# LiDAR Report:
# LA_Catahoula_Concordia_2017_D17 D1

**LiDAR Collection, Processing, and QA/QC**

**G17PD1255: LA_Catahoula_Concordia_2017_D17 D1**

**QL1 LiDAR**

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**US Geological Survey**

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**Contract: G16P00044 Contractor: Digital Aerial Solutions**

**Task Order: G17PD1255: LA_Catahoula_Concordia_2017_D17**

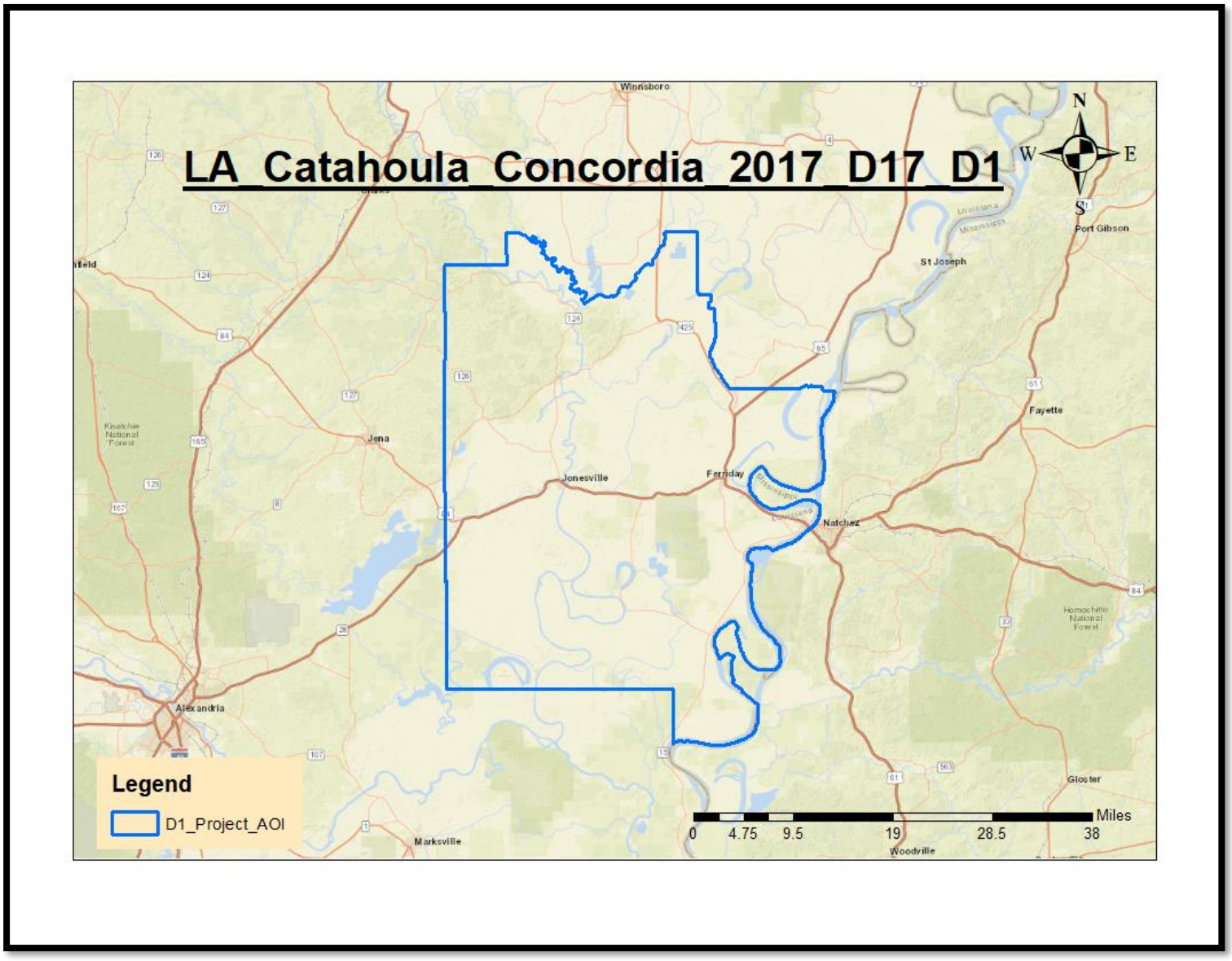


Image 1: LA_Catahoula_Concordia_2017_D17 D1 AOI

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# 1 Introduction and Specifications

Digital Aerial Solutions, LLC (Das) was tasked to collect and process a Light Detection and Ranging (LiDAR) derived elevated dataset for the **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1**. The area encompasses approximately 1,261 square miles. Aerial LiDAR data was collected utilizing a Lecia Terrain Mapper. The Terrain Mapper is a discrete return topographic LiDAR mapping system manufactured by Leica Geosystems. LiDAR data collected for **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1** LiDAR survey has an Aggregated Nominal Pulse (ANPS) spacing of 0.35 meters (**QL1**) and includes up to 2 discrete return per pulse, along with intensity values of each return.

LIDAR datasets were post process to generate elevation point cloud swaths for each flight lines. Deliverables include tiled point cloud classified by land cover type, breaklines to support hydro-flattening of digital elevations models (DEM), intensity tiles, and bare-earth DEM titles. The point cloud deliverables are store in the LAS Version 1.4, point data record format 6. The tiling scheme for the tiled deliverables is a **1,000 x 1,000** meters grid. Tile naming convection is based on the Based on the U.S. National Grid and named according to the U.S. National Grid System based on the SW corner (**e.g. 12TVK0616)**. All deliverables were generated in conformance with the U.S Geological Survey National Geospatial Program Guidelines and Base Specifications, Version 2.1.

# 2 Spatial Reference System

The spatial reference of the data is as follows:

**Horizontal Spatial Reference**

– Coordinates: Universal Transverse Mercator, UTM, Zone 15 North Meters (to 2 decimal places)

– Datum: North American Datum 1983 (2011), Meters (to 2 decimal places)

**Vertical Spatial Reference**

All datasets are available with orthometric elevation; point cloud datasets are also available with ellipsoid heights.

– Datum: North American Vertical Datum of 1988 (GEOID 12B)

# 3 LiDAR Acquisition

## 3.1 Survey Area

The **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1** survey covers approximately 1,261 square miles located Catahoula and Concordia parishes in Louisiana. The project consisted of consisted of 95 flight lines totaling 3,206.94 nautical miles.

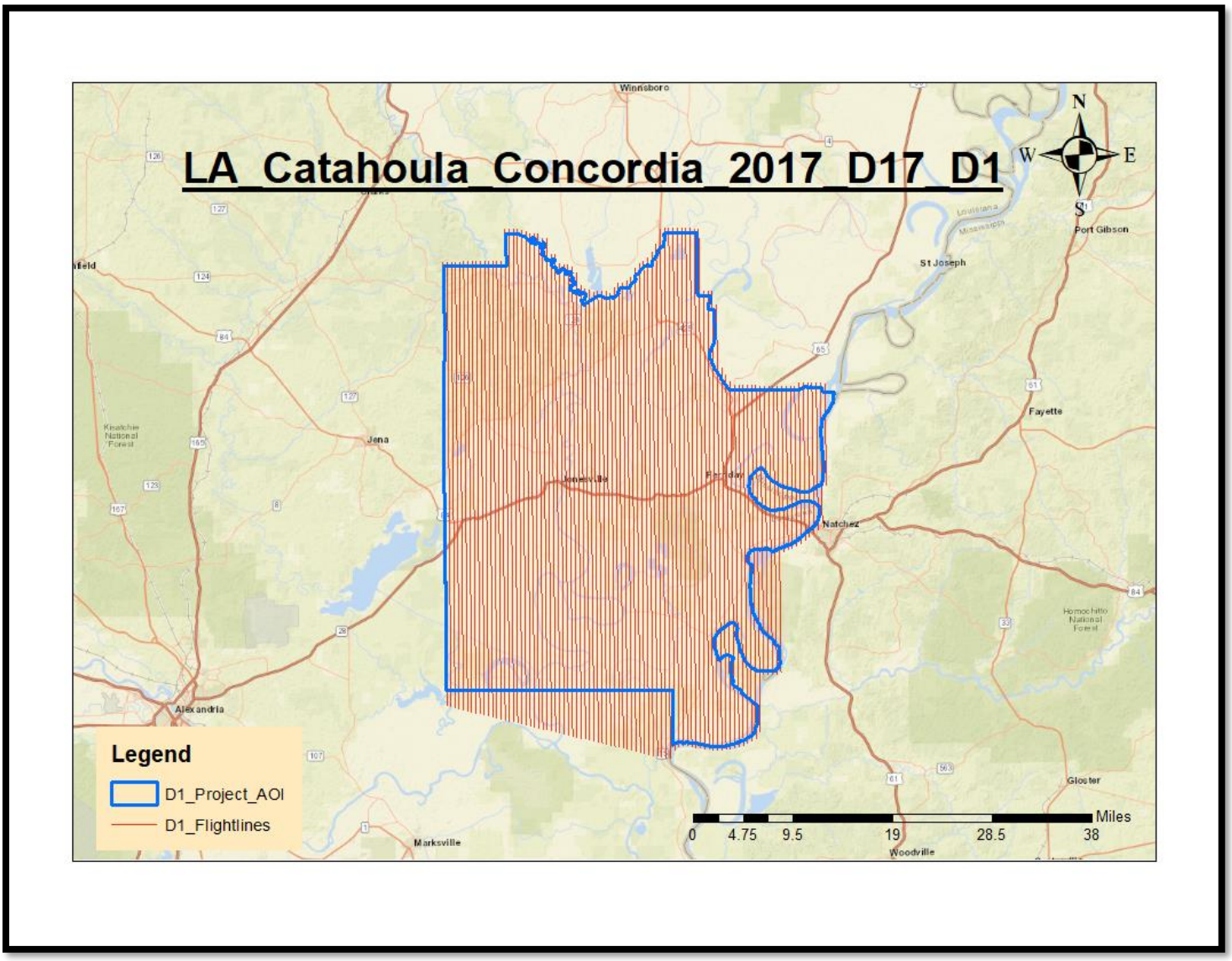



**Image 2: LA_Cathoula_Concordia_2017_D17 D1 Flightlines**

## 3.2 Acquisition Parameters

Acquisition parameters include the sensor configuration and the flight plan characteristics, and are selected based on a number of project specific criteria. Criteria reviewed include the required accuracies for the final dataset, the land cover types within the project survey area, and the required nominal pulse spacing. Aggregate Nominal Pulse Density (ANPD) for QL1 AOI is no less than 8ppm. The project parameters are summarized below.

| Parameter (QL1) | Terrain Mapper |
|---|---|
| Flying Height Above Ground Level: | 6,234 feet |
| Nominal Sidelap: | 30-55% |
| Nominal Speed Over Ground: | 170 Knots |
| Field of View: | 40° |
| Laser Rate: | 154.00 kHz |
| Scan Rate: | 150.00 Hz |
| Maximum Across Track Spacing: | 0.43meters |
| Maximum Along Track Spacing: | 0.58 meters |
| Average point Spacing: | 0.35 meters |

**Table 1: Flight Parameters**

## 3.3 Acquisition Mission

The acquisition mission for **G179D1255: LA_Catahoula_Concordia_2017_D17 D1** QL1 LiDAR survey was coordinated for optimal collection conditions and was completed in 10 lifts from December 2nd 2019–December 14th, 2019. The GPS Session forms and NGS monument information can be found in **Appendix B**.

## 3.4 Airborne GPS/IMU

Airborne global positioning system (GPS) and inertial measurement unit (IMU) data was collected on the aircraft during the acquisition mission, providing sensor position and orientation information for geo-referencing the LiDAR data. Airborne GPS observations were collected at a frequency of 0.5Hz, and IMU observations are collected at a frequency of 200Hz.

| Aircraft | Sensor | GPS Lever Arm (m) | IMU Lever Arm (m) |
|---|---|---|---|
| C441-N207SS | TM_9054 | X: -0.054, Y: -0.199, Z: -1.131 | X: -0.174, Y: -.0178, Z: 1.256 |

**Table 2: Aircraft and Lever Arms**

GPS data was collected with ground base stations during the acquisition missions, providing corrections to support differential post-processing of the airborne GPS. Base stations were setup at the following Airports St Hardy-Anders Field Natchez Adams County Airport (**KHEZ**). Ground GPS observations were collected at a frequency of 0.5Hz.

| Name | Latitude | Longitude | Ellipsoid (m) |
|---|---|---|---|
| Hardy-Anders Field Natchez Adams County Airport (KHEZ) | 31°36' 56.46414" | -91° 28' 38.66190" | 55.417 |

**Table 3: Base Stations Location**

# 4 LiDAR Processing

## 4.1 Acquisition Post Processing

Inertial Explorer 8.90 software was used to compute inertial solution file (*.sol) for each mission using ground GPS base station (**KHEZ**) and Grafnet position coordinate in table above. The resulting solution was checked to ensure a minimum accuracy of +/- 0.10m, combined separation, for horizontal and vertical positions. Inertial Explorer methodology integrates Inertial Navigation Solution by processing the GPS data and Inertial Measurement Unit (IMU). The software applies the reference lever arms for the GPS and IMU during the process to determine the trajectory (position and orientation) of the LiDAR sensor during the acquisition mission. Inertial Explorer generated graphical results were reviewed to ensure that the IMU data was healthy.

Raw LiDAR sensor ranging data and the final solution sensor trajectory (*.sol), from Inertial Explorer, were processed in Leica's HxMap software to produce LiDAR point cloud swath for each flight line in LAS version 1.4 file format. Quality control of the swath point cloud was performed to validate proper functioning of the sensor system, full coverage of the project area and point density of the LiDAR data. Swath point clouds were assigned unique file source identification. The data was found to be complete and consistent with the sensor calibration parameters.

## 4.2 Geometric Calibration

LiDAR data calibration was done using Leica HxMap v2.6.0 software. HxMap is the common workflow platform for Leica airborne sensors. The processing workflow involves; Ingest, Block Creation, LiDAR Matching, Quality Assurance (QA) and Product Generation. LiDAR is processed in HxMap by generating point clouds from raw sensor data during the Ingest step. Noise filtering, sensor installation calibration and atmospheric condition parameters are also applied during the ingest process. Once all data is processed through ingest, they are assembled into a block for LiDAR Matching. The LiDAR Matching step resolves LiDAR registration errors which remain in the point clouds after sensor and installation calibration parameters are applied in the ingest step.

QA tool is run on the Block after LiDAR Matching to verify quality of results. QA results are reviewed to ensure that, 95% of patches<5cm for Vertical Scan Direction and Vertical Line Separation. Ground control points are also included to assess absolute accuracy for the point cloud data. LiDAR products are finally generated in the Product Generation step as LAS swaths (LAS 1.4). Vertical (Z) shift (calculated from QA step) is also applied during the product generation. The exported LAS 1.4 swath data from HxMap is imported into GeoCue Group's product workflow management software, GeoCue v2017. The full point cloud is tiled into a manageable size for processing in TerraScan.

For **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1** QL1 LiDAR project, the control lines listed below were used in data adjustment.

| Point Id | Easting | Northing | Orth. Height |
|---|---|---|---|
| 3_GS00002 | 636192.807 | 3499335.093 | 16.994 |
| 3_GS00007 | 602176.796 | 3474469.542 | 20.018 |
| 3_GS00001 | 616573.25 | 3517105.716 | 17.573 |
| 3_GS00003 | 621279.198 | 3497796.315 | 17.754 |
| 3_GS00004 | 599482.794 | 3509326.095 | 25.681 |
| 3_GS00005 | 607421.396 | 3483723.11 | 17.774 |
| 3_GS00006 | 608491.665 | 3470809.549 | 19.05 |

The final geometrically calibrated swath point clouds were compared to the bare-earth profile survey data. The data fit the profile surveys within the vertical accuracy tolerance specified for the project. Full documentation of the vertical accuracy checks maybe found in section 5.1.

## 4.3 Point Cloud Classification

Georeferenced information was applied to the swath point cloud LAS files. Geometrically calibrated swath point clouds were cut into USNG index, **1,000 meters x 1,000 meters** LAS 1.4 format tiles for point cloud classification and derived in LAS 1.4 format for product creation.

Tiled point cloud data was processed in Terrasolid's TerraScan software to assign initial classification values. The TerraScan software provides a number of routines to algorithmically detect and assign points to their appropriate class. Points left unclassified by the algorithmic routine remain as Class 1– Processed, but unclassified. Automated classification routines assigned points to one of the following classes:

**Class 1 – Processed, but unclassified**
**Class 2 – Bare-earth ground**
**Class 7 – Low Noise (low, manually identified, if necessary)**
**Class 9 — Water**
**Class 17 — Bridge Decks**
**Class 18 – High Noise (high, manually identified, if necessary)**
**Class 20 — Ignored Ground (Breakline Proximity)**
**Class 21- Snow (If present and identifiable)**
**Class 22- Temporal exclusion (typically non-favored data in intertidal zones)**

Automated classification results were reviewed for each tiled point cloud, and manual edits made where necessary to correct for misclassified points. Points remaining in Class 1 after the automated classification routines were run were left in Class 1. Points falling outside of a 100-meter buffer of the project AOI polygon were excluded from the tiled point clouds.

## 4.4 Breakline Collection

Hydro break lines were compiled in ArcMap using the LiDAR intensity data and surface terrain model of the entire project area. After the collection of hydro lines all features were conflated and validated for monotonicity and vertical variance, to ensure that no points were floating above ground. The hydro break lines were then embedded into the LiDAR surface and used to create a hydro enforced DEM.

The data collected for the **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1** survey maintained significant point density in the water, marsh, and swamp, limiting the usefulness of point density as guiding factor in breakline placement. Points classified as **Class 2 – Bare-earth ground**, falling within a tenth of a meter buffer of the collected breaklines, were reassigned to **Class 20 – Ignored Ground**. These points are excluded from the surface model during DEM generation to preserve the hydro-flattening characteristics of the breaklines.

## 4.5 DEM Generation

The final classified point clouds and collected breaklines were reviewed for conformance to the task order (scope of work). Within the LP360 software, points in Class 2 – Bare- earth ground and breaklines were combined to generate TIN elevation models for each tile, from which the bare-earth DEM tiles were interpolated and exported as GeoTIFF 32-bit floating point raster format ".tiff" format

# 5 Quality Control

## 5.1 Point Clouds

Accuracy and completeness of the LiDAR point clouds directly impacts the quality of all other derived LiDAR derived products. Ensuring a quality LiDAR dataset begins with proper mission planning and execution. Ground GPS base stations are located such that GPS baselines between the ground and airborne receivers do not exceed 30km.For the **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1** project, two base stations were used to meet this requirement. Static alignment is performed both before take-off and after landing to allow for GPS integer ambiguity resolution. Sensor operators carefully monitor the LiDAR unit and its various subsystems during the acquisition mission to ensure proper function. Airborne GPS positional dilution of precision (PDOP) estimates are monitored to ensure they remain less than 3. The optical system is monitored to ensure there are no ranging errors encountered during the flight lines

During acquisition post-processing estimates of the trajectory data accuracy are reviewed to ensure they will support the required accuracies of the point cloud data. The trajectory accuracy is a function of the differentially corrected GPS data and the IMU data.

Geometric calibration quality control validates that the positional accuracy requirements of the project are met, and includes relative accuracy assessments for intra-swath (within) and inter-swath (between) accuracy, along with absolute accuracy assessments against project ground control.

**Image 3** below**,** shows the swath to swath calibration assessment depicted by an intensity ortho created by using all returns, and colored by elevation difference between the swaths. The source deltas are an image type used for visualizing the elevation mismatch between overlapping swaths of LAS data. The granularity is controlled by the interval's selection. The interval size specifies the Z threshold at which the color bands apply. The interval used to create the difference elevation image is 0.040m. Colors shown as green indicates swath separation <0.040m, yellow indicates separation > 0.040m and <0.080m, red indicates separation >0.080m. All red areas depicted in the image have been reviewed and represent locations of high vegetation.

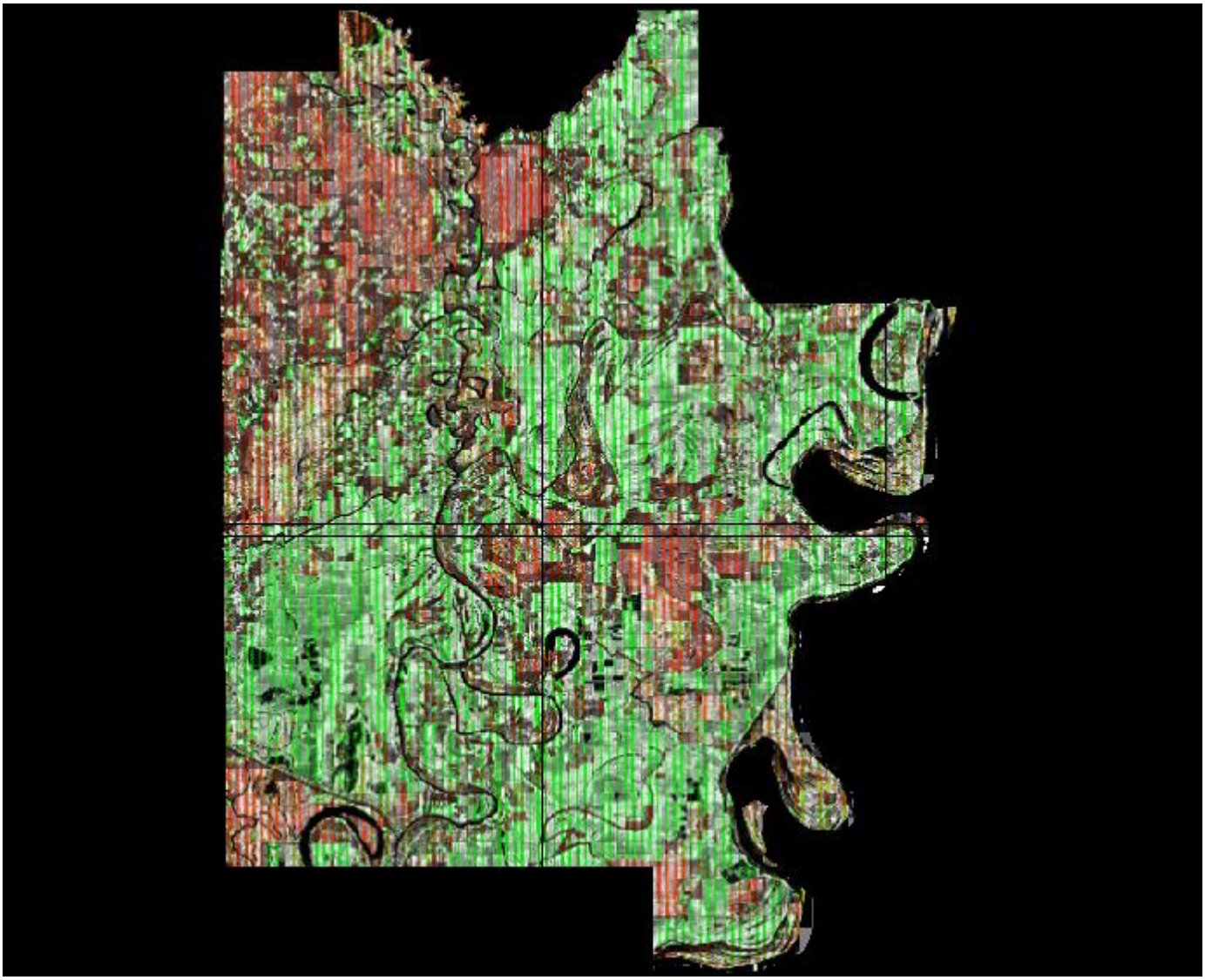


**Image 3: Swath Separation Raster**

*This data set was produced to meet ASPRS "Positional Accuracy Standards for Digital Geospatial Data" (2014) for a 21.3(cm) RMSEx / RMSEy Horizontal Accuracy Class which equates to Positional Horizontal Accuracy =+/- 41.7cm at a 95%*

Absolute vertical accuracy assessments for the point cloud data are made against ground check point data. For the **G17PD1255:LA_Catahoula_Concordia_2017_D17 D1** project, ground check point data consisted of the ground GPS base station and real-time kinematic (RTK) GPS techniques.

Check point locations were collected at .5 second intervals during the RTK survey. Points collected during the static pre-initialization and post-initialization was removed from the assessment so as not to bias the assessment.

Local TIN models of the elevation points are built around each ground check points. The tin model elevation is sampled at the horizontal position of the ground check point. The TIN model elevation and ground check point survey elevation values were used to calculate the Non-vegetated Vertical Accuracy (NVA) of the swath point clouds. Table 7 below shows the tested accuracy values for TIN and DEM data at 95% confidence level. The full calculations for all check points can be found in Appendix C.

| Tested Accuracy | $RMSE_Z$ | NVA | VVA |
|---|---|---|---|
| Classified LiDAR | 0.088 | 32 | 35 |
| Digital Elevation Model | 0.088 | 32 | 35 |

**Table 7: Tested $RMSE_Z$ of NVA, NVA and VVA of LiDAR Point Cloud and Digital Elevation Model**

| Total # | # NVA | # VVA |
|---|---|---|
| 67 | 32 | 35 |

***Table 8: Number of Survey Points used to calculate accuracy of data.***

The tiled point cloud products were reviewed for full coverage of the AOI and proper classification. As part of the QC process, TINs are built in the Terramodeler software for each tile using the ground class and the hydro-flattening breaklines. The TINs are reviewed for non-ground features, and edited where necessary to remove any remaining non-ground features. Points were also reviewed for absolute elevation, and points falling below the selected orthometric elevation for water were removed from the ground class.

## 5.2 Breaklines

The final breaklines in ESRI 3D shapefile format were reviewed for topological consistency and correct elevation. Breaklines features are continuous and do not have overlaps or dangles

## 5.3 Digital Elevation Models

Digital elevation models (DEMs) were reviewed for conformance with the SOW and the Base Mapping Specification version 2.1 guidelines. DEM files were loaded in the Global Mapper software and inspected visually for edge matching between tiles, void areas within the project AOI, and proper coding of the NODATA values. DEM file naming was verified for consistency with the USNG index.

# Appendix A. Flight Logs

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | La_Cat_Con_TM | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 1 | 10 | 6 | 30.19 | Geoffrey McCall |

| Date/Julian: | 12/2/2019 | Disk Drive | Sensor | Pilot |
|---|---|---|---|---|
| Hobbs End | 2110 | TM MM30 (103, 104) | TM_90524 | Mike Wasielewski |

| Hobbs ST | 2107.4 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
|---|---|---|---|---|---|---|---|---|---|---|
| Flight Time | 2.6 | 4,314 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421-N112MJ | KHEZ ( Natchez, MS) |

| | Flight Line | Mission Line | UTC time: Begin: | UTC time: End: | Direction | GPS Altitude | Speed | Available MM Space | S/Vs | Position Acc. AVG PDOP | Position Acc. AVG HDOP | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 234 | 234 N | 21:15 | | 2° | 4278 | 130 | 7153 | 21 | 1.2 | 0.7 | failed to change state of lidar |
| | 234 | 234 N | 21:32 | 21:36 | 1° | 4271 | 131 | 7152 | 19 | 1.3 | 0.7 | |
| | 233 | 233 S | 21:40 | 21:44 | 181° | 4288 | 166 | 7132 | 17 | 1.5 | 0.8 | |
| | 232 | 232 N | 21:49 | 21:54 | 359° | 4245 | 137 | 7113 | 17 | 1.4 | 0.8 | |
| | 231 | 231 S | 21:59 | 22:03 | 180° | 4303 | 160 | 7087 | 19 | 1.1 | 0.7 | |
| | 230 | 230 N | 22:09 | 22:15 | 0° | 4275 | 136 | 7064 | 19 | 1.1 | 0.7 | |
| | 229 | 229 S | 22:19 | 22:25 | 182° | 4325 | 162 | 7033 | 20 | 1.1 | 0.7 | |
| | 228 | 228 N | 22:29 | 22:35 | 0° | 4278 | 141 | 7008 | 19 | 1.2 | 0.8 | |
| | 227 | 227 S | 22:39 | 22:44 | 180° | 4315 | 165 | 6980 | 19 | 1.2 | 0.8 | |
| | 226 | 226 N | 22:50 | 22:56 | 0° | 4297 | 135 | 6953 | 19 | 1.2 | 0.7 | |
| | 225 | 225 S | 23:01 | 23:06 | 180° | 4325 | 164 | 6924 | 19 | 1.2 | 0.7 | |
| | 224 | 224 N | 23:11 | 23:17 | 358° | 4250 | 137 | 6900 | 21 | 1.2 | 0.7 | |
| | 223 | 223 S | 23:21 | 23:30 | 181° | 4257 | 163 | 6870 | 24 | 1.1 | 0.6 | |
| | 222 | 222 N | 23:36 | 23:46 | 358° | 4240 | 142 | 6825 | 24 | 1.2 | 0.6 | |
| | 221 | 221 S | 23:50 | 24:00 | 178° | 4282 | 162 | 6772 | 24 | 1.2 | 0.6 | |
| | 220 | 220 N | 24:05 | 24:15 | 0° | 4282 | 140 | 6727 | 23 | 1.2 | 0.6 | |
| | 219 | 219 S | 24:19 | 24:29 | 180° | 4300 | 161 | 6677 | 24 | 1.1 | 0.6 | |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | La_Cat_Con_TM | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 2 | 7 | 13 | 30.01 | Geoffrey McCall |

| Date/Julian: | 12/3/2019 | Disk Drive | Sensor | Pilot |
|---|---|---|---|---|
| Hobbs End | 2114.9 | TM MM30 (103, 104) | TM_90524 | Mike Wasielewski |

| Hobbs ST | 2111 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
|---|---|---|---|---|---|---|---|---|---|---|
| Flight Time | 3.9 | 4,314 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421-N112MJ | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 236 | 236 N | 15:39 | 15:40 | 1° | 4304 | 148 | 6632 | 19 | 1.2 | 0.6 | |
| | 235 | 235 S | 15:45 | 15:46 | 179° | 4290 | 155 | 6627 | 18 | 1.3 | 0.7 | |
| | 218 | 218 S | 15:54 | 16:04 | 181° | 4262 | 161 | 6623 | 18 | 1.3 | 0.7 | |
| | 217 | 217 N | 16:08 | 16:20 | 0° | 4260 | 152 | 6570 | 20 | 1.2 | 0.7 | |
| | 216 | 216 S | 16:26 | 16:37 | 179° | 4186 | 159 | 6515 | 21 | 1.1 | 0.7 | |
| | 215 | 215 N | 16:41 | 16:52 | 1° | 4180 | 157 | 6461 | 20 | 1.3 | 0.7 | |
| | 214 | 214 S | 16:57 | 17:08 | 185° | 4250 | 154 | 6404 | 21 | 1.2 | 0.7 | |
| | 213 | 213 N | 17:13 | 17:25 | 359° | 4240 | 158 | 6347 | 22 | 1.3 | 0.7 | |
| | 212 | 212 S | 17:29 | 17:41 | 180° | 4236 | 159 | 6291 | 26 | 1.1 | 0.6 | |
| | 211 | 211 N | 17:45 | 17:57 | 0° | 4236 | 157 | 6232 | 25 | 1.1 | 0.6 | |
| | 210 | 210 S | 18:01 | 18:13 | 180° | 4229 | 159 | 6172 | 22 | 1.2 | 0.7 | |
| | 209 | 209 N | 18:17 | 18:31 | 0° | 4226 | 158 | 6110 | 26 | 1.2 | 0.6 | |
| | 208 | 208 S | 18:35 | 18:50 | 180° | 4227 | 156 | 6040 | 27 | 1.0 | 0.6 | |
| | 207 | 207 N | 18:53 | 19:08 | 2° | 4232 | 163 | 5966 | 24 | 1.2 | 0.7 | |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | La_Cat_Con_TM | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 3 | 15 | 7 | 29.69 | Geoffrey McCall |

