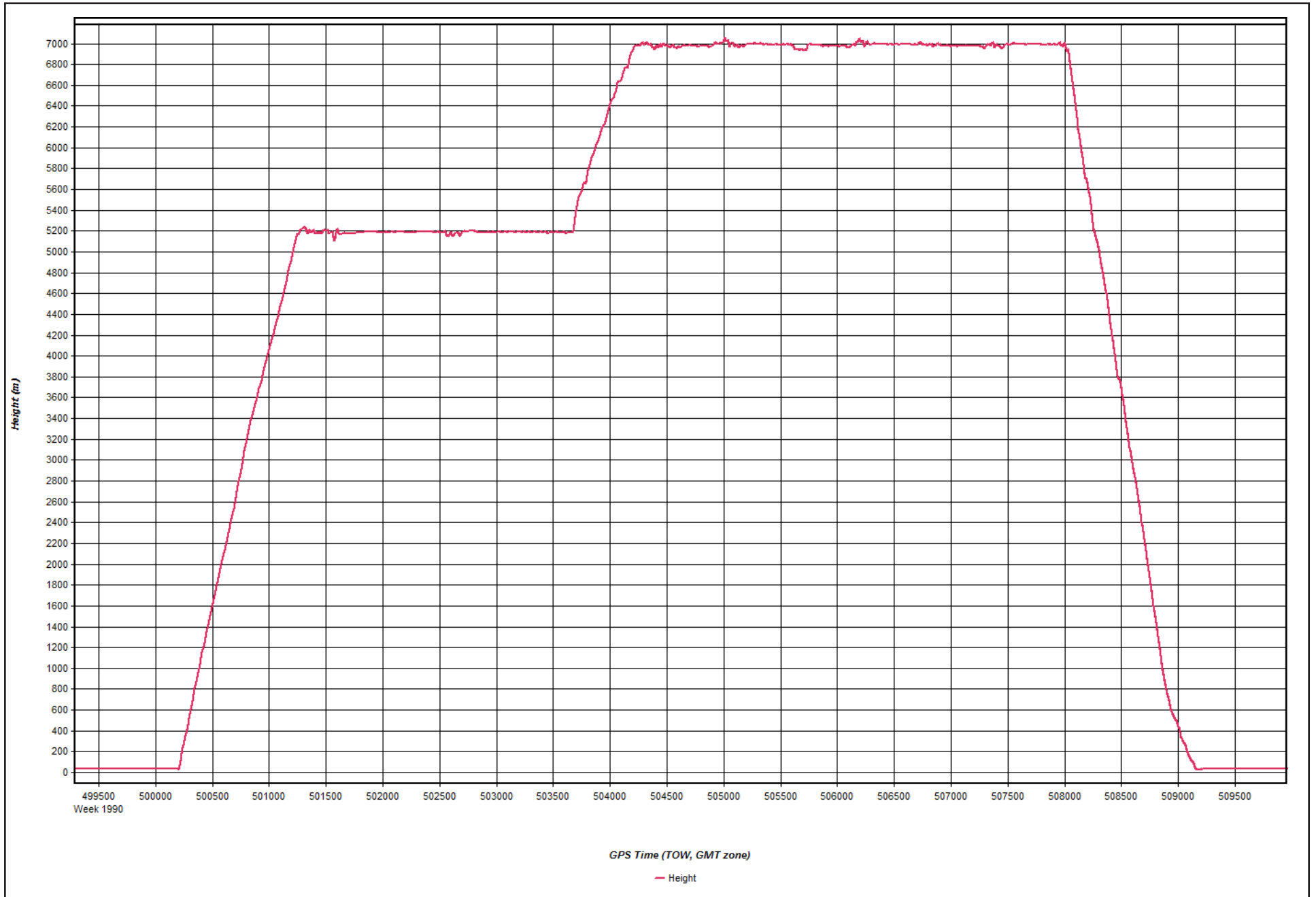
2018-03-02_Day061_7 - 20180302184020

Figure 14: Body Frame Velocity Plot



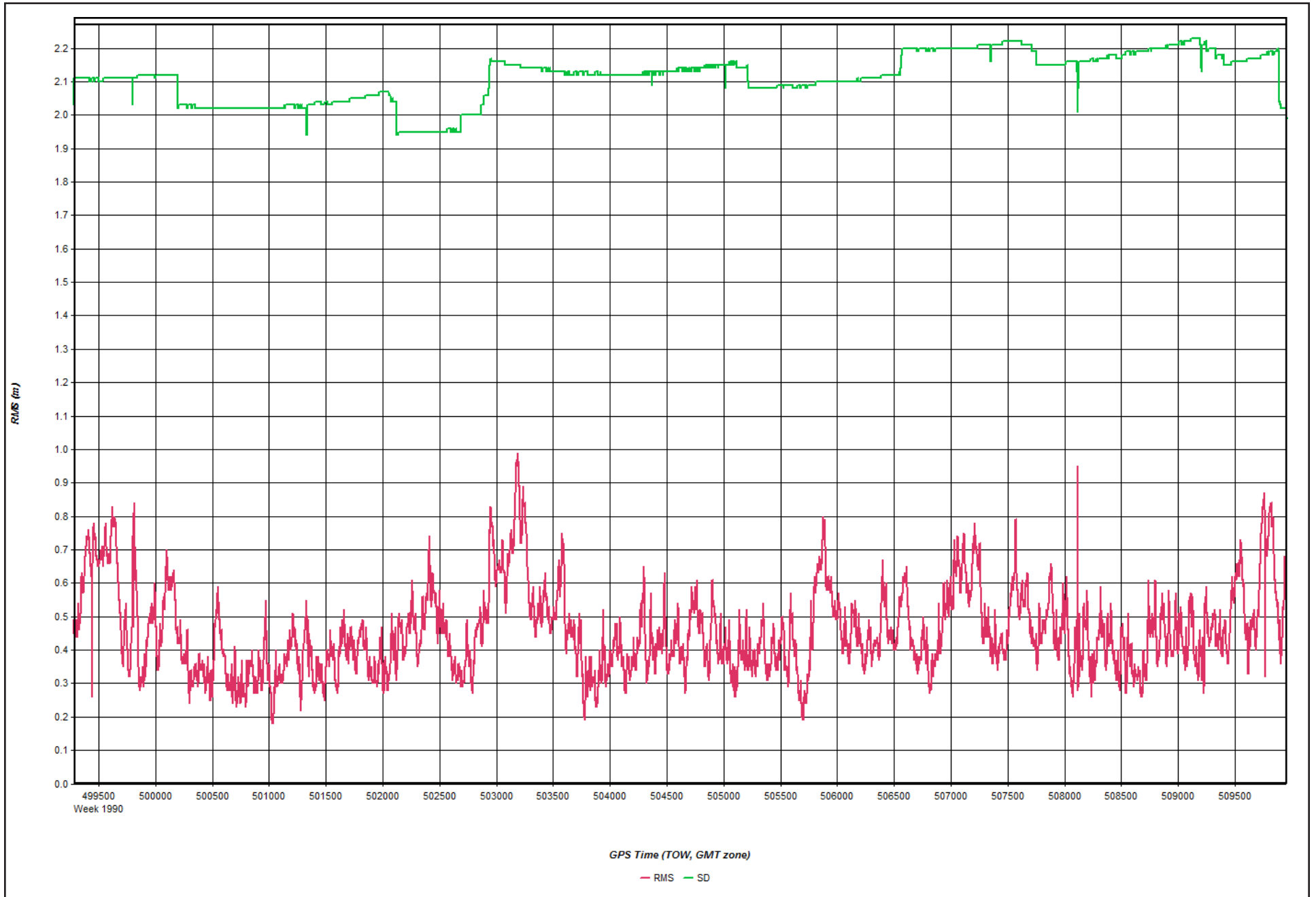
2018-03-02_Day061_7 - 20180302184020

Figure 15: Height Profile Plot



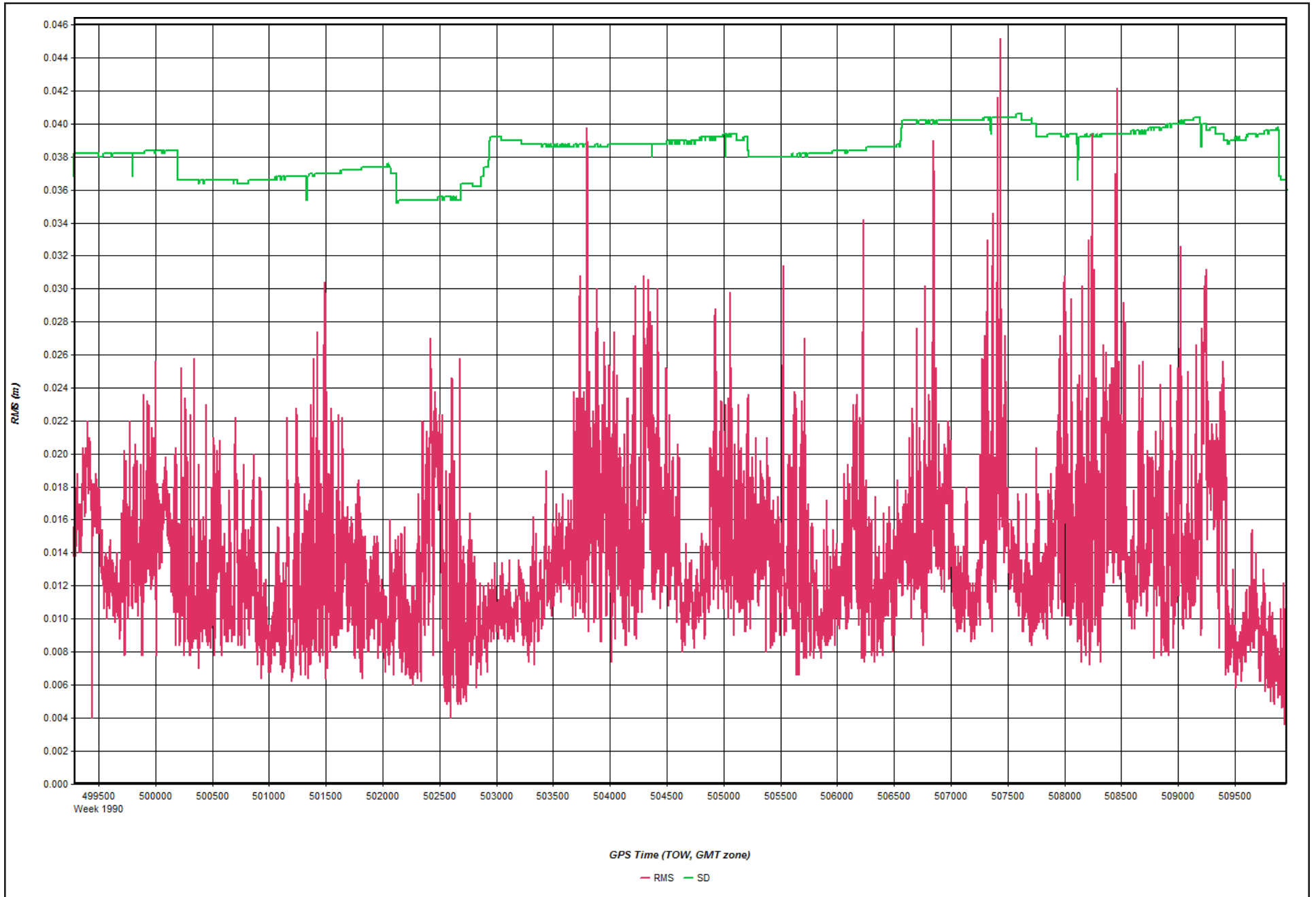
2018-03-02_Day061_7 - 20180302184020

Figure 16: C/A Code Residual RMS Plot



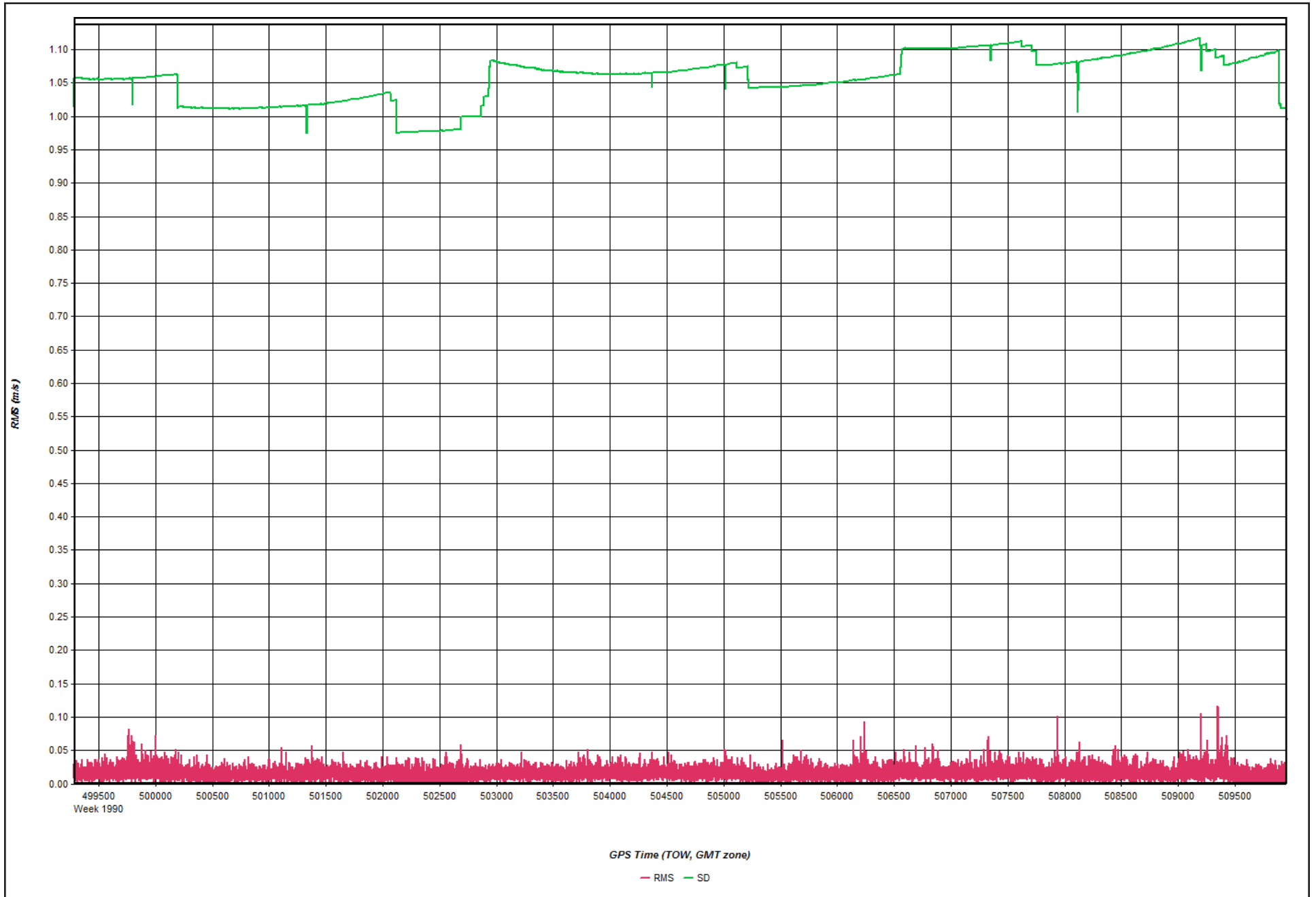
2018-03-02_Day061_7 - 20180302184020

Figure 17: Carrier Residual RMS Plot



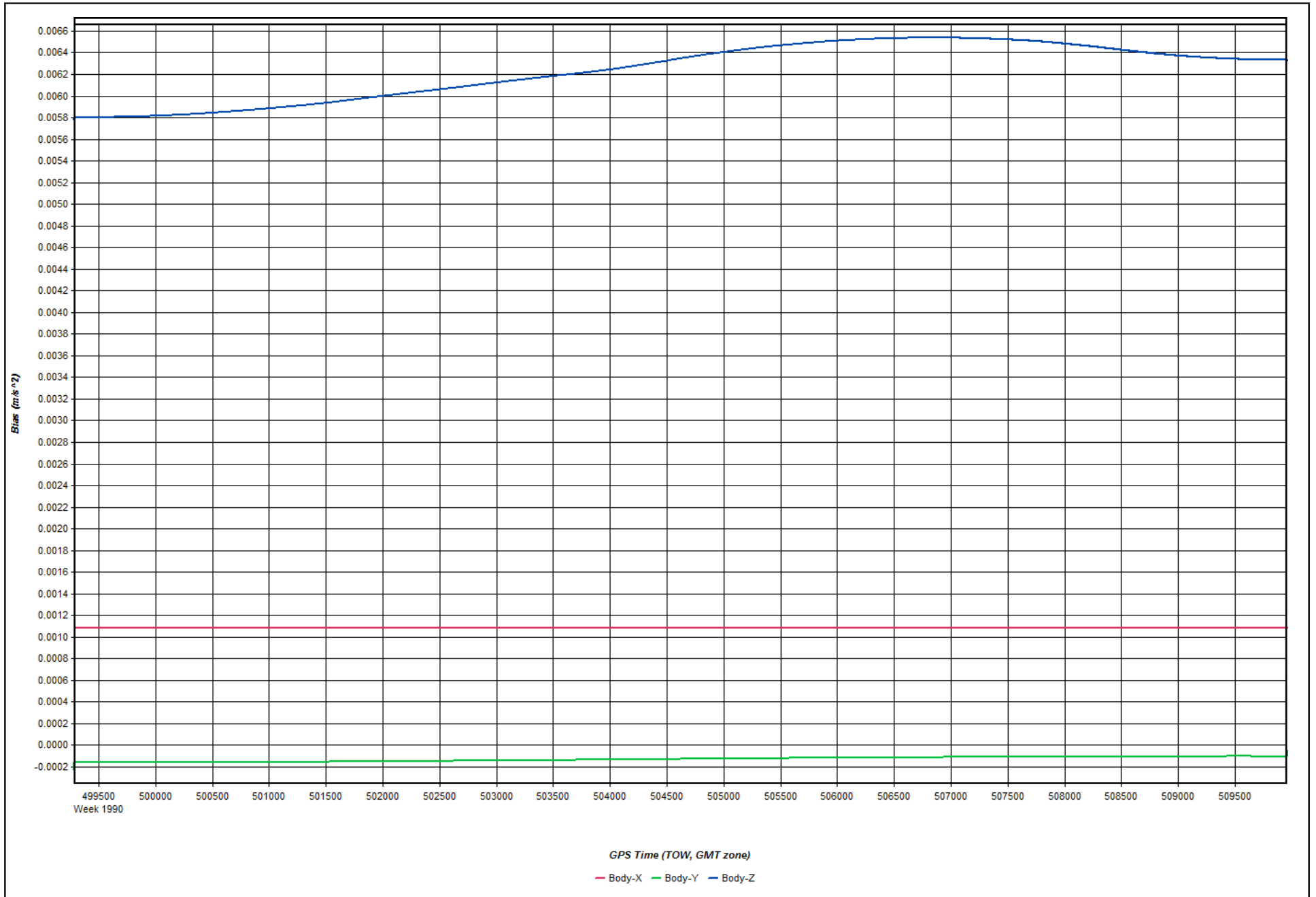
2018-03-02_Day061_7 - 20180302184020

Figure 18: L1 Doppler Residual RMS Plot



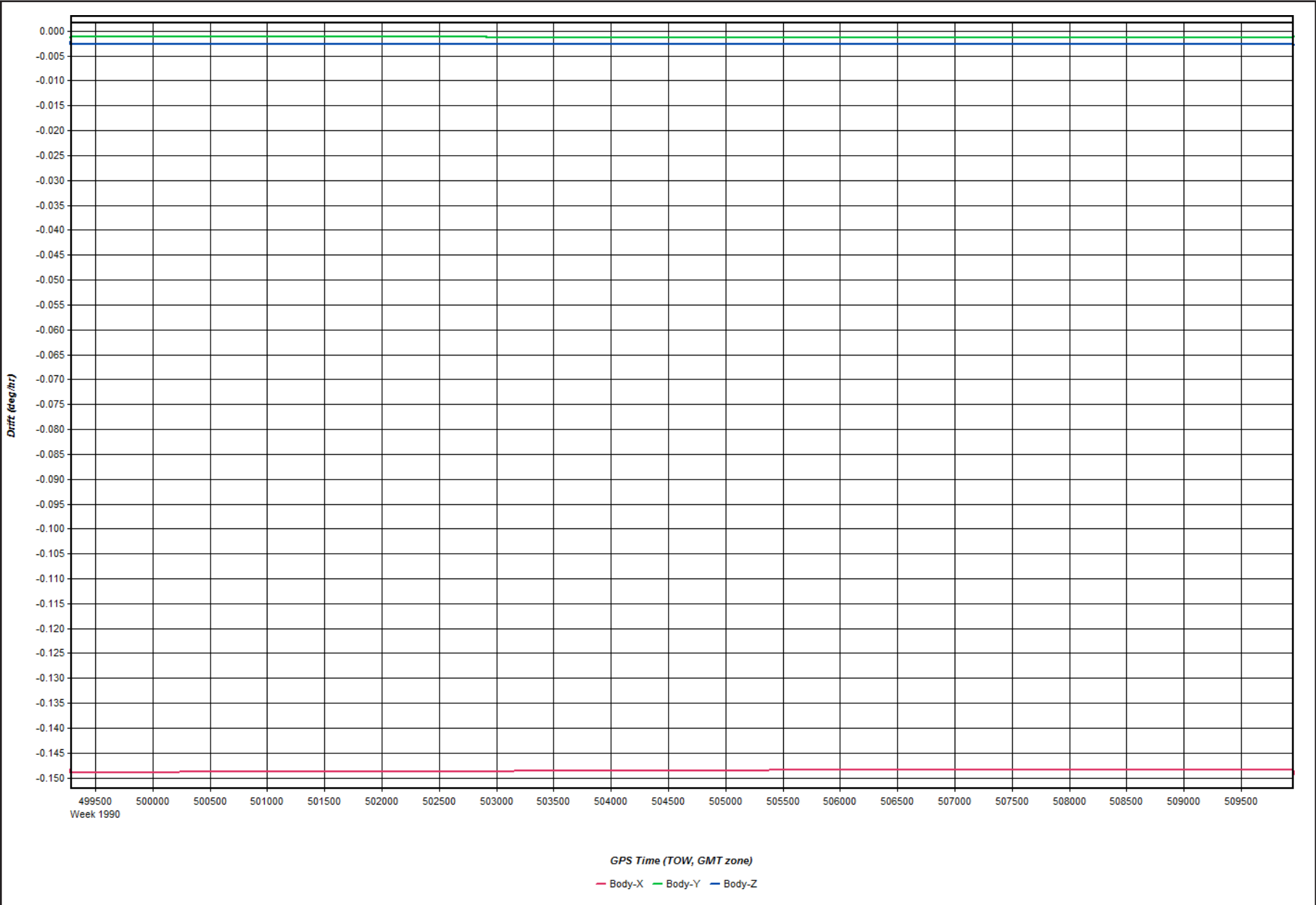
2018-03-02_Day061_7 - 20180302184020

Figure 19: Accelerometer Bias Plot



2018-03-02_Day061_7 - 20180302184020

Figure 20: Gyro Drift Plot



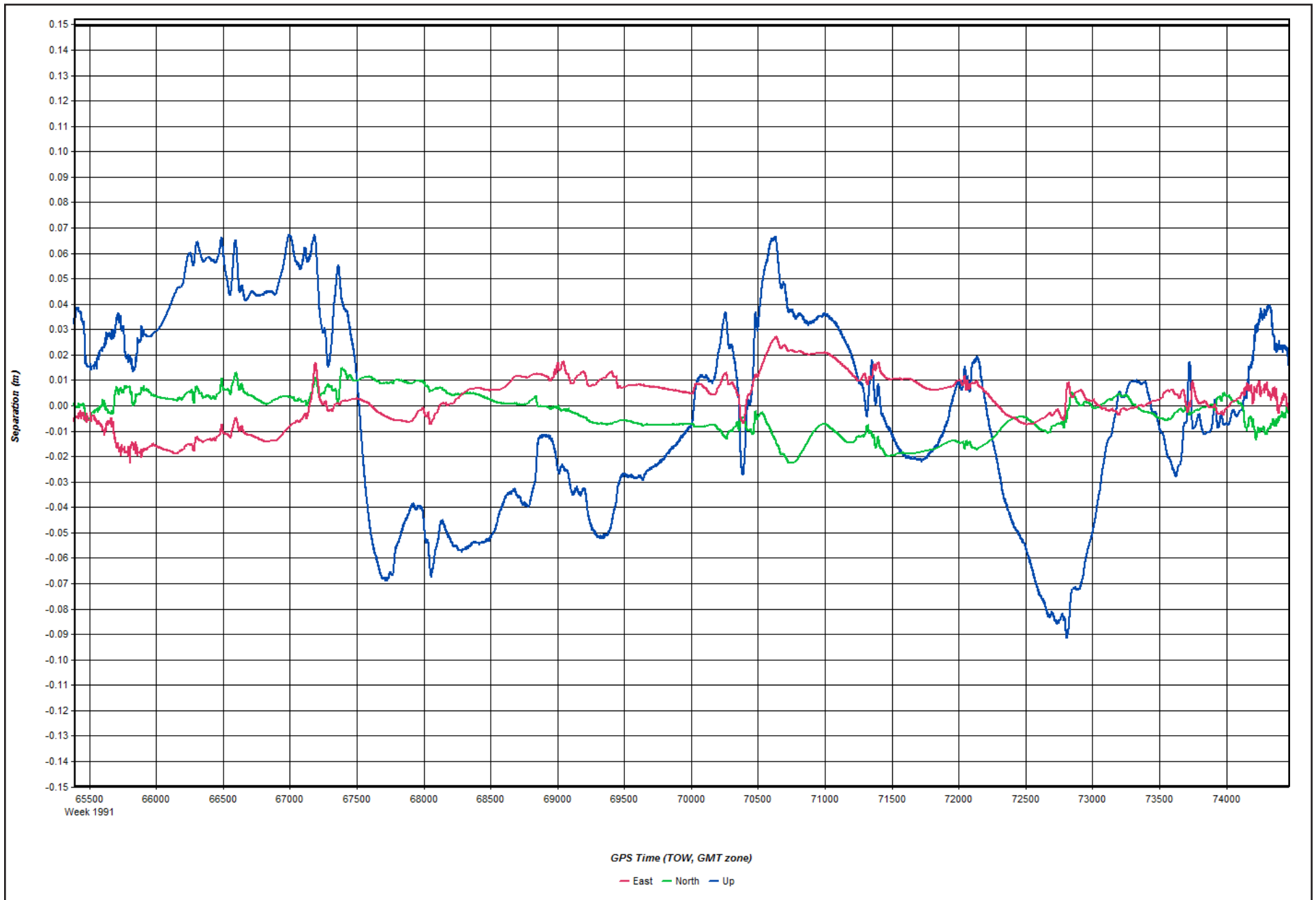
2018-03-04_Day063_7 - 20180304180851

Figure 1: Map



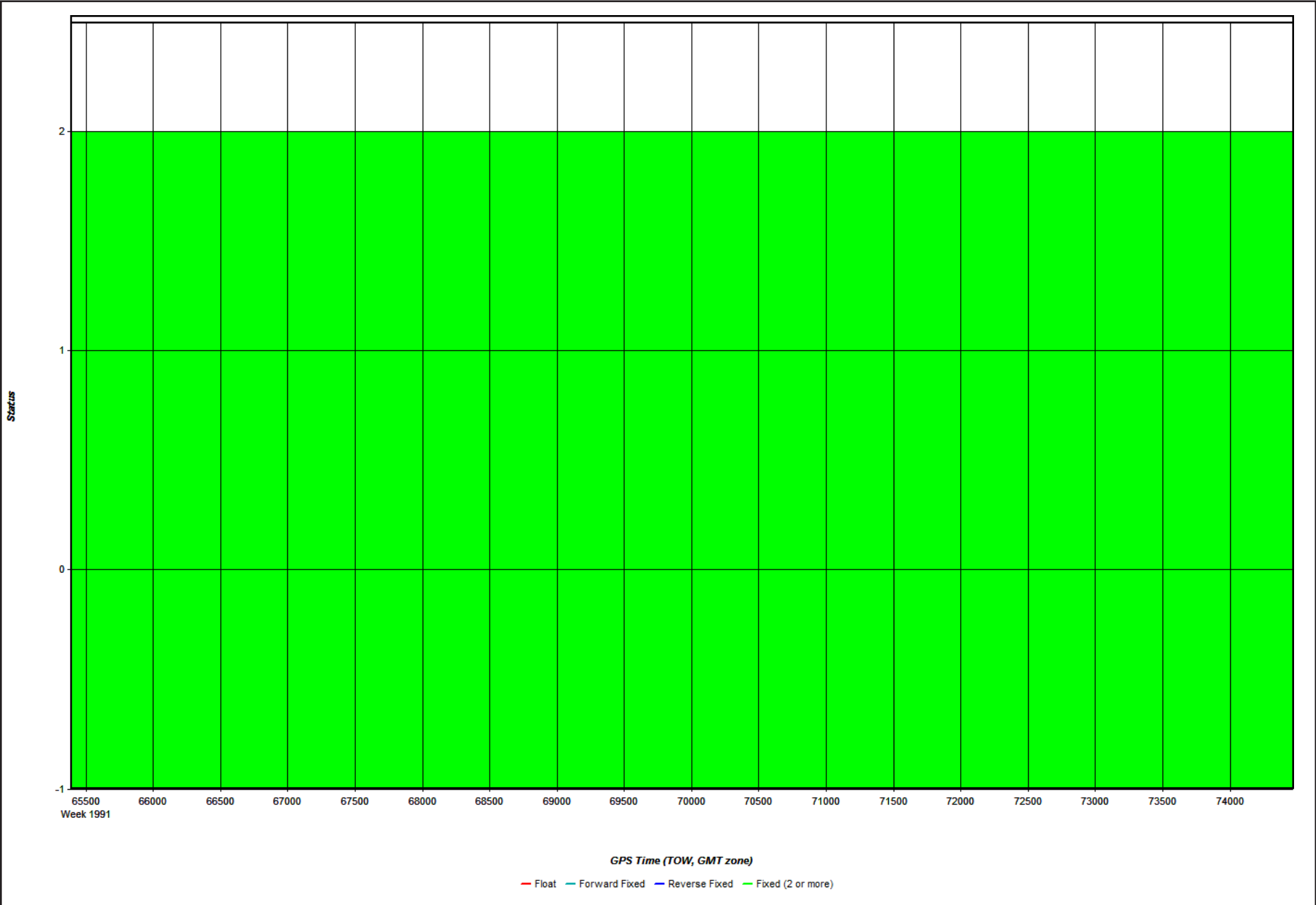
2018-03-04_Day063_7 - 20180304180851

Figure 2: Forward/Reverse or Combined Separation Plot



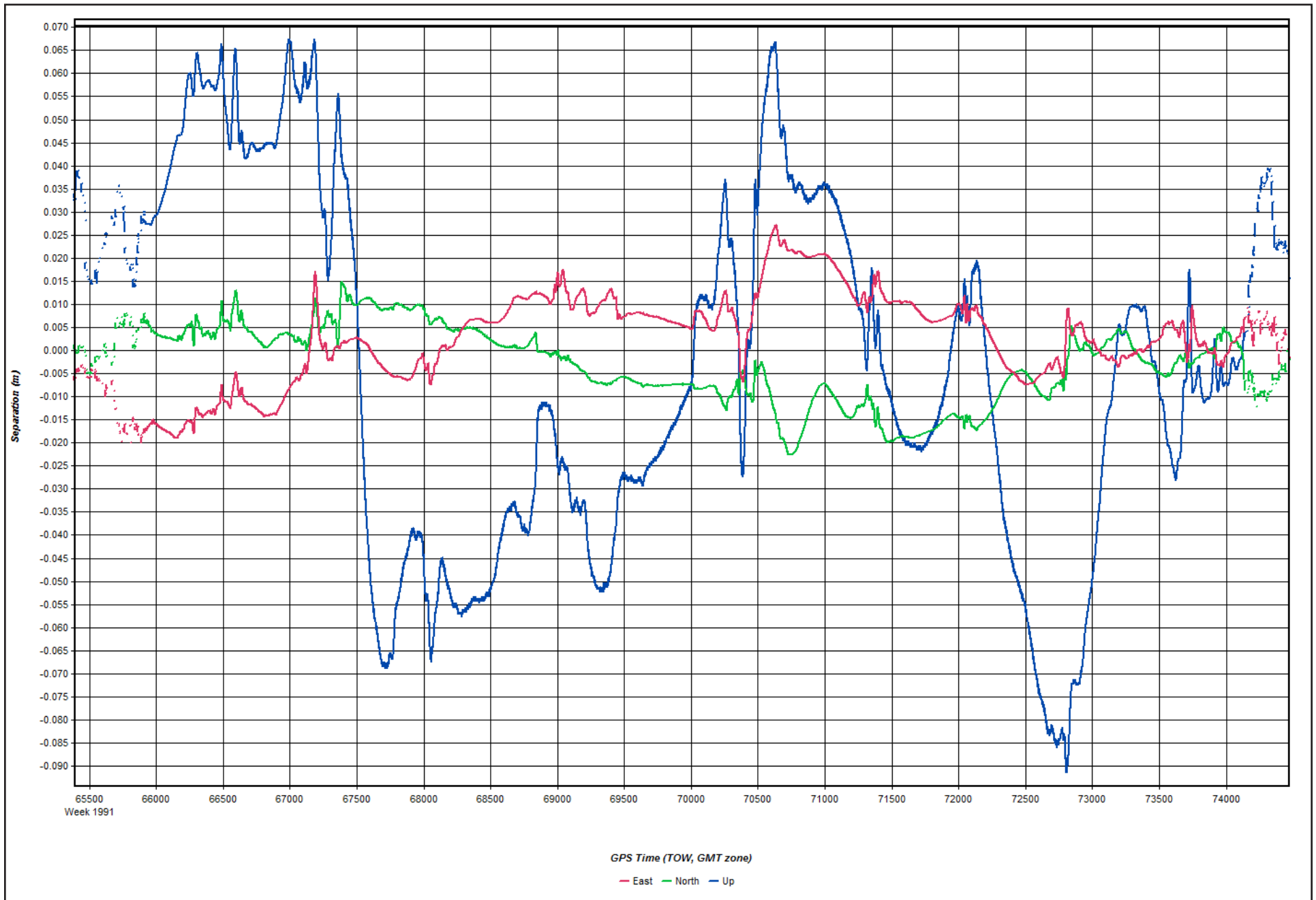
2018-03-04_Day063_7 - 20180304180851

Figure 3: Float or Fixed Ambiguity



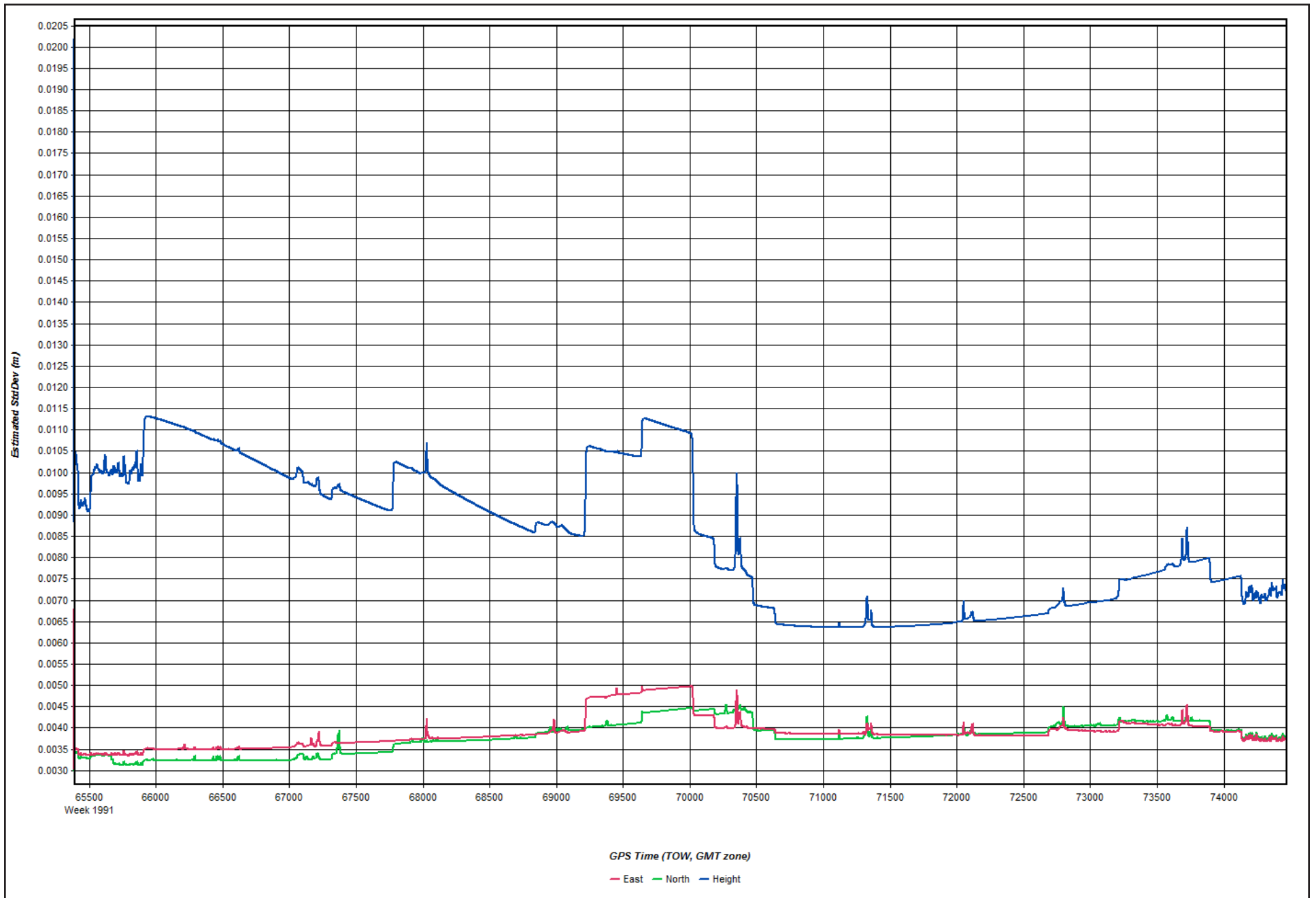
2018-03-04_Day063_7 - 20180304180851

Figure 4: Forward/Reverse Separation Plot (Fixed)



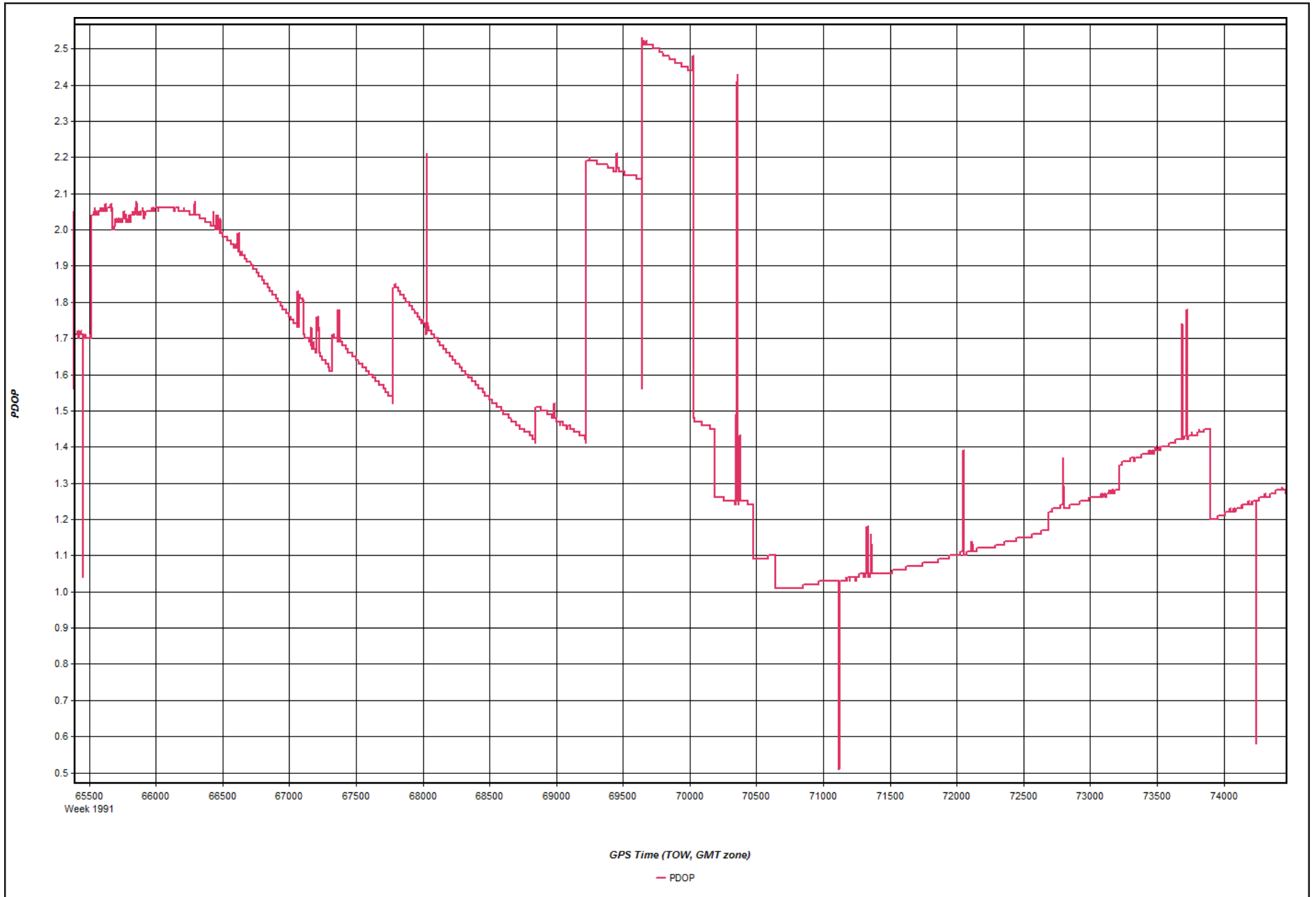
2018-03-04_Day063_7 - 20180304180851

Figure 5: Estimated Position Accuracy Plot



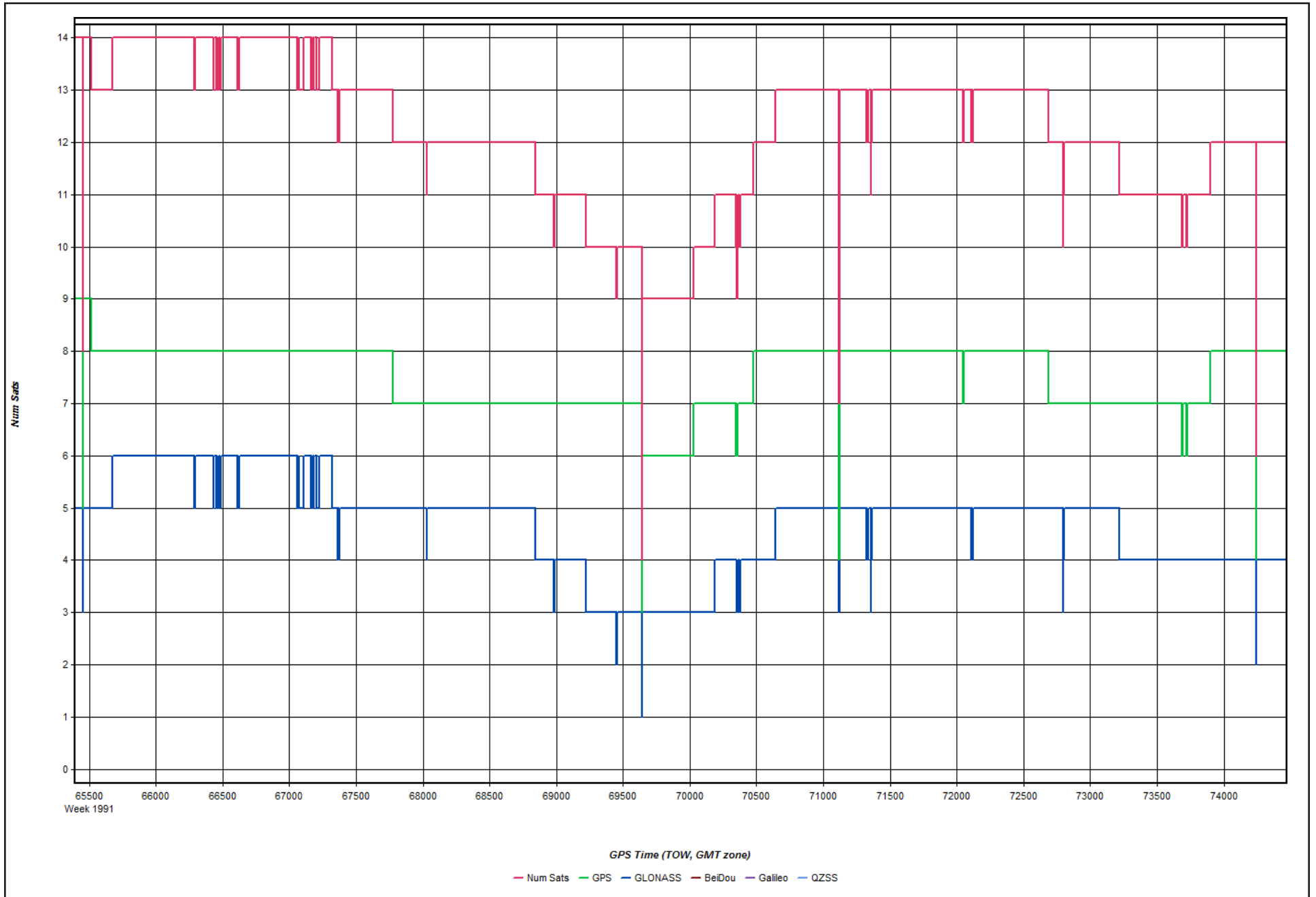
2018-03-04_Day063_7 - 20180304180851

Figure 6: PDOP Plot



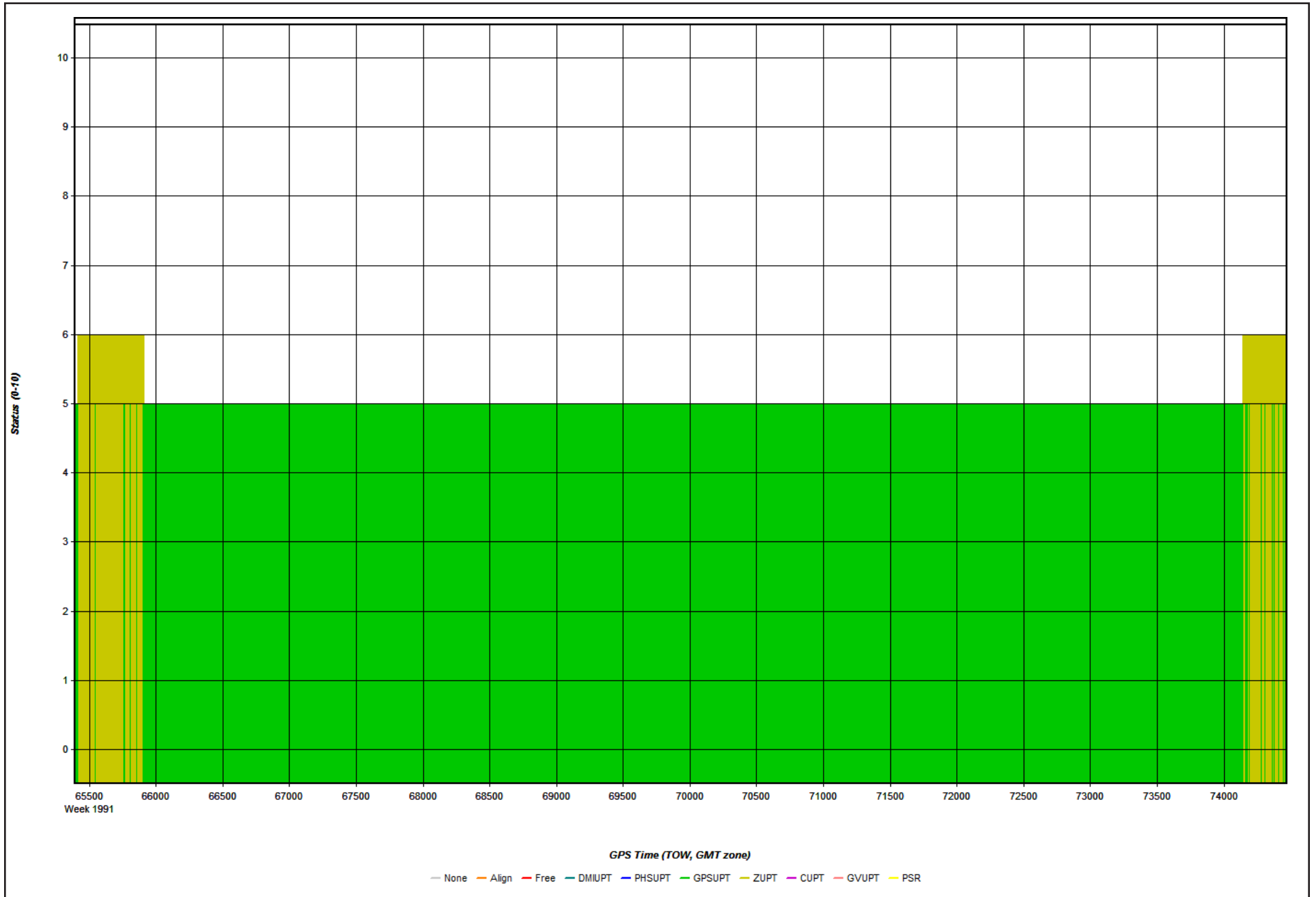
2018-03-04_Day063_7 - 20180304180851

Figure 7: Number of Satellites Line Plot



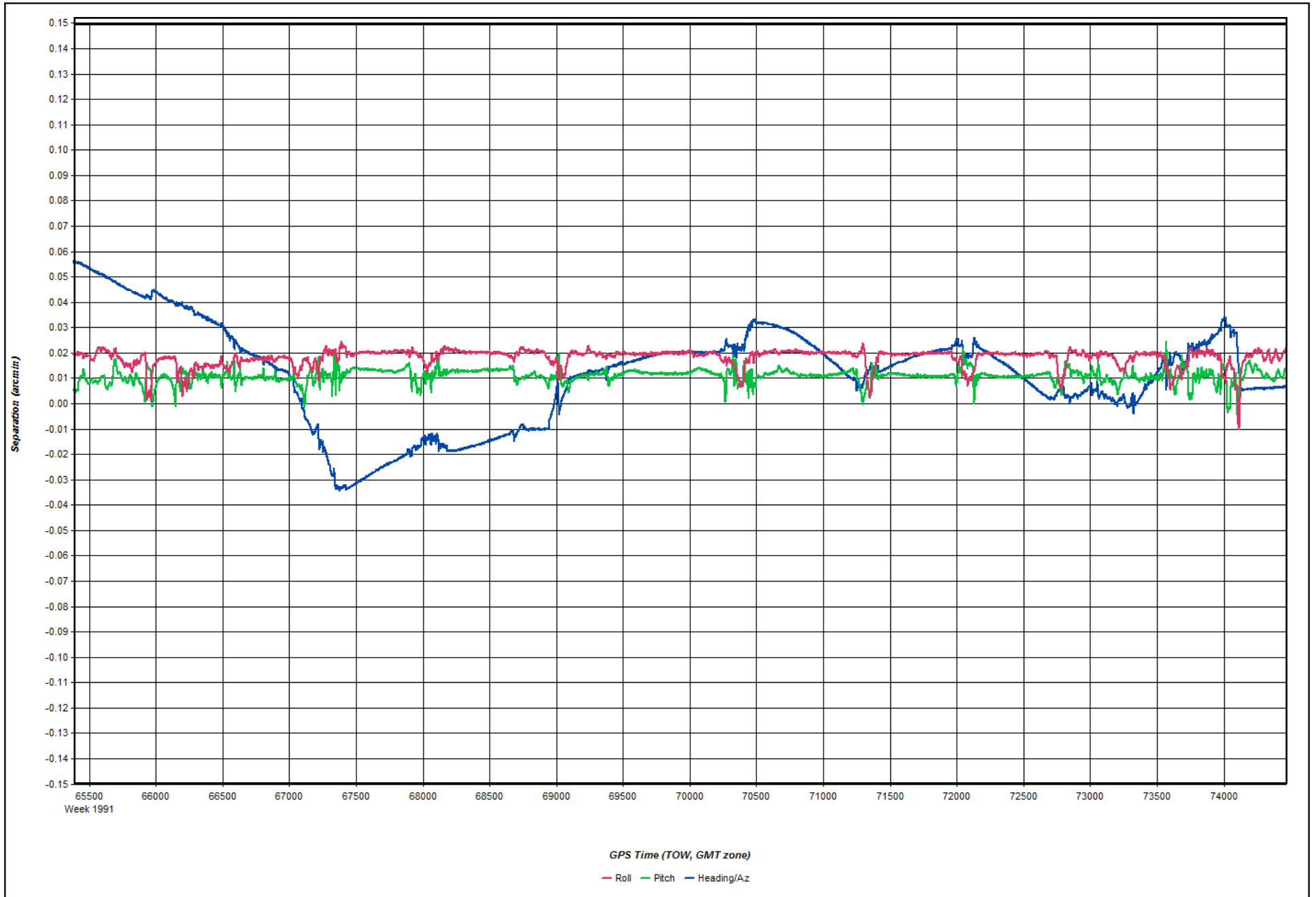
2018-03-04_Day063_7 - 20180304180851

Figure 8: Status flag for IMU processing



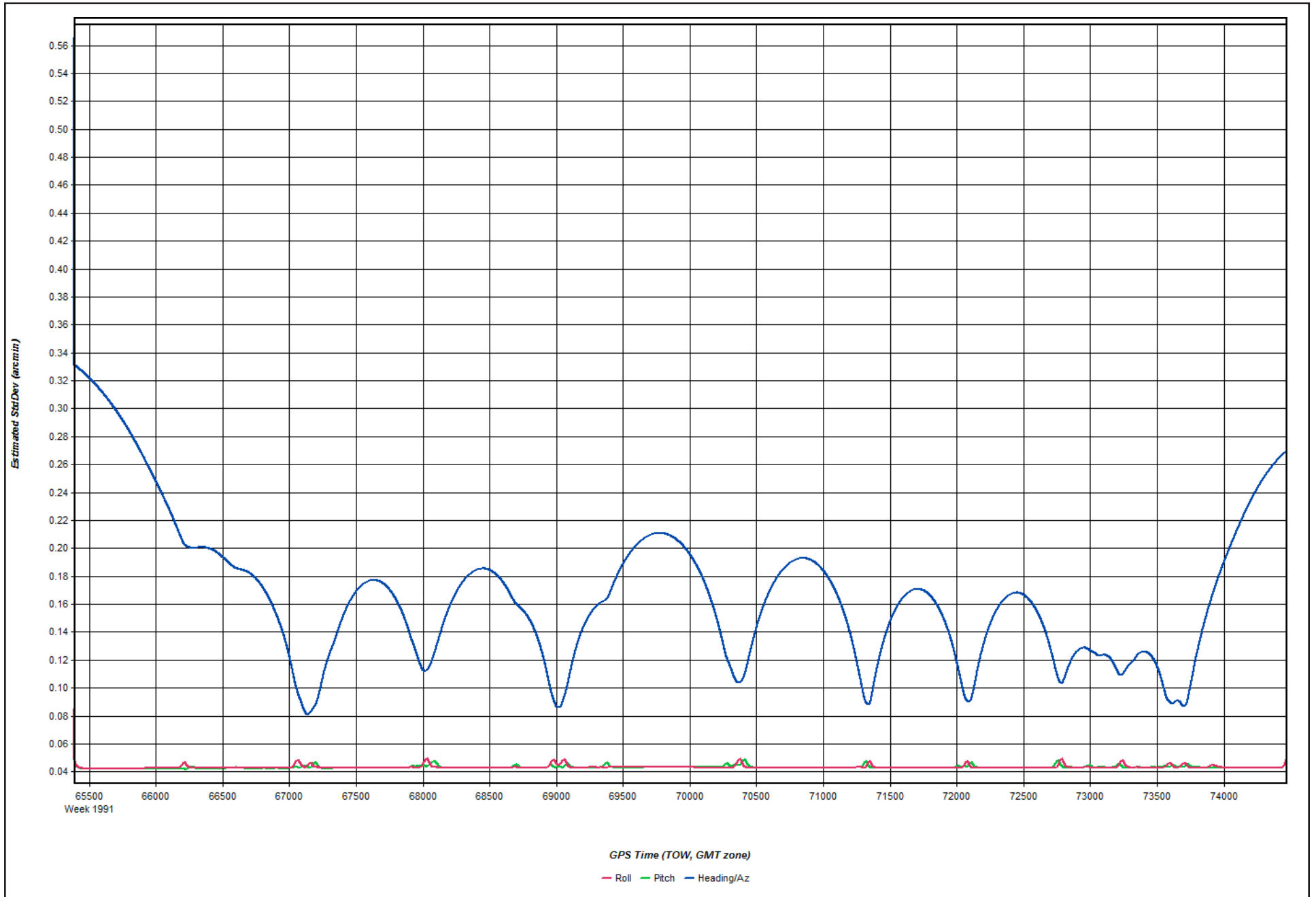
2018-03-04_Day063_7 - 20180304180851

Figure 9: Fwd/Rev Attitude Separation Plot



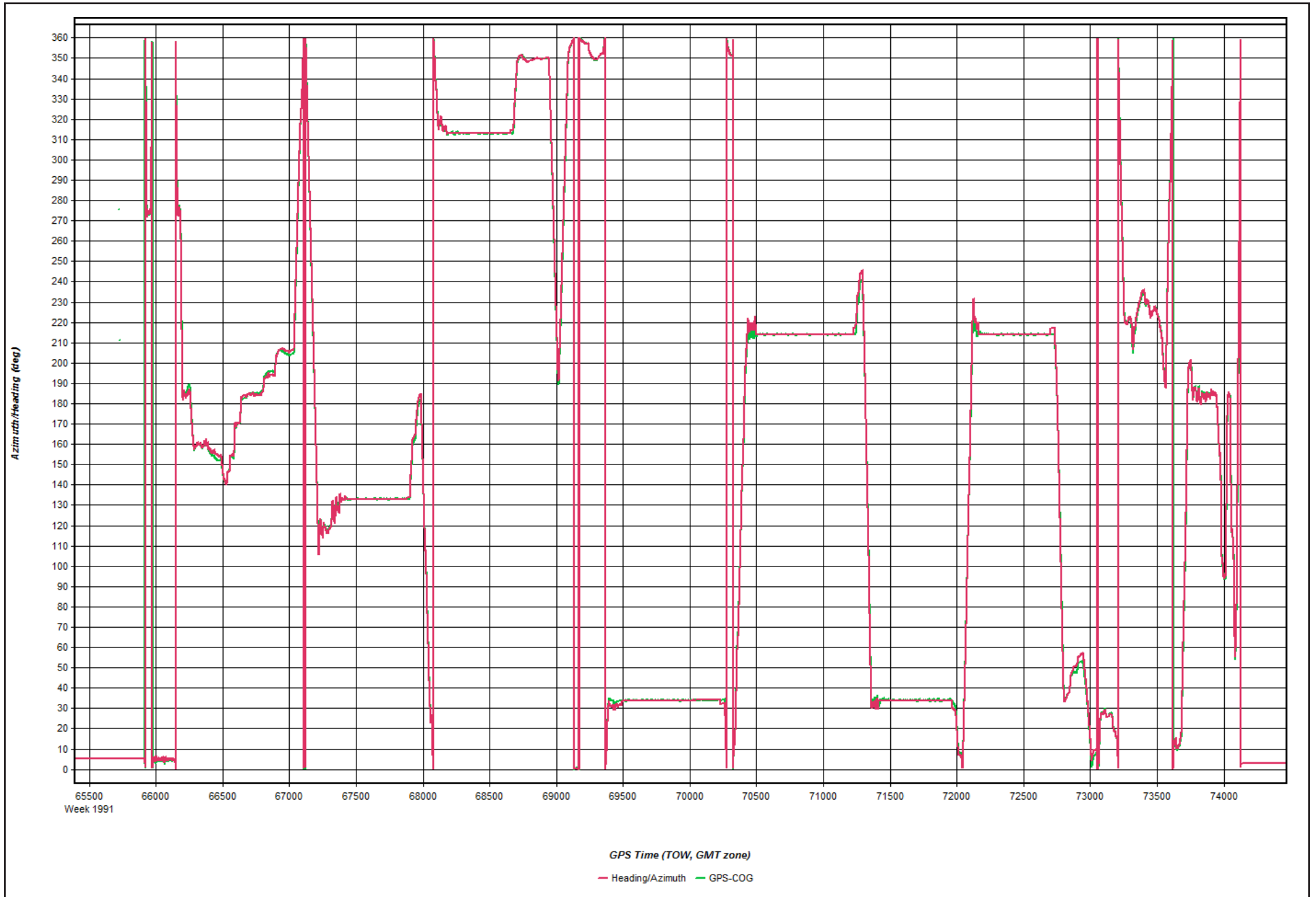
2018-03-04_Day063_7 - 20180304180851

Figure 10: Estimated Attitude Accuracy Plot



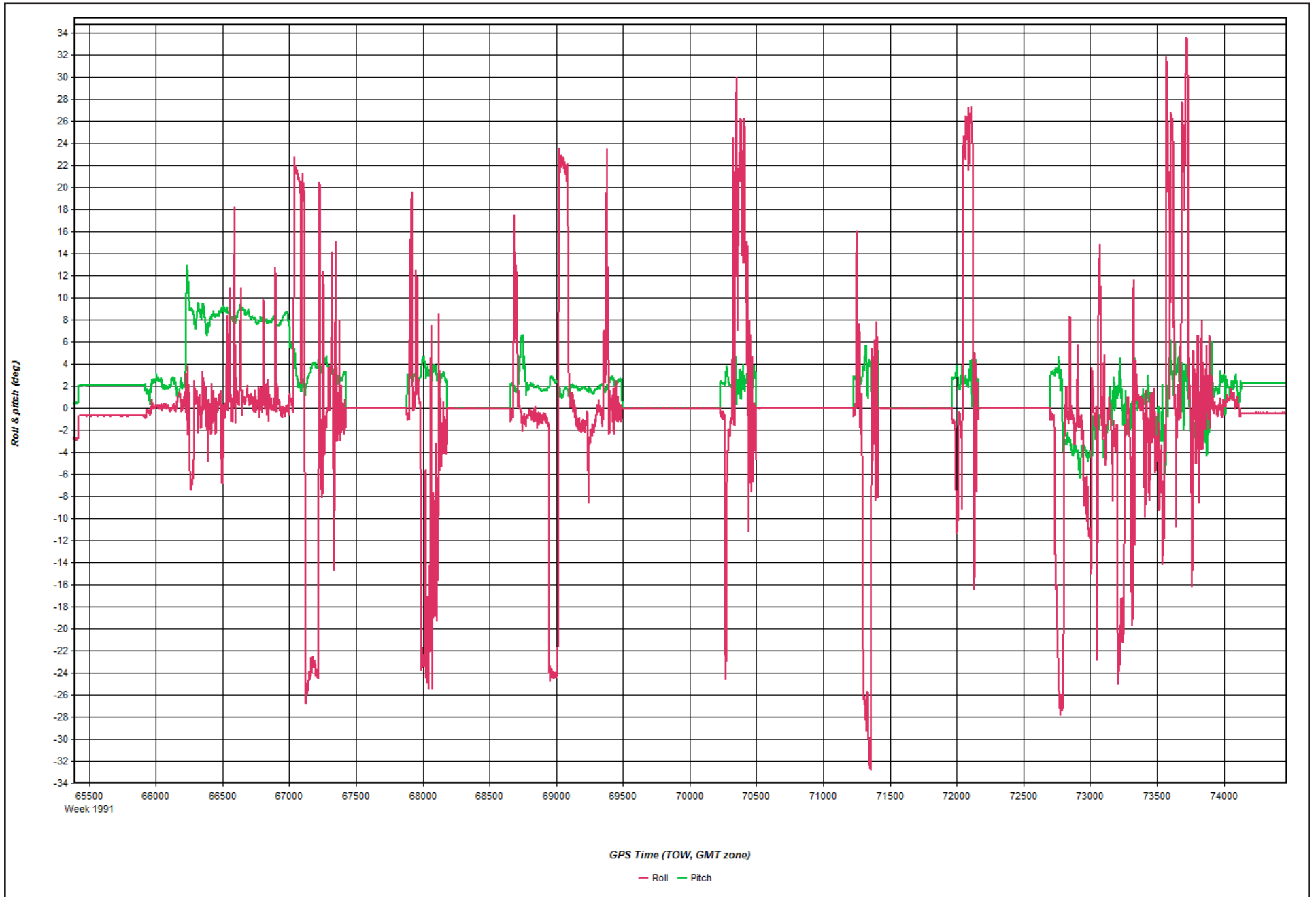
2018-03-04_Day063_7 - 20180304180851

Figure 11: Azimuth Plot



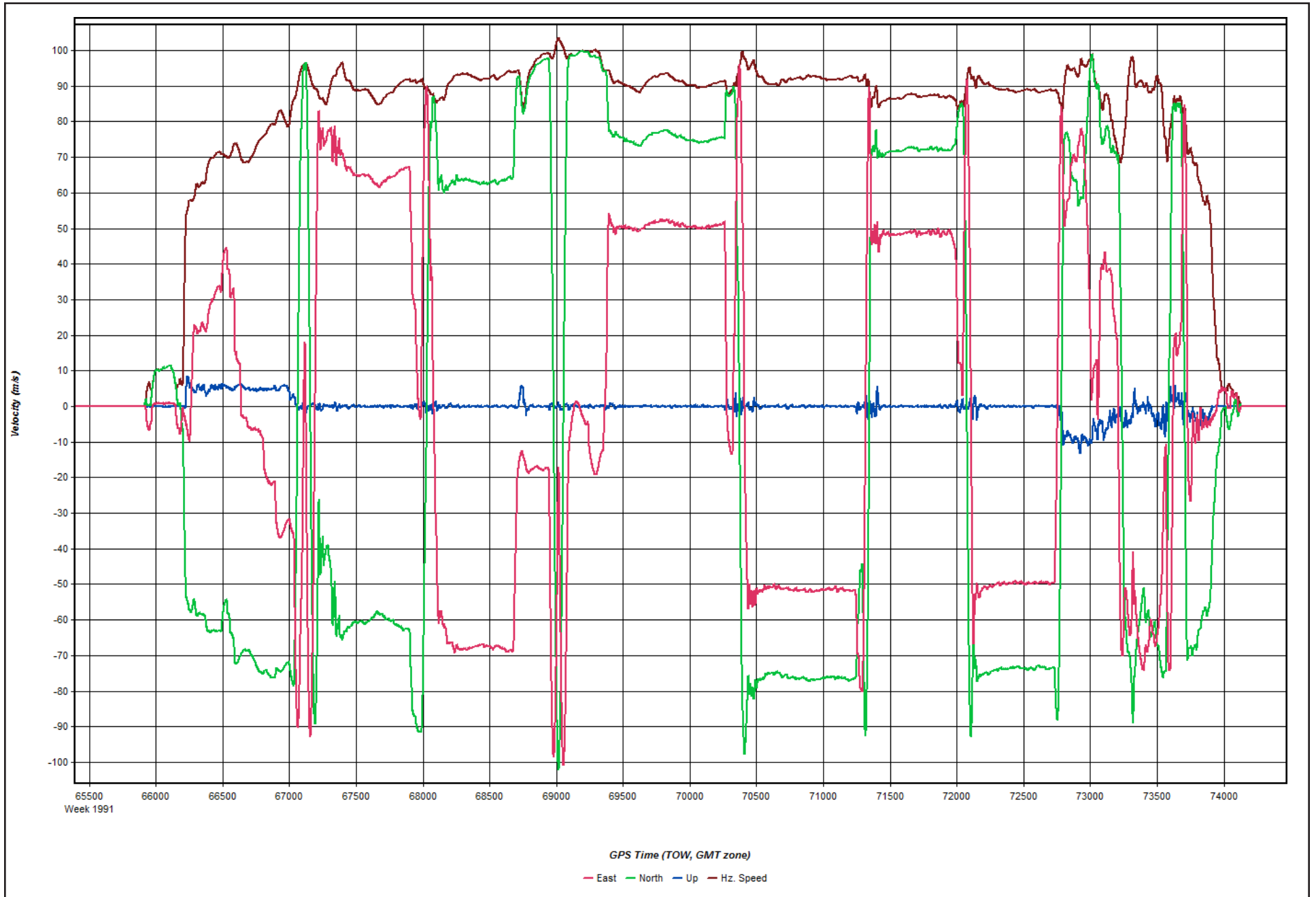
2018-03-04_Day063_7 - 20180304180851

Figure 12: Roll & Pitch Plot



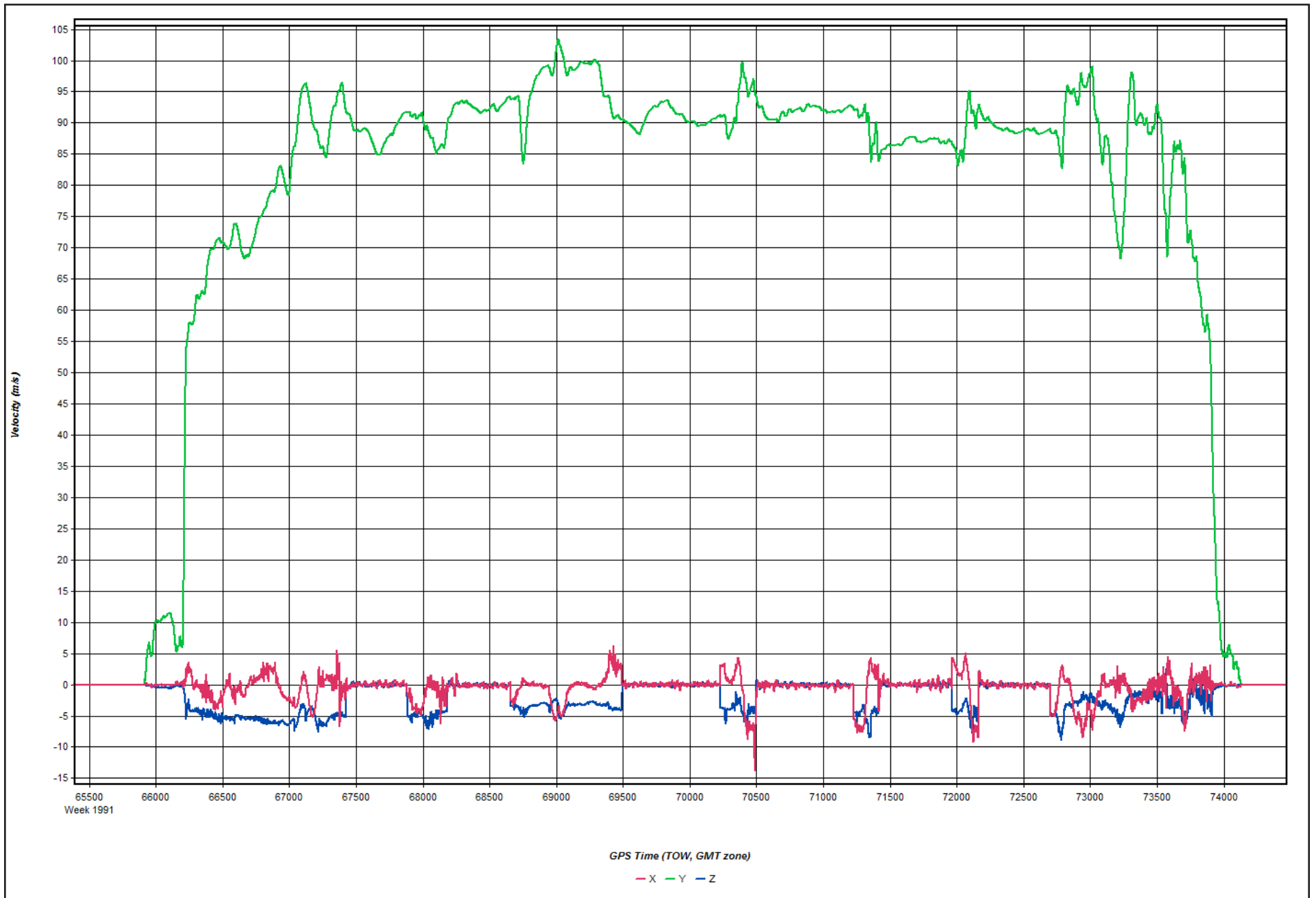
2018-03-04_Day063_7 - 20180304180851

Figure 13: Velocity Profile Plot



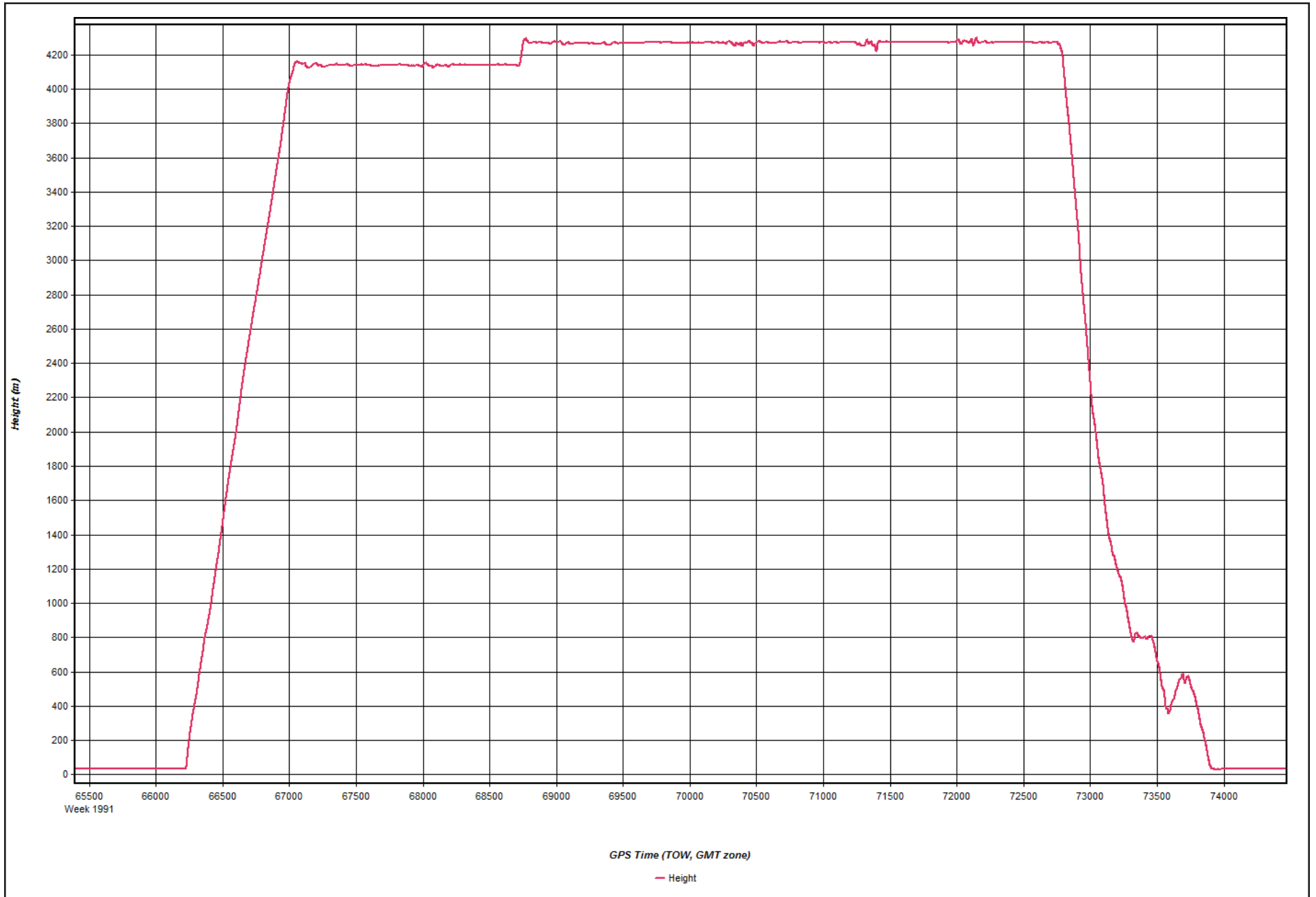
2018-03-04_Day063_7 - 20180304180851

Figure 14: Body Frame Velocity Plot



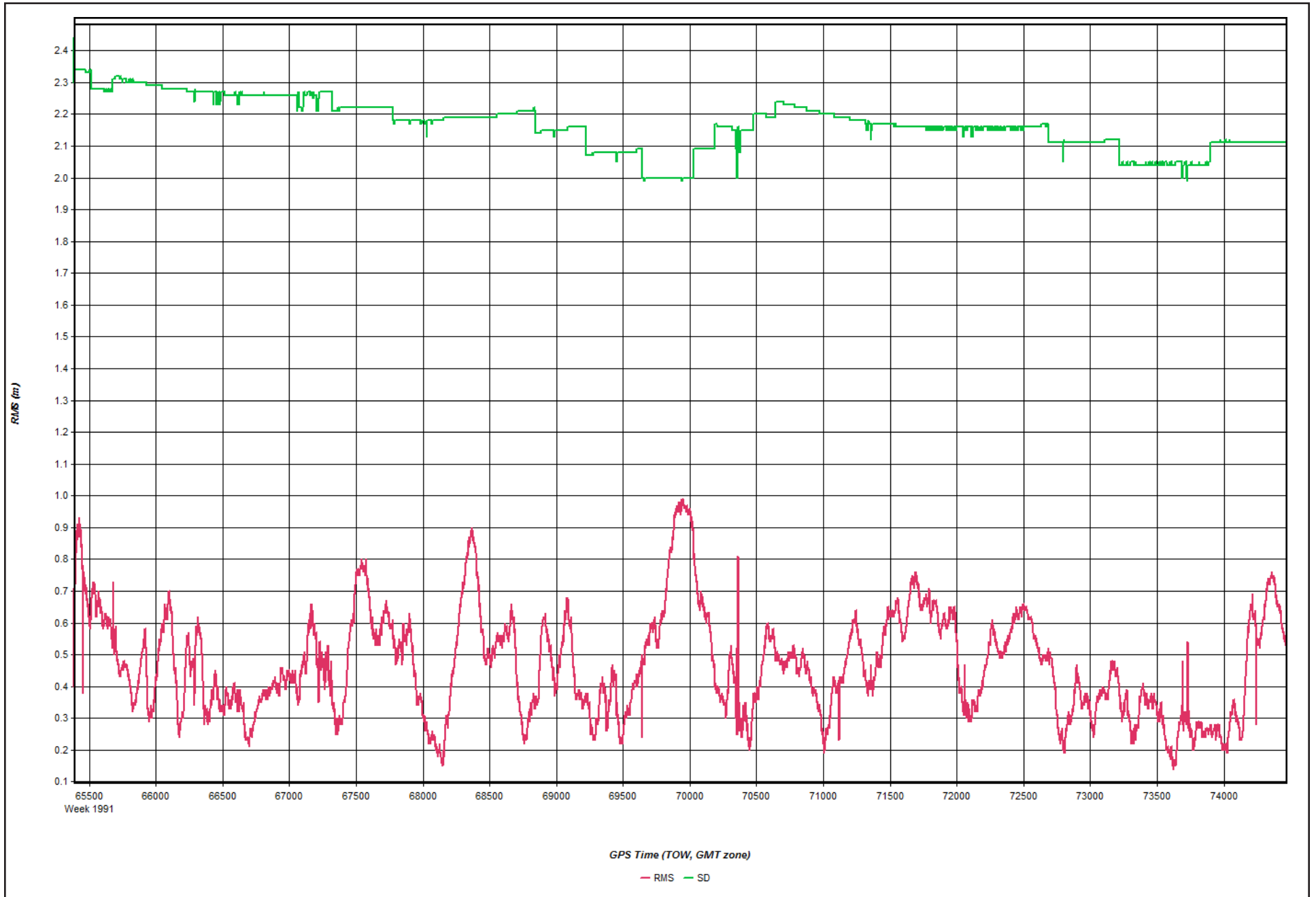
2018-03-04_Day063_7 - 20180304180851

Figure 15: Height Profile Plot



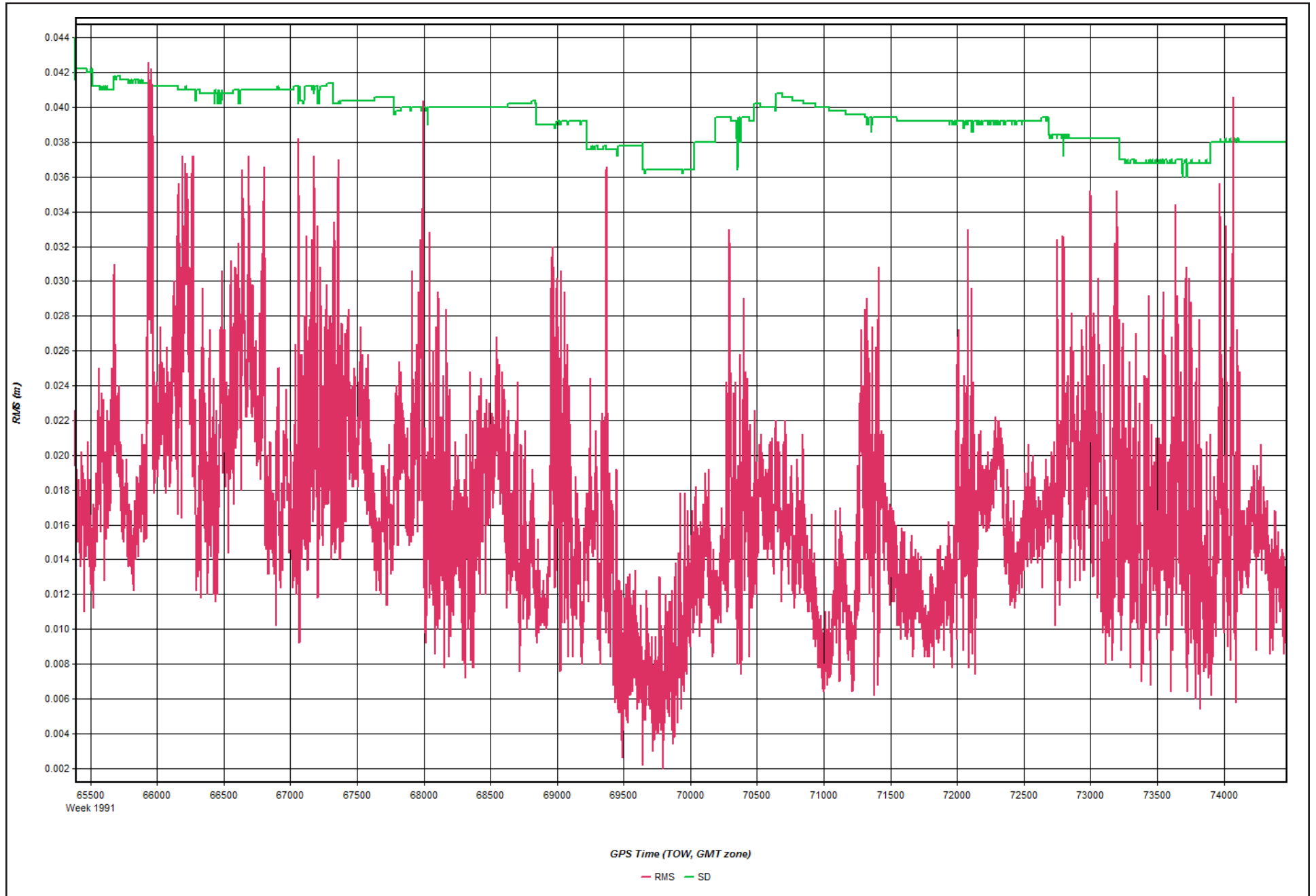
2018-03-04_Day063_7 - 20180304180851

Figure 16: C/A Code Residual RMS Plot



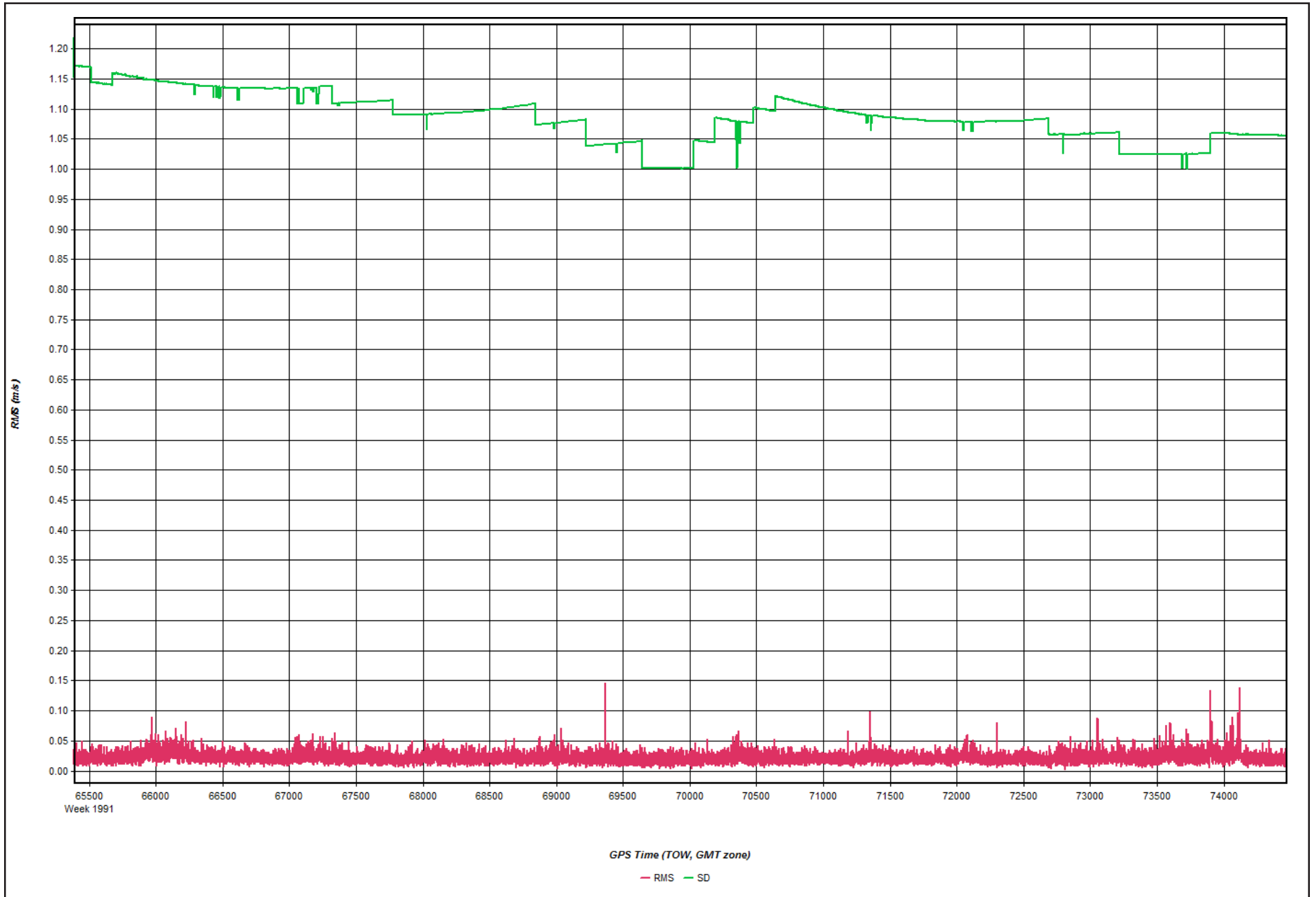
2018-03-04_Day063_7 - 20180304180851

Figure 17: Carrier Residual RMS Plot



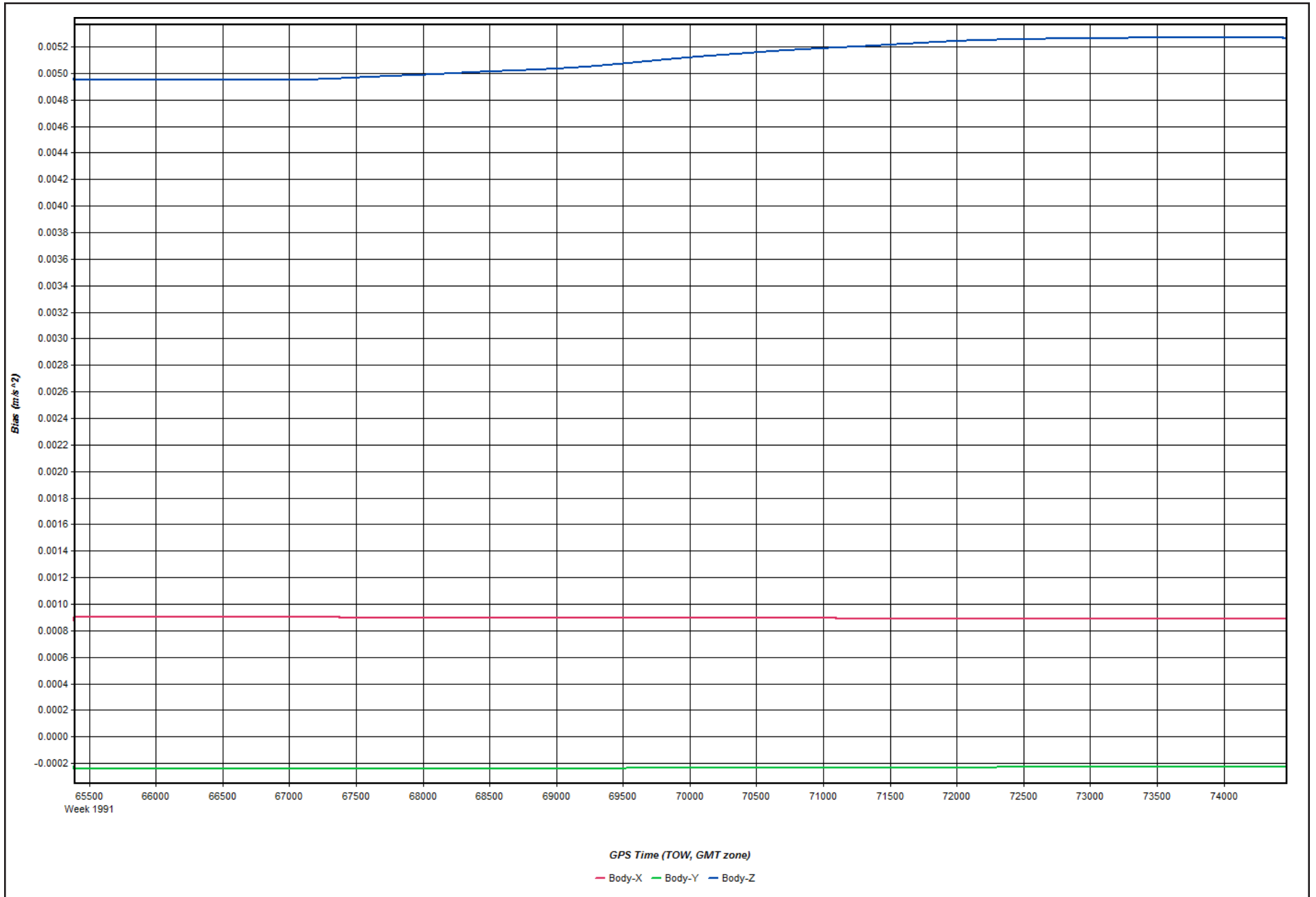
2018-03-04_Day063_7 - 20180304180851

Figure 18: L1 Doppler Residual RMS Plot



2018-03-04_Day063_7 - 20180304180851

Figure 19: Accelerometer Bias Plot



2018-03-04_Day063_7 - 20180304180851

Figure 20: Gyro Drift Plot

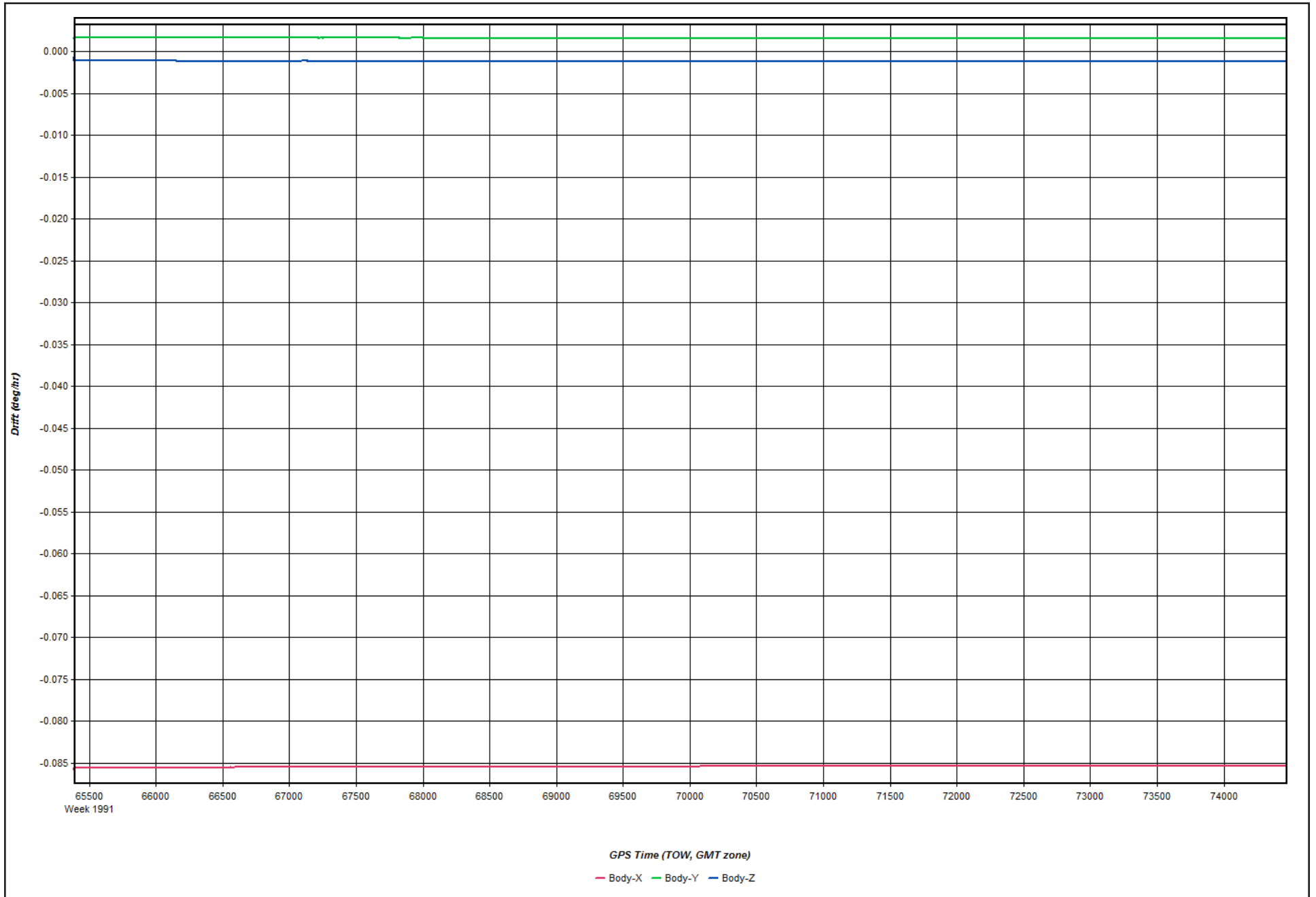
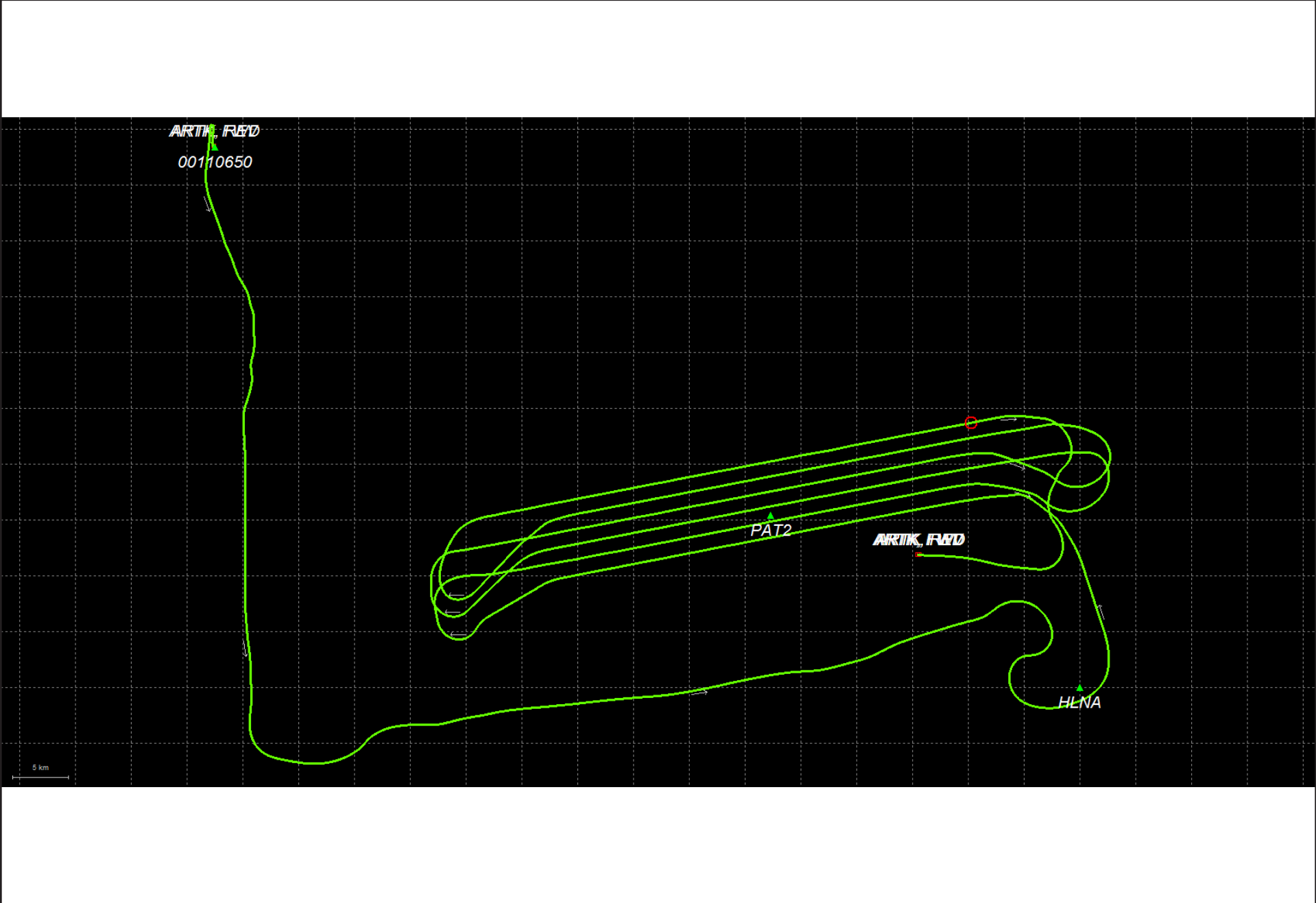
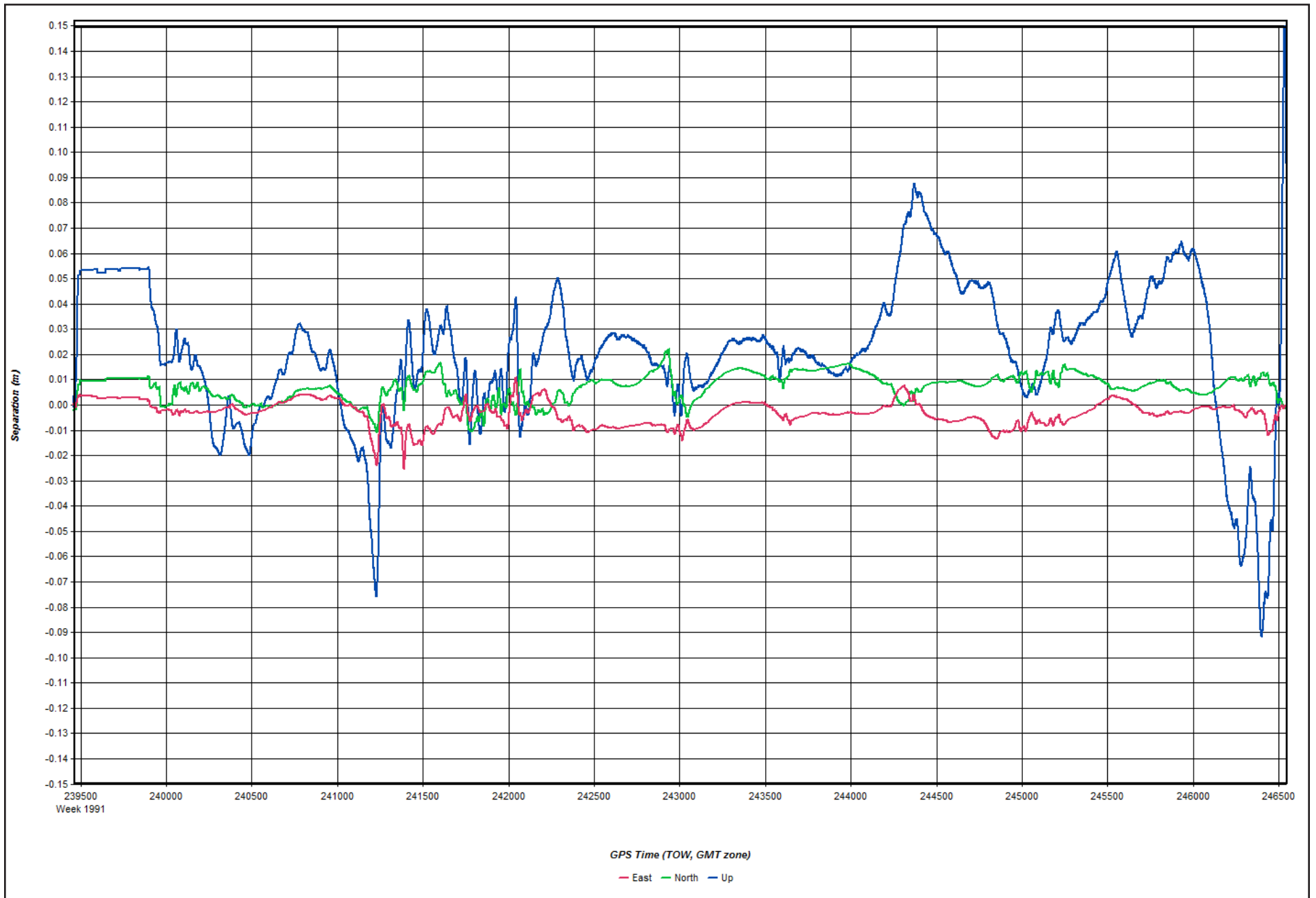


