

**WI 12 County B22 Vilas
County
LIDAR PROCESSING REPORT**

Project ID: 230110
Work Unit: 230107

Prepared for:



2023

Submitted: November 9, 2023

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GEOSPATIAL

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1. Summary / Scope

1.1. Summary

This report contains a summary of the WI 12 County B22 Vilas County, Work Unit 230107 lidar acquisition task order, issued by USGS under their Contract 140G0221D0012 on March 28, 2022. The task order yielded a work unit area covering 1,027 square miles over Wisconsin at Quality Level 1. The intent of this document is only to provide specific validation information for the data acquisition/collection, processing, and production of deliverables completed as specified in the task order.

1.2. Scope

Aerial topographic lidar was acquired using state of the art technology along with the necessary surveyed ground control points (GCPs) and airborne GPS and inertial navigation systems. The aerial data collection was designed with the following specifications listed in Table 1 below.

Table 1. Originally Planned Lidar Specifications

Average Point Density	Flight Altitude (AGL)	Field of View	Minimum Side Overlap	RMSEz
8 pts / m2	2,083 m	58.5°	20%	≤ 10 cm

1.3. Coverage

The work unit boundary covers 1,027 square miles over Wisconsin. Work unit extents are shown in Figure 1.

1.4. Duration

Lidar data was acquired from May 4, 2022 and May 15, 2022 in 8 total lifts. See “Section: 2.4. Time Period” for more details.

1.5. Issues

There are no issues to report.

WI 12 County B22 Vilas County Work Unit 230107 Projected Coordinate System: Wisconsin Coordinate Reference System - Vilas Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID 18) Units: Survey Feet	
Lidar Point Cloud	Classified Point Cloud in .LAS 1.4 format
Rasters	<ul style="list-style-type: none"> 1-foot Hydro-flattened Bare Earth Digital Elevation Model (DEM) in GeoTIFF format 1-foot Intensity images in GeoTIFF format 2-foot Maximum Surface Height Raster in GeoTIFF format 2-foot Swath Separation Images in GeoTIFF format
Vectors	Shapefiles (*.shp) <ul style="list-style-type: none"> Project Boundary Lidar Tile Index Geodatabase (*.gdb) <ul style="list-style-type: none"> Continuous Hydro-flattened Breaklines Flightlines Swath
Reports	Reports in PDF format <ul style="list-style-type: none"> Focus on Delivery Survey Report Processing Report
Metadata	XML Files (*.xml) <ul style="list-style-type: none"> Breaklines Classified Point Cloud DEM Intensity Imagery

WI 12 County B22 Vilas County Work Unit 230107 Boundary

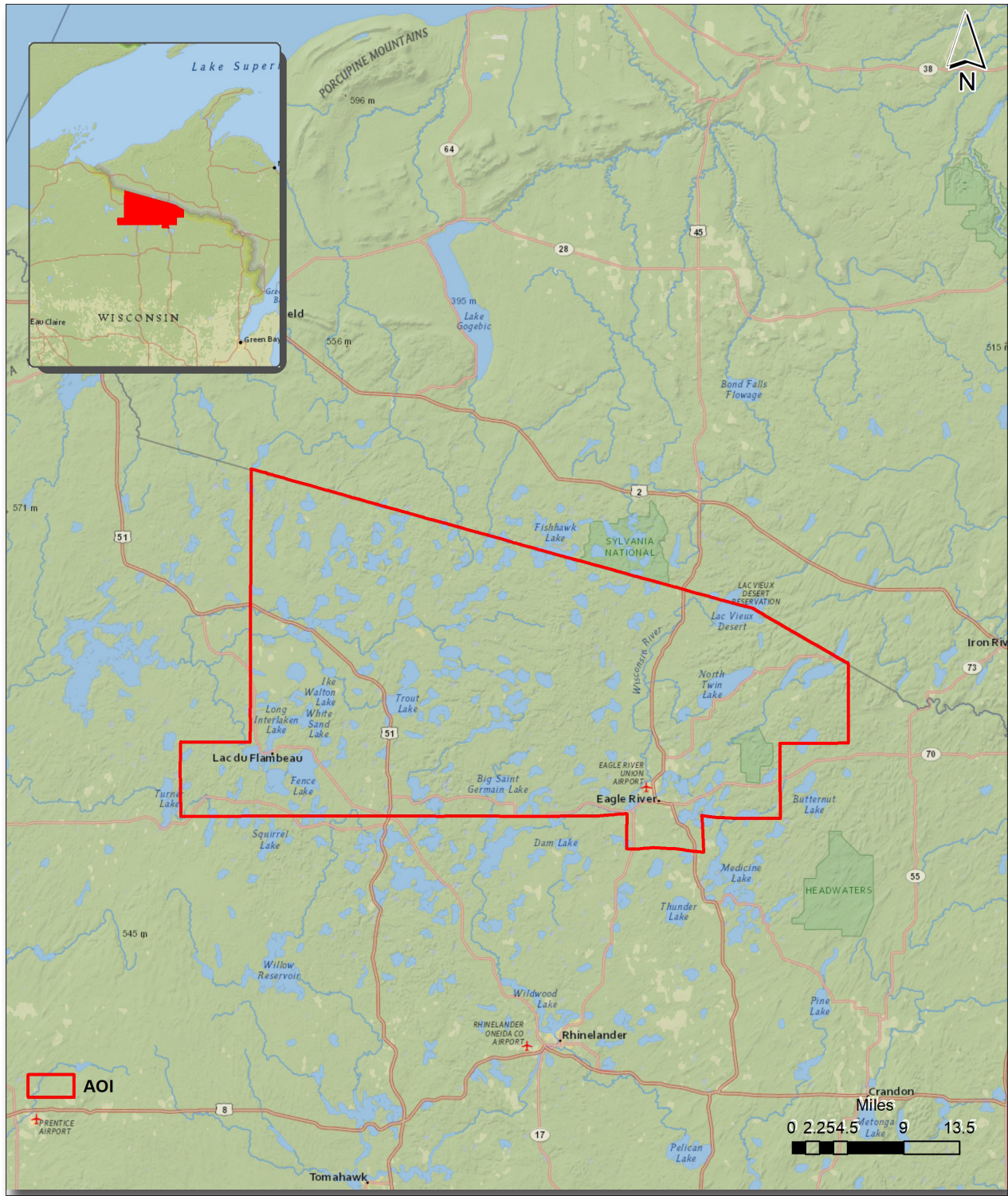


Figure 1. Work Unit Boundary

2. Planning / Equipment

2.1. Flight Planning

Flight planning was based on the unique project requirements and characteristics of the project site. The basis of planning included: required accuracies, type of development, amount / type of vegetation within project area, required data posting, and potential altitude restrictions for flights in project vicinity.

Detailed project flight planning calculations were performed for the project using RiPARAMETER planning software.

2.2. Lidar Sensor

NV5 Geospatial utilized Riegl VQ1560ii lidar sensors (Figure 2), serial number(s) 3062, for data acquisition.

The Riegl 1560ii system is a dual channel waveform processing airborne scanning system. It has a laser pulse repetition rate of up to 4 MHz resulting in up to 2.66 million measurements per second. The system utilizes a Multi-Pulse in the Air option (MPIA) and an integrated IMU/GNSS unit.

A brief summary of the aerial acquisition parameters for the project are shown in the lidar System Specifications in Table 2.

Table 2. Lidar System Specifications

		Riegl VQ1560ii (SN3062)	Riegl VQ1560ii (SN3543)
Terrain and Aircraft Scanner	Flying Height	1584 m	1050 m
	Recommended Ground Speed	160 kts	160 kts
Scanner	Field of View	60°	60°
	Scan Rate Setting Used	191 lps	295 Hz
Laser	Laser Pulse Rate Used	2400 kHz	1000 kHz
	Multi Pulse in Air Mode	yes	yes
Coverage	Full Swath Width	1827 m	1846 m
	Line Spacing	1462 m	1477 m
Point Spacing and Density	Average Point Spacing	0.35 m	0.35 m
	Average Point Density	8 pts / m ²	8 pts / m ²

Figure 2. Riegl VQ1560ii Lidar Sensor



2.3. Aircraft

All flights for the project were accomplished through the use of customized aircraft. Plane type and tail numbers are listed below.

Lidar Collection Planes

- Piper PA-31, Tail Number(s): C-GAYY, C-FFRY

These aircraft provided an ideal, stable aerial base for lidar acquisition. These aerial platforms have relatively fast cruise speeds, which are beneficial for project mobilization / demobilization while maintaining relatively slow stall speeds, proving ideal for collection of high-density, consistent data posting using a state-of-the-art lidar system. NV5 Geospatial’s operating aircraft can be seen in Figure 3 below.

Figure 3. NV5 Geospatial’s Aircraft



2.4. Time Period

Project specific flights were conducted between May 4, 2022 and May 15, 2022. Eight aircraft lifts were completed. Accomplished lifts are listed below.

Lift	Start UTC	End UTC
05042022A (SN3062,C-GAYY)	5/04/2022 3:39:34 PM	5/04/2022 5:40:27 PM
05052022A (SN3062,C-GAYY)	5/05/2022 4:58:56 PM	5/05/2022 6:11:40 PM
05062022A (SN3062,C-GAYY)	5/06/2022 1:50:58 PM	5/06/2022 6:03:23 PM
05072022A (SN3062,C-GAYY)	5/07/2022 1:37:31 PM	5/07/2022 5:31:41 PM
05082022A (SN3062,C-GAYY)	5/08/2022 1:48:53 PM	5/08/2022 3:13:56 PM
05082022A (SN3543,C-FFRY)	5/08/2022 1:41:00 PM	5/08/2022 3:09:27 PM
05142022A (SN3543,C-FFRY)	5/14/2022 12:58:02 PM	5/14/2022 4:34:53 PM
05152022A (SN3543,C-FFRY)	5/15/2022 12:55:12 PM	5/15/2022 3:45:07 PM

3. Processing Summary

3.1. Flight Logs

Flight logs were completed by Lidar sensor technicians for each mission during acquisition. These logs depict a variety of information, including:

- Job / Project #
- Flight Date / Lift Number
- FOV (Field of View)
- Scan Rate (HZ)
- Pulse Rate Frequency (Hz)
- Ground Speed
- Altitude
- Base Station
- PDOP avoidance times
- Flight Line #
- Flight Line Start and Stop Times
- Flight Line Altitude (AMSL)
- Heading
- Speed
- Returns
- Crab

Notes: (Visibility, winds, ride, weather, temperature, dew point, pressure, etc). Project specific flight logs for each sortie are available in Appendix A.

3.2. Lidar Processing

Applanix + POSPac software was used for post-processing of airborne GPS and inertial data (IMU), which is critical to the positioning and orientation of the lidar sensor during all flights. Applanix POSPac combines aircraft raw trajectory data with stationary GPS base station data yielding a “Smoothed Best Estimate Trajectory” (SBET) necessary for additional post processing software to develop the resulting geo-referenced point cloud from the lidar missions.

During the sensor trajectory processing (combining GPS & IMU datasets) certain statistical graphs and tables are generated within the Applanix POSPac processing environment which are commonly used as indicators of processing stability and accuracy. This data for analysis include: max horizontal / vertical GPS variance, separation plot, altitude plot, PDOP plot, base station baseline length, processing mode, number of satellite vehicles, and mission trajectory.

Point clouds in flightline swath format were created using the RiPROCESS software. The generated point cloud is the mathematical three dimensional composite of all returns from all laser pulses as determined from the aerial mission. Each flightline swath point cloud was calibrated using Strip Align software that corrects systematic geometric errors and improves the relative and absolute accuracy of the flightline swath point cloud. The calibrated point cloud swaths were imported into GeoCue distributive processing software and the imported data was then tiled so further processing could take place in TerraScan software. Using TerraScan, the vertical accuracy of the surveyed ground control was tested and any vertical bias was removed from the data. TerraScan and TerraModeler software packages were then used for automated data classification and manual cleanup. The data were manually reviewed and any remaining artifacts removed using functionality provided by TerraScan and TerraModeler.

DEMs and Intensity Images are then generated using proprietary software. In the bare earth surface model, above-ground features are excluded from the data set. Global Mapper is used as a final check of the bare earth dataset.

Finally, proprietary software is used to perform statistical analysis of the LAS files.

Software	Version
Applanix + POSPac	8.6
RiPROCESS	1.8.6
GeoCue	2020.1.22.1
Global Mapper	19.1;20.1
Microstation Connect	10.16.02.34
TerraModeler	21.008
TerraScan	21.016
StripAlign	2.21

3.3. LAS Classification Scheme

The classification classes are determined by Lidar Base Specifications 2021, Revision A and are an industry standard for the classification of lidar point clouds. All data starts the process as Class 1 (Unclassified), and then through automated classification routines, the classifications are determined using TerraScan macro processing.

The classes used in the dataset are as follows and have the following descriptions:

Table 3. LAS Classifications

	Classification Name	Description
1	Processed, but Unclassified	Laser returns that are not included in the bare earth class, or any other project classification
2	Bare earth	Laser returns that are determined to be bare earth using automated and manual cleaning algorithms
7	Low Noise	Laser returns that are often associated with scattering from reflective surfaces, or artificial points below the bare earth surface
9	Water	Laser returns that are found inside of hydro features
17	Bridge Deck	Laser returns falling on bridge decks
18	High Noise	Laser returns that are often associated with birds or artificial points above the bare earth surface
20	Ignored Ground	Bare earth points that fall within the given threshold of a collected hydro feature.
21	Snow	Bare earth points that fall on snow, where identifiable
22	Temporal Exclusion	Points that are excluded due to differences in collection dates

3.4. Classified LAS Processing

The bare earth surface is then manually reviewed to ensure correct classification on the Class 2 (Ground) points. After the bare- earth surface is finalized; it is then used to generate all hydro-breaklines through heads-up digitization.

All ground (ASPRS Class 2) lidar data inside of the Lake Pond and Double Line Drain hydro flattening breaklines were then classified to water (ASPRS Class 9) using proprietary tools. A buffer of 1.5 feet/0.5 meter was also used around each hydro flattened feature to classify these ground (ASPRS Class 2) points to Ignored ground (ASPRS Class 20). All Lake Pond Island and Double Line Drain Island features were checked to ensure that the ground (ASPRS Class 2) points were reclassified to the correct classification after the automated classification was completed.

Any noise that was identified either through manual review or automated routines was classified to the appropriate class (ASPRS Class 7 and/or ASPRS Class 18) followed by flagging with the withheld bit.

All data was manually reviewed and any remaining artifacts removed using functionality provided by TerraScan and TerraModeler. Global Mapper is used as a final check of the bare earth dataset. GeoCue was then used to create the deliverable industry-standard LAS files for all point cloud data. NV5 Geospatial's proprietary software was used to perform final statistical analysis of the classes in the LAS files, on a per tile level to verify final classification metrics and full LAS header information.

3.5. Hydro-Flattened Breakline Processing

Using heads-up digitization, all Lake-Ponds, Double Line Drains, and Islands are manually collected that are within the project size specification. This includes Lake-Ponds greater than 2 acres in size, Double Line Drains with greater than a 100 foot nominal width, and Islands greater than 1 acre in size within a collected hydro feature. Lidar intensity imagery and bare-earth surface models are used to ensure appropriate and complete collection of these features.

Elevation values are assigned to all collected hydro features via NV5 Geospatial's proprietary software. This software sets Lake-Ponds to an appropriate, single elevation to allow for the generation of hydro-flattened digital elevation models (DEM). Double Line Drain elevations are assigned based on lidar elevations and surrounding terrain feature to ensure all breaklines match the lidar within acceptable tolerances. Some deviation is expected between breakline and lidar elevations due to monotonicity, connectivity, and flattening rules that are enforced on the breaklines. Once complete, horizontal placement, and vertical variances are reviewed, all breaklines are evaluated for topological consistency and data integrity using a combination of proprietary tools and manual review of hydro-flattened DEMs.

Breaklines are combined into one seamless shapefile, clipped to the project boundary, and imported into an Esri file geodatabase for delivery.

3.6. Hydro-Flattened Raster DEM Processing

Hydro-Flattened DEMs (topographic) represent a lidar-derived product illustrating the grounded terrain and associated breaklines (as described above) in raster form. NV5 Geospatial’s proprietary software was used to take all input sources (bare earth lidar points, bridge and hydro breaklines, etc.) and create a Triangulated Irregular Network (TIN) on a tile-by-tile basis. Data extending past the tile edge is incorporated in this process so that proper triangulation can occur. From the TIN, linear interpolation is used to calculate the cell values for the raster product. The raster product is then clipped back to the tile edge so that no overlapping cells remain across the project area. A 32-bit floating point GeoTIFF DEM was generated for each tile with a pixel size of 1-foot. NV5 Geospatial’s proprietary software was used to write appropriate horizontal and vertical projection information as well as applicable header values into the file during product generation. Each DEM is reviewed in Global Mapper to check for any surface anomalies and to ensure a seamless dataset. NV5 Geospatial ensures there are no void or no-data values (-999999) in each derived DEM. This is achieved by using propriety software checking all cell values that fall within the project boundary. NV5 Geospatial uses a proprietary tool called FOCUS on Delivery to check all formatting requirements of the DEMs against what is required before final delivery.

3.7. Intensity Image Processing

Intensity images represent reflectivity values collected by the lidar sensor during acquisition. Proprietary software generates intensity images using first returns and excluding those flagged with a withheld bit. Intensity images are linearly scaled to a value range specific to the project area to standardize the images and reduce differences between individual tiles. Appropriate horizontal projection information as well as applicable header values are written during product generation.

3.8. Swath Separation Raster Processing

Swath Separation Images are rasters that represent the interswath alignment between flight lines and provide a qualitative evaluation of the positional quality of the point cloud. NV5 Geospatial proprietary software generated 2-foot raster images in GeoTIFF format using last returns, excluding points flagged with the withheld bit, and using a point-in-cell algorithm. Images are generated with a 75% intensity opacity and (4) absolute 8-cm intervals, see below for interval coloring. Intensity images are linearly scaled to a value range specific to the project area to standardize the images and reduce differences between individual tiles. Appropriate horizontal projection information as well as applicable header values are written to the file during product generation. NV5 Geospatial uses a proprietary tool called FOCUS on Delivery to check all formatting requirements of the images against what is required before final delivery.

	0-8cm
	8-16cm
	16-24cm
	>24cm

3.9. Maximum Surface Height Raster Processing

Maximum Surface Height rasters (topographic) represent a lidar-derived product illustrating natural and built-up features. NV5 Geospatial's proprietary software was used to take all classified lidar points, excluding those flagged with a withheld bit, and create a raster on a tile-by-tile basis. Data extending past the tile edge is incorporated in this process so that proper gridding can occur. The raster is created by laying a 2-foot DEM cell size over the area and assigning the values to cells by using the maximum lidar point that intersects that grid cell. The raster product is then clipped back to the tile edge so that no overlapping cells remain across the project area. A 32-bit floating point GeoTIFF was then generated for each tile with a pixel size of 2-foot. There is no interpolation type being used in creating the raster product. NV5 Geospatial's proprietary software was used to write appropriate horizontal and vertical projection information as well as applicable header values into the file during product generation. Each maximum surface height raster is reviewed in Global Mapper to check for any anomalies and to ensure a seamless dataset. NV5 Geospatial uses a proprietary tool called FOCUS on Delivery to check all formatting requirements of the DEMs against what is required before final delivery.

3.10. Point Density

The acquisition parameters were designed to acquire an average first-return density of 8 points/m². First return density describes the density of pulses emitted from the laser that return at least one echo to the system. Multiple returns greater than 1 from a single pulse were not considered in first return density analysis. Some types of surfaces (e.g., breaks in terrain, water, and steep slopes) may have returned fewer pulses than originally emitted by the laser. First returns typically reflect off the highest feature on the landscape within the footprint of the pulse. In forested or urban areas, the highest feature could be a tree, building or power line, while in areas of unobstructed ground, the first return will be the only echo and represents the bare earth surface.

The density of ground-classified lidar returns was also analyzed for this project. Terrain character, land cover, and ground surface reflectivity all influenced the density of ground surface returns. In vegetated areas, fewer pulses may penetrate the canopy, resulting in lower ground density.

The average first-return density of lidar data for the project was 13.85 points/m² while the average ground classified density was 9.4 points/m². The statistical and spatial distributions of first return densities and classified ground return densities per 100 m x 100 m cell are portrayed in Figures 4 and 5.

WI 12 County B22 Vilas County Work Unit 230107 First Return Density

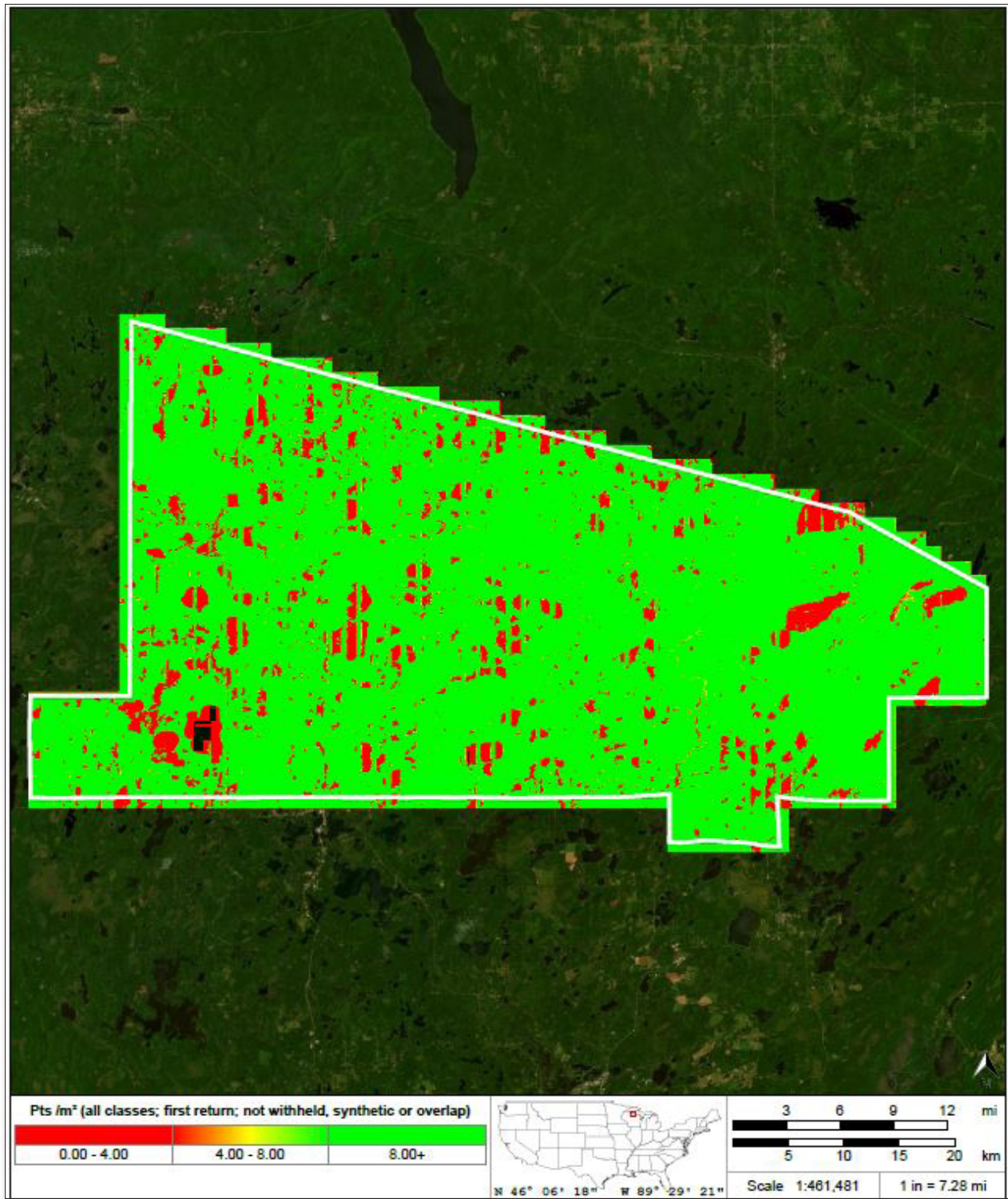


Figure 4. First Return Point Density

WI 12 County B22 Vilas County Work Unit 230107 Ground Density

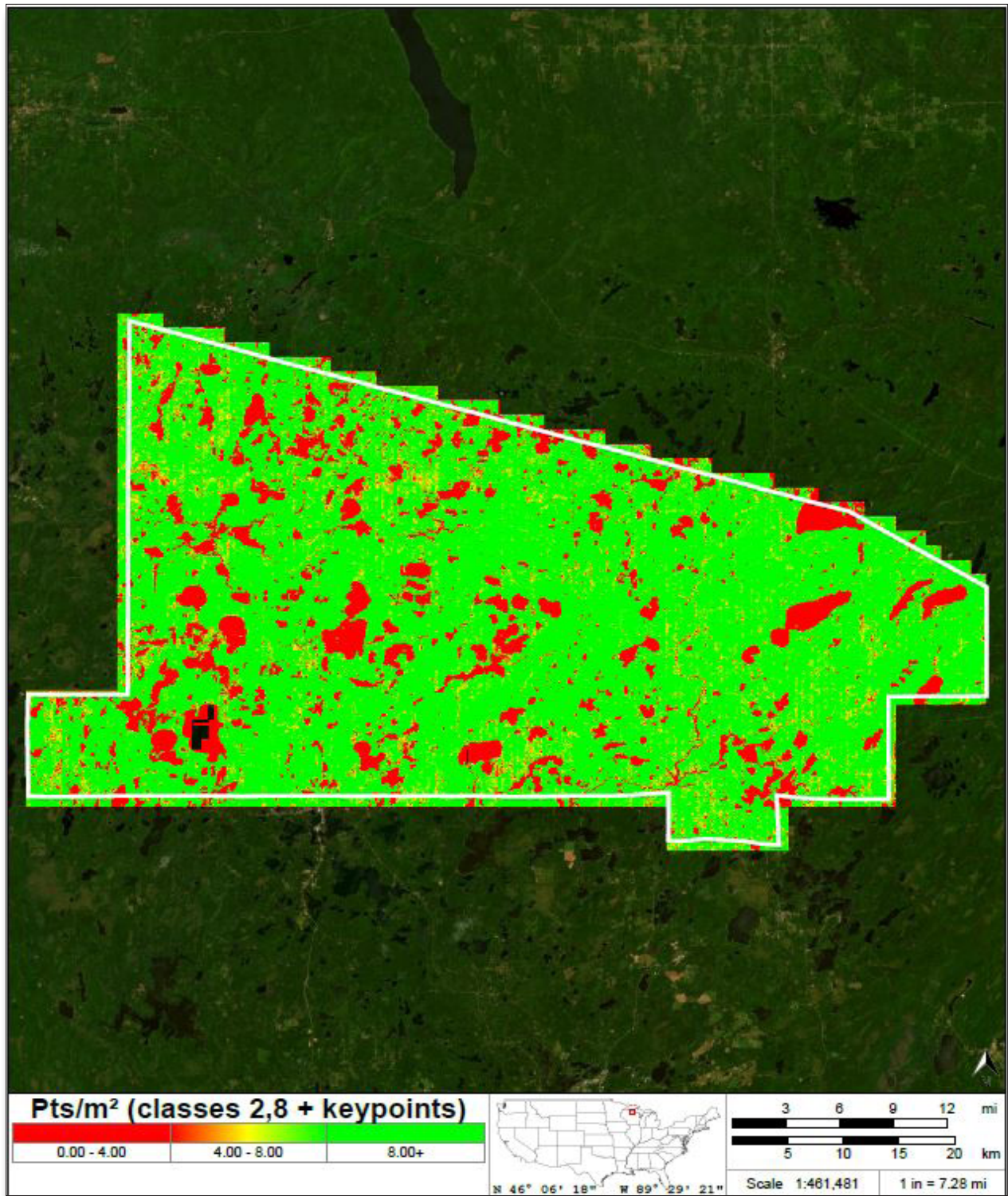


Figure 5. Ground Density

WI 12 County B22 Vilas County Work Unit 230107 Tile Layout

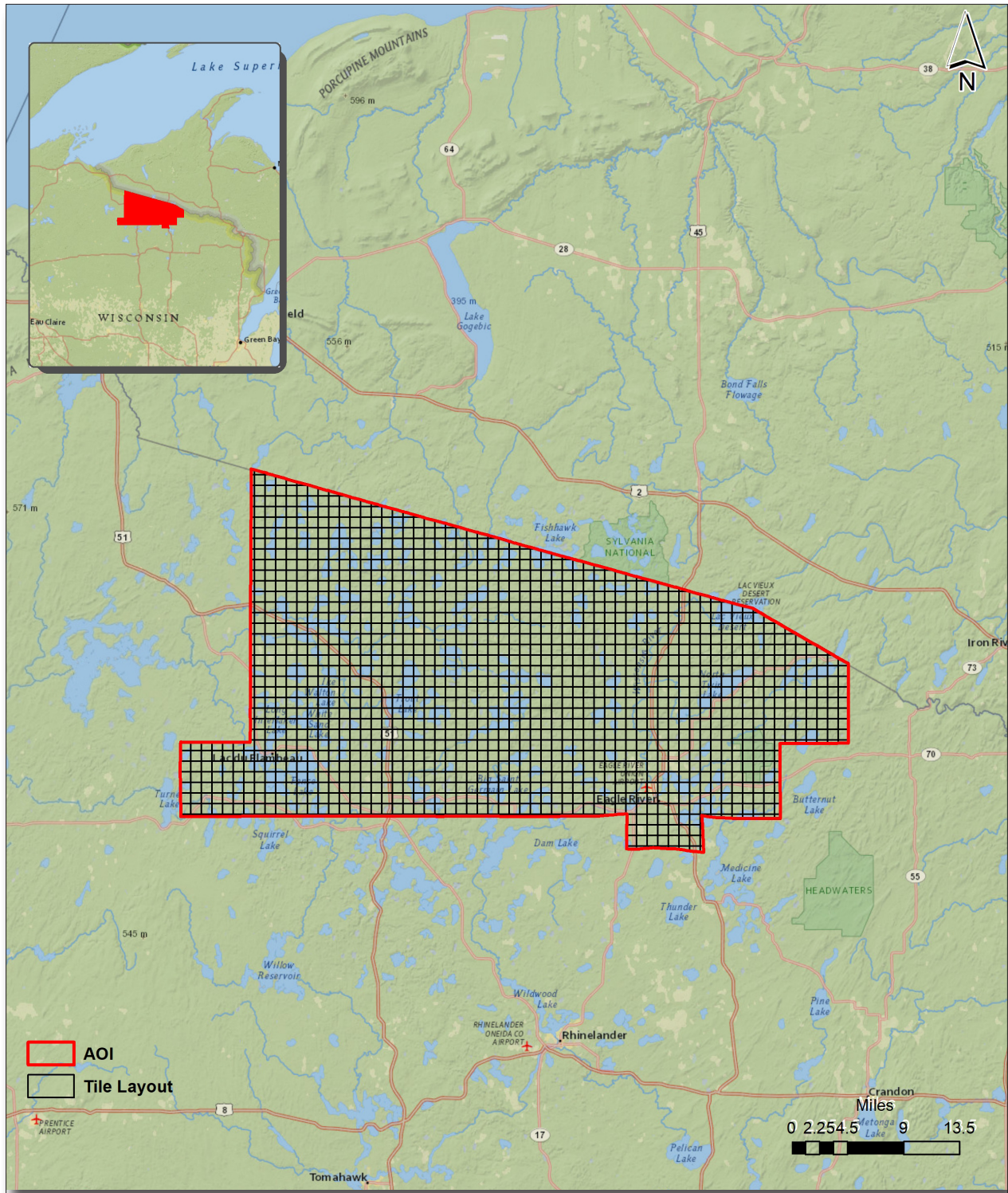


Figure 6. Lidar Tile Layout

4. Project Coverage Verification

A proprietary tool (FOCUS on Flight) produces grid-based polygons of each flightline, depicting exactly where lidar points exist. These swath polygons are reviewed against the project boundary to verify adequate project coverage. Please refer to Figure 7.

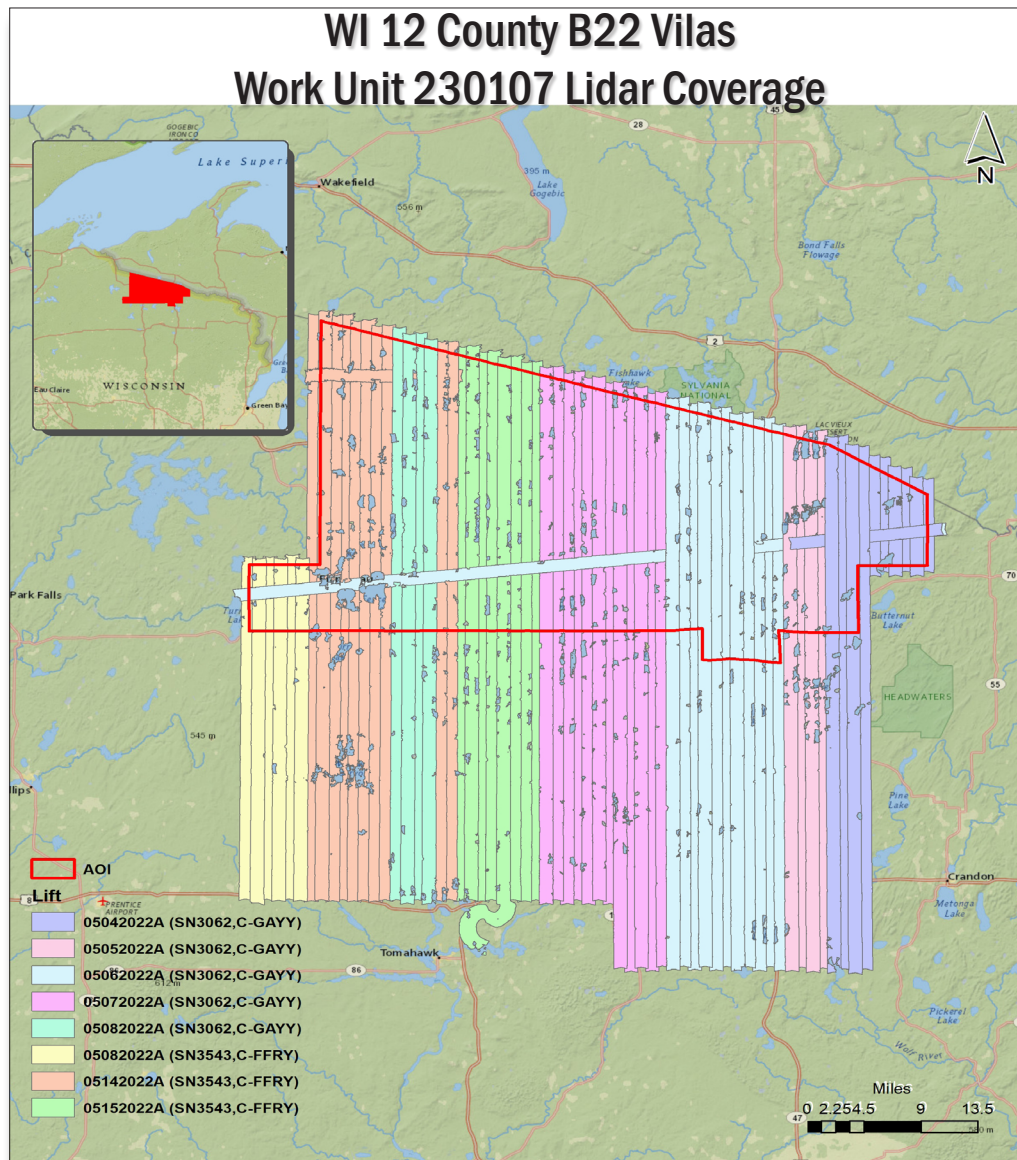


Figure 7. Lidar Coverage

5. Accuracy Testing

5.1. Calibration Control Point Testing

Figure 6 shows the location of each bare earth calibration point for the project area. TerraScan was used to perform a quality assurance check using the lidar bare earth calibration points. The results of the surface calibration are not an independent assessment of the accuracy of these project deliverables, but the statistical results do provide additional feedback as to the overall quality of the elevation surface.

5.2. Point Cloud Testing

The project specifications require that only Non-Vegetated Vertical Accuracy (NVA) be computed for raw lidar point cloud swath files. The required accuracy (ACCz) is: 19.6 cm at a 95% confidence level, derived according to NSSDA, i.e., based on RMSE of 10 cm in the “bare earth” and “urban” land cover classes. The NVA was tested with 227 checkpoints located in bare earth and urban (non-vegetated) areas. These check points were not used in the calibration or post processing of the lidar point cloud data. The checkpoints were distributed throughout the project area and were surveyed using GPS techniques. See survey report for additional survey methodologies.

Elevations from the unclassified lidar surface were measured for the x,y location of each check point. Elevations interpolated from the lidar surface were then compared to the elevation values of the surveyed control points. AccuracyZ has been tested to meet 19.6 cm or better Non-Vegetated Vertical Accuracy at 95% confidence level using $RMSE(z) \times 1.9600$ as defined by the National Standards for Spatial Data Accuracy (NSSDA); assessed and reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines.

5.3. Digital Elevation Model (DEM) Testing

The project specifications require the accuracy (ACCz) of the derived DEM be calculated and reported in two ways:

1. The required NVA is: 19.6 cm at a 95% confidence level, derived according to NSSDA, i.e., based on RMSE of 10 cm in the “bare earth” and “urban” land cover classes. This is a required accuracy. The NVA was tested with 227 checkpoints located in bare earth and urban (non-vegetated) areas. See Figure 7.
2. Vegetated Vertical Accuracy (VVA): VVA shall be reported for “brushlands/low trees” and “tall weeds/crops” land cover classes. The target VVA is: 29.4 cm at the 95th percentile, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for lidar Data, i.e., based on the 95th percentile error in all vegetated land cover classes combined. This is a target accuracy. The VVA was tested with 162 checkpoints located in tall weeds/crops and brushlands/low trees (vegetated) areas. The checkpoints were distributed throughout the project area. See Figure 8.

AccuracyZ has been tested to meet 19.6 cm or better Non-Vegetated Vertical Accuracy at 95% confidence level using $RMSE(z) \times 1.9600$ as defined by the National Standards for Spatial Data Accuracy (NSSDA); assessed and reported using National Digital Elevation Program (NDEP)/ASRPS Guidelines.

A brief summary of results are listed below.

	Target	Measured	Point Count
Raw NVA	0.196 m	0.0509 m	227
NVA	0.196 m	0.0496 m	227
VVA	0.294 m	0.147 m	162

WI 12 County B22 Calibration Points

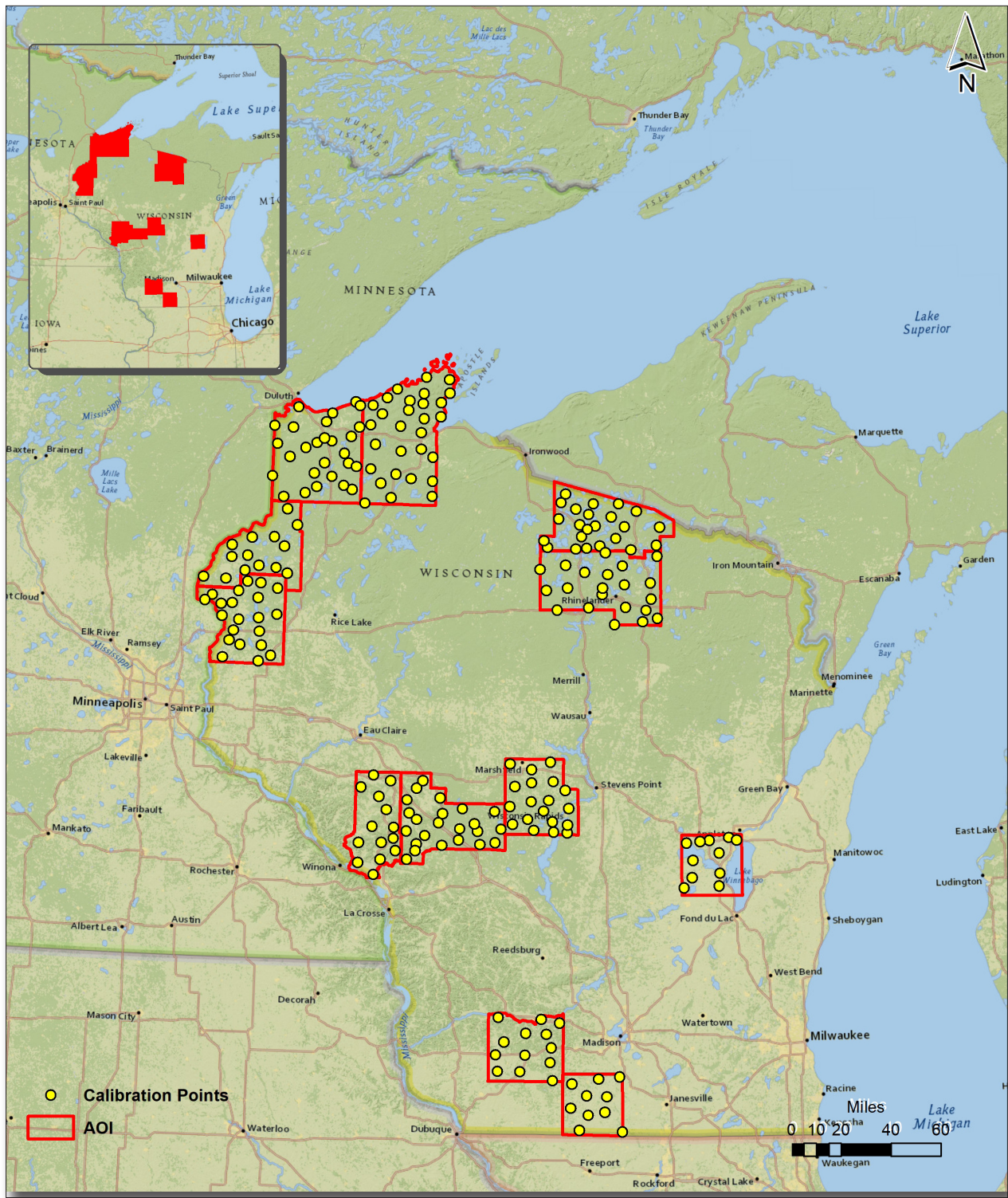


Figure 8. Calibration Control Point Locations

WI 12 County B22 NVA Points

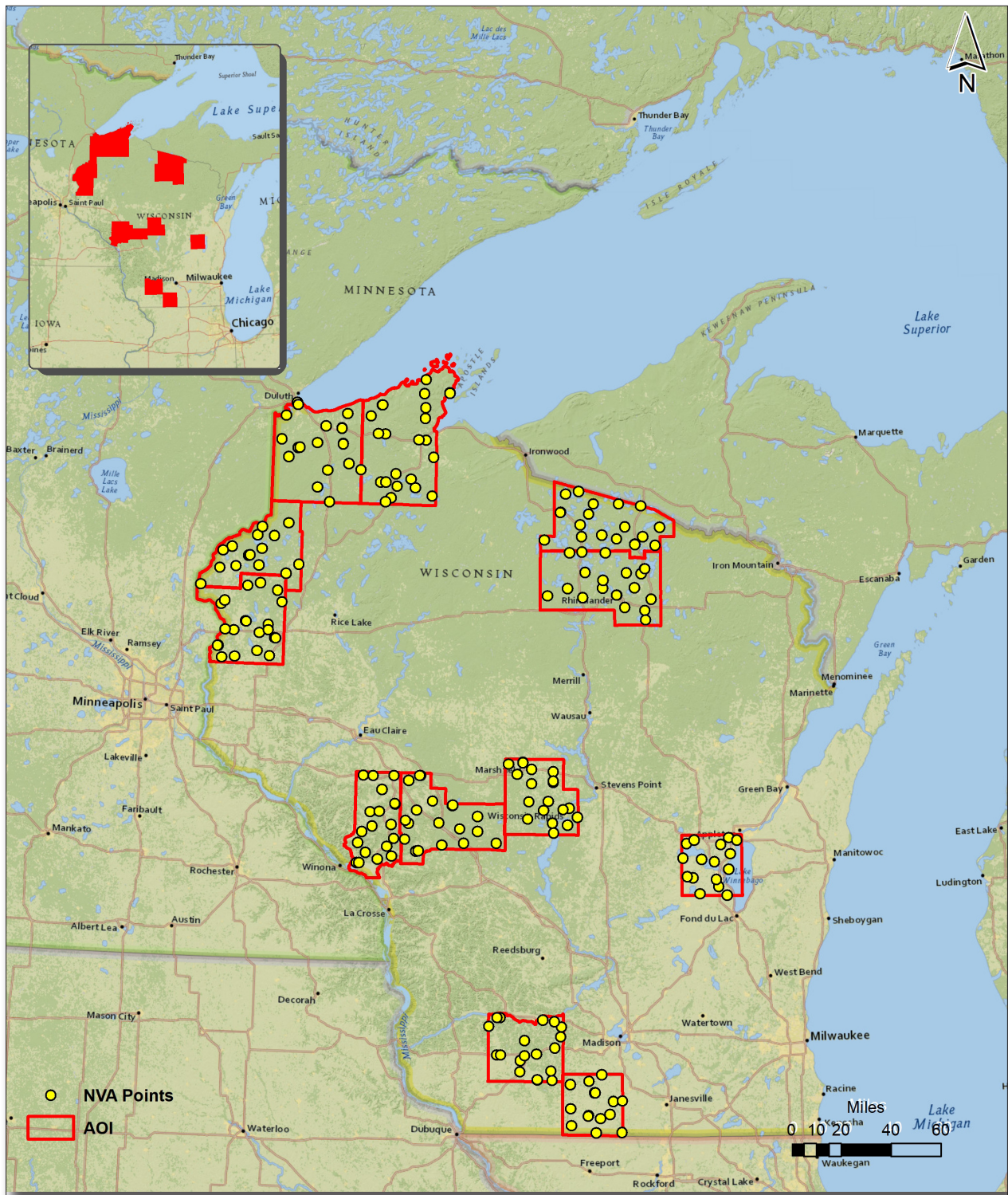


Figure 9. QC Checkpoint Locations - NVA

WI 12 County B22 VVA Points

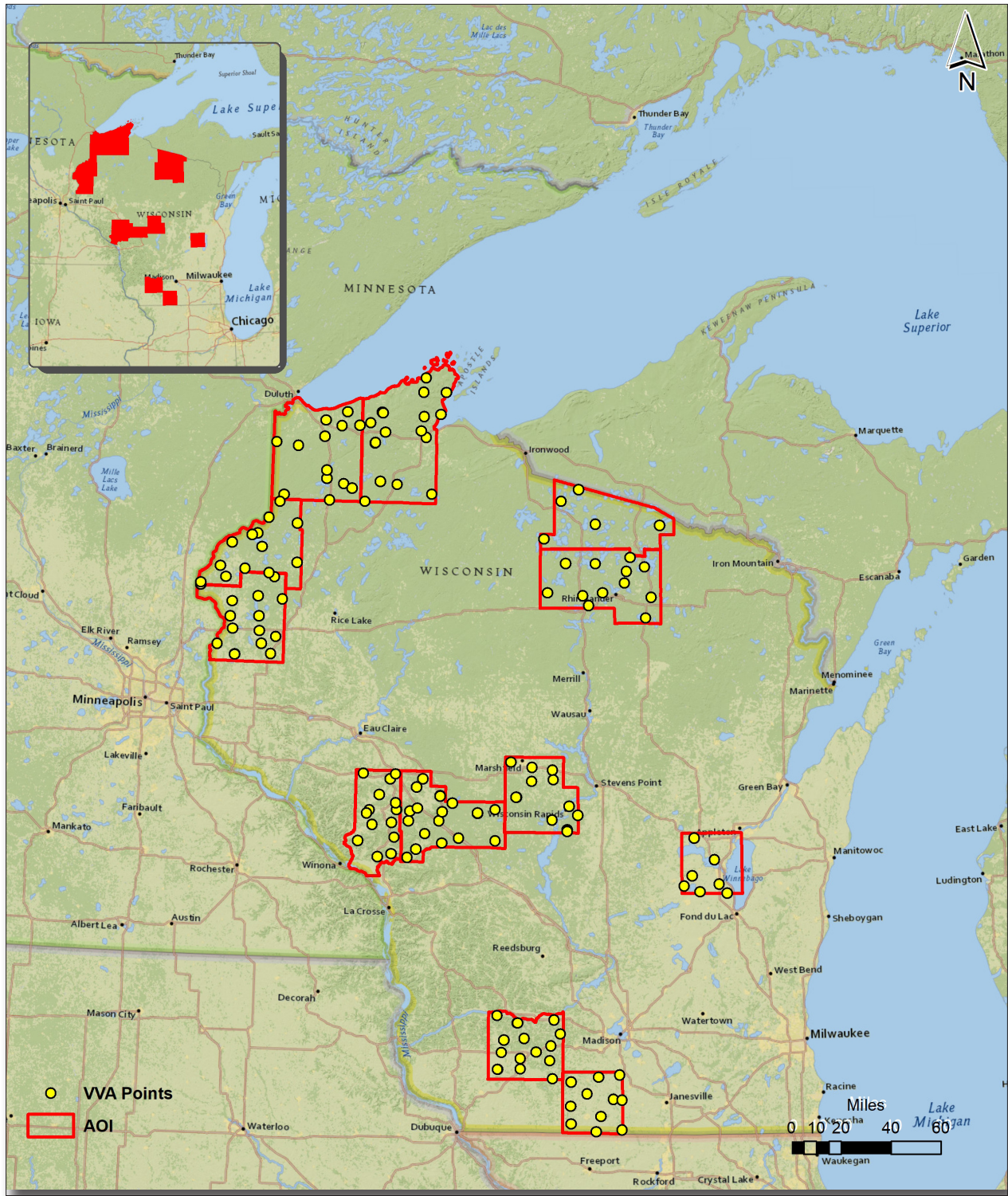


Figure 10. QC Checkpoint Locations - VVA

6. Geometric Accuracy

6.1. Horizontal Accuracy

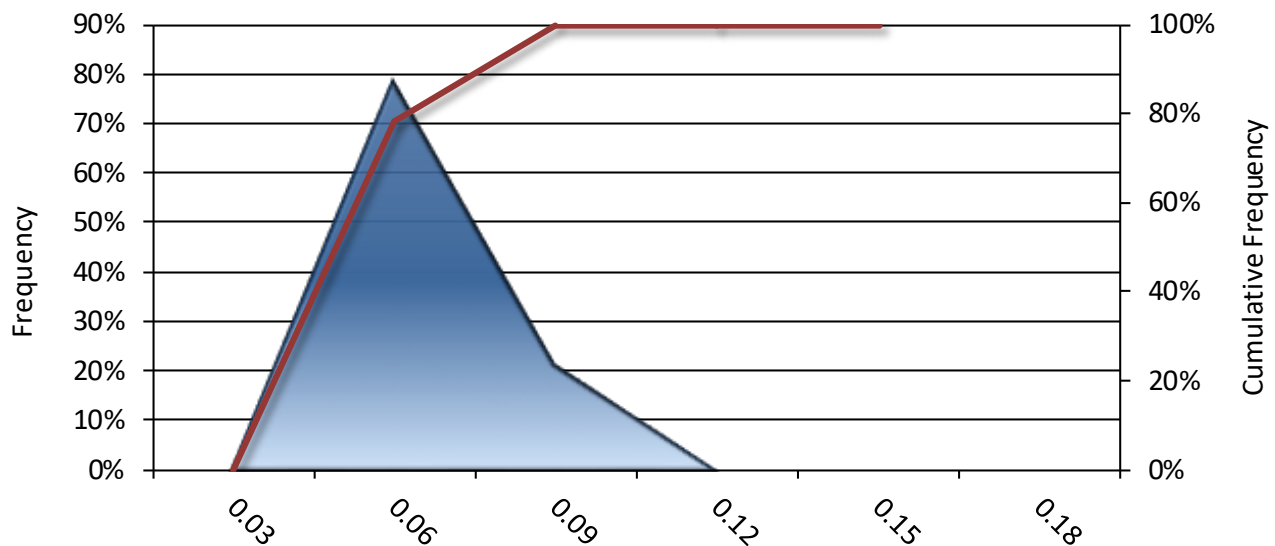
Lidar horizontal accuracy is a function of Global Navigation Satellite System (GNSS) derived positional error, flying altitude, and INS derived attitude error. The obtained $RMSE_r$ value is multiplied by a conversion factor of 1.7308 to yield the horizontal component of the National Standards for Spatial Data Accuracy (NSSDA) reporting standard where a theoretical point will fall within the obtained radius 95% of the time. Based on a flying altitude of 1606 meters, an IMU error of 0.002 decimal degrees, and a GNSS positional error of 0.015 meters, this project was compiled to meet 0.18 meter horizontal accuracy at the 95% confidence level. A summary is shown below.

Horizontal Accuracy	
$RMSE_r$	0.33 ft
	0.10 m
ACC_r	0.58 ft
	0.18 m

6.2. Relative Vertical Accuracy

Relative vertical accuracy refers to the internal consistency of the data set as a whole: the ability to place an object in the same location given multiple flight lines, GPS conditions, and aircraft attitudes. When the lidar system is well calibrated, the swath-to-swath vertical divergence is low (<0.10 meters). The relative vertical accuracy was computed by comparing the ground surface model of each individual flight line with its neighbors in overlapping regions. The average (mean) line to line relative vertical accuracy for the WI 12 County B22 Vilas County project was 0.058 feet (0.018 meters). A summary is shown below.

Relative Vertical Accuracy	
Sample	65 flight line surfaces
Average	0.058 ft
	0.018 m
Median	0.058 ft
	0.018 m
RMSE	0.058 ft
	0.018 m
Standard Deviation (1σ)	0.002 ft
	0.001 m
1.96σ	0.004 ft
	0.001 m



Wisconsin 12 County -Vilas, Wisconsin Relative Vertical Accuracy (ft)
 Total Compared Points (n = 6,893,830,508)

6.3. Intrawath Precision (Smooth Surface Precision)

Intrawath Precision (smooth surface precision) is the measure of reliability of the lidar point cloud elevations along a planar surface. This measurement is performed on hard surfaces against a single flightline. NV5 digitized several large parking lots as polygons across the project area. These polygons were then used to calculate precision on a single FL basis using the below formula:

$$\text{Precision} = \text{Range} - (\text{Slope} \times \text{Cellsize} \times 1.414)$$

Range – Is the difference between the highest and lowest lidar points in each cell

Slope – is the maximum slope of the cell to its 8 neighbors

Cellsize – is set to the ANPS, rounded up to the next integer, and then doubled

NV5 calculated the RMSDz to be 2 cm, minimum slope-corrected range to be 0 cm, and the maximum slope-corrected range to be 6.5 cm.

Project Report Appendices

The following section contains the appendices as listed in the WI 12 County B22 Vilas County Lidar Project Report.

Appendix A

Flight Logs

Julian Day 124 Flight B

LIDAR Flight Log



Date	May 04, 2022	Aircraft	C-FFRY
Project	3238_NV5_WM3DEP_V3	Pilot	Kane G
Location	Eau Claire WI	Operator	Daniel. A
Mission Objective			

System	Riegl VQ-1560ii
Unit	43
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes
 T- 15C Moderate Turbulence
 H- 36%
 AMLS-278m
 Hpa-1022
 Time to next maintenance: _____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	19:19	Takeoff 19:38
Engine Off	23:03	Landing 22:53
Total	3.7 hrs	Total 3.3 hrs

Mission Plan					
AGL Height	1050	m	Pulse Rate	1000	khz/ch
Target Speed	160	kts	Scan Rate	295	hz/ch
Laser Current	100	%	FOV	60	degs

Static Alignment	GPS Time		
	Start	End	
	1925	1930	
Pre Mission	2256	Post Mission	2301

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
F8			1947	1952				
3199	432212443		2001	2010			200155	Refly 14nm from E end of the line
3194	432212444		2016	2027			201620	
3198	432212445		2031	2033		2033	203110	Aborted due to Traffic not talkig to ATC
3198	432212446		2041	2059			204120	Refly
3197	432212447		2103	2121			210302	
3196	432212448		2124	2143			212455	
3195	432212449		2146	2205			214629	
3193	432212450		2207	2218			220743	
Xtie	432212451		2220	2222			222049	
F8			2226	2231				

LIDAR Flight Log



Date	May 14, 2022	Aircraft	C-FFRY
Project	3238_NV5_WM3DEP_QL1	Pilot	Kane G
Location	Duluth MI	Operator	Daniel. A
Mission Objective			

System	Riegl VQ-1560ii
Unit	43
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes	
T-11C 30Kt Wind/ Moderate to Severe	
H- 71% Turbulence	
AMLS-278m	
Hpa-1012	
Time to next maintenance: _____	☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	11:58	Takeoff 12:15
Engine Off	17:58	Landing 17:47
Total	6.0 hrs	Total 5.5 hrs

Mission Plan			
AGL Height	1584 m	Pulse Rate	1200 khz/ch
Target Speed	160 kts	Scan Rate	188 hz/ch
Laser Current	100 %	FOV	60 degs

Static Alignment	GPS Time	
	Start	End
	Pre Mission	1203
Post Mission	1752	1757

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
F8			1245	1250				
3007	432213401		1258	1315			125801	
3008	432213402		1319	1337			131909	
3009	432213403		1340	1358			134041	
3010	432213404		1404	1421			140416	
3011	432213405		1425	1443			142544	
3012	432213406		1446	1504			144656	
3013	432213407		1507	1526			150759	
3014	432213408		1529	1546			152948	
3019	432213409		1549	1607			154920	
3020	432213410		1610	1626			161028	
Xtie	432213411		1630	1635			163007	
F8			1635	1640				
F8			1716	1721				
1001			1730	1732	1732		173024	Aborted Rain 3237_NV5_QL1

Julian Day 135 Flight A

LIDAR Flight Log



Date	May 15, 2022	Aircraft	C-FFRY
Project	3238_NV5_WI3DEP_2022	Pilot	Kane G
Location	Duluth MI	Operator	Daniel. A
Mission Objective			

System	Riegl VQ-1560ii
Unit	43
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes
 T- 8C Moderate to Severe Turbulence
 H- 76%
 AMLS-435m
 Hpa-1012
 Time to next maintenance: _____ 50 hr 100 hr

Aircraft Block Time		
Engine On	11:55	Takeoff 12:12
Engine Off	17:56	Landing 17:44
Total	6.0 hrs	Total 5.5 hrs

Mission Plan			
AGL Height	1584 m	Pulse Rate	1200 khz/ch
Target Speed	160 kts	Scan Rate	186hz/ch
Laser Current	100 %	FOV	60 degs

Static Alignment	GPS Time	
	Start	End
Pre Mission	1200	1205
Post Mission	1747	1752

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
F8			1245	1250				
3021	432213501		1255	1311			125511	
3022	432213502		1314	1332			131459	
3023	432213503		1335	1351			135443	
3024	432213504		1355	1412			135541	
3025	432213505		1416	1432			141621	Laser did not stop after fish the line
3026	432213506		1439	1456			143958	
3027	432213507		1503	1519			150329	
3028	432213508		1523	1539			152311	
Xtie	432213509		1542	1545			154212	
F8			1550	1555				
F8			1630	1631				
1001	432213510		1644	1656			164415	3237_NV5_QL1_2022
1002	432213511		1659	1611			165916	
1003	432213512		1714	1726			171414	

Julian Day 124 Flight A

LIDAR Flight Log



Date	April 4, 2022	Aircraft	C-GAYY
Project	3238_NV5_QL1	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes	
Time to next maintenance:	_____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	12:04	Takeoff 12:21
Engine Off	18:39	Landing 18:31
Total	6.6 hrs	Total 6.2 hrs

Mission Plan					
AGL Height	1584 m	Pulse Rate	1200 khz/ch		
Target Speed	160 kts	Scan Rate	191 lps/ch		
Laser Current	100 %	FOV	60 degs		

Static Alignment	GPS Time	
	Start	End
	Pre Mission	12:11
Post Mission	18:32	18:37

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted	Mission ID	Comments
			Start	End			
Test Strip		-	12:30	12:30		220504	
figure 8		-	12:38	12:42		-	
X-TIE 3212-18	622212401	182°	12:49	12:52		124943	
3218	622212402	272°	13:01	13:10		130105	
3217	622212403	92°	13:12	13:21		131251	
3216	622212404	272°	13:24	13:32		132437	
3215	622212405	92°	13:36	13:45		133600	
3214	622212406	272°	13:47	13:56		134754	
3213	622212407	92°	13:59	14:07		135912	
3212	622212408	272°	14:10	14:19		141053	
figure 8		-	14:19	14:23		-	
X-TIE	622212409	92°	14:58	15:03		145832	switched to 3237 QL2 parameters
figure 8		-	15:31	15:35		-	Aborted, clouds in the area switched back to 3238 QL1 parameters

Julian Day 124 Flight A

LIDAR Flight Log



Date	April 4, 2022	Aircraft	C-GAYY
Project	3238_NV5_QL1	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes	
Time to next maintenance:	_____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	12:04	Takeoff 12:21
Engine Off	18:39	Landing 18:31
Total	6.6 hrs	Total 6.2 hrs

Mission Plan					
AGL Height	1584 m	Pulse Rate	1200 khz/ch		
Target Speed	160 kts	Scan Rate	191 lps/ch		
Laser Current	100 %	FOV	60 degs		

Static Alignment	GPS Time	
	Start	End
	12:11	12:16
Post Mission	18:32	18:37

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
3059	622212410	004°	15:39	15:54			220504 Time Stamp	153934
3060	622212411	184°	15:57	16:01				155737
3061	622212412	004°	16:04	16:07				160406
3062	622212413	184°	16:10	16:14				161047
3063	622212414	004°	16:16	16:19				161653
3064	622212415	184°	16:22	16:25				162259
3065	622212416	004°	16:28	16:31				162837
X-TIE 3056-65	622212417	268°	16:36	16:40				163658
3058	622212418	184°	16:47	17:03				164747
3057	622212419	004°	17:06	17:21				170628
3056	622212420	184°	17:23	17:40				172359
figure 8		-	17:40	17:44				-

Julian Day 125 Flight A

LIDAR Flight Log



Date	April 5, 2022	Aircraft	C-GAYY
Project	3237_NV5_QL2	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes

Time to next maintenance: _____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	13:04	Takeoff 13:20
Engine Off	19:14	Landing 19:06
Total	6.2 hrs	Total 5.8 hrs

Mission Plan					
AGL Height	2300 m	Pulse Rate	500 khz/ch		
Target Speed	160 kts	Scan Rate	102 lps/ch		
Laser Current	100 %	FOV	60 degs		

Static Alignment	GPS Time	
	Start	End
	Pre Mission	13:10
Post Mission	19:08	19:13

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
figure 8		-	14:06	14:11			220505	
X-TIE		94°	14:13	14:17			141310	line aborted early
X-TIE	622212525	94°	14:24	14:28			142407	Data Recorder error, rebooted
2042	622212526	184°	14:34	14:43			143431	
2041	622212527	004°	14:46	14:54			144602	
2040	622212528	184°	14:57	15:06			145737	
2039	622212529	004°	15:08	15:17			150858	
2038	622212530	184°	15:19	15:28			151955	
2037	622212531	004°	15:31	15:39			153114	
2036	622212532	184°	15:42	15:50			154202	
2035	622212533	004°	15:53	16:01			155326	
2034	622212534	184°	16:04	16:13			160427	
2033	622212535	004°	16:16	16:24			161602	
figure 8		-	16:24	16:28			-	

Julian Day 125 Flight A

LIDAR Flight Log



Date	April 5, 2022	Aircraft	C-GAYY
Project	3237_NV5_QL2	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes

Time to next maintenance: _____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	13:04	Takeoff 13:20
Engine Off	19:14	Landing 19:06
Total	6.2 hrs	Total 5.8 hrs

Mission Plan			
AGL Height	2300 m	Pulse Rate	500 khz/ch
Target Speed	160 kts	Scan Rate	102 lps/ch
Laser Current	100 %	FOV	60 degs

Static Alignment	GPS Time	
	Start	End
	Pre Mission	13:10
Post Mission	19:08	19:13

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
Figure 8		-	16:54	16:58			220505	changed scanner settings for 3238 QL1
3055	622212536	004°	16:58	17:14			-	
3054	622212537	184°	17:17	17:33			165855	
3053	622212538	004°	17:36	17:52			171758	
3052	622212539	184°	17:55	18:11			173657	
X-TIE	622212540	096°	18:15	18:17			175552	
figure 8		-	18:17	18:21			181515	
							-	

Julian Day 126 Flight A

LIDAR Flight Log



Date	April 6, 2022	Aircraft	C-GAYY
Project	3238_NV5_QL1	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes	moderate turbulence
Time to next maintenance:	_____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	12:53	Takeoff 13:08
Engine Off	18:58	Landing 18:48
Total	6.1 hrs	Total 5.7 hrs

Mission Plan					
AGL Height	1584 m	Pulse Rate	1200 khz/ch		
Target Speed	160 kts	Scan Rate	191 lps/ch		
Laser Current	100 %	FOV	60 degs		

Static Alignment	GPS Time	
	Start	End
	Pre Mission	12:58
Post Mission	18:50	18:55

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
figure 8		-	13:43	13:47			-	
3066		086°	13:50	13:52			135057	line aborted, data recorder error
3066 X-TIE	622212601	086°	14:01	14:21			140107	
3051	622212602	184°	14:29	14:45			142938	
3050	622212603	004°	14:49	15:05			144918	
3049	622212604	184°	15:08	15:25			150856	
3048	622212605	004°	15:28	15:44			152844	
3047	622212606	184°	15:48	16:04			154802	
3046	622212607	004°	16:07	16:23			160727	
3045	622212608	184°	16:26	16:43			162659	
3044	622212609	004°	16:46	17:02			164638	
3043	622212610	184°	17:06	17:23			170630	
3042	622212611	004°	17:26	17:43			172637	
3041	622212612	184°	17:46	18:03			174615	
figure 8		-	18:04	18:08			-	

Julian Day 127 Flight A

LIDAR Flight Log



Date	April 7, 2022	Aircraft	C-GAYY
Project	3238_NV5_QL1	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes	
Time to next maintenance:	_____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	12:25	Takeoff 12:40
Engine Off	18:23	Landing 18:14
Total	6.0 hrs	Total 5.6 hrs

Mission Plan					
AGL Height	1584 m	Pulse Rate	1200 khz/ch		
Target Speed	160 kts	Scan Rate	191 lps/ch		
Laser Current	100 %	FOV	60 degs		

Static Alignment	GPS Time	
	Start	End
Pre Mission	12:30	12:35
Post Mission	18:16	18:21

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
figure 8		-	13:09	13:14			-	
X-TIE	622212726	092°	13:21	13:29			132106	
3040	622212727	004°	13:37	13:55			133730	
3039	622212728	184°	13:58	14:14			135837	
3038	622212729	004°	14:18	14:36			141819	
3037	622212730	184°	14:39	14:56			143940	
3036	622212731	004°	14:59	15:18			145953	
3035	622212732	184°	15:21	15:36			152121	
3034	622212733	004°	15:40	15:56			154001	
3033	622212734	184°	15:59	16:14			155902	
3032	622212735	004°	16:17	16:33			161732	
3031	622212736	184°	16:36	16:53			163642	
3030	622212737	004°	16:55	17:11			165558	
3029	622212738	184°	17:14	17:31			171444	
figure 8		-	17:32	17:36			-	

Julian Day 128 Flight A

LIDAR Flight Log



Date	April 8, 2022	Aircraft	C-GAYY
Project	3238_NV5_QL1	Pilot	A. Hering
Location	Eau Claire, Wisconsin	Operator	B.Eisenbart
Mission Objective			

System	VQ-1560II
Unit	S2223062
IMU	Applanix AP60
GPS Rx	Trimble GNSS17
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes

Time to next maintenance: _____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	12:38	Takeoff 12:54
Engine Off	16:14	Landing 16:04
Total	3.6 hrs	Total 3.2 hrs

Mission Plan			
AGL Height	1584 m	Pulse Rate	1200 khz/ch
Target Speed	160 kts	Scan Rate	191 lps/ch
Laser Current	100 %	FOV	60 degs

Static Alignment	GPS Time	
	Start	End
Pre Mission	12:42	12:47
Post Mission	16:07	16:12

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
figure 8		-	13:25	13:29			Time Stamp 220508	
X-TIE	622212810	94°	13:32	13:37			133202	
3015	622212811	004°	13:48	14:05			134853	
3016	622212812	184°	14:09	14:30			140949	
3017	622212813	004°	14:33	14:49			143304	
3018	622212814	184°	14:53	15:13			145351	
figure 8		004°	15:14	15:18			-	cloud ceiling dropped too low
								conditions deteriorating

Appendix B

SBET and POSPAC Reports

General Information

Mission Information

Project name	05042022A_3062
Processing date	2022-05-06 14:30:55
Mission date	2022-05-04 12:12:13
Mission duration	06:25:55.478
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8708
IMU type	57
Receiver type	BD982
Antenna type	Bilinmeyen harici

Project File List

Rover Data Files

File name	File type
220504_121154_INS-GPS_1.raw	POS Data

Input Files

File Name	File Type
Ephm1240.22g	GLONASS Broadcast Ephemeris
Ephm1240.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05042022A_3062.out	SBET Trajectory File

Rover Data Summary

First raw data file	220504_121154_INS-GPS_1.raw		
Last raw data file	220504_121154_INS-GPS_1.raw		
Start GPS week	2208		
Start time	303114.662 (5/4/2022 12:11:54 PM)		
End time	326270.140 (5/4/2022 6:37:50 PM)		
Start of fine alignment	303139.977 (5/4/2022 12:12:19 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.142	-0.236	-1.269
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

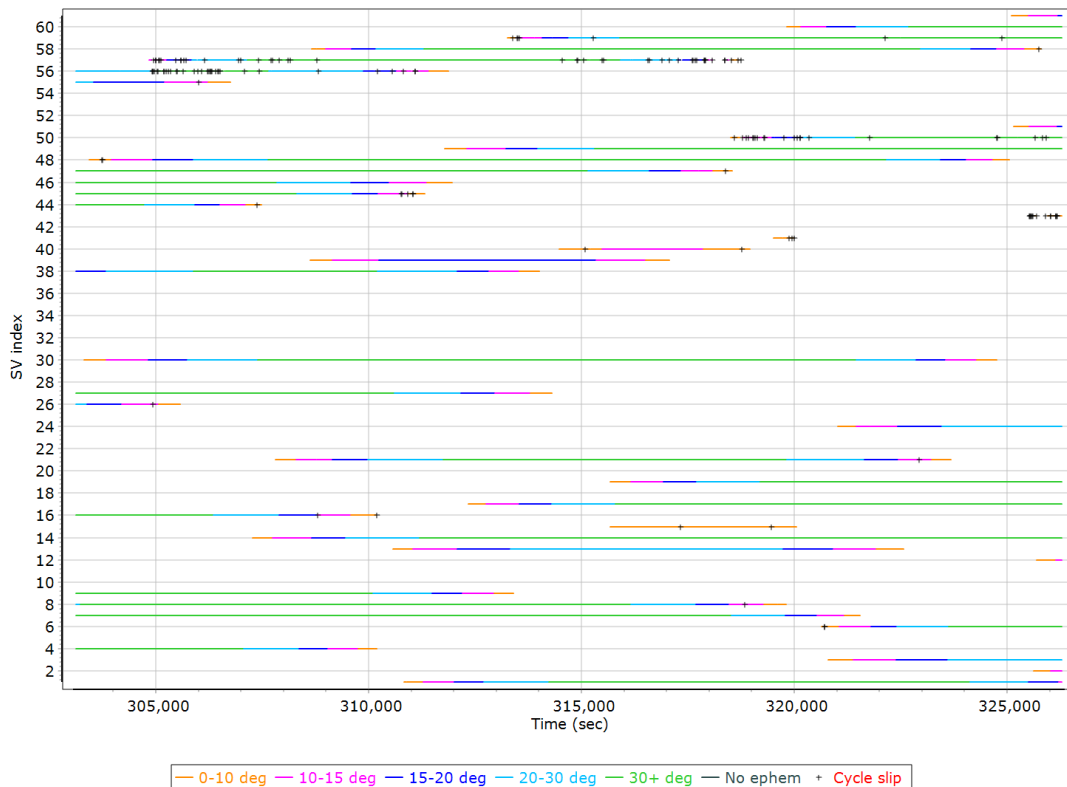
Rover Data QC

Raw IMU Import QC Summary

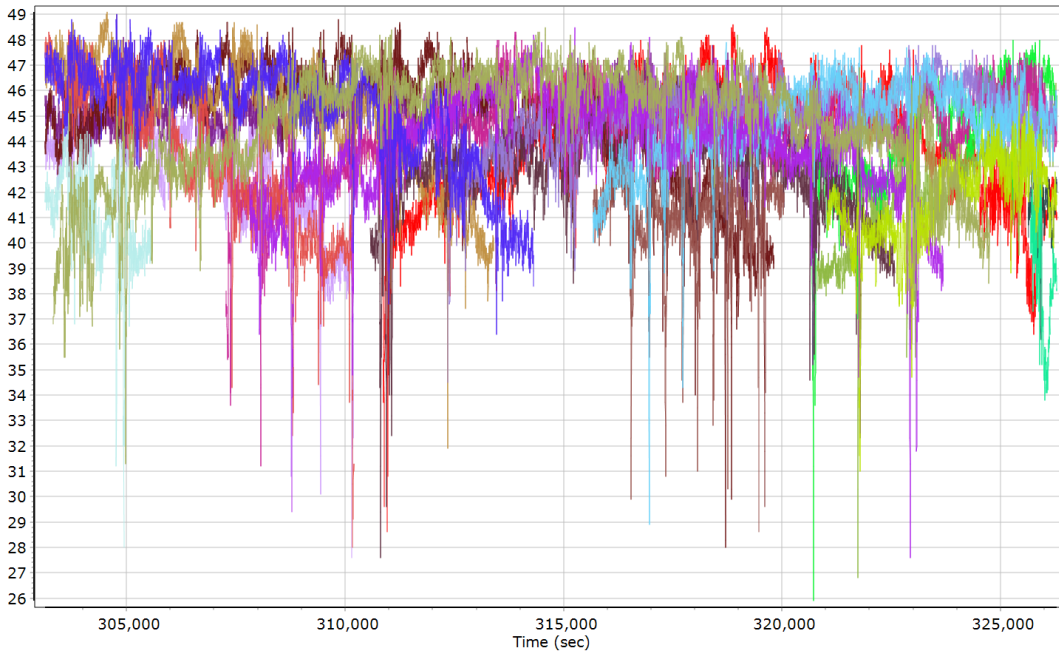
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05042022A_3062.log
IMU Records Processed	4630555
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

GPS/GLONASS L1 Satellite Lock/Elevation

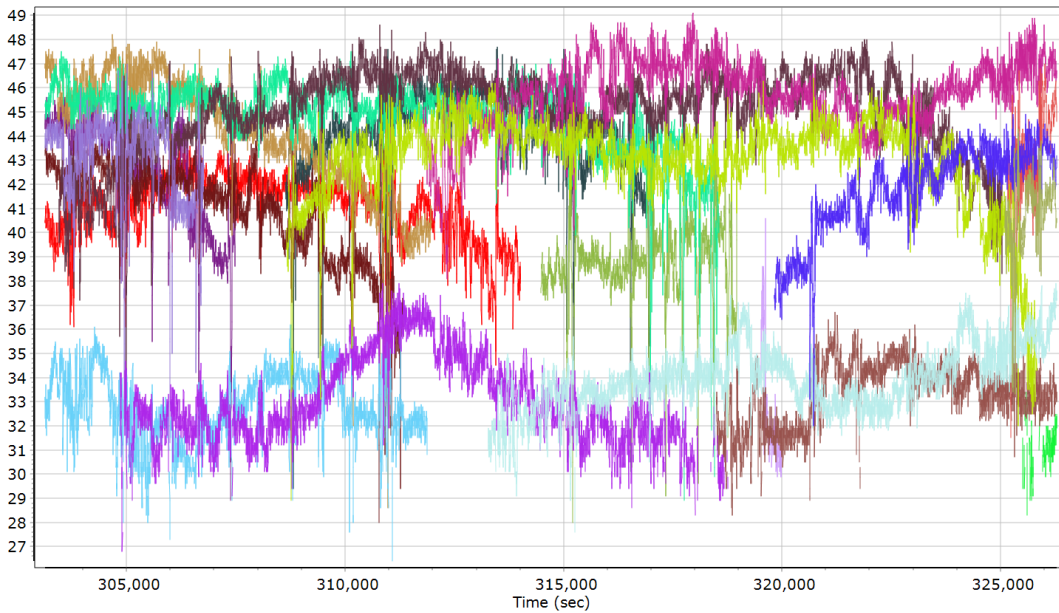


GPS L1 SNR



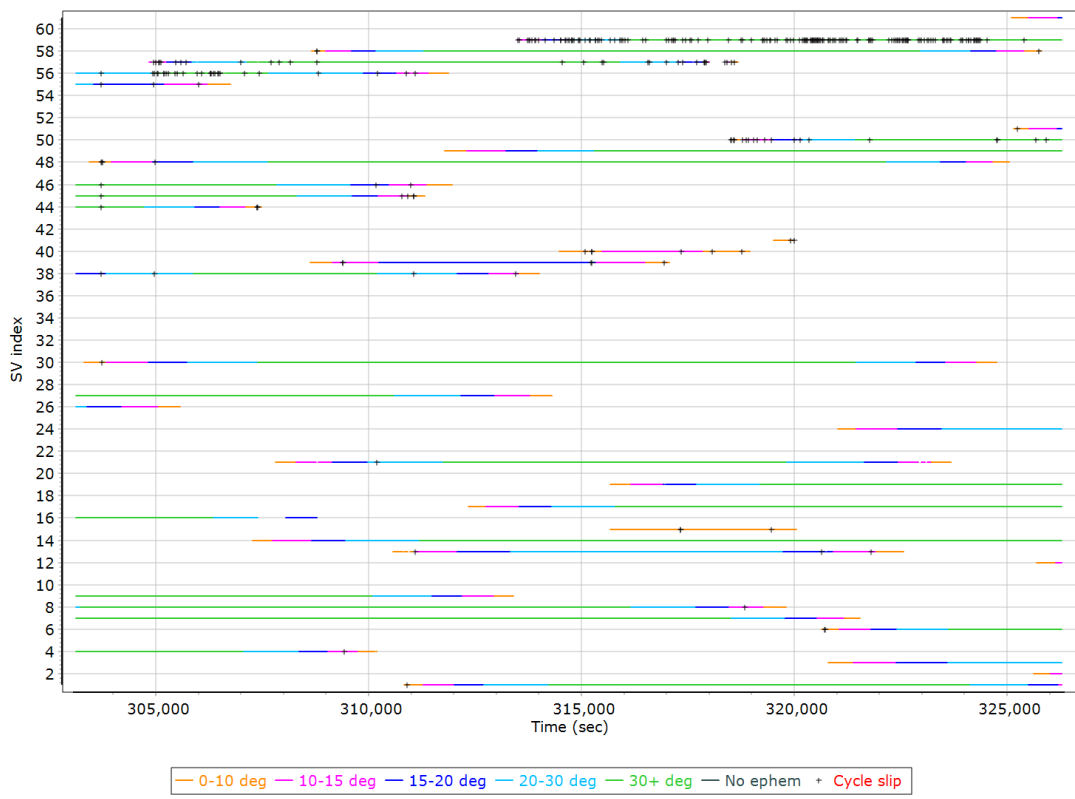
- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 SNR (dB/Hz) | GPS PRN 04 L1 SNR (dB/Hz) |
| GPS PRN 06 L1 SNR (dB/Hz) | GPS PRN 07 L1 SNR (dB/Hz) | GPS PRN 08 L1 SNR (dB/Hz) | GPS PRN 09 L1 SNR (dB/Hz) |
| GPS PRN 12 L1 SNR (dB/Hz) | GPS PRN 13 L1 SNR (dB/Hz) | GPS PRN 14 L1 SNR (dB/Hz) | GPS PRN 15 L1 SNR (dB/Hz) |
| GPS PRN 16 L1 SNR (dB/Hz) | GPS PRN 17 L1 SNR (dB/Hz) | GPS PRN 19 L1 SNR (dB/Hz) | GPS PRN 21 L1 SNR (dB/Hz) |
| GPS PRN 24 L1 SNR (dB/Hz) | GPS PRN 26 L1 SNR (dB/Hz) | GPS PRN 27 L1 SNR (dB/Hz) | GPS PRN 30 L1 SNR (dB/Hz) |

GLONASS L1 SNR

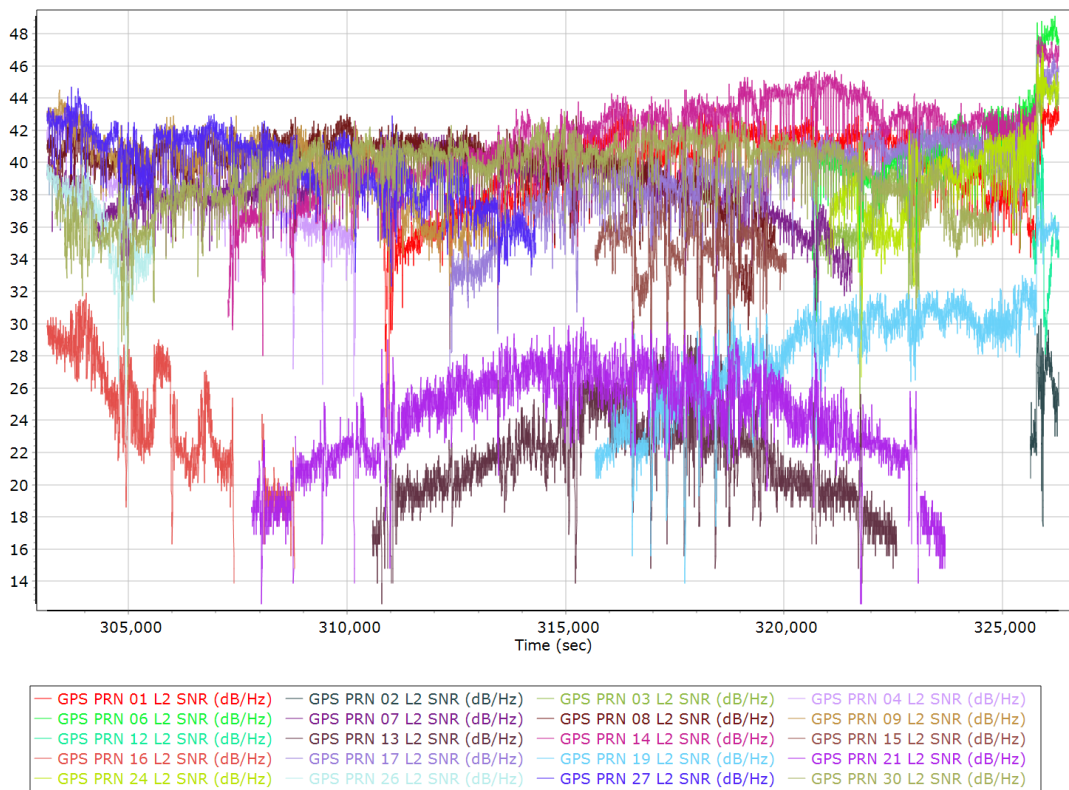


- | | | |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 06 L1 SNR (dB/Hz) | GLONASS 07 L1 SNR (dB/Hz) |
| GLONASS 08 L1 SNR (dB/Hz) | GLONASS 09 L1 SNR (dB/Hz) | GLONASS 10 L1 SNR (dB/Hz) |
| GLONASS 11 L1 SNR (dB/Hz) | GLONASS 12 L1 SNR (dB/Hz) | GLONASS 13 L1 SNR (dB/Hz) |
| GLONASS 14 L1 SNR (dB/Hz) | GLONASS 18 L1 SNR (dB/Hz) | GLONASS 19 L1 SNR (dB/Hz) |
| GLONASS 20 L1 SNR (dB/Hz) | GLONASS 21 L1 SNR (dB/Hz) | GLONASS 22 L1 SNR (dB/Hz) |
| GLONASS 23 L1 SNR (dB/Hz) | GLONASS 24 L1 SNR (dB/Hz) | |

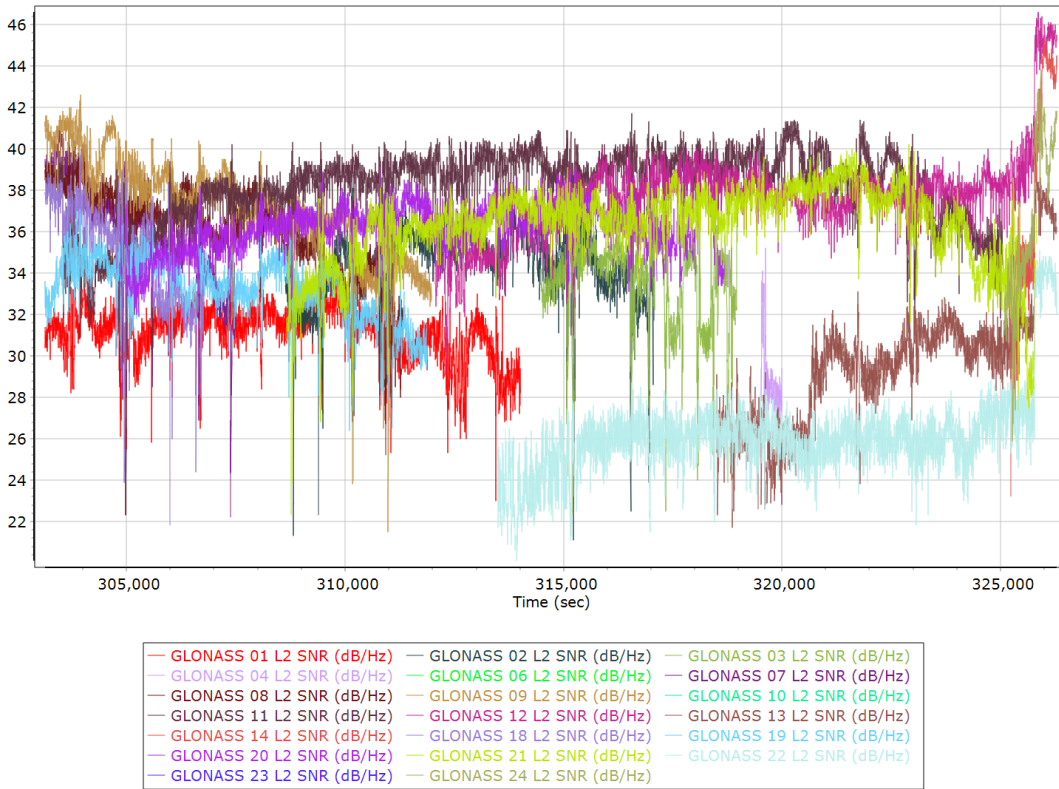
GPS/GLONASS L2 Satellite Lock/Elevation



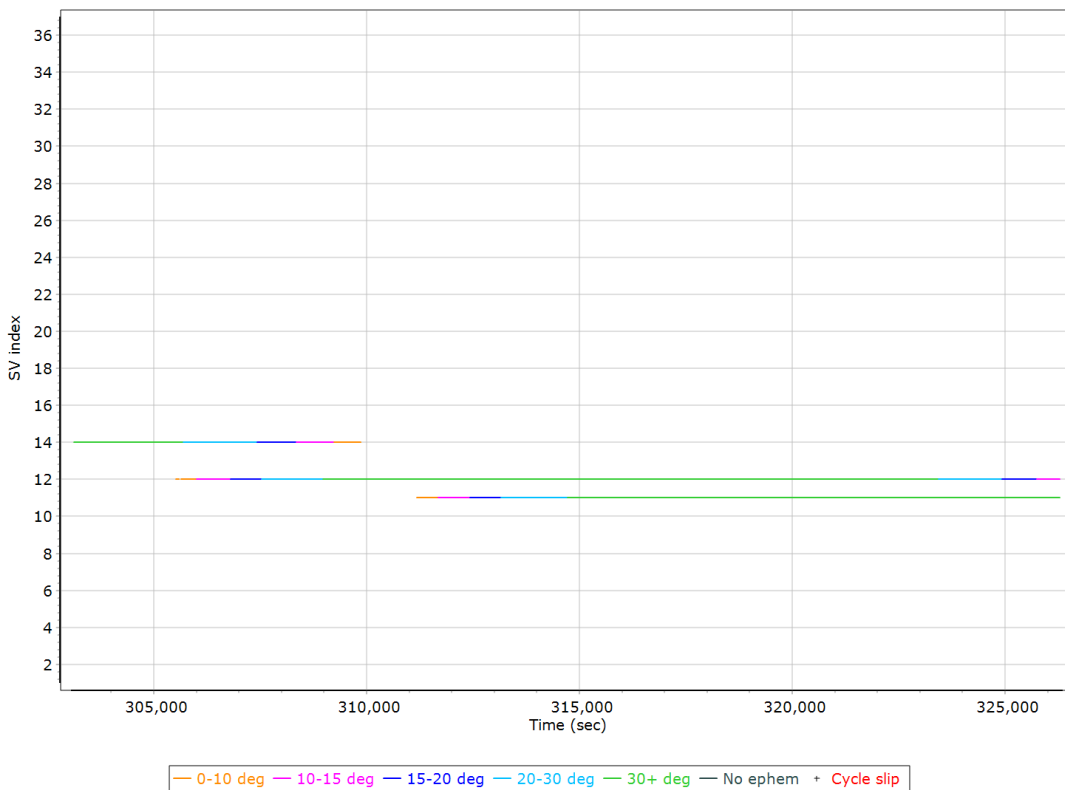
GPS L2 SNR



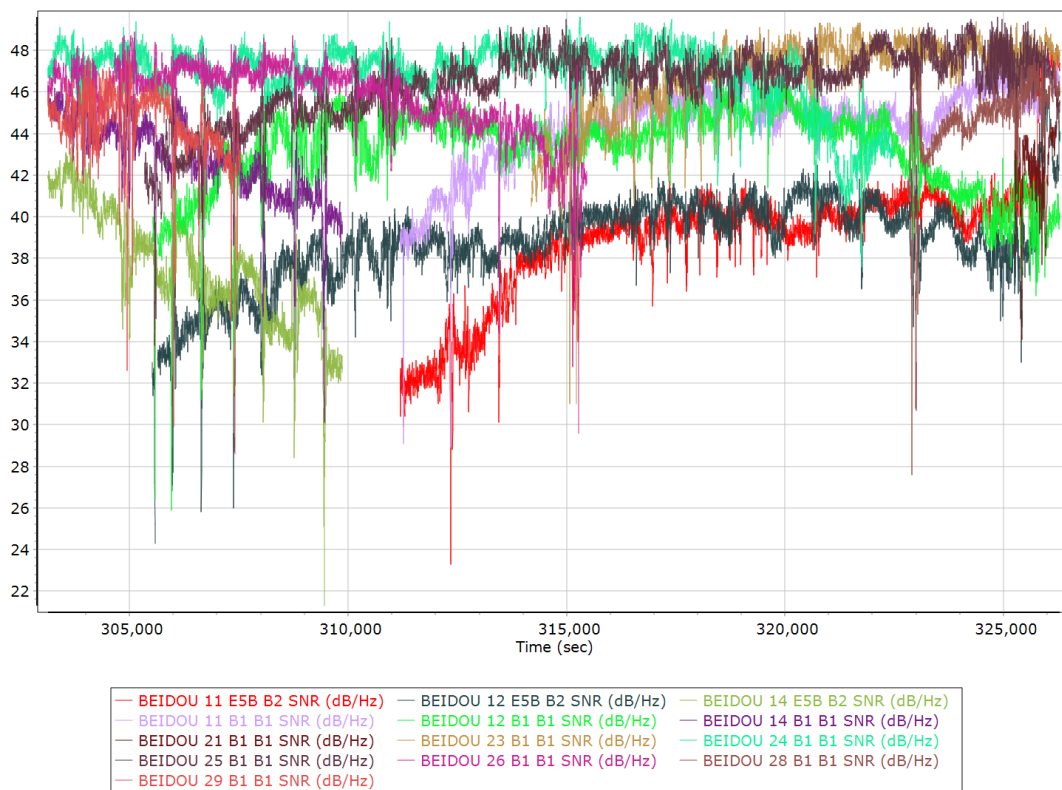
GLONASS L2 SNR



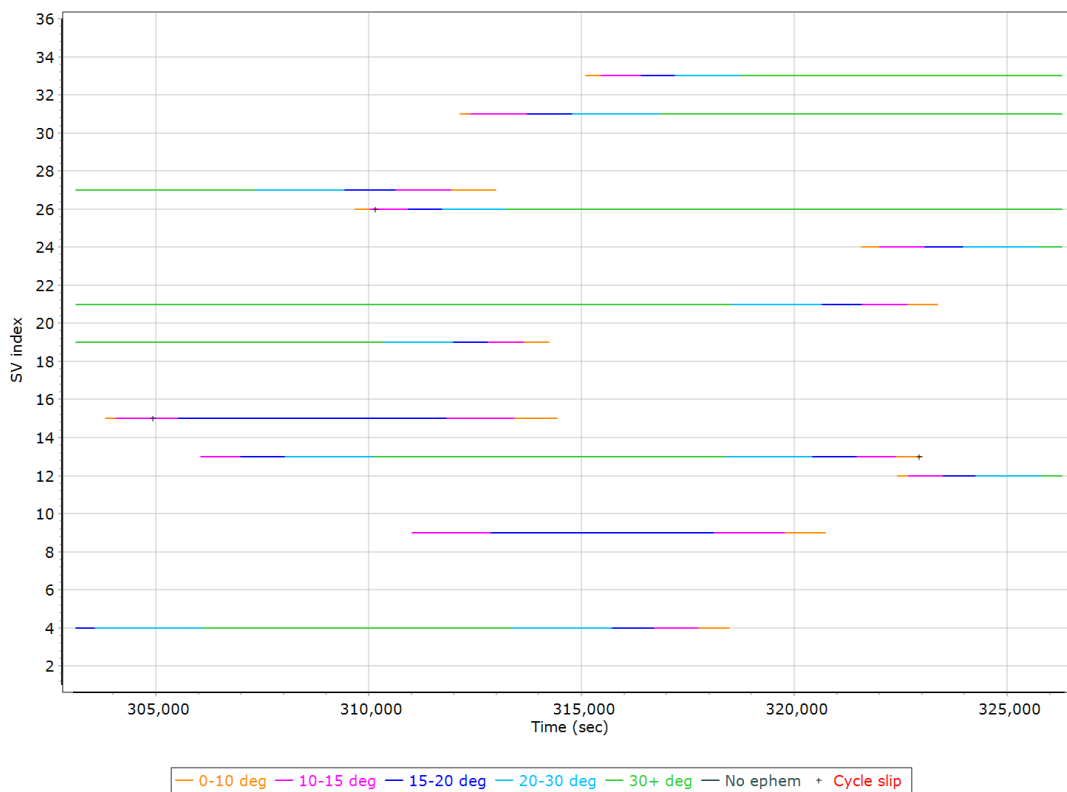
BEIDOU Satellite Lock/Elevation



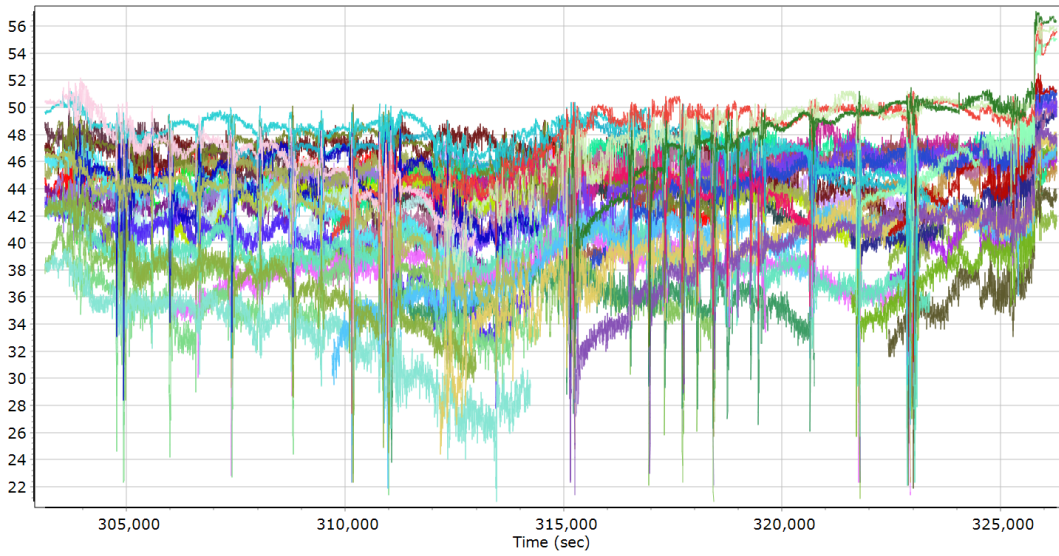
BEIDOU SNR



GALILEO Satellite Lock/Elevation



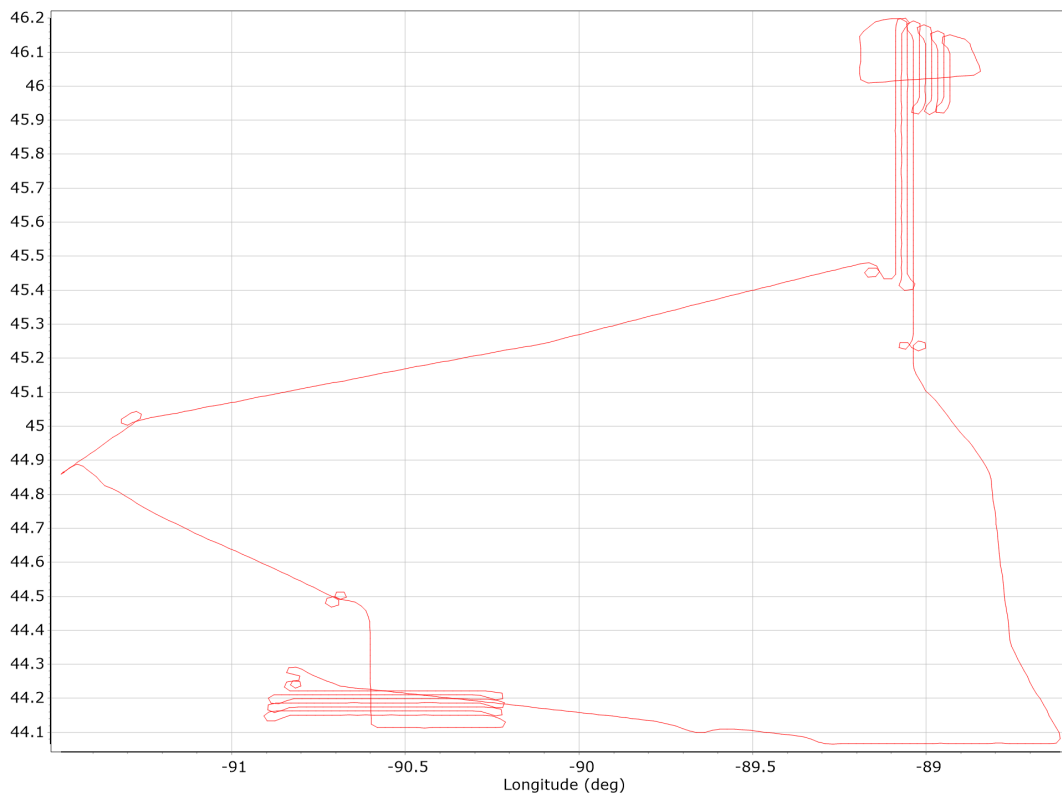
GALILEO SNR



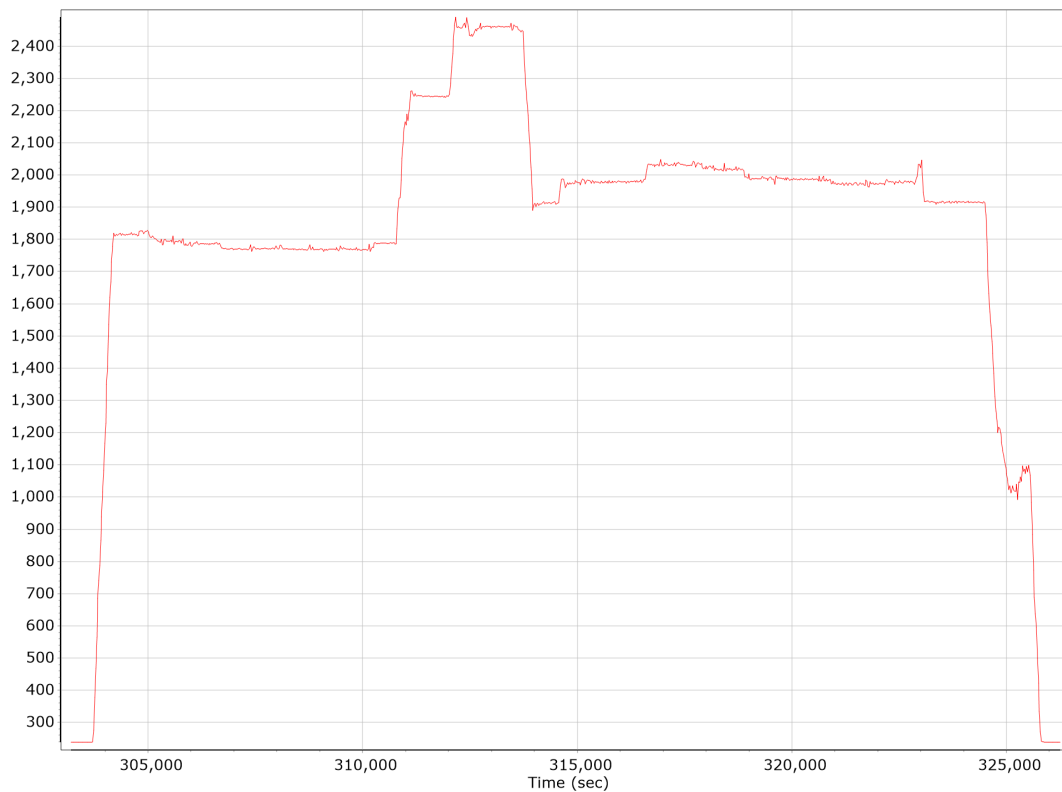
— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 24 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 26 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 27 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 31 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 33 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 34 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 04 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 09 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 12 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 13 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 15 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 19 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 21 L5E5A BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

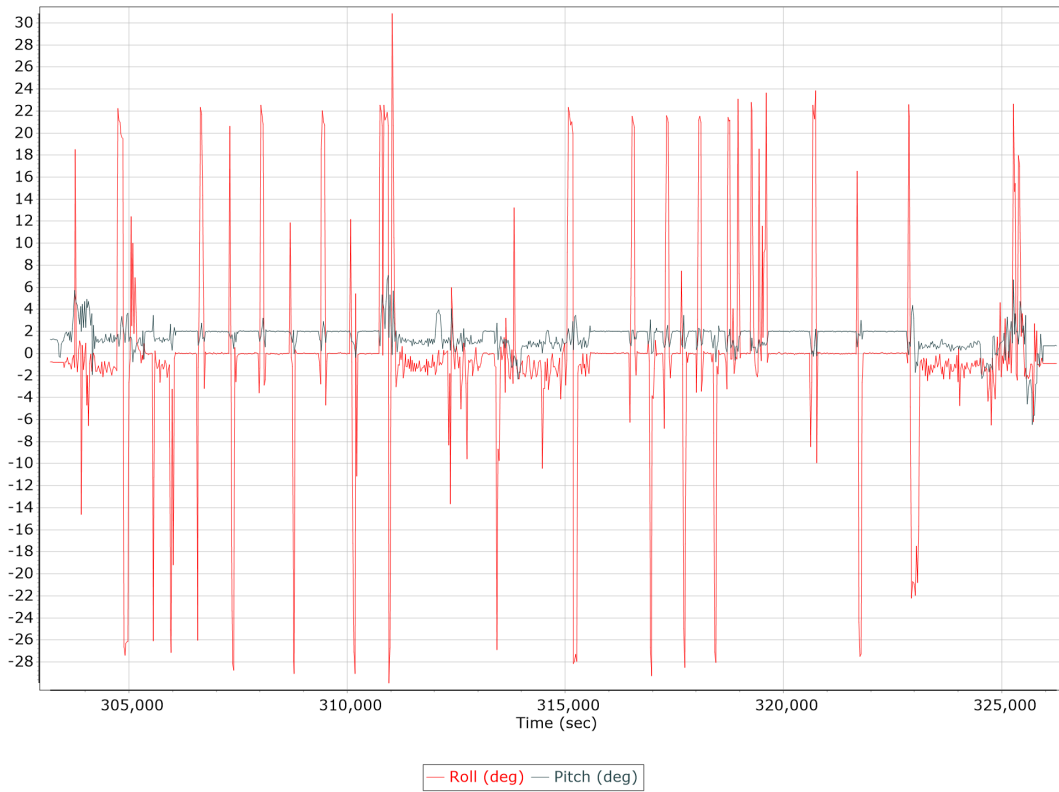
Top View



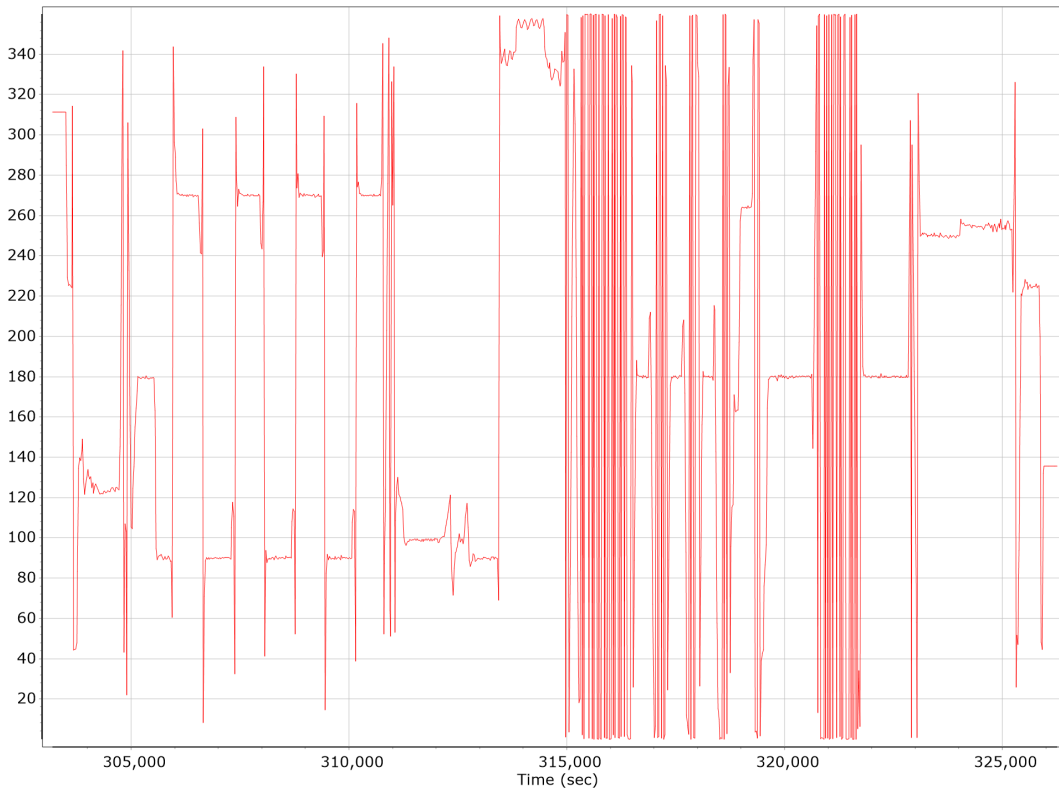
Altitude



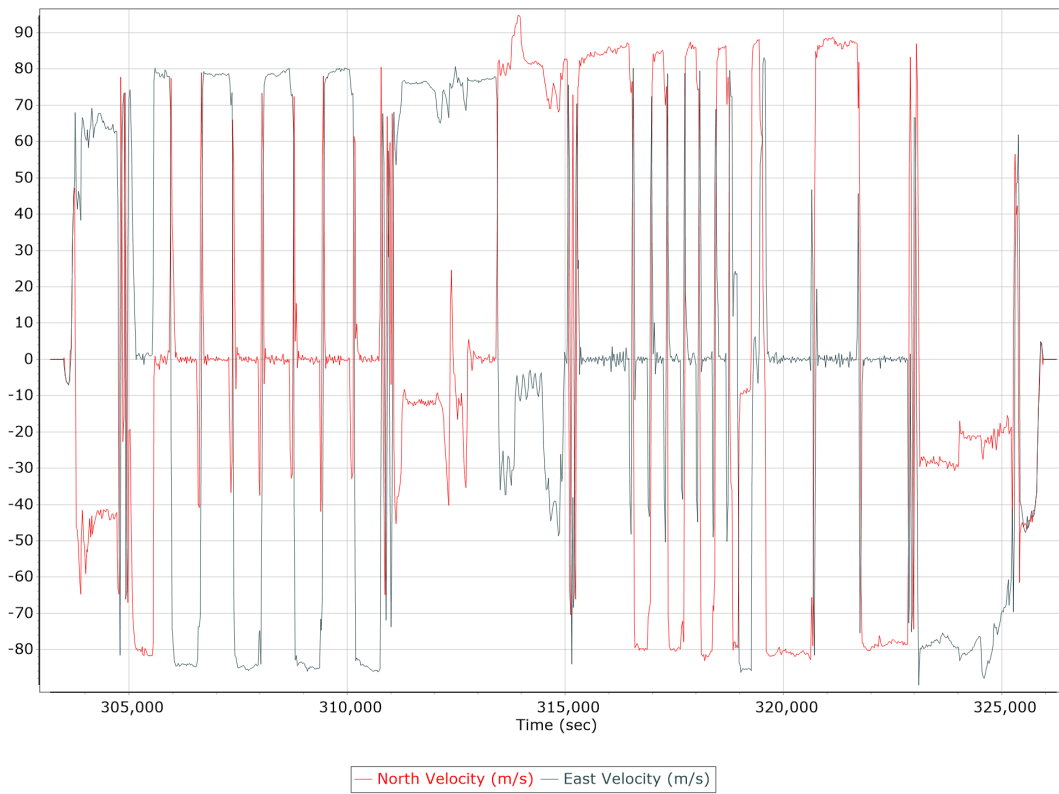
Roll/Pitch



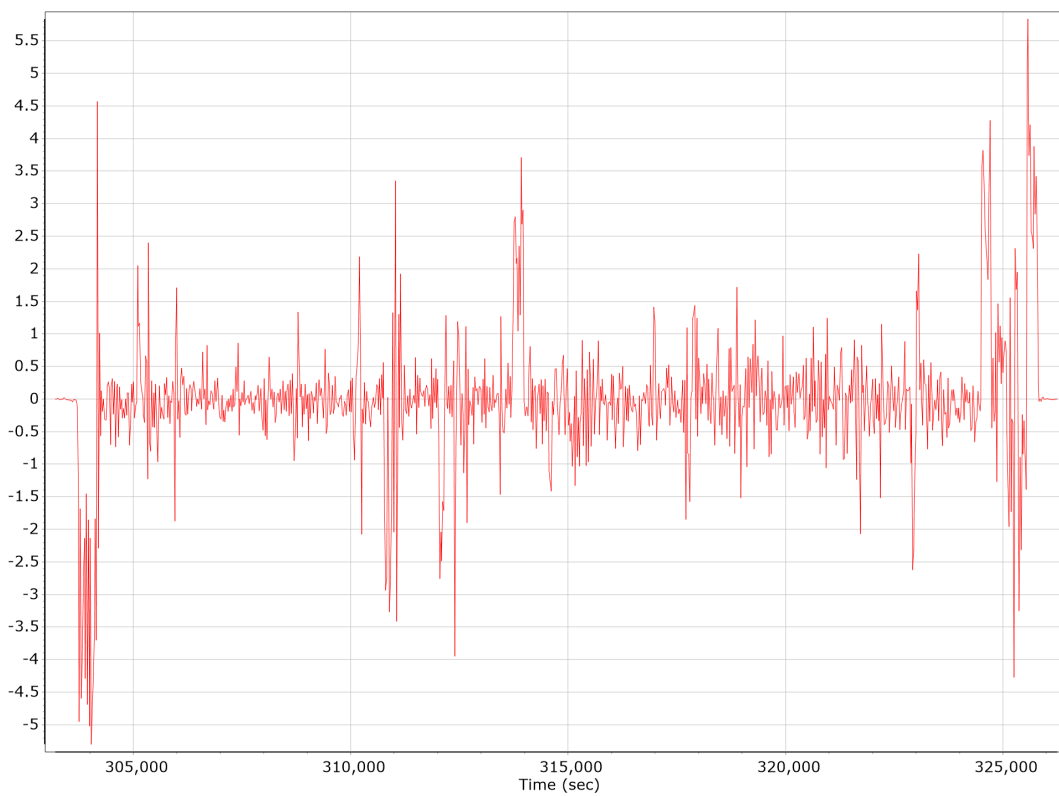
Heading



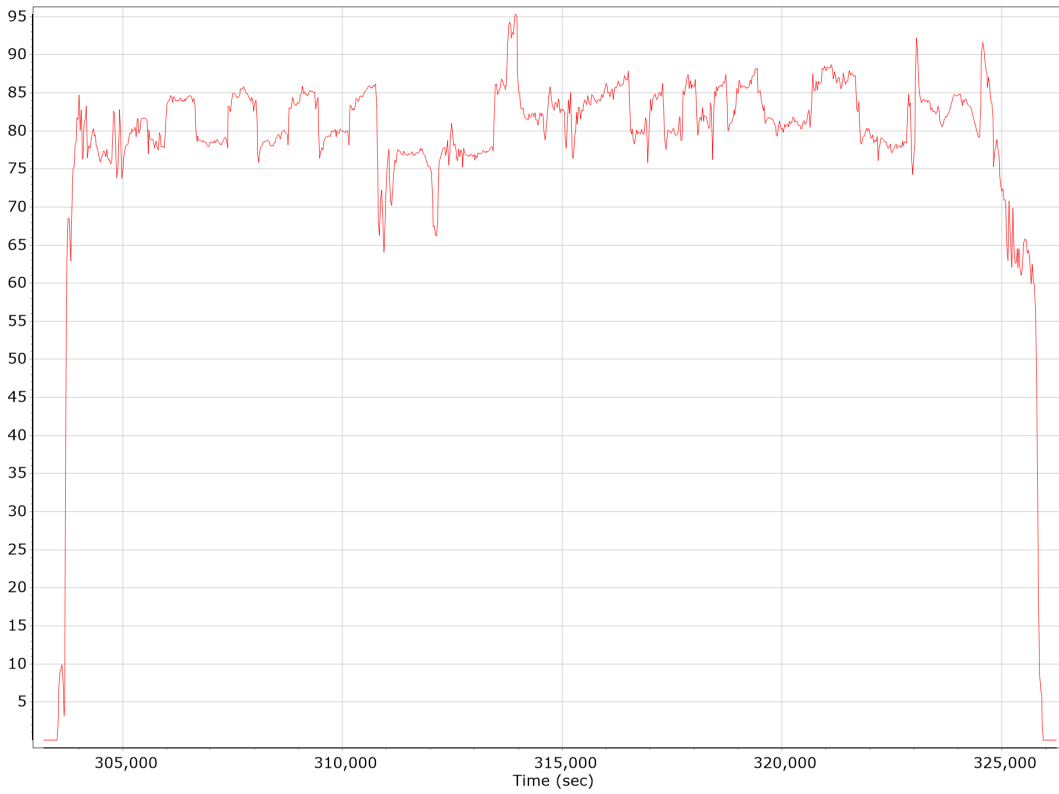
North/East Velocity



Down Velocity



Total Speed



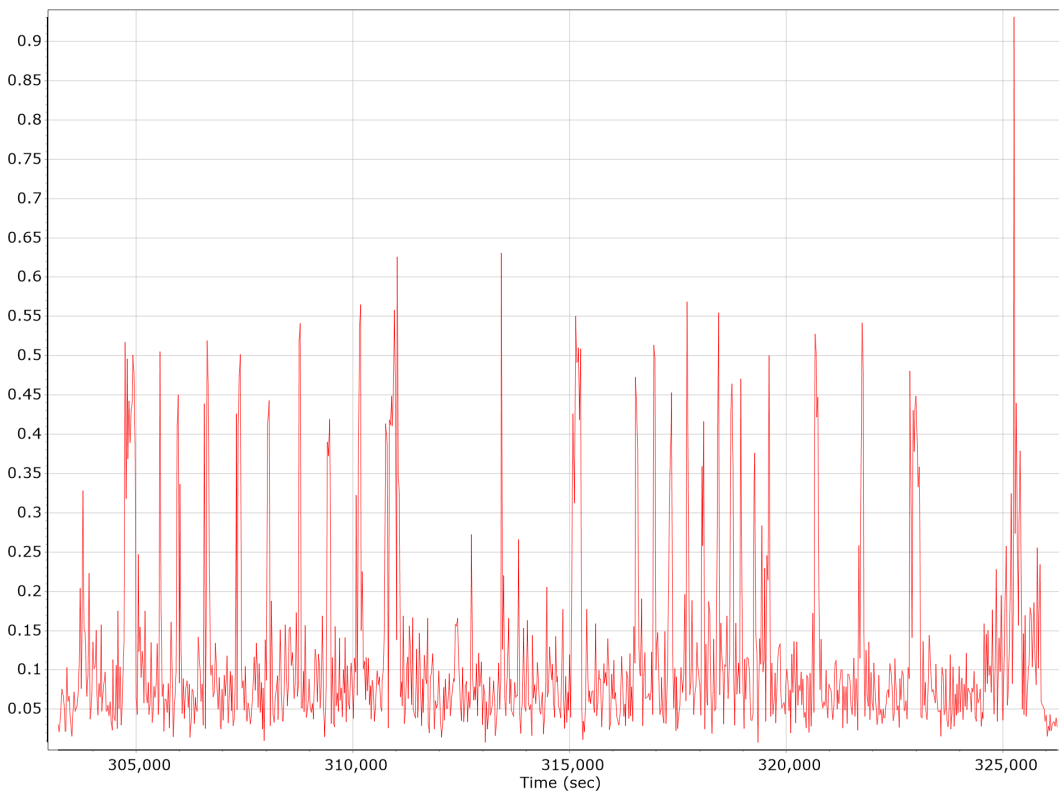
Ground Speed



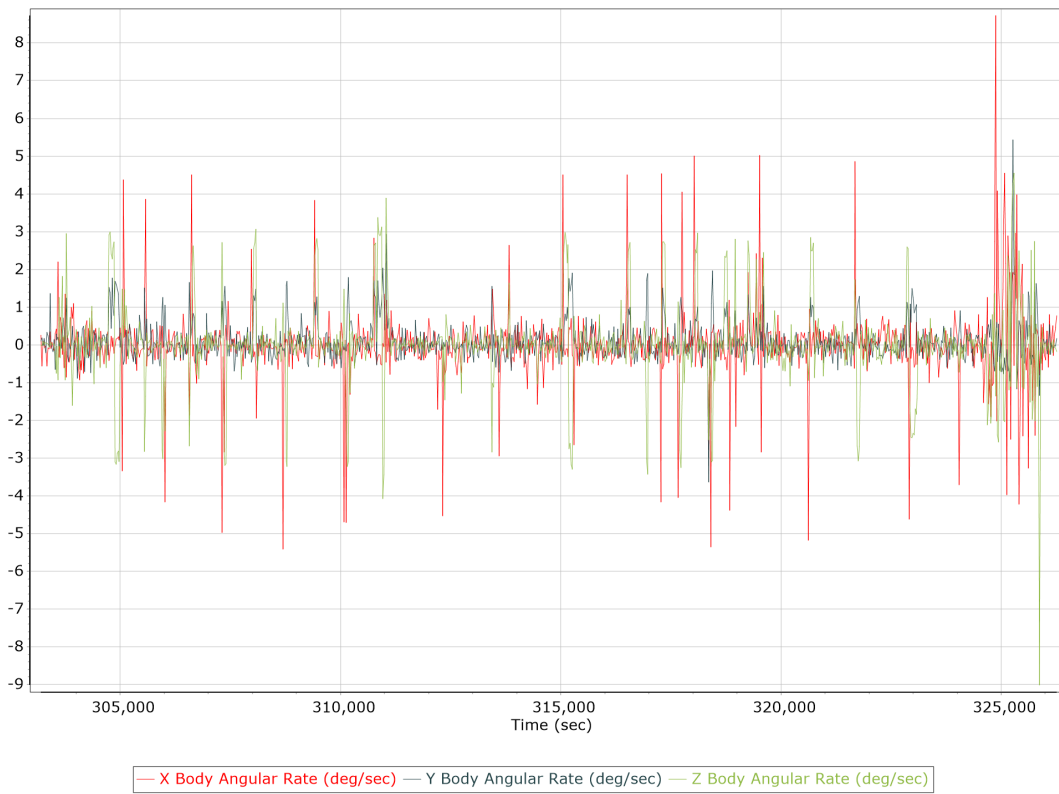
Body Acceleration



Total Body Acceleration

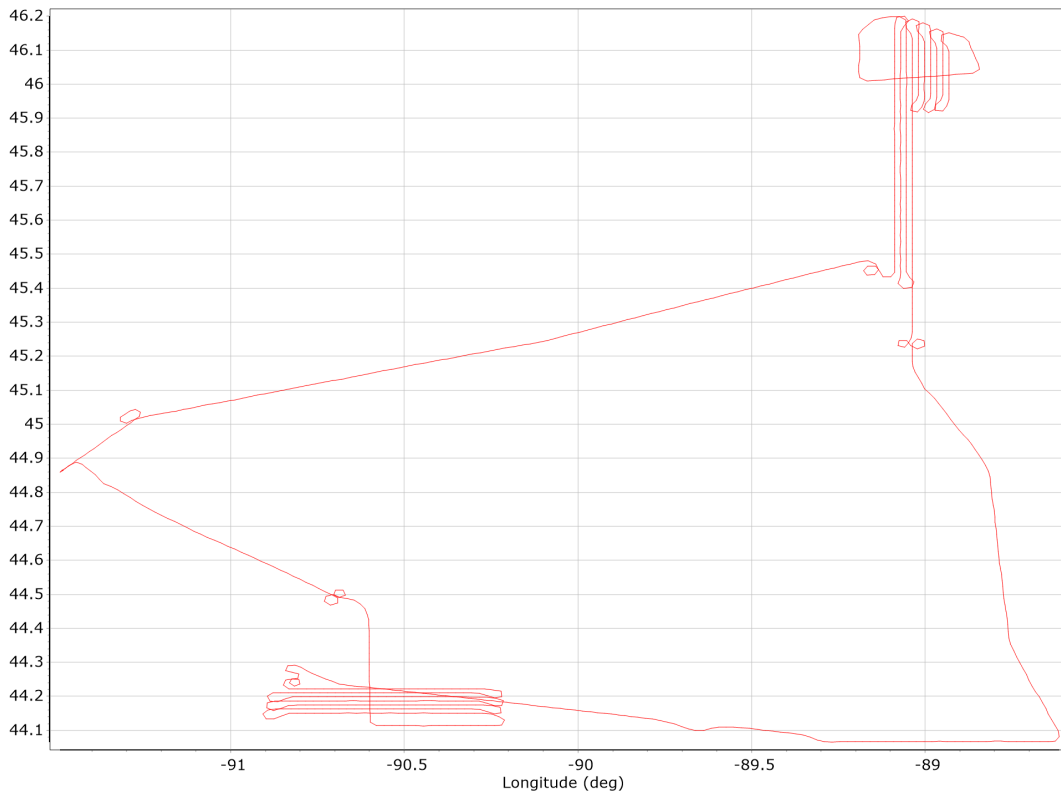


Body Angular Rate

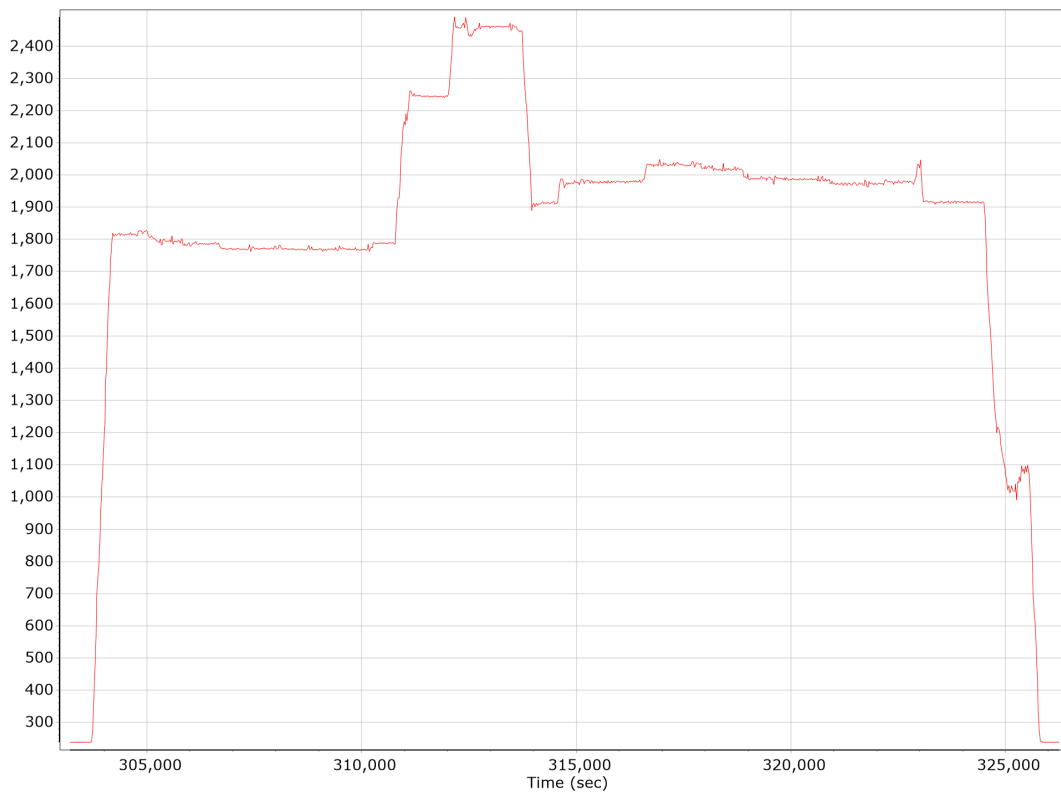


Forward Processed Trajectory Information

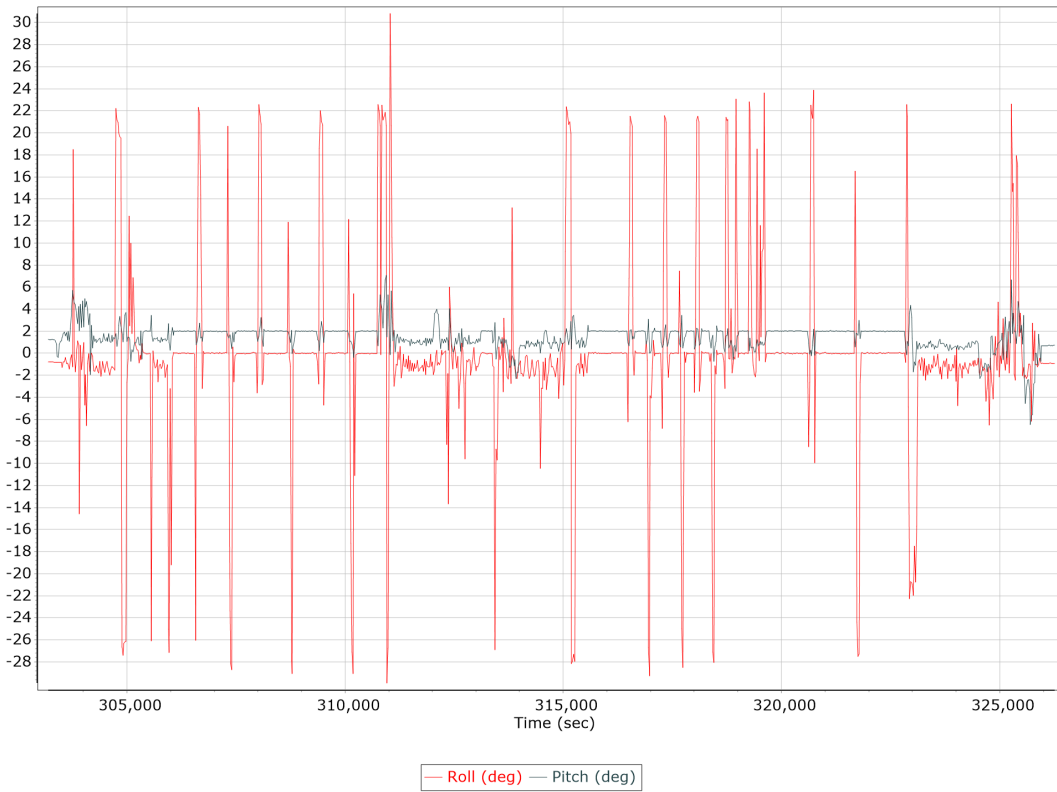
Top View



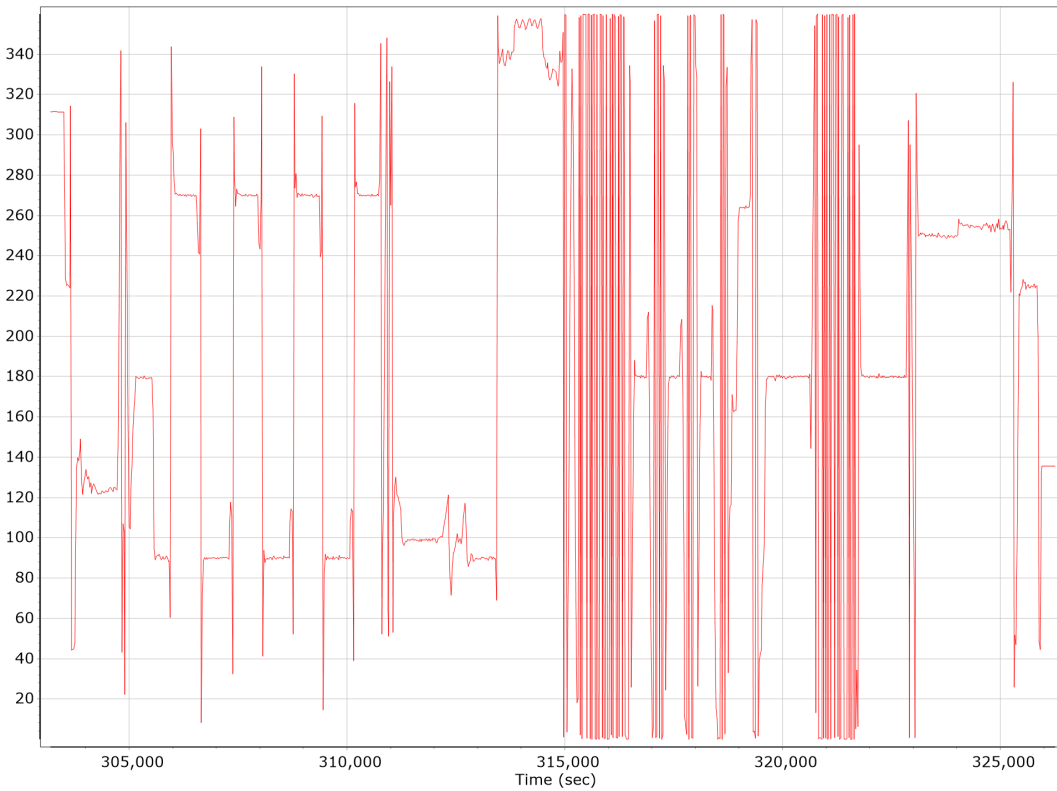
Altitude



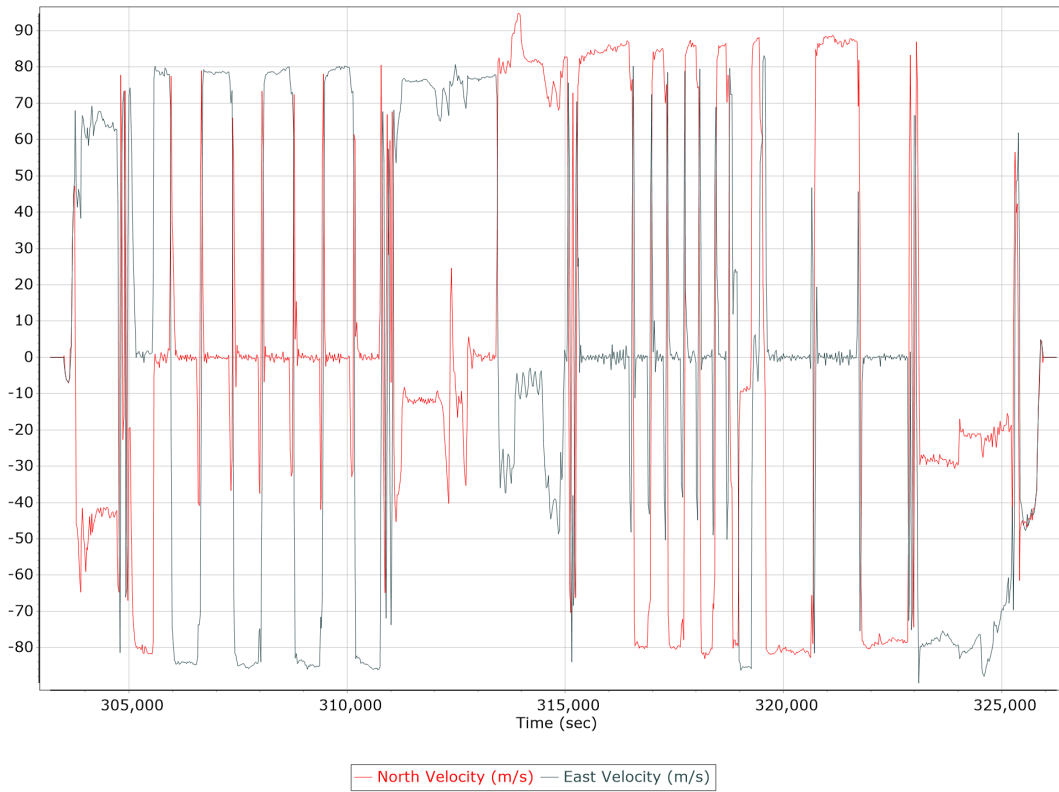
Roll/Pitch



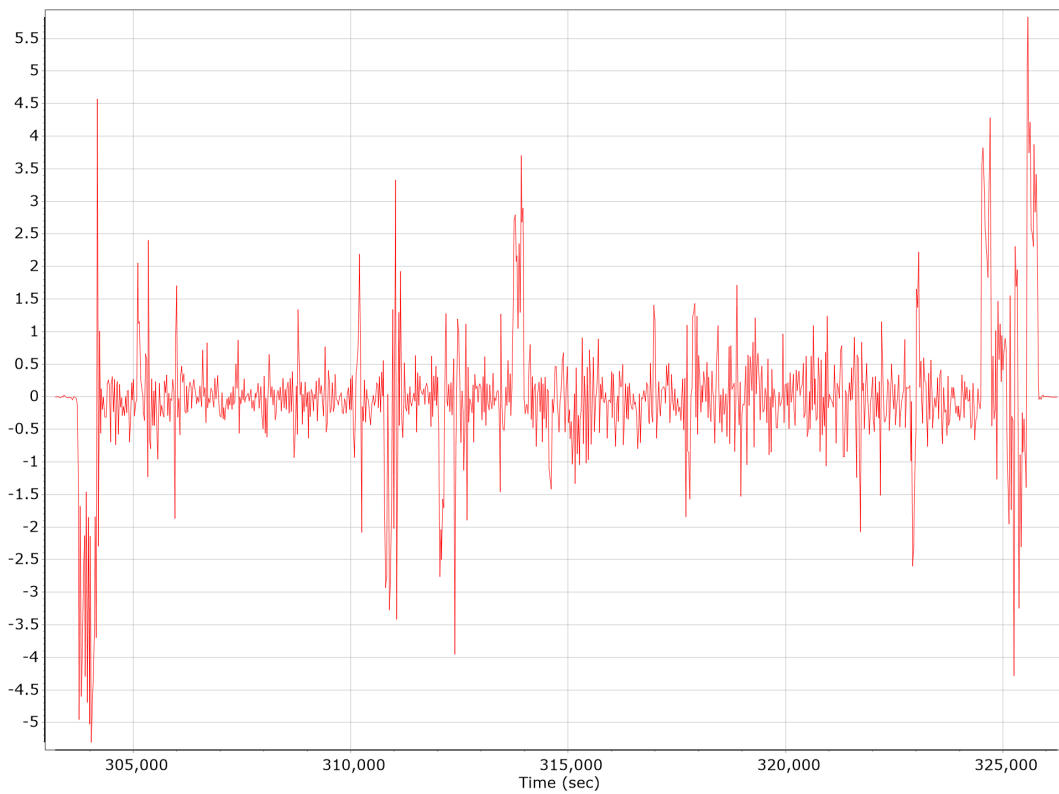
Heading



North/East Velocity



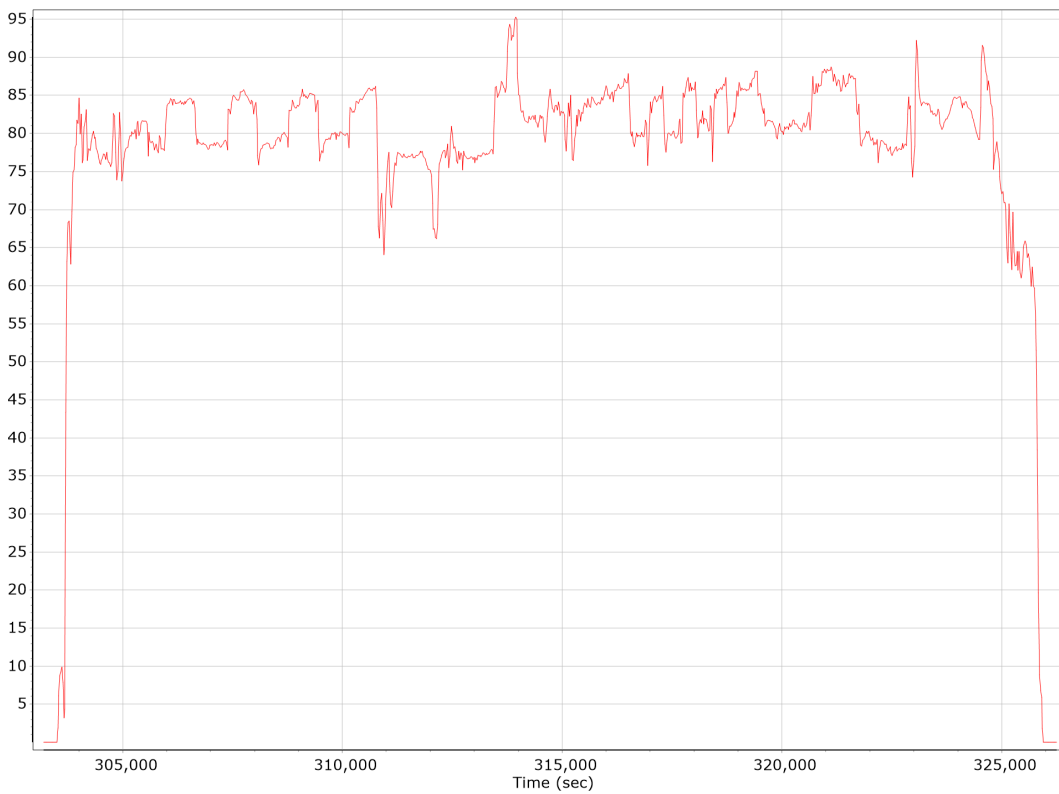
Down Velocity



Total Speed



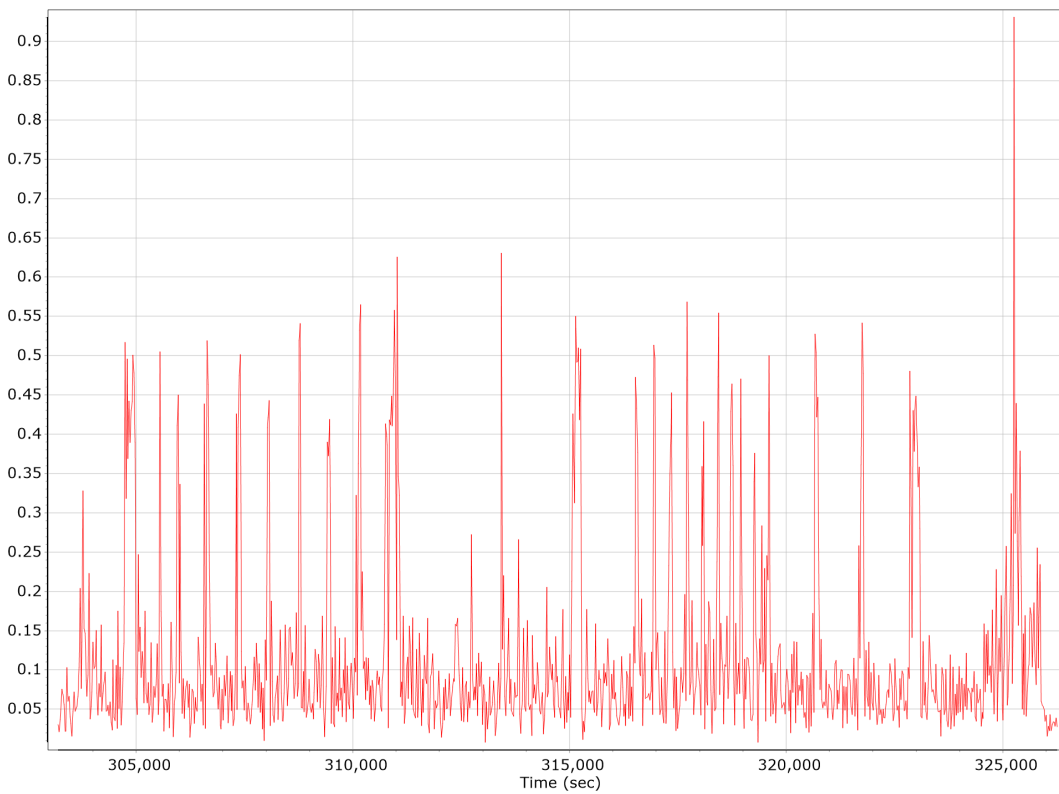
Ground Speed



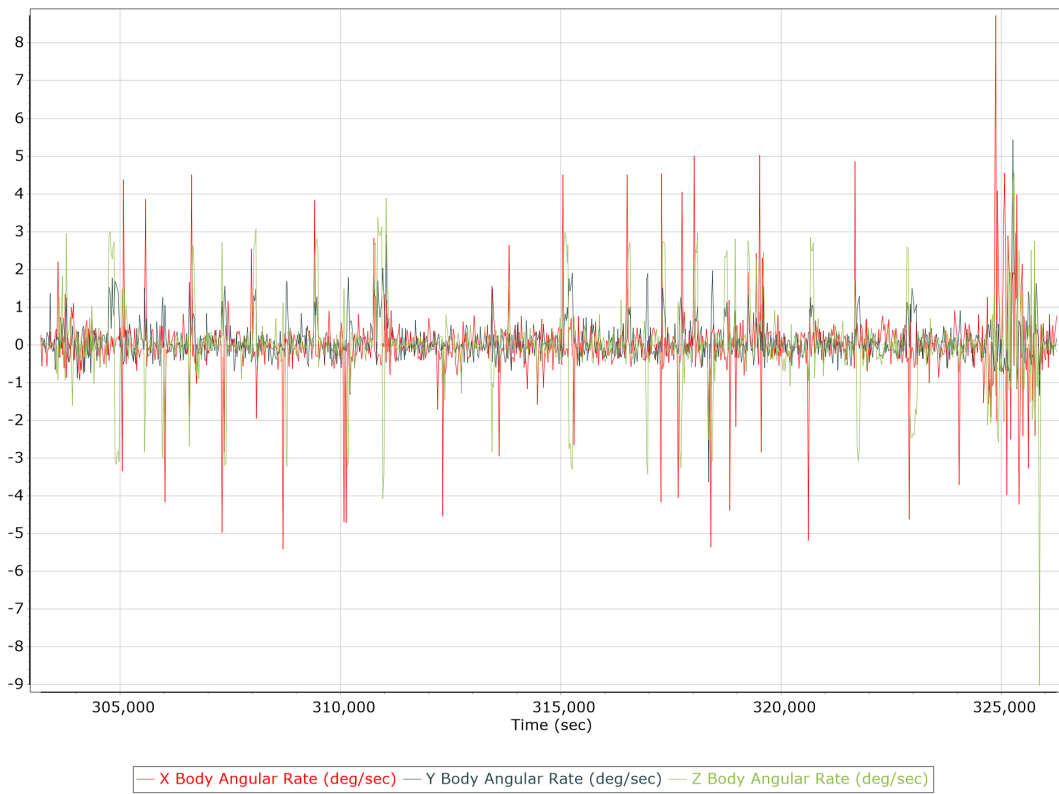
Body Acceleration



Total Body Acceleration



Body Angular Rate

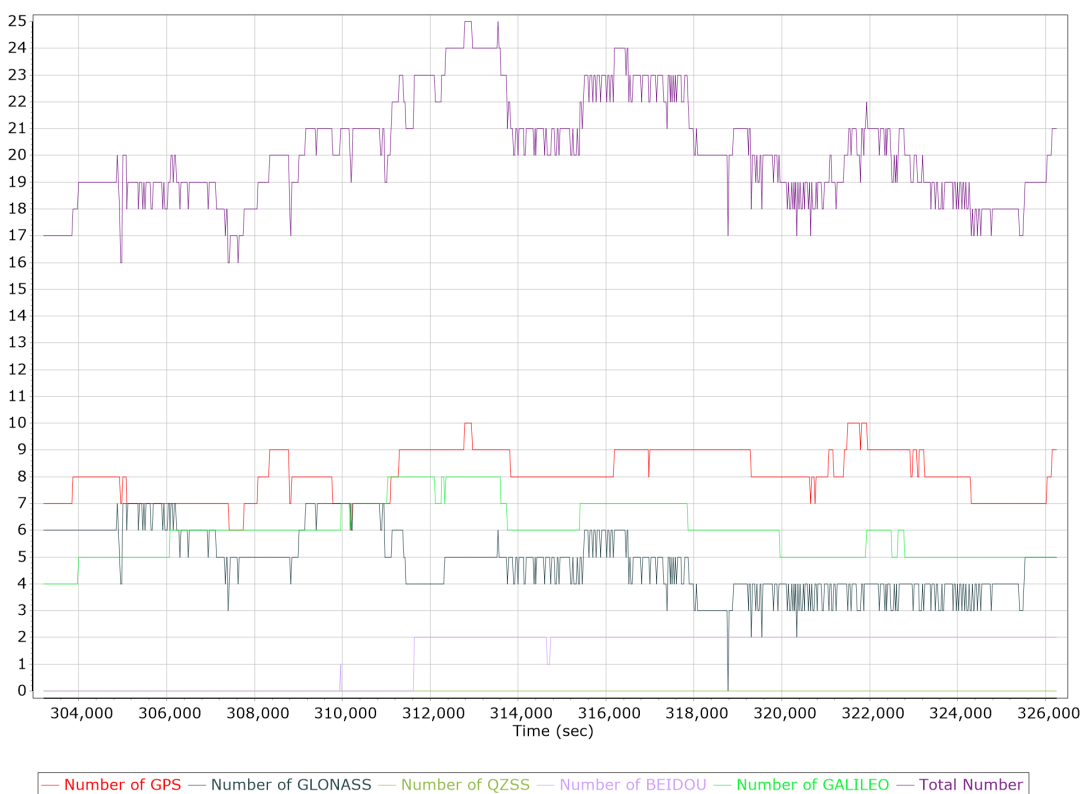


GNSS QC

GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	6	10	8
Number of GLONASS SV	0	7	5
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	2	1
Number of GALILEO SV	4	8	6
Total number of SV	11	25	20
PDOP	0.99	2.02	1.27
QC Solution Gaps	1.00	1.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	23091.00	0.00	40.00
Percentage	99.83	0.00	0.17

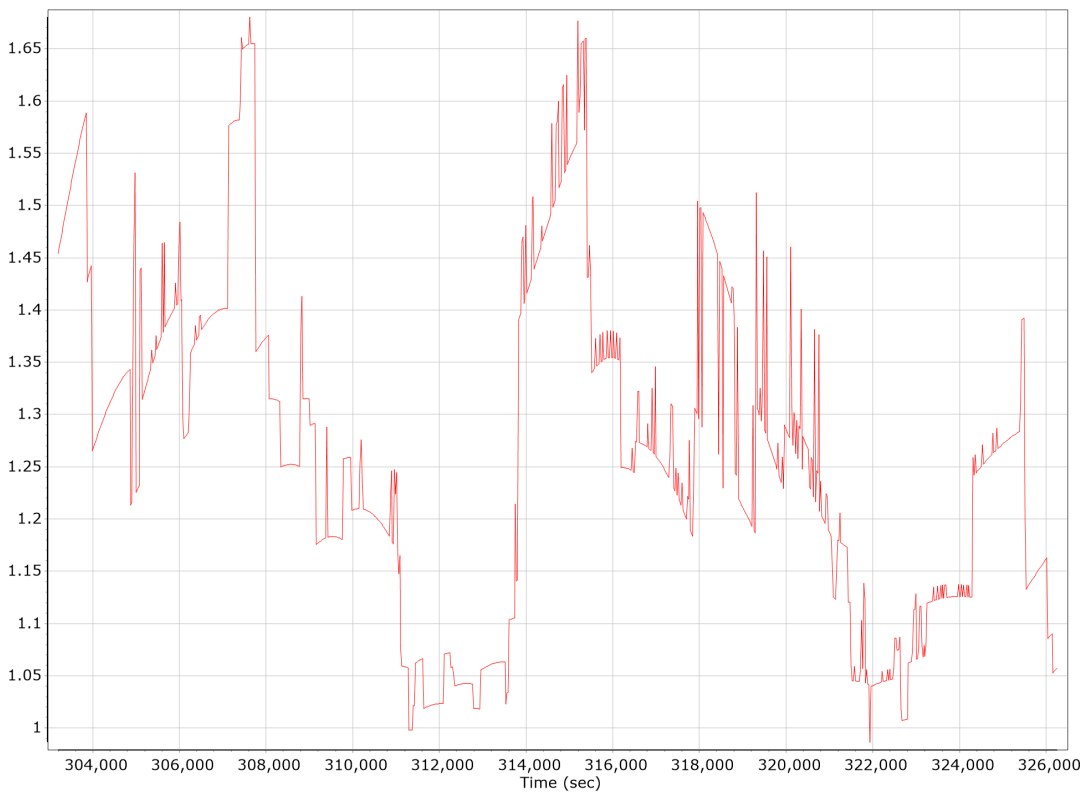
Num SVs in solution



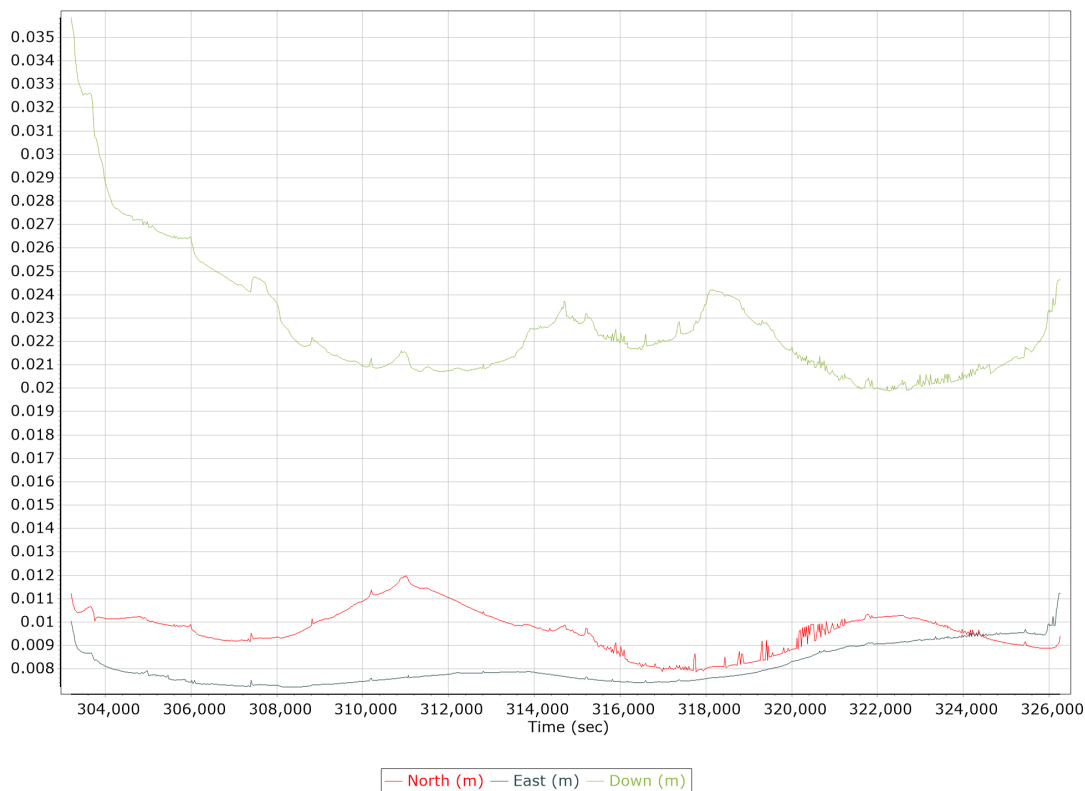
Forward/Reverse Separation



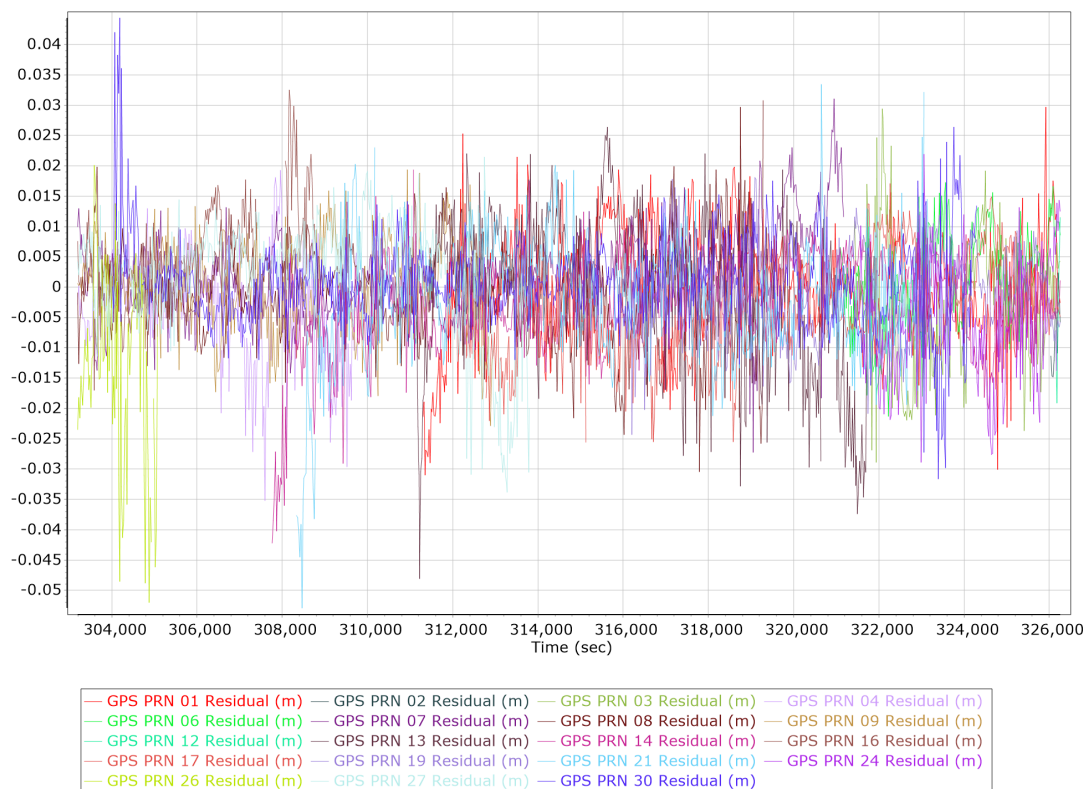
PDOP



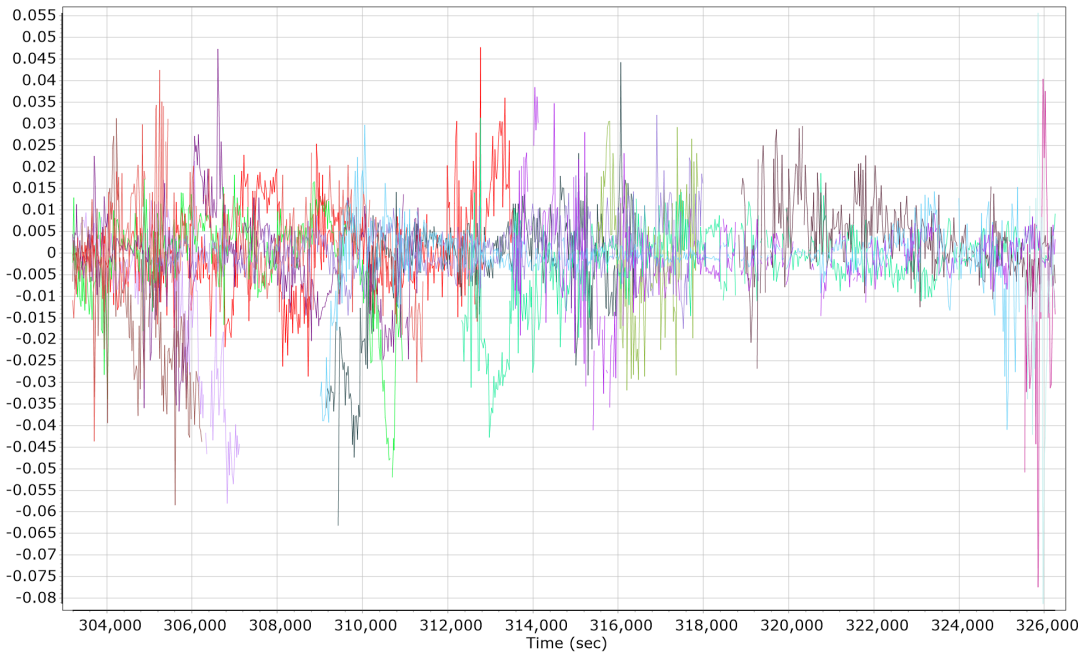
Estimated Position Accuracy



GPS Residuals

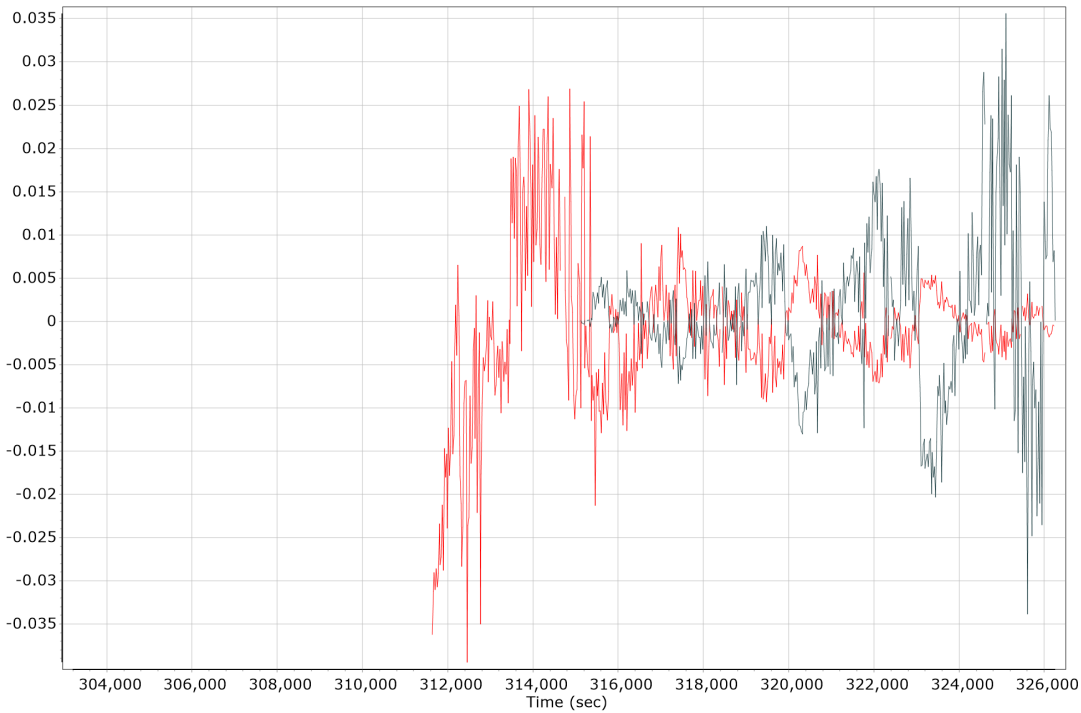


GLONASS Residuals



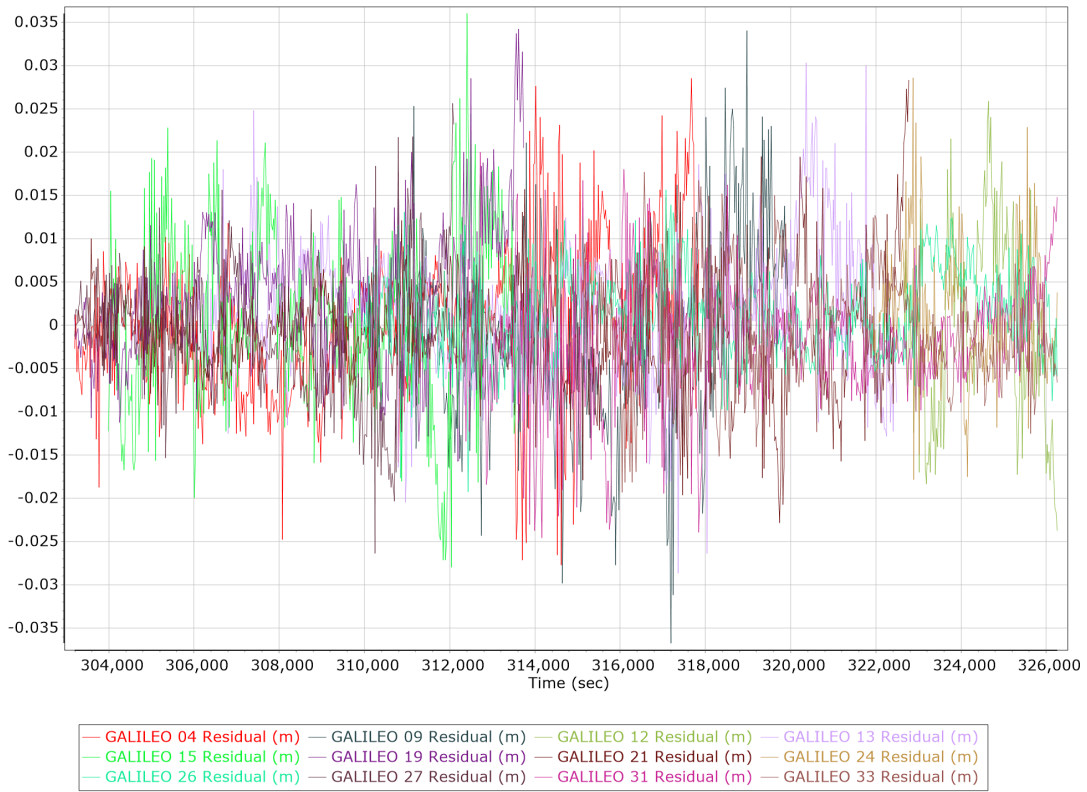
- | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GLONASS 01 Residual (m) | GLONASS 02 Residual (m) | GLONASS 03 Residual (m) | GLONASS 07 Residual (m) |
| GLONASS 08 Residual (m) | GLONASS 09 Residual (m) | GLONASS 10 Residual (m) | GLONASS 11 Residual (m) |
| GLONASS 12 Residual (m) | GLONASS 13 Residual (m) | GLONASS 14 Residual (m) | GLONASS 18 Residual (m) |
| GLONASS 19 Residual (m) | GLONASS 20 Residual (m) | GLONASS 21 Residual (m) | GLONASS 22 Residual (m) |
| GLONASS 23 Residual (m) | GLONASS 24 Residual (m) | | |

BEIDOU Residuals



- | | | | |
|------------------------|------------------------|------------------------|------------------------|
| BEIDOU 11 Residual (m) | BEIDOU 12 Residual (m) | BEIDOU 21 Residual (m) | BEIDOU 23 Residual (m) |
| BEIDOU 24 Residual (m) | BEIDOU 25 Residual (m) | BEIDOU 26 Residual (m) | BEIDOU 28 Residual (m) |

GALILEO Residuals



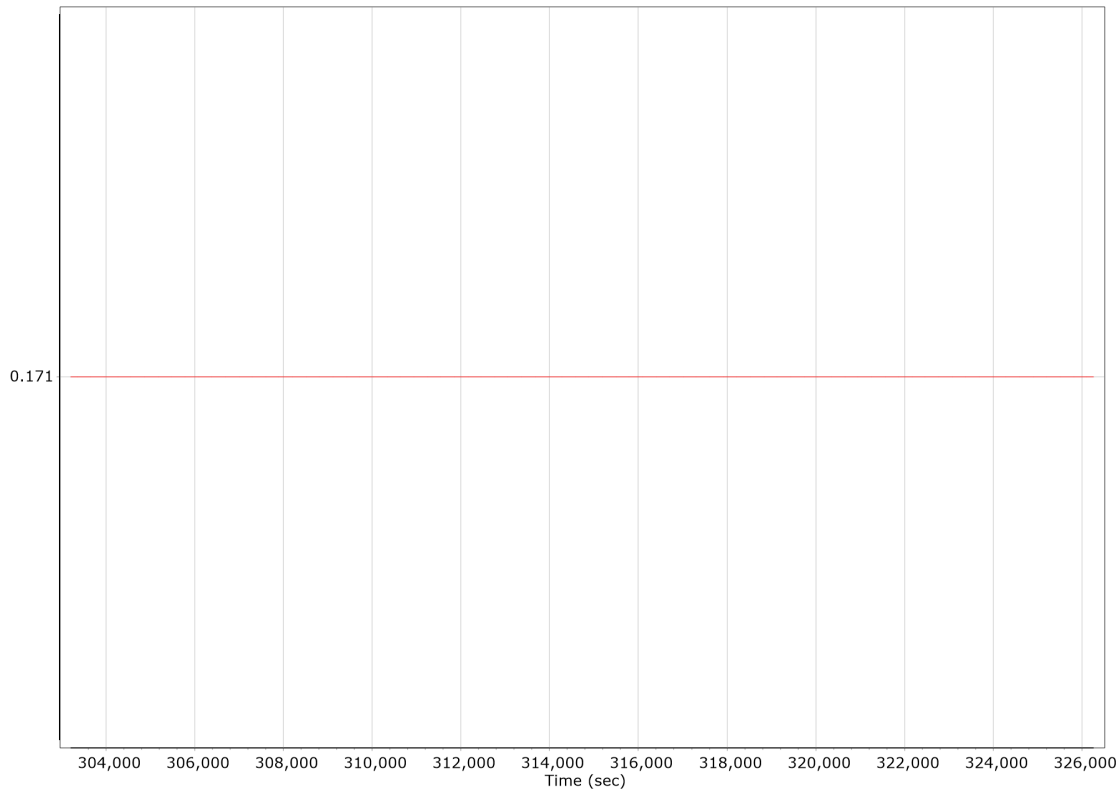
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	303115.000 (5/4/2022 12:11:55 PM)		
Processing end time	326272.000 (5/4/2022 6:37:52 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.171	-0.238	-1.273
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

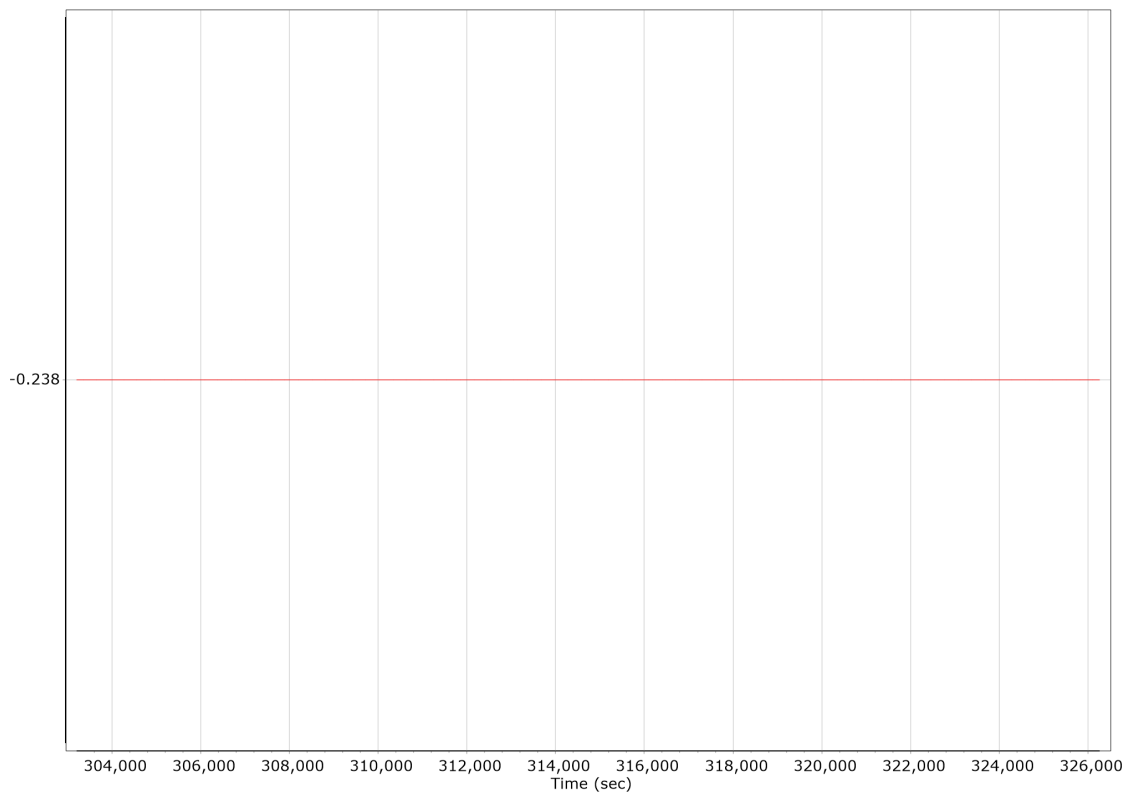
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

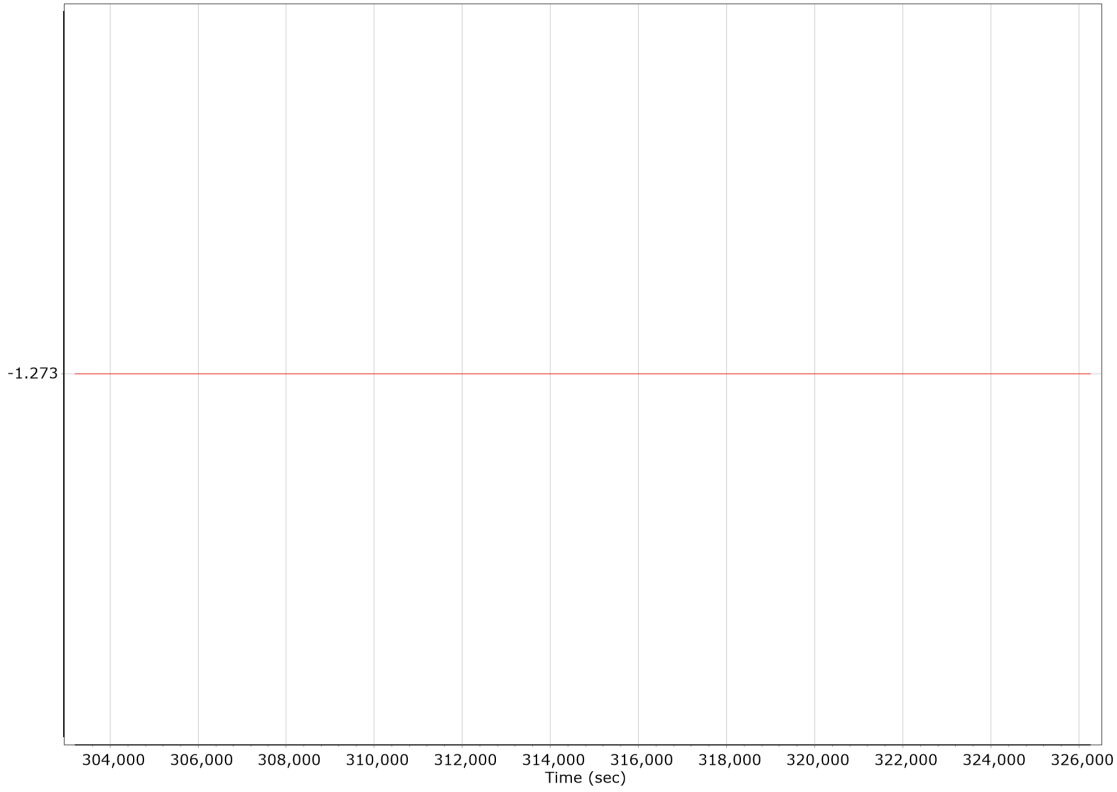
X Reference-Primary GNSS Lever Arm (m)



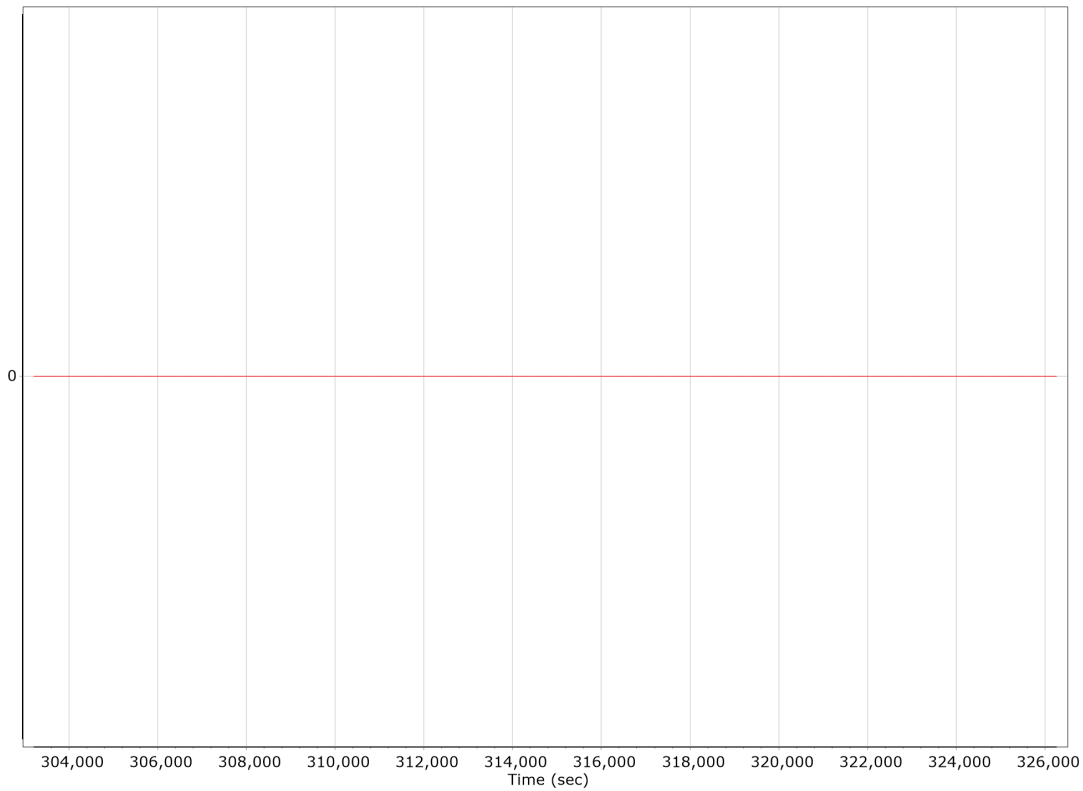
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



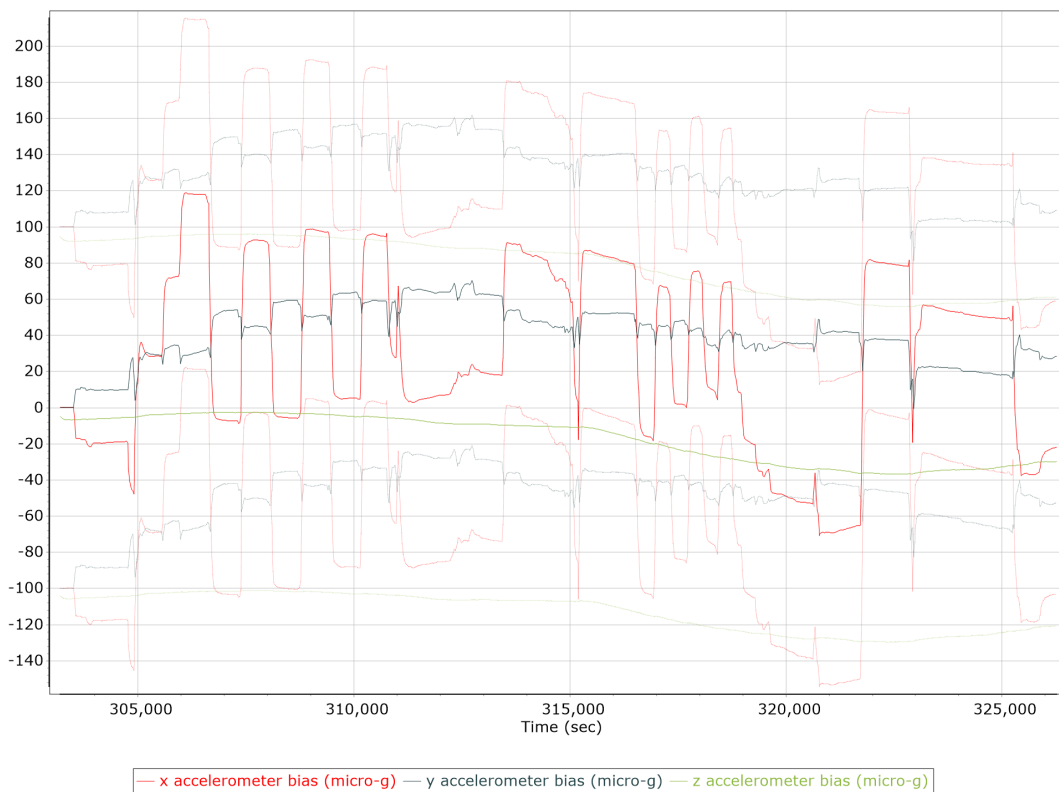
Reference-Primary GNSS Lever Arm Figure of Merit