| Date/Julian: | 12/3/2019 | Disk Drive | Sensor | | | | | | Pilot | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hobbs End | 2118.1 | TM MM30 (103, 104) | TM_90524 | | | | | | Mike Wasielewski | |
| Hobbs ST | 2114.9 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
| Flight Time | 3.2 | 4,314 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421-N112MJ | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 206 | 206 S | 21:43 | 21:58 | 180° | 4214 | 160 | 5892 | 18 | 1.4 | 0.8 | |
| | 205 | 205 N | 22:02 | 22:19 | 2° | 4235 | 157 | 5817 | 19 | 1.3 | 0.8 | |
| | 204 | 204 S | 22:23 | 22:40 | 182° | 4249 | 159 | 5731 | 21 | 1.2 | 0.7 | |
| | 203 | 203 N | 22:43 | 22:59 | 0° | 4250 | 155 | 5645 | 21 | 1.3 | 0.7 | |
| | 202 | 203 S | 23:05 | 23:22 | 184° | 4258 | 155 | 5558 | 22 | 1.2 | 0.6 | |
| | 201 | 201 N | 23:26 | 23:42 | 358° | 4256 | 153 | 5474 | 23 | 1.1 | 0.6 | |
| | 200 | 200 S | 23:47 | 24:03 | 180° | 4267 | 162 | 5387 | 24 | 1.2 | 0.6 | |
| | 199 | 199 N | 24:07 | | 358° | 4242 | 153 | 5300 | 22 | 1.2 | 0.6 | *0022 Screen frozen config error on sensor |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 4 | 11 | 18 | 101.69 | Geoffrey McCall |

| Date/Julian: | 12.4.19 | Disk Drive | Sensor | Pilot |
|---|---|---|---|---|
| Hobbs End | 2121.9 | TM MM30 (107, 108) | TM_90524 | Wes Ashmore |

| Hobbs ST | 2118.1 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
|---|---|---|---|---|---|---|---|---|---|---|
| Flight Time | 3.8 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 199 | 199 | 15:48 | 16:04 | 180° | 4233 | 159 | 7153 | 18 | 1.2 | 0.6 | |
| | 198 | 198 | 16:08 | 16:24 | 359° | 4214 | 158 | 7065 | 20 | 1.2 | 0.7 | |
| | 197 | 197 | 16:28 | 169:45 | 178° | 4235 | 163 | 6979 | 20 | 1.3 | 0.8 | |
| | 196 | 196 | 16:49 | 17:06 | 1° | 4242 | 156 | 68891 | 19 | 1.4 | 0.8 | |
| | 195 | 195 | 17:10 | 17:26 | 180° | 4260 | 159 | 6805 | 22 | 1.3 | 0.7 | |
| | 194 | 194 | 17:30 | 17:46 | 359° | 4236 | 159 | 6720 | 25 | 1.2 | 0.6 | |
| | 193 | 193 | 17:50 | 18:06 | 179° | 4257 | 160 | 6639 | 25 | 1.1 | 0.6 | |
| | 192 | 192 | 18:10 | 18:25 | 359° | 4144 | 162 | 6558 | 22 | 1.3 | 0.7 | |
| | 191 | 191 | 18:29 | 18:45 | 179° | 4189° | 166 | 6476 | 27 | 1.0 | 0.6 | |
| | 190 | 190 | 18:48 | 19:04 | 0° | 4177° | 163 | 6395 | 22 | 1.2 | 0.7 | |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 5 | 19 | 11 | 101.79 | Geoffrey McCall |

| Date/Julian: | 12.4.19 | Disk Drive | Sensor | | | | | | Pilot | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hobbs End | 2125.5 | TM MM30 (107, 108) | TM_90524 | | | | | | Mike Wasielewski | |
| Hobbs ST | 2121.9 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
| Flight Time | 3.6 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 189 | 189 | 21:24 | 21:39 | 178° | 4266 | 160 | 6311 | 20 | 1.4 | 0.7 | |
| | 188 | 188 | 21:43 | 21:59 | 359° | 4228 | 153 | 6231 | 20 | 1.3 | 0.7 | |
| | 187 | 187 | 22:02 | 22:17 | 179° | 4276 | 159 | 6148 | 19 | 1.1 | 0.7 | |
| | 186 | 186 | 22:21 | 22:37 | 0° | 4180 | 152 | 6073 | 20 | 1.1 | 0.7 | |
| | 185 | 185 | 22:40 | 22:55 | 182° | 4213 | 159 | 5995 | 18 | 1.4 | 0.8 | |
| | 184 | 184 | 22:59 | 23:14 | 1° | 4208 | 149 | 5921 | 18 | 1.4 | 0.7 | |
| | 183 | 183 | 23:18 | 23:32 | 181° | 4246 | 165 | 5841 | 20 | 1.2 | 0.6 | |
| | 182 | 182 | 23:36 | 23:52 | 359° | 4220 | 150 | 5764 | 21 | 1.2 | 0.6 | |
| | 181 | 181 | 23:56 | :10 | 179° | 4255 | 159 | 5682 | 21 | 1.2 | 0.6 | |
| | 180 | 180 | :14 | :29 | 0° | 4250 | 149 | 5609 | 19 | 1.2 | 0.6 | |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 1 | 8 | 2 | 103.15 | Cynthia Williams |

| Date/Julian: | 12.11.19 | Disk Drive | Sensor | | | | | Pilot | |
|---|---|---|---|---|---|---|---|---|---|
| Hobbs End | 4860.3 | TM MM30 (105, 106) | TM_90524 | | | | | Wes Ashmore | |
| Hobbs ST | 4856.4 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
| Flight Time | 3.9 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 179 | 179 | :16 | :31 | 181° | 4280 | 157 | 5220 | 20 | 1.3 | 0.7 | gimbal pav missing |
| | 178 | 178 | :34 | :49 | 1° | 4264 | 156 | 5142 | 18 | 1.3 | 0.7 | |
| | 177 | 177 | :52 | 1:06 | 179° | 4286 | 131 | 5068 | 20 | 1.2 | 0.6 | |
| | 176 | 176 | 11:11 | 1:27 | 0° | 4216 | 154 | 4988 | 21 | 1.2 | 0.6 | |
| | 175 | 175 | 1:30 | 1:46 | 180° | 4235 | 148 | 4910 | 22 | 1.2 | 0.6 | |
| | 174 | 174 | 1:49 | 2:06 | 361° | 4217 | 143 | 4819 | 23 | 1.2 | 0.6 | |
| | 173 | 173 | 2:09 | 2:24 | 180° | 4273 | 141 | 4654 | 23 | 1.3 | 0.7 | |
| | 172 | 172 | 2:29 | | 359° | 4228 | 155 | 4670 | 23 | 1.3 | 0.7 | heart beat error airstart |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 2 | 16 | 8 | 102.30 | Cynthia Williams |

| Date/Julian: | 12.12.19 | Disk Drive | Sensor | | | | | | Pilot | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hobbs End | 4860.3 | TM MM30 (105, 106) | TM_90524 | | | | | | Wes Ashmore | |
| Hobbs ST | 4856.4 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
| Flight Time | 3.9 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 172 | 172 | 15:31 | 151:47 | 180° | 4249° | 157 | 4659 | 20 | 1..2 | 0.7 | |
| | 171 | 171 | 15:50 | 16:06 | 359° | 4245° | 156 | 4579 | 21 | 1.1 | 0.6 | |
| | 170 | 170 | 16:09 | 16:25 | 180° | 4244° | 154 | 4411 | 19 | 1.4 | 0.7 | |
| | 169 | 169 | 16:37 | 16:53 | 356° | 4232° | 162 | 4395 | 20 | 1.3 | 0.7 | |
| | 168 | 168 | 16:56 | 17:13 | 8° | 4229° | 151 | 4307 | 24 | 1.2 | 0.6 | |
| | 167 | 167 | 17:16 | 17:33 | 178° | 4227° | 157 | 4220 | 24 | 1.1 | 0.6 | |
| | 166 | 166 | 17:36 | 17:52 | 359° | 4210° | 157 | 4132 | 25 | 1.1 | 0.6 | |
| | 165 | 165 | 17:55 | 18:12 | 151° | 4212° | 155 | 4208 | 26 | 1.0 | 0.6 | clouds at end 35 miles |
| | 154 | 154 | 18:15 | 18:31 | 359° | 4186° | 147 | 4180 | 22 | 1.2 | 0.7 | |
| | 153 | 153 | 18:32 | 18:48 | 179° | 4238° | 159 | 4238 | 24 | 1.1 | 0.6 | |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 3 | 16 | 8 | 102.30 | Cynthia Williams |

| Date/Julian: | 12.12.19 | Disk Drive | Sensor | Pilot |
|---|---|---|---|---|
| Hobbs End | 4861.5 | TM MM30 (107, 108) | TM_90524 | Wes Ashmore |

| Hobbs ST | 4860.3 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
|---|---|---|---|---|---|---|---|---|---|---|
| Flight Time | 1.2 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 152 | 152 | 20:07 | 20:16 | 6° | 4210° | 169 | 5527 | 21 | 1.4 | 0.7 | pav |
| | 151 | 151 | 20:19 | 20:34 | 179° | 4186° | 148 | 5445 | 24 | 1.1 | 0.6 | clouds at 6.85 end |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 4 | 17 | 13 | 101.19 | Cynthia Williams |

| Date/Julian: | 12.14.19 | Disk Drive | Sensor | | | | | | Pilot | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hobbs End | 4864.6 | TM MM30 (103, 104) | TM_90524 | | | | | | Wes Ashmore | |
| Hobbs ST | 4861.5 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
| Flight Time | 3.1 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| ∠ | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 165 | 165 | 21:14 | 21:18 | 181° | 4218° | 158 | 5728 | 19 | 1.2 | 0.7 | refly gimbal pav |
| | 164 | 164 | 21:21 | 21:23 | 355° | 4225° | 156 | 5712 | 17 | 1.5 | 0.8 | |
| | 163 | 163 | 21:40 | 21:56 | 182° | 4216° | 159 | 5626 | 19 | 1.2 | 0.7 | |
| | 162 | 162 | 22:00 | 22:16 | 360° | 4232° | 156 | 5540 | 18 | 1.4 | 0.7 | |
| | 161 | 161 | 22:19 | 22:35 | 184° | 4214° | 157 | 5451 | 19 | 1.5 | 0.8 | |
| | 160 | 160 | 23:38 | 22:54 | 359° | 4234° | 156 | 5363 | 21 | 1.2 | 0.7 | |
| | 159 | 159 | 22:57 | 23:14 | 180° | 4221° | 159 | 5276 | 22 | 1.3 | 0.7 | |
| | 158 | 158 | 23:17 | 23:32 | 1° | 4242° | 158 | 5189 | 20 | 1.3 | 0.7 | |
| | 157 | 157 | 23:34 | 23:50 | 181° | 4244° | 154 | 5107 | 19 | 1.4 | 0.7 | |

# Digital Aerial Solutions Flight Log

| Project/Flight Plan: | TM_CAT_CORD | Lift | Temp °C Before | Temp °C After | Pressure (kPa) | Sensor Operator |
|---|---|---|---|---|---|---|
| | | 5 | 10 | 7 | 101.46 | Cynthia Williams |

| Date/Julian: | 12.14.19 | Disk Drive | Sensor | | | | | | Pilot | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hobbs End | 4868.1 | TM MM30 (103, 104) | TM_90524 | | | | | | Wes Ashmore | |
| Hobbs ST | 4864.6 | TARGET MSL | Target AIRSPD | Base Name | PID | Base Name | PID | Base Height | Aircraft | Airport Identifcation: |
| Flight Time | 3.5 | 4,200 | 160 | KHEZ01 | | KHEZ02 | | 1.500 | C421_N811A | KHEZ ( Natchez, MS) |

| | Flight Line | Mission Line | UTC time: | | Direction | GPS Altitude | Speed | Available | S/Vs | Position Acc. | | Comments and Conditions: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Begin: | End: | | | | MM Space | | AVG PDOP | AVG HDOP | |
| | 144 | 144 | 1:14 | 1:29 | 182° | 4247° | 151 | 5025 | 1.2 | 0.6 | | |
| | 145 | 145 | 1:32 | 1:46 | 359° | 4261° | 156 | 4932 | 1.2 | 0.6 | | roll mount |
| | 146 | 146 | 1:49 | 2:05 | 180° | 4240° | 154 | 4851 | 1.3 | 0.6 | | |
| | 147 | 147 | 2:08 | 2:22 | 390° | 4252° | 158 | 4760 | 1.3 | 0.6 | | |
| | 148 | 148 | 2:26 | 2:41 | 180° | 4241° | 154 | 4673 | 1.1 | 0.6 | | |
| | 149 | 149 | 2:44 | 2:59 | 360° | 4248° | 163 | 4581 | 1.3 | 0.7 | | |
| | 150 | 150 | 3:02 | 3:19 | 180° | 4247° | 155 | 4494 | 1.1 | 0.7 | | |
| | 151 | 151 | 3:20 | 3:23 | 360° | 4269° | 160 | 4406 | 1.2 | 0.7 | | |
| | 155 | 155 | 3:31 | 3:46 | 353° | 4272° | 152 | 4392 | 1.3 | 0.8 | | |
| | 156 | 156 | 3:49 | 4:05 | 180° | 4246° | 155 | 4308 | 1.3 | 0.8 | | |

# Appendix B. Basestation GPS Session Forms

# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.02.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Geoffrey McCall |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ01 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 6684_1202_114221.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |

| Data Collector Manufacturer | Data Collector Model | Data Collector Serial No. |
|---|---|---|
| Leica | GS15 | 1506684 |

| Antenna Part No. | Antenna Model | Antenna Serial No. |
|---|---|---|
| 4255298 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

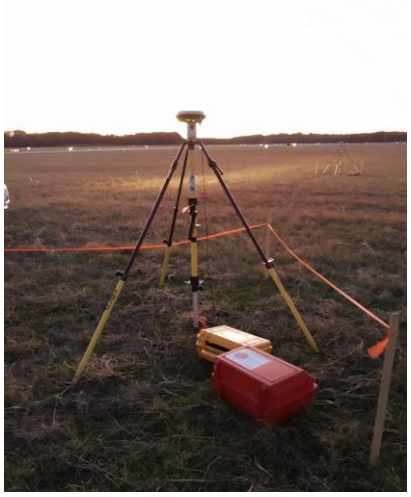
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.02.2019 | 20:40 | N 31 36 56.47358 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.03.2019 | 1:55 | W 91 17 38.70616 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.03.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Geoffrey McCall |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ01 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 6684_1203_065206.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1506684 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 4255298 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

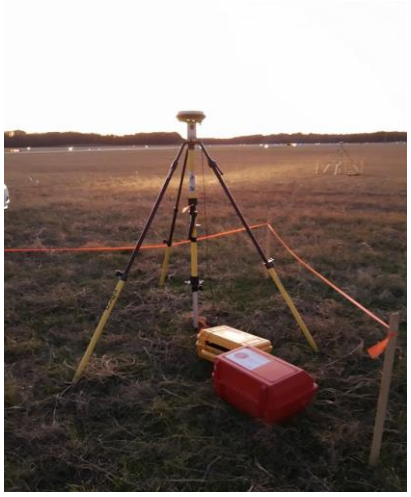
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.03.2019 | 15:15 | N 31 36 56.47358 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.04.2019 | 1:55 | W 91 17 38.70616 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.04.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Geoffrey McCall |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ01 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) STATIC RTK | 6684_1204_065220.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1506684 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 4255298 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

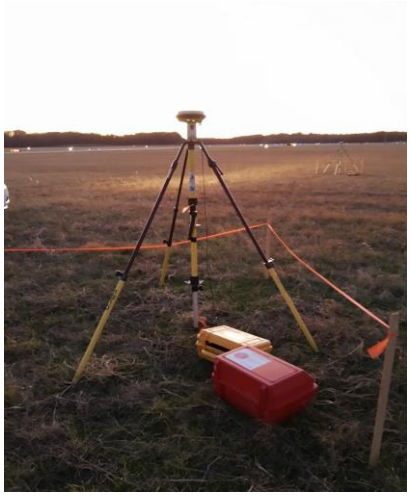
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.04.2019 | 15:10 | N 31 36 56.47358 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.05.2019 | 1:40 | W 91 17 38.70616 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.02.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Geoffrey McCall |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ02 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 1514_1202_144732.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1501514 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 3725413 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

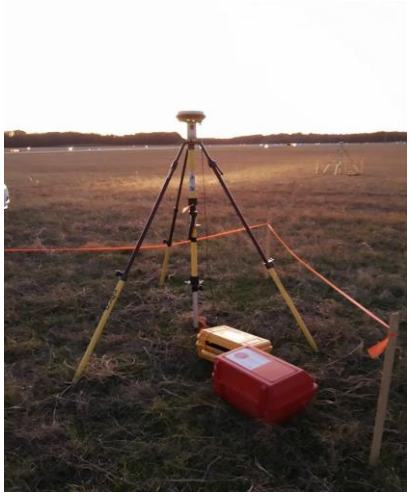
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.02.2019 | 20:45 | N 31 36 56.48549 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.03.2019 | 2:00 | W 91 17 39.44453 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.03.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Geoffrey McCall |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ02 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 1514_1203_095647.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1501514 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 3725413 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

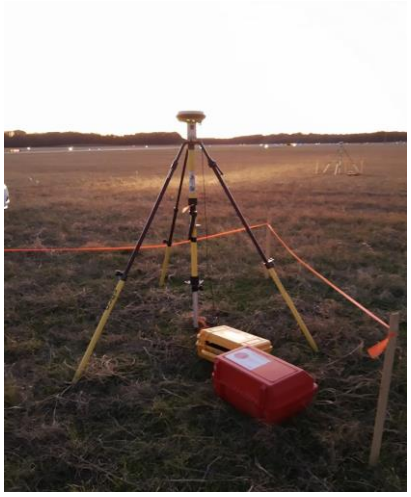
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.03.2019 | 15:20 | N 31 36 56.48549 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.04.2019 | 2:00 | W 91 17 39.44453 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.04.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Geoffrey McCall |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ02 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 1514_1204_095714.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1501514 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 3725413 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

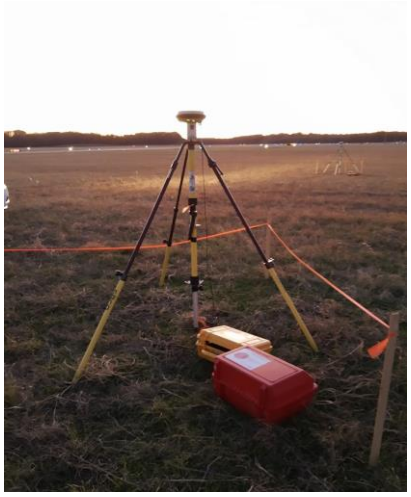
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.04.2019 | 15:15 | N 31 36 56.48549 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.05.2019 | 1:45 | W 91 17 39.44453 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.11.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Cynthia Williams |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ01 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 6684_1211_151504.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1506684 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 4255298 | N/A | N/A |

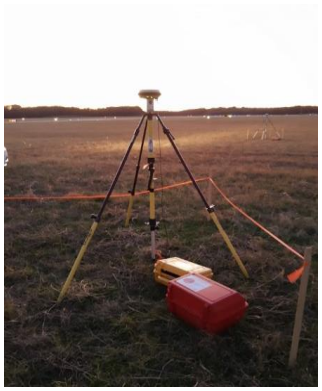
| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG<br>1.5 | TRUE VERTICAL (ARP) |
| **Ending Antenna Height in Feet** | **Ending Antenna Height in Meters** | **Type of Measurement** *(circle one)* |
| 1 2 3 AVG | 1 2 3 AVG<br>1.5 | TRUE VERTICAL (ARP) |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.11.2019 | 22:14 | N 31 36 56.50570 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.11.2019 | 2:15 | W 91 17 38.72067 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.11.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Cynthia Williams |

| Monument Name/Designation | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ02 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 1514_1211_182304.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |

| Data Collector Manufacturer | Data Collector Model | Data Collector Serial No. |
|---|---|---|
| Leica | GS15 | 1501514 |

| Antenna Part No. | Antenna Model | Antenna Serial No. |
|---|---|---|
| 3725413 | N/A | N/A |

| Starting Antenna Height in Feet | | | | Starting Antenna Height in Meters | | | | Type of Measurement *(circle one)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | AVG | 1 | 2 | 3 | AVG | TRUE VERTICAL (ARP) |
| | | | | | | | 1.5 | |

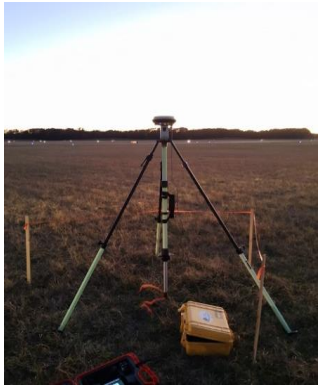
| Ending Antenna Height in Feet | | | | Ending Antenna Height in Meters | | | | Type of Measurement *(circle one)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | AVG | 1 | 2 | 3 | AVG | TRUE VERTICAL (ARP) |
| | | | | | | | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.11.2019 | 22:25 | N 31 36 56.52102 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.11.2019 | 2:15 | W 91 17 39.45885 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.12.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Cynthia Williams |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ01 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 6684_1211_151504.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |

| Data Collector Manufacturer | Data Collector Model | Data Collector Serial No. |
|---|---|---|
| Leica | GS15 | 1506684 |

| Antenna Part No. | Antenna Model | Antenna Serial No. |
|---|---|---|
| 4255298 | N/A | N/A |

| Starting Antenna Height in Feet | | | | Starting Antenna Height in Meters | | | | Type of Measurement *(circle one)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | AVG | 1 | 2 | 3 | AVG | TRUE VERTICAL (ARP) |
| | | | | | | | 1.5 | |

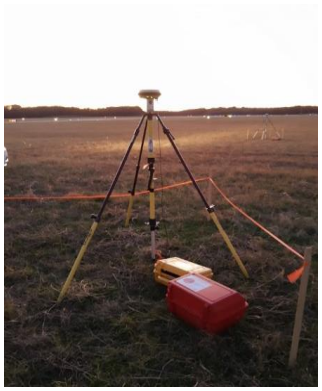
| Ending Antenna Height in Feet | | | | Ending Antenna Height in Meters | | | | Type of Measurement *(circle one)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | AVG | 1 | 2 | 3 | AVG | TRUE VERTICAL (ARP) |
| | | | | | | | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.12.2019 | 13:45 | N 31 36 56.50570 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.12.2019 | 20:04 | W 91 17 38.72067 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.12.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Cynthia Williams |

| Monument Name/Designation | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ02 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 1514_1211_182304.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1501514 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 3725413 | N/A | N/A |

| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

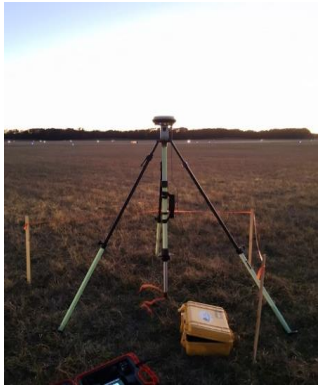
| Ending Antenna Height in Feet | Ending Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.12.2019 | 13:40 | N 31 36 56.52102 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.12.2019 | 20:05 | W 91 17 39.45885 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.14.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Cynthia Williams |

| Monument Name/Desigination | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ01 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 6684_1211_151504.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |
| **Data Collector Manufacturer** | **Data Collector Model** | **Data Collector Serial No.** |
| Leica | GS15 | 1506684 |
| **Antenna Part No.** | **Antenna Model** | **Antenna Serial No.** |
| 4255298 | N/A | N/A |

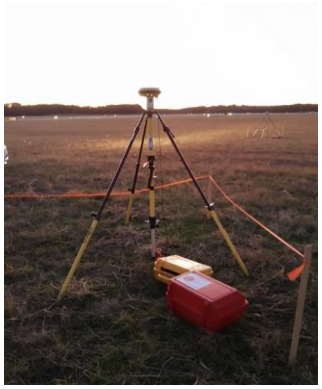
| Starting Antenna Height in Feet | Starting Antenna Height in Meters | Type of Measurement *(circle one)* |
|---|---|---|
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |
| **Ending Antenna Height in Feet** | **Ending Antenna Height in Meters** | **Type of Measurement** *(circle one)* |
| 1 2 3 AVG | 1 2 3 AVG | TRUE VERTICAL (ARP) |
| | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.14.2019 | 19:32 | N 31 36 56.50570 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.14.2019 | 3:34 | W 91 17 38.72067 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# GPS SESSION FORM

| Contract # / TO # | Client / Project Name | Date |
|---|---|---|
| G16PC00044 | U. S. GEOLOGICAL SURVEY Denver, Colorado<br>LA_Catahoula_Concordia_2017_D17 | 12.14.2019 |

| DAS Project No. | Survey Firm | Operator Name |
|---|---|---|
| 18003 | DAS | Cynthia Williams |

| Monument Name/Designation | Exact Stamping *(include photo in survey report)* |
|---|---|
| KHEZ02 | n/a |

| Monument No./PID | Collection Type *(circle one)* | File Name *(receiver generated)* |
|---|---|---|
| n/a | (ABGPS) **STATIC** RTK | 1514_1211_182304.m00 |

| Receiver Manufacturer | Receiver Model | Receiver Serial No. |
|---|---|---|
| N/A | N/A | N/A |

| Data Collector Manufacturer | Data Collector Model | Data Collector Serial No. |
|---|---|---|
| Leica | GS15 | 1501514 |

| Antenna Part No. | Antenna Model | Antenna Serial No. |
|---|---|---|
| 3725413 | N/A | N/A |

| Starting Antenna Height in Feet | | | | Starting Antenna Height in Meters | | | | Type of Measurement *(circle one)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | AVG | 1 | 2 | 3 | AVG | TRUE VERTICAL (ARP) |
| | | | | | | | 1.5 | |

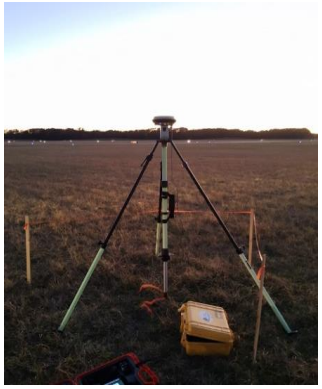
| Ending Antenna Height in Feet | | | | Ending Antenna Height in Meters | | | | Type of Measurement *(circle one)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | AVG | 1 | 2 | 3 | AVG | TRUE VERTICAL (ARP) |
| | | | | | | | 1.5 | |

**Antenna Reference Point** *(include and reference a dimensional diagram in Survey Report)*
*(e.g., bottom edge of notch in ground plane, Page 5, Figure 2)*

| Start Date (UTC) | Start Time (UTC) | Approx. Lat. *(if available)* |
|---|---|---|
| 12.14.2019 | 19:36 | N 31 36 56.52102 |
| **End Date (UTC)** | **End Time (UTC)** | **Approx. Long.** *(if available)* |
| 12.14.2019 | 3:38 | W 91 17 39.45885 |

**Describe any abnormalites and/or problems encountered during the session, include time of occurance and duration.**

**Site Diagram/Setup-Photo**



# Appendix C. Vertical Accuracy Calculations

## Project Information

Prepared By: DAS
Project Name: G17PD1255: LA_Catahoula_Concordia_2017_D17
Sensor Info: TM90524
Required Nominal Pulse Spacing: 0.35
Vendor Name: Digital Aerial Solutions LLC
Units: Meters
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 1/24/2018 Finish: 12/15/2019

## Metadata Information

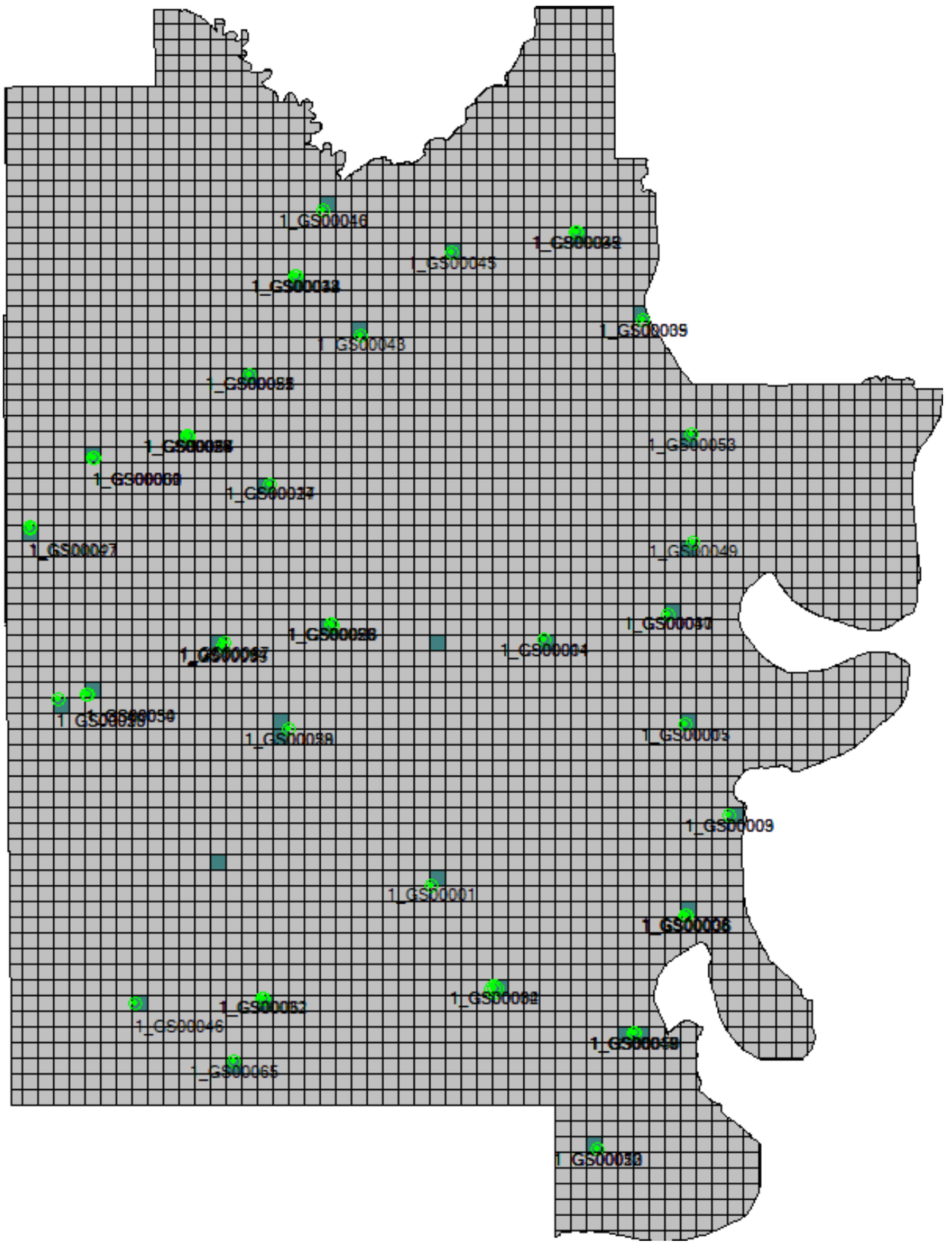
Tile Index:
- Filename: Tile_Index_DAS_Delivery1_Use.shp
- Number of Polys: 0