Figure 1: Map



2018-03-06_Day065_7 - 20180306183005

Figure 2: Forward/Reverse or Combined Separation Plot



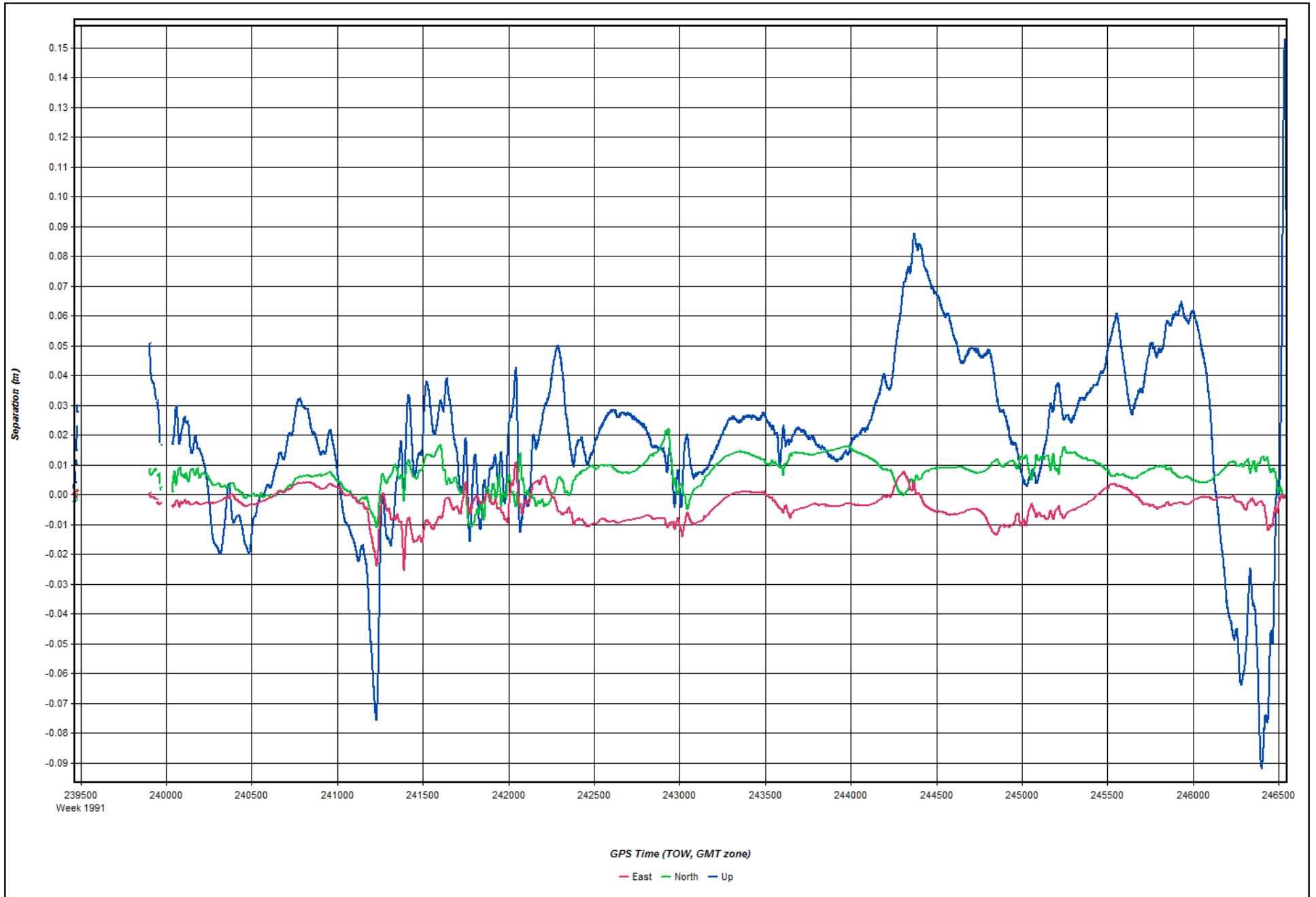
2018-03-06_Day065_7 - 20180306183005

Figure 3: Float or Fixed Ambiguity



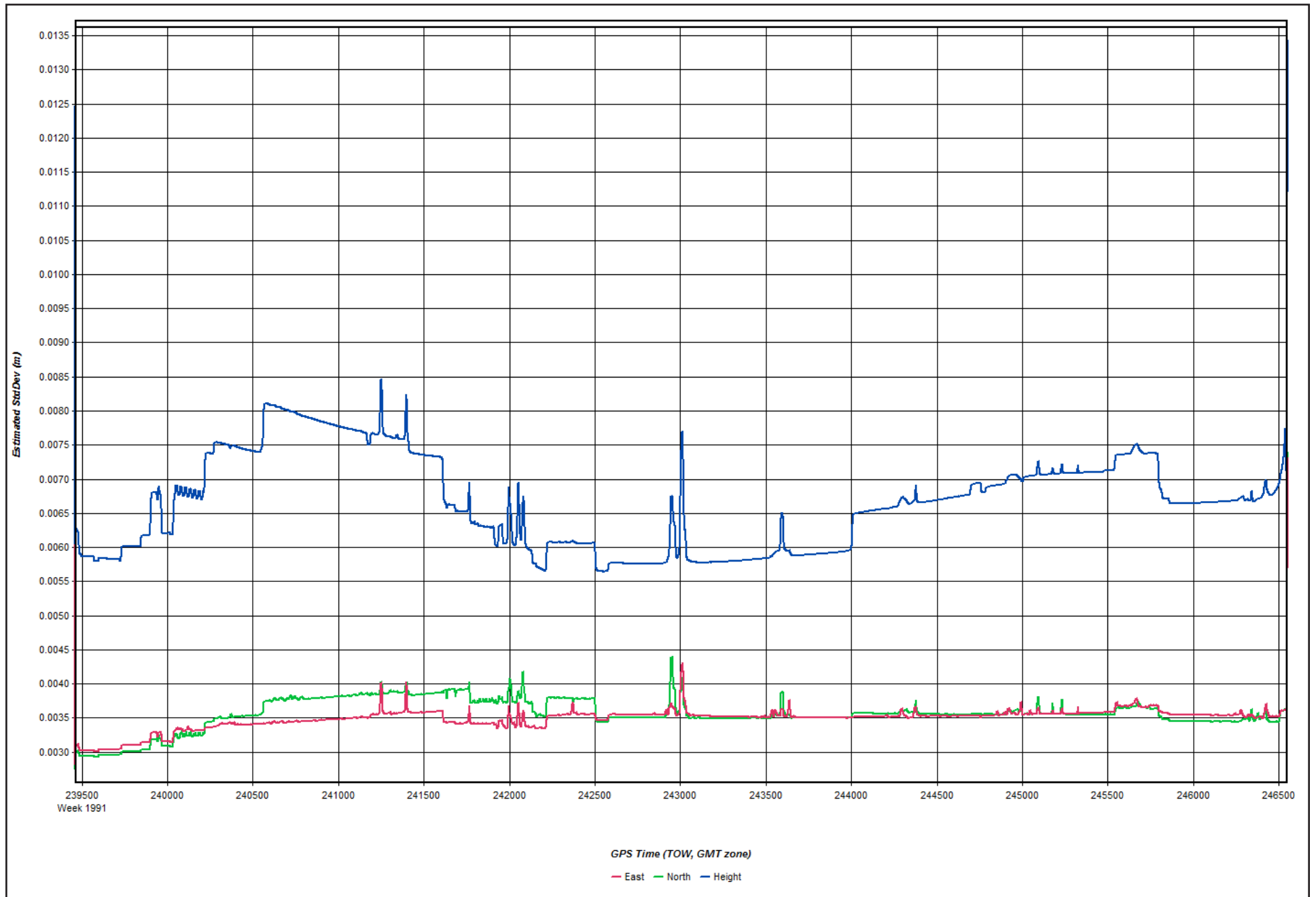
2018-03-06_Day065_7 - 20180306183005

Figure 4: Forward/Reverse Separation Plot (Fixed)



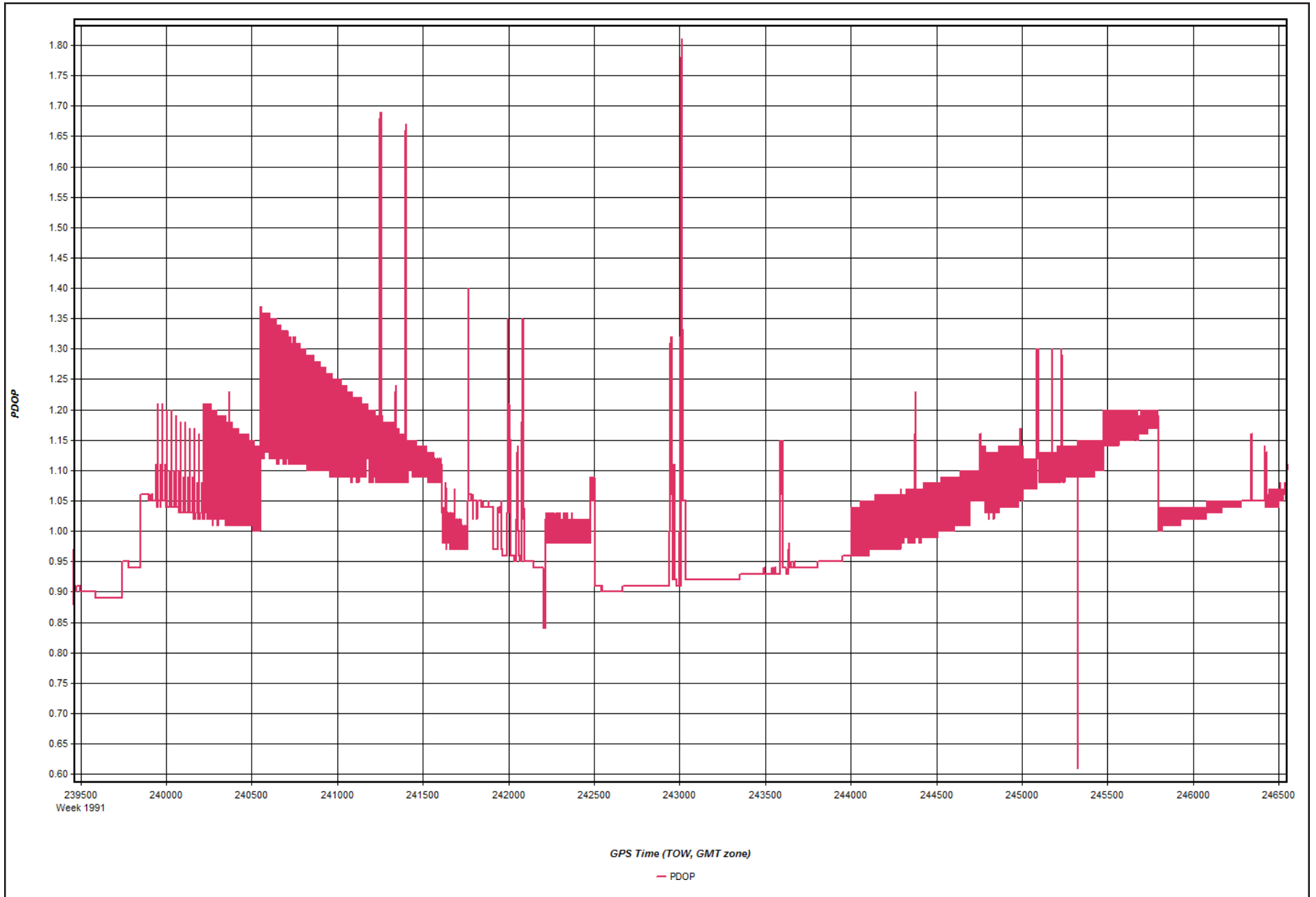
2018-03-06_Day065_7 - 20180306183005

Figure 5: Estimated Position Accuracy Plot



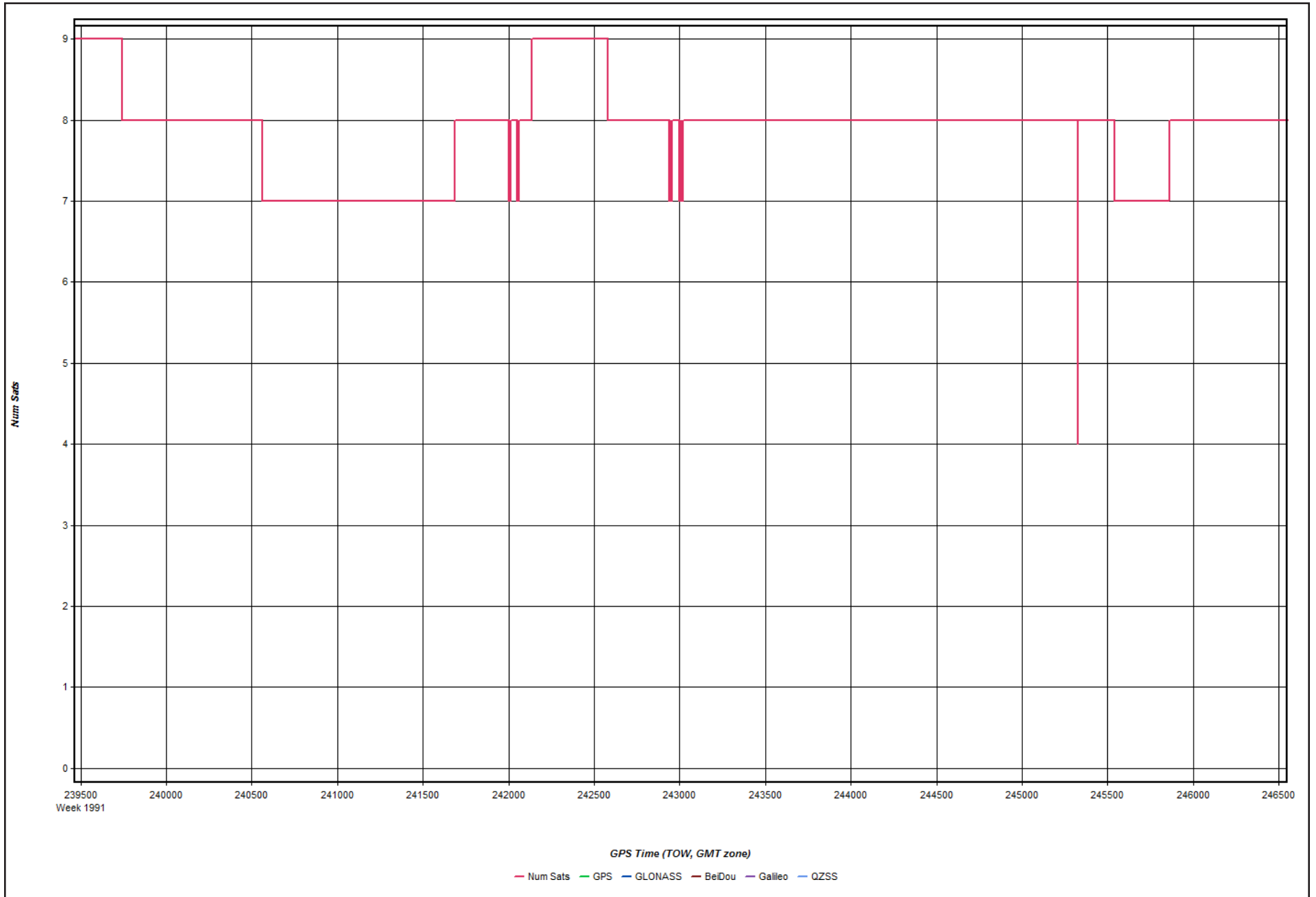
2018-03-06_Day065_7 - 20180306183005

Figure 6: PDOP Plot



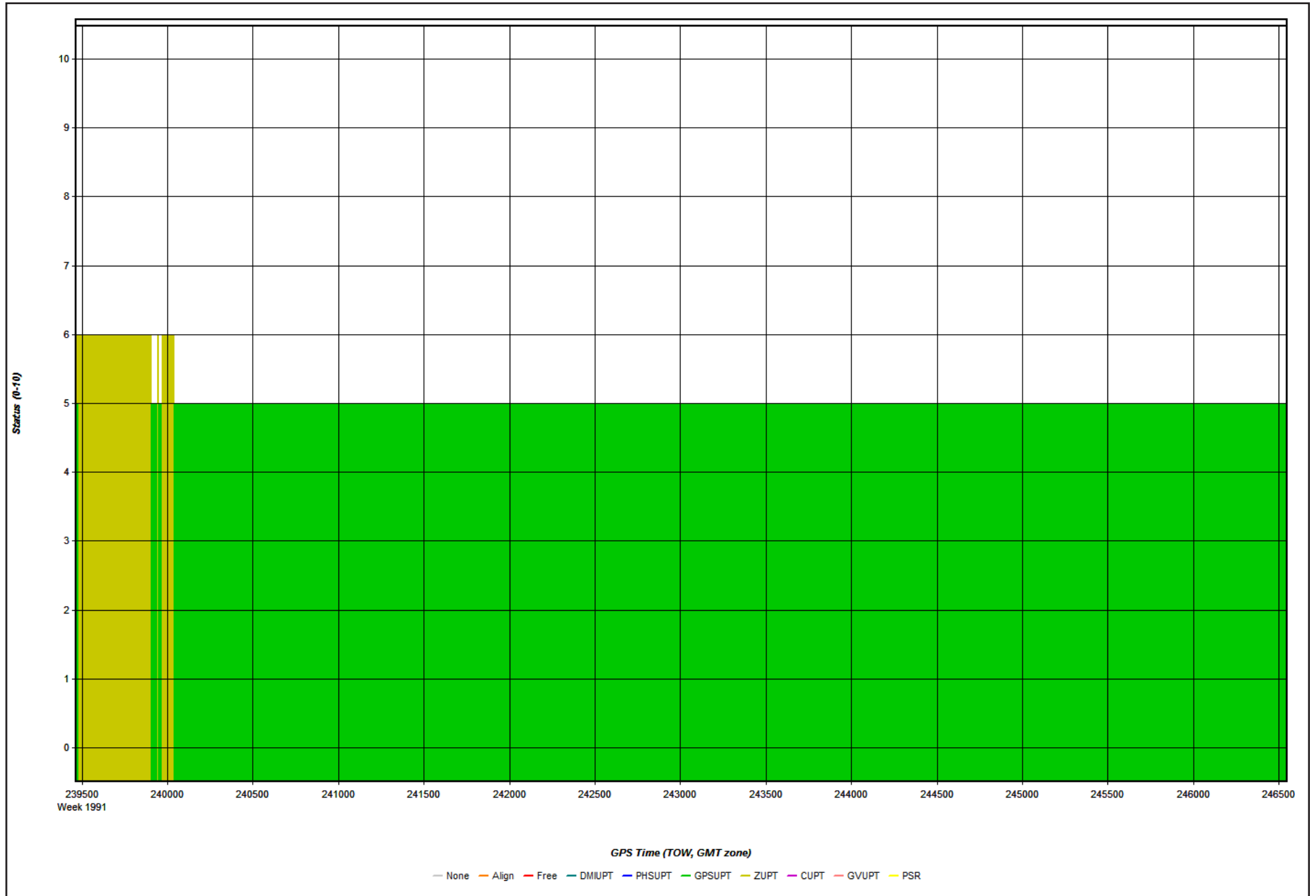
2018-03-06_Day065_7 - 20180306183005

Figure 7: Number of Satellites Line Plot



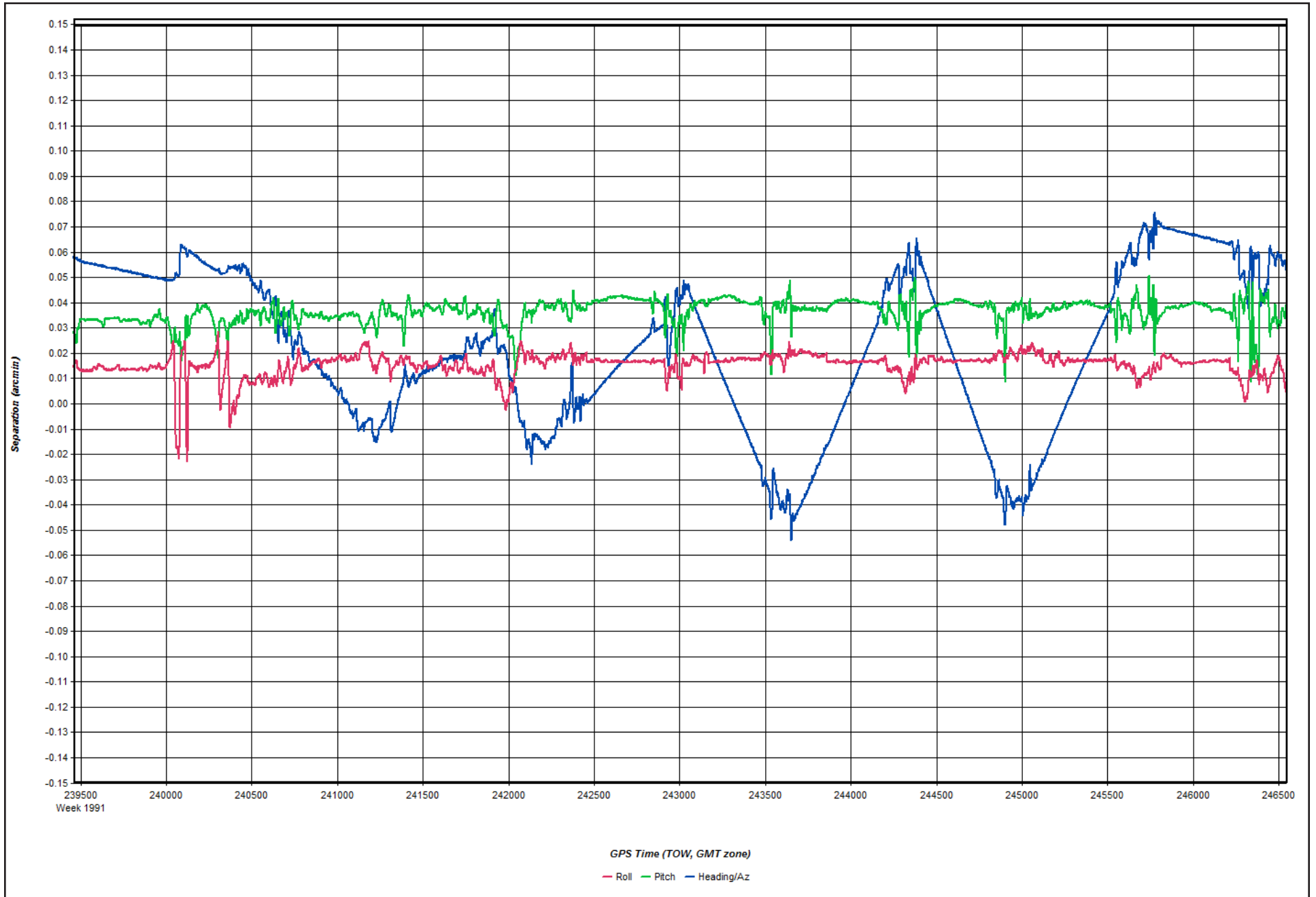
2018-03-06_Day065_7 - 20180306183005

Figure 8: Status flag for IMU processing



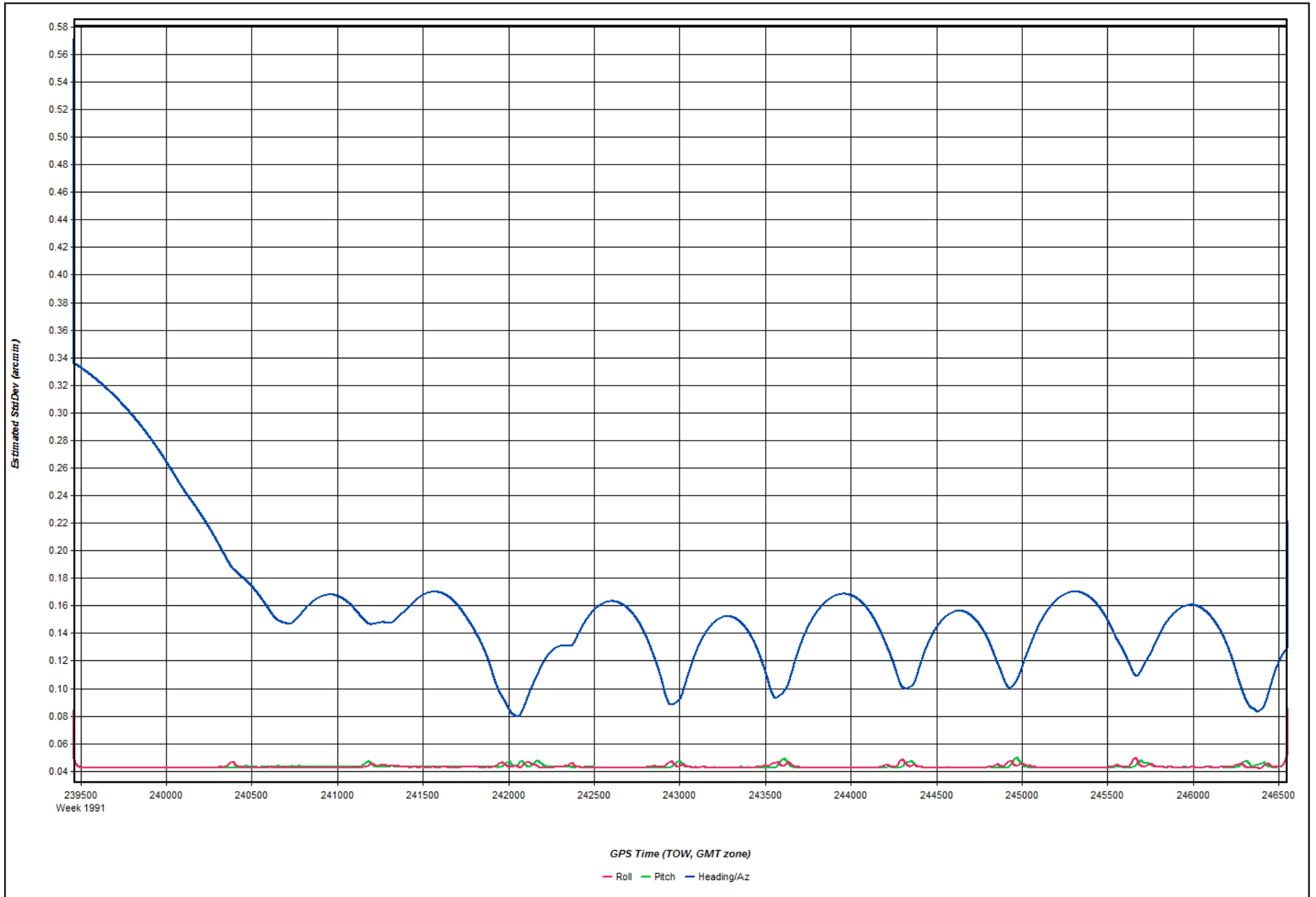
2018-03-06_Day065_7 - 20180306183005

Figure 9: Fwd/Rev Attitude Separation Plot



2018-03-06_Day065_7 - 20180306183005

Figure 10: Estimated Attitude Accuracy Plot



2018-03-06_Day065_7 - 20180306183005

Figure 11: Azimuth Plot



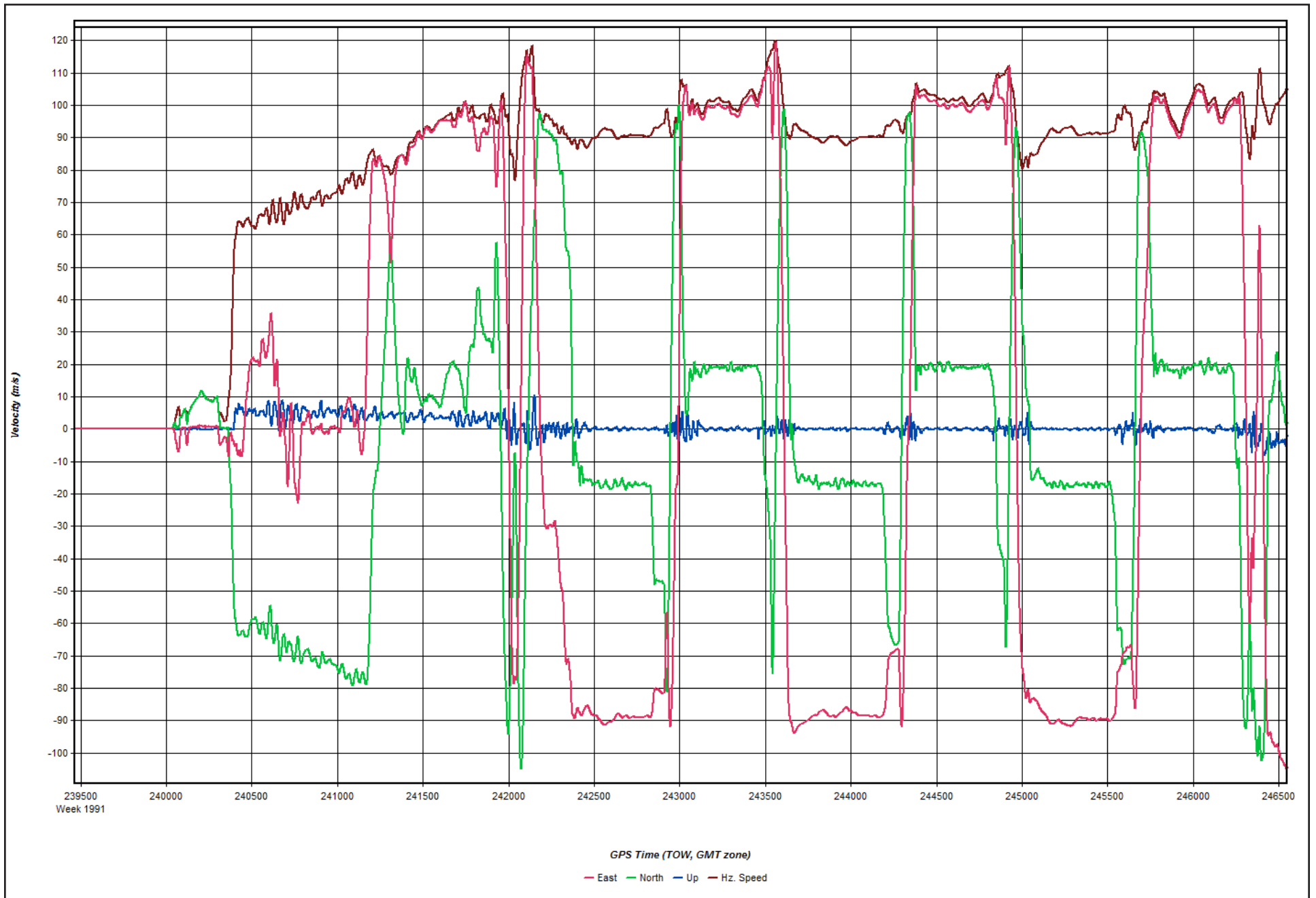
2018-03-06_Day065_7 - 20180306183005

Figure 12: Roll & Pitch Plot



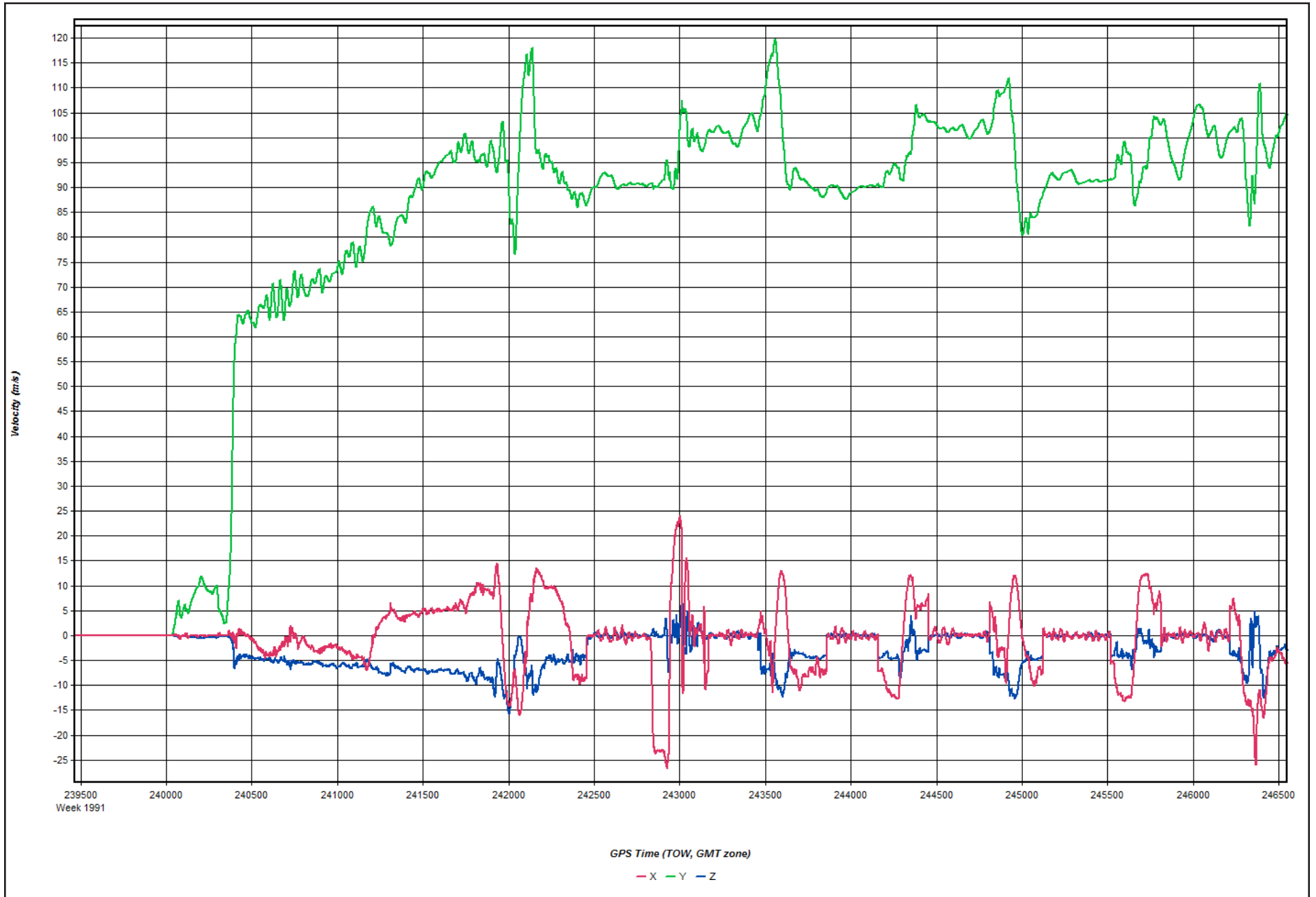
2018-03-06_Day065_7 - 20180306183005

Figure 13: Velocity Profile Plot



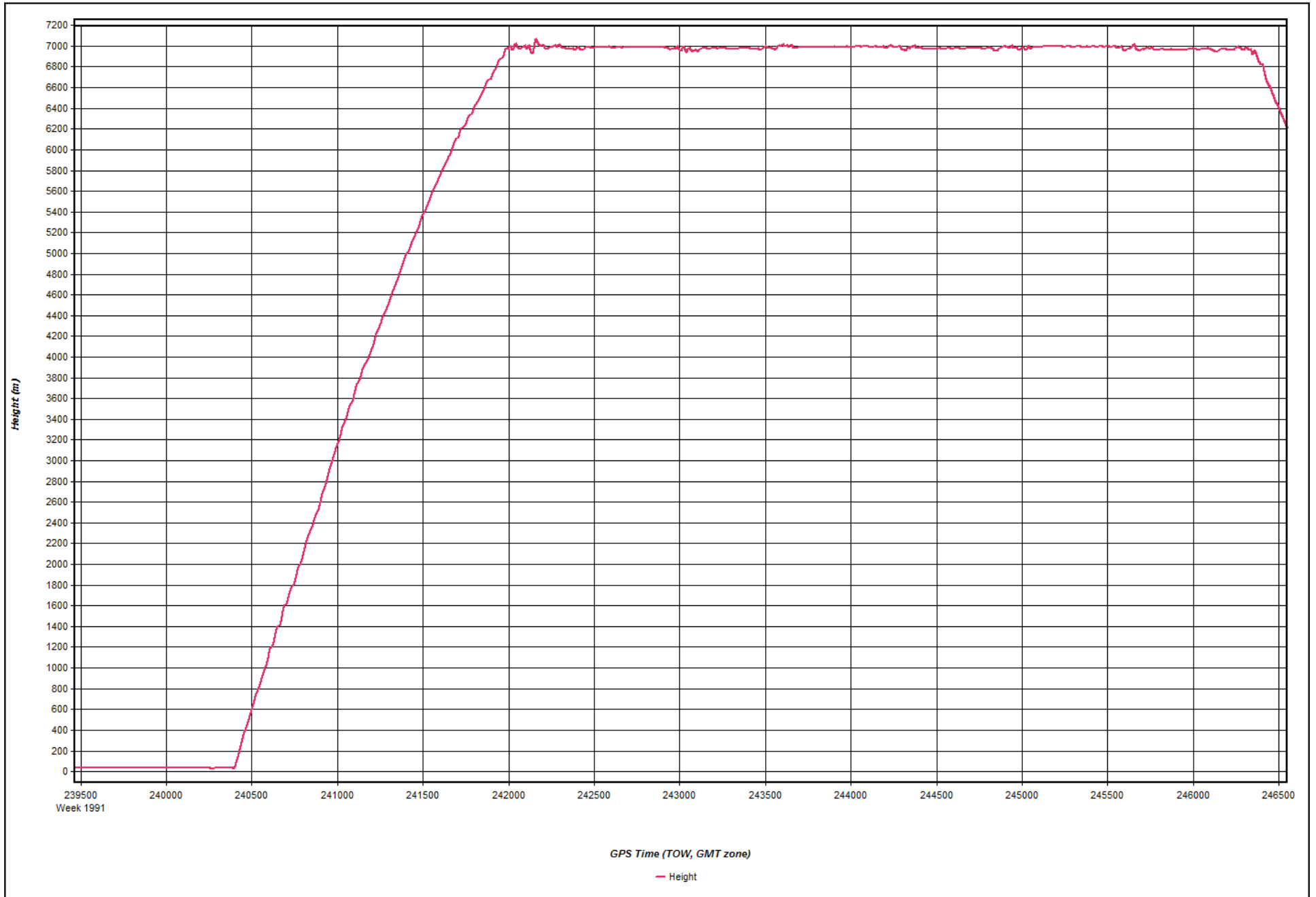
2018-03-06_Day065_7 - 20180306183005

Figure 14: Body Frame Velocity Plot



2018-03-06_Day065_7 - 20180306183005

Figure 15: Height Profile Plot



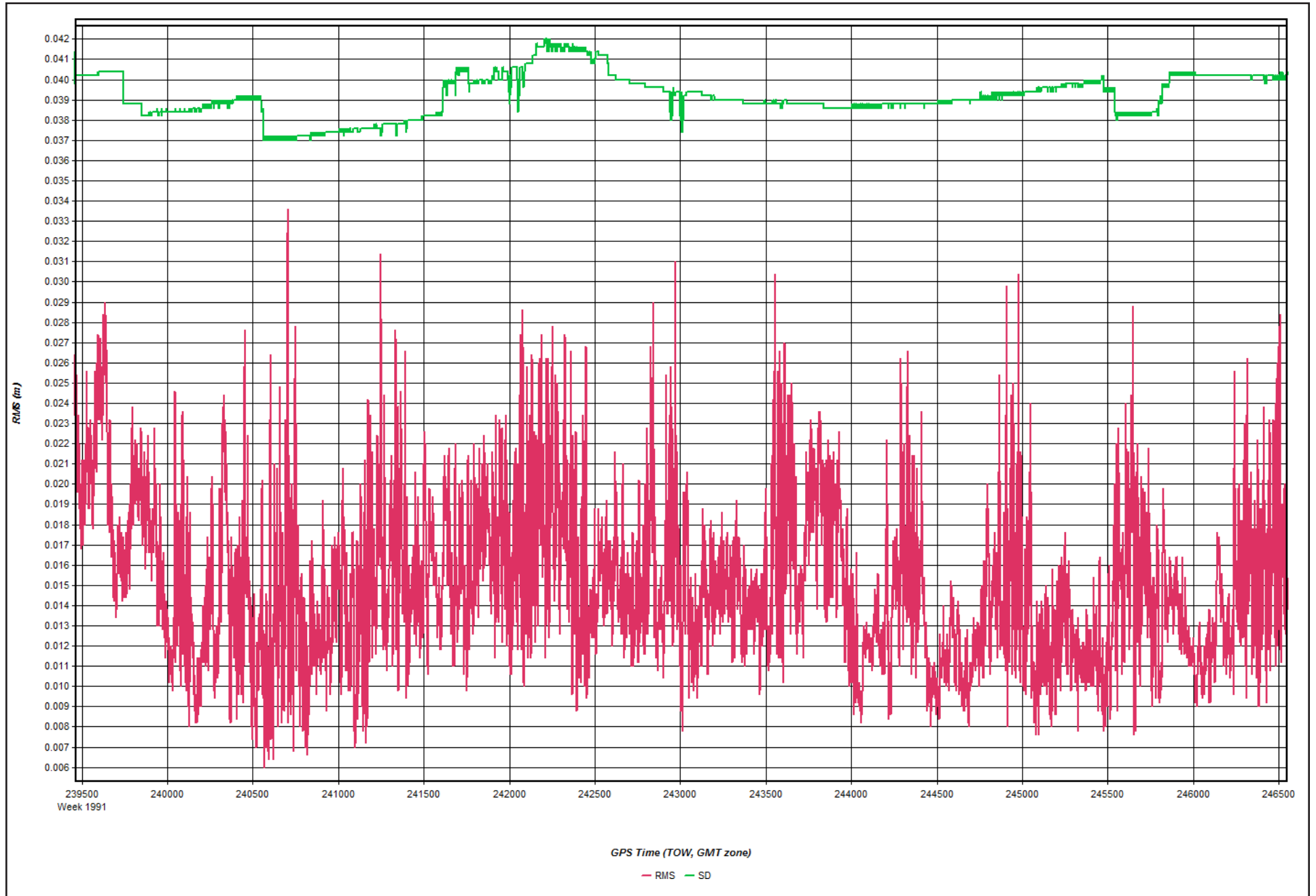
2018-03-06_Day065_7 - 20180306183005

Figure 16: C/A Code Residual RMS Plot



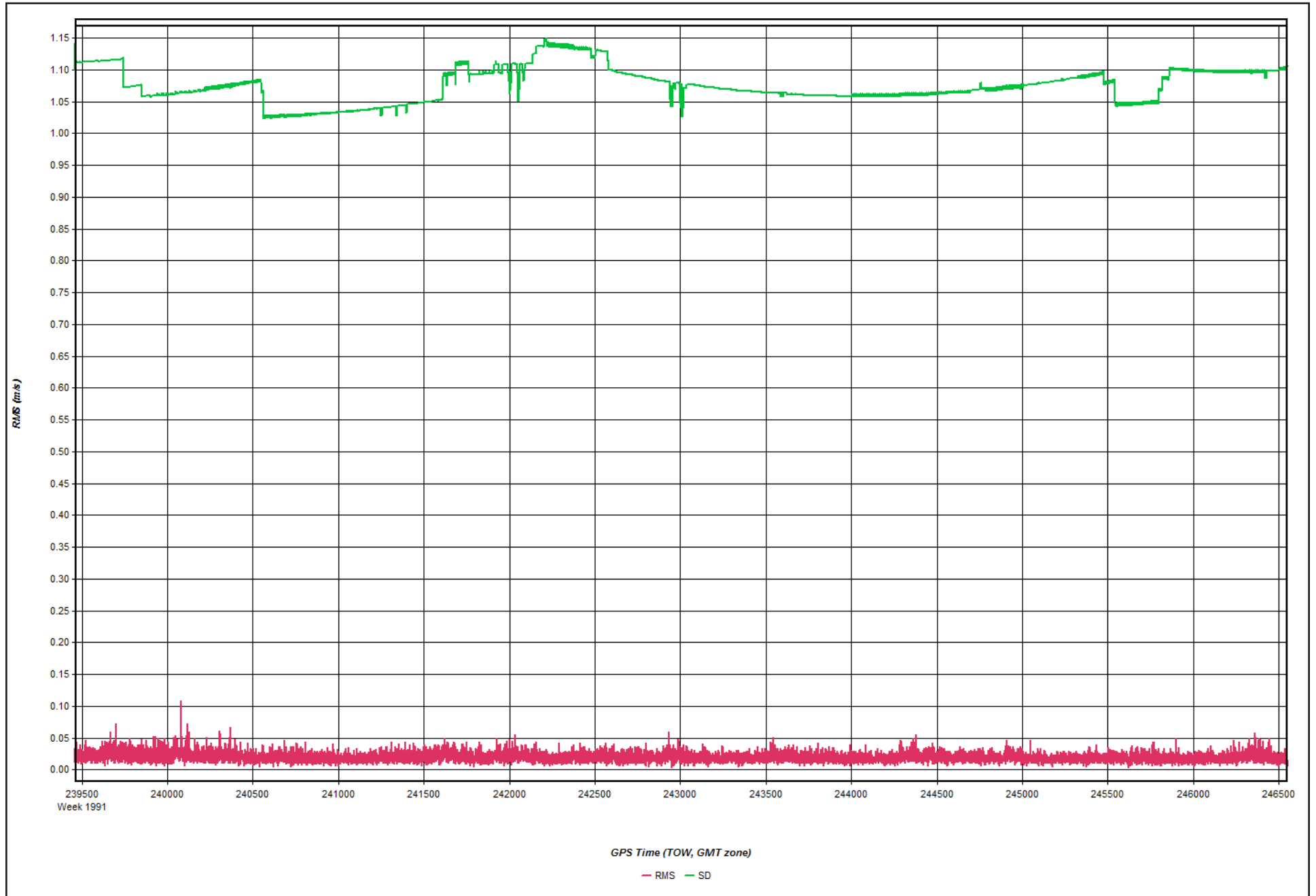
2018-03-06_Day065_7 - 20180306183005

Figure 17: Carrier Residual RMS Plot



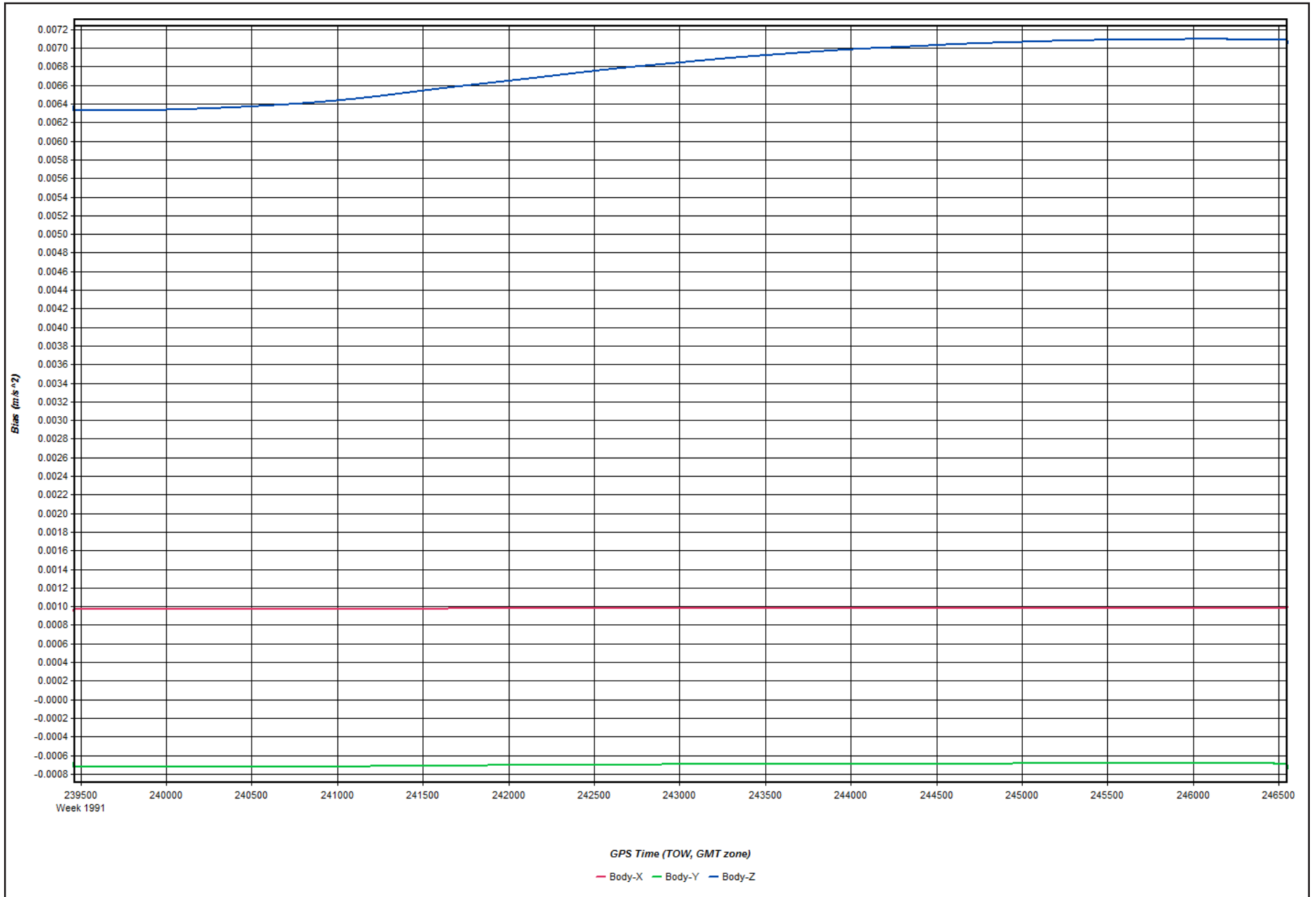
2018-03-06_Day065_7 - 20180306183005

Figure 18: L1 Doppler Residual RMS Plot



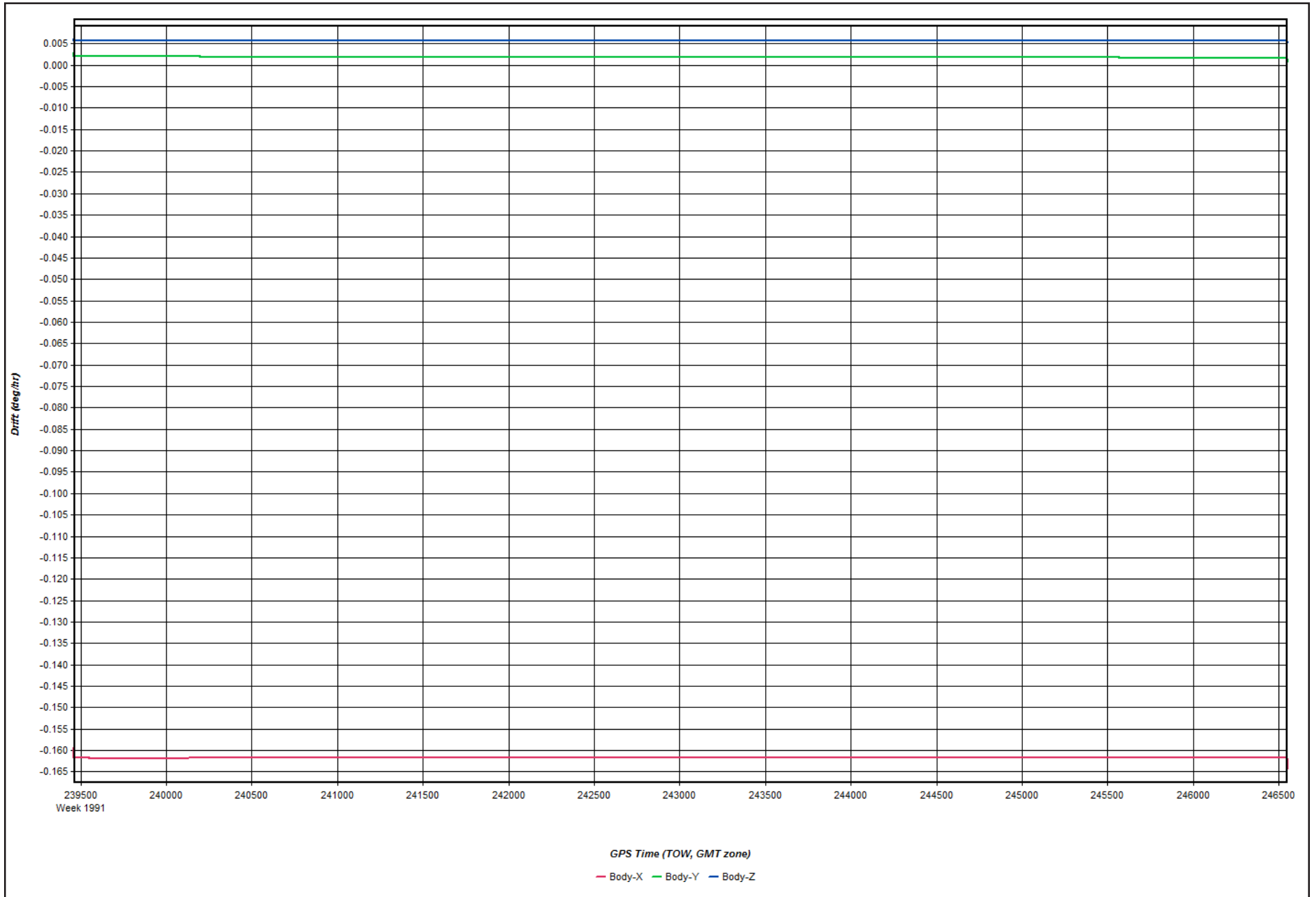
2018-03-06_Day065_7 - 20180306183005

Figure 19: Accelerometer Bias Plot



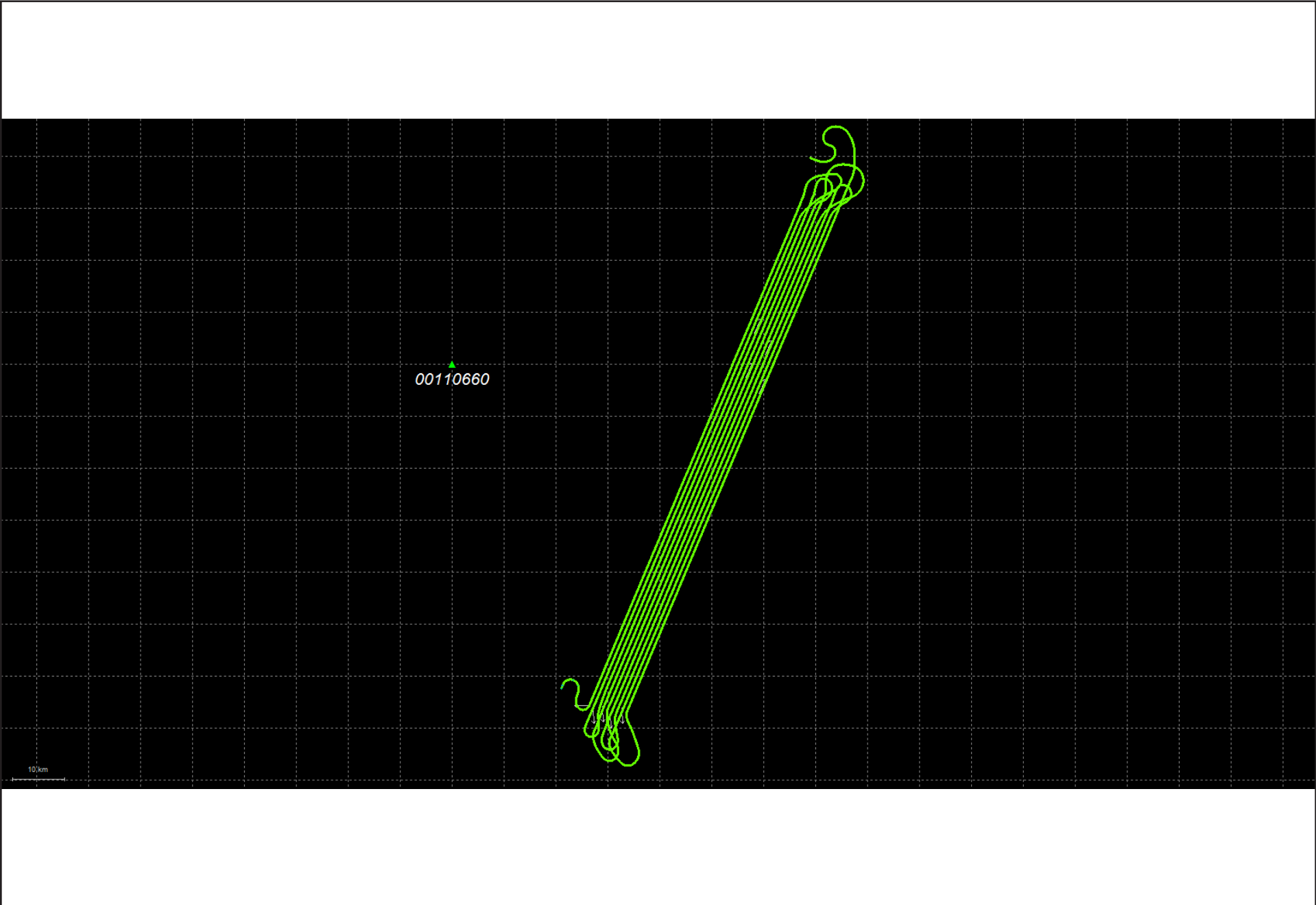
2018-03-06_Day065_7 - 20180306183005

Figure 20: Gyro Drift Plot



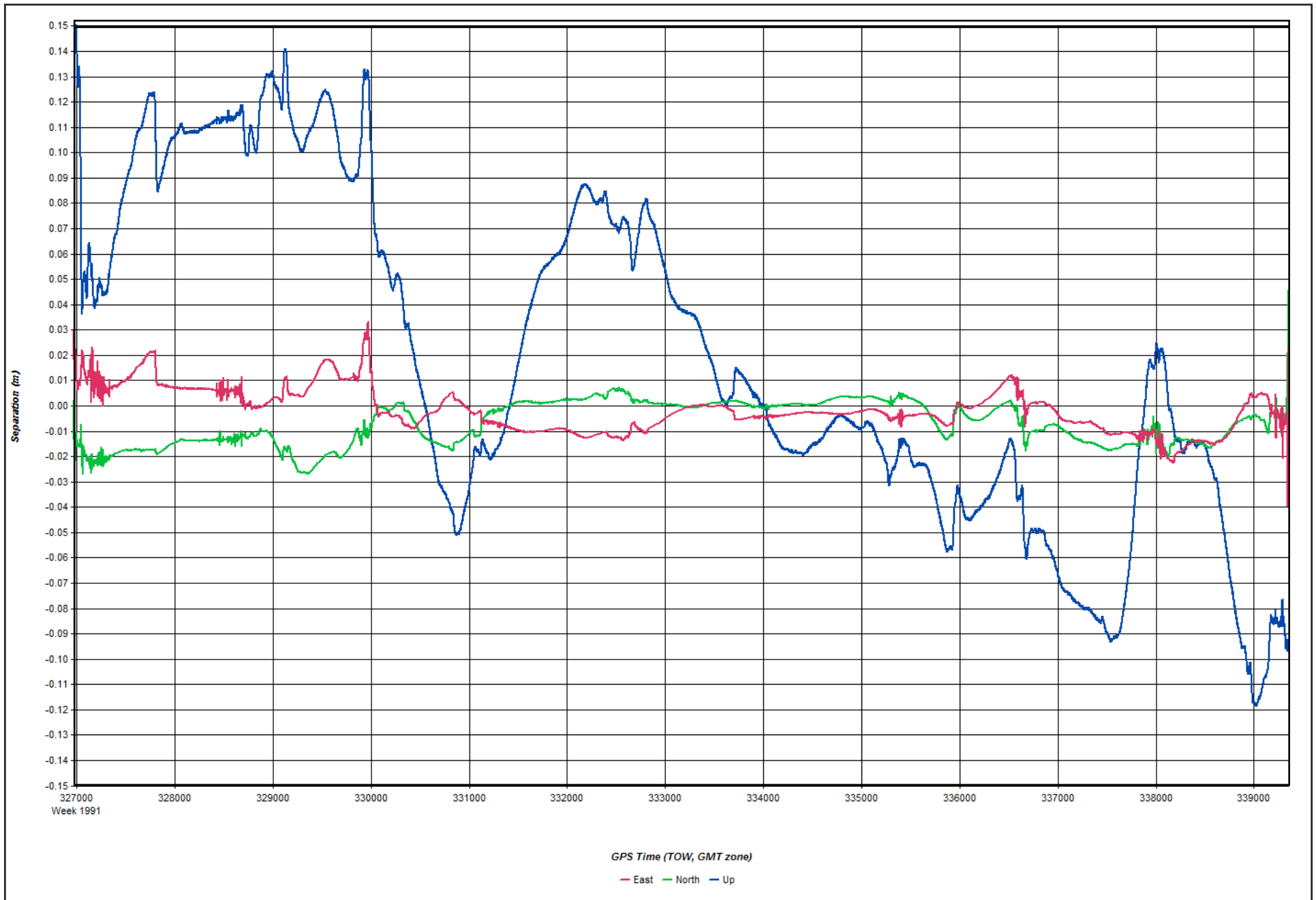
2018-03-07_Day066_7 - 20180307181345

Figure 1: Map



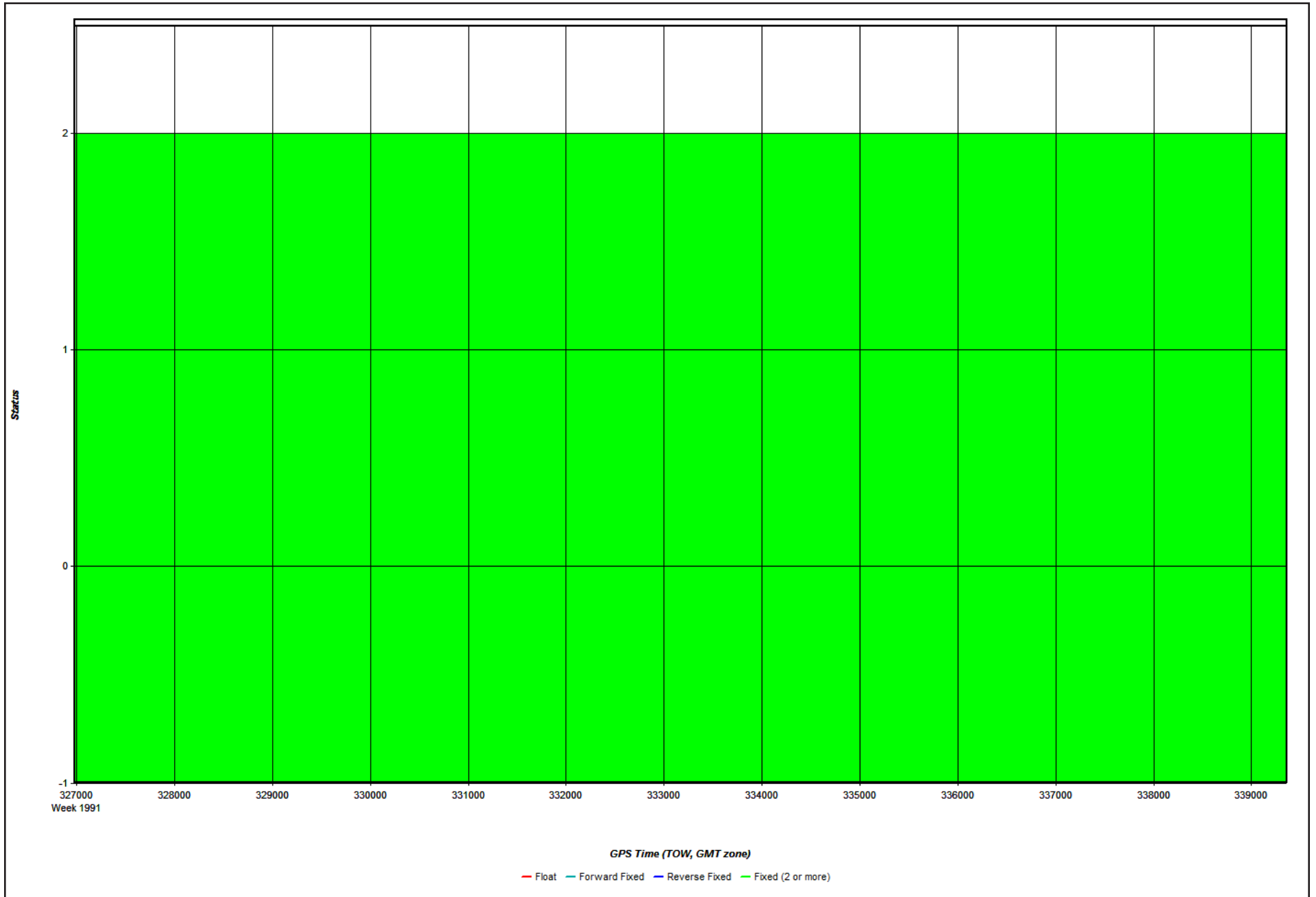
2018-03-07_Day066_7 - 20180307181345

Figure 2: Forward/Reverse or Combined Separation Plot



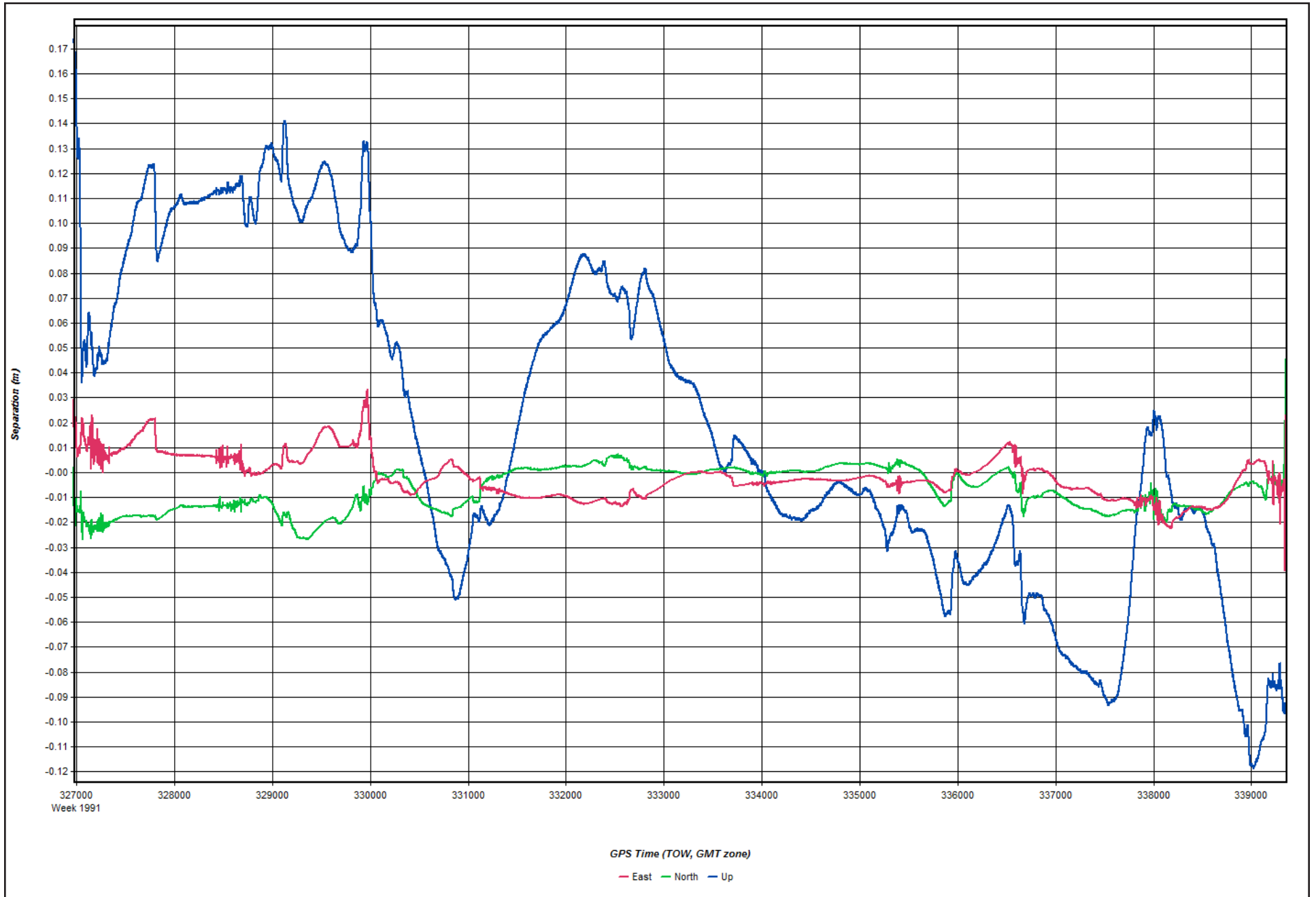
2018-03-07_Day066_7 - 20180307181345

Figure 3: Float or Fixed Ambiguity



2018-03-07_Day066_7 - 20180307181345

Figure 4: Forward/Reverse Separation Plot (Fixed)



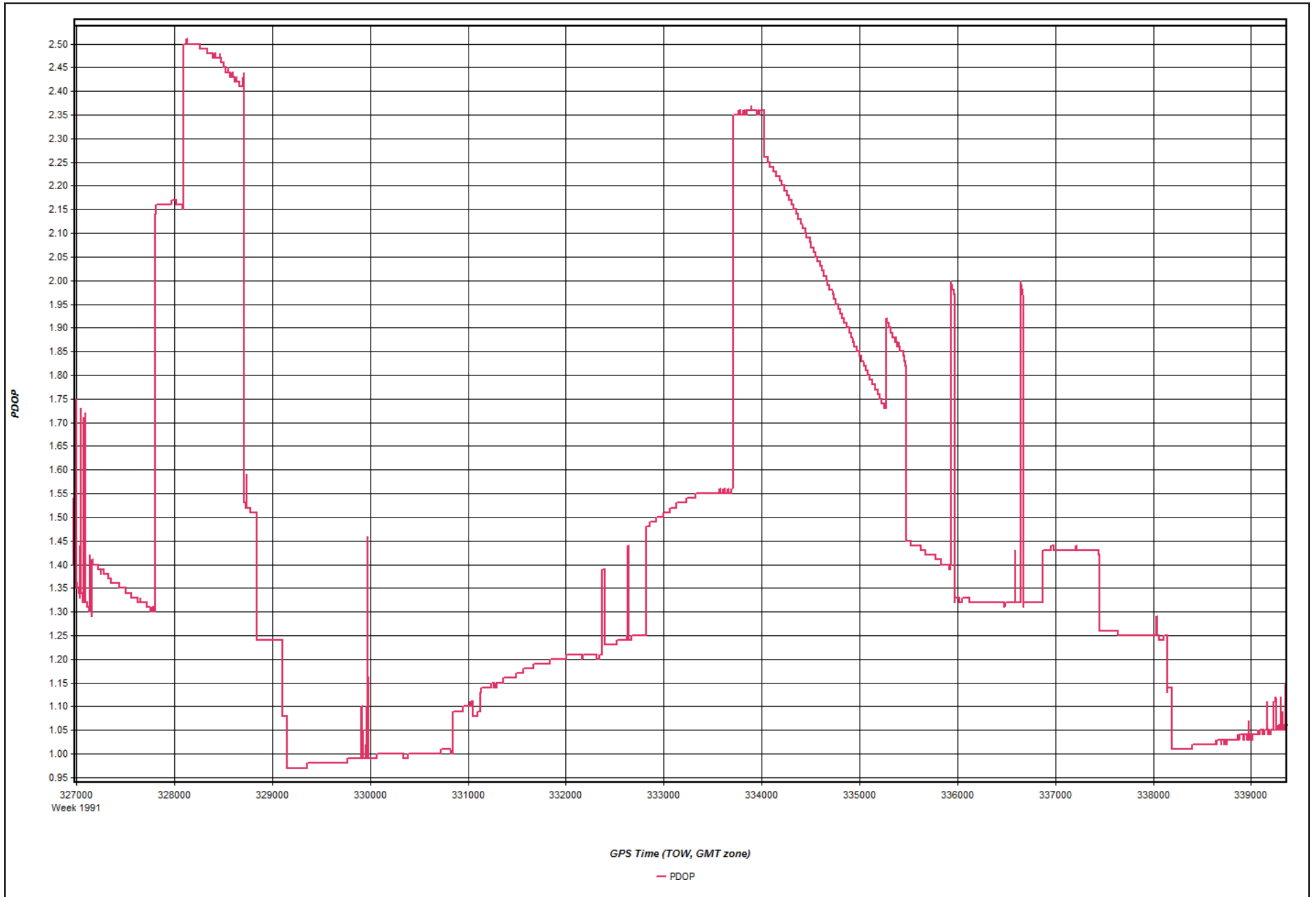
2018-03-07_Day066_7 - 20180307181345

Figure 5: Estimated Position Accuracy Plot



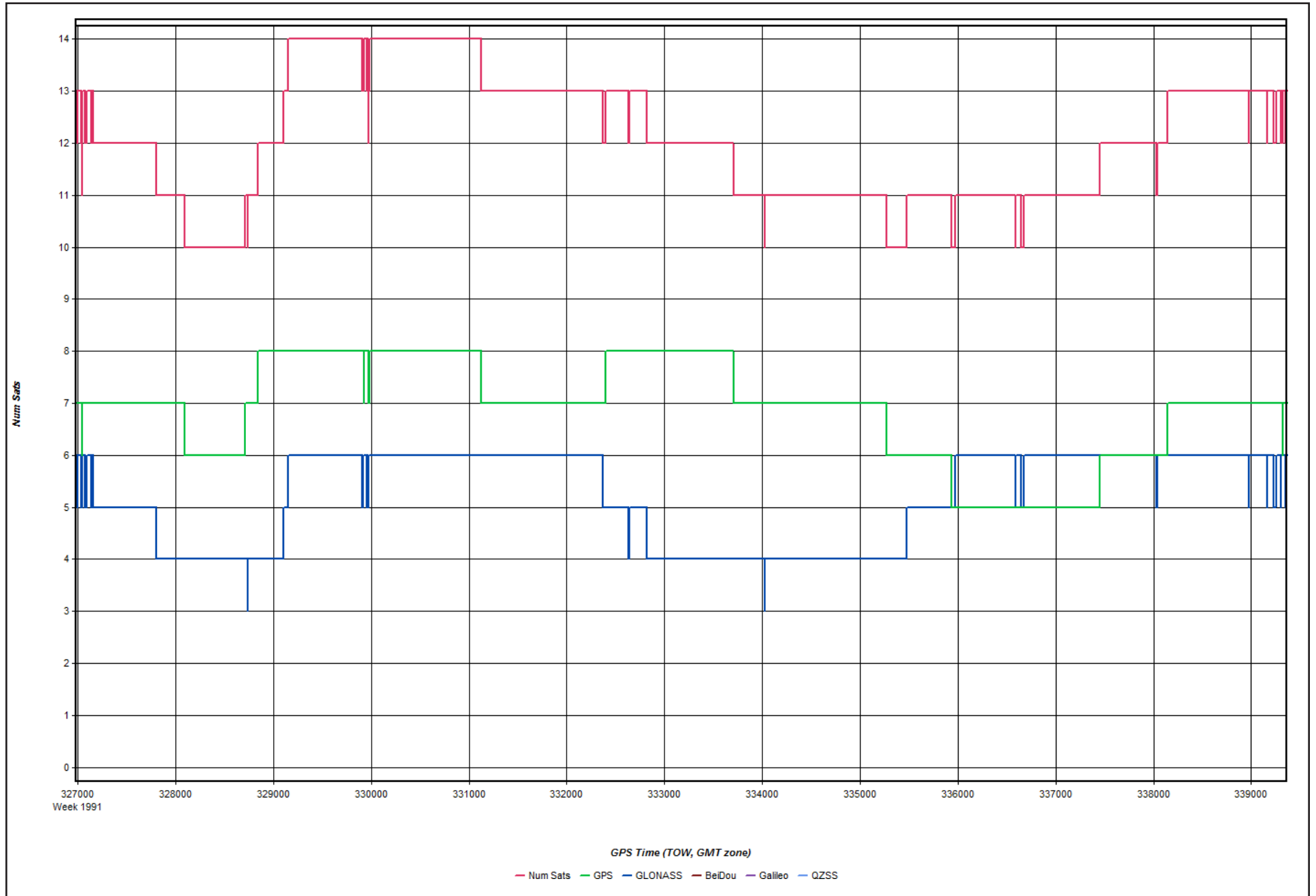
2018-03-07_Day066_7 - 20180307181345

Figure 6: PDOP Plot



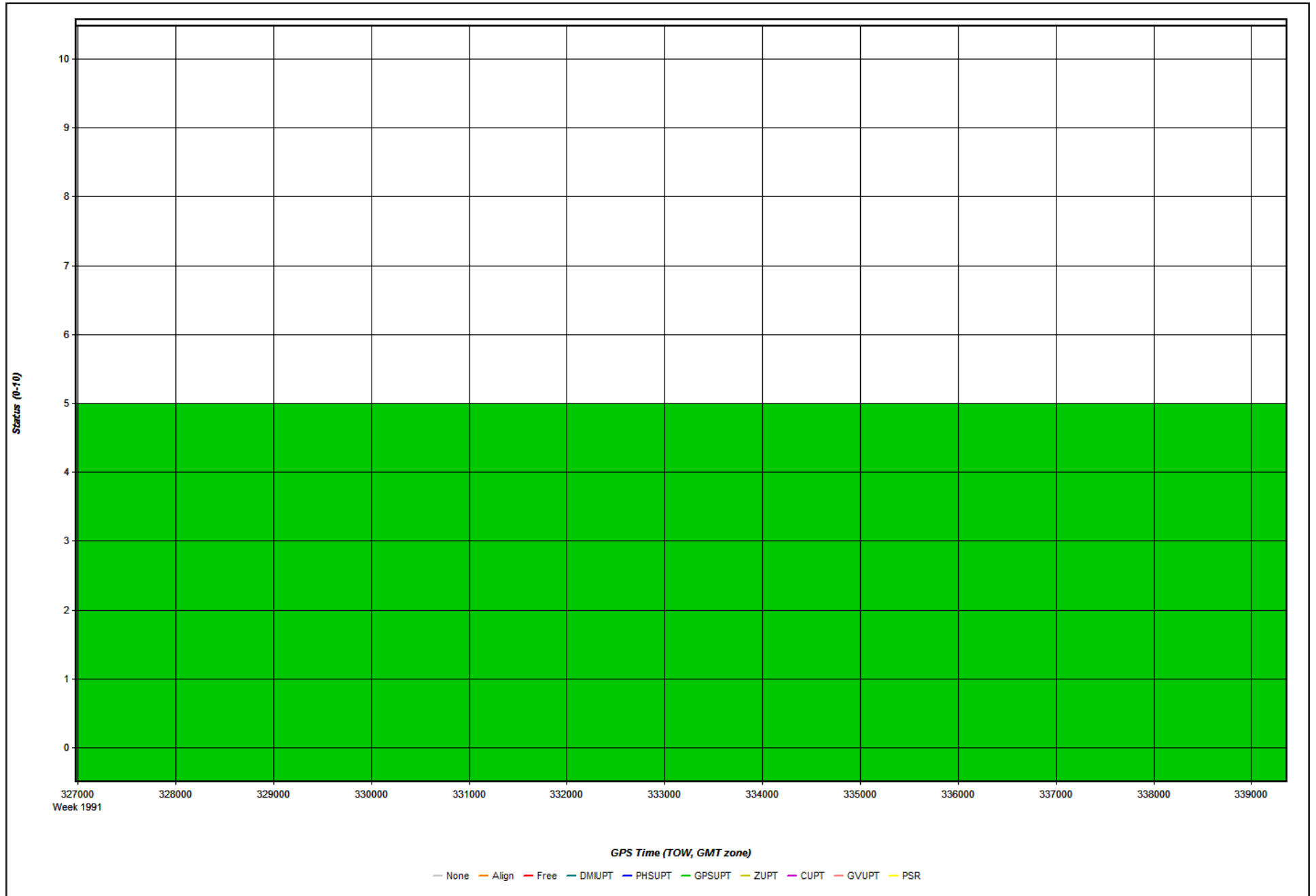
2018-03-07_Day066_7 - 20180307181345

Figure 7: Number of Satellites Line Plot



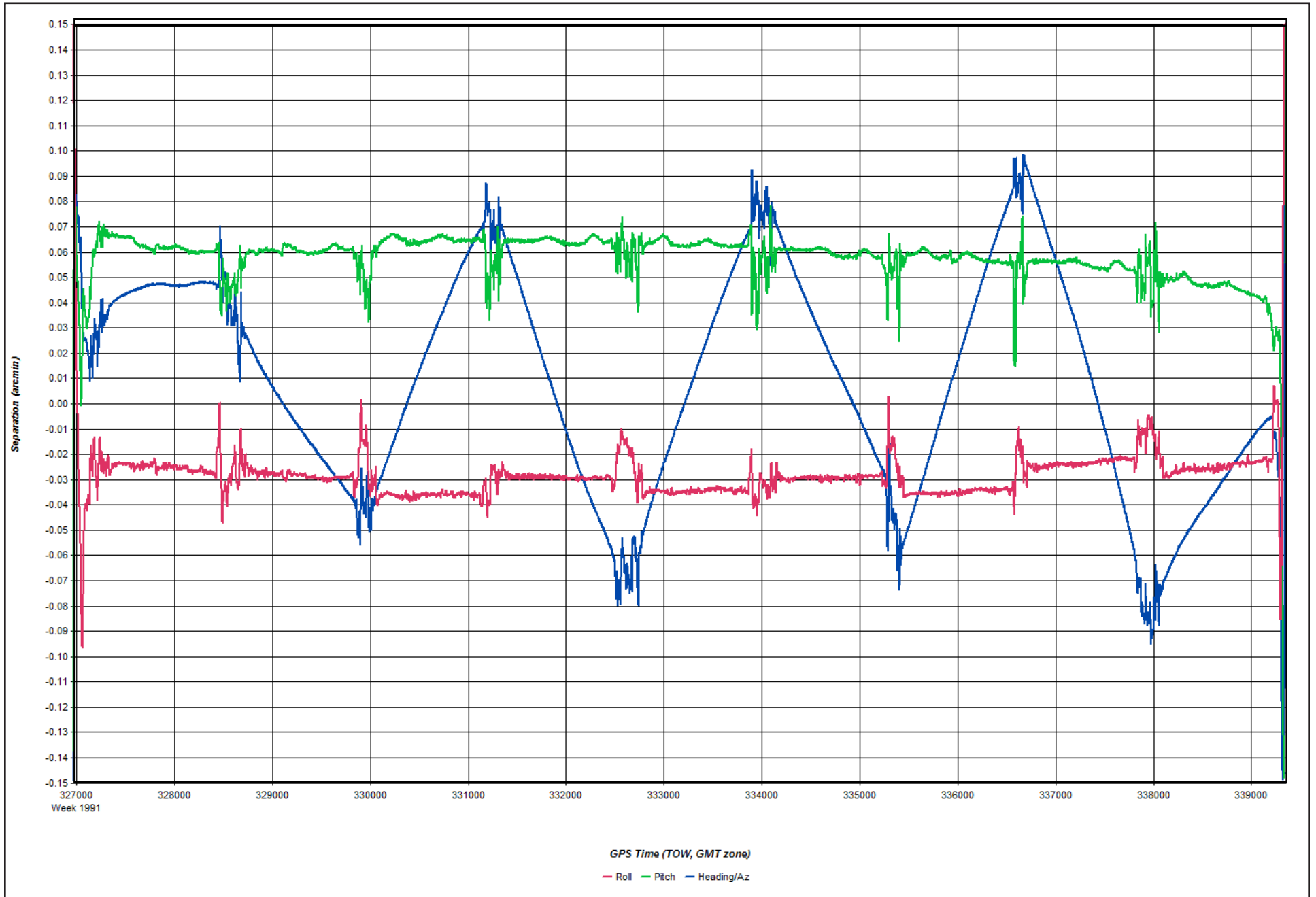
2018-03-07_Day066_7 - 20180307181345

Figure 8: Status flag for IMU processing



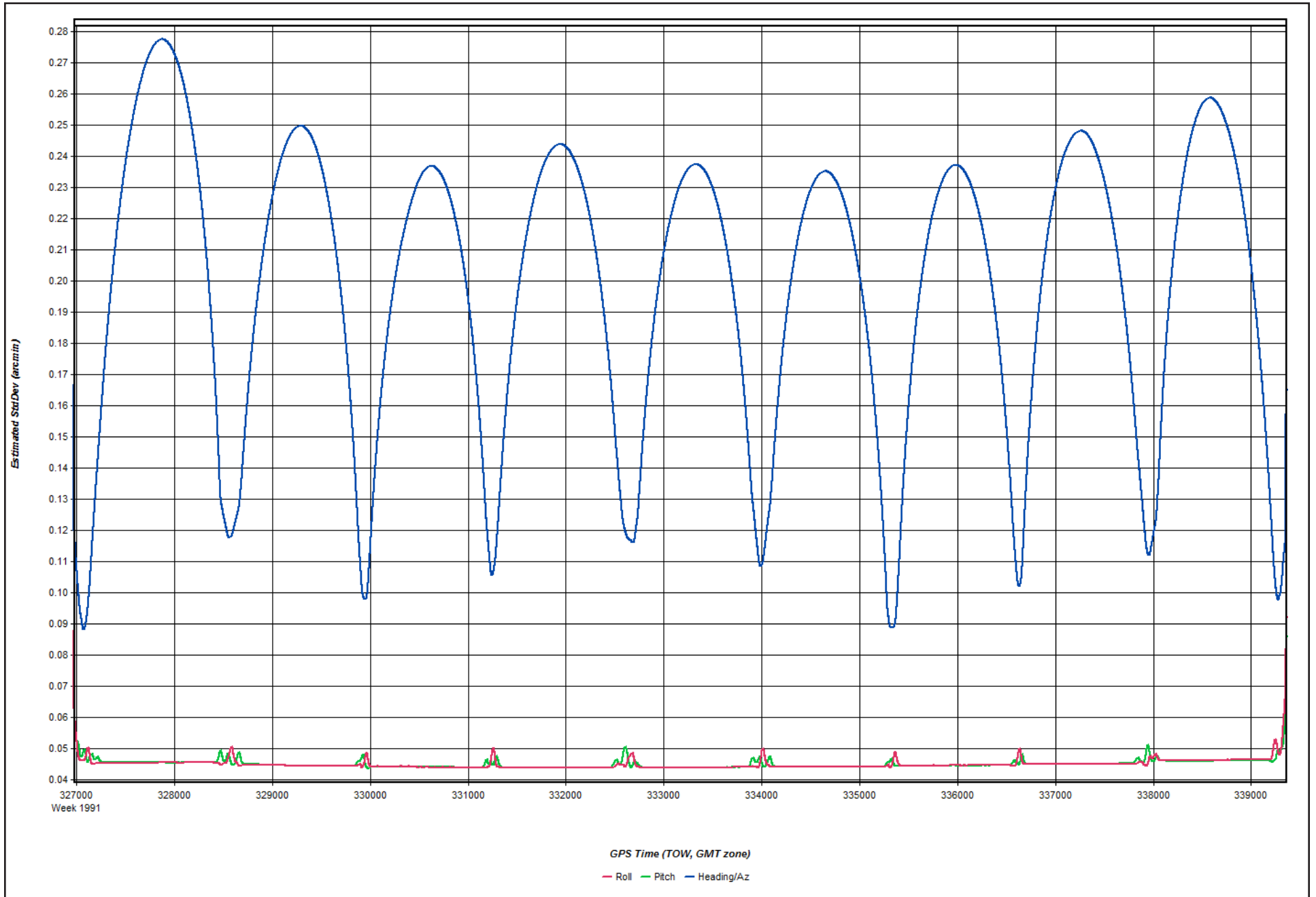
2018-03-07_Day066_7 - 20180307181345

Figure 9: Fwd/Rev Attitude Separation Plot



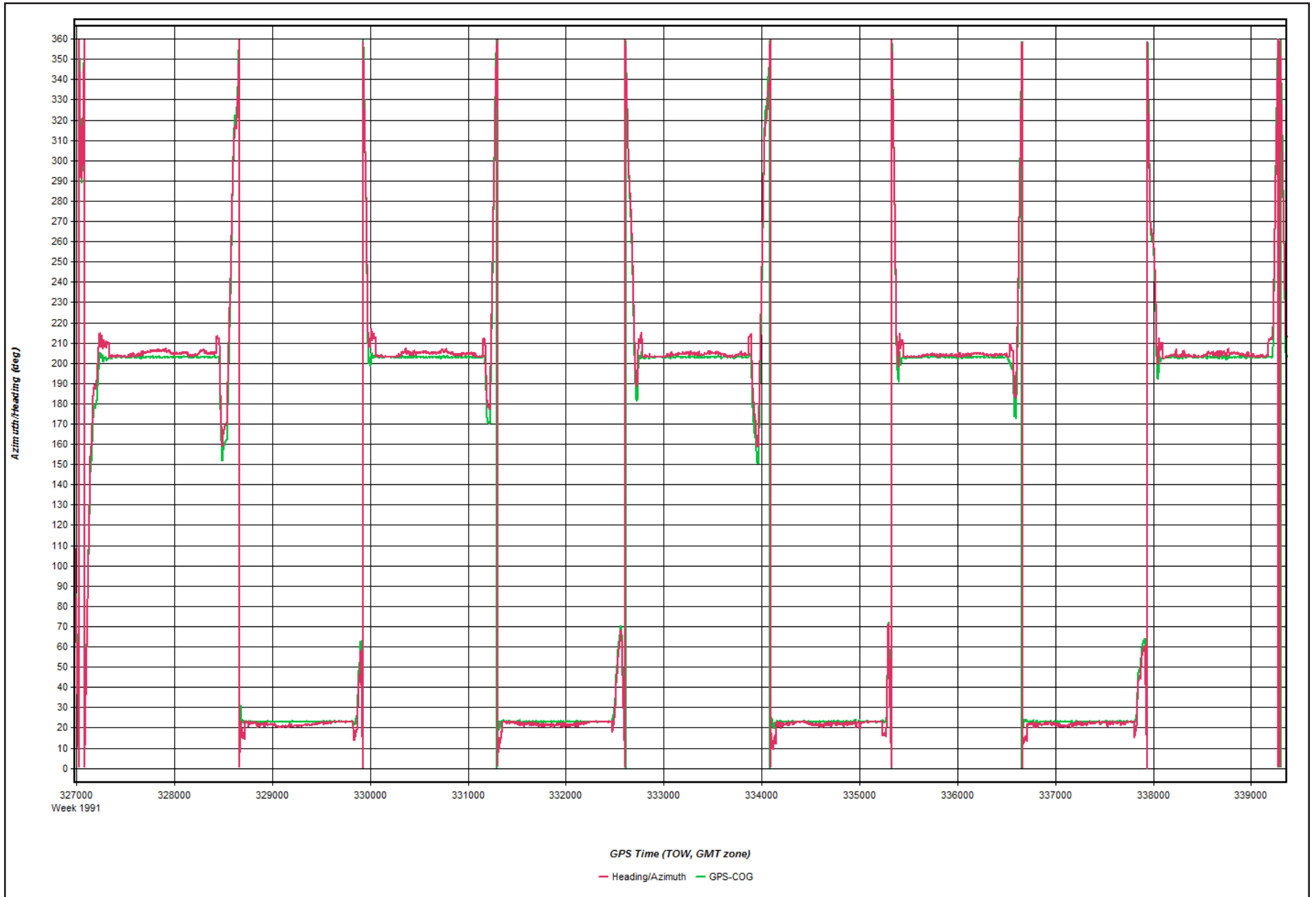
2018-03-07_Day066_7 - 20180307181345

Figure 10: Estimated Attitude Accuracy Plot



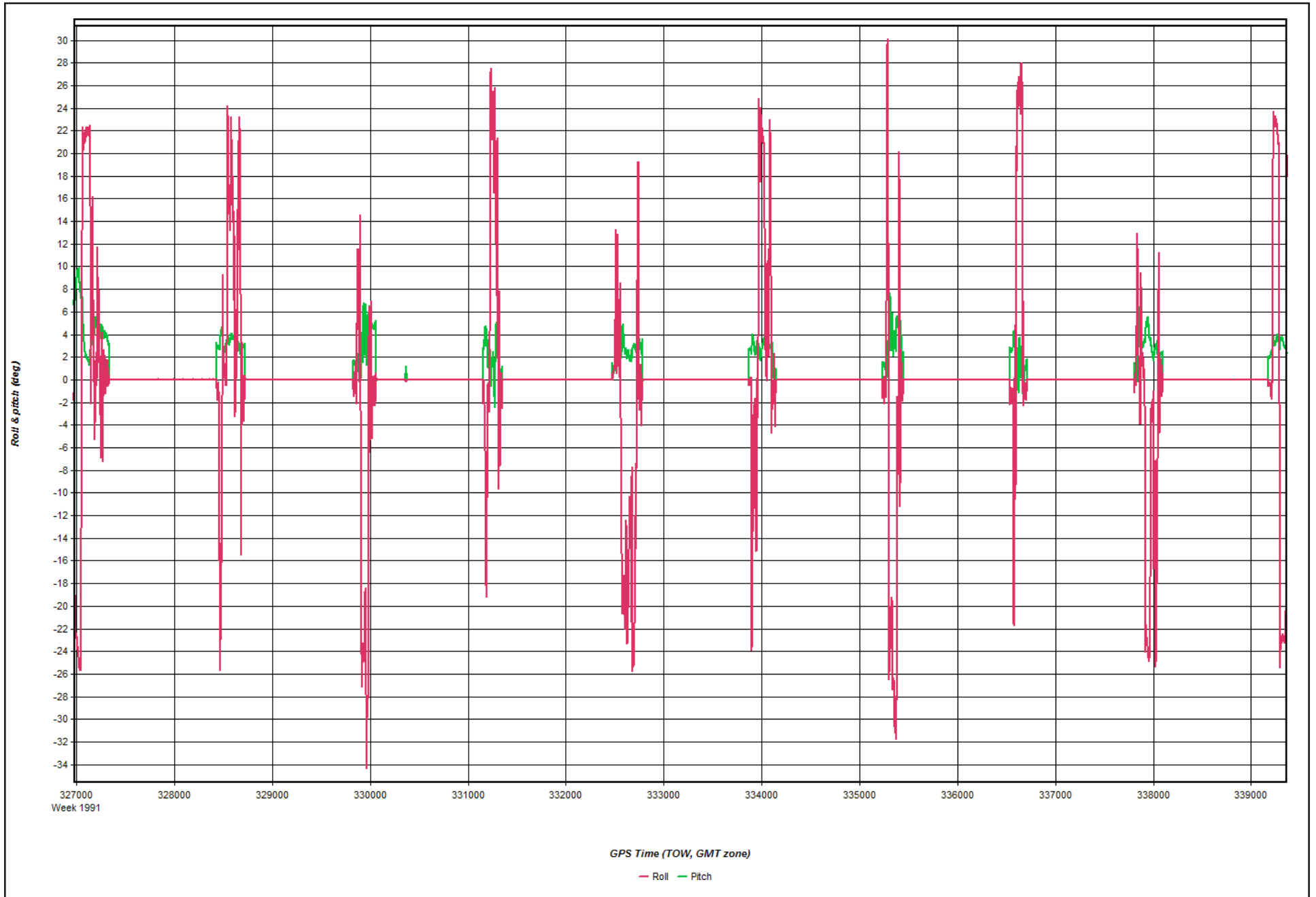
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Figure 11: Azimuth Plot



