

## WI 12 County B22 Jackson LIDAR PROCESSING REPORT

Project ID: 230110  
Work Unit: 300212

Prepared for:



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# 1. Summary / Scope

## 1.1. Summary

This report contains a summary of the WI 12 County B22 Jackson, Work Unit 300212 lidar acquisition task order, issued by USGS under their Contract 140G0221D0012 on March 28, 2022. The task order yielded a work unit area covering 1010 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 1010 square miles over Wisconsin. Work unit extents are shown in Figure 1.

## 1.4. Duration

Lidar data was acquired from April 27, 2022 to May 4, 2022 in 6 total lifts. See “Section: 2.4. Time Period” for more details.

## 1.5. Issues

There are no issues to report.



<b>WI 12 County B22 Jackson Work Unit 300212</b> <b>Projected Coordinate System: Wisconsin Coordinate Reference System - Jackson</b> <b>Horizontal Datum: NAD83 (2011)</b> <b>Vertical Datum: NAVD88 (GEOID 18)</b> <b>Units: Survey Feet</b>	
Lidar Point Cloud	Classified Point Cloud in .LAS 1.4 format
Rasters	<ul style="list-style-type: none"> <li>• 1-foot Hydro-flattened Bare Earth Digital Elevation Model (DEM) in GeoTIFF format</li> <li>• 1-foot Intensity images in GeoTIFF format</li> <li>• 2-foot Maximum Surface Height Raster in GeoTIFF format</li> <li>• 2-foot Swath Separation Images in GeoTIFF format</li> </ul>
Vectors	Shapefiles (*.shp) <ul style="list-style-type: none"> <li>• Project Boundary</li> <li>• Lidar Tile Index</li> </ul> Geodatabase (*.gdb) <ul style="list-style-type: none"> <li>• Continuous Hydro-flattened Breaklines</li> <li>• Flightlines Swath</li> </ul>
Reports	Reports in PDF format <ul style="list-style-type: none"> <li>• Focus on Delivery</li> <li>• Survey Report</li> <li>• Processing Report</li> </ul>
Metadata	XML Files (*.xml) <ul style="list-style-type: none"> <li>• Breaklines</li> <li>• Classified Point Cloud</li> <li>• DEM</li> <li>• Intensity Imagery</li> </ul>



# WI 12 County B22 Jackson Work Unit 300212 Boundary

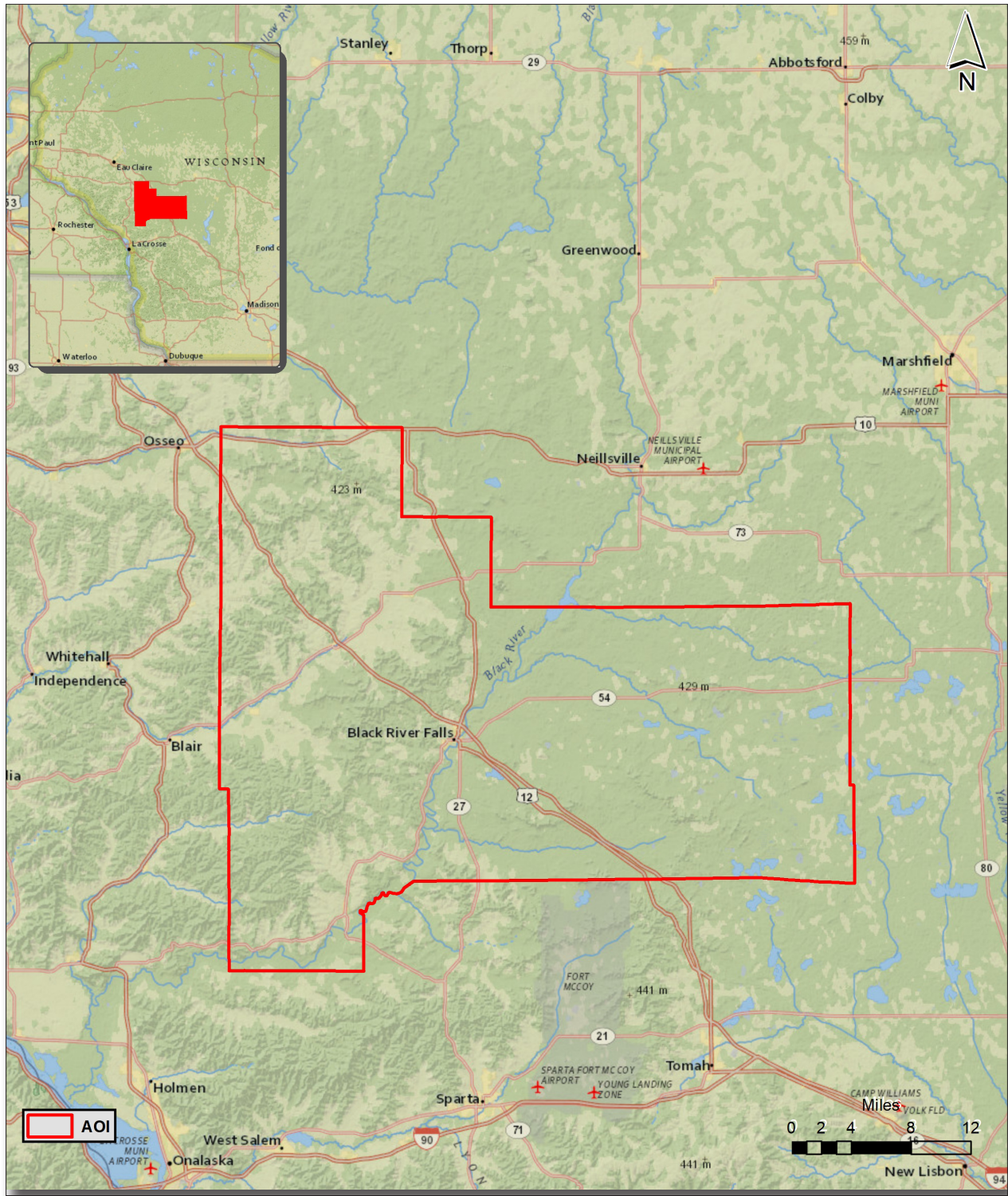


Figure 1. Work Unit Boundary

## 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 and 3543, 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)
<b>Terrain and Aircraft Scanner</b>	Flying Height	1584 m	1050 m
	Recommended Ground Speed	160 kts	160 kts
<b>Scanner</b>	Field of View	60°	60°
	Scan Rate Setting Used	191 lps	295 Hz
<b>Laser</b>	Laser Pulse Rate Used	2400 kHz	1000 kHz
	Multi Pulse in Air Mode	yes	yes
<b>Coverage</b>	Full Swath Width	1827 m	1846 m
	Line Spacing	1462 m	1477 m
<b>Point Spacing and Density</b>	Average Point Spacing	0.35 m	0.35 m
	Average Point Density	8 pts / m <sup>2</sup>	8 pts / m <sup>2</sup>

**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 April 27, 2022 and May 4, 2022. Six aircraft lifts were completed. Accomplished lifts are listed below.

Lift	Start UTC	End UTC
04272022A (SN3062,C-GAYY)	4/27/2022 4:14:08 PM	4/27/2022 8:03:15 PM
04272022A (SN3543,C-FFRY)	4/27/2022 3:58:42 PM	4/27/2022 5:44:25 PM
05042022A (SN3062,C-GAYY)	5/04/2022 12:49:44 PM	5/04/2022 2:19:00 PM
05042022A1 (SN3543,C-FFRY)	5/04/2022 12:07:10 PM	5/04/2022 12:32:39 PM
05042022A2 (SN3543,C-FFRY)	5/04/2022 1:19:21 PM	5/04/2022 6:15:51 PM
05042022B (SN3543,C-FFRY)	5/04/2022 8:01:56 PM	5/04/2022 10:04:59 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.

Each sensor is initially factory calibrated. Further adjustment is performed on each sensor by periodically flying boresight locations and using this data to update boresight values used in data processing. Various proprietary tools and methodologies are used during this process. Once all data has been processed with updated boresight values, FL to FL match is performed by using strip align and other proprietary tools/processes.

Point clouds 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. The flight line strips are calibrated using Strip Align software. This process involves correcting for systematic errors remaining in the dataset after the boresight values are applied to the dataset. Corrections are made from line to line as well as from lift to lift in order improve the relative accuracy of the dataset and exceed specifications. Each adjusted flight line channel is merged using proprietary software to form the final flight line strips. The point cloud data is then imported into GeoCue, where they are then cut into a tiled dataset. Automated ground macros are run, and the vertical accuracy of the calibrated point cloud is tested against the surveyed ground control and any bias is validated, and the remaining bias is removed from the data using a TerraScan macro that is run through the GeoCue distributive process.

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.

### 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.

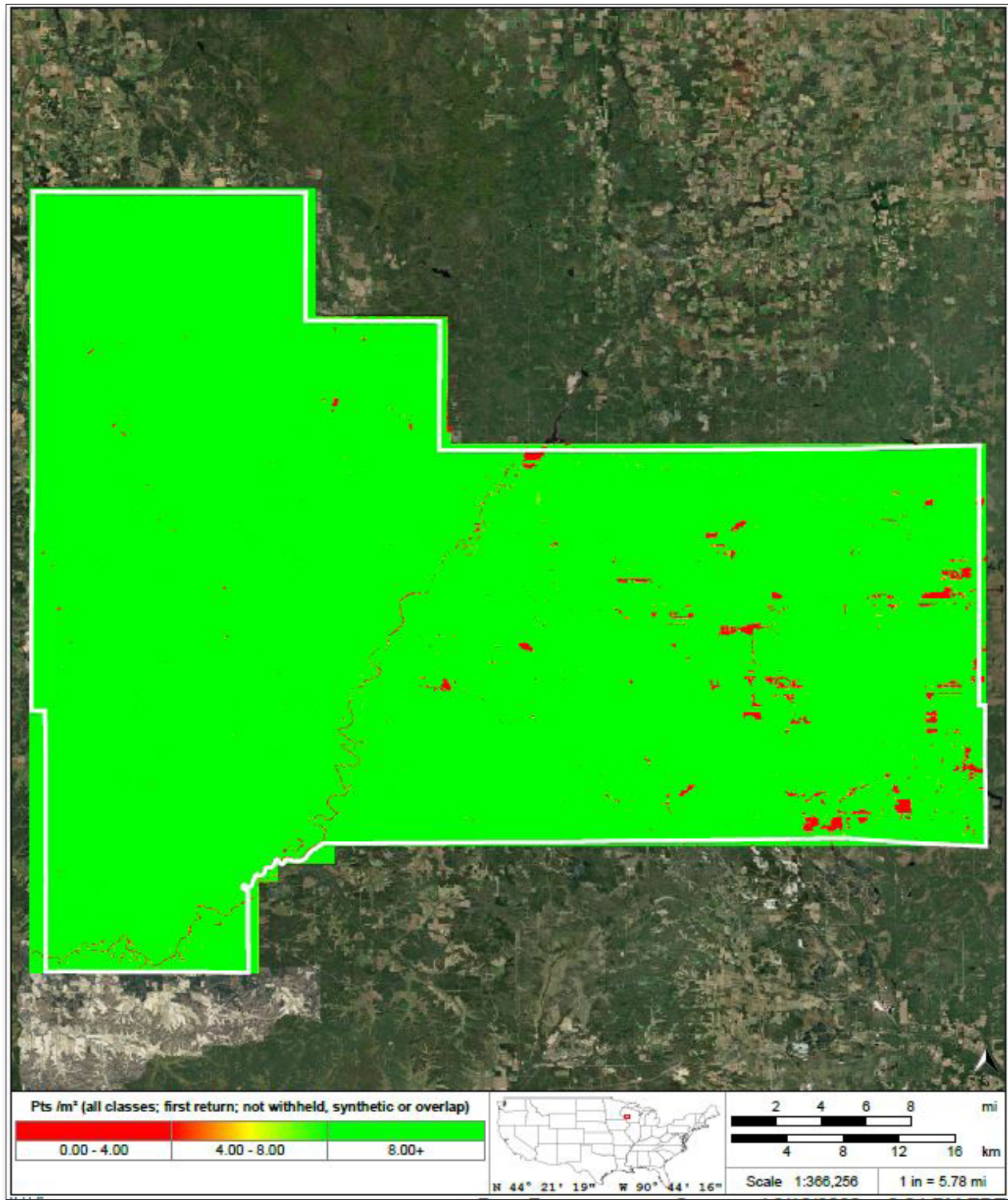
### 3.10. Point Density

The acquisition parameters were designed to acquire an average first-return density of 8 points/m<sup>2</sup>. 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 15.97 points/m<sup>2</sup> while the average ground classified density was 13.41 points/m<sup>2</sup>. 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 Jackson County Work Unit 300212 First Return Density



**Figure 4. First Return Point Density**



## WI 12 County B22 Jackson County Work Unit 300212 Ground Density

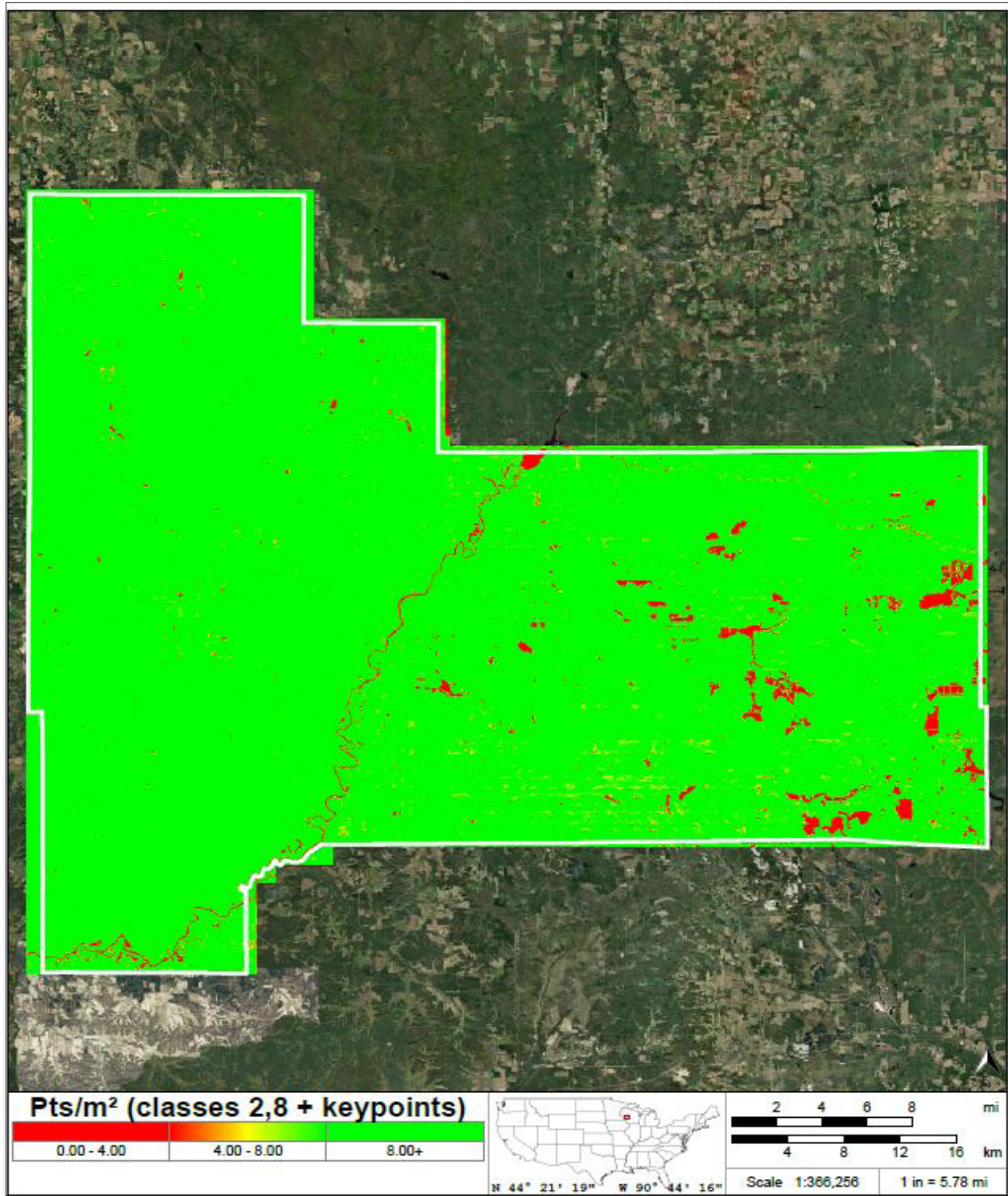


Figure 5. Ground Density



# WI 12 County B22 Jackson Work Unit 300212 Tile Layout

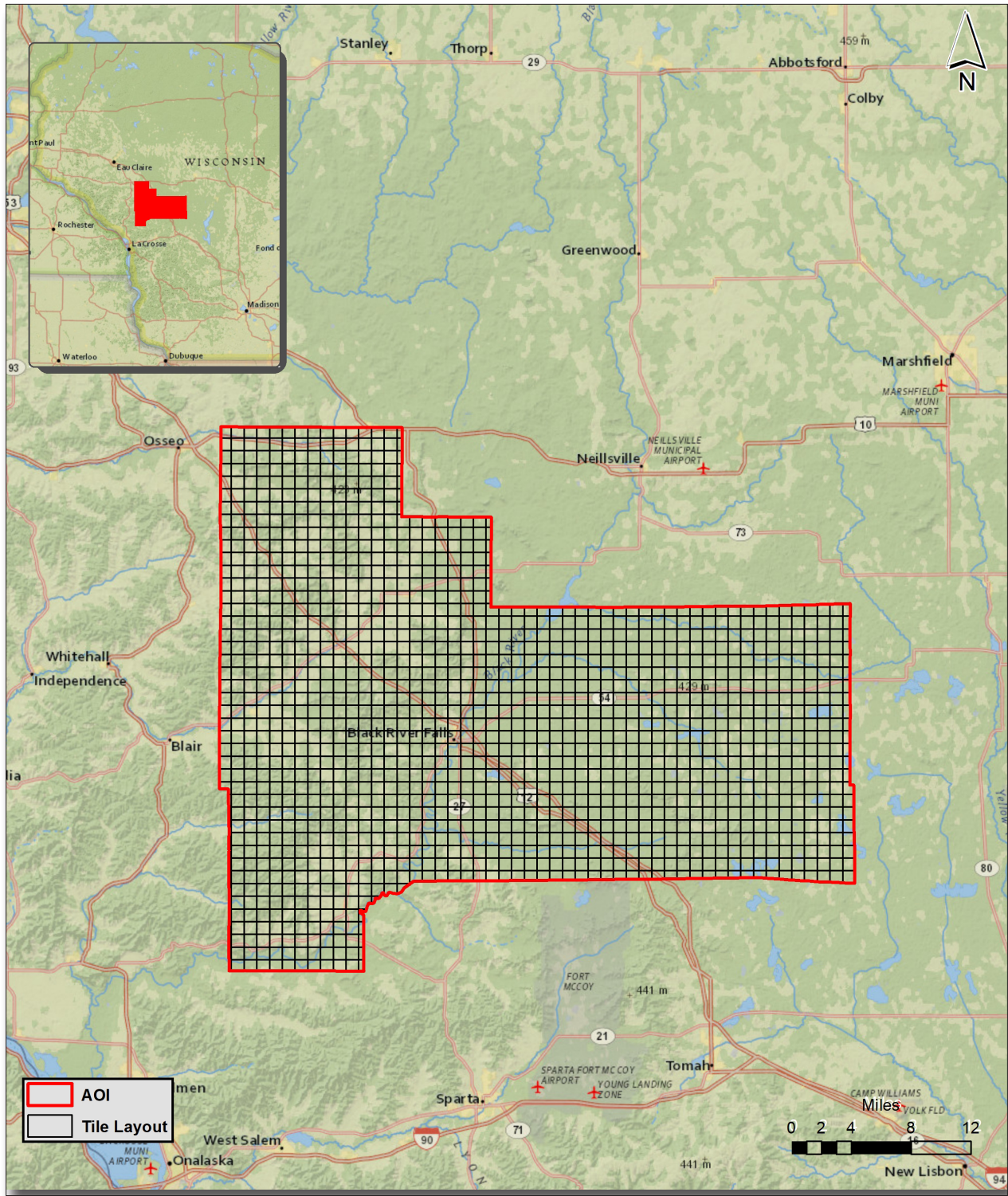


Figure 6. Lidar Tile Layout



# 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 5.

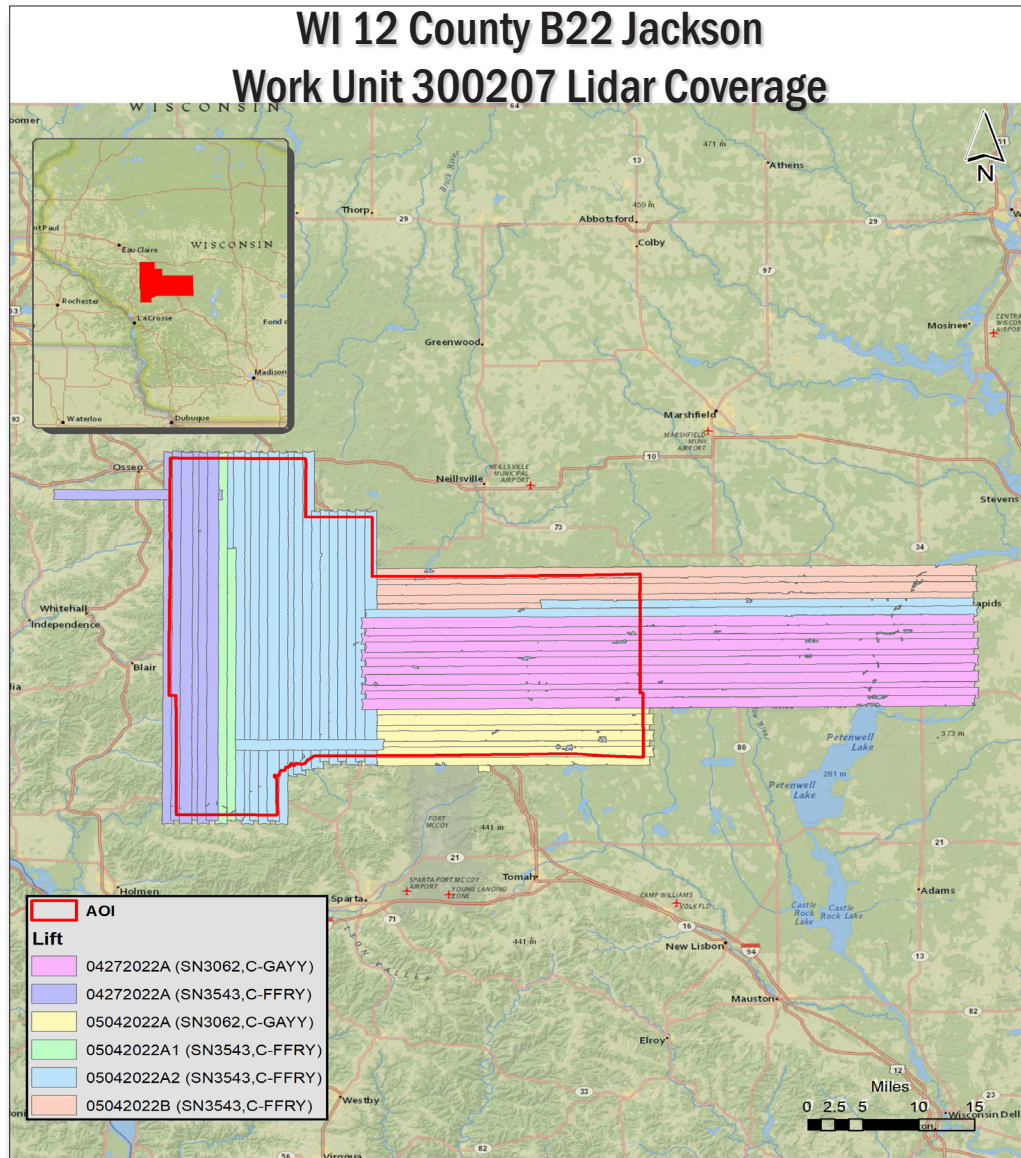


Figure 7. Lidar Coverage



## 5. Geometric Accuracy

### 5.1. Horizontal Accuracy

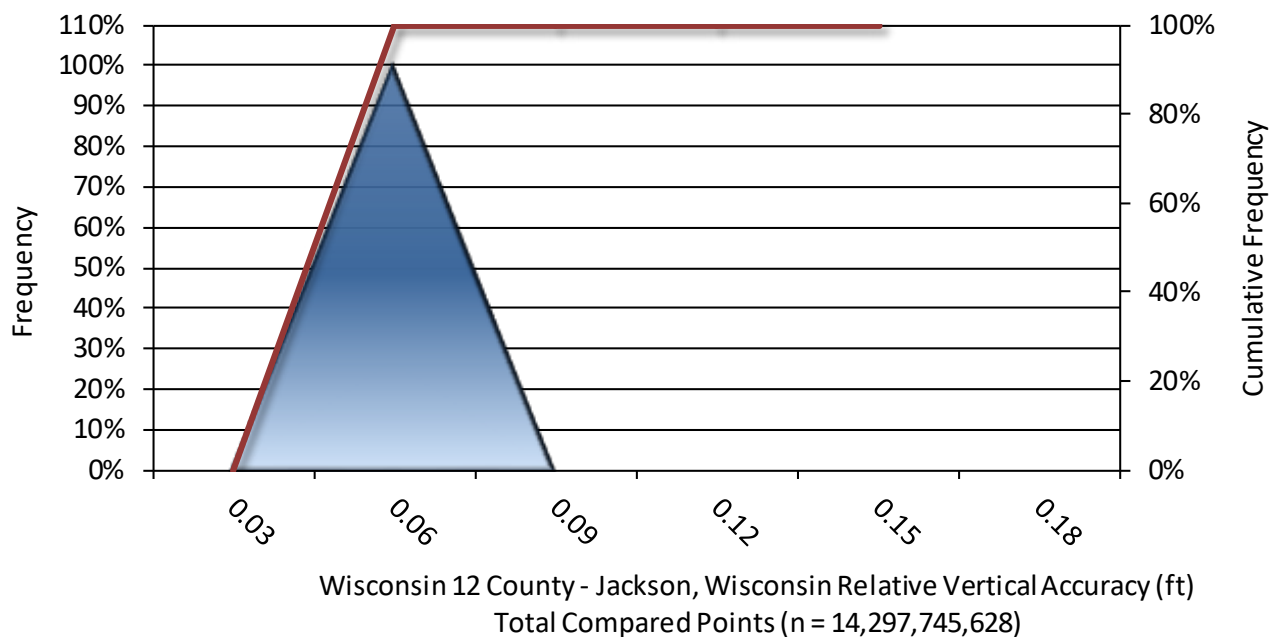
Lidar horizontal accuracy is a function of Global Navigation Satellite System (GNSS) derived positional error, flying altitude, and INS derived attitude error. The obtained  $RMSE_r$  value is multiplied by a conversion factor of 1.7308 to yield the horizontal component of the National Standards for 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 1311 meters, an IMU error of 0.002 decimal degrees, and a GNSS positional error of 0.015 meters, this project was compiled to meet 0.14 meter horizontal accuracy at the 95% confidence level. A summary is shown below.

Horizontal Accuracy	
$RMSE_r$	0.27 ft
	0.083 m
$ACC_r$	0.47 ft
	0.14 m

## 5.2. 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 Jackson project was 0.046 feet (0.014 meters). A summary is shown below.

Relative Vertical Accuracy	
Sample	50 flight line surfaces
Average	0.046 ft
	0.014 m
Median	0.046 ft
	0.014 m
RMSE	0.048 ft
	0.015 m
Standard Deviation (1σ)	0.005 ft
	0.002 m
1.96σ	0.011 ft
	0.003 m



### 5.3. Intraswath Precision (Smooth Surface Precision)

Intraswath 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:

**Precision = Range – (Slope x Cellsize x 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 2.5 cm, minimum slope-corrected range to be 0 cm, and the maximum slope-corrected range to be 9 cm.

## Project Report Appendices

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

## Appendix A

### Flight Logs



**Julian Day 117 Flight A**

# LIDAR Flight Log



<b>Date</b>	April 27, 2022	<b>Aircraft</b>	C-FFRY
<b>Project</b>	3238_NV5_WM3DEP_V3	<b>Pilot</b>	Nick H - Kane G
<b>Location</b>	Eau Claire WI	<b>Operator</b>	Daniel. A
<b>Mission Objective</b>			

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

<b>Additional Notes</b>	
T- -2C	
H- 74%	
AMLS-278m	
Hpa-1028	
Time to next maintenance: _____ ☉ 50 hr ○ 100 hr	

Aircraft Block Time		
<b>Engine On</b>	11:49	<b>Takeoff</b> 12:07
<b>Engine Off</b>	18:10	<b>Landing</b> 18:00
<b>Total</b>	6.4 hrs	<b>Total</b> 5.9 hrs

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

Static Alignment	GPS Time	
	<b>Start</b>	<b>End</b>
	Pre Mission	1157
Post Mission	1804	1809

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
F8			1217	1222				
3237	432211701		1226	1240			122602	
3238	432211702		1244	1259			124426	
3239	432211703		1303	1319			130359	
3240	432211704		1323	1338			132347	
3241	432211705		1343	1356			134327	
3242	432211706		1400	1413			140044	
3243	432211707		1418	1431			141803	
3244	432211708		1435	1448			144509	
3245	432211709		1451	1505			145152	
3246	432211710		1508	1521			150811	
3247	432211711		1525	1538			152527	
3248	432211712		1542	1554			154210	
3249	432211713		1558	1611			155841	
3250	432211714		1615	1628			161523	









**Julian Day 124 Flight A**

# LIDAR Flight Log



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

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

**Additional Notes**

T- 1C  
H- 86%  
AMLS-278m  
Hpa-1023

Time to next maintenance: \_\_\_\_\_ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
<b>Engine On</b>	11:28	<b>Takeoff</b> 11:50
<b>Engine Off</b>	18:49	<b>Landing</b> 18:37
<b>Total</b>	7.4 hrs	<b>Total</b> 6.8 hrs

Mission Plan			
<b>AGL Height</b>	1550 m	<b>Pulse Rate</b>	1200khz/ch
<b>Target Speed</b>	160 kts	<b>Scan Rate</b>	186 hz/ch
<b>Laser Current</b>	100 %	<b>FOV</b>	60 degs

Static Alignment	GPS Time	
	Start	End
<b>Pre Mission</b>	1140	1145
<b>Post Mission</b>	1842	1847

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
F8			1158	1203				
3255	432212421		1207	1719			120710	
3256	432212422		1223	1233	1233		122325	Error TCP System crashed 9.9nm EOL
Test strip			1308	1309			130855	Teststrip after full system restart
3257	432212423		1319	1331			131920	
3256	432212424		1335	1340			133551	Refly 9.9nm from the North EOL
3258	432212425		1349	1402			134936	
3259	432212426		1407	1419			140713	
3260	432212427		1424	1436			142411	
3261	432212428		1440	1453			144038	
3262	432212429		1457	1509			145709	
3263	432212430		1513	1523			151309	
3264	432212431		1528	1539			152816	
3265	432212432		1543	1553			154313	
3266	432212433		1557	1606			155743	



# 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- 1C	
H- 86%	
AMLS-278m	
Hpa-1023	
Time to next maintenance:	_____ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	11:28	Takeoff 11:50
Engine Off	18:49	Landing 18:37
Total	7.4 hrs	Total 6.8 hrs

Mission Plan			
AGL Height	1550 m	Pulse Rate	1200khz/ch
Target Speed	160 kts	Scan Rate	186 hz/ch
Laser Current	100 %	FOV	60 degs

Static Alignment	GPS Time	
	Start	End
	Pre Mission	1140
Post Mission	1842	1847

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
3267	432212434		1610	1618			161007	
3268	432212435		1622	1630			162228	
3269	432212436		1634	1643			163452	
3270	432212437		1647	1655			164724	
3271	432212438		1659	1707			165925	
3272	432212439		1711	1720			171158	
Xtie	432212440		1725	1730			172508	
F8			1730	1735				
3200	432212441		1741	1759			174110	
3199	432212442		1803	1815		1815	180305	Aborted not enough fuel to finish 14nm

## LIDAR Flight Log



<b>Date</b>	May 04, 2022	<b>Aircraft</b>	C-FFRY
<b>Project</b>	3238_NV5_WI3DEP_V3	<b>Pilot</b>	Kane G
<b>Location</b>	Eau Claire WI	<b>Operator</b>	Daniel A
<b>Mission Objective</b>			

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

<b>Additional Notes</b>
T- 1C
H- 86%
AMLS-278m
Hpa-1023
Time to next maintenance: _____ ☉ 50 hr ○ 100 hr

Aircraft Block Time			
<b>Engine On</b>	11:28	<b>Takeoff</b>	11:50
<b>Engine Off</b>	18:49	<b>Landing</b>	18:37
<b>Total</b>	7.4 hrs	<b>Total</b>	6.8 hrs

Mission Plan					
<b>AGL Height</b>	1550	<b>m</b>	<b>Pulse Rate</b>	1200	<b>khz/ch</b>
<b>Target Speed</b>	160	<b>kts</b>	<b>Scan Rate</b>	186	<b>hz/ch</b>
<b>Laser Current</b>	100	<b>%</b>	<b>FOV</b>	60	<b>degs</b>

Static Alignment	GPS Time	
	Start	End
	Pre Mission	1140
Post Mission	1842	1847

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		

**Julian Day 124 Flight A**

**LIDAR Flight Log**



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

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

**Additional Notes**  
 T- 1C  
 H- 86%  
 AMLS-278m  
 Hpa-1023  
 Time to next maintenance: \_\_\_\_\_ Ⓞ 50 hr ○ 100 hr

<b>Aircraft Block Time</b>		
<b>Engine On</b>	11:28	<b>Takeoff</b> 11:50
<b>Engine Off</b>	18:49	<b>Landing</b> 18:37
<b>Total</b>	7.4 hrs	<b>Total</b> 6.8 hrs

<b>Mission Plan</b>			
<b>AGL Height</b>	1550 m	<b>Pulse Rate</b>	1200khz/ch
<b>Target Speed</b>	160 kts	<b>Scan Rate</b>	186 hz/ch
<b>Laser Current</b>	100 %	<b>FOV</b>	60 degs

<b>Static Alignment</b>	<b>GPS Time</b>	
	Start	End
	Pre Mission	1140
Post Mission	1842	
	1842	1847

<b>Flight Line</b>	<b>LiDAR File Name</b>	<b>Flight Direction</b>	<b>GPS Time</b>		<b>Line Aborted</b>		<b>Mission ID</b> <small>Time Stamp</small>	<b>Comments</b>
			Start	End	Time	nmi to End		

Julian Day 124 Flight A

### LIDAR Flight Log



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

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

**Additional Notes**  
 T- 1C  
 H- 86%  
 AMLS-278m  
 Hpa-1023  
 Time to next maintenance: \_\_\_\_\_ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
<b>Engine On</b>	11:28	<b>Takeoff</b> 11:50
<b>Engine Off</b>	18:49	<b>Landing</b> 18:37
<b>Total</b>	7.4 hrs	<b>Total</b> 6.8 hrs

Mission Plan			
<b>AGL Height</b>	1550 m	<b>Pulse Rate</b>	1200khz/ch
<b>Target Speed</b>	160 kts	<b>Scan Rate</b>	186 hz/ch
<b>Laser Current</b>	100 %	<b>FOV</b>	60 degs

Static Alignment	GPS Time	
	Start	End
<b>Pre Mission</b>	1140	1145
<b>Post Mission</b>	1842	1847

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		

**Julian Day 124 Flight B**

# LIDAR Flight Log



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

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

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

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

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

Static Alignment	GPS Time		
	<b>Start</b>	<b>End</b>	
	1925	1930	
<b>Pre Mission</b>	2256	<b>Post Mission</b>	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				



**Julian Day 124 Flight B**

# LIDAR Flight Log



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

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

**Additional Notes**

T- 15C Moderate Turbulence  
 H- 36%  
 AMLS-278m  
 Hpa-1022

Time to next maintenance: \_\_\_\_\_ Ⓞ 50 hr ○ 100 hr

**Aircraft Block Time**

<b>Engine On</b>	19:19	<b>Takeoff</b>	19:38
<b>Engine Off</b>	23:03	<b>Landing</b>	22:53
<b>Total</b>	3.7 hrs	<b>Total</b>	3.3 hrs

**Mission Plan**

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

**Static Alignment**

<b>Pre Mission</b>	Start	End
<b>Post Mission</b>	1925	1930
	2256	2301

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		

**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
<b>Mission Objective</b>			

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

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

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

<b>Mission Plan</b>			
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
Pre Mission	1925	1930
Post Mission	2256	2301

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		

# 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**

	Start	End
Pre Mission	1925	1930
Post Mission	2256	2301

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		



**LIDAR Flight Log**



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

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

<b>Additional Notes</b>	T- 15C Moderate Turbulence H- 36% AMLS-278m Hpa-1022 Time to next maintenance: _____ Ⓞ 50 hr Ⓞ 100 hr
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<b>Aircraft Block Time</b>		
<b>Engine On</b>	19:19	<b>Takeoff</b> 19:38
<b>Engine Off</b>	23:03	<b>Landing</b> 22:53
<b>Total</b>	3.7 hrs	<b>Total</b> 3.3 hrs

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

<b>Static Alignment</b>	<b>GPS Time</b>	
	<b>Start</b>	<b>End</b>
	Pre Mission	1925
Post Mission	2256	2301

<b>Flight Line</b>	<b>LiDAR File Name</b>	<b>Flight Direction</b>	<b>GPS Time</b>		<b>Line Aborted</b>		<b>Mission ID</b> Time Stamp	<b>Comments</b>
			<b>Start</b>	<b>End</b>	<b>Time</b>	<b>nmi to End</b>		

**Julian Day 125 Flight A**

# LIDAR Flight Log



<b>Date</b>	May 05, 2022	<b>Aircraft</b>	C-FFRY
<b>Project</b>	3238_NV5_WM3DEP_V3	<b>Pilot</b>	Kane G
<b>Location</b>	Eau Claire WI	<b>Operator</b>	Daniel. A
<b>Mission Objective</b>			

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

**Additional Notes**  
 T-3C  
 H- 87%  
 AMLS-278m  
 Hpa-1020  
 Time to next maintenance: \_\_\_\_\_ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
<b>Engine On</b>	11:57	<b>Takeoff</b> 12:13
<b>Engine Off</b>	17:40	<b>Landing</b> 17:27
<b>Total</b>	5.7 hrs	<b>Total</b> 5.2 hrs

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

Static Alignment	GPS Time	
	<b>Start</b>	<b>End</b>
	Pre Mission	1202
Post Mission	1730	1735

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
F8			1223	1228				
3192	432212501		1243	1253			124335	
3191	432212502		1257	1307			125712	
3190	432212503		1311	1321			131102	
3189	432212504		1324	1334			132437	
3188	432212505		1338	1348			133834	
3187	432212506		1352	1402			135217	
3186	432212507		1405	1414			140557	
3185	432212508		1417	1425			141722	
3184	432212509		1429	1437			142911	
3183	432212510		1440	1448			144044	
3182	432212511		1452	1500			145214	
3181	432212512		1503	1511			150345	
3180	432212513		1515	1524			151551	
3179	432212514		1527	1535			152742	

Julian Day 125 Flight A

# LIDAR Flight Log



Date	May 05, 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-3C  
 H- 87%  
 AMLS-278m  
 Hpa-1020  
 Time to next maintenance: \_\_\_\_\_ @ 50 hr ○ 100 hr

Aircraft Block Time		
Engine On	11:57	Takeoff 12:13
Engine Off	17:40	Landing 17:27
Total	5.7 hrs	Total 5.2 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
Pre Mission	1202	1207
Post Mission	1730	1735

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
3178	432212515		1539	1547			153912	
3177	432212516		1550	1558			155030	
3176	432212517		1601	1610			160155	
3175	432212518		1613	1621			161310	
3174	432212519		1624	1632			162447	
Xtie	432212520		1636	1643			163647	
3219	432212521		1653	1700			165321	possible cloud
F8			1701	1706				



**Julian Day 117 Flight A**

# LIDAR Flight Log



<b>Date</b>	April 27, 2022	<b>Aircraft</b>	C-GAYY
<b>Project</b>	3238_NV5_QL1	<b>Pilot</b>	A. Hering
<b>Location</b>	Eau Claire, Wisconsin	<b>Operator</b>	B.Eisenbart
<b>Mission Objective</b>			

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

**Additional Notes**

Time to next maintenance: \_\_\_\_\_ ☉ 50 hr ○ 100 hr

Aircraft Block Time		
<b>Engine On</b>	14:04	<b>Takeoff</b> 14:29
<b>Engine Off</b>	20:36	<b>Landing</b> 20:26
<b>Total</b>	6.5 hrs	<b>Total</b> 6.0 hrs

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

Static Alignment	GPS Time	
	Start	End
	Pre Mission	14:14
Post Mission	20:29	20:34

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
figure 8		-	14:54	14:59			220427	
3220 X-TIE	622211720	183°	15:01	15:11			145920	
3211		273°	15:19	15:40			151739	Data recorder error closing file
3210		93°	15:43	16:01			154159	Data recorder error closing file
3211	622211721	273°	16:15	16:32			161324	rebooted recorder, swapped drives
3210	622211722	93°	16:37	16:55			163540	reflew line
3209	622211723	273°	16:58	17:15			165635	reflew line
3208	622211724	93°	17:18	17:36			171653	
3207	622211725	273°	17:40	17:58			173809	
3206	622211726	93°	18:01	18:19			175924	
3205	622211727	273°	18:22	18:40			182008	
3204	622211728	93°	18:43	19:01			184115	
3203	622211729	273°	19:03	19:21			190154	
3202	622211730	93°	19:24	19:43			192256	

Julian Day 117

LIDAR Flight Log

Flight A

Date	April 27, 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	14:04
Takeoff	14:29
Engine Off	20:36
Landing	20:26
Total	6.5 hrs

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

Static Alignment	GPS Time	
	Start	End
Pre Mission	14:14	14:19
Post Mission	20:29	20:34

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
3201	622211731	273°	19:45	20:03			220427	
figure 8		-	20:03	20:07			194345	

Julian Day 117

# LIDAR Flight Log

Flight A



Date	April 27, 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

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Time to next maintenance: \_\_\_\_\_ ☉ 50 hr ○ 100 hr

Aircraft Block Time	
Engine On	14:04
Takeoff	14:29
Engine Off	20:36
Landing	20:26
Total	6.5 hrs
Total	6.0 hrs

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

Static Alignment	GPS Time	
	Start	End
Pre Mission	14:14	14:19
Post Mission	20:29	20:34

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted	Mission ID	Comments
			Start	End			
						Mission ID 220427 Time Stamp	

**Julian Day 117 Flight A**

**LIDAR Flight Log**

<b>Date</b>	April 27, 2022	<b>Aircraft</b>	C-GAYY
<b>Project</b>	3238_NV5_QL1	<b>Pilot</b>	A. Hering
<b>Location</b>	Eau Claire, Wisconsin	<b>Operator</b>	B.Eisenbart
<b>Mission Objective</b>			

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

<b>Additional Notes</b>	
<b>Time to next maintenance:</b>	_____ ☉ 50 hr ○ 100 hr

<b>Aircraft Block Time</b>			
<b>Engine On</b>	14:04	<b>Takeoff</b>	14:29
<b>Engine Off</b>	20:36	<b>Landing</b>	20:26
<b>Total</b>	6.5 hrs	<b>Total</b>	6.0 hrs

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

<b>Static Alignment</b>		<b>GPS Time</b>
<b>Pre Mission</b>	Start	<b>End</b>
	14:14	14:19
<b>Post Mission</b>	Start	<b>End</b>
	20:29	20:34

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted	Mission ID	Comments
			Start	End			
						Time Stamp 220427	

**LIDAR Flight Log**



<b>Date</b>	April 27, 2022	<b>Aircraft</b>	C-GAYY
<b>Project</b>	3238_NV5_QL1	<b>Pilot</b>	A. Hering
<b>Location</b>	Eau Claire, Wisconsin	<b>Operator</b>	B.Eisenbart
<b>Mission Objective</b>			

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

**Additional Notes**

Time to next maintenance: \_\_\_\_\_ Ⓞ 50 hr ○ 100 hr

Aircraft Block Time		
<b>Engine On</b>	14:04	<b>Takeoff</b> 14:29
<b>Engine Off</b>	20:36	<b>Landing</b> 20:26
<b>Total</b>	6.5 hrs	<b>Total</b> 6.0 hrs

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

Static Alignment	GPS Time	
	Start	End
	Pre Mission 14:14	14:19
Post Mission 20:29	20:34	

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
							220427	

**Julian Day 124 Flight A**

# LIDAR Flight Log



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

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

**Additional Notes**

Time to next maintenance: \_\_\_\_\_ ☉ 50 hr ○ 100 hr

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

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

Static Alignment	GPS Time	
	Start	End
<b>Pre Mission</b>	12:11	12:16
<b>Post Mission</b>	18:32	18:37

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted	Mission ID	Comments
			Start	End			
Test Strip figure 8		-	12:30	12:30		220504 Time Stamp 123028	
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		-	switched to 3237 QL2 parameters
X-TIE	622212409	92°	14:58	15:03		145832	Aborted, clouds in the area
figure 8		-	15:31	15:35		-	switched back to 3238 QL1 parameters

**Julian Day 124 Flight A**

# LIDAR Flight Log



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

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

<b>Additional Notes</b>
Time to next maintenance: _____ ☉ 50 hr ○ 100 hr

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

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

Static Alignment	GPS Time	
	<b>Start</b>	<b>End</b>
	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	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 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	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		
							Mission ID Time Stamp 220504	



# LIDAR Flight Log

<b>Julian Day 124</b>	<b>Flight A</b>
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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	12:16
Post Mission	18:32	18:37

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted	Mission ID	Comments
			Start	End			

# 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 ips/ch
Laser Current	100 %	FOV	60 degs

**Static Alignment**

	Start	End
Pre Mission	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		

**Appendix B**

**SBET and POSPAC Reports**

## General Information

### Mission Information

Project name	04272022A_3062
Processing date	2022-04-29 15:57:54
Mission date	2022-04-27 14:13:09
Mission duration	06:21:25.361
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
220427_141250_INS-GPS_1.raw	POS Data

### Input Files

File Name	File Type
Ephm1170.22g	GLONASS Broadcast Ephemeris
Ephm1170.22n	GPS Broadcast Ephemeris

### Output Files

Filename	File type
sbet_04272022A_3062.out	SBET Trajectory File

## Rover Data Summary

First raw data file	220427_141250_INS-GPS_1.raw		
Last raw data file	220427_141250_INS-GPS_1.raw		
Start GPS week	2207		
Start time	310370.079 (4/27/2022 2:12:50 PM)		
End time	333255.440 (4/27/2022 8:34:15 PM)		
Start of fine alignment	310394.594 (4/27/2022 2:13:14 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
<b>IMU Installation Lever Arms &amp; Mounting Angles</b>			
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



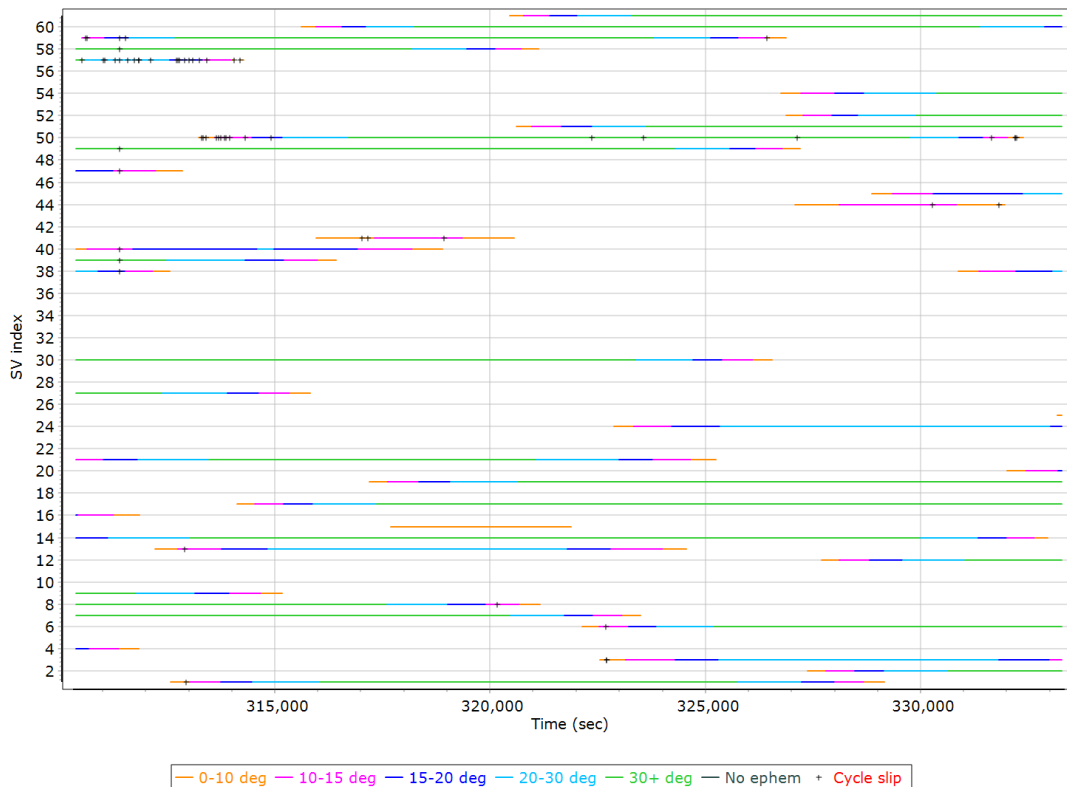
## Rover Data QC

### Raw IMU Import QC Summary

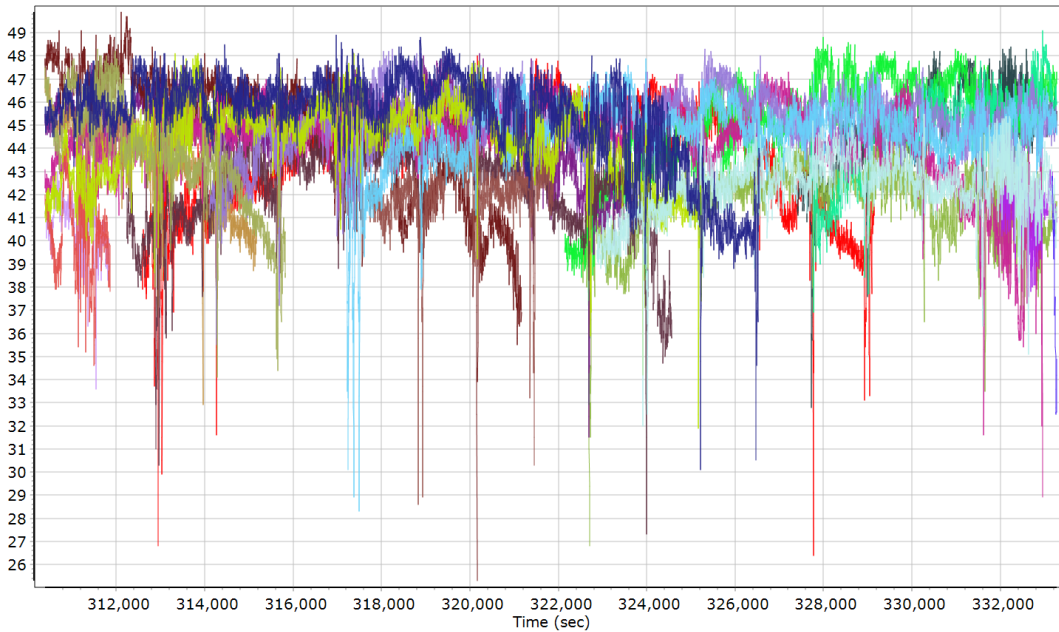
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_04272022A_3062.log
IMU Records Processed	4577062
Termination Status	Normal
IMU Anomalies	0

## Primary Observables & Satellite Data

### GPS/GLONASS L1 Satellite Lock/Elevation

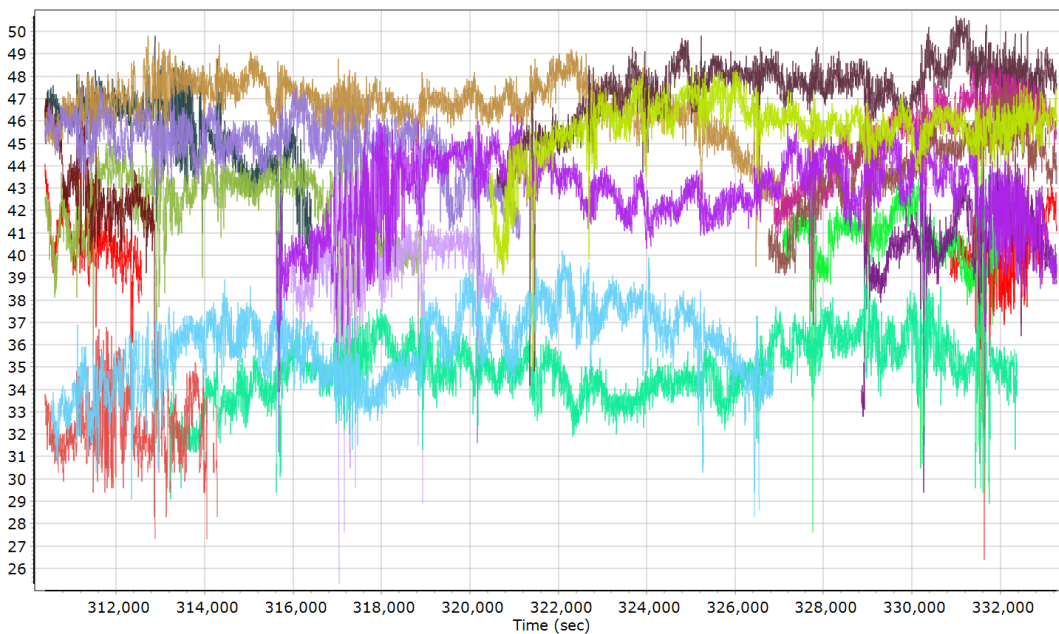


### GPS L1 SNR



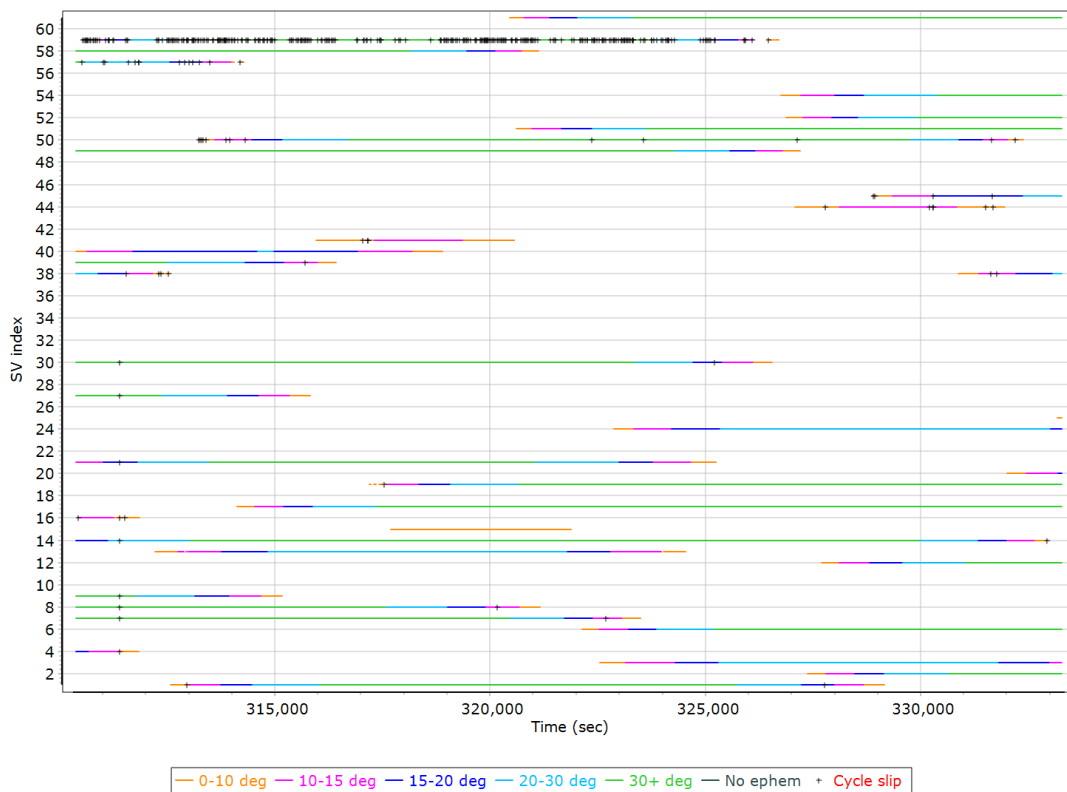
- |                           |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 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 25 L1 SNR (dB/Hz) | GPS PRN 27 L1 SNR (dB/Hz) |
| GPS PRN 30 L1 SNR (dB/Hz) |                           |                           |                           |

### GLONASS L1 SNR

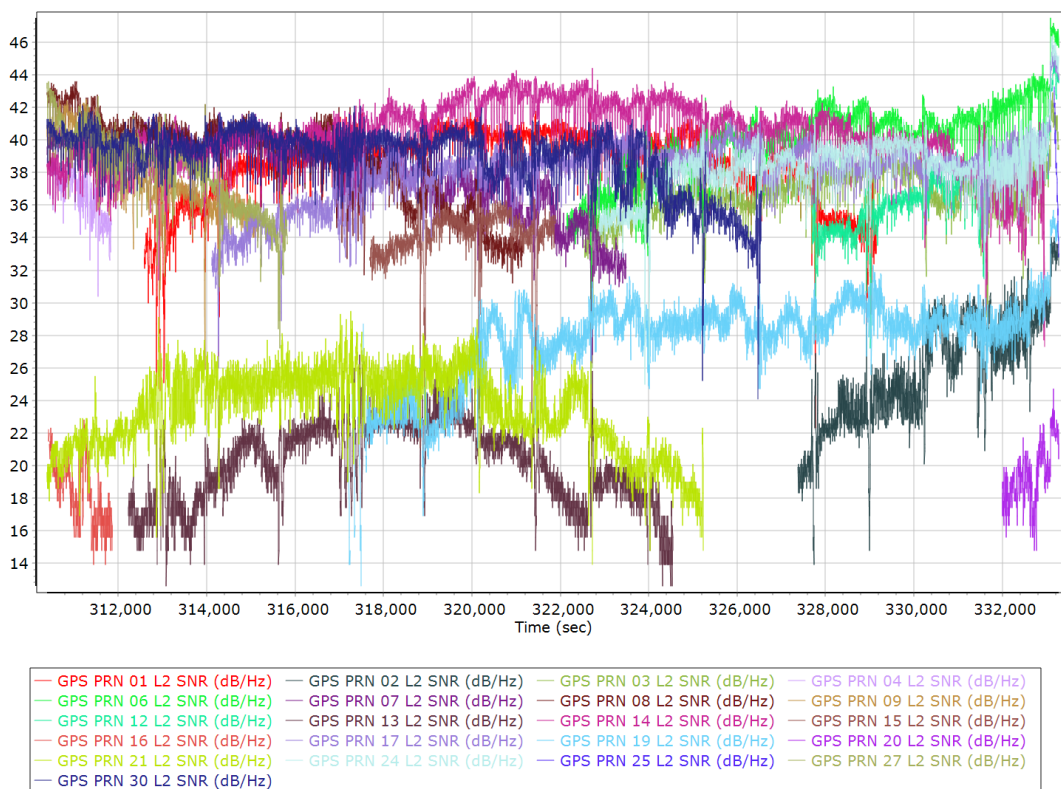


- |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 07 L1 SNR (dB/Hz) | GLONASS 08 L1 SNR (dB/Hz) |
| GLONASS 10 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) |                           |

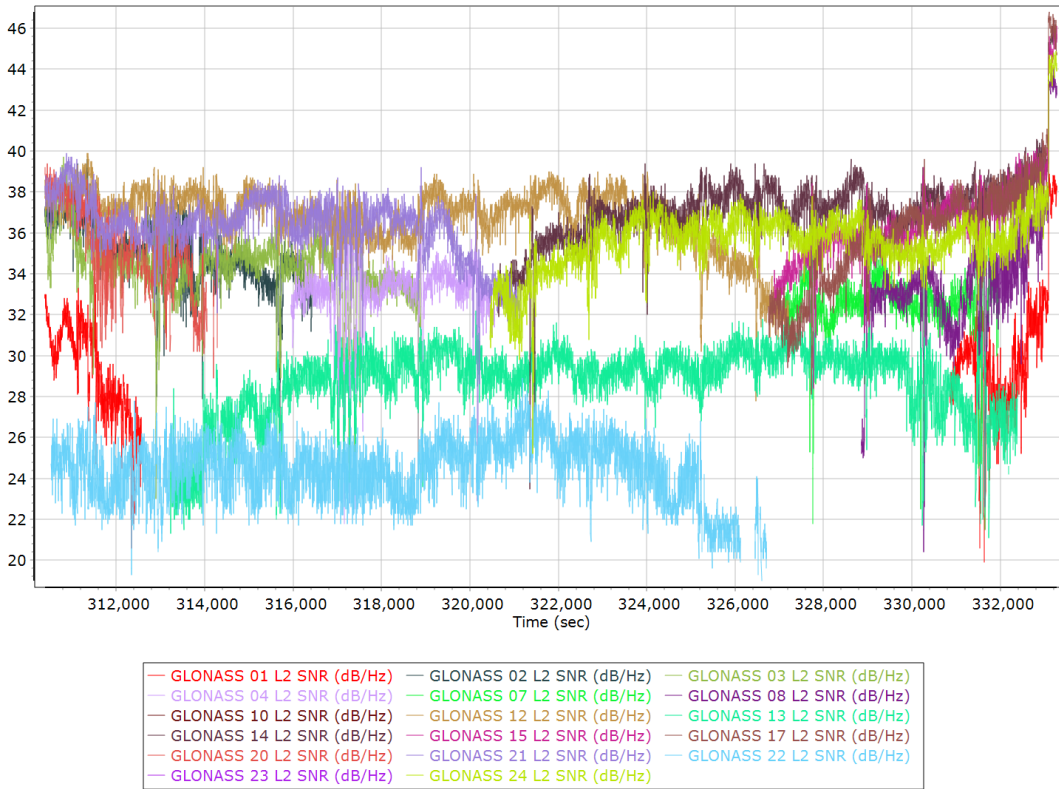
### GPS/GLONASS L2 Satellite Lock/Elevation



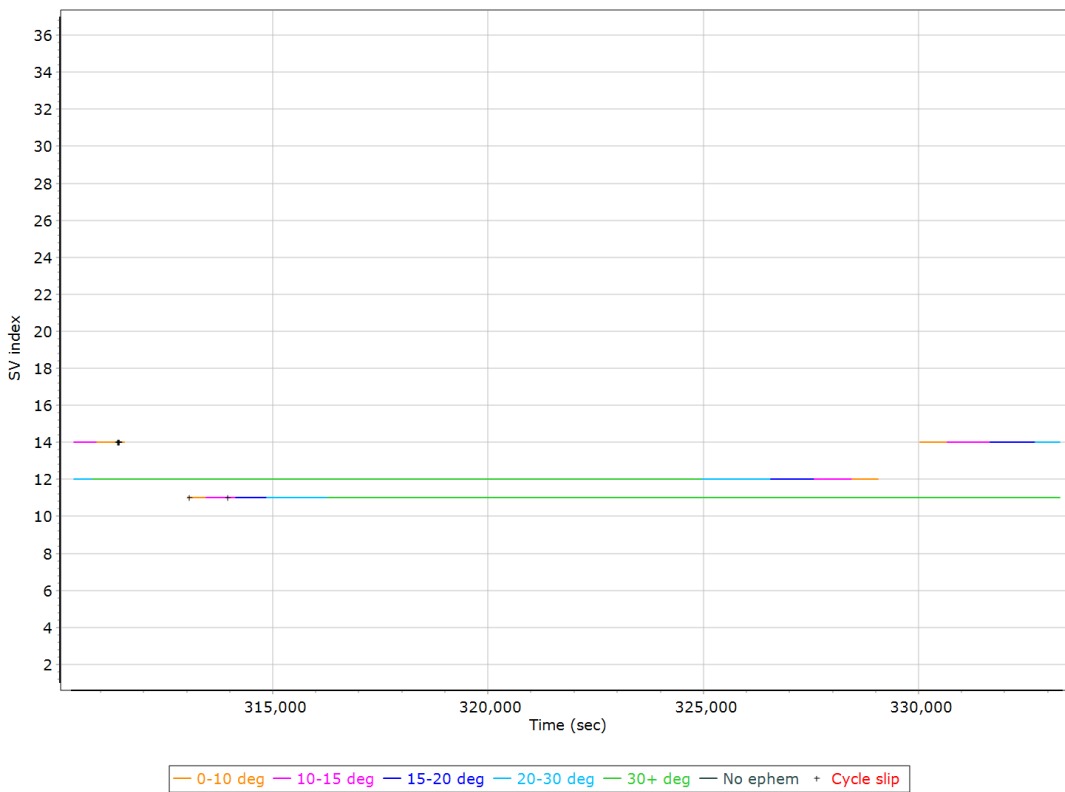
### GPS L2 SNR



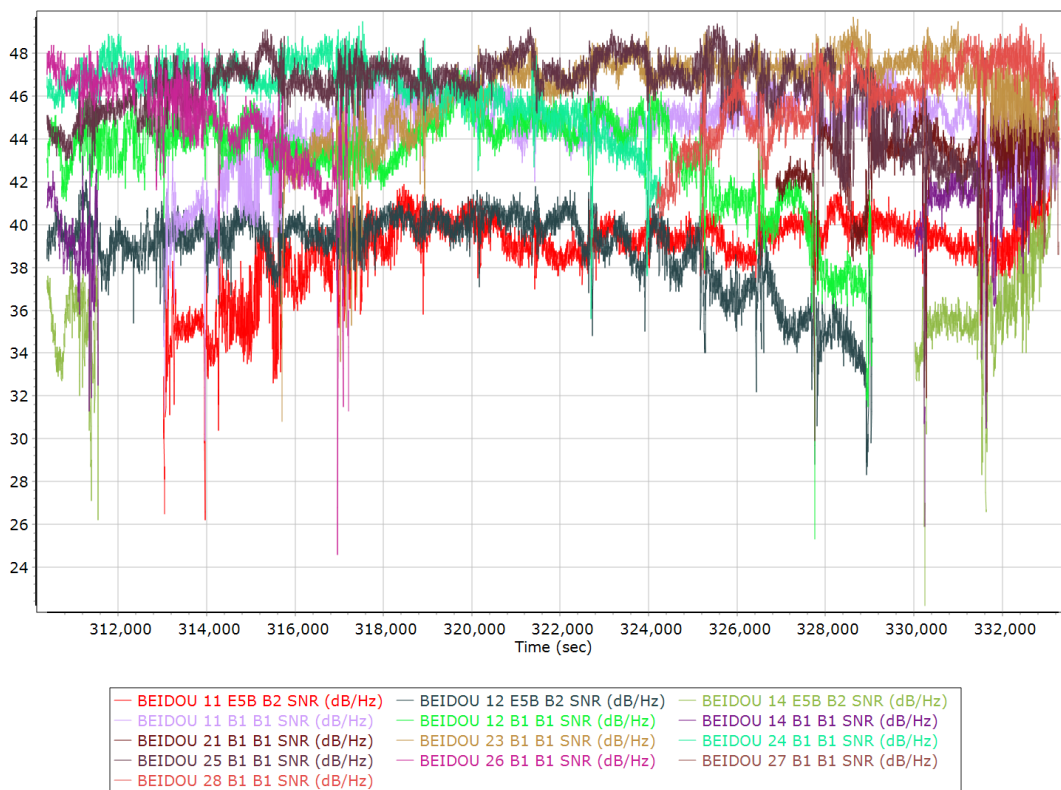
### GLONASS L2 SNR



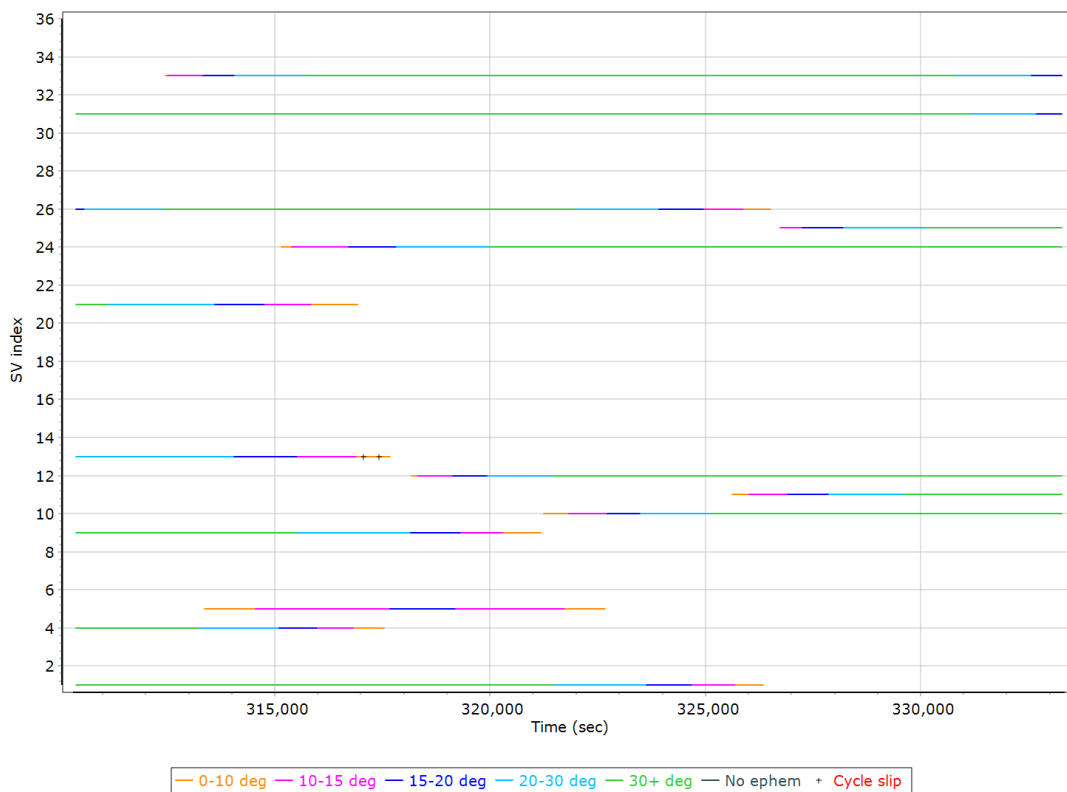
### BEIDOU Satellite Lock/Elevation



### BEIDOU SNR

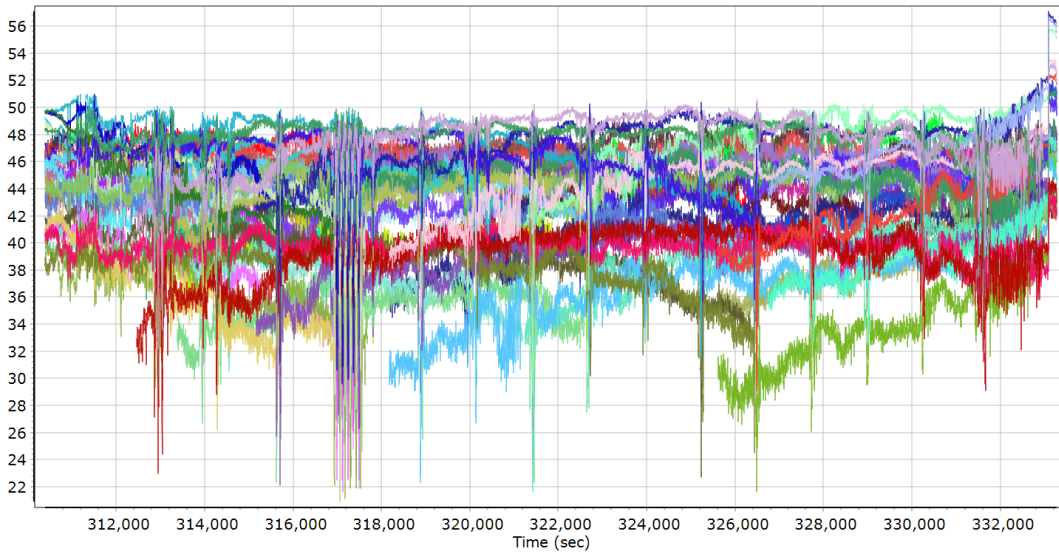


### GALILEO Satellite Lock/Elevation





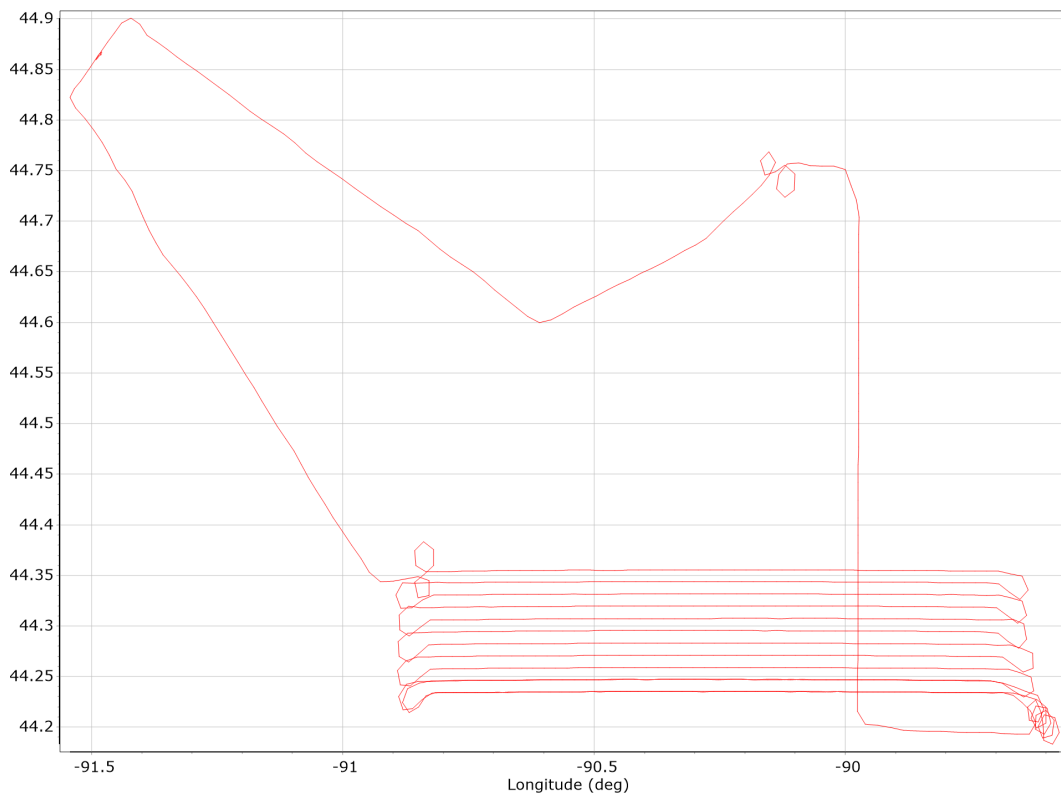
## GALILEO SNR



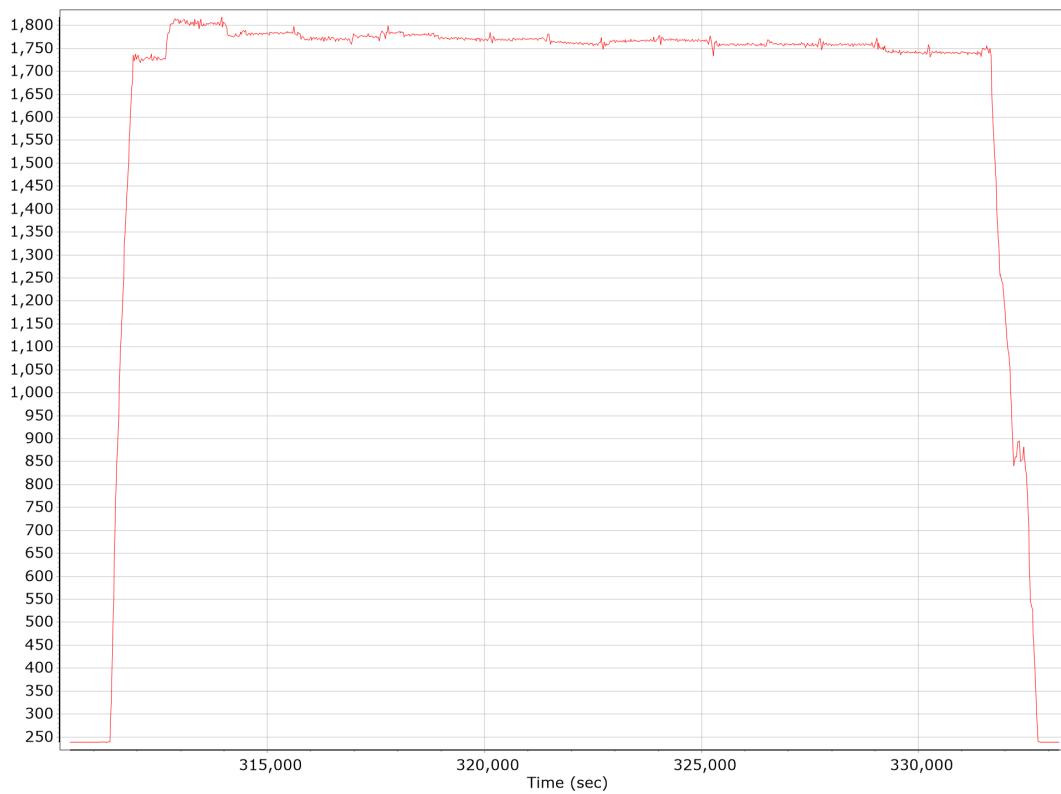
— GALILEO 01 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 05 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 10 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 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 01 L5E5A BPSK10_PD 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

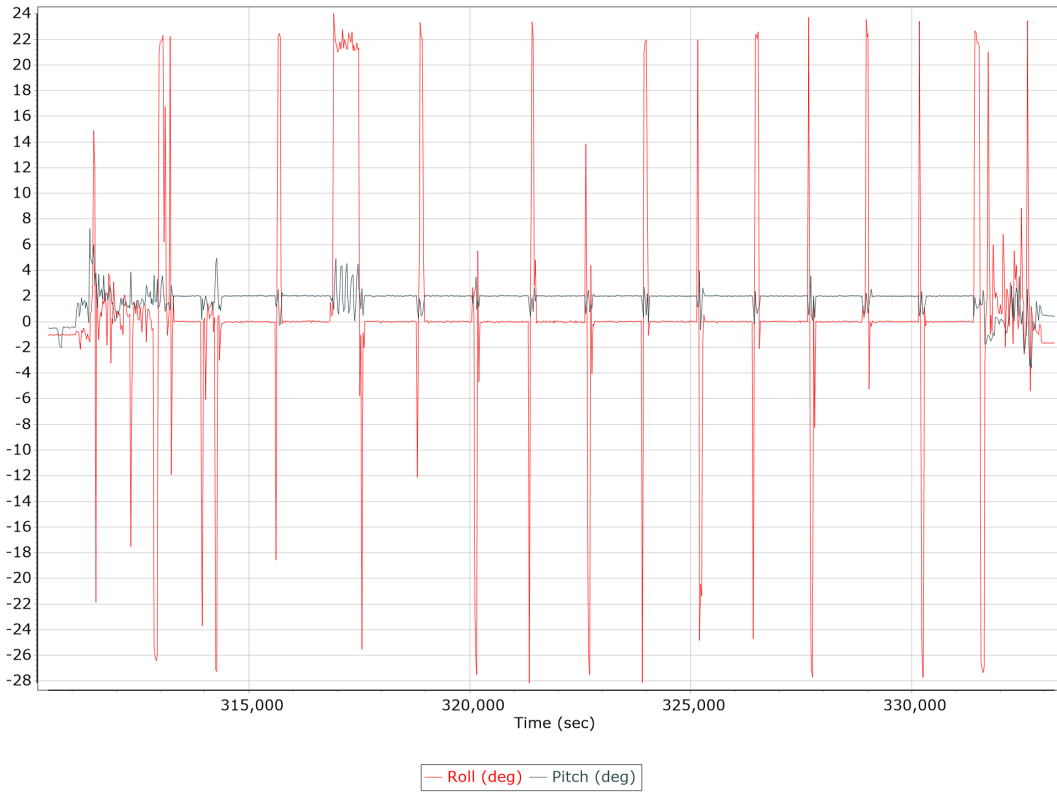
### Top View



### Altitude



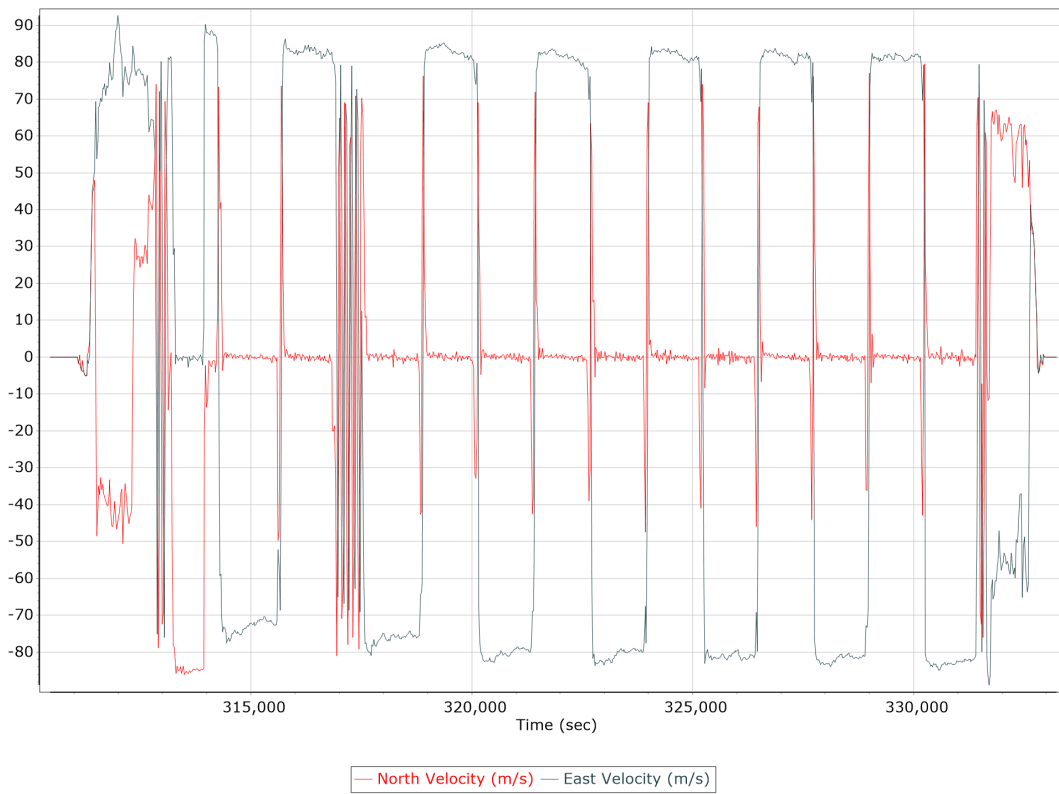
## Roll/Pitch



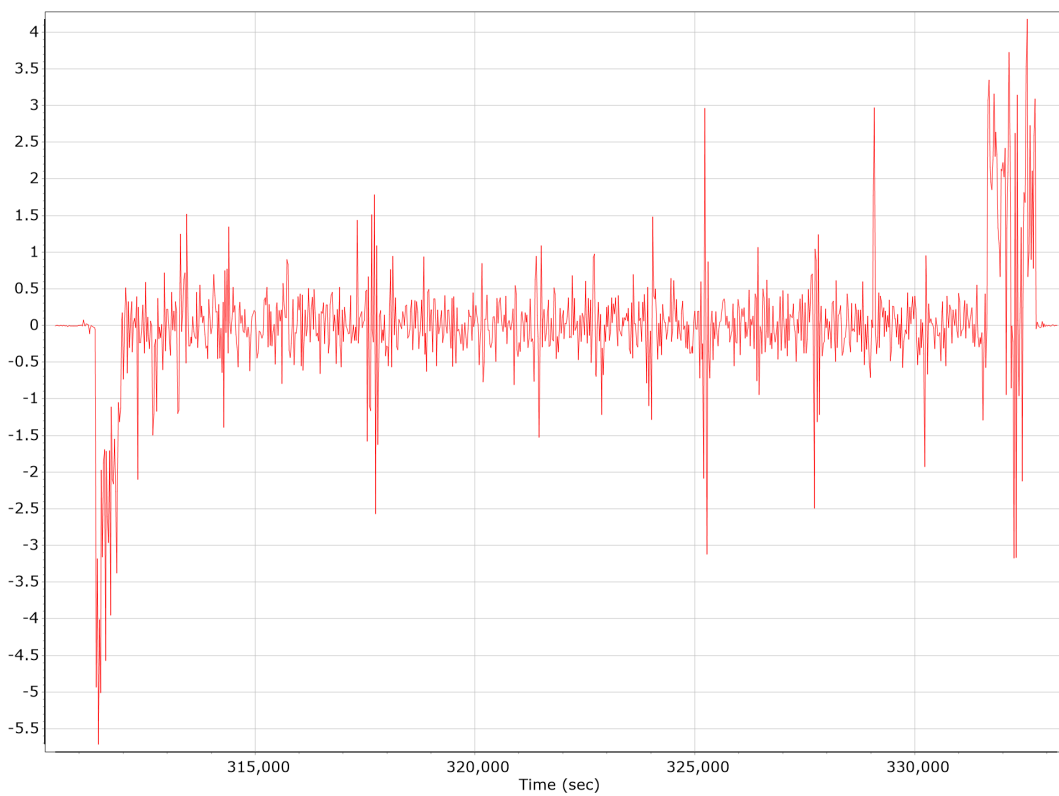
## Heading



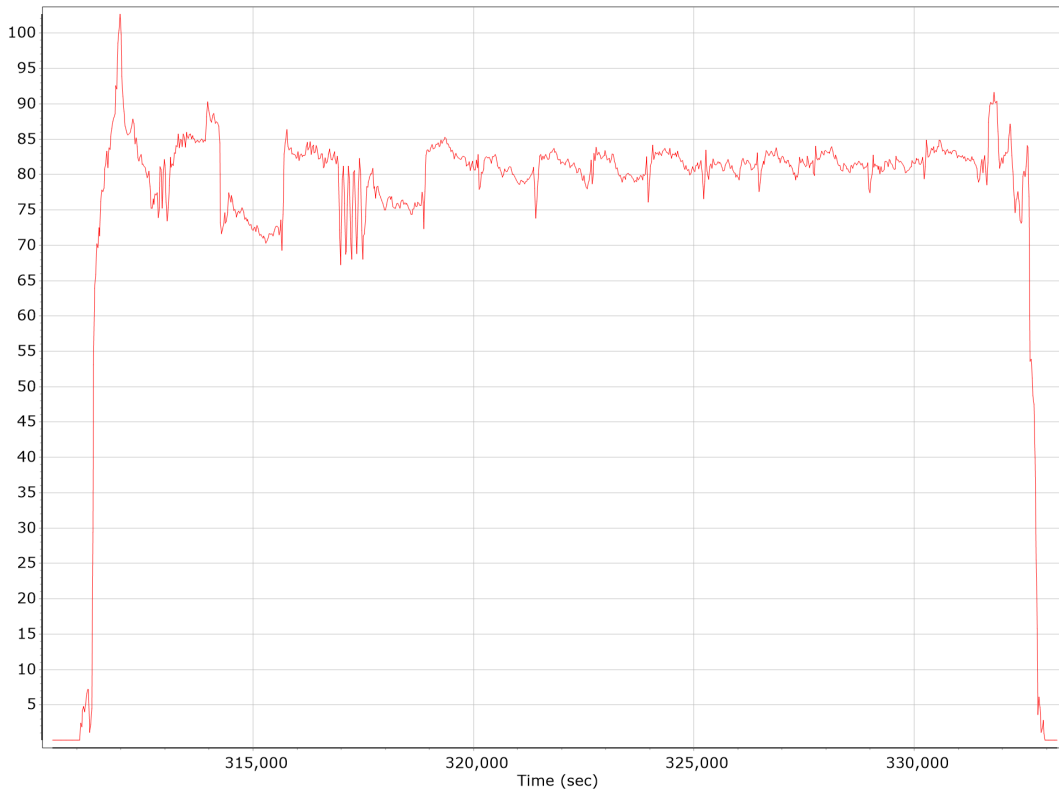
## North/East Velocity



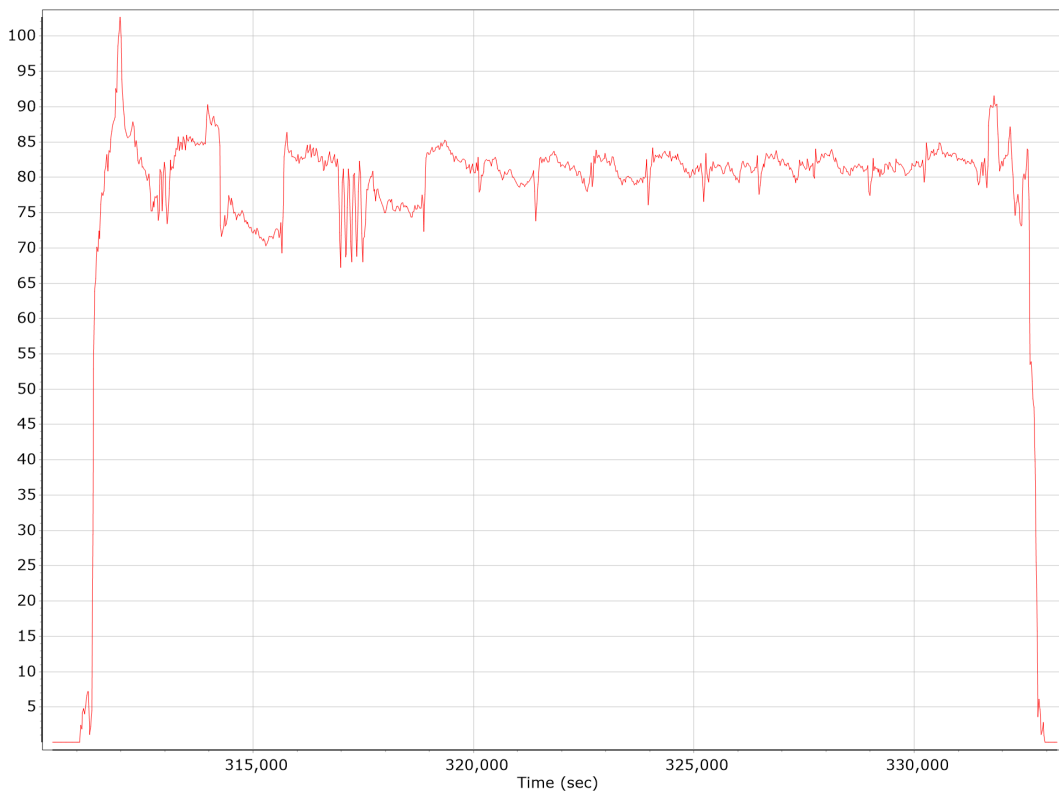
## Down Velocity



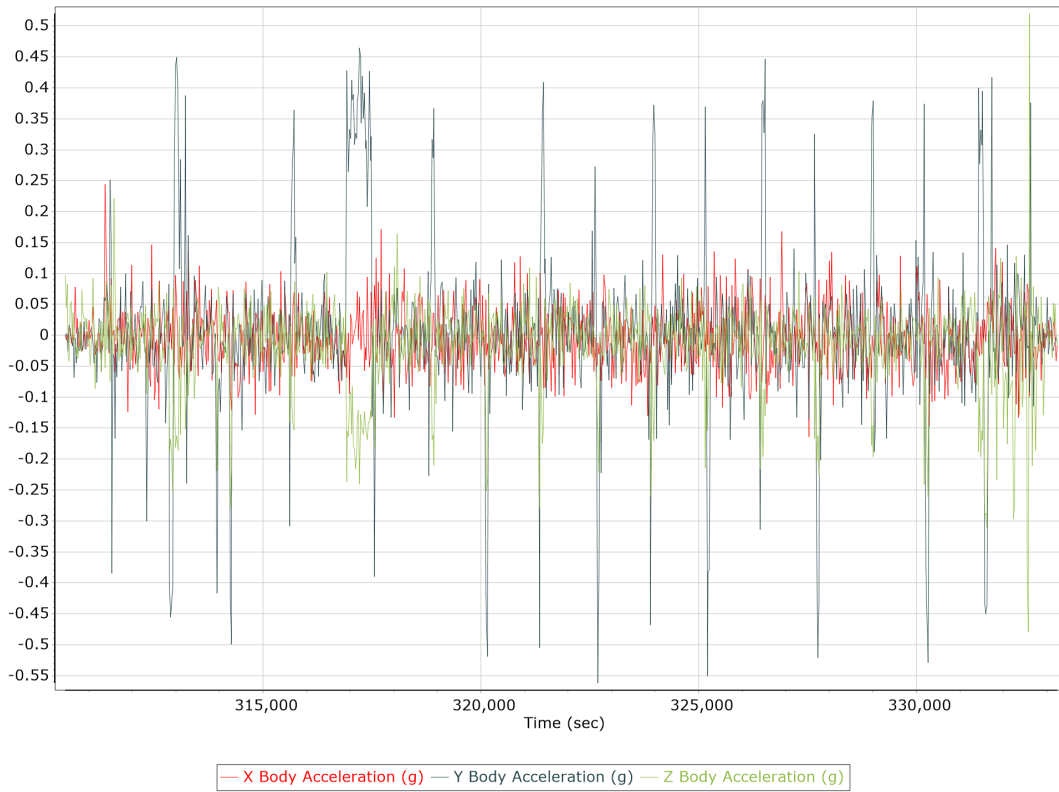
## Total Speed



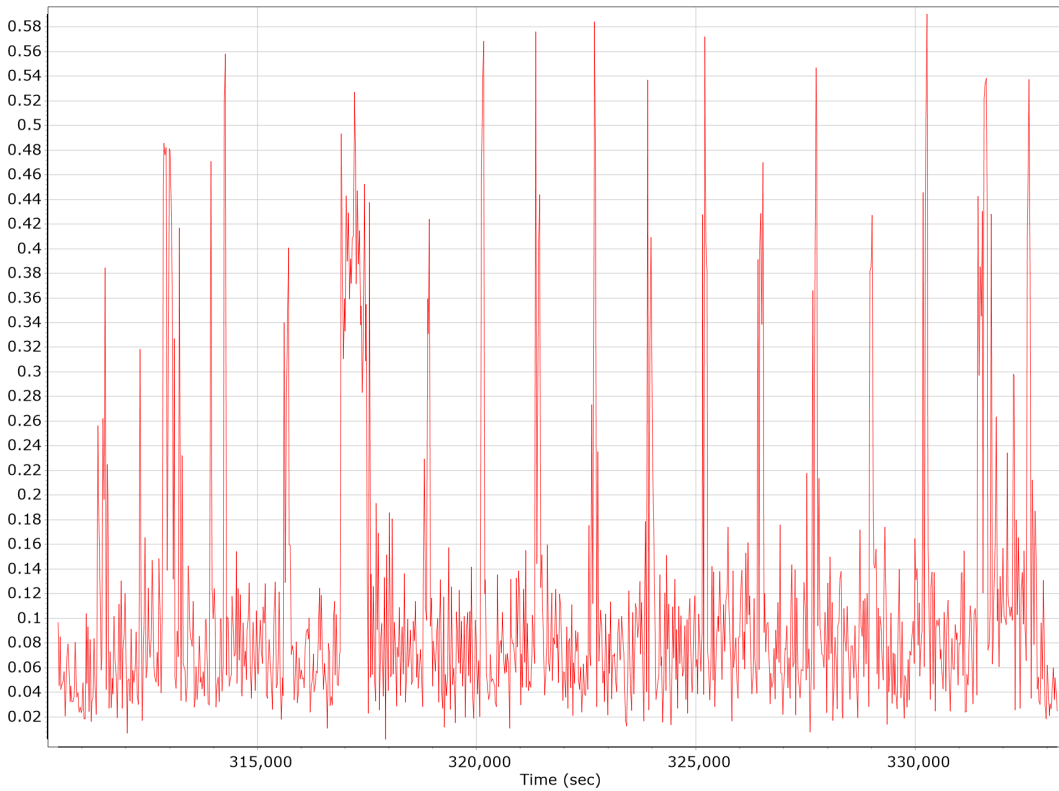
## Ground Speed



## Body Acceleration

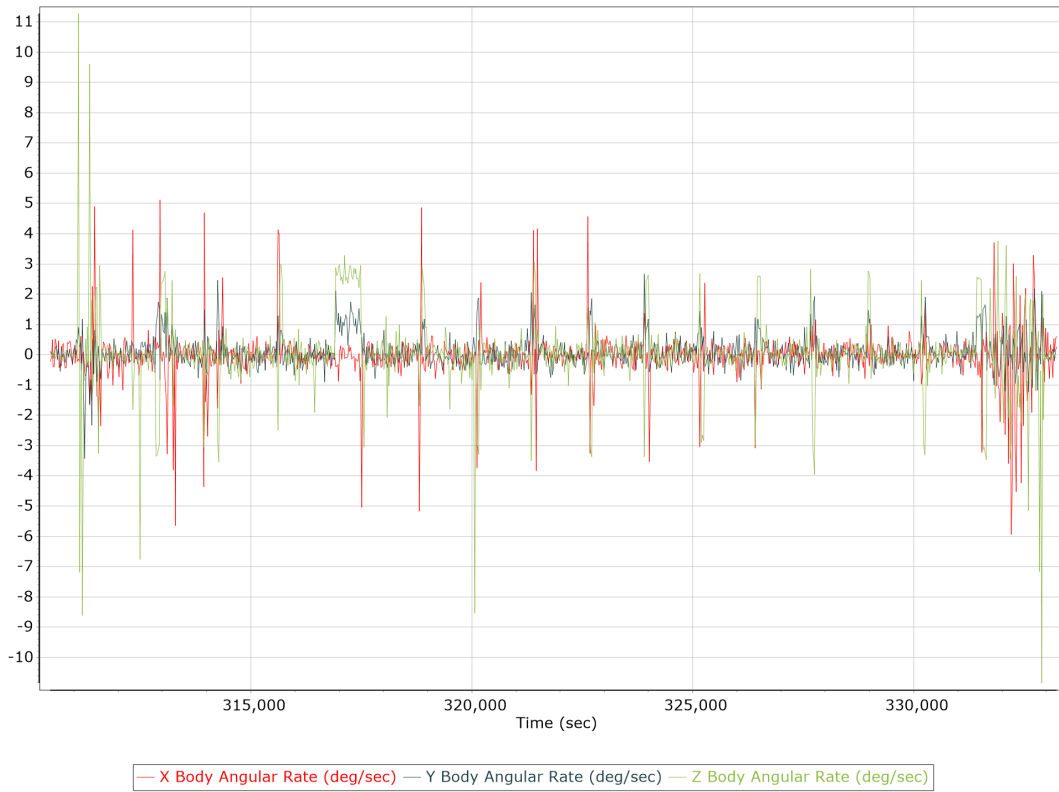


## Total Body Acceleration



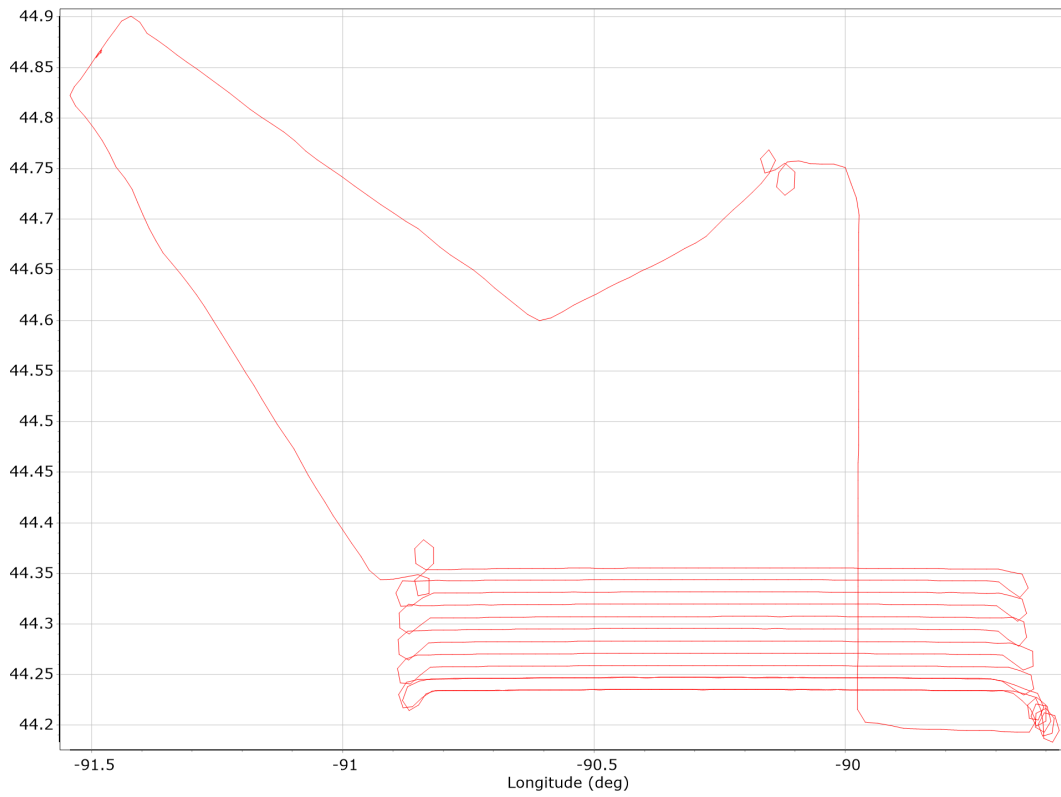


## Body Angular Rate



## Forward Processed Trajectory Information

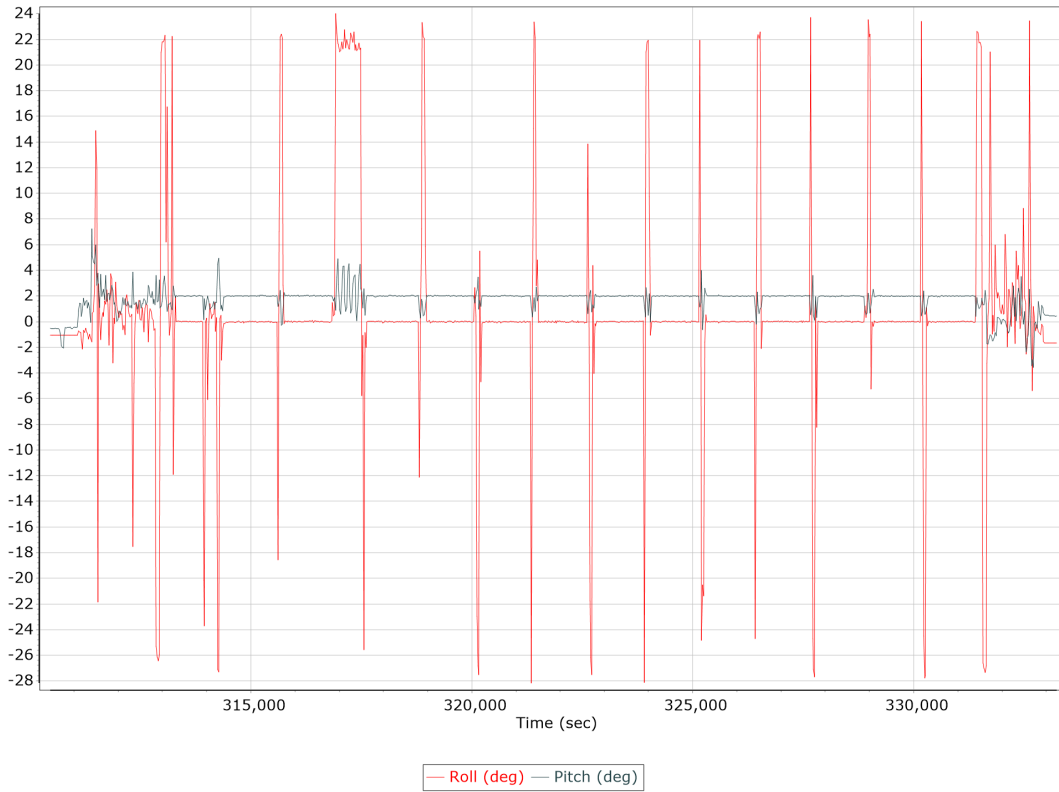
### Top View



### Altitude



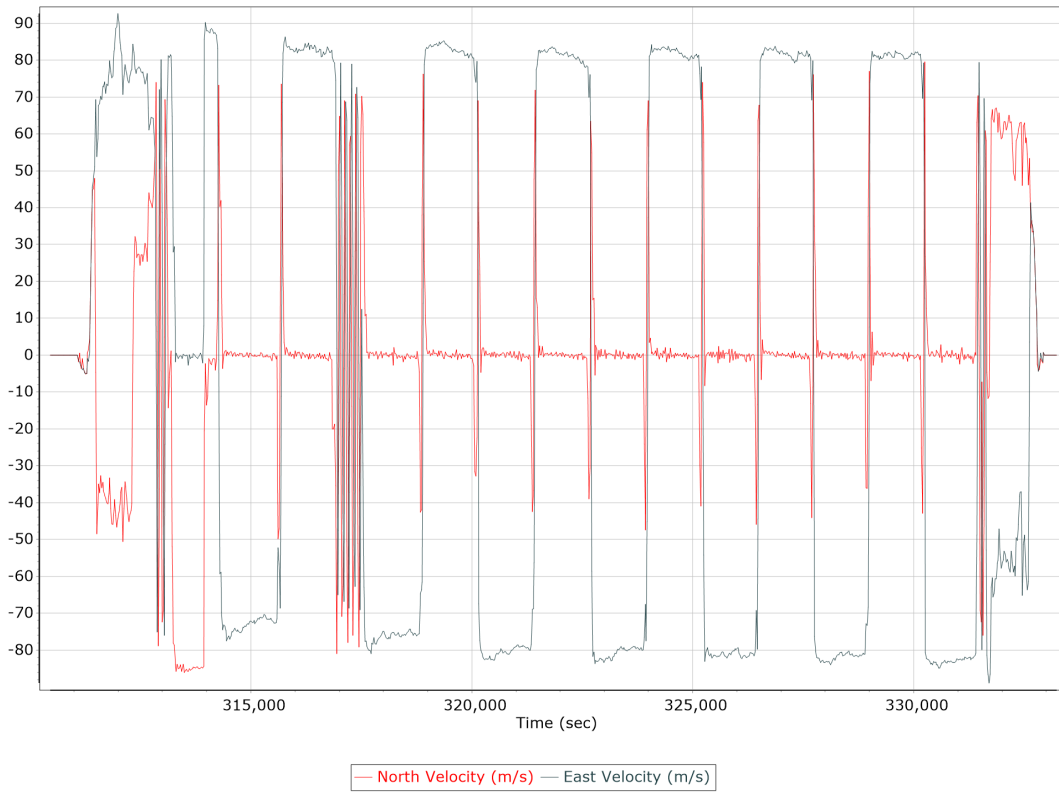
## Roll/Pitch



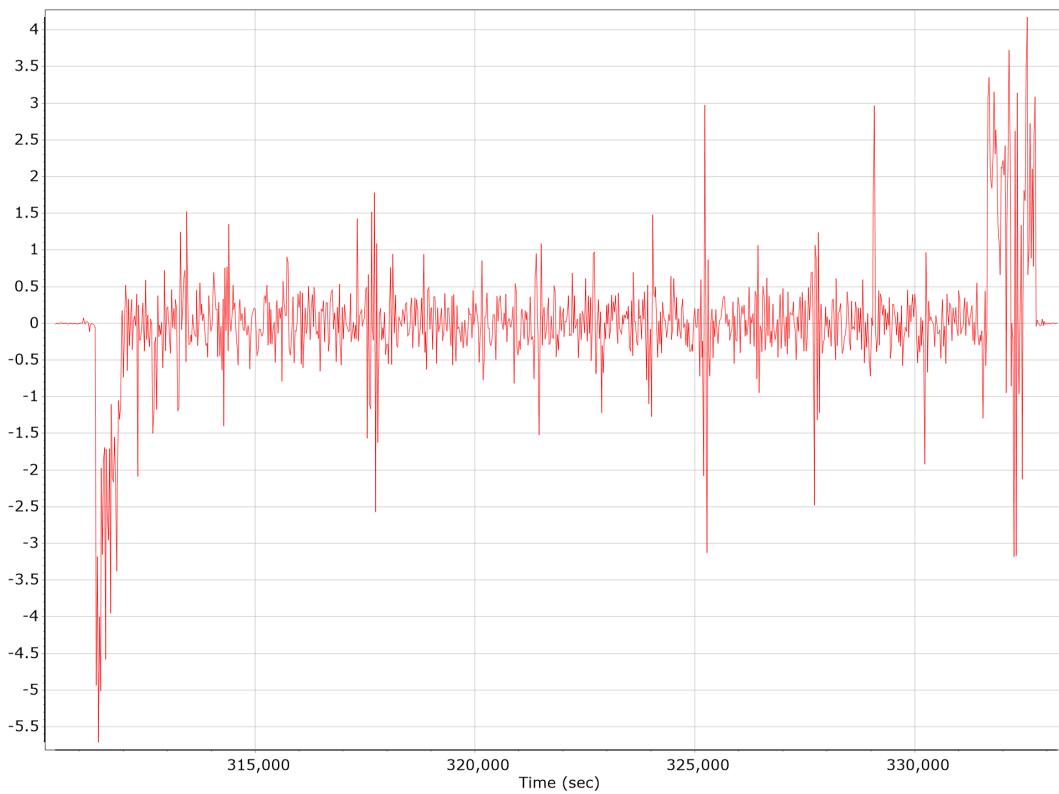
## Heading



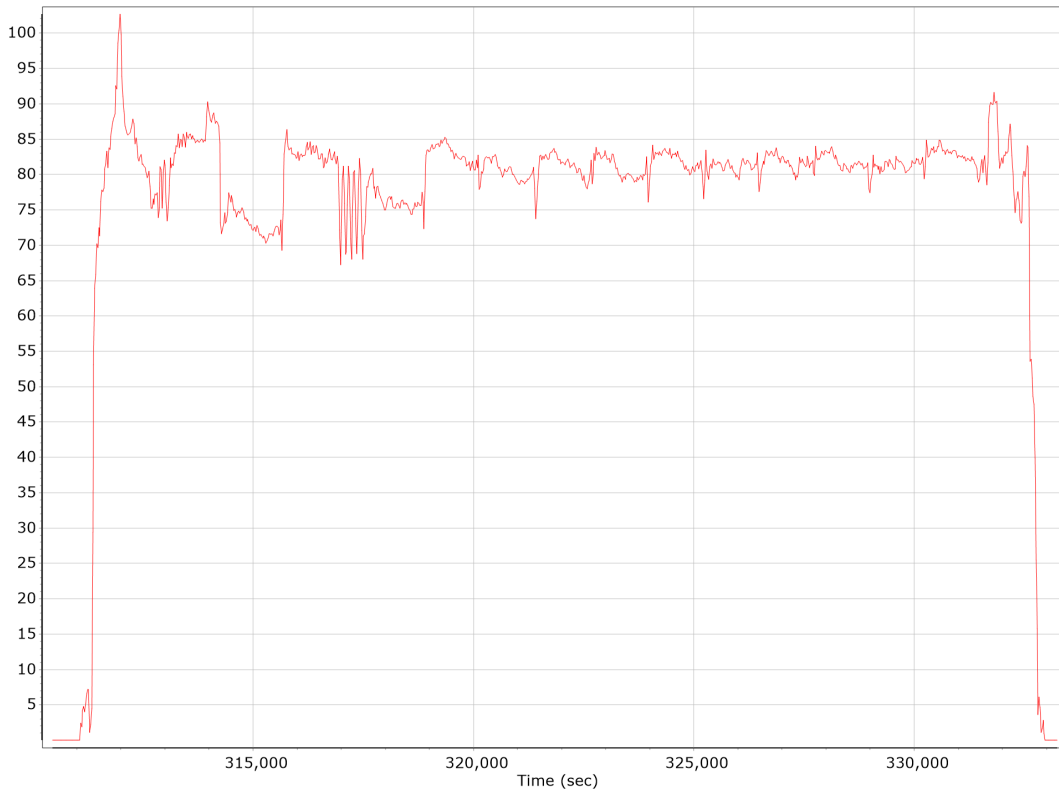
## North/East Velocity



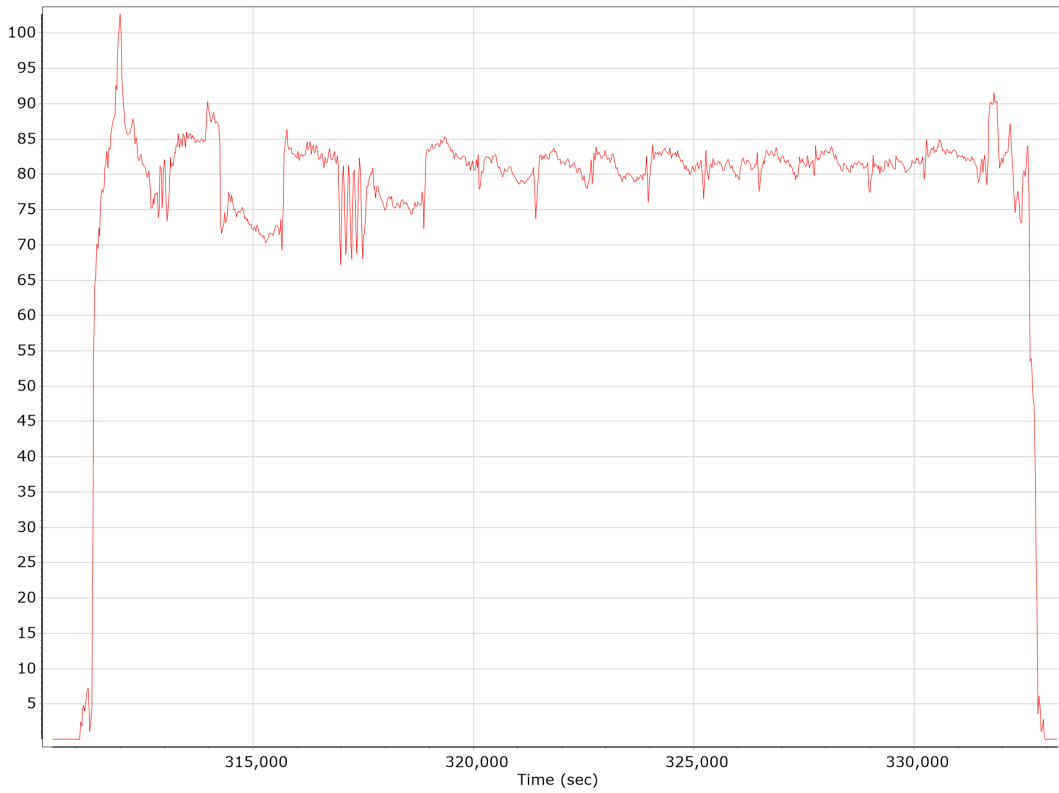
## Down Velocity



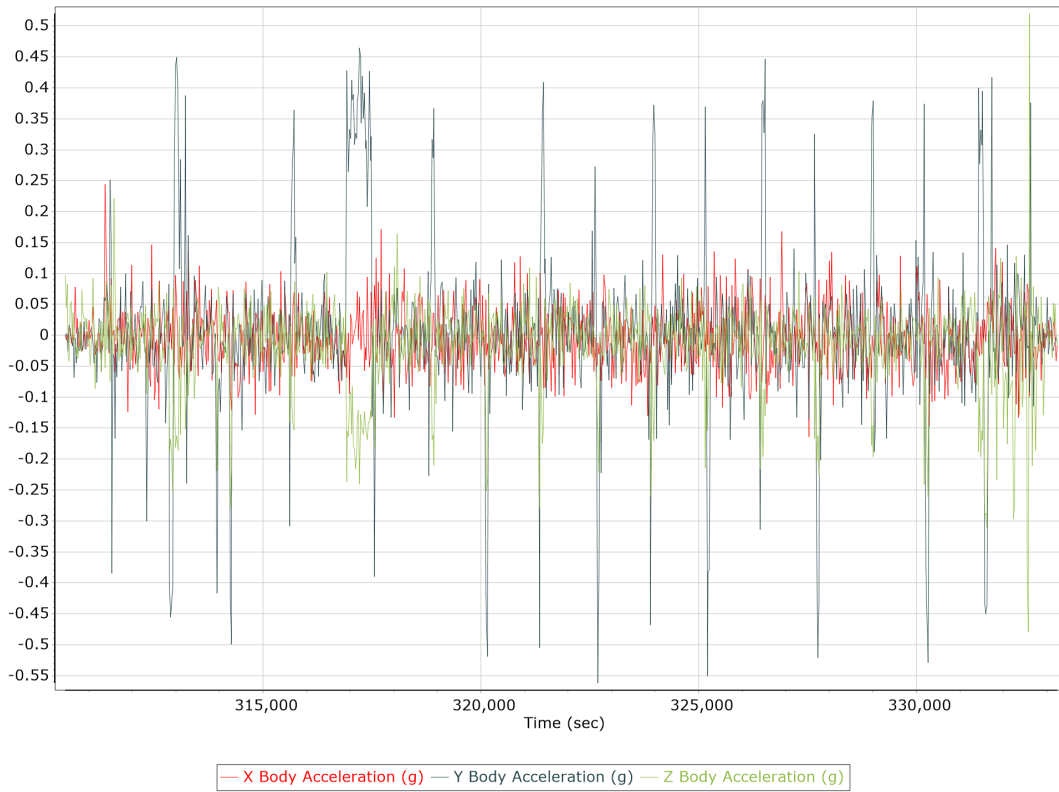
## Total Speed



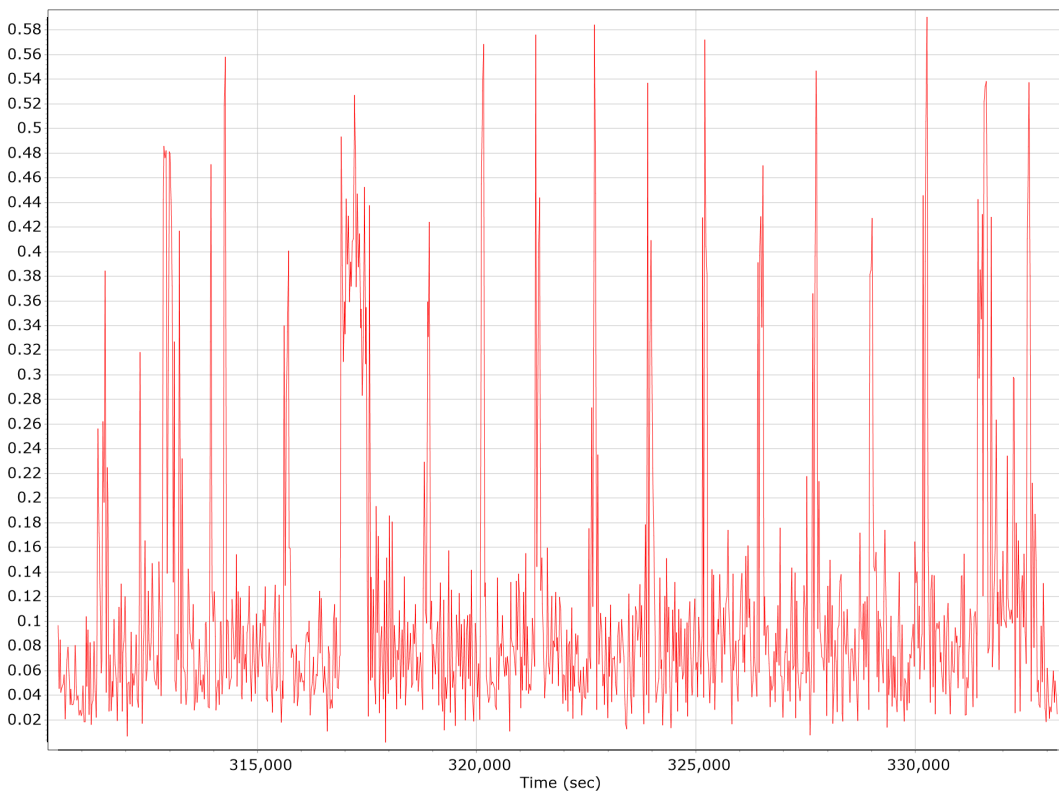
## Ground Speed



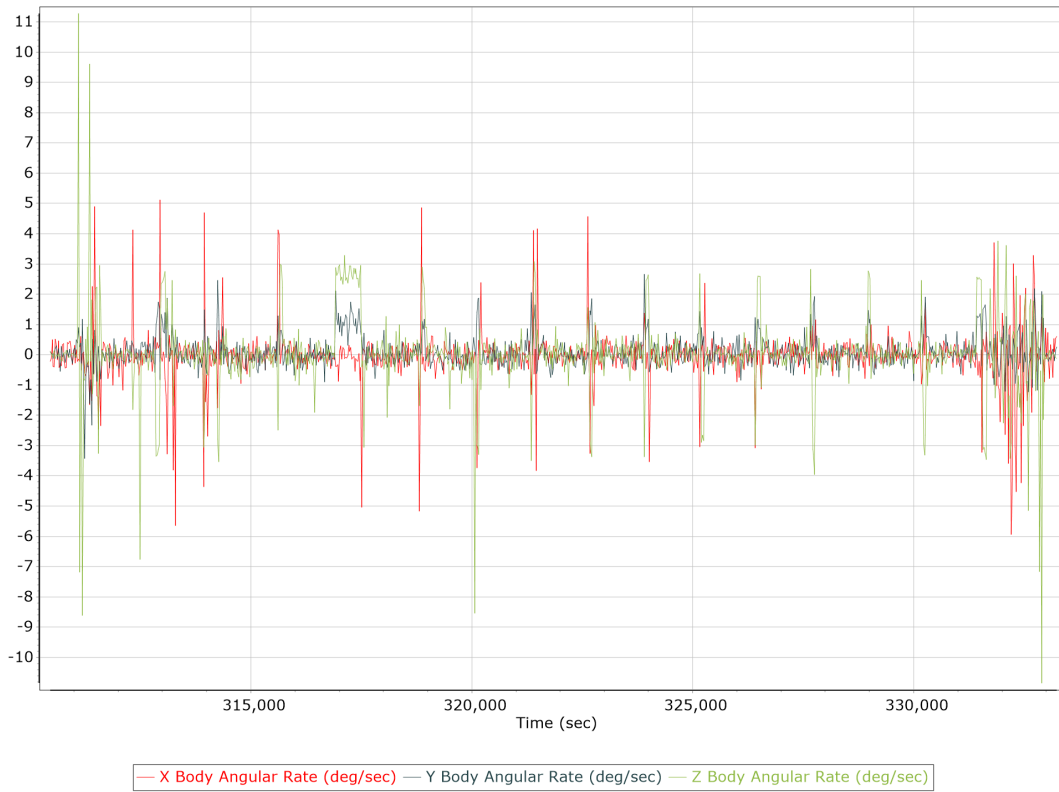
## Body Acceleration



## Total Body Acceleration



## Body Angular Rate



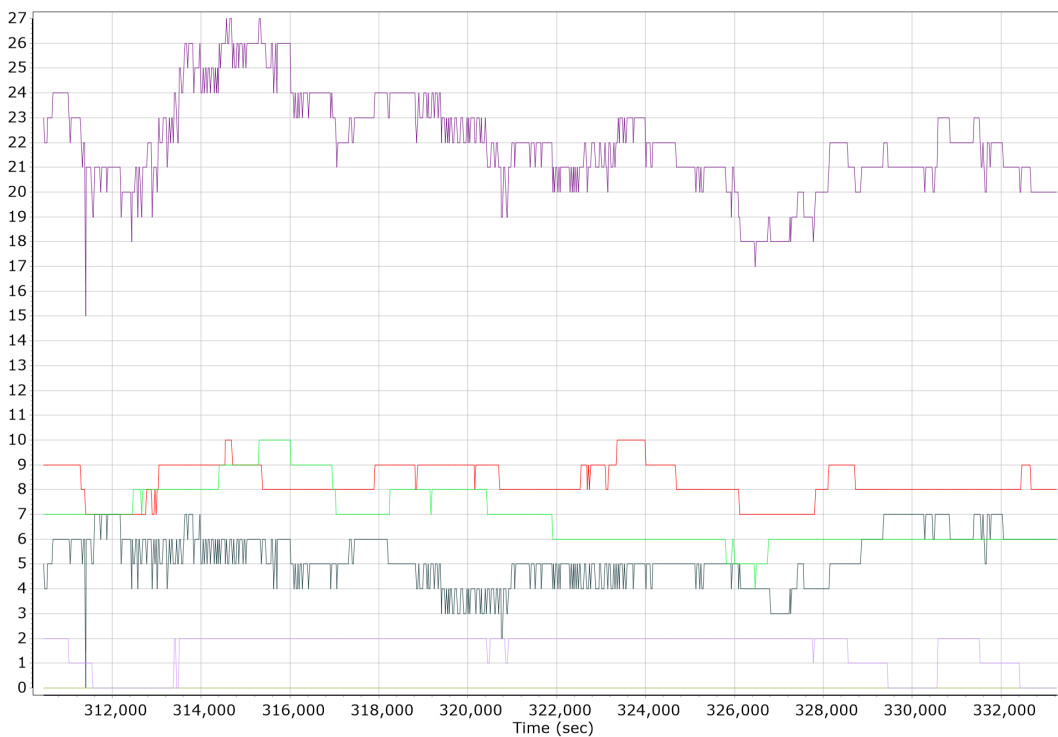


## GNSS QC

### GNSS QC Statistics

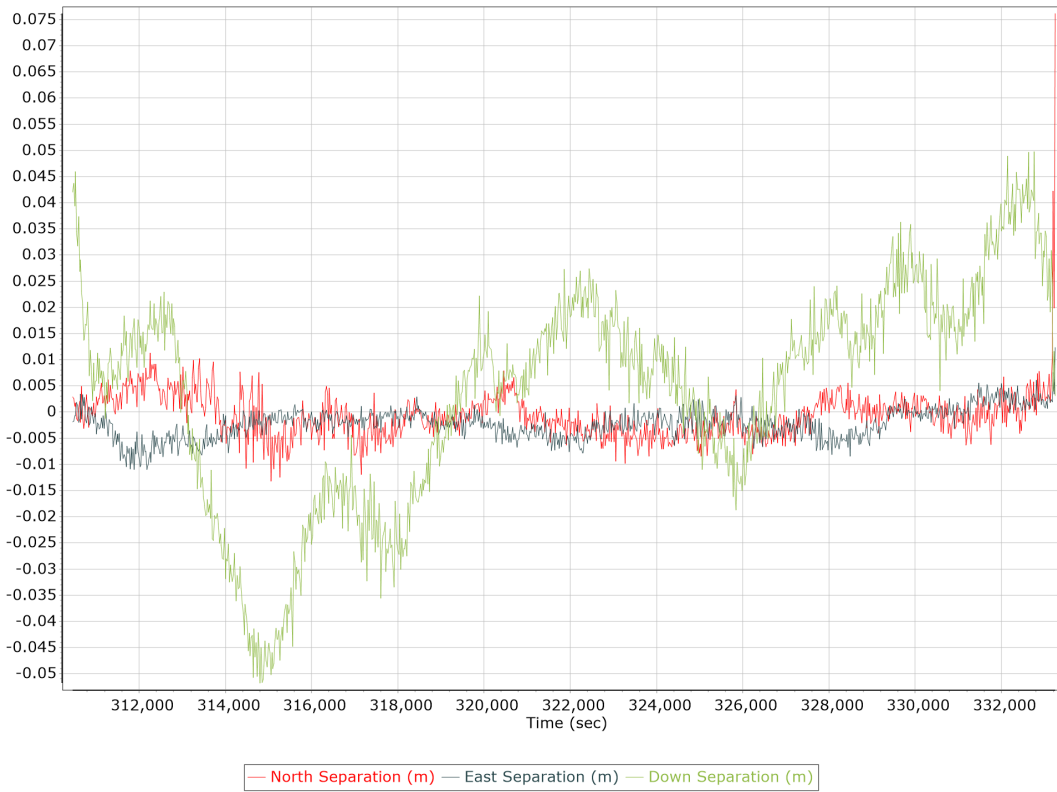
Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	6	10	8
Number of GLONASS SV	0	7	5
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	2	2
Number of GALILEO SV	4	10	7
Total number of SV	15	27	22
PDOP	0.93	1.60	1.14
QC Solution Gaps	1.00	1.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	22864.00	0.00	1.00
Percentage	100.00	0.00	0.00

### Num SVs in solution

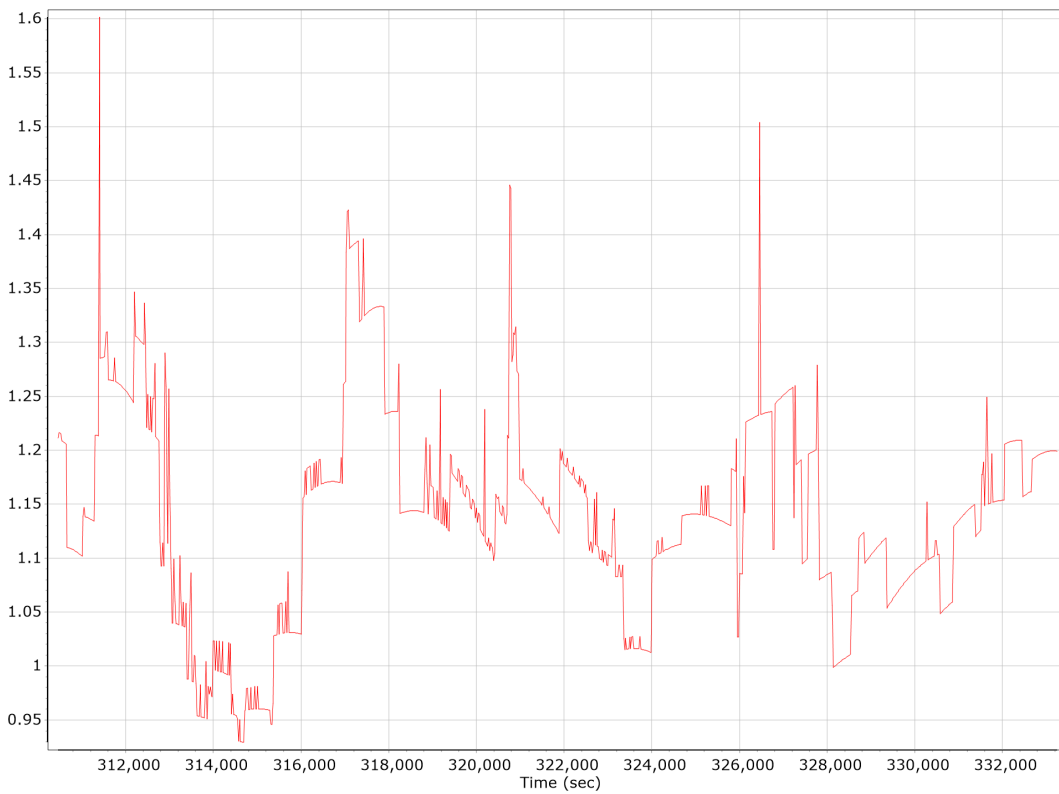


— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Number of GALILEO — Total Number