Intensity:
- Tile Index Attribute: Not Specified
- Data Filename: Not Specified

DEM:
- Tile Index Attribute: Name
- Data Filename: TIFF

LAS:
- Tile Index Attribute: Name
- Data Filename: LAS

# Tiled-Data Area



# LiDAR Accuracy Assessment Summary

| LC Type | # Points | NVA | VVA | RMSE Z |
|---|---|---|---|---|
| LAS | | 95% Confidence | 95 Percentile | |
| Bare Earth | 18 | 0.163 | | 0.083 |
| High Vegetation | 6 | | 0.163 | 0.087 |
| Low Vegetation | 24 | | 0.163 | 0.093 |
| Med Vegetation | 5 | | 0.127 | 0.100 |
| Urban Terrian | 14 | 0.158 | | 0.081 |
| NVA Total: | 32 | 0.161 | | 0.082 |
| VVA Total: | 35 | | 0.163 | 0.093 |
| Total: | 67 | | | 0.088 |
| DEM | | 95% Confidence | 95 Percentile | |
| Bare Earth | 18 | 0.168 | | 0.085 |
| High Vegetation | 6 | | 0.161 | 0.089 |
| Low Vegetation | 24 | | 0.186 | 0.098 |
| Med Vegetation | 5 | | 0.130 | 0.100 |
| Urban Terrian | 14 | 0.158 | | 0.081 |
| NVA Total: | 32 | 0.163 | | 0.083 |
| VVA Total: | 35 | | 0.176 | 0.097 |
| Total: | 67 | | | 0.088 |
| | | | Units: | Meters |

## Coordinates and Offsets of Analyzed Locations

| | | ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 1) | ☑ | **1_GS00002** | | | | | |
| | | | 625085.067 | 3475452.375 | 14.182 | 14.316 | 14.314 |
| | | | | | Bare Earth | 0.134 | 0.132 |
| 2) | ☑ | **1_GS00003** | | | | | |
| | | | 640044.118 | 3486471.016 | 24.642 | 24.765 | 24.765 |
| | | | | | Bare Earth | 0.123 | 0.123 |
| 3) | ☑ | **1_GS00004** | | | | | |
| | | | 628279.633 | 3497672.884 | 16.624 | 16.738 | 16.738 |
| | | | | | Bare Earth | 0.114 | 0.114 |
| 4) | ☑ | **1_GS00007** | | | | | |
| | | | 637248.915 | 3492276.021 | 16.461 | 16.532 | 16.532 |
| | | | | | Bare Earth | 0.071 | 0.071 |
| 5) | ☑ | **1_GS00008** | | | | | |
| | | | 637294.59 | 3480113.842 | 24.97 | 25.048 | 25.038 |
| | | | | | Bare Earth | 0.078 | 0.068 |
| 6) | ☑ | **1_GS00009** | | | | | |
| | | | 640058.895 | 3486478.4 | 26.32 | 26.408 | 26.396 |
| | | | | | Bare Earth | 0.088 | 0.076 |
| 7) | ☑ | **1_GS00010** | | | | | |
| | | | 636204.663 | 3499312.685 | 16.899 | 16.974 | 16.972 |
| | | | | | Bare Earth | 0.075 | 0.073 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | | ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 8) | ☑ | **1_GS00013** | | | | | |
| | | | 631644.674 | 3465227.496 | 13.612 | 13.641 | 13.643 |
| | | | | | Bare Earth | 0.029 | 0.031 |
| 9) | ☑ | **1_GS00017** | | | | | |
| | | | 634003.396 | 3472614.767 | 15.221 | 15.22 | 15.223 |
| | | | | | Bare Earth | -0.001 | 0.002 |
| 10) | ☑ | **1_GS00018** | | | | | |
| | | | 605560.123 | 3510671.327 | 21.367 | 21.357 | 21.358 |
| | | | | | Bare Earth | -0.01 | -0.009 |
| 11) | ☑ | **1_GS00020** | | | | | |
| | | | 631643.82 | 3465211.885 | 13.854 | 13.847 | 13.843 |
| | | | | | Bare Earth | -0.007 | -0.011 |
| 12) | ☑ | **1_GS00021** | | | | | |
| | | | 595515.297 | 3504770.325 | 17.657 | 17.638 | 17.634 |
| | | | | | Bare Earth | -0.019 | -0.023 |
| 13) | ☑ | **1_GS00022** | | | | | |
| | | | 609481.409 | 3514627.253 | 31.193 | 31.157 | 31.157 |
| | | | | | Bare Earth | -0.036 | -0.036 |
| 14) | ☑ | **1_GS00024** | | | | | |
| | | | 605549.053 | 3510662.067 | 21.622 | 21.562 | 21.565 |
| | | | | | Bare Earth | -0.06 | -0.057 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | ID | | | Z1 | Z DEM | Z LAS |
|---|---|---|---|---|---|---|
| | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 15) | 1_GS00026 | | | | | |
| | | 614720.819 | 3498682.782 | 17.413 | 17.335 | 17.342 |
| | | | | Bare Earth | -0.078 | -0.071 |
| 16) | 1_GS00030 | | | | | |
| | | 599165.202 | 3494219.386 | 17.128 | 17.025 | 17.025 |
| | | | | Bare Earth | -0.103 | -0.103 |
| 17) | 1_GS00031 | | | | | |
| | | 599544.233 | 3509339.302 | 26.57 | 26.449 | 26.453 |
| | | | | Bare Earth | -0.121 | -0.117 |
| 18) | 1_GS00033 | | | | | |
| | | 607809.779 | 3497279.117 | 17.238 | 17.085 | 17.089 |
| | | | | Bare Earth | -0.153 | -0.149 |
| 19) | 1_GS00001 | | | | | |
| | | 621026.397 | 3482034.442 | 16.477 | 16.601 | 16.596 |
| | | | | Urban Terrian | 0.124 | 0.119 |
| 20) | 1_GS00005 | | | | | |
| | | 634583.74 | 3518053.574 | 19.976 | 20.081 | 20.077 |
| | | | | Urban Terrian | 0.105 | 0.101 |
| 21) | 1_GS00006 | | | | | |
| | | 637276.974 | 3480122.289 | 23.188 | 23.266 | 23.278 |
| | | | | Urban Terrian | 0.078 | 0.09 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | ID | | | | | |
|---|---|---|---|---|---|---|
| | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 22) | 1_GS00011 | | | | | |
| | | 628251.504 | 3497692.465 | 17.44 | 17.495 | 17.497 |
| | | | | Urban Terrian | 0.055 | 0.057 |
| 23) | 1_GS00012 | | | | | |
| | | 612385.7 | 3520862.09 | 17.643 | 17.683 | 17.677 |
| | | | | Urban Terrian | 0.04 | 0.034 |
| 24) | 1_GS00015 | | | | | |
| | | 637259.042 | 3492277.689 | 16.714 | 16.735 | 16.735 |
| | | | | Urban Terrian | 0.021 | 0.021 |
| 25) | 1_GS00016 | | | | | |
| | | 614186.442 | 3525062.401 | 16.698 | 16.714 | 16.711 |
| | | | | Urban Terrian | 0.016 | 0.013 |
| 26) | 1_GS00019 | | | | | |
| | | 633982.296 | 3472618.091 | 15.921 | 15.914 | 15.912 |
| | | | | Urban Terrian | -0.007 | -0.009 |
| 27) | 1_GS00023 | | | | | |
| | | 597248.794 | 3493929.788 | 16.344 | 16.292 | 16.293 |
| | | | | Urban Terrian | -0.052 | -0.051 |
| 28) | 1_GS00025 | | | | | |
| | | 605521.26 | 3510657.335 | 22.29 | 22.235 | 22.229 |
| | | | | Urban Terrian | -0.055 | -0.061 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | ID | | | | | |
|---|---|---|---|---|---|---|
| | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 29) | 1_GS00027 | | | | | |
| | | 610750.224 | 3507630.915 | 19.458 | 19.375 | 19.376 |
| | | | | Urban Terrian | -0.083 | -0.082 |
| 30) | 1_GS00028 | | | | | |
| | | 614729.876 | 3498650.112 | 17.365 | 17.268 | 17.276 |
| | | | | Urban Terrian | -0.097 | -0.089 |
| 31) | 1_GS00029 | | | | | |
| | | 611970.997 | 3492011.484 | 17.59 | 17.481 | 17.485 |
| | | | | Urban Terrian | -0.109 | -0.105 |
| 32) | 1_GS00032 | | | | | |
| | | 610316.289 | 3474847.048 | 18.77 | 18.632 | 18.624 |
| | | | | Urban Terrian | -0.138 | -0.146 |
| 33) | 1_GS00034 | | | | | |
| | | 625087.364 | 3475479.348 | 14.234 | 14.41 | 14.397 |
| | | | | Low Vegetation | 0.176 | 0.163 |
| 34) | 1_GS00035 | | | | | |
| | | 630290.688 | 3523686.524 | 16.926 | 17.112 | 17.094 |
| | | | | Low Vegetation | 0.186 | 0.168 |
| 35) | 1_GS00036 | | | | | |
| | | 637332.888 | 3480088.59 | 16.645 | 16.834 | 16.799 |
| | | | | Low Vegetation | 0.189 | 0.154 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | ID | | | Z1 | Z DEM | Z LAS |
|---|---|---|---|---|---|---|
| | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 36) | 1_GS00038 | | | | | |
| | | 612413.586 | 3520881.676 | 17.325 | 17.475 | 17.474 |
| | | | | Low Vegetation | 0.15 | 0.149 |
| 37) | 1_GS00039 | | | | | |
| | | 634598.564 | 3518082.613 | 19.697 | 19.845 | 19.852 |
| | | | | Low Vegetation | 0.148 | 0.155 |
| 38) | 1_GS00041 | | | | | |
| | | 636141.286 | 3499317.507 | 16.35 | 16.49 | 16.489 |
| | | | | Low Vegetation | 0.14 | 0.139 |
| 39) | 1_GS00042 | | | | | |
| | | 630351.669 | 3523643.326 | 16.418 | 16.542 | 16.544 |
| | | | | Low Vegetation | 0.124 | 0.126 |
| 40) | 1_GS00046 | | | | | |
| | | 602186.752 | 3474507.917 | 15.38 | 15.465 | 15.456 |
| | | | | Low Vegetation | 0.085 | 0.076 |
| 41) | 1_GS00047 | | | | | |
| | | 595471.404 | 3504876.033 | 17.726 | 17.79 | 17.785 |
| | | | | Low Vegetation | 0.064 | 0.059 |
| 42) | 1_GS00048 | | | | | |
| | | 633938.842 | 3472612.297 | 14.454 | 14.512 | 14.515 |
| | | | | Low Vegetation | 0.058 | 0.061 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | ID | | | | | |
|---|---|---|---|---|---|---|
| | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 43) | 1_GS00049 | | | | | |
| | | 637798.94 | 3503926.008 | 17.726 | 17.762 | 17.762 |
| | | | | Low Vegetation | 0.036 | 0.036 |
| 44) | 1_GS00050 | | | | | |
| | | 634046.707 | 3472600.958 | 14.954 | 14.994 | 14.991 |
| | | | | Low Vegetation | 0.04 | 0.037 |
| 45) | 1_GS00051 | | | | | |
| | | 609463.448 | 3514608.815 | 30.93 | 30.949 | 30.953 |
| | | | | Low Vegetation | 0.019 | 0.023 |
| 46) | 1_GS00052 | | | | | |
| | | 631660.016 | 3465199.583 | 13.612 | 13.631 | 13.631 |
| | | | | Low Vegetation | 0.019 | 0.019 |
| 47) | 1_GS00053 | | | | | |
| | | 637666.765 | 3510772.162 | 18.24 | 18.254 | 18.266 |
| | | | | Low Vegetation | 0.014 | 0.026 |
| 48) | 1_GS00054 | | | | | |
| | | 599131.332 | 3494216.271 | 16.261 | 16.279 | 16.27 |
| | | | | Low Vegetation | 0.018 | 0.009 |
| 49) | 1_GS00055 | | | | | |
| | | 609457.283 | 3514631.928 | 30.71 | 30.707 | 30.703 |
| | | | | Low Vegetation | -0.003 | -0.007 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | | ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 50) | ☑ | 1_GS00056 | | | | | |
| | | | 597238.251 | 3493955.861 | 16.314 | 16.304 | 16.306 |
| | | | | | Low Vegetation | -0.01 | -0.008 |
| 51) | ☑ | 1_GS00057 | | | | | |
| | | | 605534.822 | 3510655.156 | 21.832 | 21.821 | 21.815 |
| | | | | | Low Vegetation | -0.011 | -0.017 |
| 52) | ☑ | 1_GS00059 | | | | | |
| | | | 614705.957 | 3498689.658 | 17.396 | 17.363 | 17.369 |
| | | | | | Low Vegetation | -0.033 | -0.027 |
| 53) | ☑ | 1_GS00060 | | | | | |
| | | | 599505.497 | 3509314.153 | 26.194 | 26.15 | 26.147 |
| | | | | | Low Vegetation | -0.044 | -0.047 |
| 54) | ☑ | 1_GS00061 | | | | | |
| | | | 610328.717 | 3474859.983 | 16.028 | 15.961 | 15.964 |
| | | | | | Low Vegetation | -0.067 | -0.064 |
| 55) | ☑ | 1_GS00062 | | | | | |
| | | | 599491.493 | 3509318.178 | 24.44 | 24.363 | 24.377 |
| | | | | | Low Vegetation | -0.077 | -0.063 |
| 56) | ☑ | 1_GS00067 | | | | | |
| | | | 607831.64 | 3497462.762 | 17.207 | 17.072 | 17.068 |
| | | | | | Low Vegetation | -0.135 | -0.139 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | ID | | | | | |
|---|---|---|---|---|---|---|
| | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 57) | 1_GS00040 | | | | | |
| | | 614204.979 | 3525050.739 | 16.794 | 16.924 | 16.921 |
| | | | | Med Vegetation | 0.13 | 0.127 |
| 58) | 1_GS00043 | | | | | |
| | | 616580.136 | 3517120.444 | 17.457 | 17.559 | 17.564 |
| | | | | Med Vegetation | 0.102 | 0.107 |
| 59) | 1_GS00044 | | | | | |
| | | 612441.09 | 3520852.796 | 17.083 | 17.168 | 17.179 |
| | | | | Med Vegetation | 0.085 | 0.096 |
| 60) | 1_GS00045 | | | | | |
| | | 622319.127 | 3522342.106 | 20.891 | 20.973 | 20.974 |
| | | | | Med Vegetation | 0.082 | 0.083 |
| 61) | 1_GS00066 | | | | | |
| | | 599527.808 | 3509328.39 | 25.938 | 25.847 | 25.855 |
| | | | | Med Vegetation | -0.091 | -0.083 |
| 62) | 1_GS00014 | | | | | |
| | | 610731.181 | 3507640.082 | 18.559 | 18.581 | 18.588 |
| | | | | High Vegetation | 0.022 | 0.029 |
| 63) | 1_GS00037 | | | | | |
| | | 636119.478 | 3499320.122 | 16.251 | 16.412 | 16.414 |
| | | | | High Vegetation | 0.161 | 0.163 |

## Coordinates and Offsets of Analyzed Locations (Continued)

| | | ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Survey X | Survey Y | Z1 | Z DEM | Z LAS |
| | | | | | LC Type | ΔZ DEM | ΔZ LAS |
| 64) | ☑ | 1_GS00058 | | | | | |
| | | | 611953.852 | 3491993.991 | 17.282 | 17.253 | 17.249 |
| | | | | | High Vegetation | -0.029 | -0.033 |
| 65) | ☑ | 1_GS00063 | | | | | |
| | | | 605537.709 | 3510638.599 | 21.644 | 21.581 | 21.593 |
| | | | | | High Vegetation | -0.063 | -0.051 |
| 66) | ☑ | 1_GS00064 | | | | | |
| | | | 607805.834 | 3497318.133 | 17.138 | 17.047 | 17.057 |
| | | | | | High Vegetation | -0.091 | -0.081 |
| 67) | ☑ | 1_GS00065 | | | | | |
| | | | 608489.192 | 3470783.796 | 18.285 | 18.192 | 18.196 |
| | | | | | High Vegetation | -0.093 | -0.089 |