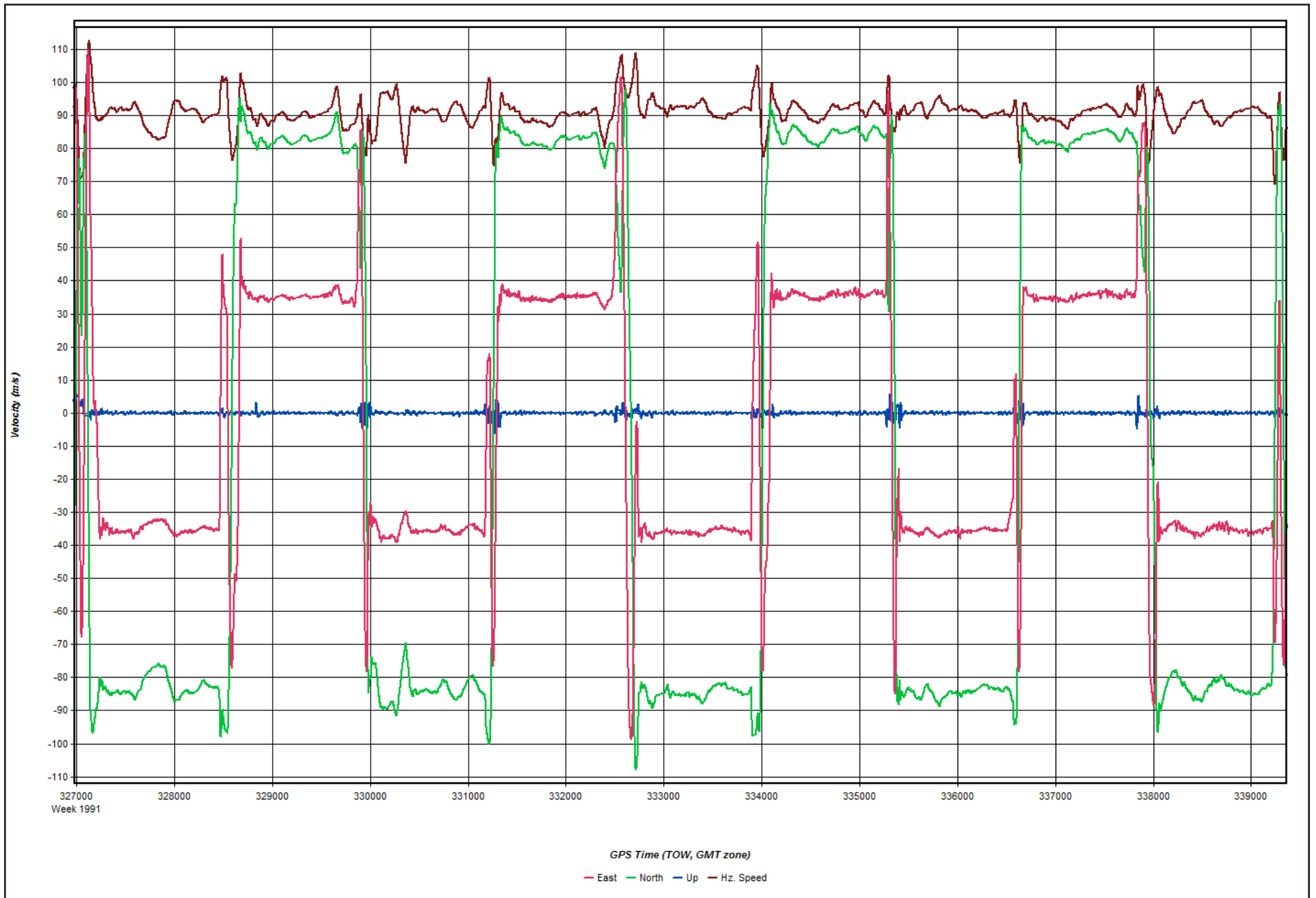
2018-03-07_Day066_7 - 20180307181345

Figure 12: Roll & Pitch Plot



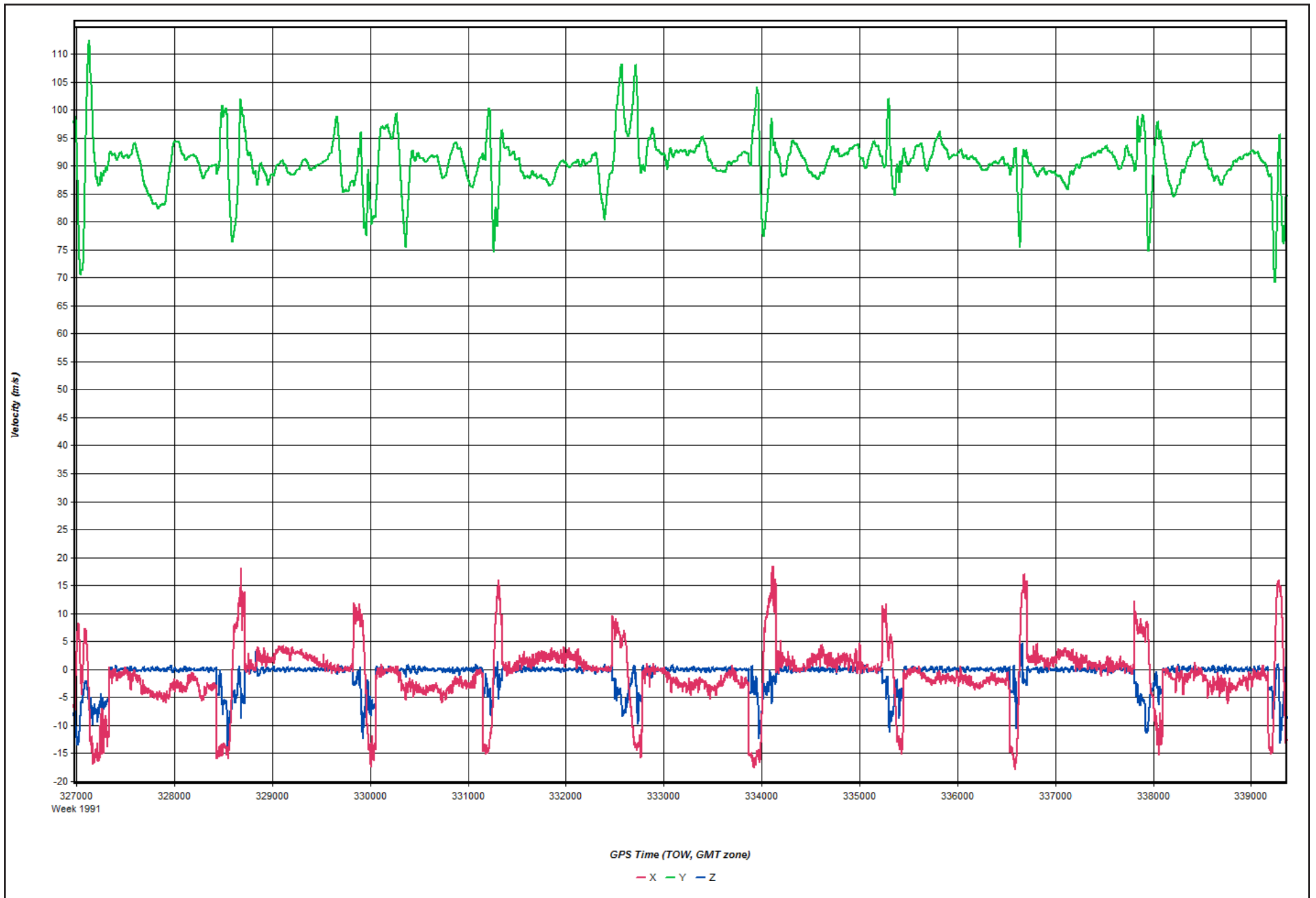
2018-03-07_Day066_7 - 20180307181345

Figure 13: Velocity Profile Plot



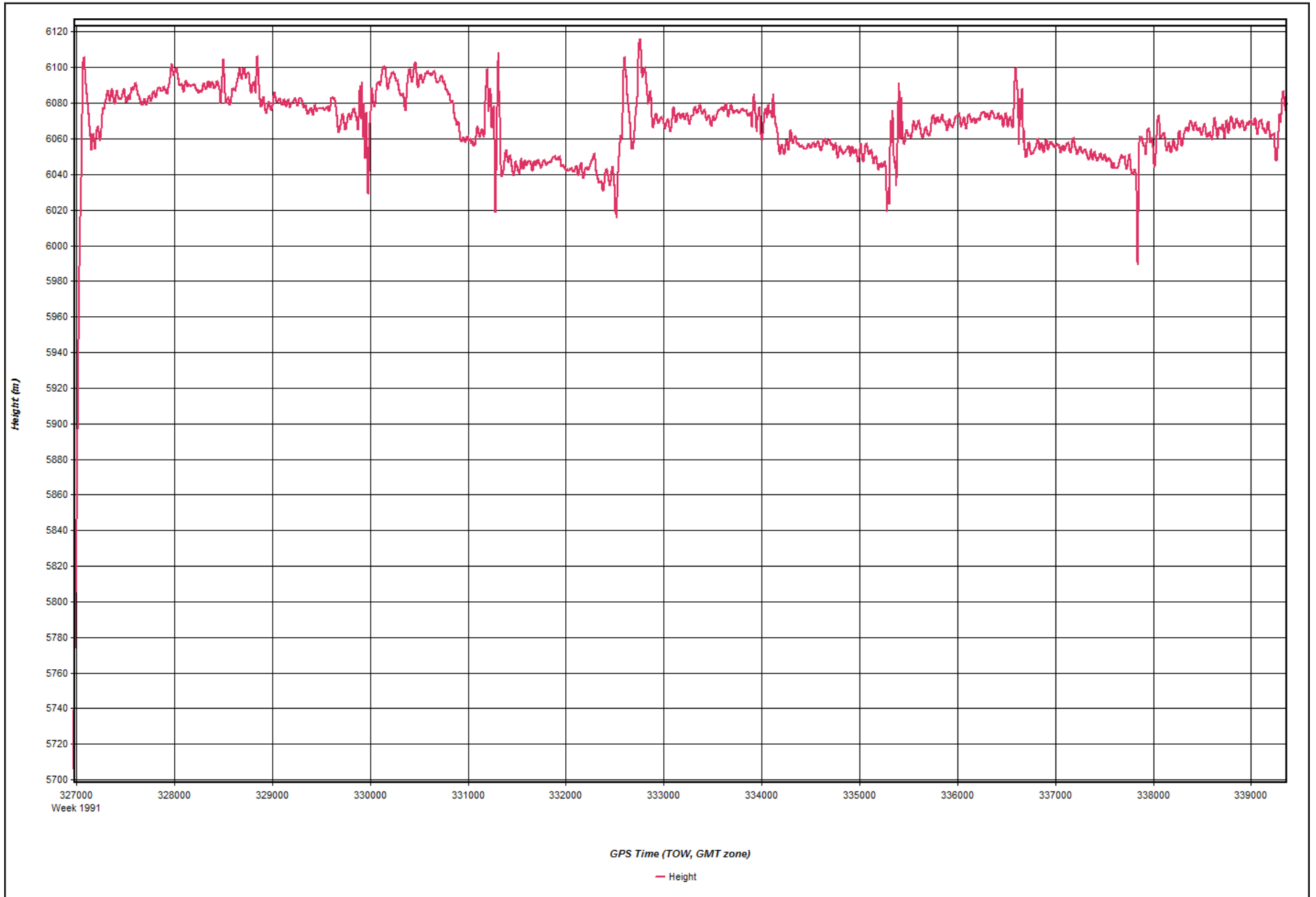
2018-03-07_Day066_7 - 20180307181345

Figure 14: Body Frame Velocity Plot



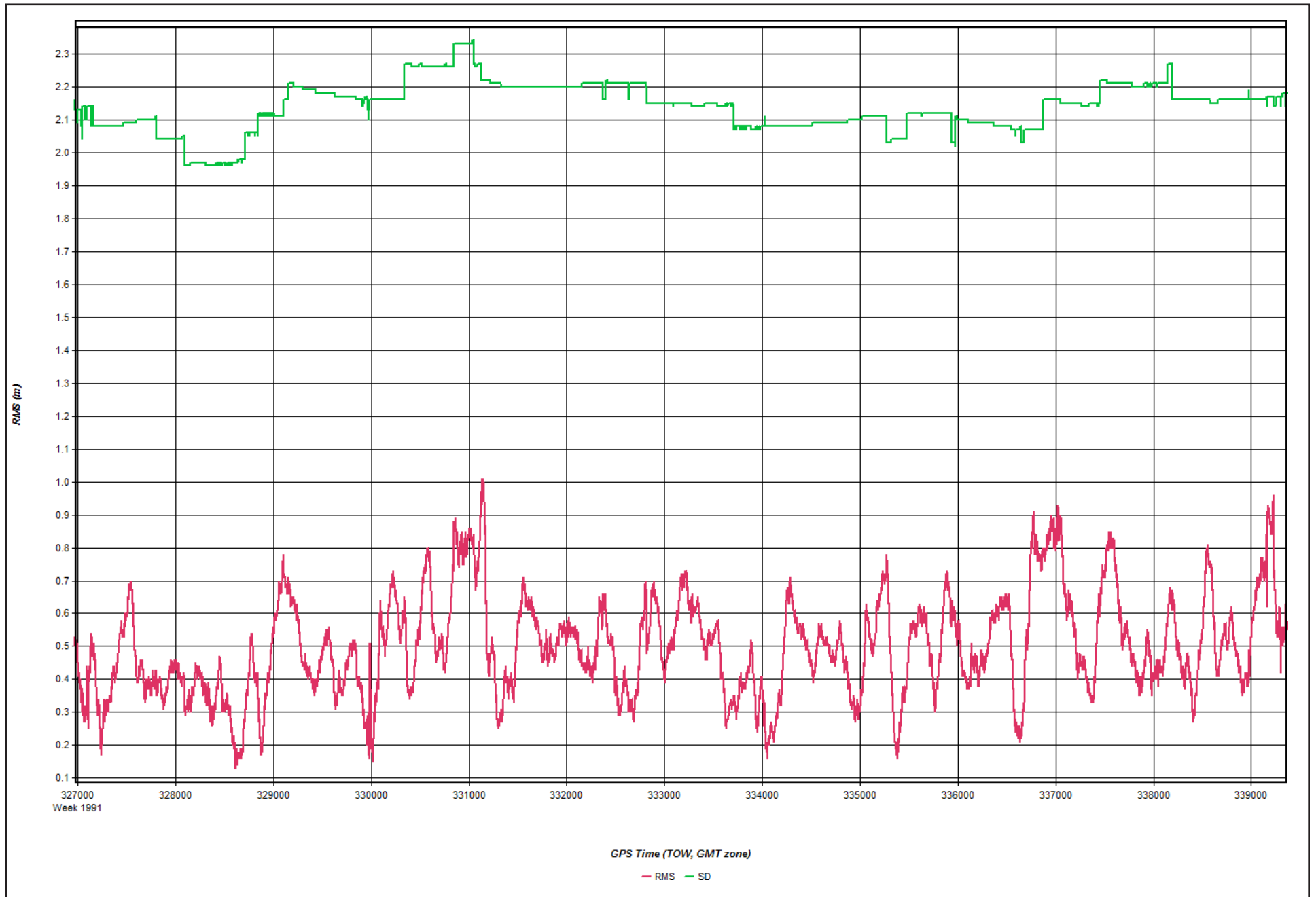
2018-03-07_Day066_7 - 20180307181345

Figure 15: Height Profile Plot



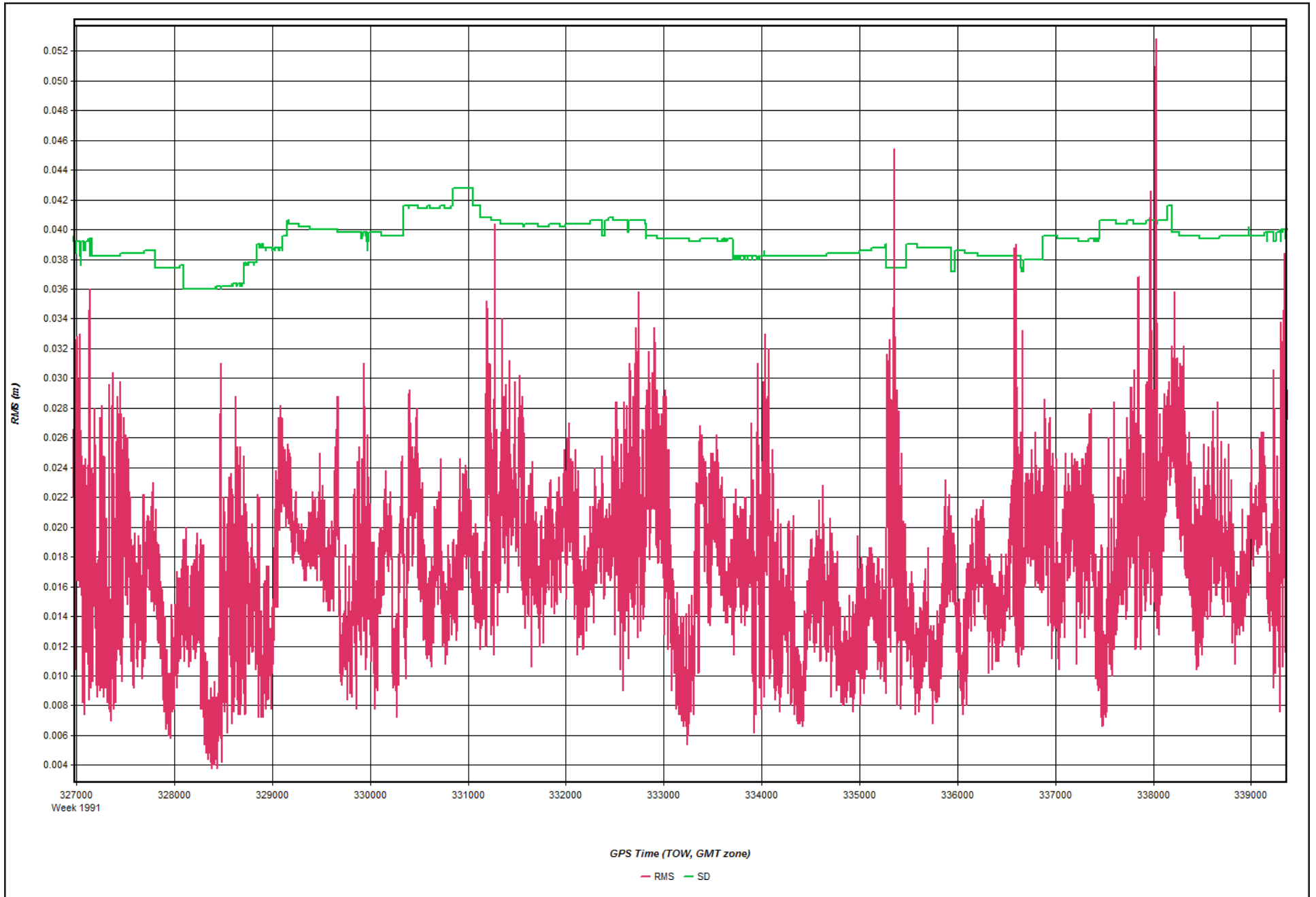
2018-03-07_Day066_7 - 20180307181345

Figure 16: C/A Code Residual RMS Plot



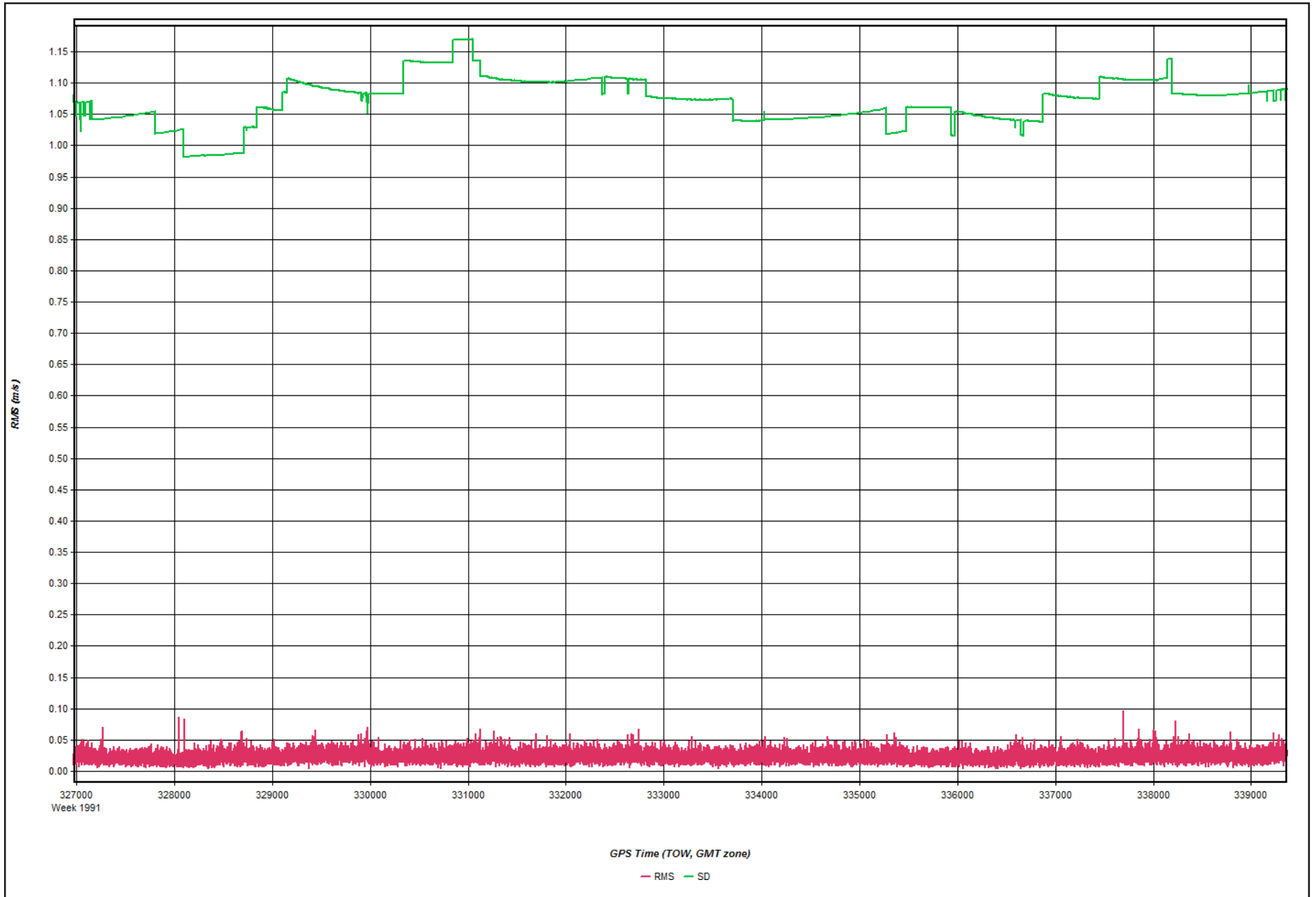
2018-03-07_Day066_7 - 20180307181345

Figure 17: Carrier Residual RMS Plot



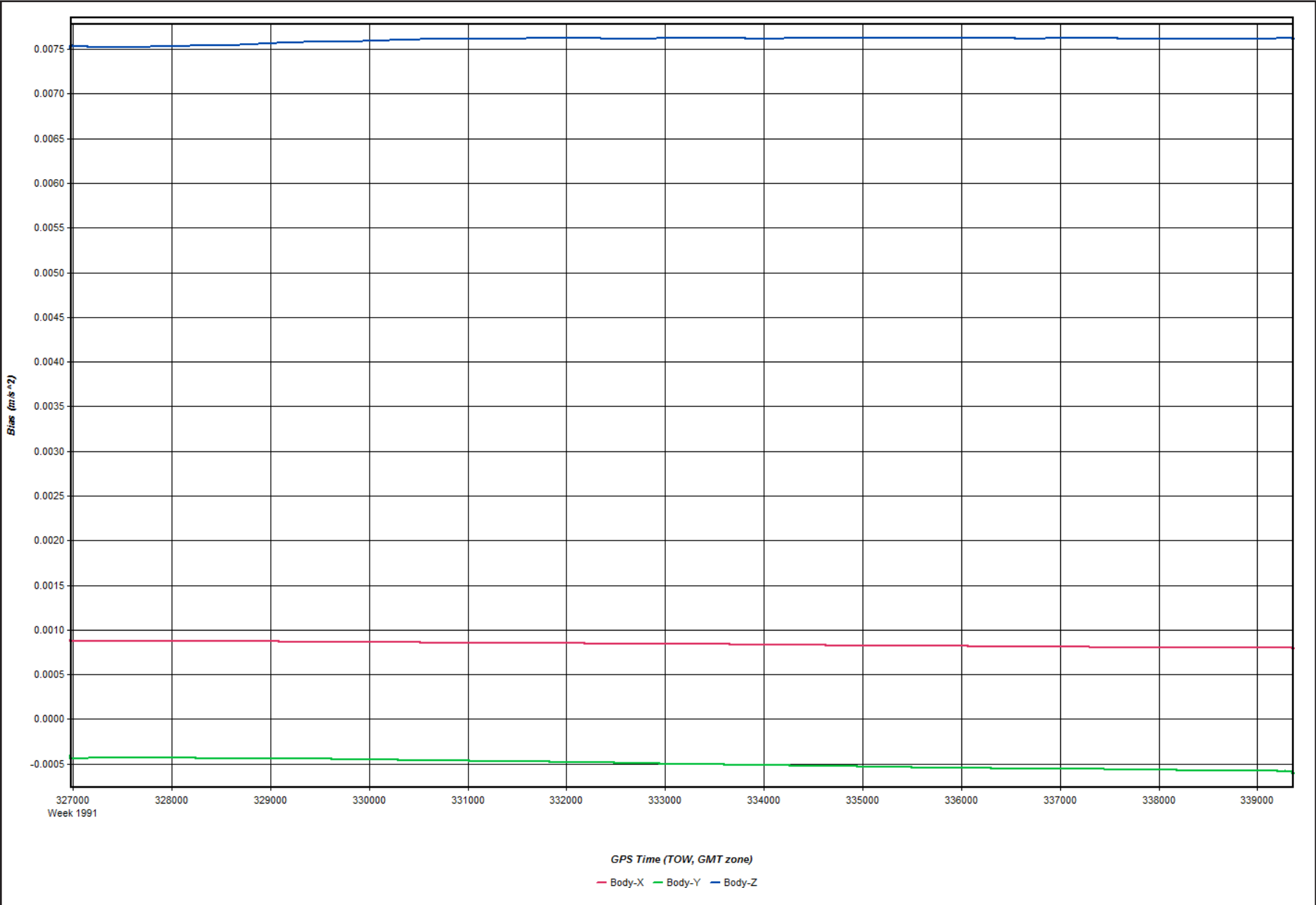
2018-03-07_Day066_7 - 20180307181345

Figure 18: L1 Doppler Residual RMS Plot



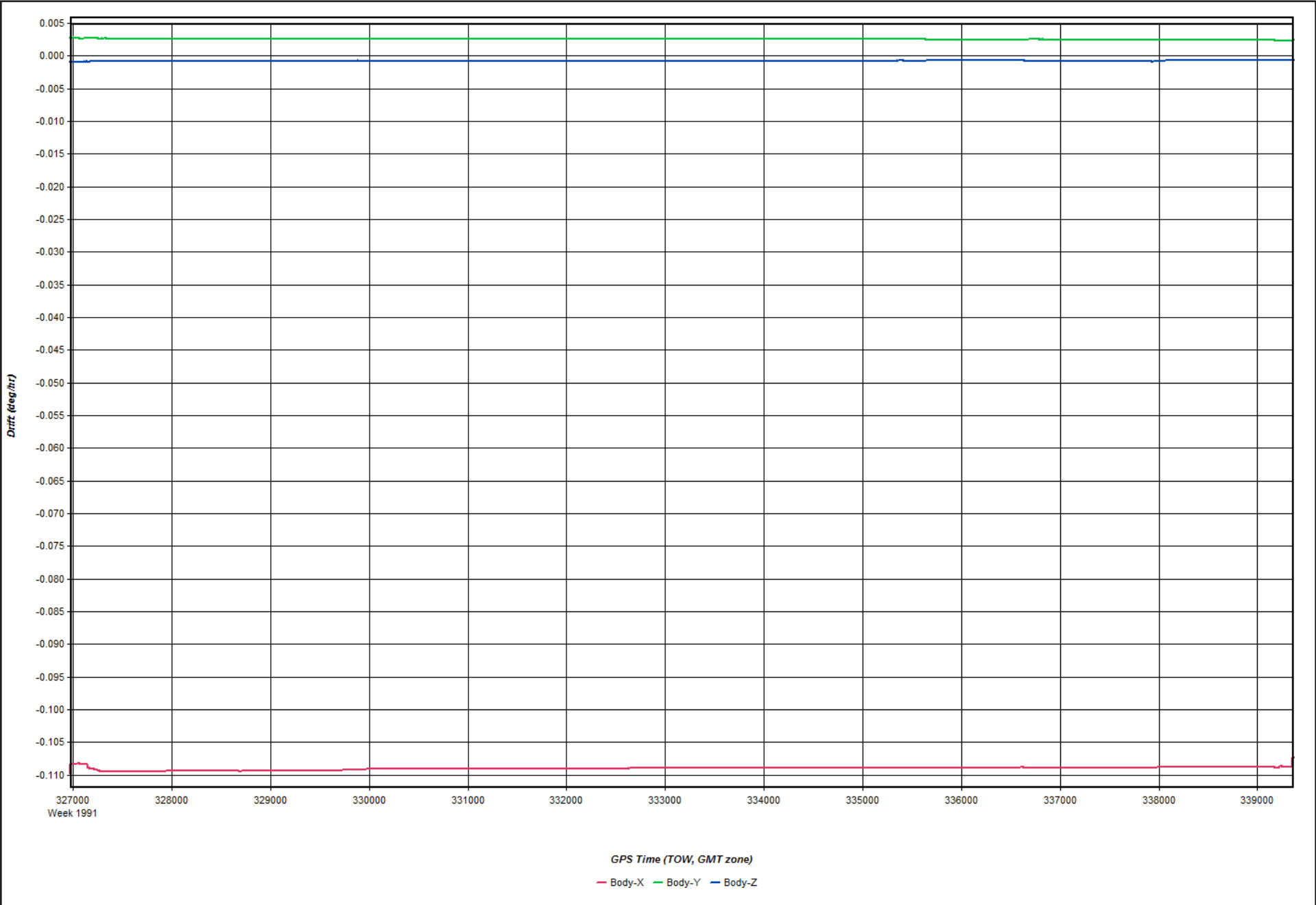
2018-03-07_Day066_7 - 20180307181345

Figure 19: Accelerometer Bias Plot



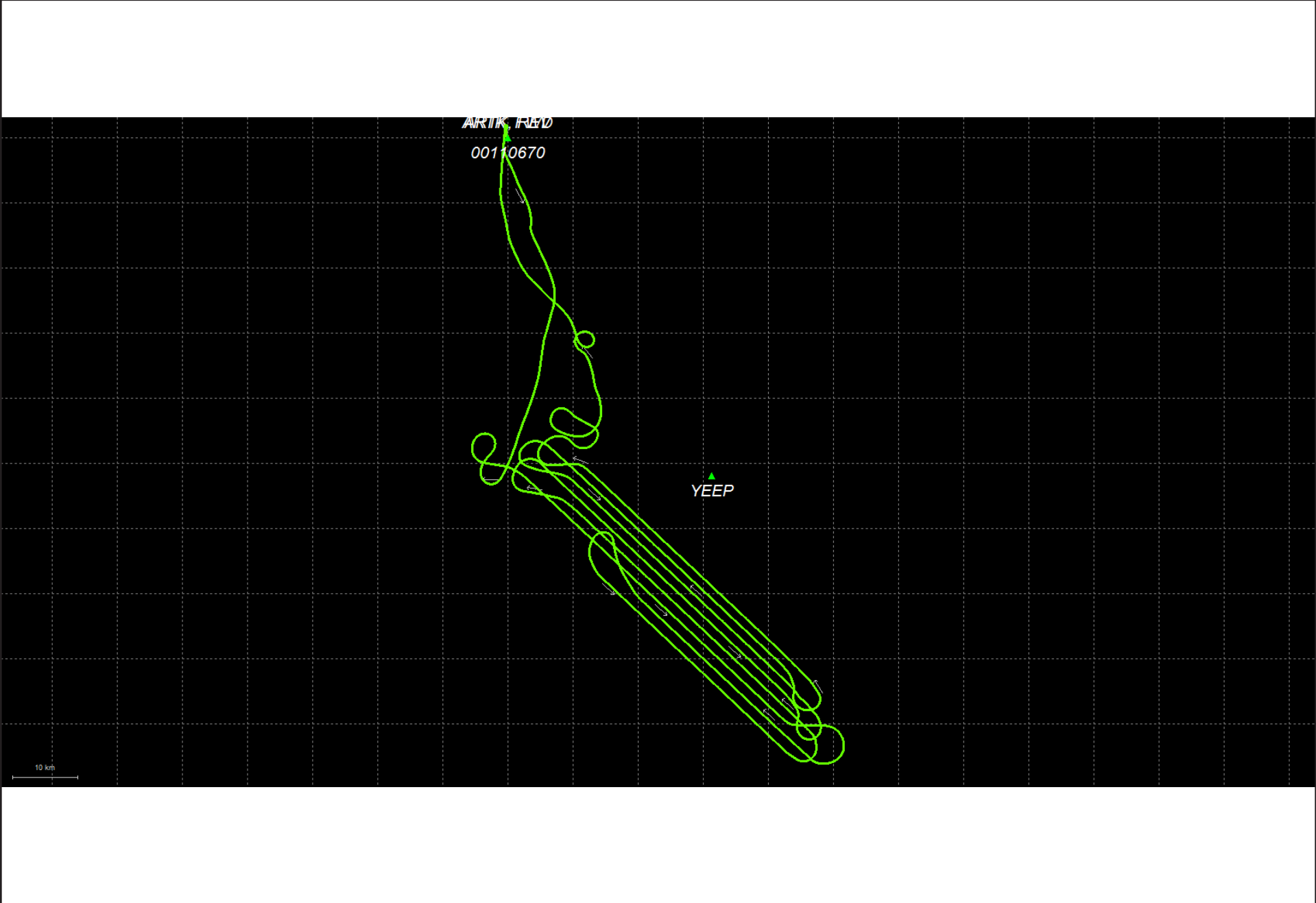
2018-03-07_Day066_7 - 20180307181345

Figure 20: Gyro Drift Plot



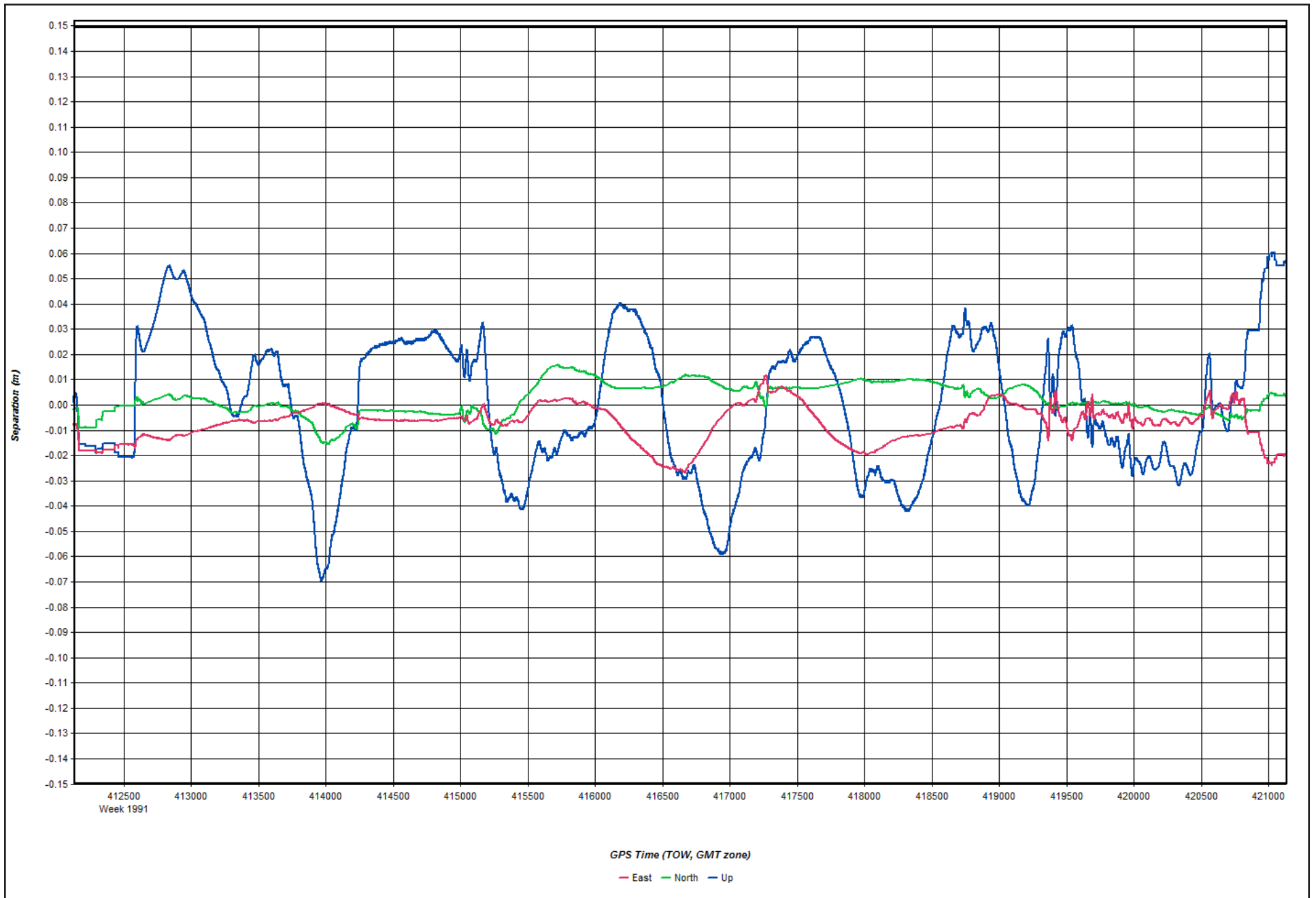
2018-03-08_Day067_7 - 20180308182750

Figure 1: Map



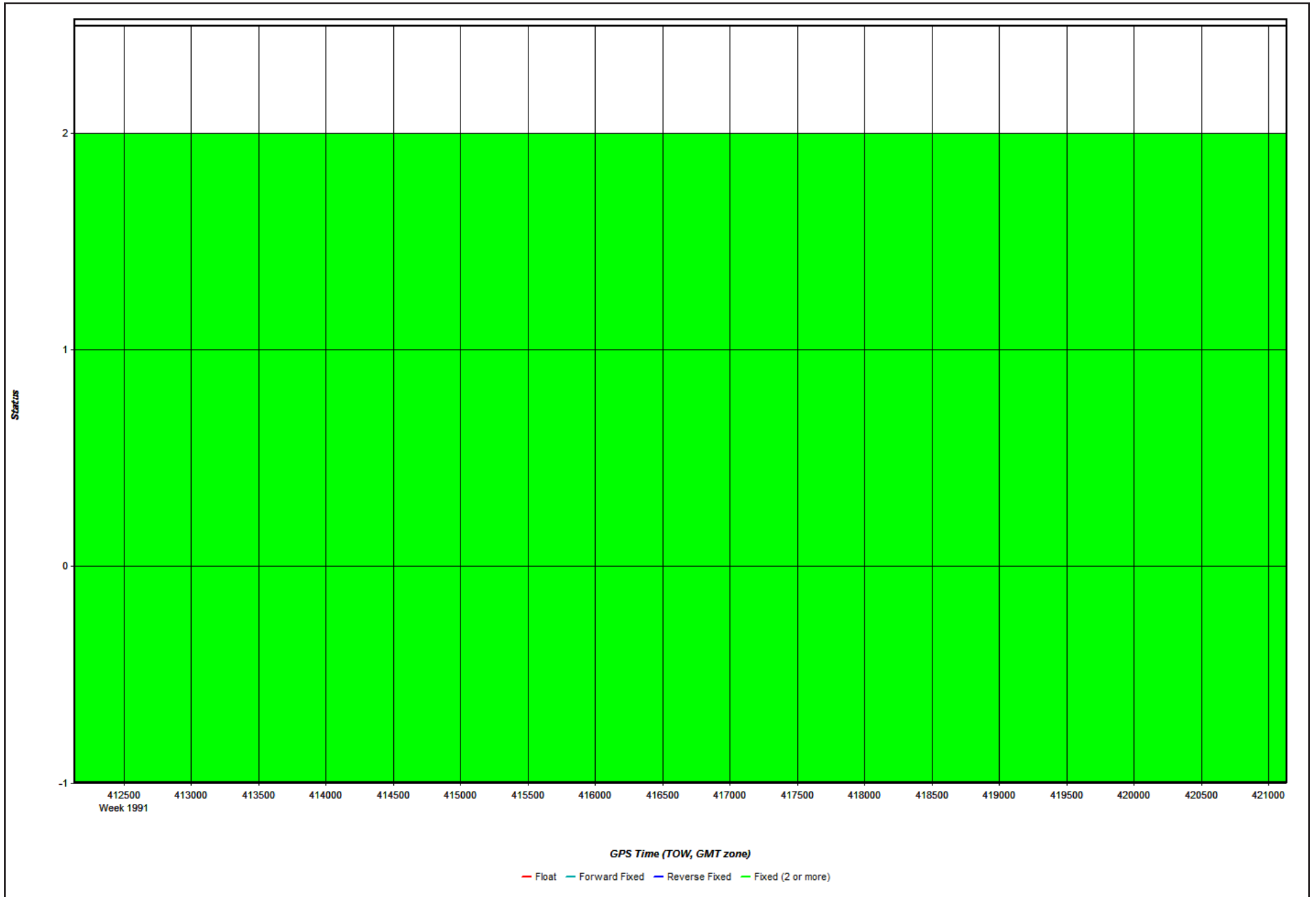
2018-03-08_Day067_7 - 20180308182750

Figure 2: Forward/Reverse or Combined Separation Plot



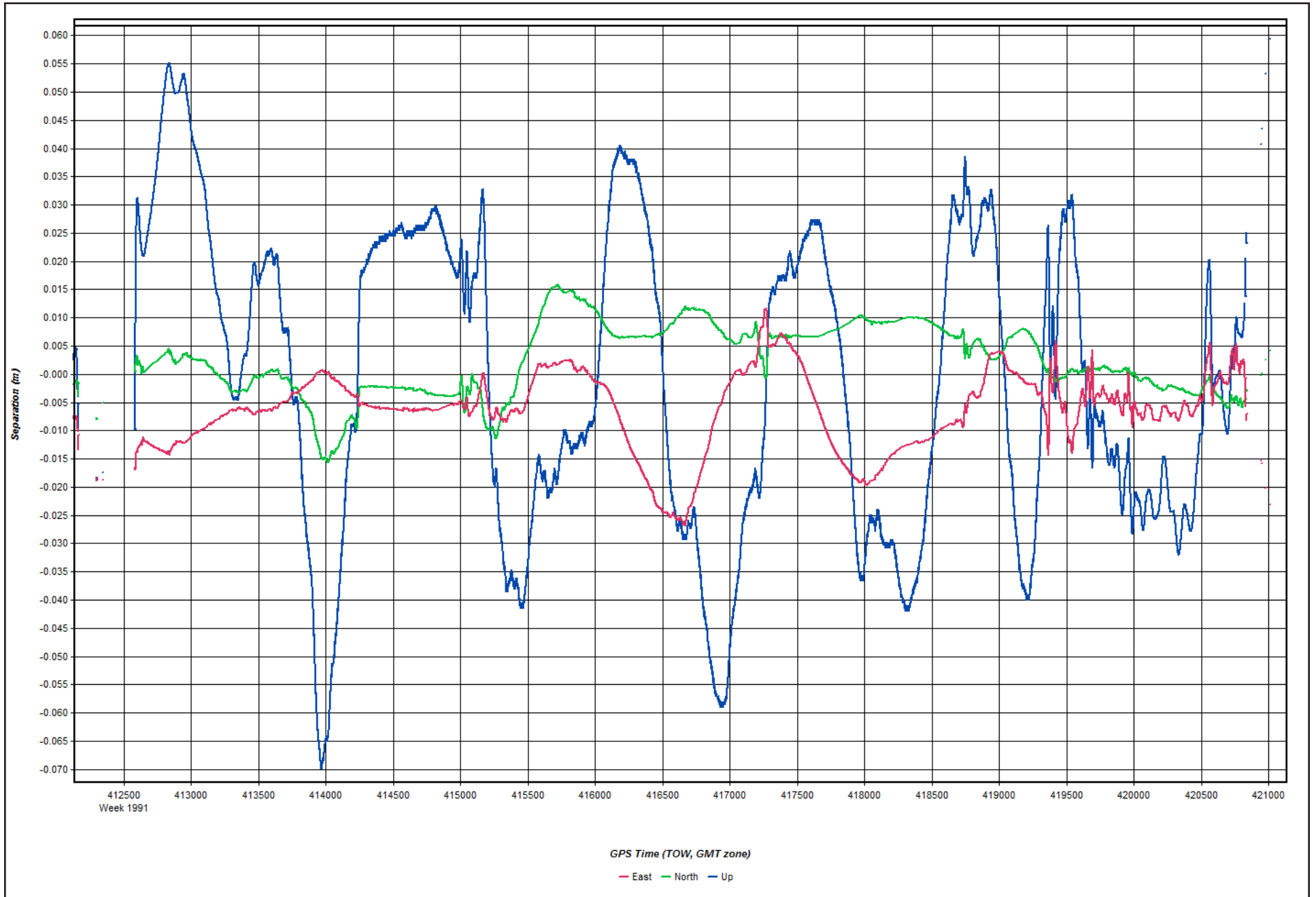
2018-03-08_Day067_7 - 20180308182750

Figure 3: Float or Fixed Ambiguity



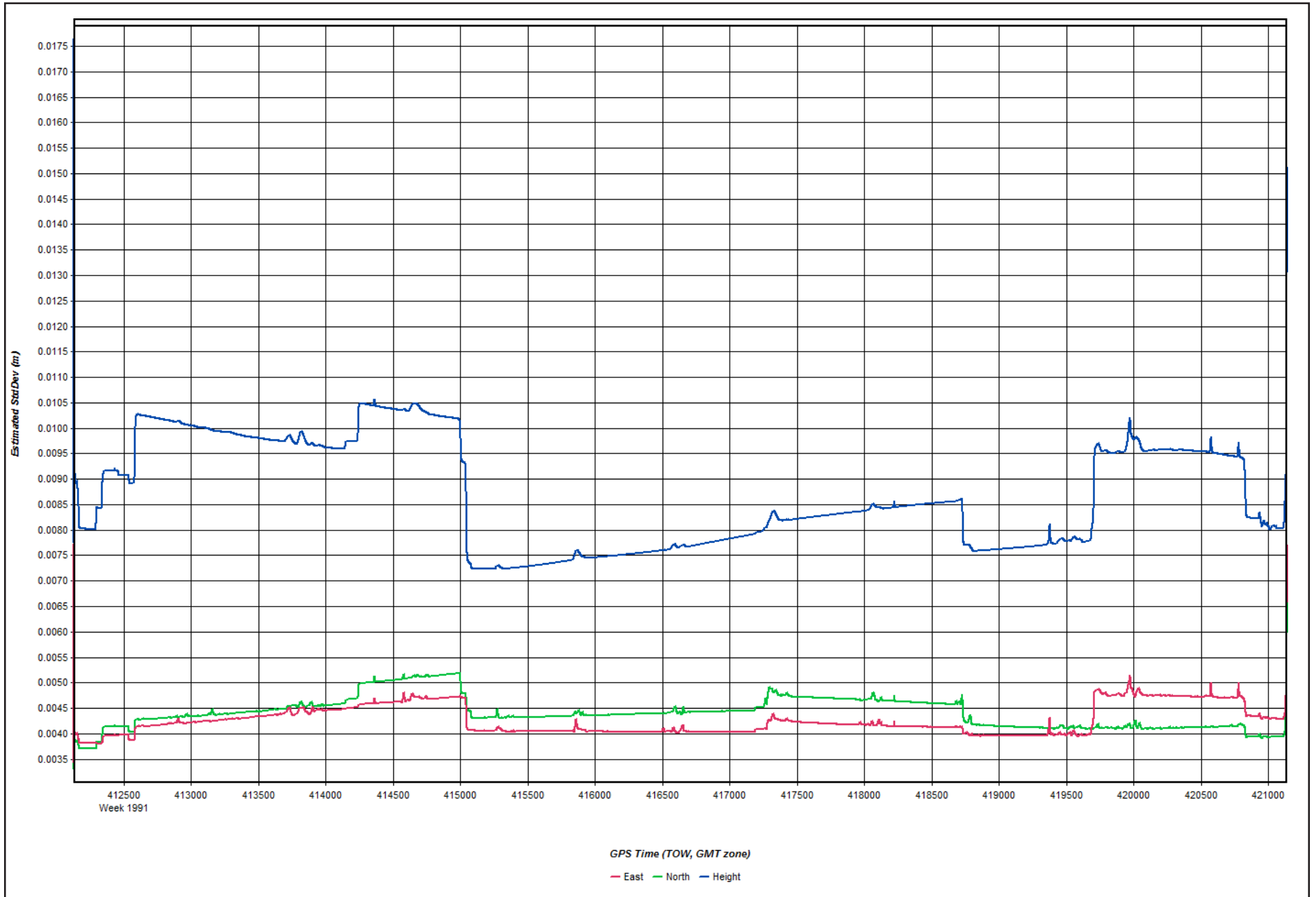
2018-03-08_Day067_7 - 20180308182750

Figure 4: Forward/Reverse Separation Plot (Fixed)



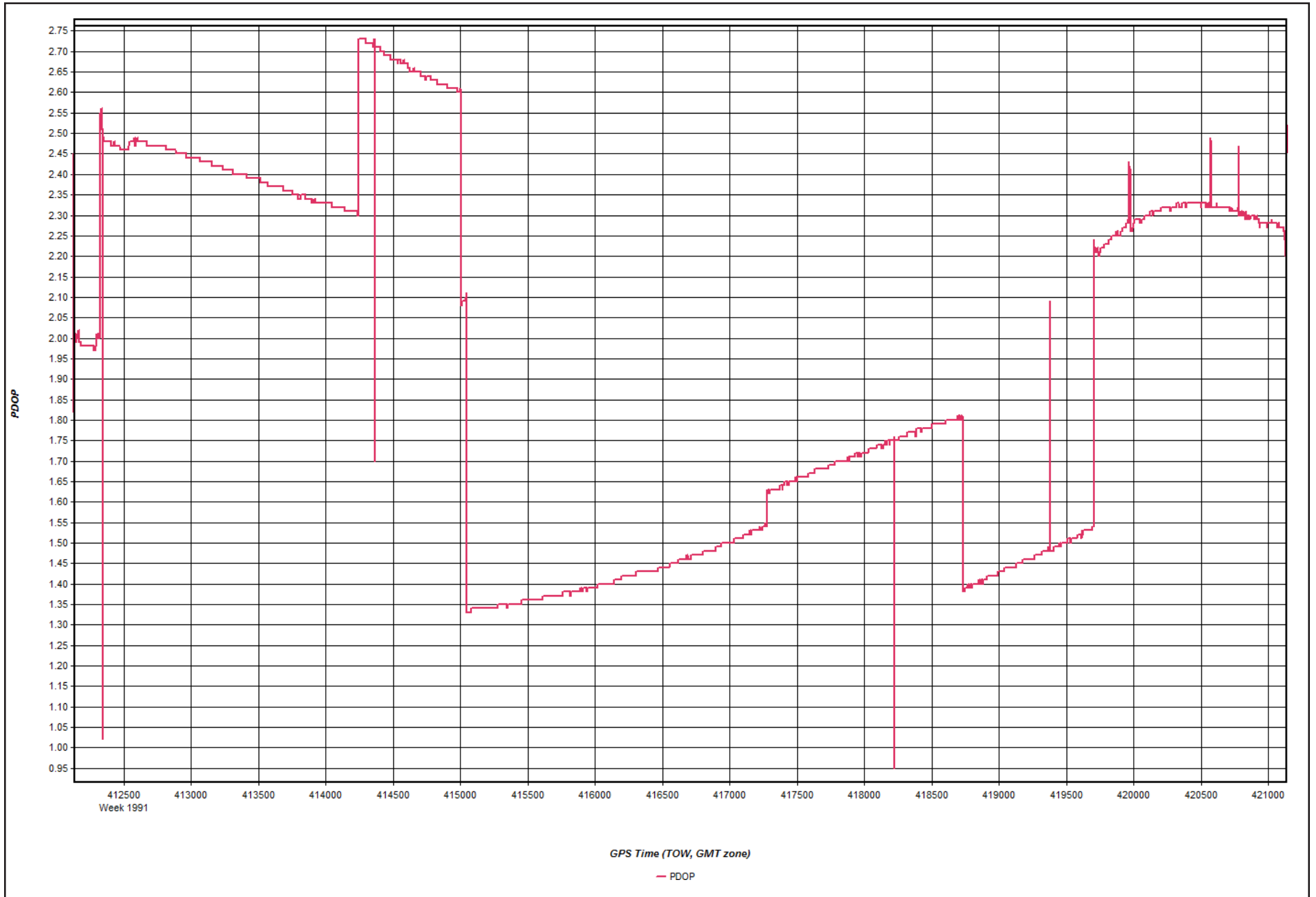
2018-03-08_Day067_7 - 20180308182750

Figure 5: Estimated Position Accuracy Plot



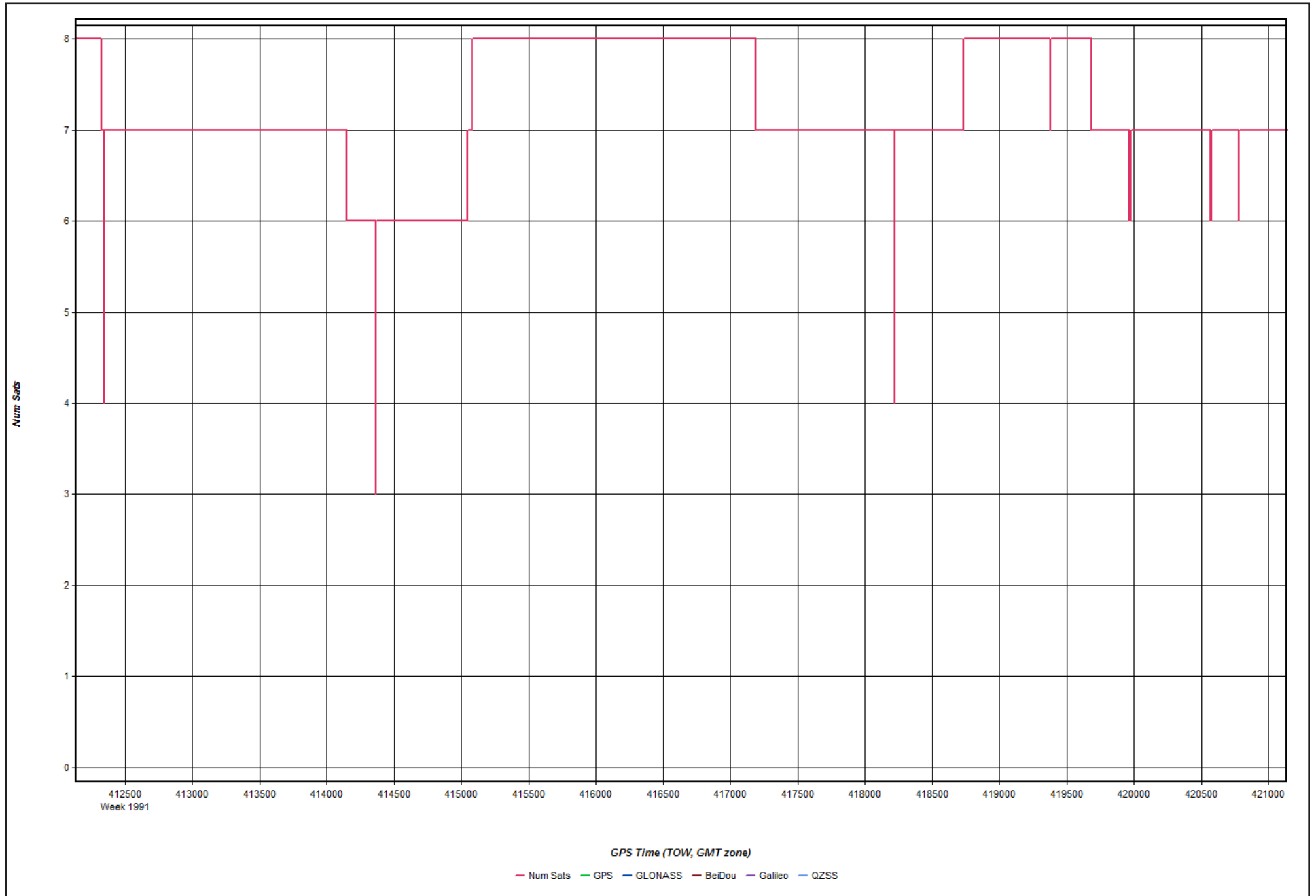
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Figure 6: PDOP Plot



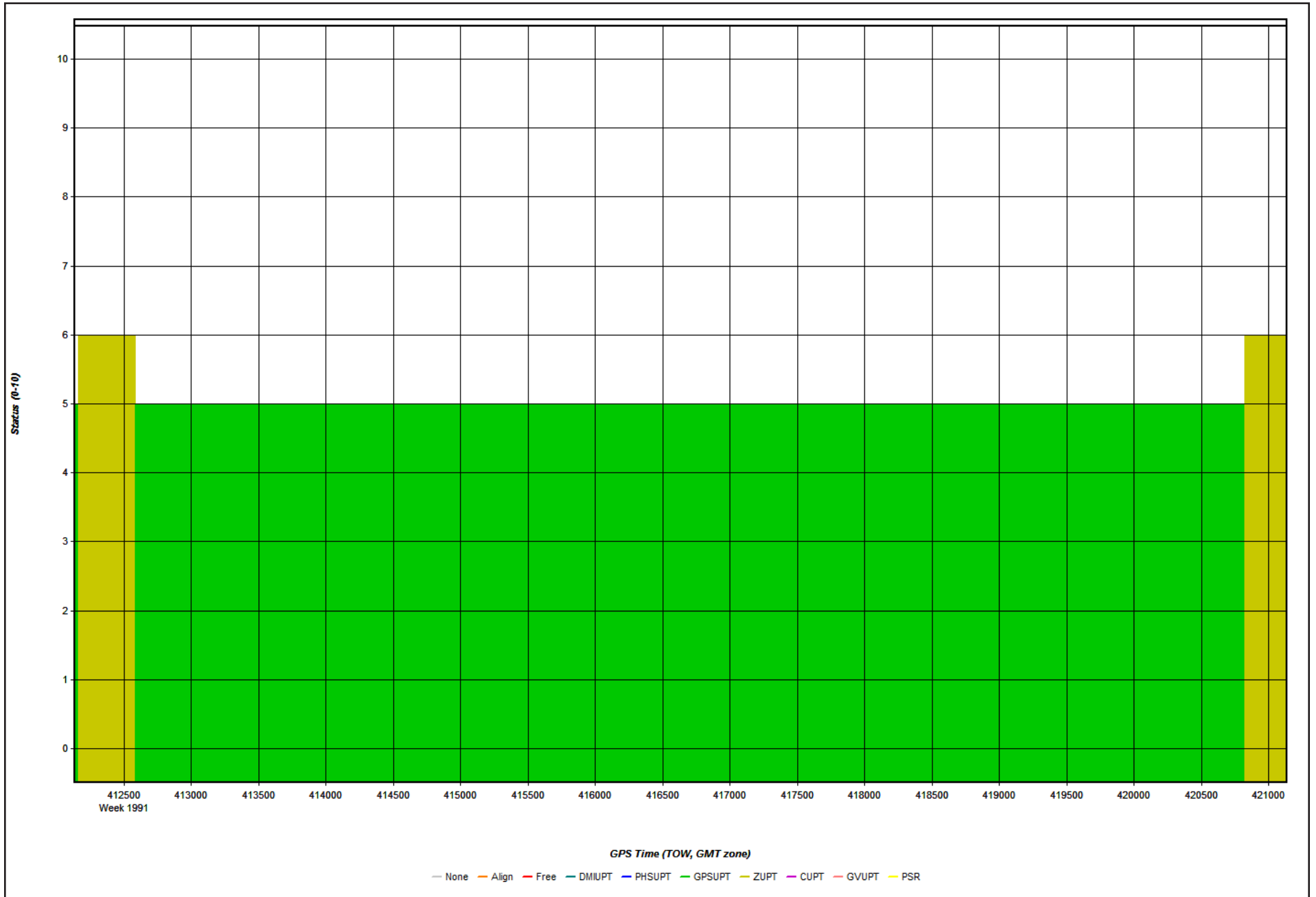
2018-03-08_Day067_7 - 20180308182750

Figure 7: Number of Satellites Line Plot



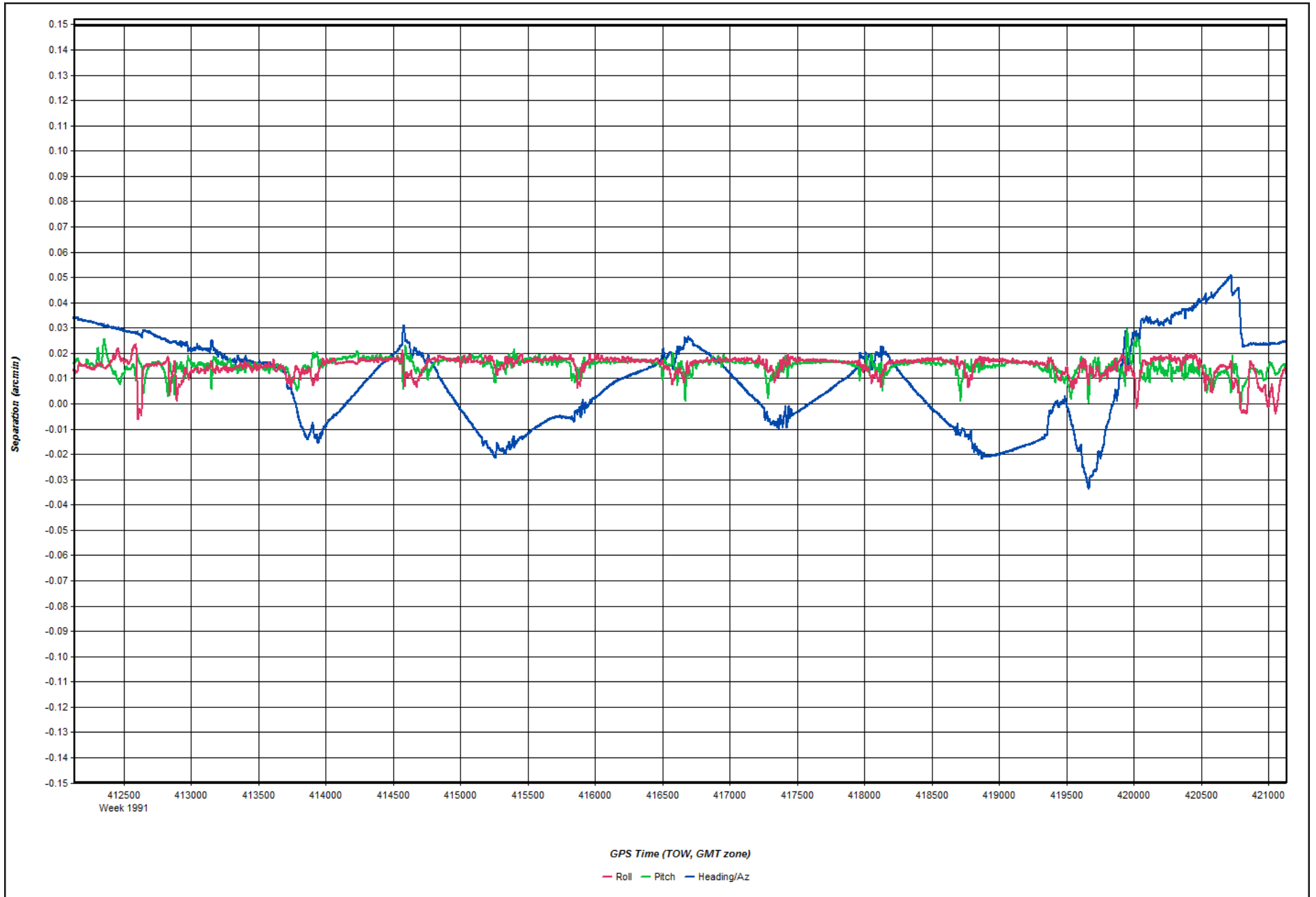
2018-03-08_Day067_7 - 20180308182750

Figure 8: Status flag for IMU processing



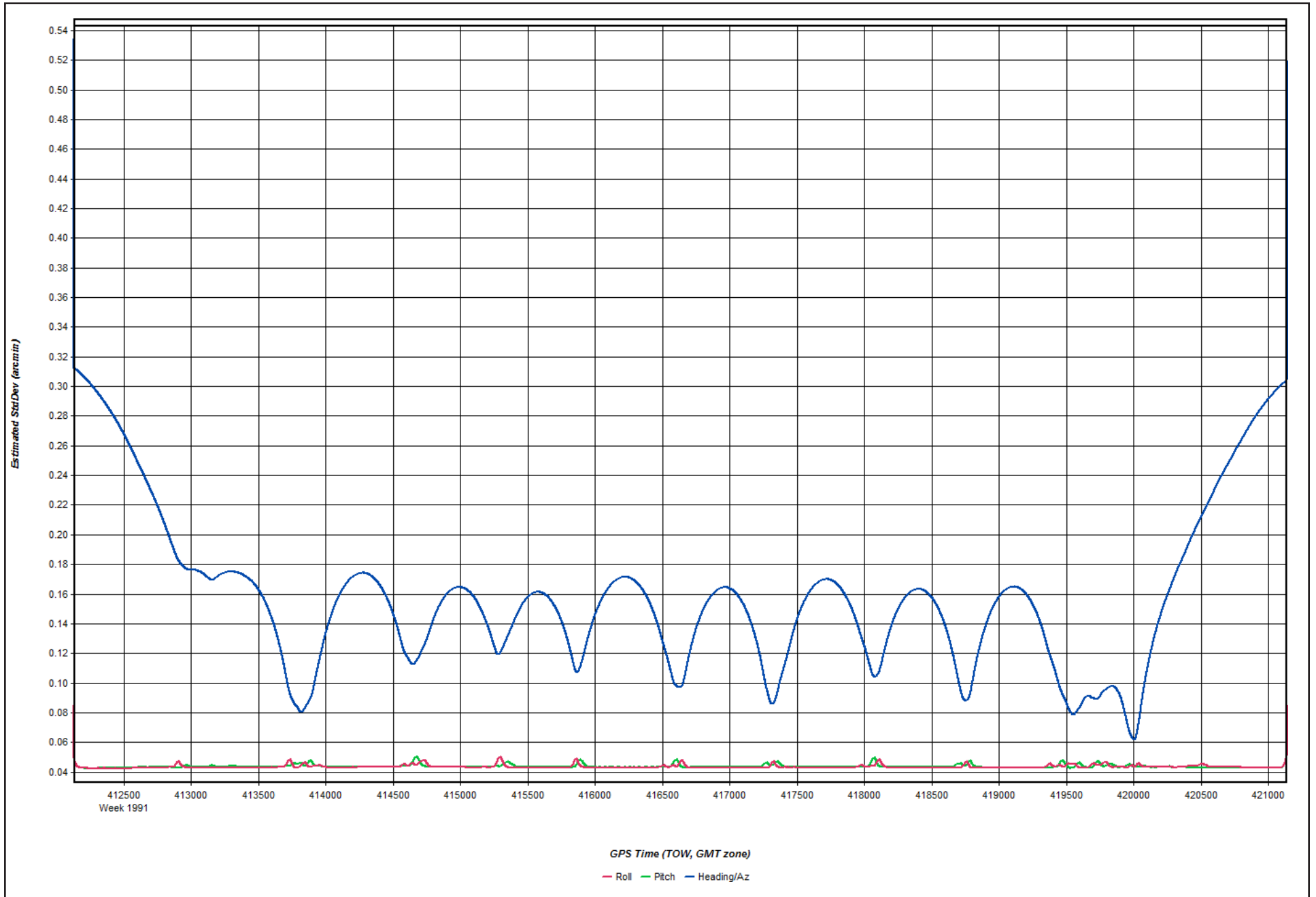
2018-03-08_Day067_7 - 20180308182750

Figure 9: Fwd/Rev Attitude Separation Plot



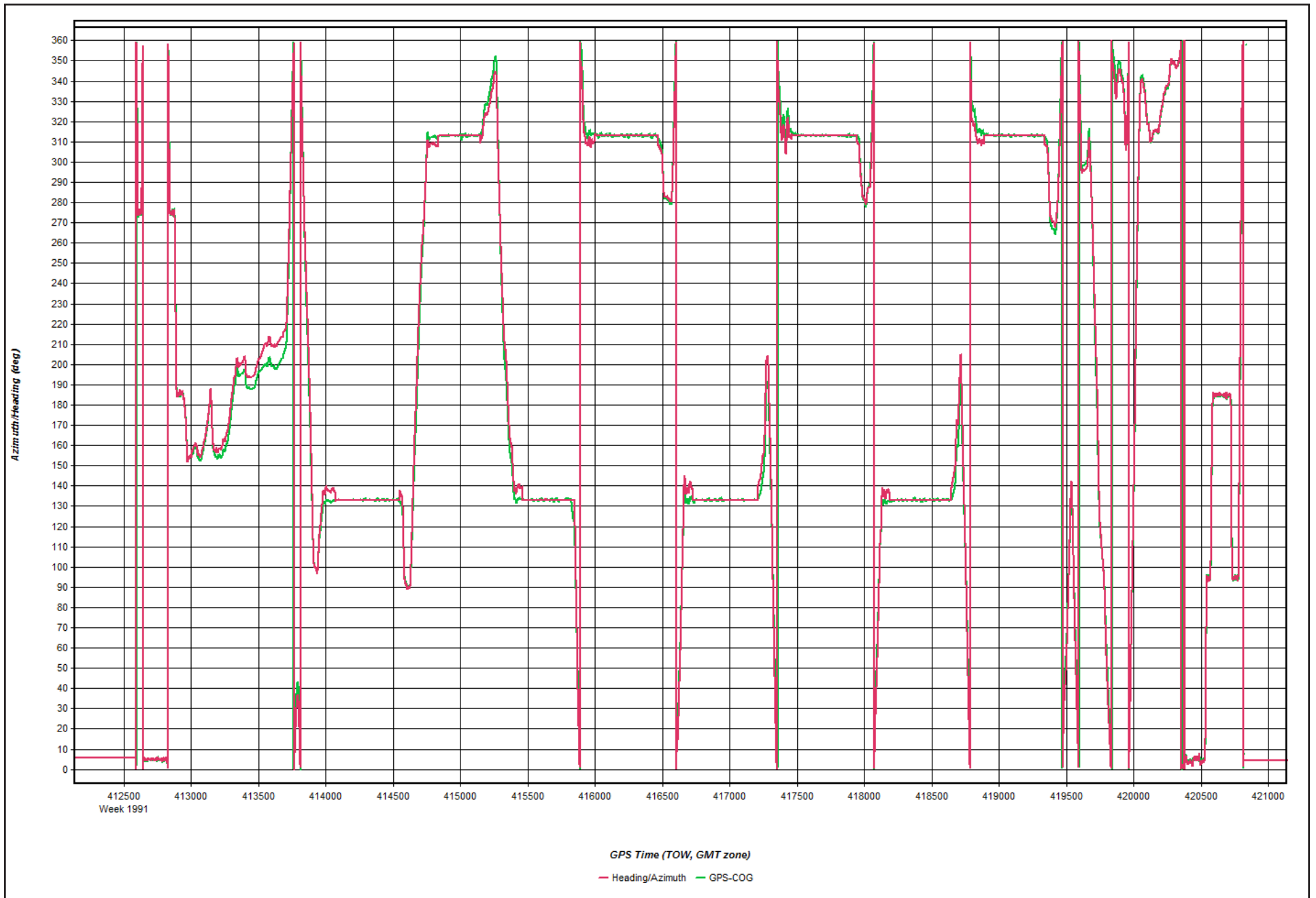
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Figure 10: Estimated Attitude Accuracy Plot



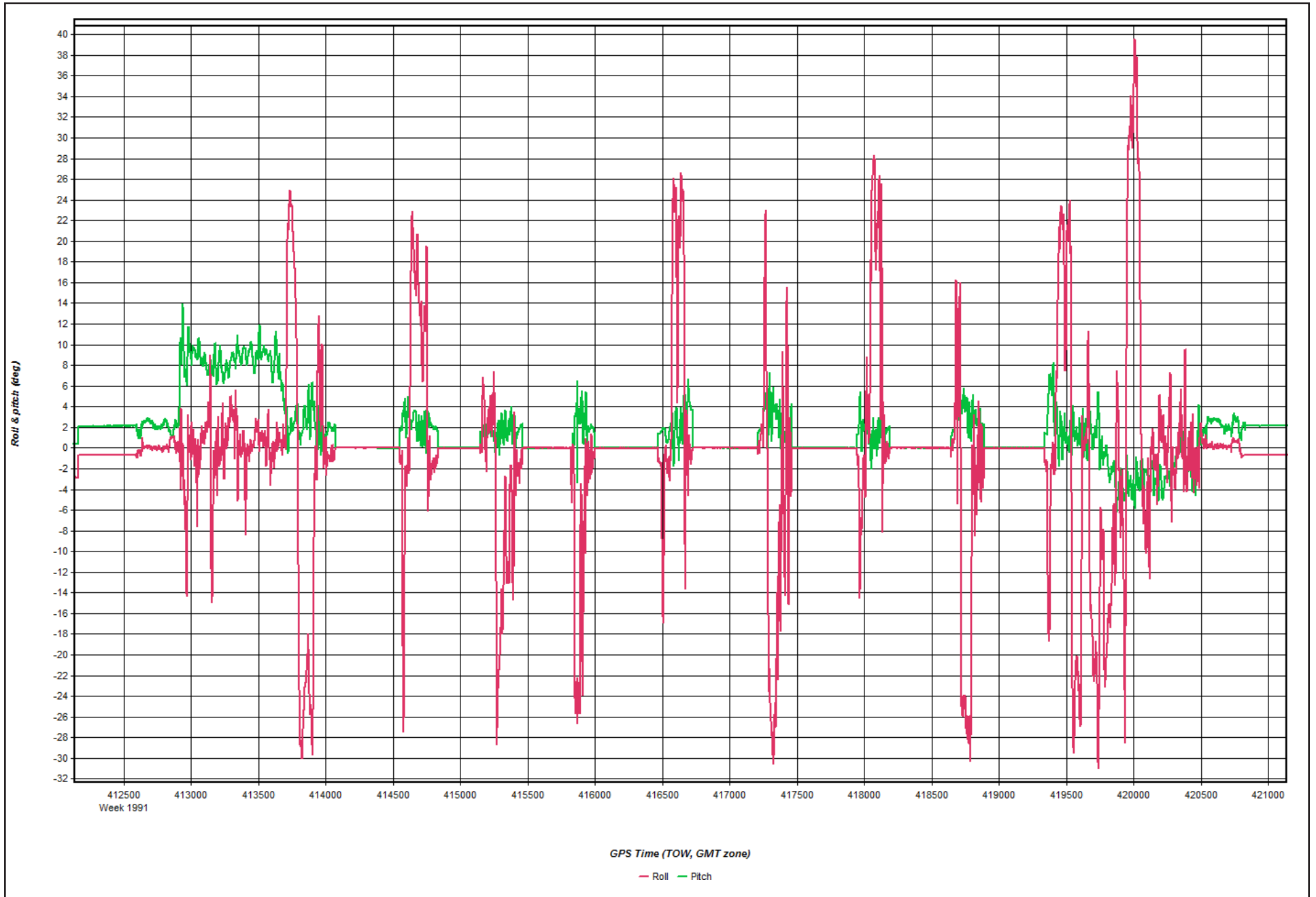
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Figure 11: Azimuth Plot



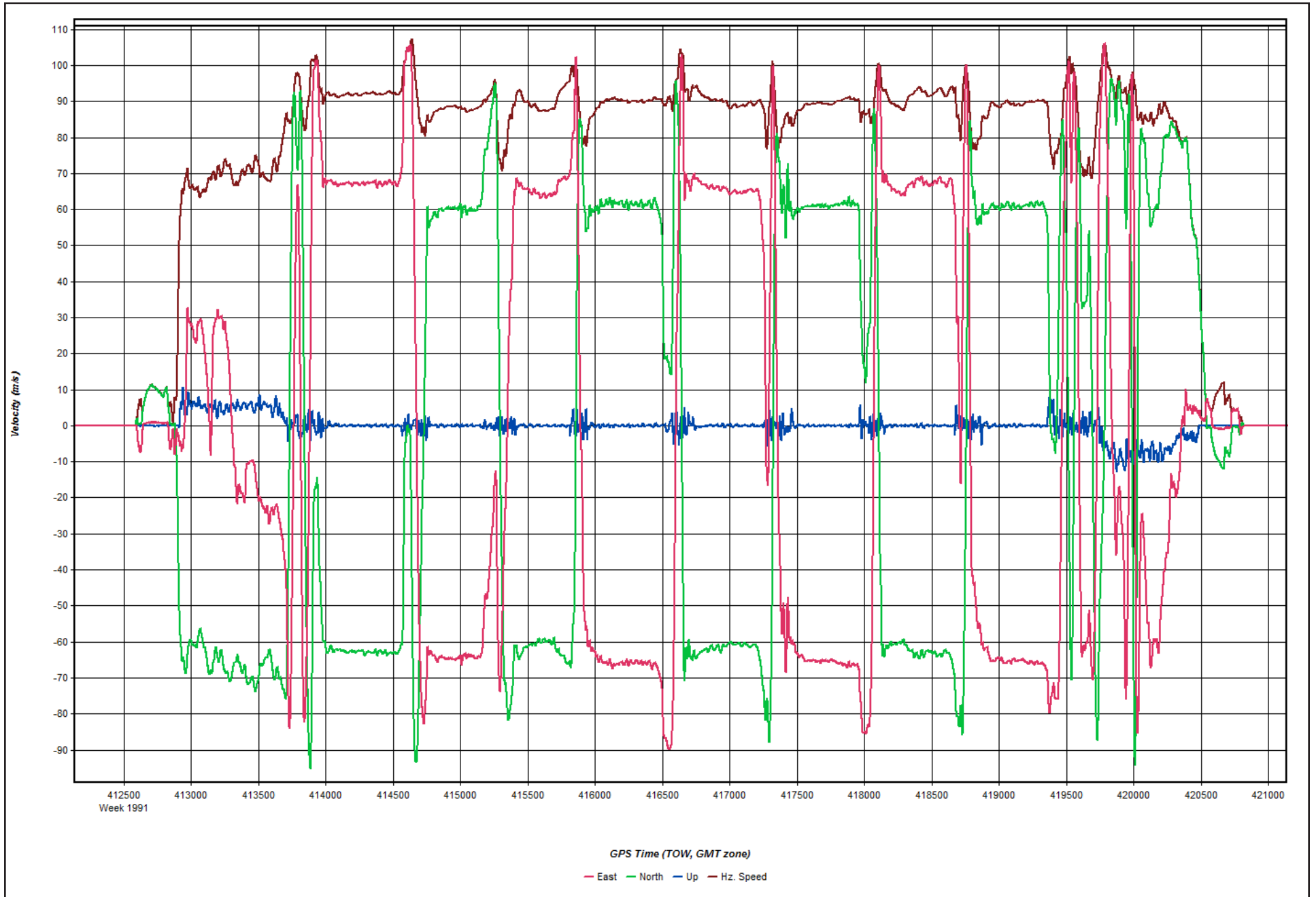
2018-03-08_Day067_7 - 20180308182750

Figure 12: Roll & Pitch Plot



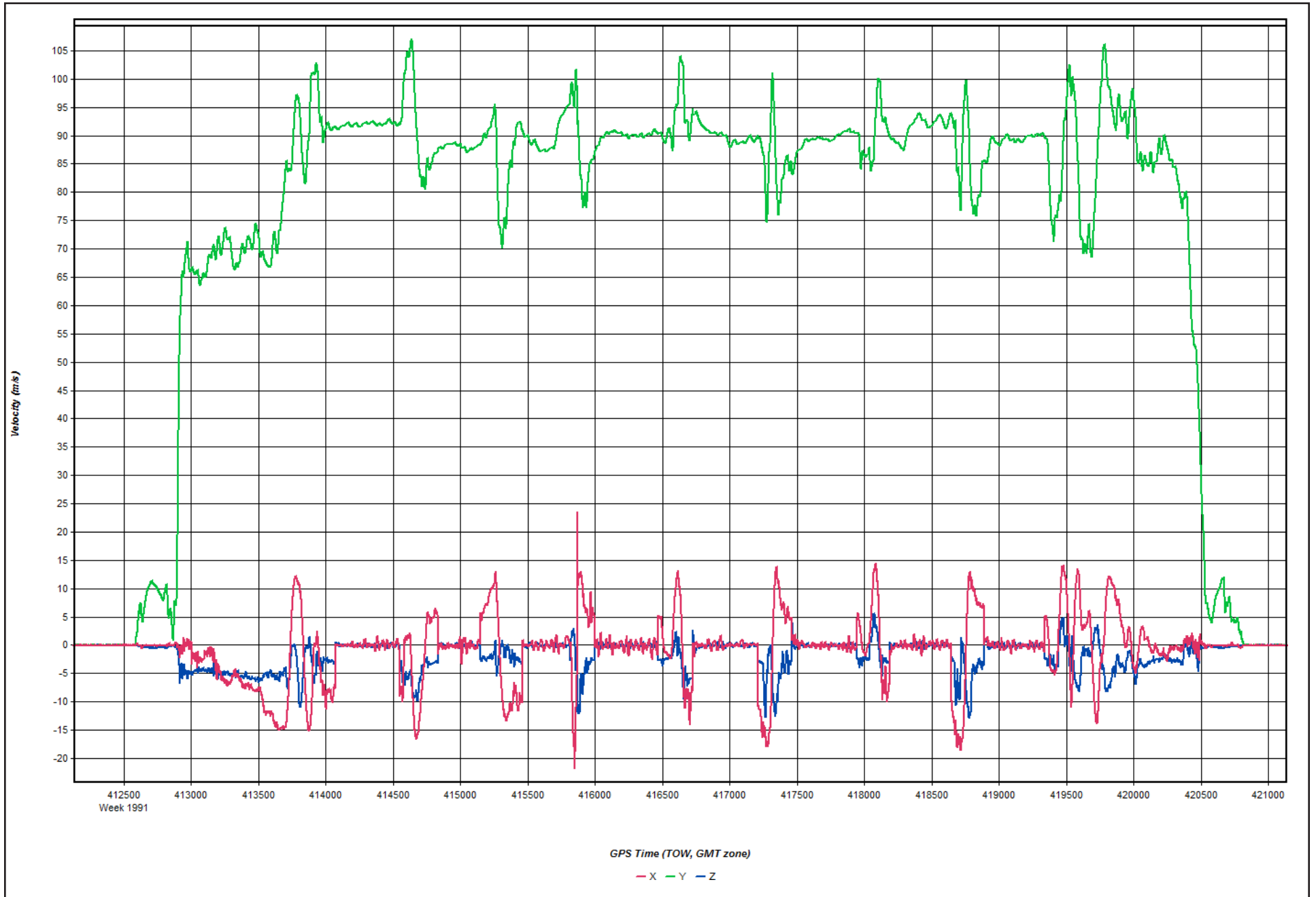
2018-03-08_Day067_7 - 20180308182750

Figure 13: Velocity Profile Plot



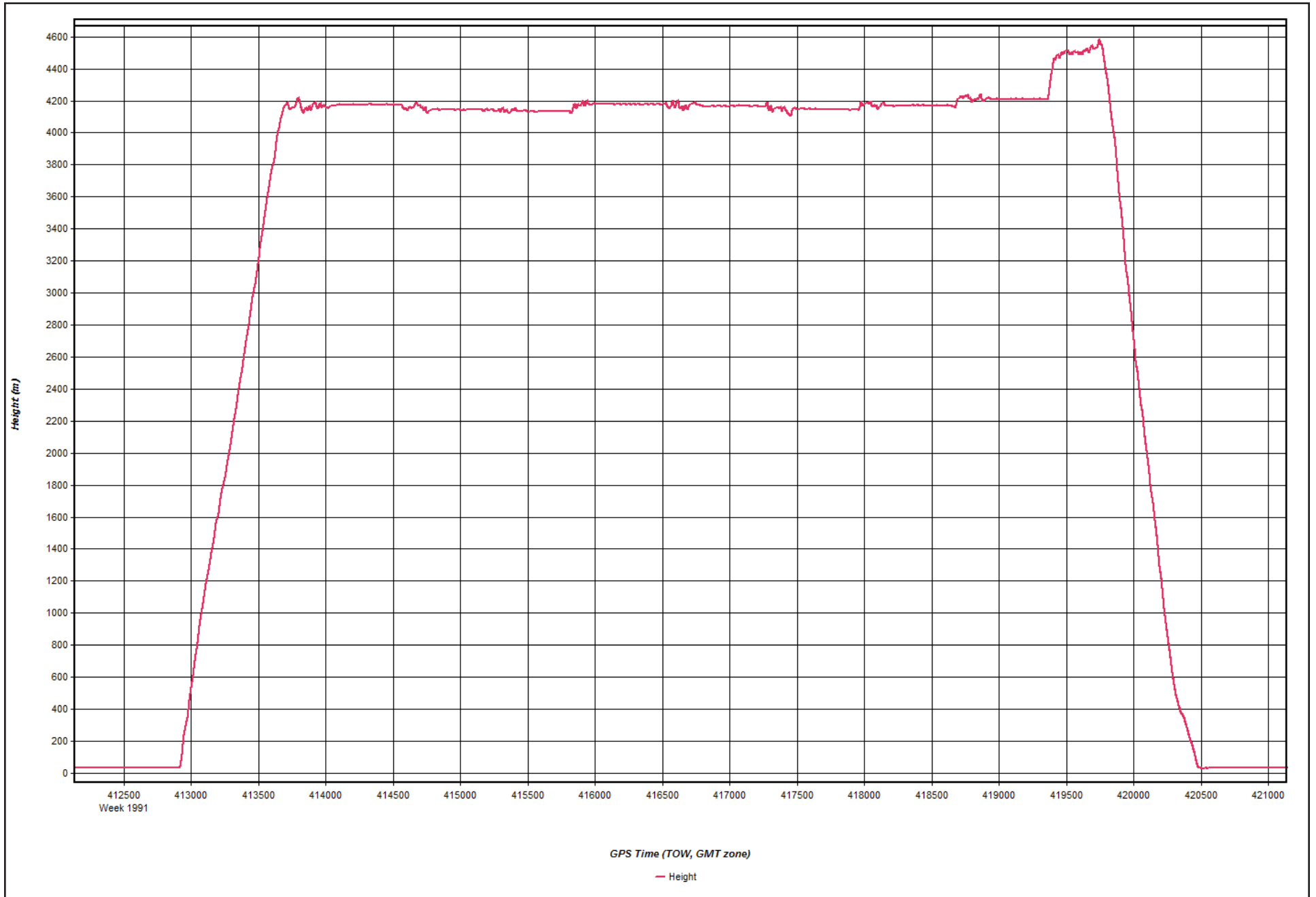
2018-03-08_Day067_7 - 20180308182750

Figure 14: Body Frame Velocity Plot



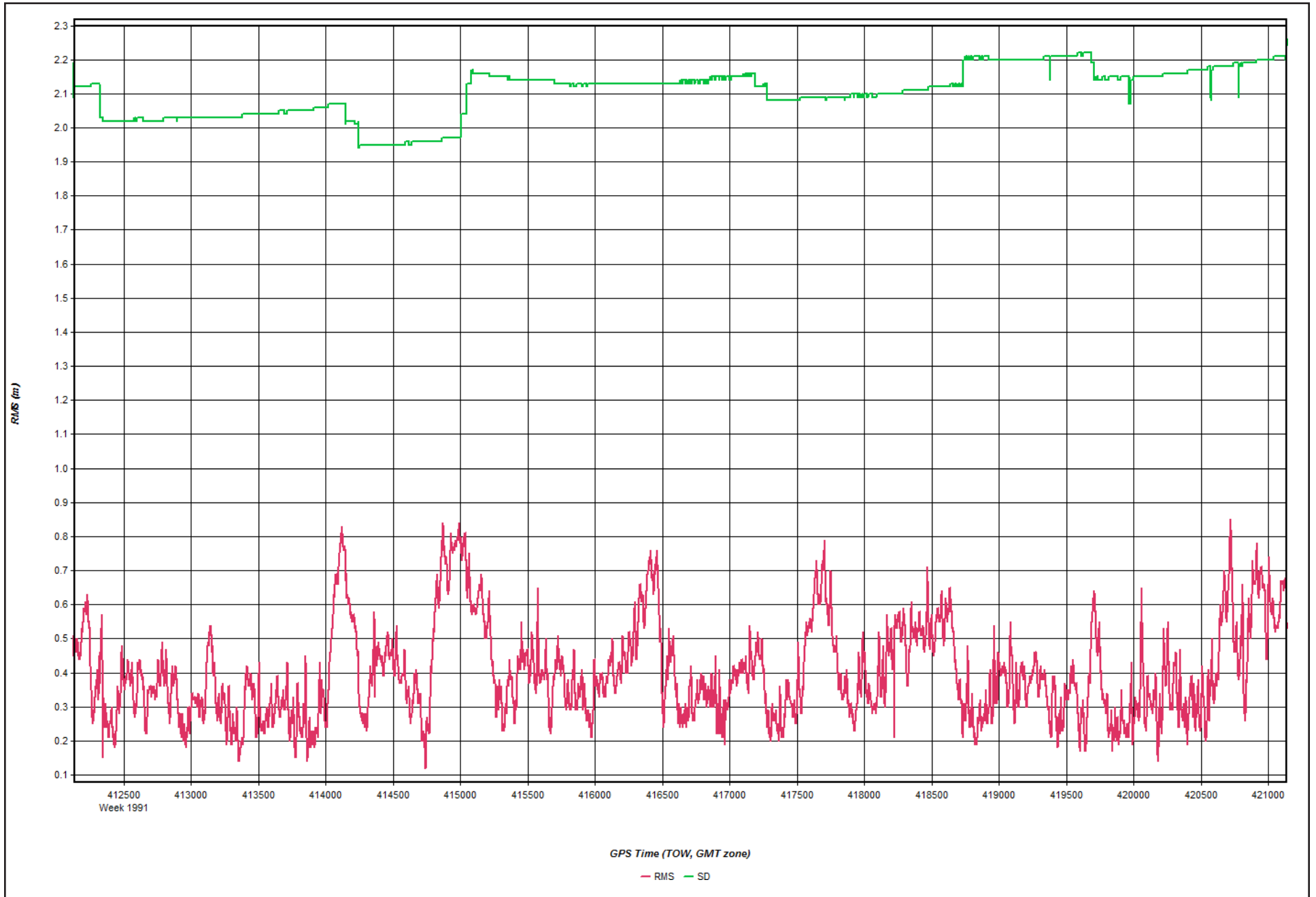
2018-03-08_Day067_7 - 20180308182750

Figure 15: Height Profile Plot



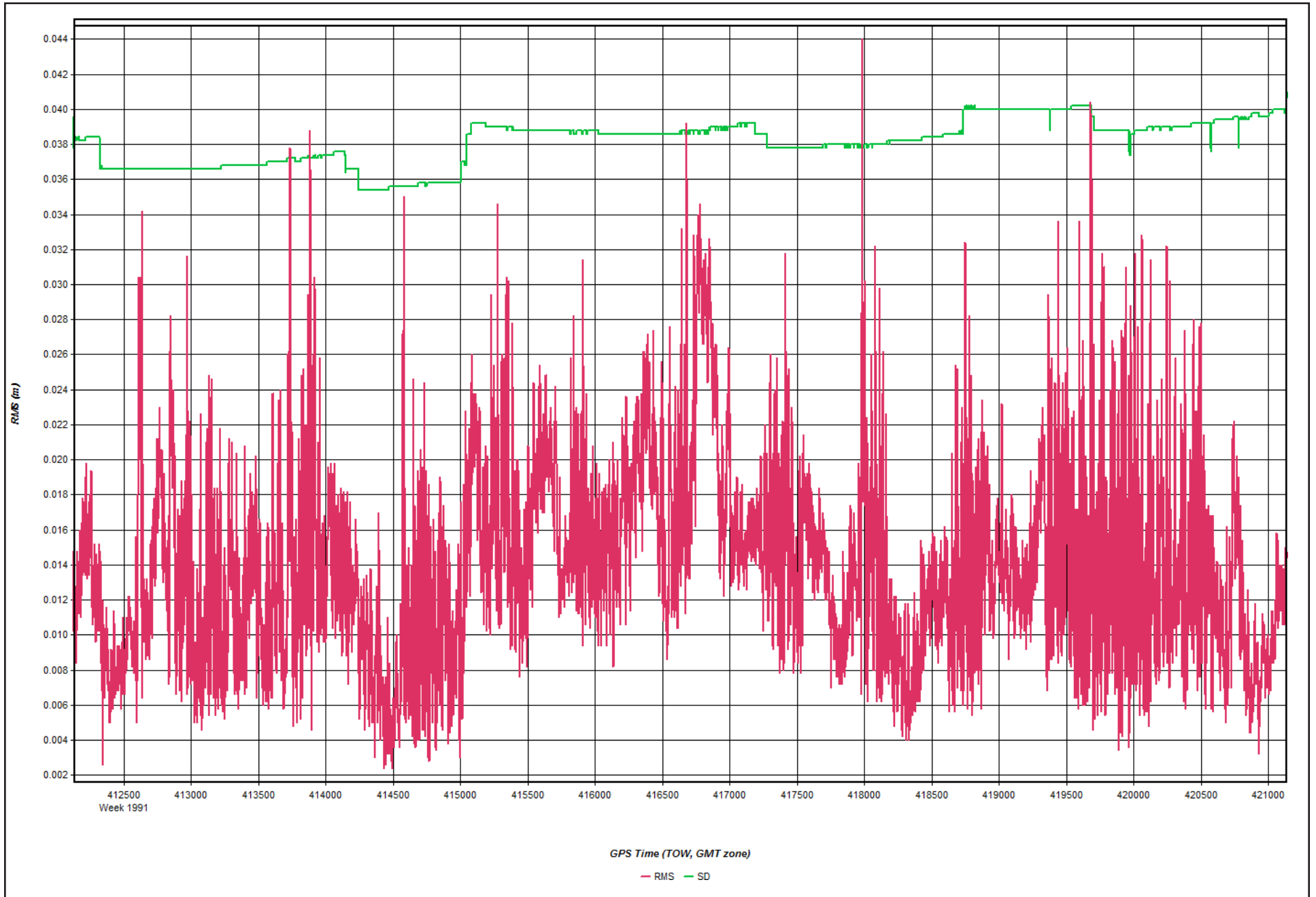
2018-03-08_Day067_7 - 20180308182750

Figure 16: C/A Code Residual RMS Plot



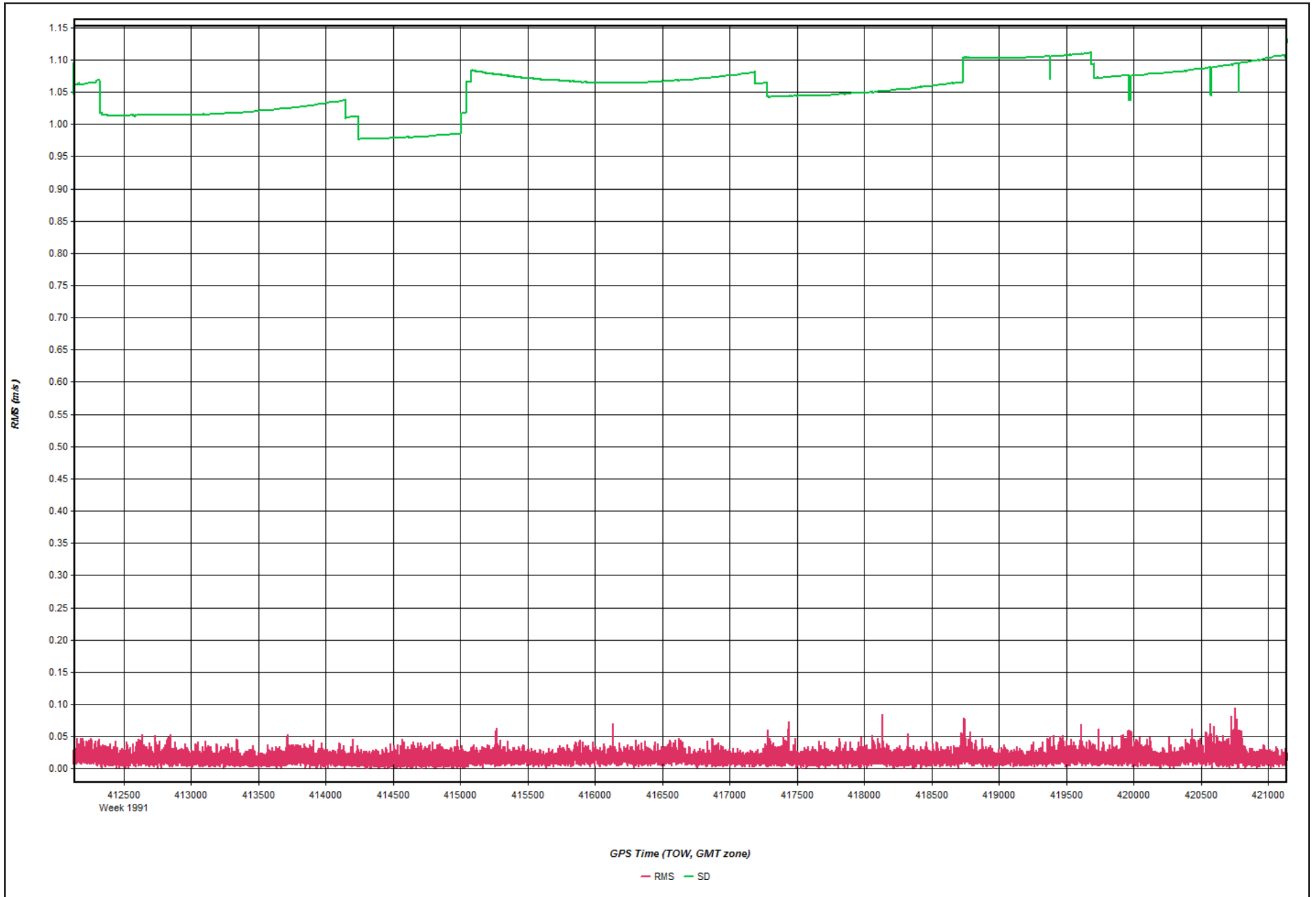
2018-03-08_Day067_7 - 20180308182750

Figure 17: Carrier Residual RMS Plot



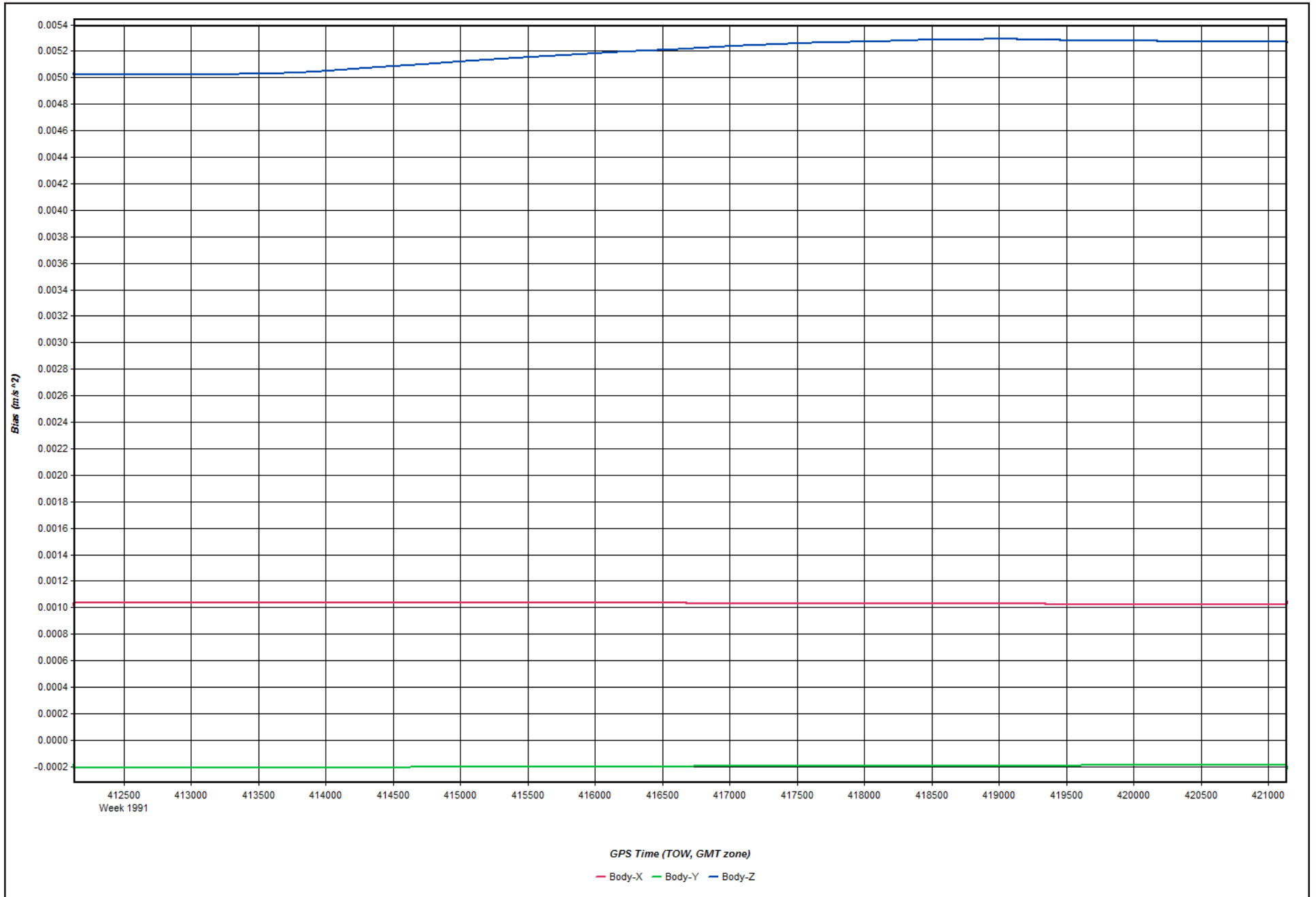
2018-03-08_Day067_7 - 20180308182750

Figure 18: L1 Doppler Residual RMS Plot



2018-03-08_Day067_7 - 20180308182750

Figure 19: Accelerometer Bias Plot



2018-03-08_Day067_7 - 20180308182750

Figure 20: Gyro Drift Plot

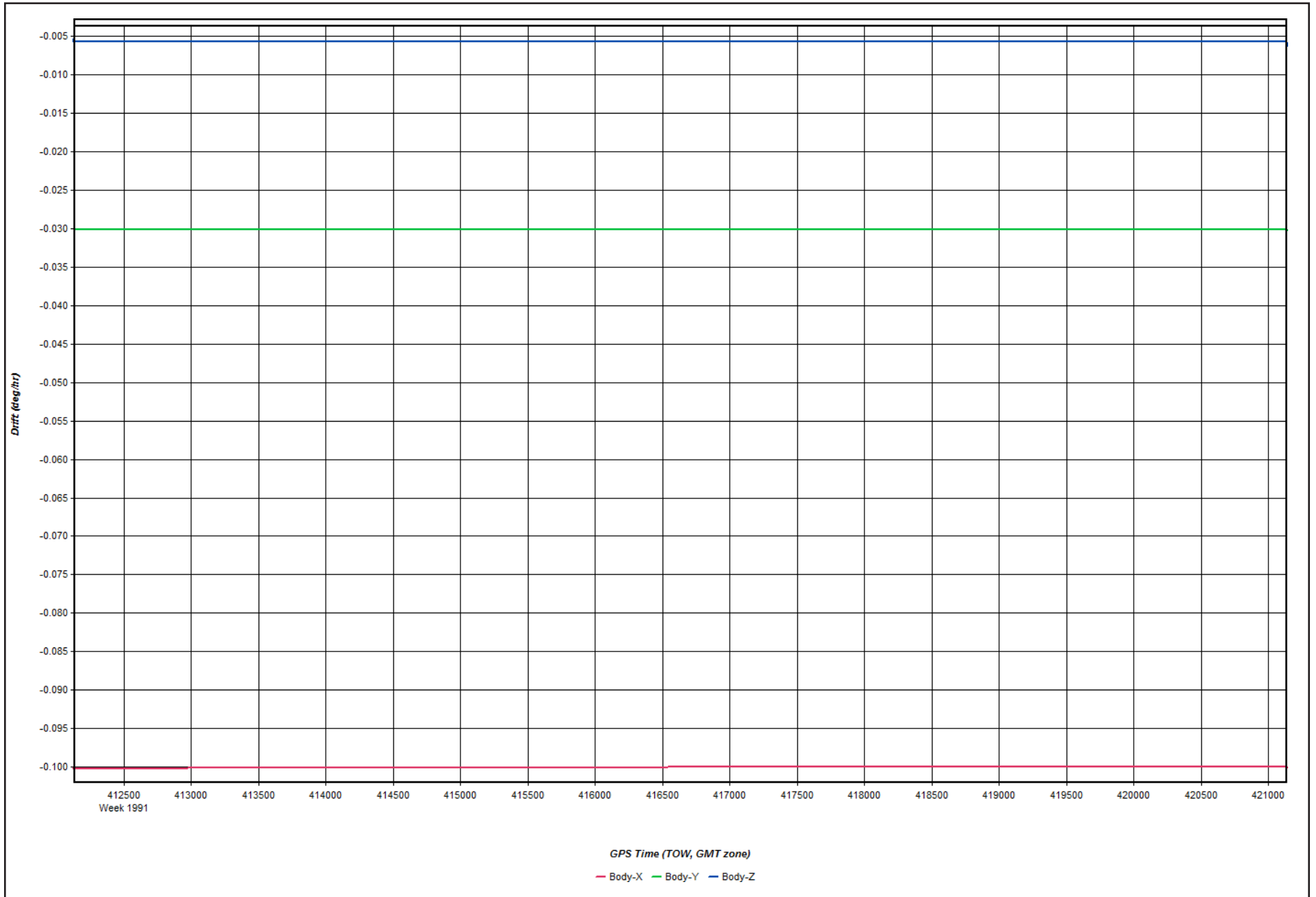
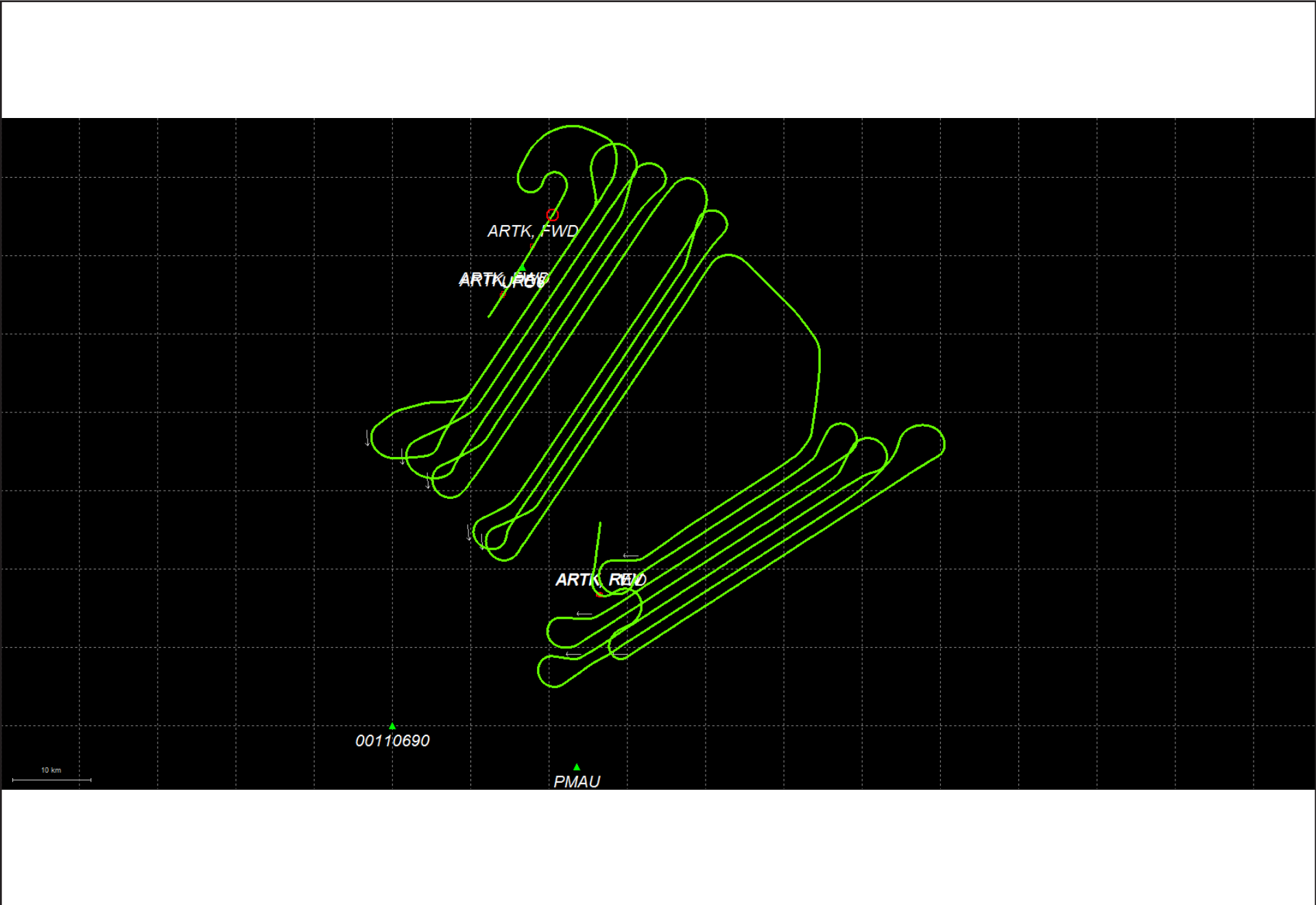
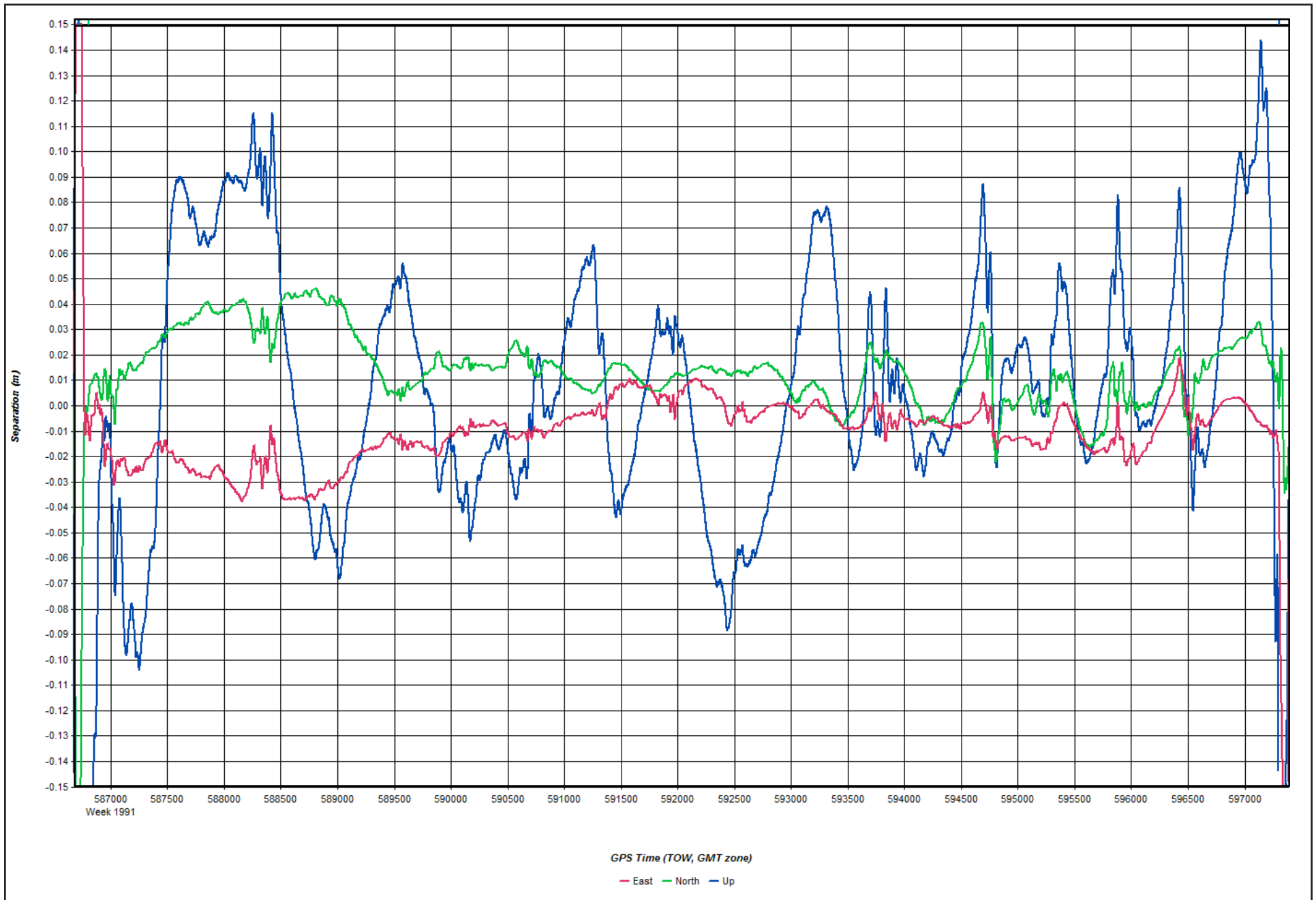