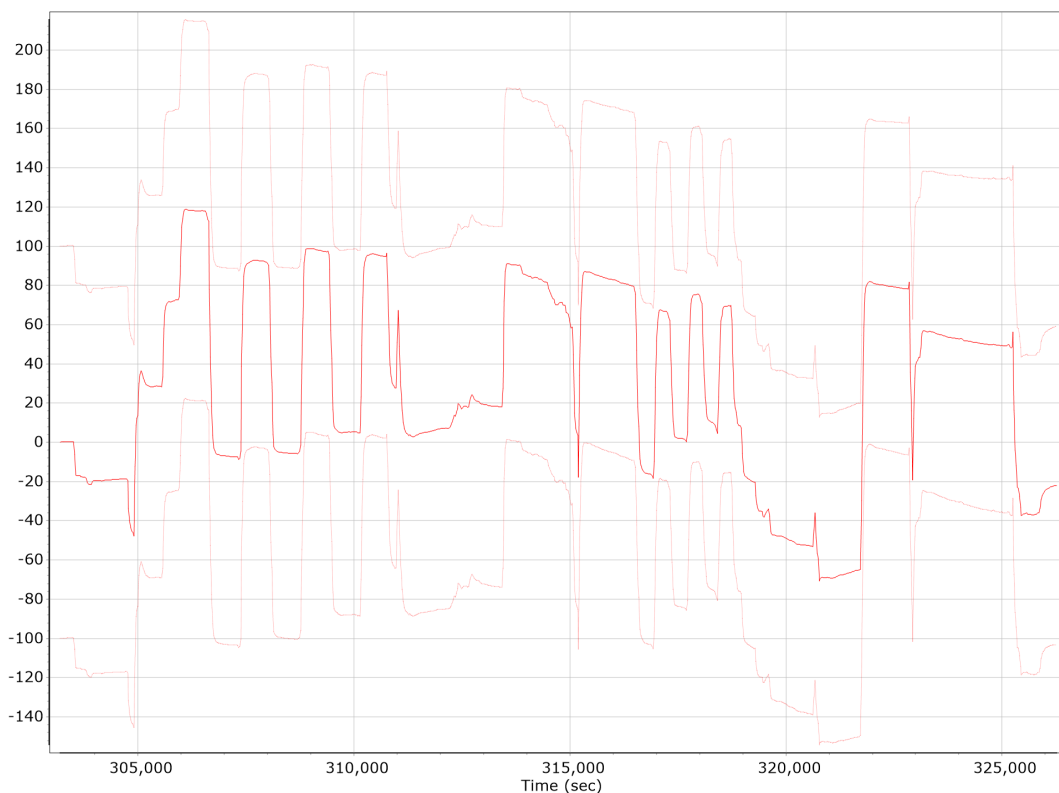
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

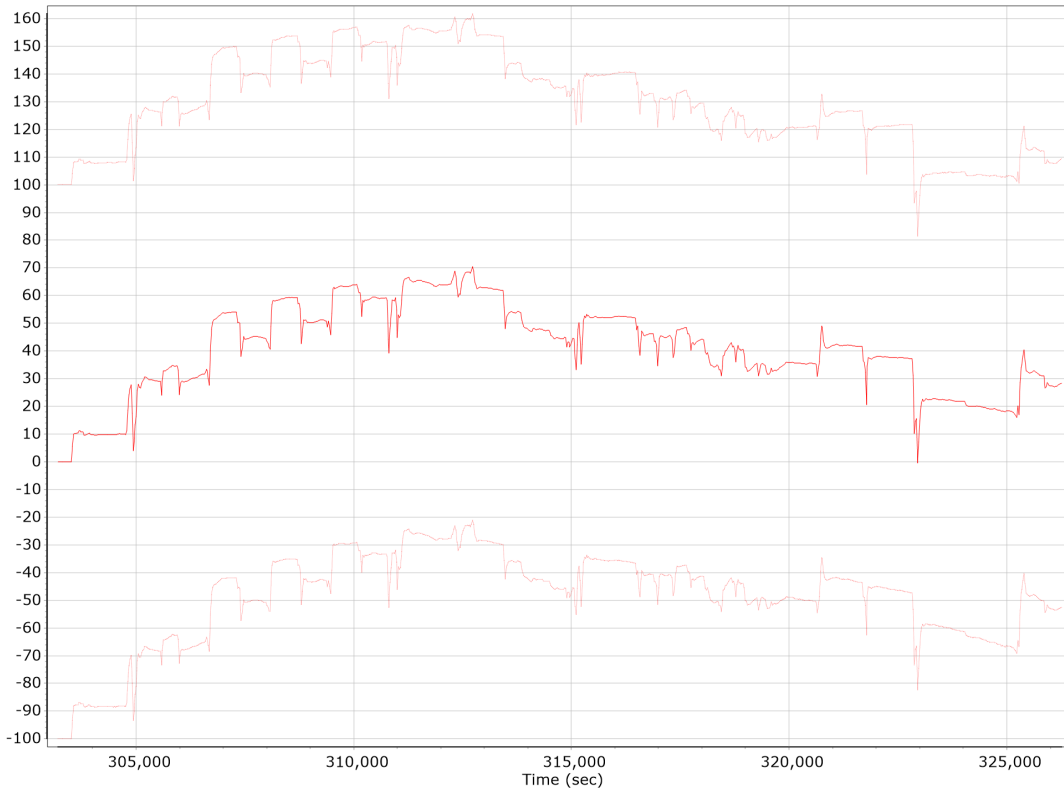
Accelerometer Bias (micro-g)



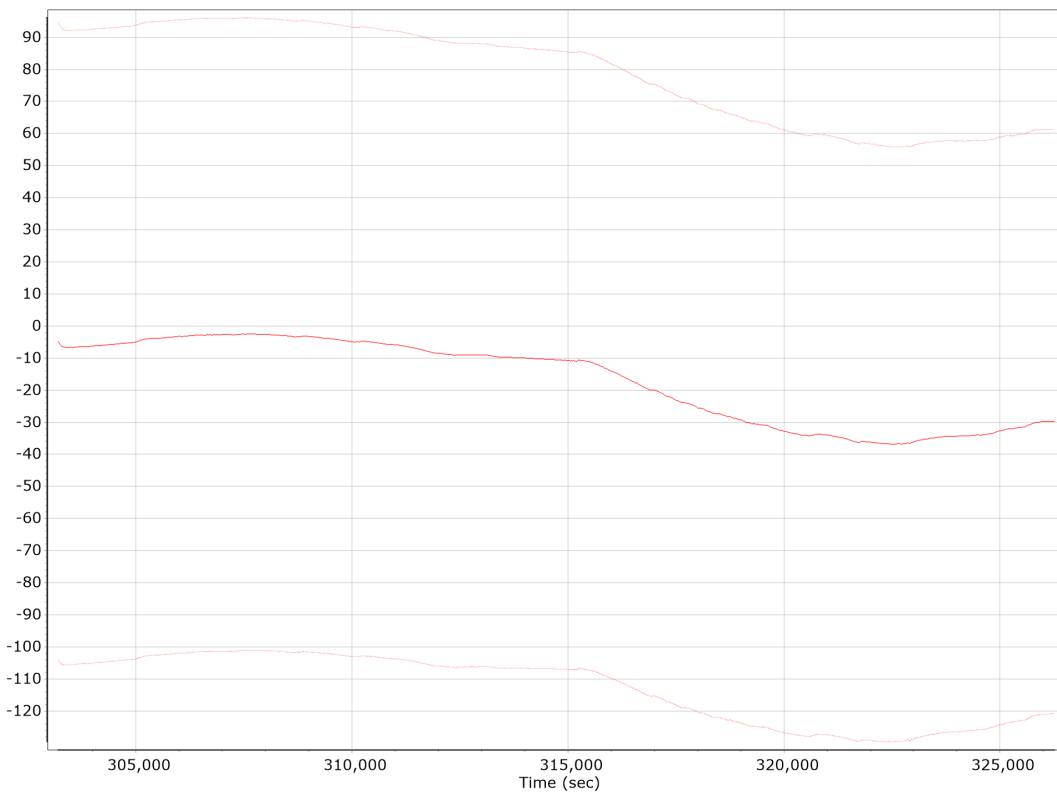
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



Y Accelerometer Scale Error (ppm)



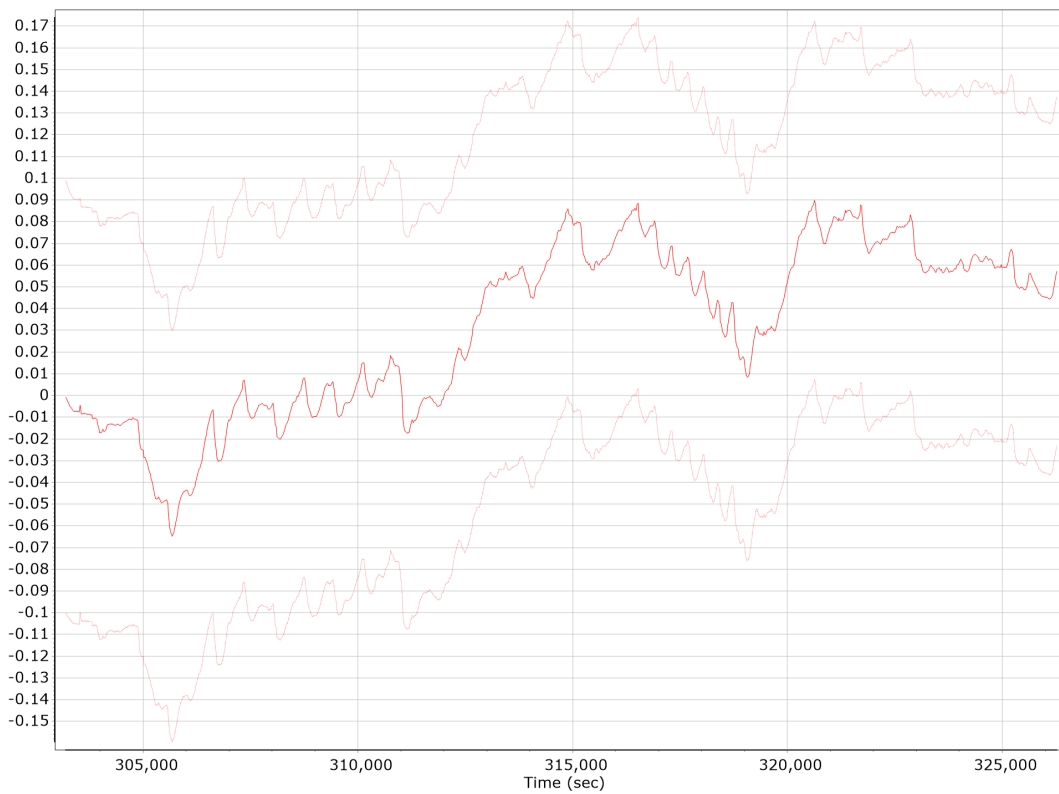
Z Accelerometer Scale Error (ppm)



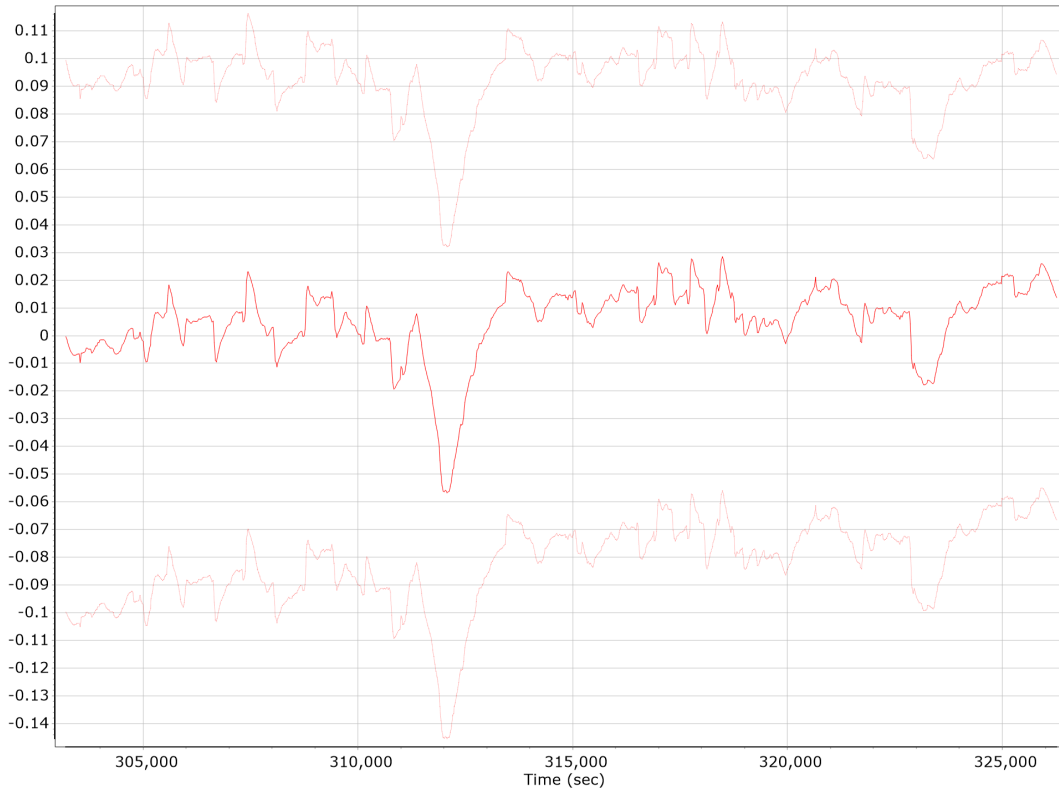
Gyro Bias (deg/h)



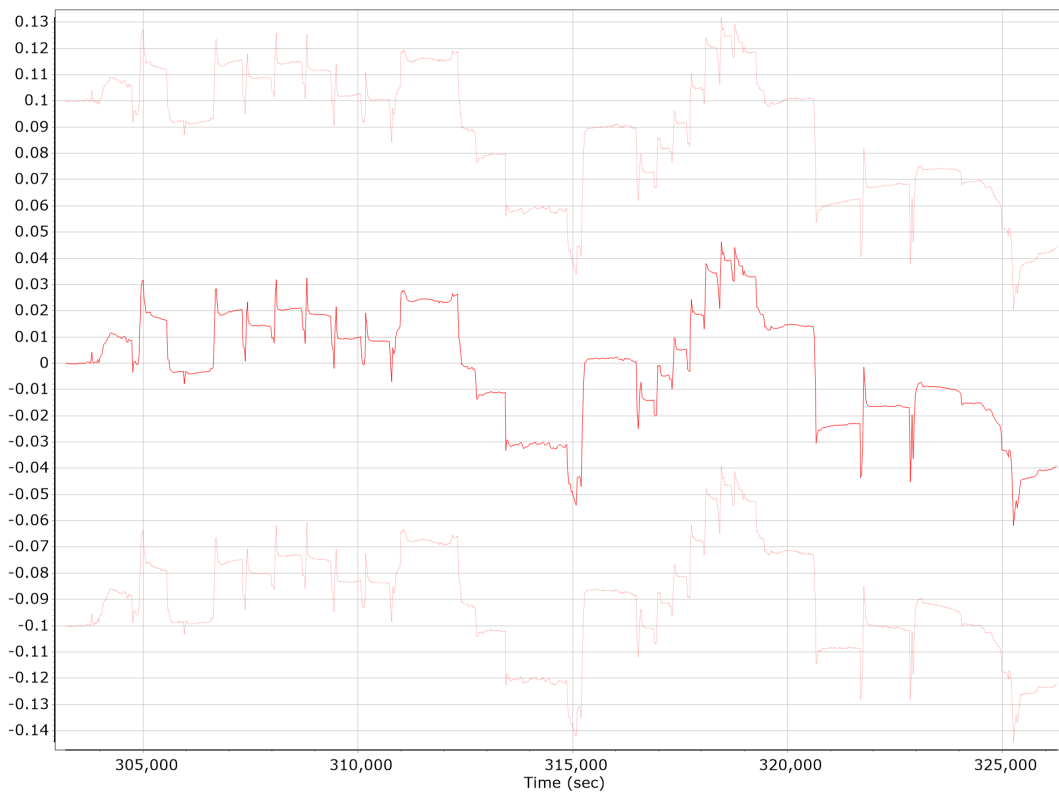
X Gyro Bias (deg/h)



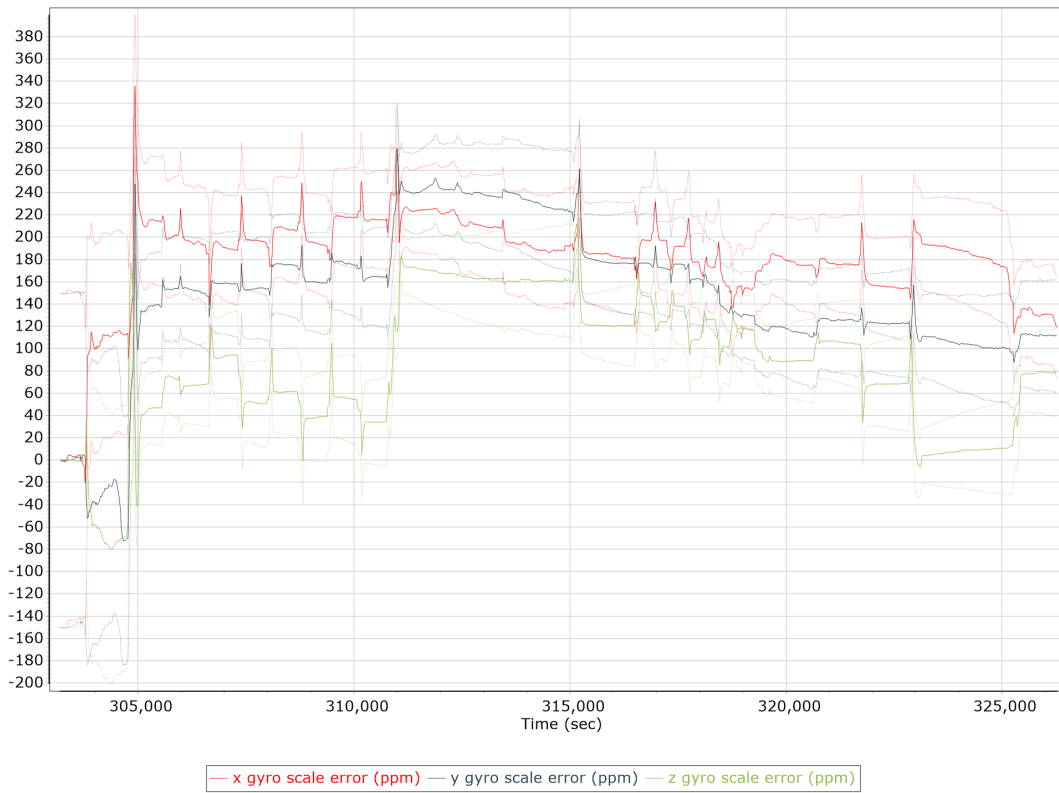
Y Gyro Bias (deg/h)



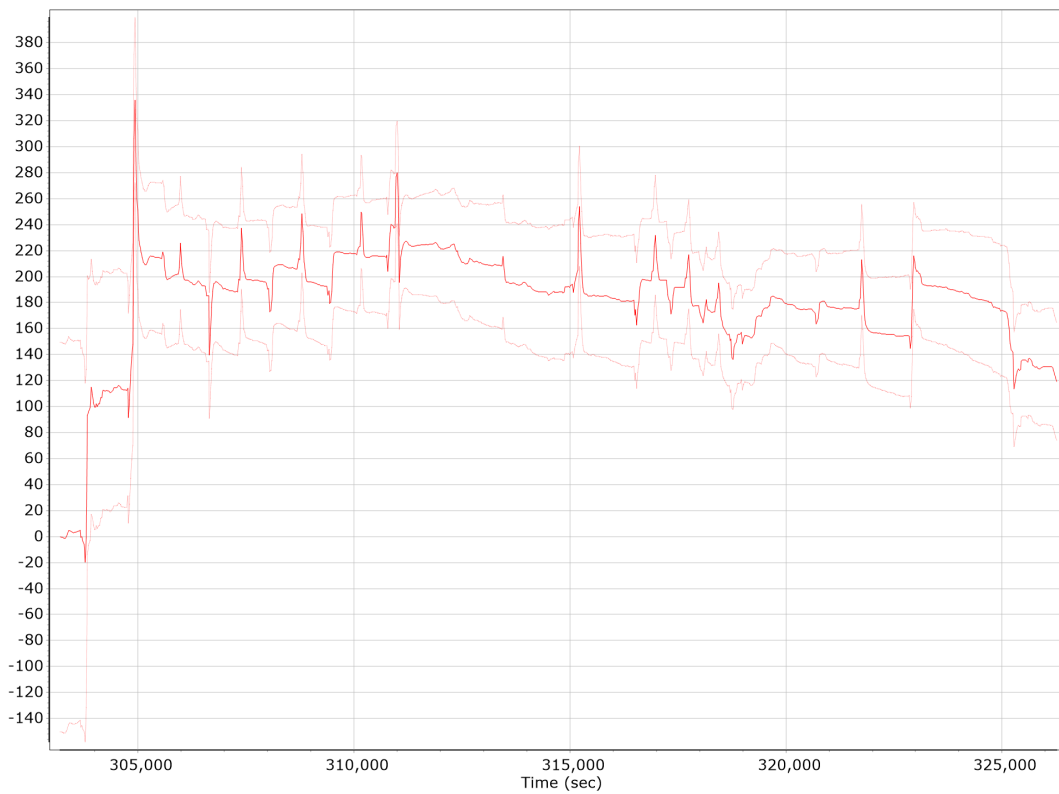
Z Gyro Bias (deg/h)



Gyro Scale Error (ppm)



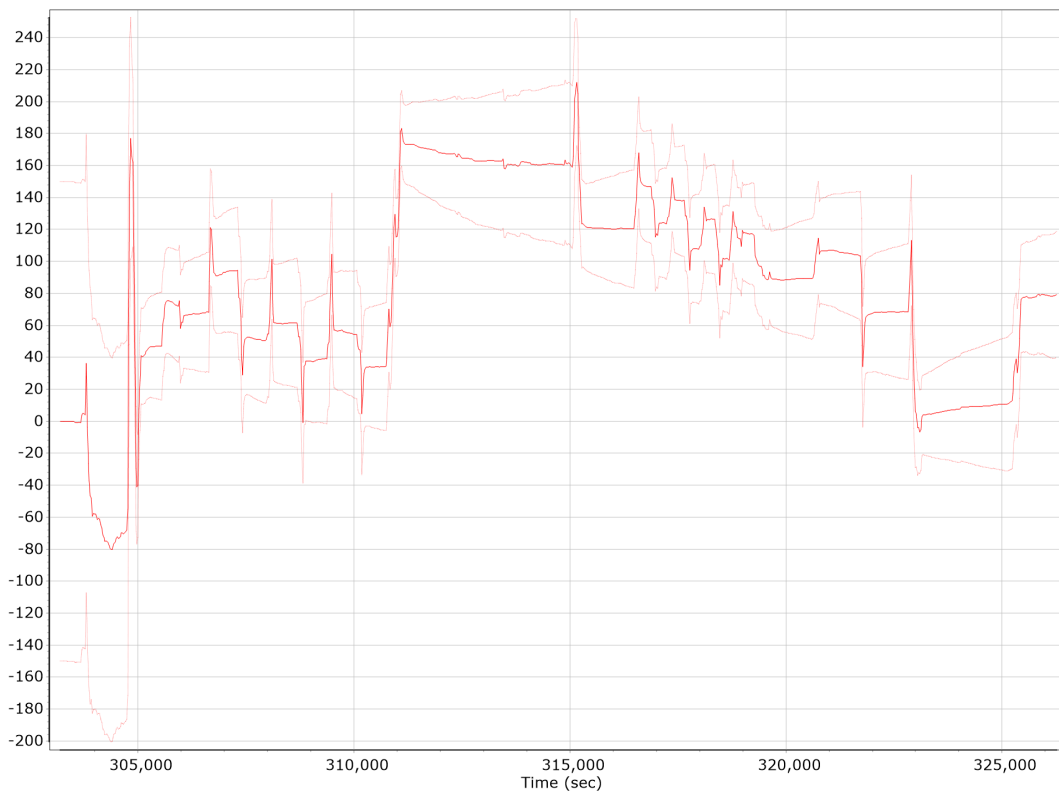
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

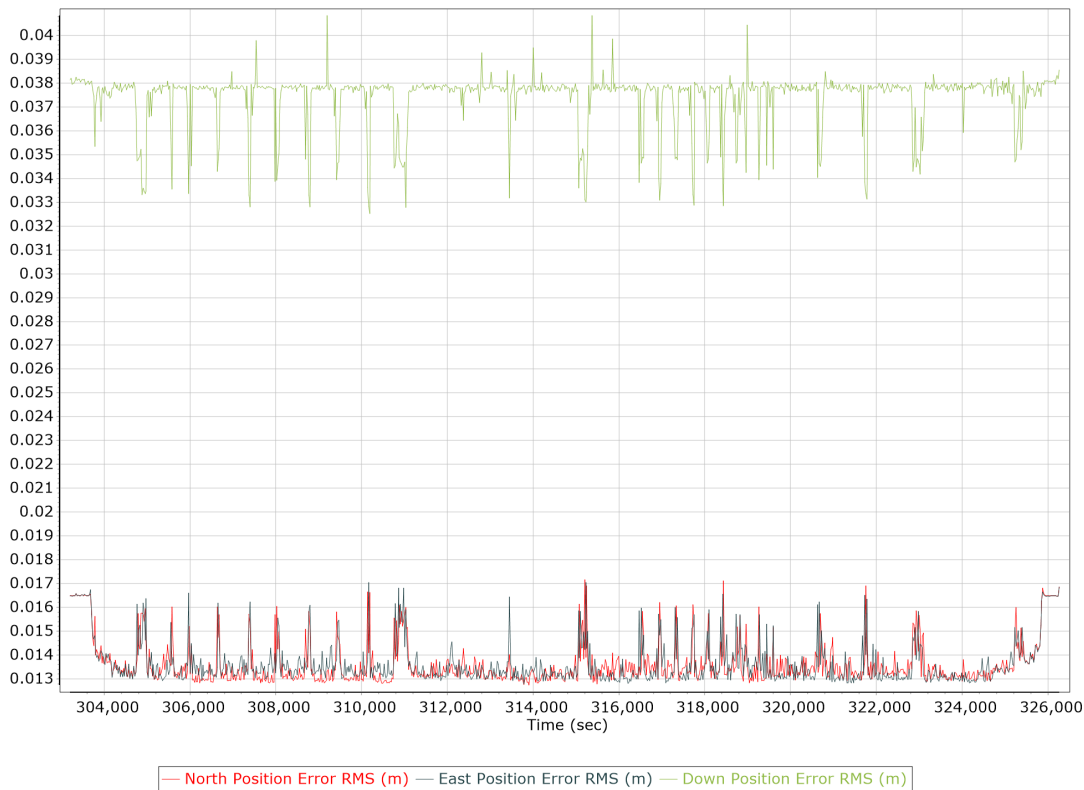


Z Gyro Scale Error (ppm)

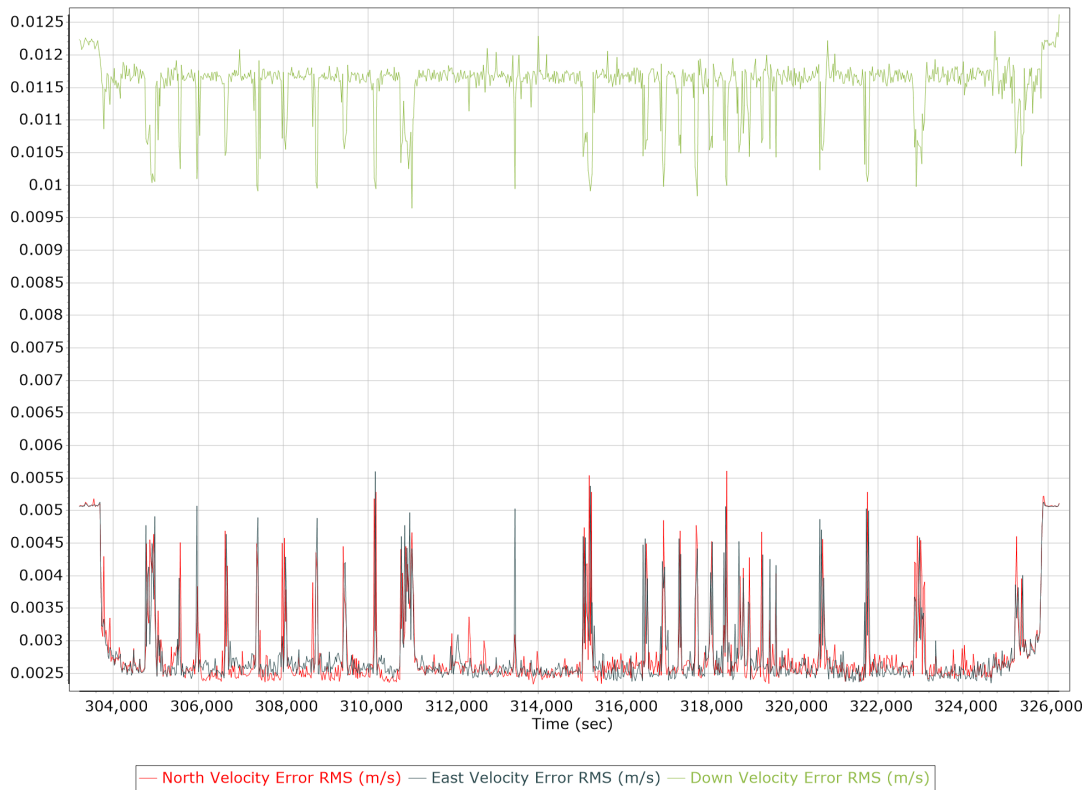


Smoothed Performance Metrics

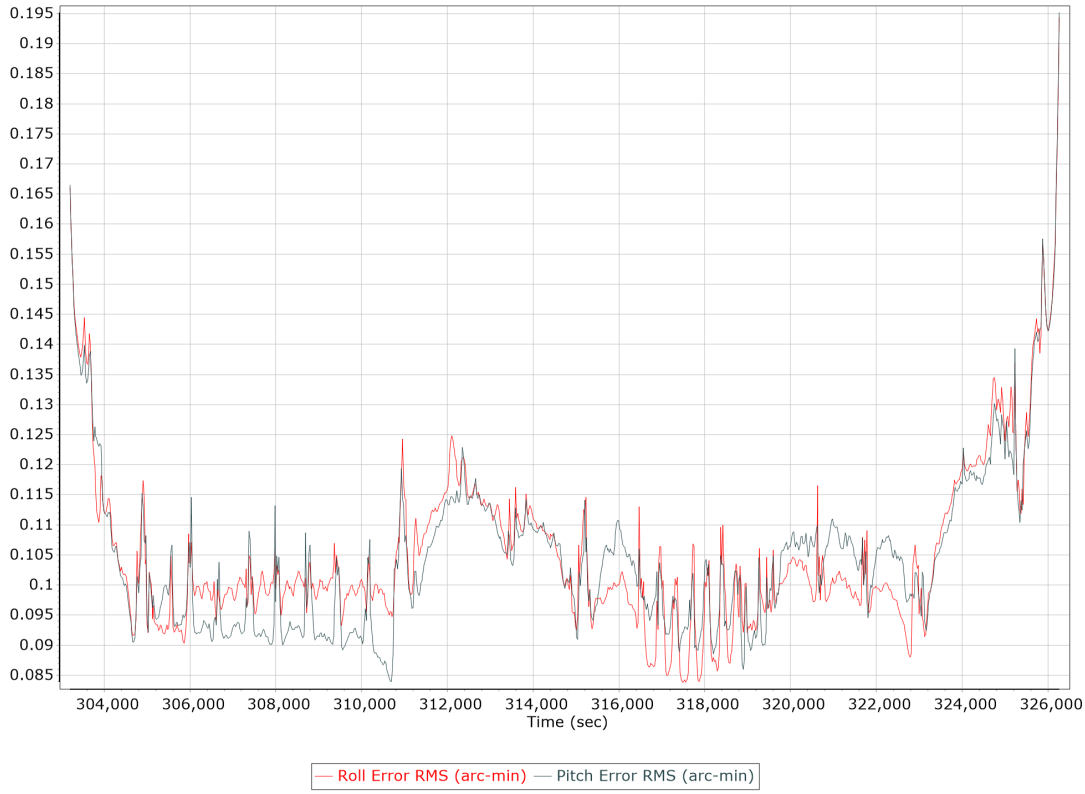
Position Error RMS (m)



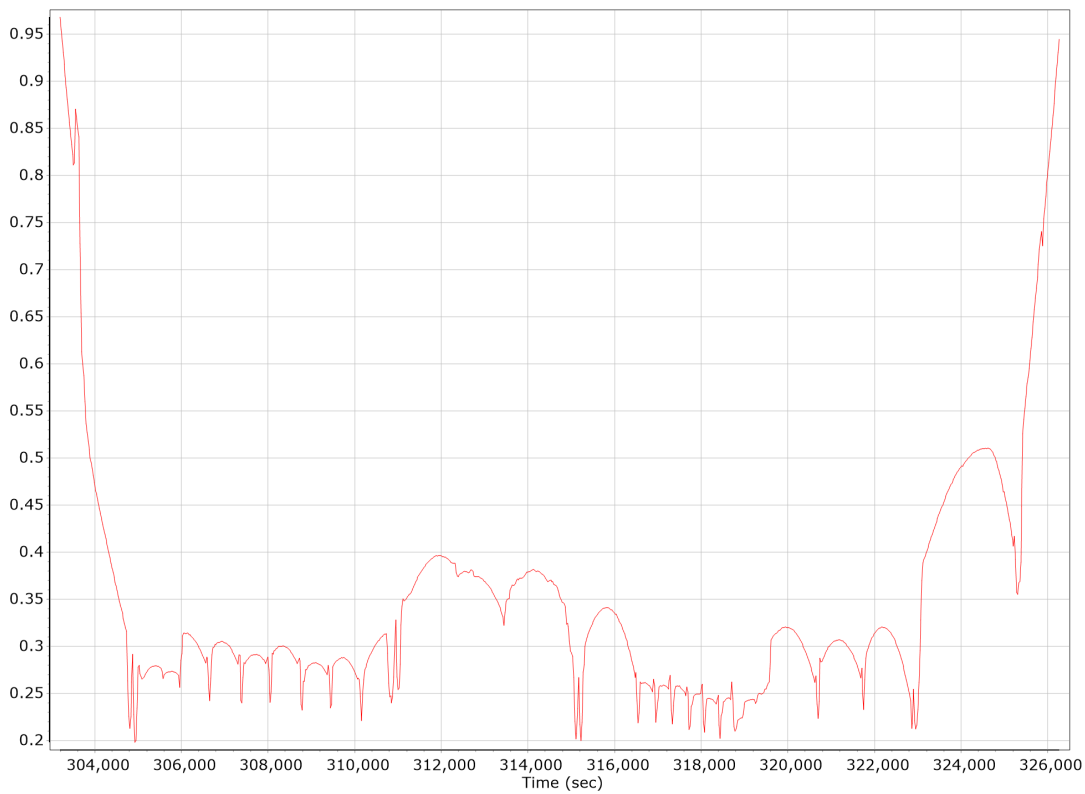
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)



Heading Error RMS (arc-min)



Forward Processed Performance Metrics

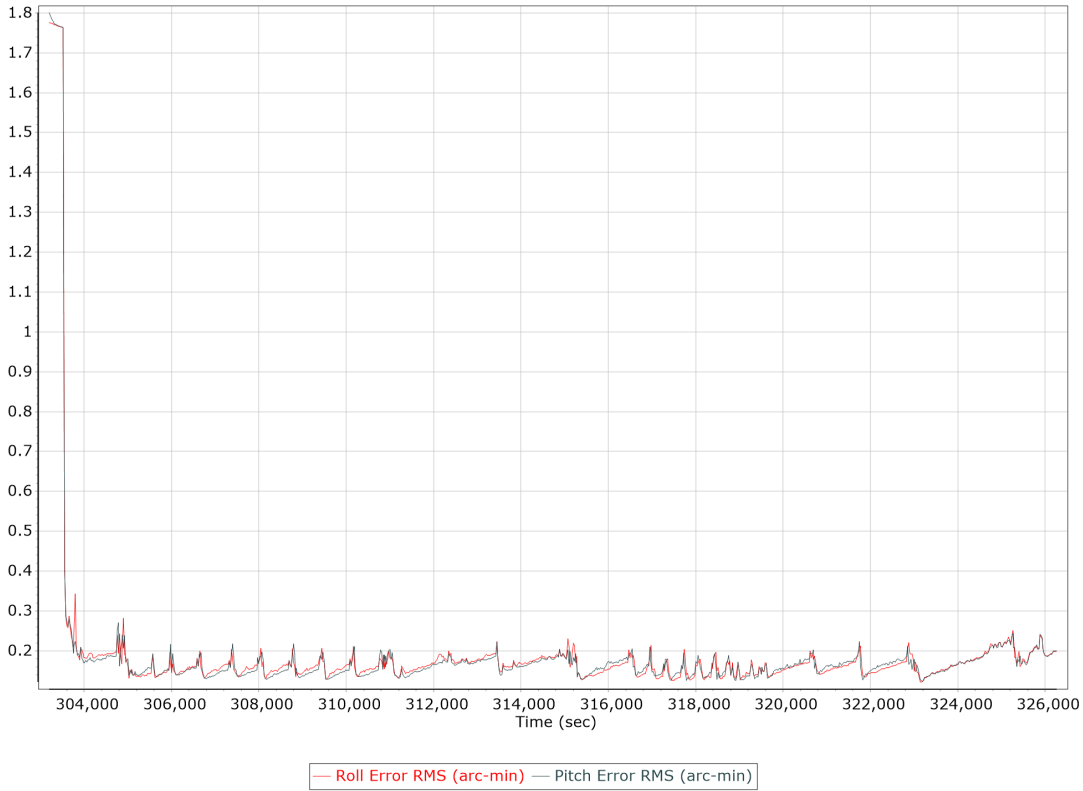
Position Error RMS (m)



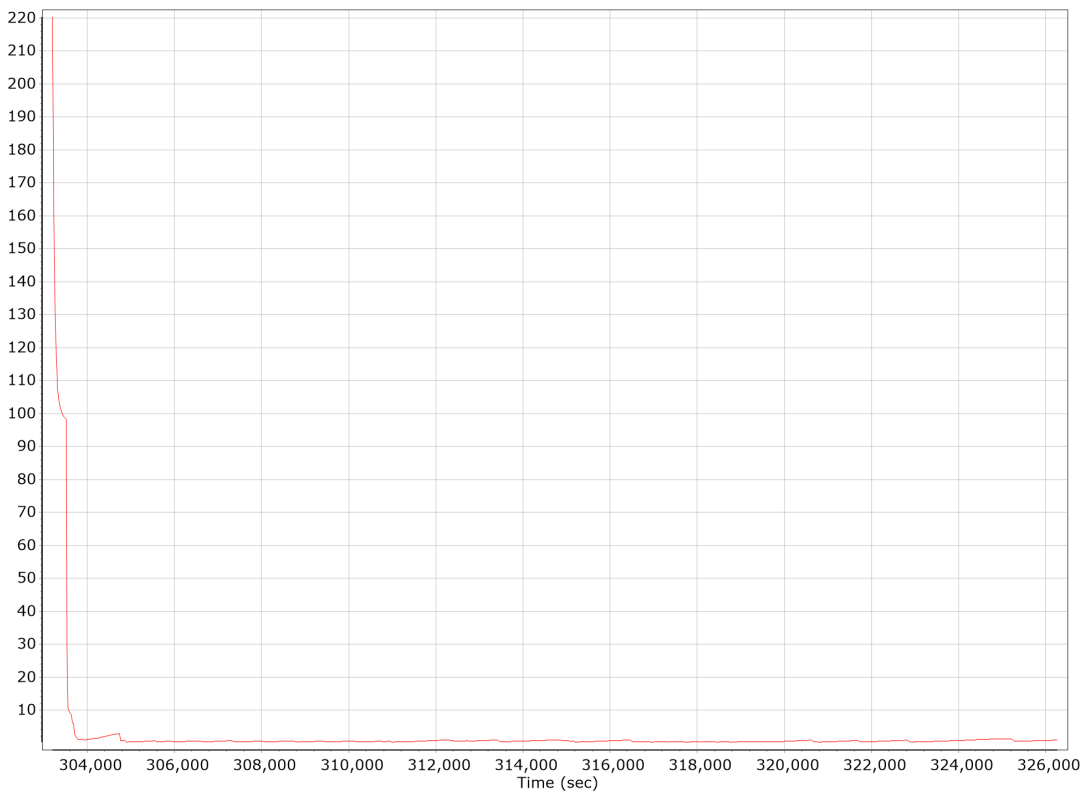
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

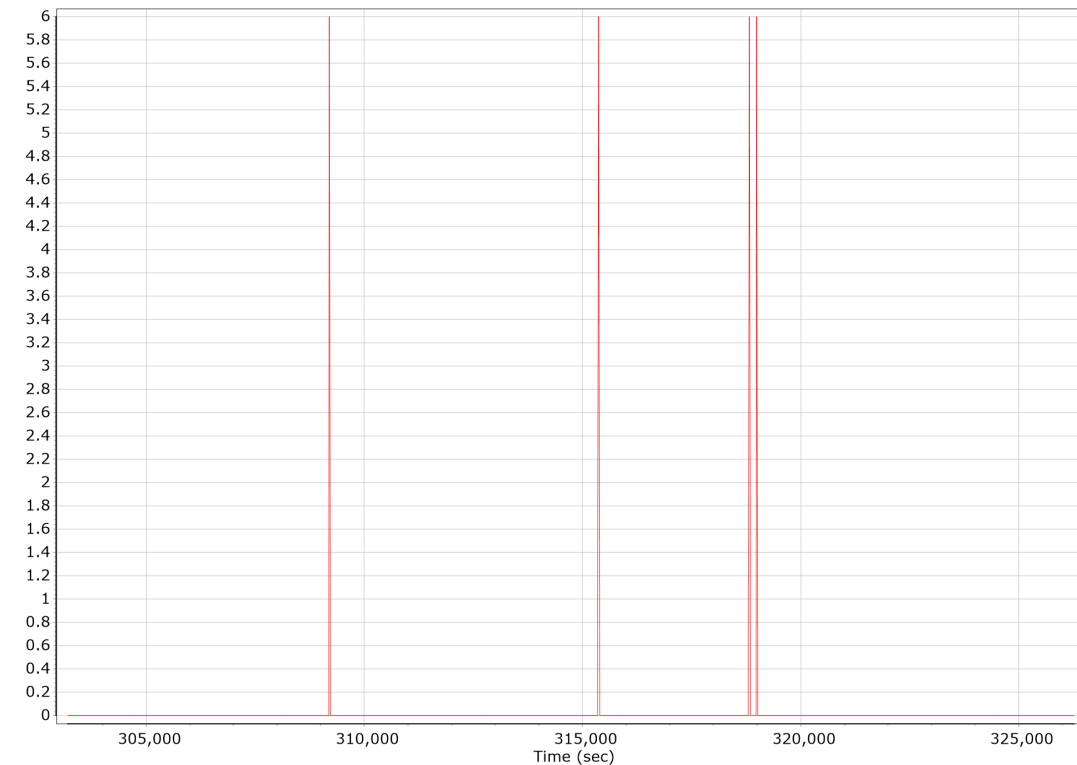


Heading Error RMS (arc-min)



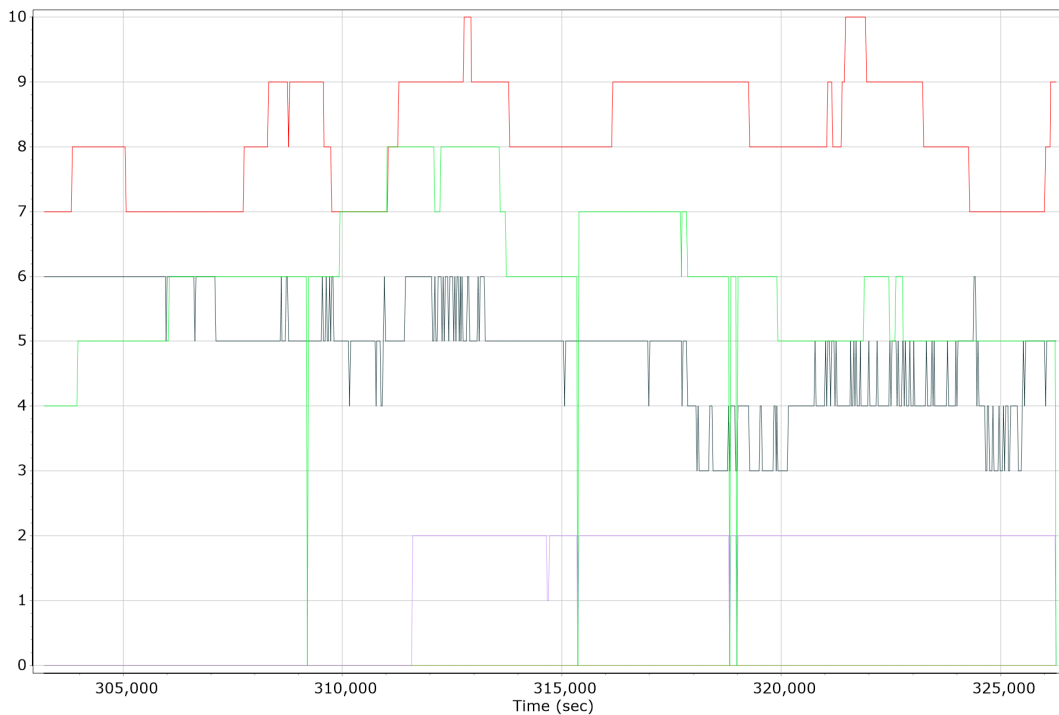
Forward Processed Solution Status

Processing Mode



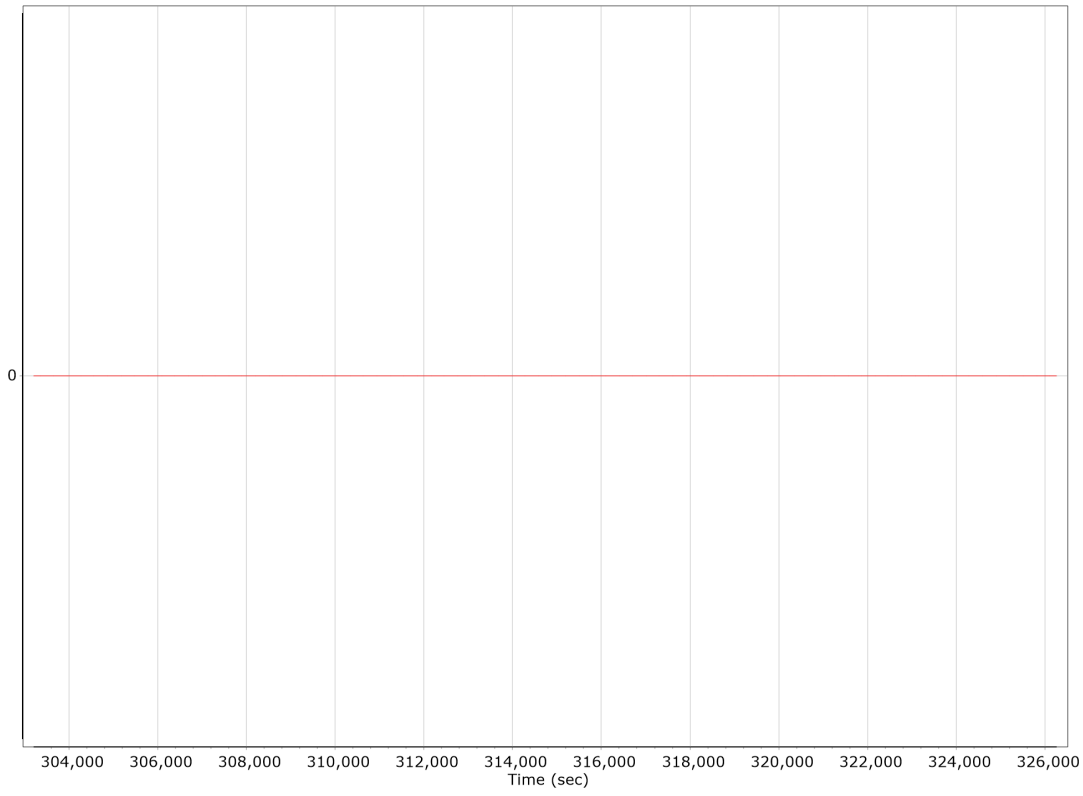
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites
 — Number of GLONASS Satellites
 — Number of QZSS Satellites
— Number of BEIDOU Satellites
 — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05052022A_3062
Processing date	2022-05-10 18:17:00
Mission date	2022-05-05 13:11:16
Mission duration	06:03:05.156
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8708
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
220505_131057_INS-GPS_1.raw	POS Data

Input Files

File Name	File Type
Ephm1250.22g	GLONASS Broadcast Ephemeris
Ephm1250.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05052022A_3062.out	SBET Trajectory File

Rover Data Summary

First raw data file	220505_131057_INS-GPS_1.raw		
Last raw data file	220505_131057_INS-GPS_1.raw		
Start GPS week	2208		
Start time	393057.478 (5/5/2022 1:10:57 PM)		
End time	414842.634 (5/5/2022 7:14:02 PM)		
Start of fine alignment	393197.219 (5/5/2022 1:13:17 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.142	-0.236	-1.269
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

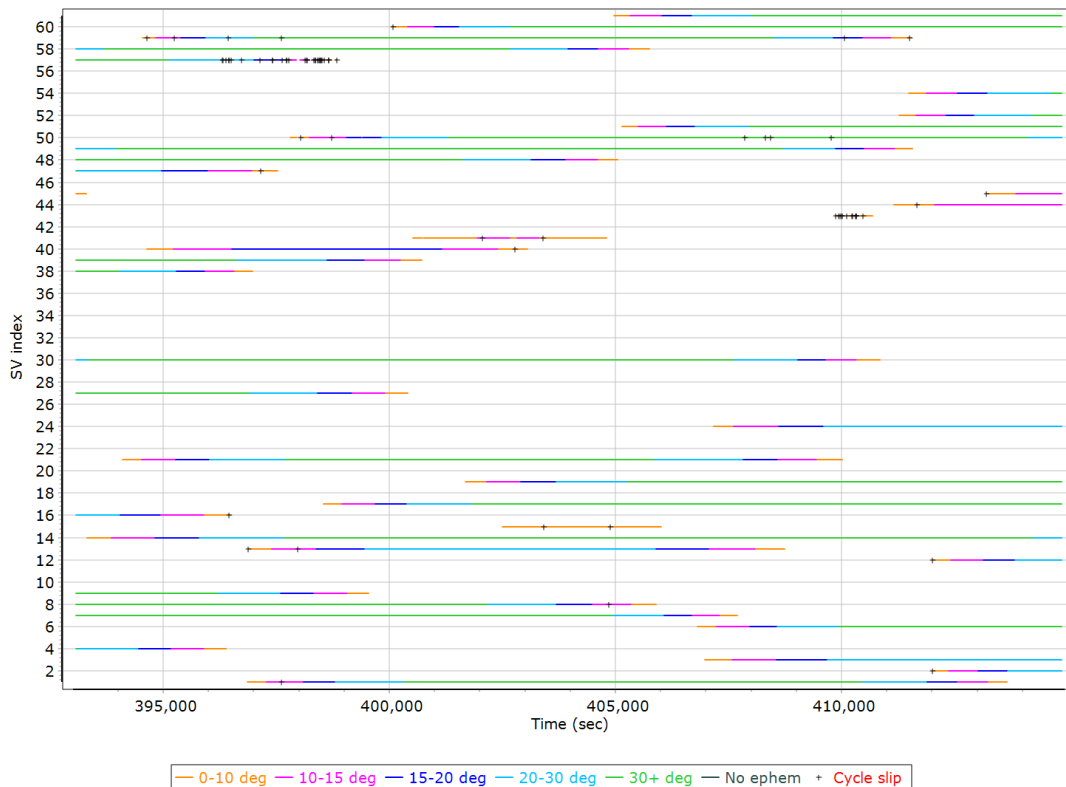
Rover Data QC

Raw IMU Import QC Summary

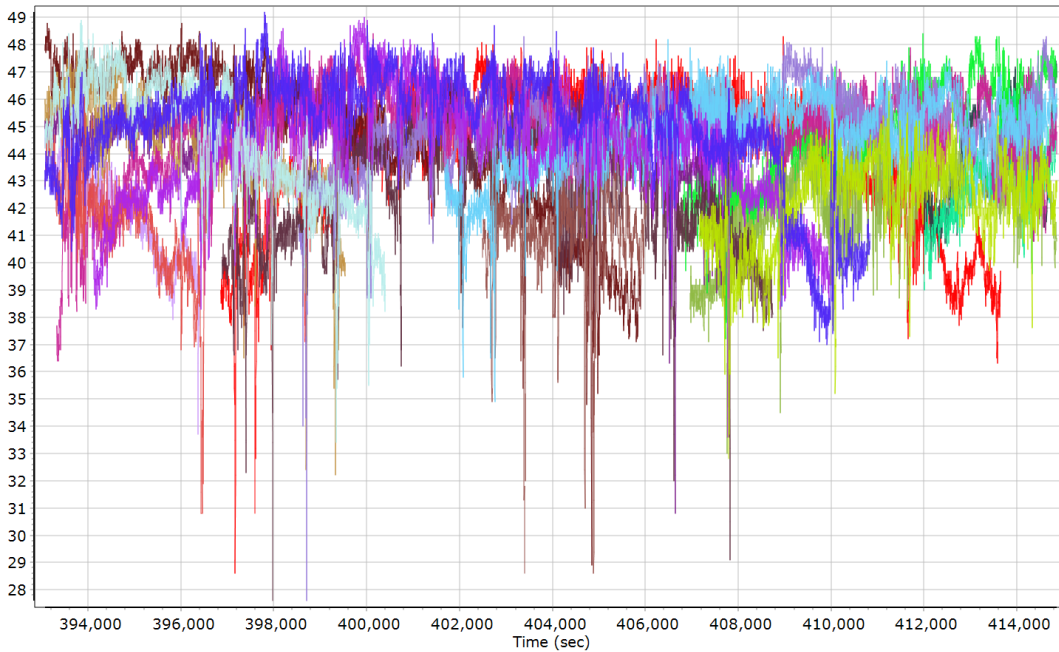
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05052022A_3062.log
IMU Records Processed	4356266
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

GPS/GLONASS L1 Satellite Lock/Elevation

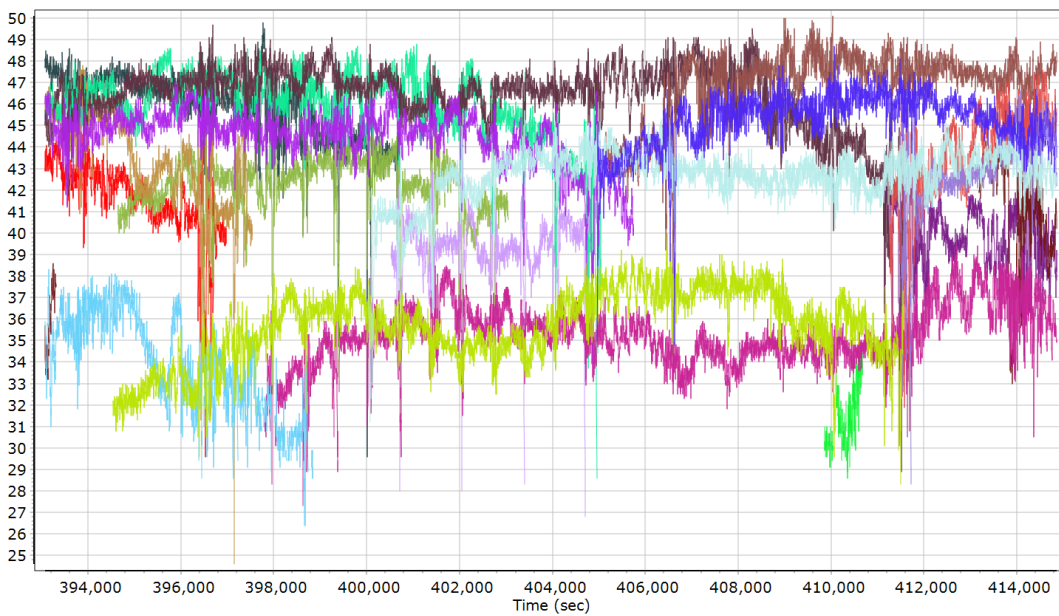


GPS L1 SNR



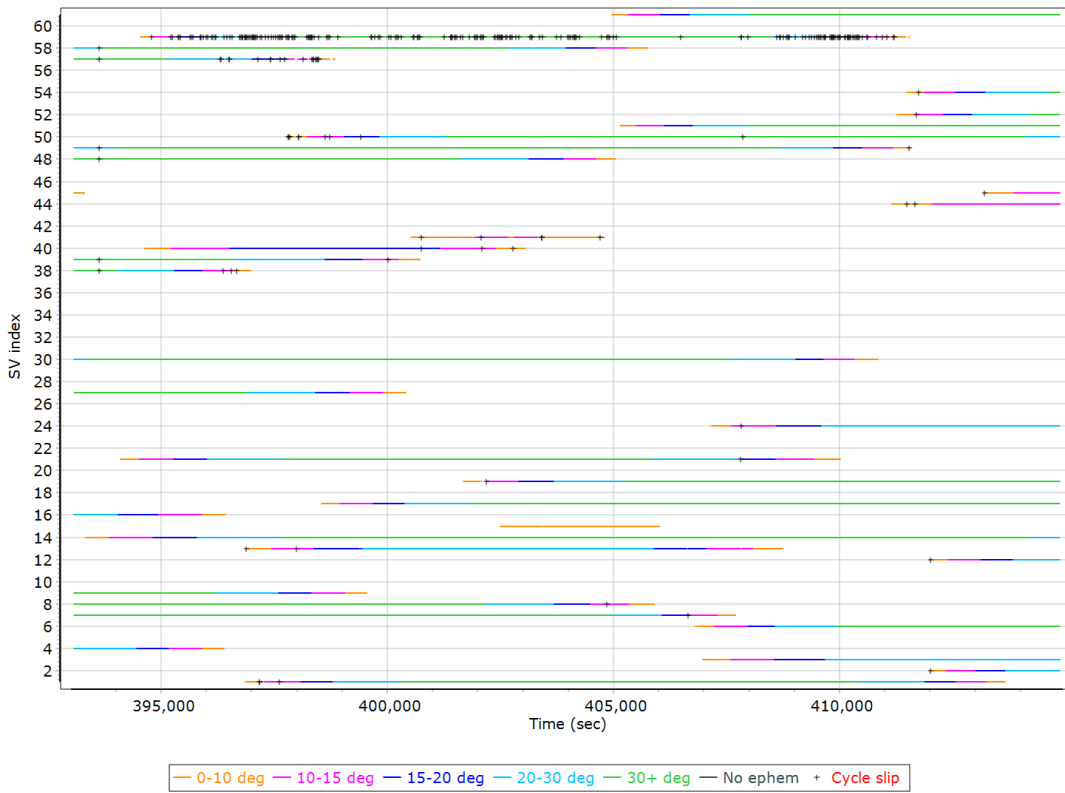
- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 SNR (dB/Hz) | GPS PRN 04 L1 SNR (dB/Hz) |
| GPS PRN 06 L1 SNR (dB/Hz) | GPS PRN 07 L1 SNR (dB/Hz) | GPS PRN 08 L1 SNR (dB/Hz) | GPS PRN 09 L1 SNR (dB/Hz) |
| GPS PRN 12 L1 SNR (dB/Hz) | GPS PRN 13 L1 SNR (dB/Hz) | GPS PRN 14 L1 SNR (dB/Hz) | GPS PRN 15 L1 SNR (dB/Hz) |
| GPS PRN 16 L1 SNR (dB/Hz) | GPS PRN 17 L1 SNR (dB/Hz) | GPS PRN 19 L1 SNR (dB/Hz) | GPS PRN 21 L1 SNR (dB/Hz) |
| GPS PRN 24 L1 SNR (dB/Hz) | GPS PRN 27 L1 SNR (dB/Hz) | GPS PRN 30 L1 SNR (dB/Hz) | |

GLONASS L1 SNR

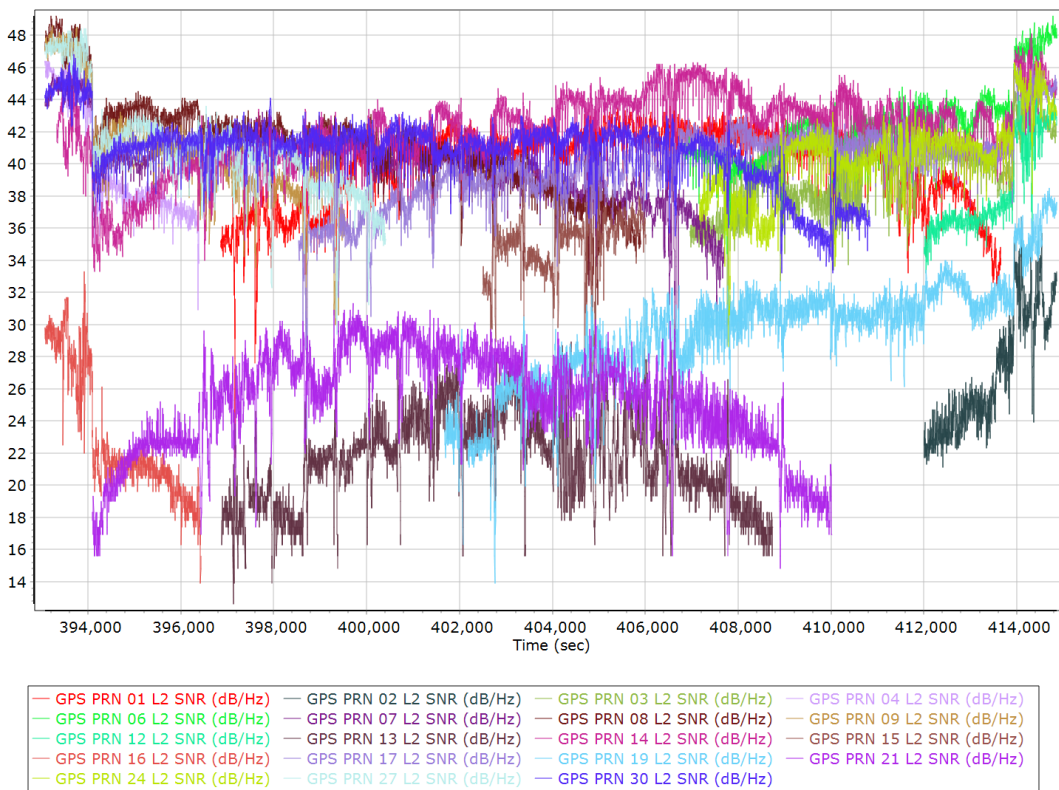


- | | | |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 06 L1 SNR (dB/Hz) | GLONASS 07 L1 SNR (dB/Hz) |
| GLONASS 08 L1 SNR (dB/Hz) | GLONASS 10 L1 SNR (dB/Hz) | GLONASS 11 L1 SNR (dB/Hz) |
| GLONASS 12 L1 SNR (dB/Hz) | GLONASS 13 L1 SNR (dB/Hz) | GLONASS 14 L1 SNR (dB/Hz) |
| GLONASS 15 L1 SNR (dB/Hz) | GLONASS 17 L1 SNR (dB/Hz) | GLONASS 20 L1 SNR (dB/Hz) |
| GLONASS 21 L1 SNR (dB/Hz) | GLONASS 22 L1 SNR (dB/Hz) | GLONASS 23 L1 SNR (dB/Hz) |
| GLONASS 24 L1 SNR (dB/Hz) | | |

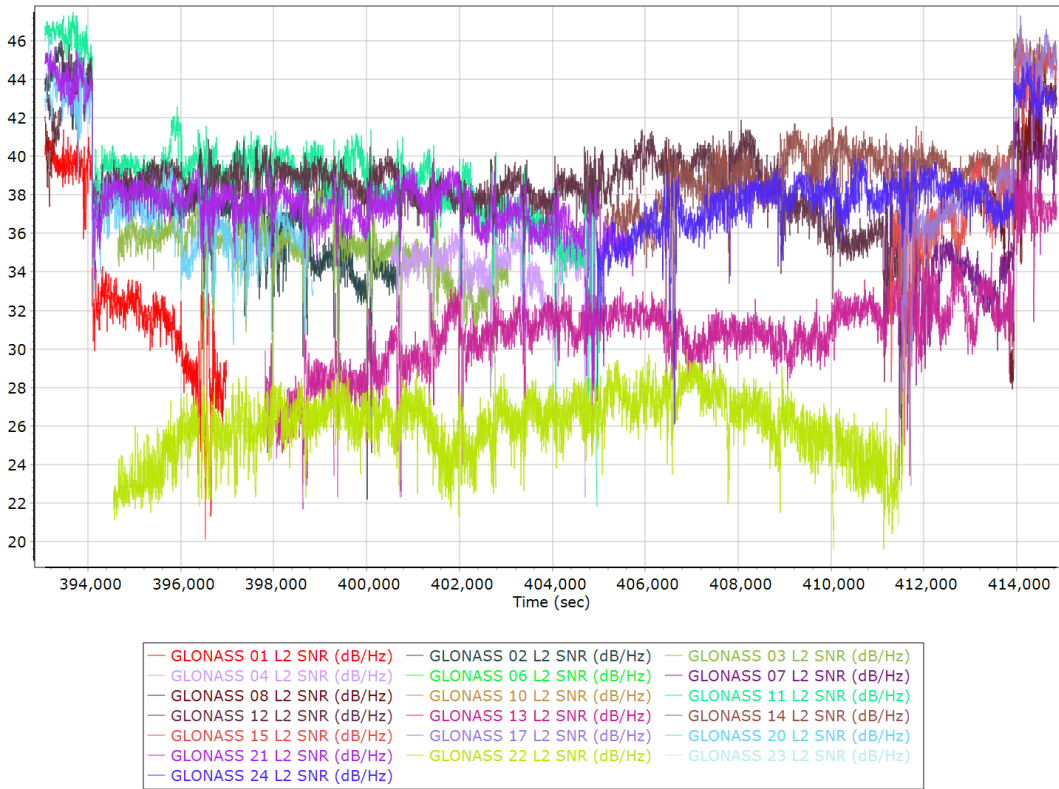
GPS/GLONASS L2 Satellite Lock/Elevation



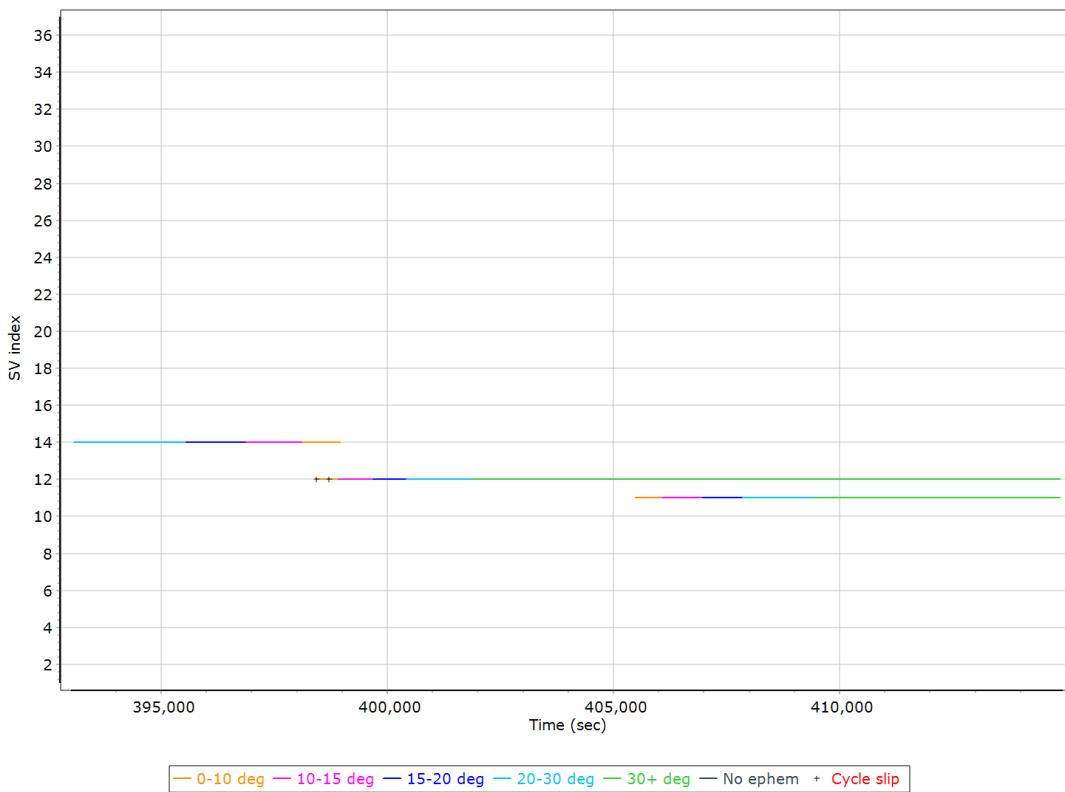
GPS L2 SNR



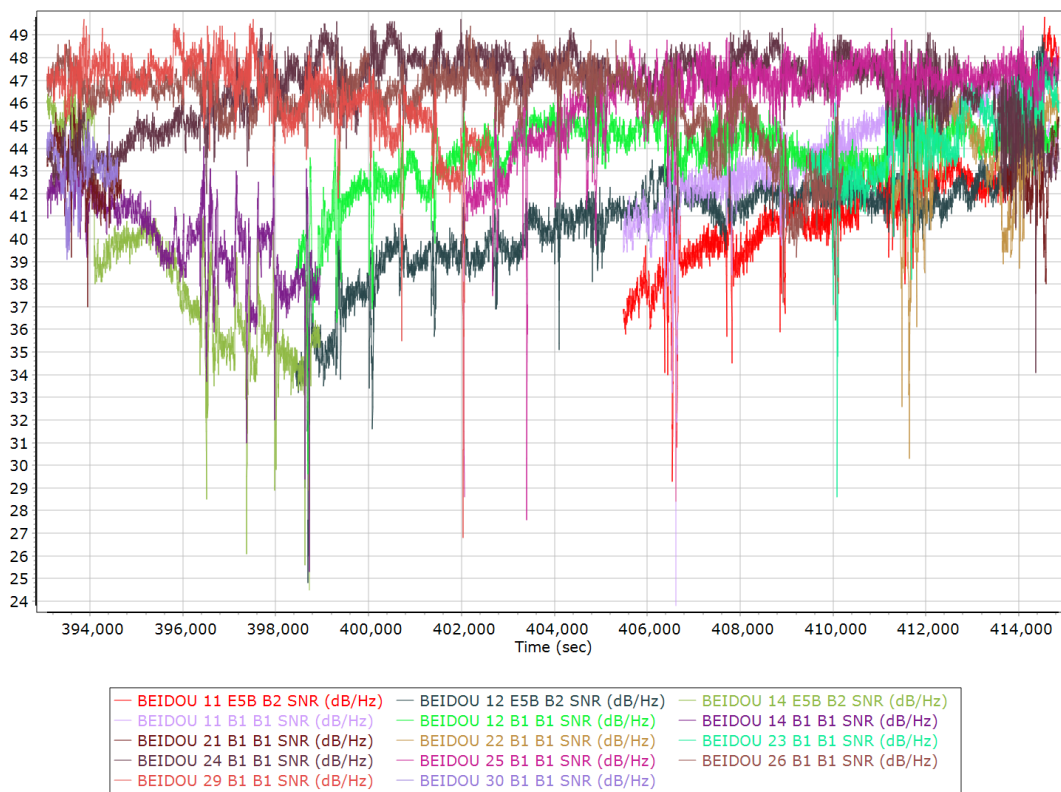
GLONASS L2 SNR



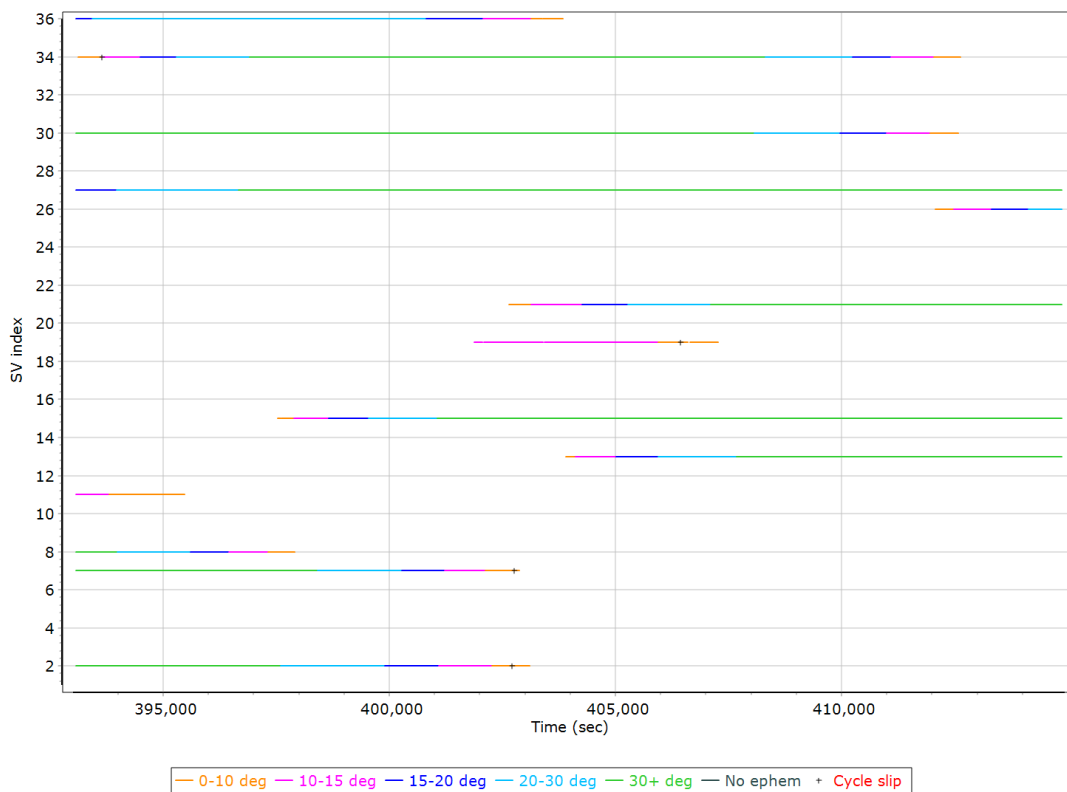
BEIDOU Satellite Lock/Elevation



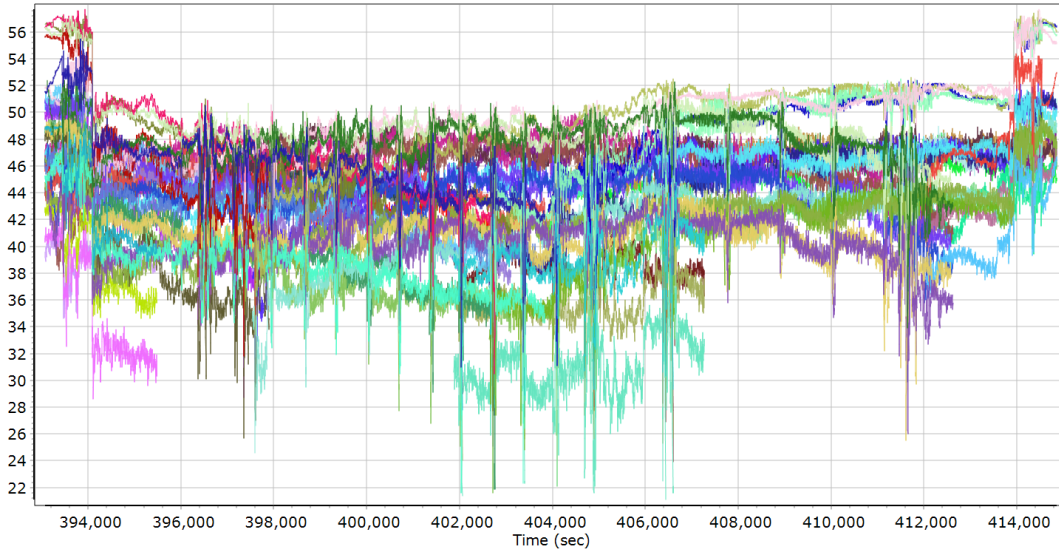
BEIDOU SNR



GALILEO Satellite Lock/Elevation



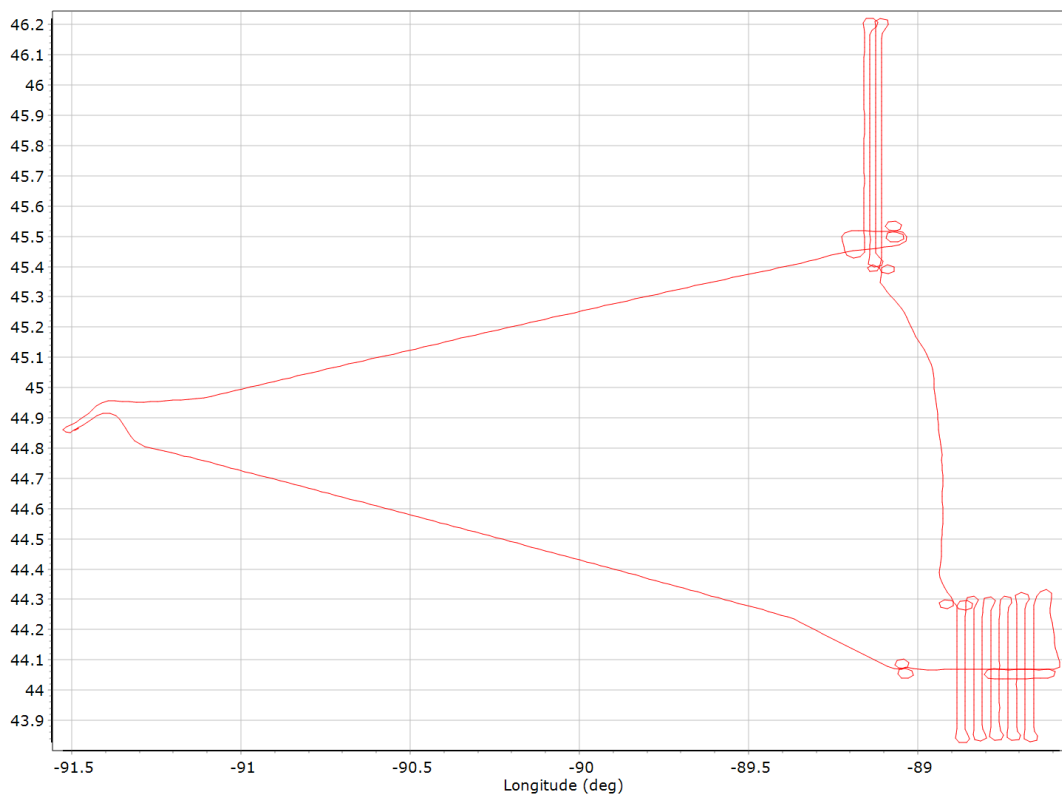
GALILEO SNR



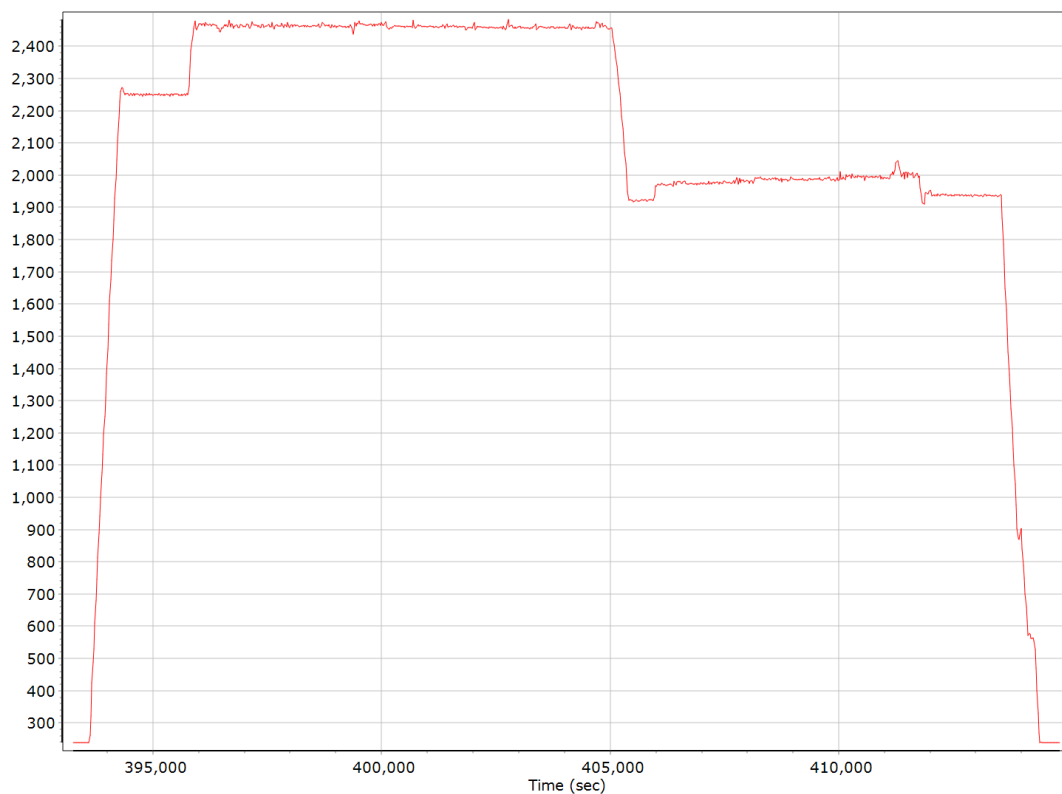
— GALILEO 02 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 07 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 08 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 26 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 27 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 30 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 34 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 36 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 02 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 07 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 08 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 11 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 13 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 15 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 19 L5E5A BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

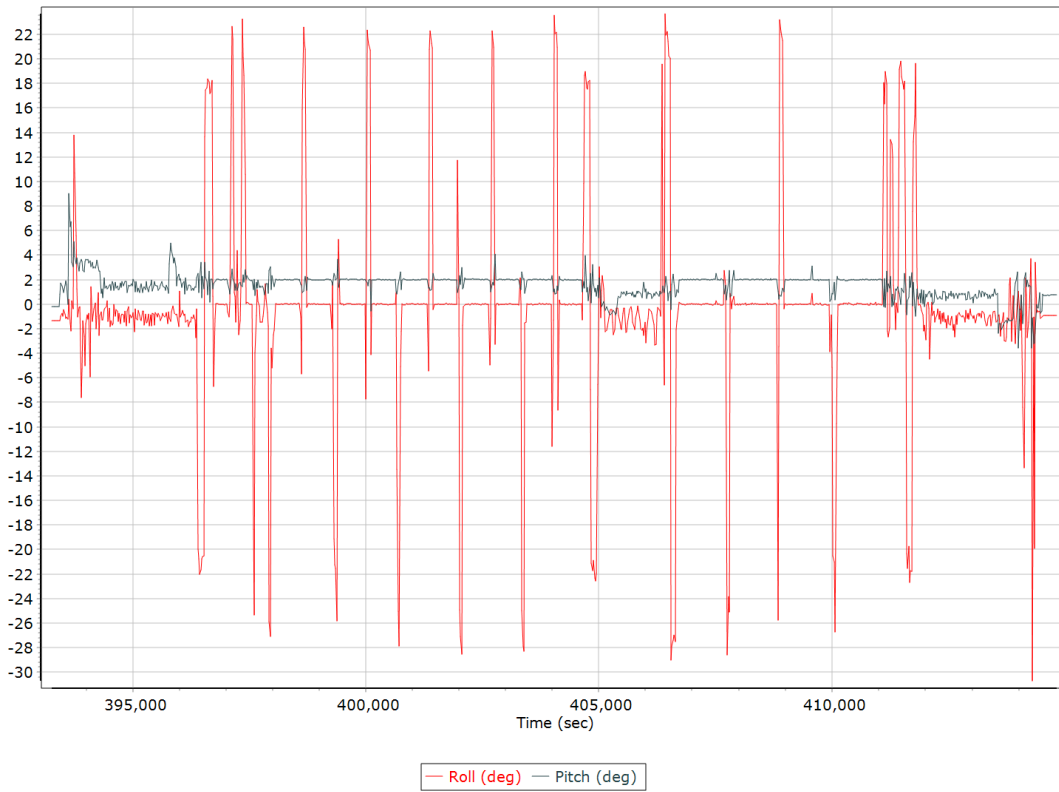
Top View



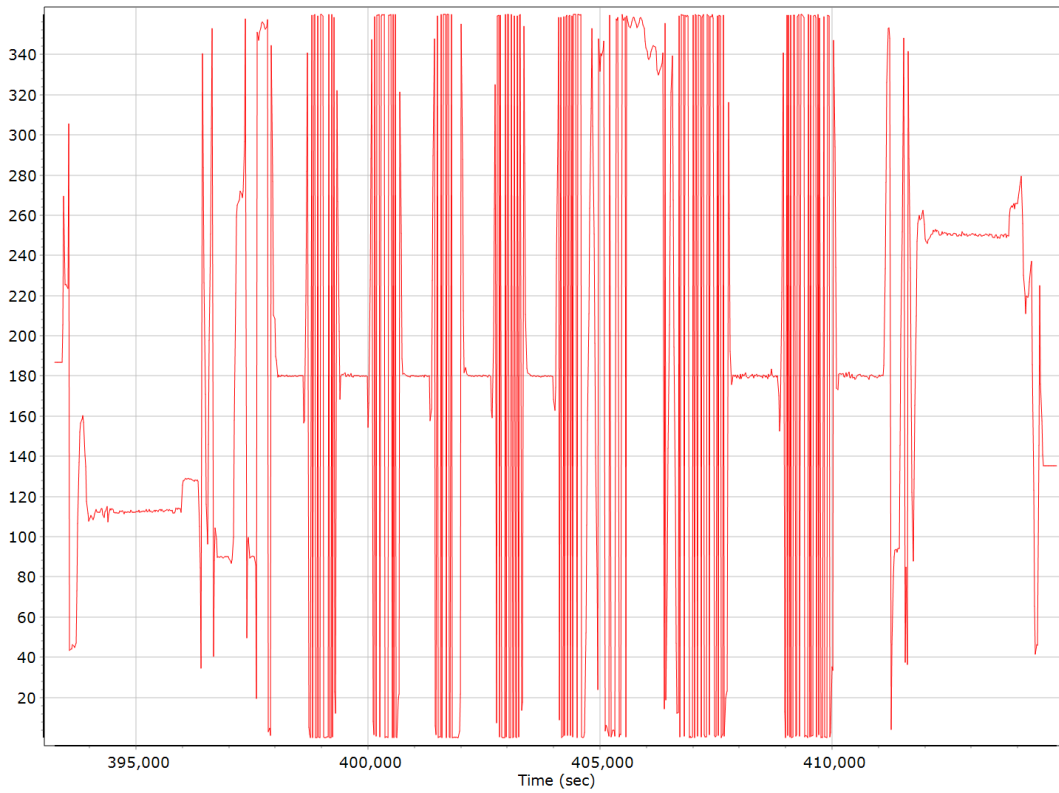
Altitude



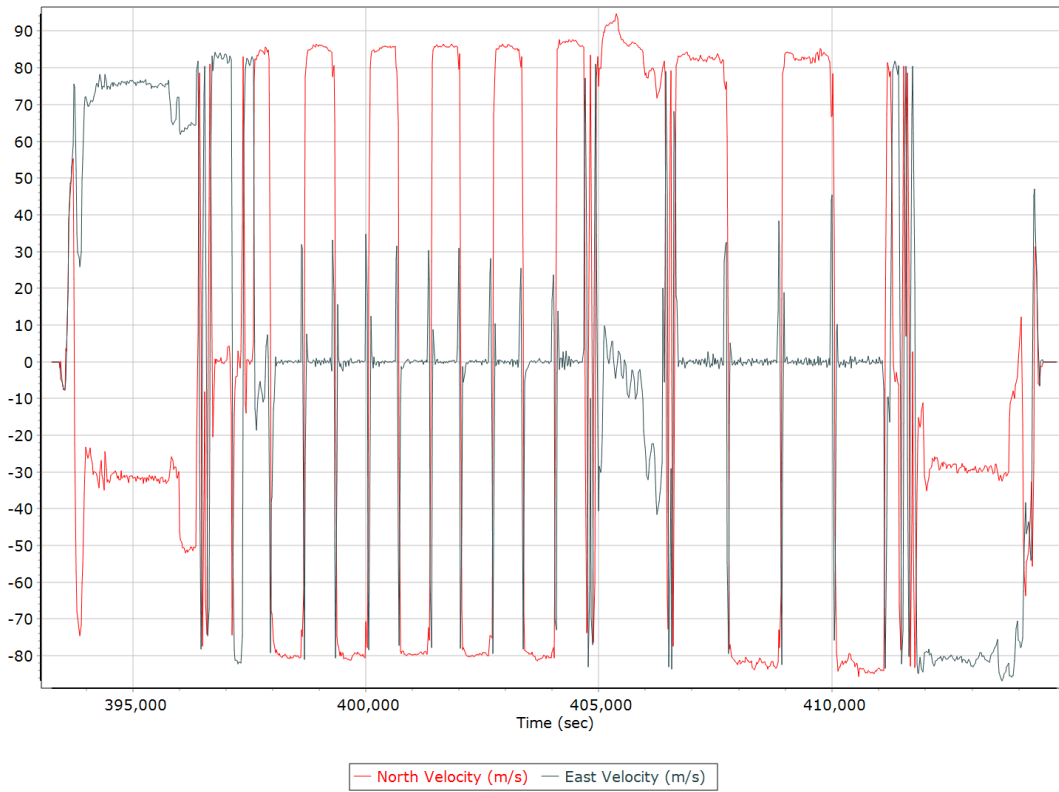
Roll/Pitch



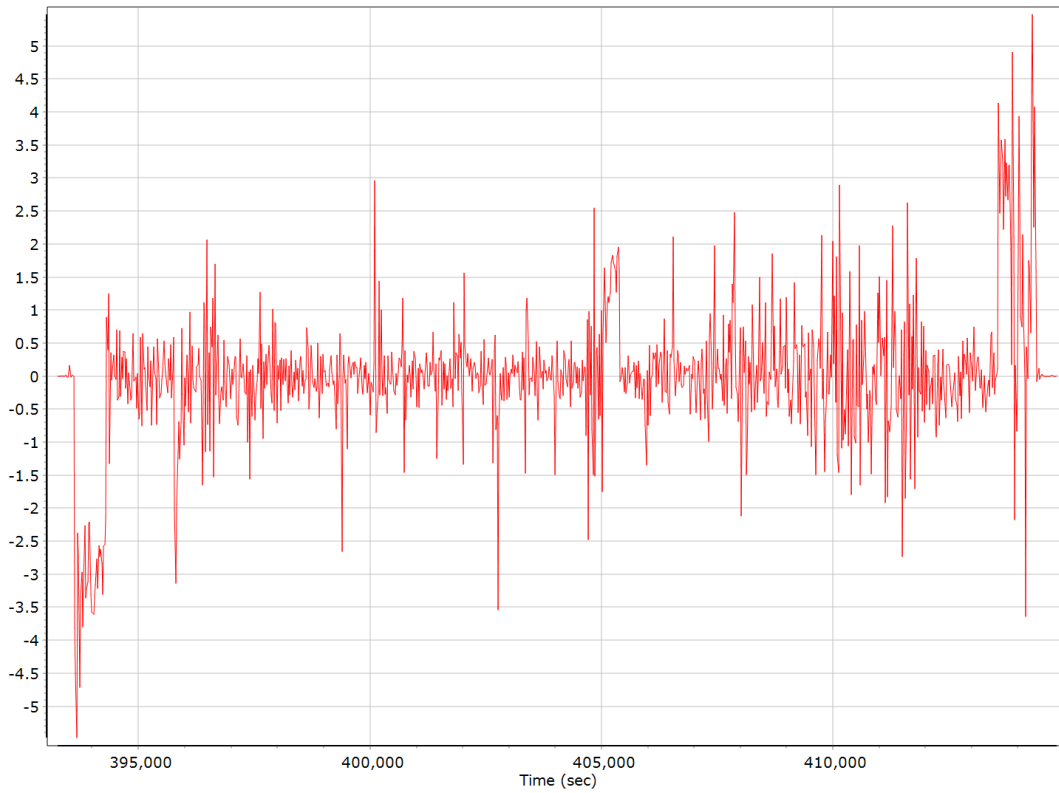
Heading



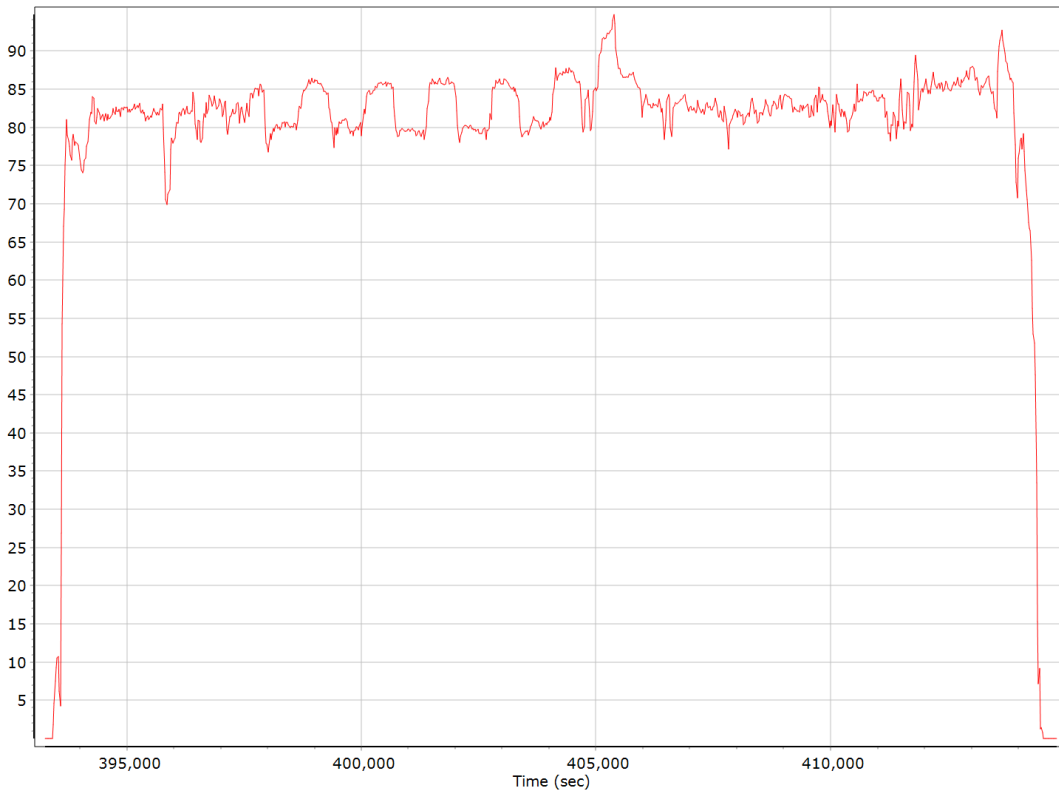
North/East Velocity



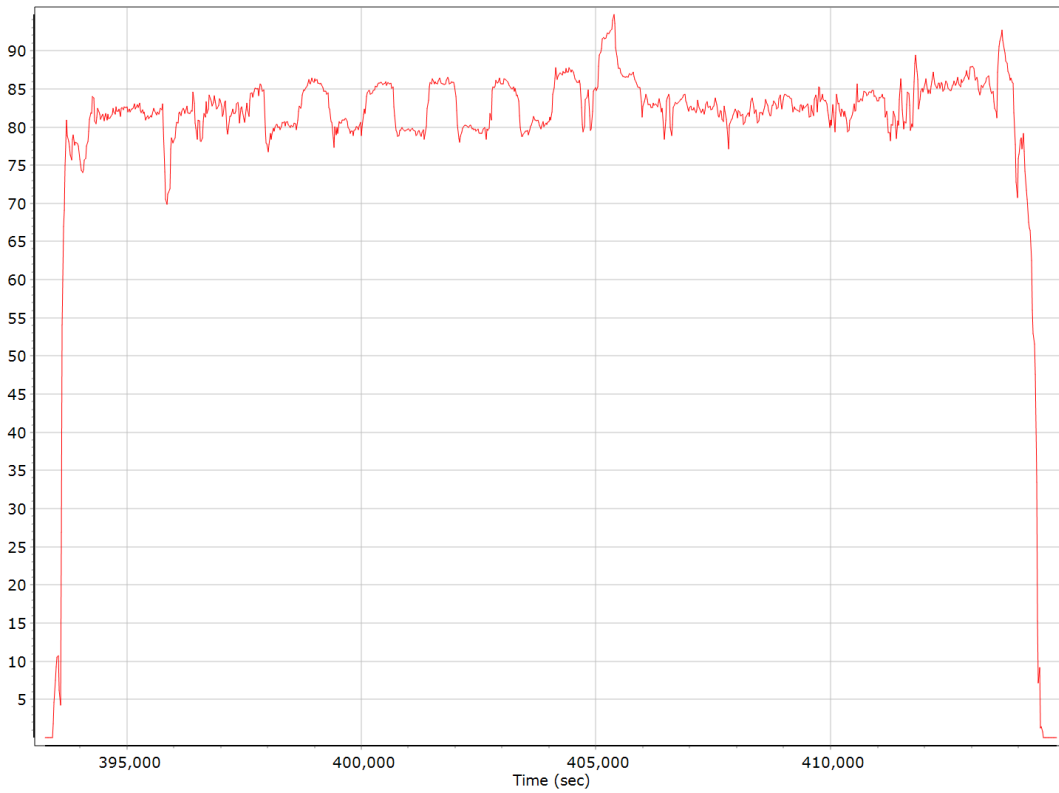
Down Velocity



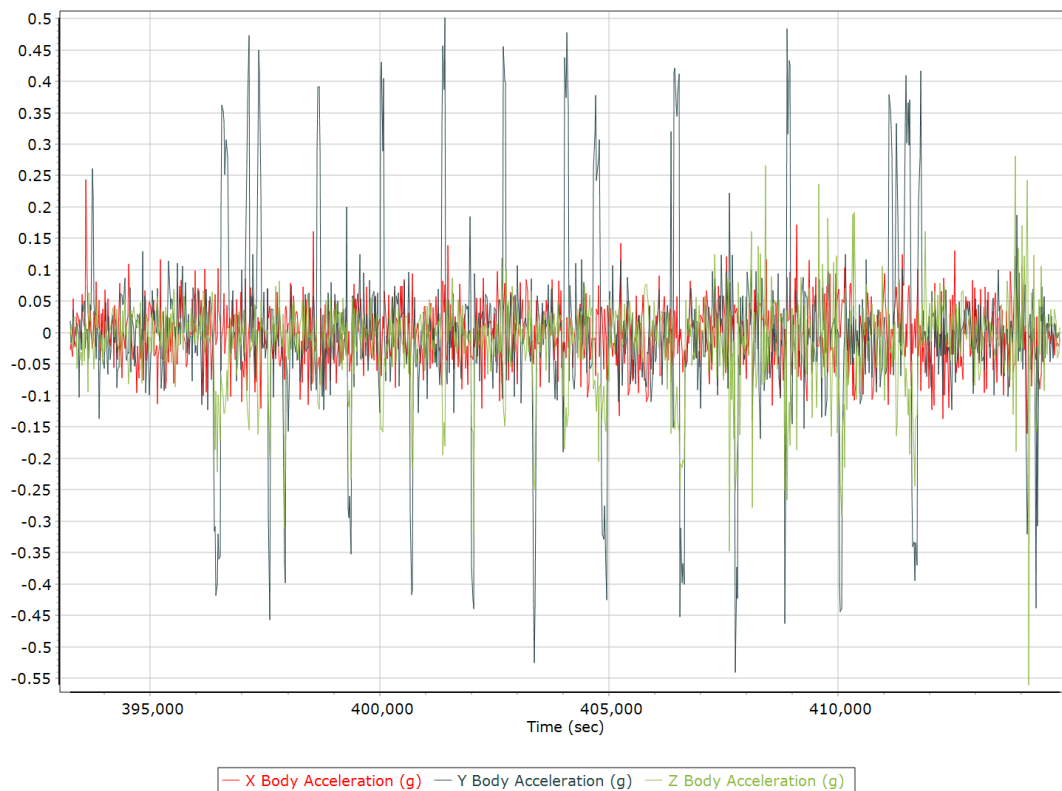
Total Speed



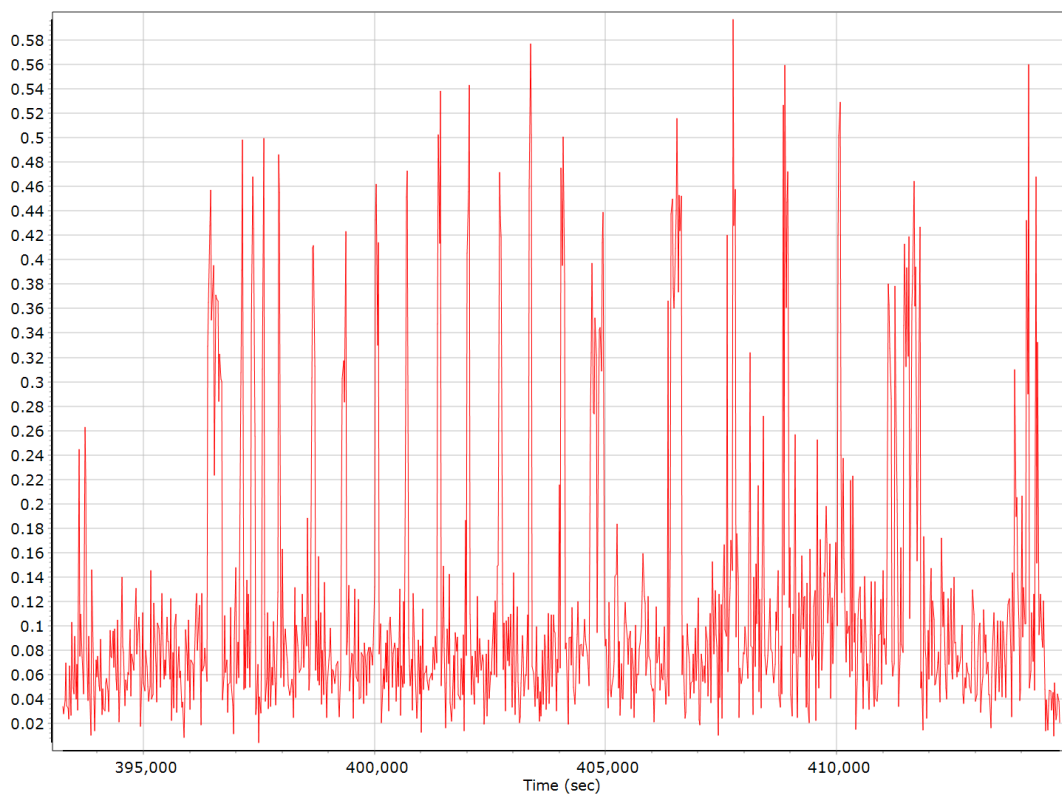
Ground Speed



Body Acceleration



Total Body Acceleration

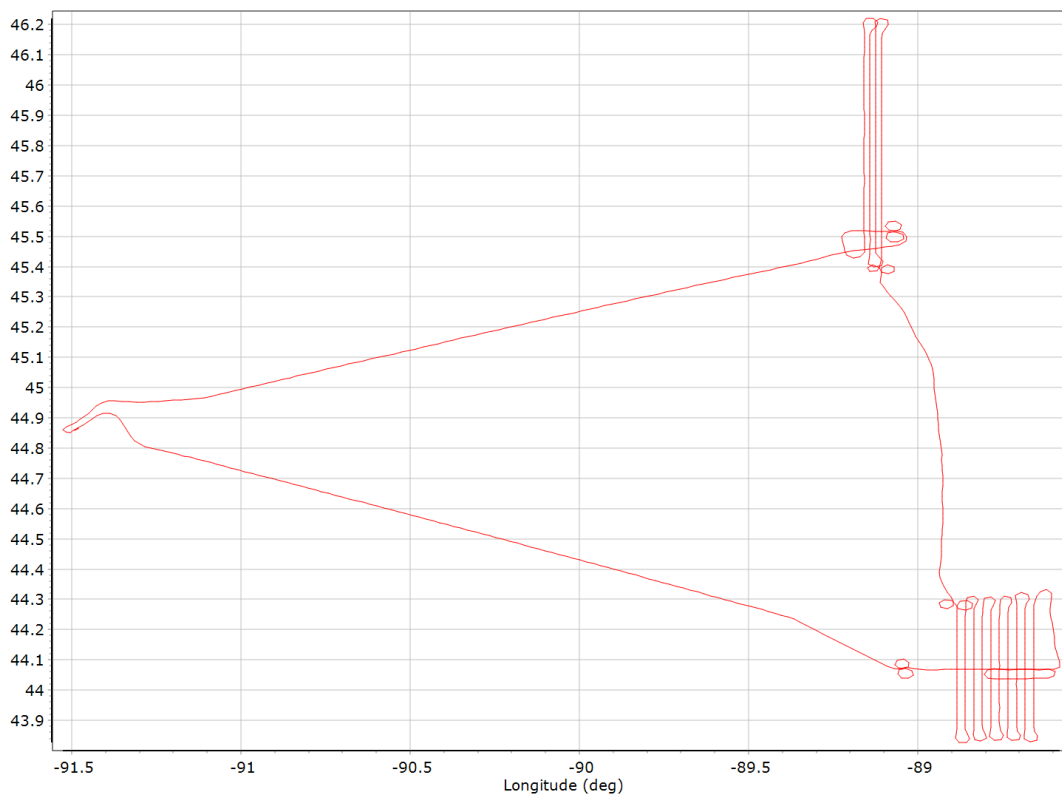


Body Angular Rate

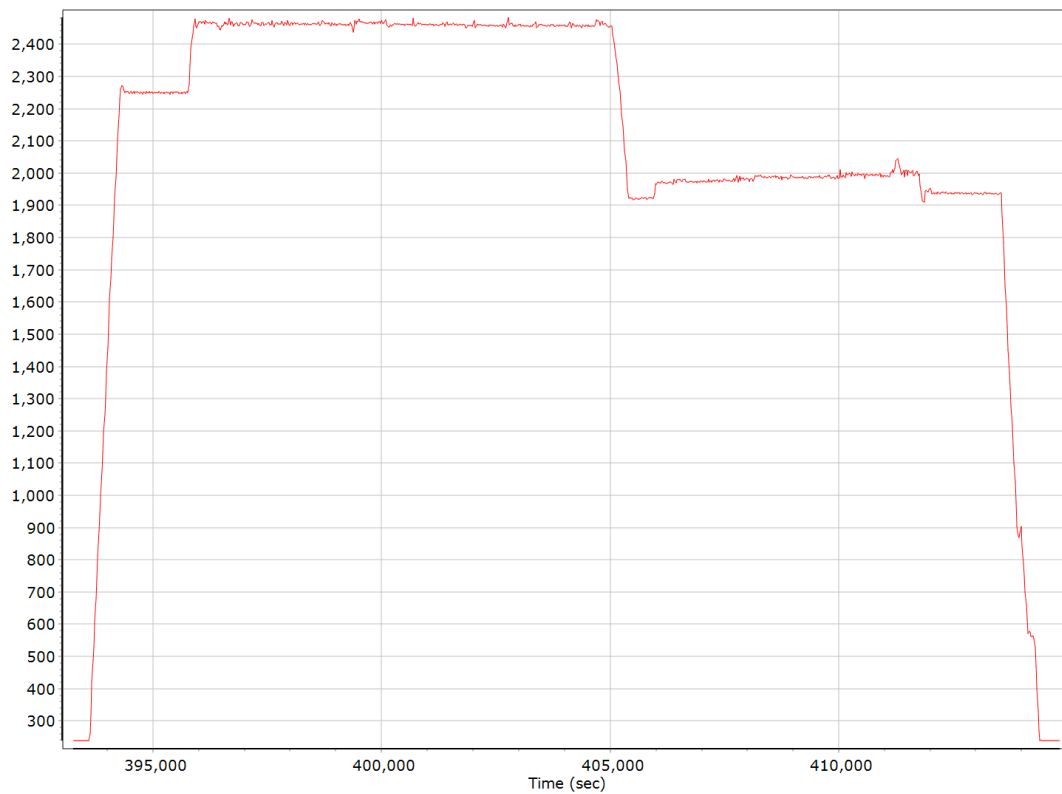


Forward Processed Trajectory Information

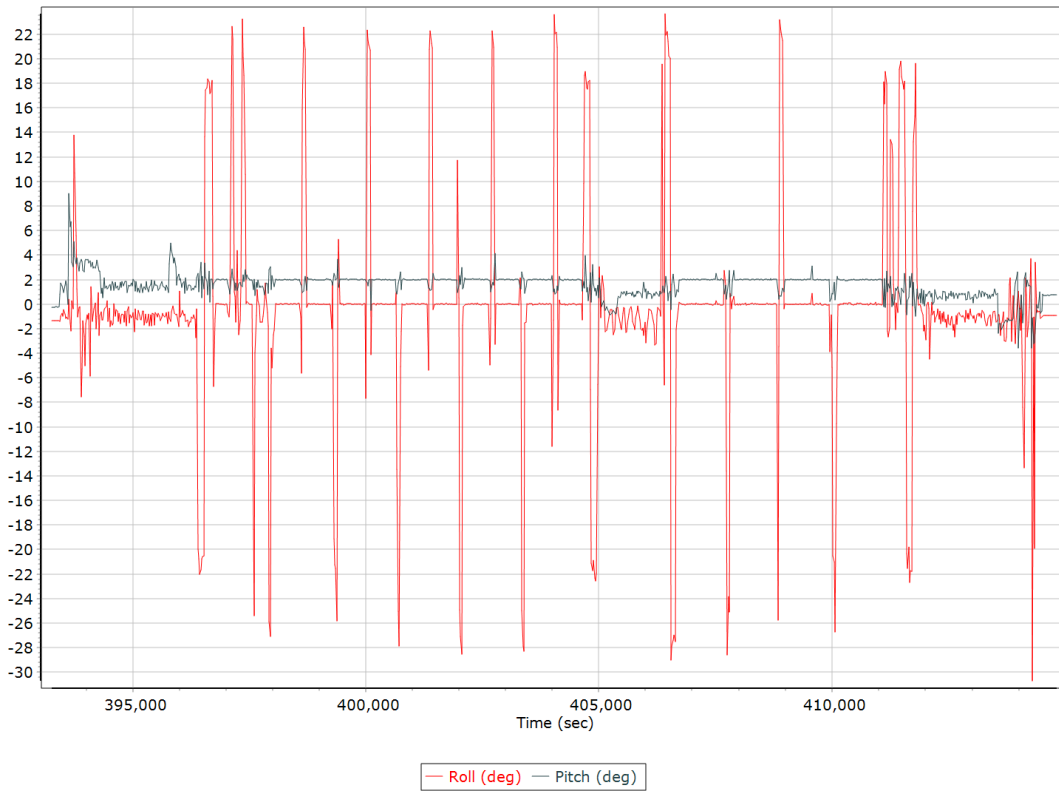
Top View



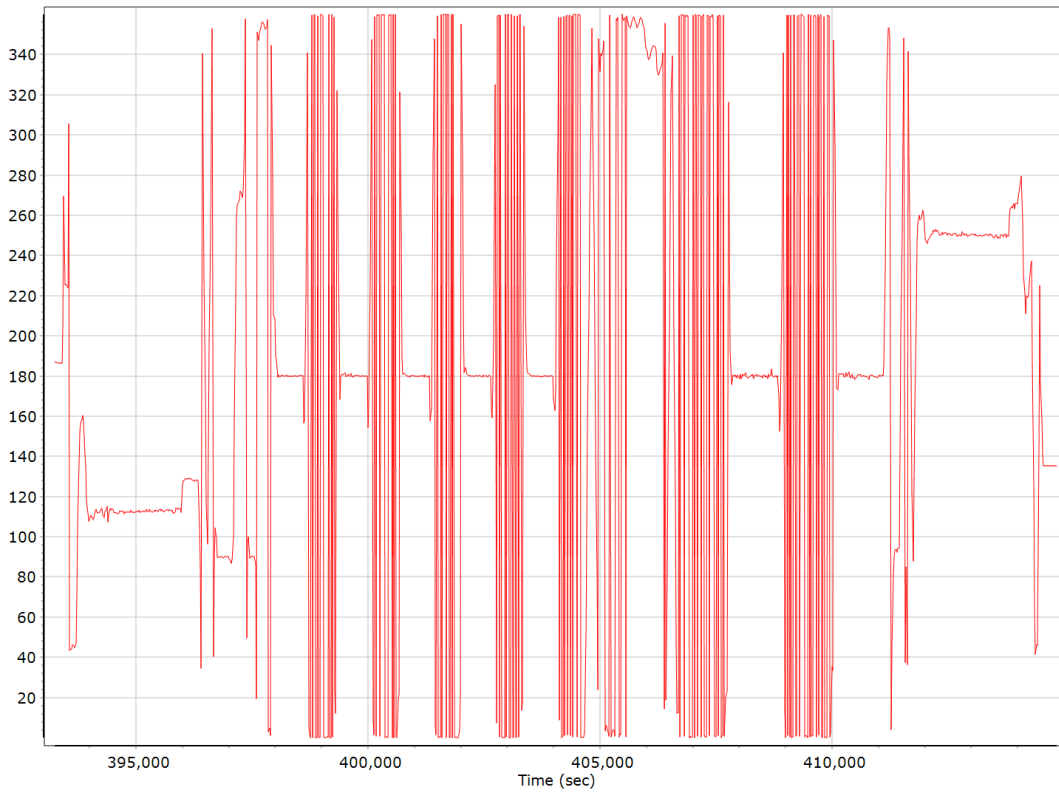
Altitude



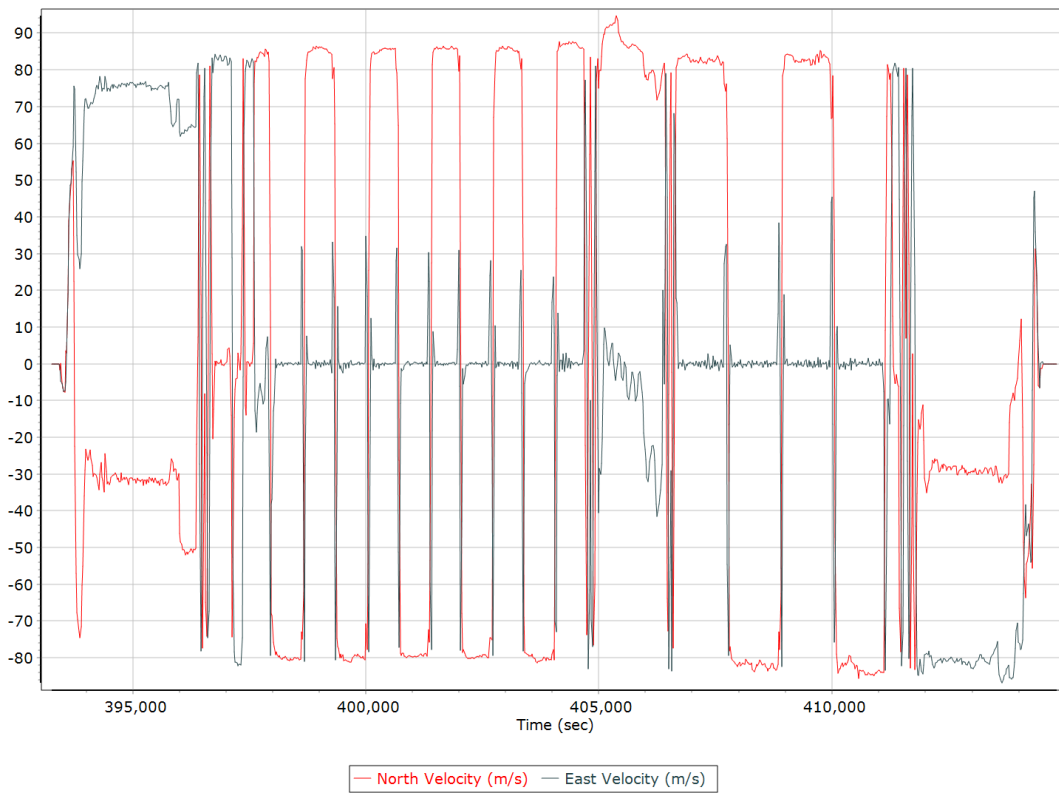
Roll/Pitch



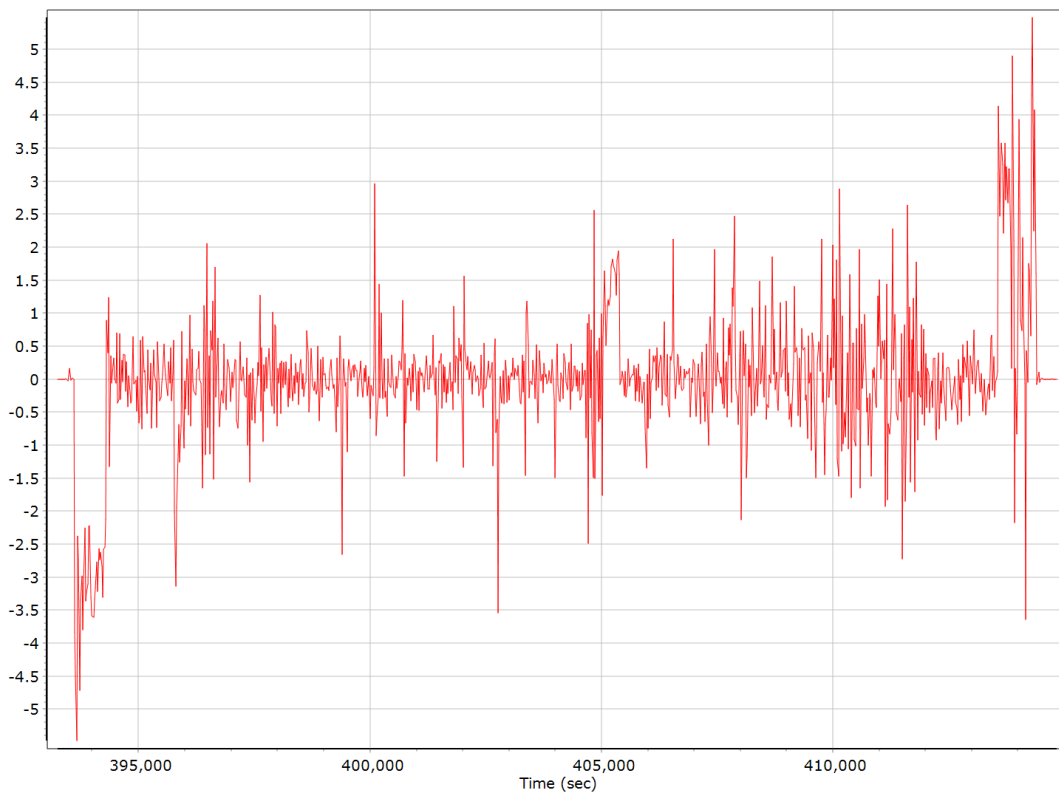
Heading



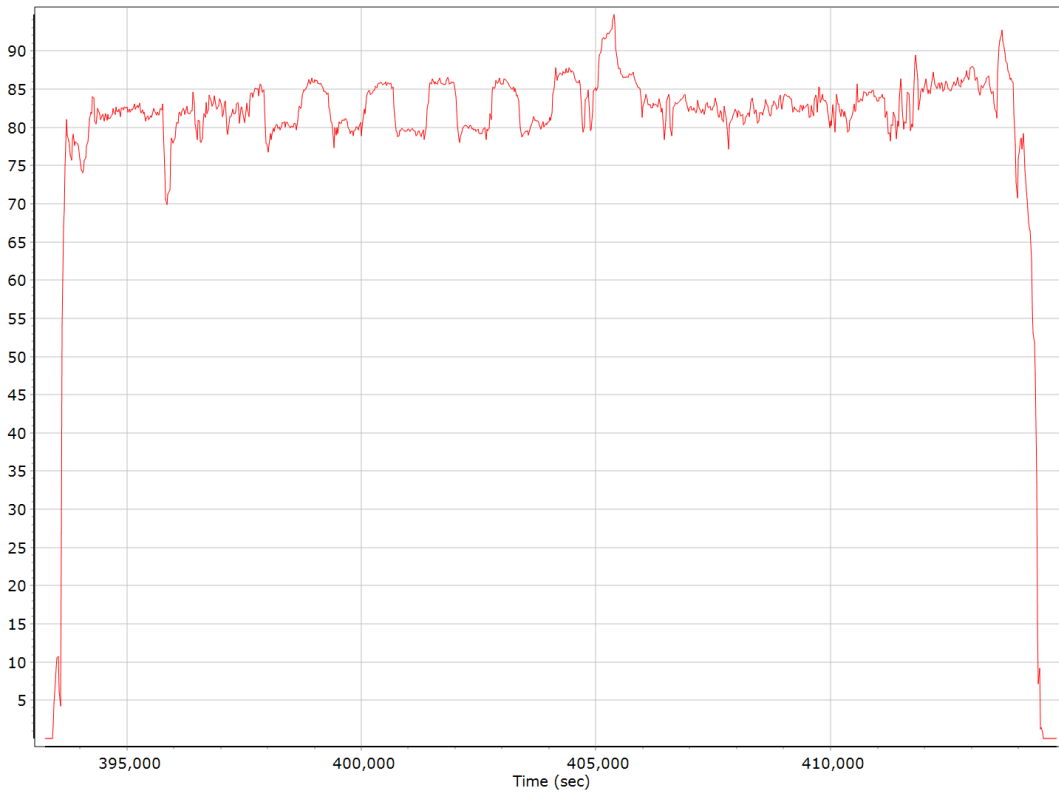
North/East Velocity



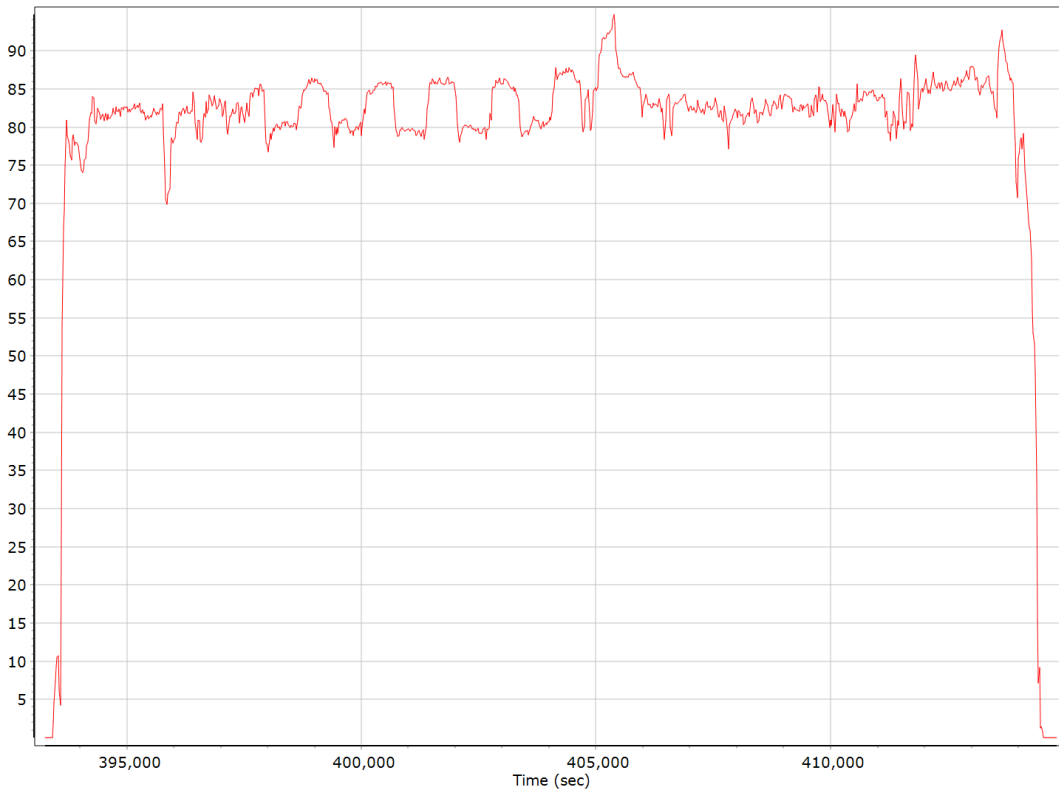
Down Velocity



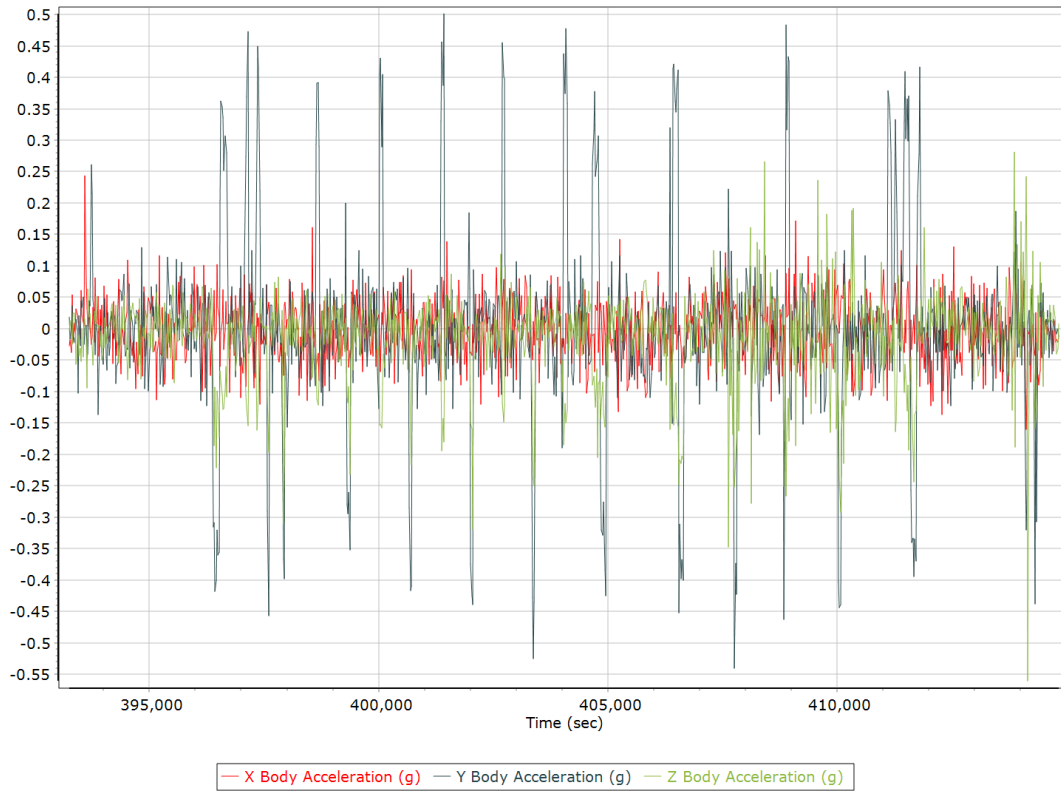
Total Speed



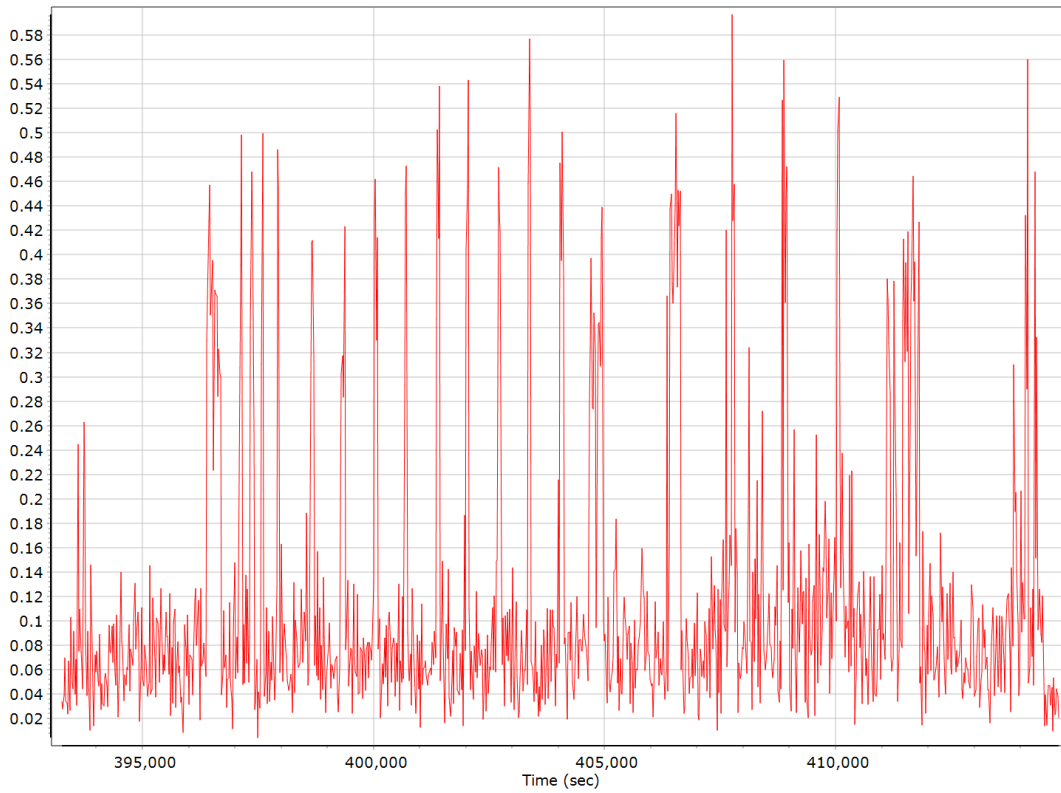
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

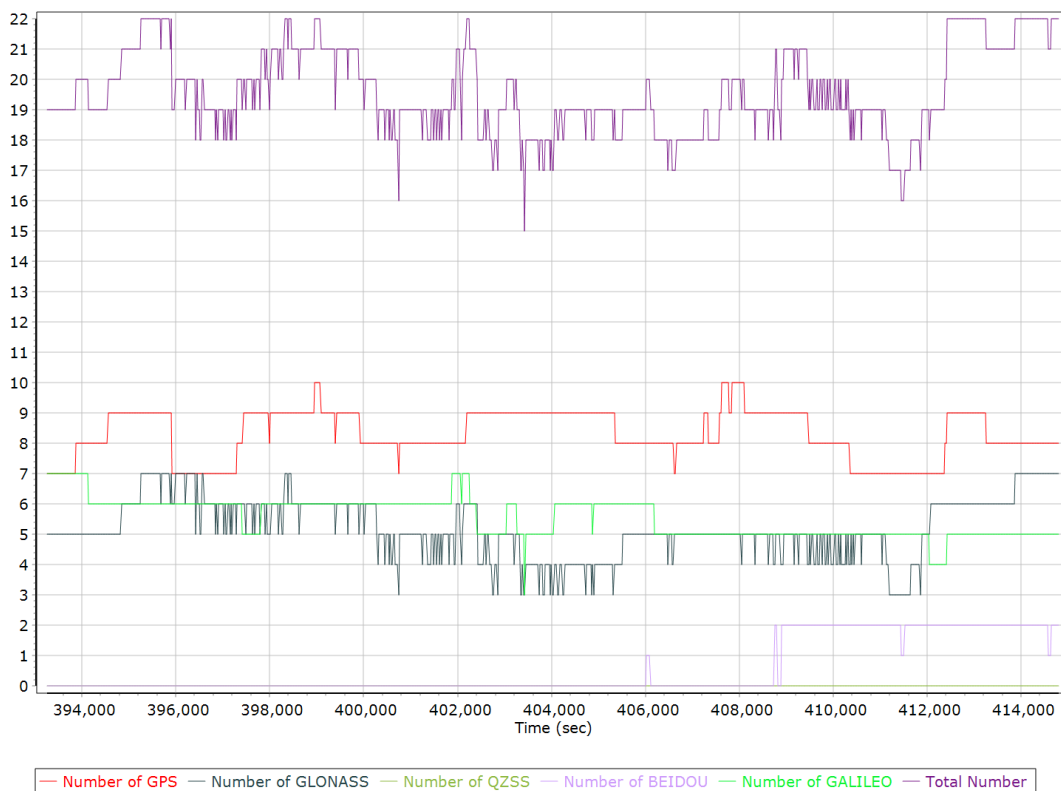


GNSS QC

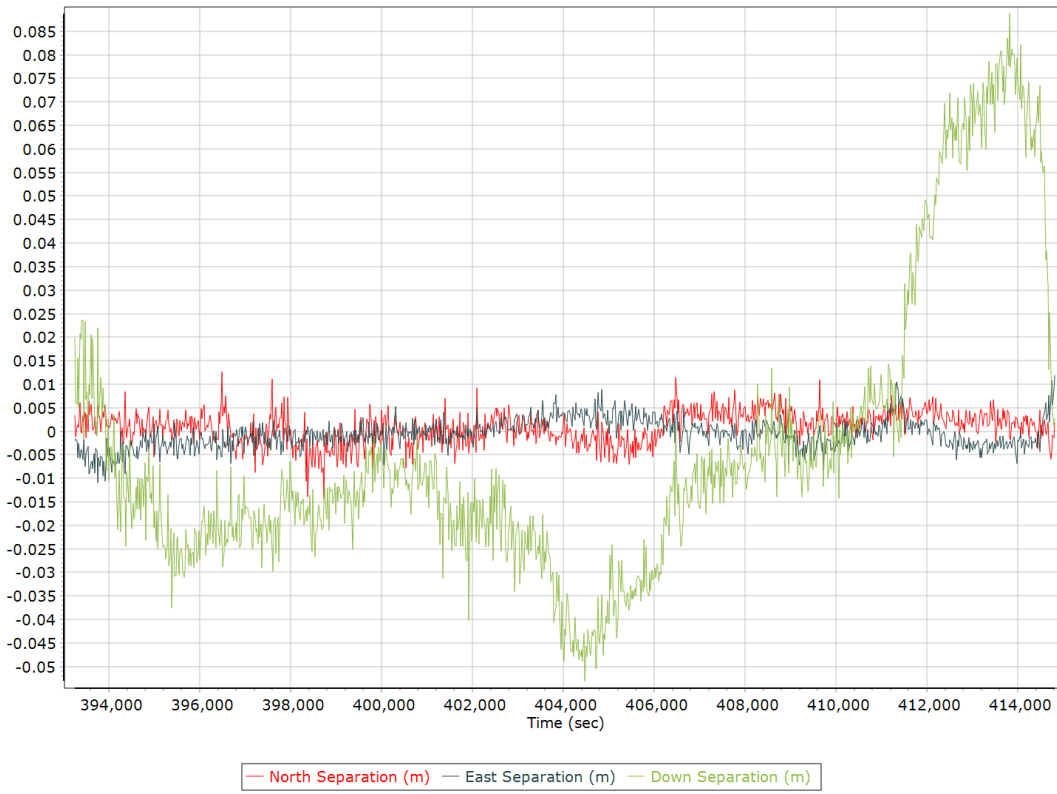
GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	2	10	8
Number of GLONASS SV	0	7	5
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	2	1
Number of GALILEO SV	1	7	6
Total number of SV	10	22	20
PDOP	1.00	5.42	1.20
QC Solution Gaps	1.00	1.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	21726.00	0.00	3.00
Percentage	99.99	0.00	0.01

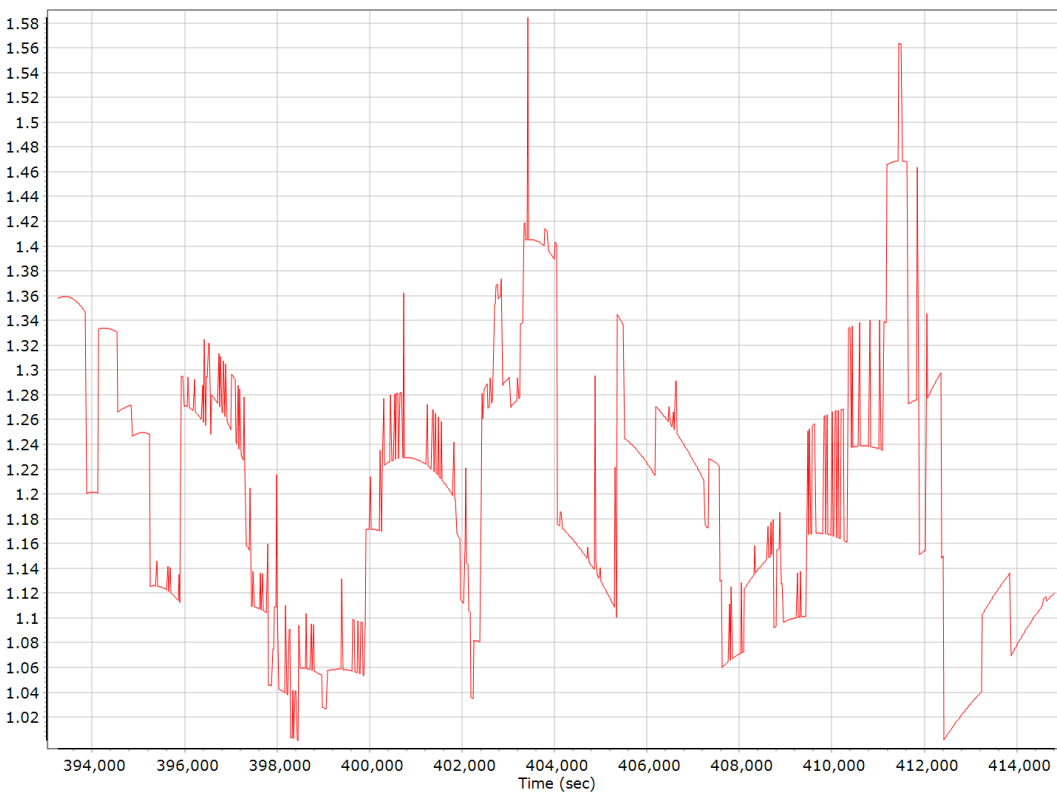
Num SVs in solution



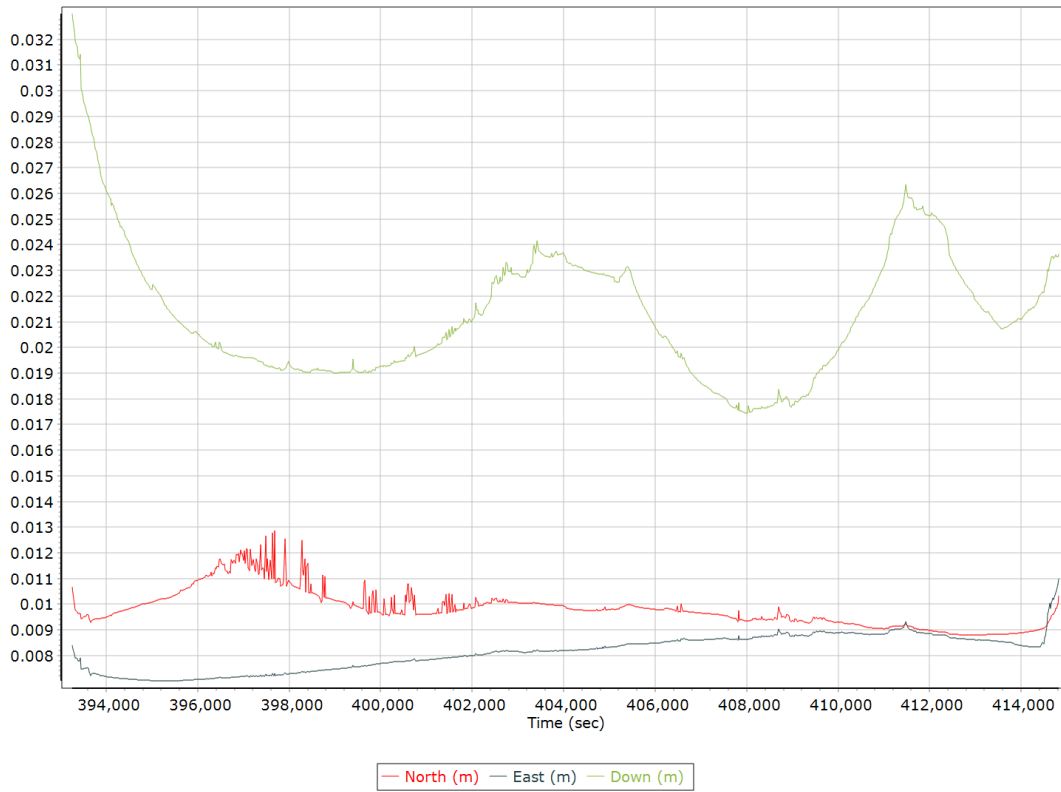
Forward/Reverse Separation



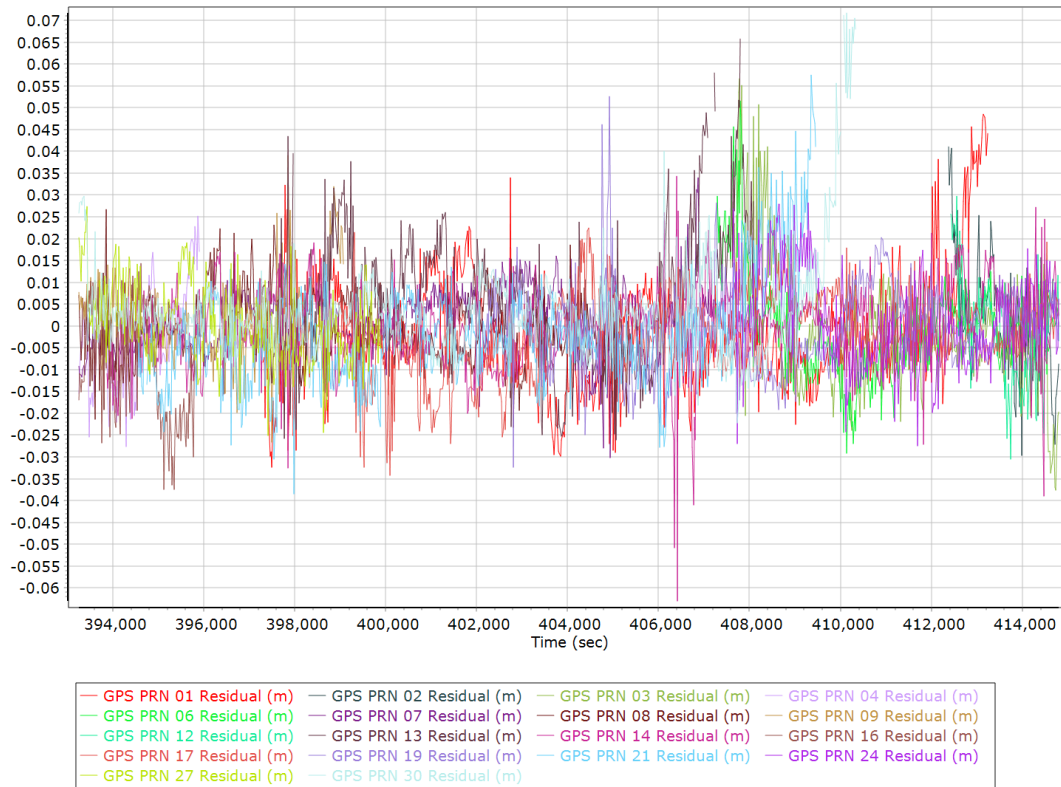
PDOP



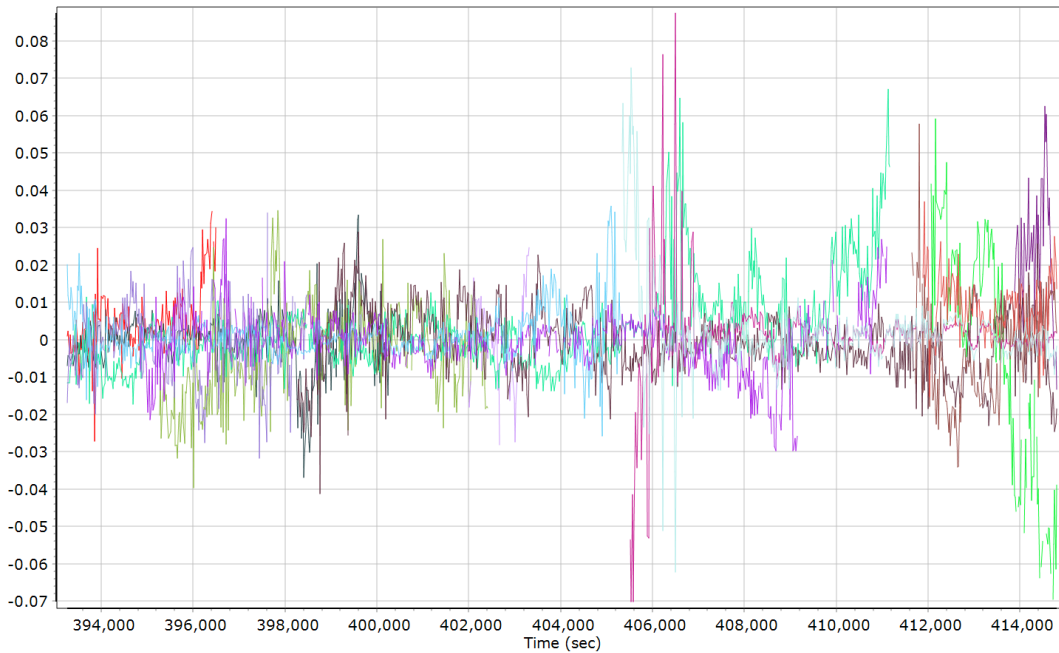
Estimated Position Accuracy



GPS Residuals

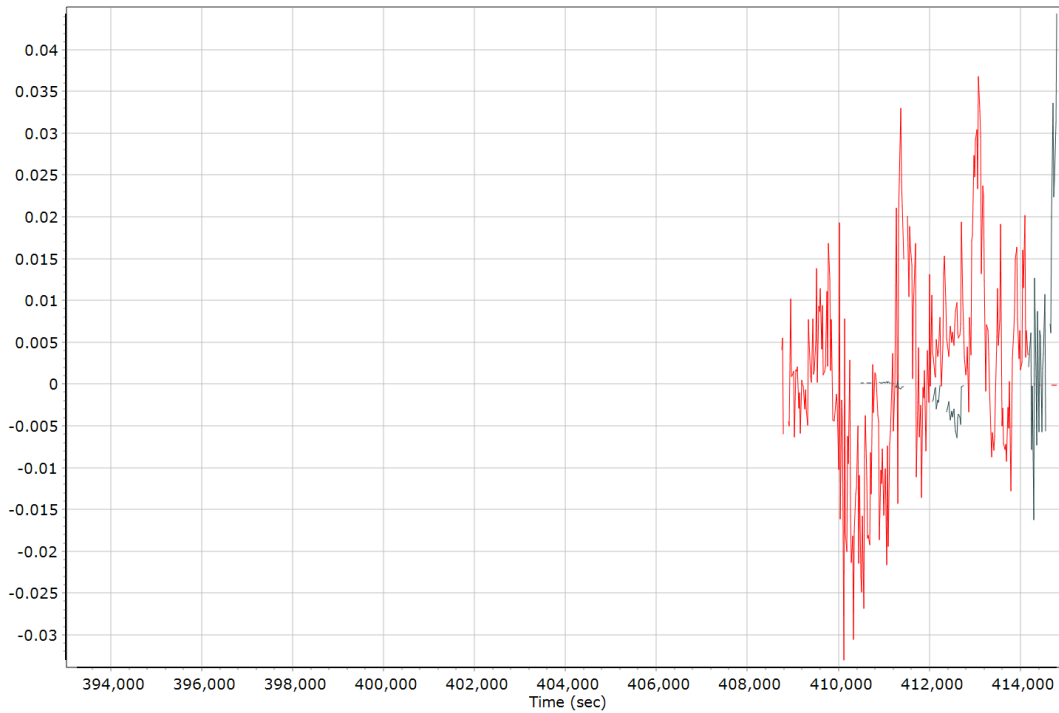


GLONASS Residuals



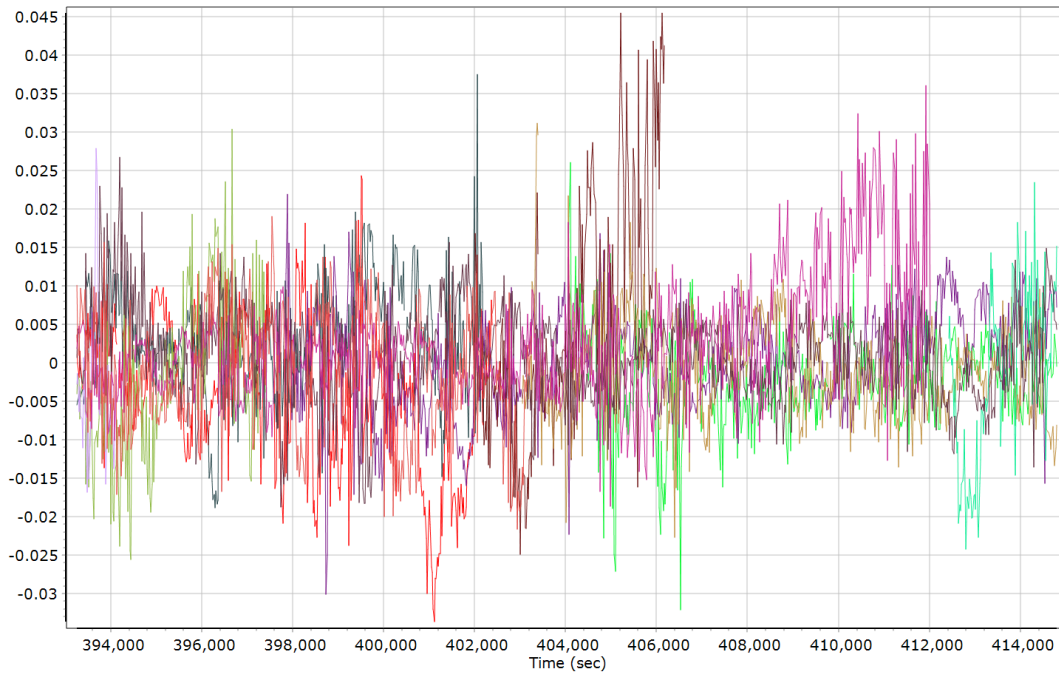
- | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GLONASS 01 Residual (m) | GLONASS 02 Residual (m) | GLONASS 03 Residual (m) | GLONASS 04 Residual (m) |
| GLONASS 07 Residual (m) | GLONASS 08 Residual (m) | GLONASS 10 Residual (m) | GLONASS 11 Residual (m) |
| GLONASS 12 Residual (m) | GLONASS 13 Residual (m) | GLONASS 14 Residual (m) | GLONASS 15 Residual (m) |
| GLONASS 17 Residual (m) | GLONASS 20 Residual (m) | GLONASS 21 Residual (m) | GLONASS 22 Residual (m) |
| GLONASS 23 Residual (m) | GLONASS 24 Residual (m) | | |

BEIDOU Residuals



- | | | | |
|------------------------|------------------------|------------------------|------------------------|
| BEIDOU 11 Residual (m) | BEIDOU 12 Residual (m) | BEIDOU 21 Residual (m) | BEIDOU 22 Residual (m) |
| BEIDOU 23 Residual (m) | BEIDOU 24 Residual (m) | BEIDOU 25 Residual (m) | BEIDOU 26 Residual (m) |

GALILEO Residuals



- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| — GALILEO 02 Residual (m) | — GALILEO 07 Residual (m) | — GALILEO 08 Residual (m) | — GALILEO 11 Residual (m) |
| — GALILEO 13 Residual (m) | — GALILEO 15 Residual (m) | — GALILEO 19 Residual (m) | — GALILEO 21 Residual (m) |
| — GALILEO 26 Residual (m) | — GALILEO 27 Residual (m) | — GALILEO 30 Residual (m) | — GALILEO 34 Residual (m) |
| — GALILEO 36 Residual (m) | | | |

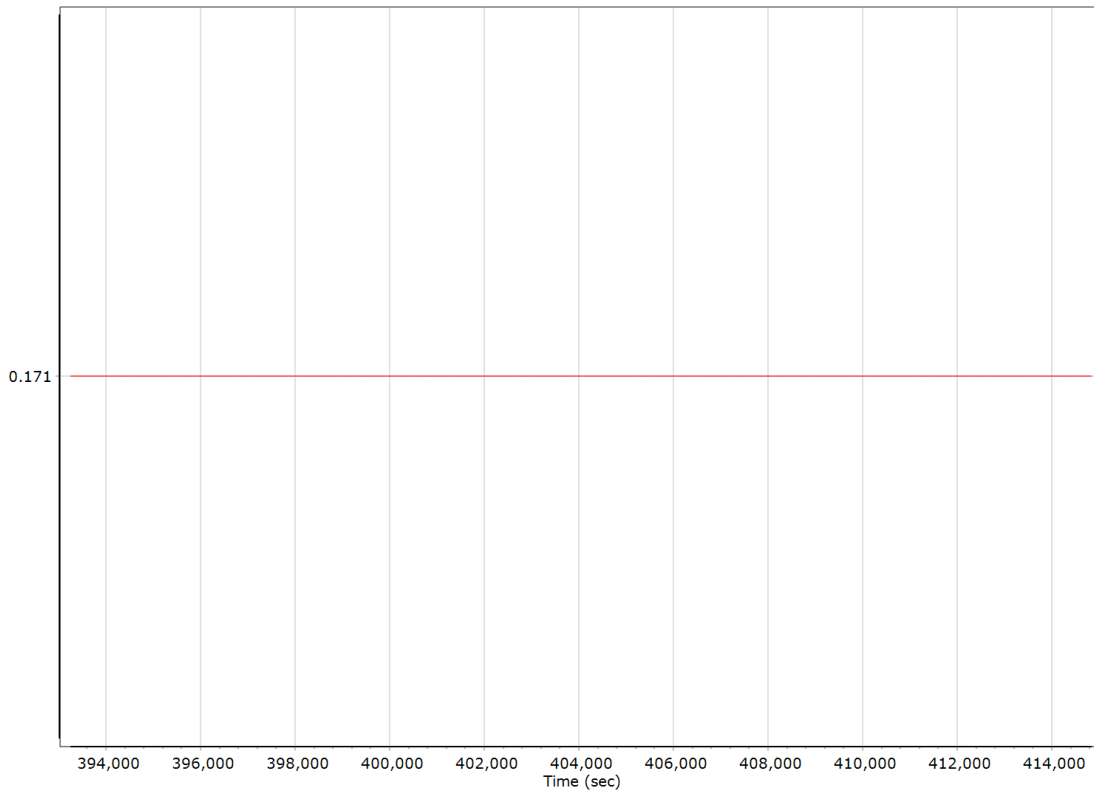
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	393058.000 (5/5/2022 1:10:58 PM)		
Processing end time	414843.000 (5/5/2022 7:14:03 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.171	-0.238	-1.273
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

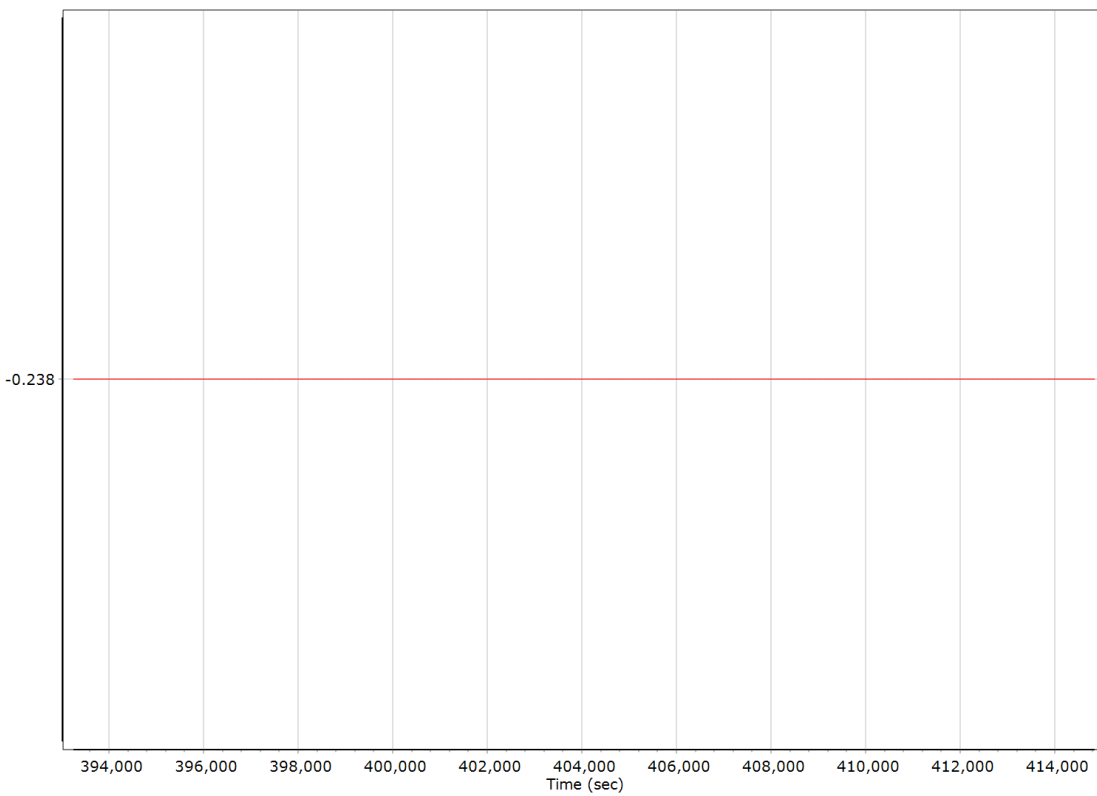
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

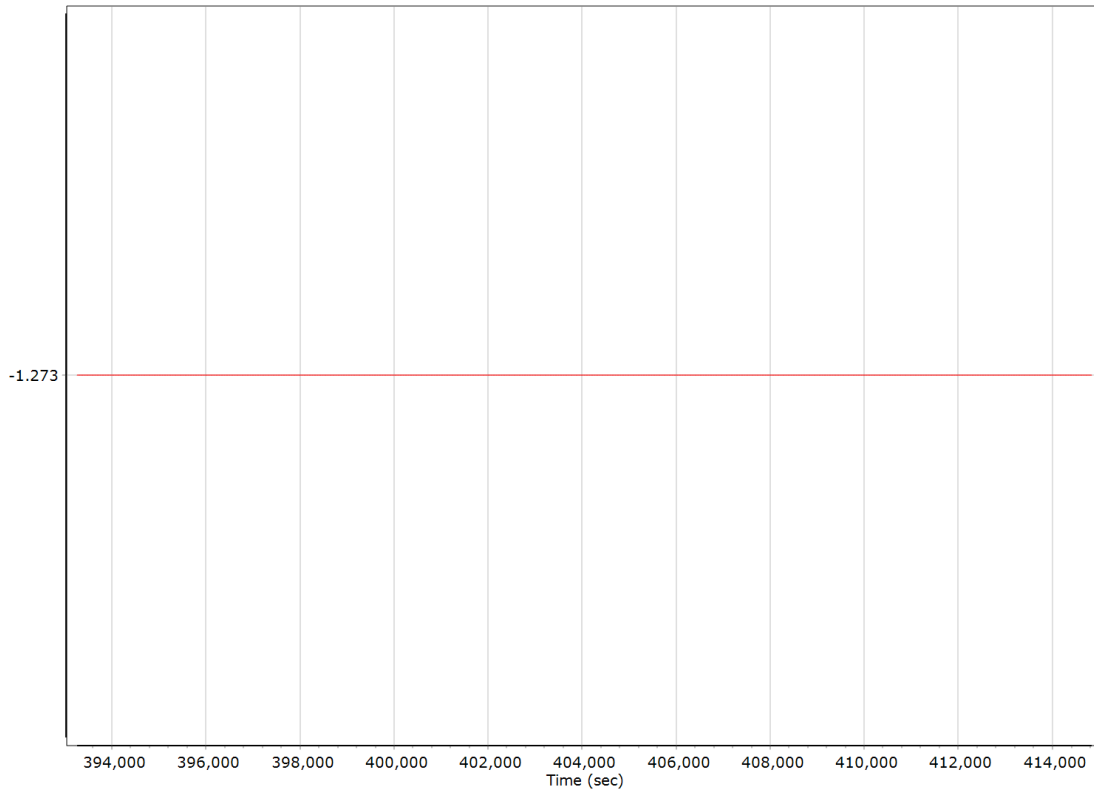
X Reference-Primary GNSS Lever Arm (m)



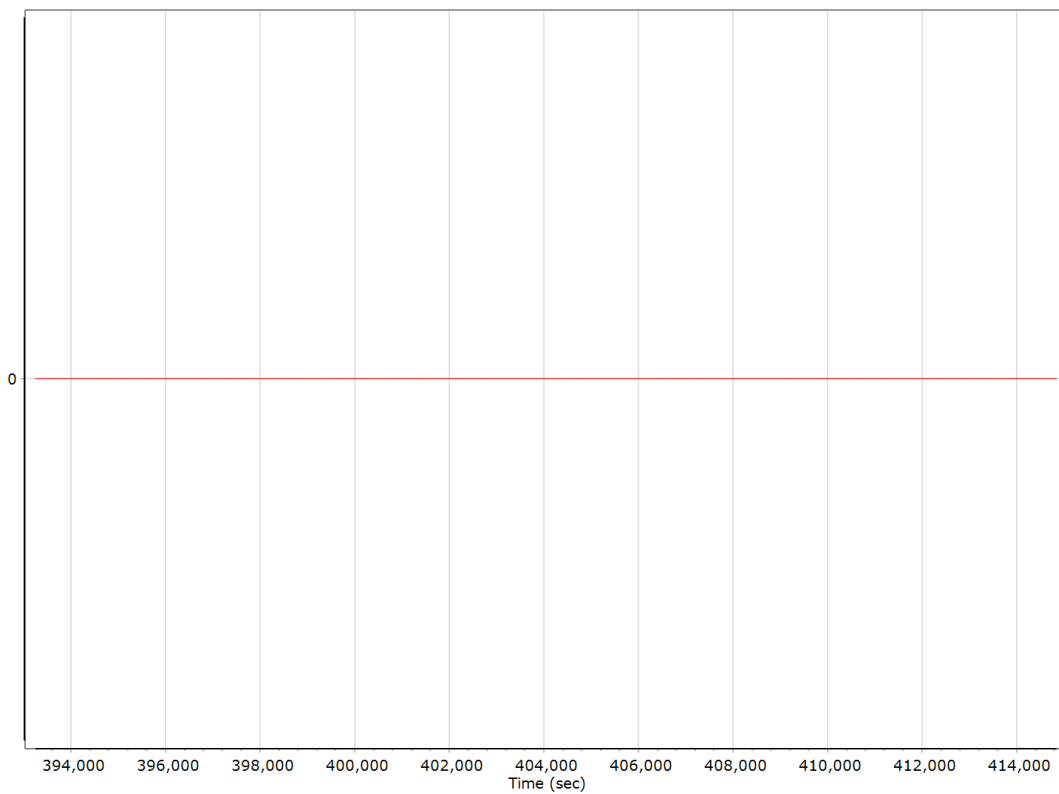
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



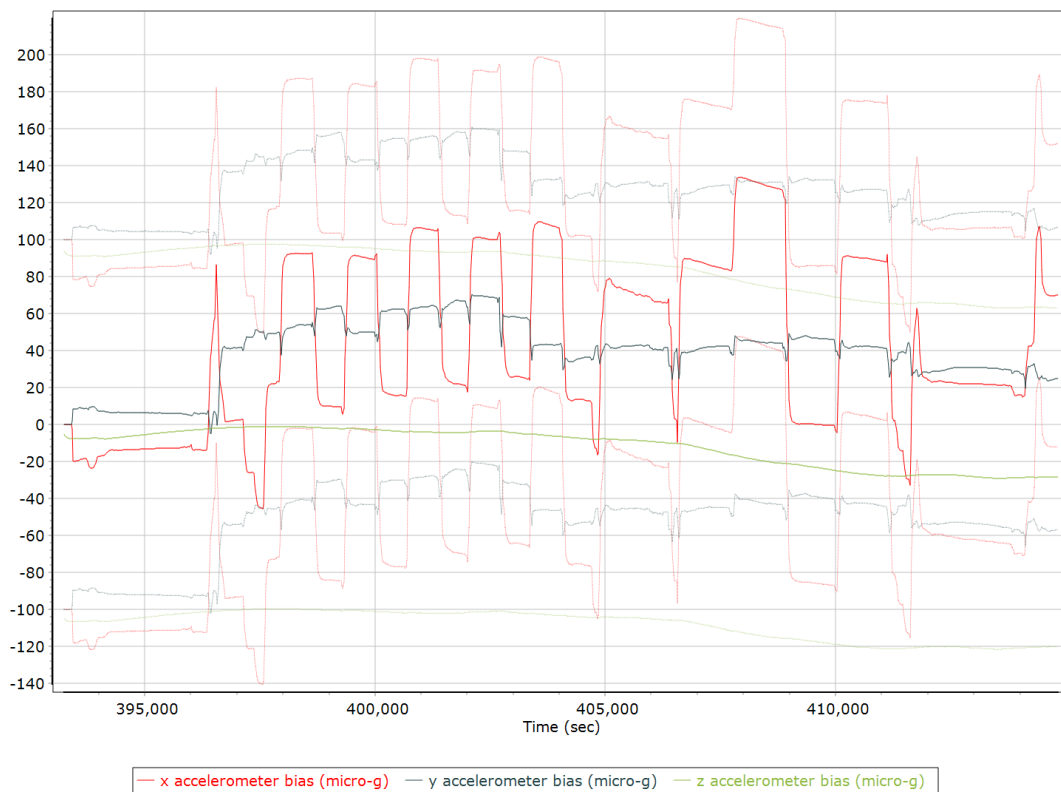
Reference-Primary GNSS Lever Arm Figure of Merit



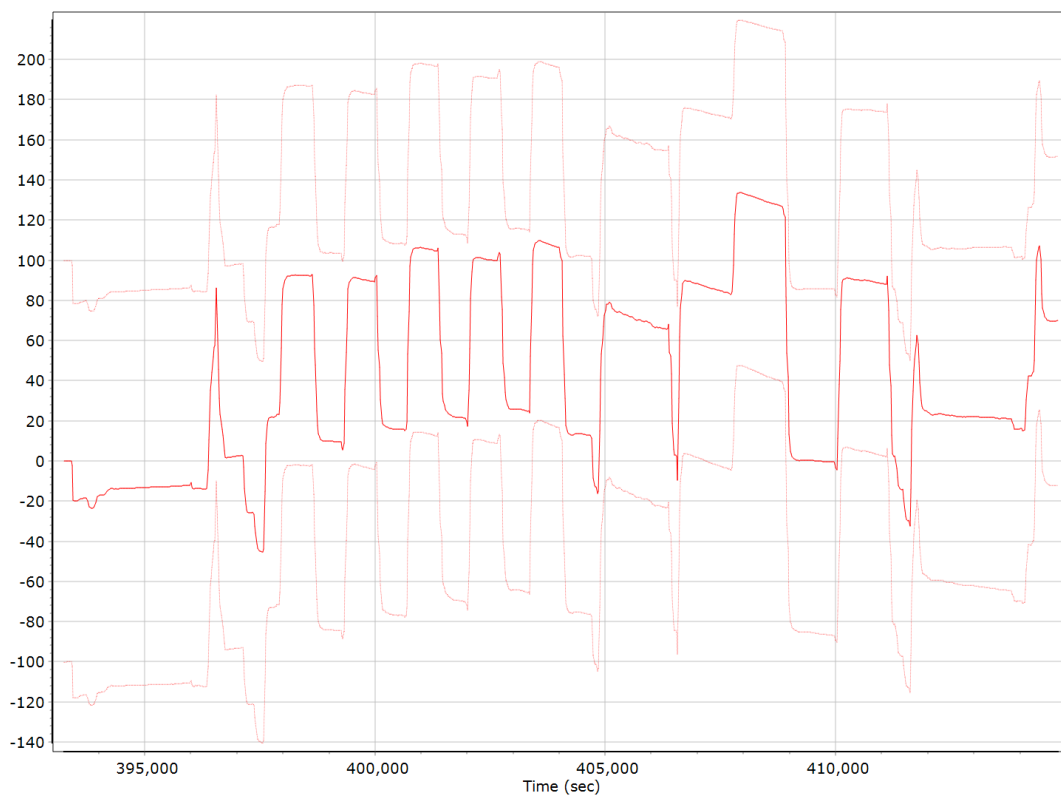
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

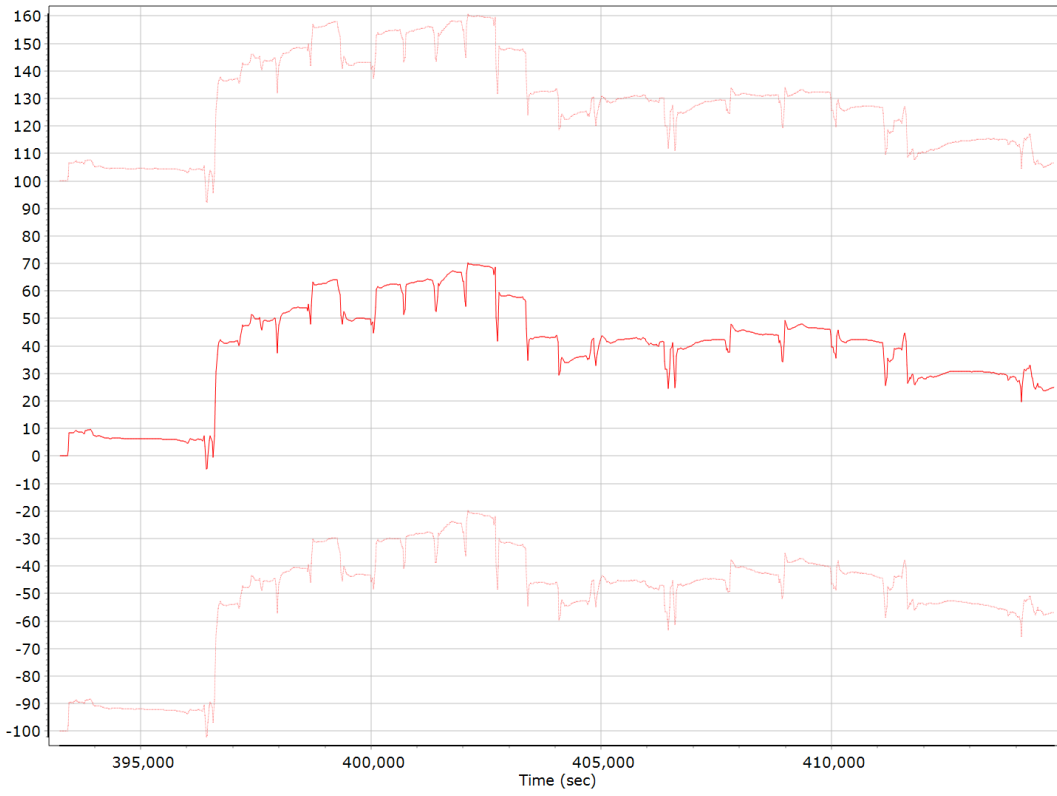
Accelerometer Bias (micro-g)



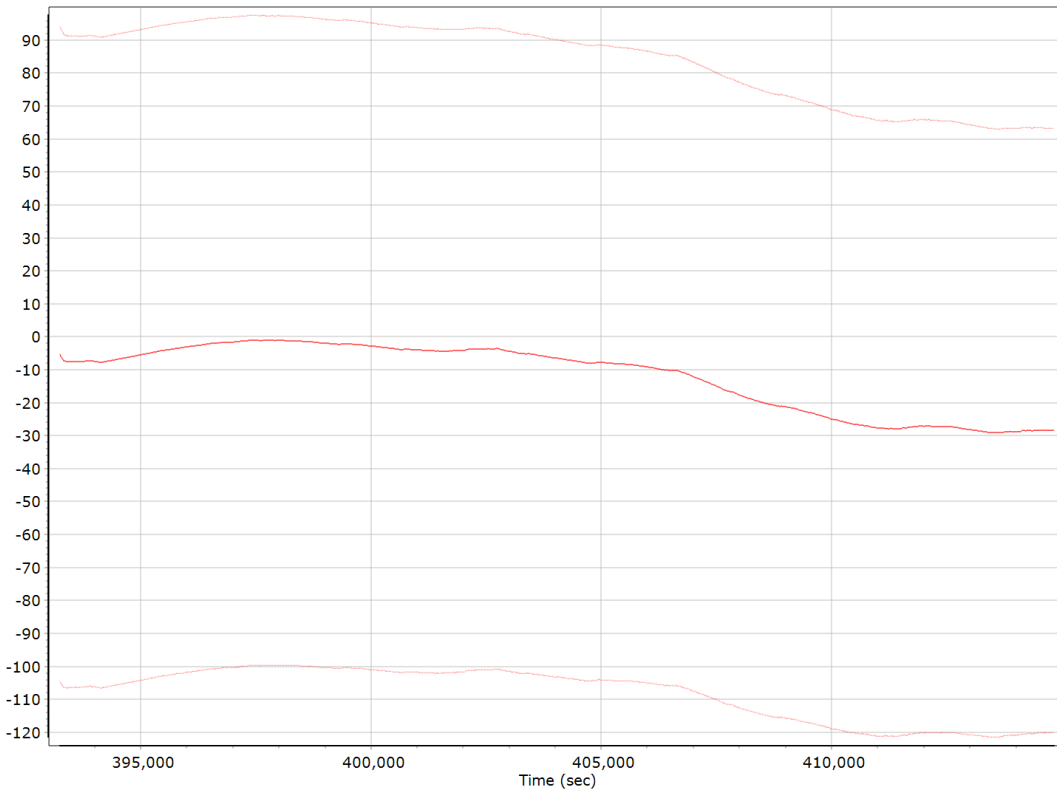
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



Accelerometer Scale Error (ppm)



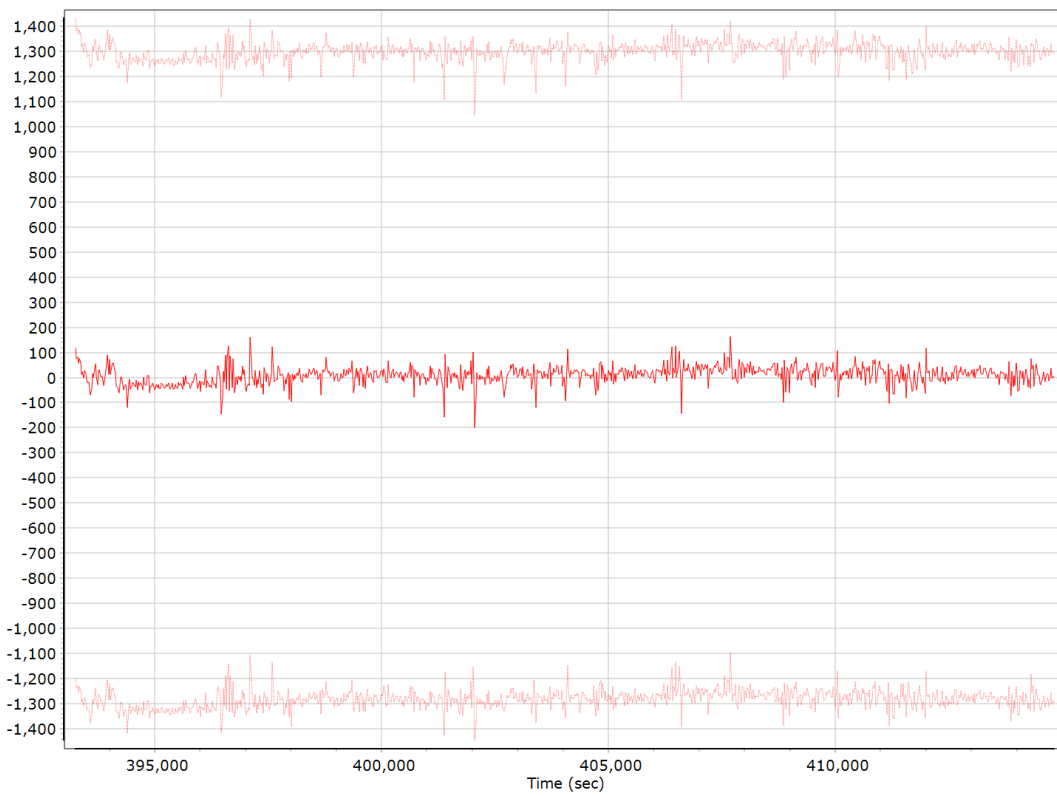
X Accelerometer Scale Error (ppm)



Y Accelerometer Scale Error (ppm)



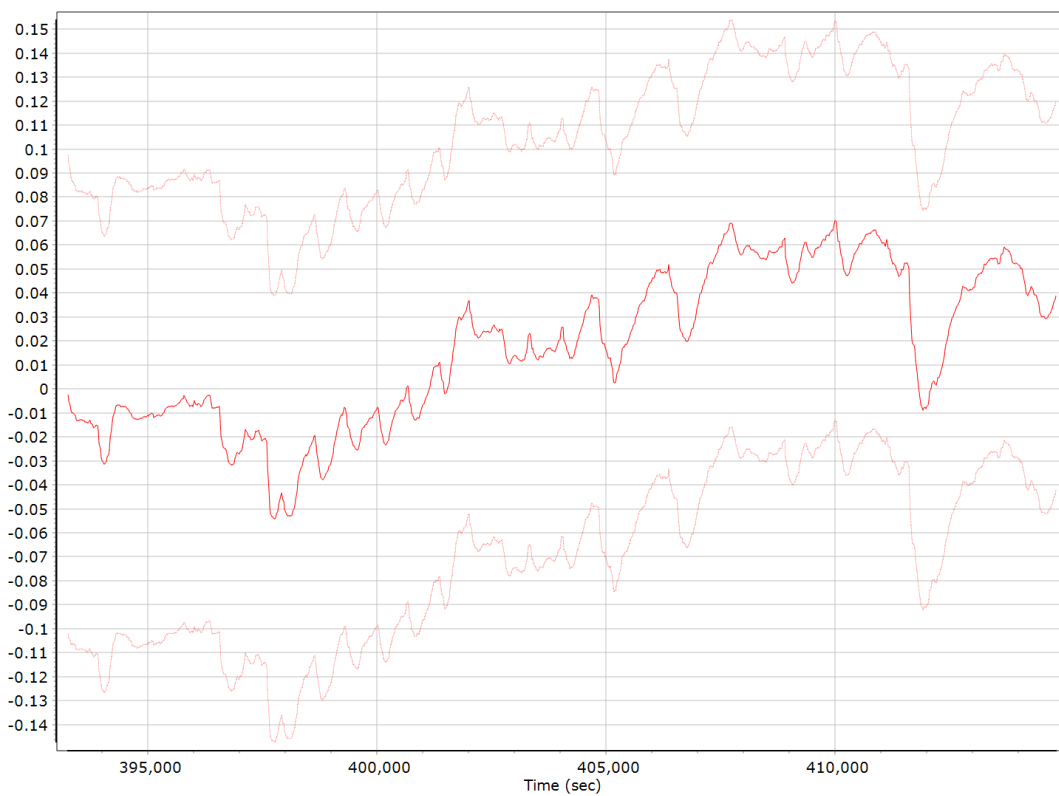
Z Accelerometer Scale Error (ppm)