# LAS

Nonvegetated Vertical Accuracy

LandCover Type: Bare Earth, Urban Terrian

Minimum DZ: -0.149

Maximum DZ: 0.132

Mean DZ: 0

Mean Magnitude DZ: 0.265

Number Observations: 32

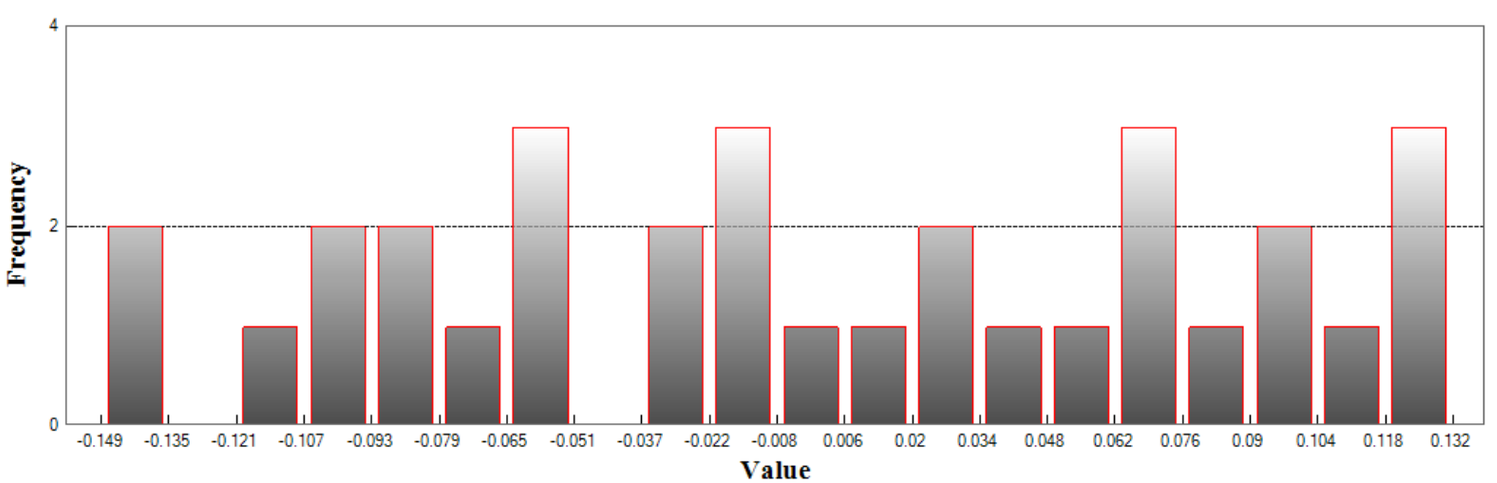
Standard Deviation DZ: 0.083

RMSE Z: 0.082

95% Confidence Level Z: 0.161

Units: Meters

# Histogram




Min: -0.149

Max: 0.132

Number Of Bins: 20

Bin Interval: 0.014

# LAS (Continued)

Vegetated Vertical Accuracy

LandCover Type: High Vegetation

Minimum DZ: -0.089

Maximum DZ: 0.163

Mean DZ: -0.01

Mean Magnitude DZ: 0.272

Number Observations: 6

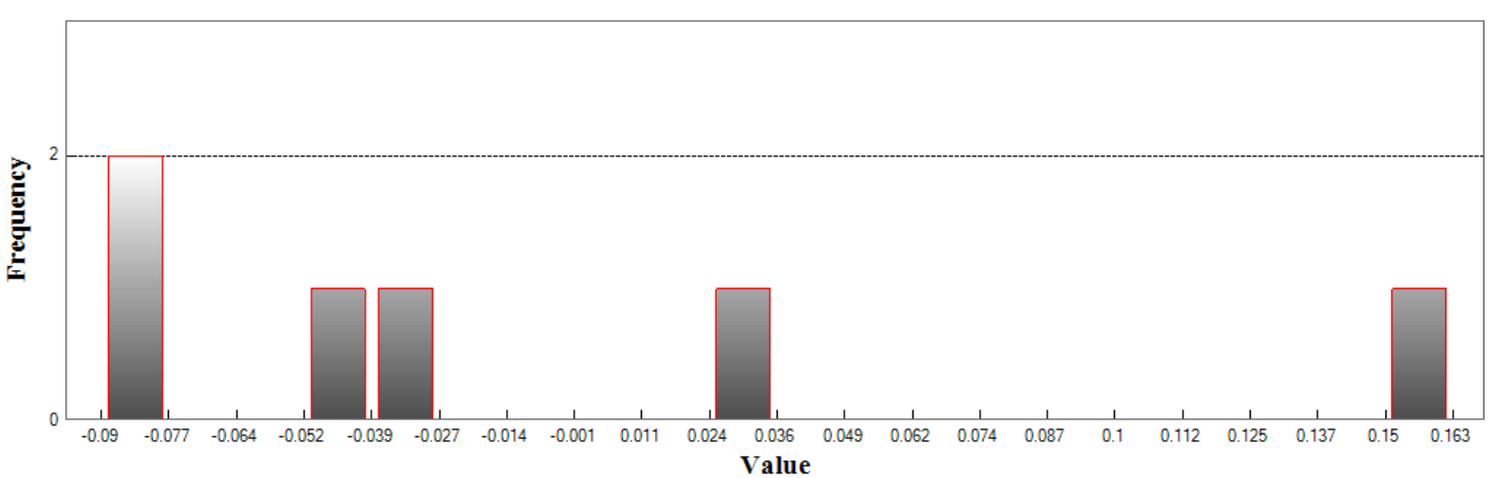
Standard Deviation DZ: 0.095

RMSE Z: 0.087

95th Percentile: 0.163

Units: Meters

# Histogram




Min: -0.089

Max: 0.163

Number Of Bins: 20

Bin Interval: 0.013

# LAS (Continued)

Vegetated Vertical Accuracy

LandCover Type: Low Vegetation

Minimum DZ: -0.139

Maximum DZ: 0.168

Mean DZ: 0.043

Mean Magnitude DZ: 0.272

Number Observations: 24

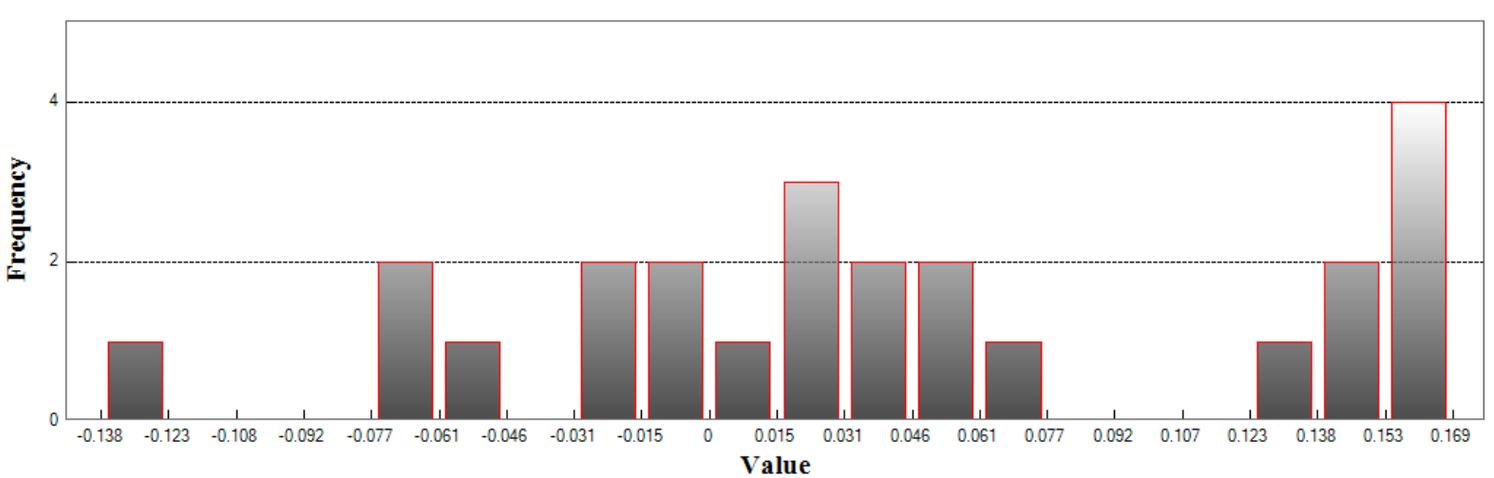
Standard Deviation DZ: 0.084

RMSE Z: 0.093

95th Percentile: 0.163

Units: Meters

# Histogram




Min: -0.139

Max: 0.168

Number Of Bins: 20

Bin Interval: 0.015

# LAS (Continued)

Vegetated Vertical Accuracy

LandCover Type: Med Vegetation

Minimum DZ: -0.083

Maximum DZ: 0.127

Mean DZ: 0.066

Mean Magnitude DZ: 0.315

Number Observations: 5

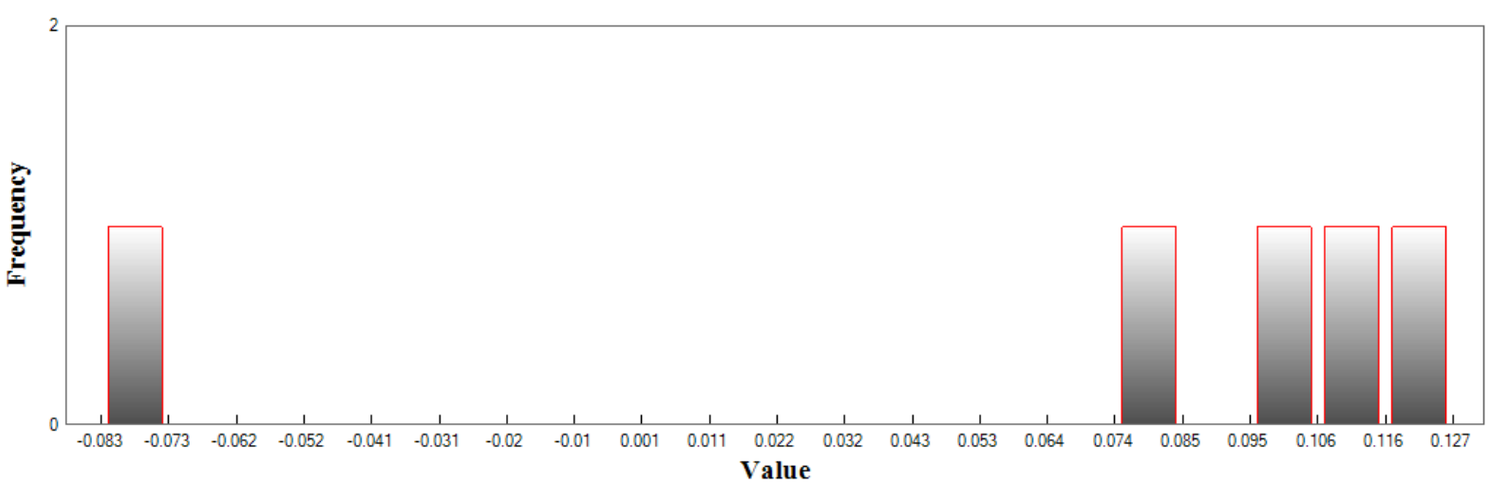
Standard Deviation DZ: 0.085

RMSE Z: 0.1

95th Percentile: 0.127

Units: Meters

# Histogram




Min: -0.083

Max: 0.127

Number Of Bins: 20

Bin Interval: 0.01

# DEM

Nonvegetated Vertical Accuracy

LandCover Type: Bare Earth, Urban Terrian

Minimum DZ: -0.153

Maximum DZ: 0.134

Mean DZ: 0.001

Mean Magnitude DZ: 0.267

Number Observations: 32

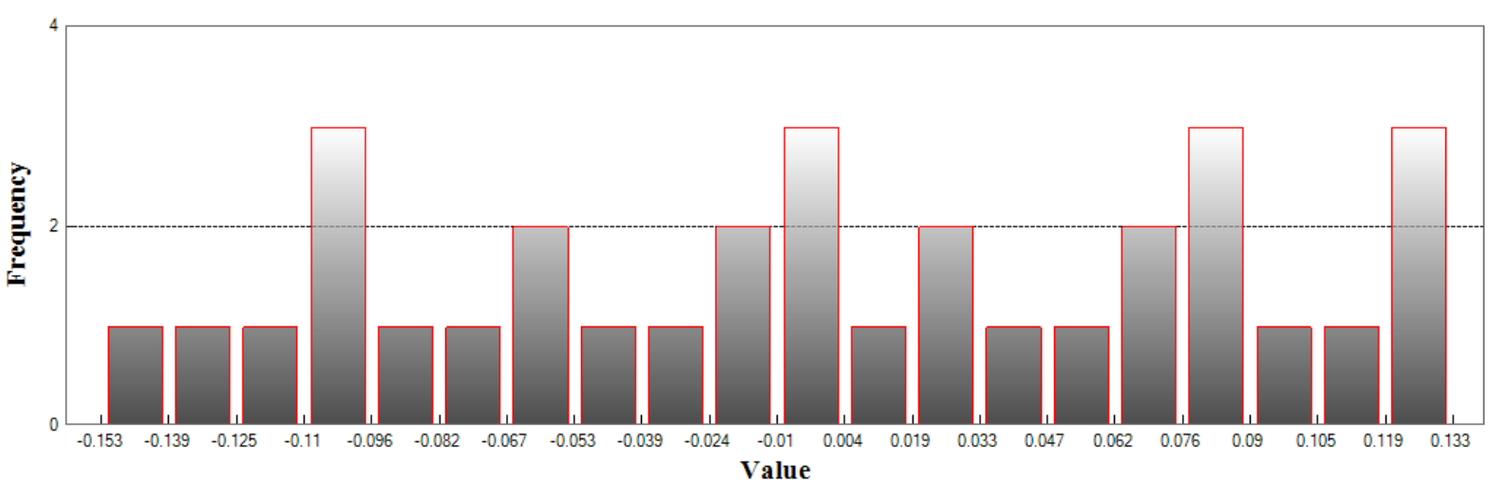
Standard Deviation DZ: 0.085

RMSE Z: 0.083

95% Confidence Level Z: 0.163

Units: Meters

# Histogram




Min: -0.153

Max: 0.134

Number Of Bins: 20

Bin Interval: 0.014

# DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: High Vegetation

Minimum DZ: -0.093

Maximum DZ: 0.161

Mean DZ: -0.015

Mean Magnitude DZ: 0.276

Number Observations: 6

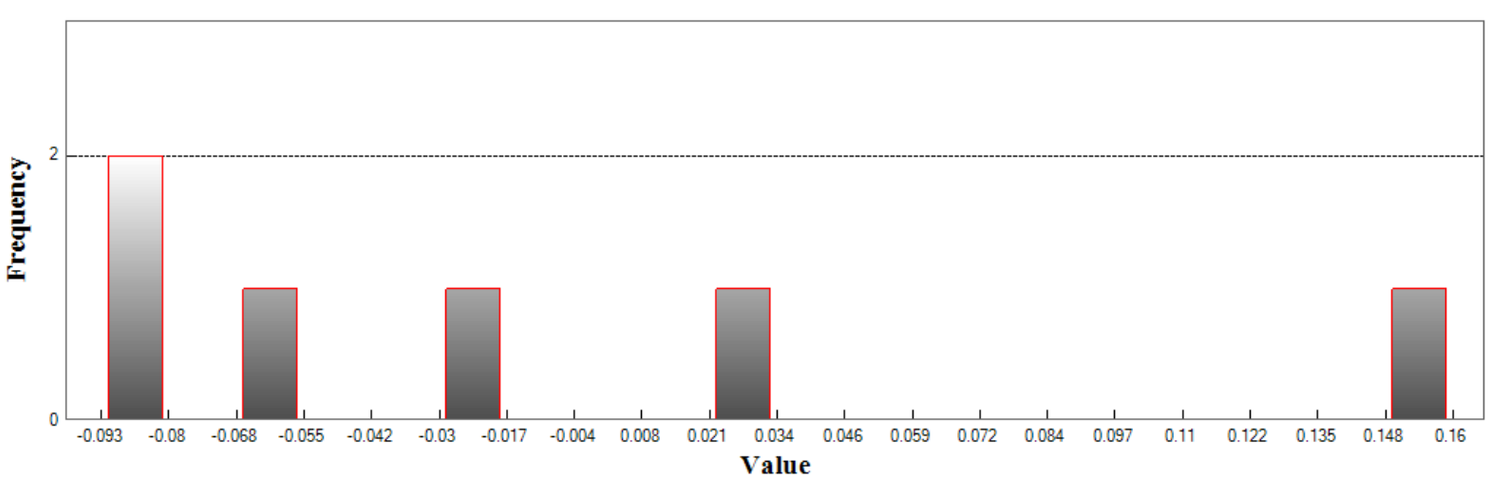
Standard Deviation DZ: 0.096

RMSE Z: 0.089

95th Percentile: 0.161

Units: Meters

# Histogram




Min: -0.093

Max: 0.161

Number Of Bins: 20

Bin Interval: 0.013

# DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: Low Vegetation

Minimum DZ: -0.135

Maximum DZ: 0.189

Mean DZ: 0.045

Mean Magnitude DZ: 0.277

Number Observations: 24

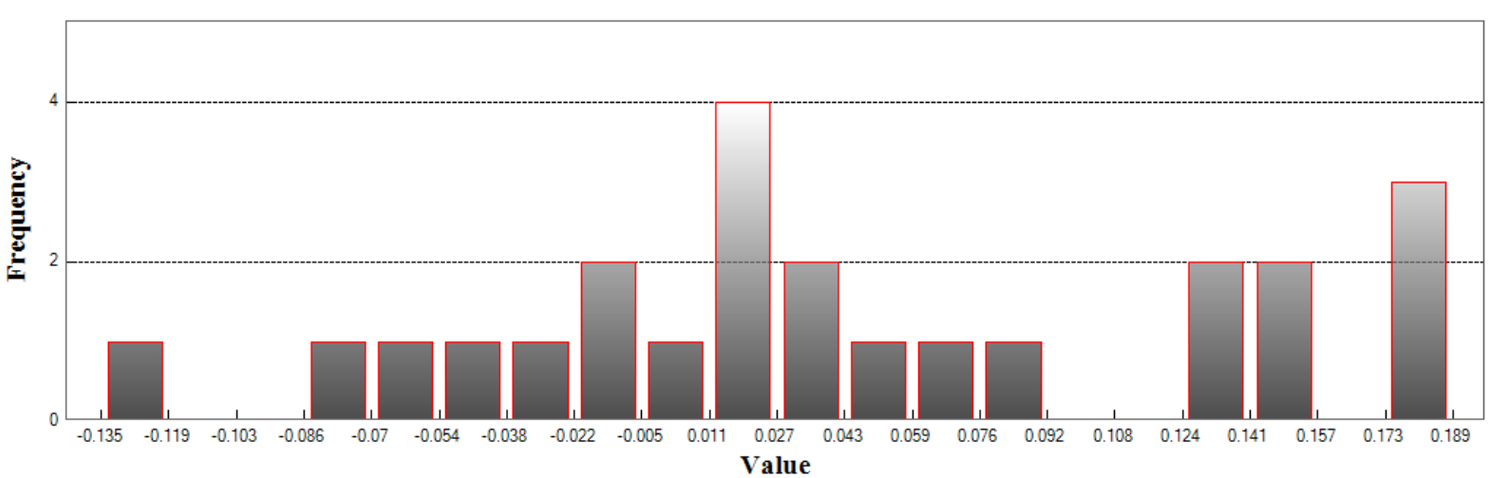
Standard Deviation DZ: 0.089

RMSE Z: 0.098

95th Percentile: 0.186

Units: Meters

# Histogram




Min: -0.135

Max: 0.189

Number Of Bins: 20

Bin Interval: 0.016

# DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: Med Vegetation

Minimum DZ: -0.091

Maximum DZ: 0.13

Mean DZ: 0.062

Mean Magnitude DZ: 0.313

Number Observations: 5

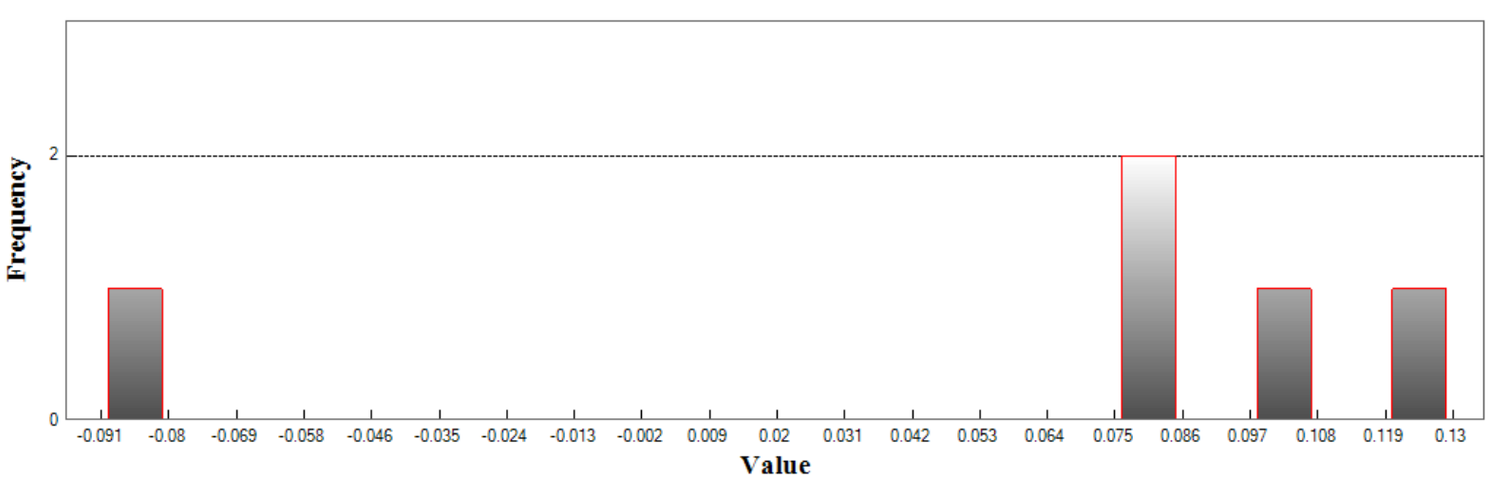
Standard Deviation DZ: 0.087

RMSE Z: 0.1

95th Percentile: 0.13

Units: Meters

# Histogram




Min: -0.091

Max: 0.13

Number Of Bins: 20

Bin Interval: 0.011

# Appendix D. Inertial Explorer

# Output Results for 20191202212125

Inertial Explorer Version 8.80.2305
12/11/2019

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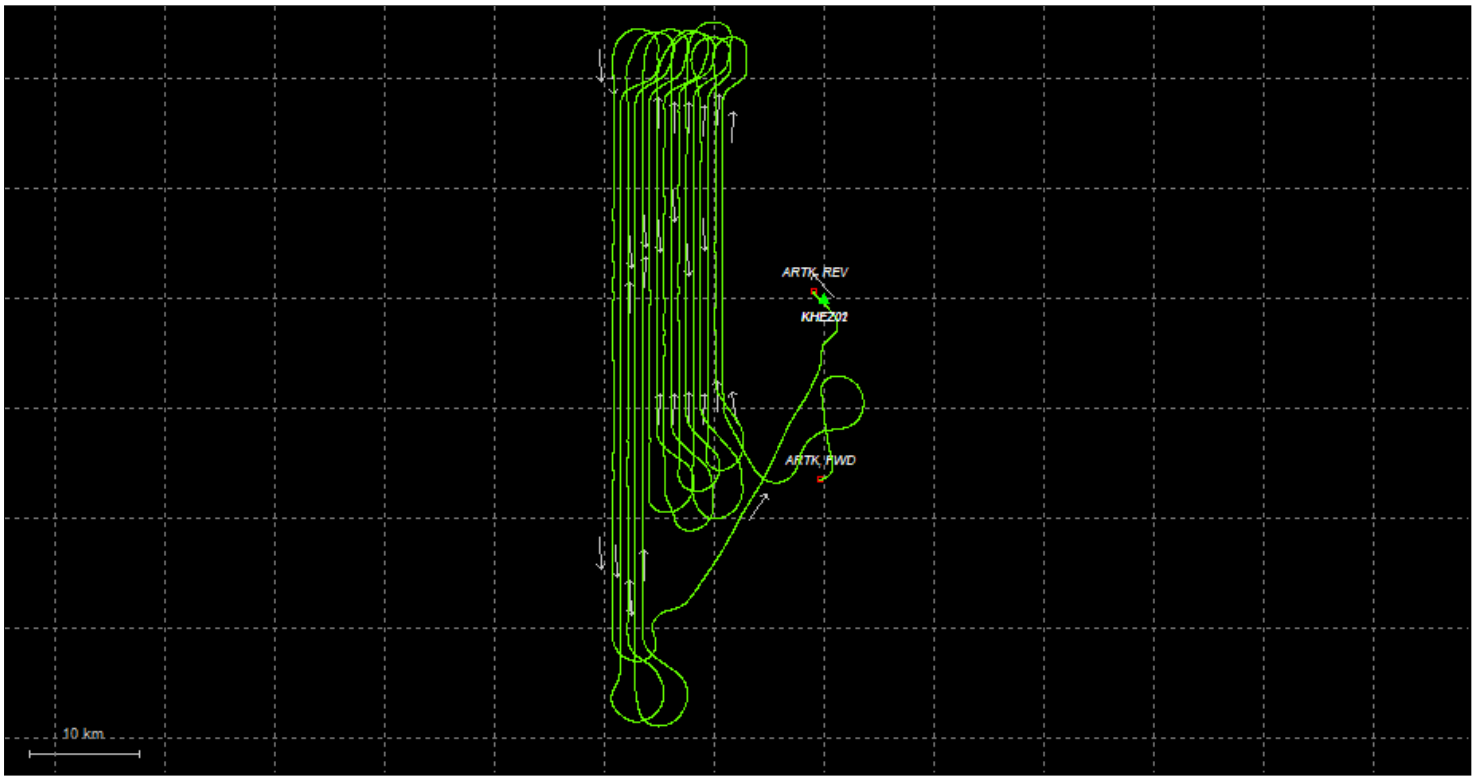
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |
|---|---|---|---|---|

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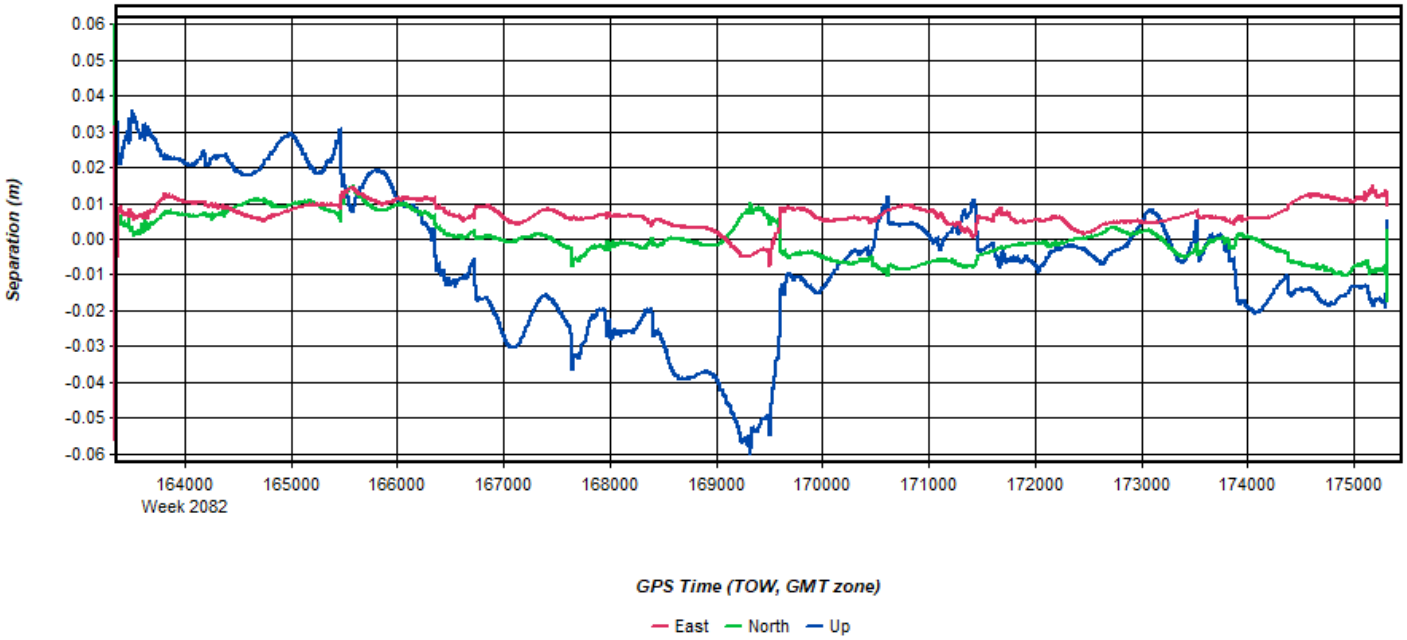
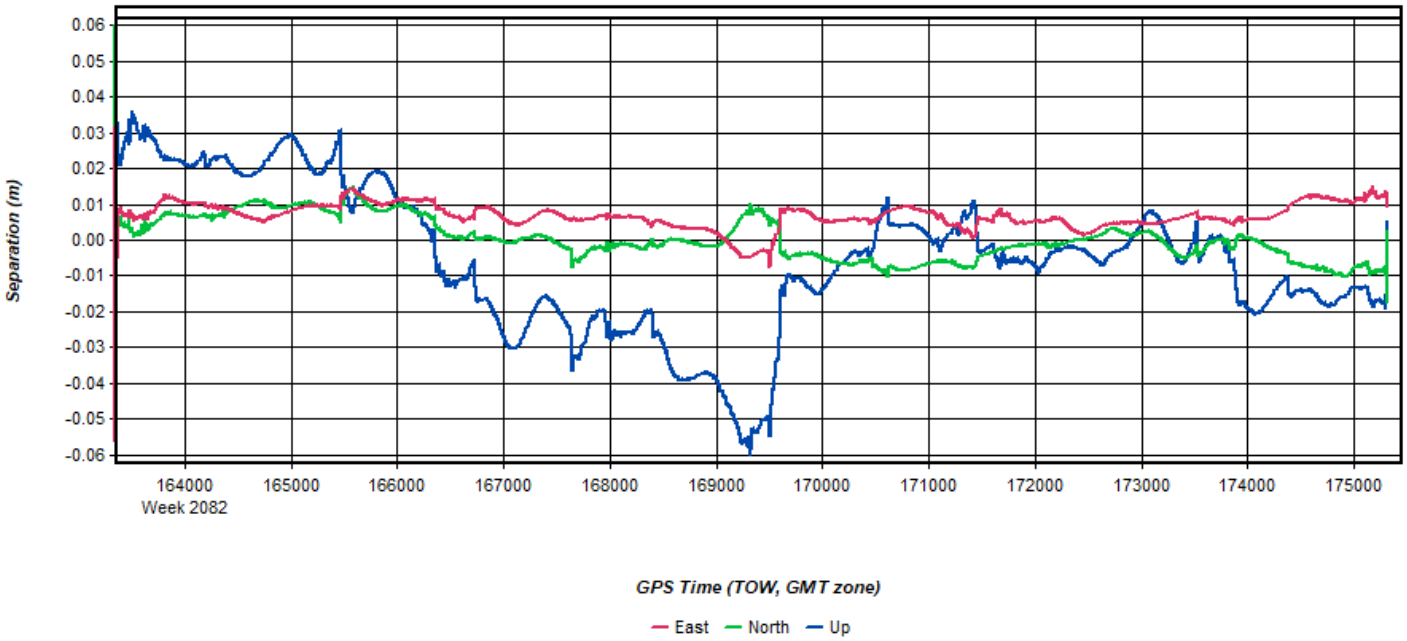
**Figure 2: 20191202212125 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

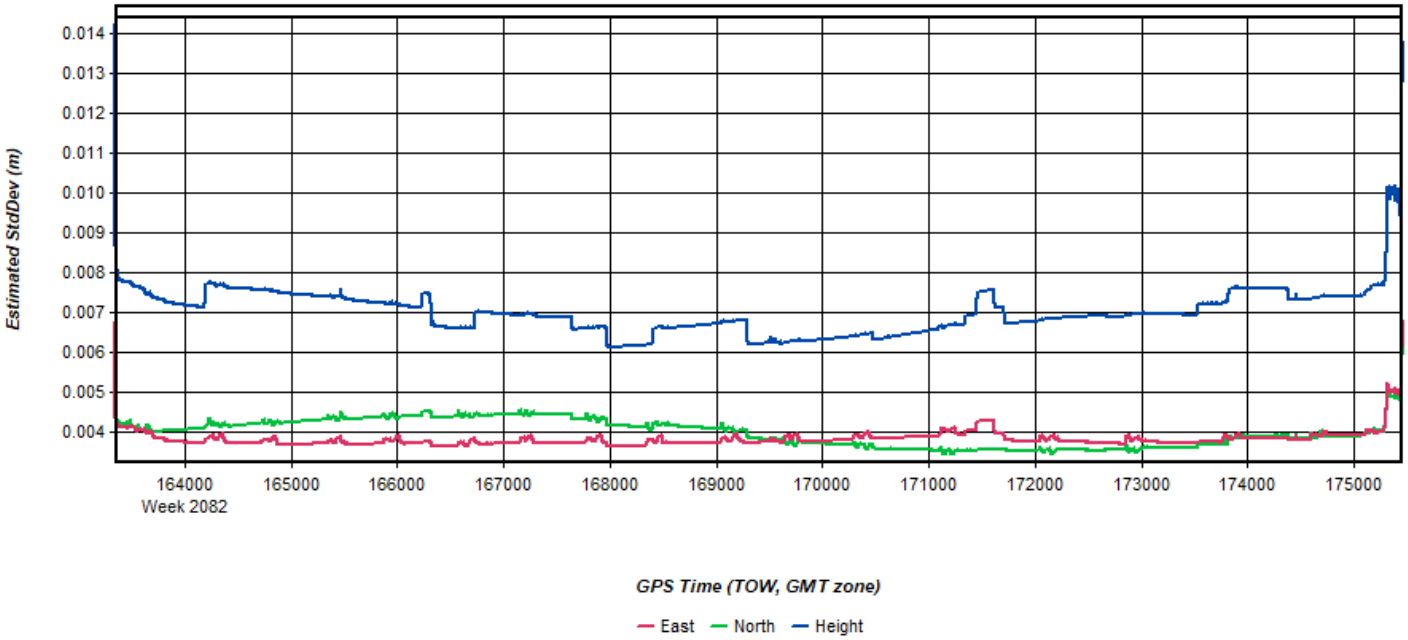
Object 20191202212125 [Smoothed TC Combined] - Float or Fixed Ambiguity failed--NULL bitmap handle

**Figure 3: 20191202212125 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



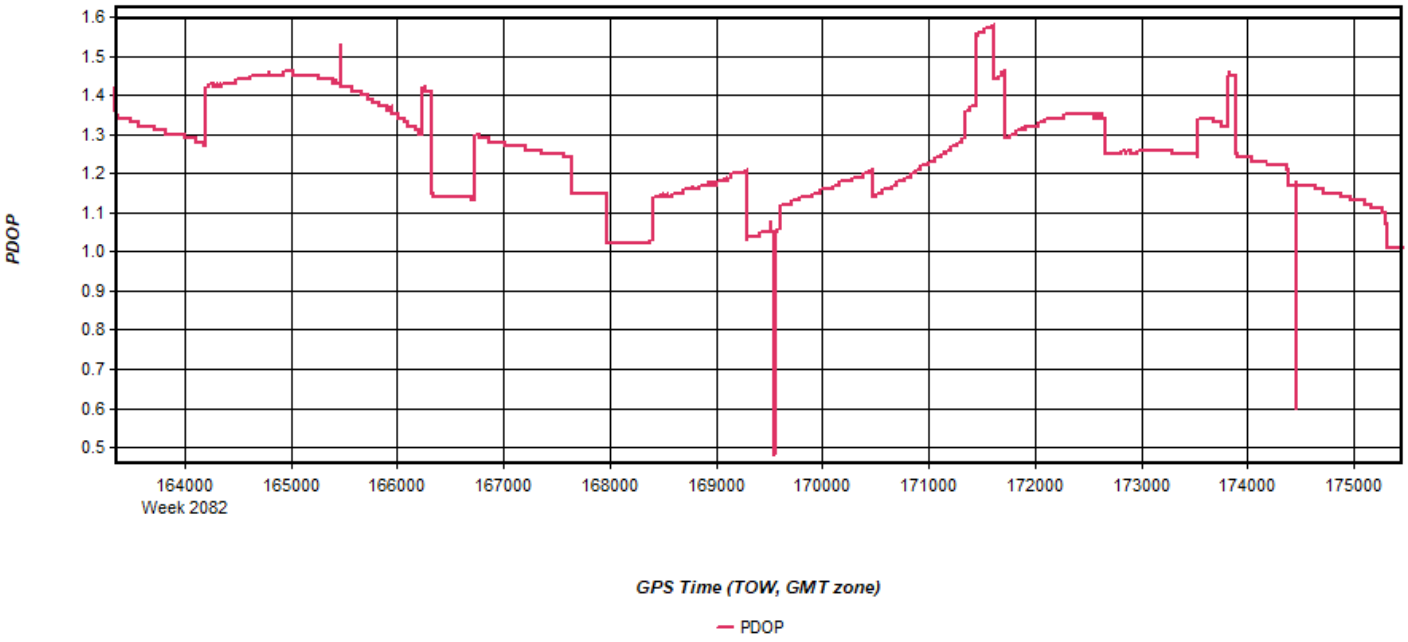

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 4: 20191202212125 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



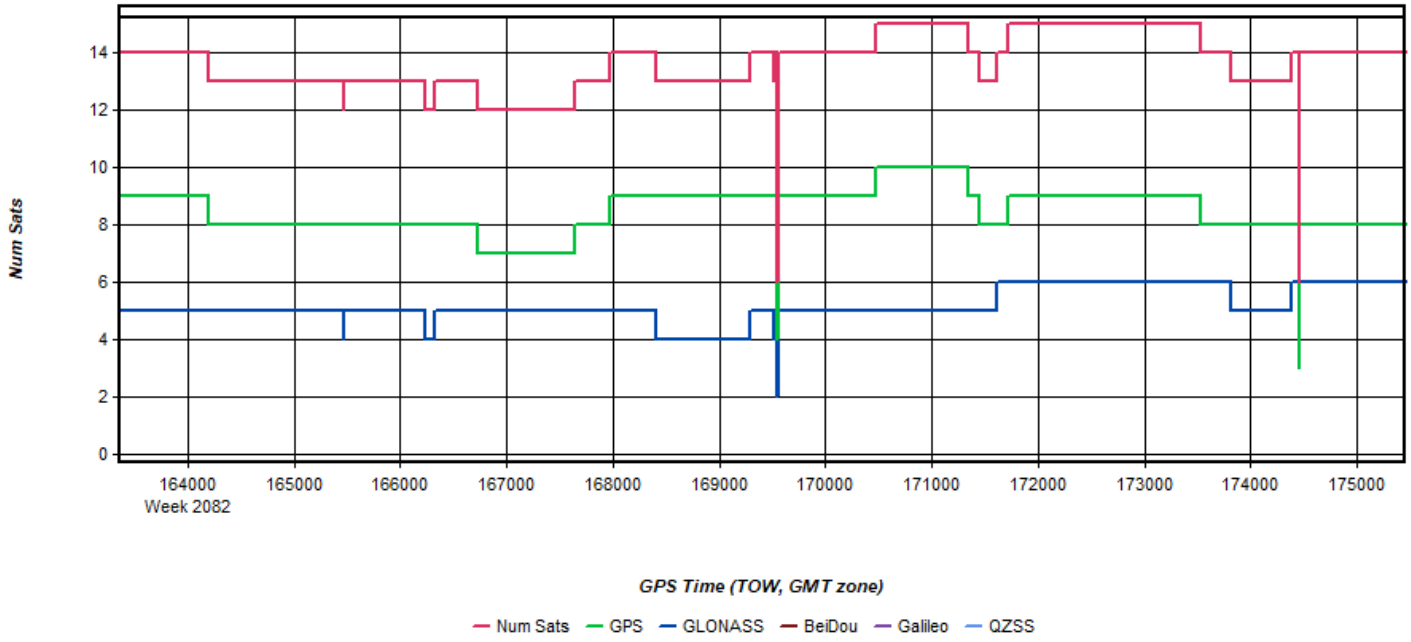

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 5: 20191202212125 [Smoothed TC Combined] - PDOP Plot**



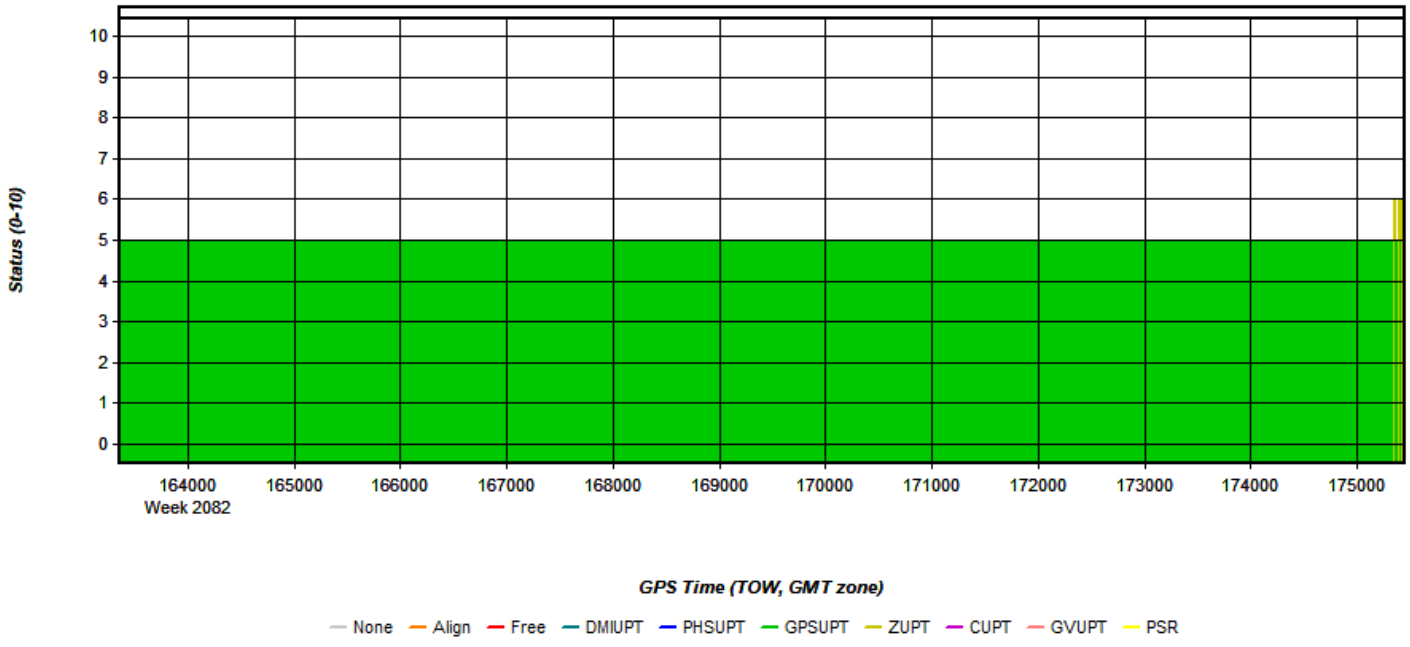

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 6: 20191202212125 [Smoothed TC Combined] - Number of Satellites Line Plot**



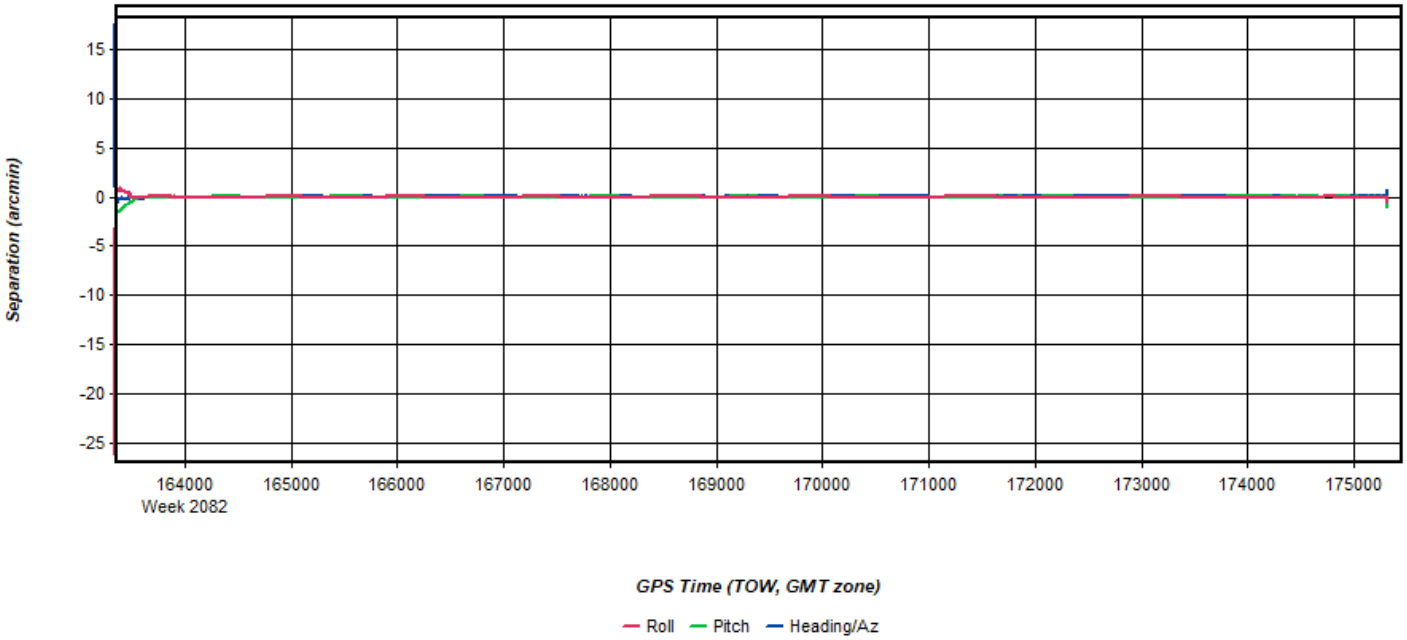

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 7: 20191202212125 [Smoothed TC Combined] - Status flag for IMU processing**