Figure 1: Map



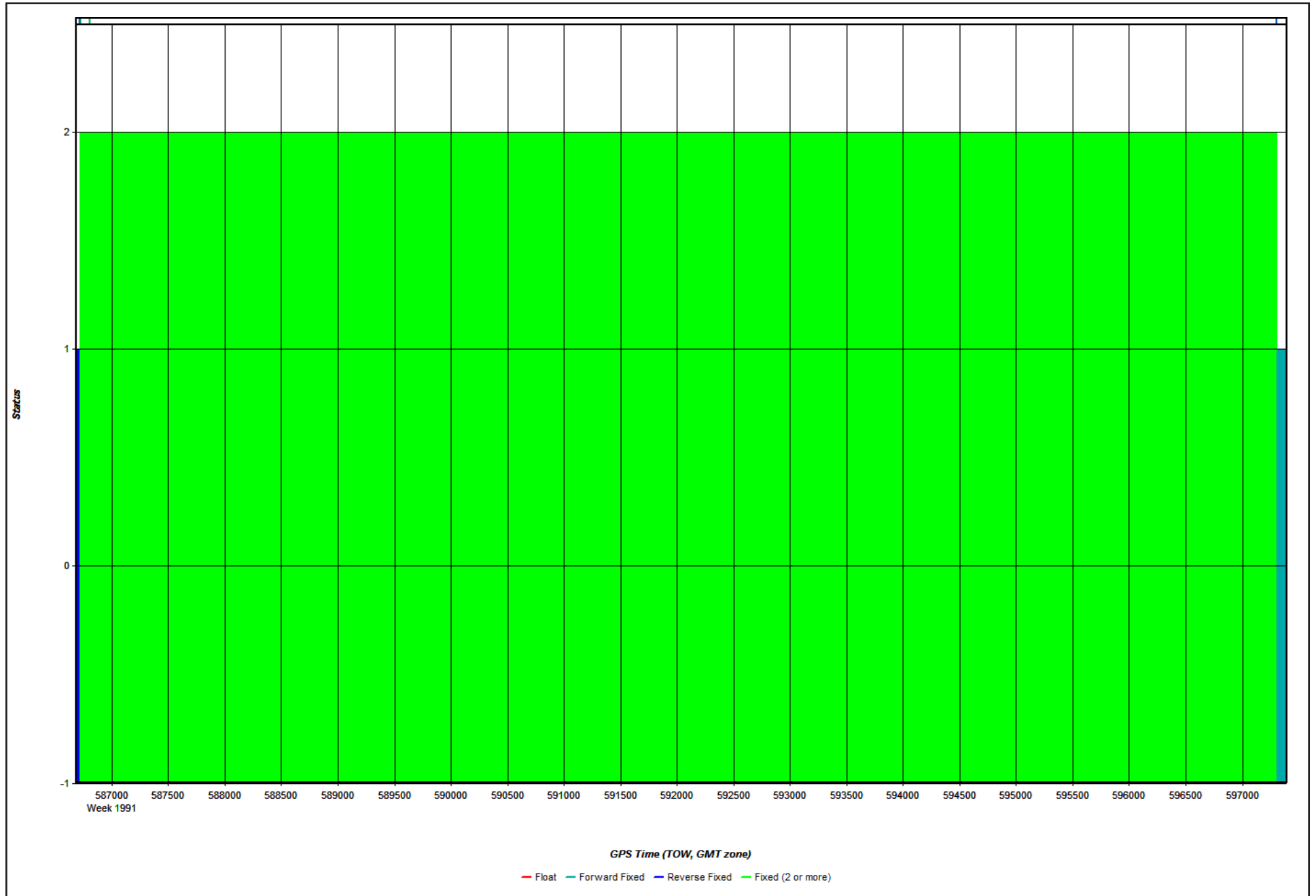
2018-03-10_Day069_7 - 20180310182752

Figure 2: Forward/Reverse or Combined Separation Plot



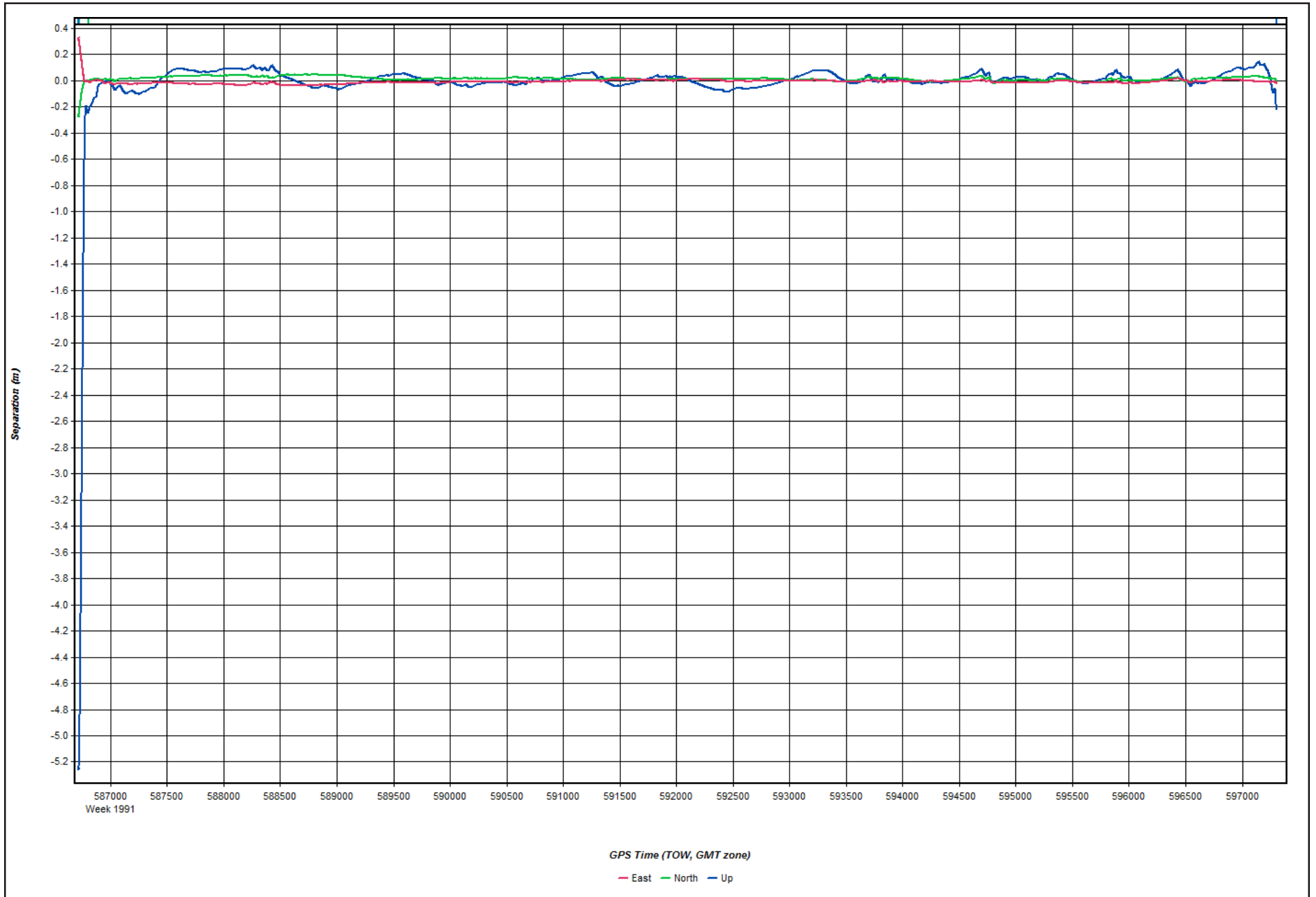
2018-03-10_Day069_7 - 20180310182752

Figure 3: Float or Fixed Ambiguity



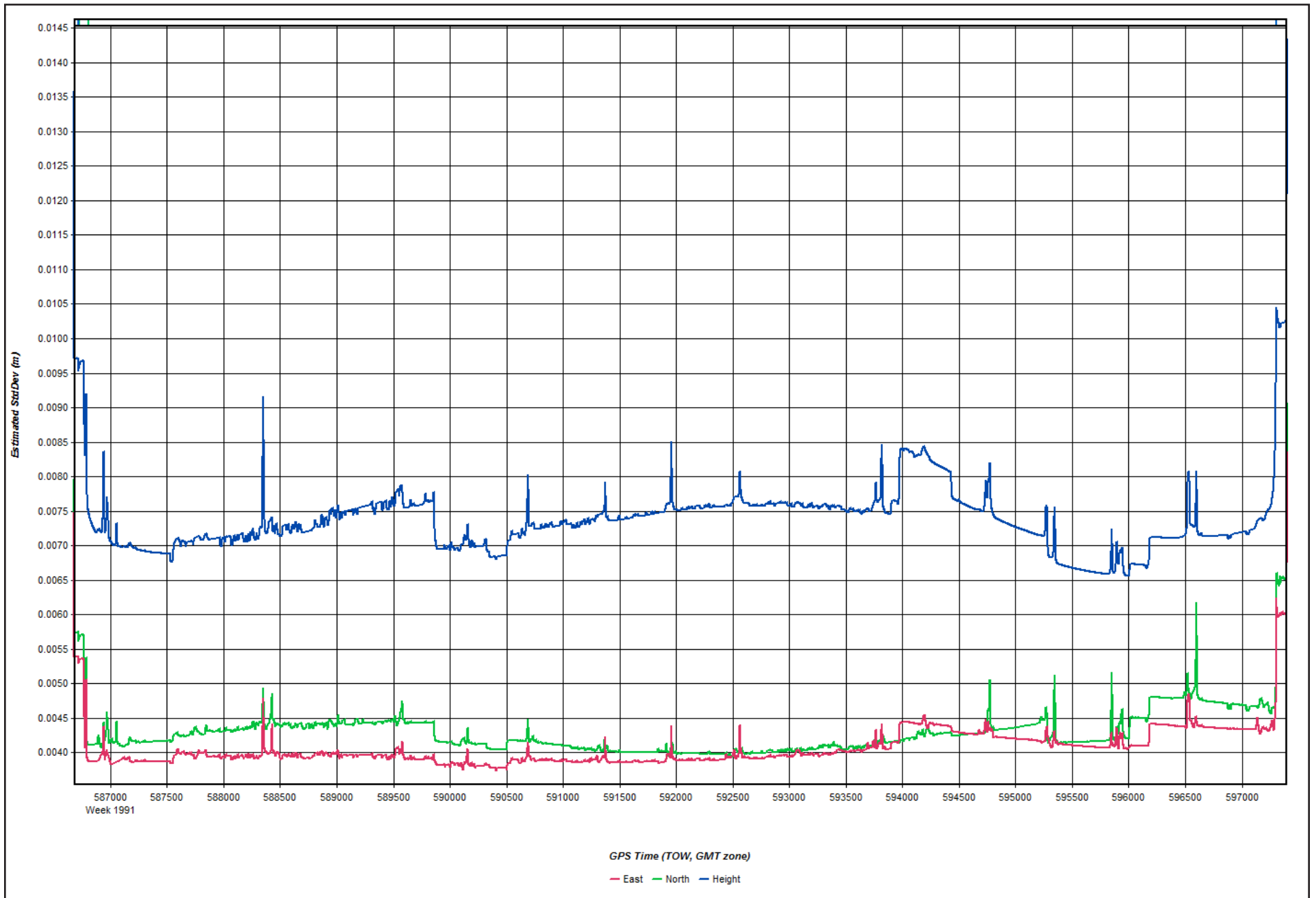
2018-03-10_Day069_7 - 20180310182752

Figure 4: Forward/Reverse Separation Plot (Fixed)



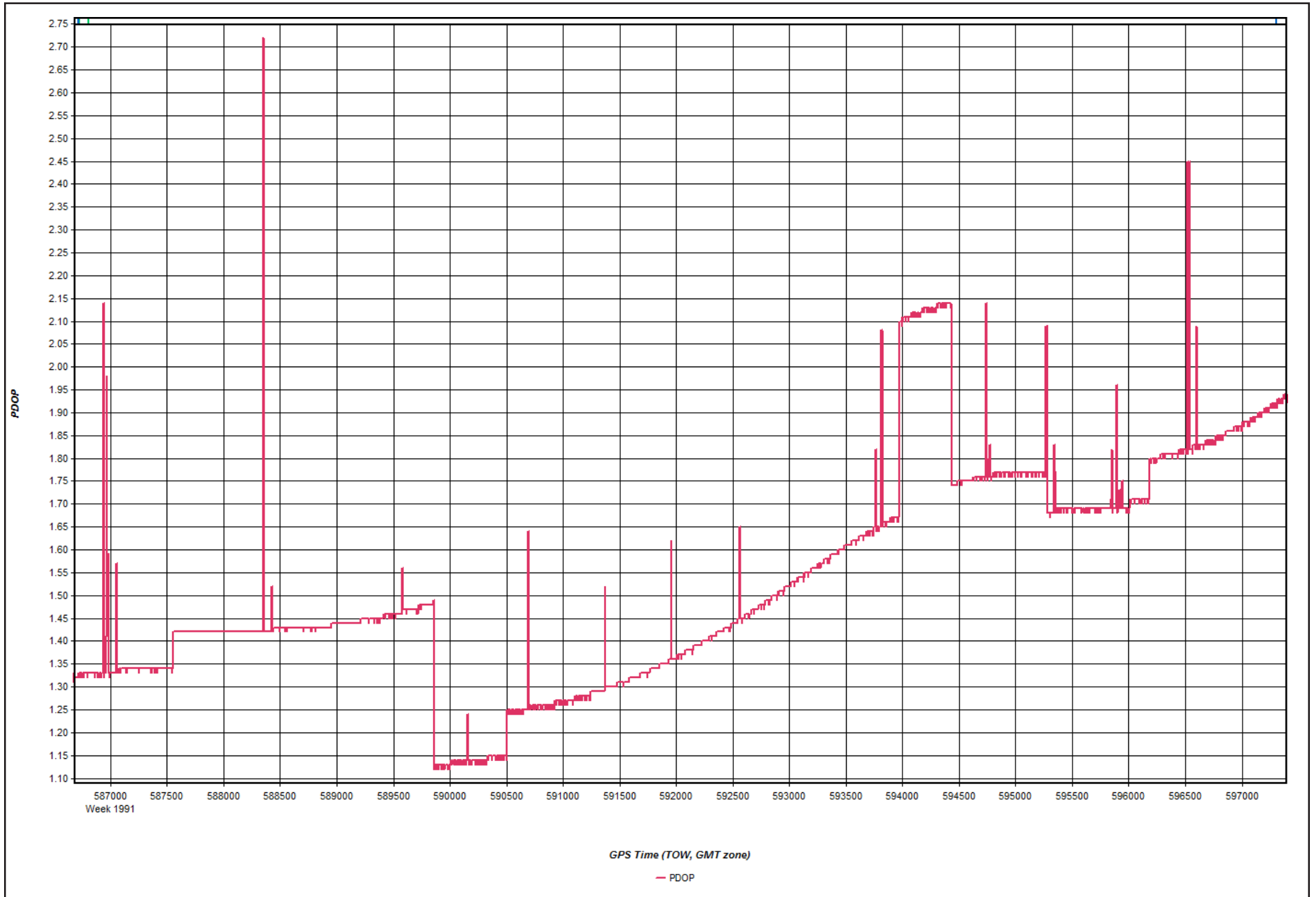
2018-03-10_Day069_7 - 20180310182752

Figure 5: Estimated Position Accuracy Plot



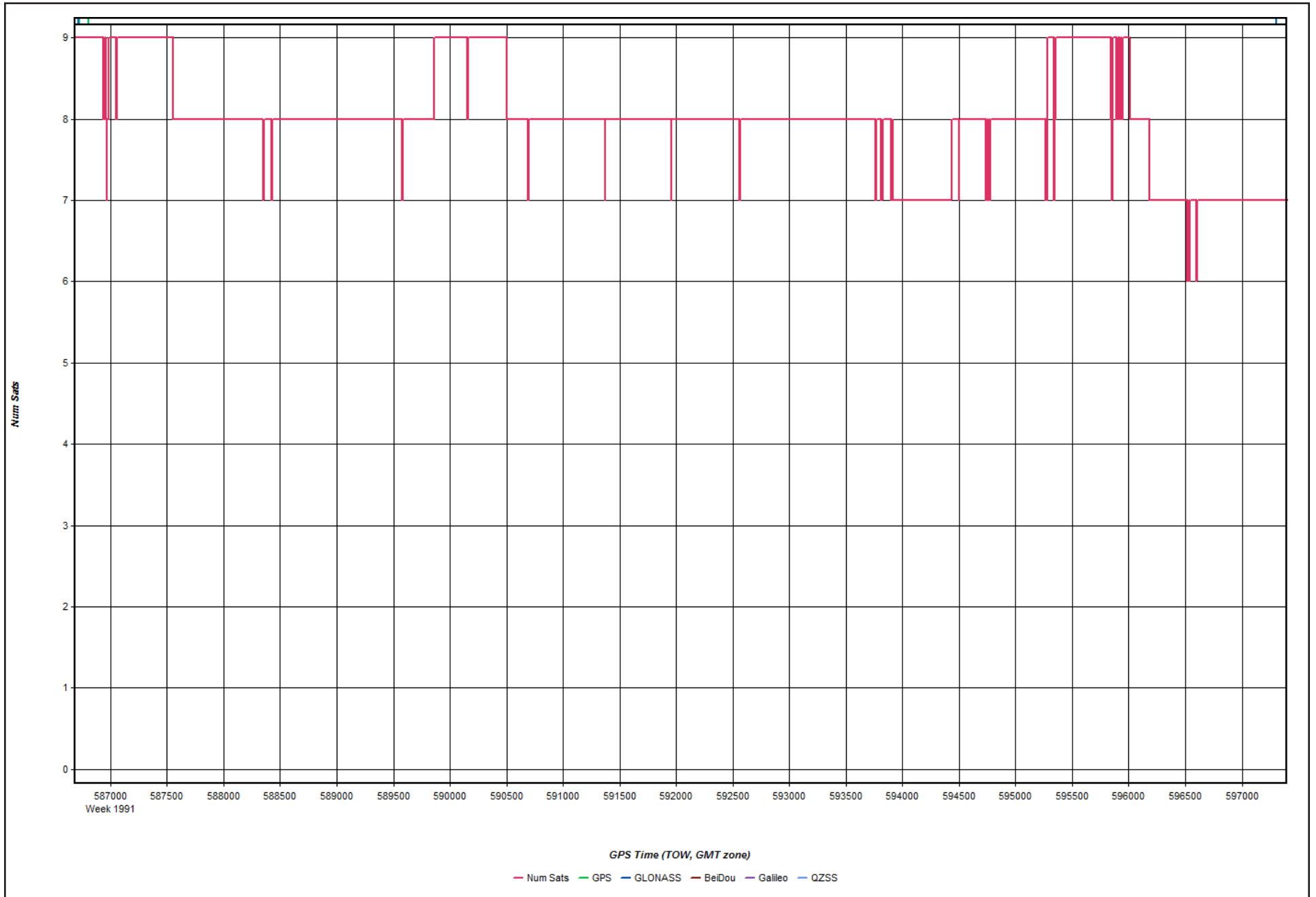
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Figure 6: PDOP Plot



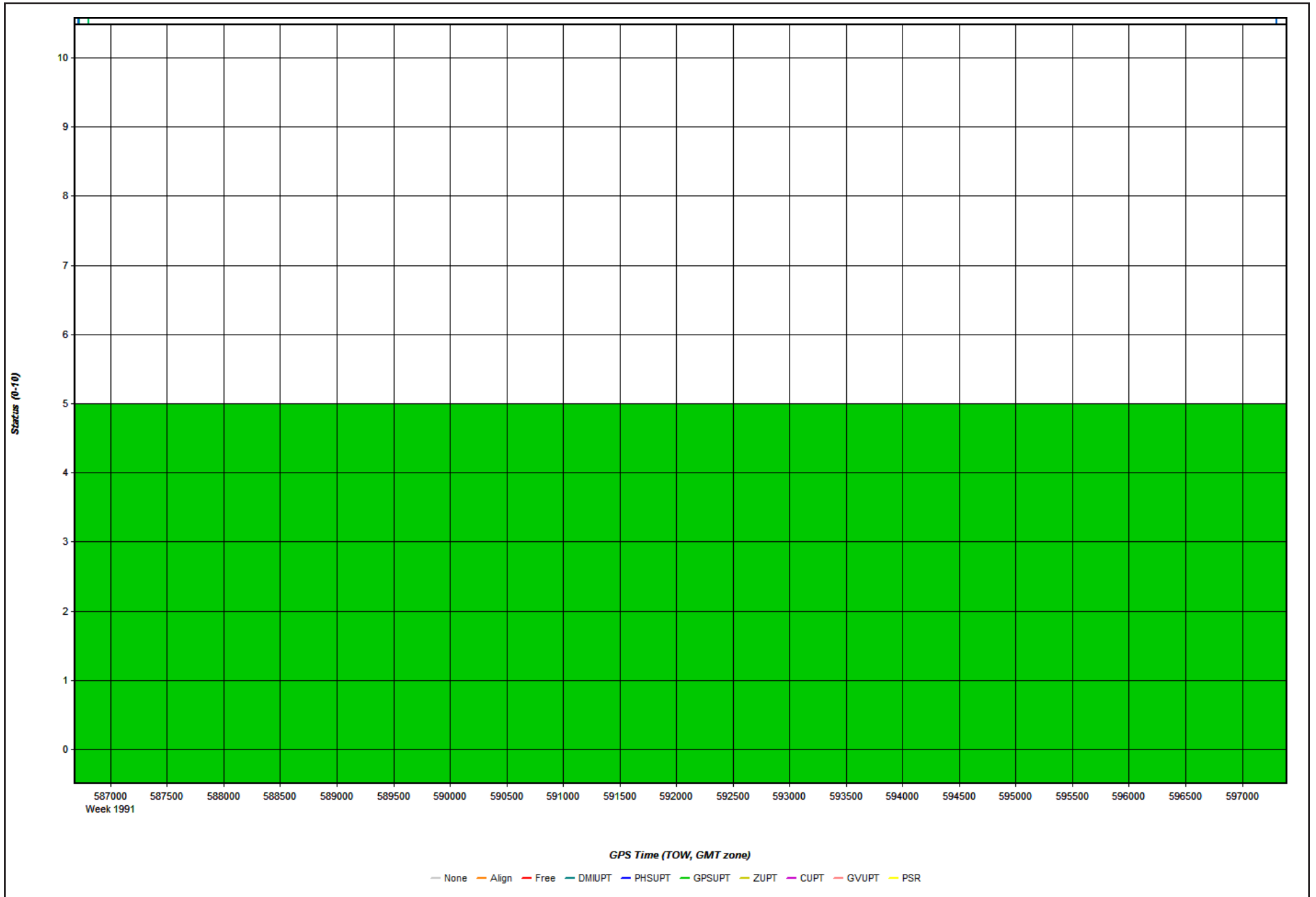
2018-03-10_Day069_7 - 20180310182752

Figure 7: Number of Satellites Line Plot



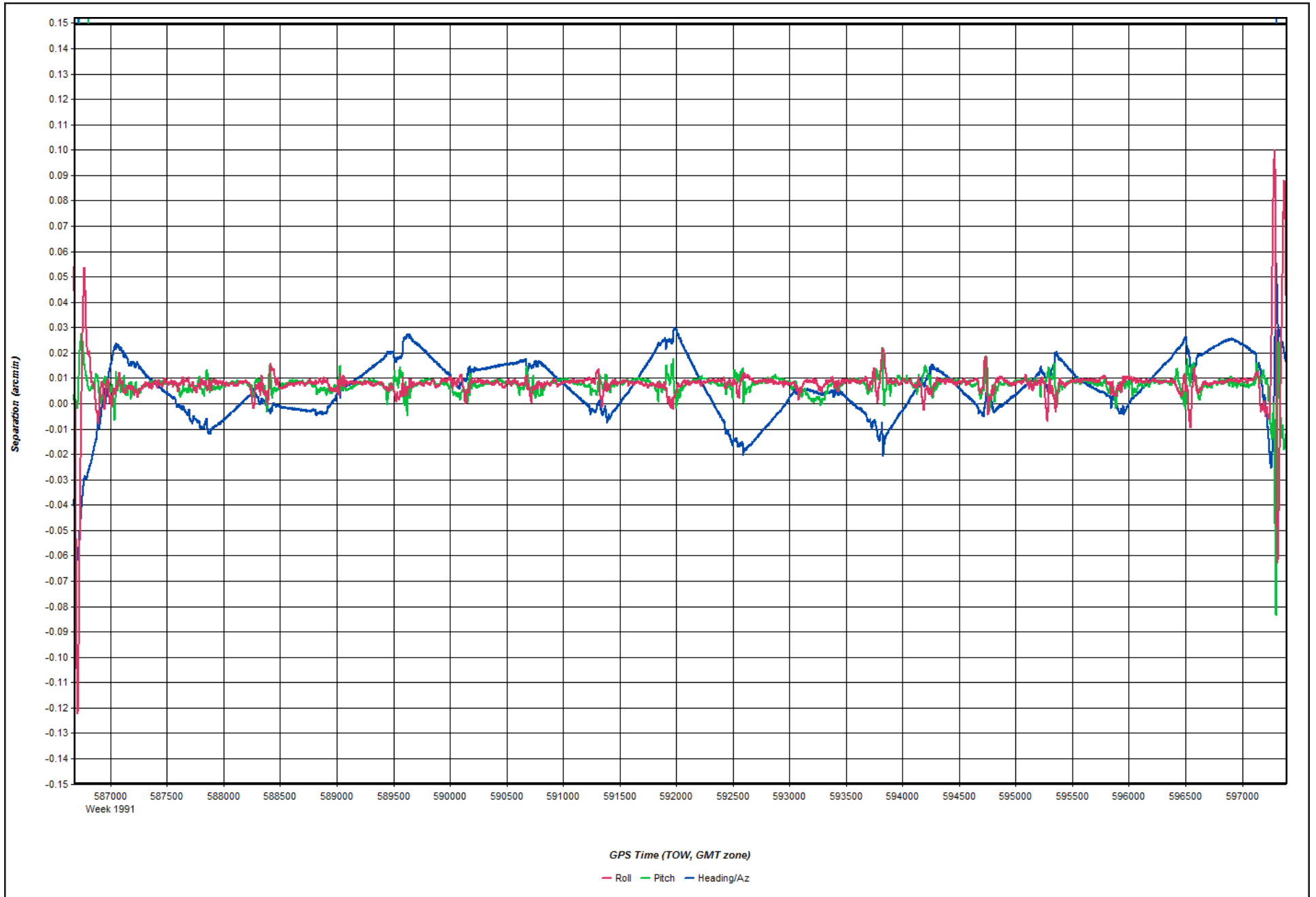
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Figure 8: Status flag for IMU processing



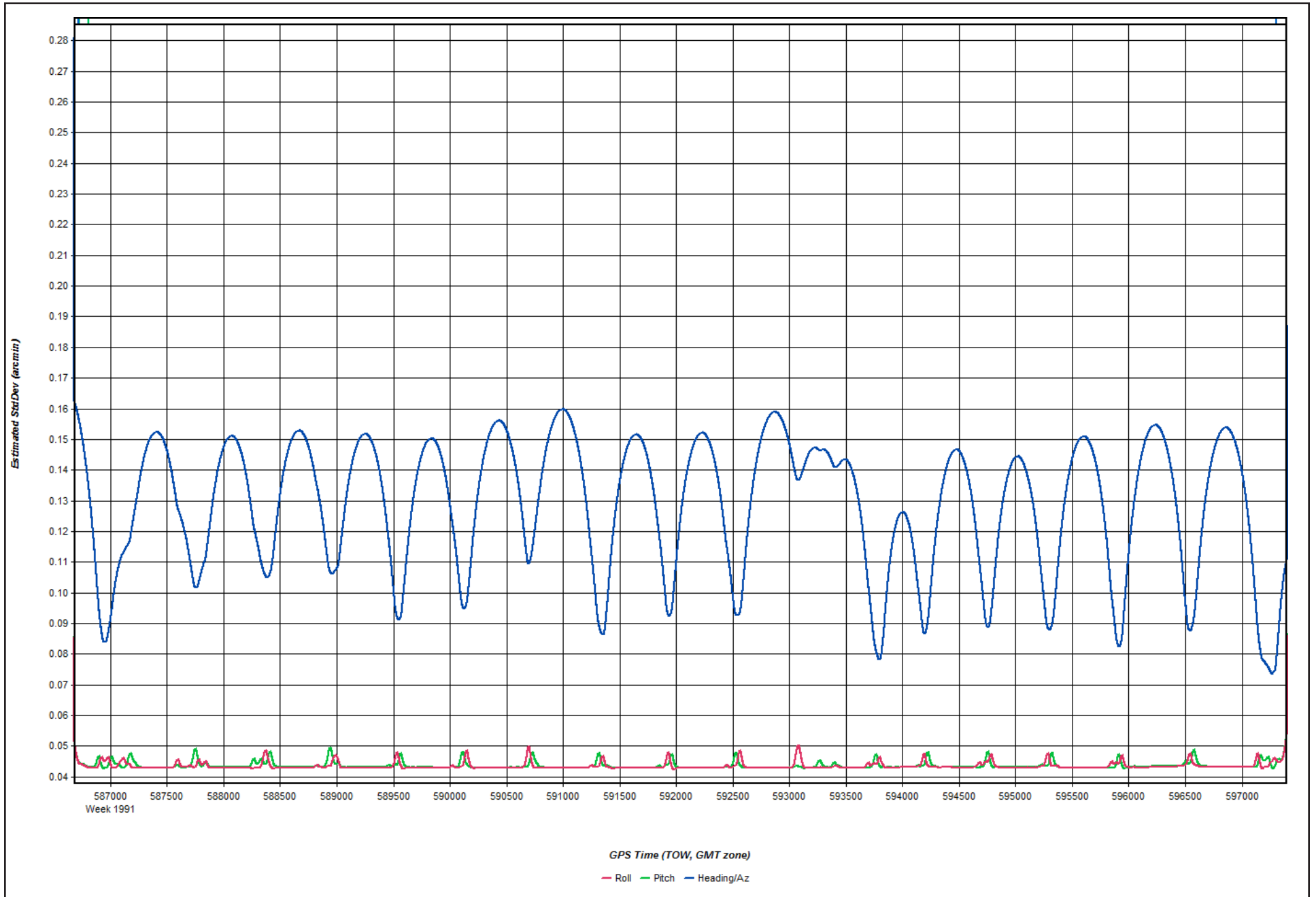
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Figure 9: Fwd/Rev Attitude Separation Plot



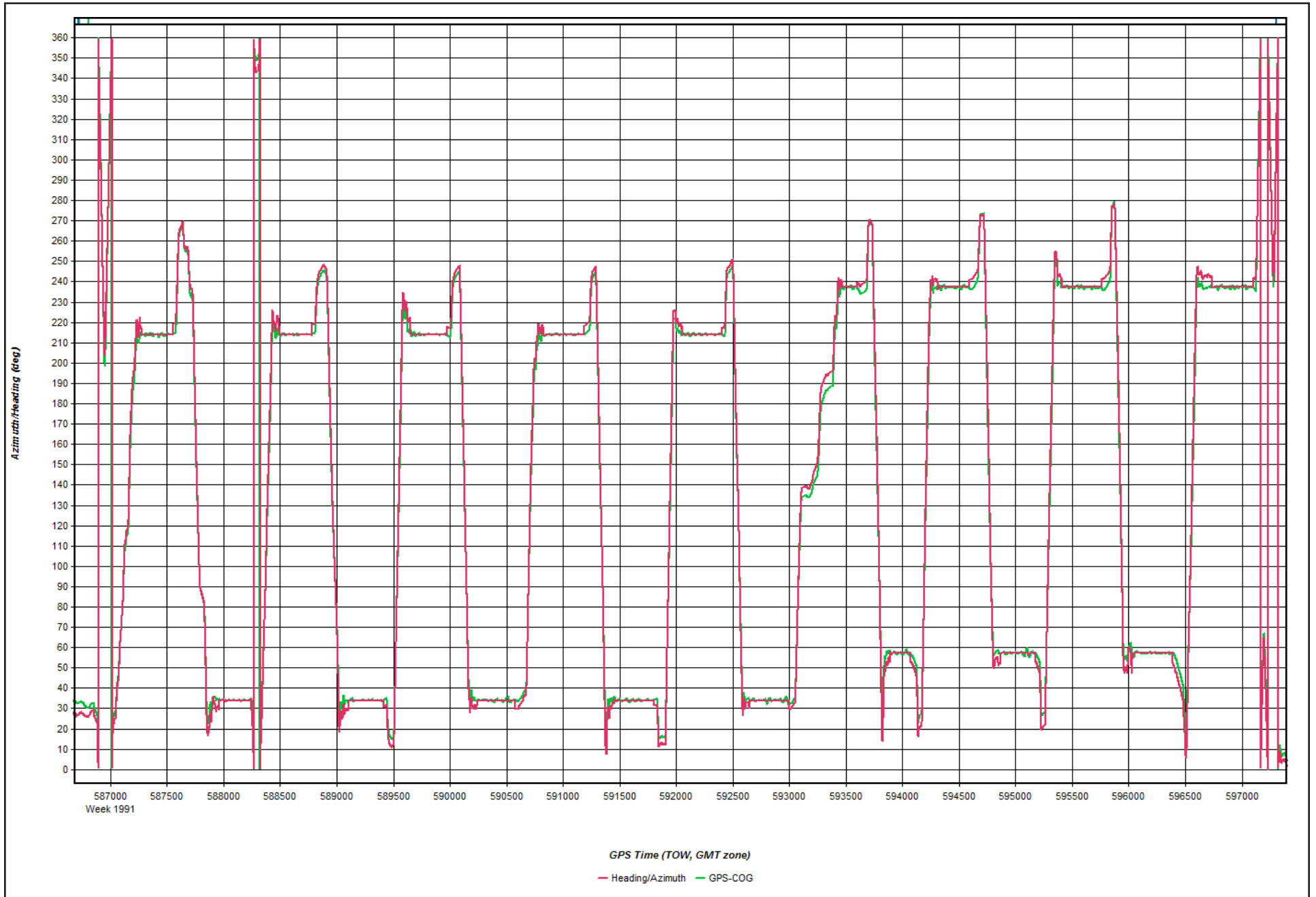
2018-03-10_Day069_7 - 20180310182752

Figure 10: Estimated Attitude Accuracy Plot



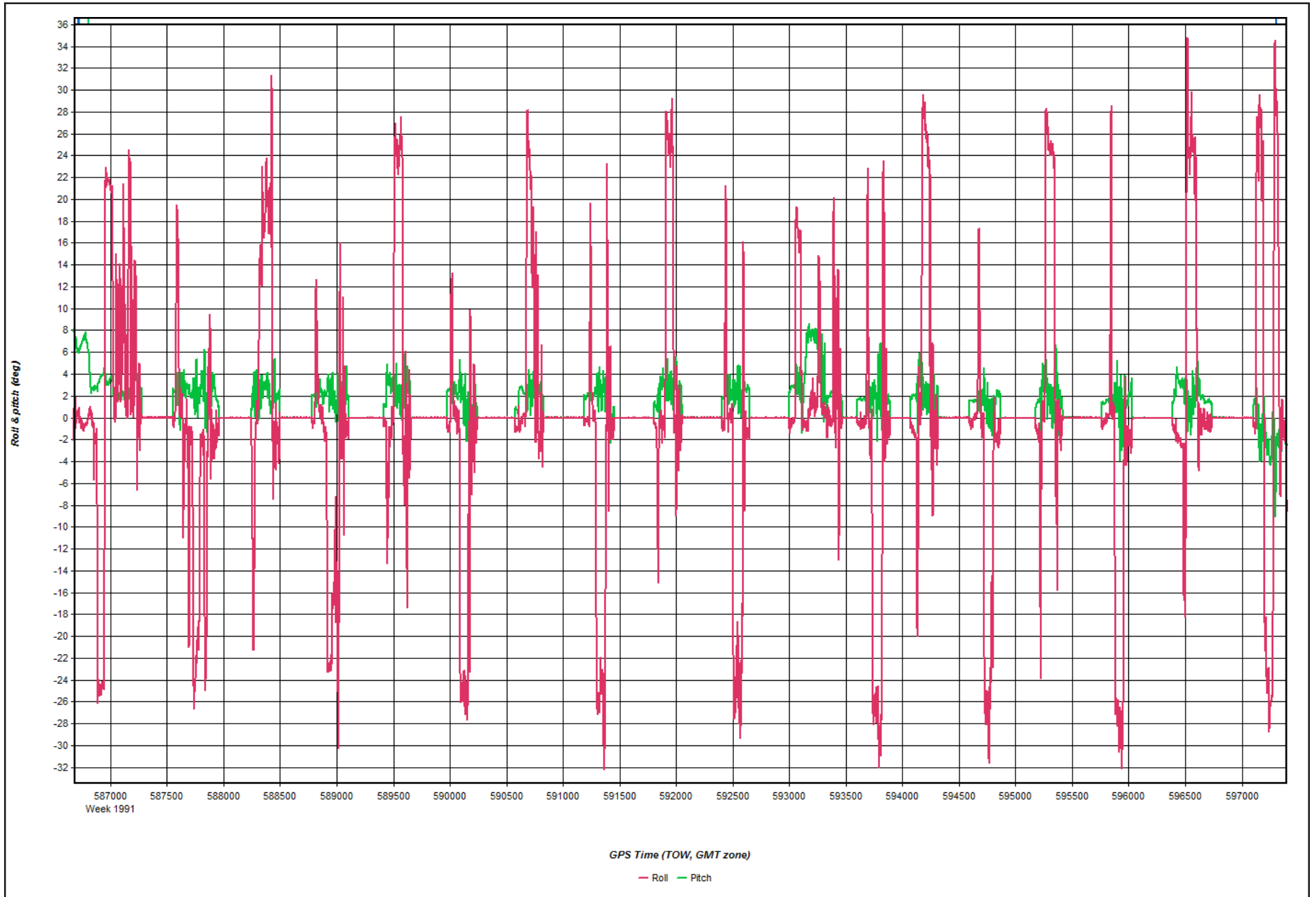
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Figure 11: Azimuth Plot



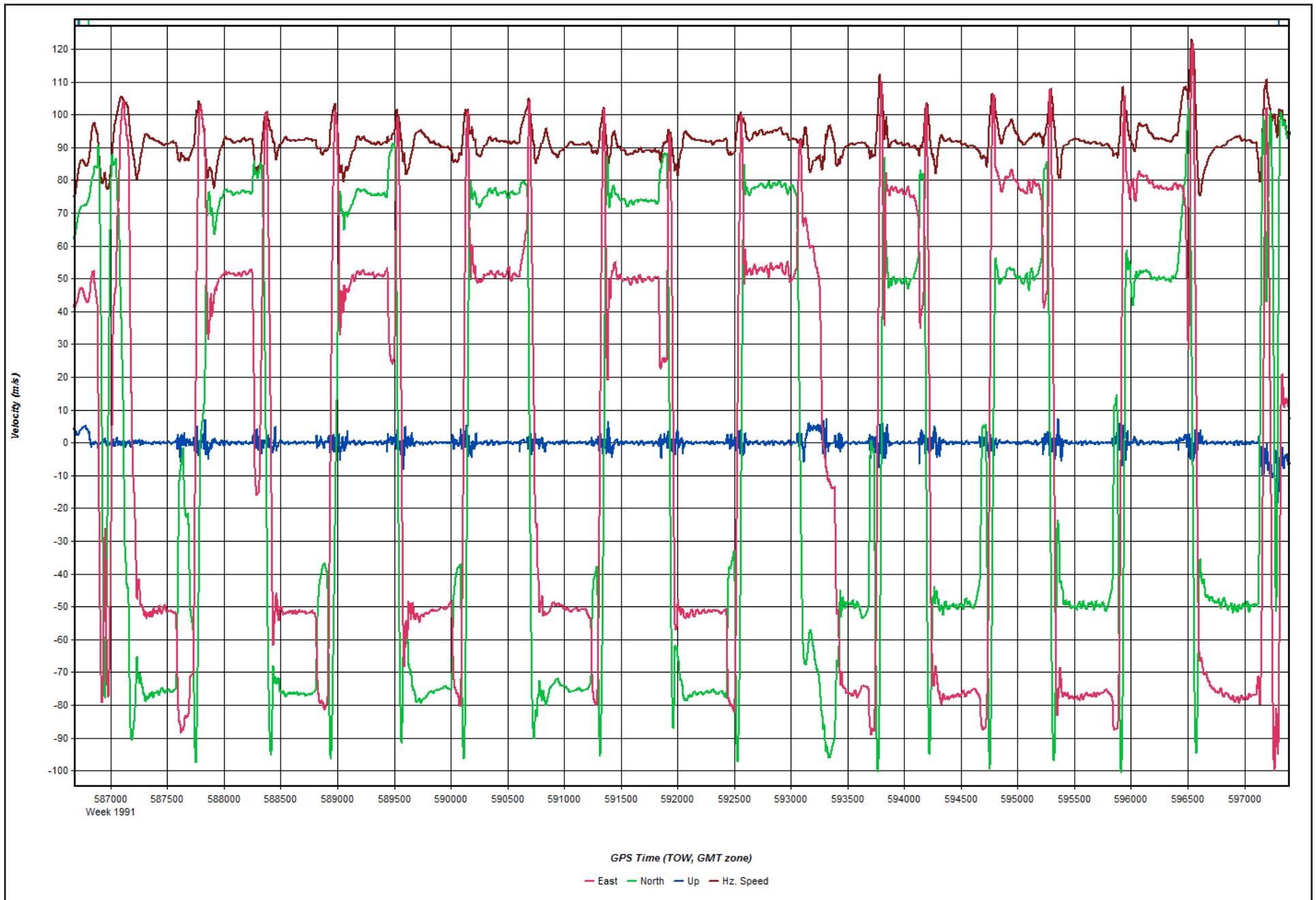
2018-03-10_Day069_7 - 20180310182752

Figure 12: Roll & Pitch Plot



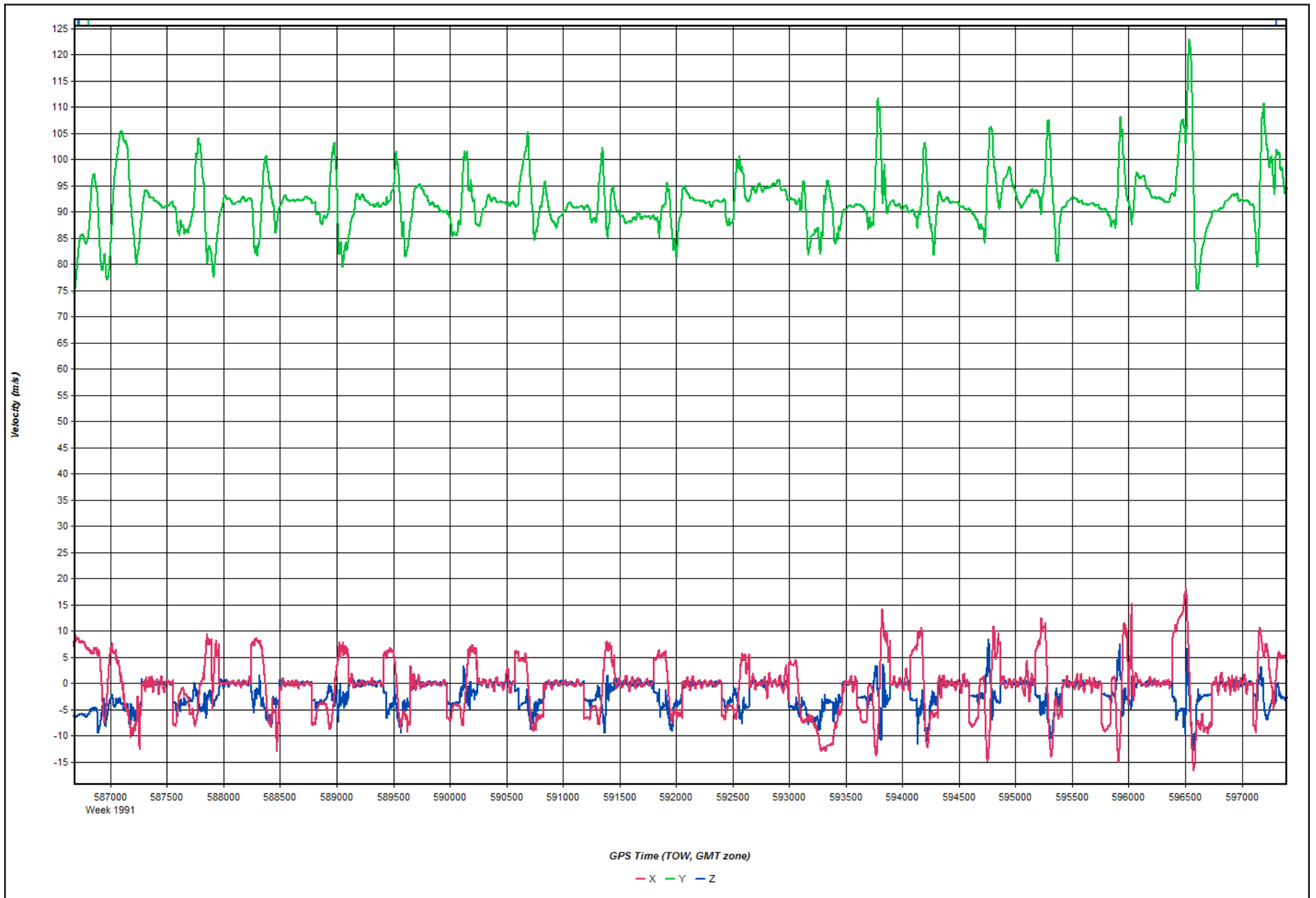
2018-03-10_Day069_7 - 20180310182752

Figure 13: Velocity Profile Plot



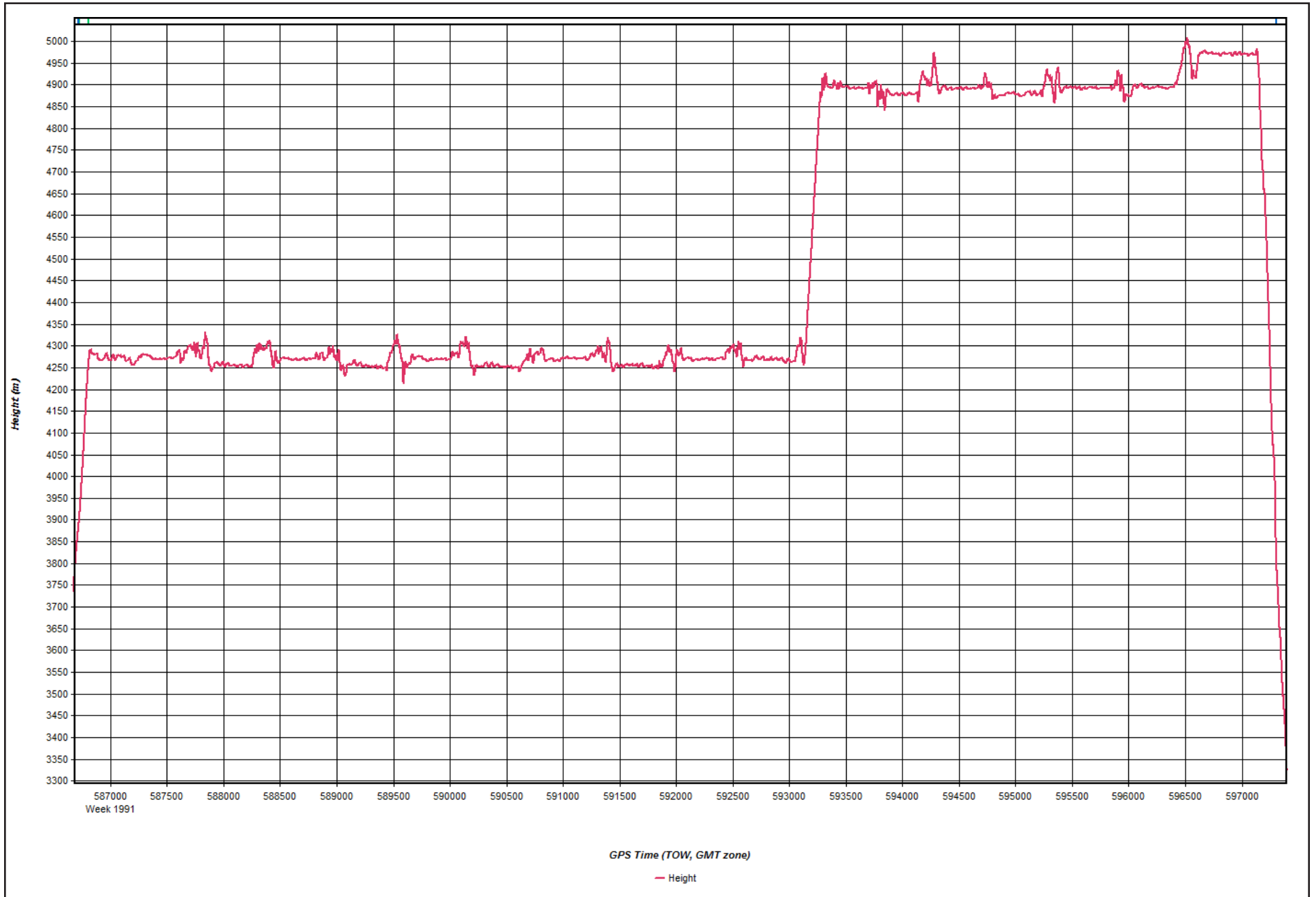
2018-03-10_Day069_7 - 20180310182752

Figure 14: Body Frame Velocity Plot



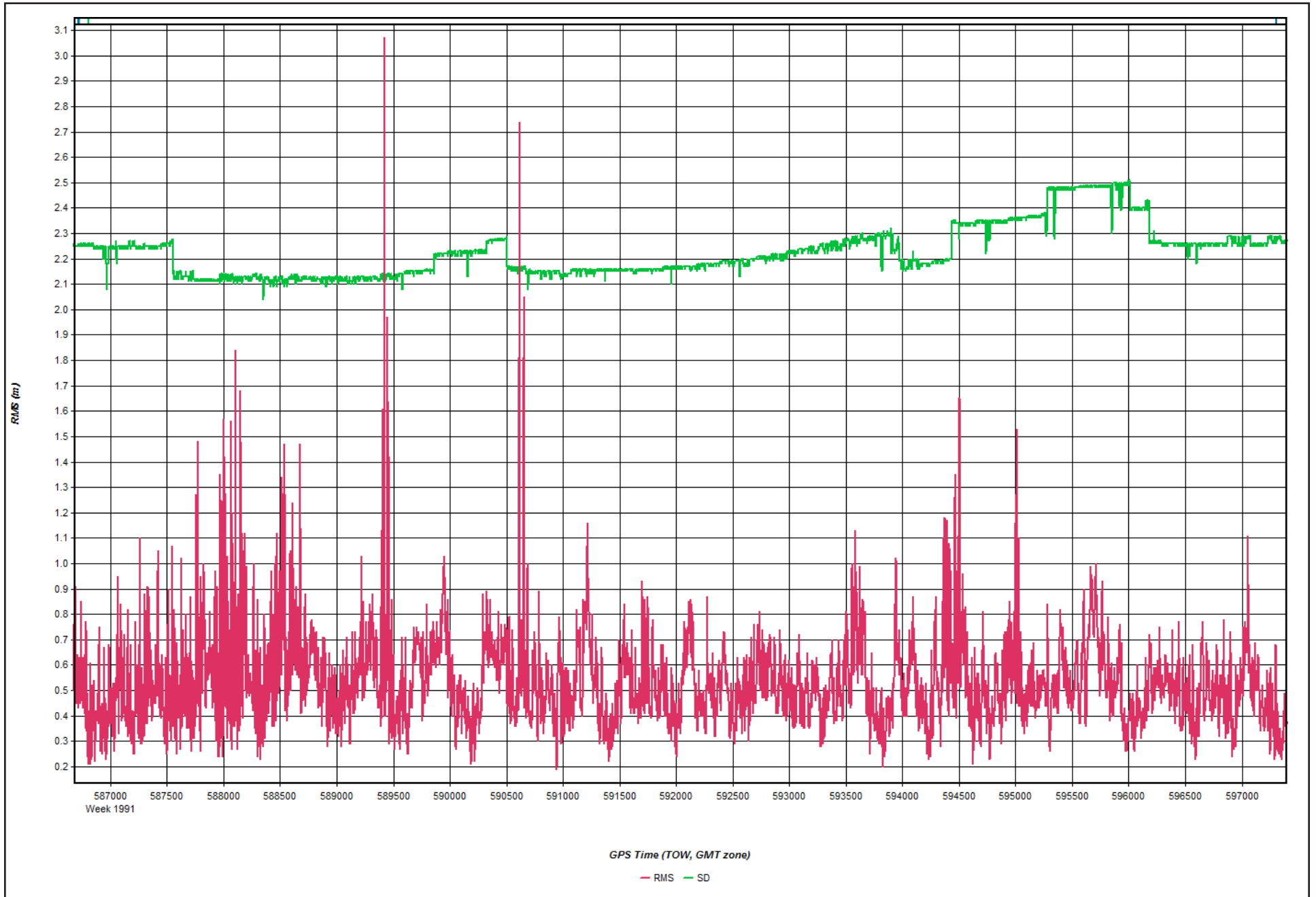
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Figure 15: Height Profile Plot



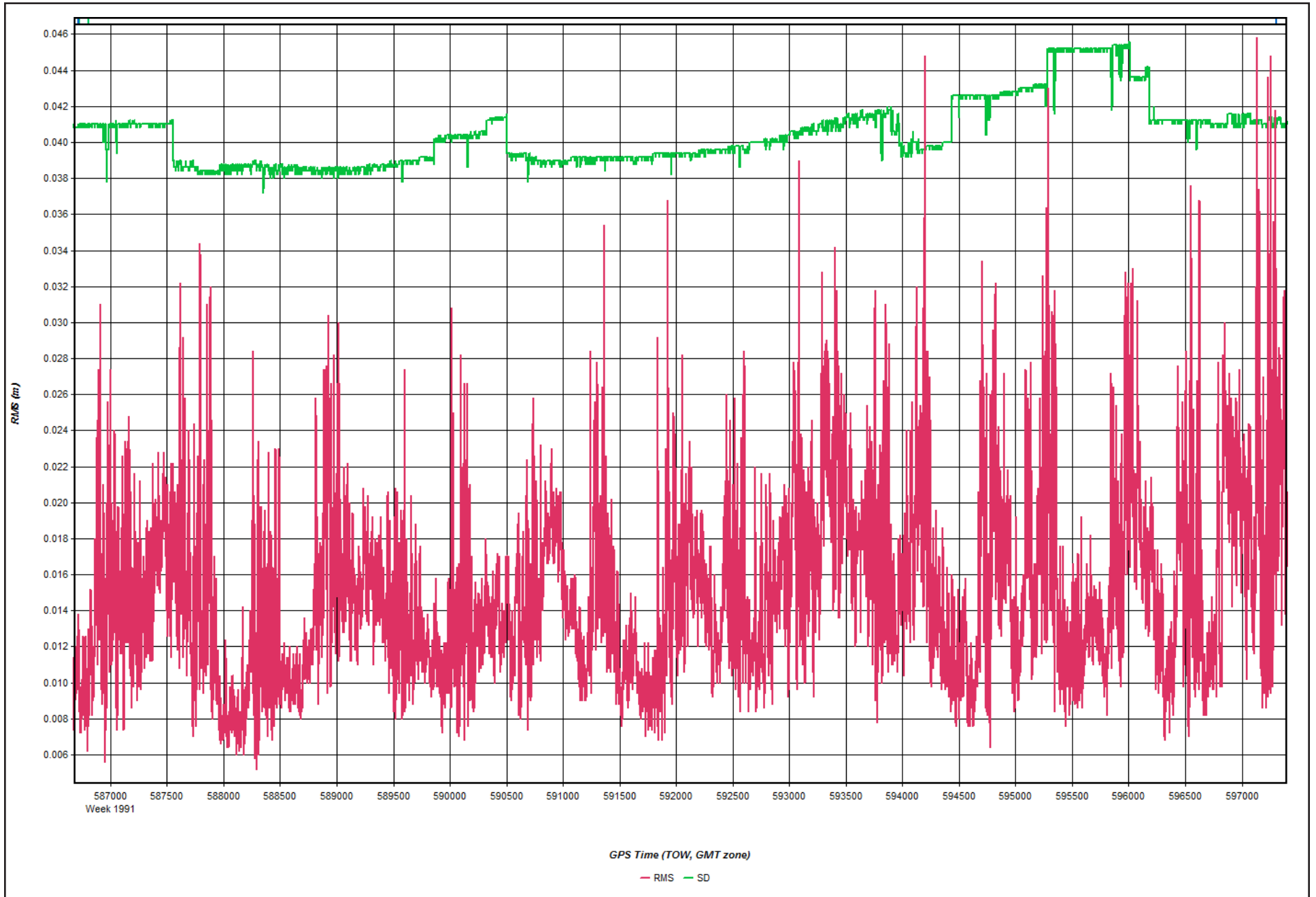
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Figure 16: C/A Code Residual RMS Plot



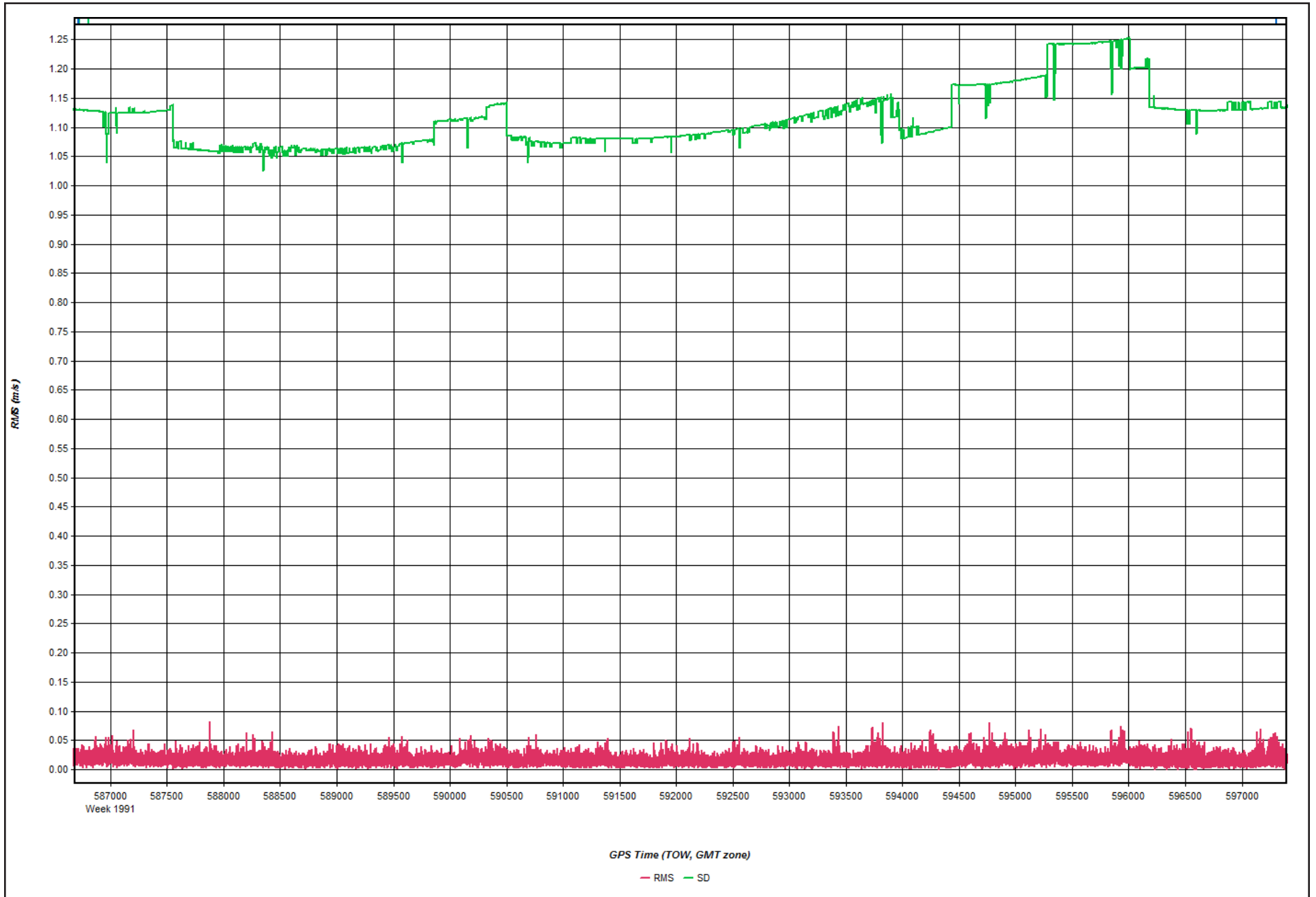
2018-03-10_Day069_7 - 20180310182752

Figure 17: Carrier Residual RMS Plot



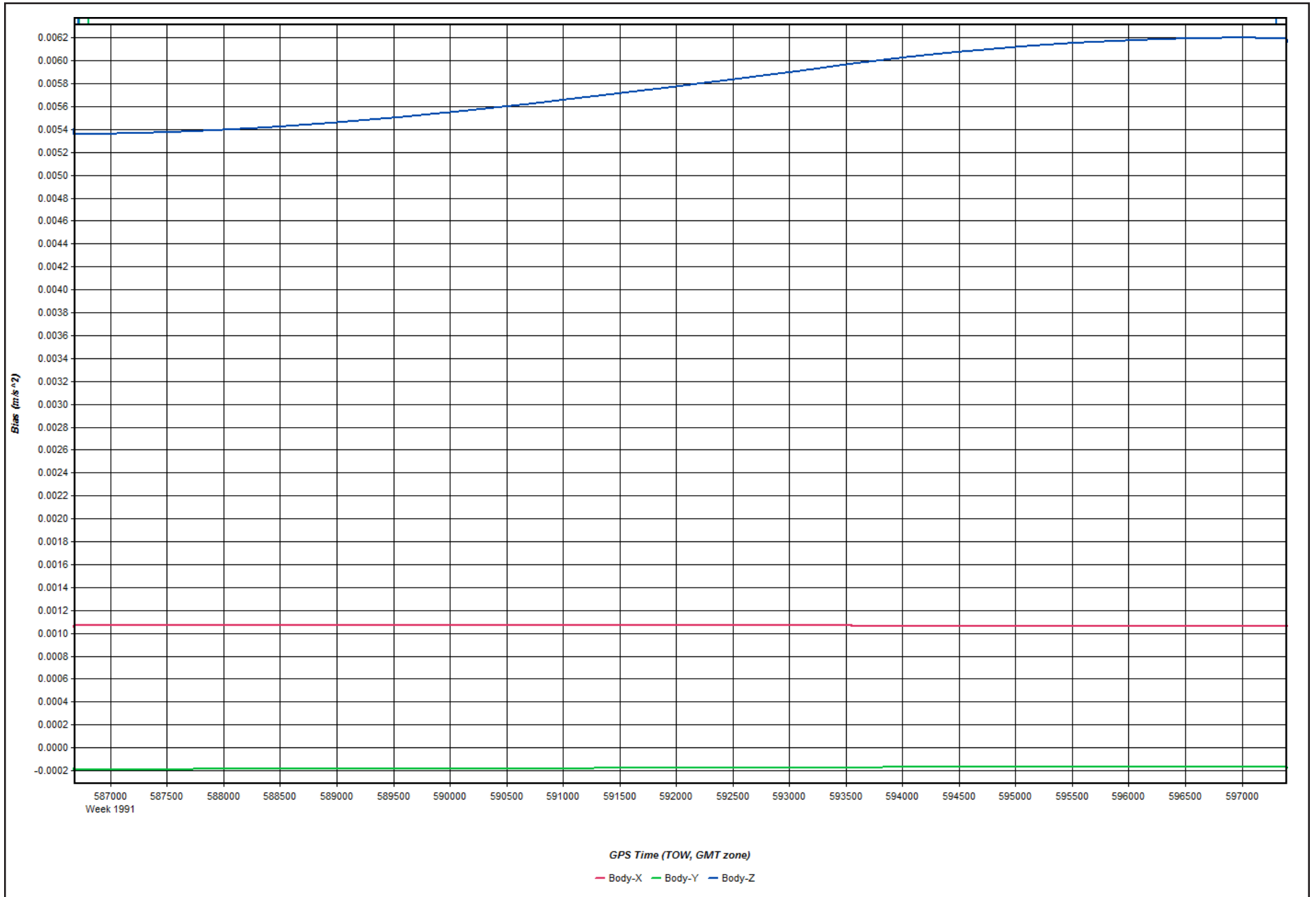
2018-03-10_Day069_7 - 20180310182752

Figure 18: L1 Doppler Residual RMS Plot



2018-03-10_Day069_7 - 20180310182752

Figure 19: Accelerometer Bias Plot



2018-03-10_Day069_7 - 20180310182752

Figure 20: Gyro Drift Plot

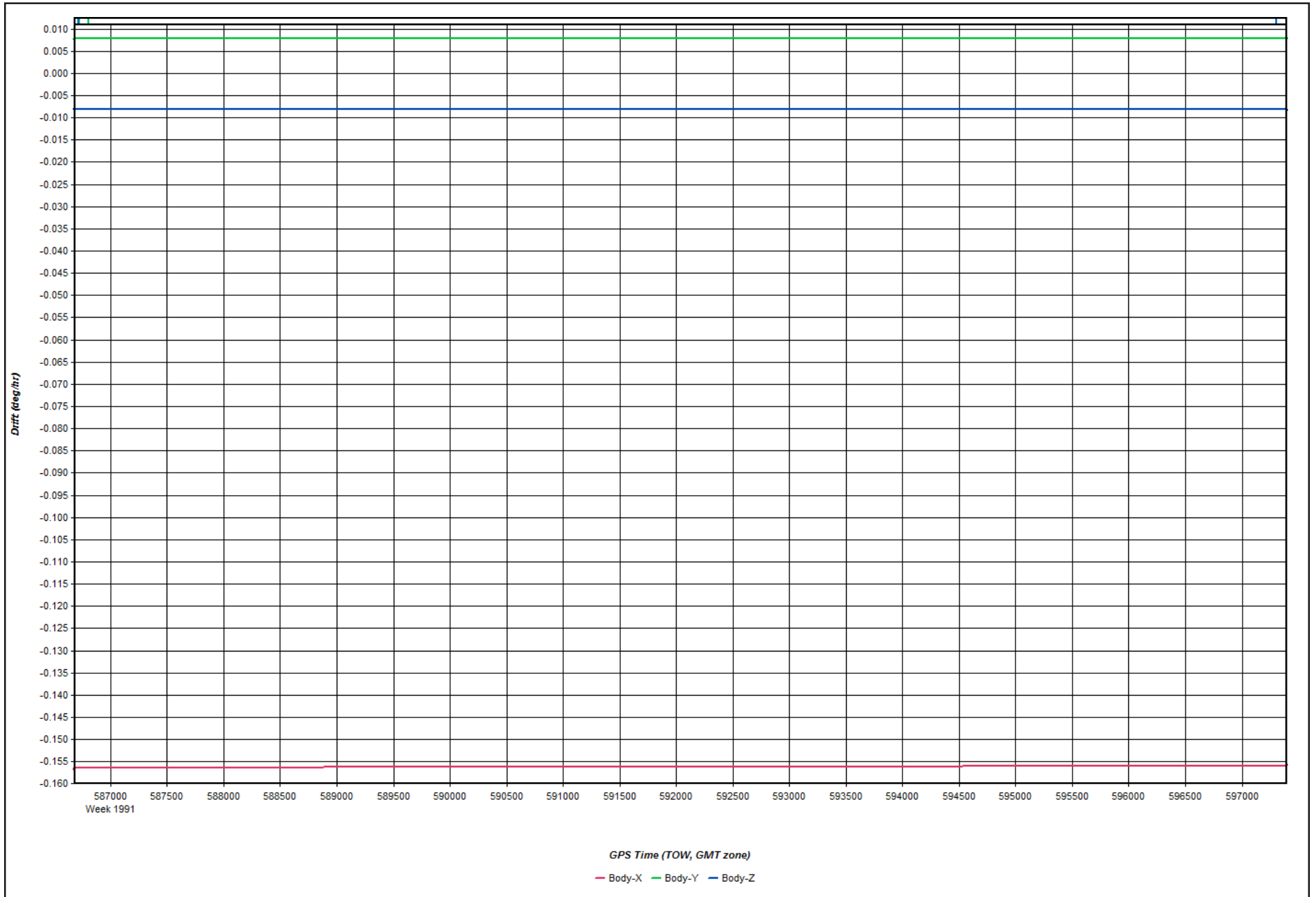
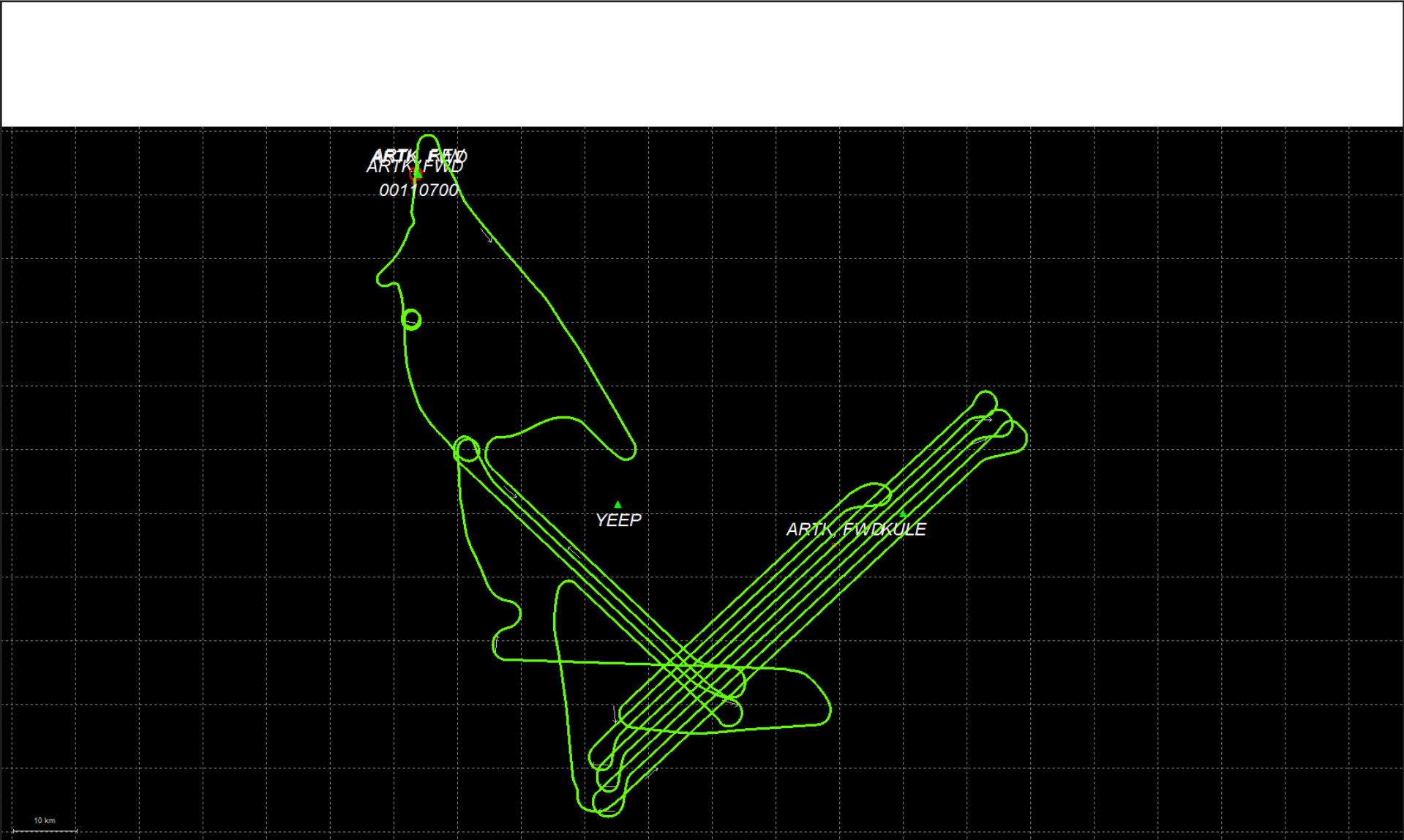
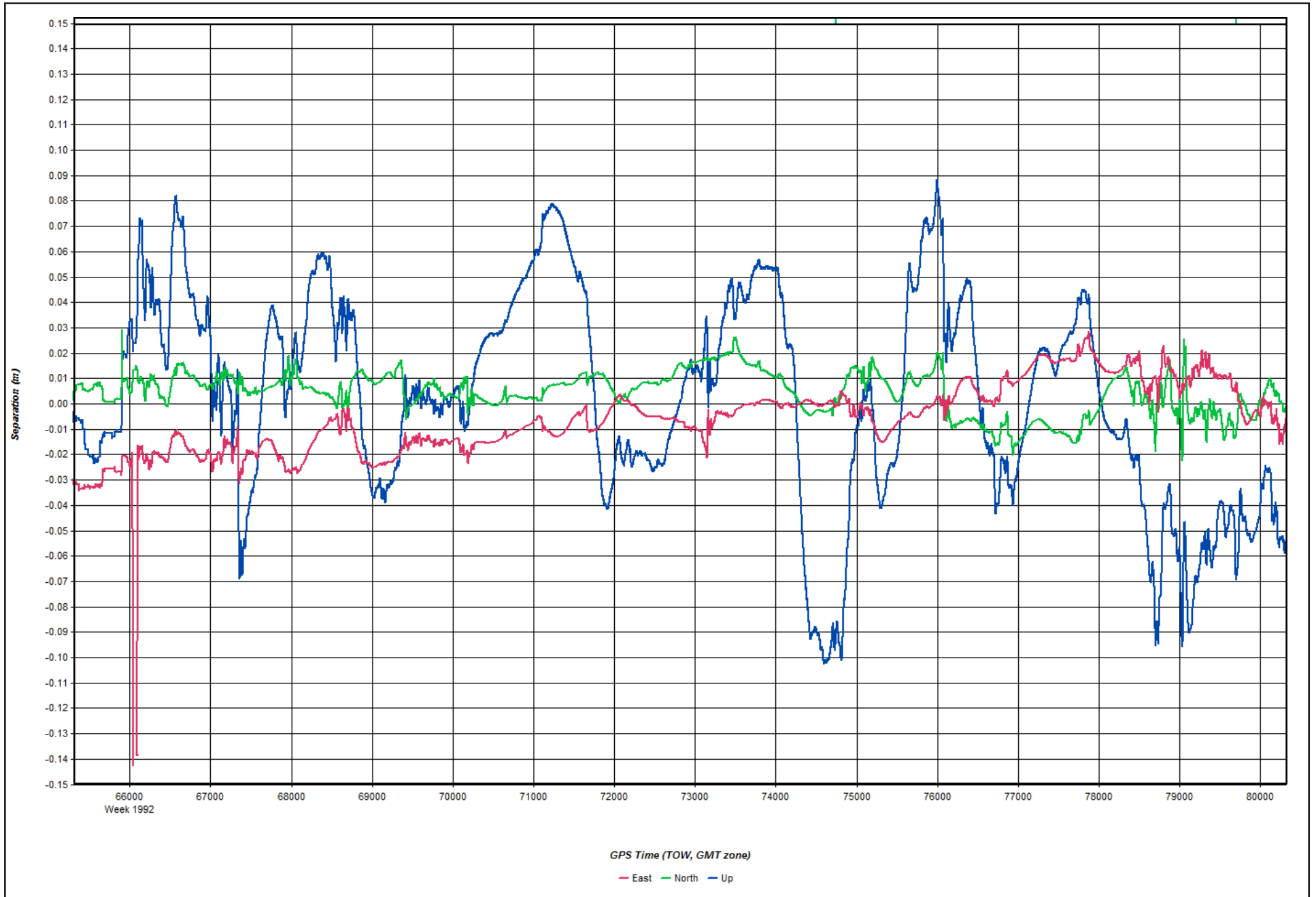


Figure 1: Map



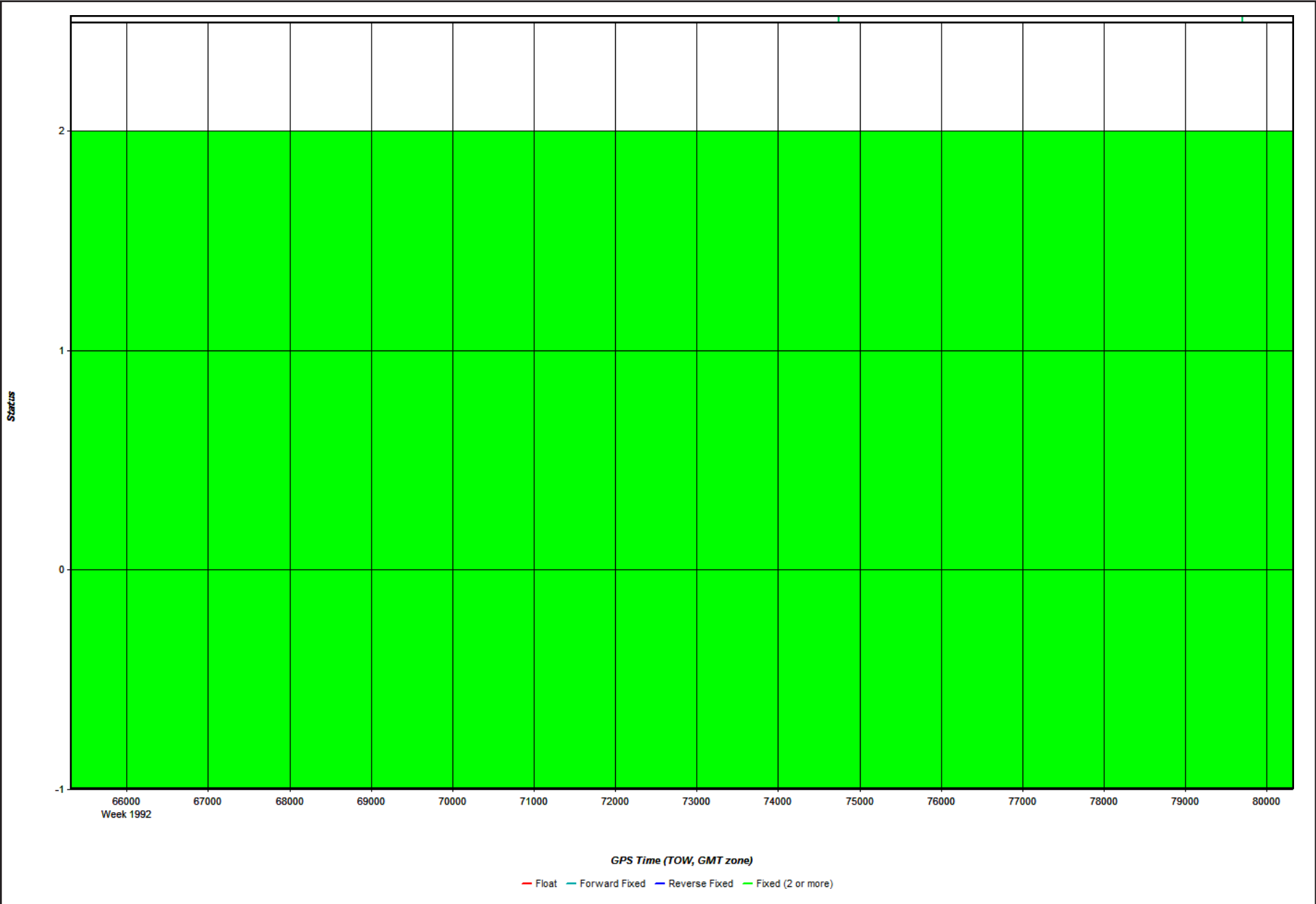
2018-03-11_Day070_7 - 20180311180726

Figure 2: Forward/Reverse or Combined Separation Plot



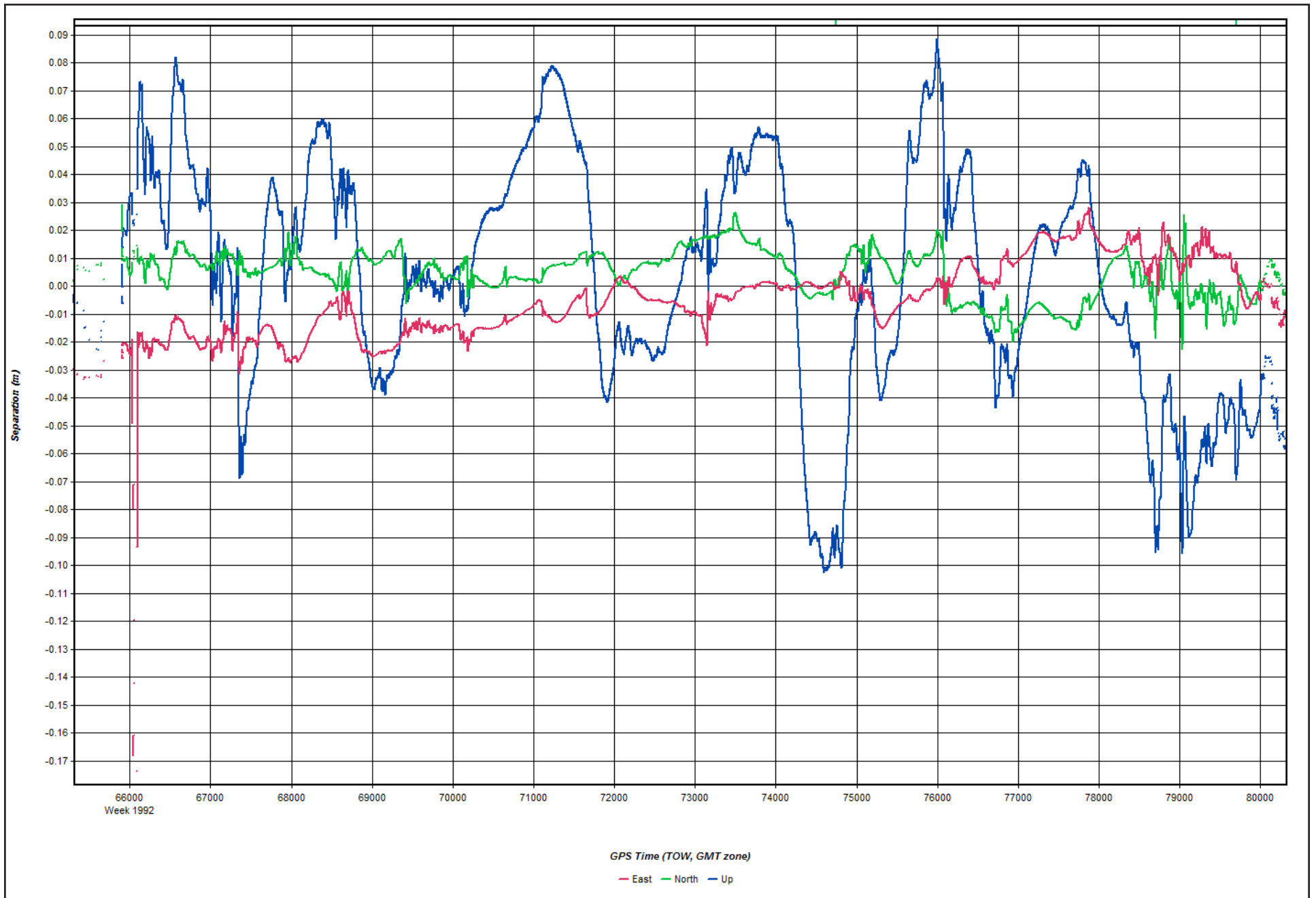
2018-03-11_Day070_7 - 20180311180726

Figure 3: Float or Fixed Ambiguity



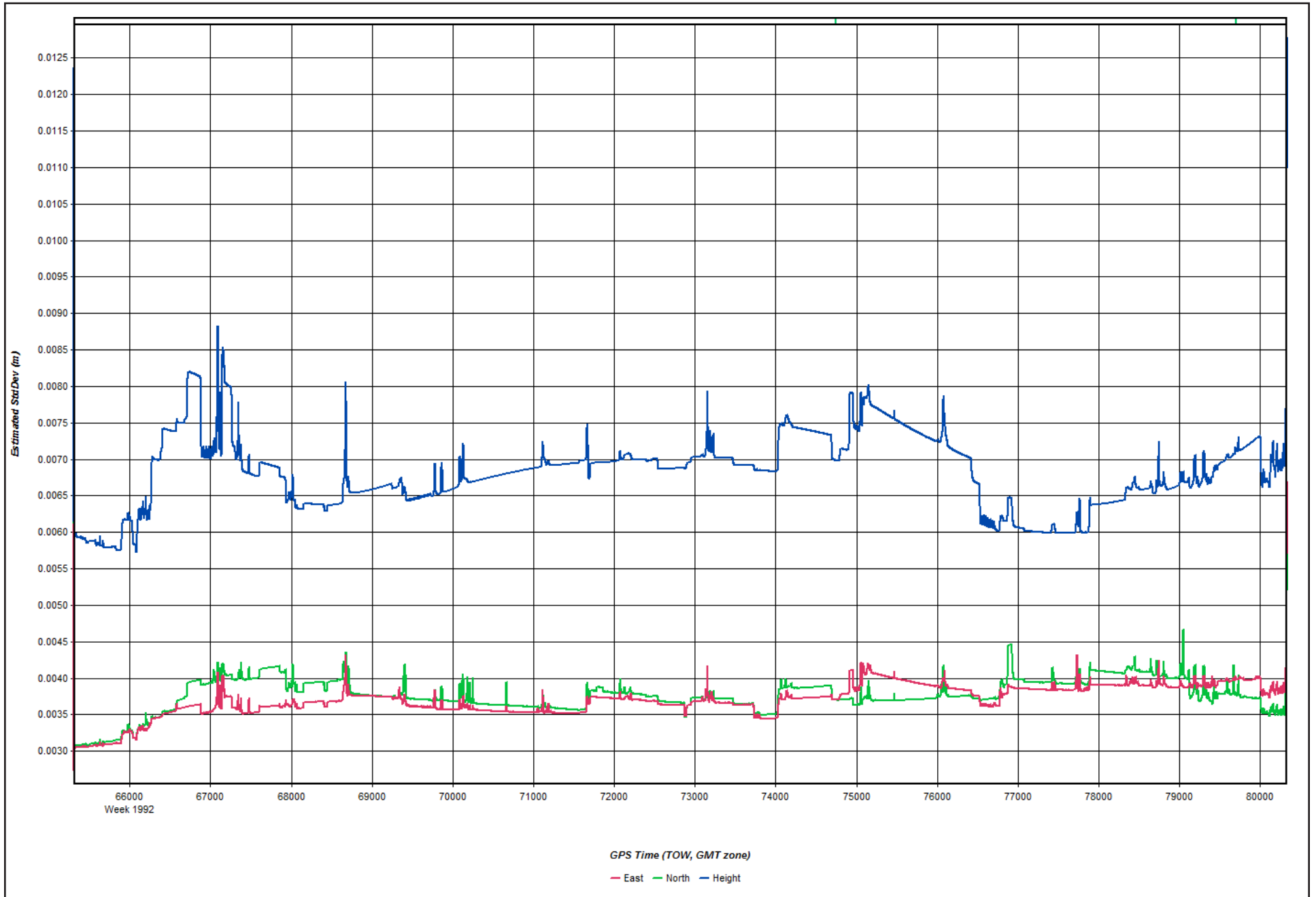
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Figure 4: Forward/Reverse Separation Plot (Fixed)



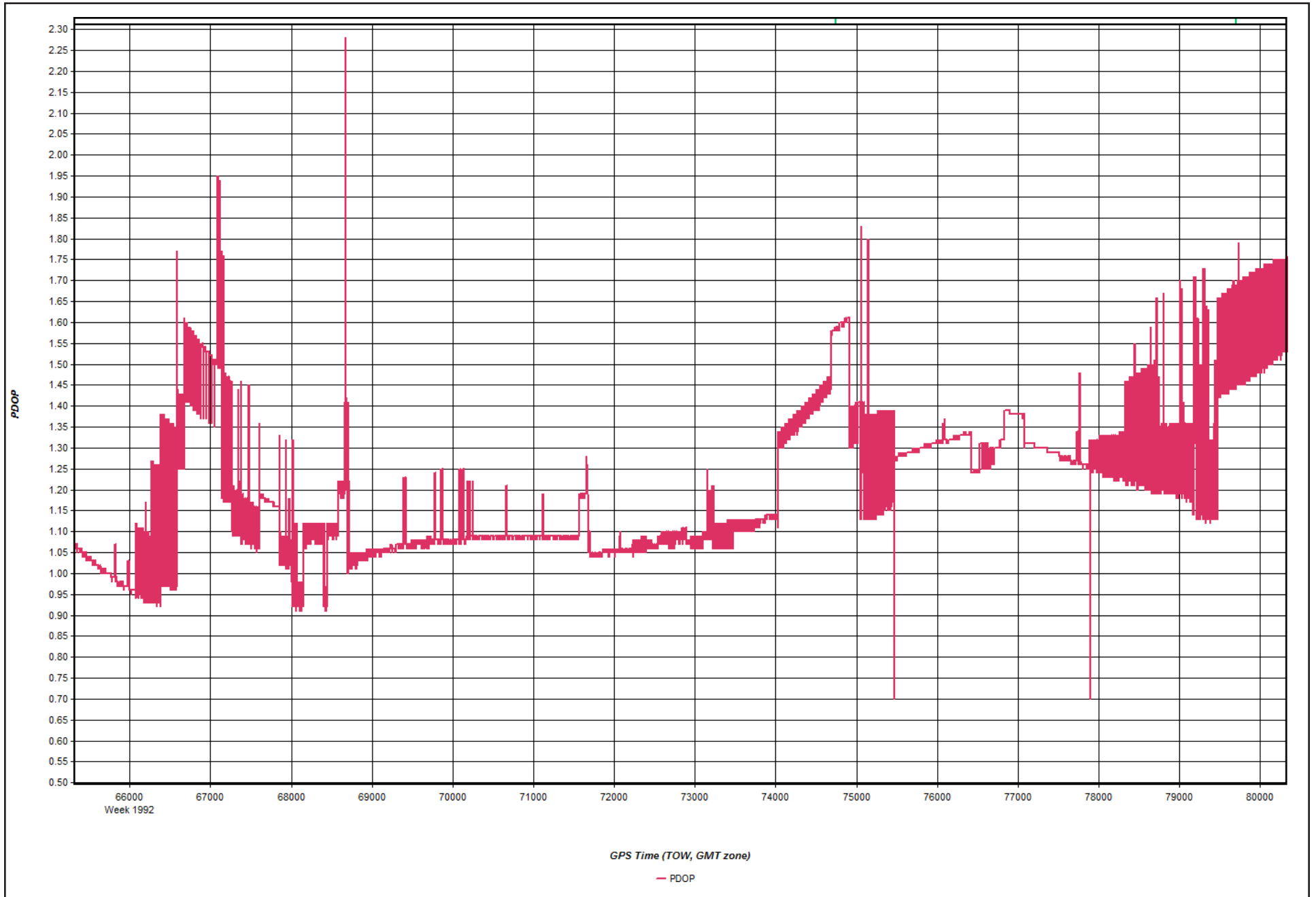
2018-03-11_Day070_7 - 20180311180726

Figure 5: Estimated Position Accuracy Plot



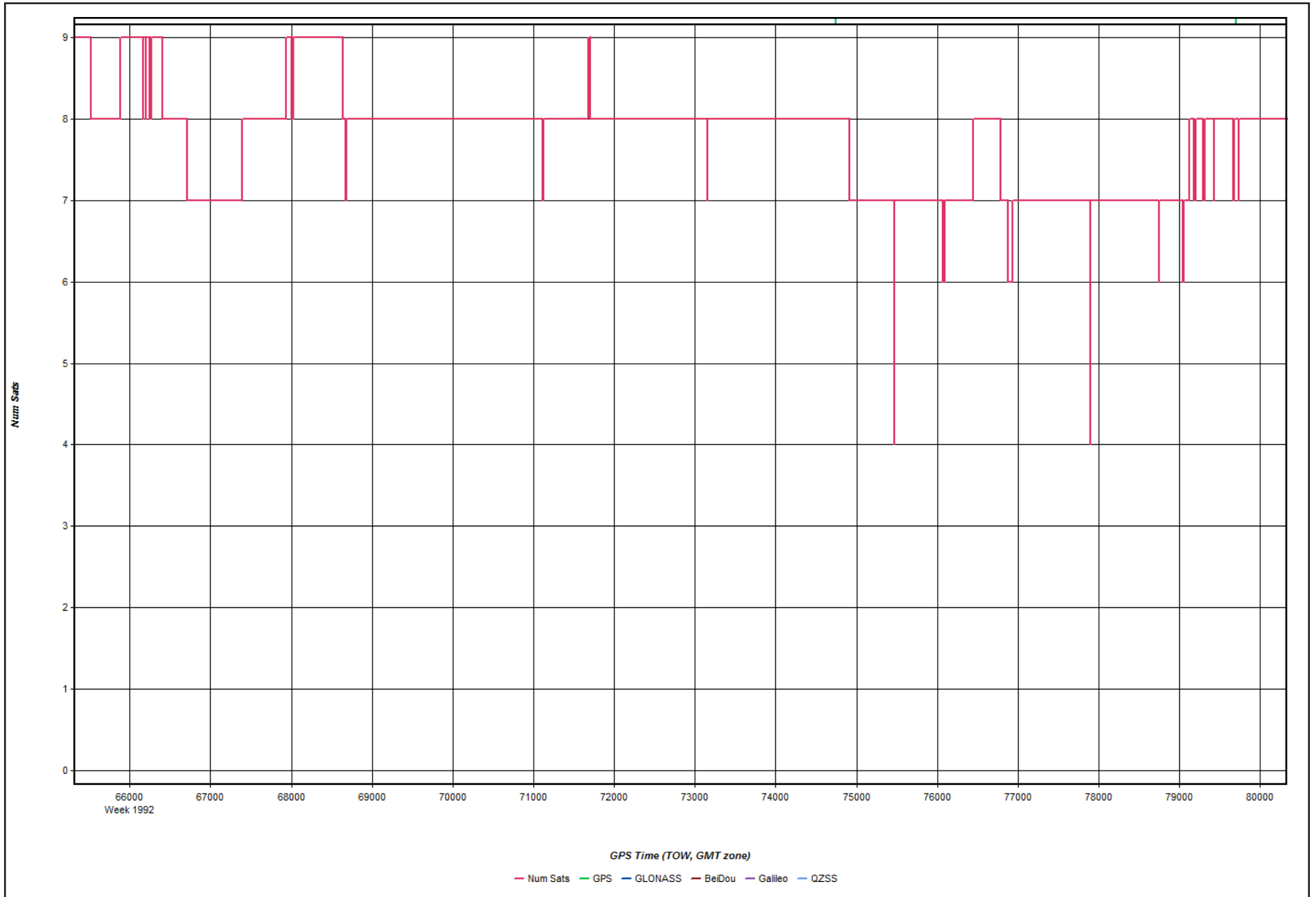
2018-03-11_Day070_7 - 20180311180726

Figure 6: PDOP Plot



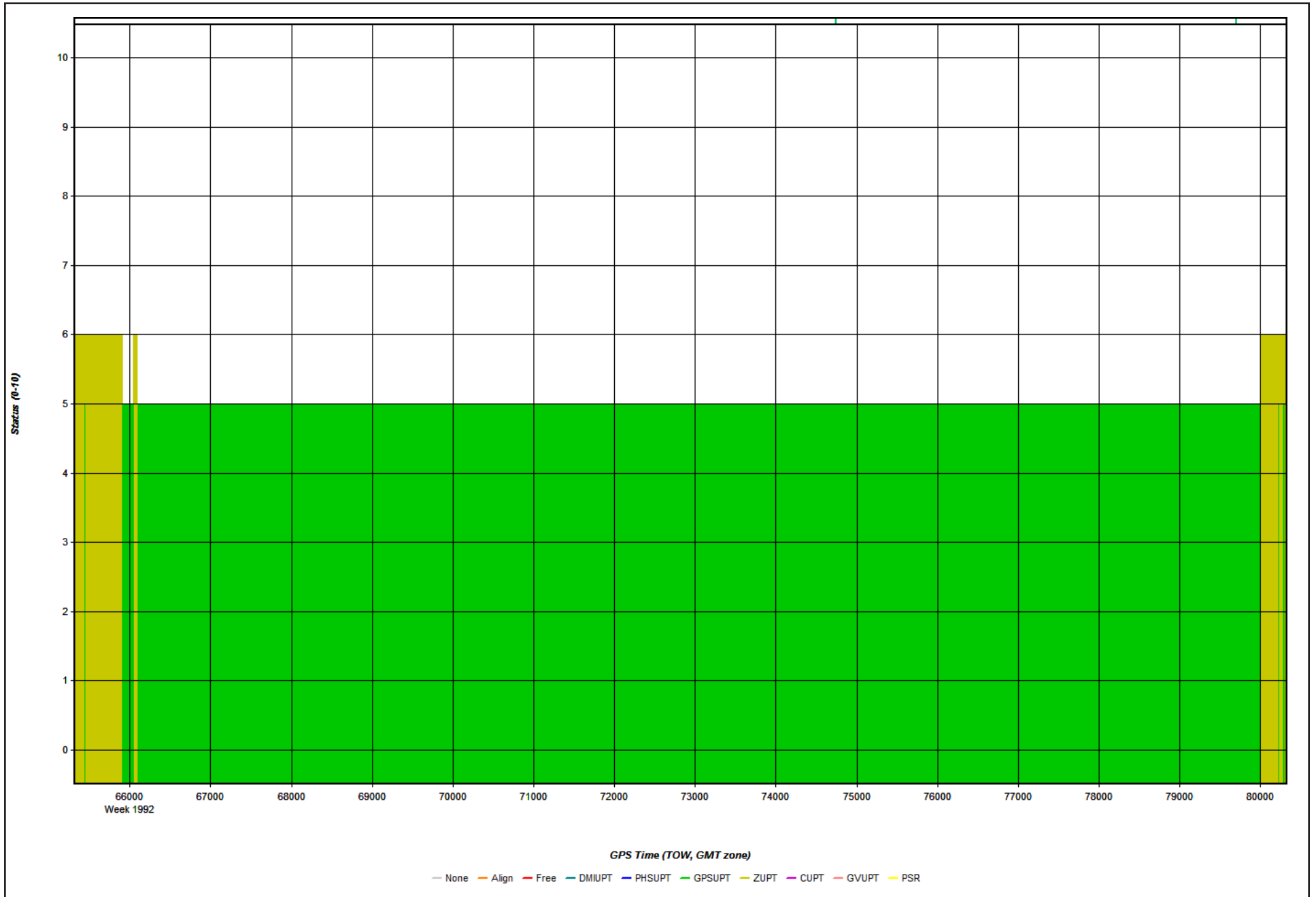
2018-03-11_Day070_7 - 20180311180726

Figure 7: Number of Satellites Line Plot



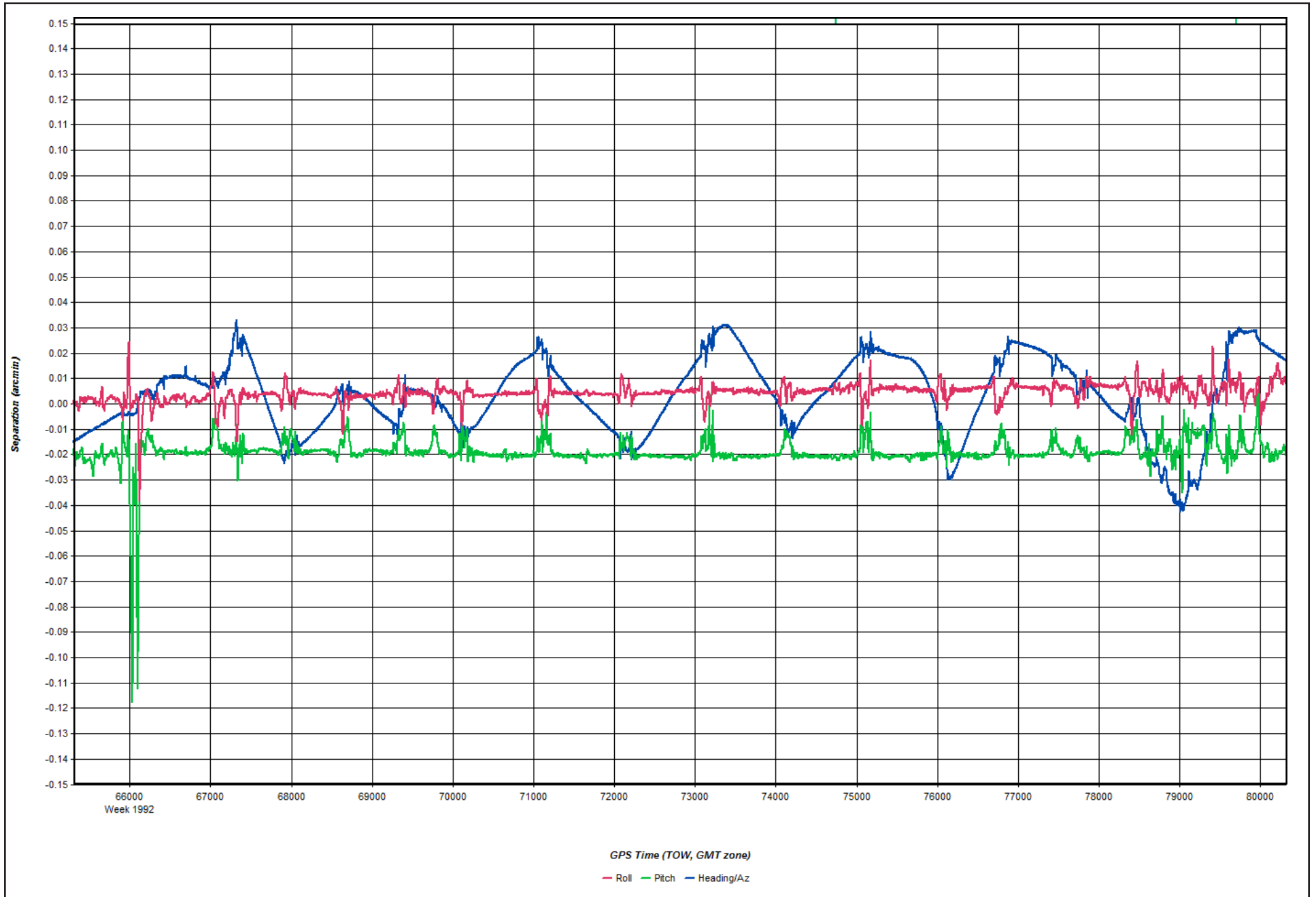
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Figure 8: Status flag for IMU processing