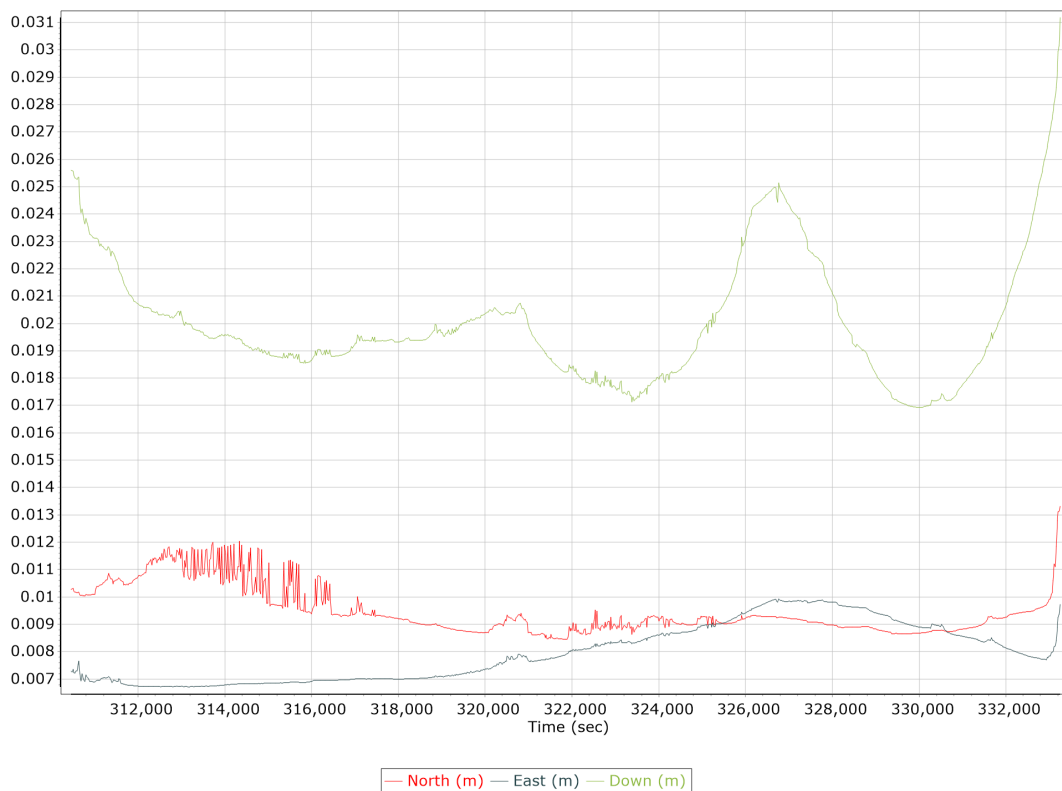
## Forward/Reverse Separation



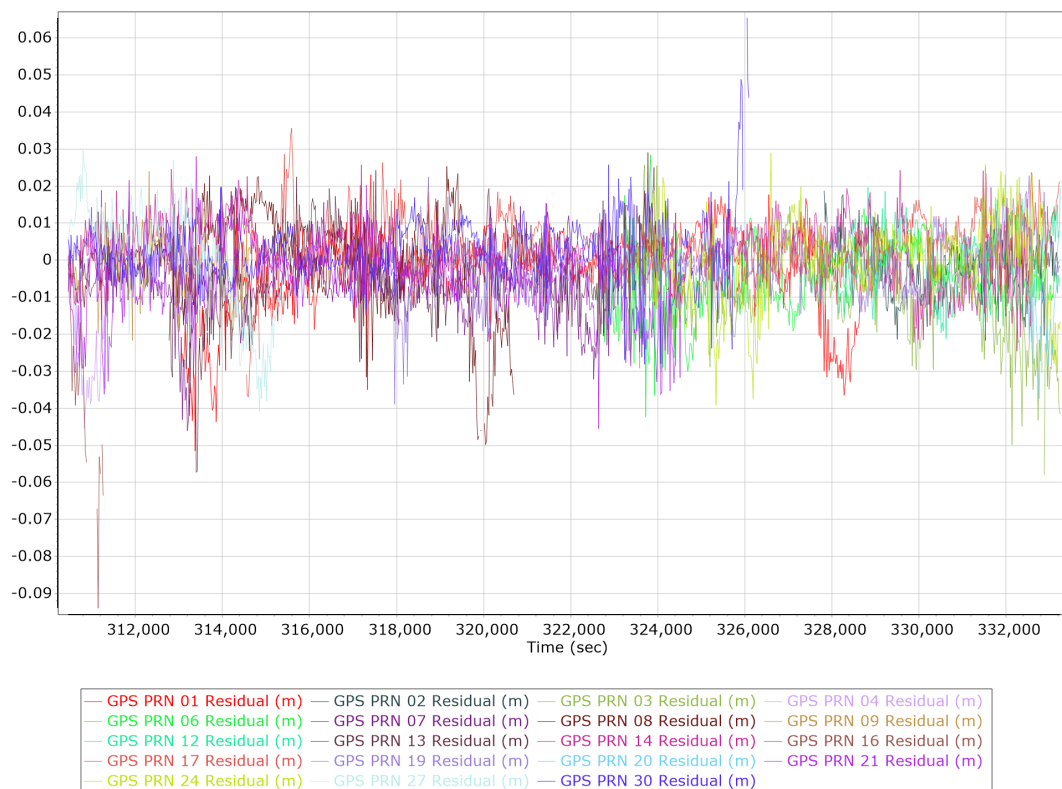
## PDOP



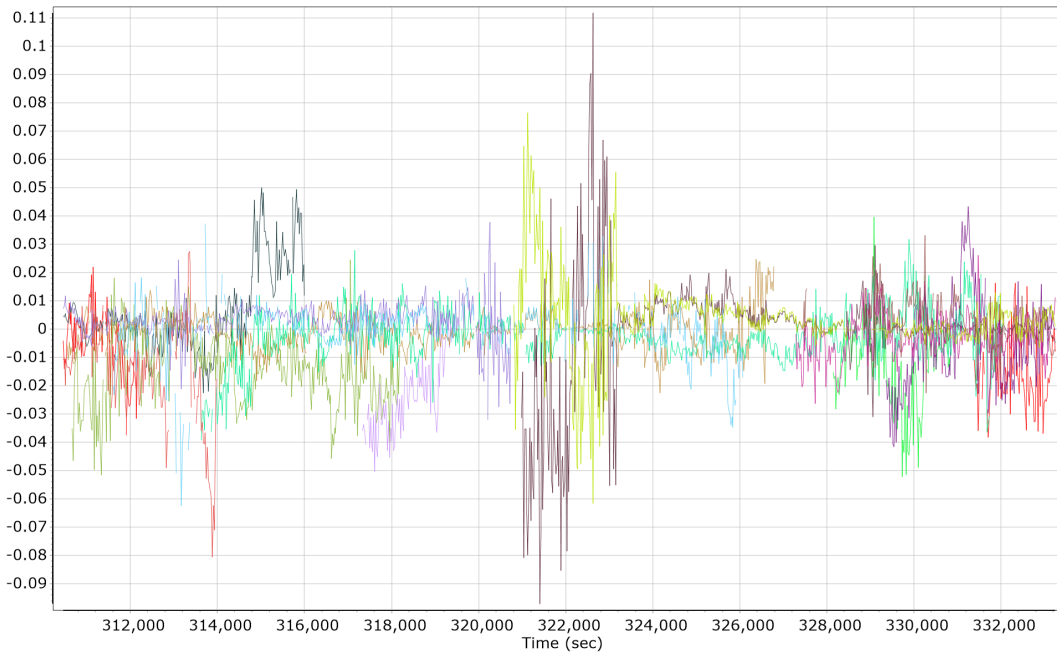
## Estimated Position Accuracy



## GPS Residuals

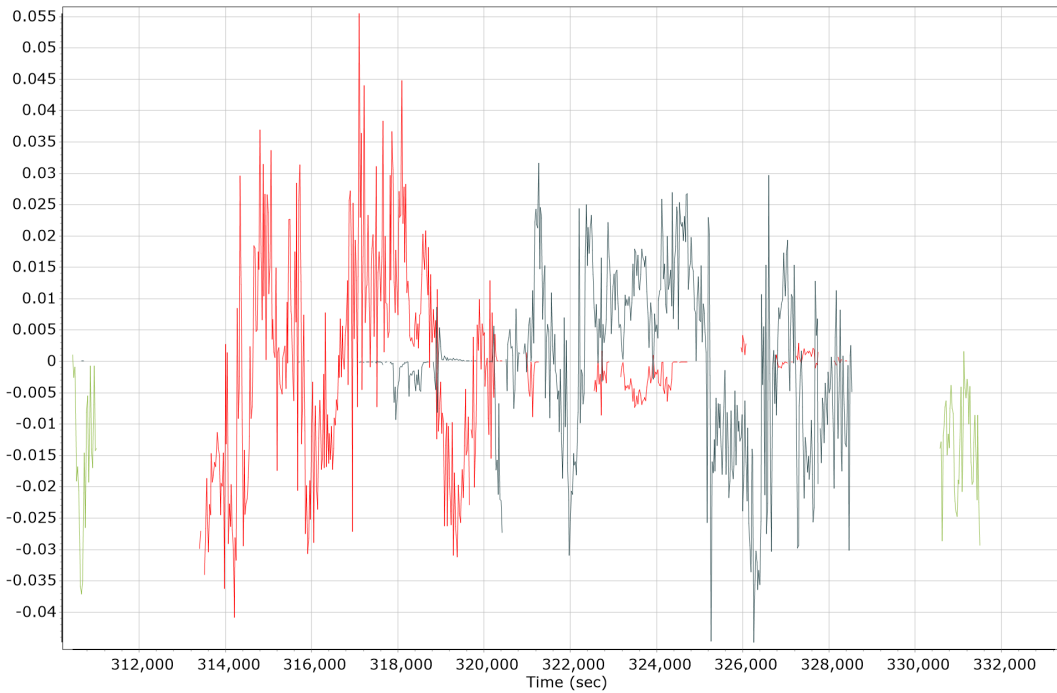


## GLONASS Residuals



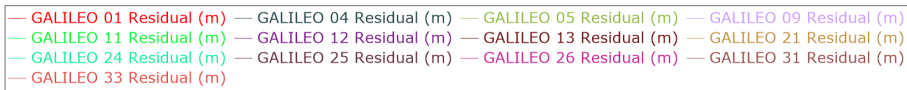
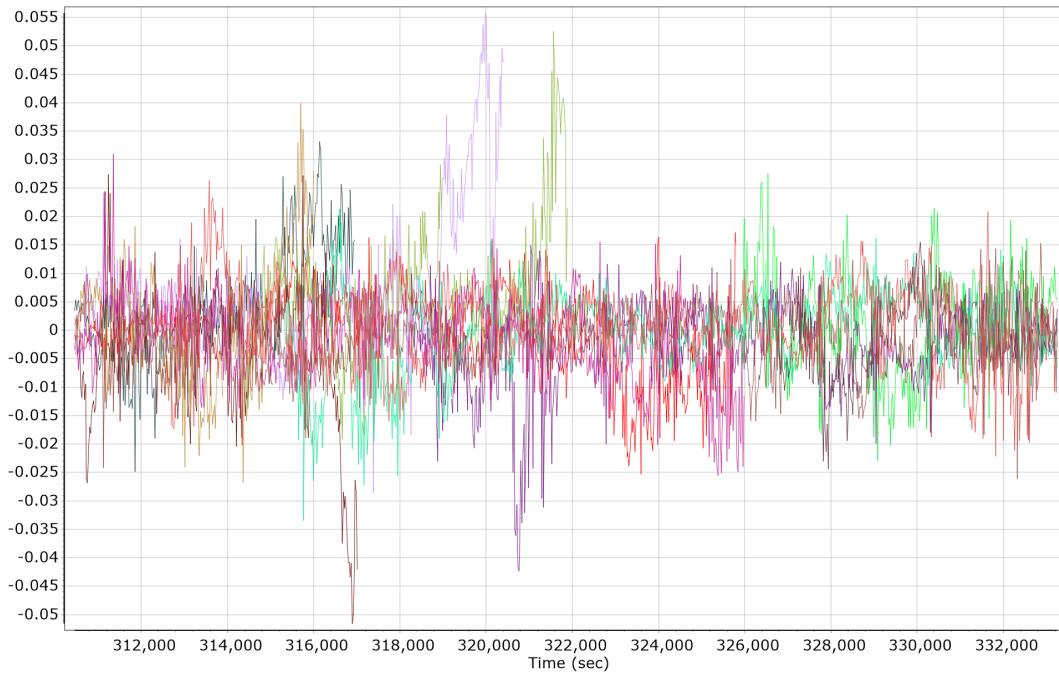
- GLONASS 01 Residual (m) — GLONASS 02 Residual (m) — GLONASS 03 Residual (m) — GLONASS 04 Residual (m)
- GLONASS 07 Residual (m) — GLONASS 08 Residual (m) — GLONASS 10 Residual (m) — GLONASS 12 Residual (m)
- GLONASS 13 Residual (m) — GLONASS 14 Residual (m) — GLONASS 15 Residual (m) — GLONASS 17 Residual (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 14 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



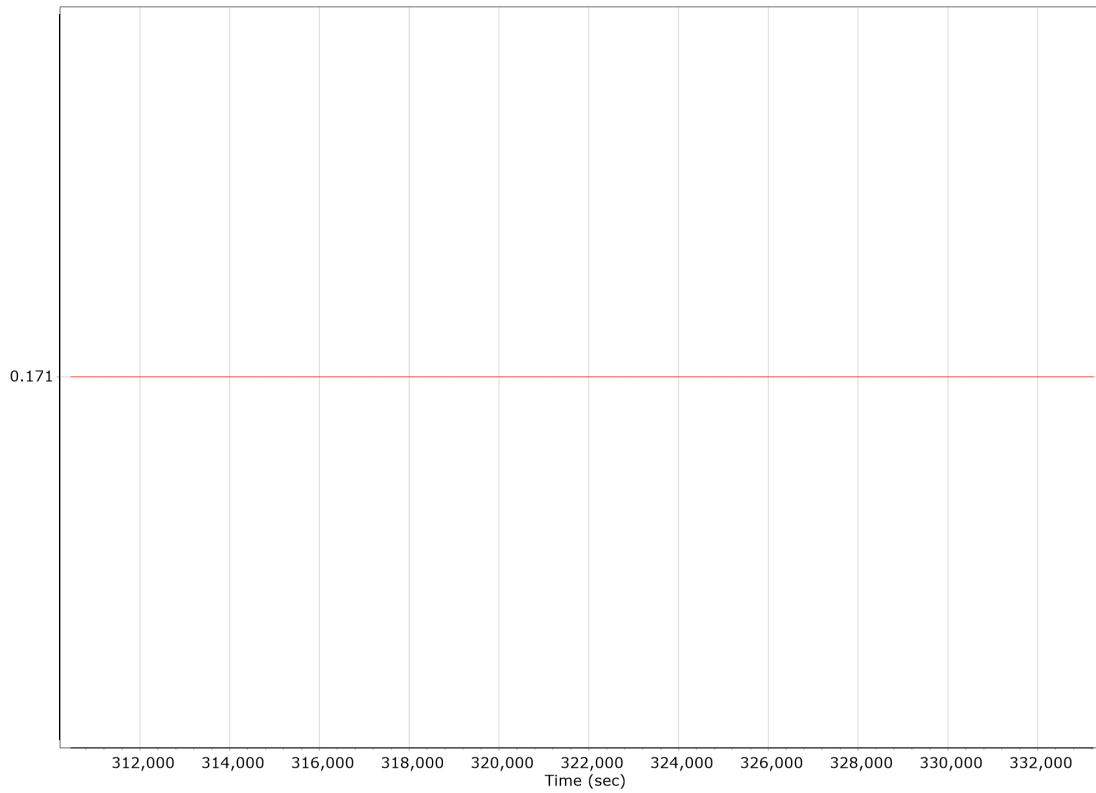
## GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	310371.000 (4/27/2022 2:12:51 PM)		
Processing end time	333260.000 (4/27/2022 8:34:20 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

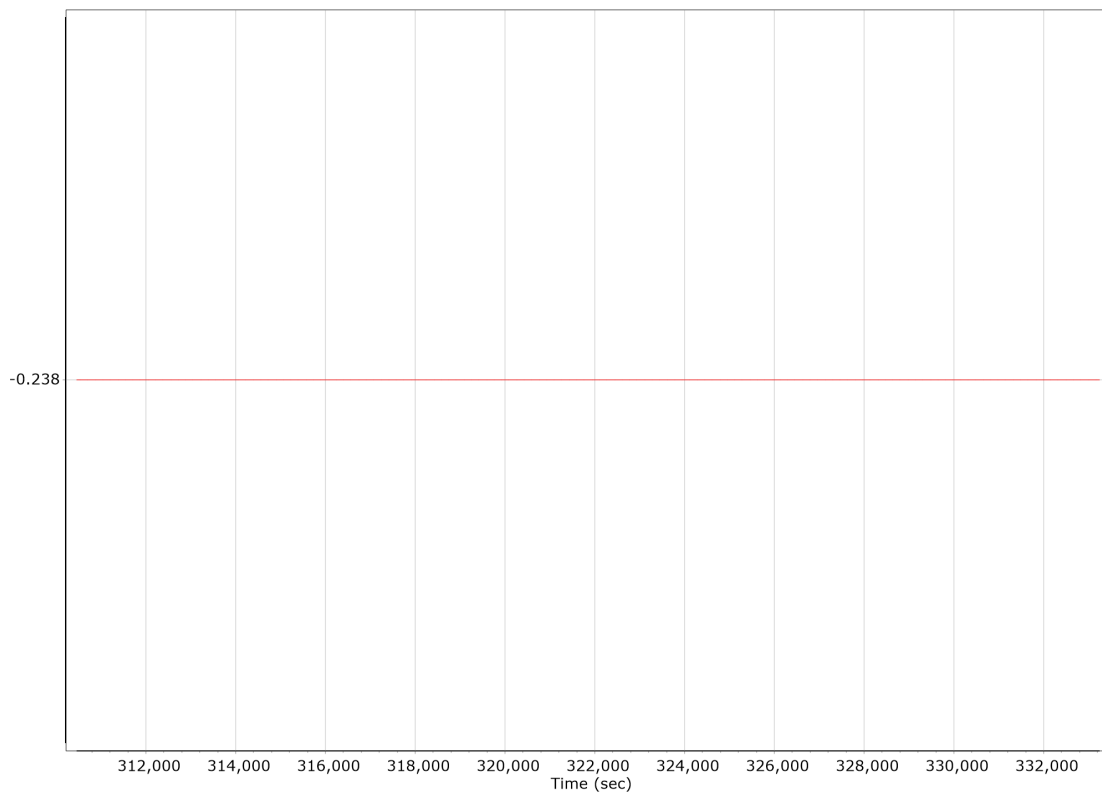
## Calibrated Installation Parameters

### Reference-Primary GNSS Lever Arm (m)

#### X Reference-Primary GNSS Lever Arm (m)

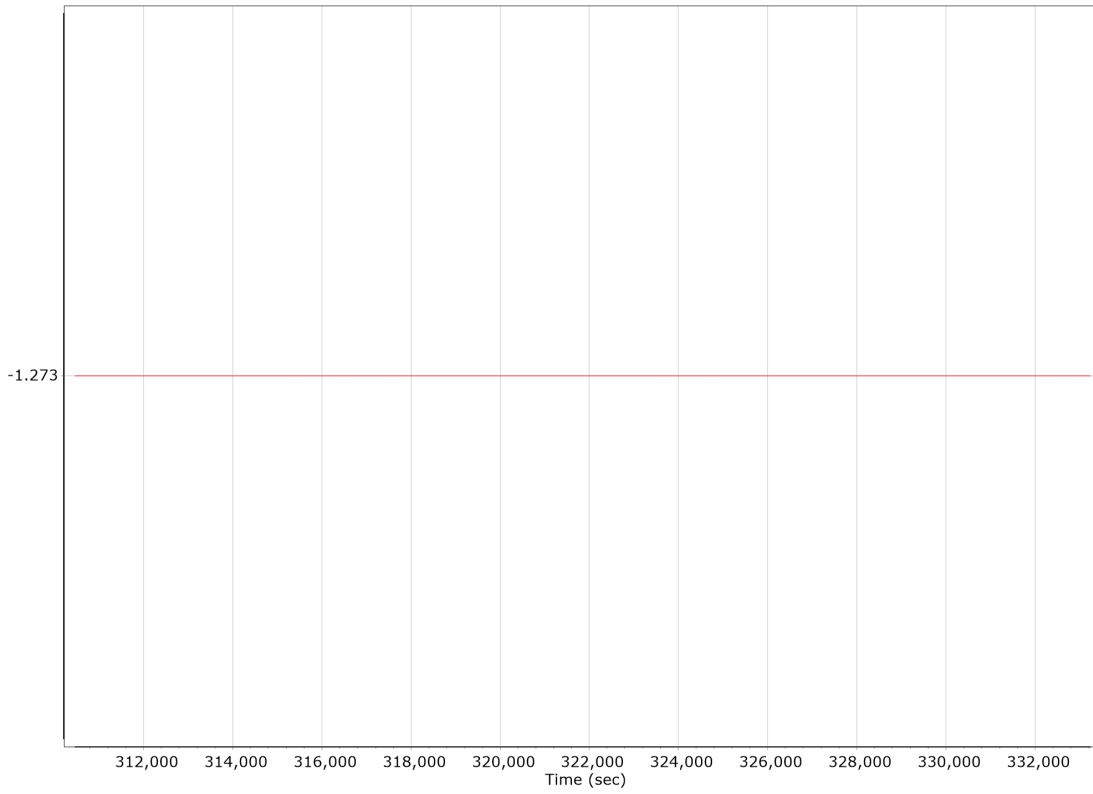


#### Y Reference-Primary GNSS Lever Arm (m)

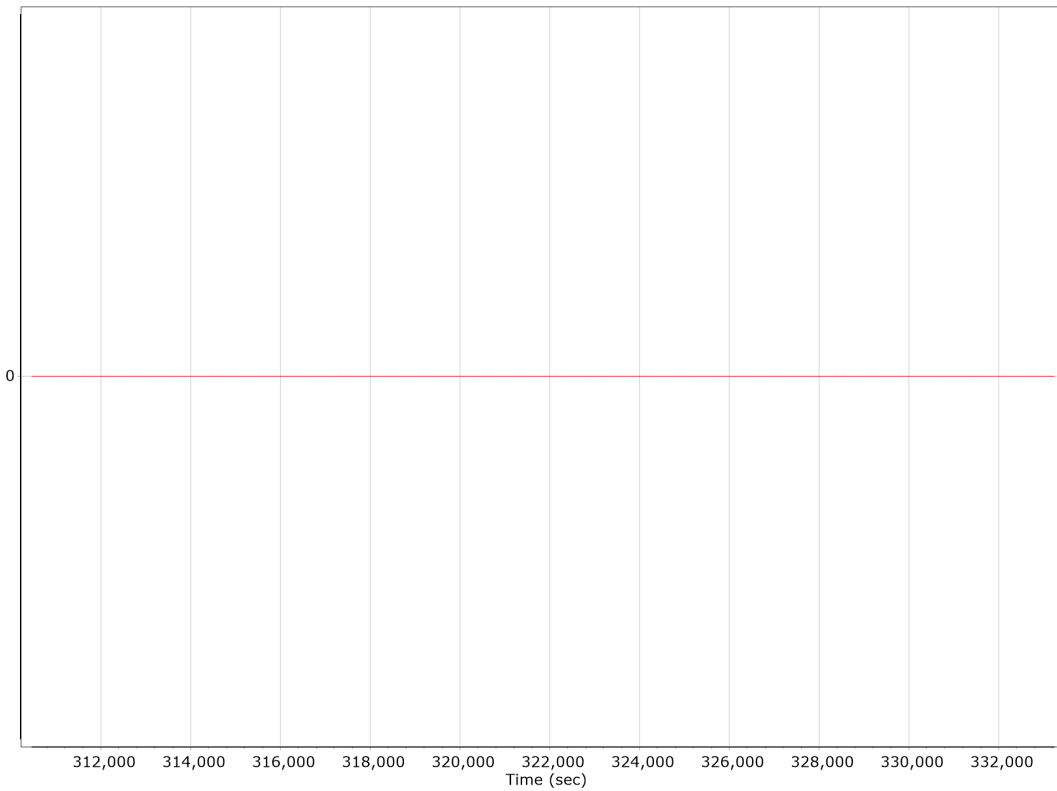




### Z Reference-Primary GNSS Lever Arm (m)



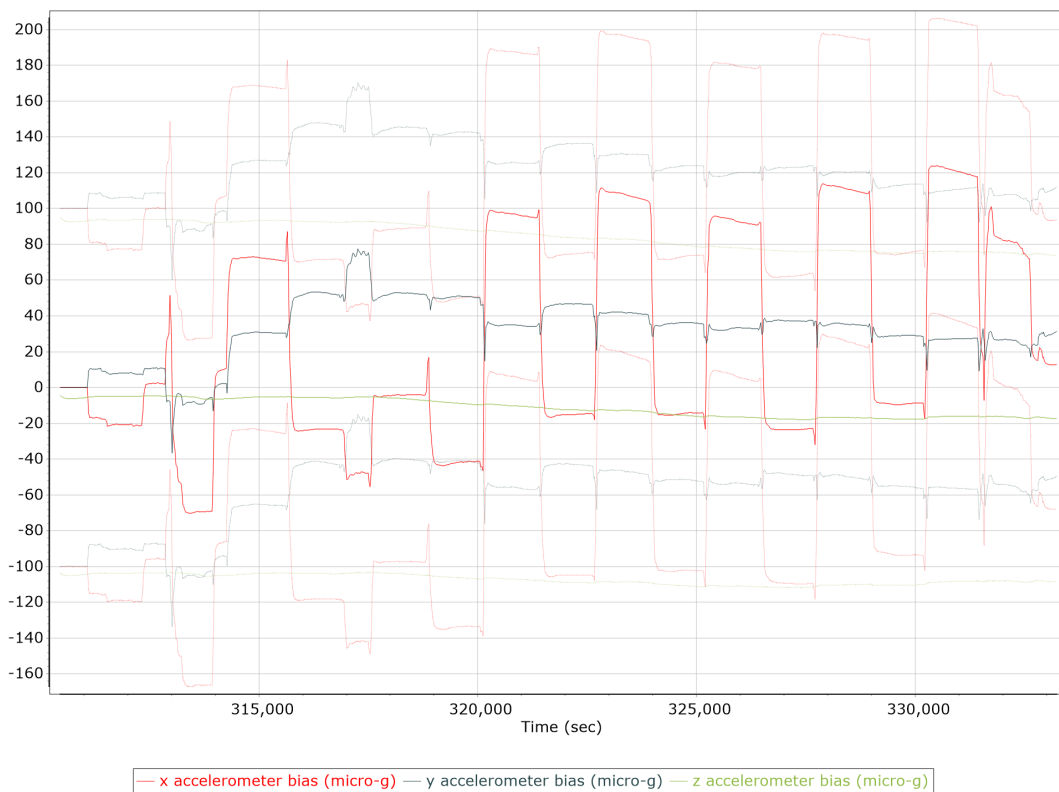
### Reference-Primary GNSS Lever Arm Figure of Merit



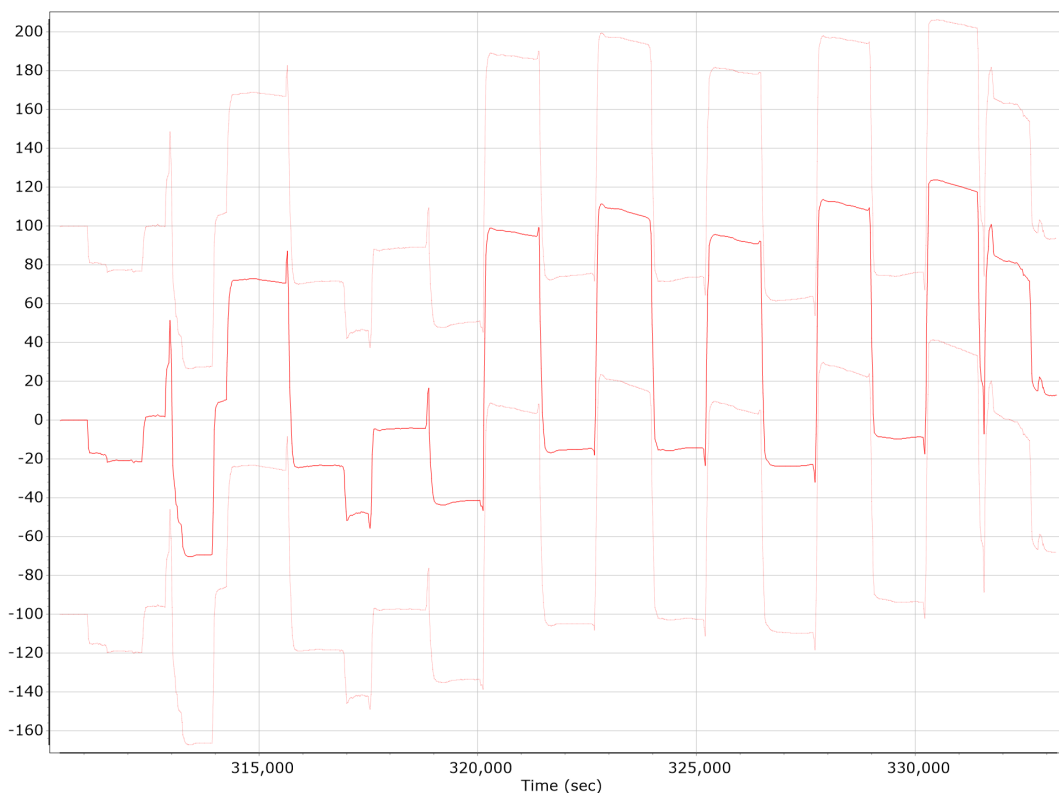
## IN-Fusion QC

### Forward Processed Estimated Errors, Reference Frame

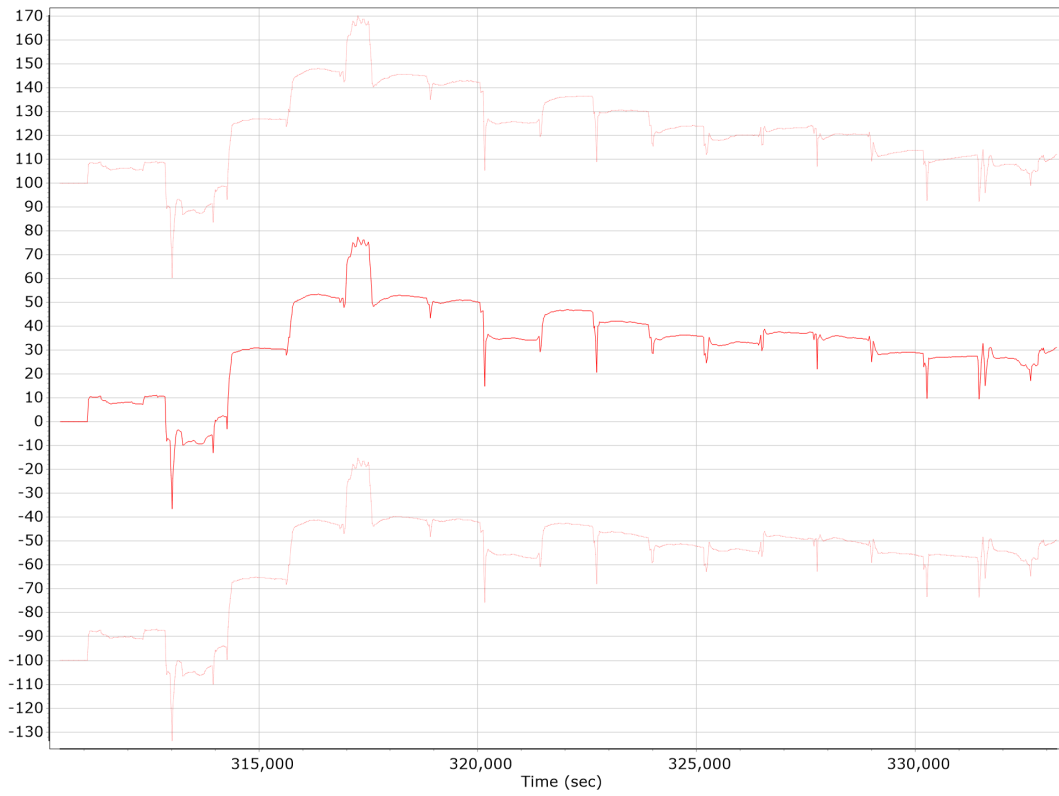
#### Accelerometer Bias (micro-g)



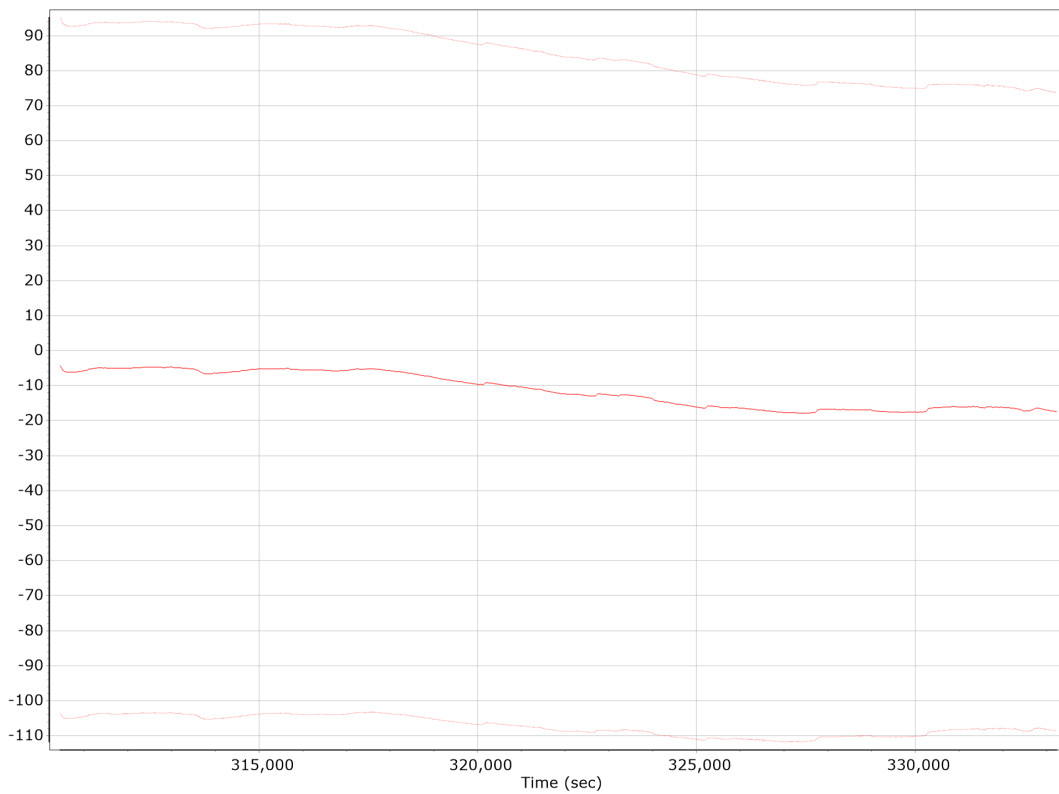
#### X Accelerometer Bias (micro-g)



### Y Accelerometer Bias (micro-g)



### Z Accelerometer Bias (micro-g)



### Accelerometer Scale Error (ppm)



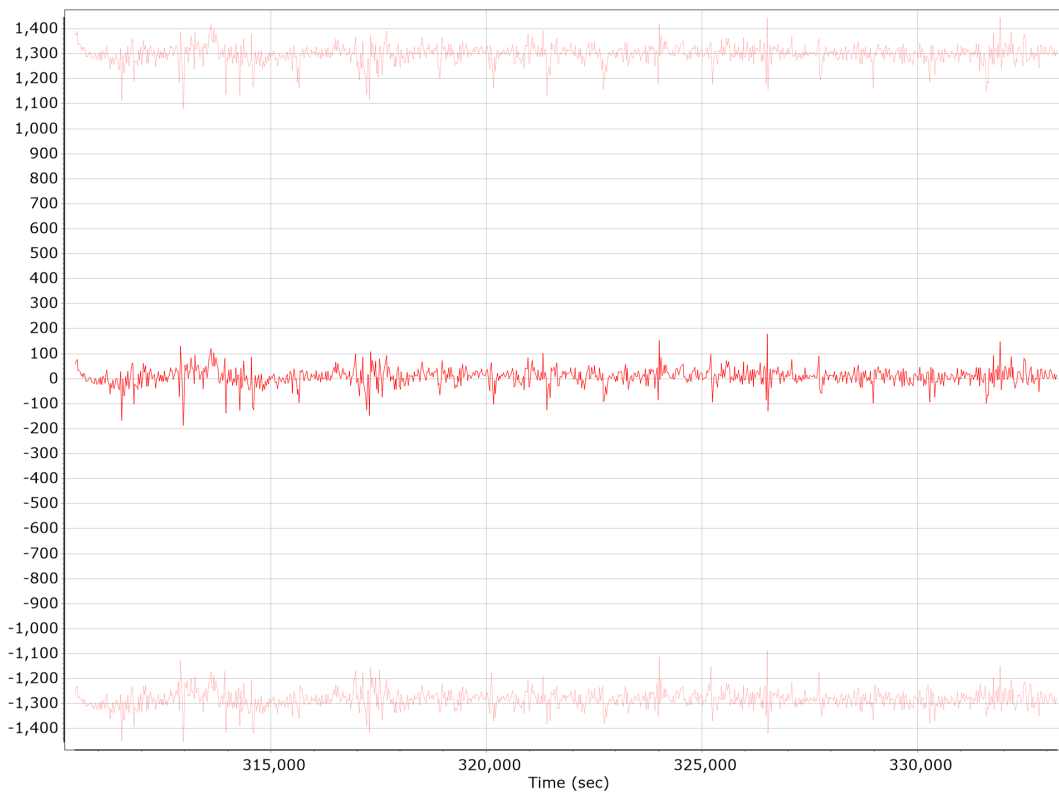
### X Accelerometer Scale Error (ppm)



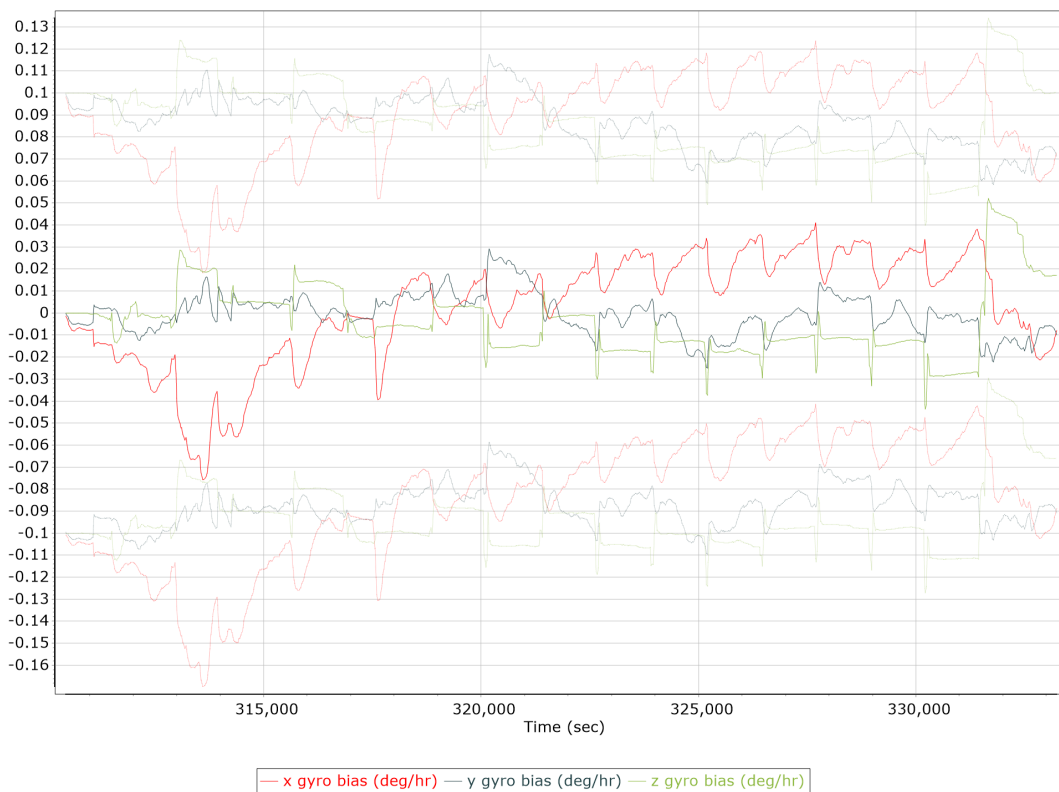
### Y Accelerometer Scale Error (ppm)



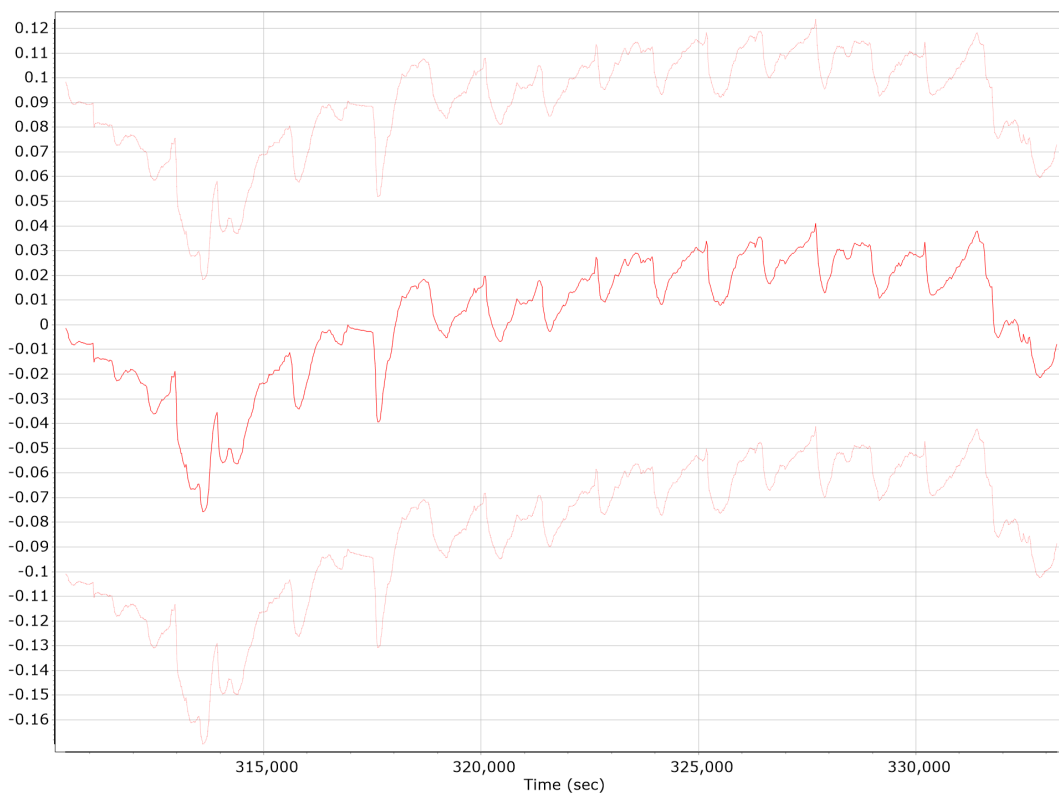
### Z Accelerometer Scale Error (ppm)



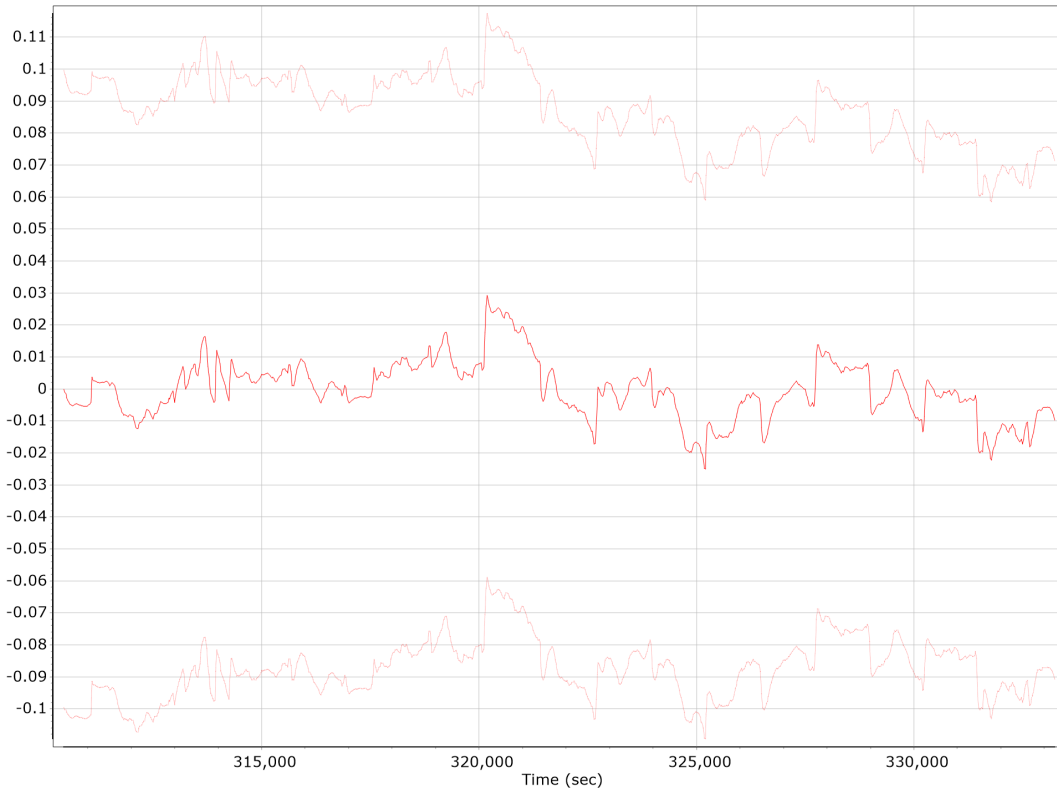
### Gyro Bias (deg/h)



### X Gyro Bias (deg/h)



### Y Gyro Bias (deg/h)

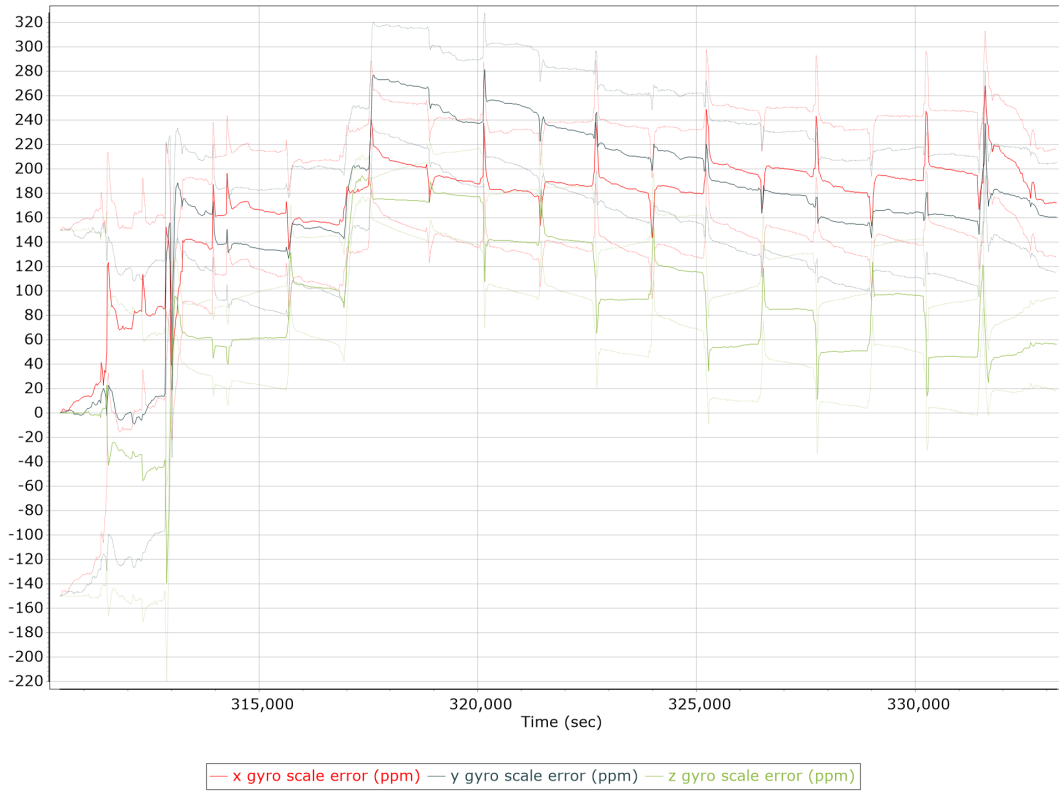


### Z Gyro Bias (deg/h)

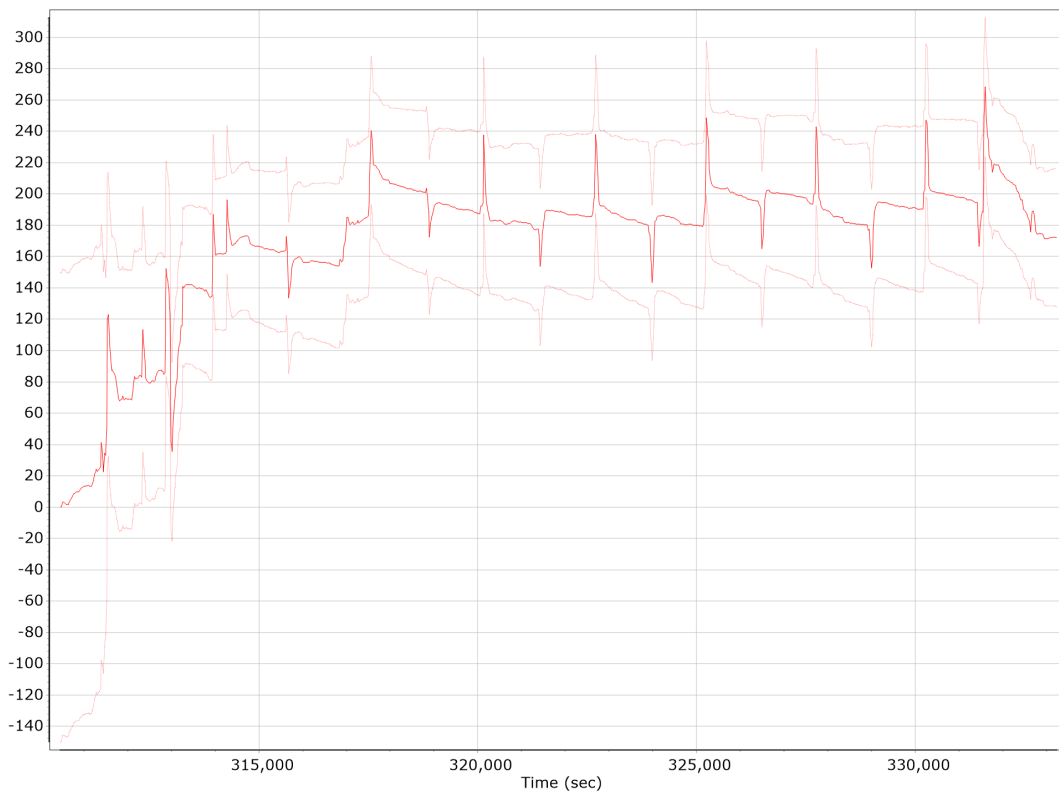




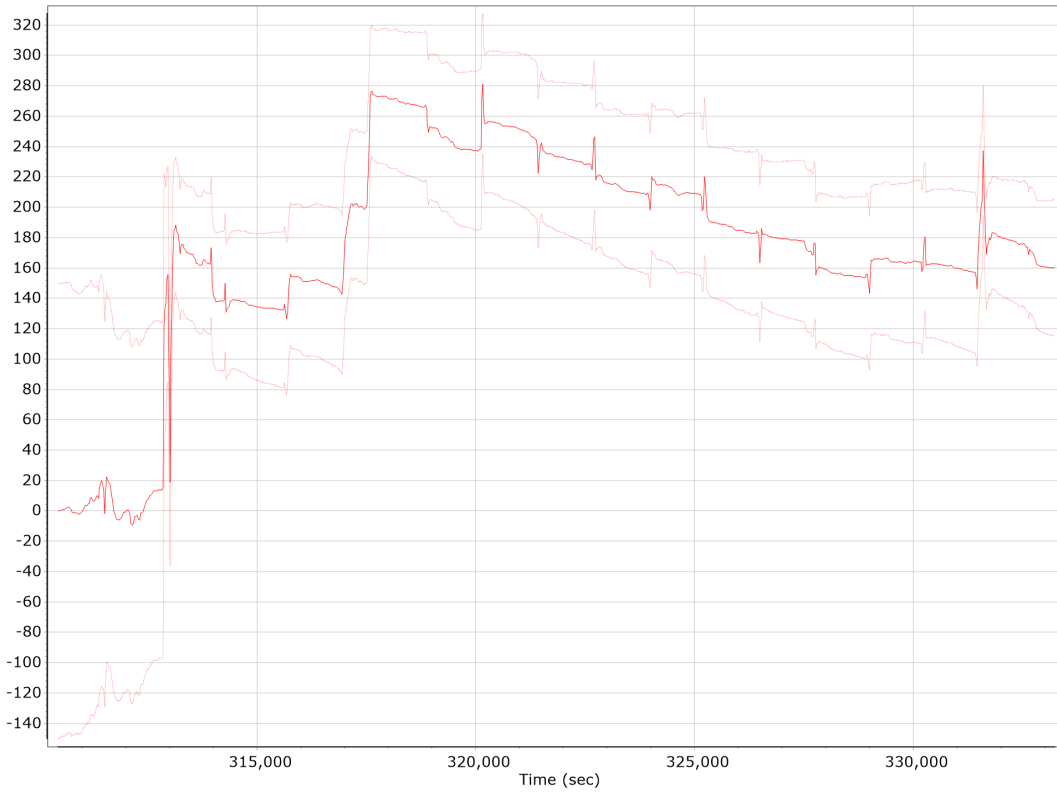
### Gyro Scale Error (ppm)



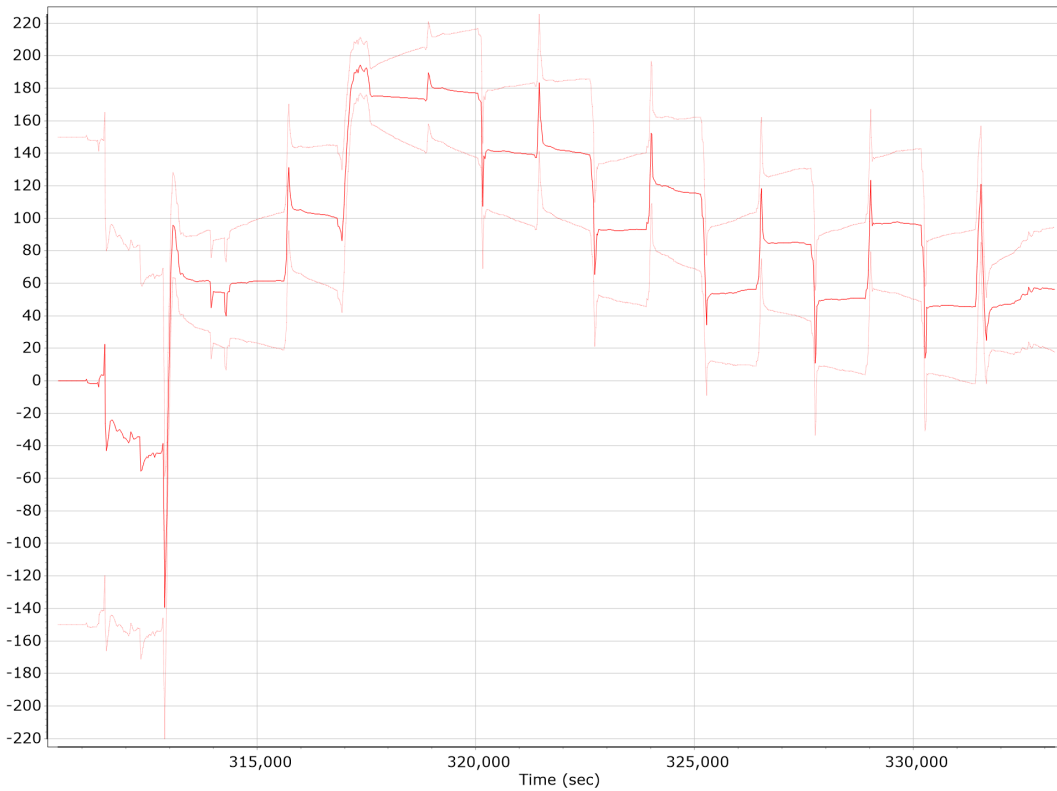
### X Gyro Scale Error (ppm)



### Y Gyro Scale Error (ppm)



### Z Gyro Scale Error (ppm)

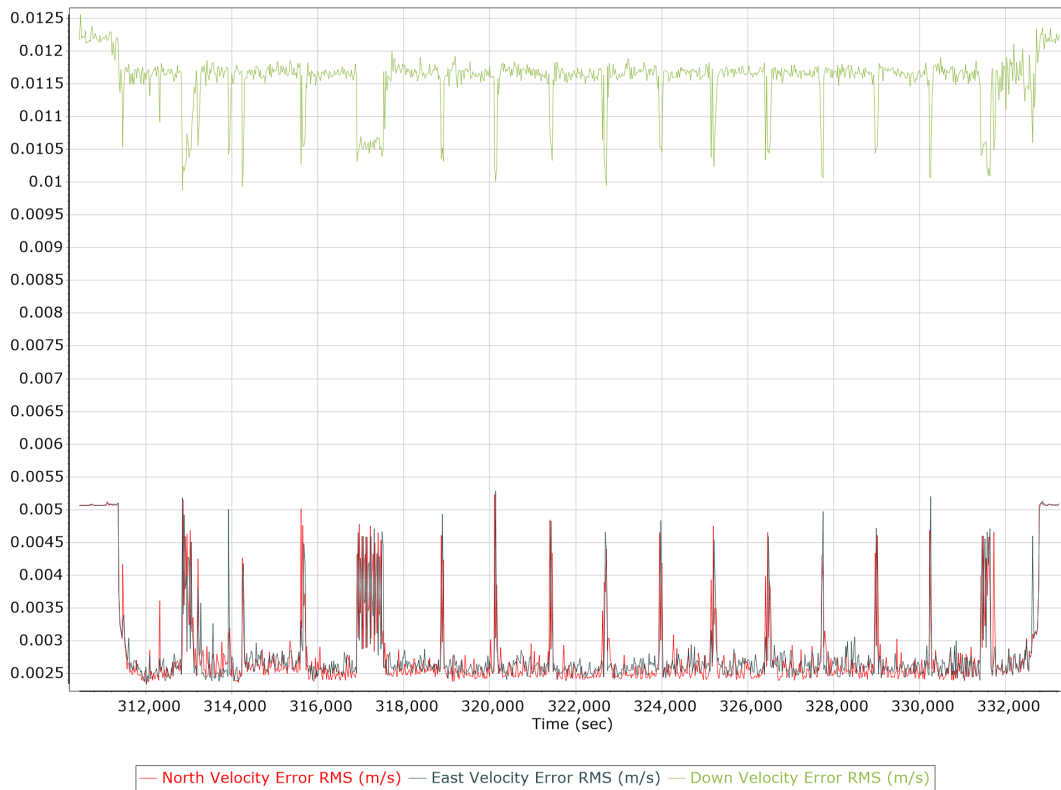


## Smoothed Performance Metrics

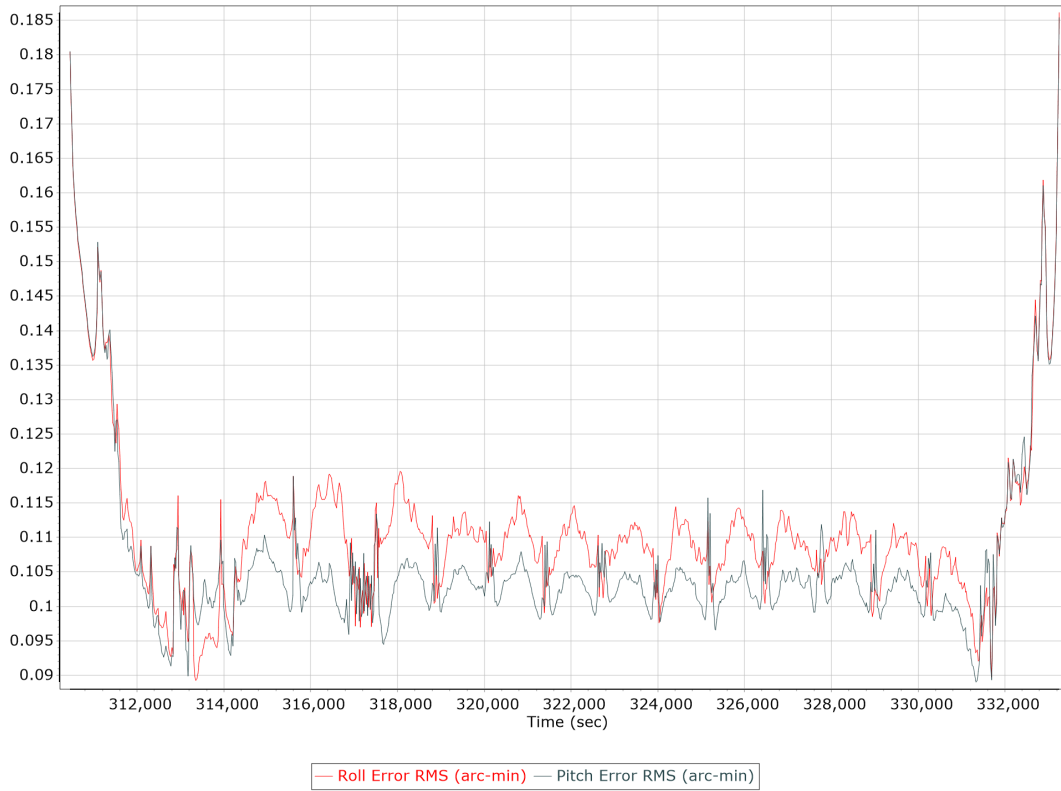
### Position Error RMS (m)



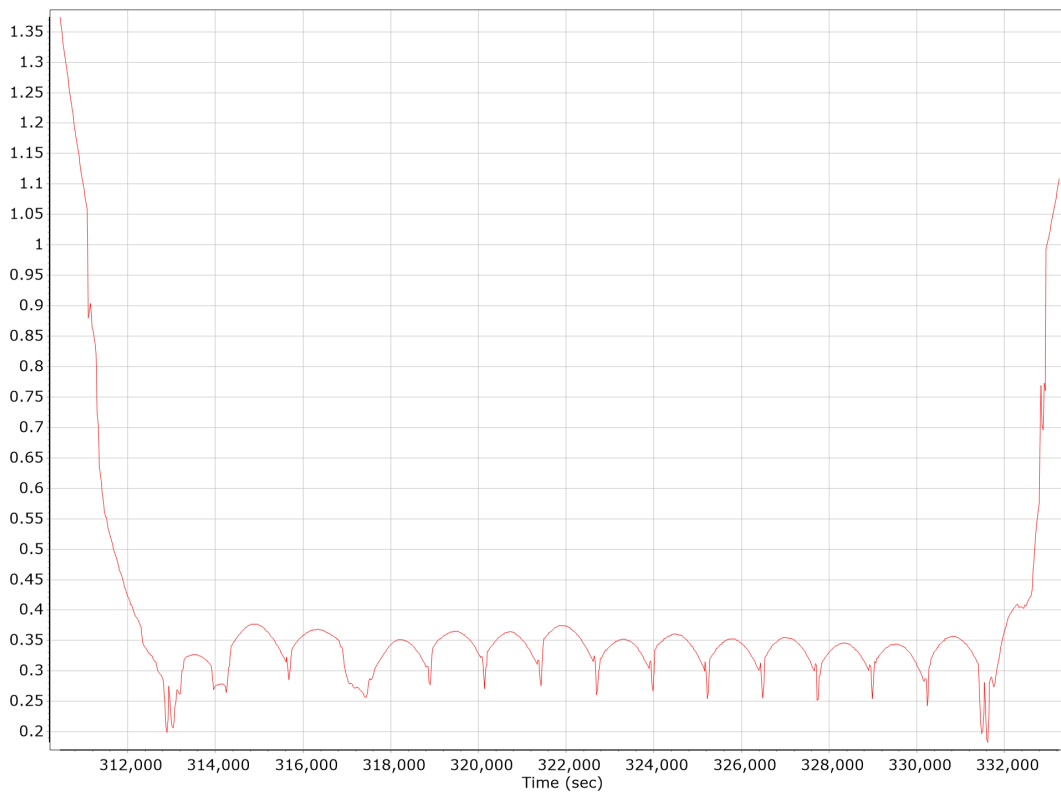
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

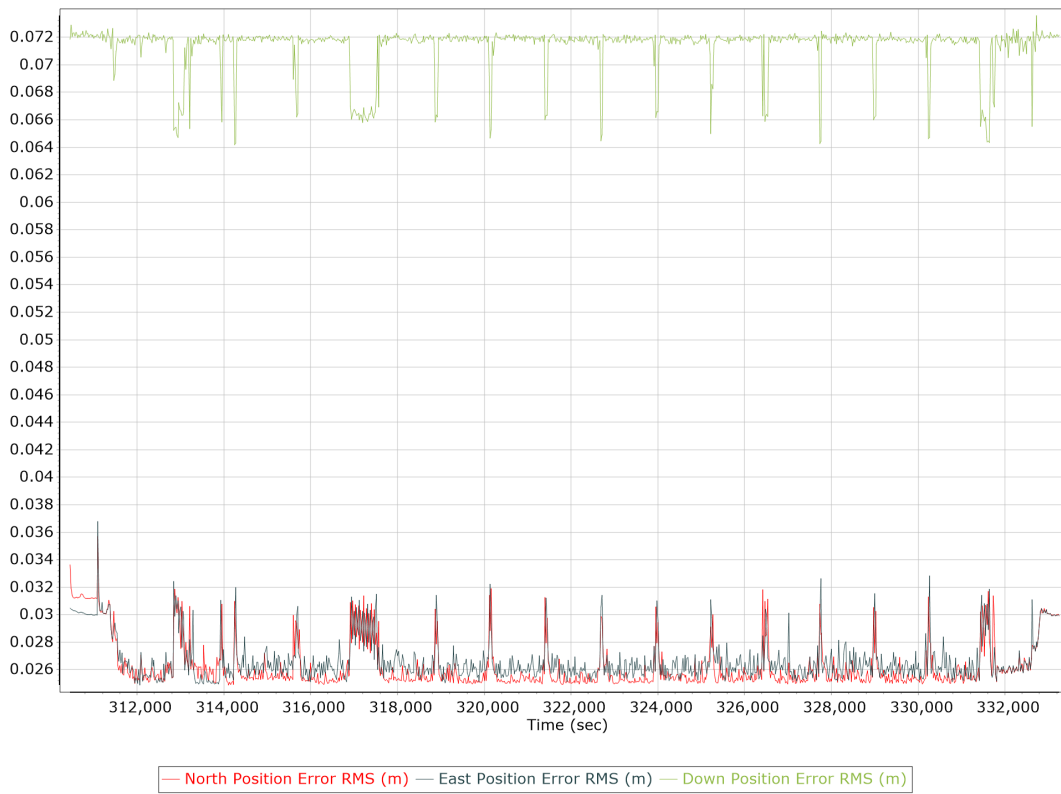


### Heading Error RMS (arc-min)

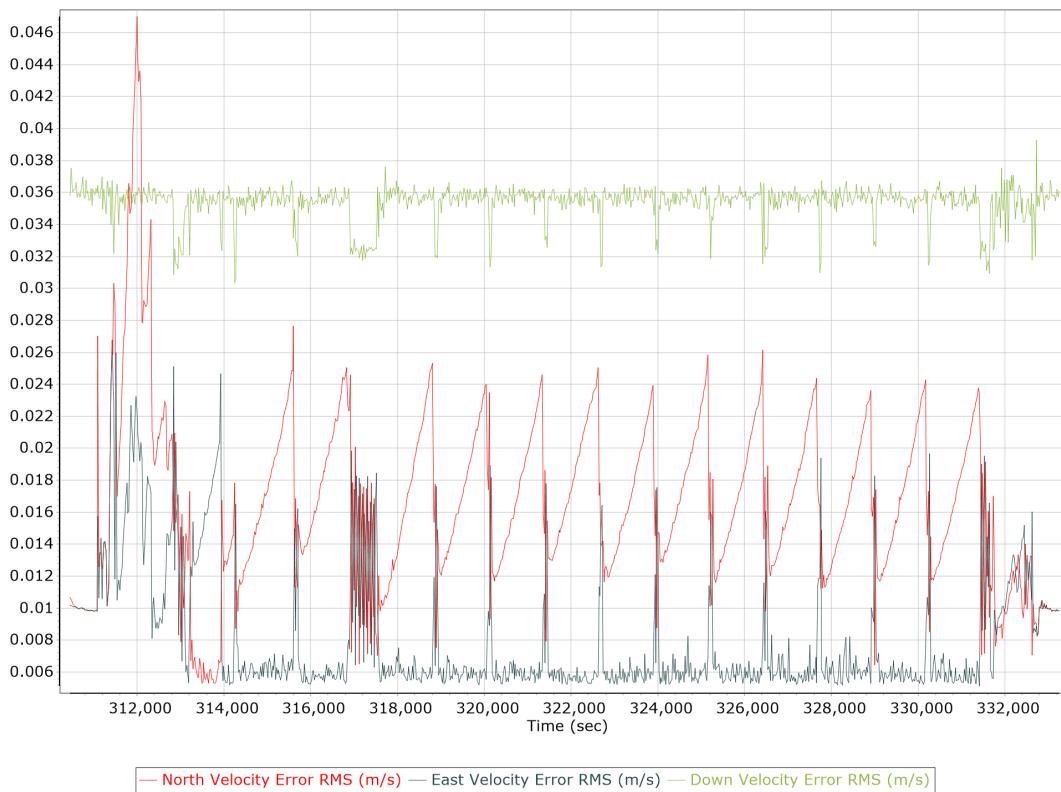


## Forward Processed Performance Metrics

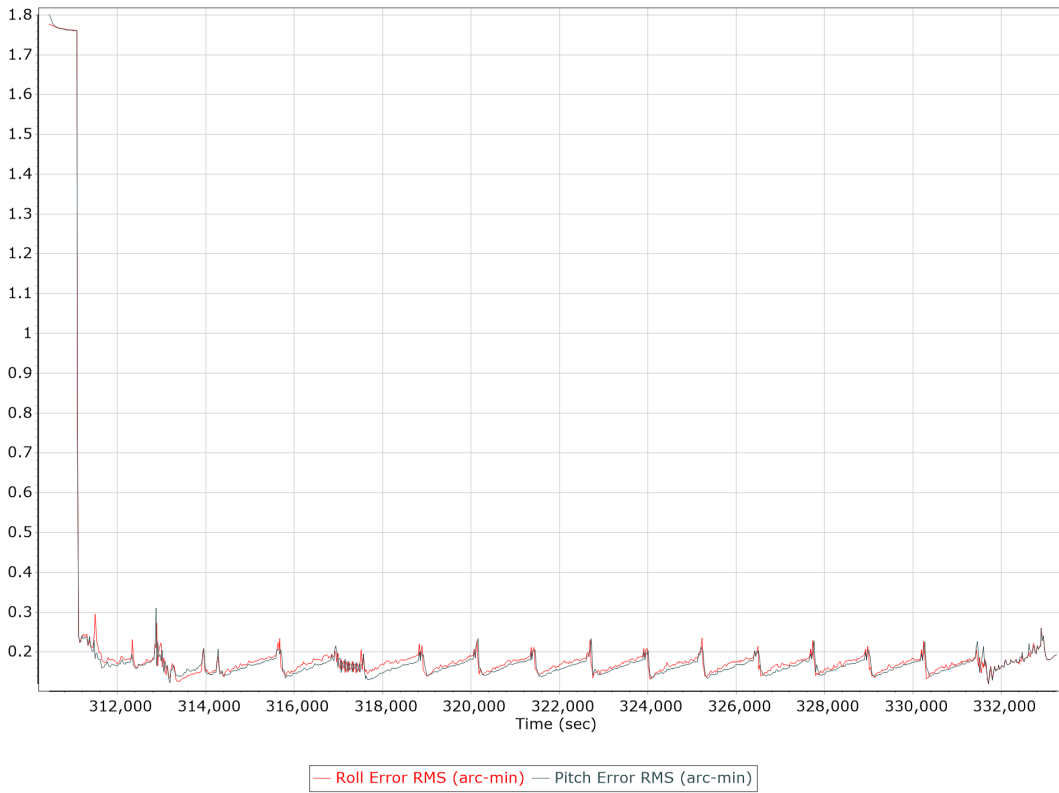
### Position Error RMS (m)



### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

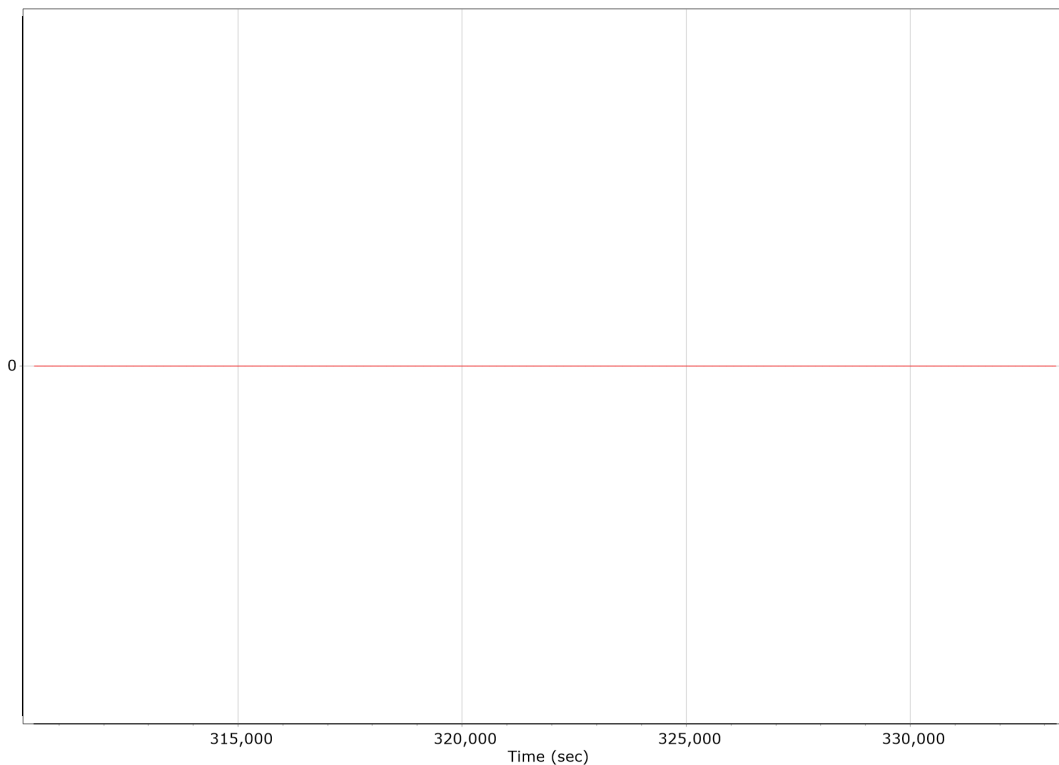


### Heading Error RMS (arc-min)



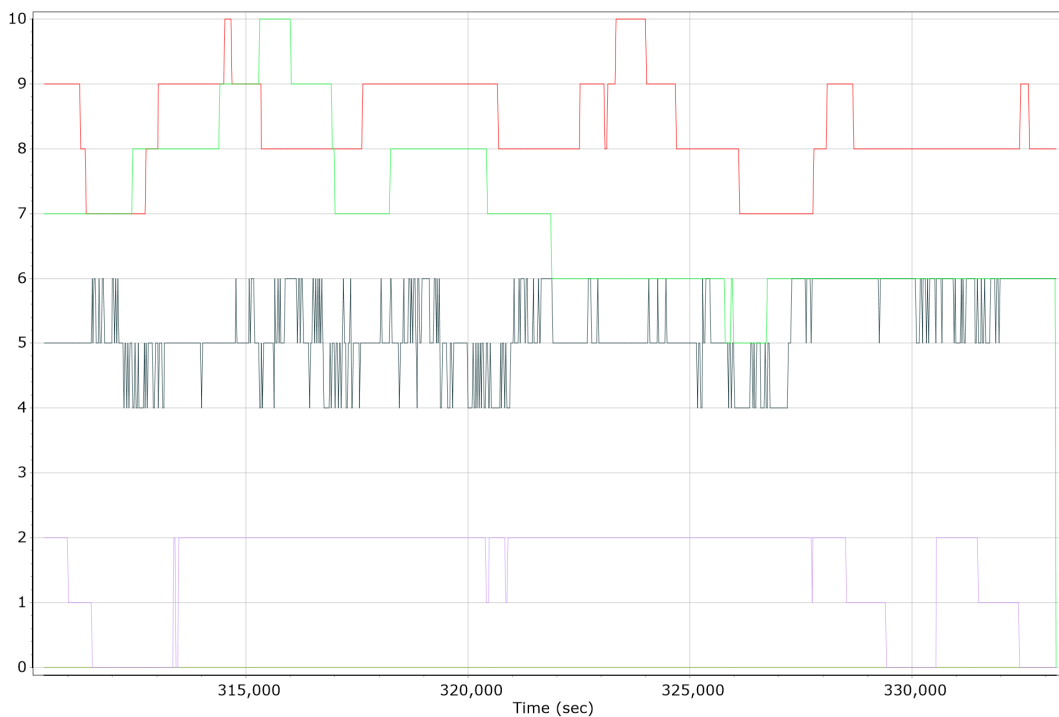
## Forward Processed Solution Status

### Processing Mode



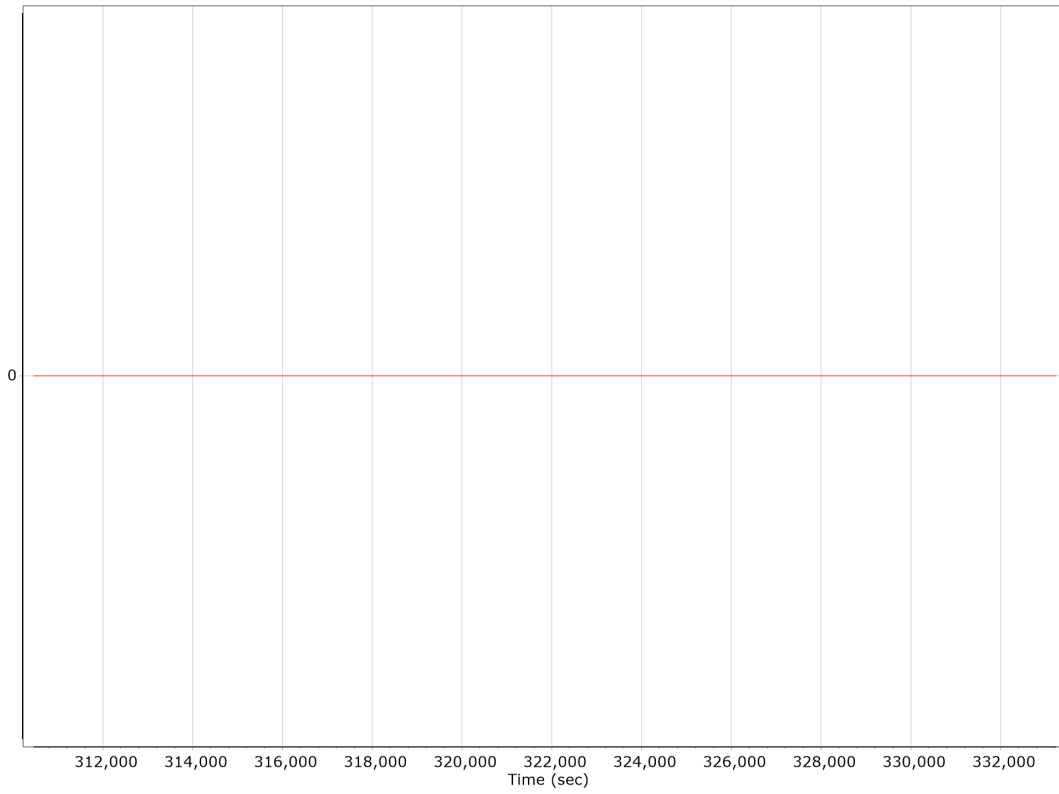
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

### 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	04272022A_3543
Processing date	2022-04-29 15:20:15
Mission date	2022-04-27 11:57:27
Mission duration	06:11:55.348
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	Bilinmeyen harici

## Project File List

### Rover Data Files

File name	File type
220427_115708_INS-GPS_1.raw	POS Data

### Input Files

File Name	File Type
Ephm1170.22g	GLONASS Broadcast Ephemeris
Ephm1170.22n	GPS Broadcast Ephemeris

### Output Files

Filename	File type
sbet_04272022A_3543.out	SBET Trajectory File

## Rover Data Summary

First raw data file	220427_115708_INS-GPS_1.raw		
Last raw data file	220427_115708_INS-GPS_1.raw		
Start GPS week	2207		
Start time	302228.891 (4/27/2022 11:57:08 AM)		
End time	324544.239 (4/27/2022 6:09:04 PM)		
Start of fine alignment	302577.175 (4/27/2022 12:02:57 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
<b>IMU Installation Lever Arms &amp; Mounting Angles</b>			
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

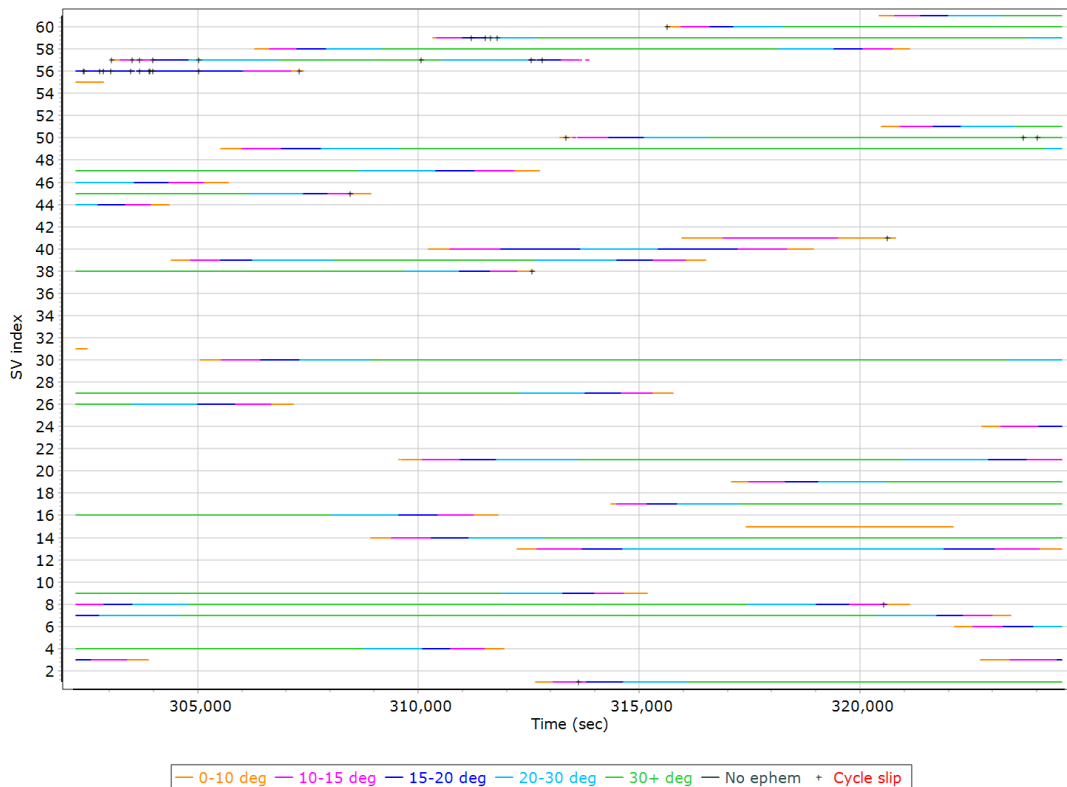
## Rover Data QC

### Raw IMU Import QC Summary

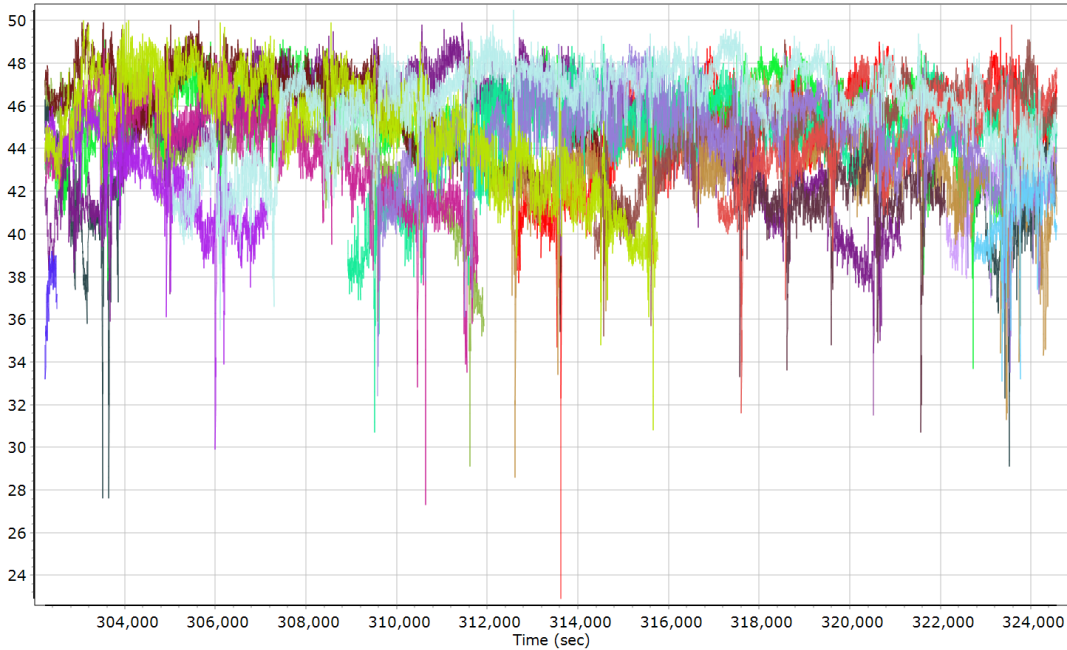
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_04272022A_3543.log
IMU Records Processed	4462893
Termination Status	Normal
IMU Anomalies	0

## Primary Observables & Satellite Data

### GPS/GLONASS L1 Satellite Lock/Elevation

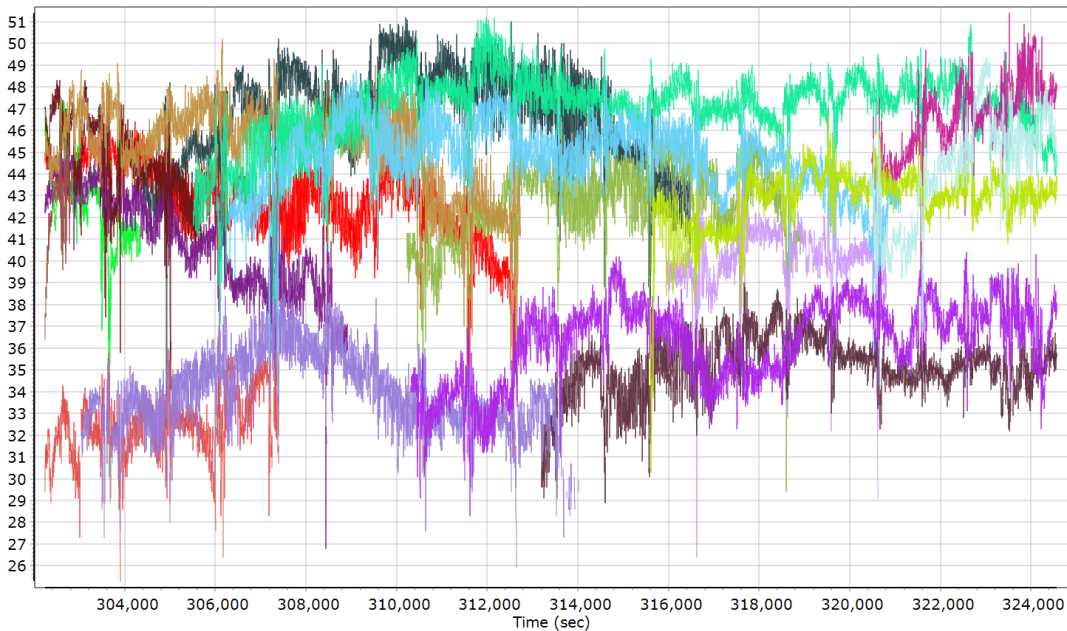


### GPS L1 SNR



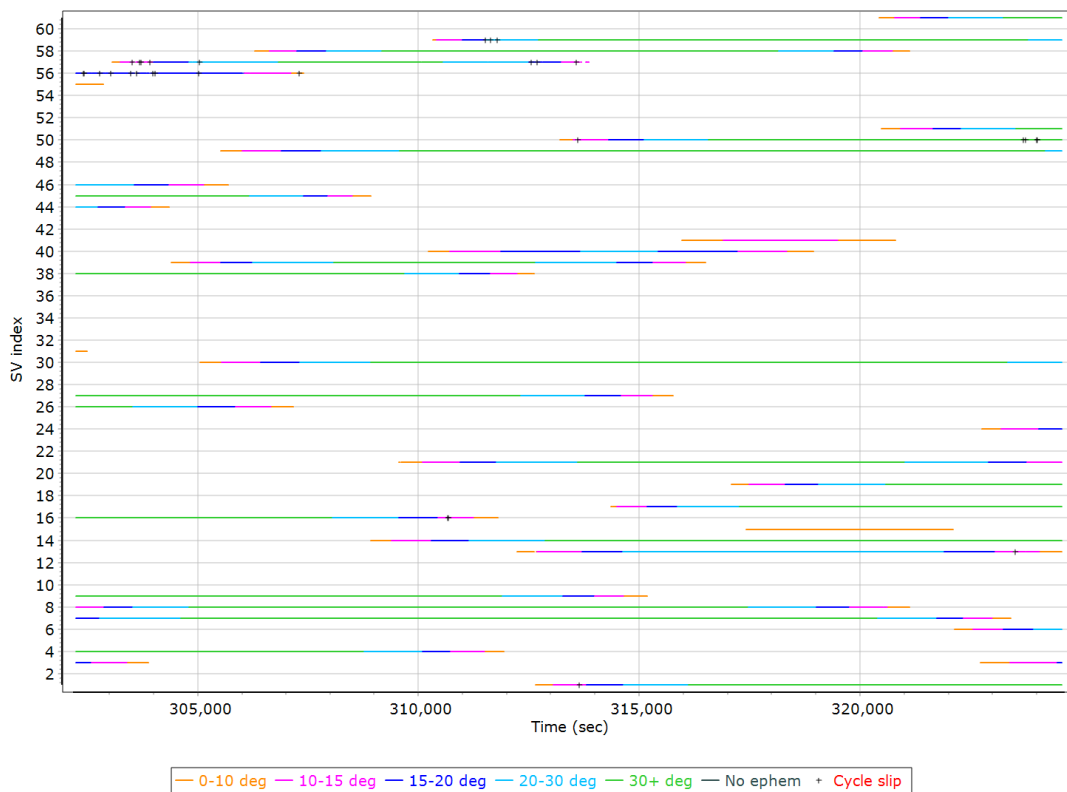
- |                           |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 03 L1 SNR (dB/Hz) | GPS PRN 04 L1 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 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) | GPS PRN 31 L1 SNR (dB/Hz) |                           |

### GLONASS L1 SNR

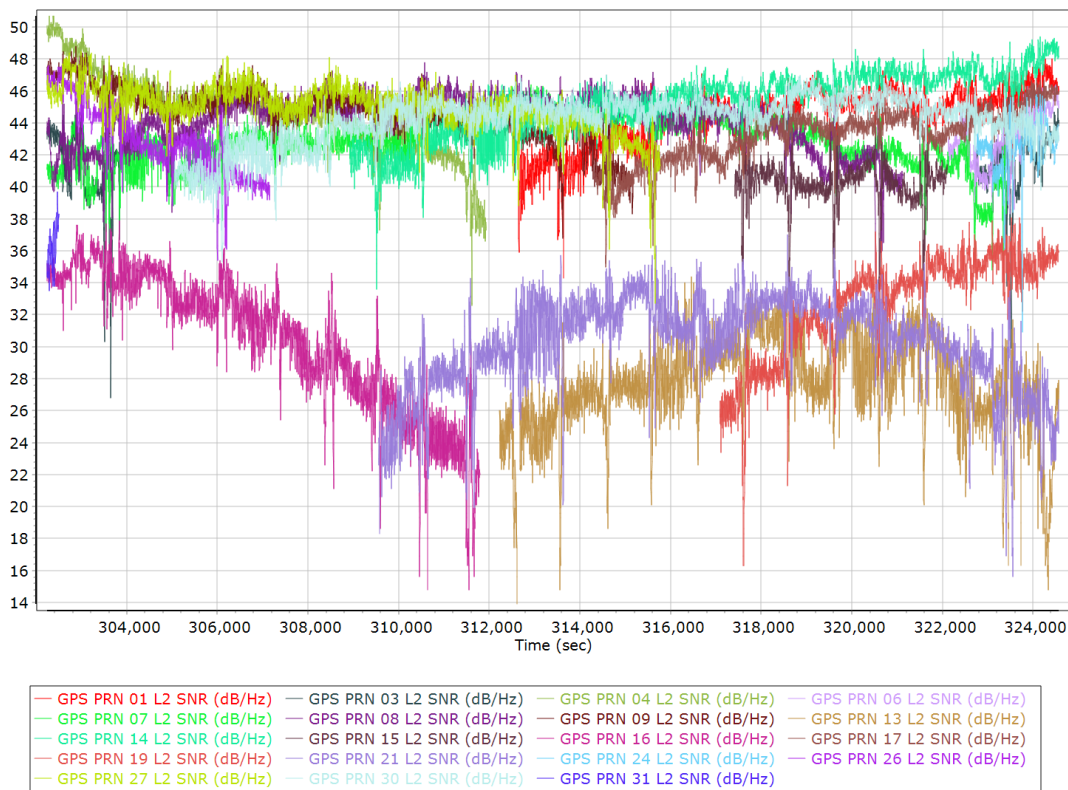


- |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 07 L1 SNR (dB/Hz) | GLONASS 08 L1 SNR (dB/Hz) |
| GLONASS 09 L1 SNR (dB/Hz) | GLONASS 10 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) |

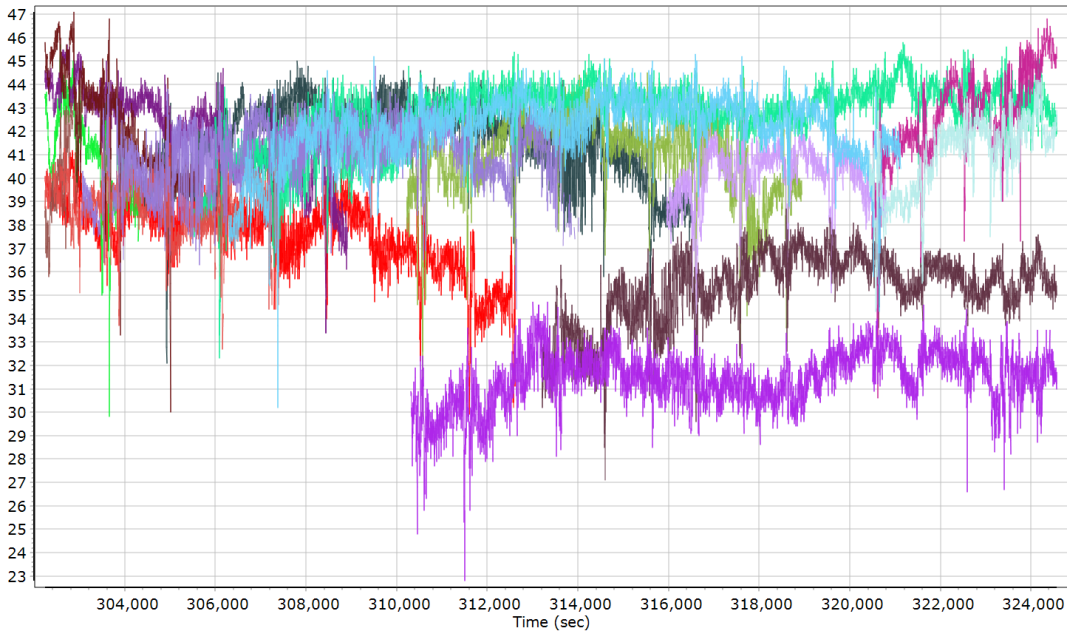
### GPS/GLONASS L2 Satellite Lock/Elevation



### GPS L2 SNR

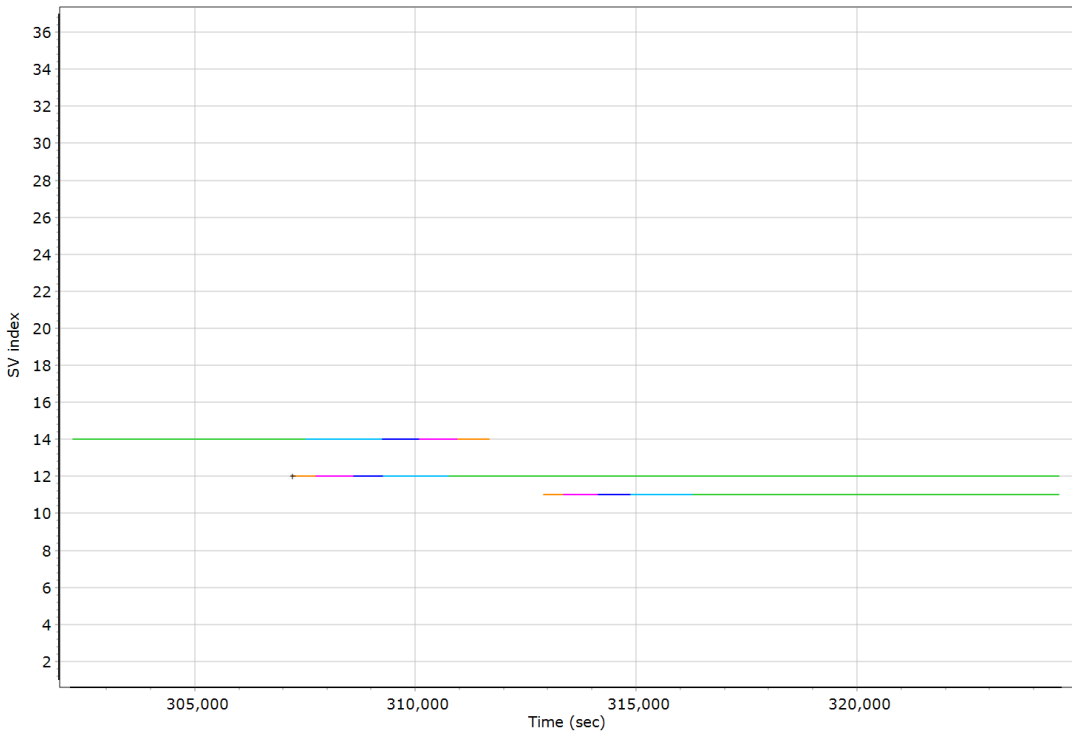


### GLONASS L2 SNR



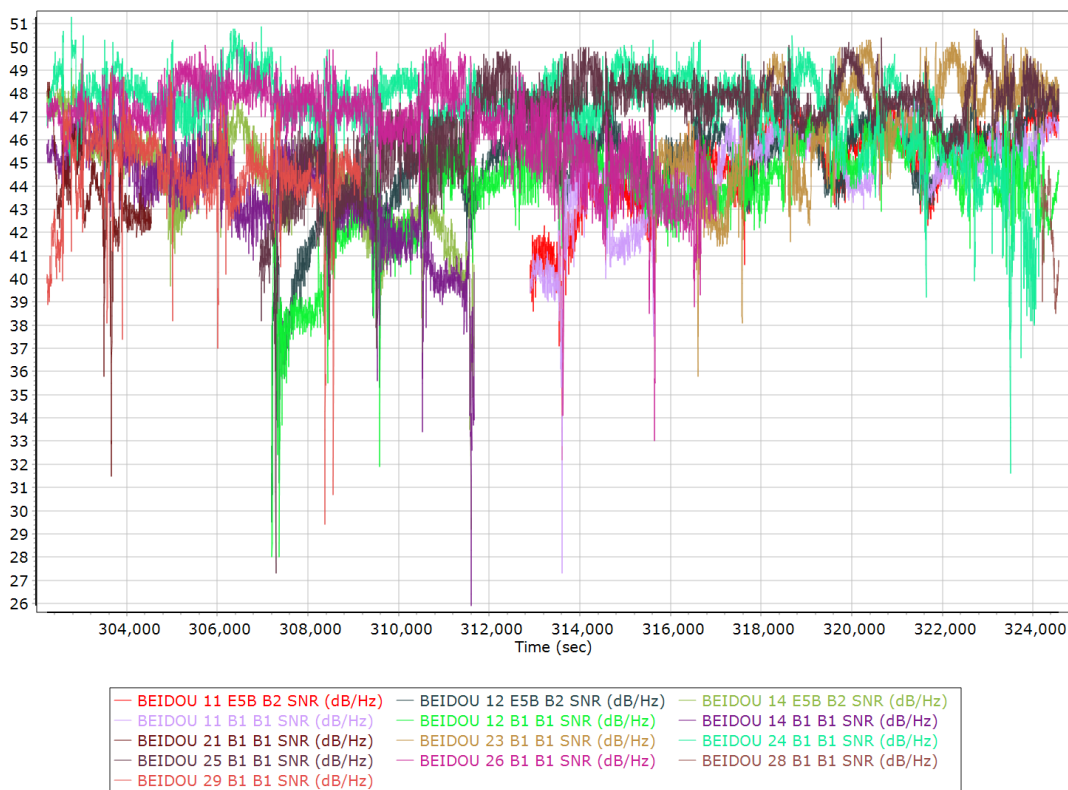
- GLONASS 01 L2 SNR (dB/Hz)
- GLONASS 02 L2 SNR (dB/Hz)
- GLONASS 03 L2 SNR (dB/Hz)
- GLONASS 04 L2 SNR (dB/Hz)
- GLONASS 07 L2 SNR (dB/Hz)
- GLONASS 08 L2 SNR (dB/Hz)
- GLONASS 09 L2 SNR (dB/Hz)
- GLONASS 10 L2 SNR (dB/Hz)
- GLONASS 12 L2 SNR (dB/Hz)
- GLONASS 13 L2 SNR (dB/Hz)
- GLONASS 14 L2 SNR (dB/Hz)
- GLONASS 18 L2 SNR (dB/Hz)
- GLONASS 19 L2 SNR (dB/Hz)
- GLONASS 20 L2 SNR (dB/Hz)
- GLONASS 21 L2 SNR (dB/Hz)
- GLONASS 22 L2 SNR (dB/Hz)
- GLONASS 23 L2 SNR (dB/Hz)
- GLONASS 24 L2 SNR (dB/Hz)

### BEIDOU Satellite Lock/Elevation

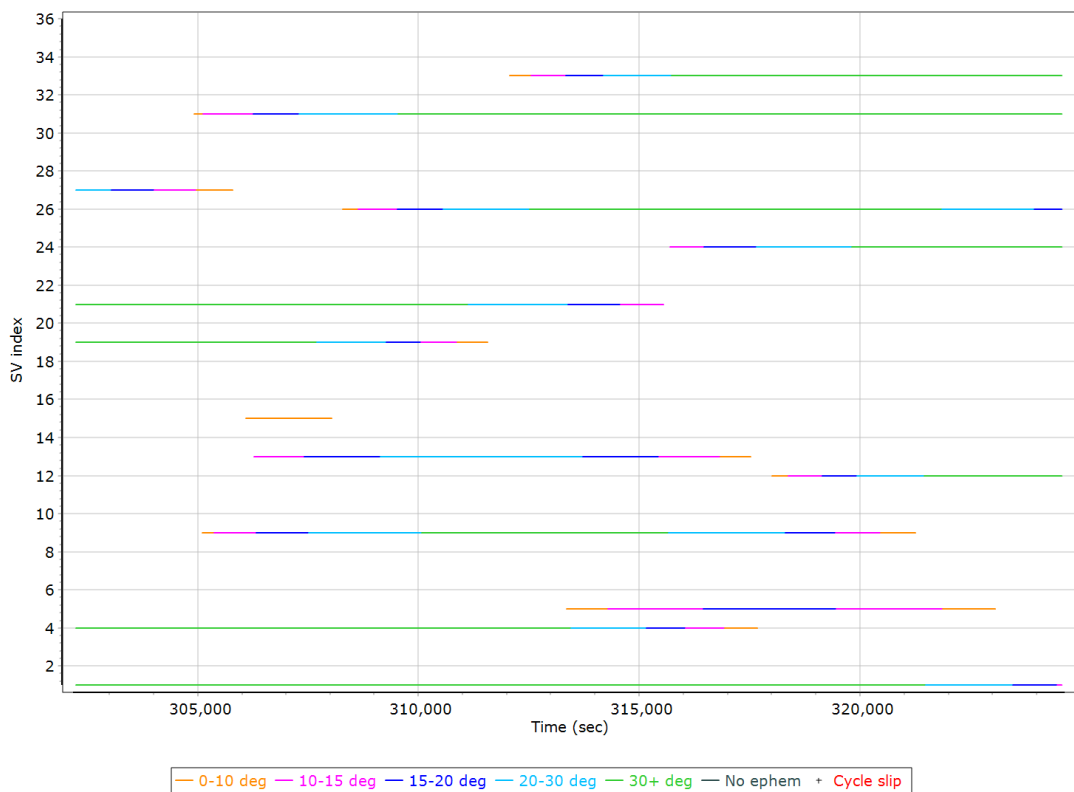


- 0-10 deg
- 10-15 deg
- 15-20 deg
- 20-30 deg
- 30+ deg
- No ephem
- + Cycle slip

### BEIDOU SNR

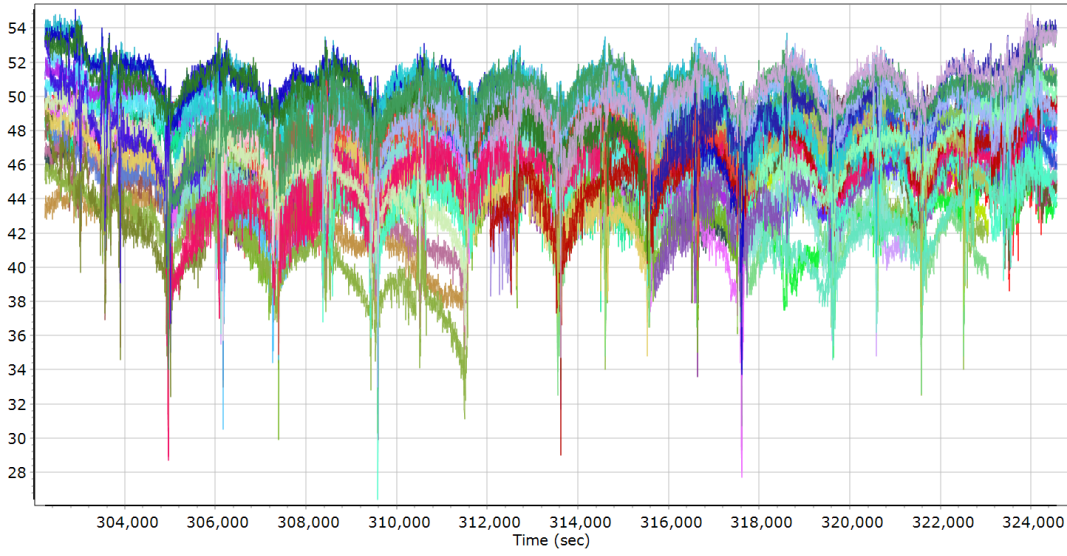


### GALILEO Satellite Lock/Elevation





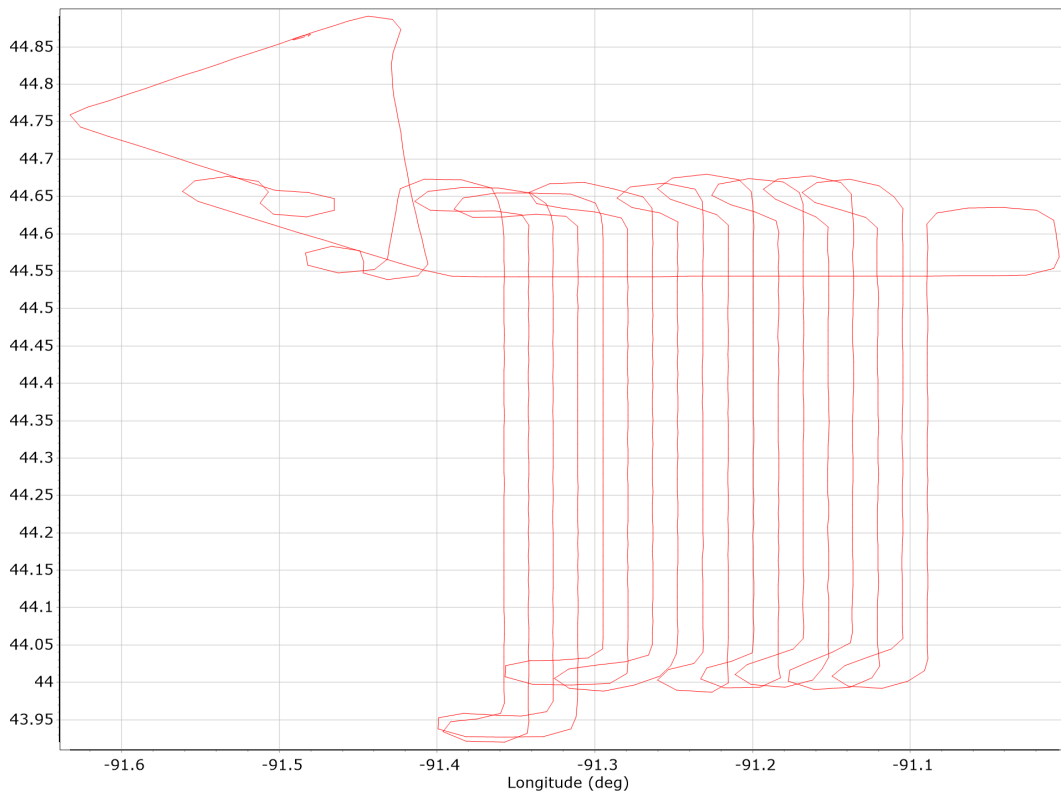
## GALILEO SNR



- |   |   |
|---|---|
| — GALILEO 01 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — 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 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 01 L5E5A BPSK10_PD 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 12 L5E5A BPSK10_PD SNR (dB/Hz)    | — GALILEO 13 L5E5A BPSK10_PD SNR (dB/Hz)    |