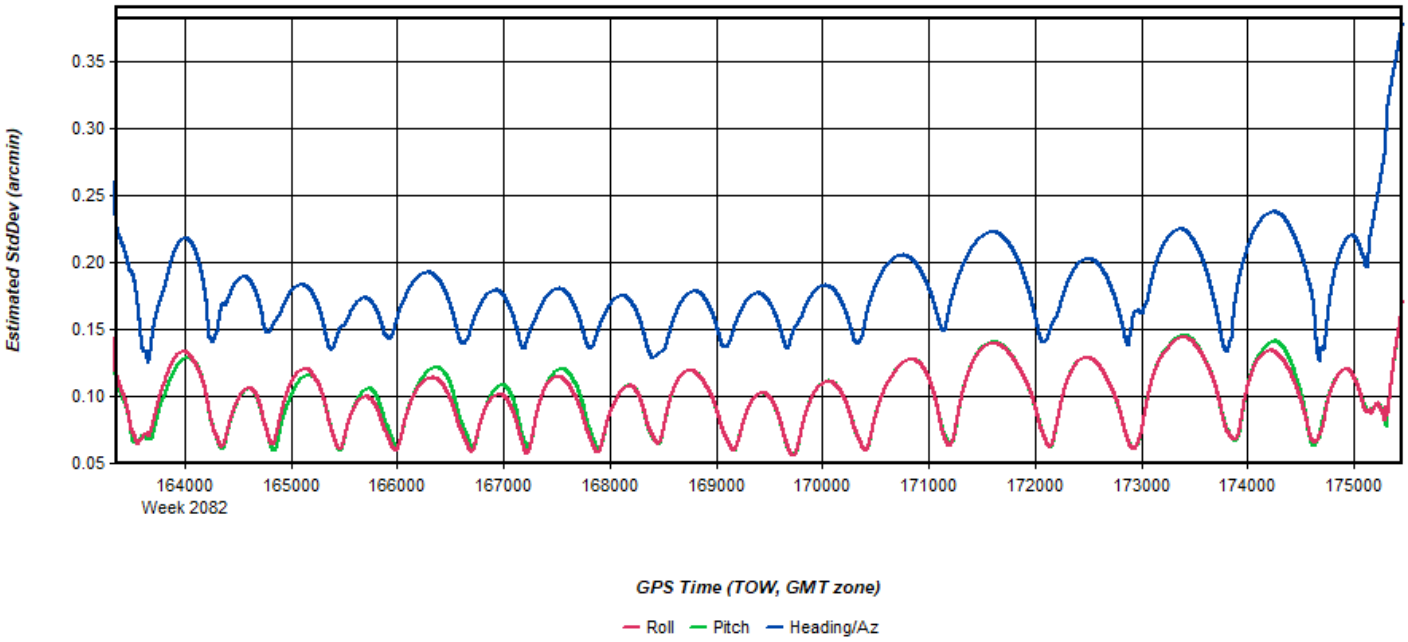

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 8: 20191202212125 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



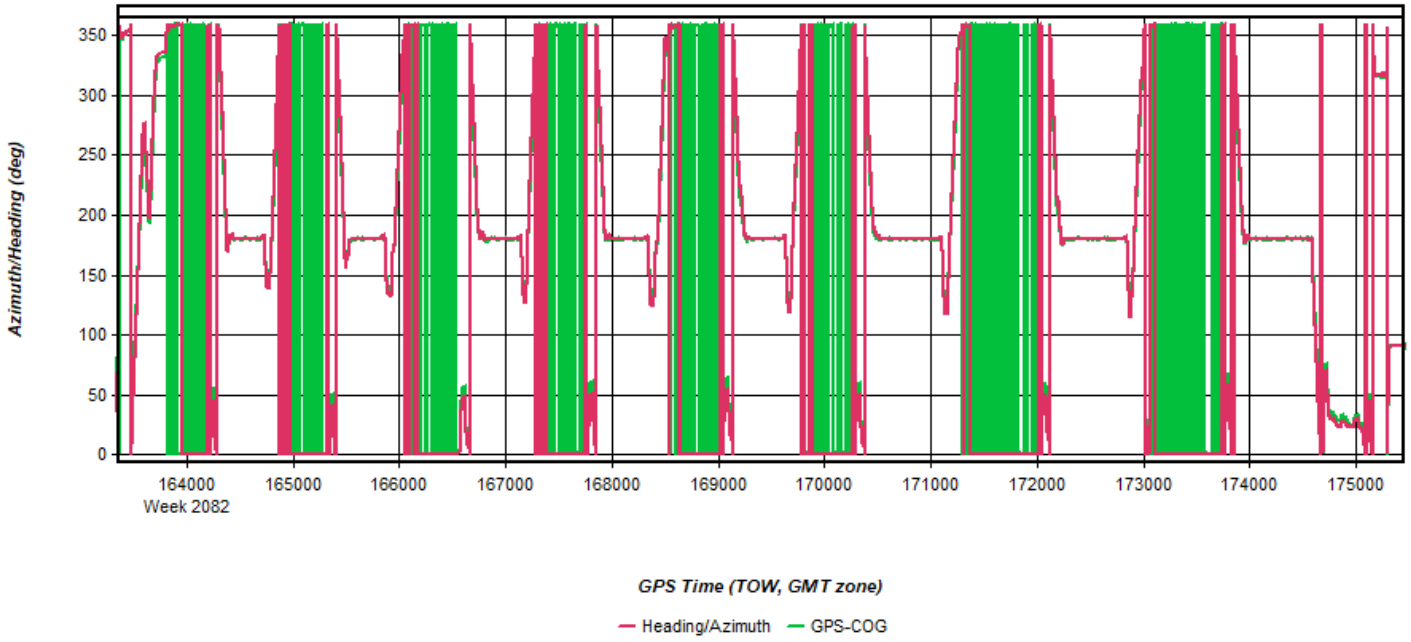

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 9: 20191202212125 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



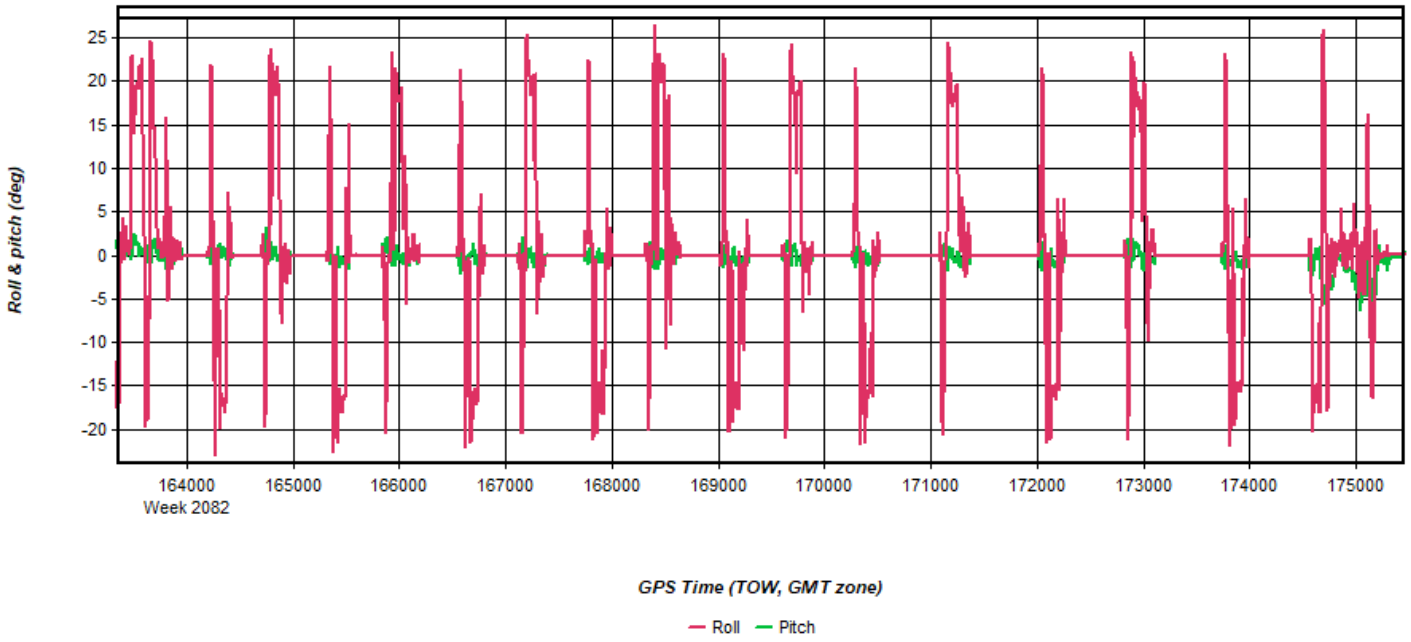

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 10: 20191202212125 [Smoothed TC Combined] - Azimuth Plot**



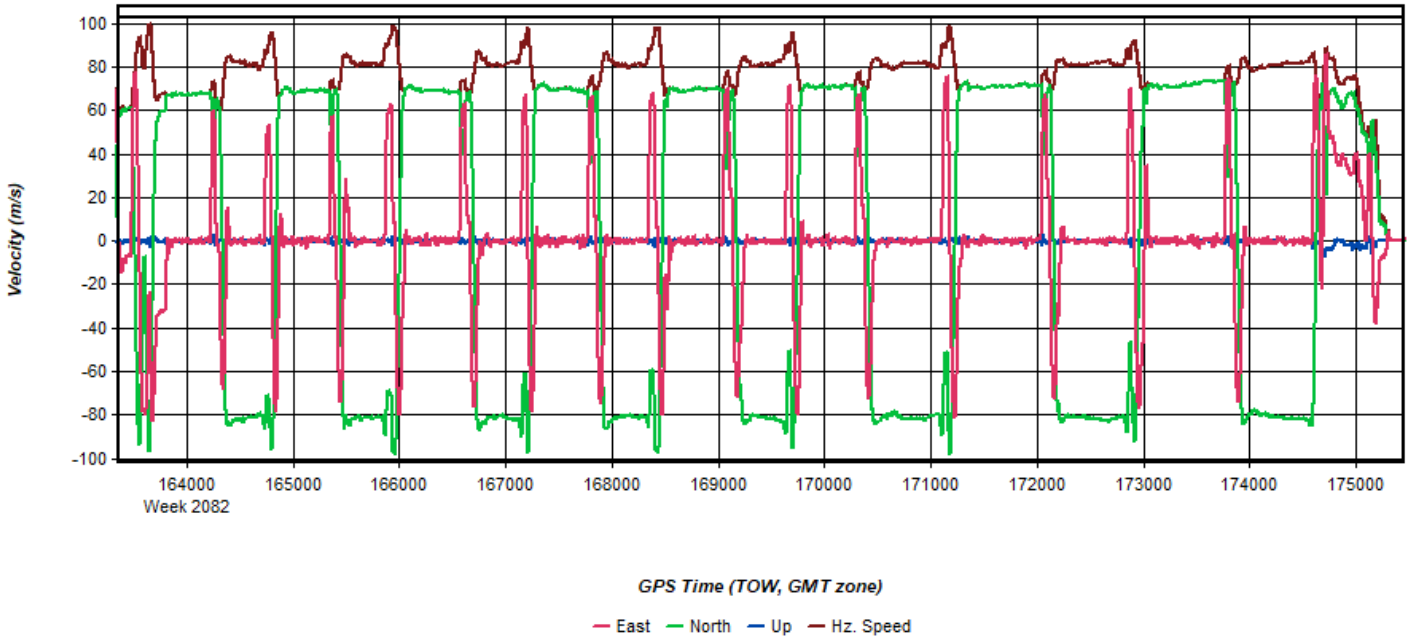

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 11: 20191202212125 [Smoothed TC Combined] - Roll & Pitch Plot**



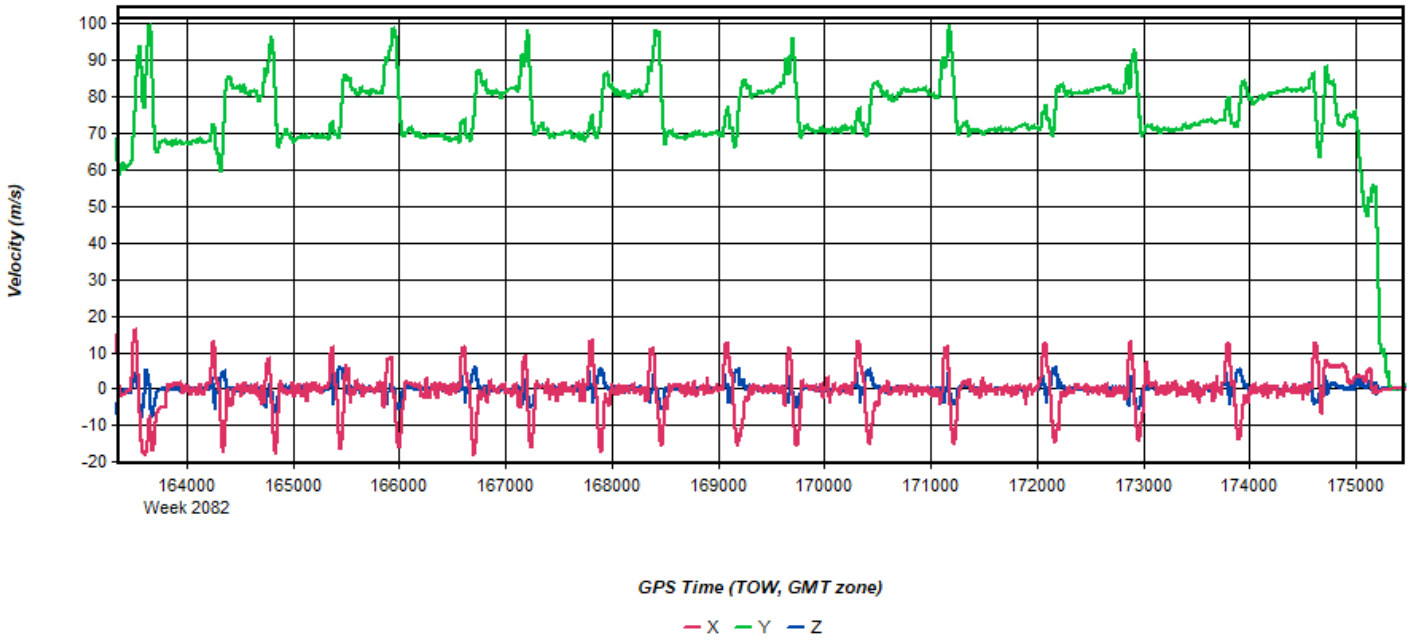

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 12: 20191202212125 [Smoothed TC Combined] - Velocity Profile Plot**



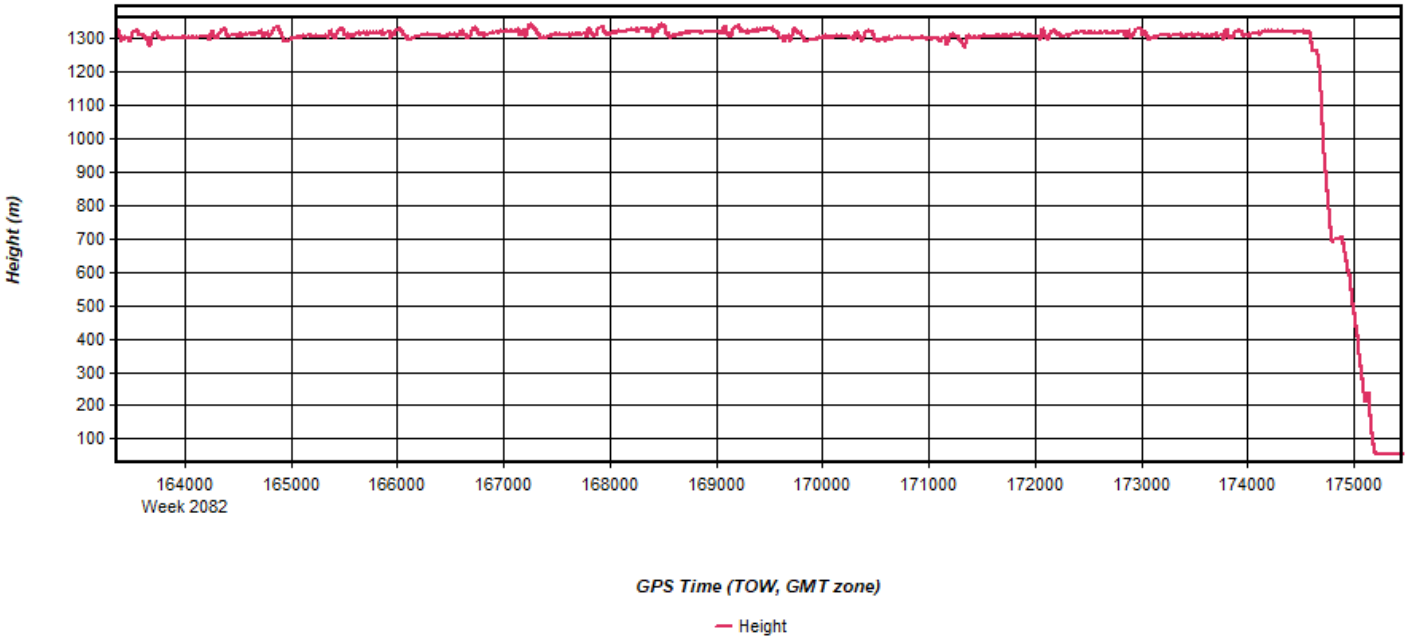

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 13: 20191202212125 [Smoothed TC Combined] - Body Frame Velocity Plot**



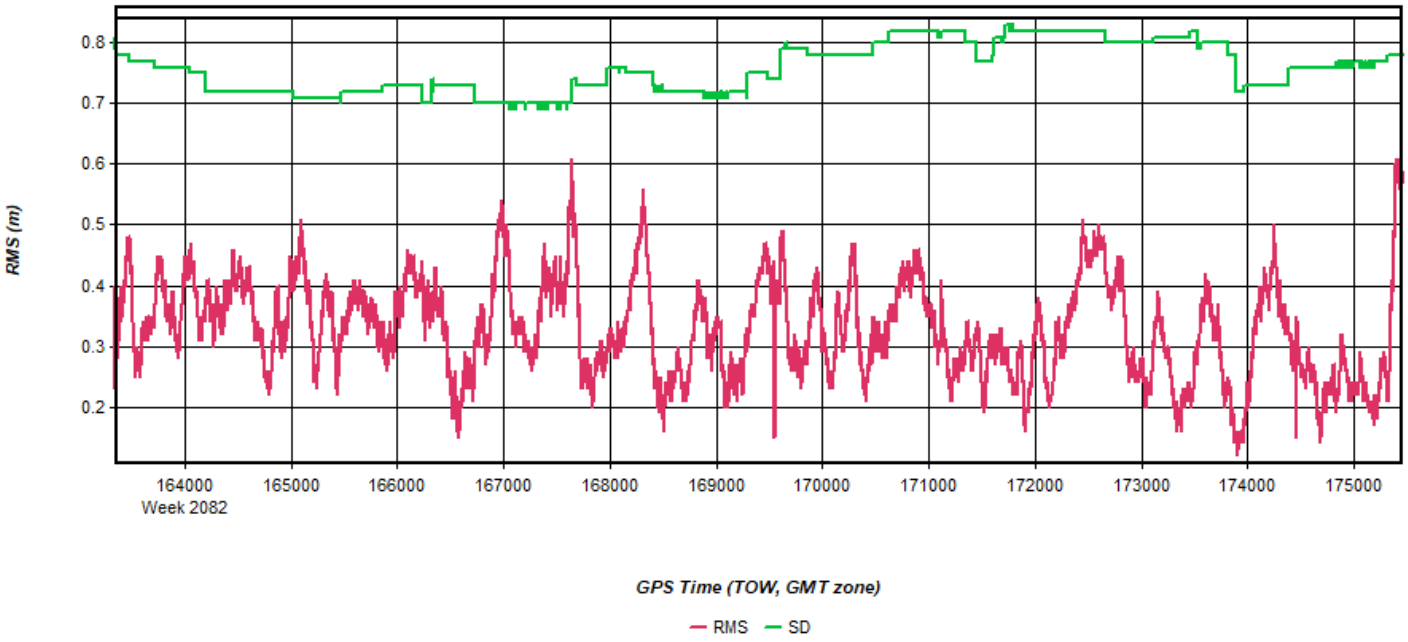

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 14: 20191202212125 [Smoothed TC Combined] - Height Profile Plot**



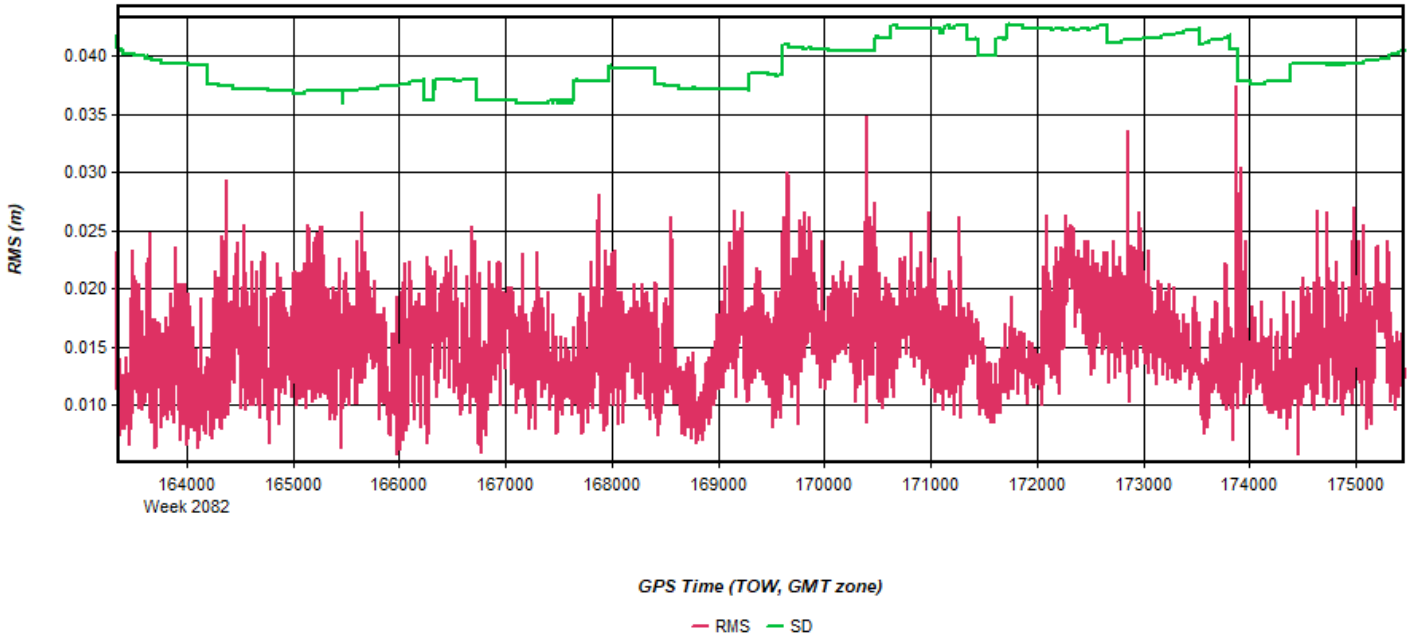

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 15: 20191202212125 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



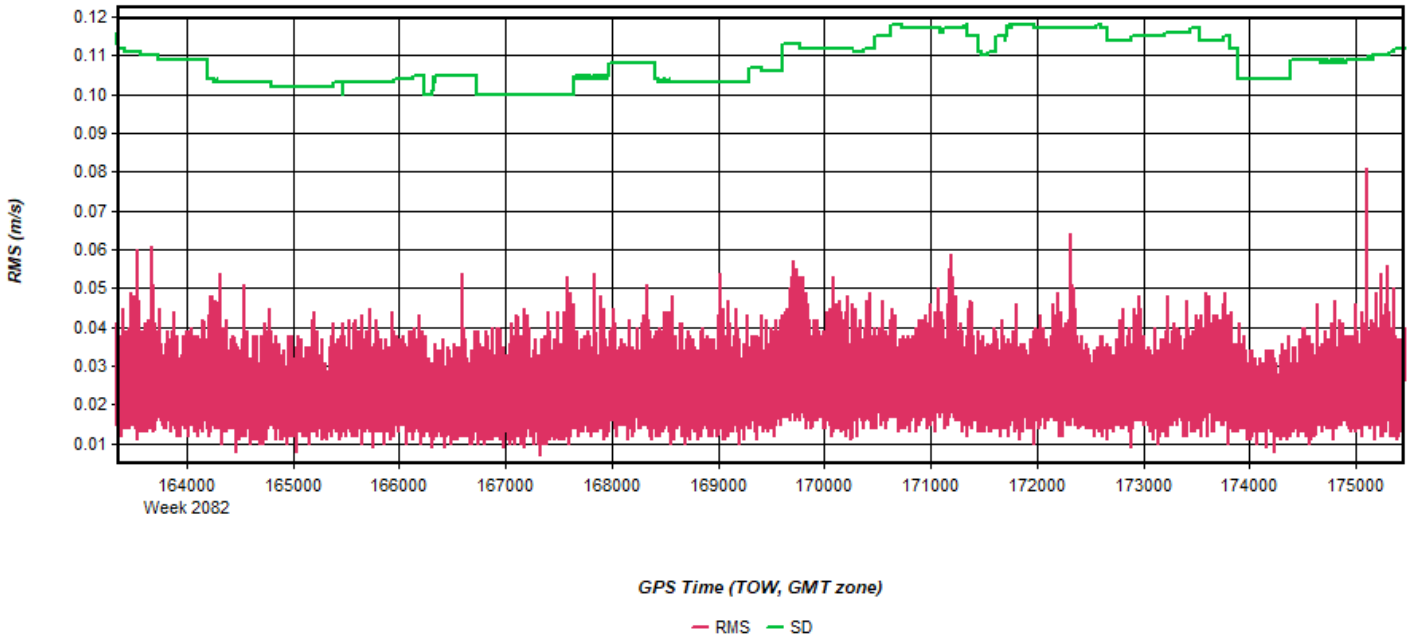

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 16: 20191202212125 [Smoothed TC Combined] - Carrier Residual RMS Plot**



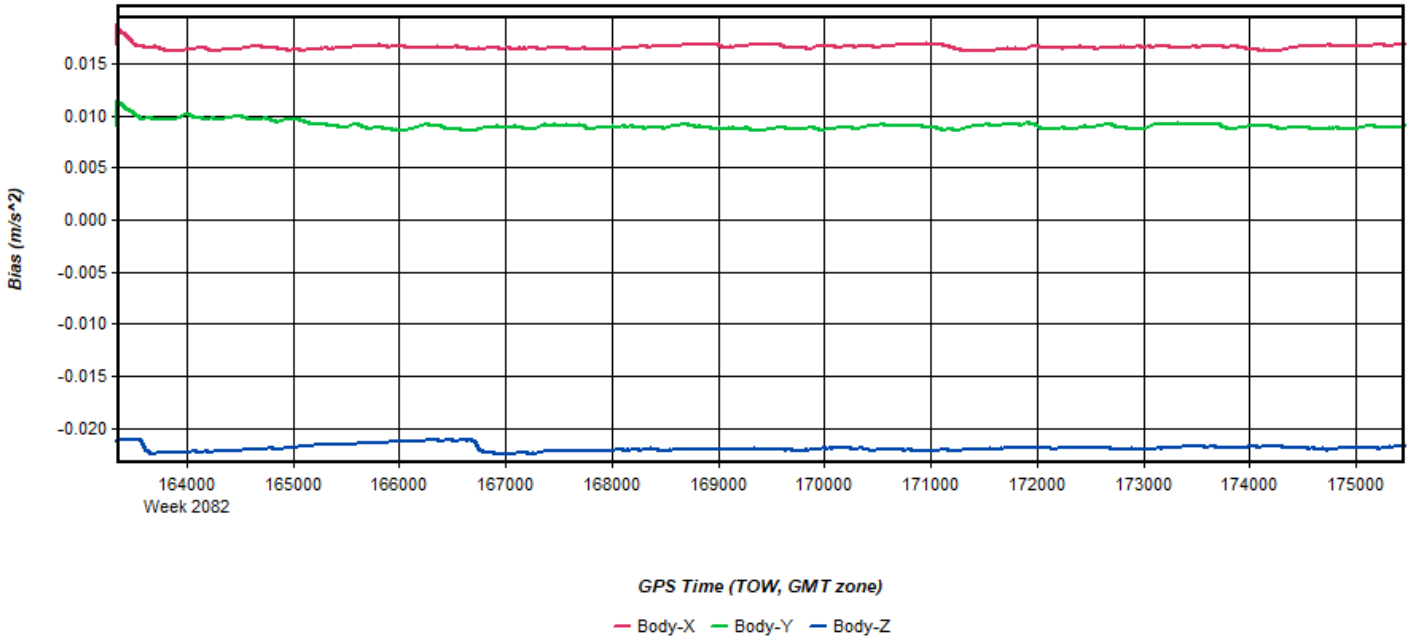

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 17: 20191202212125 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



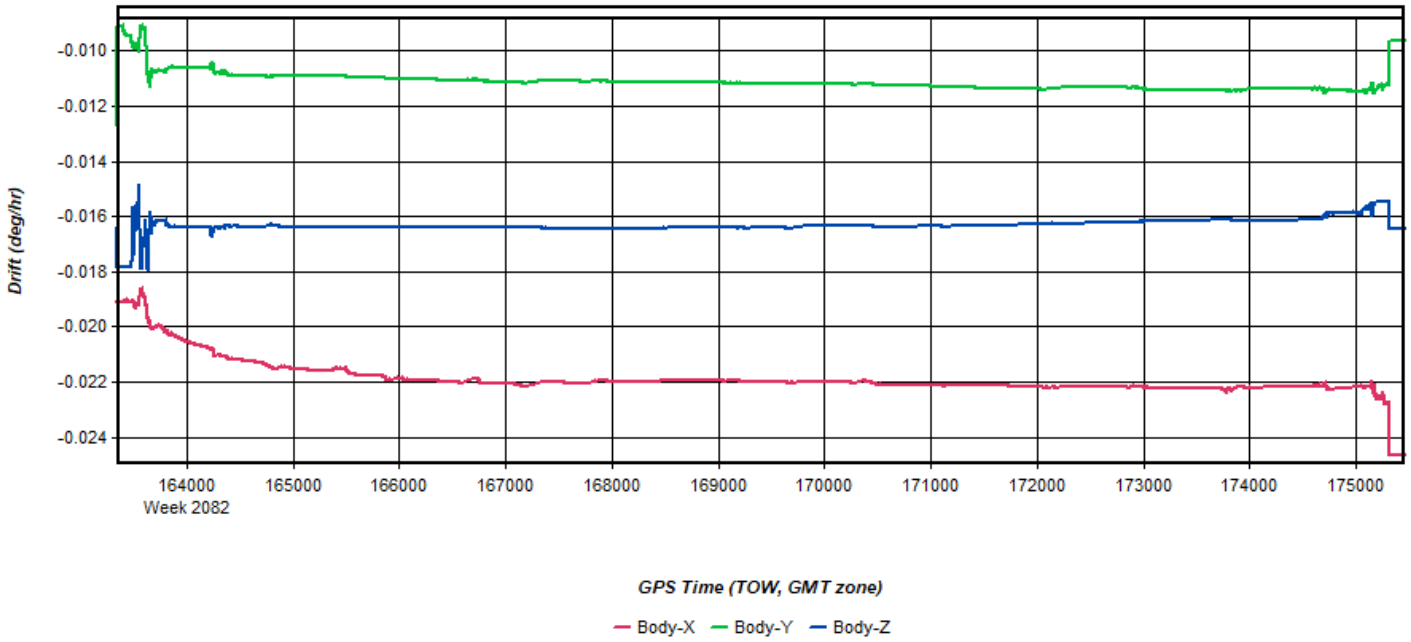

| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 18: 20191202212125 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