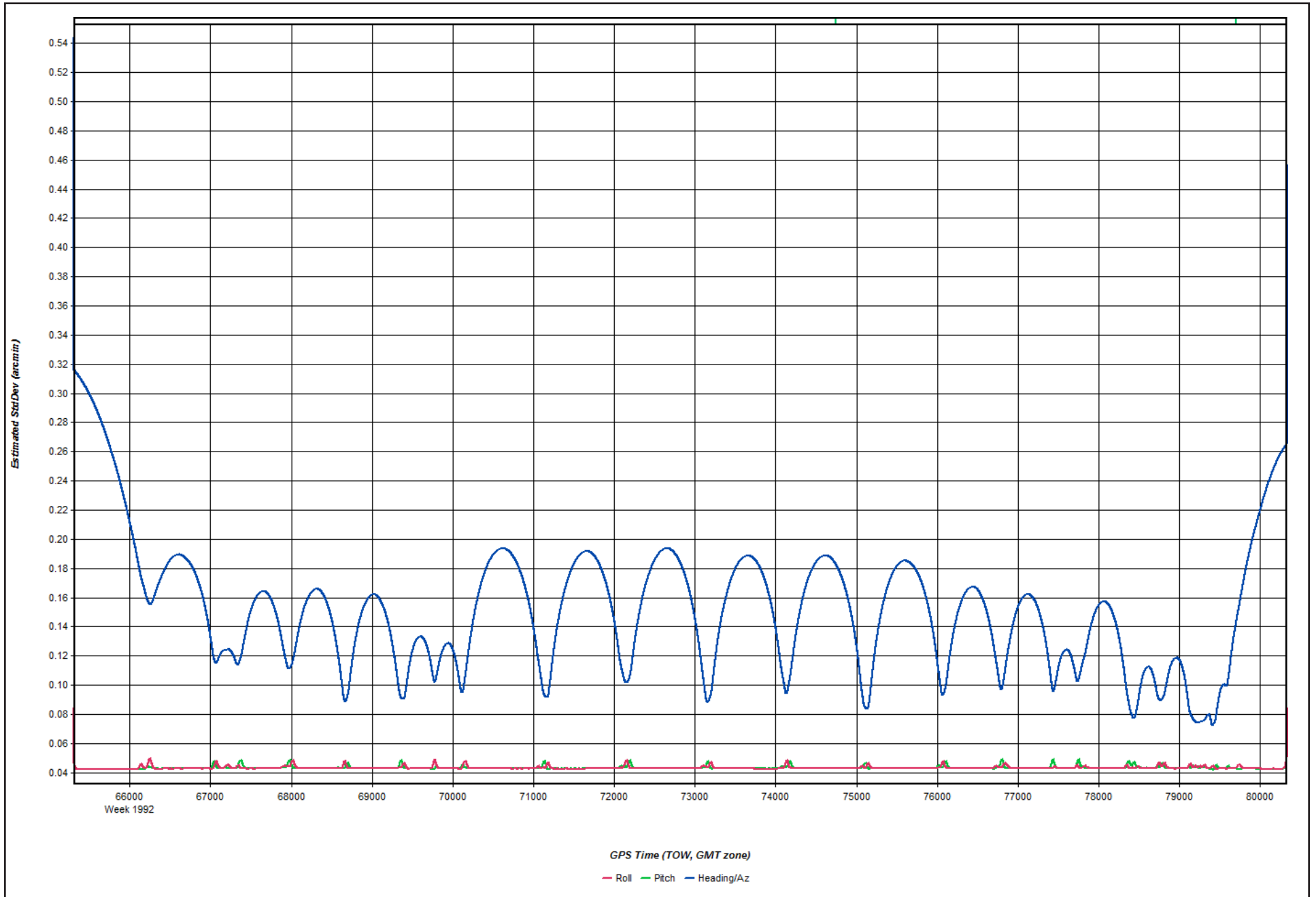
2018-03-11_Day070_7 - 20180311180726

Figure 9: Fwd/Rev Attitude Separation Plot



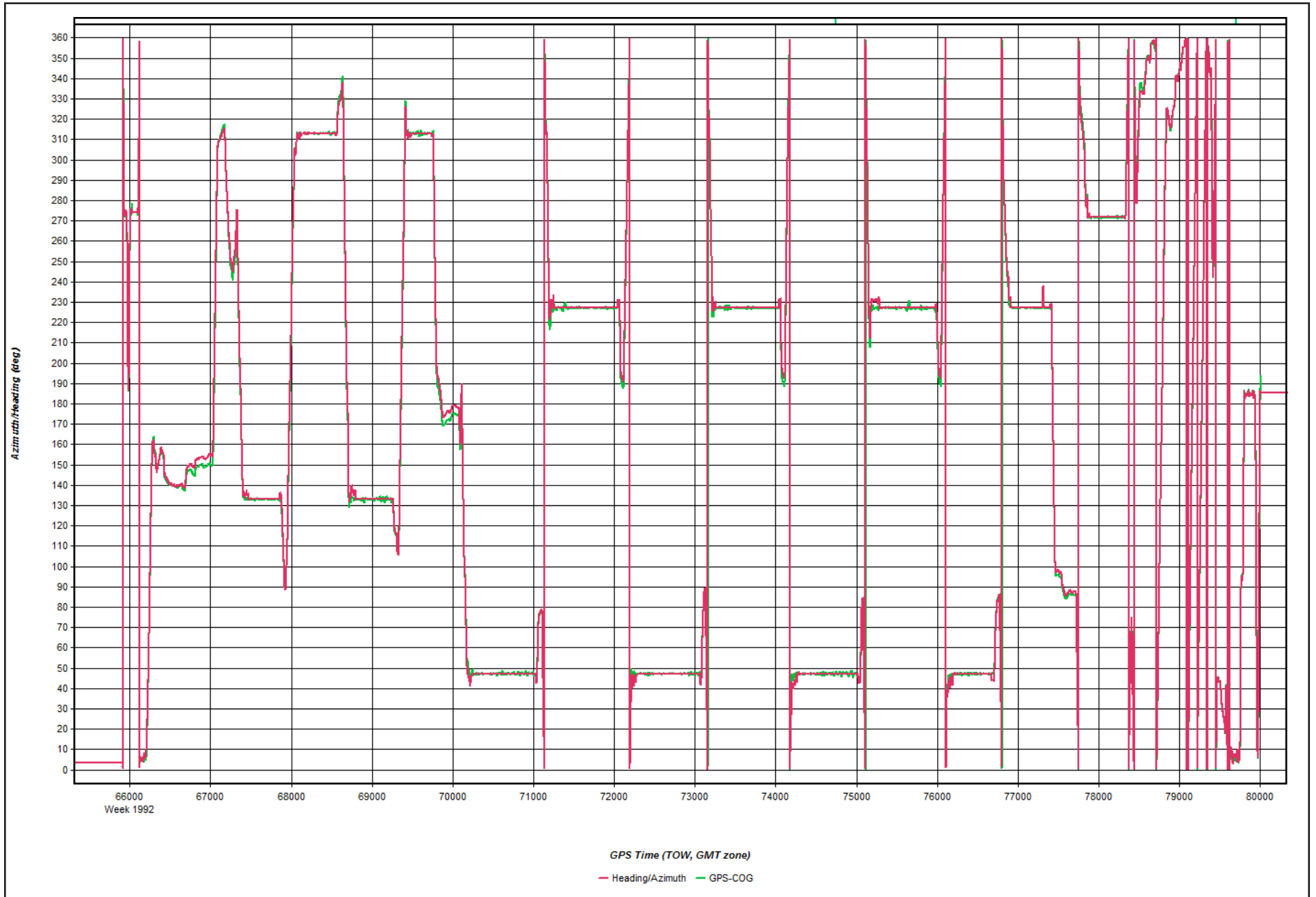
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Figure 10: Estimated Attitude Accuracy Plot



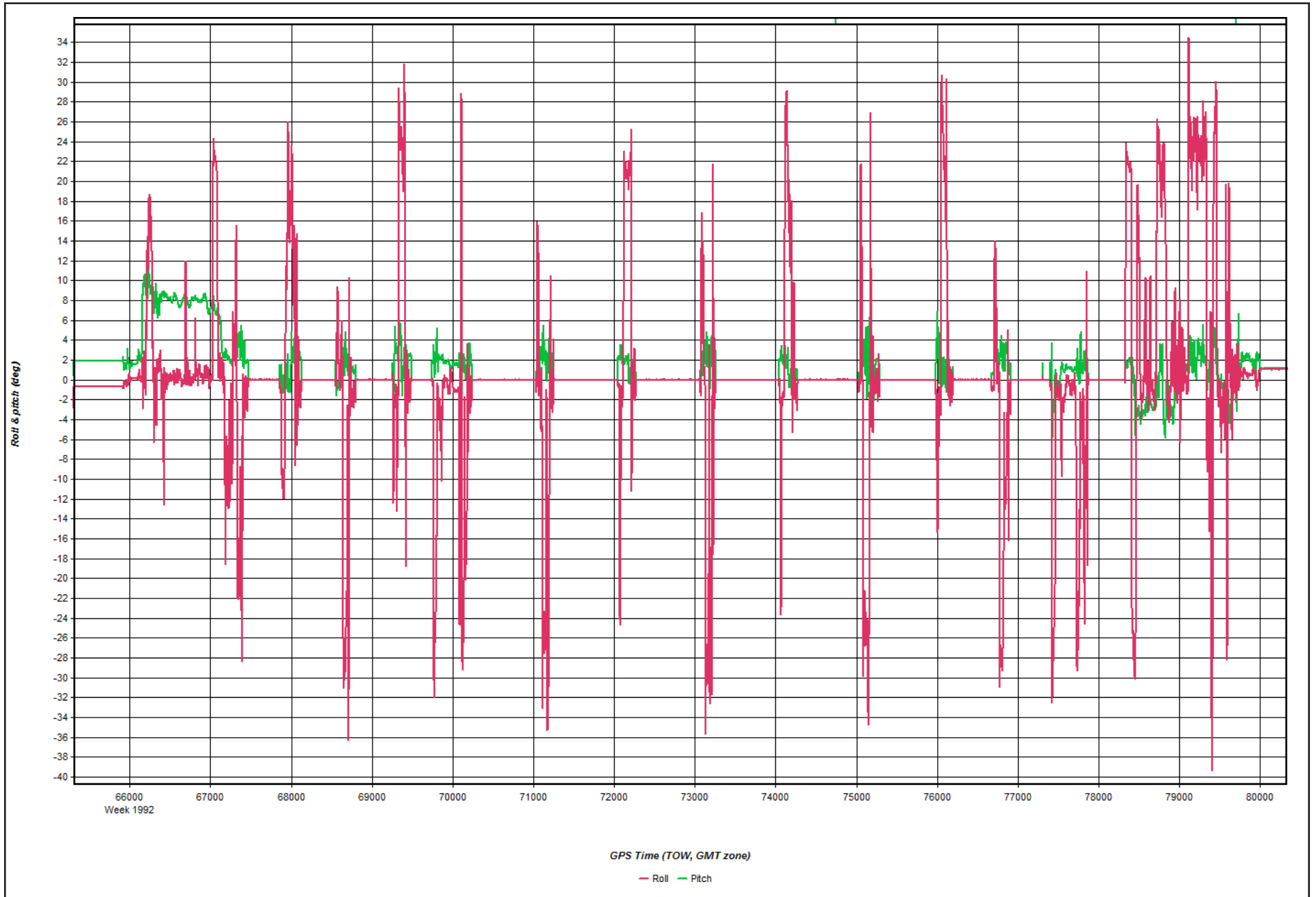
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Figure 11: Azimuth Plot



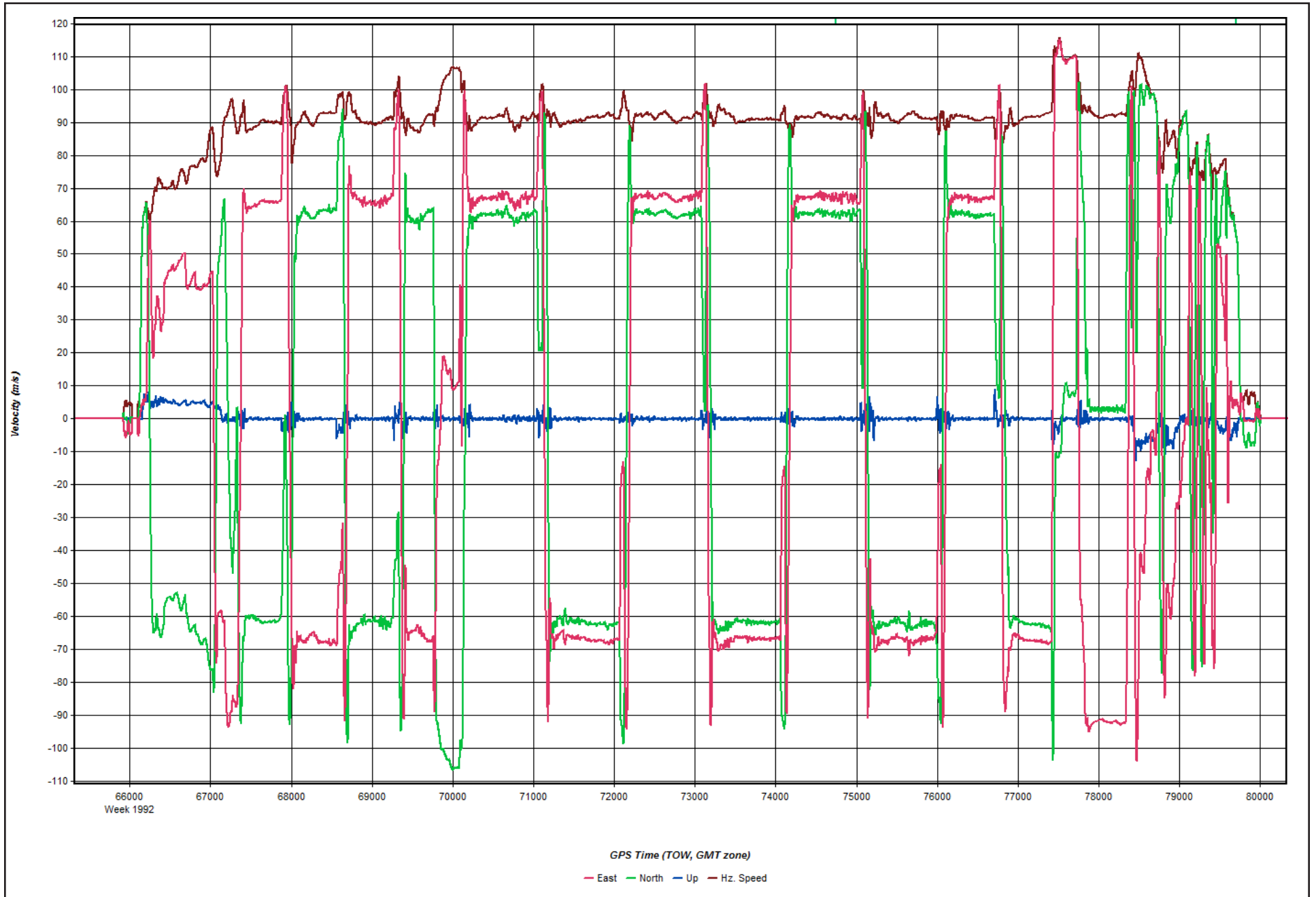
2018-03-11_Day070_7 - 20180311180726

Figure 12: Roll & Pitch Plot



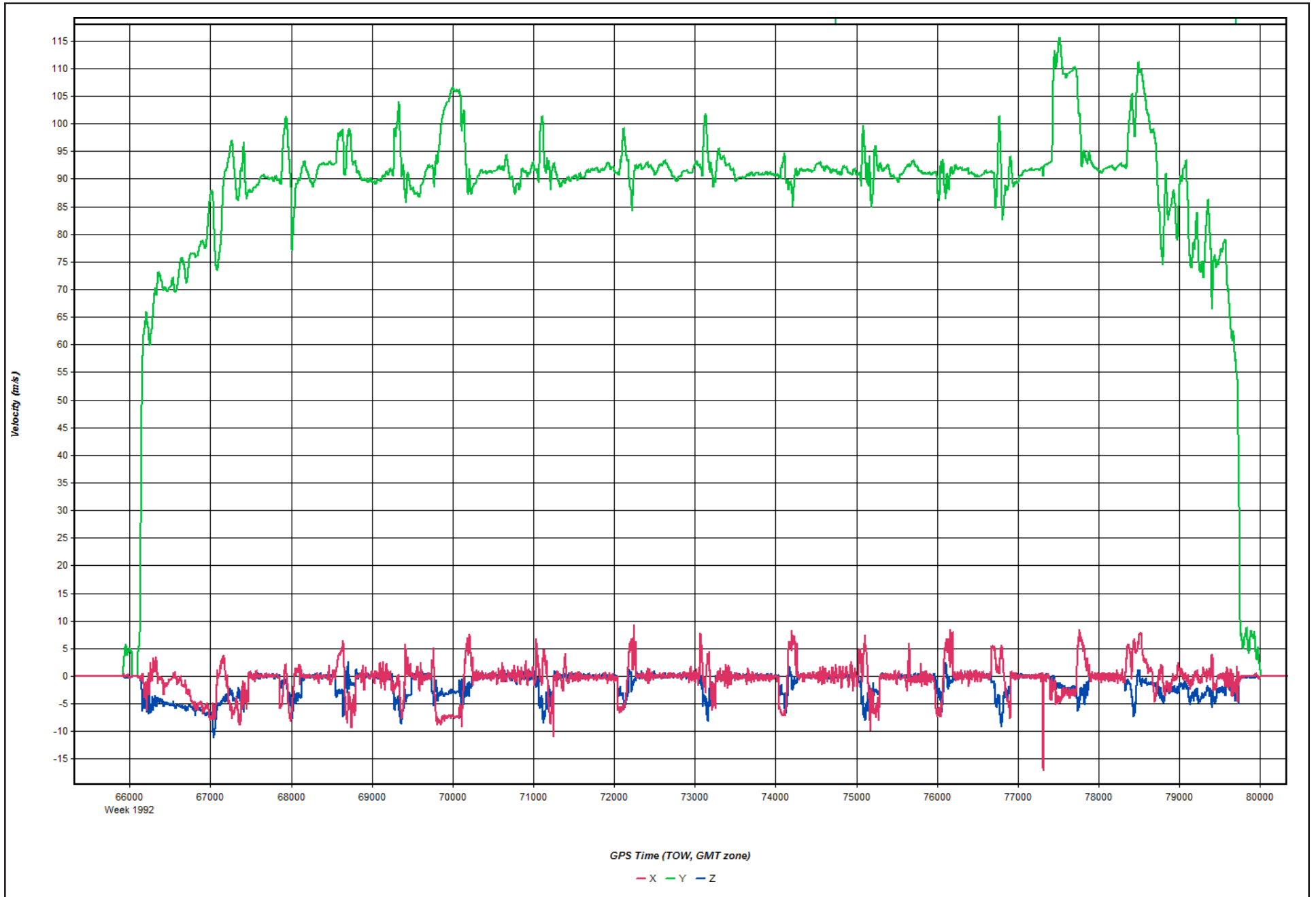
2018-03-11_Day070_7 - 20180311180726

Figure 13: Velocity Profile Plot



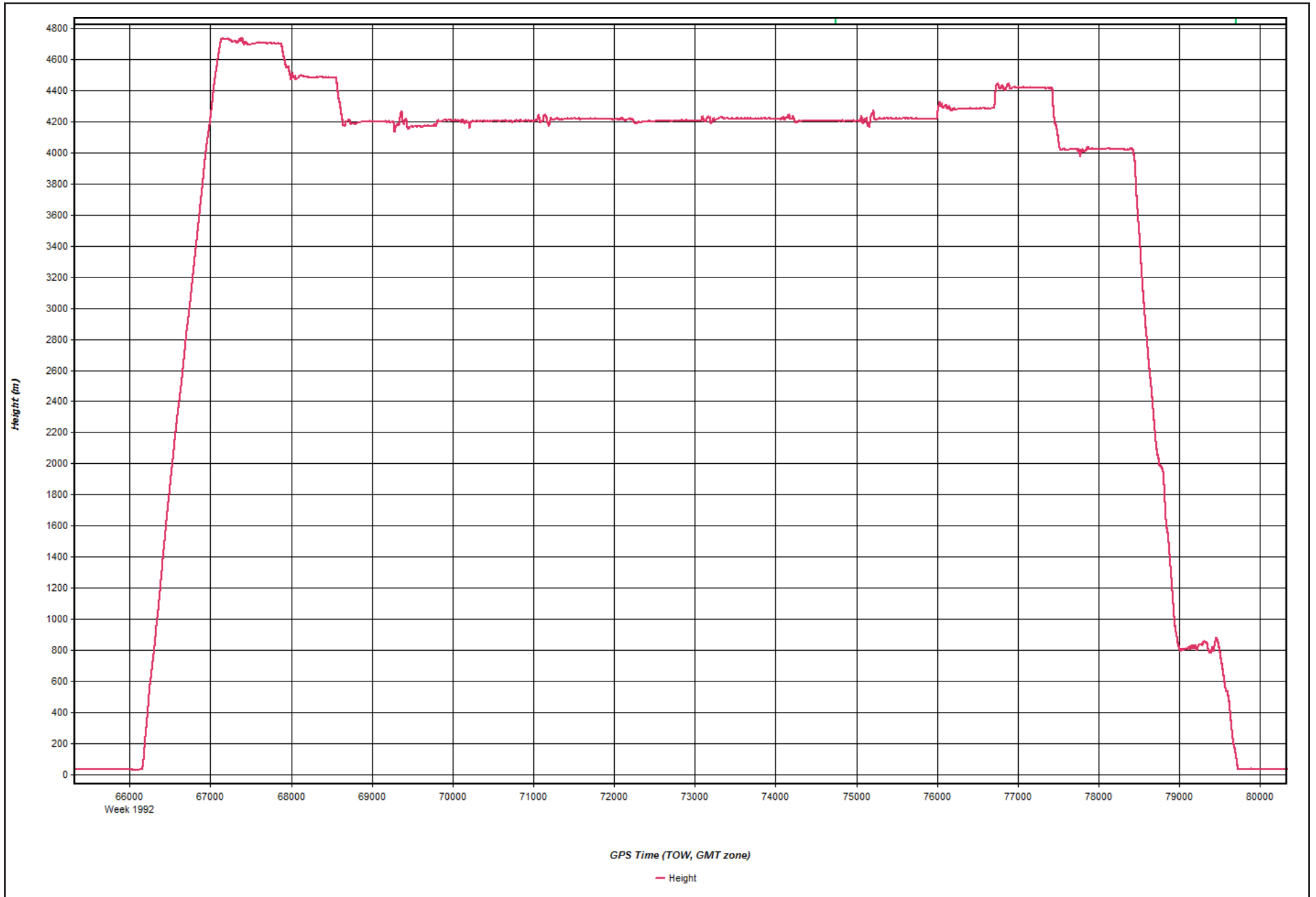
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Figure 14: Body Frame Velocity Plot



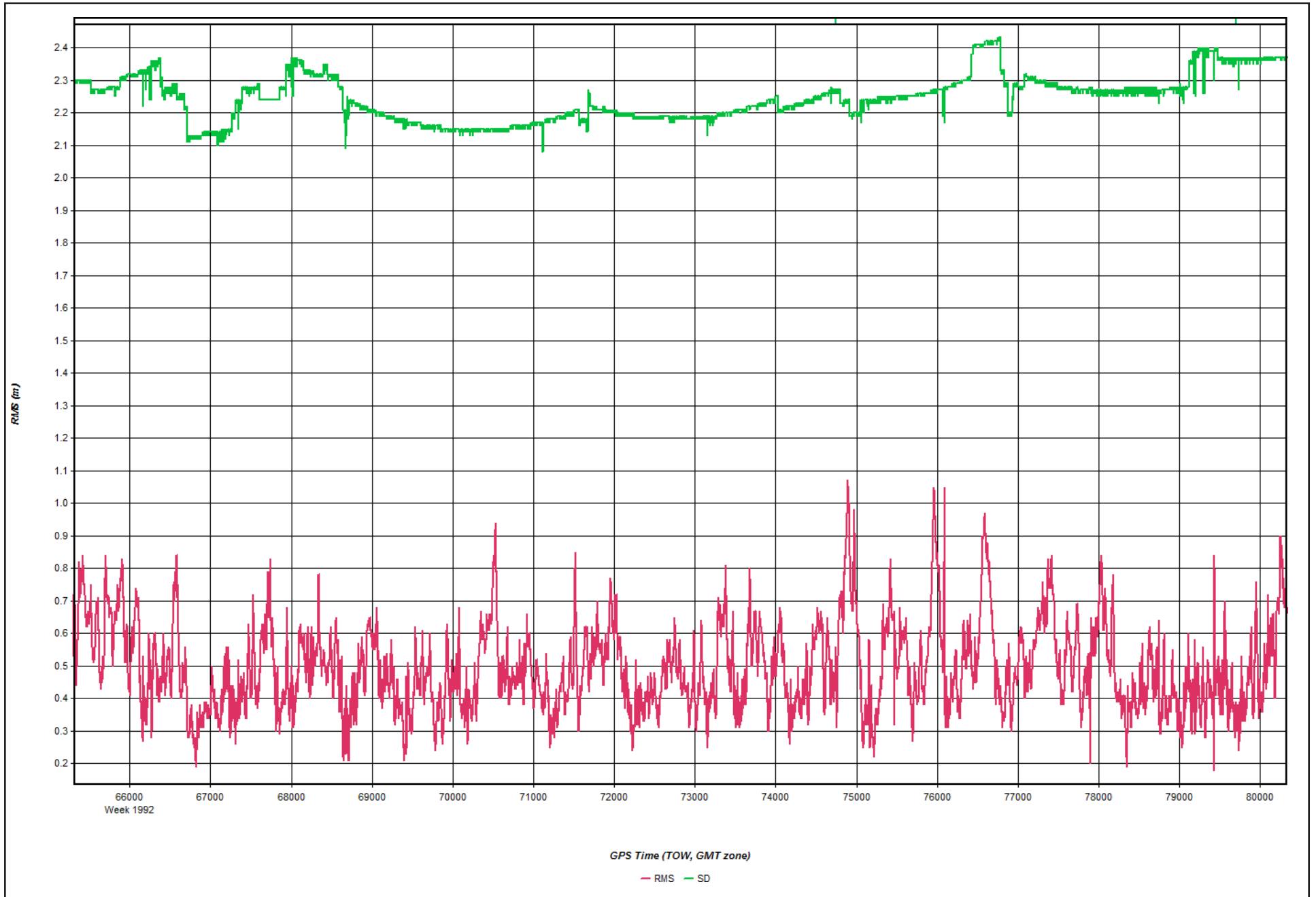
2018-03-11_Day070_7 - 20180311180726

Figure 15: Height Profile Plot



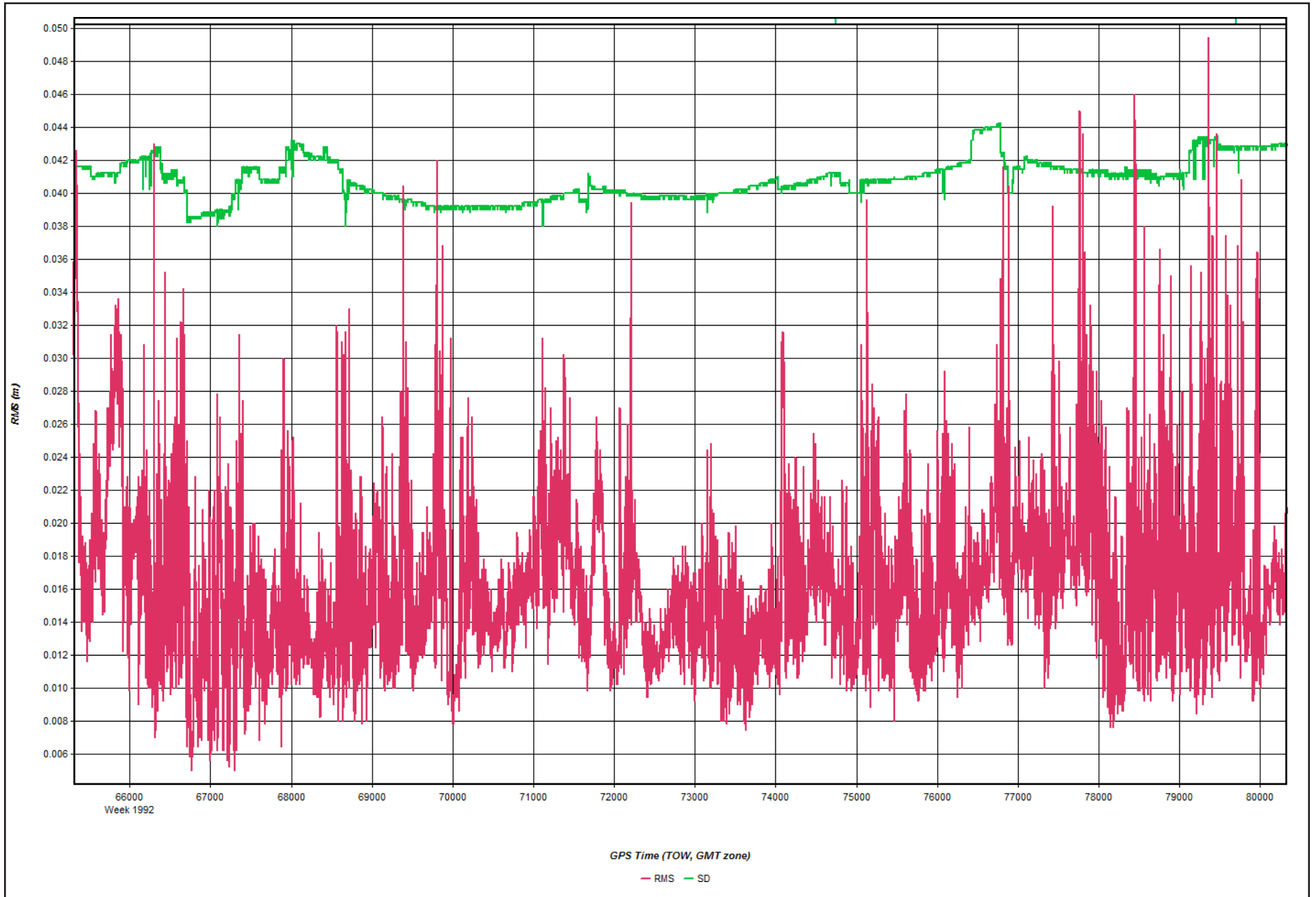
2018-03-11_Day070_7 - 20180311180726

Figure 16: C/A Code Residual RMS Plot



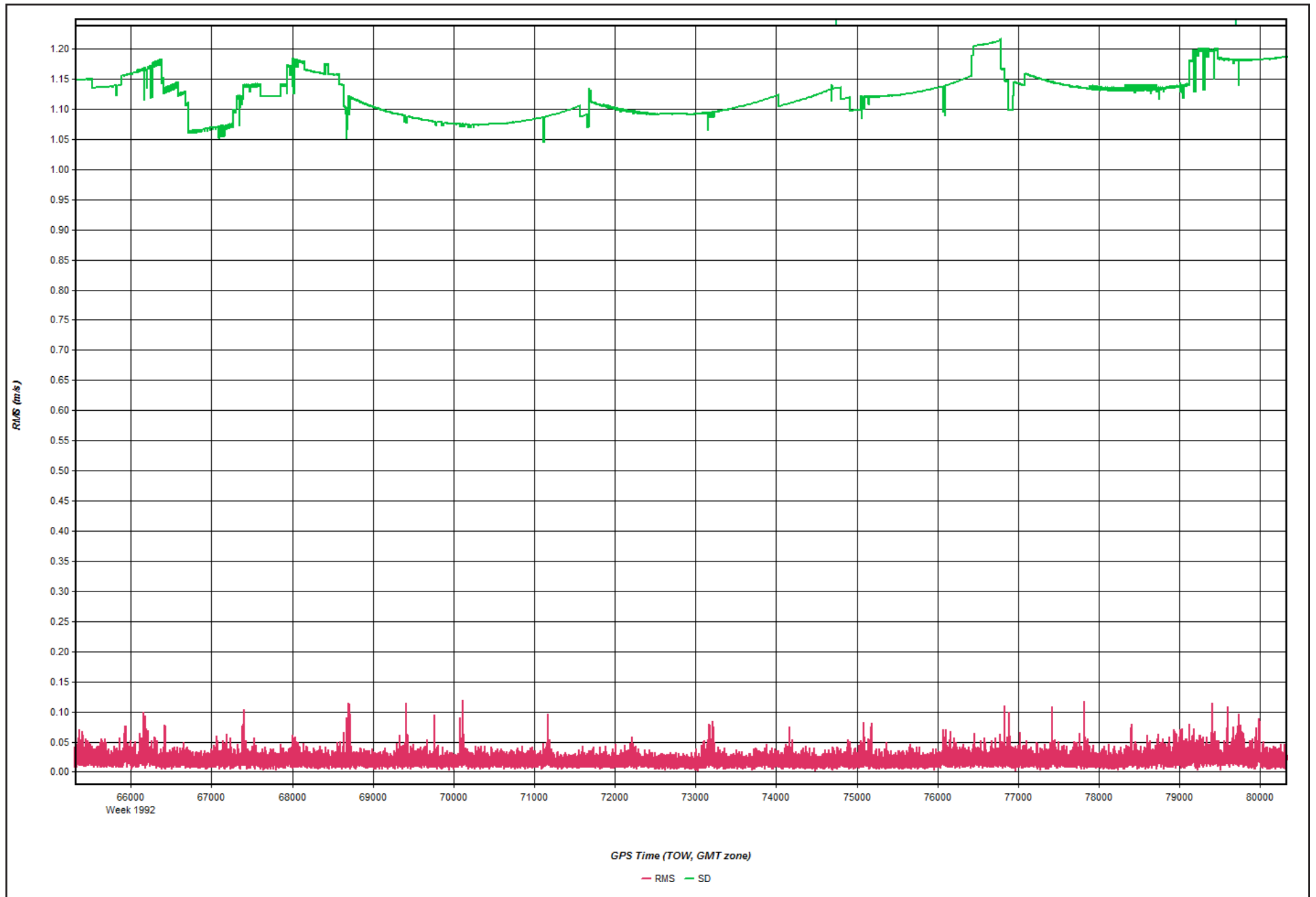
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Figure 17: Carrier Residual RMS Plot



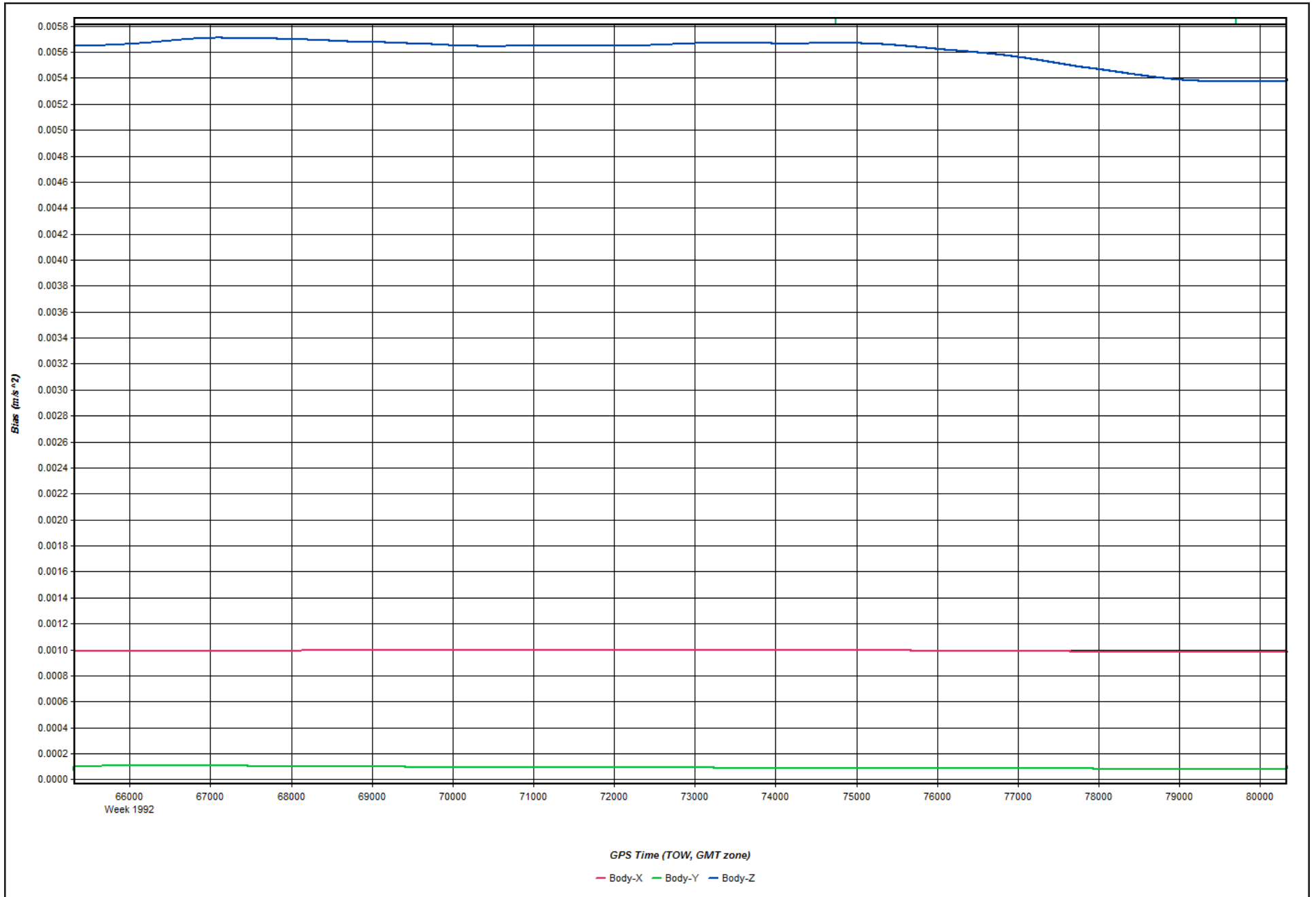
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Figure 18: L1 Doppler Residual RMS Plot



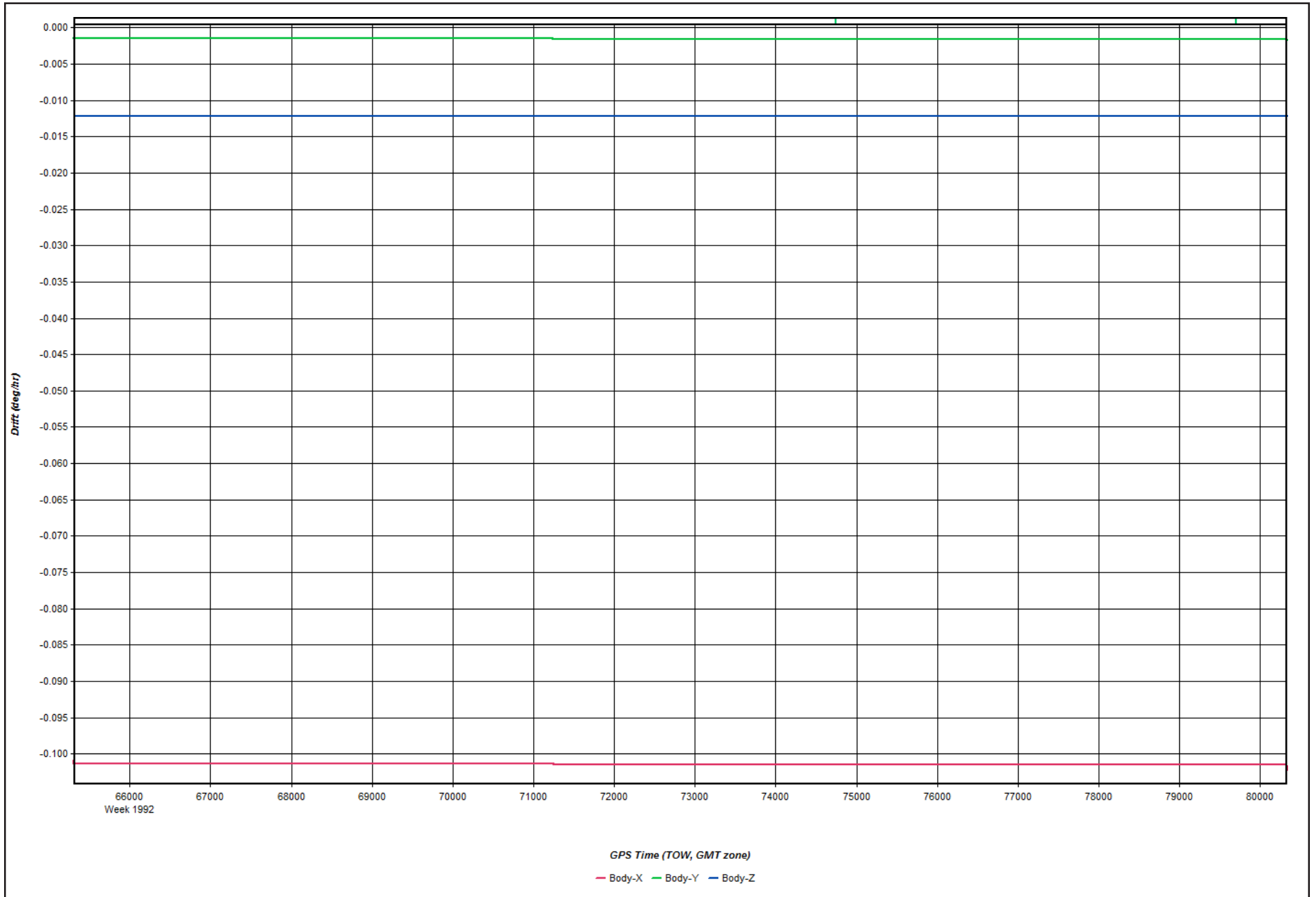
2018-03-11_Day070_7 - 20180311180726

Figure 19: Accelerometer Bias Plot



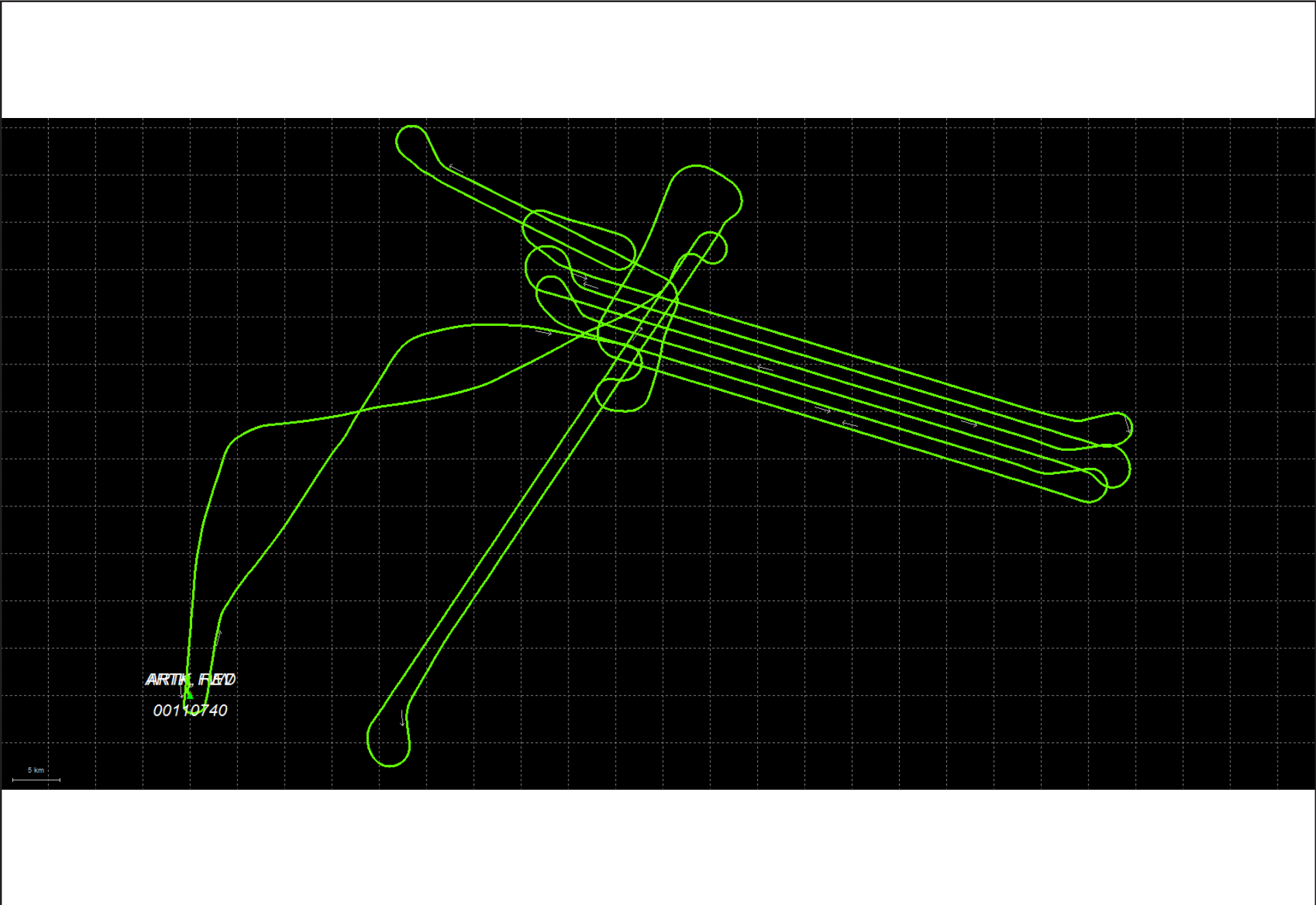
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Figure 20: Gyro Drift Plot



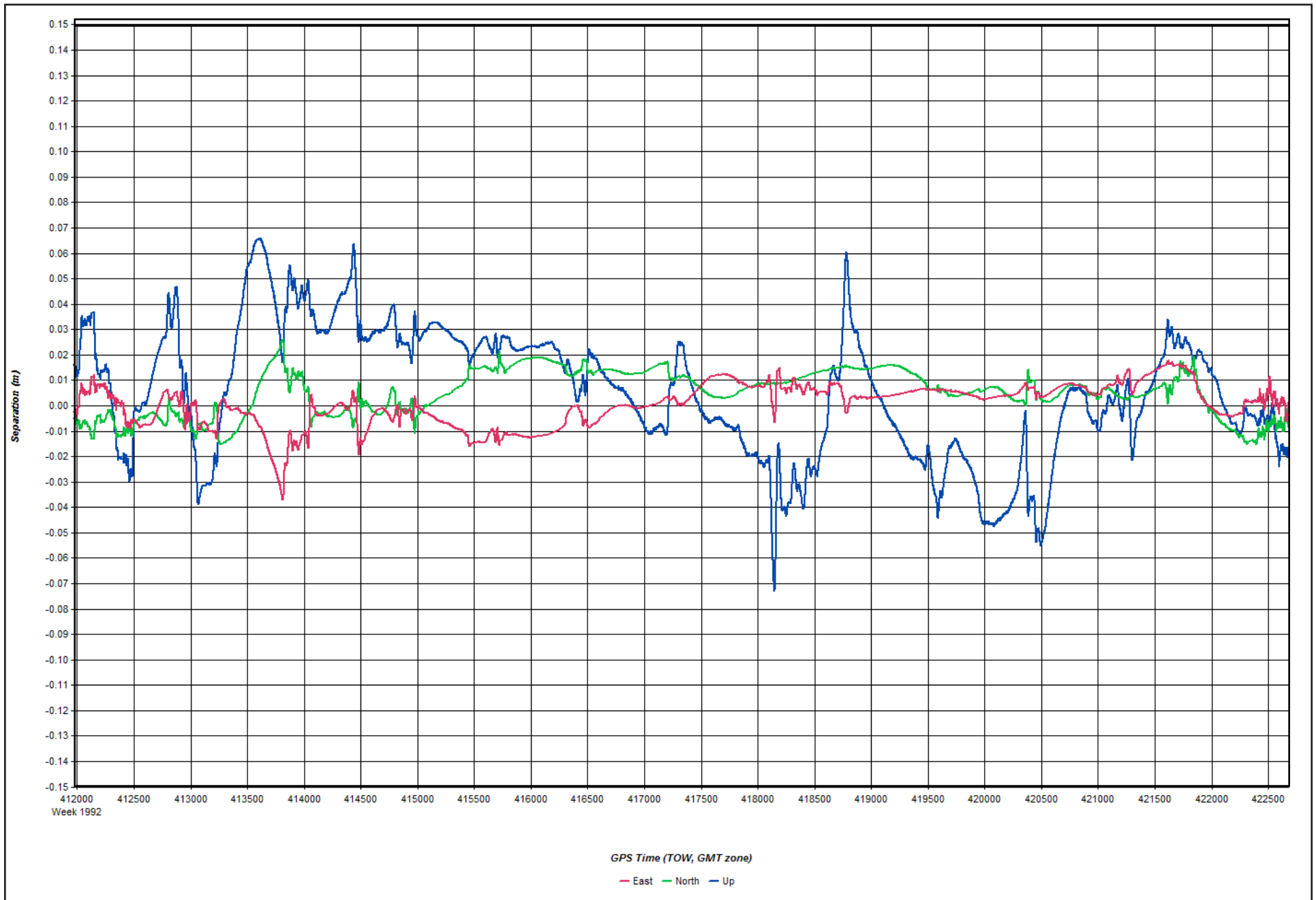
2018-03-15_Day074_7 - 20180315182513

Figure 1: Map



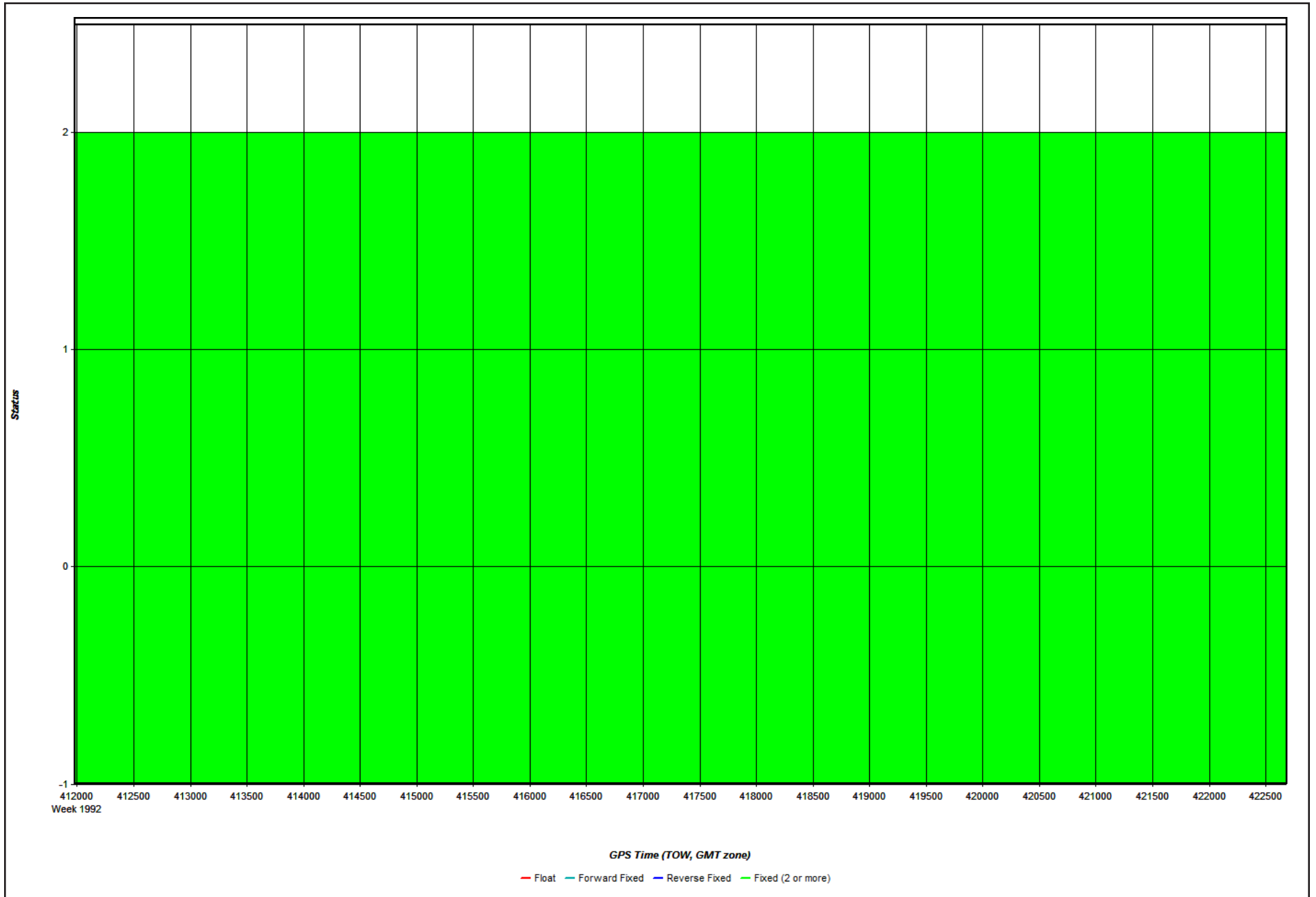
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Figure 2: Forward/Reverse or Combined Separation Plot



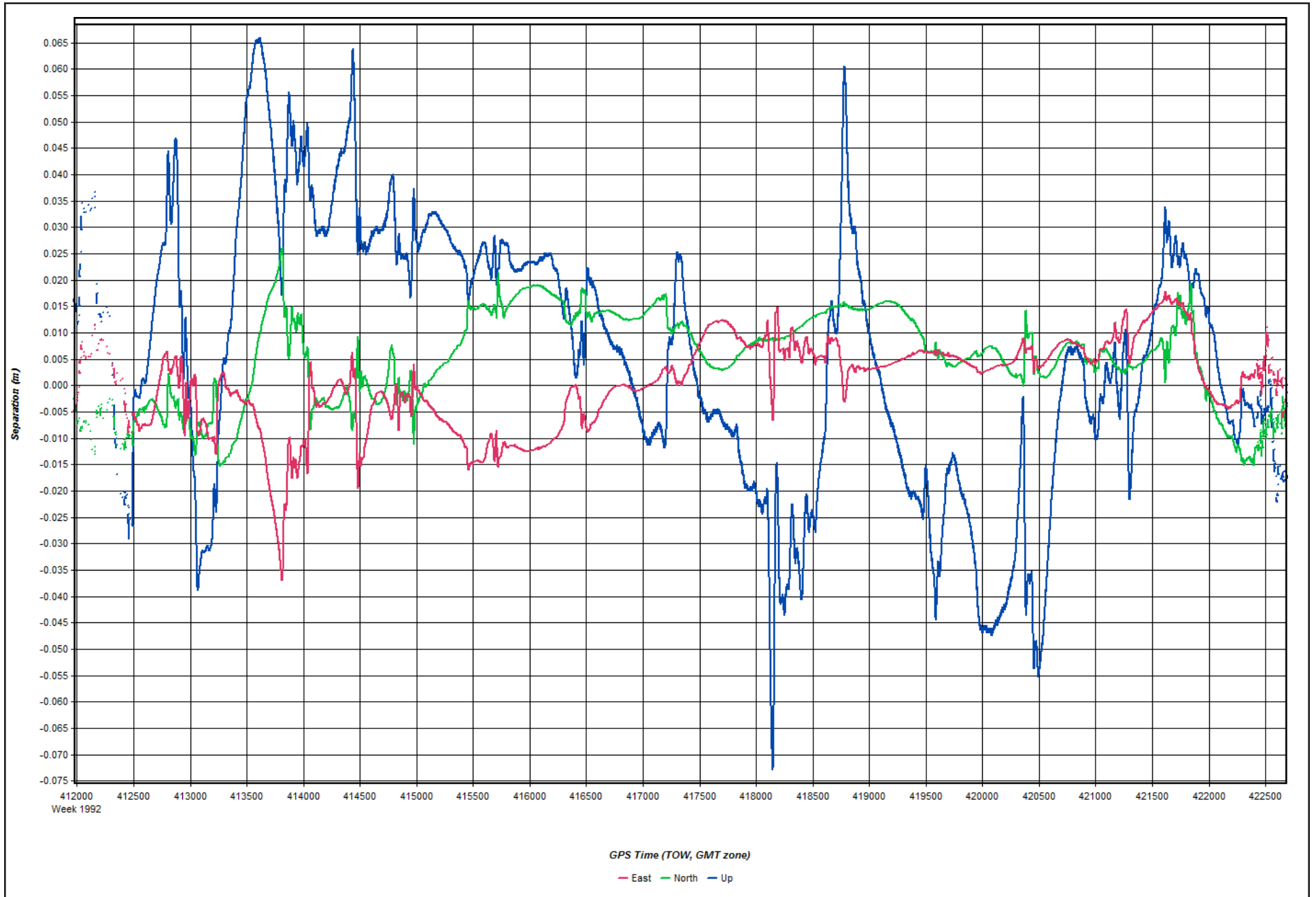
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Figure 3: Float or Fixed Ambiguity



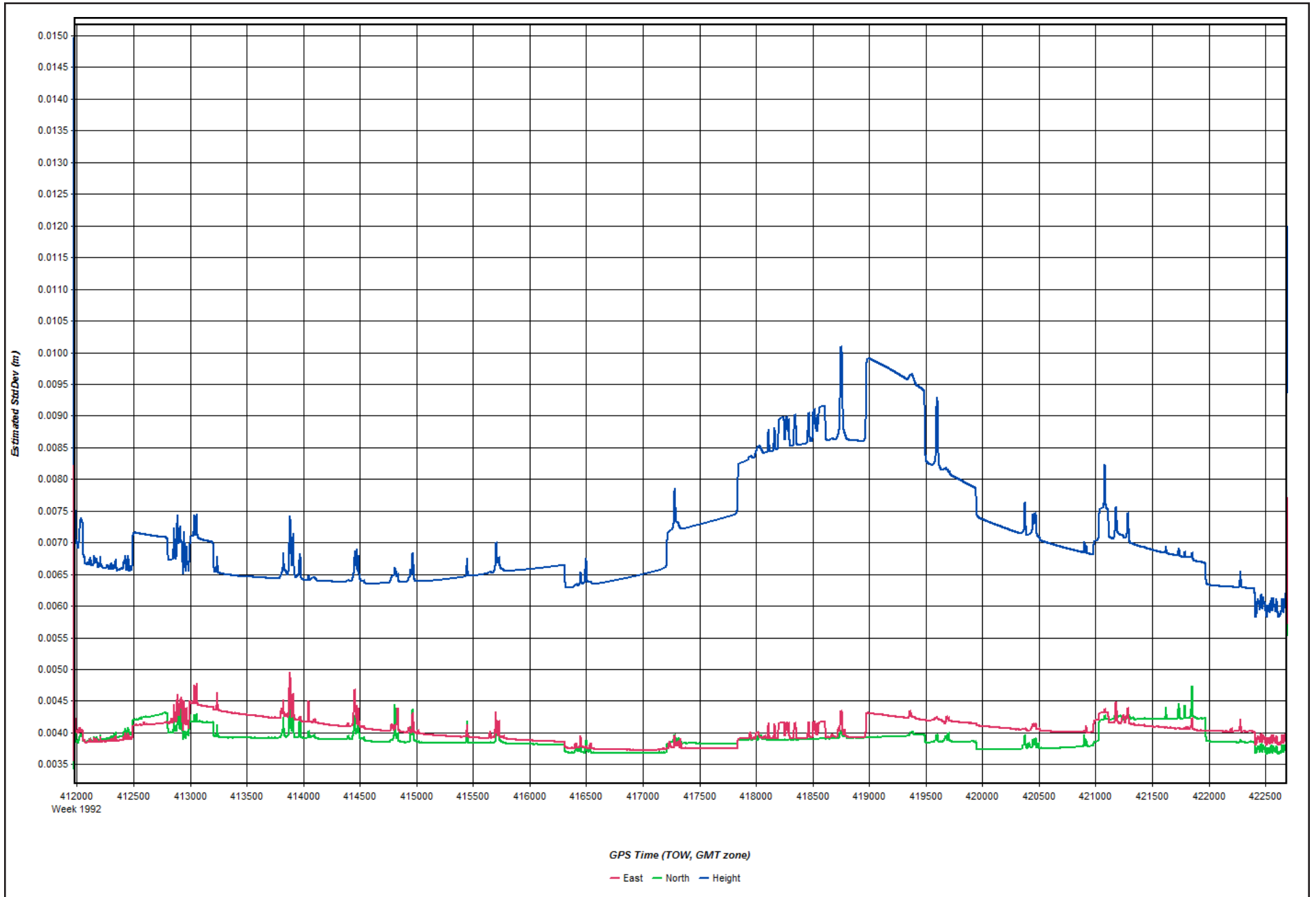
2018-03-15_Day074_7 - 20180315182513

Figure 4: Forward/Reverse Separation Plot (Fixed)



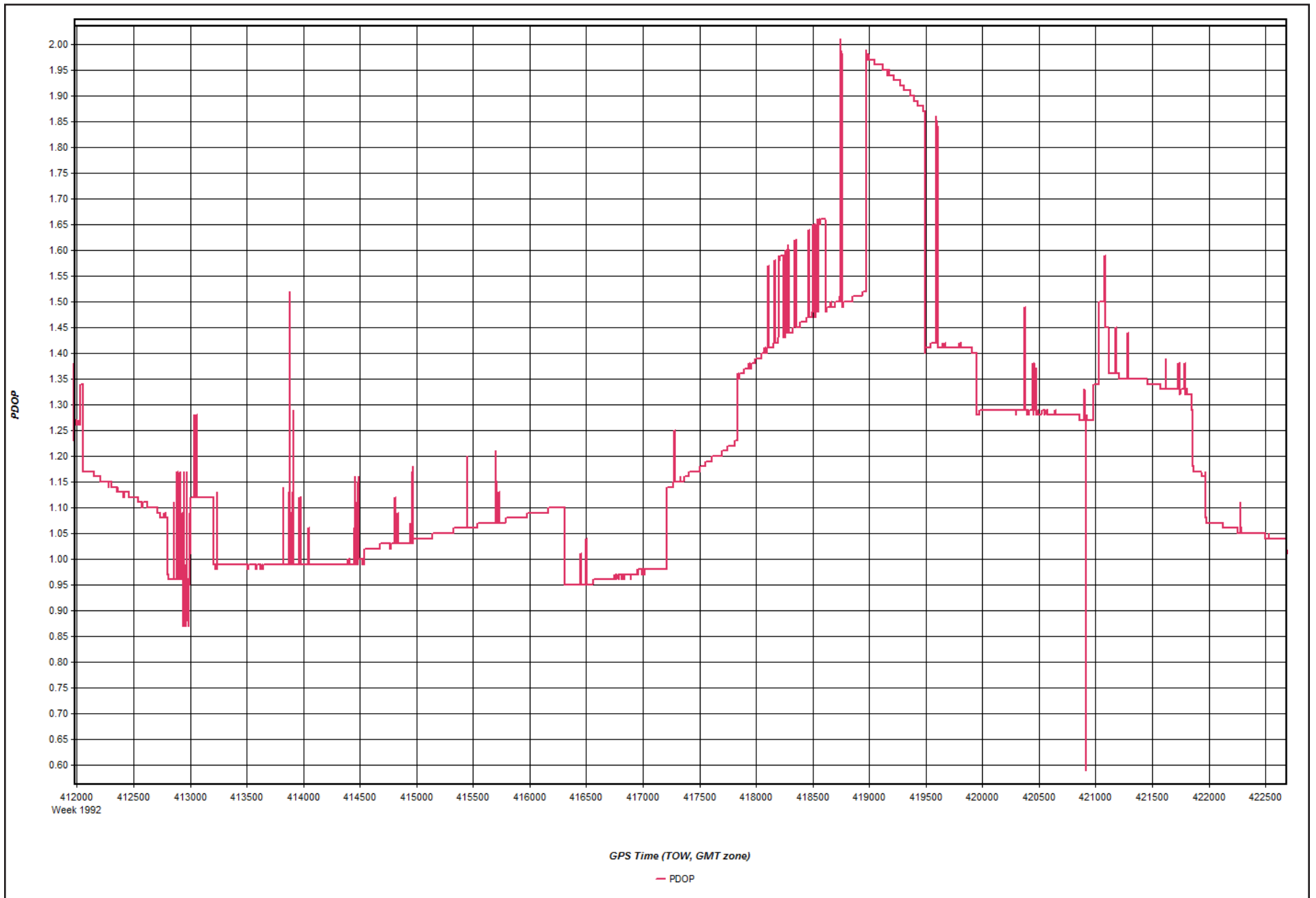
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Figure 5: Estimated Position Accuracy Plot



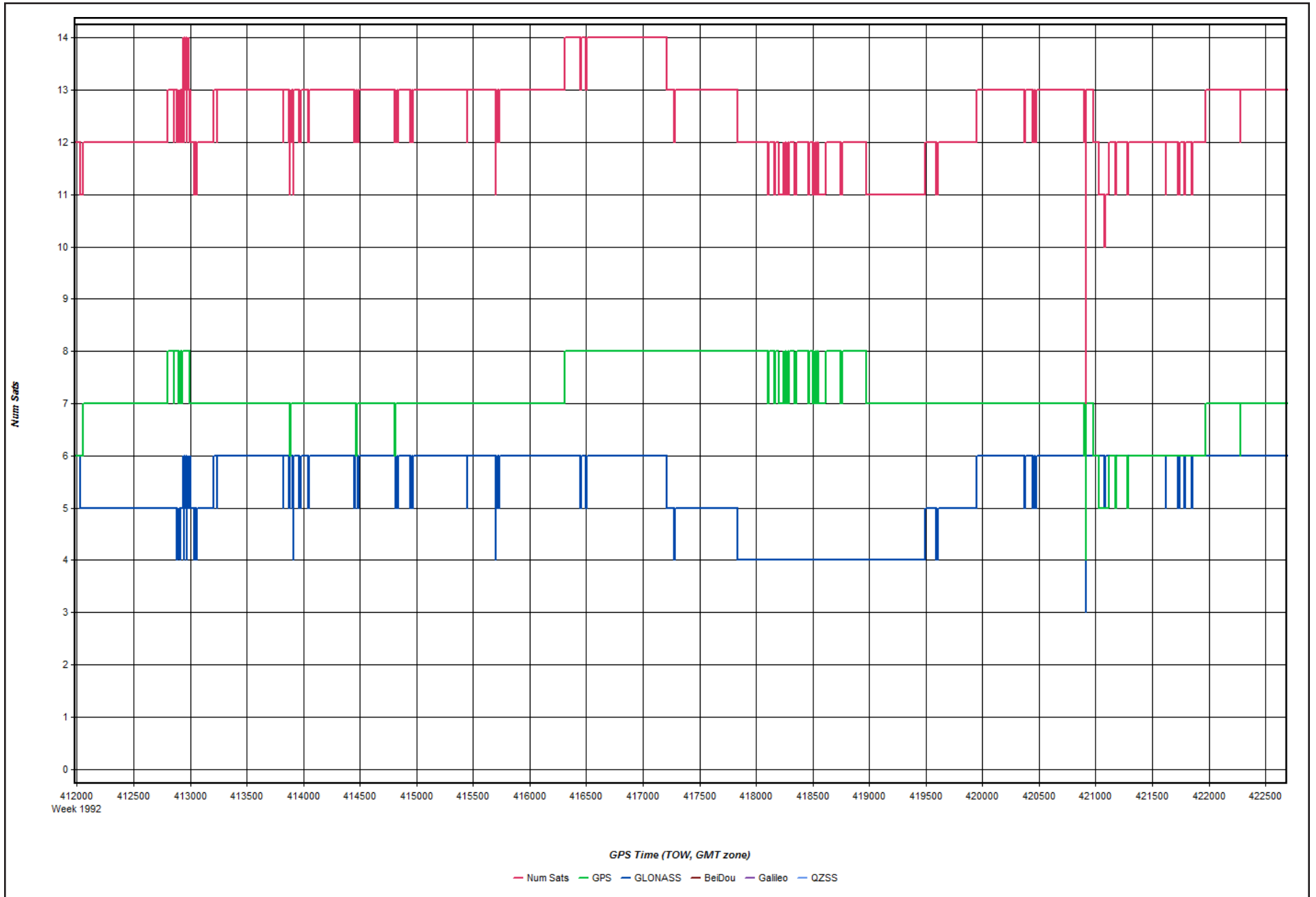
2018-03-15_Day074_7 - 20180315182513

Figure 6: PDOP Plot



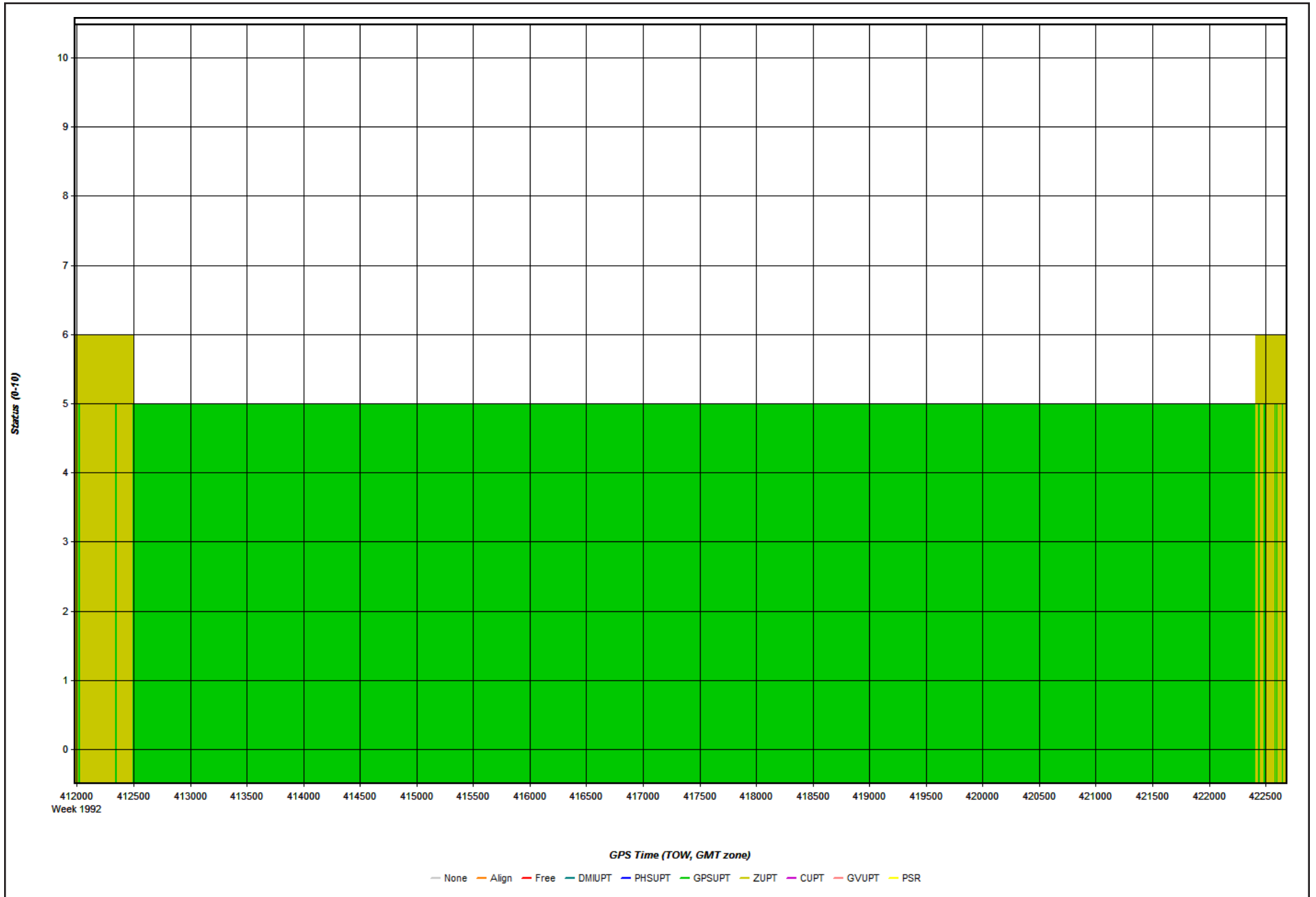
2018-03-15_Day074_7 - 20180315182513

Figure 7: Number of Satellites Line Plot



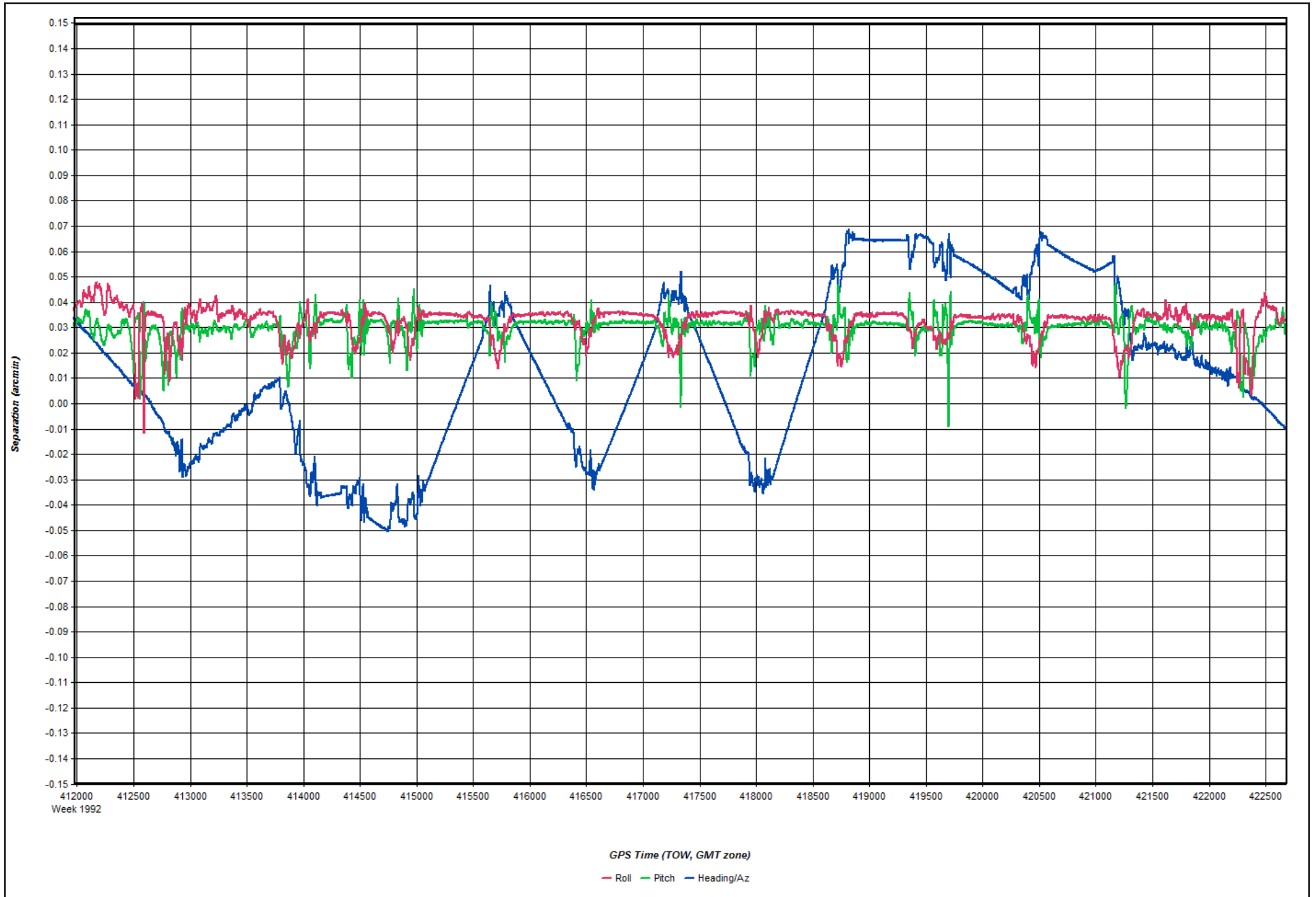
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Figure 8: Status flag for IMU processing



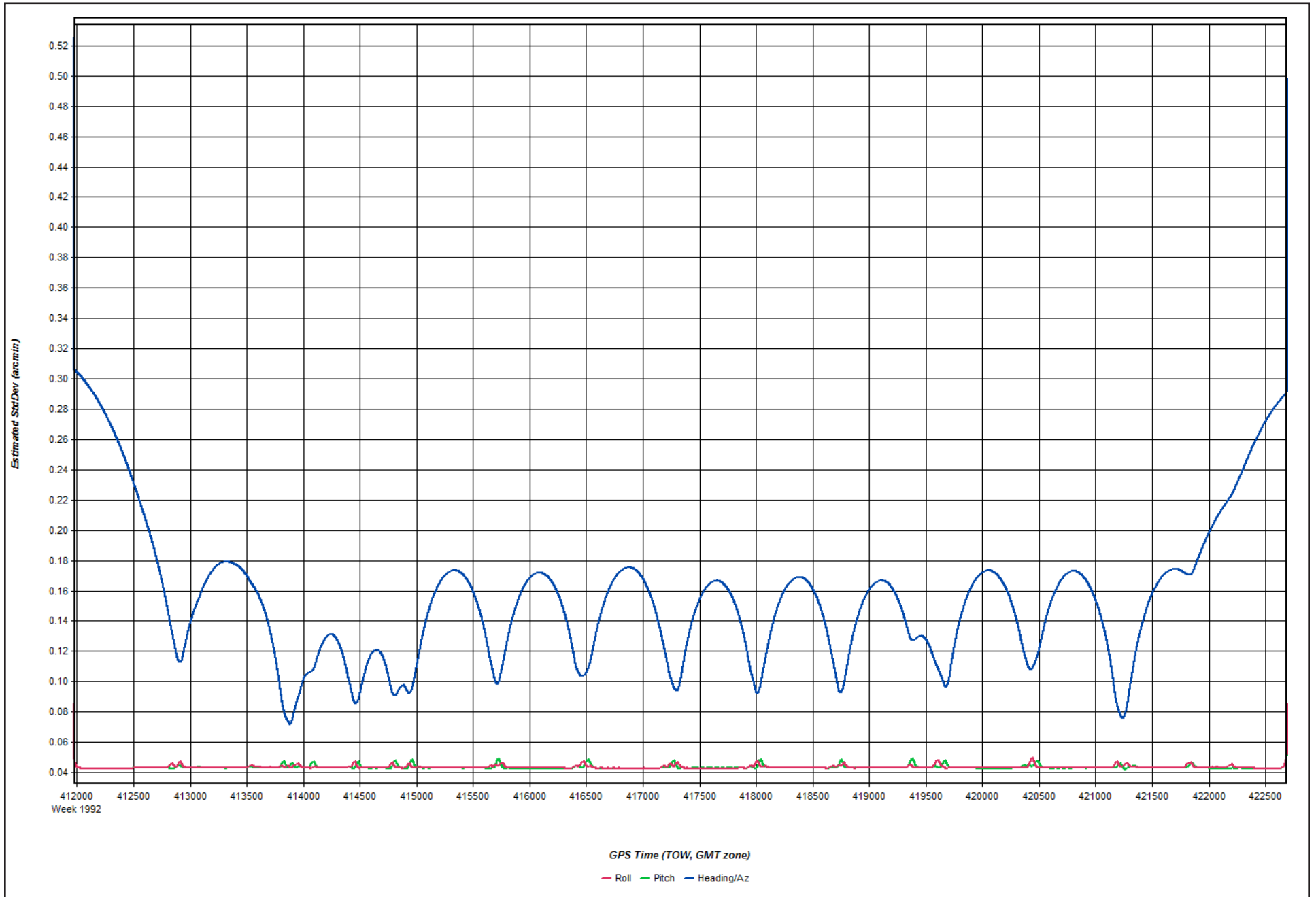
2018-03-15_Day074_7 - 20180315182513

Figure 9: Fwd/Rev Attitude Separation Plot



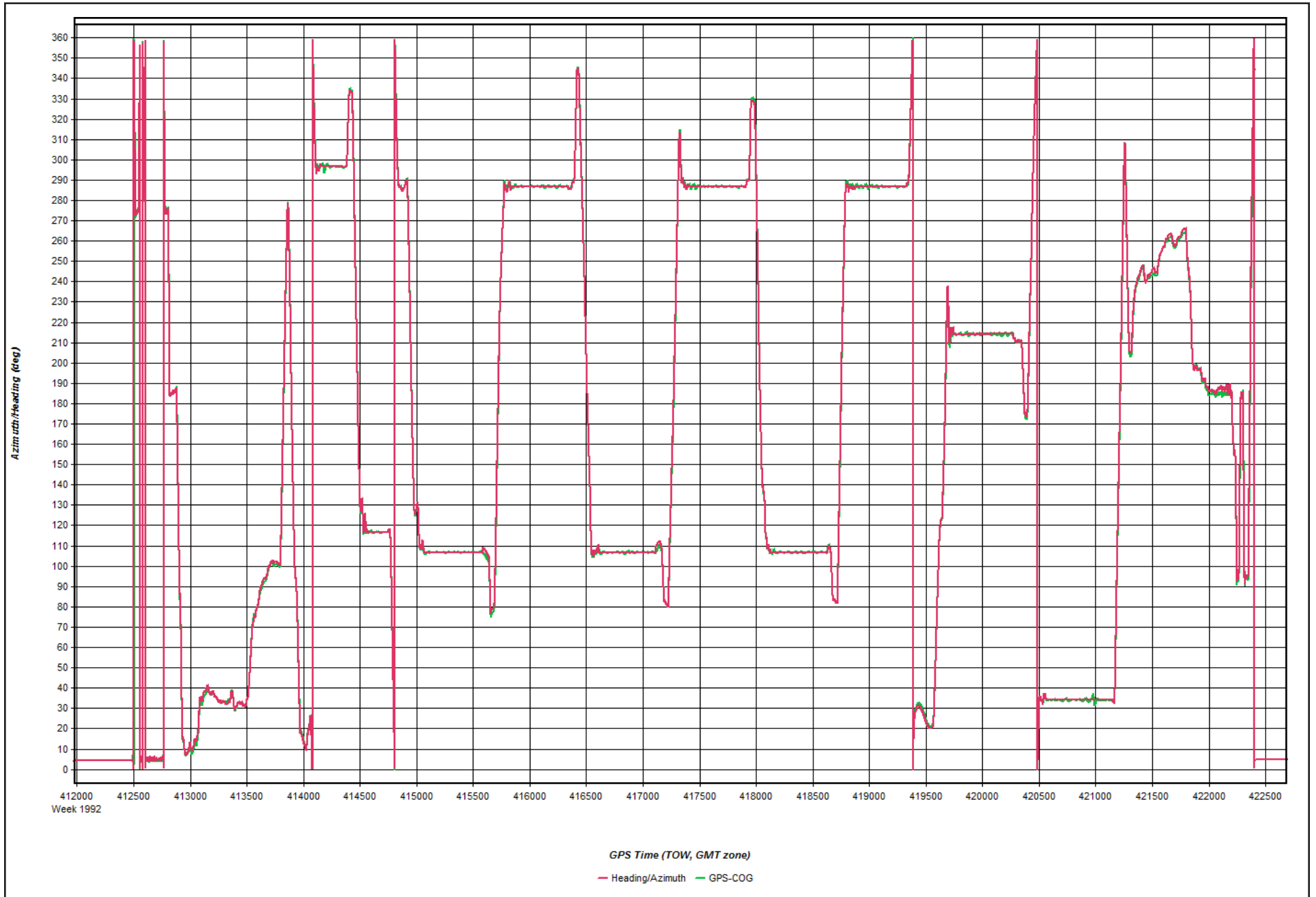
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Figure 10: Estimated Attitude Accuracy Plot



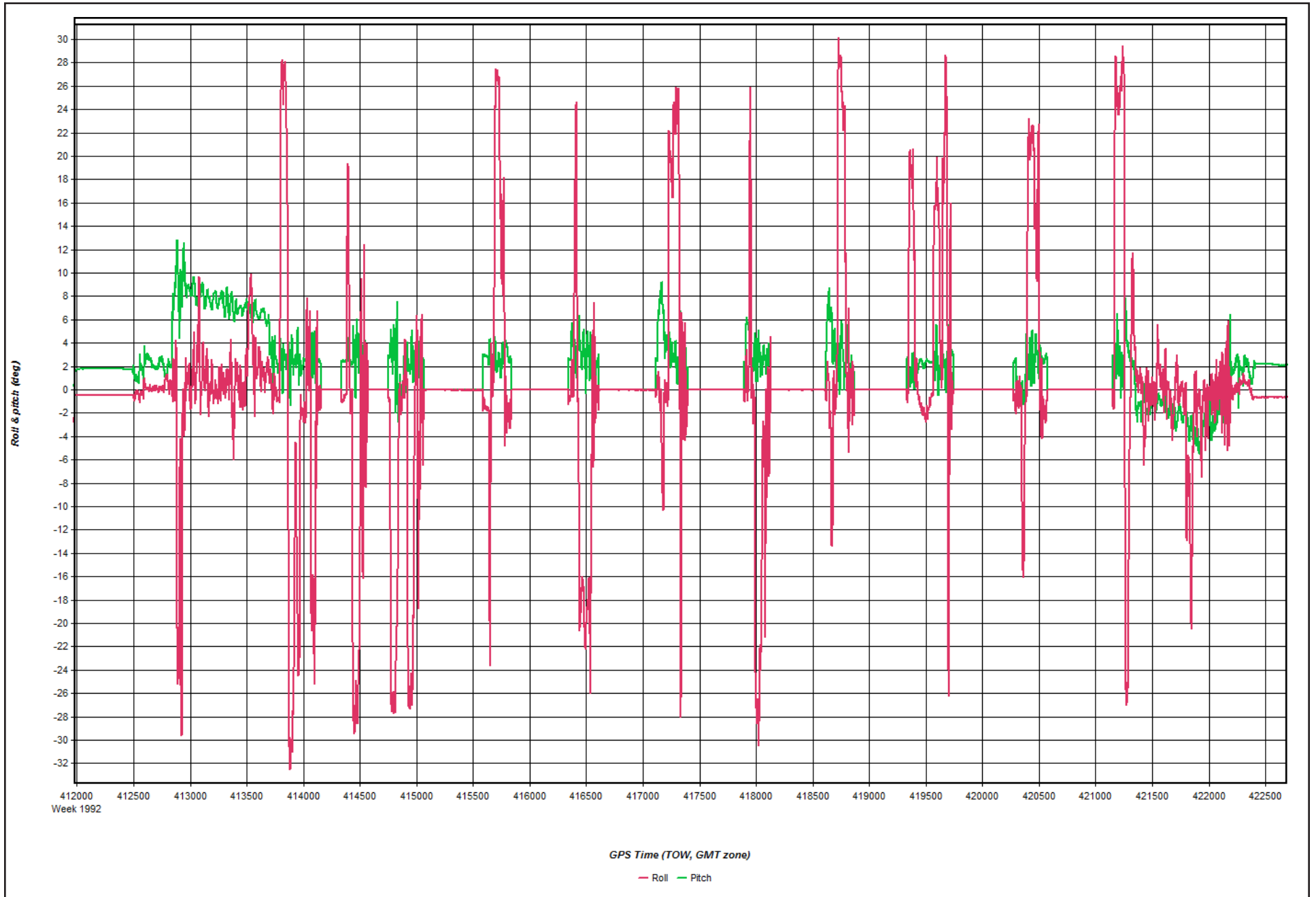
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Figure 11: Azimuth Plot



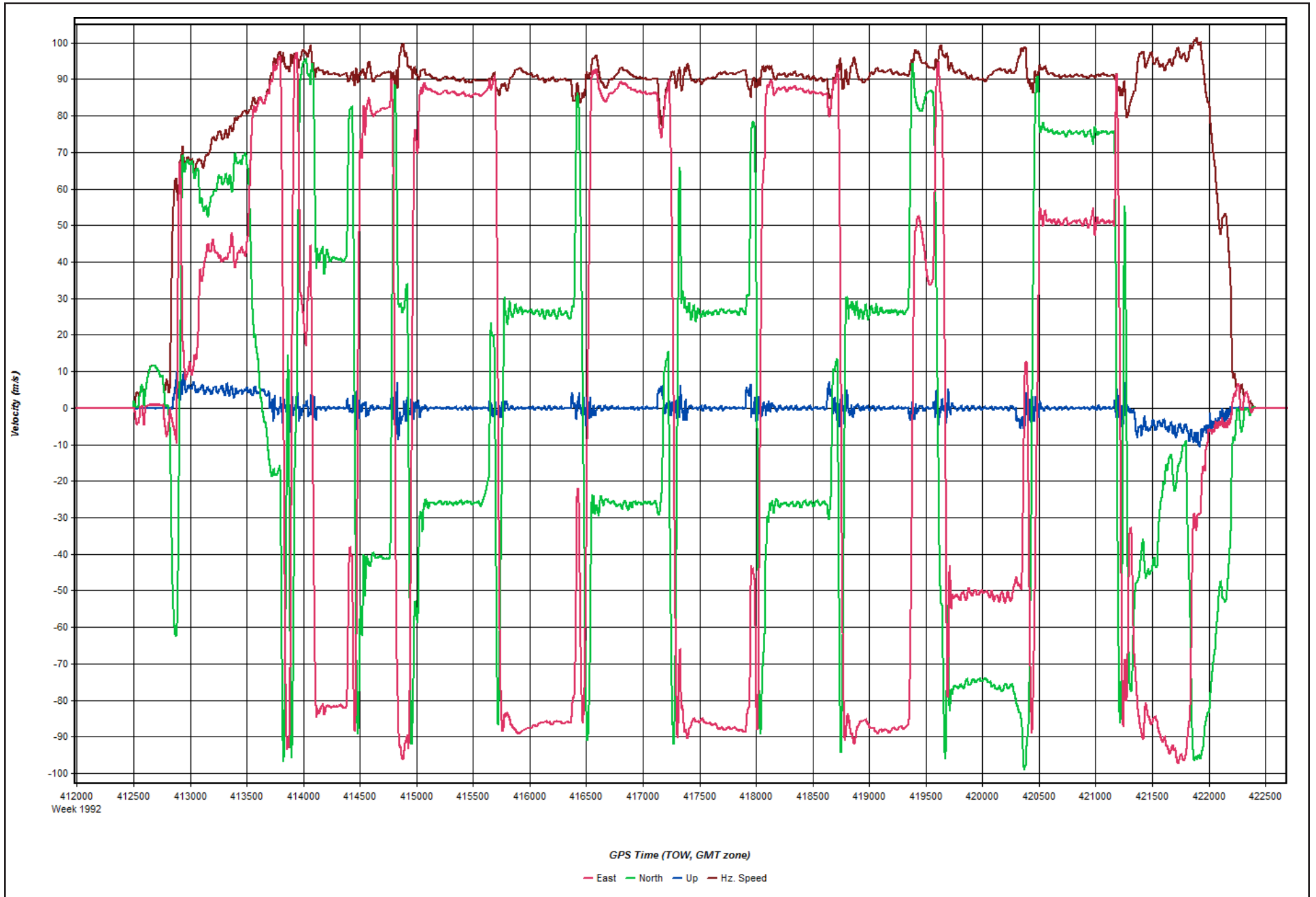
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Figure 12: Roll & Pitch Plot