## Smoothed Trajectory Information

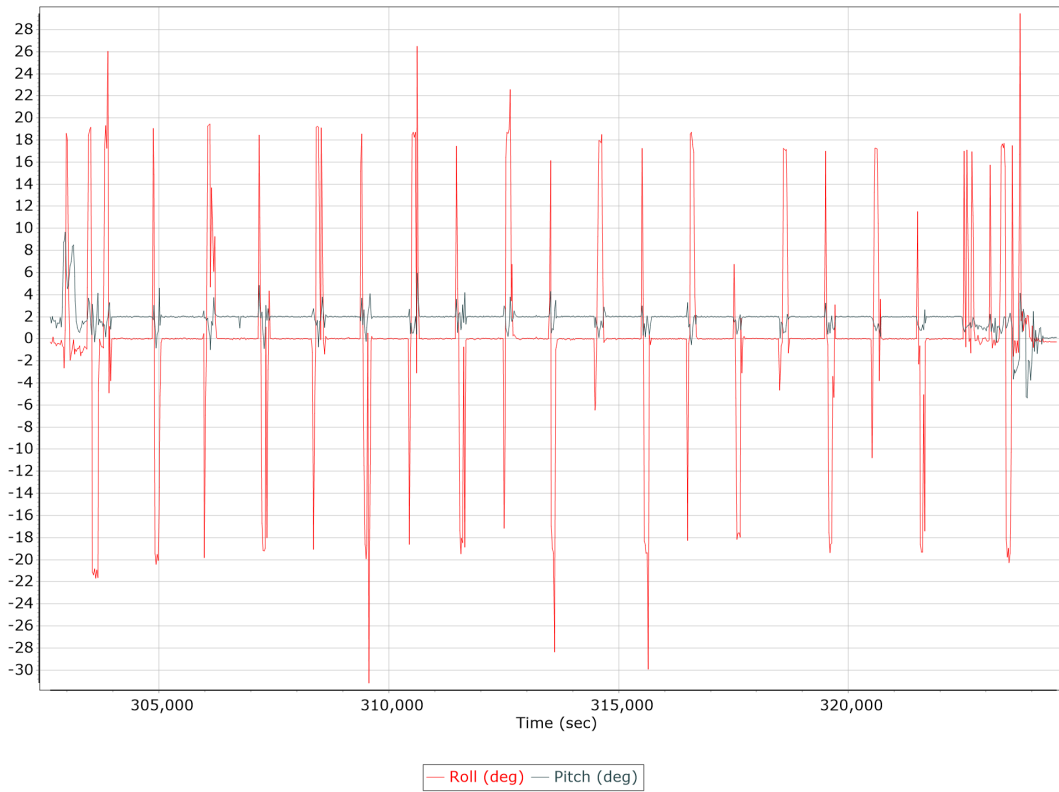
### Top View



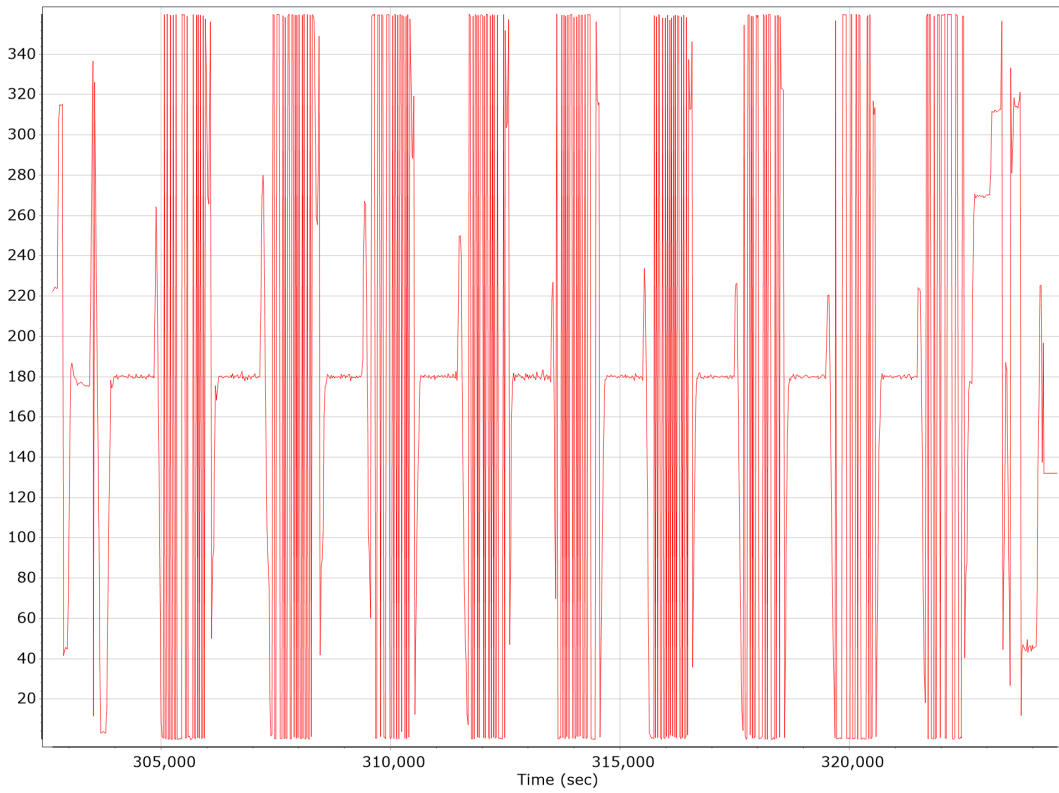
### Altitude



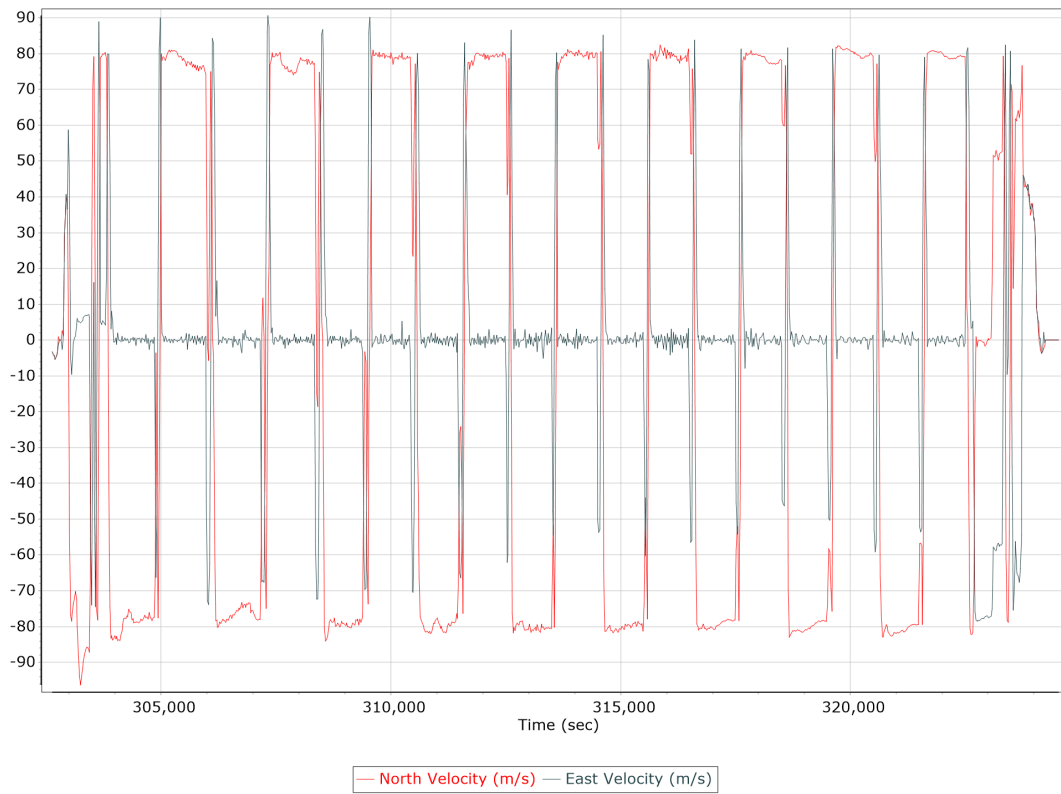
## Roll/Pitch



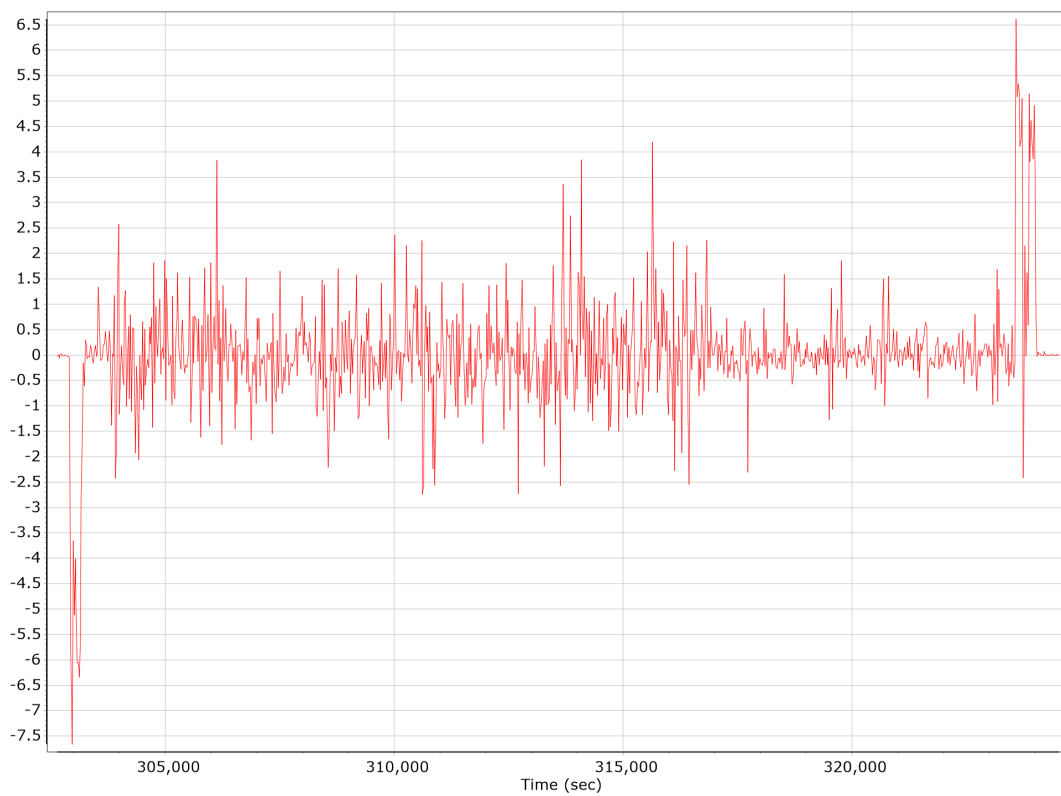
## Heading



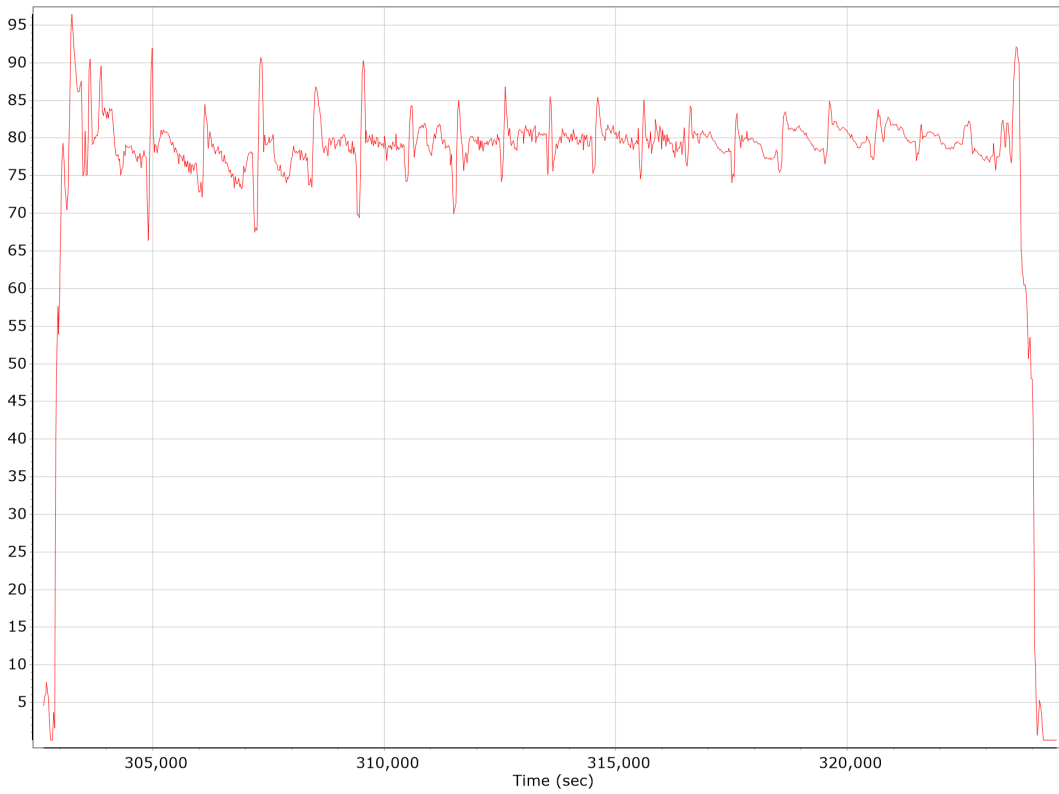
## North/East Velocity



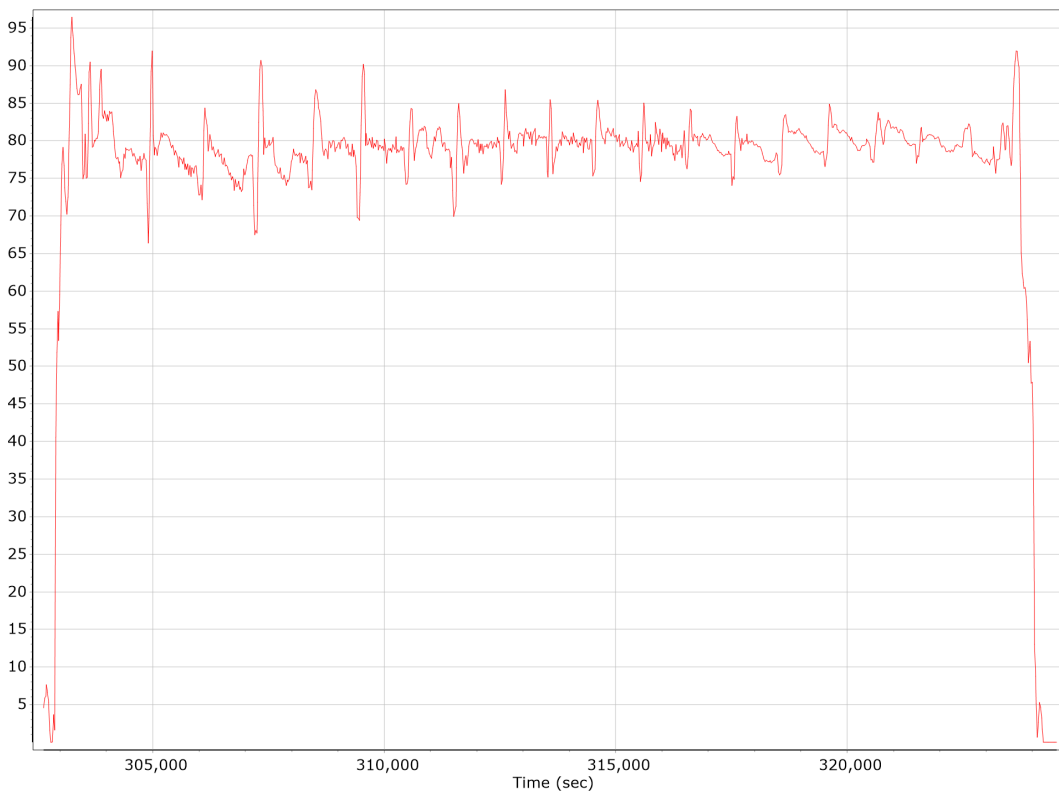
## Down Velocity



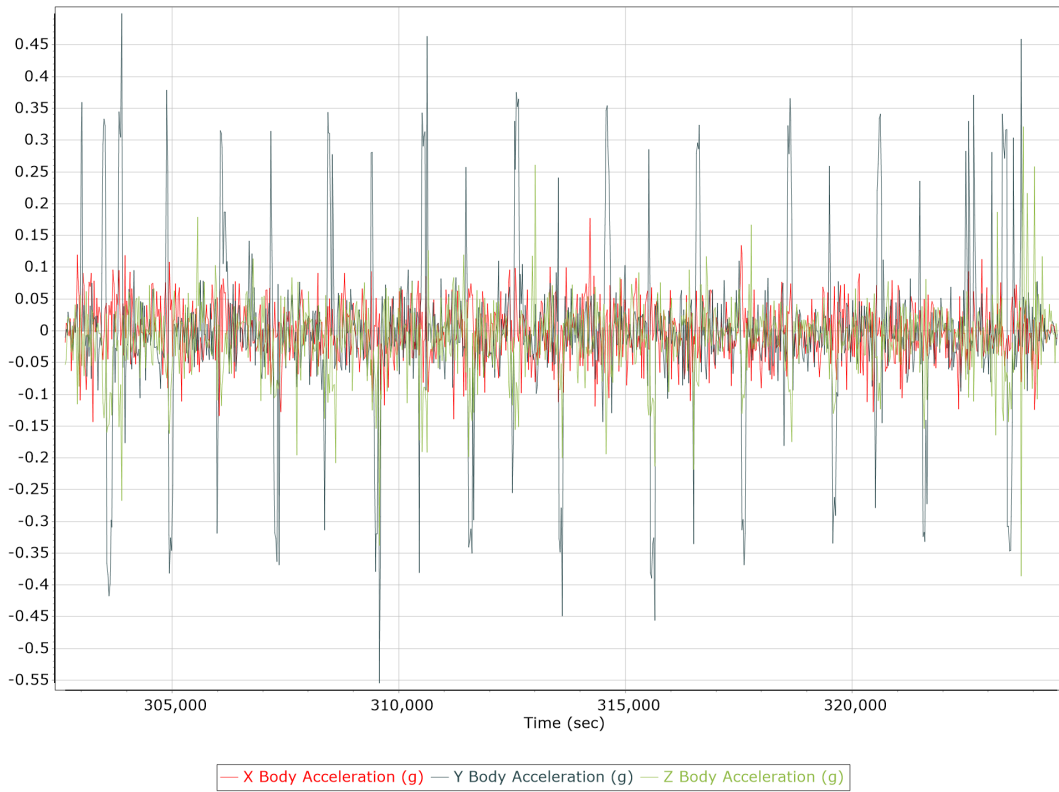
## Total Speed



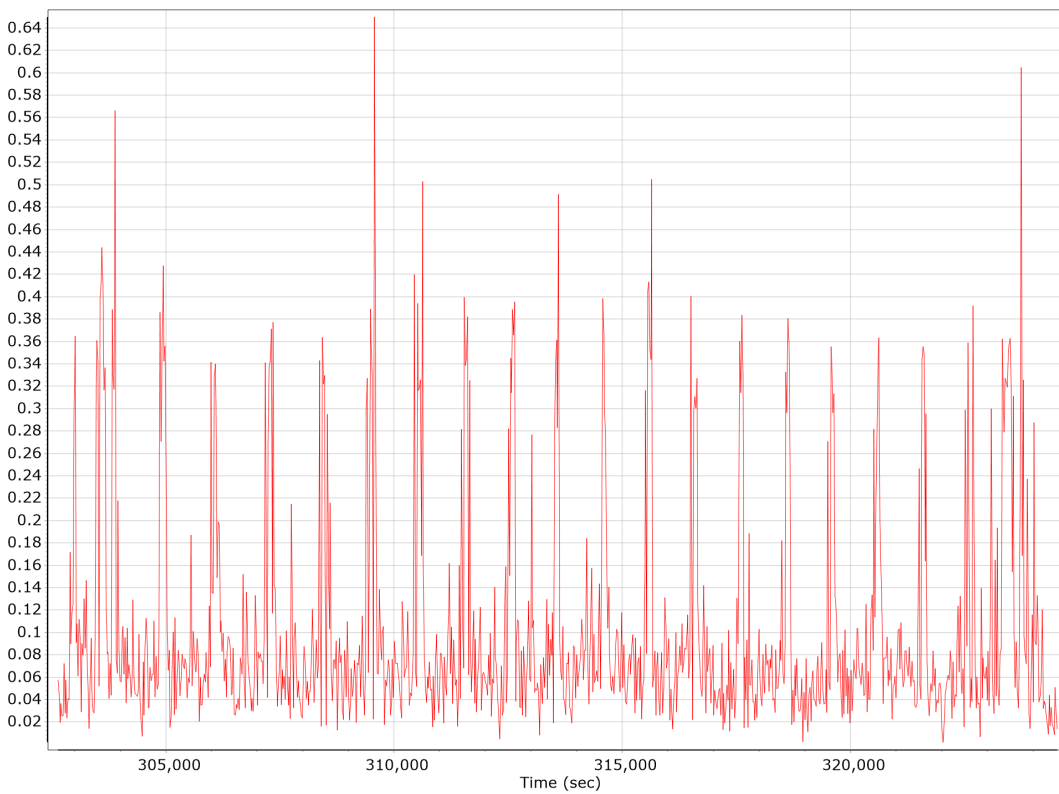
## Ground Speed



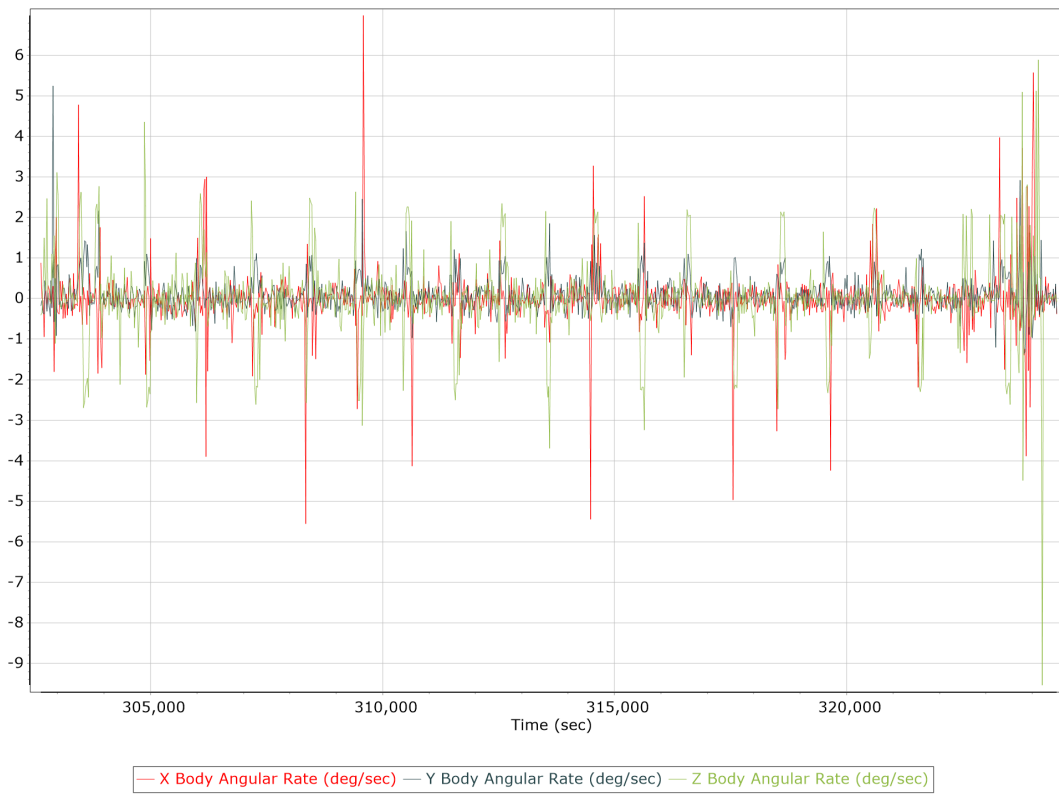
## Body Acceleration



## Total Body Acceleration

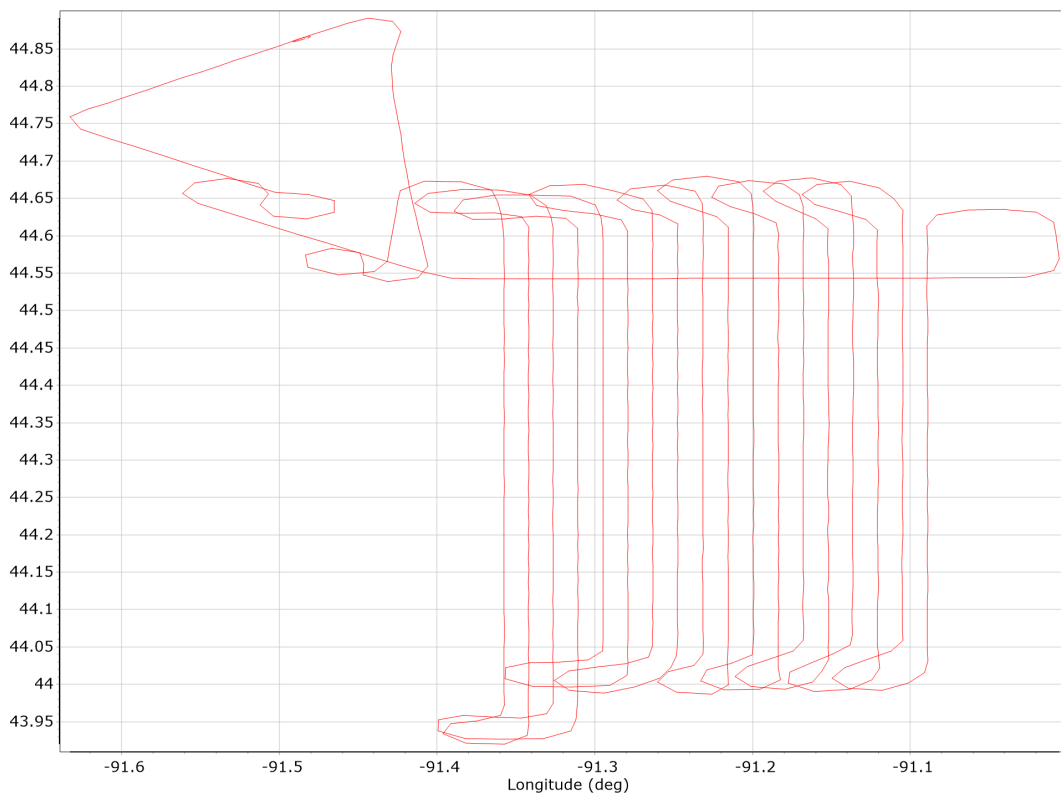


## Body Angular Rate



## Forward Processed Trajectory Information

### Top View

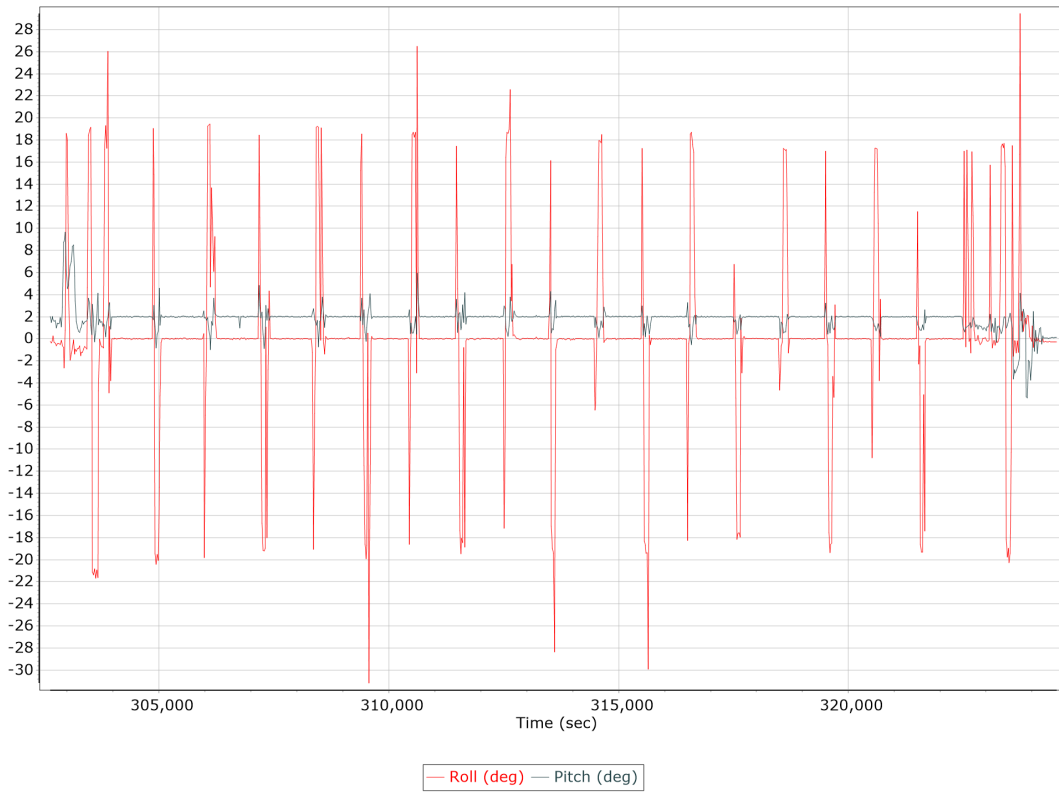


### Altitude

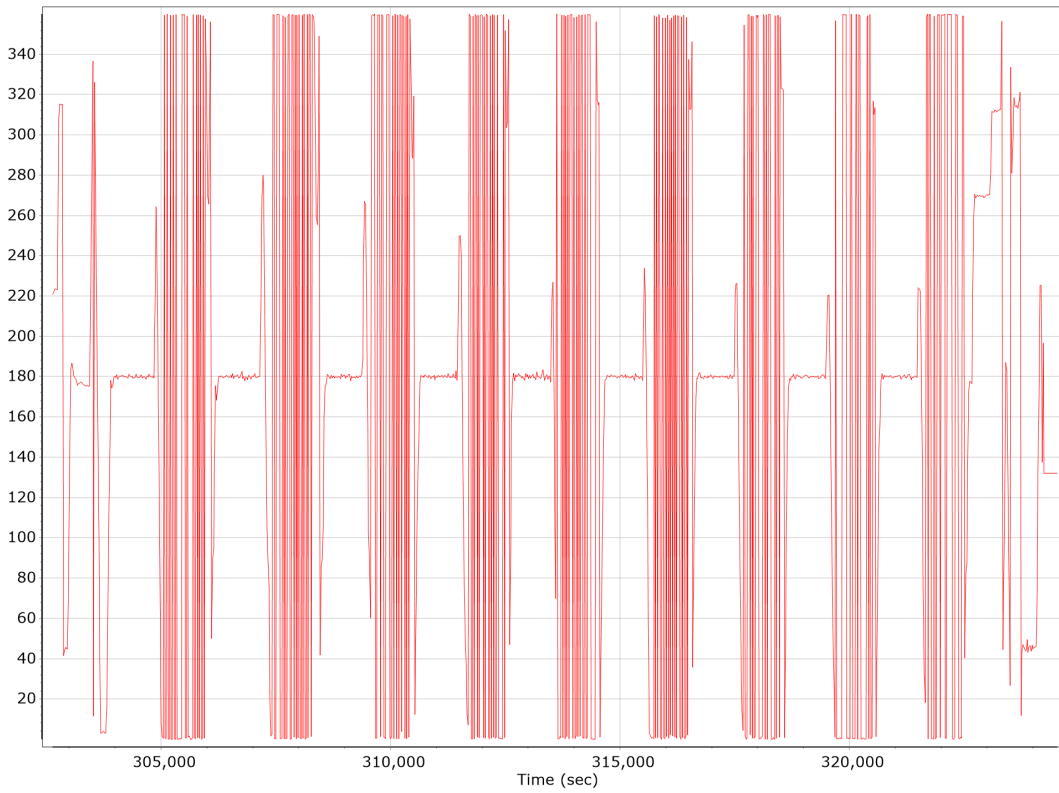




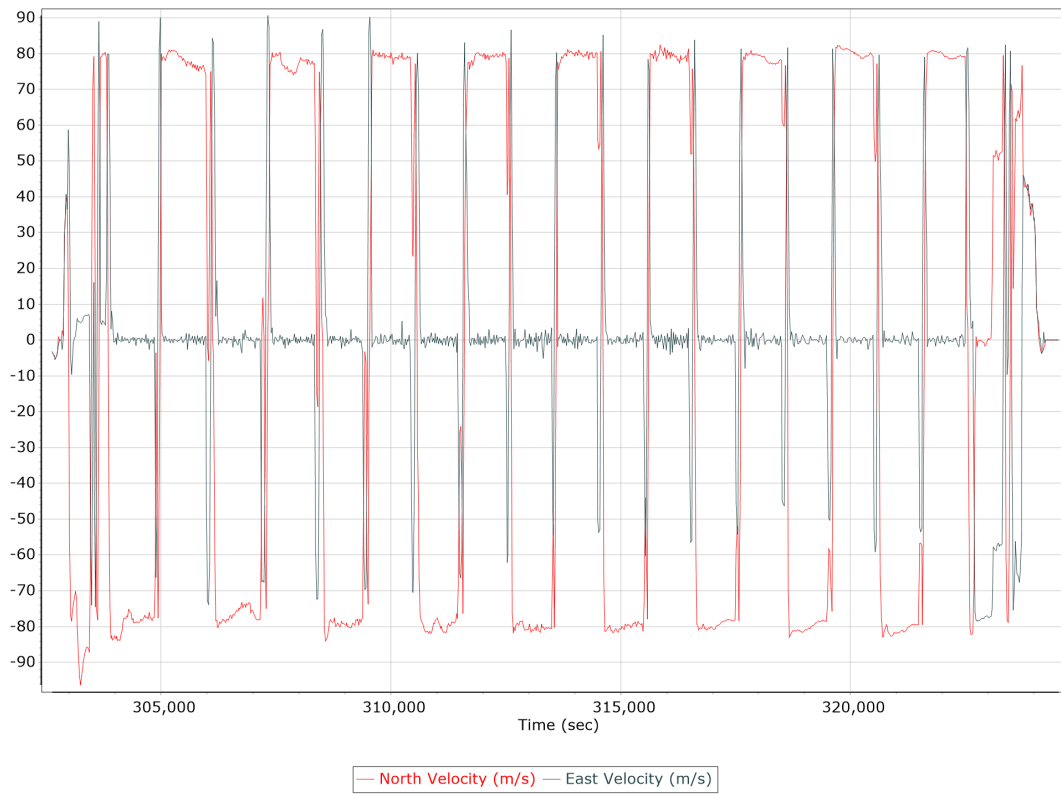
## Roll/Pitch



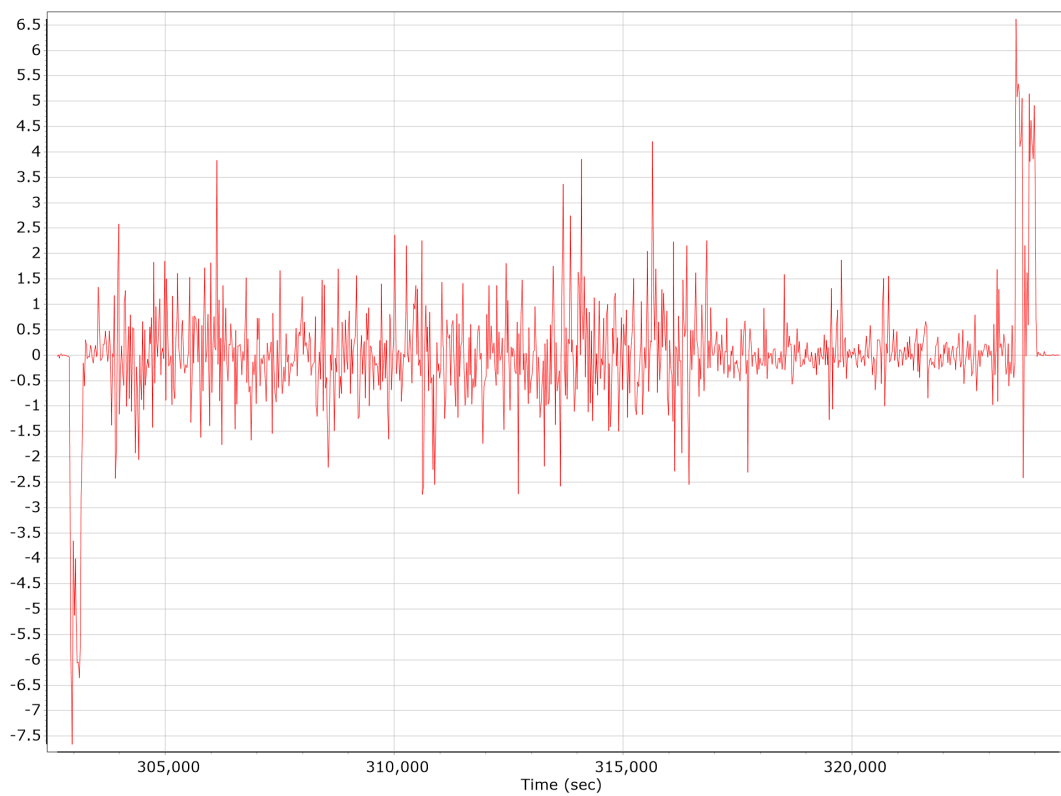
## Heading



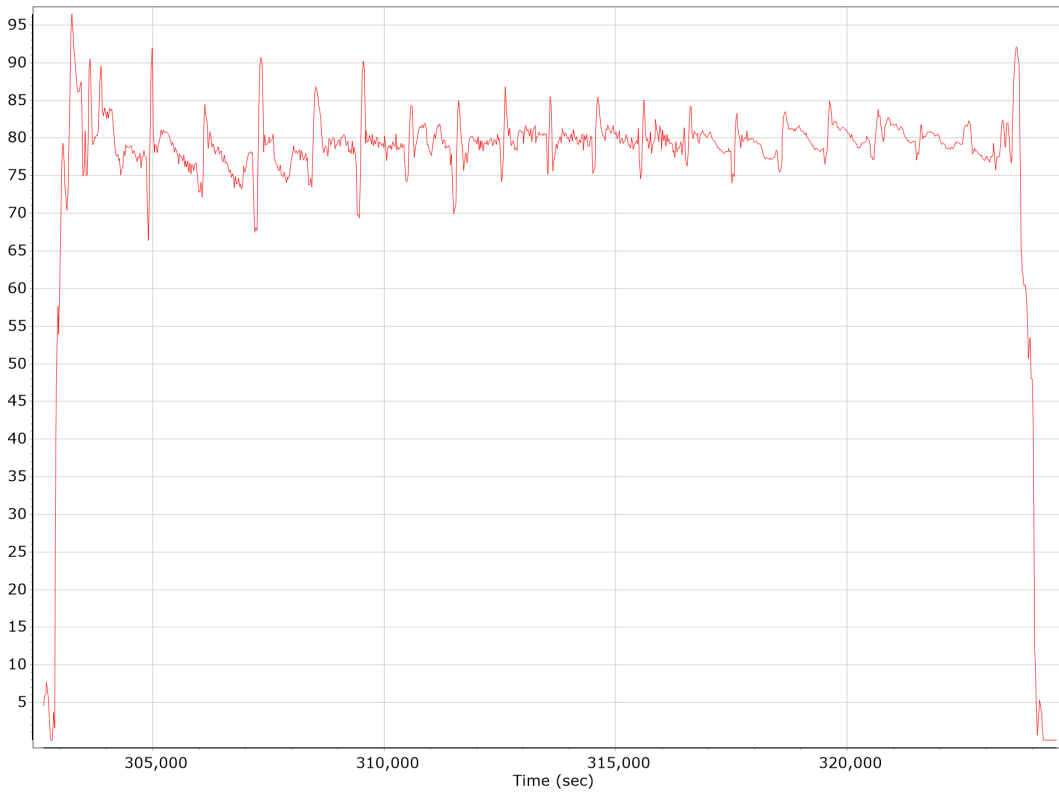
## North/East Velocity



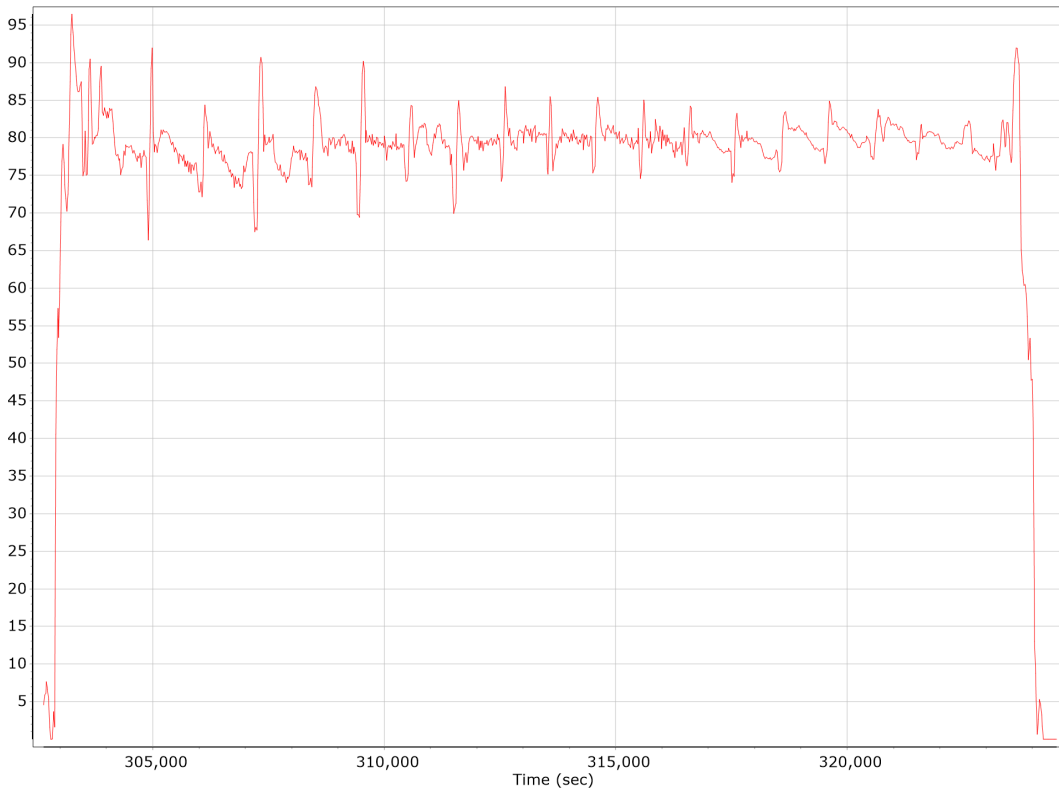
## Down Velocity



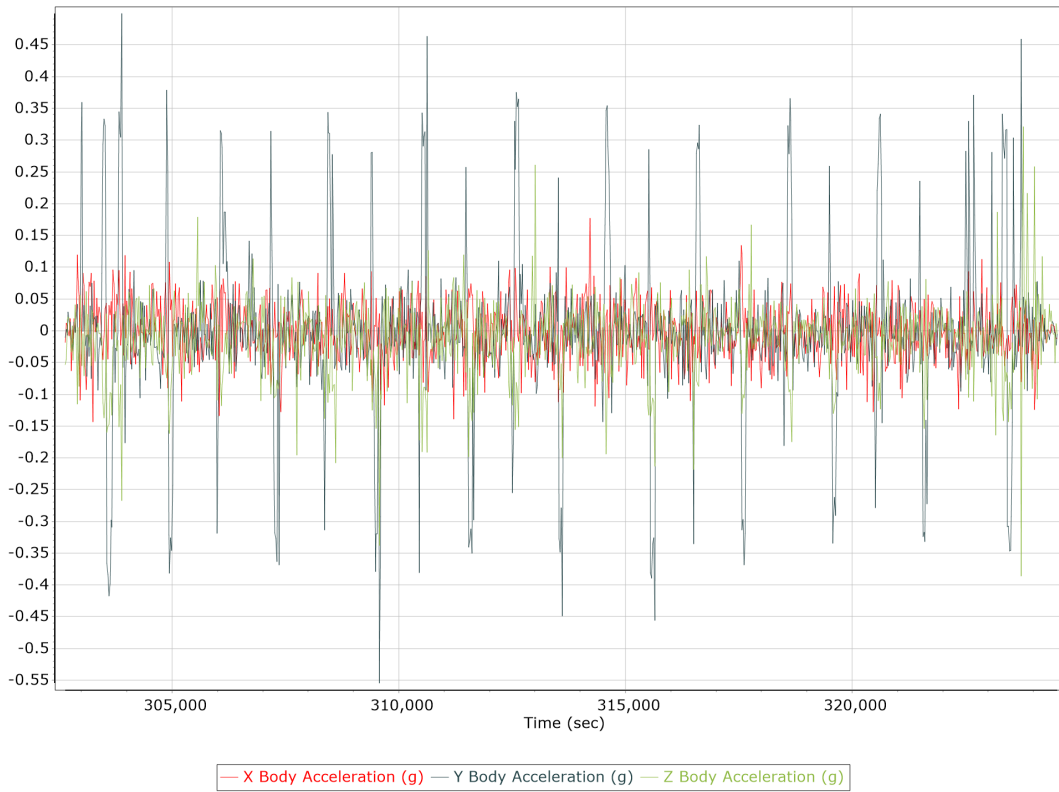
## Total Speed



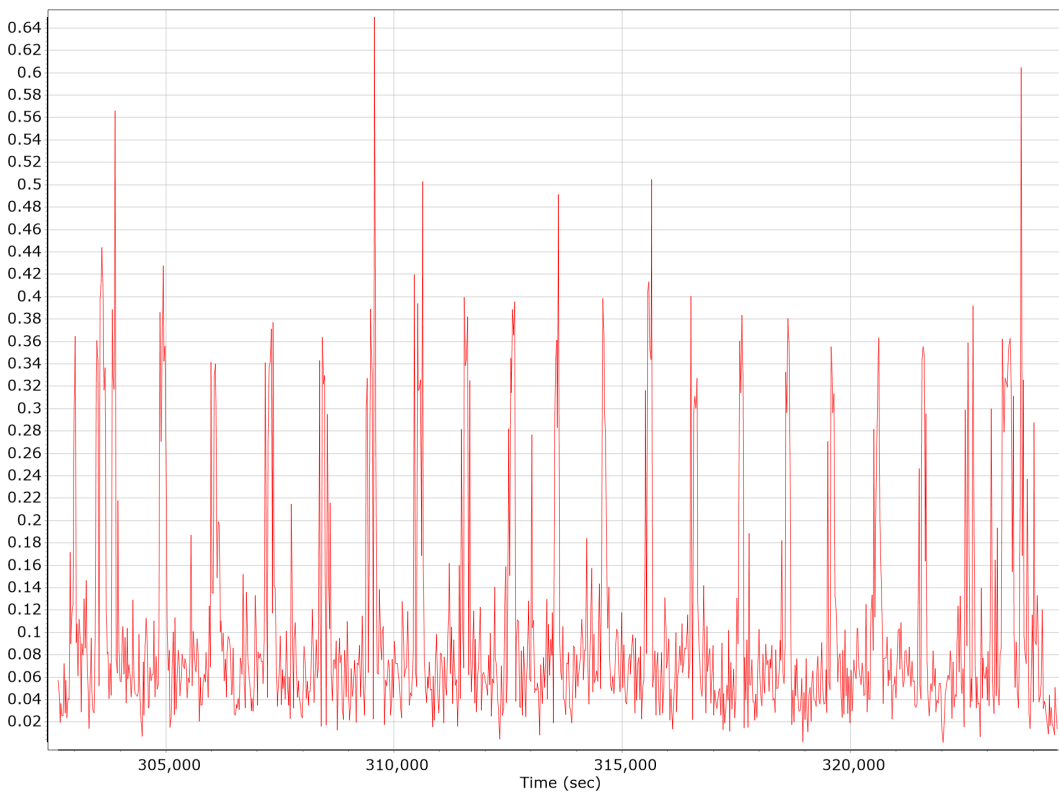
## Ground Speed



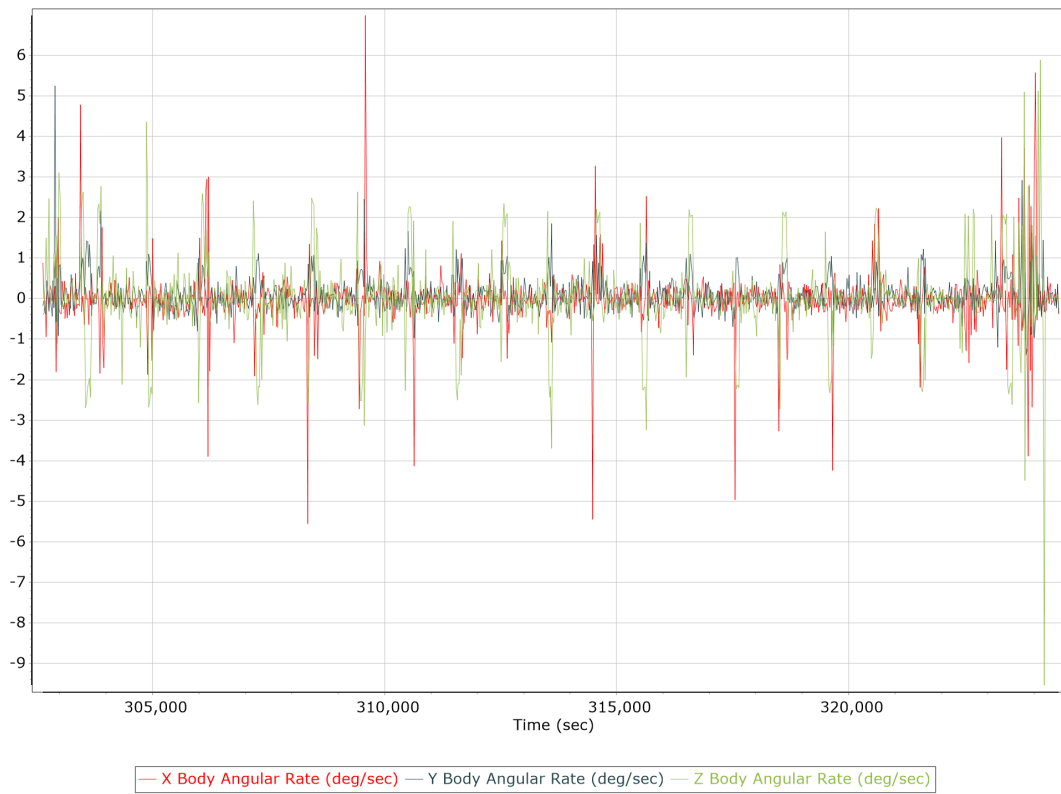
## Body Acceleration



## Total Body Acceleration



## Body Angular Rate

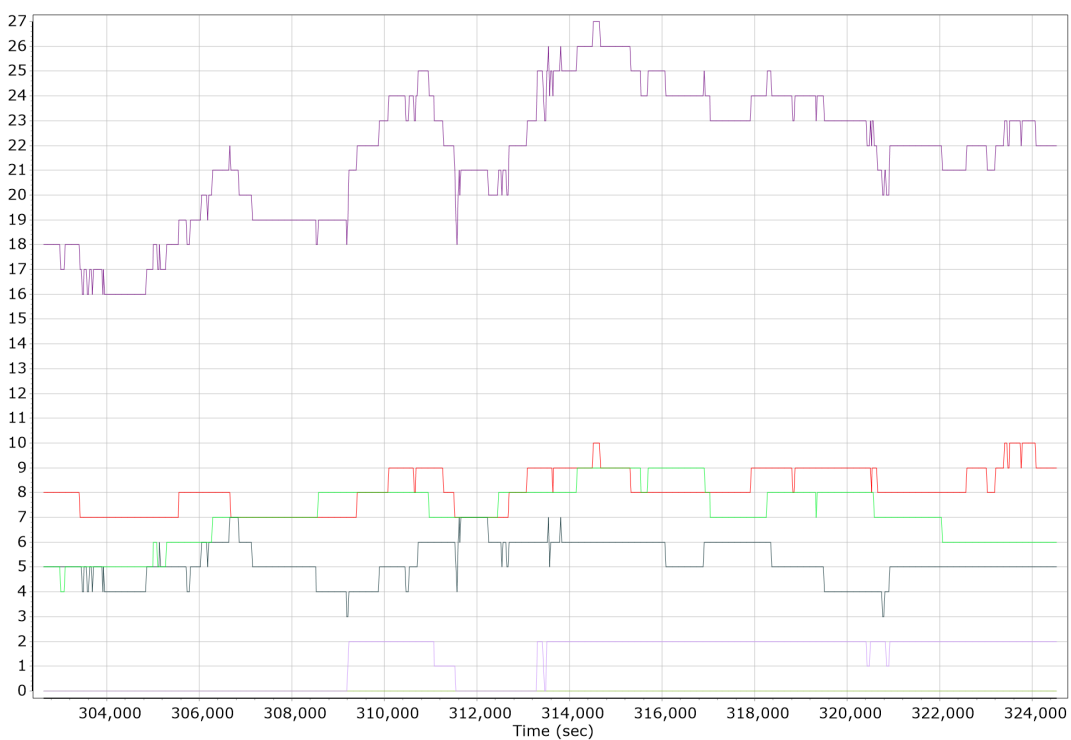


## GNSS QC

### GNSS QC Statistics

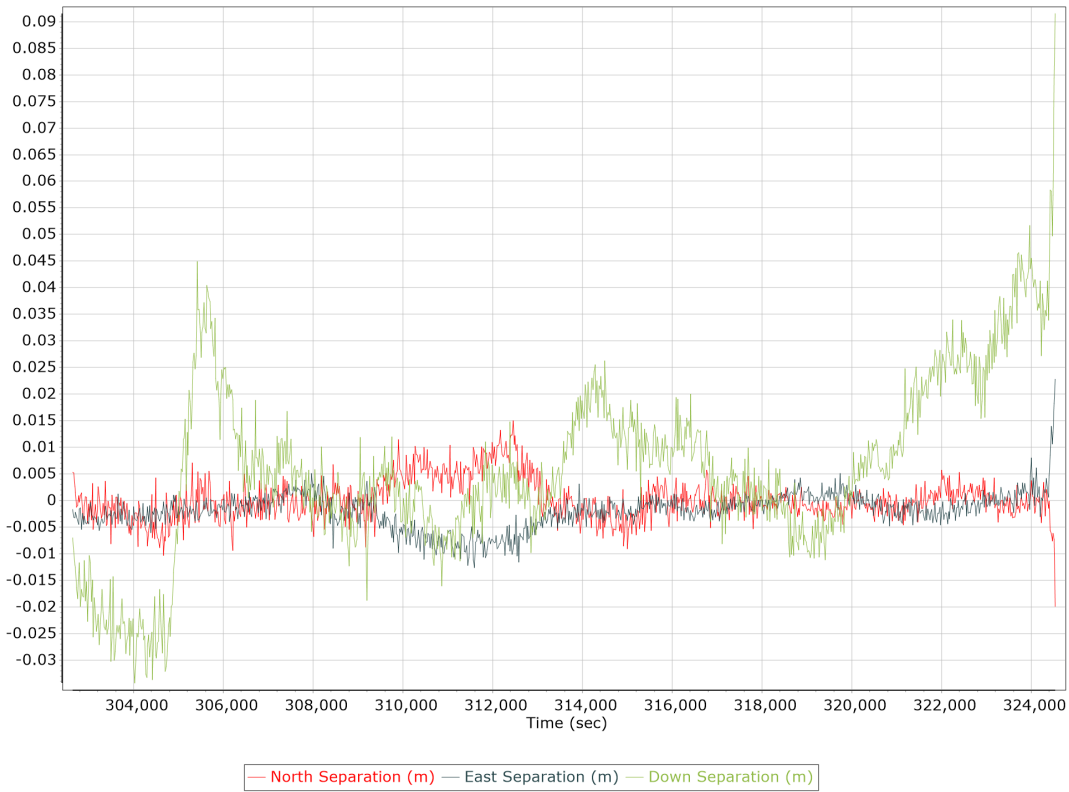
Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	3	7	5
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	2	1
Number of GALILEO SV	4	9	7
Total number of SV	15	27	22
PDOP	0.93	1.68	1.20
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	22295.00	0.00	0.00
Percentage	100.00	0.00	0.00

### Num SVs in solution

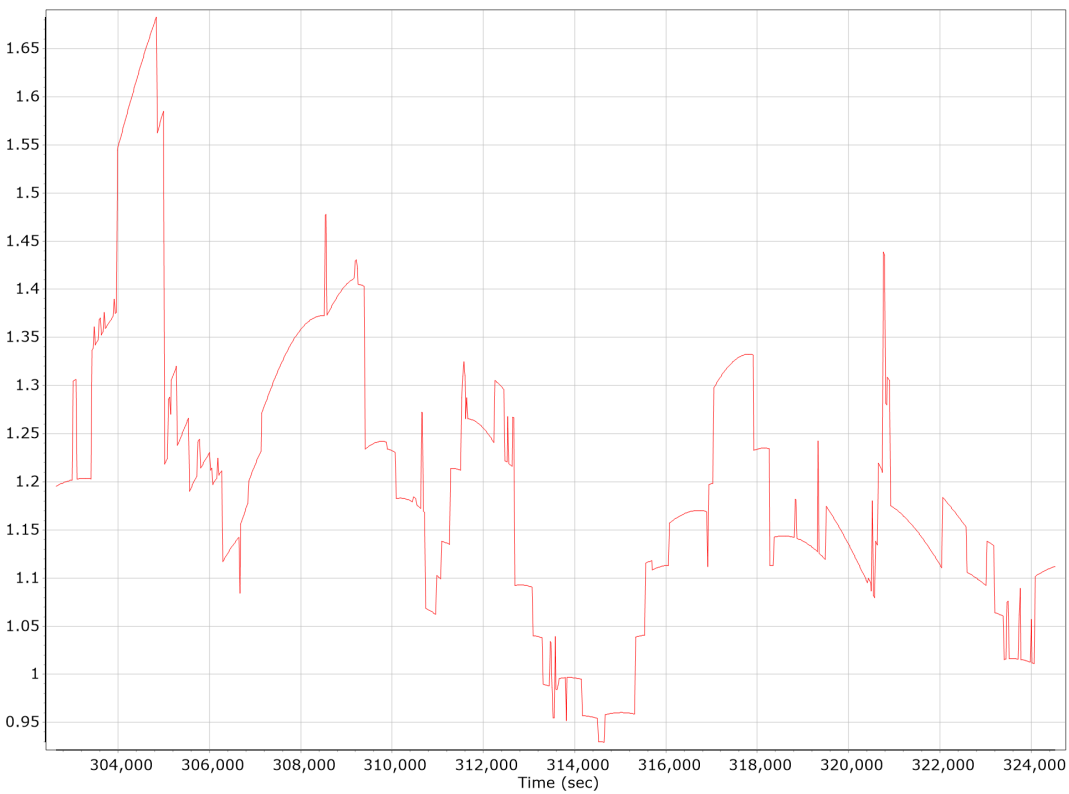


— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Number of GALILEO — Total Number

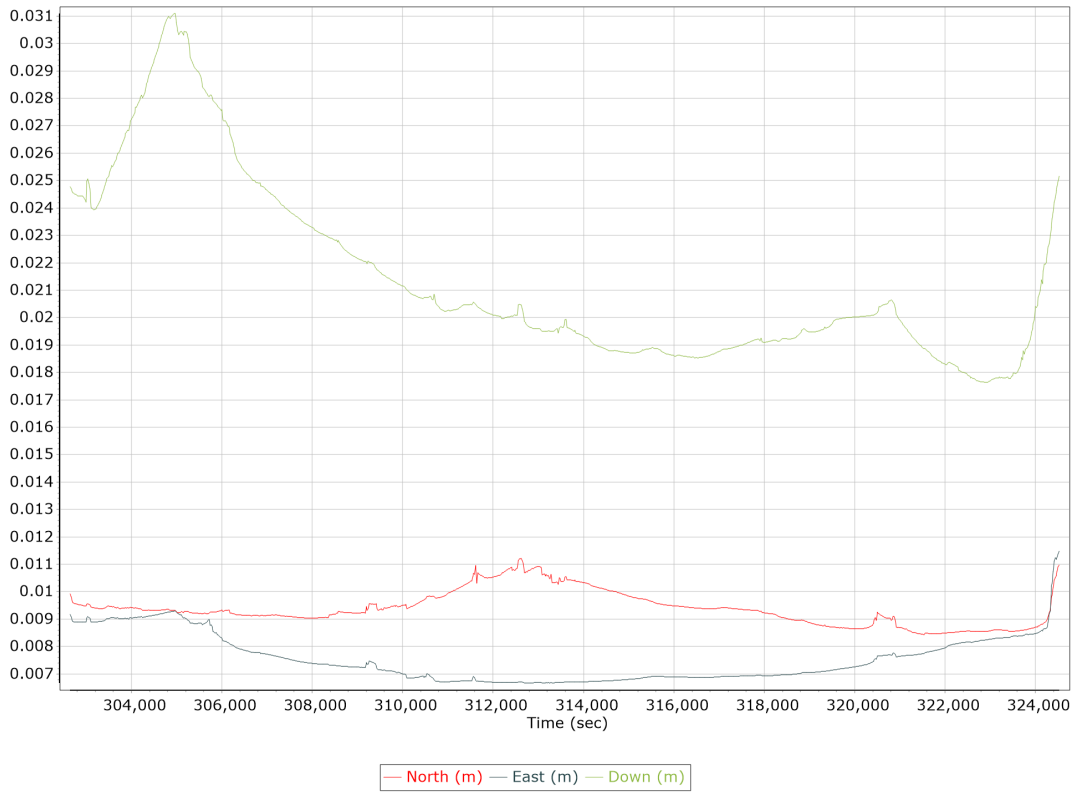
### Forward/Reverse Separation



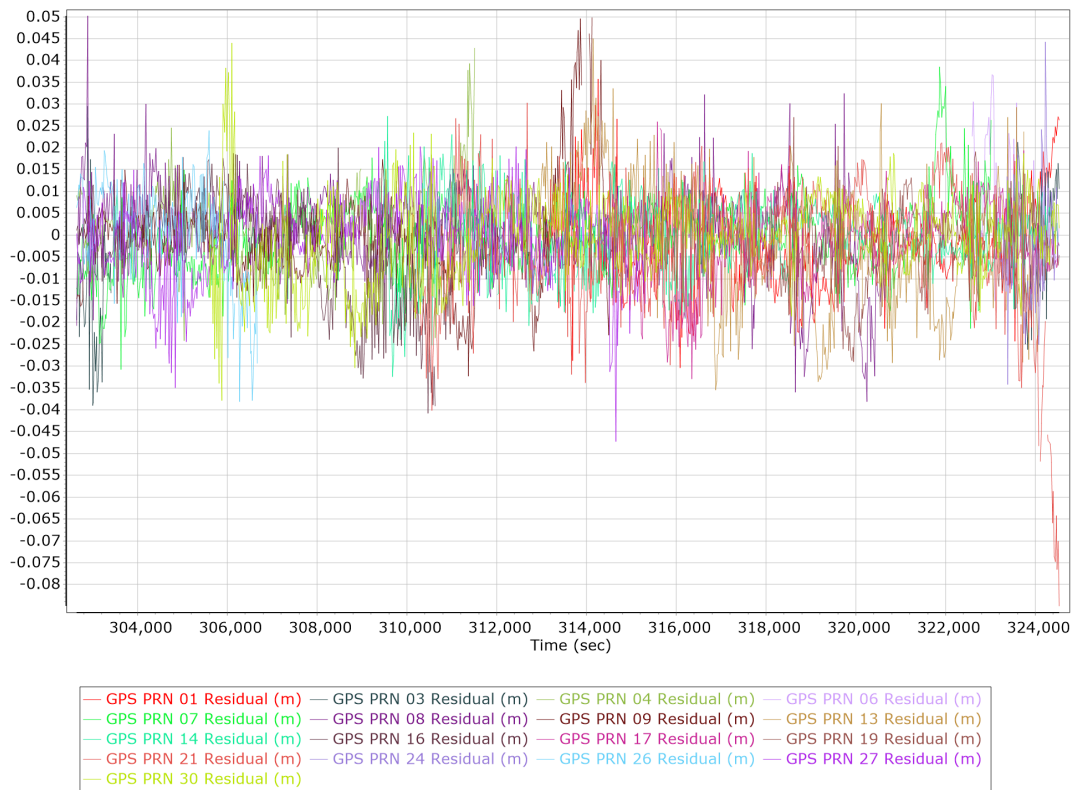
### PDOP



## Estimated Position Accuracy

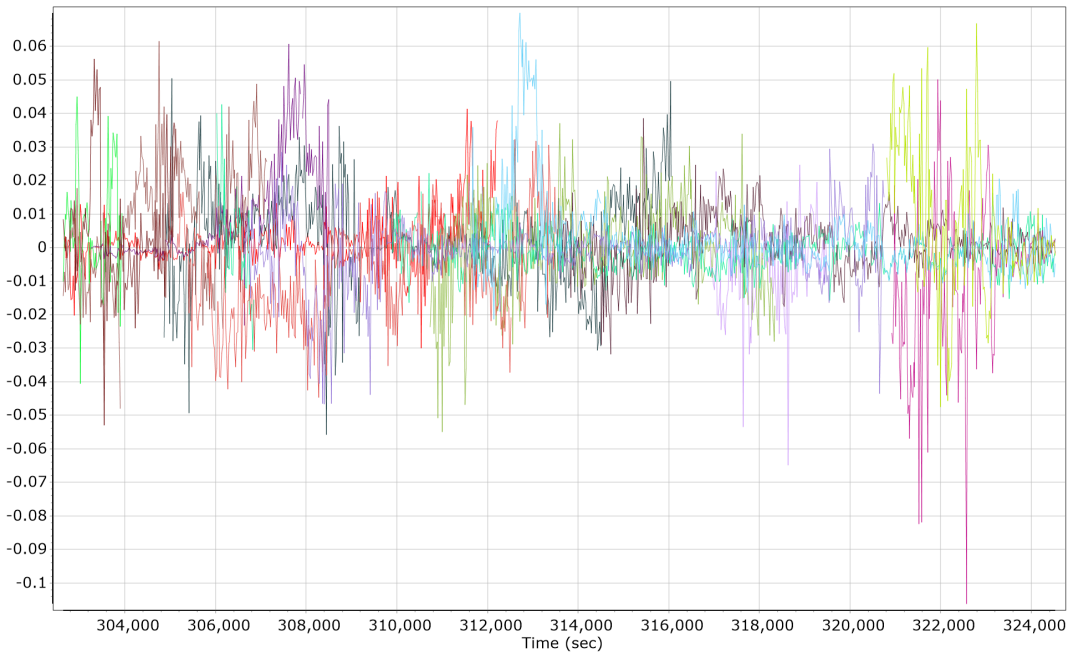


## GPS Residuals



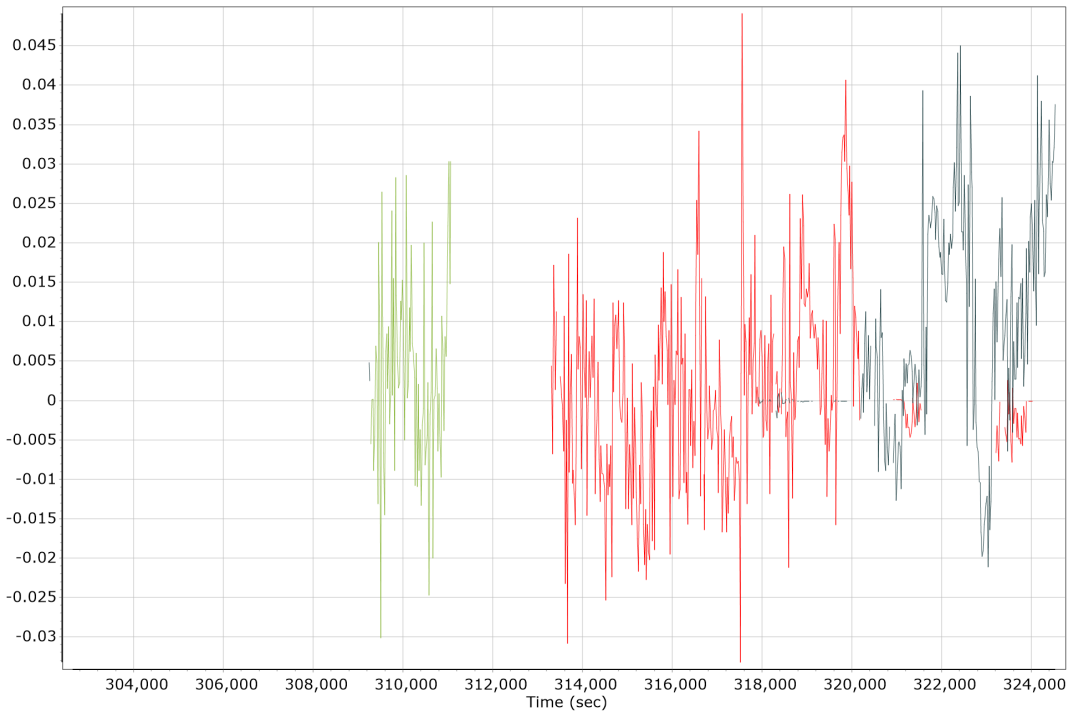


## GLONASS Residuals



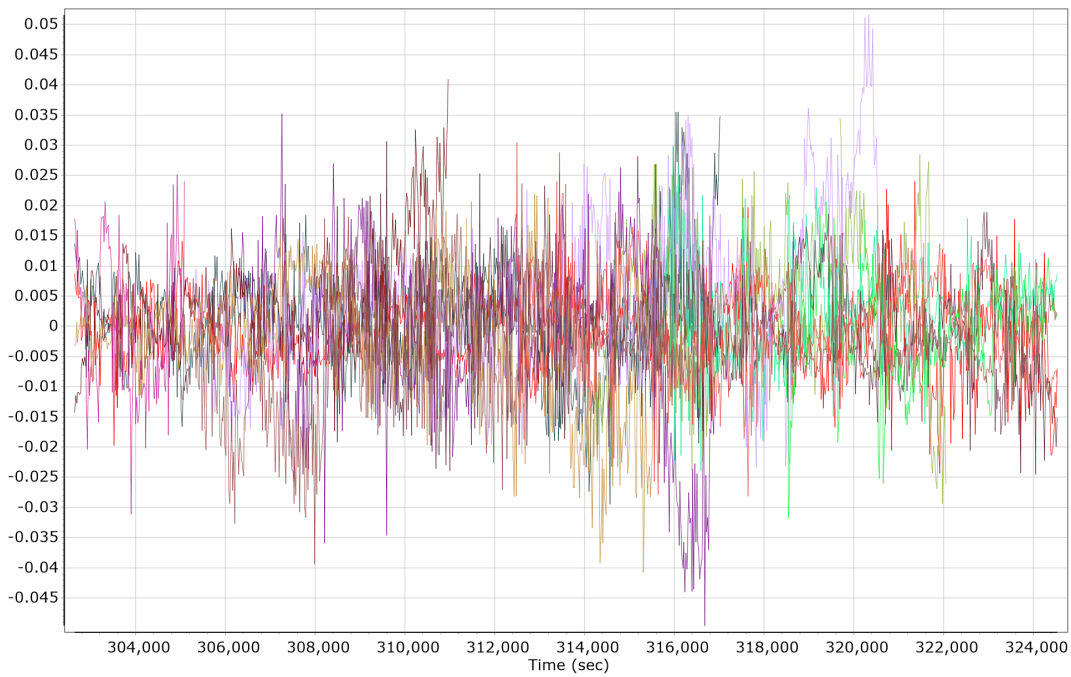
- |                         |                         |                         |                         |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GLONASS 01 Residual (m) | GLONASS 02 Residual (m) | GLONASS 03 Residual (m) | GLONASS 04 Residual (m) |
| GLONASS 07 Residual (m) | GLONASS 08 Residual (m) | GLONASS 09 Residual (m) | GLONASS 10 Residual (m) |
| GLONASS 12 Residual (m) | GLONASS 13 Residual (m) | GLONASS 14 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 14 Residual (m) | BEIDOU 23 Residual (m) |
| BEIDOU 24 Residual (m) | BEIDOU 25 Residual (m) | BEIDOU 26 Residual (m) |                        |

## GALILEO Residuals



- |                           |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|---------------------------|
| — GALILEO 01 Residual (m) | — GALILEO 04 Residual (m) | — GALILEO 05 Residual (m) | — GALILEO 09 Residual (m) |
| — GALILEO 12 Residual (m) | — GALILEO 13 Residual (m) | — GALILEO 19 Residual (m) | — GALILEO 21 Residual (m) |
| — GALILEO 24 Residual (m) | — GALILEO 26 Residual (m) | — GALILEO 27 Residual (m) | — GALILEO 31 Residual (m) |
| — GALILEO 33 Residual (m) |                           |                           |                           |

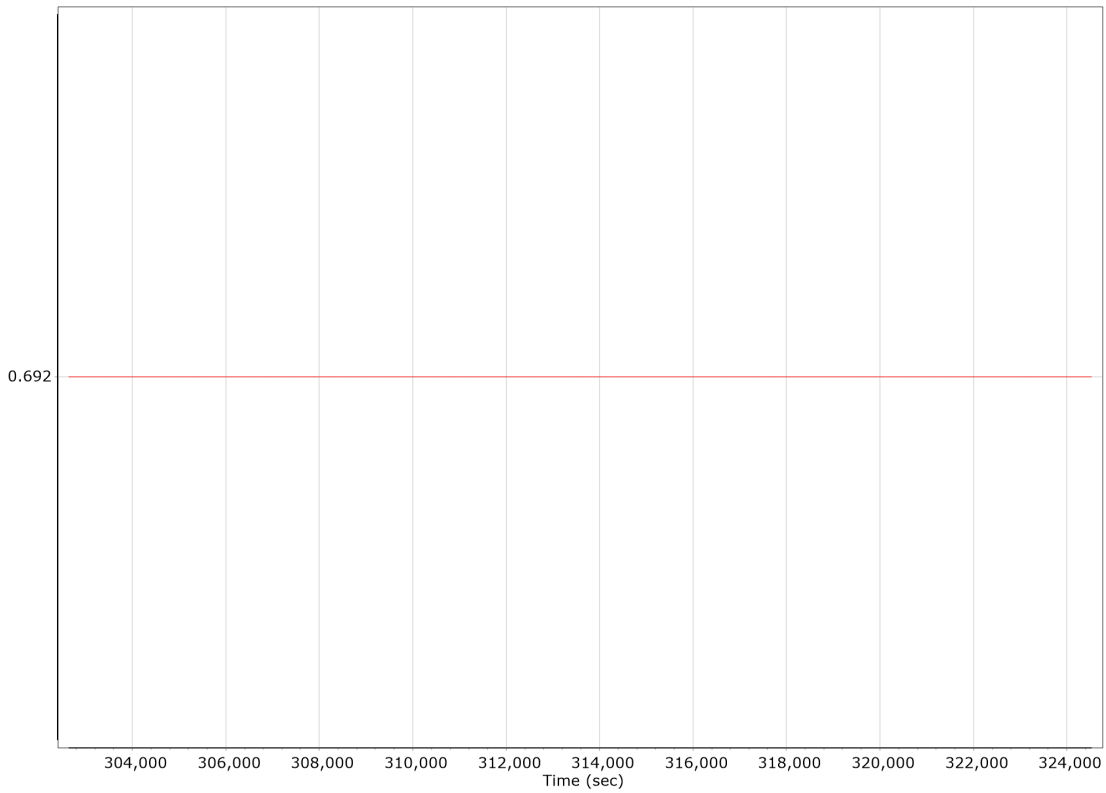
## GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	302229.000 (4/27/2022 11:57:09 AM)		
Processing end time	324548.000 (4/27/2022 6:09:08 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

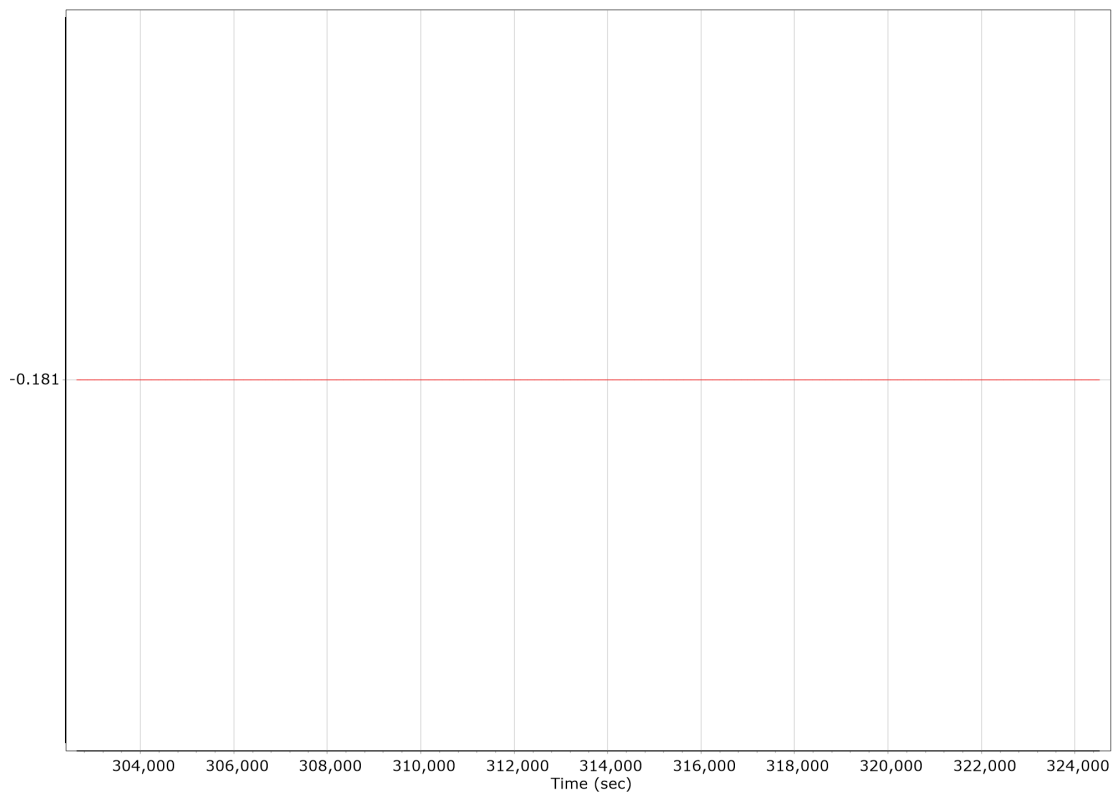
## Calibrated Installation Parameters

### Reference-Primary GNSS Lever Arm (m)

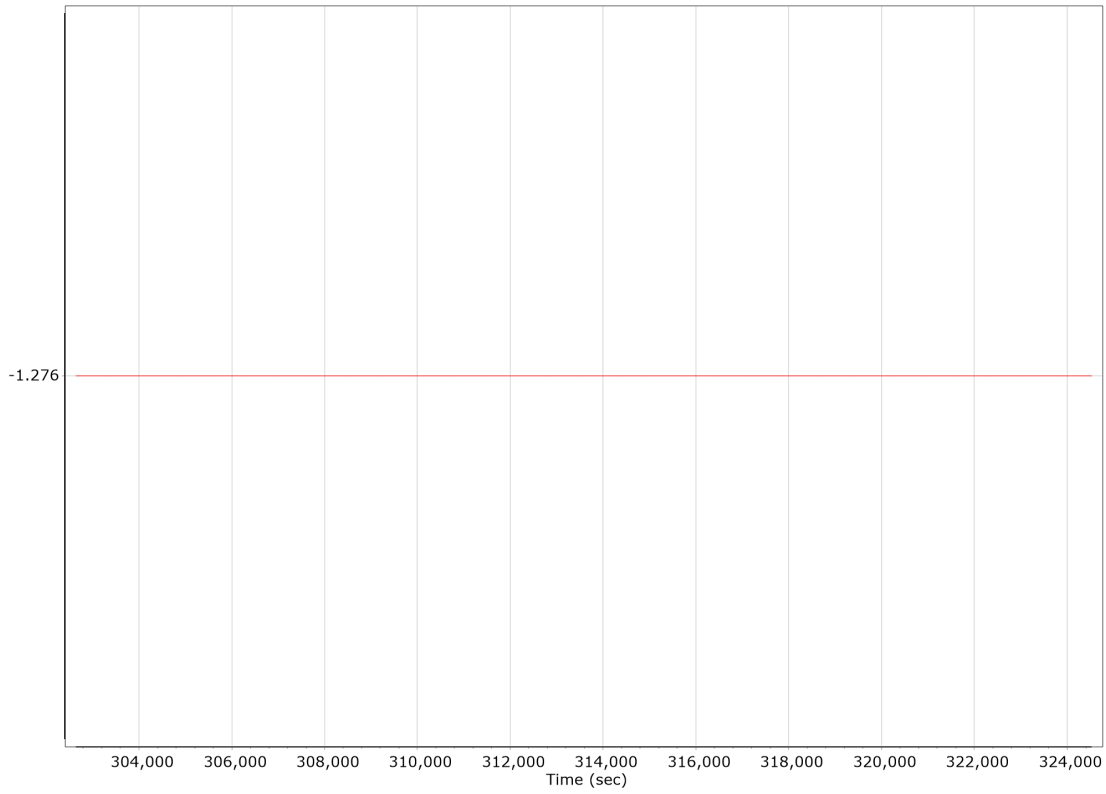
#### X Reference-Primary GNSS Lever Arm (m)



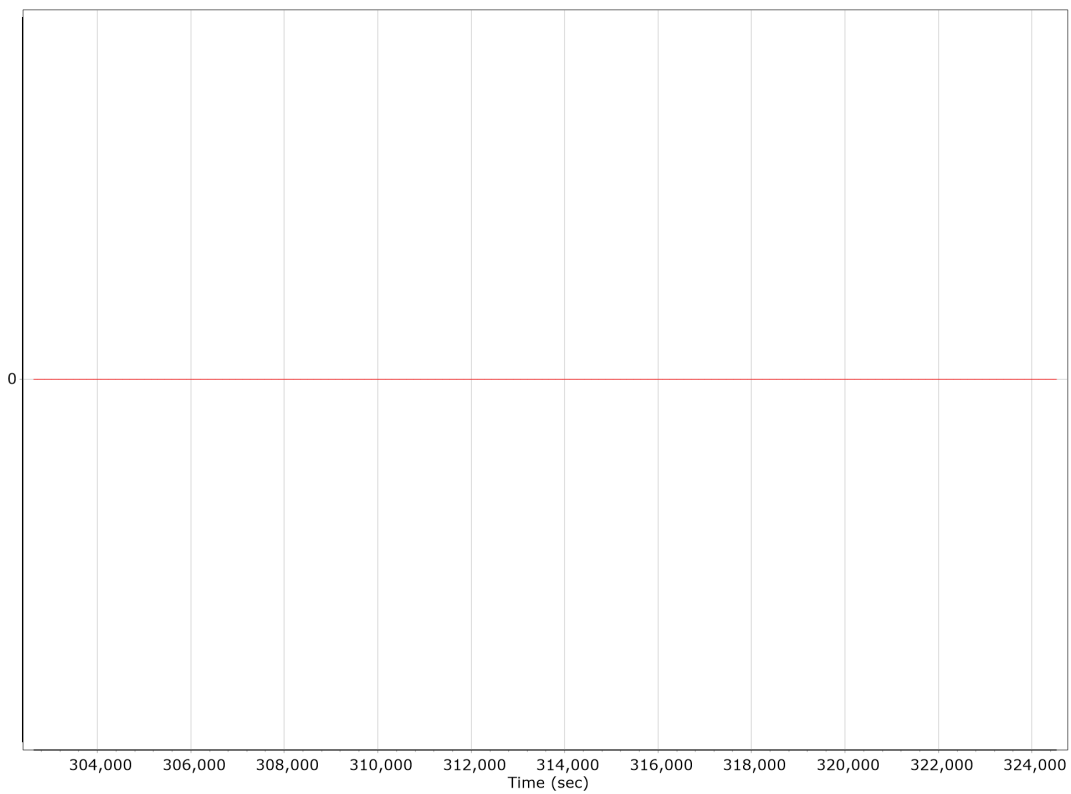
#### Y Reference-Primary GNSS Lever Arm (m)



### Z Reference-Primary GNSS Lever Arm (m)



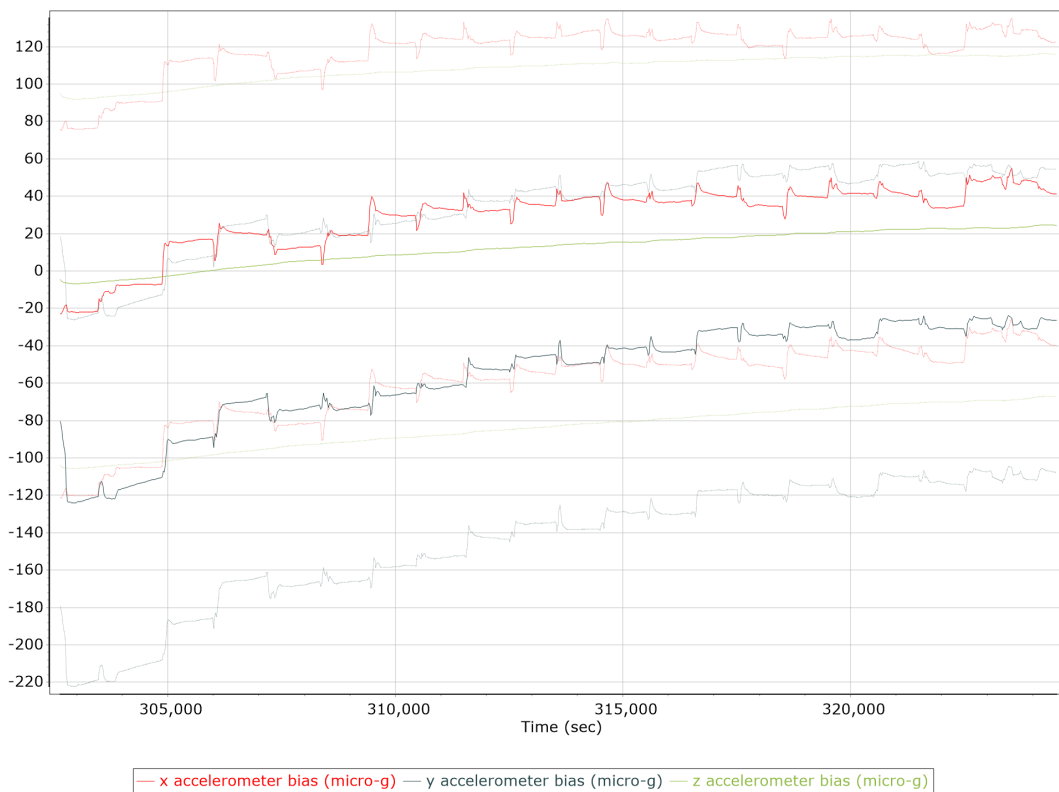
### Reference-Primary GNSS Lever Arm Figure of Merit



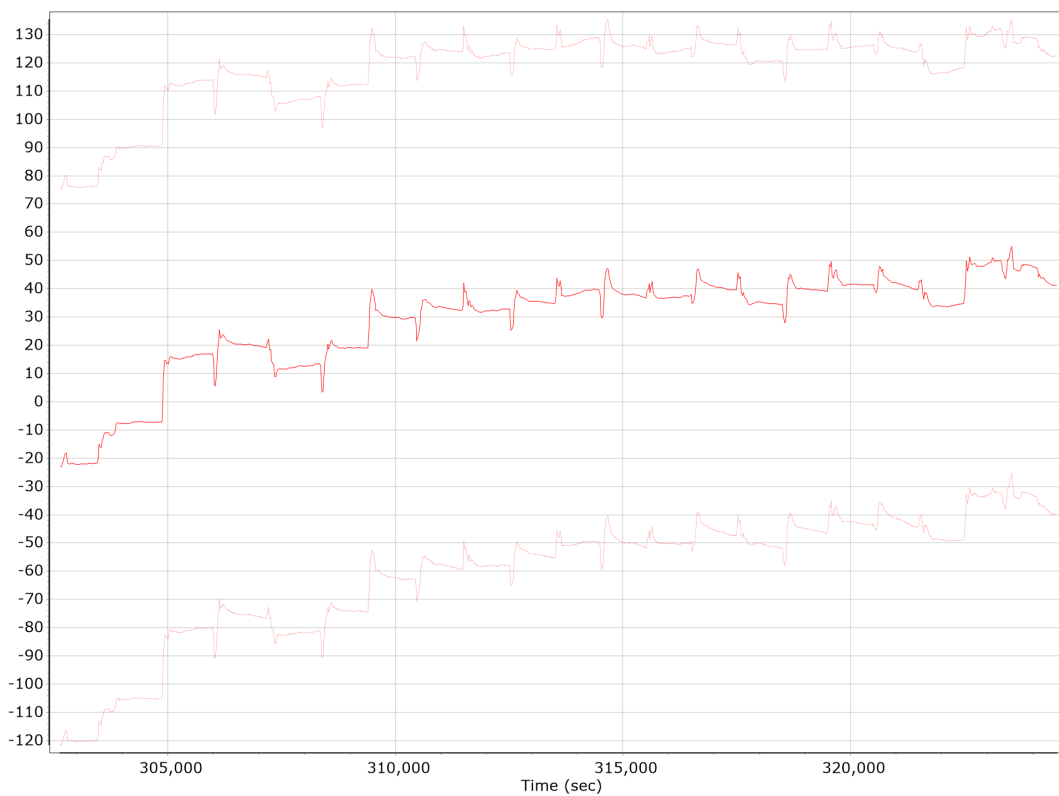
## IN-Fusion QC

### Forward Processed Estimated Errors, Reference Frame

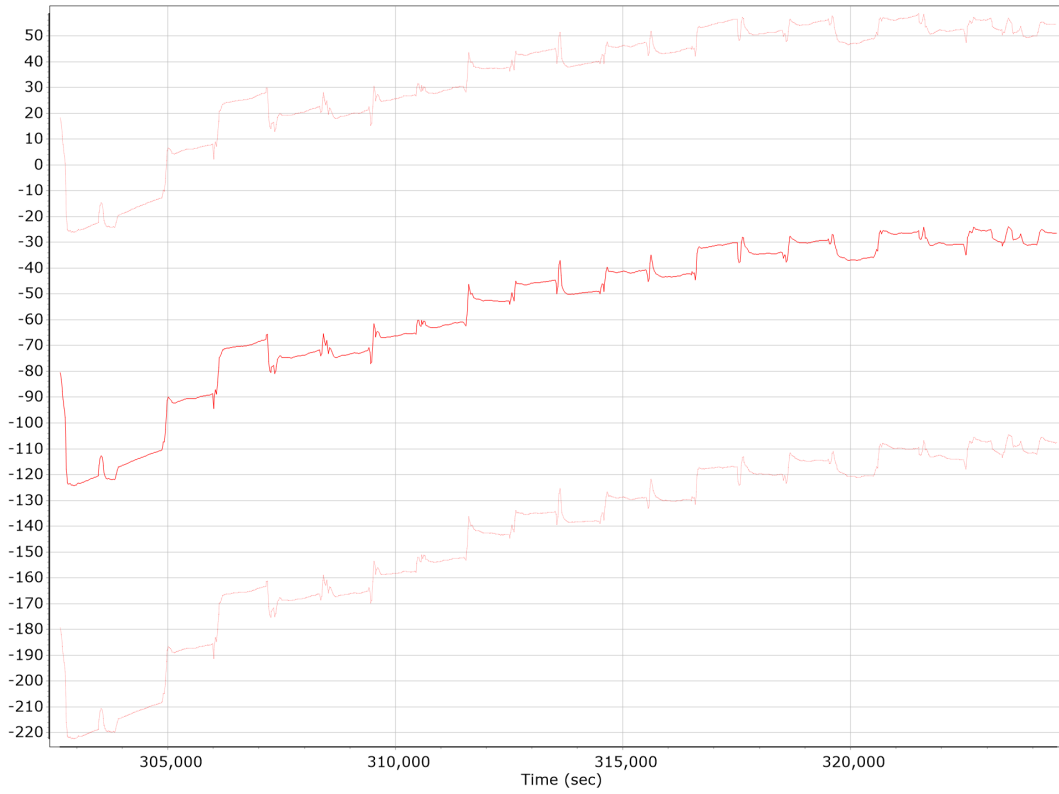
#### Accelerometer Bias (micro-g)



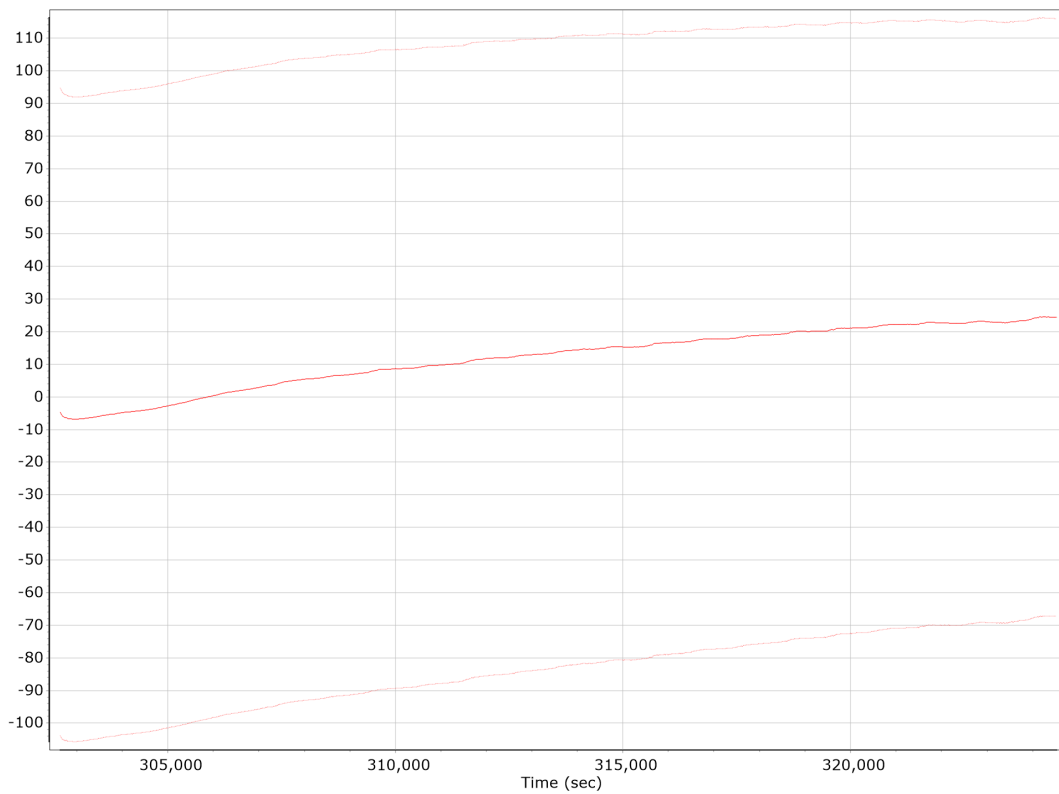
#### X Accelerometer Bias (micro-g)



### Y Accelerometer Bias (micro-g)



### Z Accelerometer Bias (micro-g)



### Accelerometer Scale Error (ppm)



### X Accelerometer Scale Error (ppm)





### Y Accelerometer Scale Error (ppm)



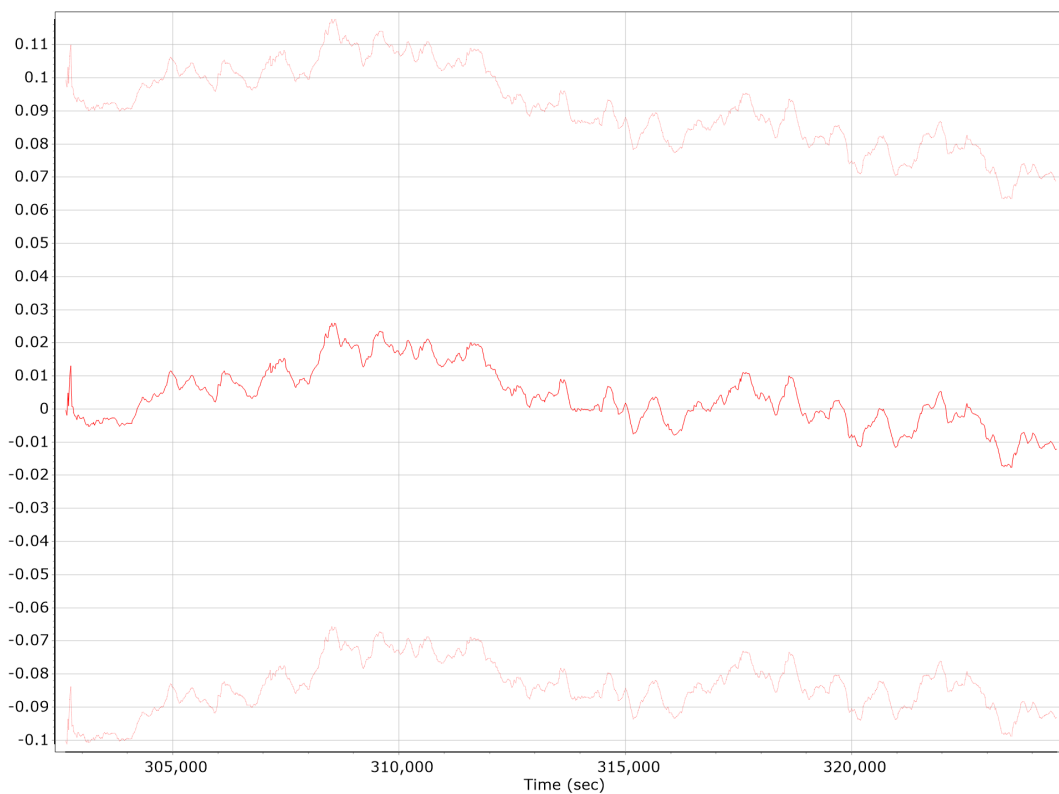
### Z Accelerometer Scale Error (ppm)



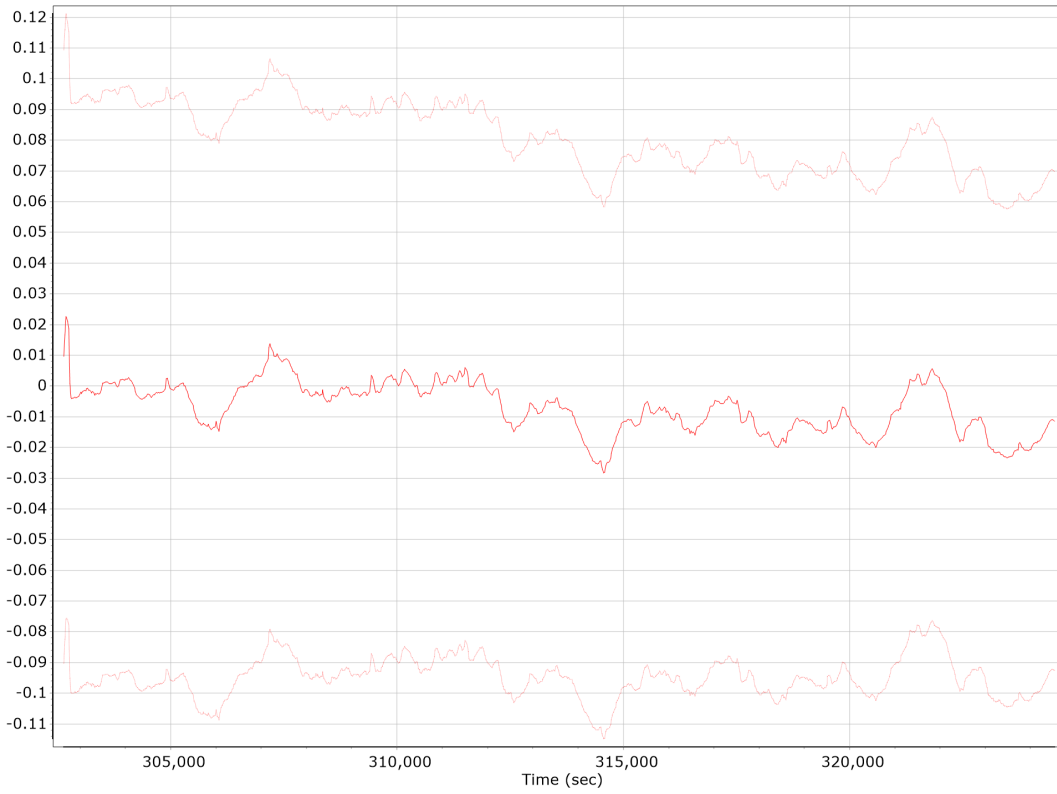
### Gyro Bias (deg/h)



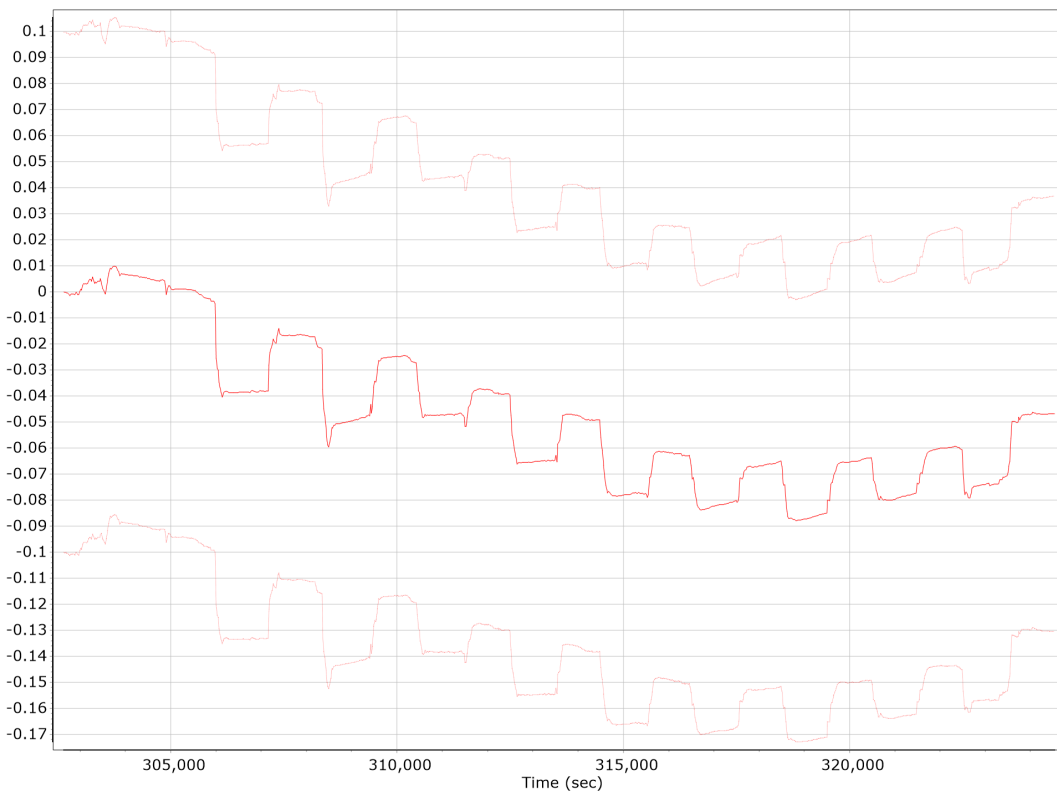
### X Gyro Bias (deg/h)



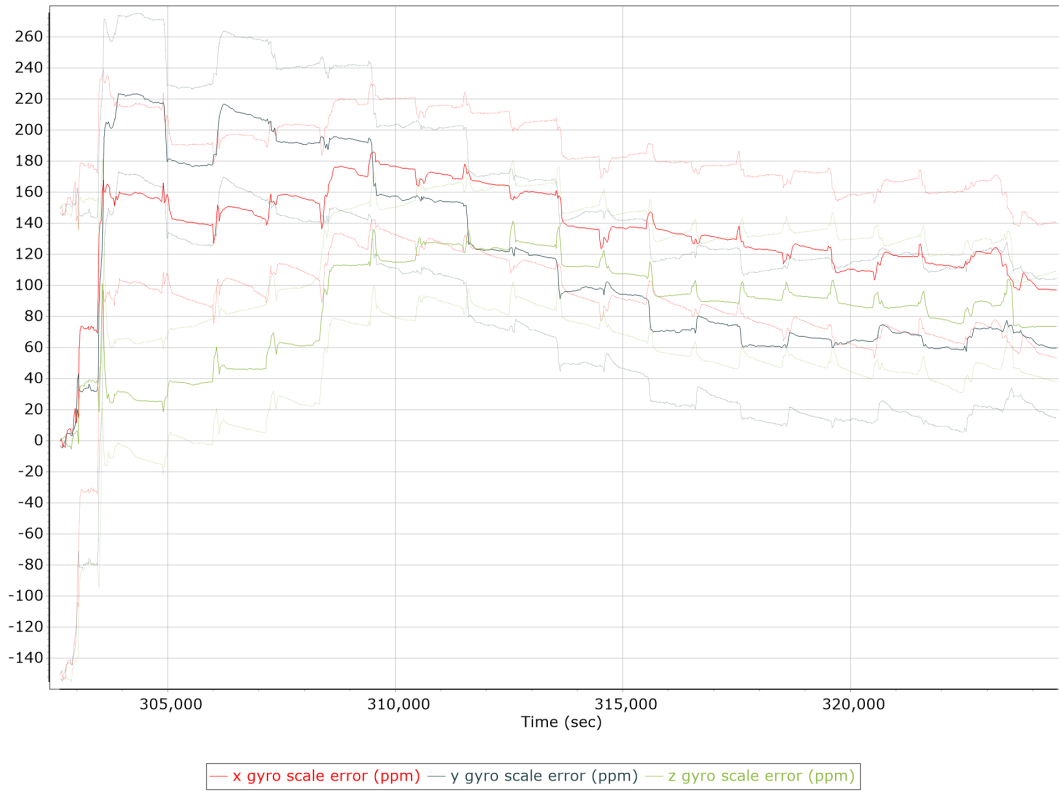
### Y Gyro Bias (deg/h)



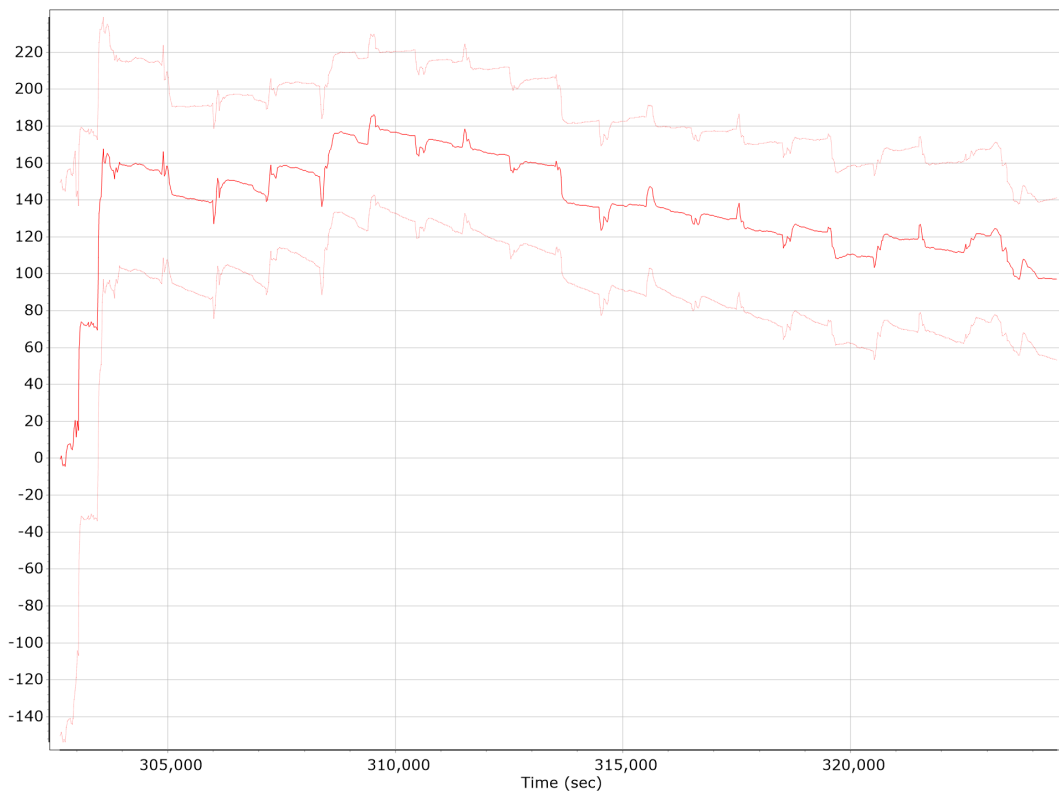
### Z Gyro Bias (deg/h)



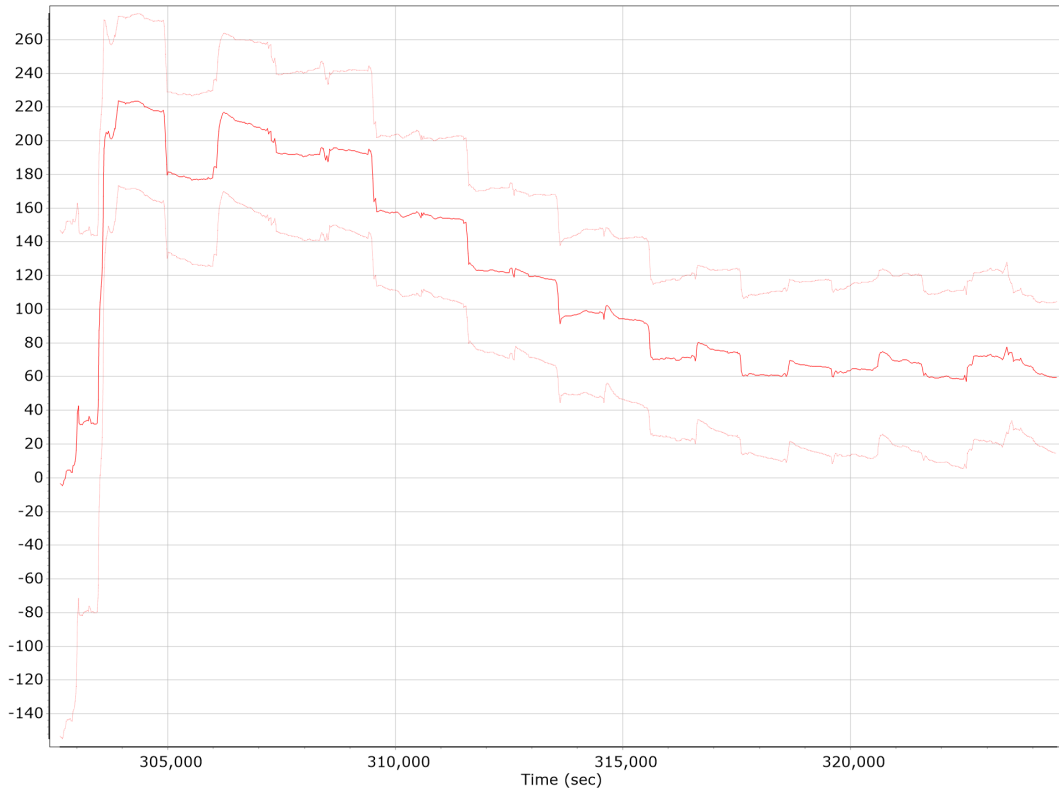
### Gyro Scale Error (ppm)



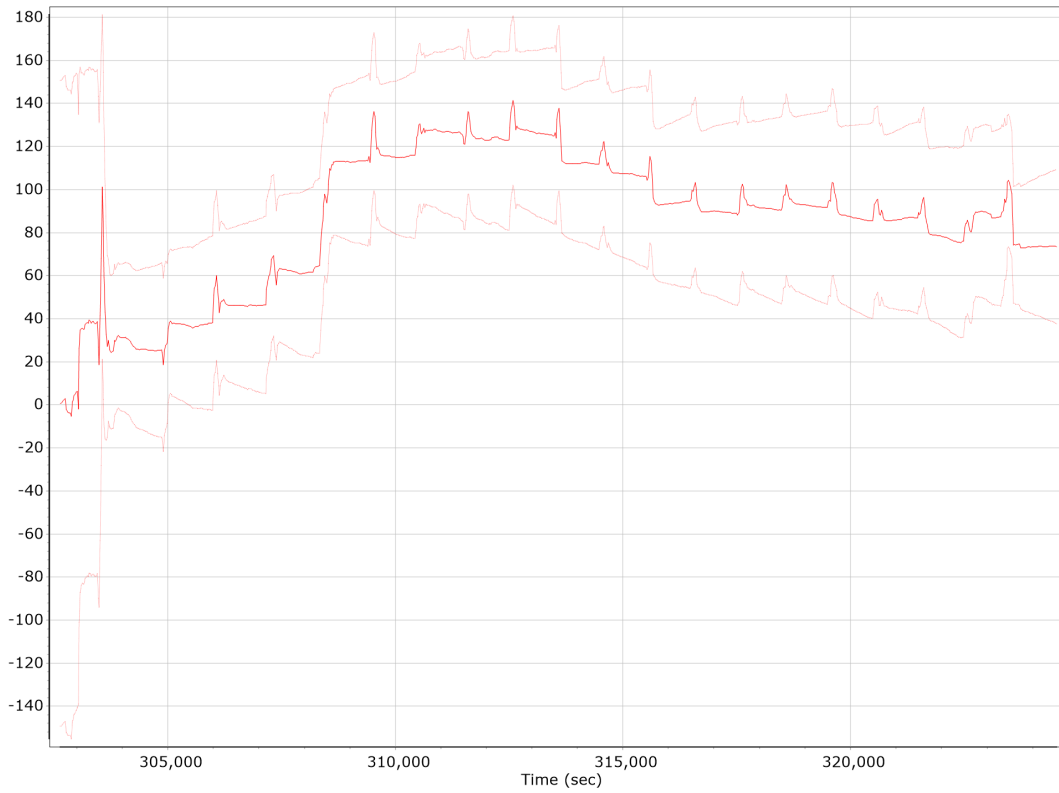
### X Gyro Scale Error (ppm)



### Y Gyro Scale Error (ppm)

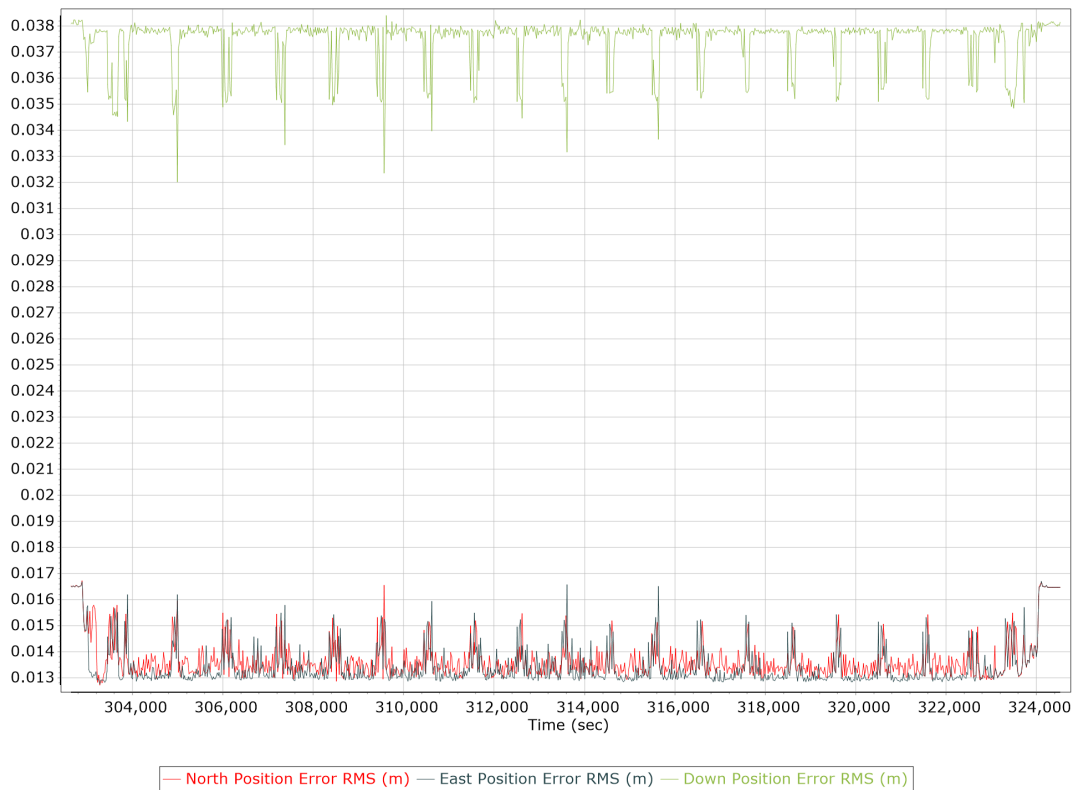


### Z Gyro Scale Error (ppm)



## Smoothed Performance Metrics

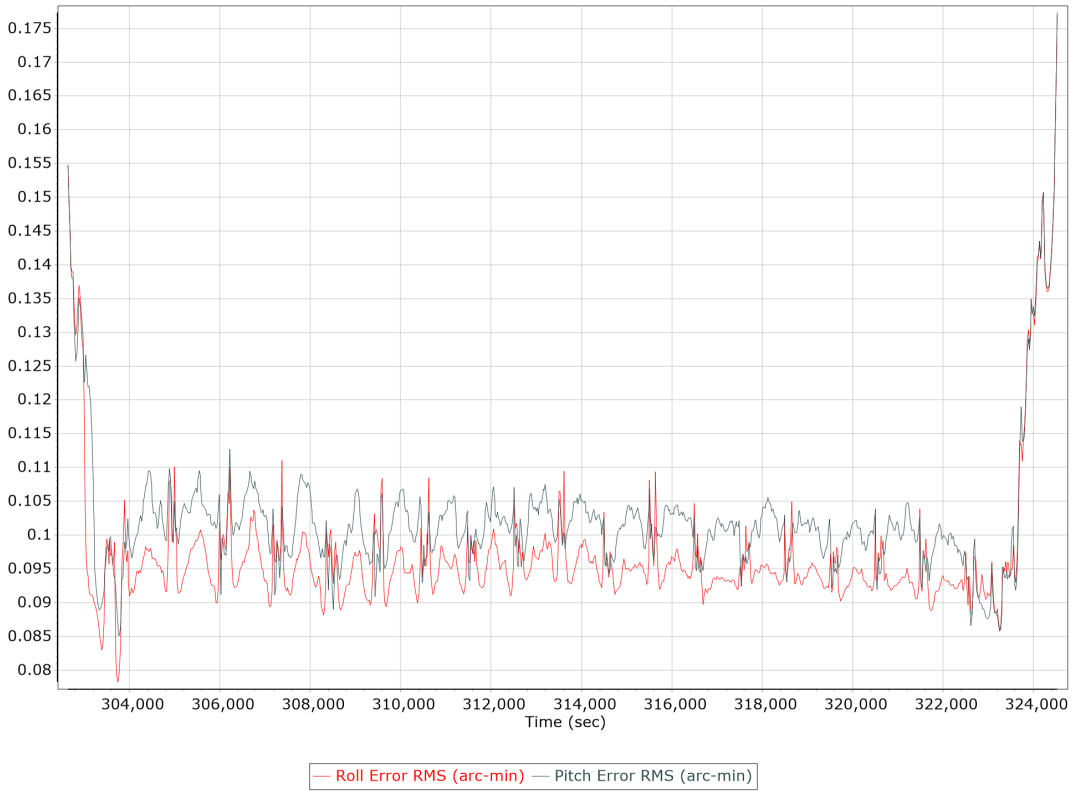
### Position Error RMS (m)



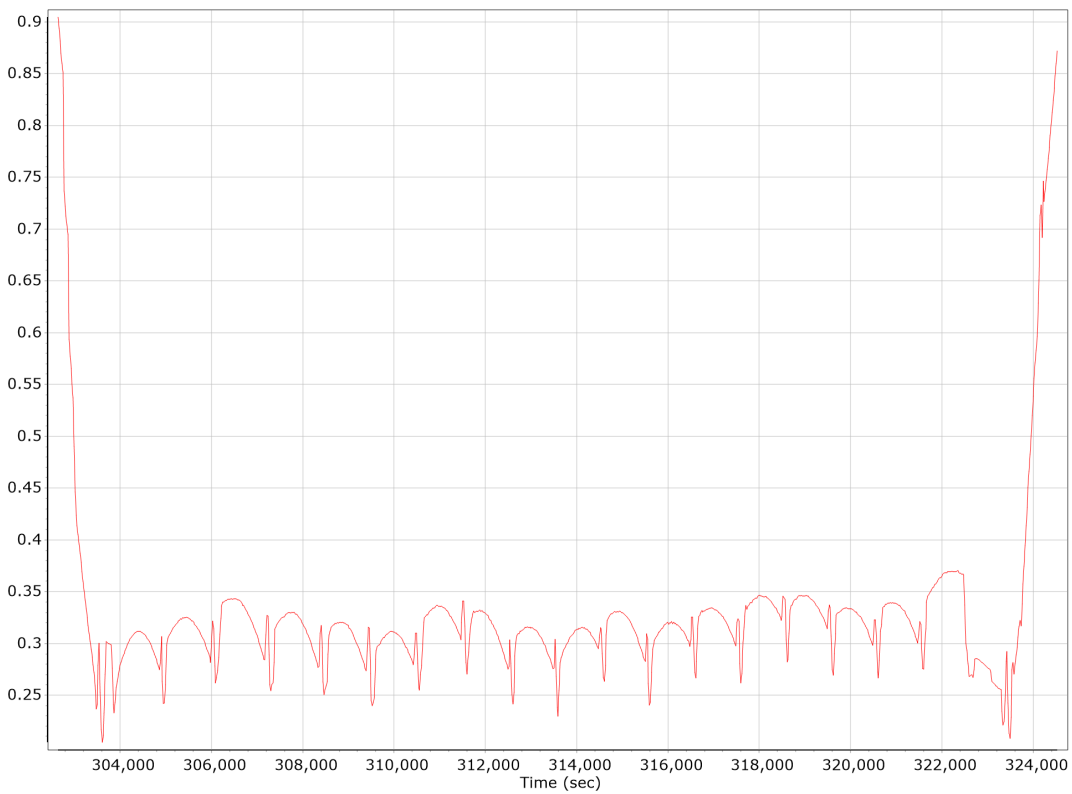
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)



### Heading Error RMS (arc-min)



## Forward Processed Performance Metrics

### Position Error RMS (m)

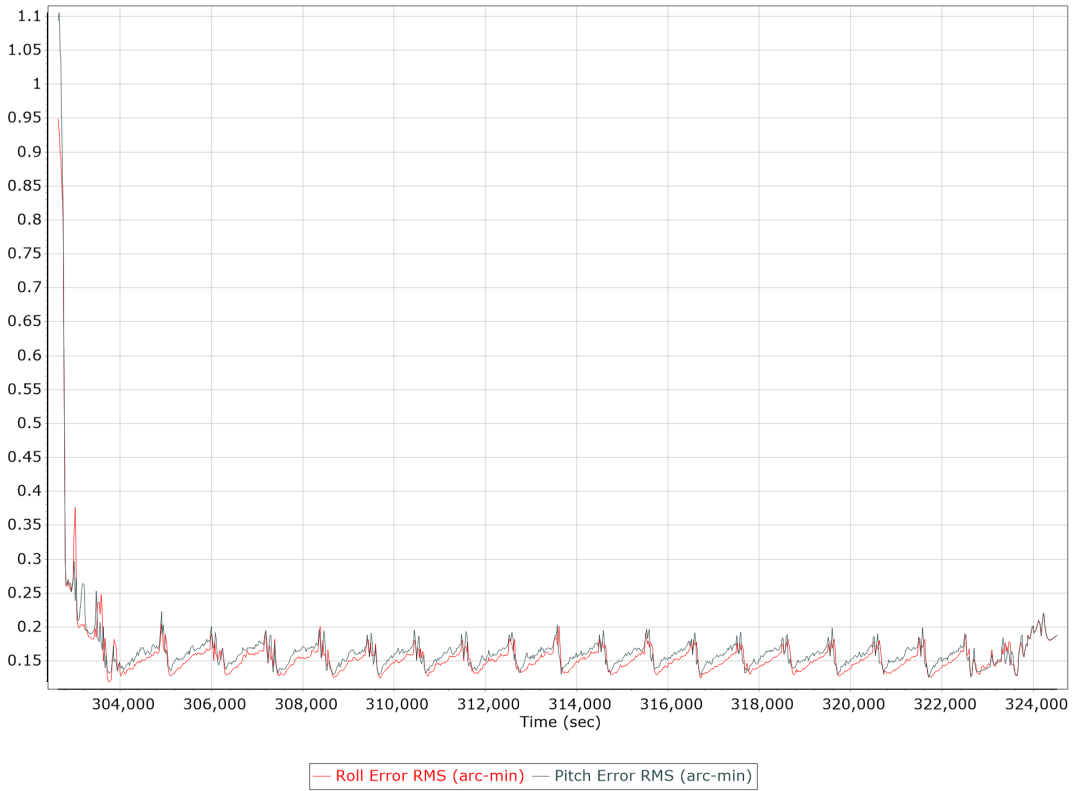


### Velocity Error RMS (m/s)





### Roll/Pitch Error RMS (arc-min)

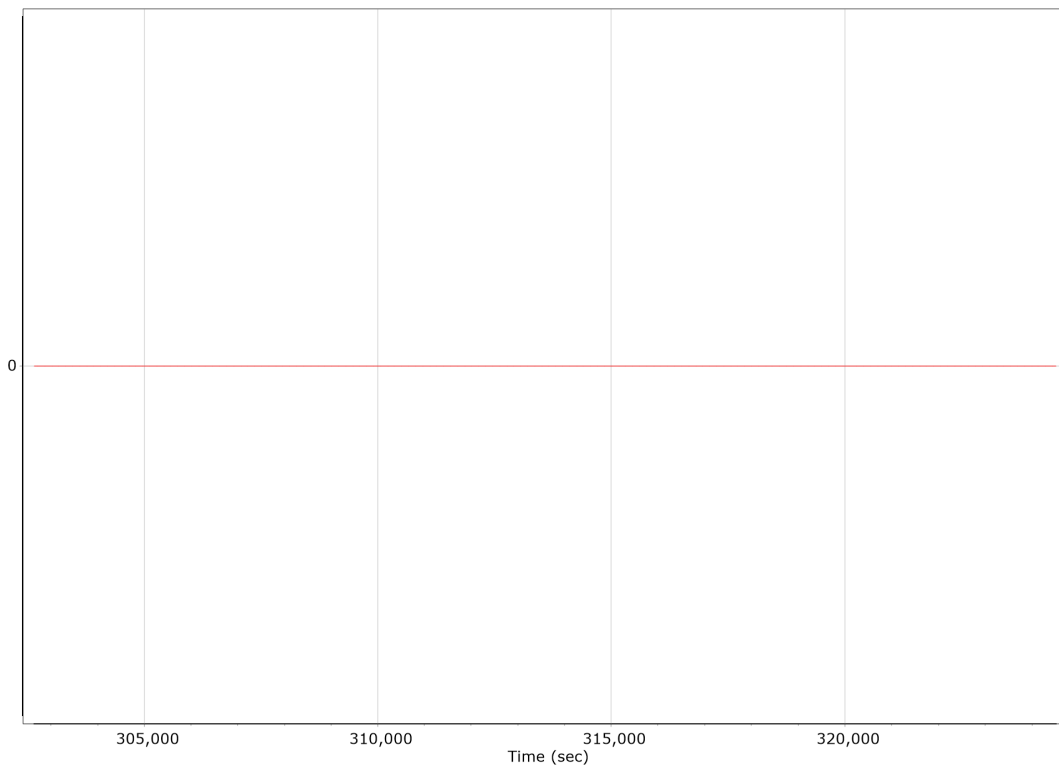


### Heading Error RMS (arc-min)



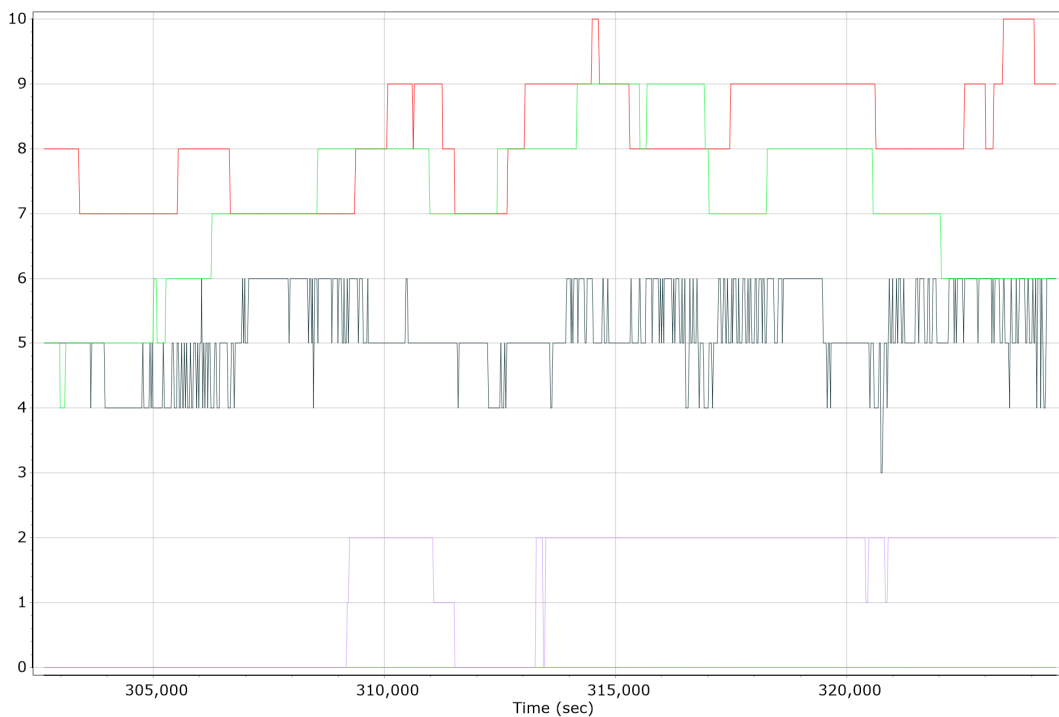
## Forward Processed Solution Status

### Processing Mode



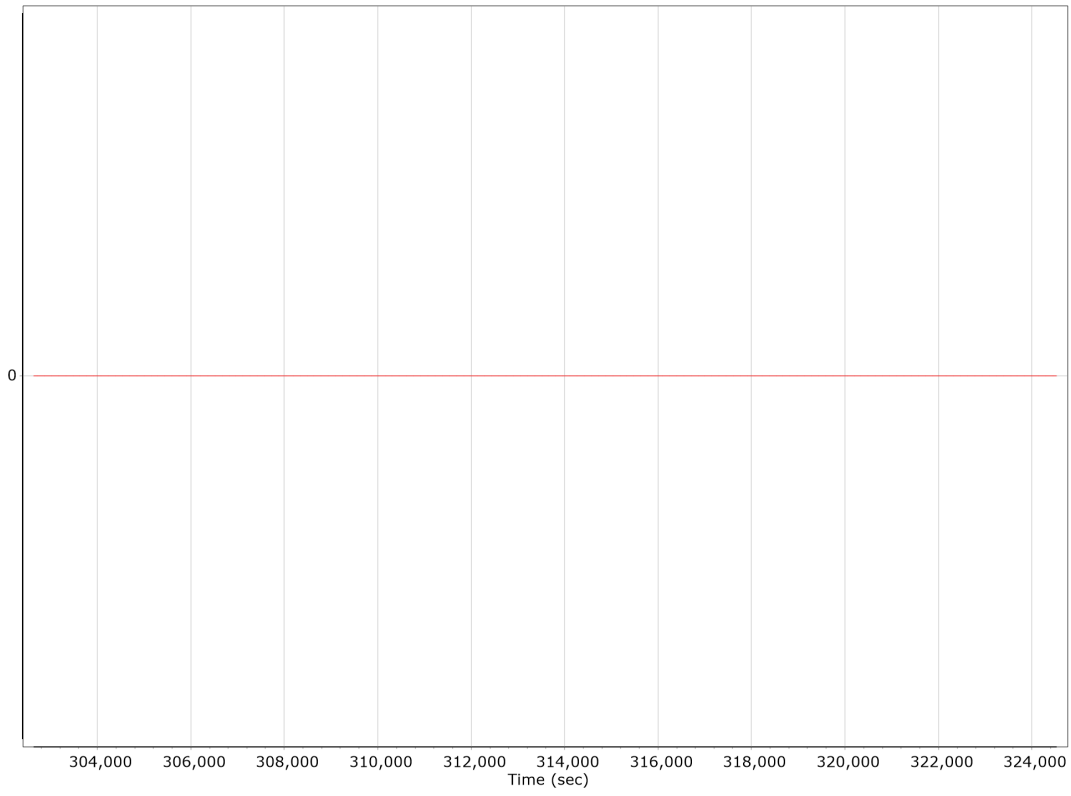
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

### 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	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		
<b>IMU Installation Lever Arms &amp; Mounting Angles</b>			
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

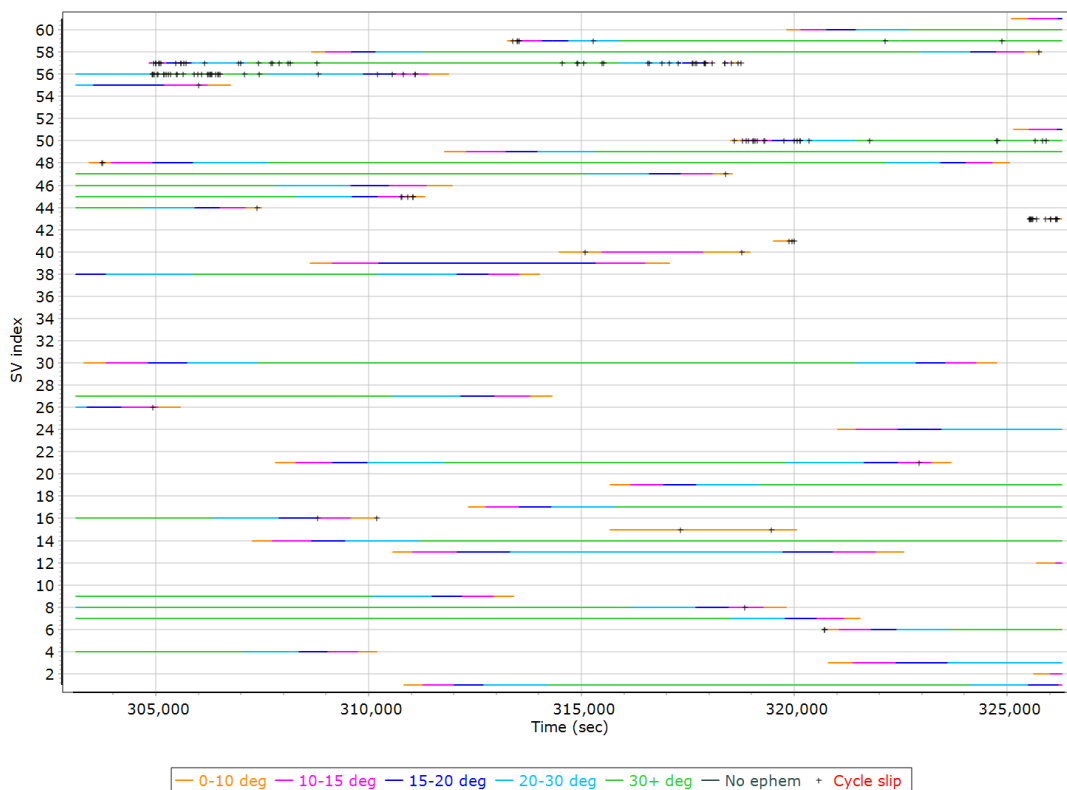
## Rover Data QC

### Raw IMU Import QC Summary

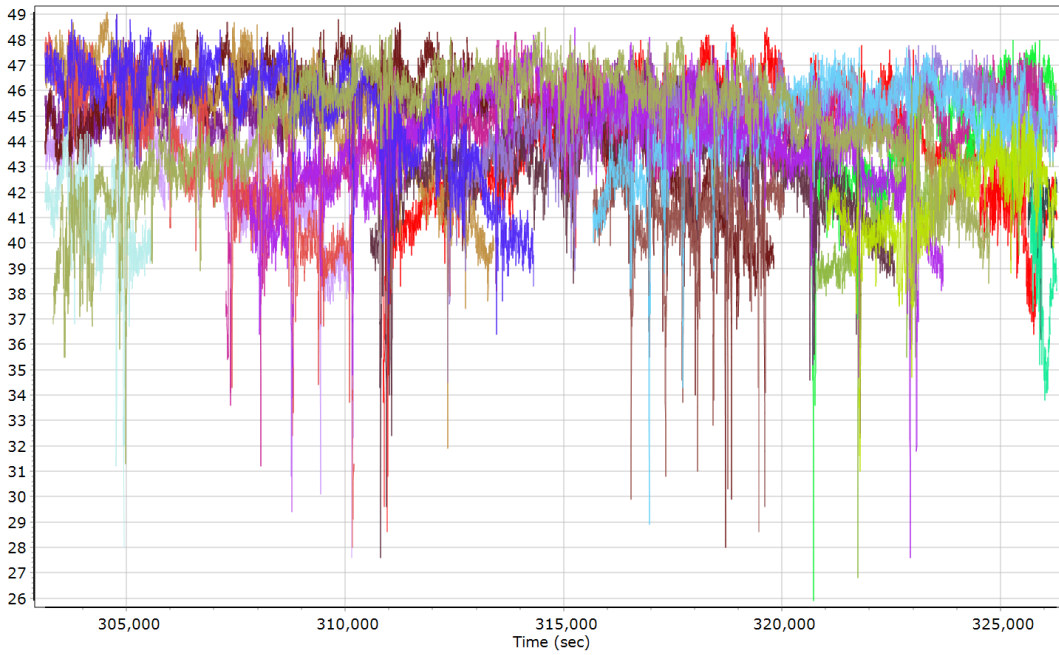
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05042022A_3062.log
IMU Records Processed	4630555
Termination Status	Normal
IMU Anomalies	0

## Primary Observables & Satellite Data

### GPS/GLONASS L1 Satellite Lock/Elevation

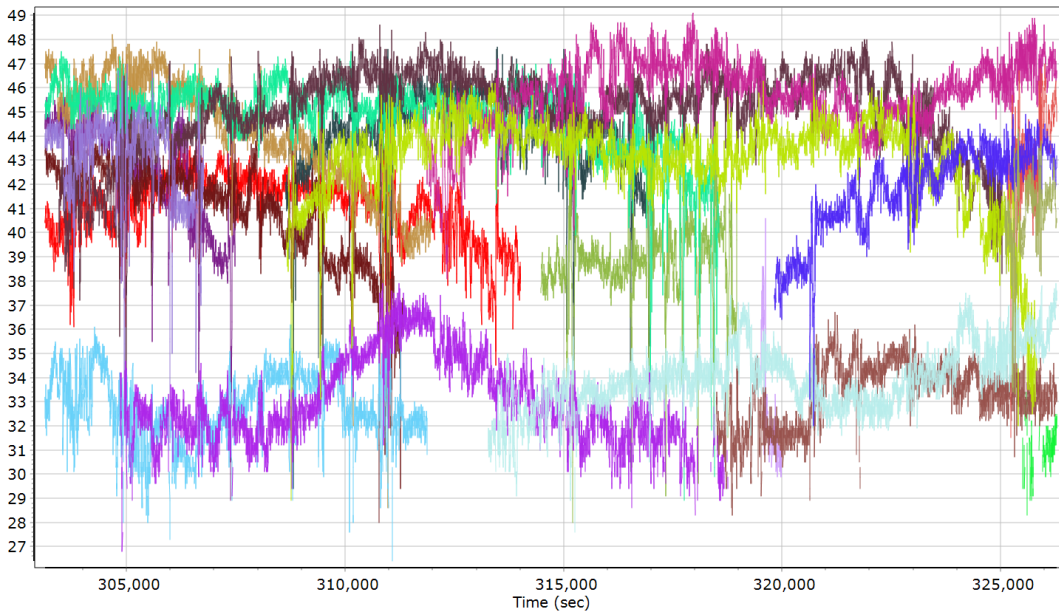


### GPS L1 SNR



- |                           |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|---------------------------|
| 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) |

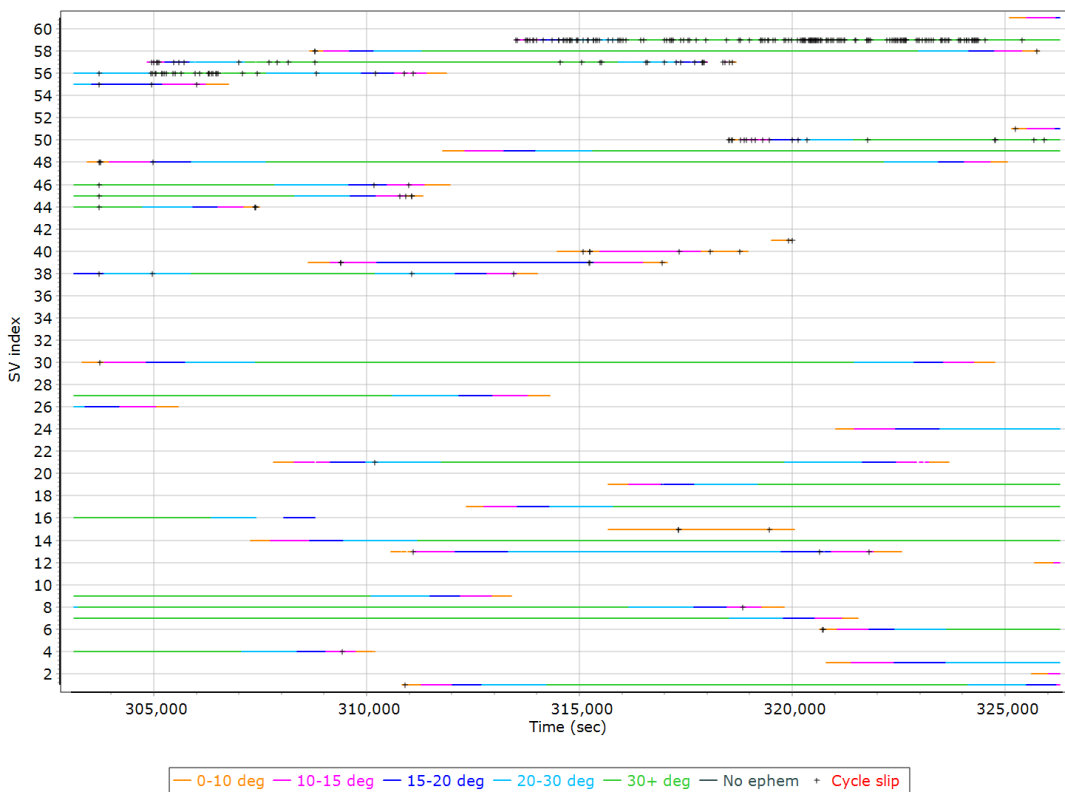
### GLONASS L1 SNR



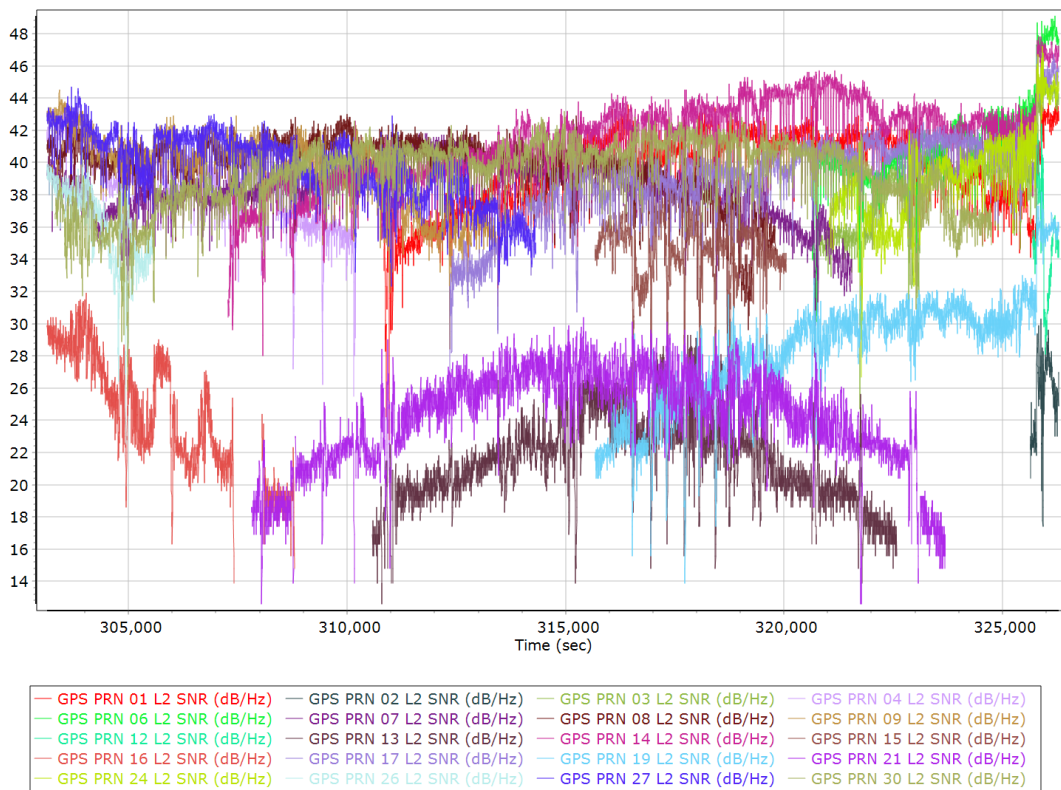
- |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 04 L1 SNR (dB/Hz) | GLONASS 06 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) |                           |



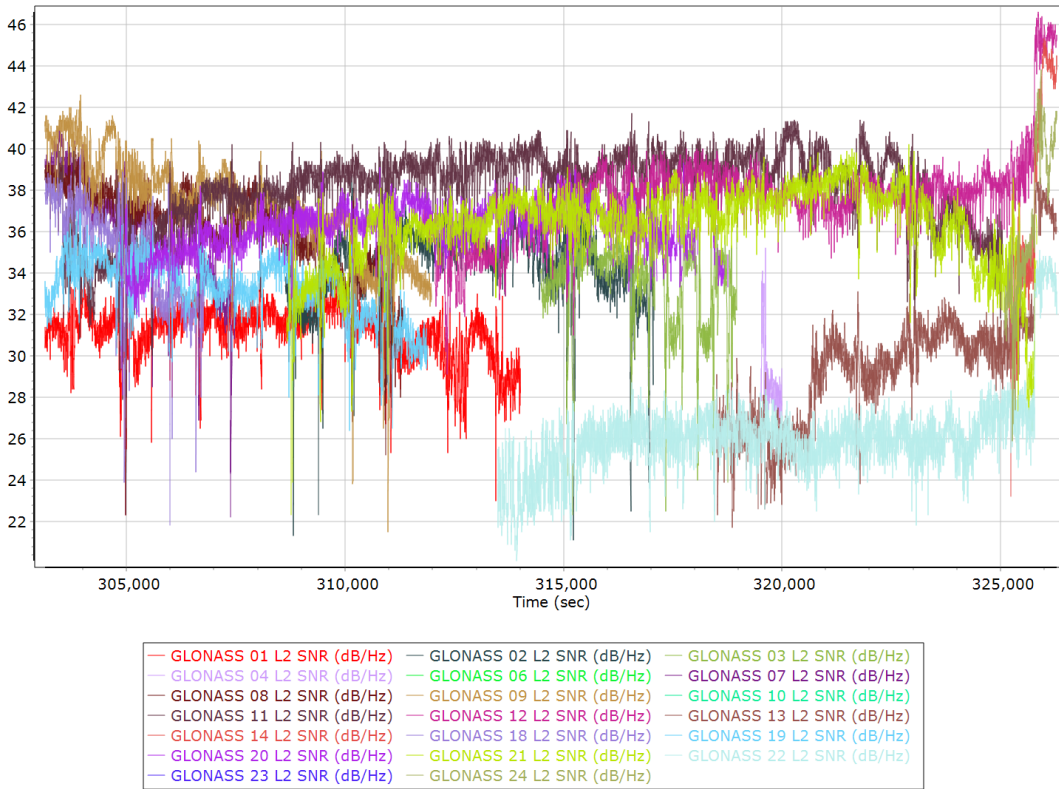
### GPS/GLONASS L2 Satellite Lock/Elevation