**Figure 19: 20191202212125 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191202212125 | by Unknown | on 12/11/2019 | at 16:35:26 |

# Output Results for 20191203151442

Inertial Explorer Version 8.80.2305
12/13/2019

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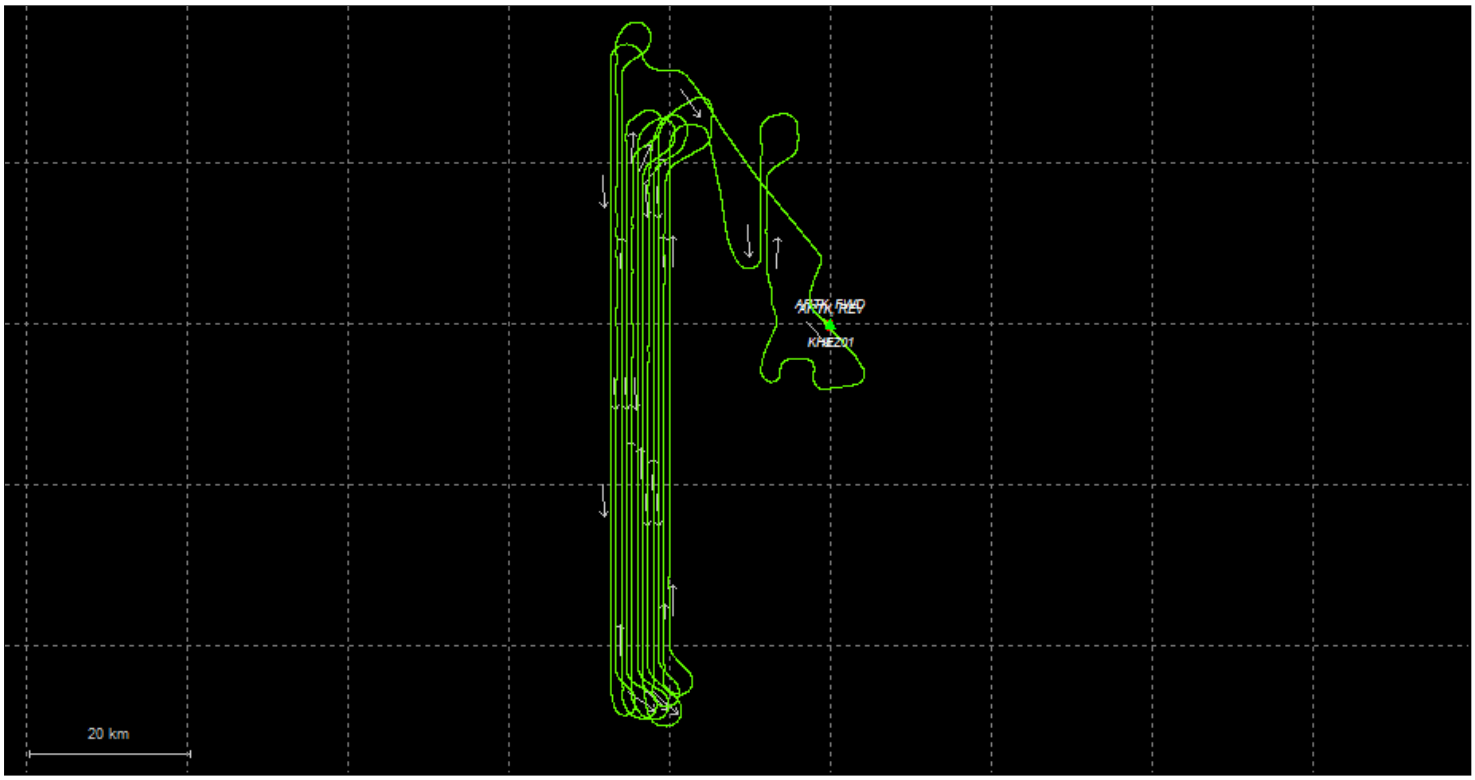
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |
|---|---|---|---|---|

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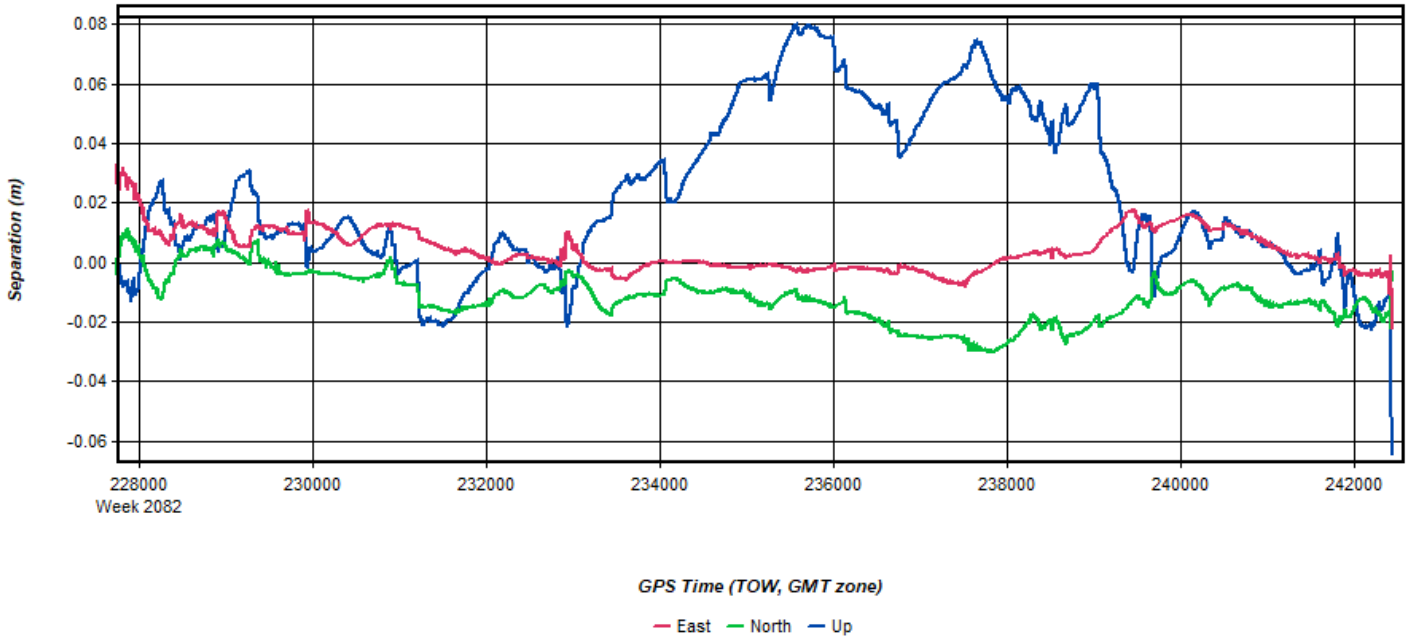
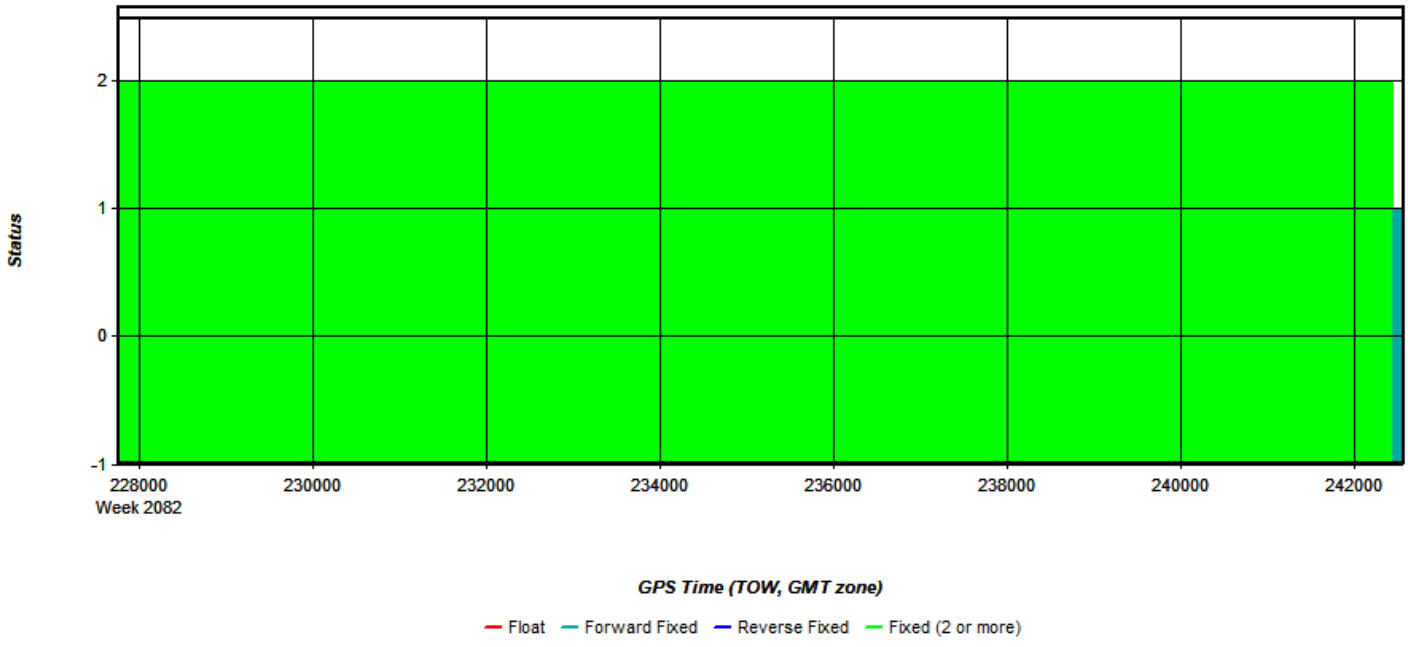
**Figure 2: 20191203151442 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



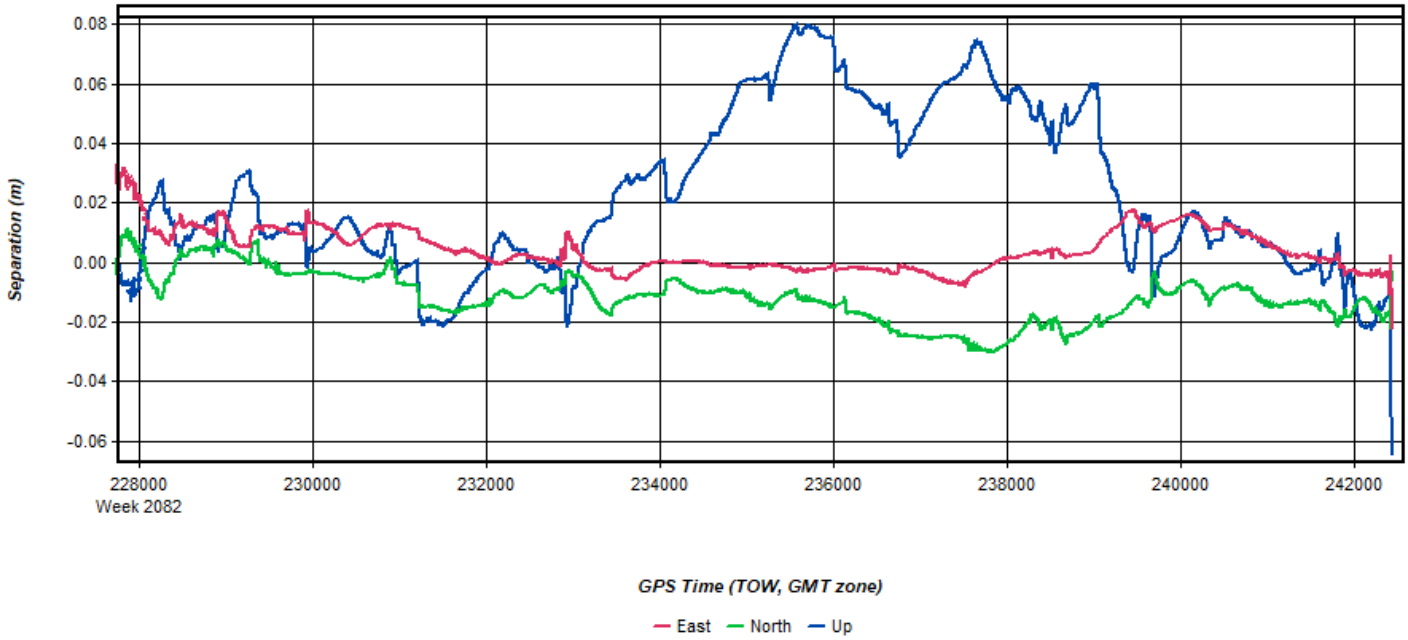

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 3: 20191203151442 [Smoothed TC Combined] - Float or Fixed Ambiguity**



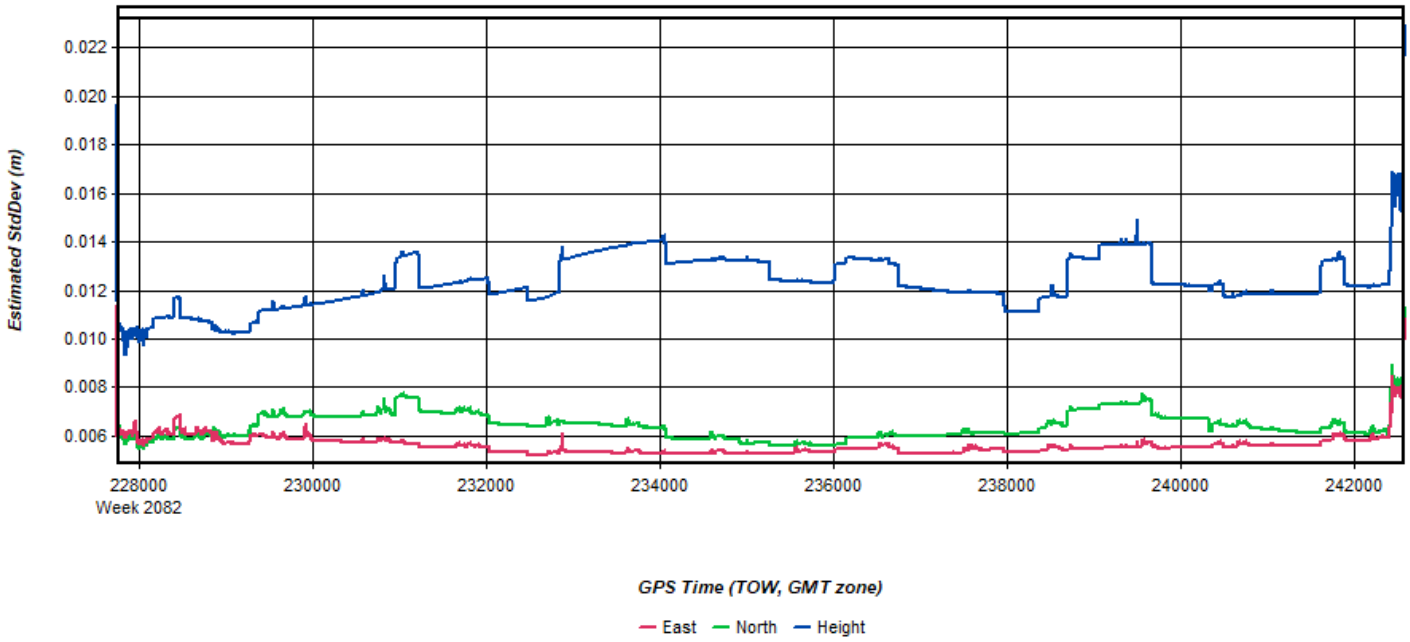

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 4: 20191203151442 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



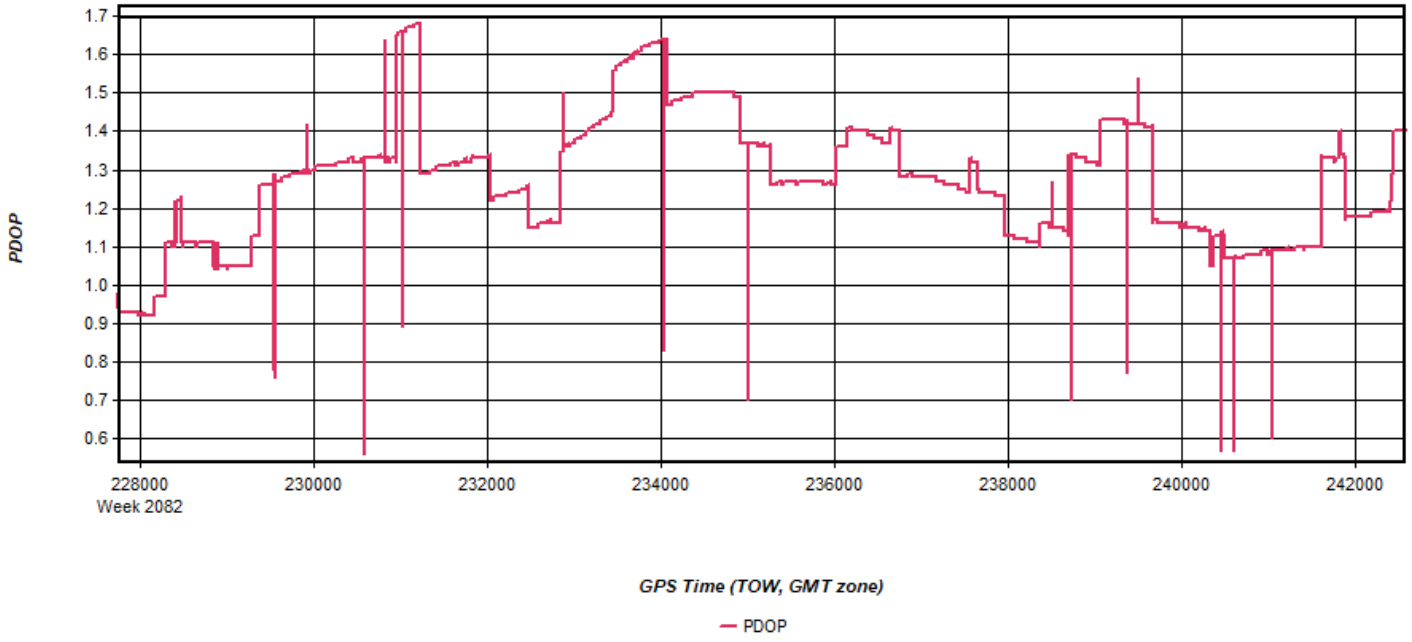

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 5: 20191203151442 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



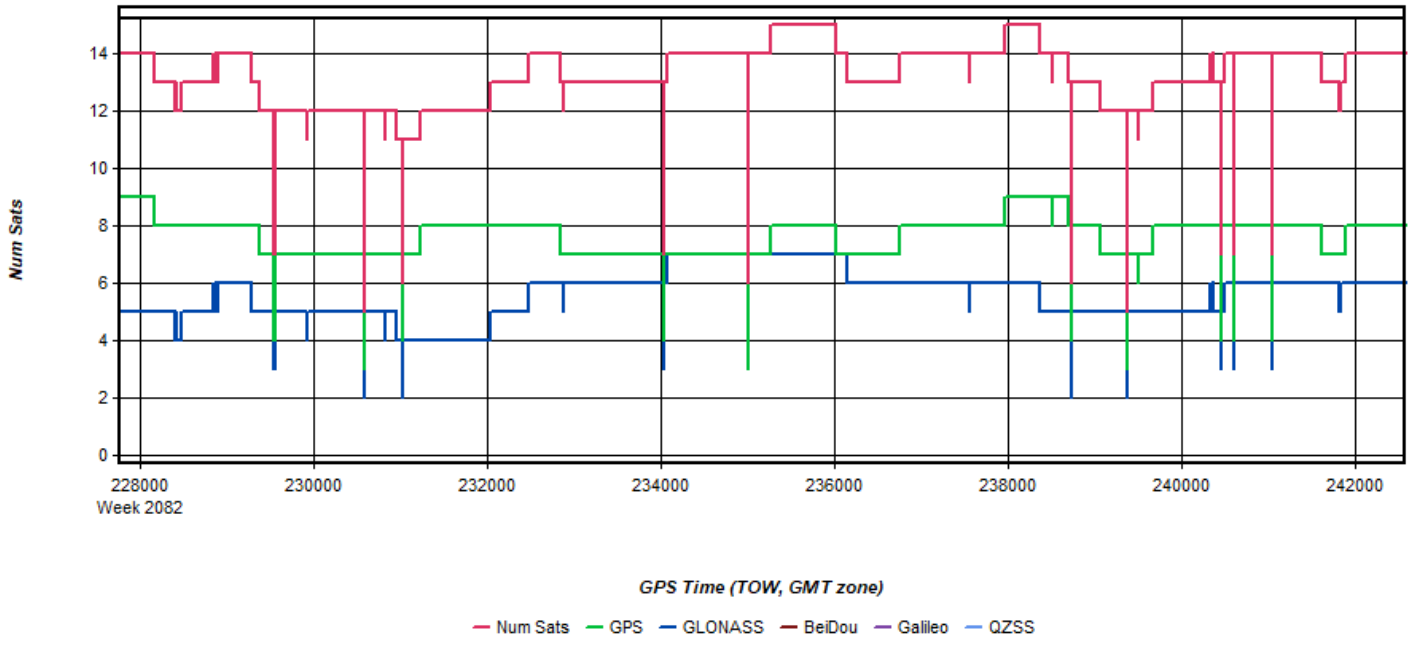

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 6: 20191203151442 [Smoothed TC Combined] - PDOP Plot**



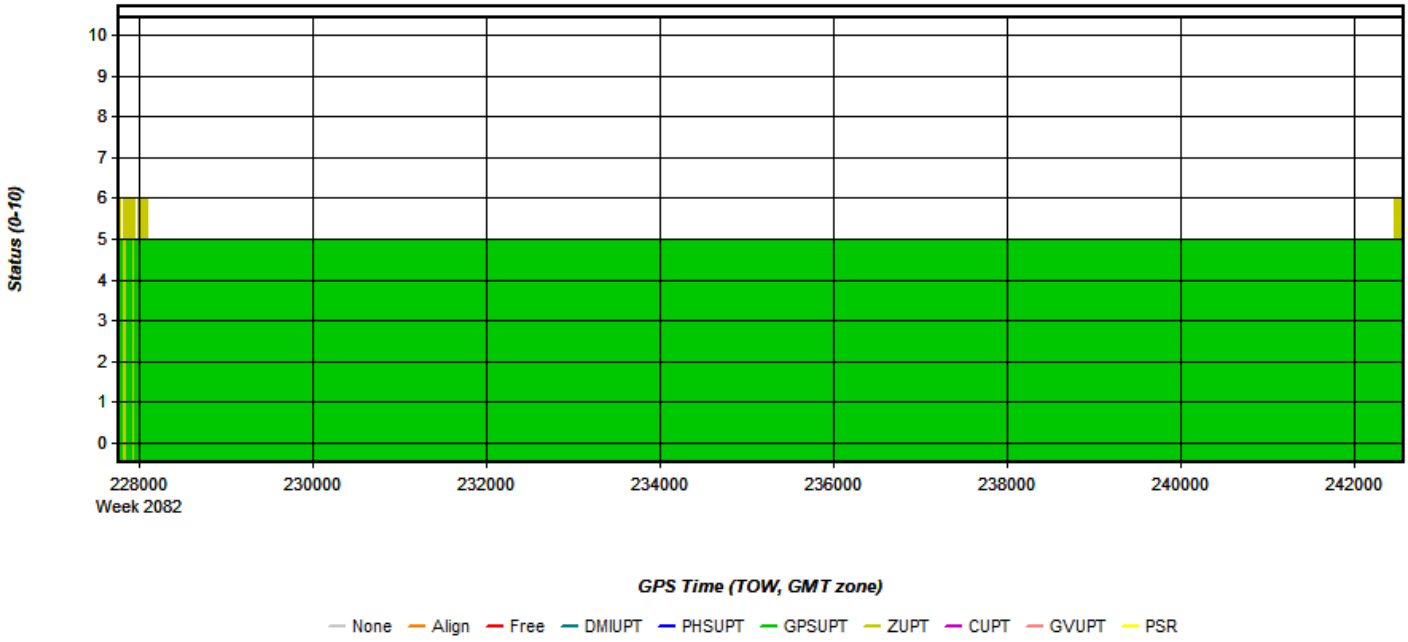

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 7: 20191203151442 [Smoothed TC Combined] - Number of Satellites Line Plot**



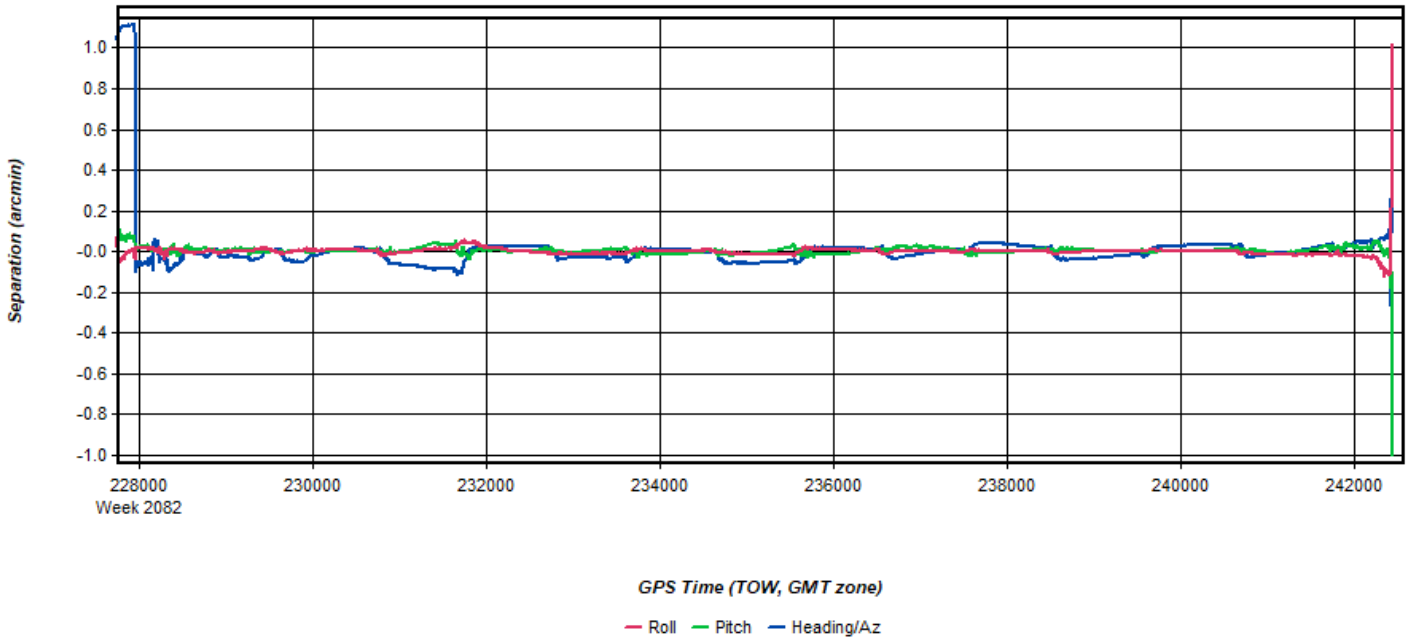

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 8: 20191203151442 [Smoothed TC Combined] - Status flag for IMU processing**



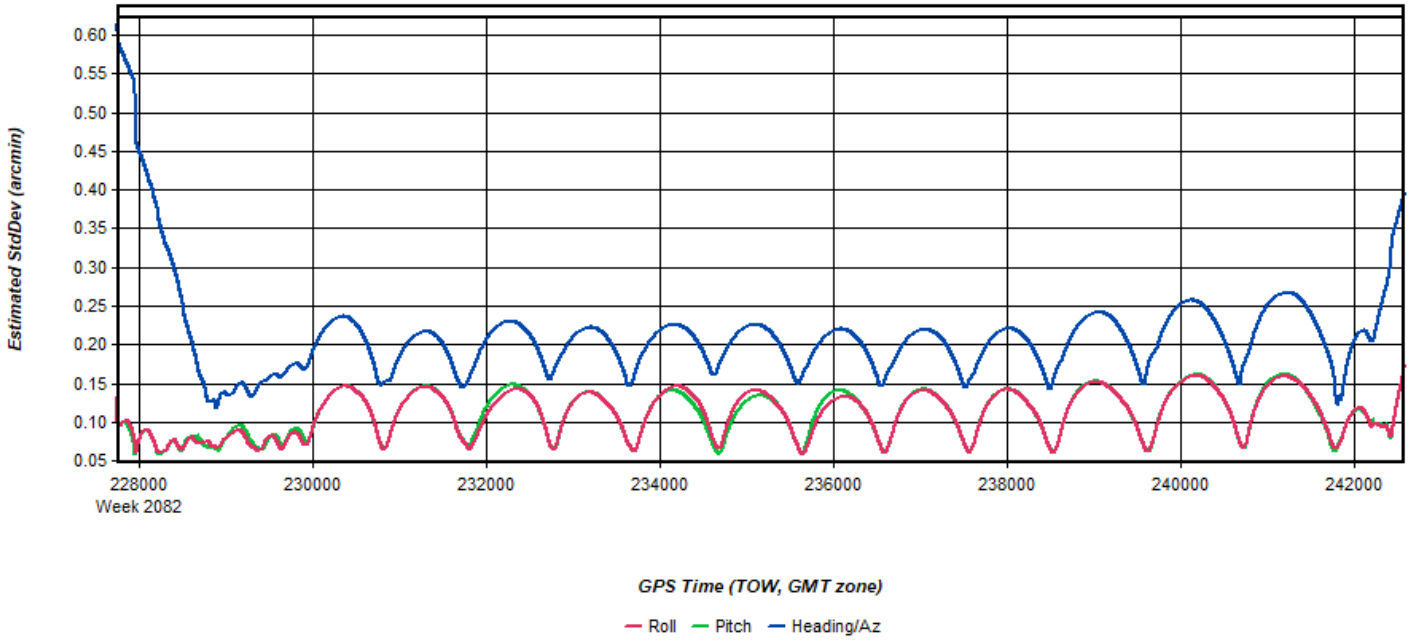

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 9: 20191203151442 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