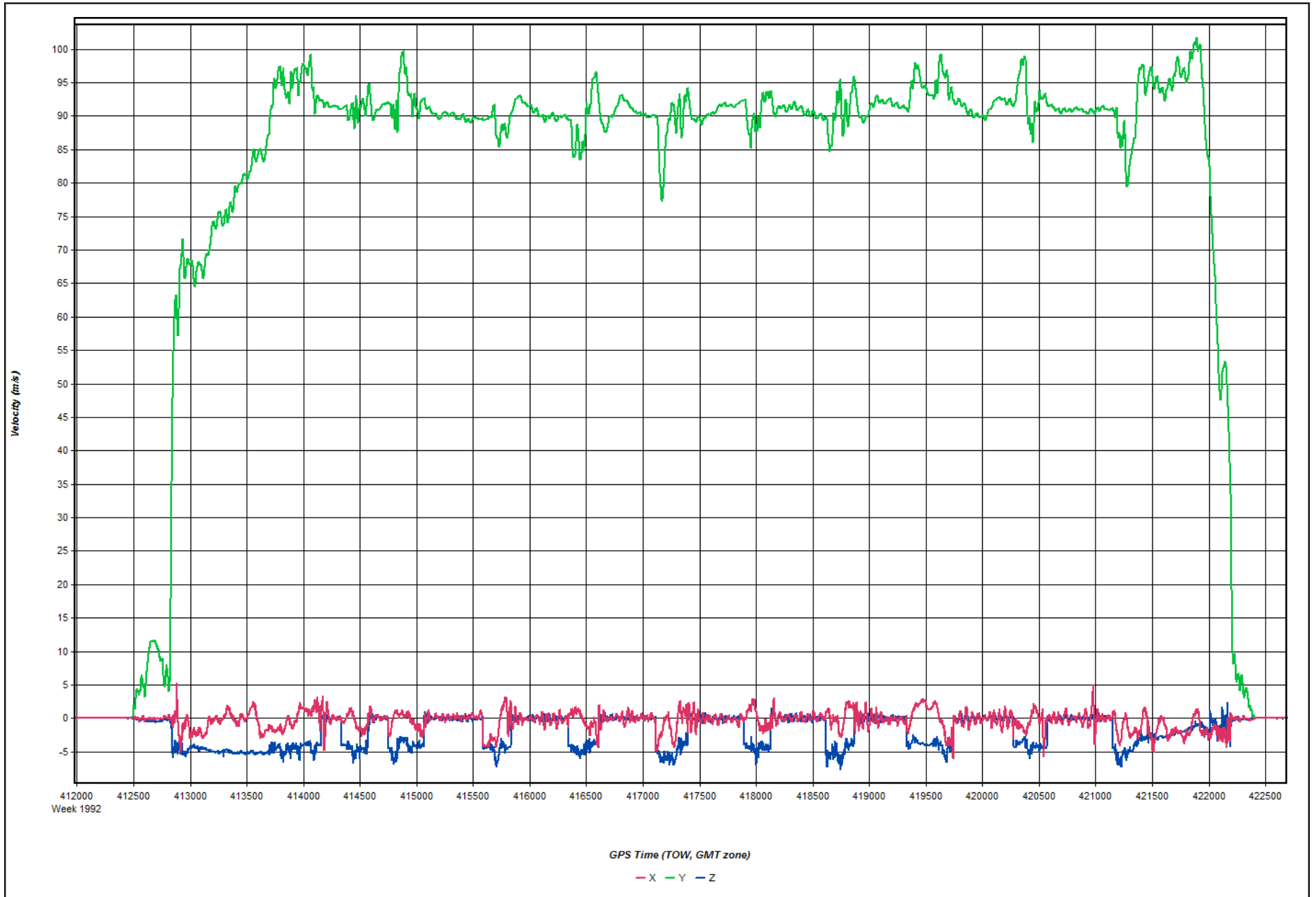
2018-03-15_Day074_7 - 20180315182513

Figure 13: Velocity Profile Plot



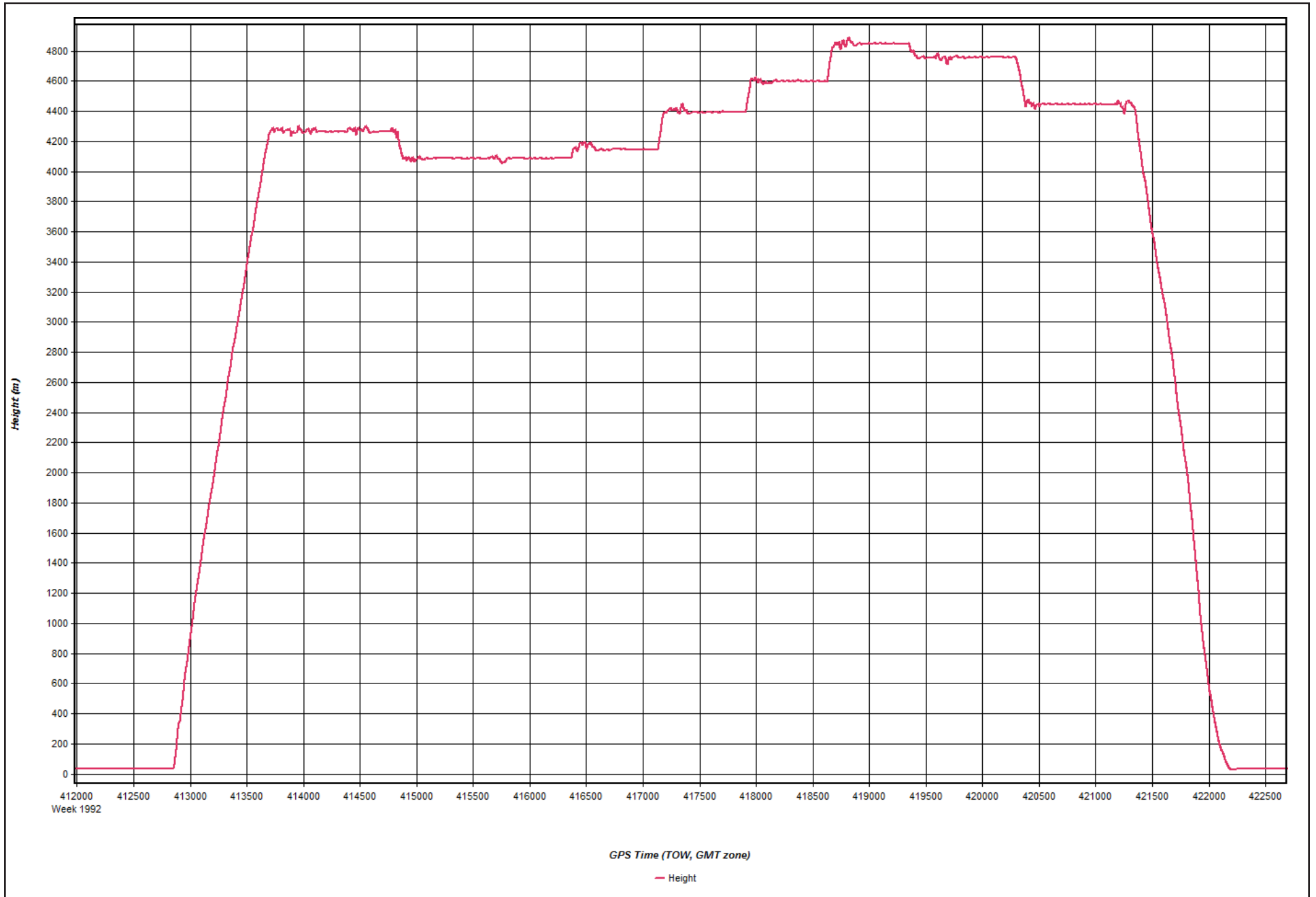
2018-03-15_Day074_7 - 20180315182513

Figure 14: Body Frame Velocity Plot



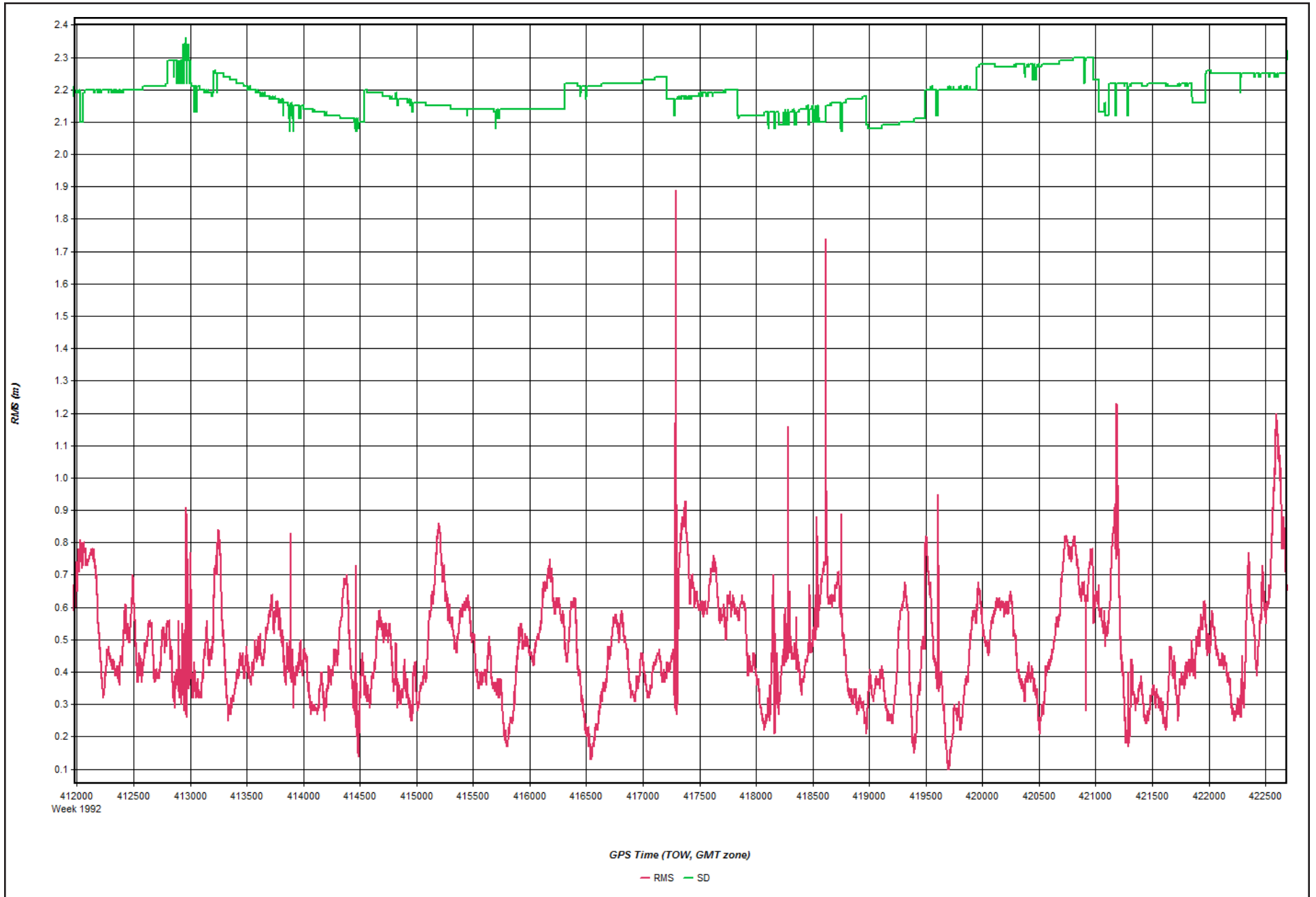
2018-03-15_Day074_7 - 20180315182513

Figure 15: Height Profile Plot



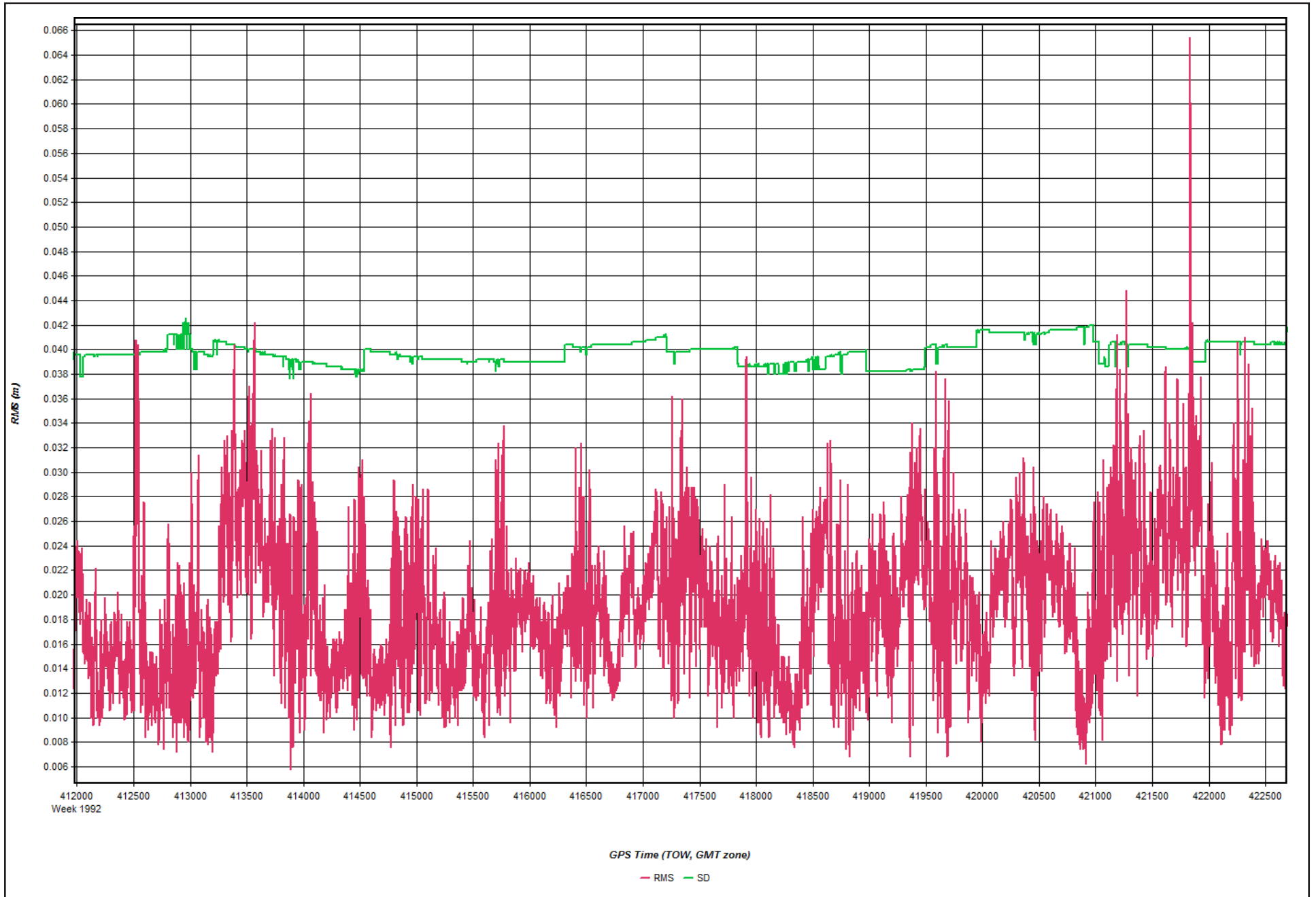
2018-03-15_Day074_7 - 20180315182513

Figure 16: C/A Code Residual RMS Plot



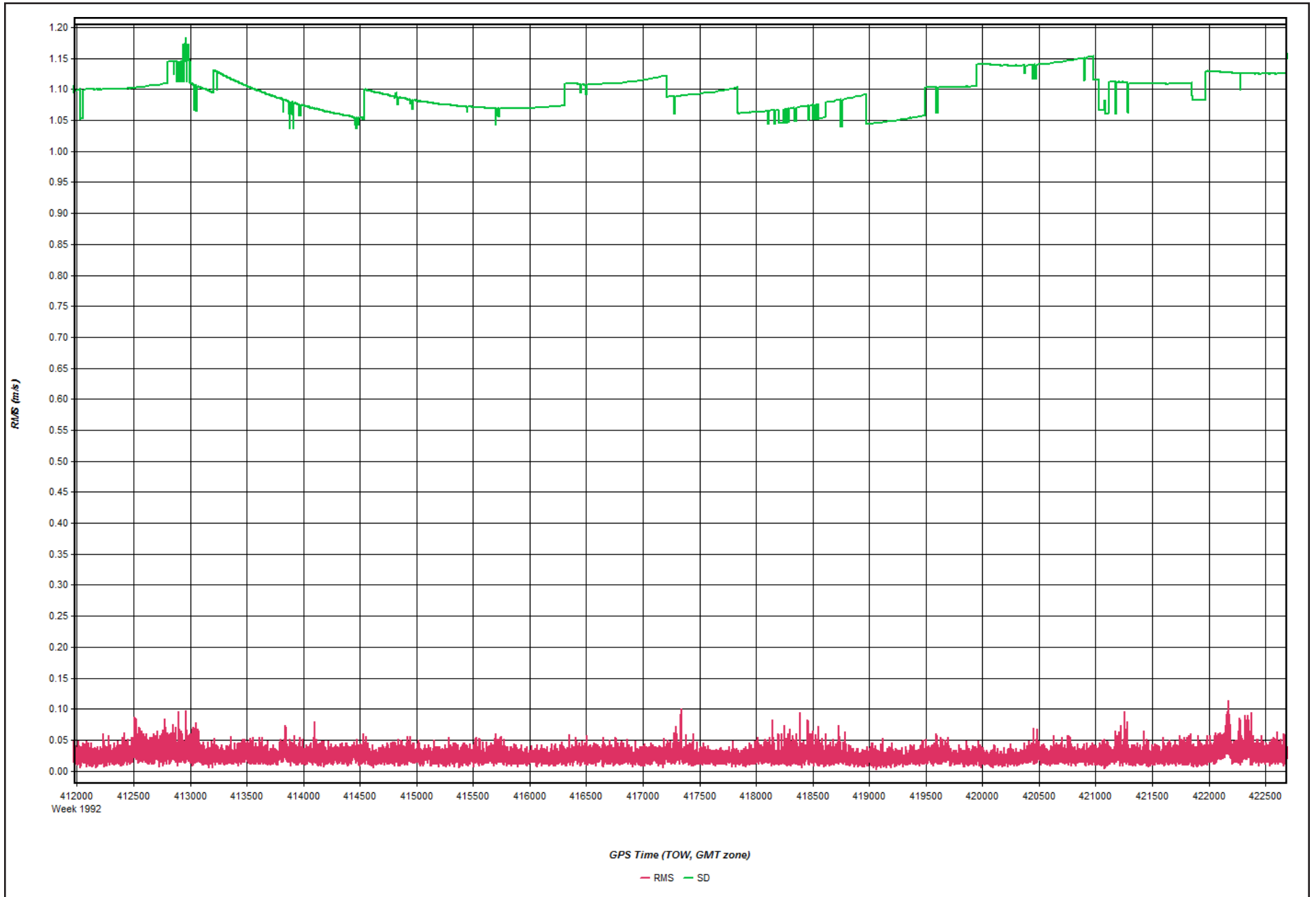
2018-03-15_Day074_7 - 20180315182513

Figure 17: Carrier Residual RMS Plot



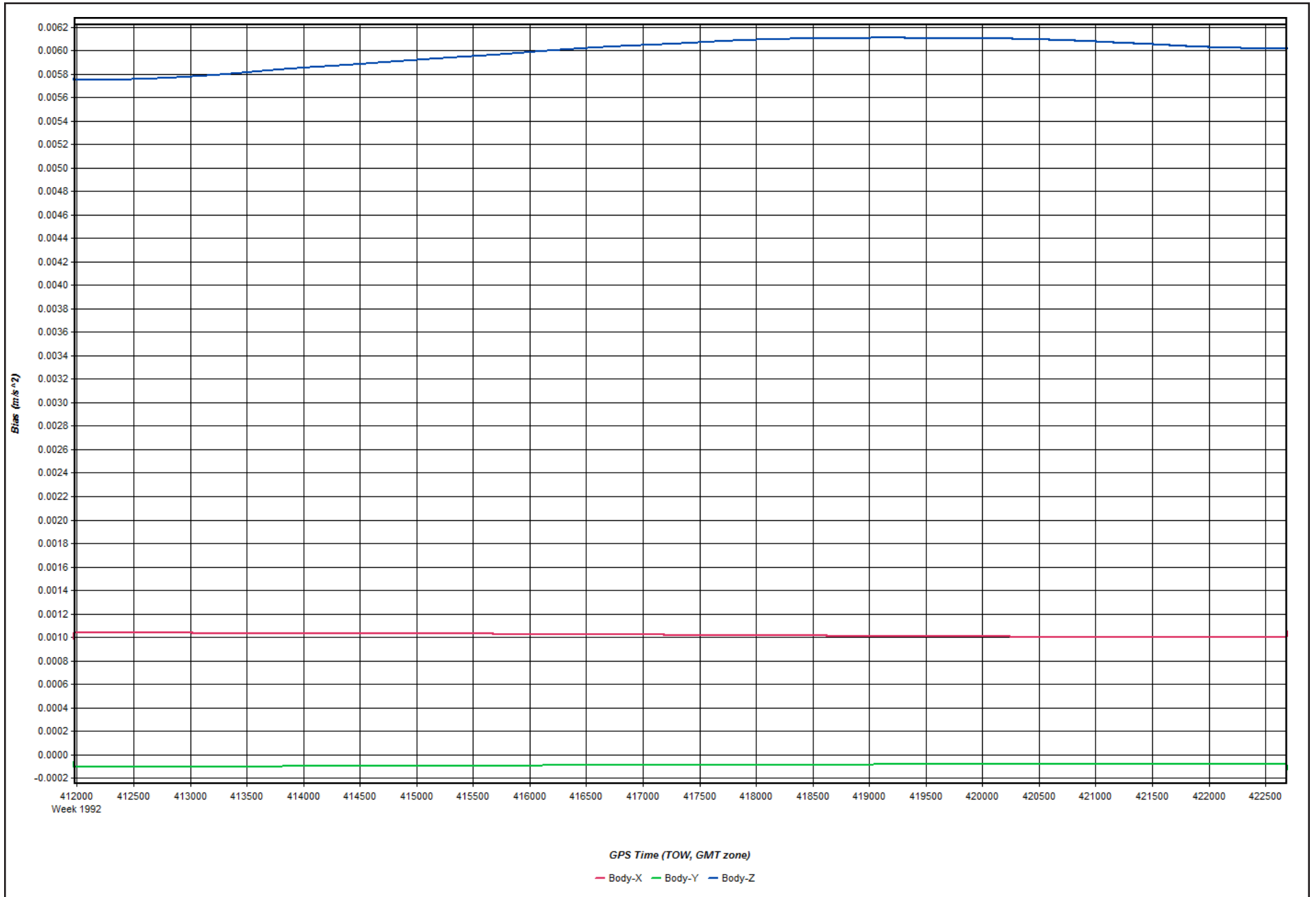
2018-03-15_Day074_7 - 20180315182513

Figure 18: L1 Doppler Residual RMS Plot



2018-03-15_Day074_7 - 20180315182513

Figure 19: Accelerometer Bias Plot



2018-03-15_Day074_7 - 20180315182513

Figure 20: Gyro Drift Plot

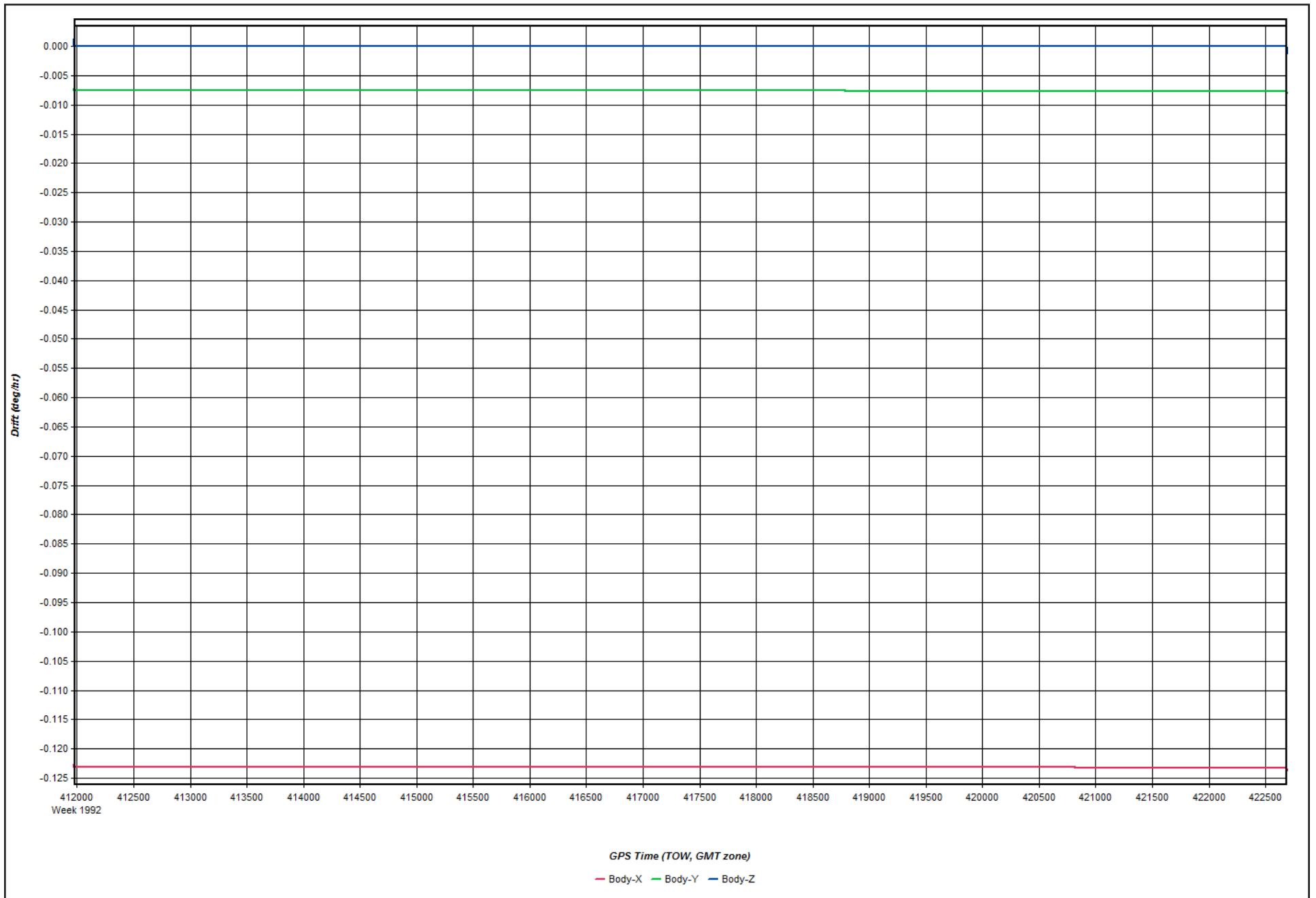
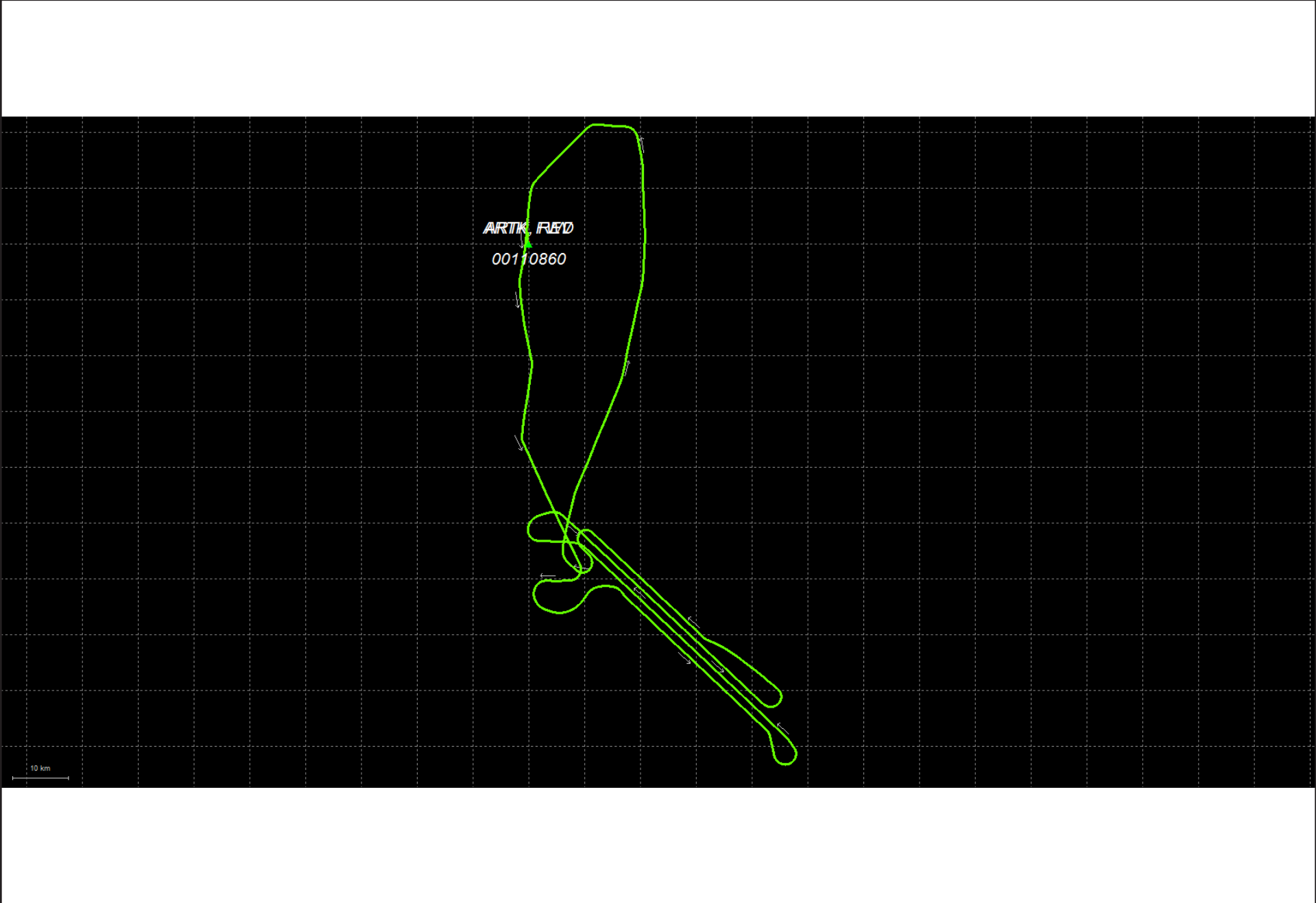
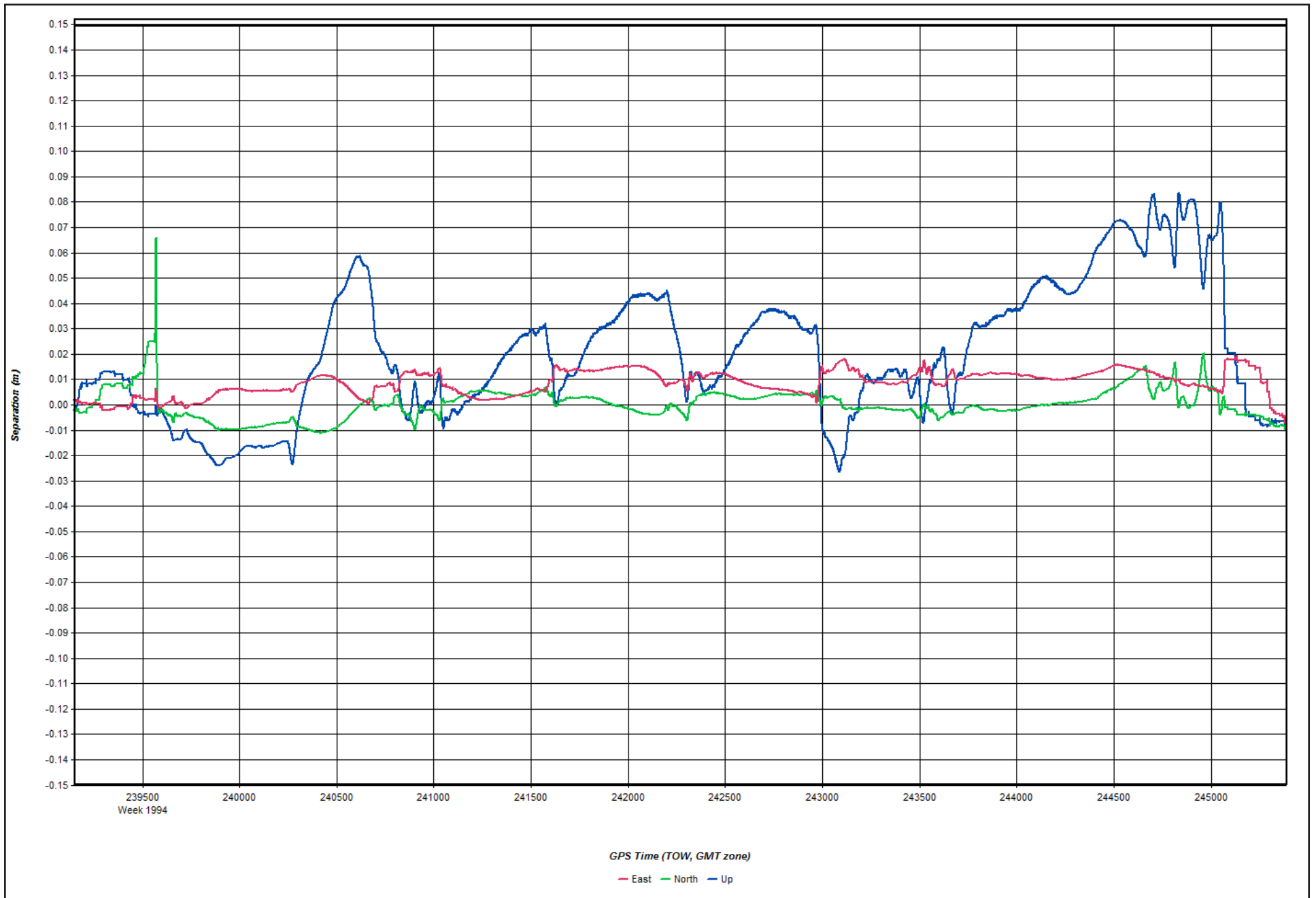


Figure 1: Map



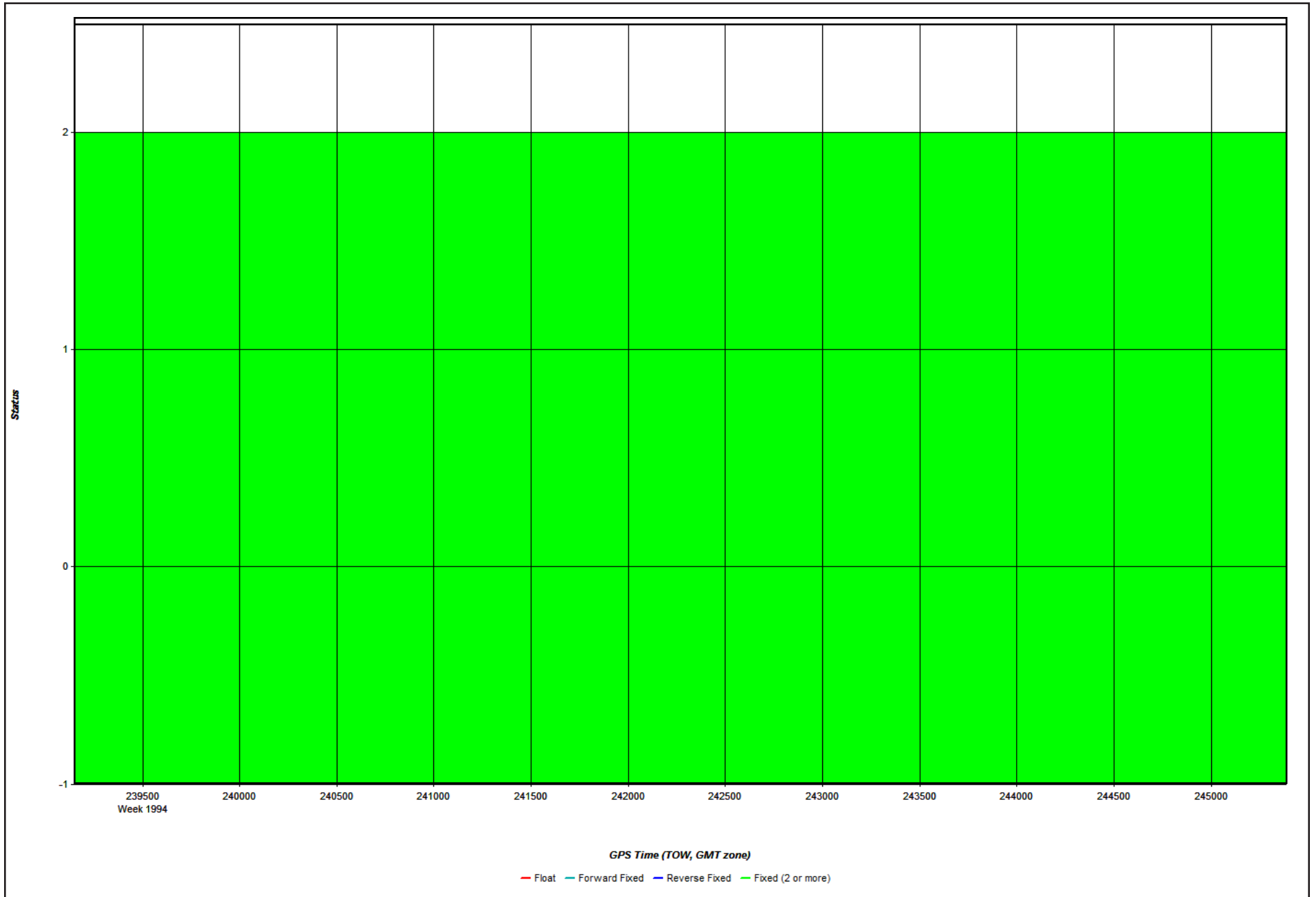
2018-03-27_Day086_7 - 20180327182502

Figure 2: Forward/Reverse or Combined Separation Plot



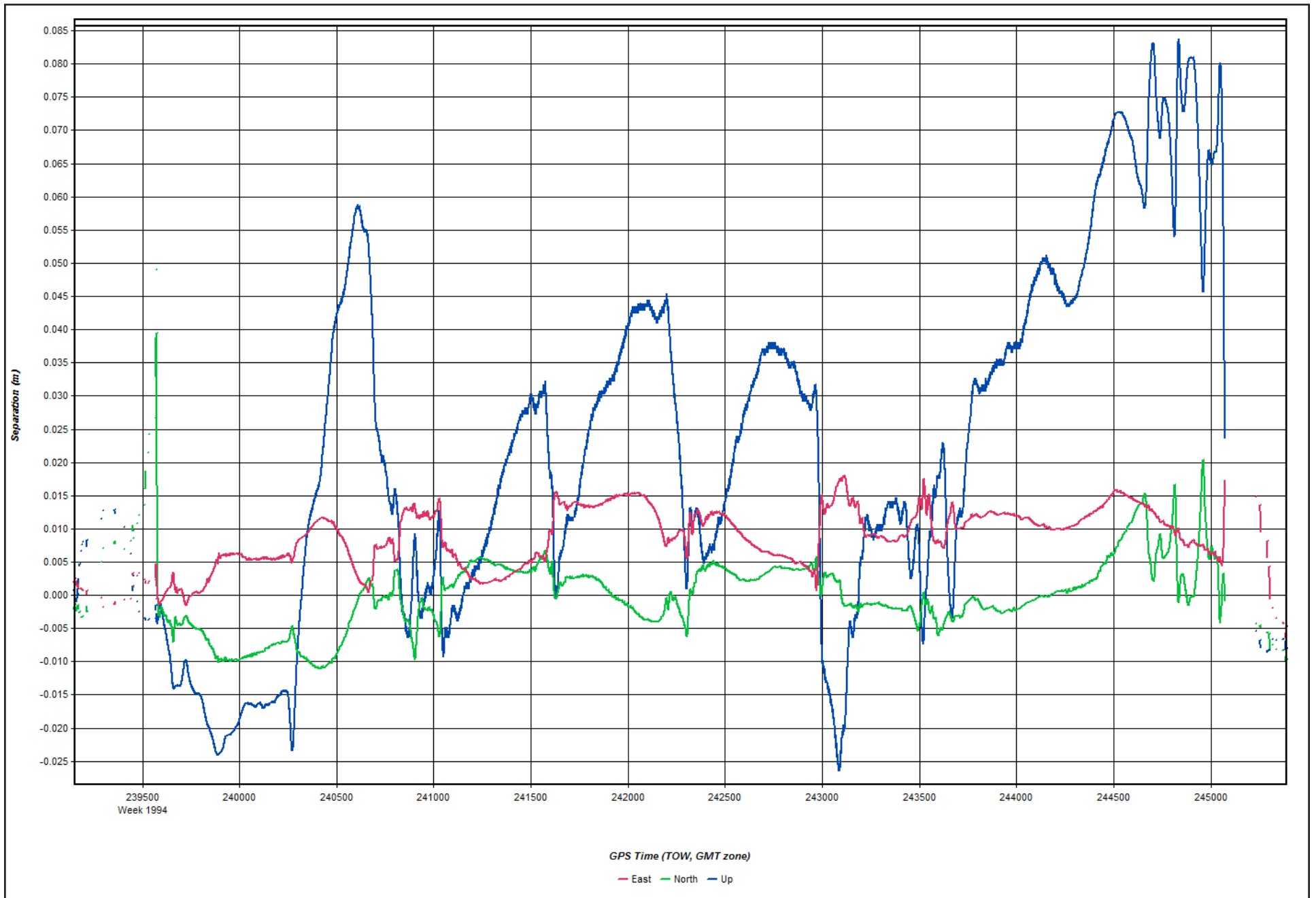
2018-03-27_Day086_7 - 20180327182502

Figure 3: Float or Fixed Ambiguity



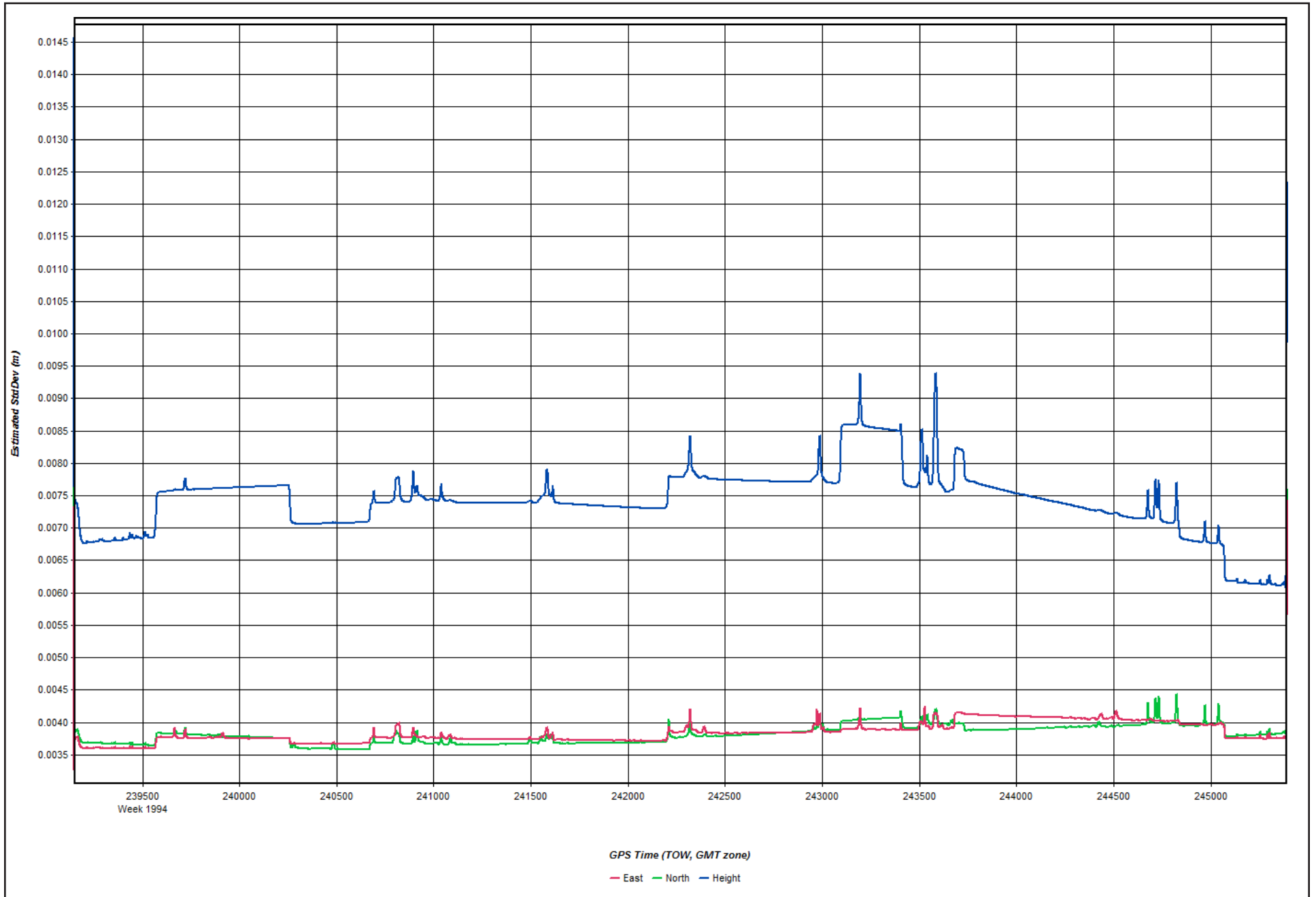
2018-03-27_Day086_7 - 20180327182502

Figure 4: Forward/Reverse Separation Plot (Fixed)



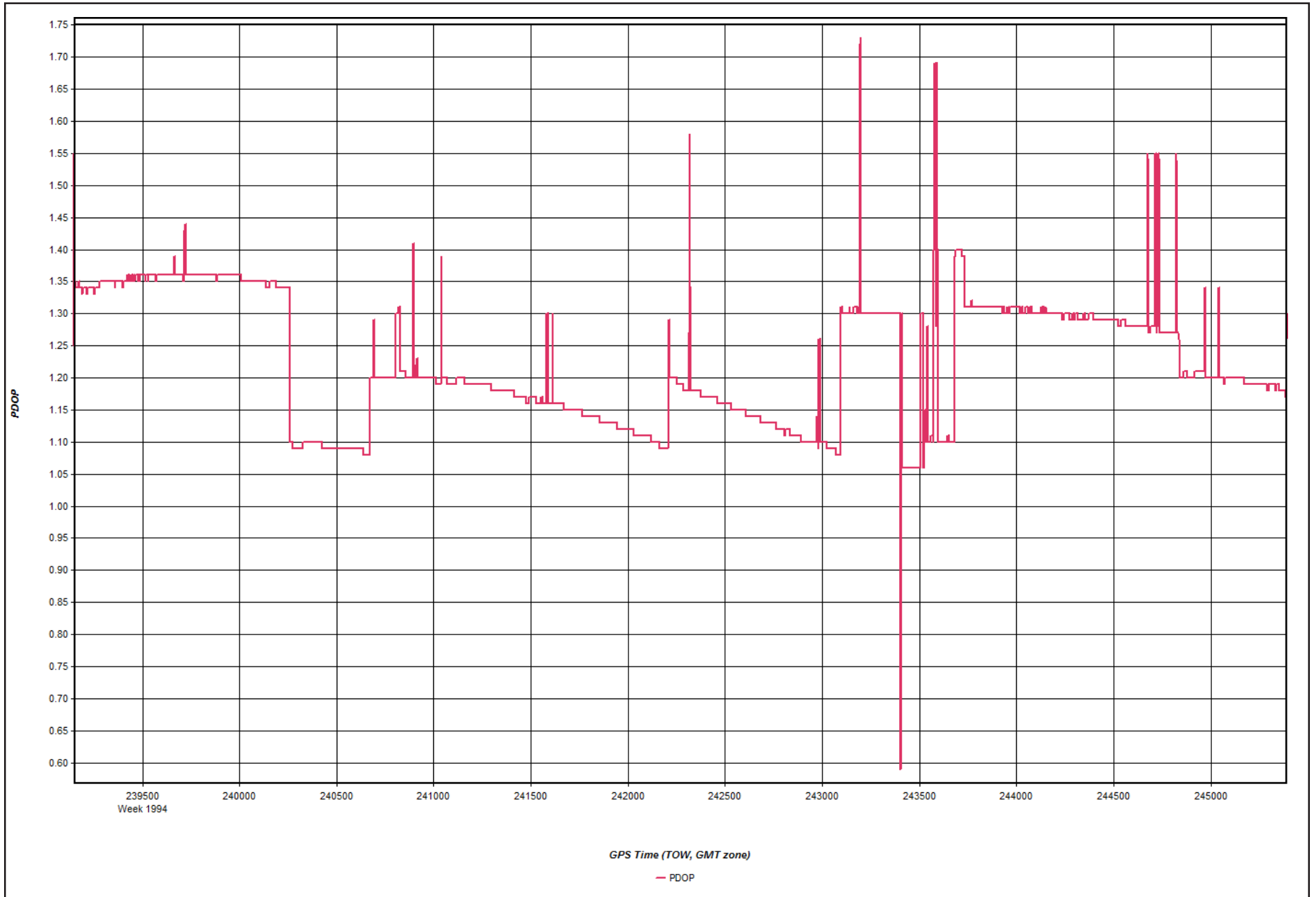
2018-03-27_Day086_7 - 20180327182502

Figure 5: Estimated Position Accuracy Plot



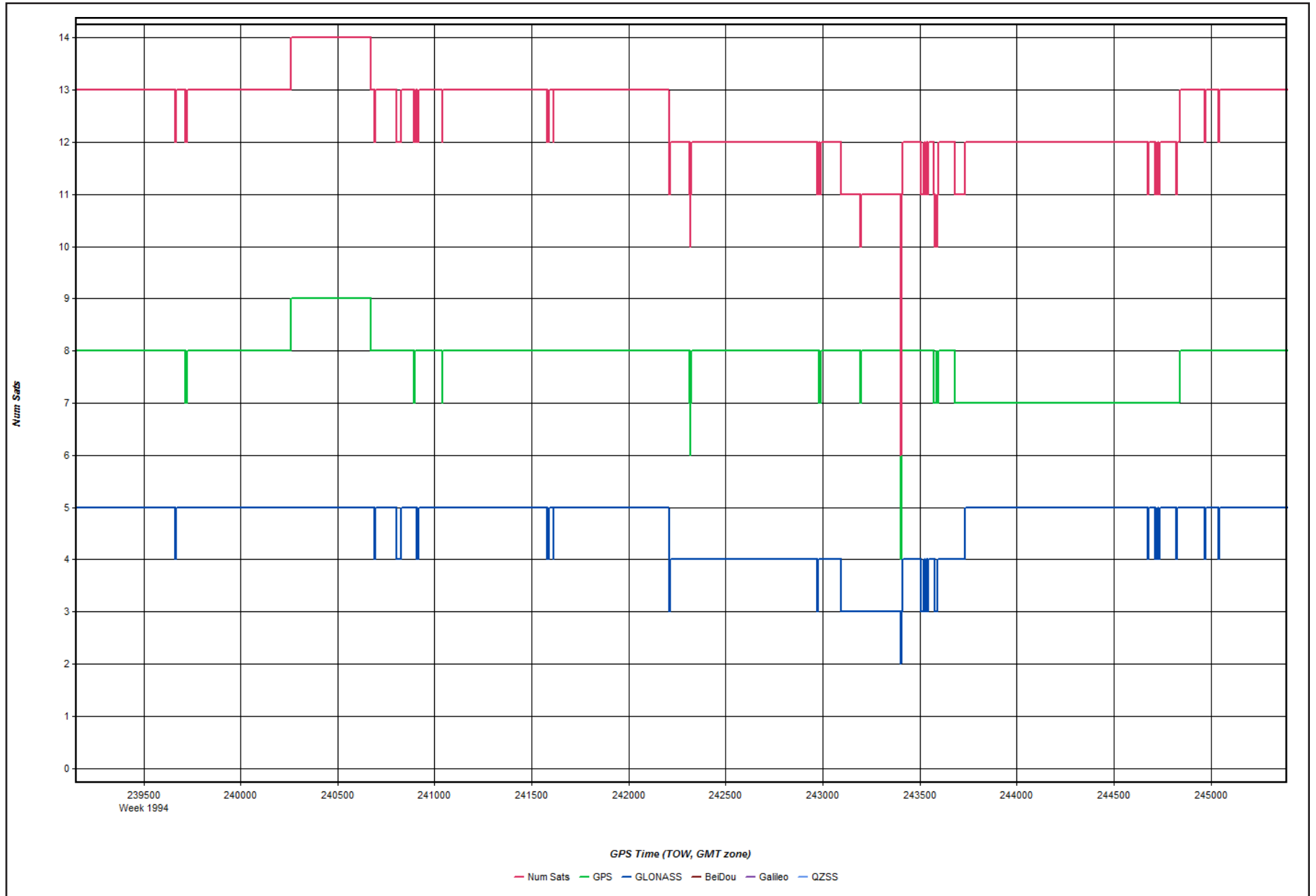
2018-03-27_Day086_7 - 20180327182502

Figure 6: PDOP Plot



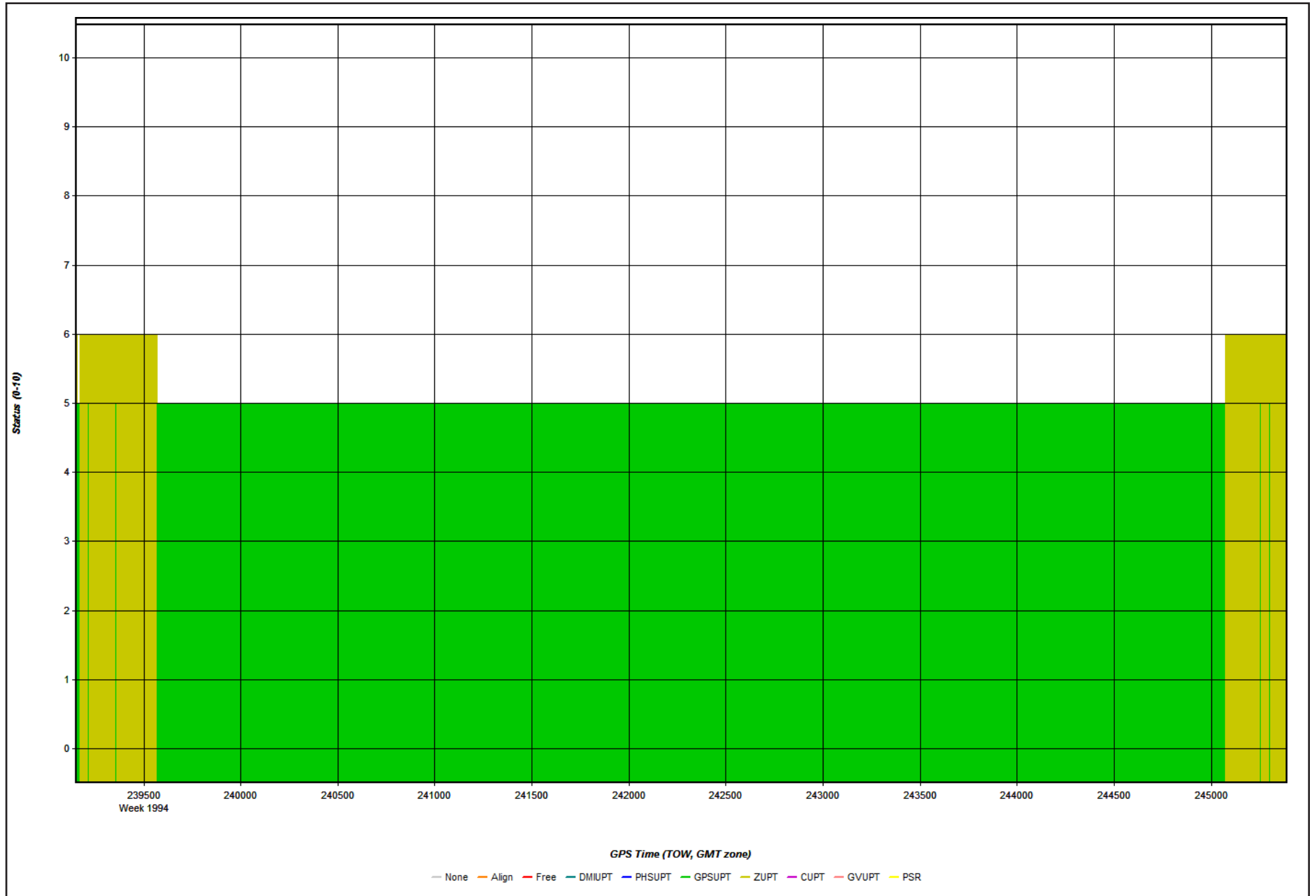
2018-03-27_Day086_7 - 20180327182502

Figure 7: Number of Satellites Line Plot



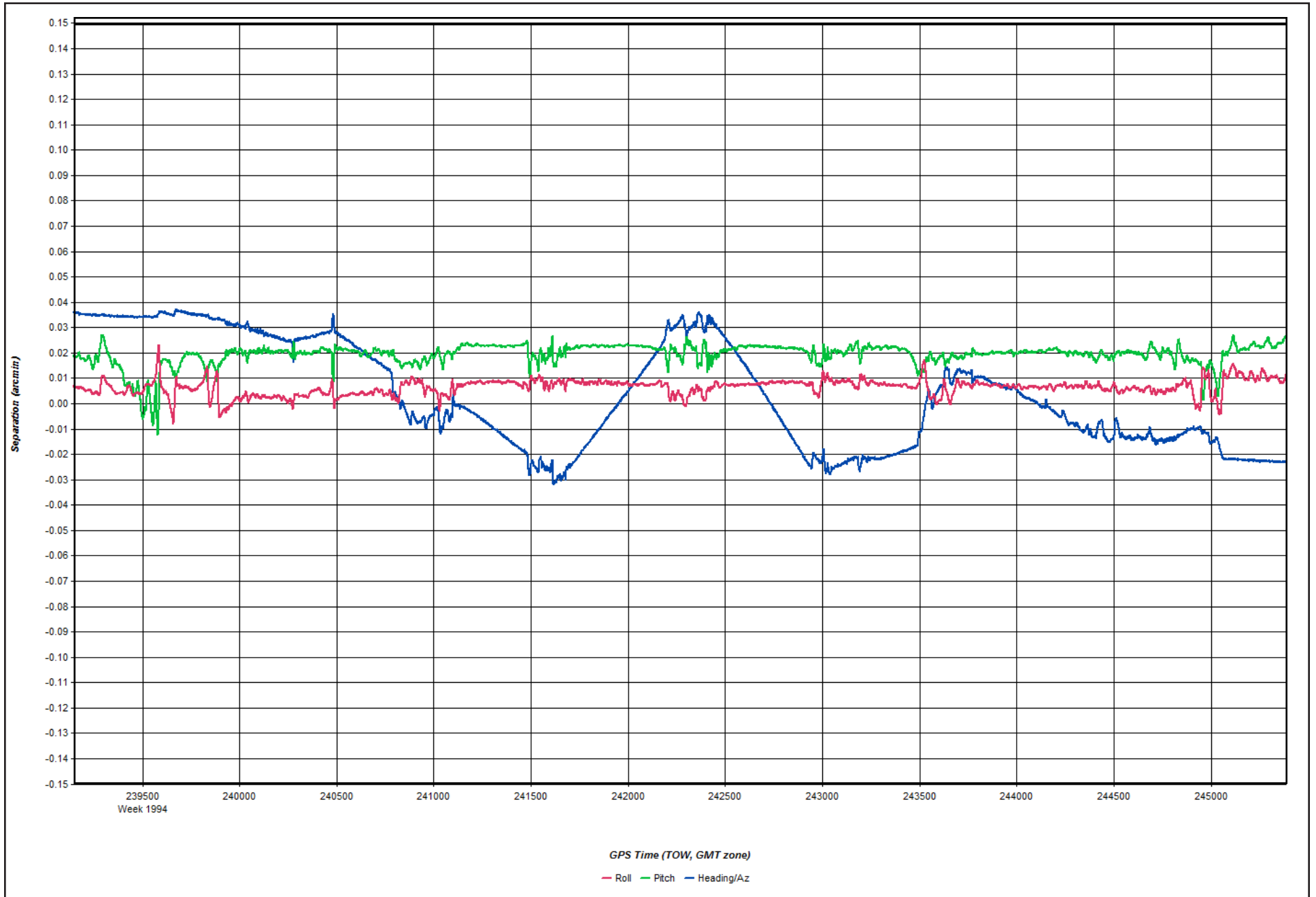
2018-03-27_Day086_7 - 20180327182502

Figure 8: Status flag for IMU processing



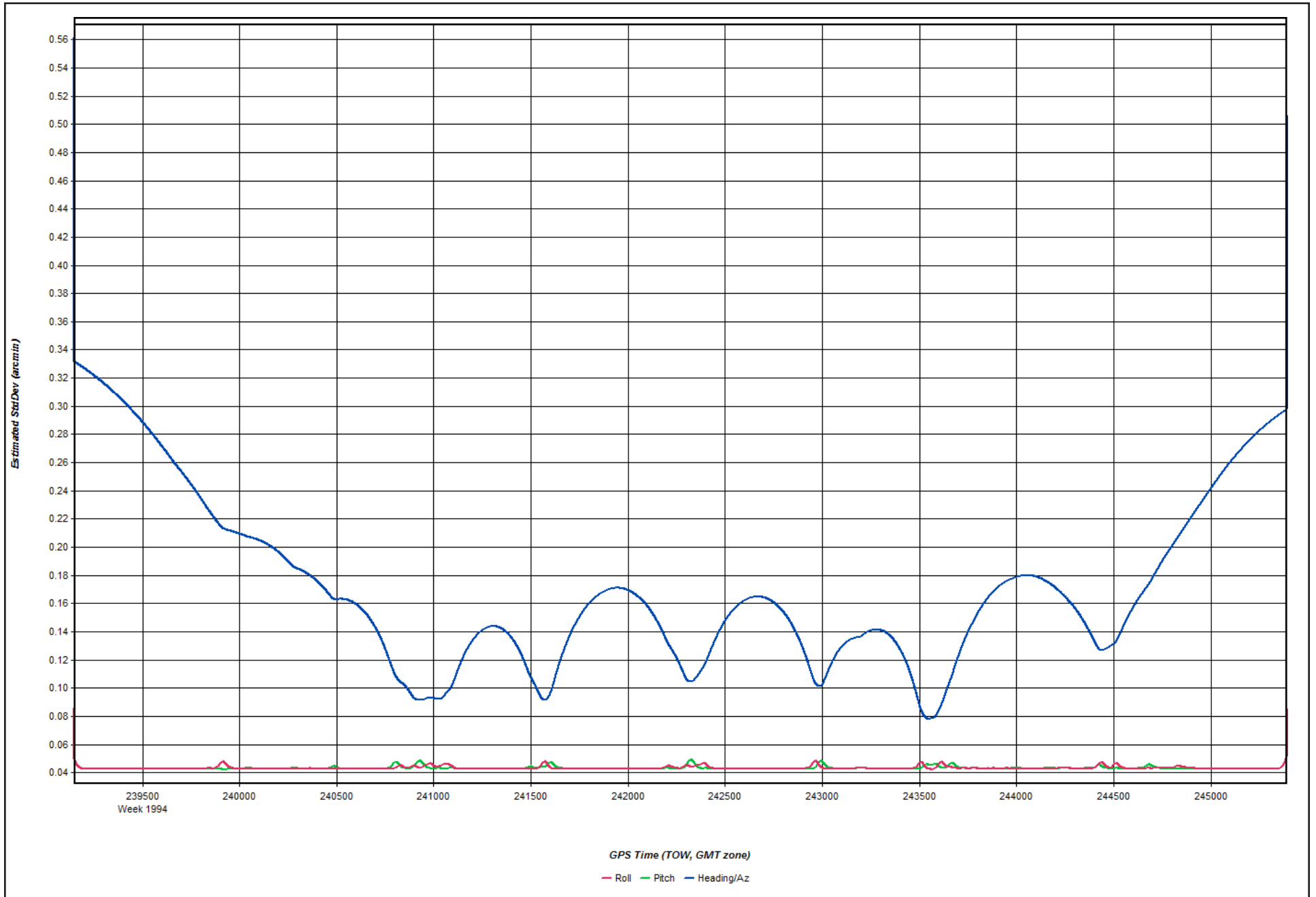
2018-03-27_Day086_7 - 20180327182502

Figure 9: Fwd/Rev Attitude Separation Plot



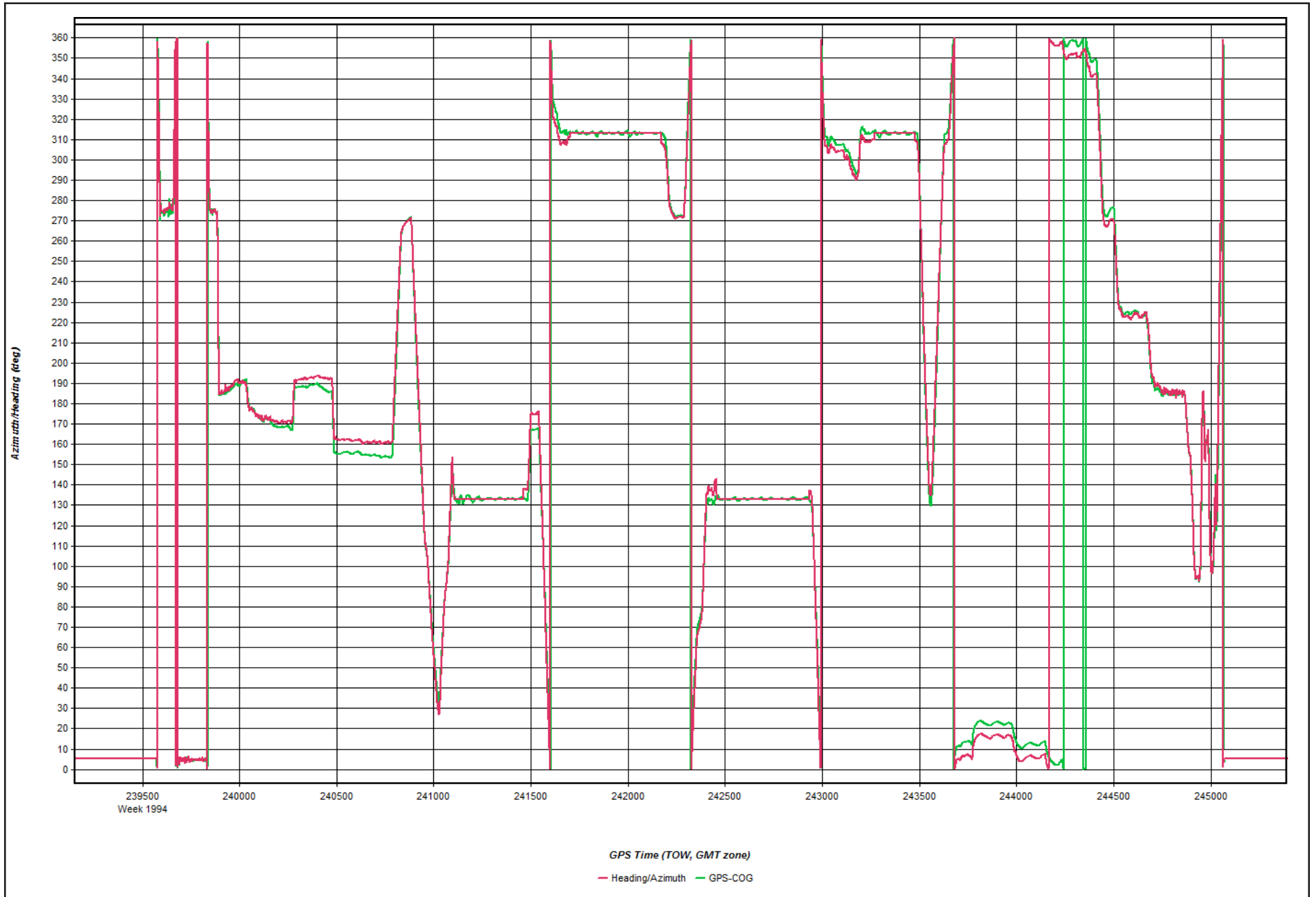
2018-03-27_Day086_7 - 20180327182502

Figure 10: Estimated Attitude Accuracy Plot



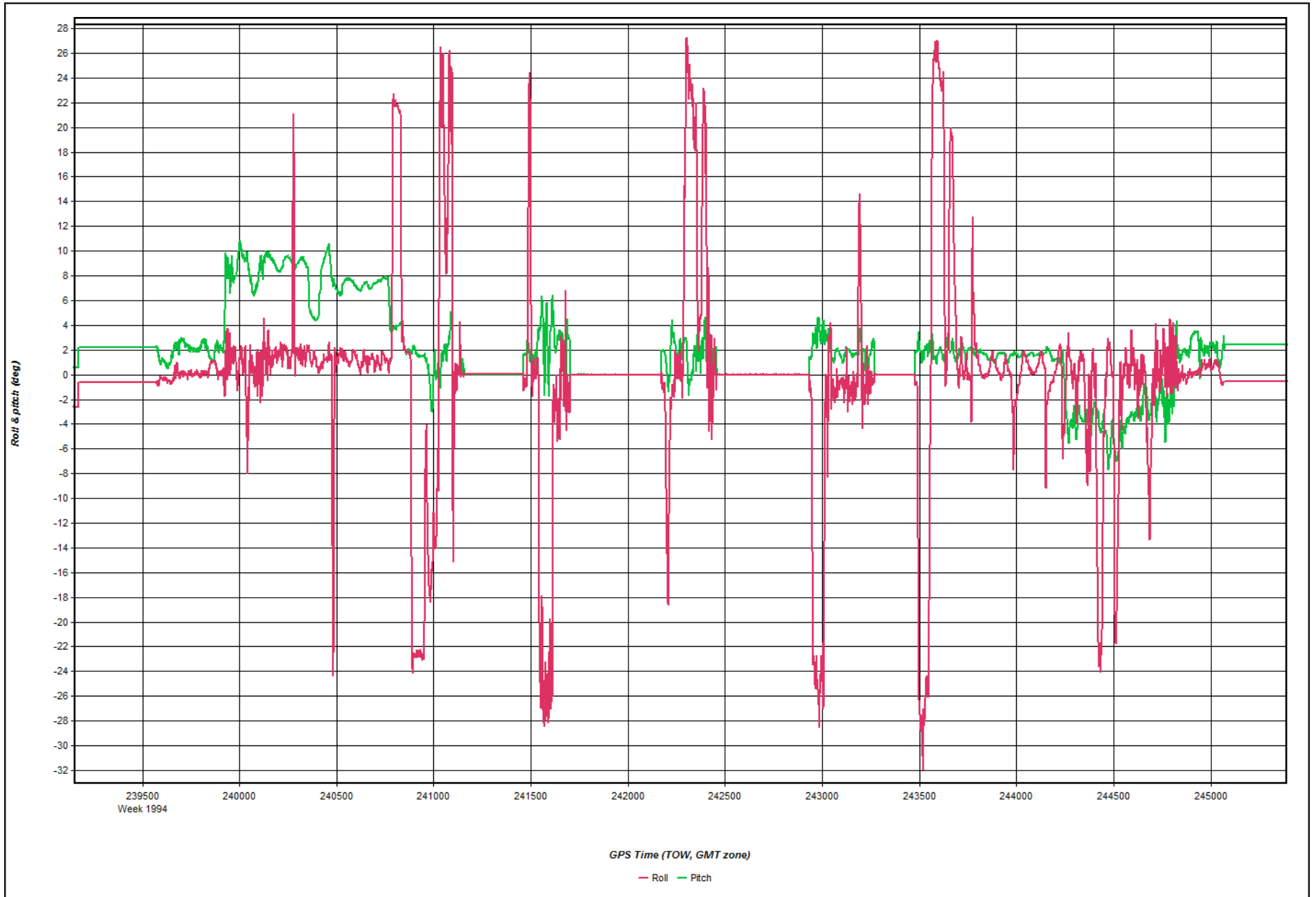
2018-03-27_Day086_7 - 20180327182502

Figure 11: Azimuth Plot



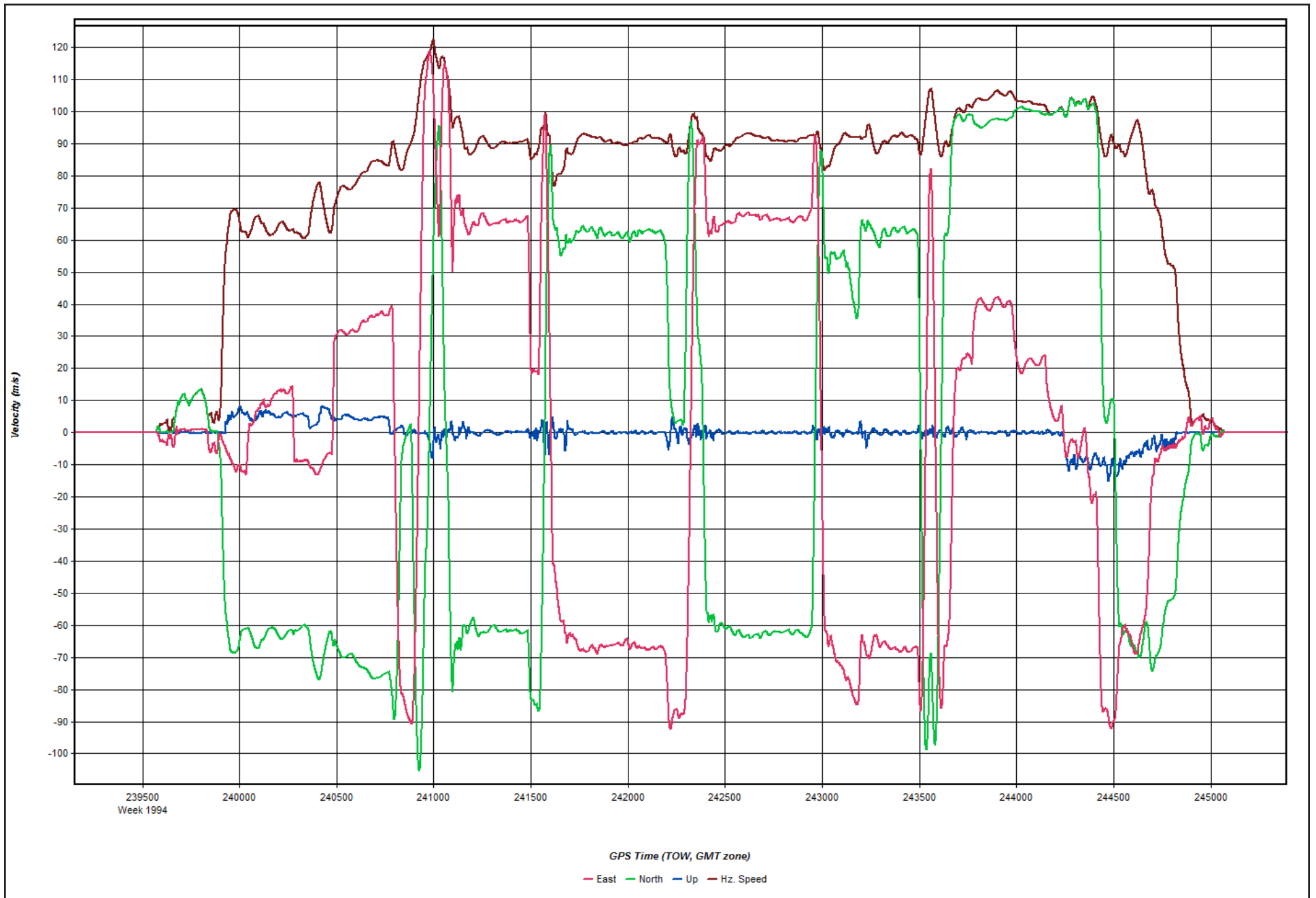
2018-03-27_Day086_7 - 20180327182502

Figure 12: Roll & Pitch Plot



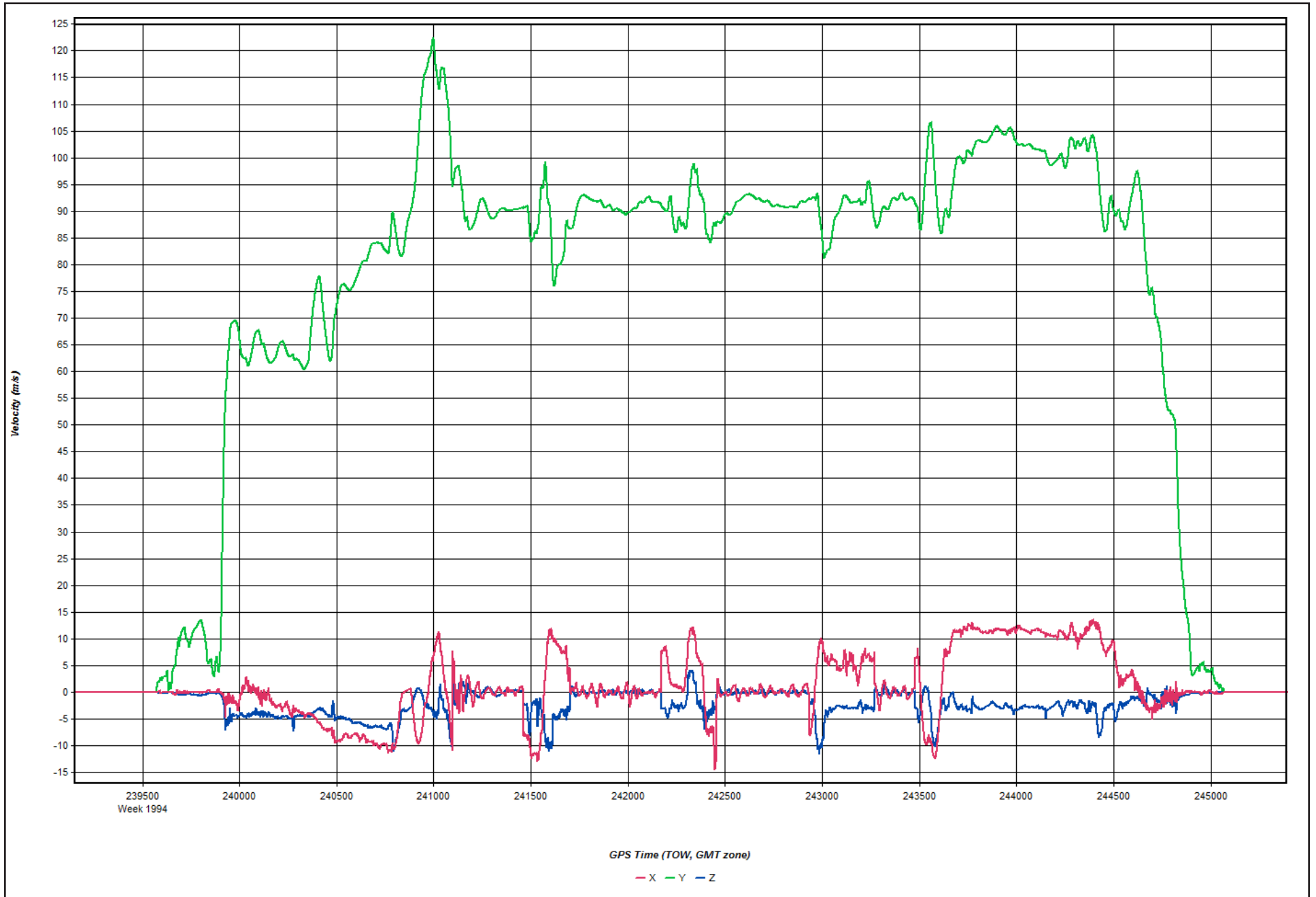
2018-03-27_Day086_7 - 20180327182502

Figure 13: Velocity Profile Plot



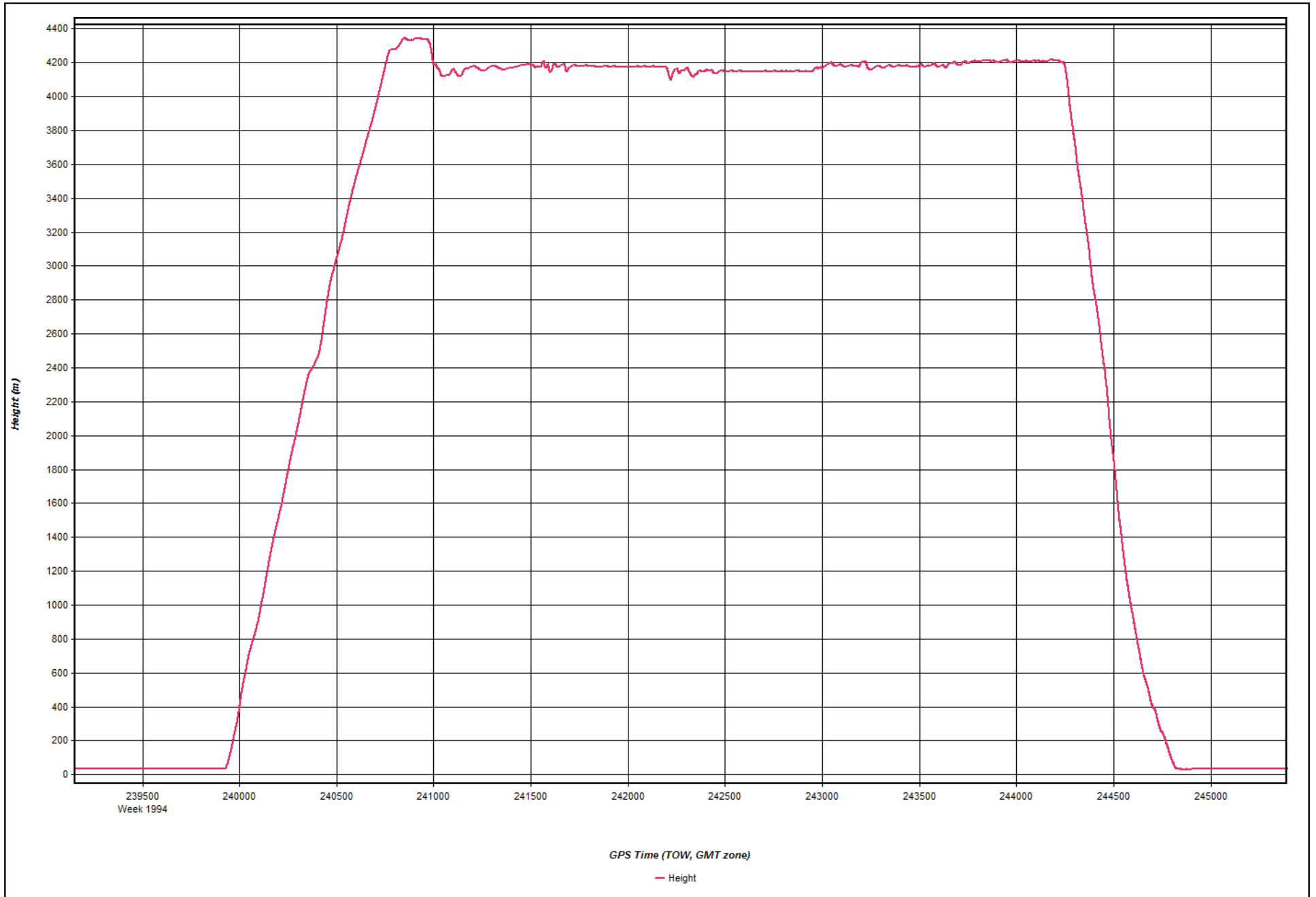
2018-03-27_Day086_7 - 20180327182502

Figure 14: Body Frame Velocity Plot



2018-03-27_Day086_7 - 20180327182502

Figure 15: Height Profile Plot



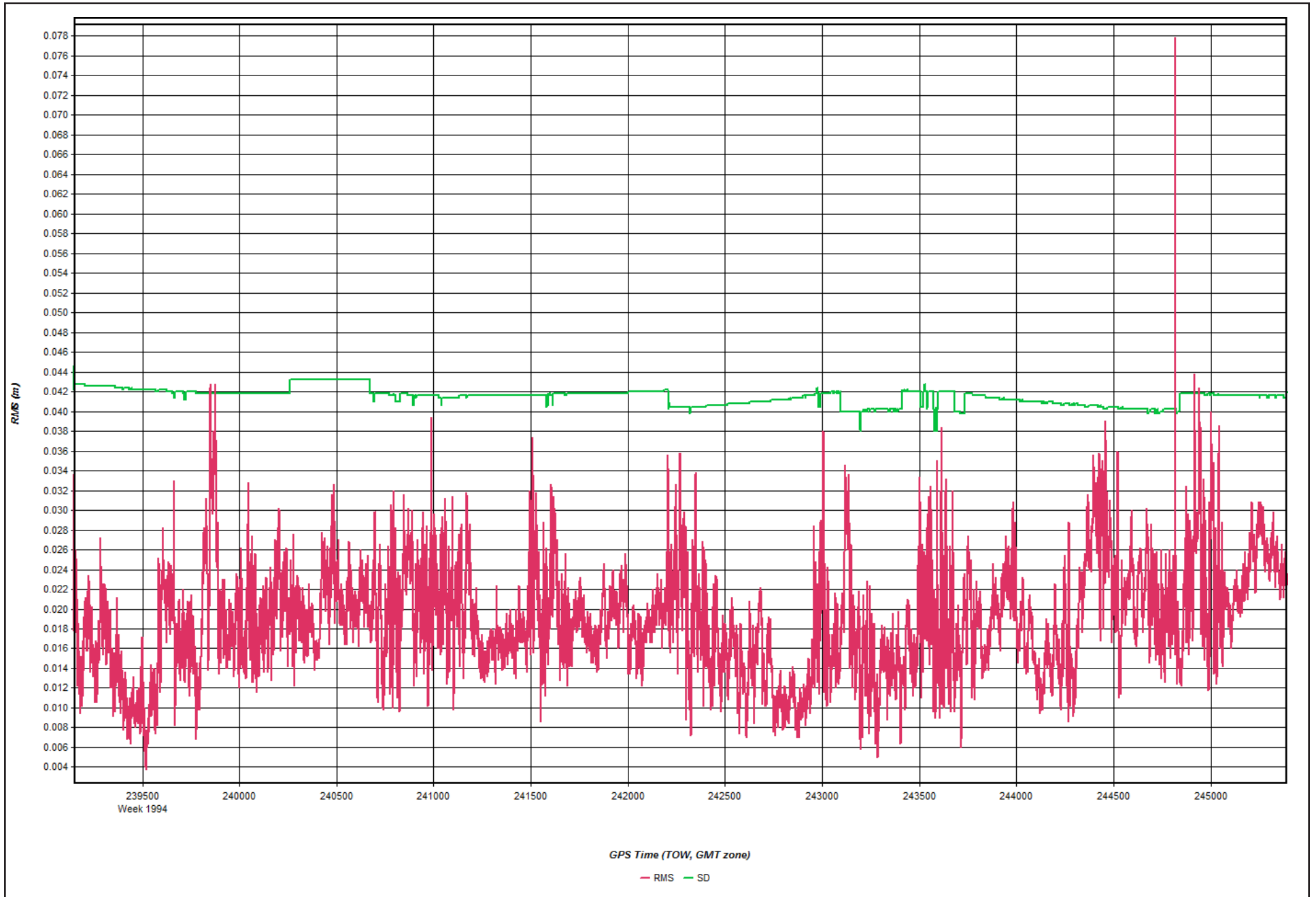
2018-03-27_Day086_7 - 20180327182502

Figure 16: C/A Code Residual RMS Plot



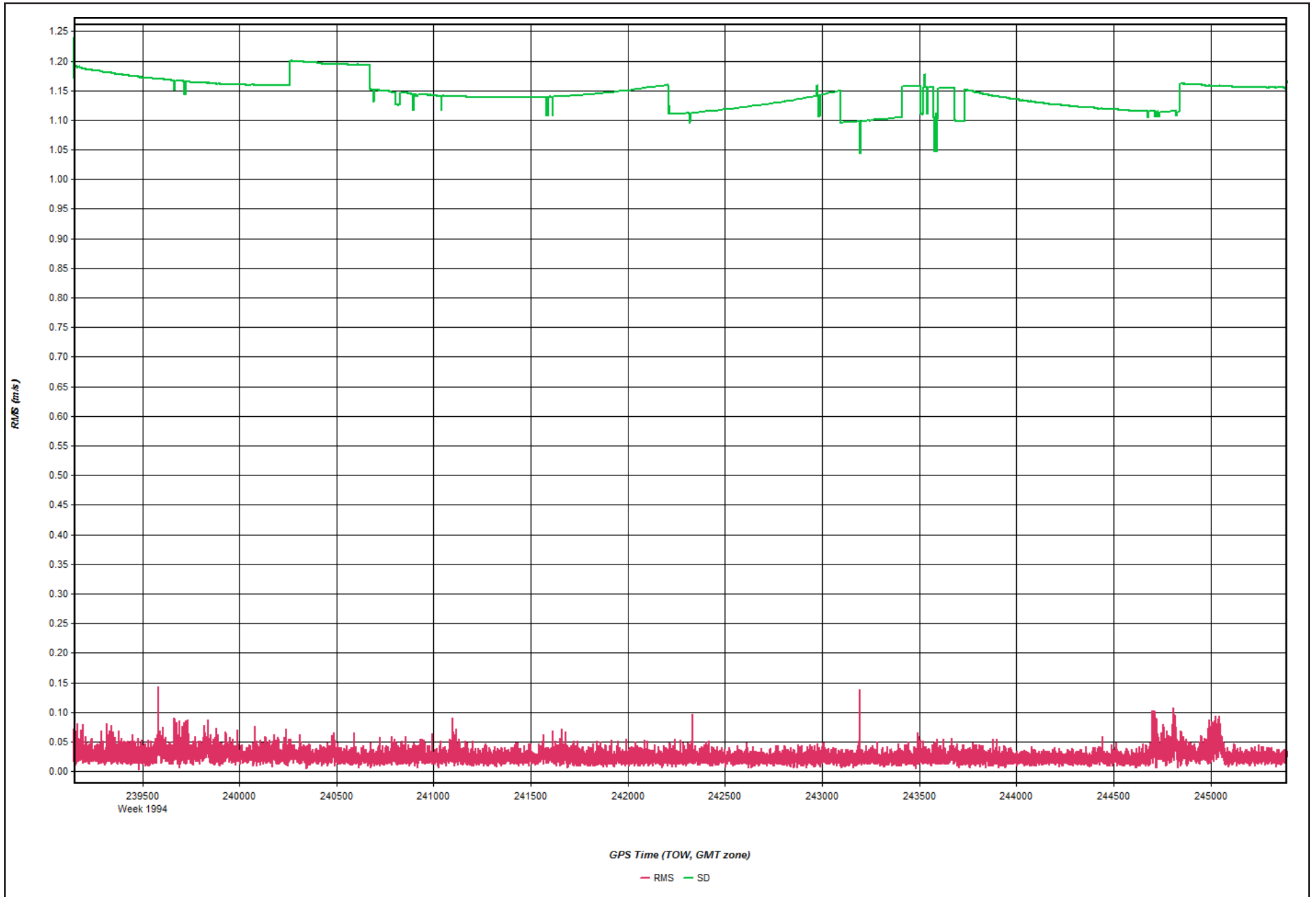
2018-03-27_Day086_7 - 20180327182502

Figure 17: Carrier Residual RMS Plot



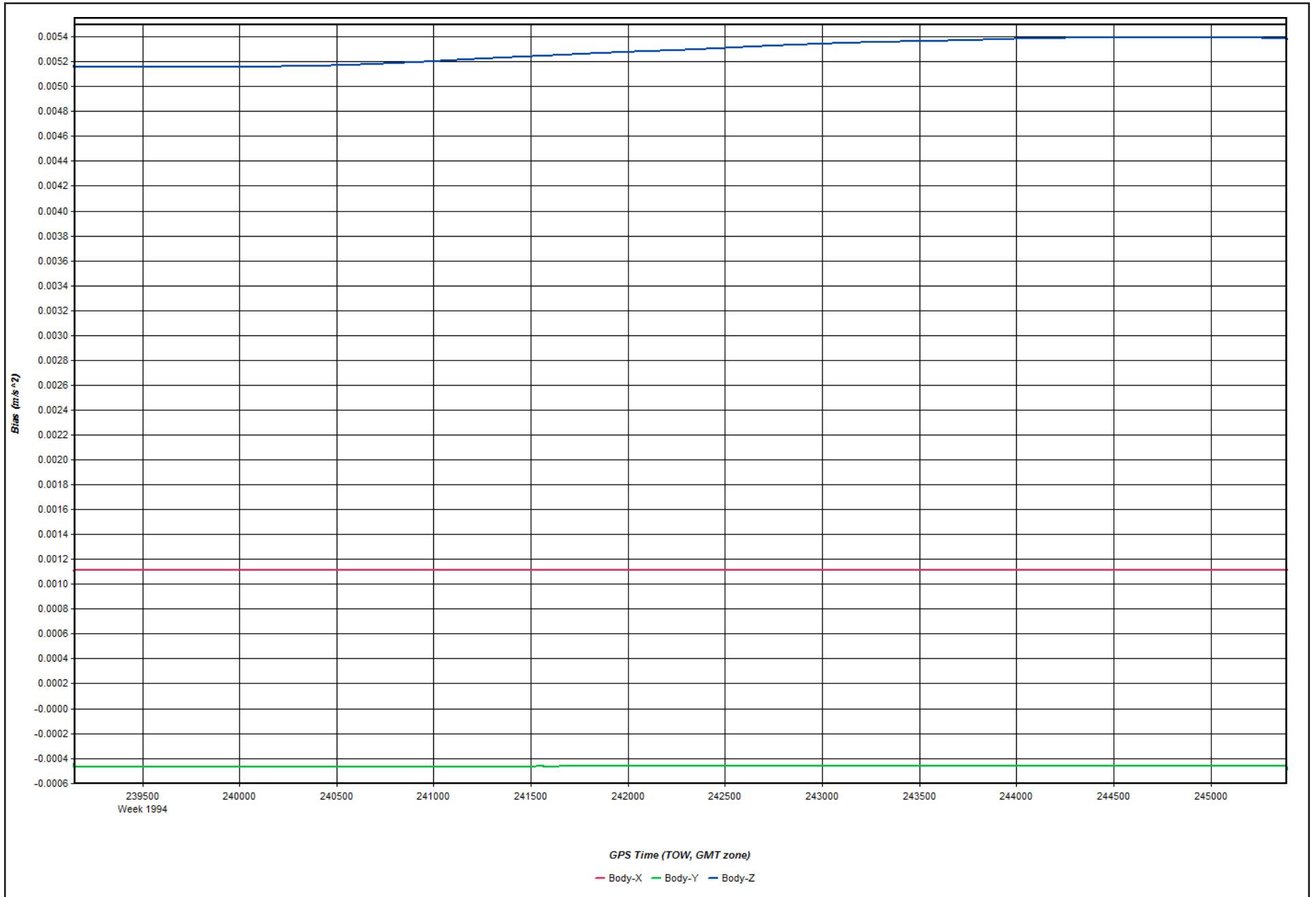
2018-03-27_Day086_7 - 20180327182502

Figure 18: L1 Doppler Residual RMS Plot



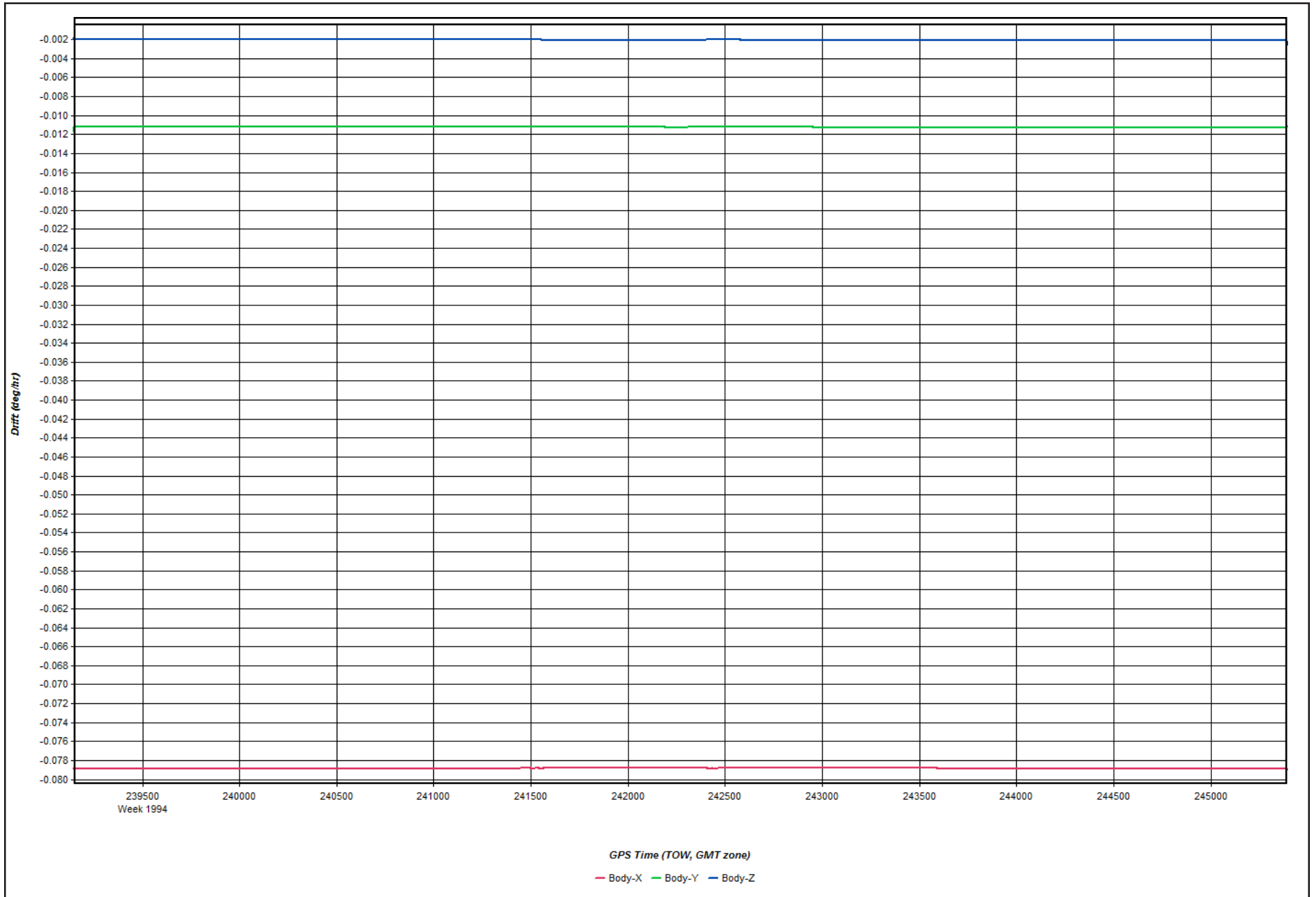
2018-03-27_Day086_7 - 20180327182502

Figure 19: Accelerometer Bias Plot



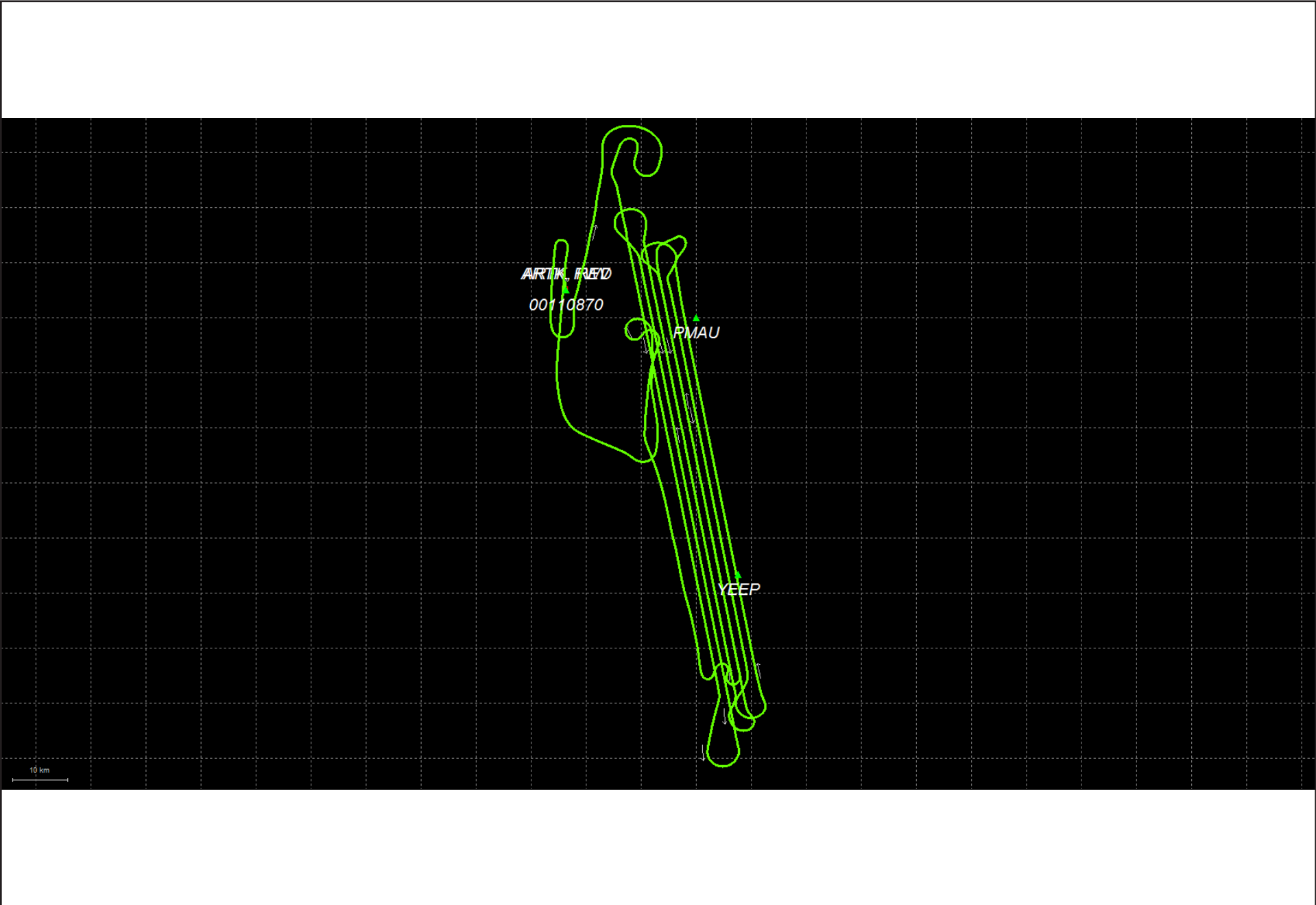
2018-03-27_Day086_7 - 20180327182502

Figure 20: Gyro Drift Plot



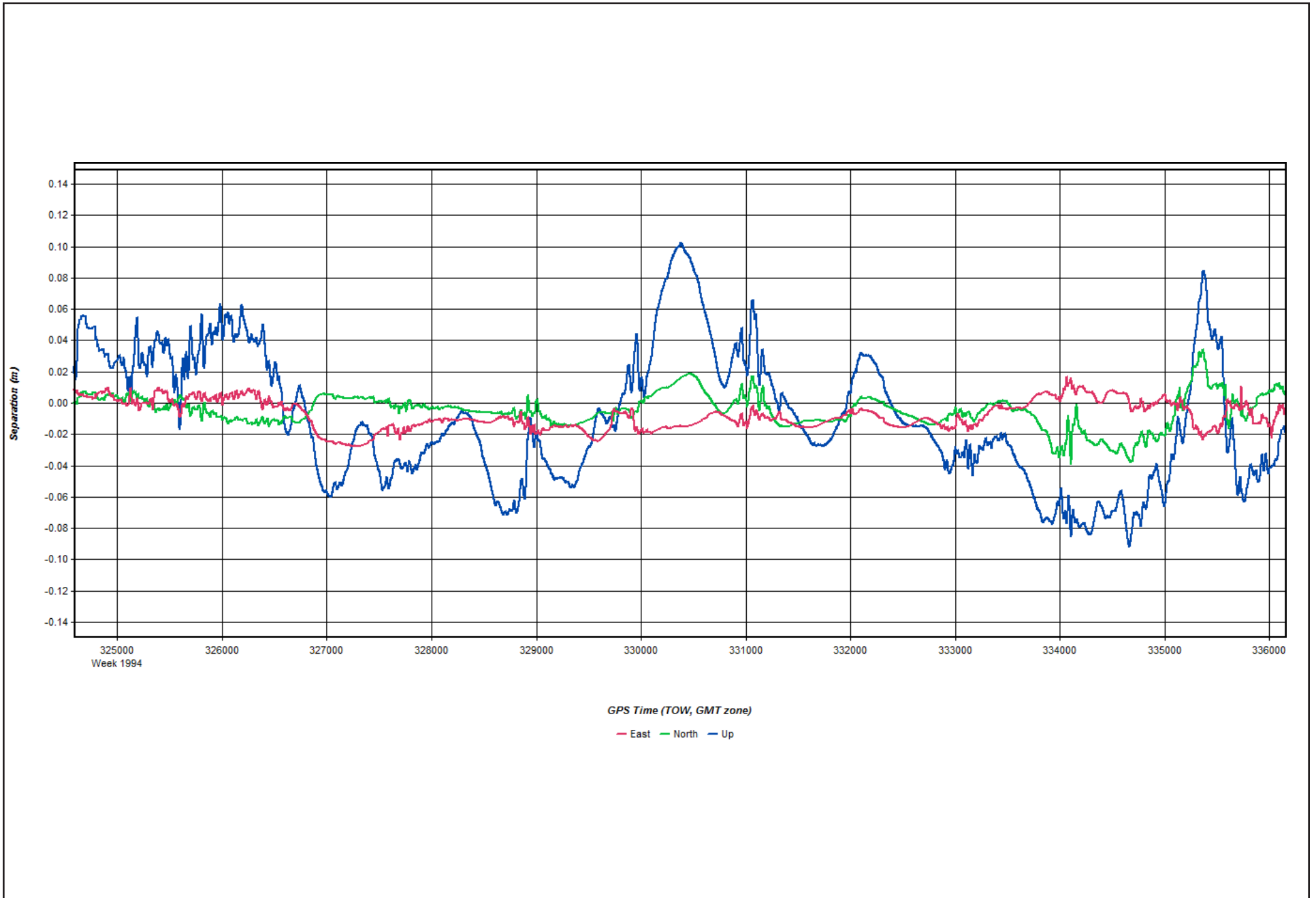
2018-03-28_Day087_7 - 20180328180848

Figure 1: Map



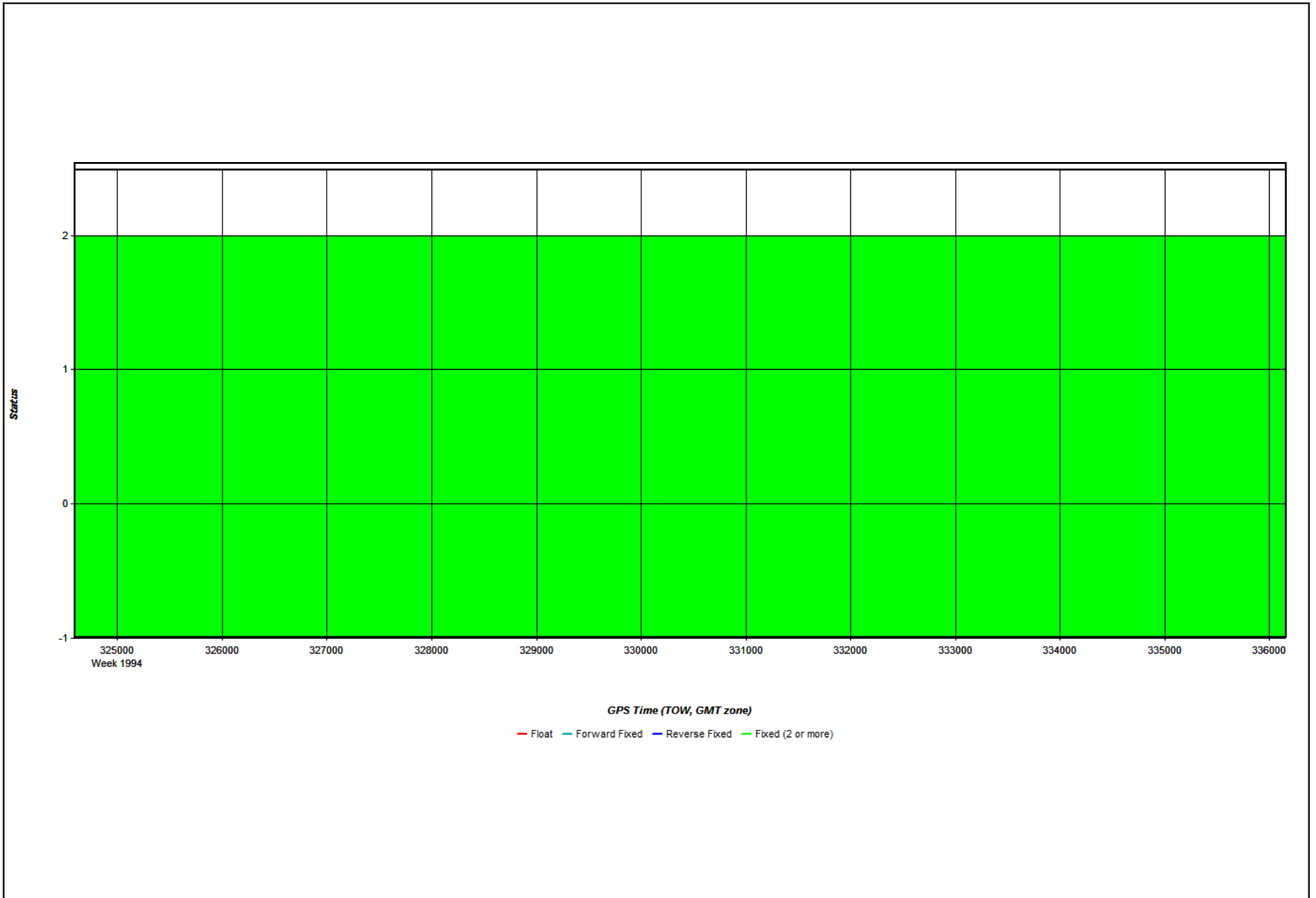
2018-03-28_Day087_7 - 20180328180848

Figure 2: Forward/Reverse or Combined Separation Plot



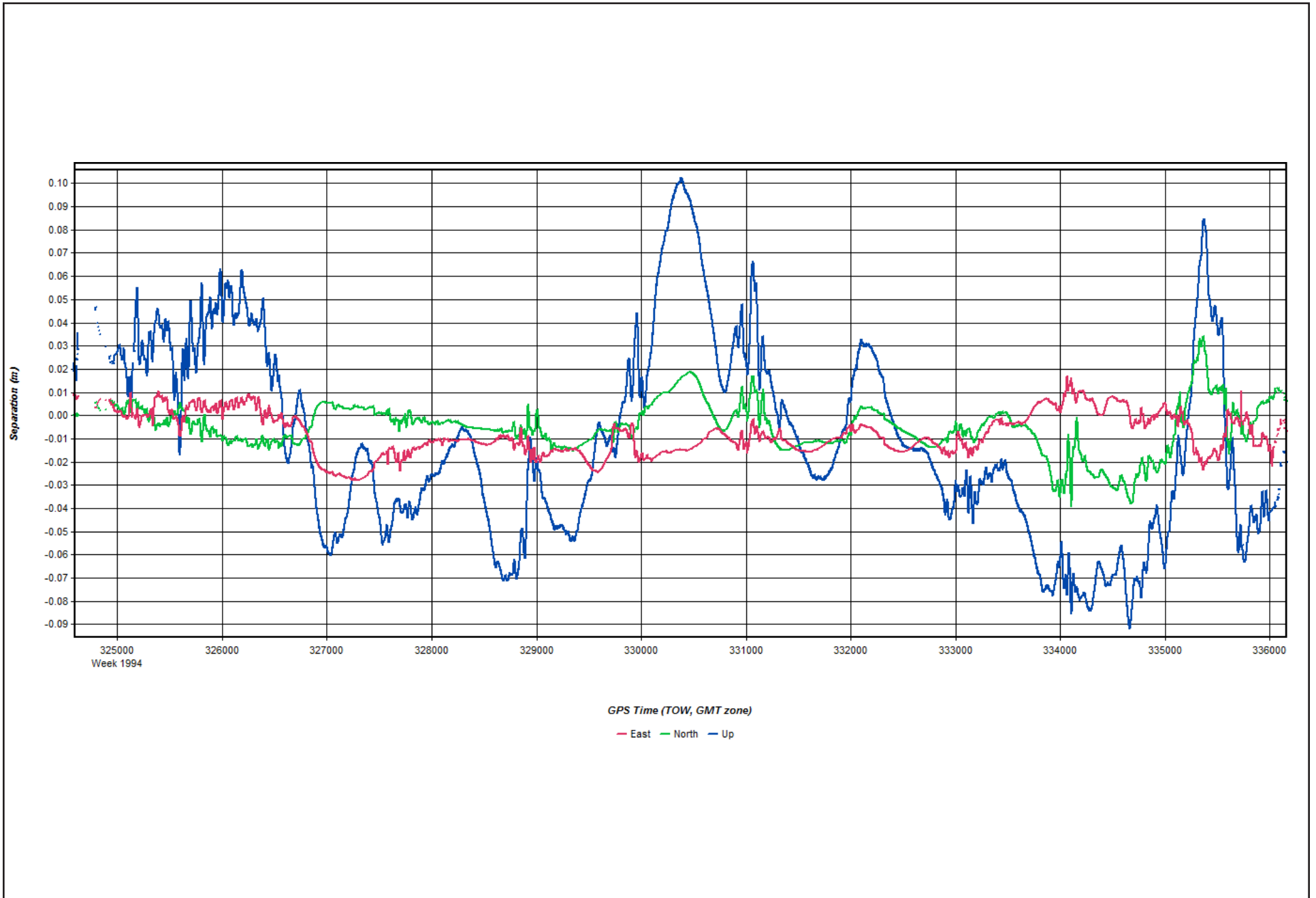
2018-03-28_Day087_7 - 20180328180848

Figure 3: Float or Fixed Ambiguity



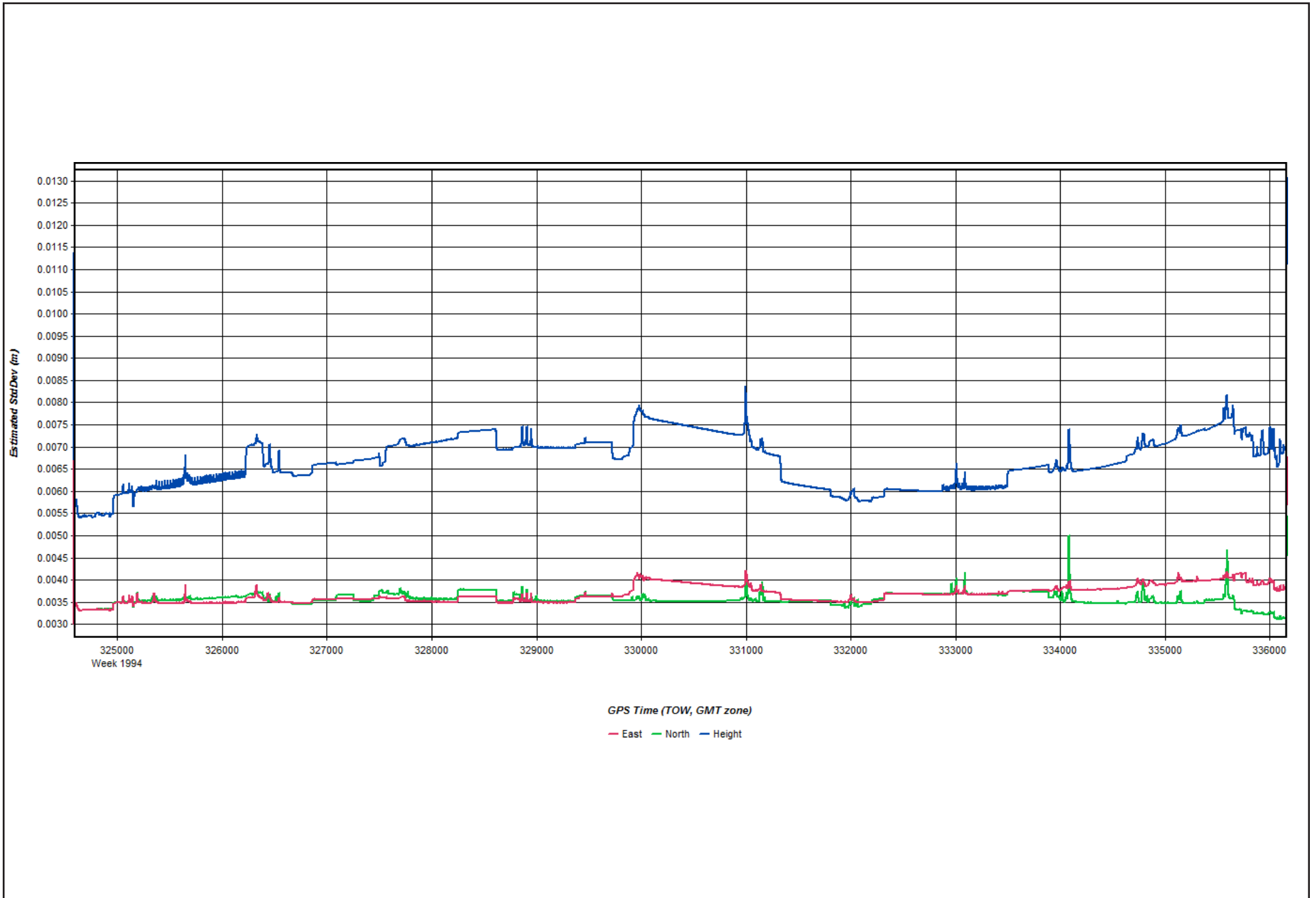
2018-03-28_Day087_7 - 20180328180848

Figure 4: Forward/Reverse Separation Plot (Fixed)