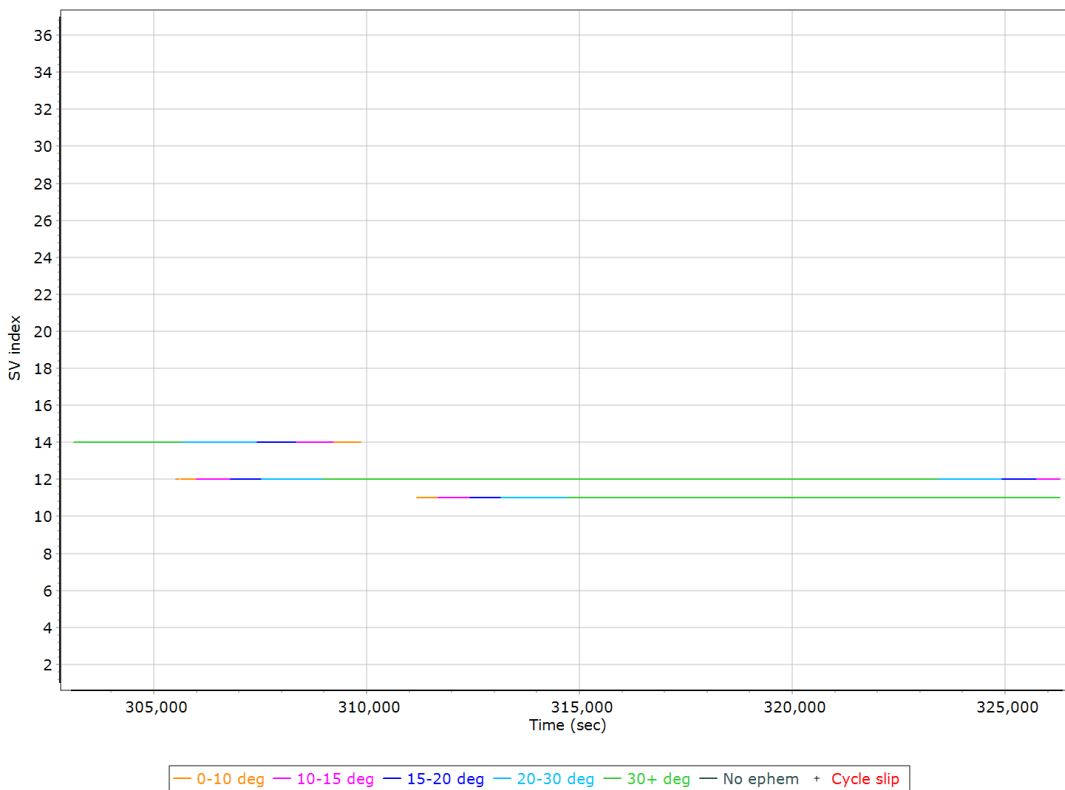
### GPS L2 SNR



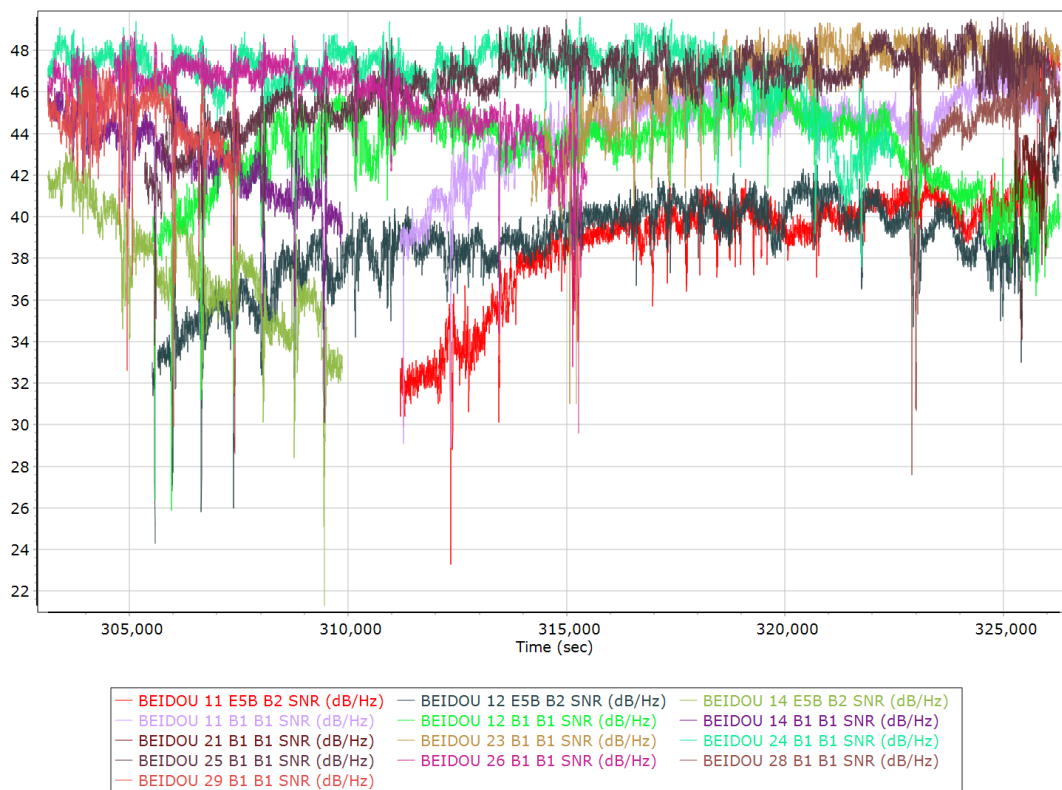
### GLONASS L2 SNR



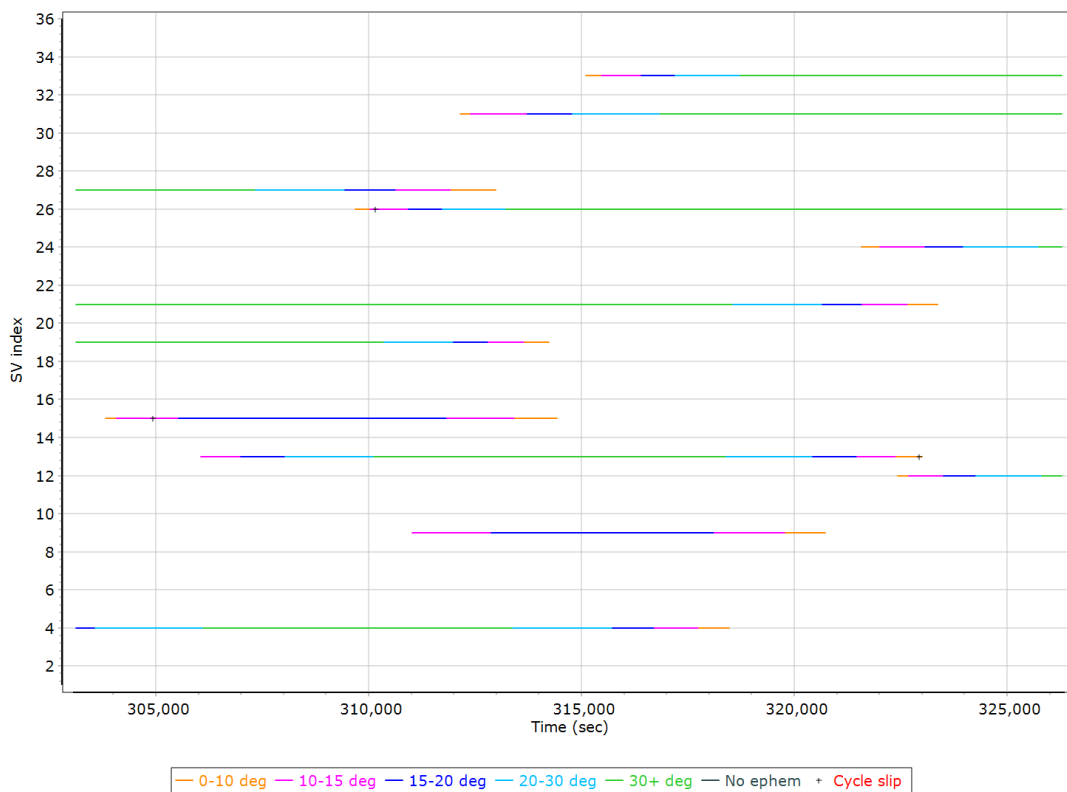
### BEIDOU Satellite Lock/Elevation



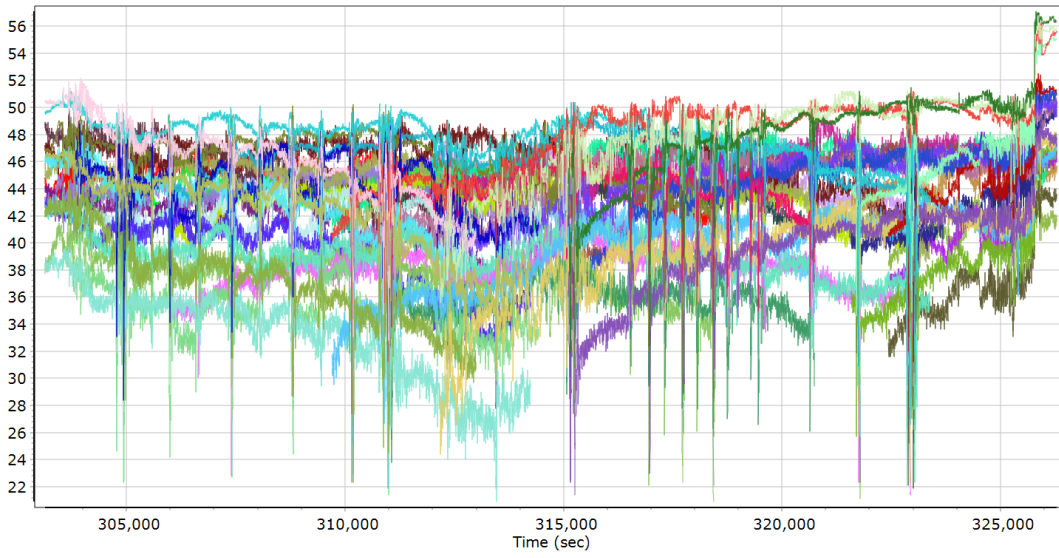
### BEIDOU SNR



### GALILEO Satellite Lock/Elevation



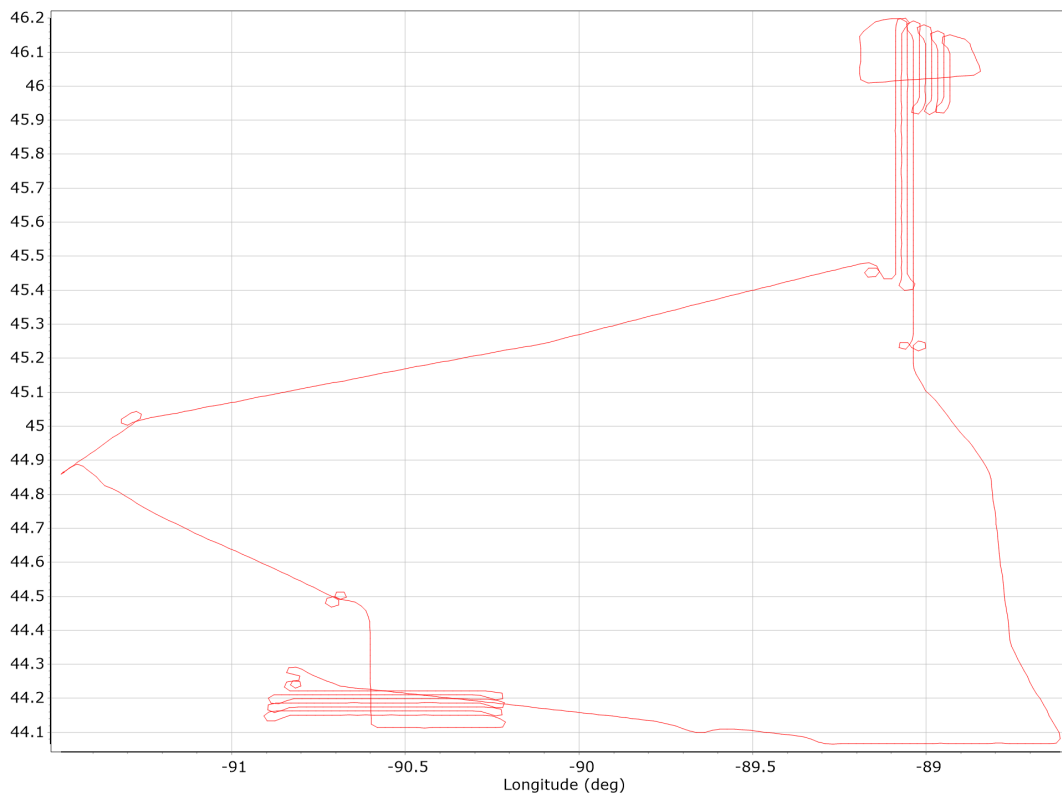
## GALILEO SNR



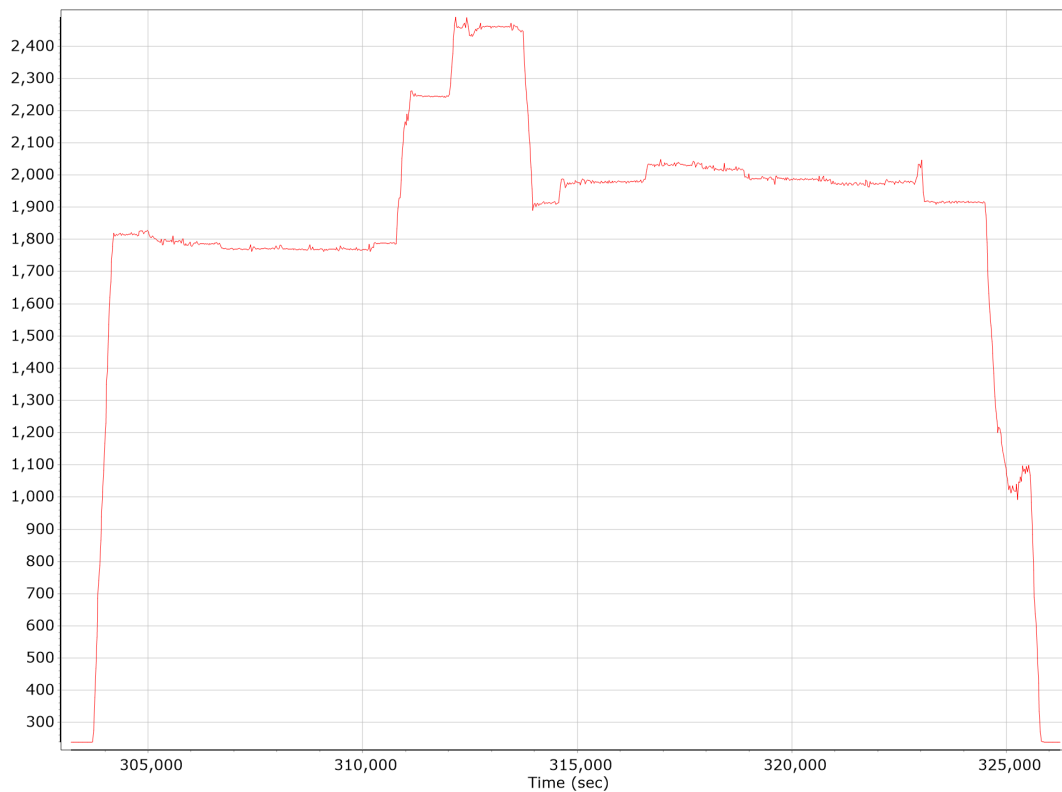
- |   |   |
|---|---|
| — GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) | — GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz) |
| — 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

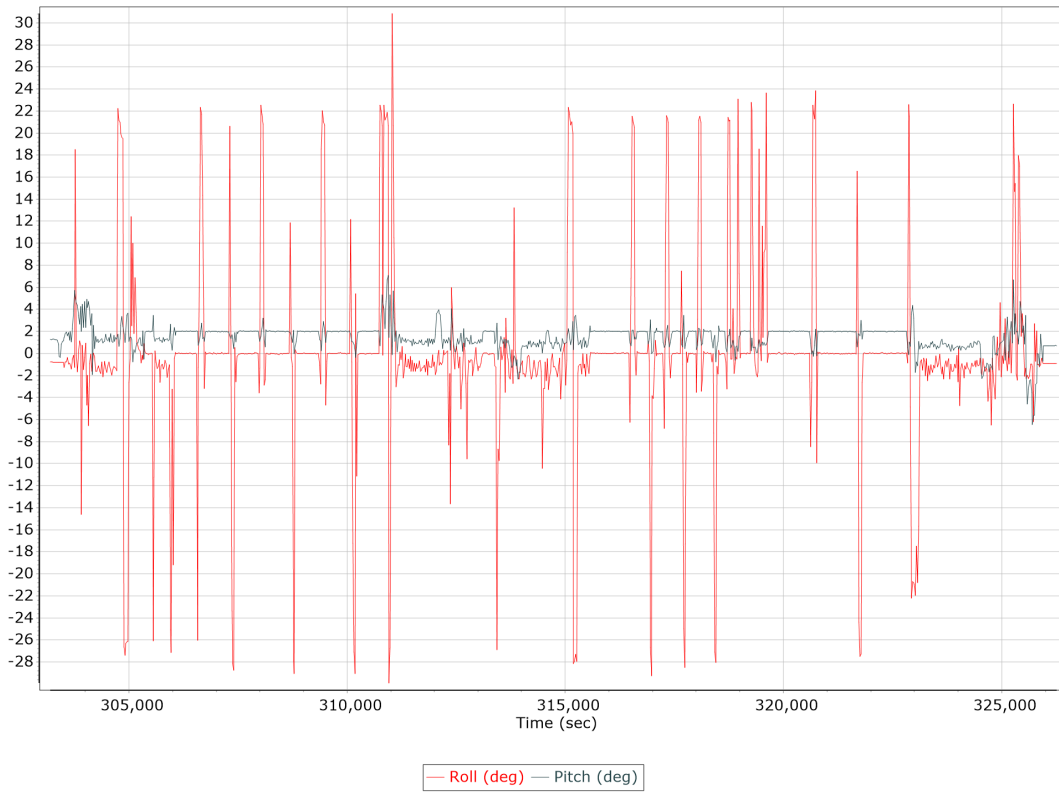
### Top View



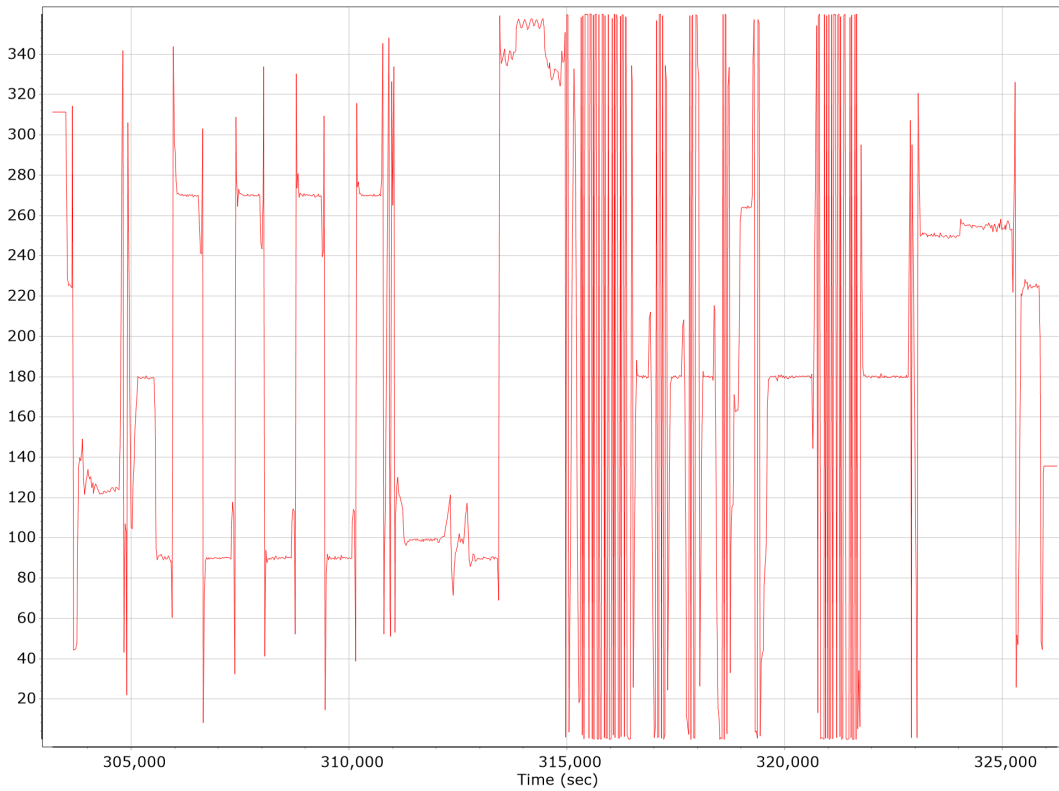
### Altitude



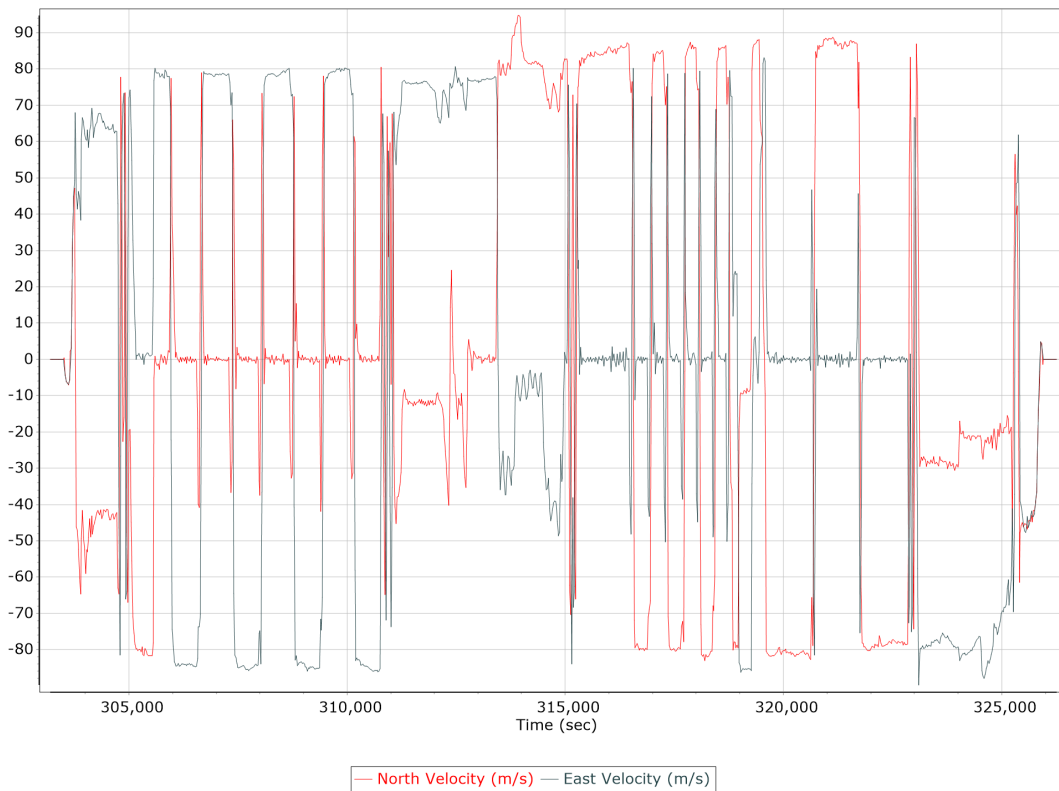
## Roll/Pitch



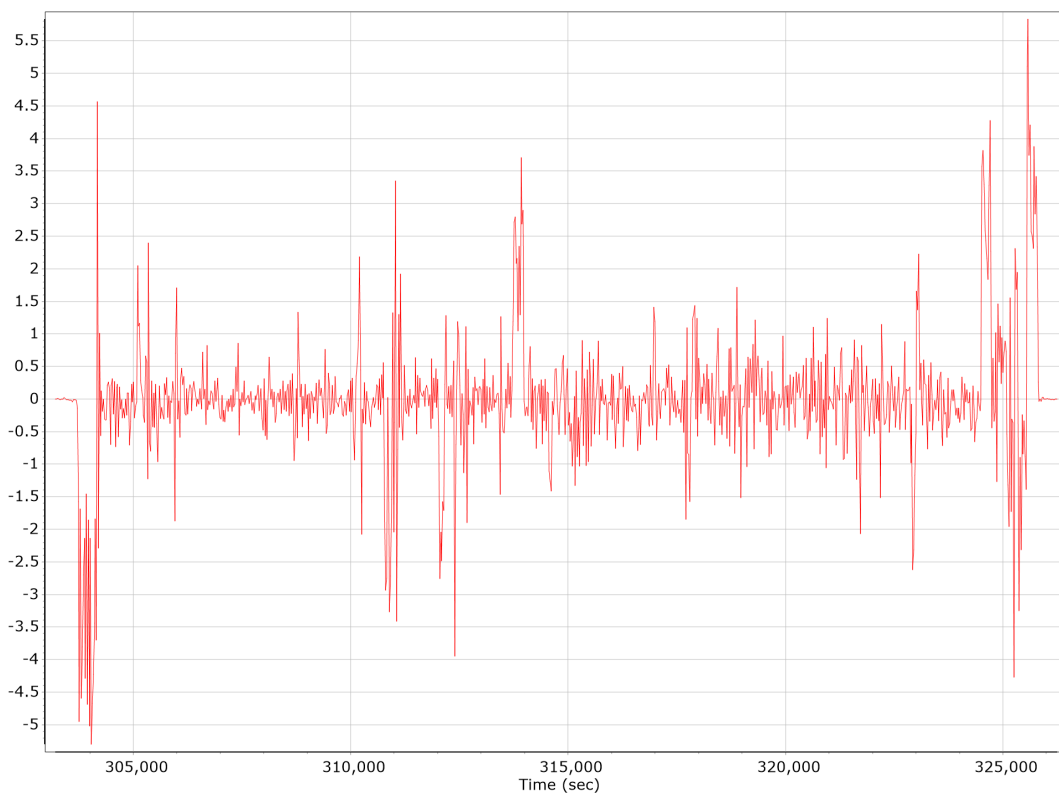
## Heading



## North/East Velocity



## Down Velocity



## Total Speed



## Ground Speed

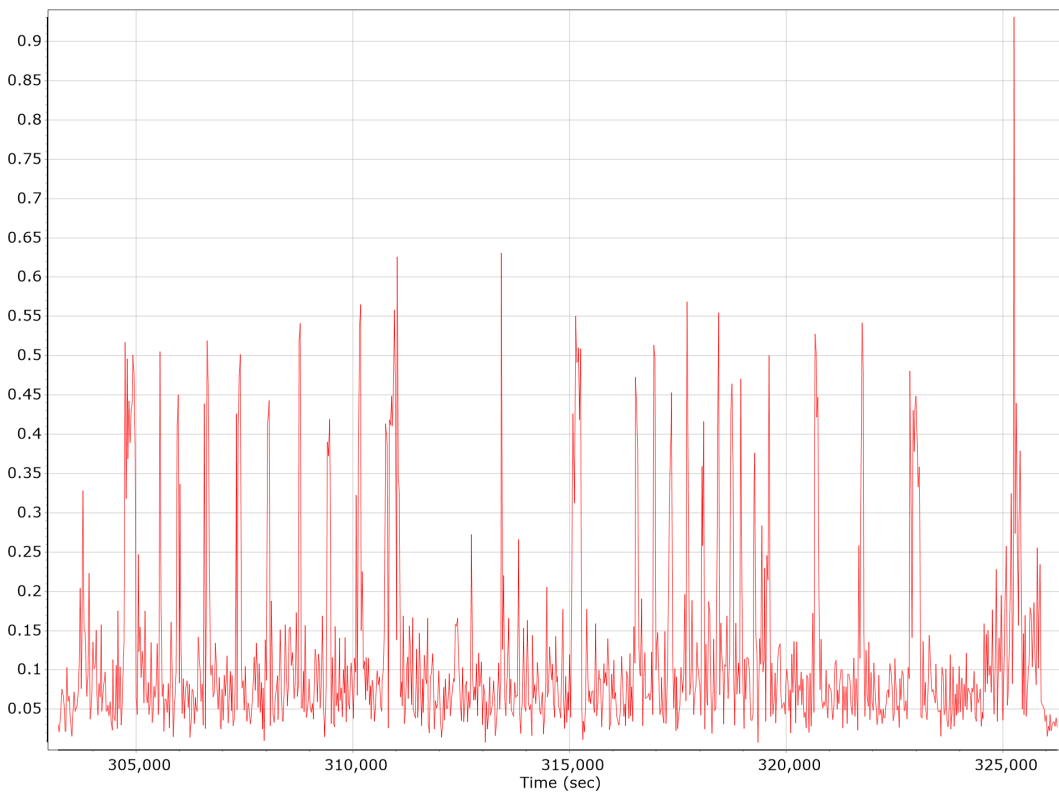




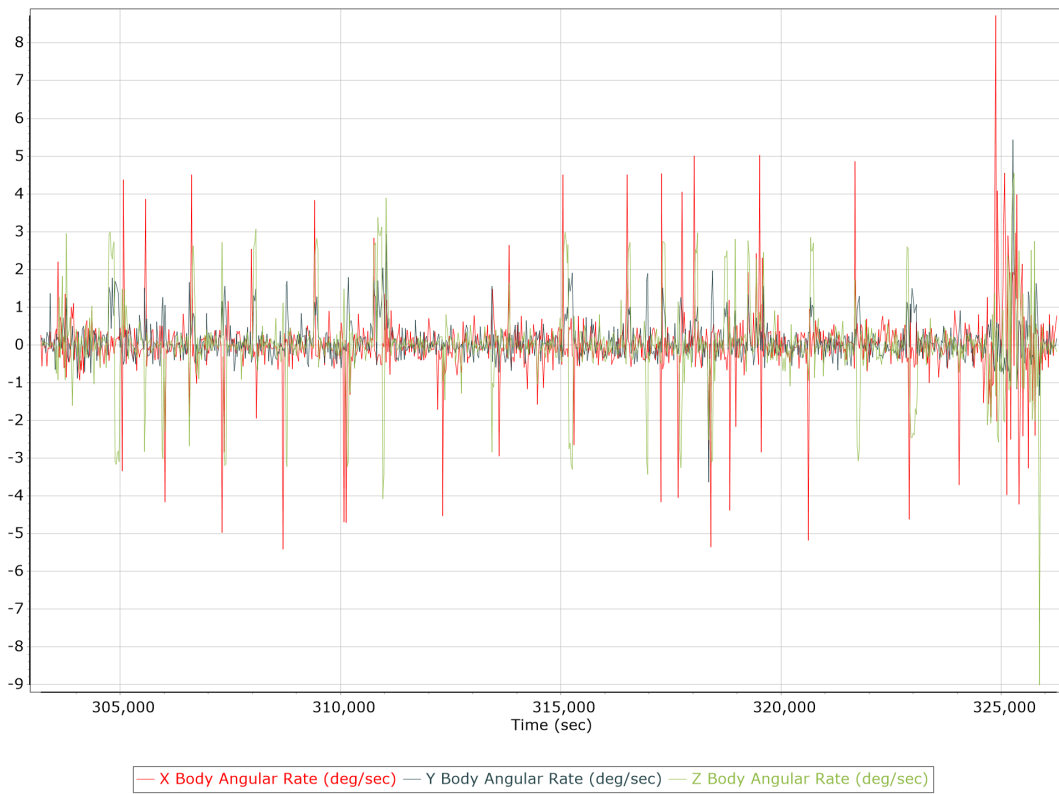
## Body Acceleration



## Total Body Acceleration

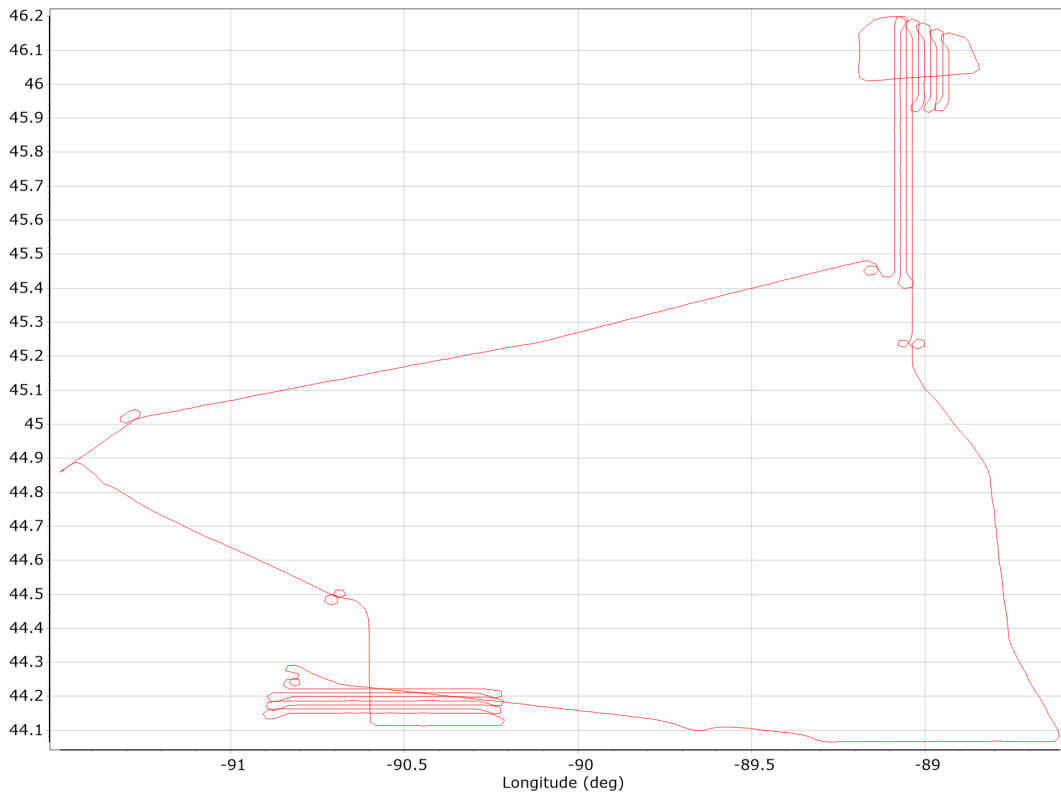


## Body Angular Rate

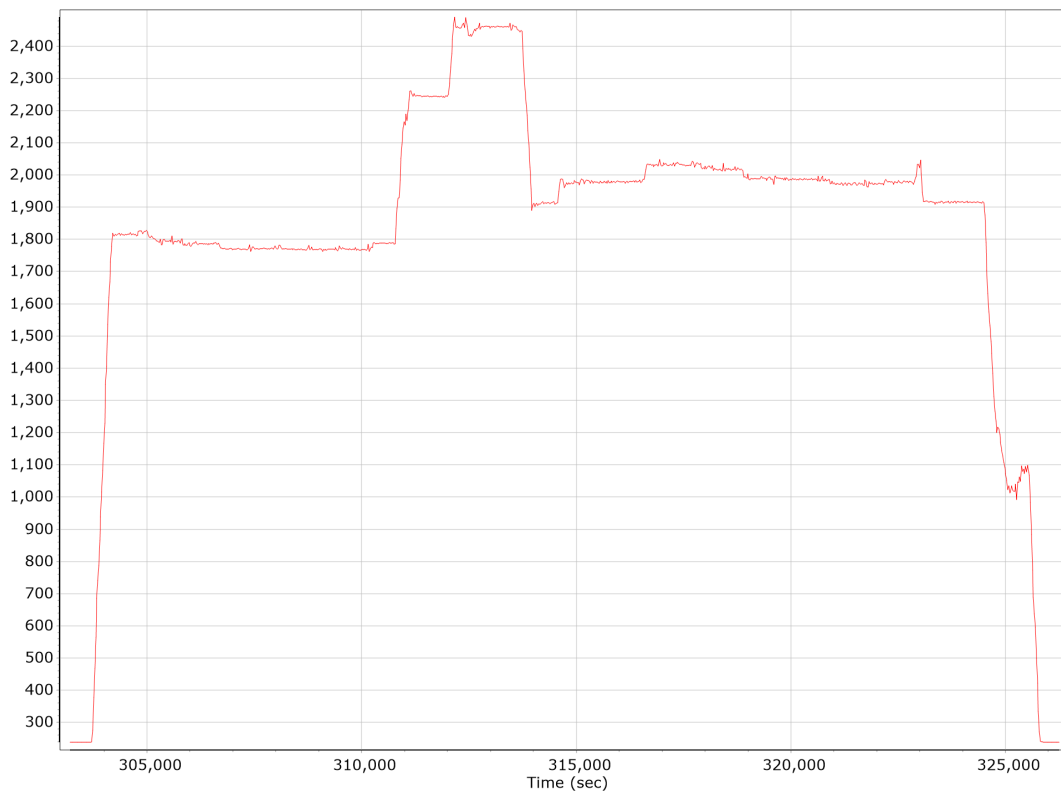


## Forward Processed Trajectory Information

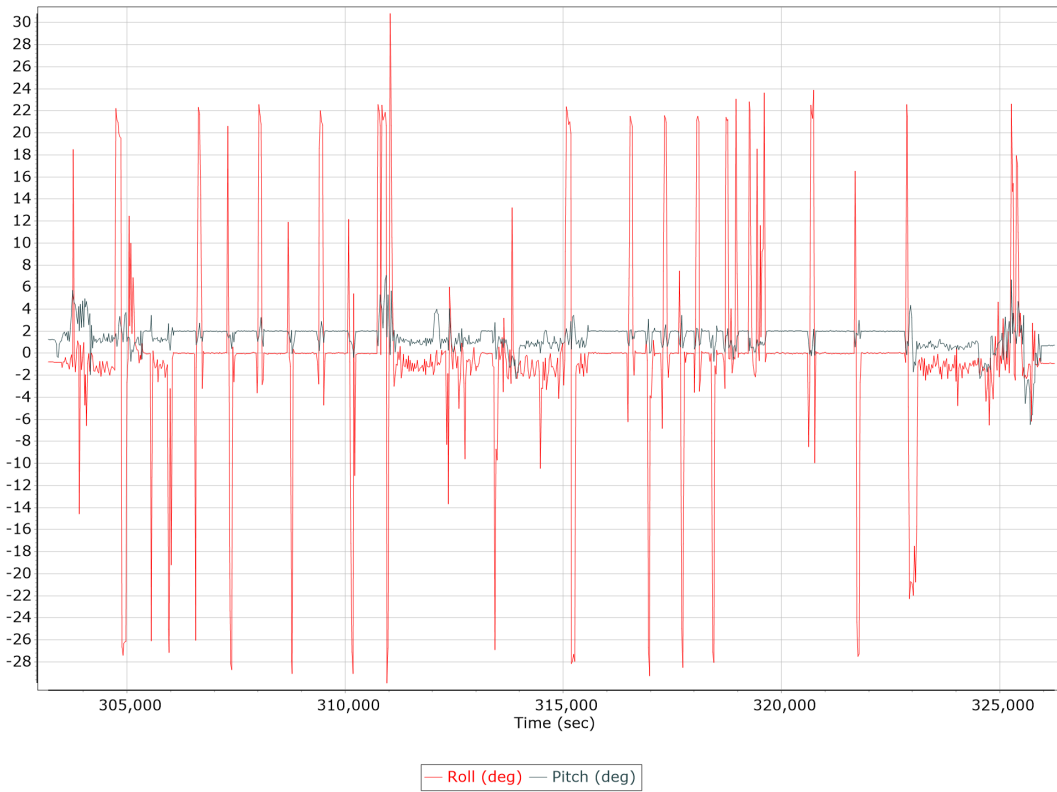
### Top View



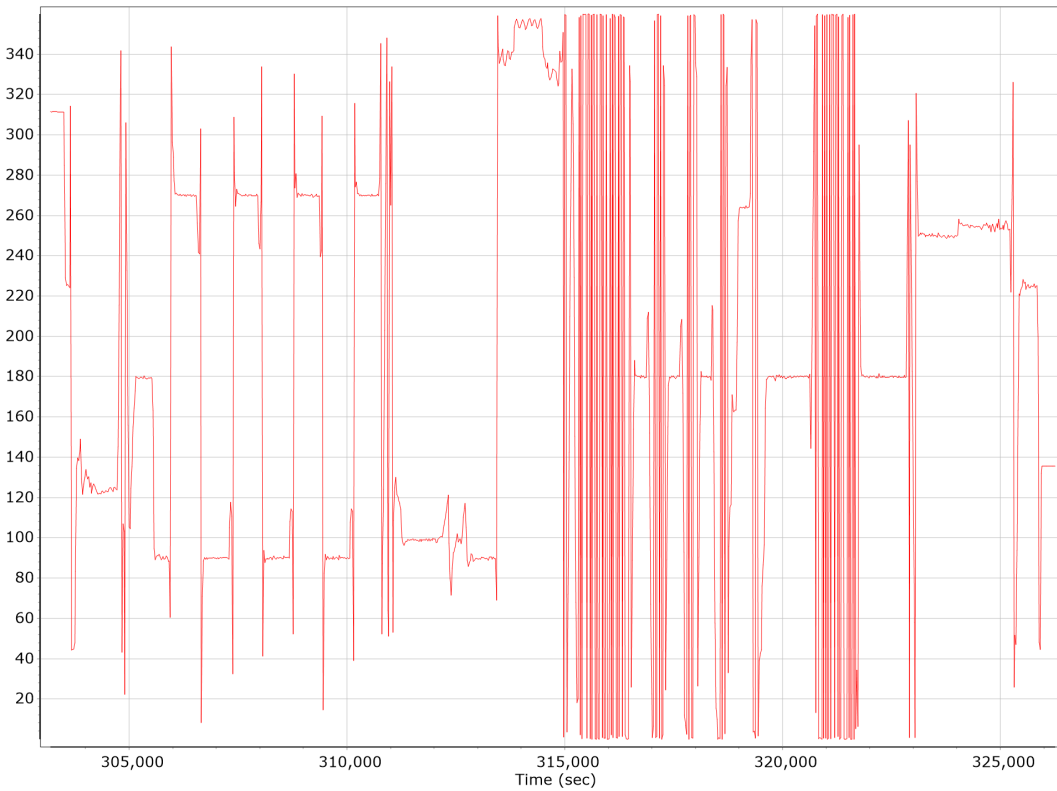
### Altitude



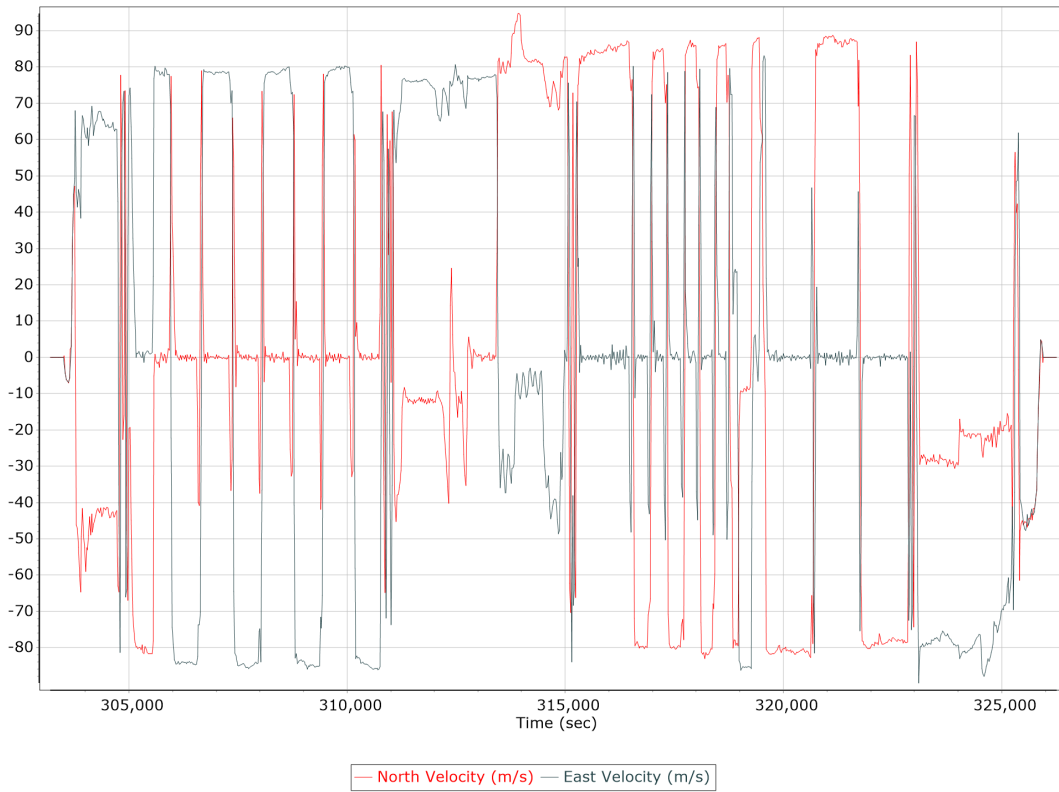
## Roll/Pitch



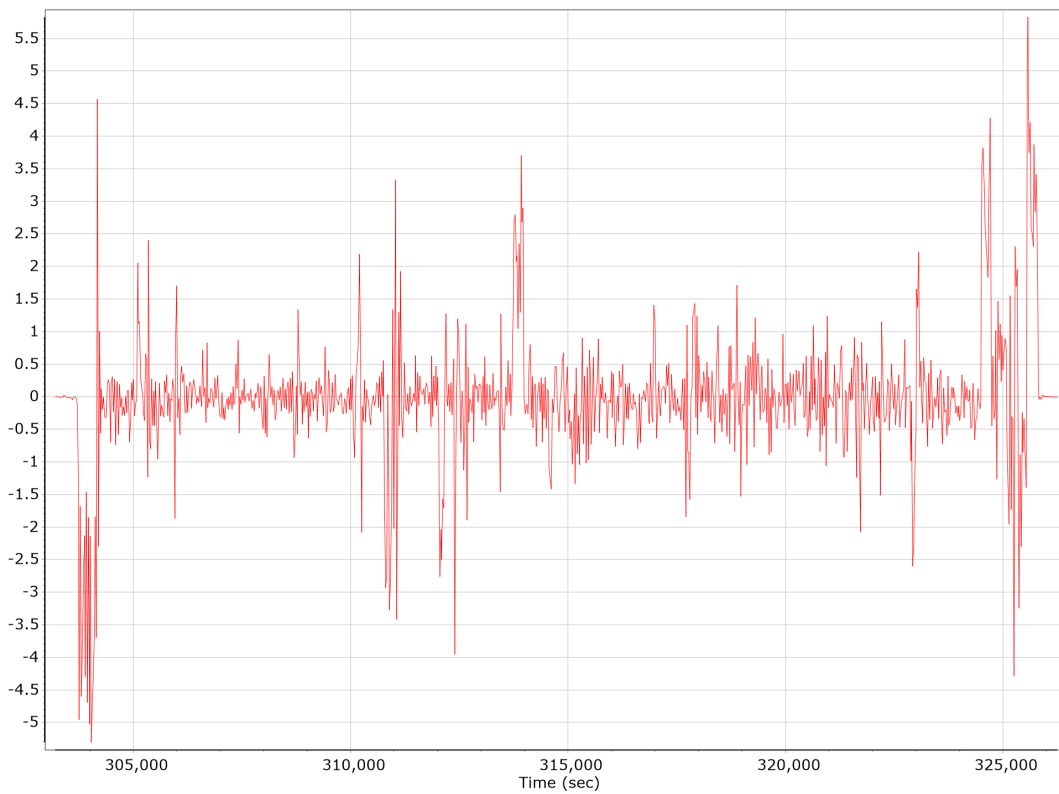
## Heading



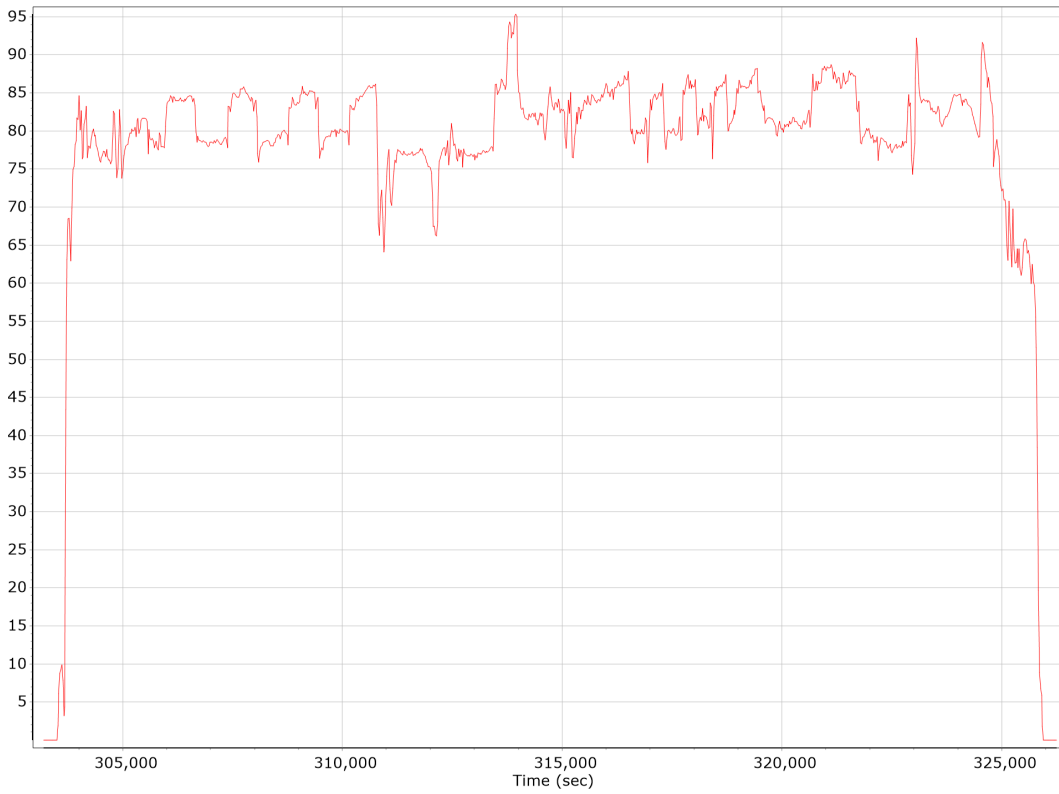
## North/East Velocity



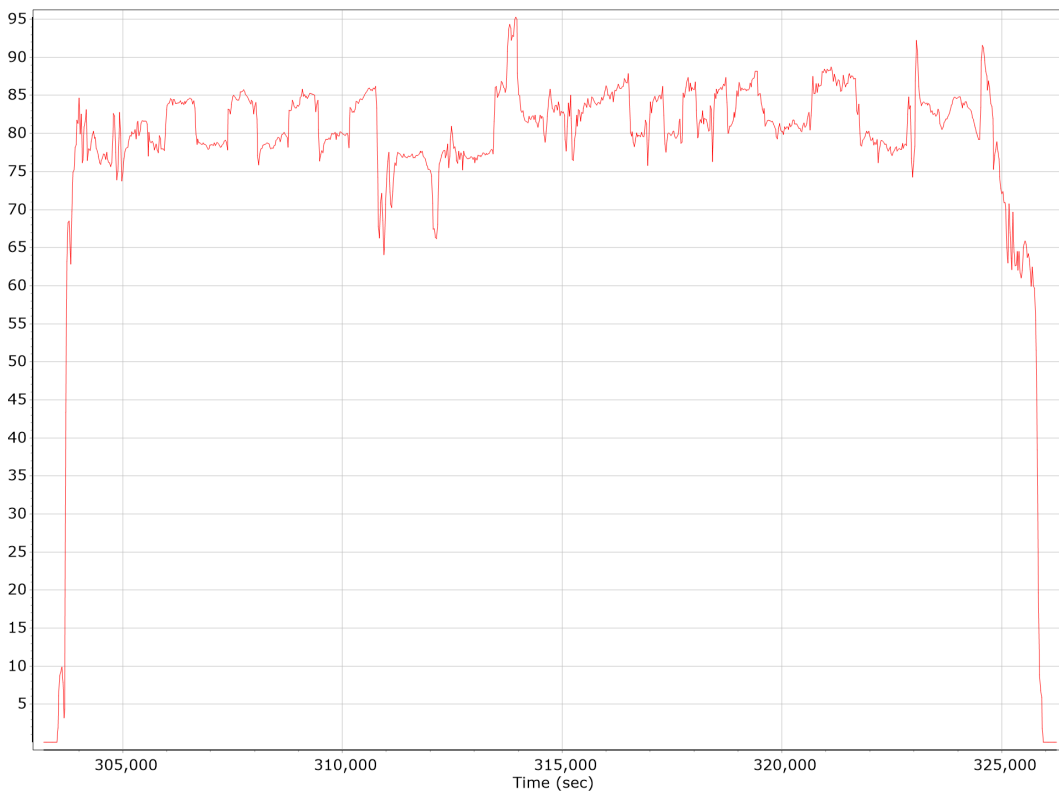
## Down Velocity



## Total Speed



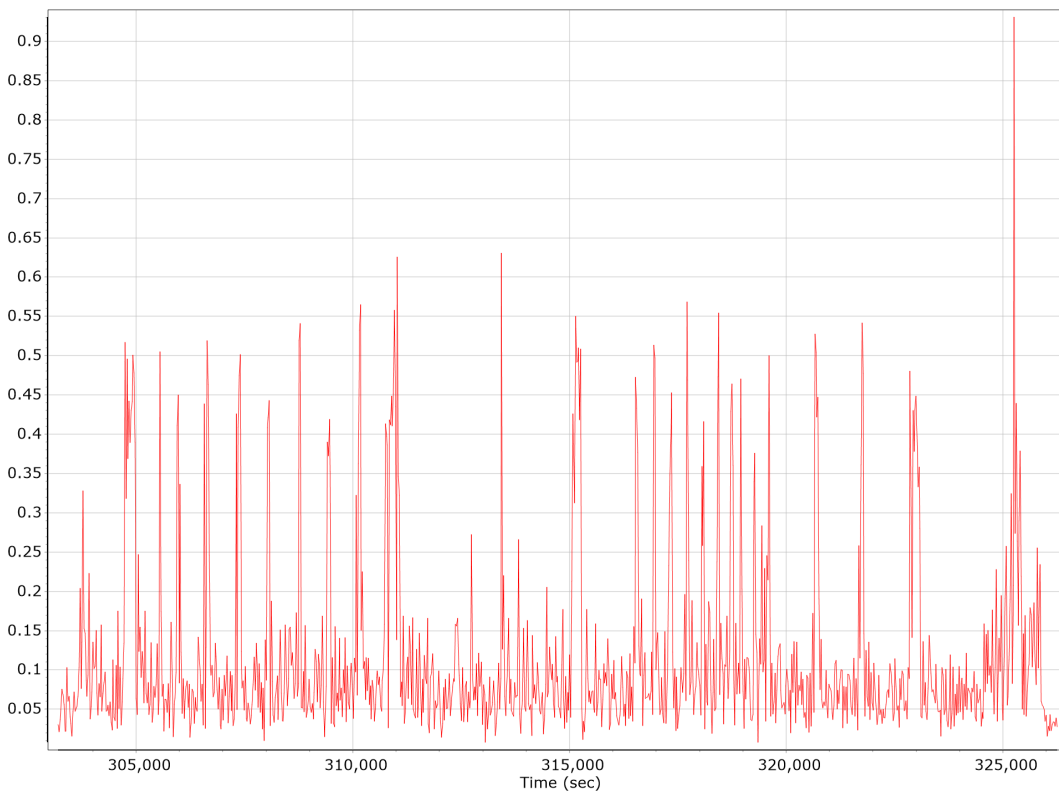
## Ground Speed



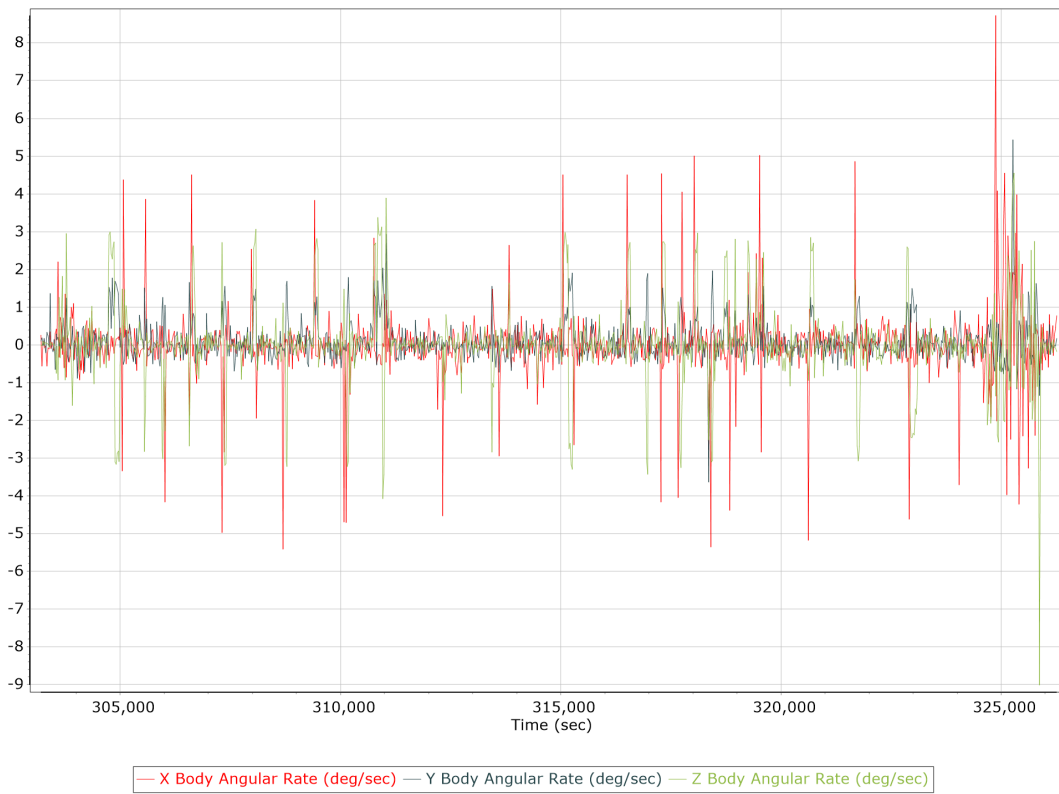
## Body Acceleration



## Total Body Acceleration



## Body Angular Rate



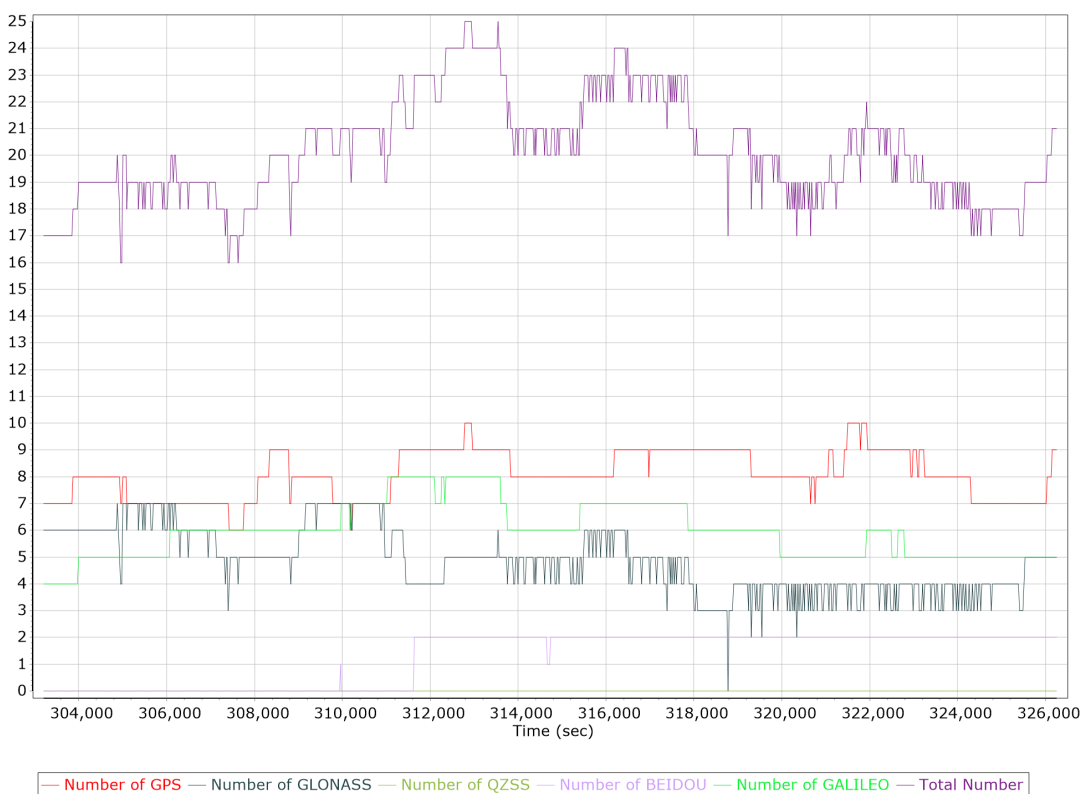


## GNSS QC

### 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



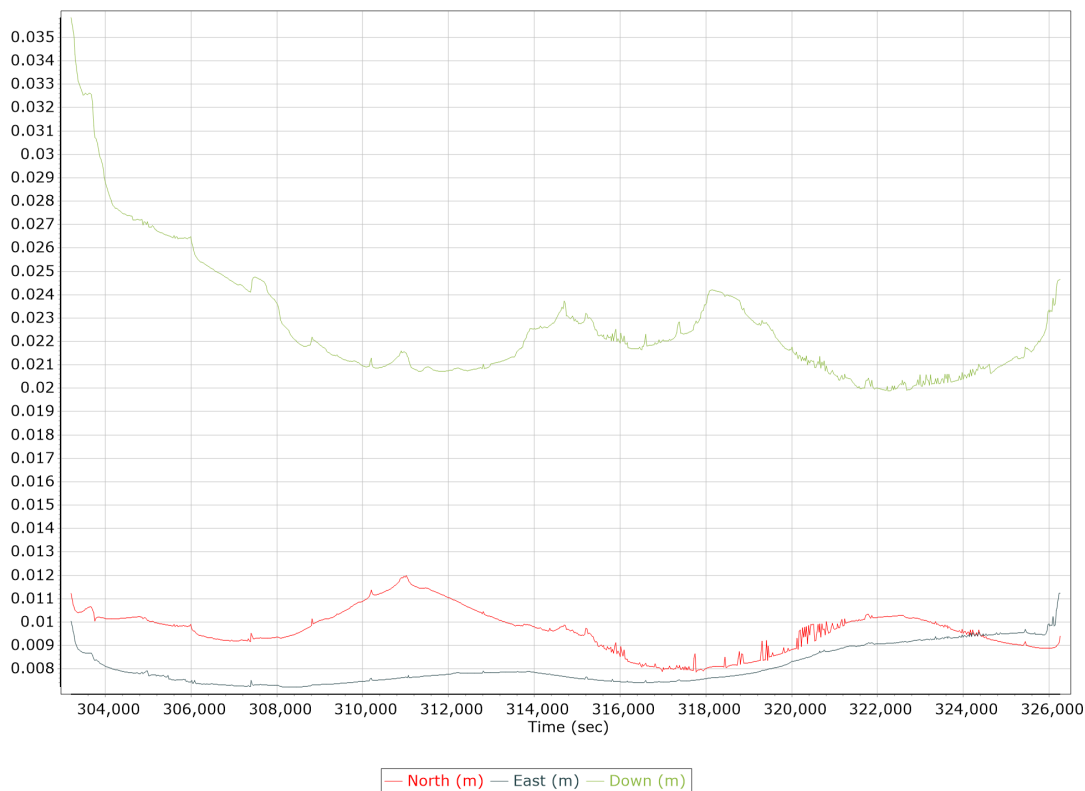
## Forward/Reverse Separation



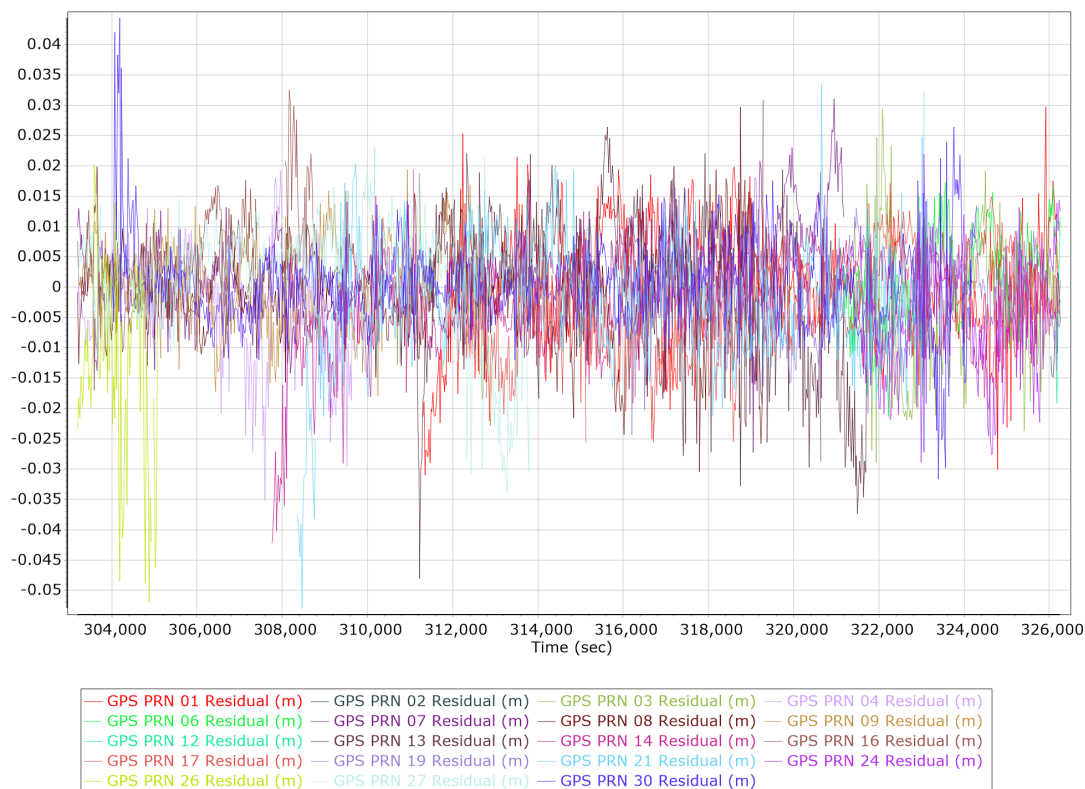
## PDOP



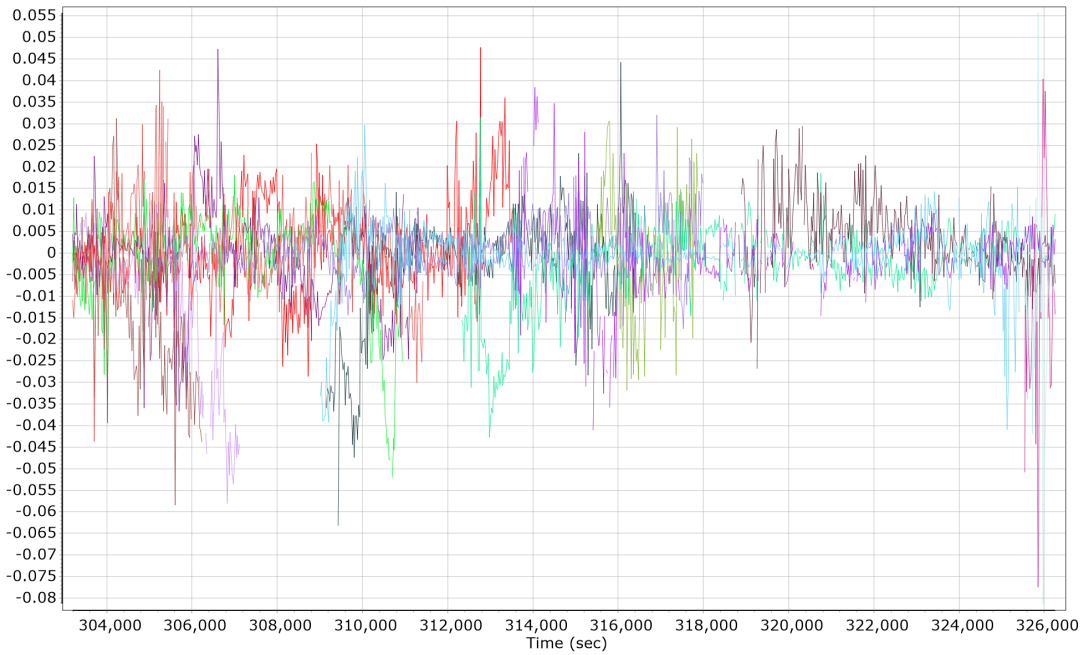
## Estimated Position Accuracy



## GPS Residuals

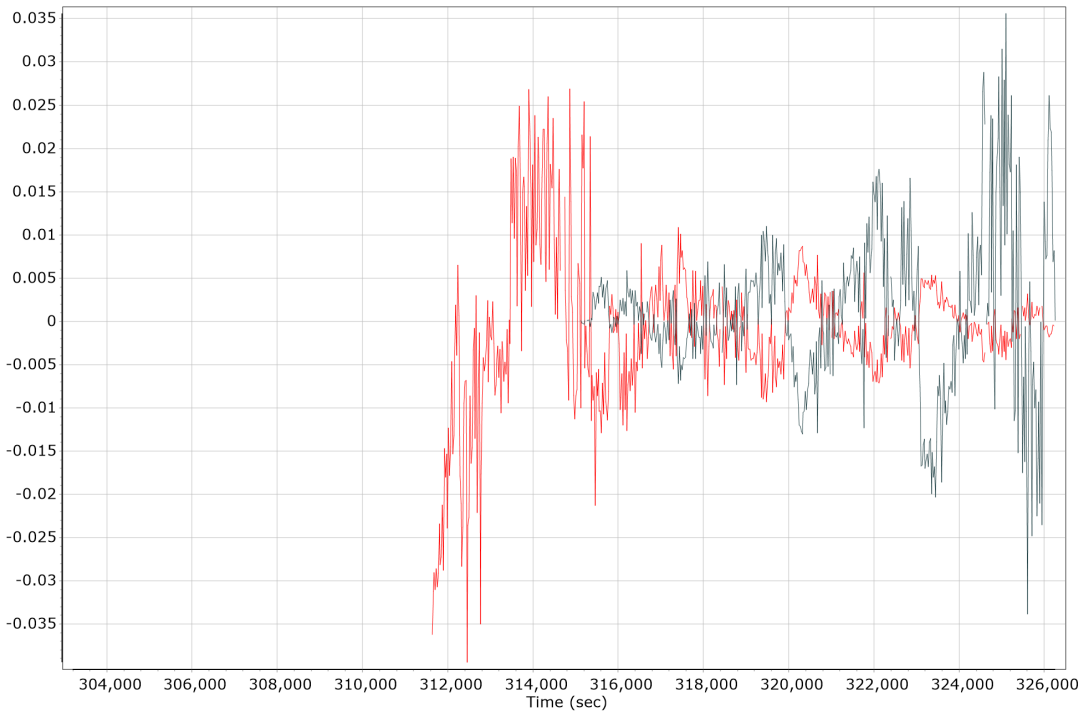


## GLONASS Residuals



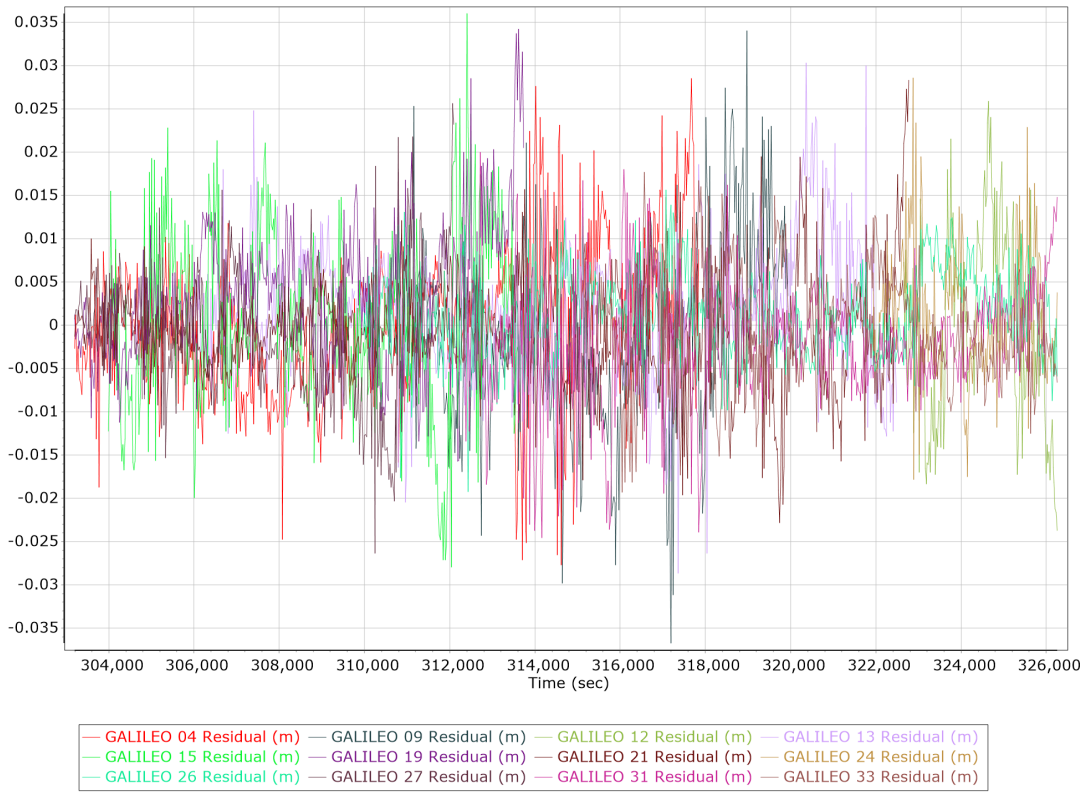
- GLONASS 01 Residual (m) — GLONASS 02 Residual (m) — GLONASS 03 Residual (m) — GLONASS 07 Residual (m)
- GLONASS 08 Residual (m) — GLONASS 09 Residual (m) — GLONASS 10 Residual (m) — GLONASS 11 Residual (m)
- GLONASS 12 Residual (m) — GLONASS 13 Residual (m) — GLONASS 14 Residual (m) — GLONASS 18 Residual (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



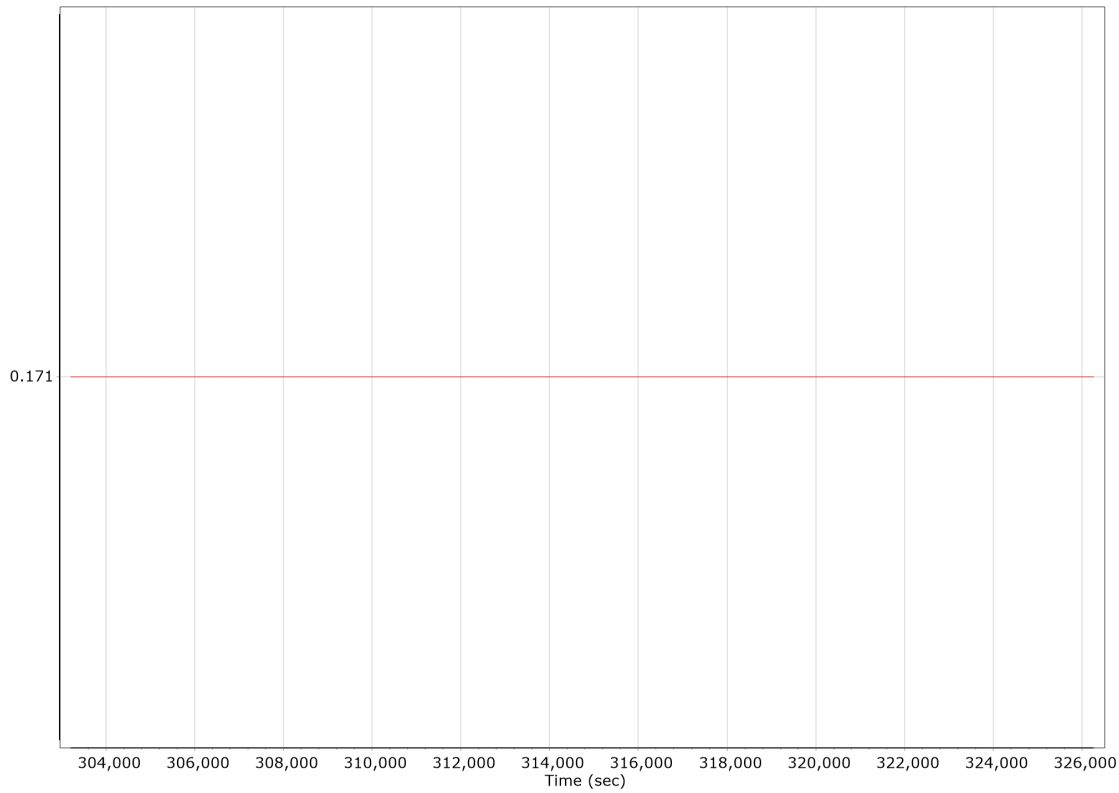
## GNSS-Inertial Processor Configuration

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

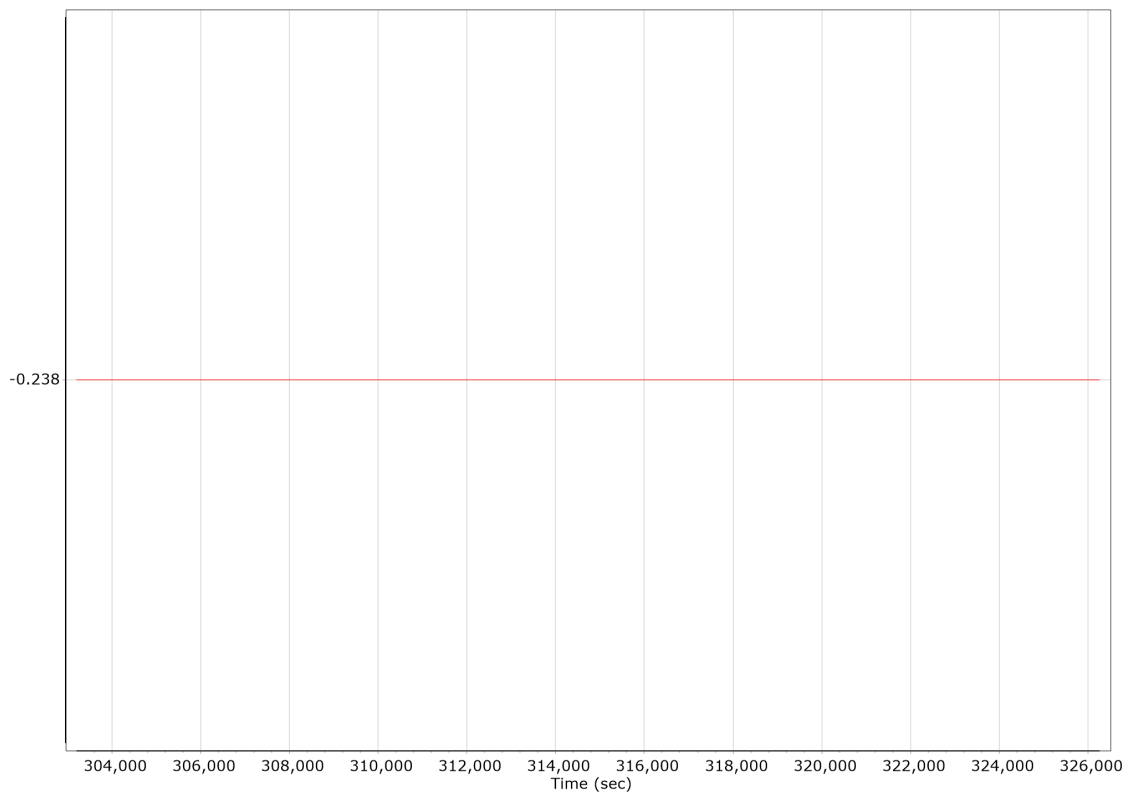
## Calibrated Installation Parameters

### Reference-Primary GNSS Lever Arm (m)

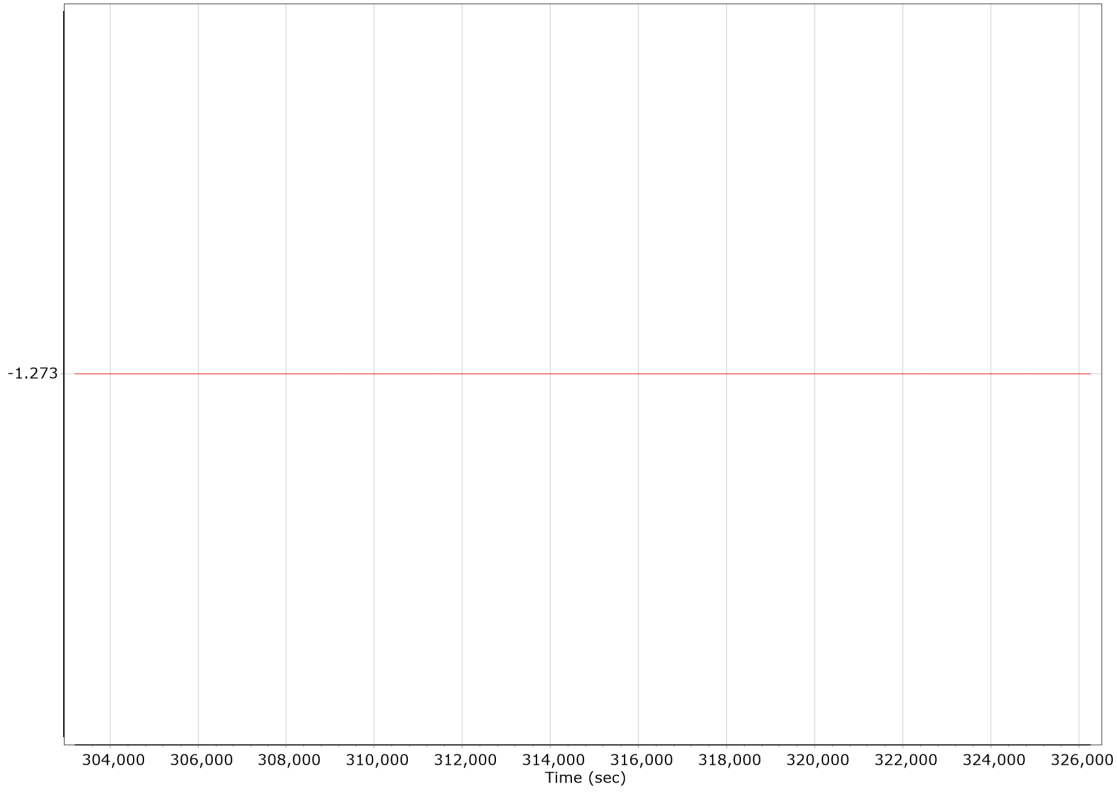
#### X Reference-Primary GNSS Lever Arm (m)



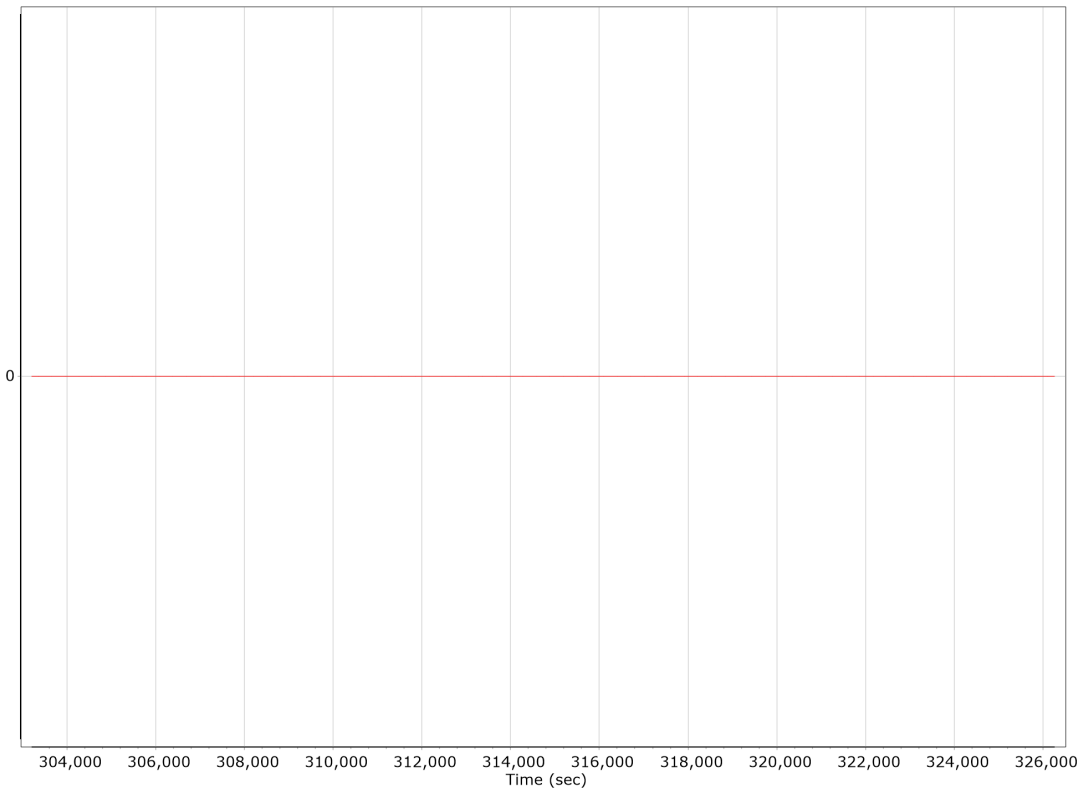
#### Y Reference-Primary GNSS Lever Arm (m)



### Z Reference-Primary GNSS Lever Arm (m)



### Reference-Primary GNSS Lever Arm Figure of Merit

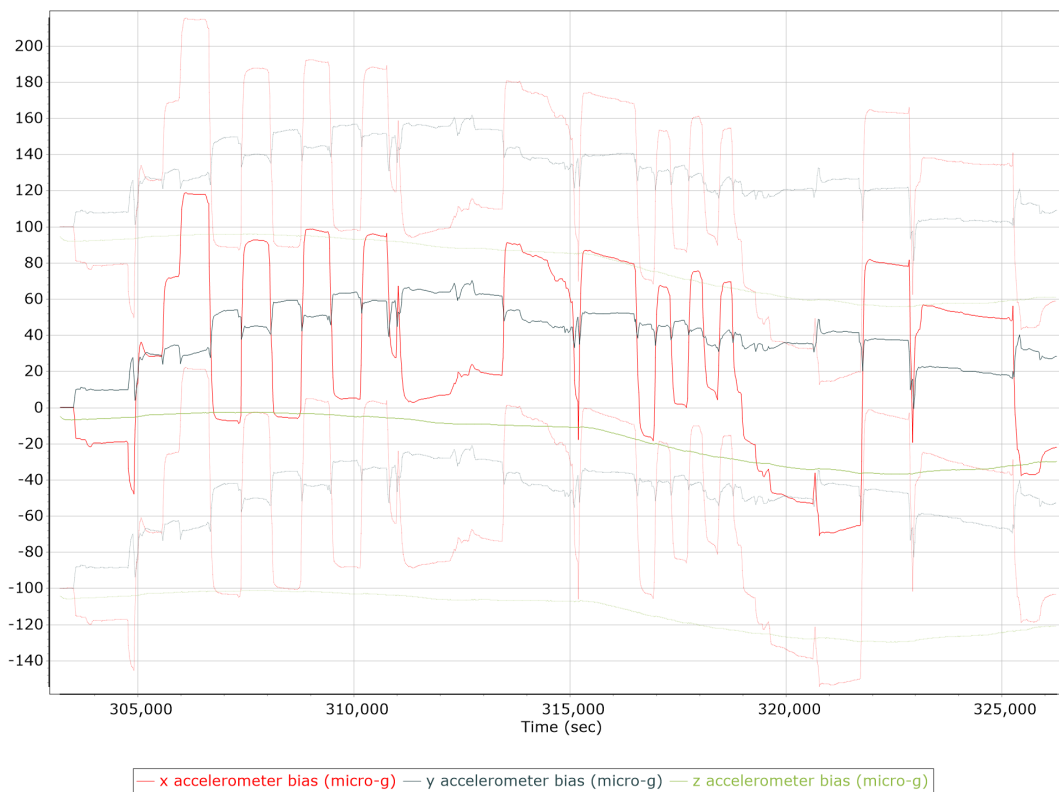




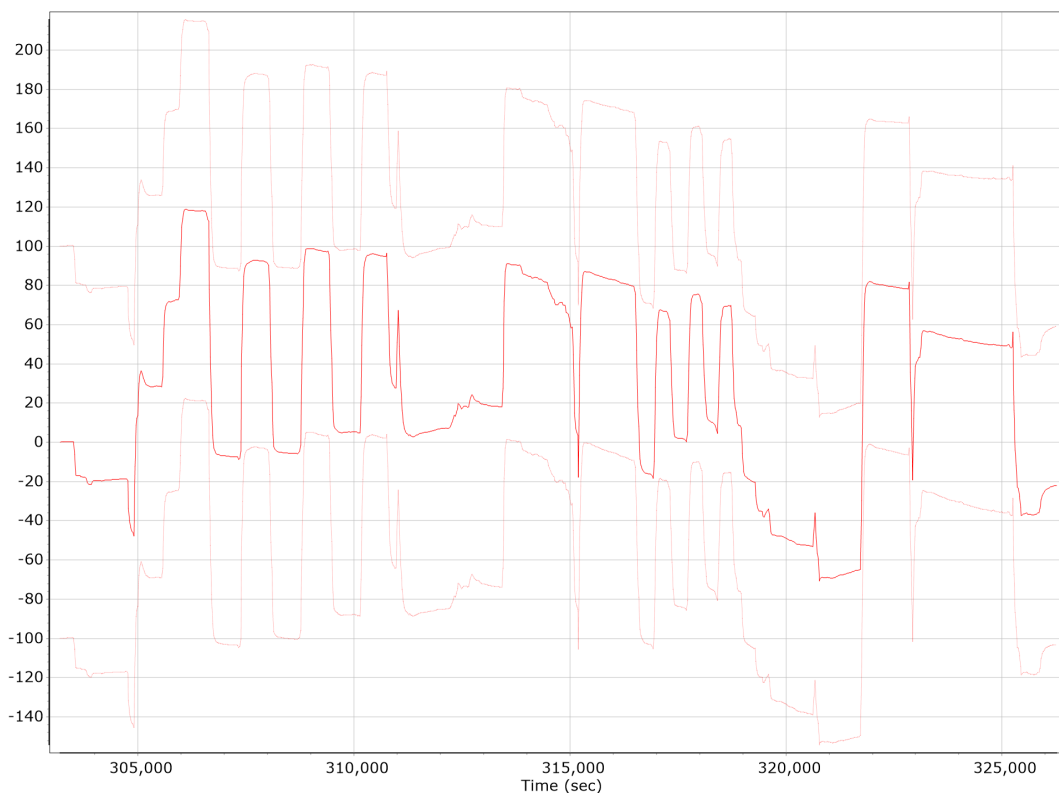
## IN-Fusion QC

### Forward Processed Estimated Errors, Reference Frame

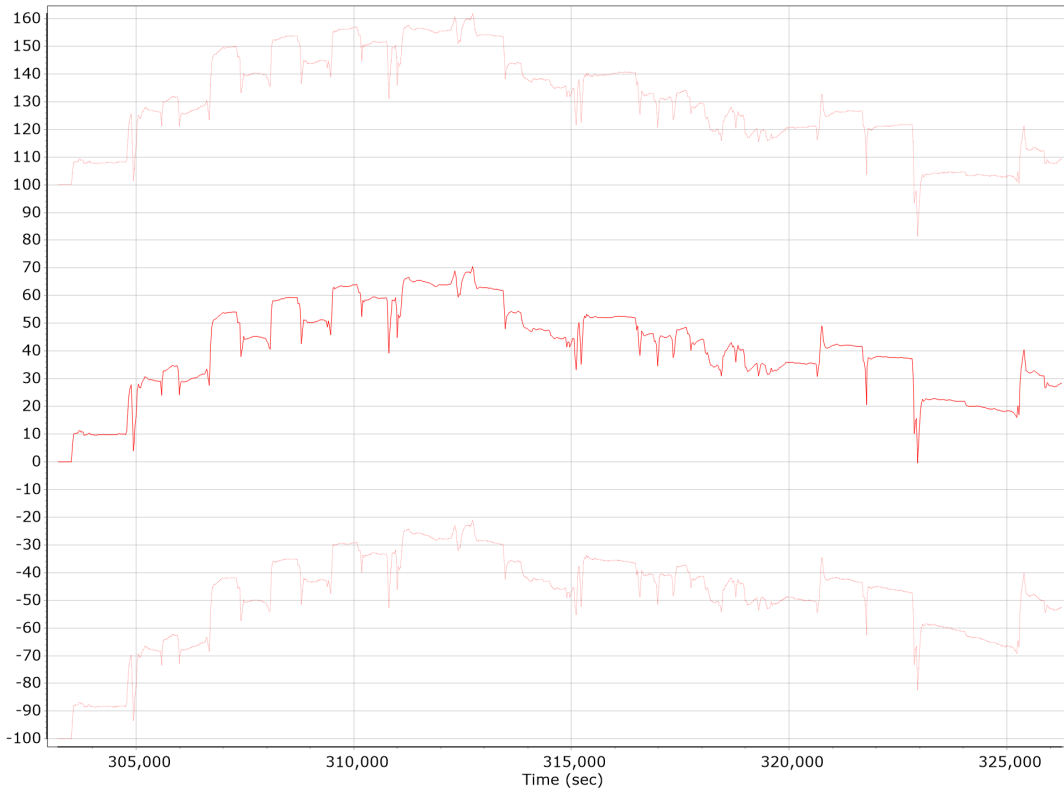
#### Accelerometer Bias (micro-g)



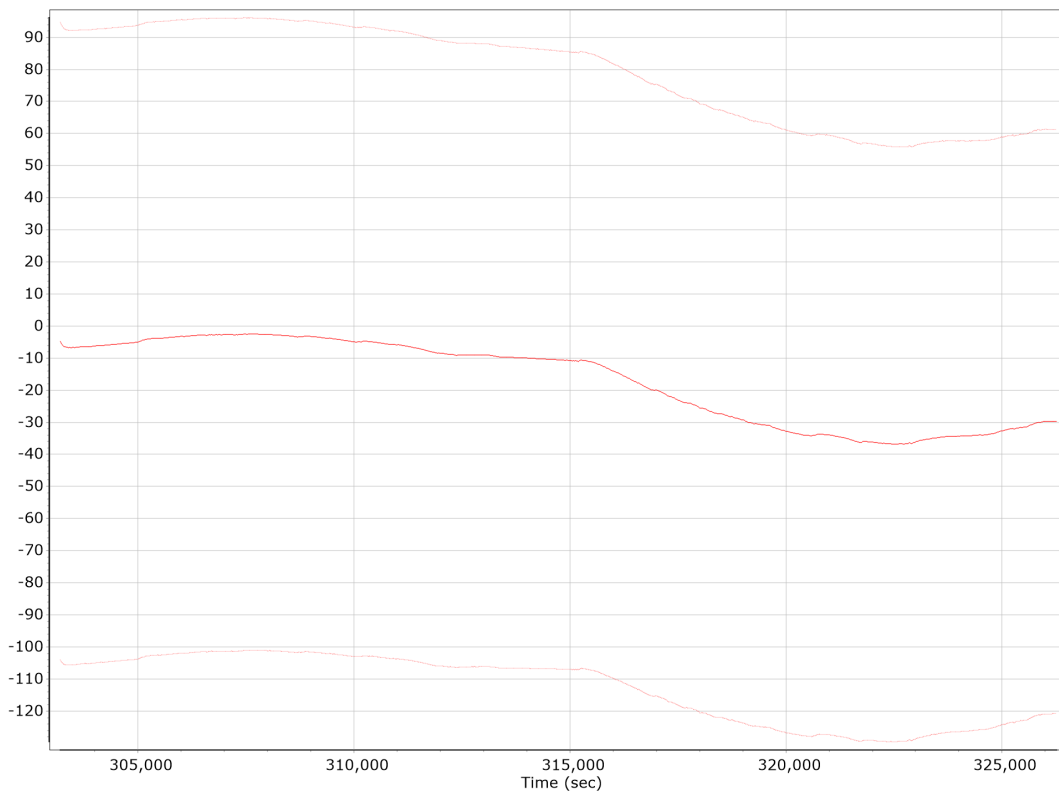
#### X Accelerometer Bias (micro-g)



### Y Accelerometer Bias (micro-g)



### Z Accelerometer Bias (micro-g)



### Accelerometer Scale Error (ppm)



### X Accelerometer Scale Error (ppm)



### Y Accelerometer Scale Error (ppm)



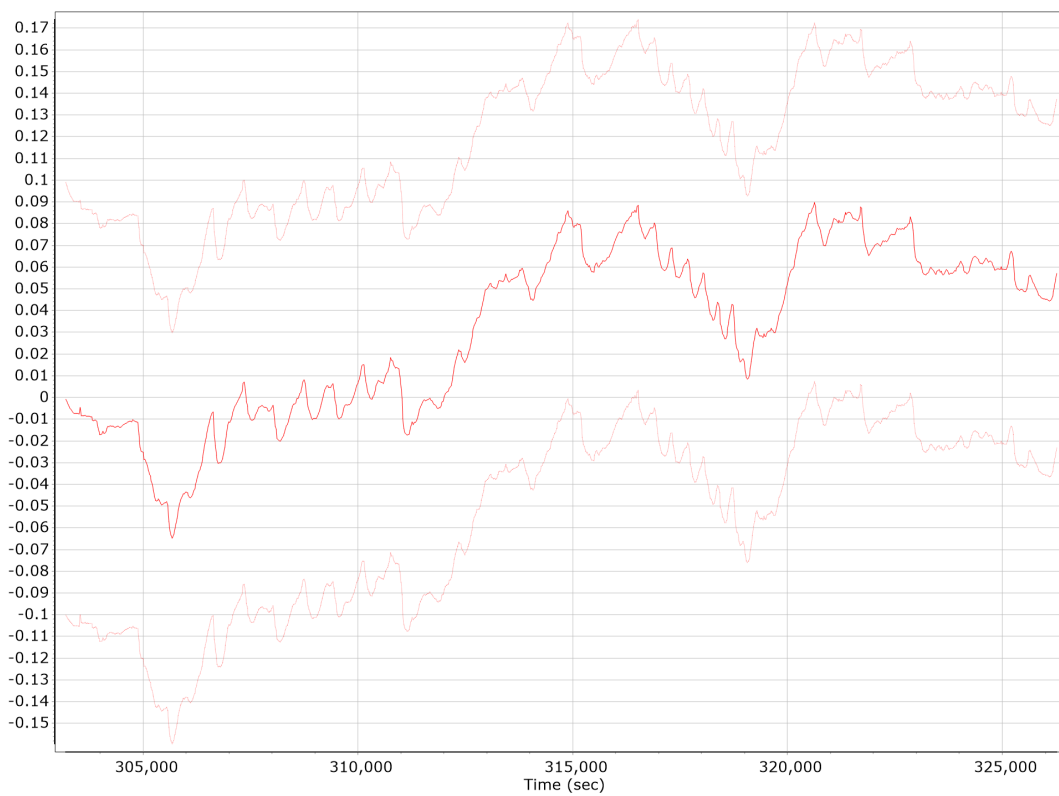
### Z Accelerometer Scale Error (ppm)



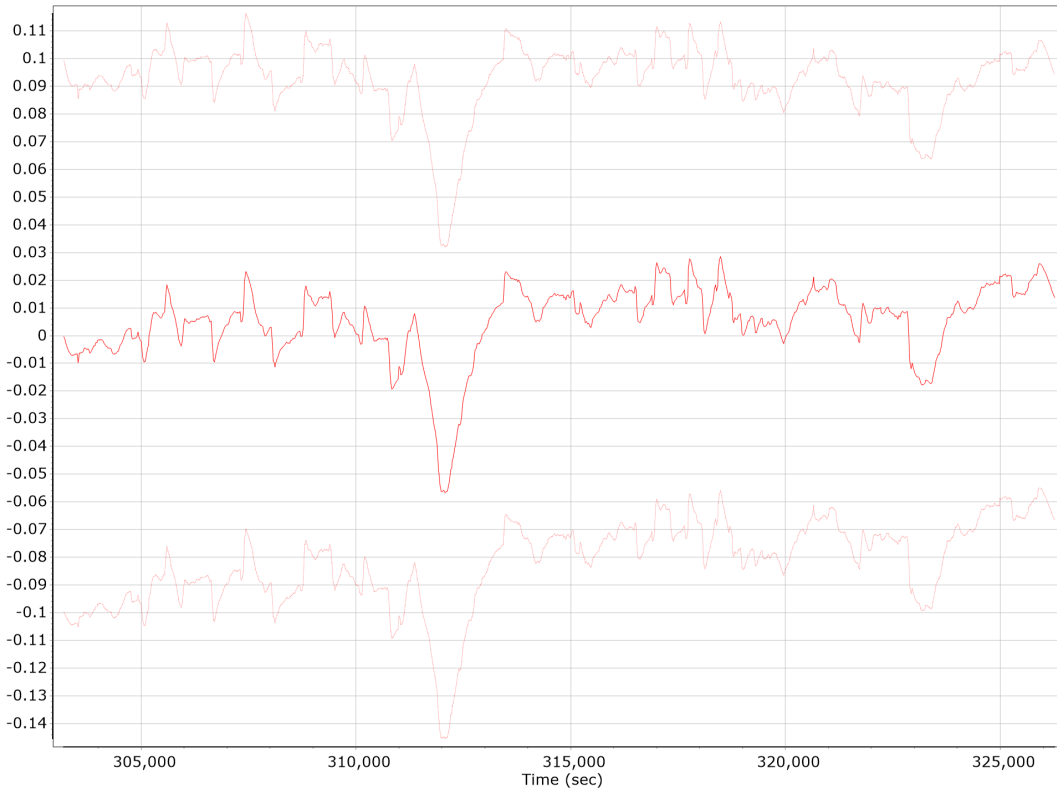
### Gyro Bias (deg/h)



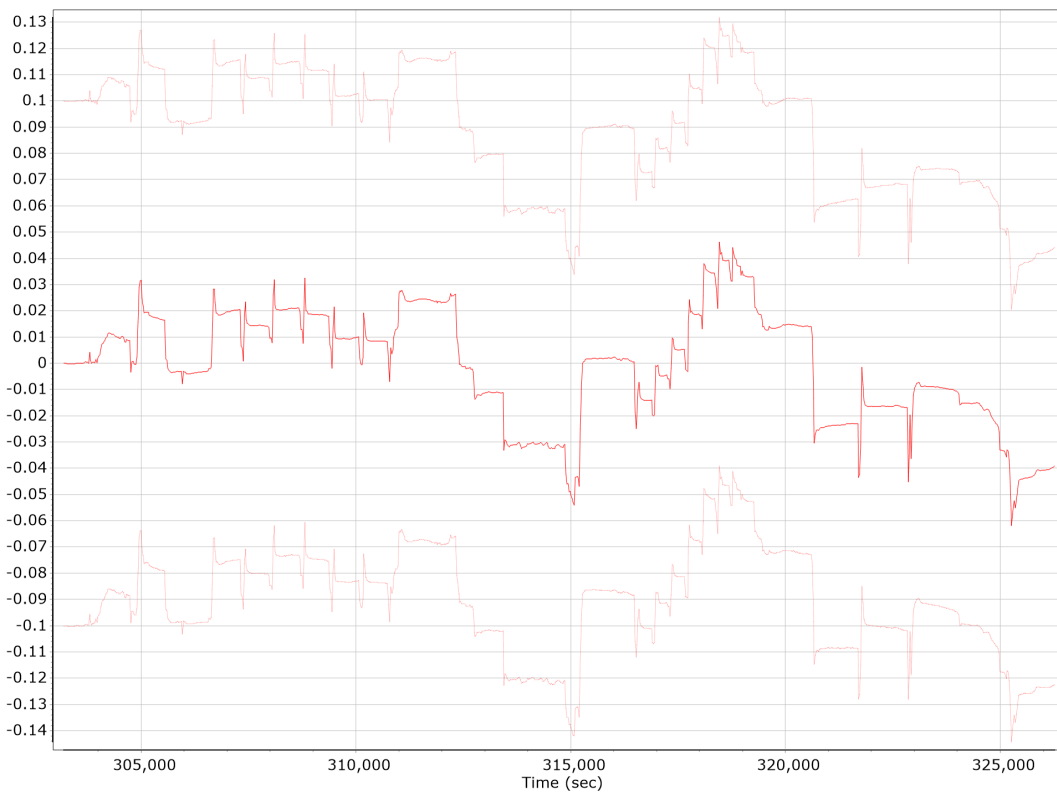
### X Gyro Bias (deg/h)



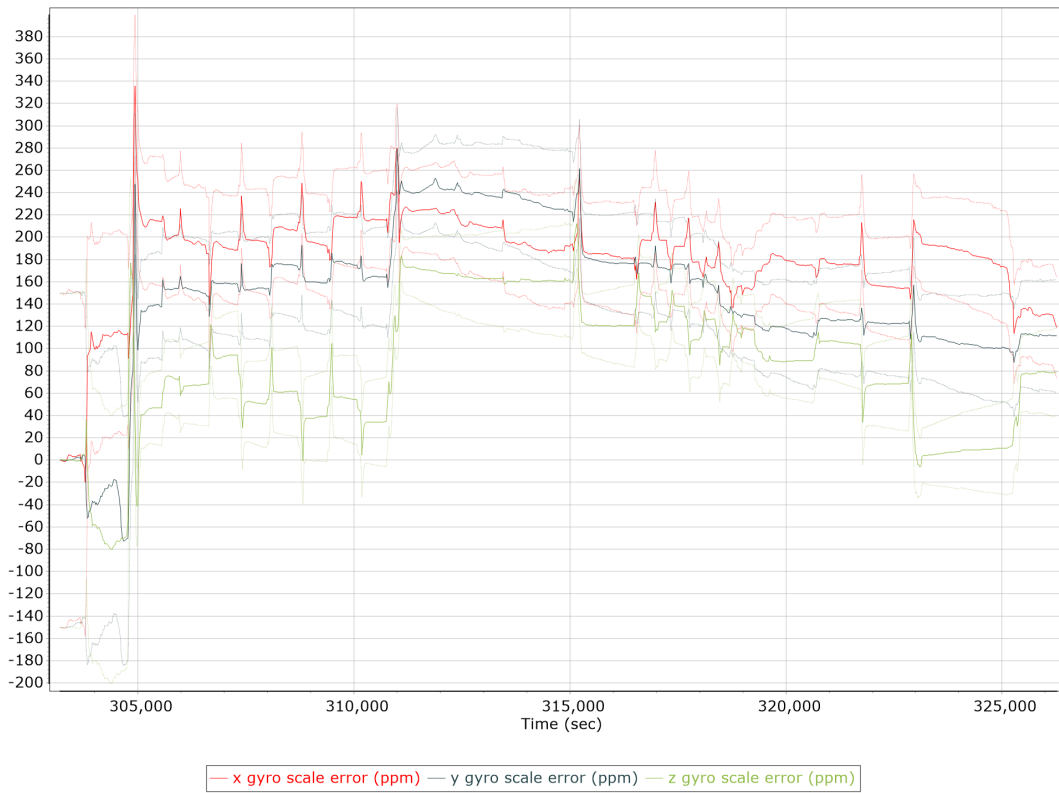
### Y Gyro Bias (deg/h)



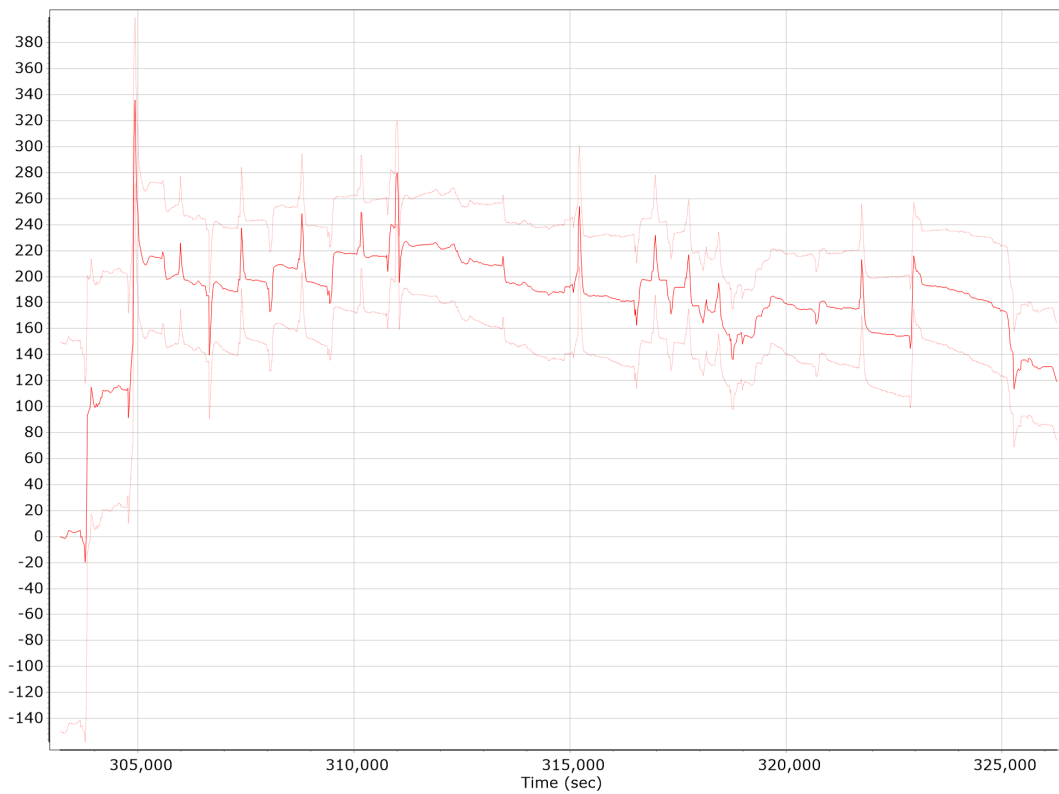
### Z Gyro Bias (deg/h)



### Gyro Scale Error (ppm)



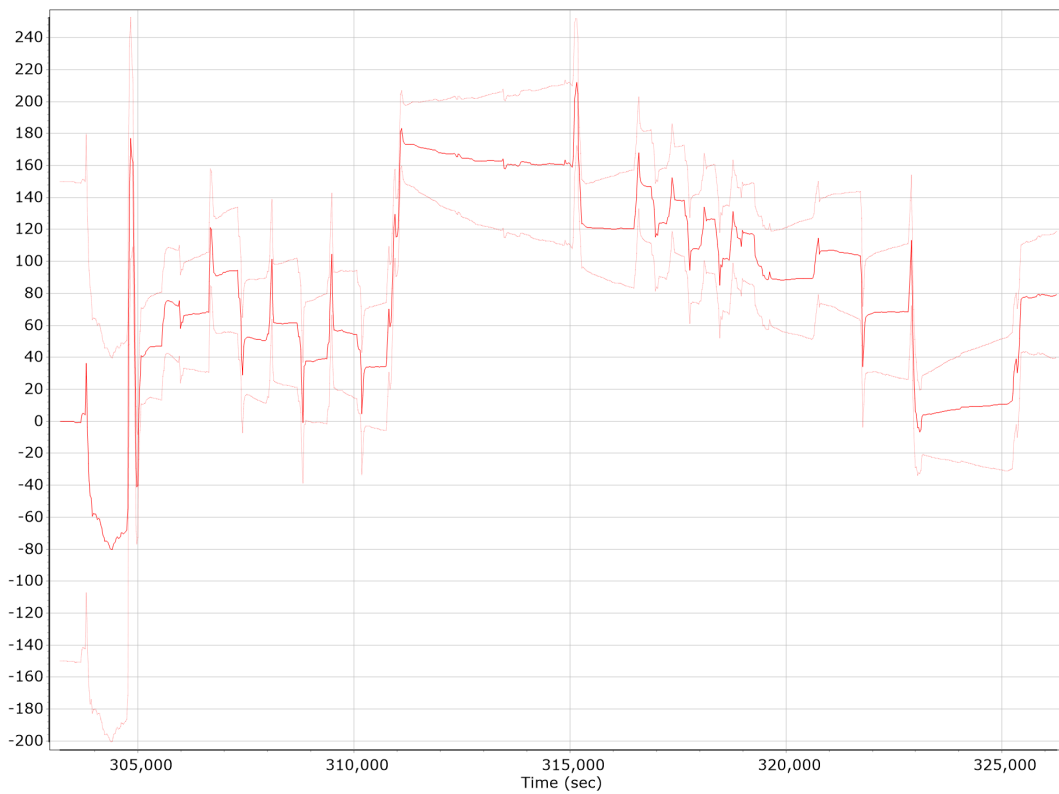
### X Gyro Scale Error (ppm)



### Y Gyro Scale Error (ppm)



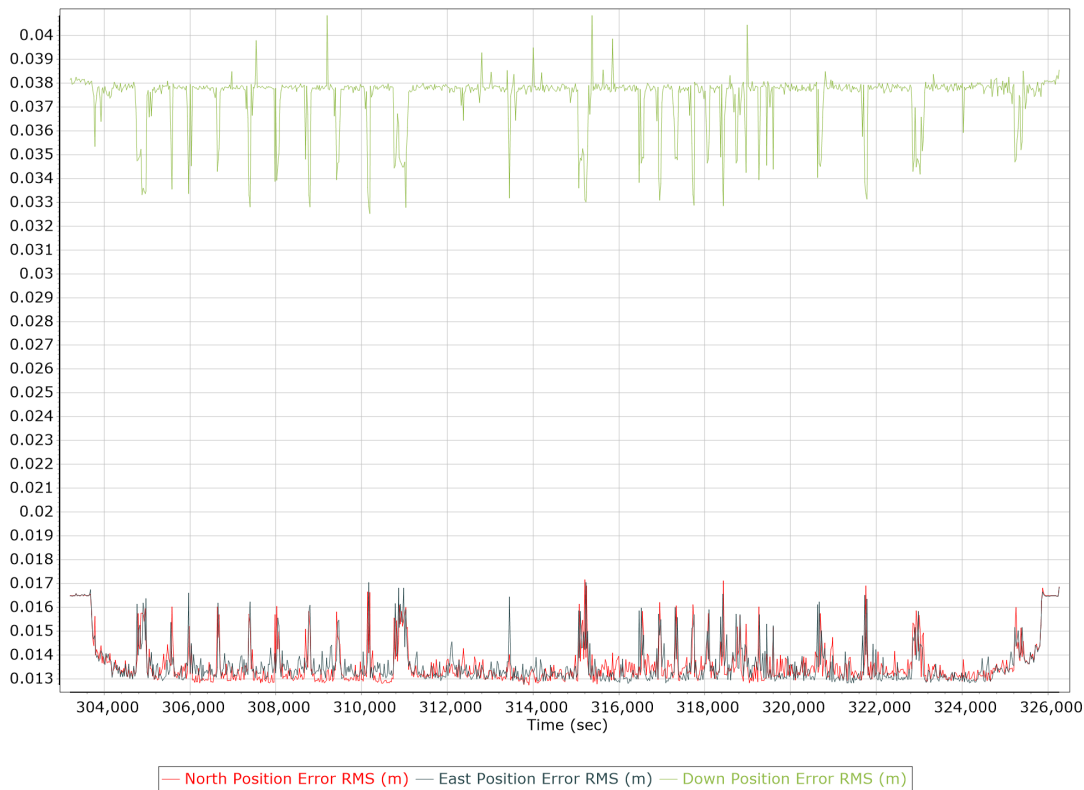
### Z Gyro Scale Error (ppm)



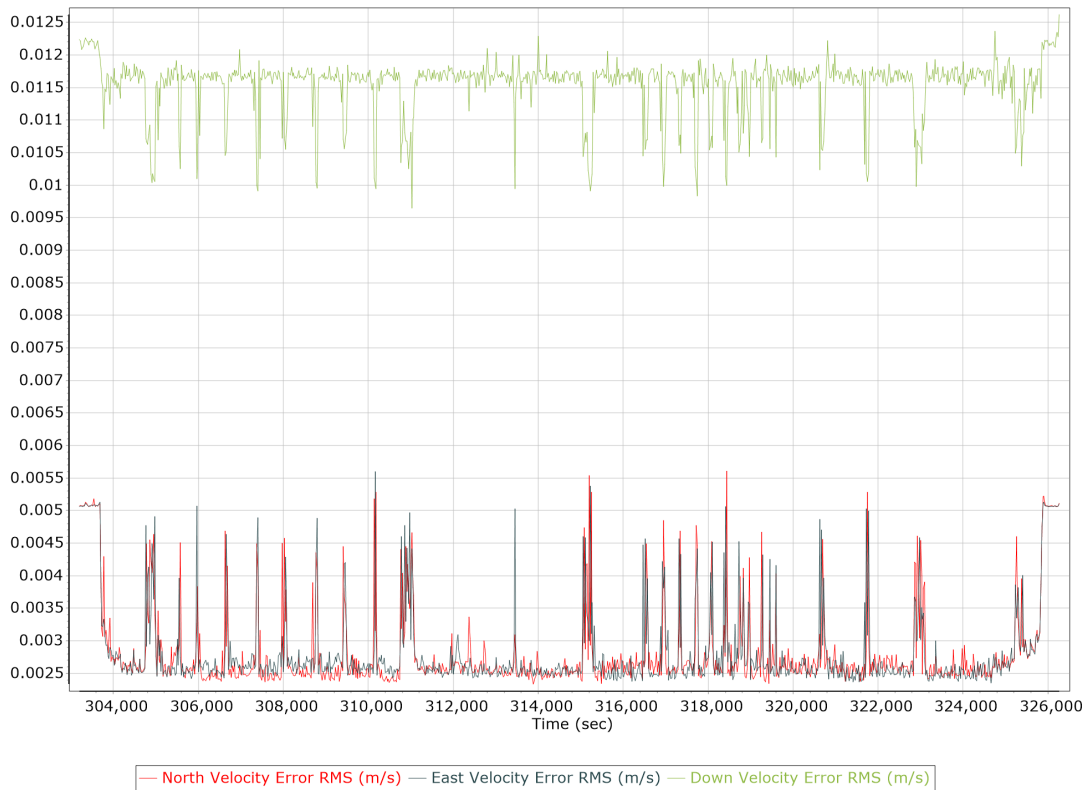


## Smoothed Performance Metrics

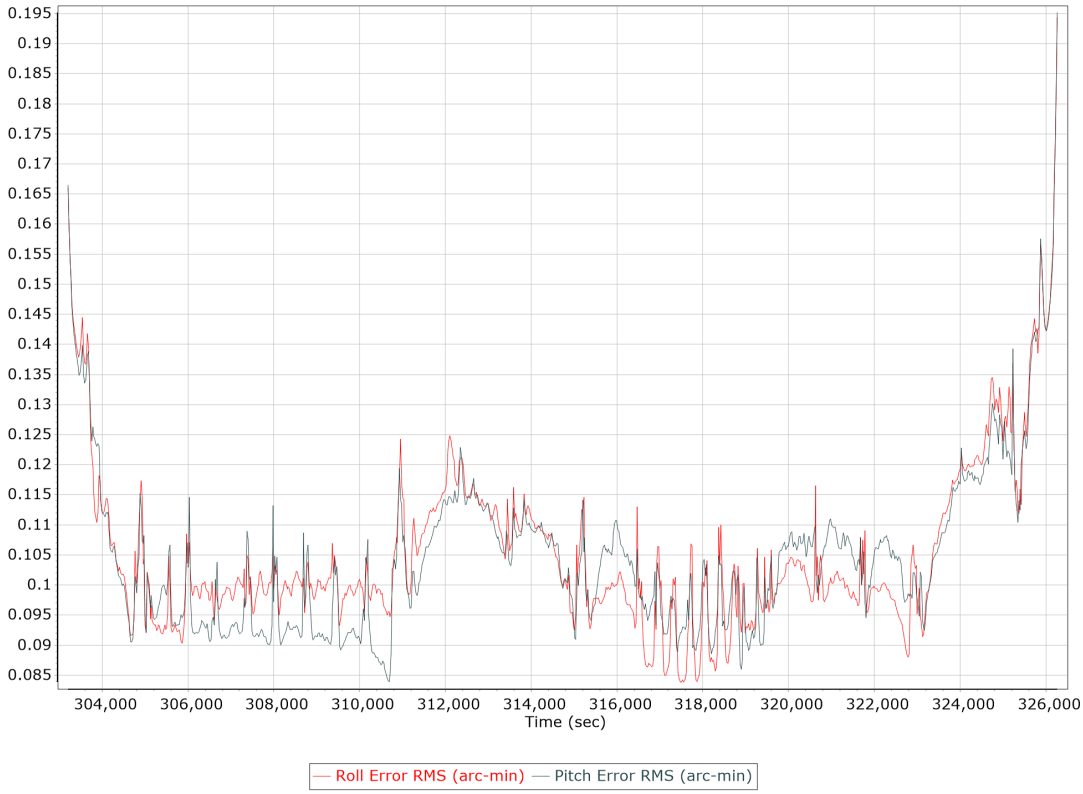
### Position Error RMS (m)



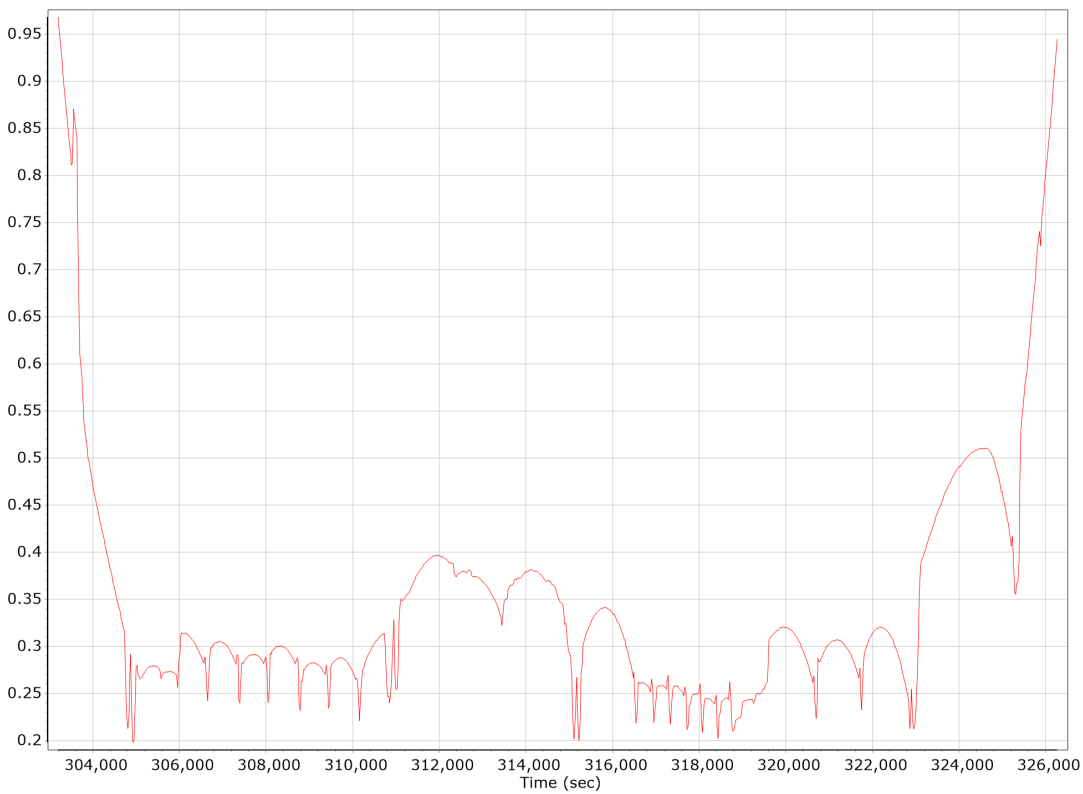
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)



### Heading Error RMS (arc-min)



## Forward Processed Performance Metrics

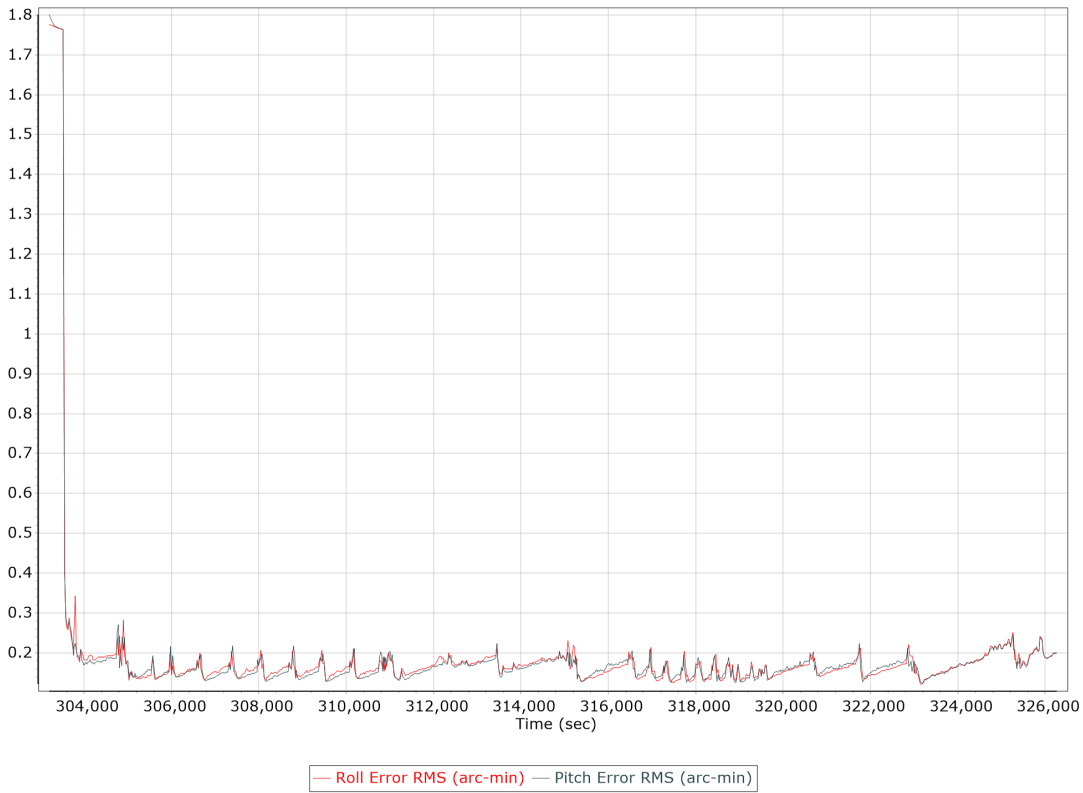
### Position Error RMS (m)



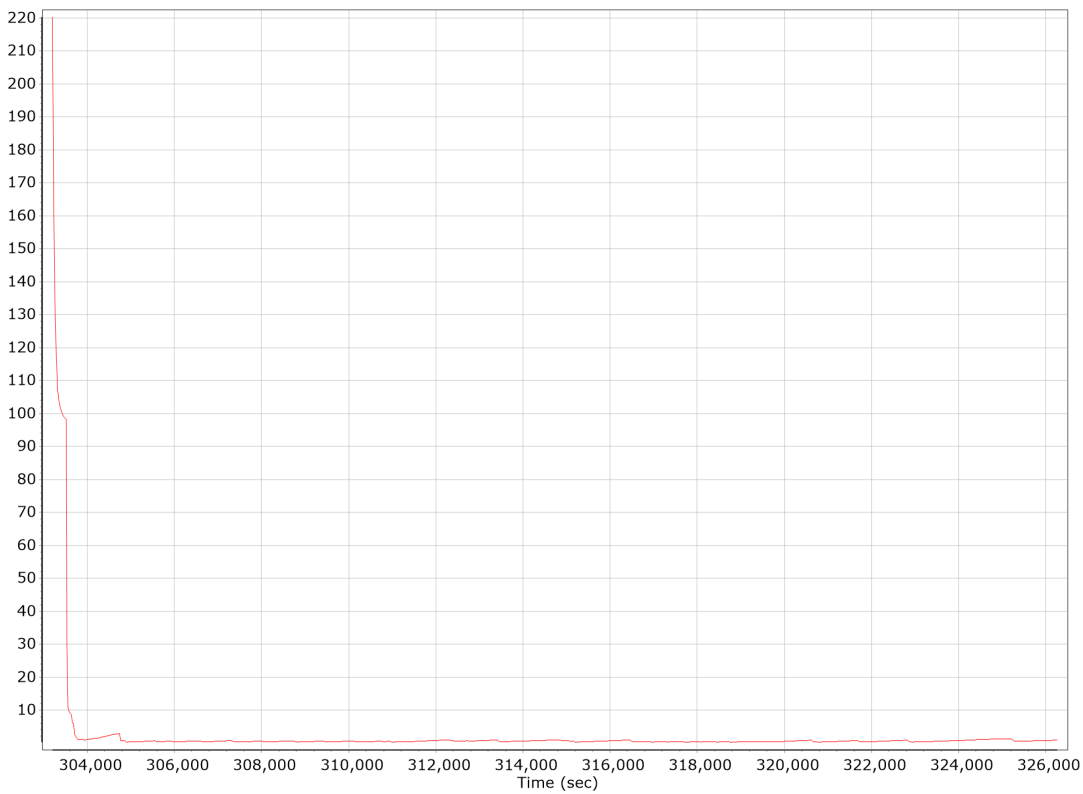
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