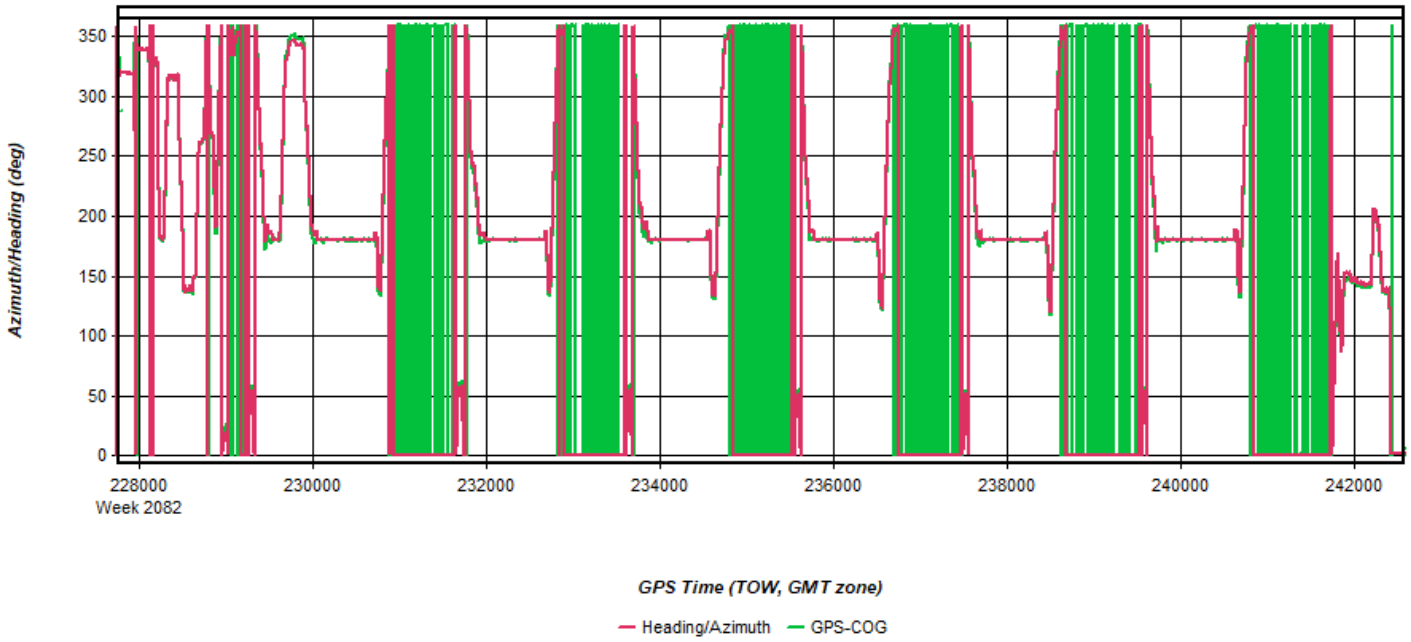

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 10: 20191203151442 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



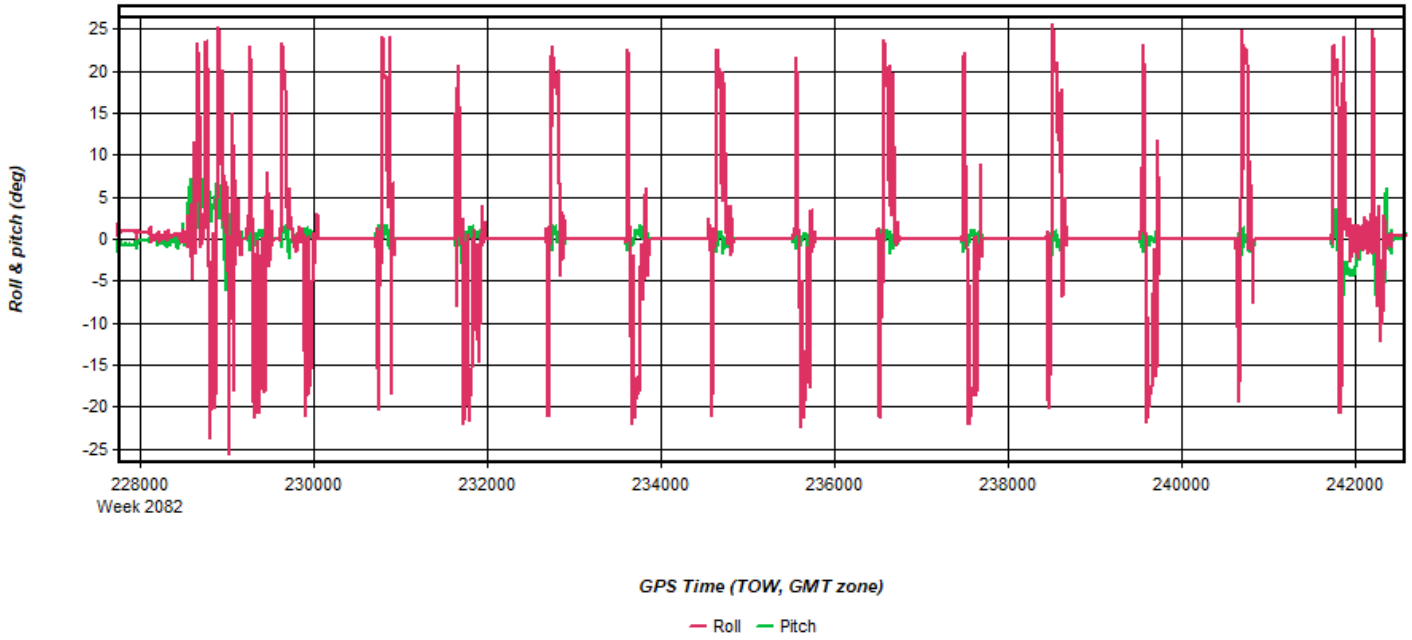

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 11: 20191203151442 [Smoothed TC Combined] - Azimuth Plot**



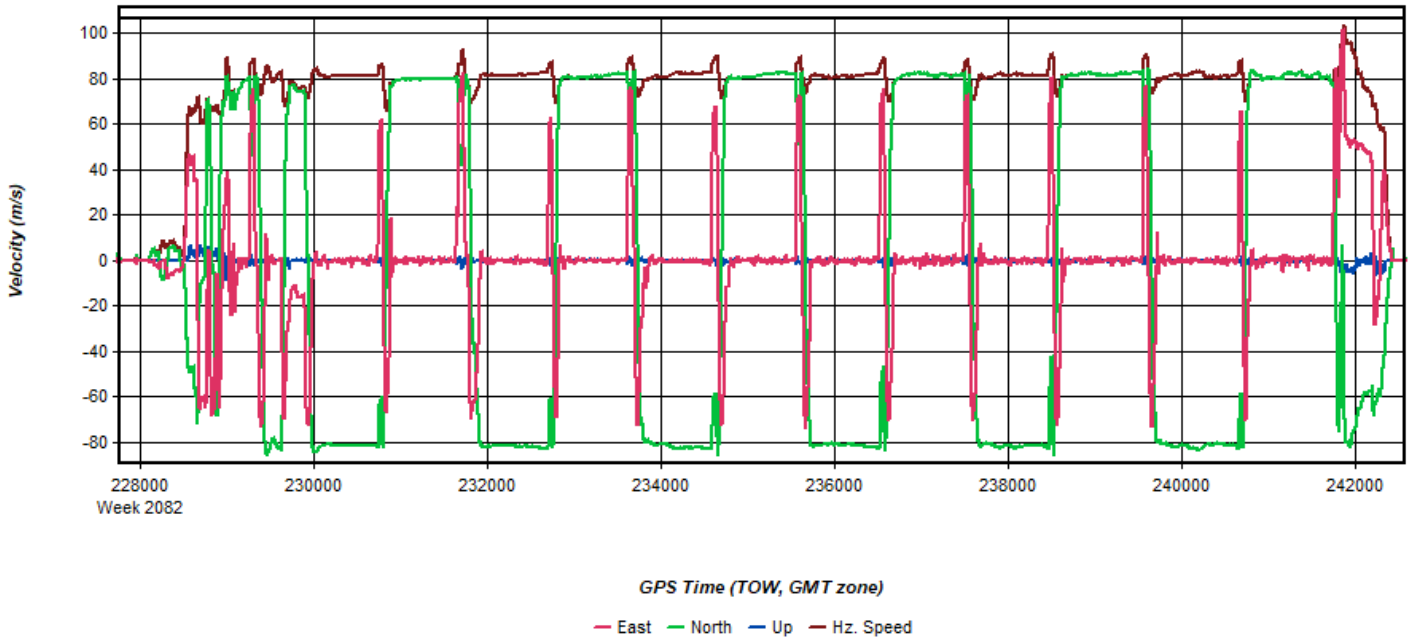

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 12: 20191203151442 [Smoothed TC Combined] - Roll & Pitch Plot**



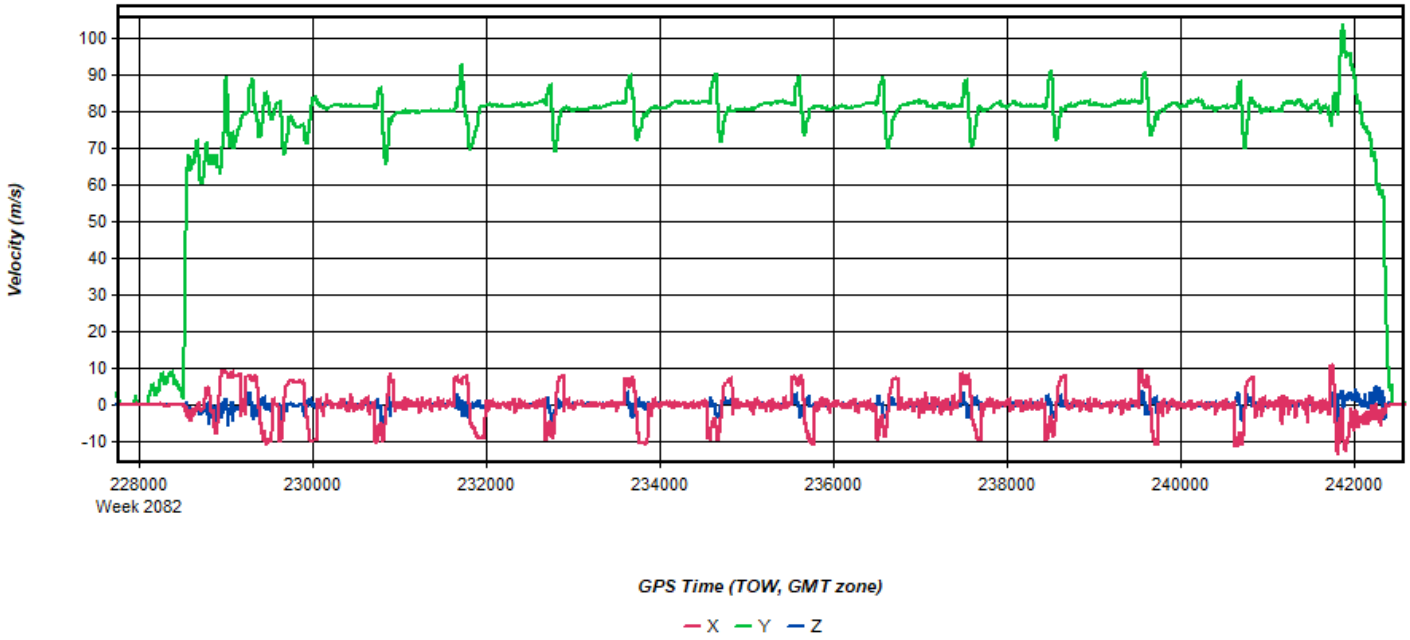

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 13: 20191203151442 [Smoothed TC Combined] - Velocity Profile Plot**



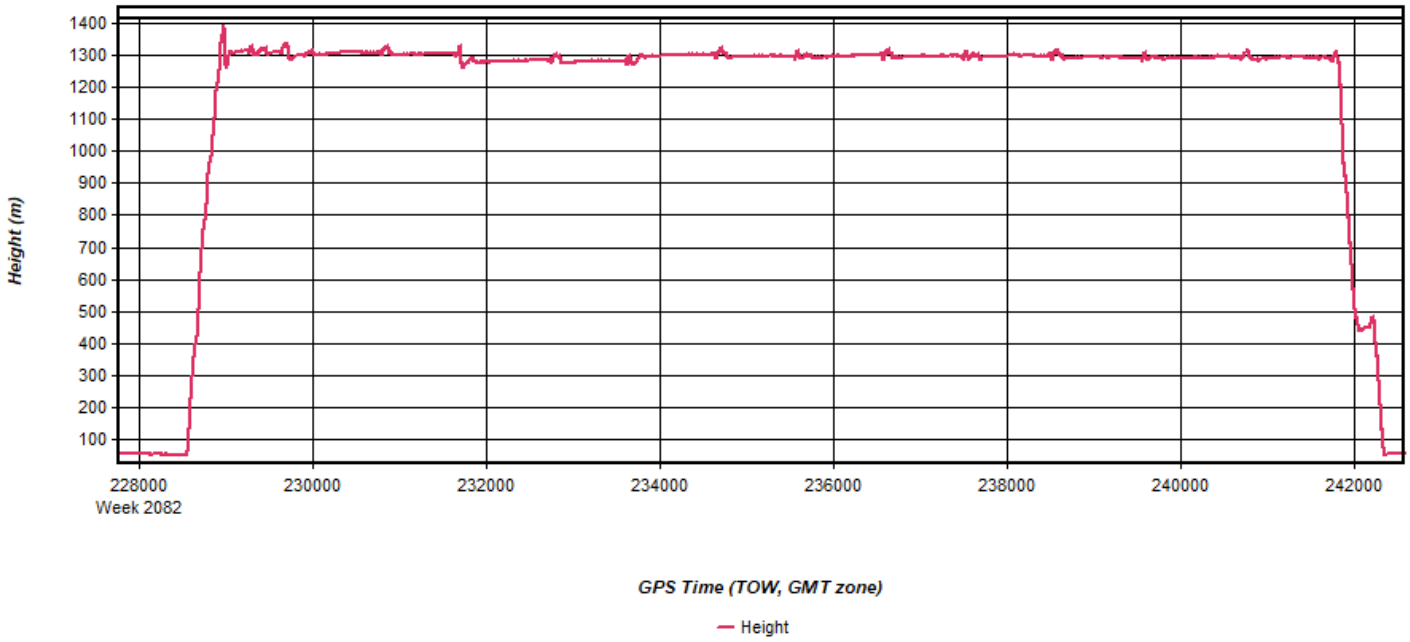

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 14: 20191203151442 [Smoothed TC Combined] - Body Frame Velocity Plot**



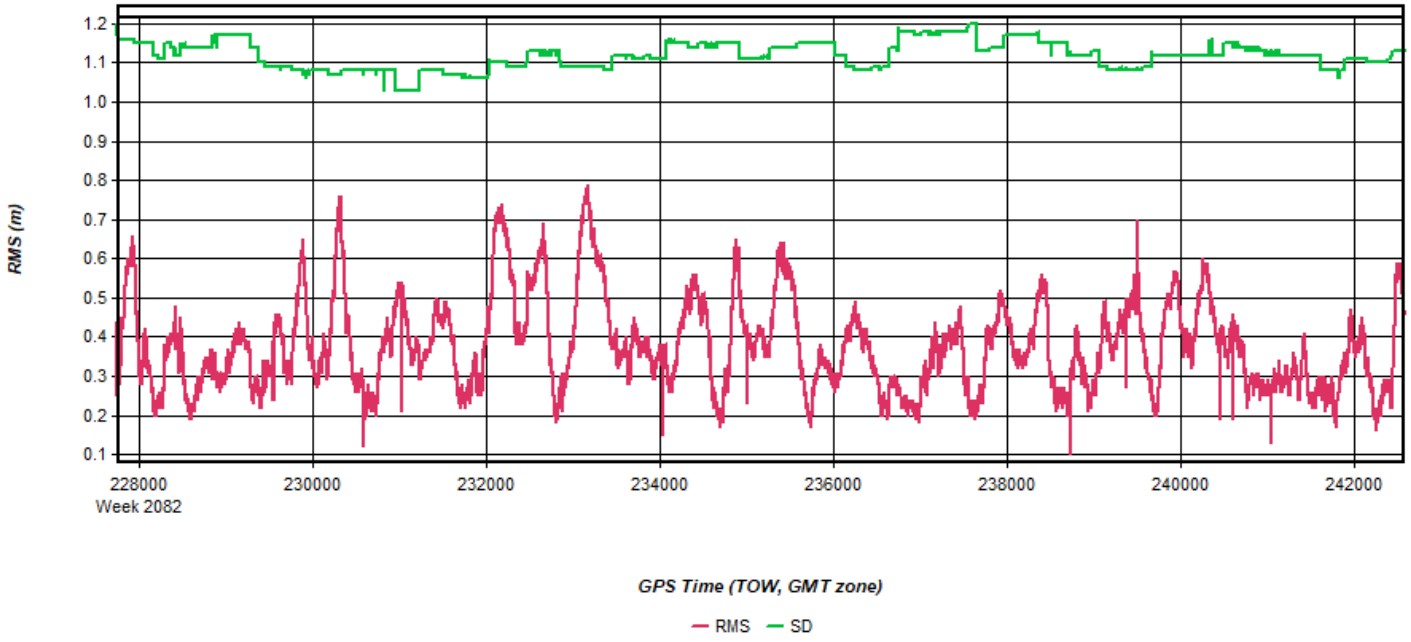

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 15: 20191203151442 [Smoothed TC Combined] - Height Profile Plot**



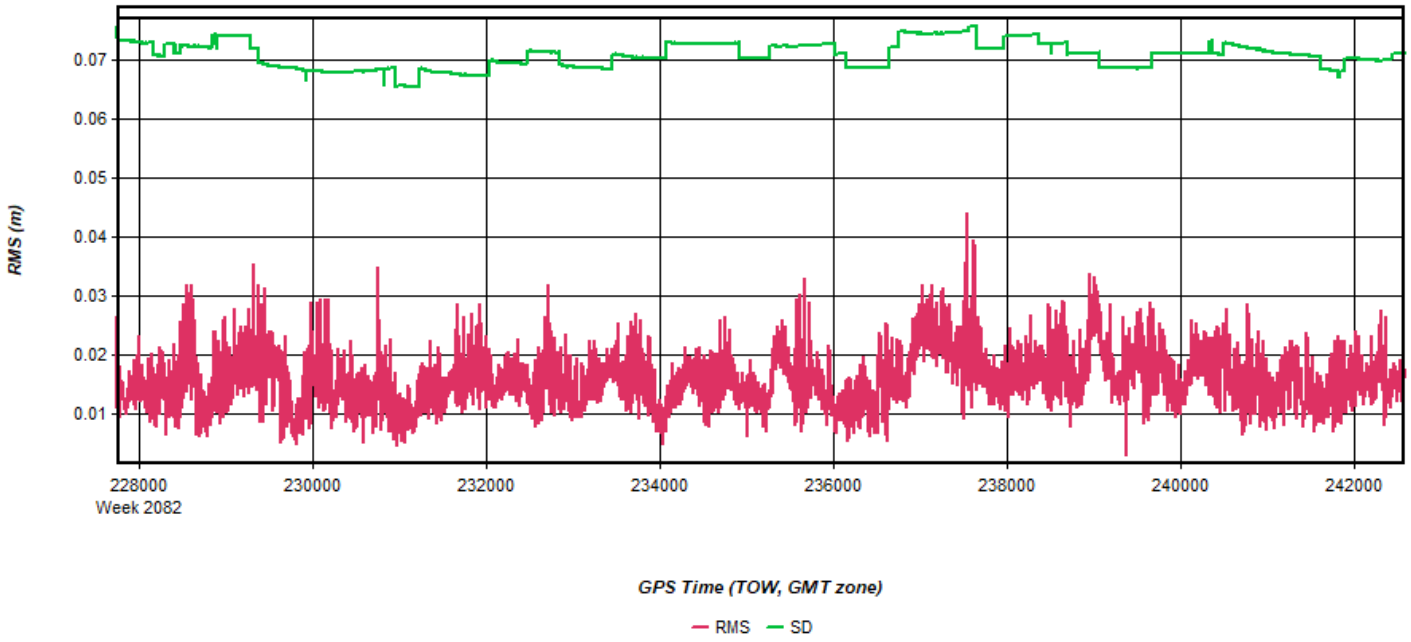

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 16: 20191203151442 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



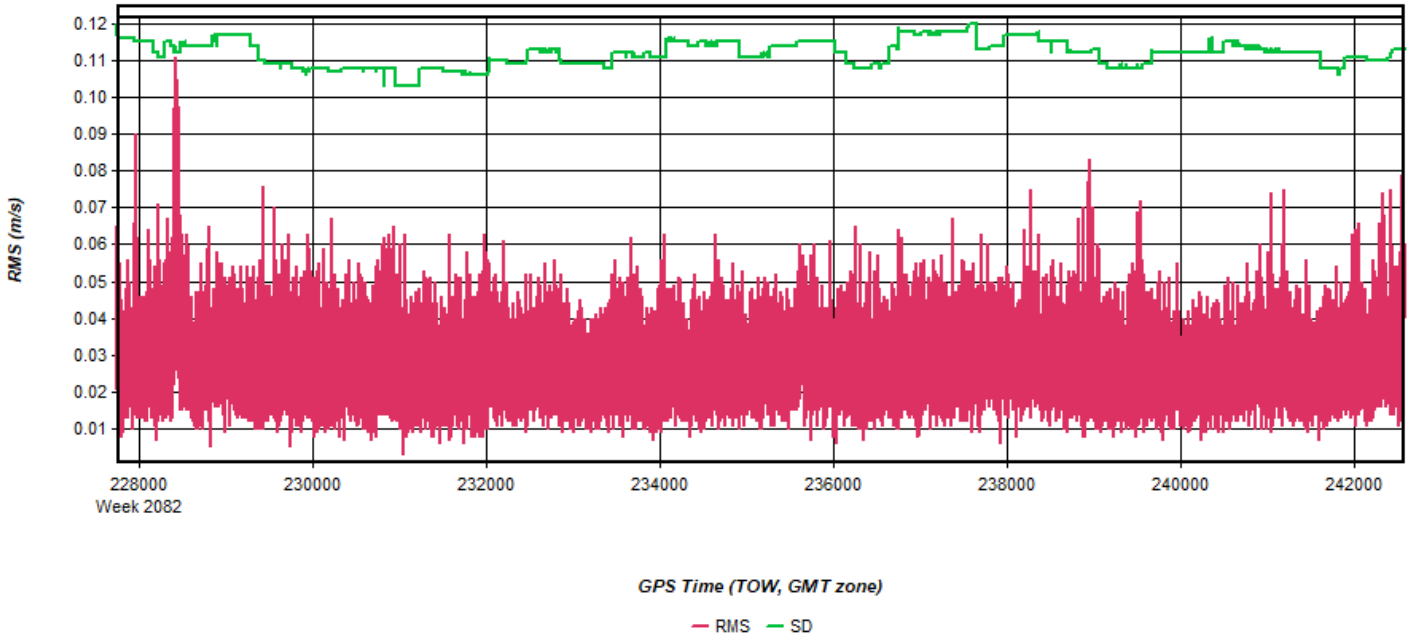

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 17: 20191203151442 [Smoothed TC Combined] - Carrier Residual RMS Plot**



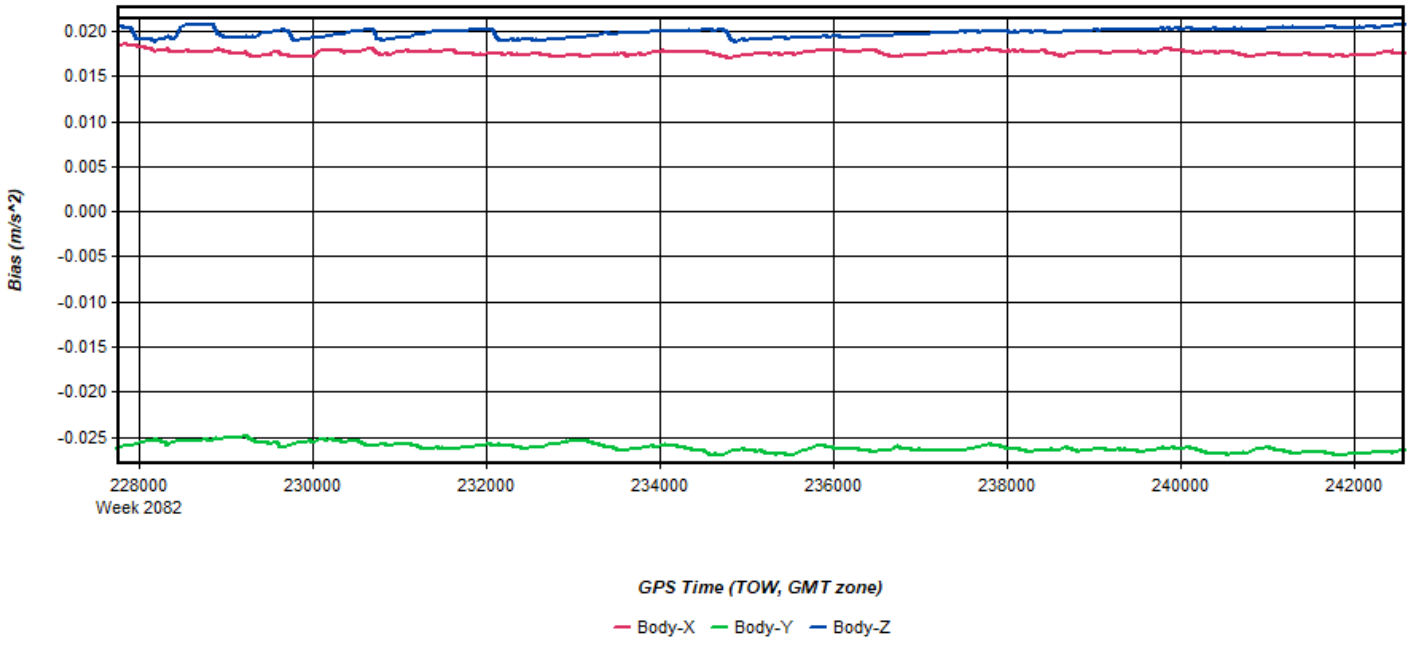

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 18: 20191203151442 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



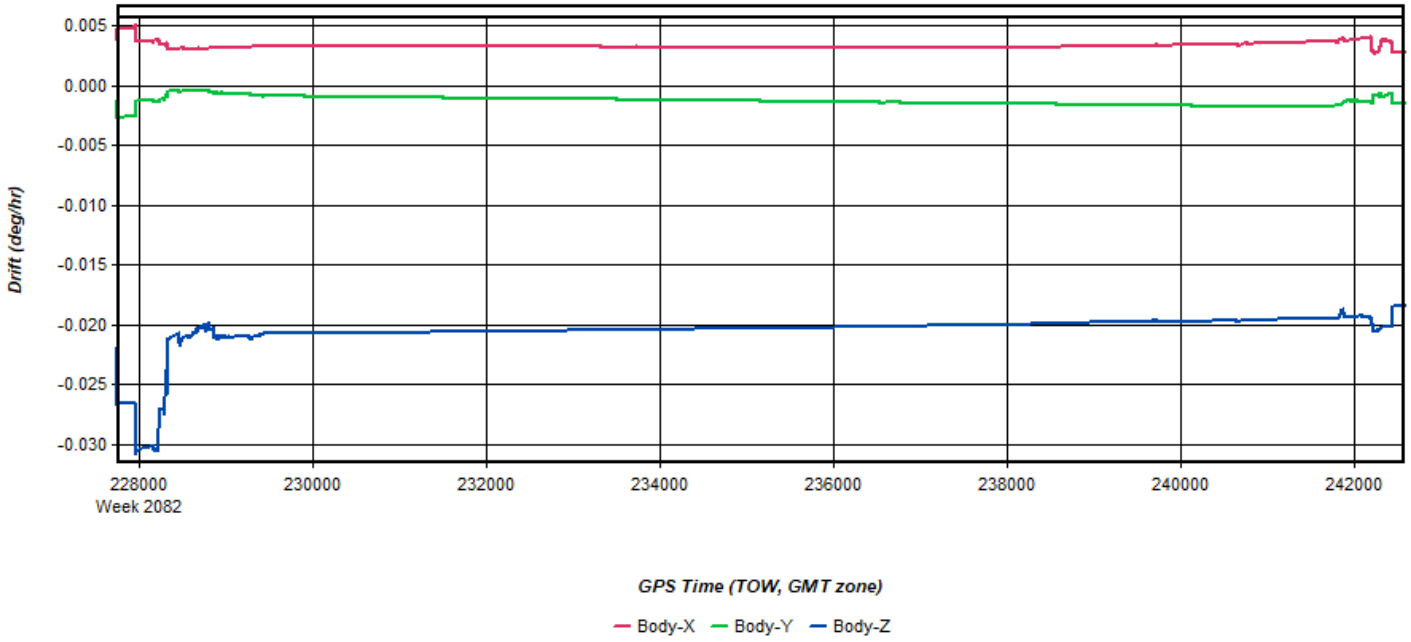

| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 19: 20191203151442 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

**Figure 20: 20191203151442 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191203151442 | by Unknown | on 12/13/2019 | at 15:20:58 |