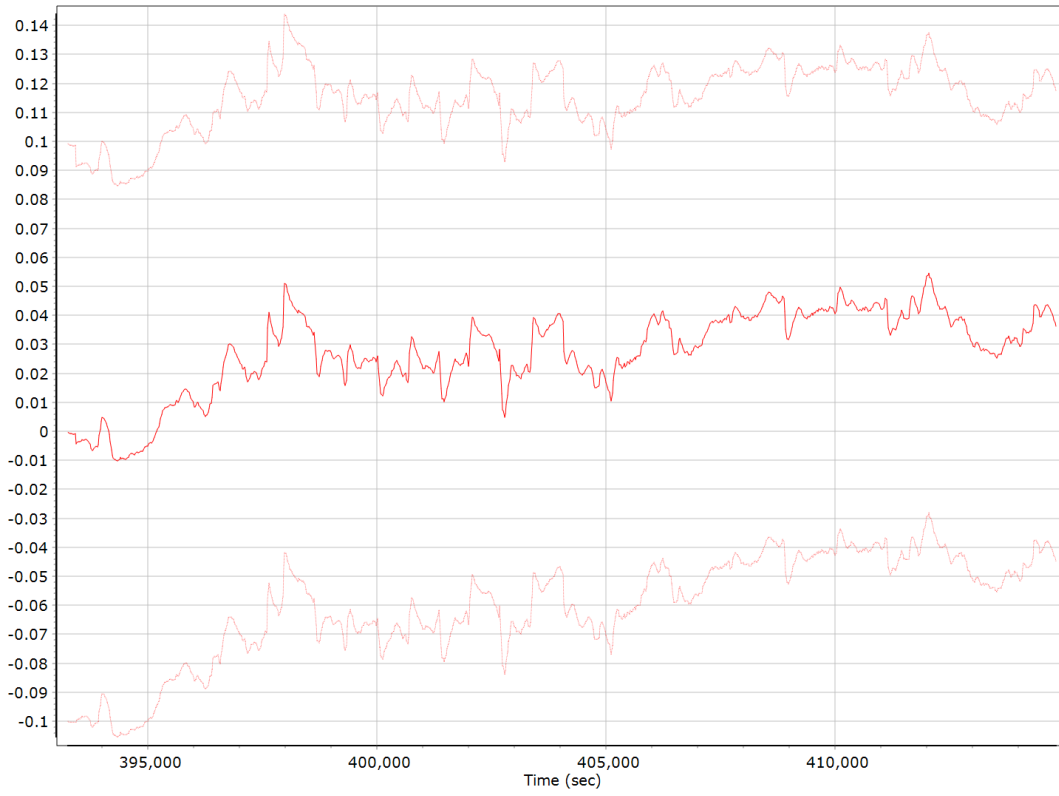
Gyro Bias (deg/h)



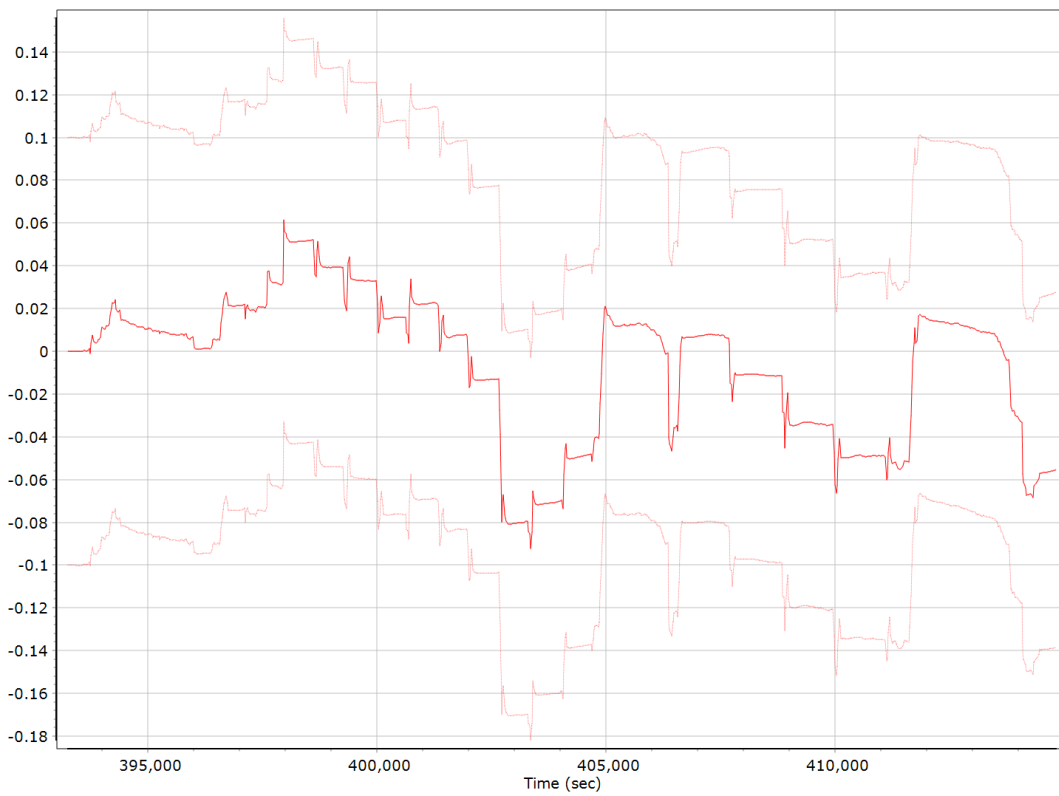
X Gyro Bias (deg/h)



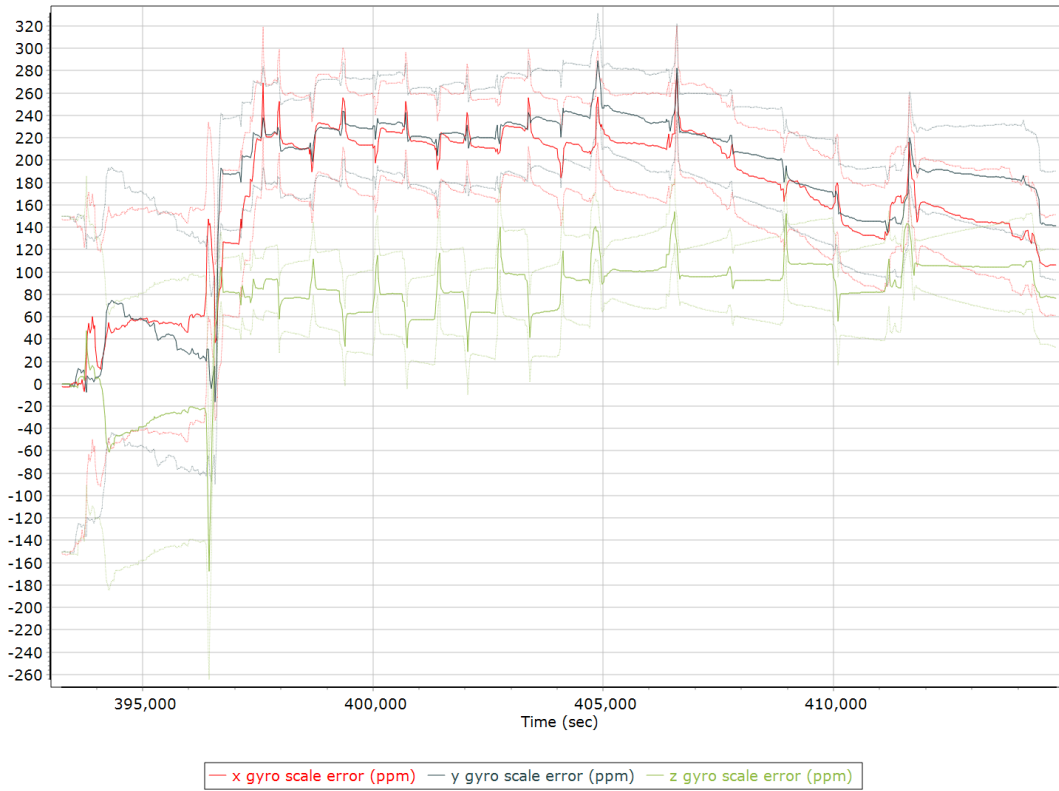
Y Gyro Bias (deg/h)



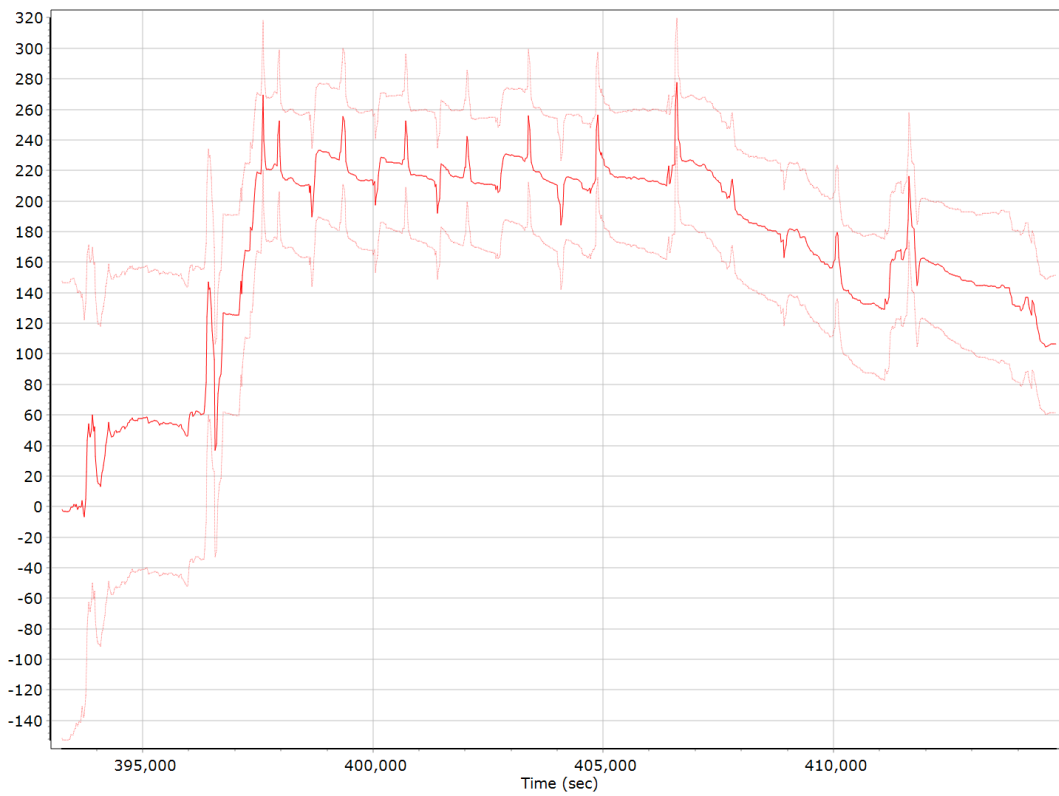
Z Gyro Bias (deg/h)



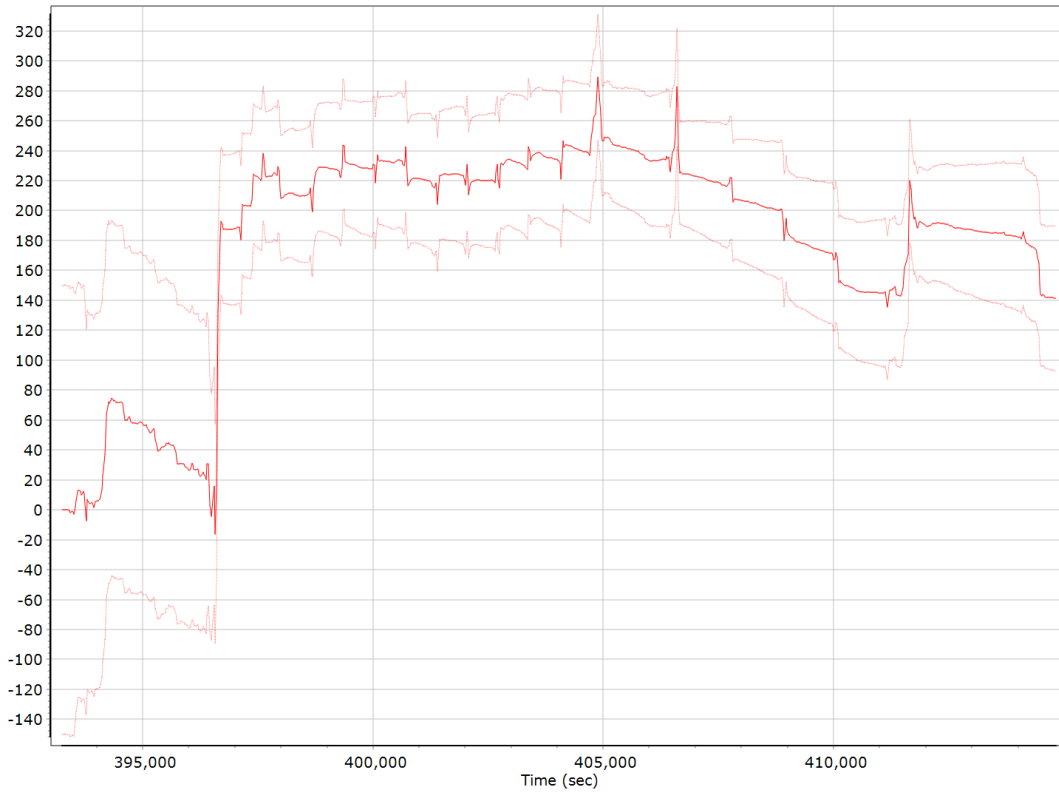
Gyro Scale Error (ppm)



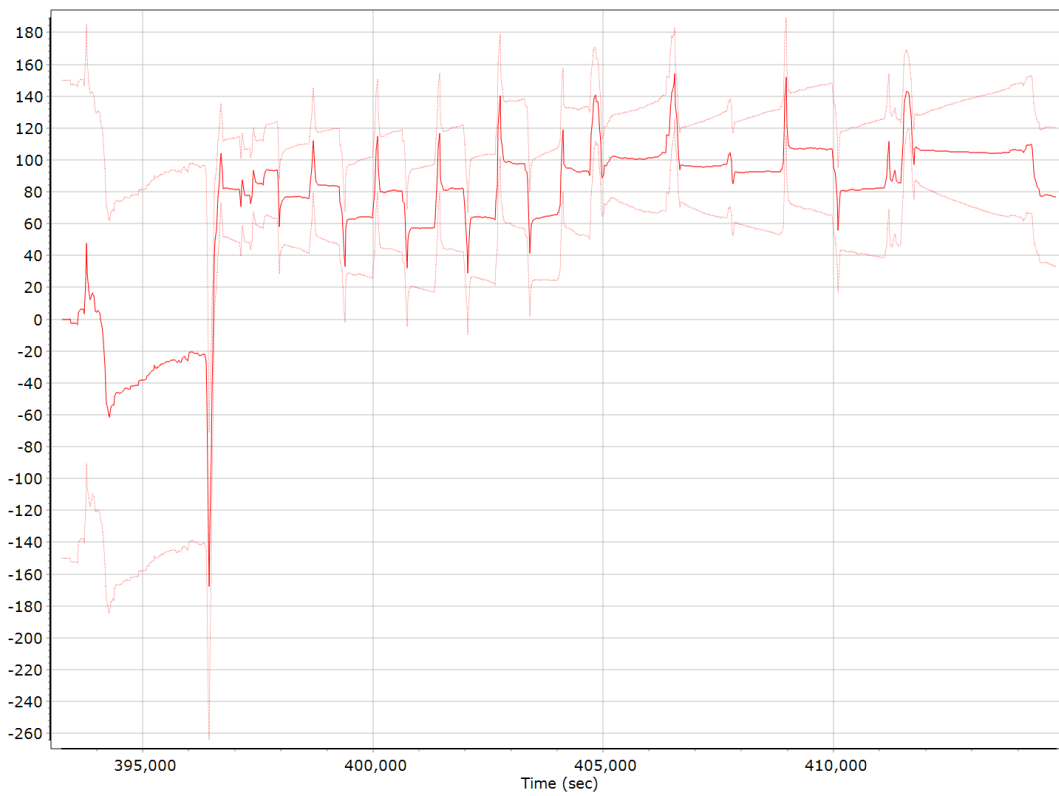
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

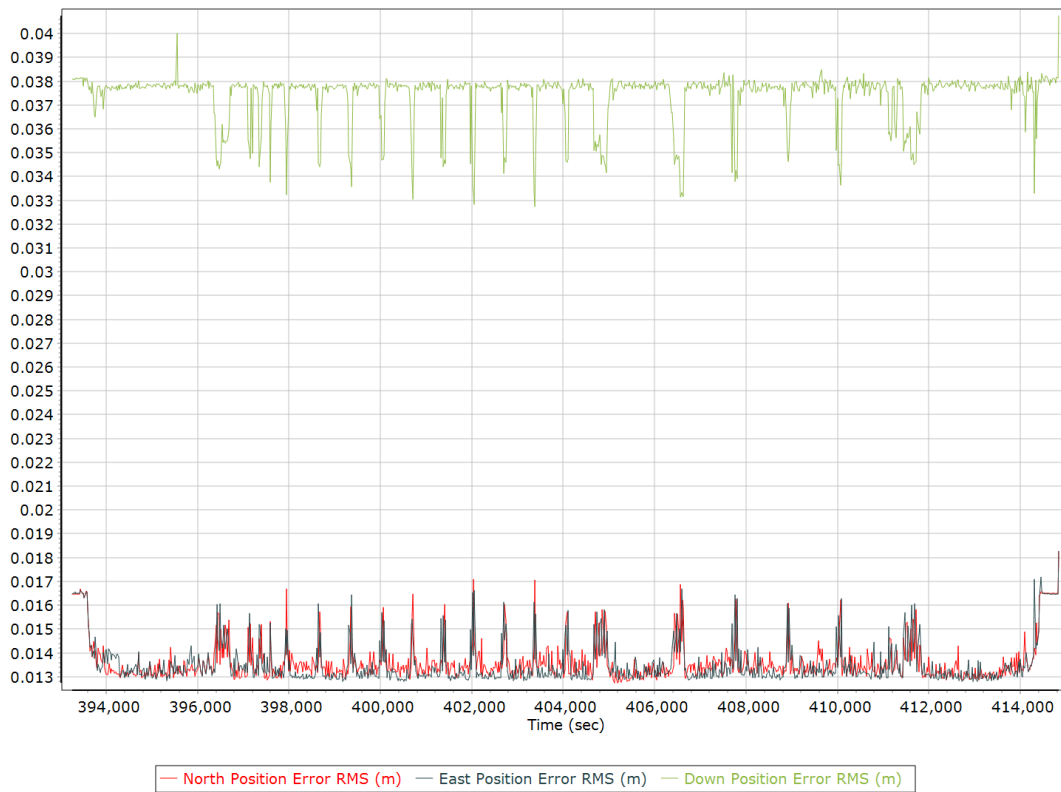


Z Gyro Scale Error (ppm)

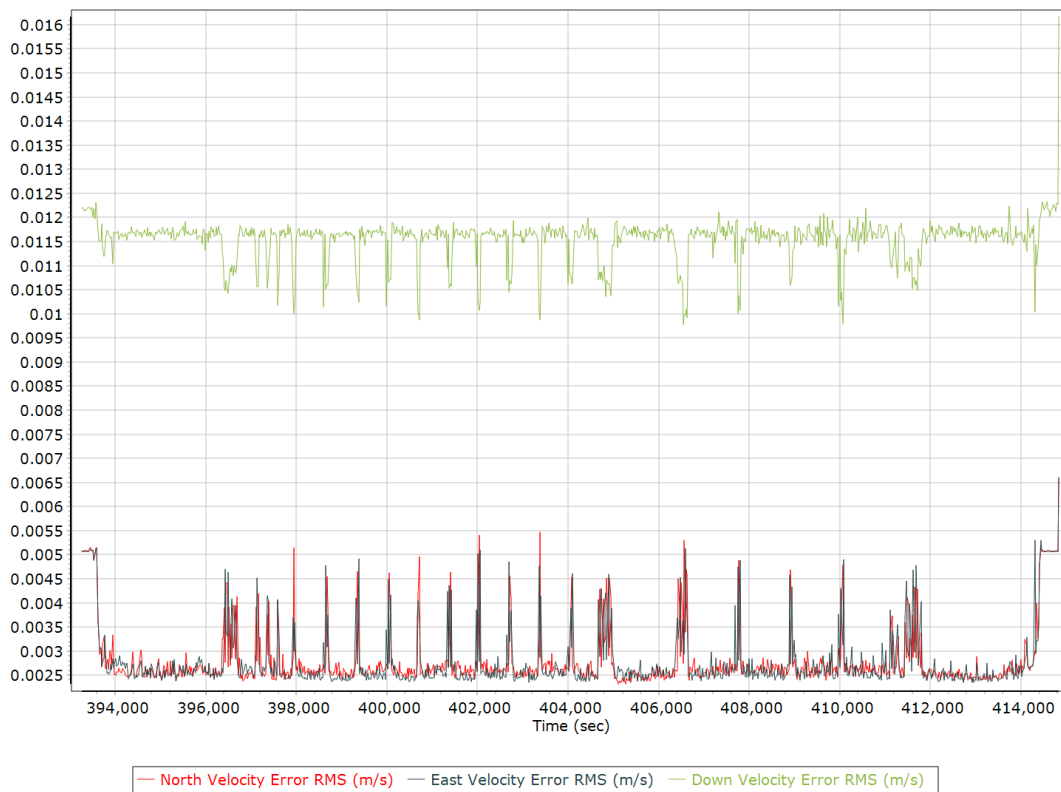


Smoothed Performance Metrics

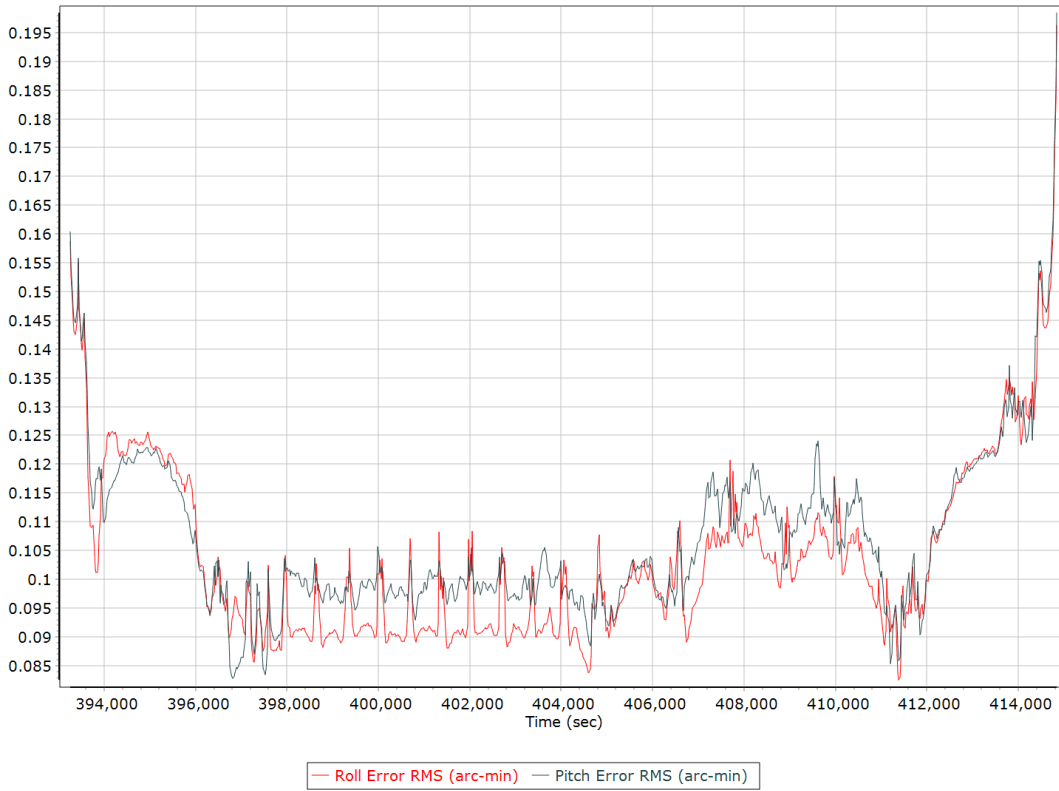
Position Error RMS (m)



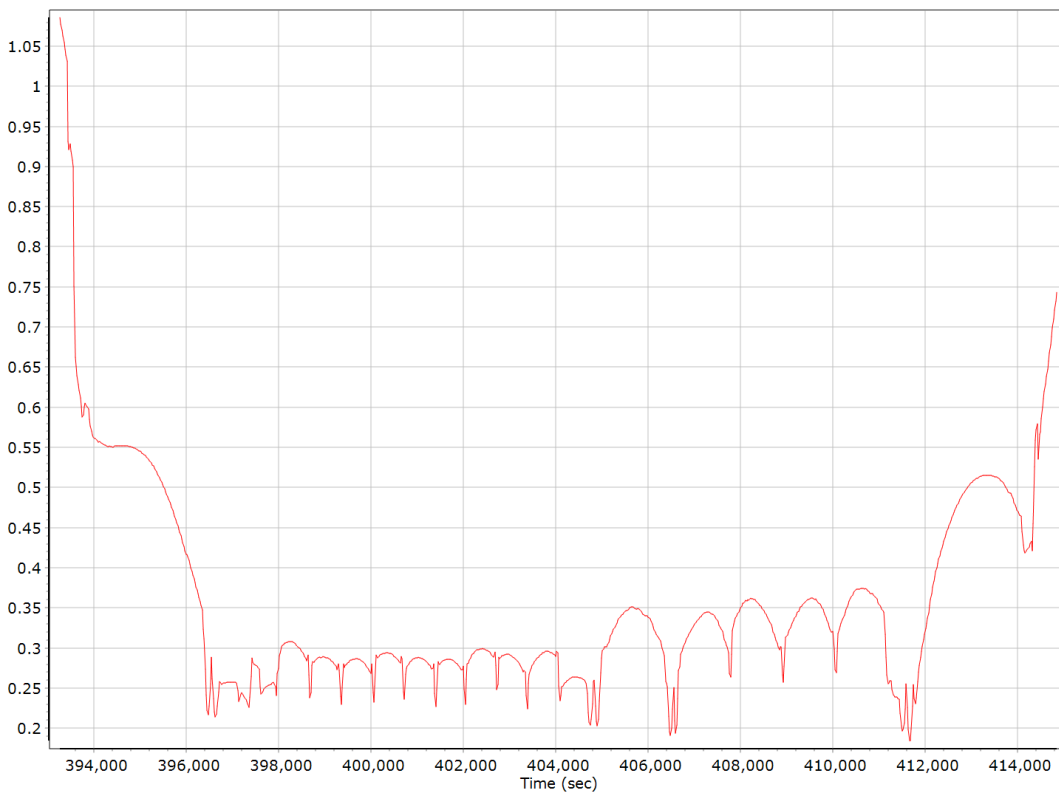
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

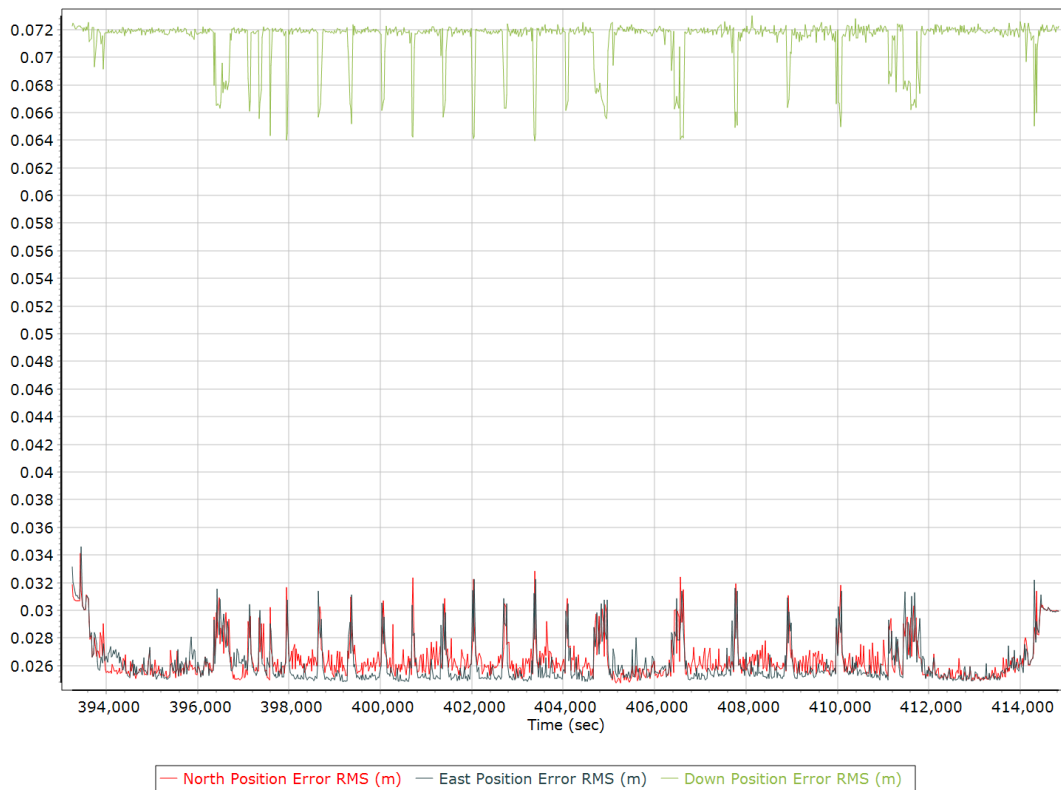


Heading Error RMS (arc-min)

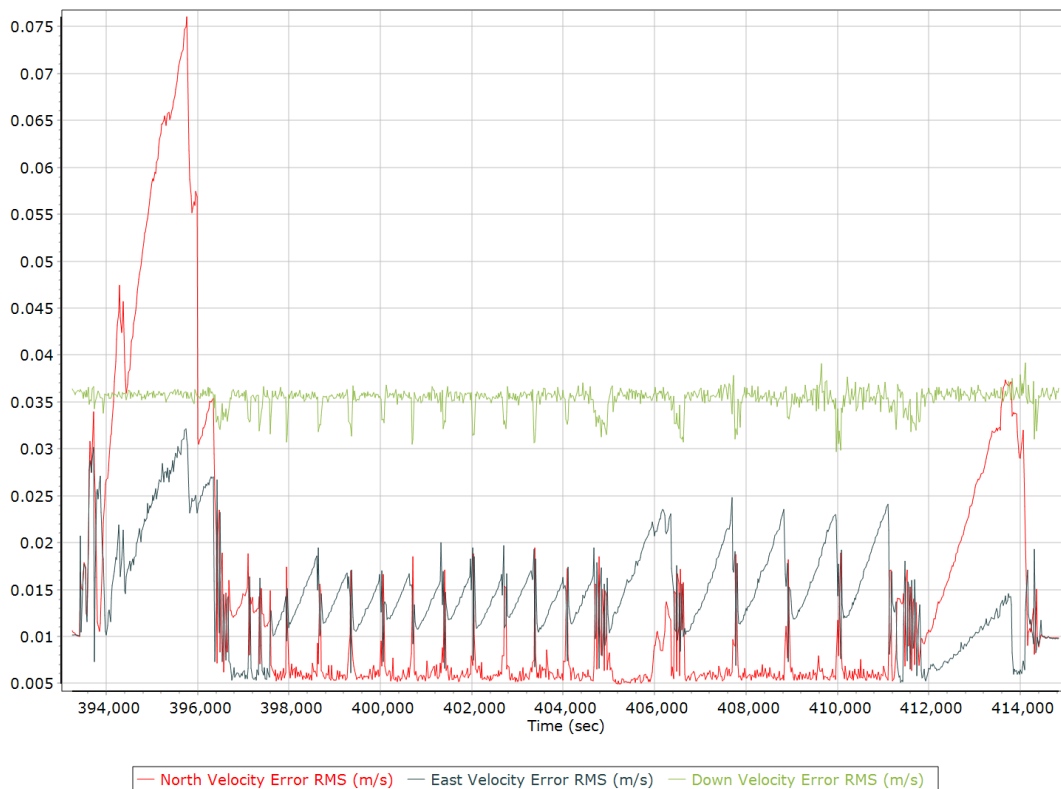


Forward Processed Performance Metrics

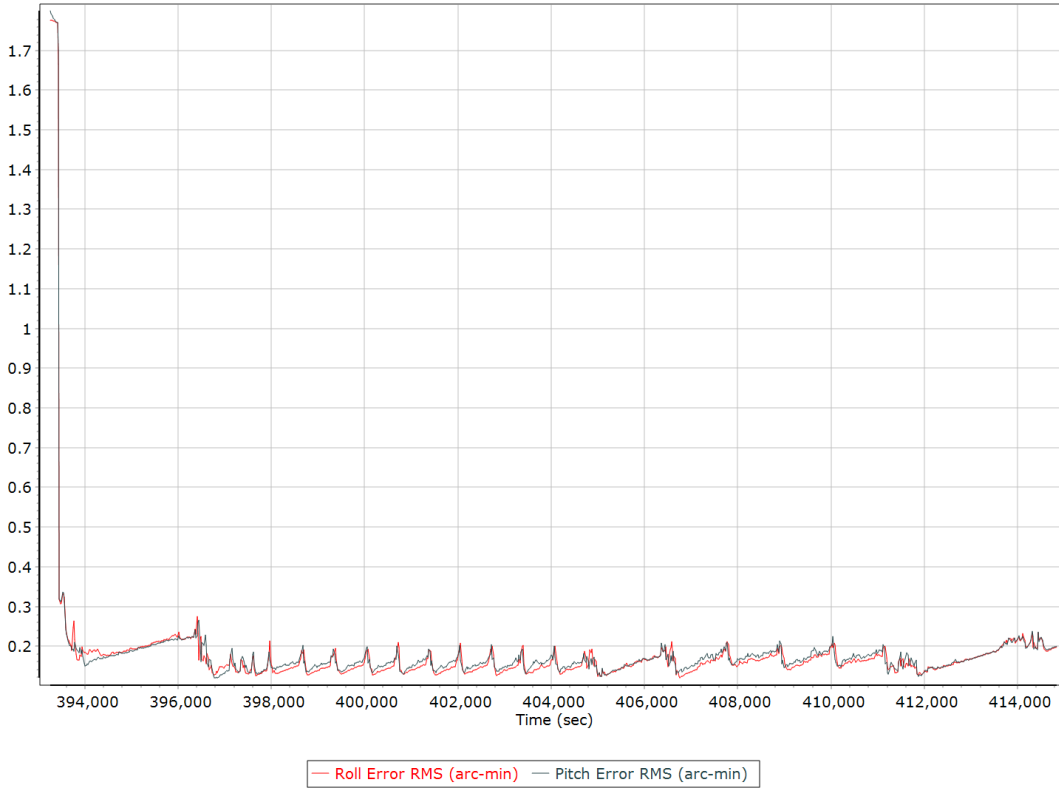
Position Error RMS (m)



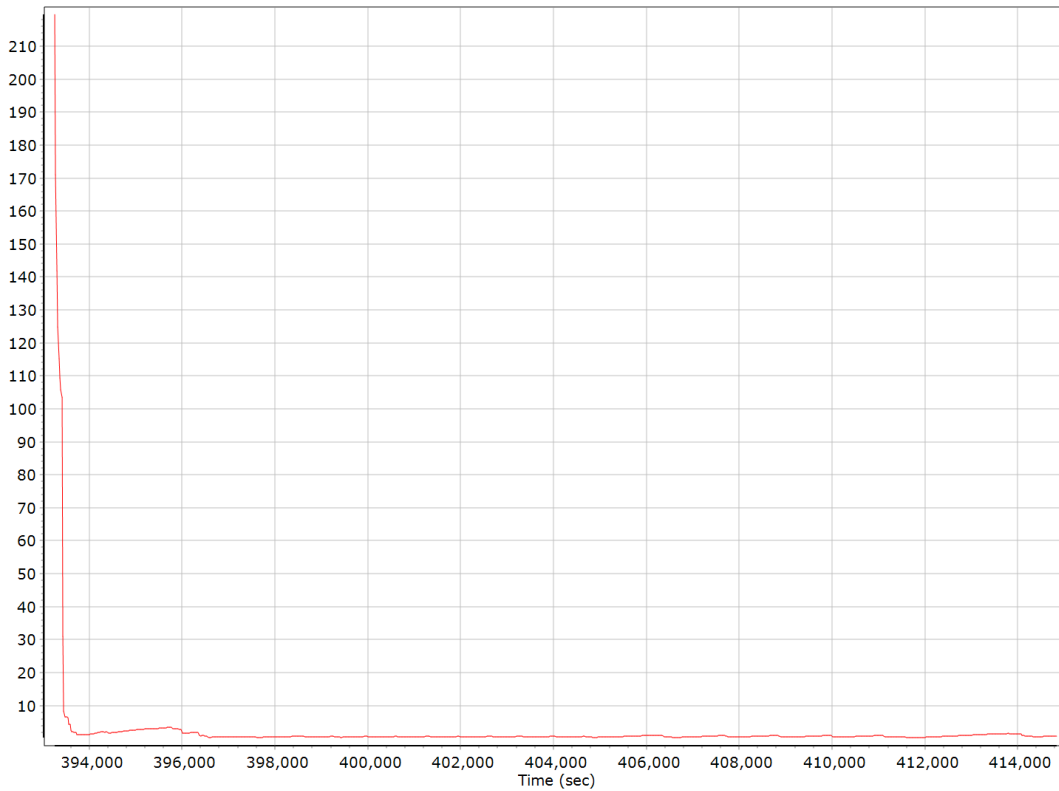
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

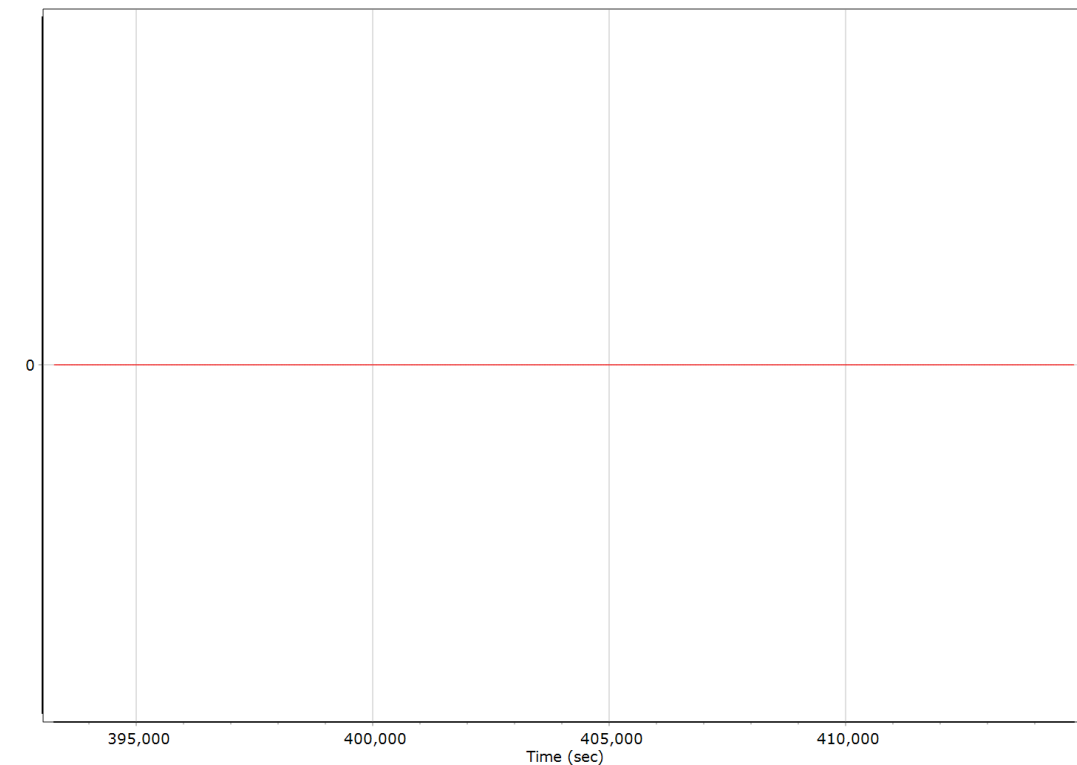


Heading Error RMS (arc-min)



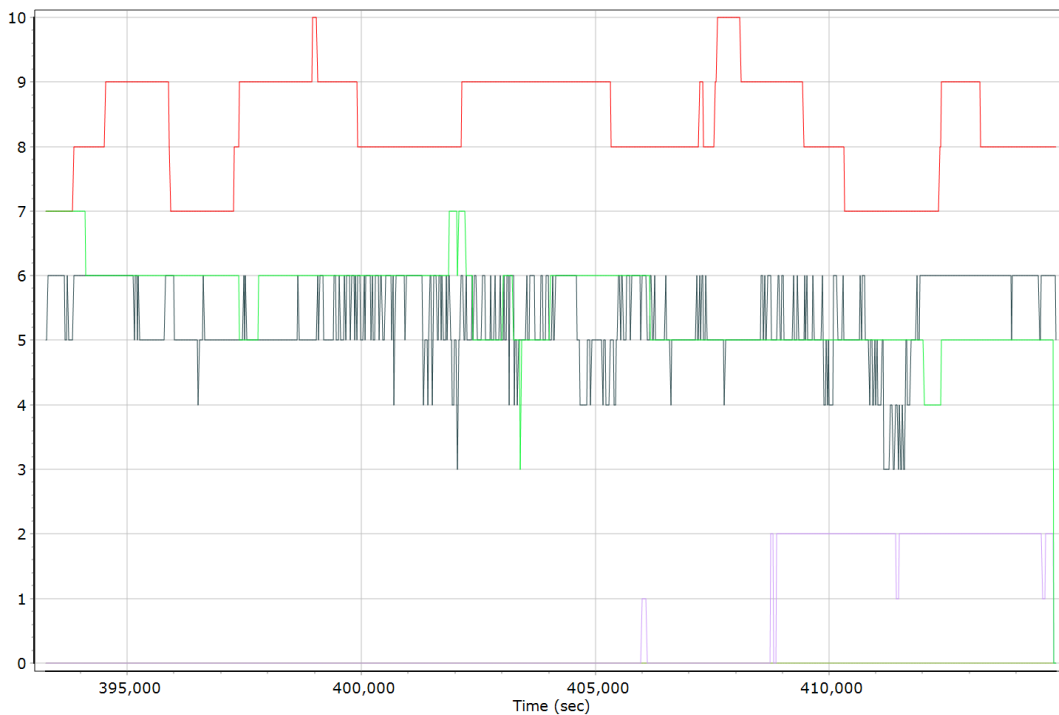
Forward Processed Solution Status

Processing Mode



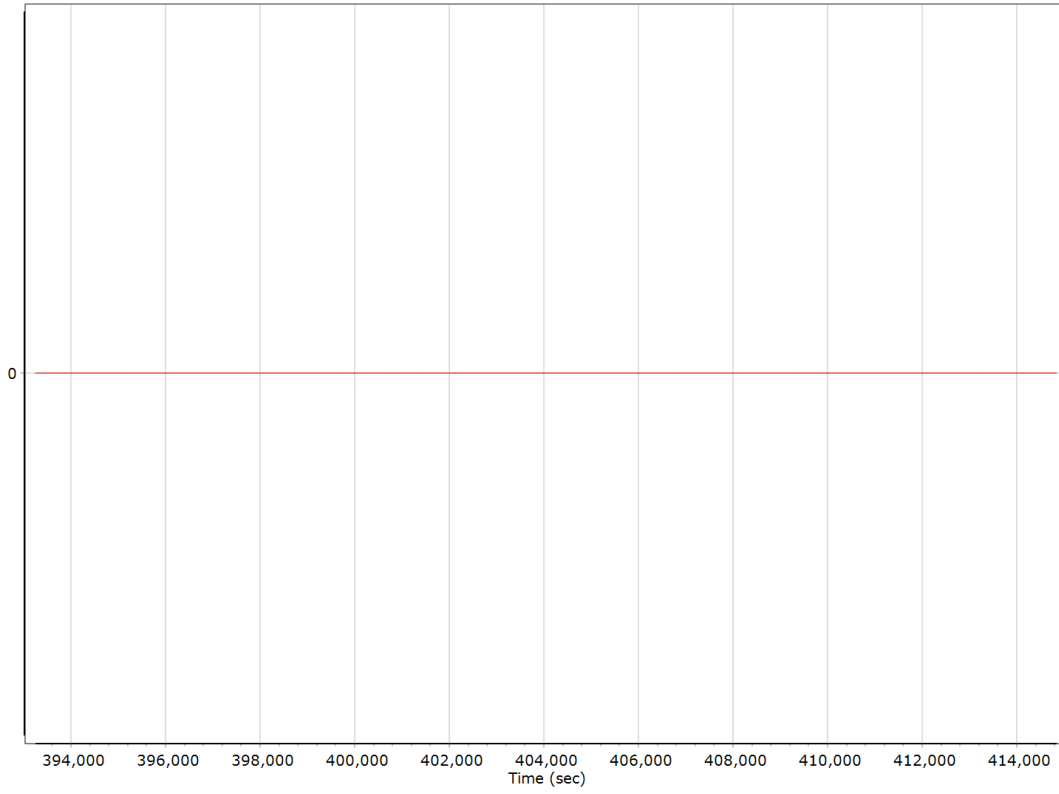
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites
 — Number of GLONASS Satellites
 — Number of QZSS Satellites
— Number of BEIDOU Satellites
 — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05062022A_3062
Processing date	2022-05-10 18:17:30
Mission date	2022-05-06 12:58:59
Mission duration	05:56:55.048
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8708
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
220506_125840_INS-GPS_1.raw	POS Data

Input Files

File Name	File Type
Ephm1260.22g	GLONASS Broadcast Ephemeris
Ephm1260.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05062022A_3062.out	SBET Trajectory File

Rover Data Summary

First raw data file	220506_125840_INS-GPS_1.raw		
Last raw data file	220506_125840_INS-GPS_1.raw		
Start GPS week	2208		
Start time	478720.709 (5/6/2022 12:58:40 PM)		
End time	500135.757 (5/6/2022 6:55:35 PM)		
Start of fine alignment	478931.966 (5/6/2022 1:02:11 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.142	-0.236	-1.269
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

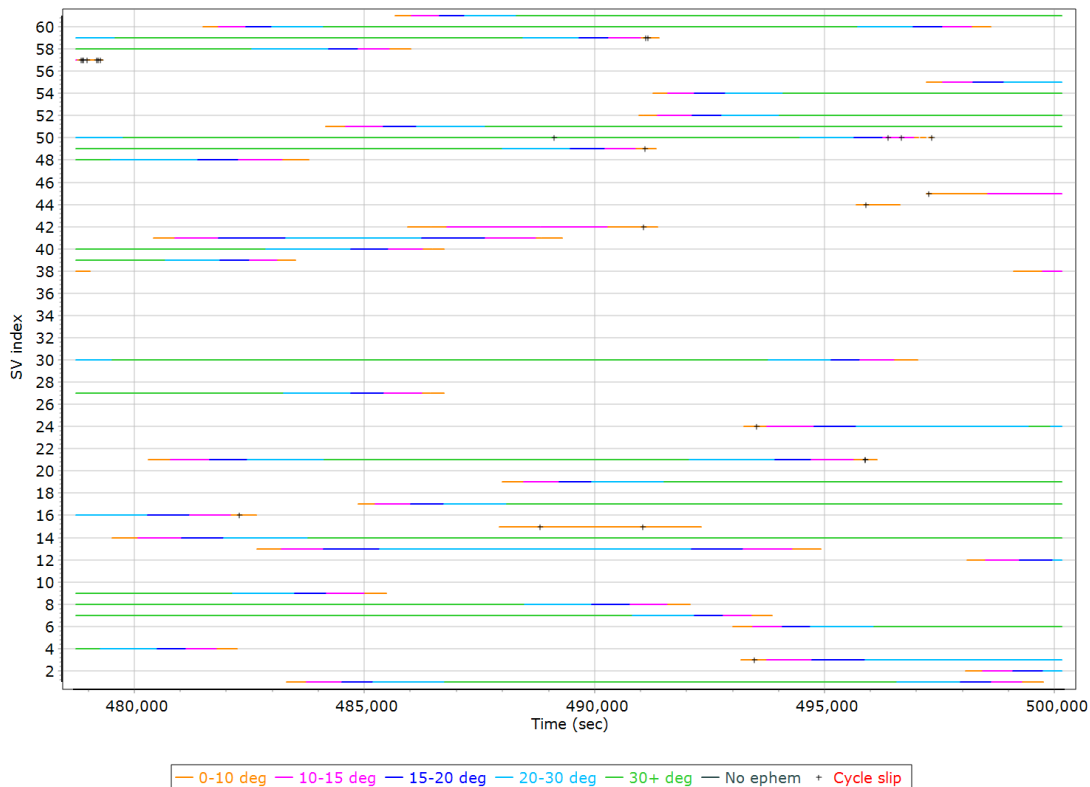
Rover Data QC

Raw IMU Import QC Summary

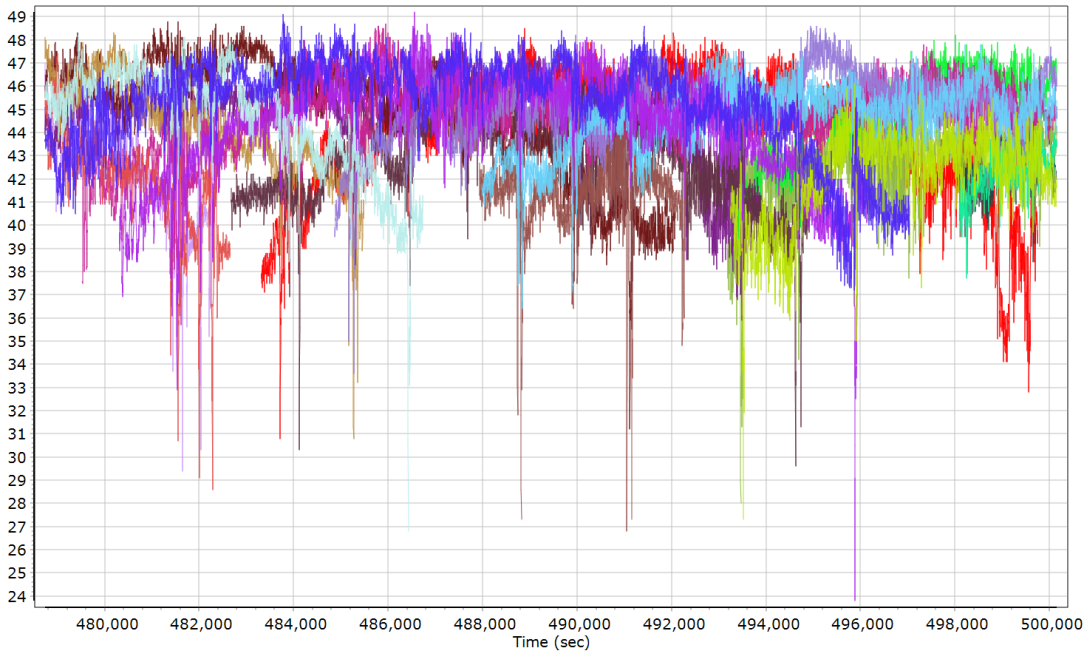
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05062022A_3062.log
IMU Records Processed	4282224
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

GPS/GLONASS L1 Satellite Lock/Elevation

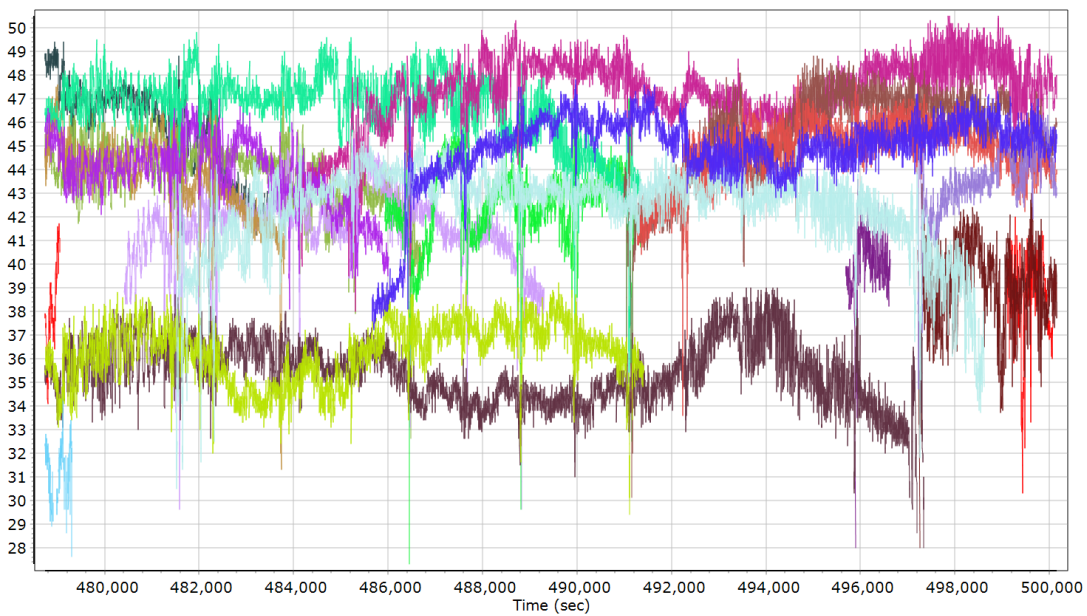


GPS L1 SNR



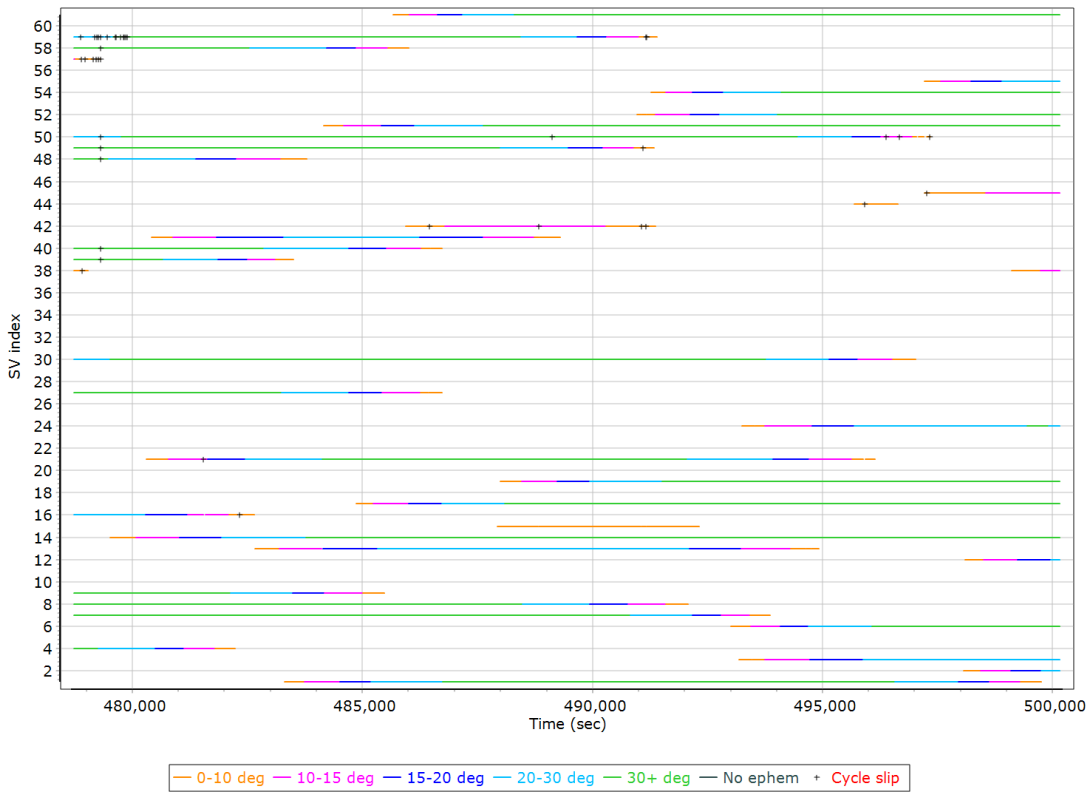
- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 SNR (dB/Hz) | GPS PRN 04 L1 SNR (dB/Hz) |
| GPS PRN 06 L1 SNR (dB/Hz) | GPS PRN 07 L1 SNR (dB/Hz) | GPS PRN 08 L1 SNR (dB/Hz) | GPS PRN 09 L1 SNR (dB/Hz) |
| GPS PRN 12 L1 SNR (dB/Hz) | GPS PRN 13 L1 SNR (dB/Hz) | GPS PRN 14 L1 SNR (dB/Hz) | GPS PRN 15 L1 SNR (dB/Hz) |
| GPS PRN 16 L1 SNR (dB/Hz) | GPS PRN 17 L1 SNR (dB/Hz) | GPS PRN 19 L1 SNR (dB/Hz) | GPS PRN 21 L1 SNR (dB/Hz) |
| GPS PRN 24 L1 SNR (dB/Hz) | GPS PRN 27 L1 SNR (dB/Hz) | GPS PRN 30 L1 SNR (dB/Hz) | |

GLONASS L1 SNR

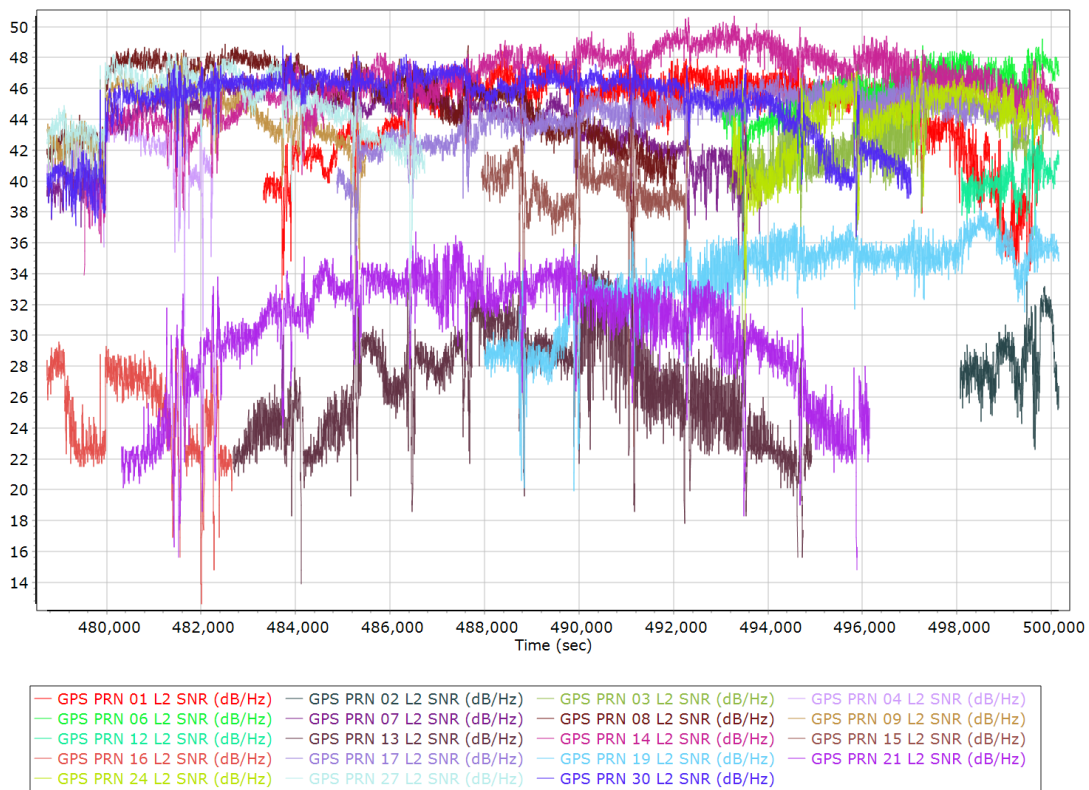


- | | | |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 05 L1 SNR (dB/Hz) | GLONASS 07 L1 SNR (dB/Hz) |
| GLONASS 08 L1 SNR (dB/Hz) | GLONASS 11 L1 SNR (dB/Hz) | GLONASS 12 L1 SNR (dB/Hz) |
| GLONASS 13 L1 SNR (dB/Hz) | GLONASS 14 L1 SNR (dB/Hz) | GLONASS 15 L1 SNR (dB/Hz) |
| GLONASS 17 L1 SNR (dB/Hz) | GLONASS 18 L1 SNR (dB/Hz) | GLONASS 20 L1 SNR (dB/Hz) |
| GLONASS 21 L1 SNR (dB/Hz) | GLONASS 22 L1 SNR (dB/Hz) | GLONASS 23 L1 SNR (dB/Hz) |
| GLONASS 24 L1 SNR (dB/Hz) | | |

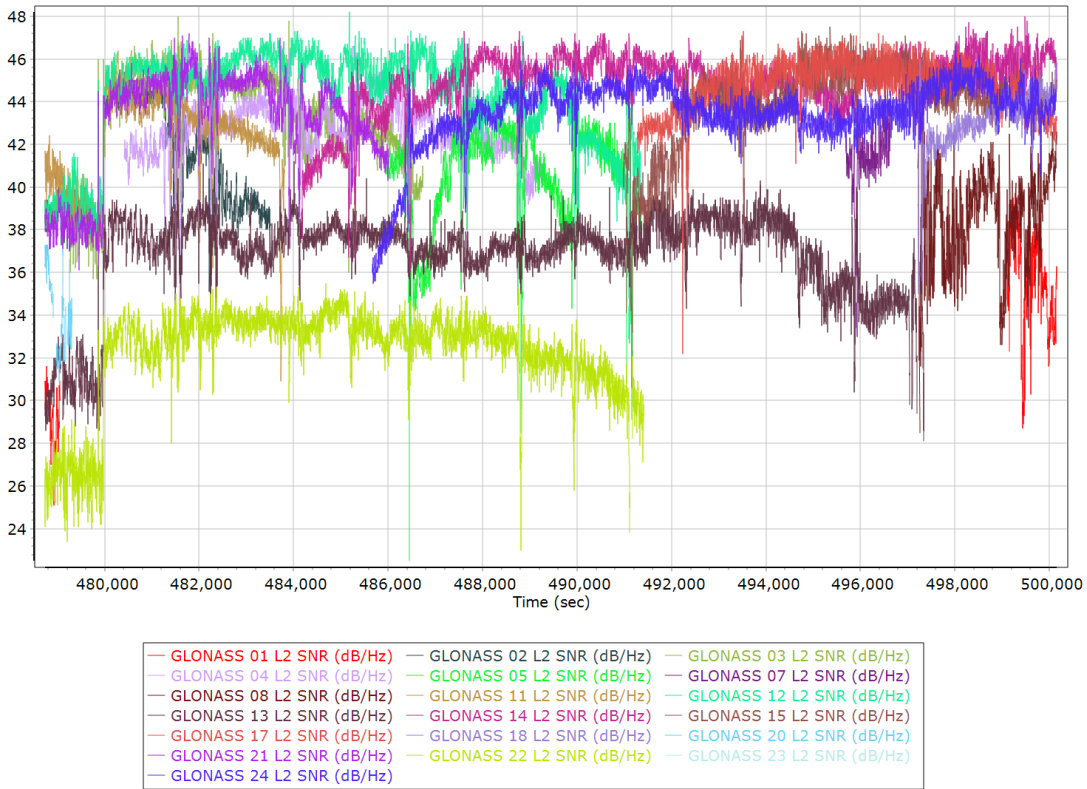
GPS/GLONASS L2 Satellite Lock/Elevation



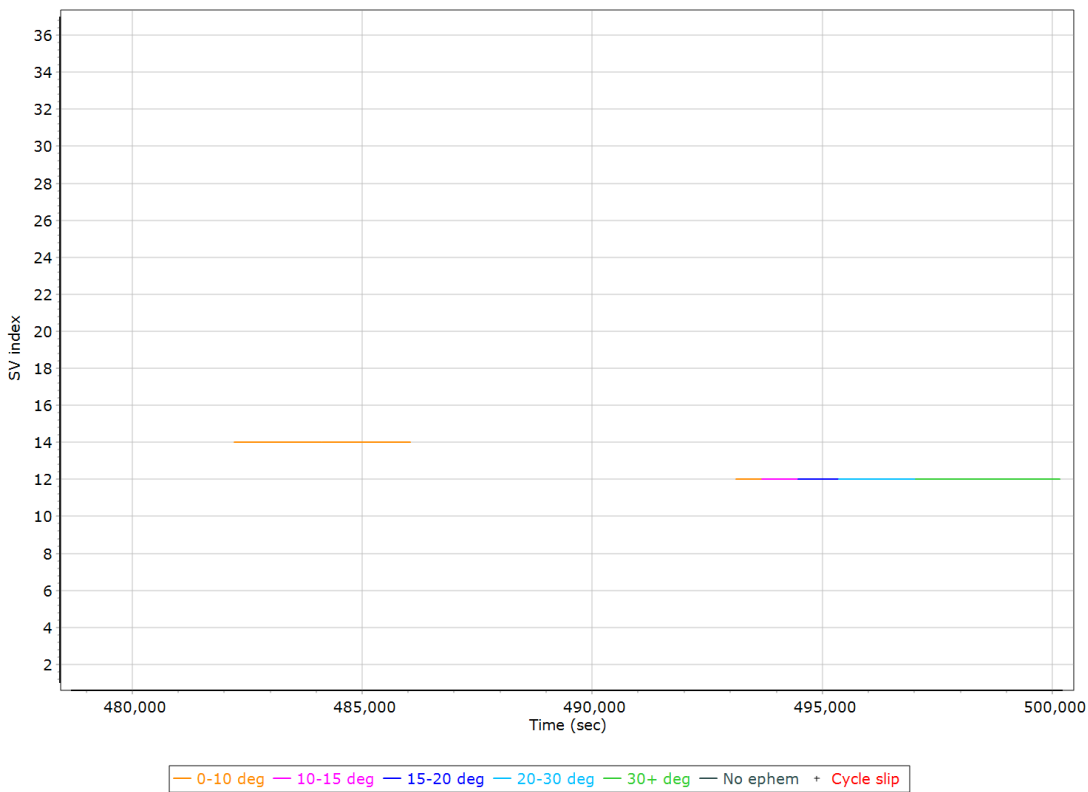
GPS L2 SNR



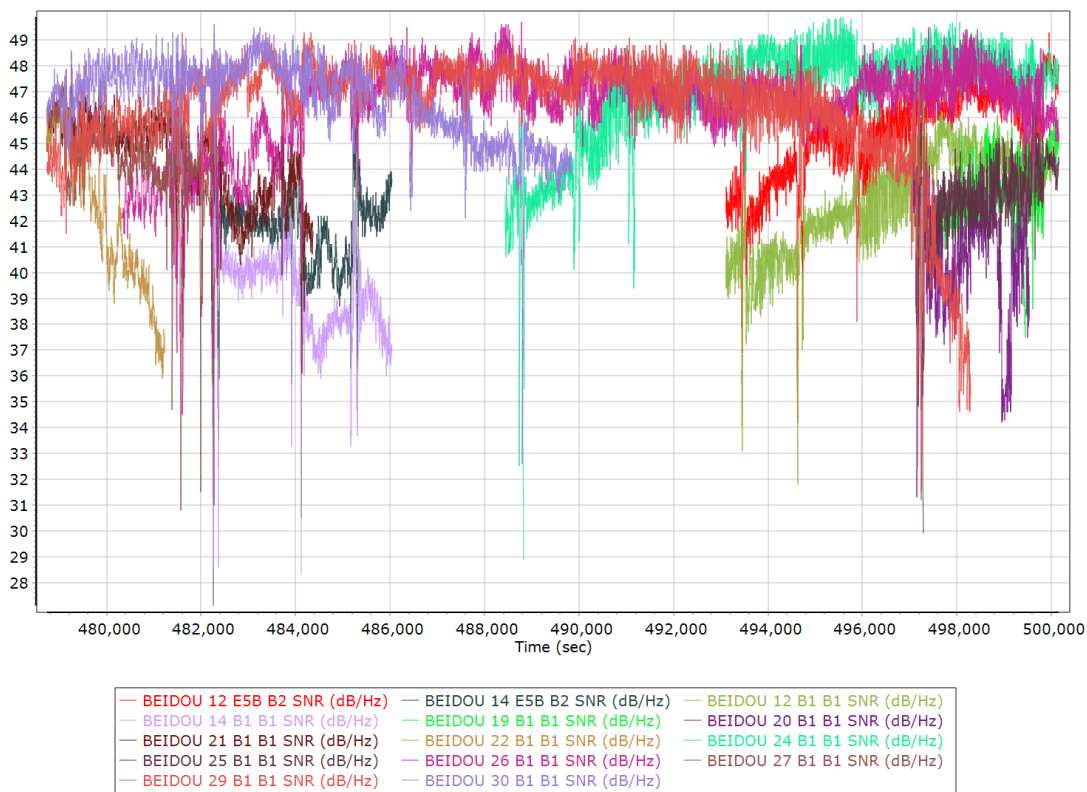
GLONASS L2 SNR



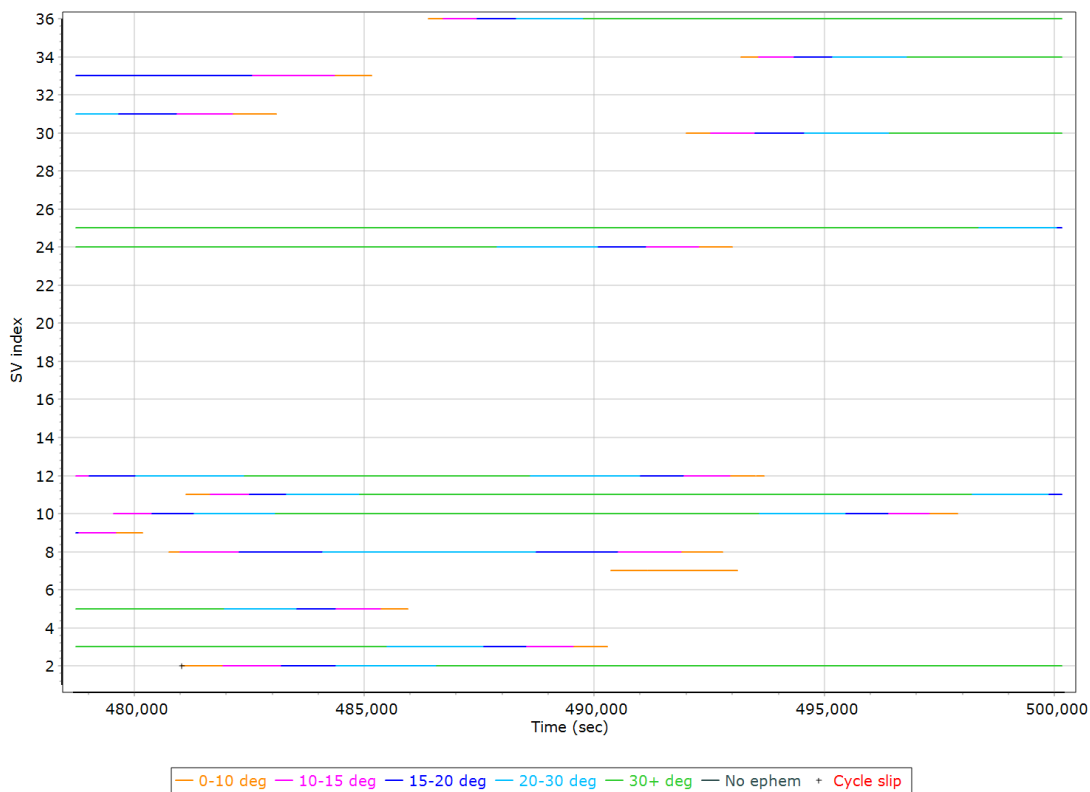
BEIDOU Satellite Lock/Elevation



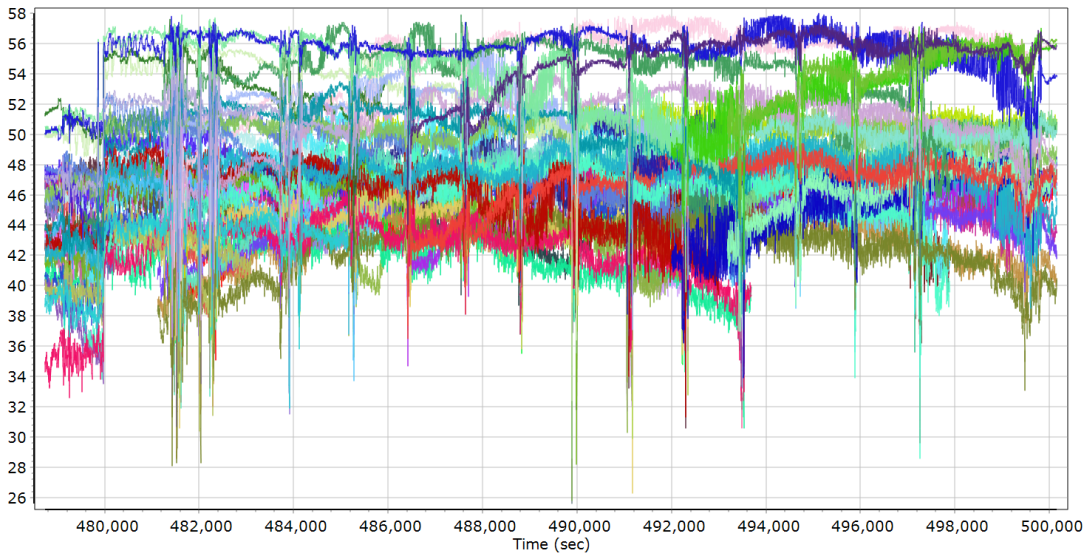
BEIDOU SNR



GALILEO Satellite Lock/Elevation



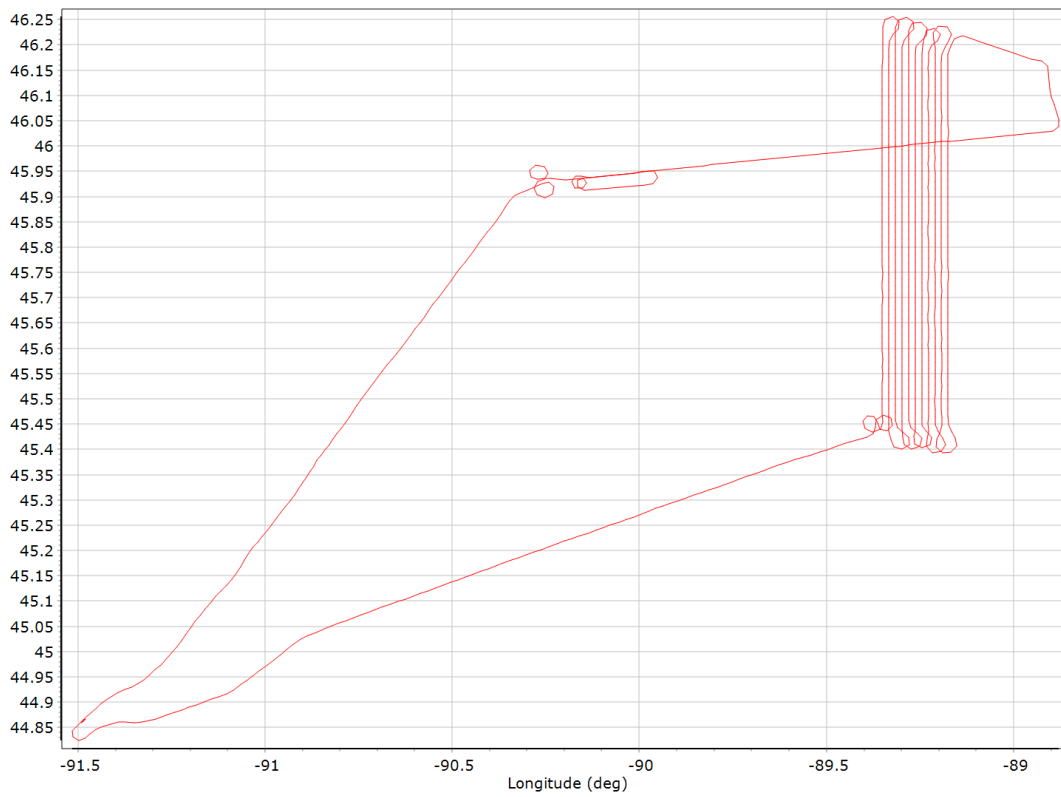
GALILEO SNR



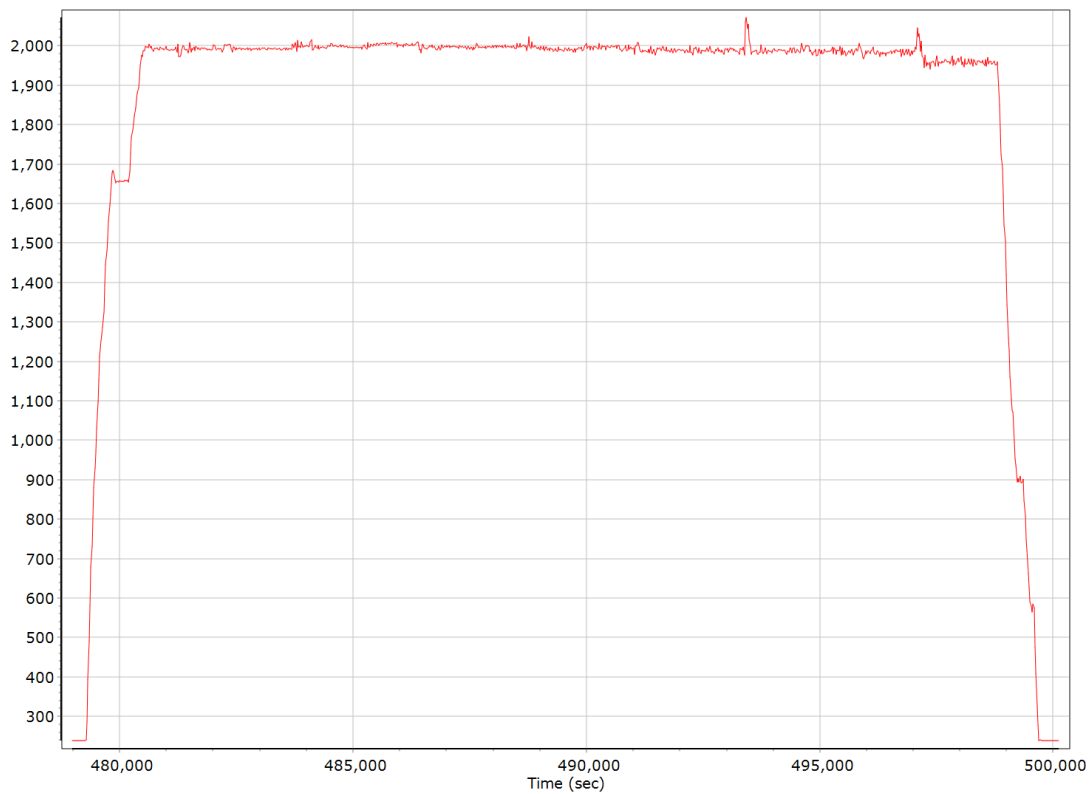
— GALILEO 02 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 03 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 05 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 07 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 08 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 10 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 24 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 25 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 30 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 31 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 33 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 34 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 36 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 02 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 03 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 05 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 07 L5E5A BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

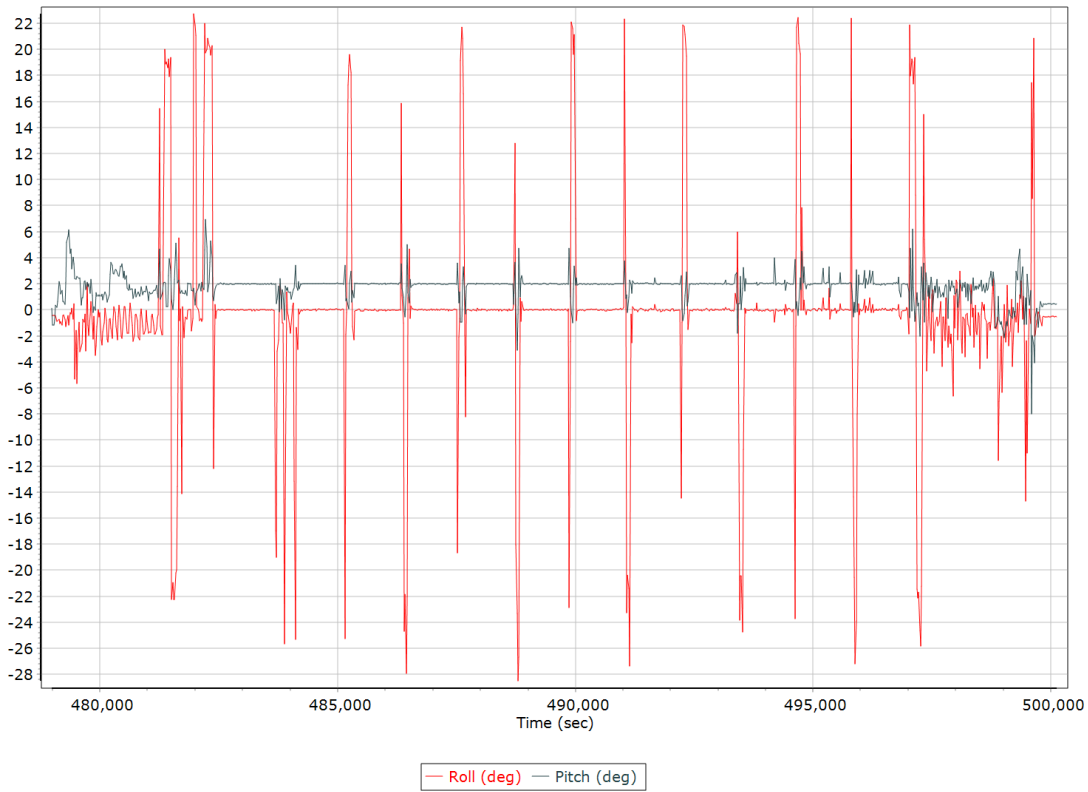
Top View



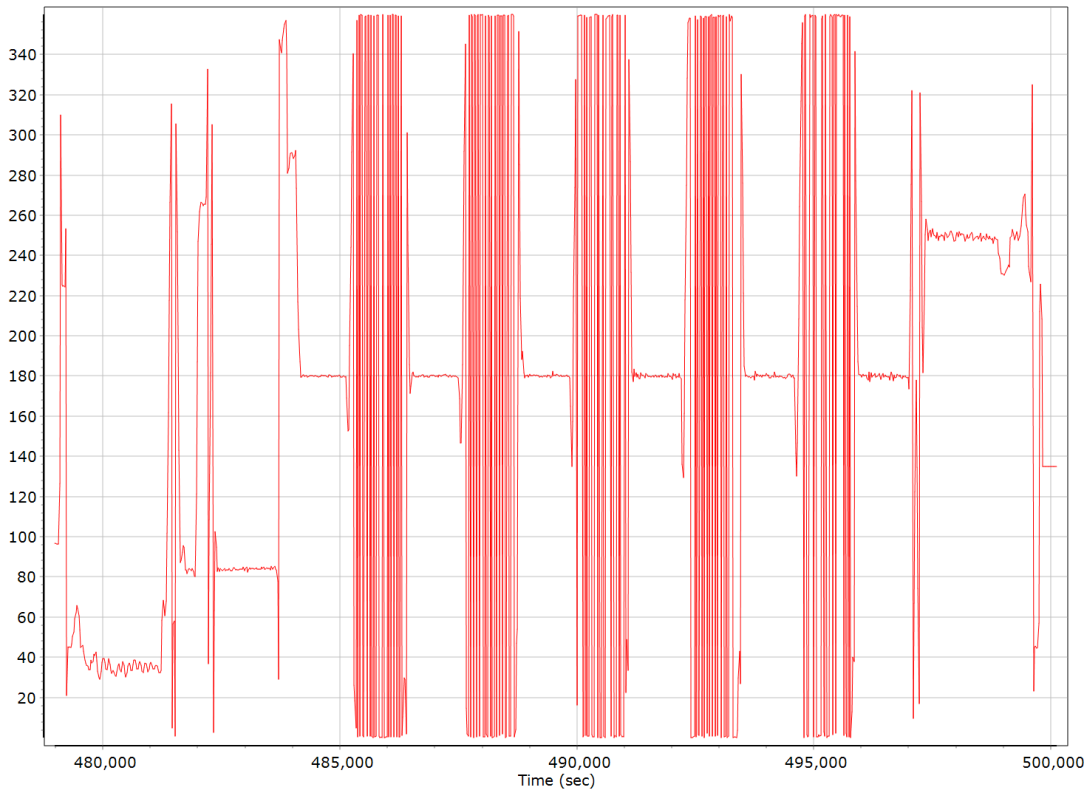
Altitude



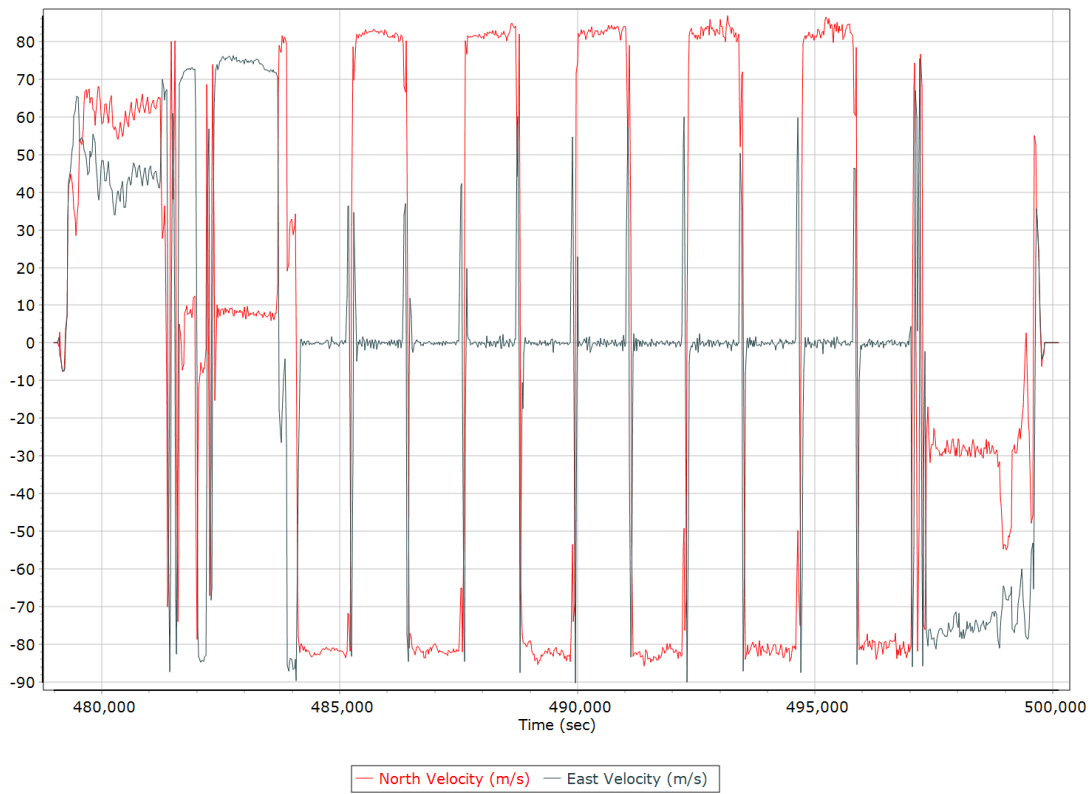
Roll/Pitch



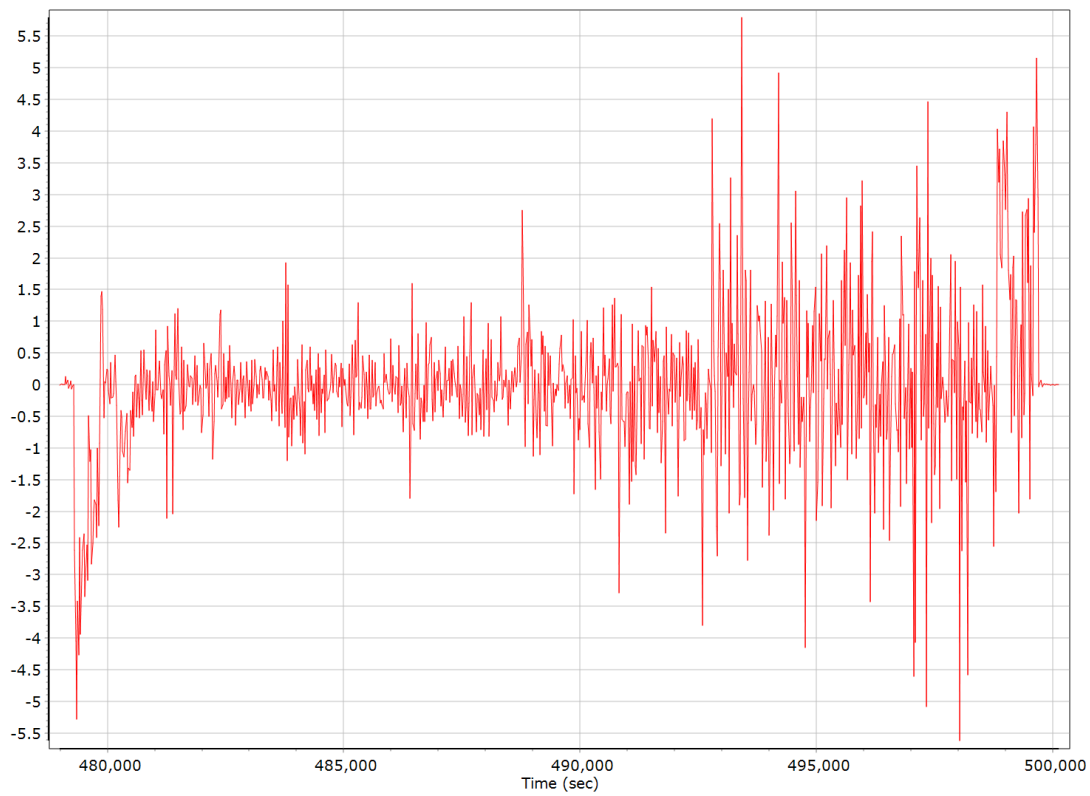
Heading



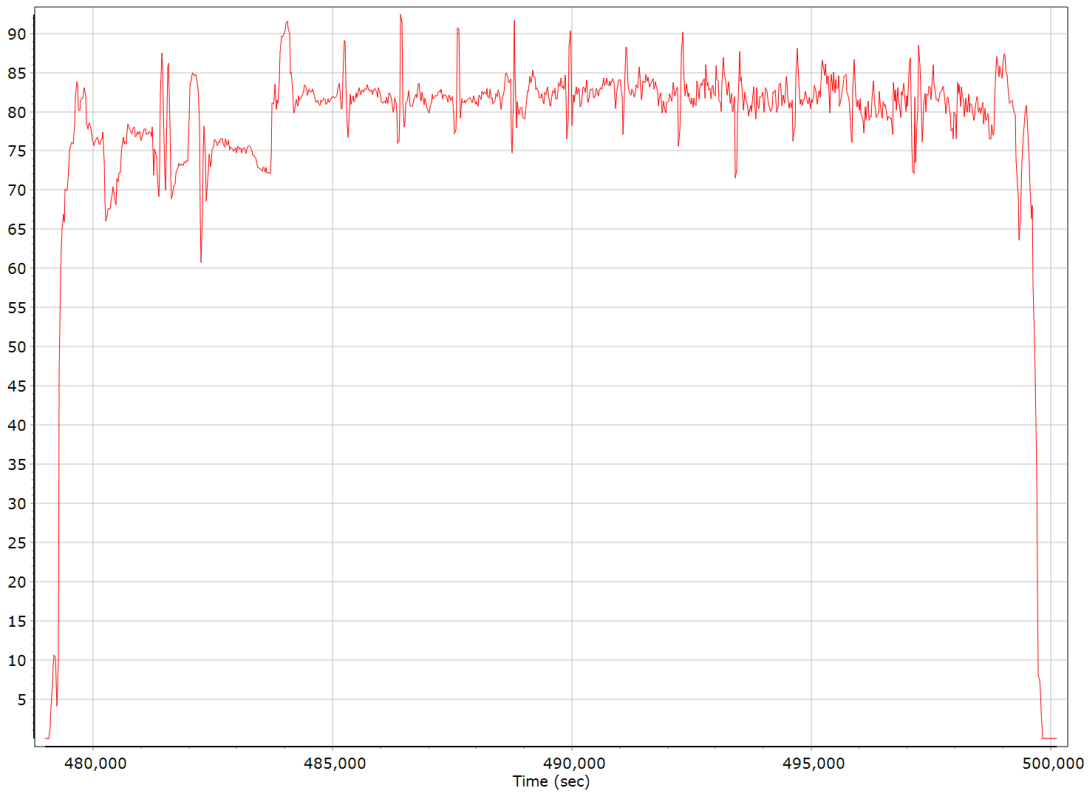
North/East Velocity



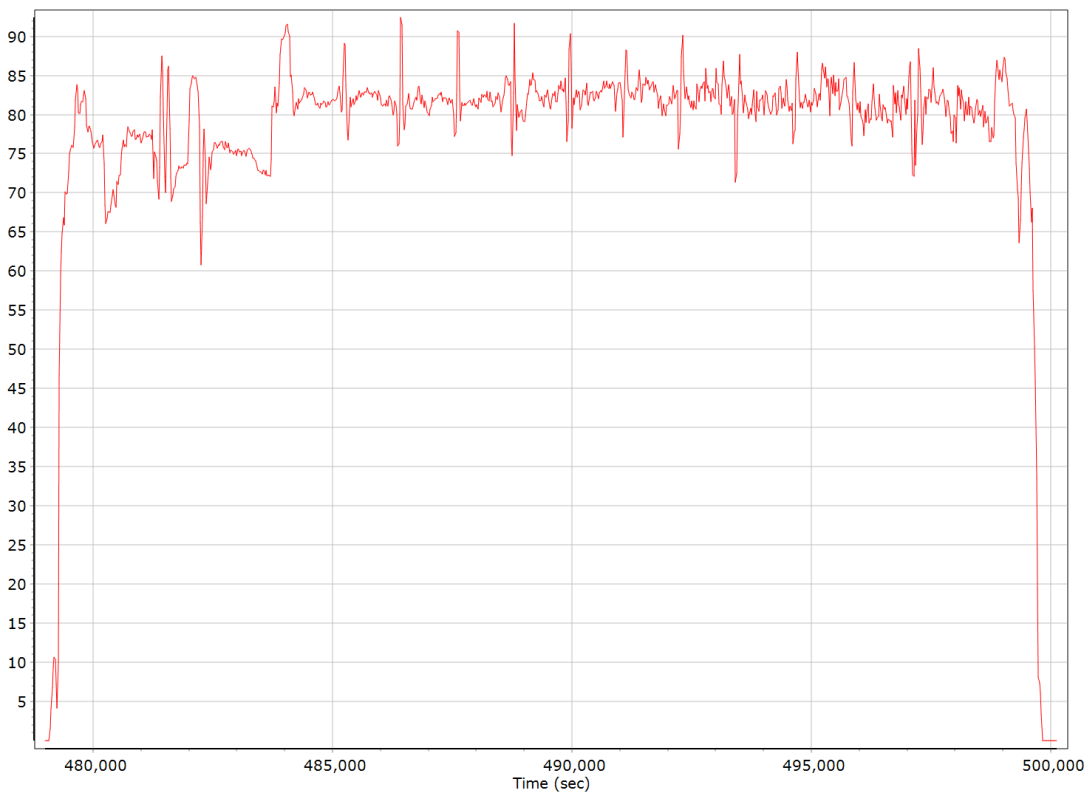
Down Velocity



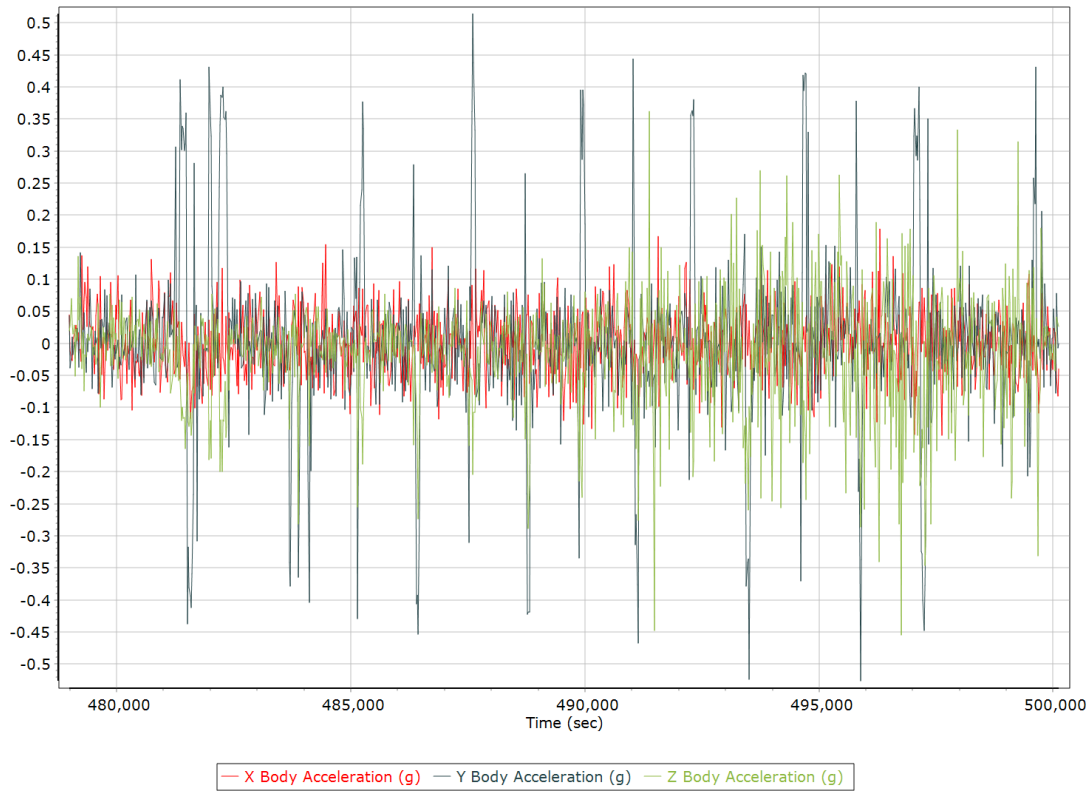
Total Speed



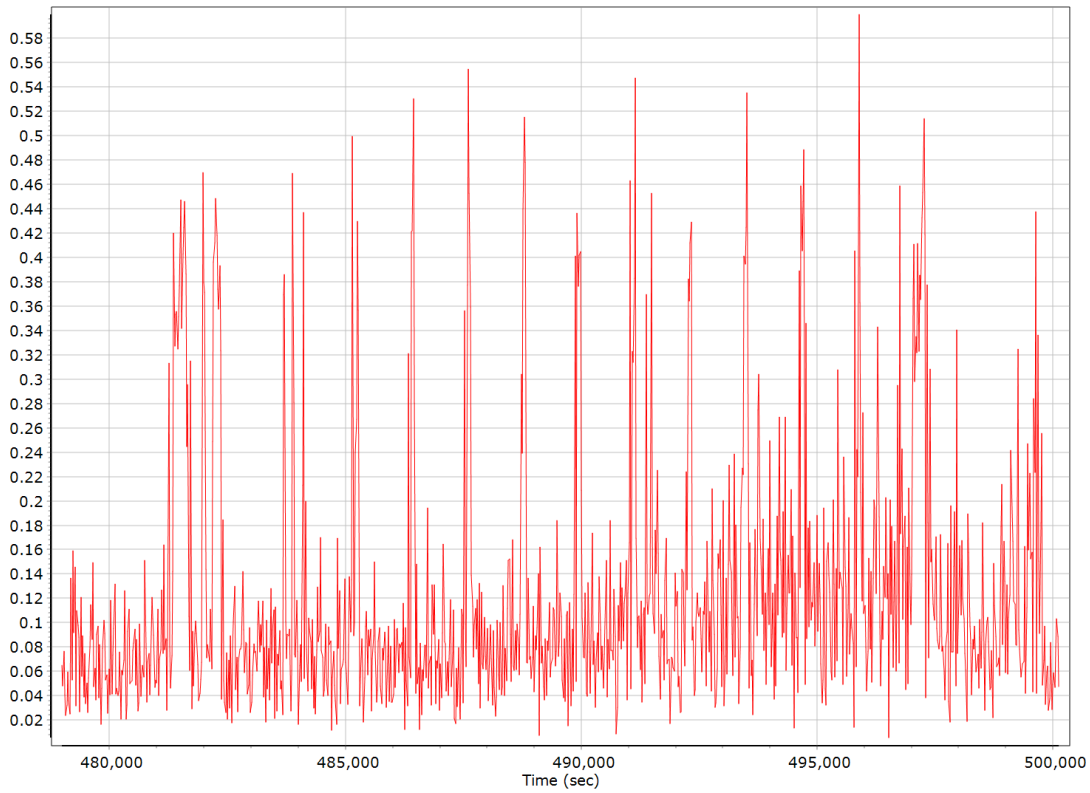
Ground Speed



Body Acceleration



Total Body Acceleration

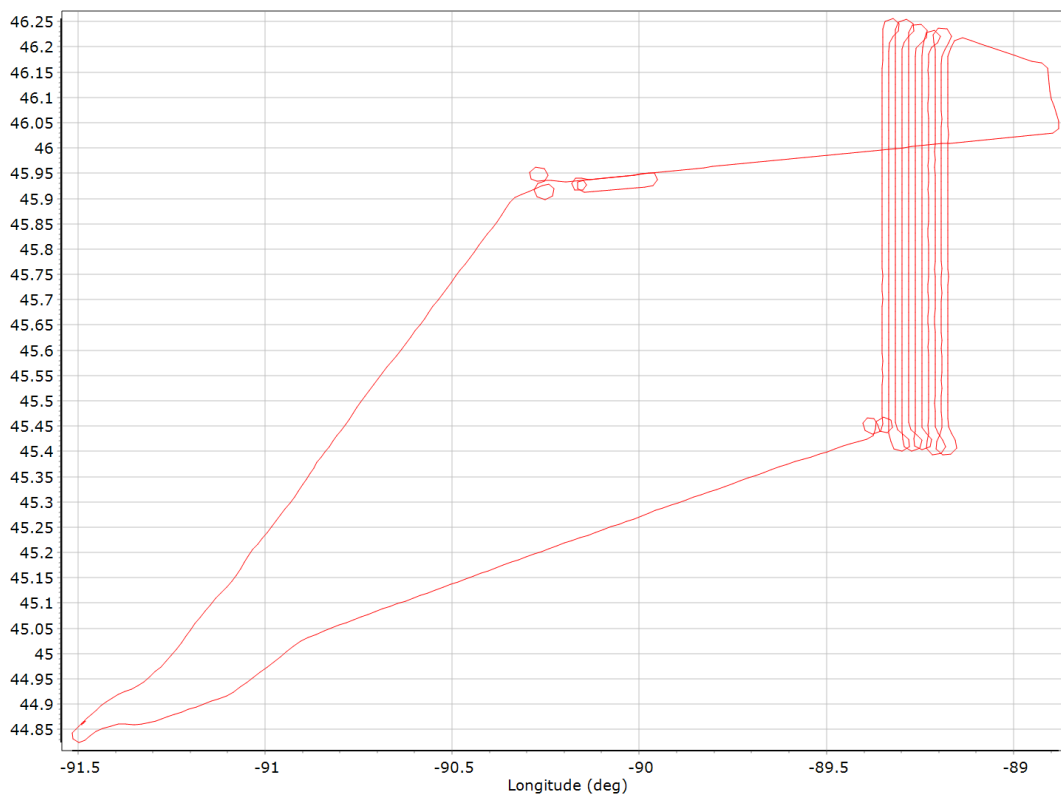


Body Angular Rate

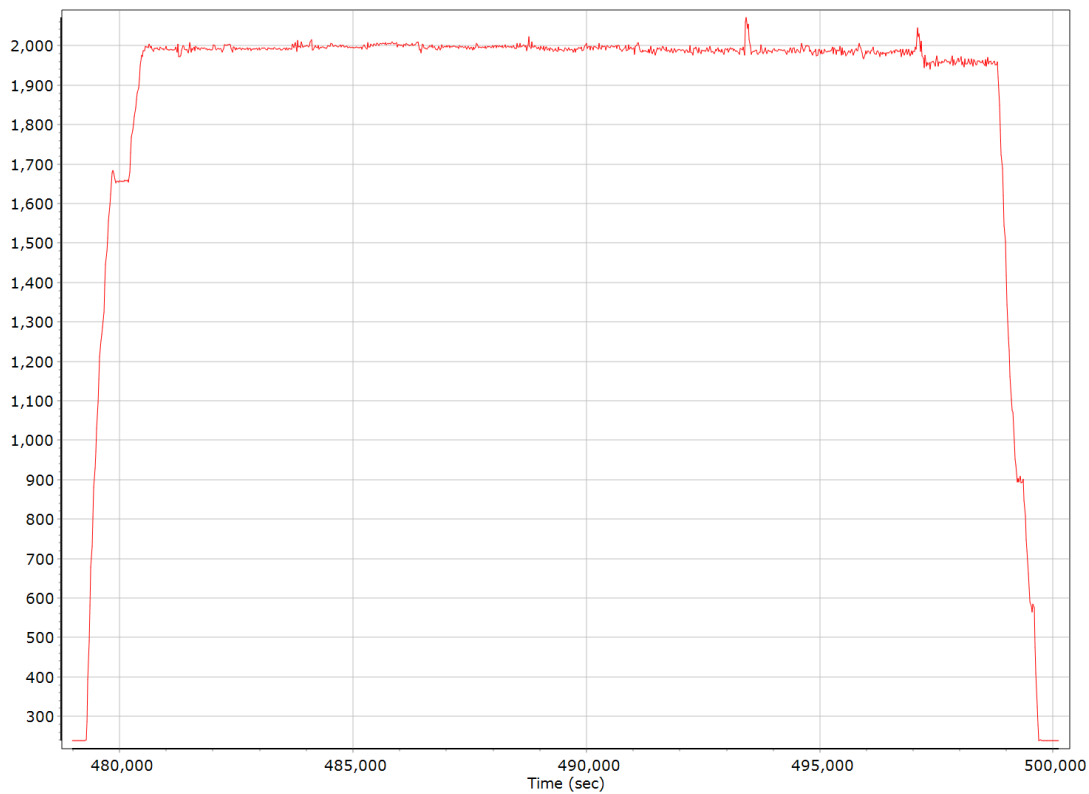


Forward Processed Trajectory Information

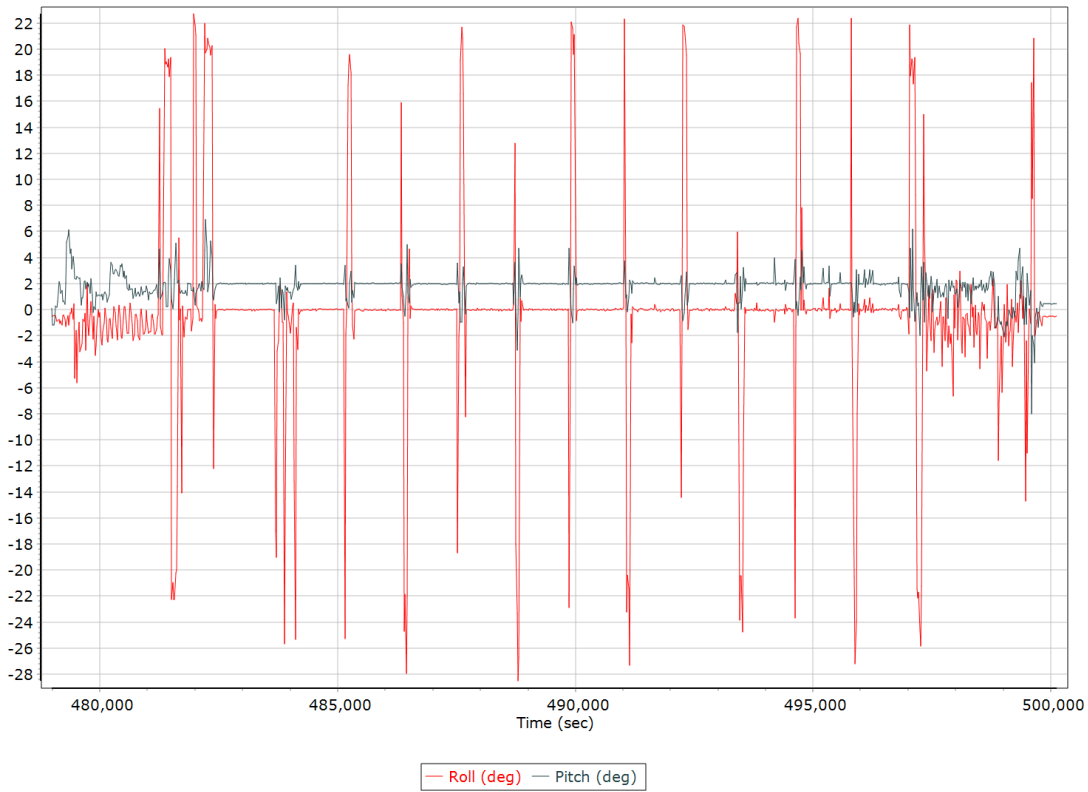
Top View



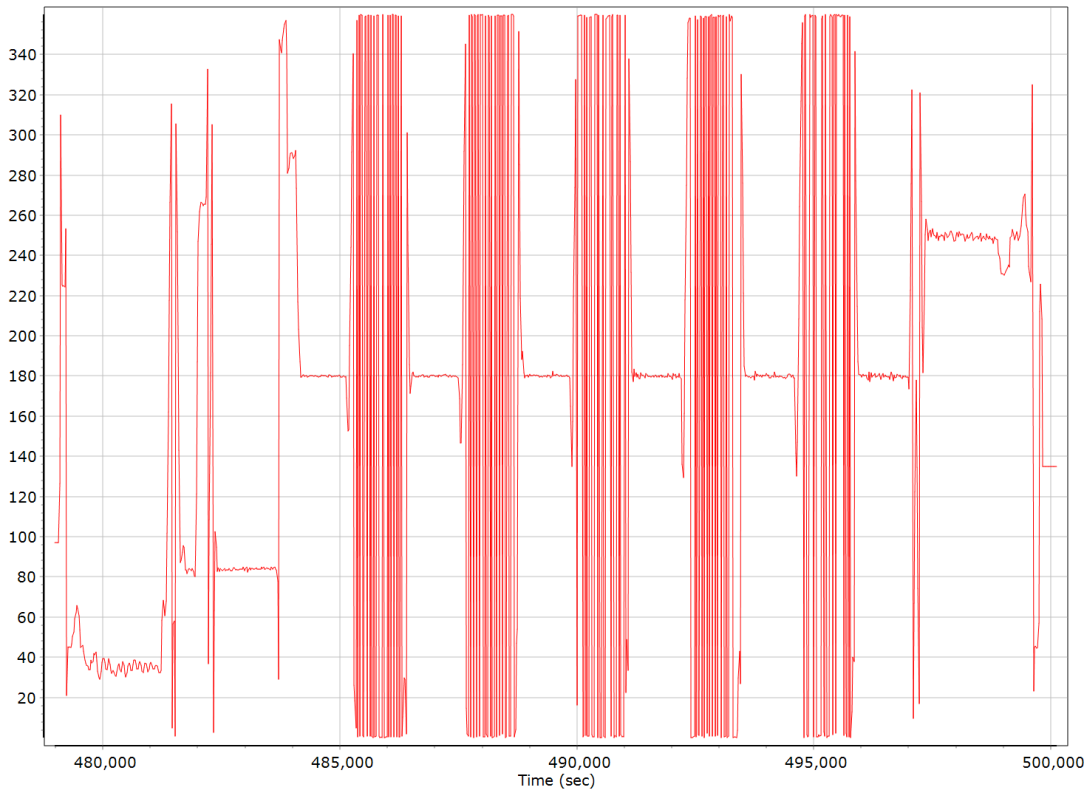
Altitude



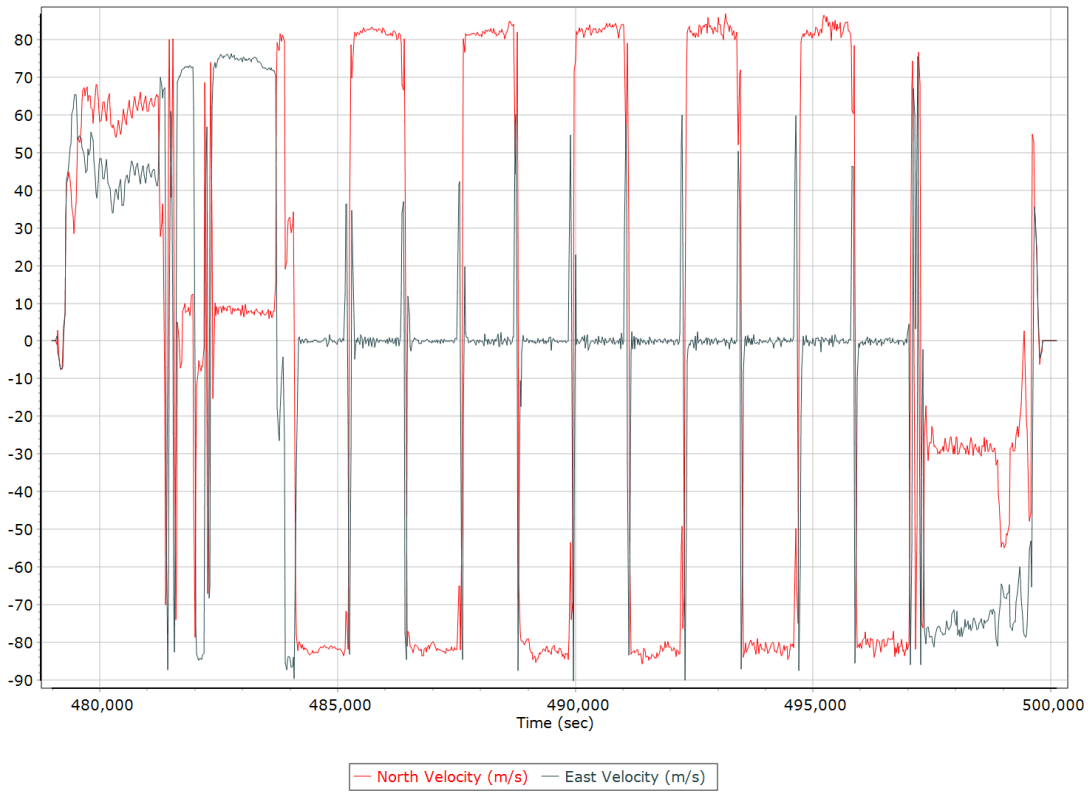
Roll/Pitch



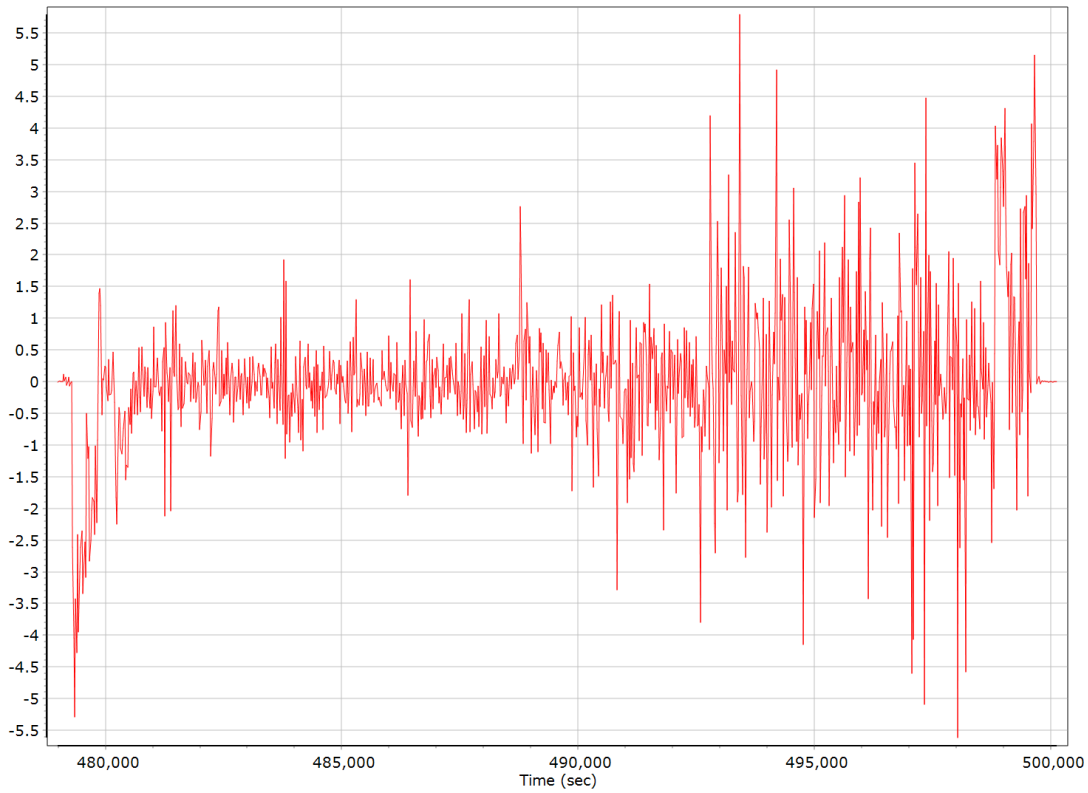
Heading



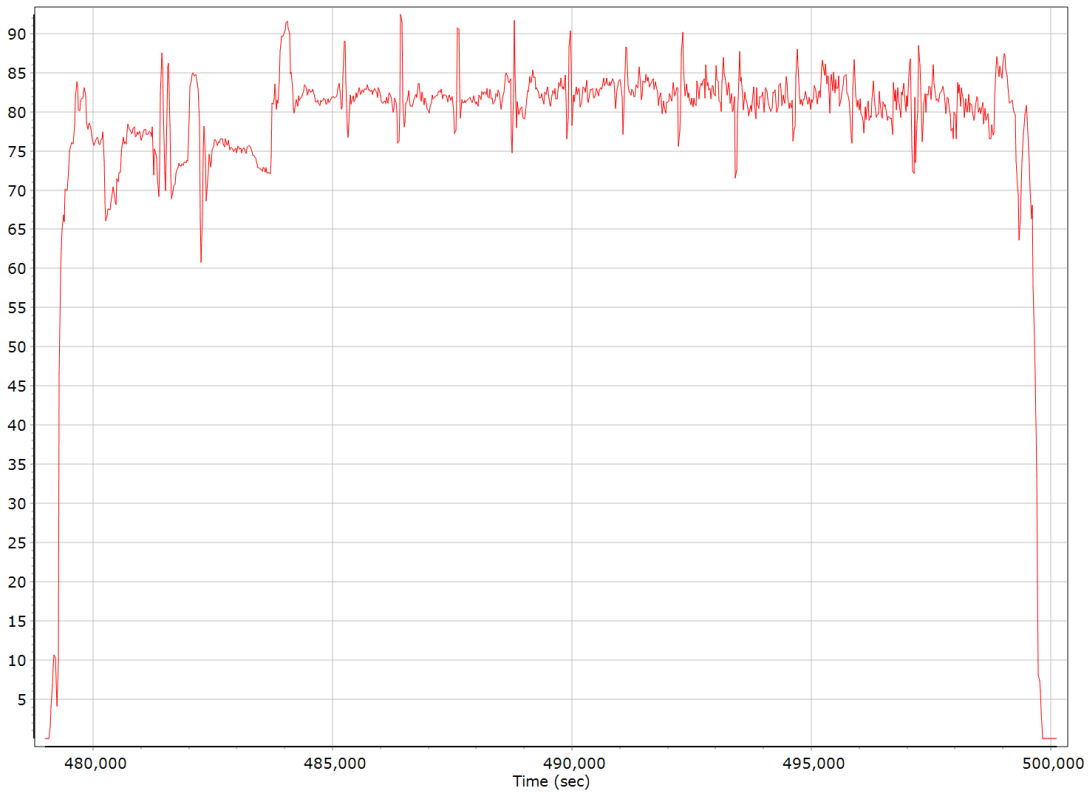
North/East Velocity



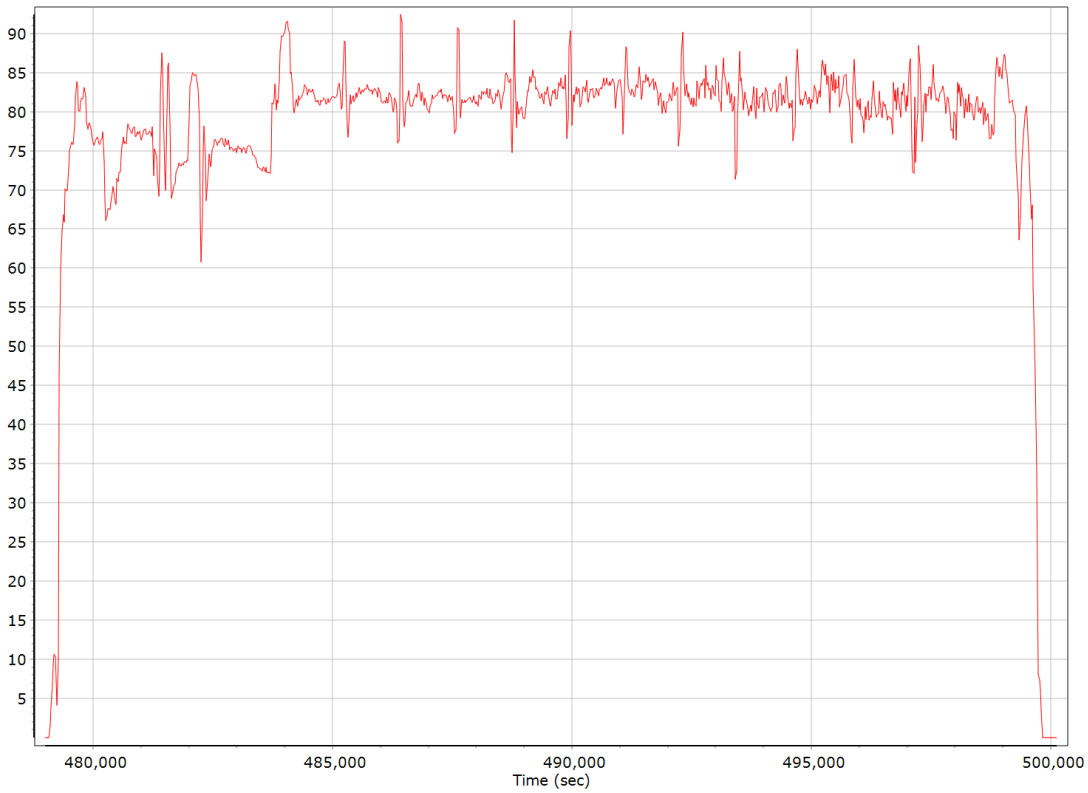
Down Velocity



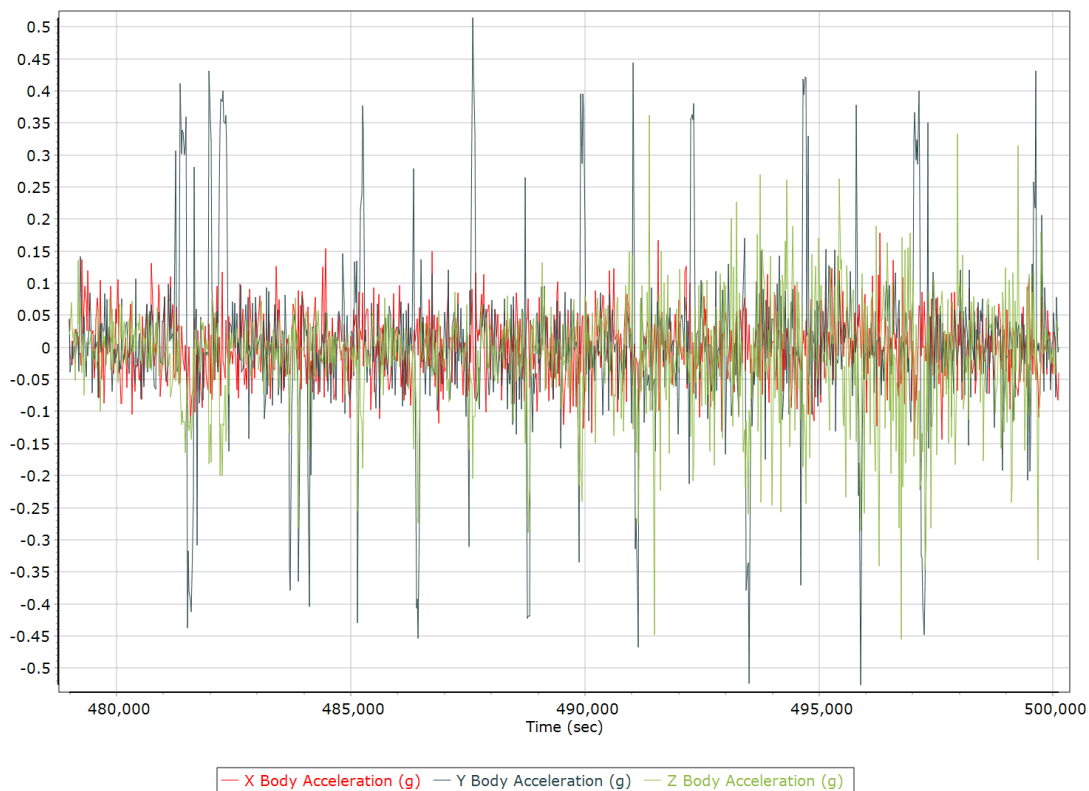
Total Speed



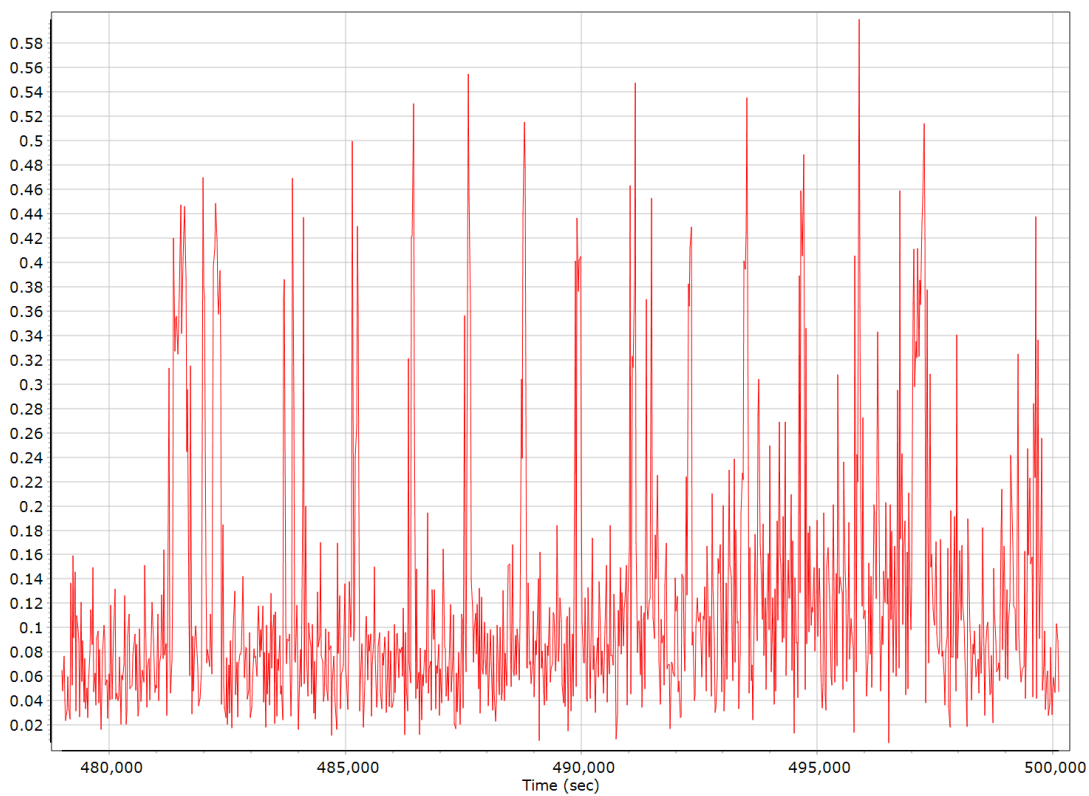
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

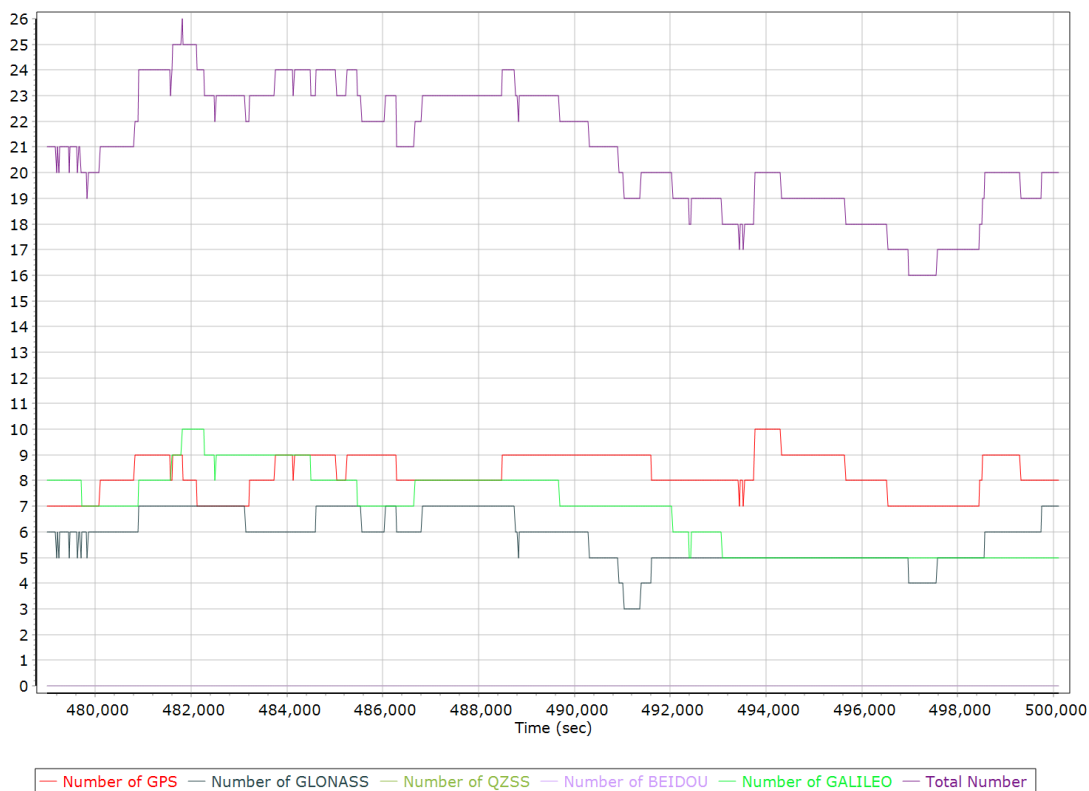


GNSS QC

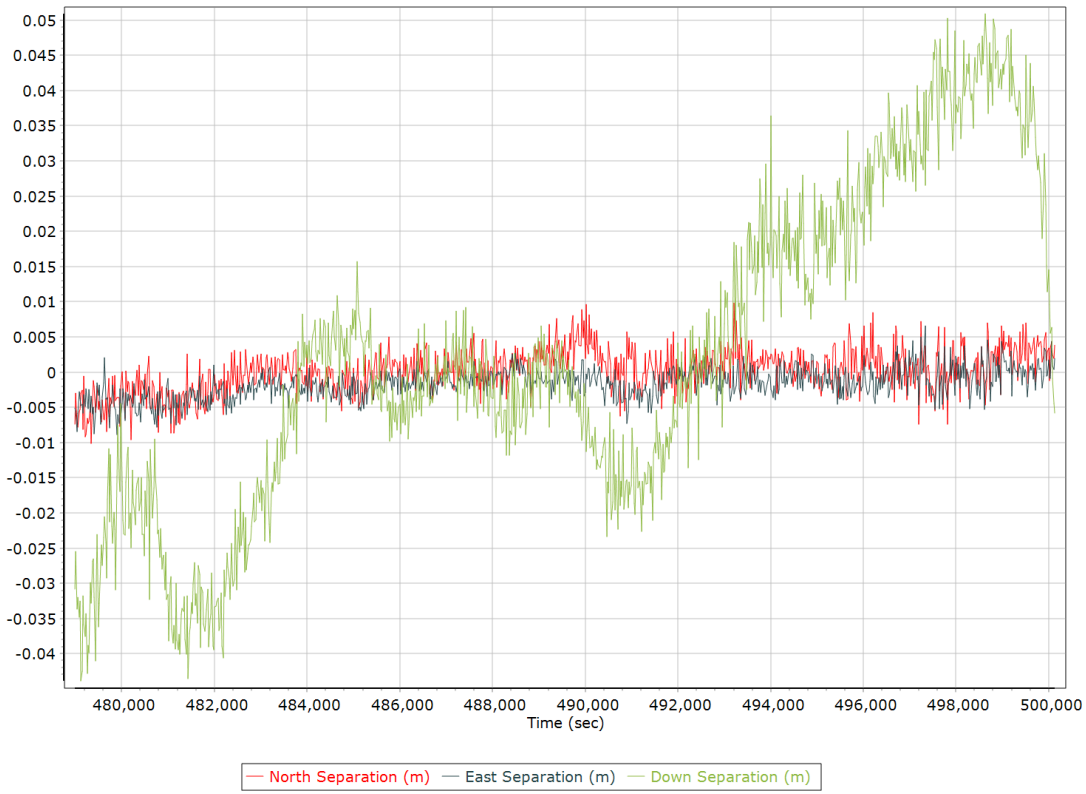
GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	0	7	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	5	10	7
Total number of SV	15	26	21
PDOP	0.94	1.67	1.15
QC Solution Gaps	1.00	1.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	21328.00	0.00	40.00
Percentage	99.81	0.00	0.19

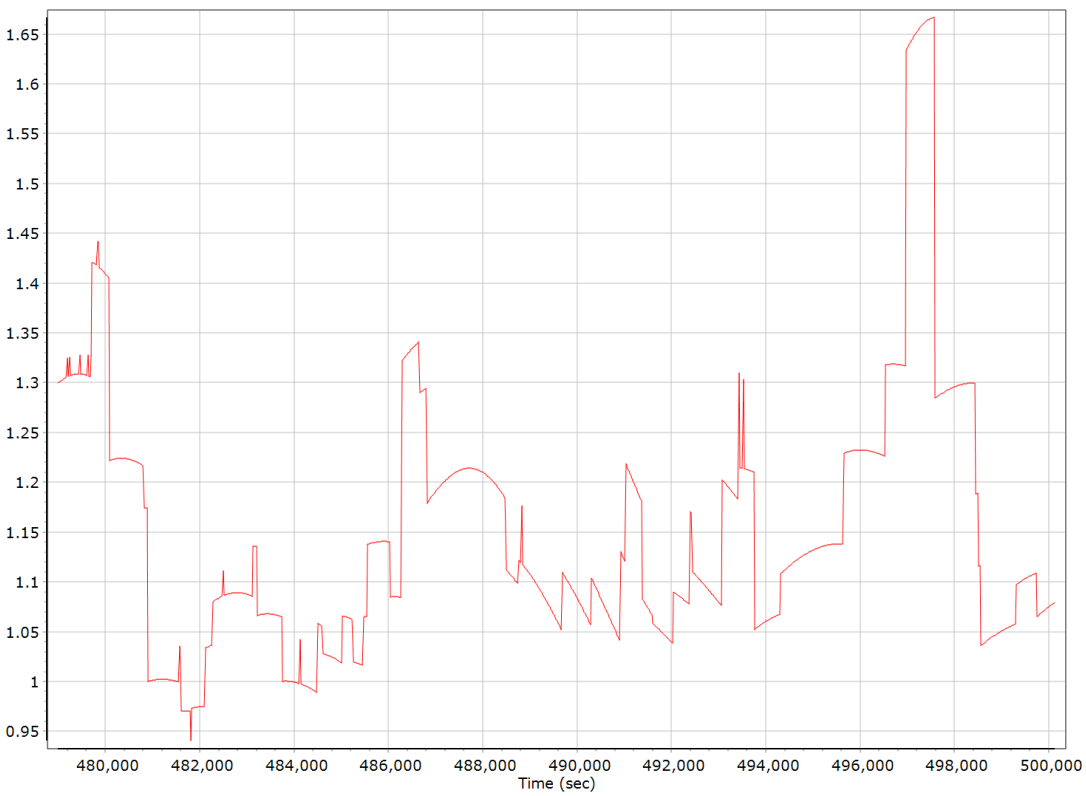
Num SVs in solution



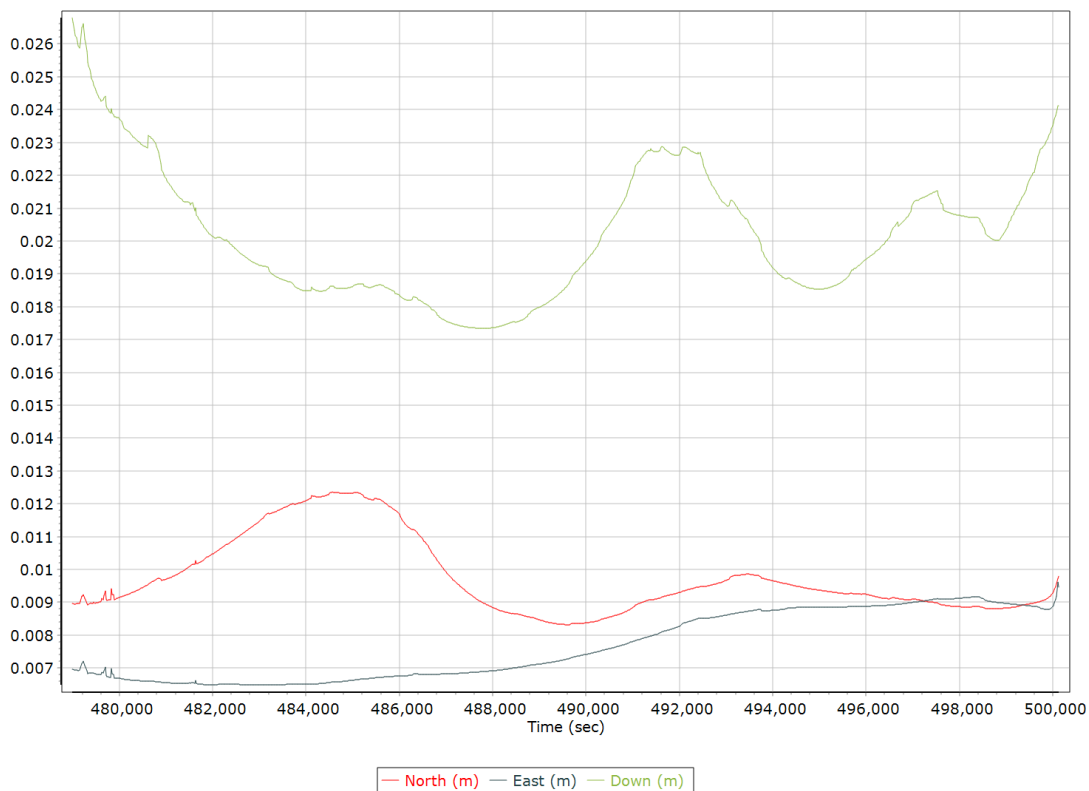
Forward/Reverse Separation



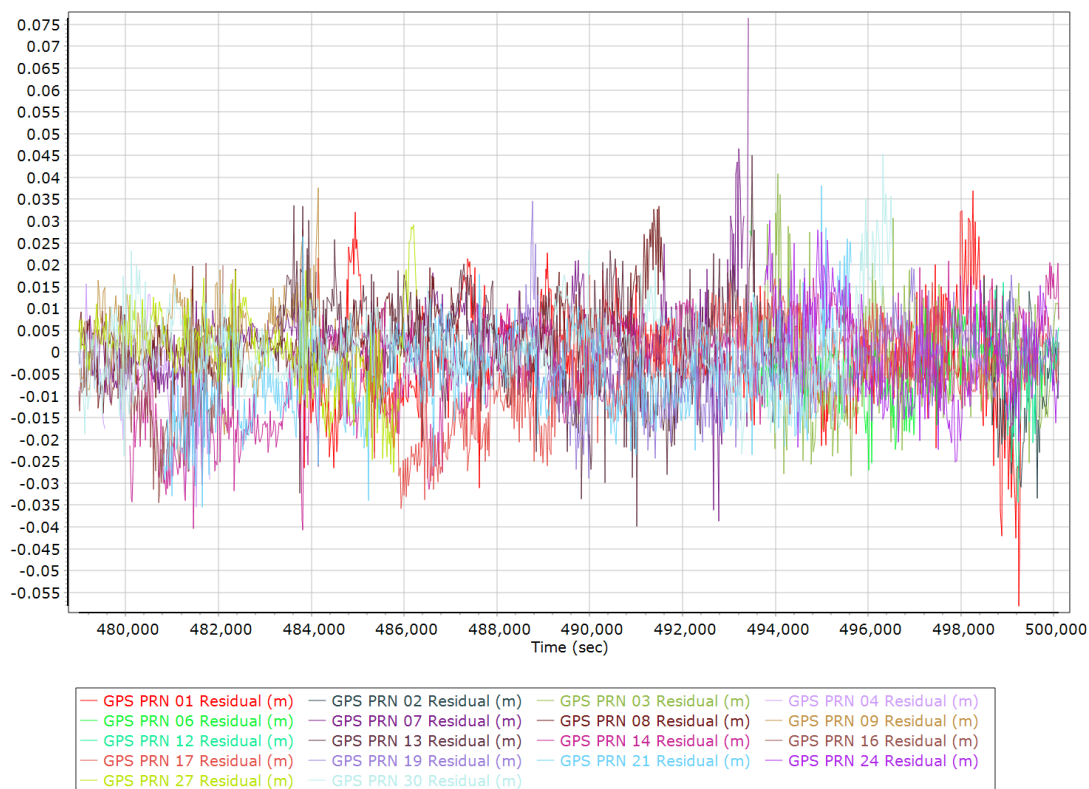
PDOP



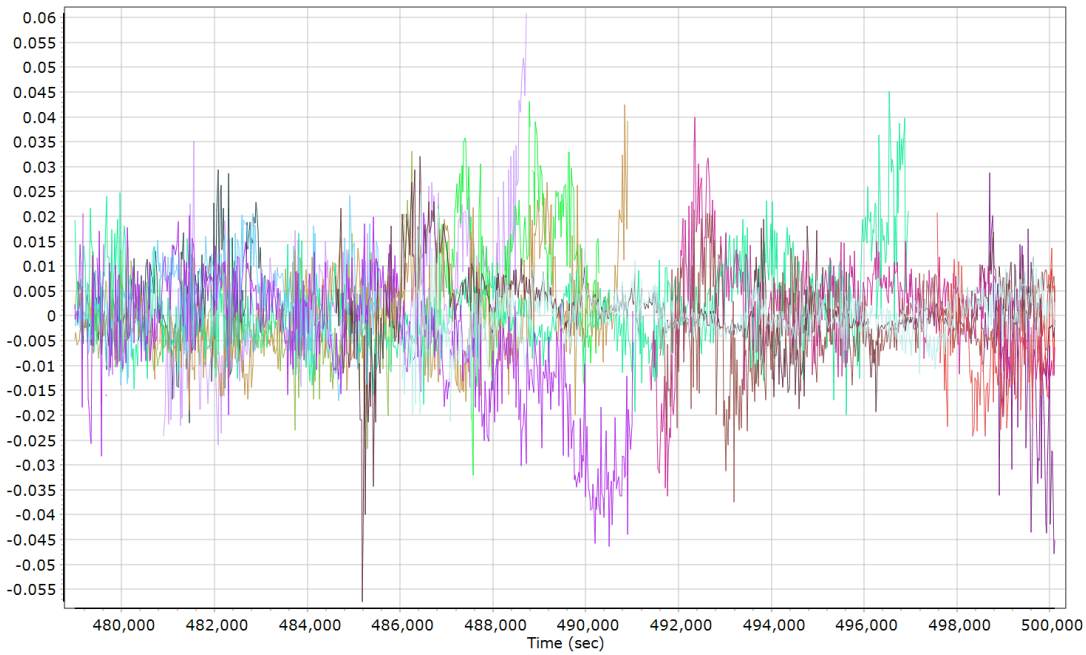
Estimated Position Accuracy



GPS Residuals

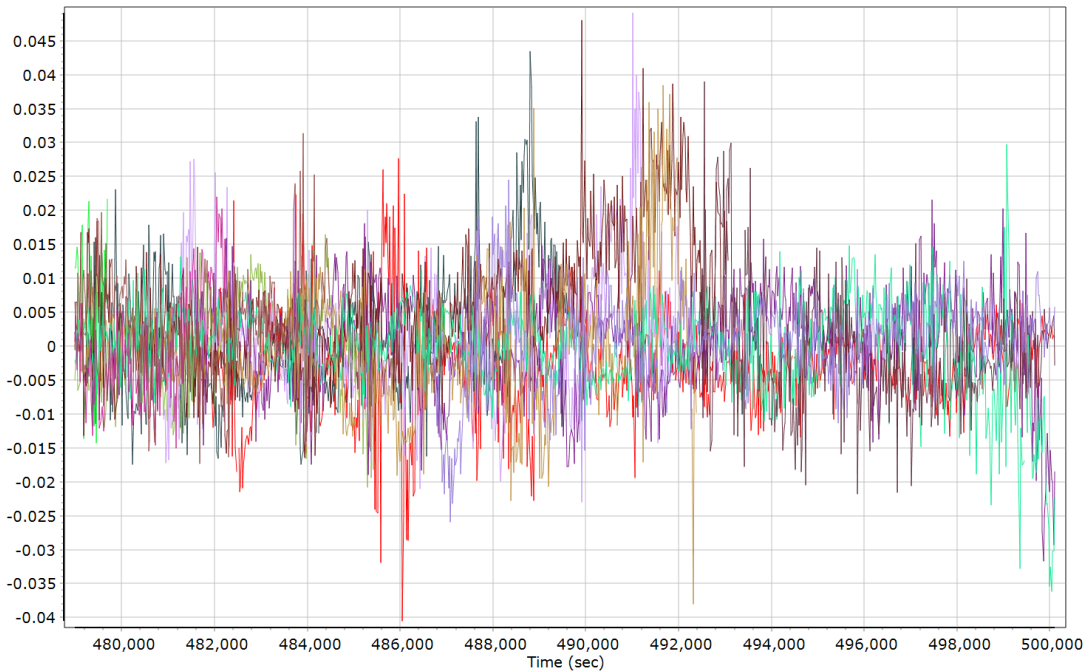


GLONASS Residuals



- | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GLONASS 01 Residual (m) | GLONASS 02 Residual (m) | GLONASS 03 Residual (m) | GLONASS 04 Residual (m) |
| GLONASS 05 Residual (m) | GLONASS 08 Residual (m) | GLONASS 11 Residual (m) | GLONASS 12 Residual (m) |
| GLONASS 13 Residual (m) | GLONASS 14 Residual (m) | GLONASS 15 Residual (m) | GLONASS 17 Residual (m) |
| GLONASS 18 Residual (m) | GLONASS 20 Residual (m) | GLONASS 21 Residual (m) | GLONASS 22 Residual (m) |
| GLONASS 23 Residual (m) | GLONASS 24 Residual (m) | | |

GALILEO Residuals



- | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GALILEO 02 Residual (m) | GALILEO 03 Residual (m) | GALILEO 05 Residual (m) | GALILEO 08 Residual (m) |
| GALILEO 09 Residual (m) | GALILEO 11 Residual (m) | GALILEO 12 Residual (m) | GALILEO 24 Residual (m) |
| GALILEO 25 Residual (m) | GALILEO 30 Residual (m) | GALILEO 31 Residual (m) | GALILEO 33 Residual (m) |
| GALILEO 34 Residual (m) | GALILEO 36 Residual (m) | | |

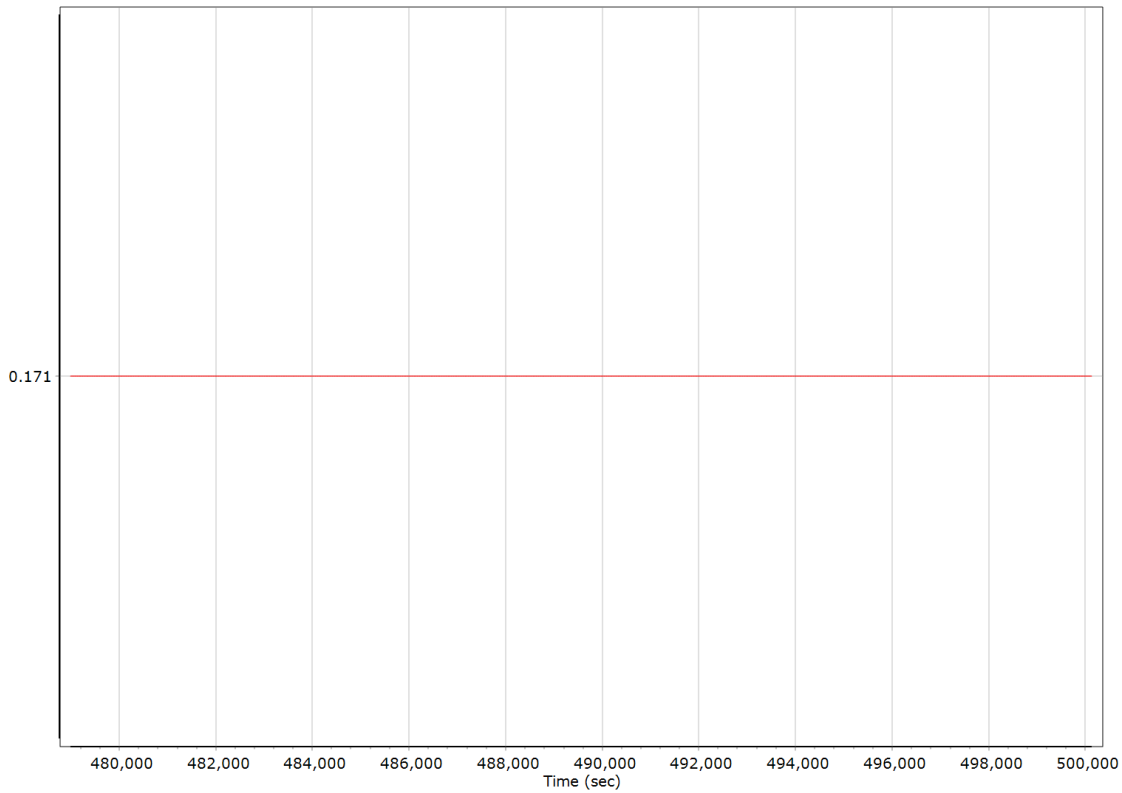
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	478721.000 (5/6/2022 12:58:41 PM)		
Processing end time	500136.000 (5/6/2022 6:55:36 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.171	-0.238	-1.273
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

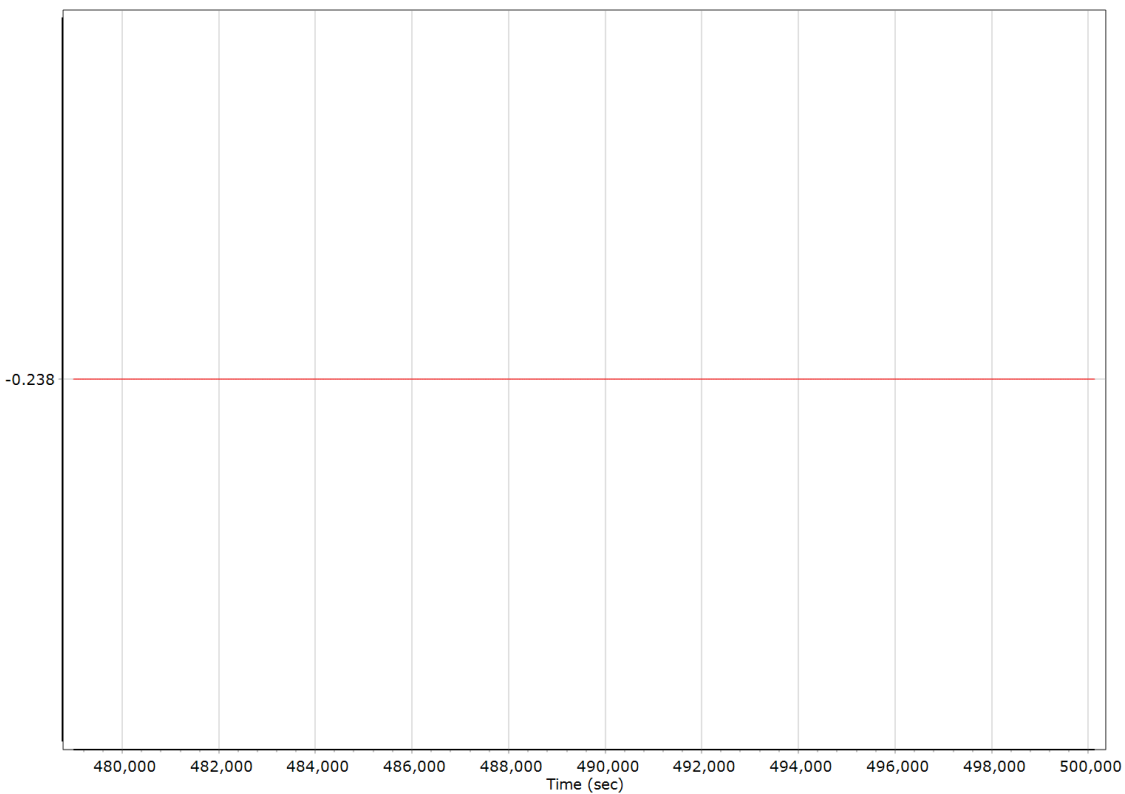
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

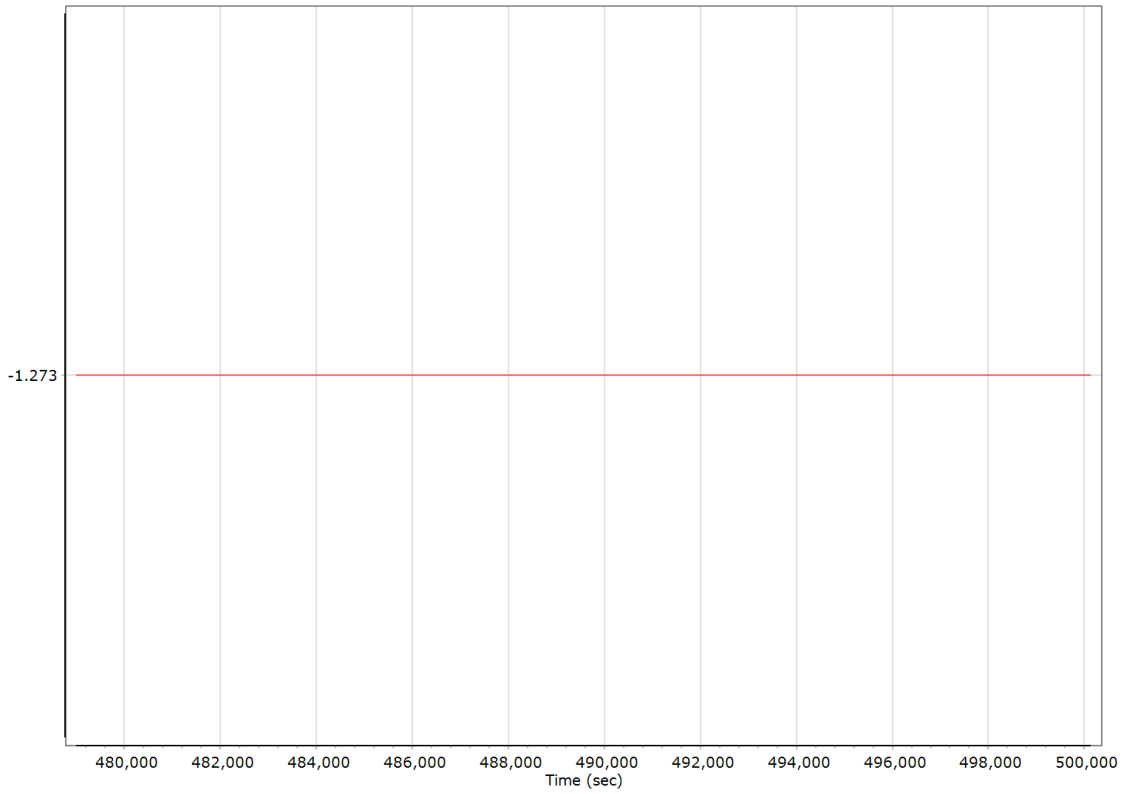
X Reference-Primary GNSS Lever Arm (m)



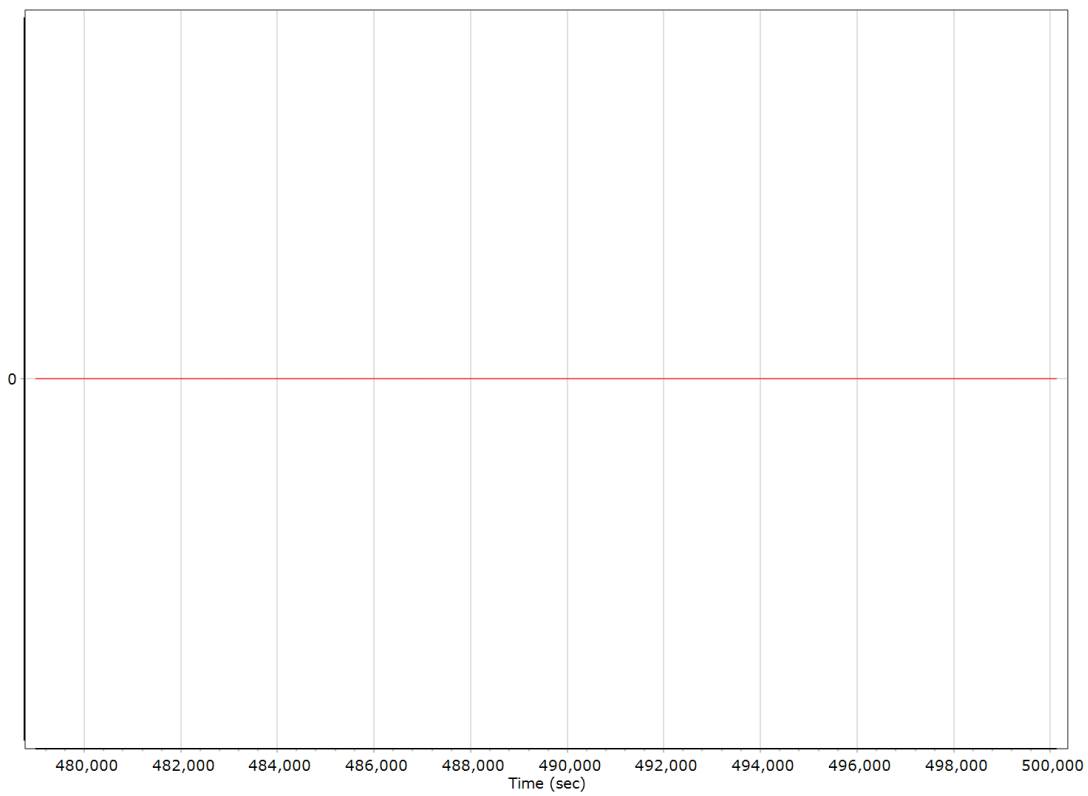
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



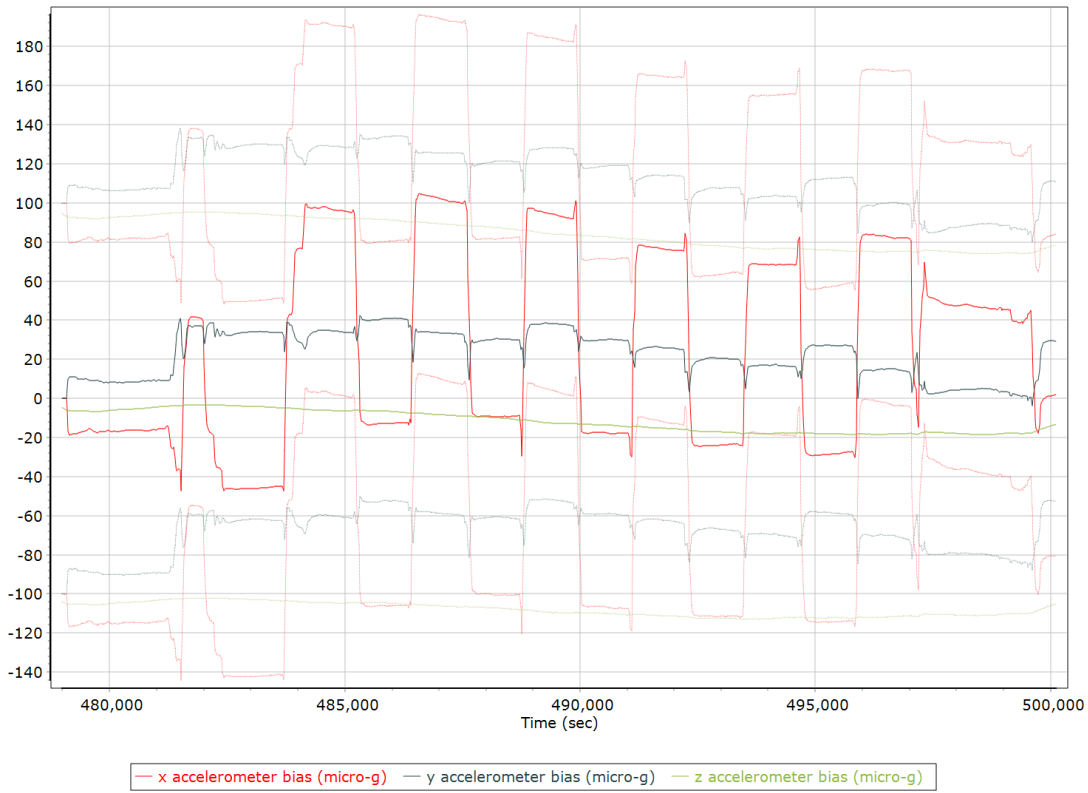
Reference-Primary GNSS Lever Arm Figure of Merit



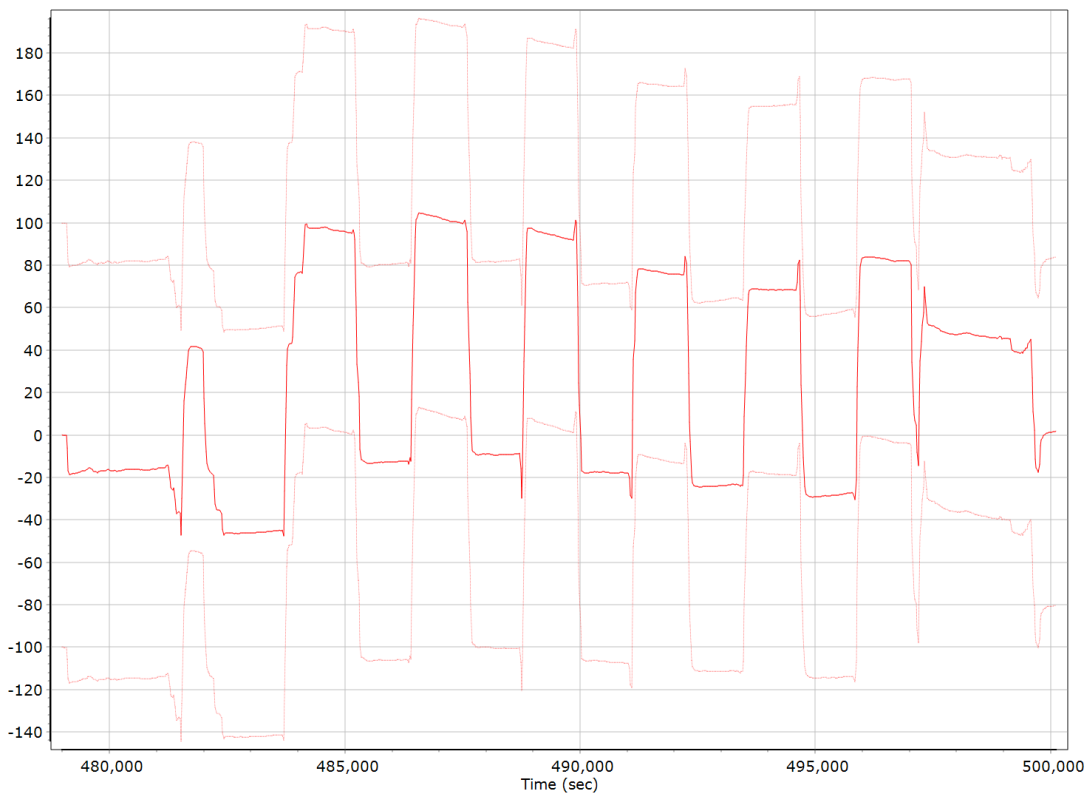
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

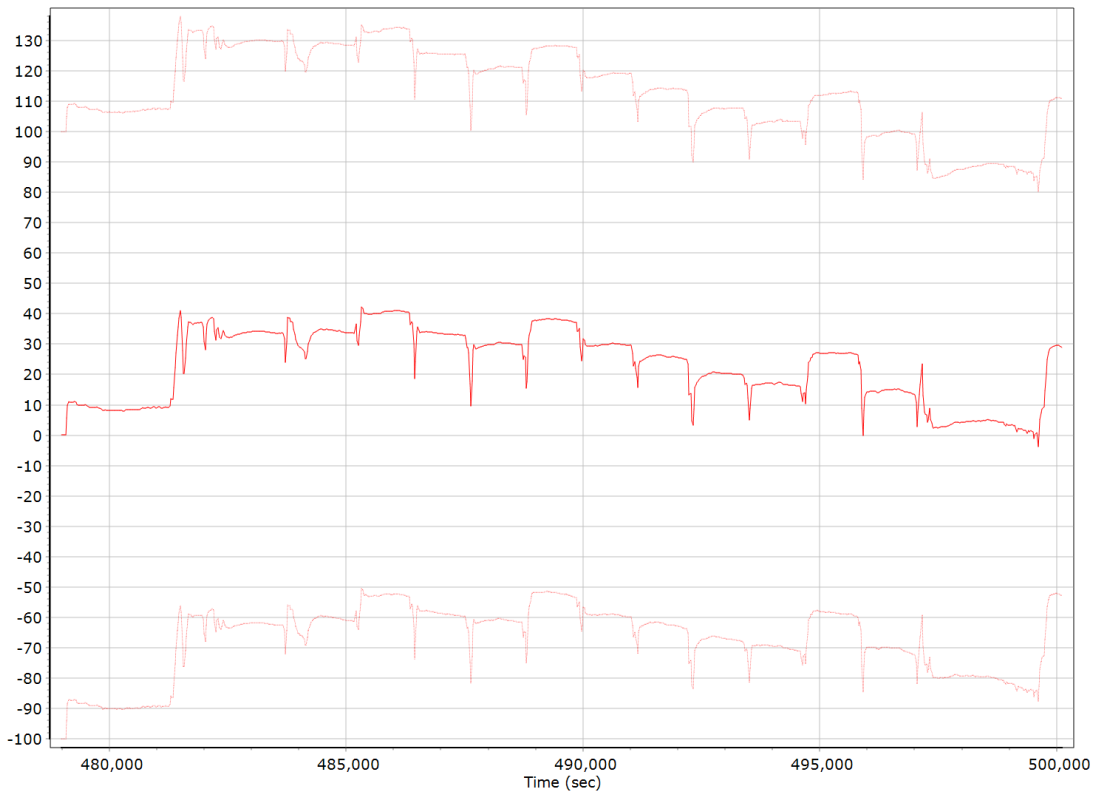
Accelerometer Bias (micro-g)



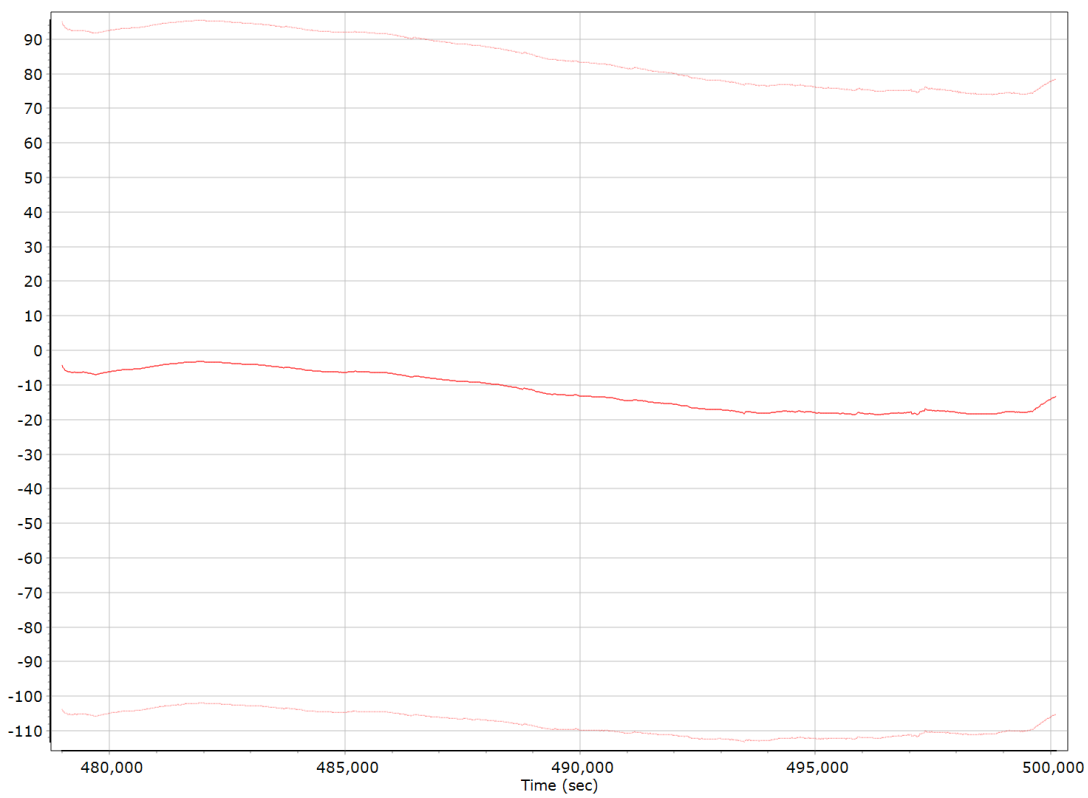
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



Y Accelerometer Scale Error (ppm)



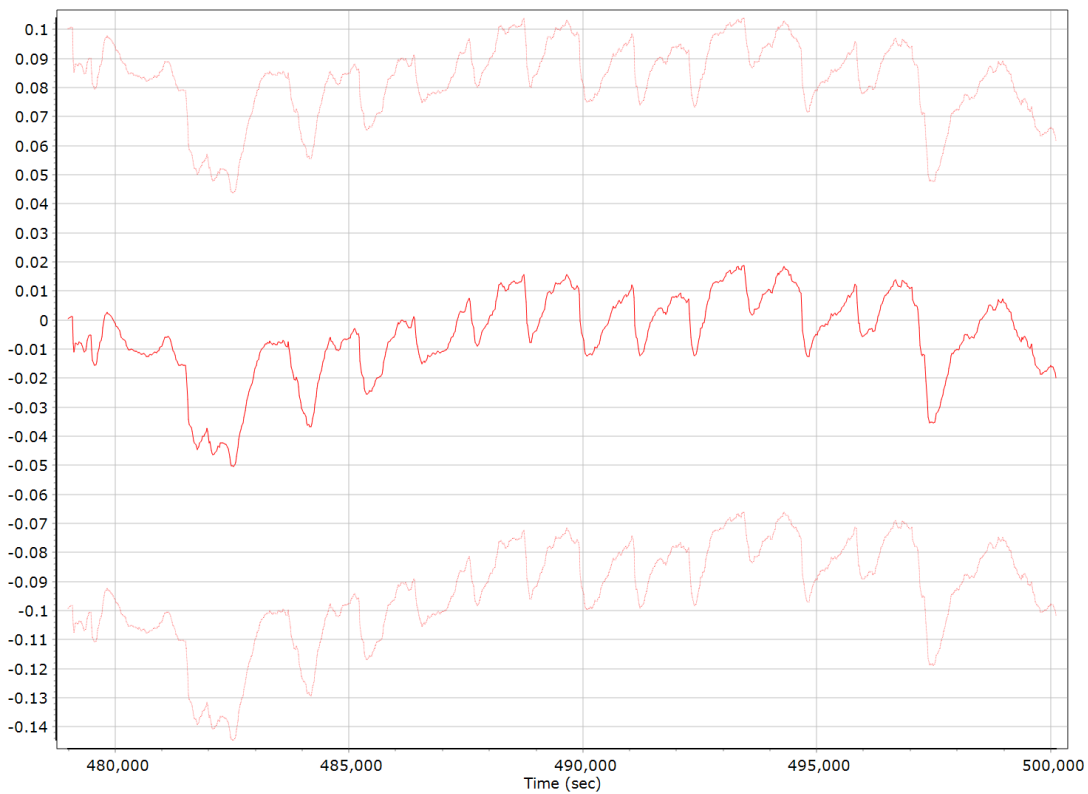
Z Accelerometer Scale Error (ppm)



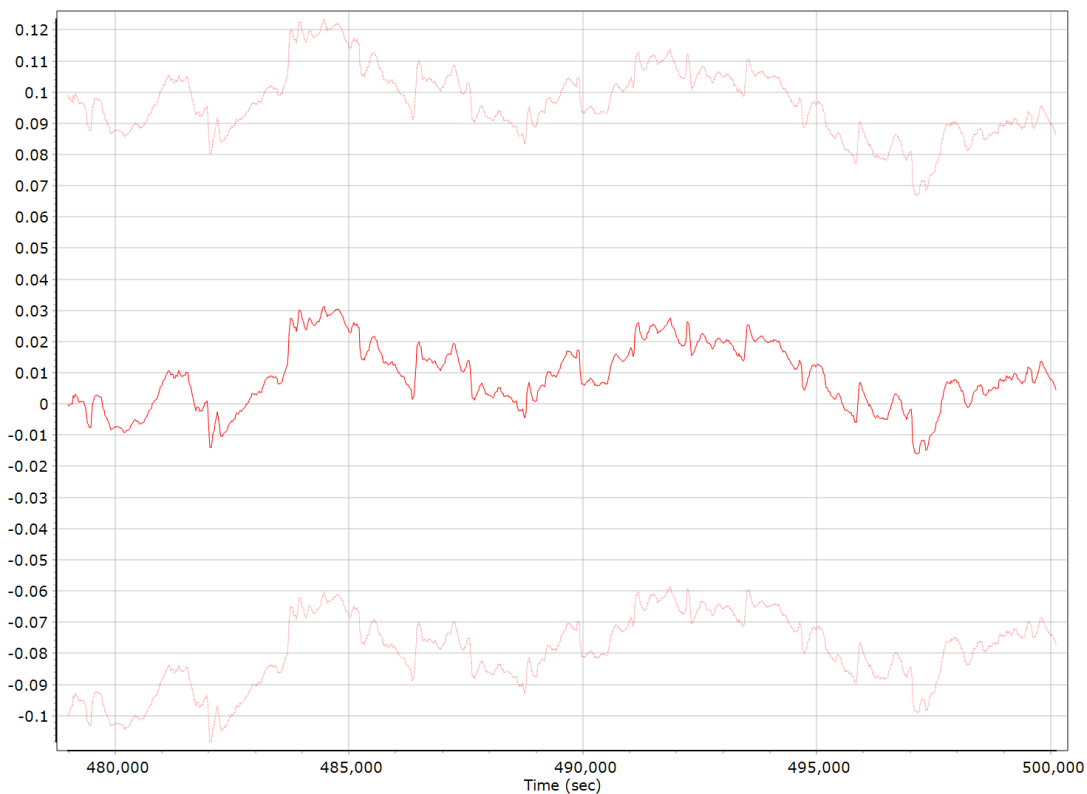
Gyro Bias (deg/h)



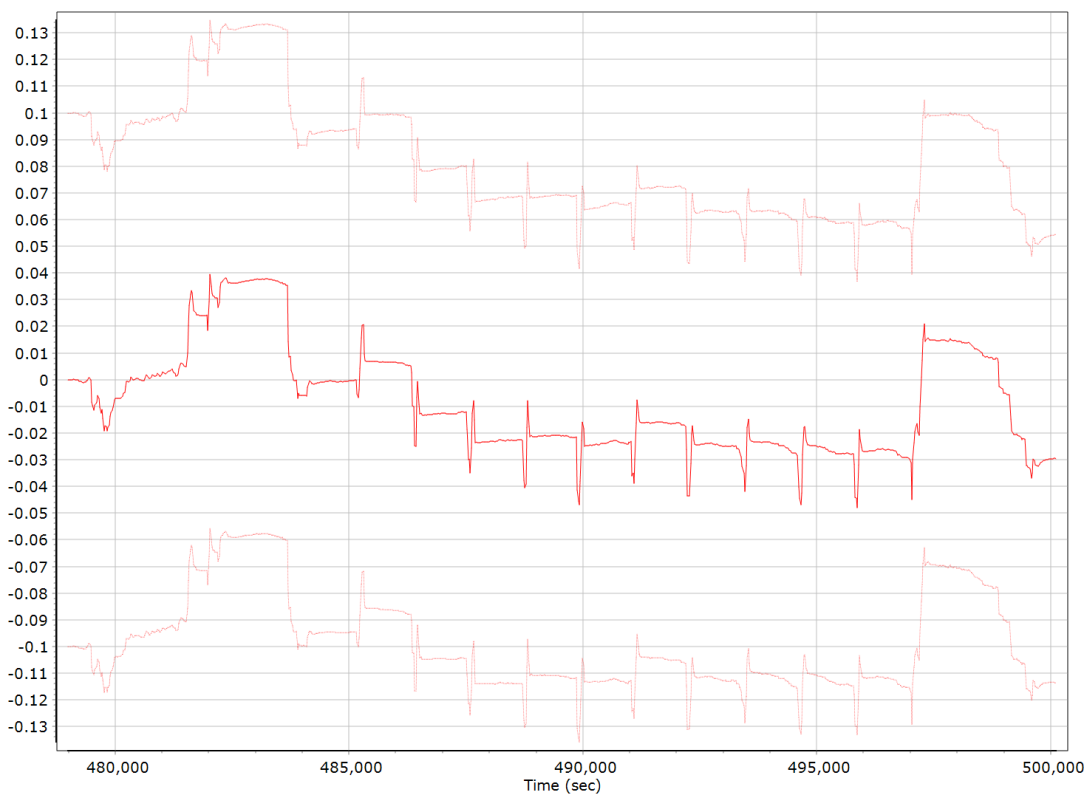
X Gyro Bias (deg/h)



Y Gyro Bias (deg/h)



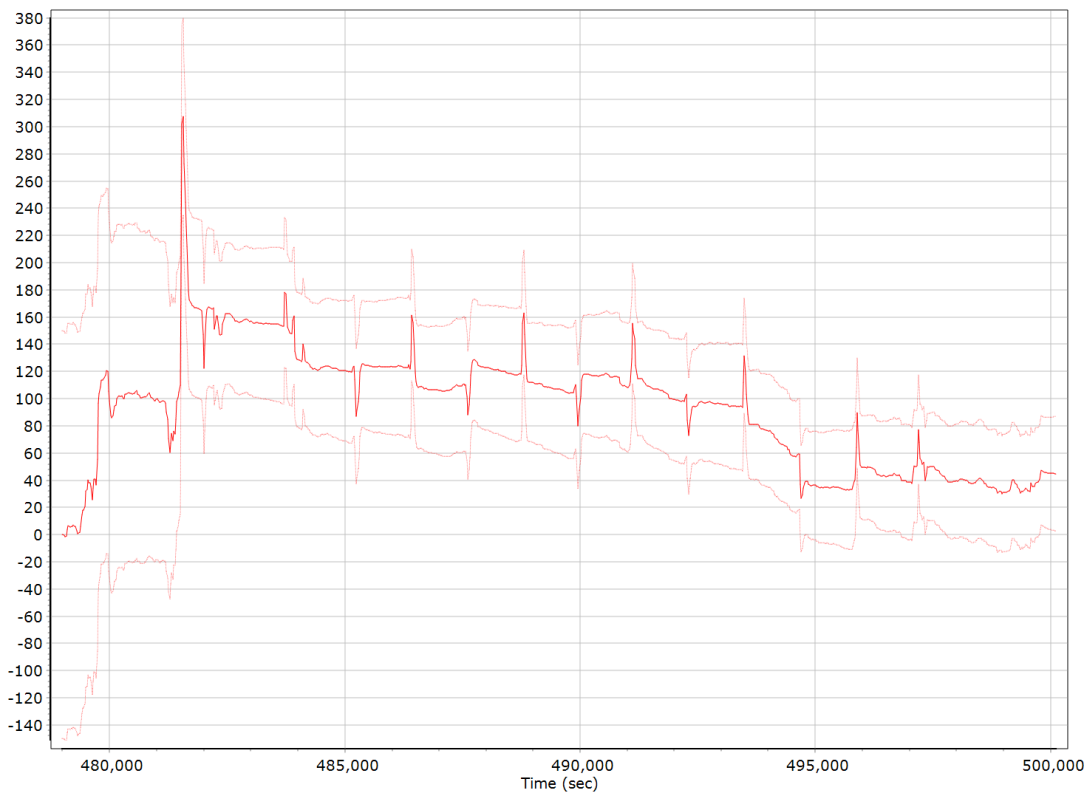
Z Gyro Bias (deg/h)