2018-03-28_Day087_7 - 20180328180848

Figure 5: Estimated Position Accuracy Plot



2018-03-28_Day087_7 - 20180328180848

Figure 6: PDOP Plot

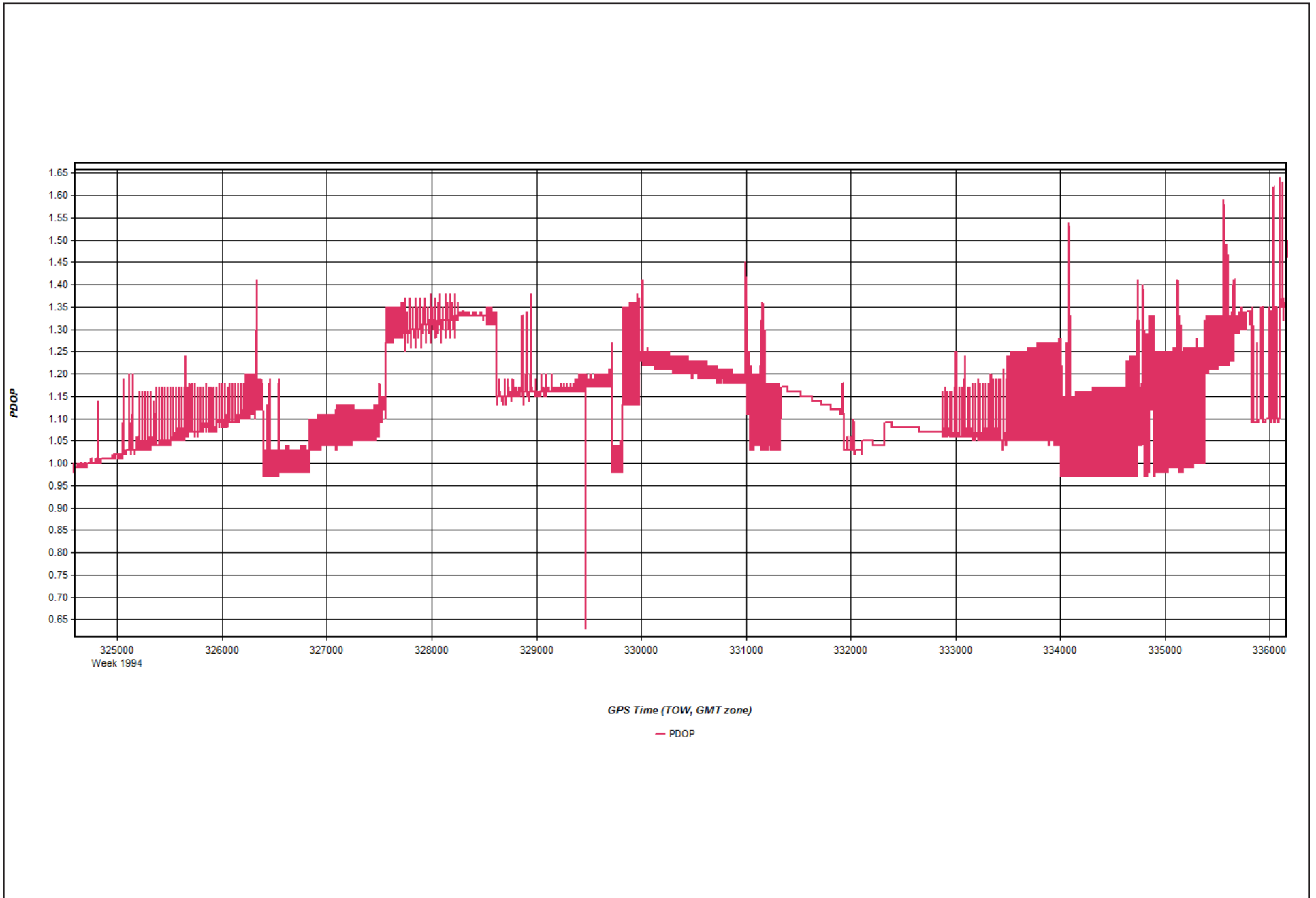
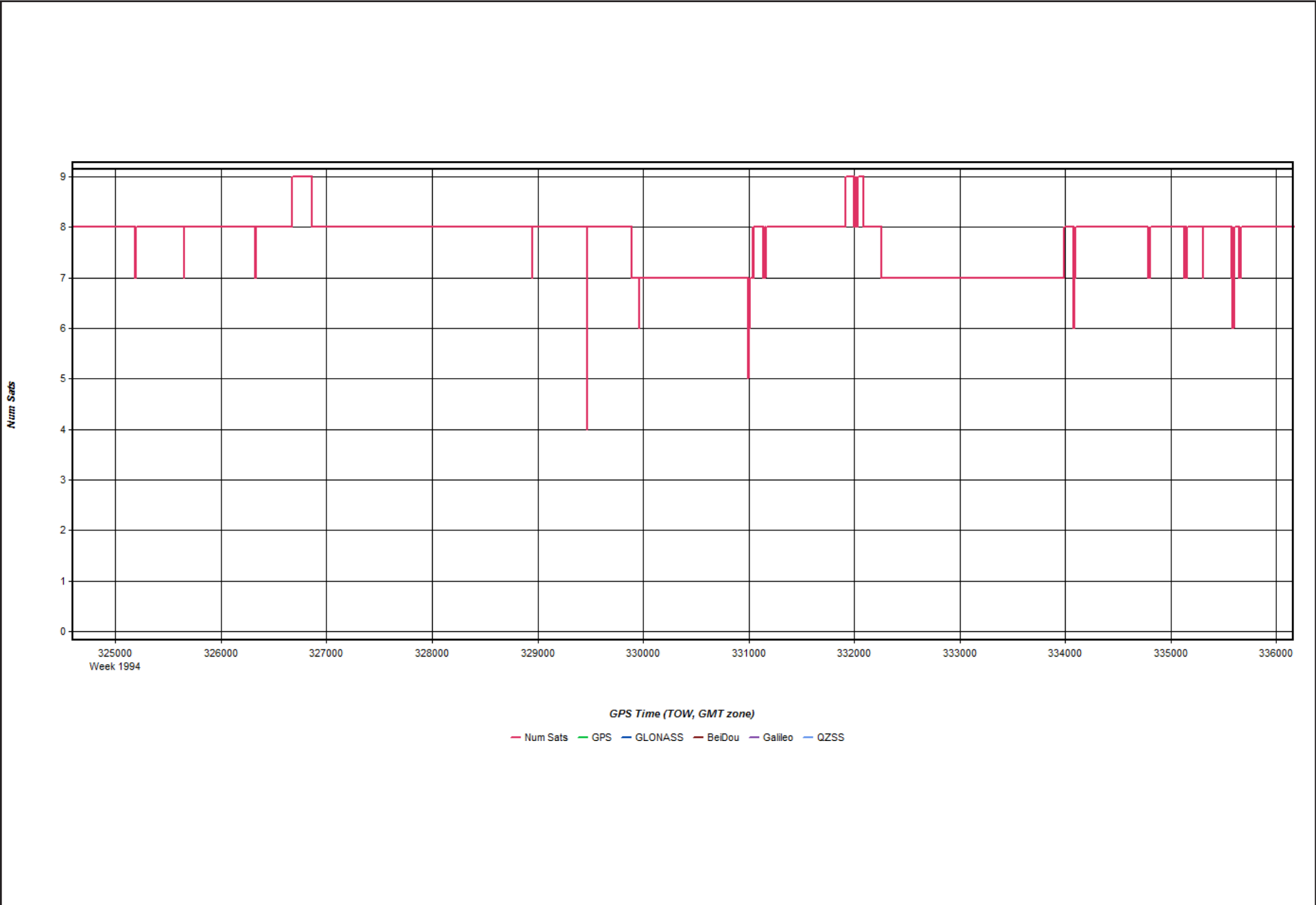
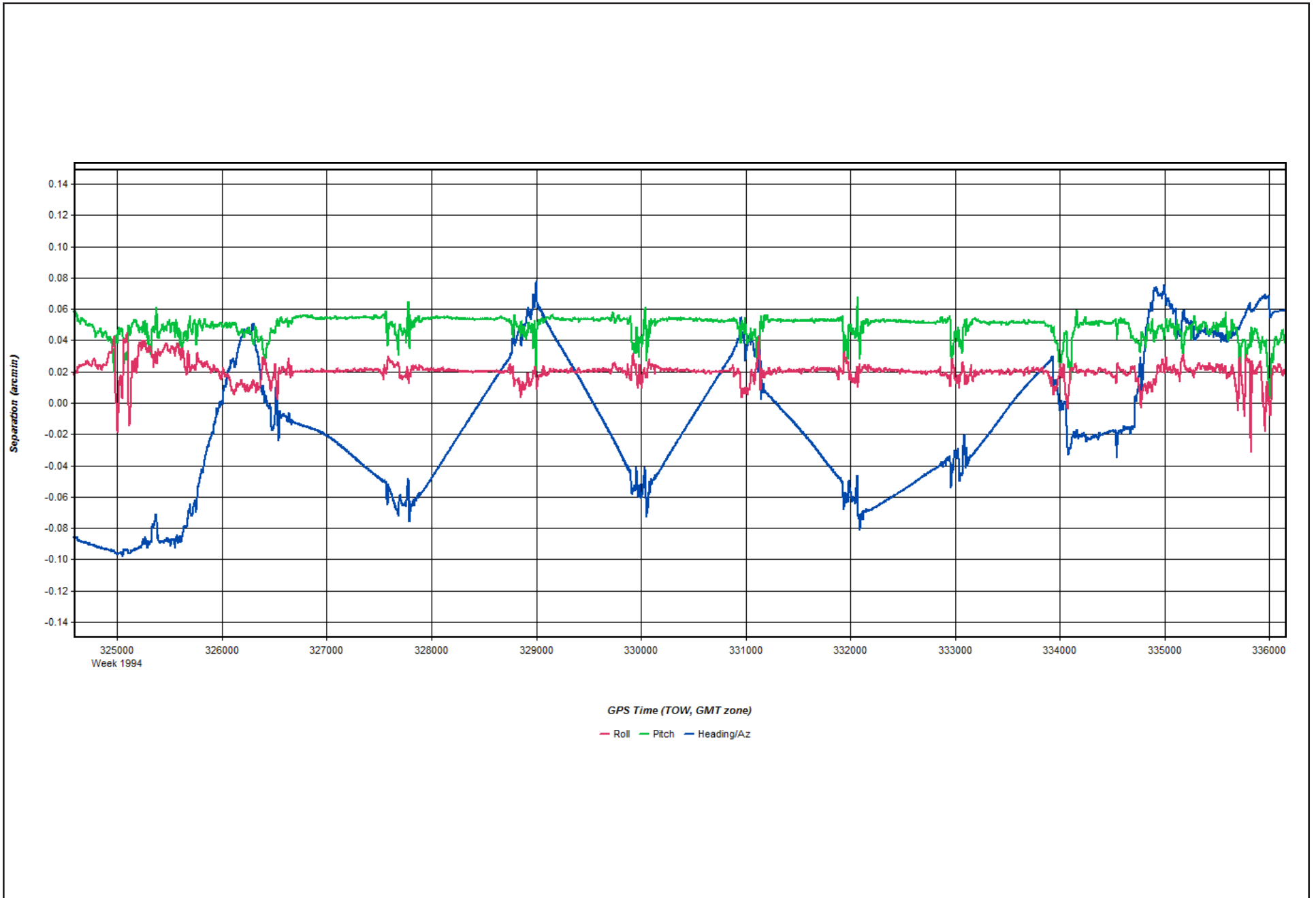


Figure 7: Number of Satellites Line Plot



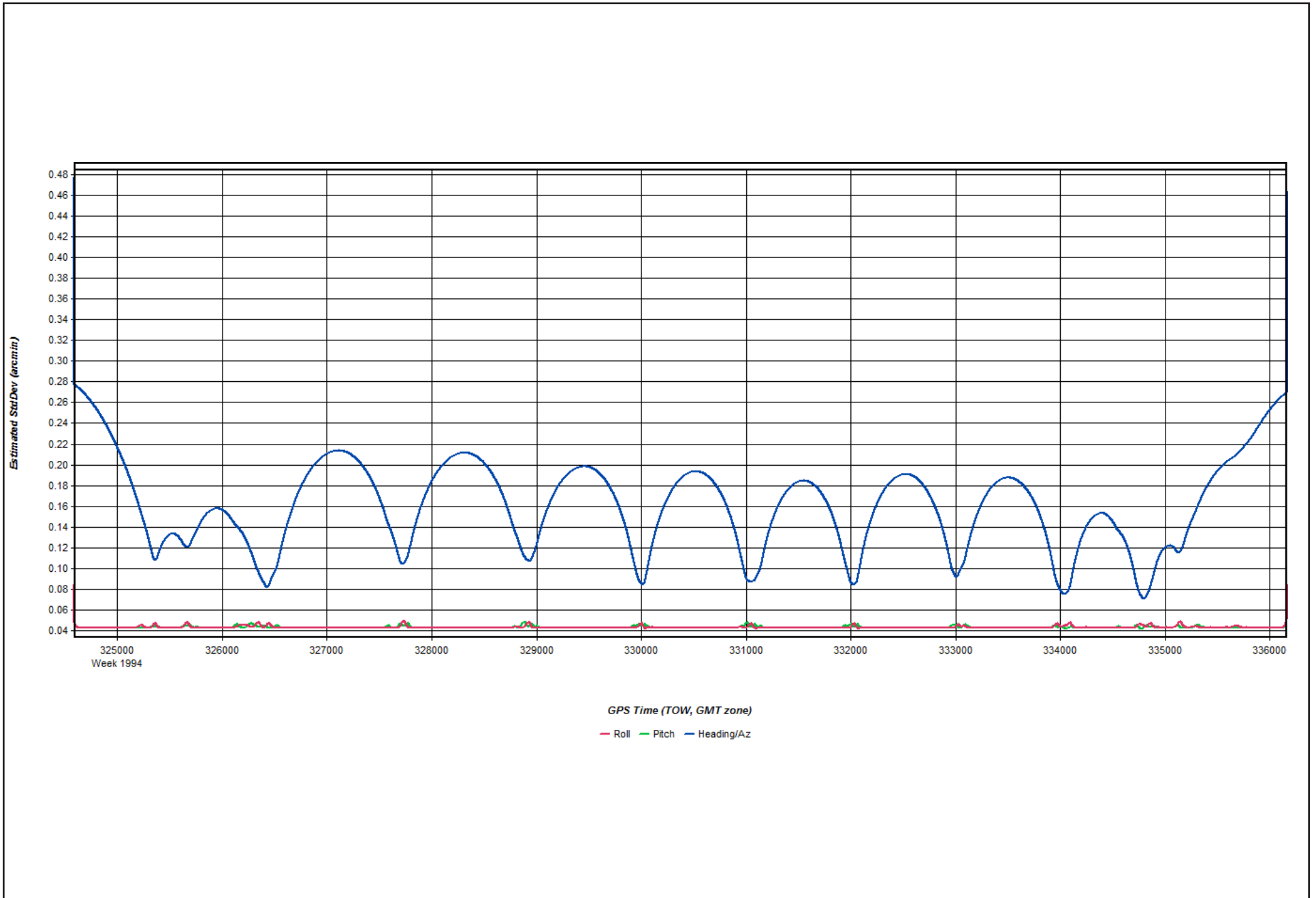
2018-03-28_Day087_7 - 20180328180848

Figure 9: Fwd/Rev Attitude Separation Plot



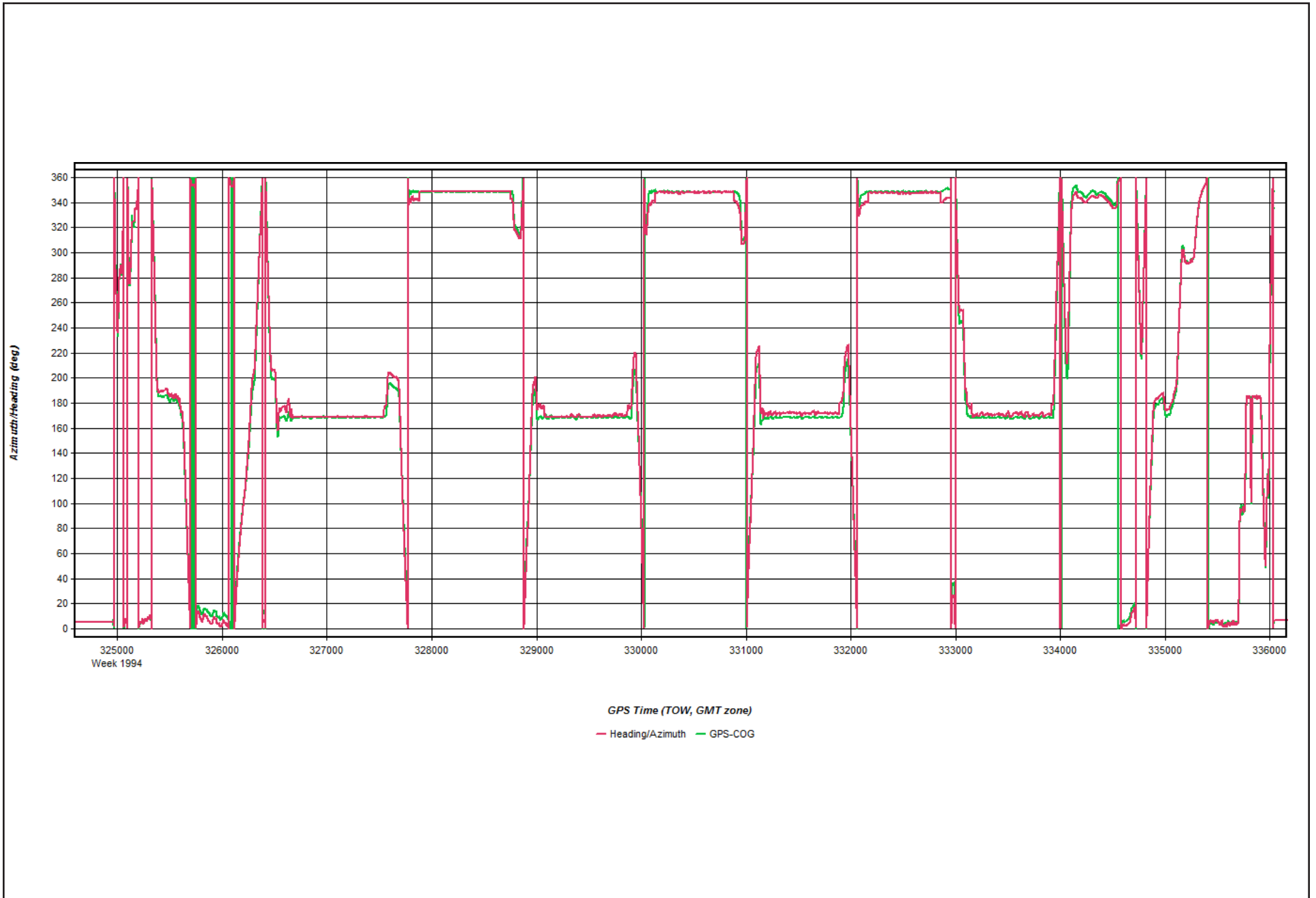
2018-03-28_Day087_7 - 20180328180848

Figure 10: Estimated Attitude Accuracy Plot



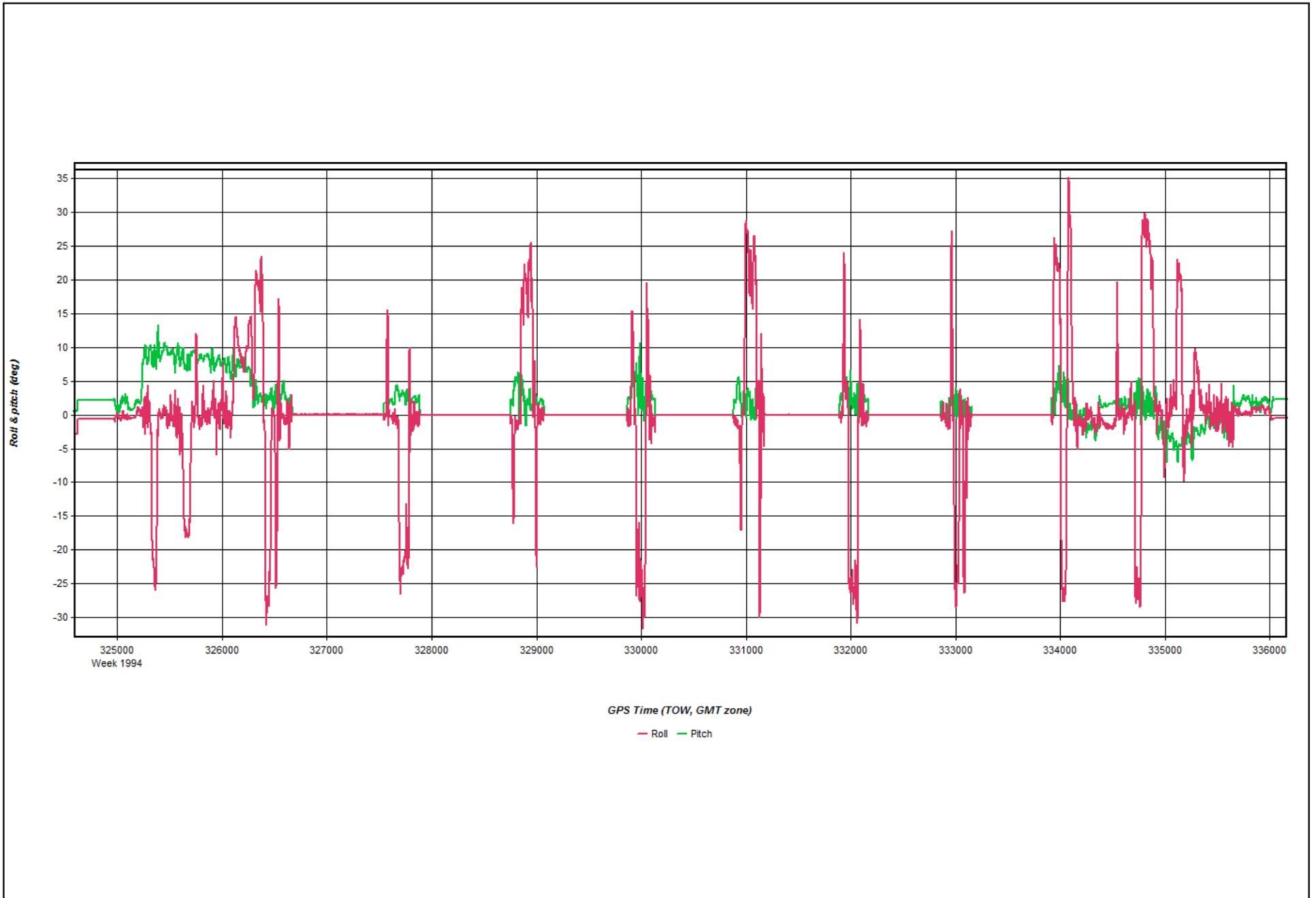
2018-03-28_Day087_7 - 20180328180848

Figure 11: Azimuth Plot



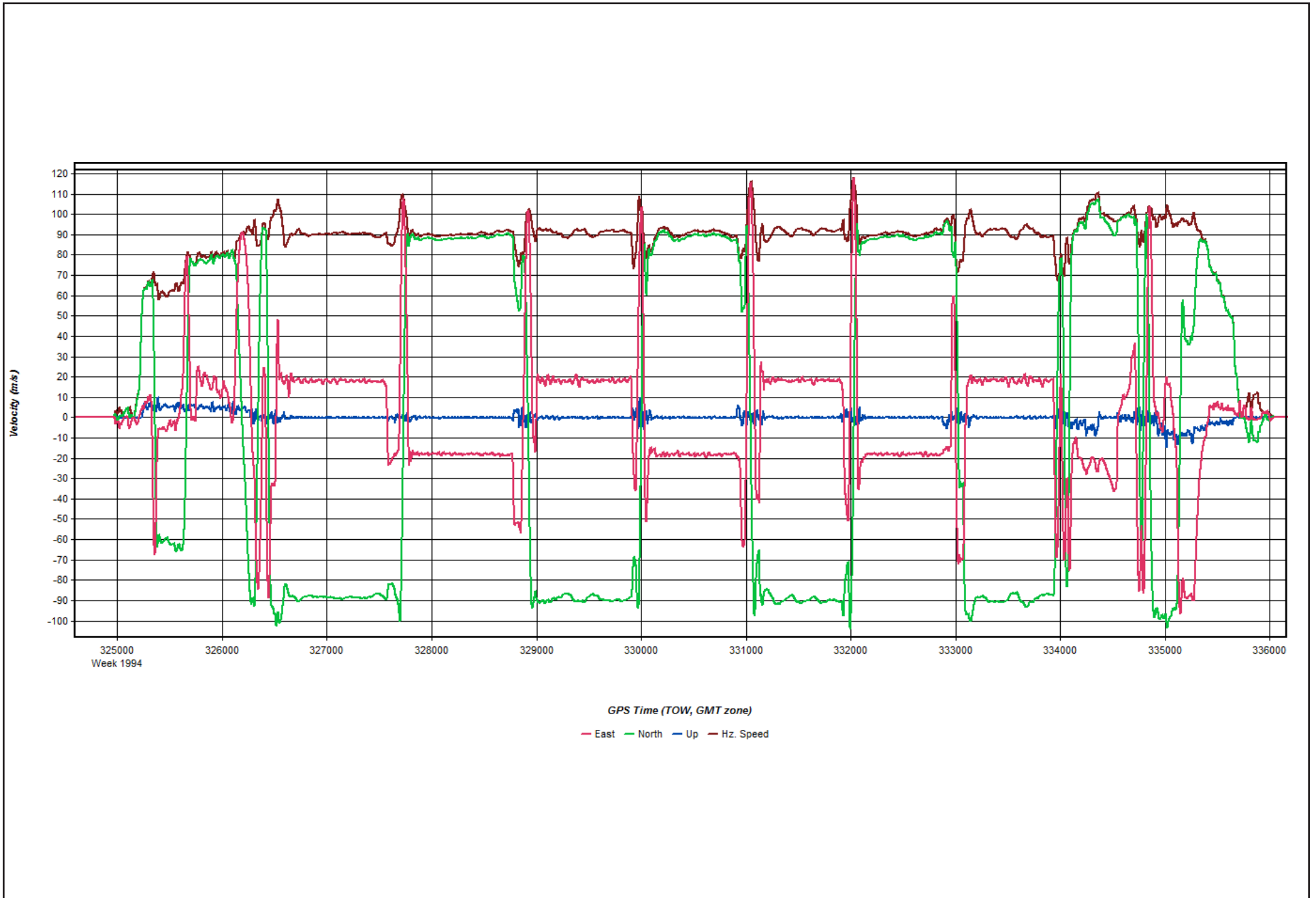
2018-03-28_Day087_7 - 20180328180848

Figure 12: Roll & Pitch Plot



2018-03-28_Day087_7 - 20180328180848

Figure 13: Velocity Profile Plot



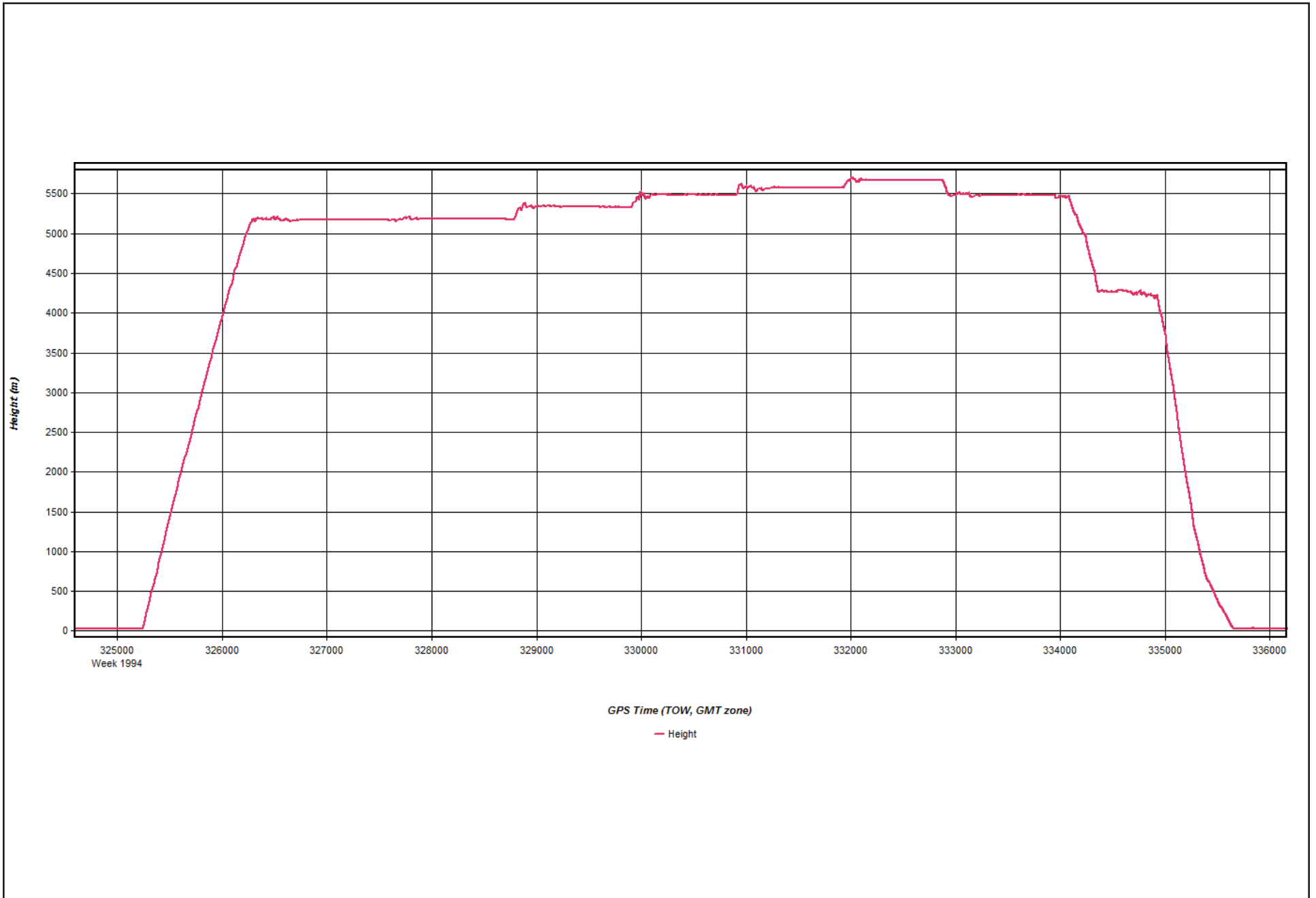
2018-03-28_Day087_7 - 20180328180848

Figure 14: Body Frame Velocity Plot



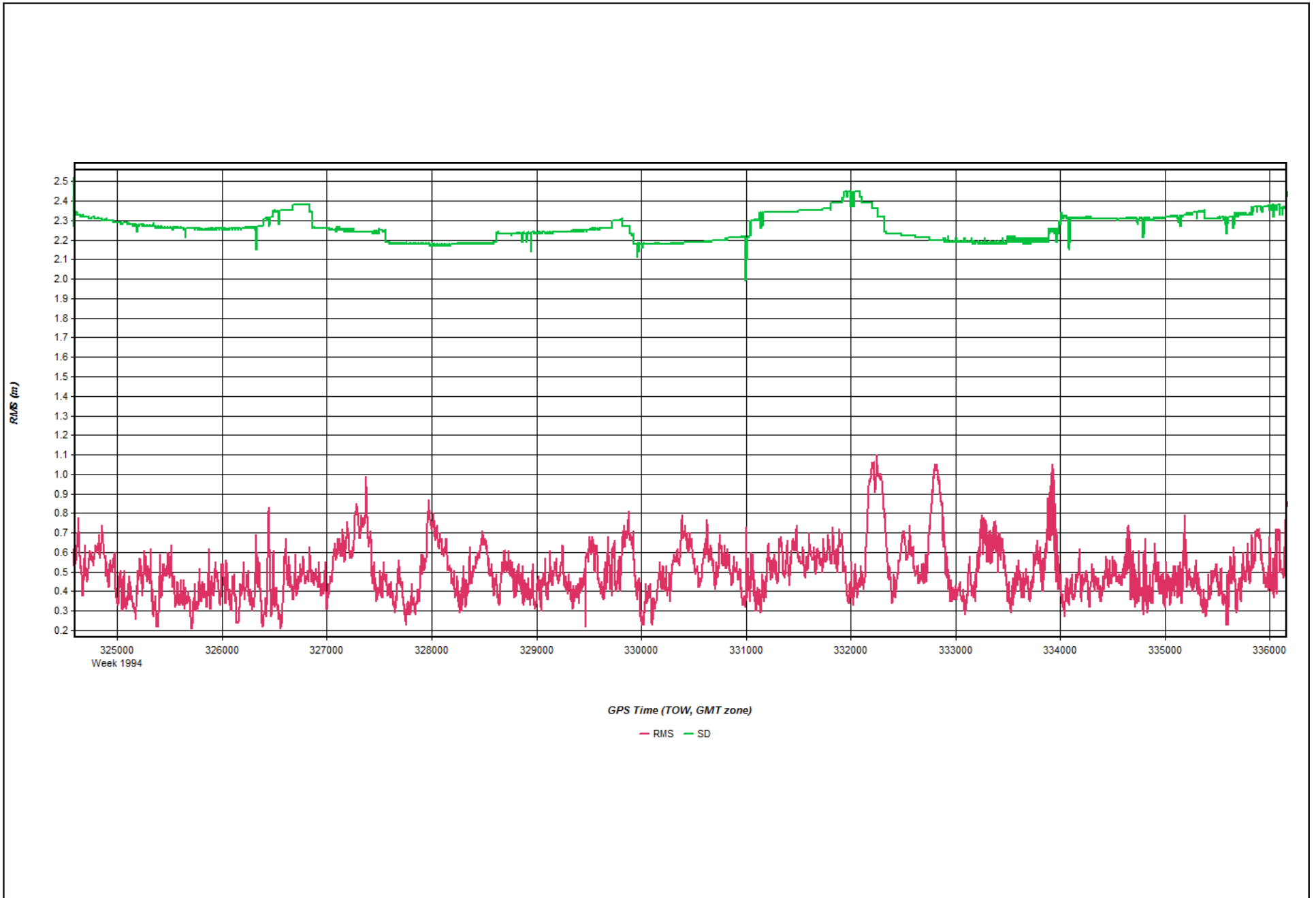
2018-03-28_Day087_7 - 20180328180848

Figure 15: Height Profile Plot



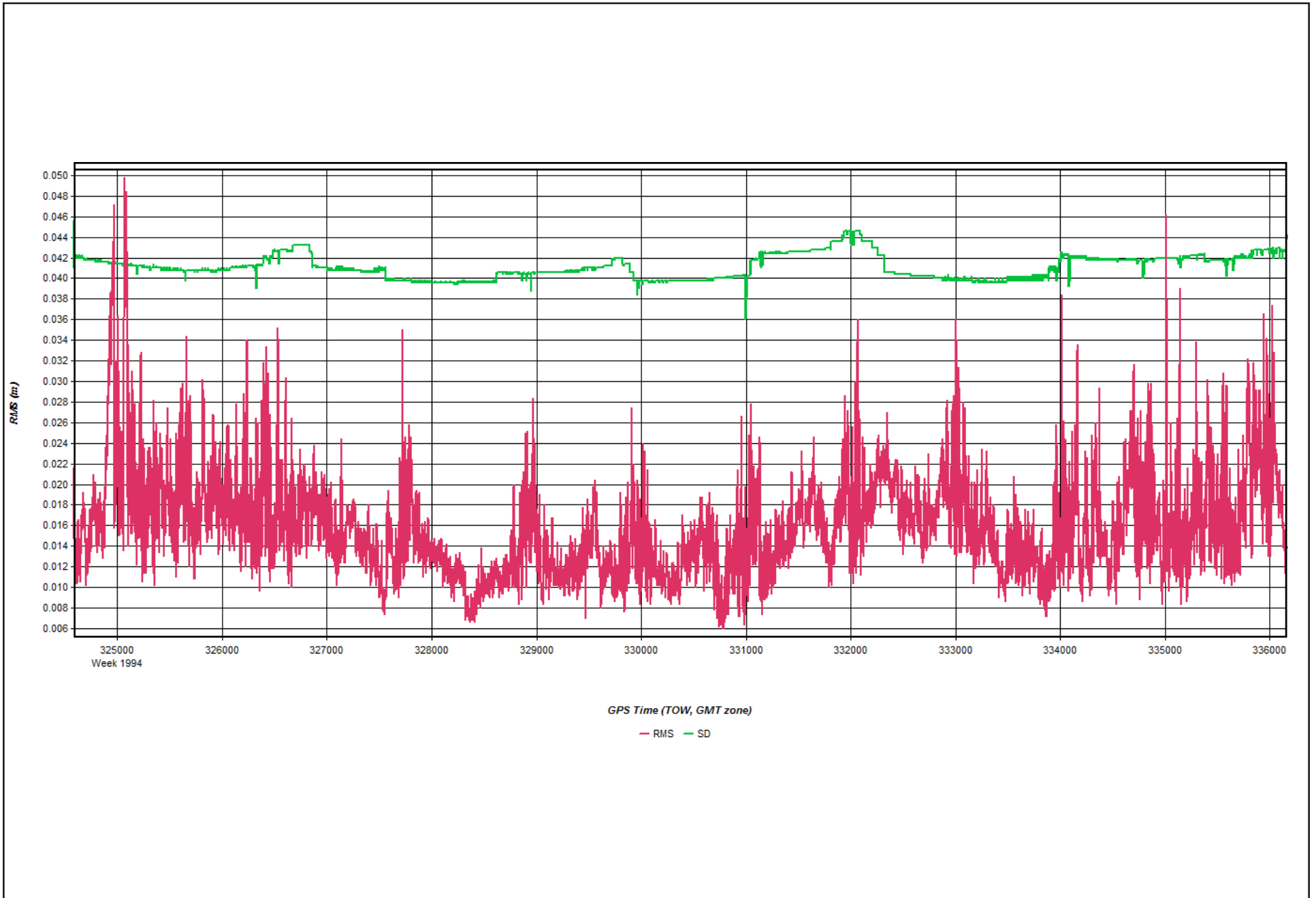
2018-03-28_Day087_7 - 20180328180848

Figure 16: C/A Code Residual RMS Plot



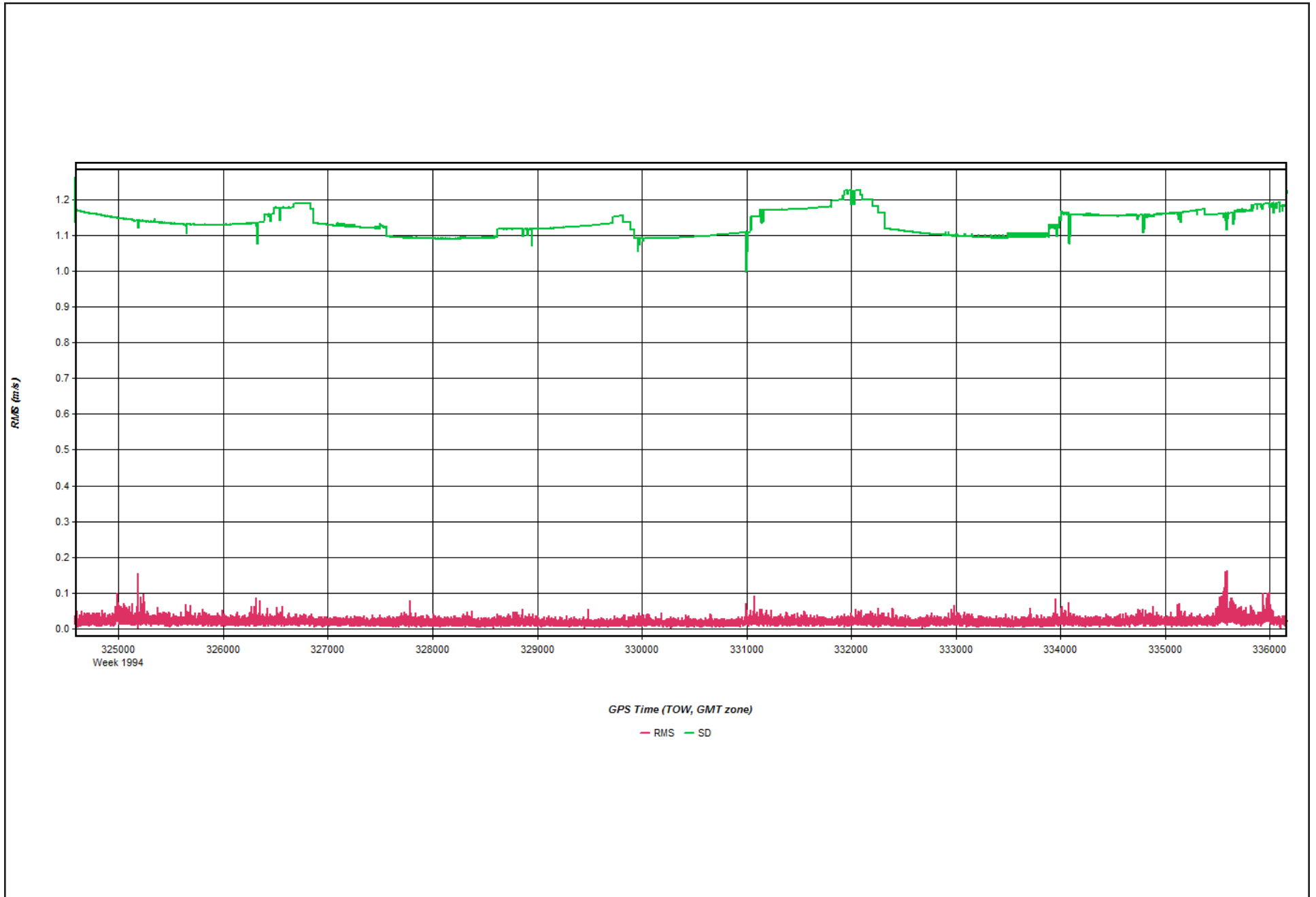
2018-03-28_Day087_7 - 20180328180848

Figure 17: Carrier Residual RMS Plot



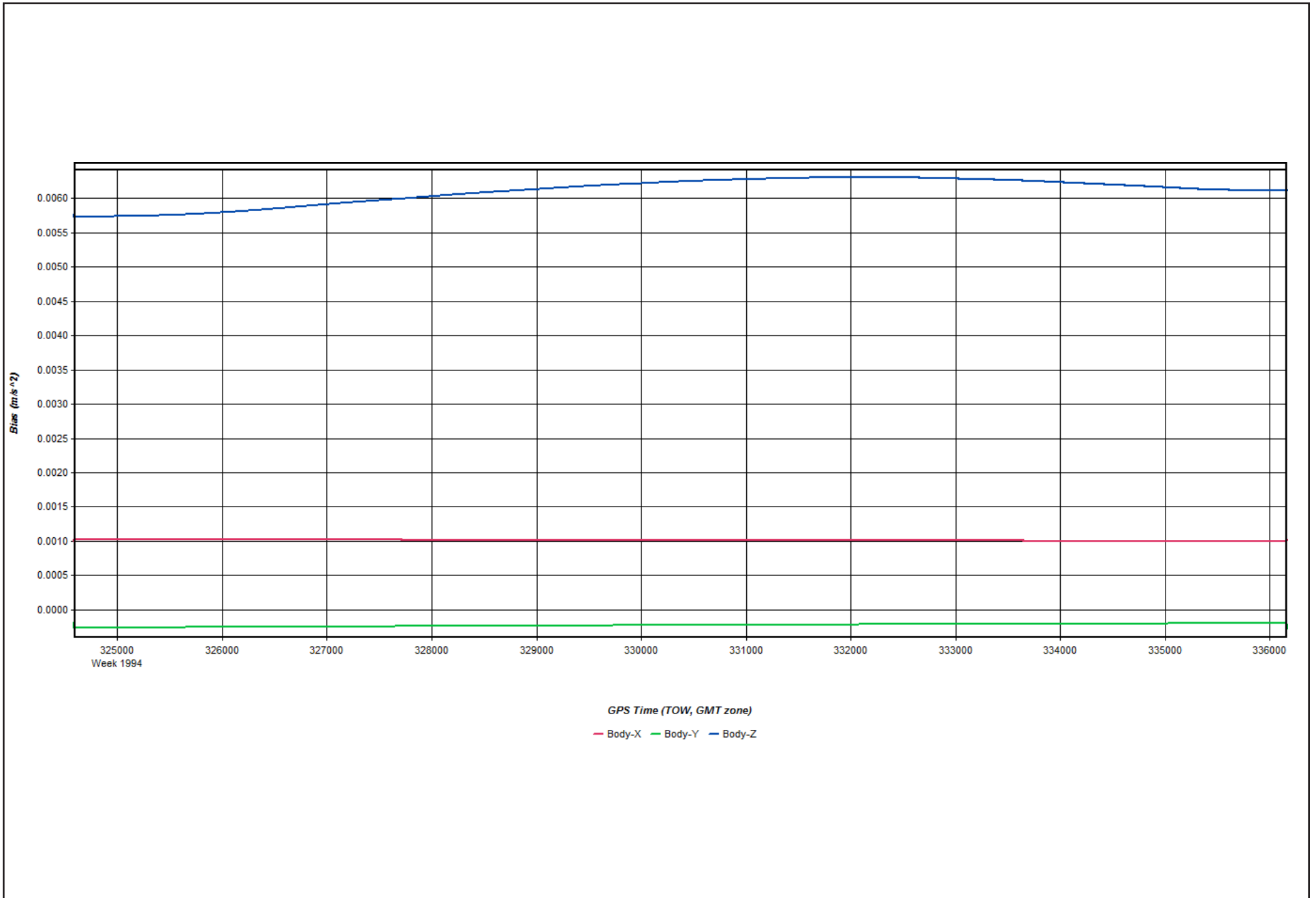
2018-03-28_Day087_7 - 20180328180848

Figure 18: L1 Doppler Residual RMS Plot



2018-03-28_Day087_7 - 20180328180848

Figure 19: Accelerometer Bias Plot



2018-03-28_Day087_7 - 20180328180848

Figure 20: Gyro Drift Plot

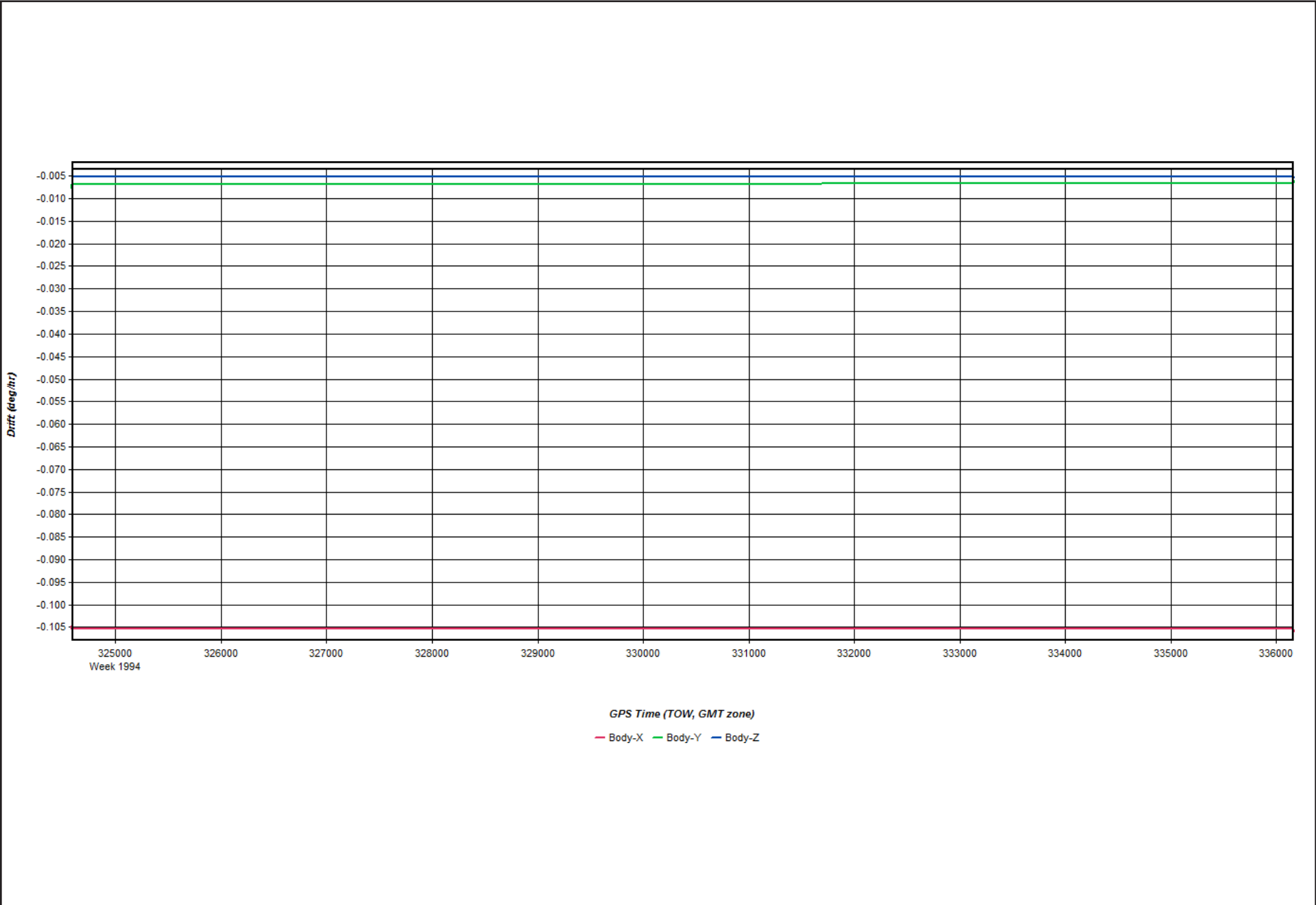


Figure 1: Map

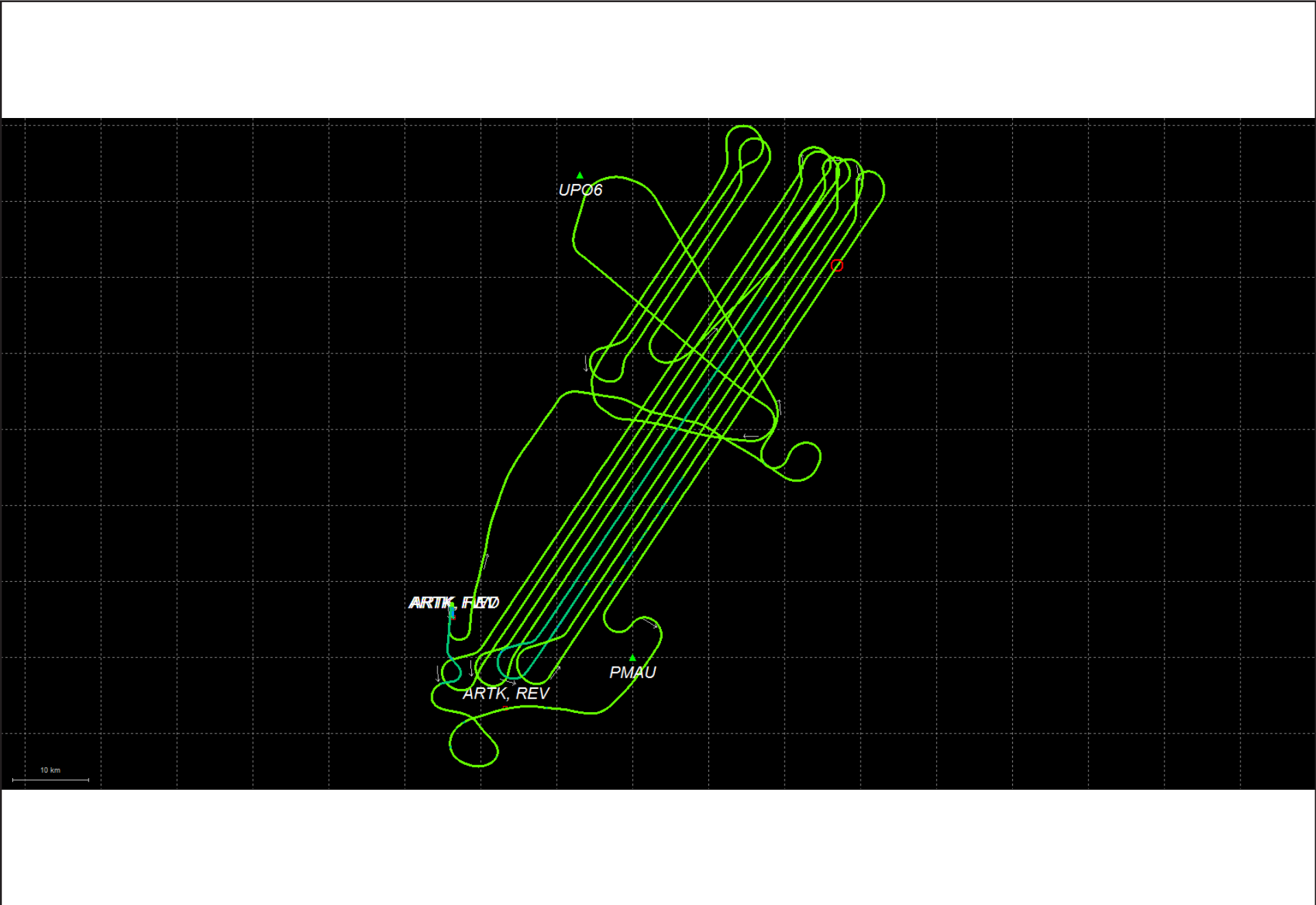


Figure 2: Forward/Reverse or Combined Separation Plot

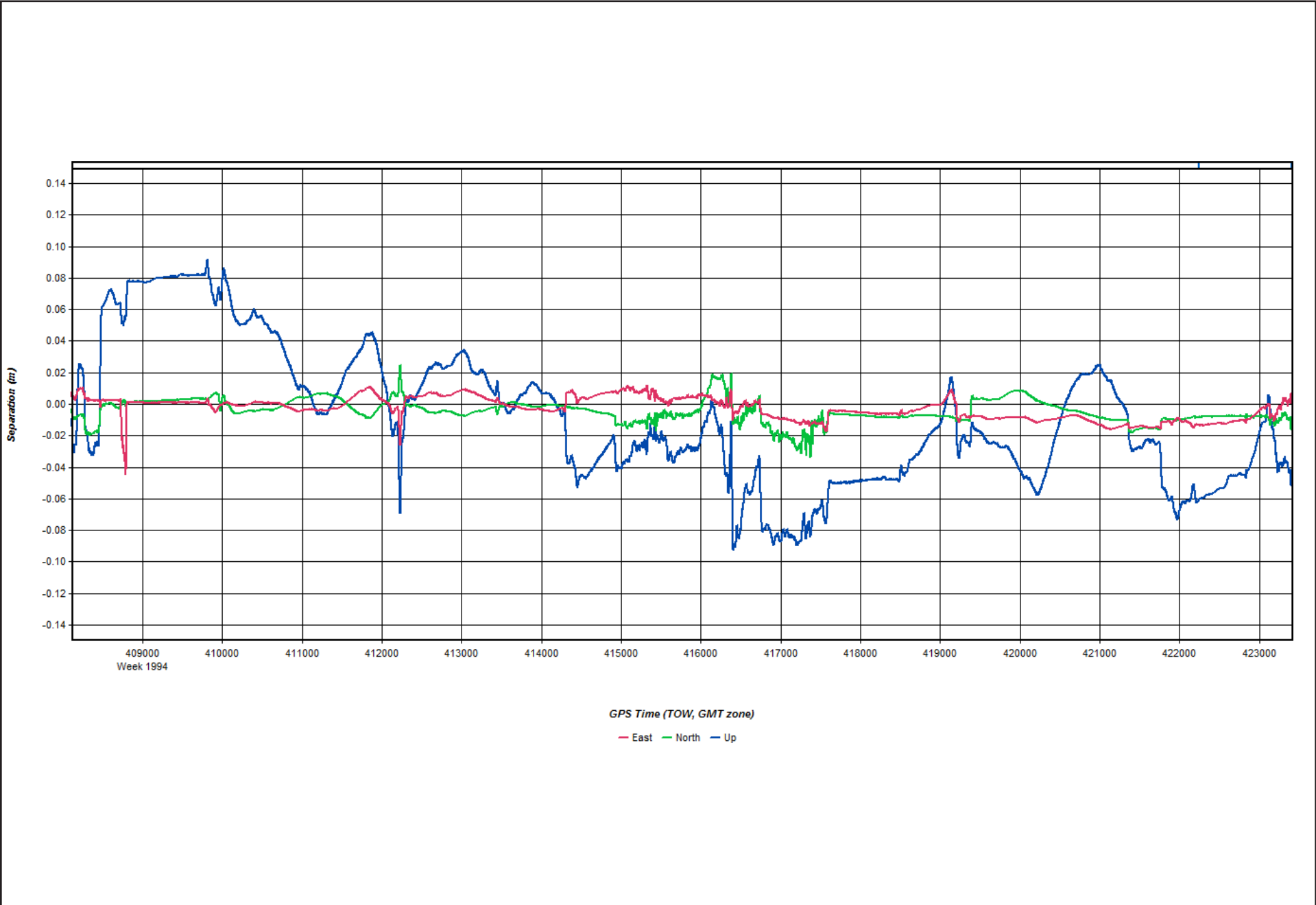
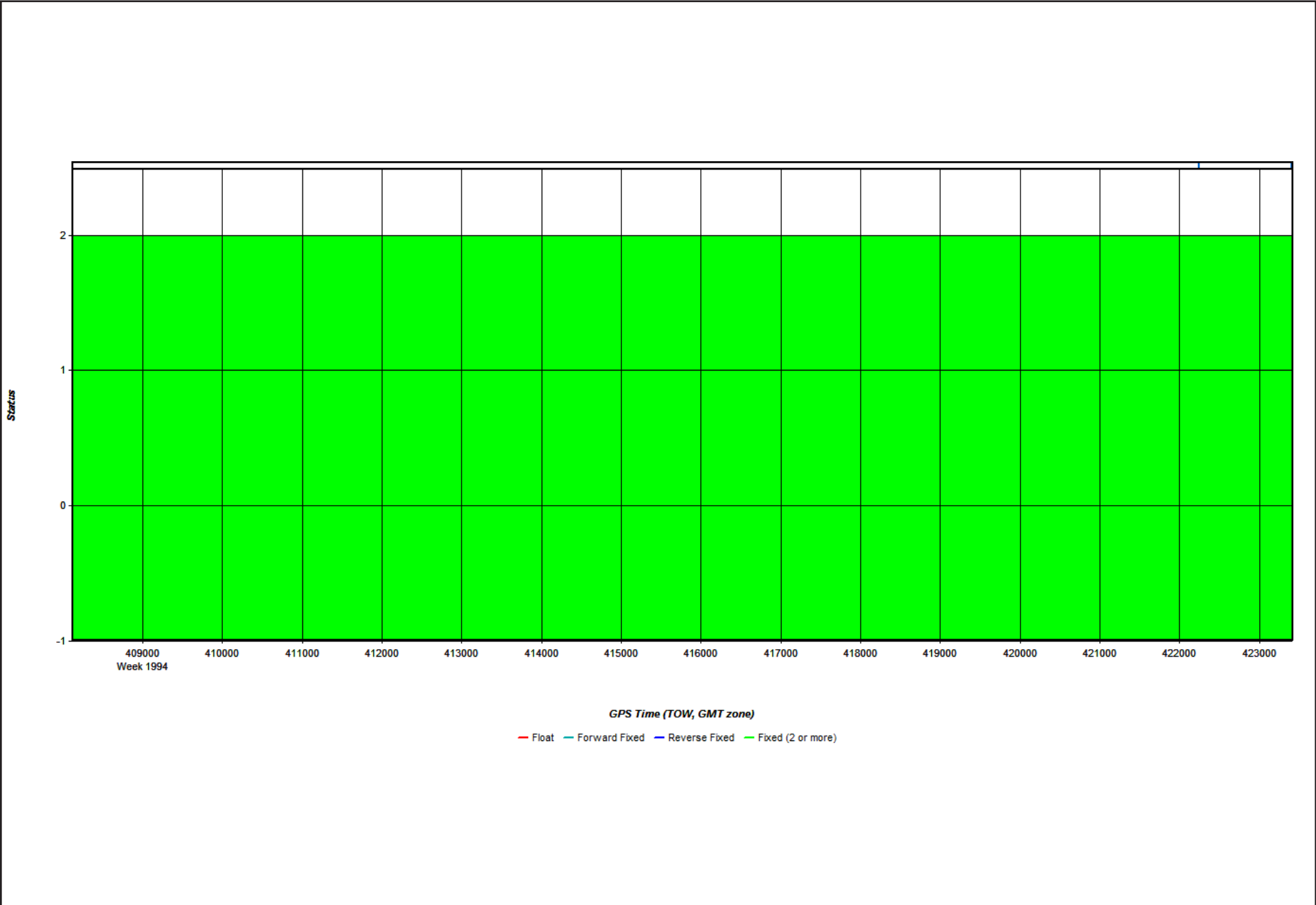


Figure 3: Float or Fixed Ambiguity



2018-03-29_Day088_7 - 20180329172052

Figure 4: Forward/Reverse Separation Plot (Fixed)

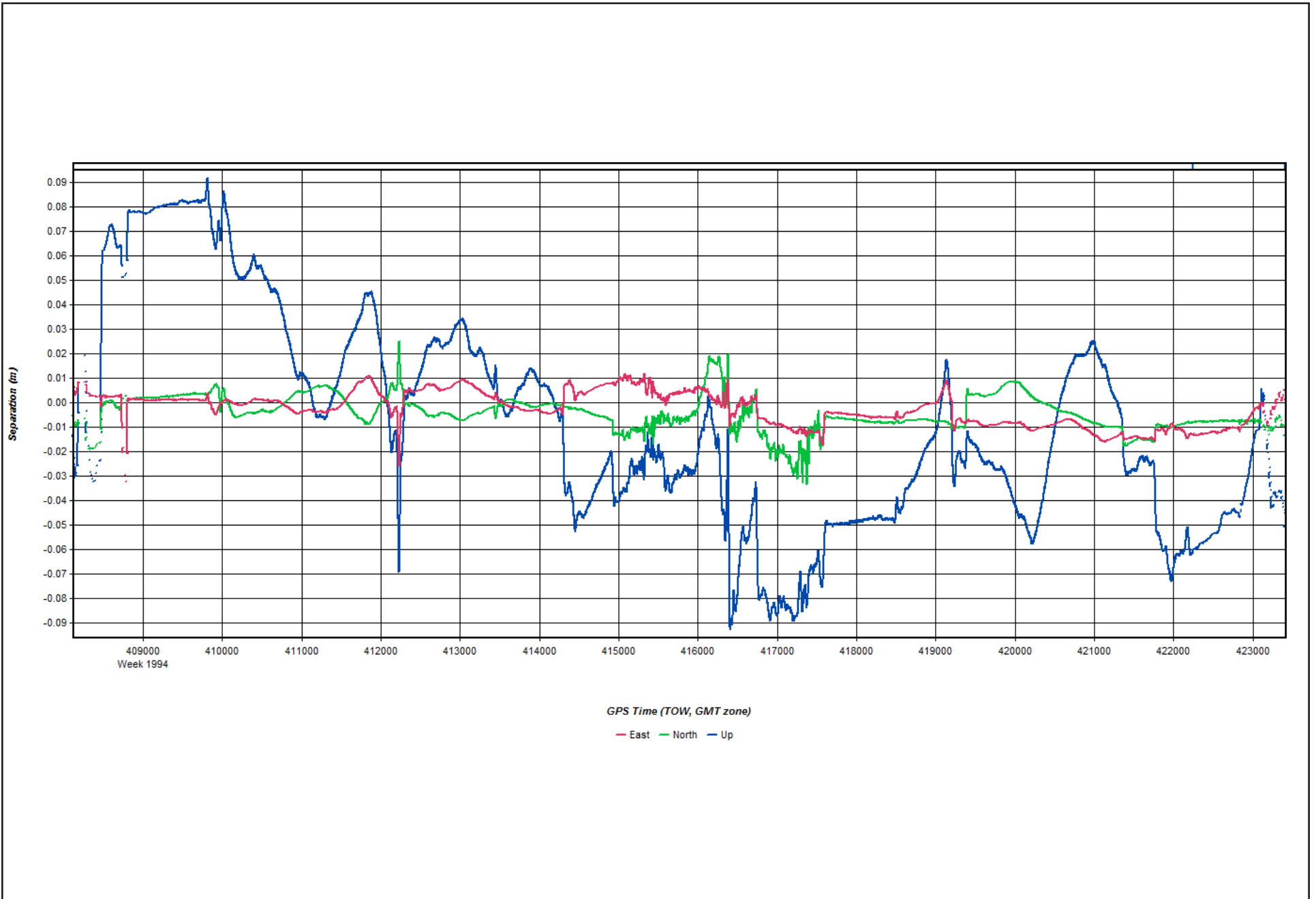


Figure 5: Estimated Position Accuracy Plot

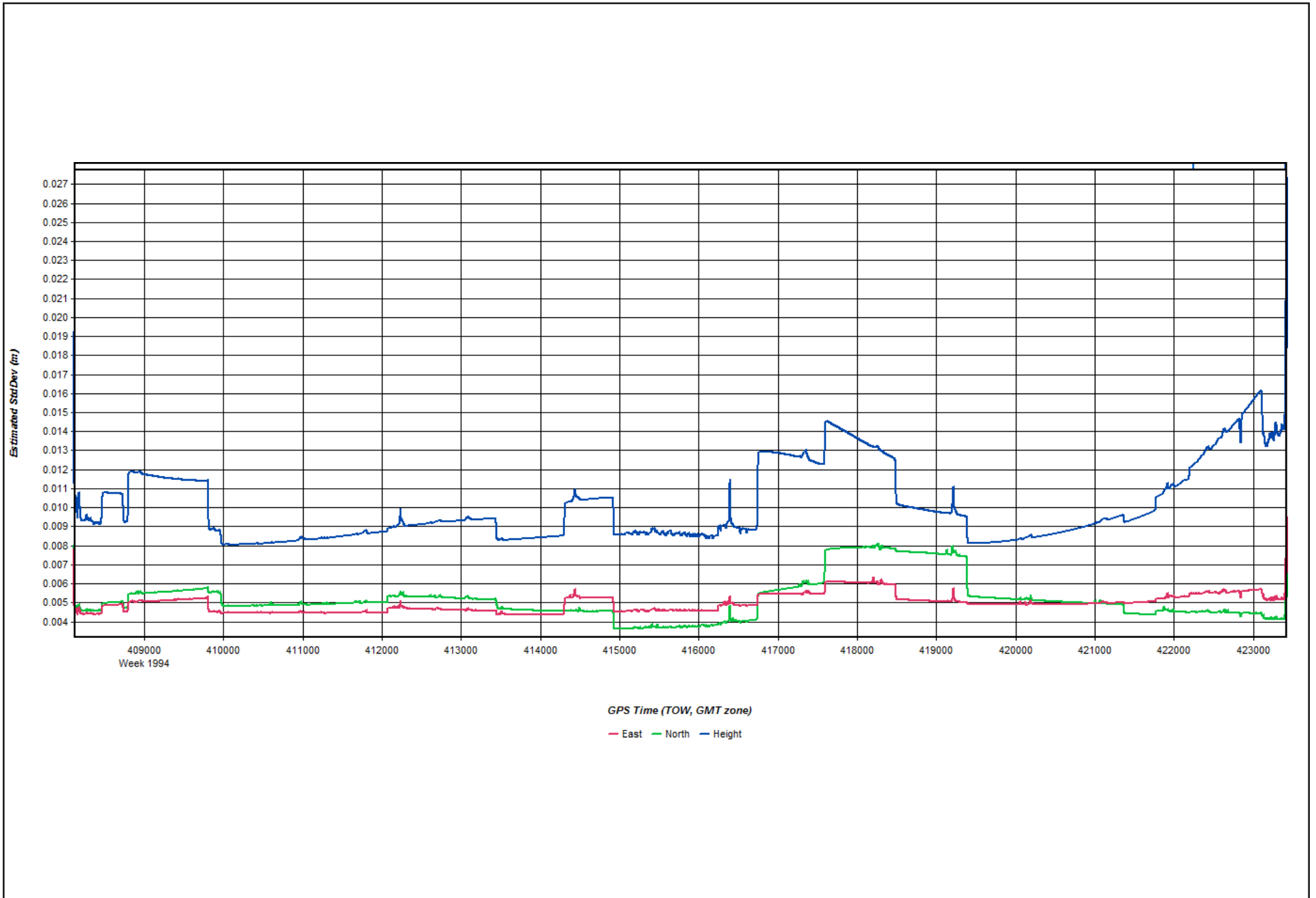


Figure 6: PDOP Plot

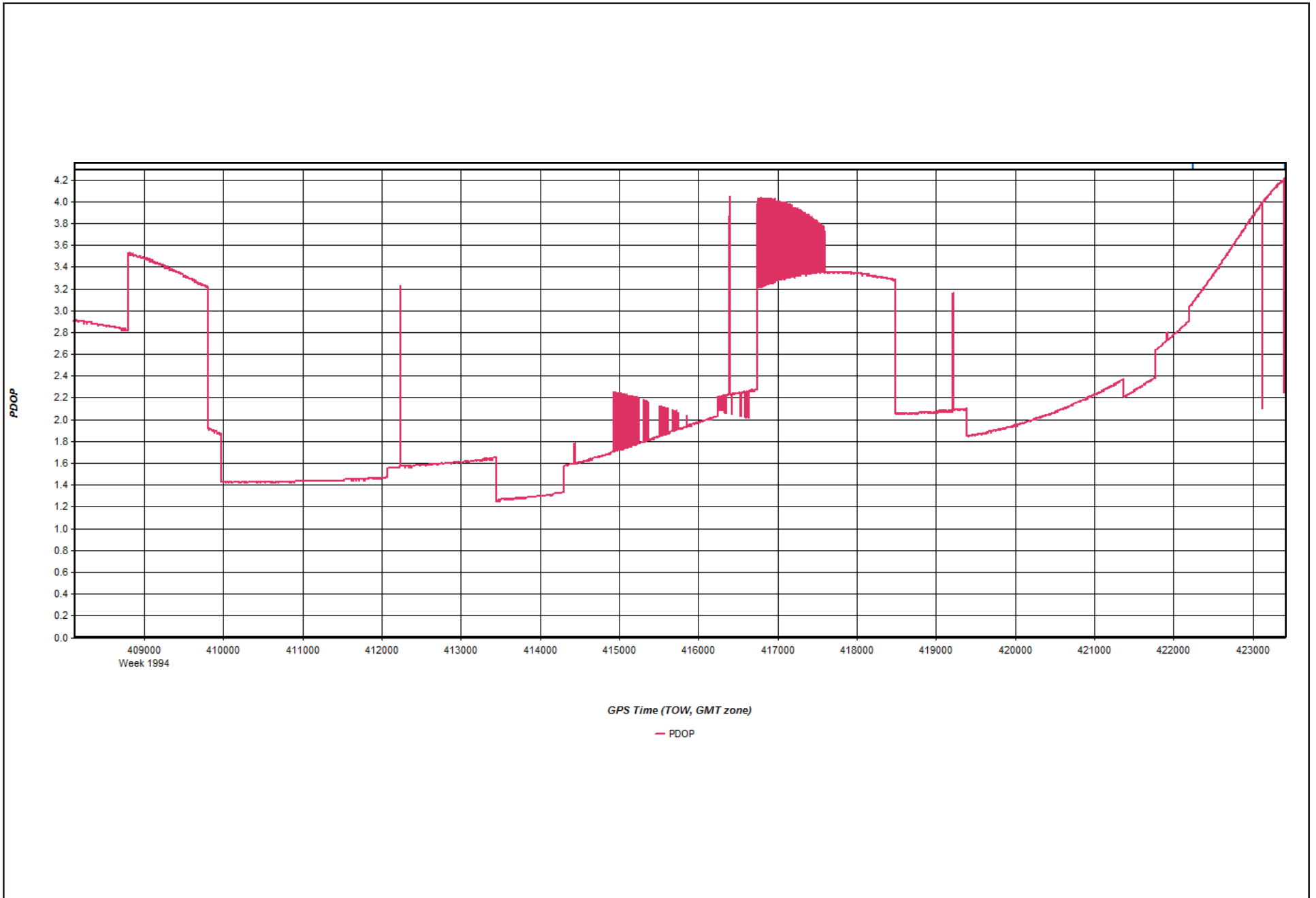


Figure 7: Number of Satellites Line Plot

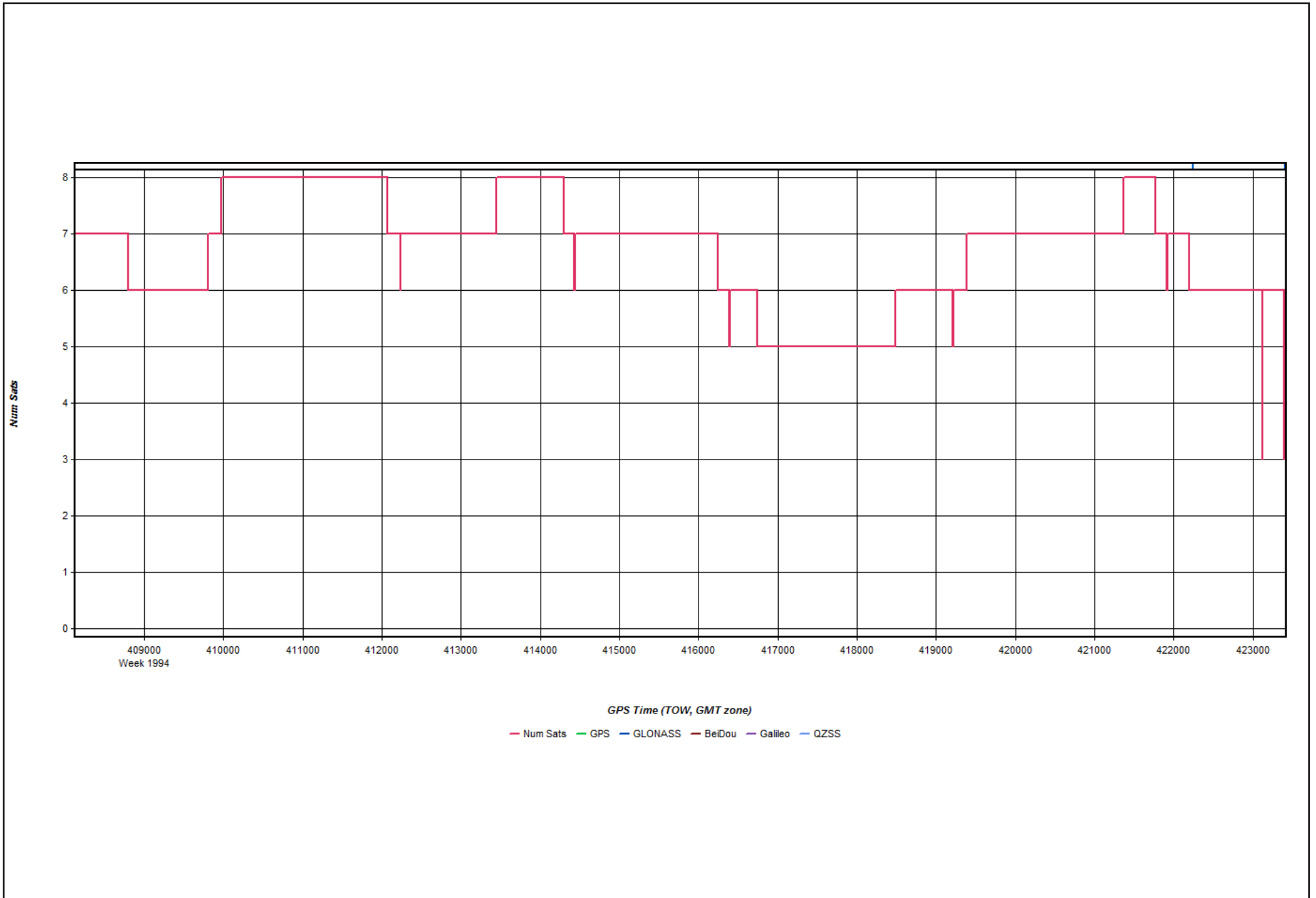


Figure 8: Status flag for IMU processing

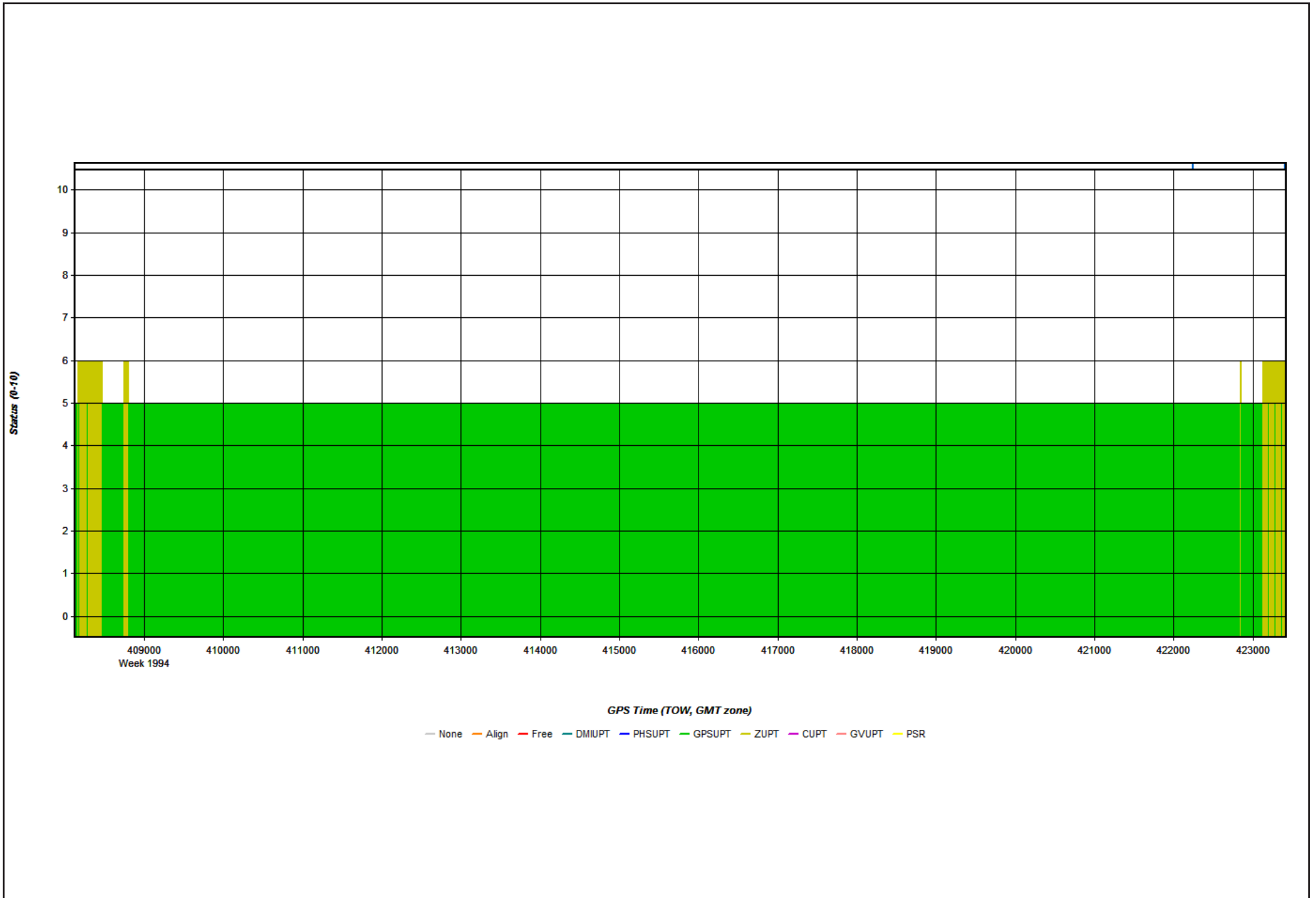
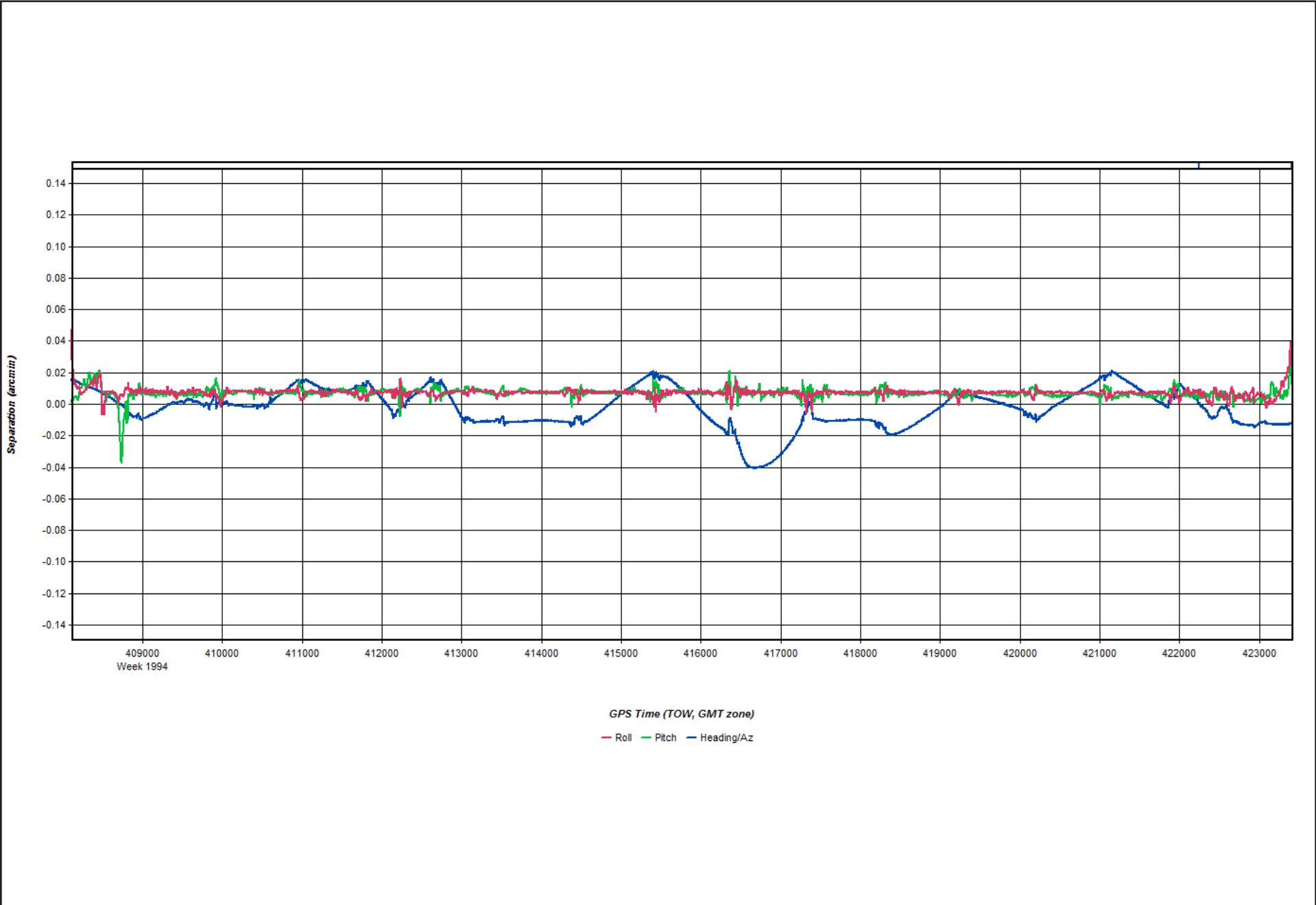
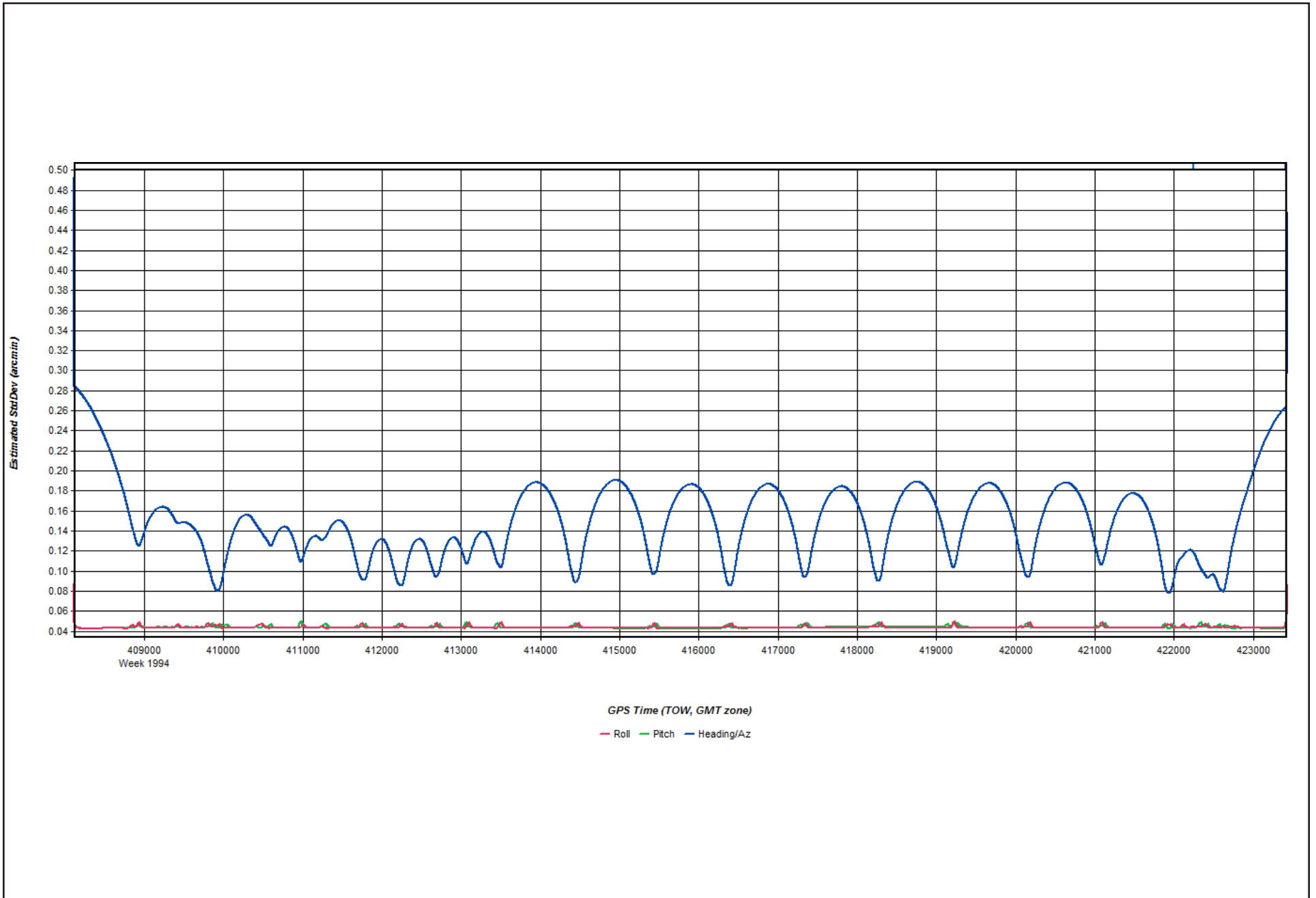