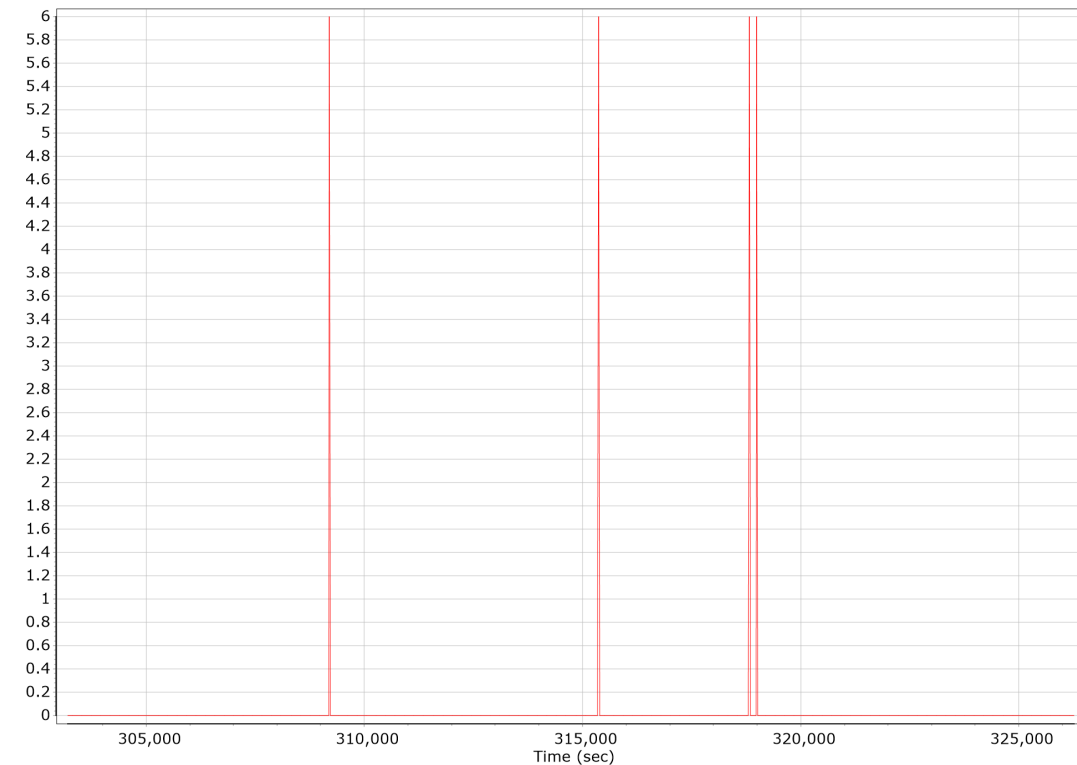


### Heading Error RMS (arc-min)



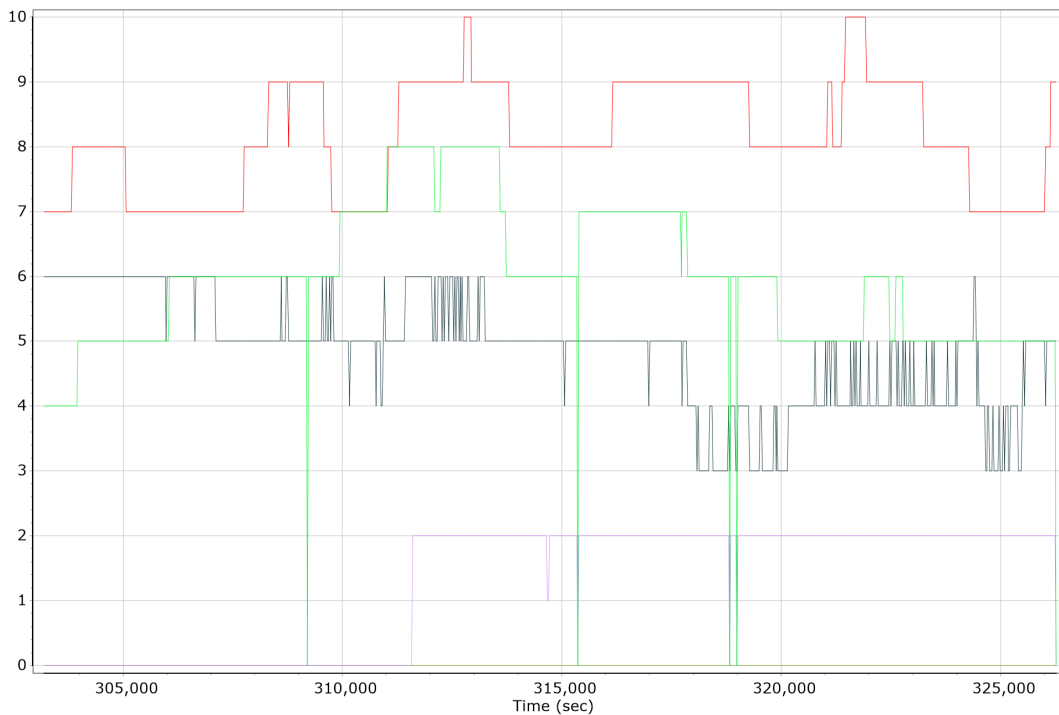
## Forward Processed Solution Status

### Processing Mode



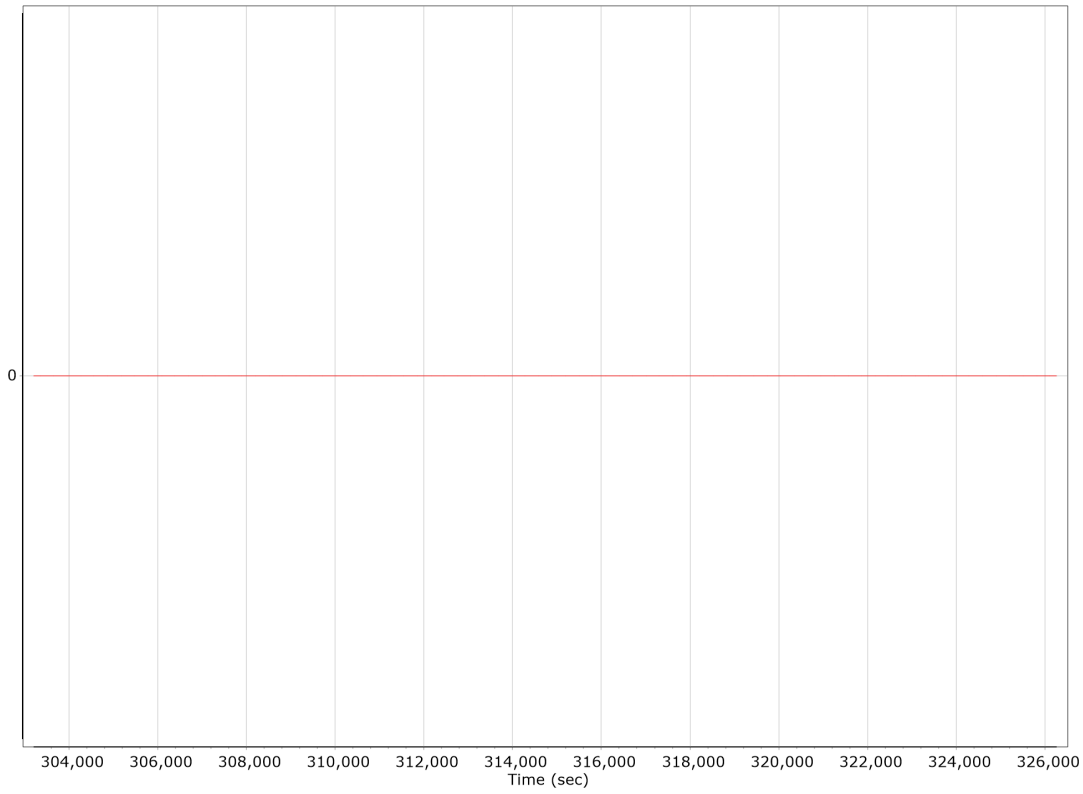
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

### 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	05042022A_3543
Processing date	2022-05-09 20:40:25
Mission date	2022-05-04 13:02:26
Mission duration	05:45:05.026
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
220504_130207_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_3543.out	SBET Trajectory File



## Rover Data Summary

First raw data file	220504_130207_INS-GPS_1.raw		
Last raw data file	220504_130207_INS-GPS_1.raw		
Start GPS week	2208		
Start time	306127.089 (5/4/2022 1:02:07 PM)		
End time	326832.115 (5/4/2022 6:47:12 PM)		
Start of fine alignment	306323.141 (5/4/2022 1:05:23 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
<b>IMU Installation Lever Arms &amp; Mounting Angles</b>			
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

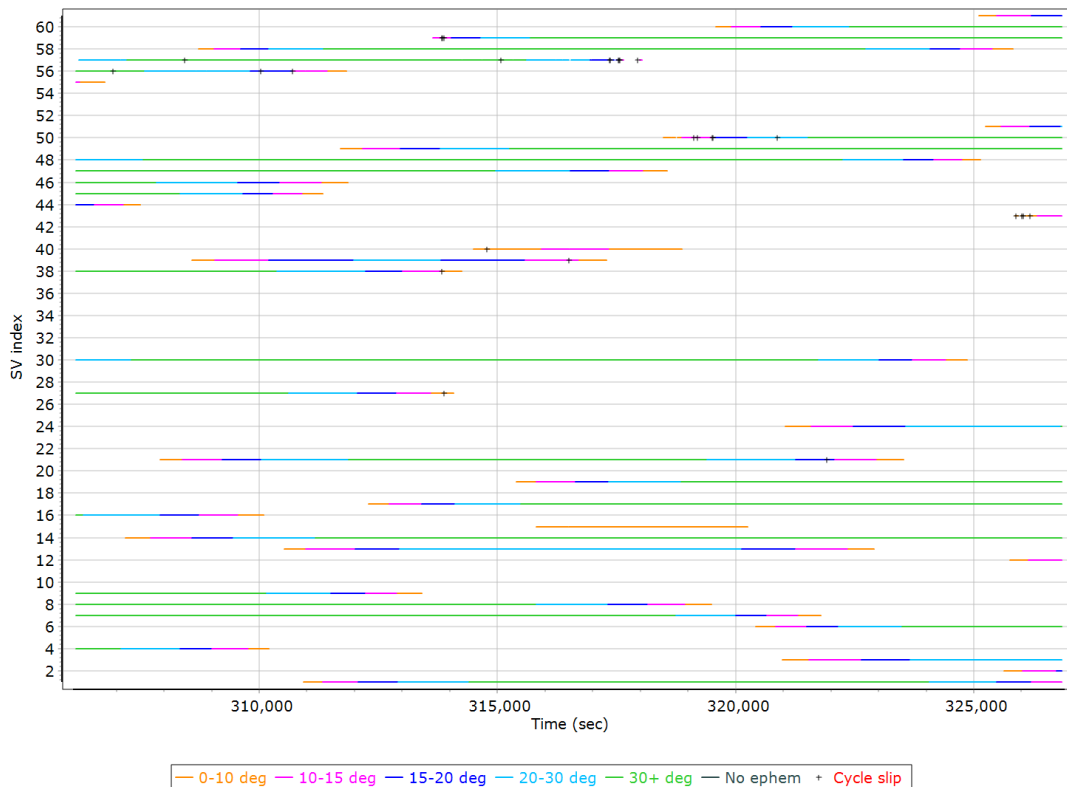
## Rover Data QC

### Raw IMU Import QC Summary

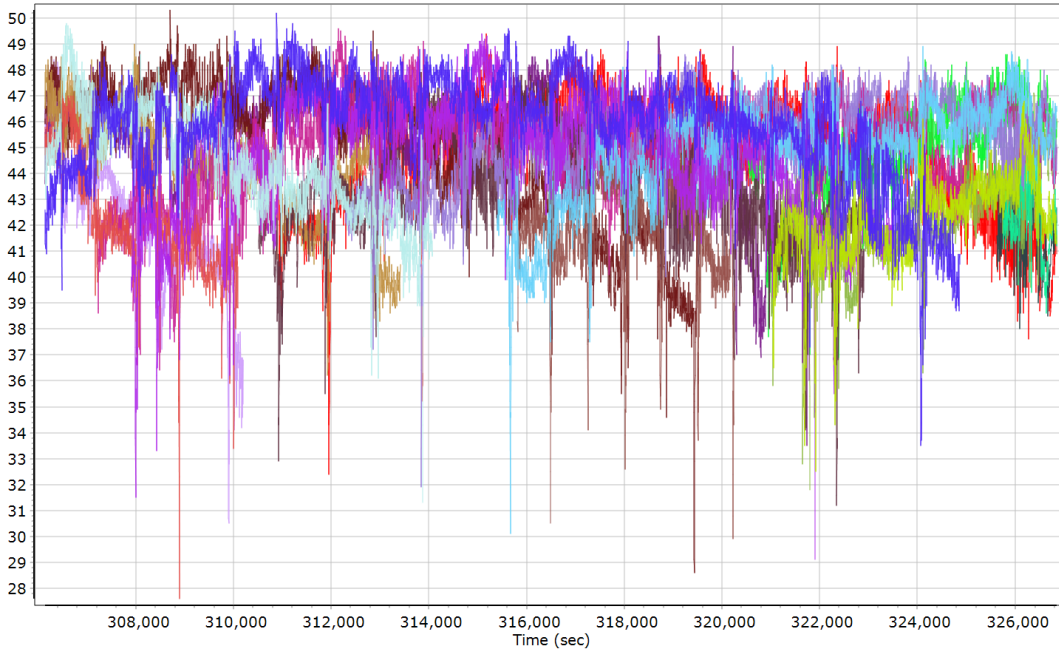
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05042022A_3543.log
IMU Records Processed	4140828
Termination Status	Normal
IMU Anomalies	0

## Primary Observables & Satellite Data

### GPS/GLONASS L1 Satellite Lock/Elevation

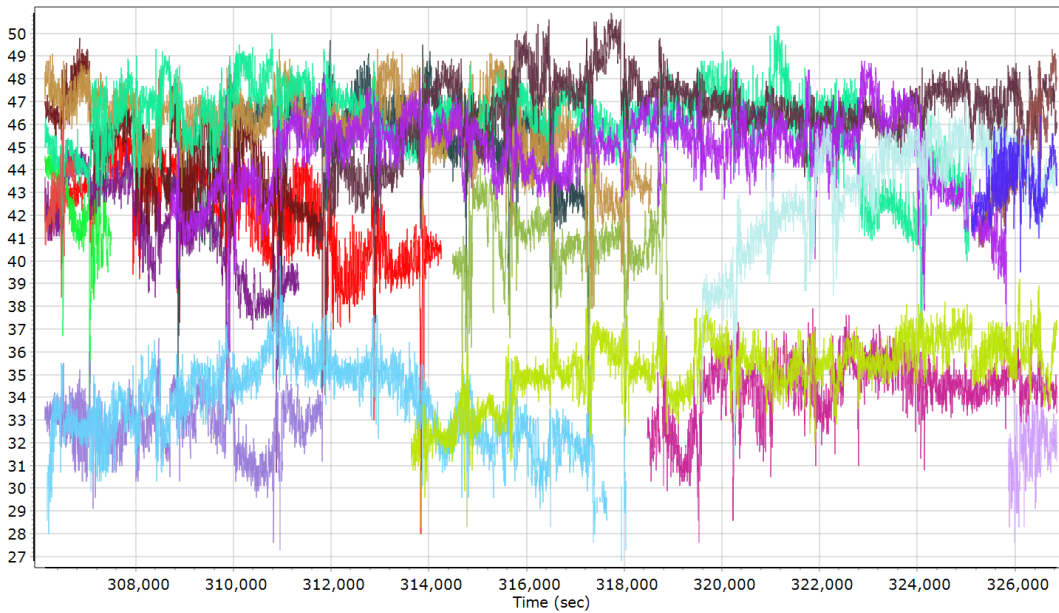


### GPS L1 SNR



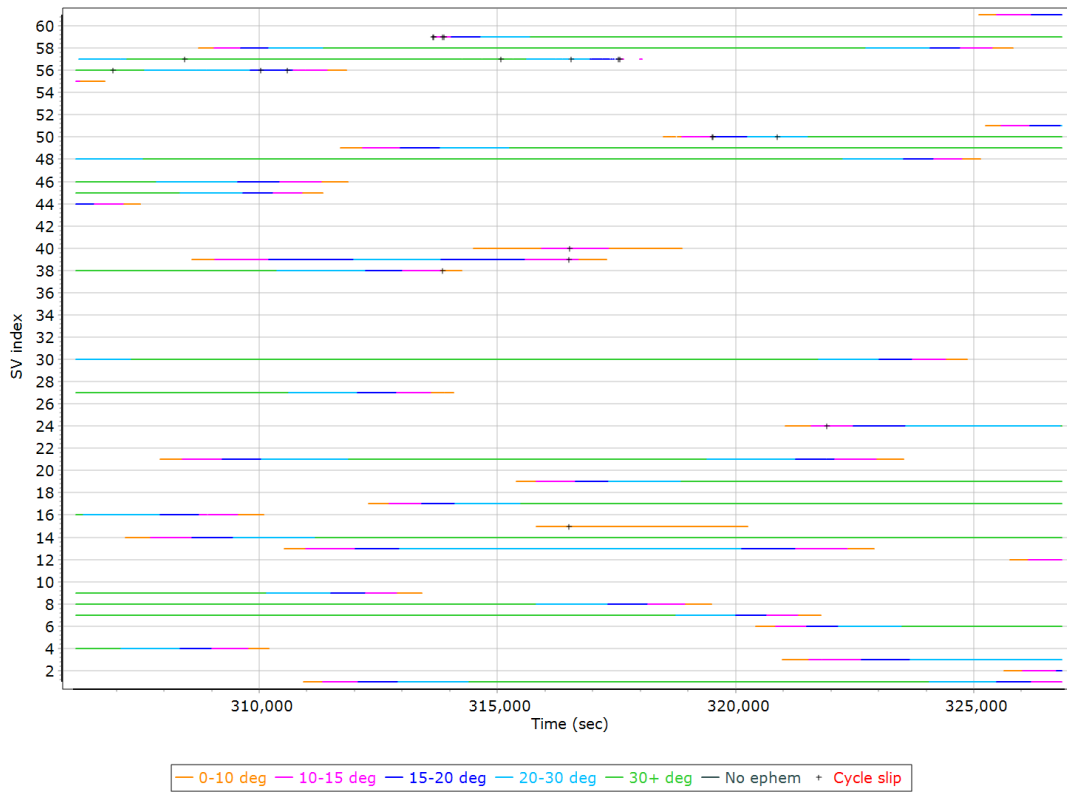
- |                           |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|---------------------------|
| GPS PRN 01 L1 SNR (dB/Hz) | GPS PRN 02 L1 SNR (dB/Hz) | GPS PRN 03 L1 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

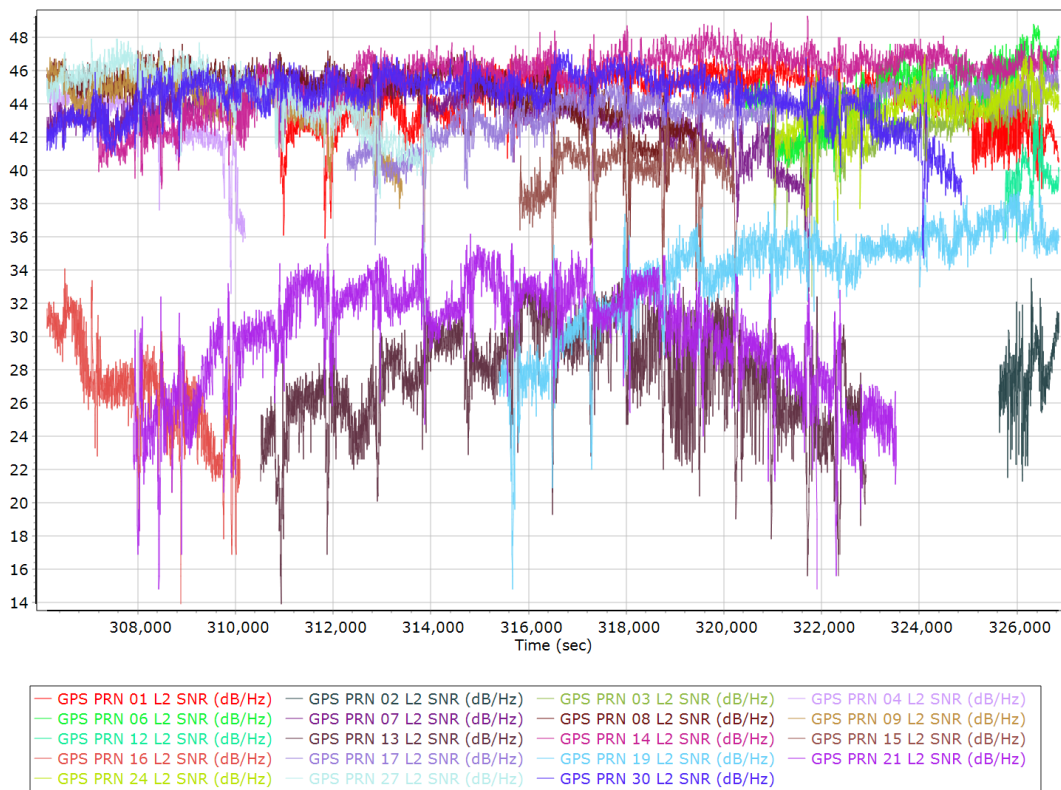


- |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| GLONASS 01 L1 SNR (dB/Hz) | GLONASS 02 L1 SNR (dB/Hz) | GLONASS 03 L1 SNR (dB/Hz) |
| GLONASS 06 L1 SNR (dB/Hz) | GLONASS 07 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) |                           |                           |

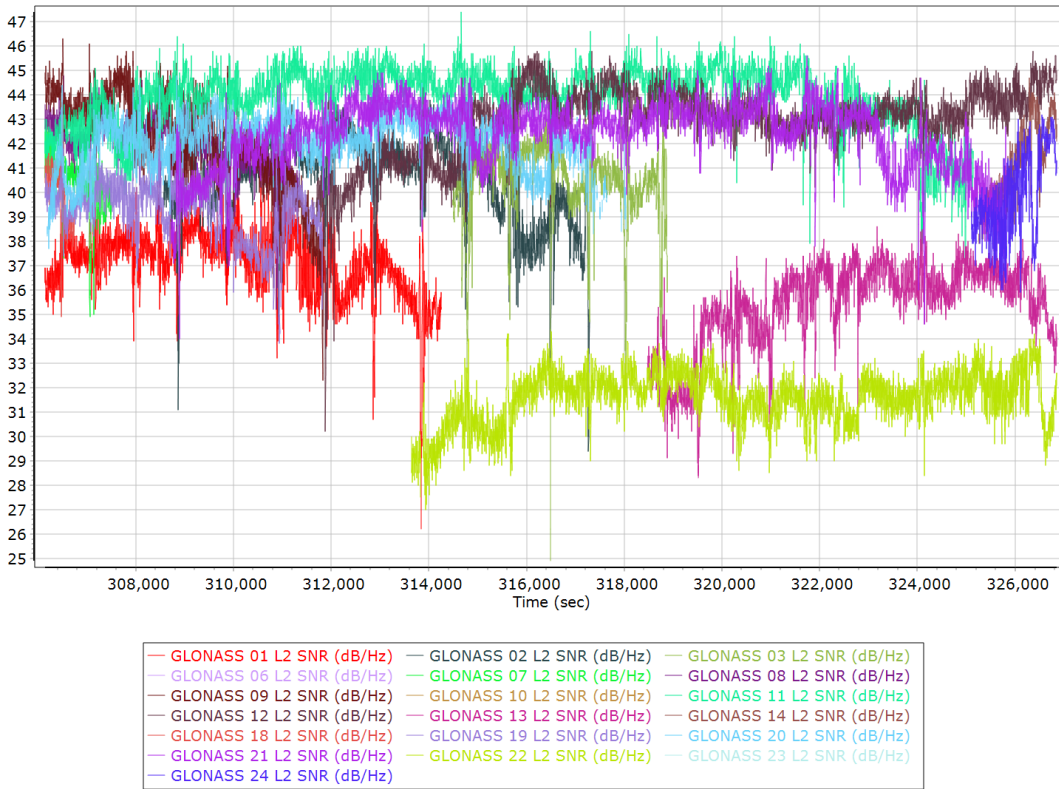
### GPS/GLONASS L2 Satellite Lock/Elevation



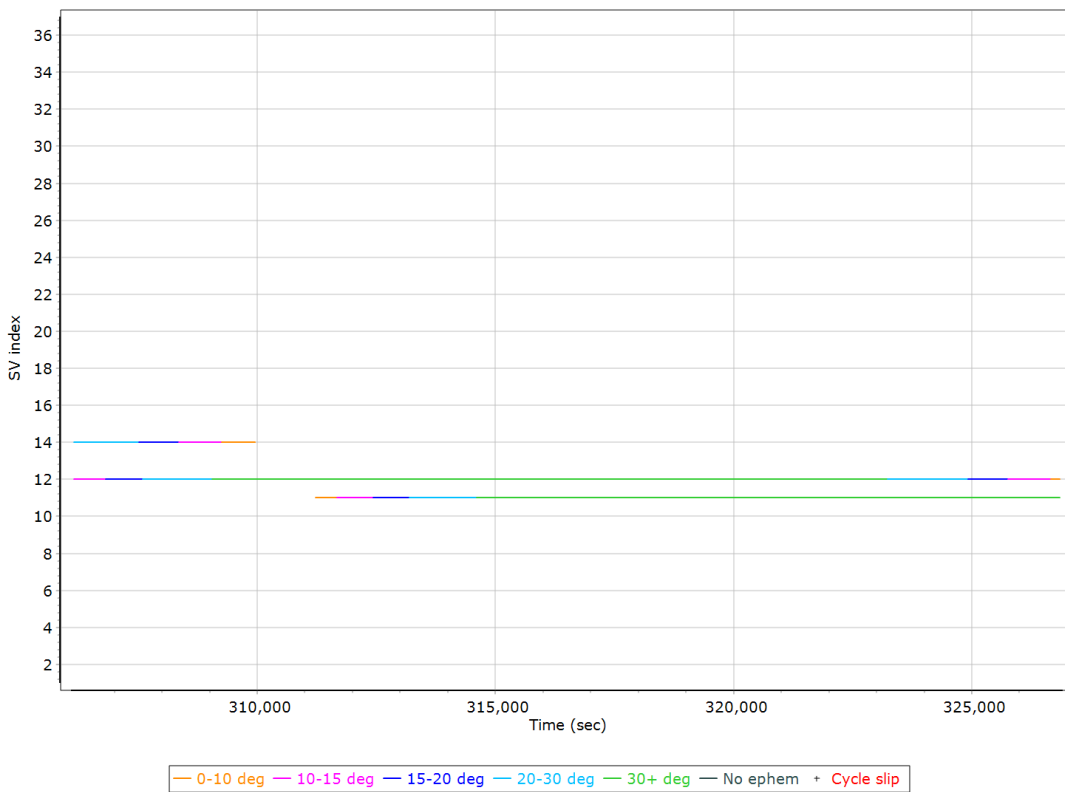
### GPS L2 SNR



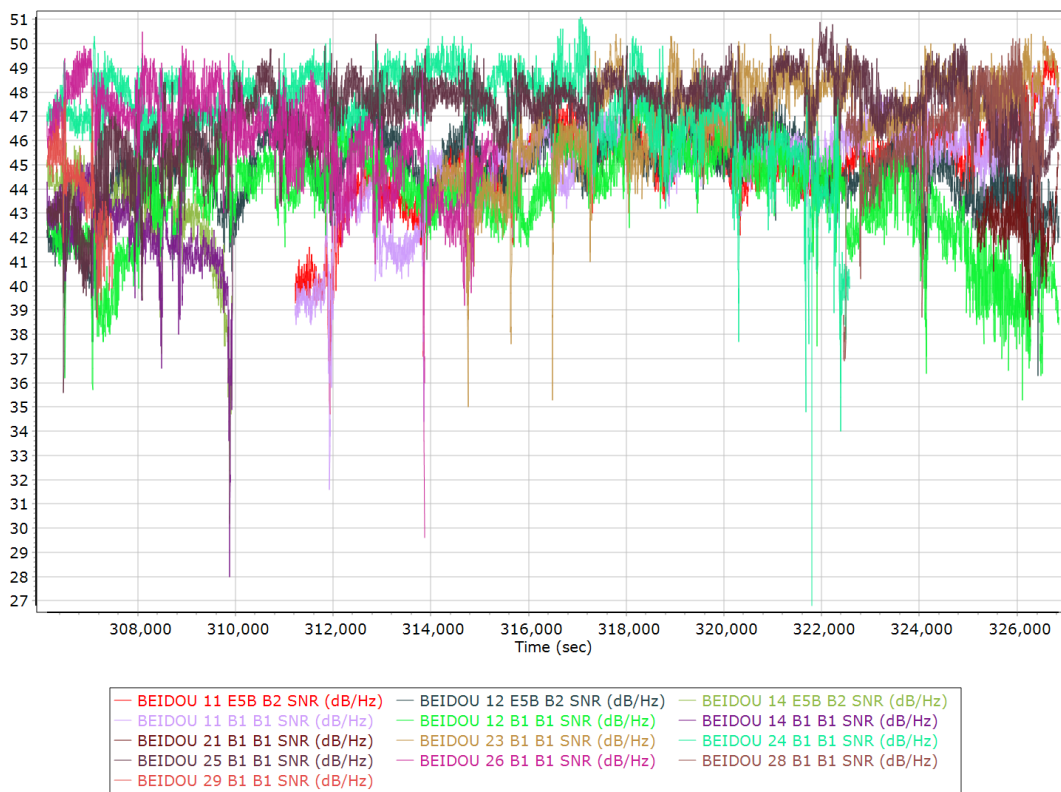
### GLONASS L2 SNR



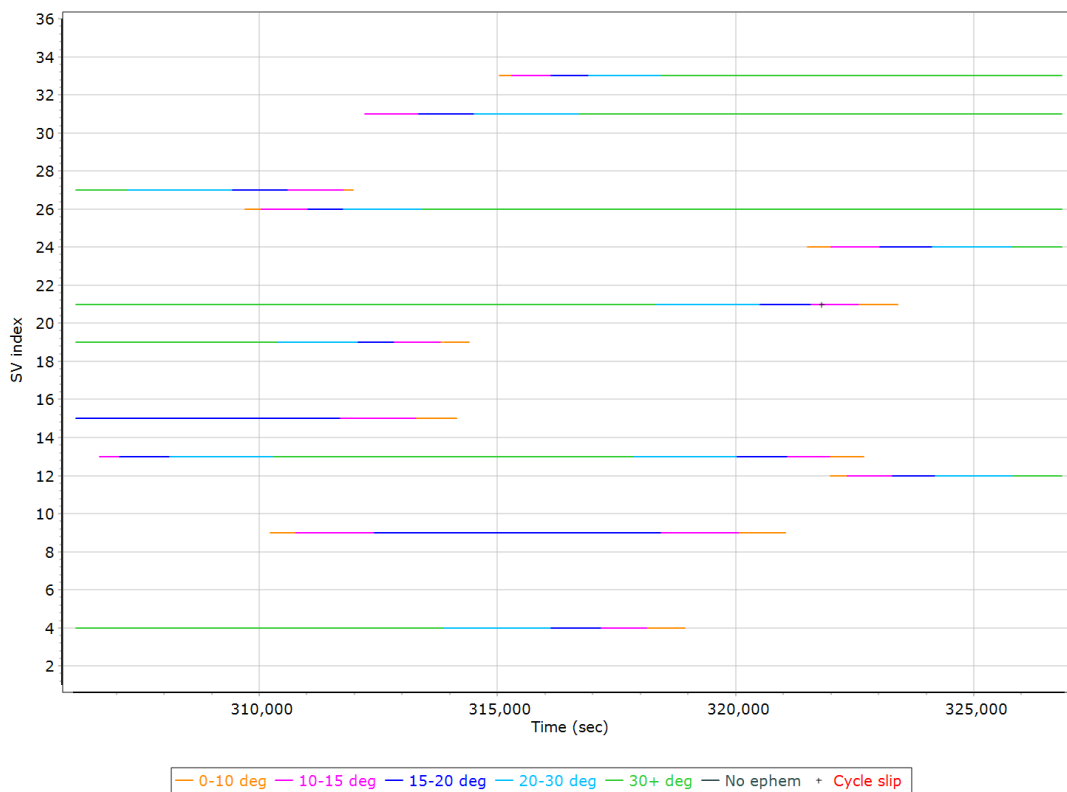
### BEIDOU Satellite Lock/Elevation



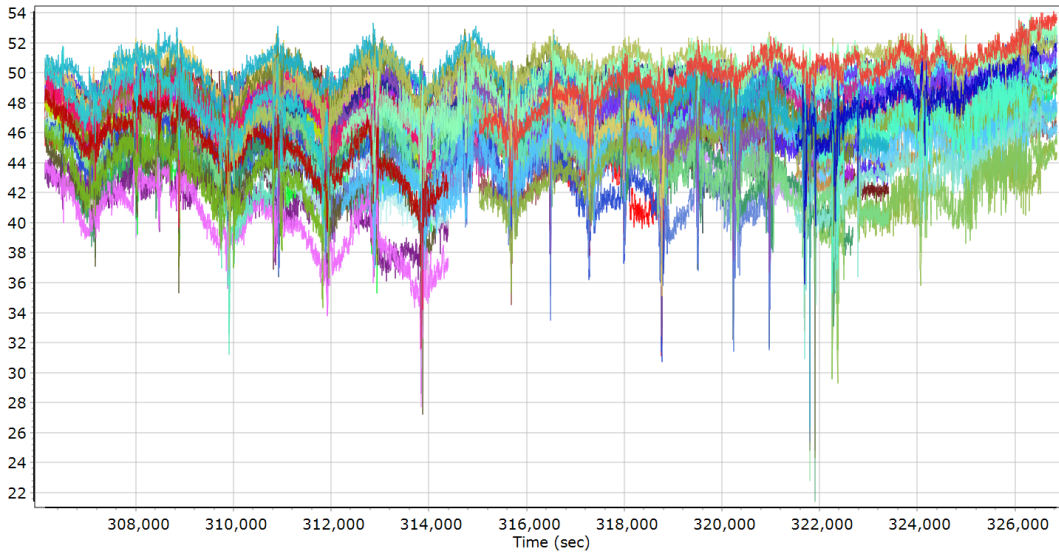
### BEIDOU SNR



### GALILEO Satellite Lock/Elevation



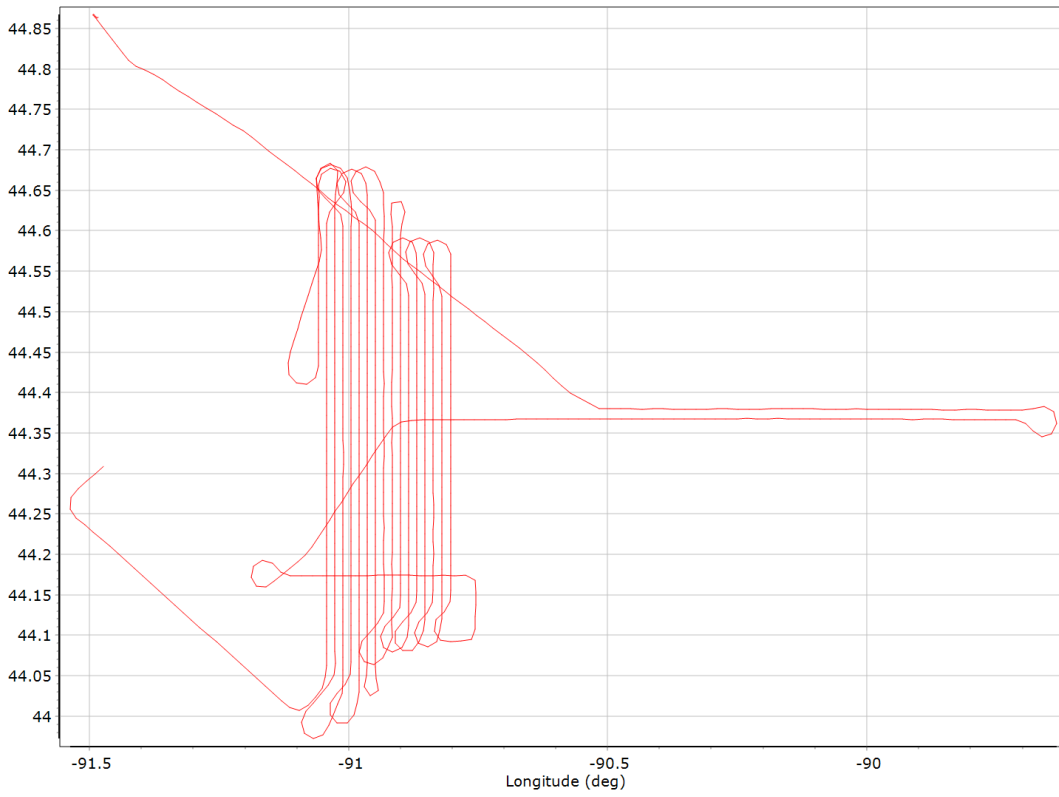
## GALILEO SNR



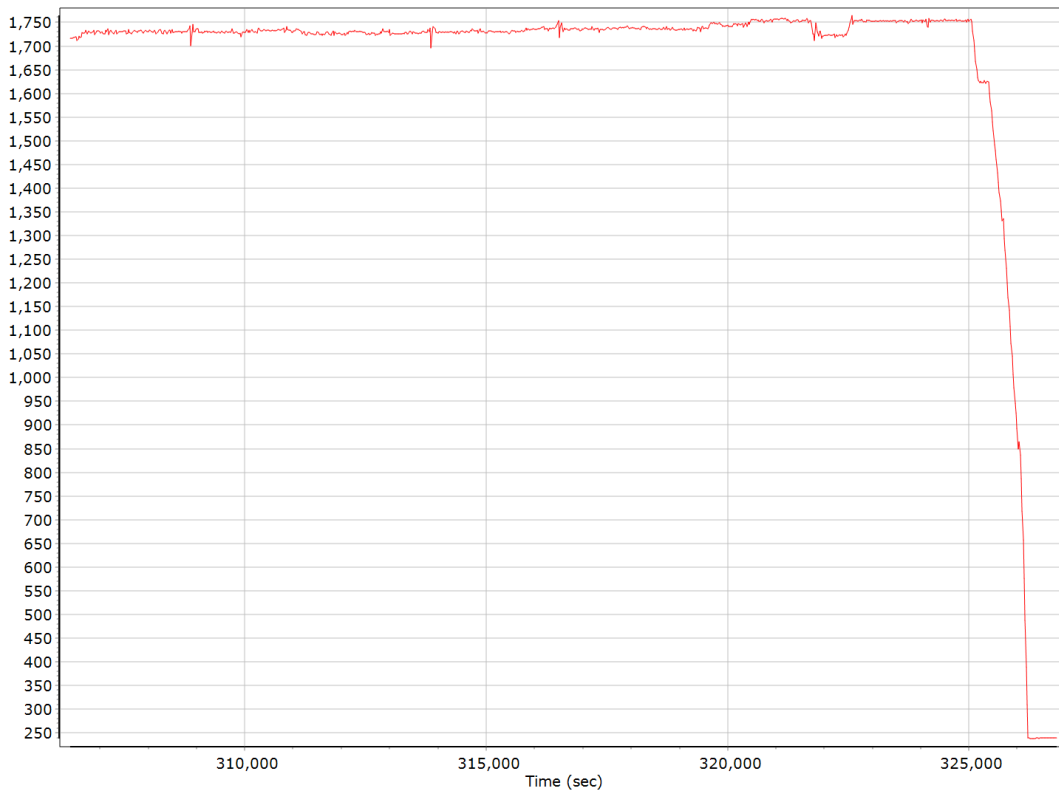
— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 09 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— 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 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

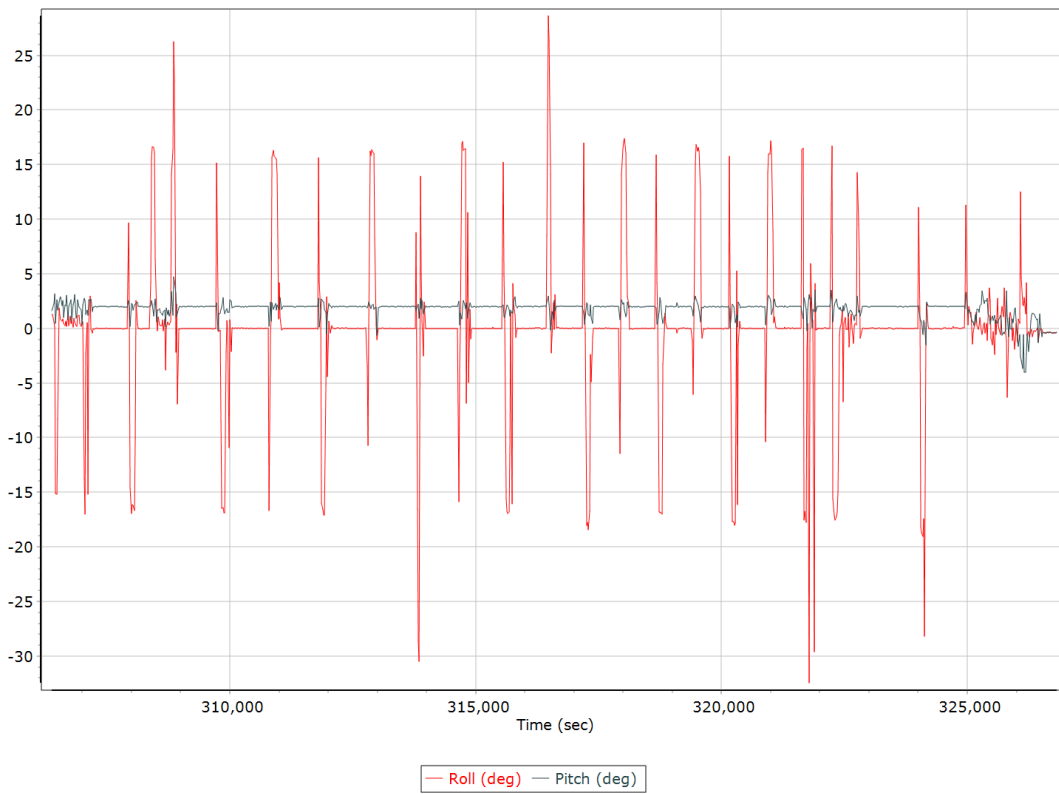


### Altitude

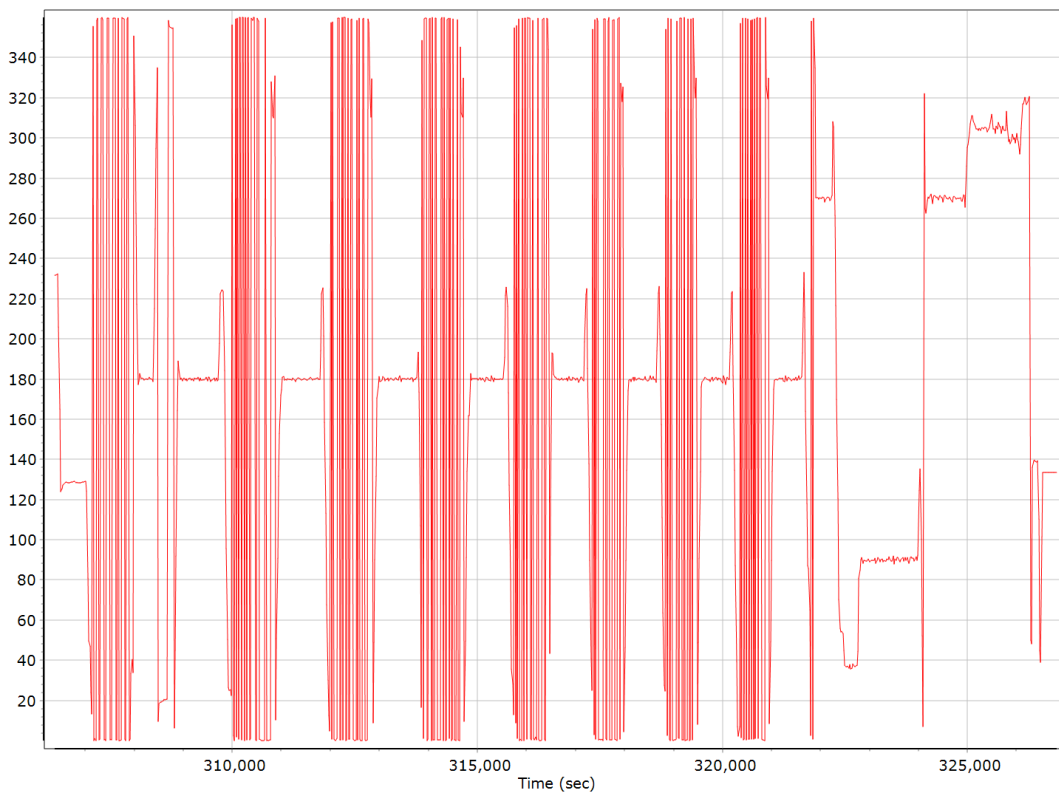




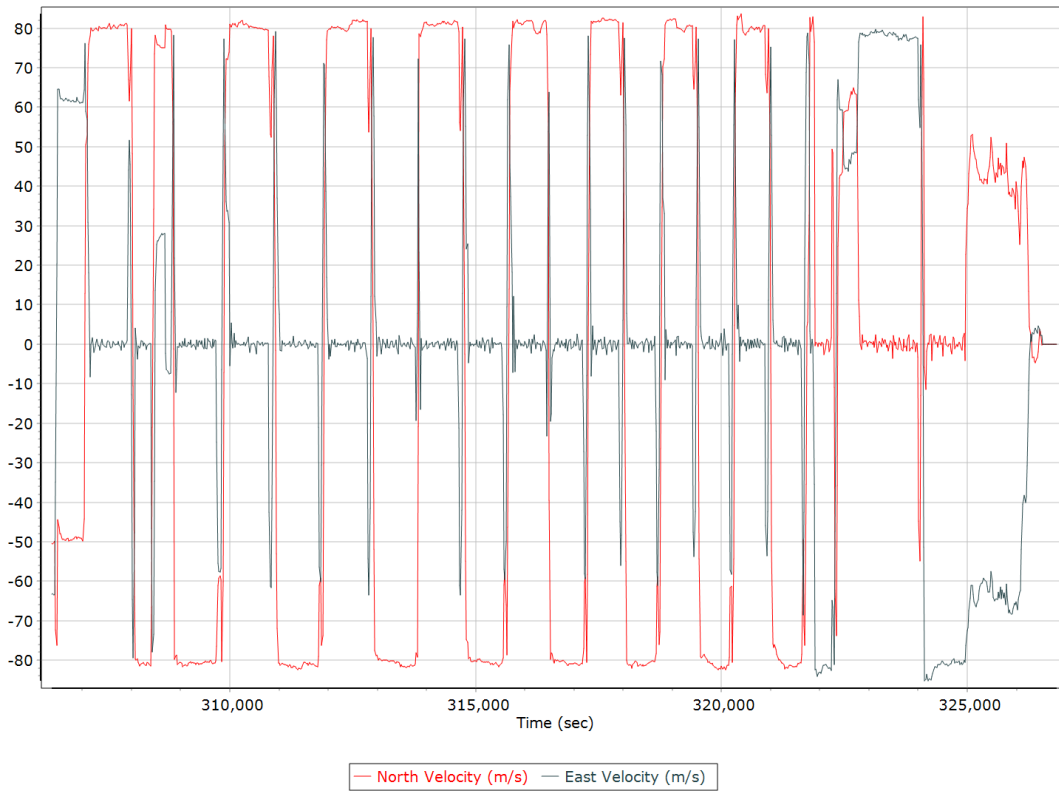
## Roll/Pitch



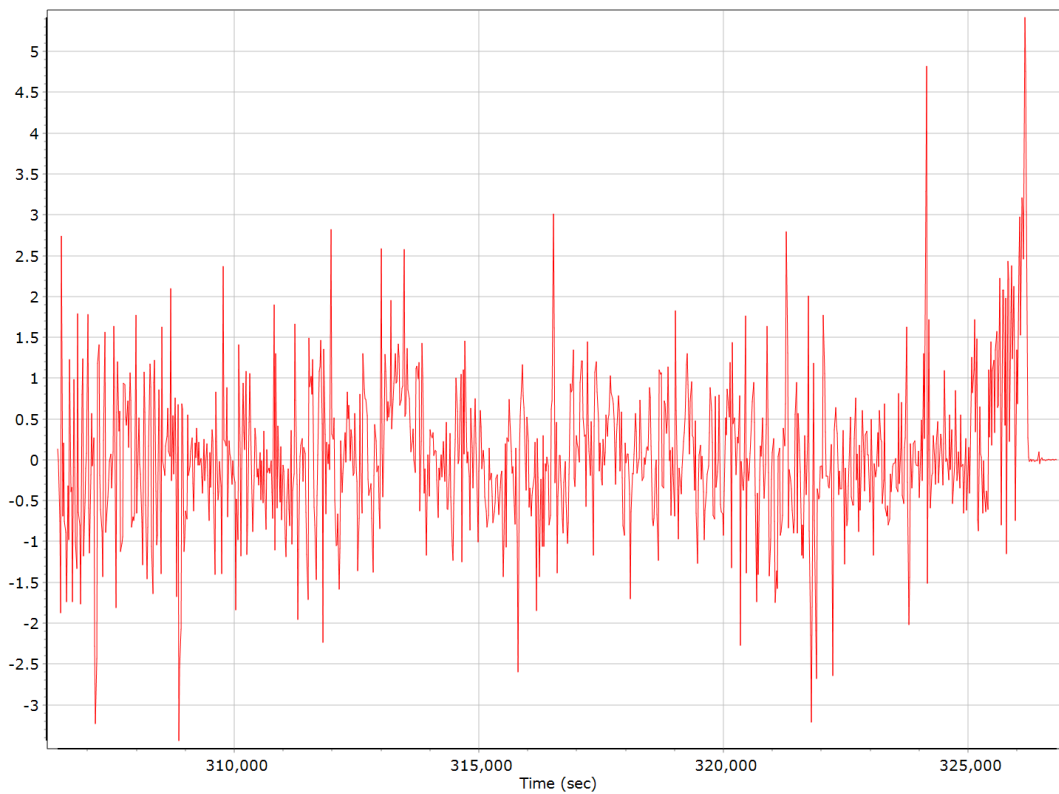
## Heading



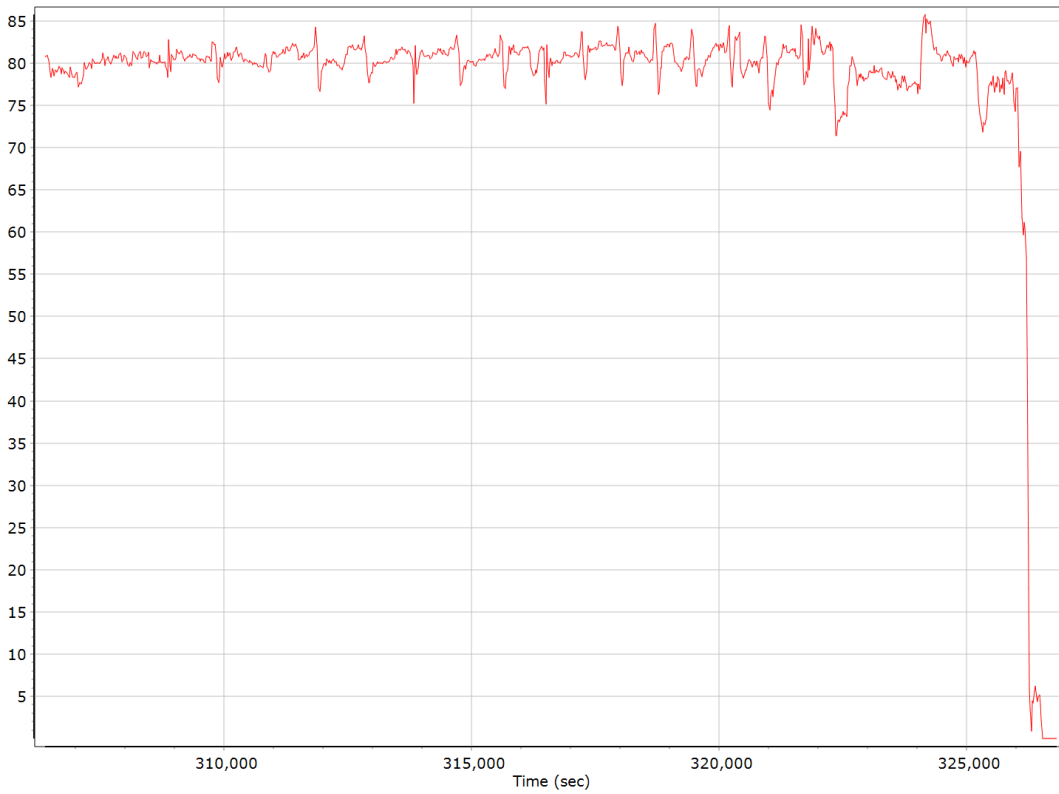
## North/East Velocity



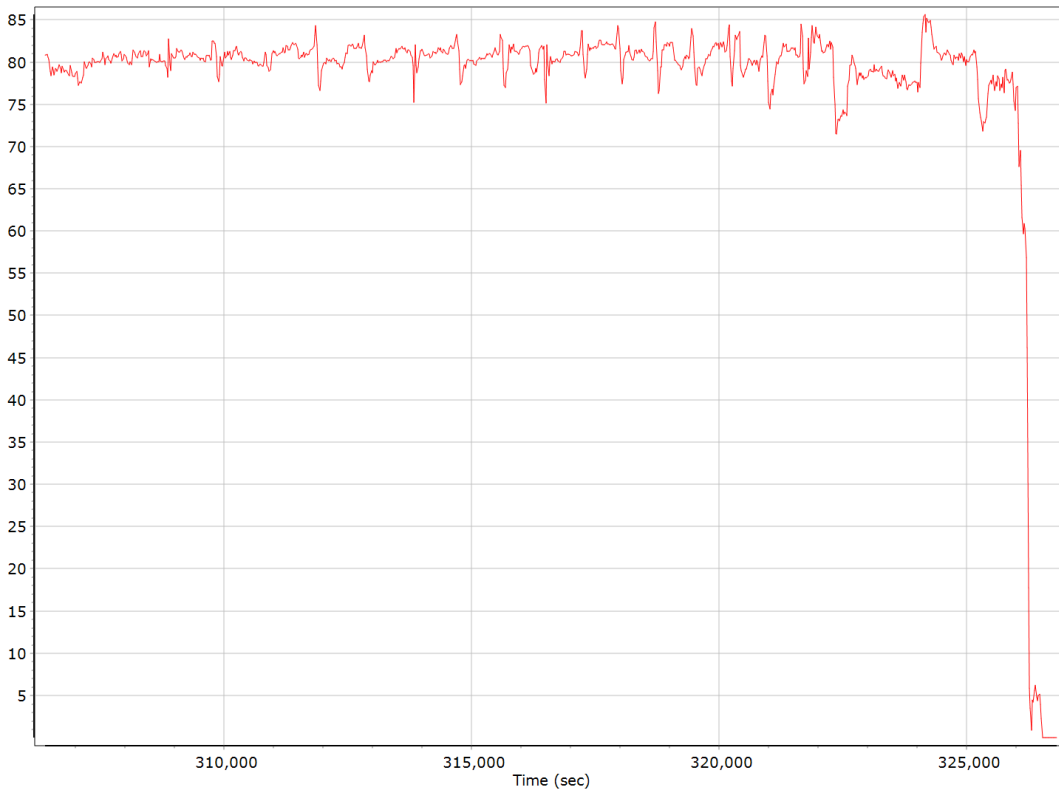
## Down Velocity



## Total Speed



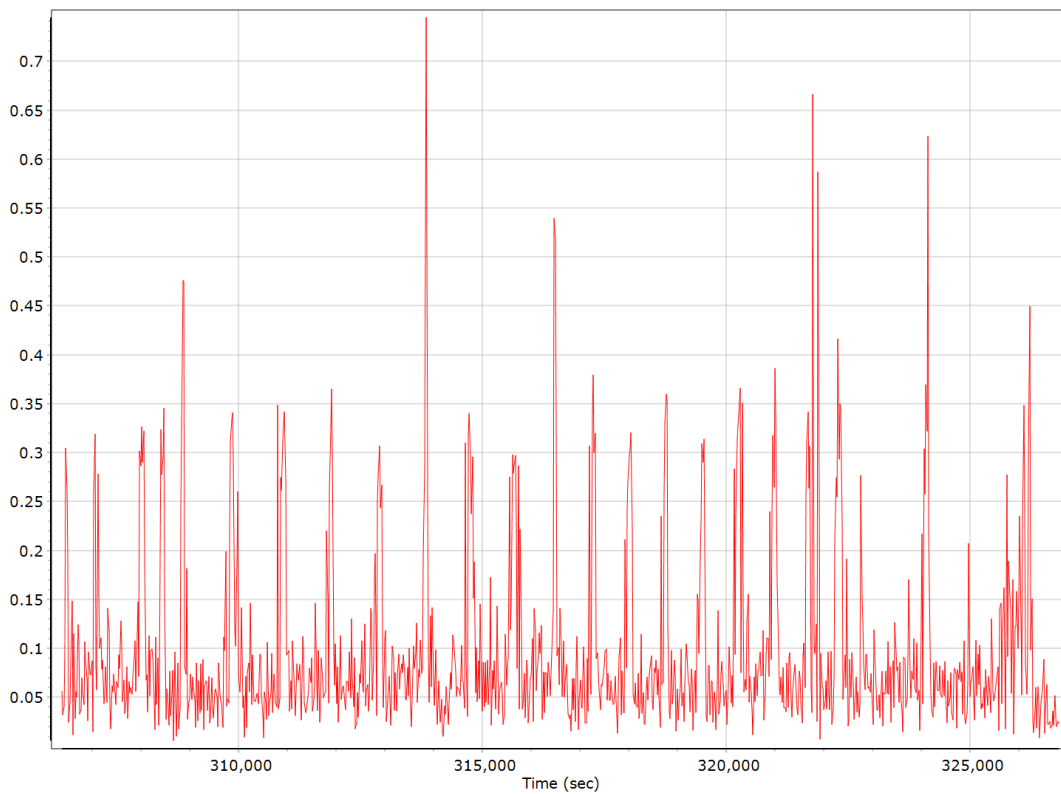
## Ground Speed



## Body Acceleration



## Total Body Acceleration

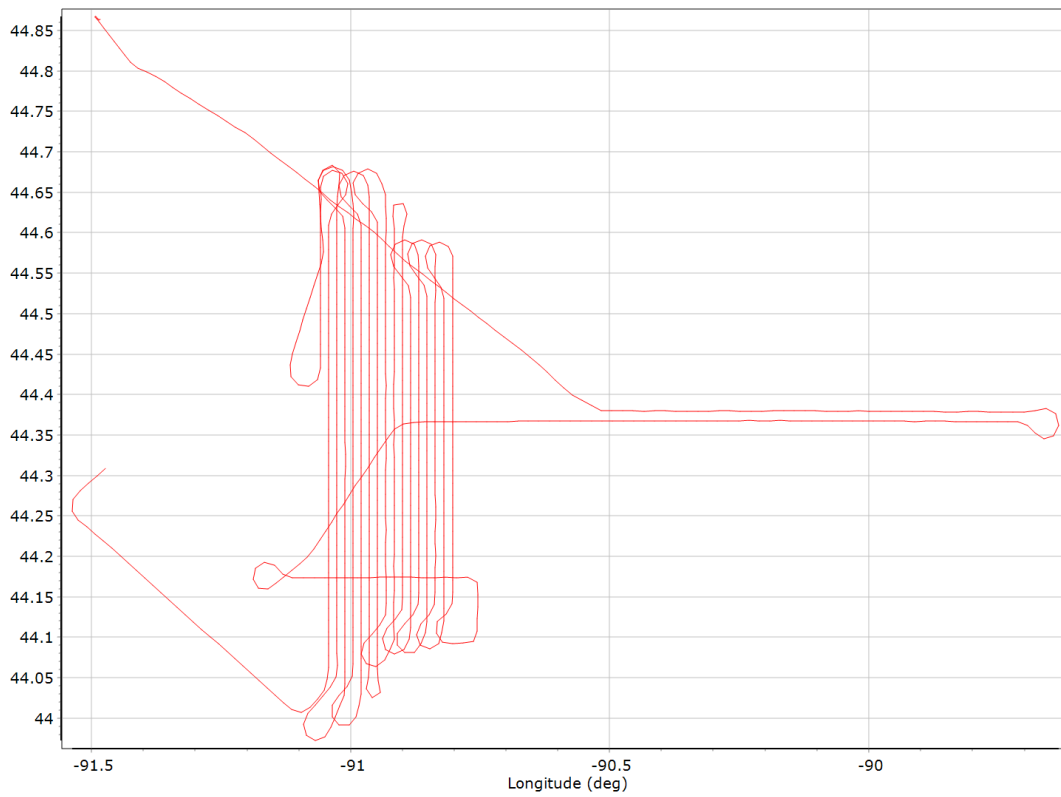


## Body Angular Rate

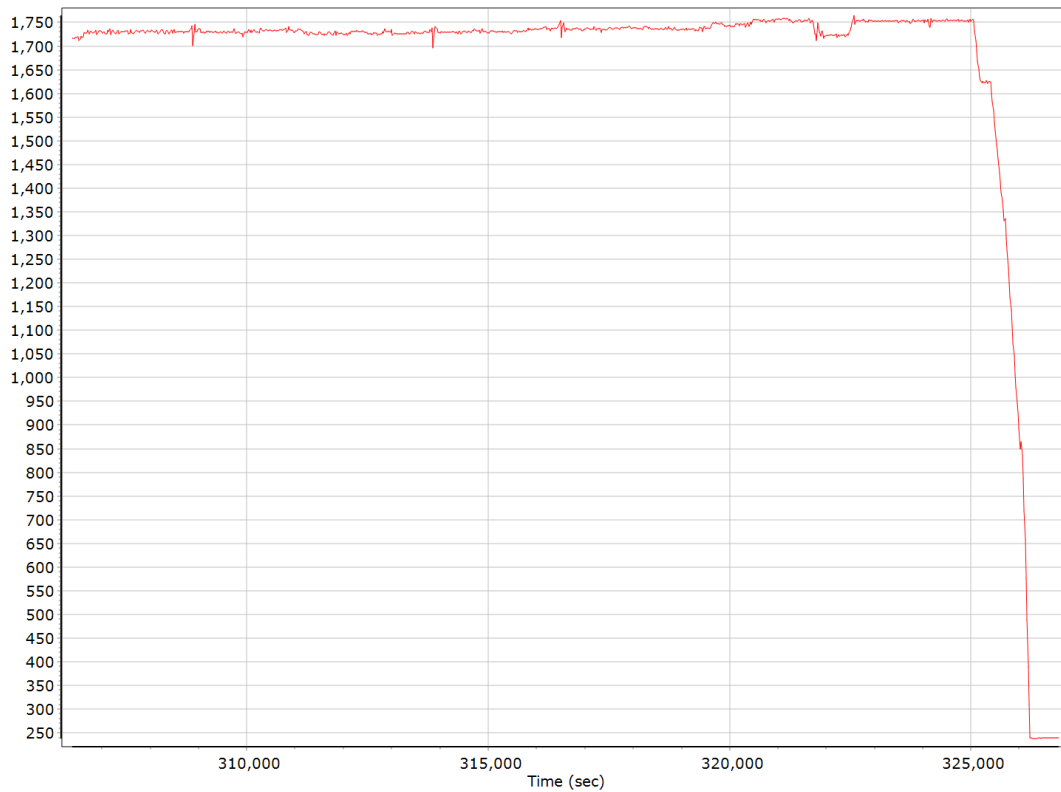


## Forward Processed Trajectory Information

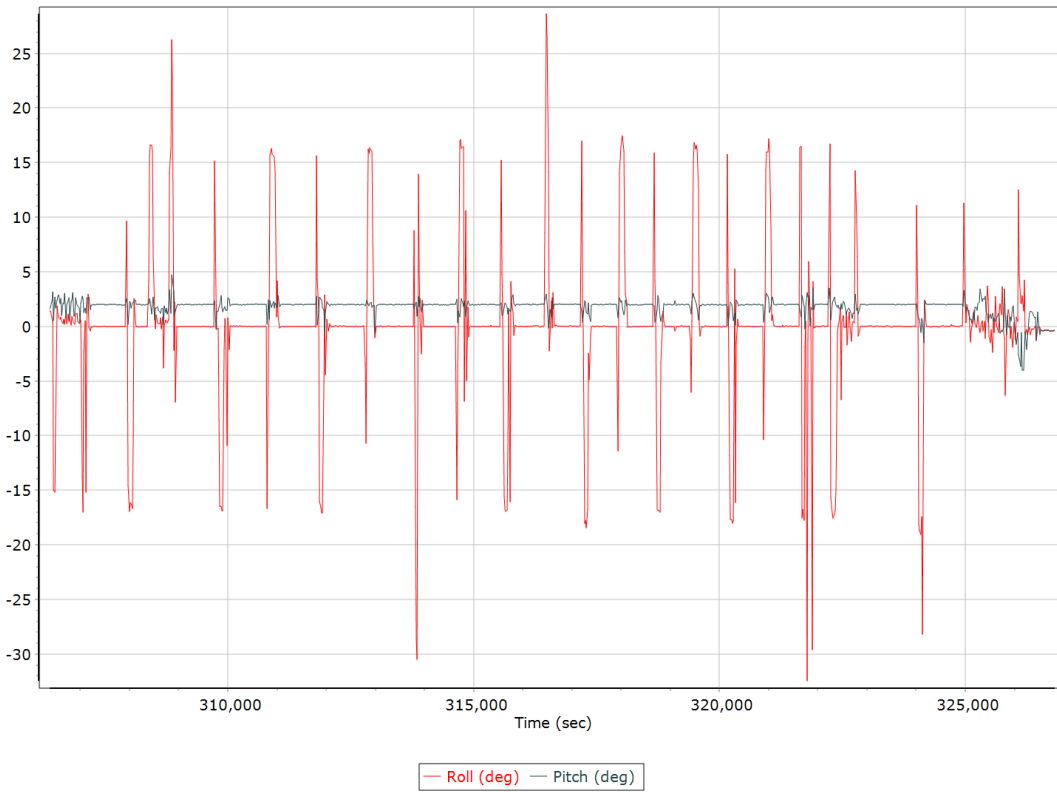
### Top View



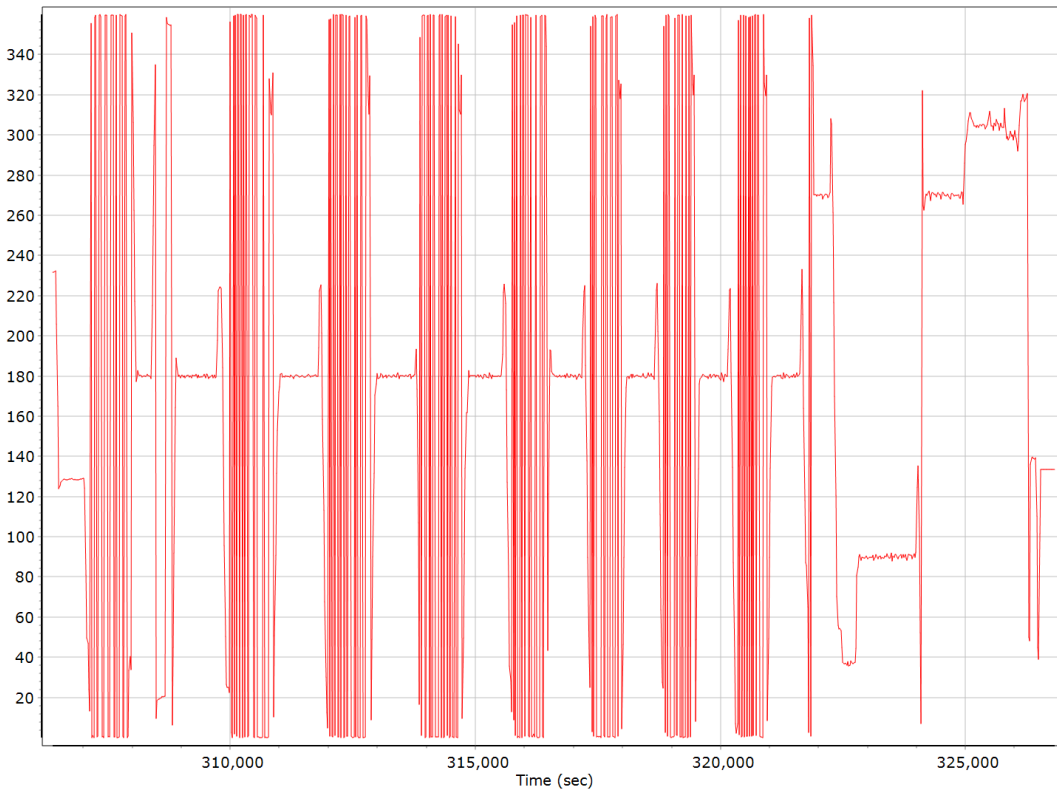
### Altitude



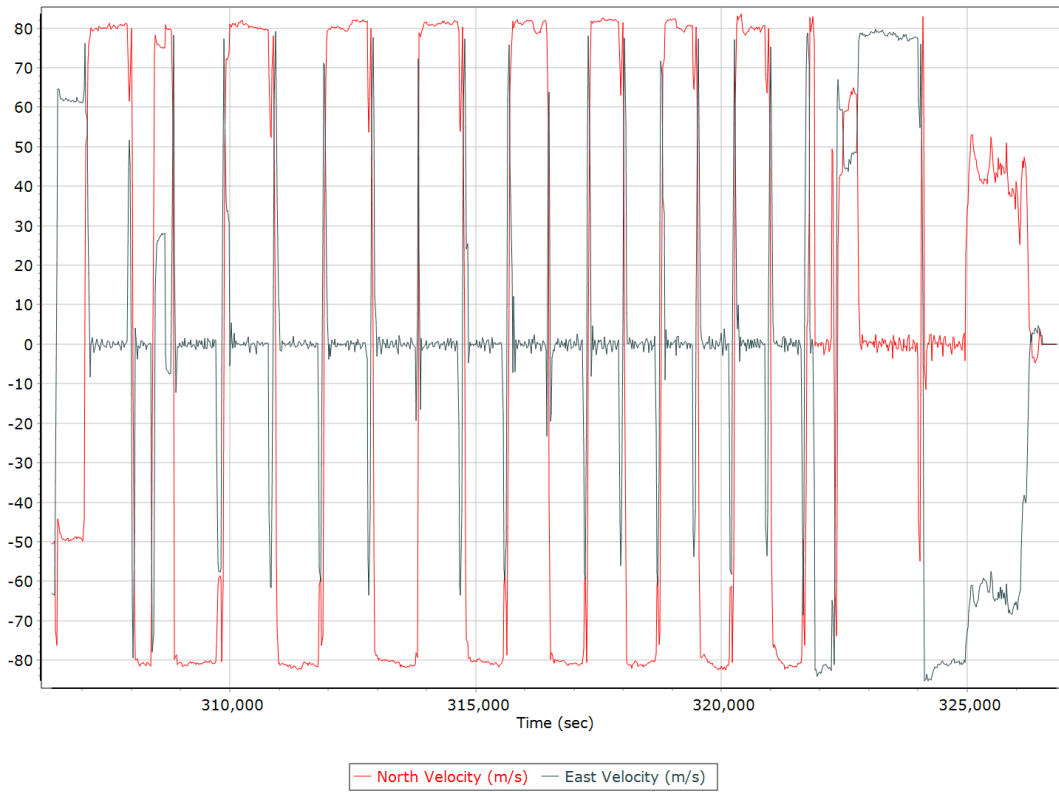
## Roll/Pitch



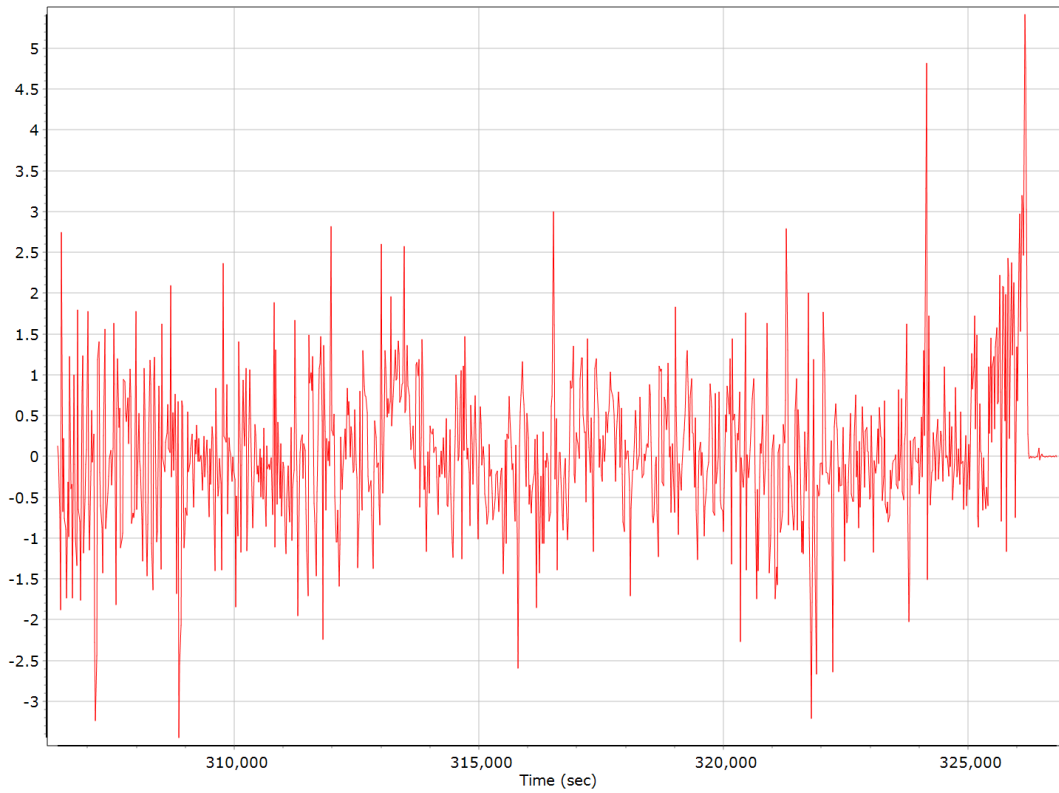
## Heading



## North/East Velocity

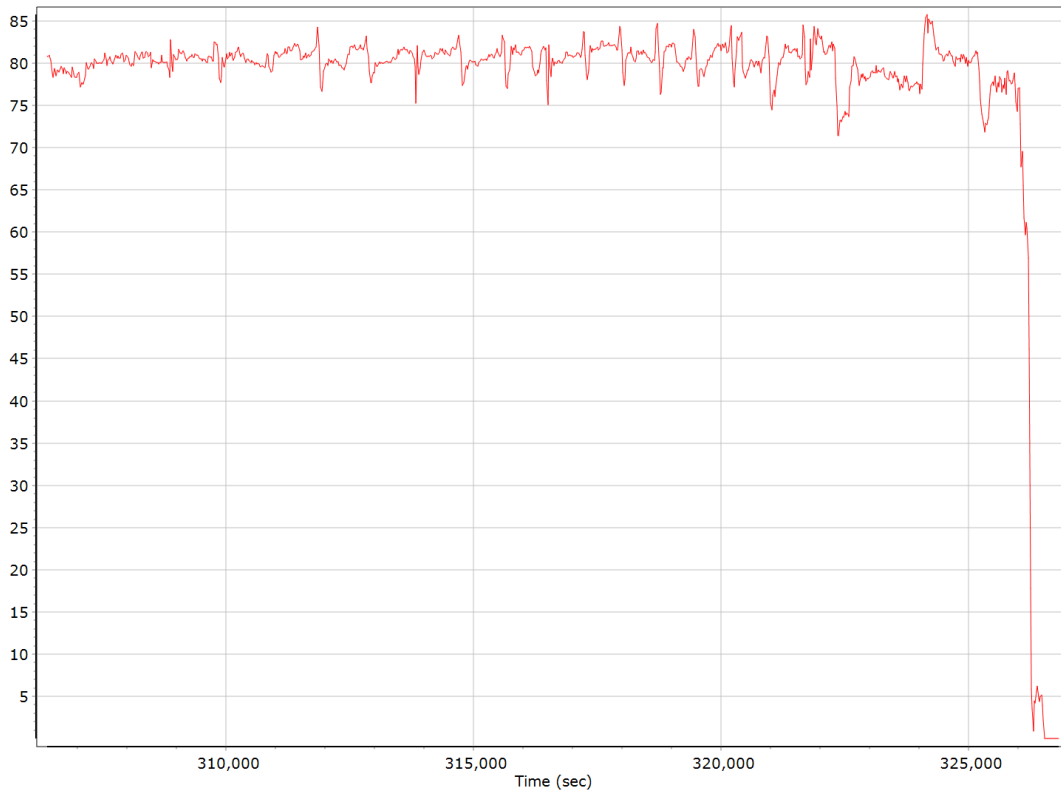


## Down Velocity

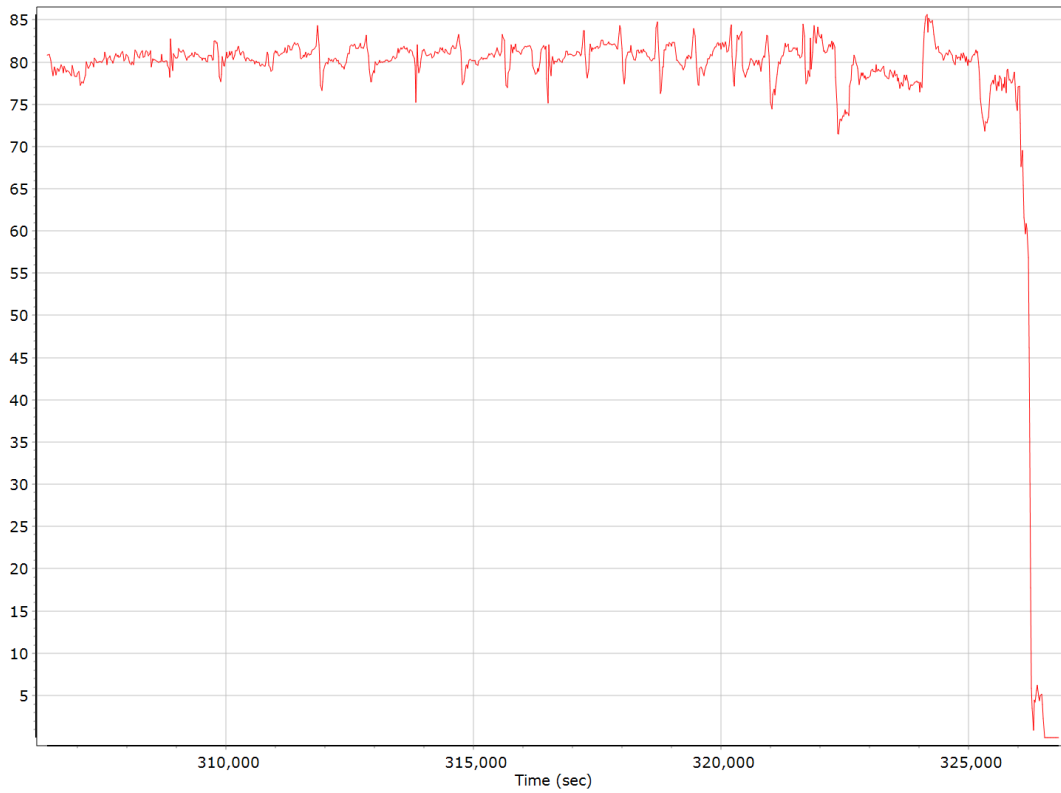




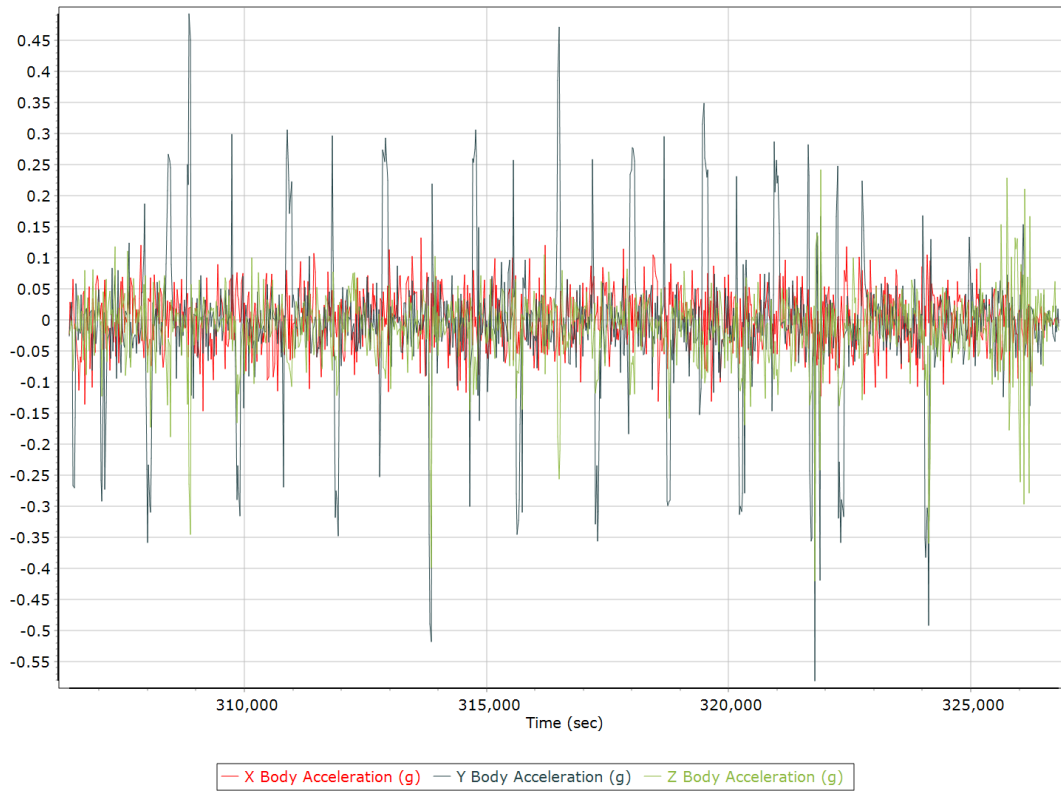
## Total Speed



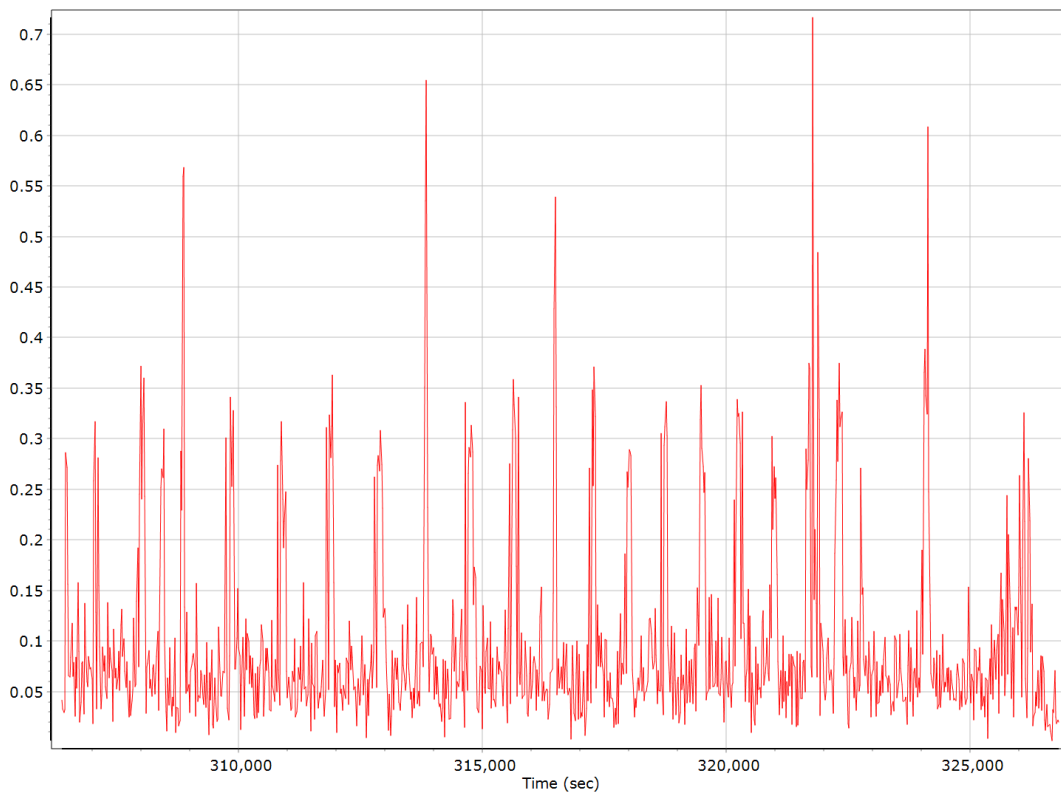
## Ground Speed



## Body Acceleration



## Total Body Acceleration



## Body Angular Rate

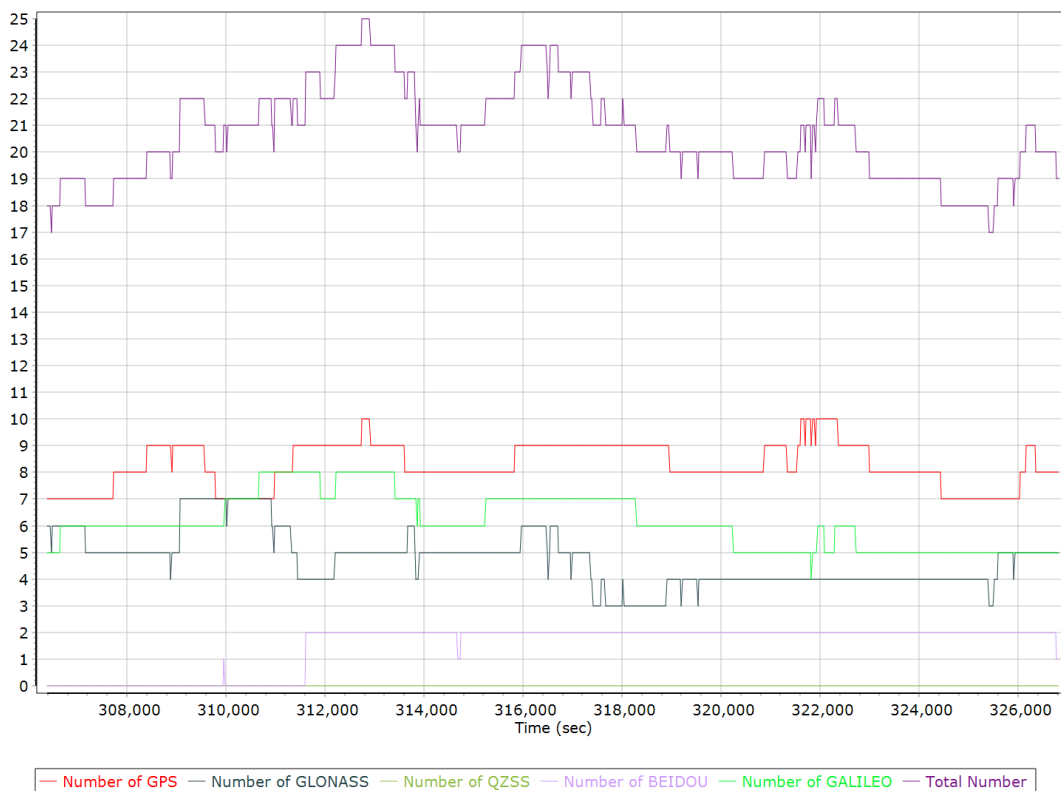


## GNSS QC

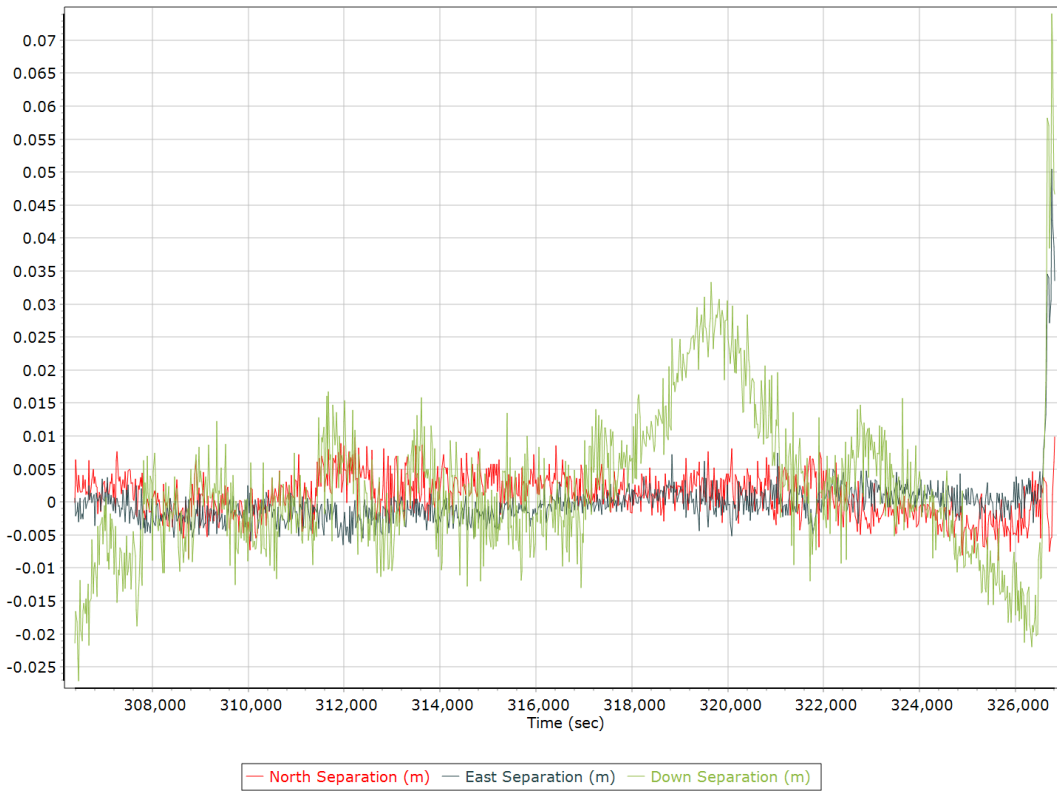
### GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	10	8
Number of GLONASS SV	3	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	17	25	21
PDOP	0.96	1.60	1.24
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	20702.00	0.00	0.00
Percentage	100.00	0.00	0.00

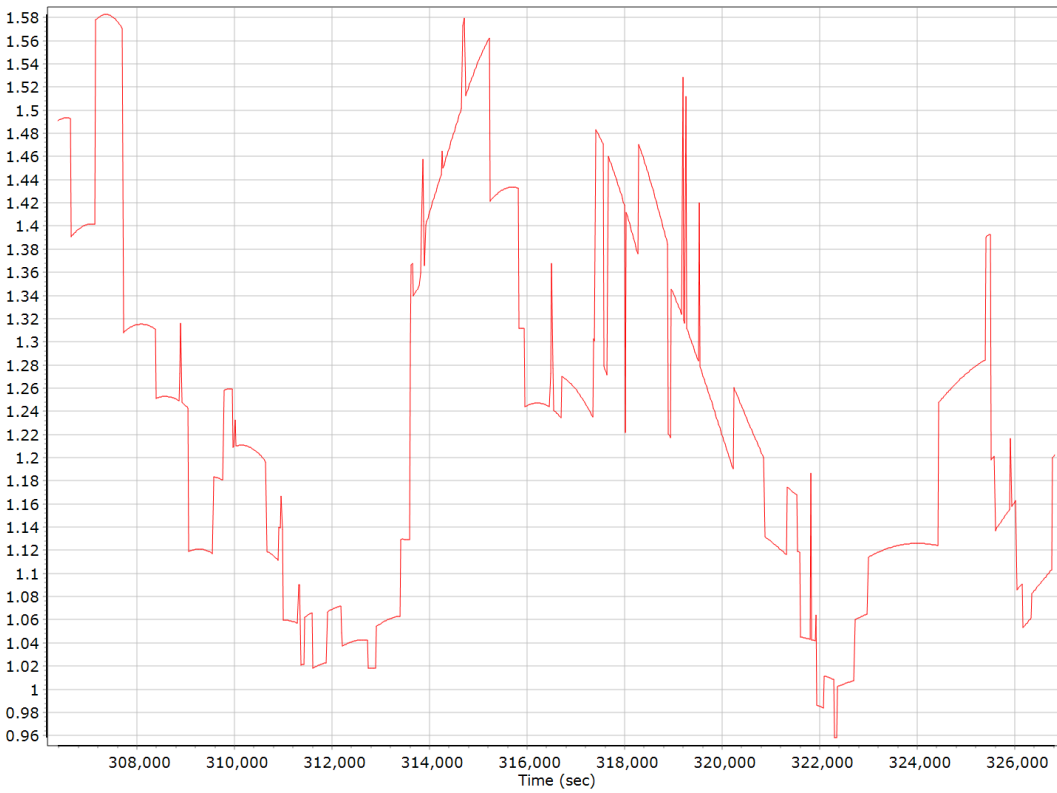
### Num SVs in solution



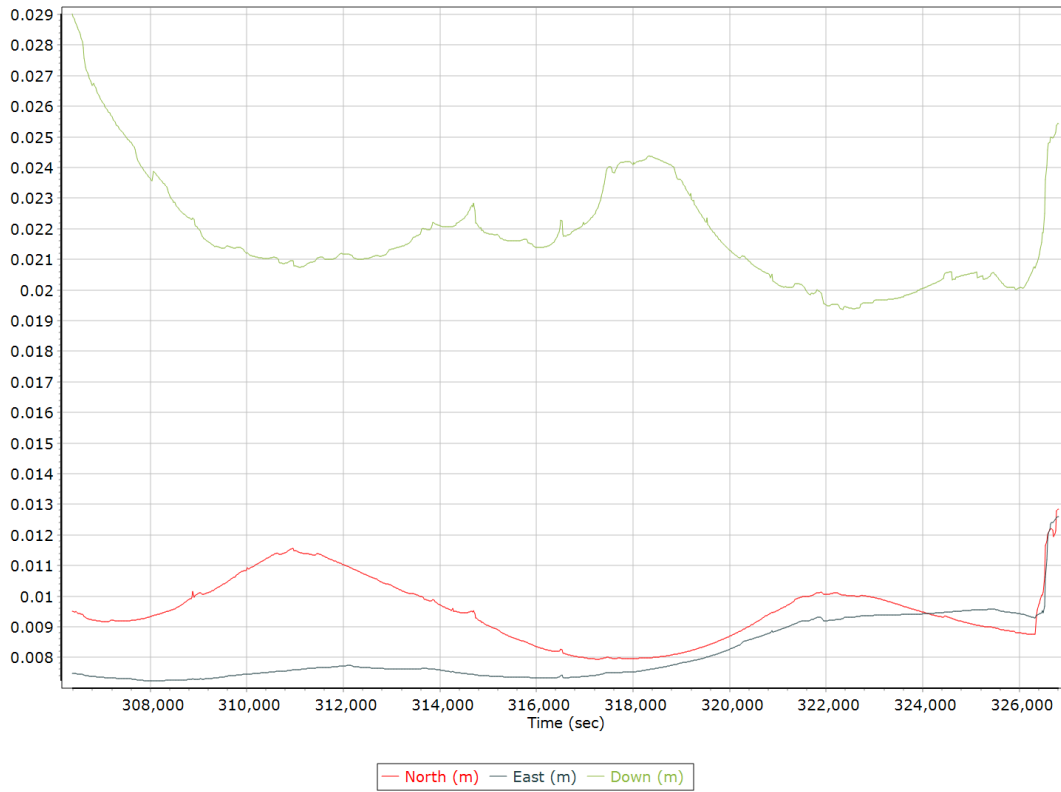
## Forward/Reverse Separation



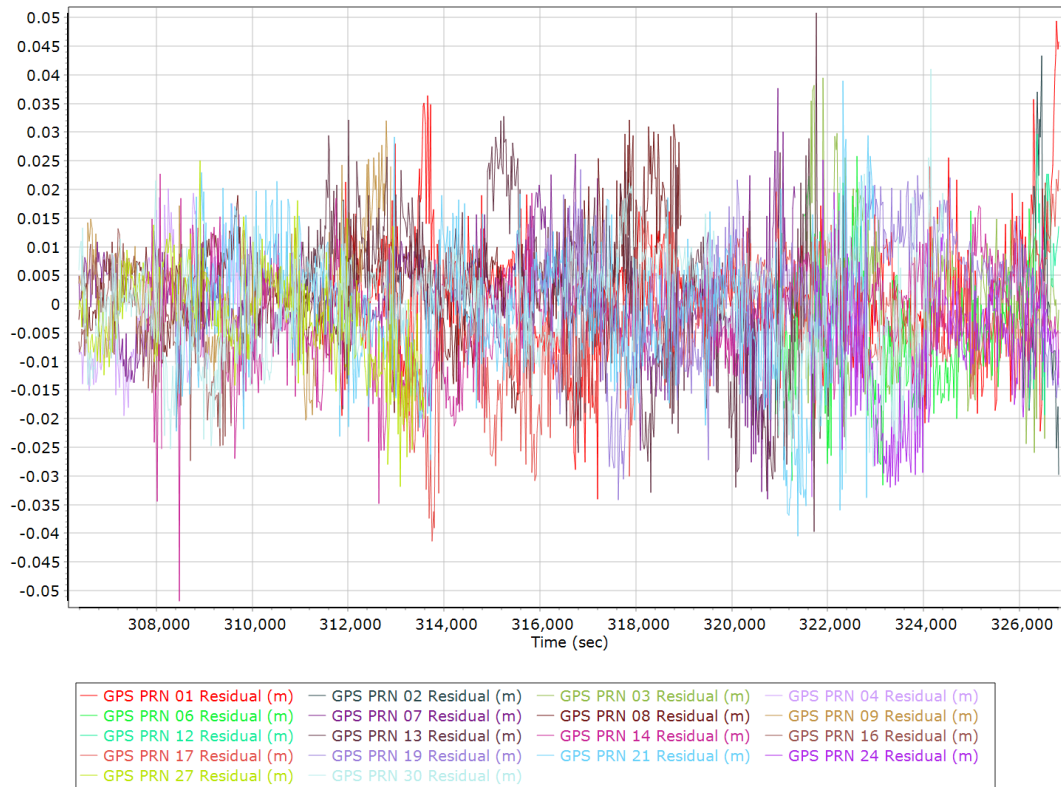
## PDOP



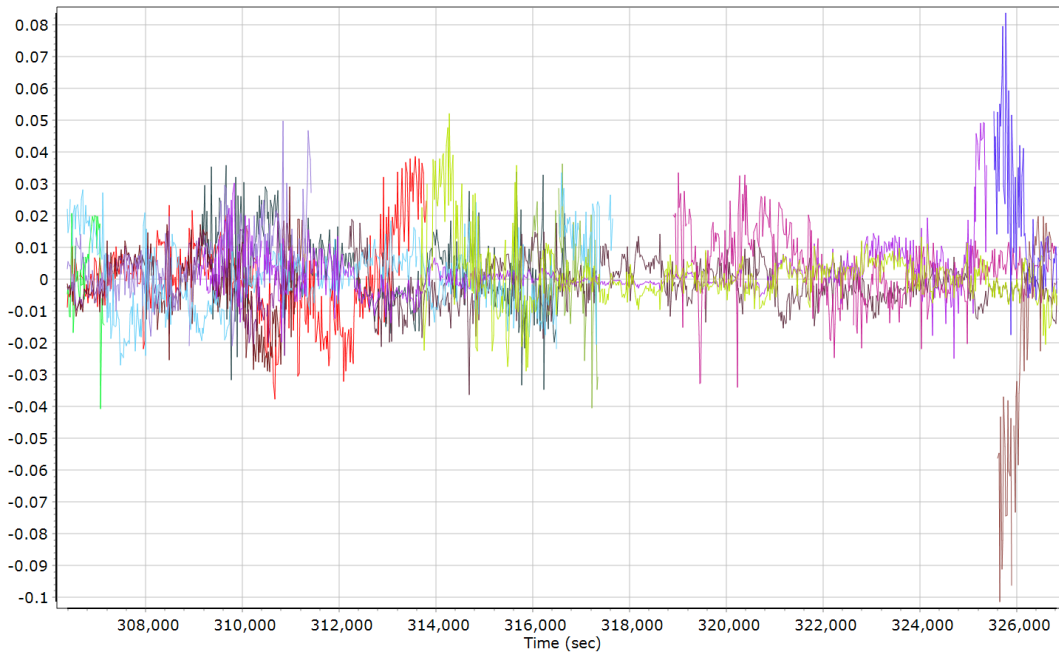
## Estimated Position Accuracy



## GPS Residuals

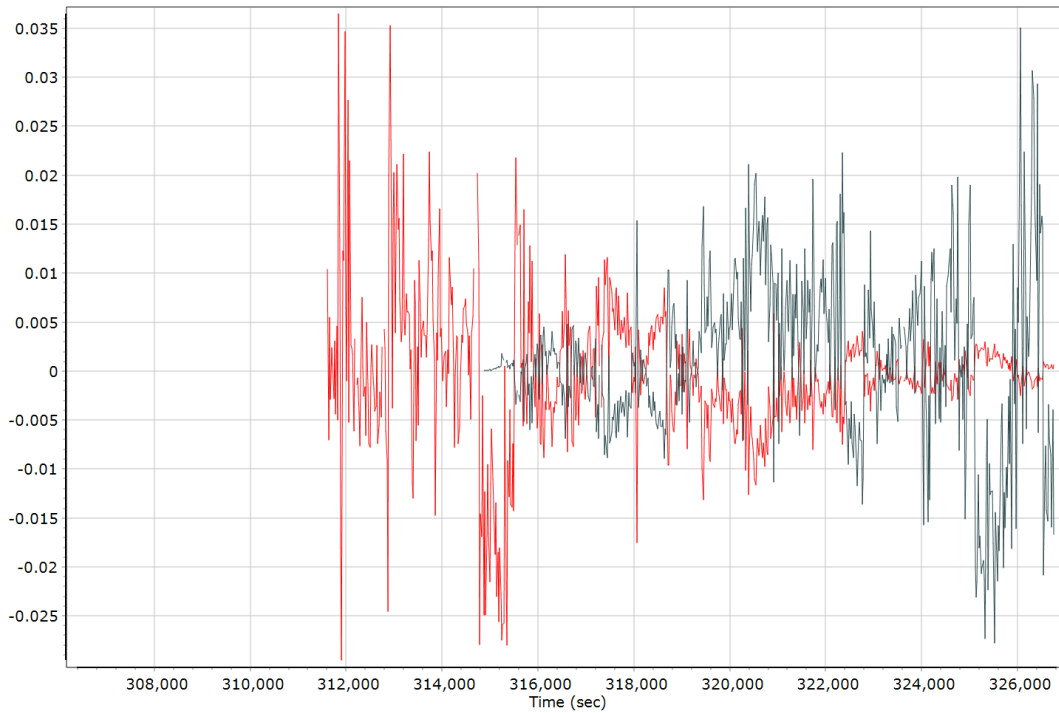


## GLONASS Residuals



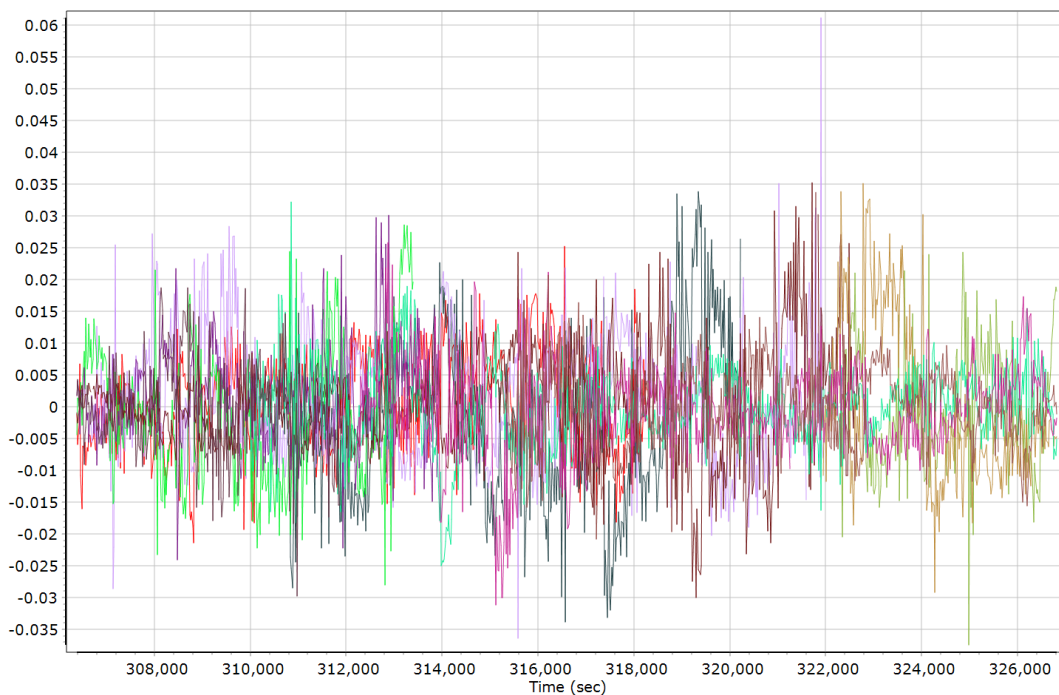
- |                         |                         |                         |                         |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GLONASS 01 Residual (m) | GLONASS 02 Residual (m) | GLONASS 03 Residual (m) | GLONASS 06 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



- |                         |                         |                         |                         |
|-------------------------|-------------------------|-------------------------|-------------------------|
| GALILEO 04 Residual (m) | GALILEO 09 Residual (m) | GALILEO 12 Residual (m) | GALILEO 13 Residual (m) |
| GALILEO 15 Residual (m) | GALILEO 19 Residual (m) | GALILEO 21 Residual (m) | GALILEO 24 Residual (m) |
| GALILEO 26 Residual (m) | GALILEO 27 Residual (m) | GALILEO 31 Residual (m) | GALILEO 33 Residual (m) |



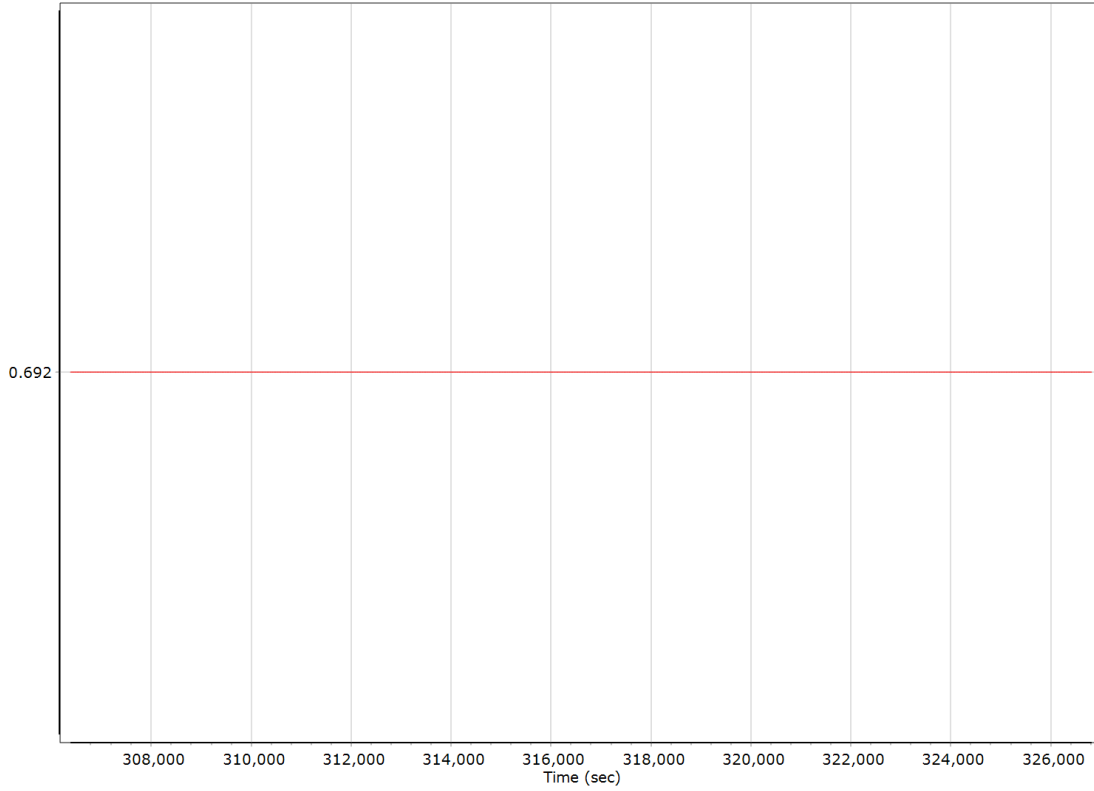
## GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	306128.000 (5/4/2022 1:02:08 PM)		
Processing end time	326835.000 (5/4/2022 6:47:15 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

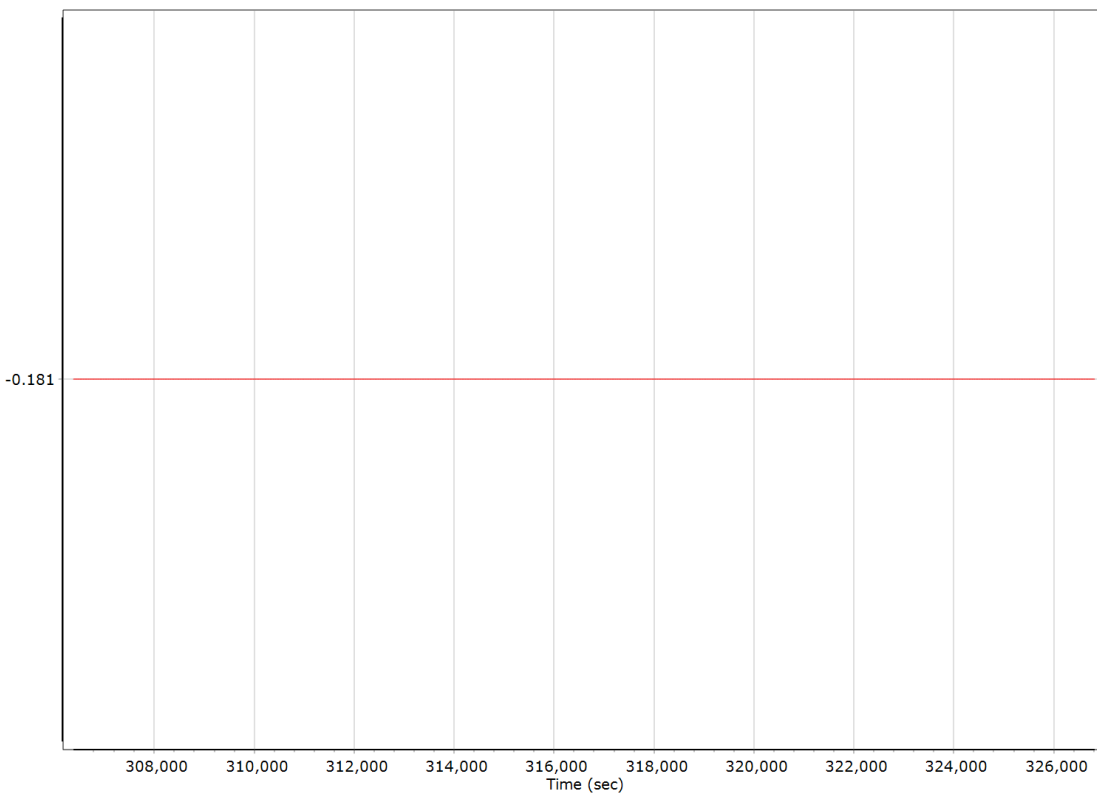
## Calibrated Installation Parameters

### Reference-Primary GNSS Lever Arm (m)

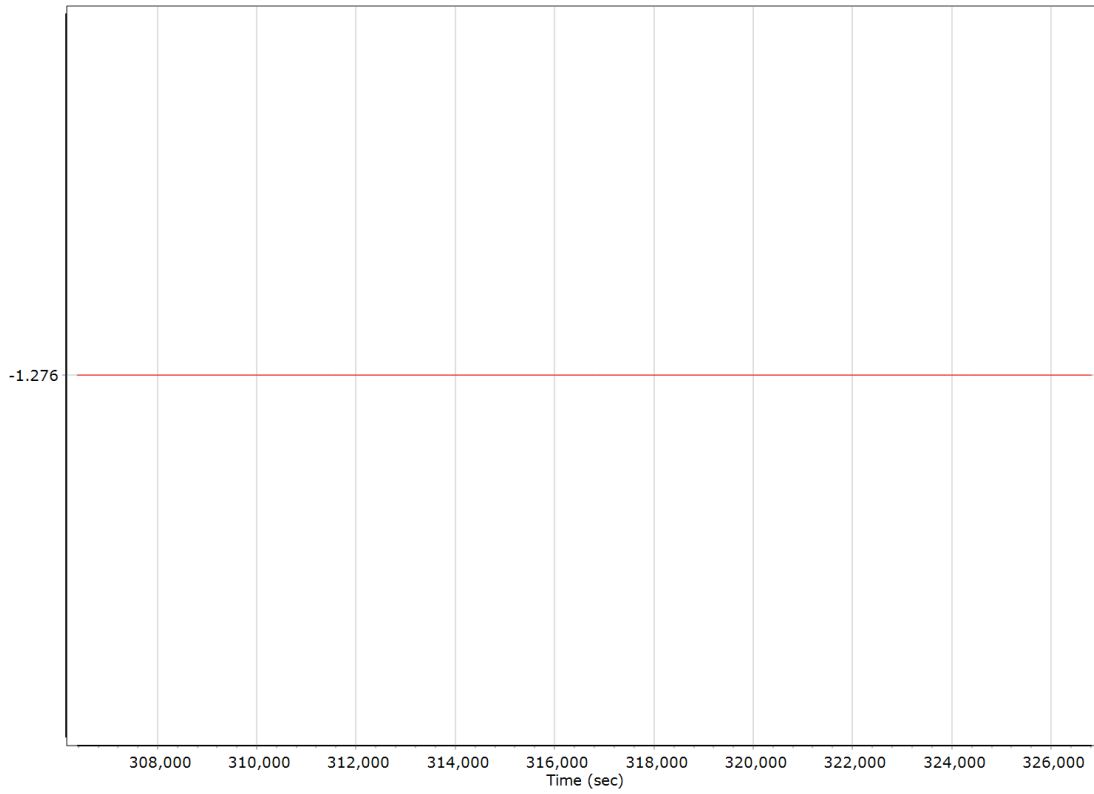
#### X Reference-Primary GNSS Lever Arm (m)



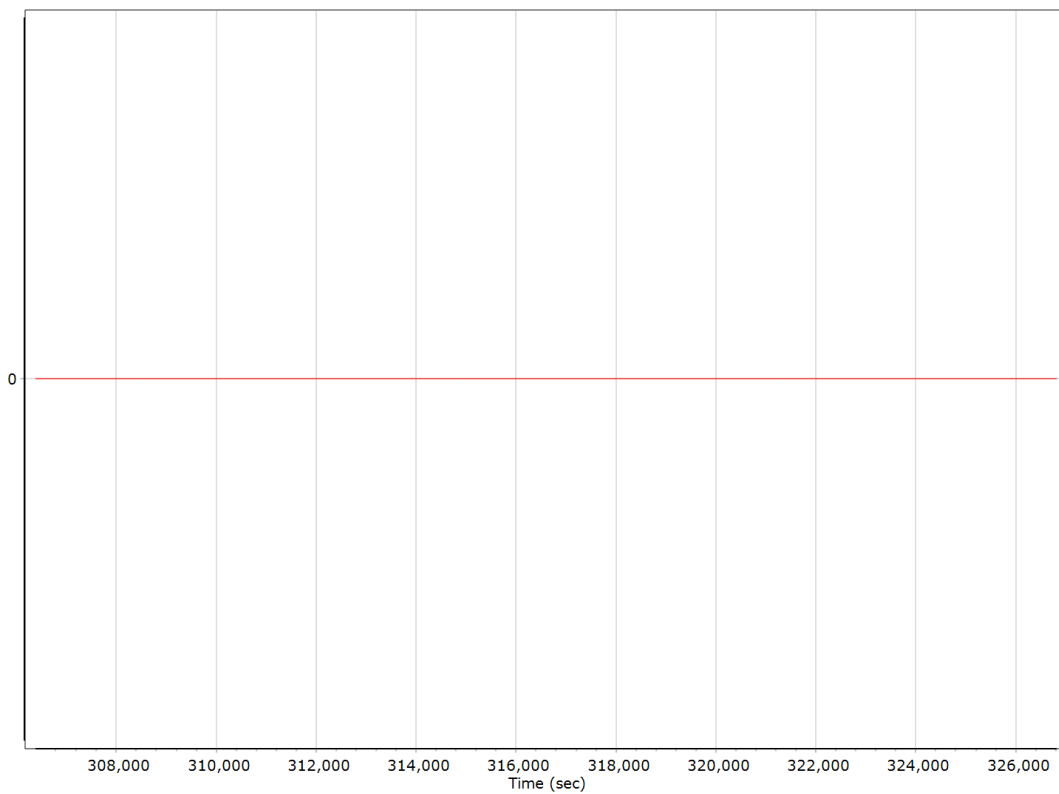
#### Y Reference-Primary GNSS Lever Arm (m)



### Z Reference-Primary GNSS Lever Arm (m)



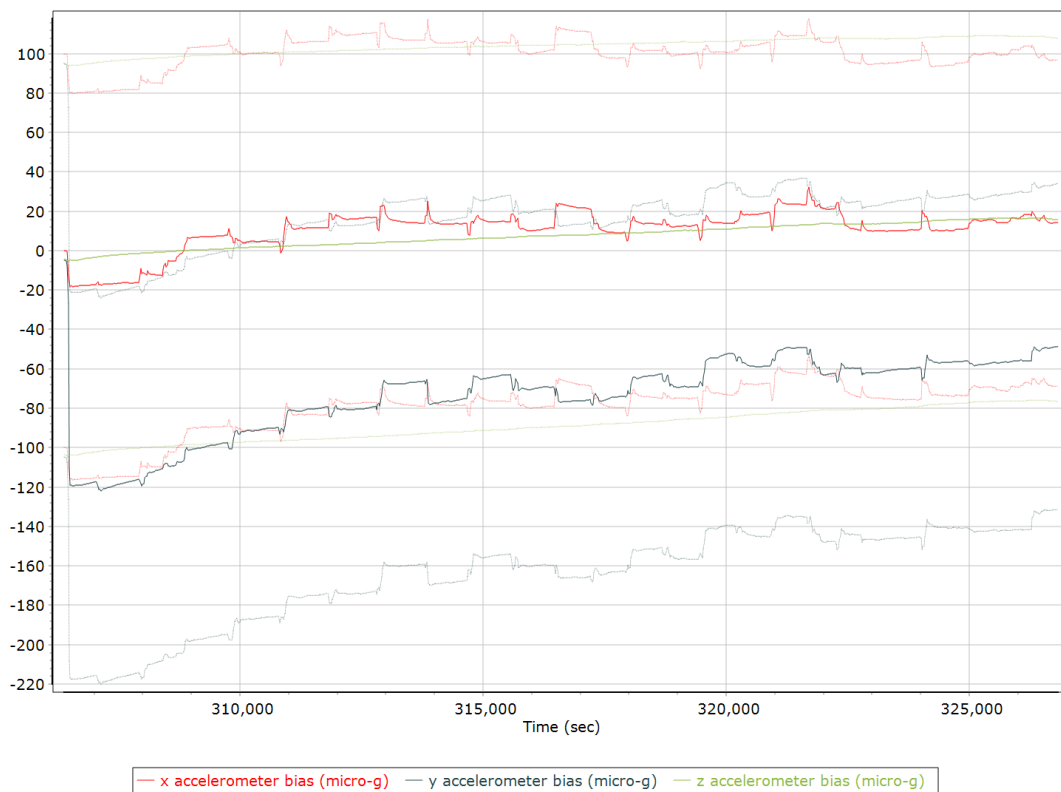
### Reference-Primary GNSS Lever Arm Figure of Merit



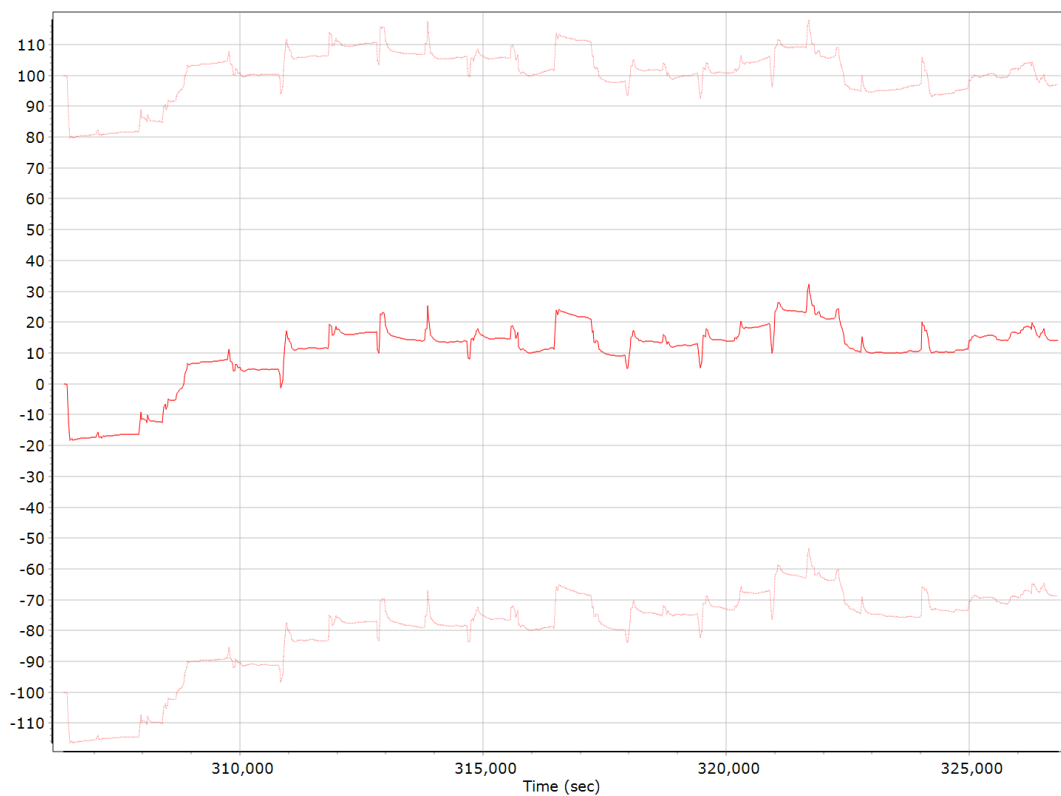
## IN-Fusion QC

### Forward Processed Estimated Errors, Reference Frame

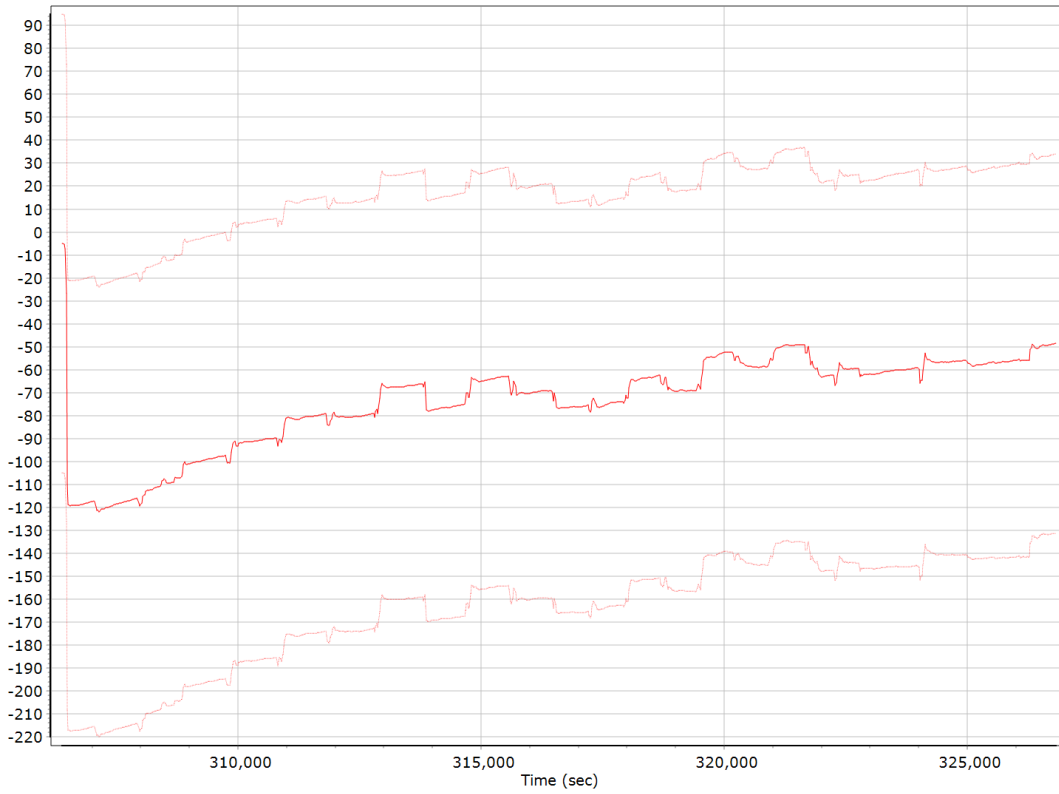
#### Accelerometer Bias (micro-g)



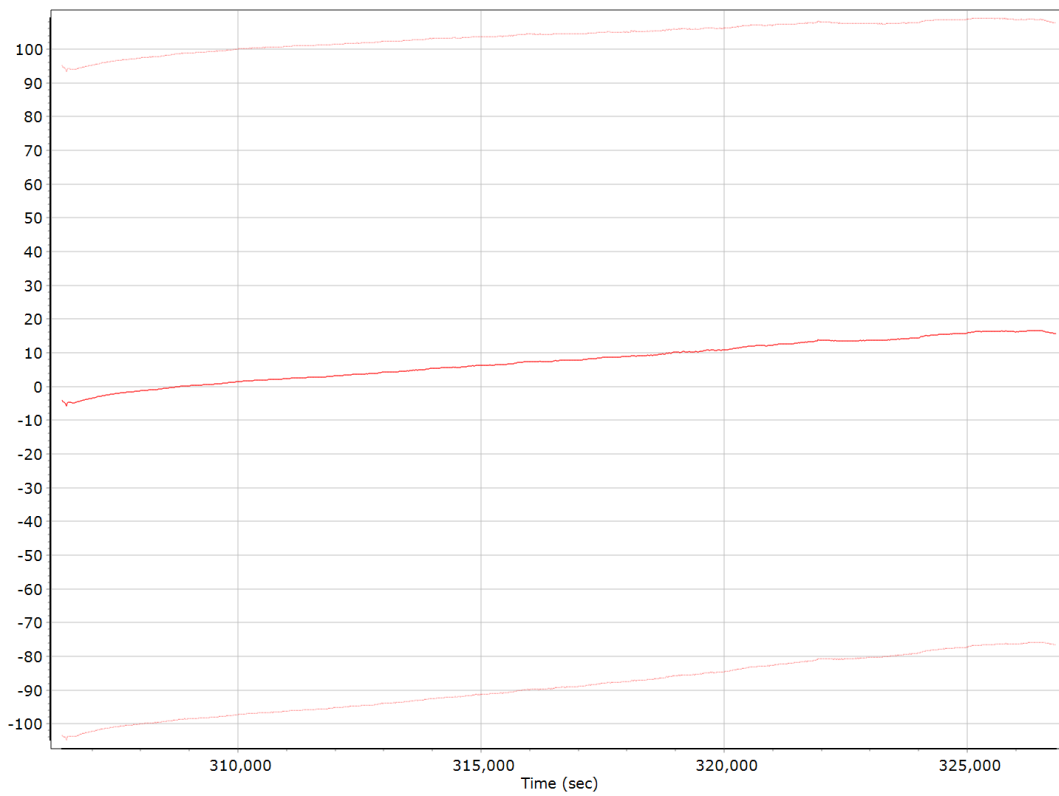
#### X Accelerometer Bias (micro-g)



### Y Accelerometer Bias (micro-g)



### Z Accelerometer Bias (micro-g)



### Accelerometer Scale Error (ppm)



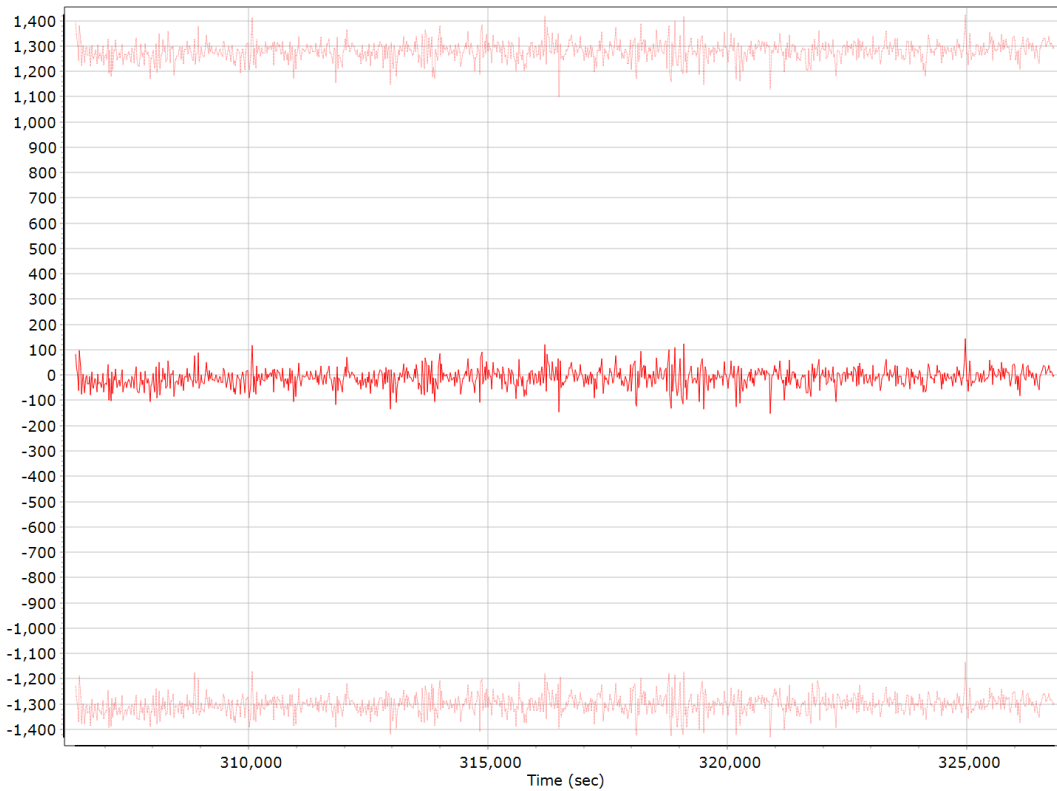
### X Accelerometer Scale Error (ppm)