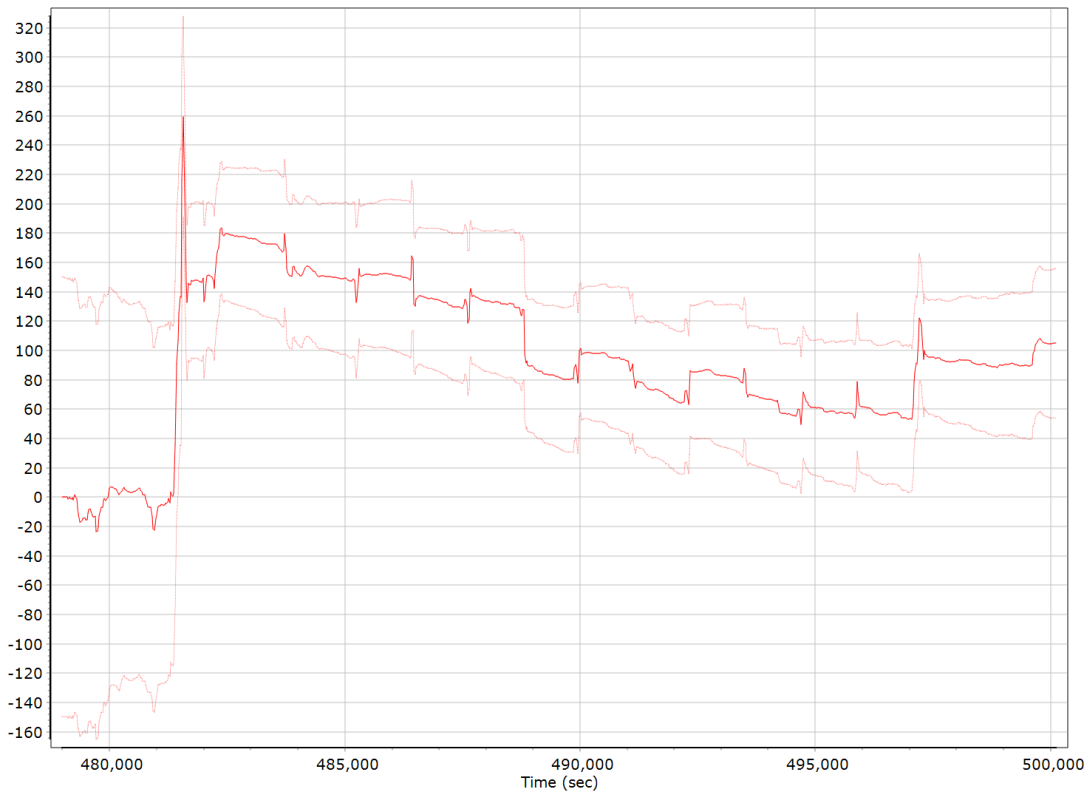
Gyro Scale Error (ppm)



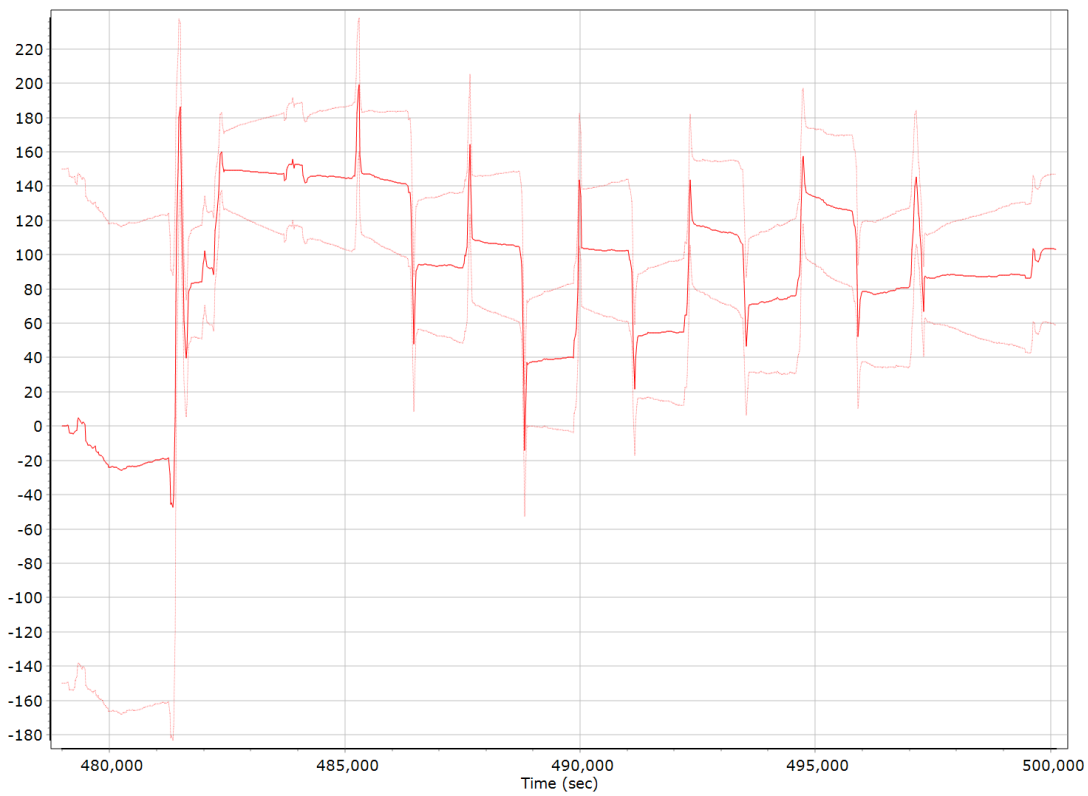
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

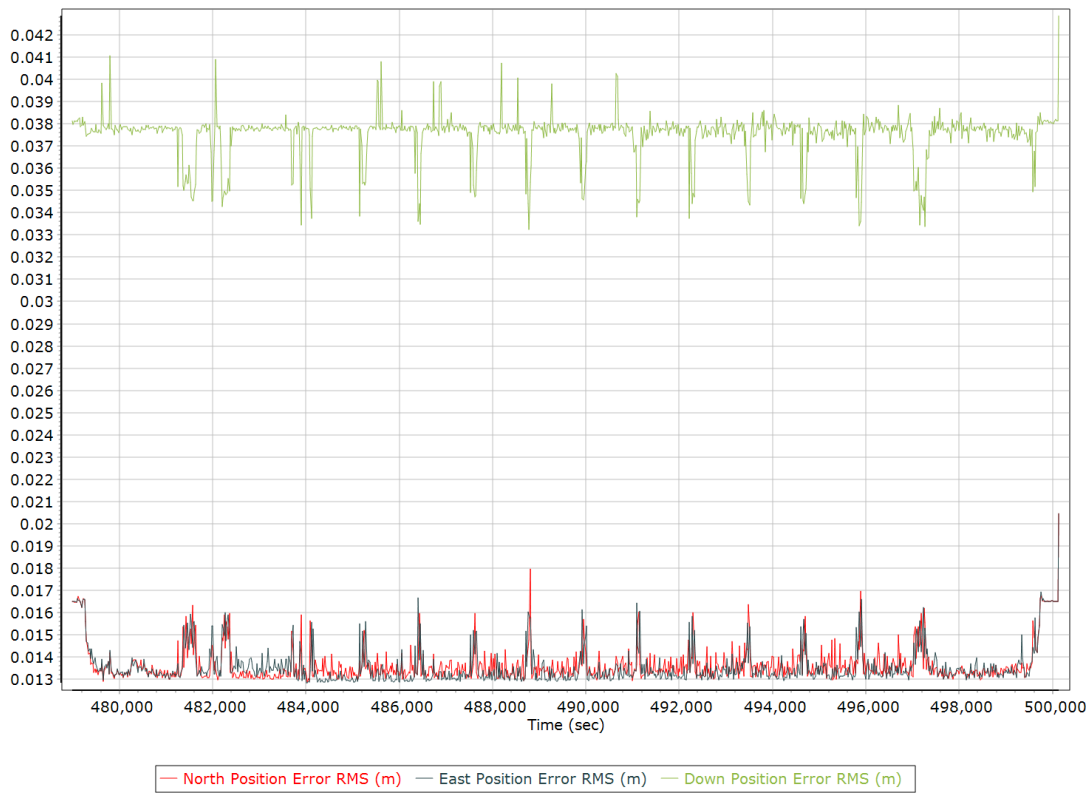


Z Gyro Scale Error (ppm)

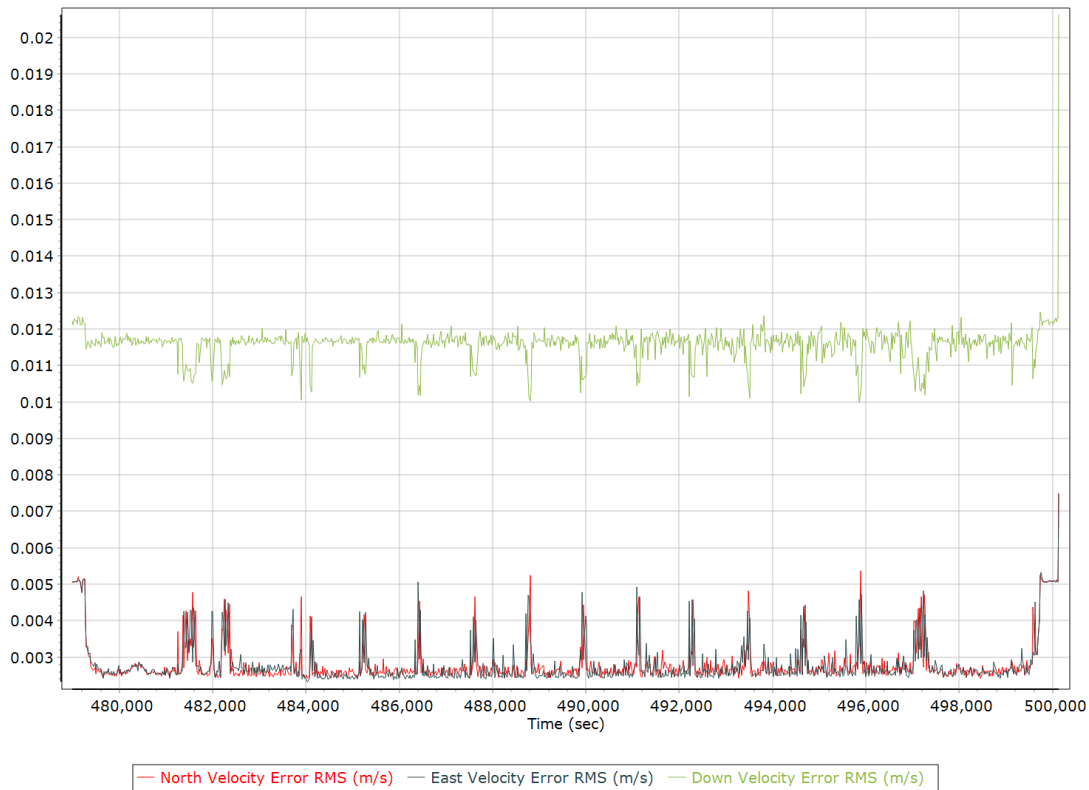


Smoothed Performance Metrics

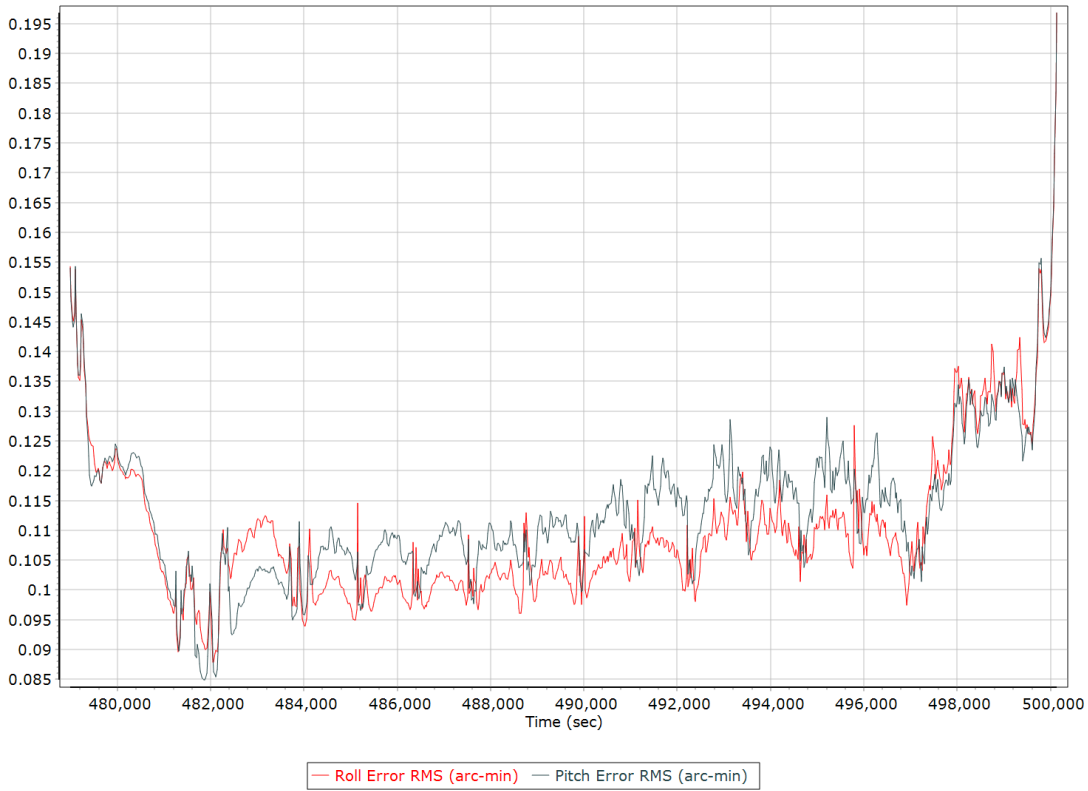
Position Error RMS (m)



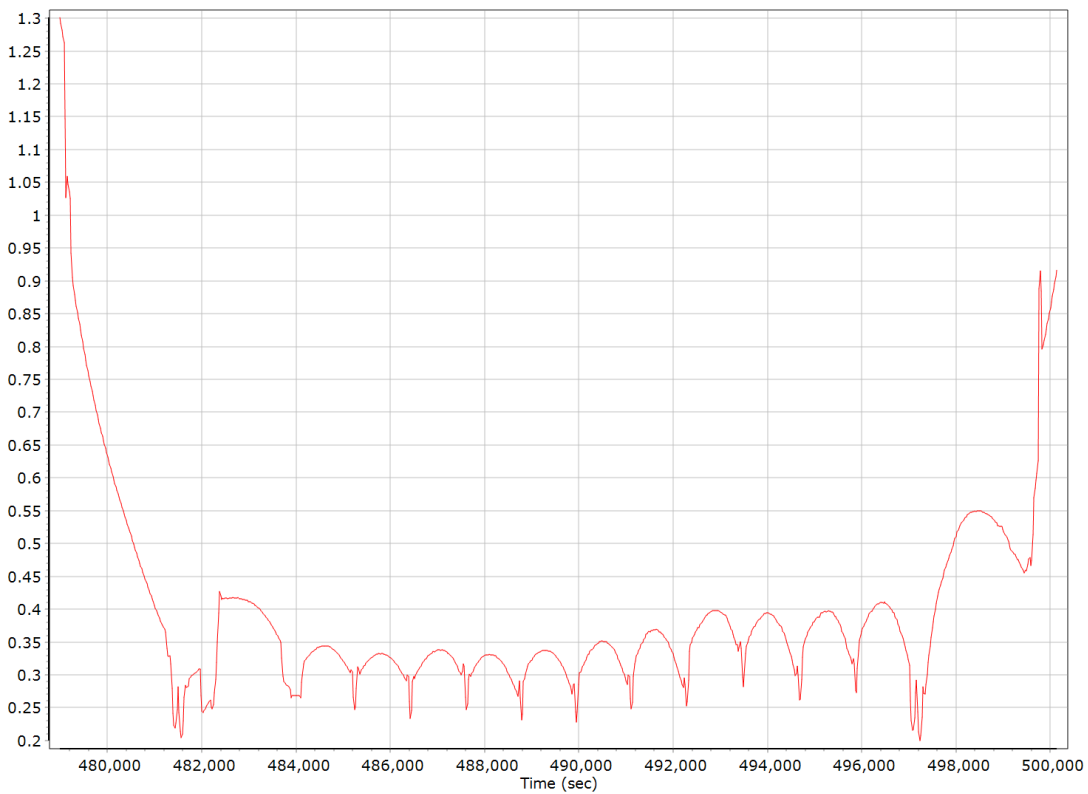
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

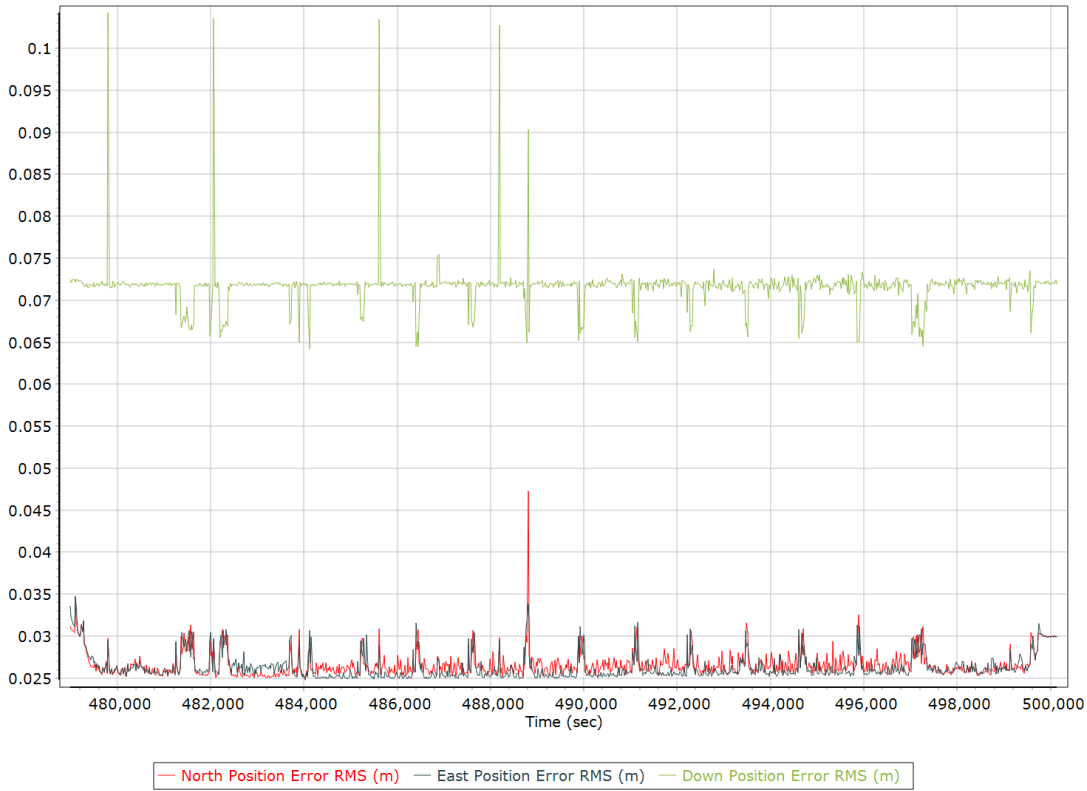


Heading Error RMS (arc-min)

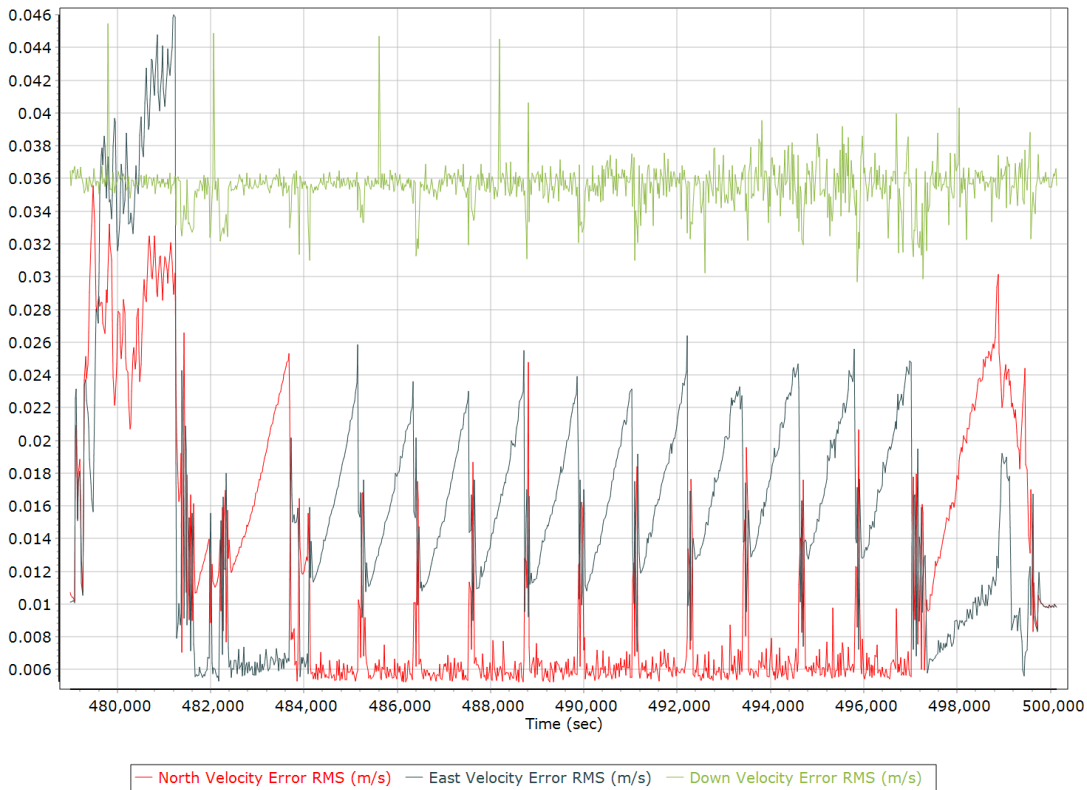


Forward Processed Performance Metrics

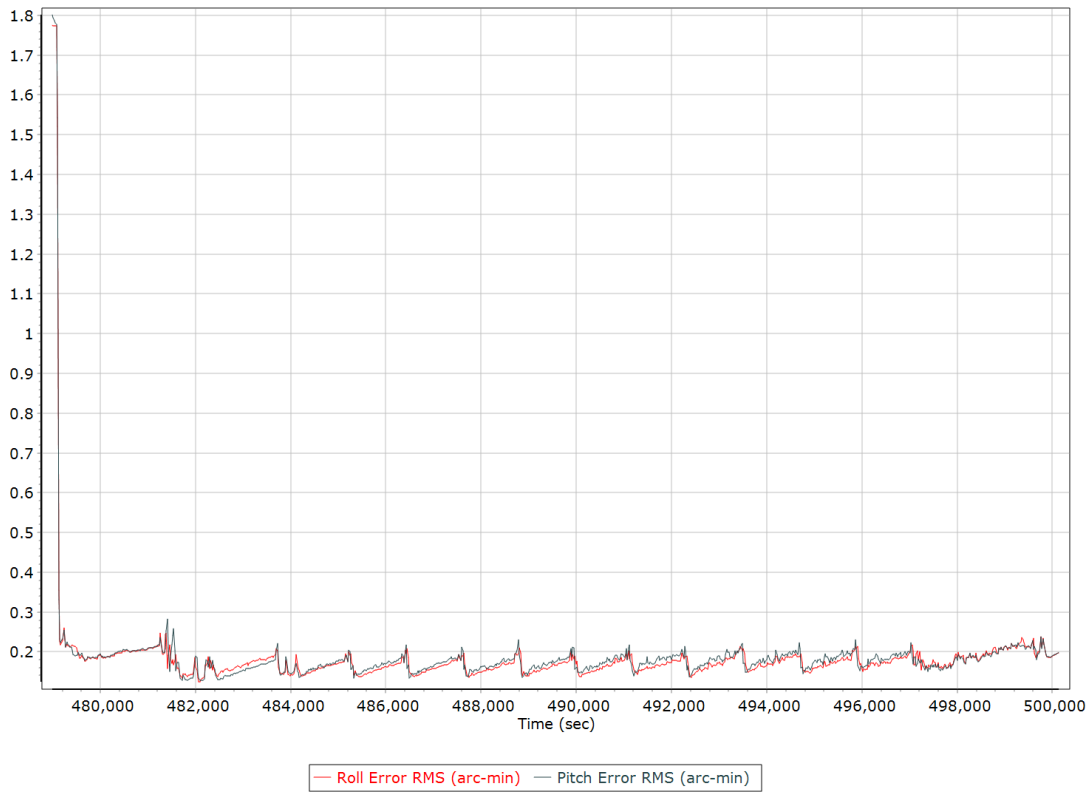
Position Error RMS (m)



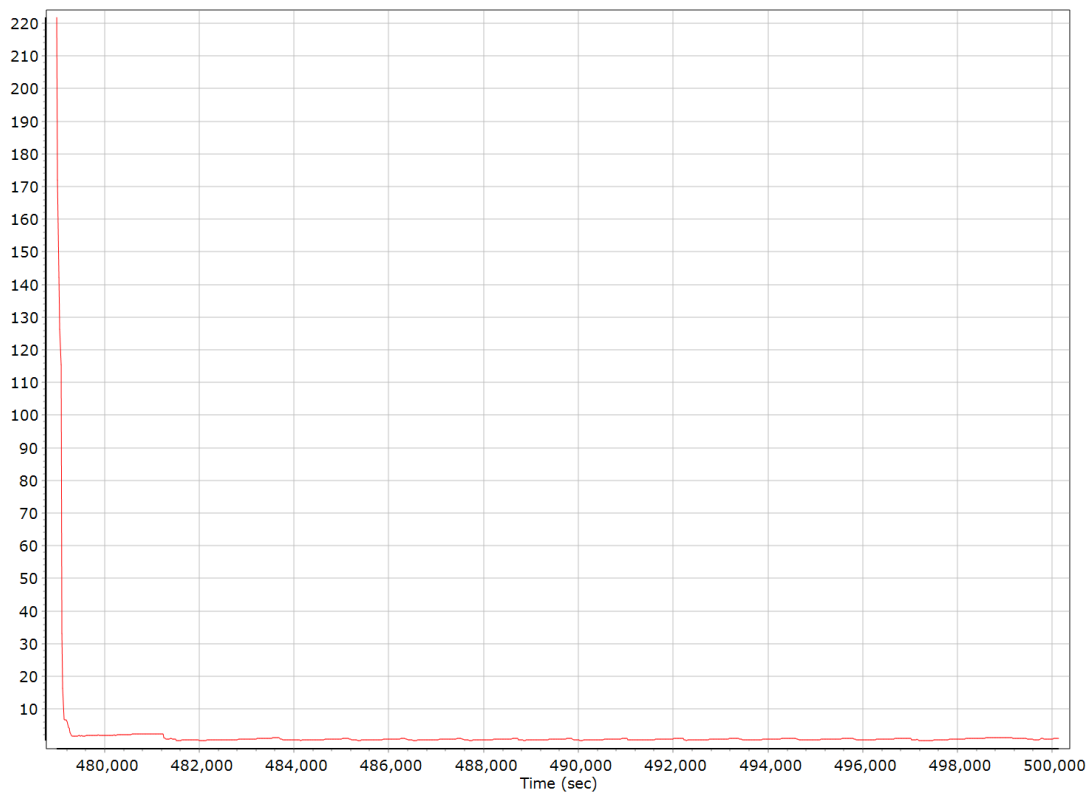
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

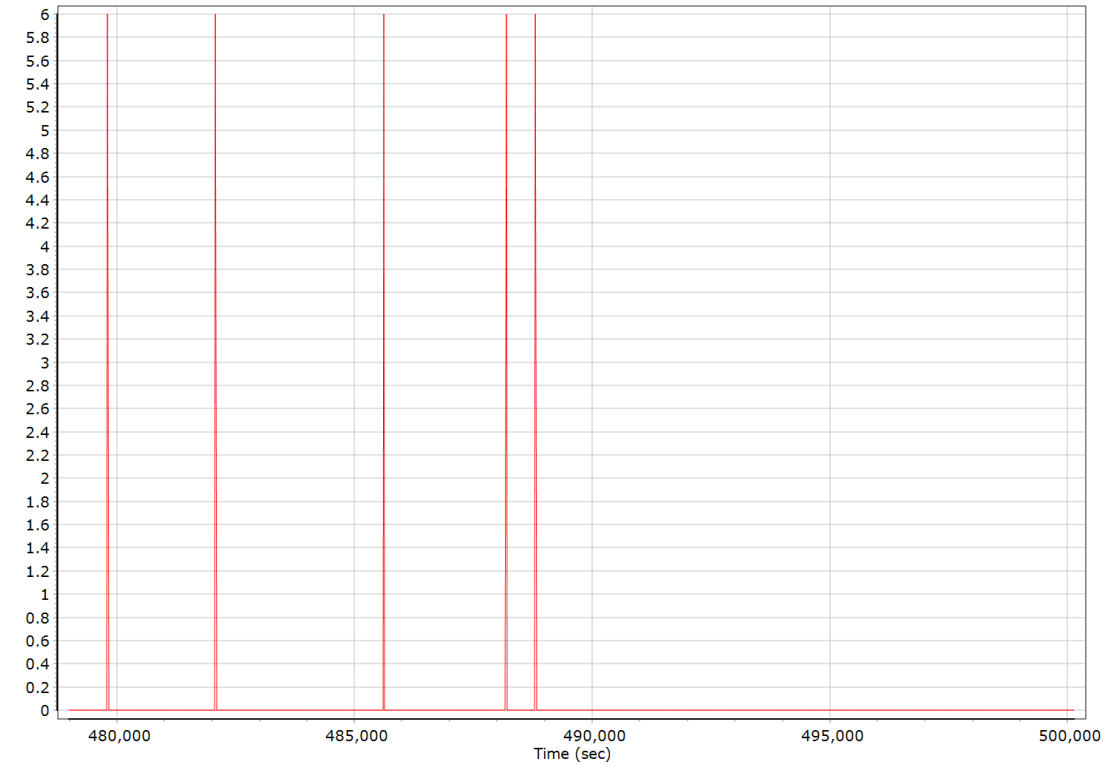


Heading Error RMS (arc-min)



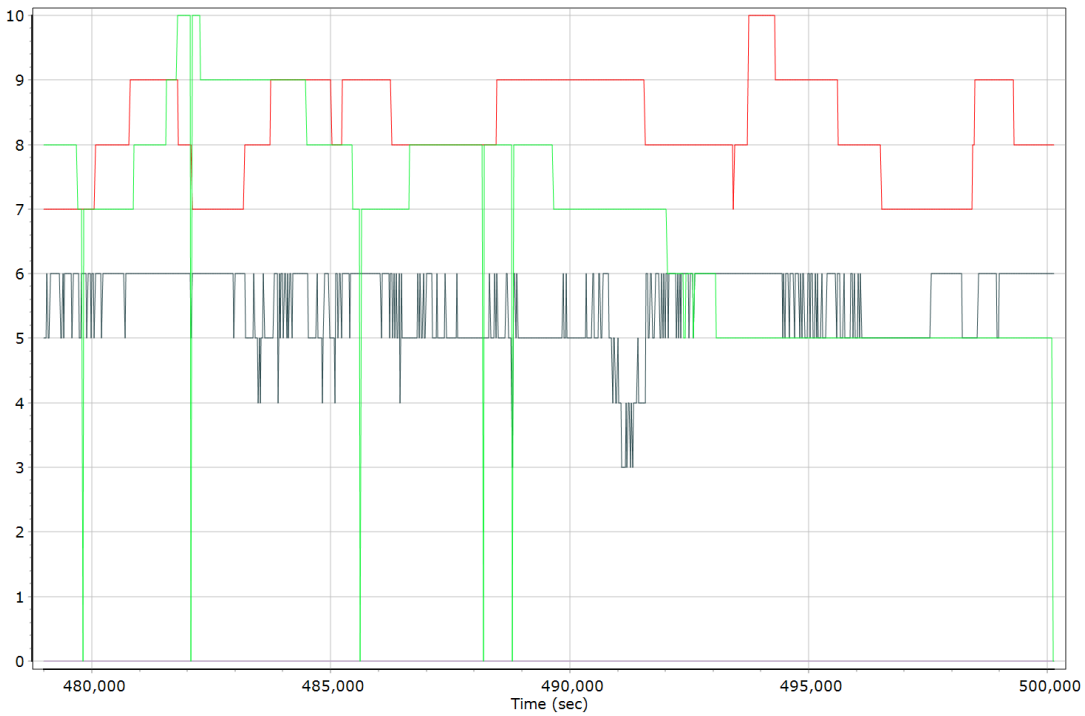
Forward Processed Solution Status

Processing Mode



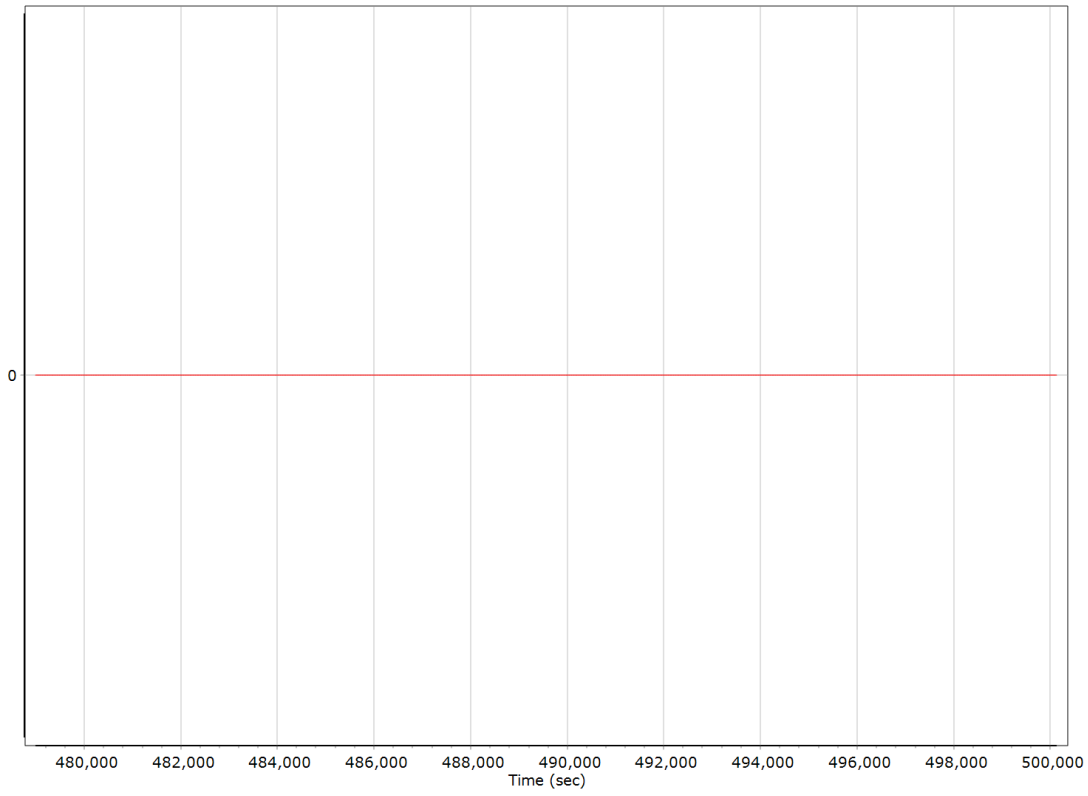
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites — Number of GLONASS Satellites — Number of QZSS Satellites
 — Number of BEIDOU Satellites — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05072022A_3062
Processing date	2022-05-17 20:00:27
Mission date	2022-05-07 12:29:26
Mission duration	05:52:35.099
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8708
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
6222127.000	POS Data
6222127.001	POS Data
6222127.002	POS Data
6222127.003	POS Data
6222127.004	POS Data
6222127.005	POS Data
6222127.006	POS Data
6222127.007	POS Data
6222127.008	POS Data
6222127.009	POS Data
6222127.010	POS Data
6222127.011	POS Data
6222127.012	POS Data
6222127.013	POS Data
6222127.014	POS Data
6222127.015	POS Data
6222127.016	POS Data
6222127.017	POS Data
6222127.018	POS Data
6222127.019	POS Data
6222127.020	POS Data
6222127.021	POS Data
6222127.022	POS Data
6222127.023	POS Data
6222127.024	POS Data
6222127.025	POS Data
6222127.026	POS Data
6222127.027	POS Data
6222127.028	POS Data
6222127.029	POS Data
6222127.030	POS Data
6222127.031	POS Data
6222127.032	POS Data
6222127.033	POS Data
6222127.034	POS Data
6222127.035	POS Data
6222127.036	POS Data
6222127.037	POS Data
6222127.038	POS Data
6222127.039	POS Data
6222127.040	POS Data
6222127.041	POS Data
6222127.042	POS Data
6222127.043	POS Data
6222127.044	POS Data
6222127.045	POS Data
6222127.046	POS Data

Input Files

File Name	File Type
Ephm1270.22g	GLONASS Broadcast Ephemeris
Ephm1270.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbt_05072022A_3062.out	SBET Trajectory File

Rover Data Summary

First raw data file	6222127.000		
Last raw data file	6222127.046		
Start GPS week	2208		
Start time	563347.221 (5/7/2022 12:29:07 PM)		
End time	584502.320 (5/7/2022 6:21:42 PM)		
Start of fine alignment	563825.626 (5/7/2022 12:37:05 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.142	-0.236	-1.269
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

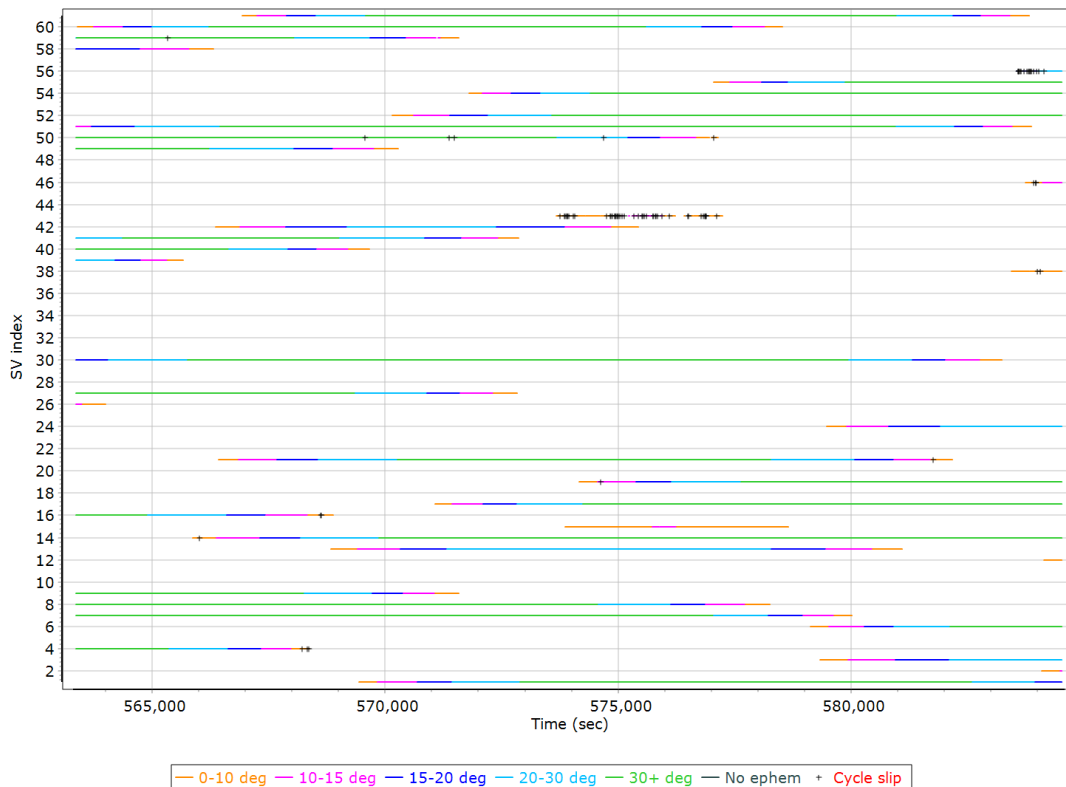
Rover Data QC

Raw IMU Import QC Summary

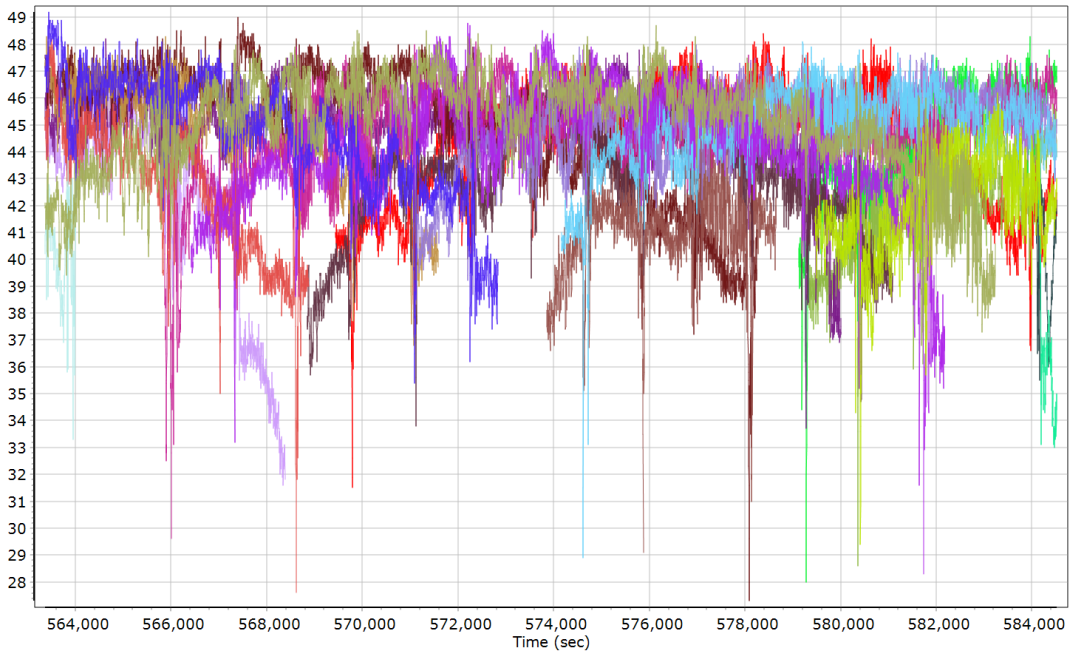
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05072022A_3062.log
IMU Records Processed	4230164
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

GPS/GLONASS L1 Satellite Lock/Elevation

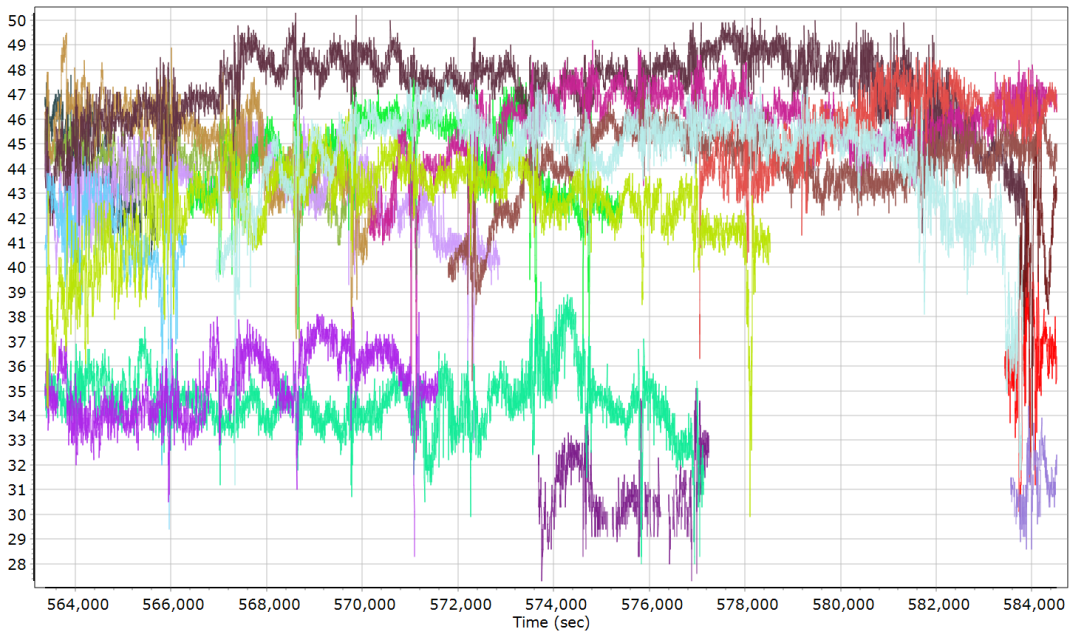


GPS L1 SNR



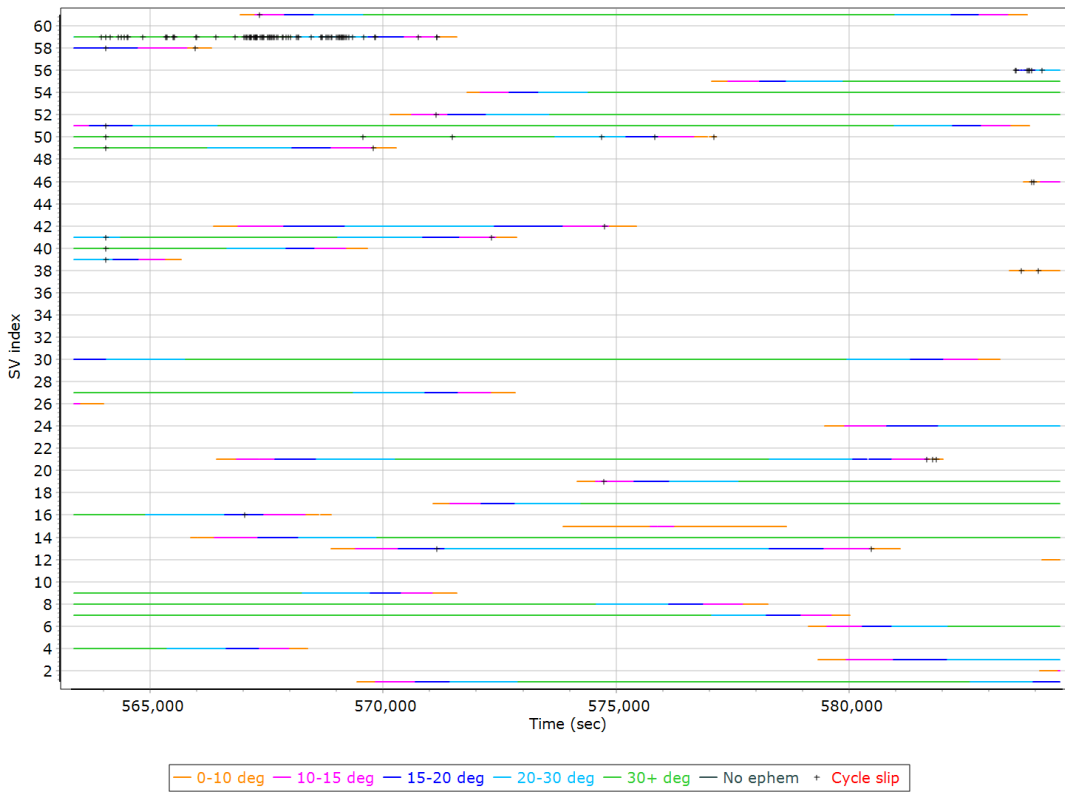
- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 SNR (dB/Hz) | GPS PRN 04 L1 SNR (dB/Hz) |
| GPS PRN 06 L1 SNR (dB/Hz) | GPS PRN 07 L1 SNR (dB/Hz) | GPS PRN 08 L1 SNR (dB/Hz) | GPS PRN 09 L1 SNR (dB/Hz) |
| GPS PRN 12 L1 SNR (dB/Hz) | GPS PRN 13 L1 SNR (dB/Hz) | GPS PRN 14 L1 SNR (dB/Hz) | GPS PRN 15 L1 SNR (dB/Hz) |
| GPS PRN 16 L1 SNR (dB/Hz) | GPS PRN 17 L1 SNR (dB/Hz) | GPS PRN 19 L1 SNR (dB/Hz) | GPS PRN 21 L1 SNR (dB/Hz) |
| GPS PRN 24 L1 SNR (dB/Hz) | GPS PRN 26 L1 SNR (dB/Hz) | GPS PRN 27 L1 SNR (dB/Hz) | GPS PRN 30 L1 SNR (dB/Hz) |

GLONASS L1 SNR

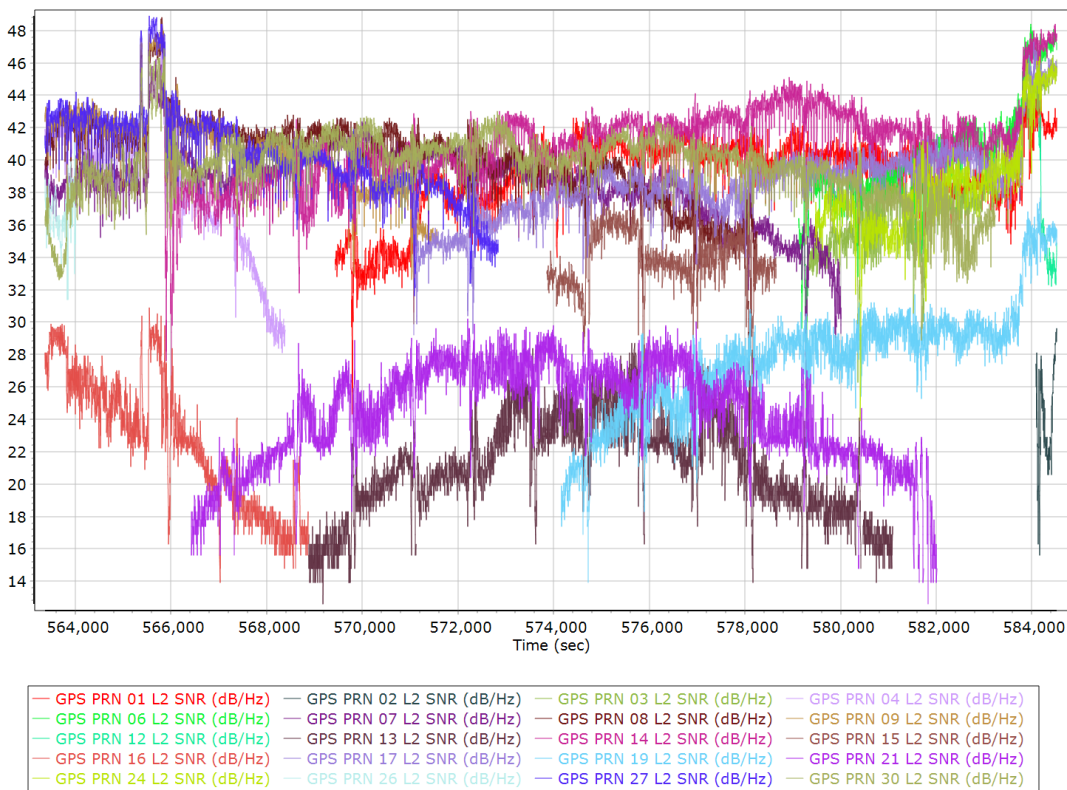


- | | | |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 05 L1 SNR (dB/Hz) | GLONASS 06 L1 SNR (dB/Hz) |
| GLONASS 09 L1 SNR (dB/Hz) | GLONASS 12 L1 SNR (dB/Hz) | GLONASS 13 L1 SNR (dB/Hz) |
| GLONASS 14 L1 SNR (dB/Hz) | GLONASS 15 L1 SNR (dB/Hz) | GLONASS 17 L1 SNR (dB/Hz) |
| GLONASS 18 L1 SNR (dB/Hz) | GLONASS 19 L1 SNR (dB/Hz) | GLONASS 21 L1 SNR (dB/Hz) |
| GLONASS 22 L1 SNR (dB/Hz) | GLONASS 23 L1 SNR (dB/Hz) | GLONASS 24 L1 SNR (dB/Hz) |

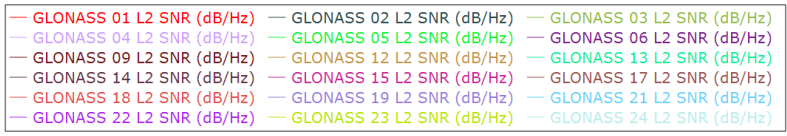
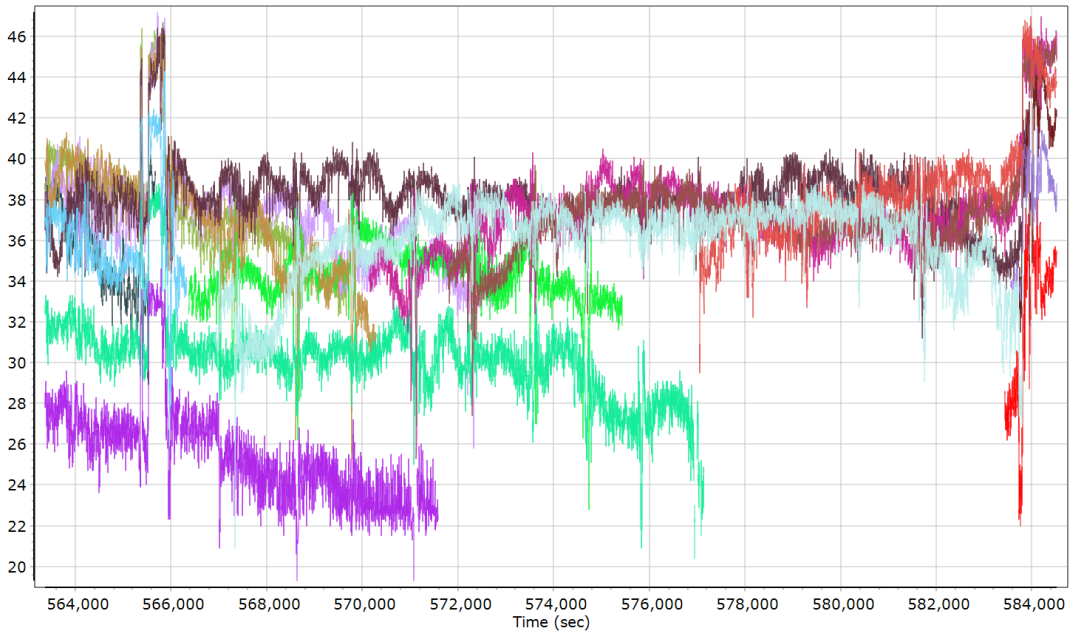
GPS/GLONASS L2 Satellite Lock/Elevation



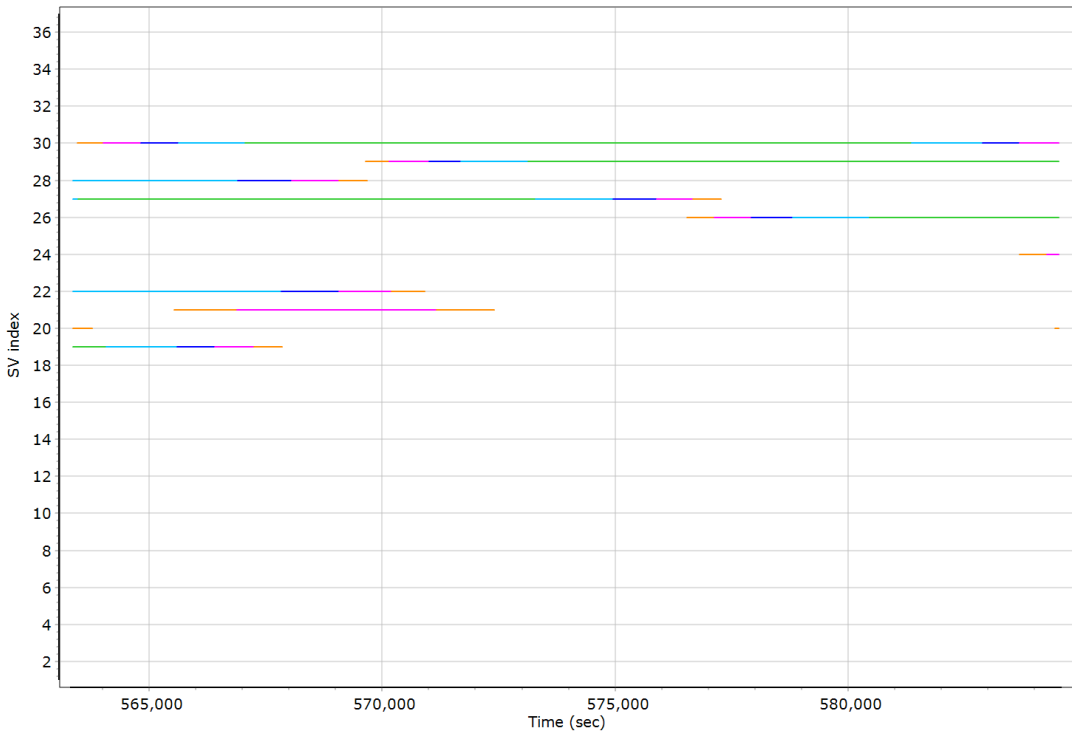
GPS L2 SNR



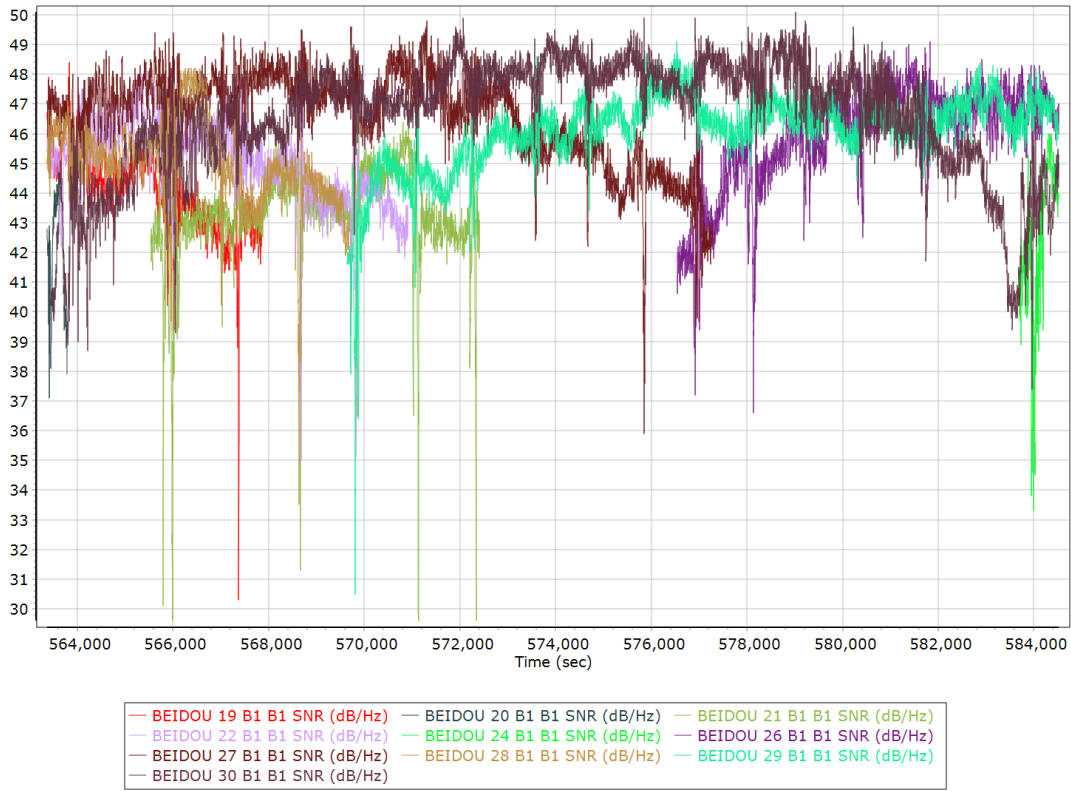
GLONASS L2 SNR



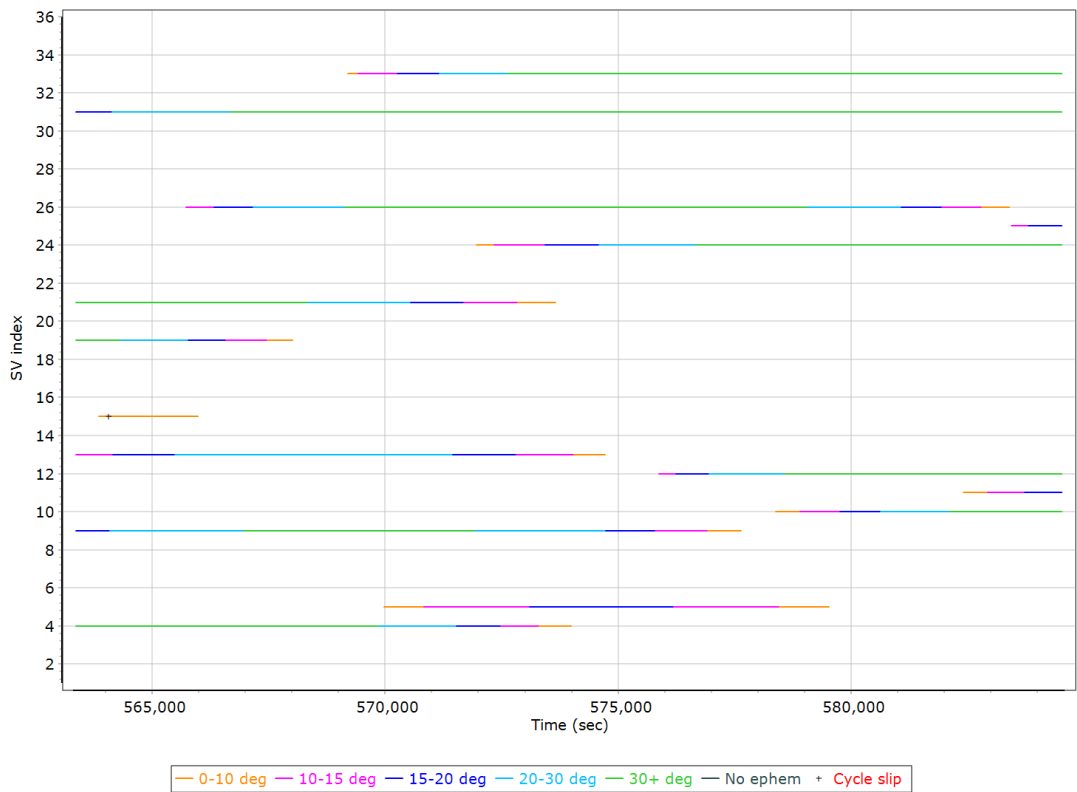
BEIDOU Satellite Lock/Elevation



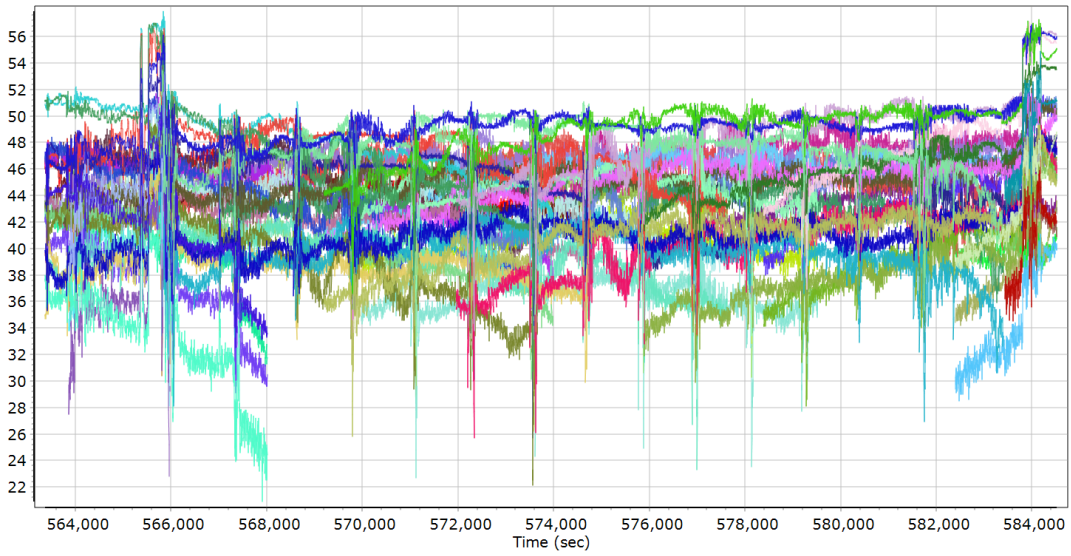
BEIDOU SNR



GALILEO Satellite Lock/Elevation



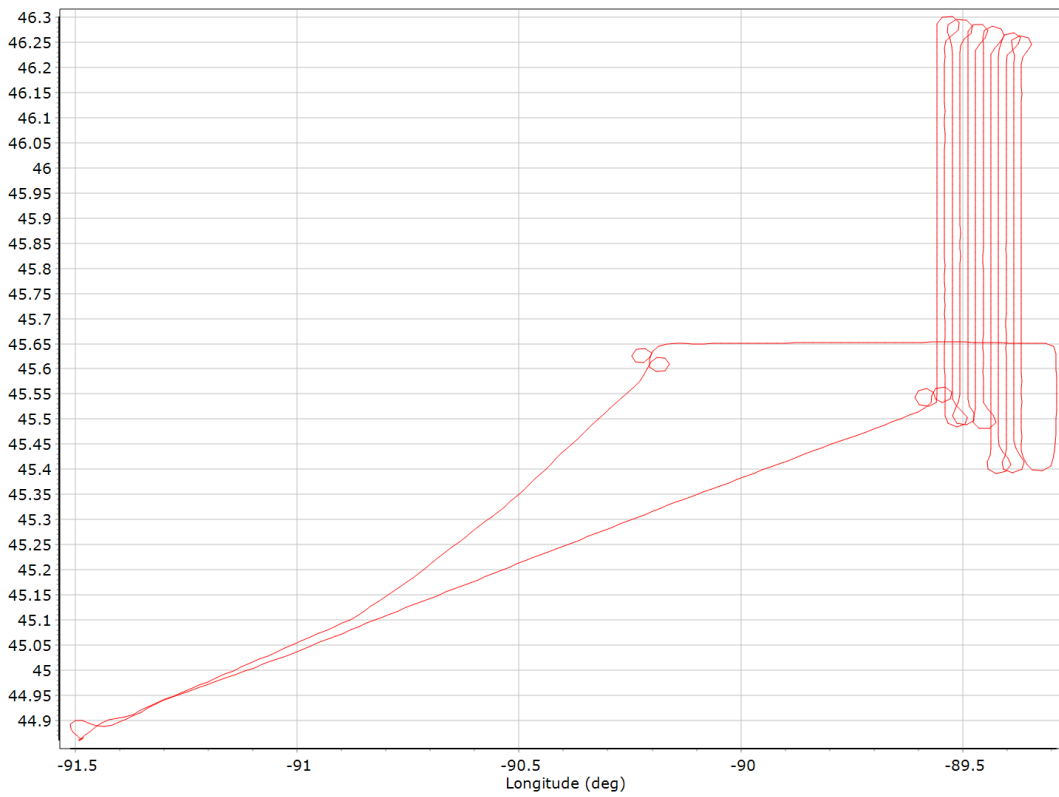
GALILEO SNR



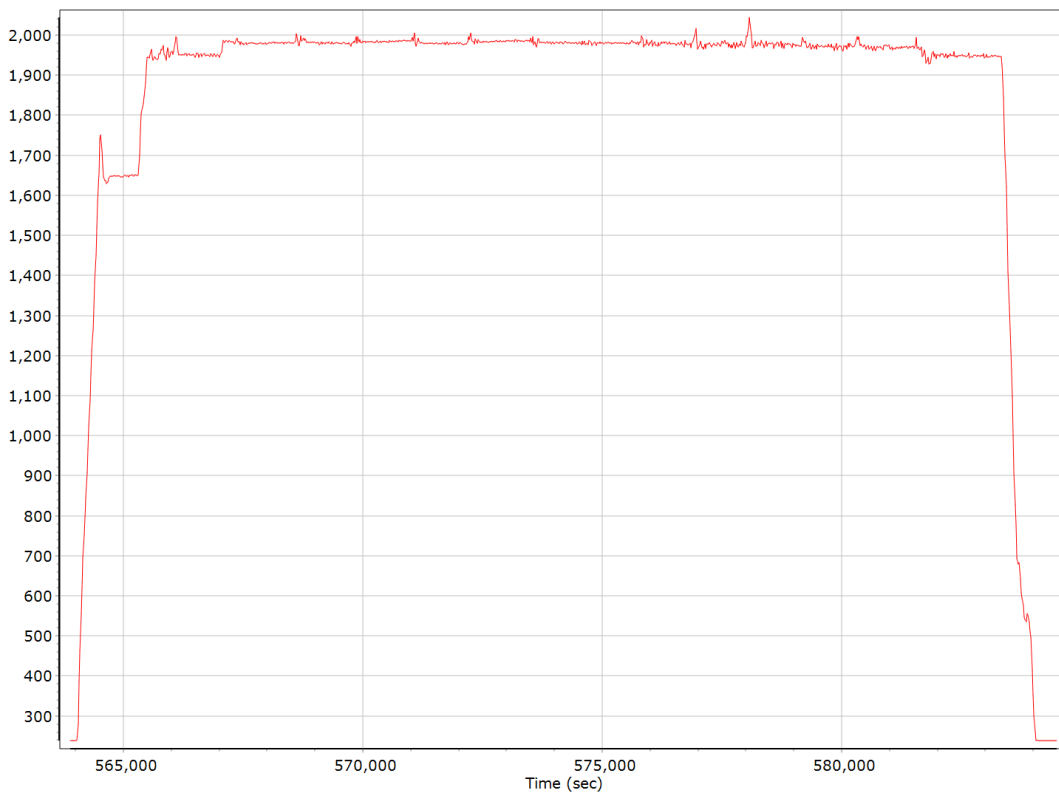
— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 05 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 10 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 24 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 25 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 26 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 31 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 33 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 04 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 05 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 09 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 10 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 11 L5E5A BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

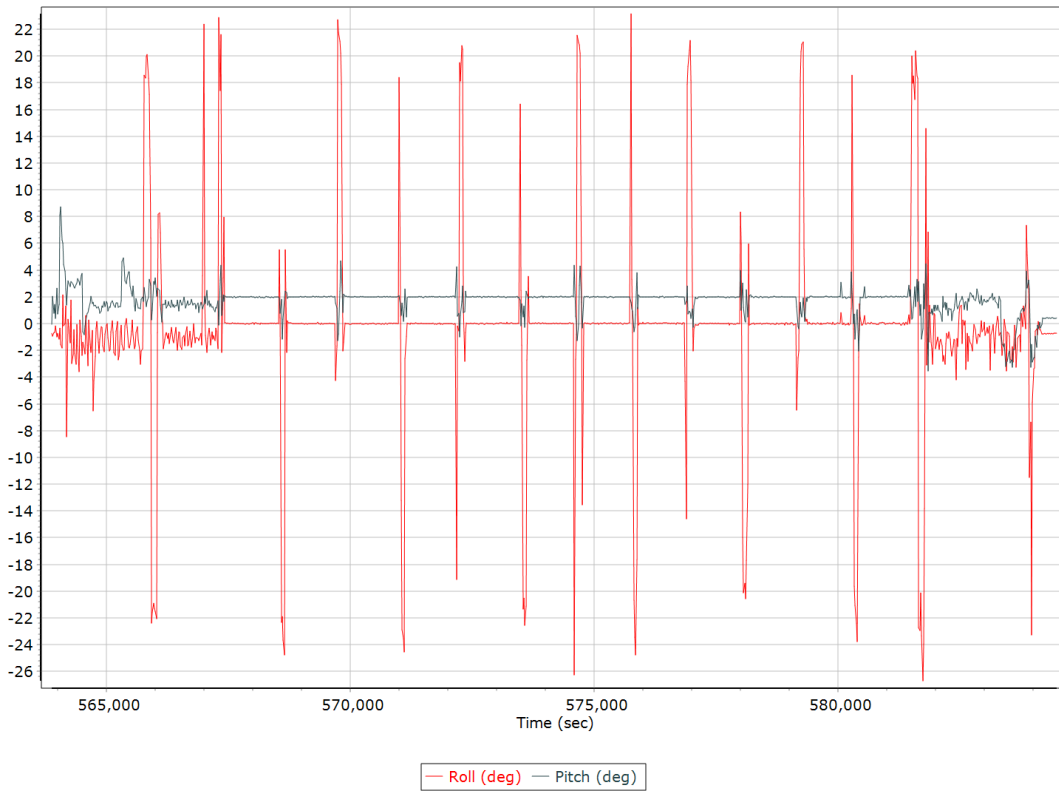
Top View



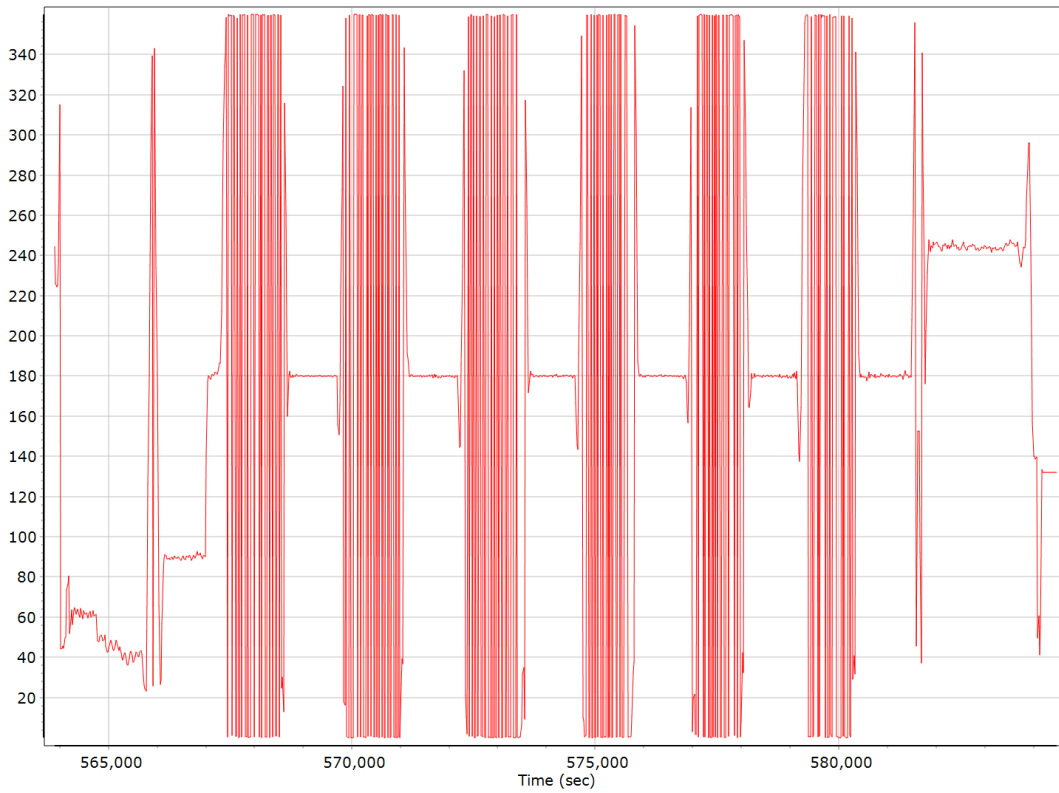
Altitude



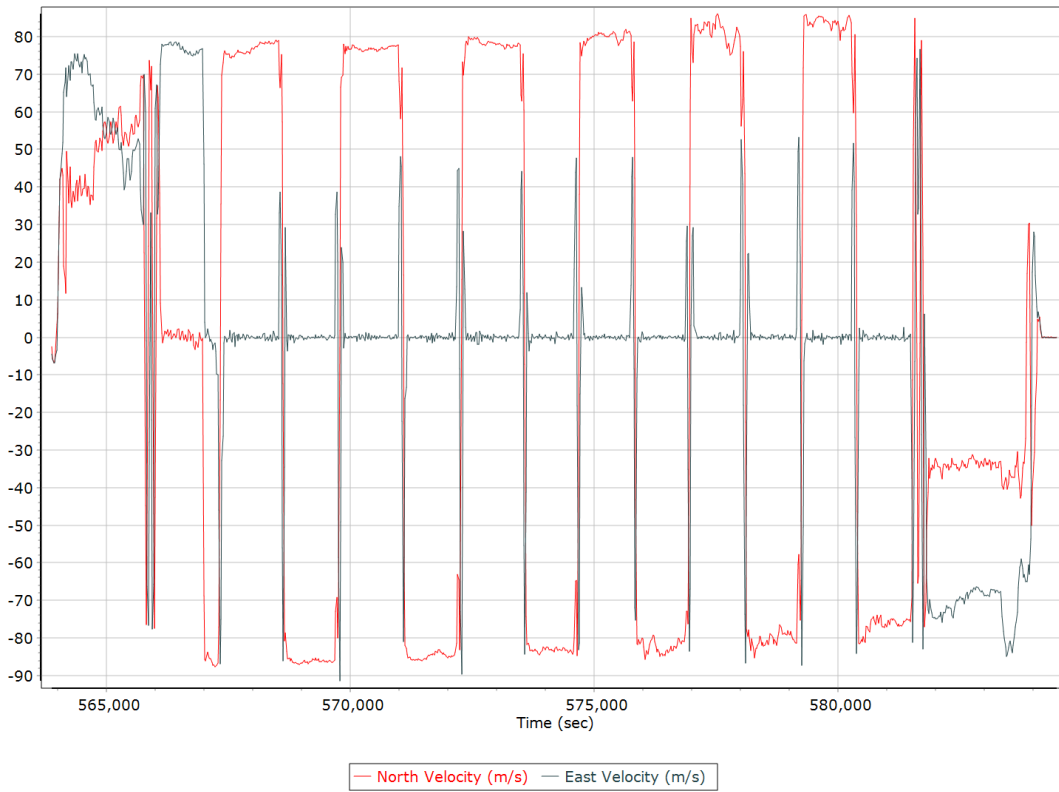
Roll/Pitch



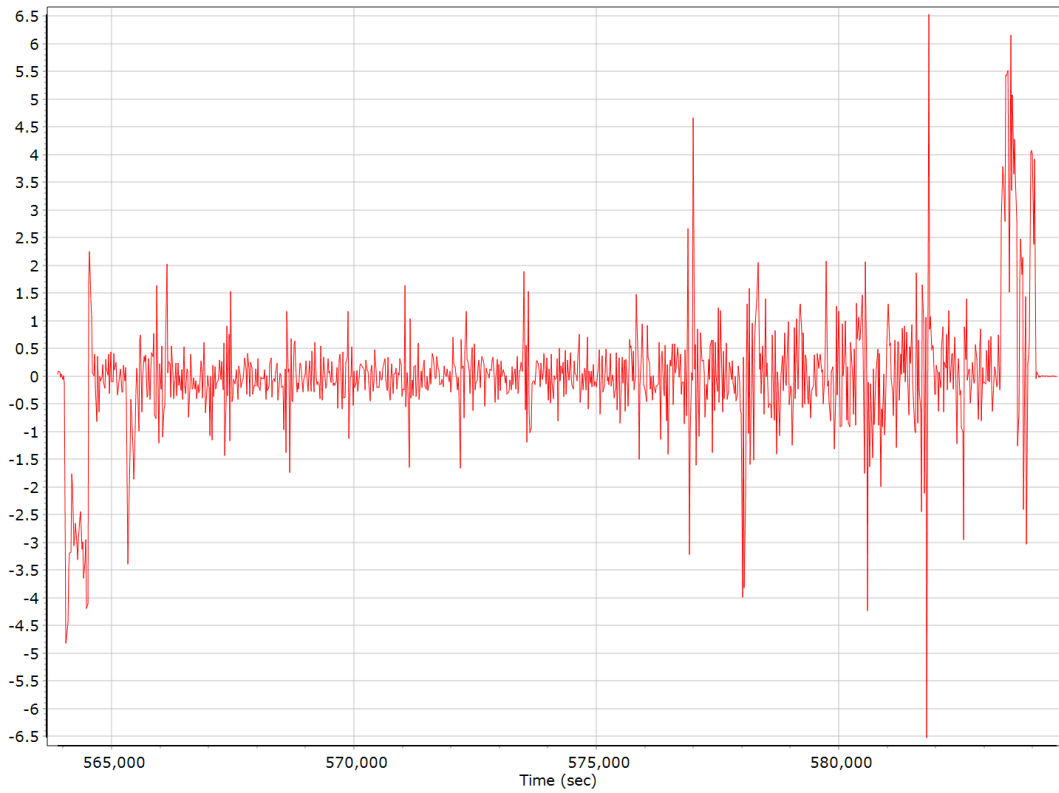
Heading



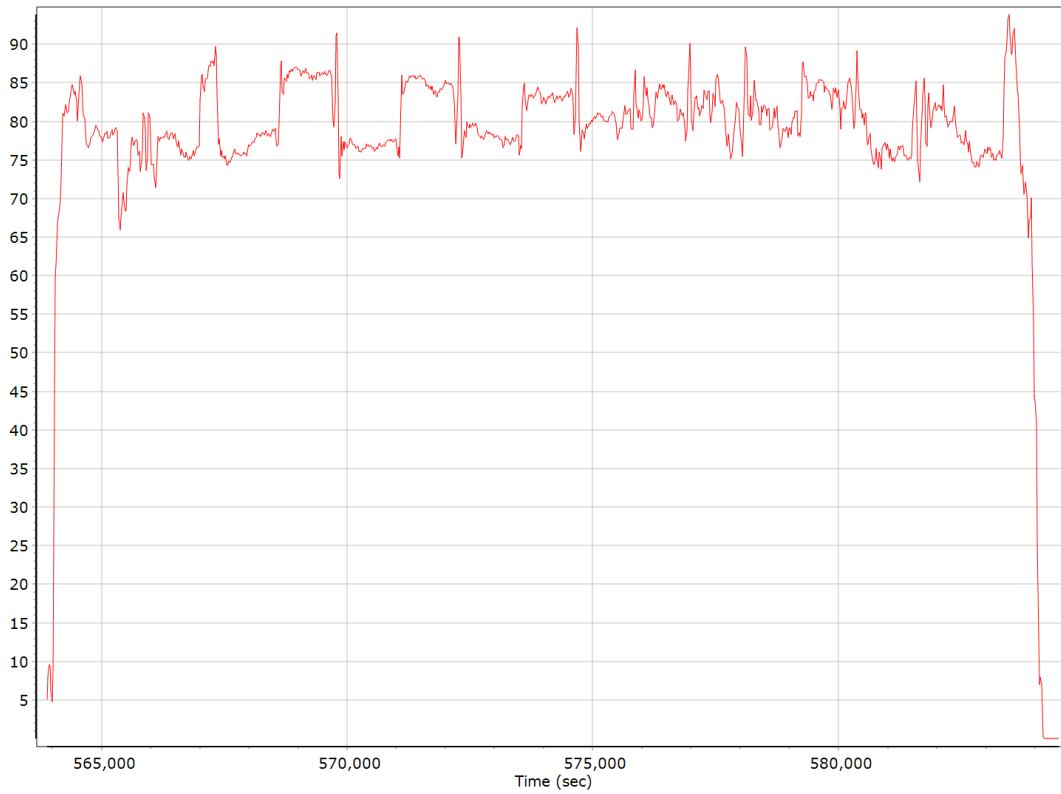
North/East Velocity



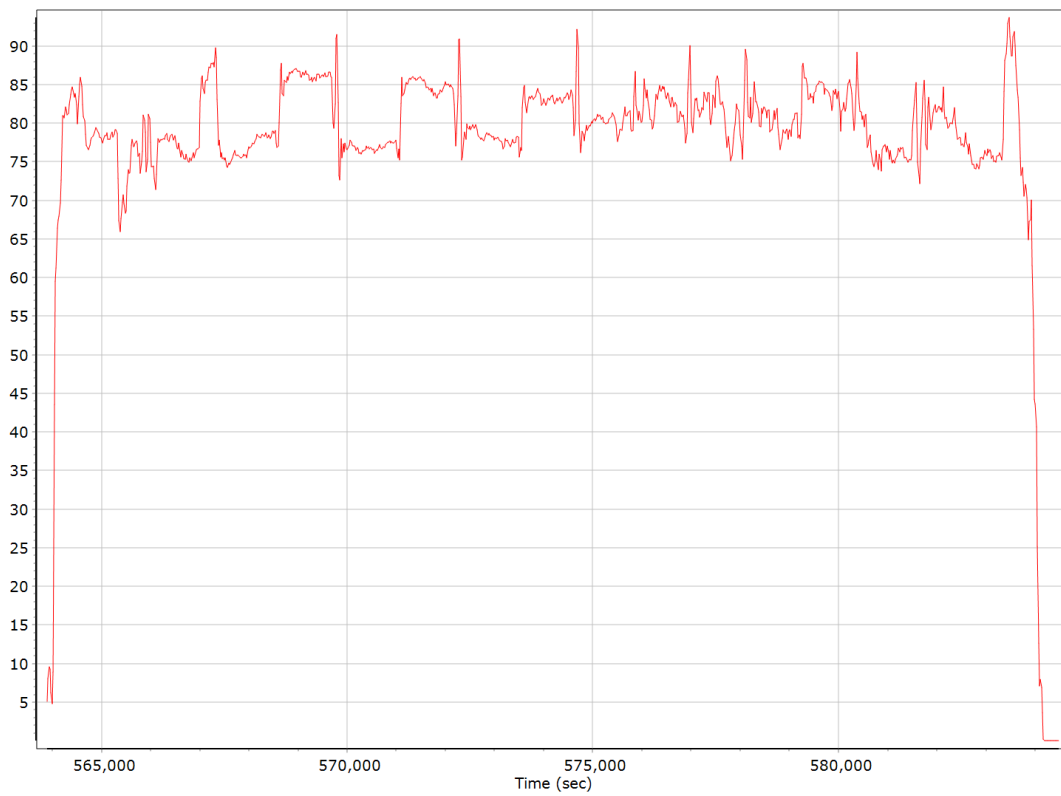
Down Velocity



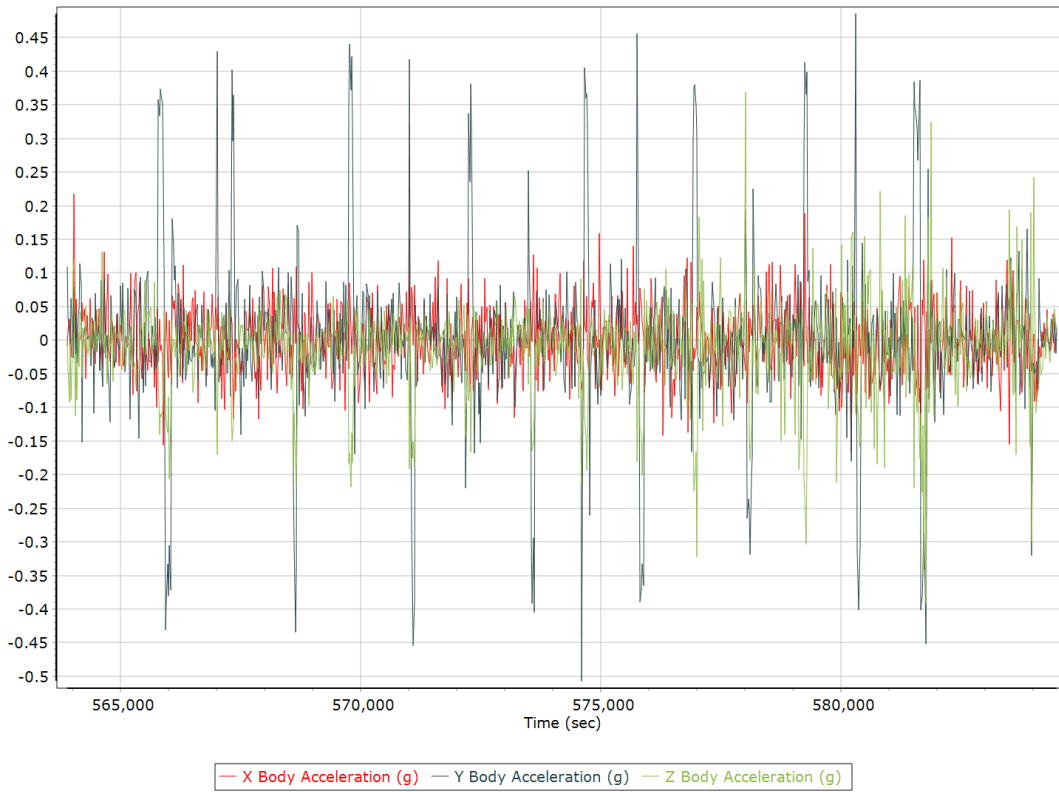
Total Speed



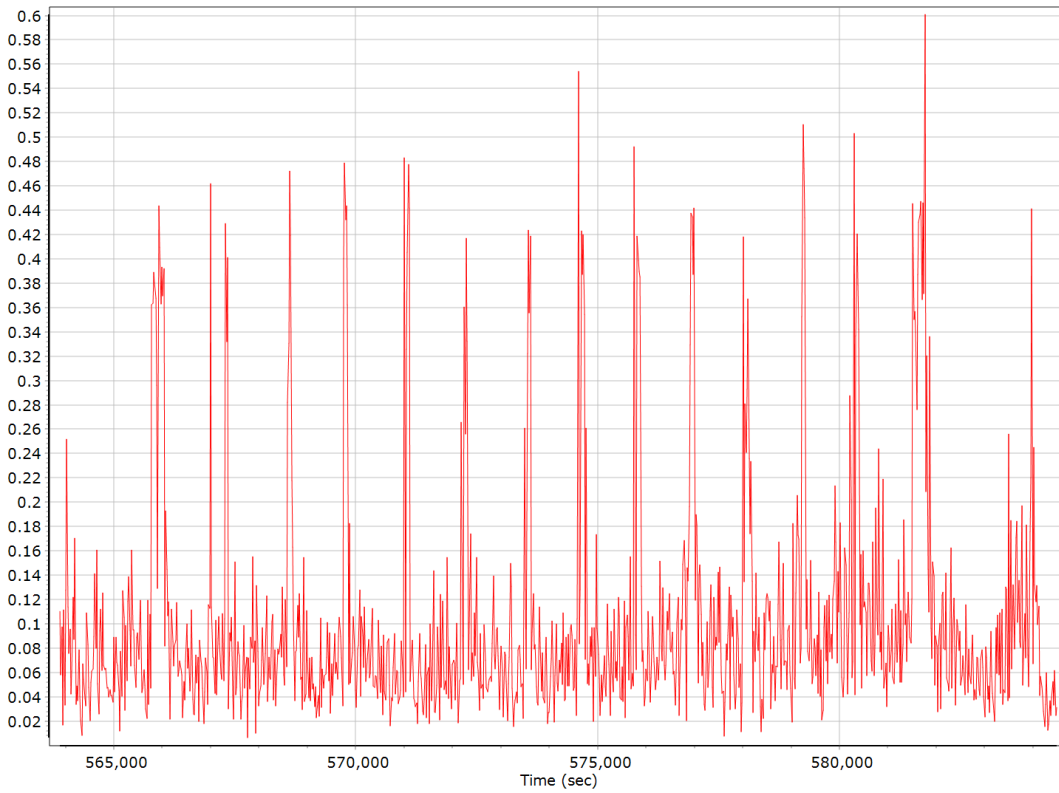
Ground Speed



Body Acceleration



Total Body Acceleration

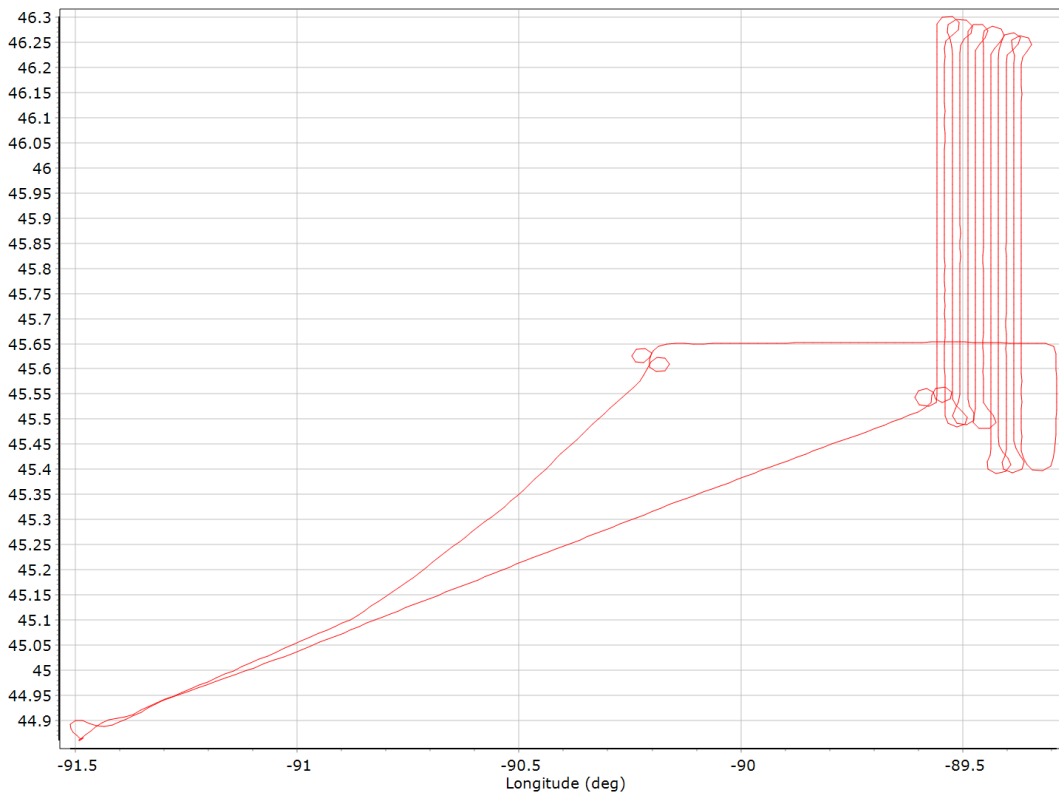


Body Angular Rate

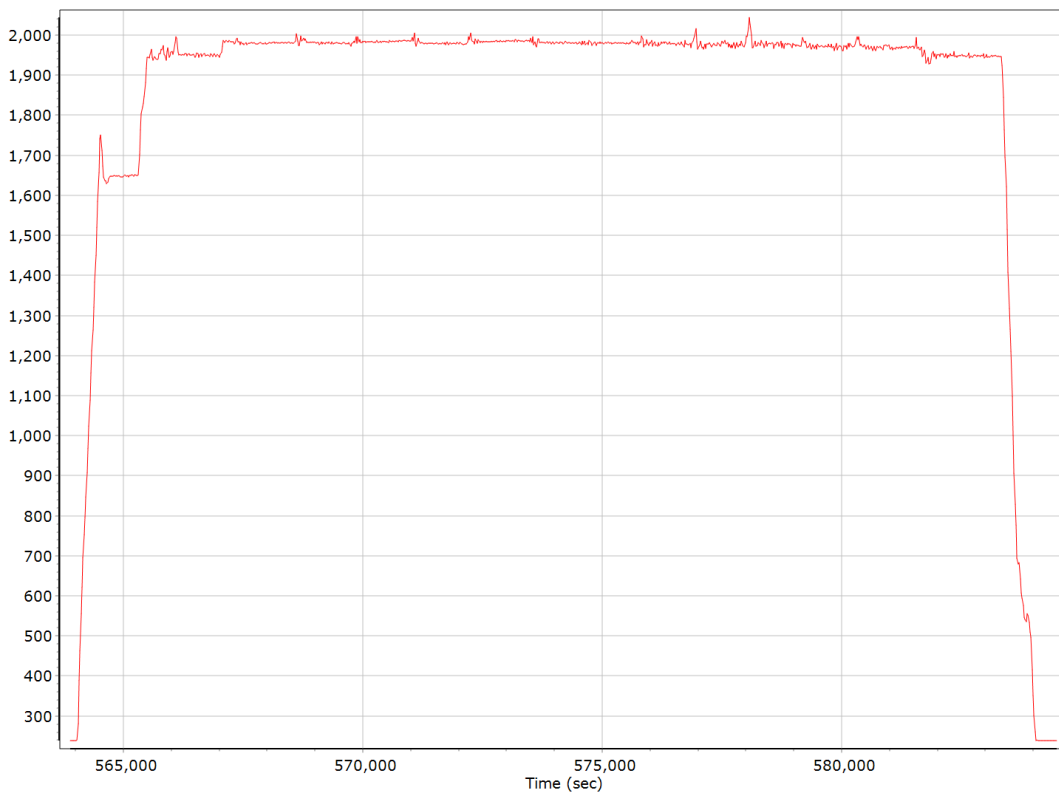


Forward Processed Trajectory Information

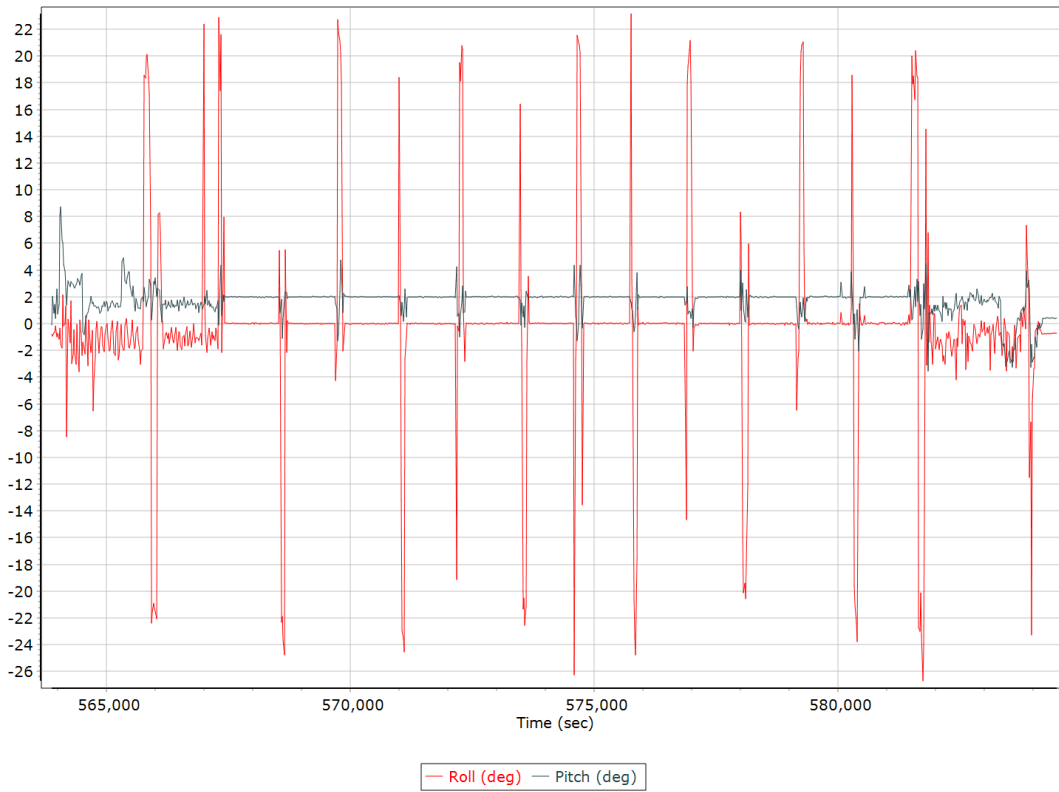
Top View



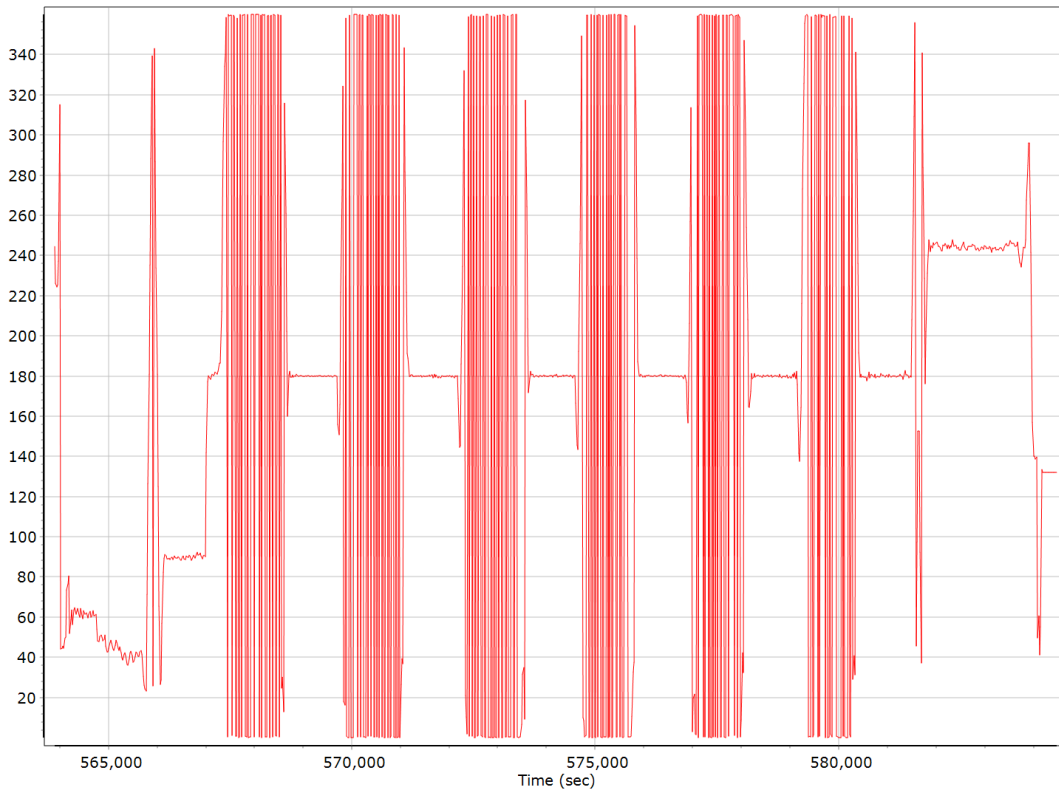
Altitude



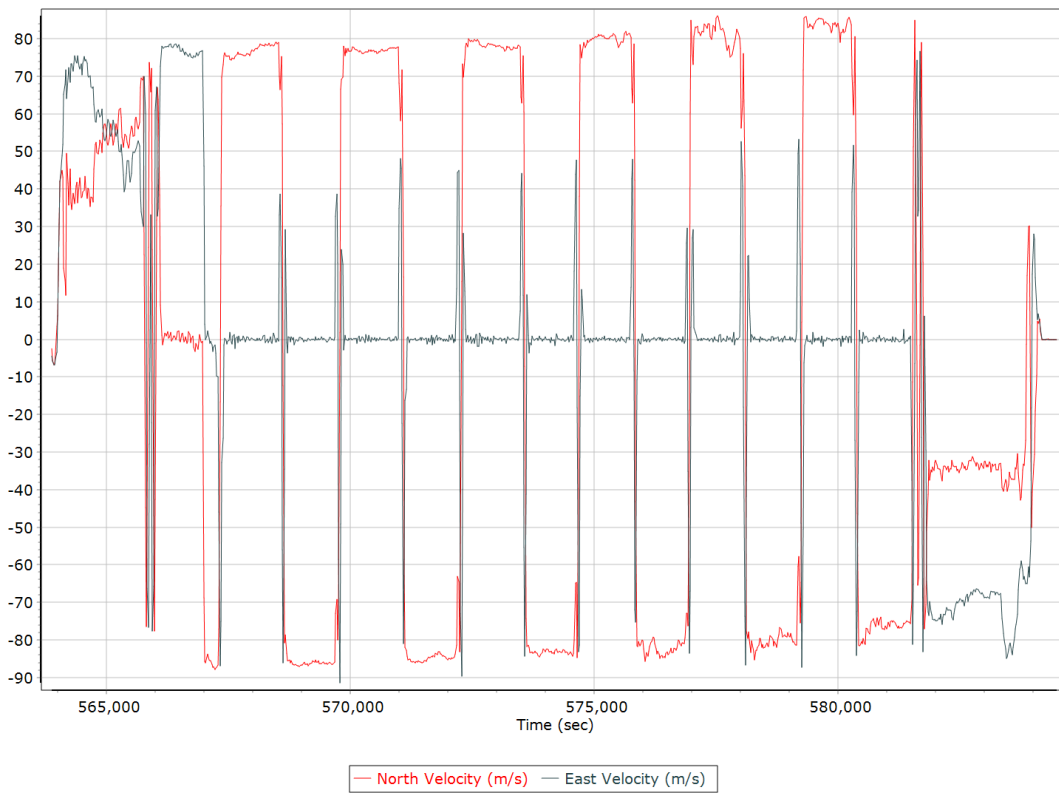
Roll/Pitch



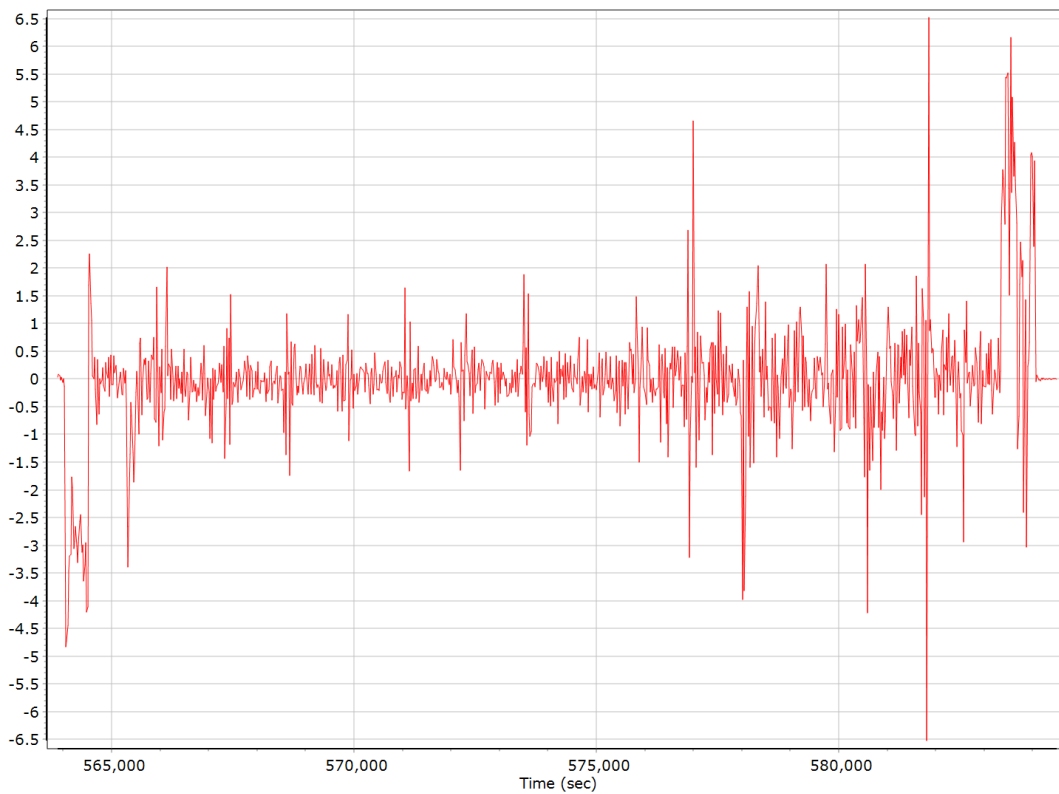
Heading



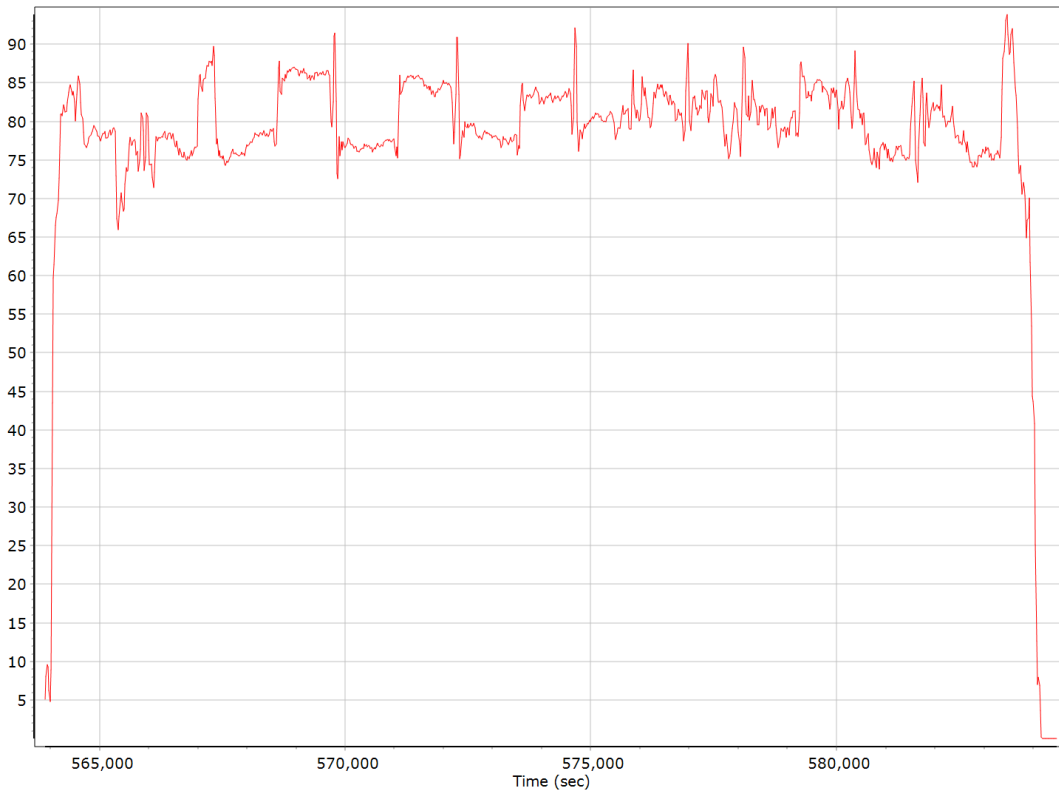
North/East Velocity



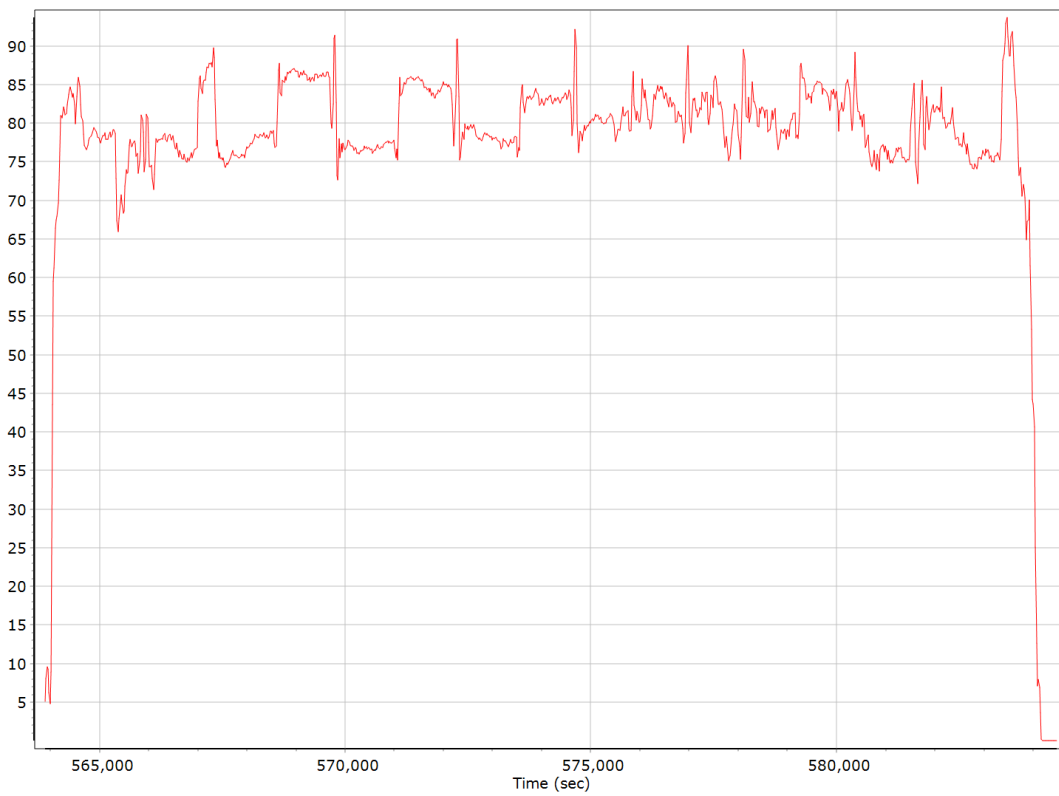
Down Velocity



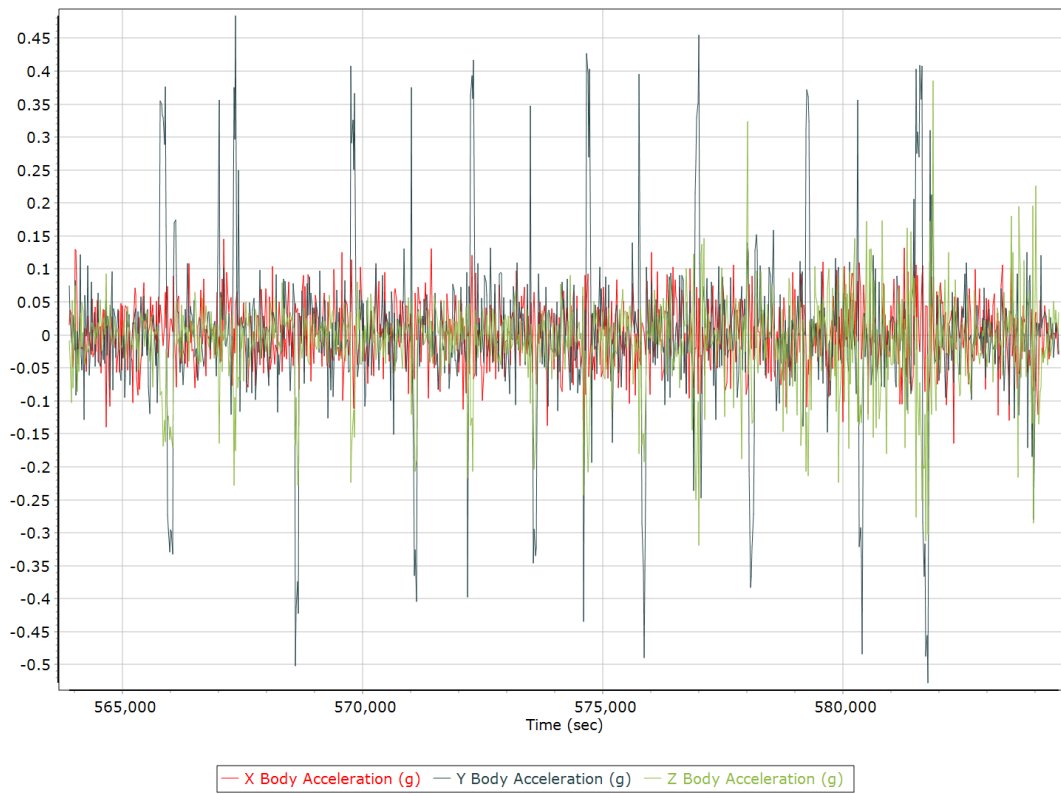
Total Speed



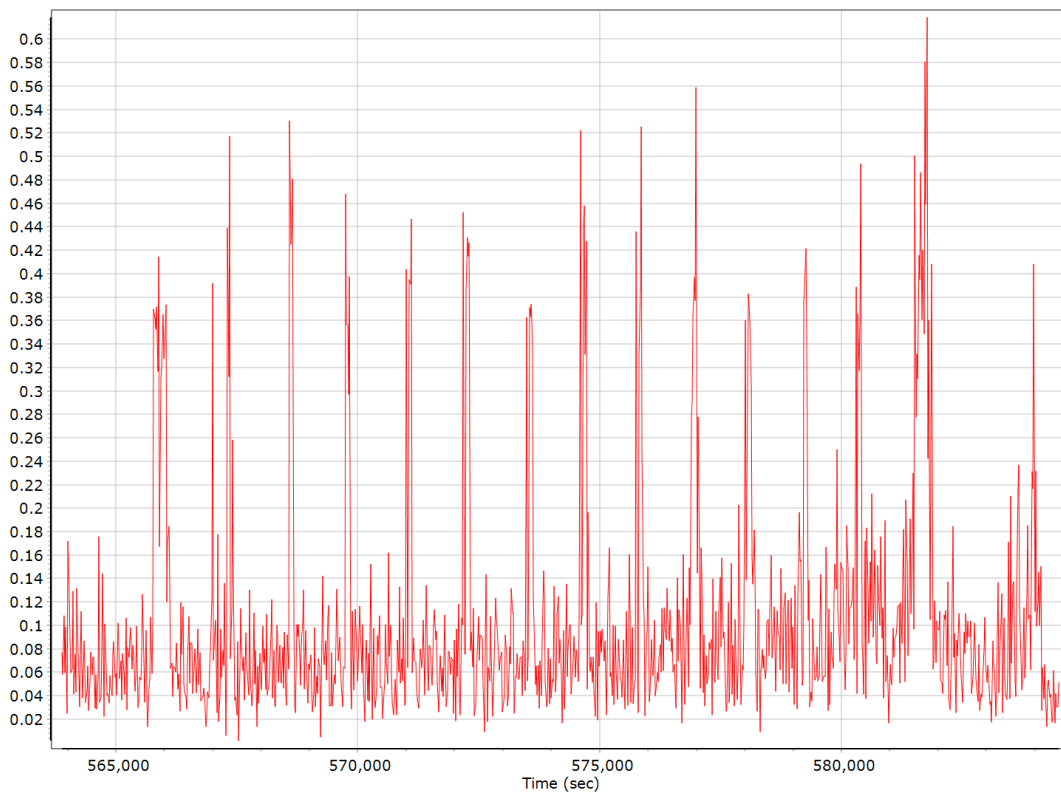
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

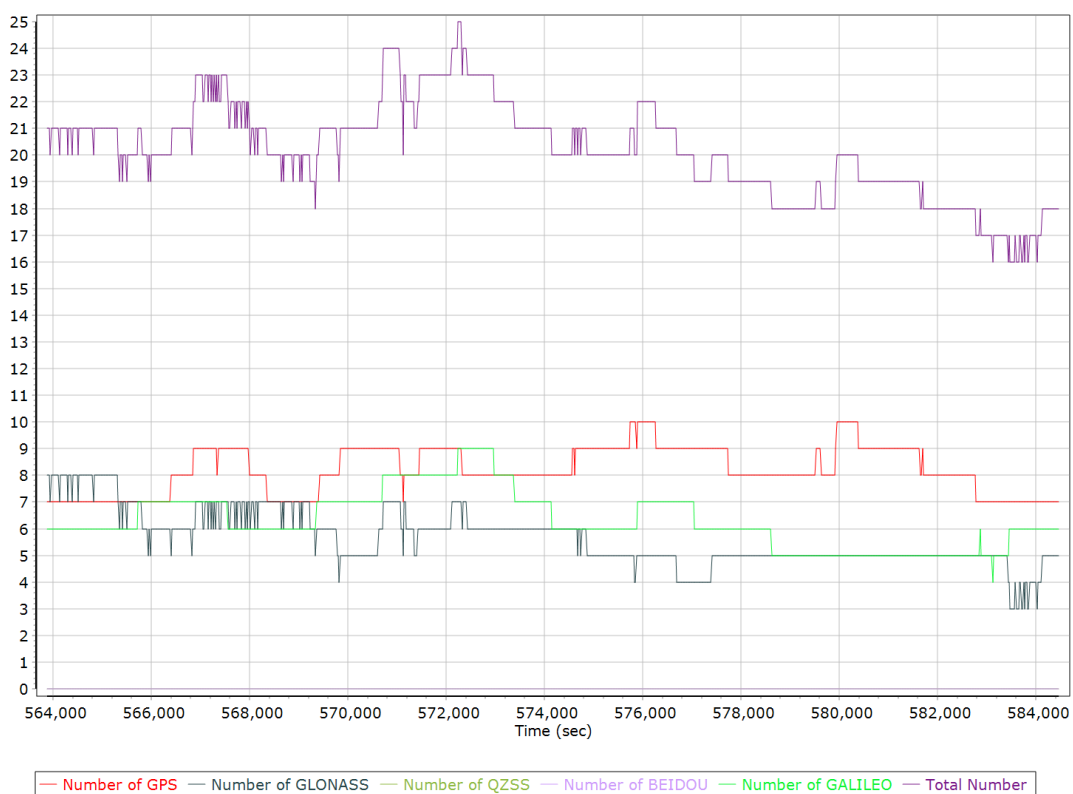


GNSS QC

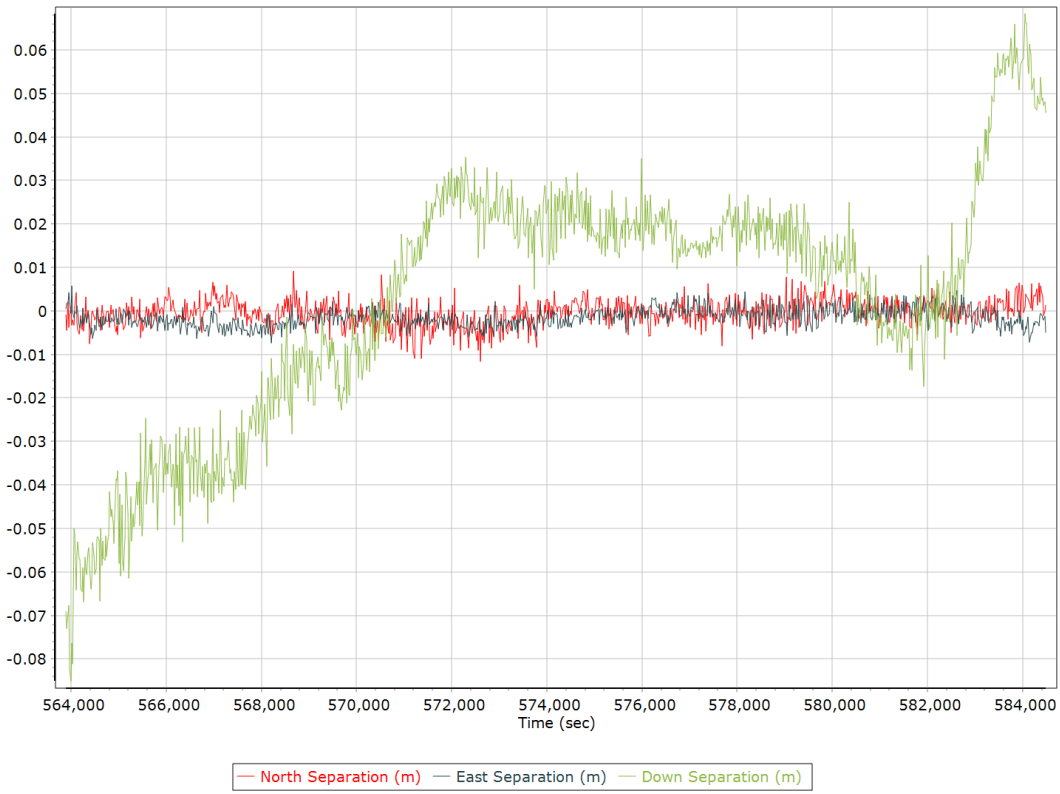
GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	0	8	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	4	9	6
Total number of SV	13	25	20
PDOP	0.96	1.69	1.22
QC Solution Gaps	1.00	1.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	21100.00	0.00	2.00
Percentage	99.99	0.00	0.01

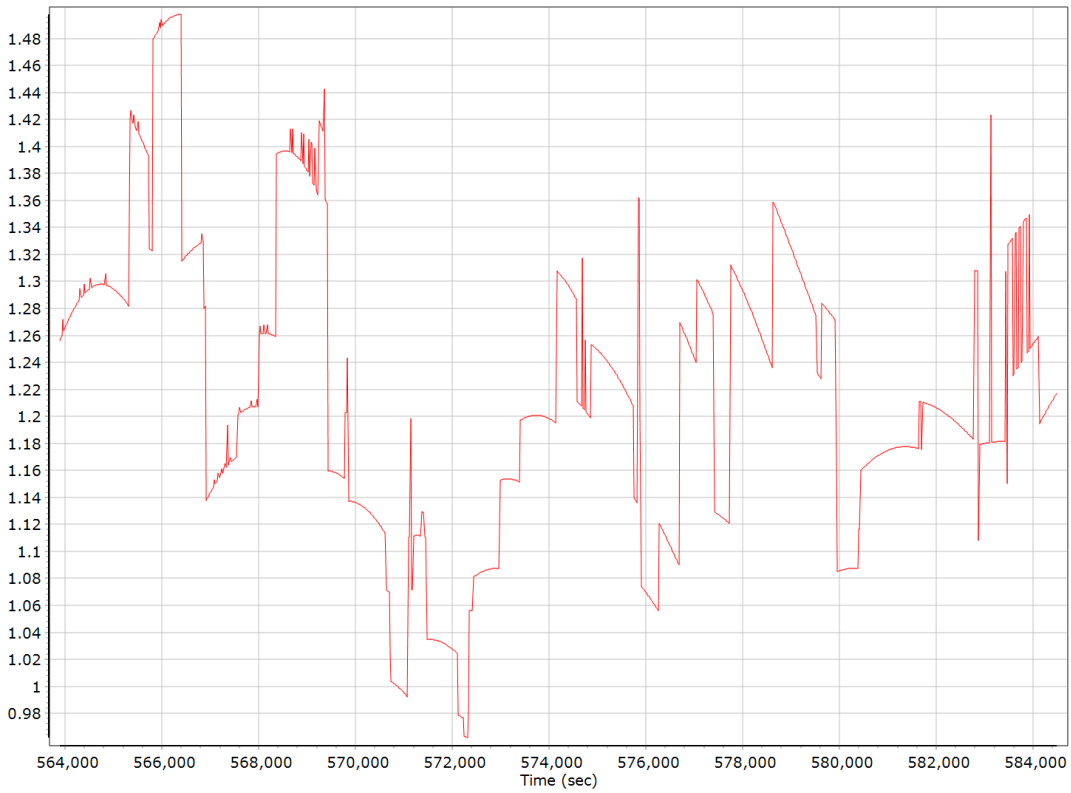
Num SVs in solution



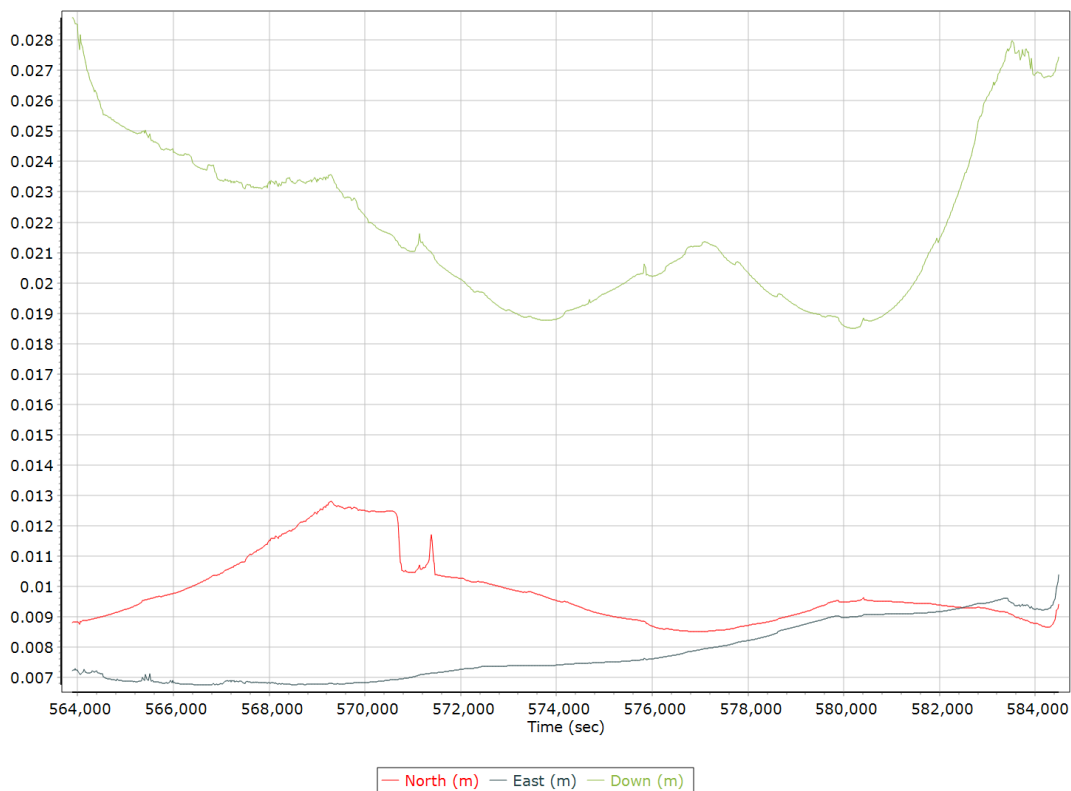
Forward/Reverse Separation



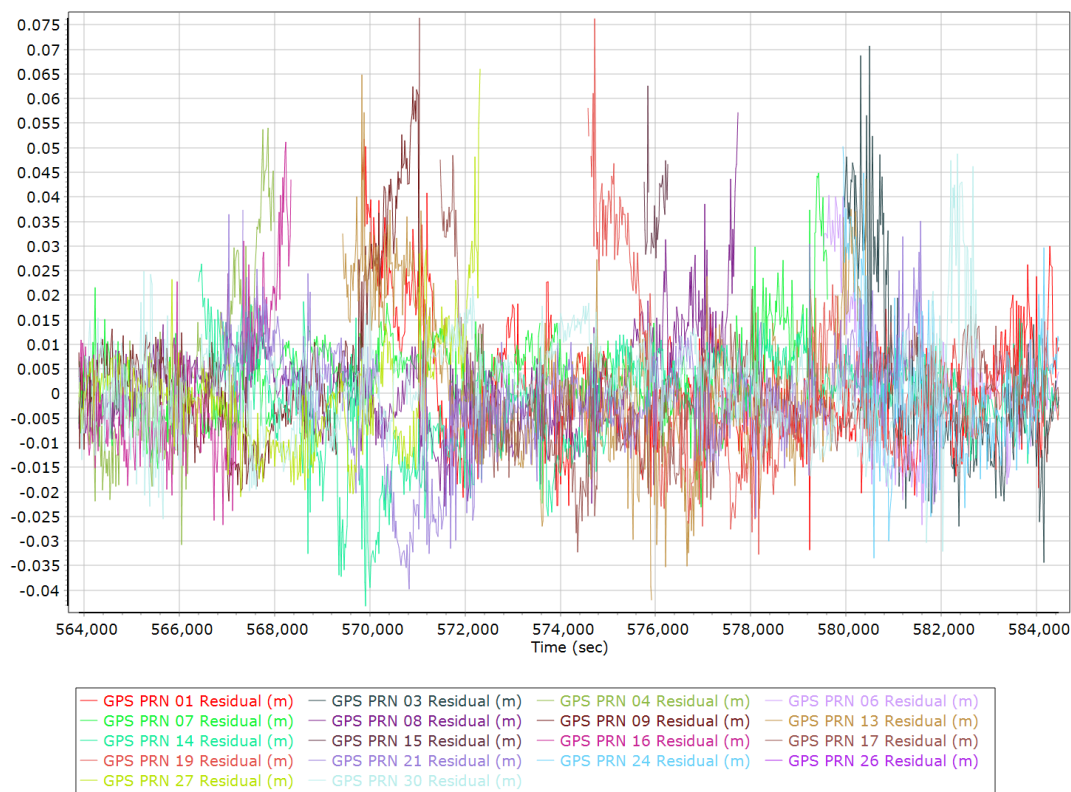
PDOP



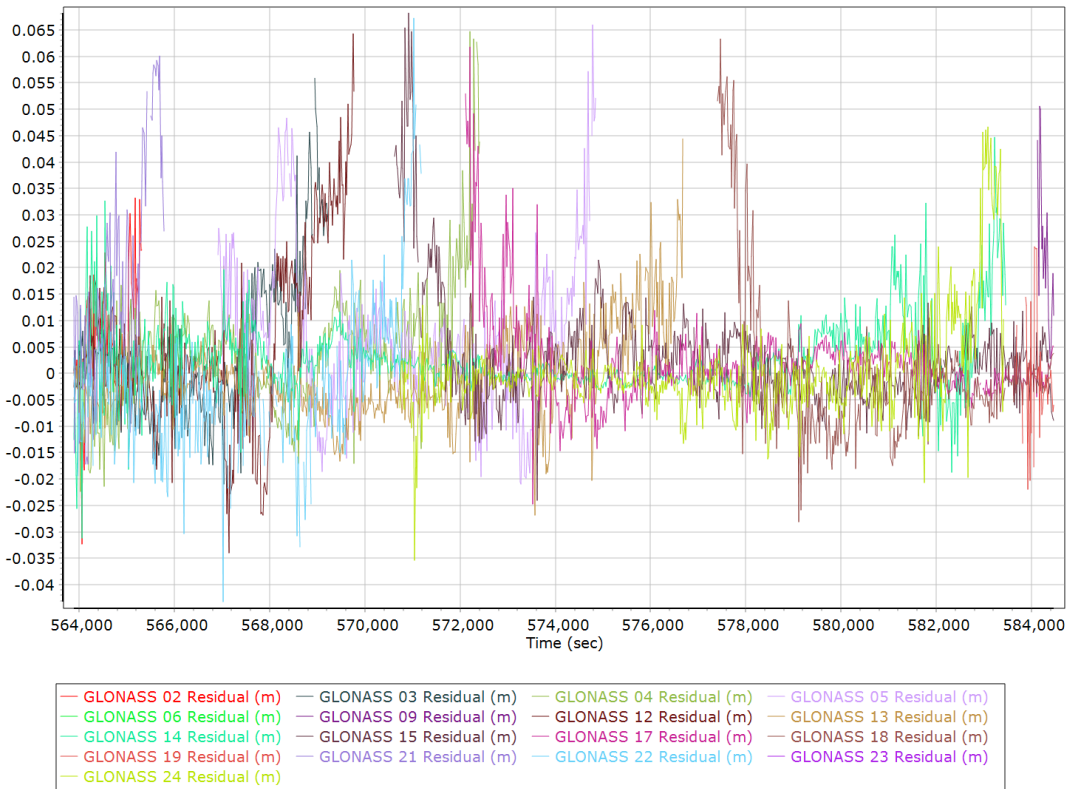
Estimated Position Accuracy



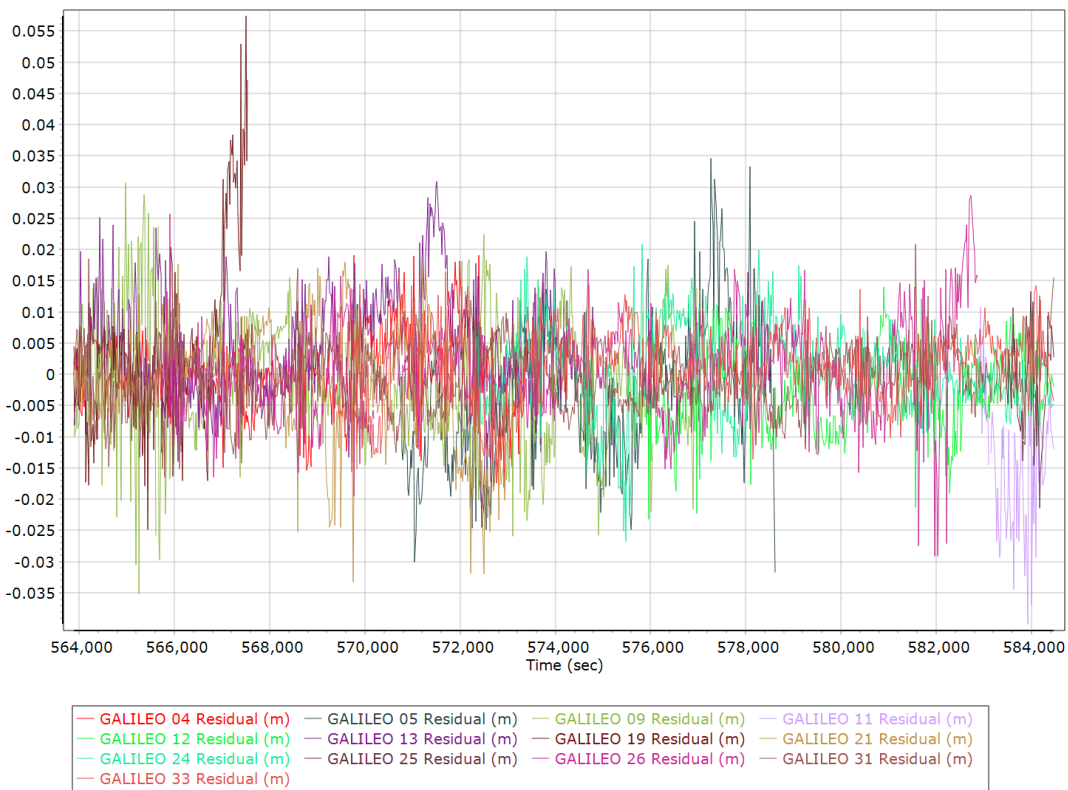
GPS Residuals



GLONASS Residuals



GALILEO Residuals



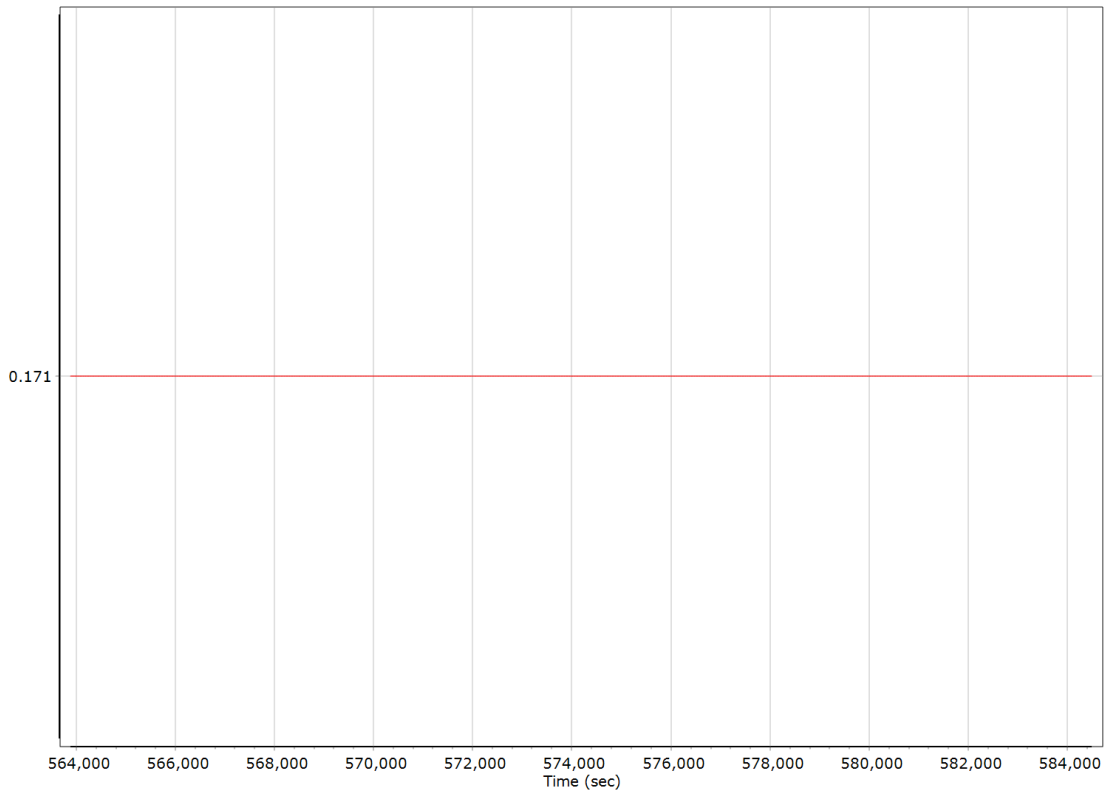
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	563348.000 (5/7/2022 12:29:08 PM)		
Processing end time	584502.000 (5/7/2022 6:21:42 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.171	-0.238	-1.273
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

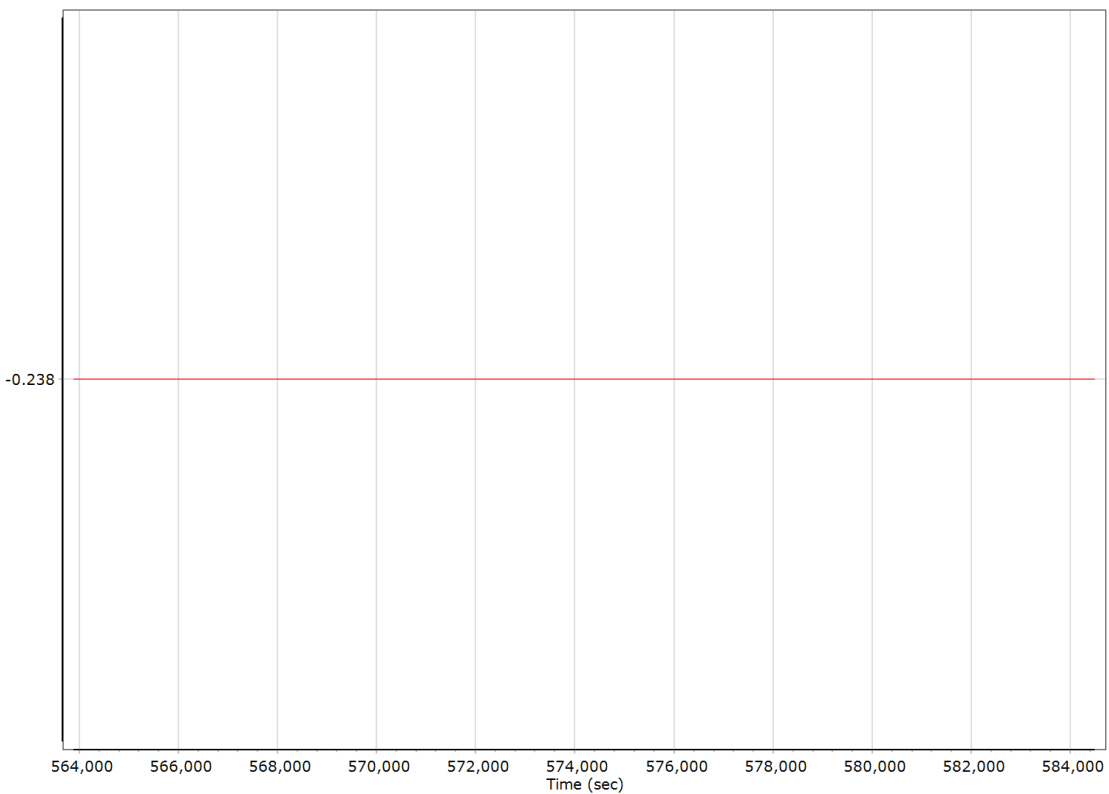
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

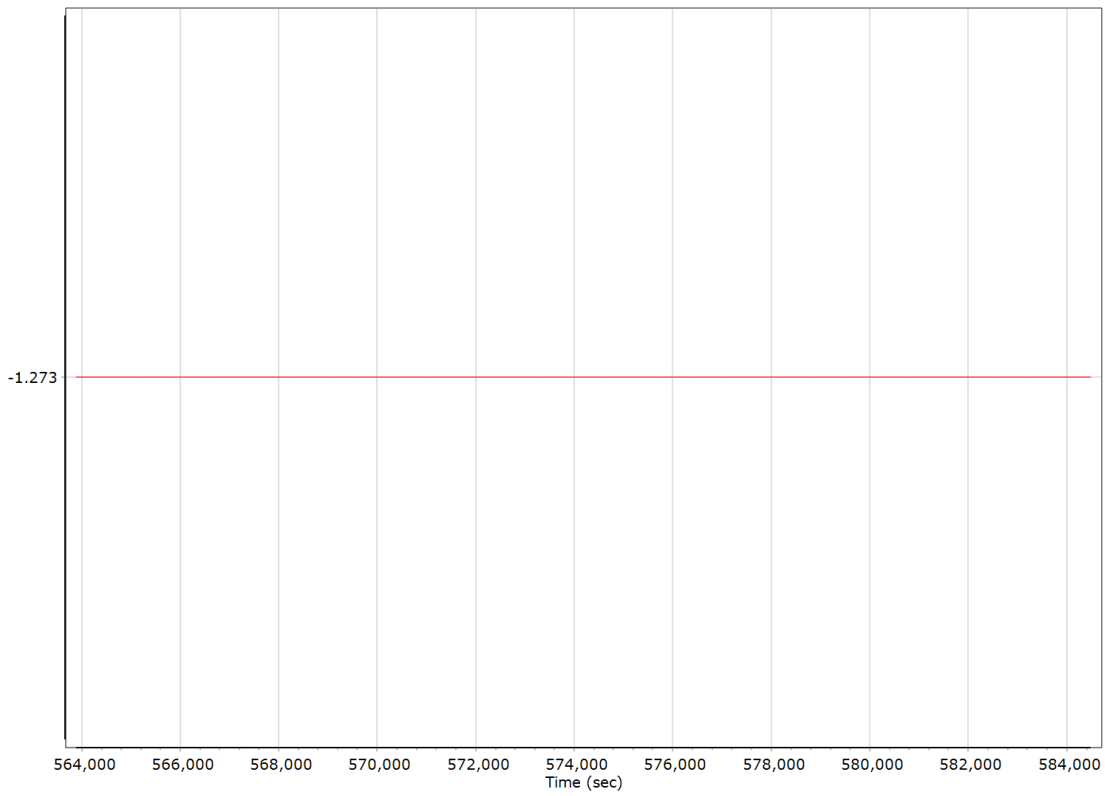
X Reference-Primary GNSS Lever Arm (m)



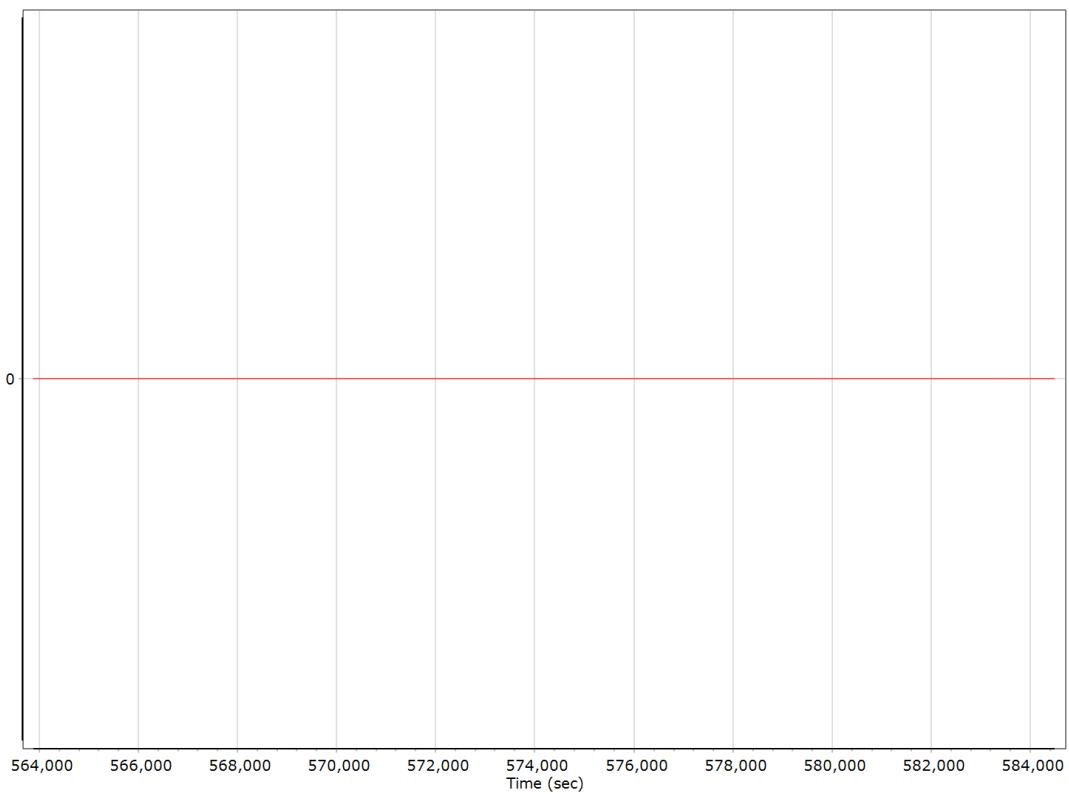
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



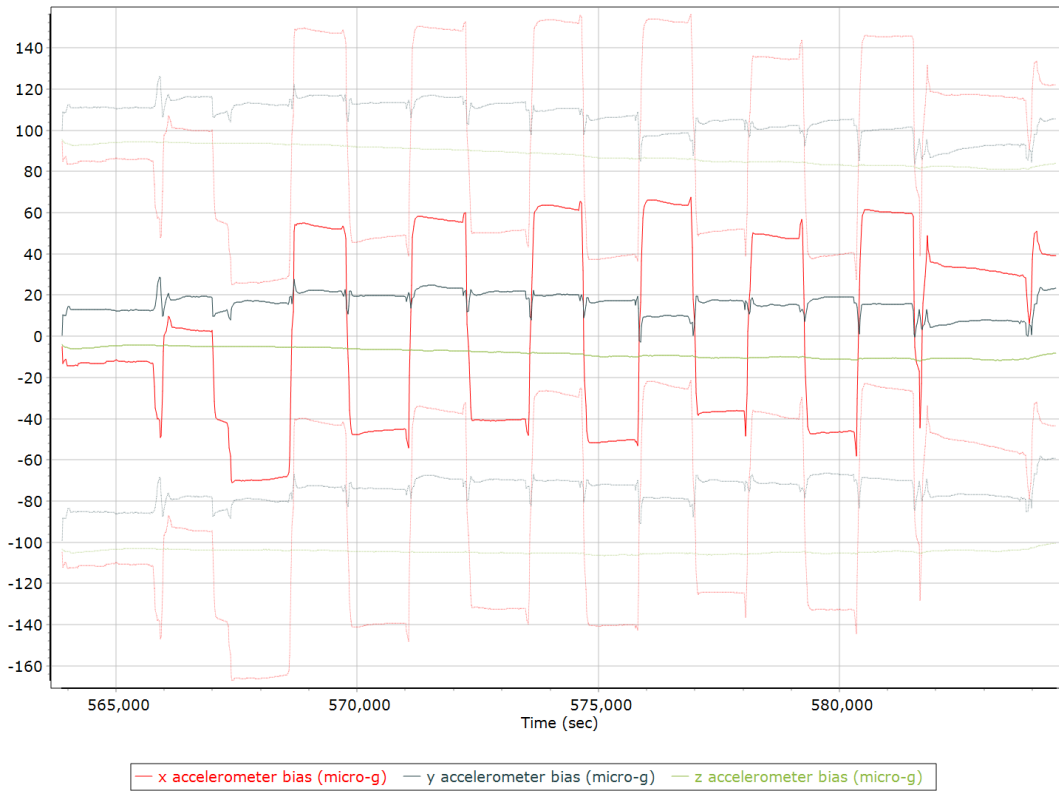
Reference-Primary GNSS Lever Arm Figure of Merit



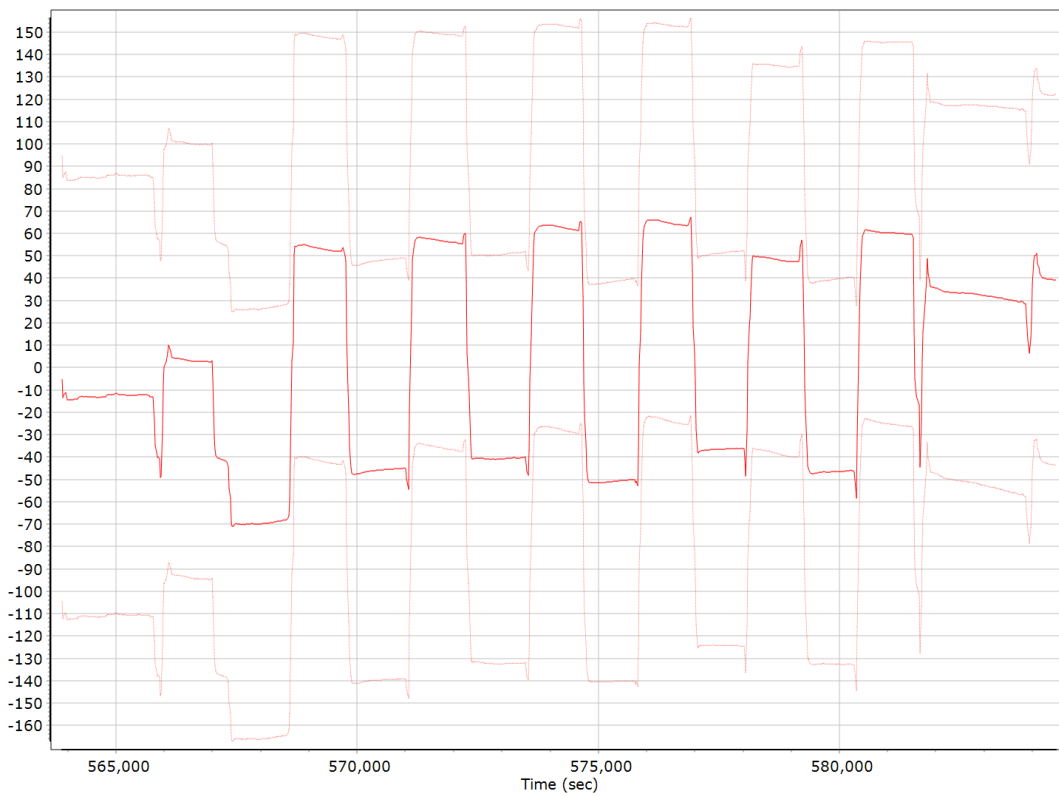
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

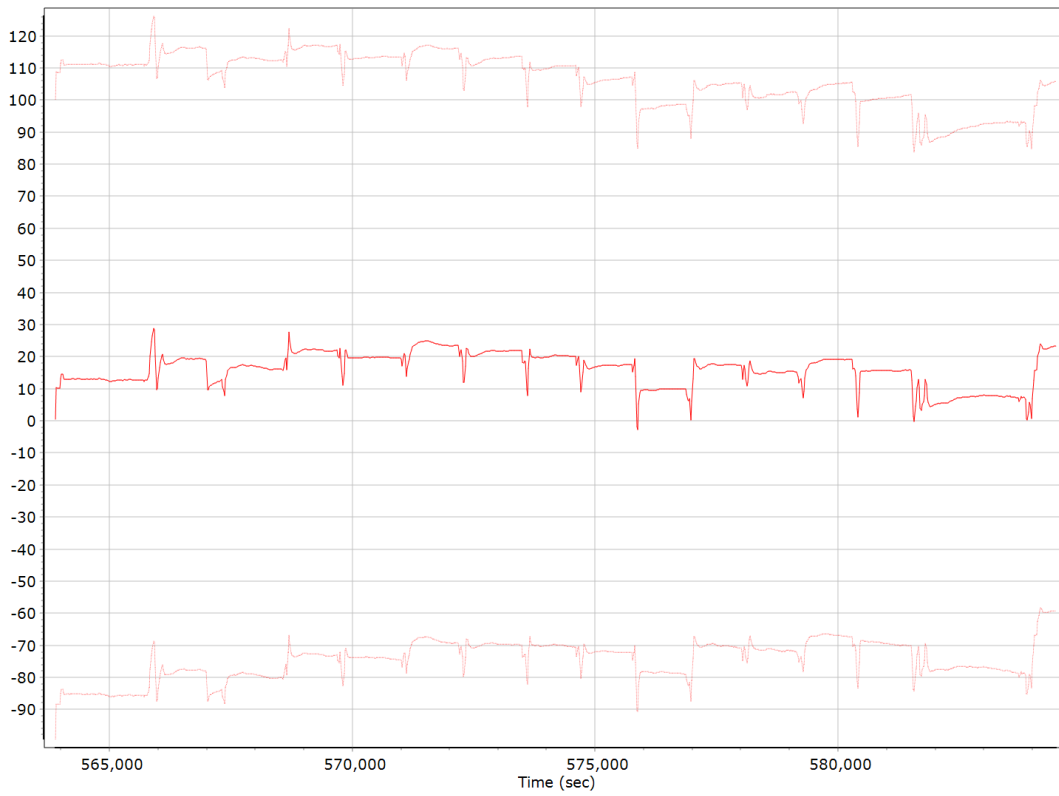
Accelerometer Bias (micro-g)



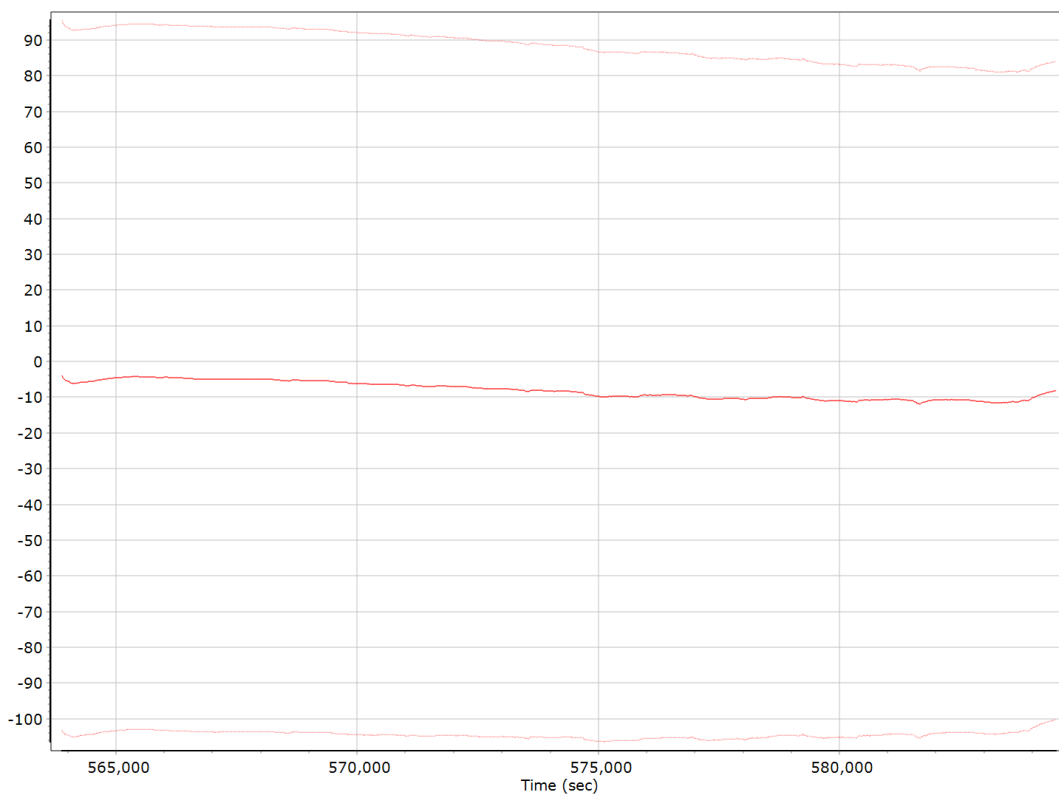
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



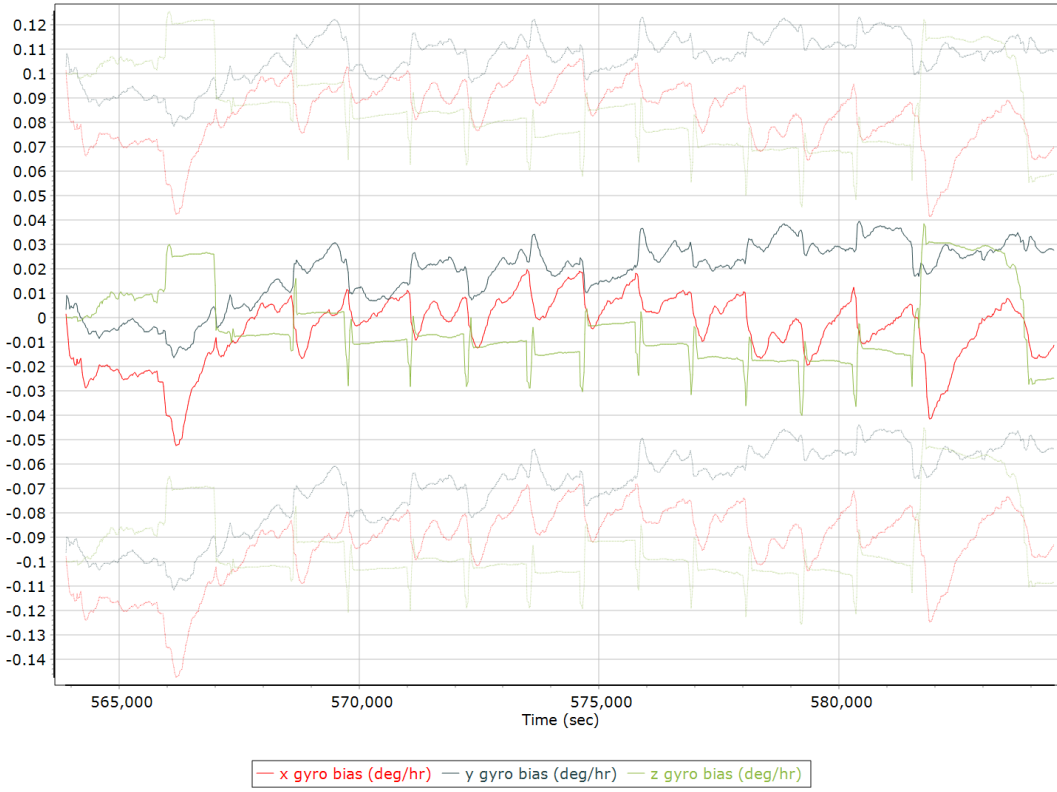
Y Accelerometer Scale Error (ppm)



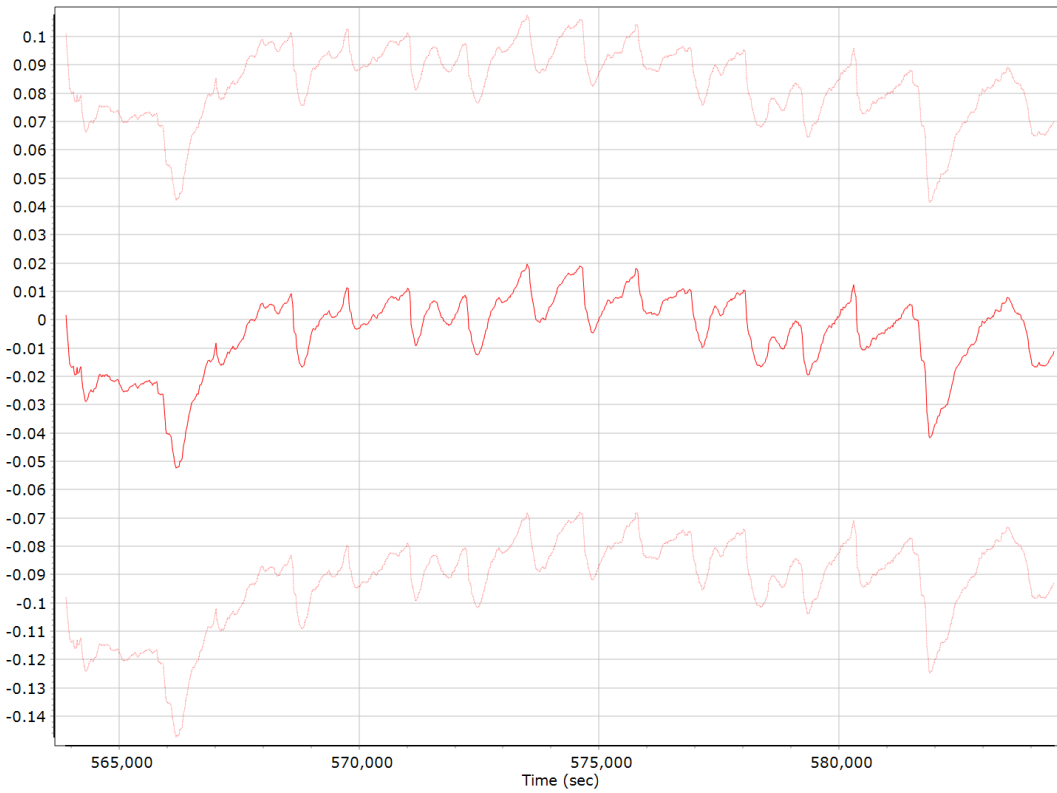
Z Accelerometer Scale Error (ppm)



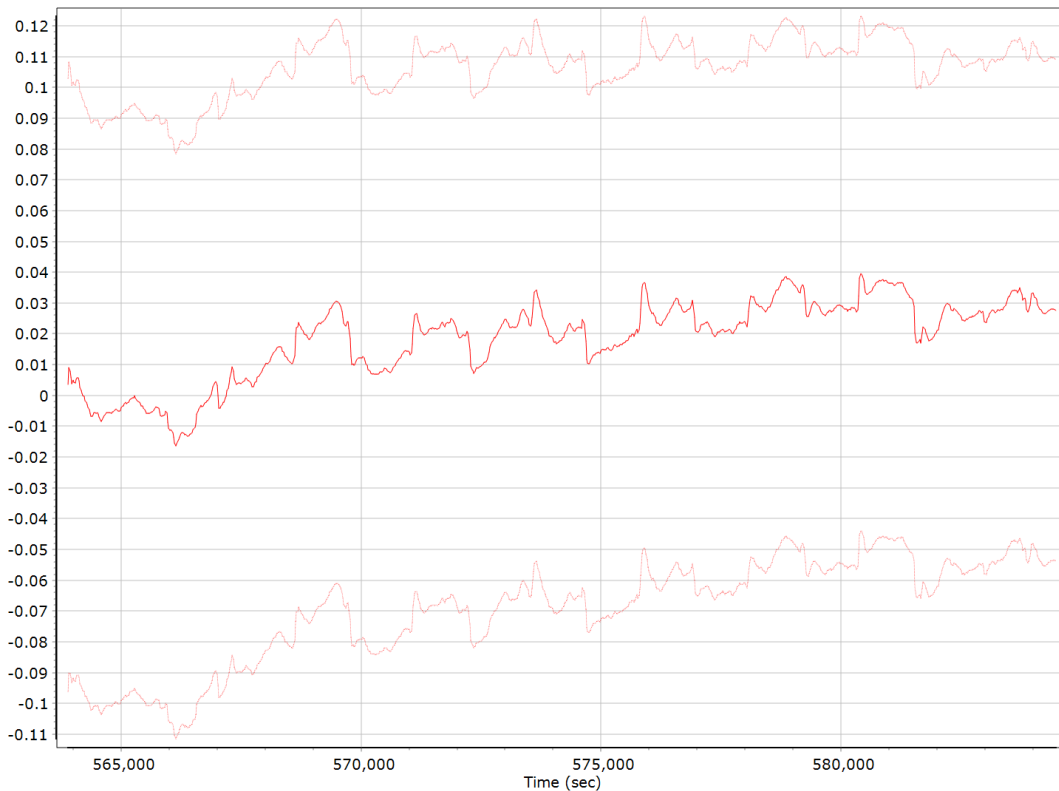
Gyro Bias (deg/h)



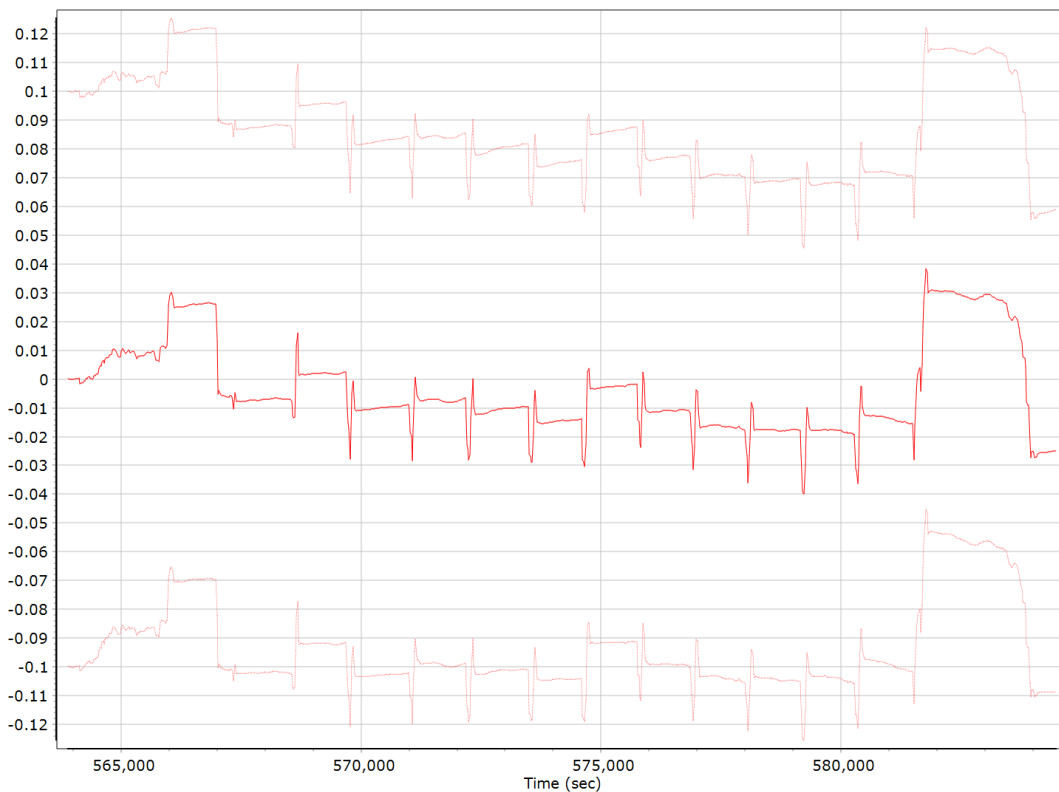
X Gyro Bias (deg/h)



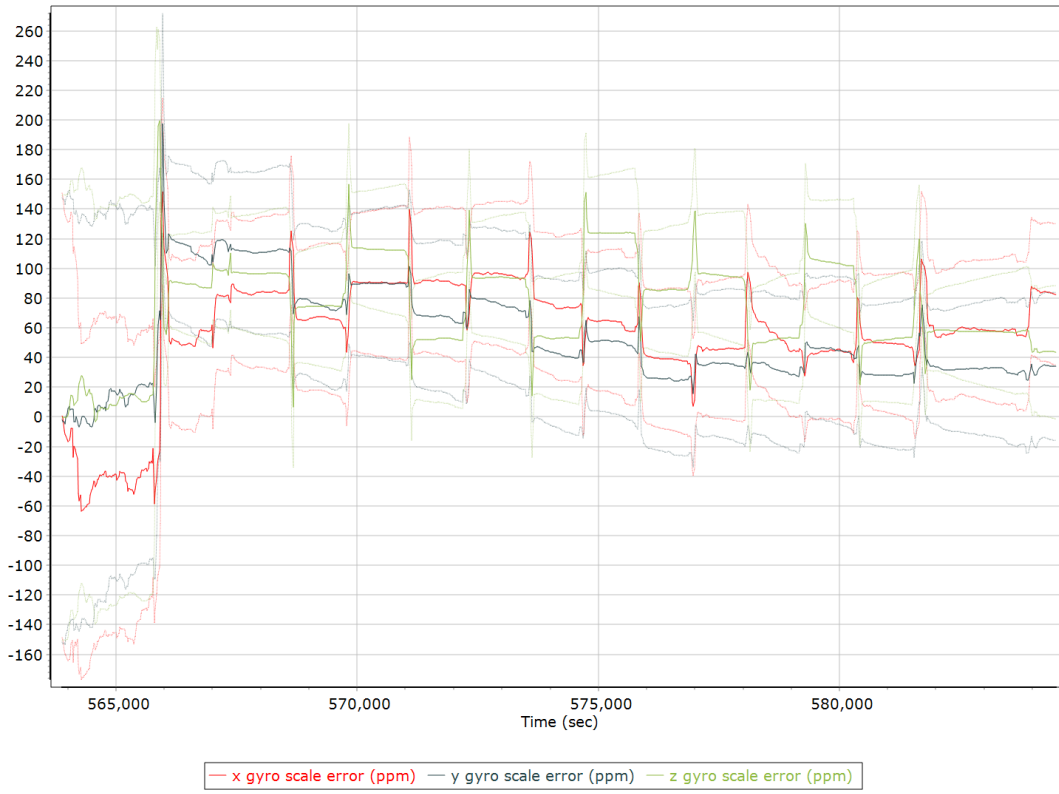
Y Gyro Bias (deg/h)



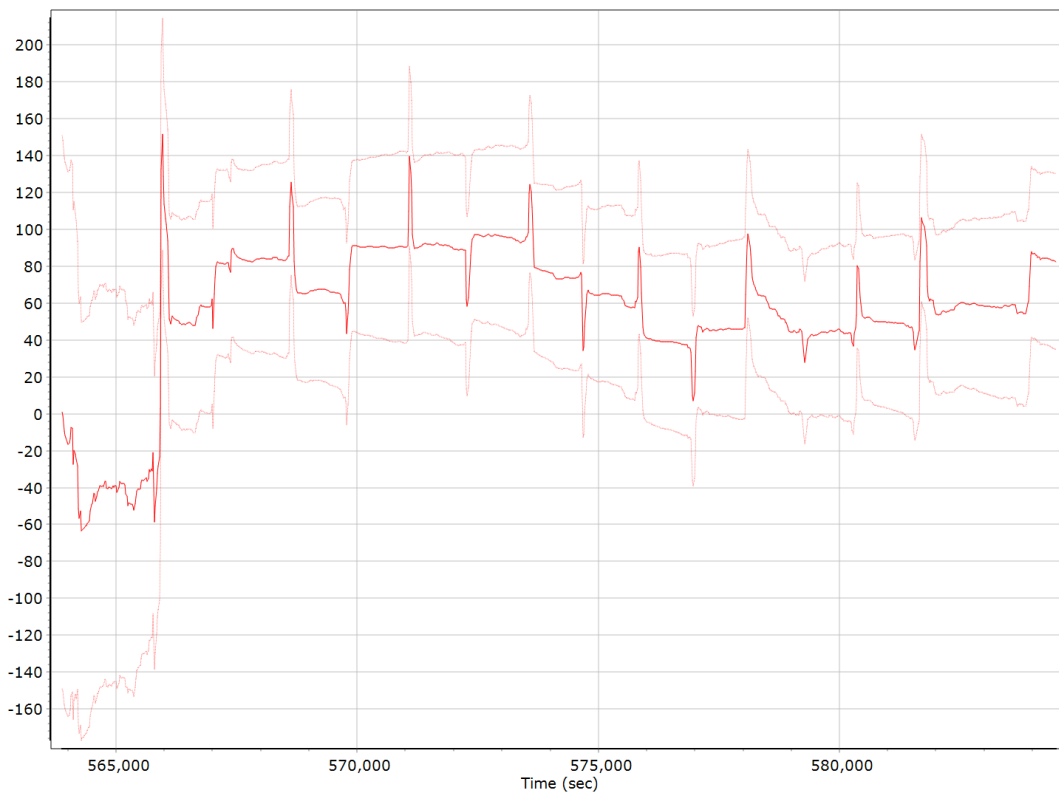
Z Gyro Bias (deg/h)



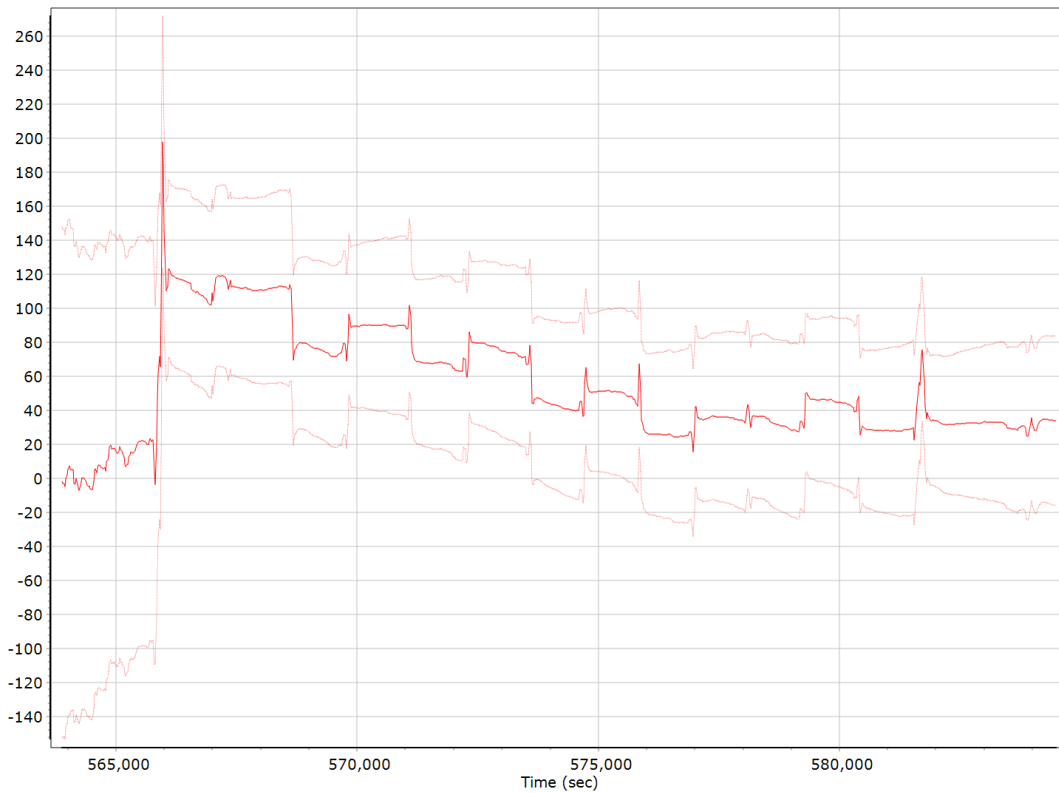
Gyro Scale Error (ppm)