Figure 9: Fwd/Rev Attitude Separation Plot



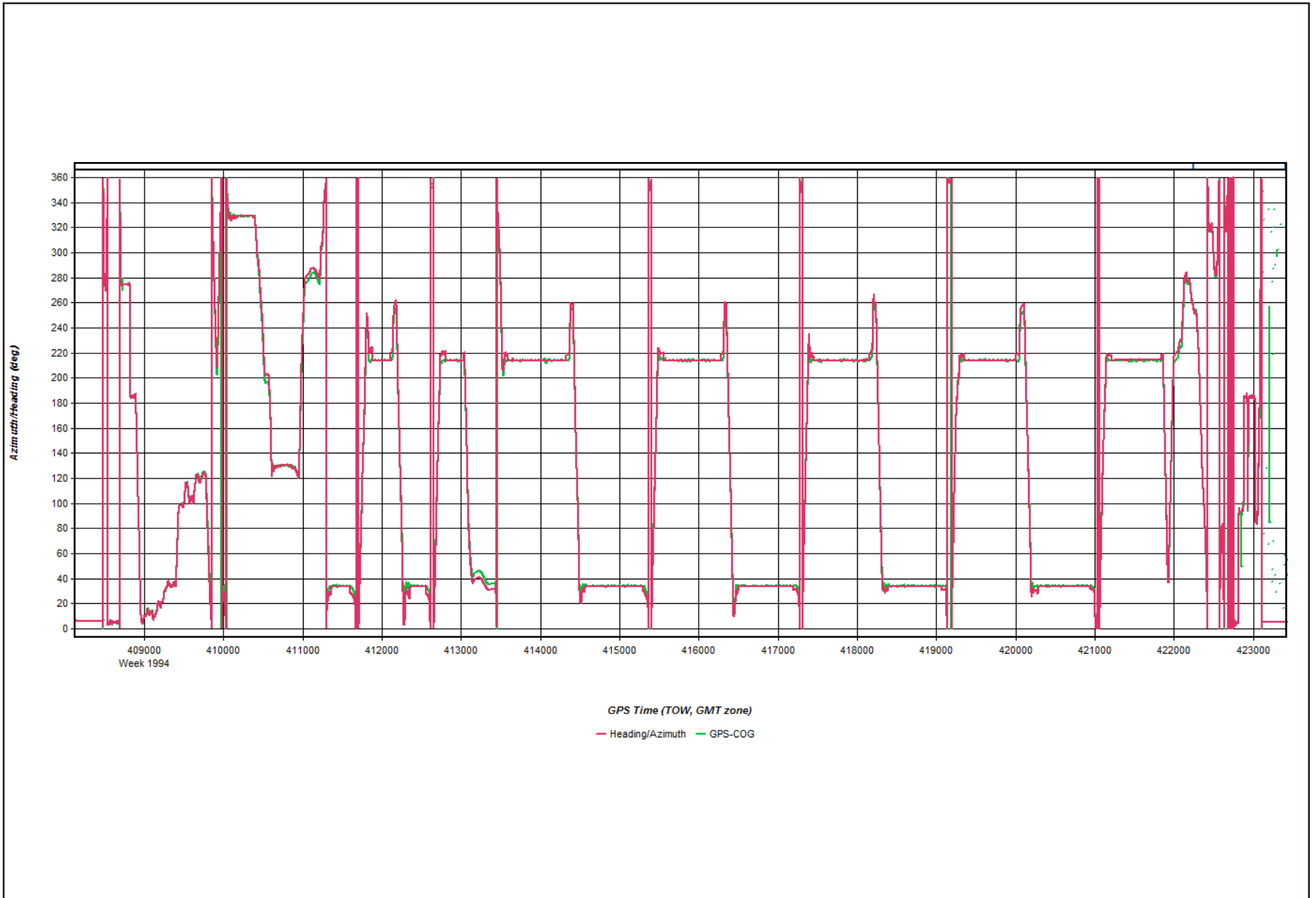
2018-03-29_Day088_7 - 20180329172052

Figure 10: Estimated Attitude Accuracy Plot



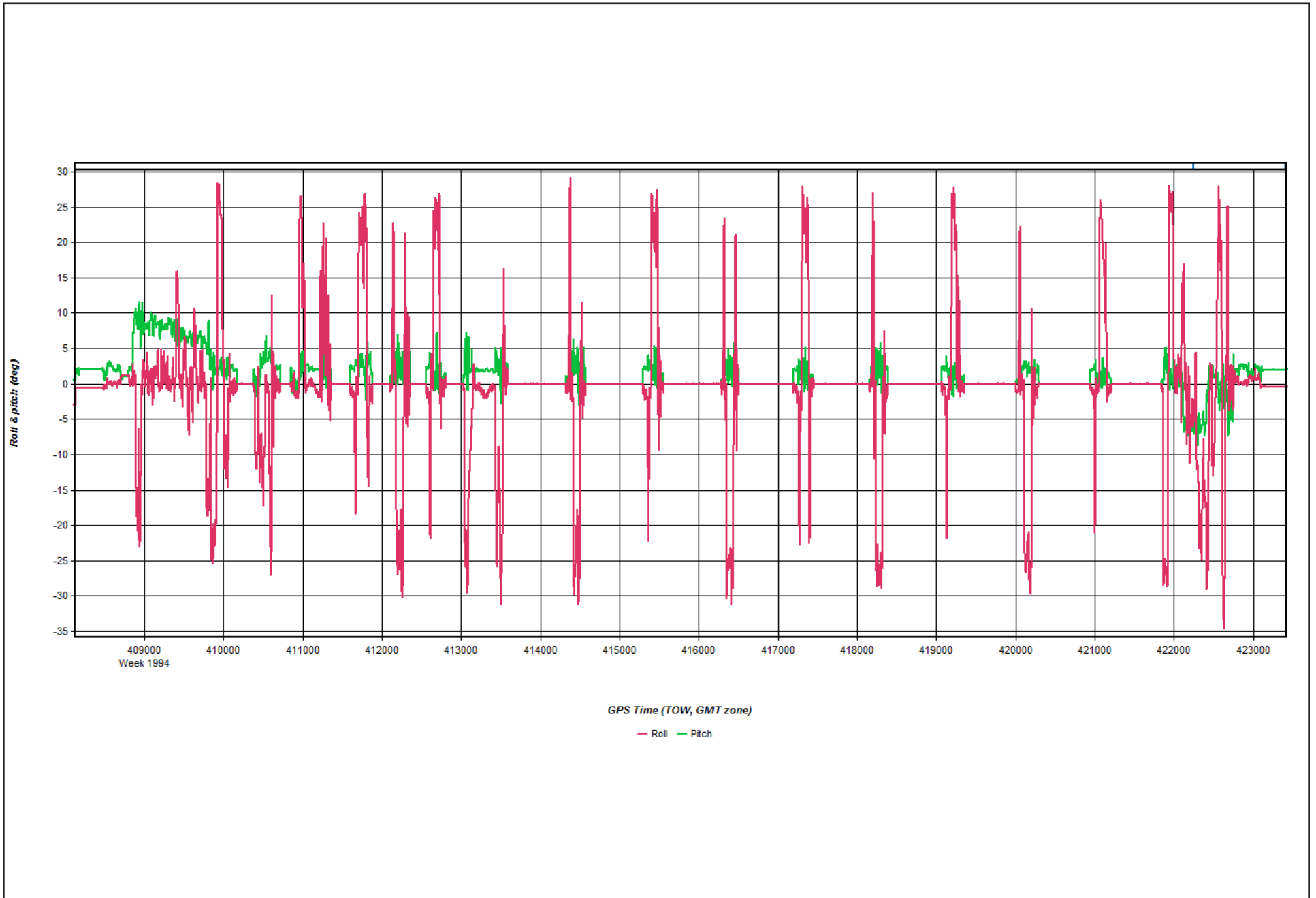
2018-03-29_Day088_7 - 20180329172052

Figure 11: Azimuth Plot



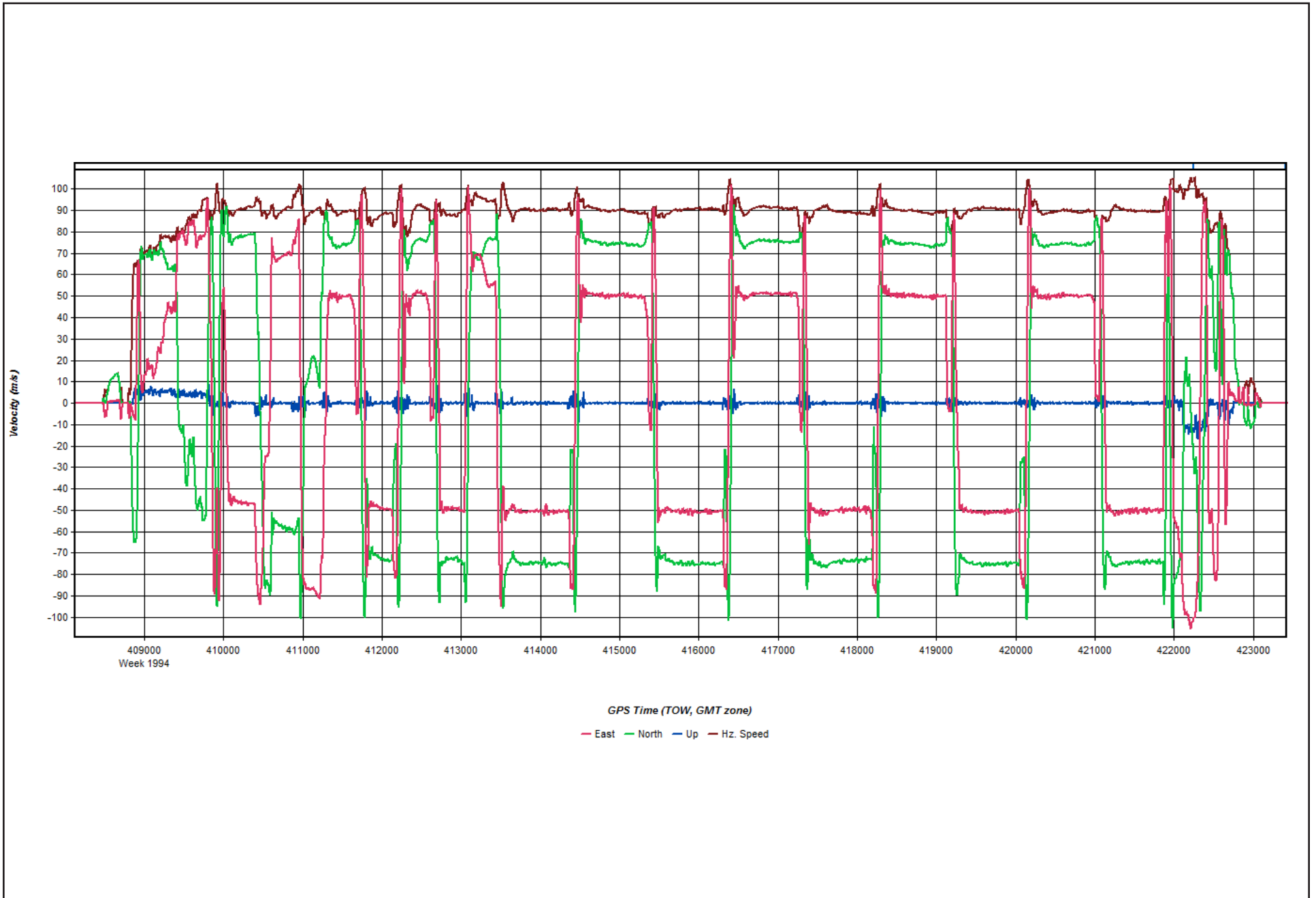
2018-03-29_Day088_7 - 20180329172052

Figure 12: Roll & Pitch Plot



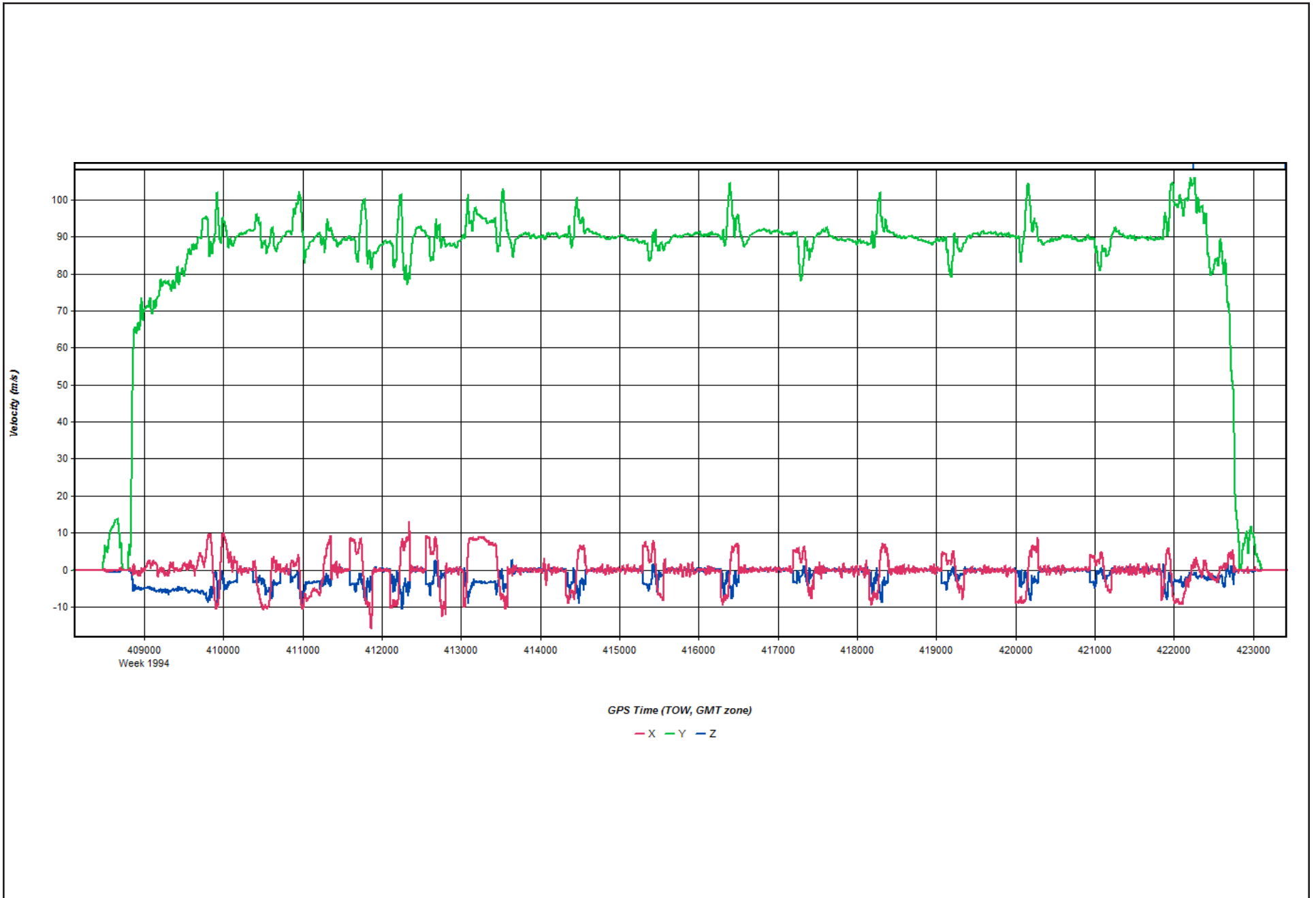
2018-03-29_Day088_7 - 20180329172052

Figure 13: Velocity Profile Plot



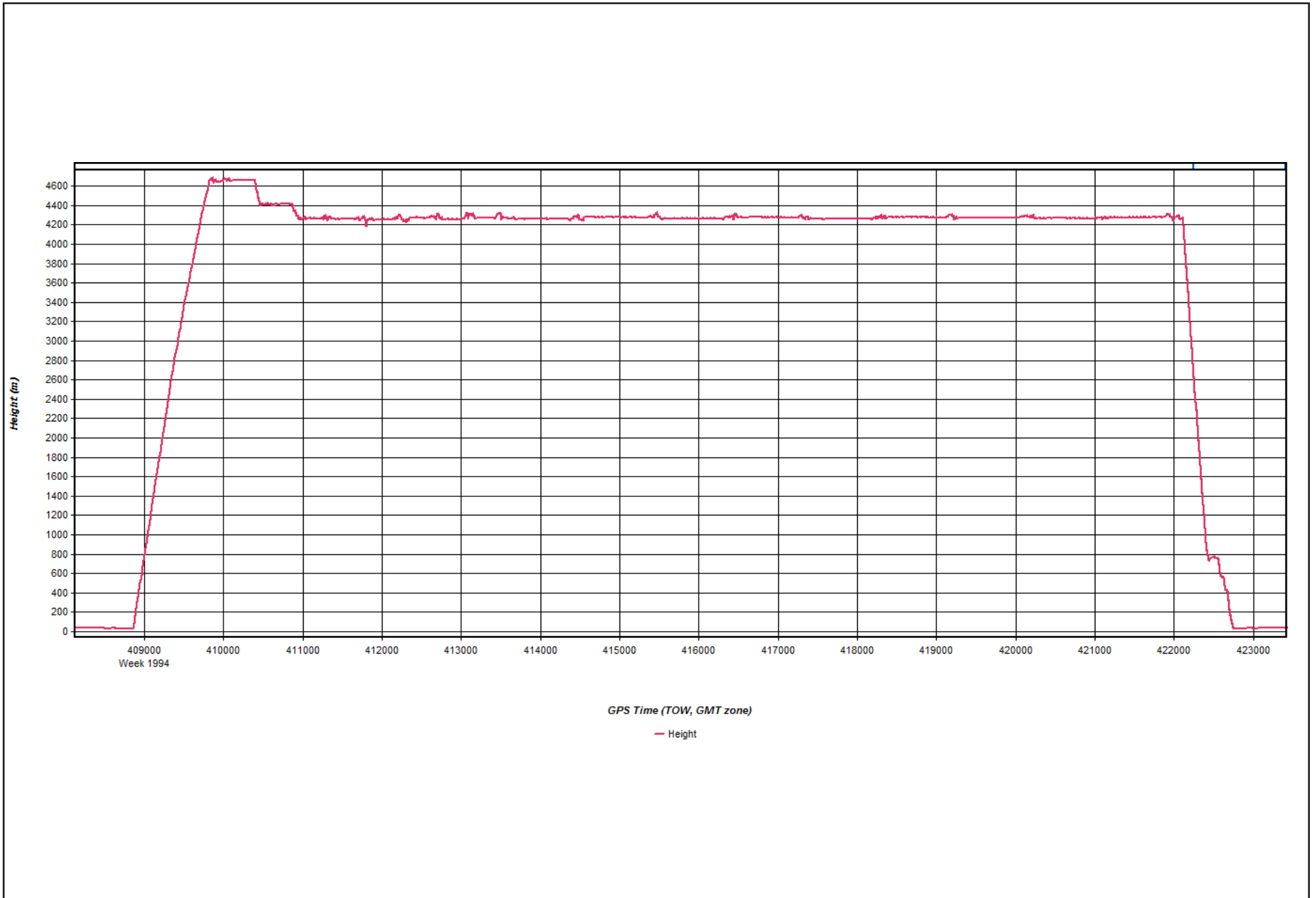
2018-03-29_Day088_7 - 20180329172052

Figure 14: Body Frame Velocity Plot



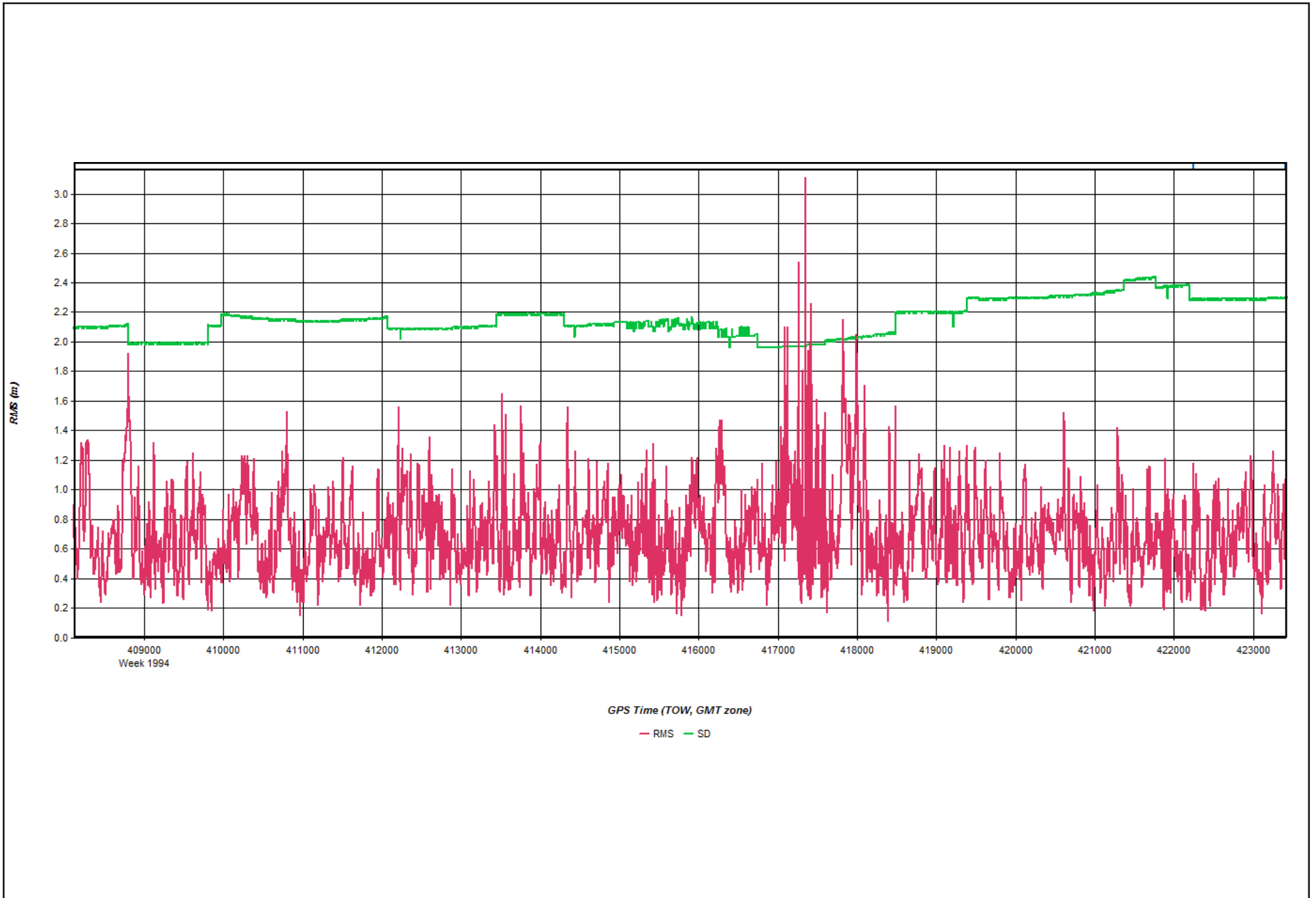
2018-03-29_Day088_7 - 20180329172052

Figure 15: Height Profile Plot



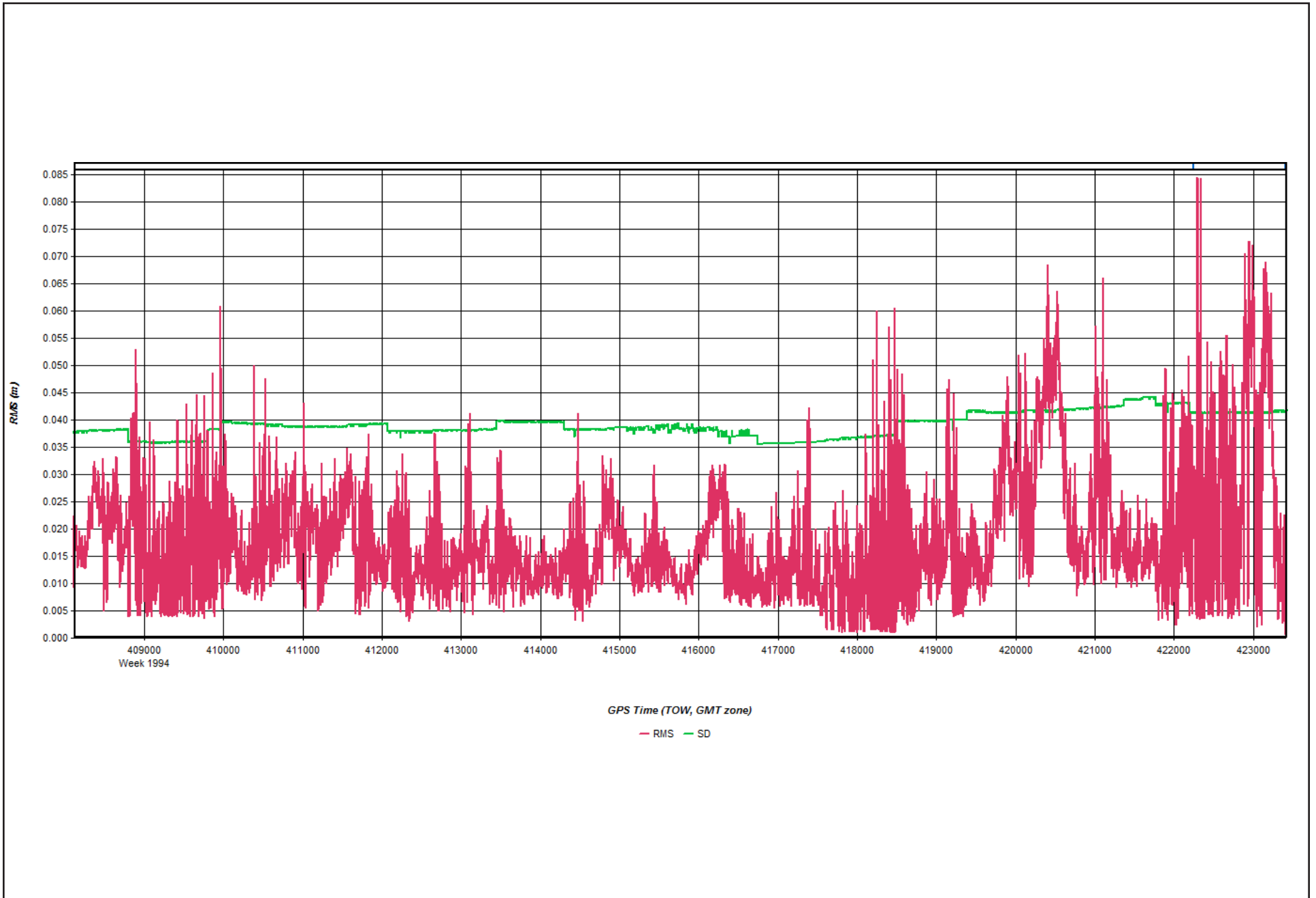
2018-03-29_Day088_7 - 20180329172052

Figure 16: C/A Code Residual RMS Plot



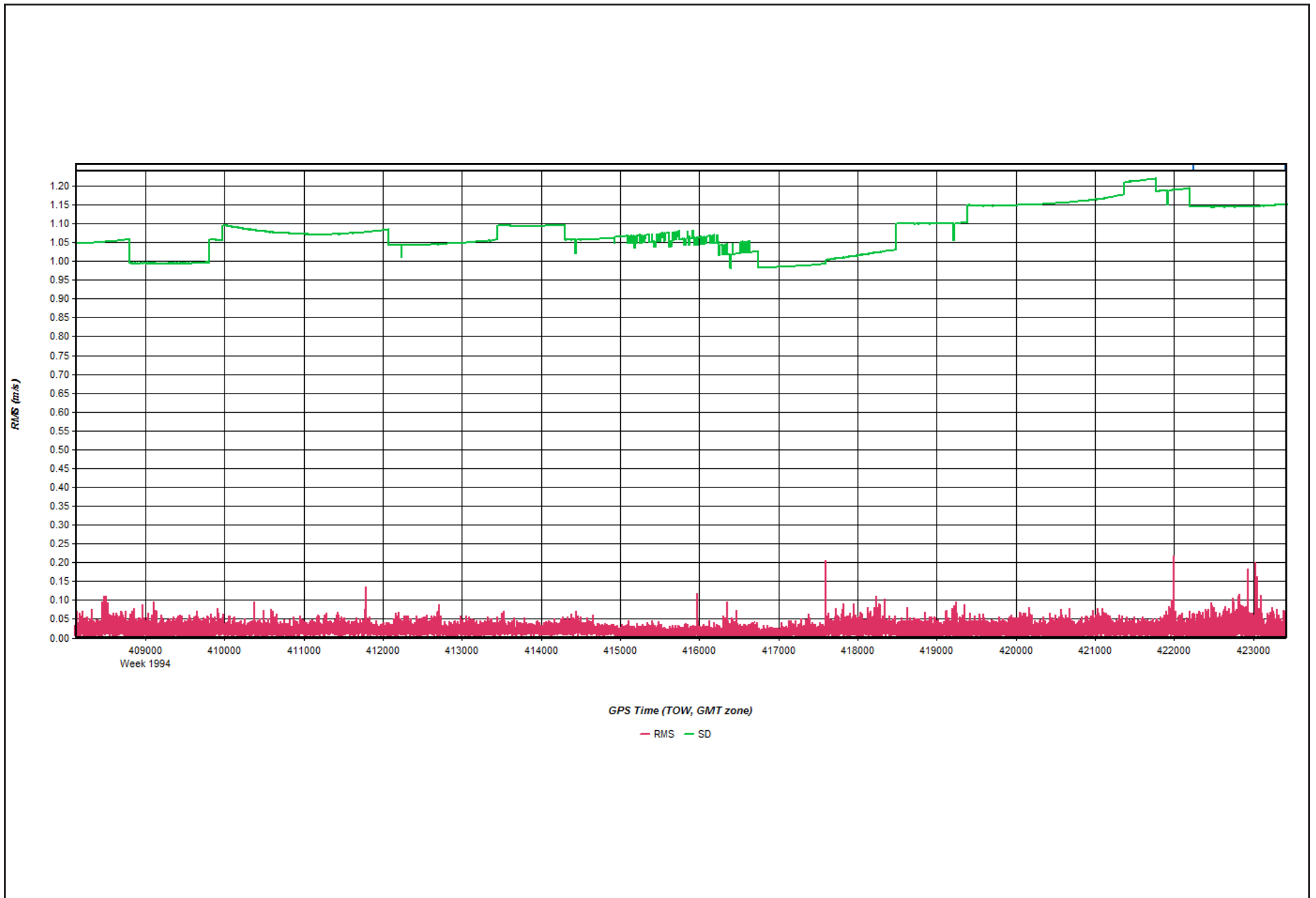
2018-03-29_Day088_7 - 20180329172052

Figure 17: Carrier Residual RMS Plot



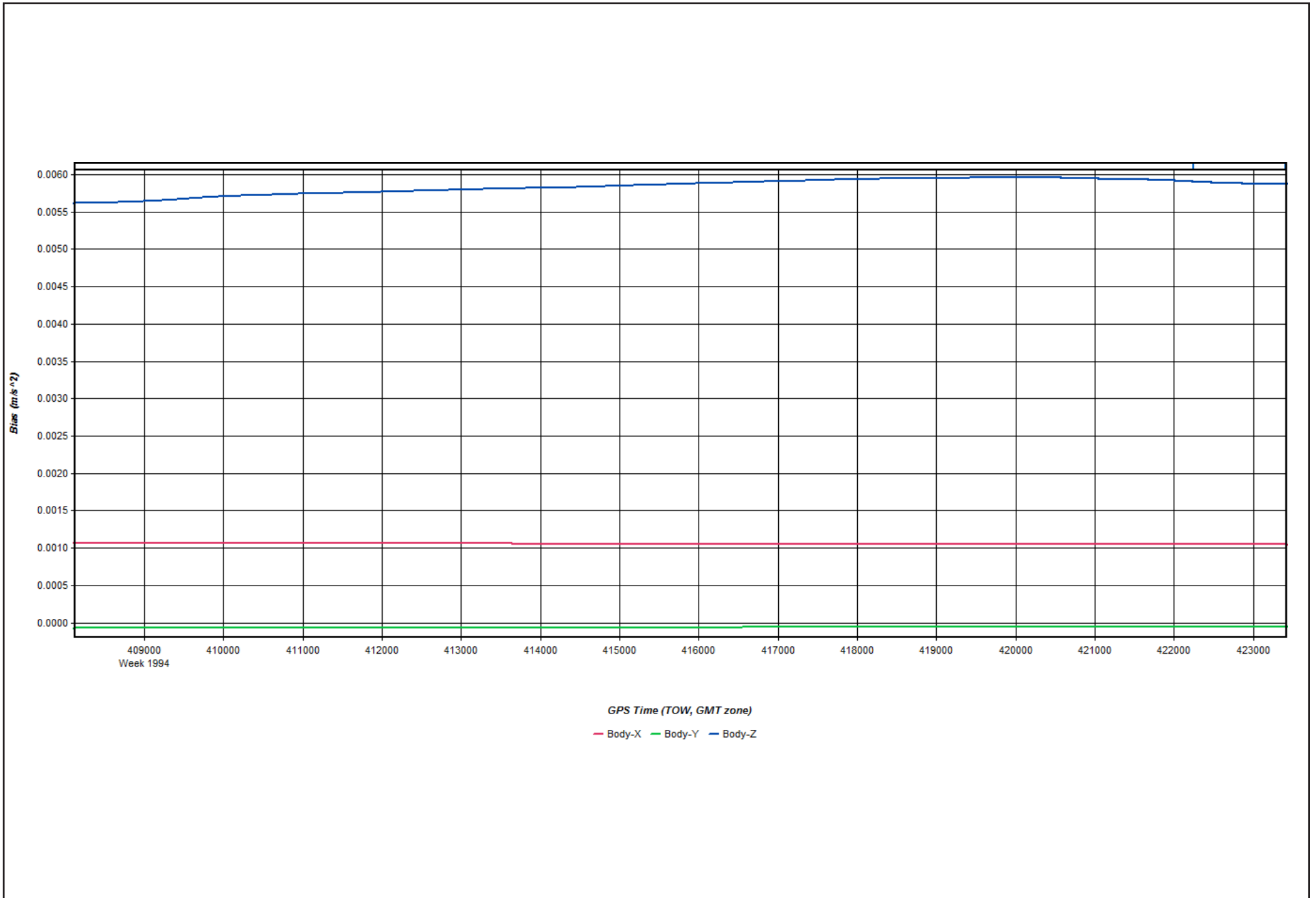
2018-03-29_Day088_7 - 20180329172052

Figure 18: L1 Doppler Residual RMS Plot



2018-03-29_Day088_7 - 20180329172052

Figure 19: Accelerometer Bias Plot



2018-03-29_Day088_7 - 20180329172052

Figure 20: Gyro Drift Plot

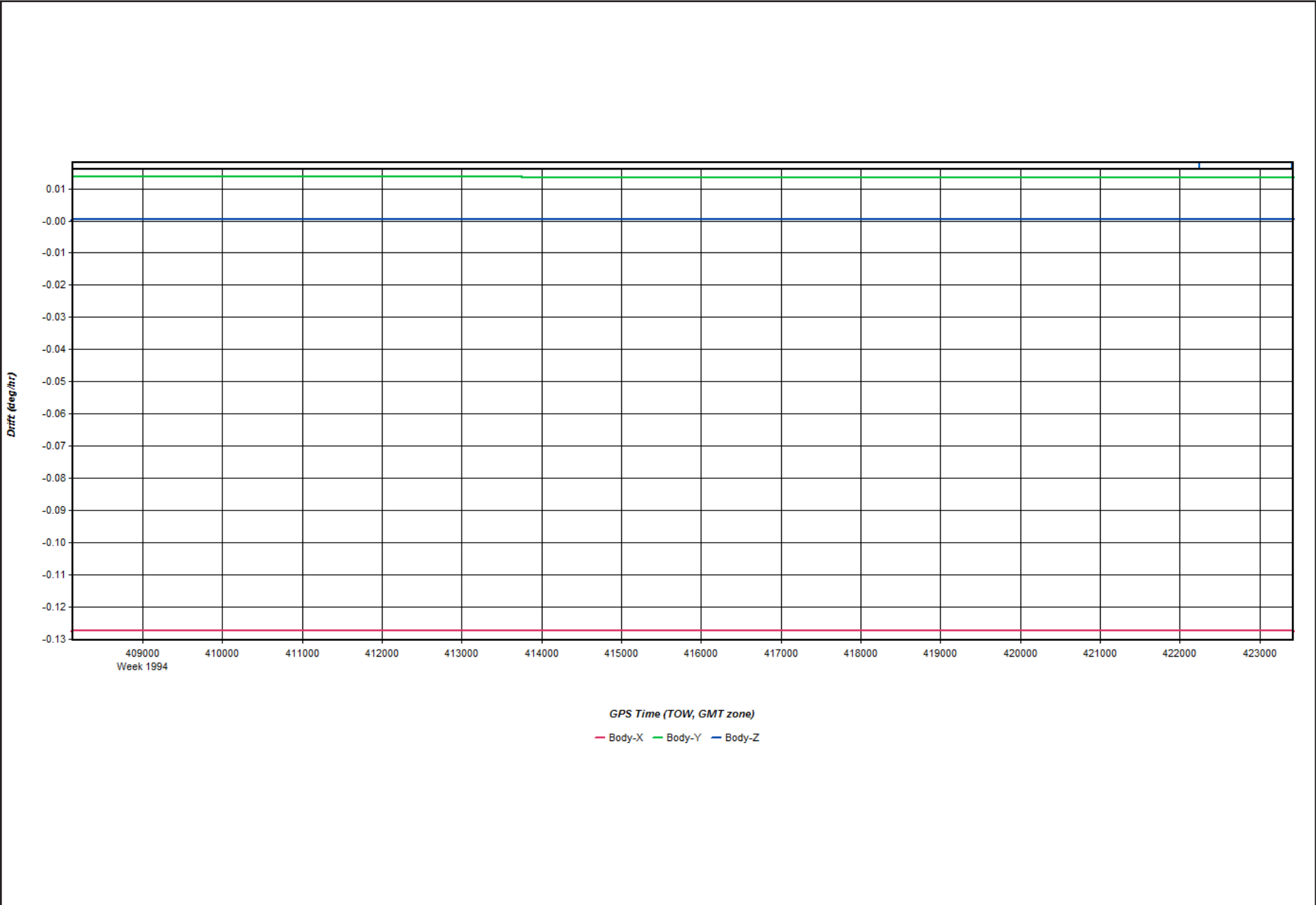
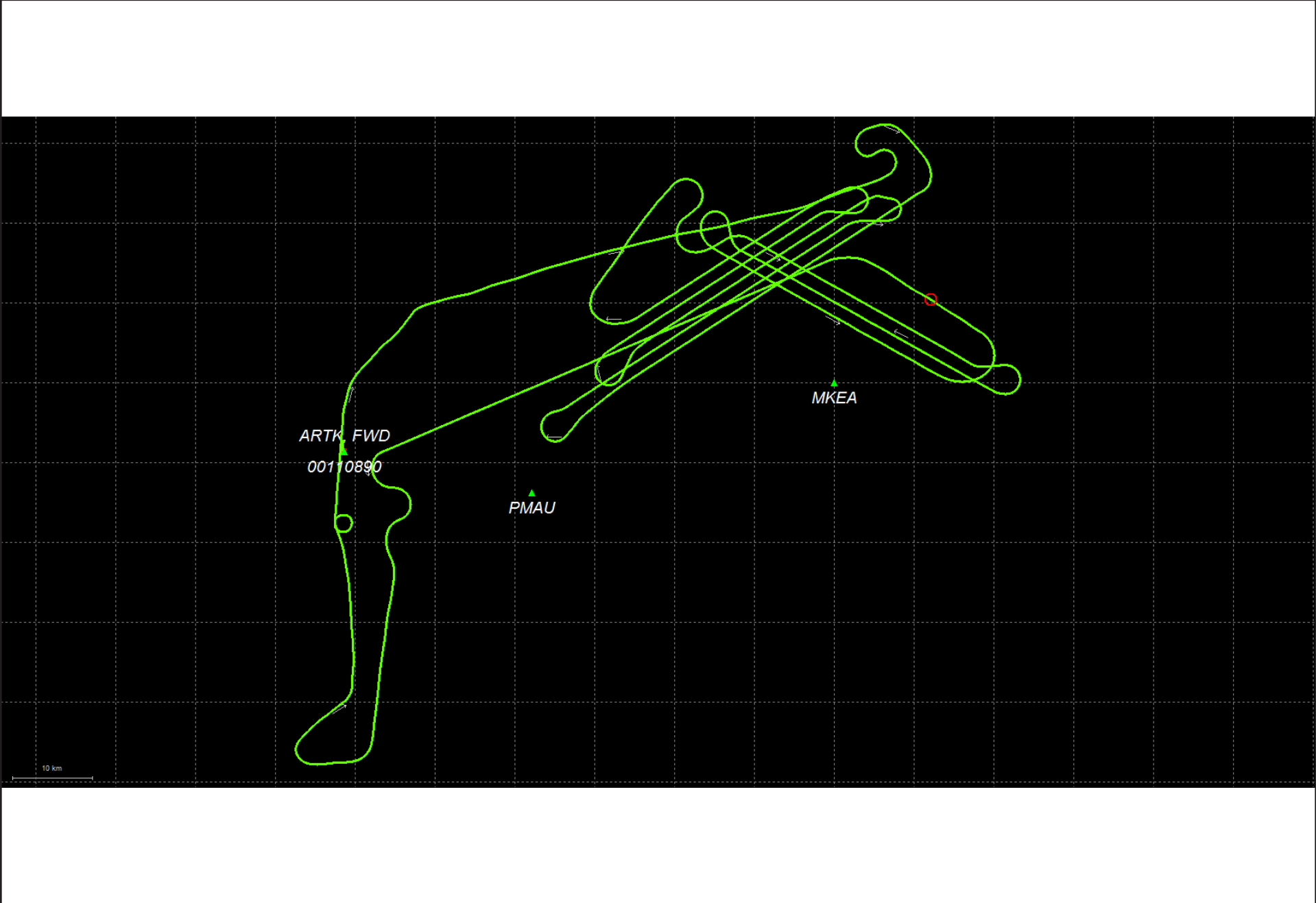
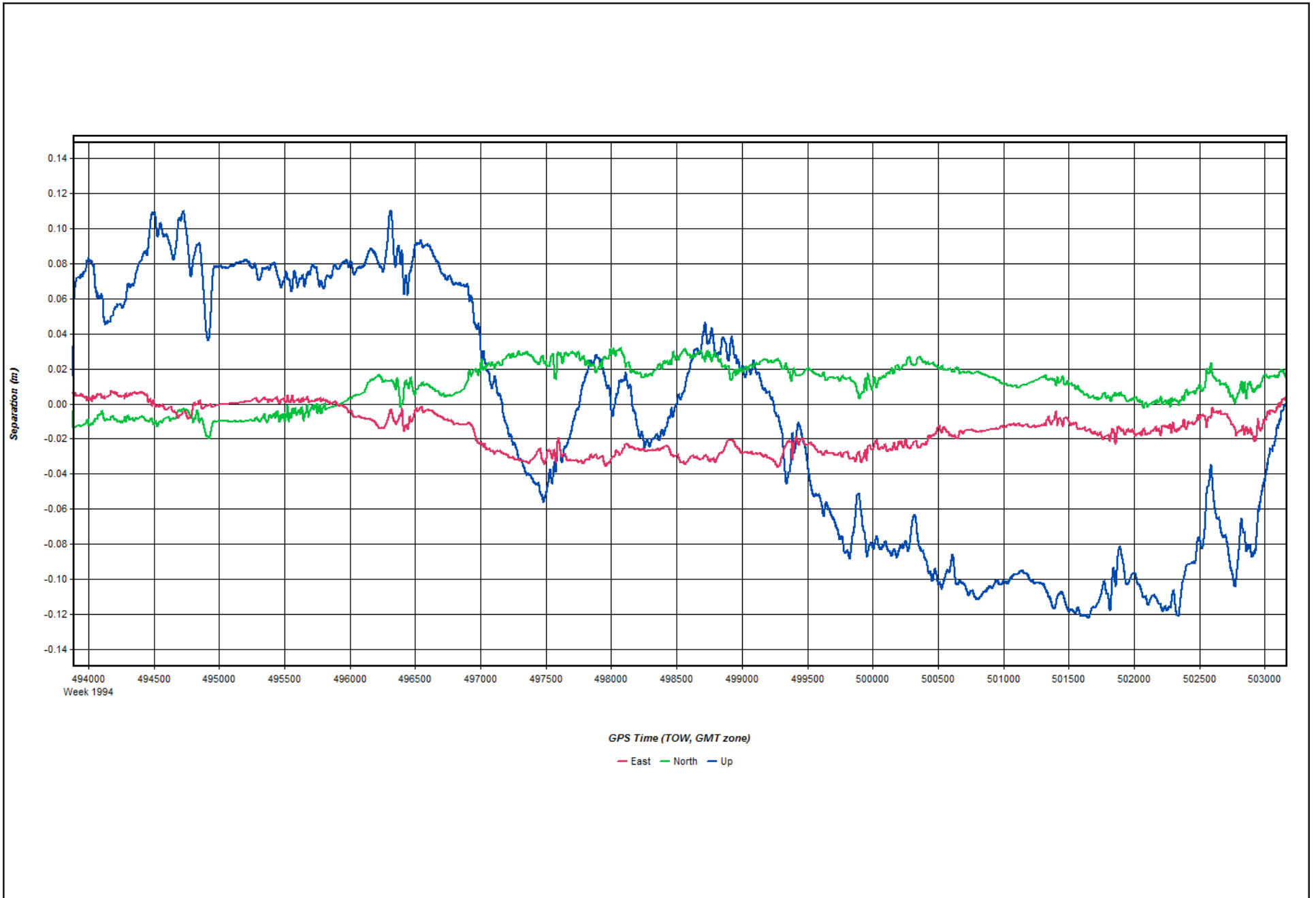


Figure 1: Map



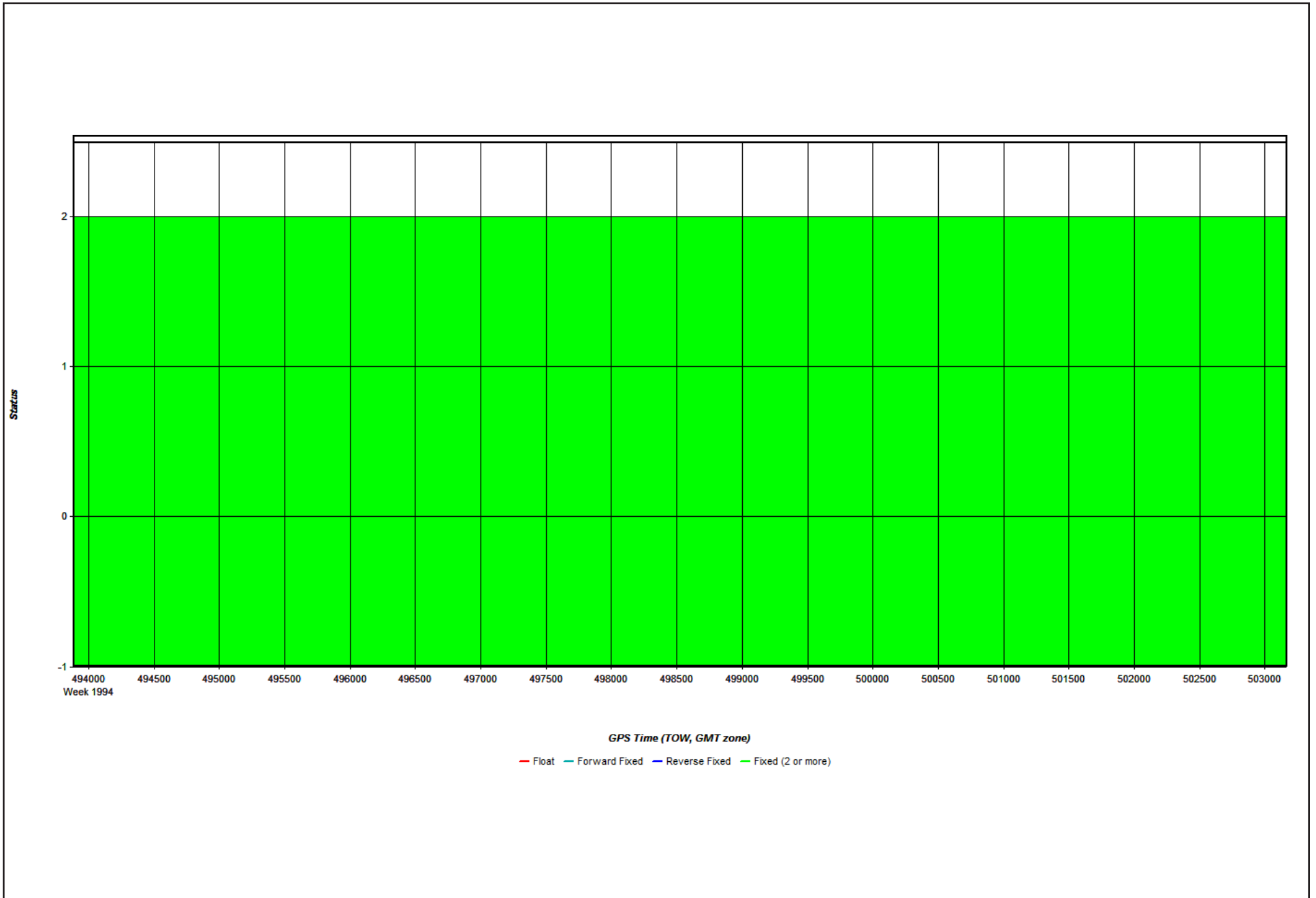
2018-03-30_Day089_7 - 20180330171024

Figure 2: Forward/Reverse or Combined Separation Plot



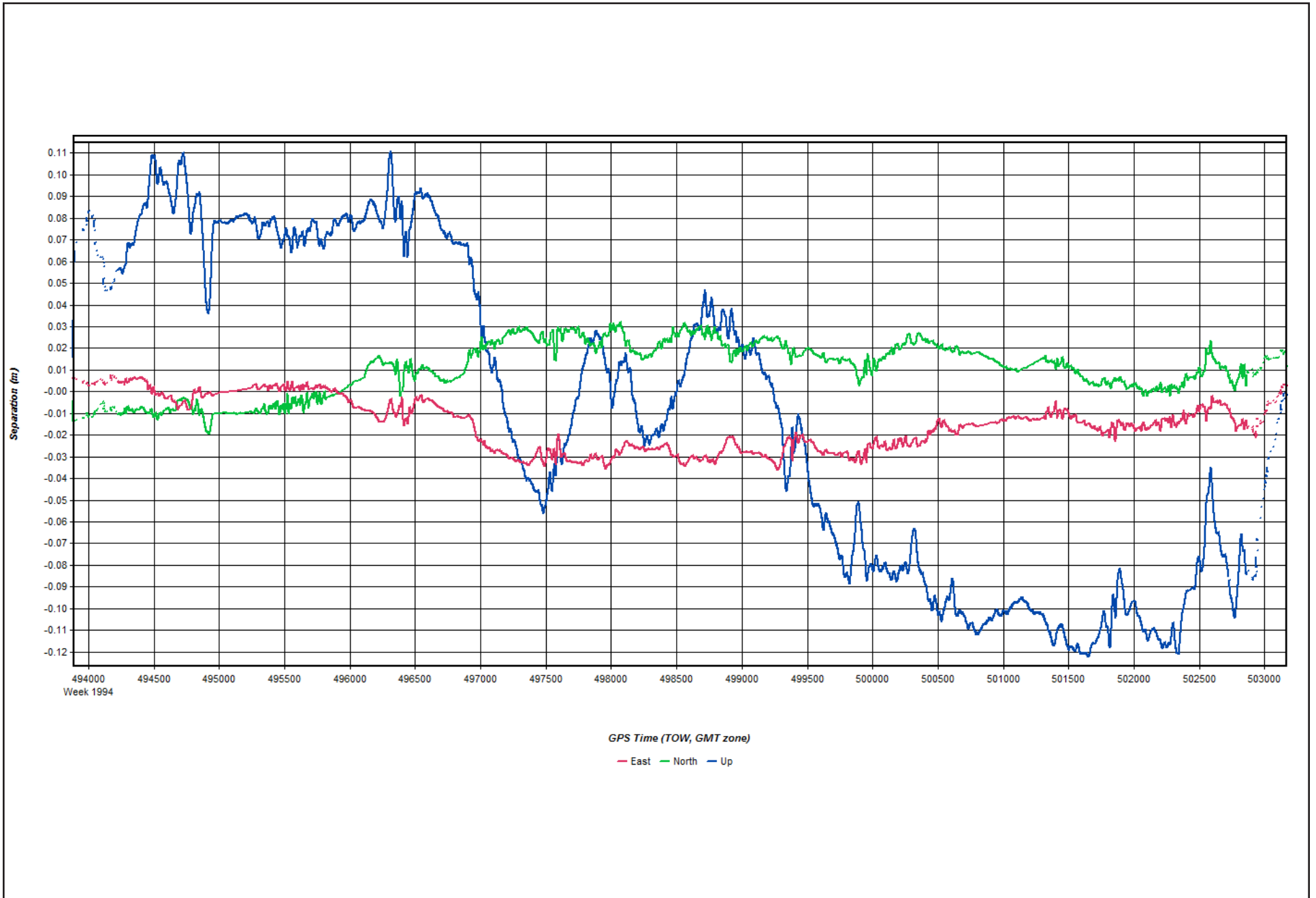
2018-03-30_Day089_7 - 20180330171024

Figure 3: Float or Fixed Ambiguity



2018-03-30_Day089_7 - 20180330171024

Figure 4: Forward/Reverse Separation Plot (Fixed)



2018-03-30_Day089_7 - 20180330171024

Figure 5: Estimated Position Accuracy Plot

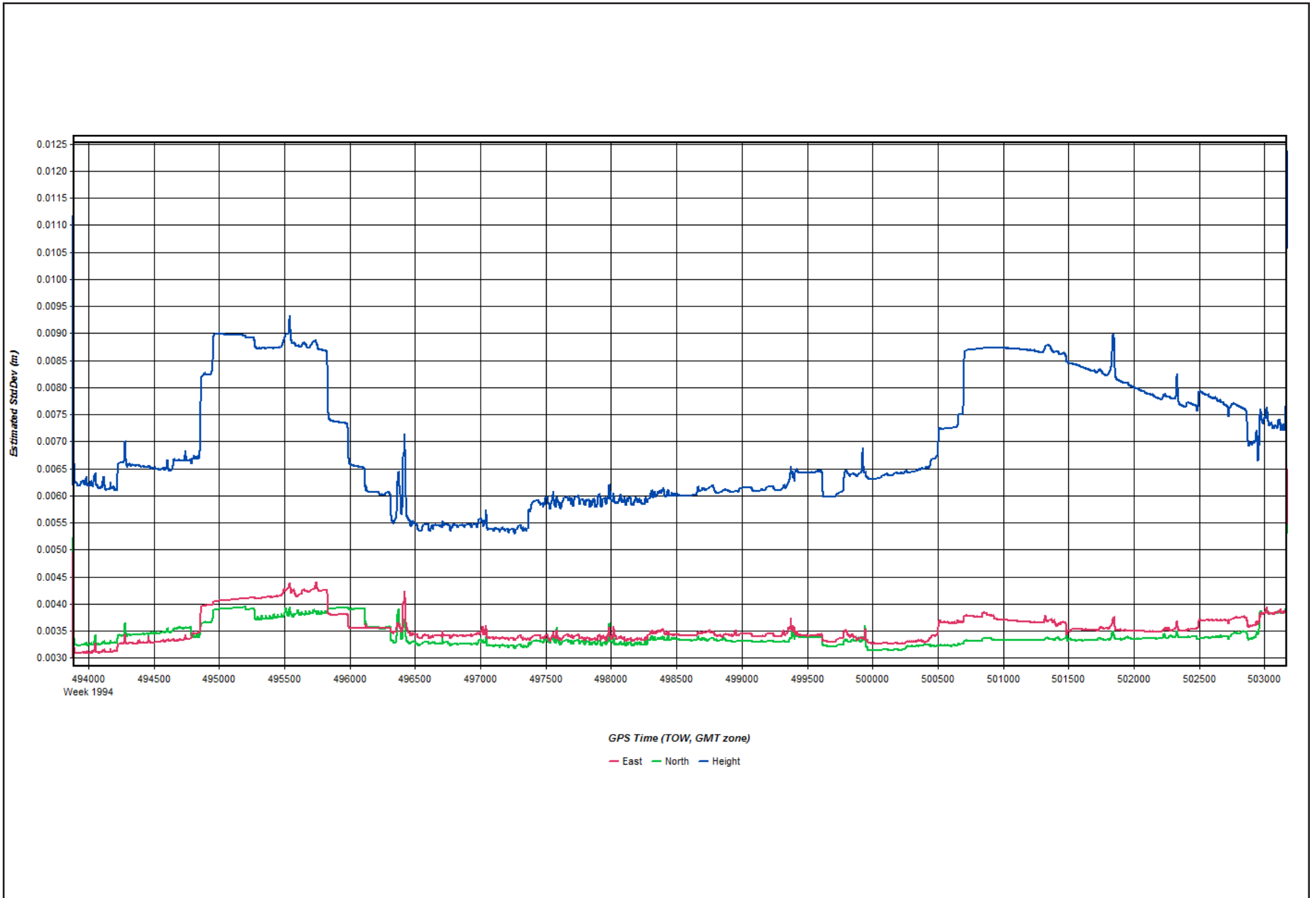
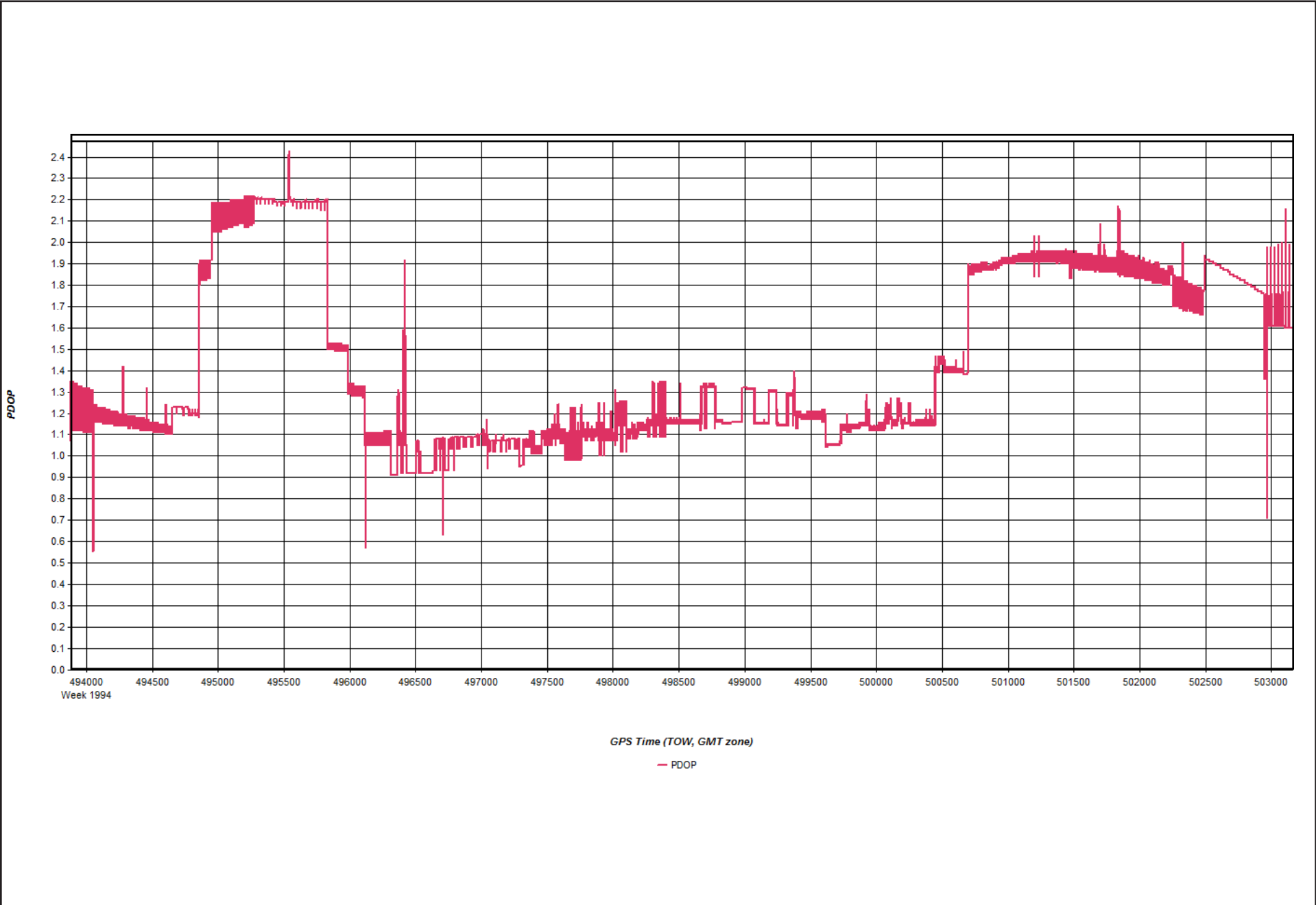
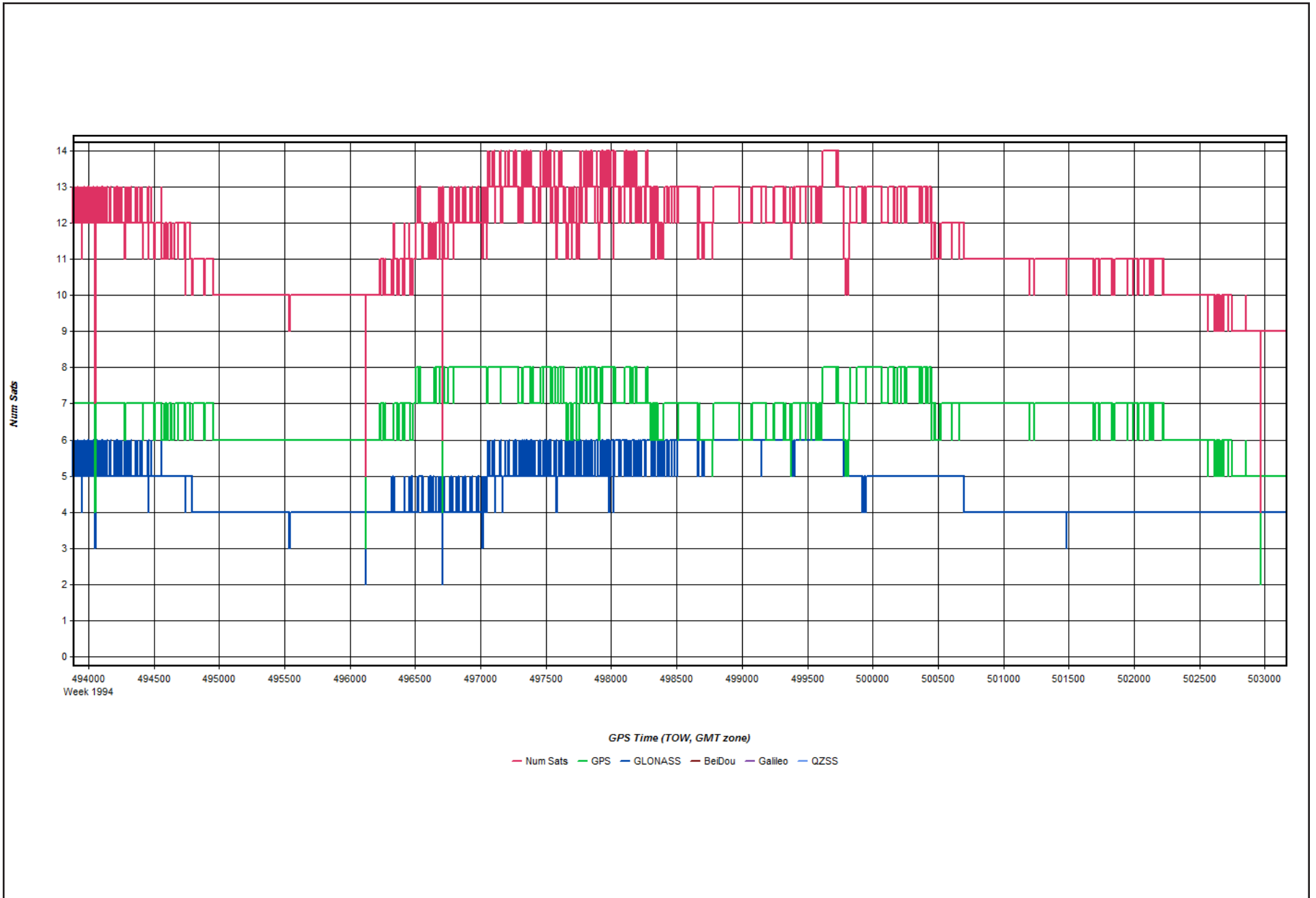


Figure 6: PDOP Plot



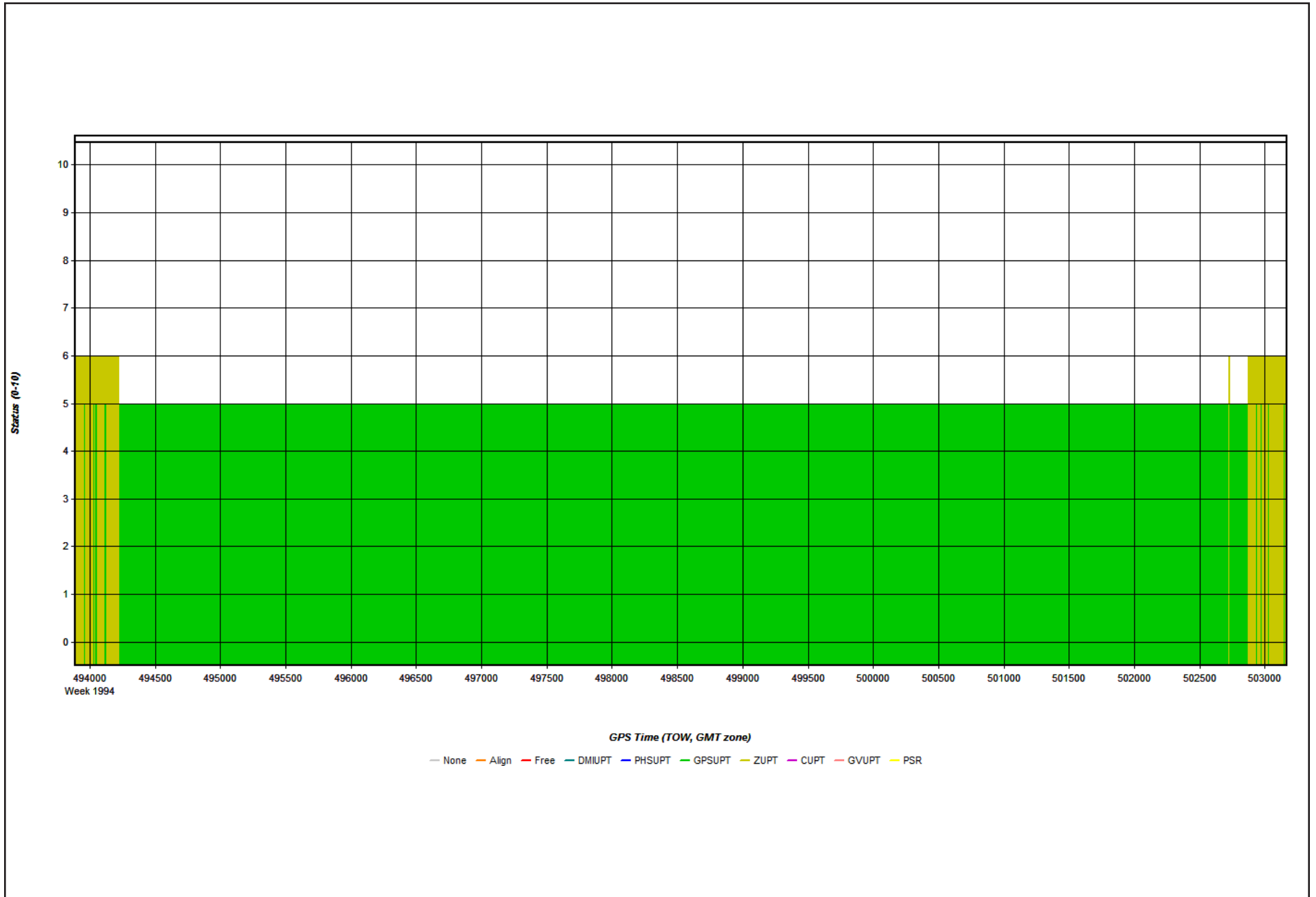
2018-03-30_Day089_7 - 20180330171024

Figure 7: Number of Satellites Line Plot



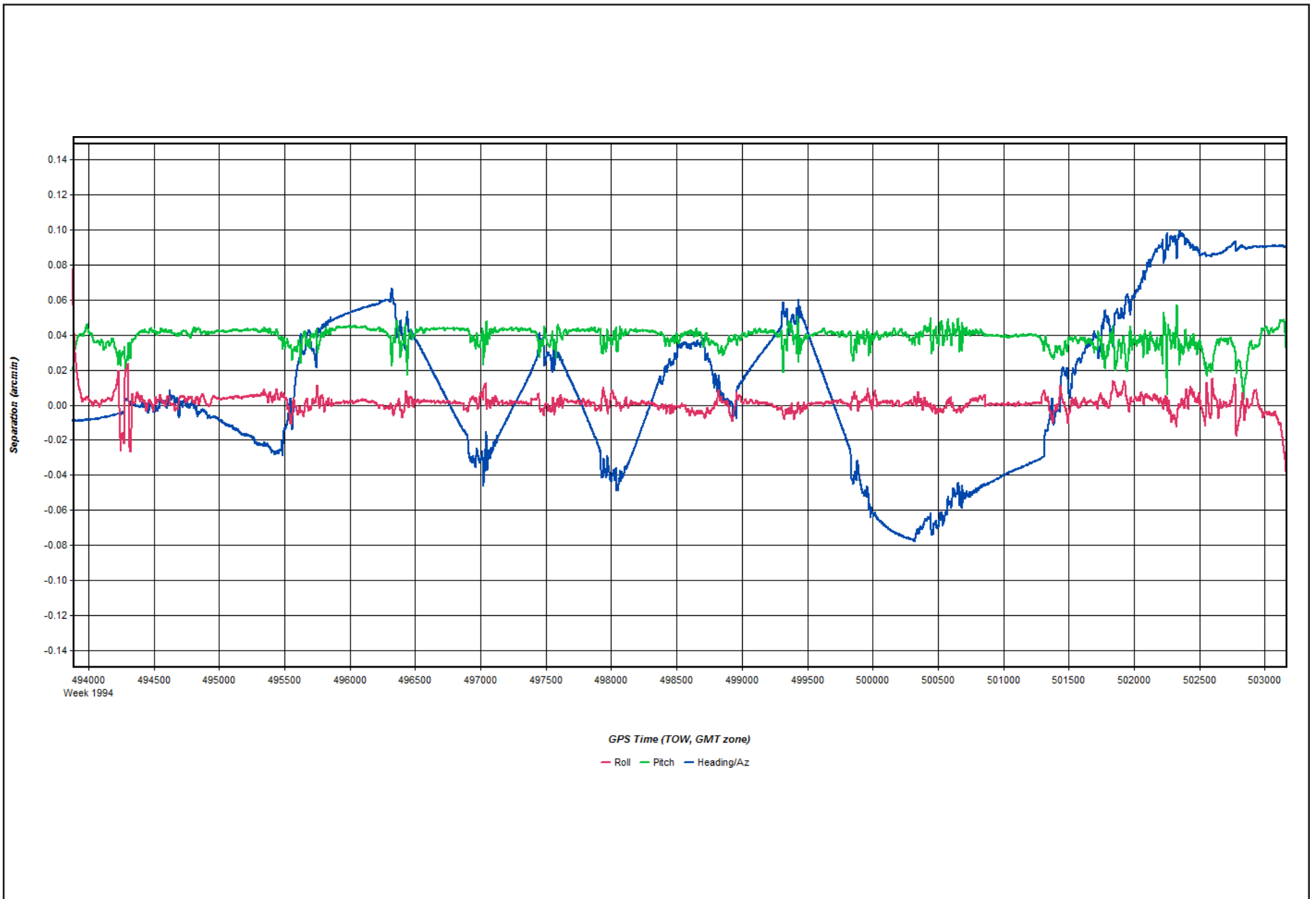
2018-03-30_Day089_7 - 20180330171024

Figure 8: Status flag for IMU processing



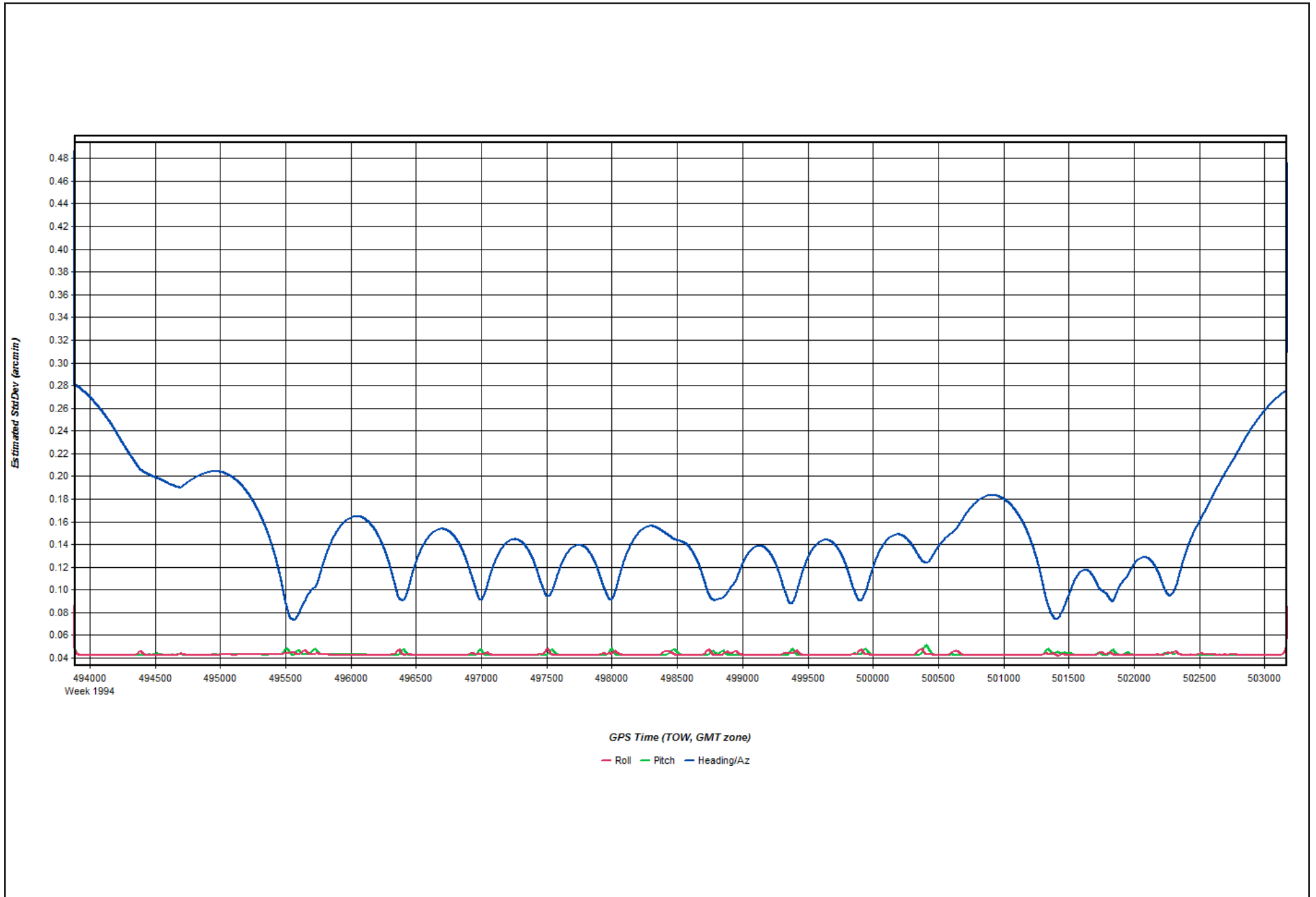
2018-03-30_Day089_7 - 20180330171024

Figure 9: Fwd/Rev Attitude Separation Plot



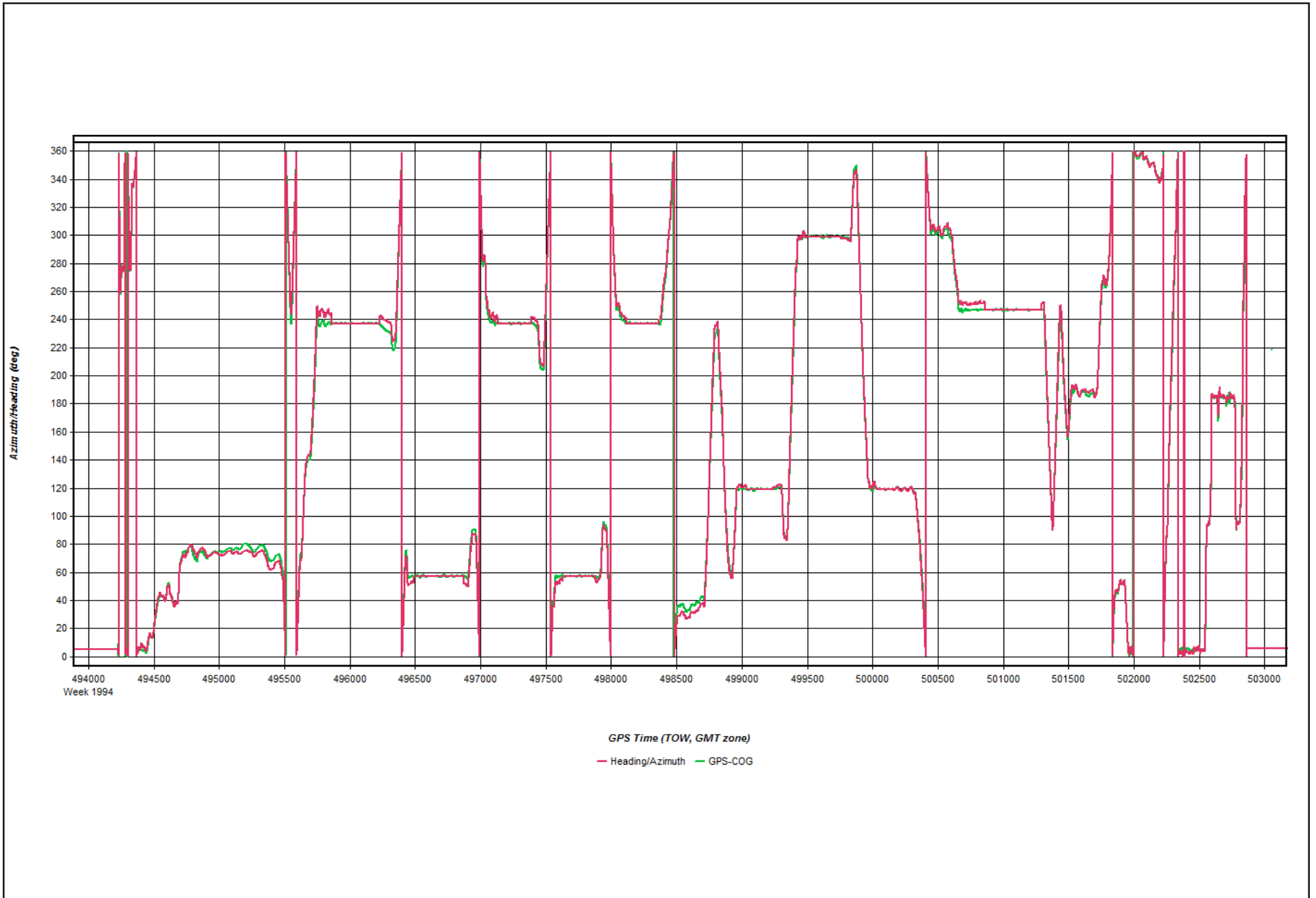
2018-03-30_Day089_7 - 20180330171024

Figure 10: Estimated Attitude Accuracy Plot



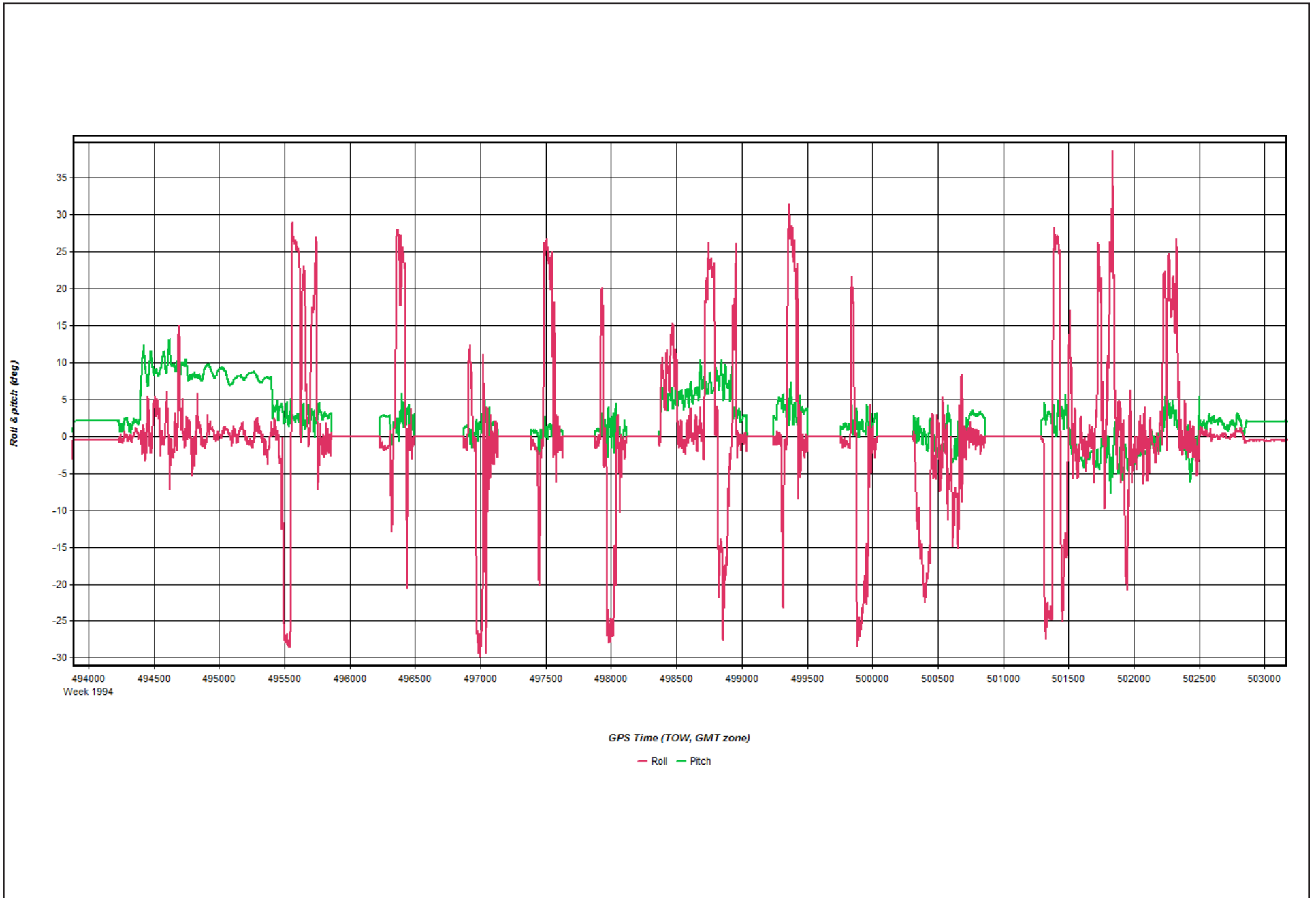
2018-03-30_Day089_7 - 20180330171024

Figure 11: Azimuth Plot



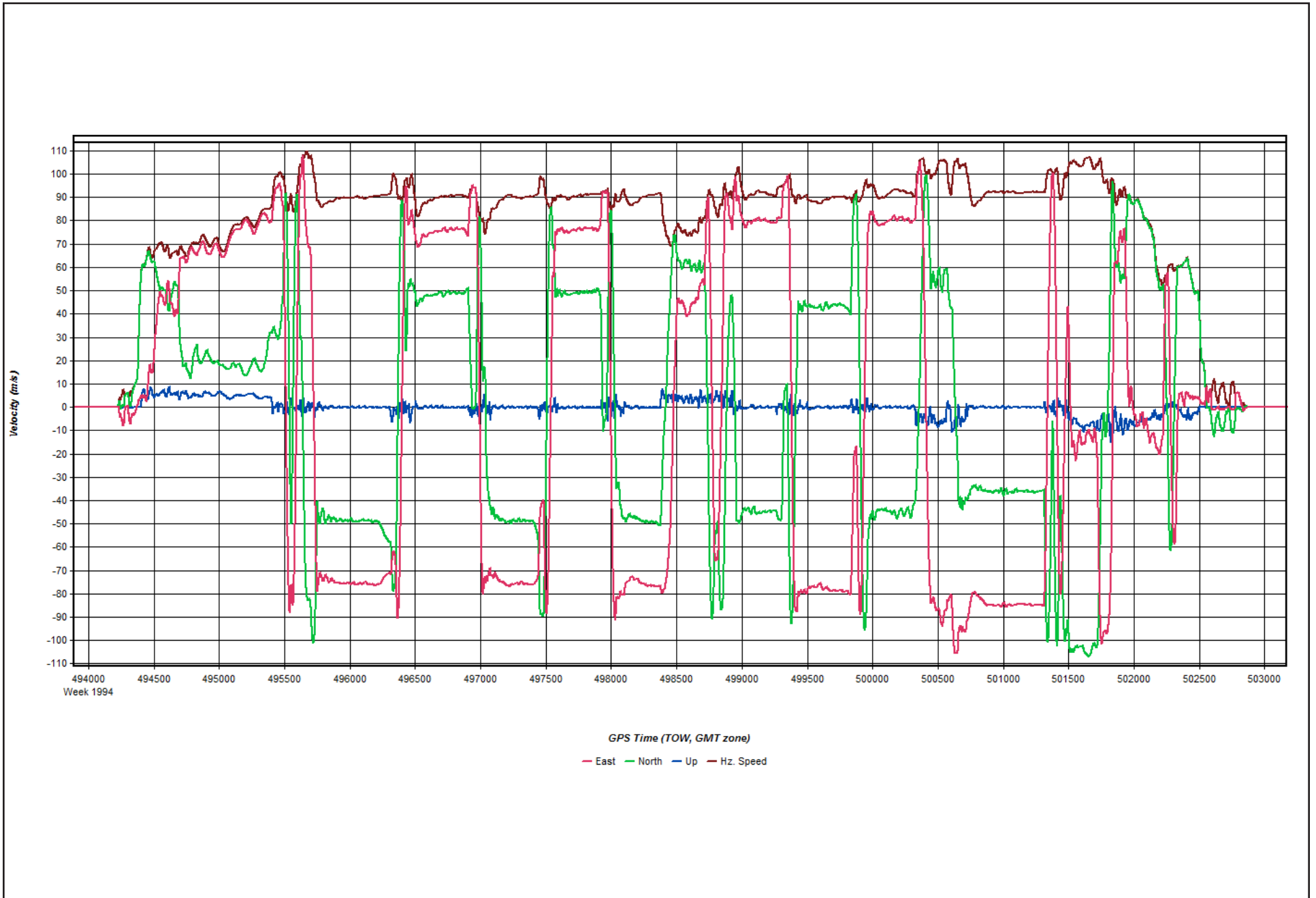
2018-03-30_Day089_7 - 20180330171024

Figure 12: Roll & Pitch Plot



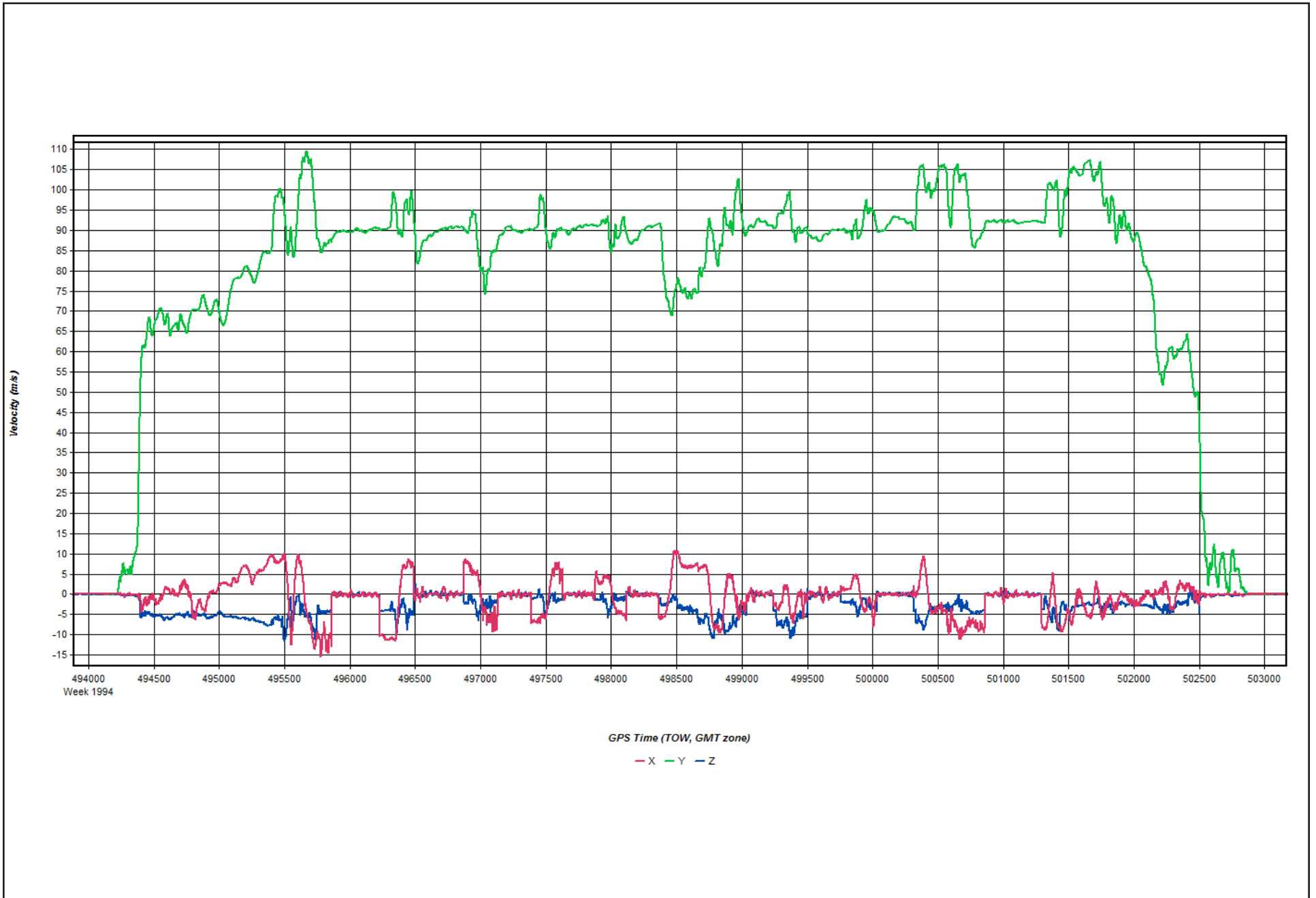
2018-03-30_Day089_7 - 20180330171024

Figure 13: Velocity Profile Plot



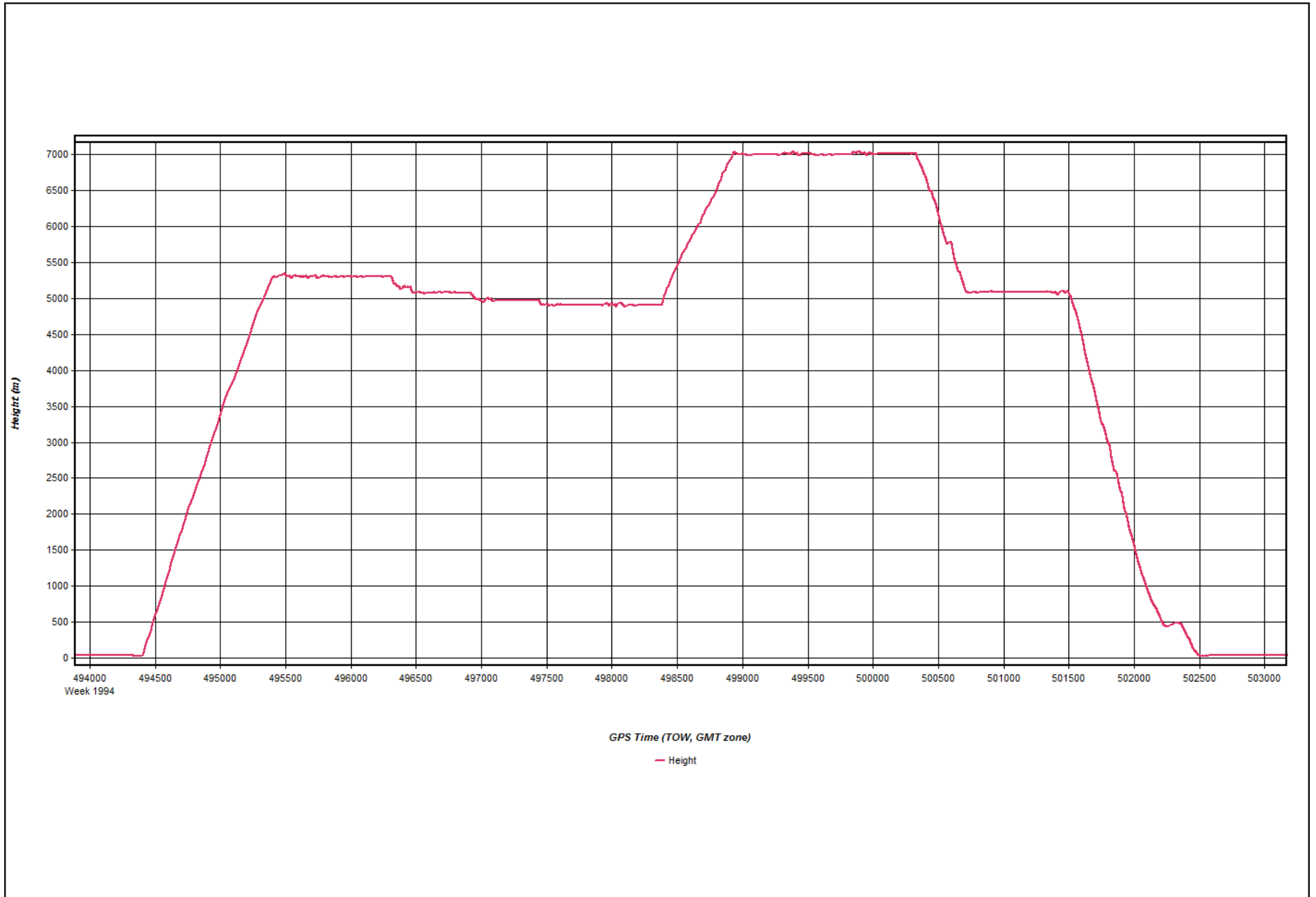
2018-03-30_Day089_7 - 20180330171024

Figure 14: Body Frame Velocity Plot



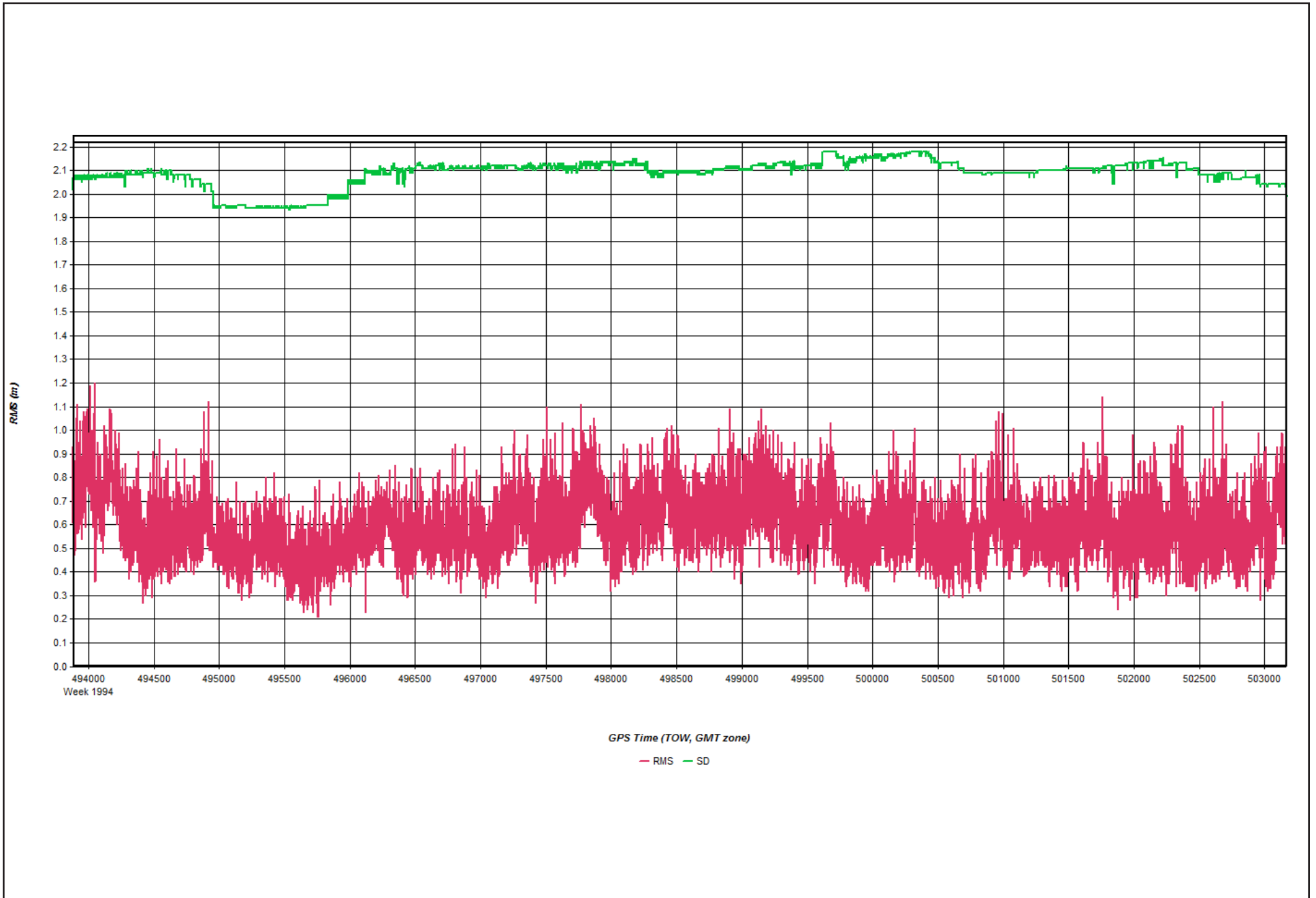
2018-03-30_Day089_7 - 20180330171024

Figure 15: Height Profile Plot



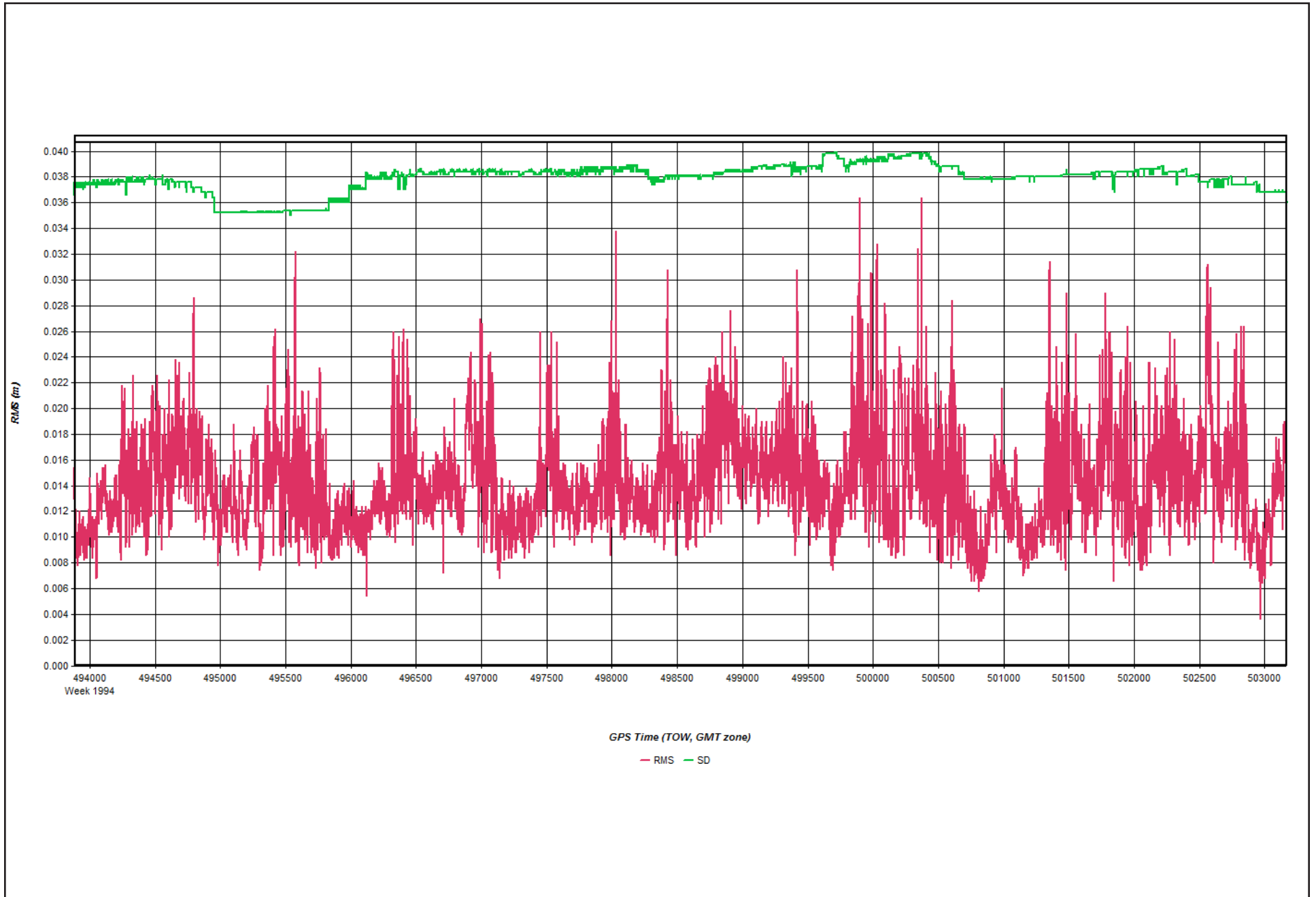
2018-03-30_Day089_7 - 20180330171024

Figure 16: C/A Code Residual RMS Plot



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Figure 17: Carrier Residual RMS Plot



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Figure 18: L1 Doppler Residual RMS Plot

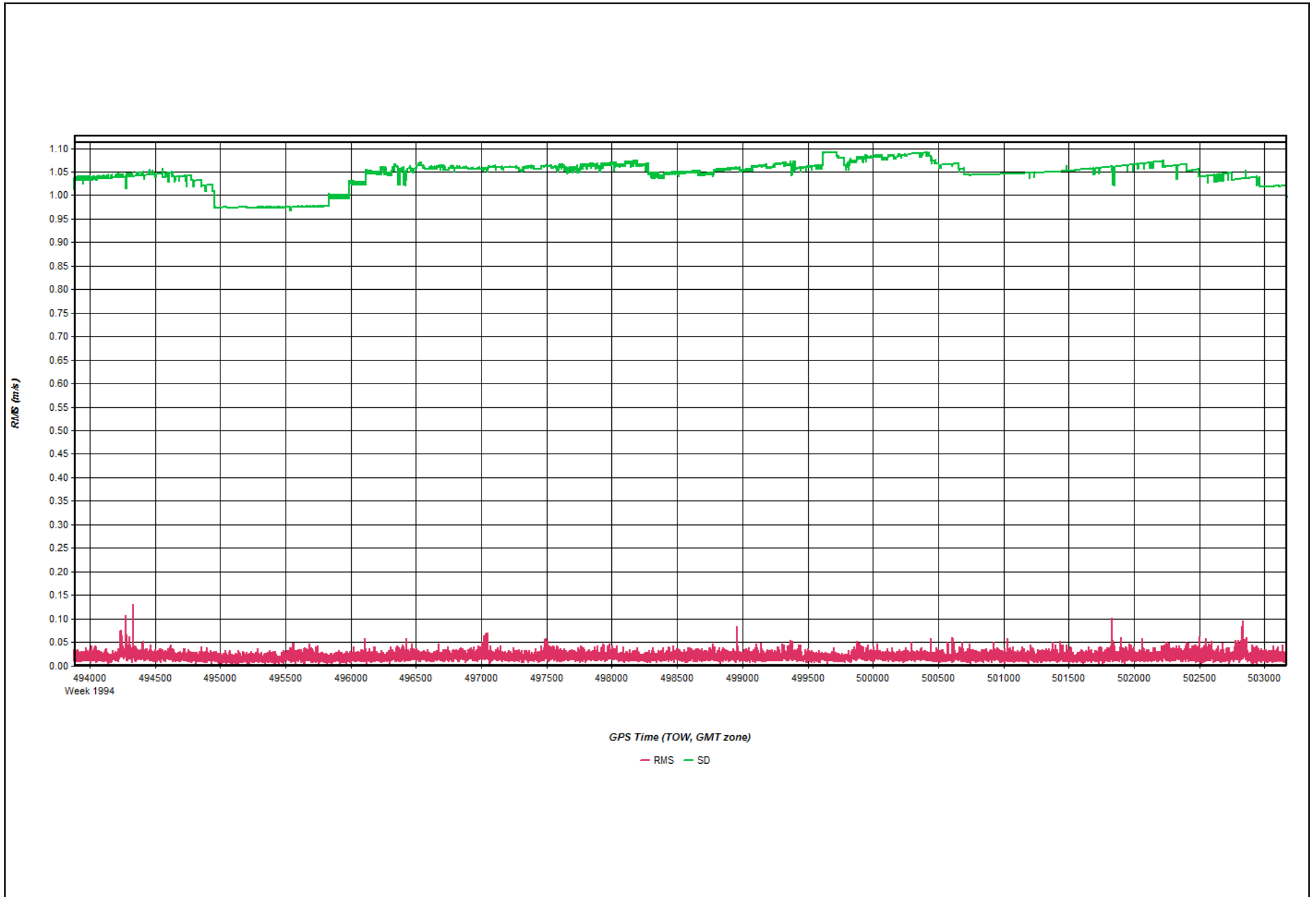


Figure 19: Accelerometer Bias Plot

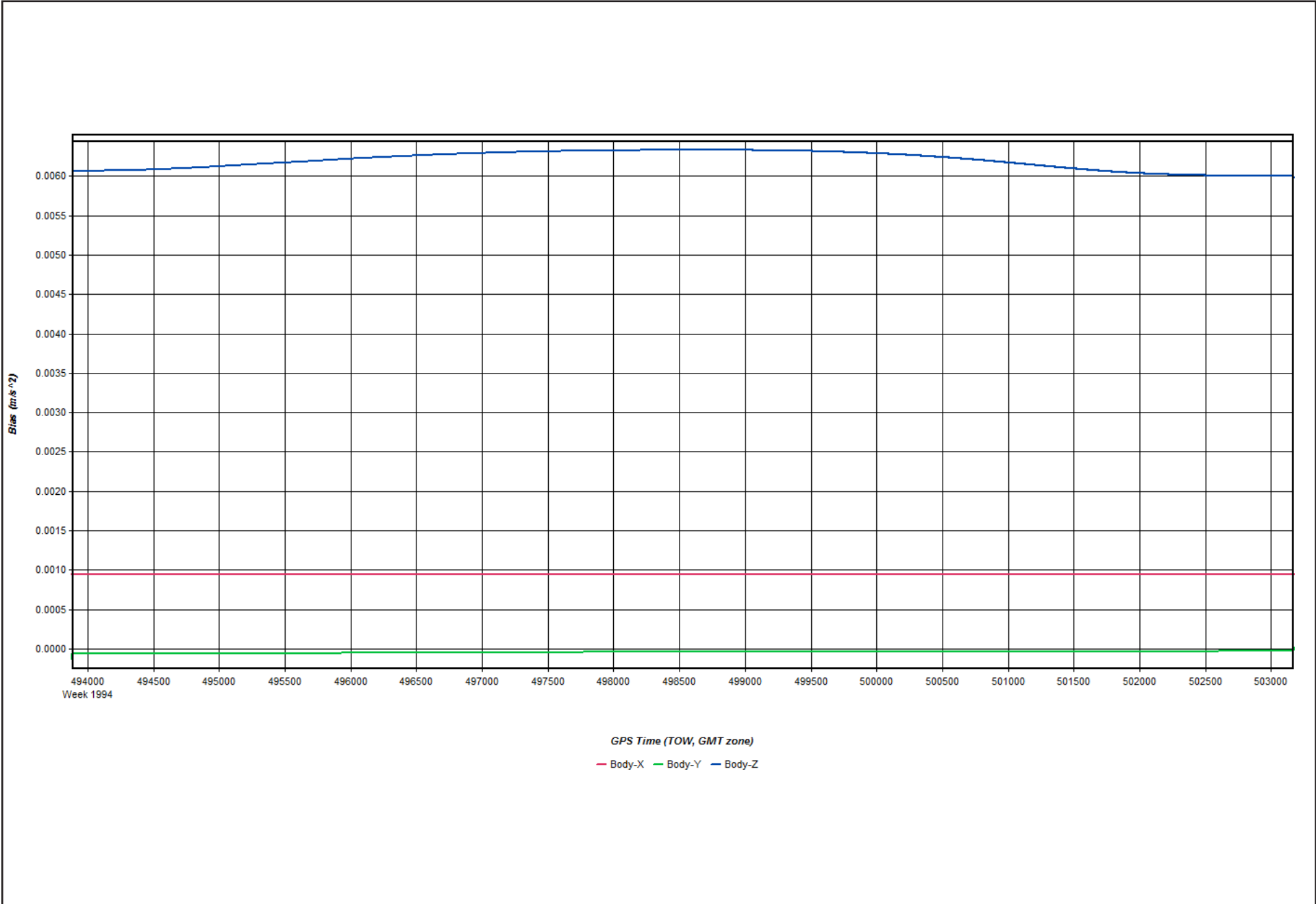


Figure 20: Gyro Drift Plot