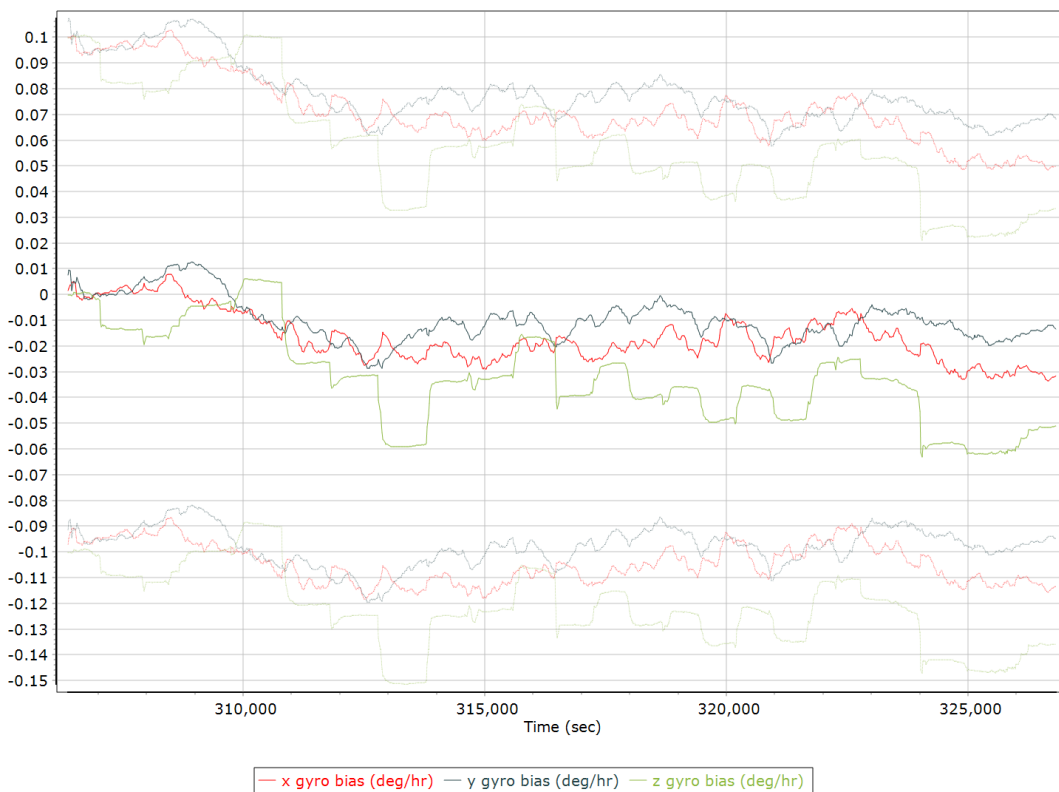
### Y Accelerometer Scale Error (ppm)



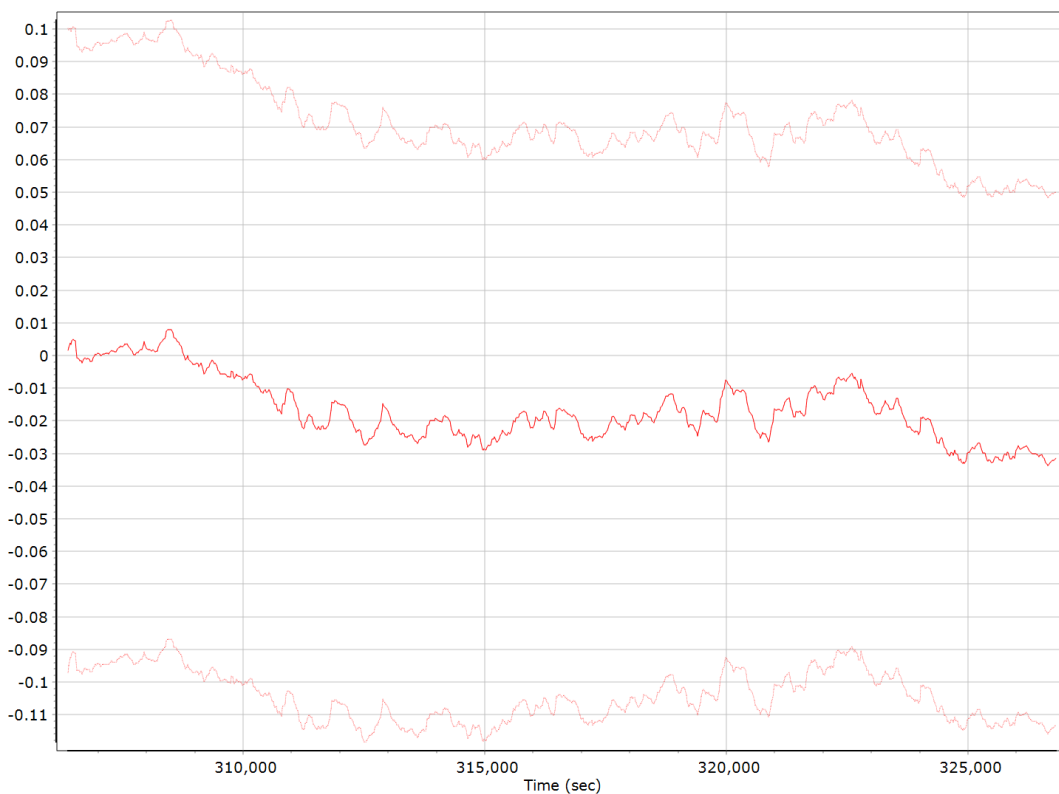
### Z Accelerometer Scale Error (ppm)



### Gyro Bias (deg/h)

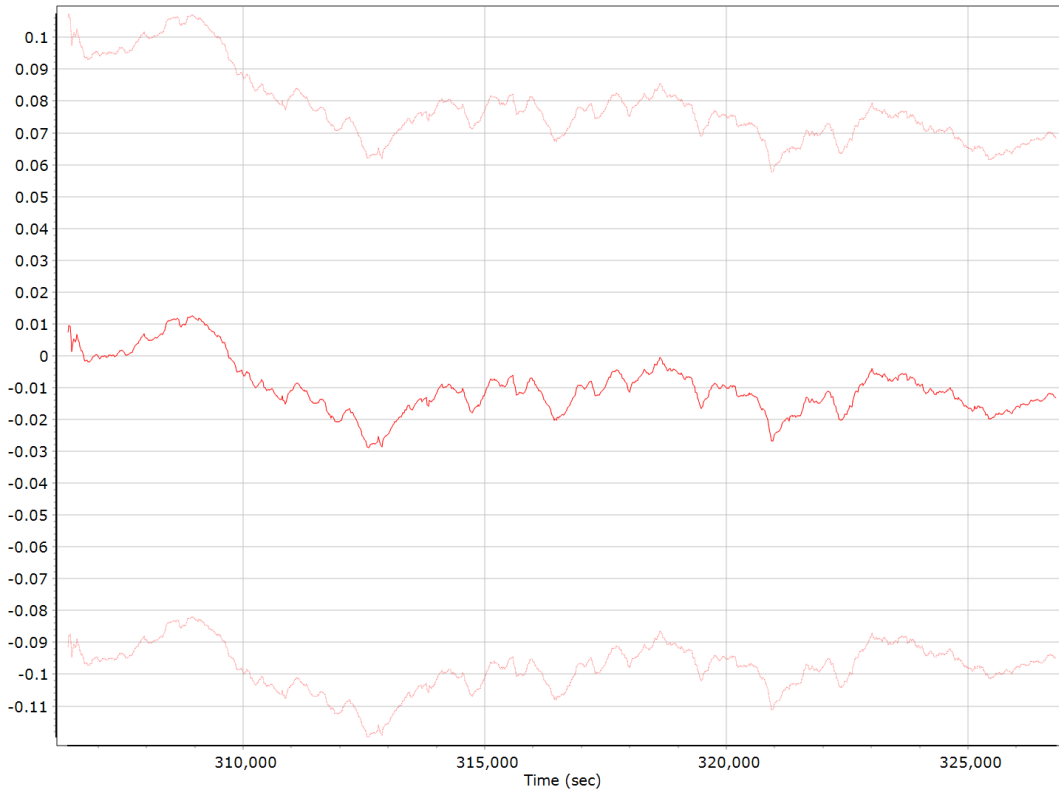


### X Gyro Bias (deg/h)

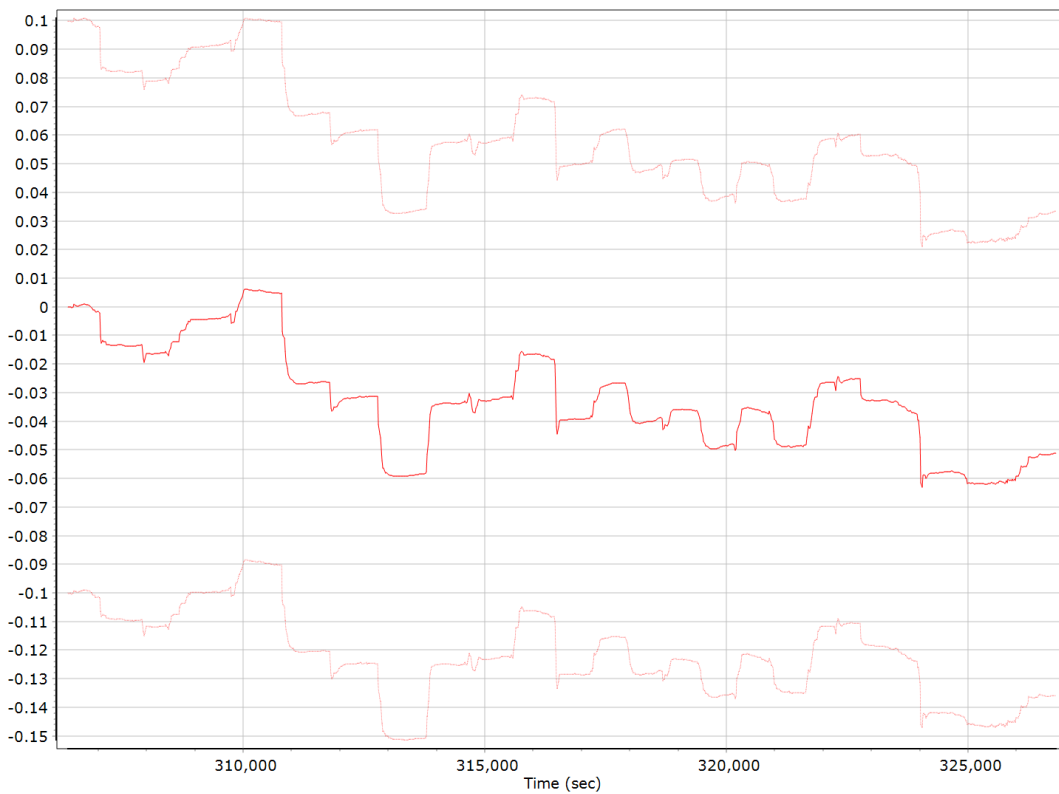




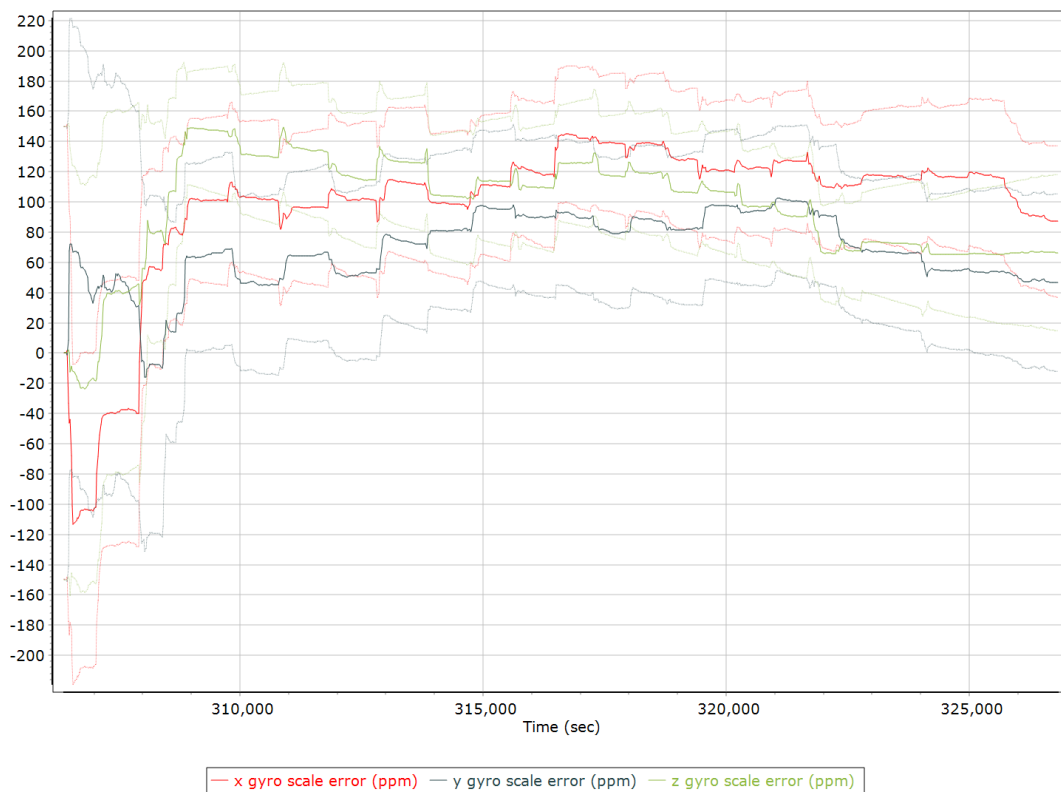
### Y Gyro Bias (deg/h)



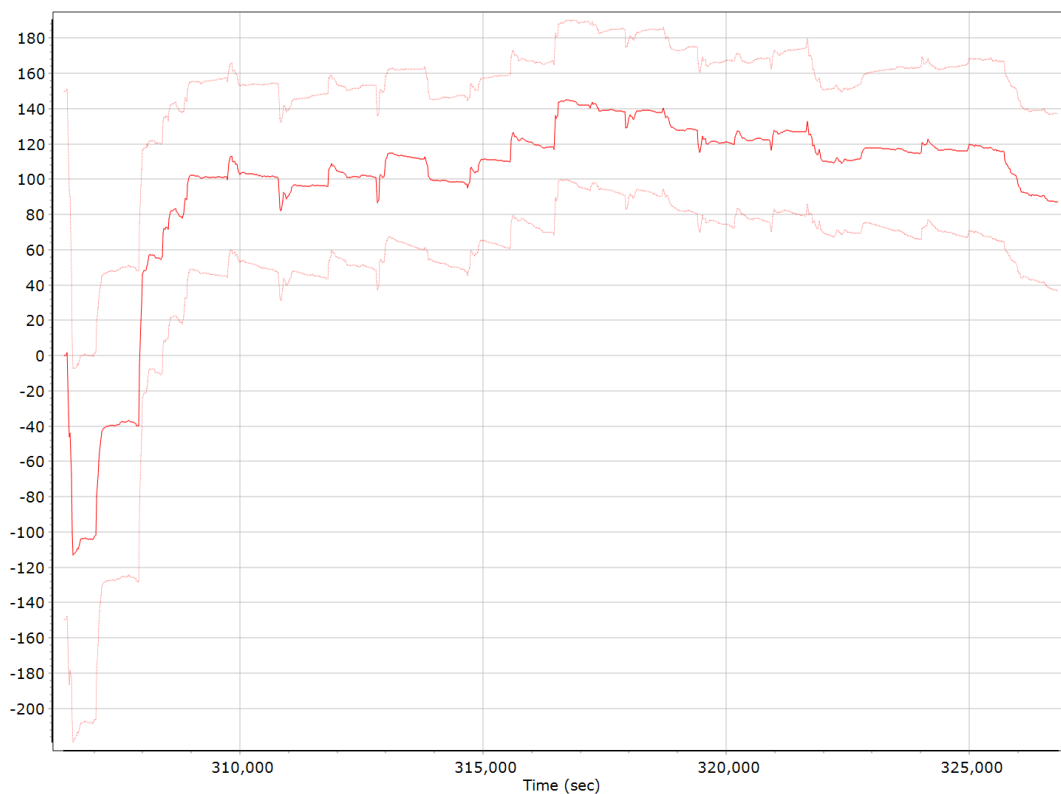
### Z Gyro Bias (deg/h)



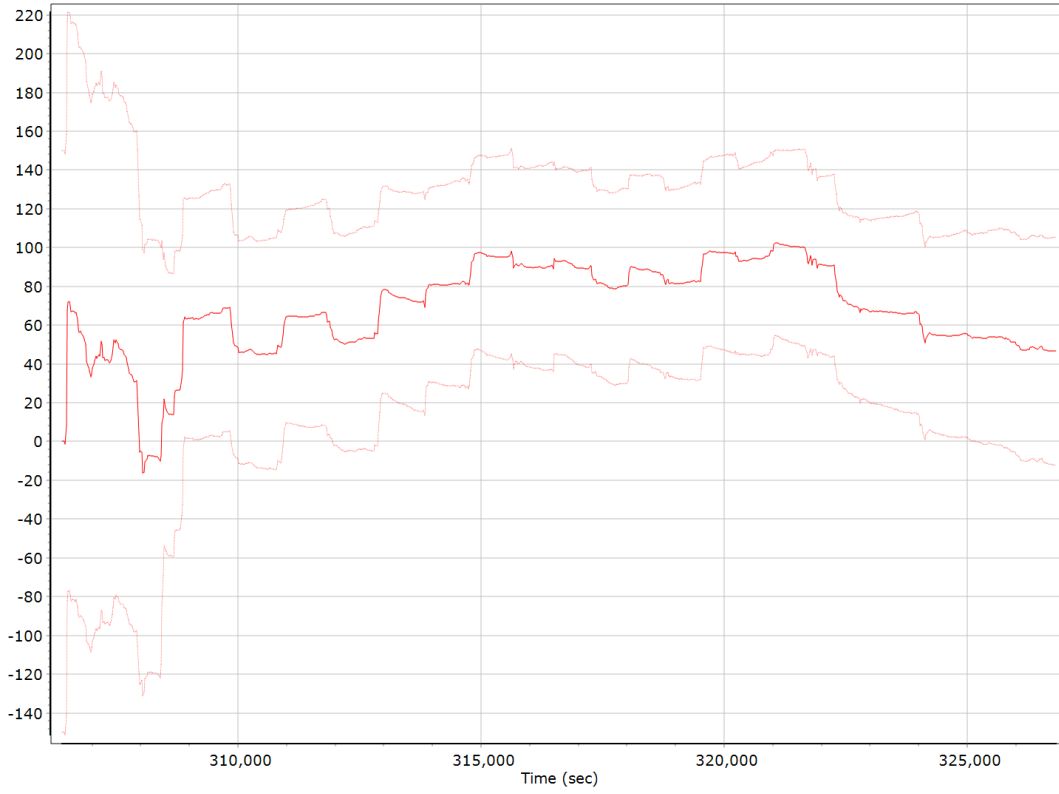
### Gyro Scale Error (ppm)



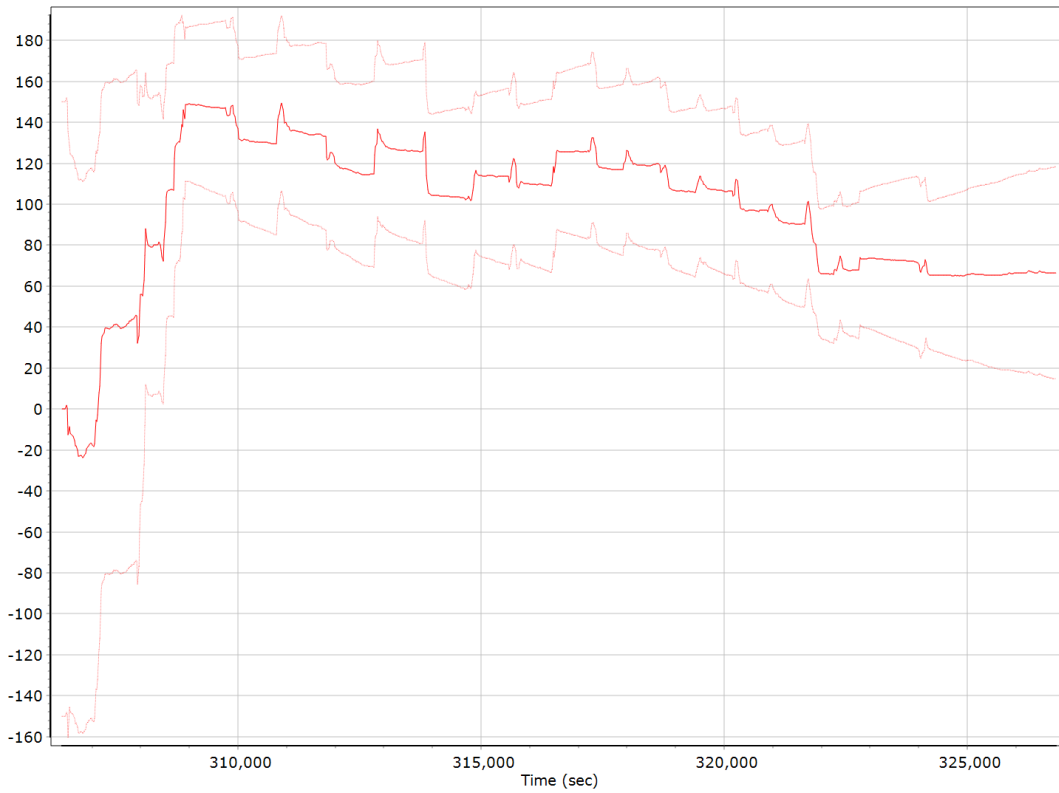
### X Gyro Scale Error (ppm)



### Y Gyro Scale Error (ppm)

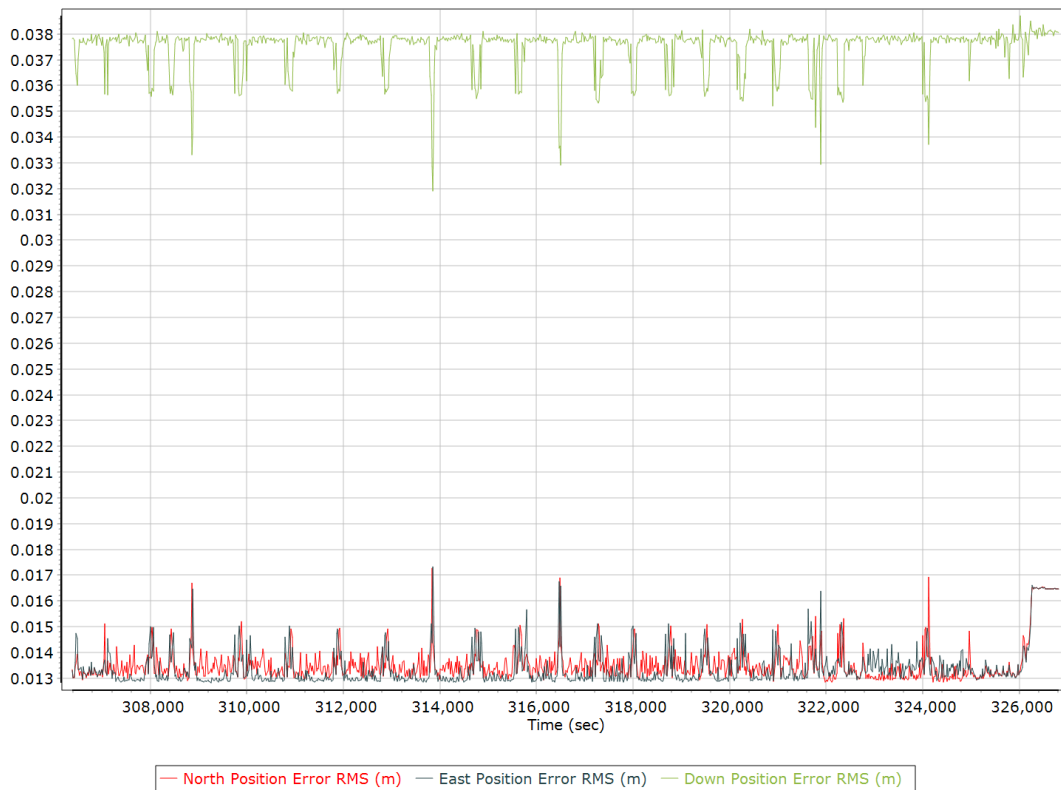


### Z Gyro Scale Error (ppm)

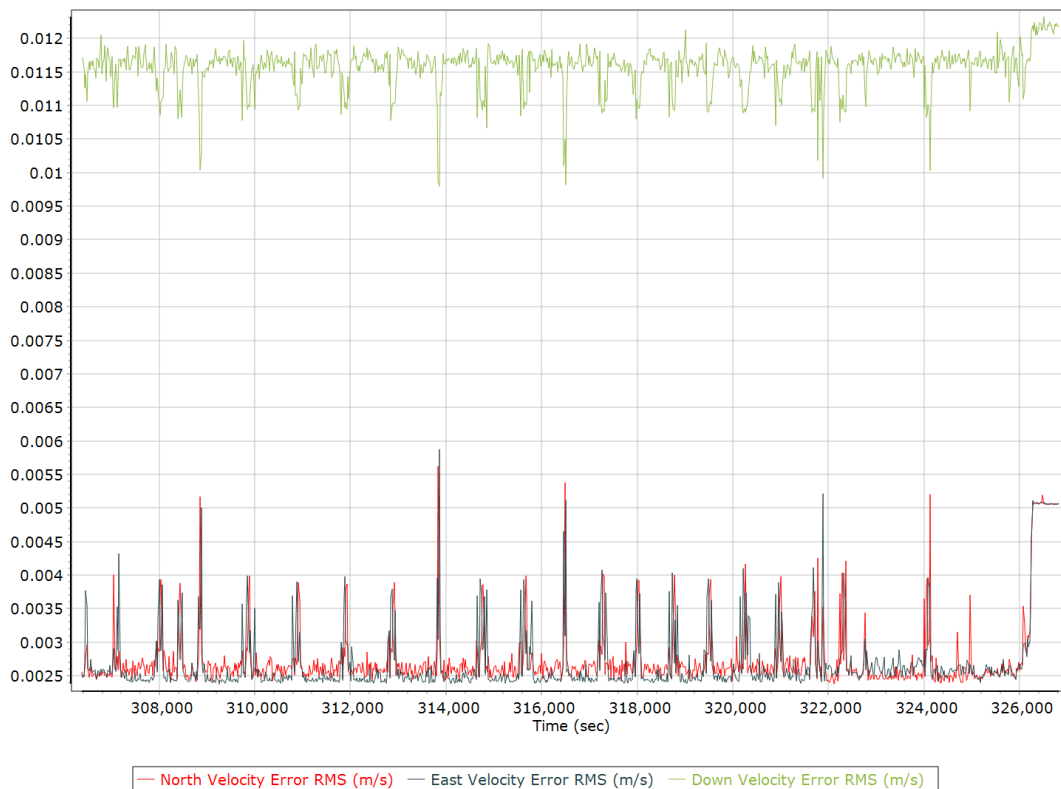


## Smoothed Performance Metrics

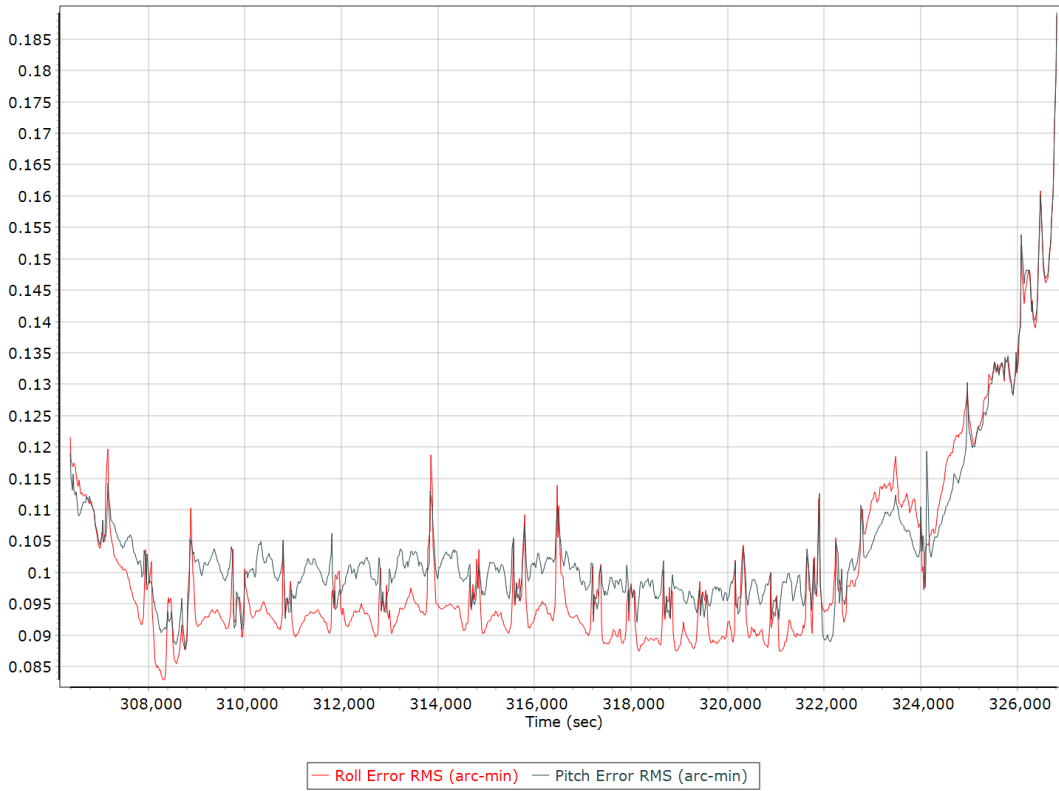
### Position Error RMS (m)



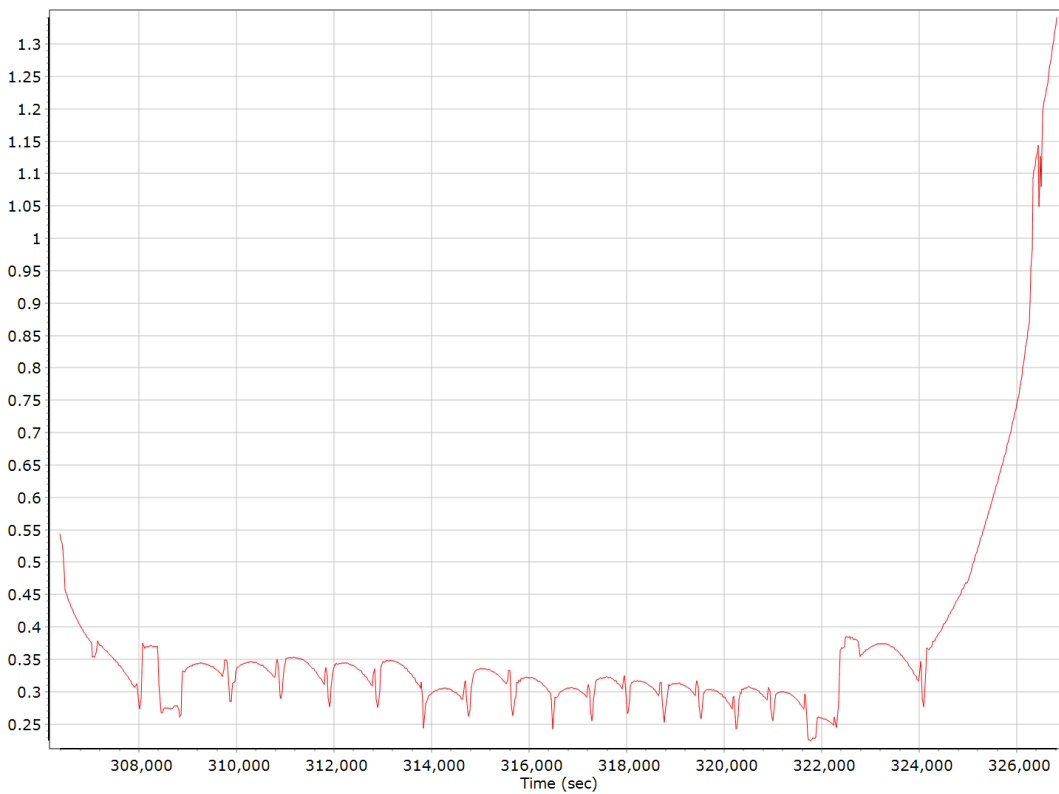
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

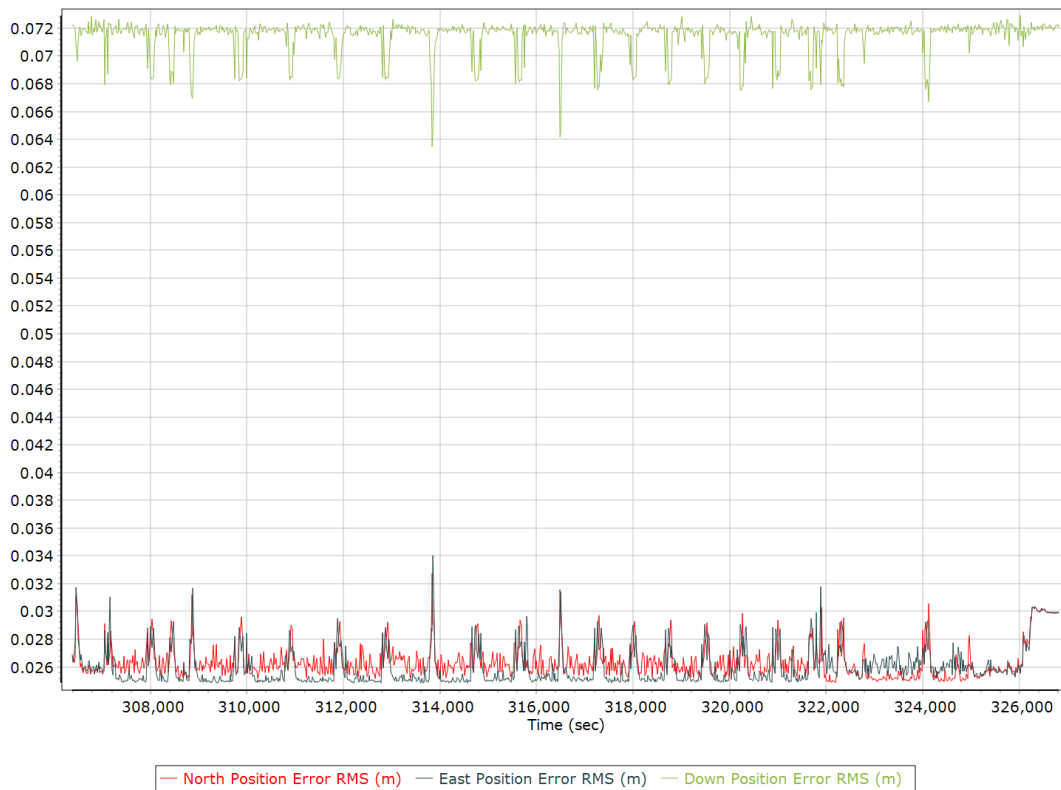


### Heading Error RMS (arc-min)

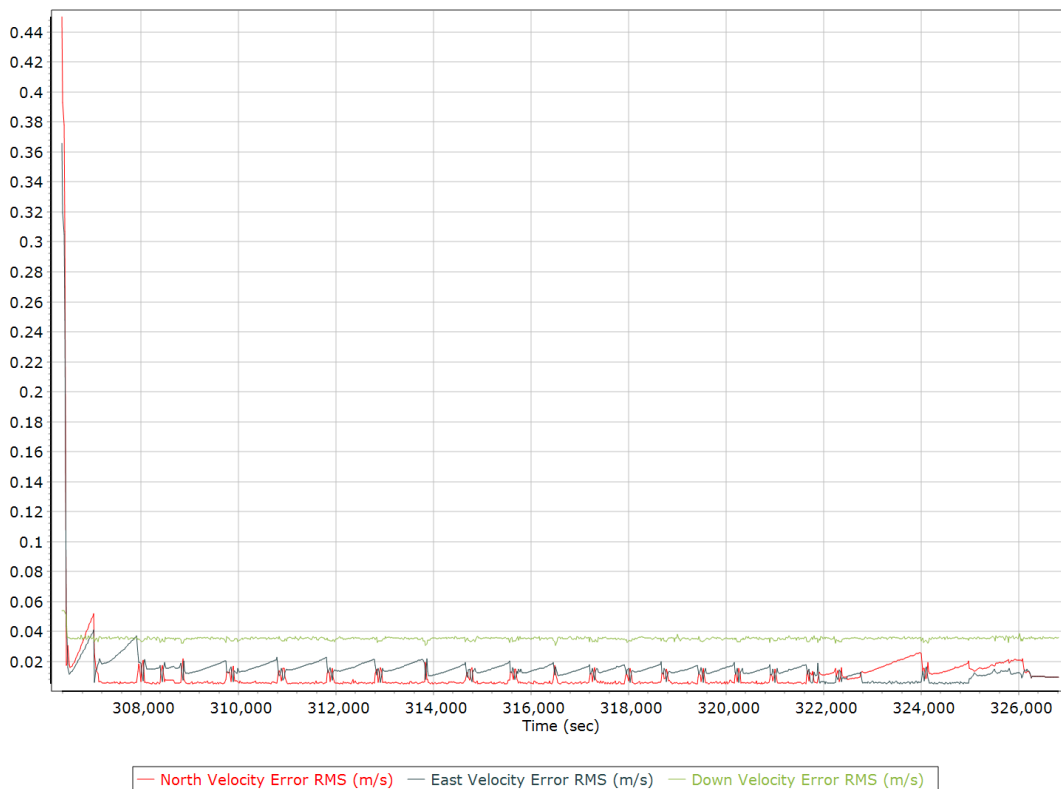


## Forward Processed Performance Metrics

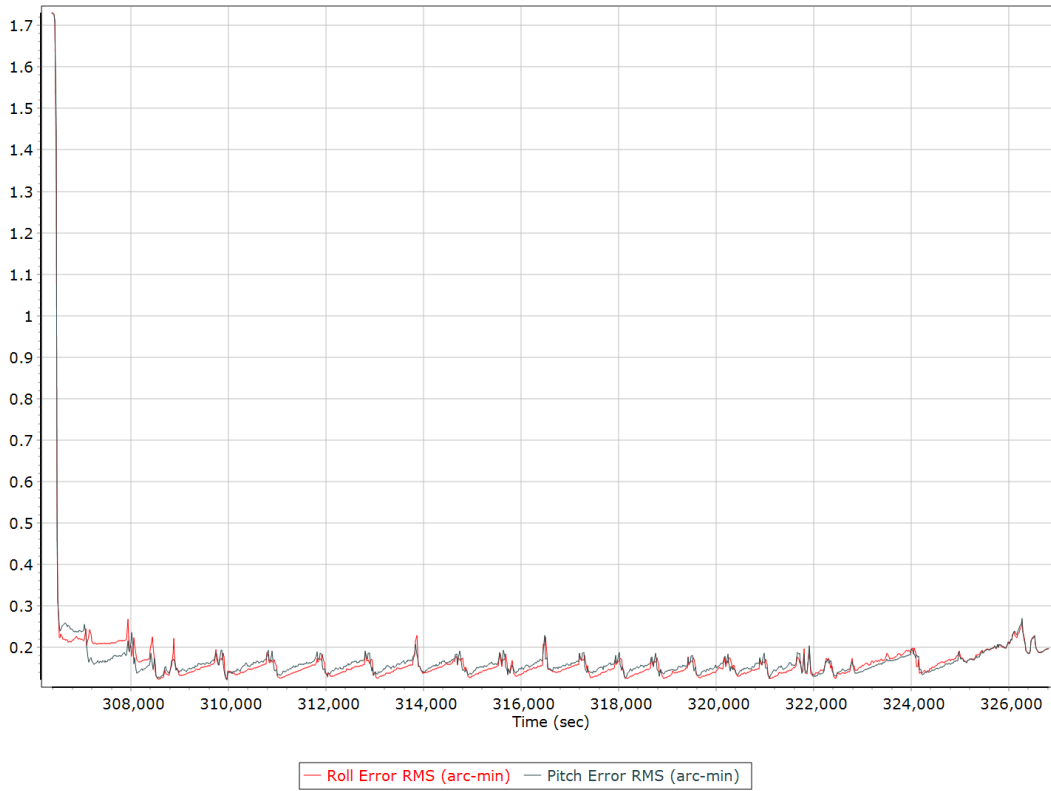
### Position Error RMS (m)



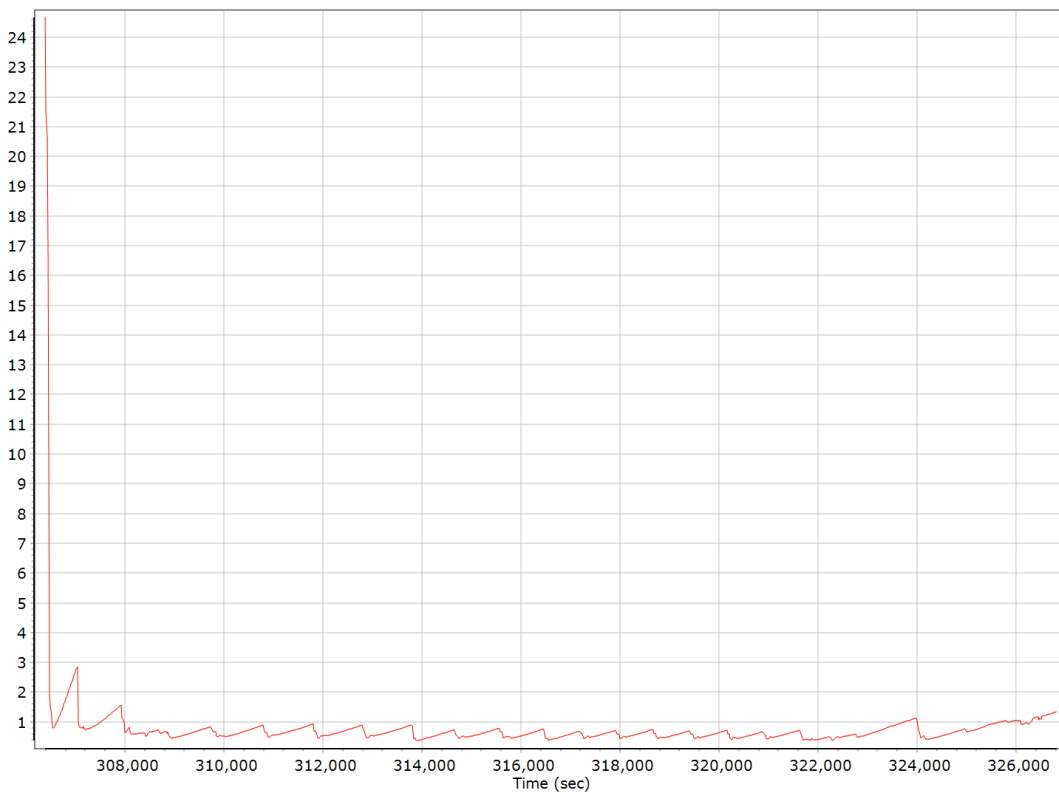
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

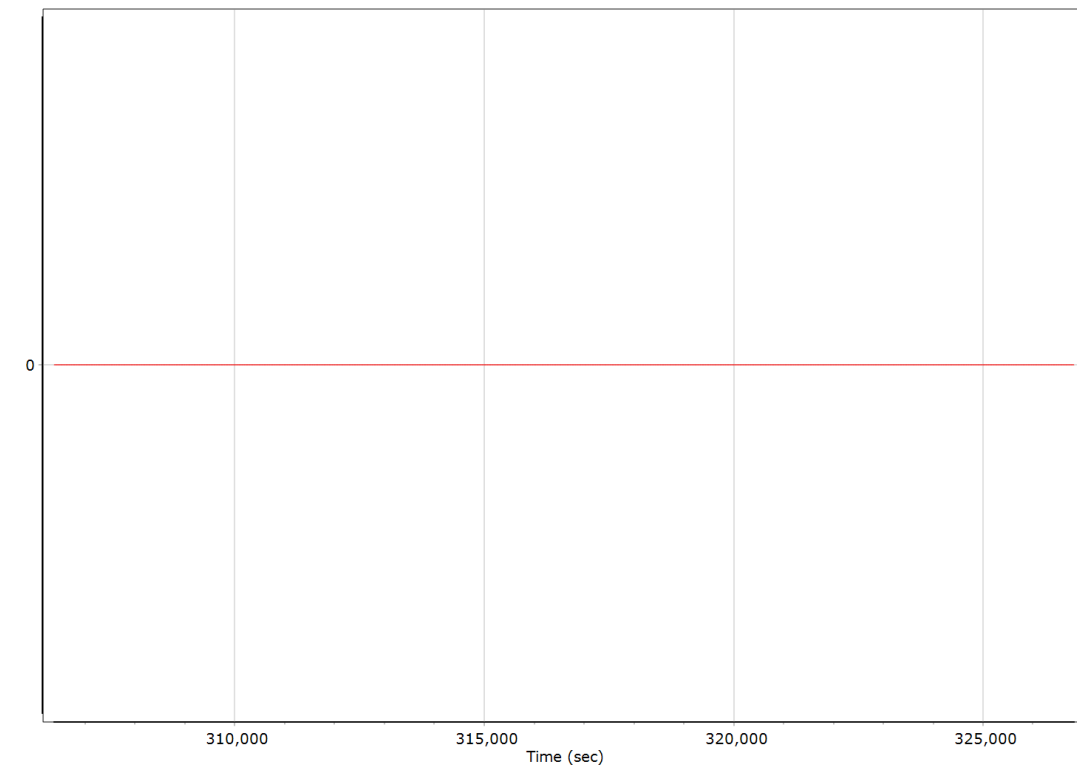


### Heading Error RMS (arc-min)



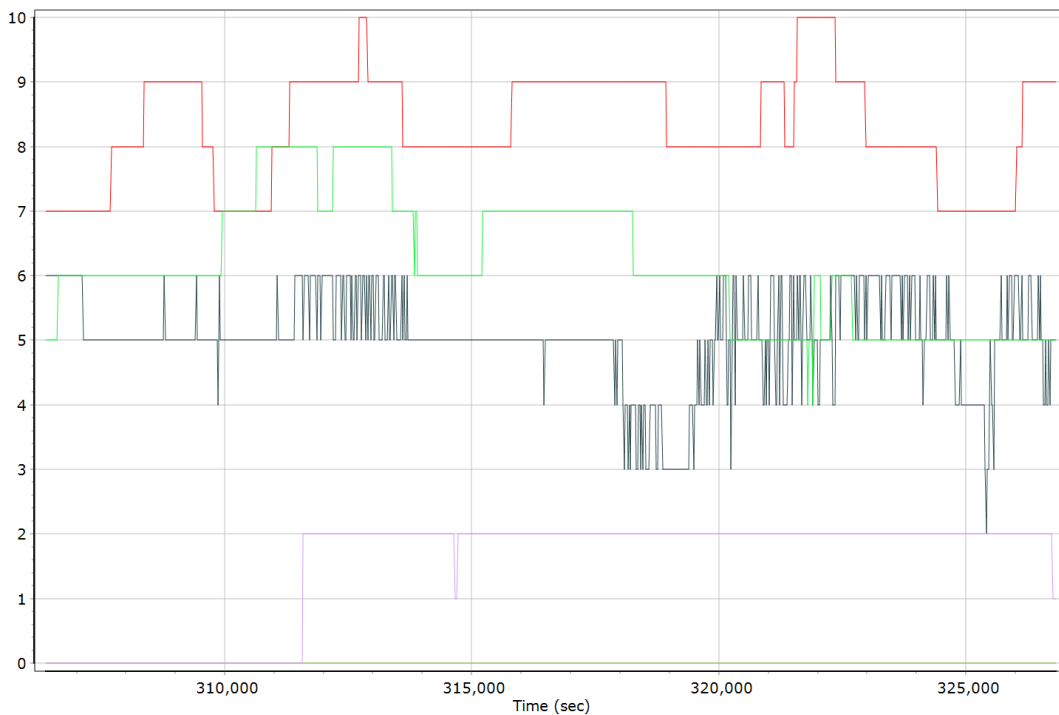
## Forward Processed Solution Status

### Processing Mode



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

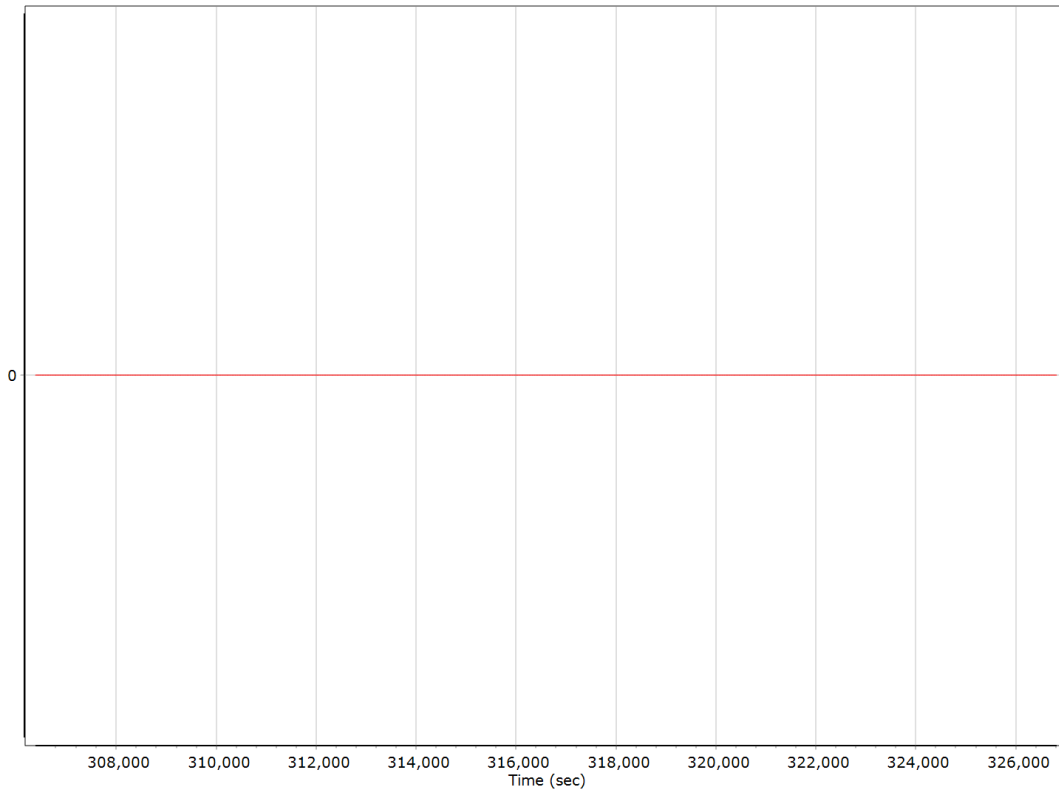
### Number of Satellites



— 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	05042022A1_3543
Processing date	2022-05-12 16:29:46
Mission date	2022-05-04 11:40:30
Mission duration	00:52:27.357
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	Bilinmeyen harici

## Project File List

### Rover Data Files

File name	File type
220504_114011_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_05042022A1_3543.out	SBET Trajectory File

## Rover Data Summary

First raw data file	220504_114011_INS-GPS_1.raw		
Last raw data file	220504_114011_INS-GPS_1.raw		
Start GPS week	2208		
Start time	301211.428 (5/4/2022 11:40:11 AM)		
End time	305726.481 (5/4/2022 12:55:26 PM)		
Start of fine alignment	301582.512 (5/4/2022 11:46:22 AM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
<b>IMU Installation Lever Arms &amp; Mounting Angles</b>			
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

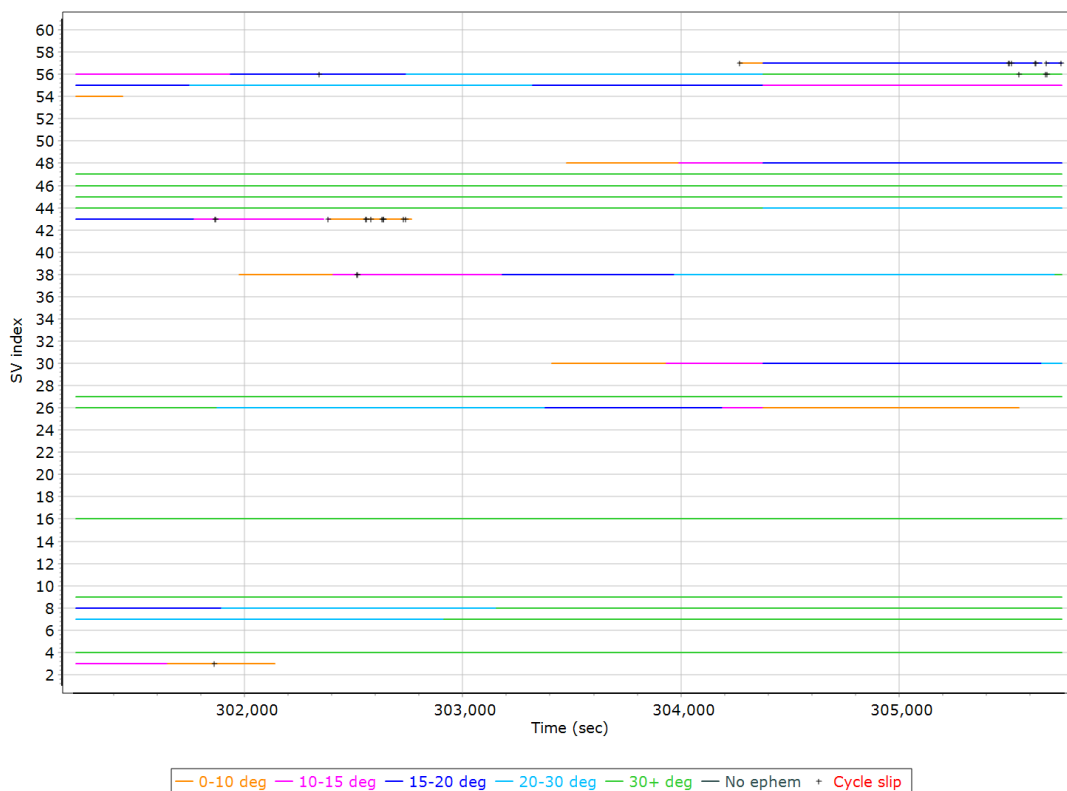
## Rover Data QC

### Raw IMU Import QC Summary

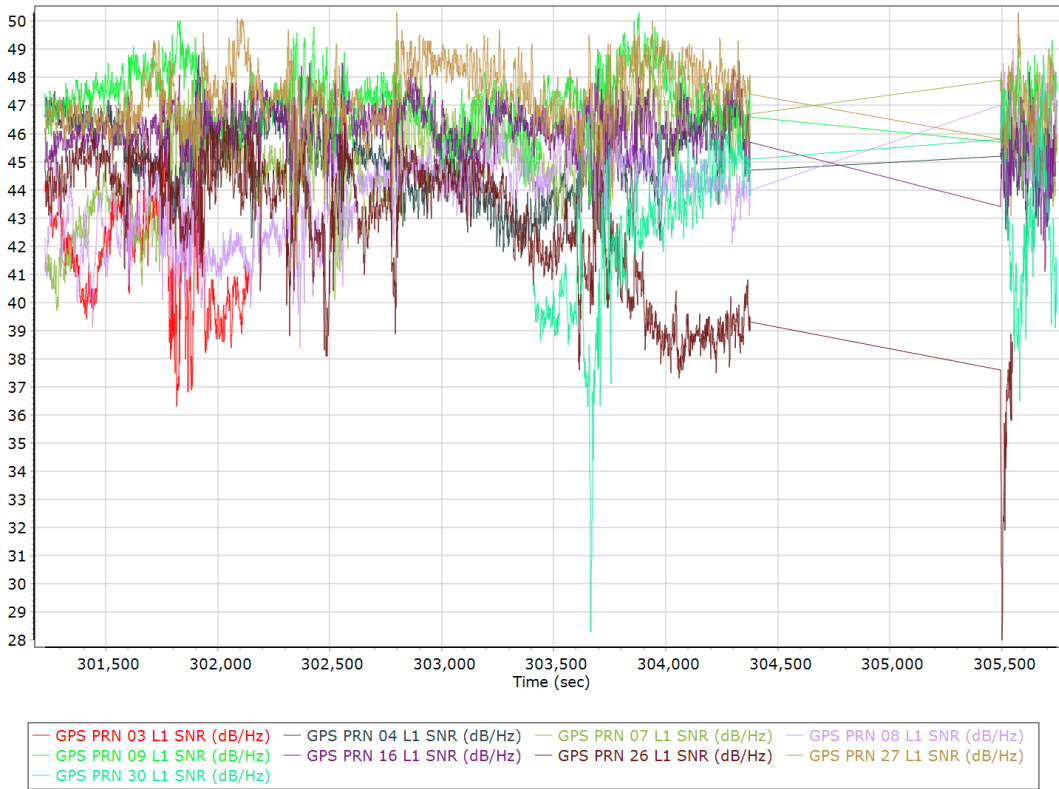
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05042022A1_3543.log
IMU Records Processed	679753
Termination Status	Warnings
IMU Anomalies	1
IMU Failure Messages	
305475.526 : WARNING : Gap of 1115.9036 seconds in CHECKDT input data	

## Primary Observables & Satellite Data

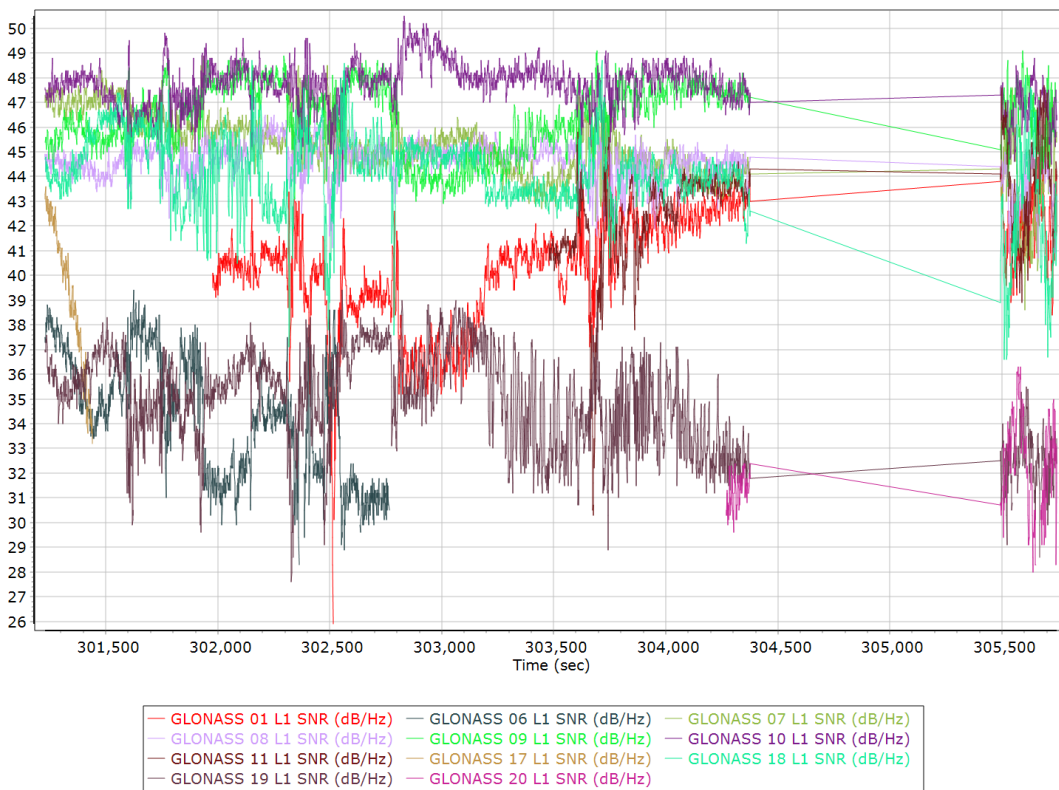
### GPS/GLONASS L1 Satellite Lock/Elevation



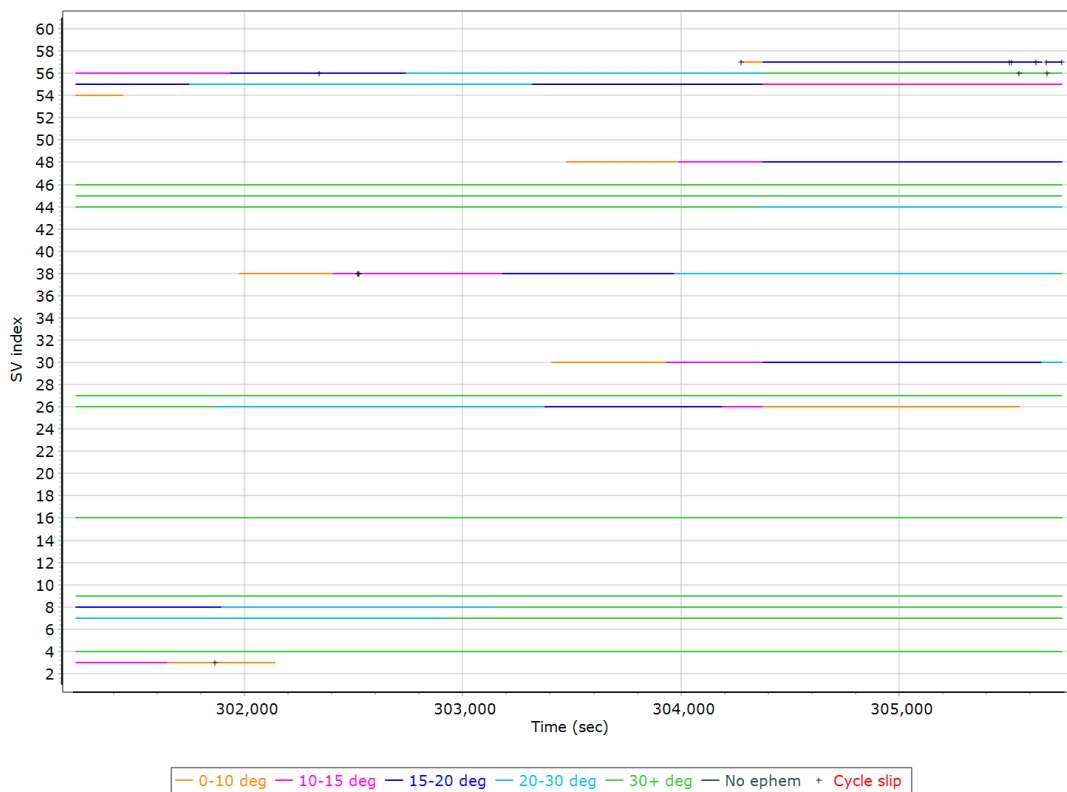
### GPS L1 SNR



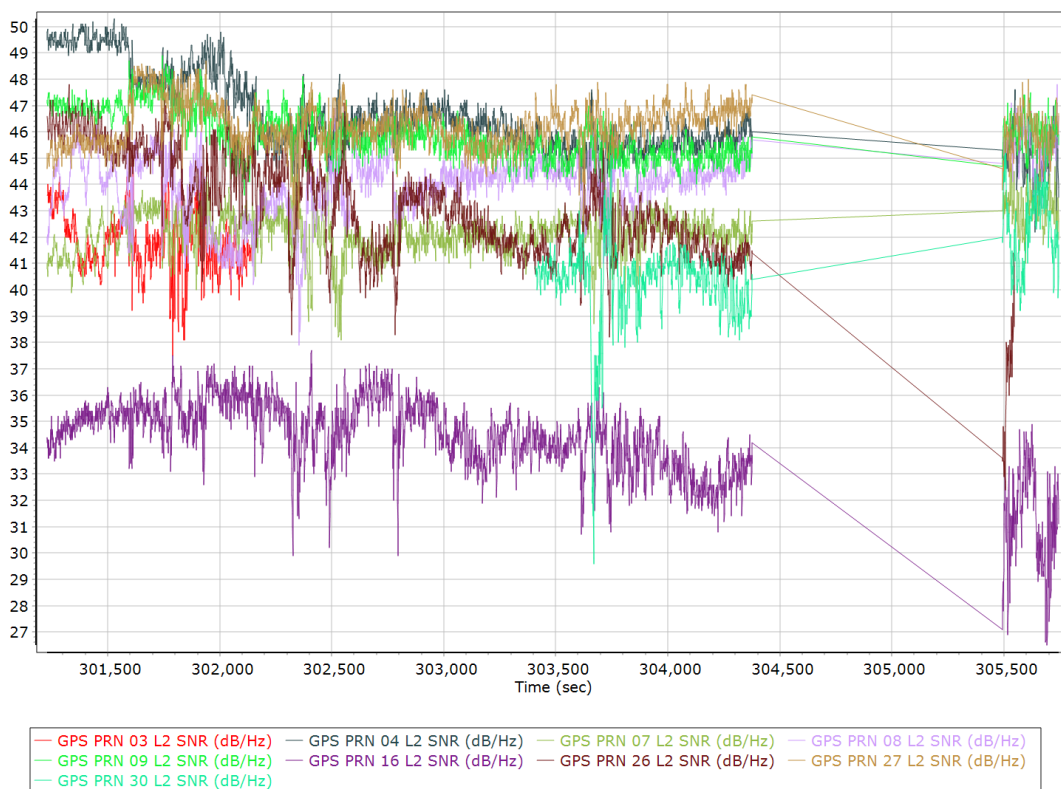
### GLONASS L1 SNR



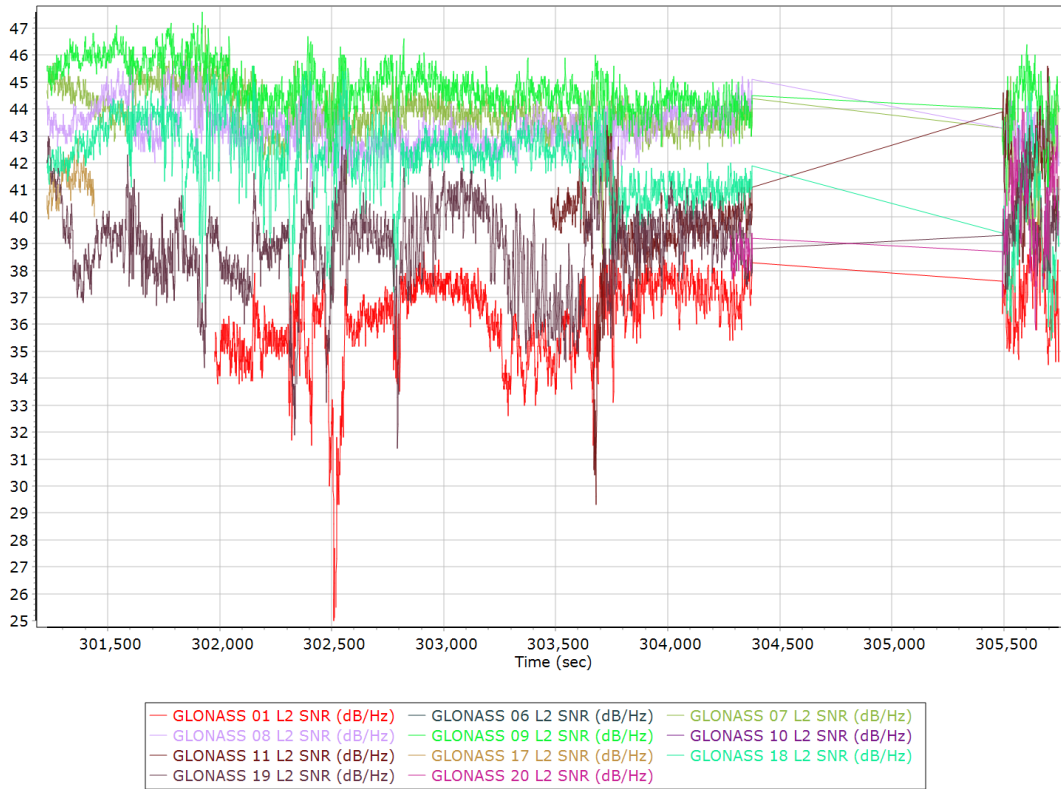
### GPS/GLONASS L2 Satellite Lock/Elevation



### GPS L2 SNR



### GLONASS L2 SNR

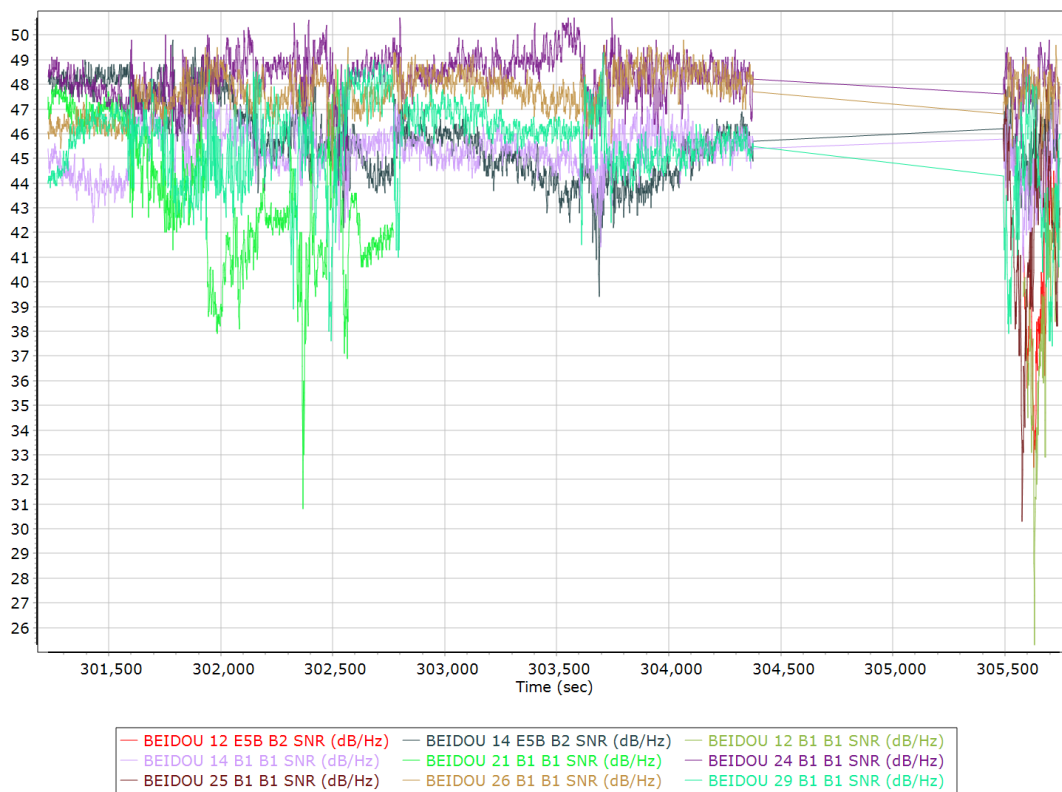


### BEIDOU Satellite Lock/Elevation

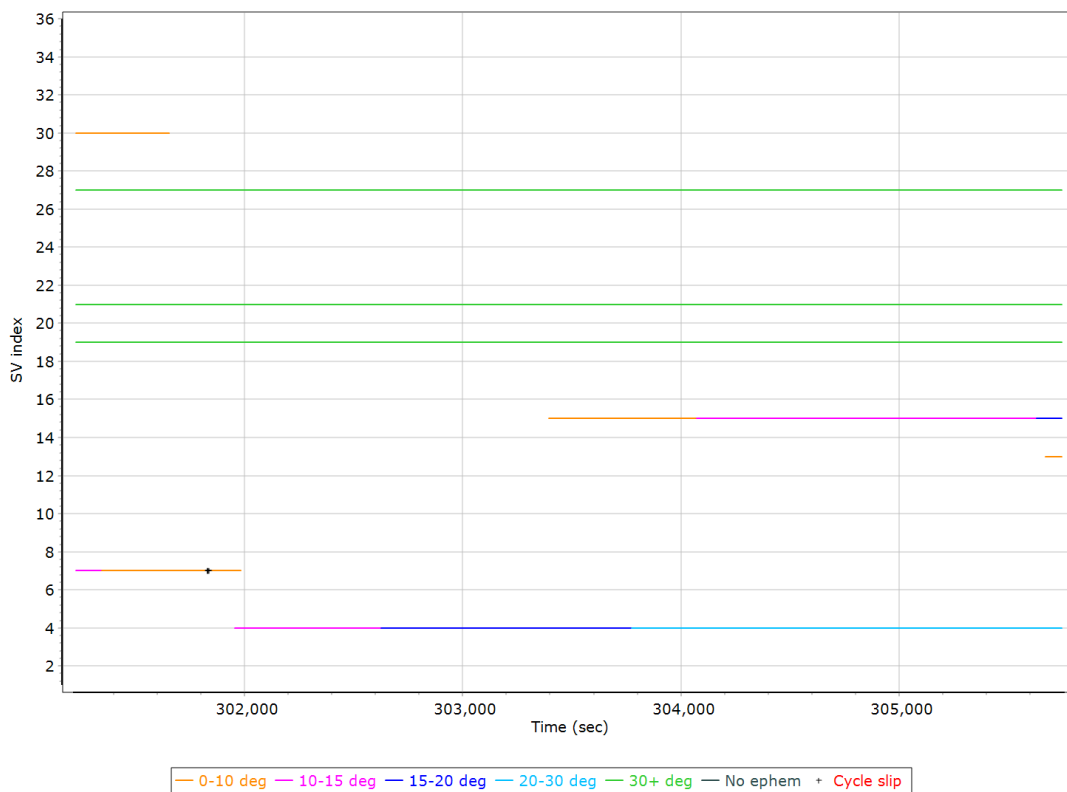




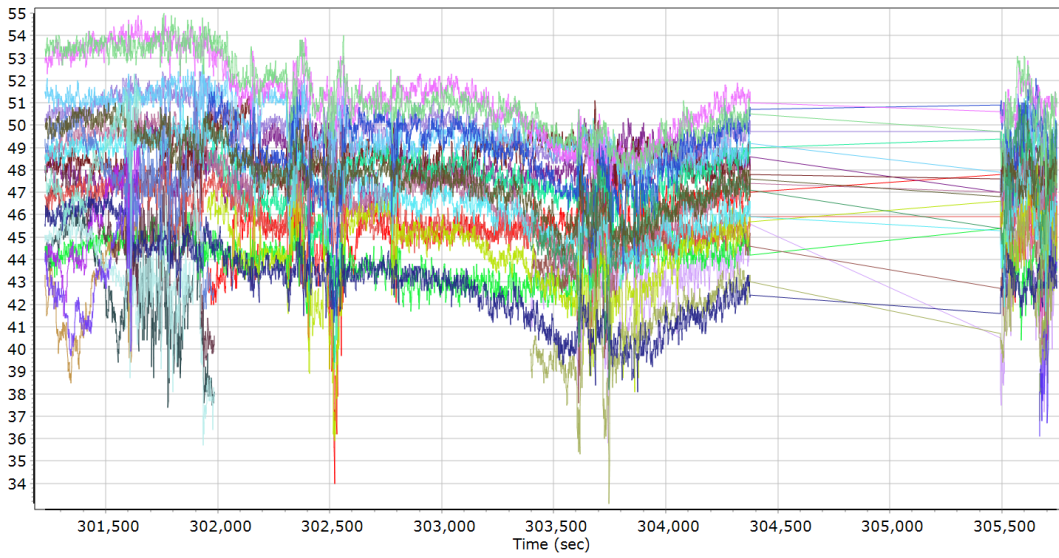
### BEIDOU SNR



### GALILEO Satellite Lock/Elevation



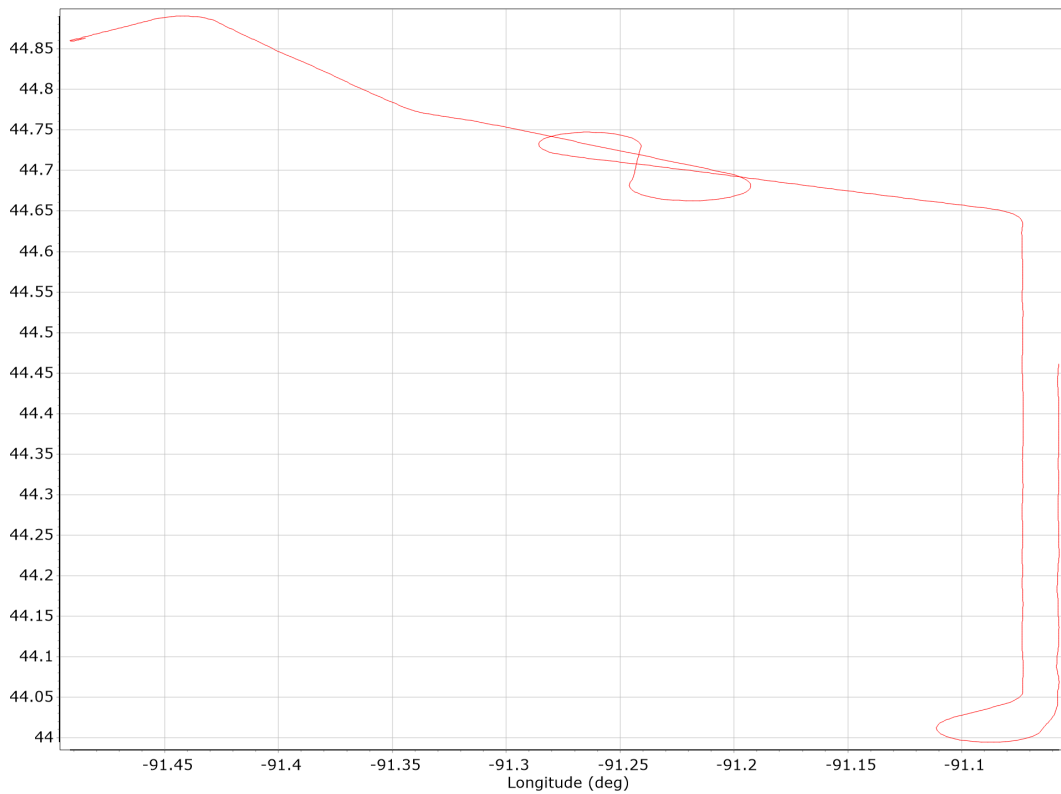
## GALILEO SNR



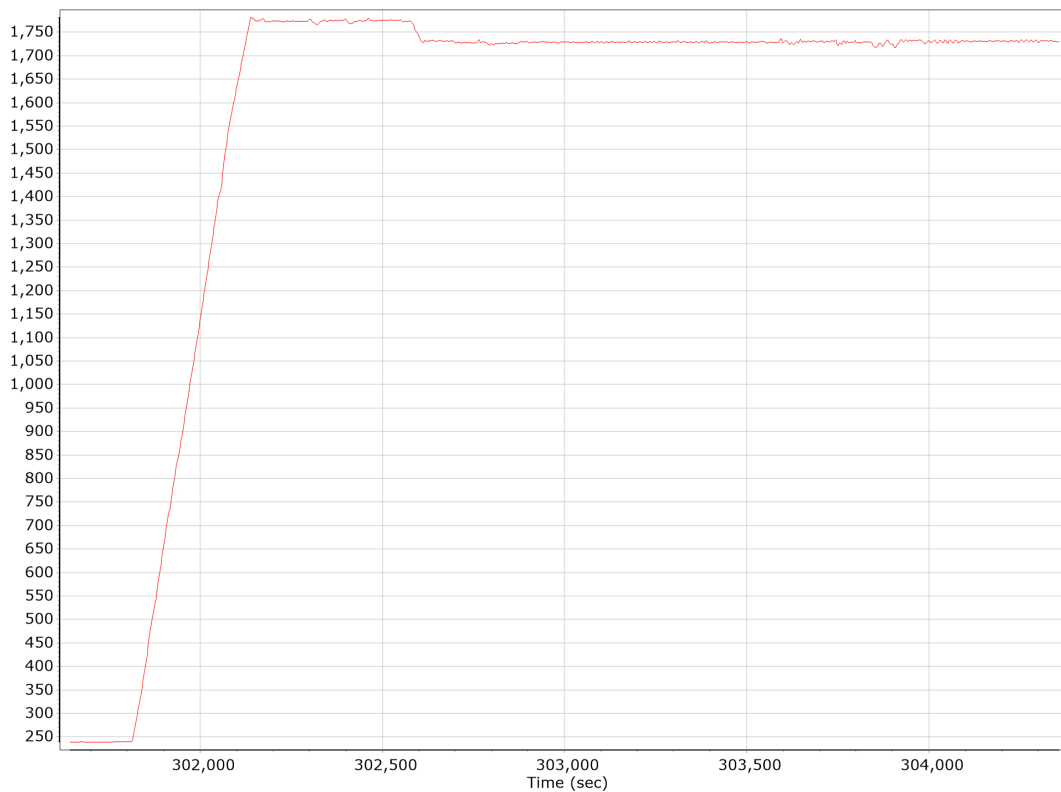
— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 07 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 13 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 15 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 21 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 27 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 30 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 04 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 07 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 27 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 30 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 04 E5B BPSK10_PD SNR (dB/Hz)	— GALILEO 07 E5B BPSK10_PD SNR (dB/Hz)
— GALILEO 13 E5B BPSK10_PD SNR (dB/Hz)	— GALILEO 15 E5B BPSK10_PD SNR (dB/Hz)

## Smoothed Trajectory Information

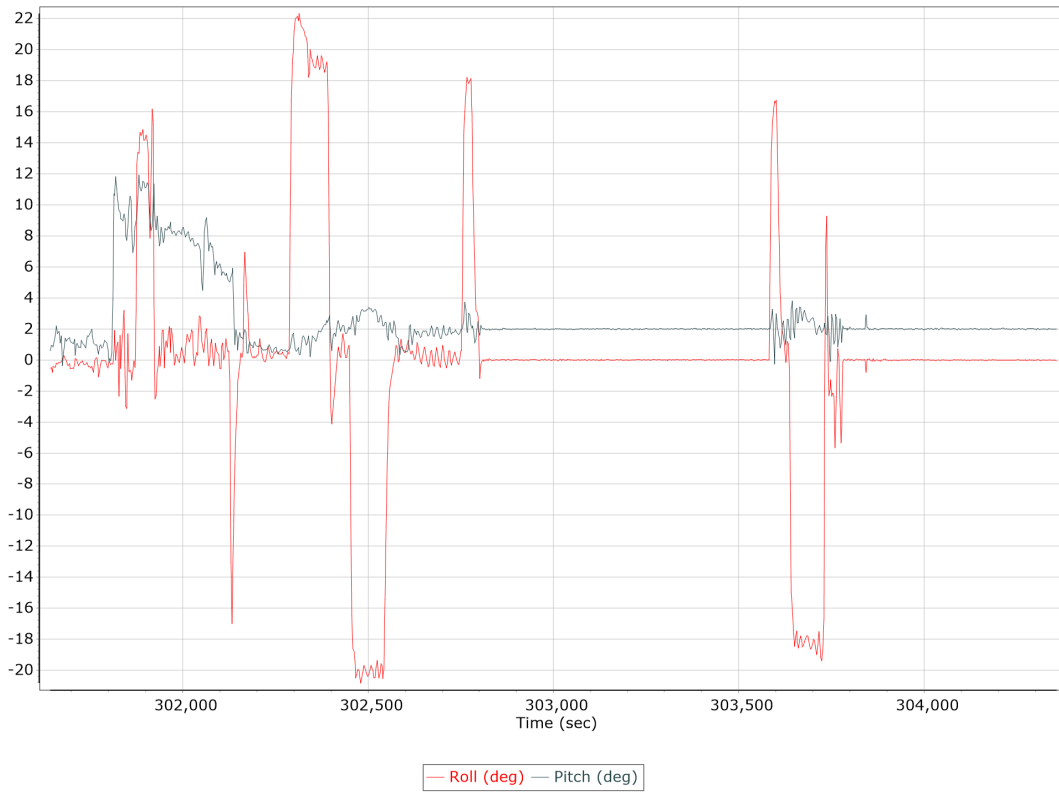
### Top View



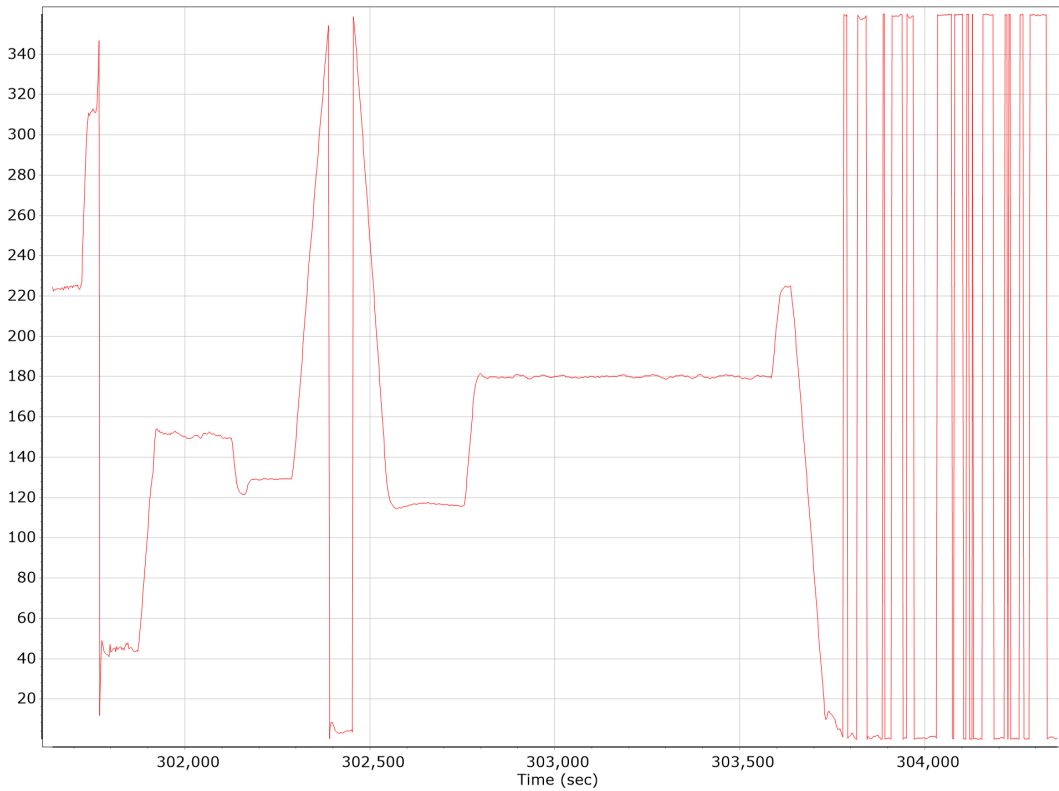
### Altitude



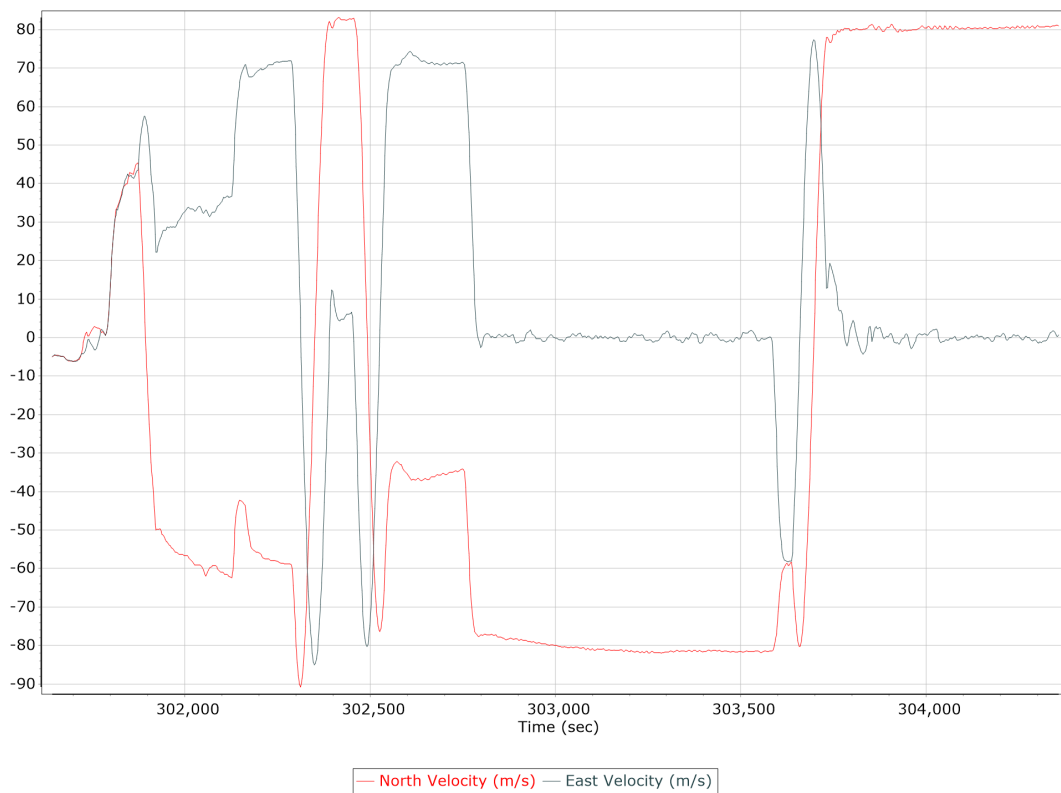
## Roll/Pitch



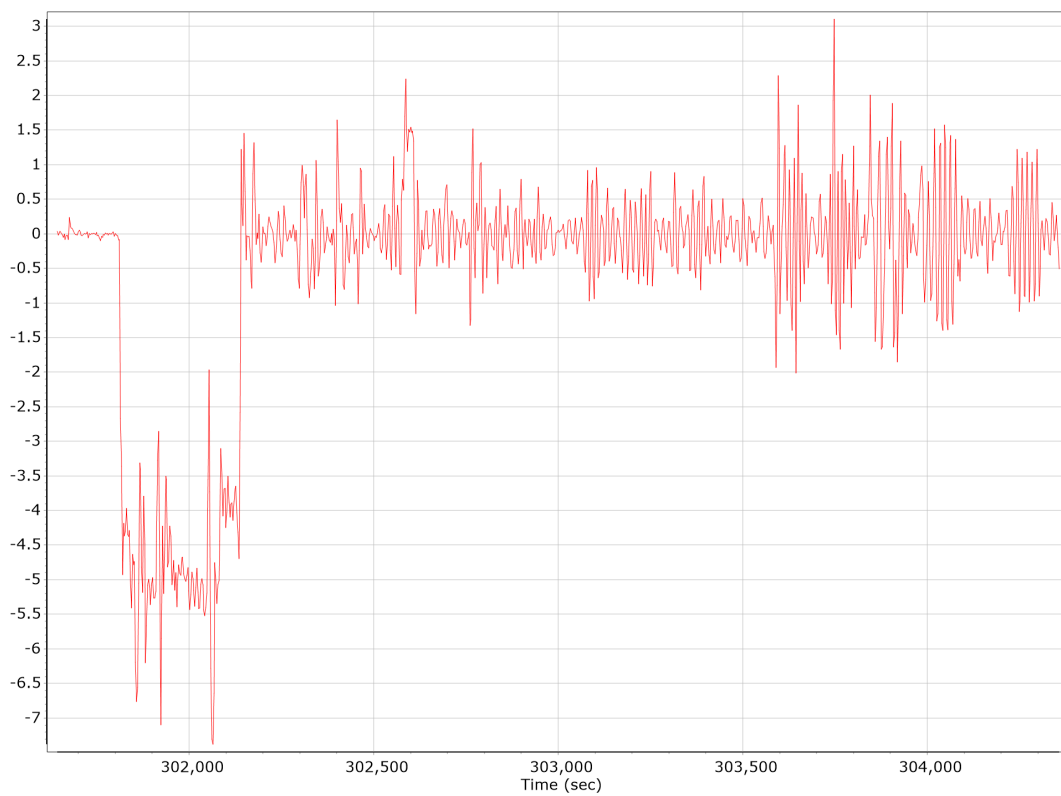
## Heading



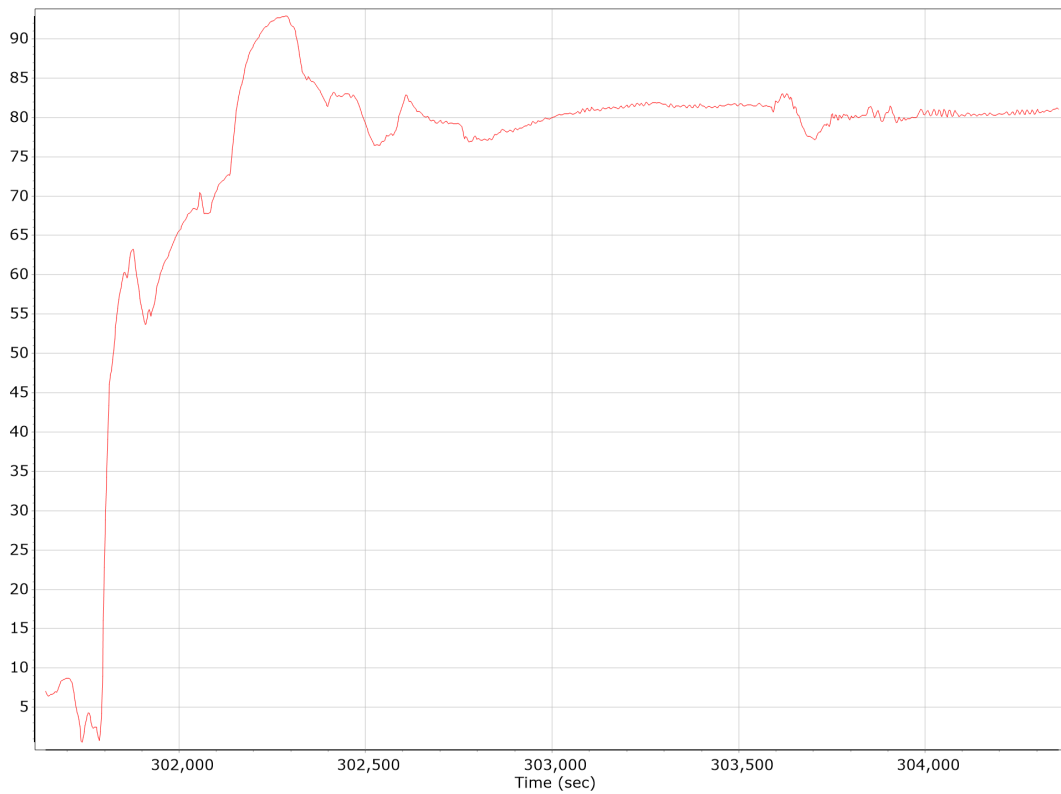
## North/East Velocity



## Down Velocity



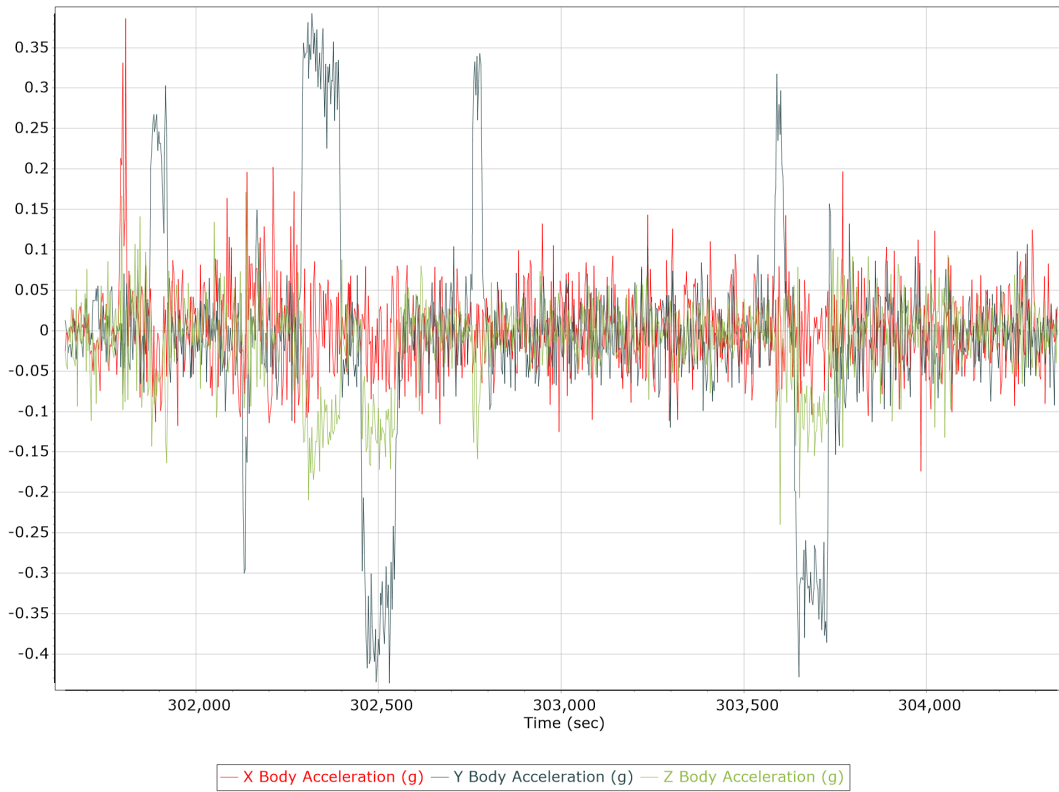
## Total Speed



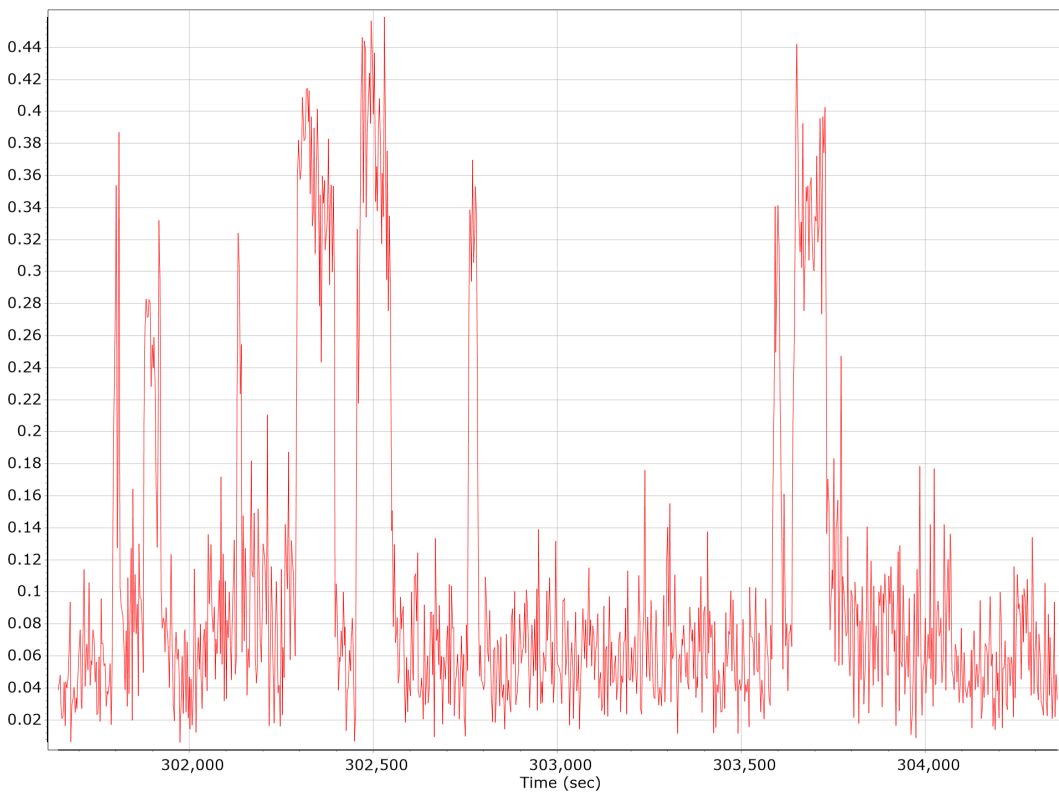
## Ground Speed



## Body Acceleration



## Total Body Acceleration



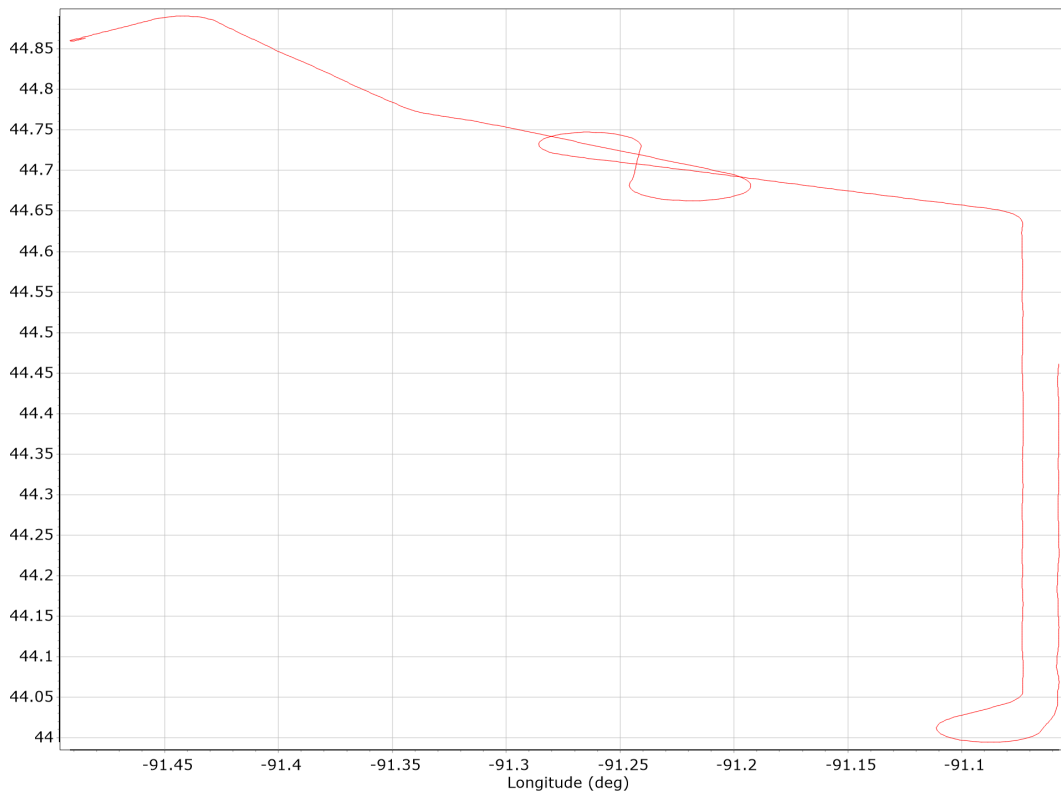
## Body Angular Rate



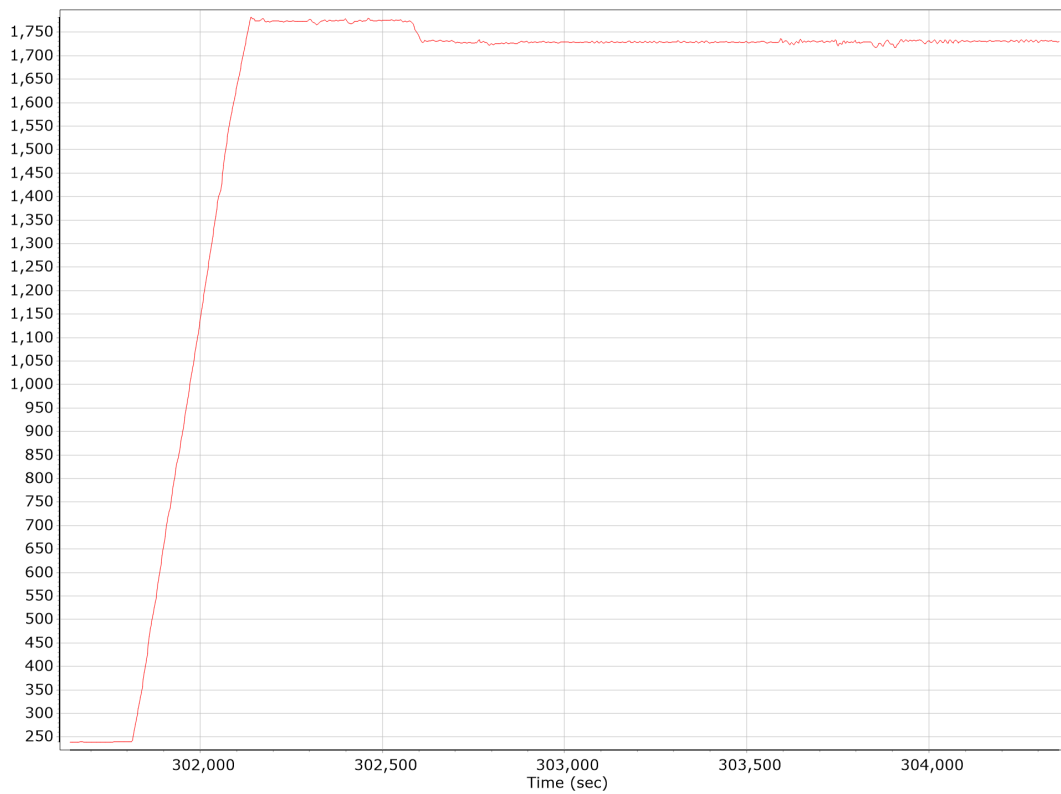


## Forward Processed Trajectory Information

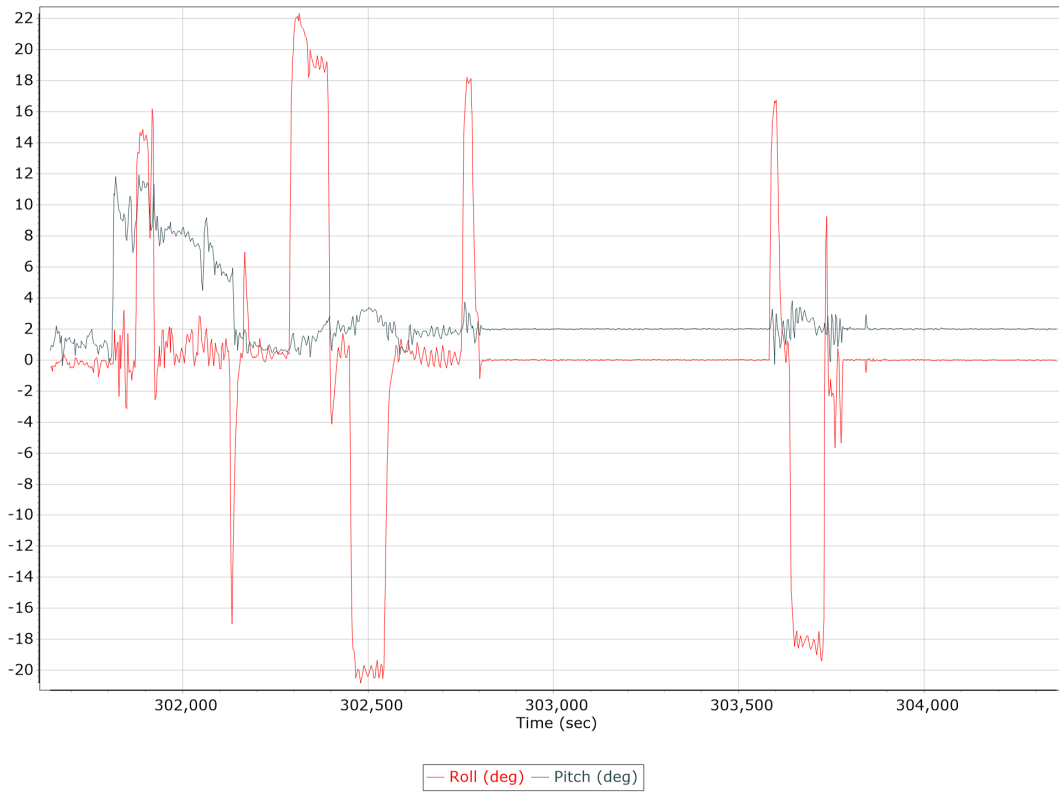
### Top View



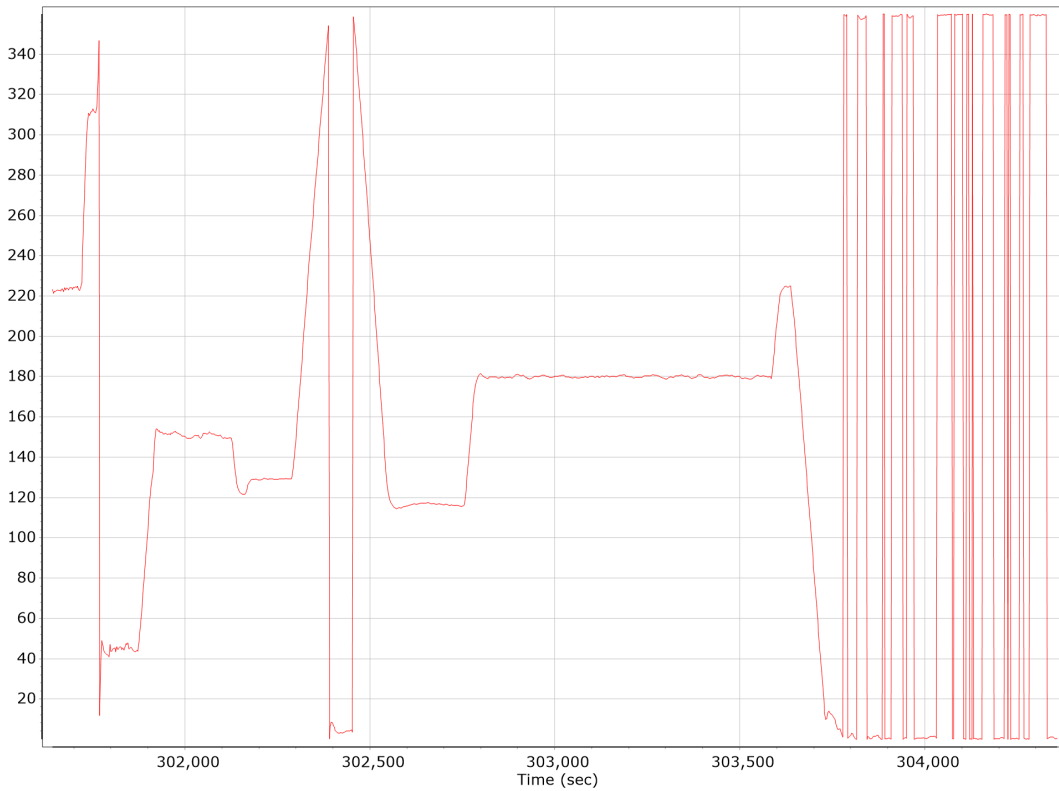
### Altitude



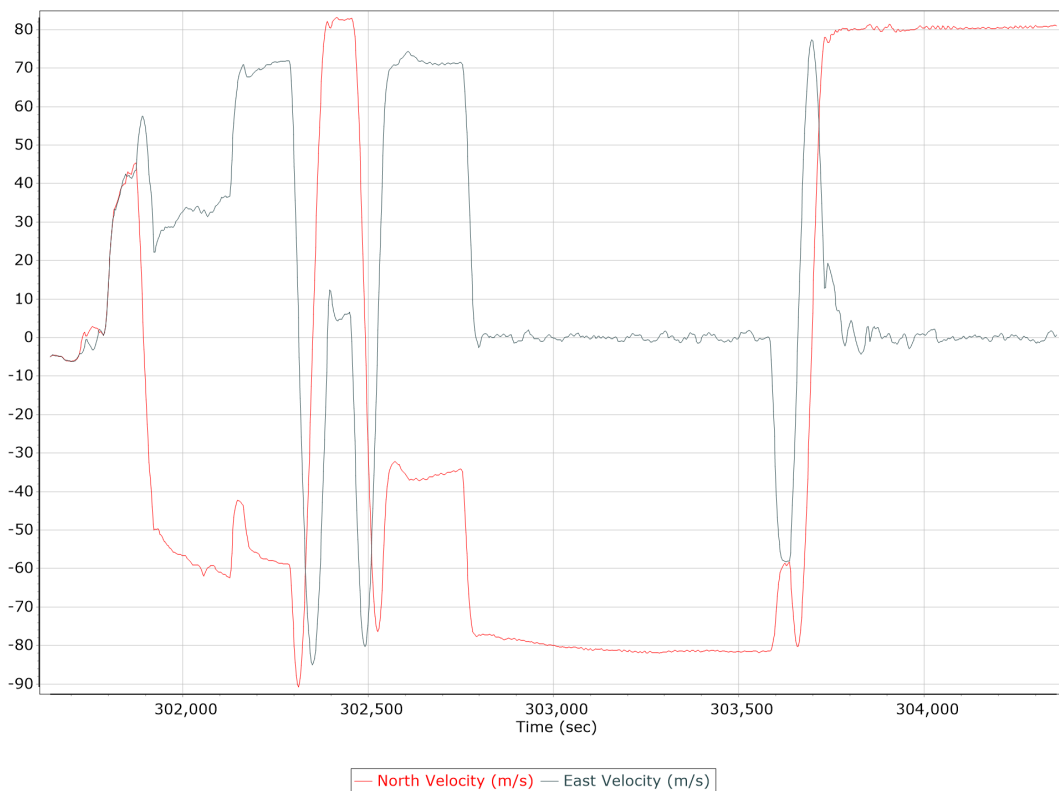
## Roll/Pitch



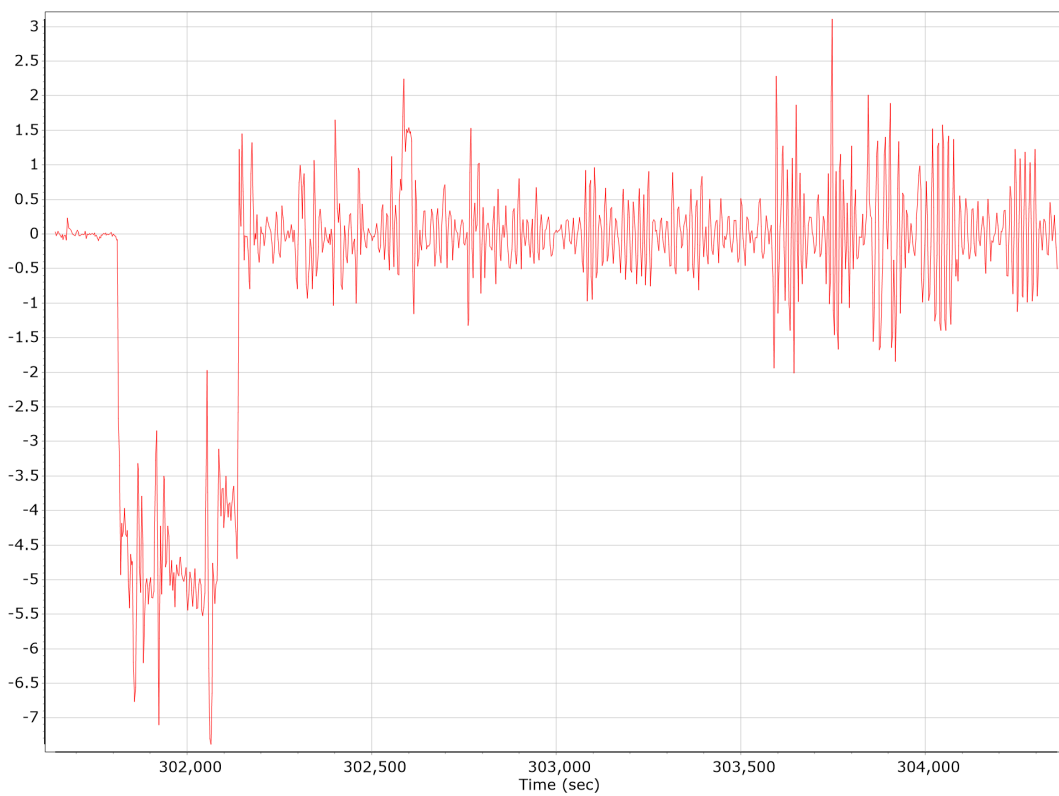
## Heading



### North/East Velocity



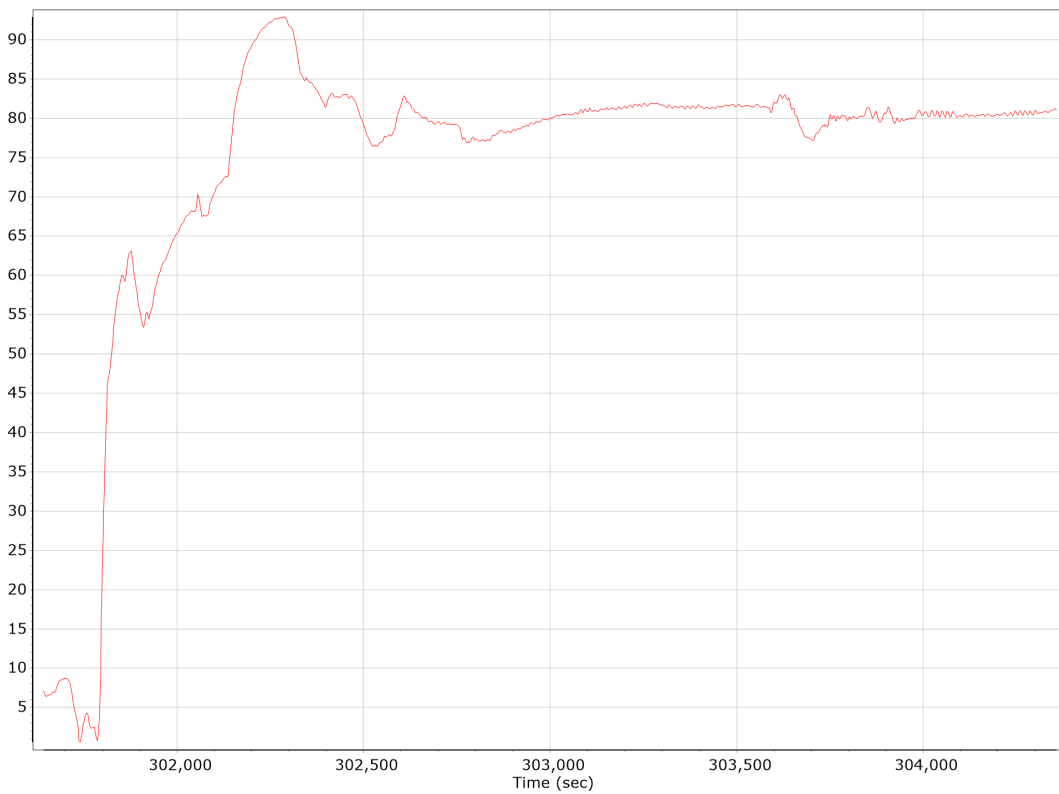
### Down Velocity



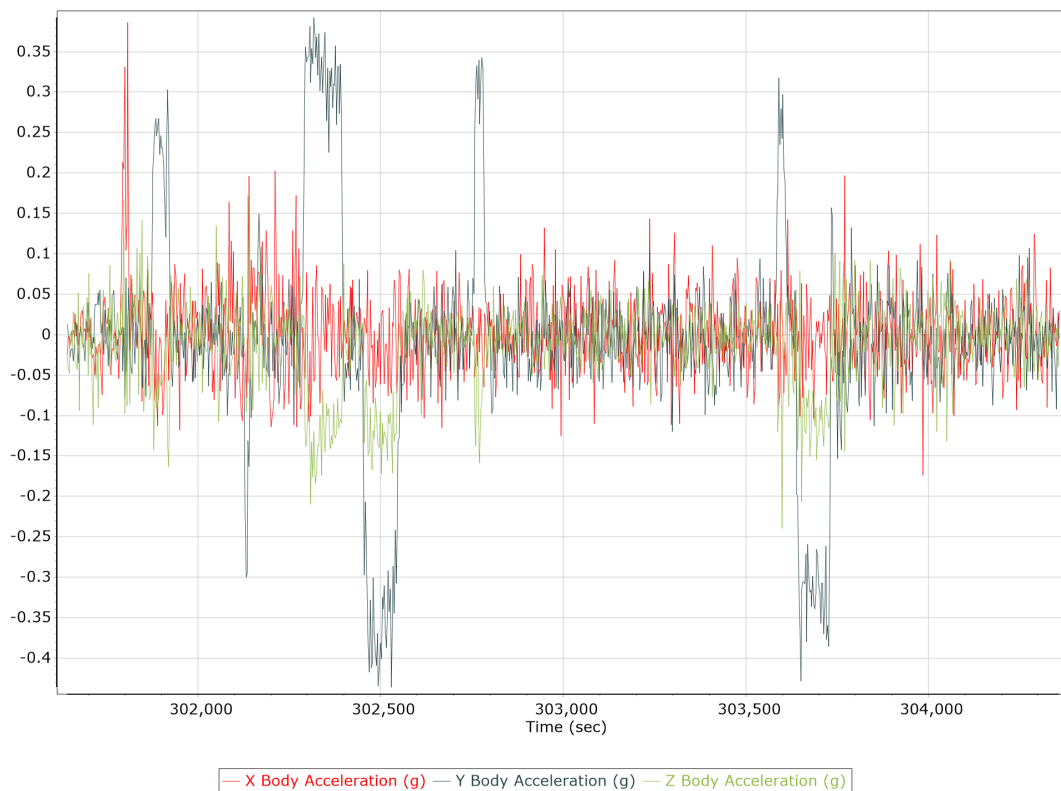
## Total Speed



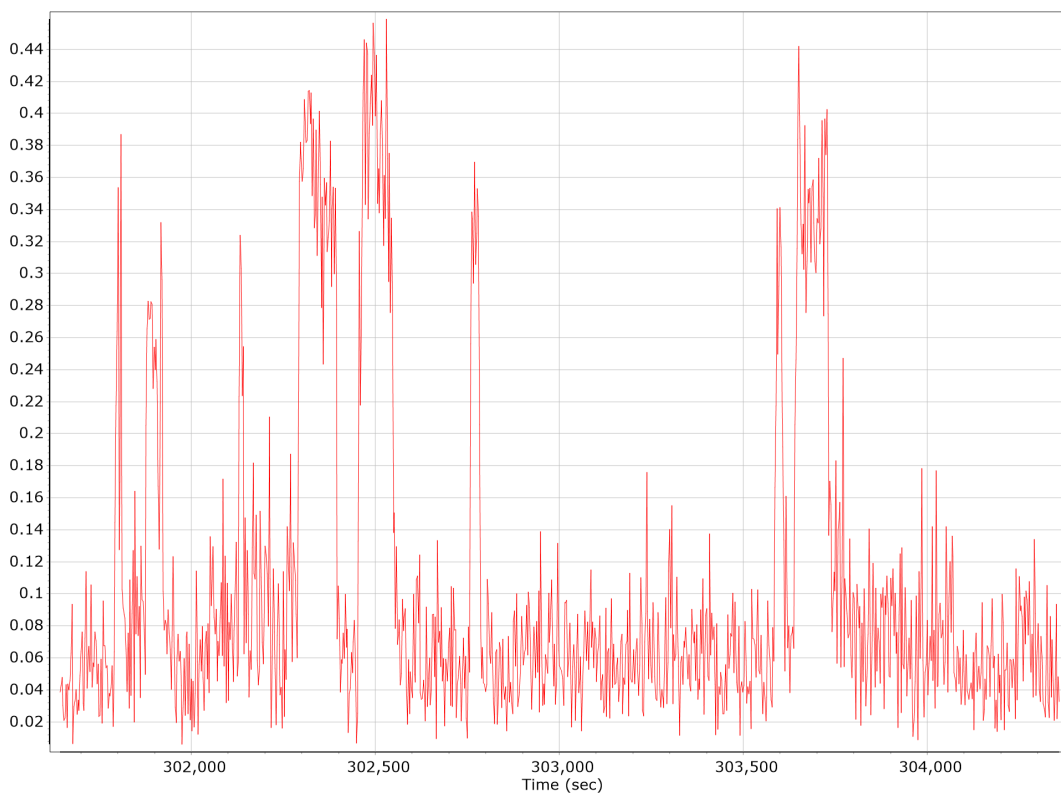
## Ground Speed



## Body Acceleration



## Total Body Acceleration



## Body Angular Rate

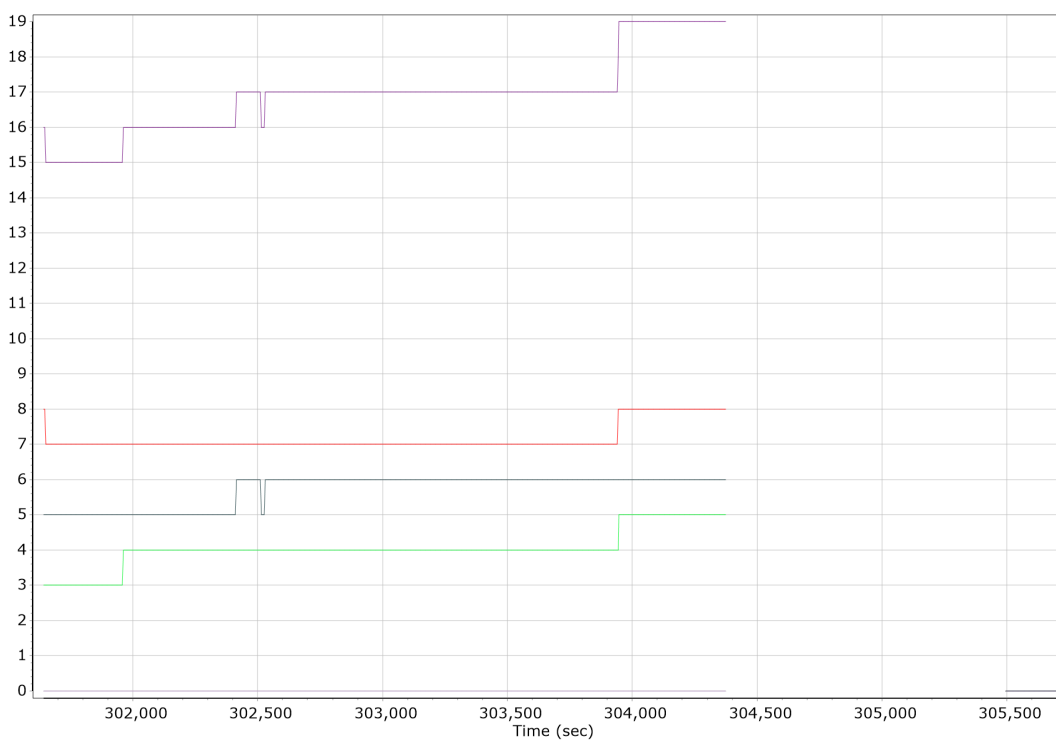


## GNSS QC

### GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	7	8	7
Number of GLONASS SV	4	6	6
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	3	5	4
Total number of SV	15	19	17
PDOP	1.26	1.61	1.40
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	3143.00	0.00	0.00
Percentage	100.00	0.00	0.00

### Num SVs in solution

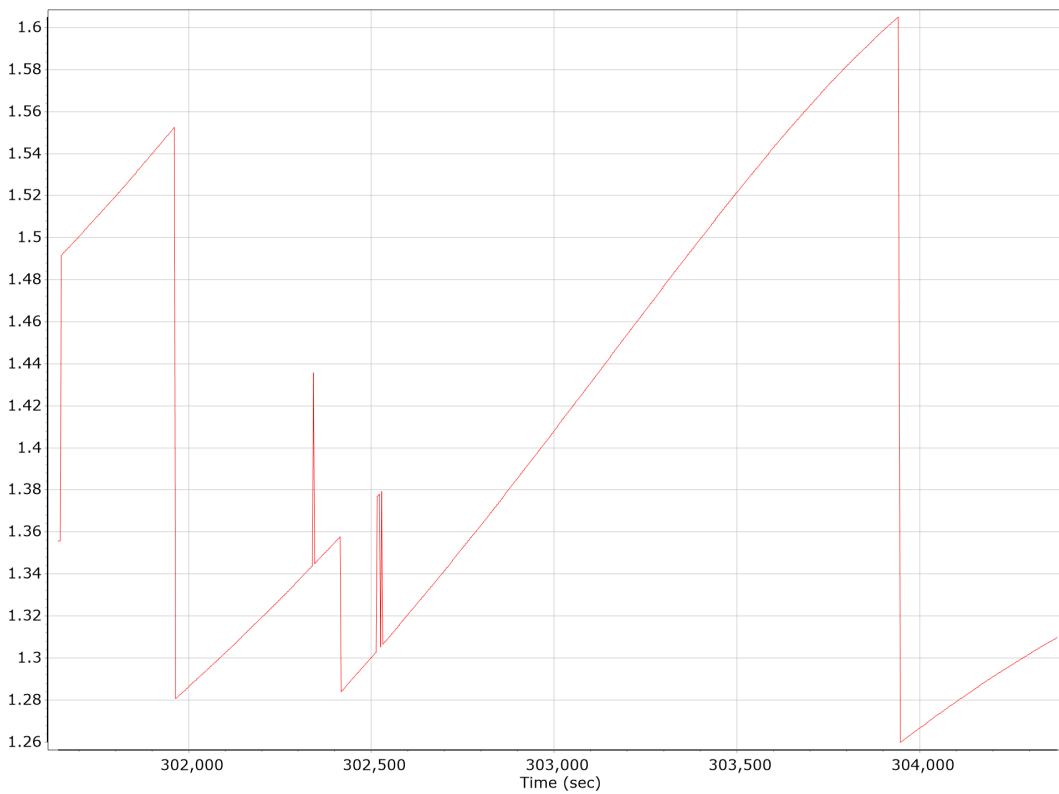


— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Number of GALILEO — Total Number