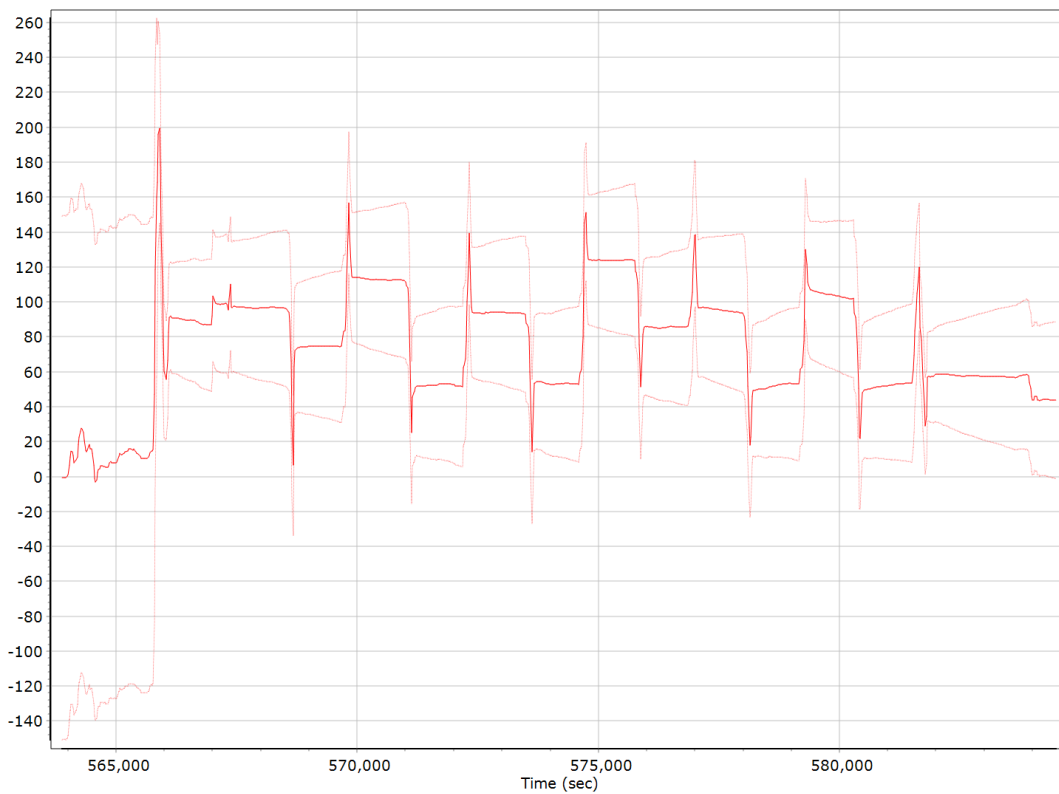
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

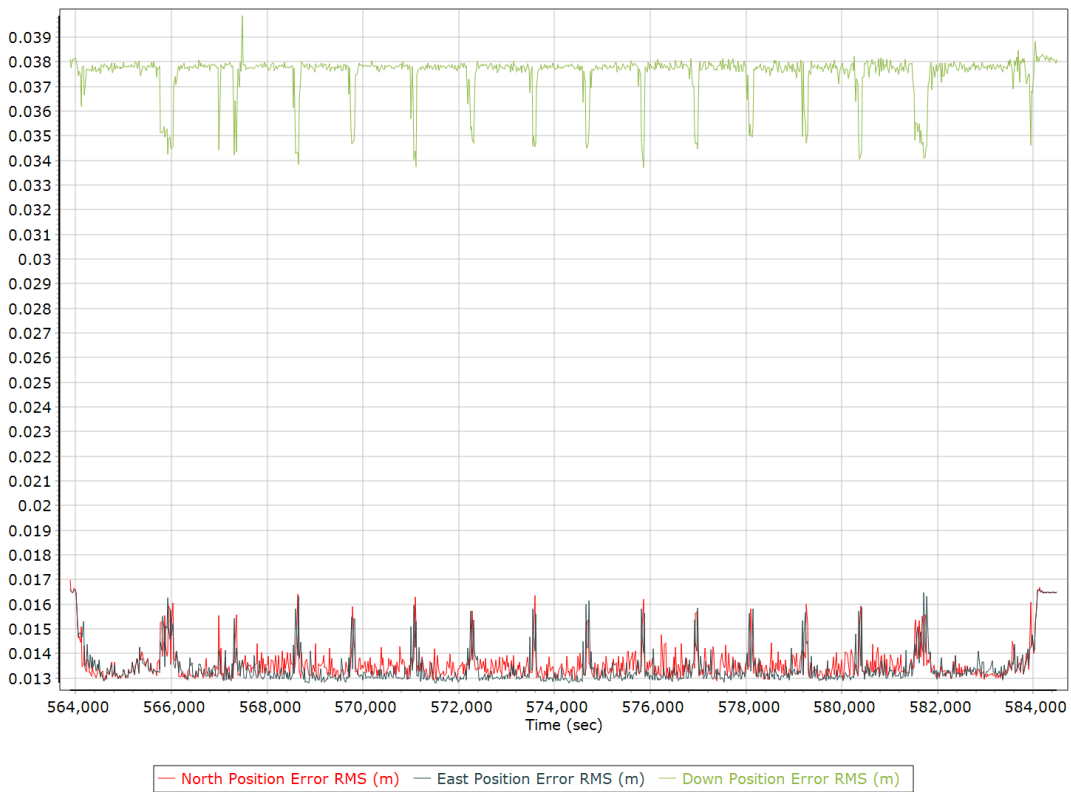


Z Gyro Scale Error (ppm)

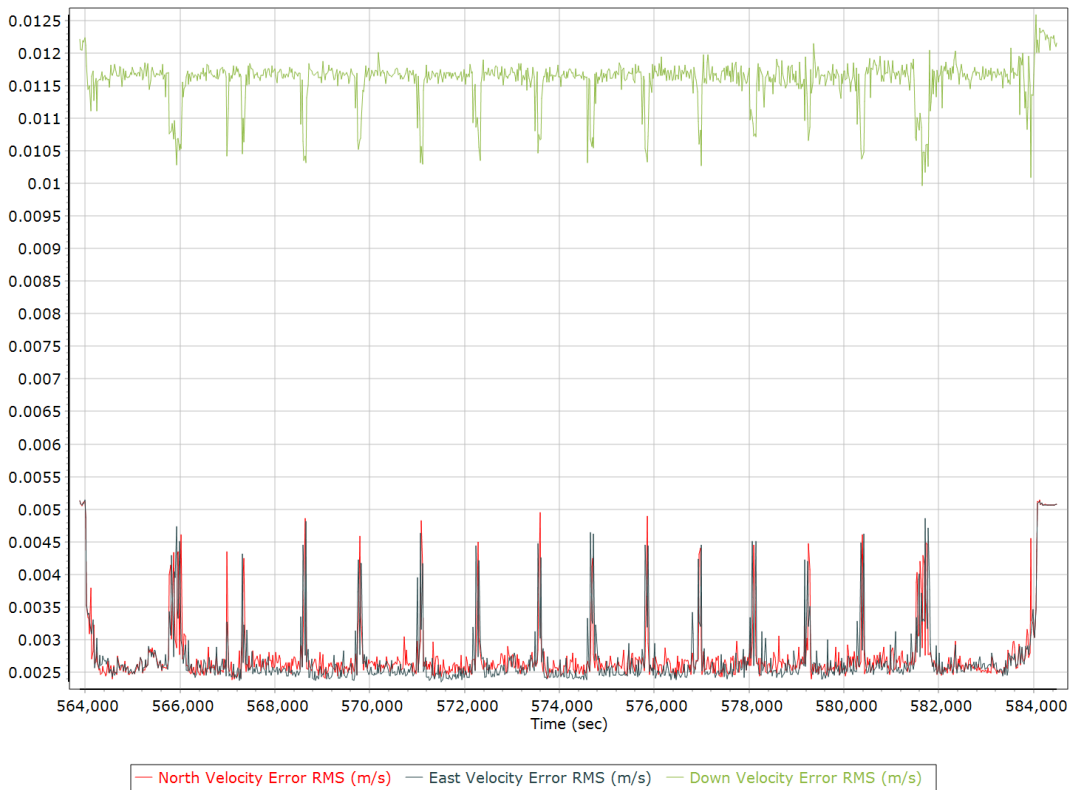


Smoothed Performance Metrics

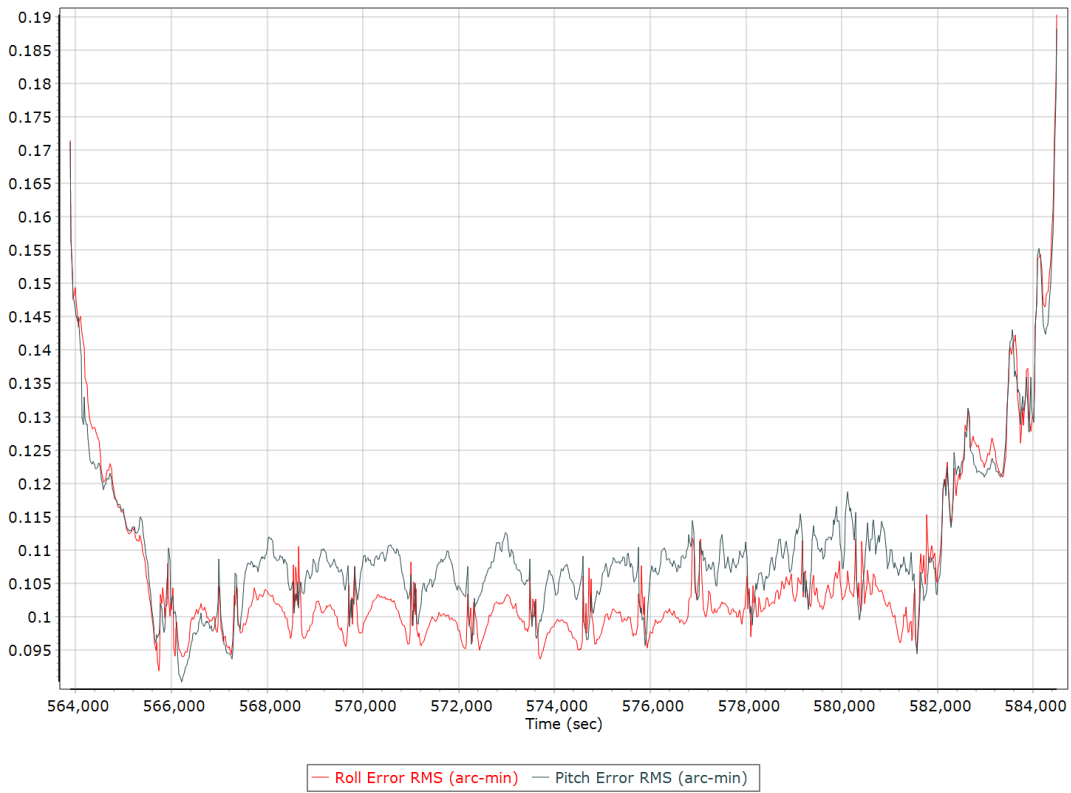
Position Error RMS (m)



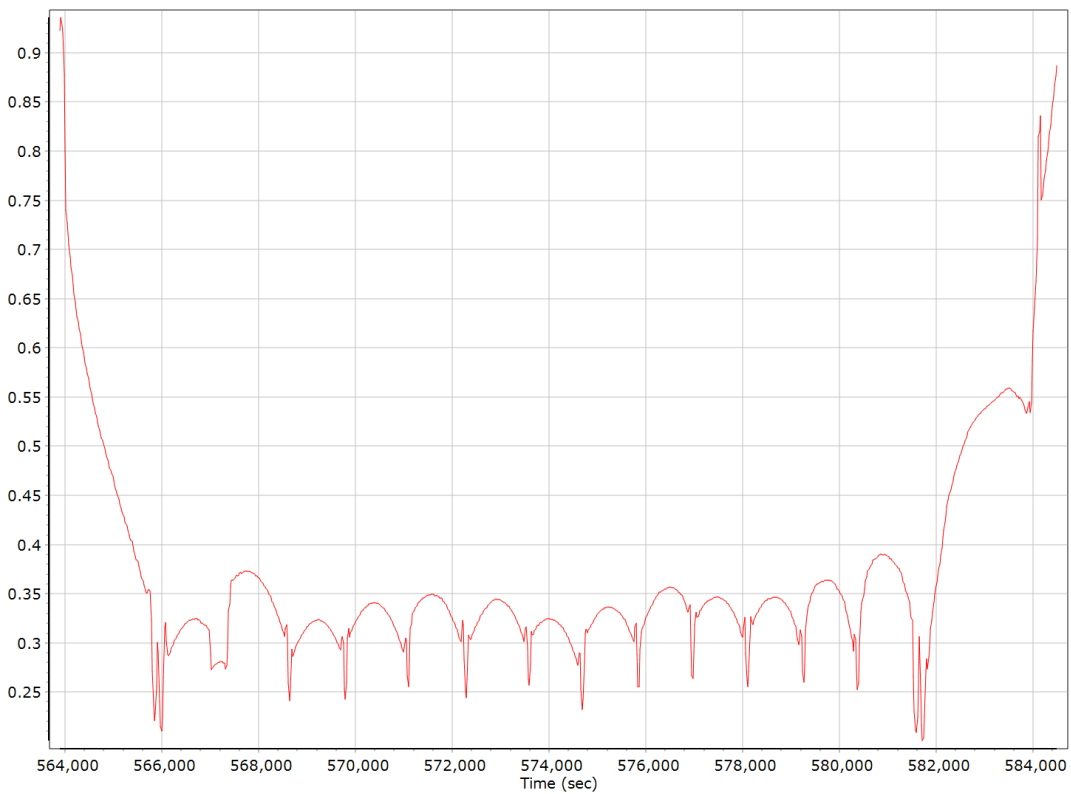
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

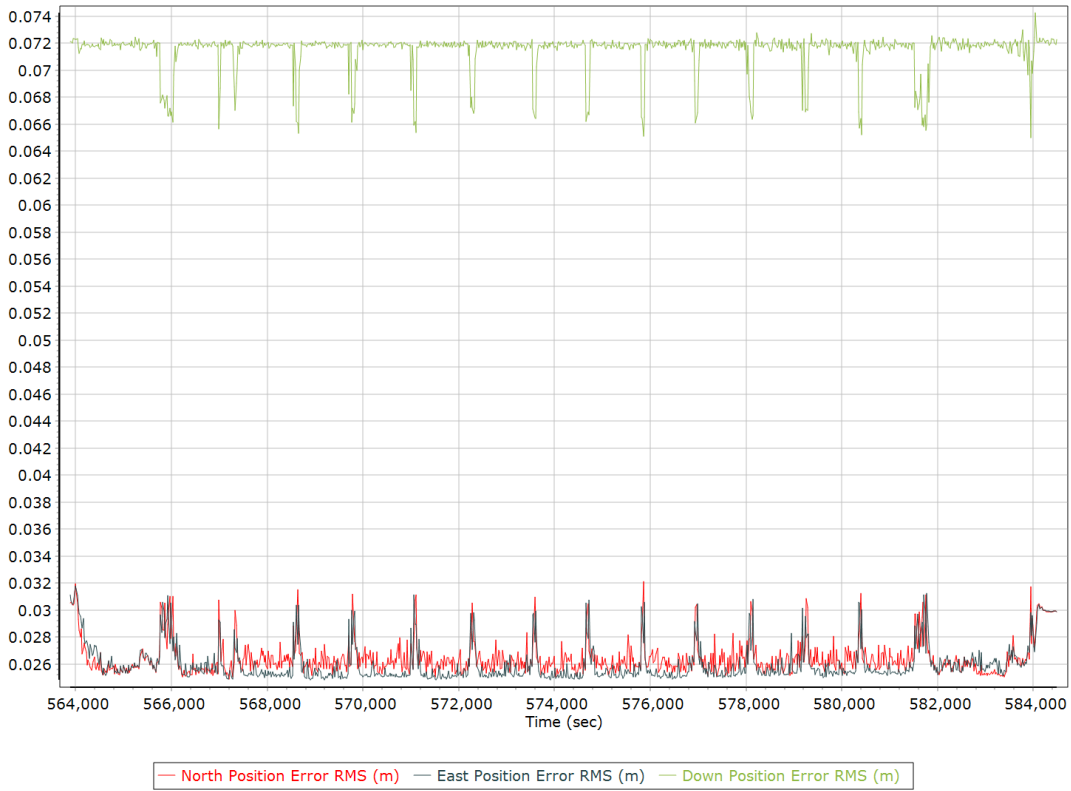


Heading Error RMS (arc-min)

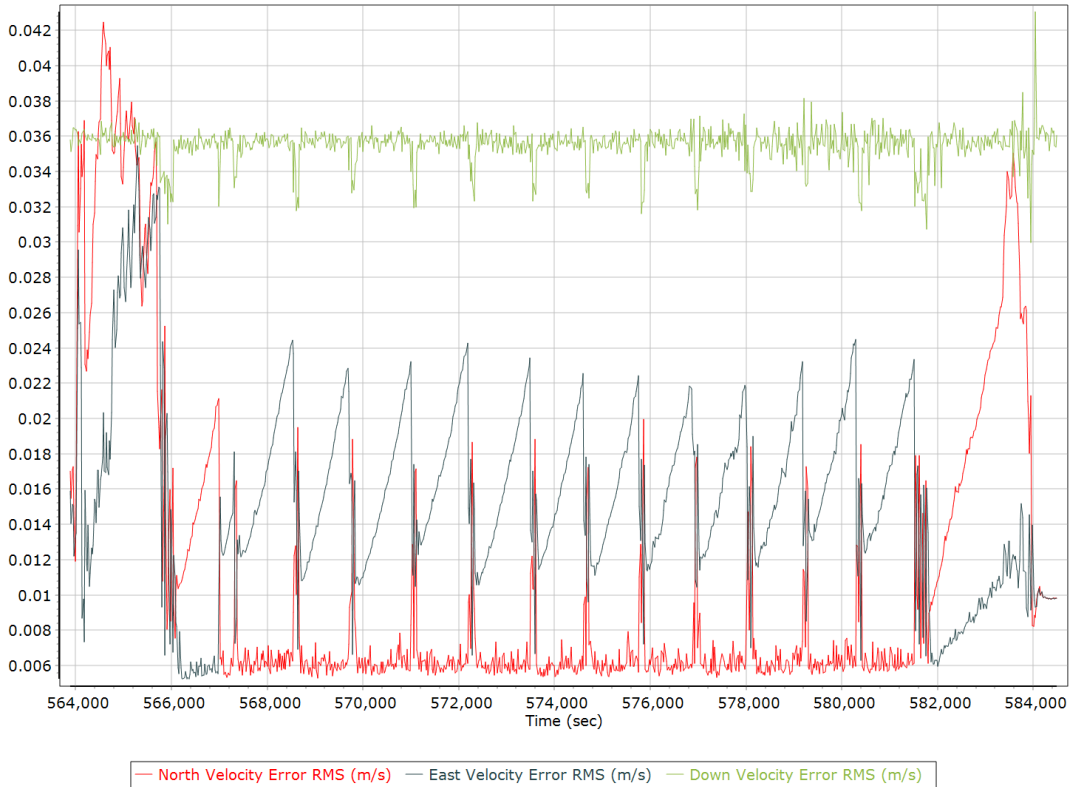


Forward Processed Performance Metrics

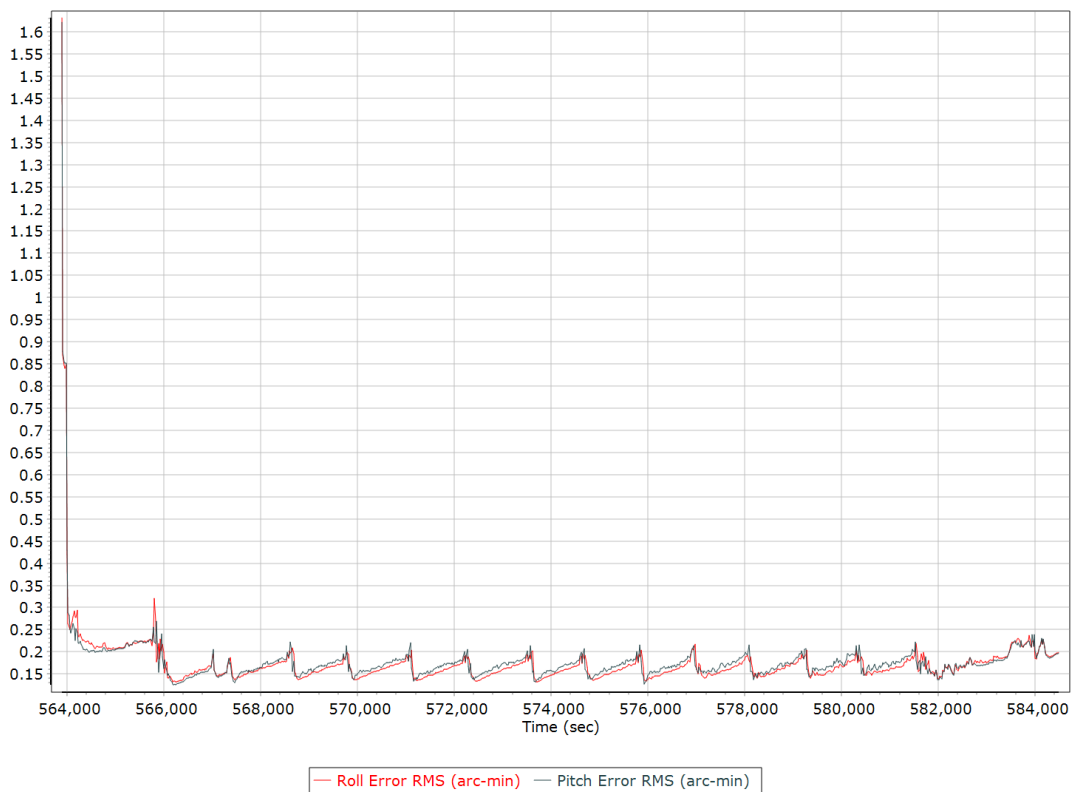
Position Error RMS (m)



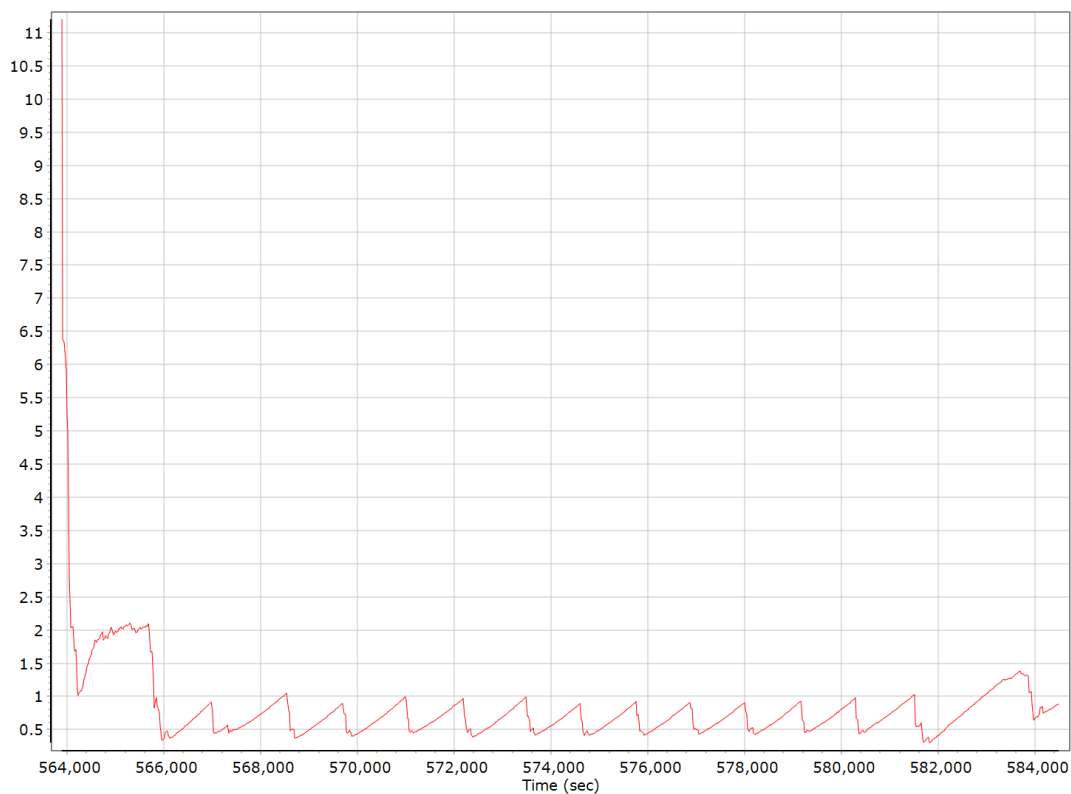
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

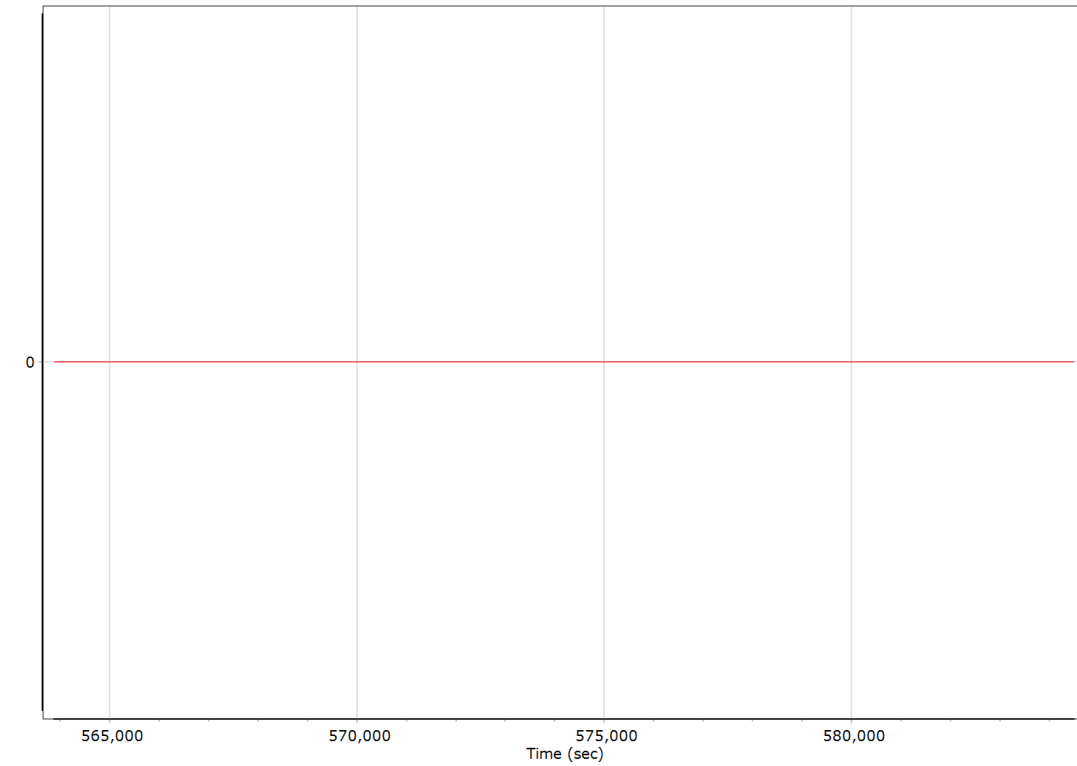


Heading Error RMS (arc-min)



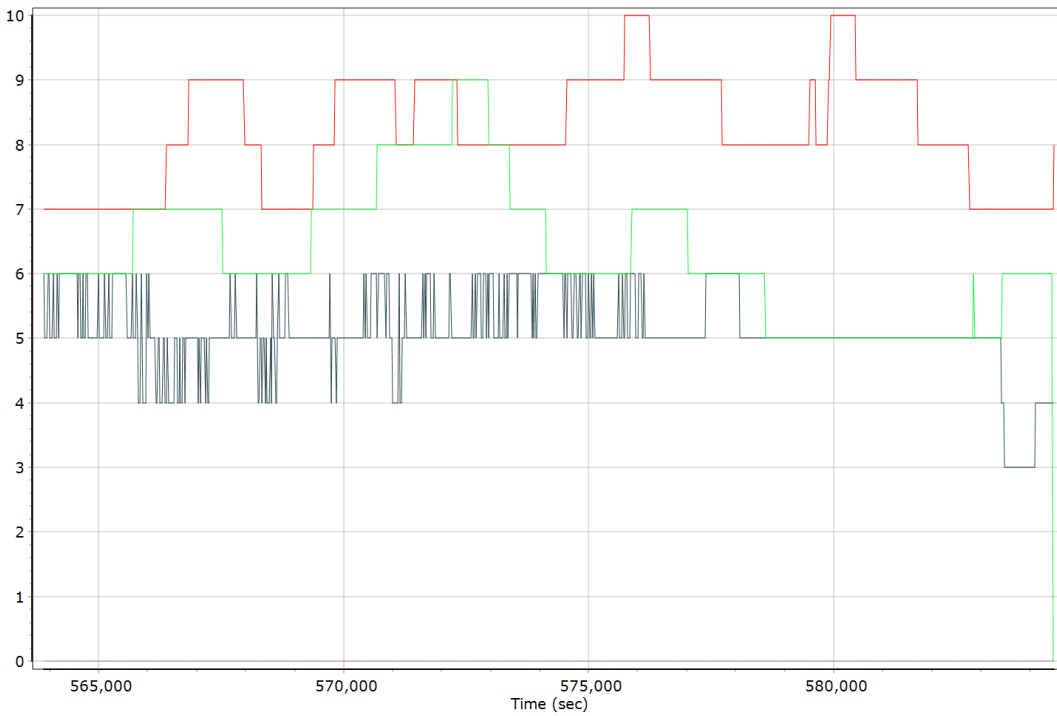
Forward Processed Solution Status

Processing Mode



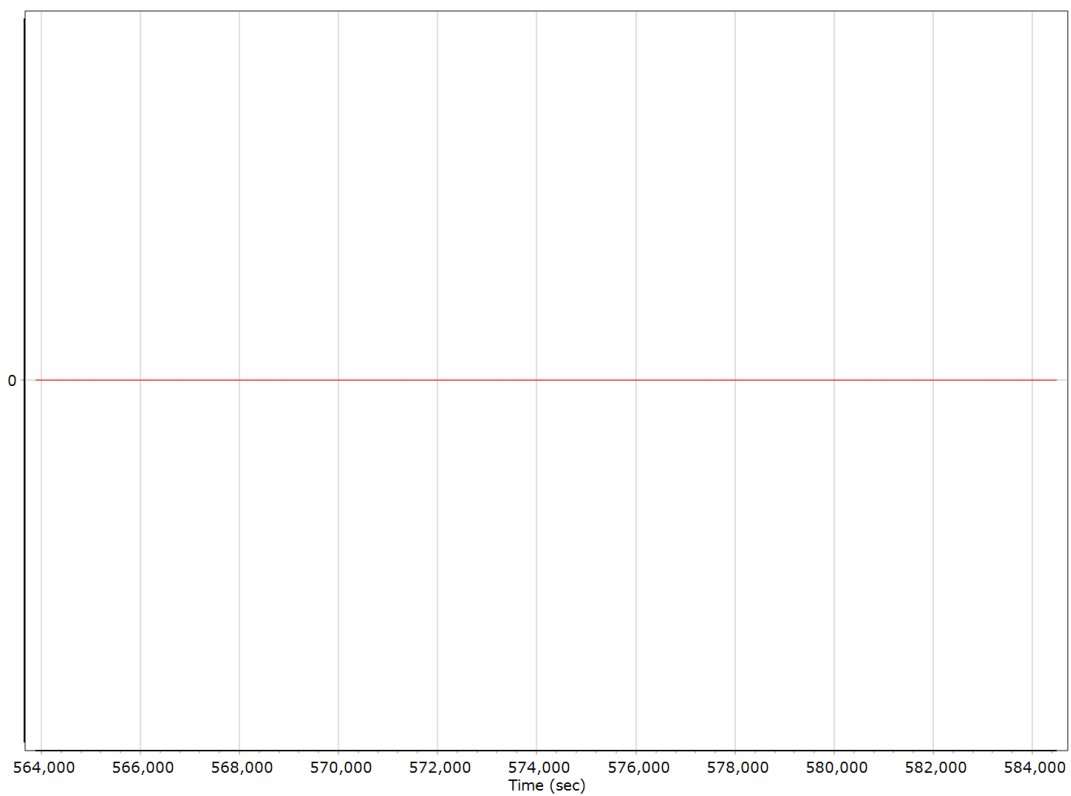
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites — Number of GLONASS Satellites — Number of QZSS Satellites
 — Number of BEIDOU Satellites — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05082022A_3062
Processing date	2022-05-12 20:34:43
Mission date	2022-05-08 12:42:08
Mission duration	03:30:15.077
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8708
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
6222128.000	POS Data
6222128.001	POS Data
6222128.002	POS Data
6222128.003	POS Data
6222128.004	POS Data
6222128.005	POS Data
6222128.006	POS Data
6222128.007	POS Data
6222128.008	POS Data
6222128.009	POS Data
6222128.010	POS Data
6222128.011	POS Data
6222128.012	POS Data
6222128.013	POS Data
6222128.014	POS Data
6222128.015	POS Data
6222128.016	POS Data
6222128.017	POS Data
6222128.018	POS Data
6222128.019	POS Data
6222128.020	POS Data
6222128.021	POS Data
6222128.022	POS Data
6222128.023	POS Data
6222128.024	POS Data
6222128.025	POS Data
6222128.026	POS Data
6222128.027	POS Data
6222128.028	POS Data

Input Files

File Name	File Type
Ephm1280.22g	GLONASS Broadcast Ephemeris
Ephm1280.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05082022A_3062.out	SBET Trajectory File

Rover Data Summary

First raw data file	6222128.000		
Last raw data file	6222128.028		
Start GPS week	2209		
Start time	45709.059 (5/8/2022 12:41:49 PM)		
End time	58324.136 (5/8/2022 4:12:04 PM)		
Start of fine alignment	46173.591 (5/8/2022 12:49:33 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.142	-0.236	-1.269
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

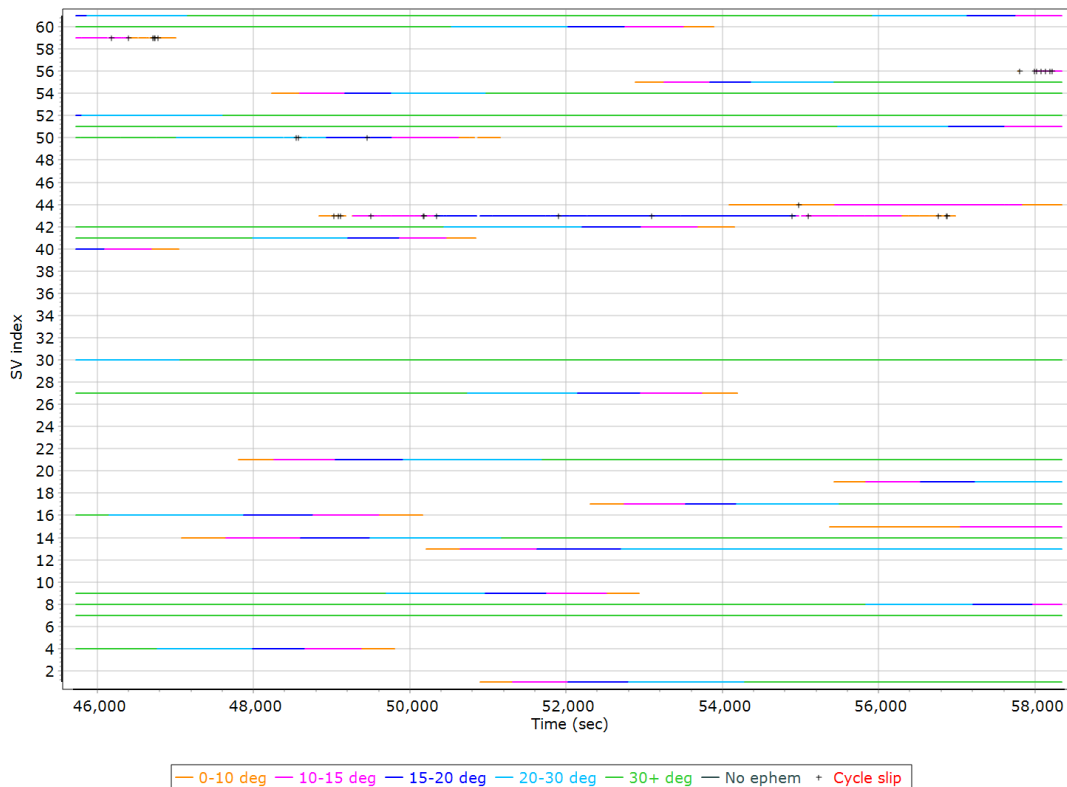
Rover Data QC

Raw IMU Import QC Summary

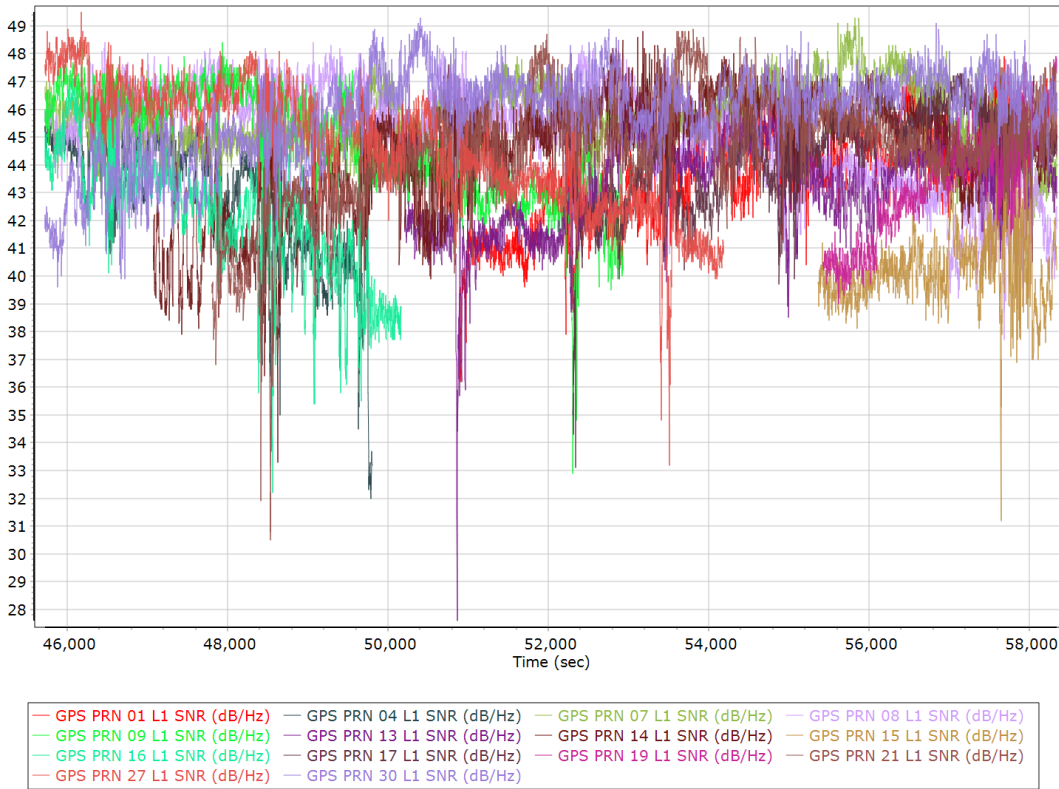
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05082022A_3062.log
IMU Records Processed	2522563
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

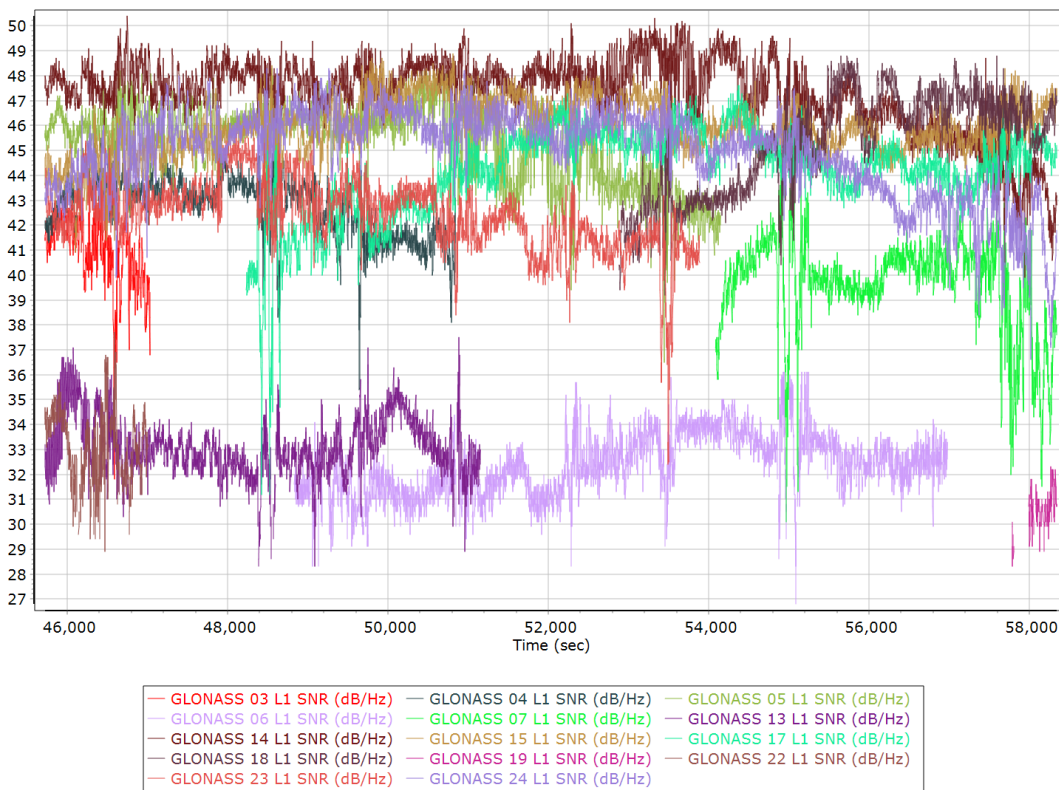
GPS/GLONASS L1 Satellite Lock/Elevation



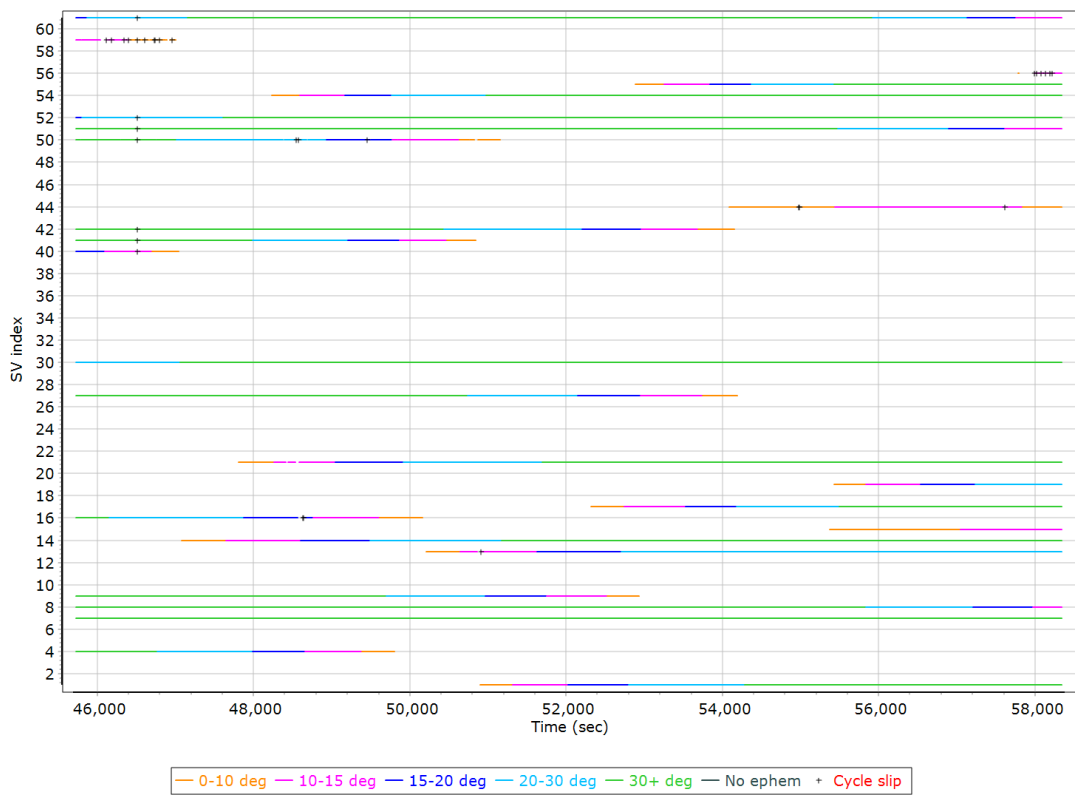
GPS L1 SNR



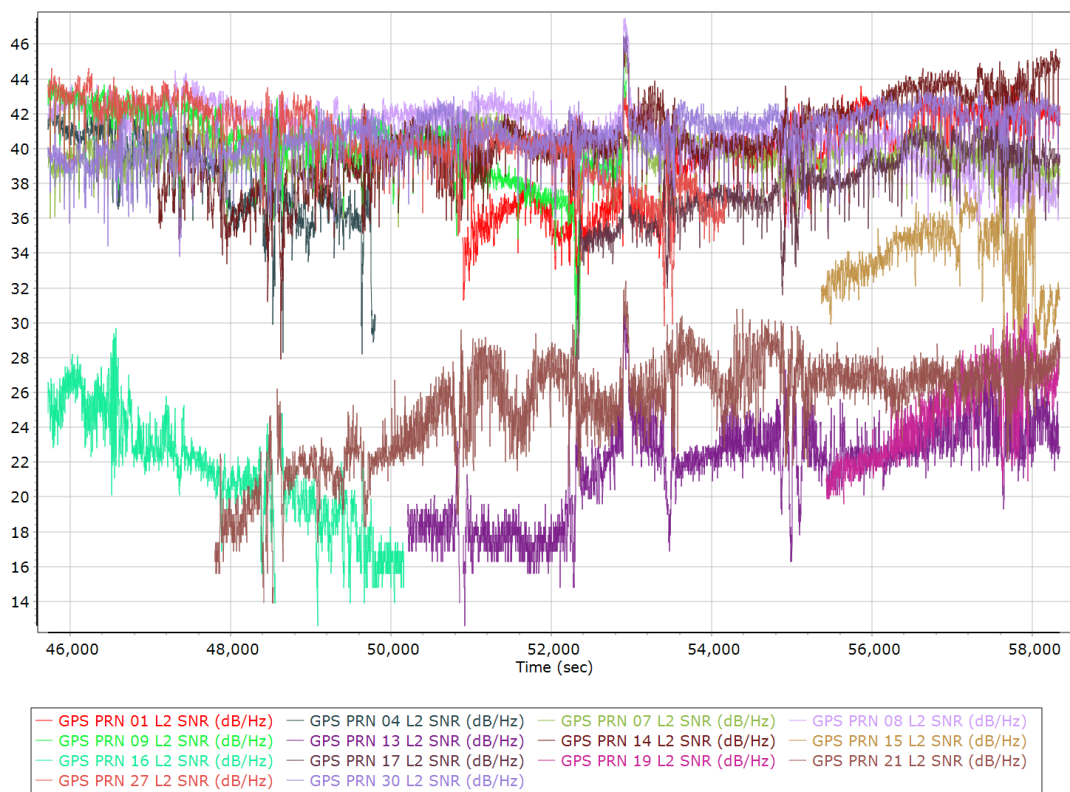
GLONASS L1 SNR



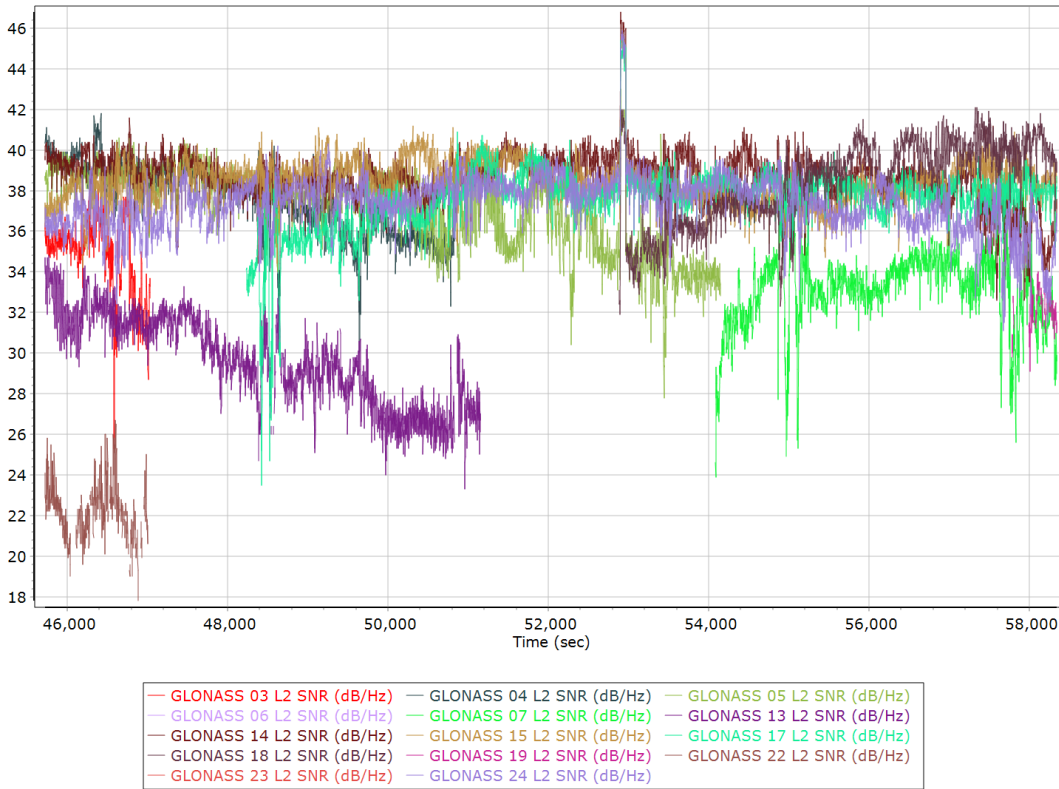
GPS/GLONASS L2 Satellite Lock/Elevation



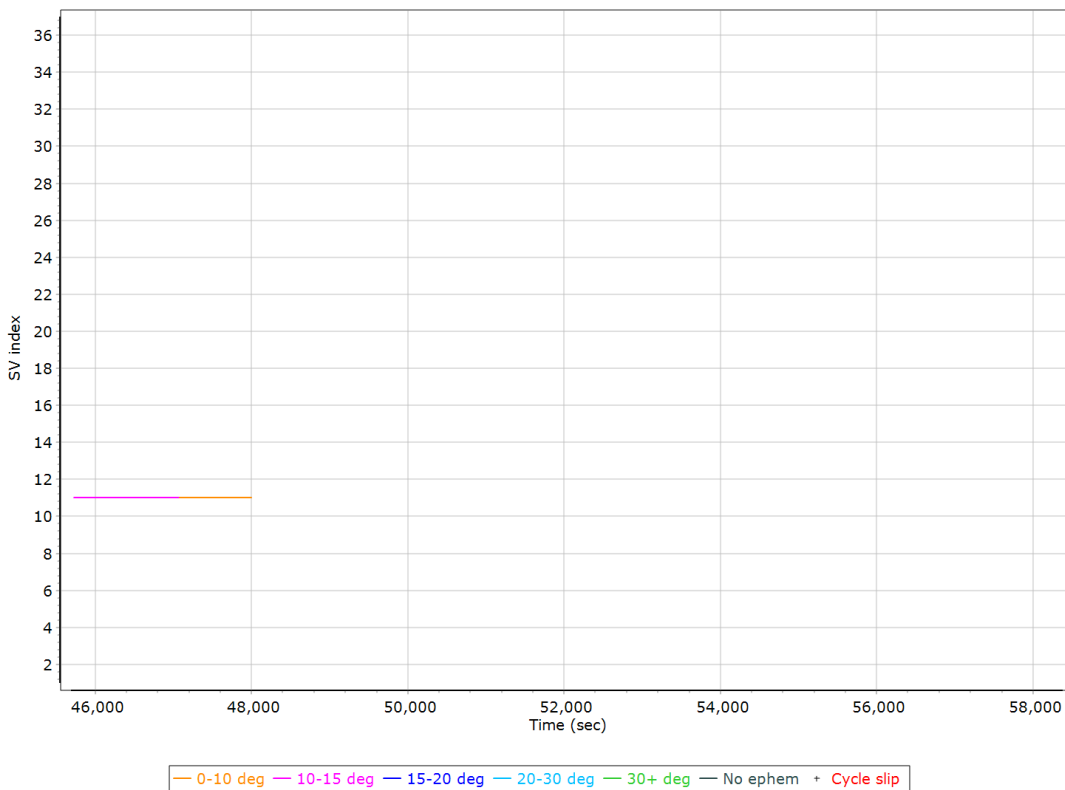
GPS L2 SNR



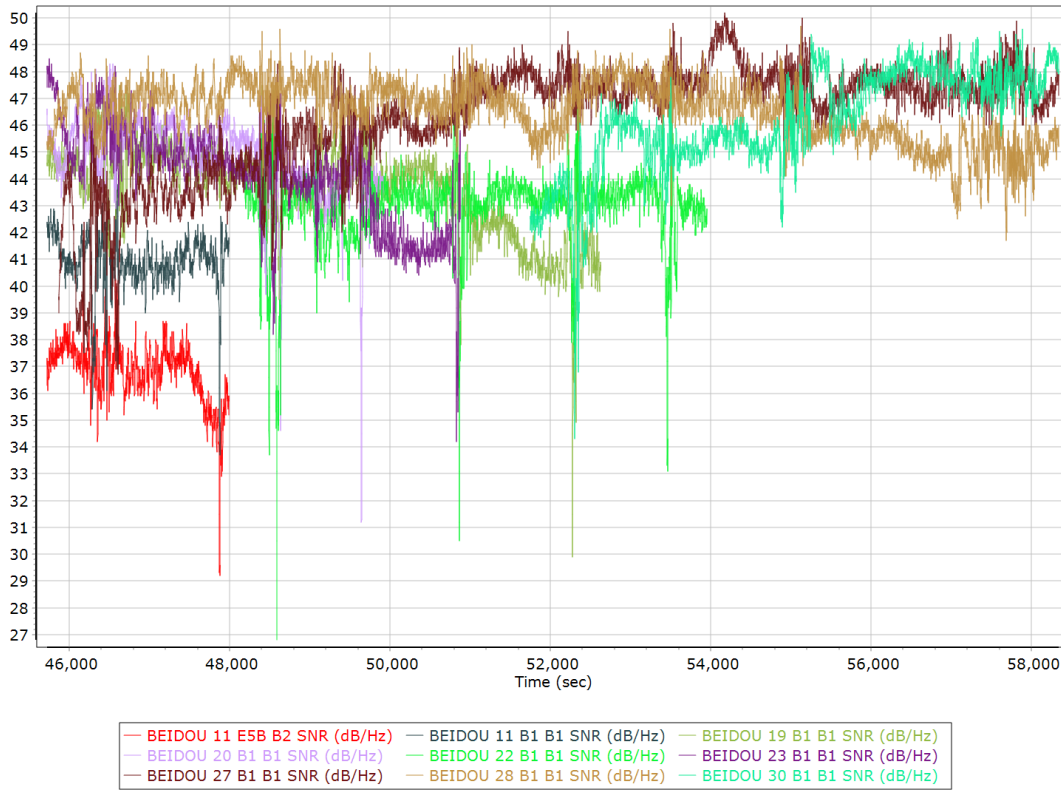
GLONASS L2 SNR



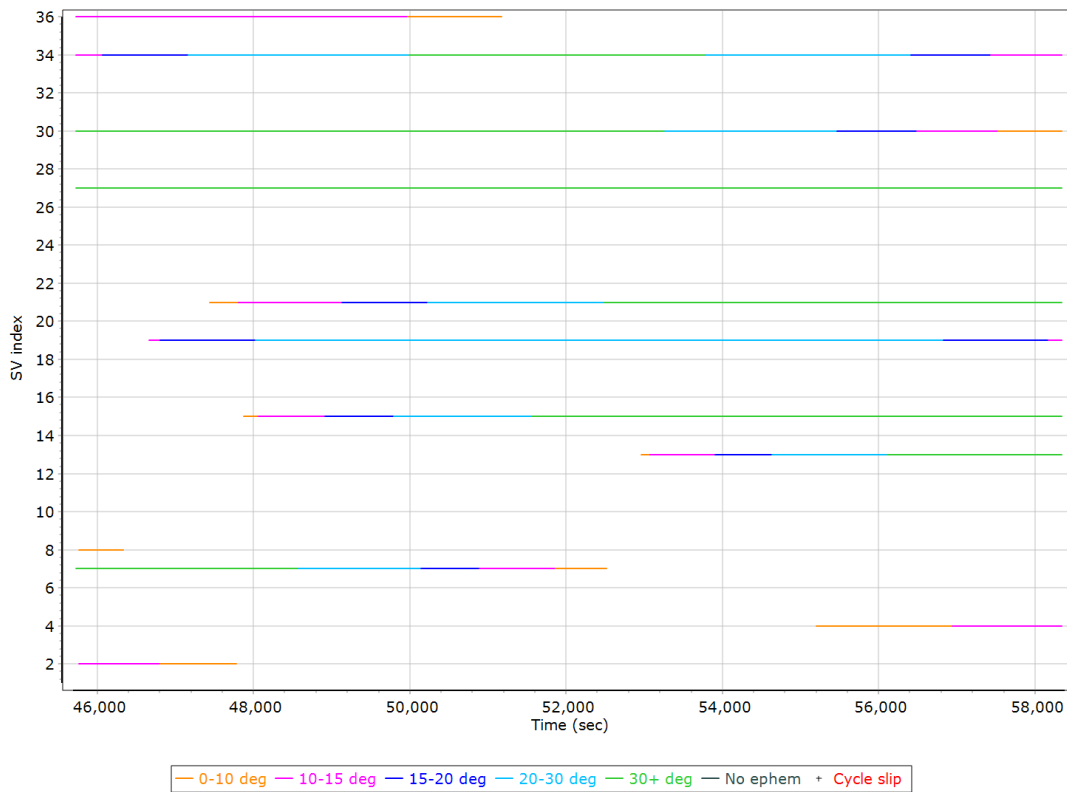
BEIDOU Satellite Lock/Elevation



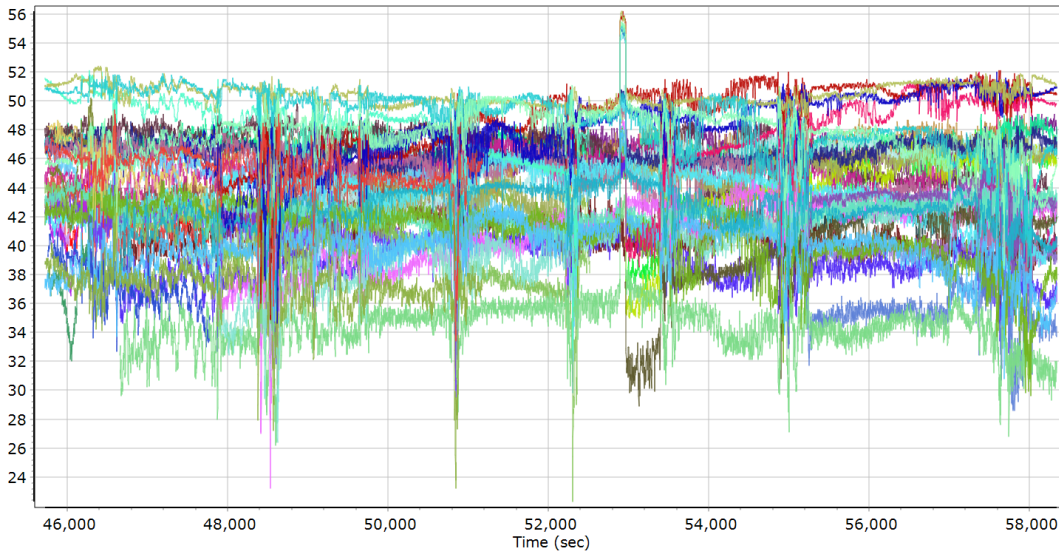
BEIDOU SNR



GALILEO Satellite Lock/Elevation



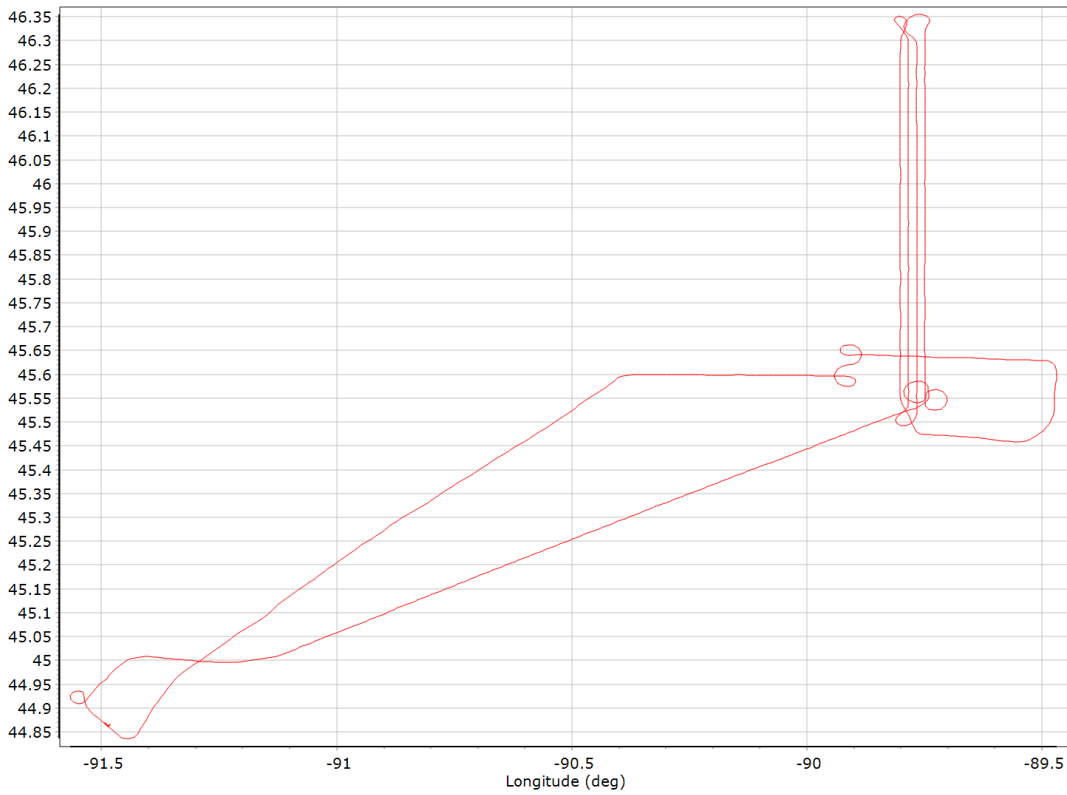
GALILEO SNR



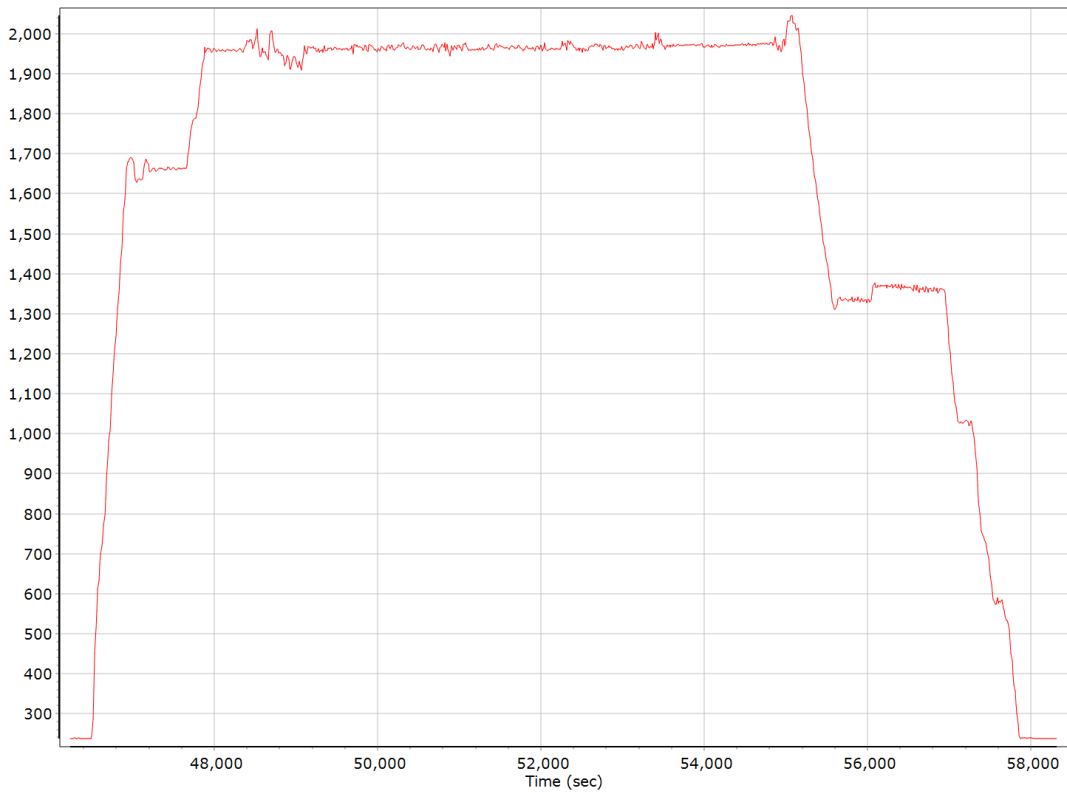
— GALILEO 02 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 07 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 08 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 27 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 30 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 34 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 36 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 02 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 04 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 07 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 08 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 13 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 15 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 19 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 21 L5E5A BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

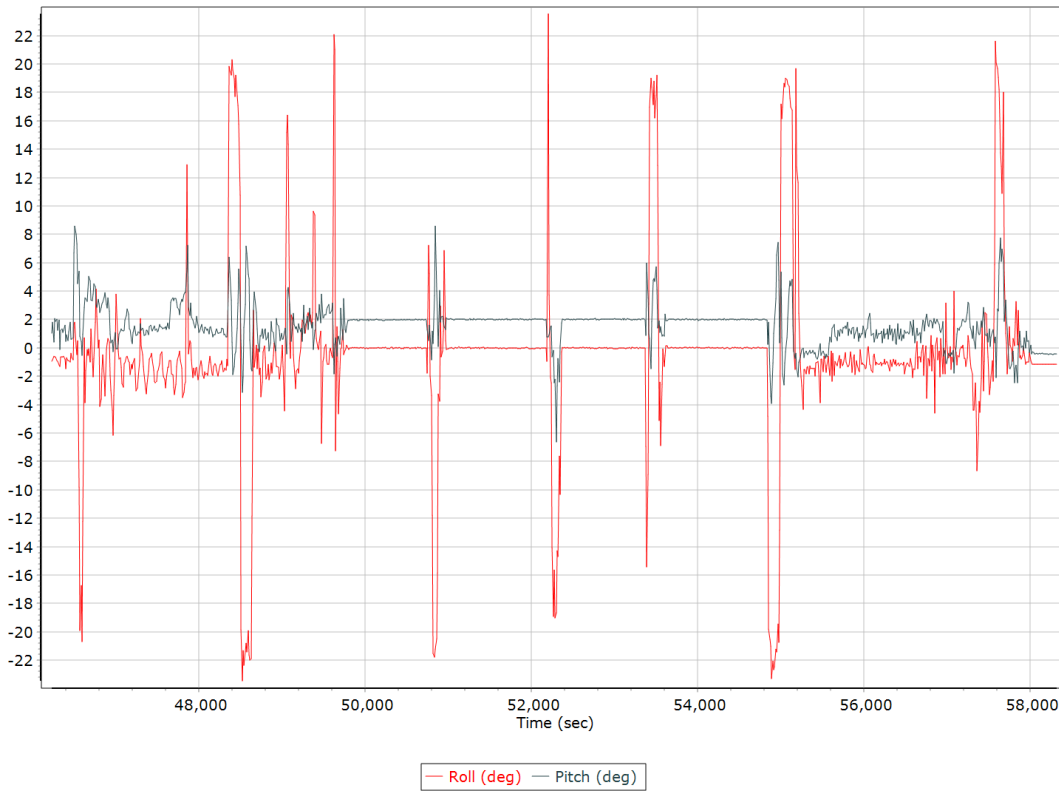
Top View



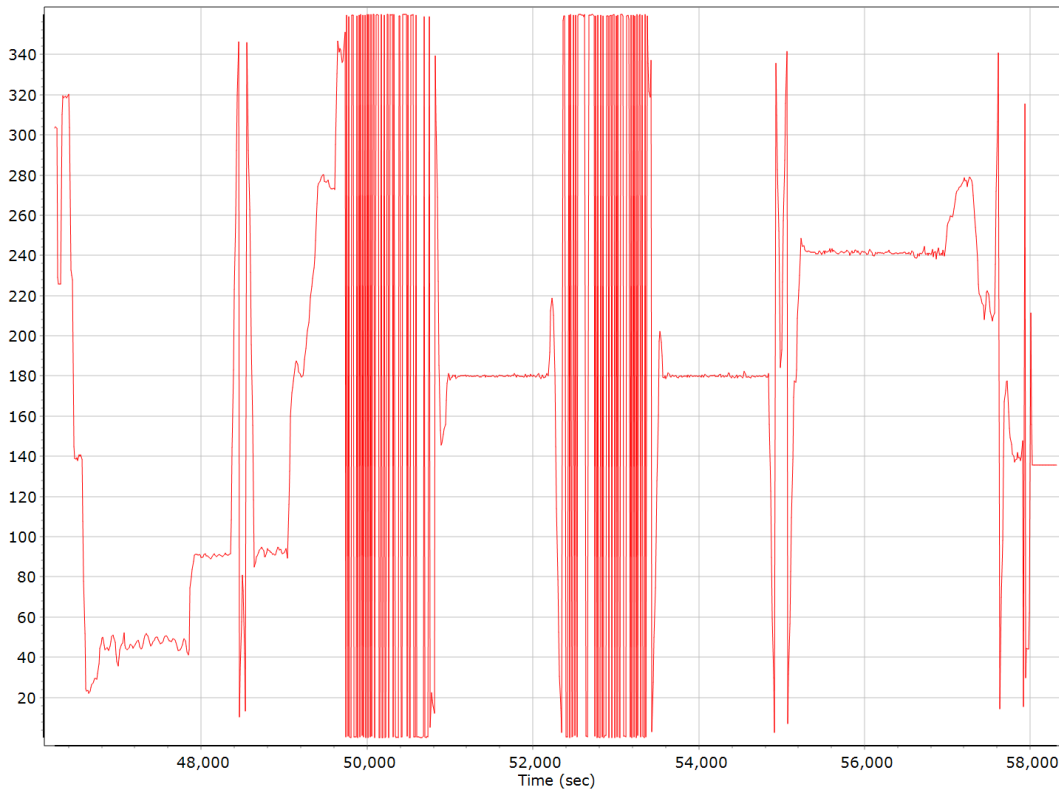
Altitude



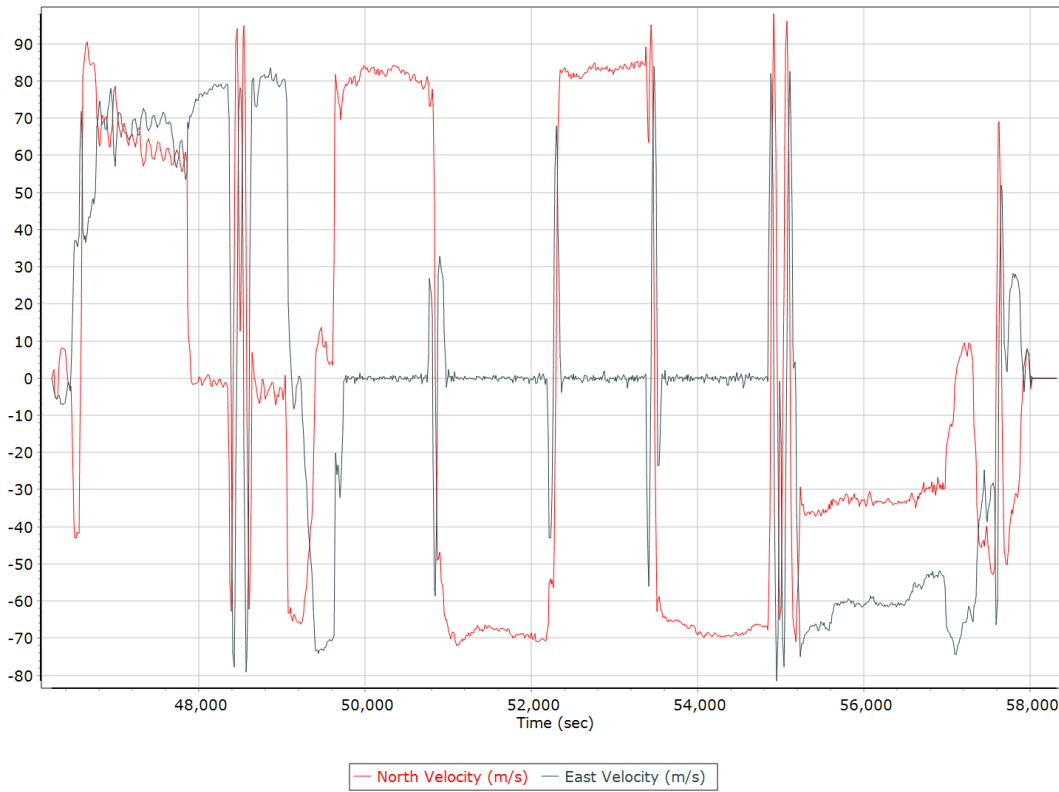
Roll/Pitch



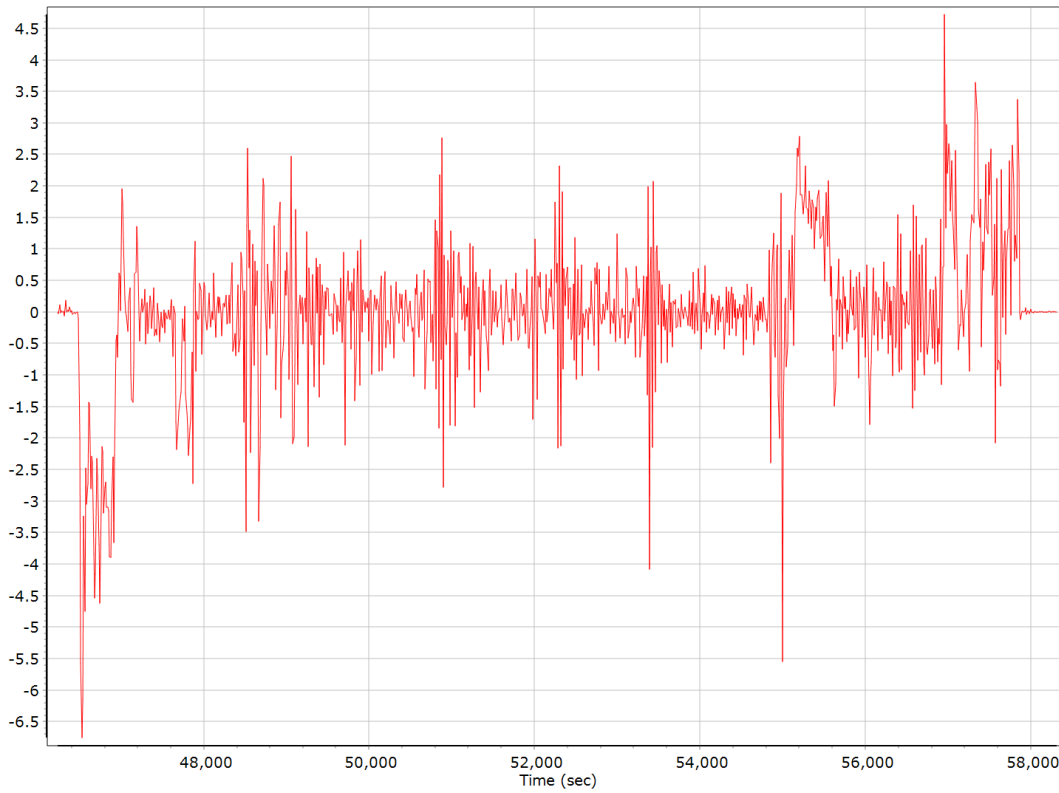
Heading



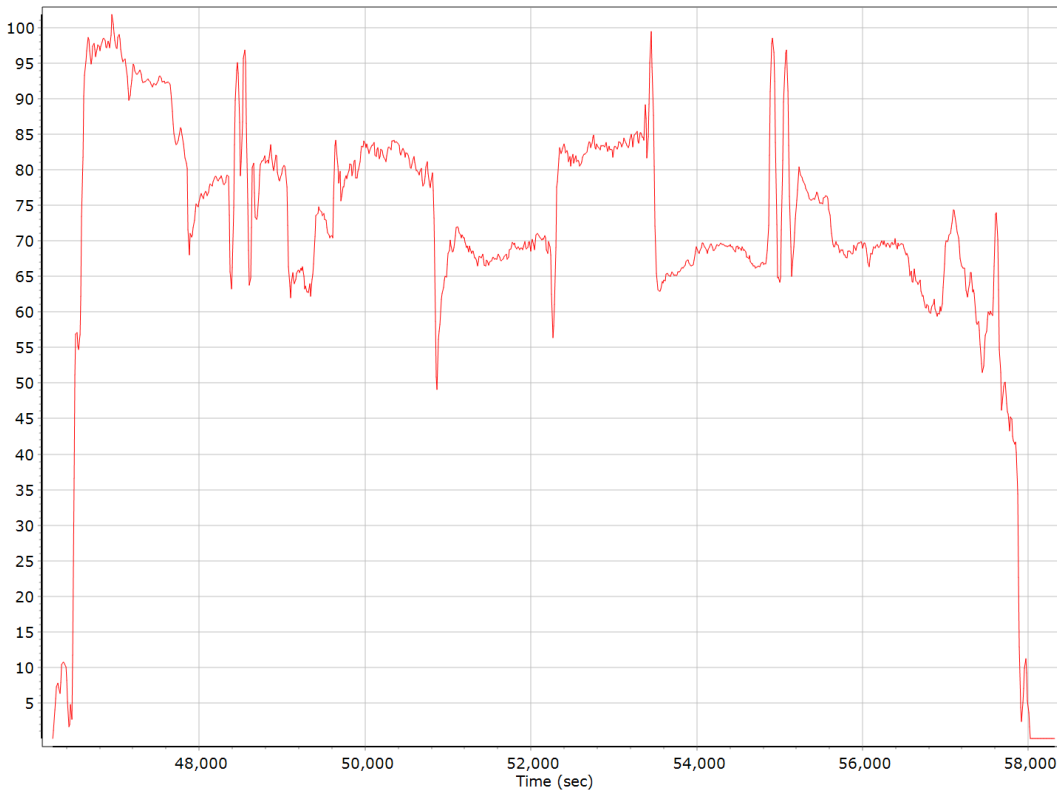
North/East Velocity



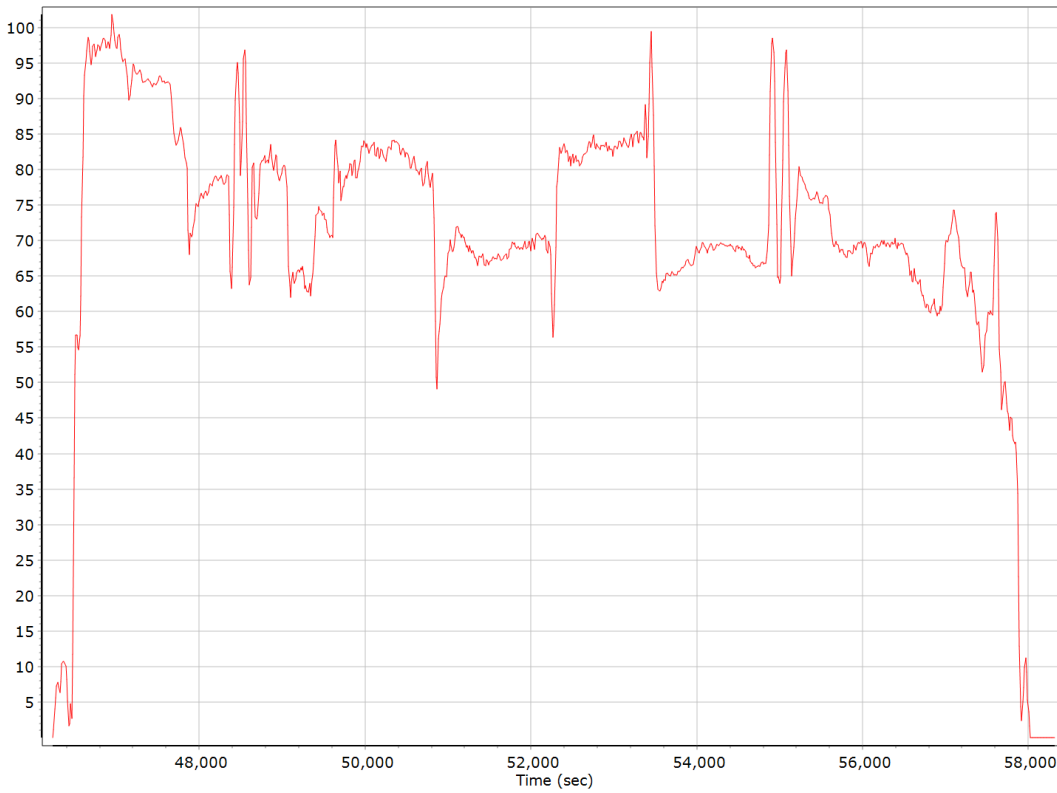
Down Velocity



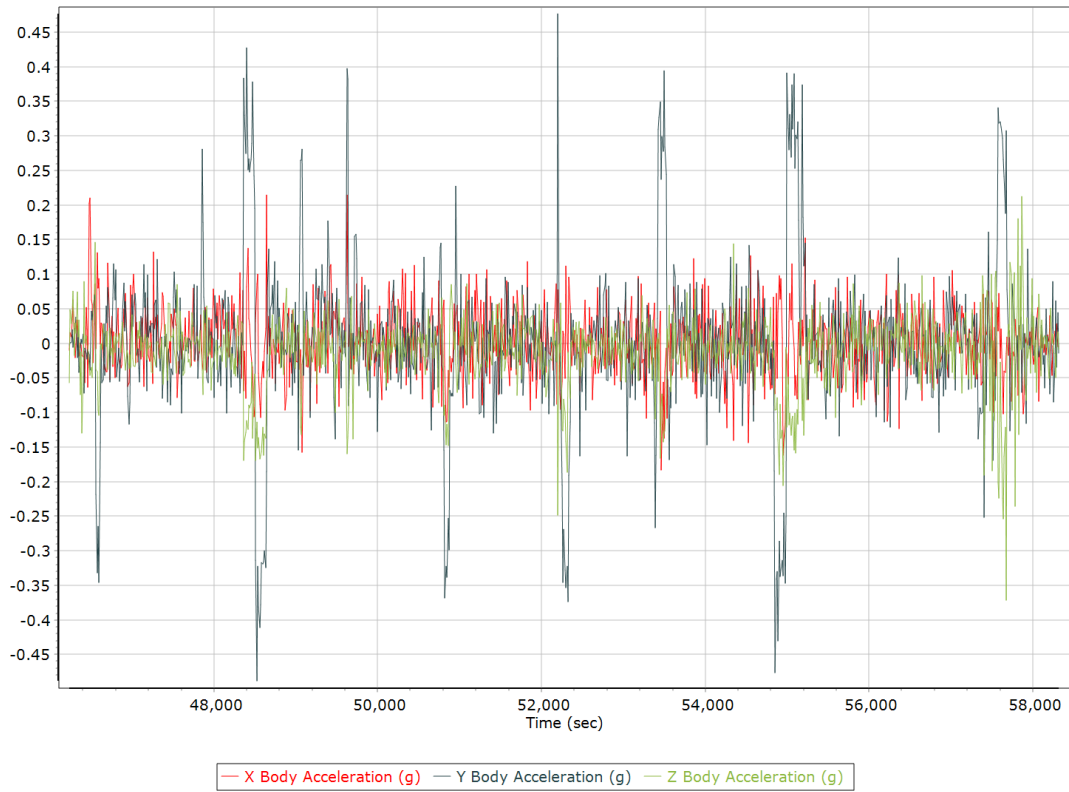
Total Speed



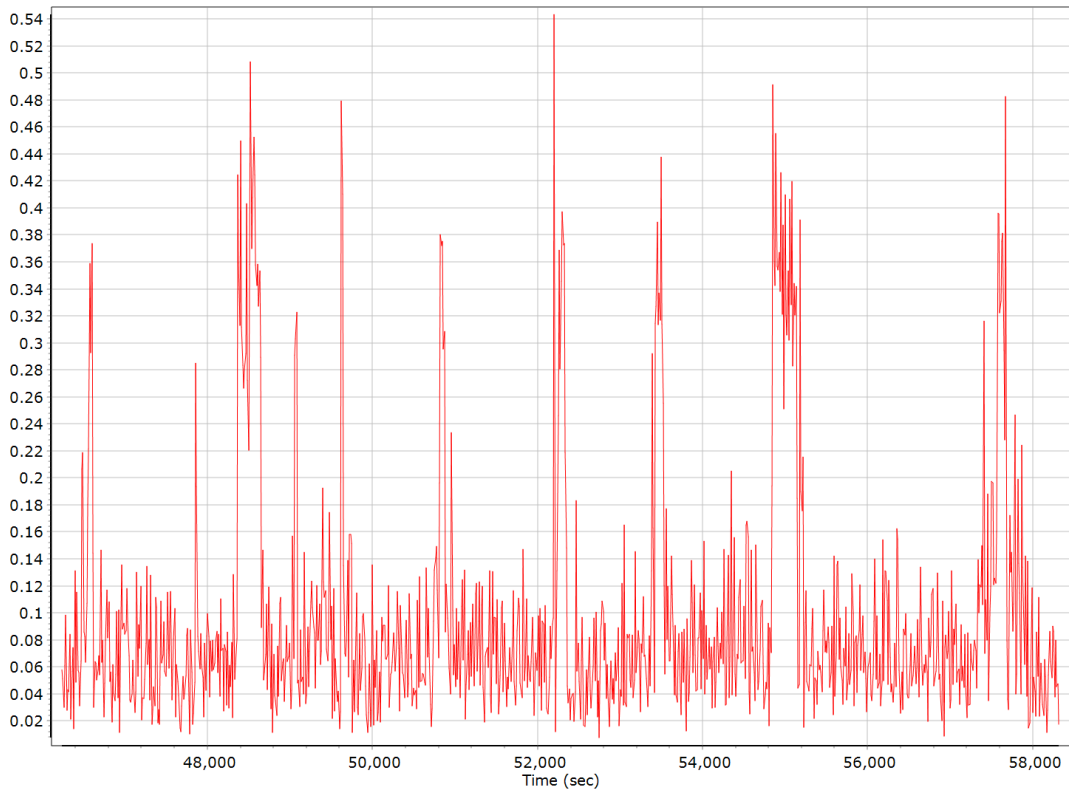
Ground Speed



Body Acceleration



Total Body Acceleration

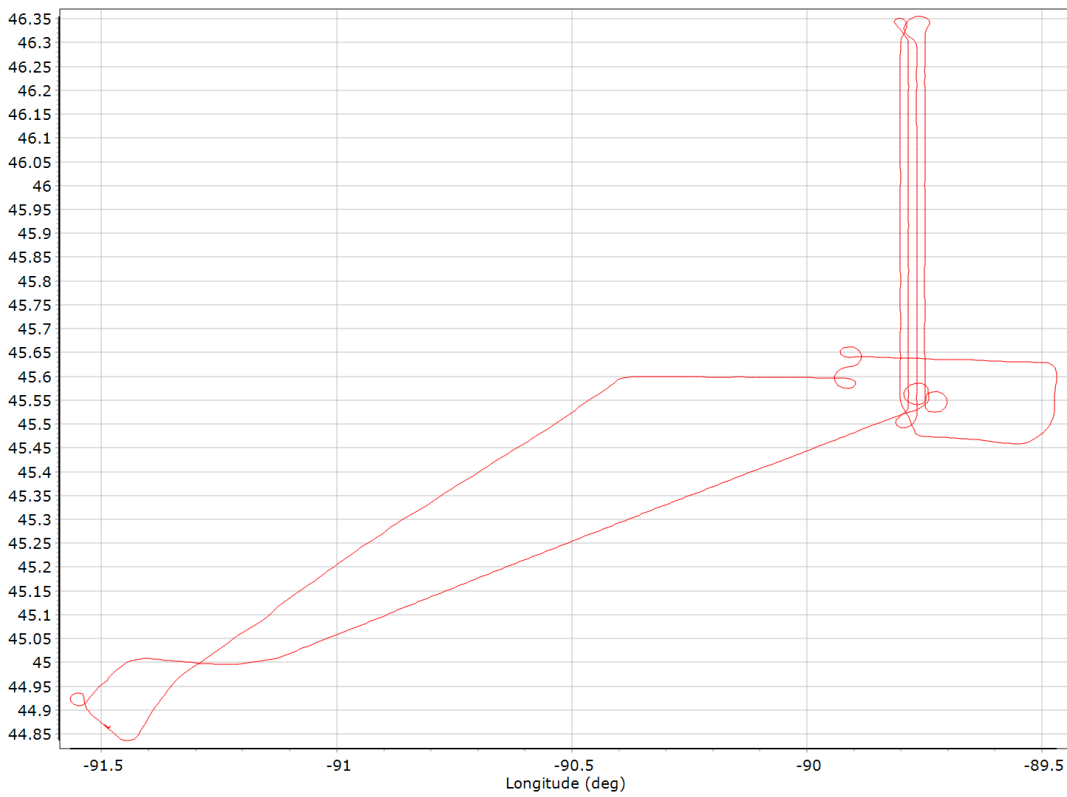


Body Angular Rate

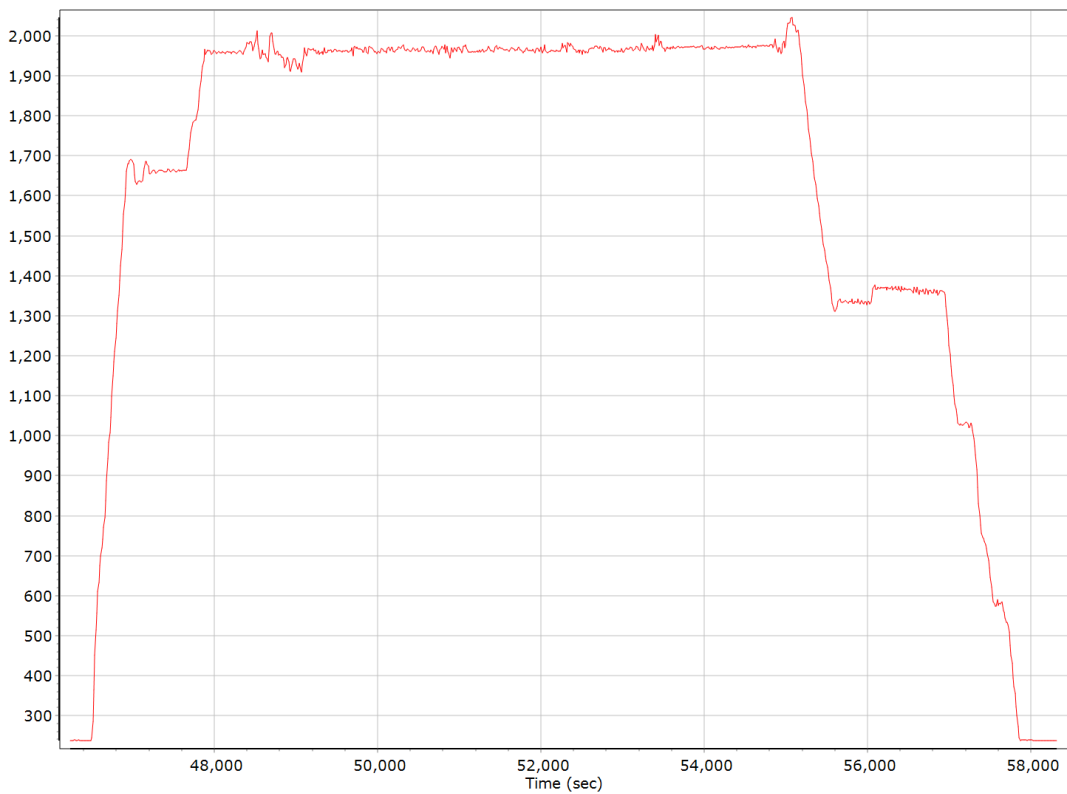


Forward Processed Trajectory Information

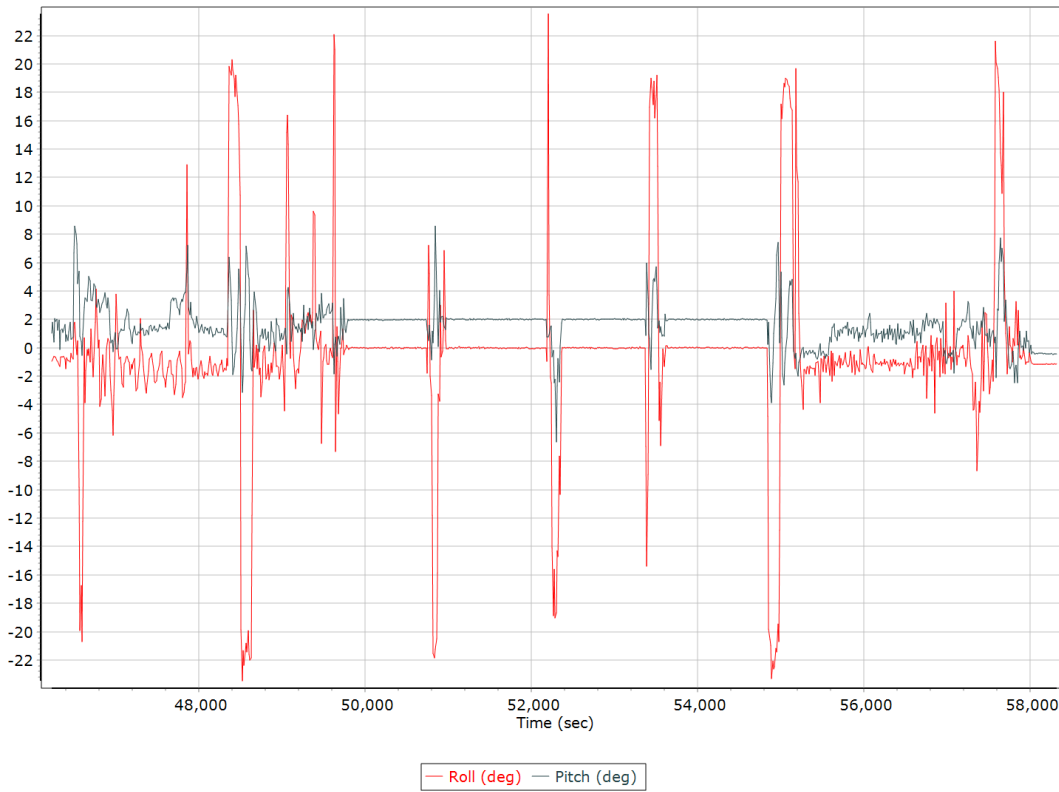
Top View



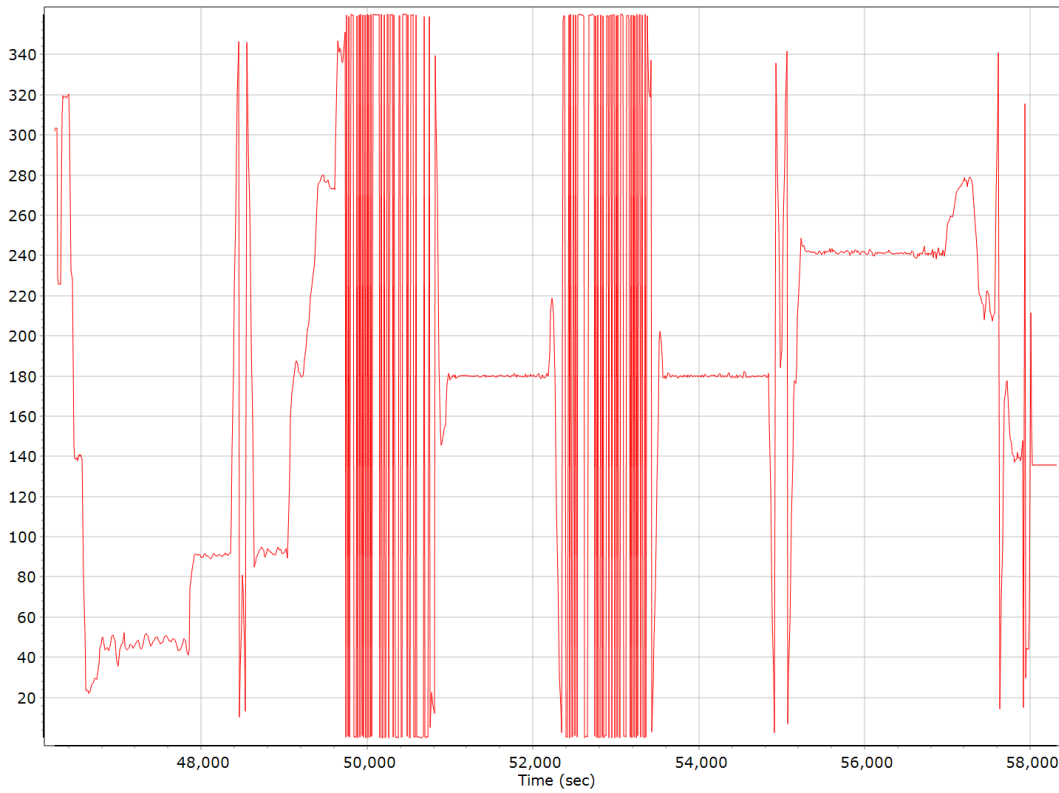
Altitude



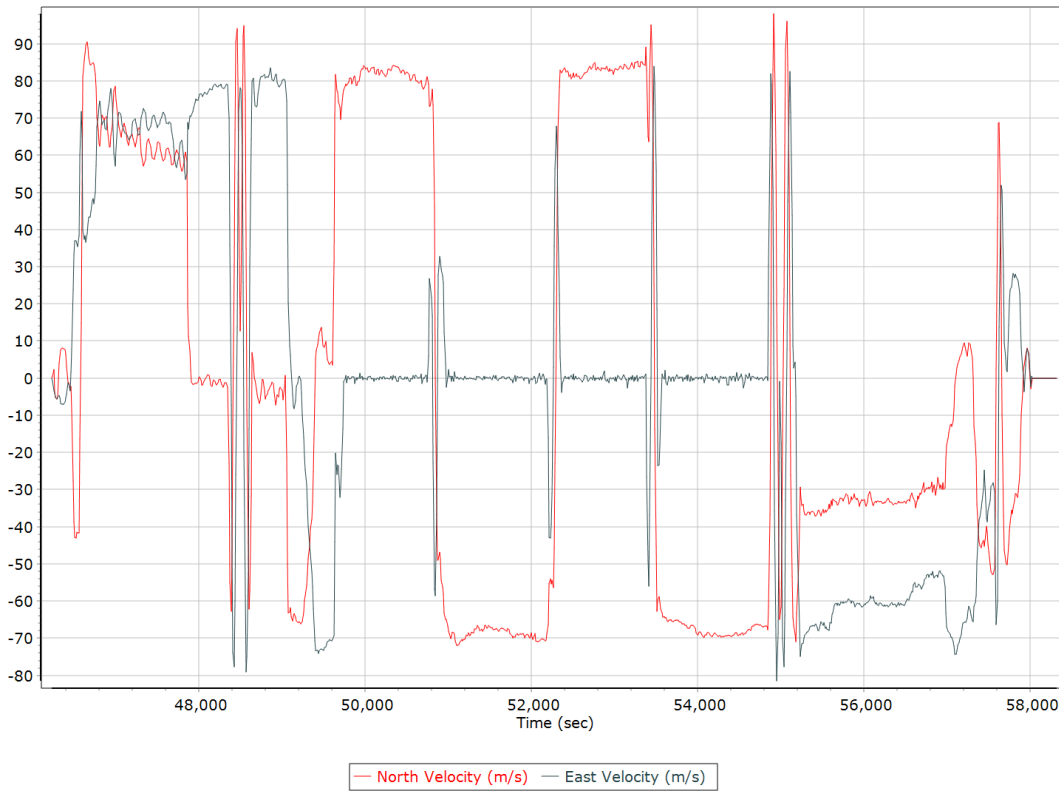
Roll/Pitch



Heading



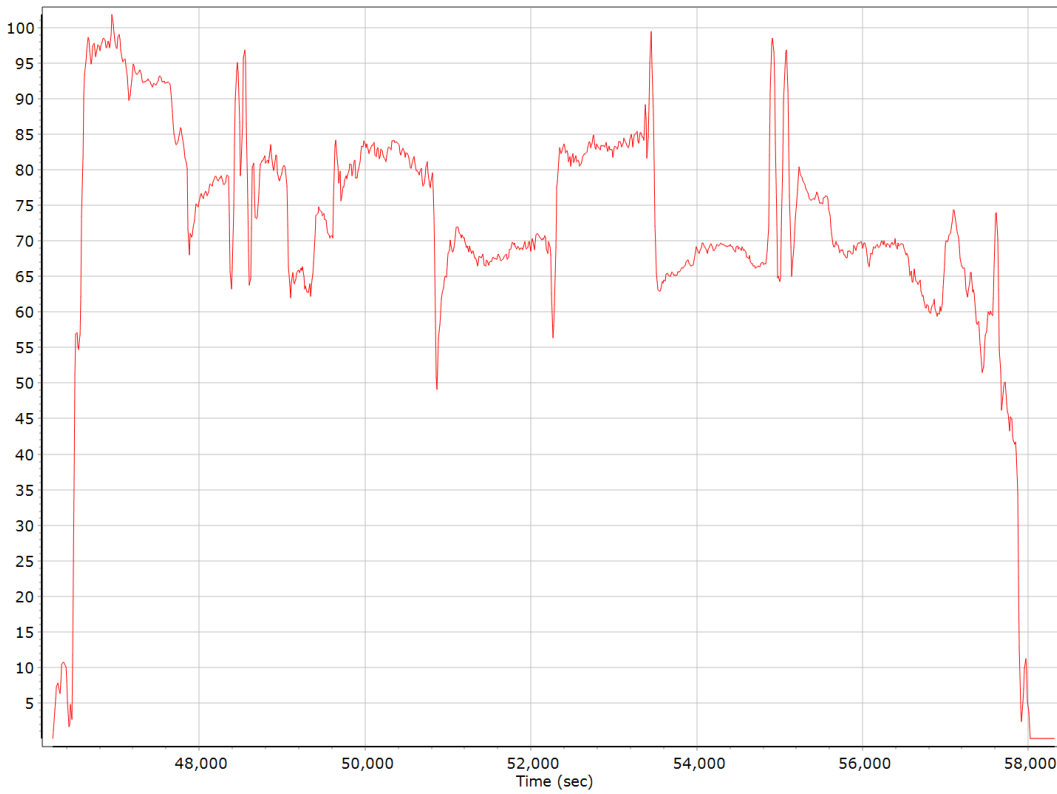
North/East Velocity



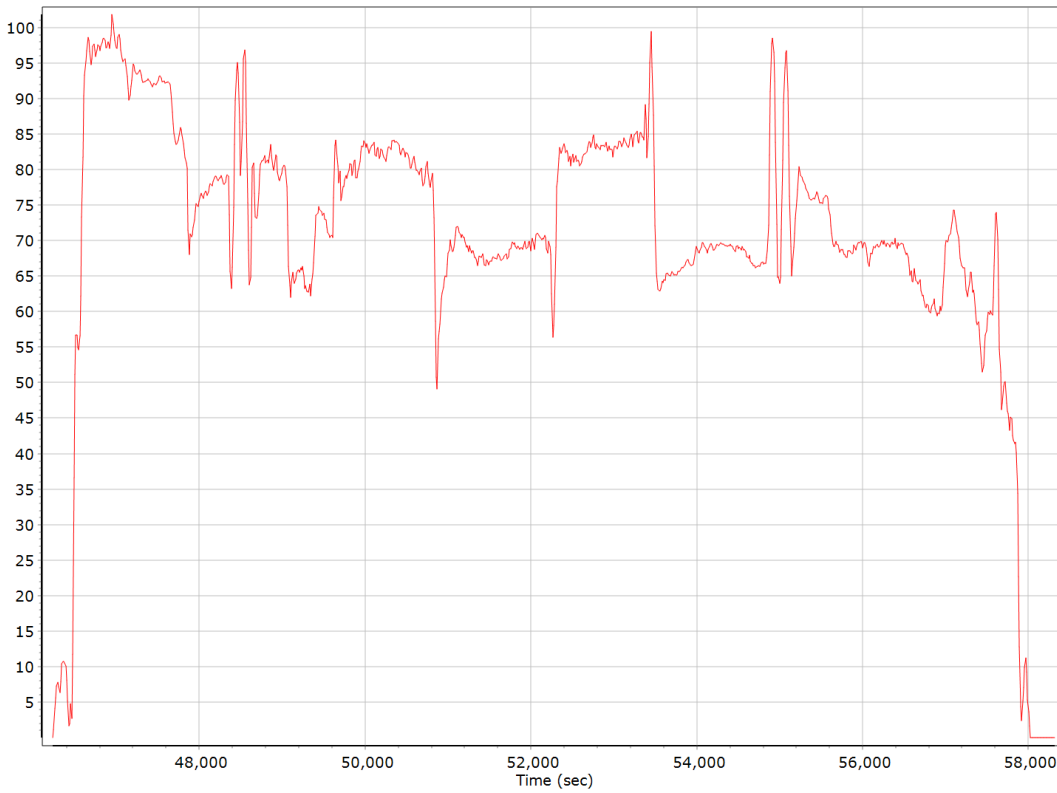
Down Velocity



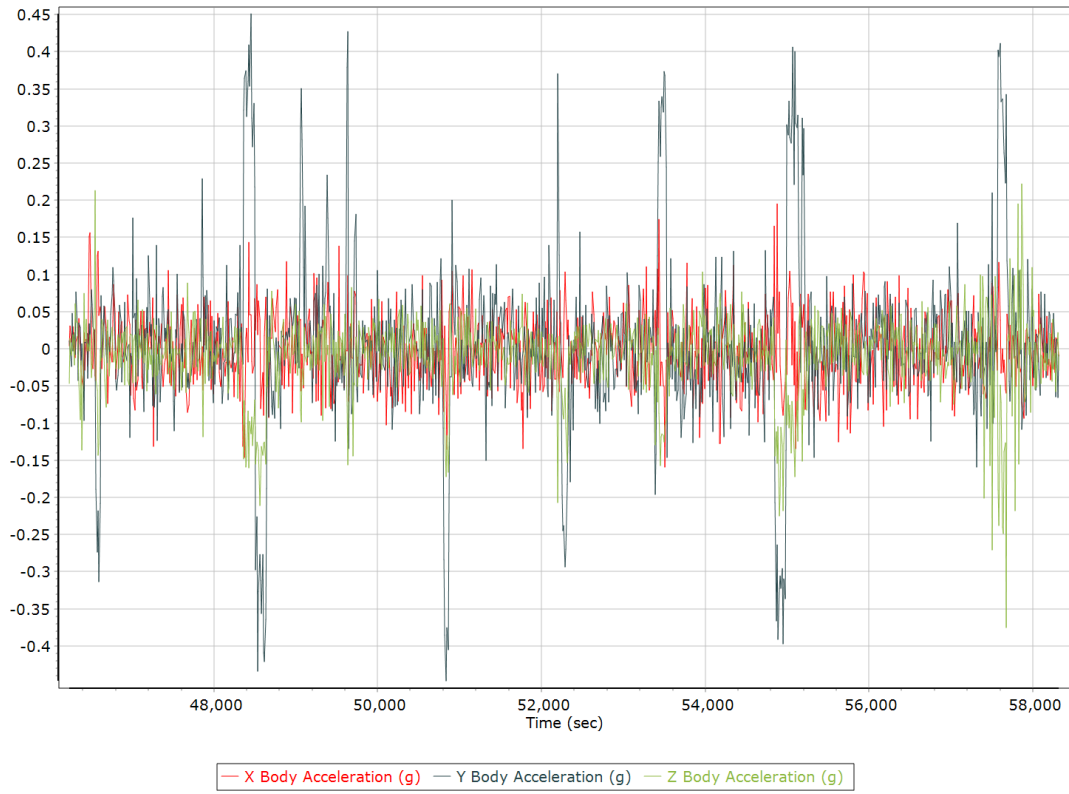
Total Speed



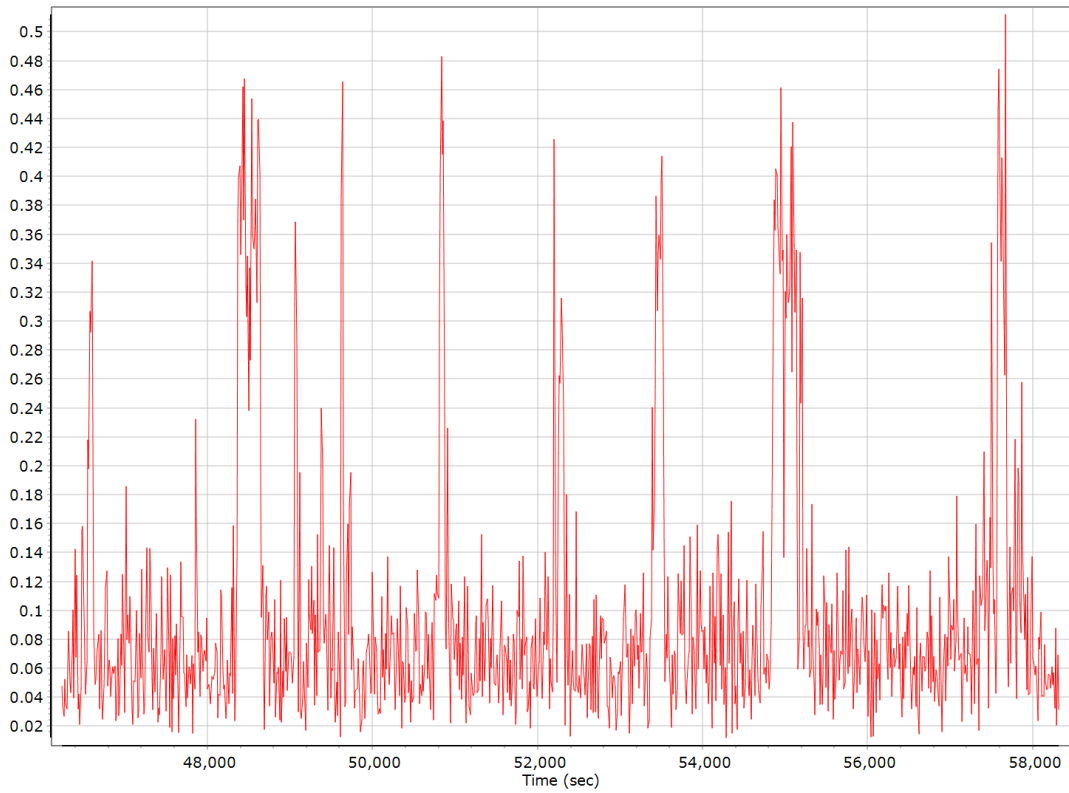
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

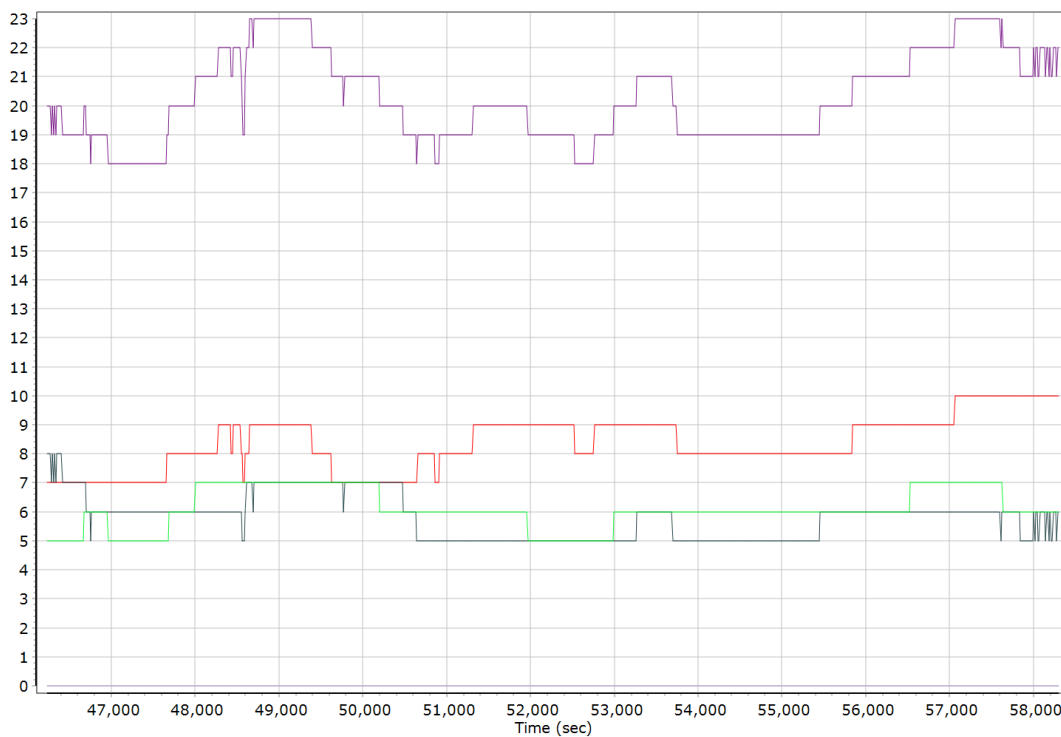


GNSS QC

GNSS QC Statistics

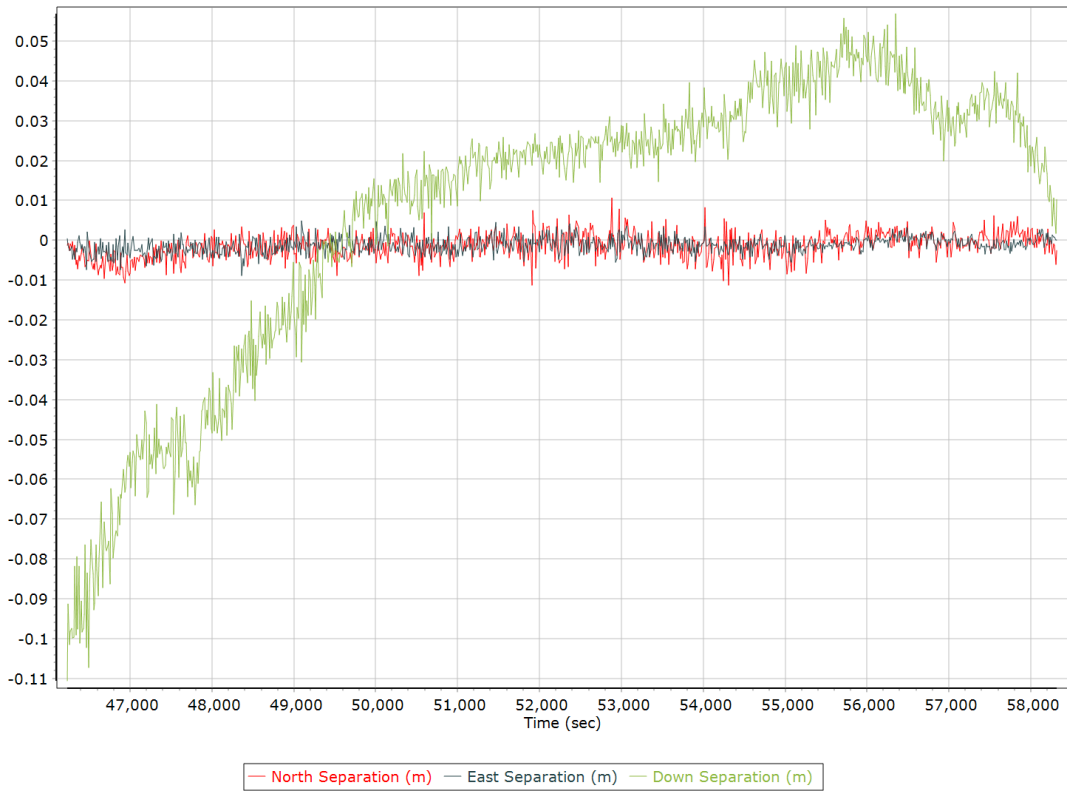
Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	0	8	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	4	7	6
Total number of SV	12	23	20
PDOP	0.99	1.74	1.20
QC Solution Gaps	1.00	2.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	12567.00	0.00	4.00
Percentage	99.97	0.00	0.03

Num SVs in solution



— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Number of GALILEO — Total Number

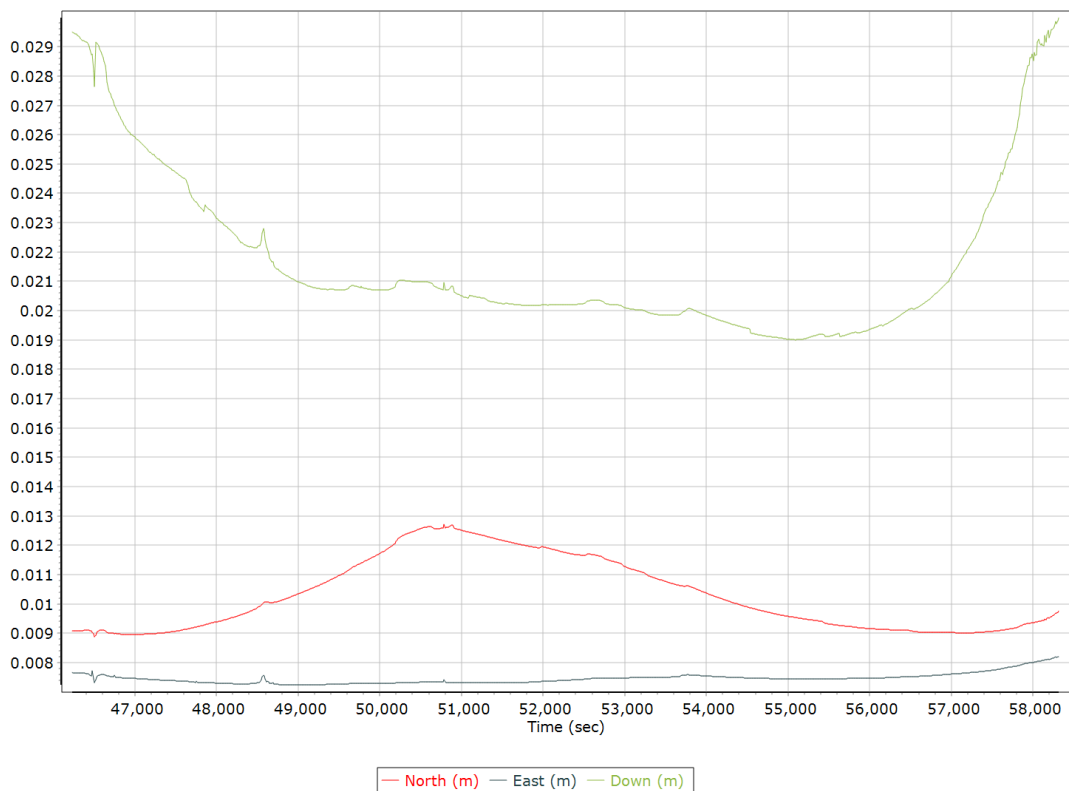
Forward/Reverse Separation



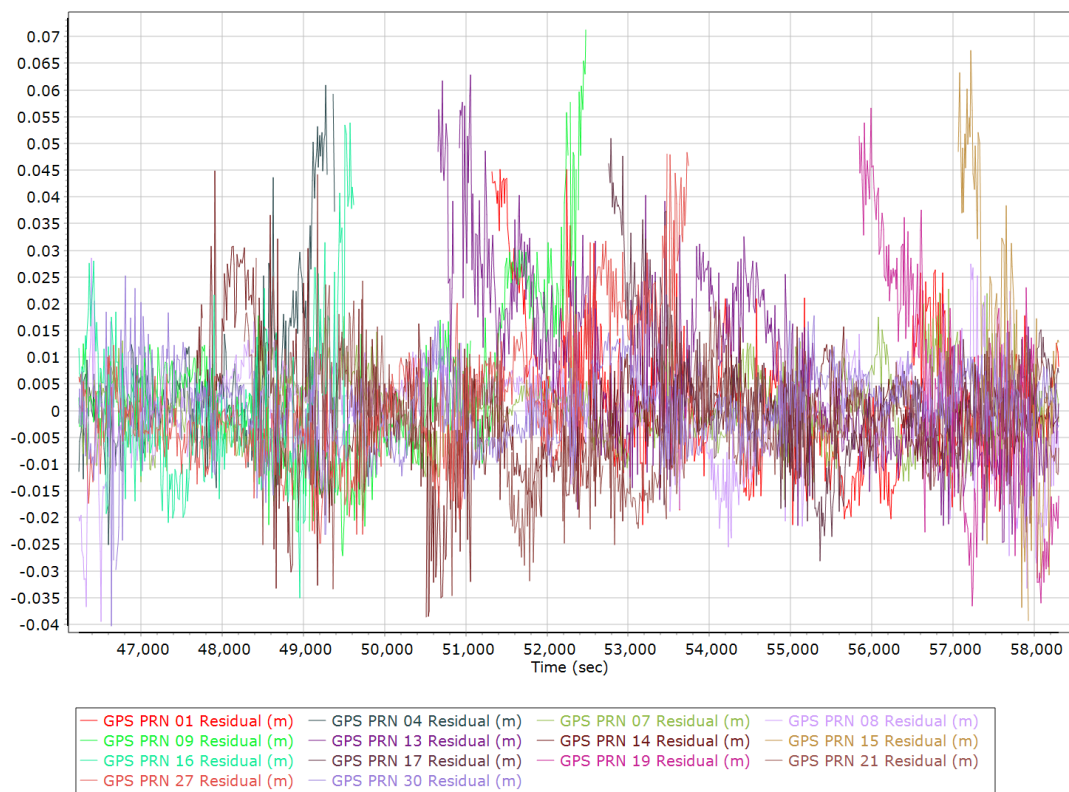
PDOP



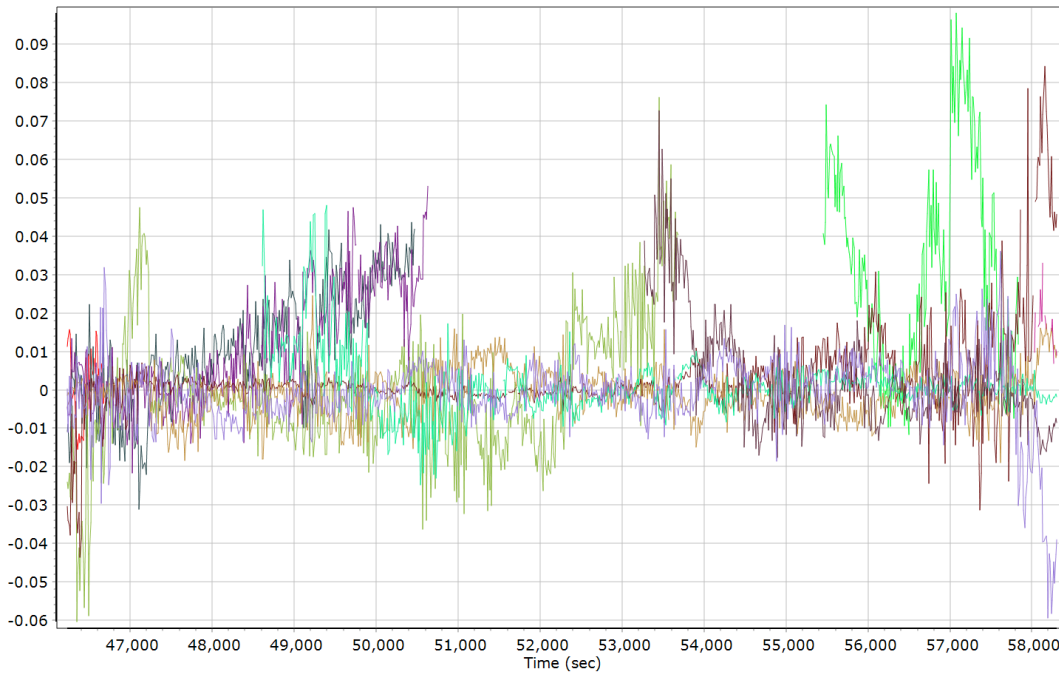
Estimated Position Accuracy



GPS Residuals

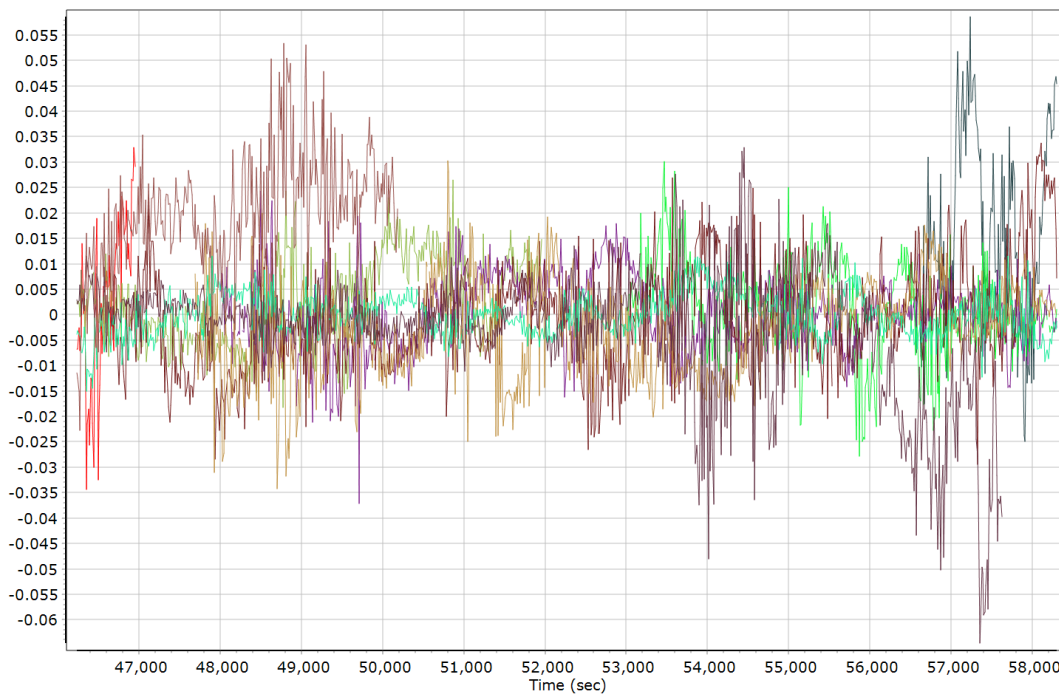


GLONASS Residuals



- | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GLONASS 03 Residual (m) | GLONASS 04 Residual (m) | GLONASS 05 Residual (m) | GLONASS 06 Residual (m) |
| GLONASS 07 Residual (m) | GLONASS 13 Residual (m) | GLONASS 14 Residual (m) | GLONASS 15 Residual (m) |
| GLONASS 17 Residual (m) | GLONASS 18 Residual (m) | GLONASS 19 Residual (m) | GLONASS 22 Residual (m) |
| GLONASS 23 Residual (m) | GLONASS 24 Residual (m) | | |

GALILEO Residuals



- | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GALILEO 02 Residual (m) | GALILEO 04 Residual (m) | GALILEO 07 Residual (m) | GALILEO 08 Residual (m) |
| GALILEO 13 Residual (m) | GALILEO 15 Residual (m) | GALILEO 19 Residual (m) | GALILEO 21 Residual (m) |
| GALILEO 27 Residual (m) | GALILEO 30 Residual (m) | GALILEO 34 Residual (m) | GALILEO 36 Residual (m) |

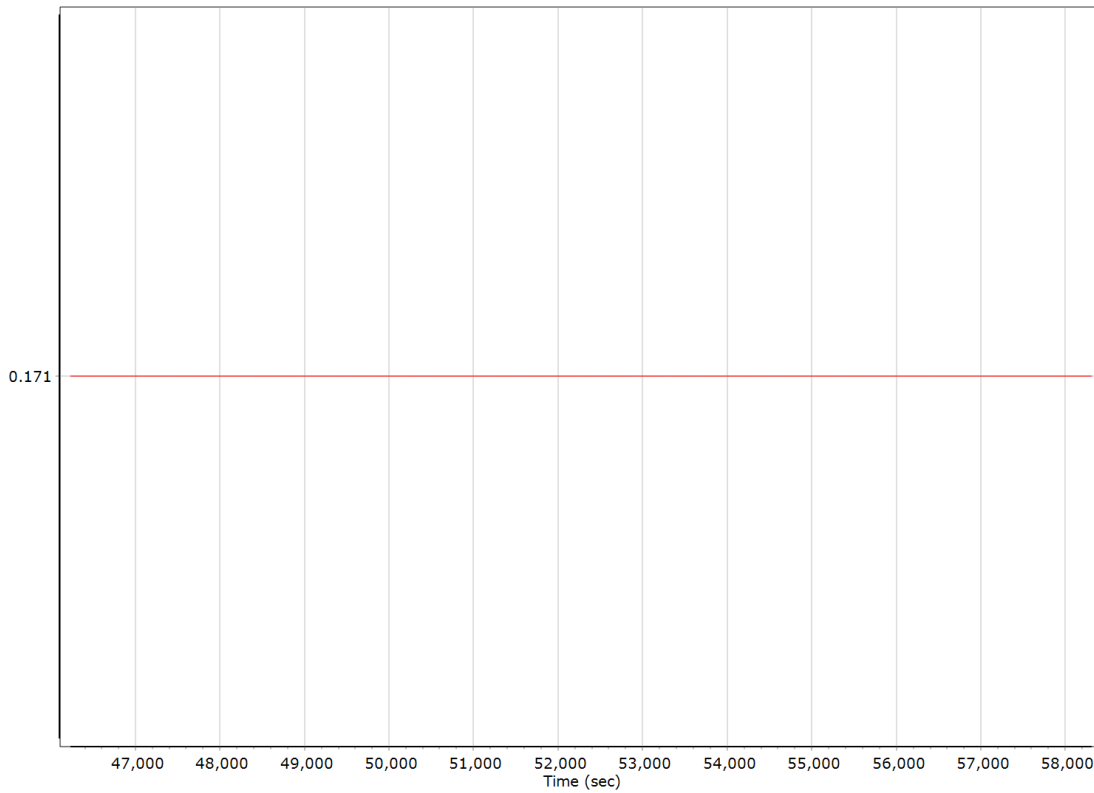
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	45710.000 (5/8/2022 12:41:50 PM)		
Processing end time	58324.000 (5/8/2022 4:12:04 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	0.000	0.000	0.000
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.171	-0.238	-1.273
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

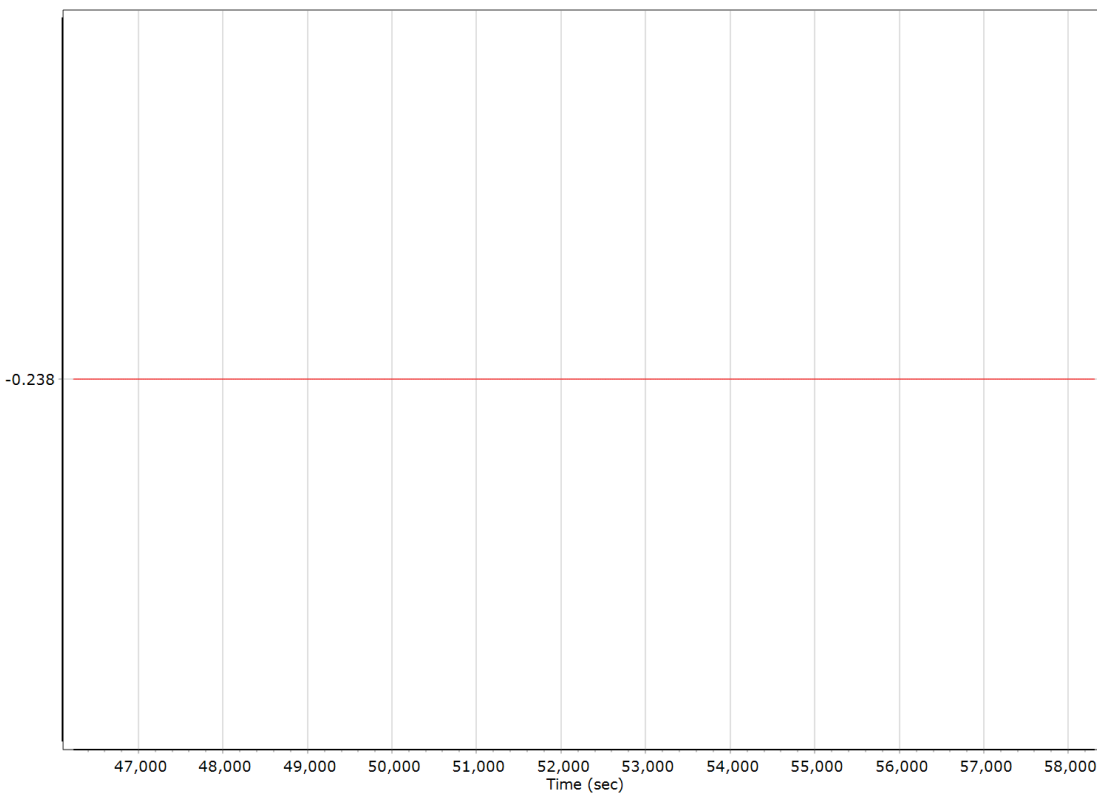
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

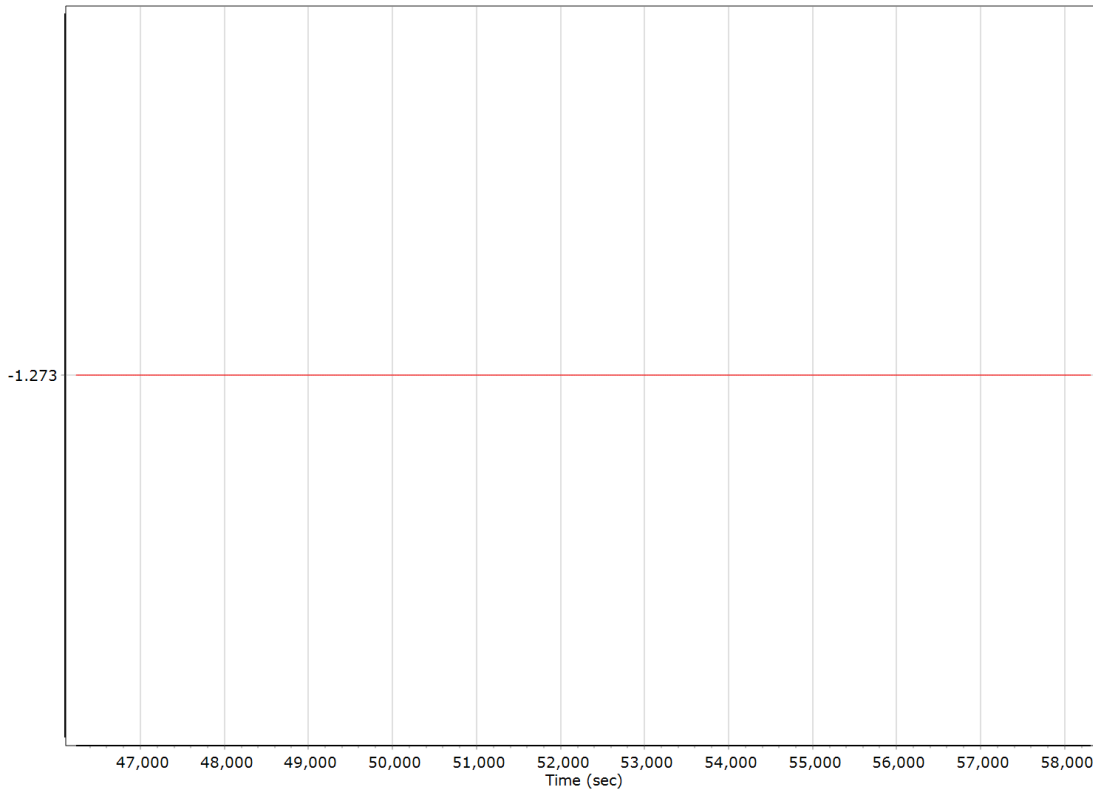
X Reference-Primary GNSS Lever Arm (m)



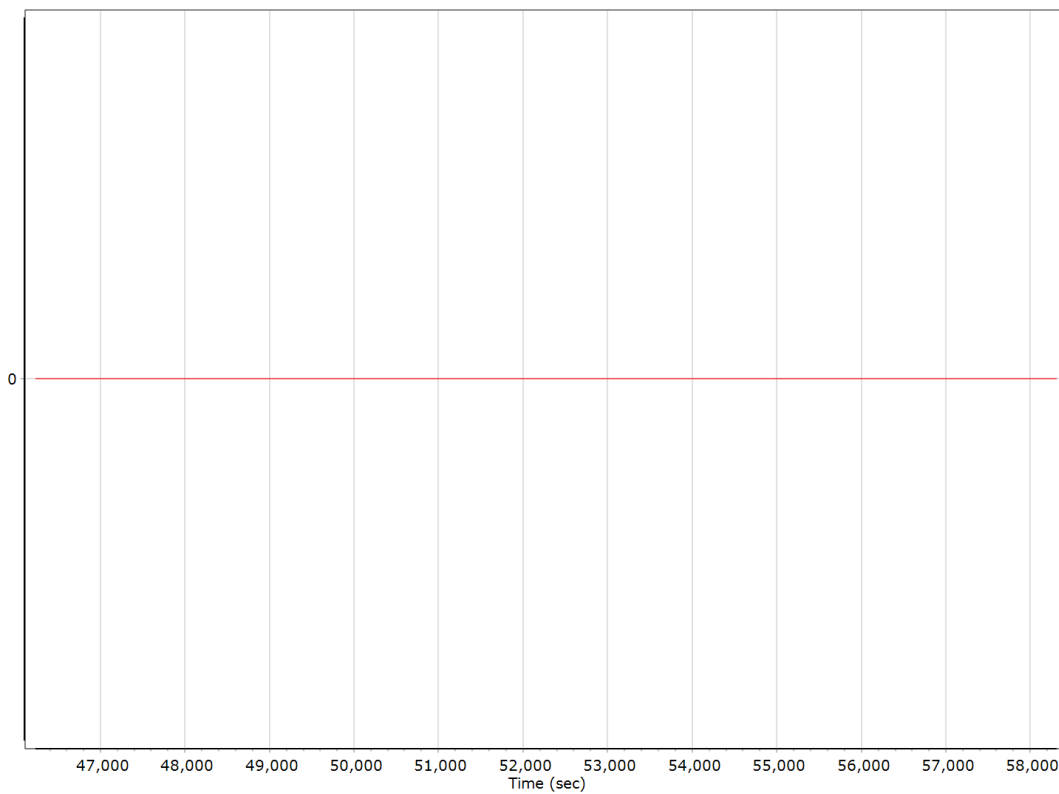
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



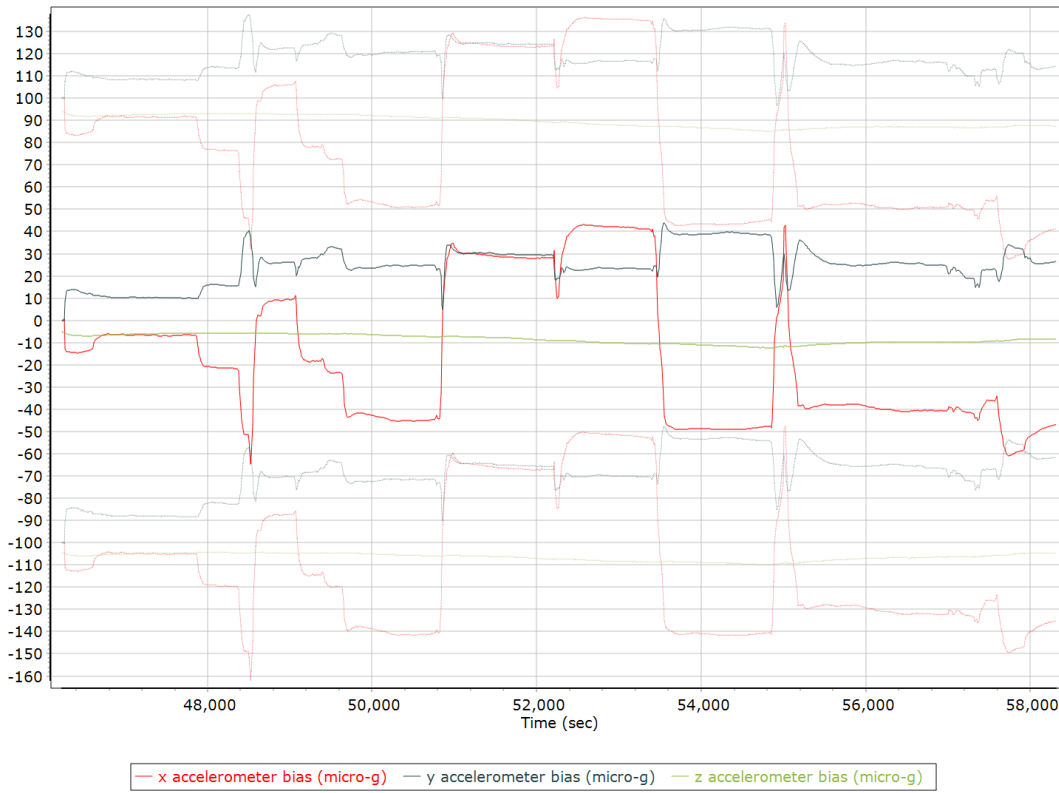
Reference-Primary GNSS Lever Arm Figure of Merit



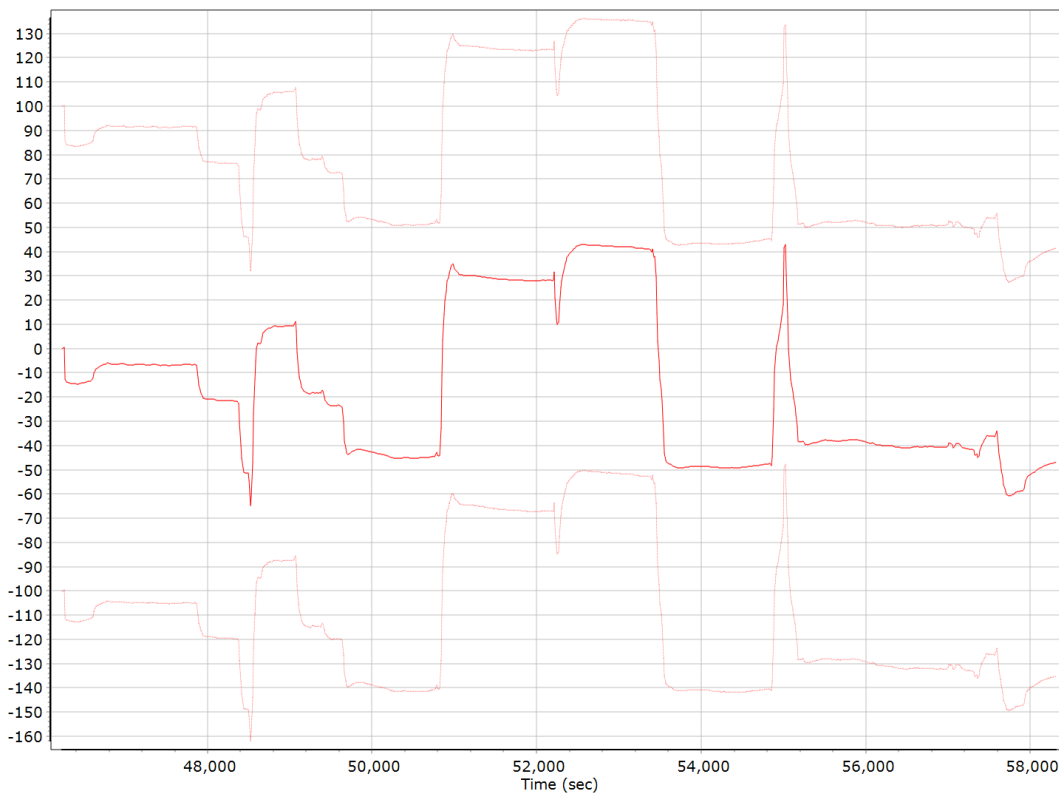
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

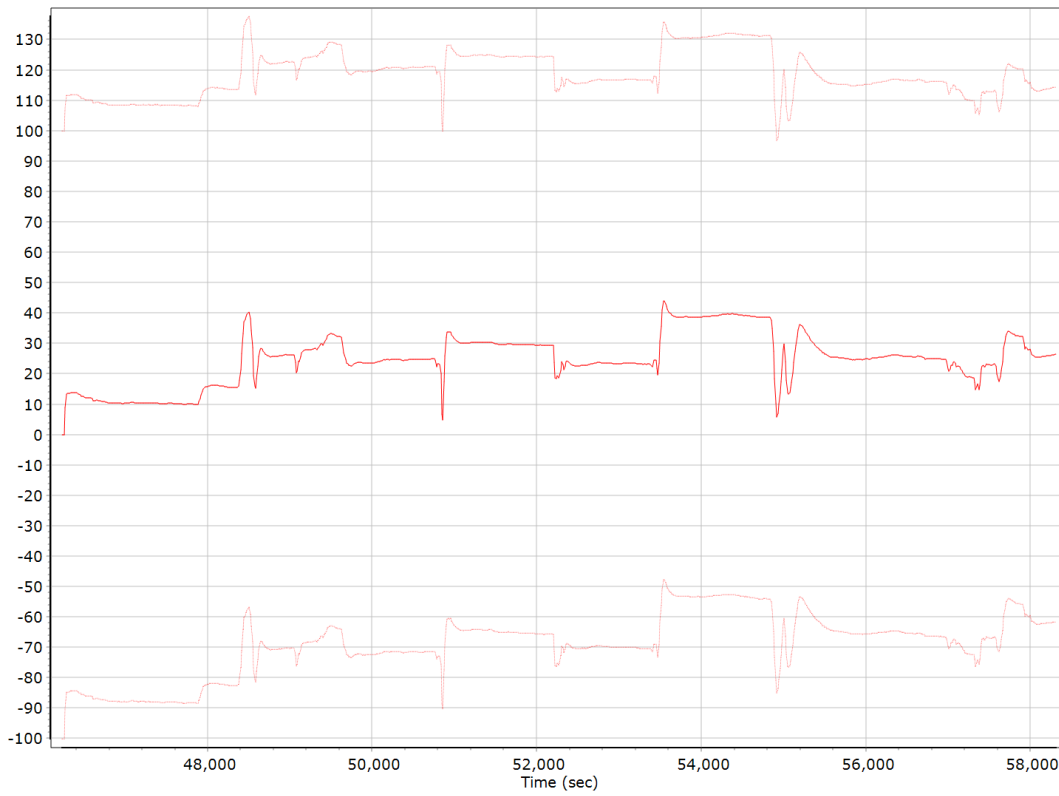
Accelerometer Bias (micro-g)



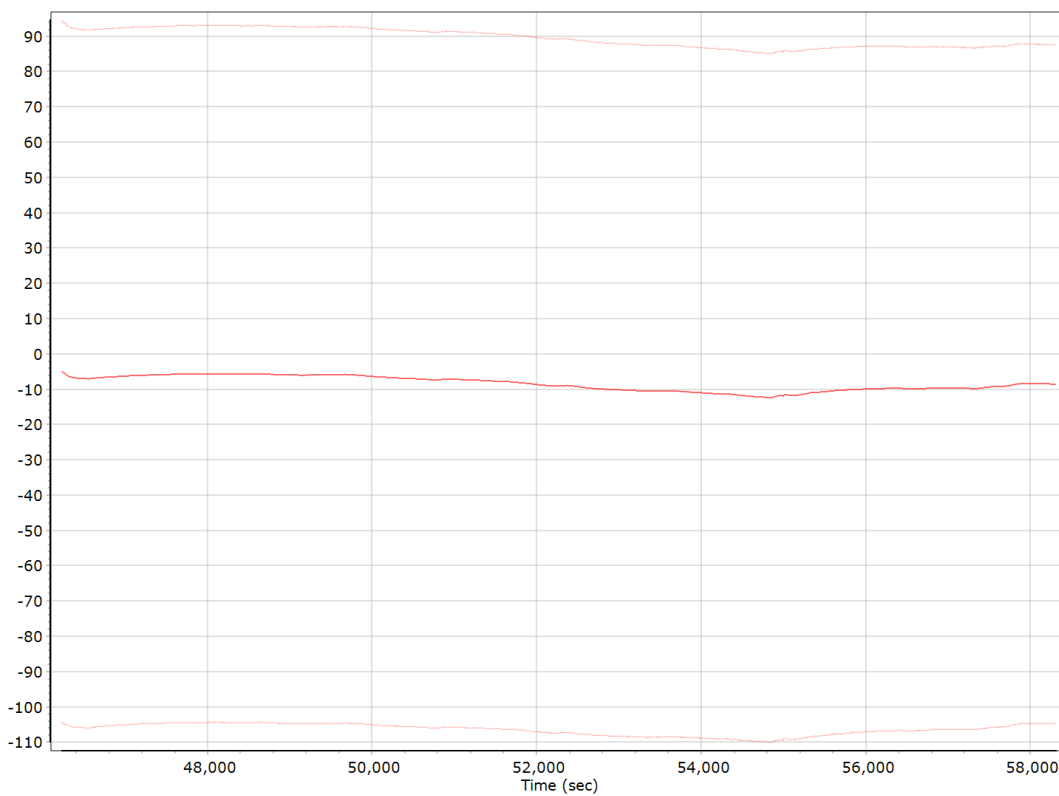
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



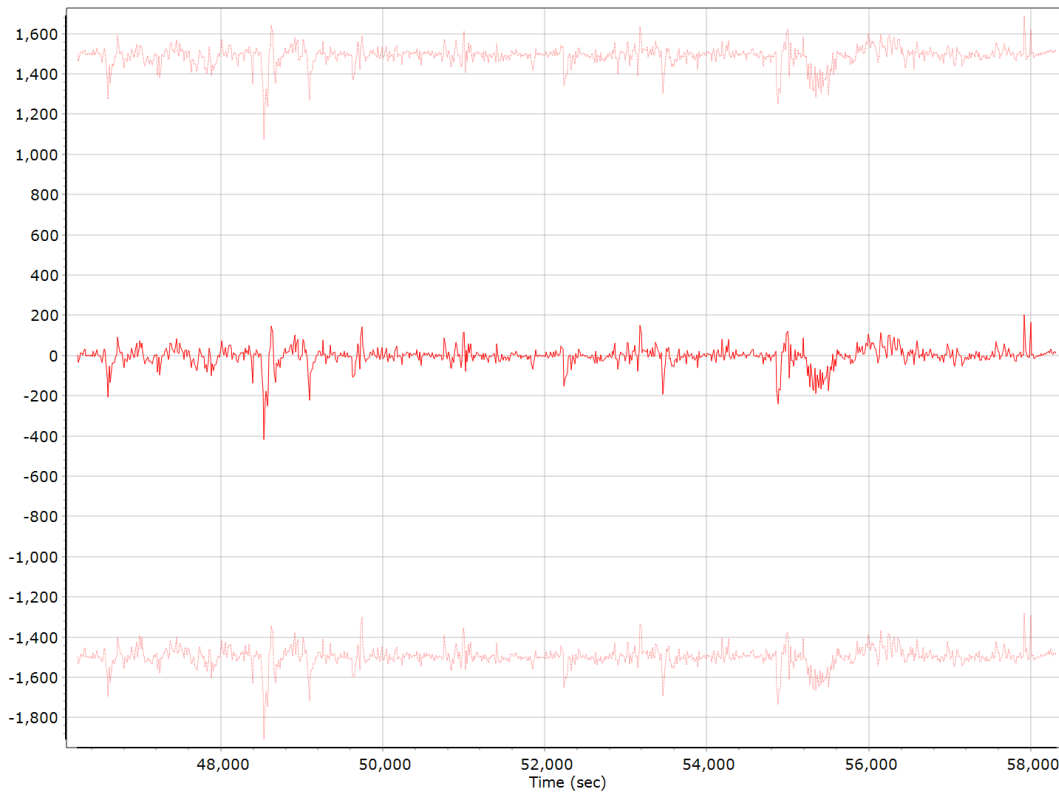
Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



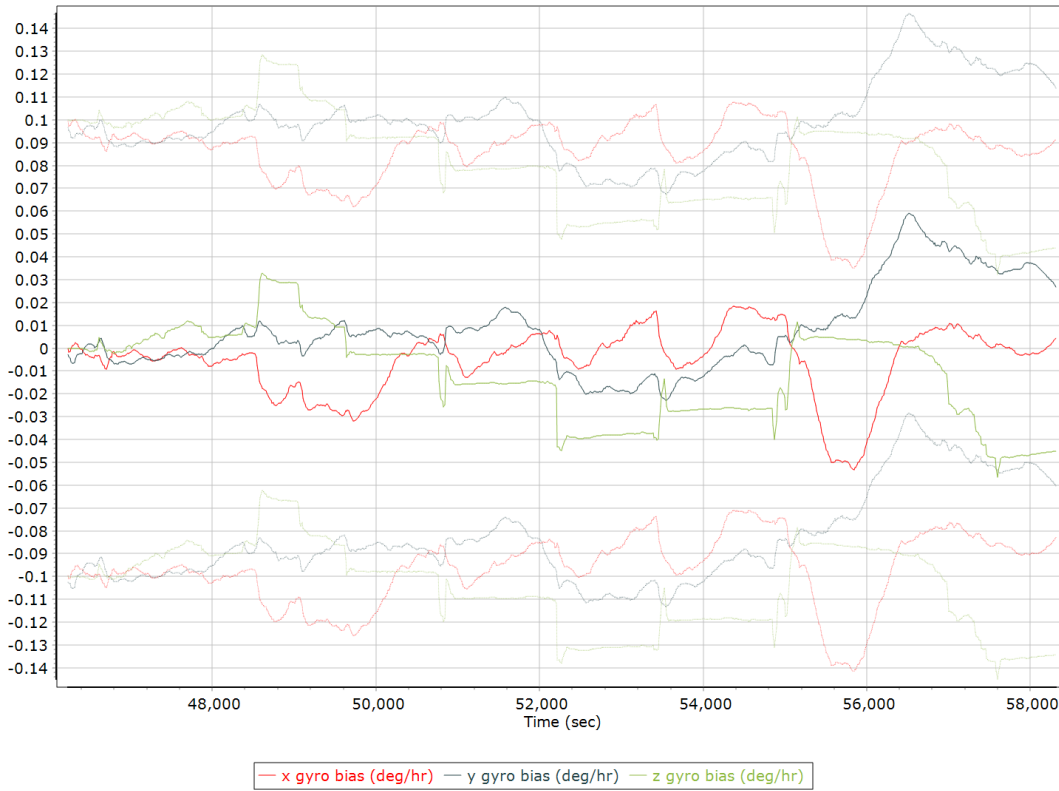
Y Accelerometer Scale Error (ppm)



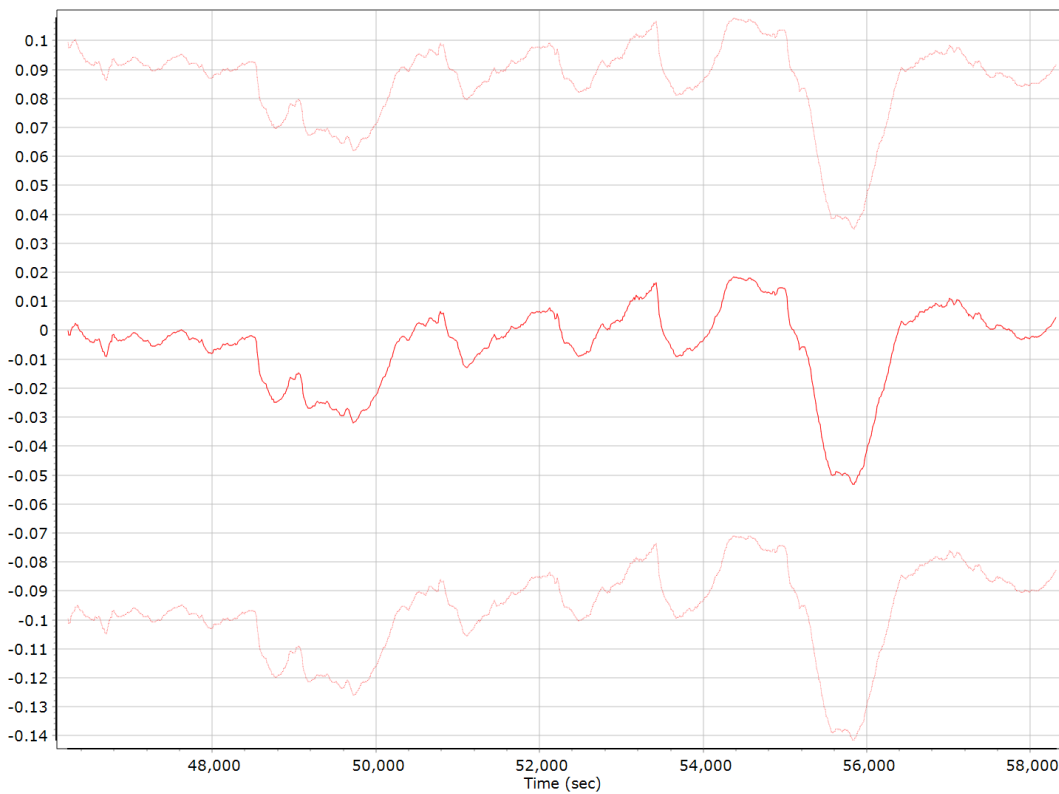
Z Accelerometer Scale Error (ppm)



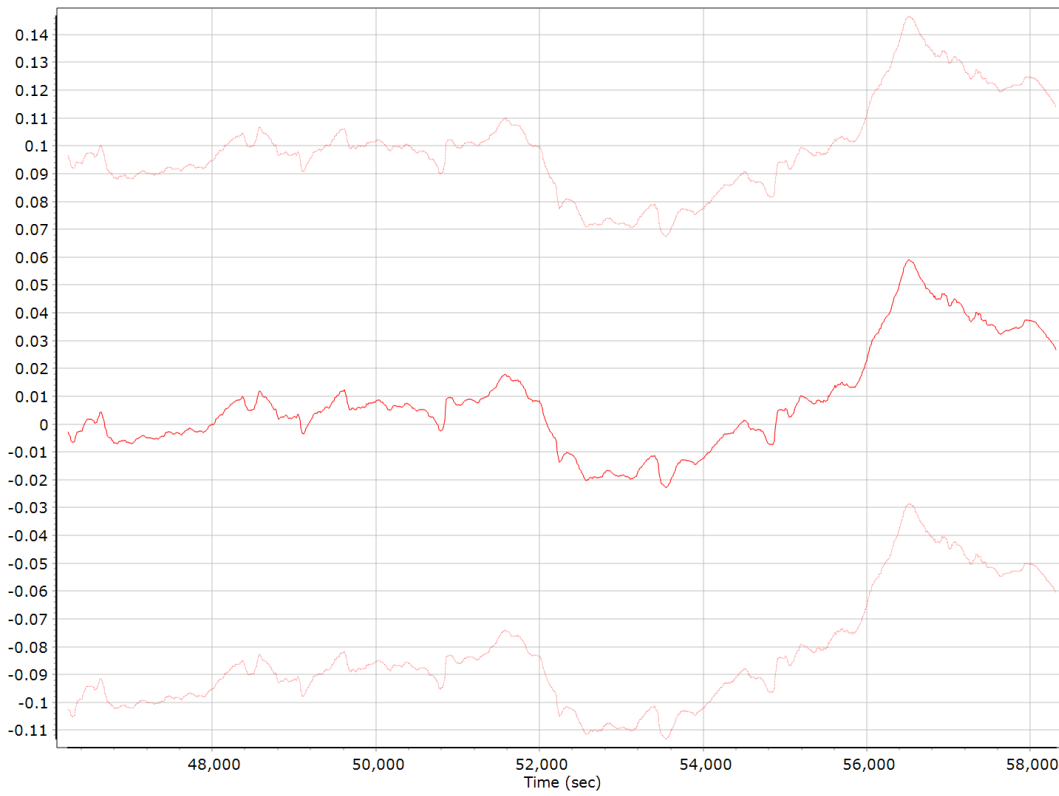
Gyro Bias (deg/h)



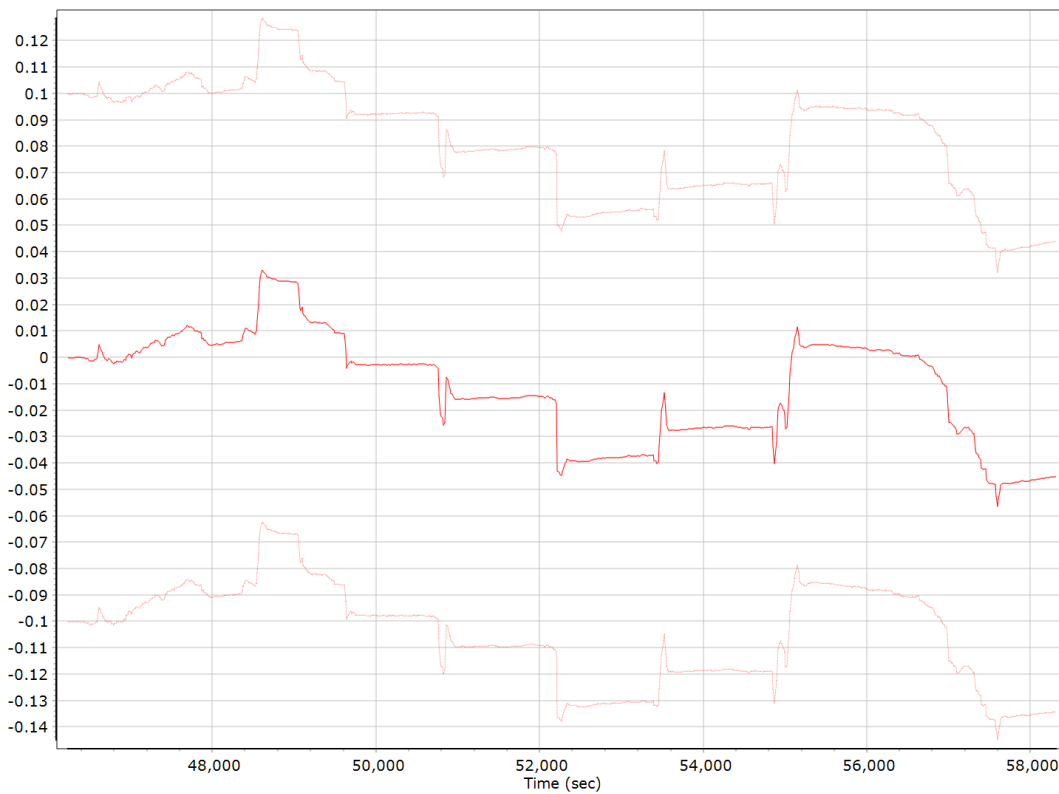
X Gyro Bias (deg/h)



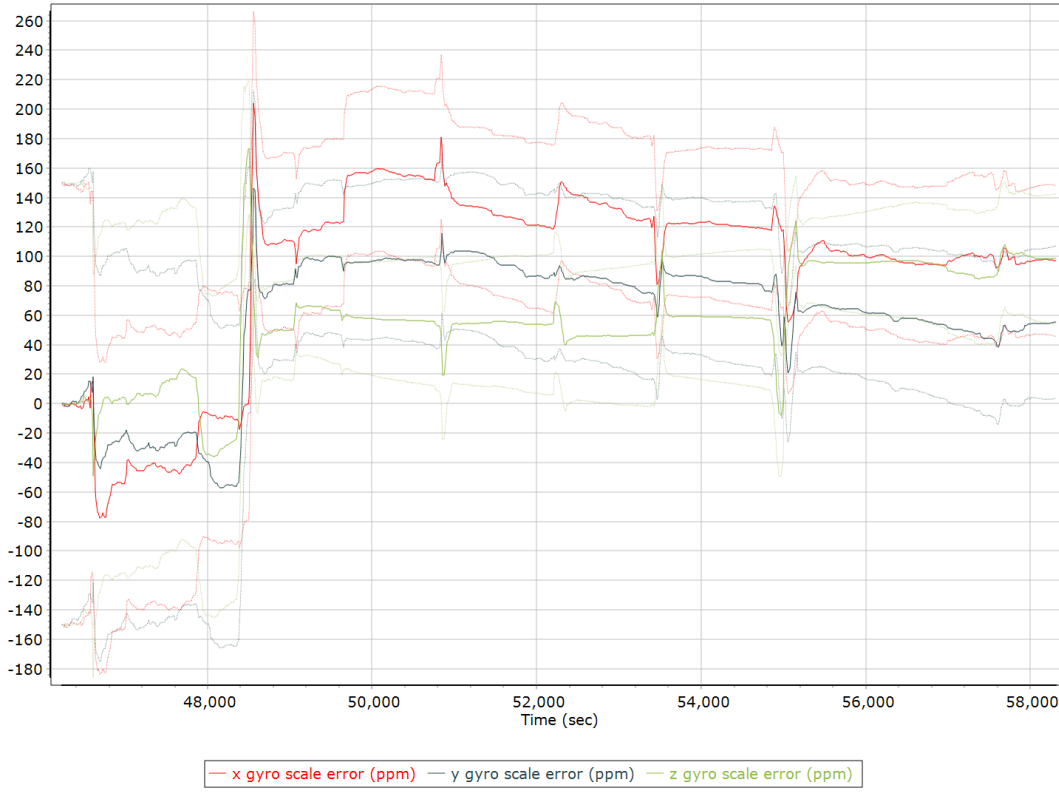
Y Gyro Bias (deg/h)



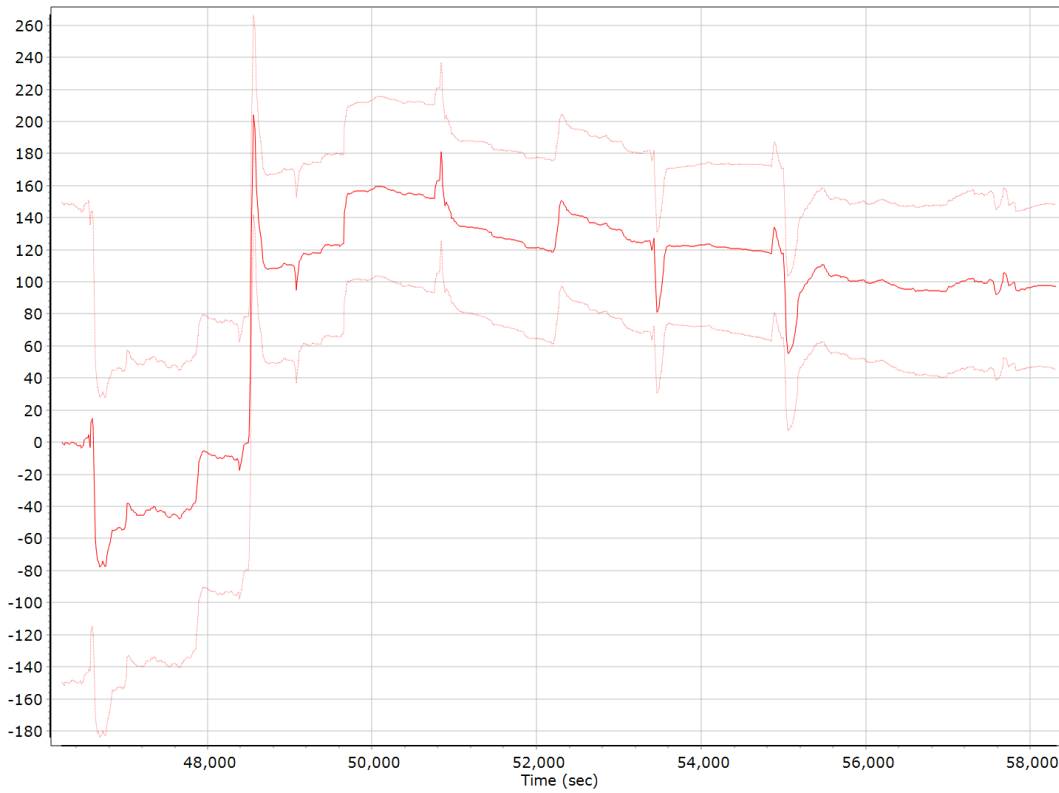
Z Gyro Bias (deg/h)



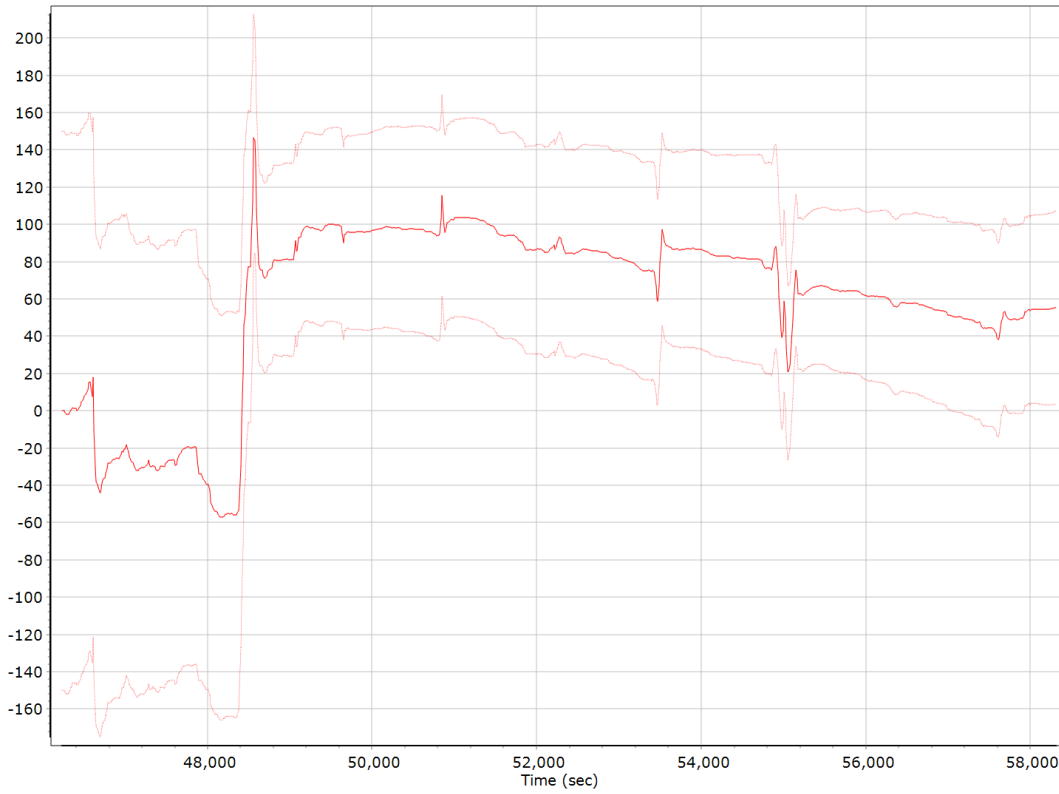
Gyro Scale Error (ppm)



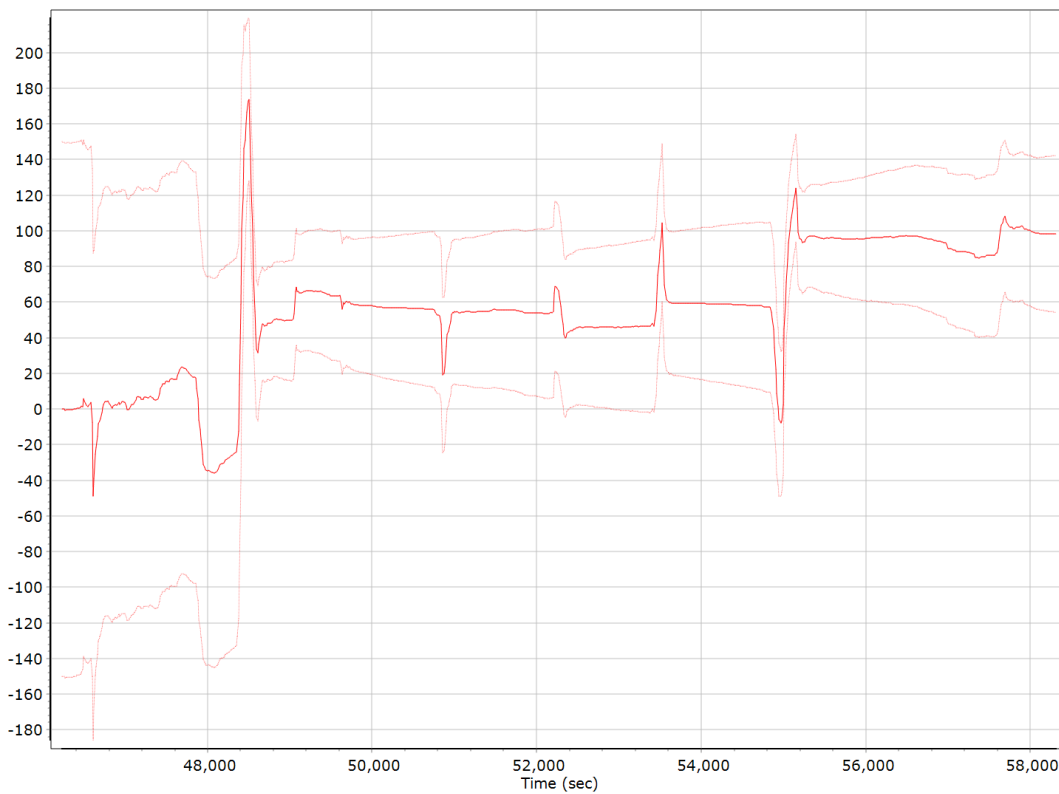
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)



Z Gyro Scale Error (ppm)

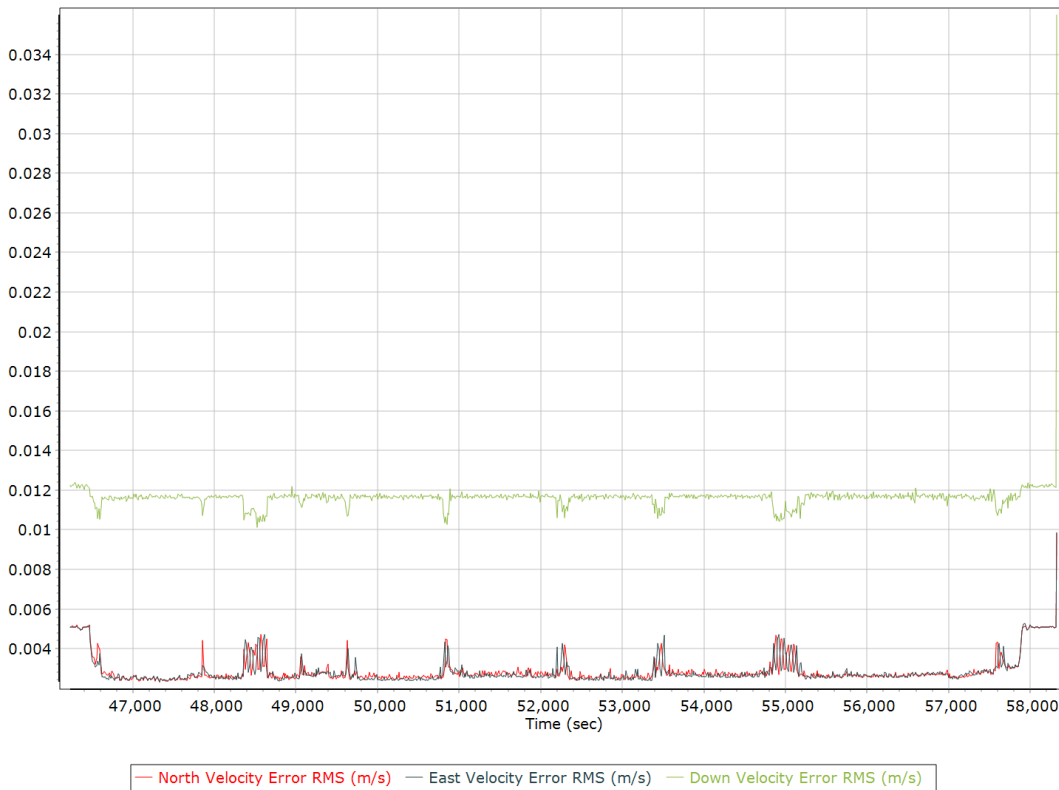


Smoothed Performance Metrics

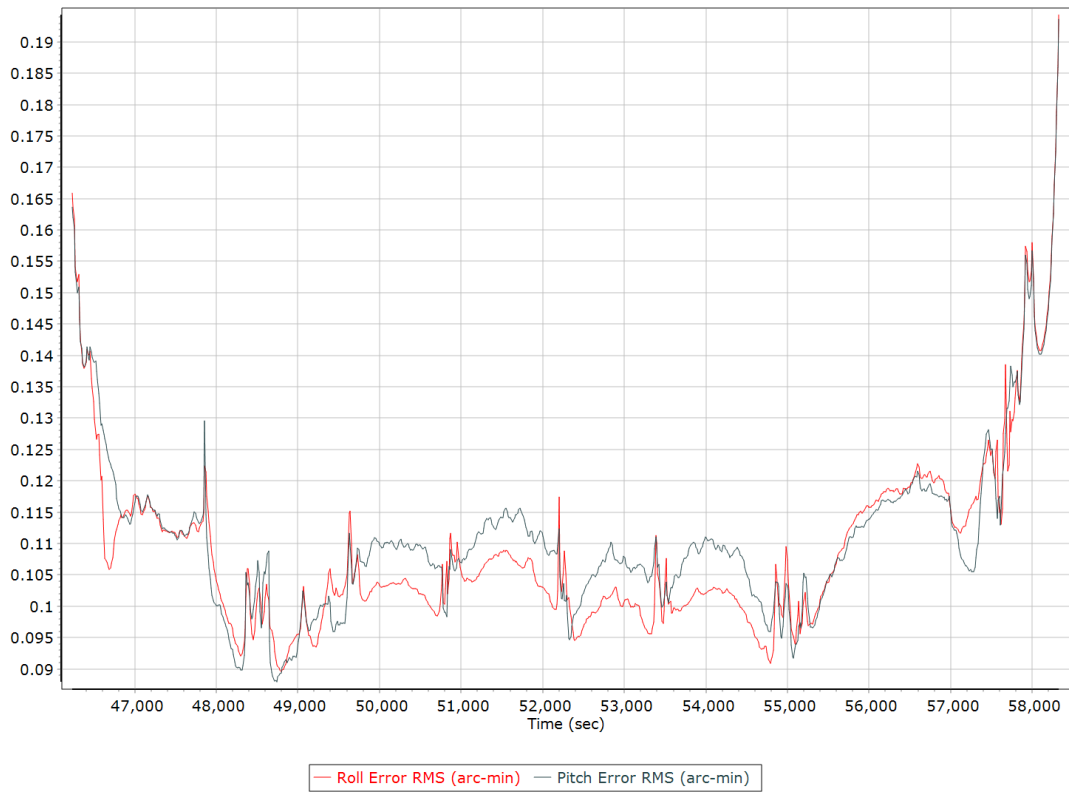
Position Error RMS (m)



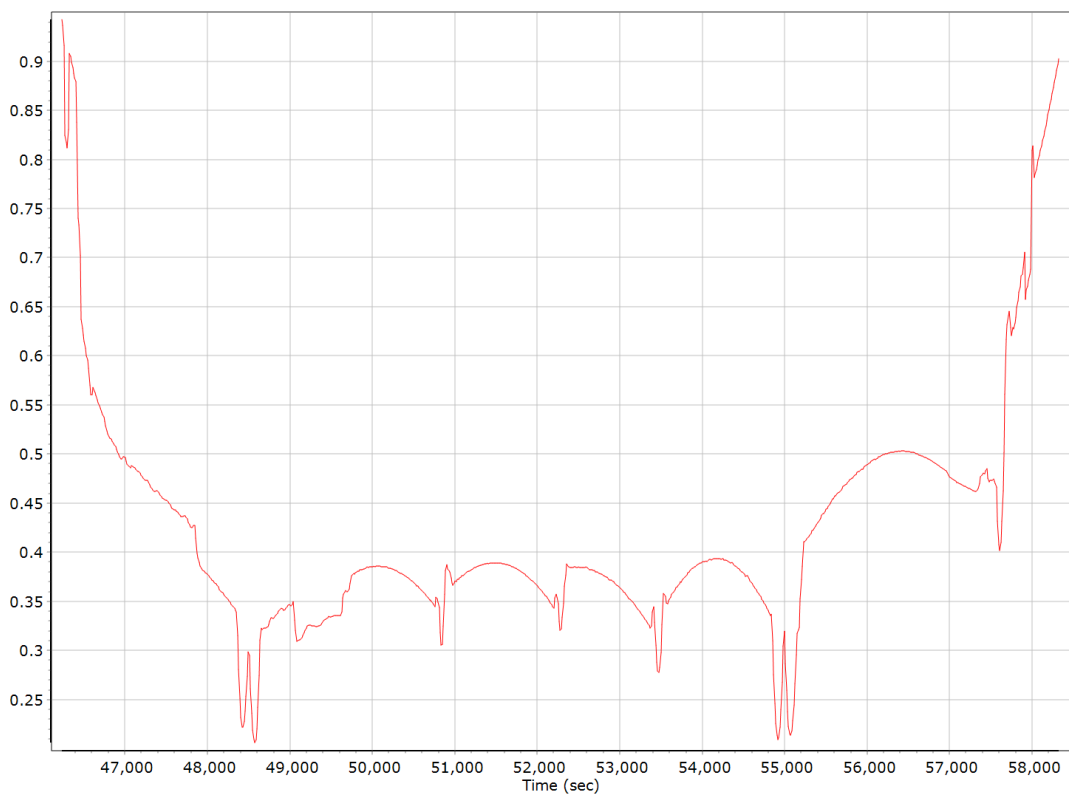
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

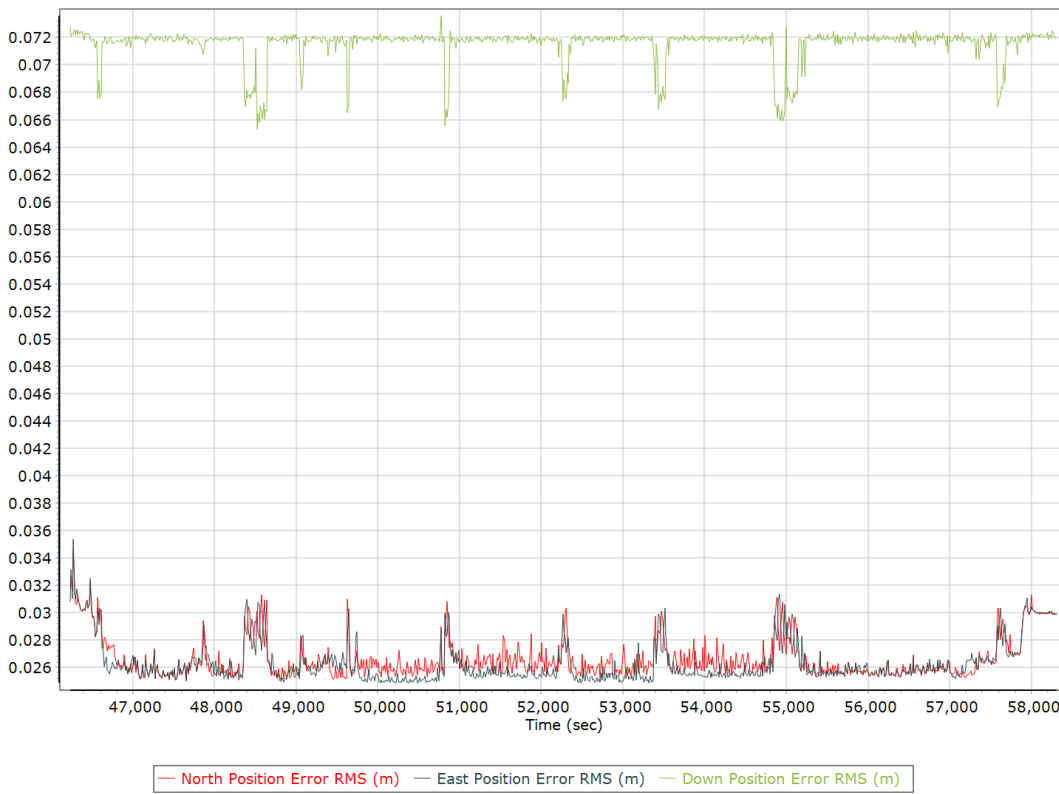


Heading Error RMS (arc-min)

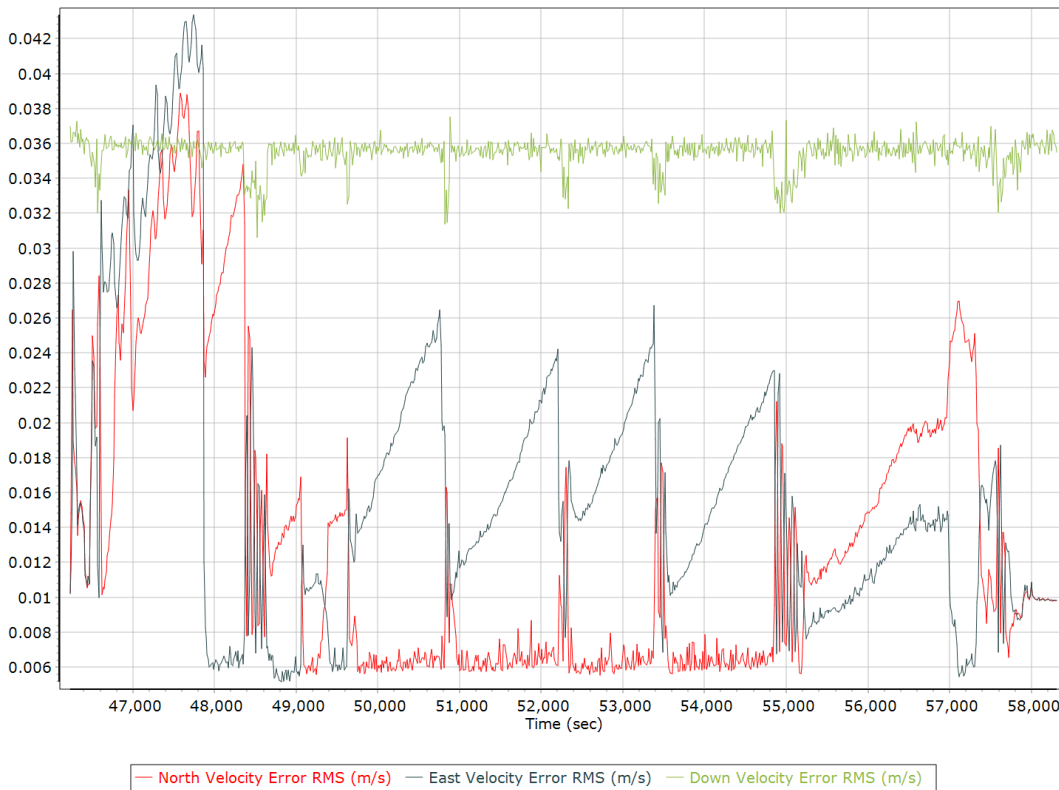


Forward Processed Performance Metrics

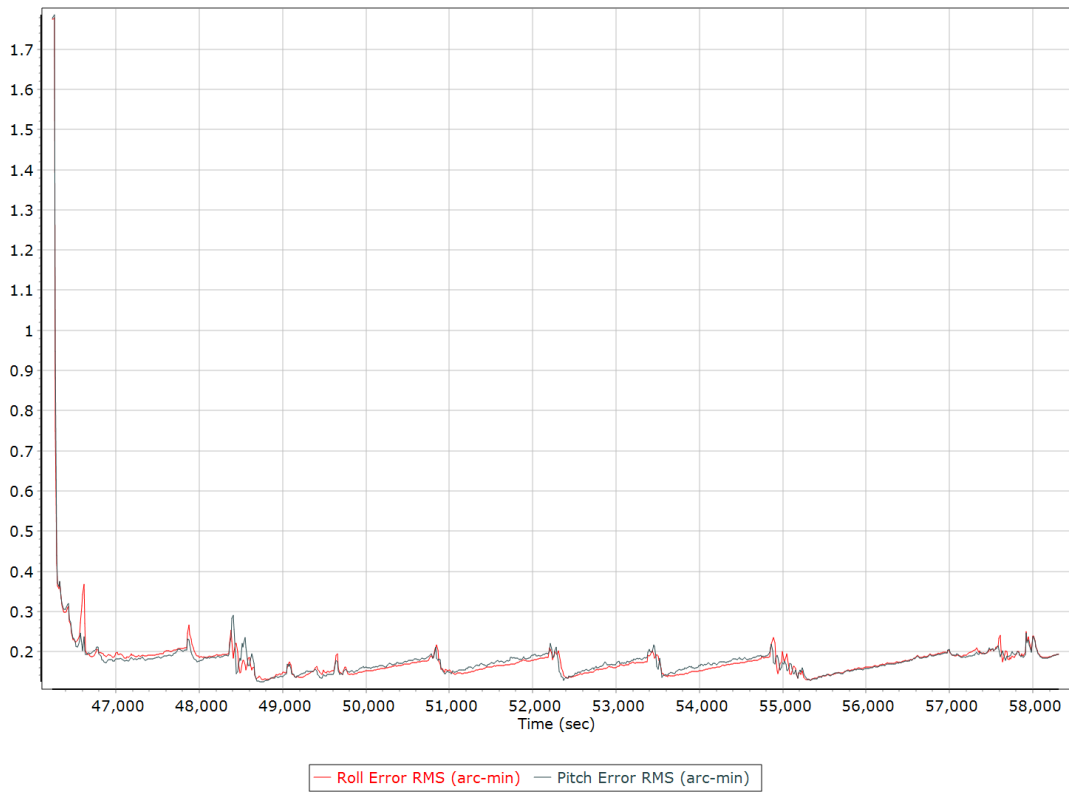
Position Error RMS (m)



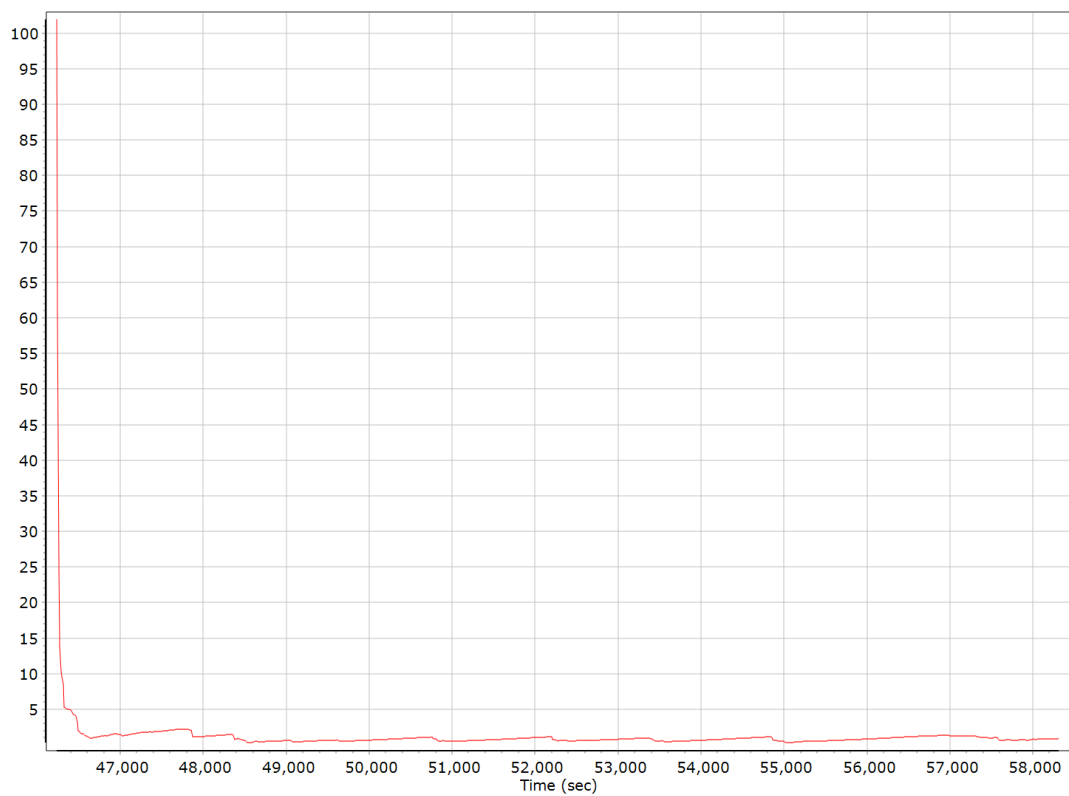
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

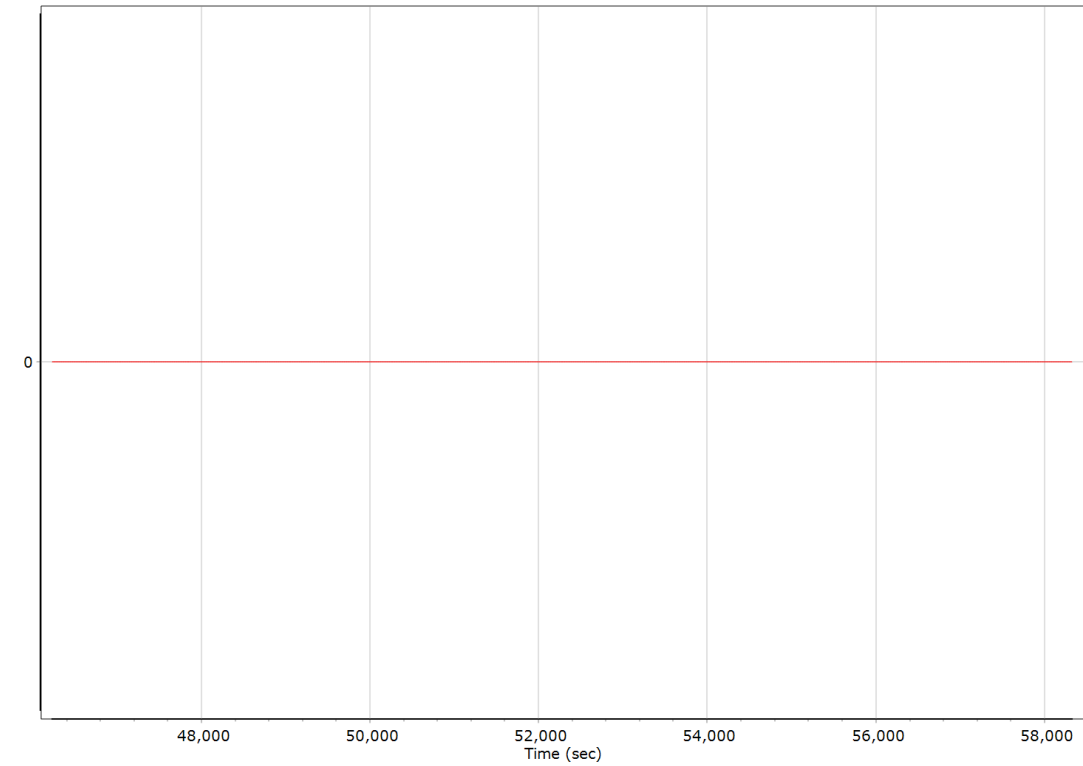


Heading Error RMS (arc-min)



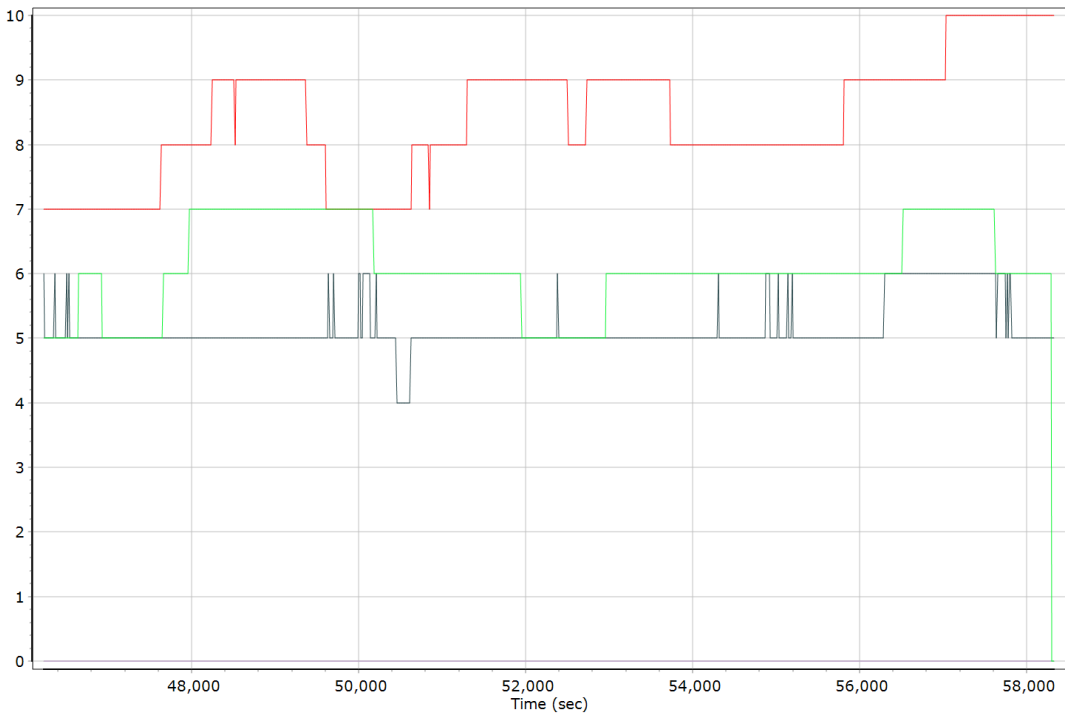
Forward Processed Solution Status

Processing Mode



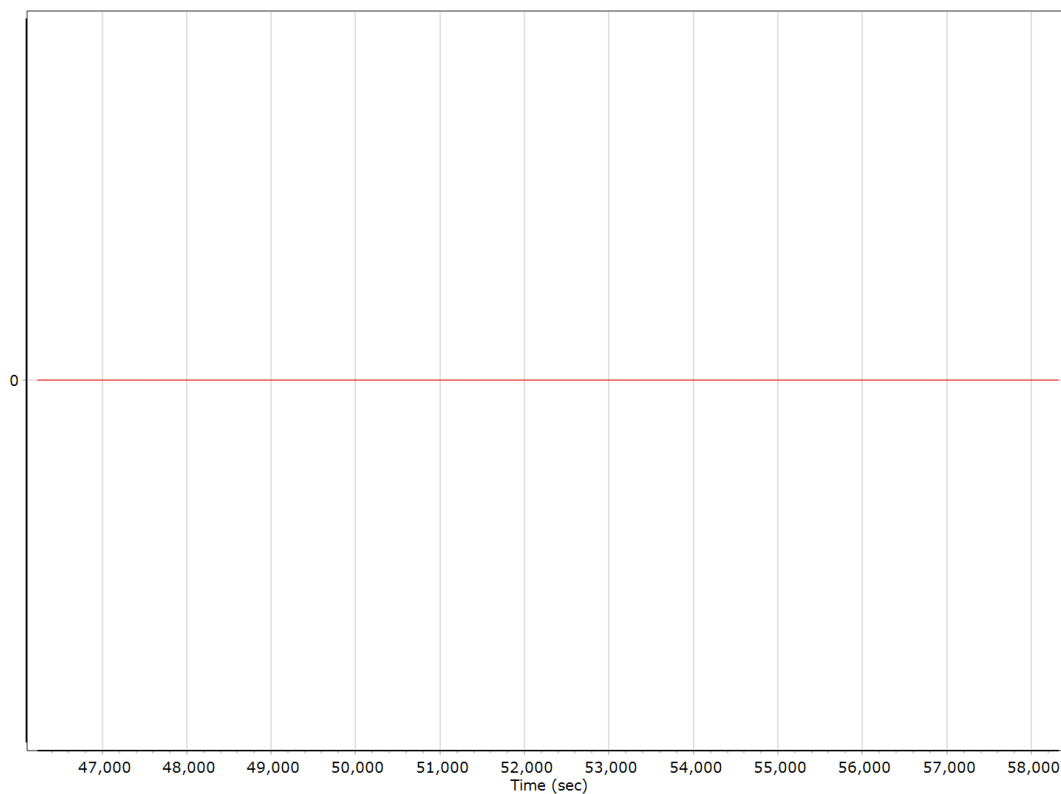
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites — Number of GLONASS Satellites — Number of QZSS Satellites
 — Number of BEIDOU Satellites — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05082022A_3543
Processing date	2022-05-10 17:38:46
Mission date	2022-05-08 12:56:24
Mission duration	03:12:08.781
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9683
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
220508_125605_INS-GPS_1.raw	POS Data

Input Files

File Name	File Type
Ephm1280.22g	GLONASS Broadcast Ephemeris
Ephm1280.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05082022A_3543.out	SBET Trajectory File

Rover Data Summary

First raw data file	220508_125605_INS-GPS_1.raw		
Last raw data file	220508_125605_INS-GPS_1.raw		
Start GPS week	2209		
Start time	46565.046 (5/8/2022 12:56:05 PM)		
End time	58093.827 (5/8/2022 4:08:13 PM)		
Start of fine alignment	46958.549 (5/8/2022 1:02:38 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	-0.034	-0.010	-0.374
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.717	-0.178	-1.265
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

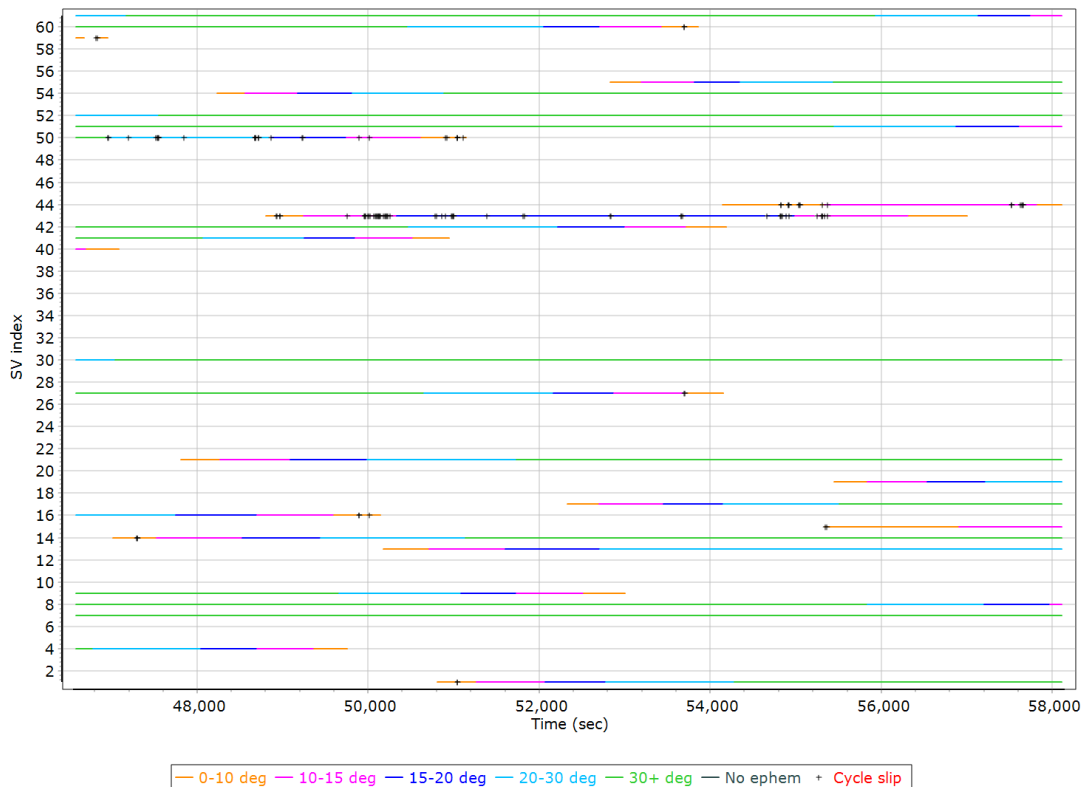
Rover Data QC

Raw IMU Import QC Summary

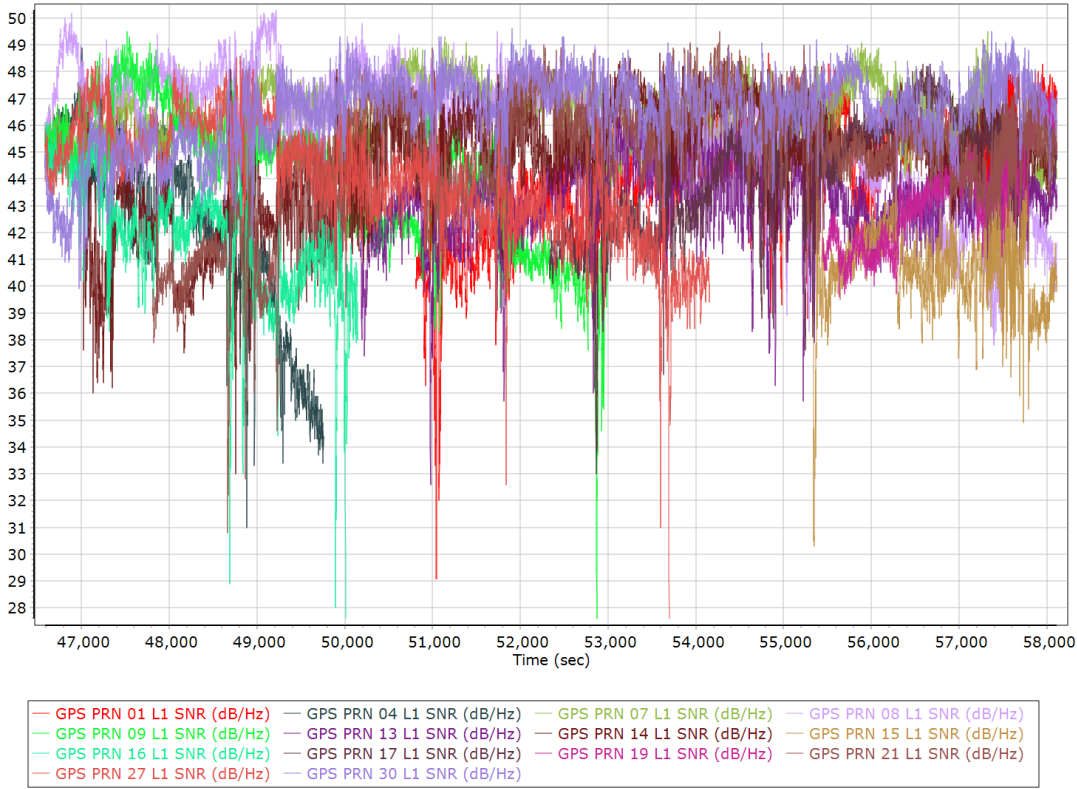
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05082022A_3543.log
IMU Records Processed	2305388
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

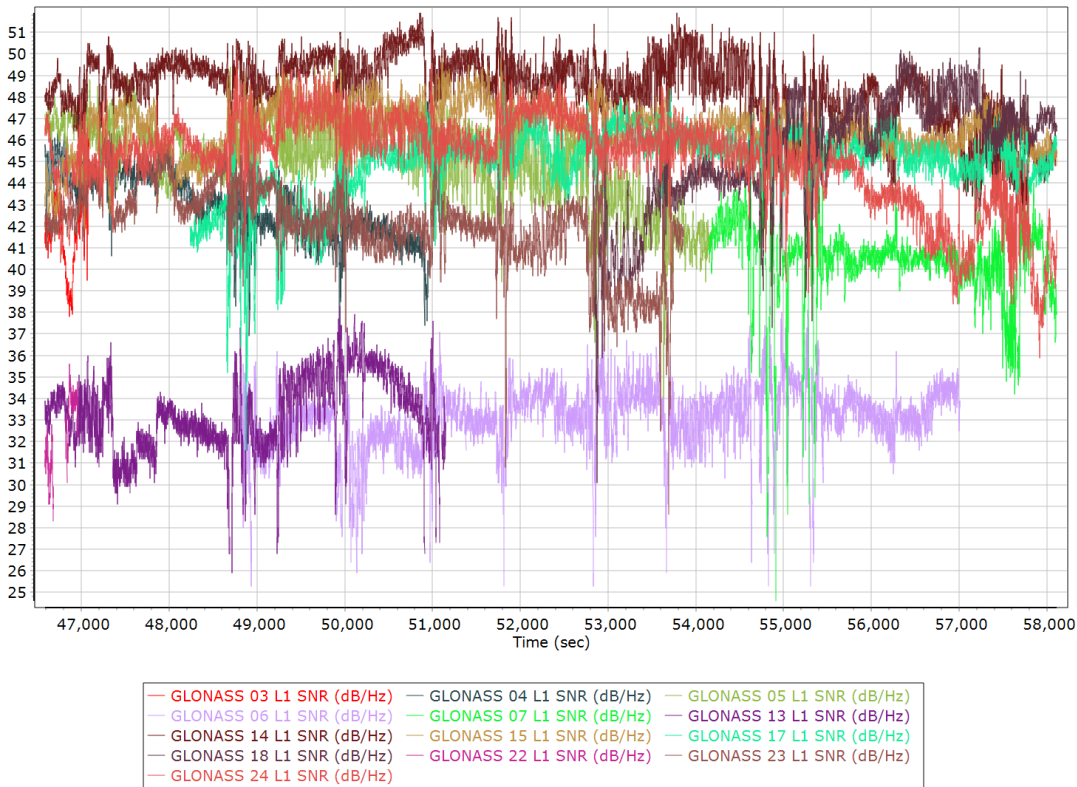
GPS/GLONASS L1 Satellite Lock/Elevation



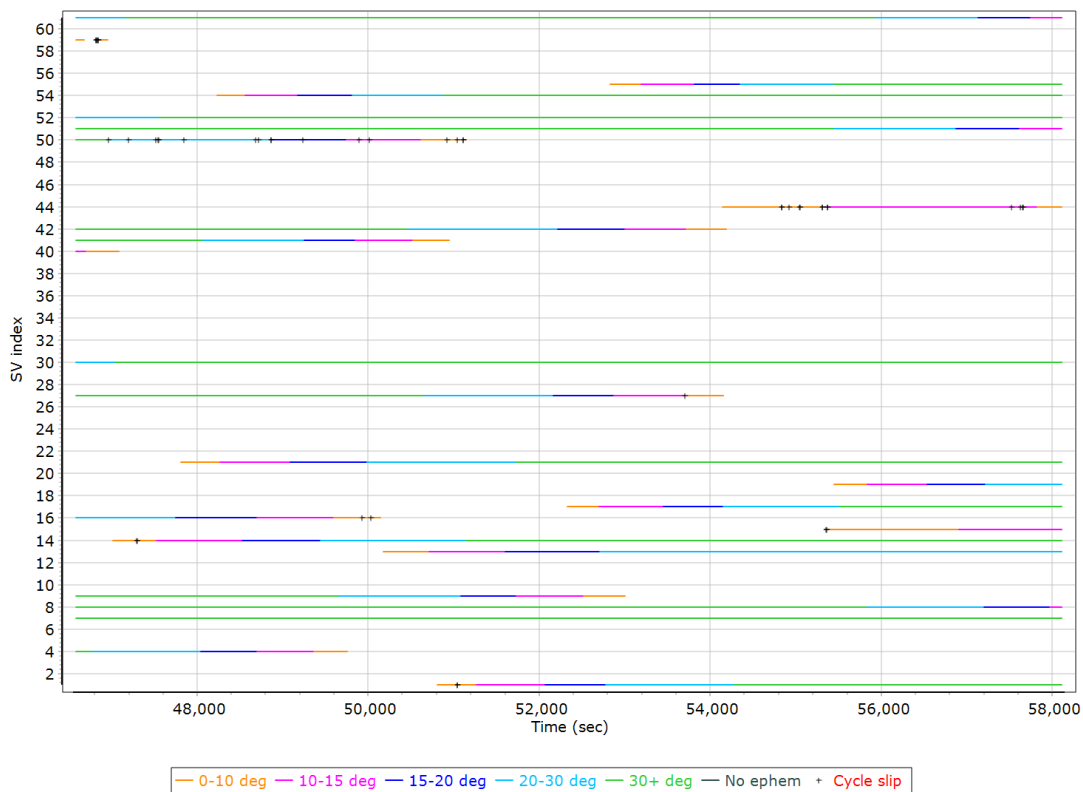
GPS L1 SNR



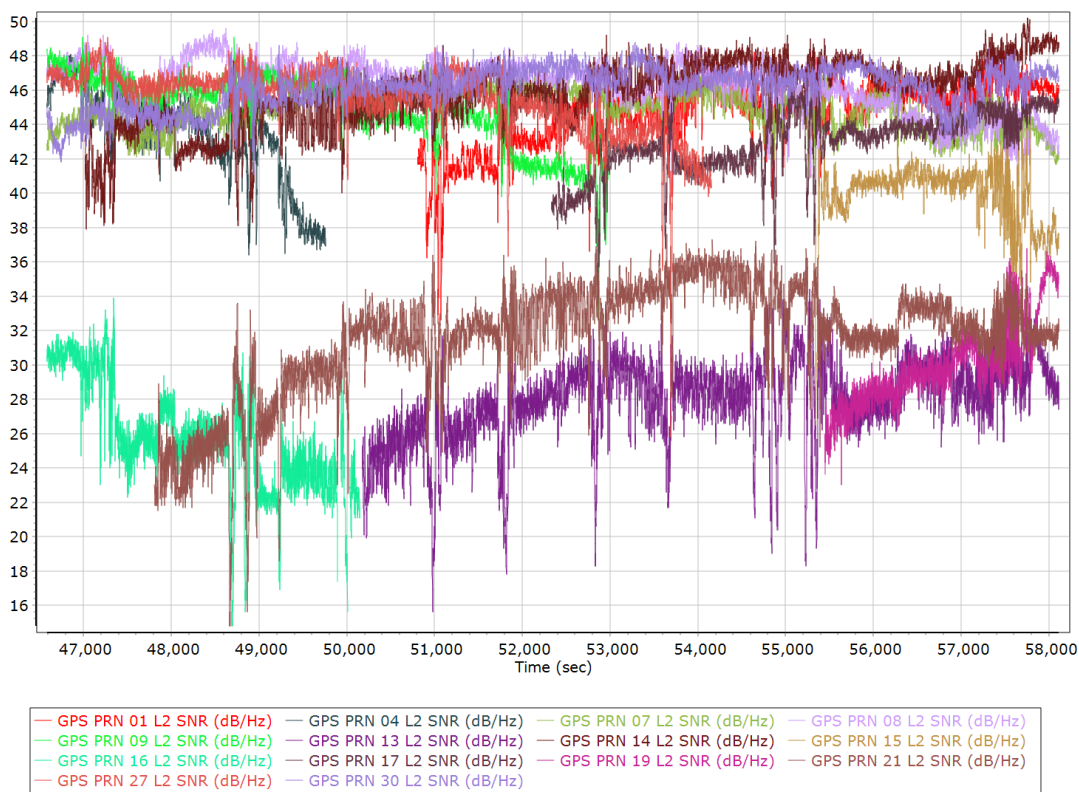
GLONASS L1 SNR



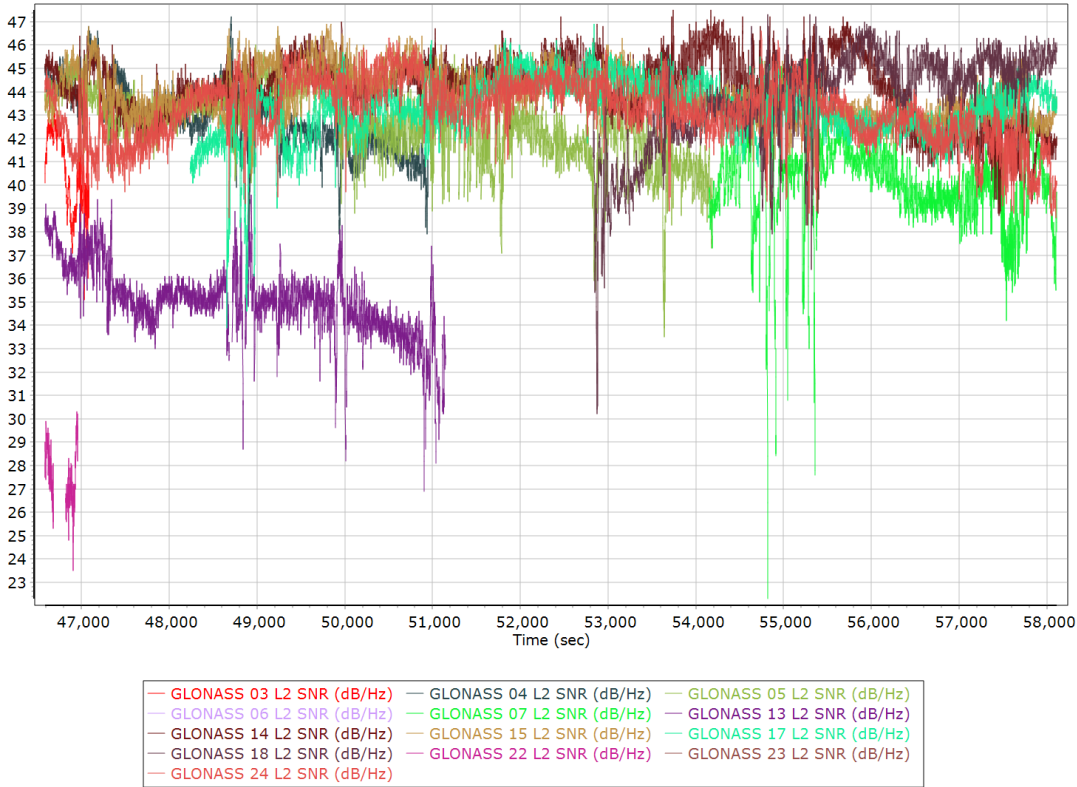
GPS/GLONASS L2 Satellite Lock/Elevation



GPS L2 SNR



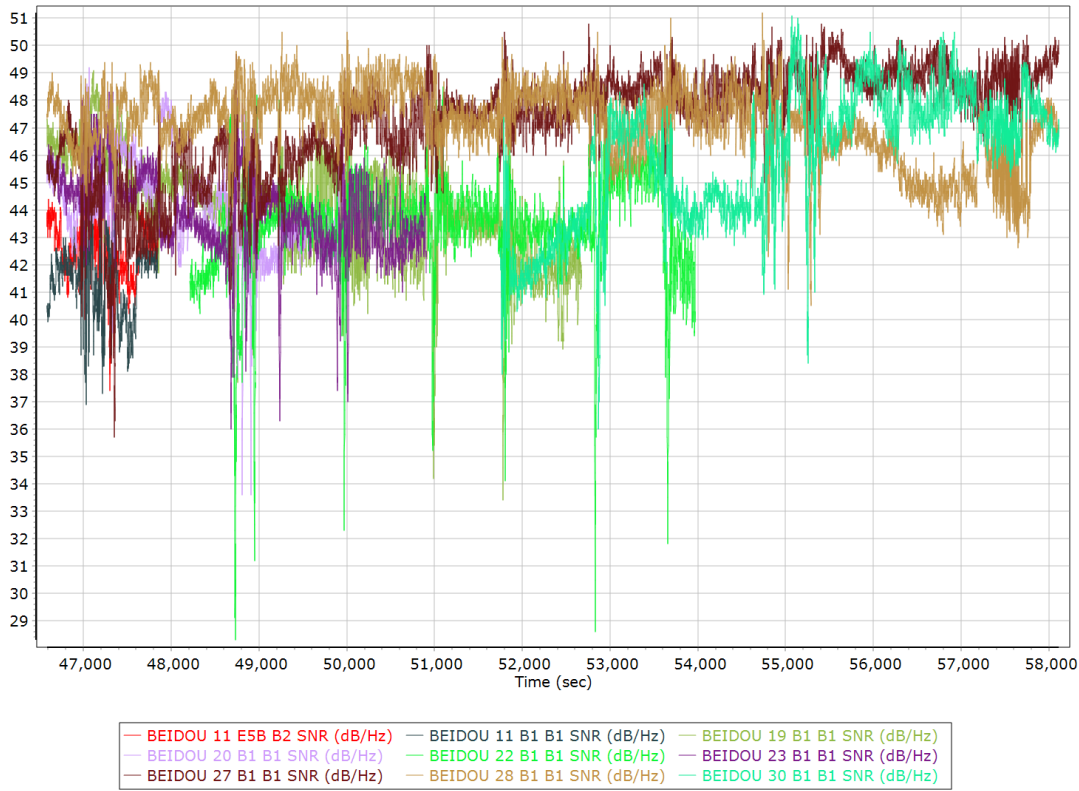
GLONASS L2 SNR



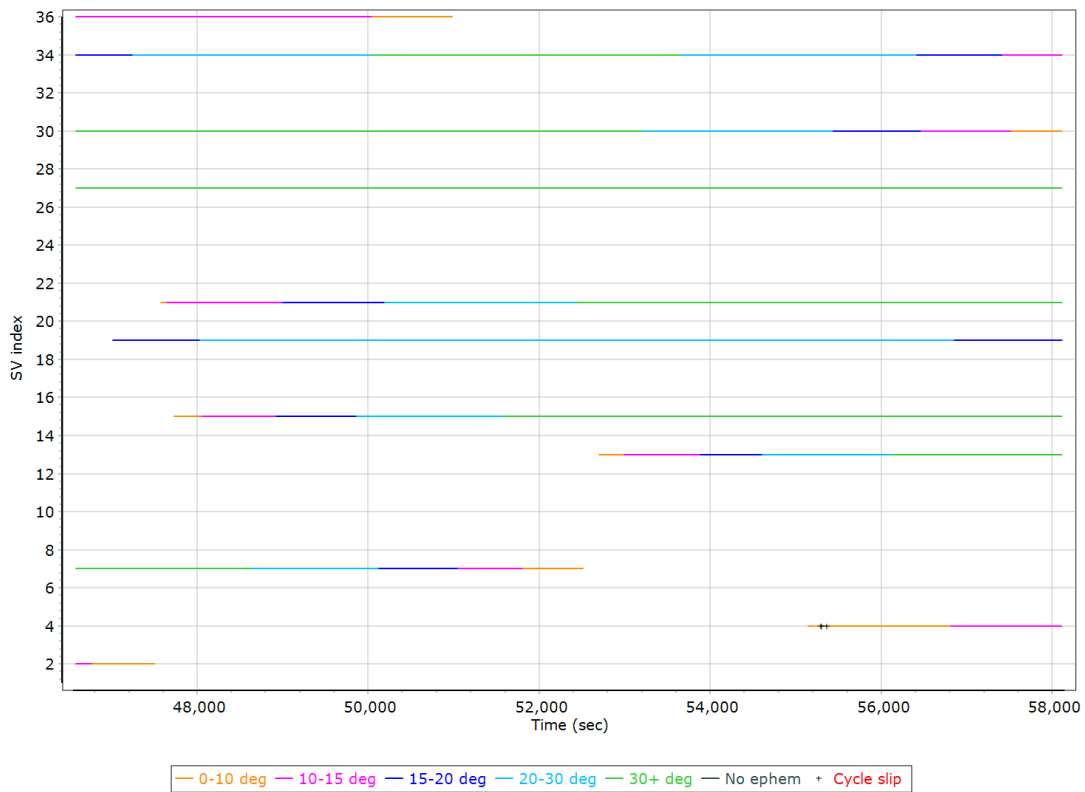
BEIDOU Satellite Lock/Elevation



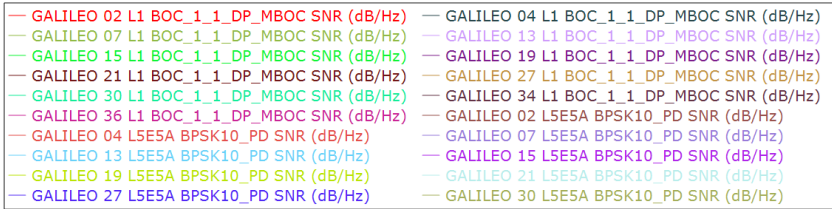
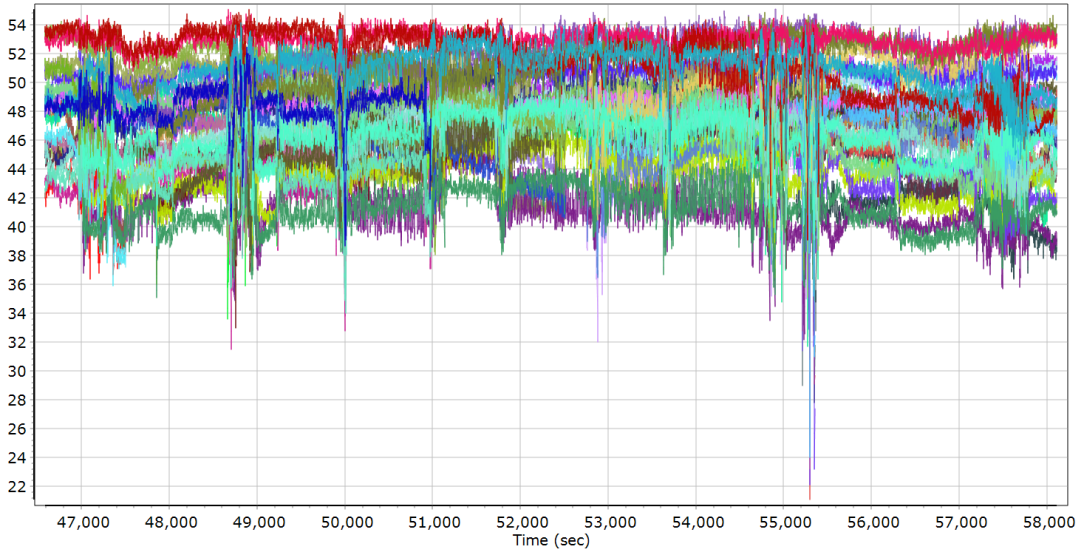
BEIDOU SNR



GALILEO Satellite Lock/Elevation

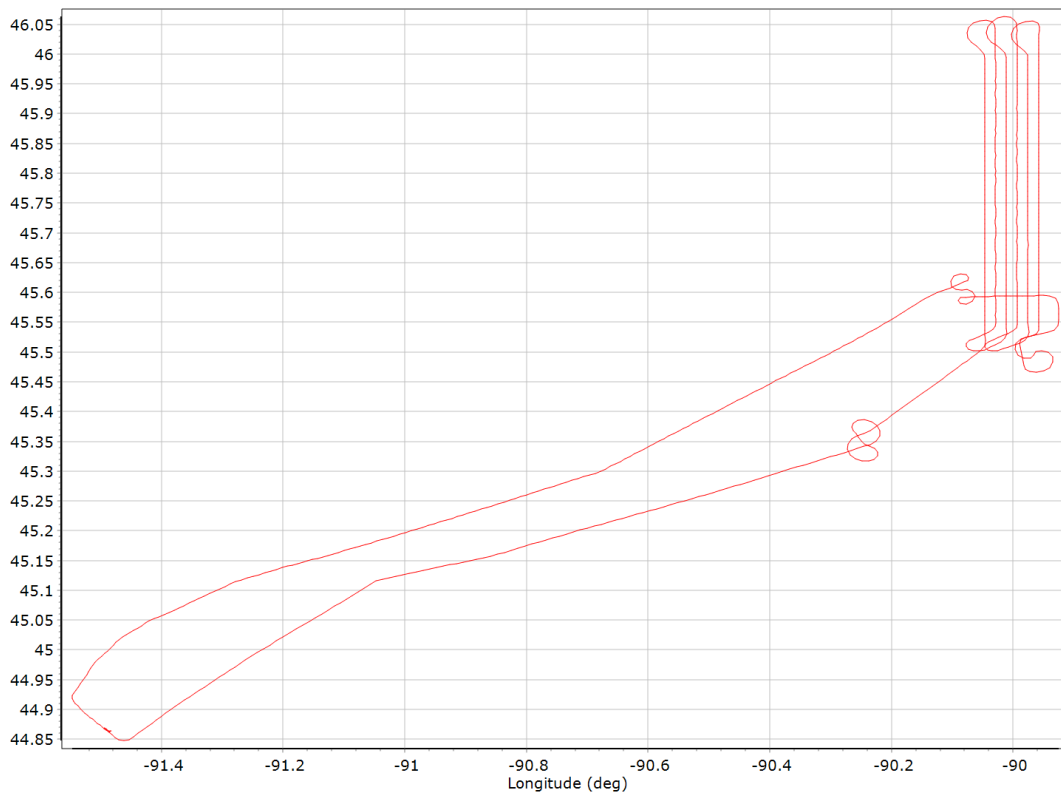


GALILEO SNR

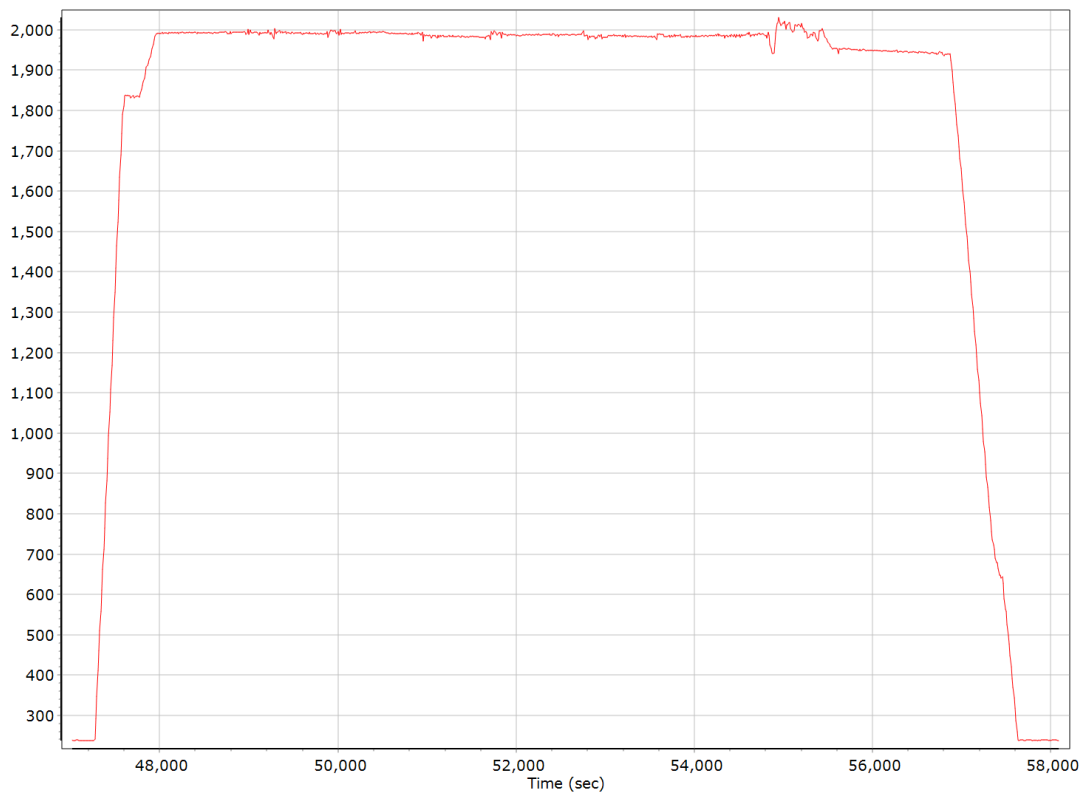


Smoothed Trajectory Information

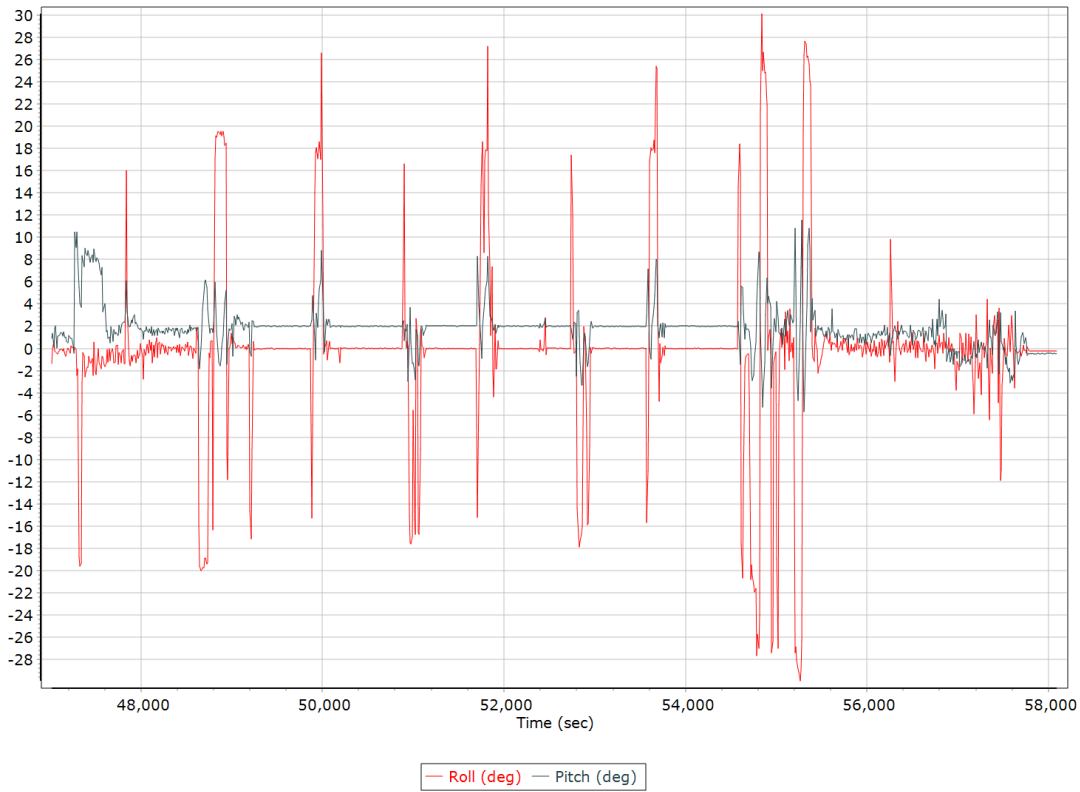
Top View



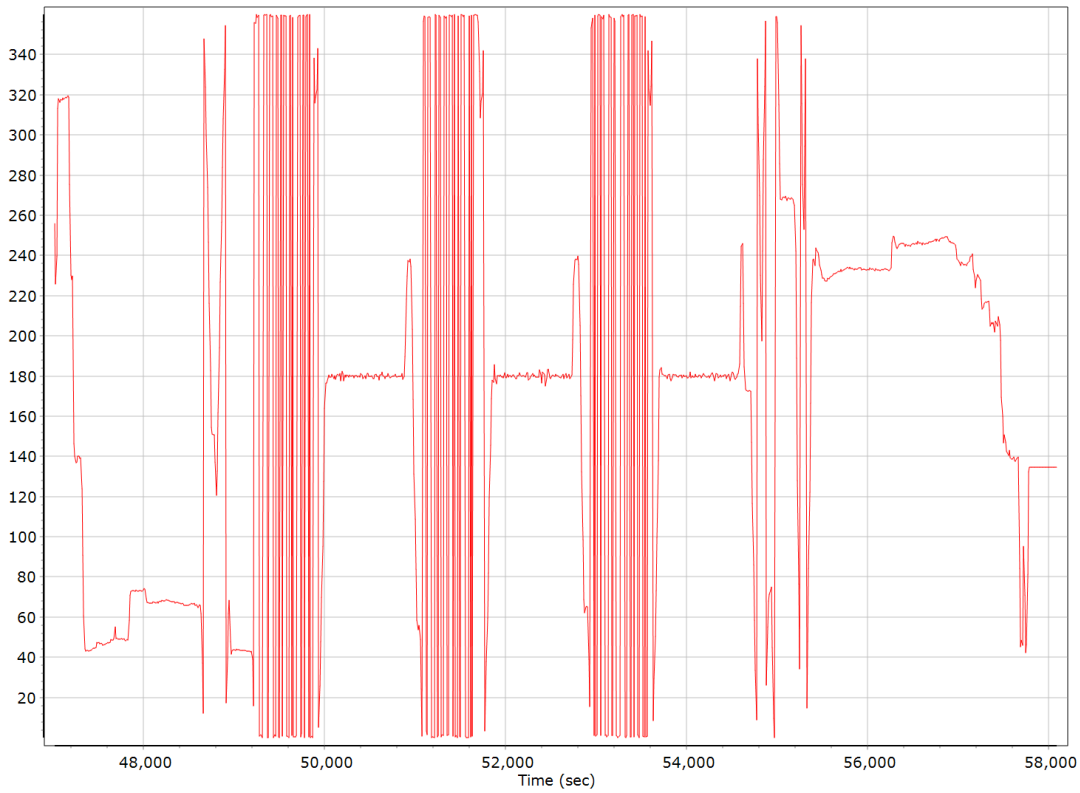
Altitude



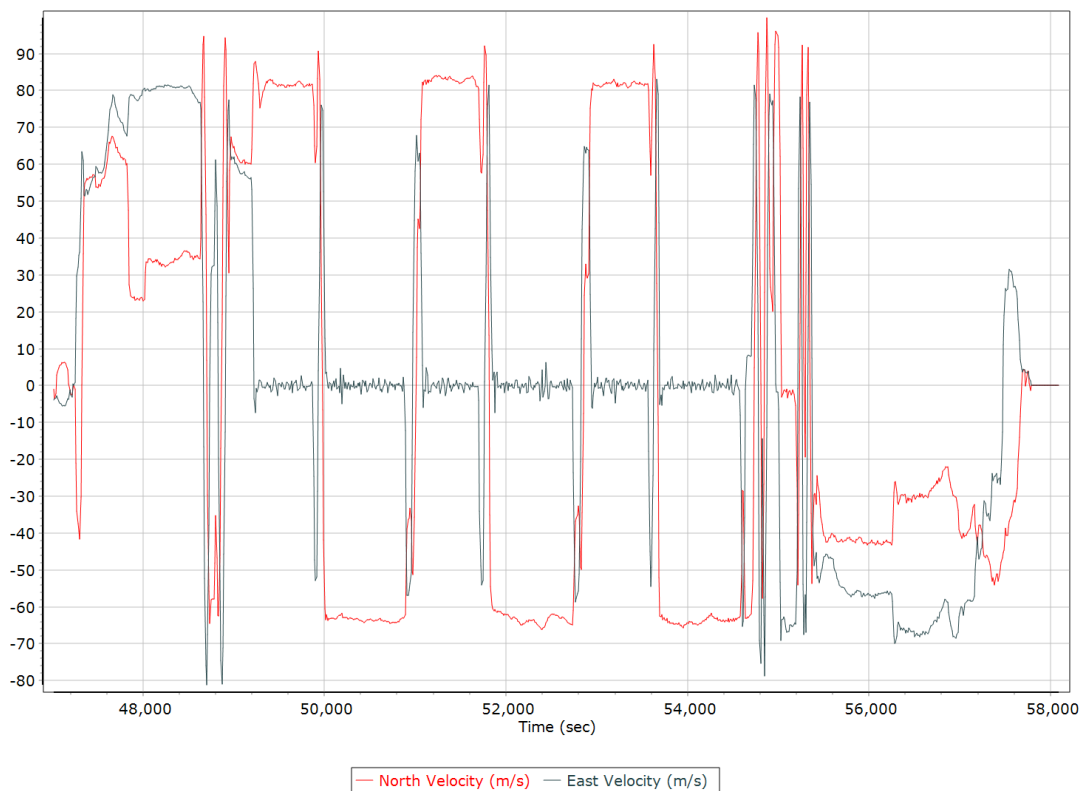
Roll/Pitch



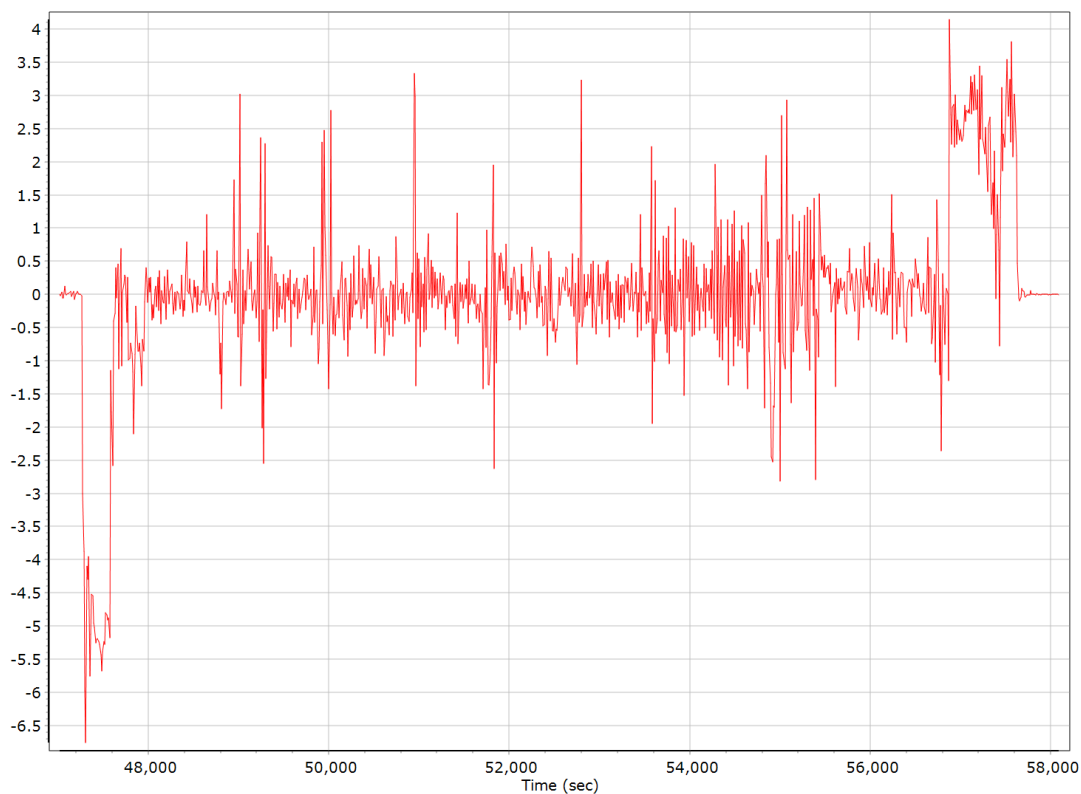
Heading



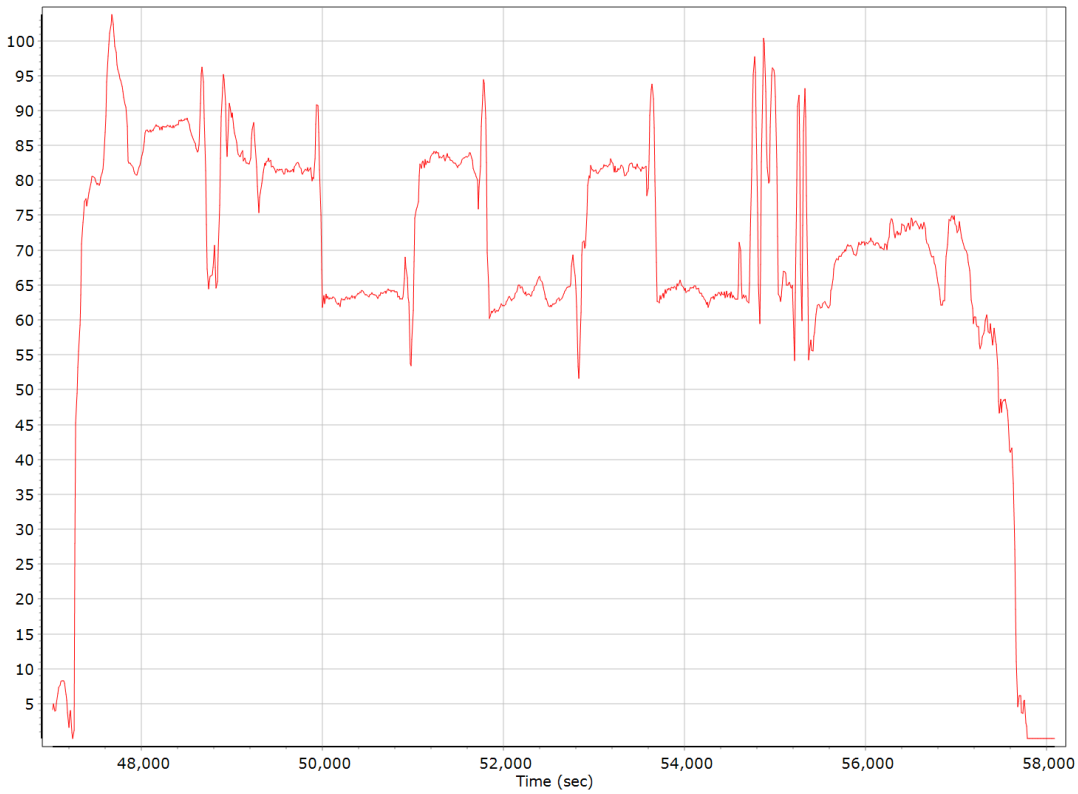
North/East Velocity



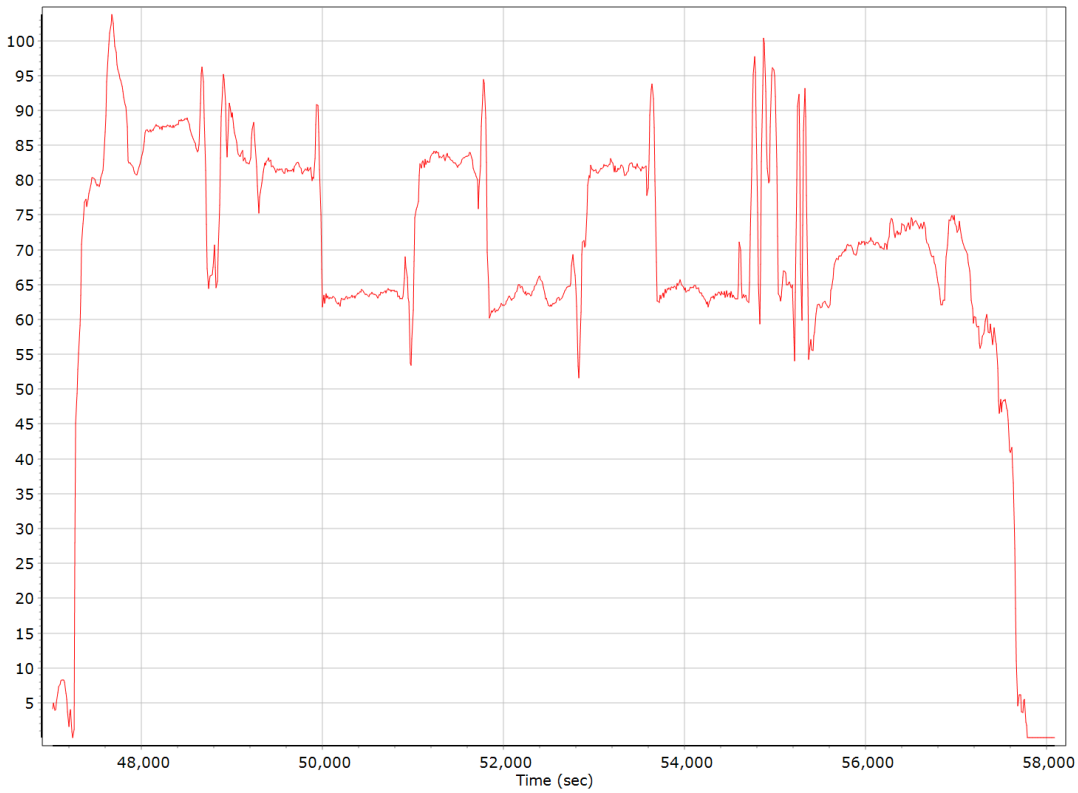
Down Velocity



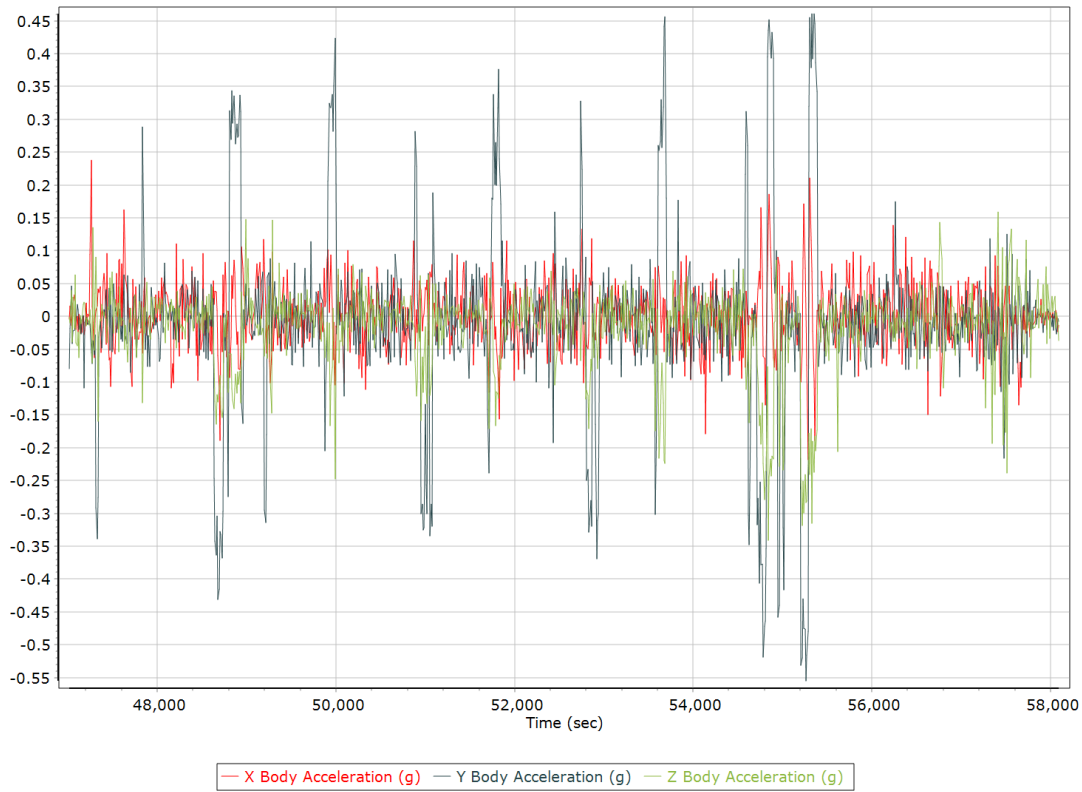
Total Speed



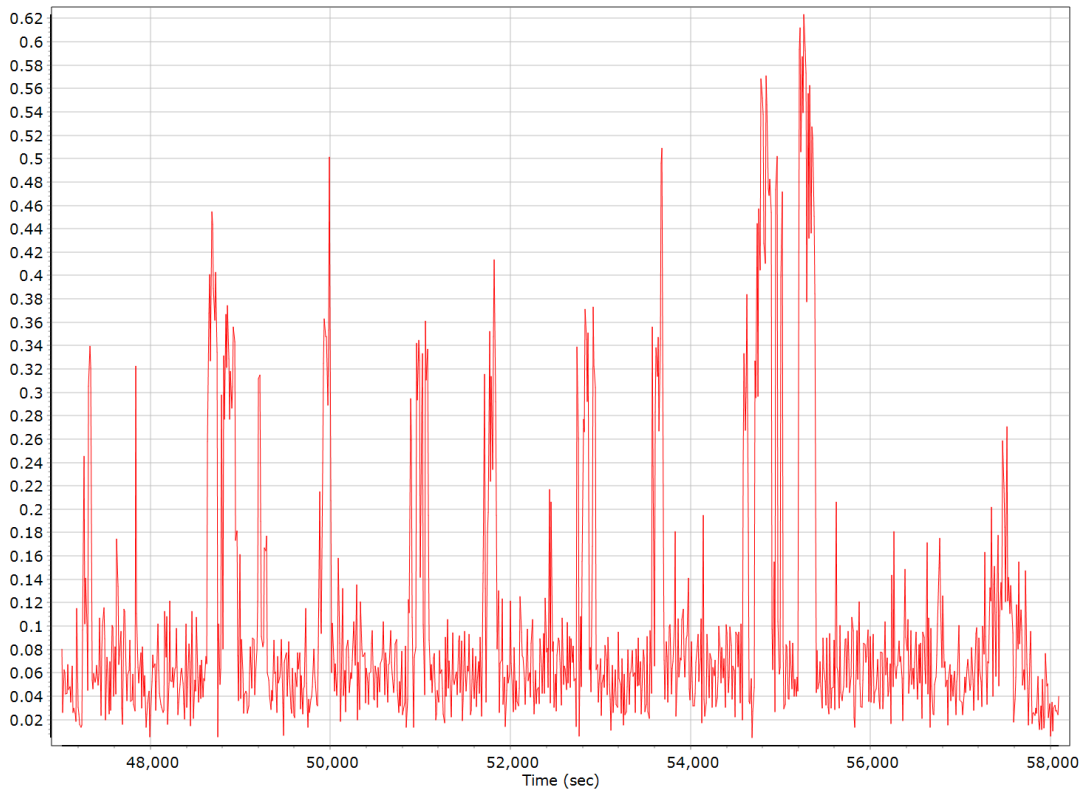
Ground Speed



Body Acceleration



Total Body Acceleration

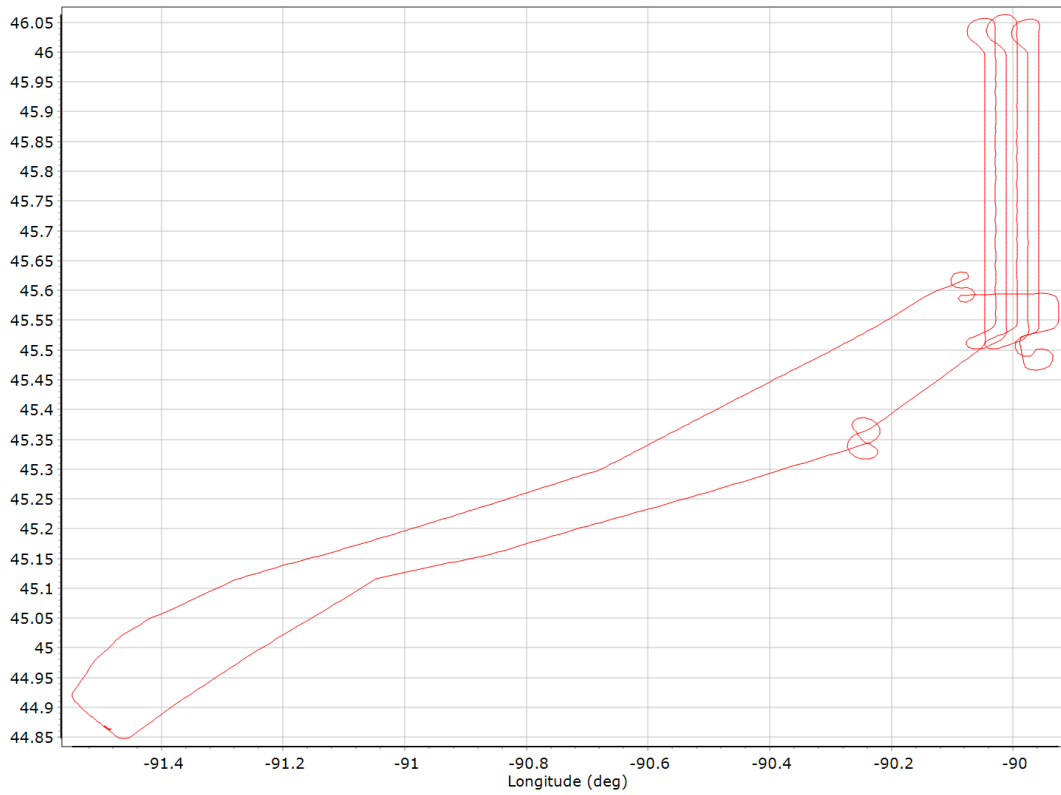


Body Angular Rate

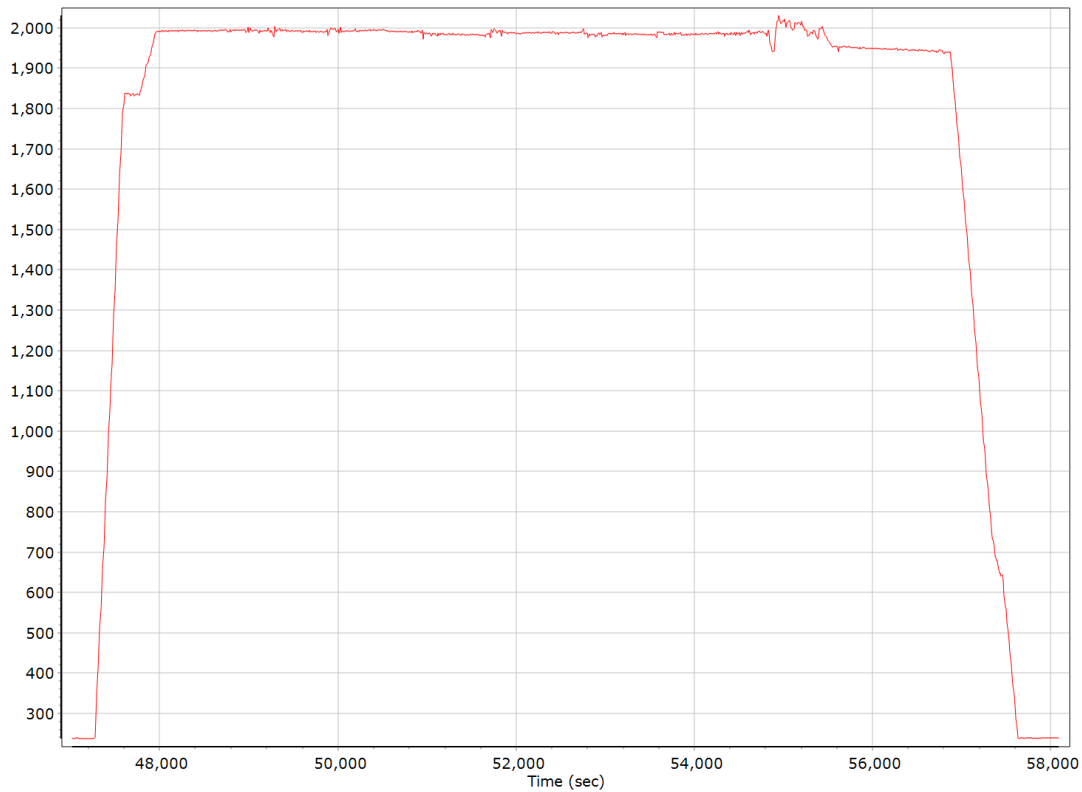


Forward Processed Trajectory Information

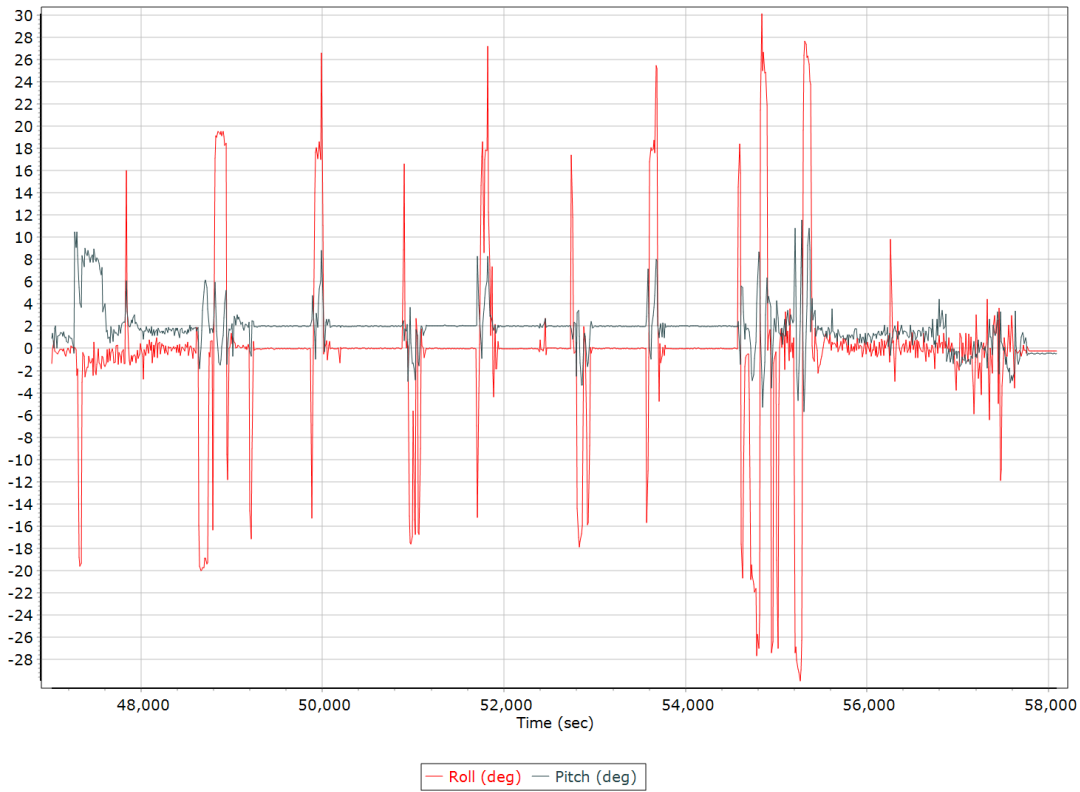
Top View



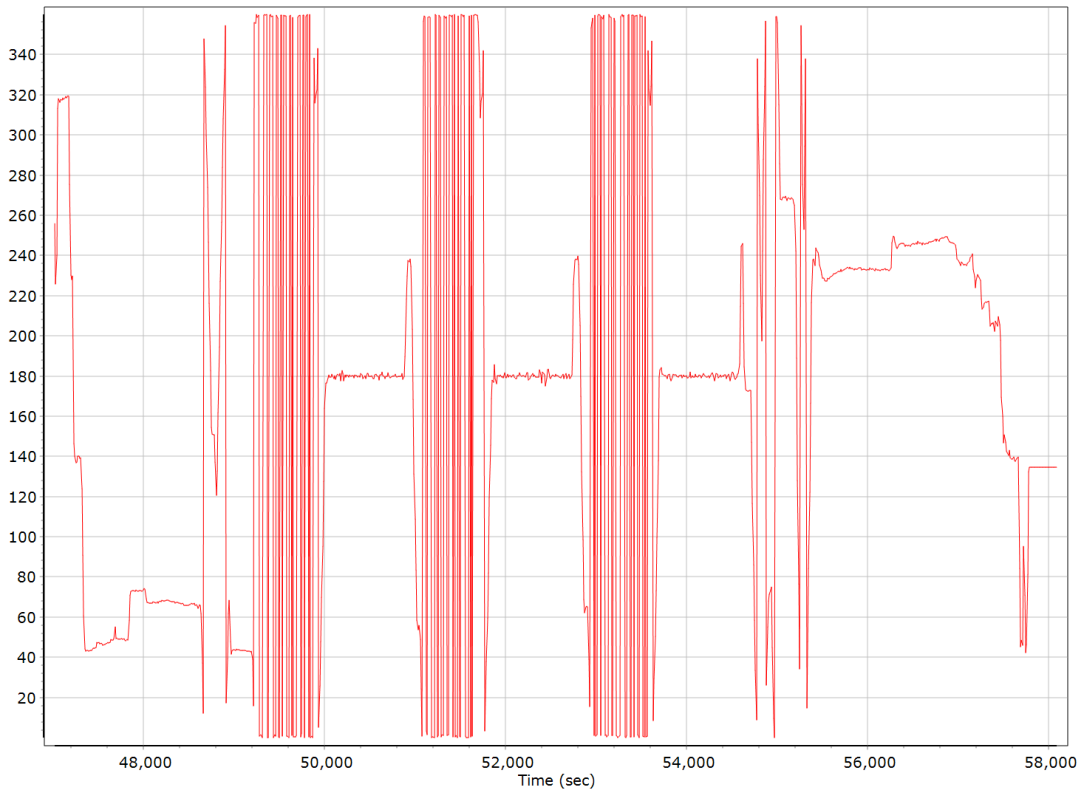
Altitude



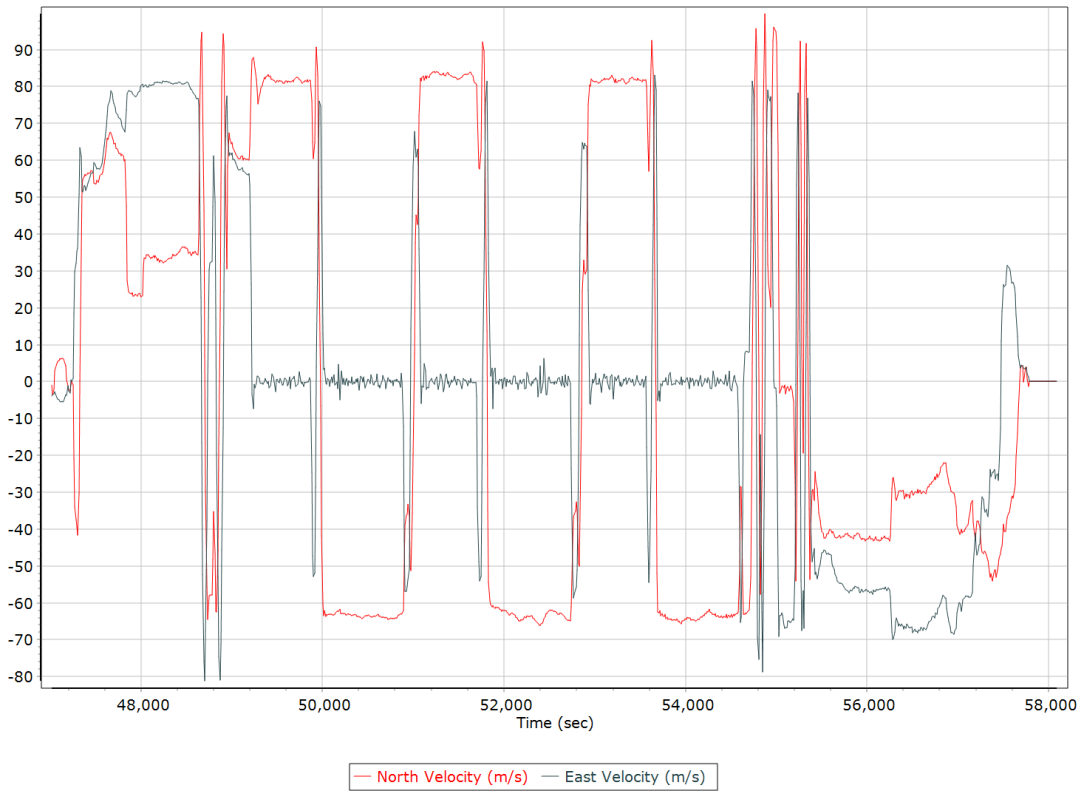
Roll/Pitch



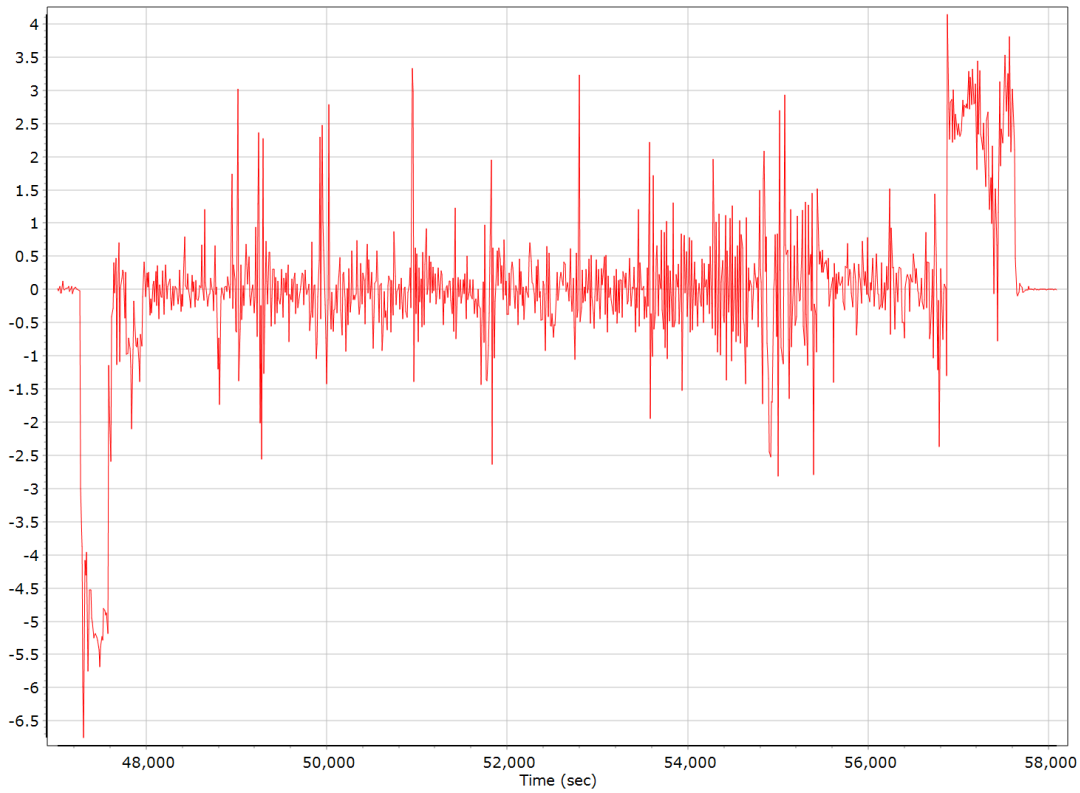
Heading



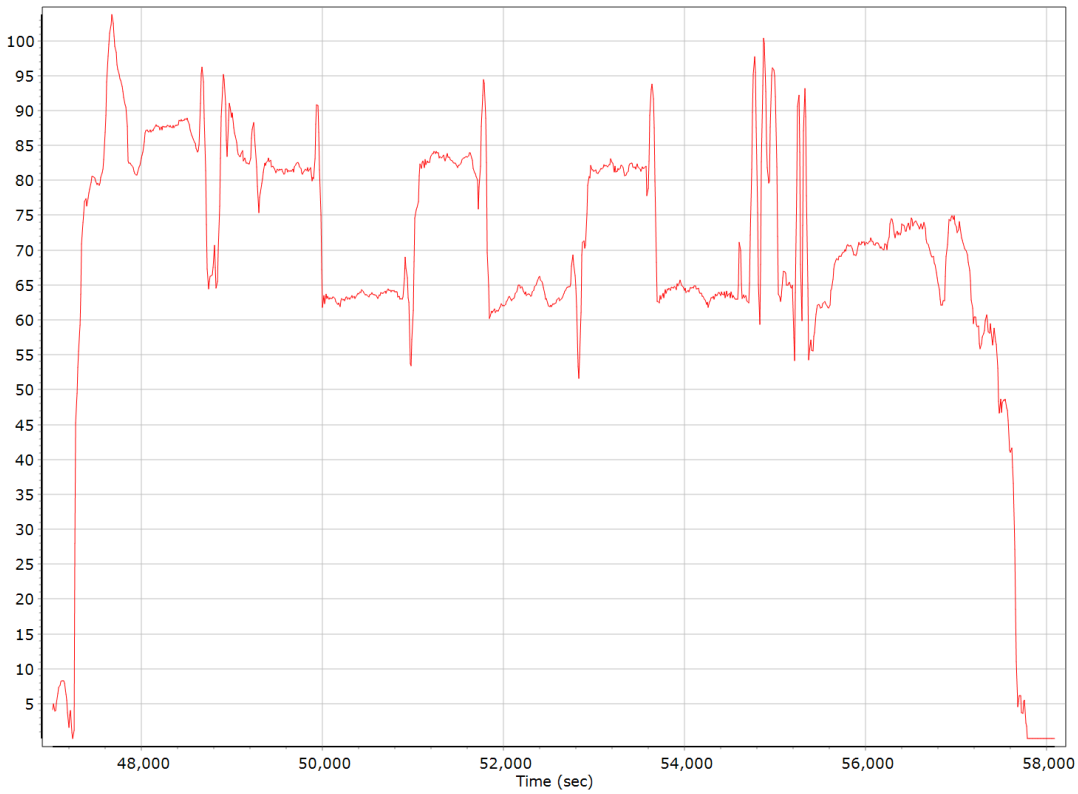
North/East Velocity



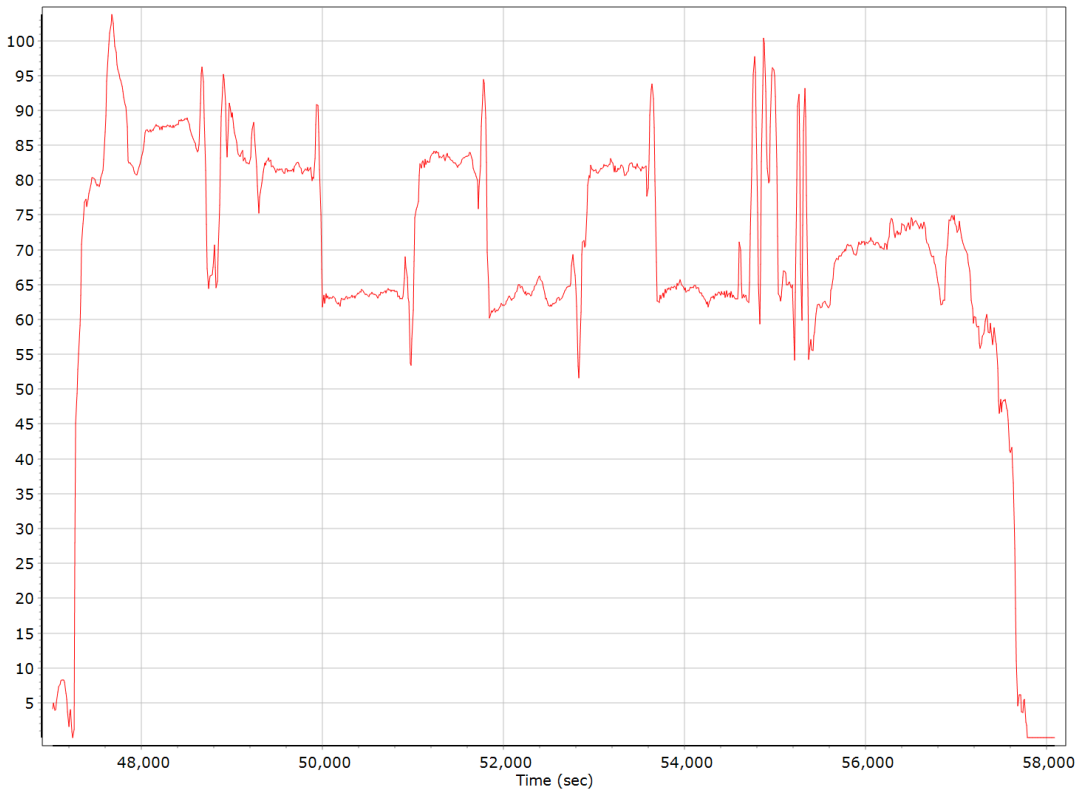
Down Velocity



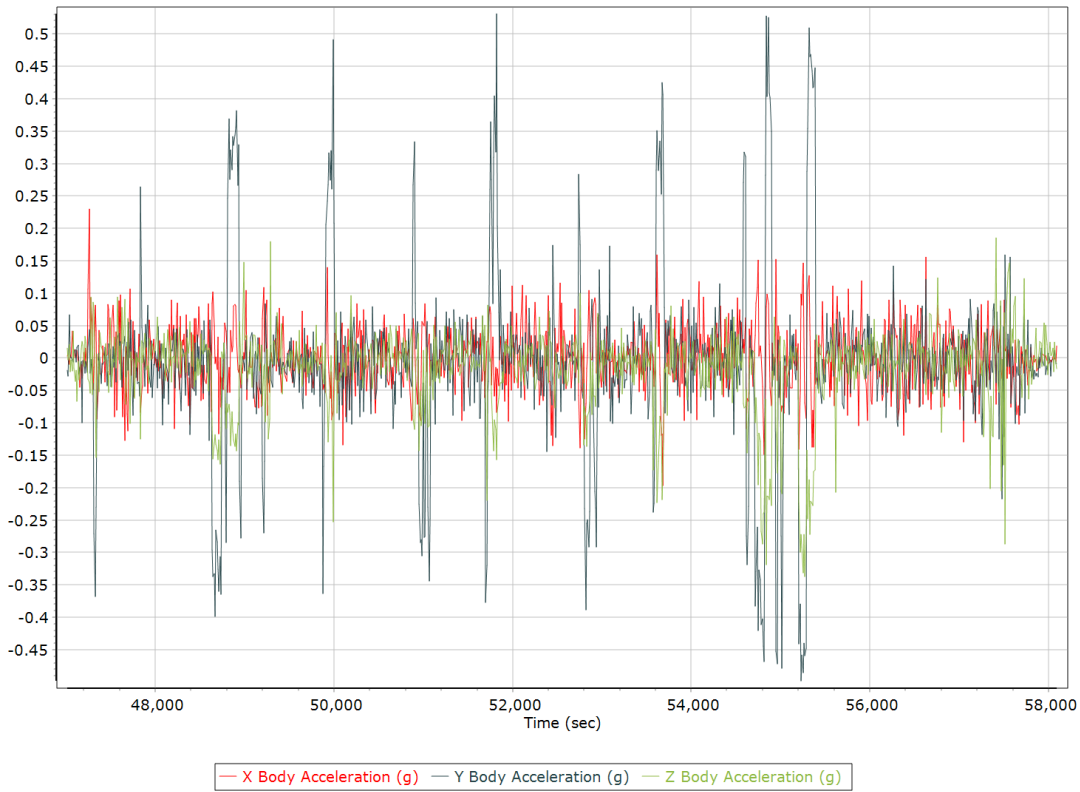
Total Speed



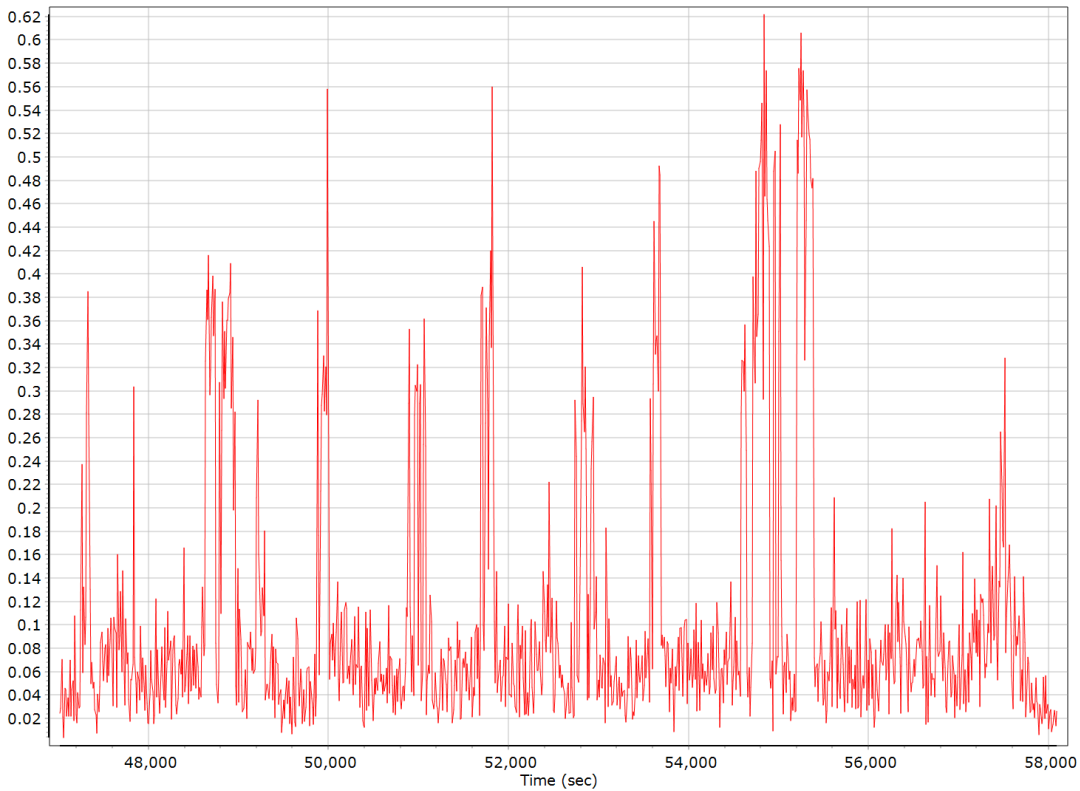
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

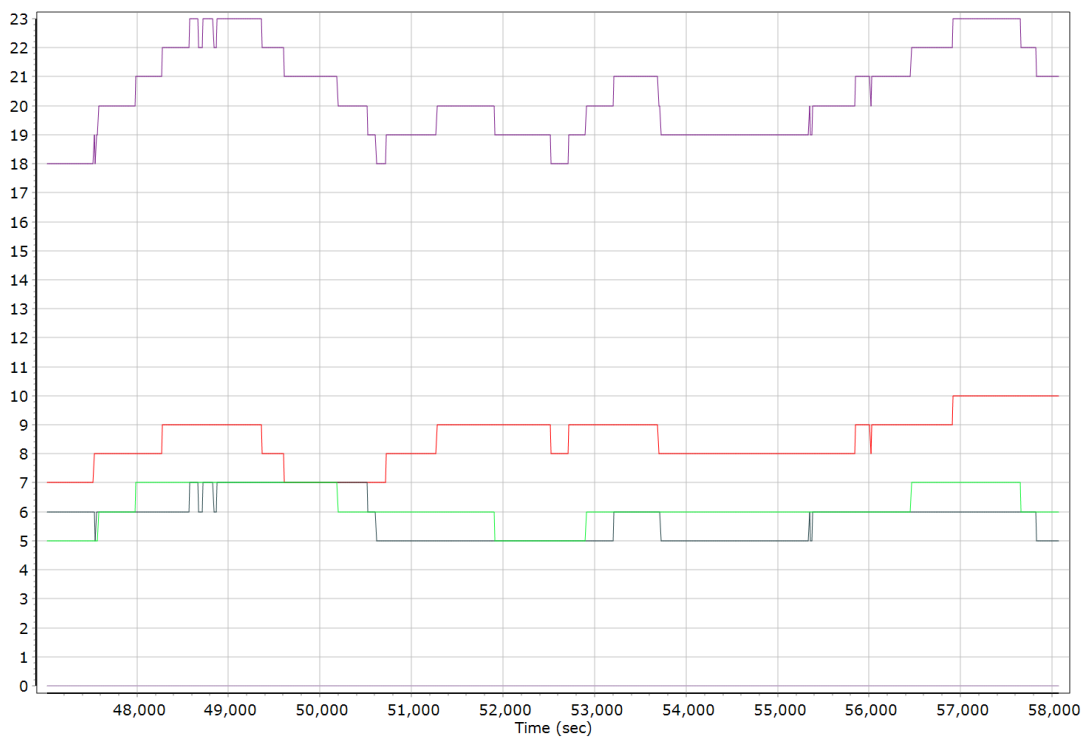


GNSS QC

GNSS QC Statistics

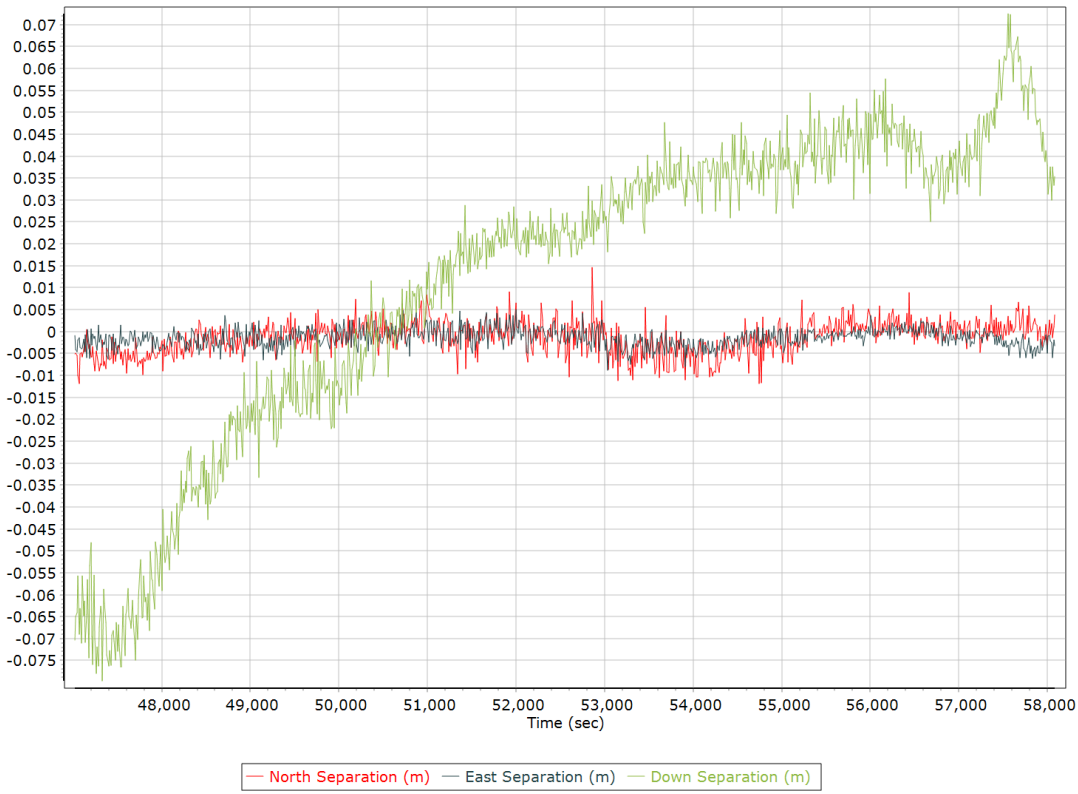
Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	5	7	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	4	7	6
Total number of SV	16	23	20
PDOP	0.99	1.57	1.21
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	11486.00	0.00	0.00
Percentage	100.00	0.00	0.00

Num SVs in solution



— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Number of GALILEO — Total Number

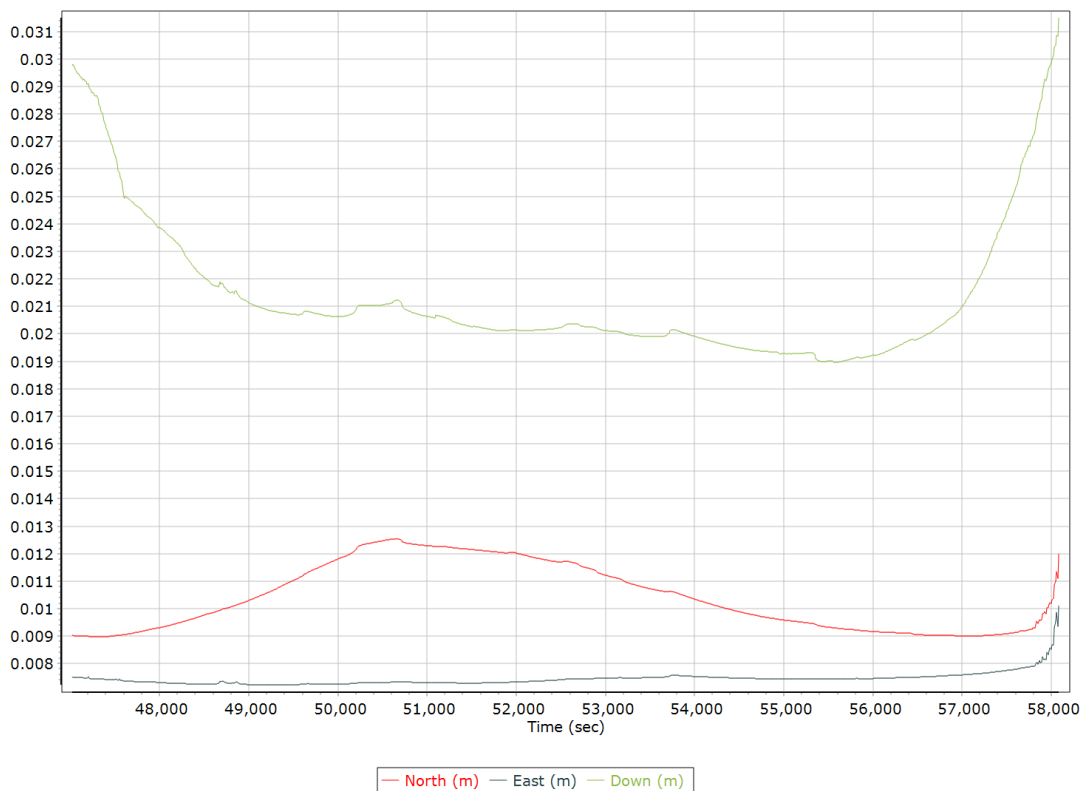
Forward/Reverse Separation



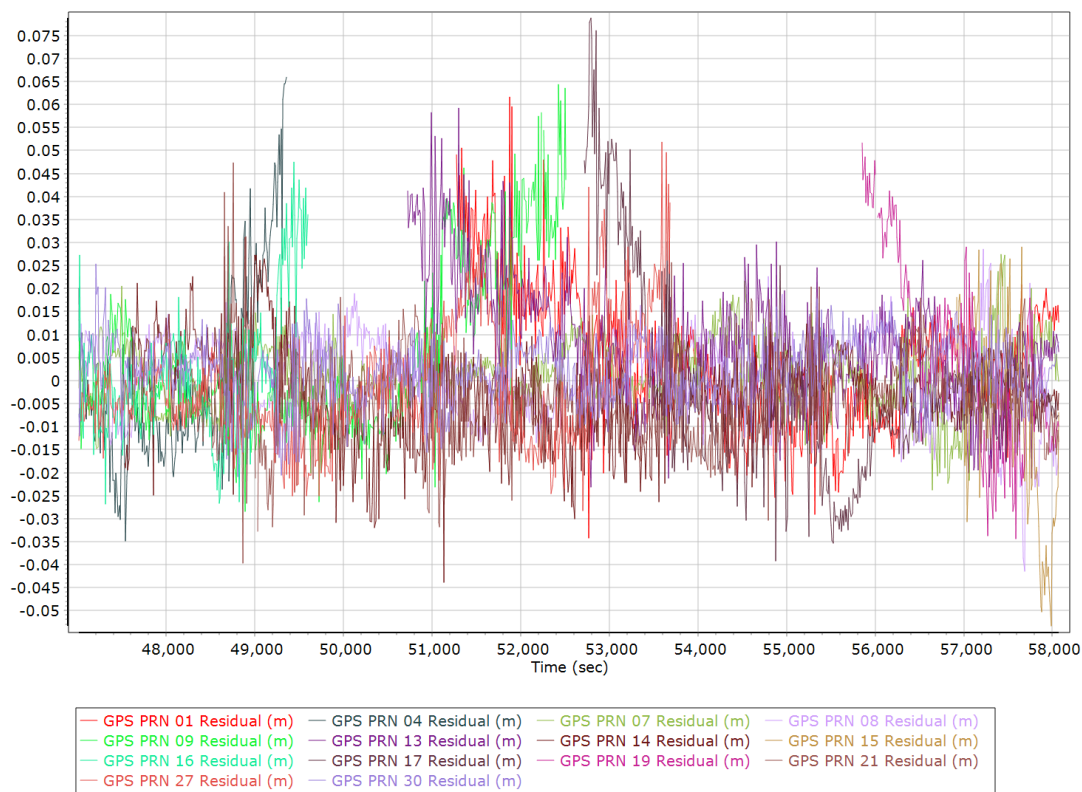
PDOP



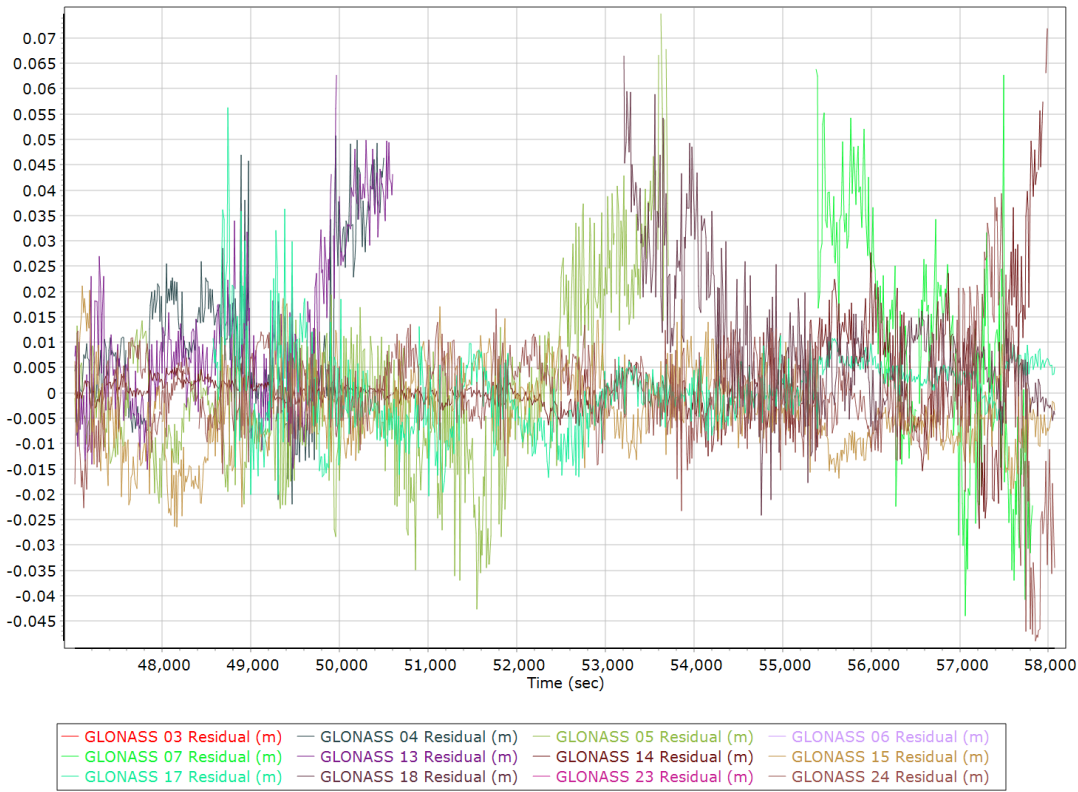
Estimated Position Accuracy



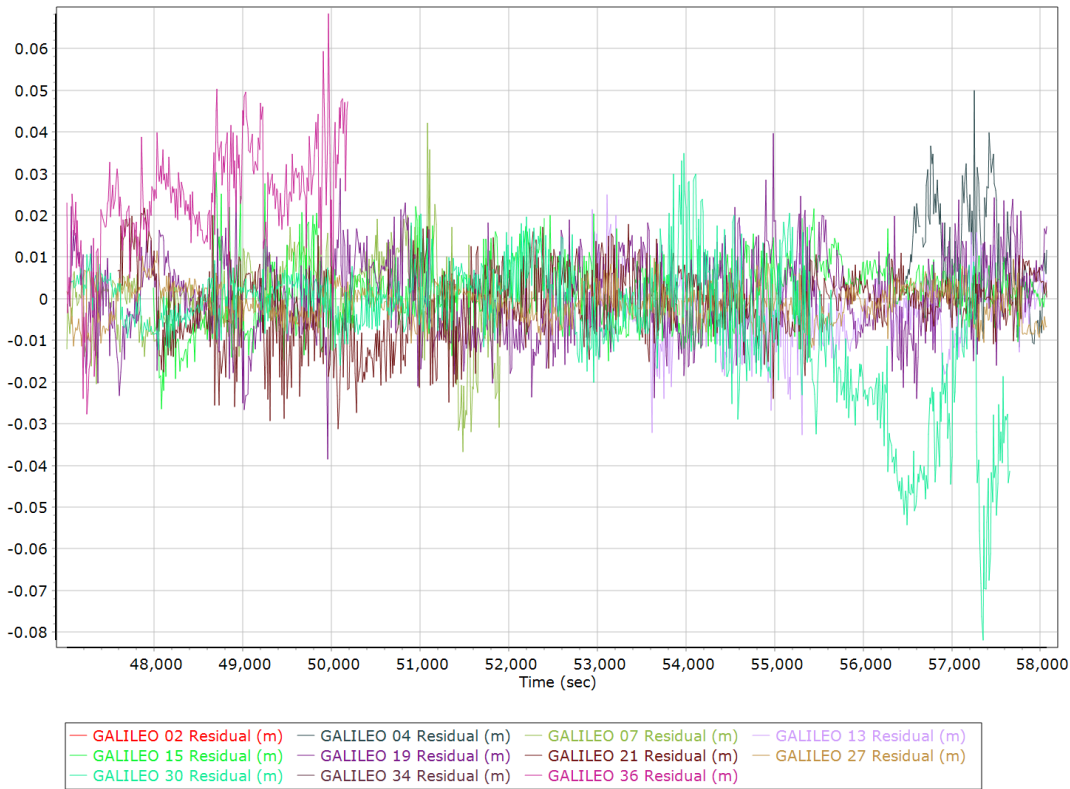
GPS Residuals



GLONASS Residuals



GALILEO Residuals



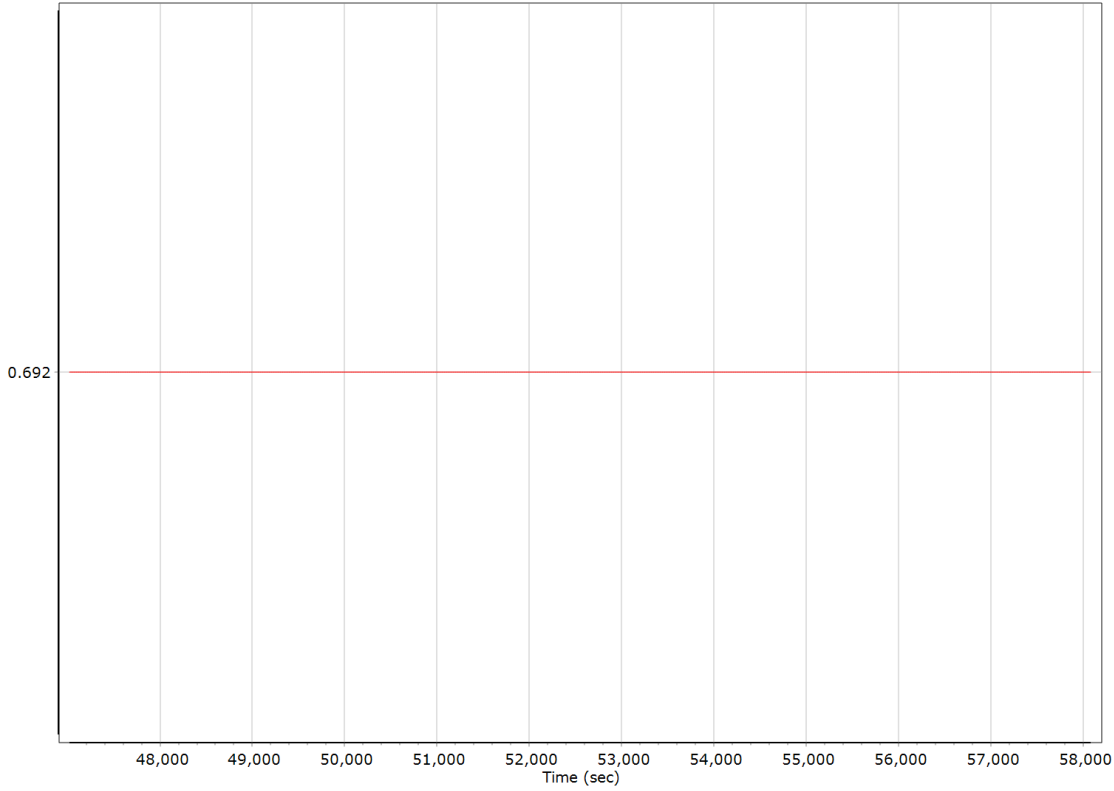
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	46566.000 (5/8/2022 12:56:06 PM)		
Processing end time	58094.000 (5/8/2022 4:08:14 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	-0.034	-0.010	-0.374
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.692	-0.181	-1.276
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

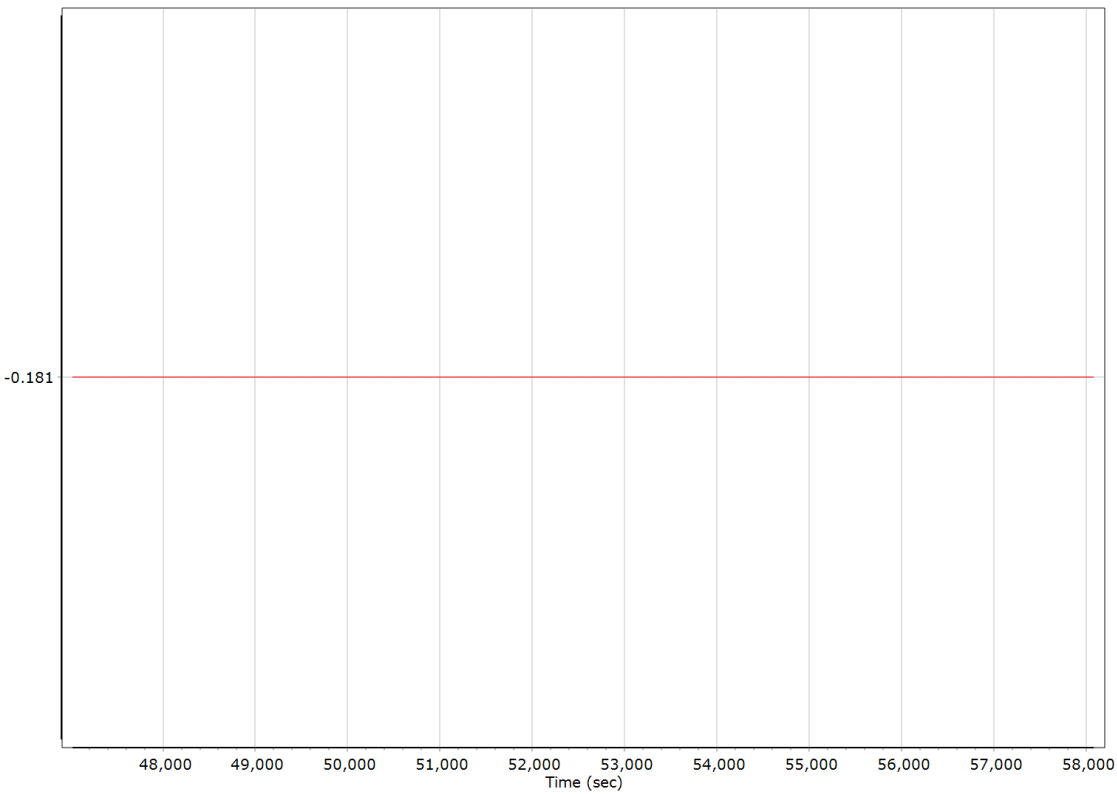
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

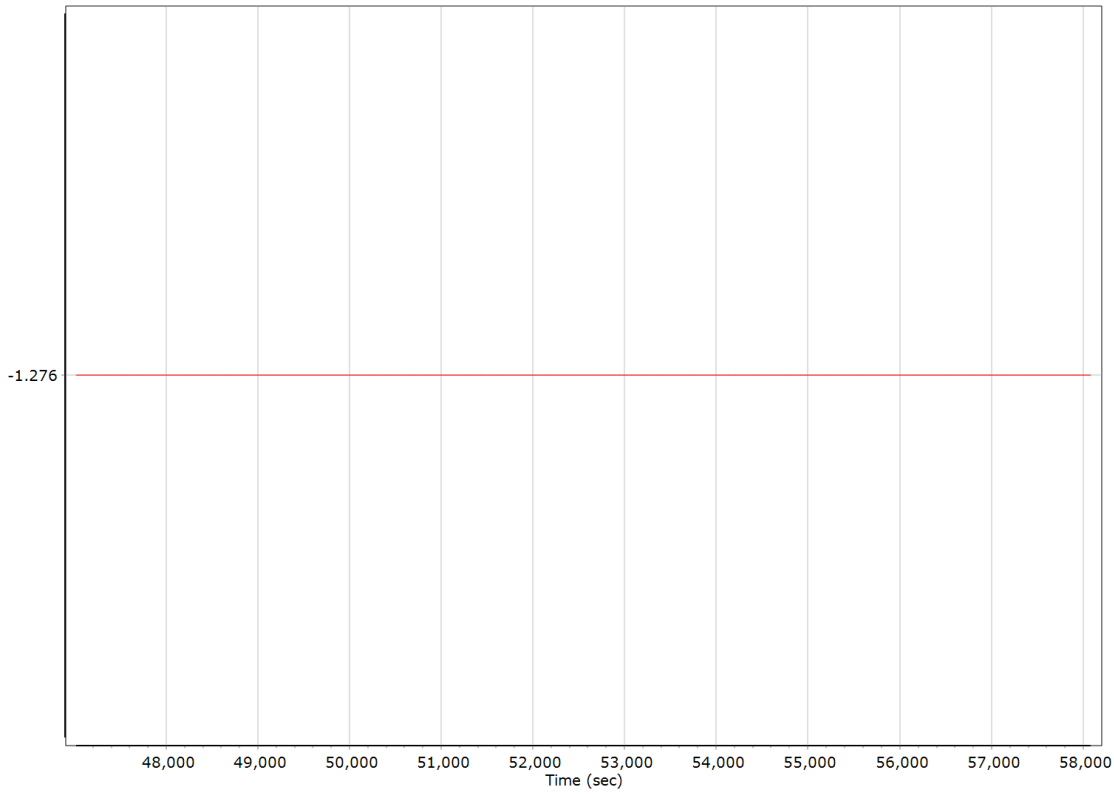
X Reference-Primary GNSS Lever Arm (m)



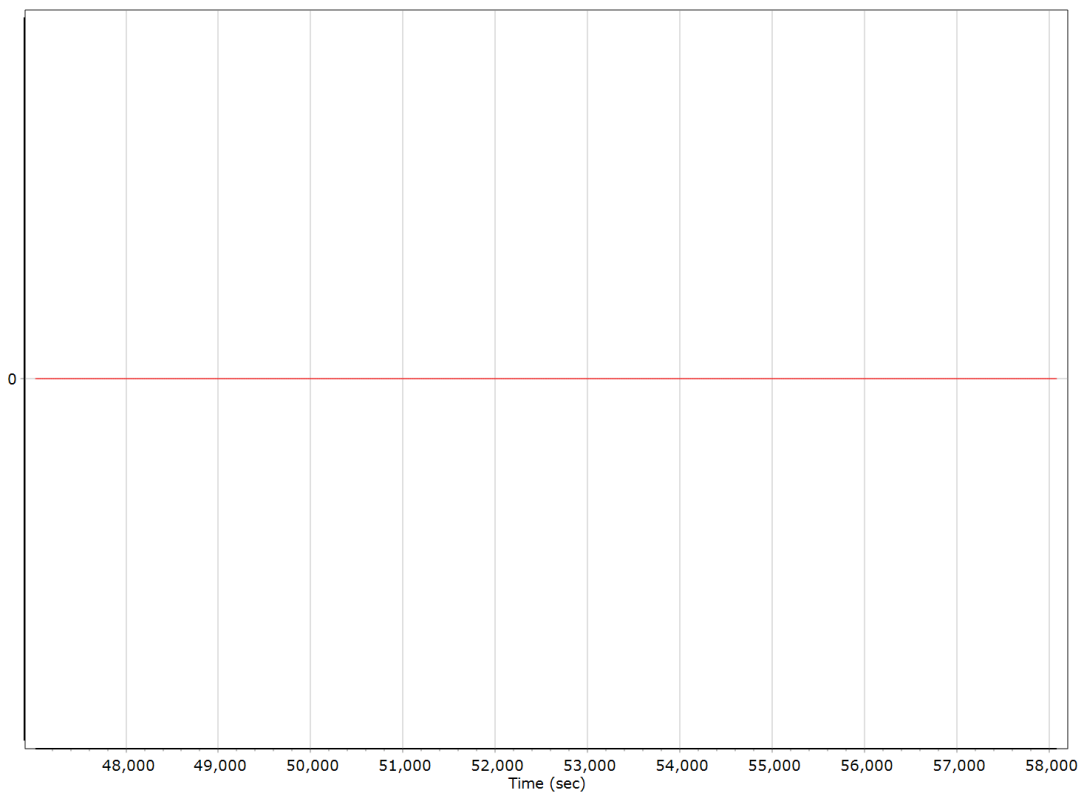
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



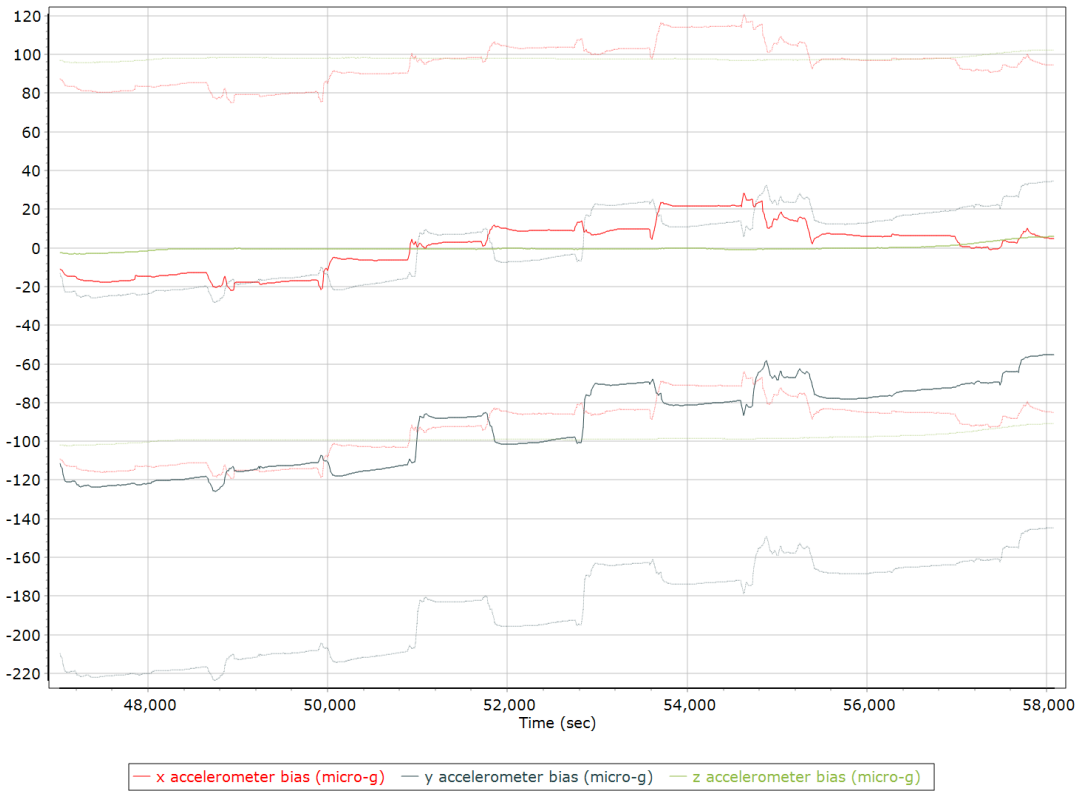
Reference-Primary GNSS Lever Arm Figure of Merit



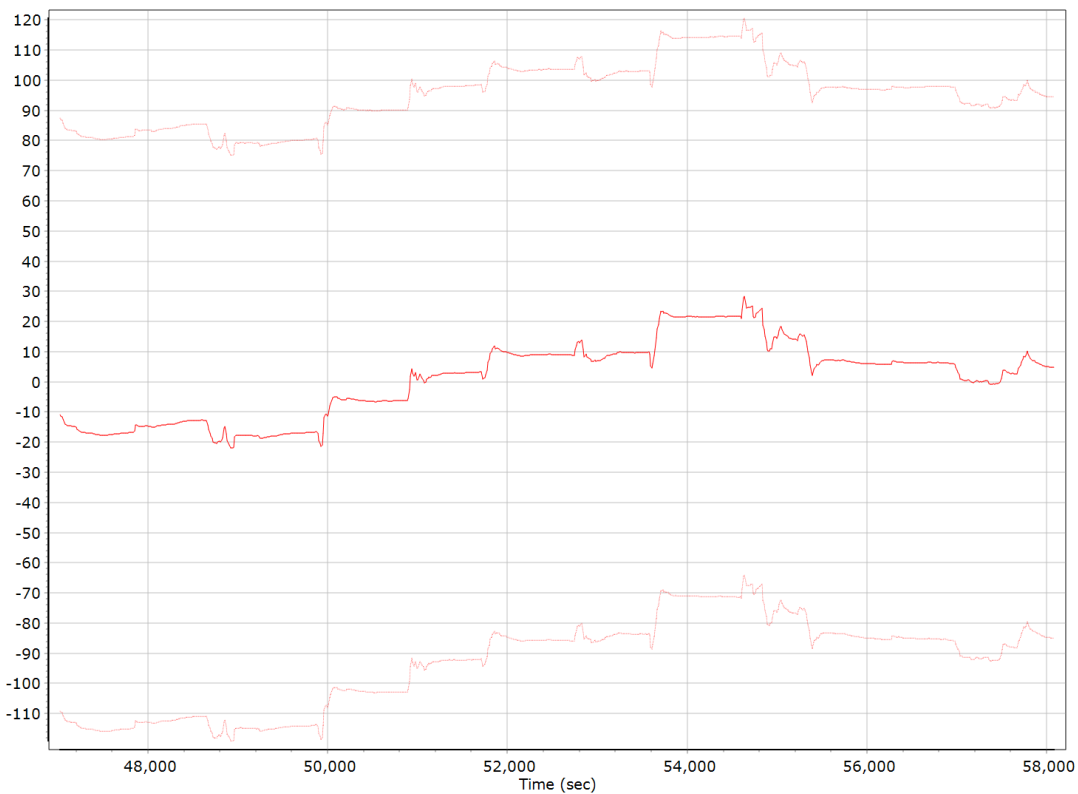
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

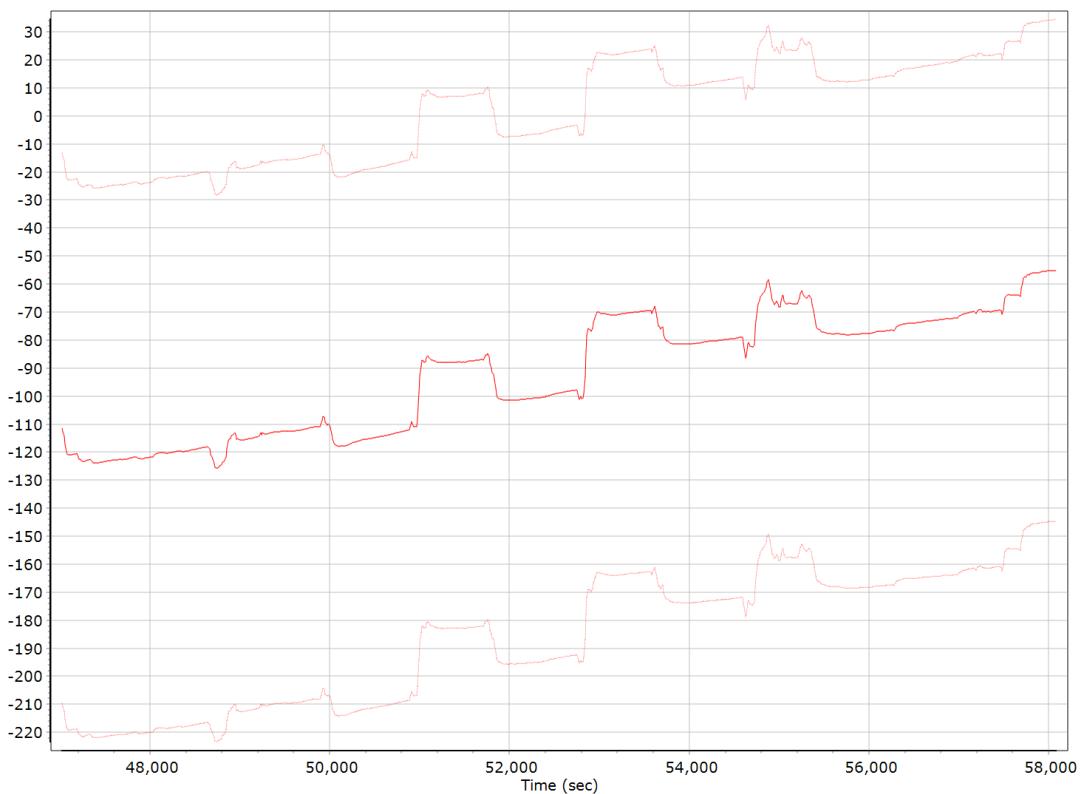
Accelerometer Bias (micro-g)



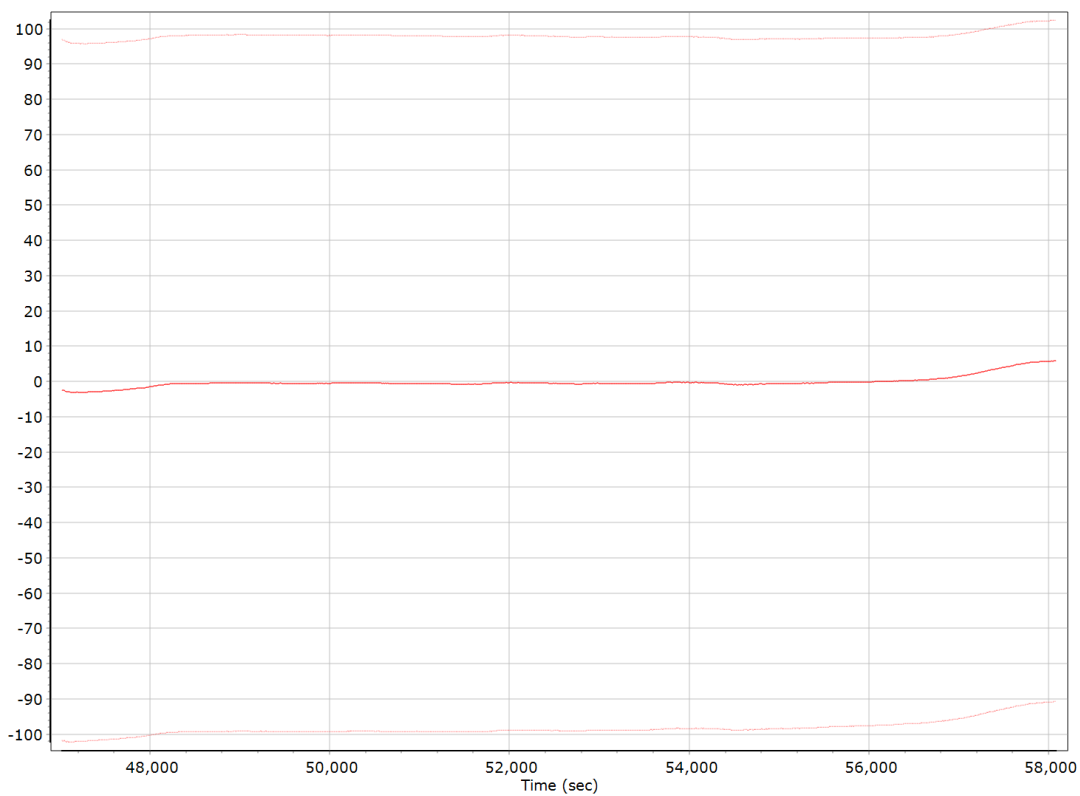
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



Accelerometer Scale Error (ppm)



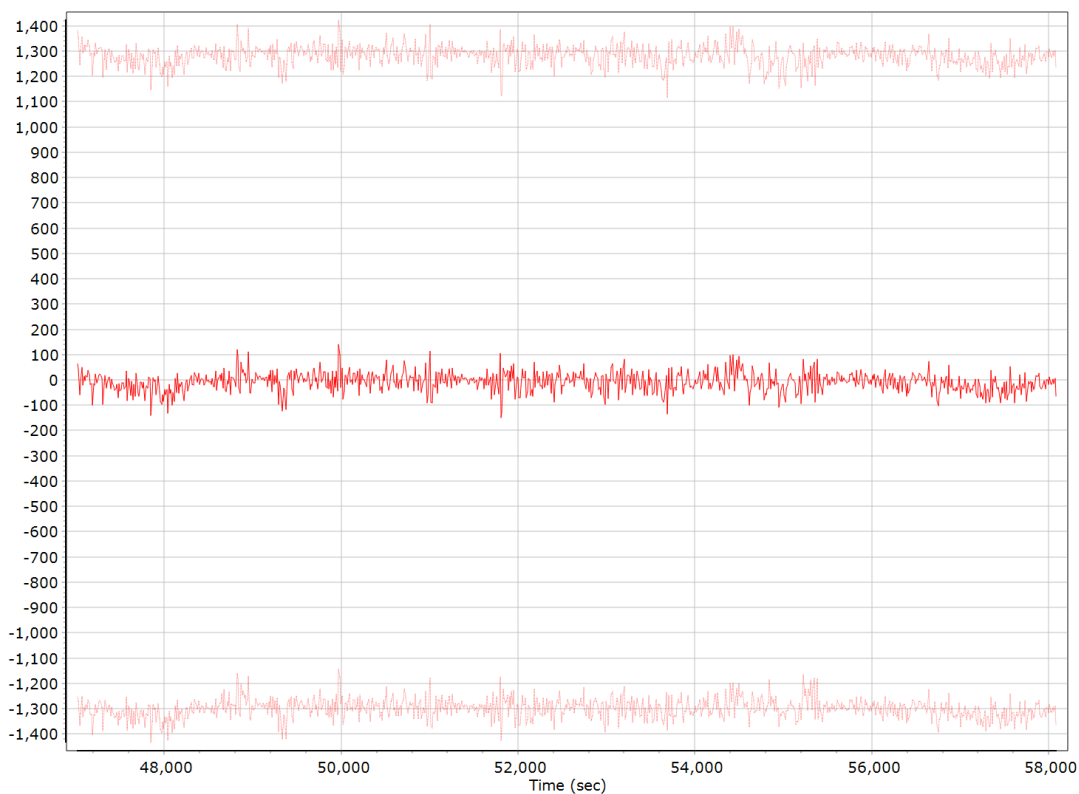
X Accelerometer Scale Error (ppm)



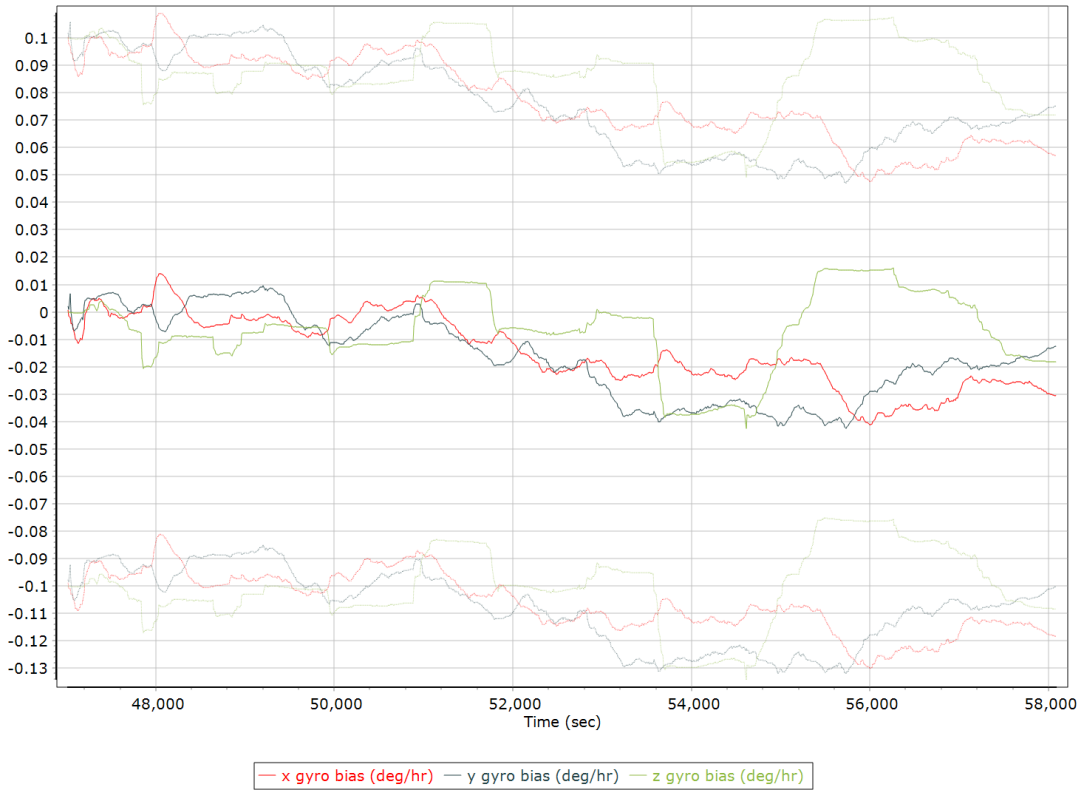
Y Accelerometer Scale Error (ppm)



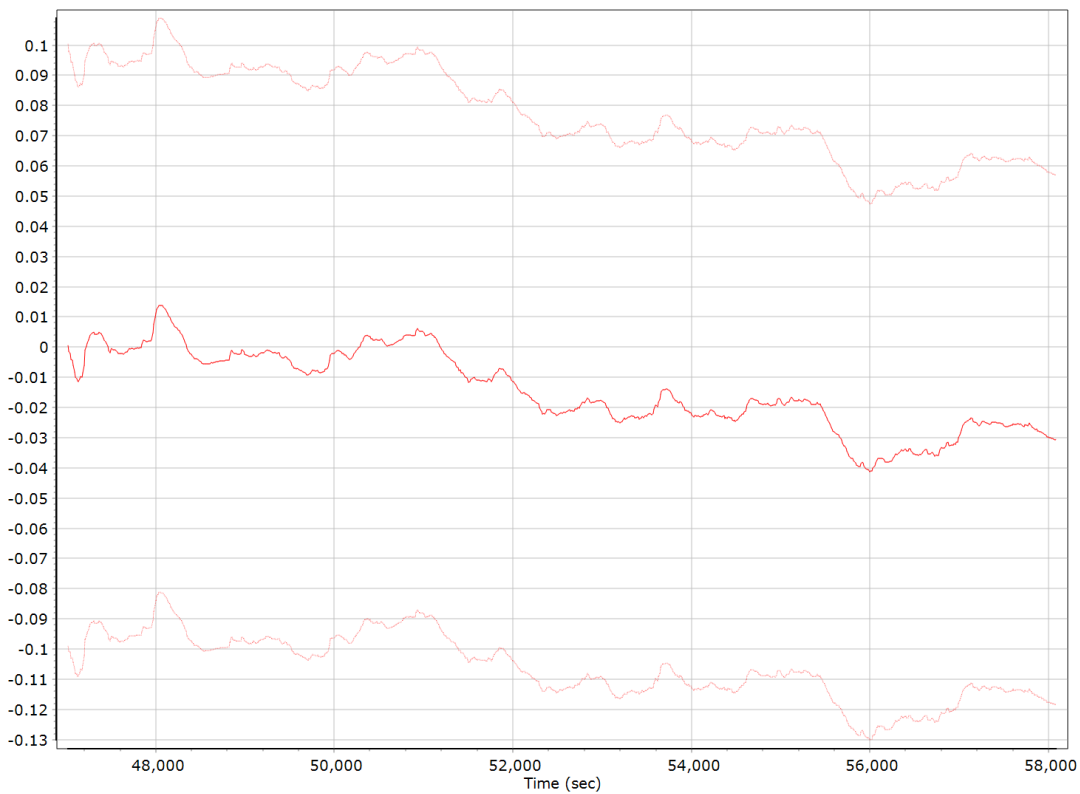
Z Accelerometer Scale Error (ppm)



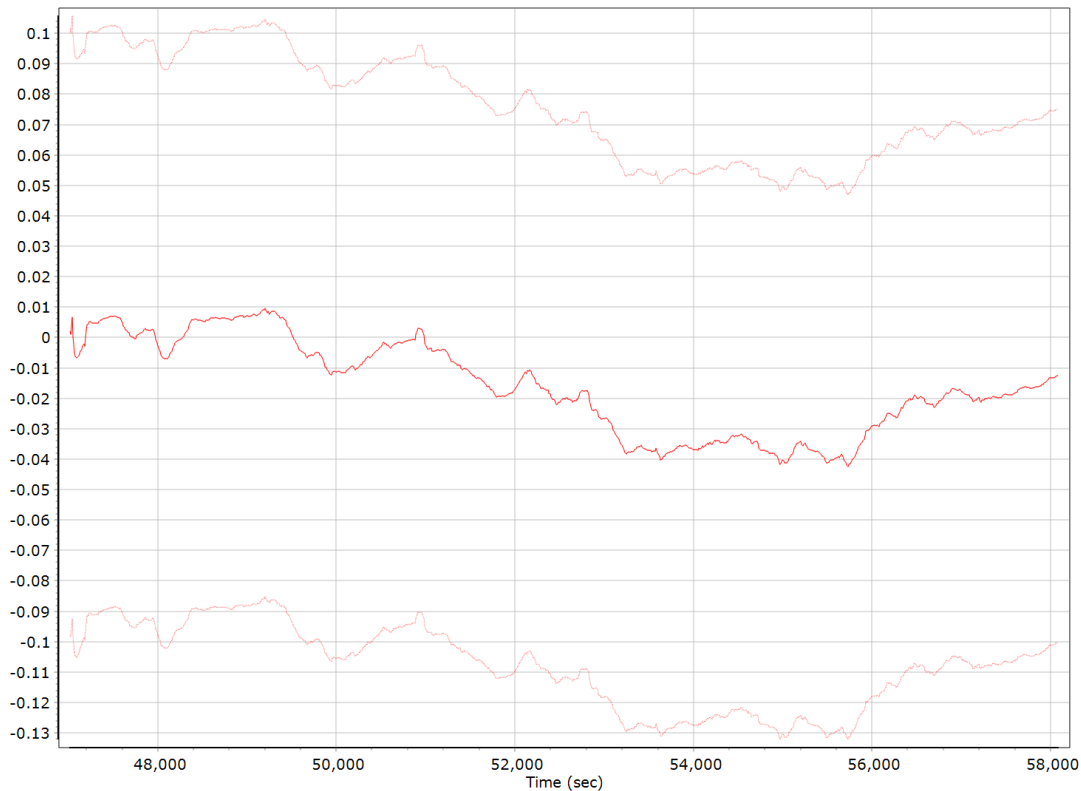
Gyro Bias (deg/h)



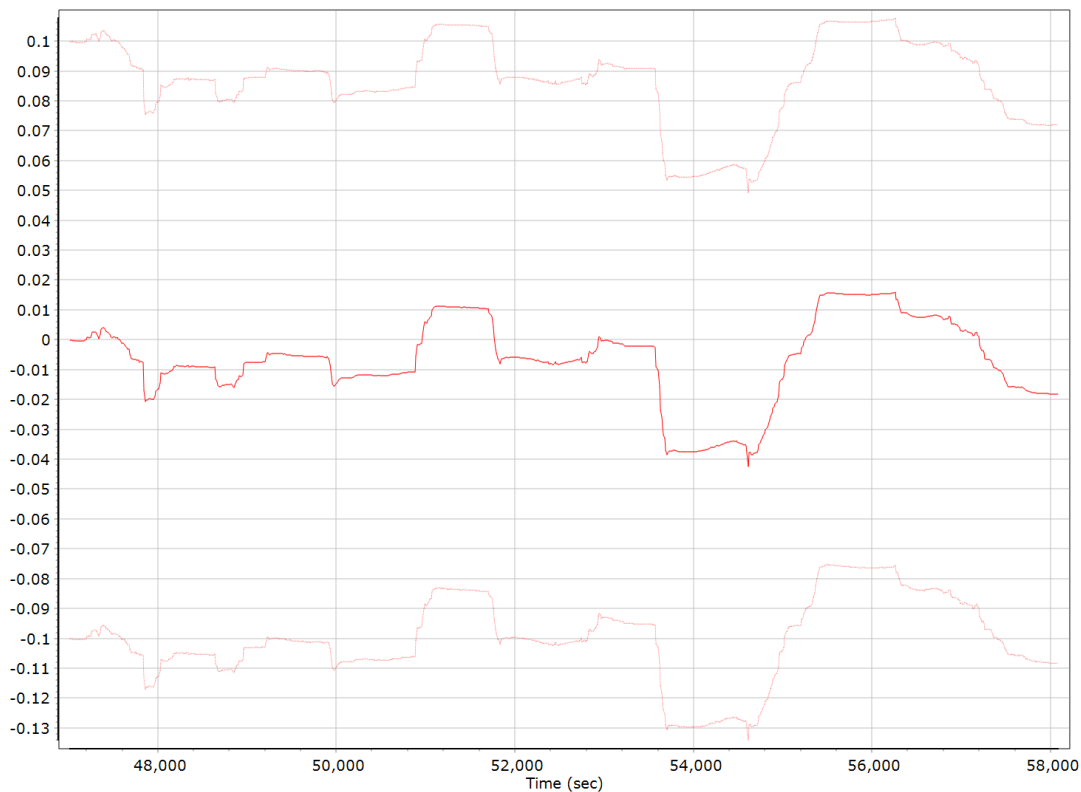
X Gyro Bias (deg/h)



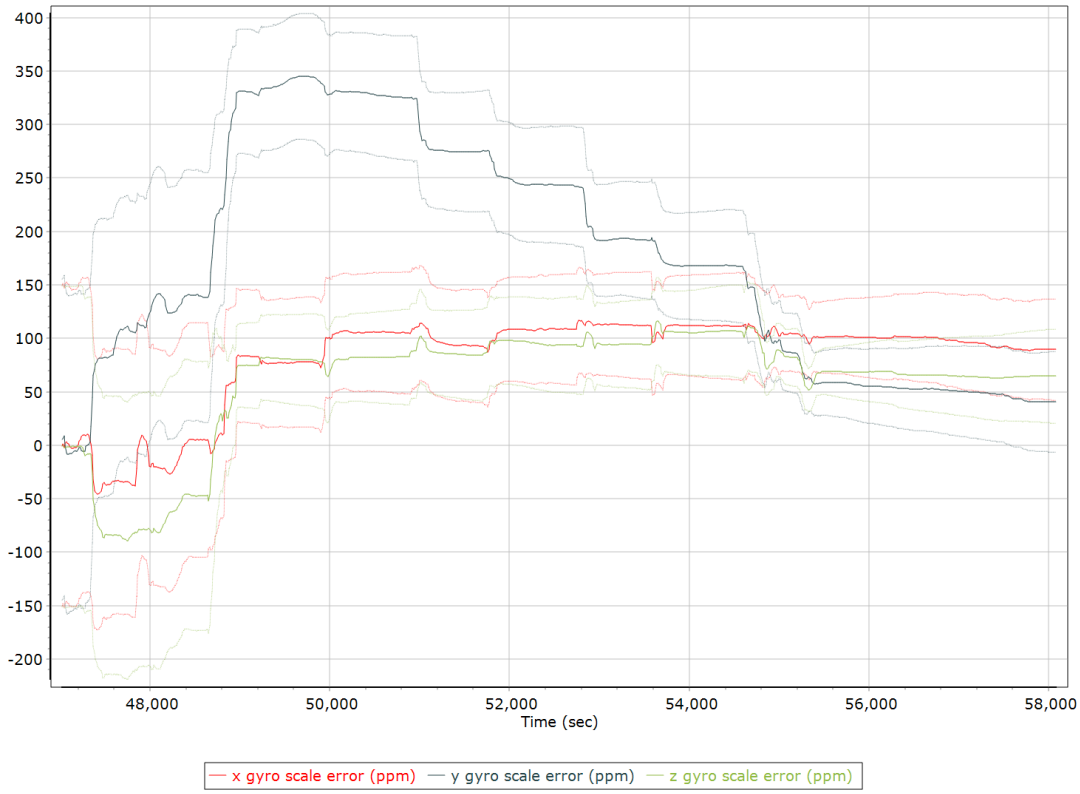
Y Gyro Bias (deg/h)



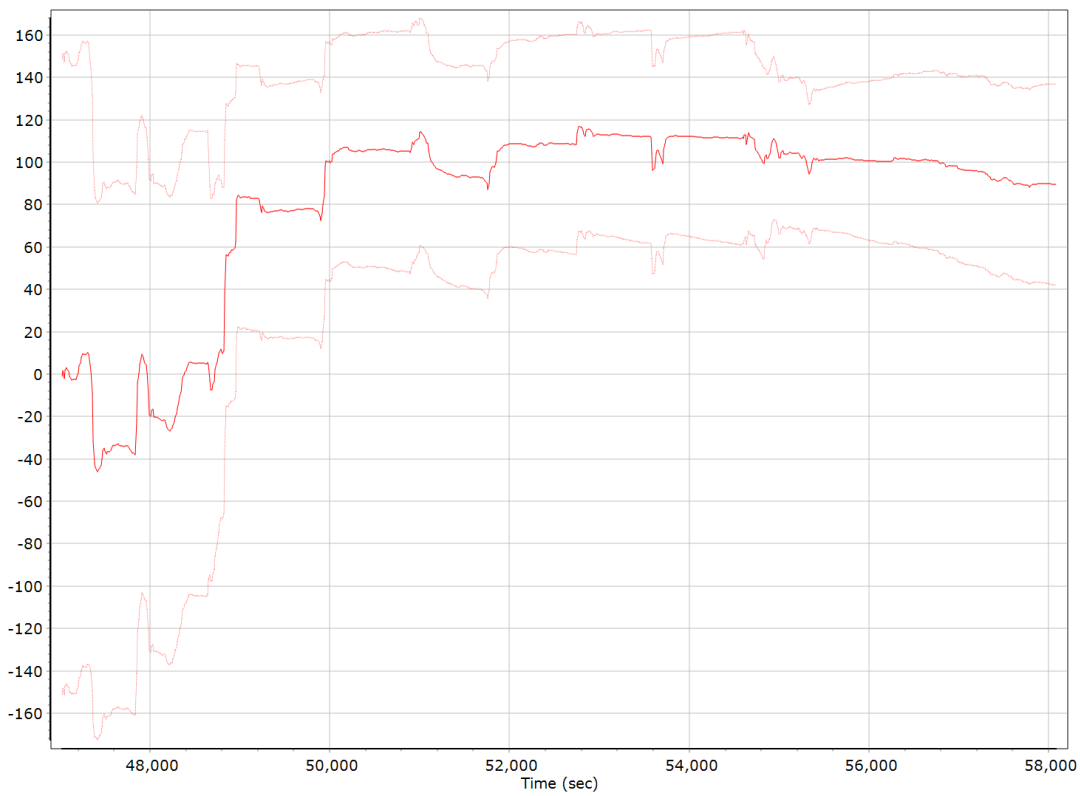
Z Gyro Bias (deg/h)



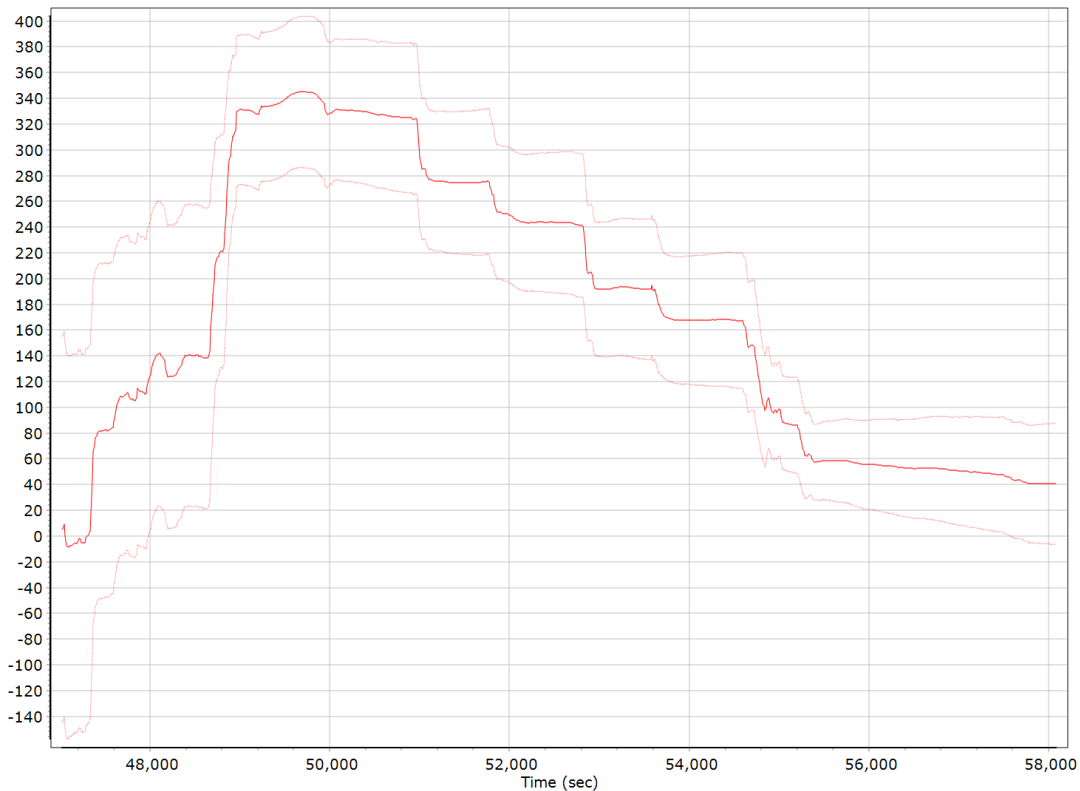
Gyro Scale Error (ppm)



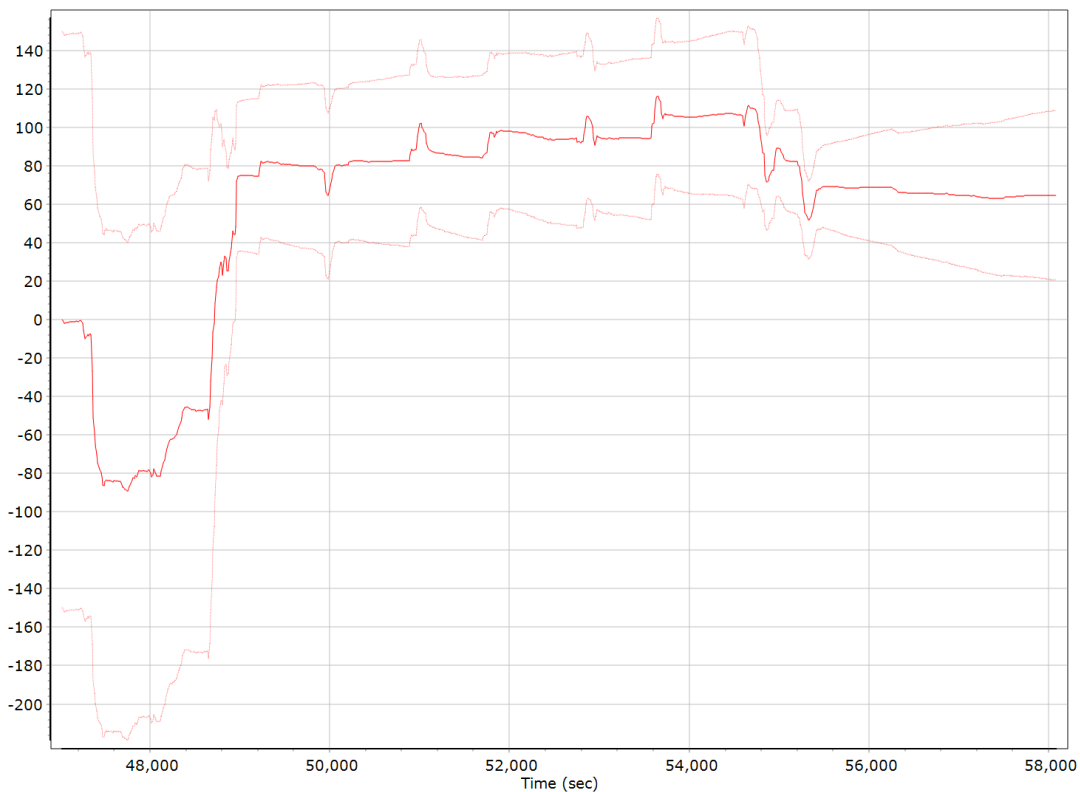
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

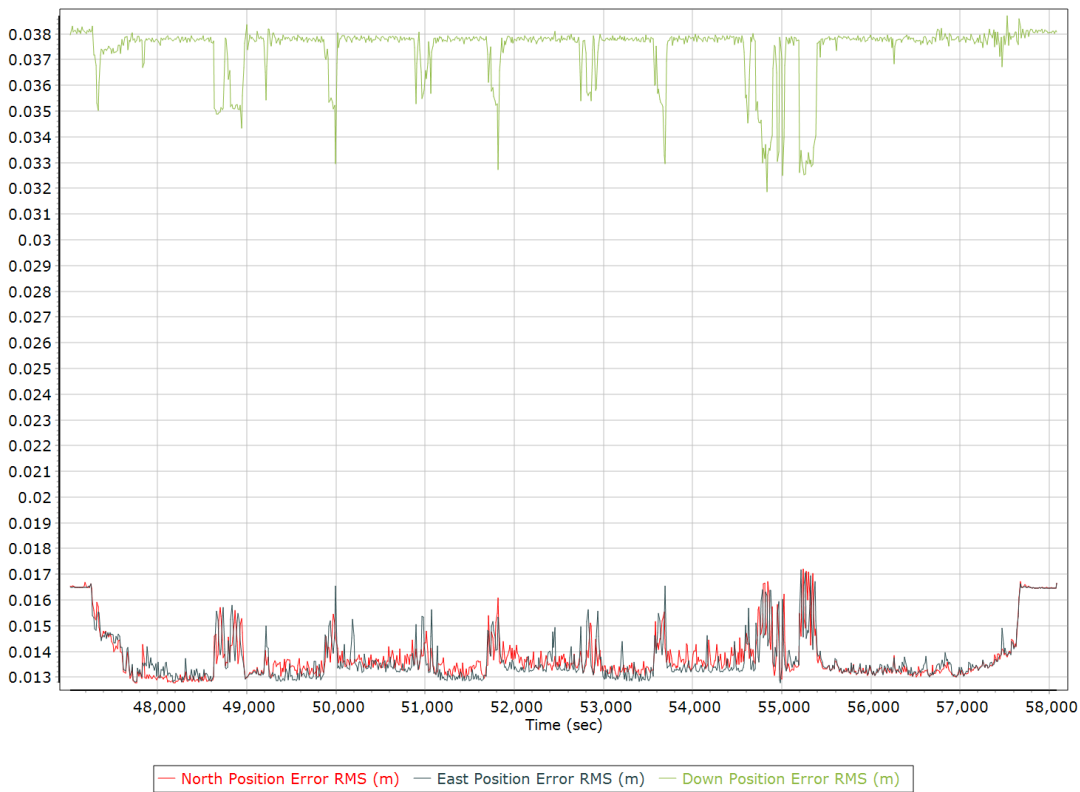


Z Gyro Scale Error (ppm)

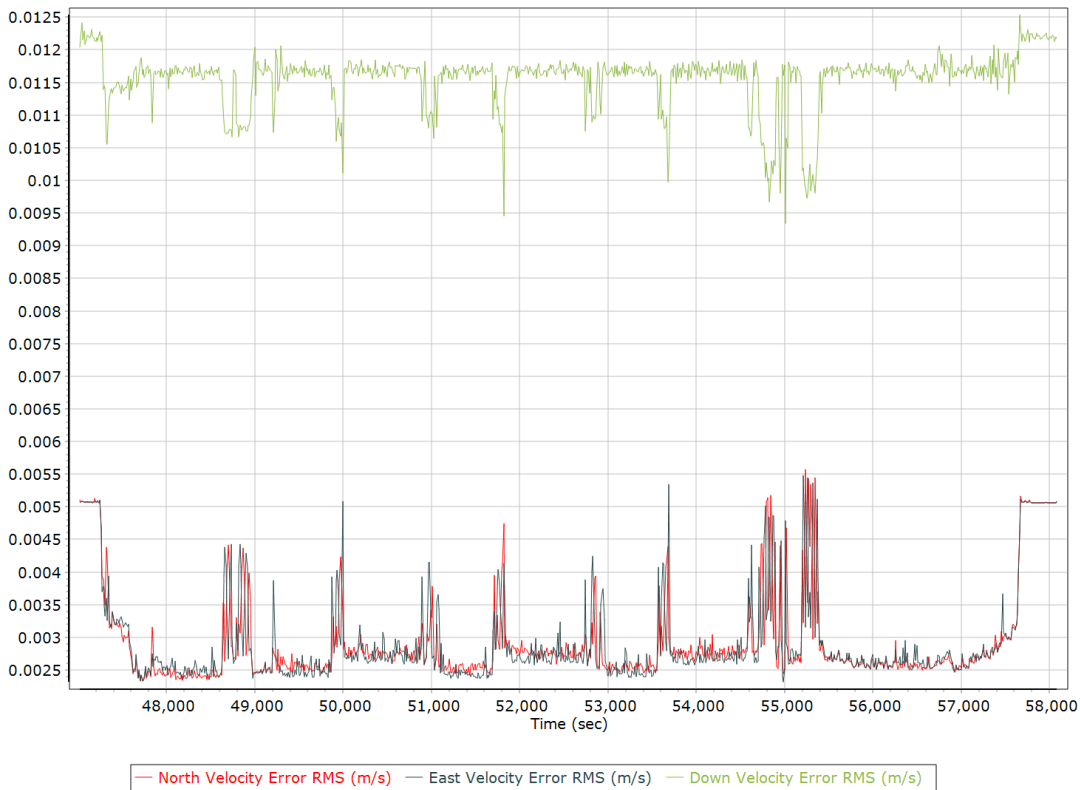


Smoothed Performance Metrics

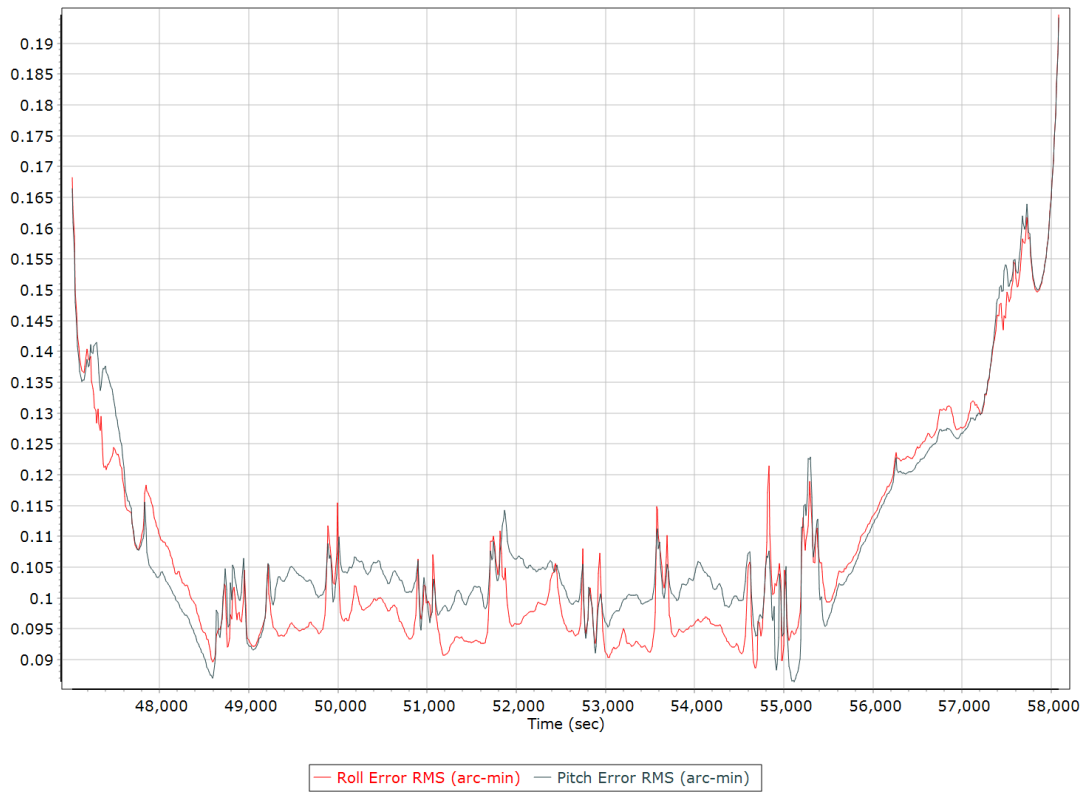
Position Error RMS (m)



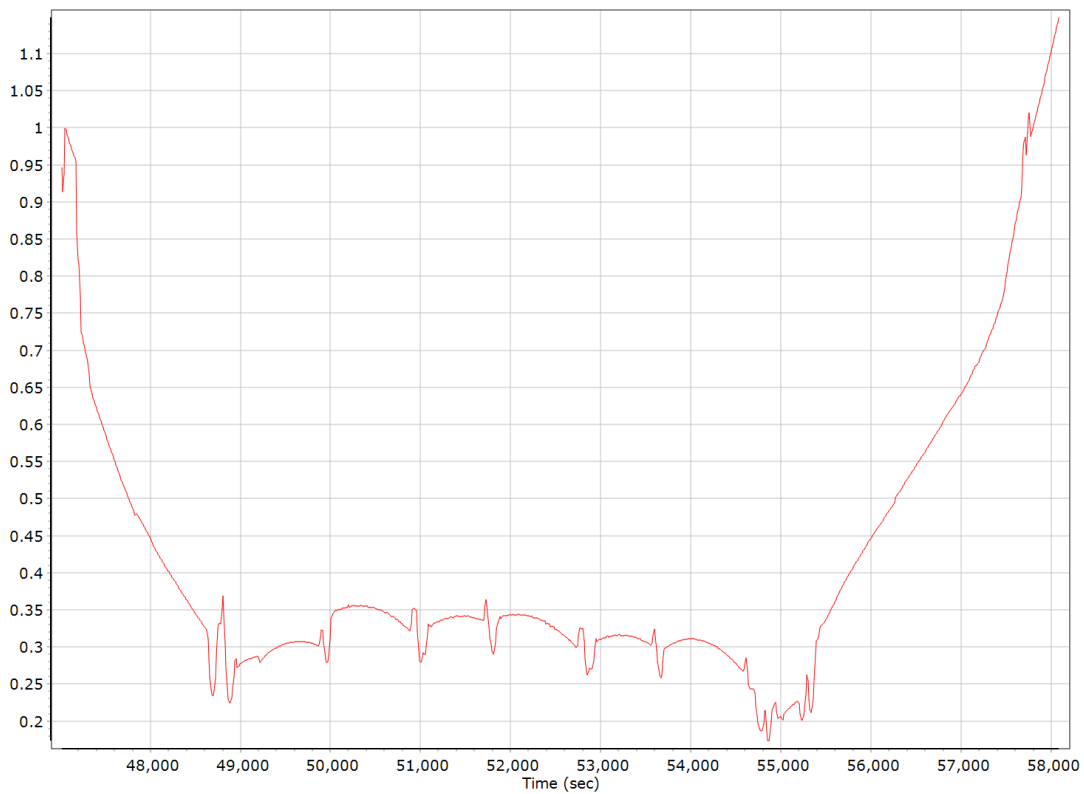
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

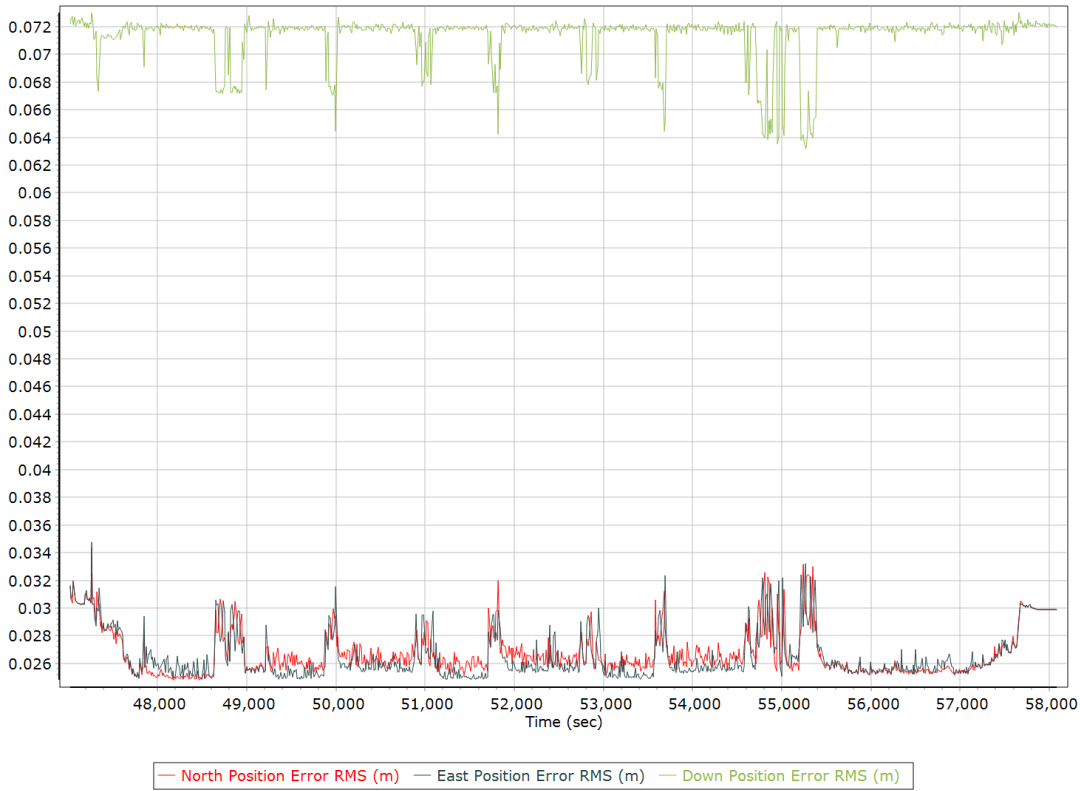


Heading Error RMS (arc-min)