## Forward/Reverse Separation

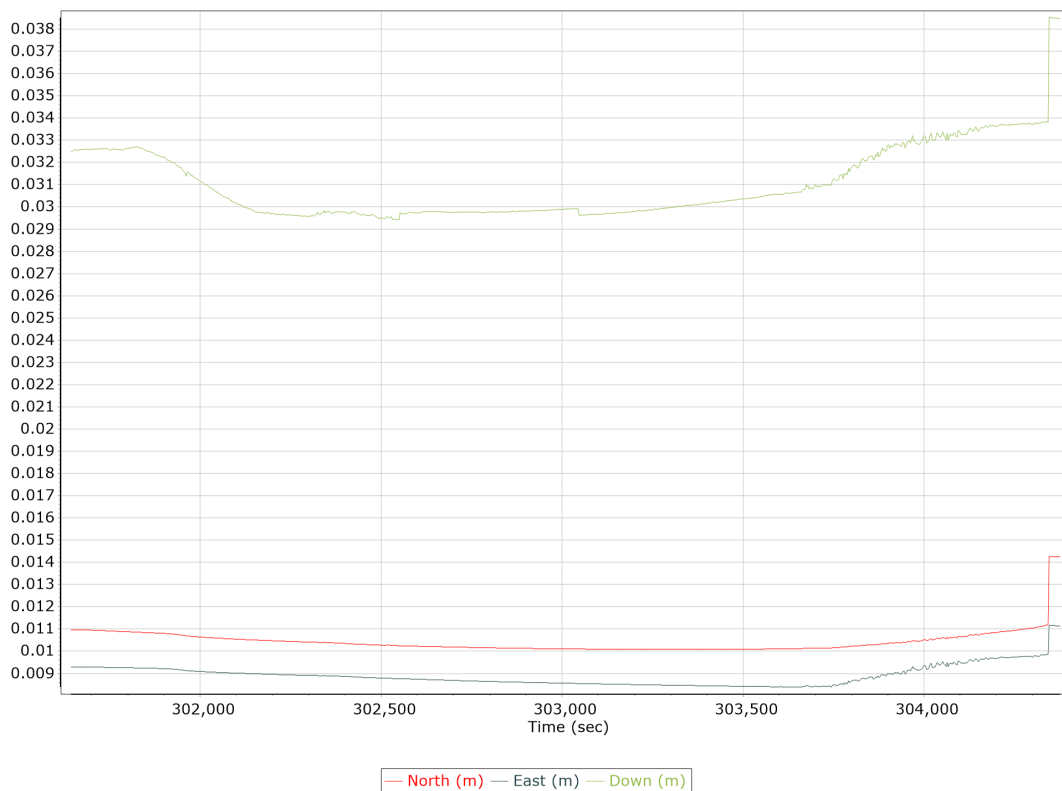


## PDOP

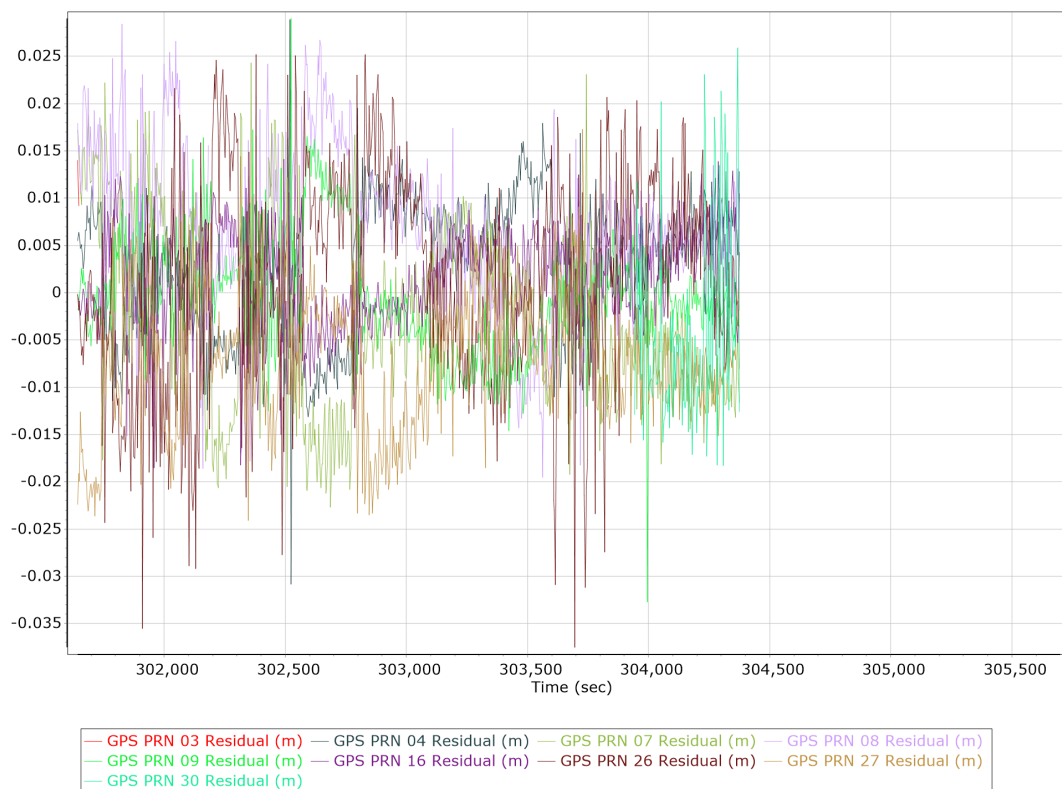




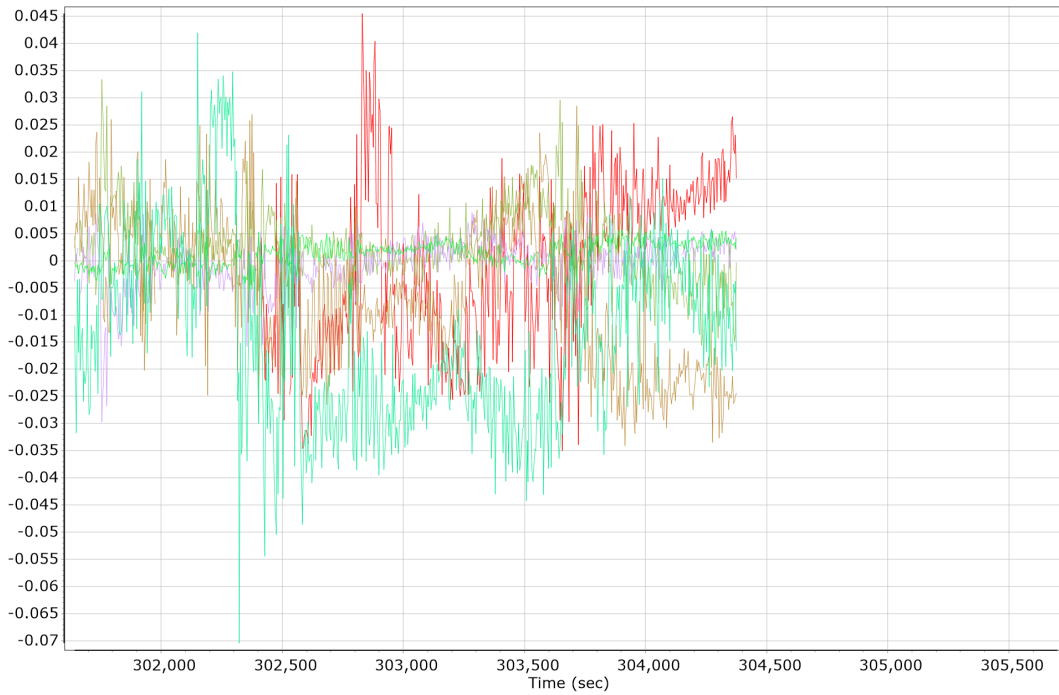
## Estimated Position Accuracy



## GPS Residuals

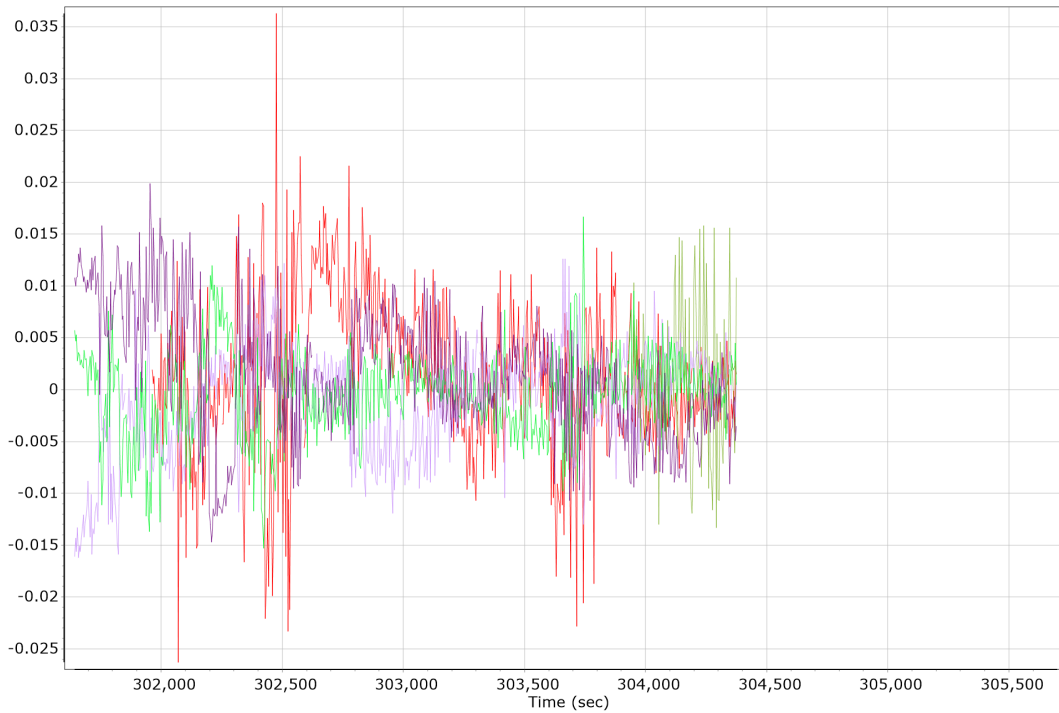


## GLONASS Residuals



— GLONASS 01 Residual (m) — GLONASS 06 Residual (m) — GLONASS 07 Residual (m) — GLONASS 08 Residual (m)  
— GLONASS 09 Residual (m) — GLONASS 10 Residual (m) — GLONASS 11 Residual (m) — GLONASS 18 Residual (m)  
— GLONASS 19 Residual (m)

## GALILEO Residuals



— GALILEO 04 Residual (m) — GALILEO 07 Residual (m) — GALILEO 15 Residual (m) — GALILEO 19 Residual (m)  
— GALILEO 21 Residual (m) — GALILEO 27 Residual (m)

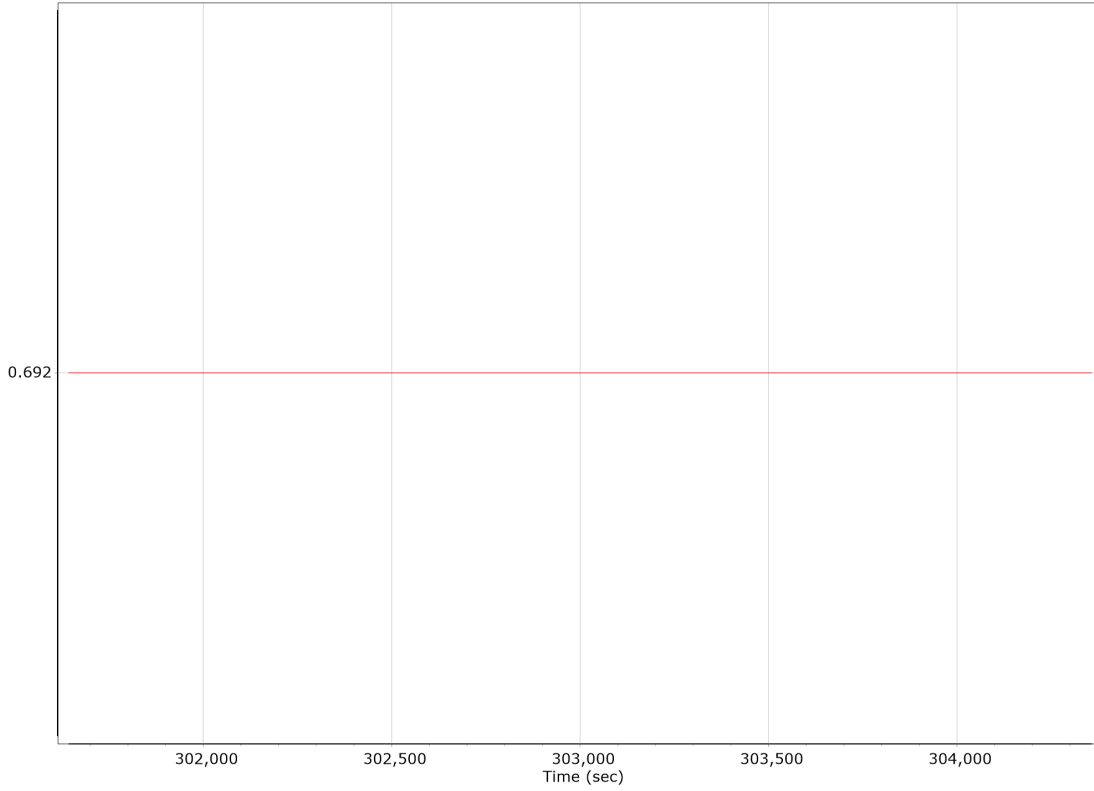
## GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	301212.000 (5/4/2022 11:40:12 AM)		
Processing end time	304359.357 (5/4/2022 12:32:39 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

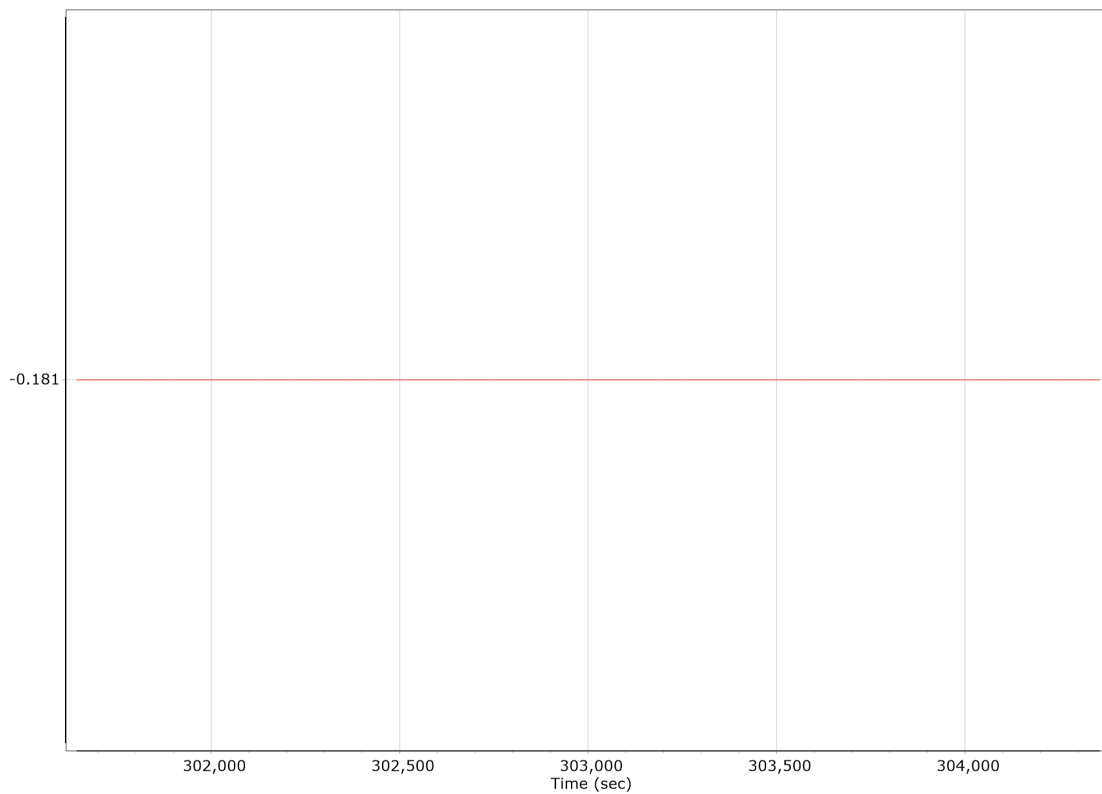
## Calibrated Installation Parameters

### Reference-Primary GNSS Lever Arm (m)

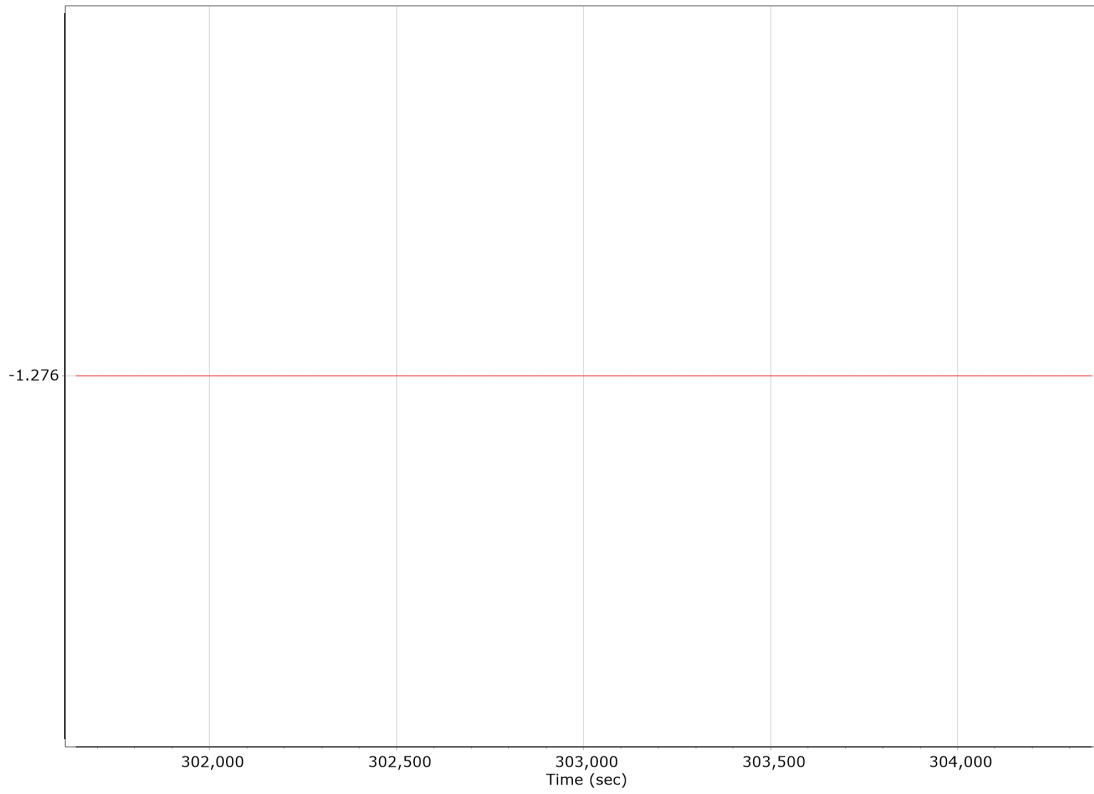
#### X Reference-Primary GNSS Lever Arm (m)



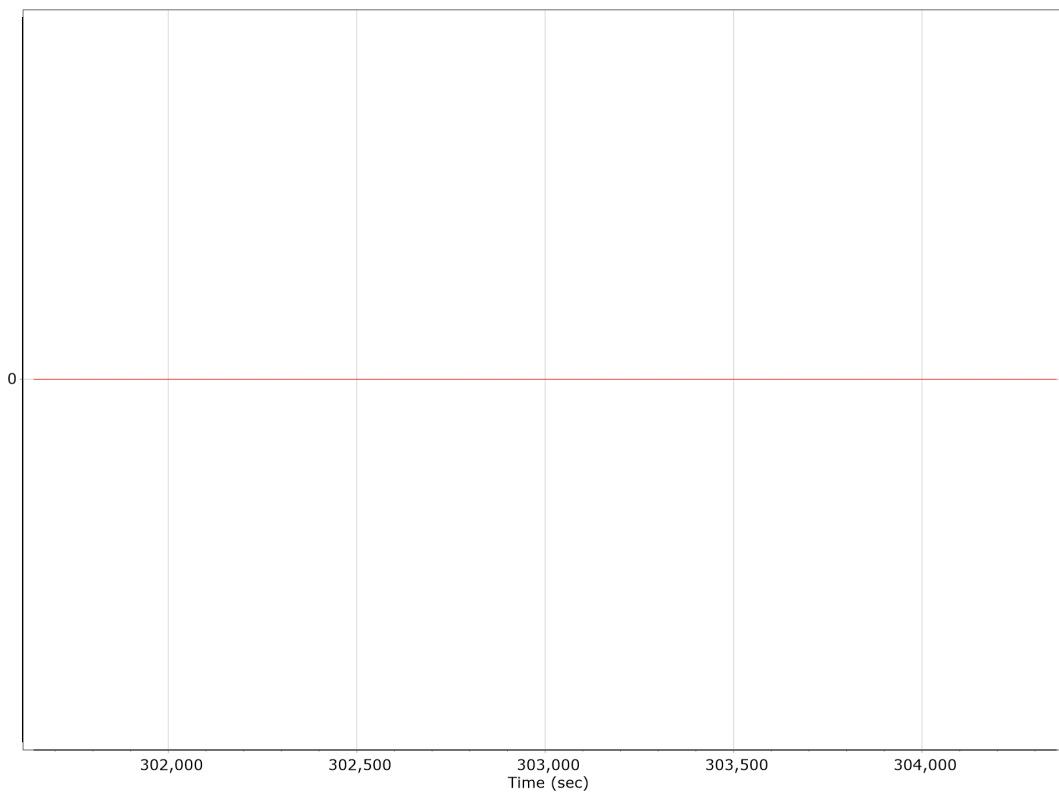
#### Y Reference-Primary GNSS Lever Arm (m)



### Z Reference-Primary GNSS Lever Arm (m)



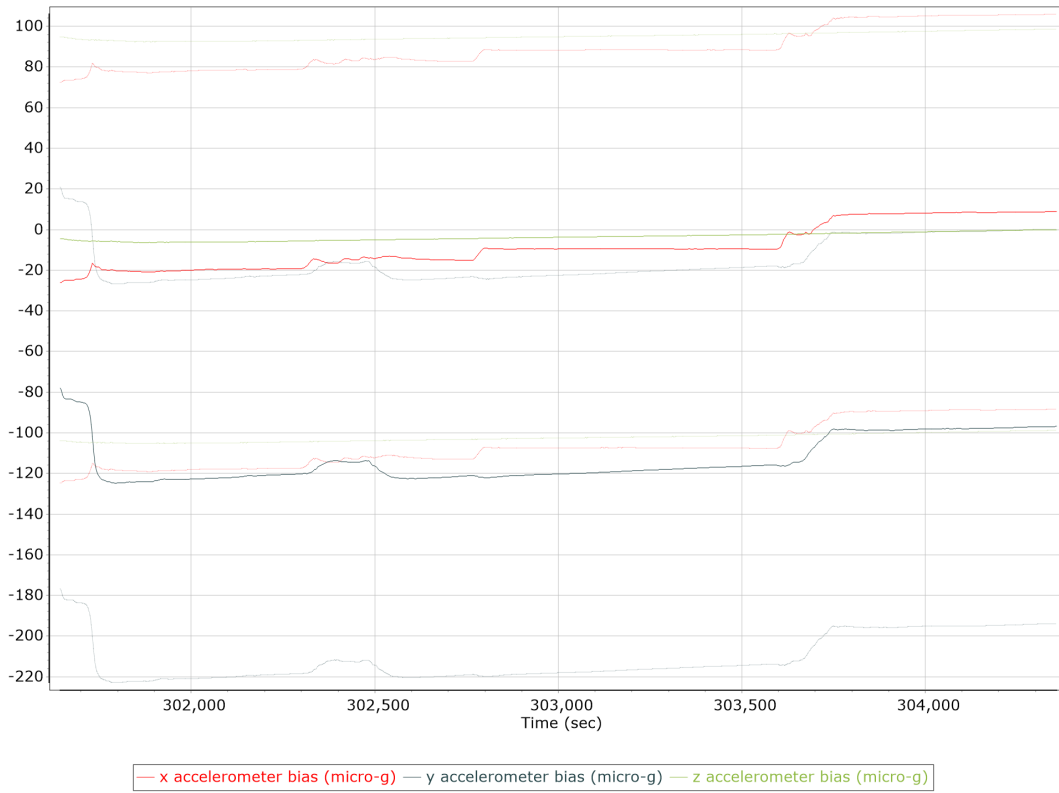
### Reference-Primary GNSS Lever Arm Figure of Merit



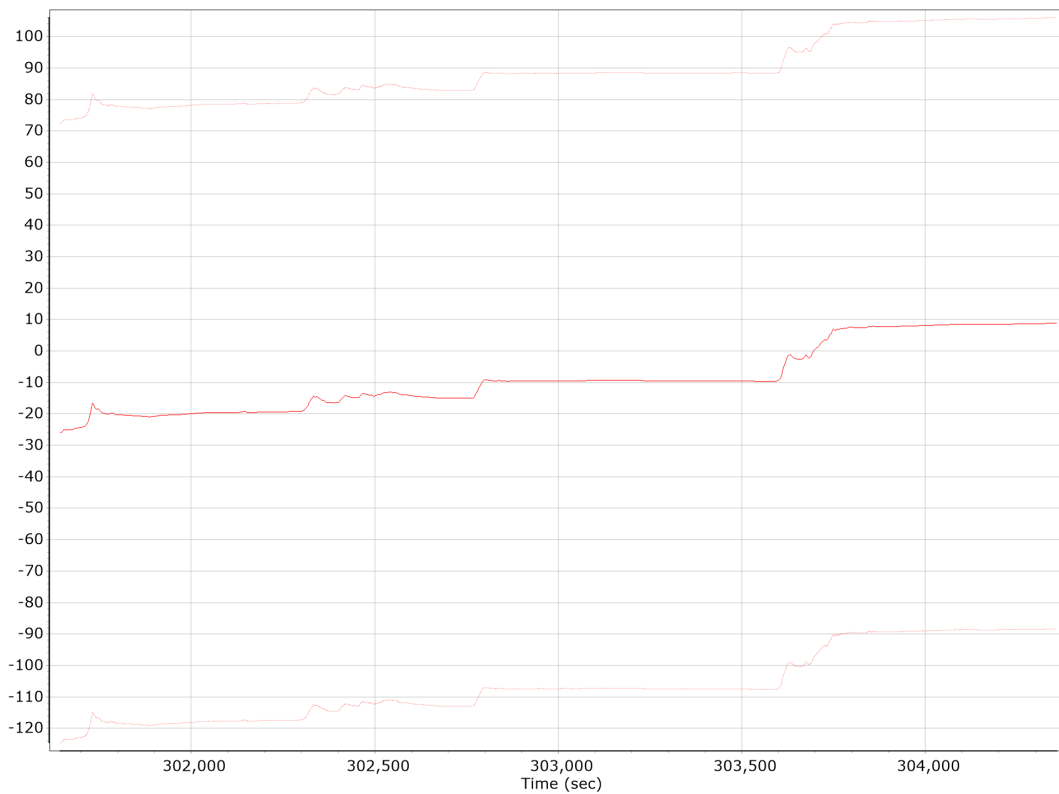
## IN-Fusion QC

### Forward Processed Estimated Errors, Reference Frame

#### Accelerometer Bias (micro-g)



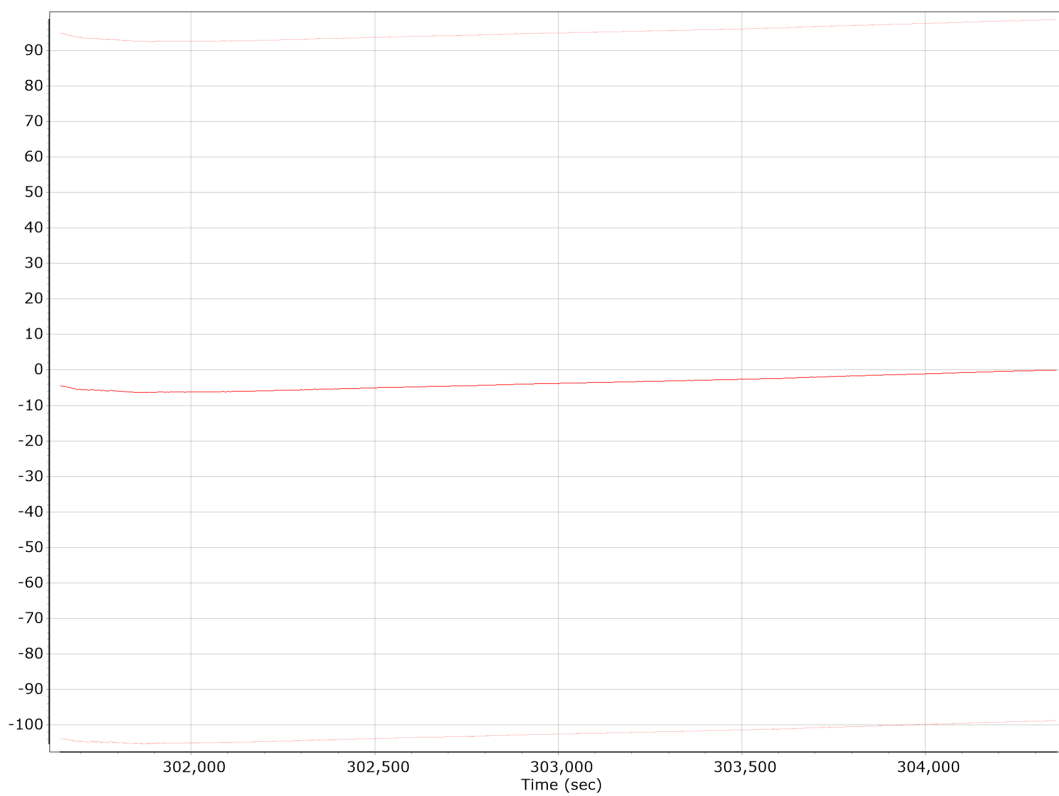
#### X Accelerometer Bias (micro-g)



### Y Accelerometer Bias (micro-g)



### Z Accelerometer Bias (micro-g)



### Accelerometer Scale Error (ppm)



### X Accelerometer Scale Error (ppm)





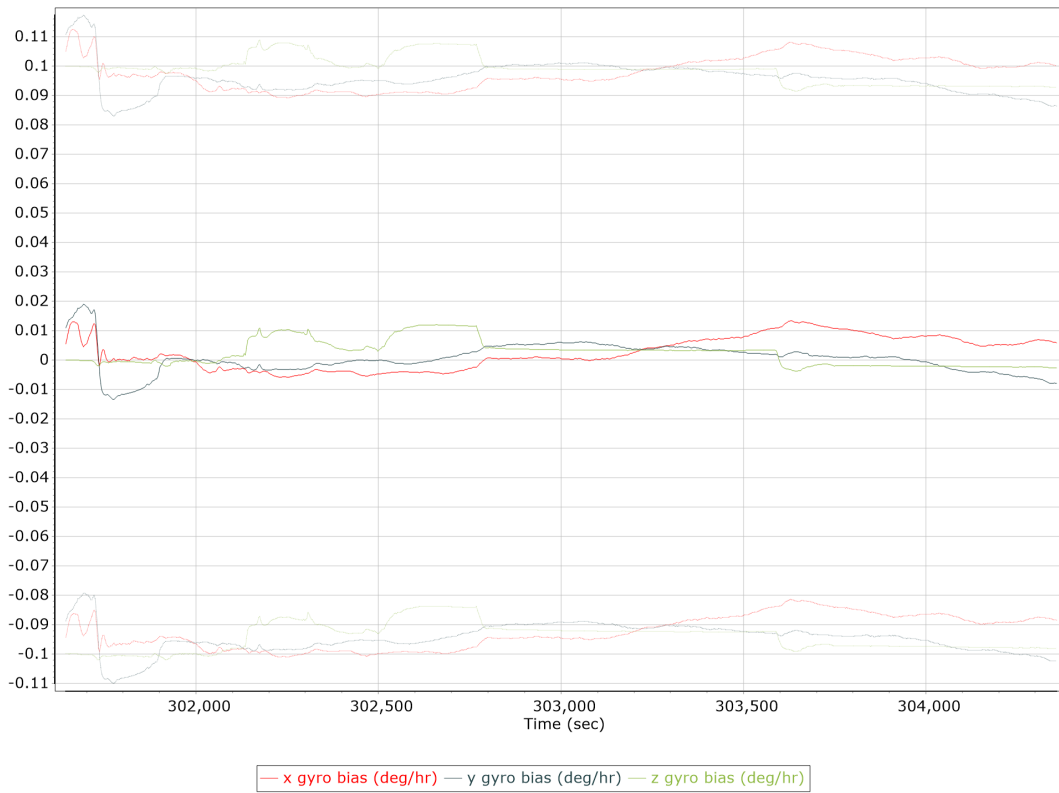
### Y Accelerometer Scale Error (ppm)



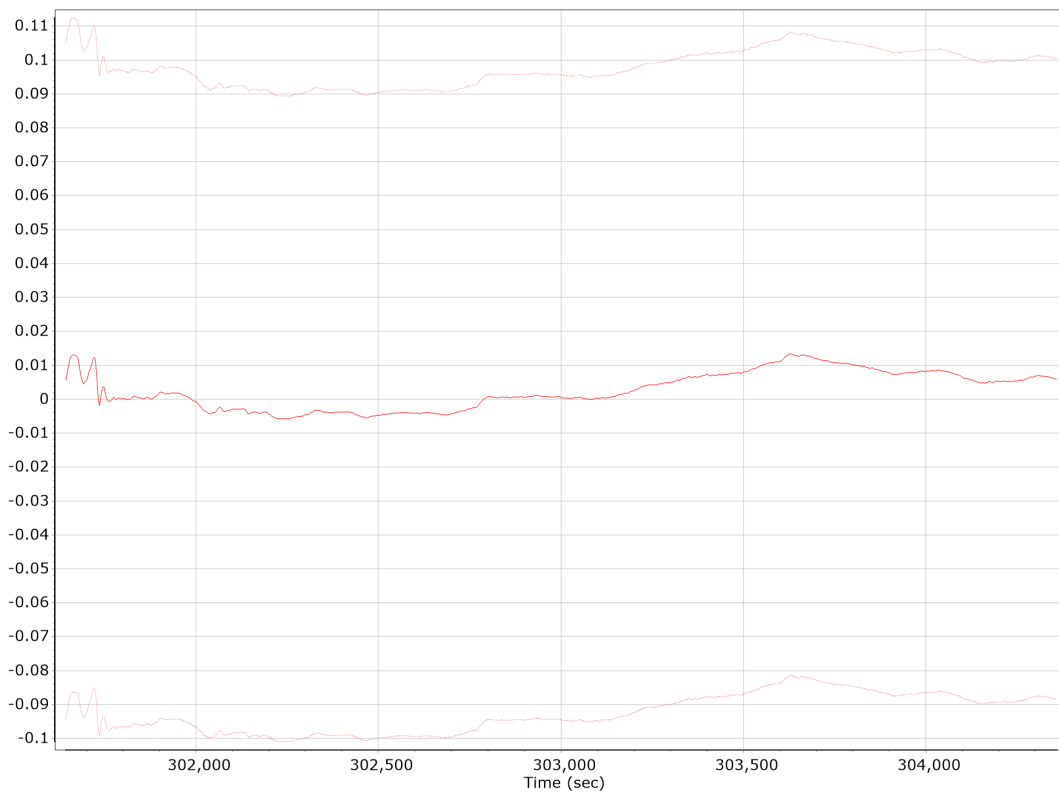
### Z Accelerometer Scale Error (ppm)



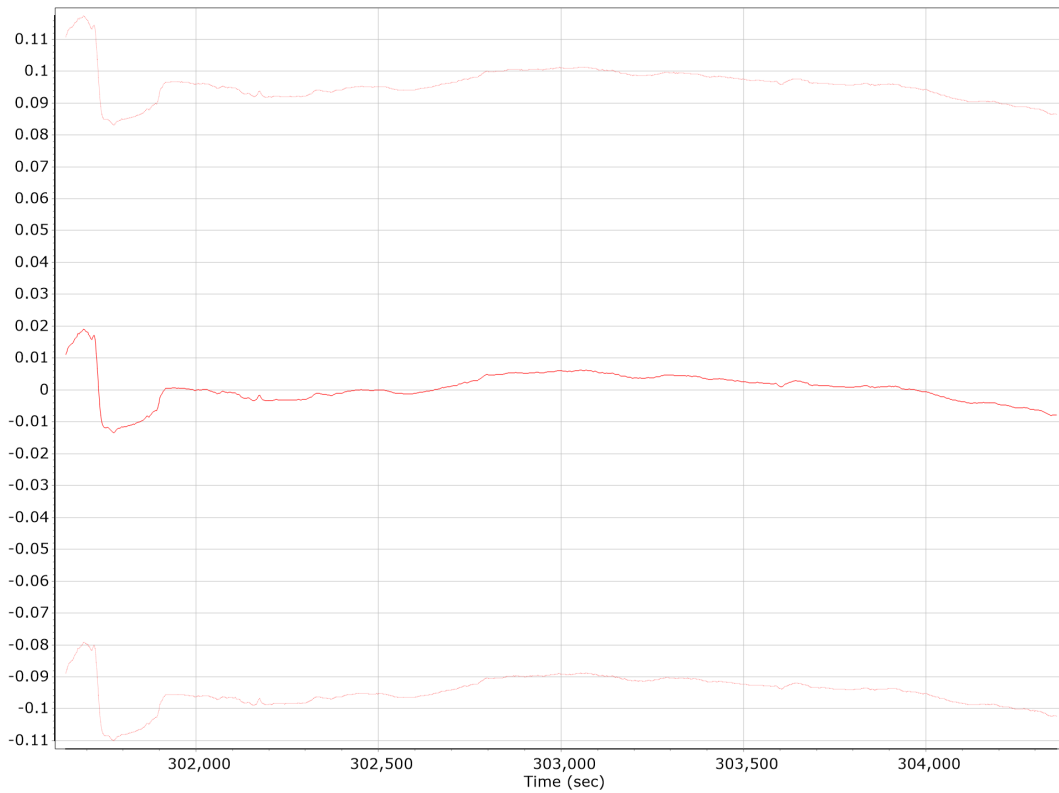
### Gyro Bias (deg/h)



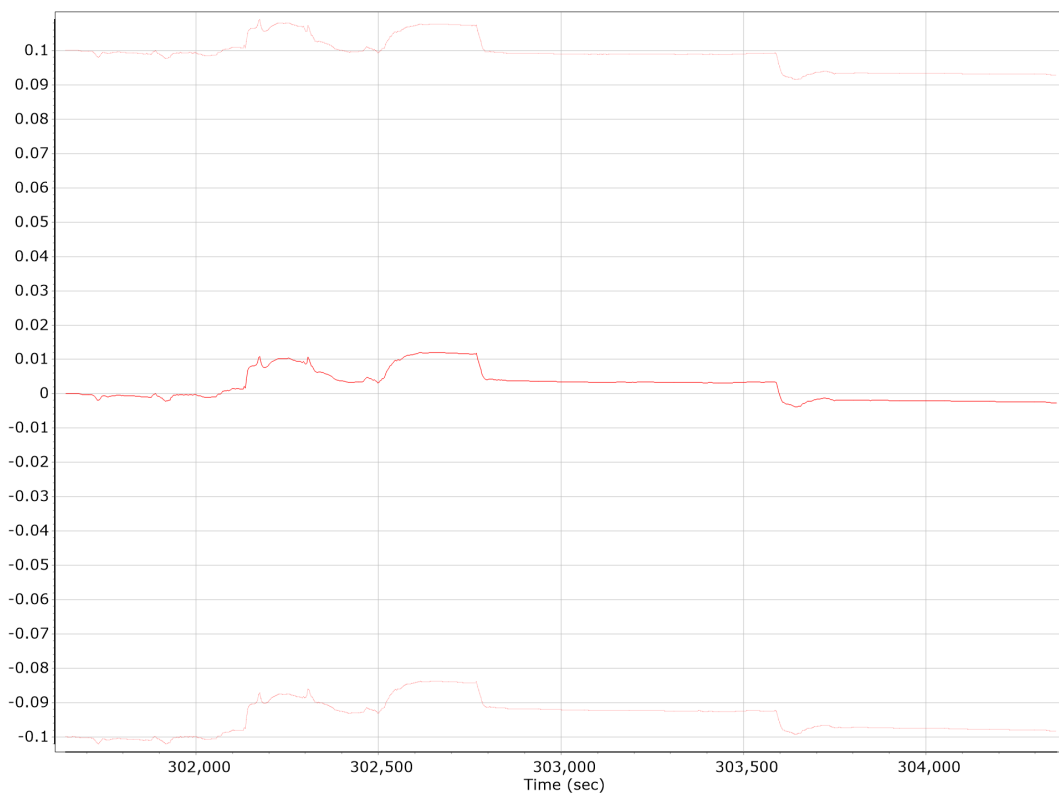
### X Gyro Bias (deg/h)



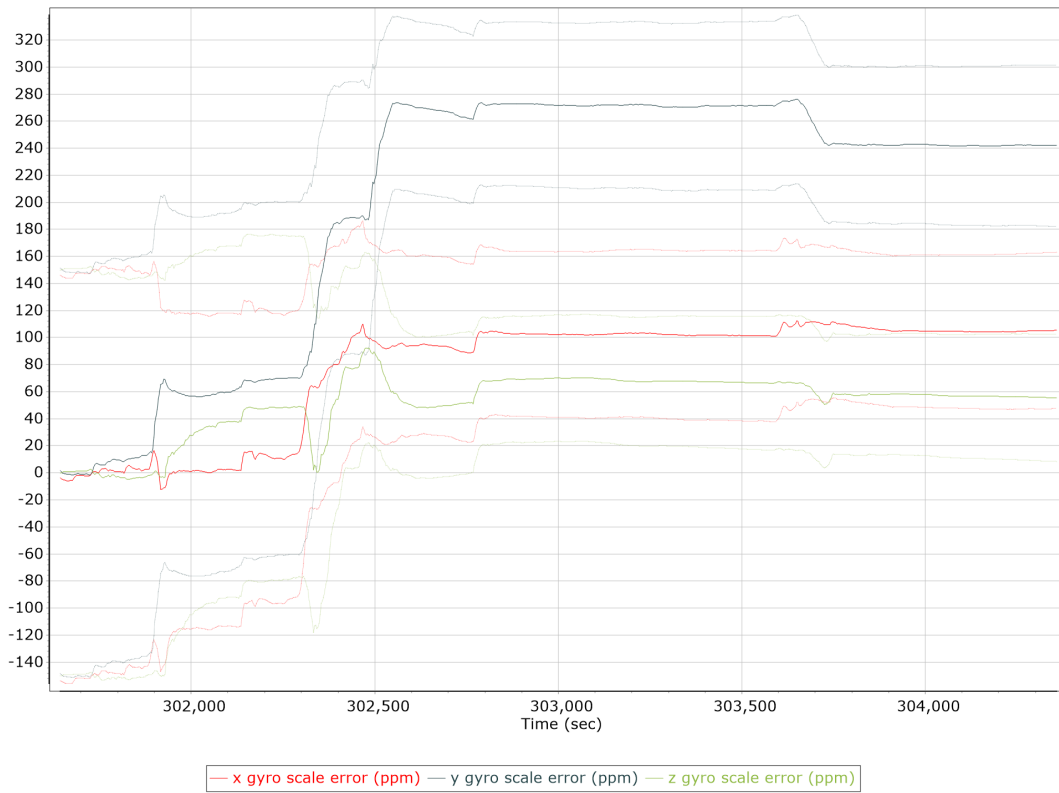
### Y Gyro Bias (deg/h)



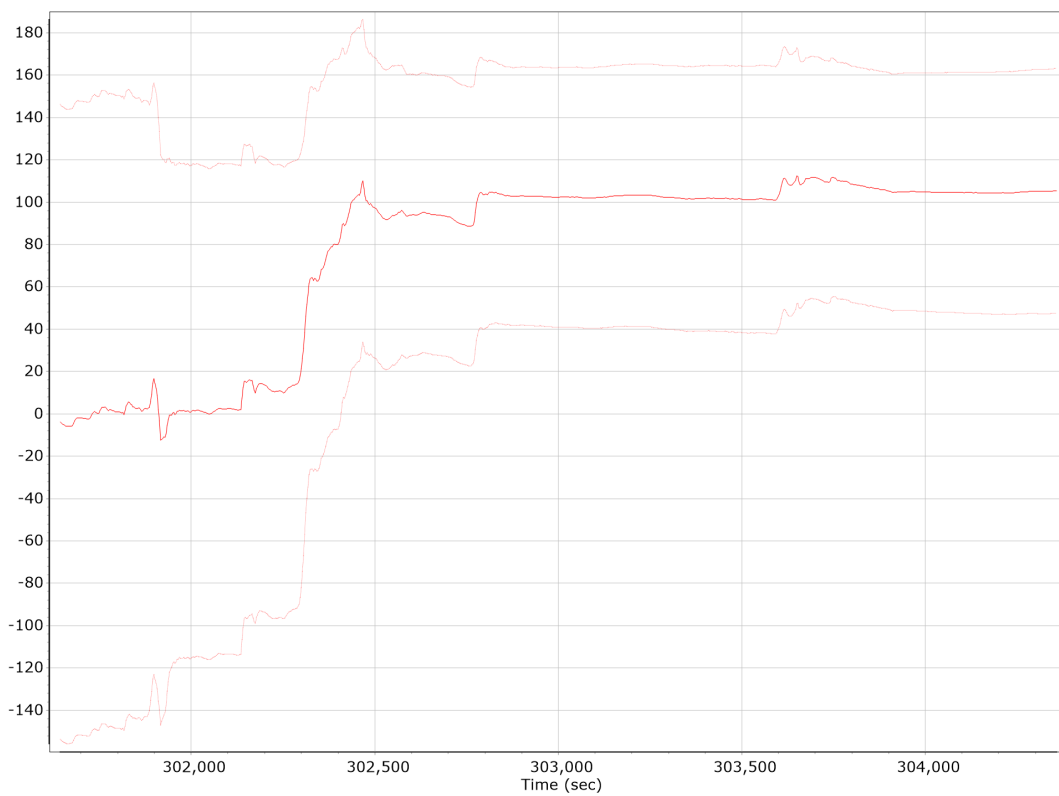
### Z Gyro Bias (deg/h)



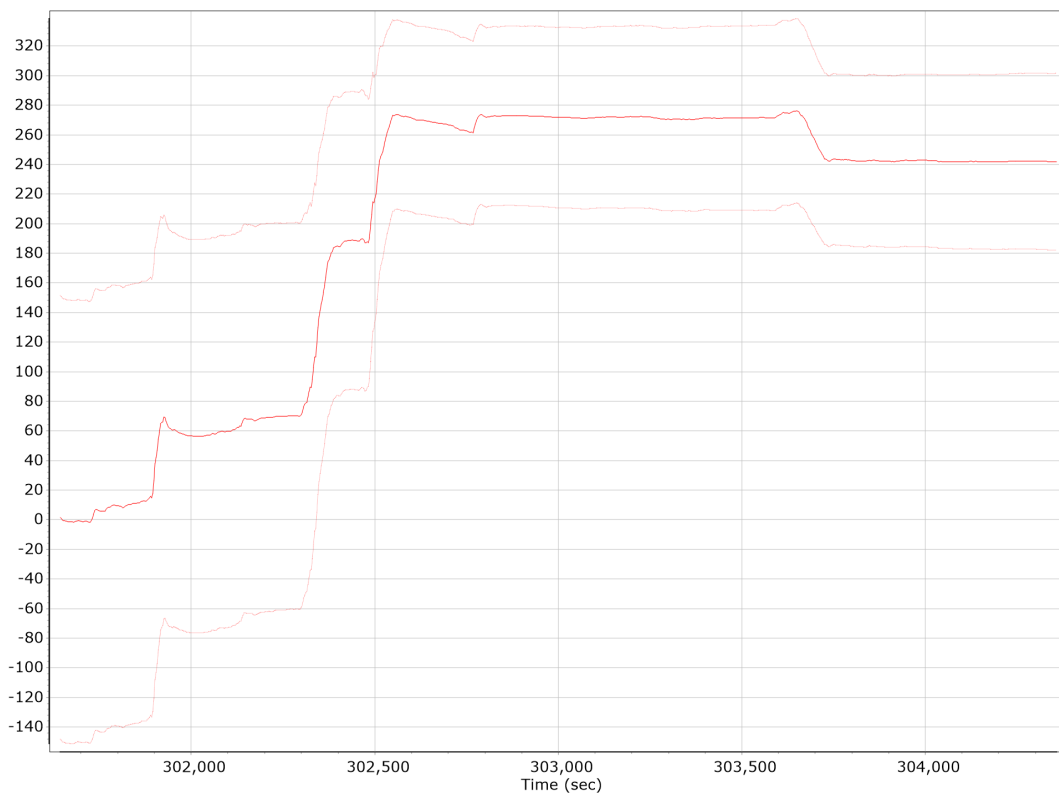
### Gyro Scale Error (ppm)



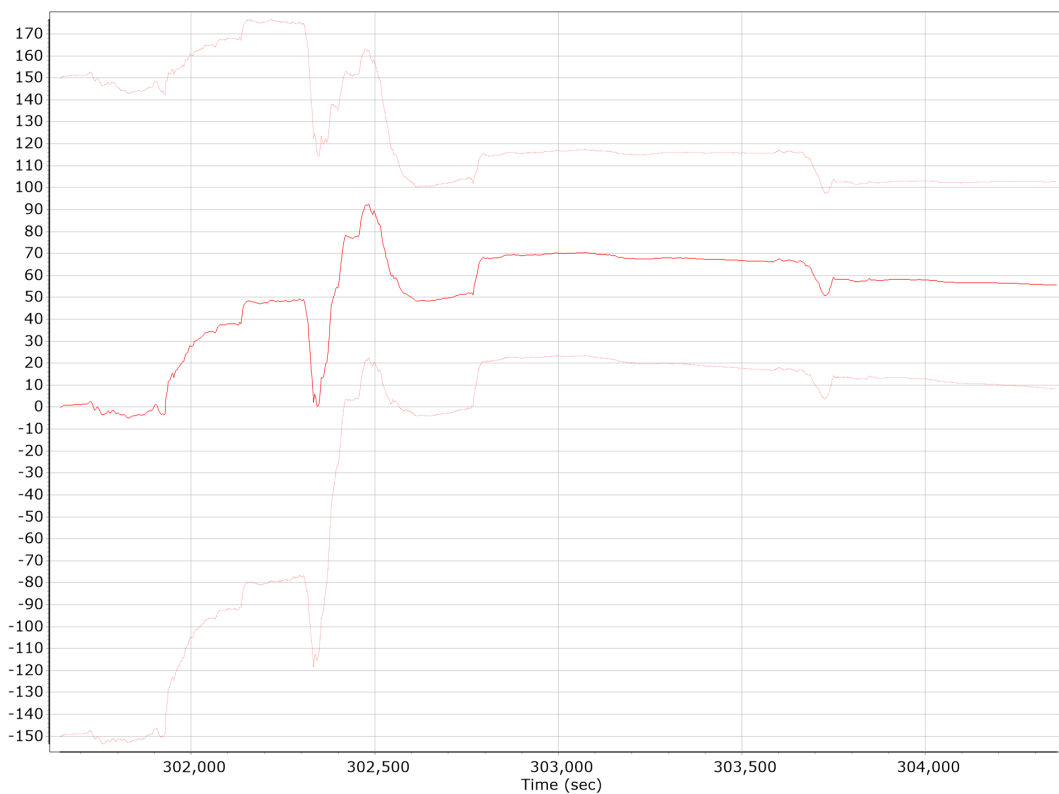
### X Gyro Scale Error (ppm)



### Y Gyro Scale Error (ppm)

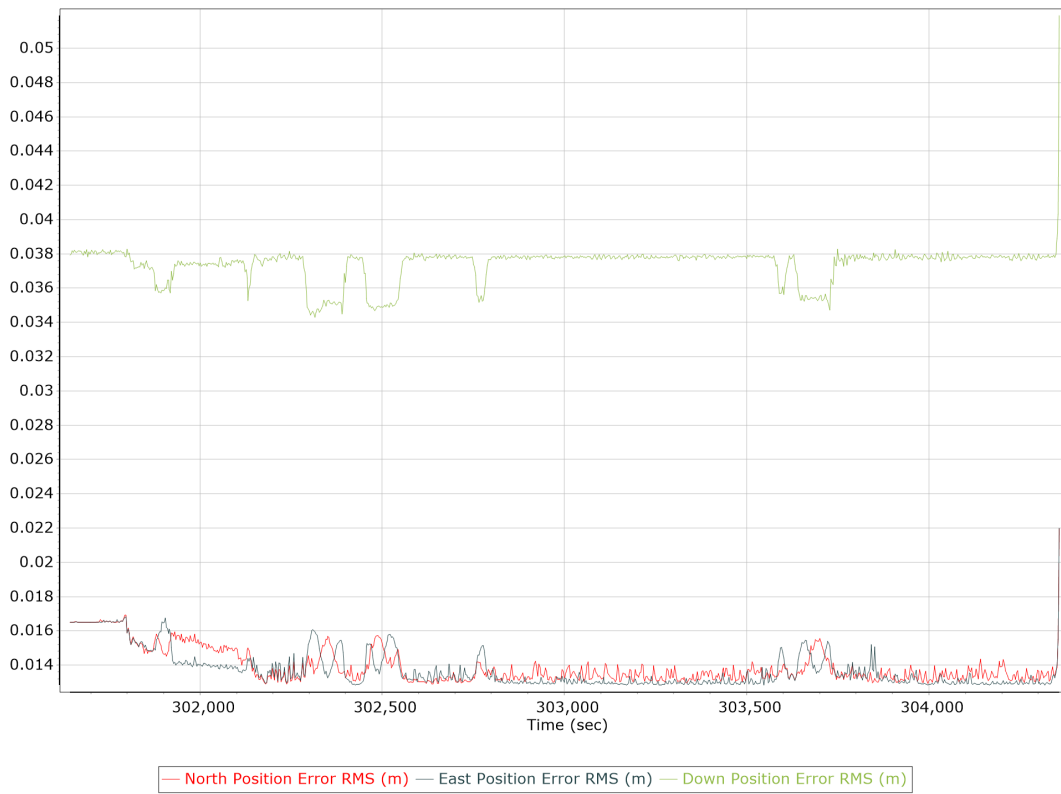


### Z Gyro Scale Error (ppm)



## Smoothed Performance Metrics

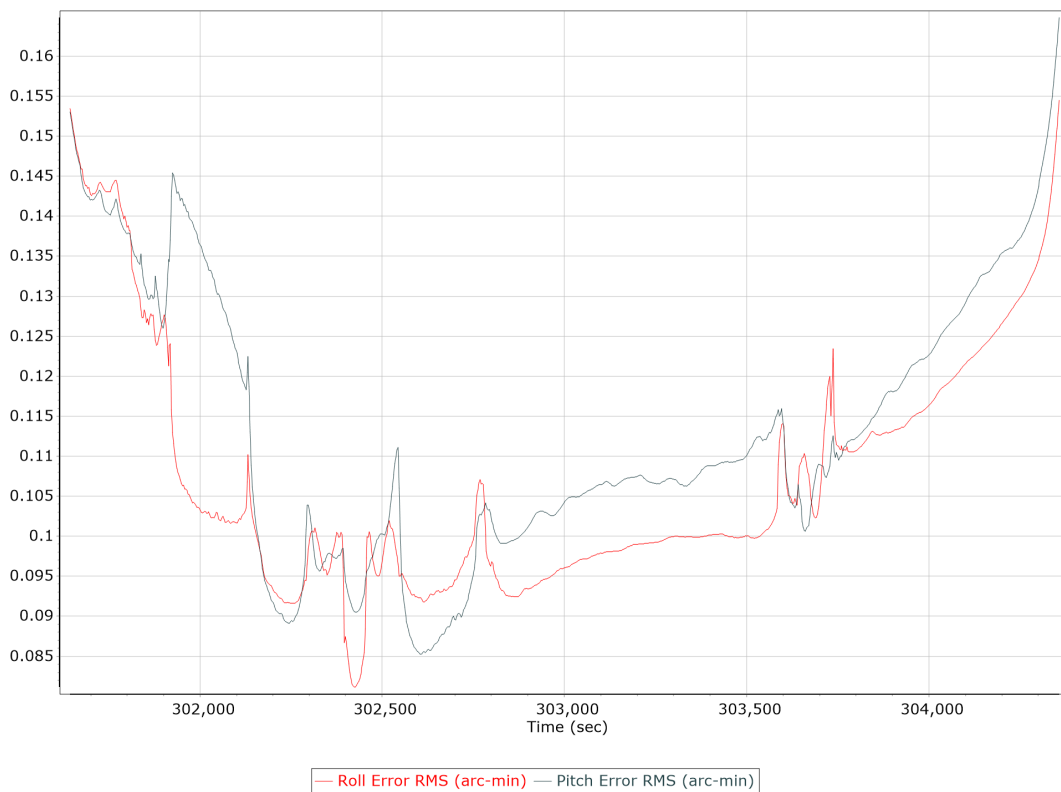
### Position Error RMS (m)



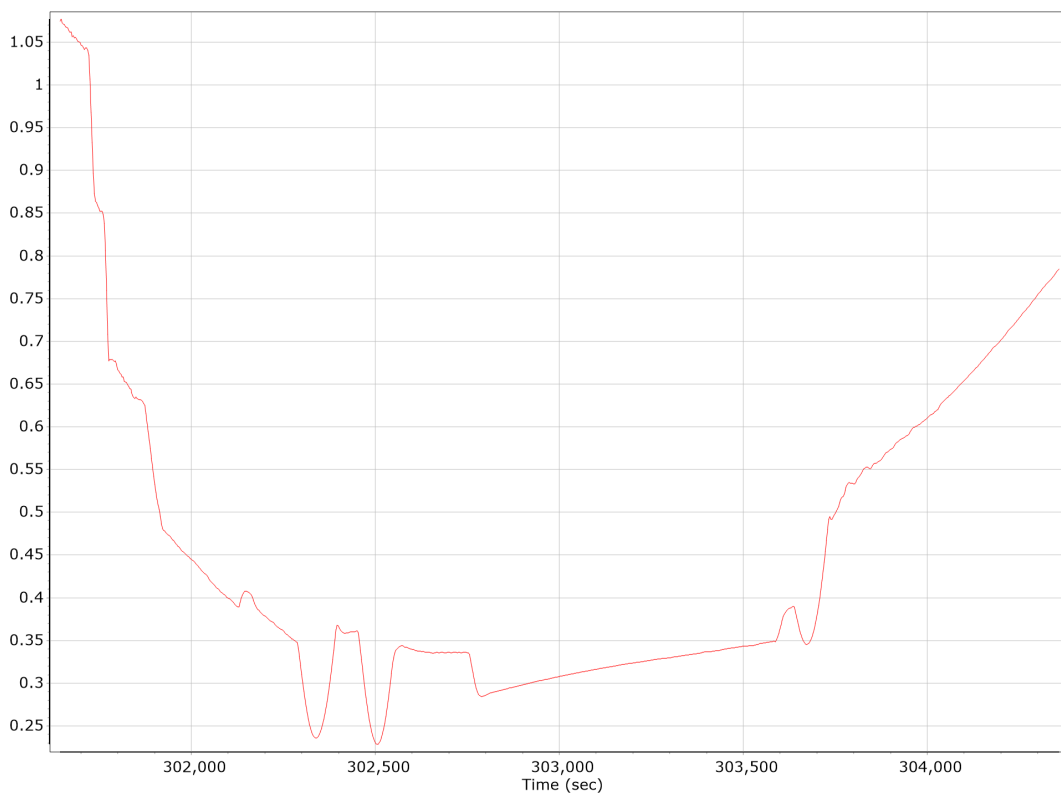
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)



### Heading Error RMS (arc-min)



## Forward Processed Performance Metrics

### Position Error RMS (m)

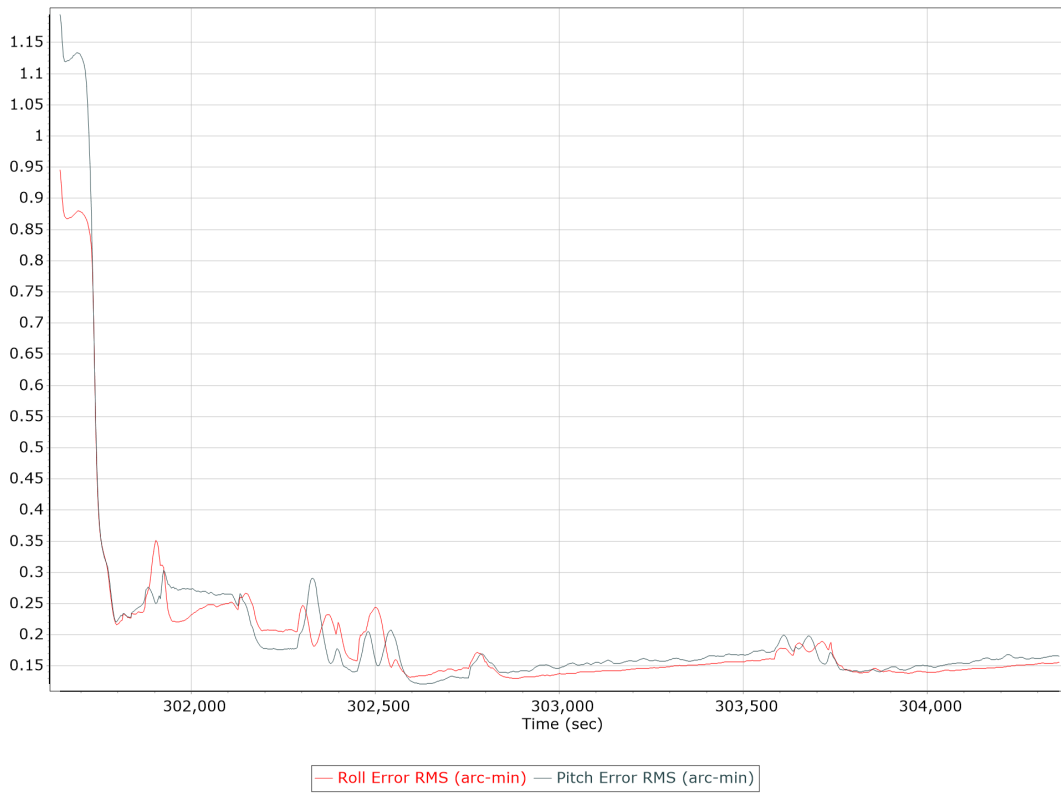


### Velocity Error RMS (m/s)

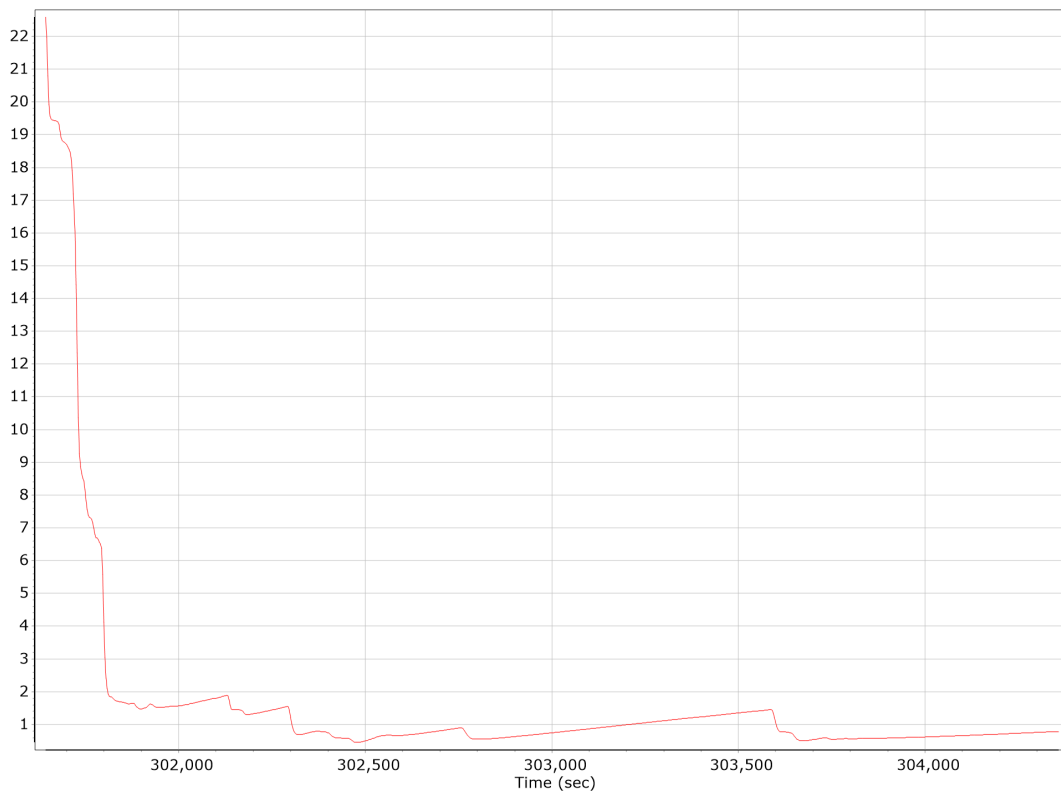




### Roll/Pitch Error RMS (arc-min)

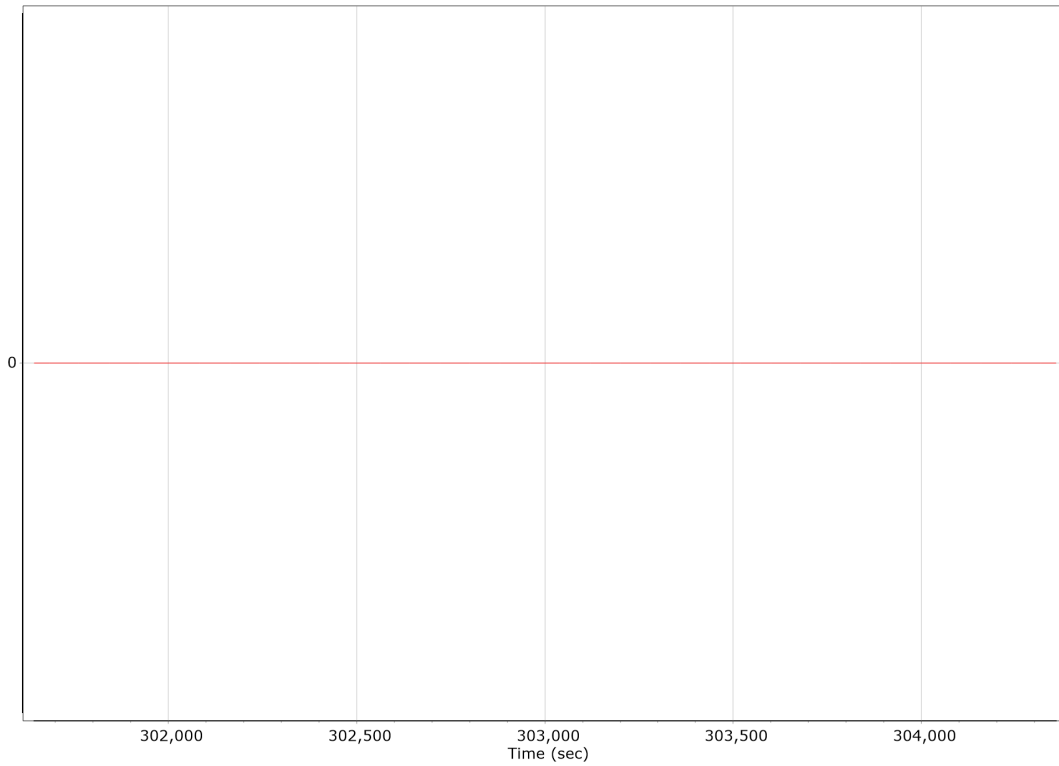


### Heading Error RMS (arc-min)



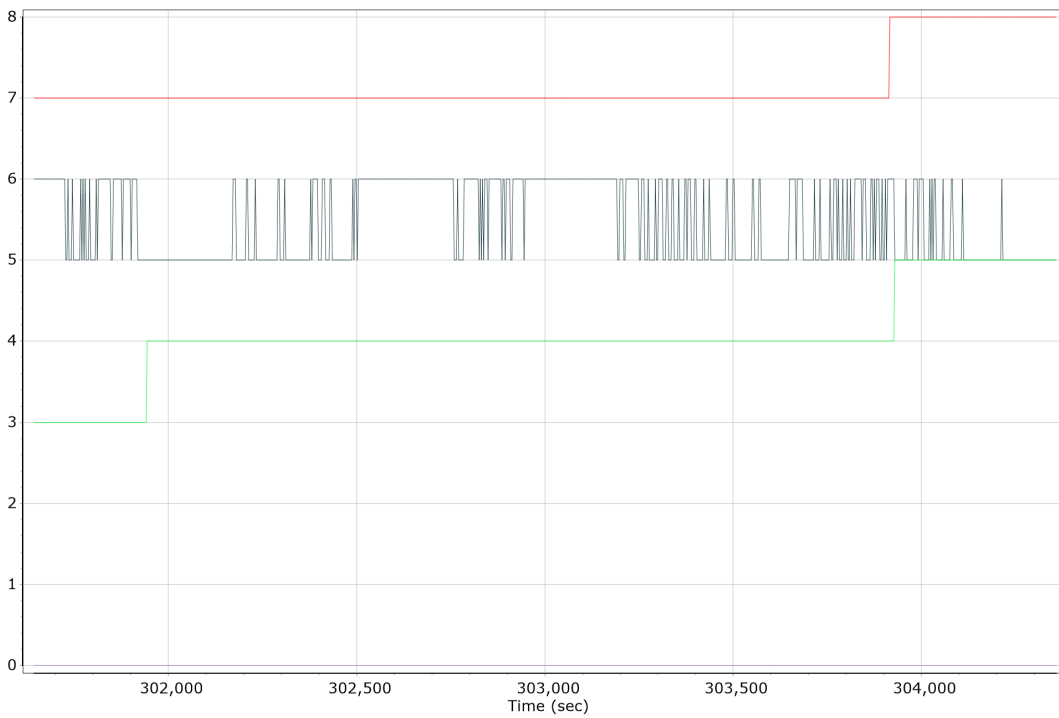
## Forward Processed Solution Status

### Processing Mode



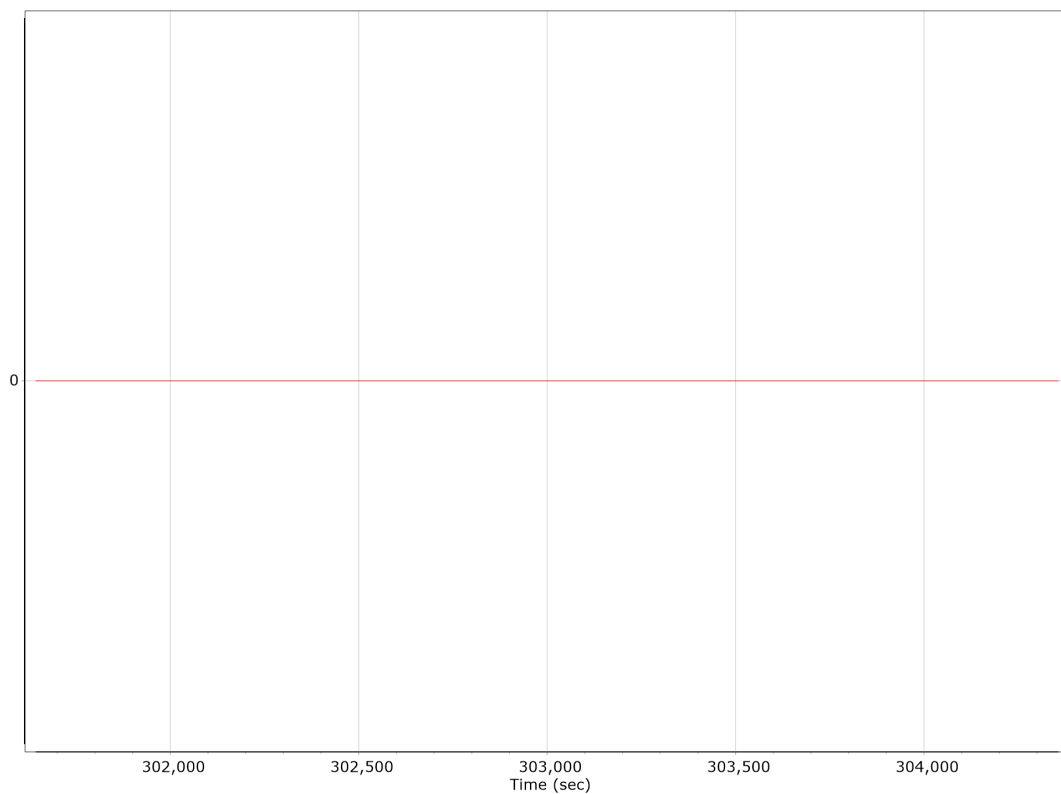
0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

### 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	05042022B_3543
Processing date	2022-05-09 19:12:21
Mission date	2022-05-04 19:28:53
Mission duration	03:31:51.077
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
N62756178.081	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
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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

### Input Files

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

### Output Files

Filename	File type
sbet_05042022B_3543.out	SBET Trajectory File

## Rover Data Summary

First raw data file	N62756178.081		
Last raw data file	N62756178.120		
Start GPS week	2208		
Start time	329314.639 (5/4/2022 7:28:34 PM)		
End time	342025.716 (5/4/2022 11:00:25 PM)		
Start of fine alignment	329501.569 (5/4/2022 7:31:41 PM)		
Available subsystems	Primary GNSS, Gimbal, IMU		
POS Event Input	None		
Correction data	None		
<b>IMU Installation Lever Arms &amp; Mounting Angles</b>			
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

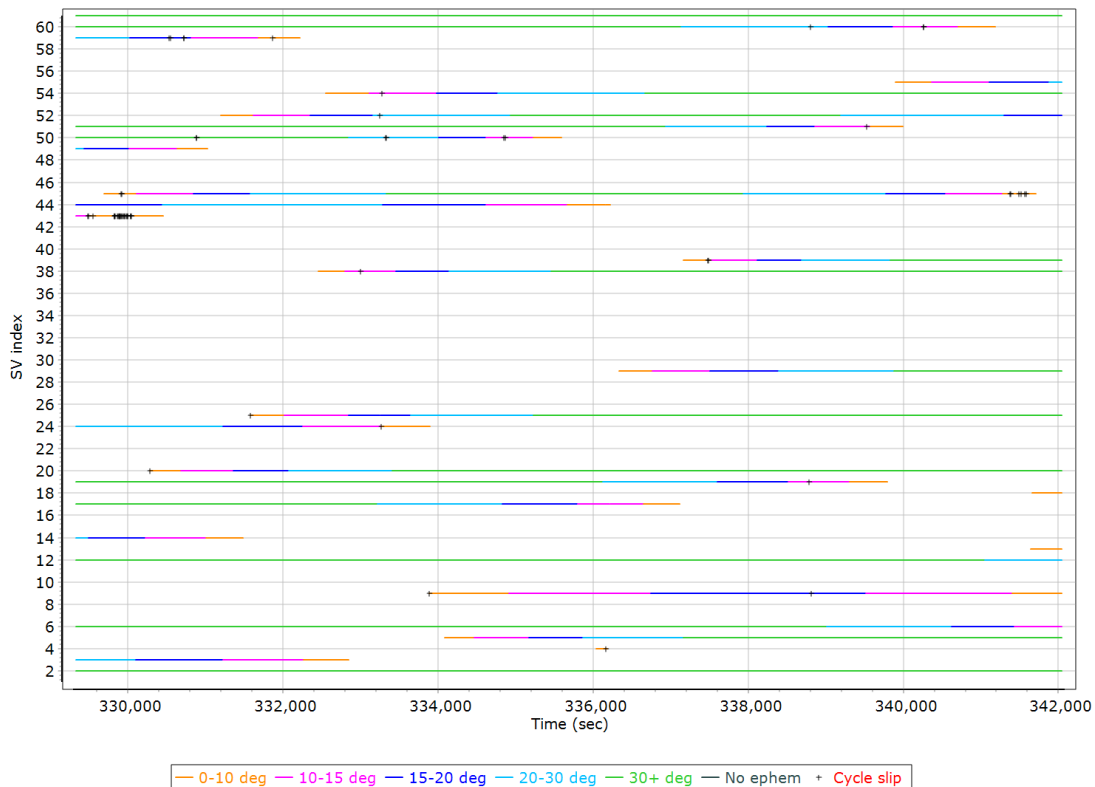
## Rover Data QC

### Raw IMU Import QC Summary

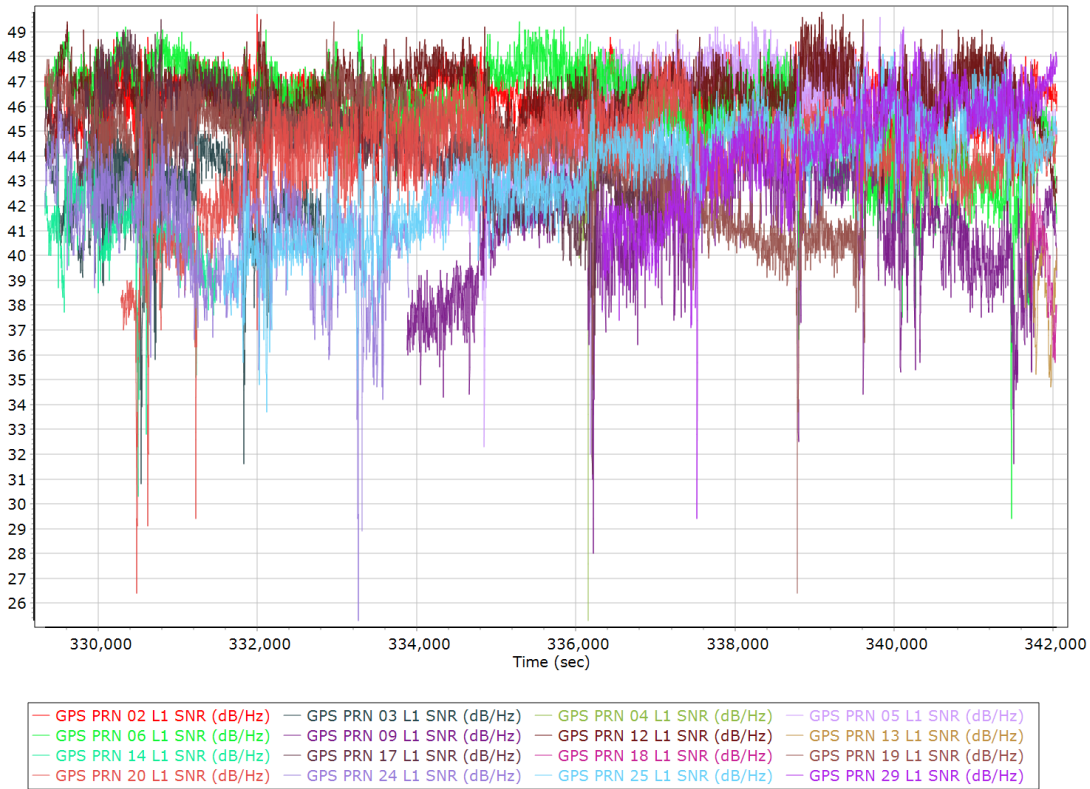
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_05042022B_3543.log
IMU Records Processed	2541666
Termination Status	Normal
IMU Anomalies	0

## Primary Observables & Satellite Data

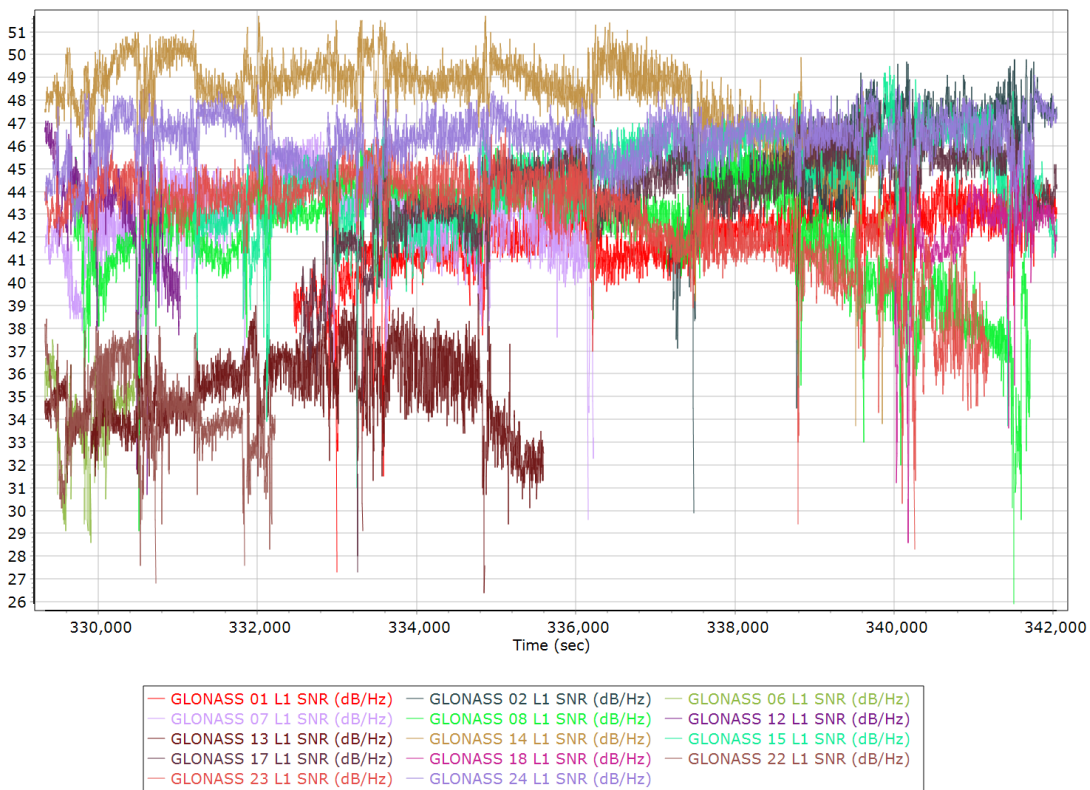
### GPS/GLONASS L1 Satellite Lock/Elevation



### GPS L1 SNR

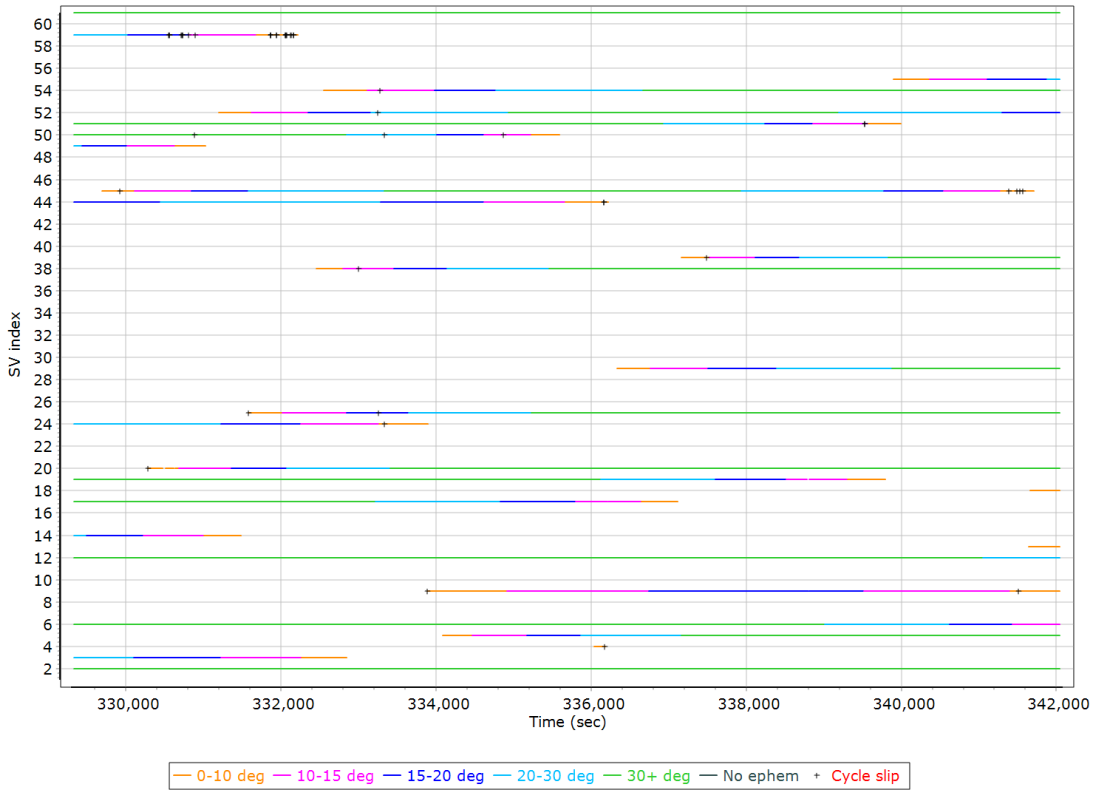


### GLONASS L1 SNR

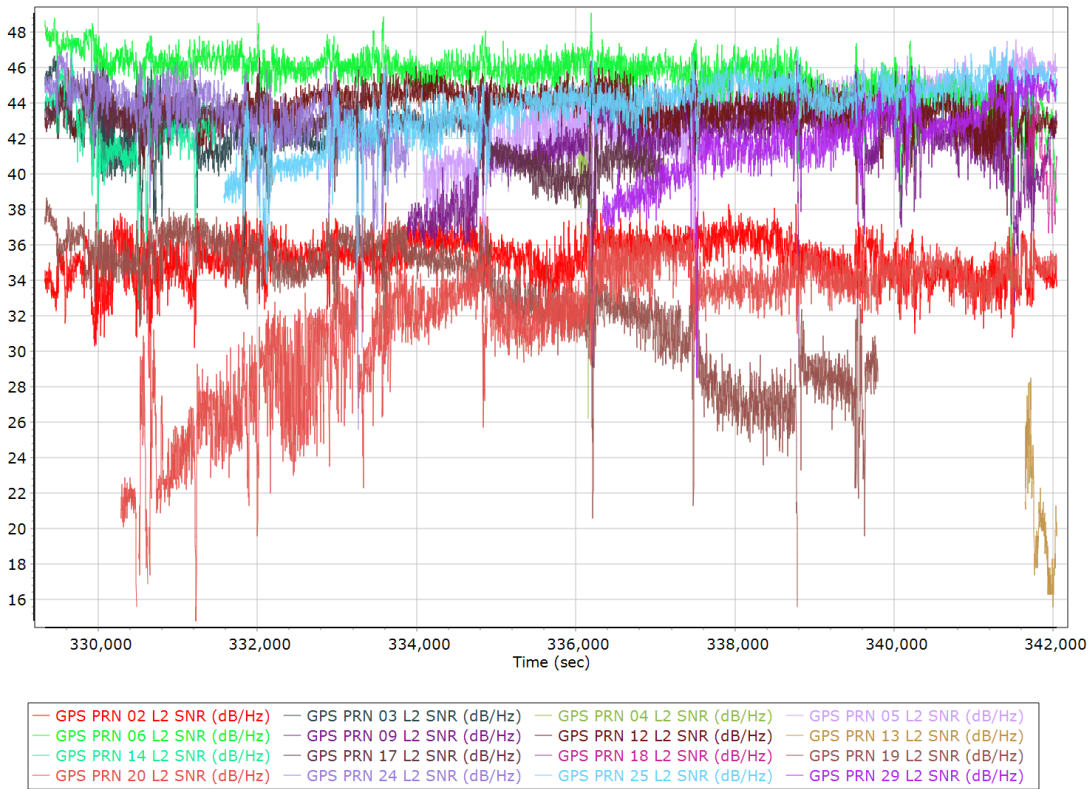




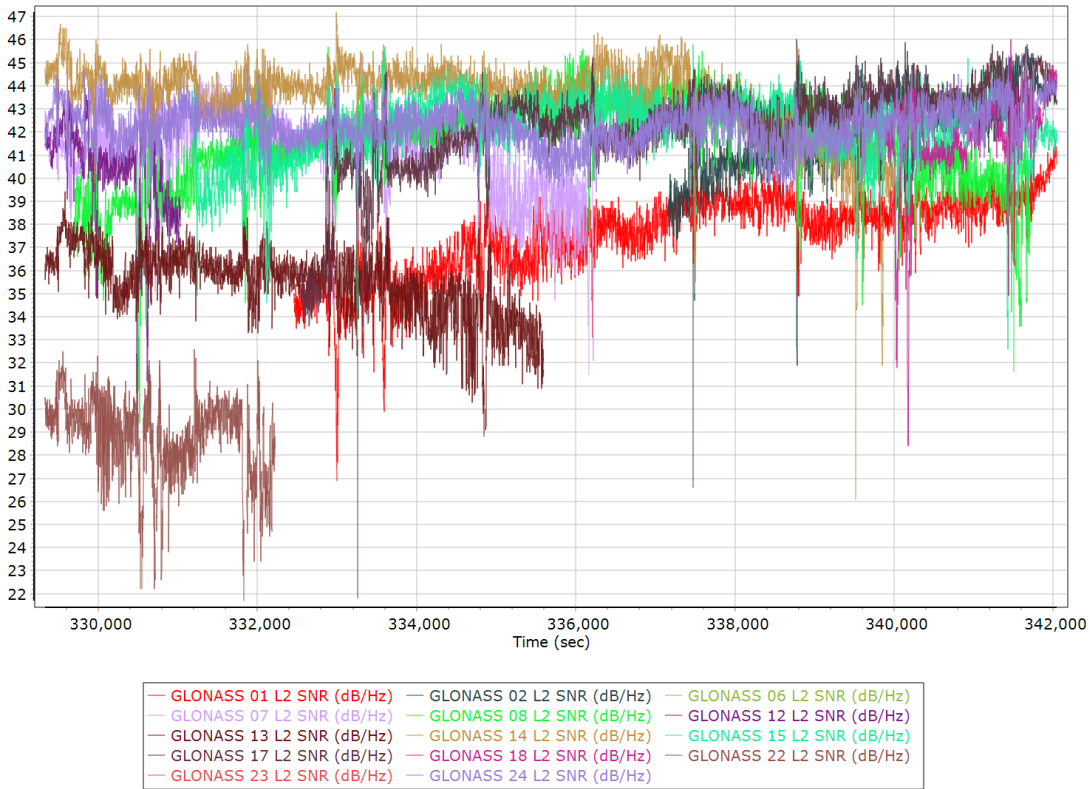
### GPS/GLONASS L2 Satellite Lock/Elevation



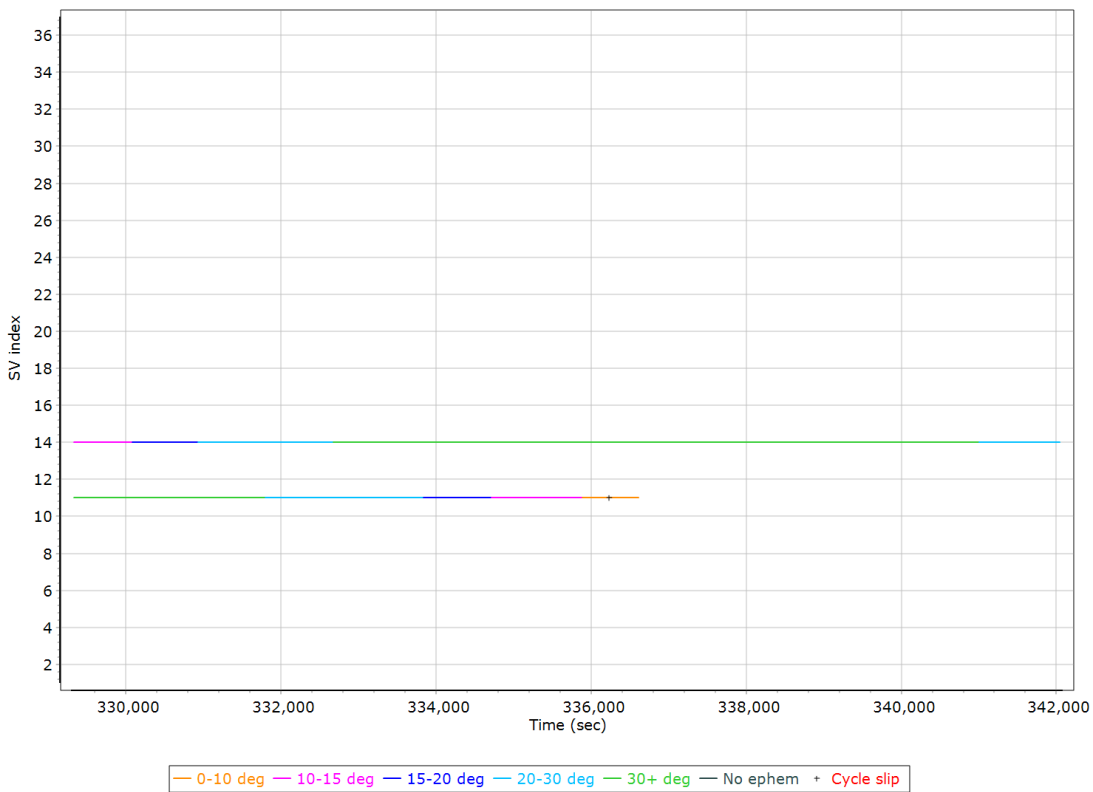
### GPS L2 SNR



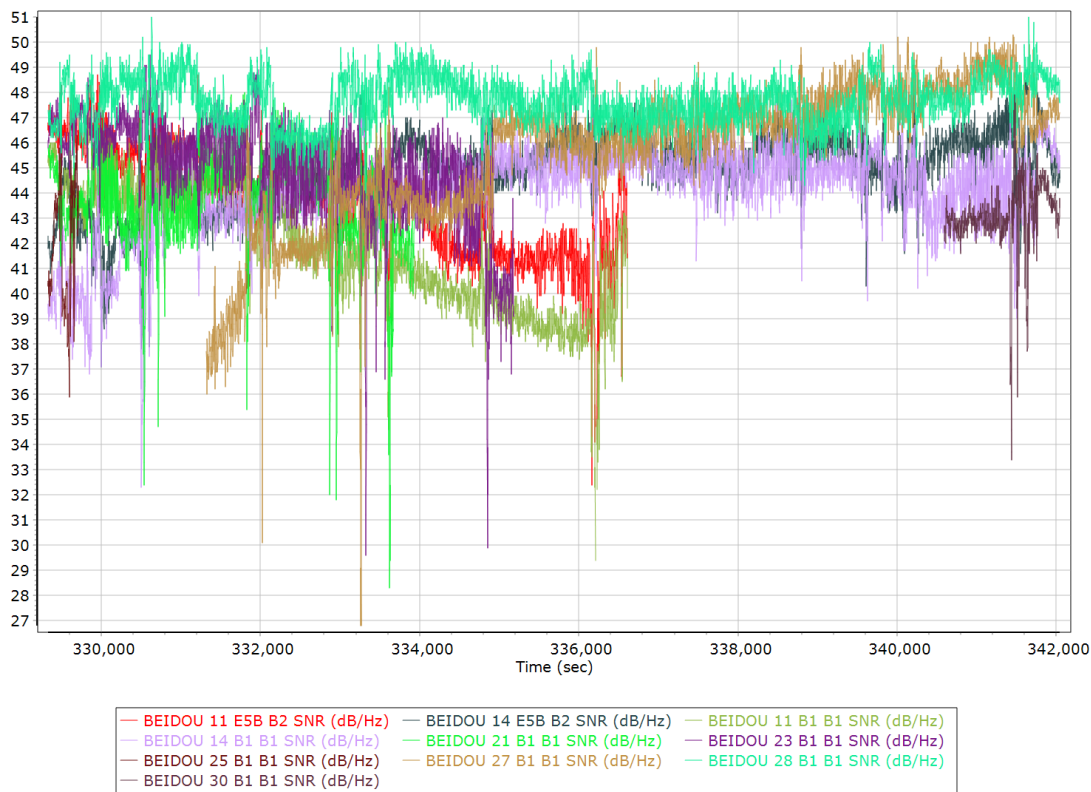
### GLONASS L2 SNR



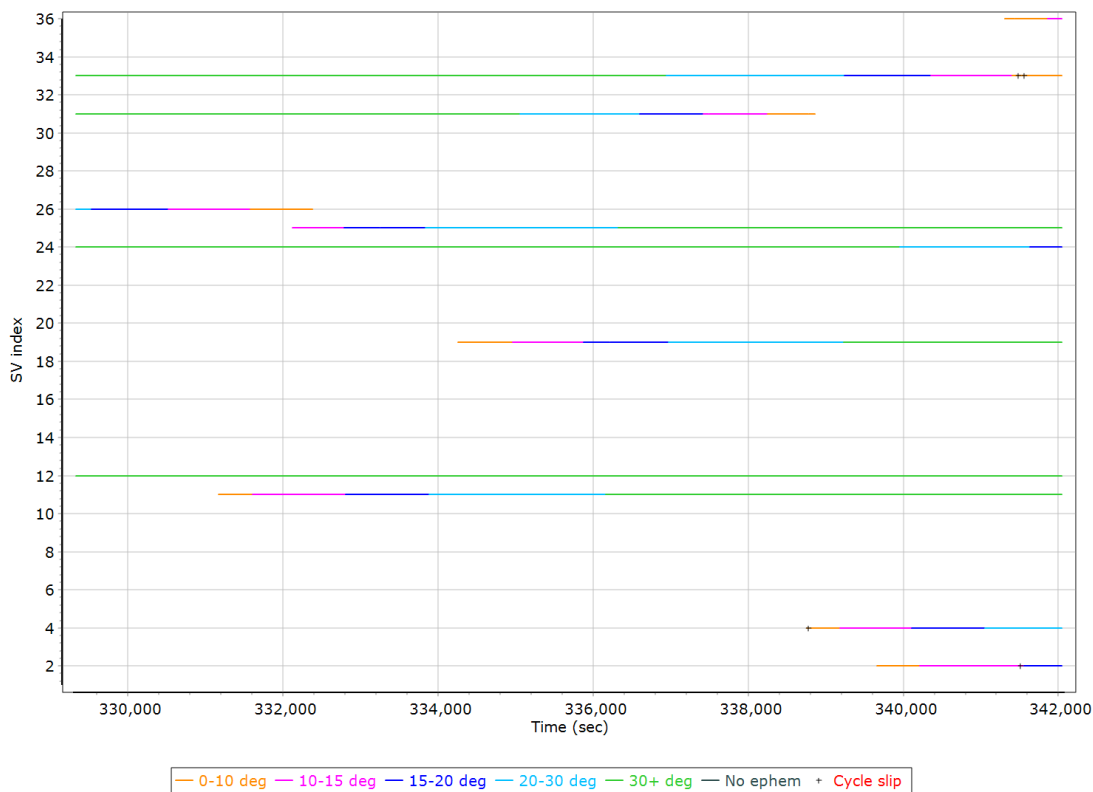
### BEIDOU Satellite Lock/Elevation



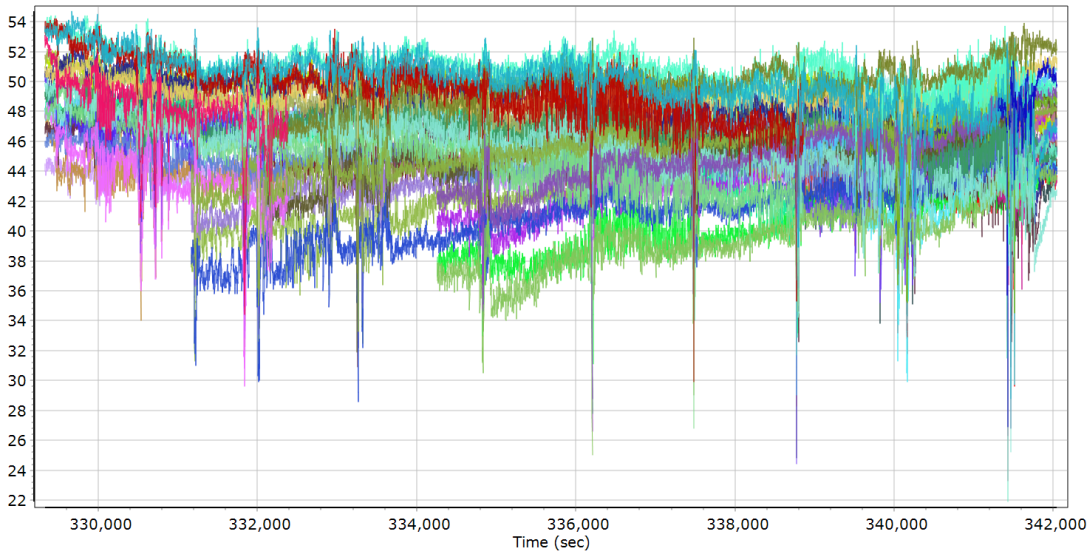
### BEIDOU SNR



### GALILEO Satellite Lock/Elevation



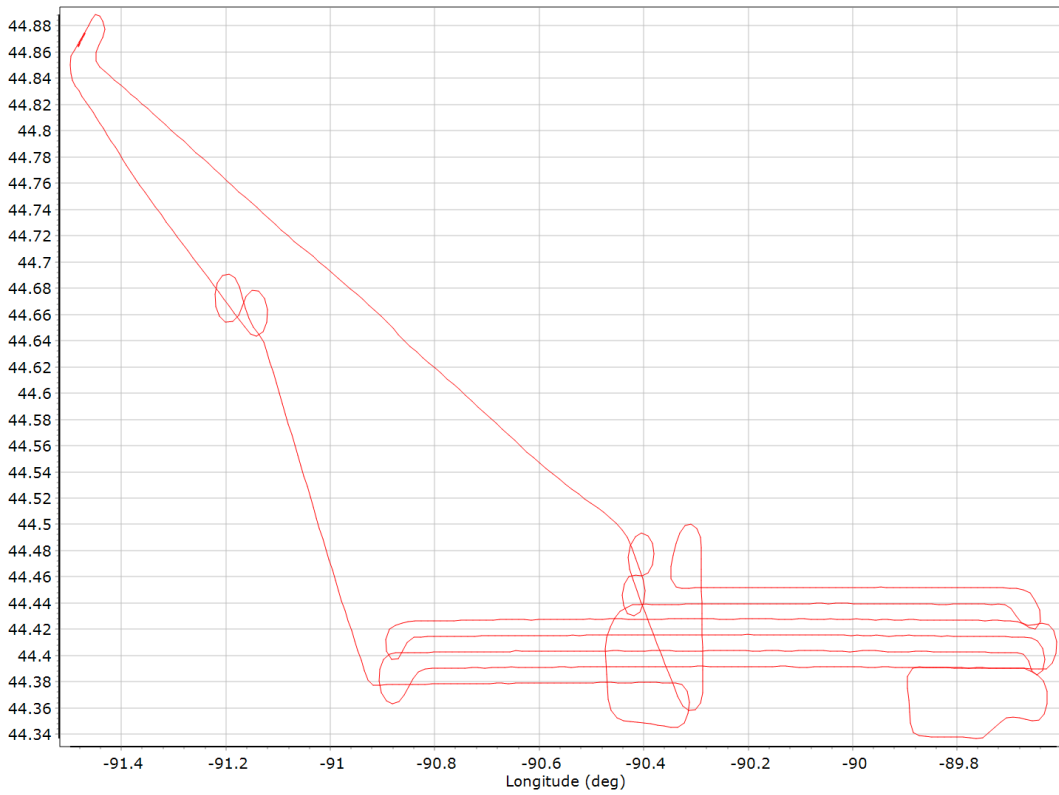
## GALILEO SNR



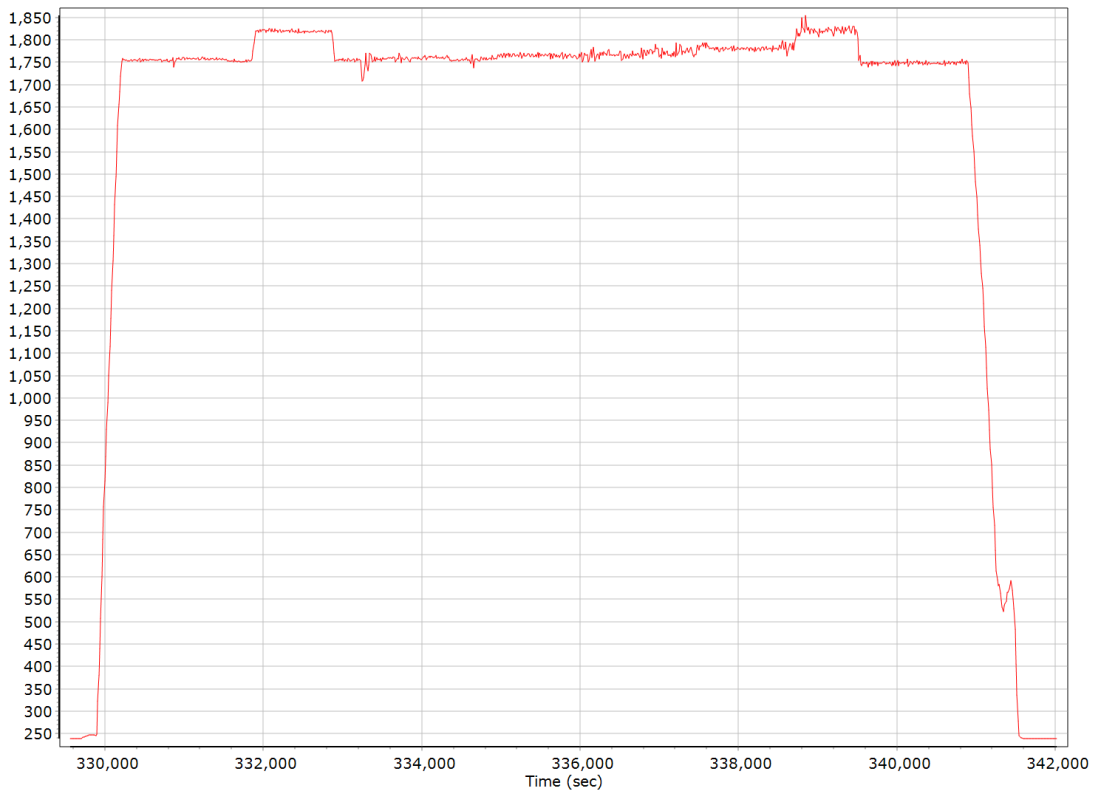
— GALILEO 02 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 04 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 19 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 24 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 25 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— 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 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 11 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 12 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 19 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 24 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 25 L5E5A BPSK10_PD SNR (dB/Hz)
— GALILEO 26 L5E5A BPSK10_PD SNR (dB/Hz)	— GALILEO 31 L5E5A BPSK10_PD SNR (dB/Hz)