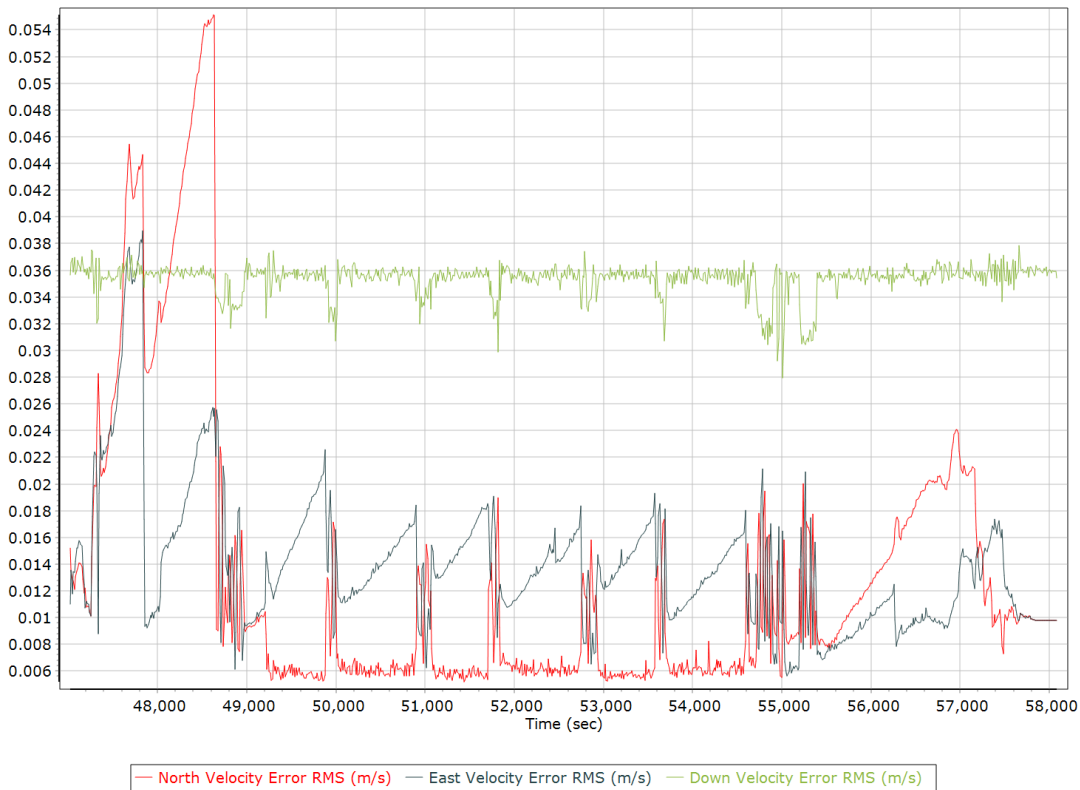


Forward Processed Performance Metrics

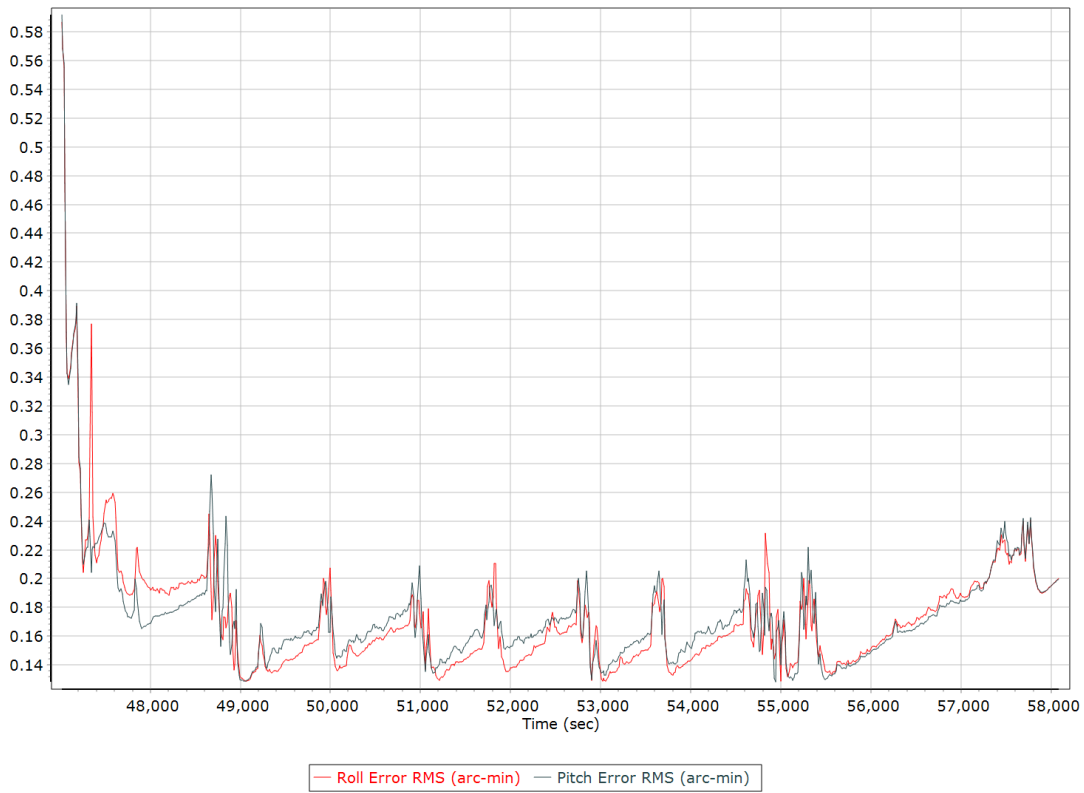
Position Error RMS (m)



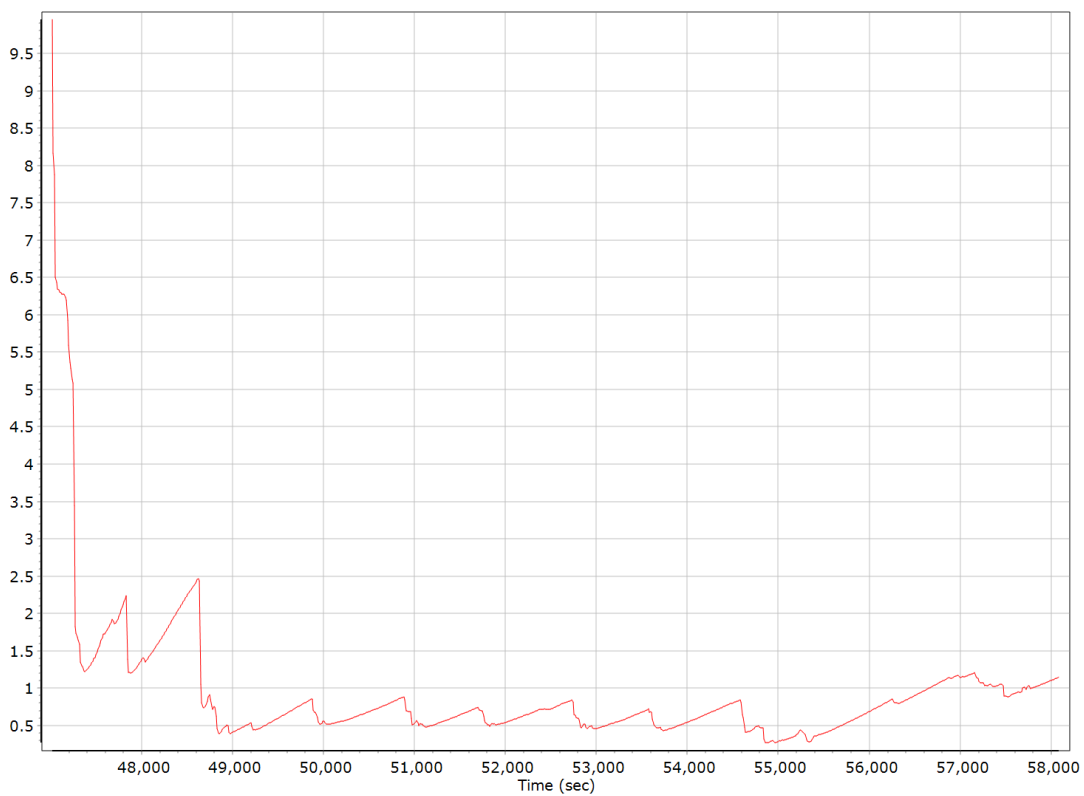
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

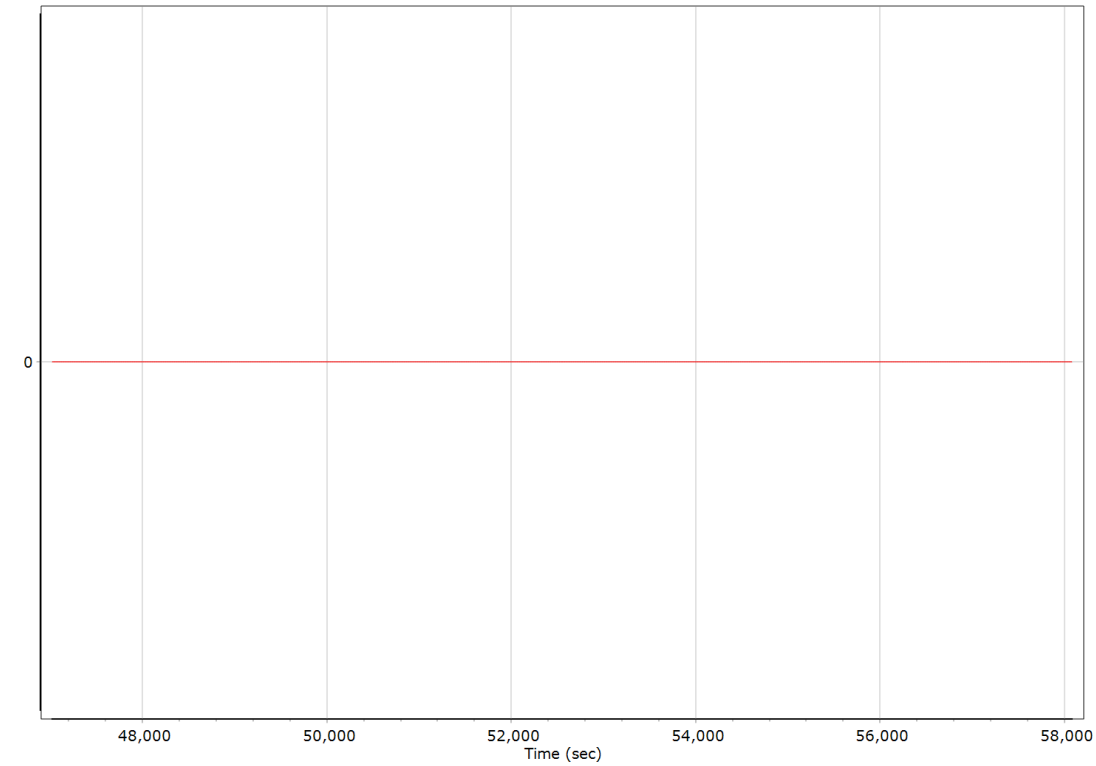


Heading Error RMS (arc-min)



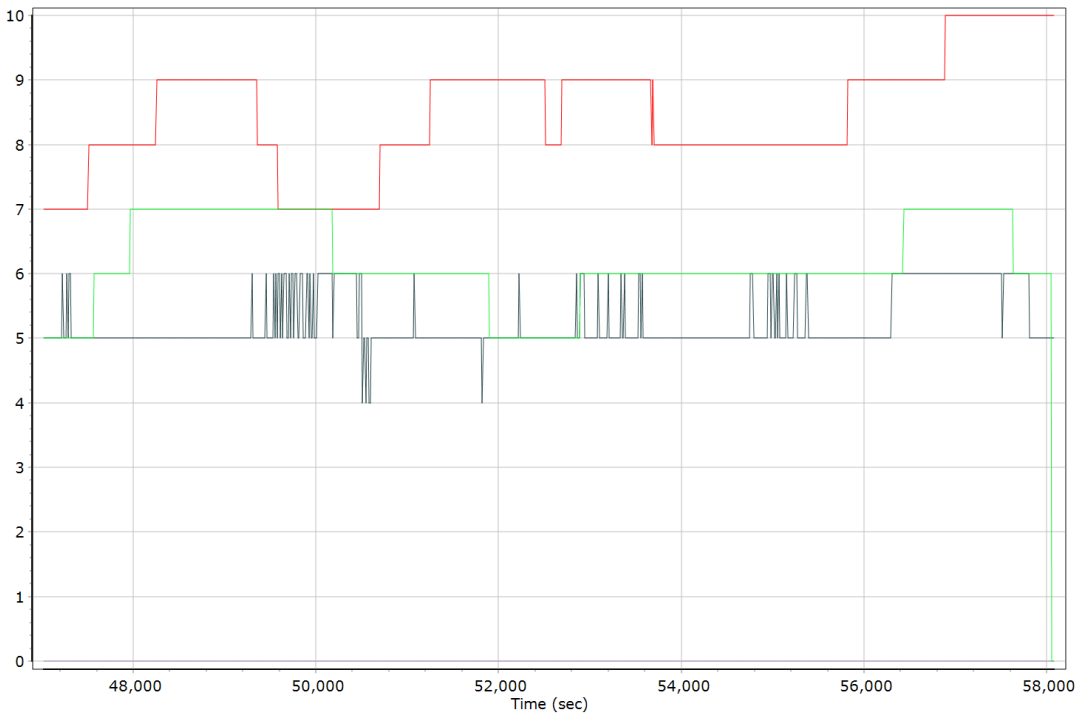
Forward Processed Solution Status

Processing Mode



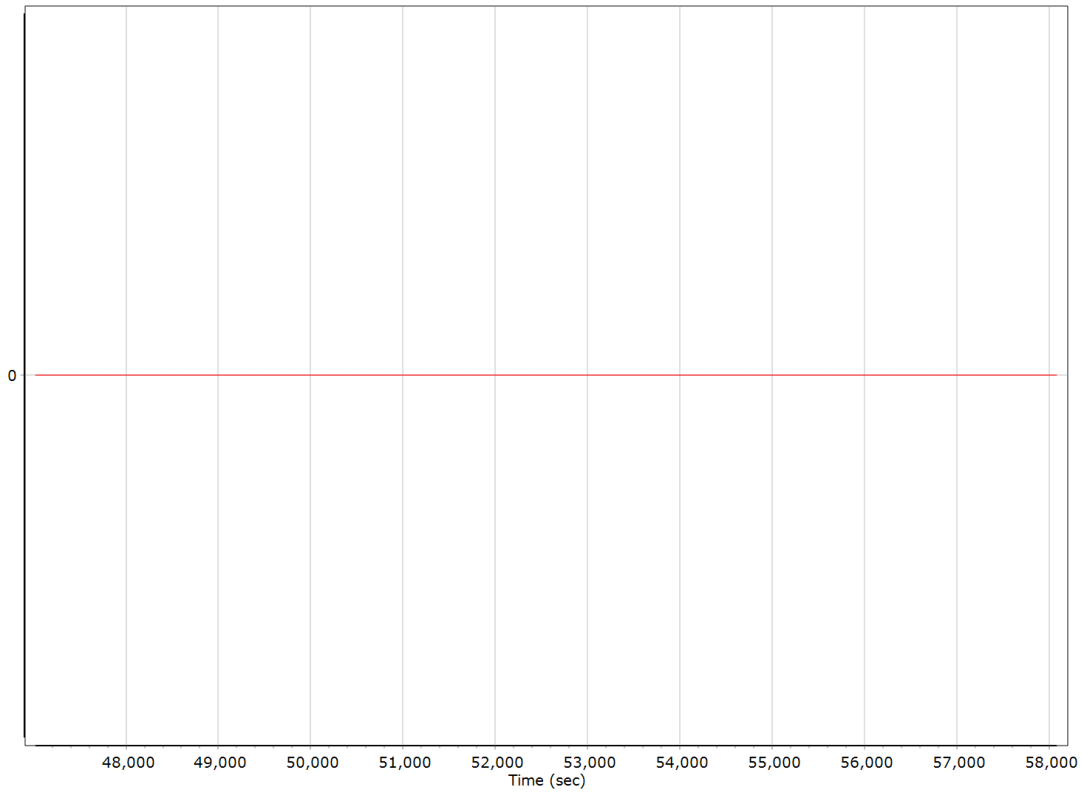
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites — Number of GLONASS Satellites — Number of QZSS Satellites
— Number of BEIDOU Satellites — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05142022A_3543
Processing date	2022-05-18 11:39:02
Mission date	2022-05-14 12:06:53
Mission duration	05:49:35.046
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9683
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
N62756178.005	POS Data
N62756178.006	POS Data
N62756178.007	POS Data
N62756178.008	POS Data
N62756178.009	POS Data
N62756178.010	POS Data
N62756178.011	POS Data
N62756178.012	POS Data
N62756178.013	POS Data
N62756178.014	POS Data
N62756178.015	POS Data
N62756178.016	POS Data
N62756178.017	POS Data
N62756178.018	POS Data
N62756178.019	POS Data
N62756178.020	POS Data
N62756178.021	POS Data
N62756178.022	POS Data
N62756178.023	POS Data
N62756178.024	POS Data
N62756178.025	POS Data
N62756178.026	POS Data
N62756178.027	POS Data
N62756178.028	POS Data
N62756178.029	POS Data
N62756178.030	POS Data
N62756178.031	POS Data
N62756178.032	POS Data
N62756178.033	POS Data
N62756178.034	POS Data
N62756178.035	POS Data
N62756178.036	POS Data
N62756178.037	POS Data
N62756178.038	POS Data
N62756178.039	POS Data
N62756178.040	POS Data
N62756178.041	POS Data
N62756178.042	POS Data
N62756178.043	POS Data
N62756178.044	POS Data
N62756178.045	POS Data
N62756178.046	POS Data
N62756178.047	POS Data
N62756178.048	POS Data
N62756178.049	POS Data
N62756178.050	POS Data
N62756178.051	POS Data
N62756178.052	POS Data
N62756178.053	POS Data
N62756178.054	POS Data
N62756178.055	POS Data
N62756178.056	POS Data
N62756178.057	POS Data
N62756178.058	POS Data
N62756178.059	POS Data
N62756178.060	POS Data
N62756178.061	POS Data
N62756178.062	POS Data
N62756178.063	POS Data

File name	File type
N62756178.064	POS Data
N62756178.065	POS Data
N62756178.066	POS Data
N62756178.067	POS Data
N62756178.068	POS Data
N62756178.069	POS Data

Input Files

File Name	File Type
Ephm1340.22g	GLONASS Broadcast Ephemeris
Ephm1340.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05142022A_3543.out	SBET Trajectory File

Rover Data Summary

First raw data file	N62756178.005		
Last raw data file	N62756178.069		
Start GPS week	2209		
Start time	561994.339 (5/14/2022 12:06:34 PM)		
End time	582969.385 (5/14/2022 5:56:09 PM)		
Start of fine alignment	562180.467 (5/14/2022 12:09:40 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	-0.034	-0.010	-0.374
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.717	-0.178	-1.265
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

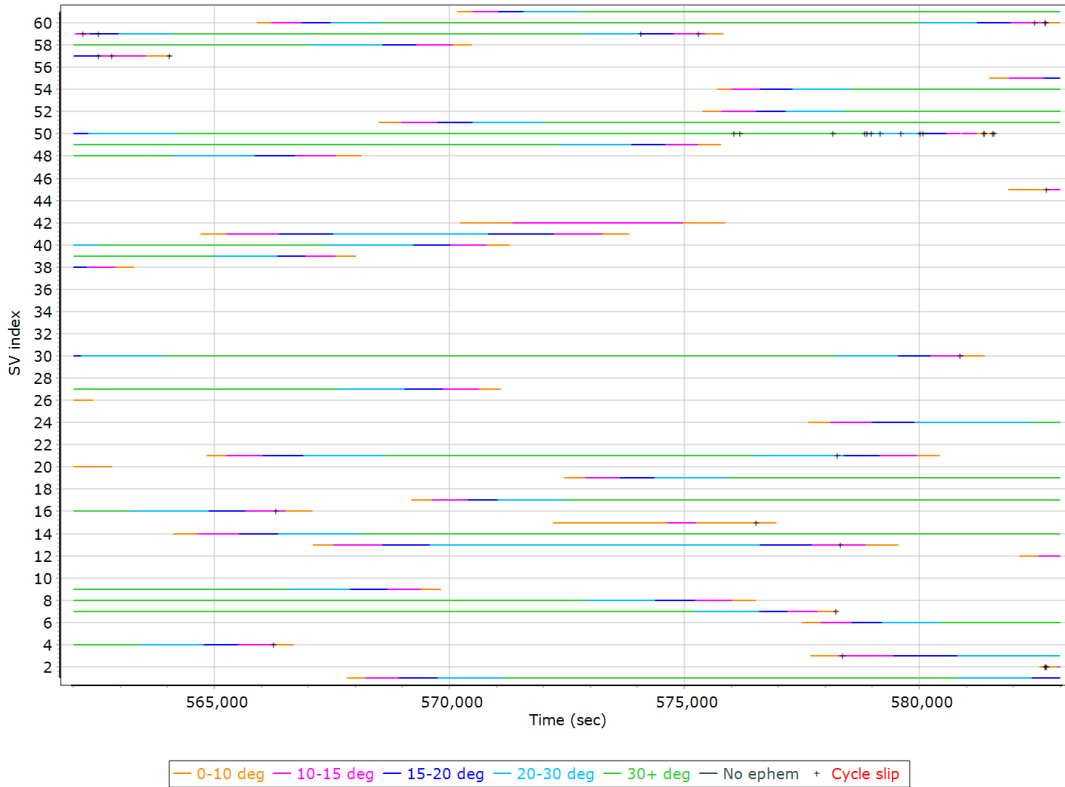
Rover Data QC

Raw IMU Import QC Summary

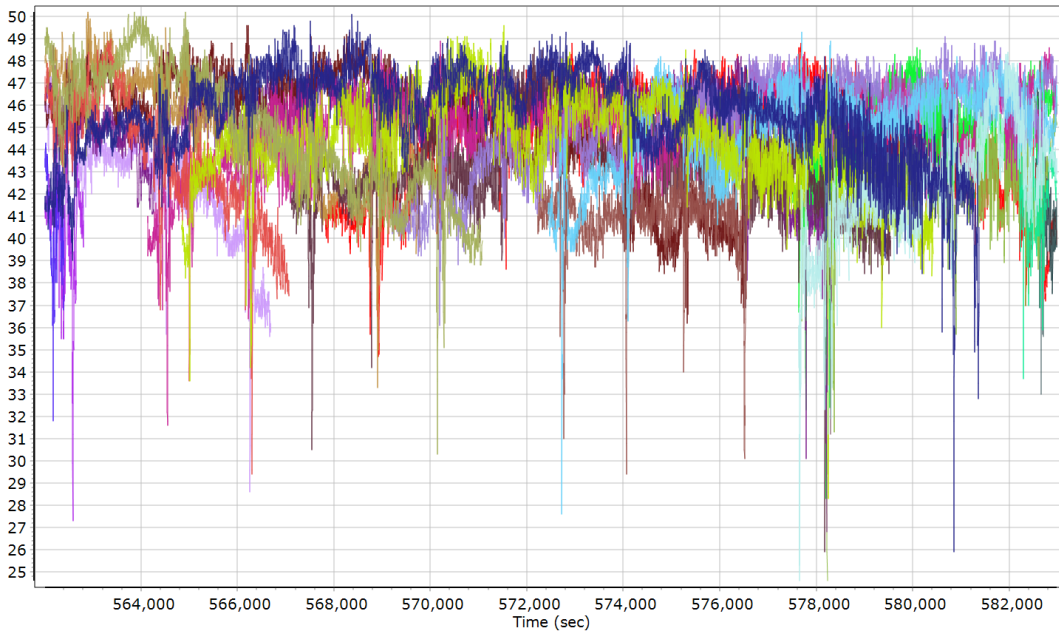
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05142022A_3543.log
IMU Records Processed	4194089
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

GPS/GLONASS L1 Satellite Lock/Elevation

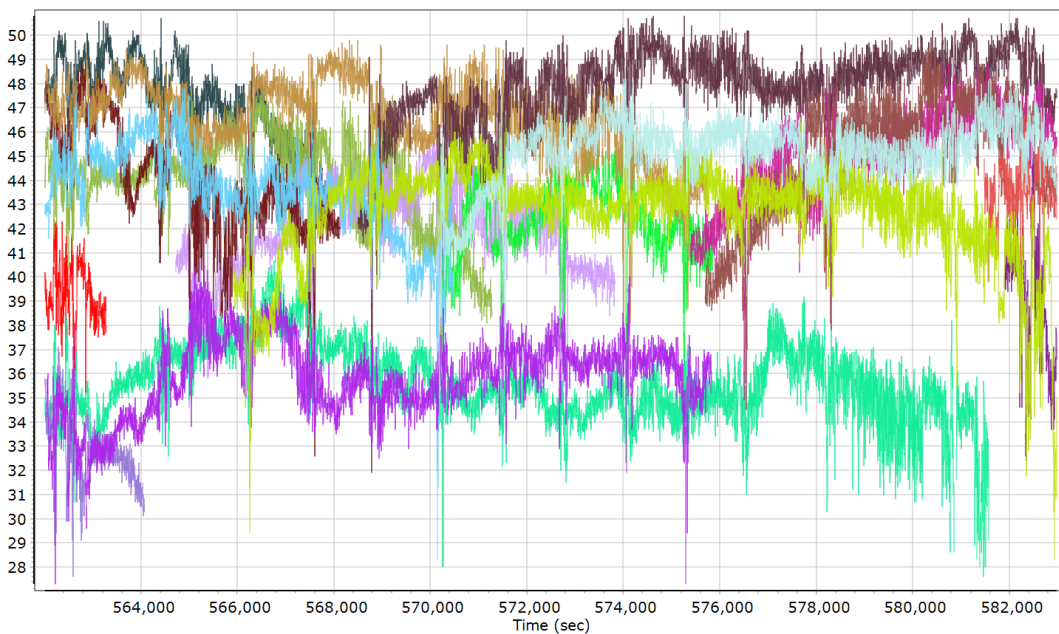


GPS L1 SNR



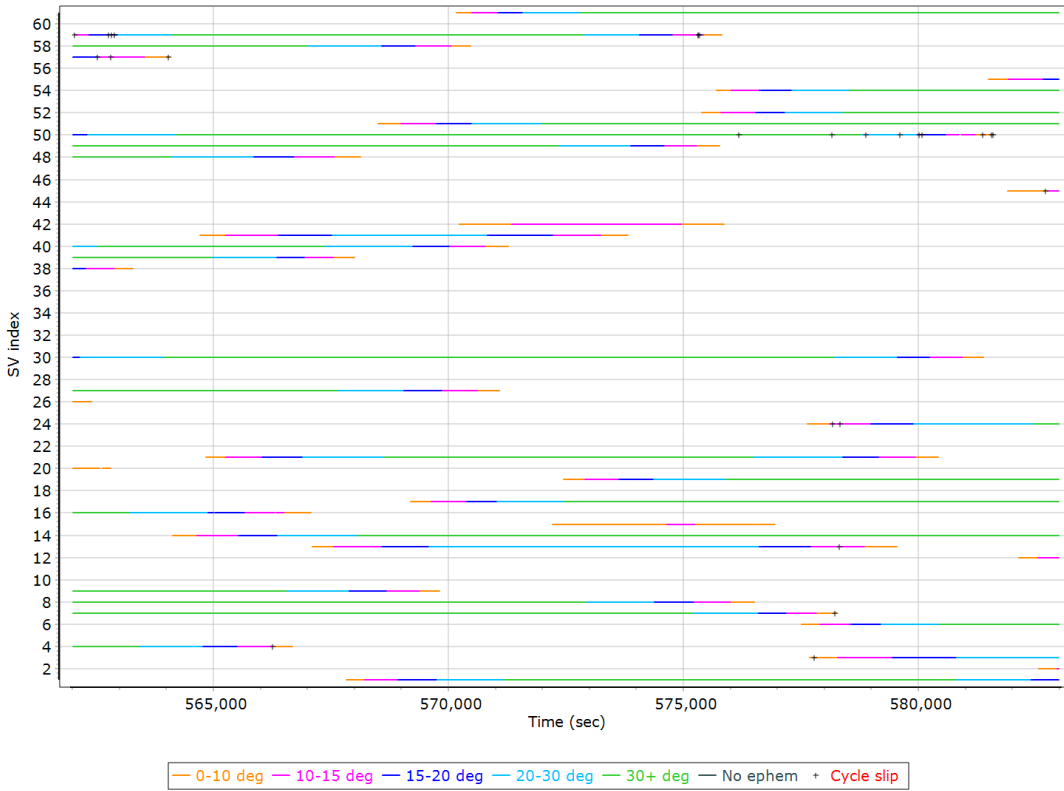
- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 SNR (dB/Hz) | GPS PRN 04 L1 SNR (dB/Hz) |
| GPS PRN 06 L1 SNR (dB/Hz) | GPS PRN 07 L1 SNR (dB/Hz) | GPS PRN 08 L1 SNR (dB/Hz) | GPS PRN 09 L1 SNR (dB/Hz) |
| GPS PRN 12 L1 SNR (dB/Hz) | GPS PRN 13 L1 SNR (dB/Hz) | GPS PRN 14 L1 SNR (dB/Hz) | GPS PRN 15 L1 SNR (dB/Hz) |
| GPS PRN 16 L1 SNR (dB/Hz) | GPS PRN 17 L1 SNR (dB/Hz) | GPS PRN 19 L1 SNR (dB/Hz) | GPS PRN 20 L1 SNR (dB/Hz) |
| GPS PRN 21 L1 SNR (dB/Hz) | GPS PRN 24 L1 SNR (dB/Hz) | GPS PRN 26 L1 SNR (dB/Hz) | GPS PRN 27 L1 SNR (dB/Hz) |
| GPS PRN 30 L1 SNR (dB/Hz) | | | |

GLONASS L1 SNR

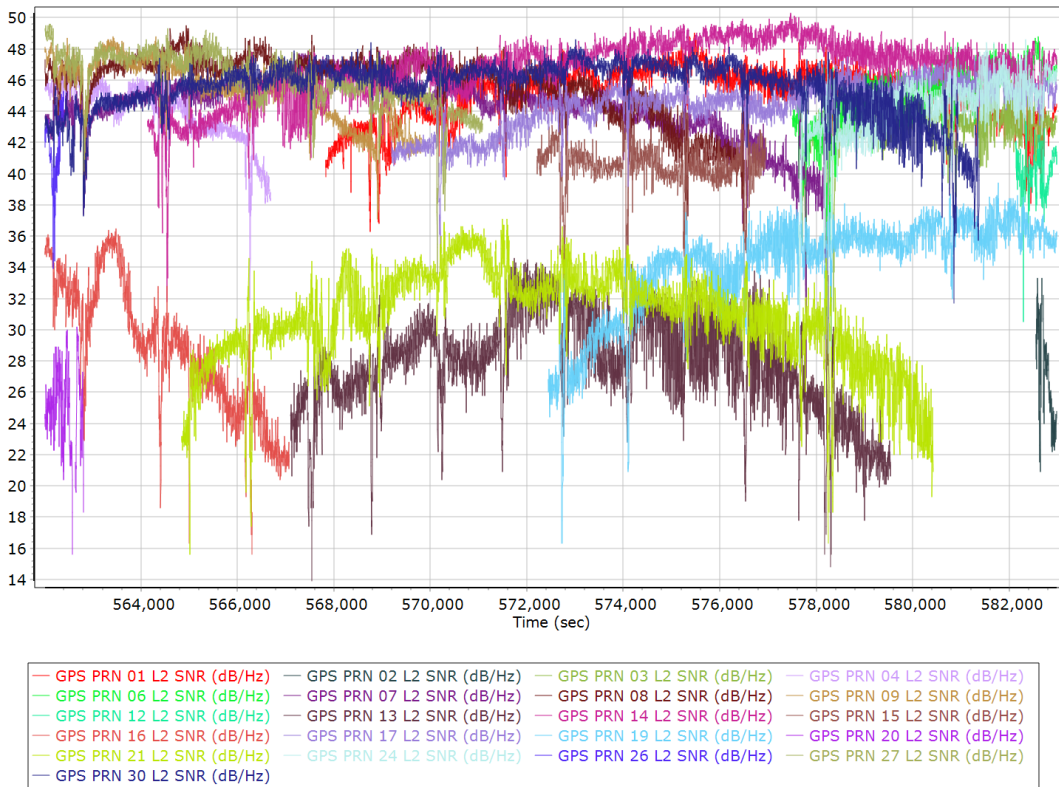


- | | | |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 05 L1 SNR (dB/Hz) | GLONASS 08 L1 SNR (dB/Hz) |
| GLONASS 11 L1 SNR (dB/Hz) | GLONASS 12 L1 SNR (dB/Hz) | GLONASS 13 L1 SNR (dB/Hz) |
| GLONASS 14 L1 SNR (dB/Hz) | GLONASS 15 L1 SNR (dB/Hz) | GLONASS 17 L1 SNR (dB/Hz) |
| GLONASS 18 L1 SNR (dB/Hz) | GLONASS 20 L1 SNR (dB/Hz) | GLONASS 21 L1 SNR (dB/Hz) |
| GLONASS 22 L1 SNR (dB/Hz) | GLONASS 23 L1 SNR (dB/Hz) | GLONASS 24 L1 SNR (dB/Hz) |

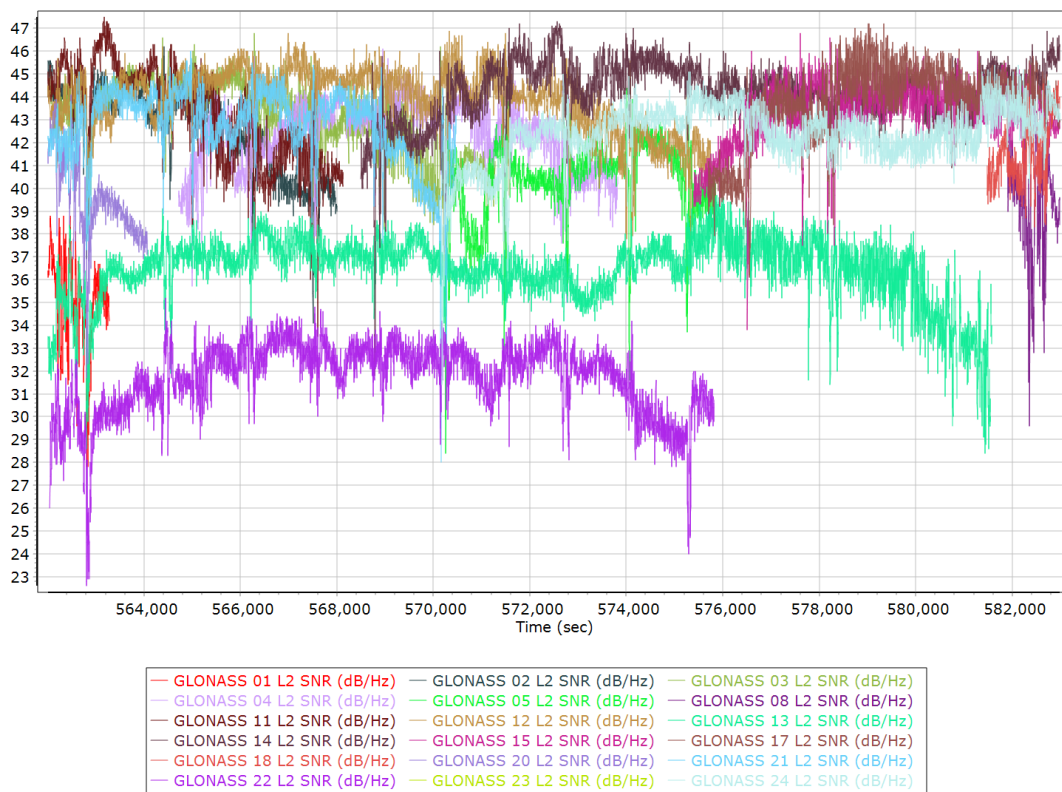
GPS/GLONASS L2 Satellite Lock/Elevation



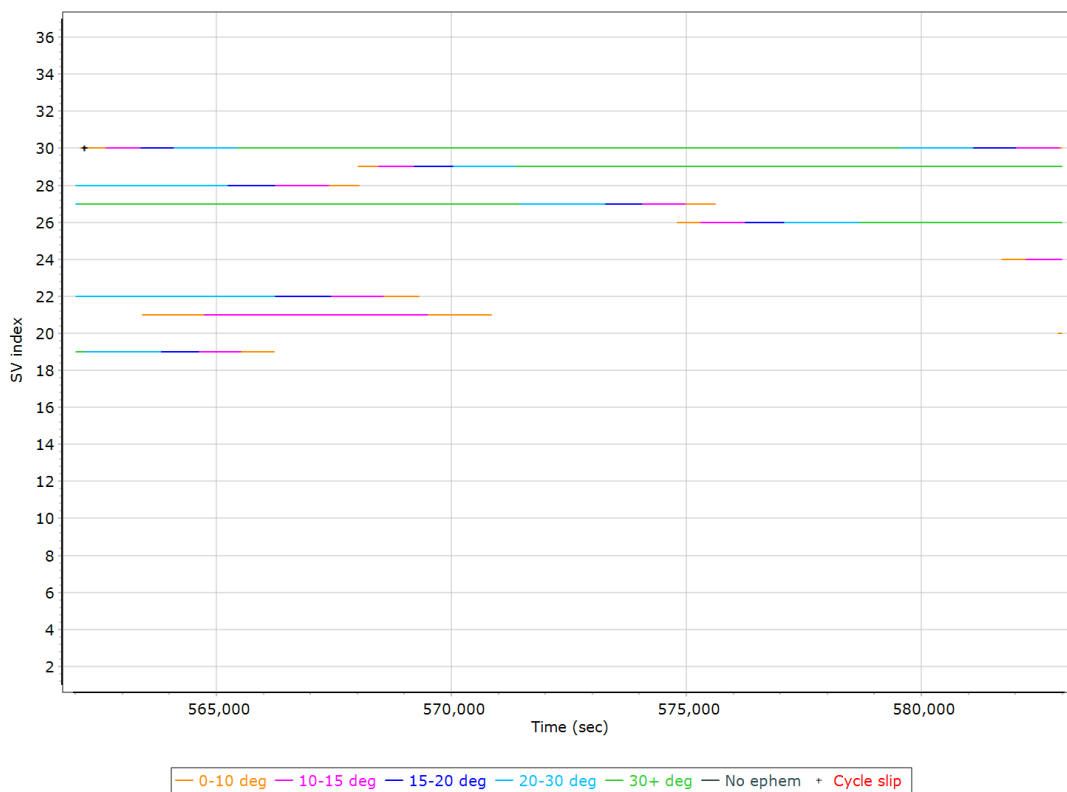
GPS L2 SNR



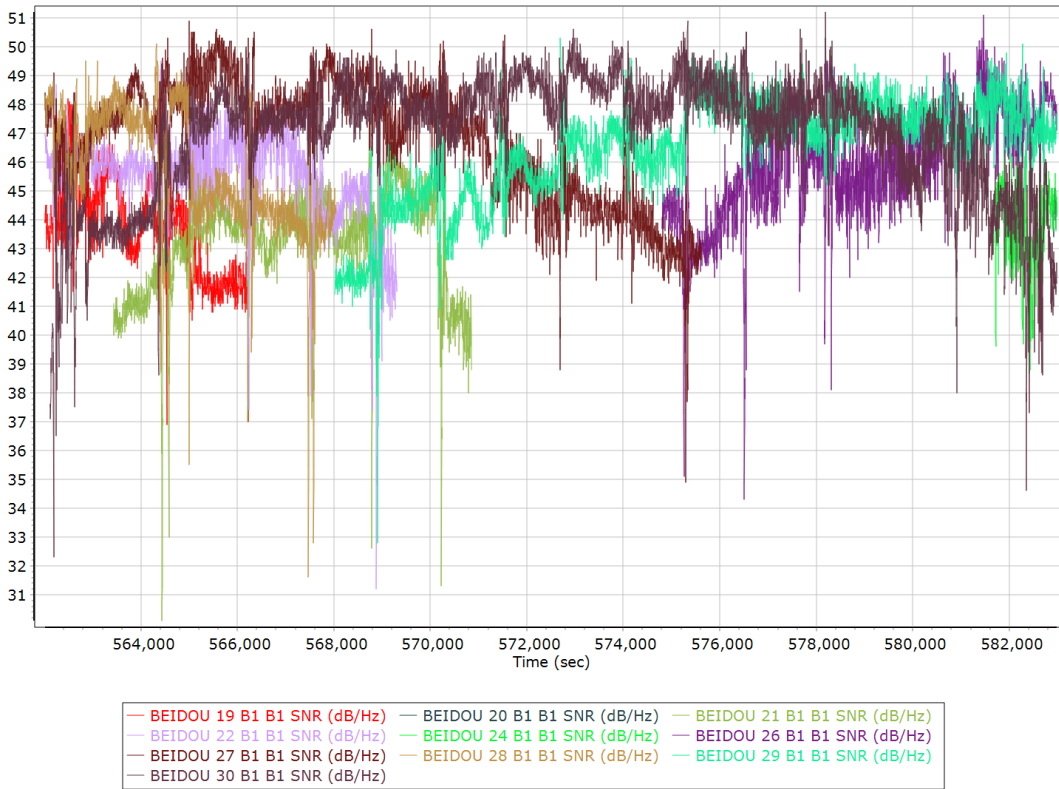
GLONASS L2 SNR



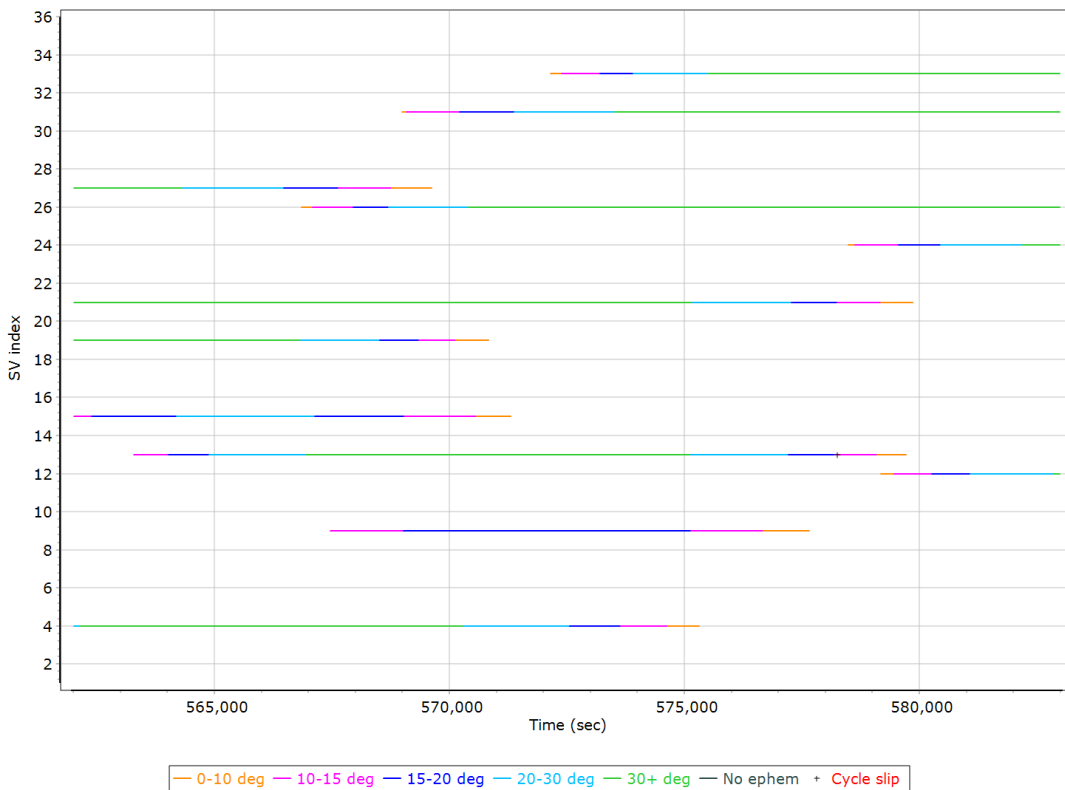
BEIDOU Satellite Lock/Elevation



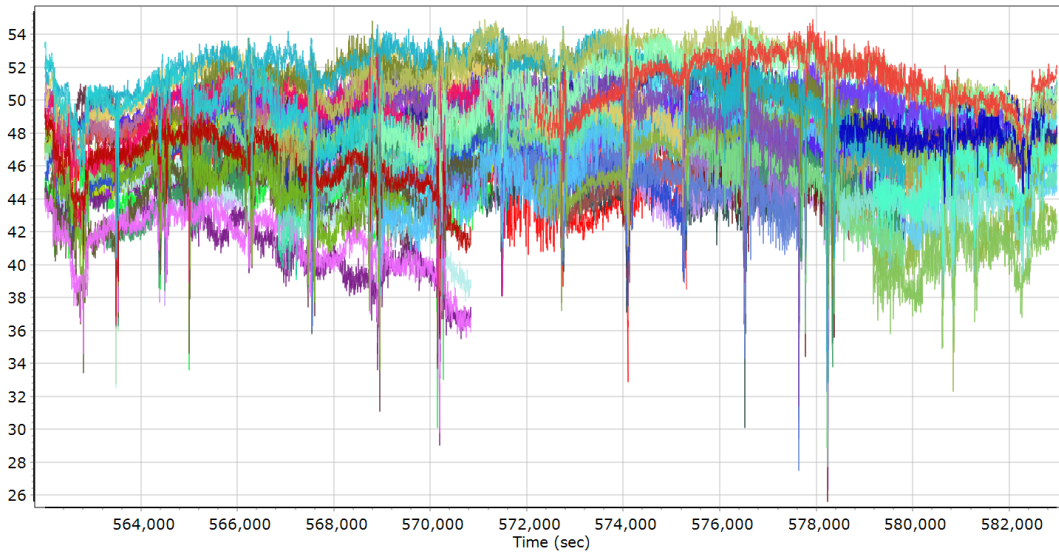
BEIDOU SNR



GALILEO Satellite Lock/Elevation



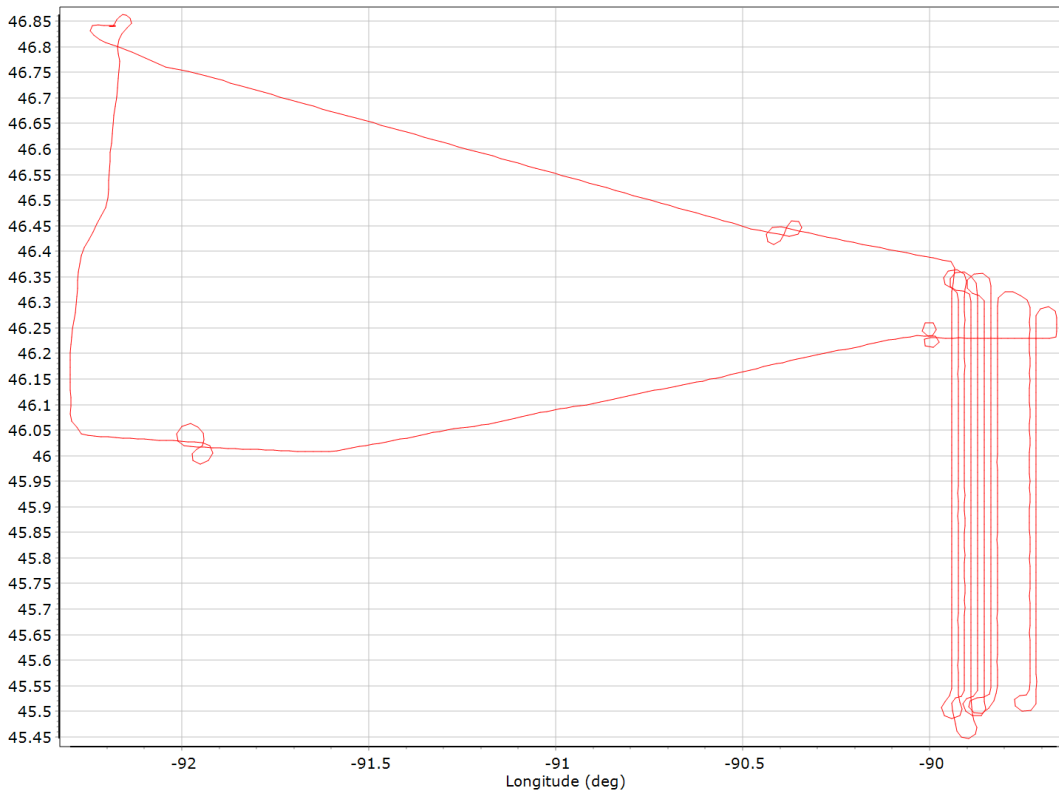
GALILEO SNR



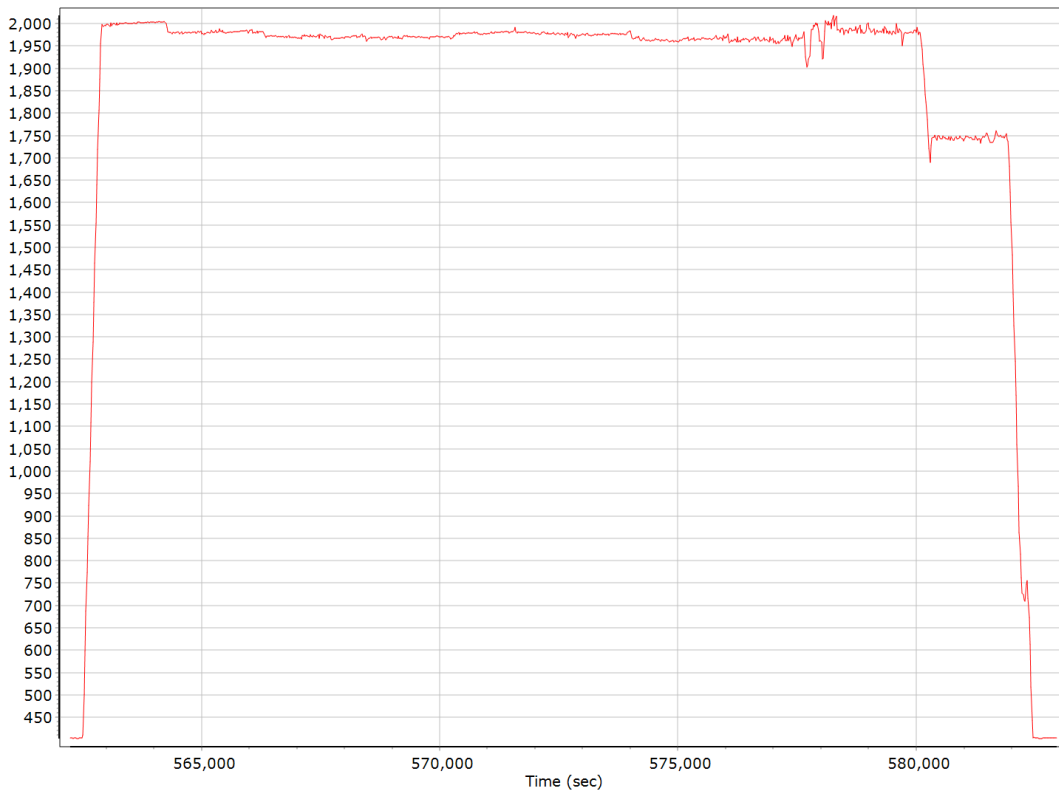
- | | |
|---|---|
| — GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 24 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 26 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 27 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 31 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 33 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 04 L5E5A BPSK10_PD SNR (dB/Hz) | — GALILEO 09 L5E5A BPSK10_PD SNR (dB/Hz) |
| — GALILEO 12 L5E5A BPSK10_PD SNR (dB/Hz) | — GALILEO 13 L5E5A BPSK10_PD SNR (dB/Hz) |
| — GALILEO 15 L5E5A BPSK10_PD SNR (dB/Hz) | — GALILEO 19 L5E5A BPSK10_PD SNR (dB/Hz) |
| — GALILEO 21 L5E5A BPSK10_PD SNR (dB/Hz) | — GALILEO 24 L5E5A BPSK10_PD SNR (dB/Hz) |

Smoothed Trajectory Information

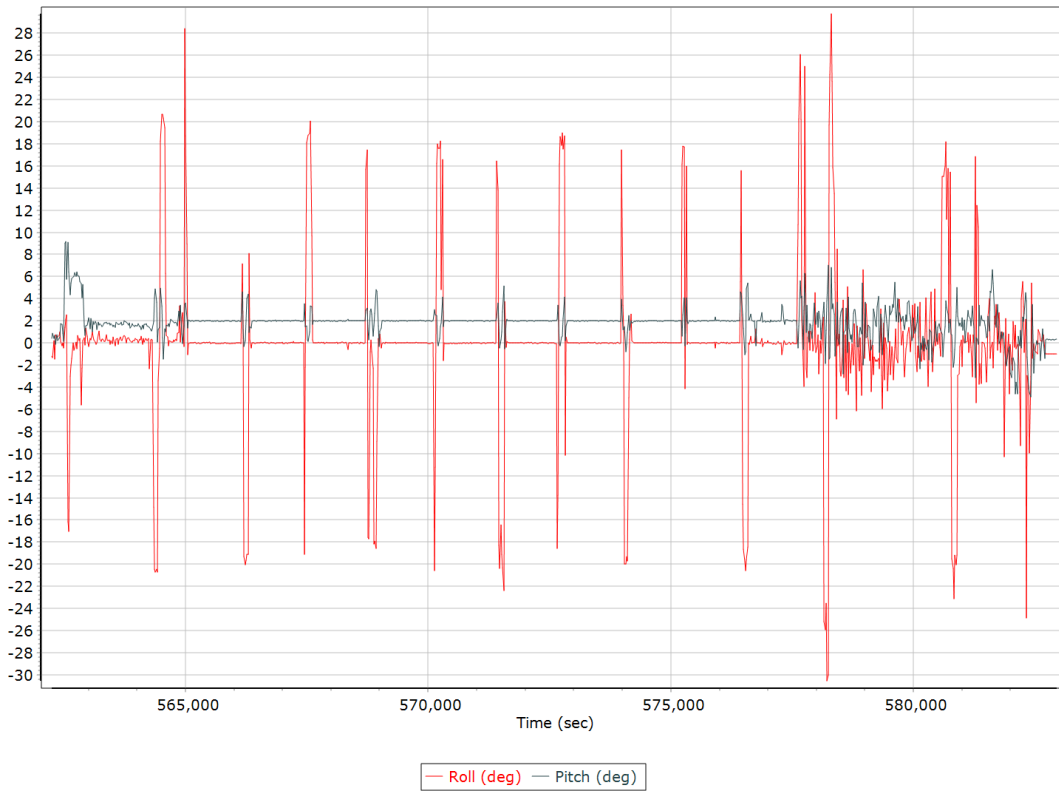
Top View



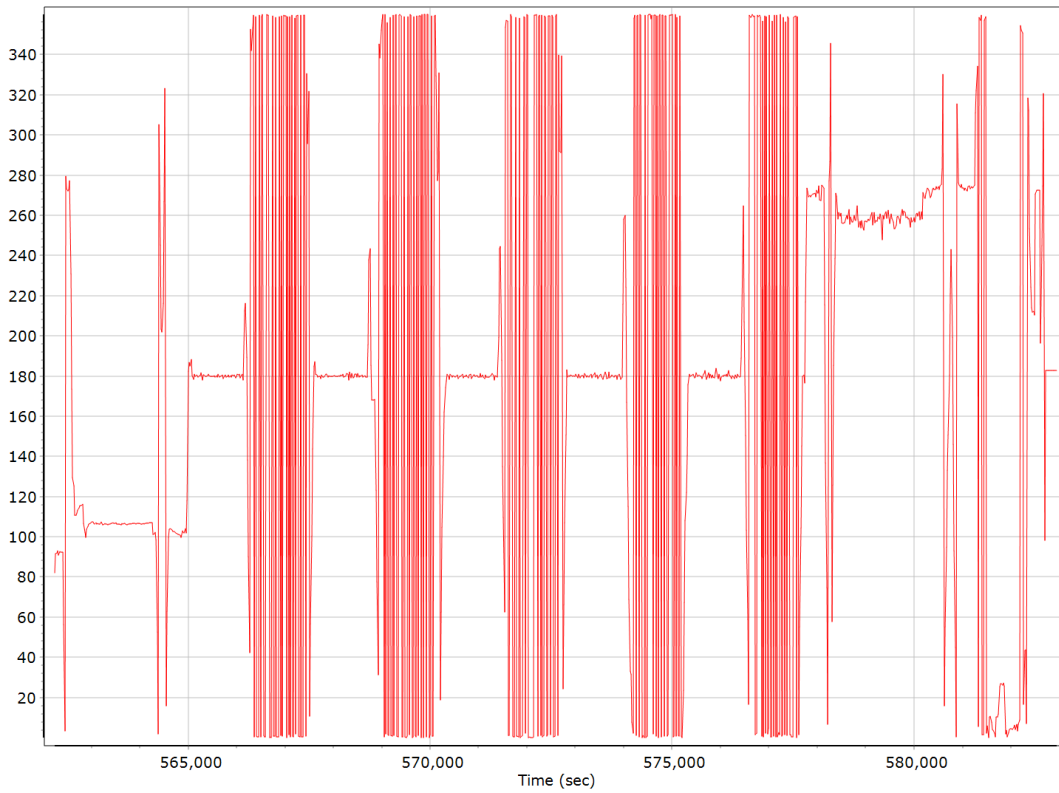
Altitude



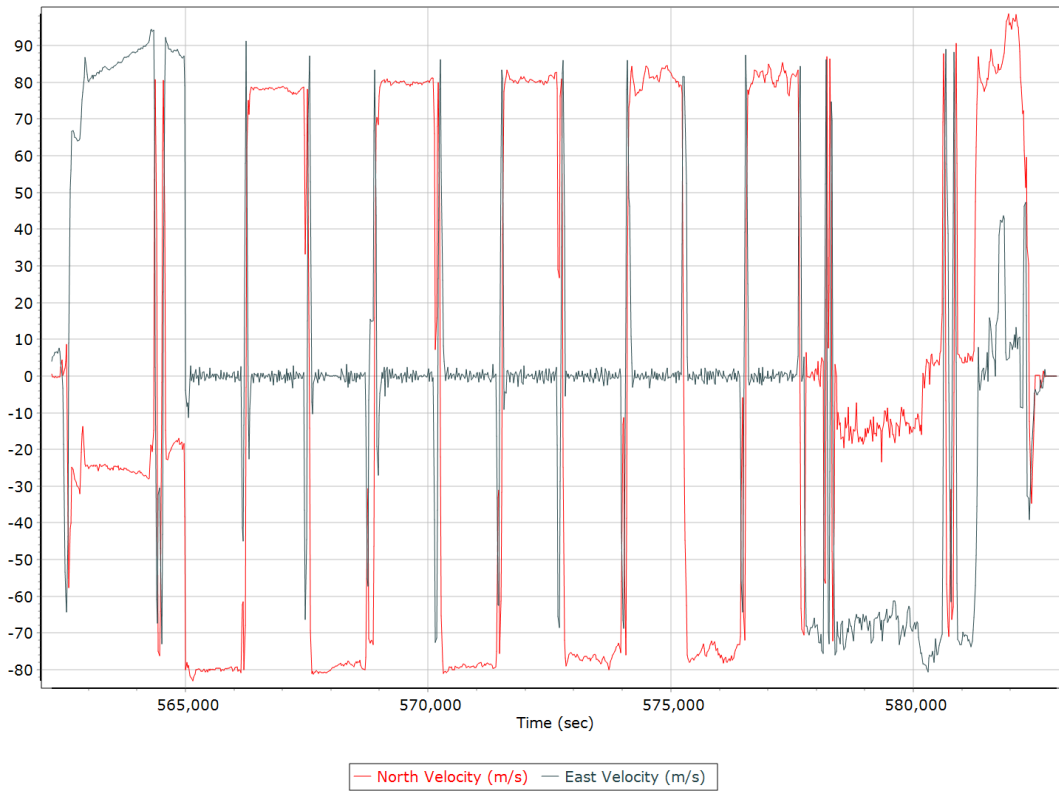
Roll/Pitch



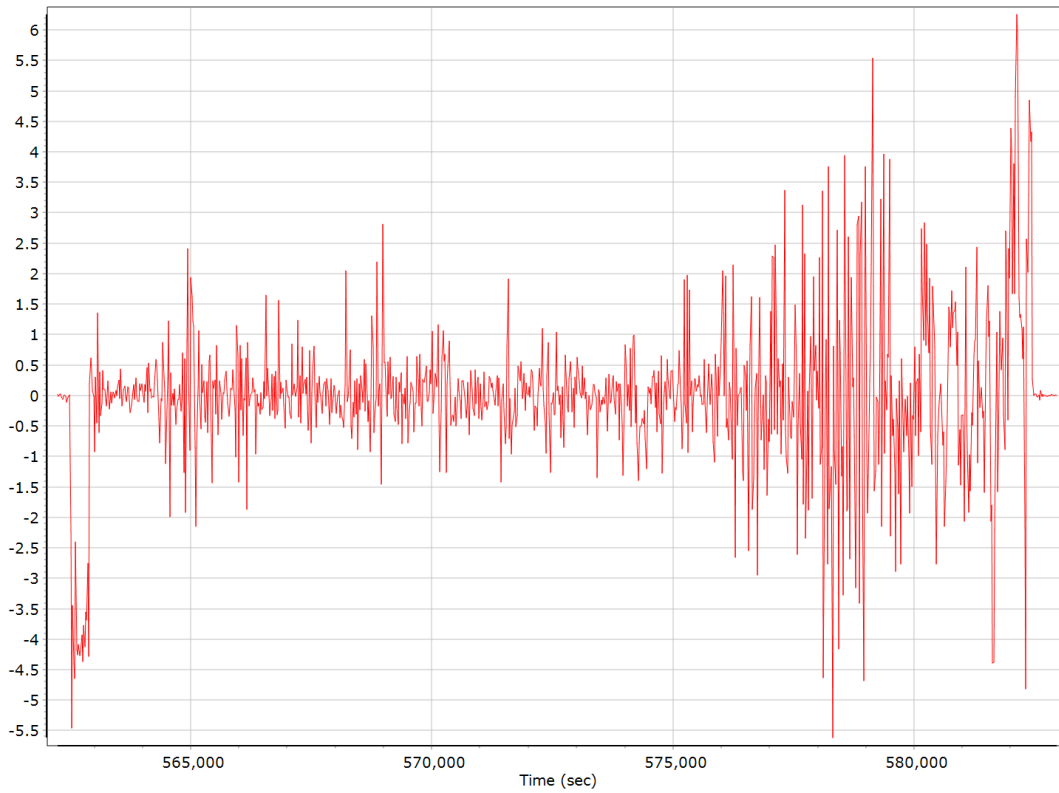
Heading



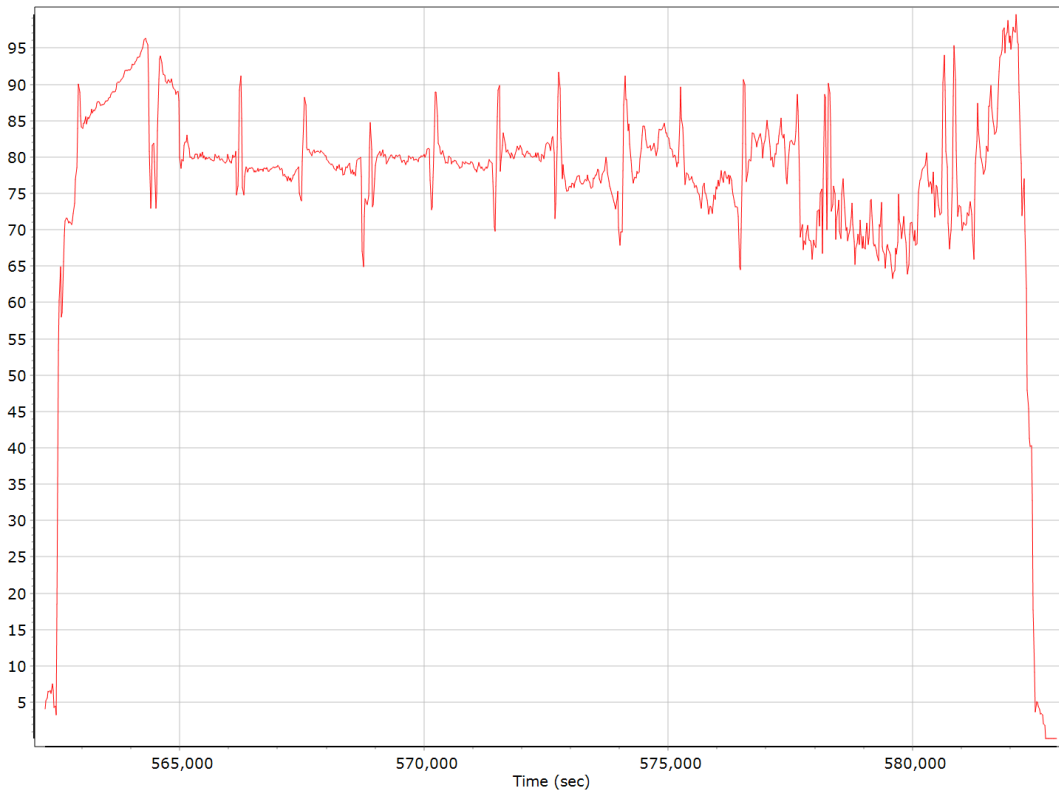
North/East Velocity



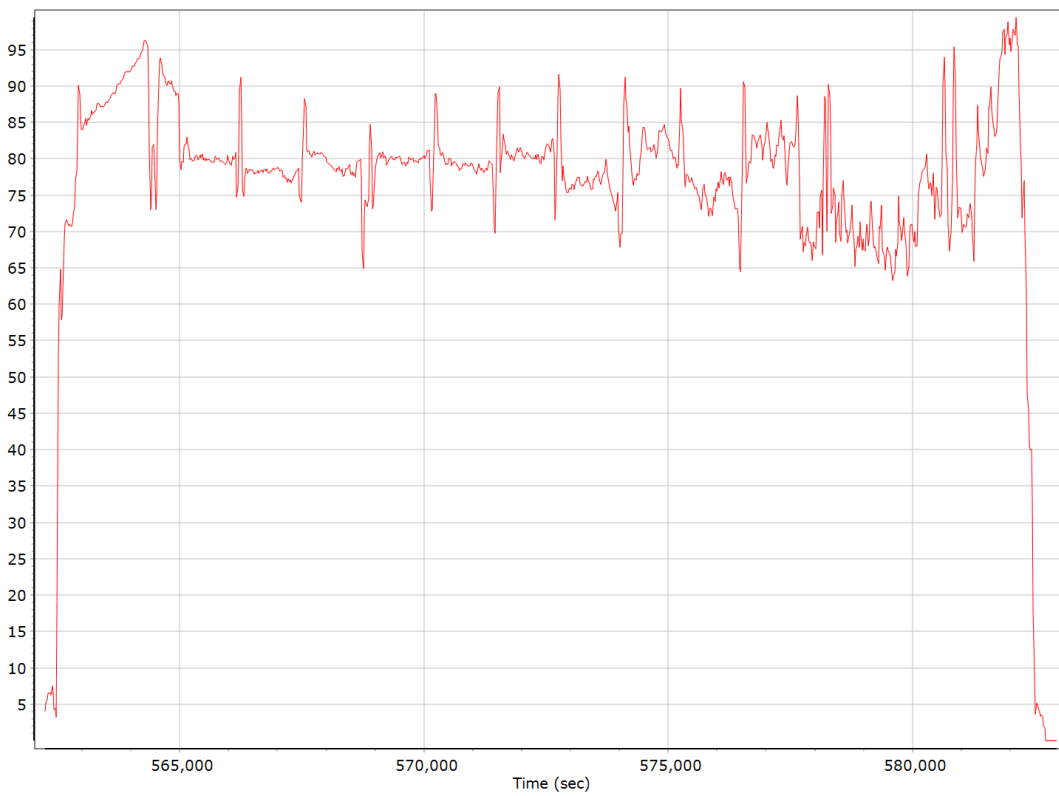
Down Velocity



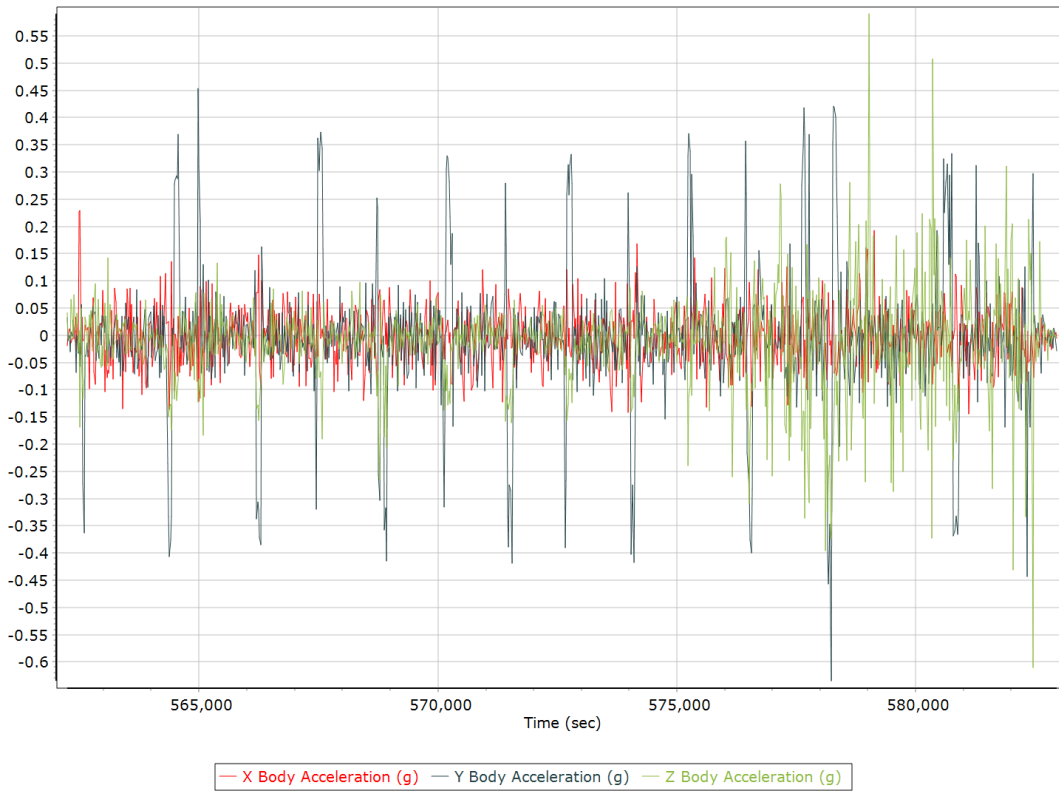
Total Speed



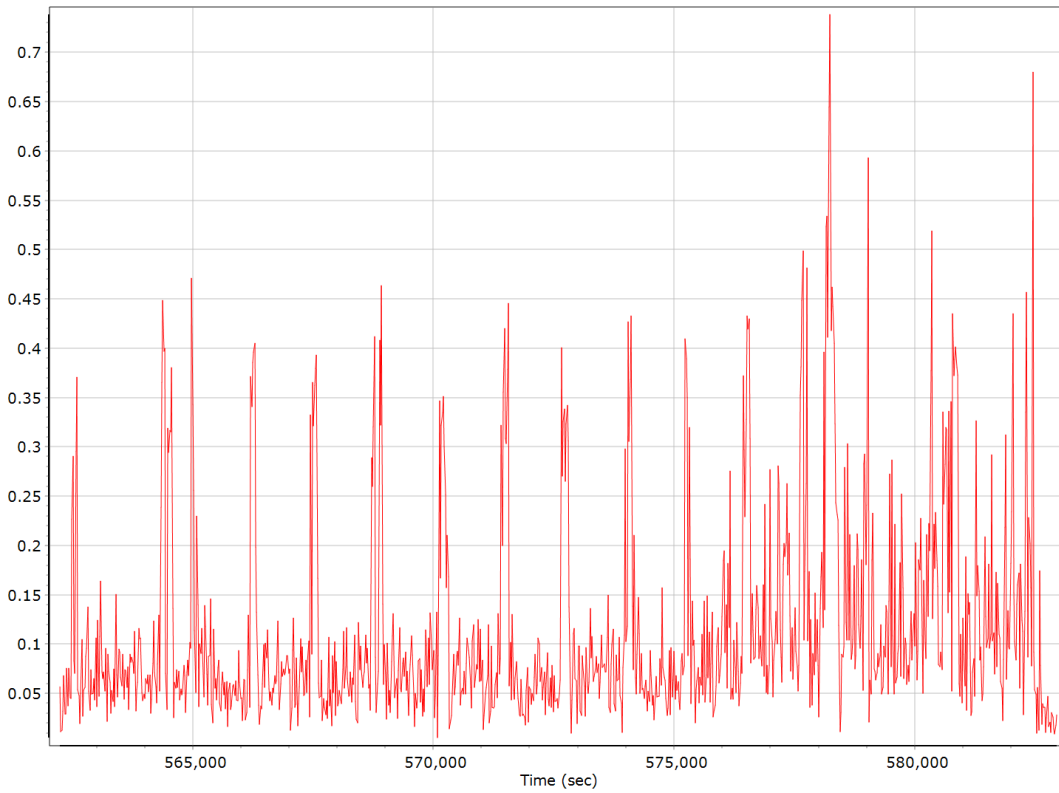
Ground Speed



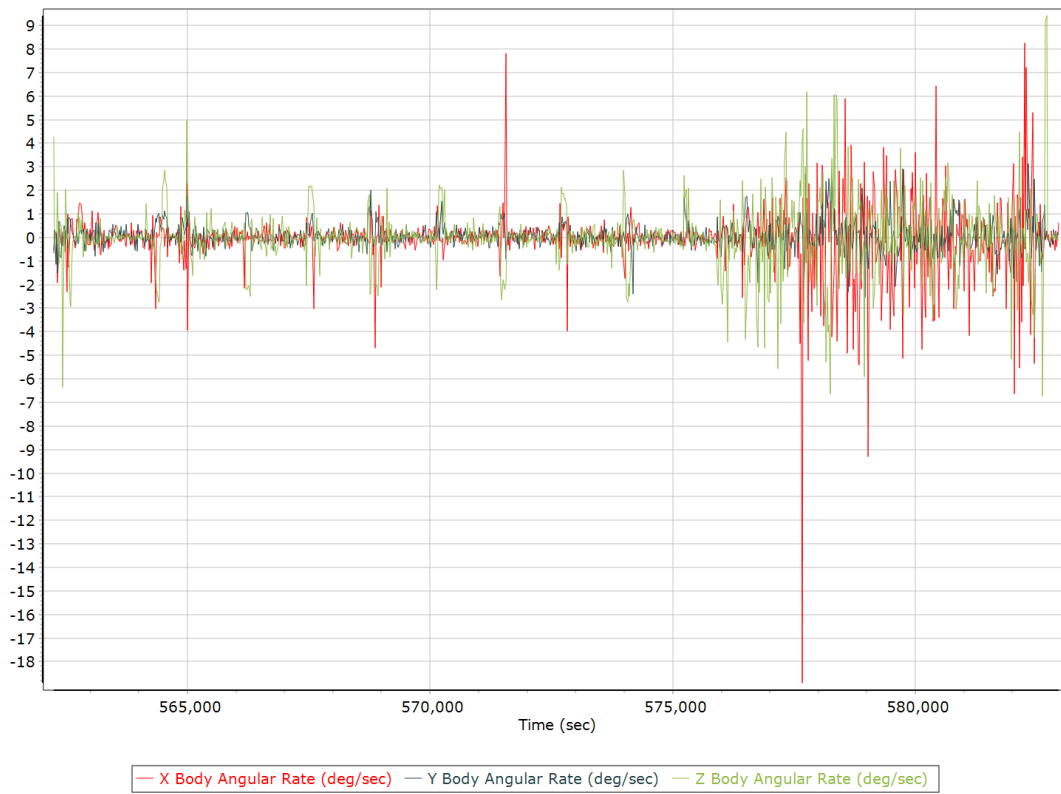
Body Acceleration



Total Body Acceleration

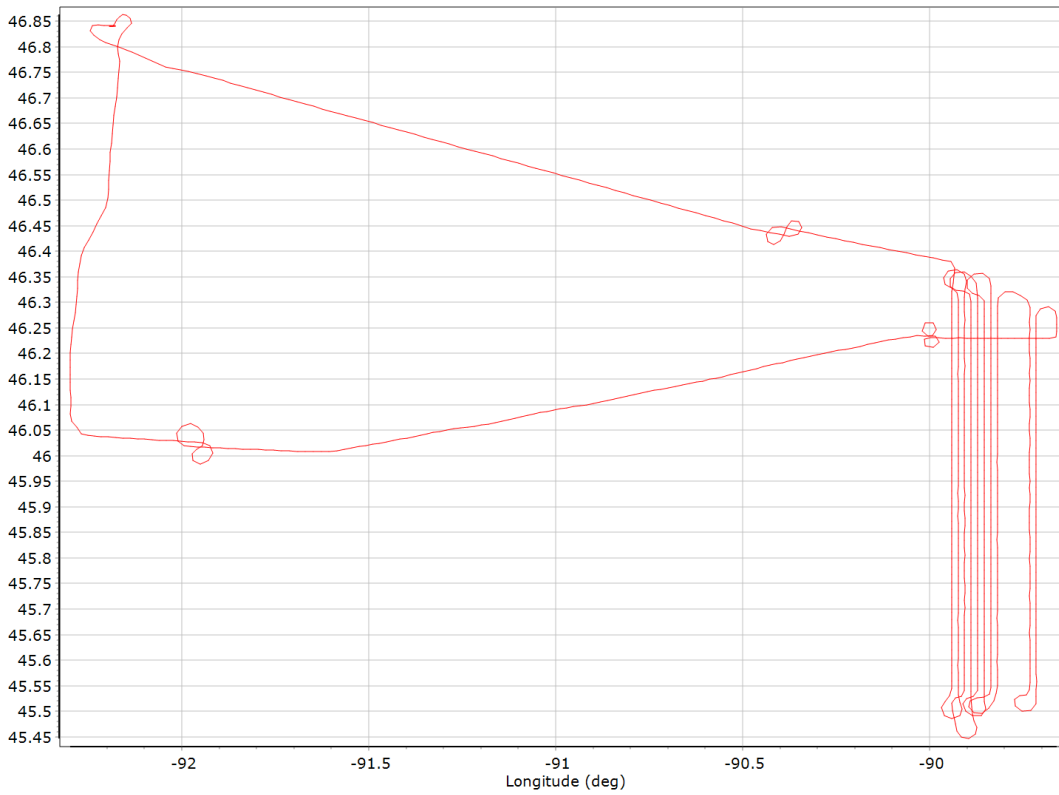


Body Angular Rate

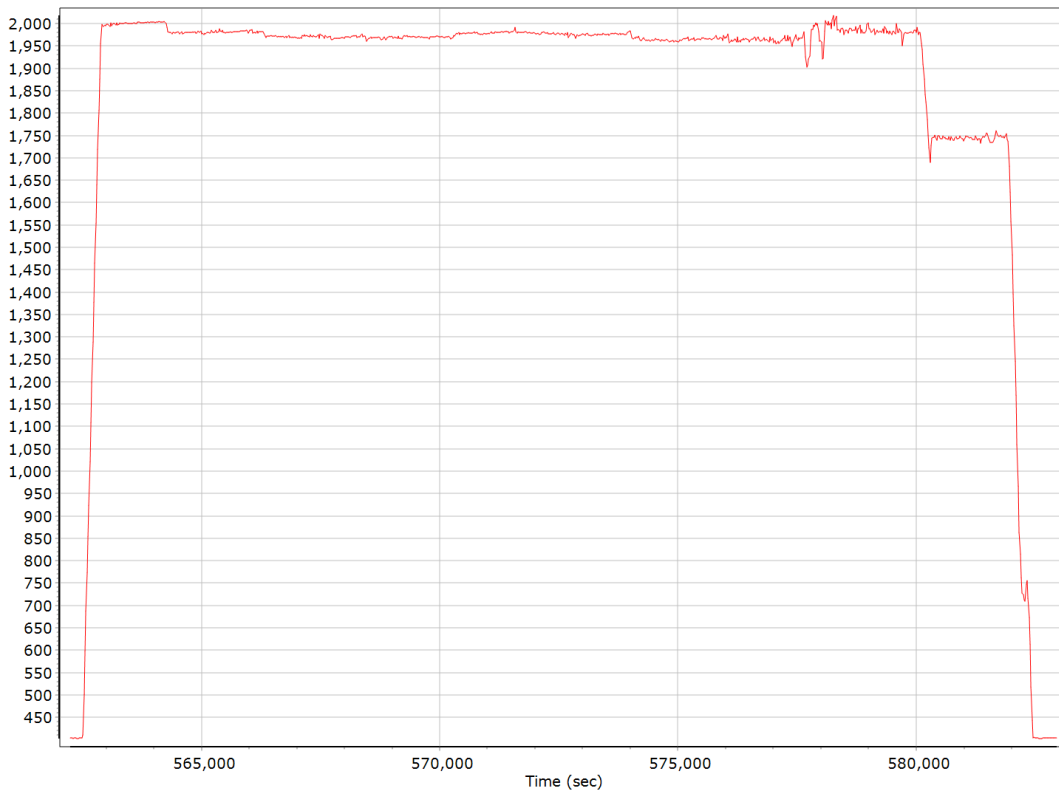


Forward Processed Trajectory Information

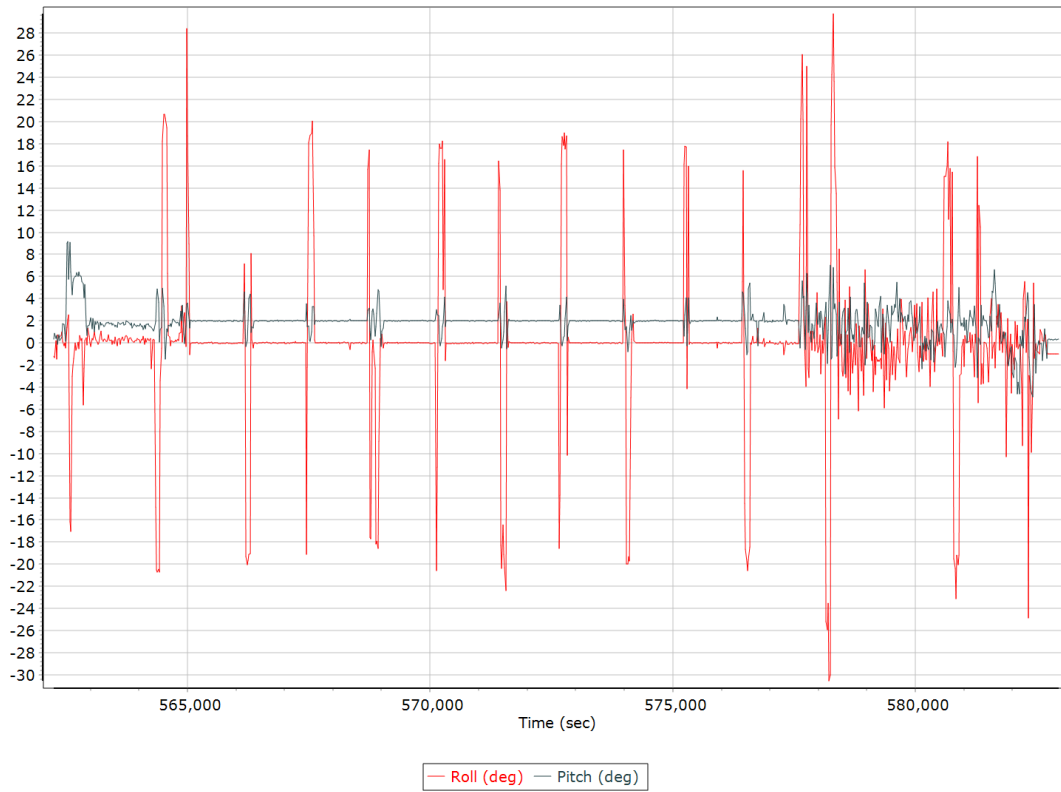
Top View



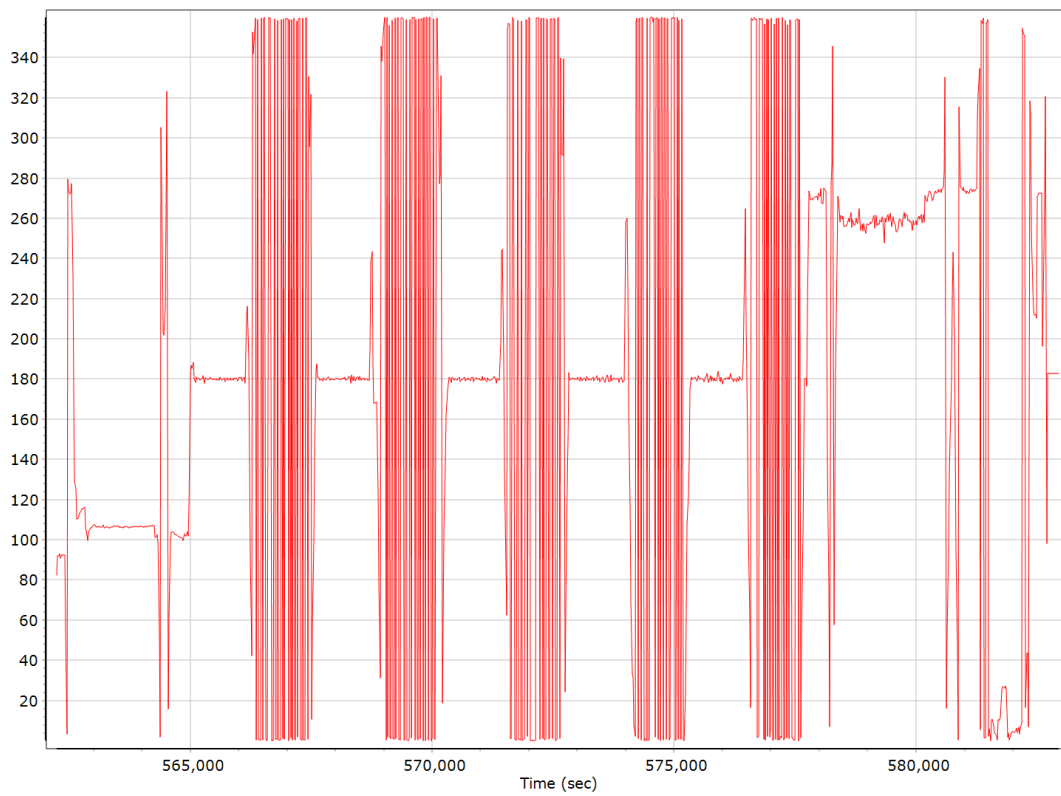
Altitude



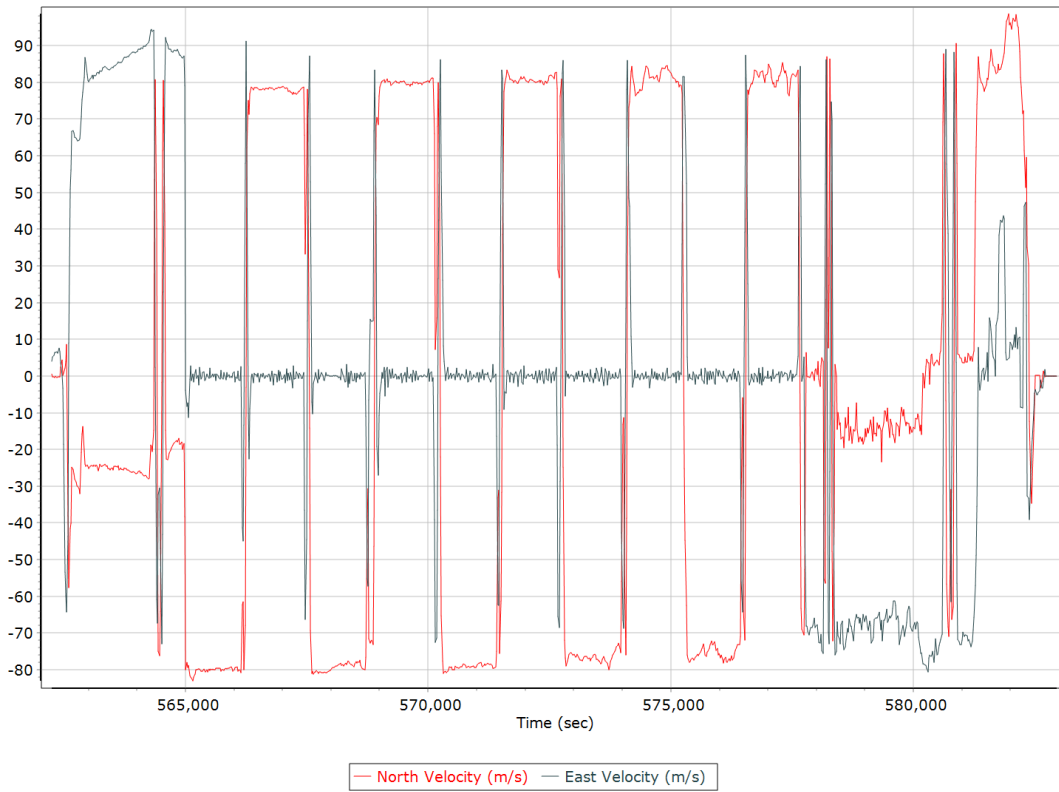
Roll/Pitch



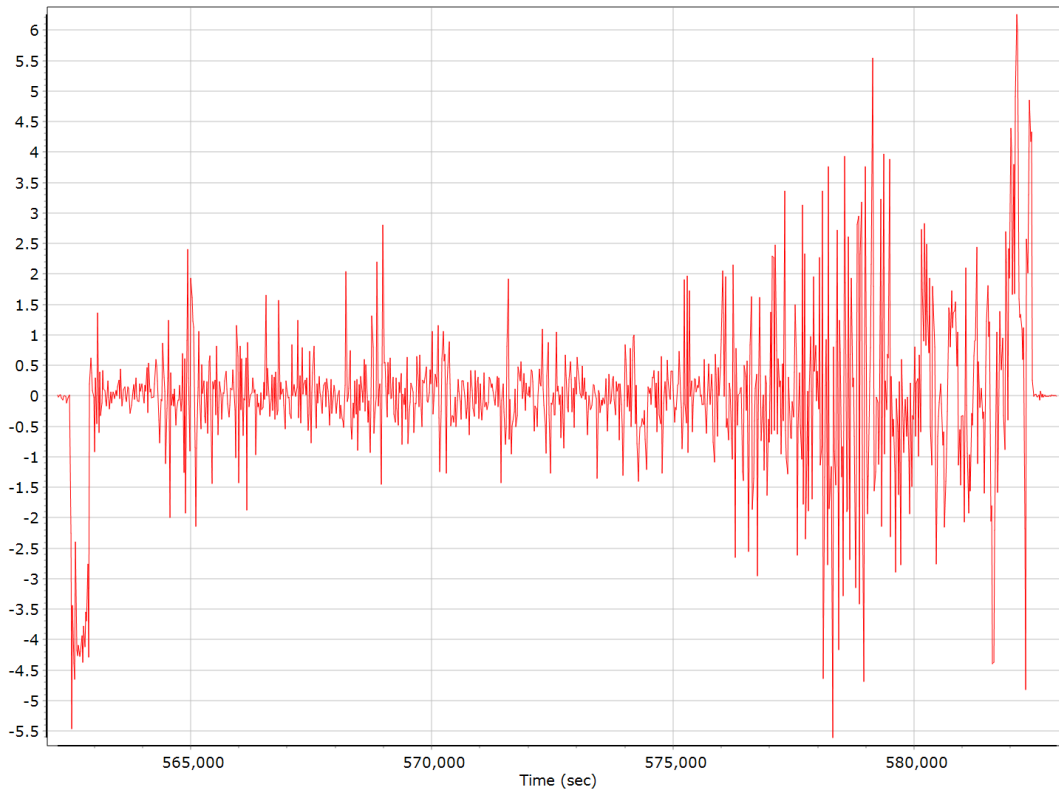
Heading



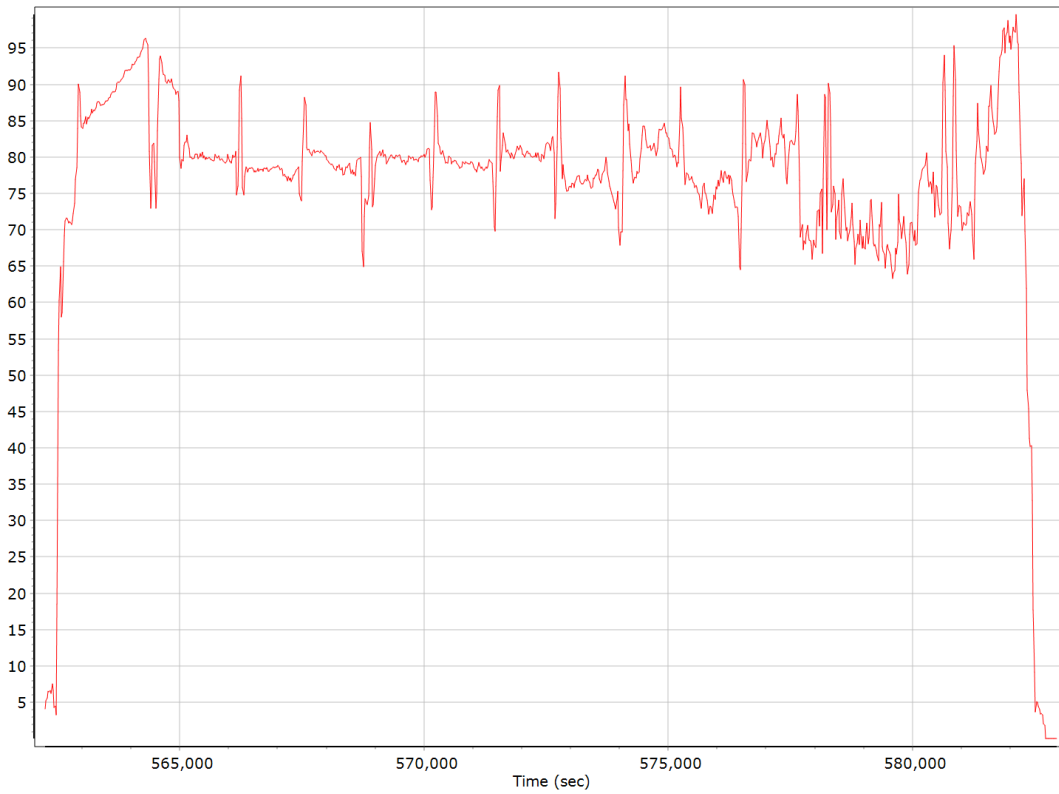
North/East Velocity



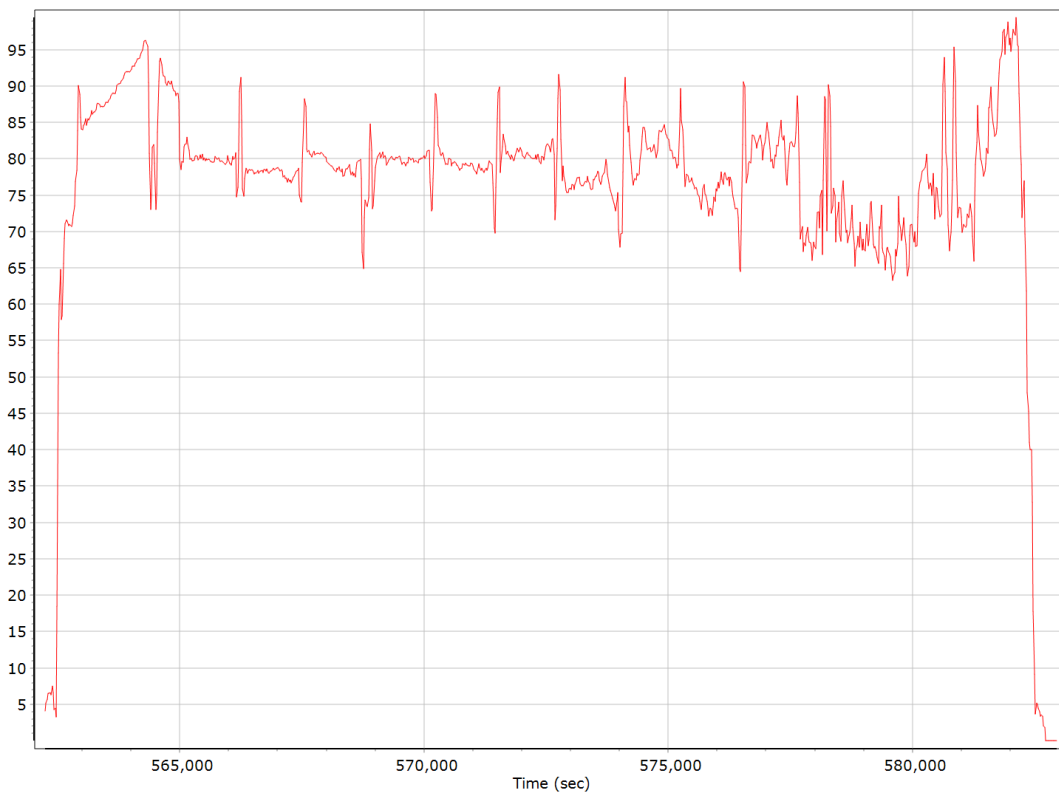
Down Velocity



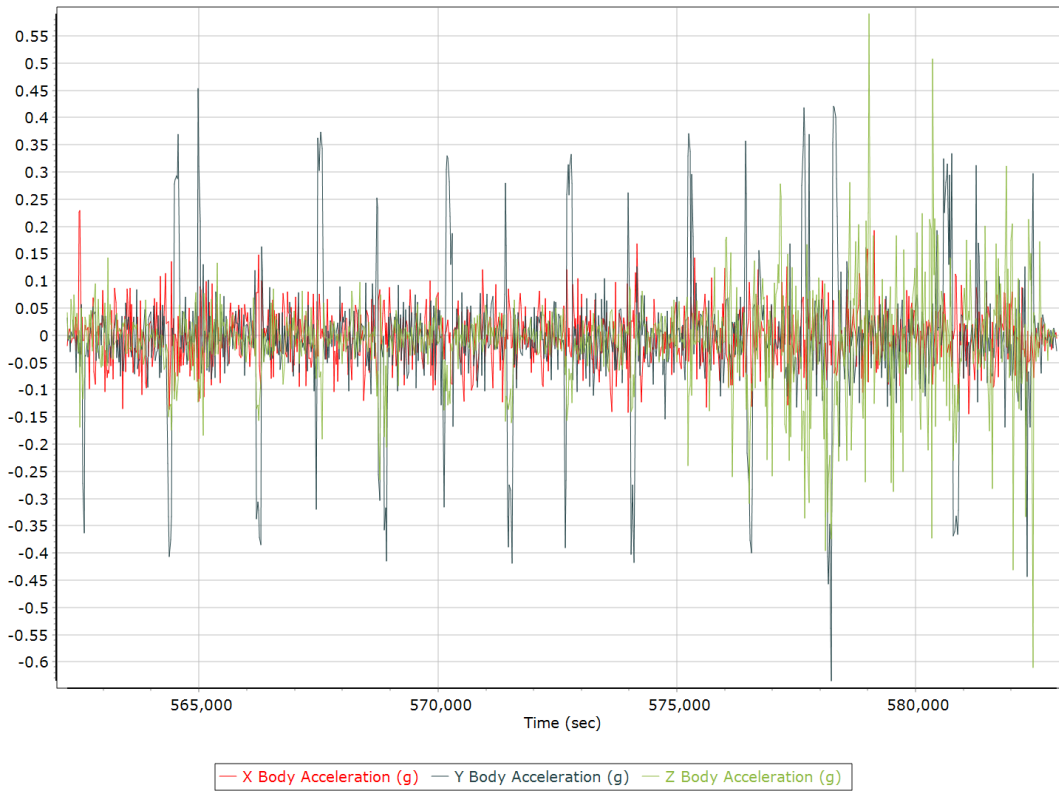
Total Speed



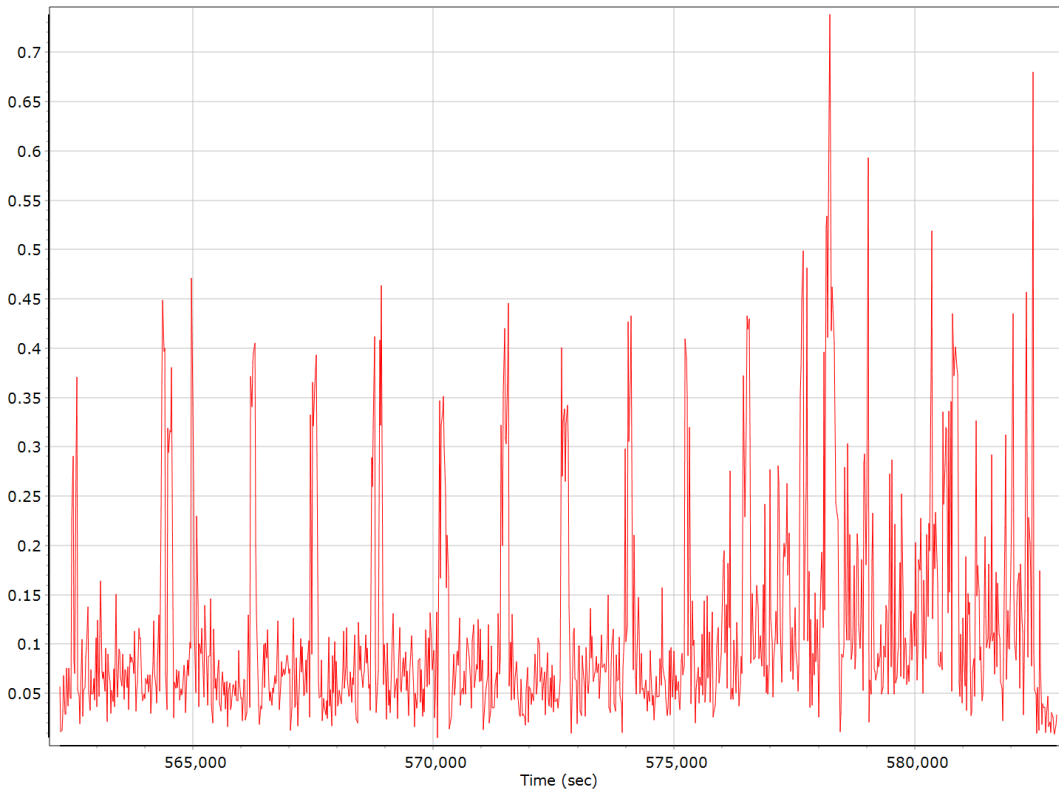
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

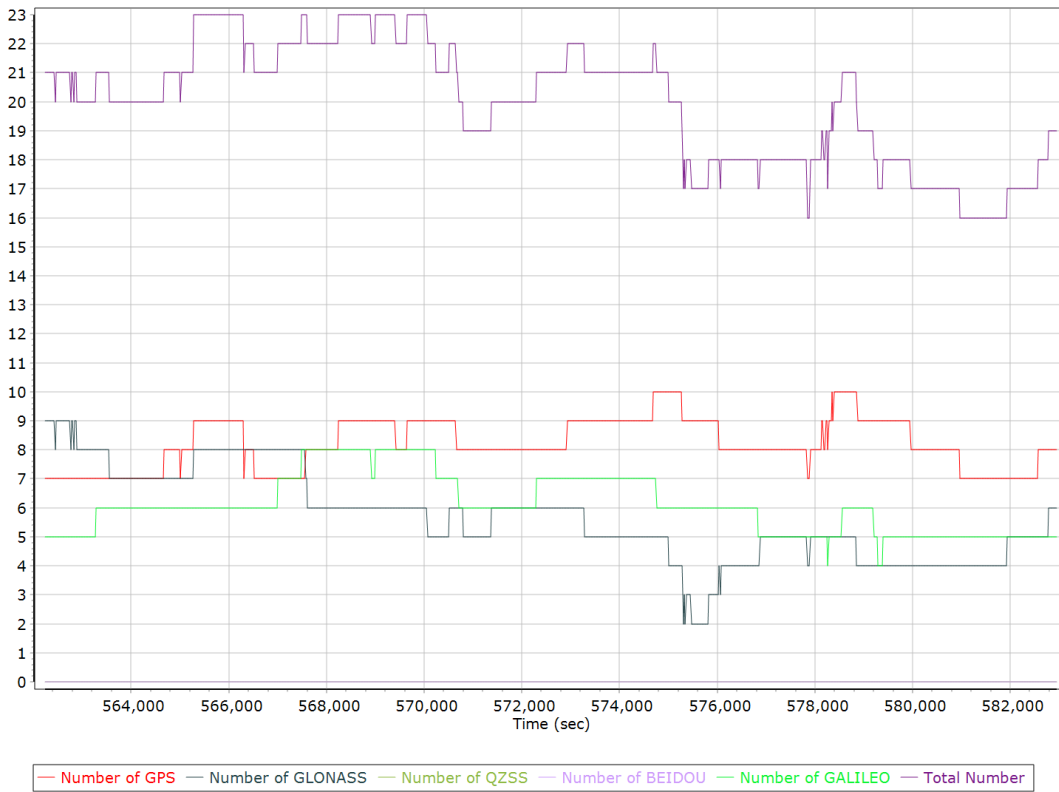


GNSS QC

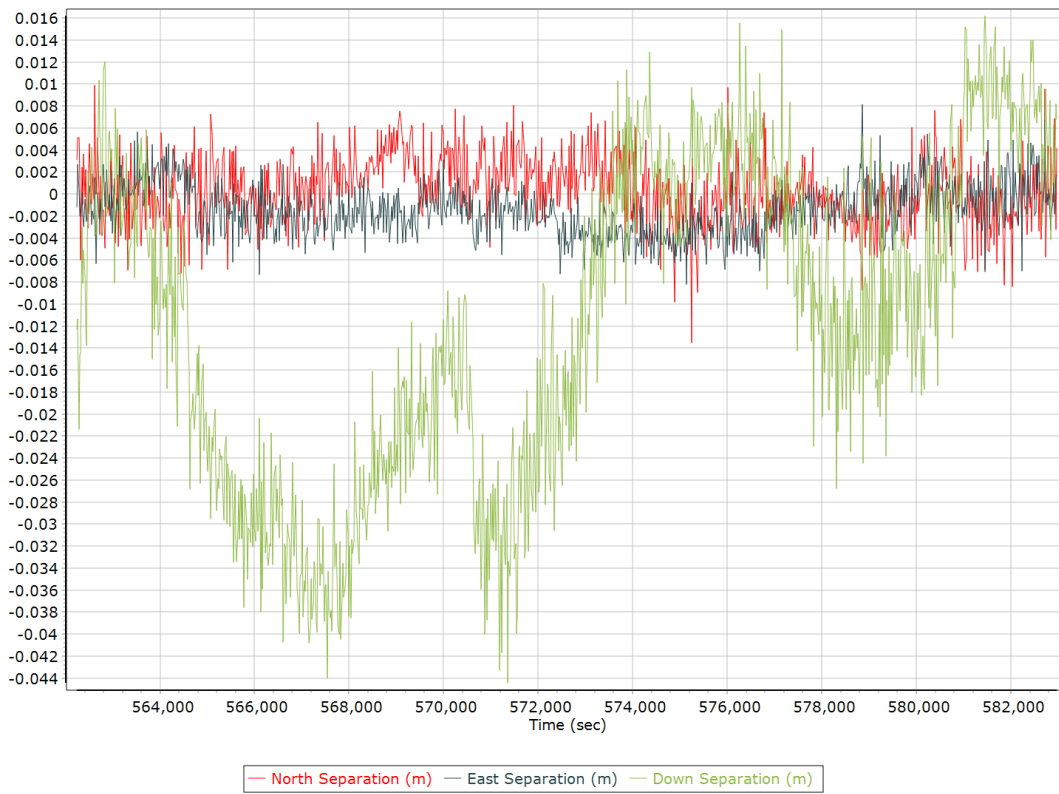
GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	2	9	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	4	8	6
Total number of SV	16	24	20
PDOP	0.95	1.51	1.22
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	20930.00	0.00	0.00
Percentage	100.00	0.00	0.00

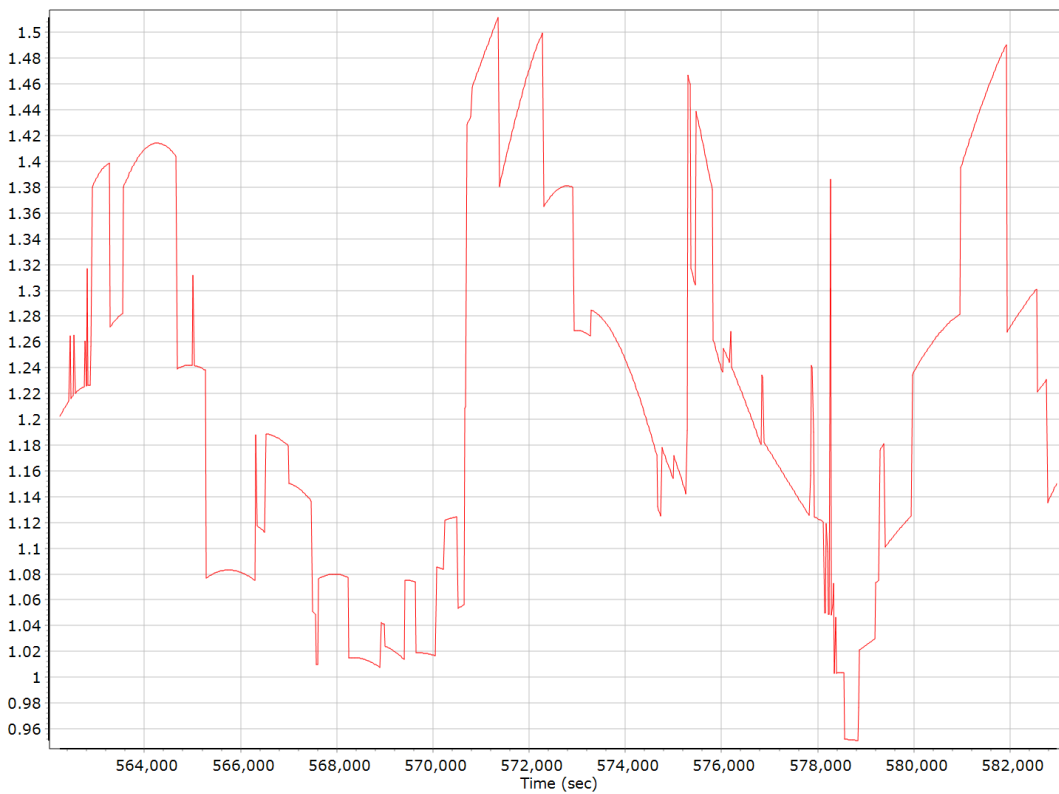
Num SVs in solution



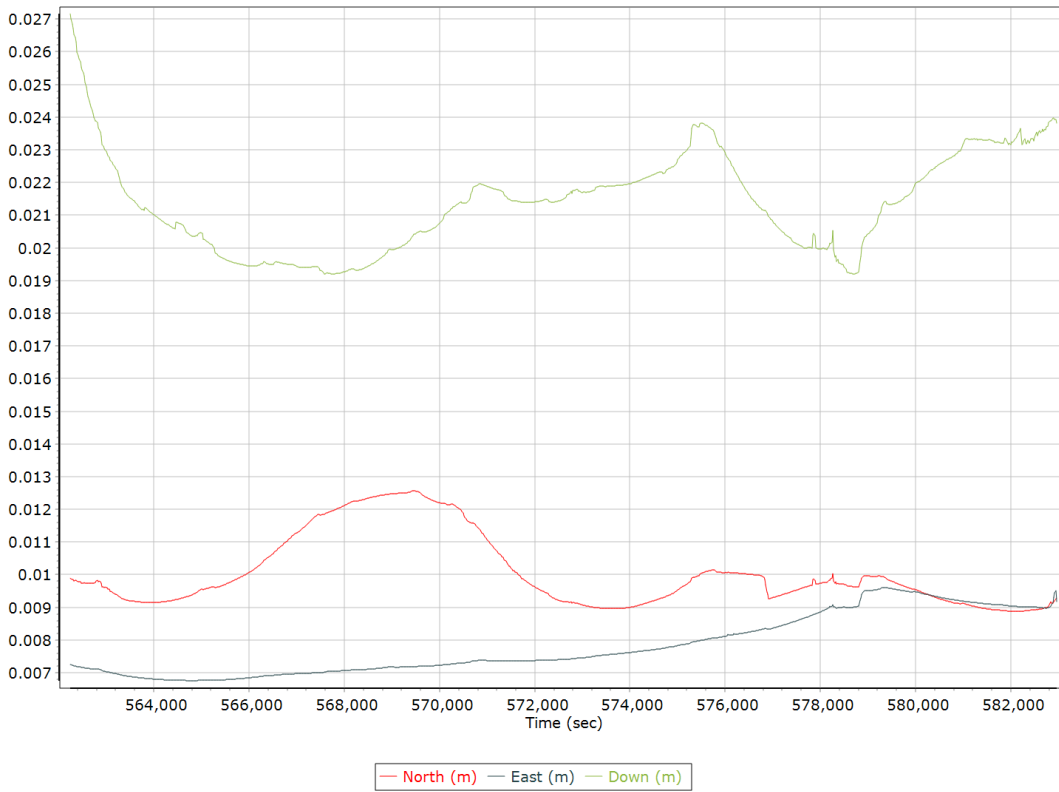
Forward/Reverse Separation



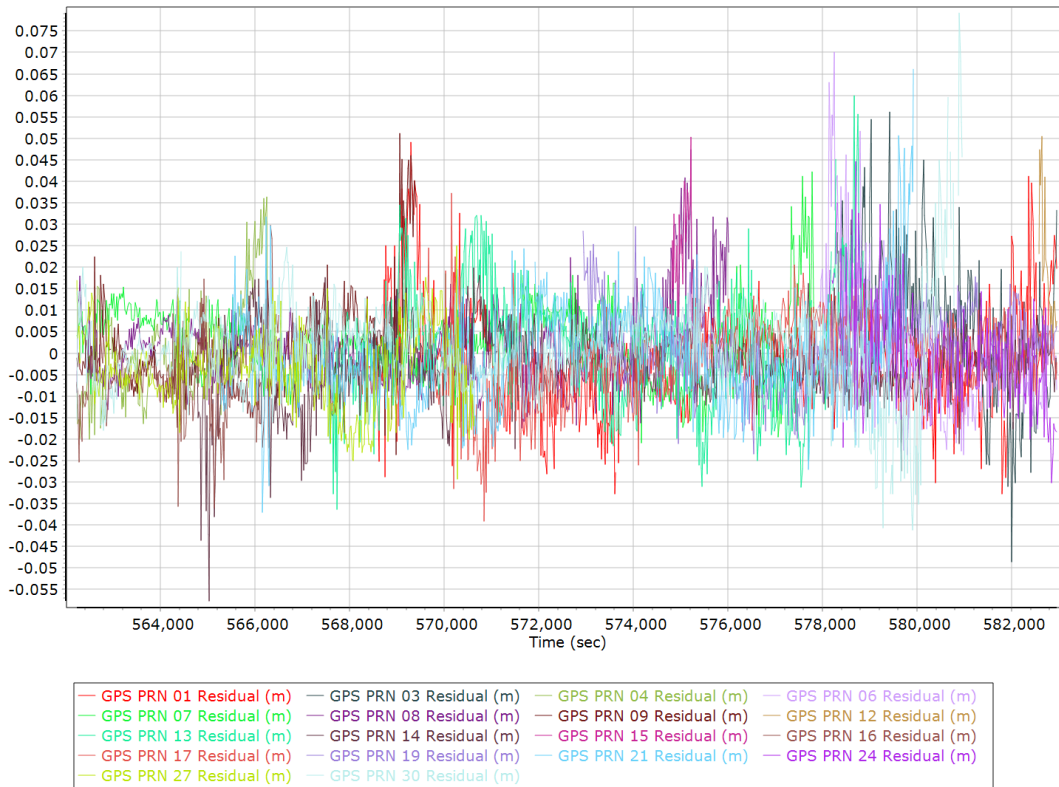
PDOP



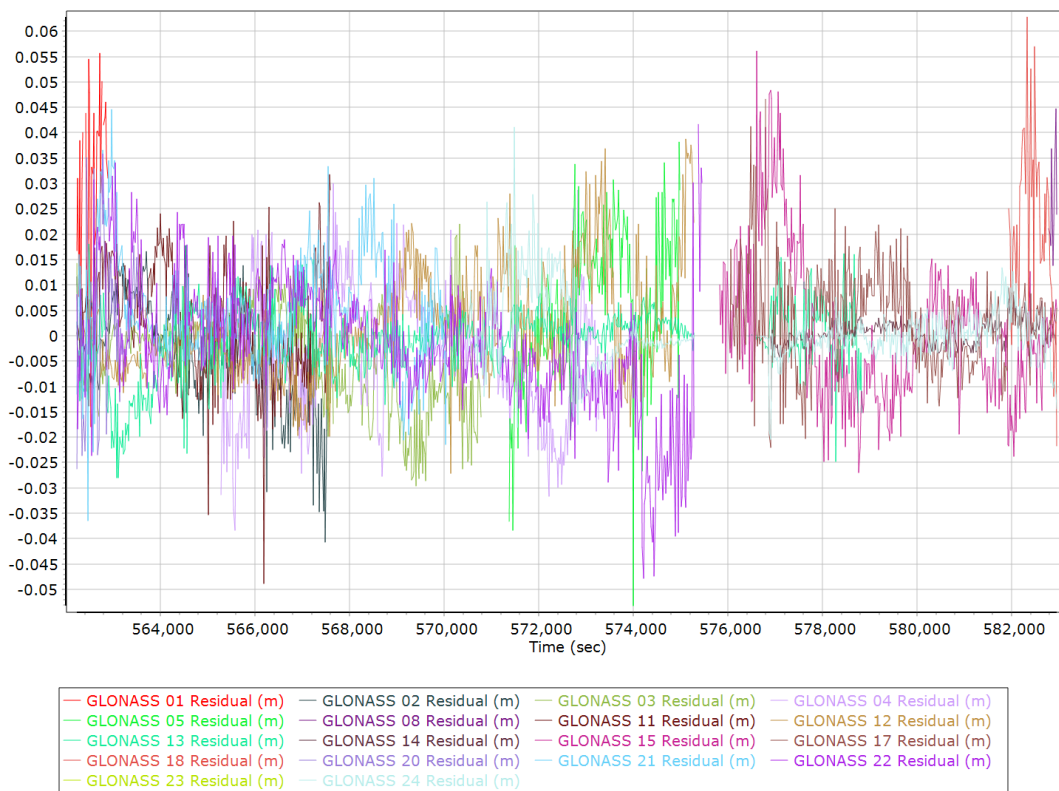
Estimated Position Accuracy



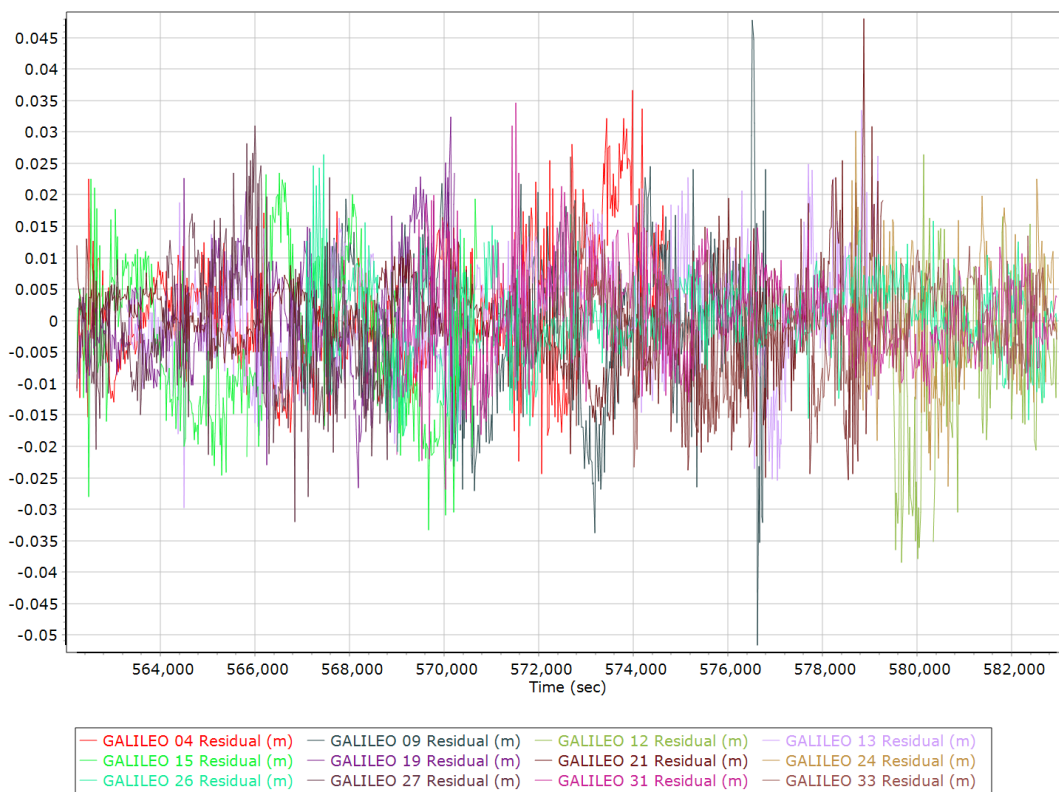
GPS Residuals



GLONASS Residuals



GALILEO Residuals



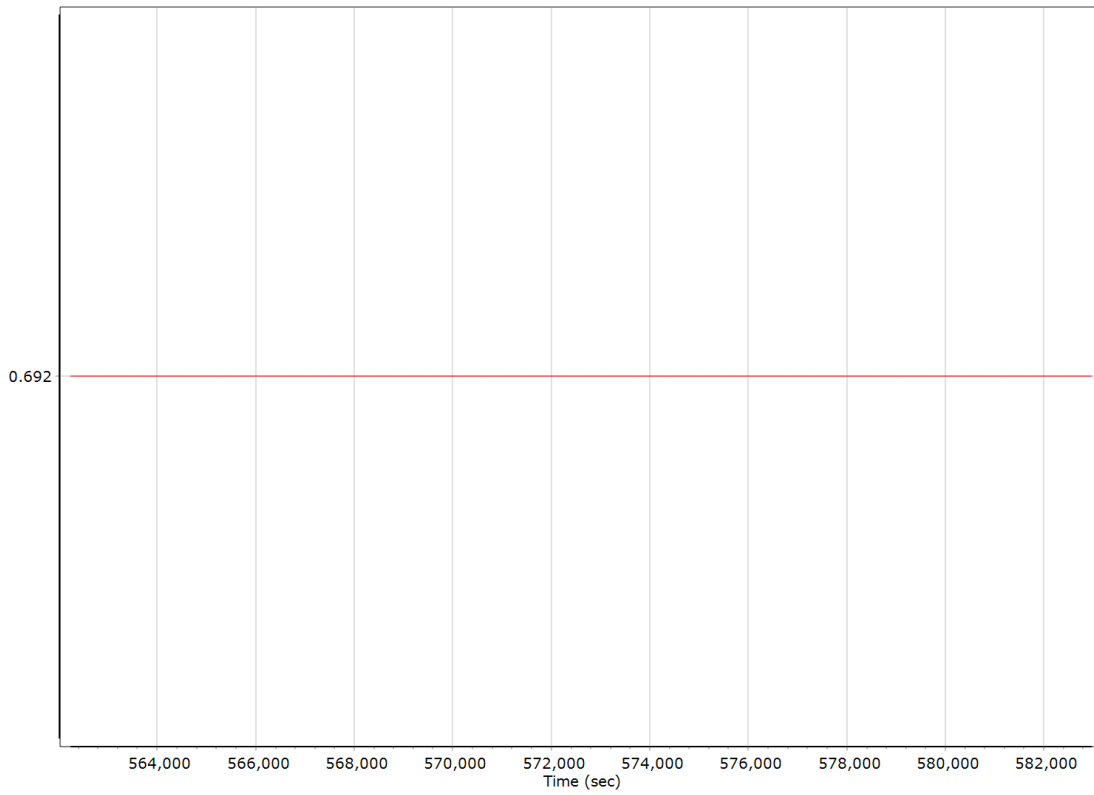
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	561995.000 (5/14/2022 12:06:35 PM)		
Processing end time	582969.000 (5/14/2022 5:56:09 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	-0.034	-0.010	-0.374
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.692	-0.181	-1.276
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

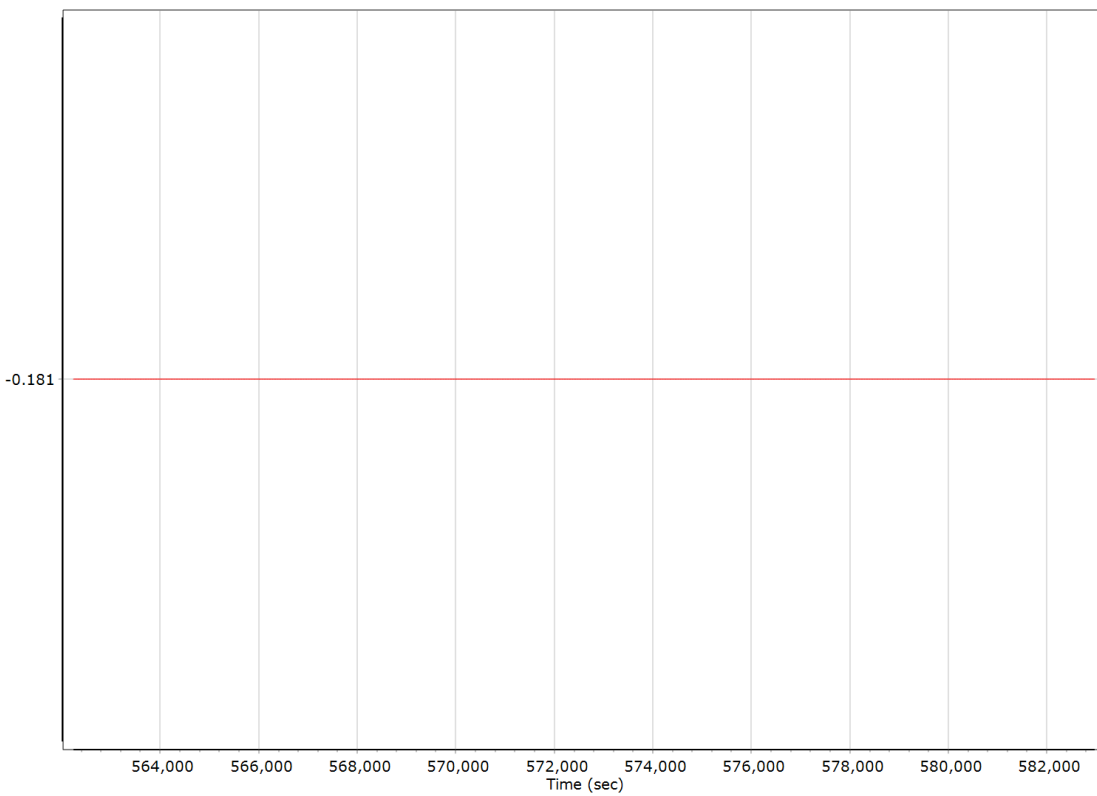
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

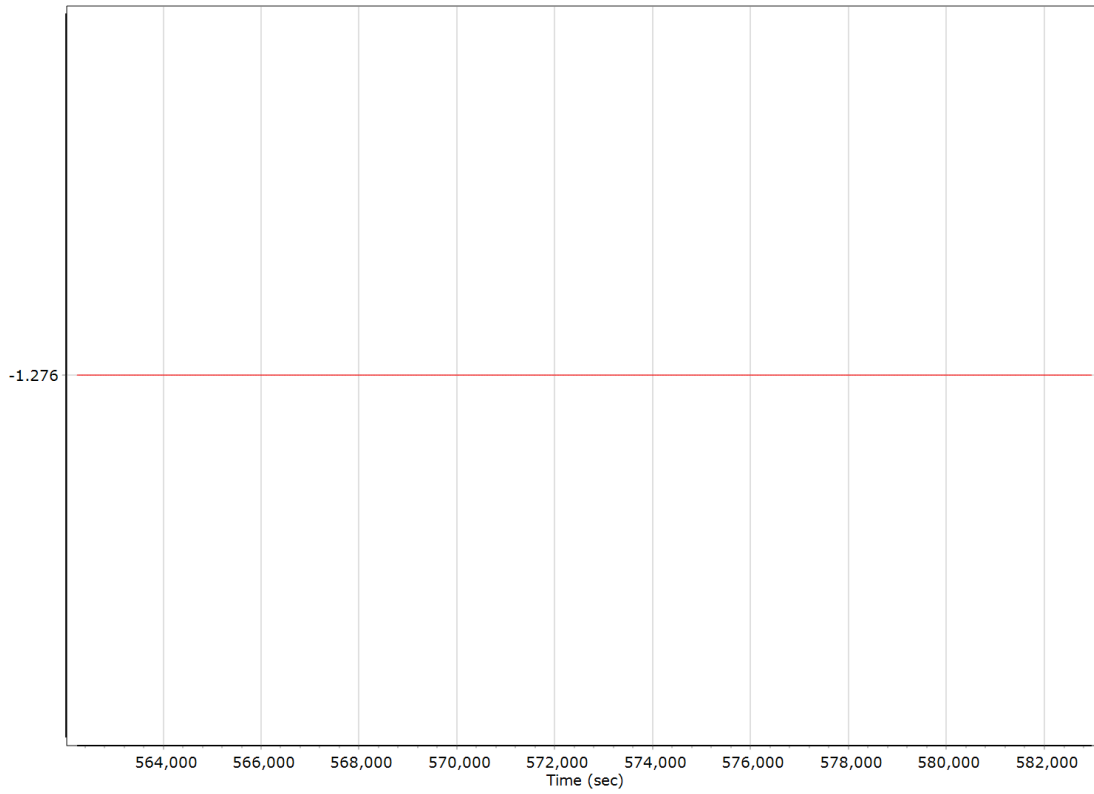
X Reference-Primary GNSS Lever Arm (m)



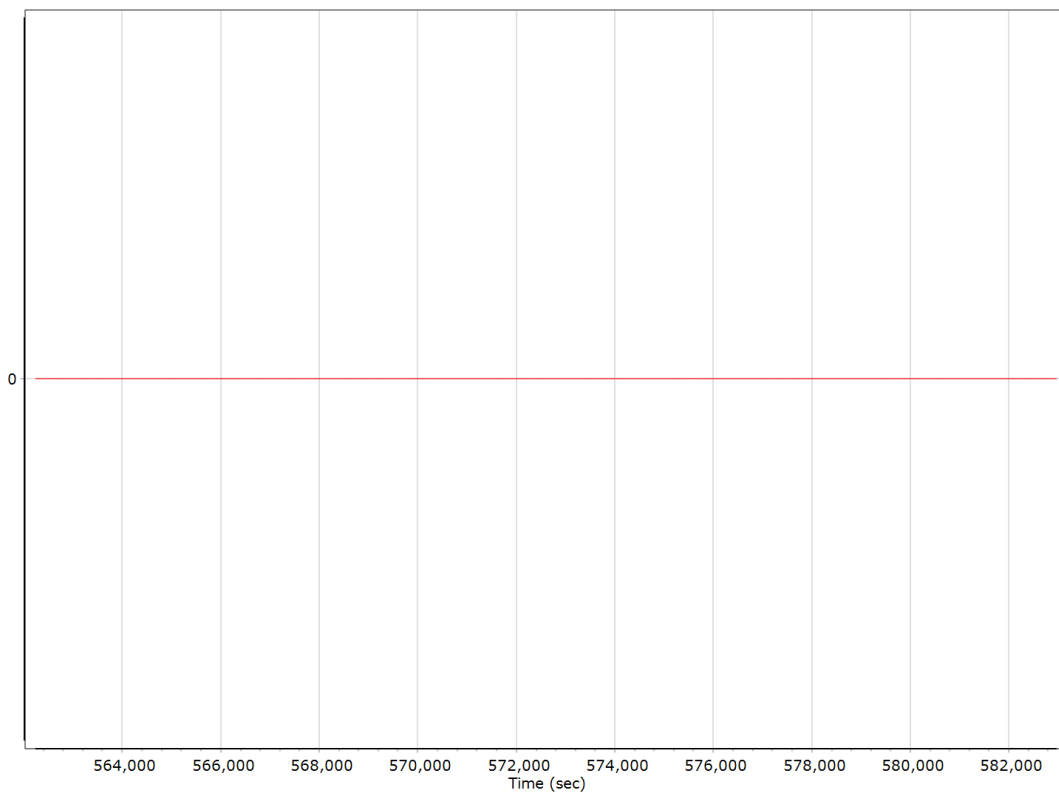
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



Reference-Primary GNSS Lever Arm Figure of Merit



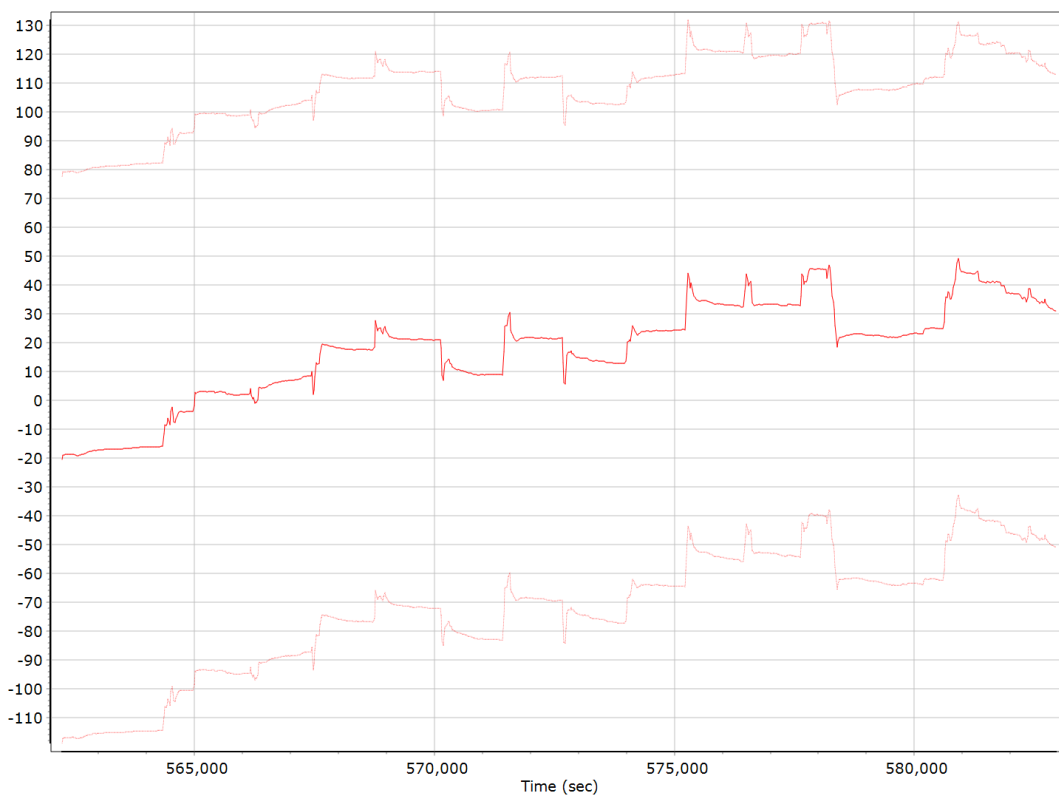
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

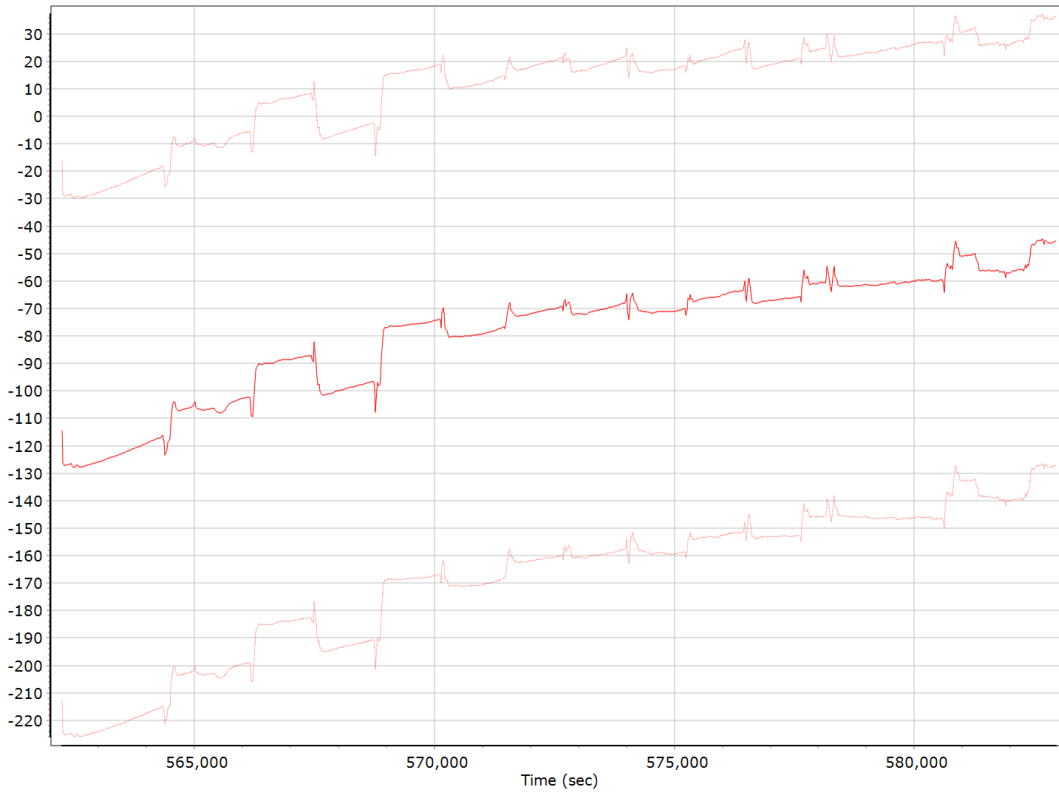
Accelerometer Bias (micro-g)



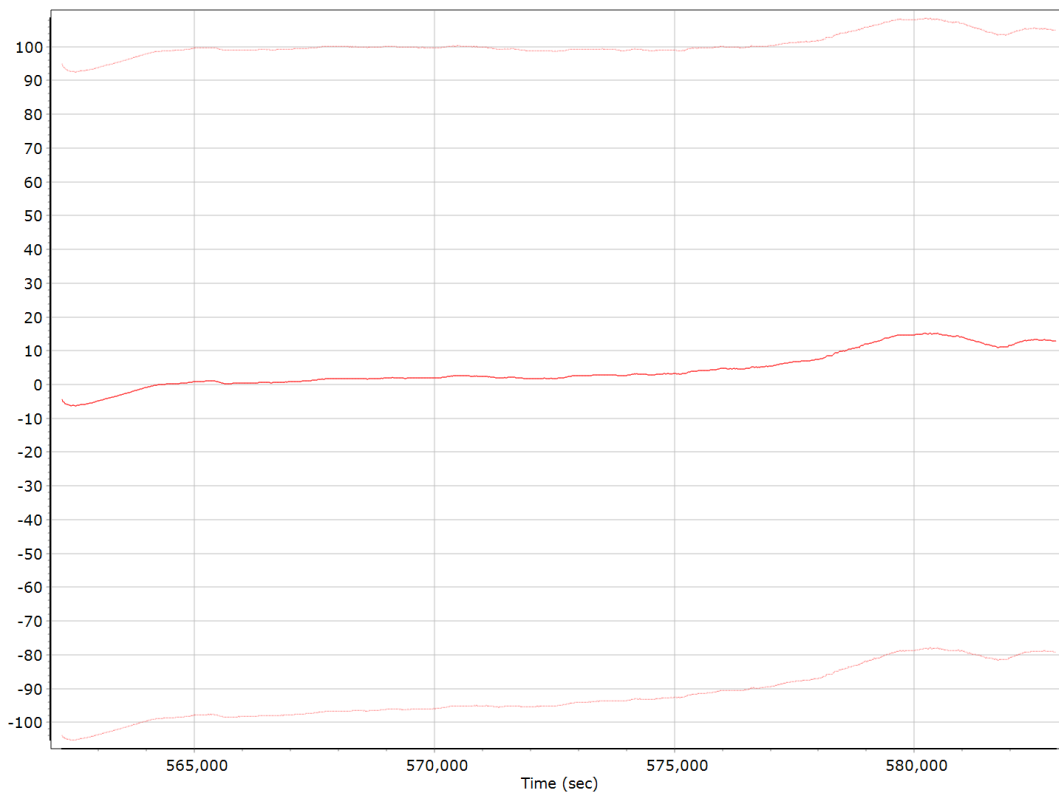
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



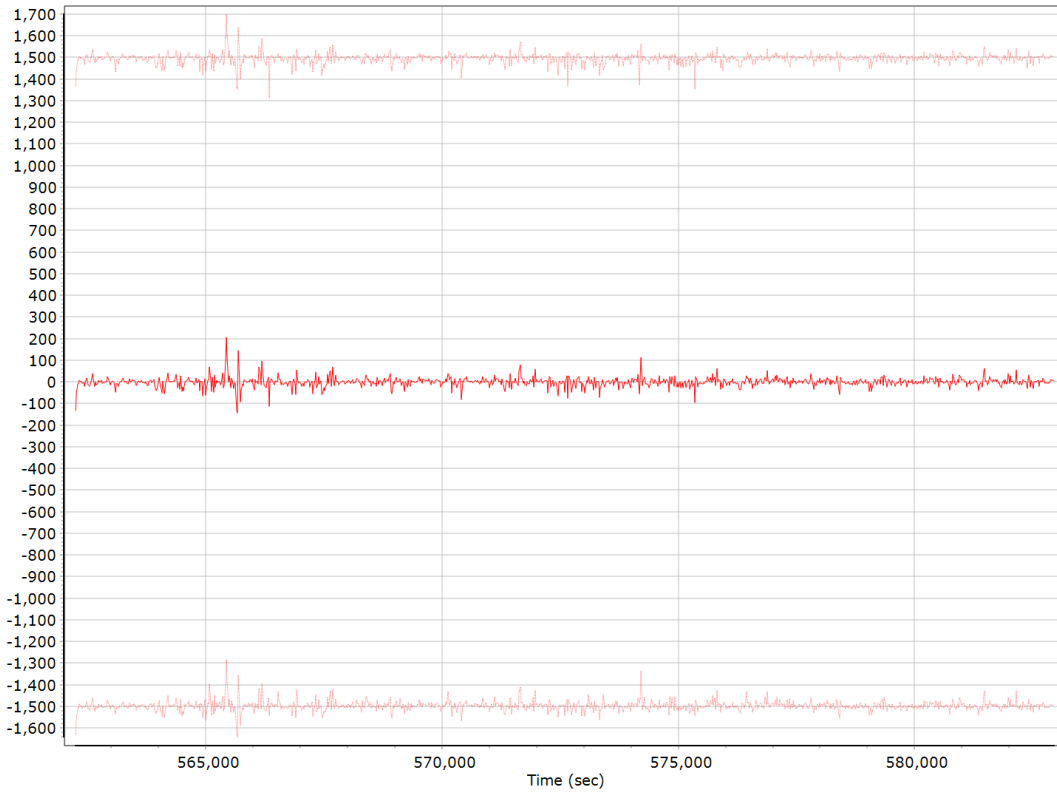
Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



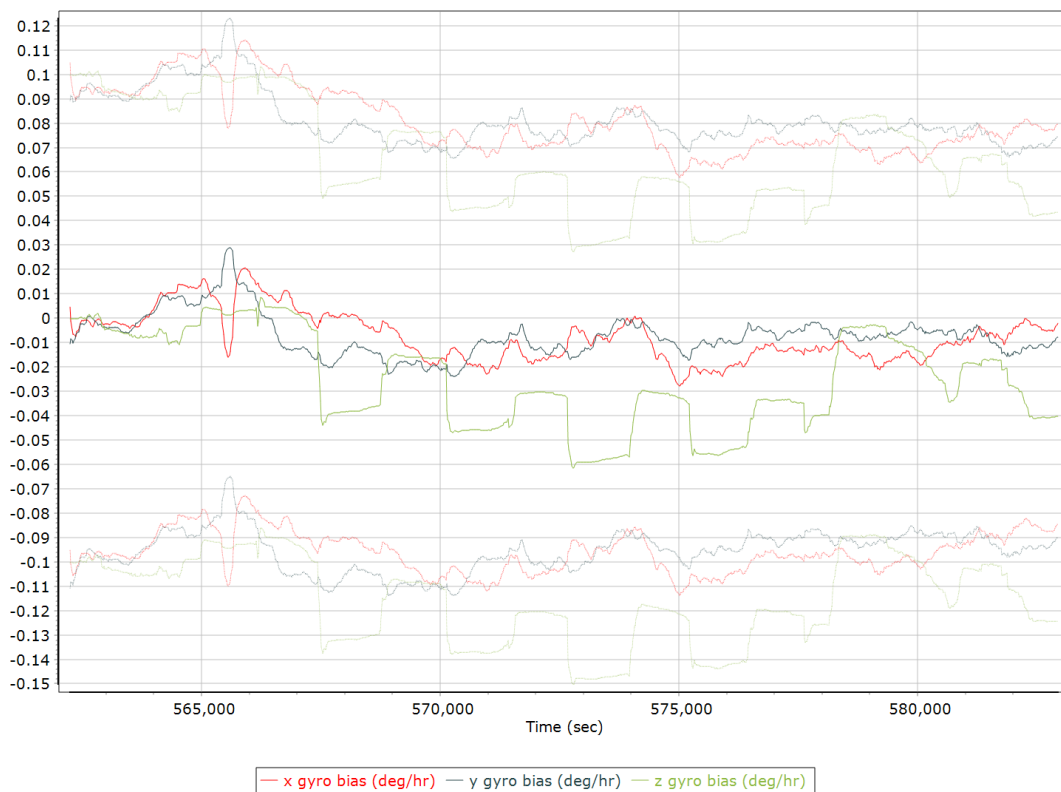
Y Accelerometer Scale Error (ppm)



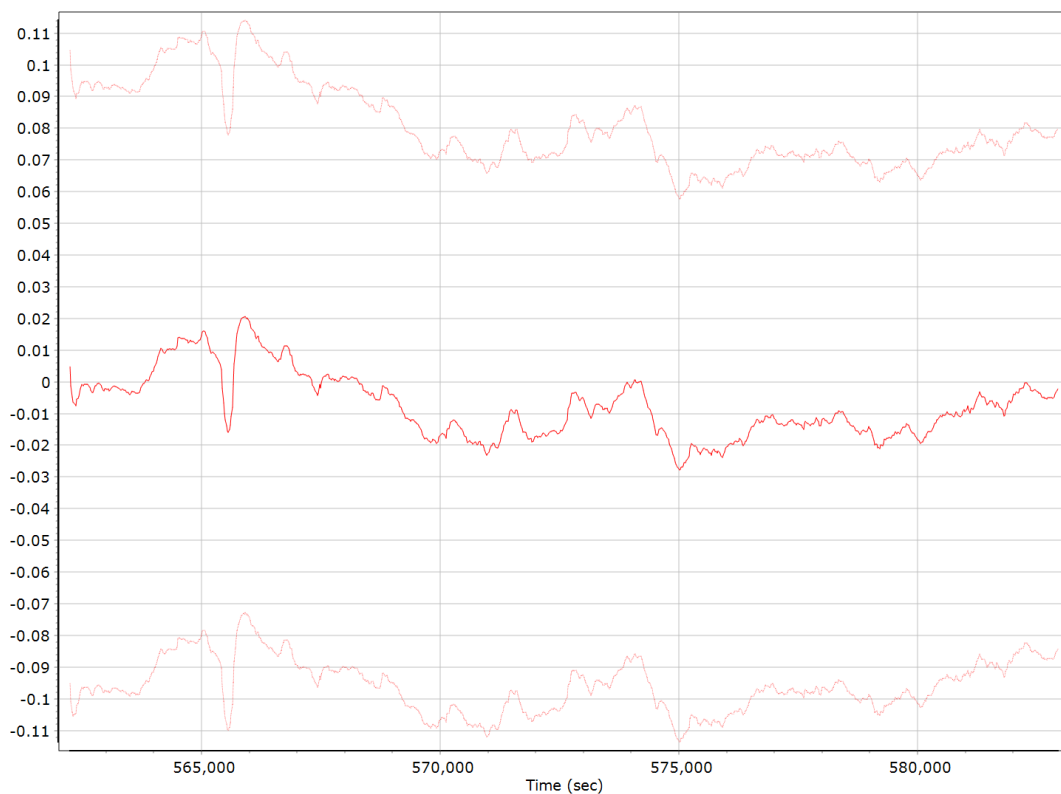
Z Accelerometer Scale Error (ppm)



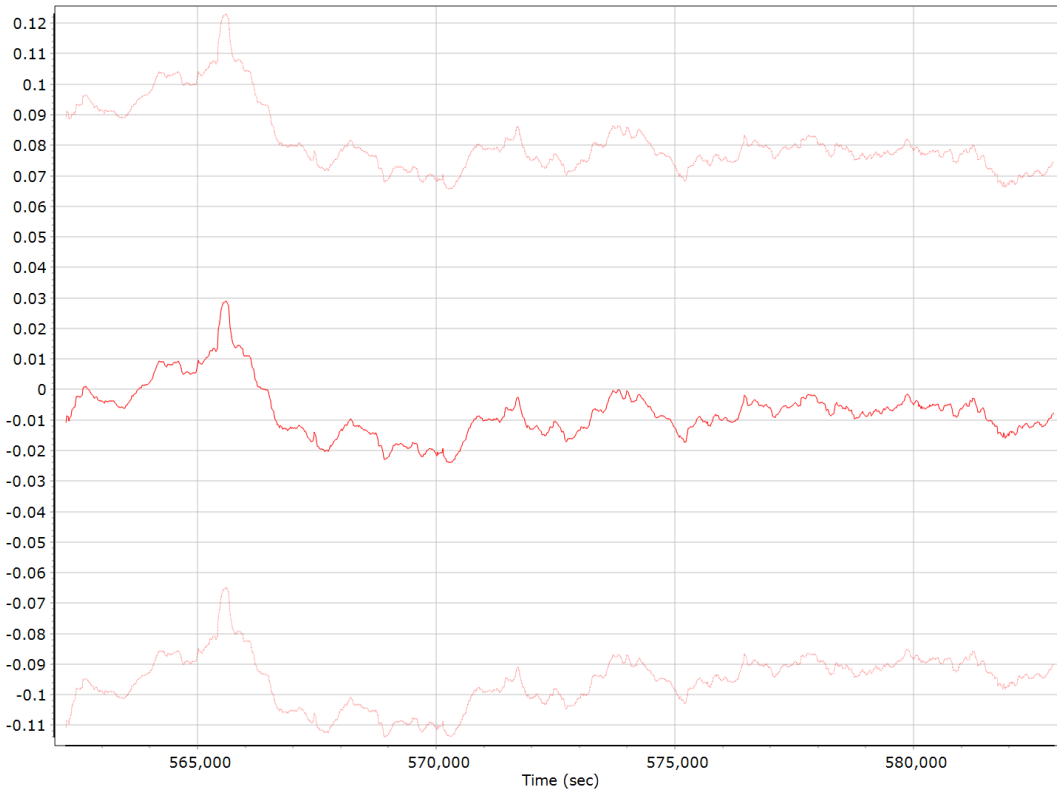
Gyro Bias (deg/h)



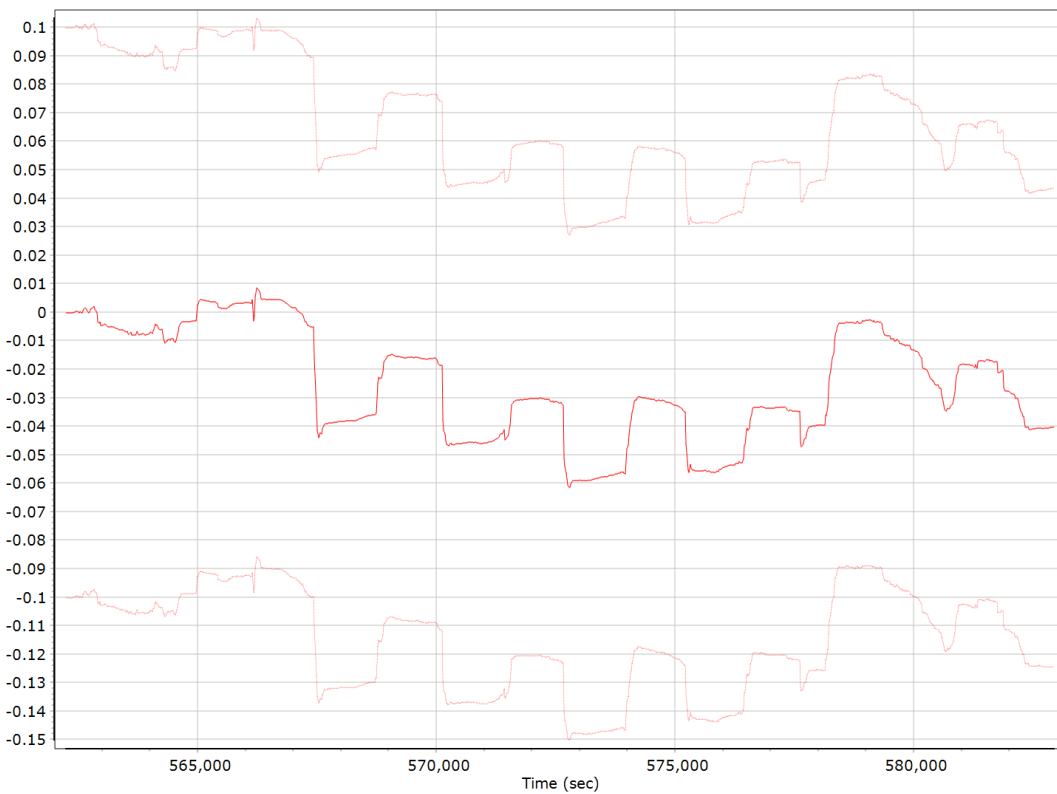
X Gyro Bias (deg/h)



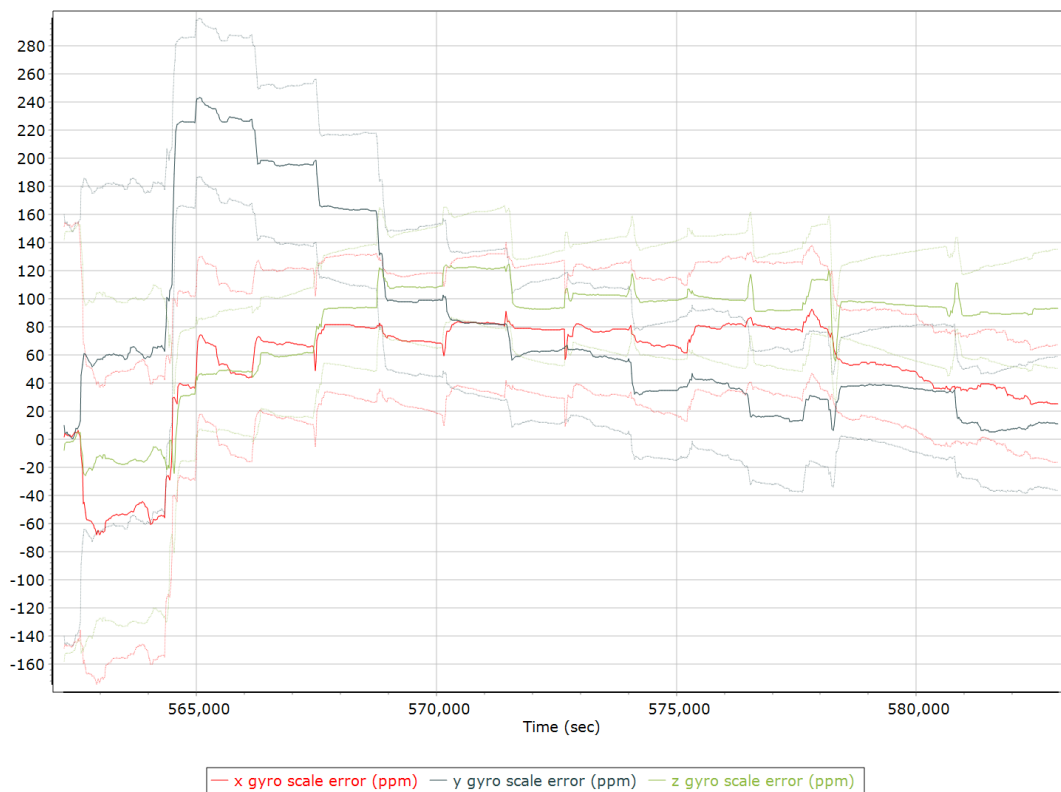
Y Gyro Bias (deg/h)



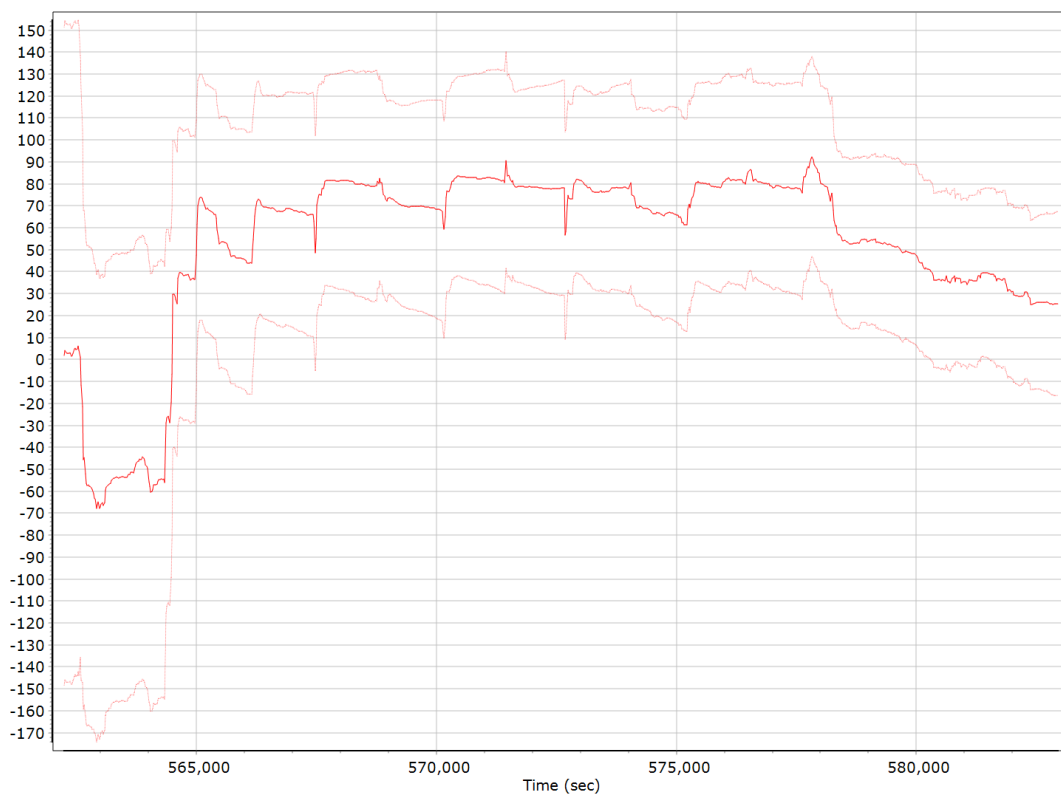
Z Gyro Bias (deg/h)



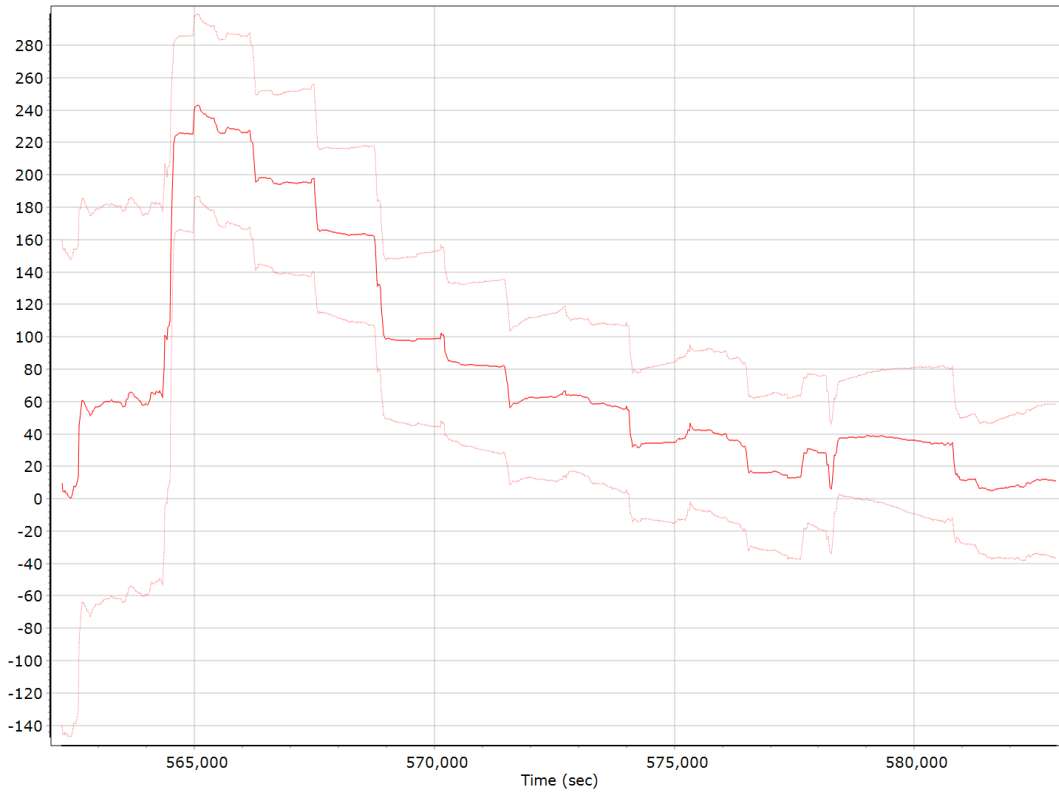
Gyro Scale Error (ppm)



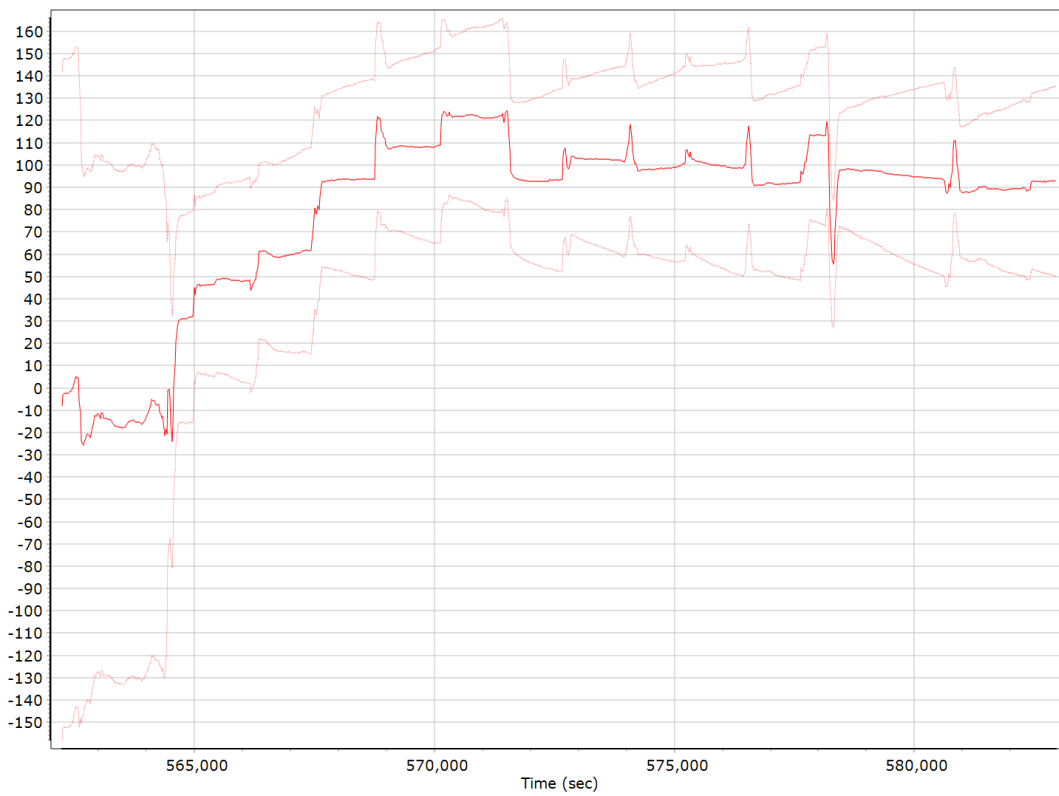
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

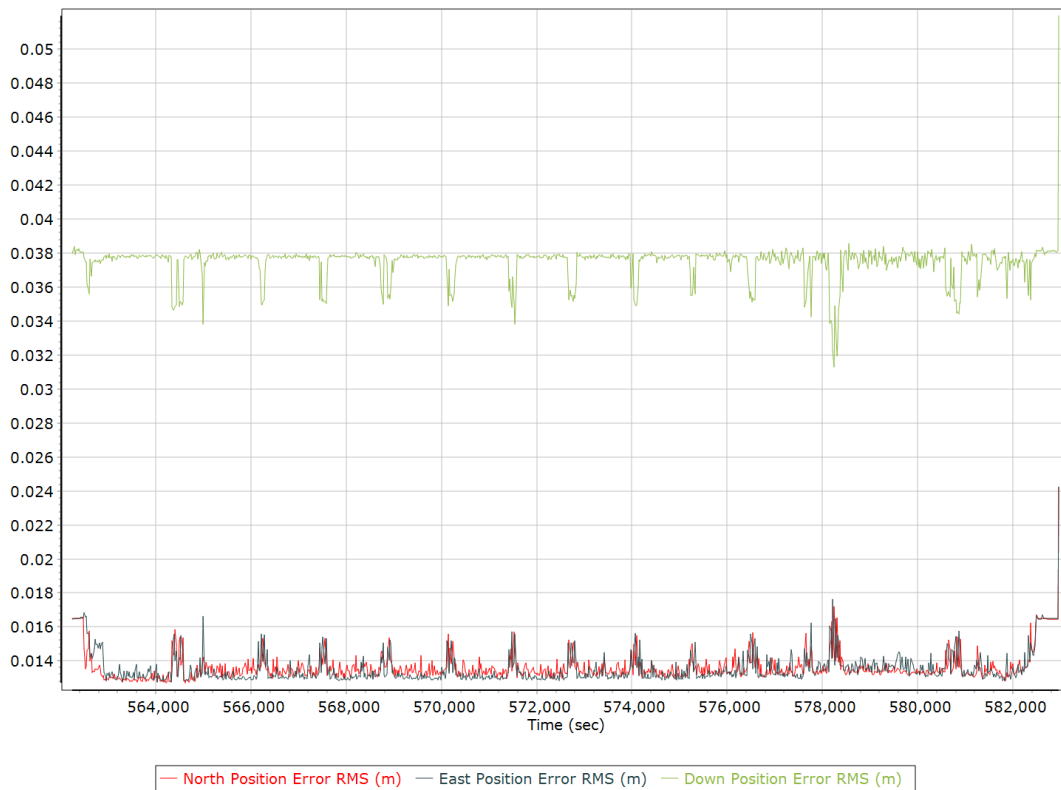


Z Gyro Scale Error (ppm)

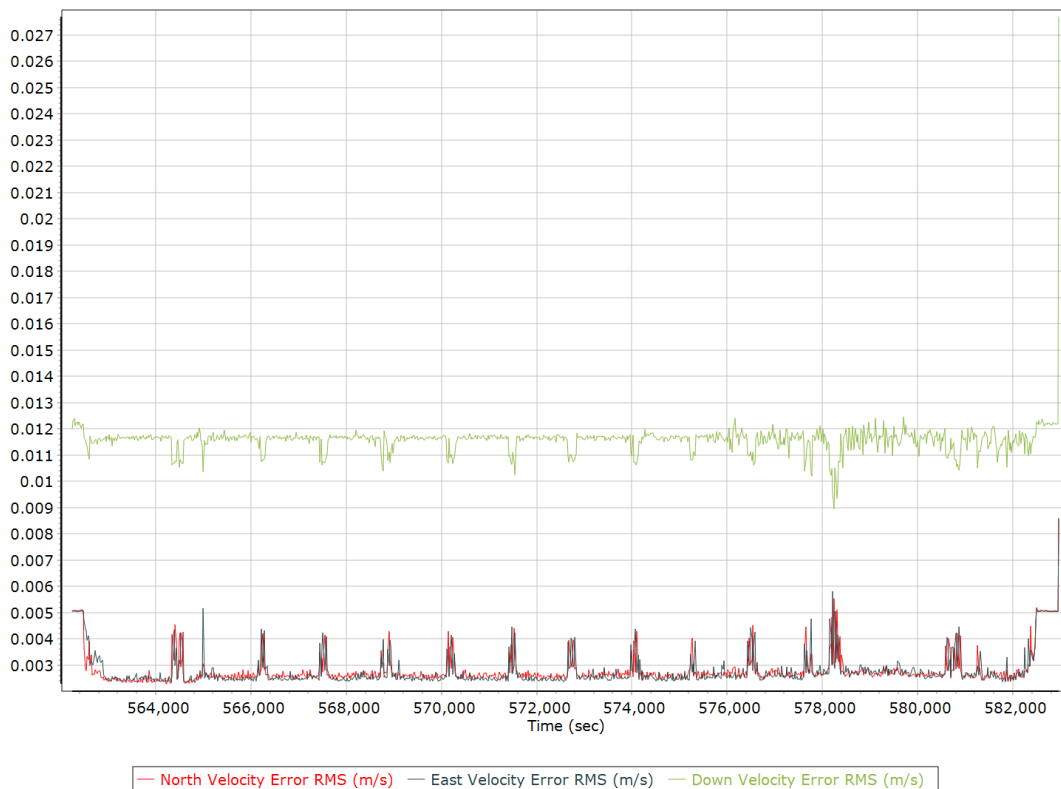


Smoothed Performance Metrics

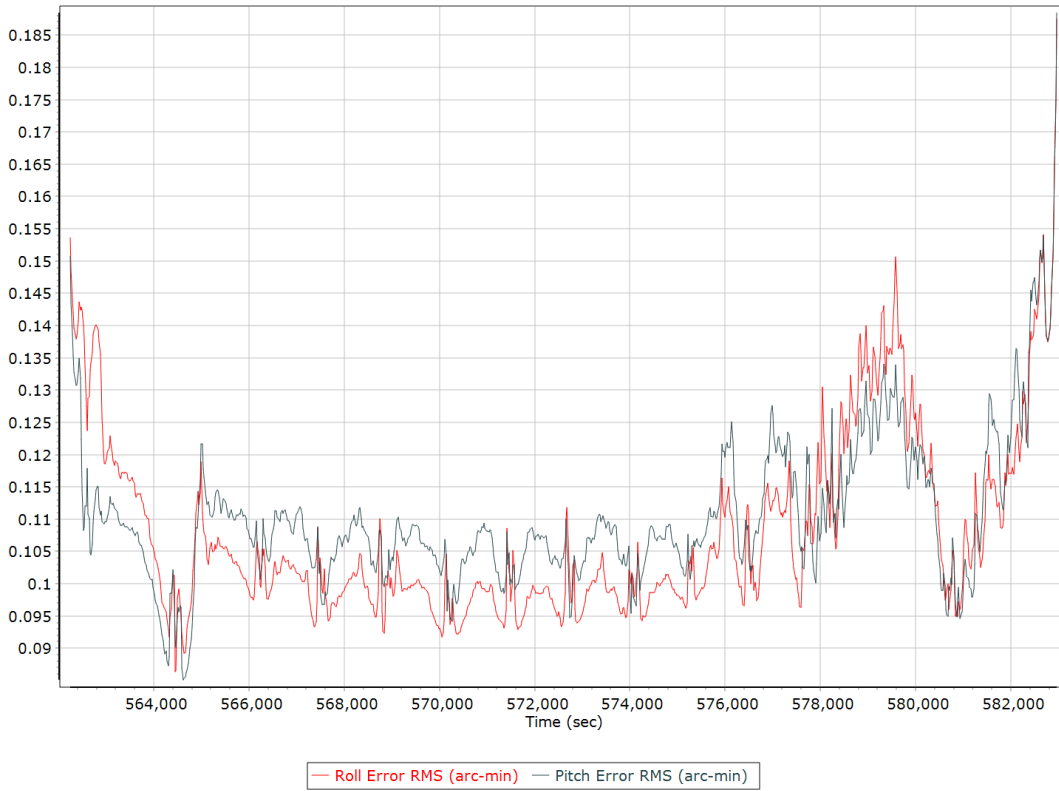
Position Error RMS (m)



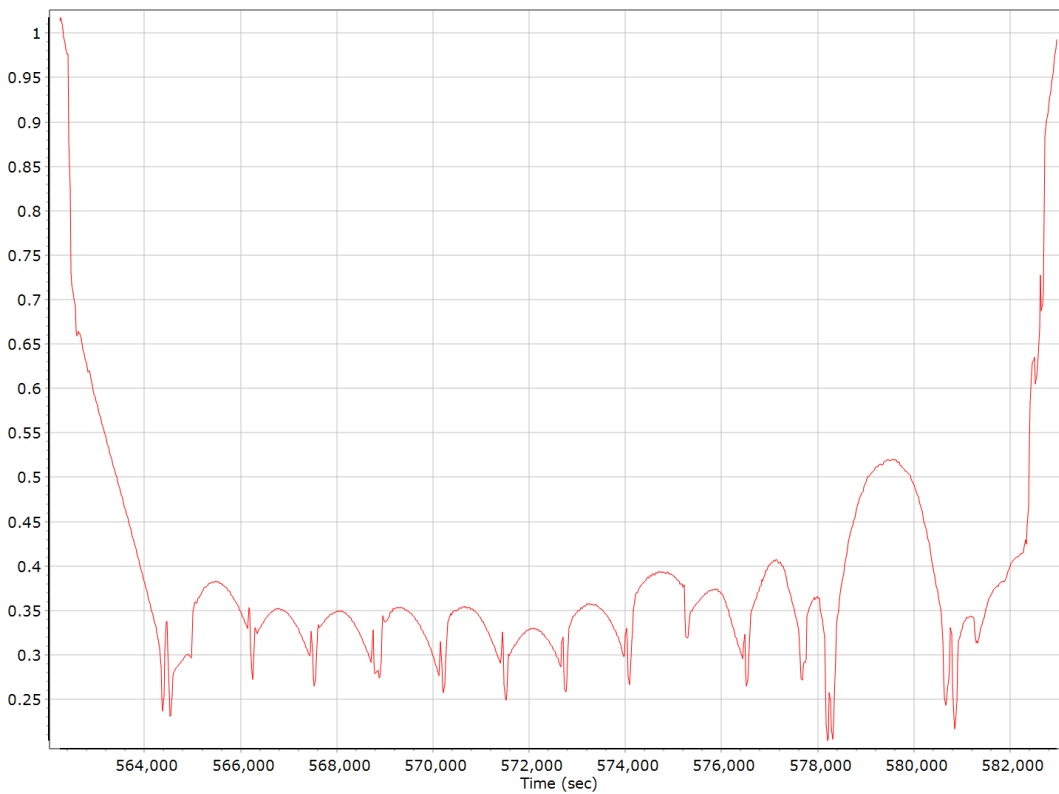
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

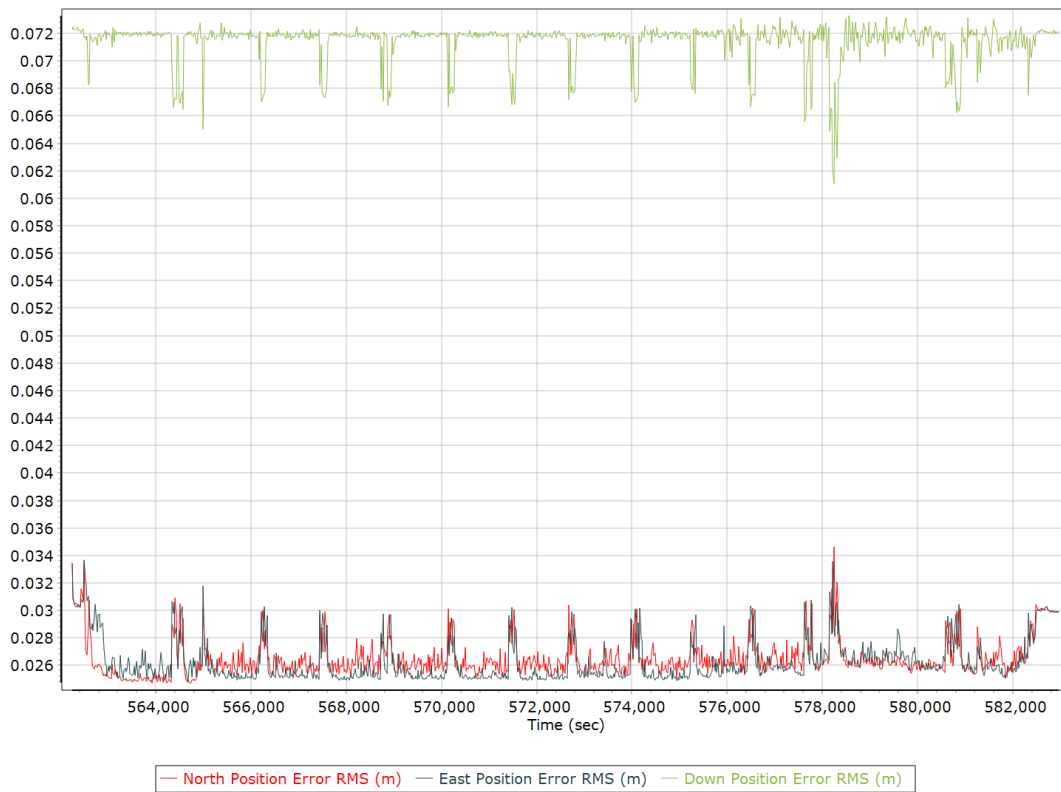


Heading Error RMS (arc-min)



Forward Processed Performance Metrics

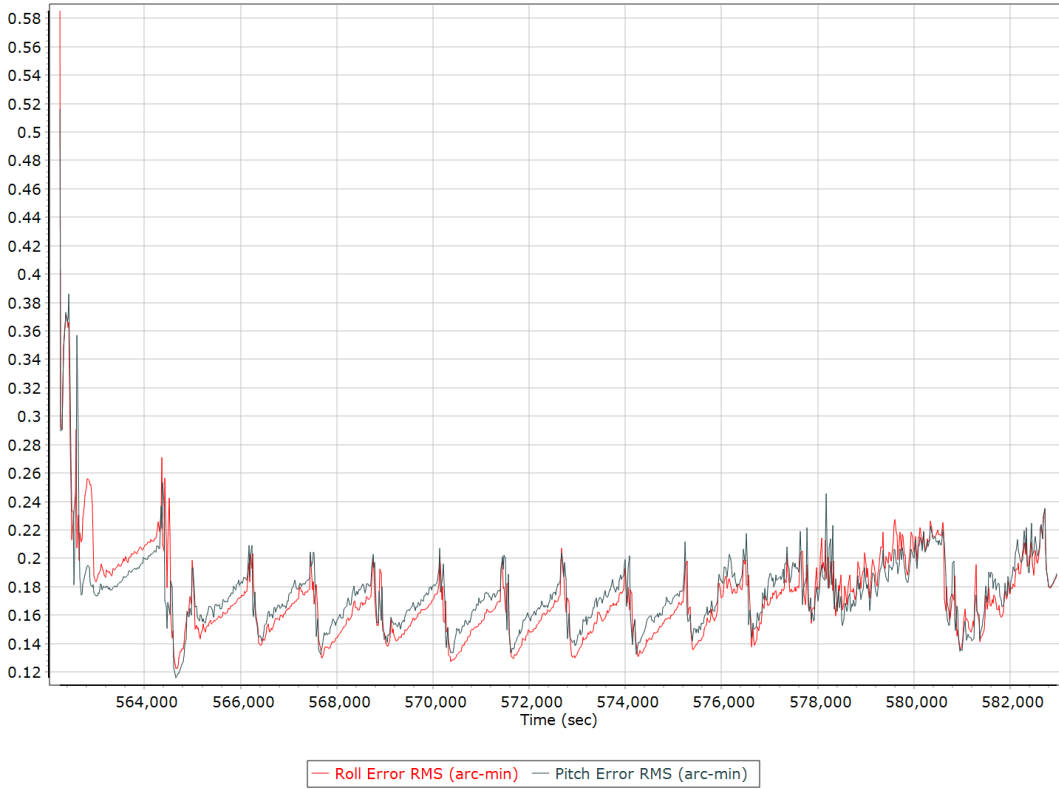
Position Error RMS (m)