## Smoothed Trajectory Information

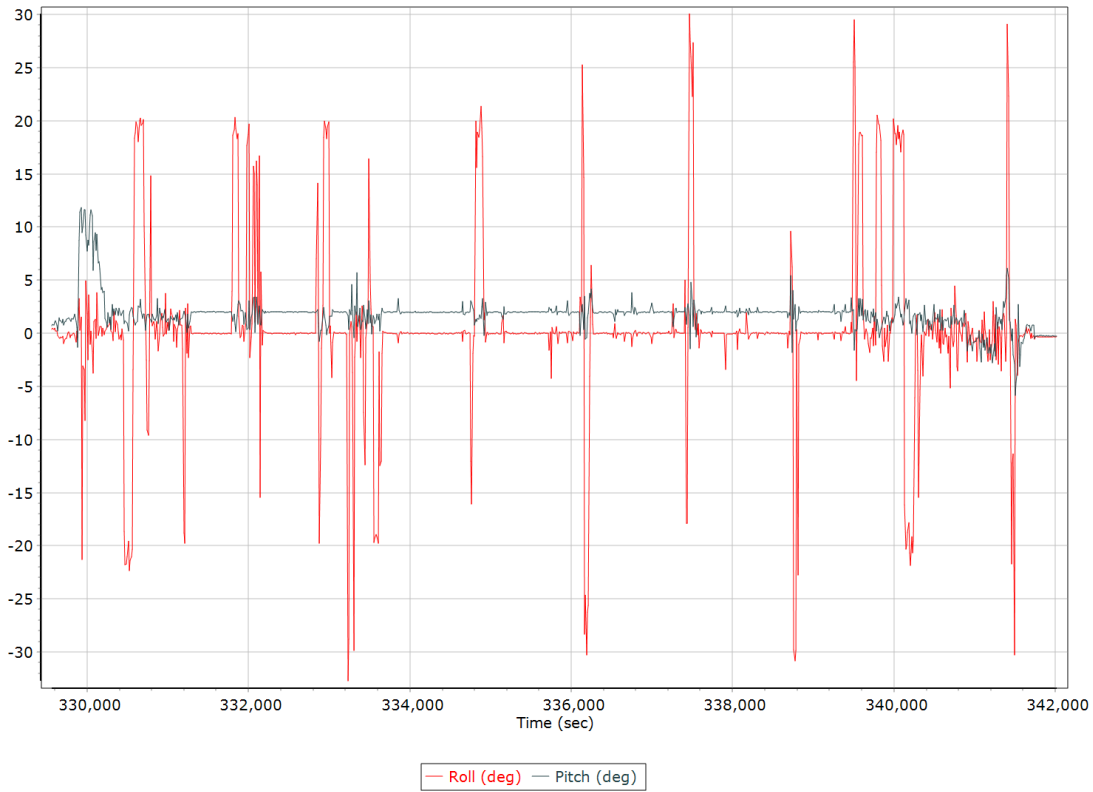
### Top View



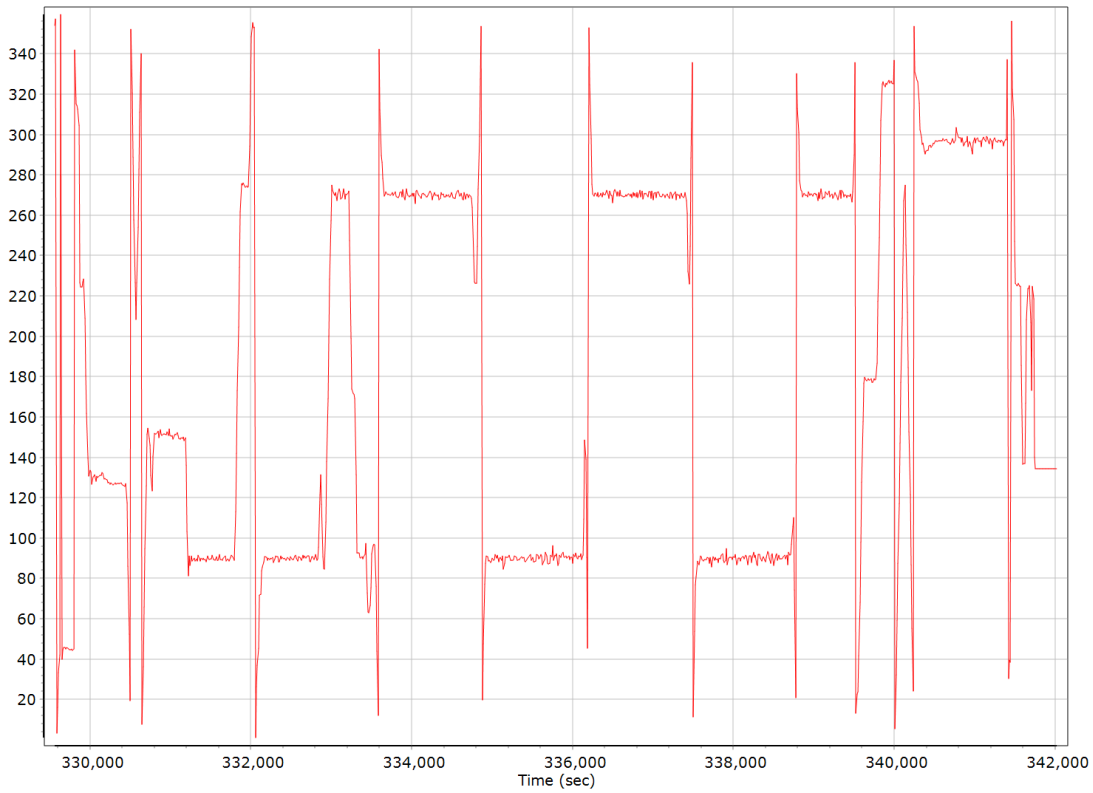
### Altitude



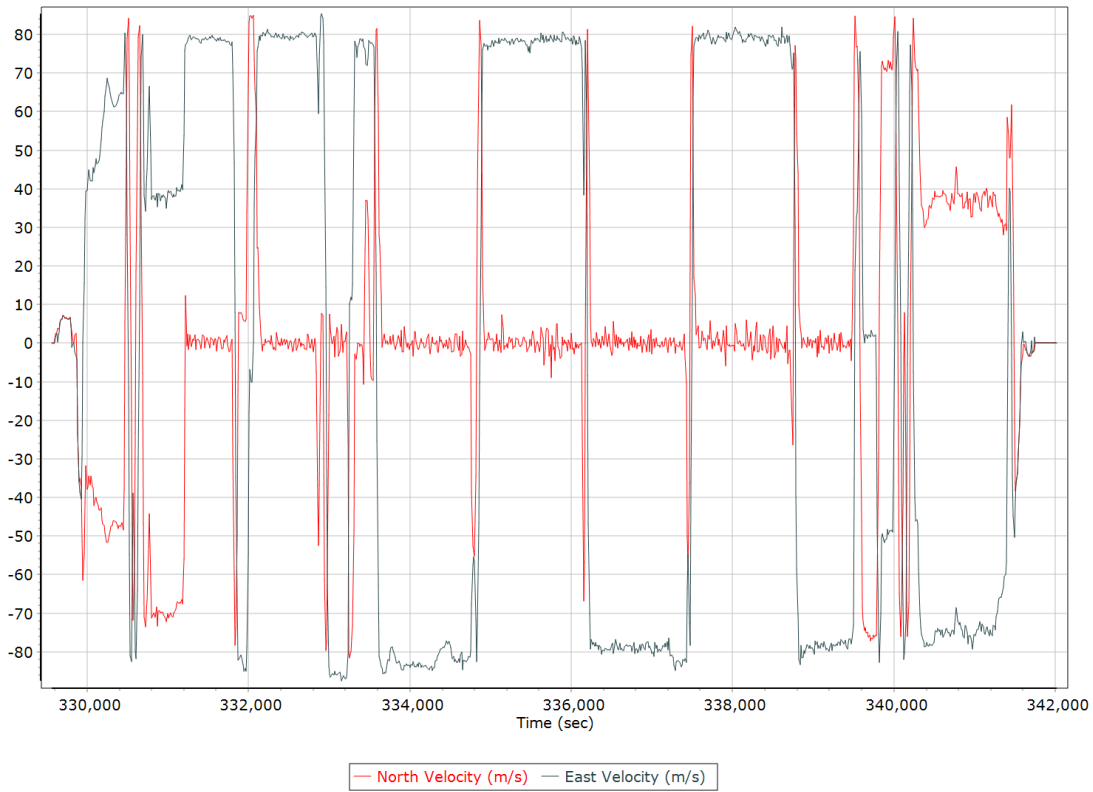
## Roll/Pitch



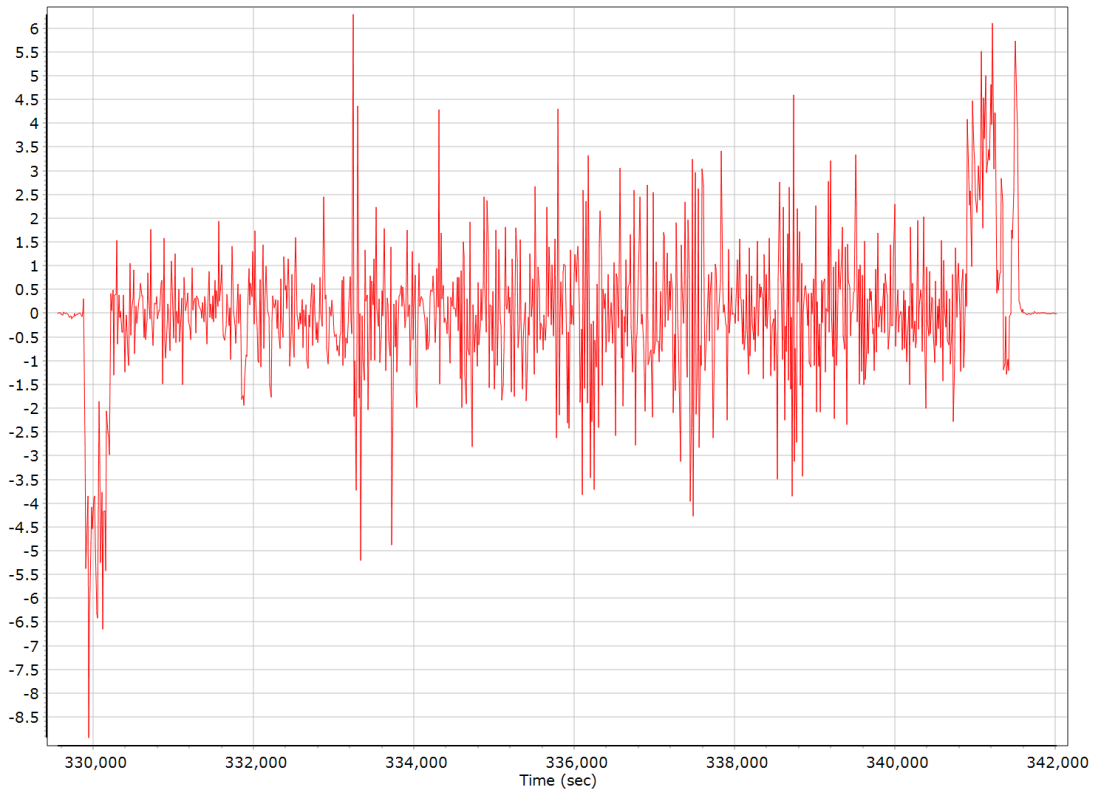
## Heading



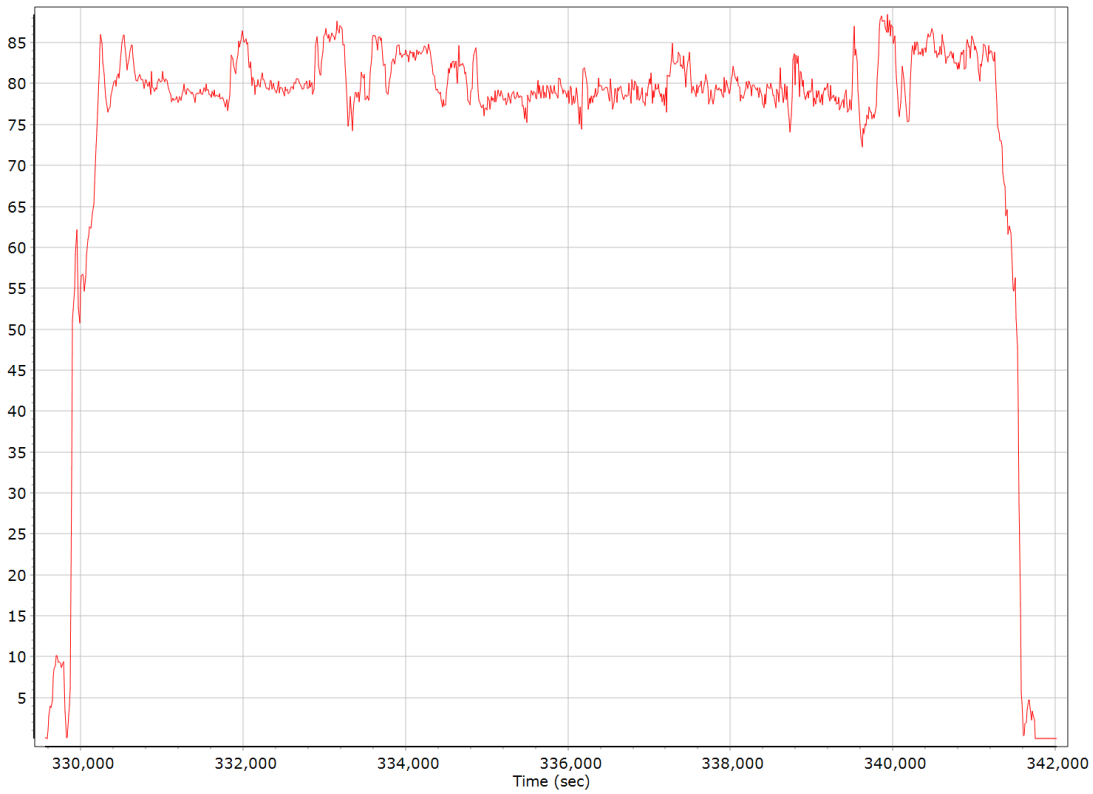
## North/East Velocity



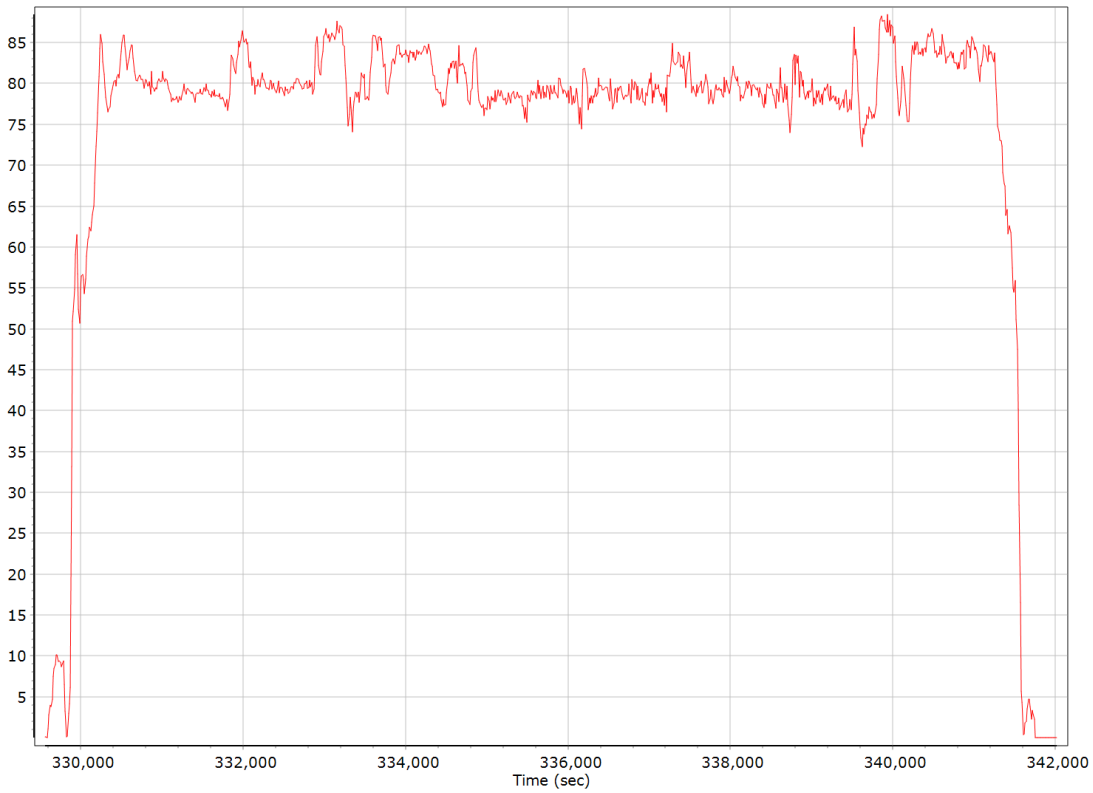
## Down Velocity



## Total Speed

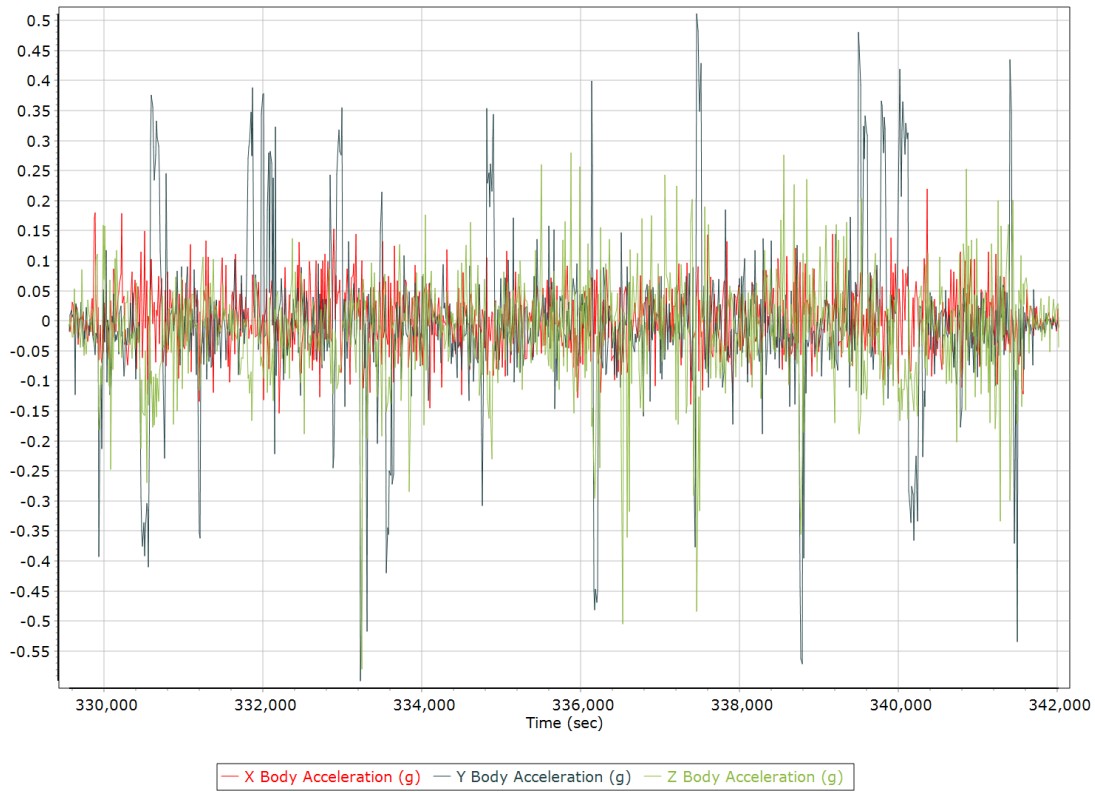


## Ground Speed

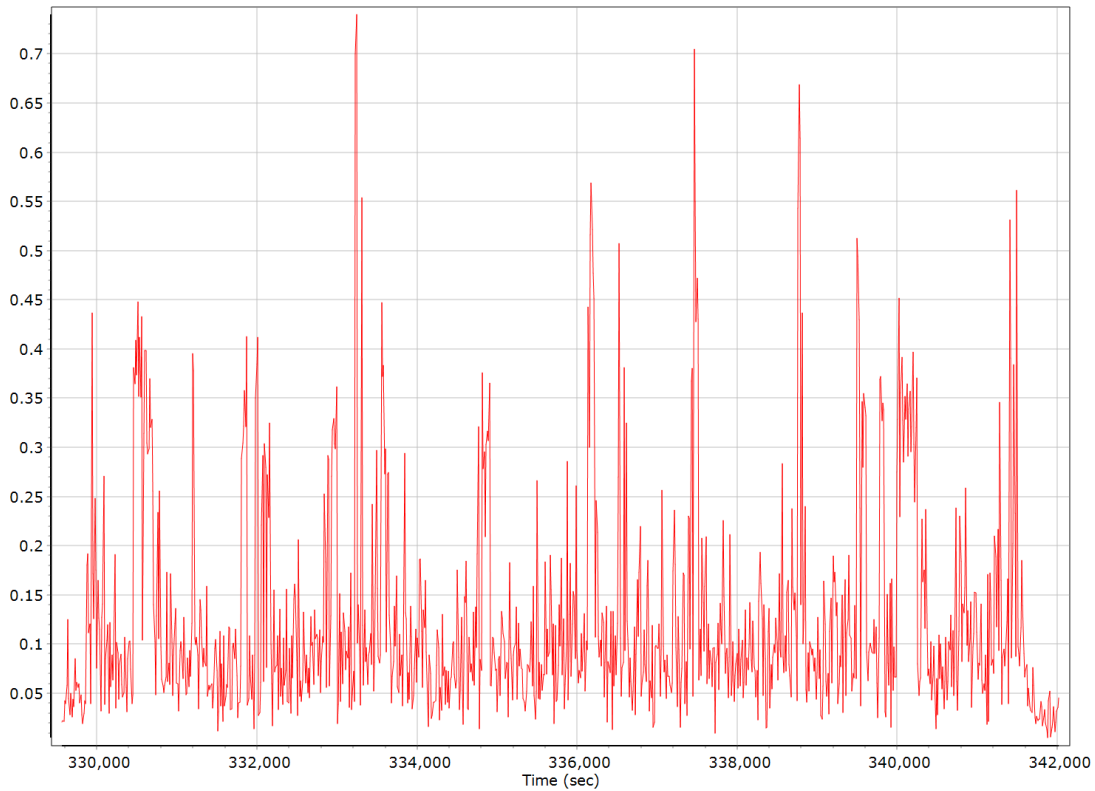




## Body Acceleration



## Total Body Acceleration

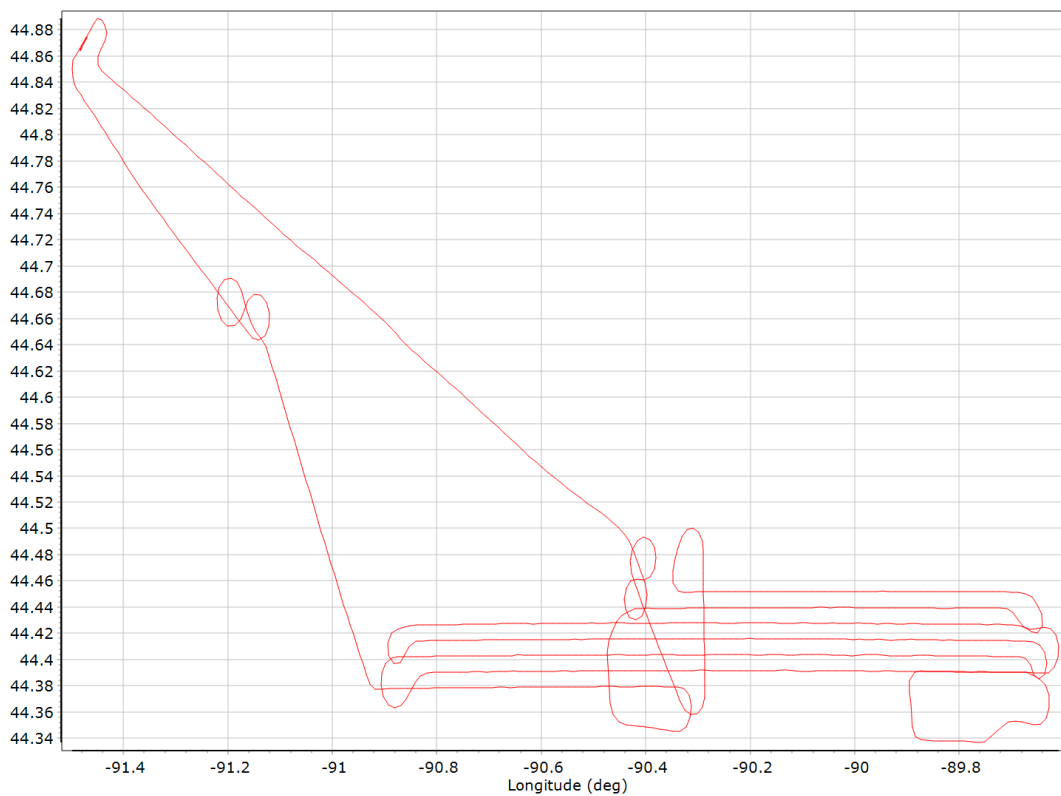


## Body Angular Rate

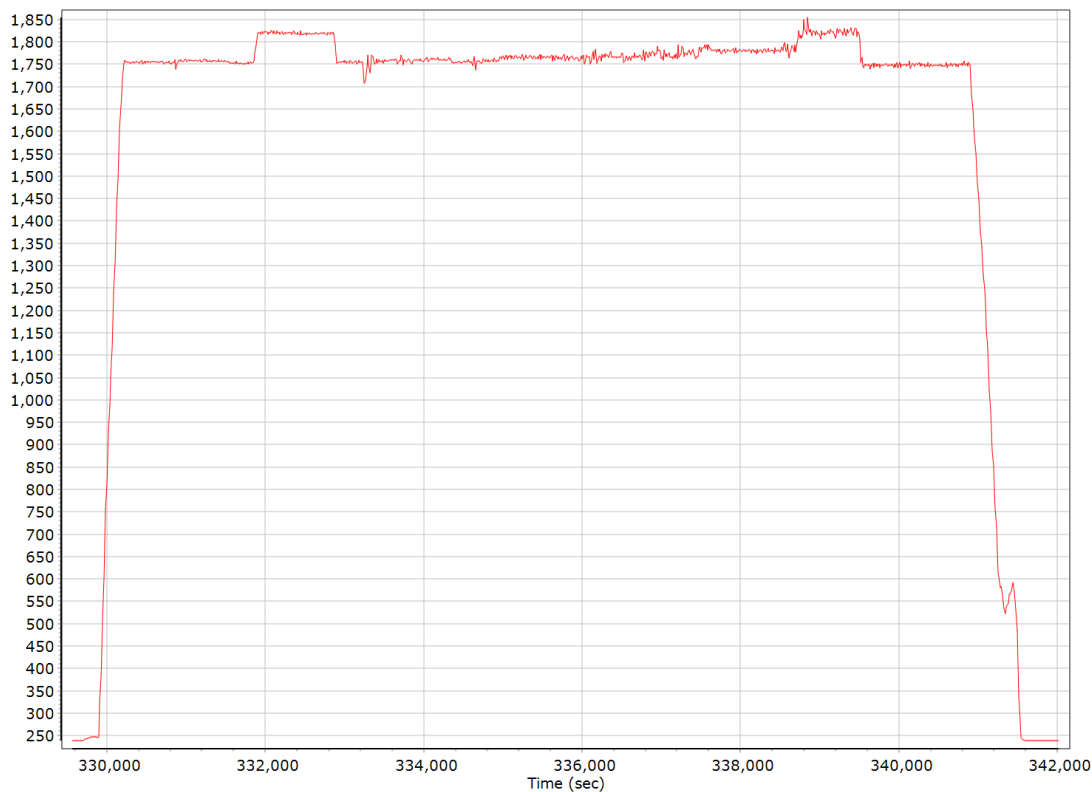


## Forward Processed Trajectory Information

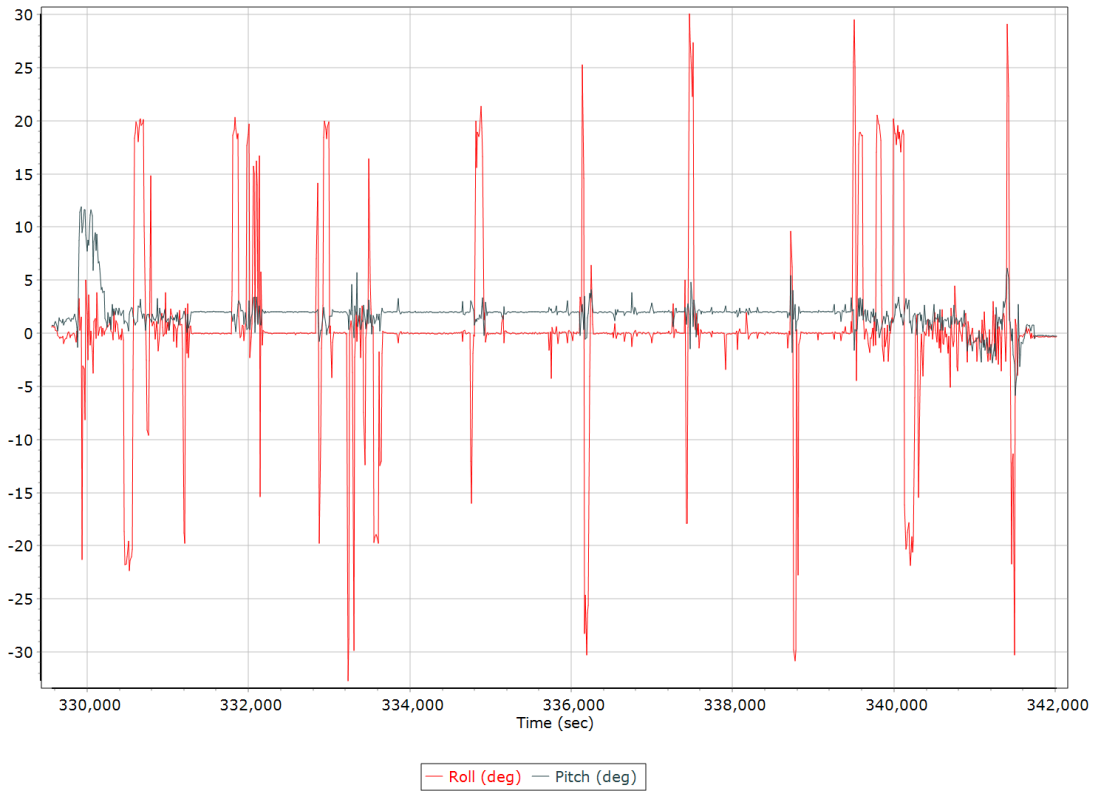
### Top View



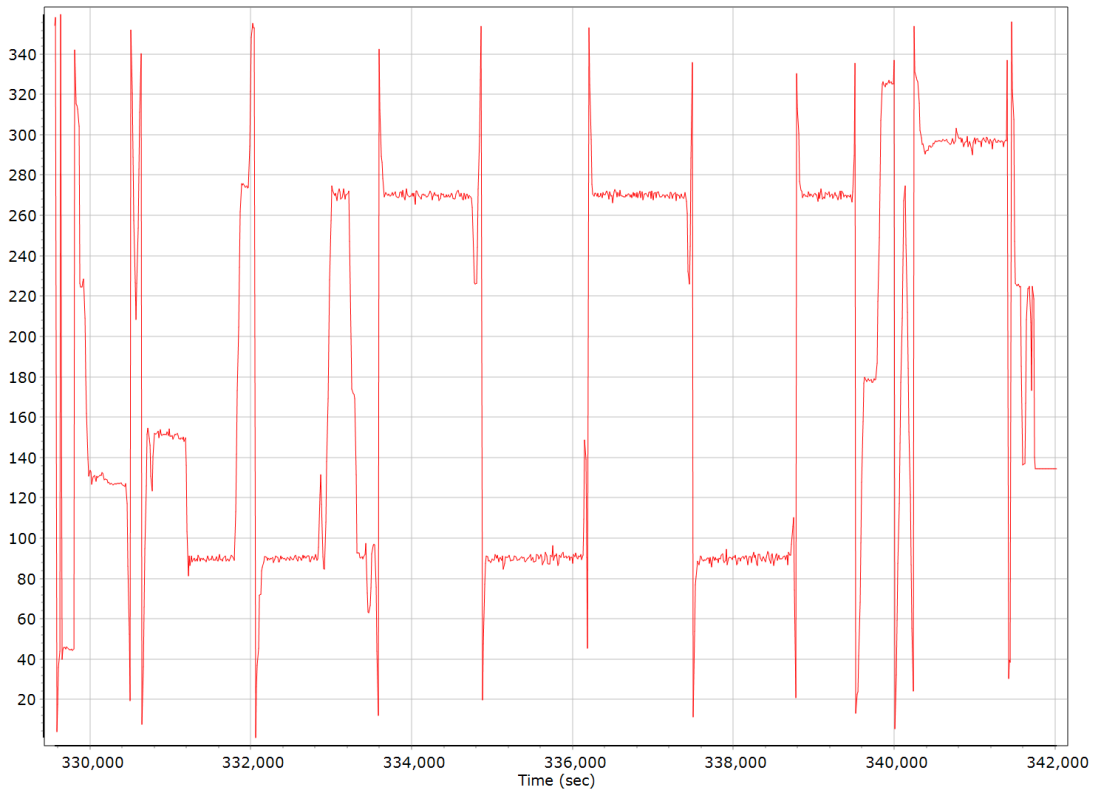
### Altitude



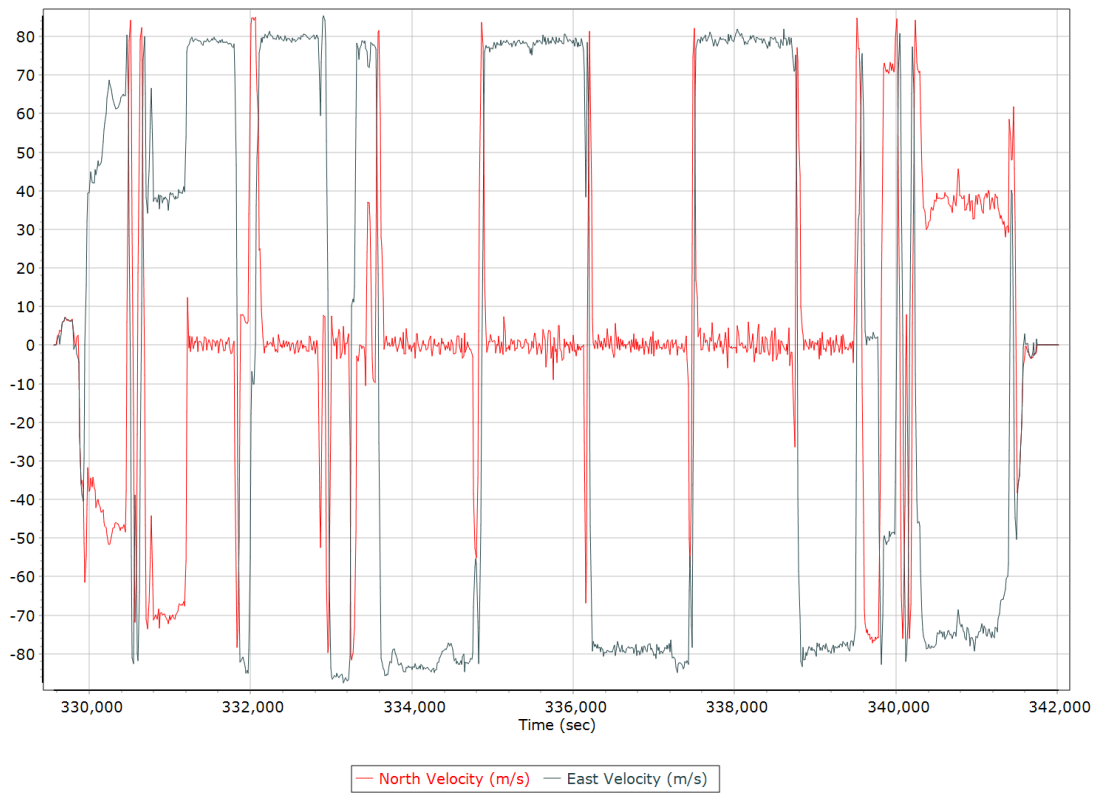
## Roll/Pitch



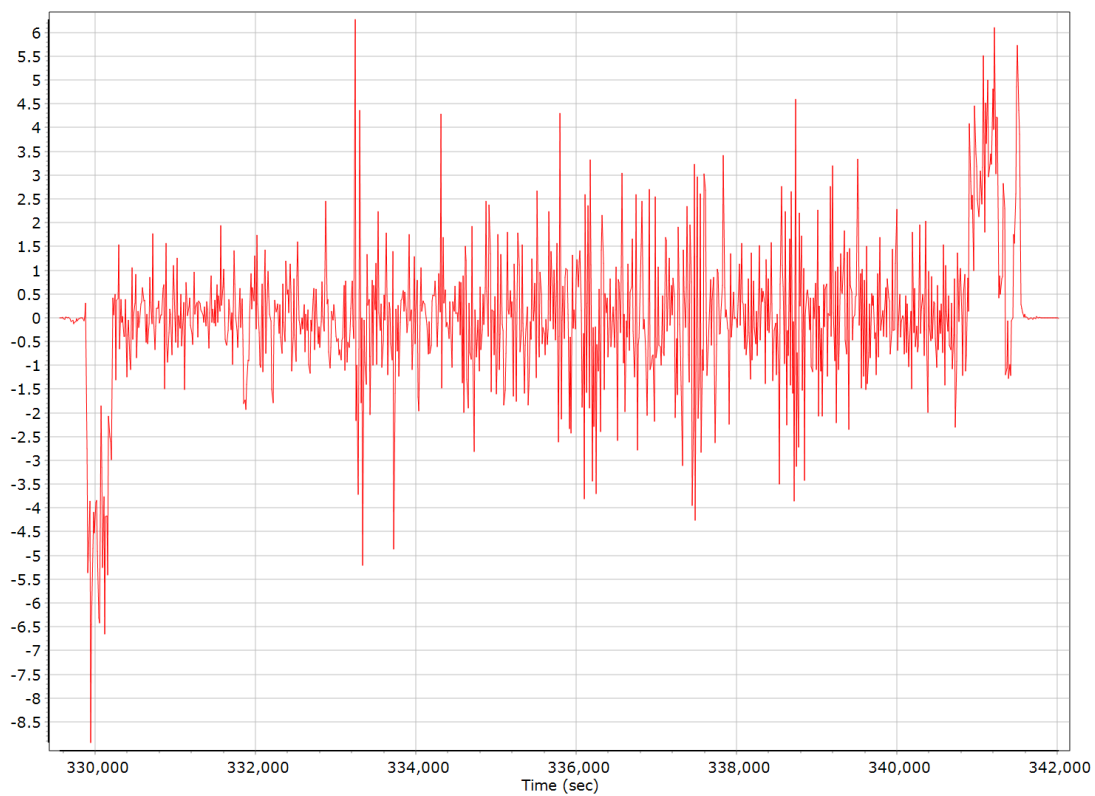
## Heading



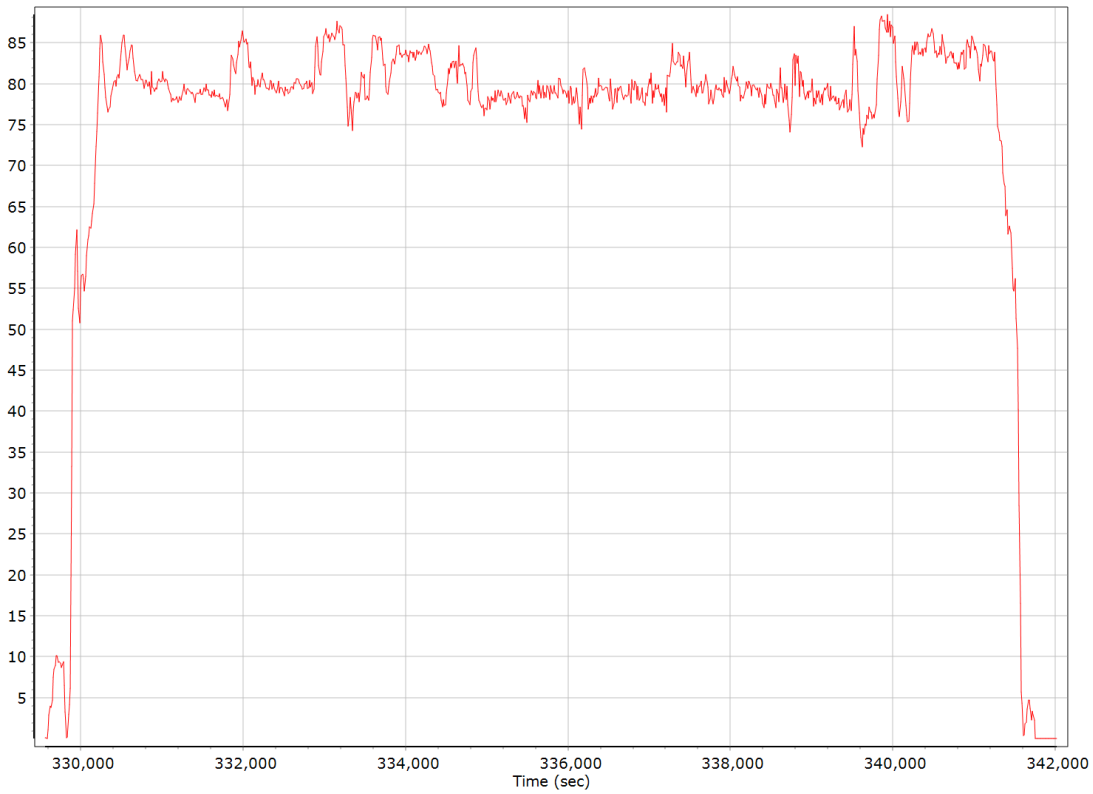
## North/East Velocity



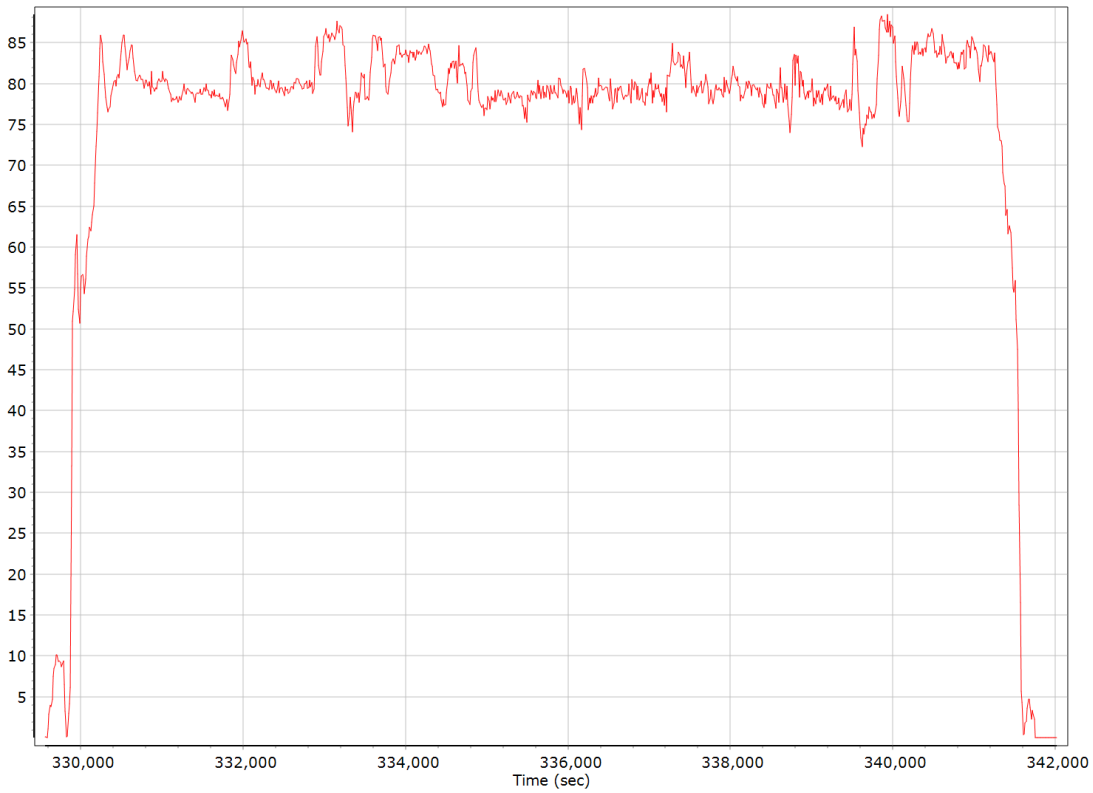
## Down Velocity



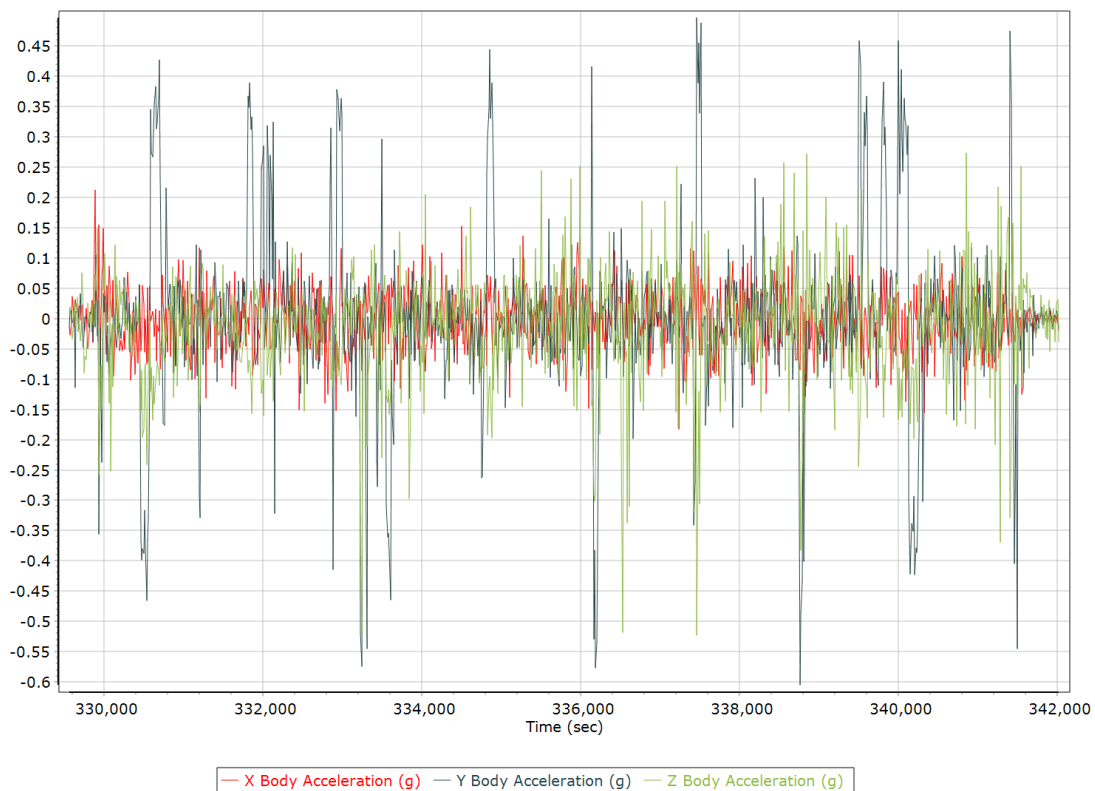
## Total Speed



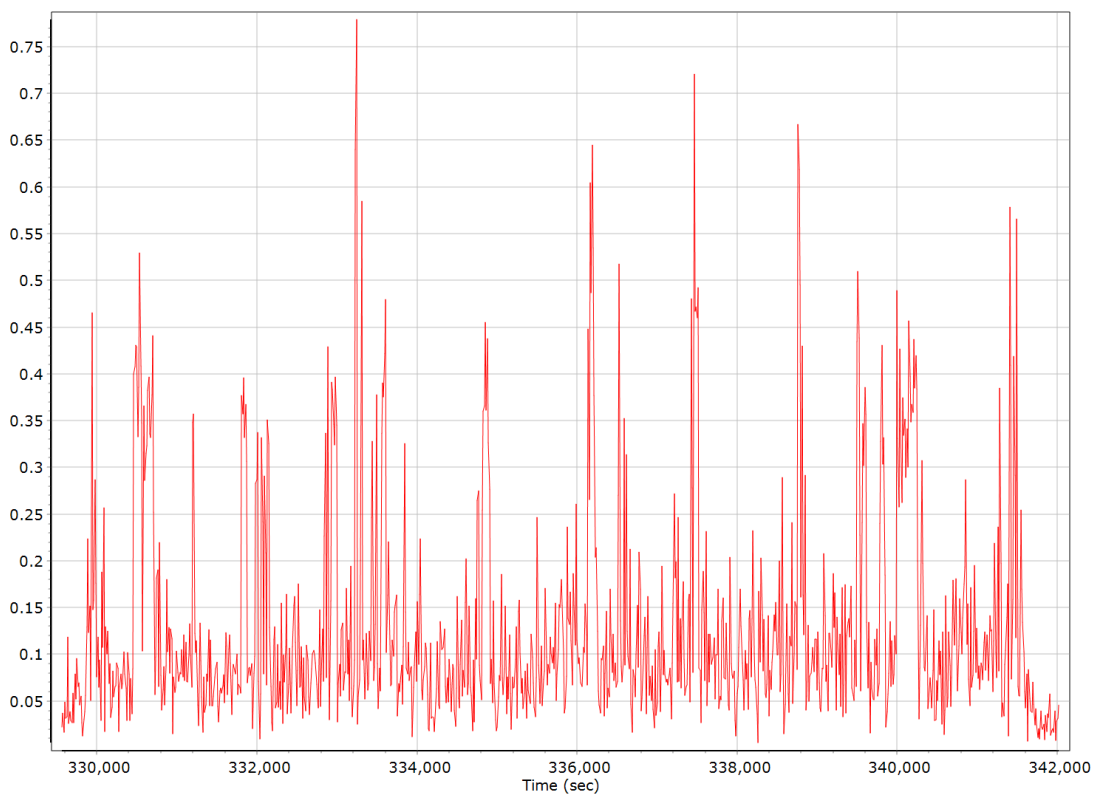
## Ground Speed



## Body Acceleration



## Total Body Acceleration



## Body Angular Rate



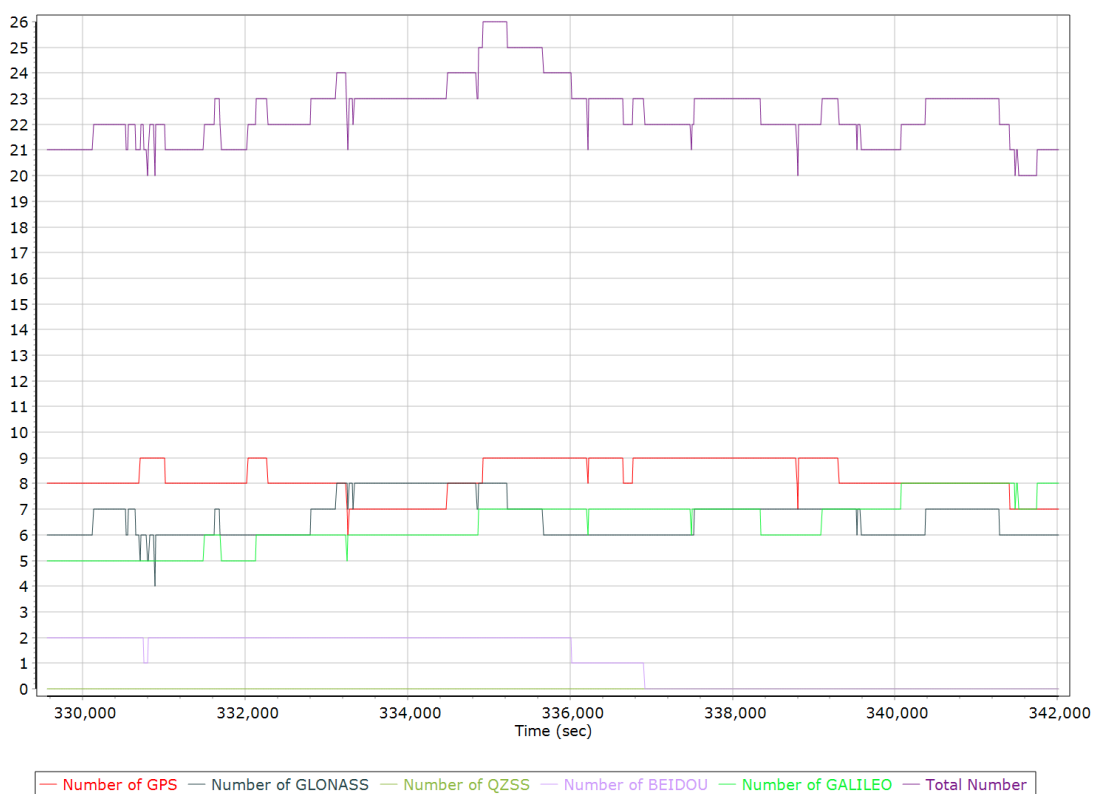


## GNSS QC

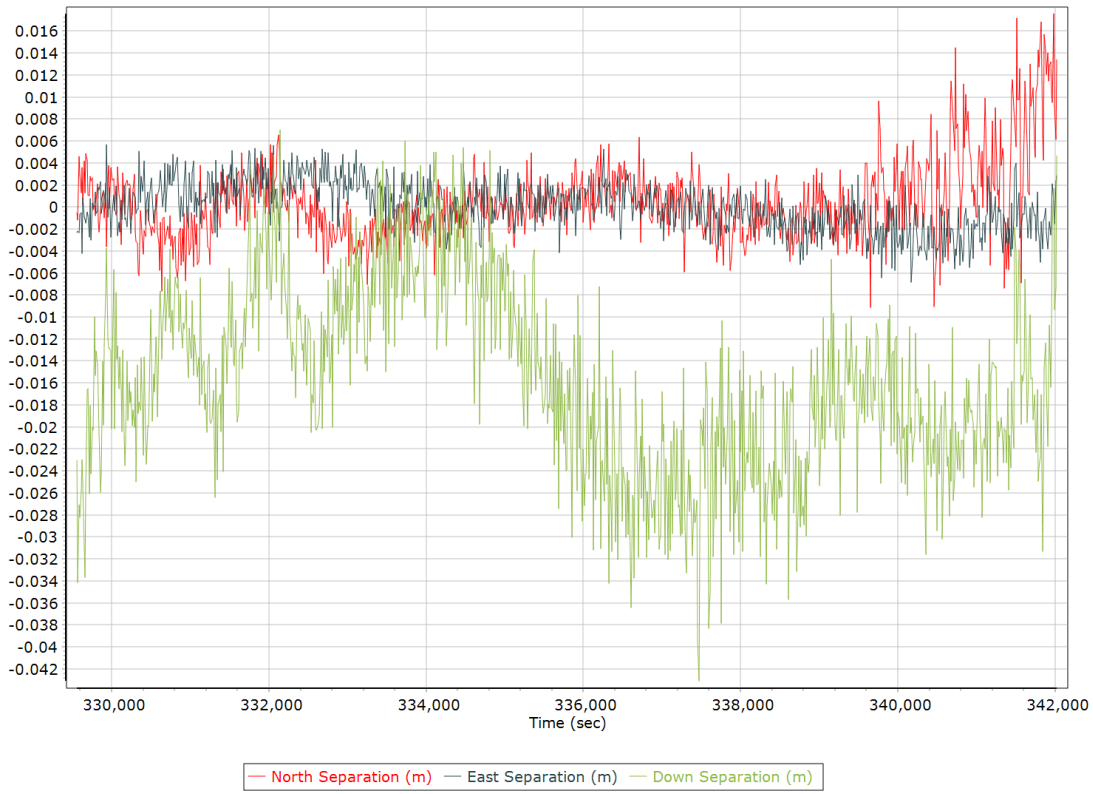
### GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.00	0.00	
Number of GPS SV	6	9	8
Number of GLONASS SV	4	8	7
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	2	1
Number of GALILEO SV	5	8	6
Total number of SV	20	26	22
PDOP	1.00	1.34	1.15
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	12681.00	0.00	0.00
Percentage	100.00	0.00	0.00

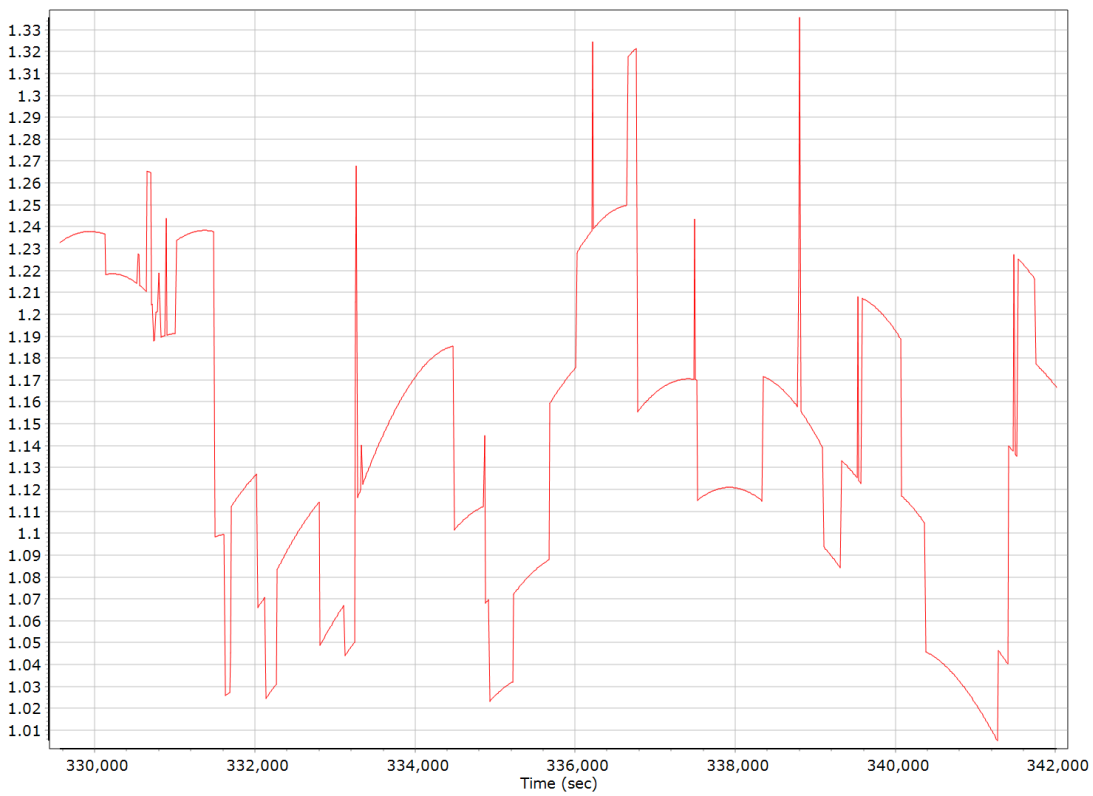
### Num SVs in solution



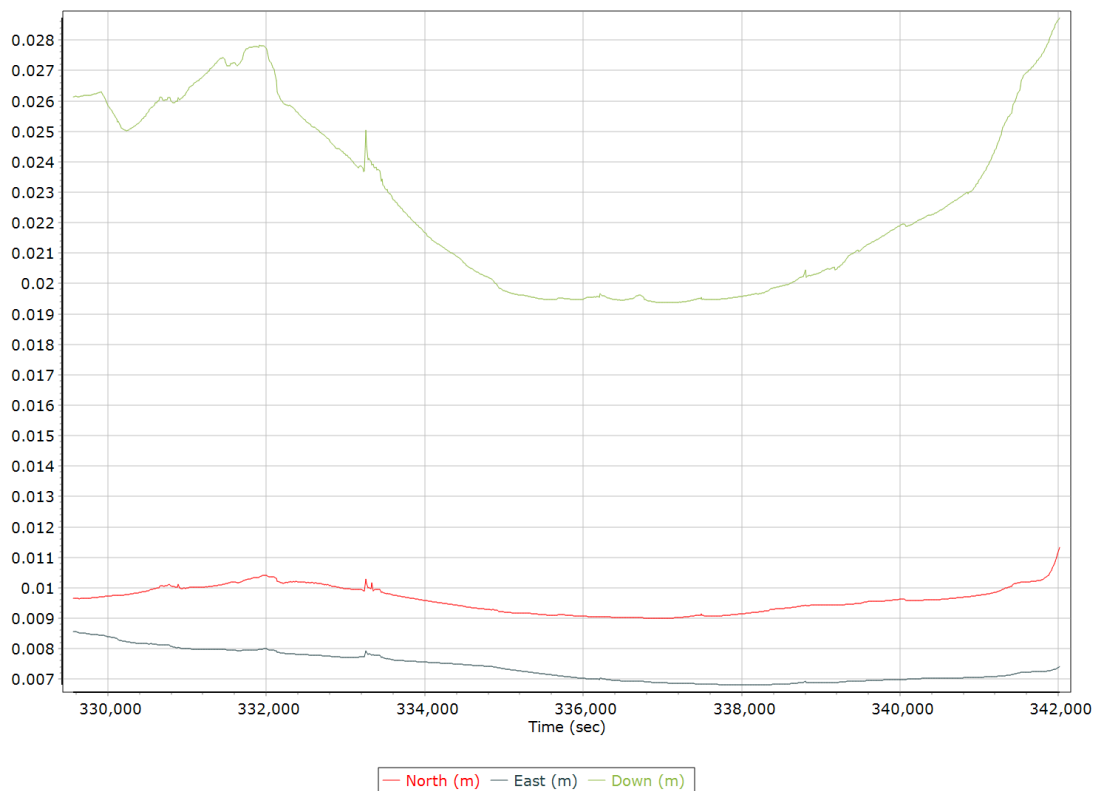
## Forward/Reverse Separation



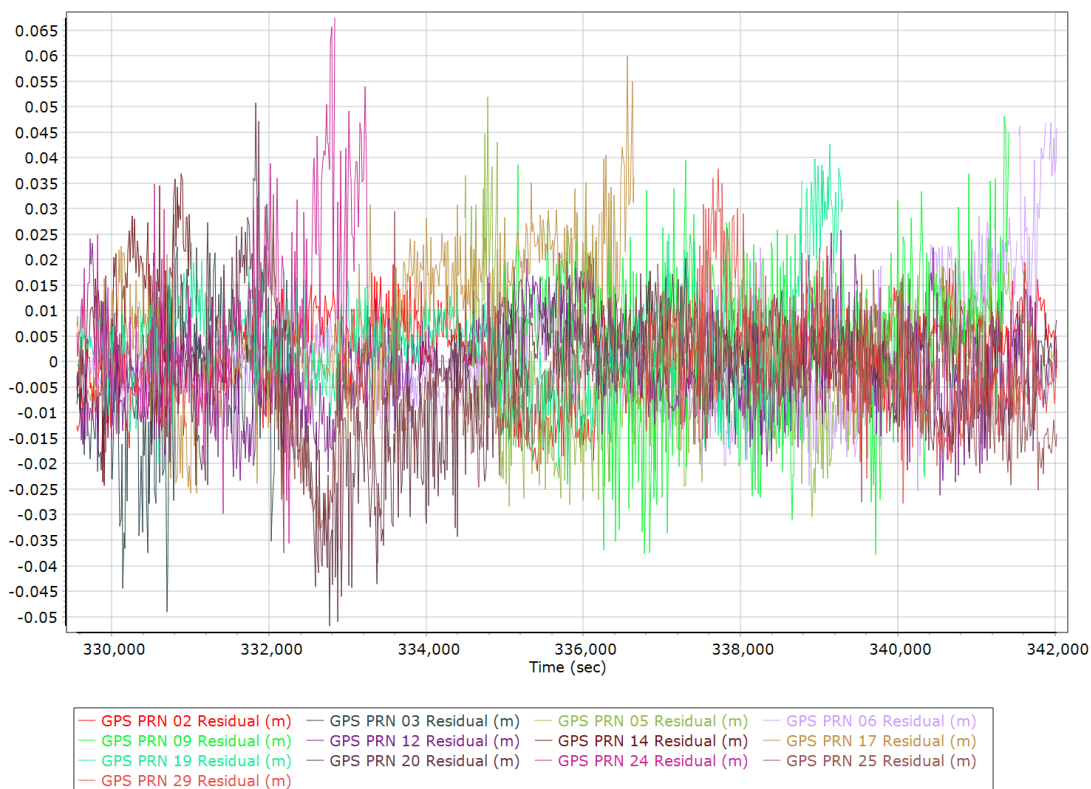
## PDOP



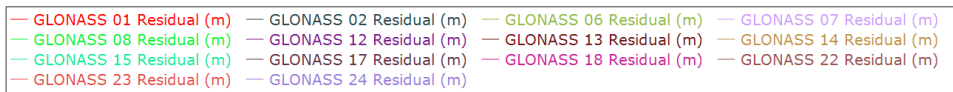
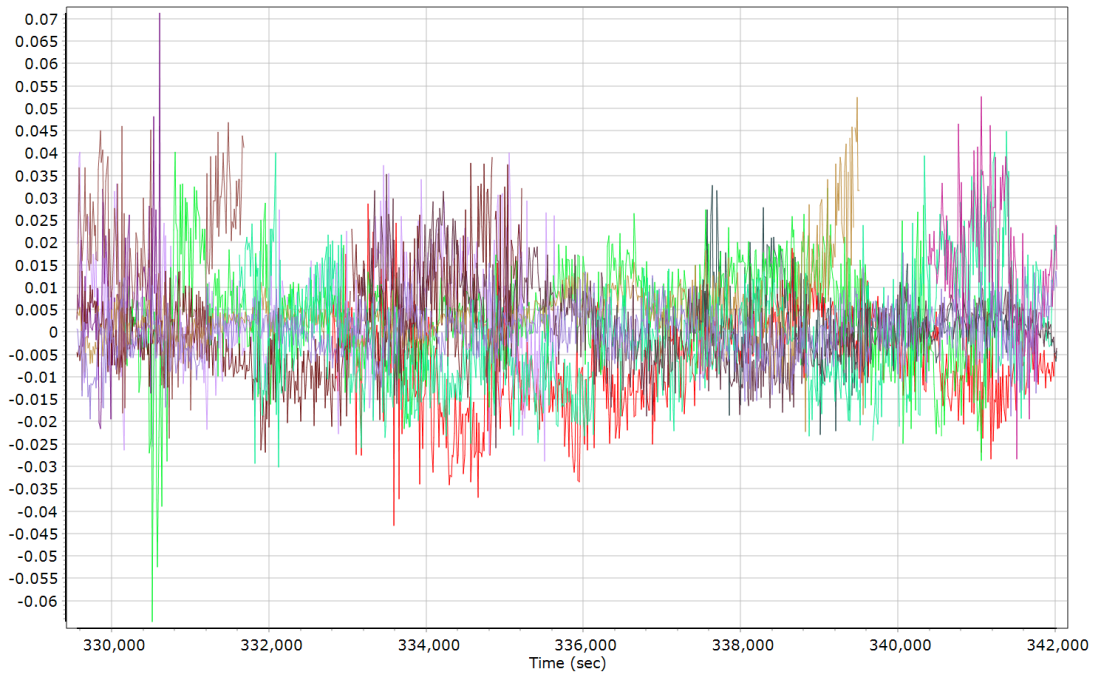
## Estimated Position Accuracy



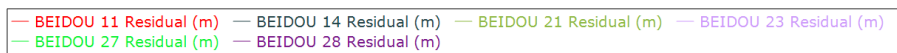
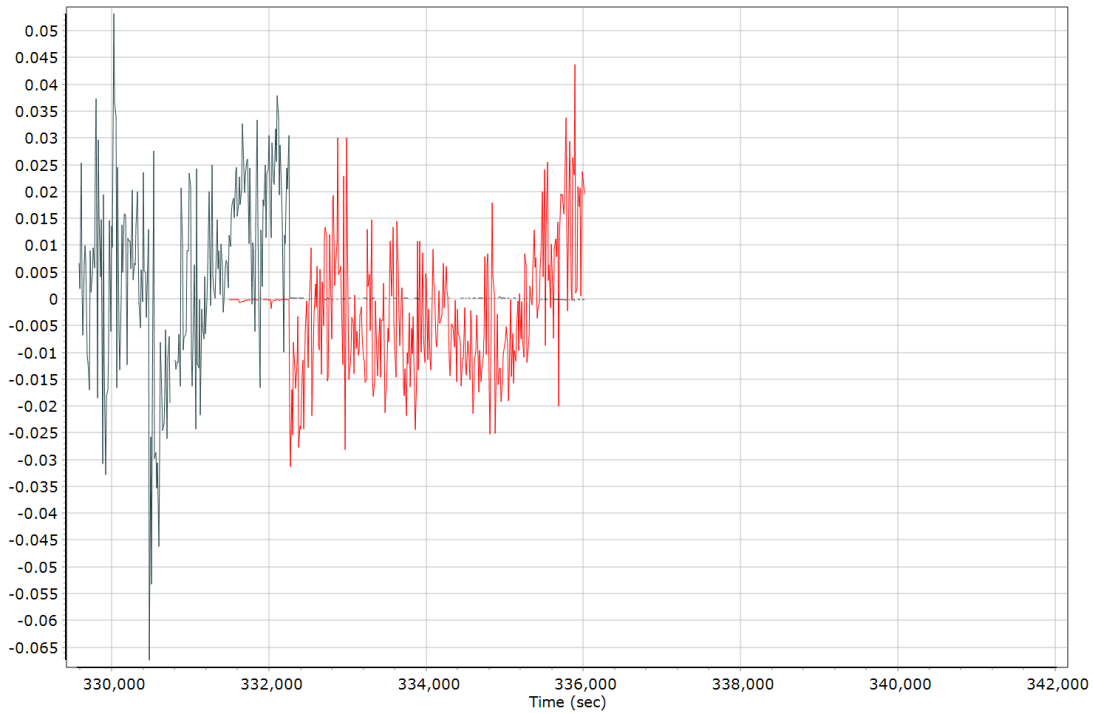
## GPS Residuals



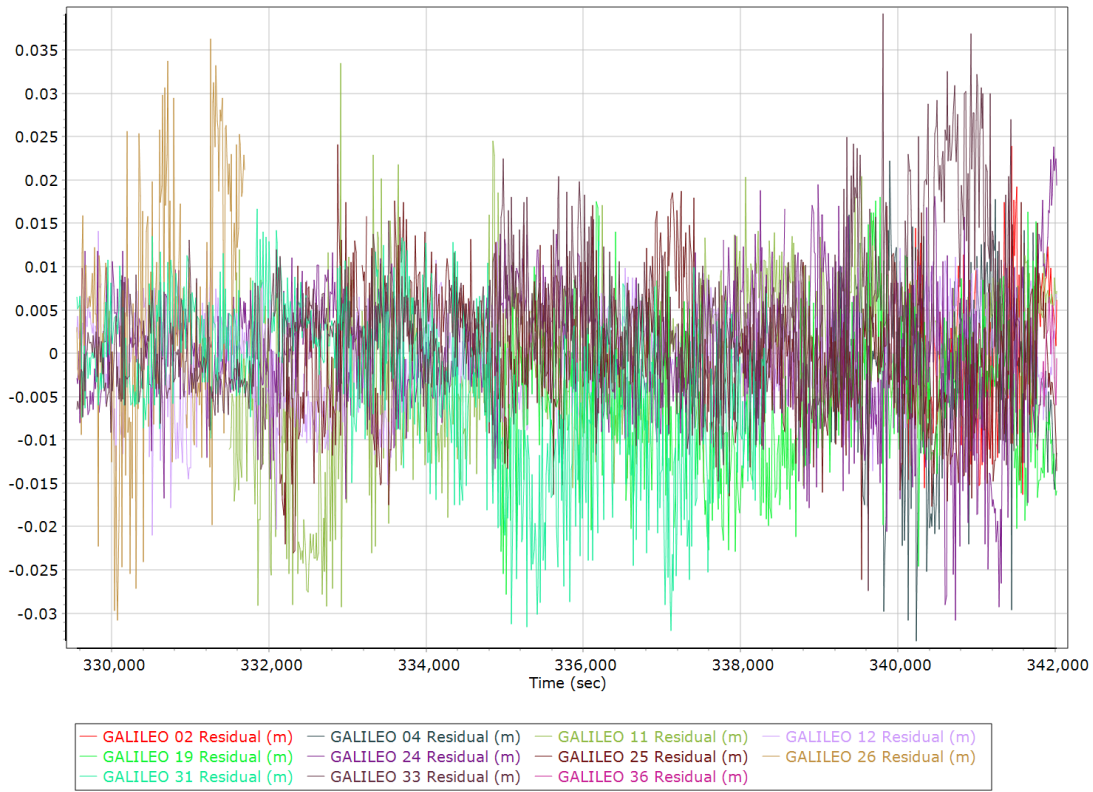
## GLONASS Residuals



## BEIDOU Residuals



## GALILEO Residuals



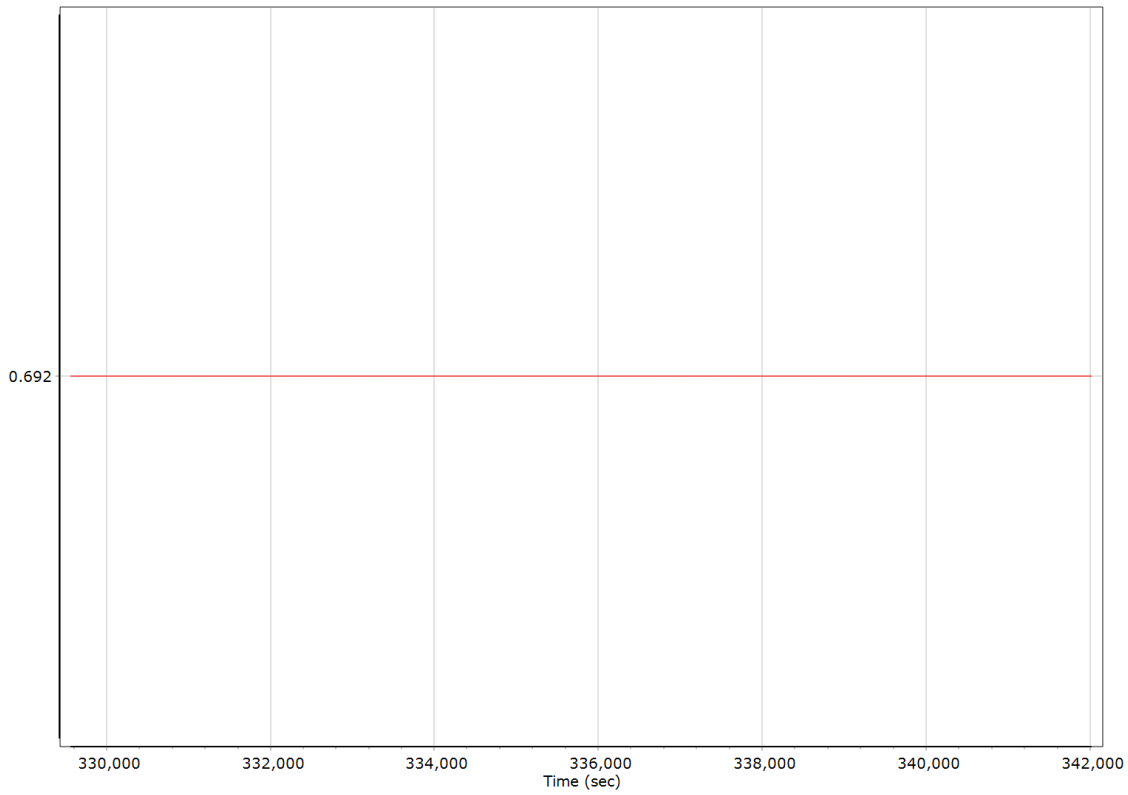
## GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion PP-RTX		
Stabilized mount	True		
Processing start time	329315.000 (5/4/2022 7:28:35 PM)		
Processing end time	342025.000 (5/4/2022 11:00:25 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

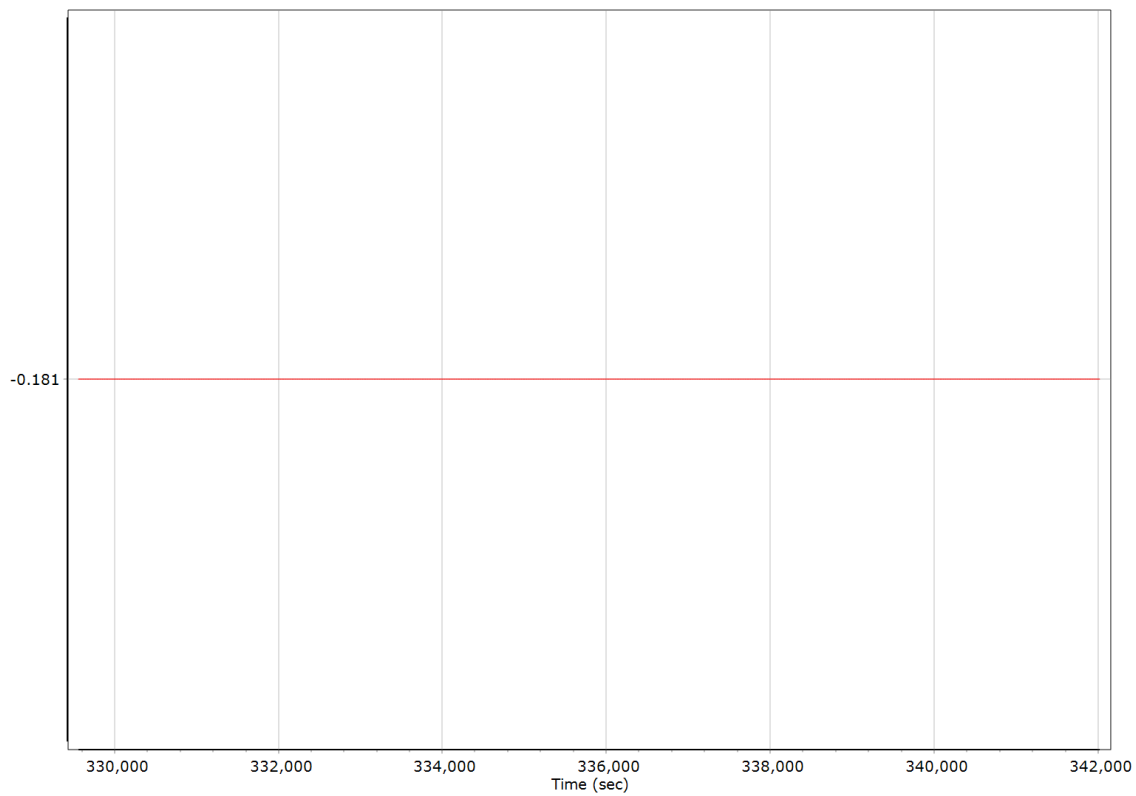
## Calibrated Installation Parameters

### Reference-Primary GNSS Lever Arm (m)

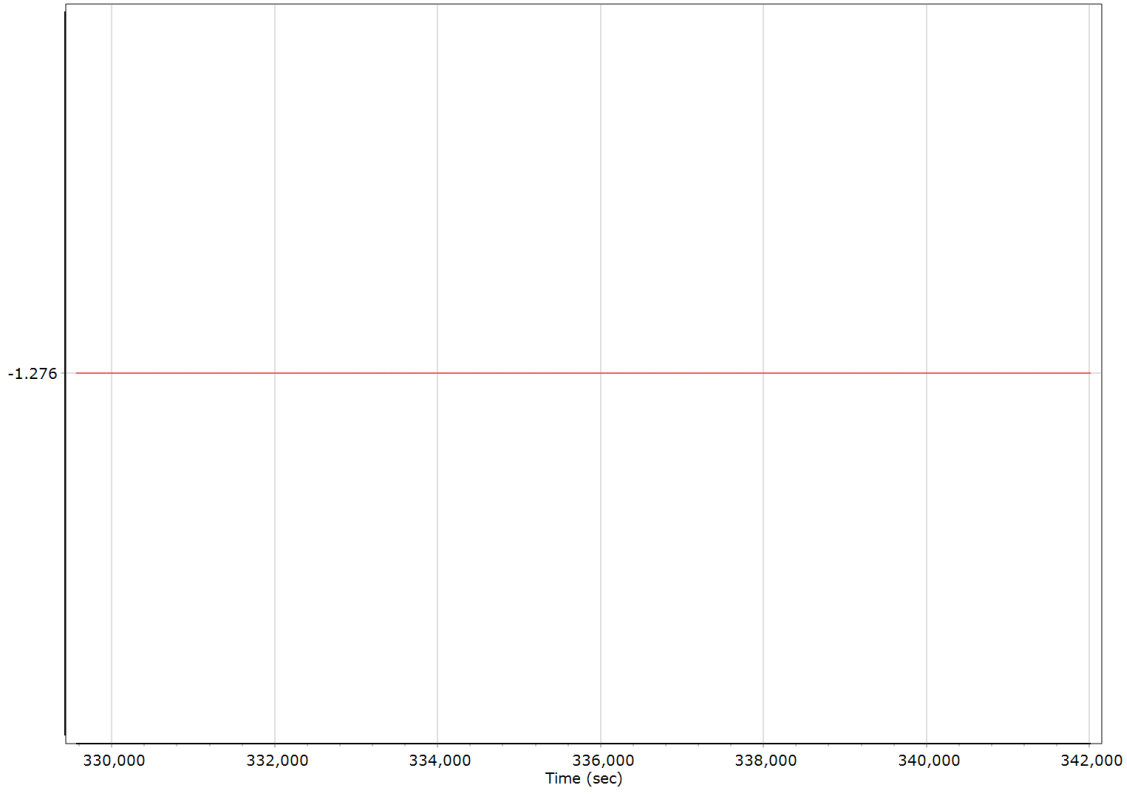
#### X Reference-Primary GNSS Lever Arm (m)



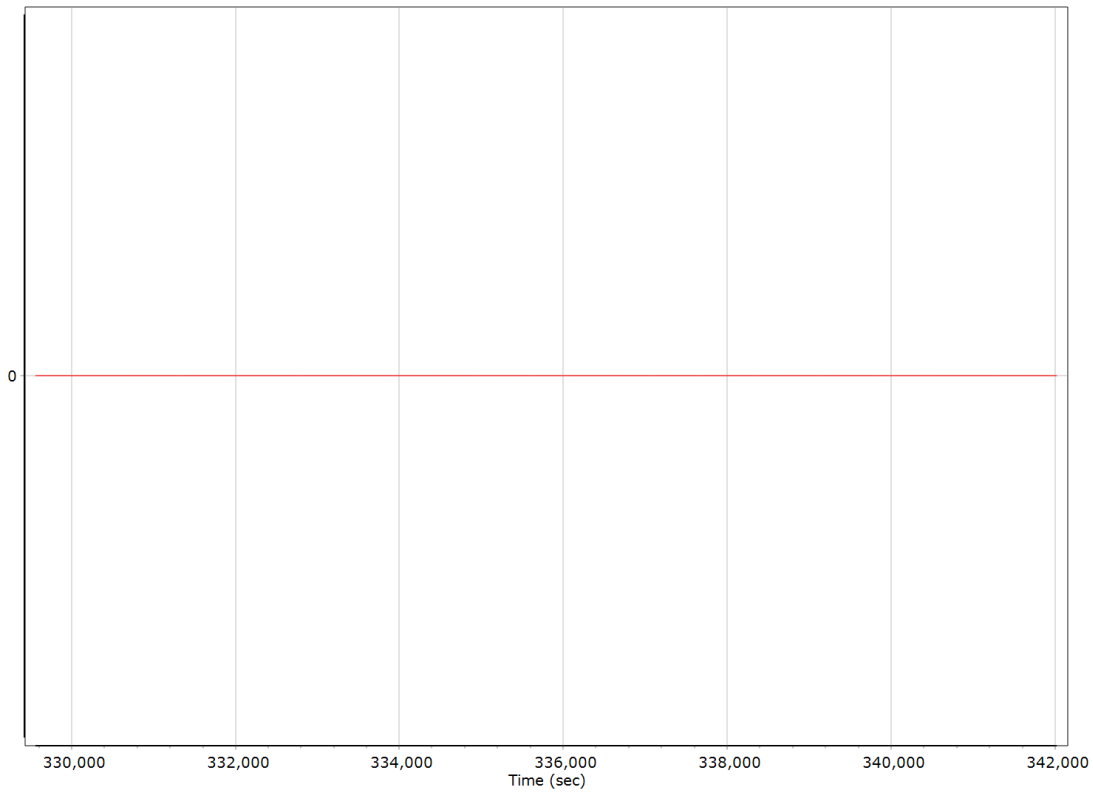
#### Y Reference-Primary GNSS Lever Arm (m)



### Z Reference-Primary GNSS Lever Arm (m)



### Reference-Primary GNSS Lever Arm Figure of Merit

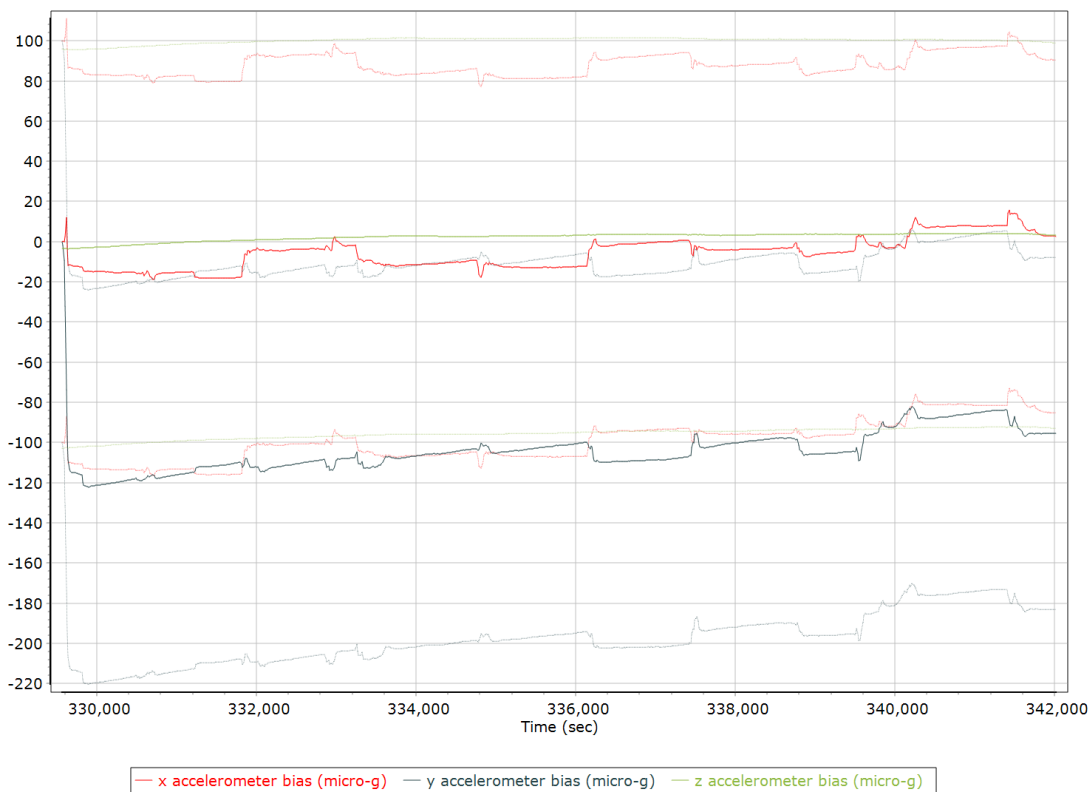




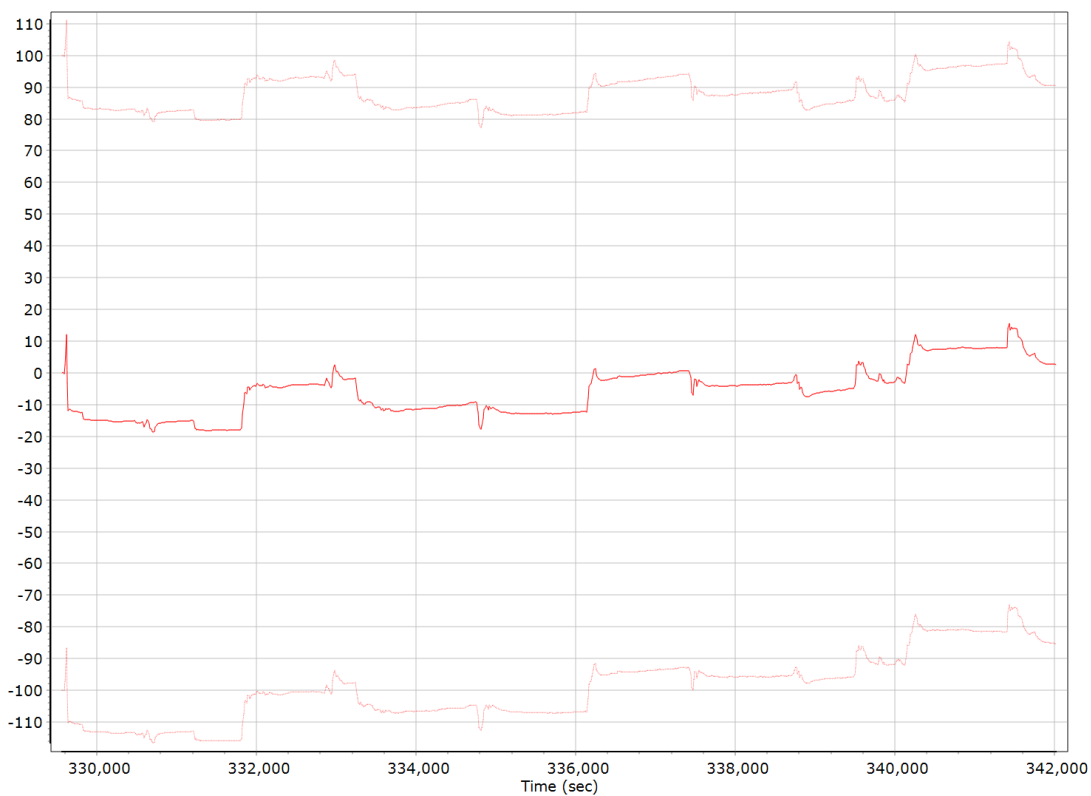
## IN-Fusion QC

### Forward Processed Estimated Errors, Reference Frame

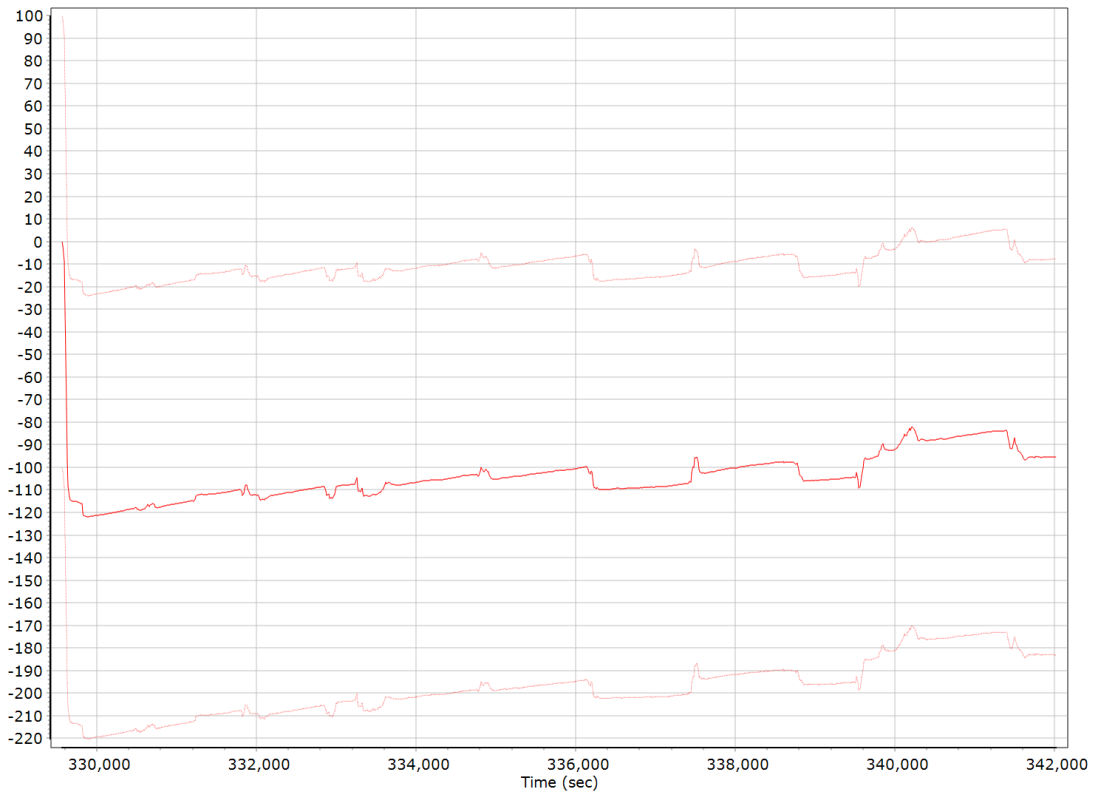
#### Accelerometer Bias (micro-g)



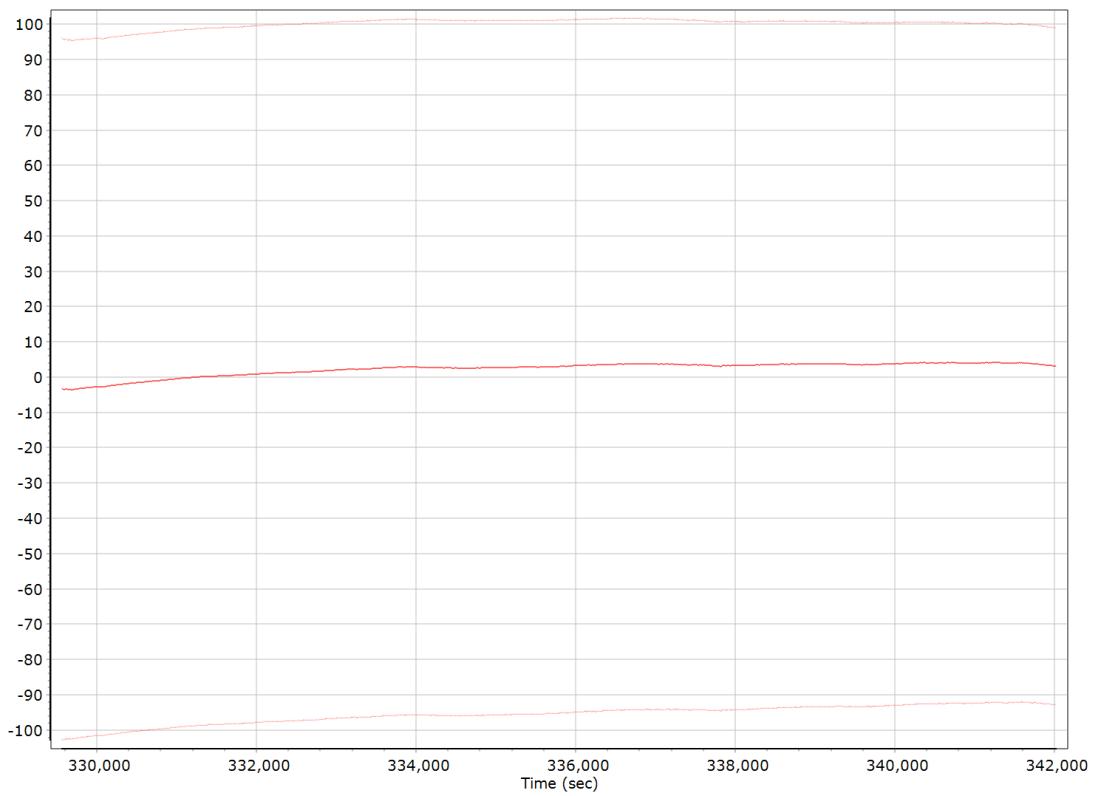
#### X Accelerometer Bias (micro-g)



### Y Accelerometer Bias (micro-g)



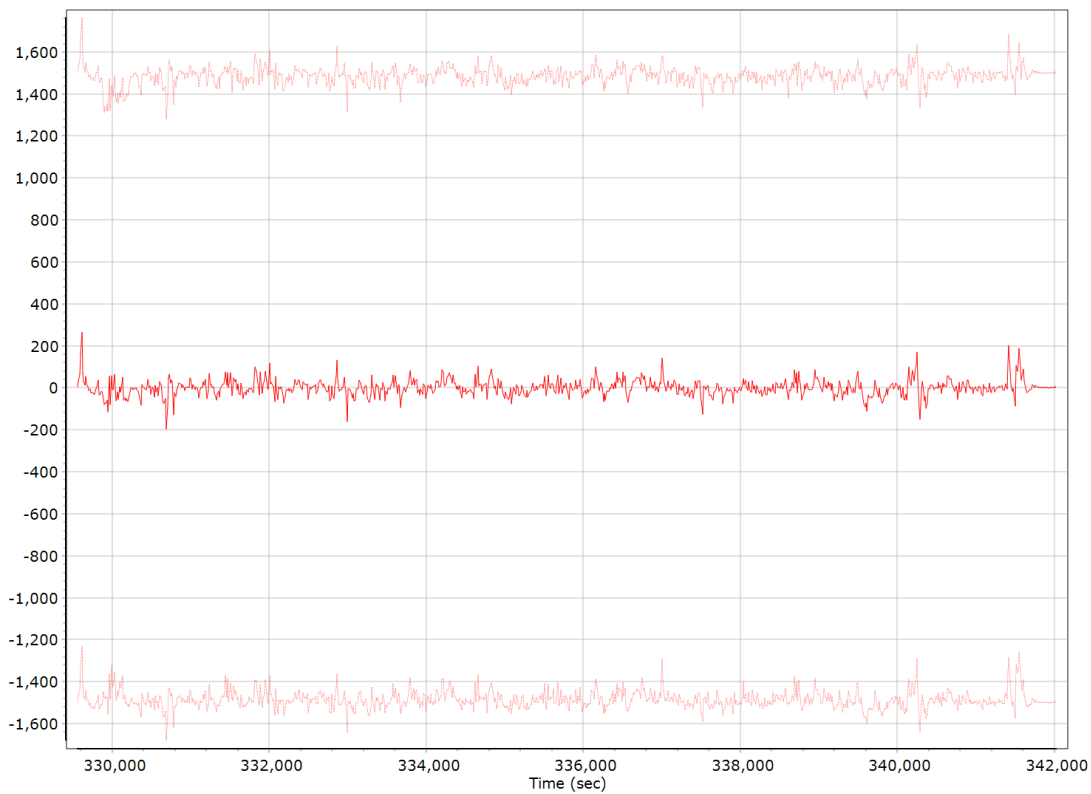
### Z Accelerometer Bias (micro-g)



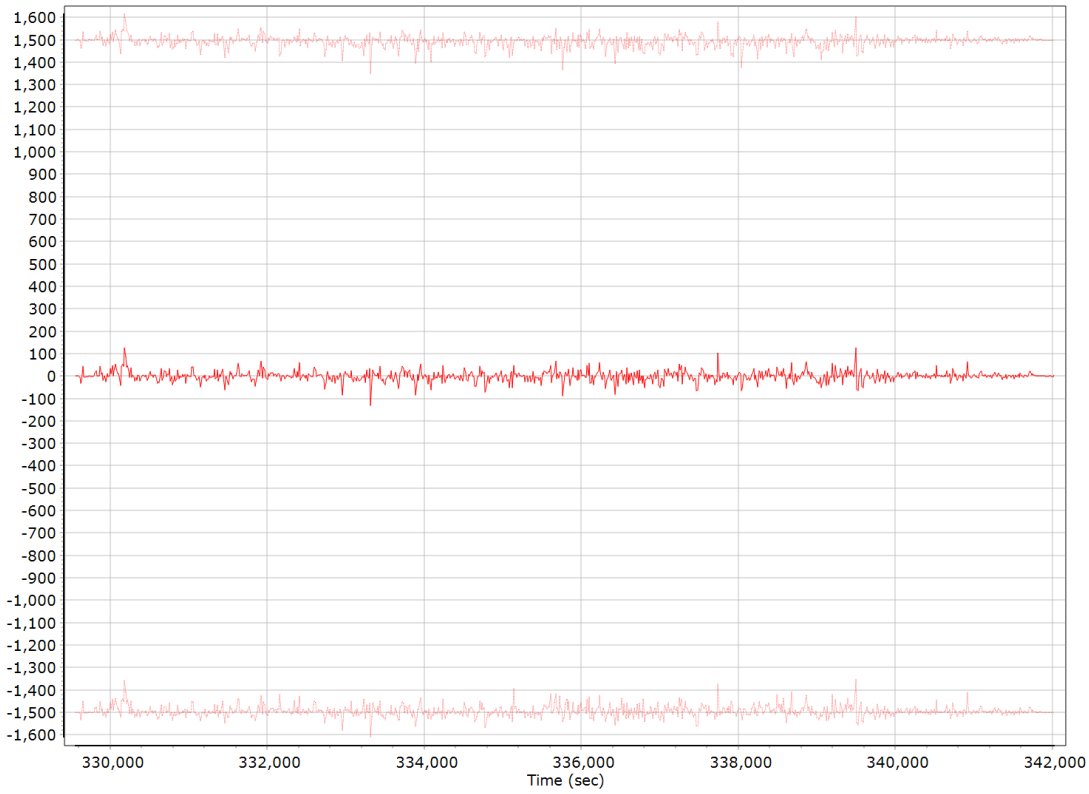
### Accelerometer Scale Error (ppm)



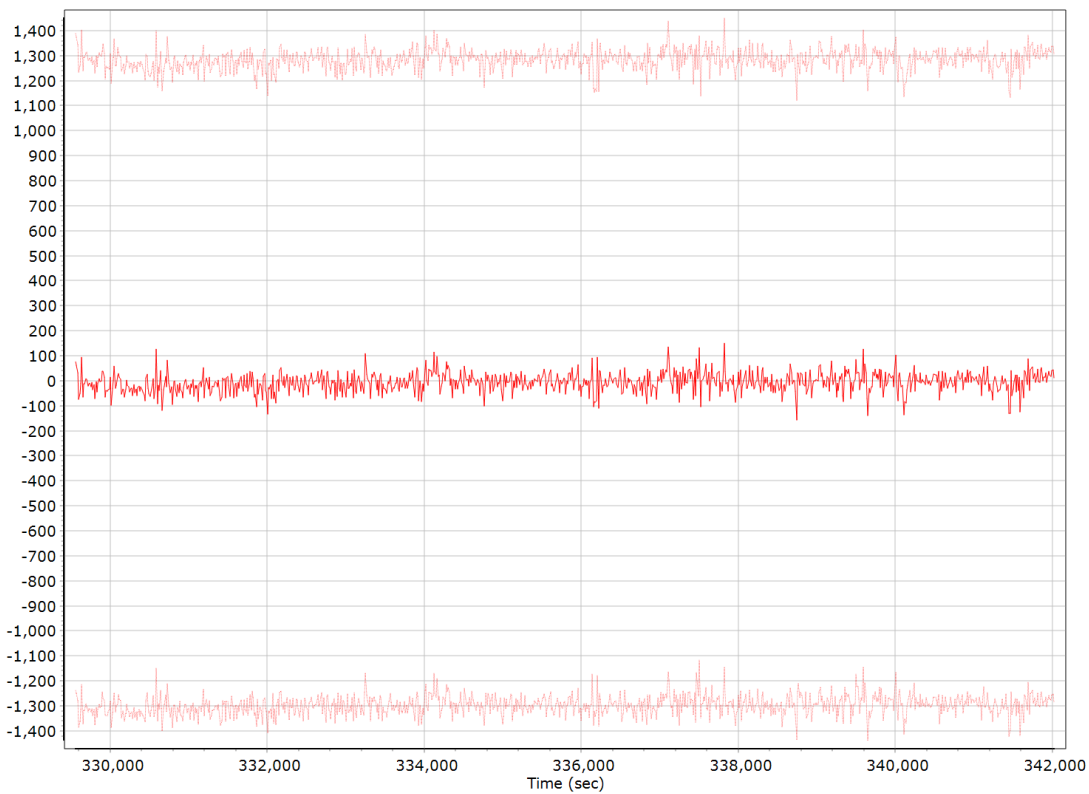
### X Accelerometer Scale Error (ppm)



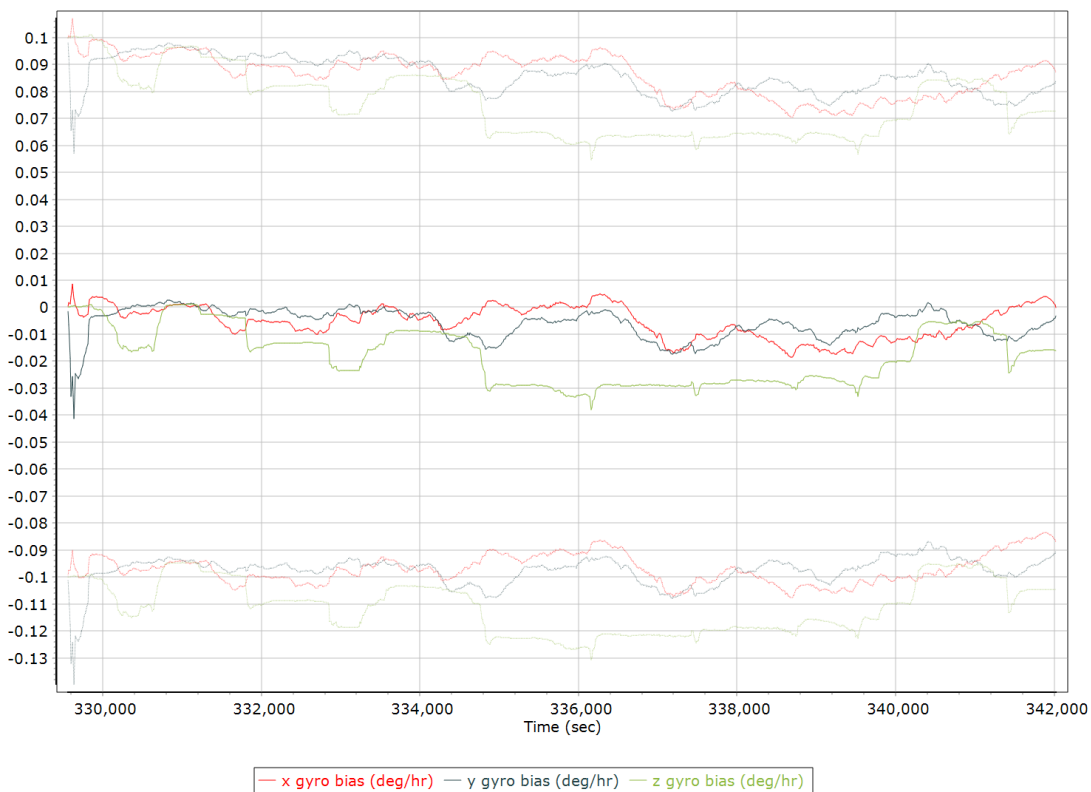
### Y Accelerometer Scale Error (ppm)



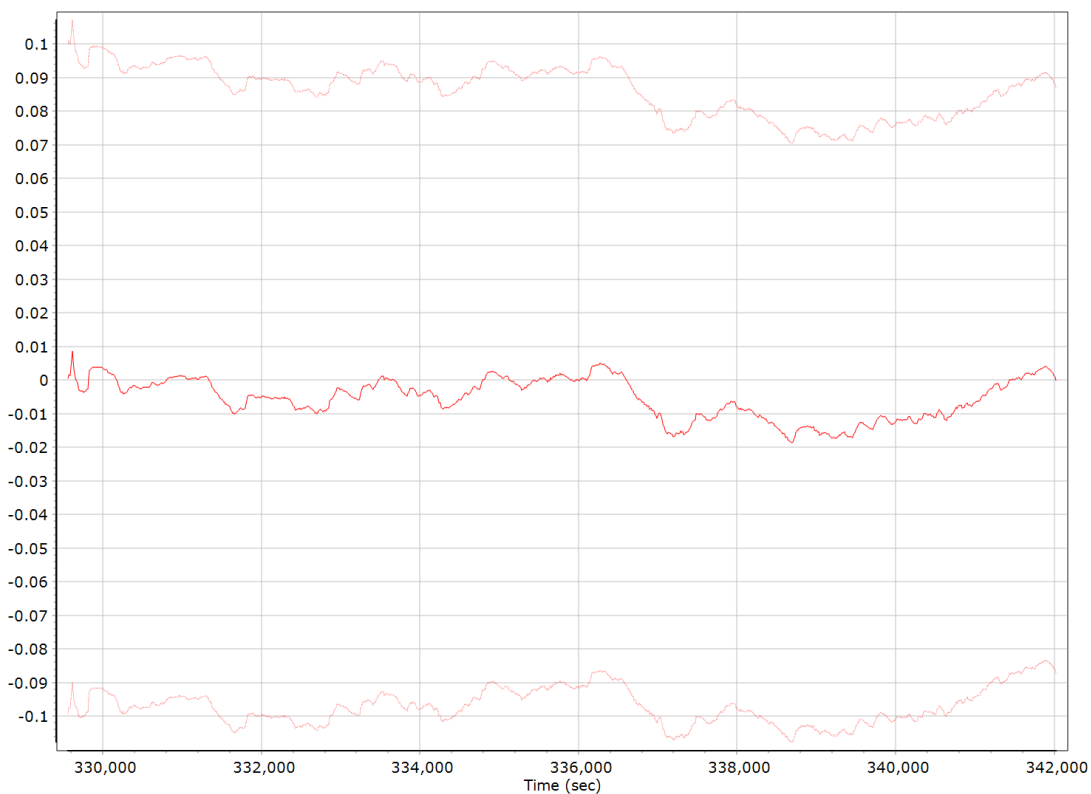
### Z Accelerometer Scale Error (ppm)



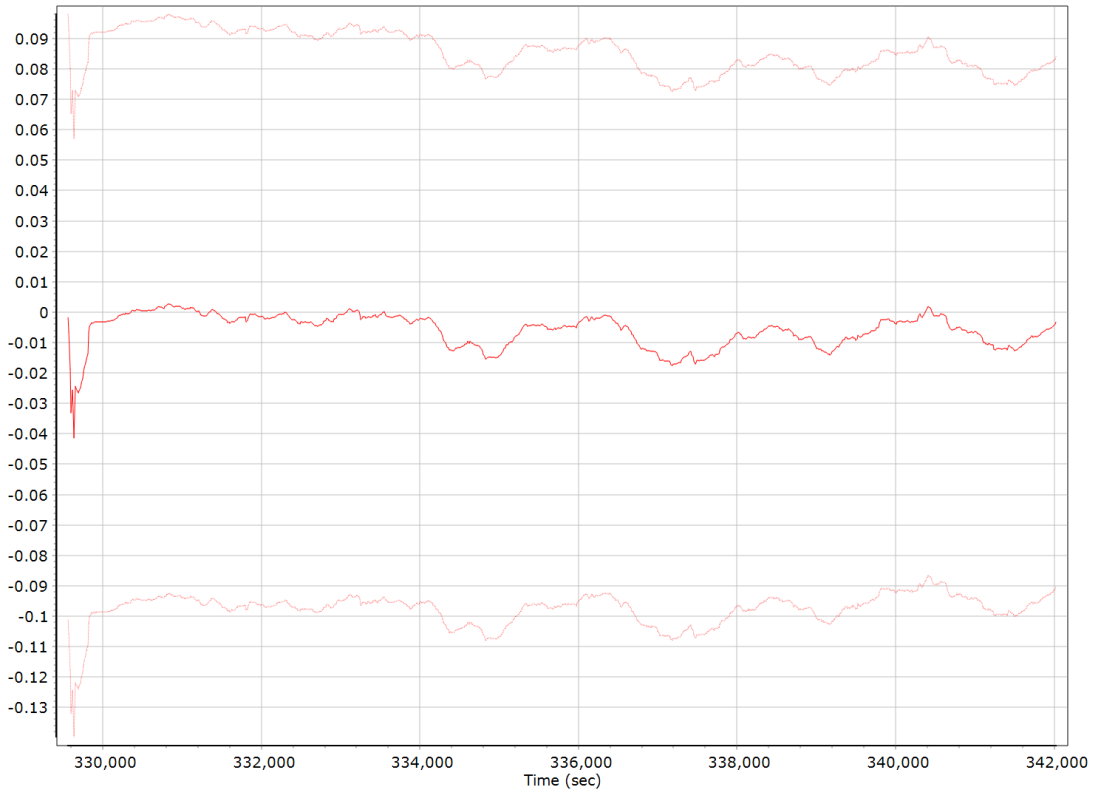
### Gyro Bias (deg/h)



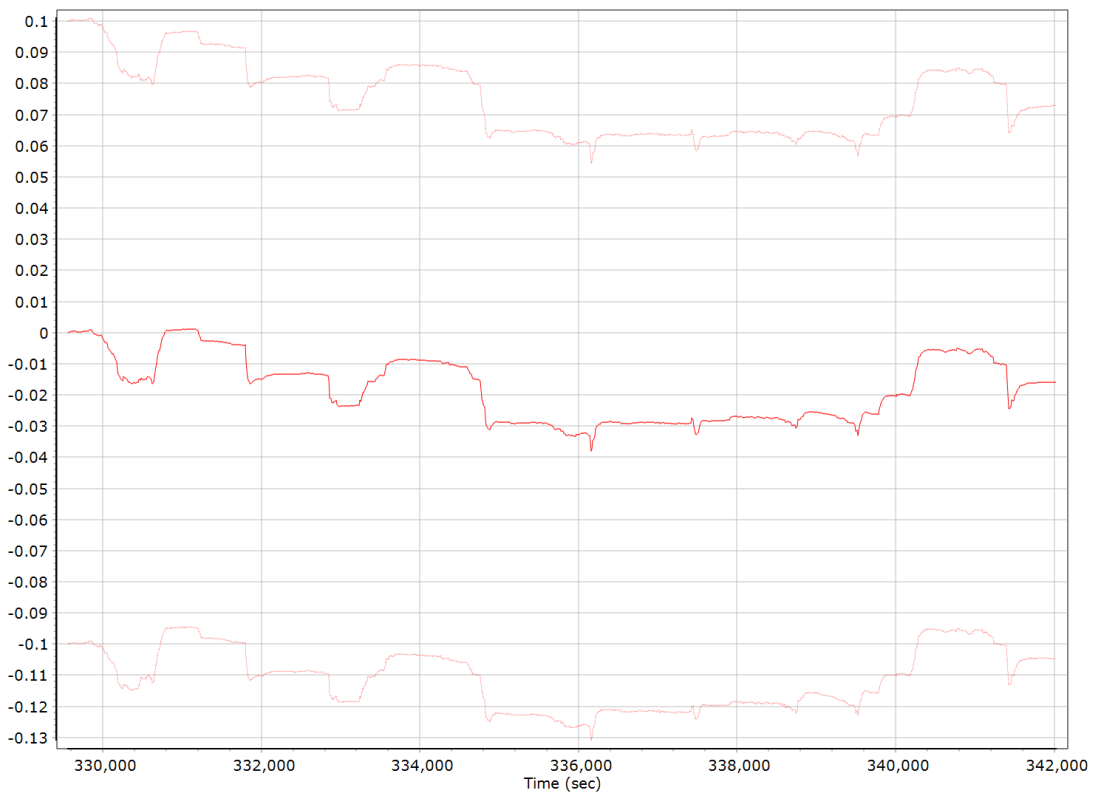
### X Gyro Bias (deg/h)



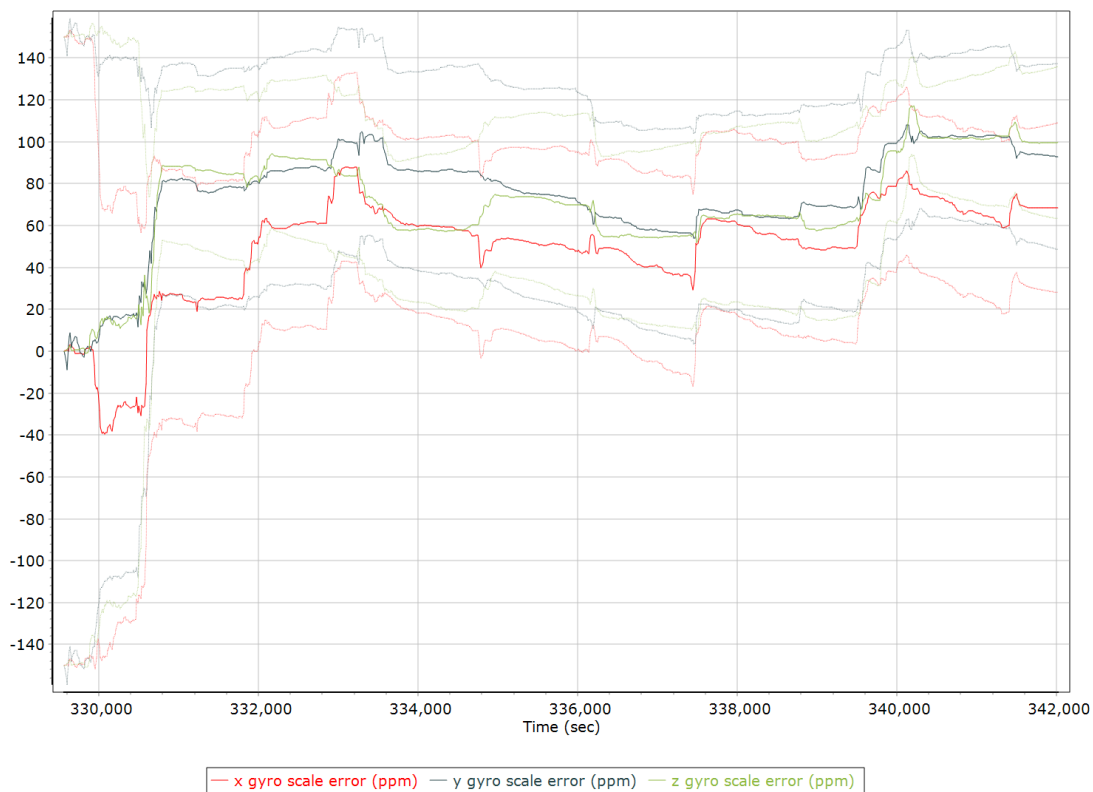
### Y Gyro Bias (deg/h)



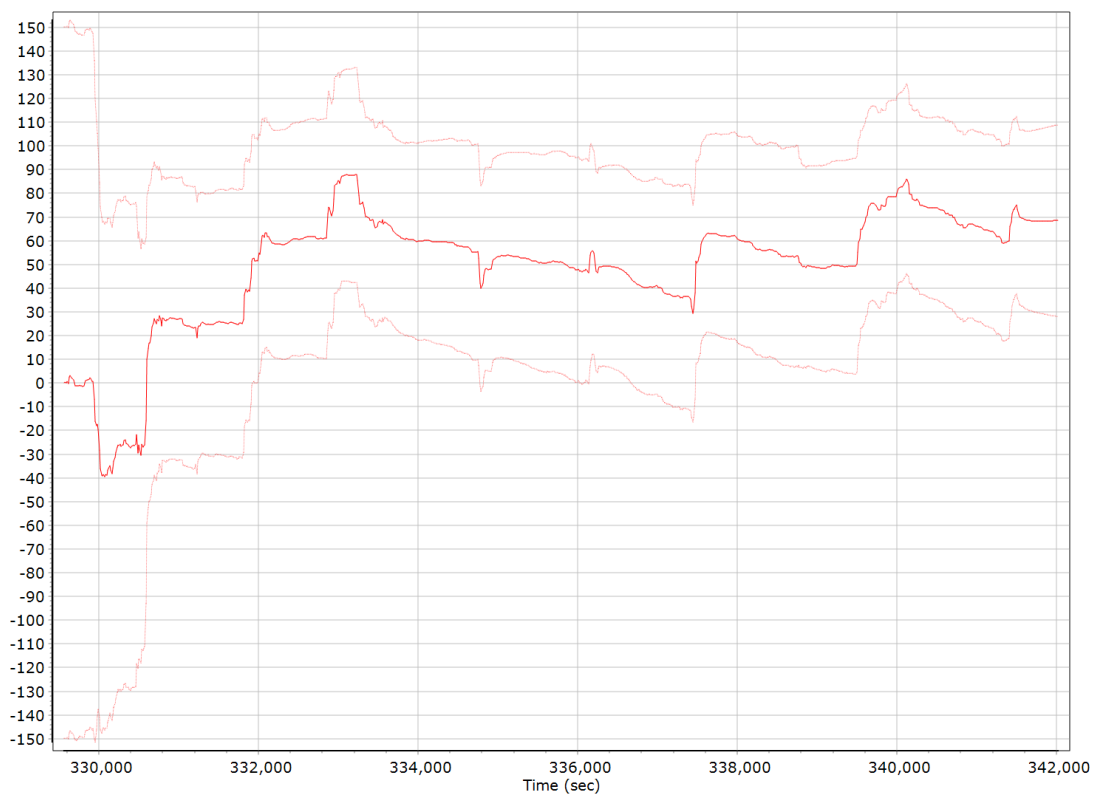
### Z Gyro Bias (deg/h)



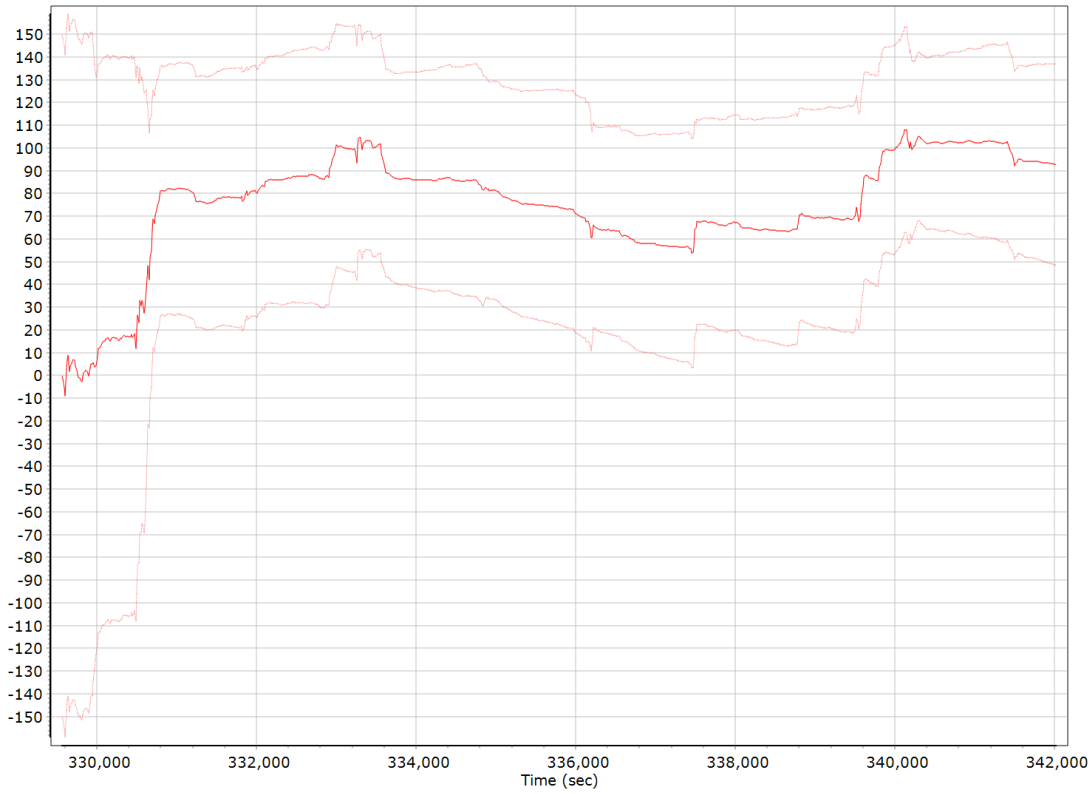
### Gyro Scale Error (ppm)



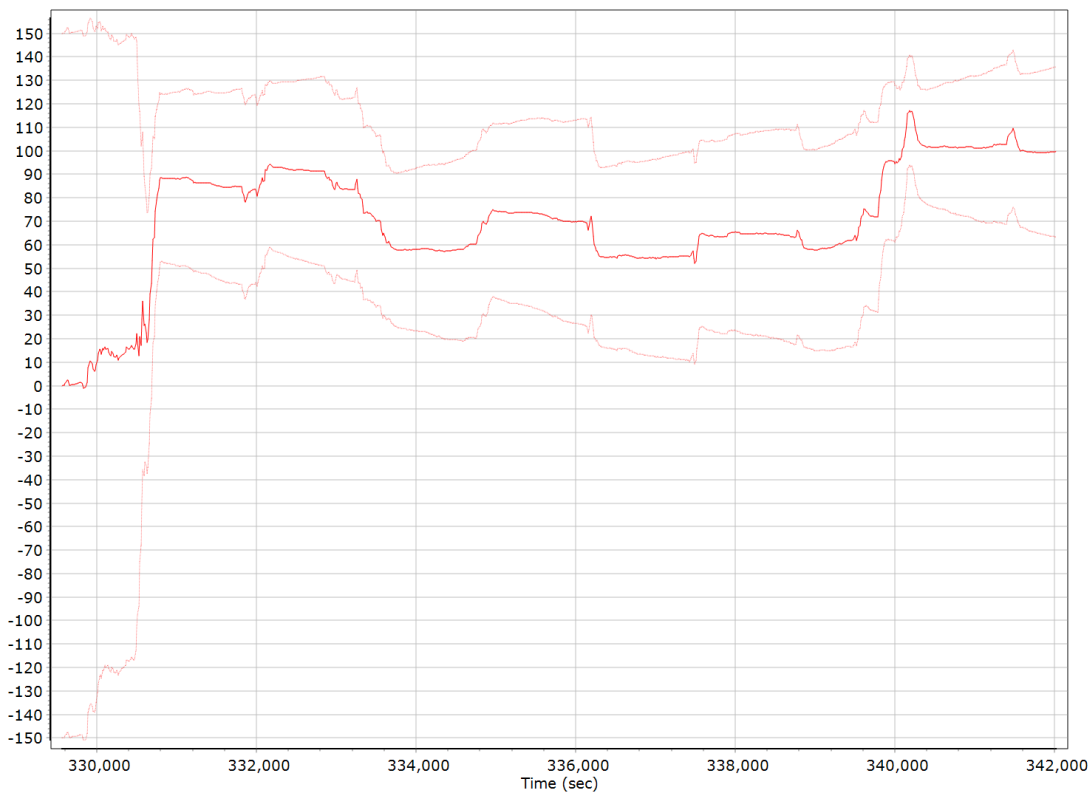
### X Gyro Scale Error (ppm)



### Y Gyro Scale Error (ppm)



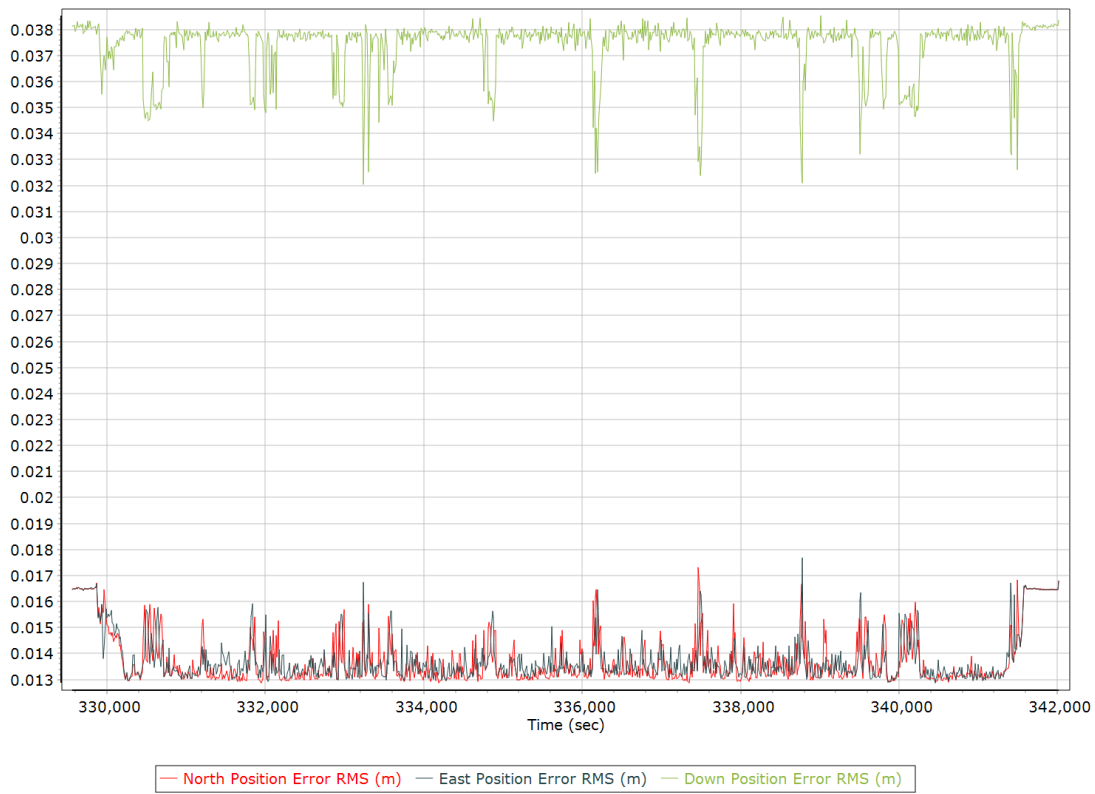
### Z Gyro Scale Error (ppm)



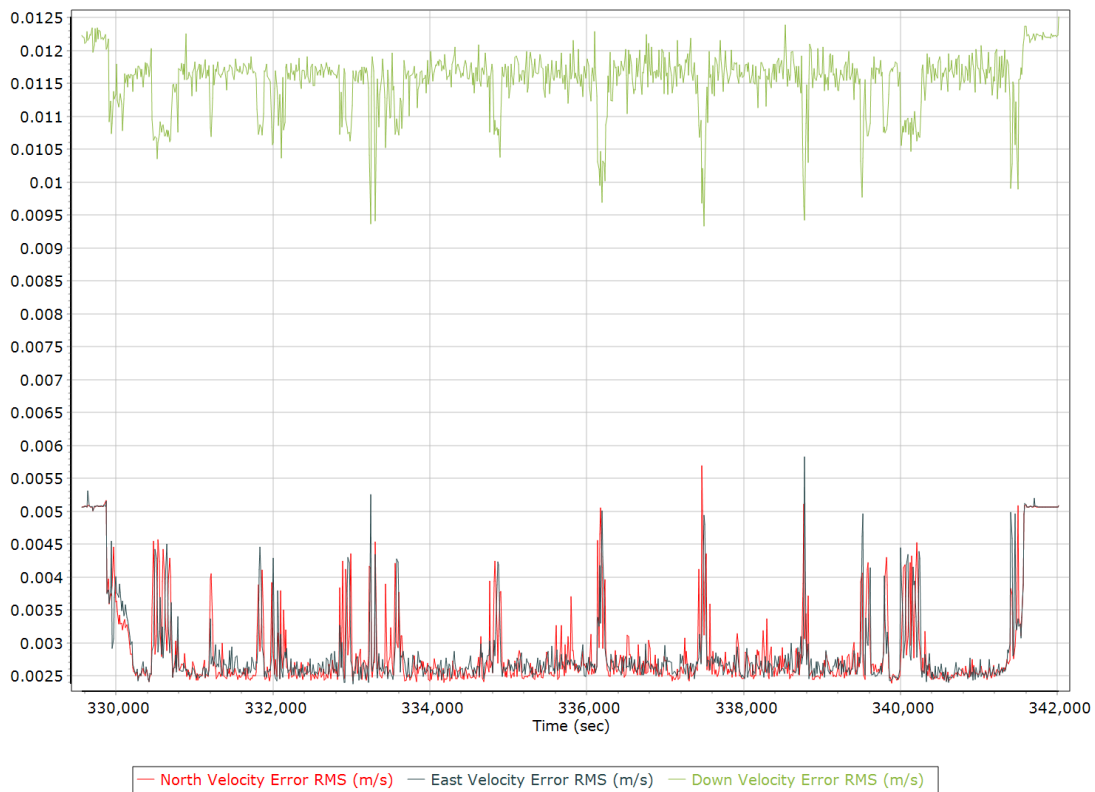


## Smoothed Performance Metrics

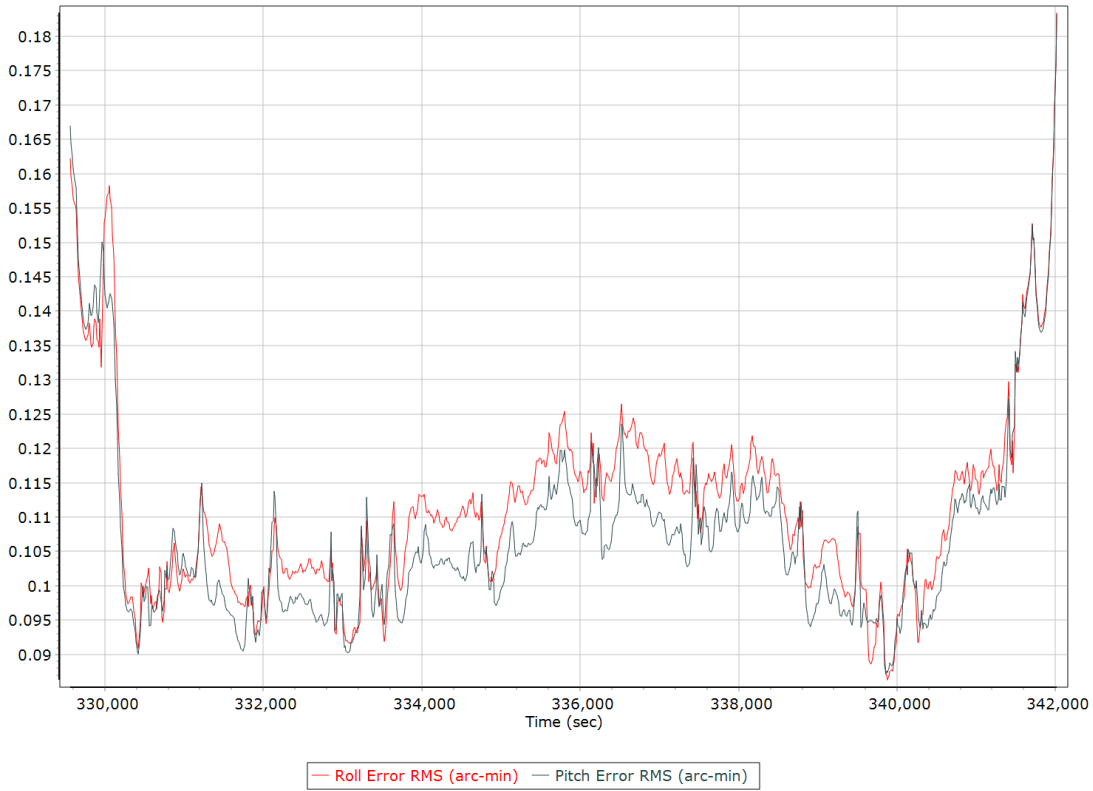
### Position Error RMS (m)



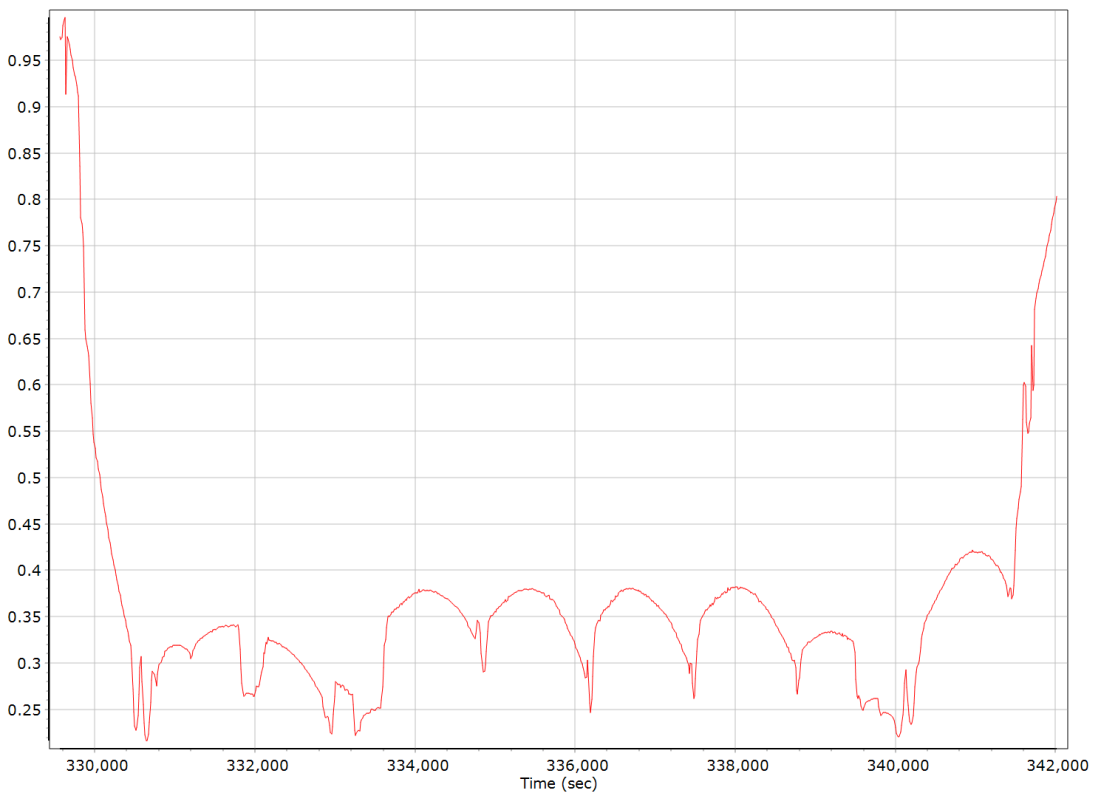
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

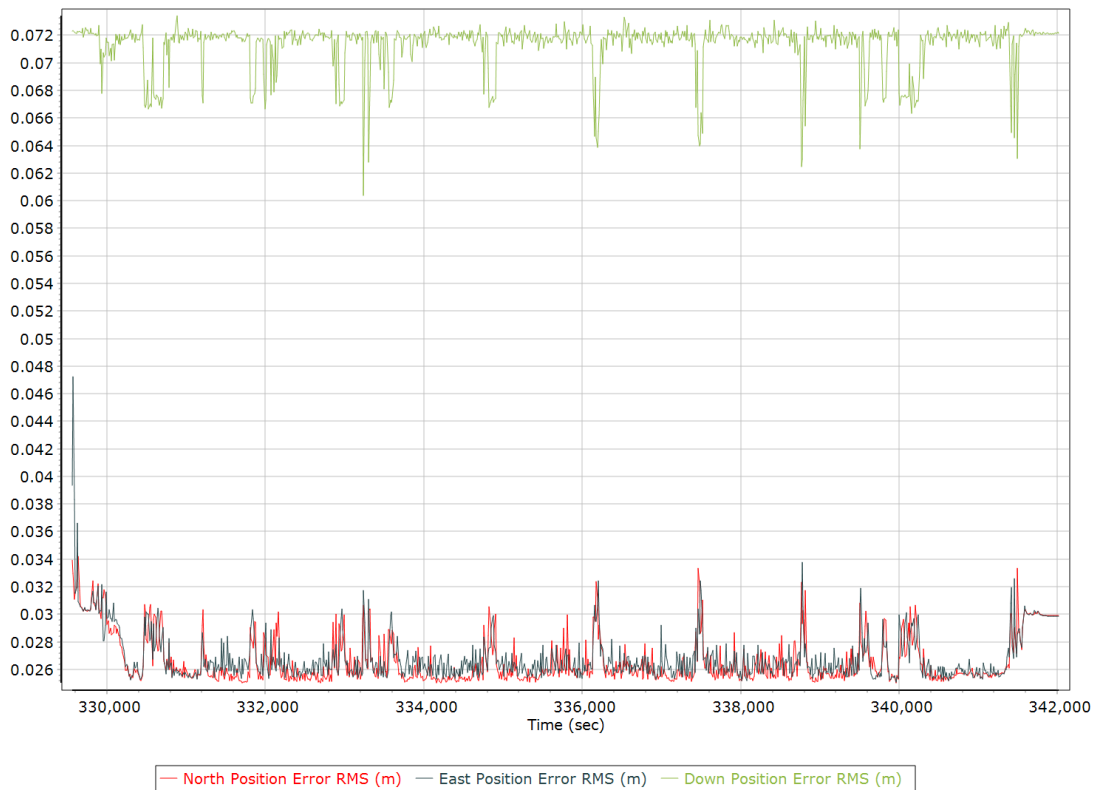


### Heading Error RMS (arc-min)

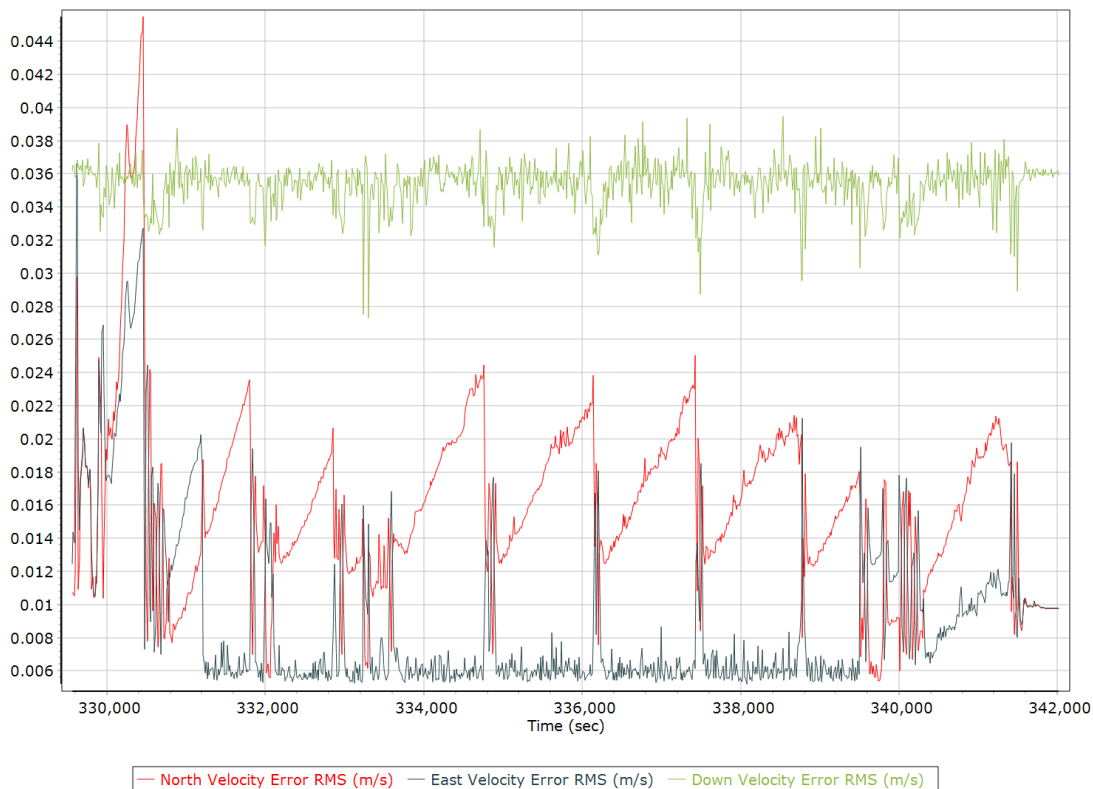


## Forward Processed Performance Metrics

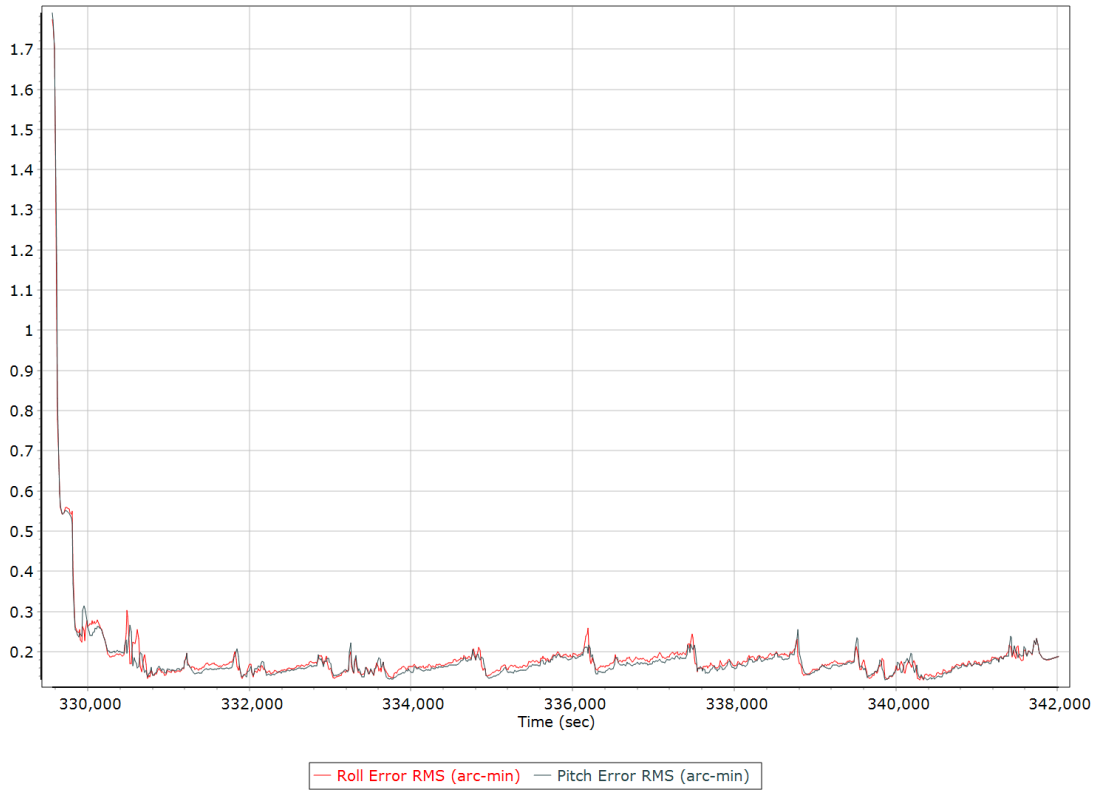
### Position Error RMS (m)



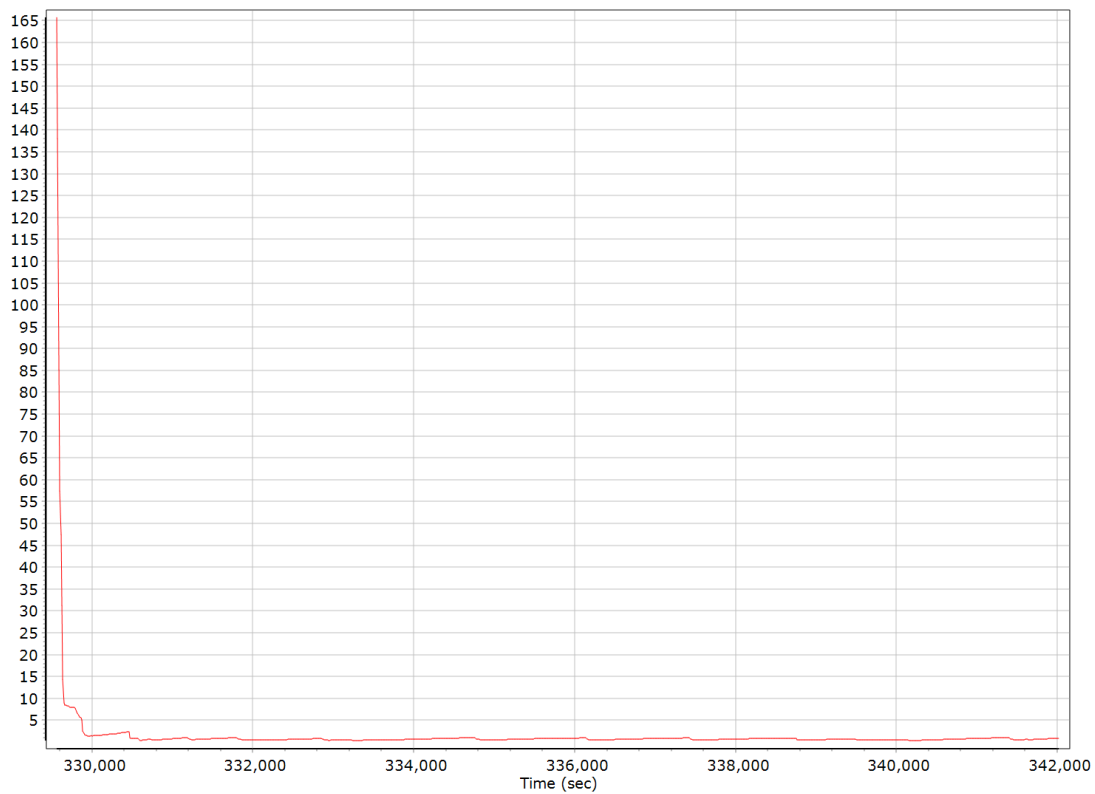
### Velocity Error RMS (m/s)



### Roll/Pitch Error RMS (arc-min)

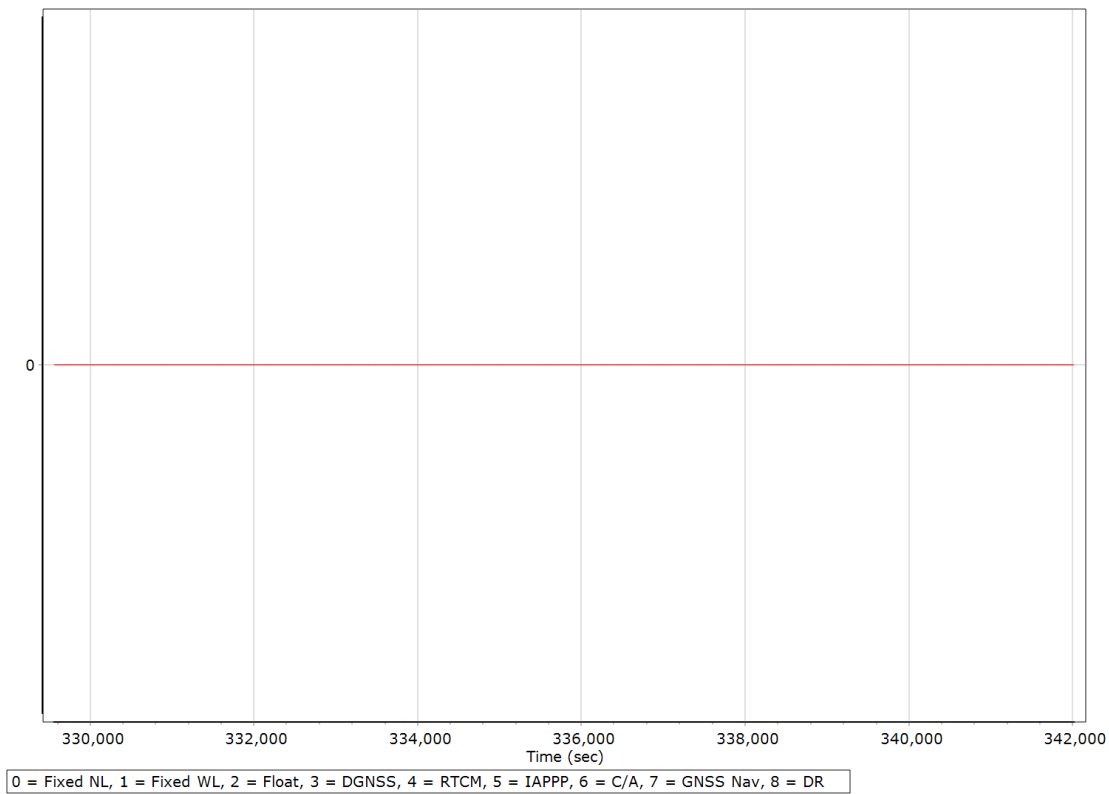


### Heading Error RMS (arc-min)

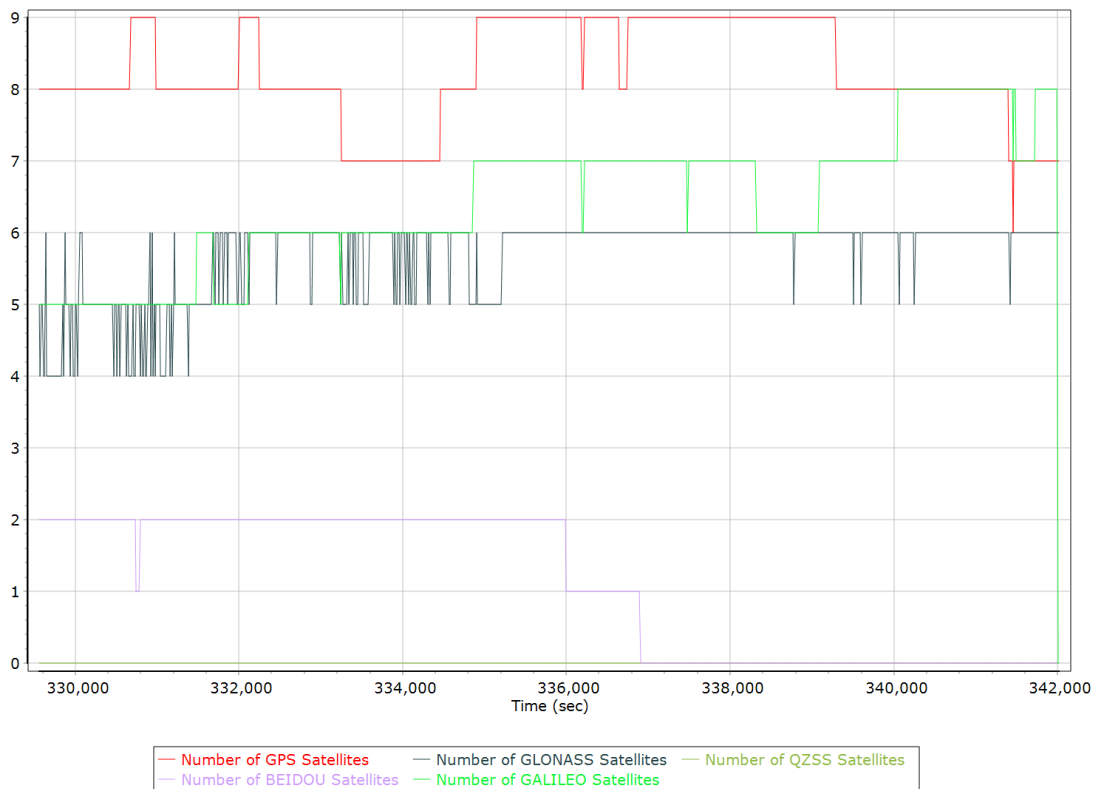


## Forward Processed Solution Status

### Processing Mode



### Number of Satellites



## Baseline Length