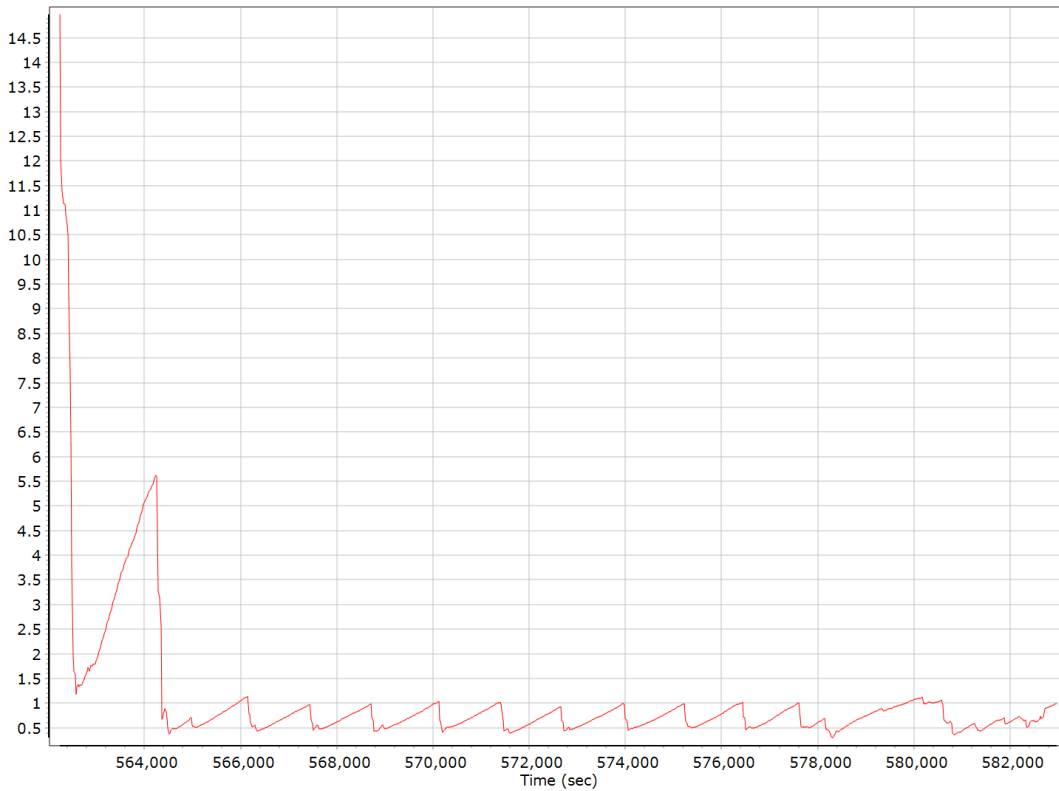
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

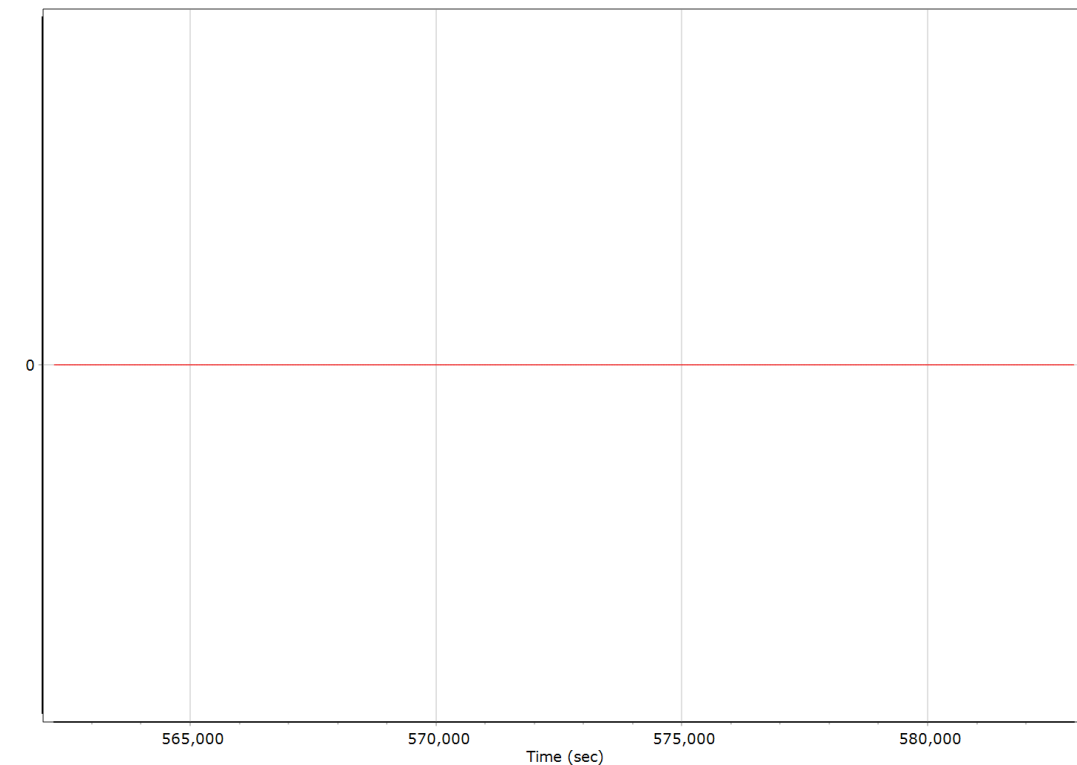


Heading Error RMS (arc-min)



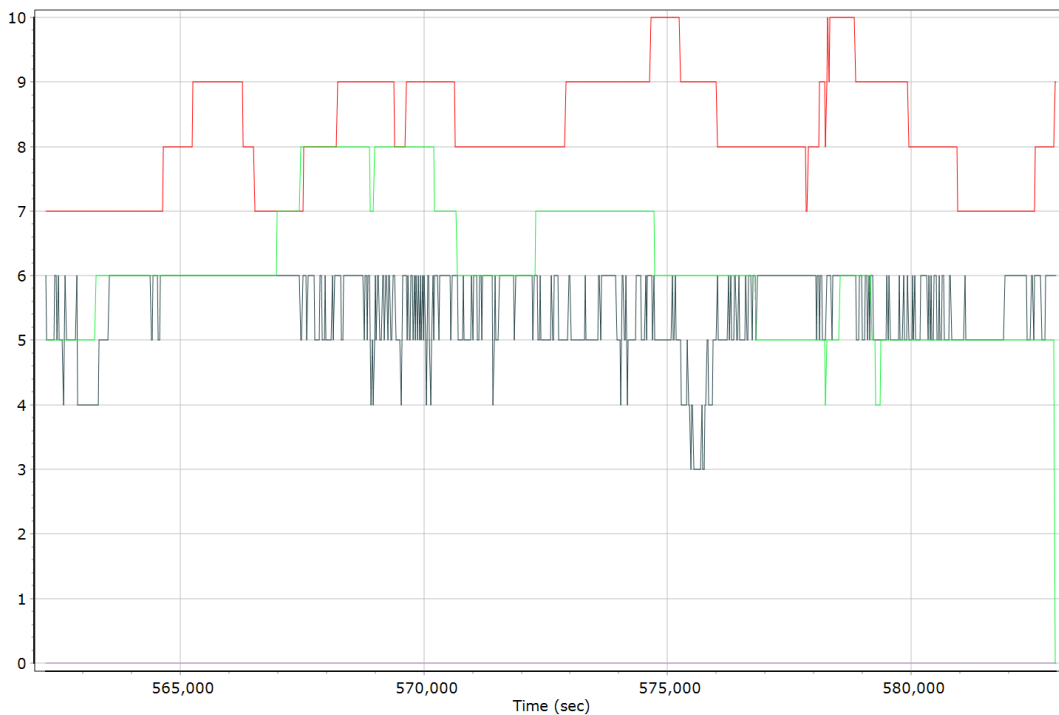
Forward Processed Solution Status

Processing Mode



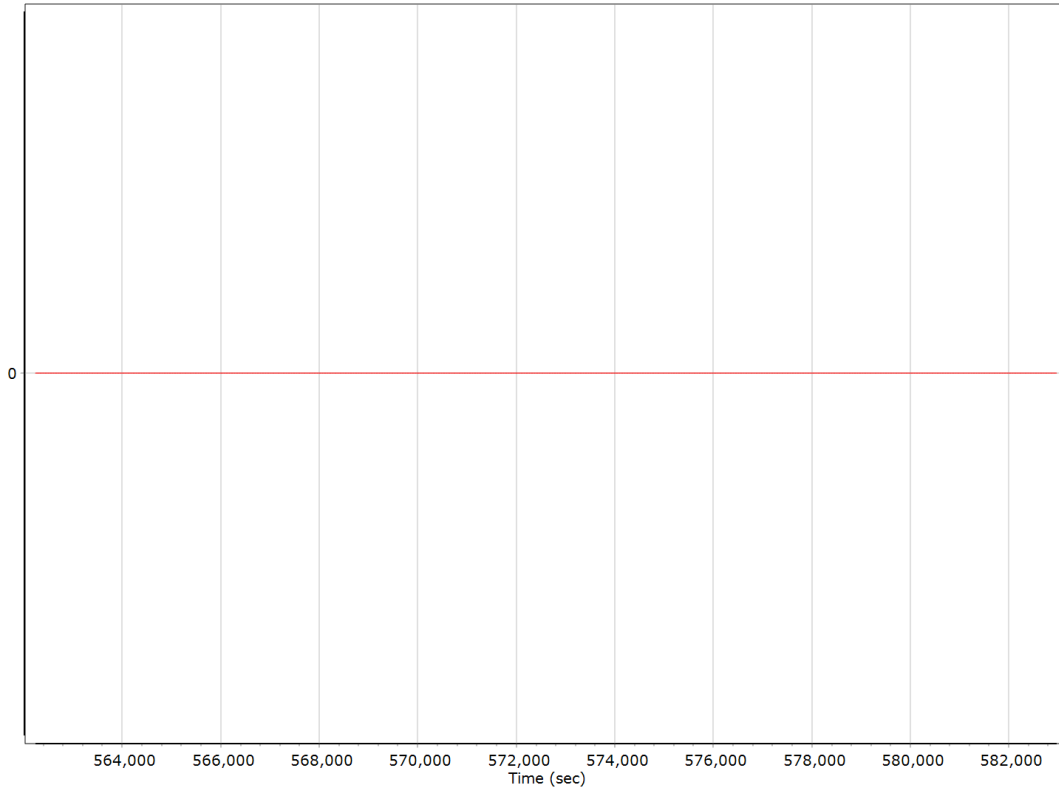
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites — Number of GLONASS Satellites — Number of QZSS Satellites
 — Number of BEIDOU Satellites — Number of GALILEO Satellites

Baseline Length



General Information

Mission Information

Project name	05152022A_3543
Processing date	2022-05-18 11:30:48
Mission date	2022-05-15 12:03:24
Mission duration	05:47:35.043
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9683
IMU type	57
Receiver type	BD982
Antenna type	AV59

Project File List

Rover Data Files

File name	File type
N62756178.071	POS Data
N62756178.072	POS Data
N62756178.073	POS Data
N62756178.074	POS Data
N62756178.075	POS Data
N62756178.076	POS Data
N62756178.077	POS Data
N62756178.078	POS Data
N62756178.079	POS Data
N62756178.080	POS Data
N62756178.081	POS Data
N62756178.082	POS Data
N62756178.083	POS Data
N62756178.084	POS Data
N62756178.085	POS Data
N62756178.086	POS Data
N62756178.087	POS Data
N62756178.088	POS Data
N62756178.089	POS Data
N62756178.090	POS Data
N62756178.091	POS Data
N62756178.092	POS Data
N62756178.093	POS Data
N62756178.094	POS Data
N62756178.095	POS Data
N62756178.096	POS Data
N62756178.097	POS Data
N62756178.098	POS Data
N62756178.099	POS Data
N62756178.100	POS Data
N62756178.101	POS Data
N62756178.102	POS Data
N62756178.103	POS Data
N62756178.104	POS Data
N62756178.105	POS Data
N62756178.106	POS Data
N62756178.107	POS Data
N62756178.108	POS Data
N62756178.109	POS Data
N62756178.110	POS Data
N62756178.111	POS Data
N62756178.112	POS Data
N62756178.113	POS Data
N62756178.114	POS Data
N62756178.115	POS Data
N62756178.116	POS Data
N62756178.117	POS Data
N62756178.118	POS Data
N62756178.119	POS Data
N62756178.120	POS Data
N62756178.121	POS Data
N62756178.122	POS Data
N62756178.123	POS Data
N62756178.124	POS Data
N62756178.125	POS Data
N62756178.126	POS Data
N62756178.127	POS Data
N62756178.128	POS Data
N62756178.129	POS Data

File name	File type
N62756178.130	POS Data
N62756178.131	POS Data
N62756178.132	POS Data
N62756178.133	POS Data
N62756178.134	POS Data
N62756178.135	POS Data

Input Files

File Name	File Type
Ephm1350.22g	GLONASS Broadcast Ephemeris
Ephm1350.22n	GPS Broadcast Ephemeris

Output Files

Filename	File type
sbet_05152022A_3543.out	SBET Trajectory File

Rover Data Summary

First raw data file	N62756178.071		
Last raw data file	N62756178.135		
Start GPS week	2210		
Start time	43385.864 (5/15/2022 12:03:05 PM)		
End time	64240.907 (5/15/2022 5:50:40 PM)		
Start of fine alignment	43661.053 (5/15/2022 12:07:41 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Gimbal to IMU lever arm (m)	-0.034	-0.010	-0.374
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.717	-0.178	-1.265
Gimbal to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

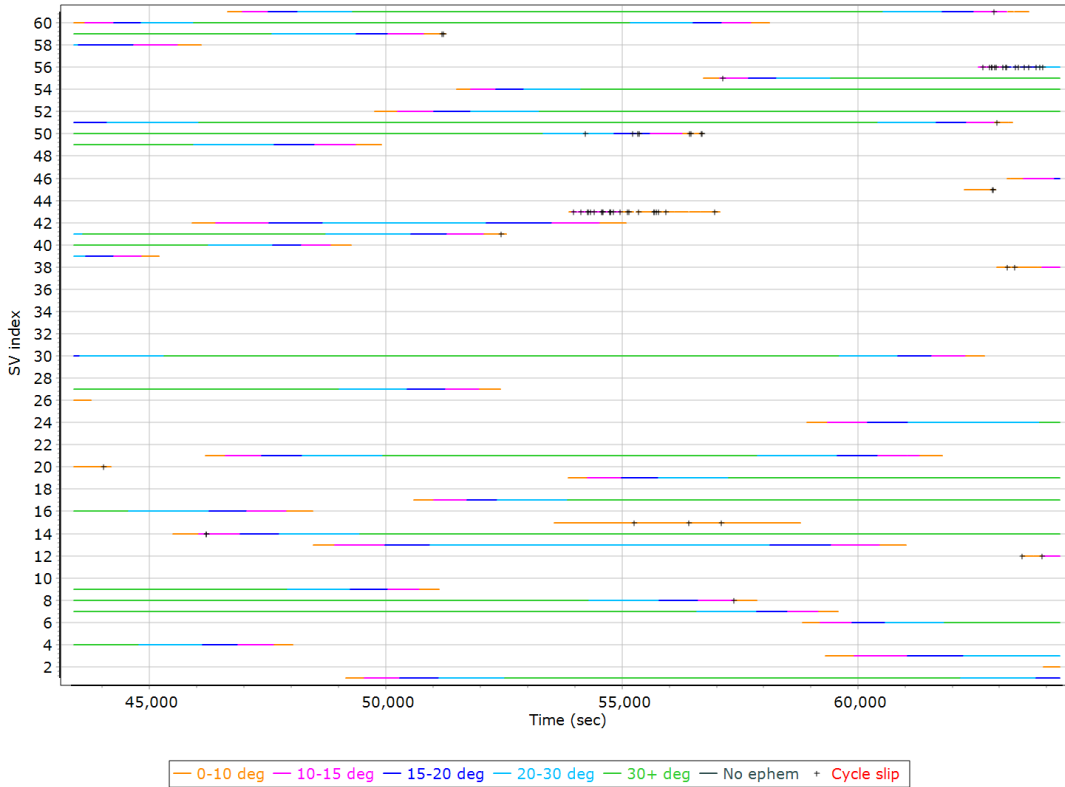
Rover Data QC

Raw IMU Import QC Summary

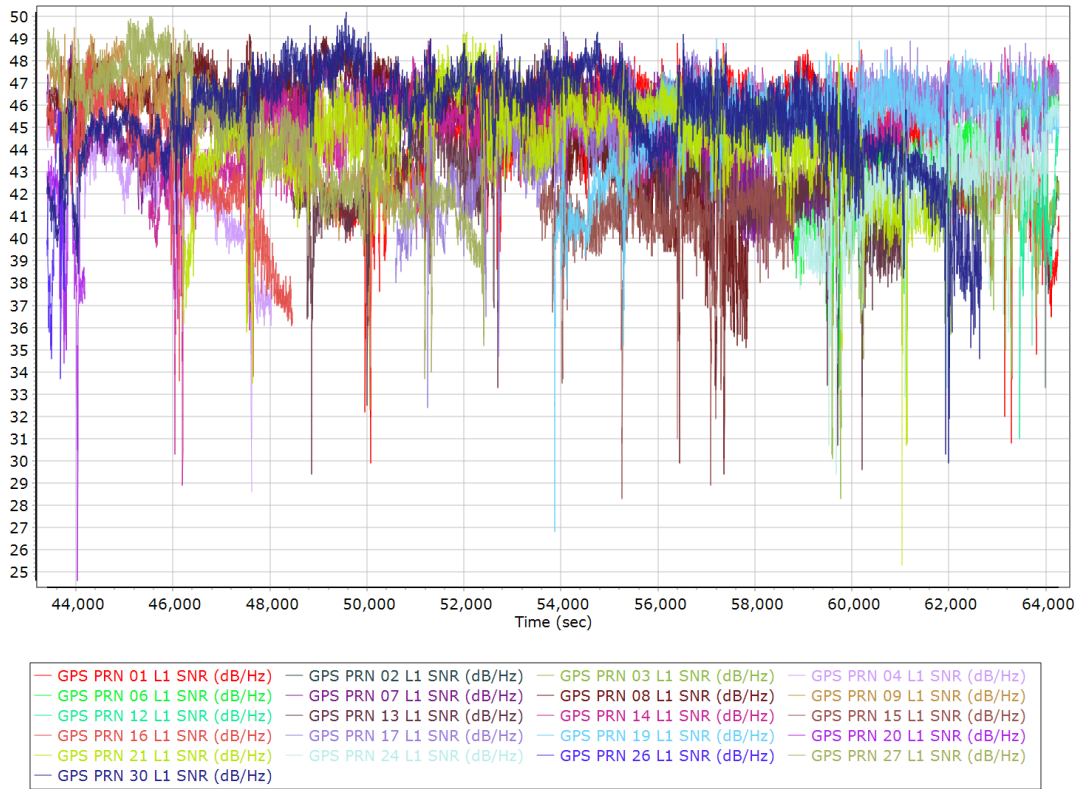
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05152022A_3543.log
IMU Records Processed	4170909
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

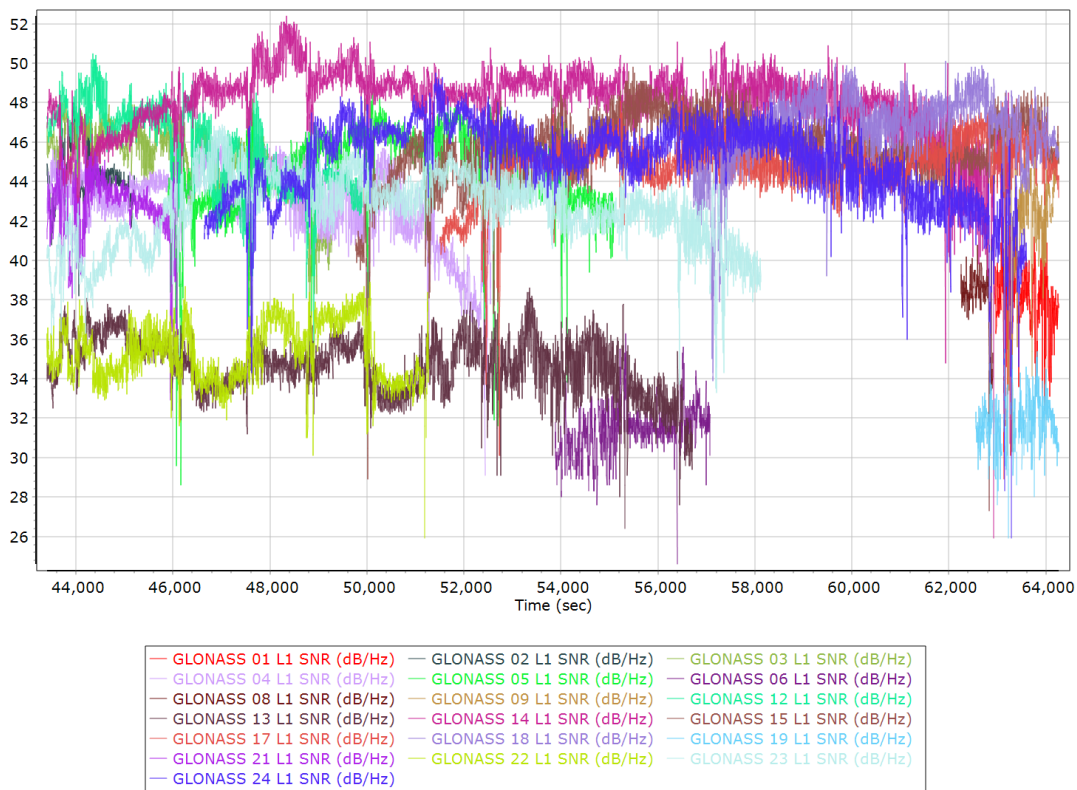
GPS/GLONASS L1 Satellite Lock/Elevation



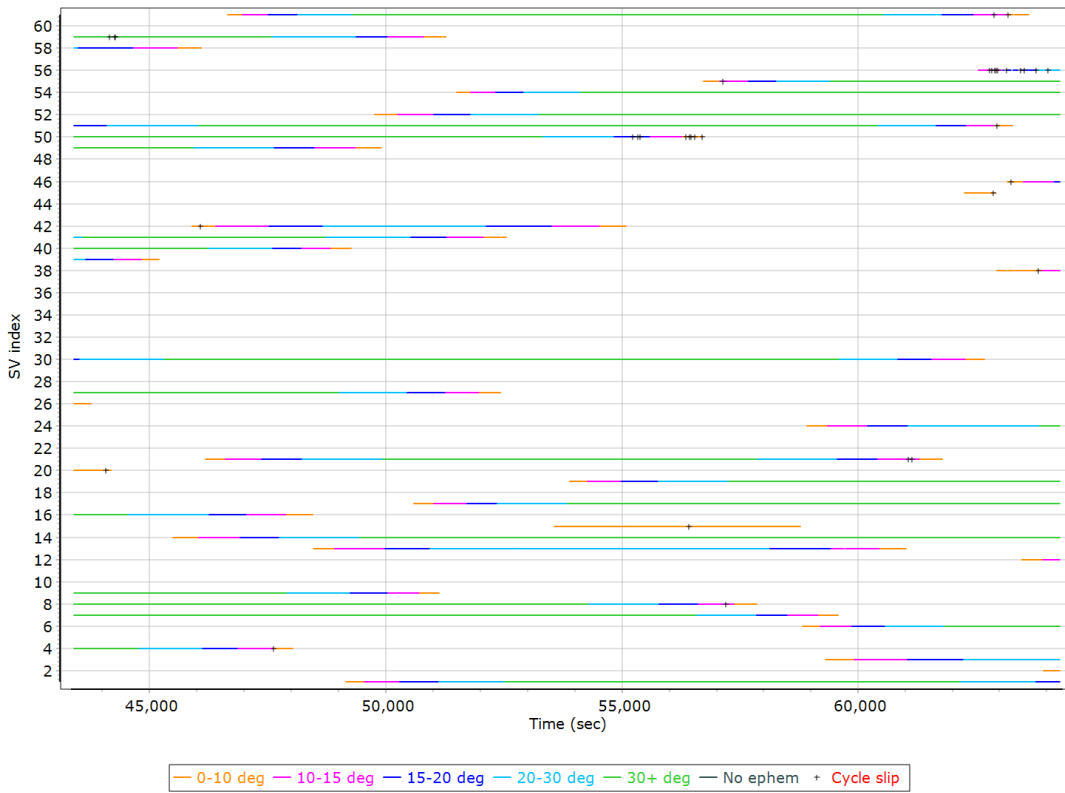
GPS L1 SNR



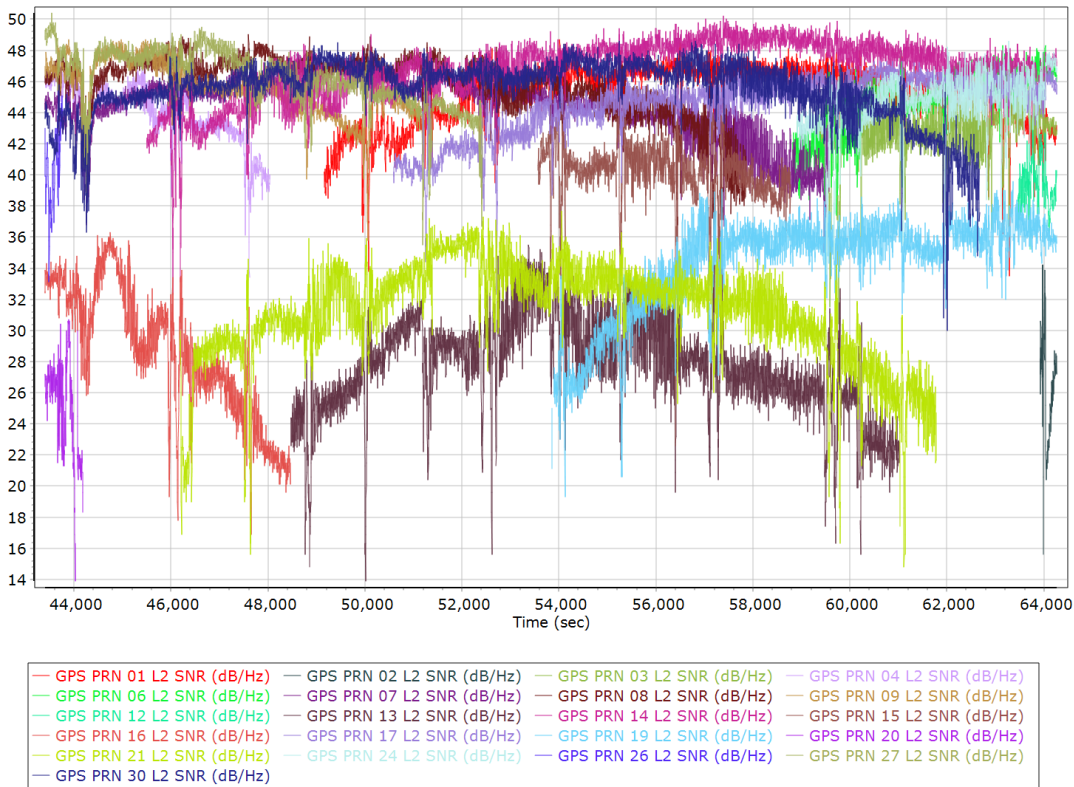
GLONASS L1 SNR



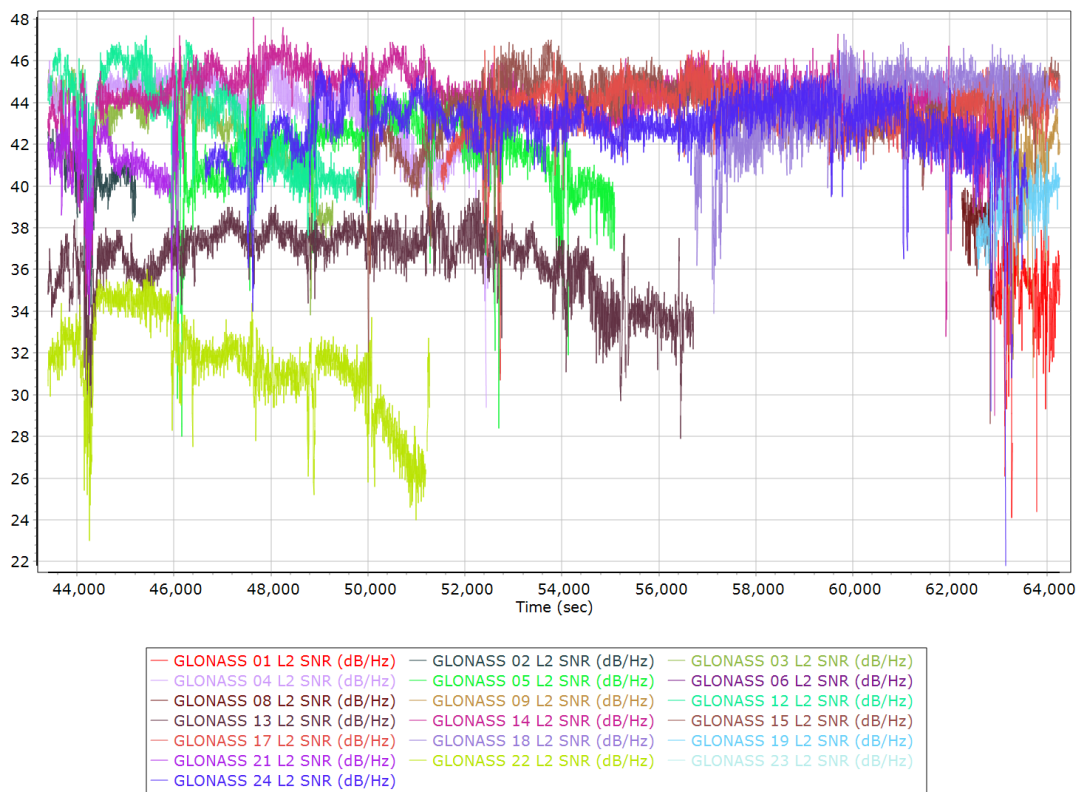
GPS/GLONASS L2 Satellite Lock/Elevation



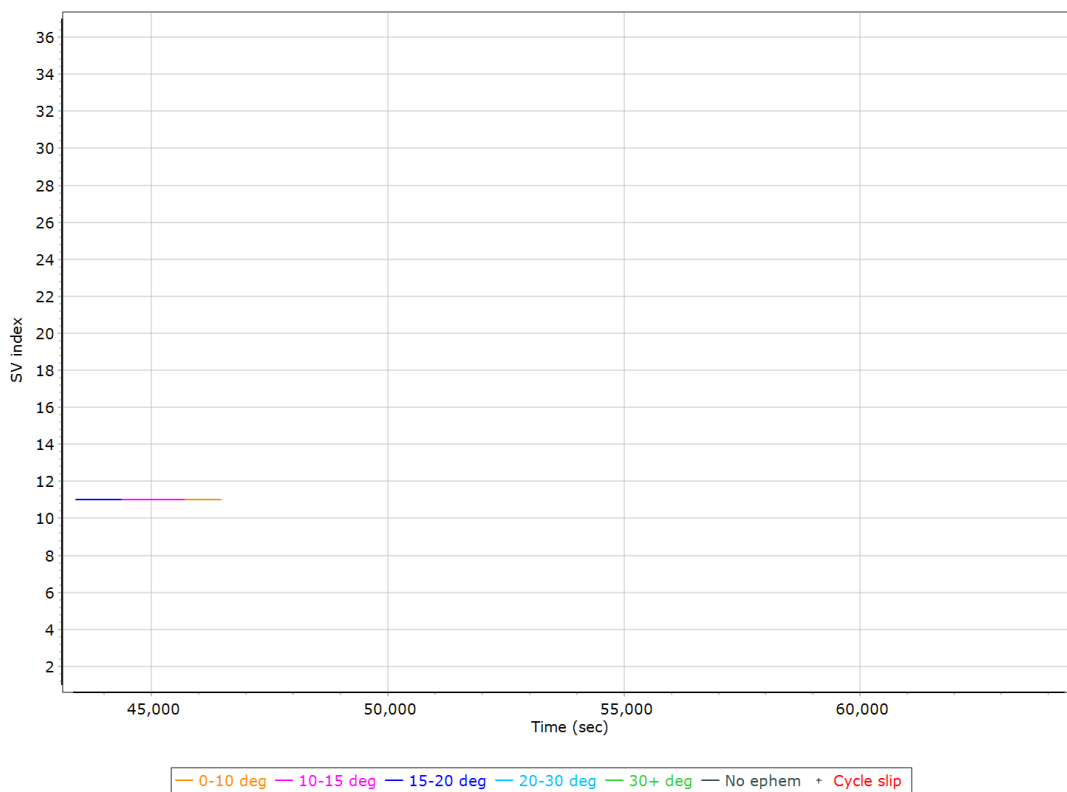
GPS L2 SNR



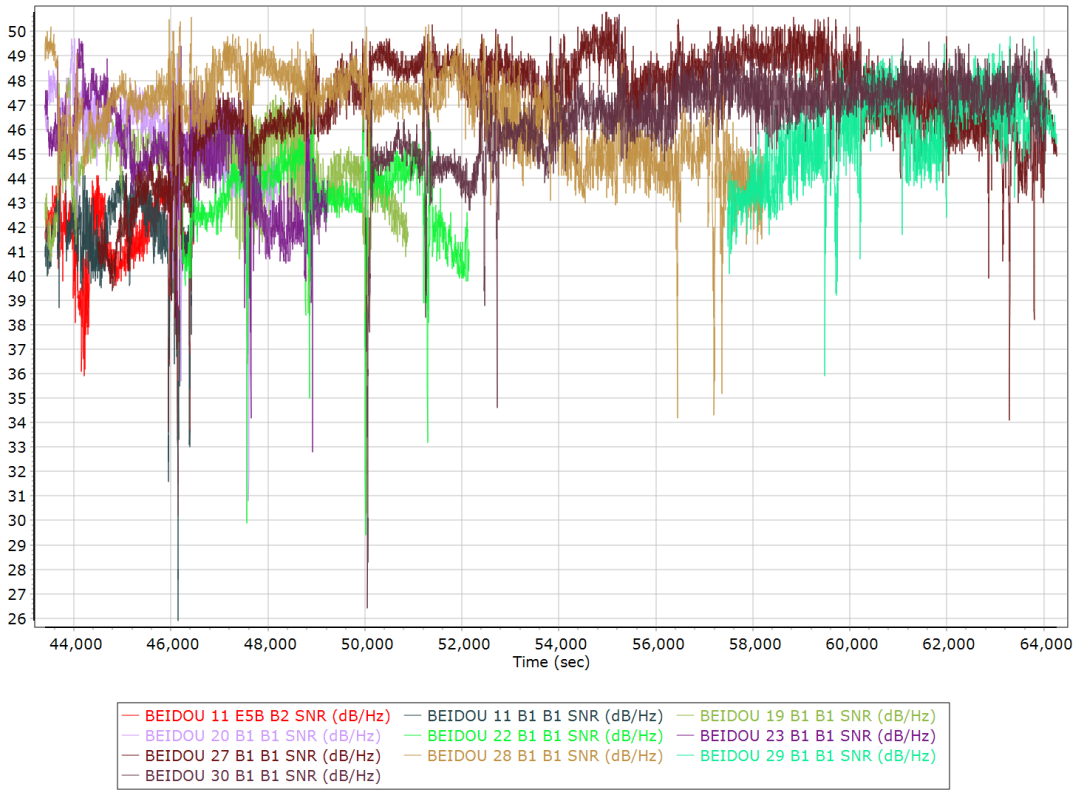
GLONASS L2 SNR



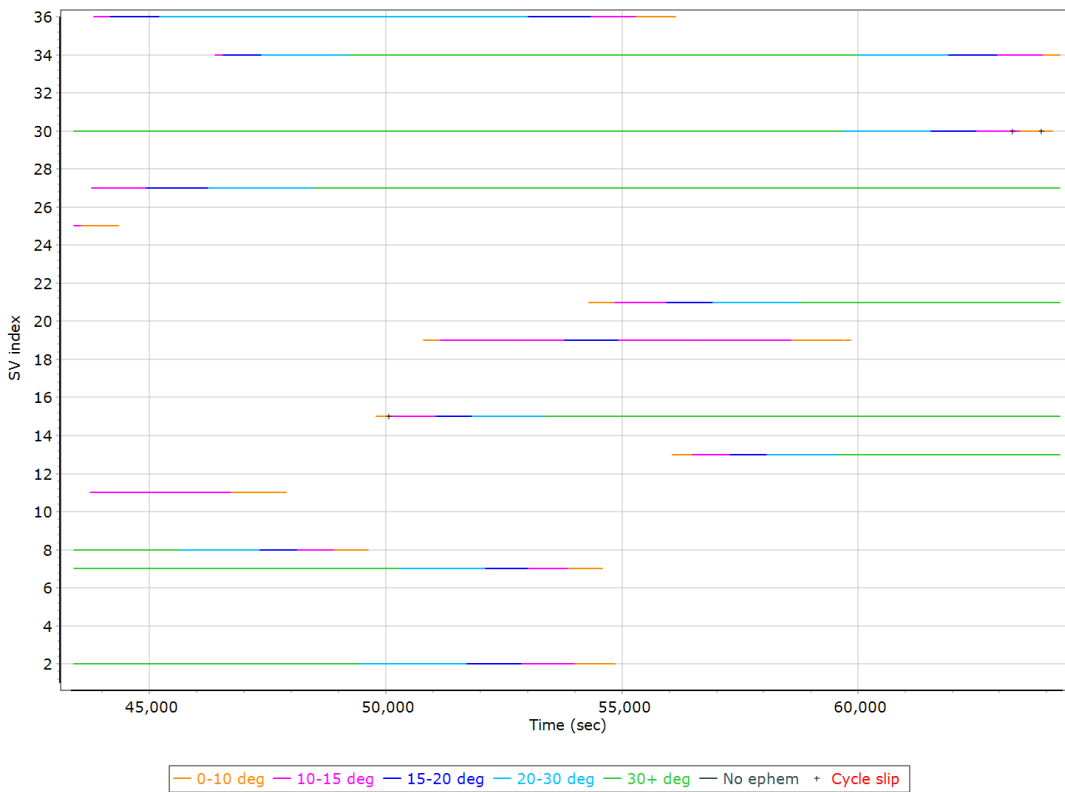
BEIDOU Satellite Lock/Elevation



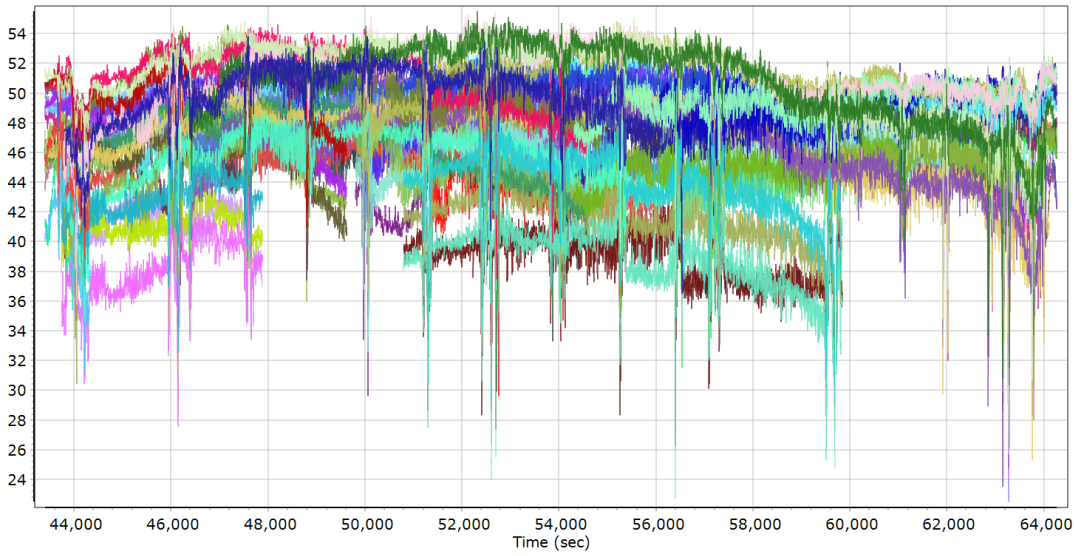
BEIDOU SNR



GALILEO Satellite Lock/Elevation



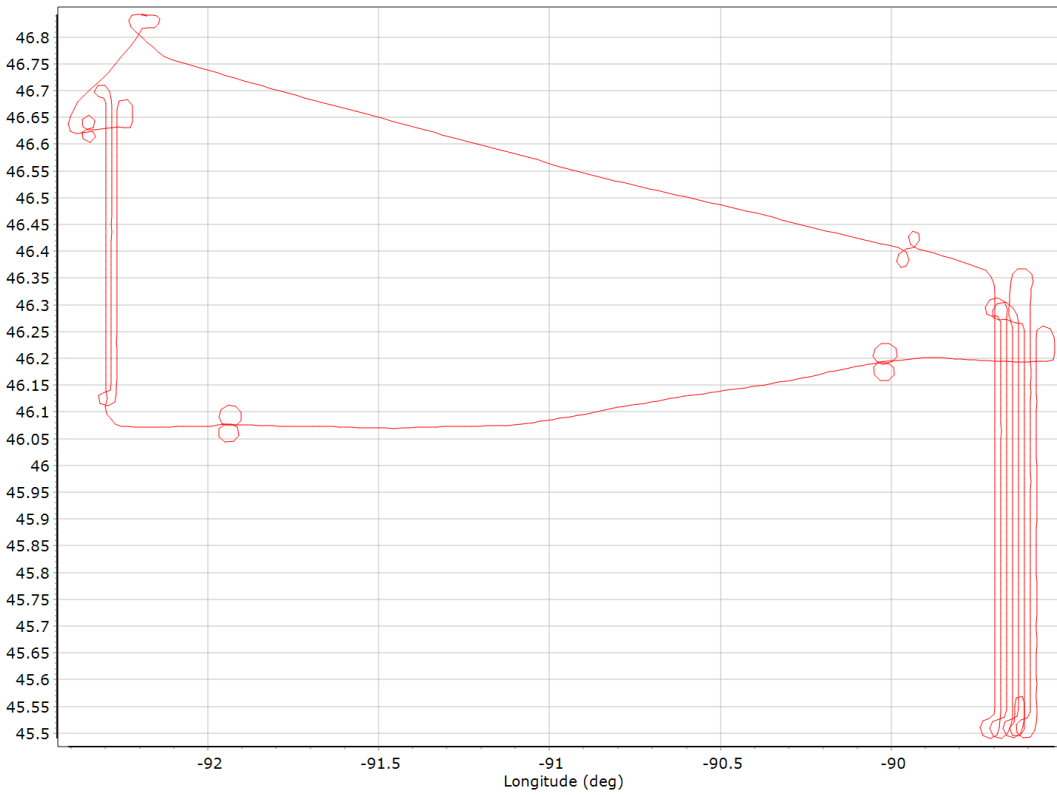
GALILEO SNR



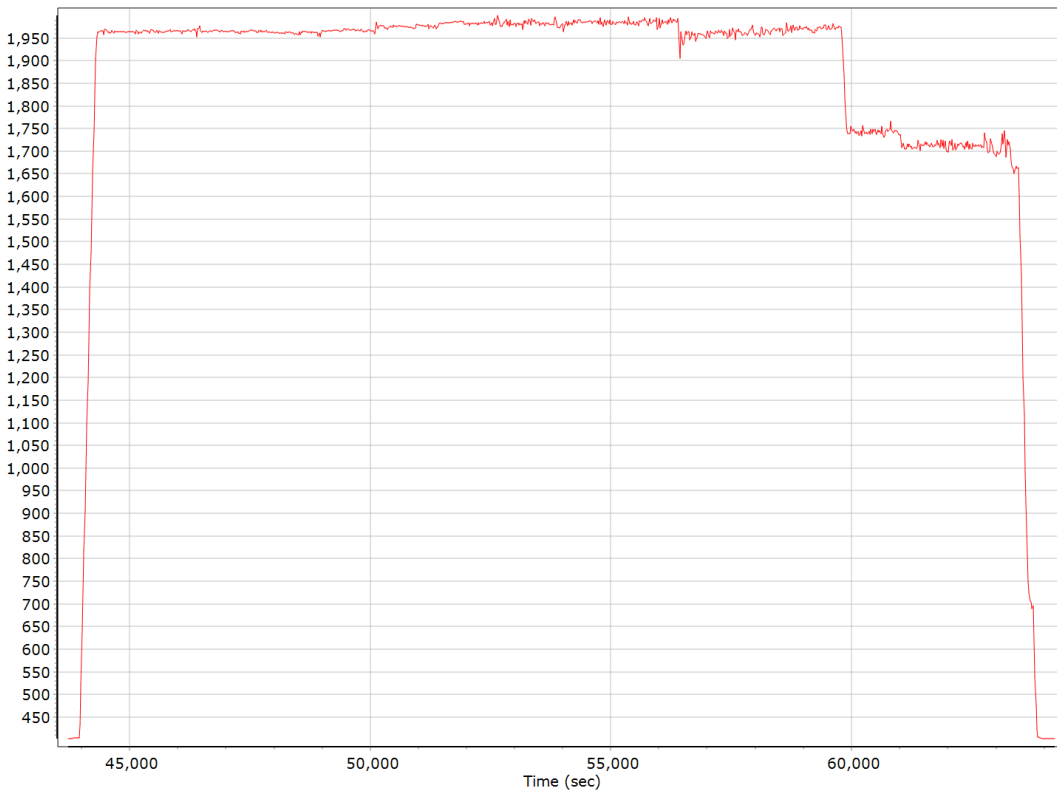
— GALILEO 02 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 07 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 08 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 25 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 27 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 30 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 34 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 36 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 02 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 07 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 08 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 11 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 13 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 15 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 19 L5E5A BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

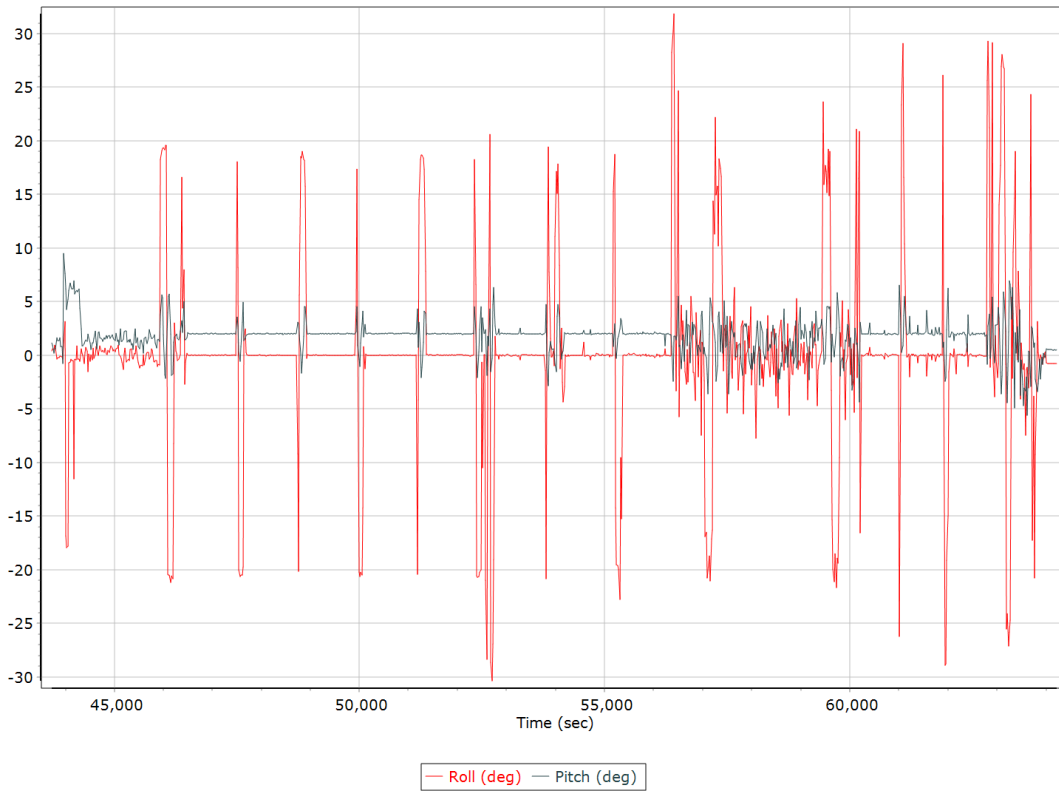
Top View



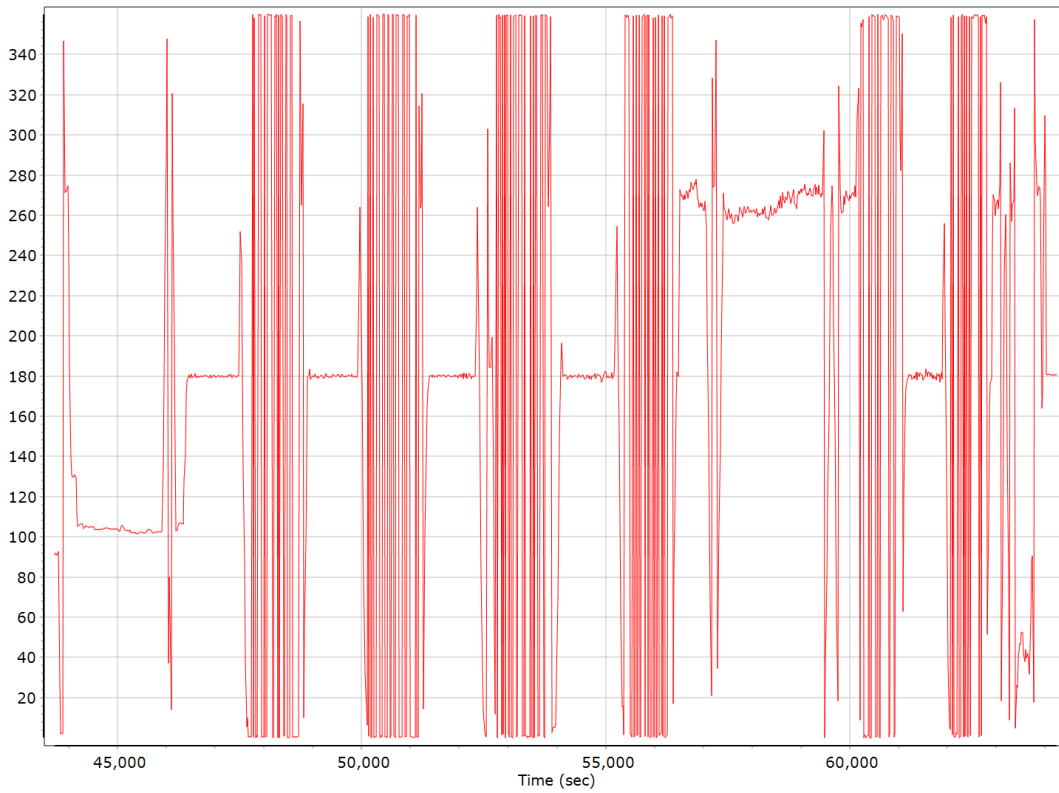
Altitude



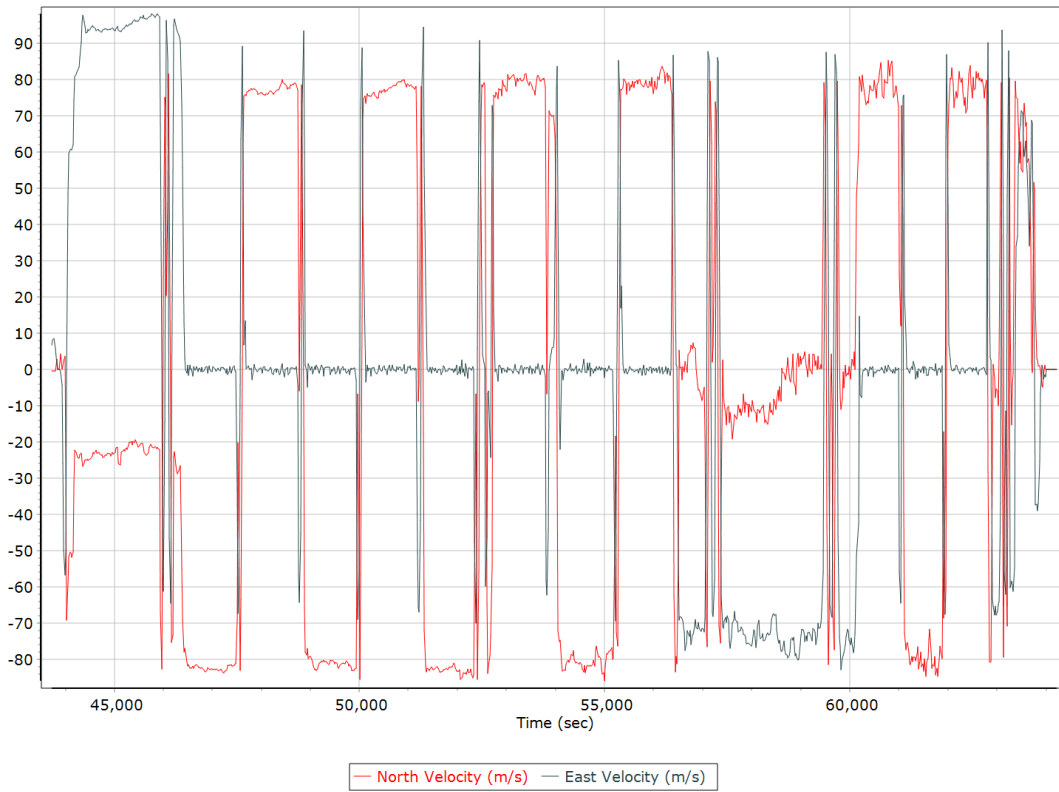
Roll/Pitch



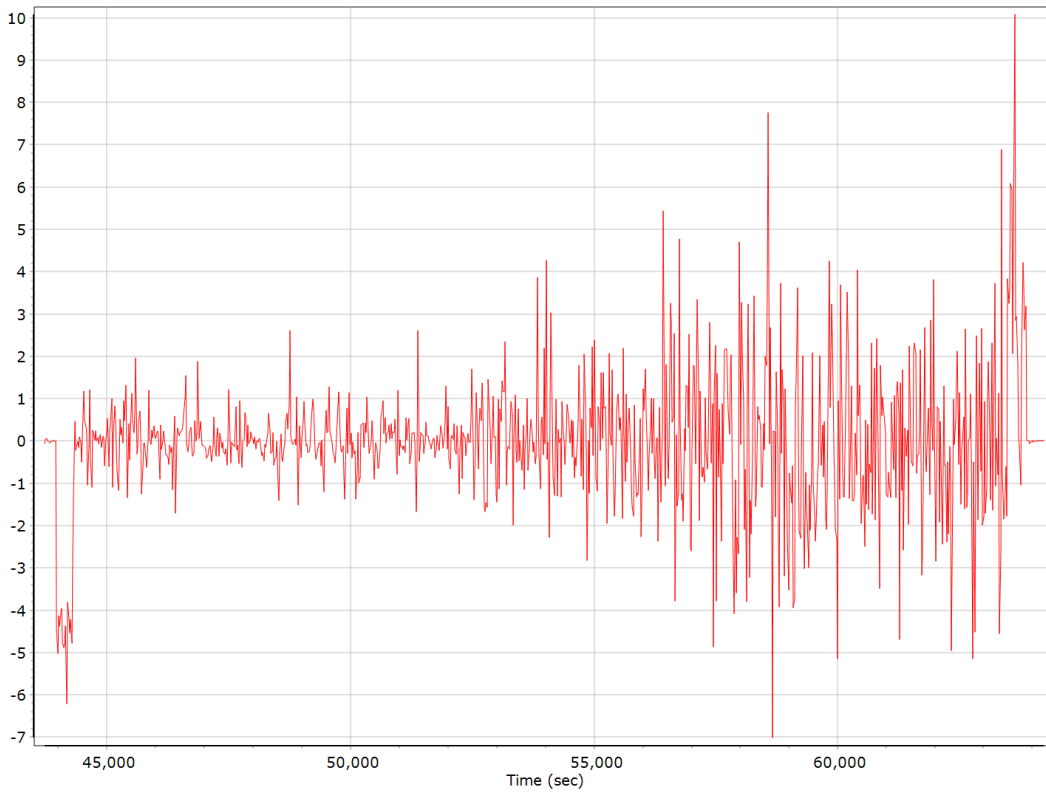
Heading



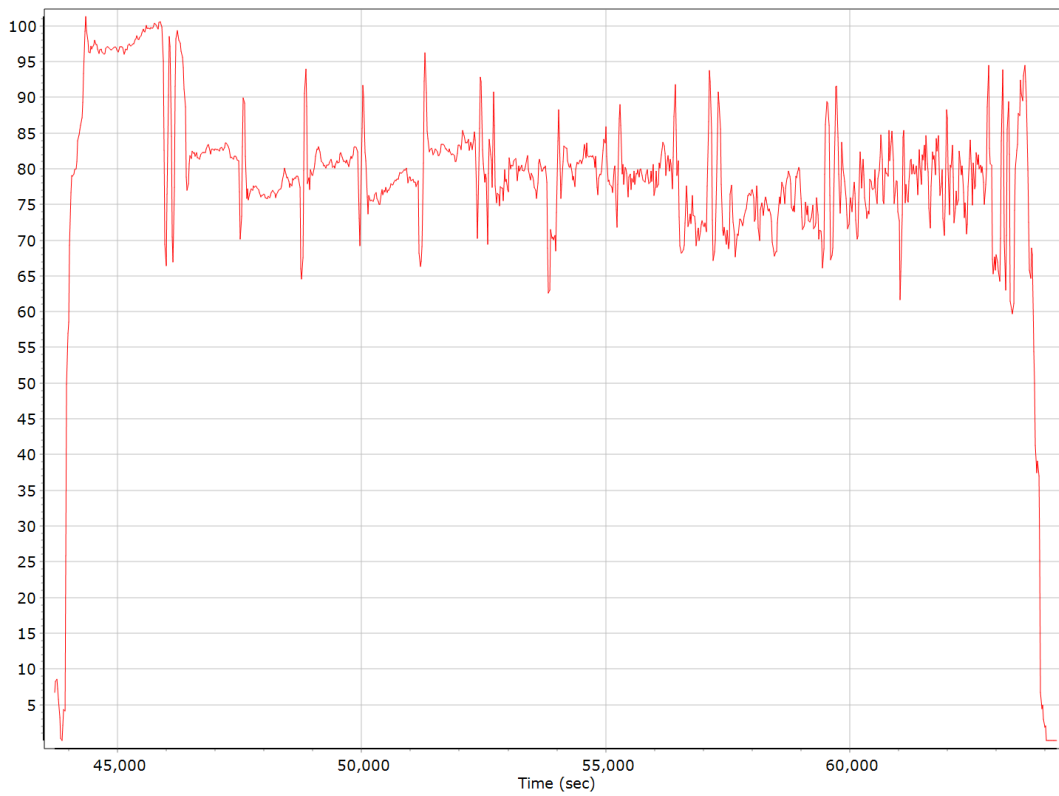
North/East Velocity



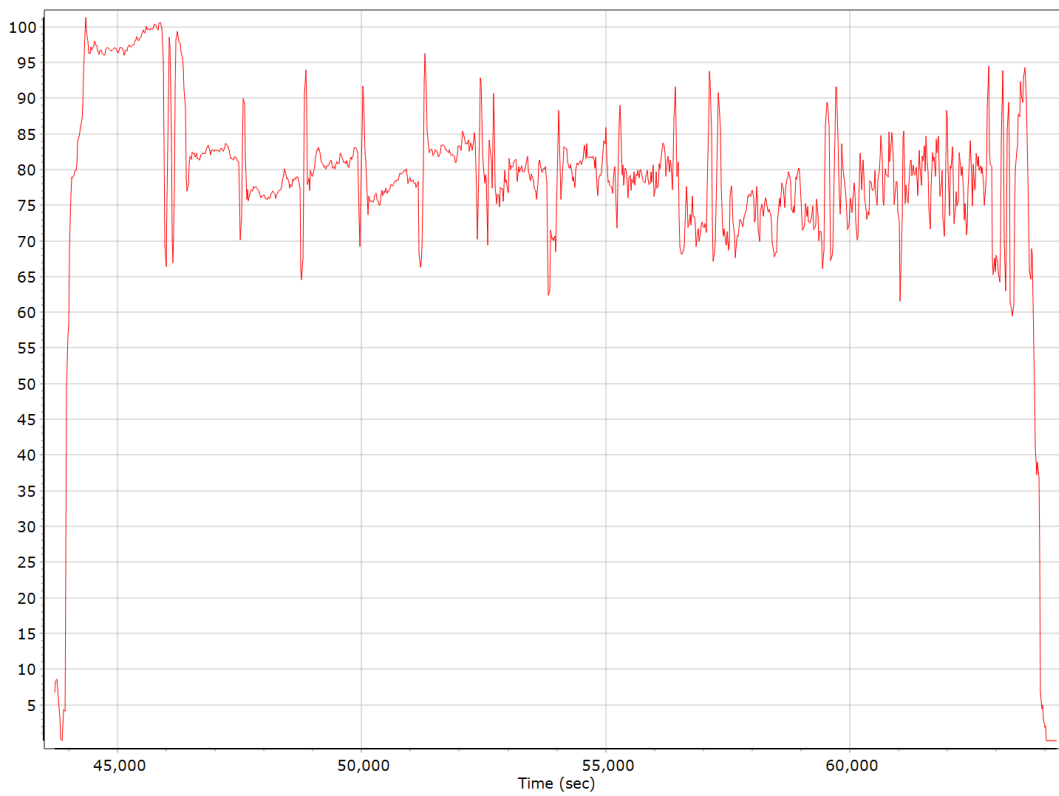
Down Velocity



Total Speed



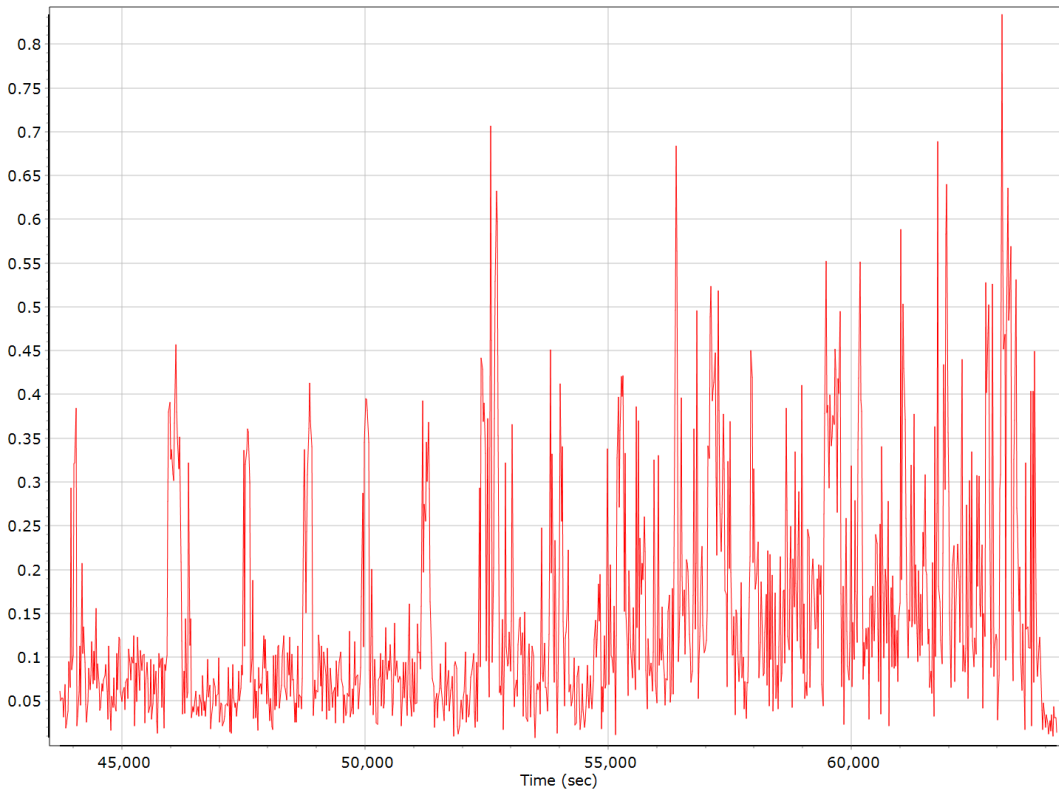
Ground Speed



Body Acceleration



Total Body Acceleration

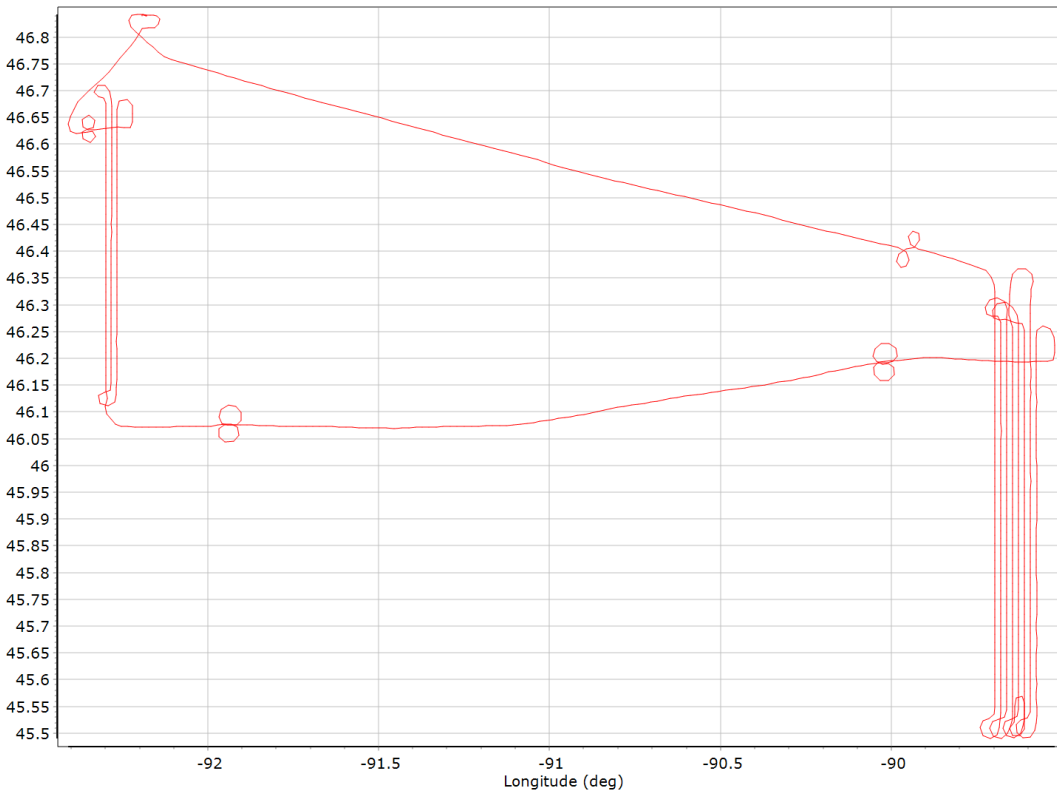


Body Angular Rate



Forward Processed Trajectory Information

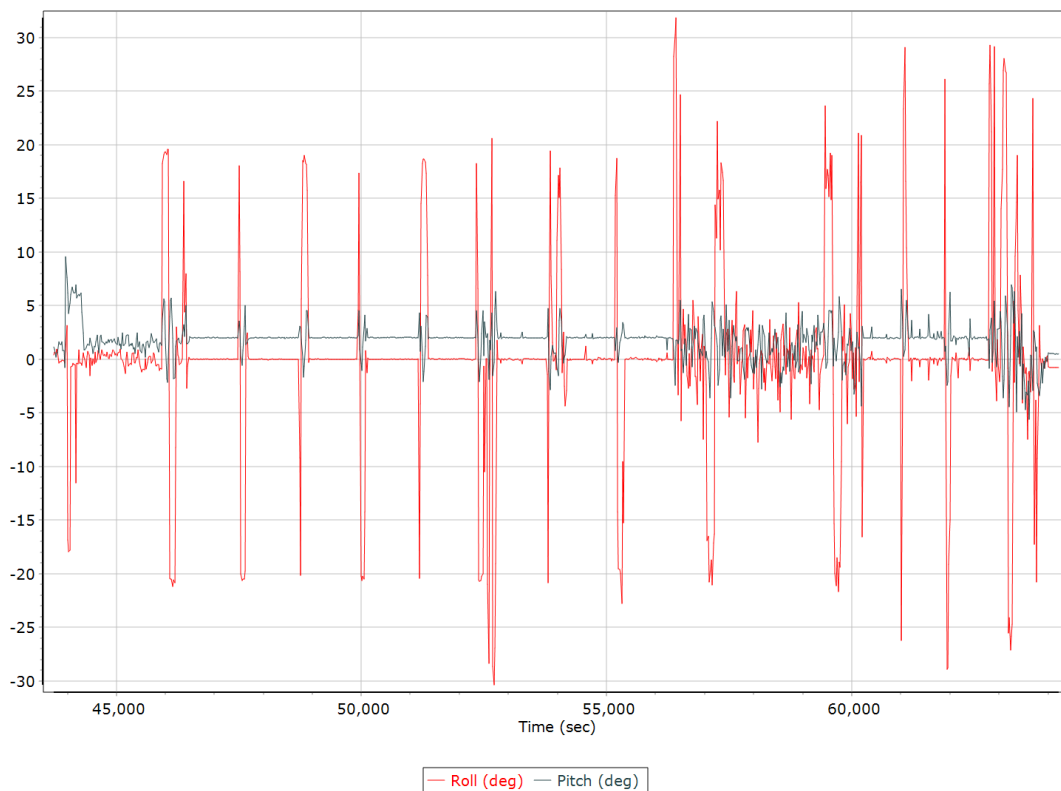
Top View



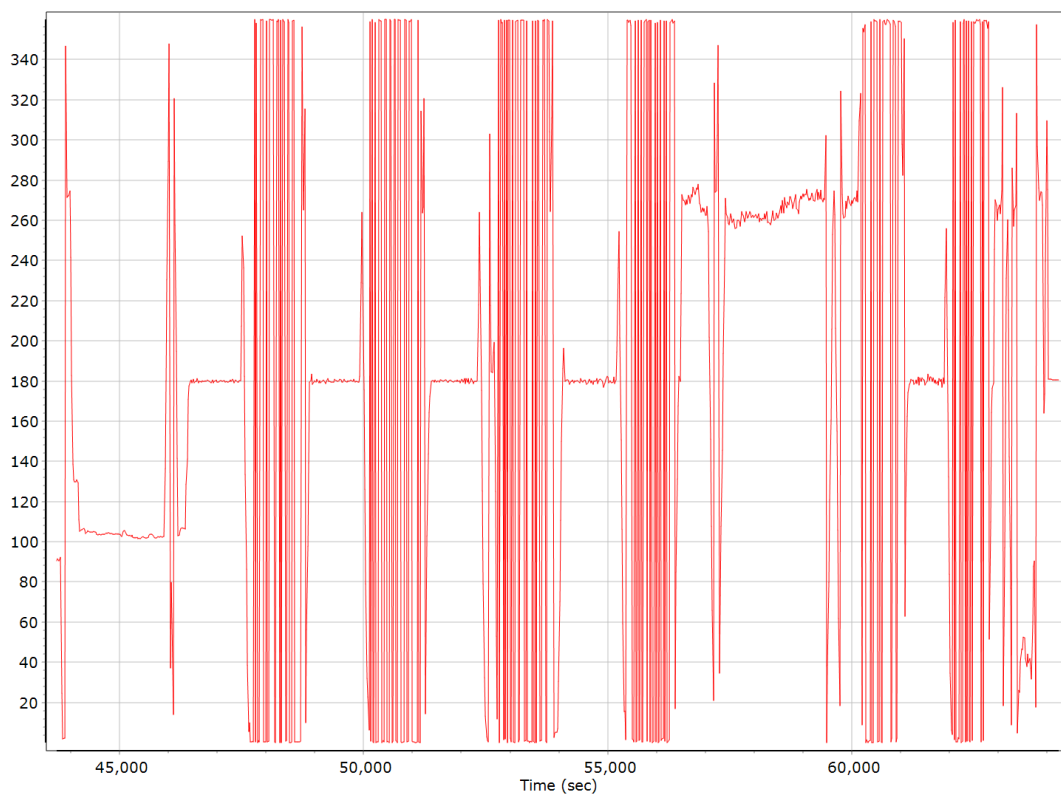
Altitude



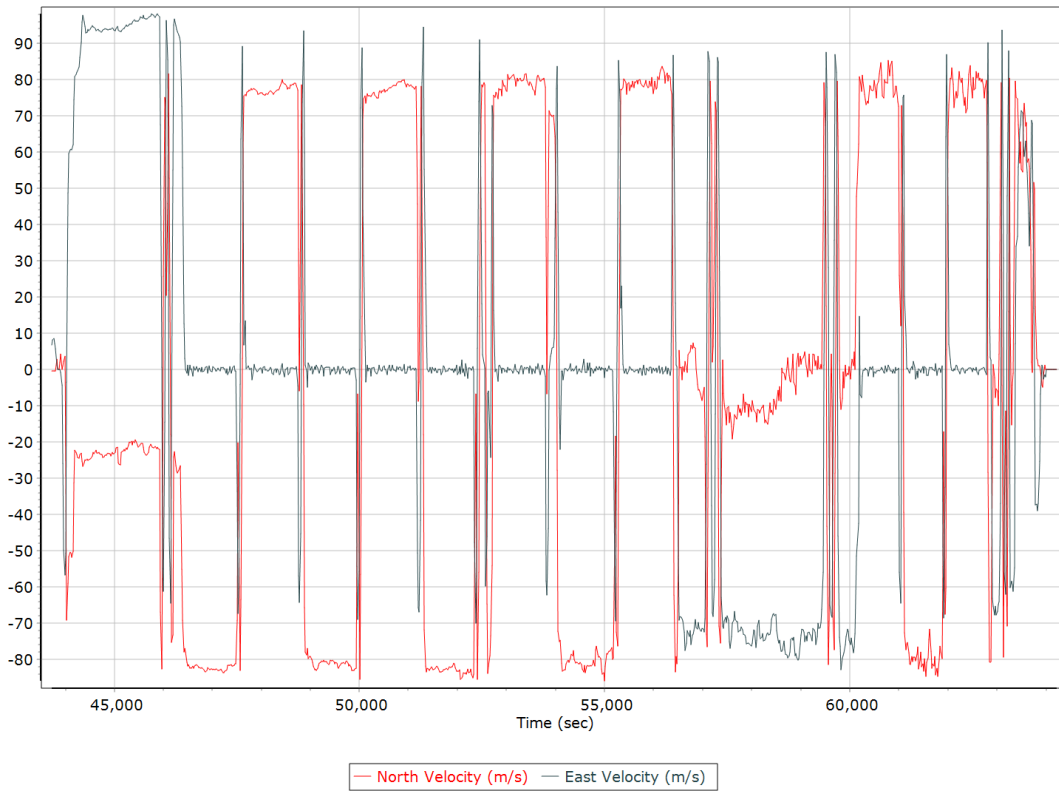
Roll/Pitch



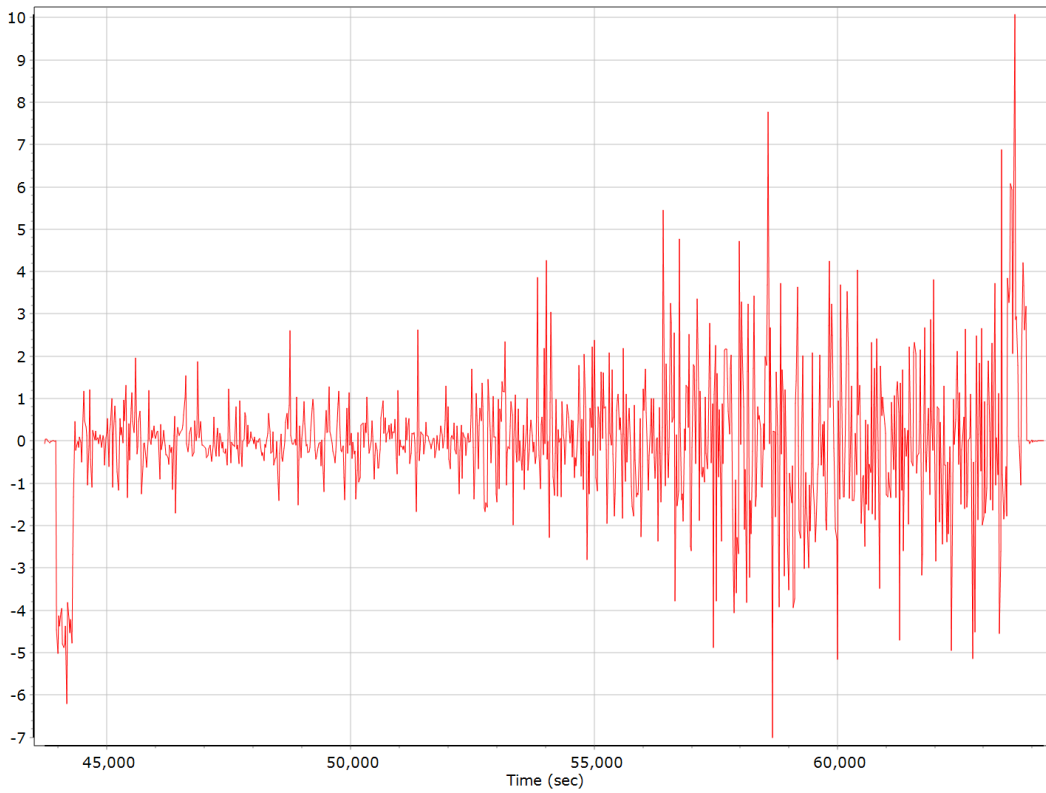
Heading



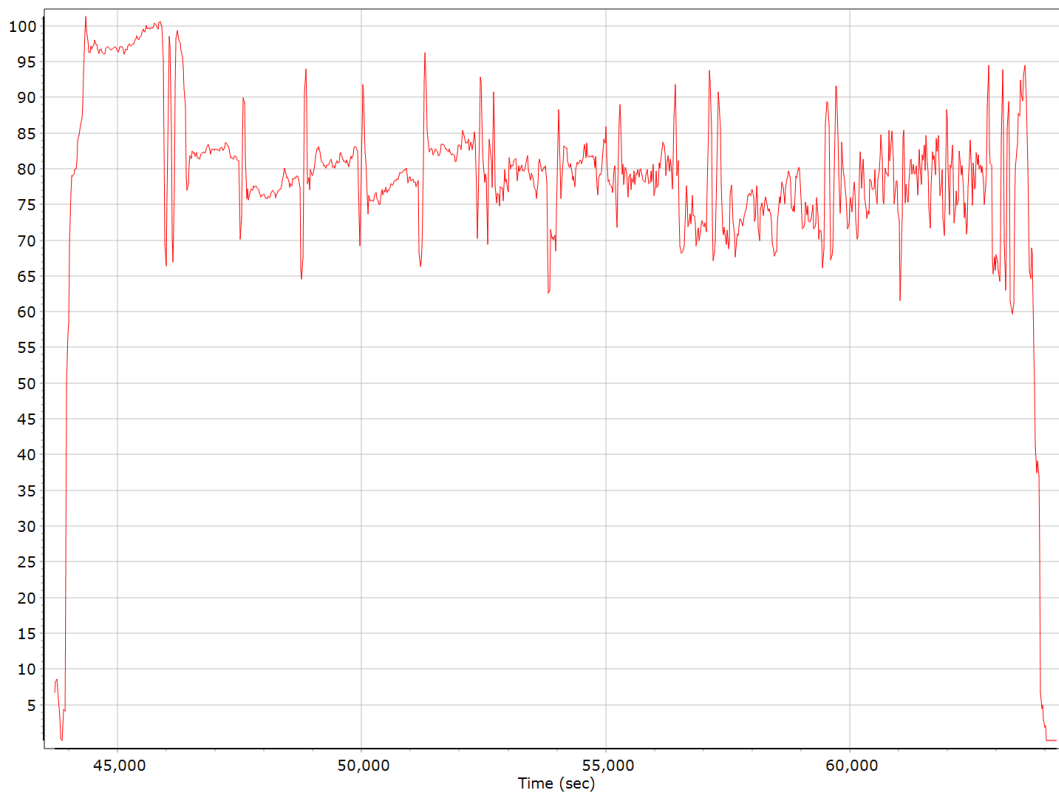
North/East Velocity



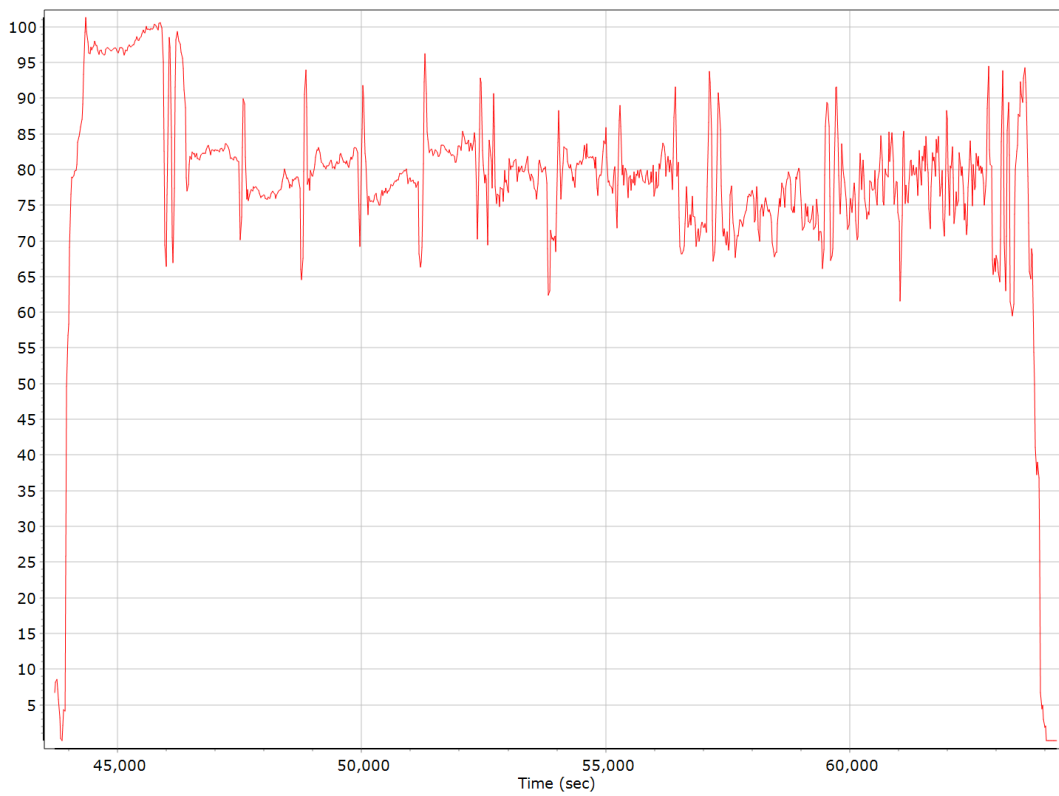
Down Velocity



Total Speed



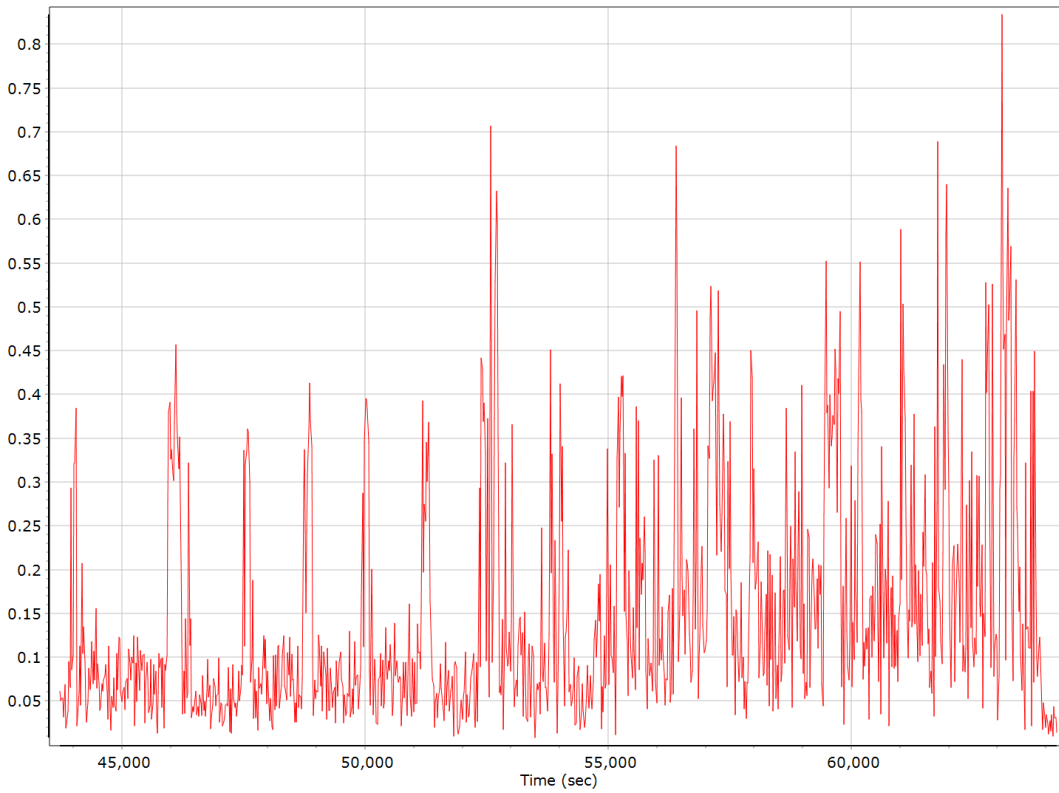
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate

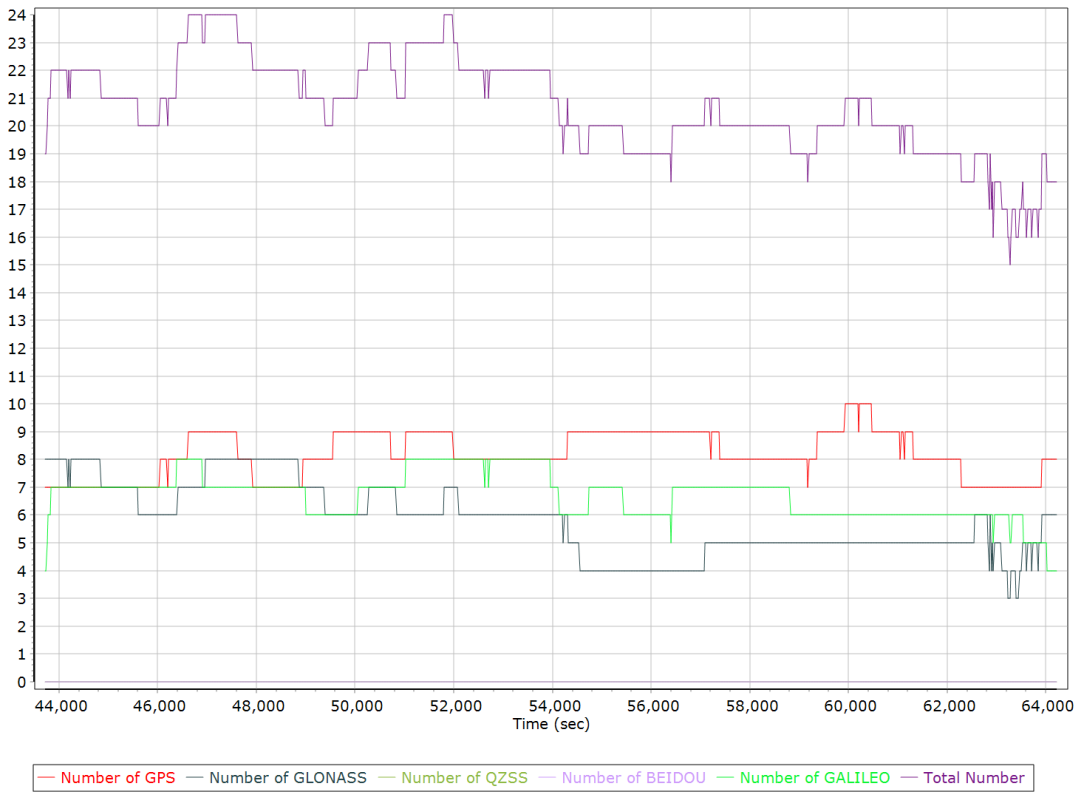


GNSS QC

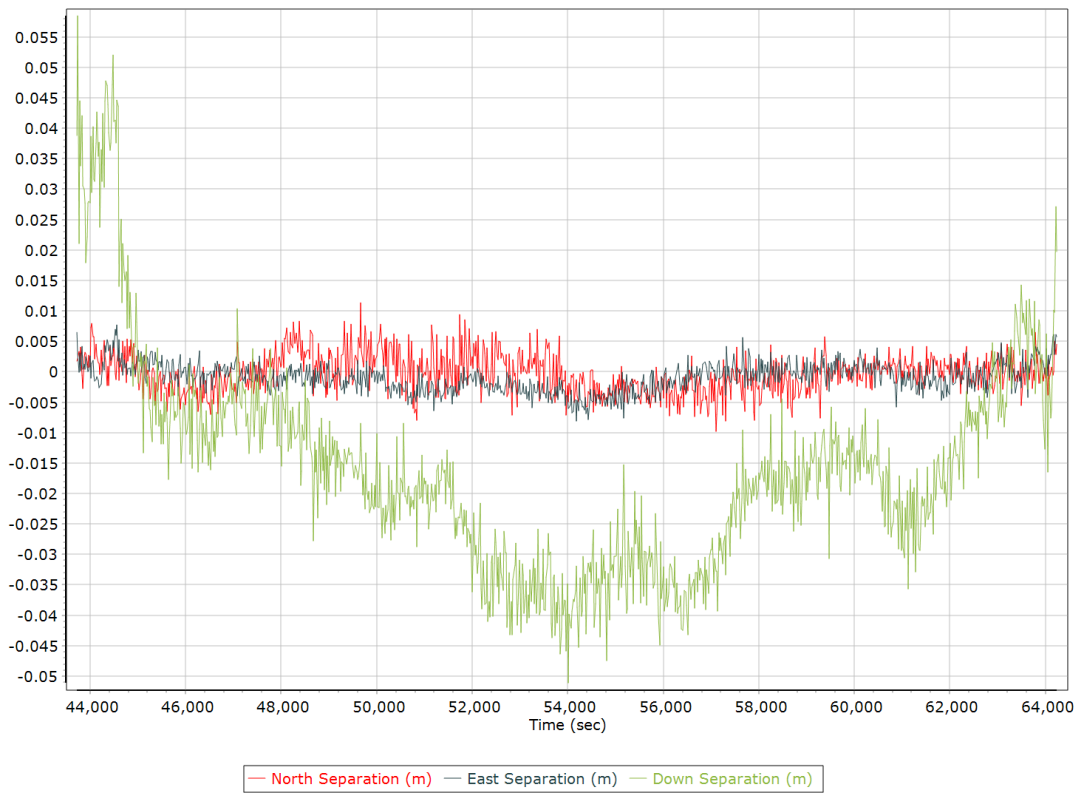
GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	3	8	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	4	8	7
Total number of SV	15	24	21
PDOP	0.97	1.70	1.18
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	20816.00	0.00	0.00
Percentage	100.00	0.00	0.00

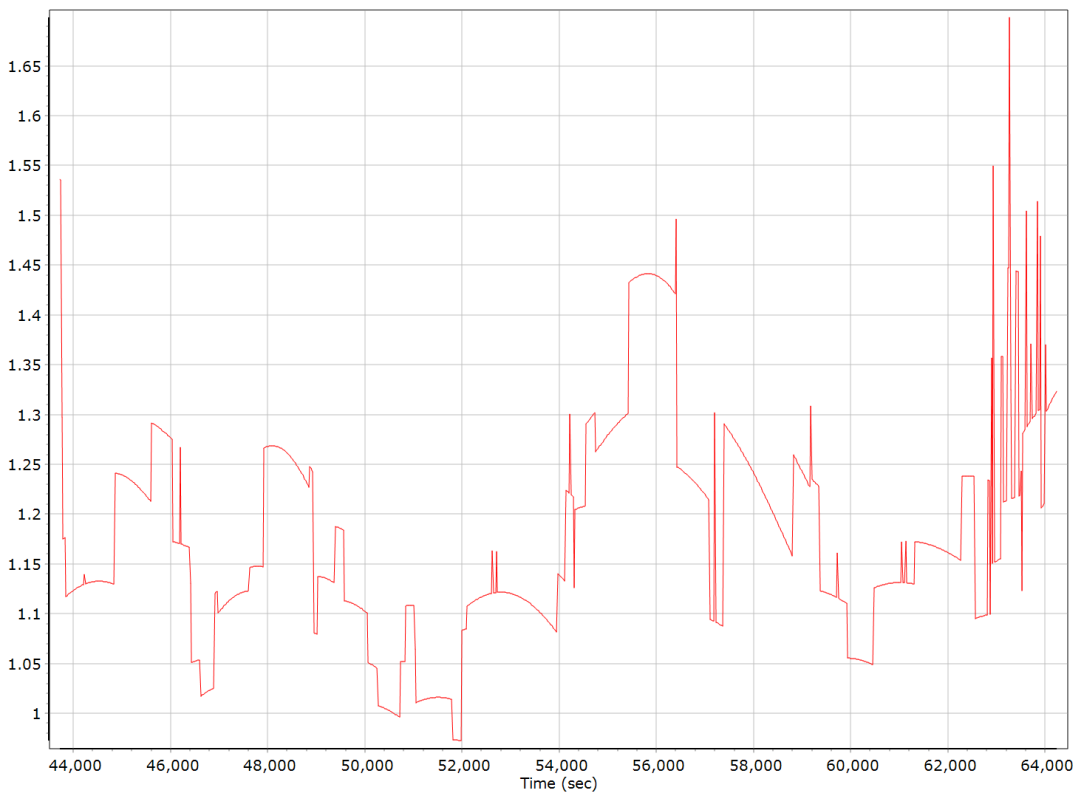
Num SVs in solution



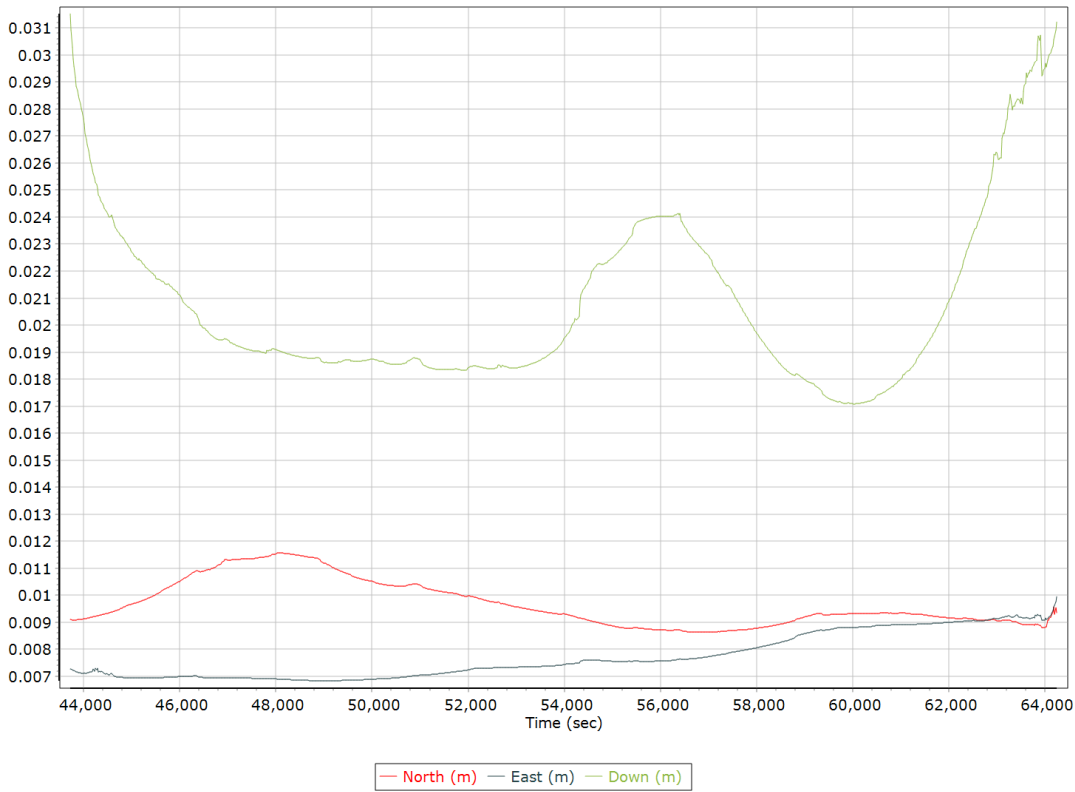
Forward/Reverse Separation



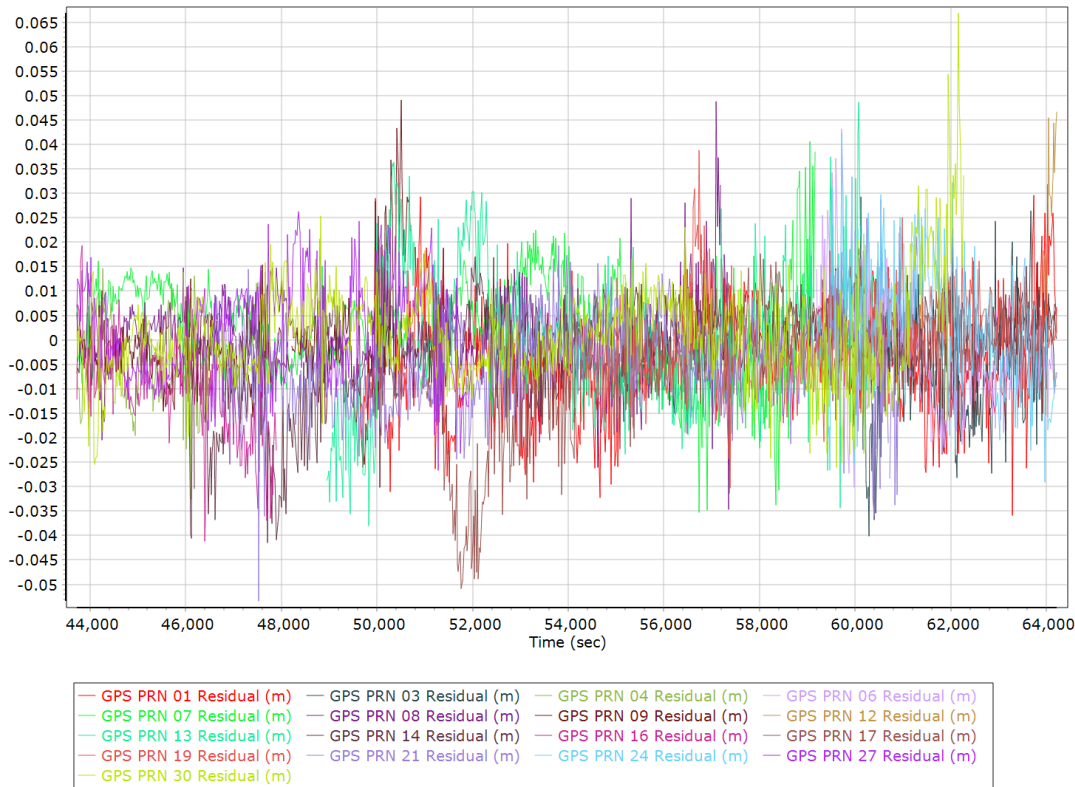
PDOP



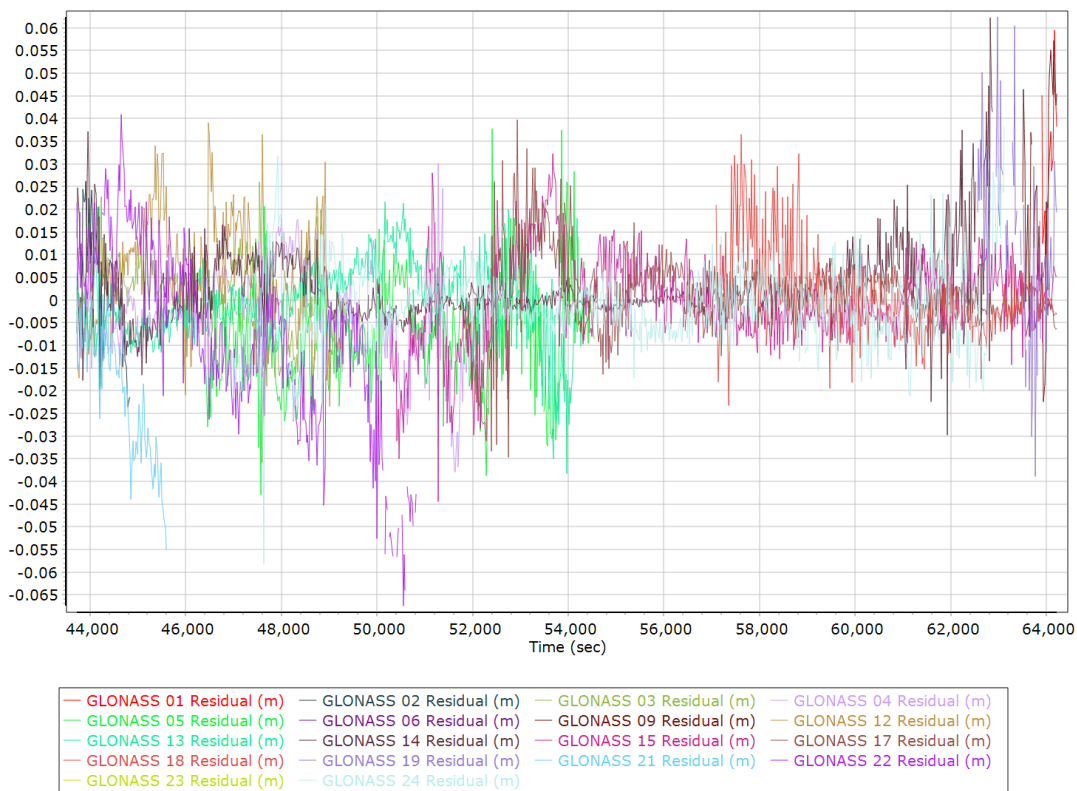
Estimated Position Accuracy



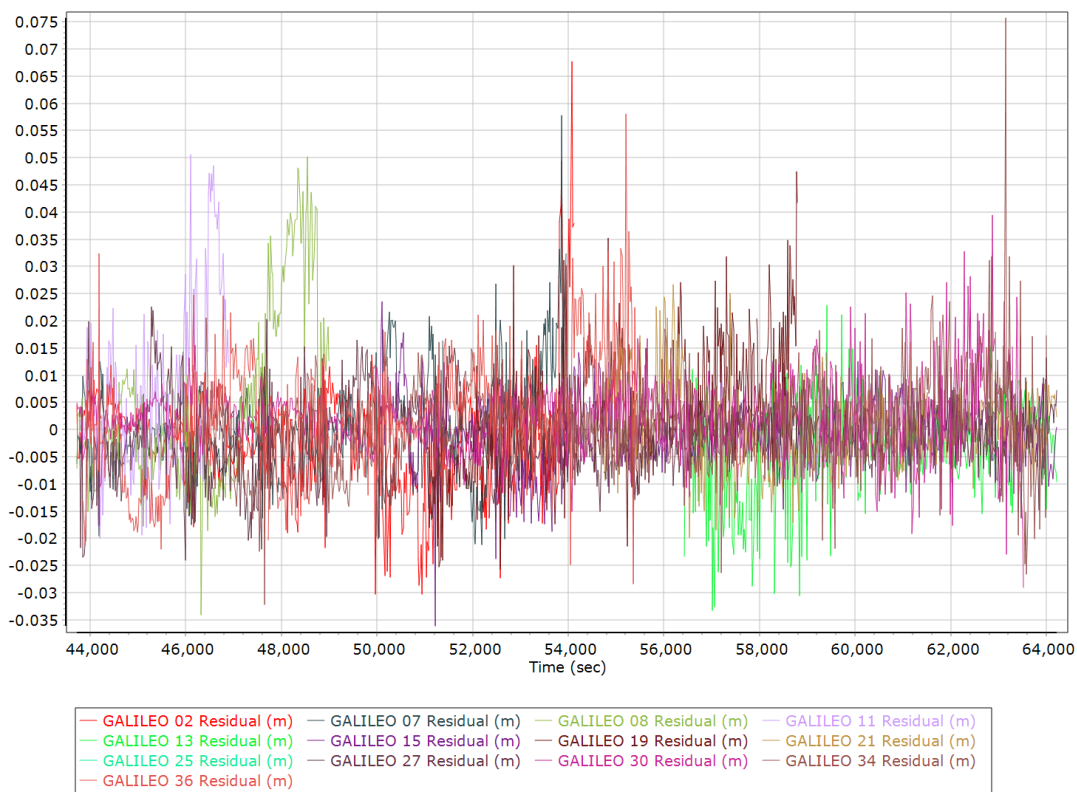
GPS Residuals



GLONASS Residuals



GALILEO Residuals



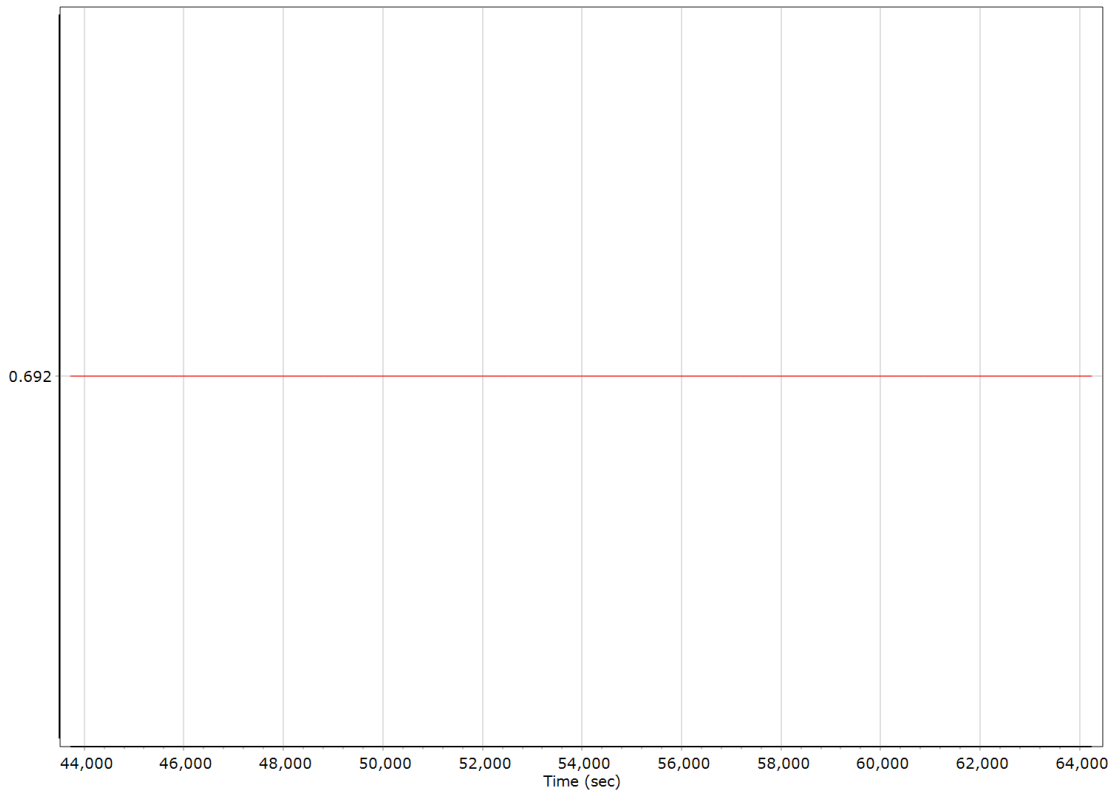
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	43386.000 (5/15/2022 12:03:06 PM)		
Processing end time	64245.000 (5/15/2022 5:50:45 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Gimbal to IMU lever arm (m)	-0.034	-0.010	-0.374
Gimbal to IMU mounting angles (deg)	0.000	0.000	0.000
Gimbal to Primary GNSS lever arm (m)	0.692	-0.181	-1.276
Gimbal to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

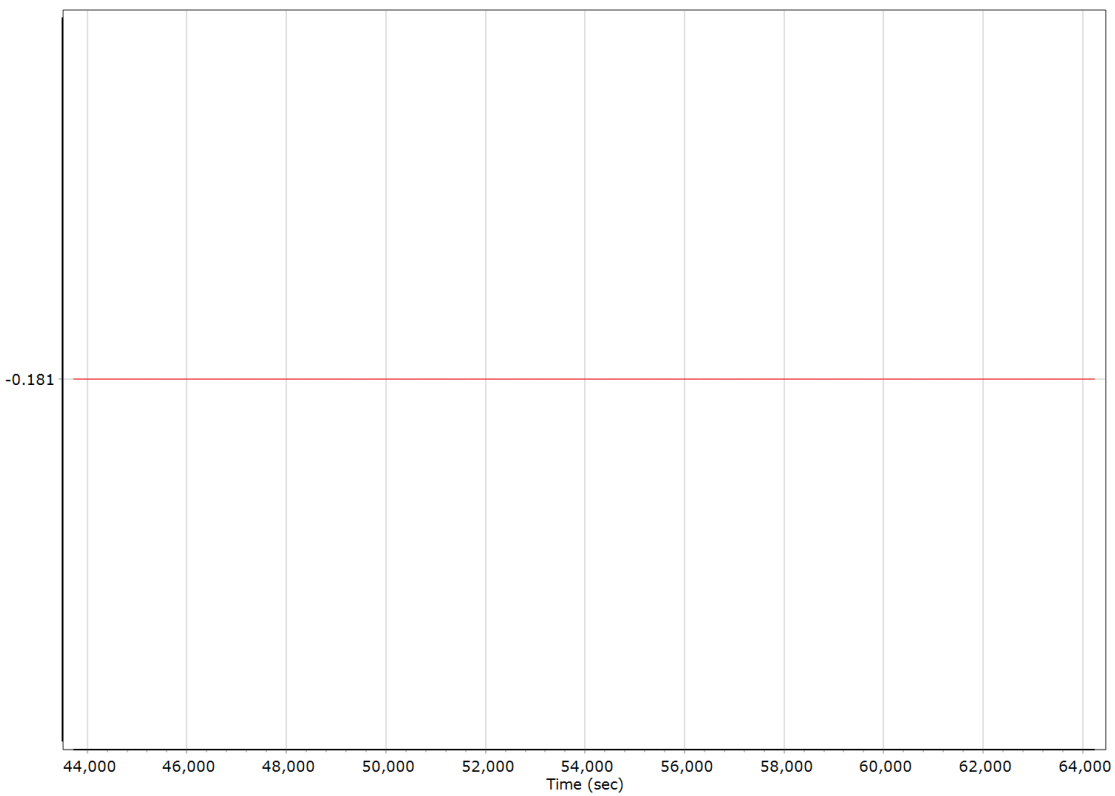
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

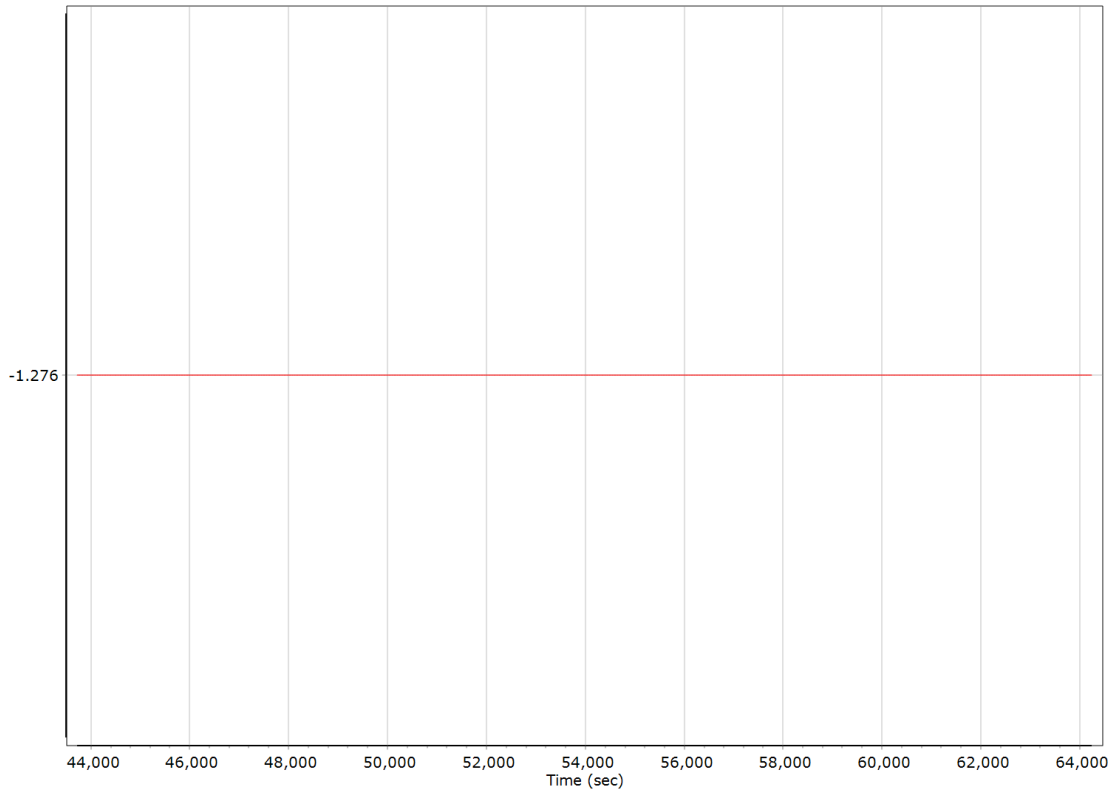
X Reference-Primary GNSS Lever Arm (m)



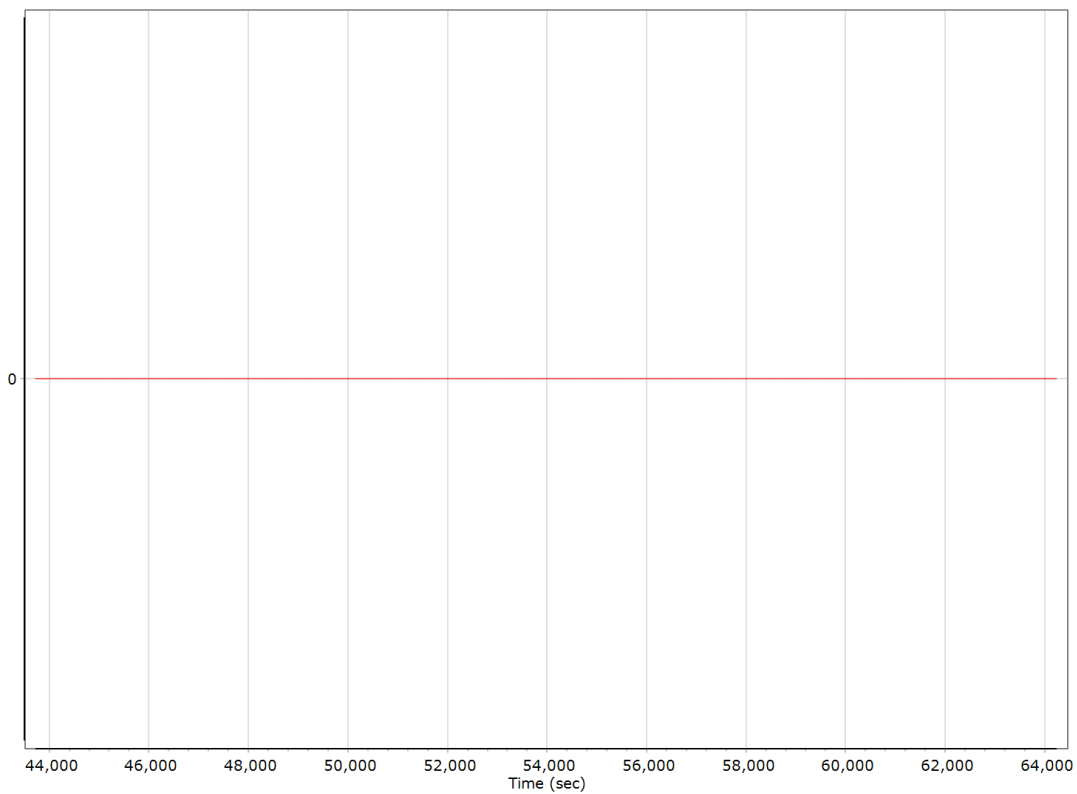
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



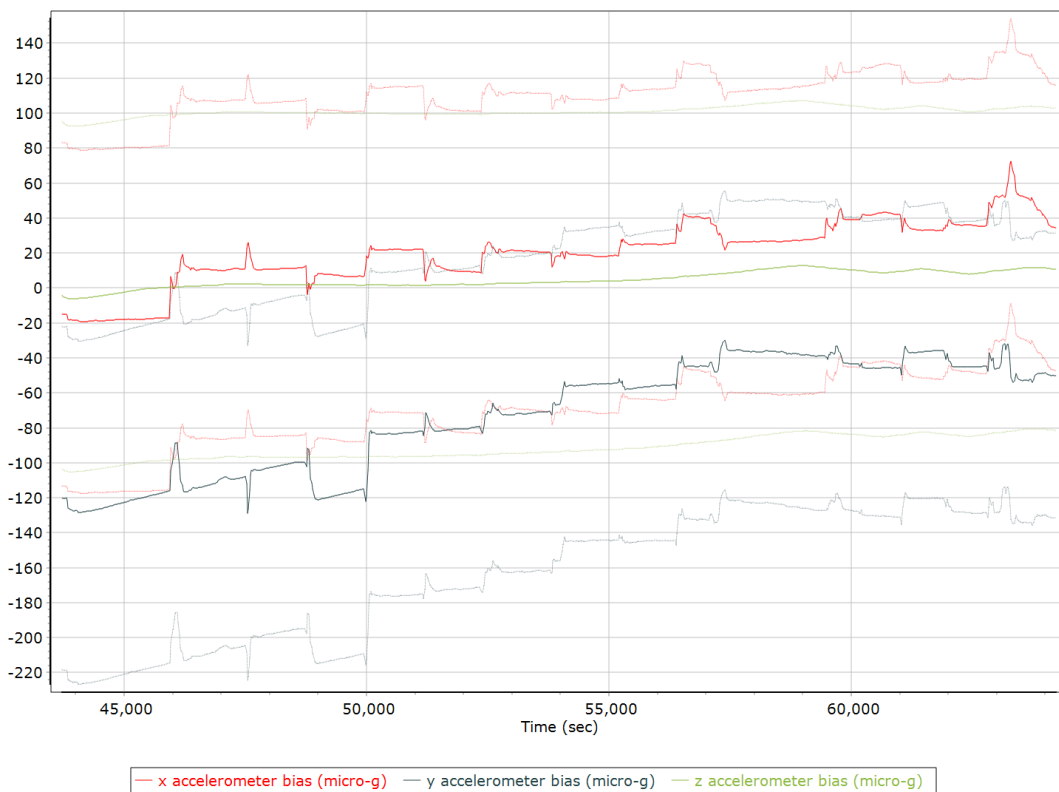
Reference-Primary GNSS Lever Arm Figure of Merit



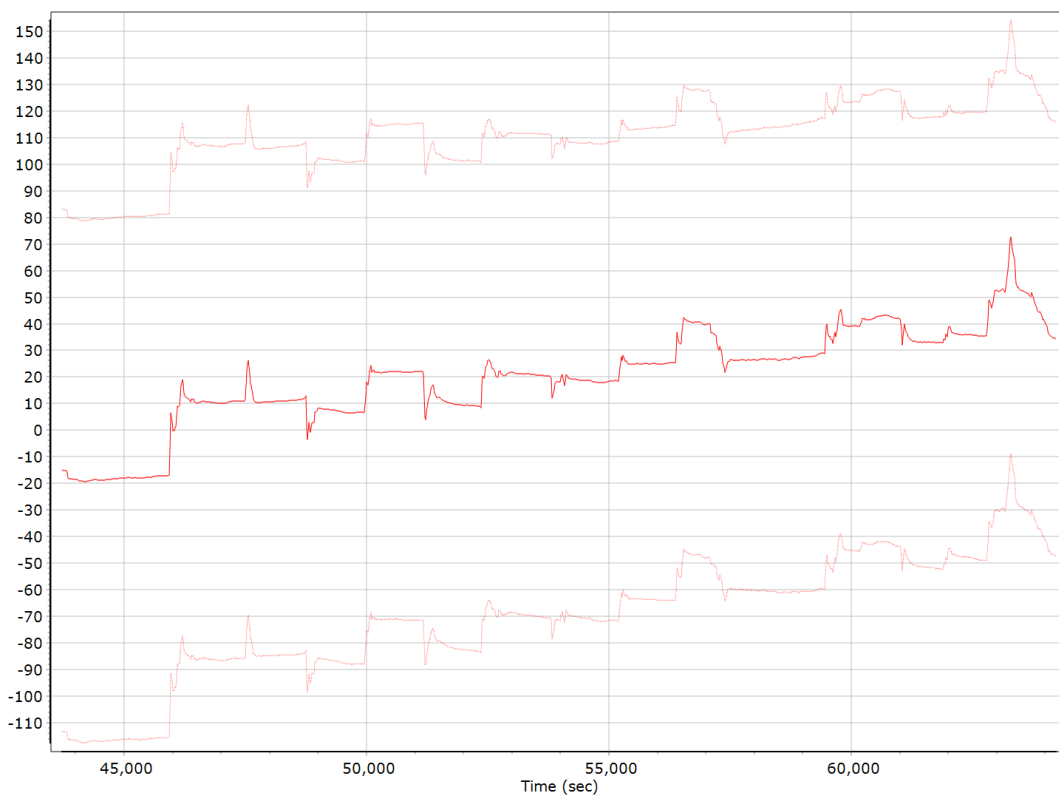
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

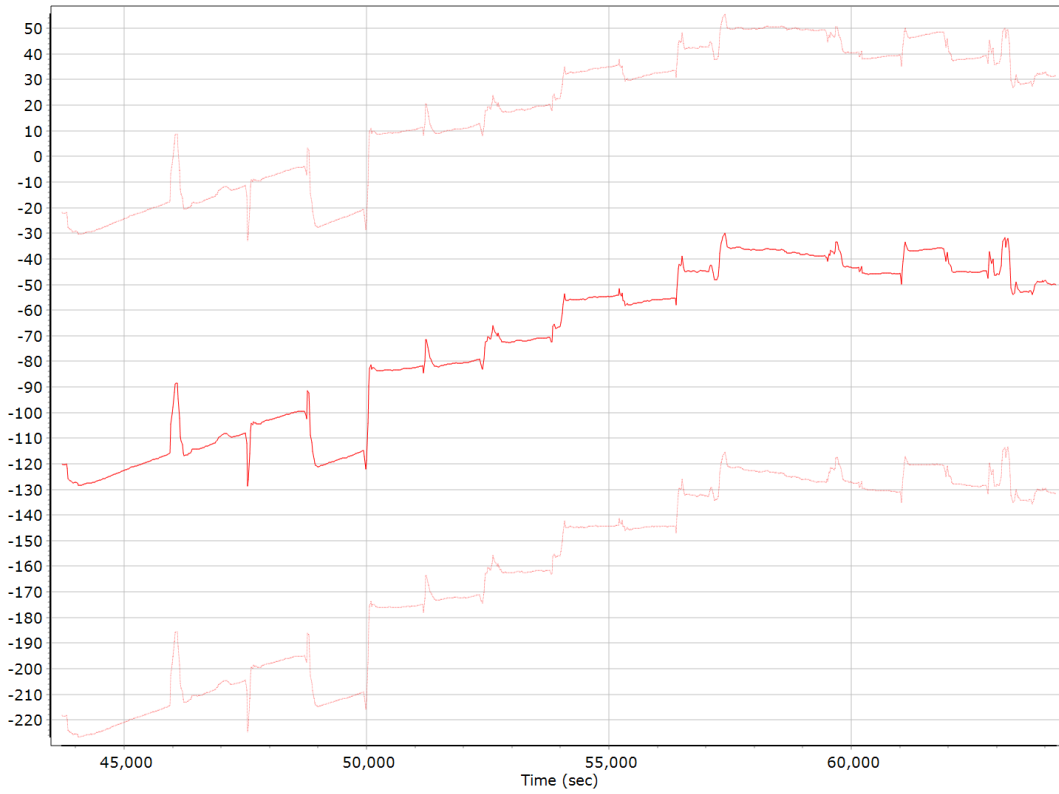
Accelerometer Bias (micro-g)



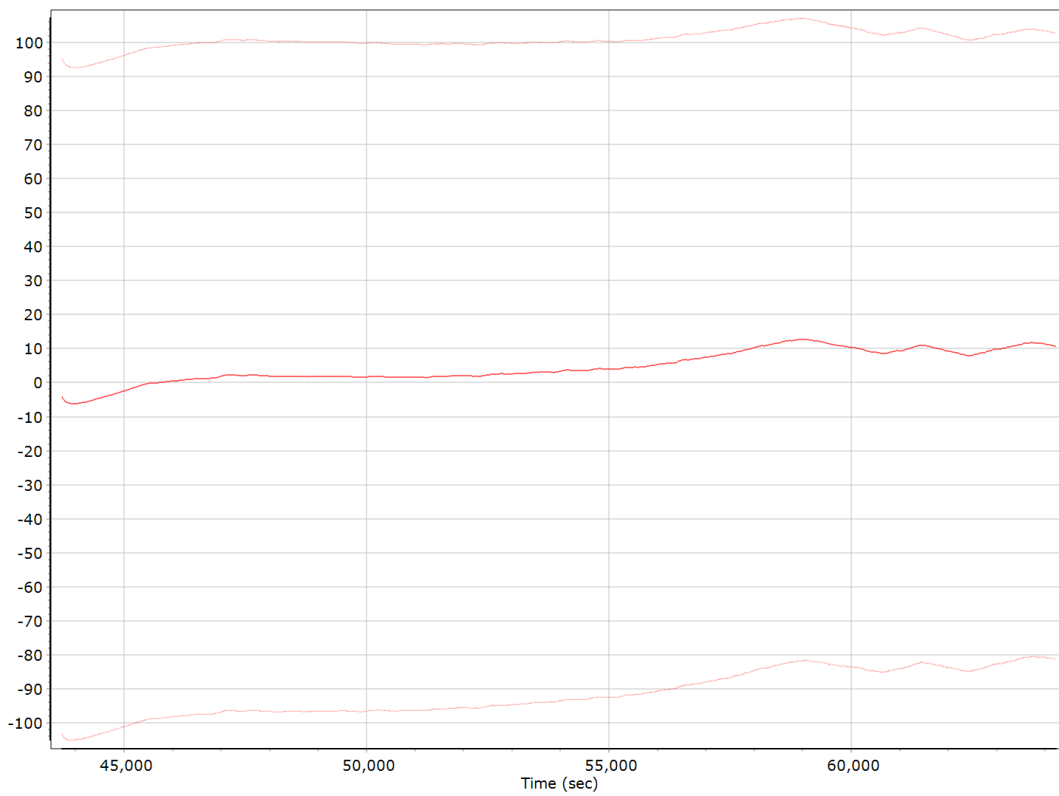
X Accelerometer Bias (micro-g)



Y Accelerometer Bias (micro-g)



Z Accelerometer Bias (micro-g)



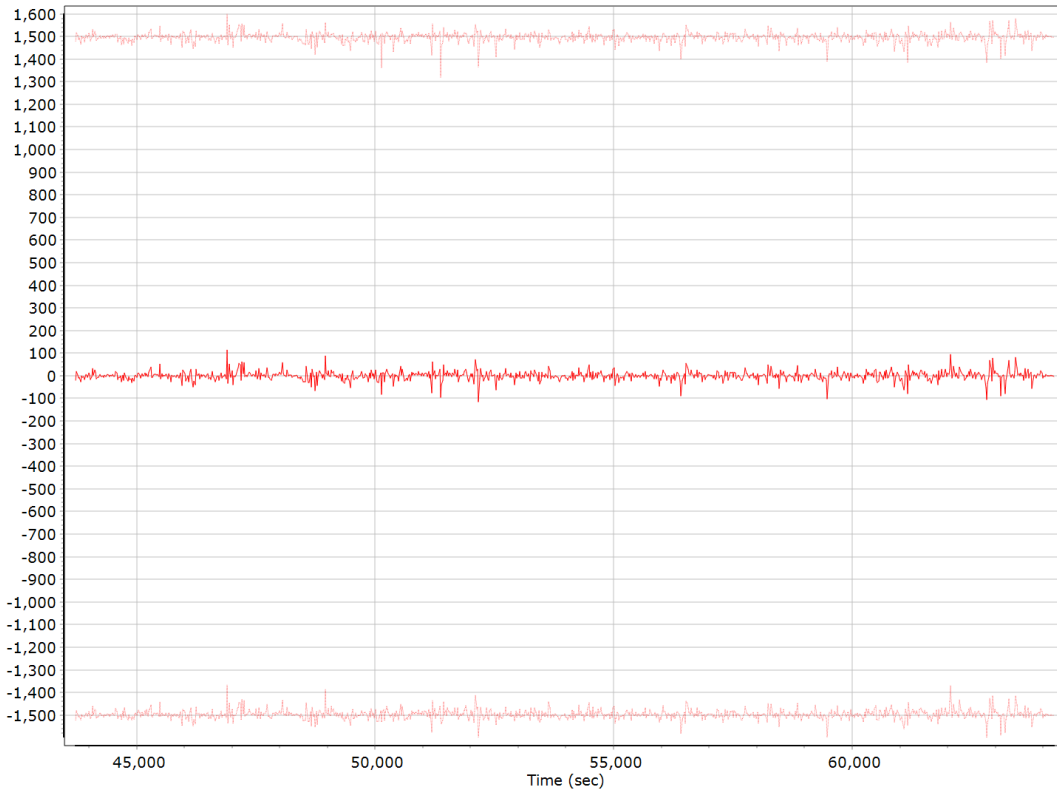
Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



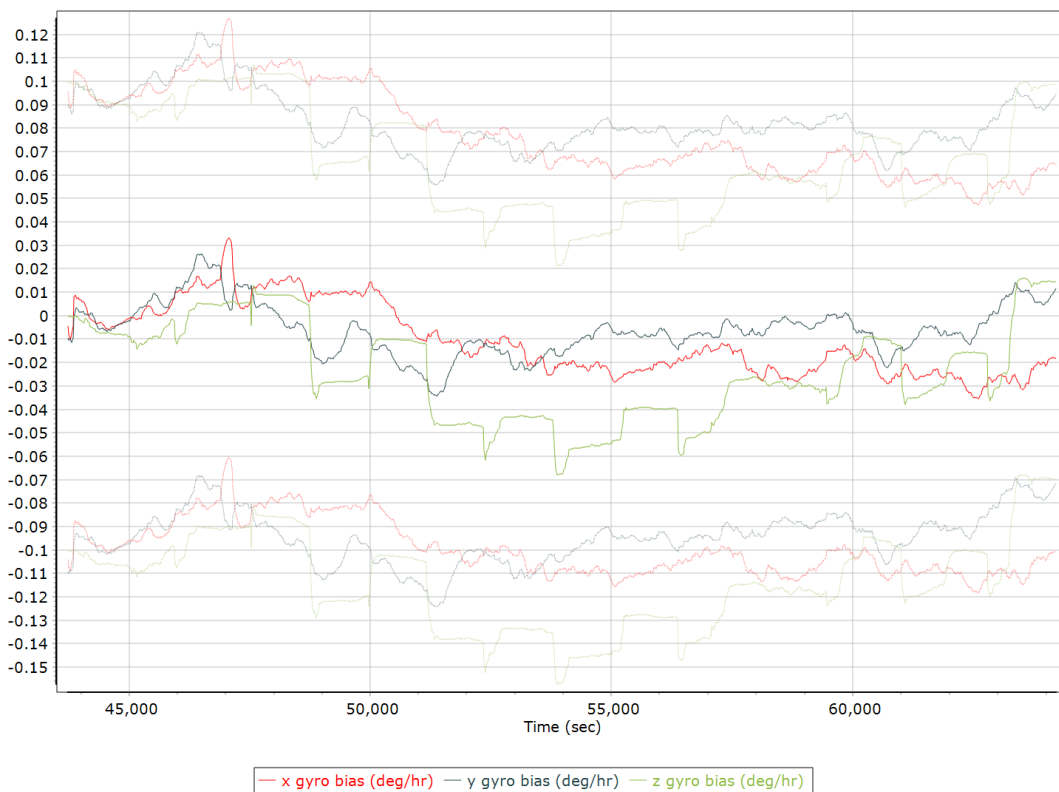
Y Accelerometer Scale Error (ppm)



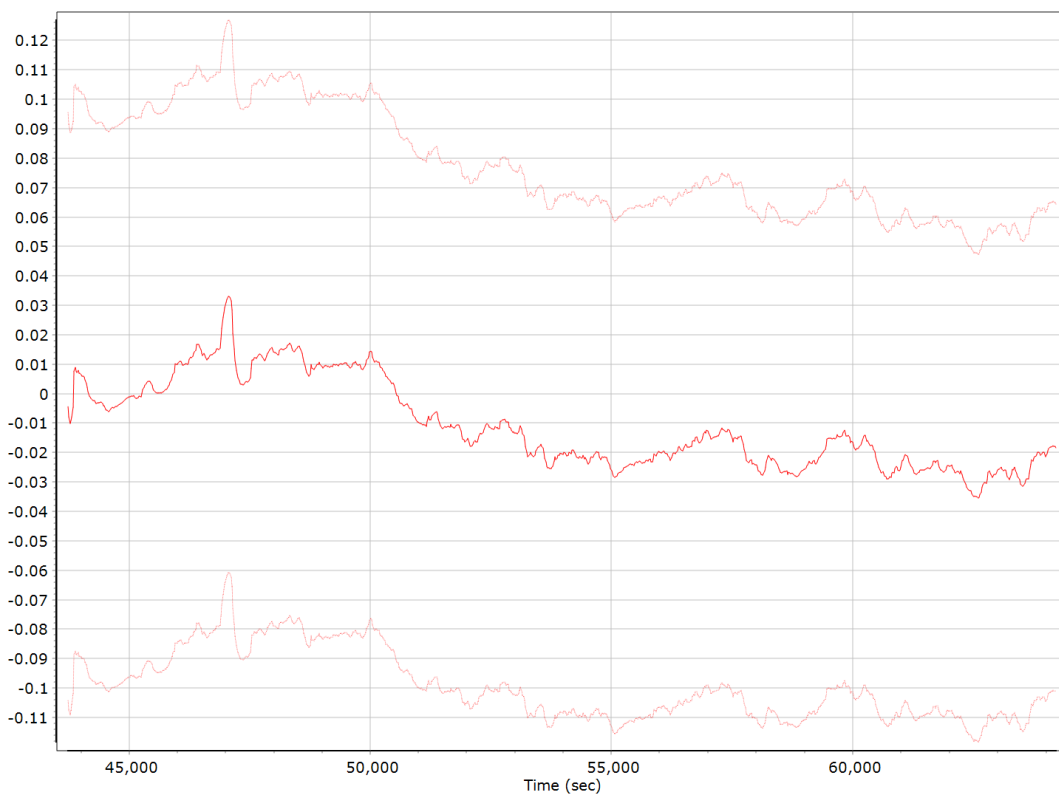
Z Accelerometer Scale Error (ppm)



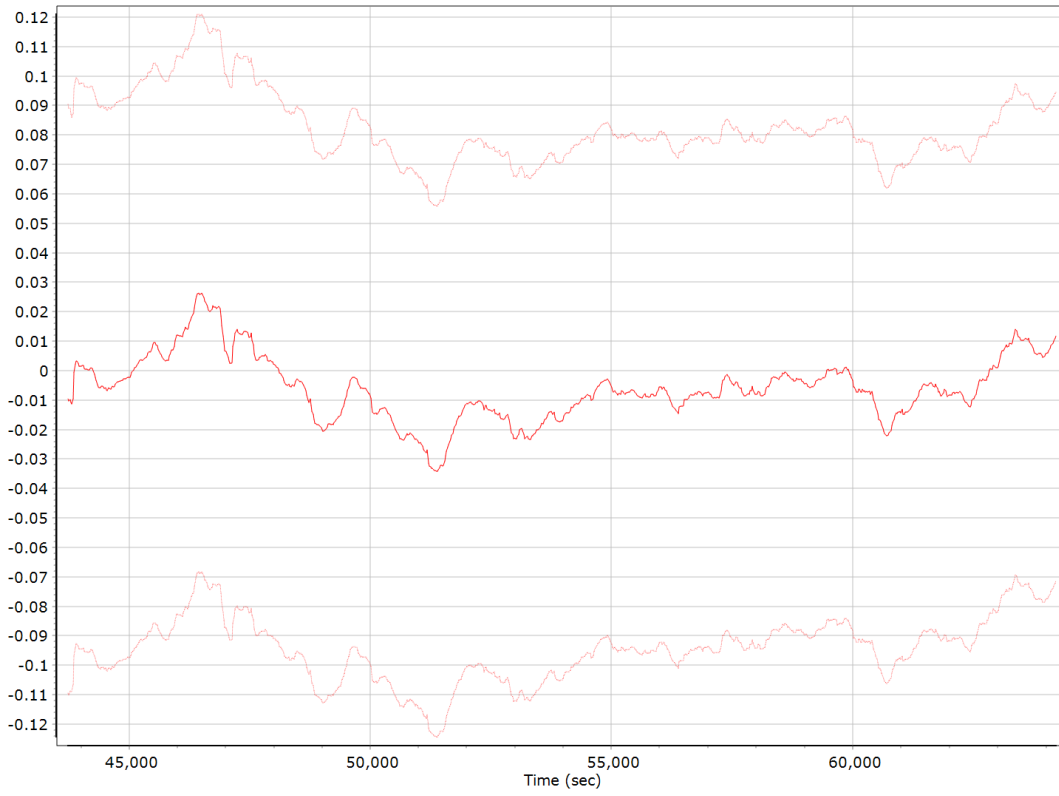
Gyro Bias (deg/h)



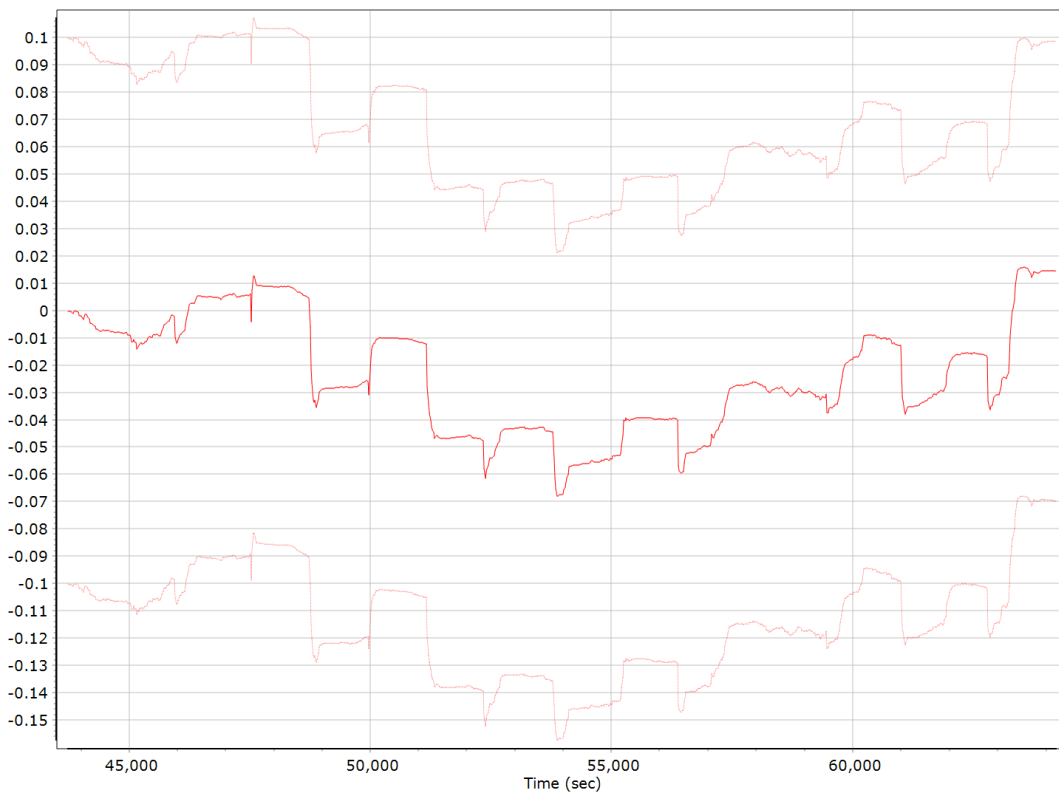
X Gyro Bias (deg/h)



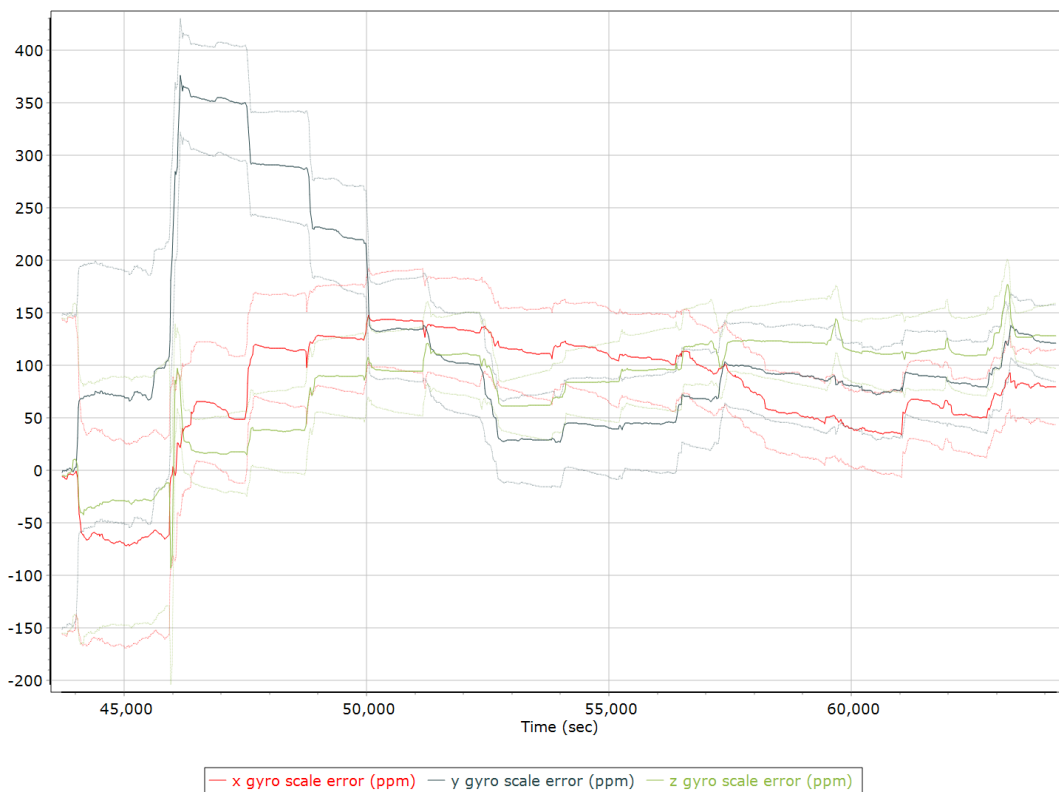
Y Gyro Bias (deg/h)



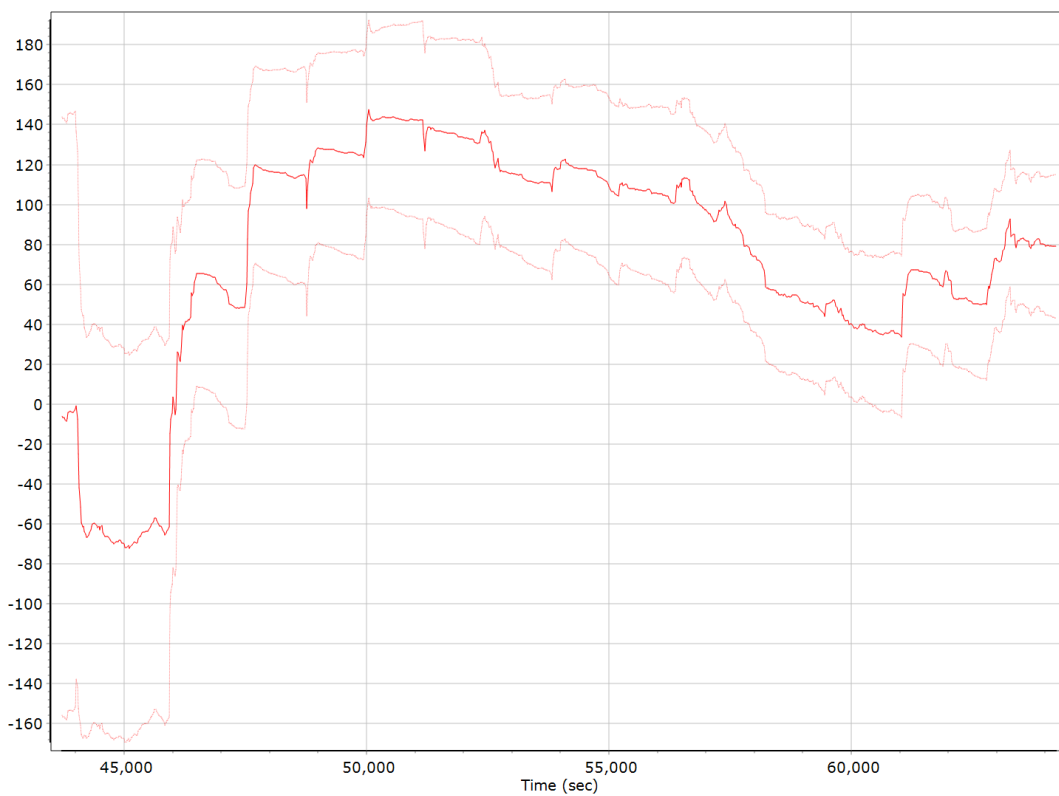
Z Gyro Bias (deg/h)



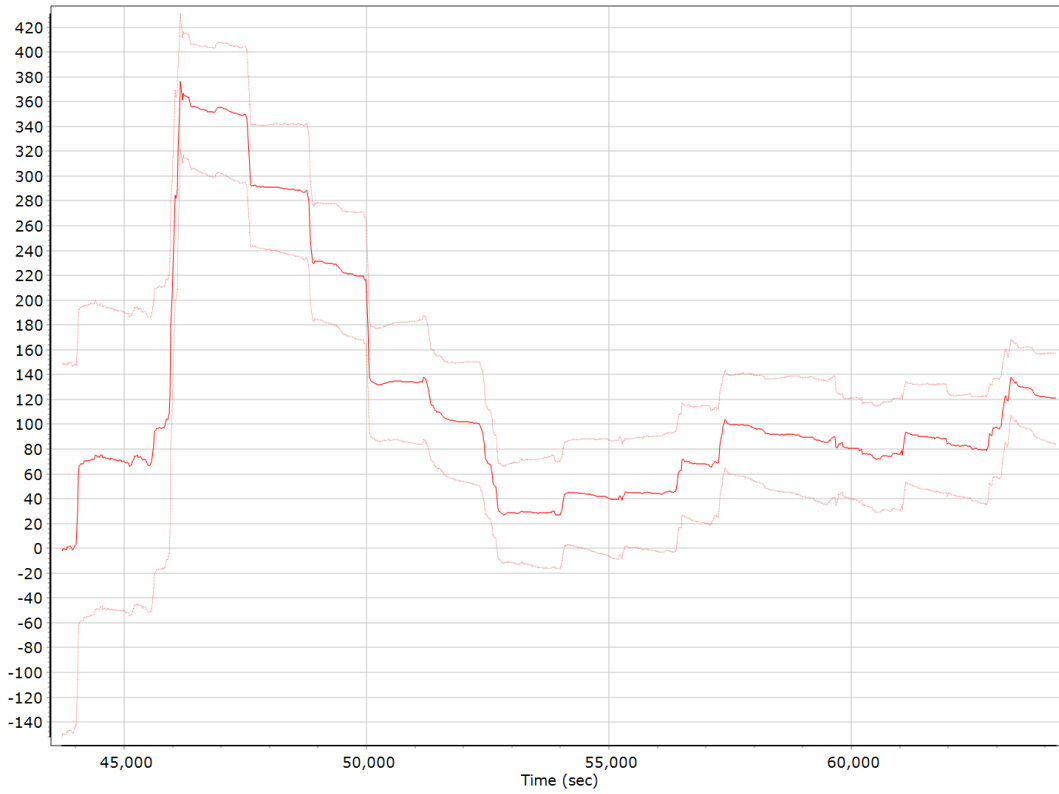
Gyro Scale Error (ppm)



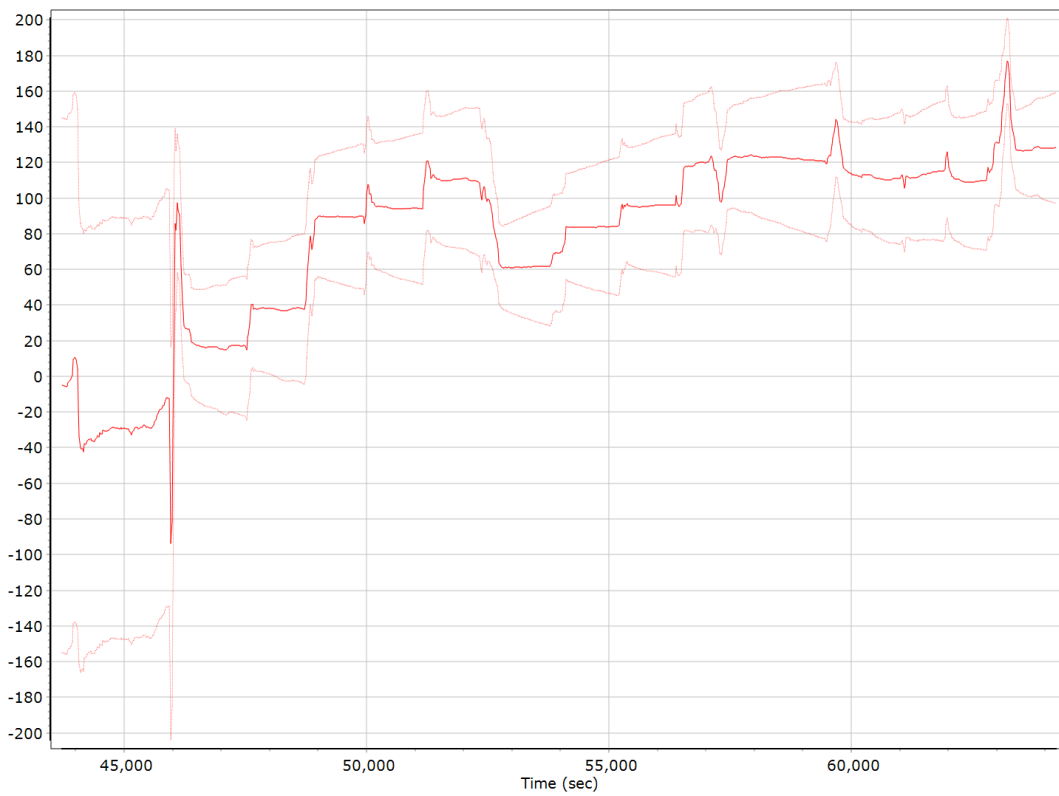
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

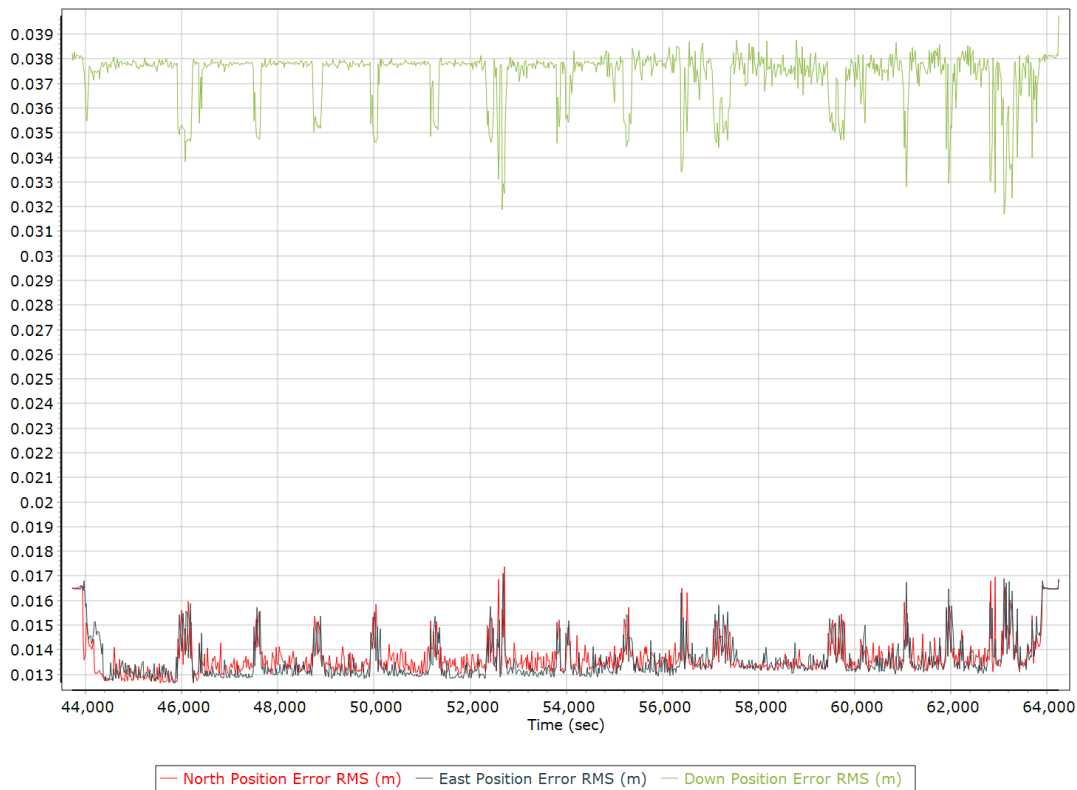


Z Gyro Scale Error (ppm)

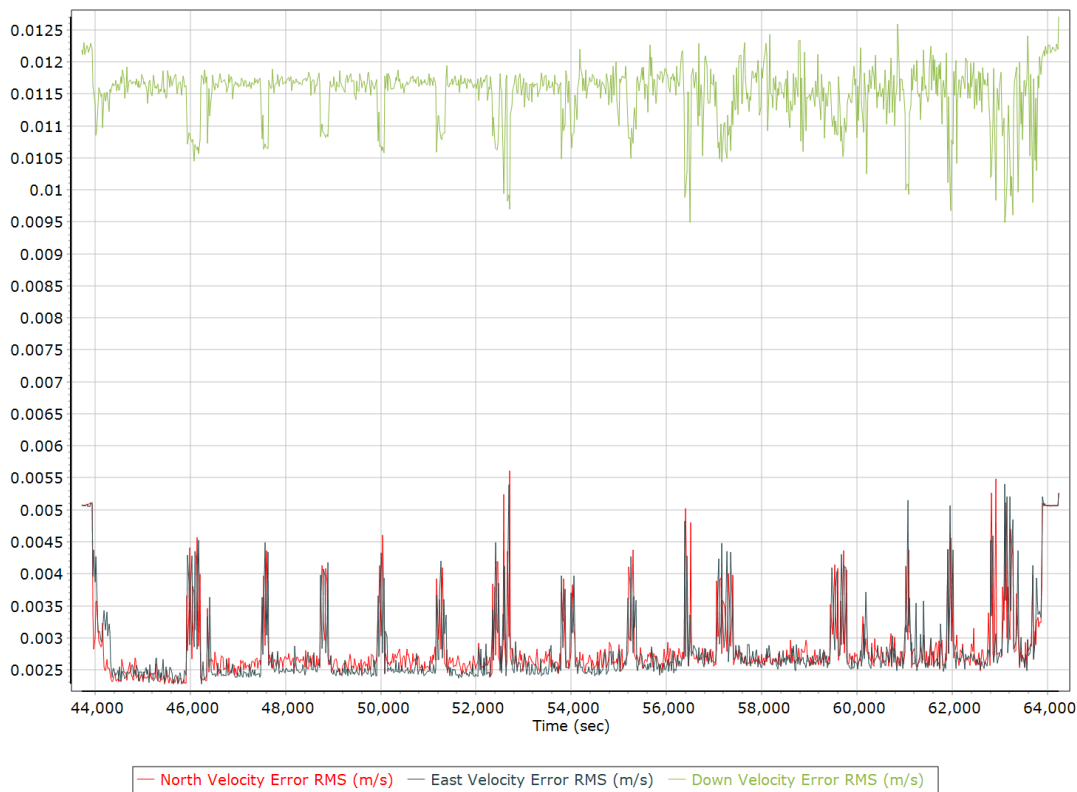


Smoothed Performance Metrics

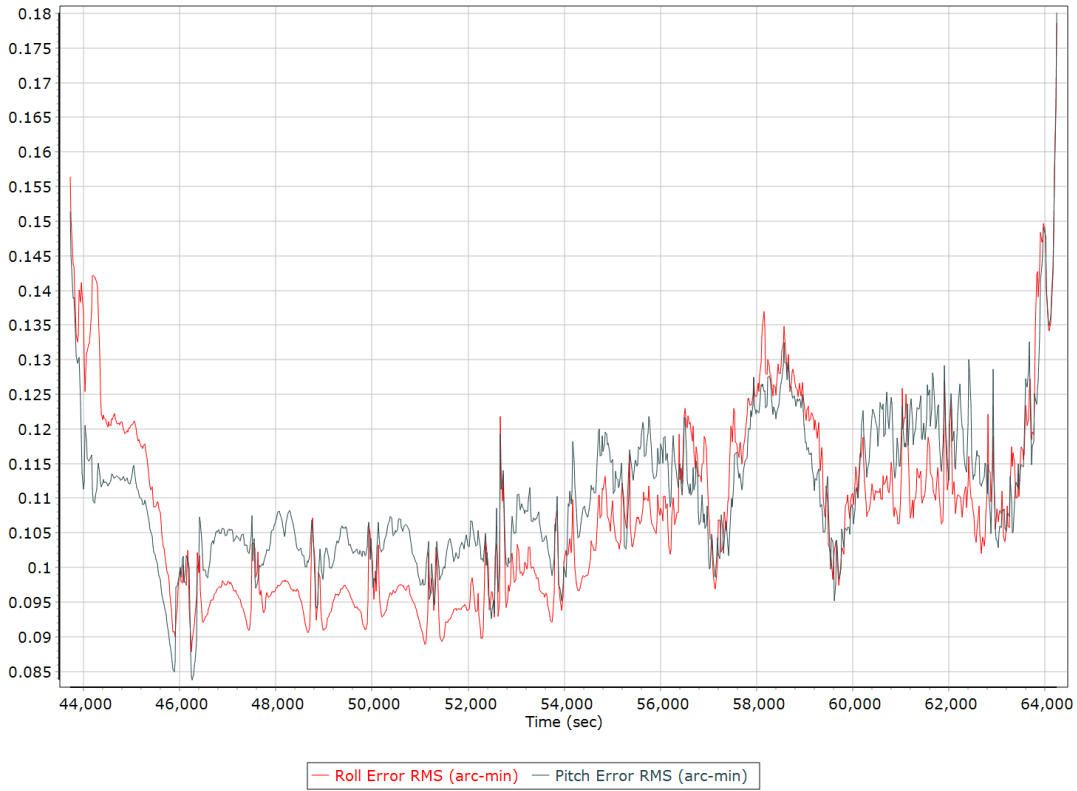
Position Error RMS (m)



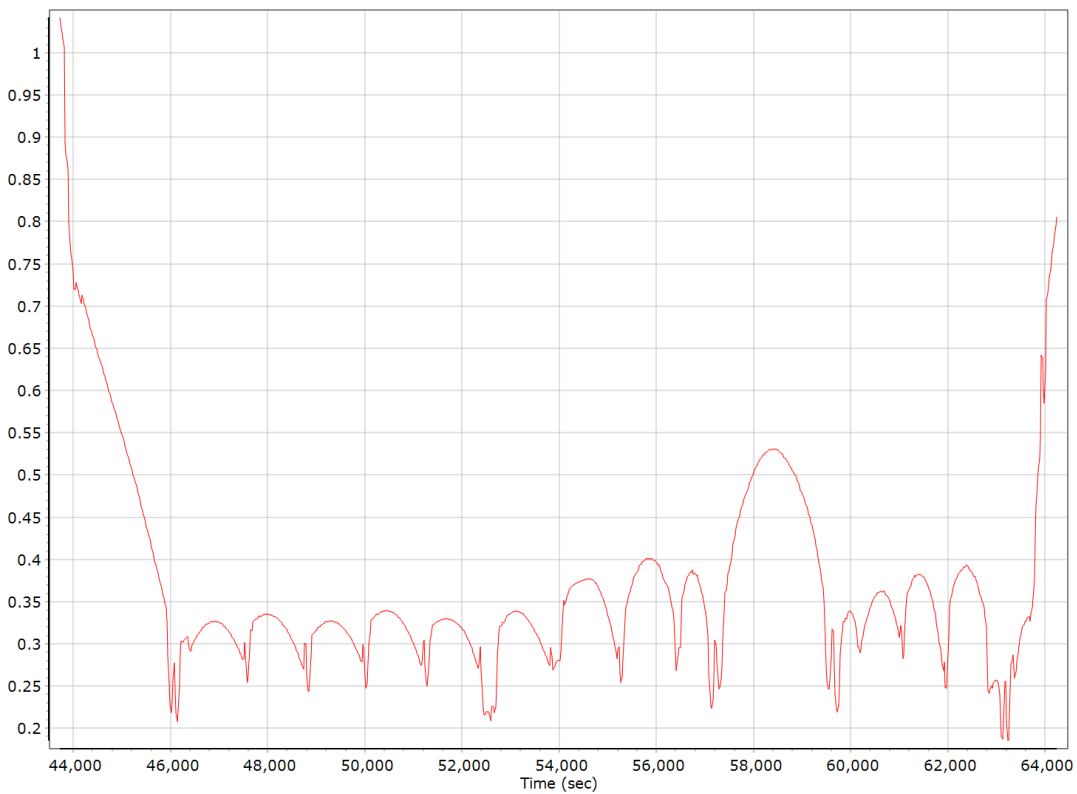
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

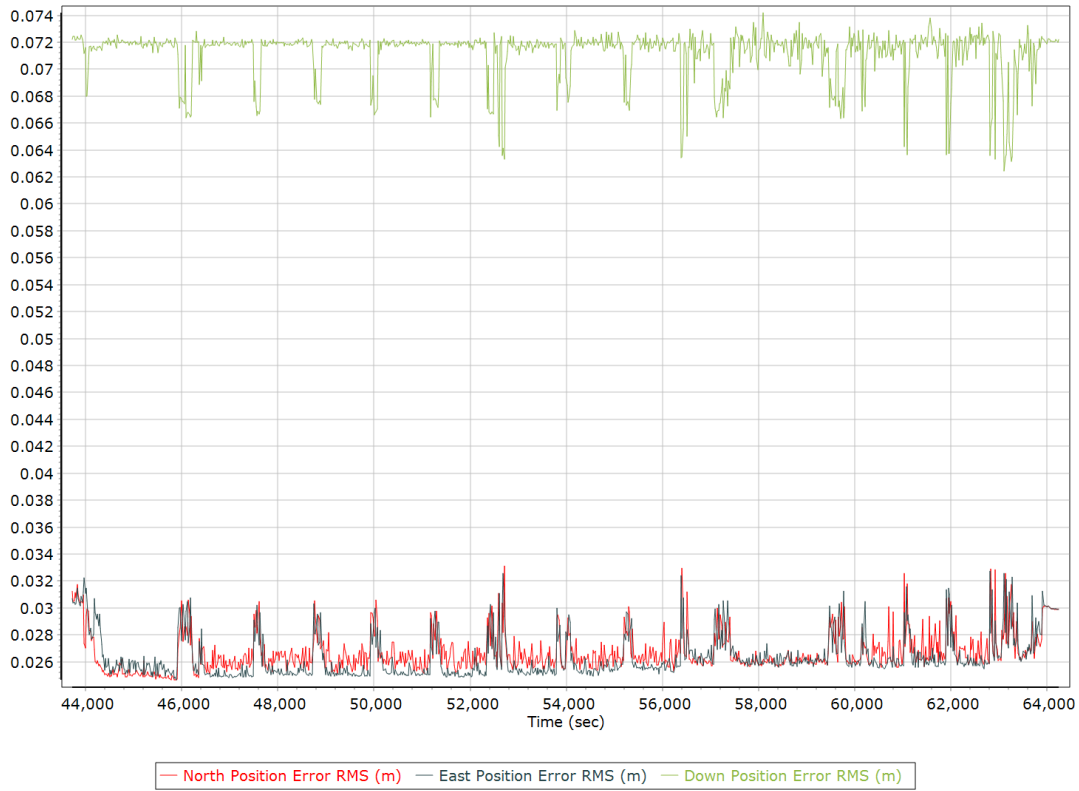


Heading Error RMS (arc-min)

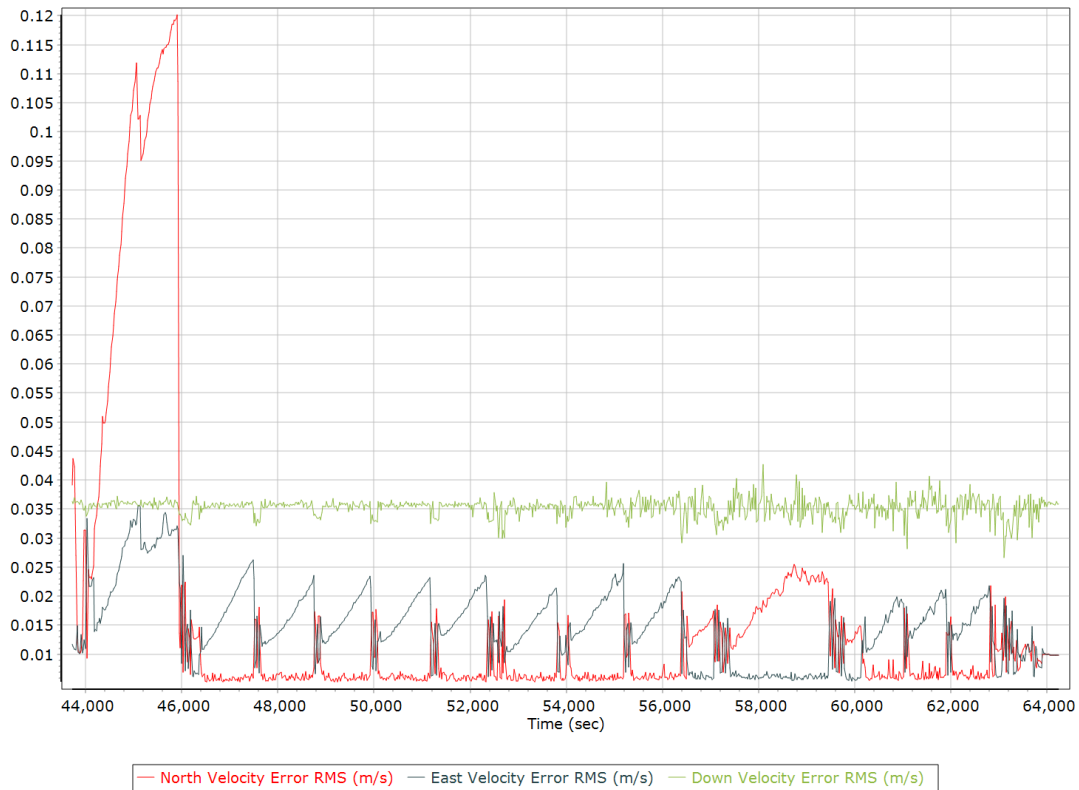


Forward Processed Performance Metrics

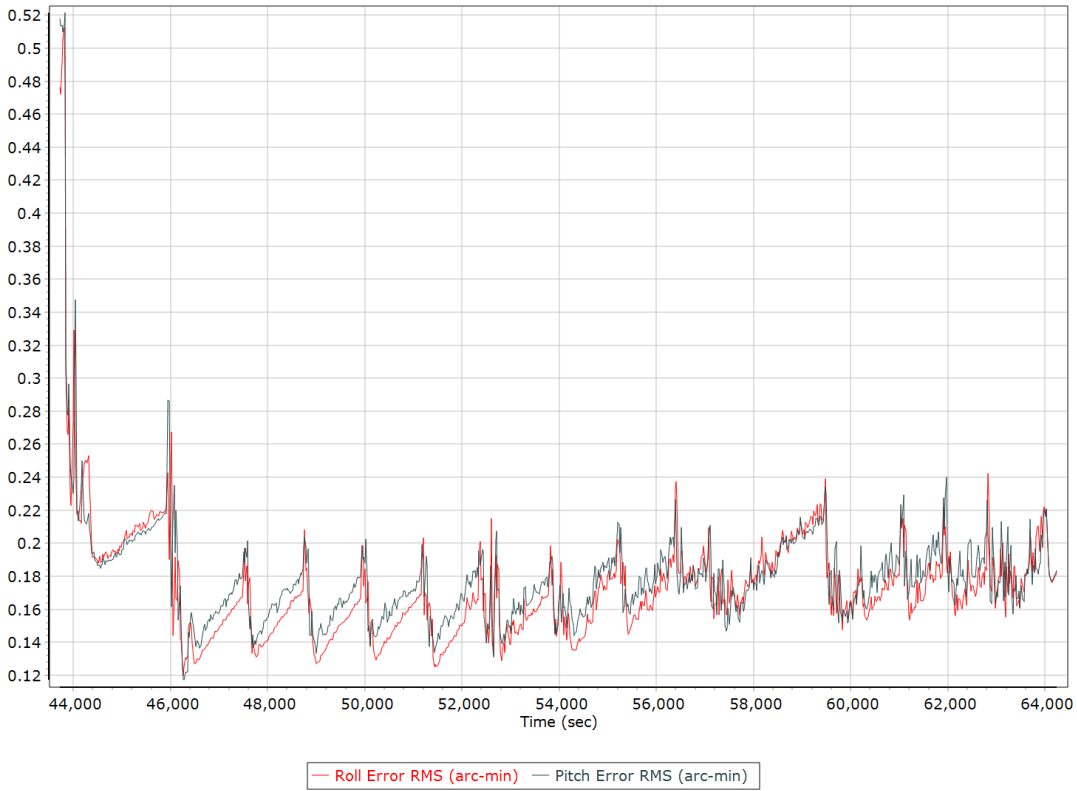
Position Error RMS (m)



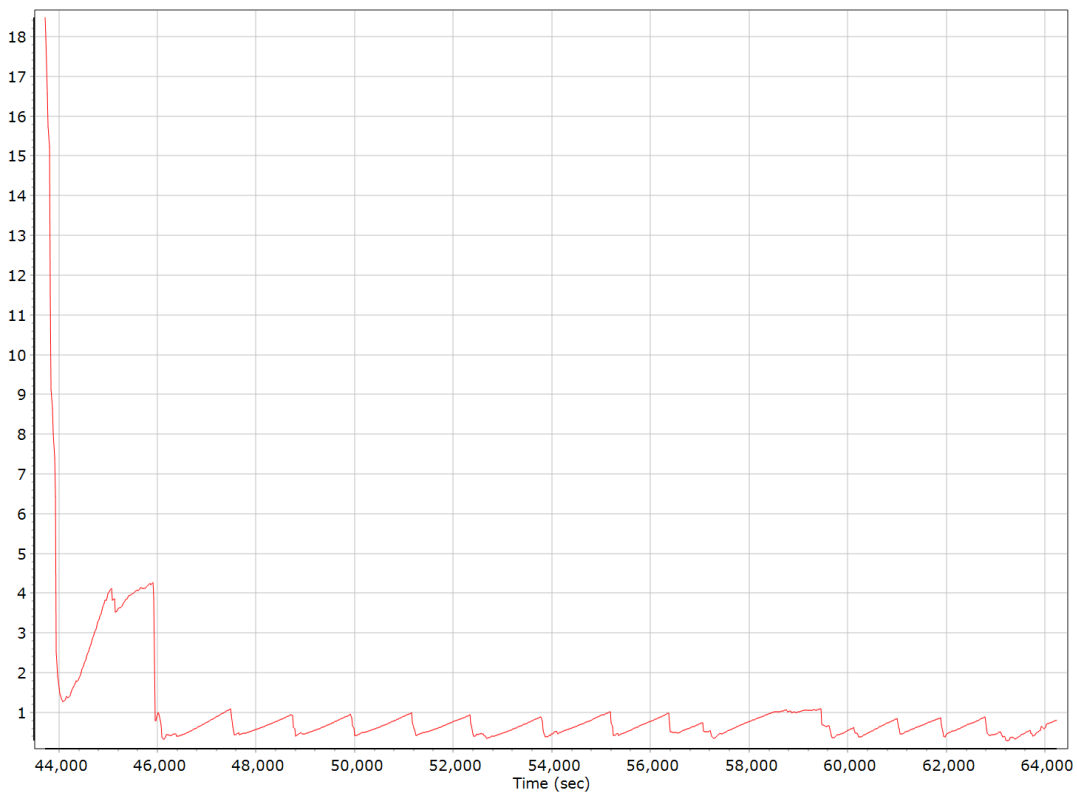
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

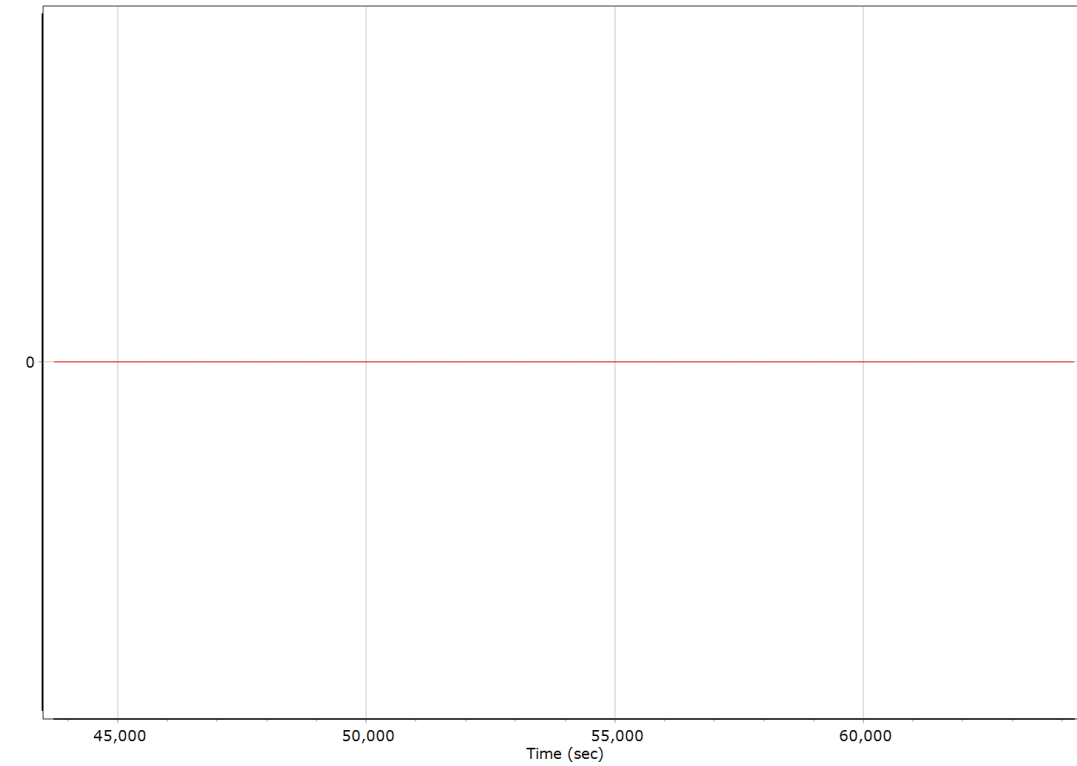


Heading Error RMS (arc-min)



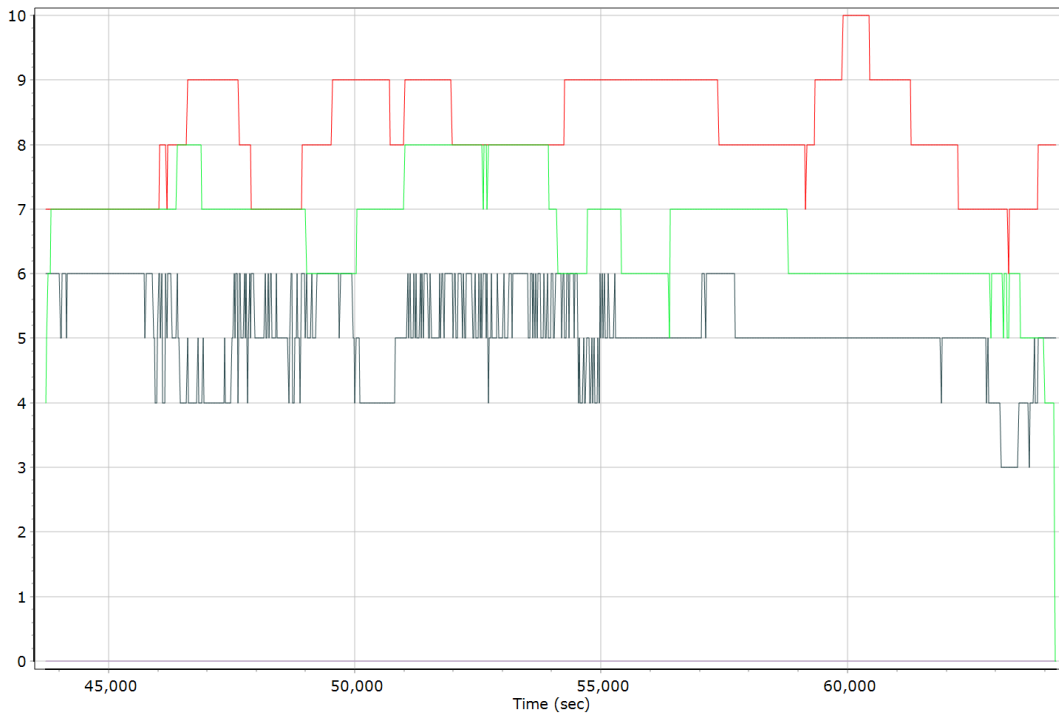
Forward Processed Solution Status

Processing Mode



0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

Number of Satellites



— Number of GPS Satellites — Number of GLONASS Satellites — Number of QZSS Satellites
— Number of BEIDOU Satellites — Number of GALILEO Satellites

Baseline Length