# Output Results for 20191203211932

Inertial Explorer Version 8.80.2305
12/13/2019

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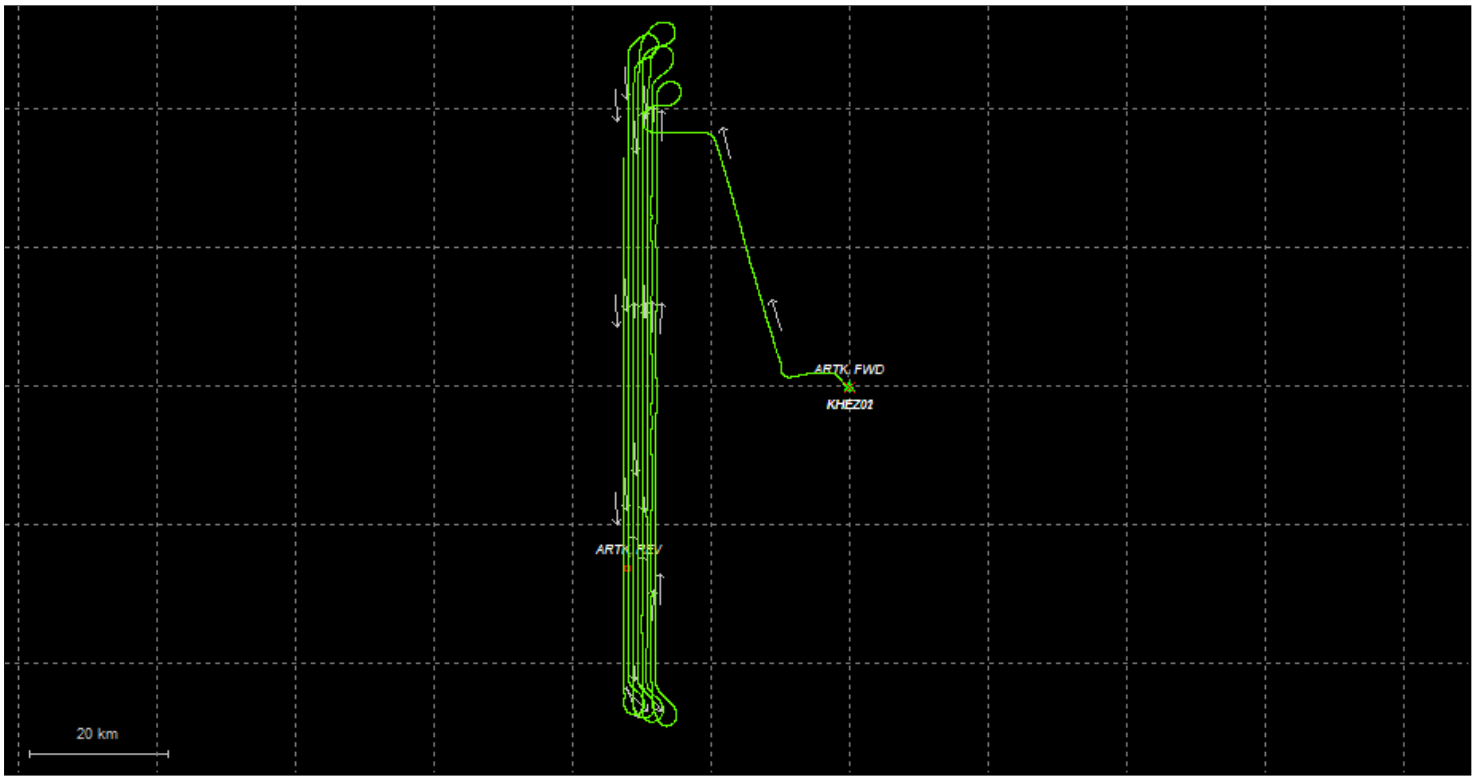
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |
|---|---|---|---|---|

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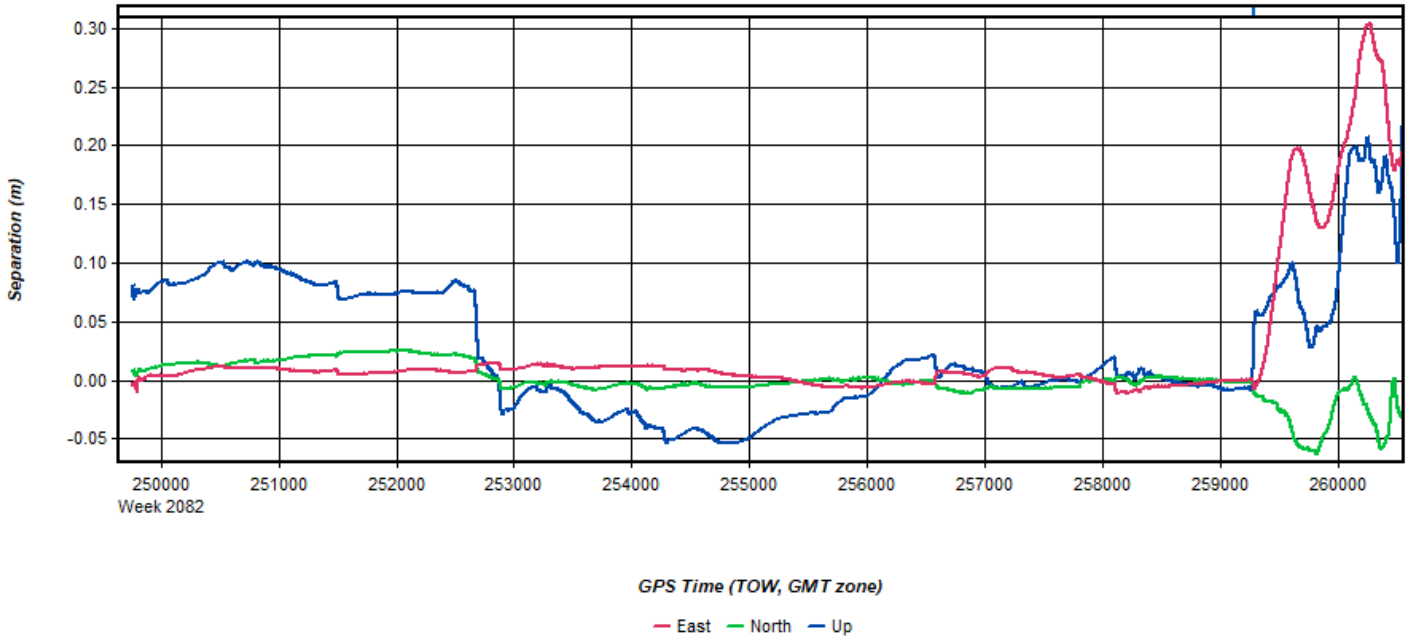
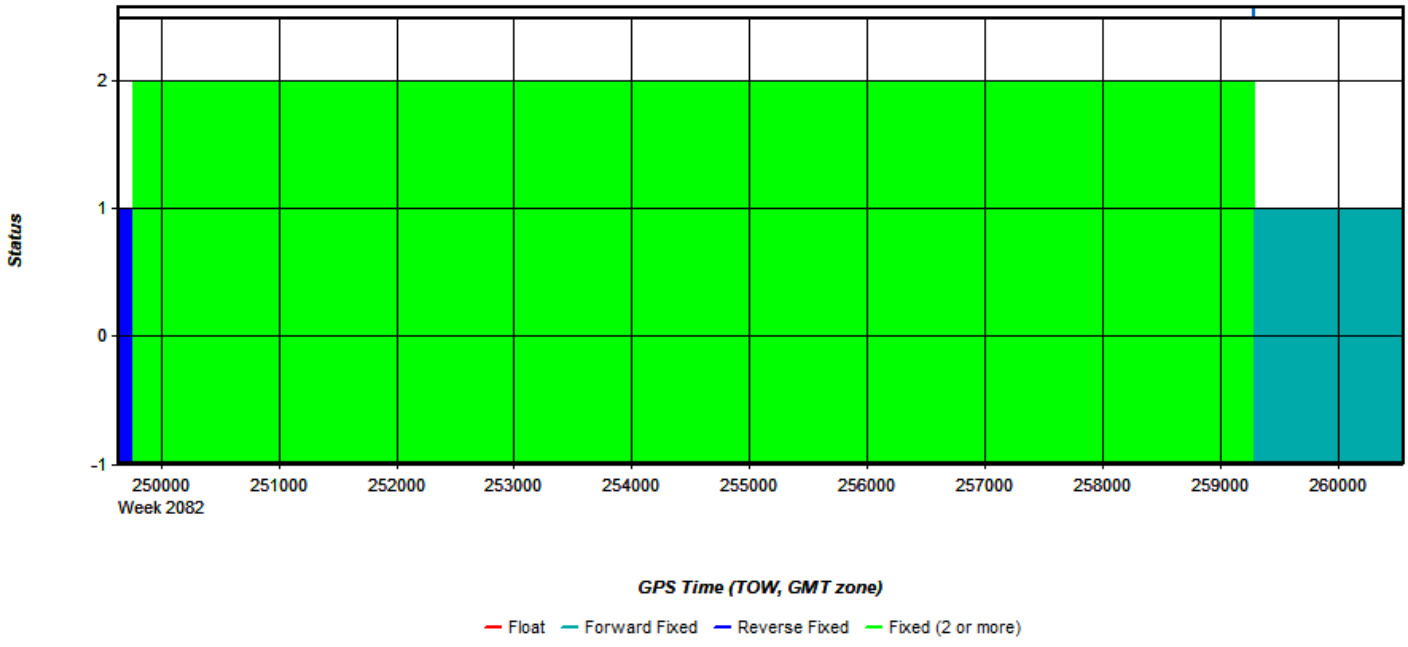
**Figure 2: 20191203211932 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



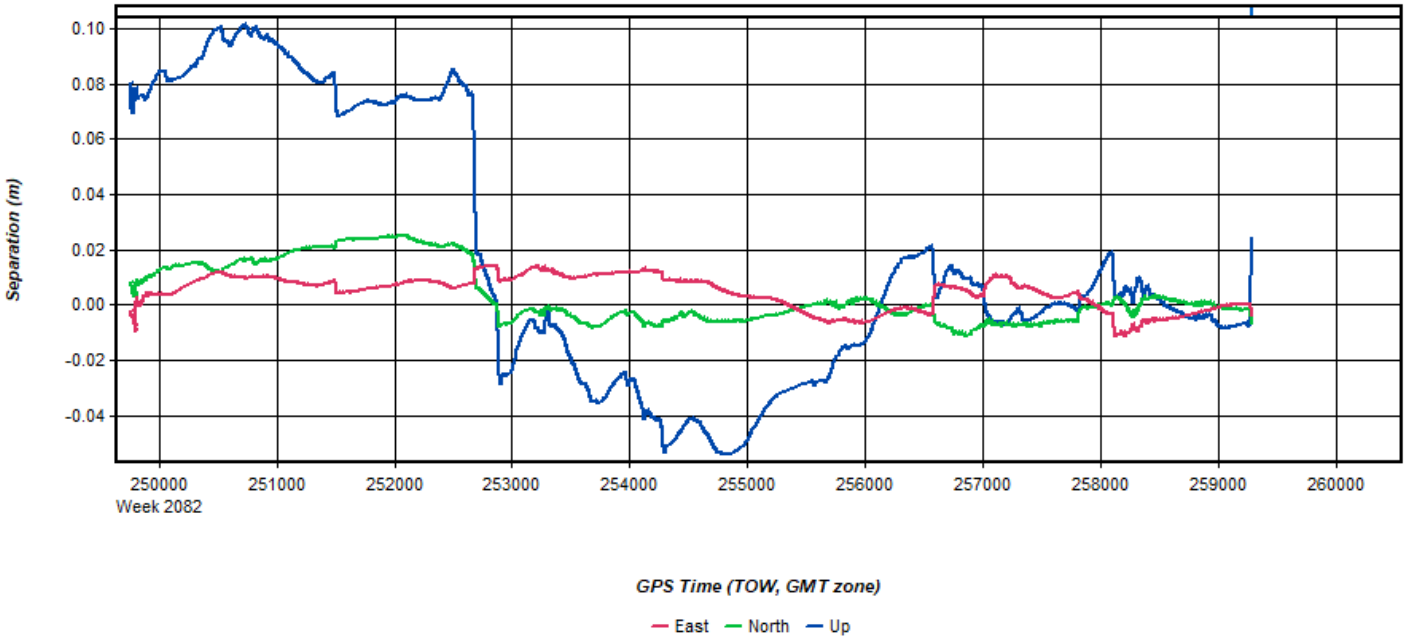

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 3: 20191203211932 [Smoothed TC Combined] - Float or Fixed Ambiguity**



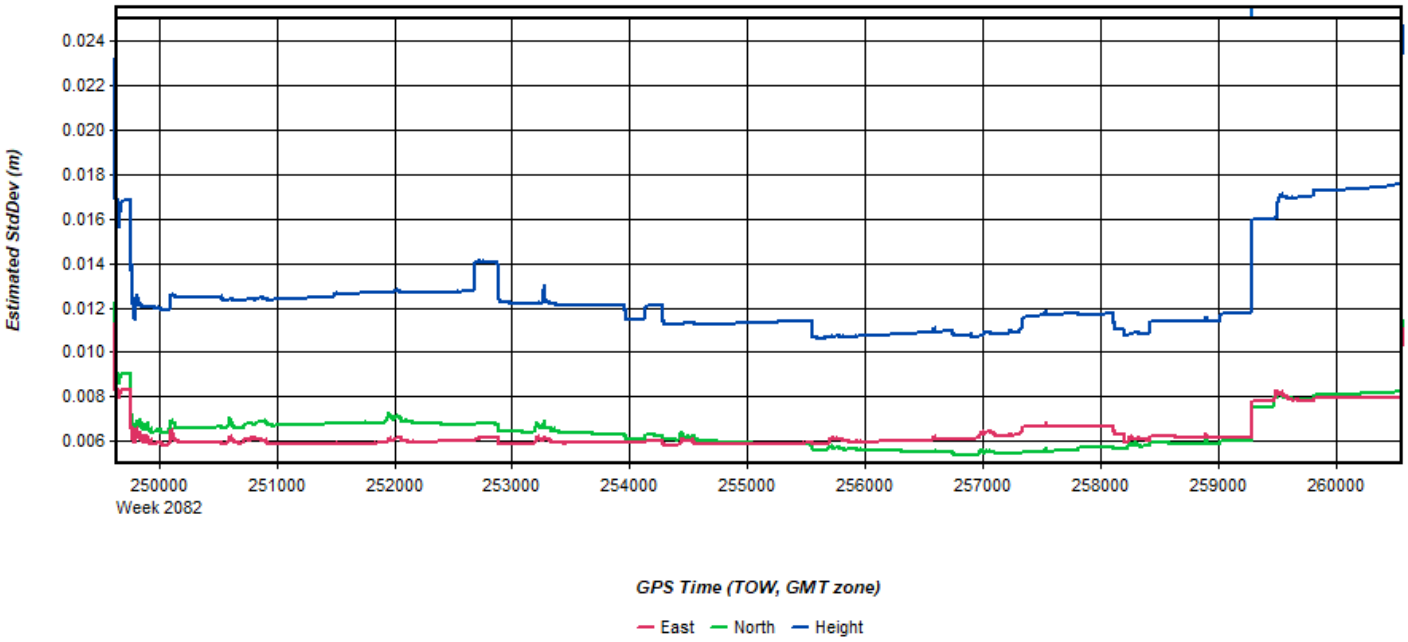

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 4: 20191203211932 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



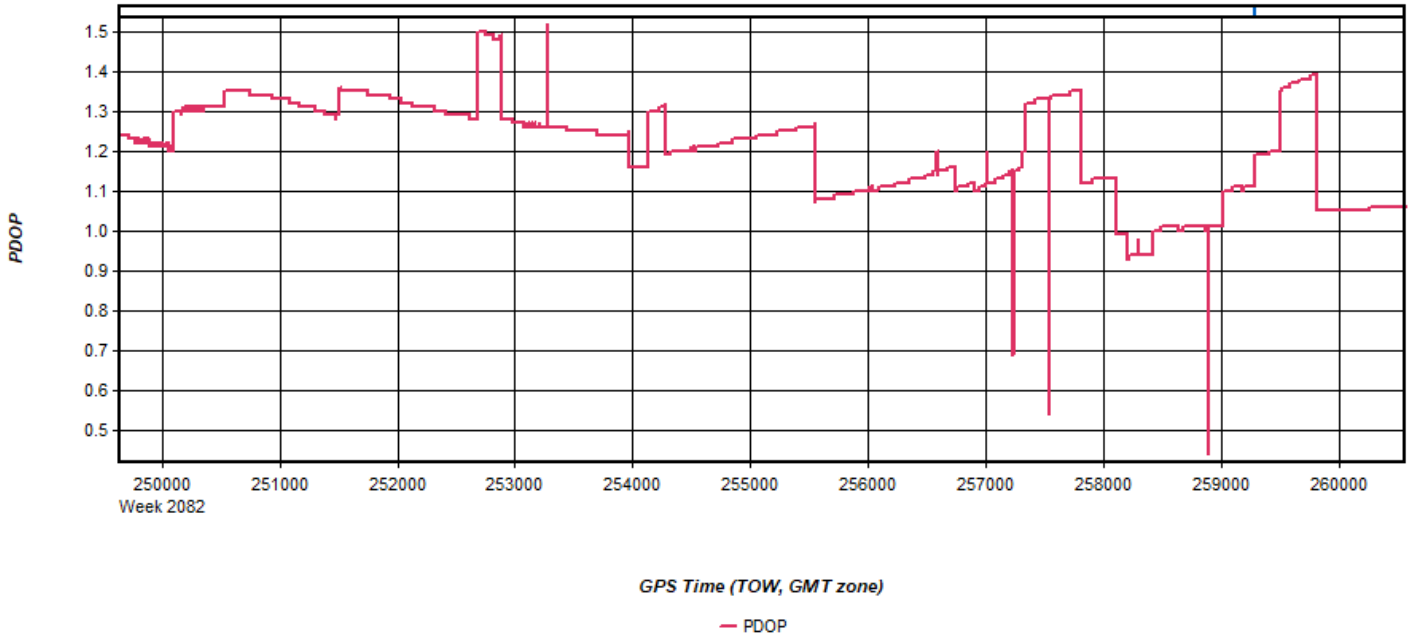

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 5: 20191203211932 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



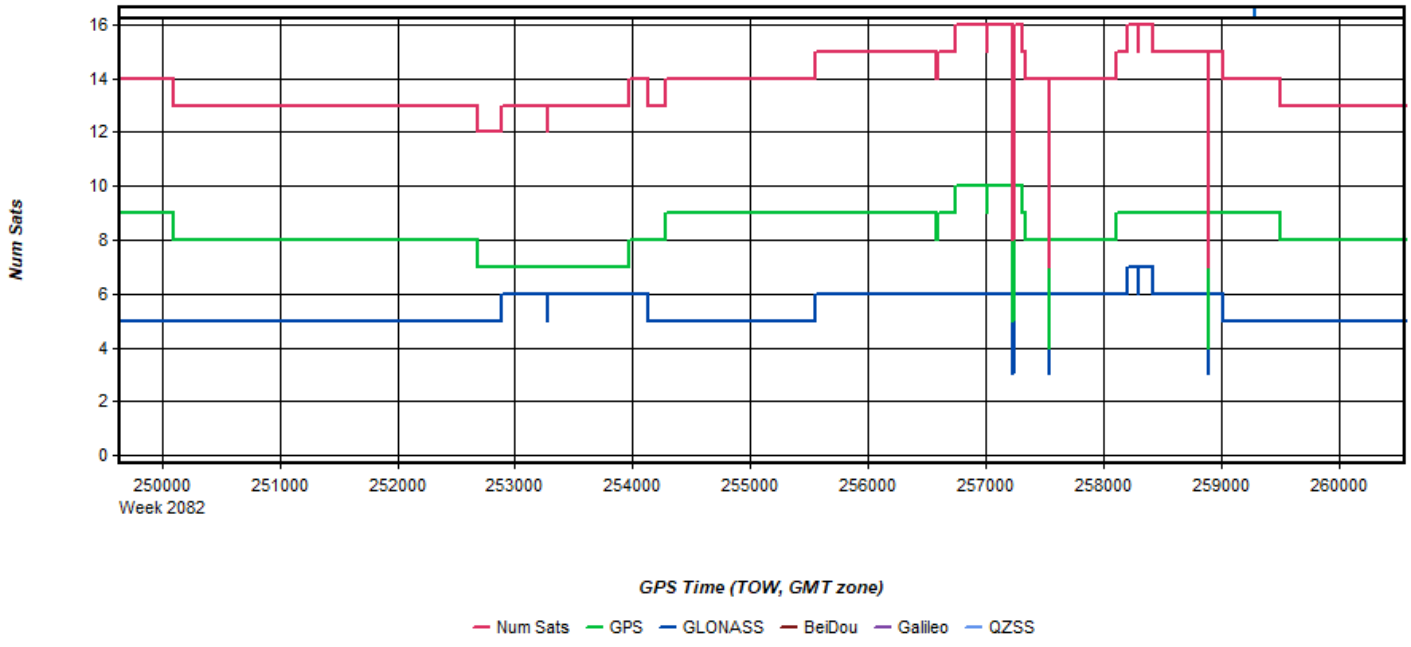

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 6: 20191203211932 [Smoothed TC Combined] - PDOP Plot**



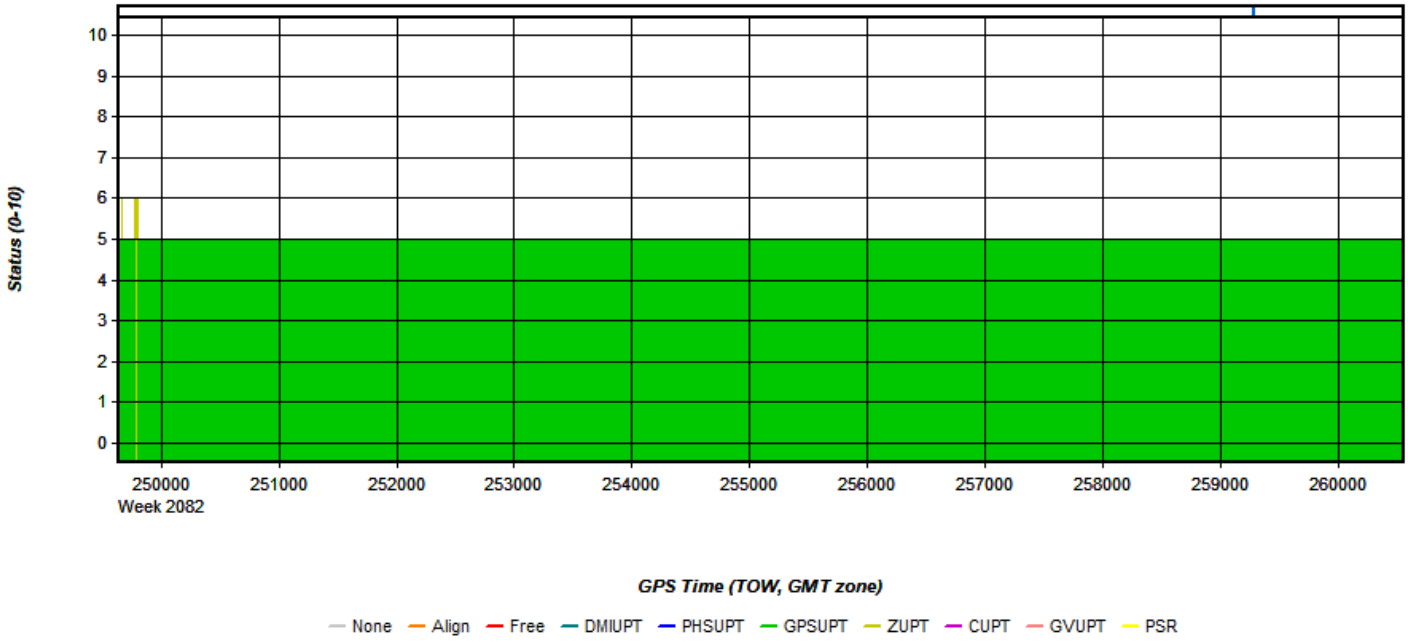

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 7: 20191203211932 [Smoothed TC Combined] - Number of Satellites Line Plot**



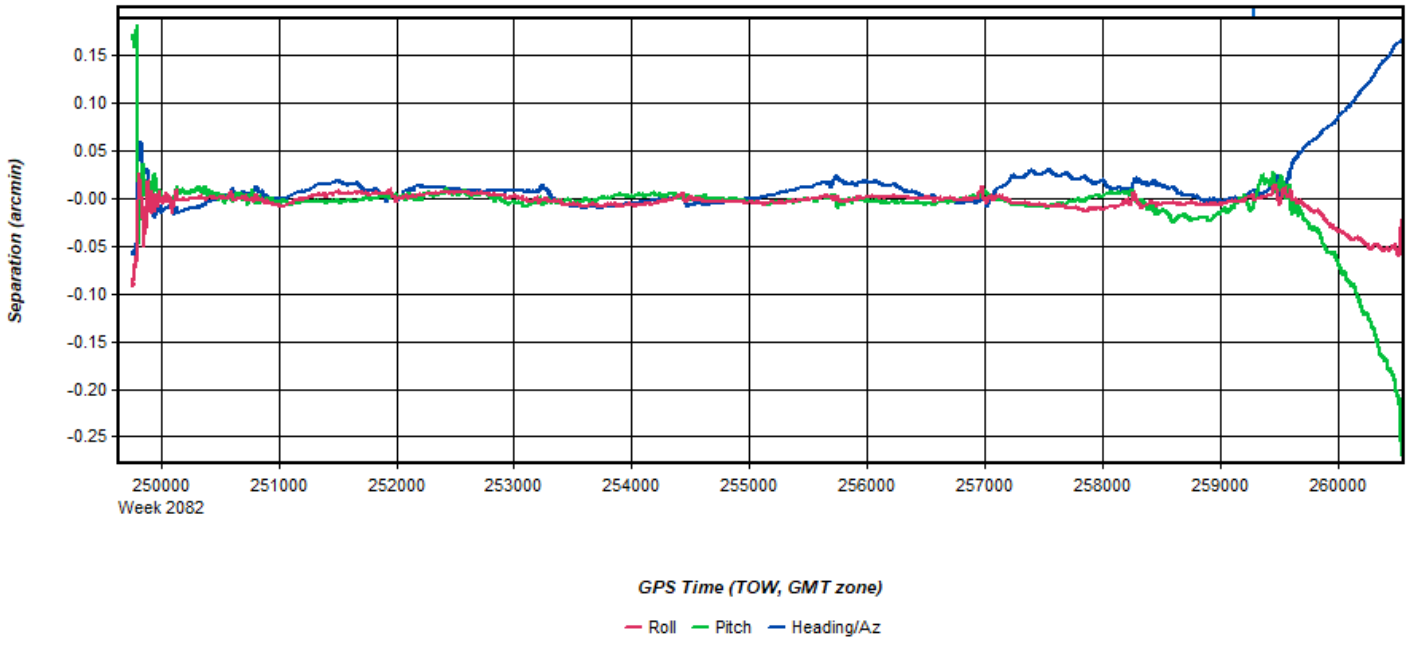

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 8: 20191203211932 [Smoothed TC Combined] - Status flag for IMU processing**



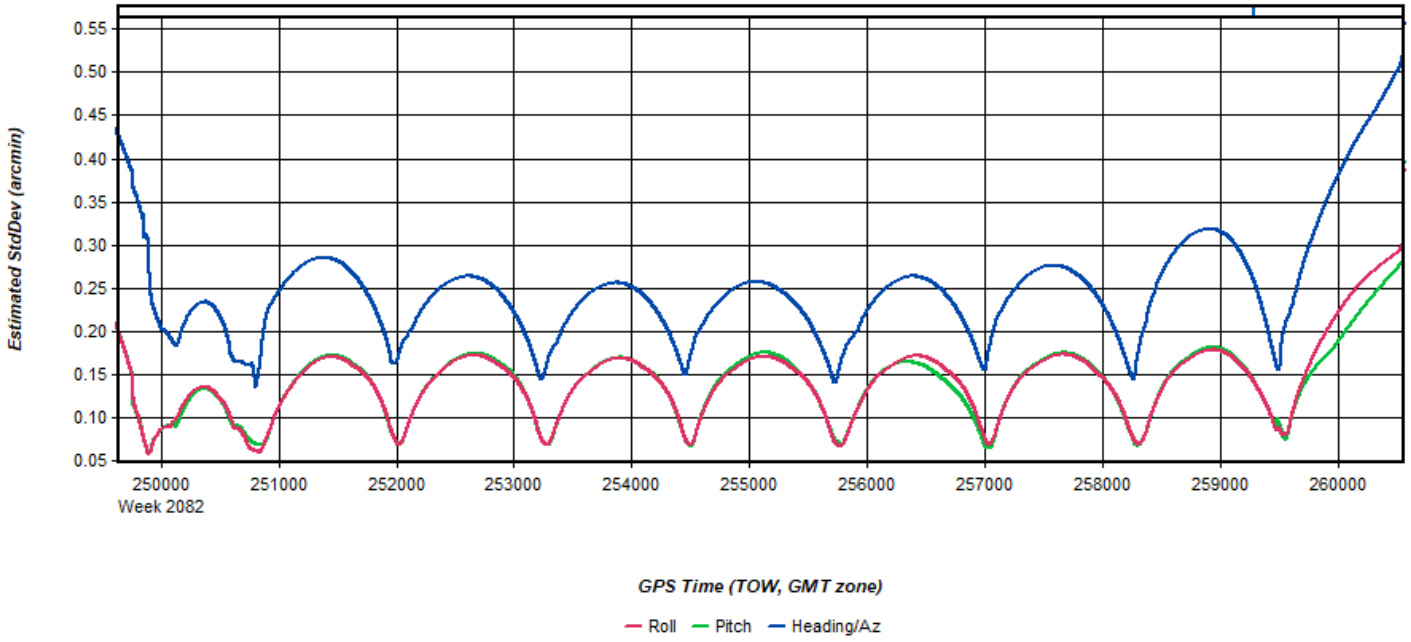

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 9: 20191203211932 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



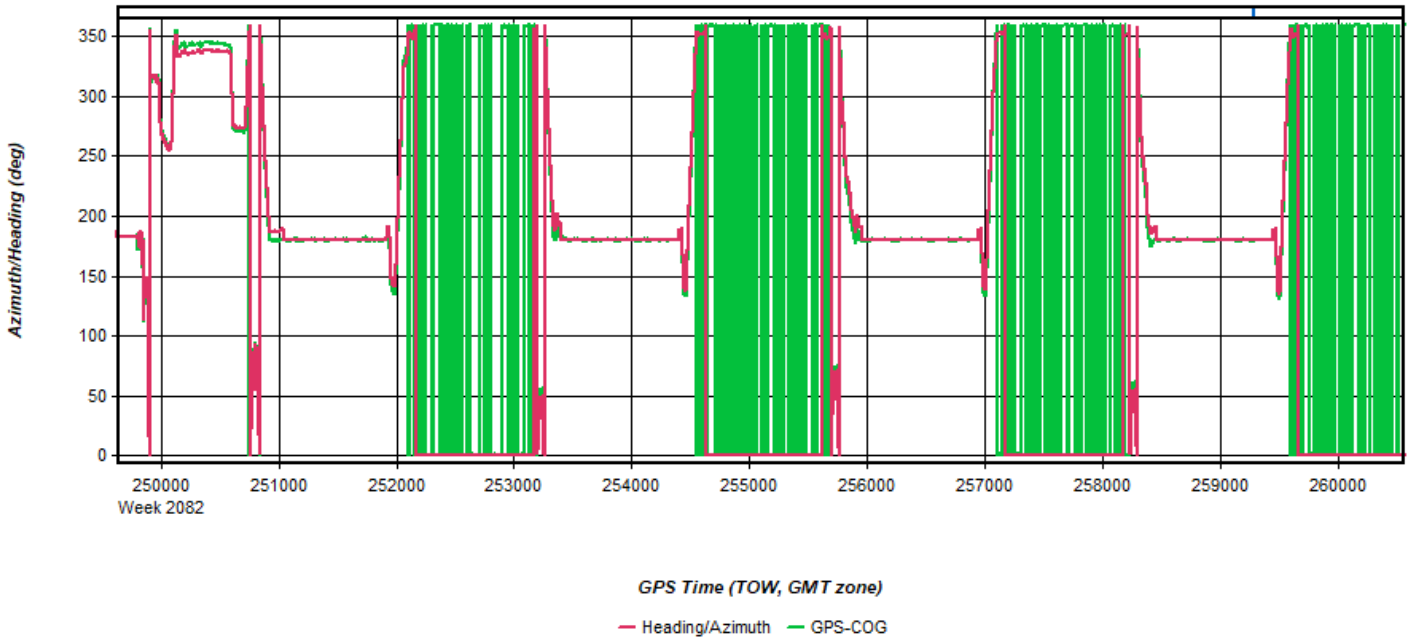

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 10: 20191203211932 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



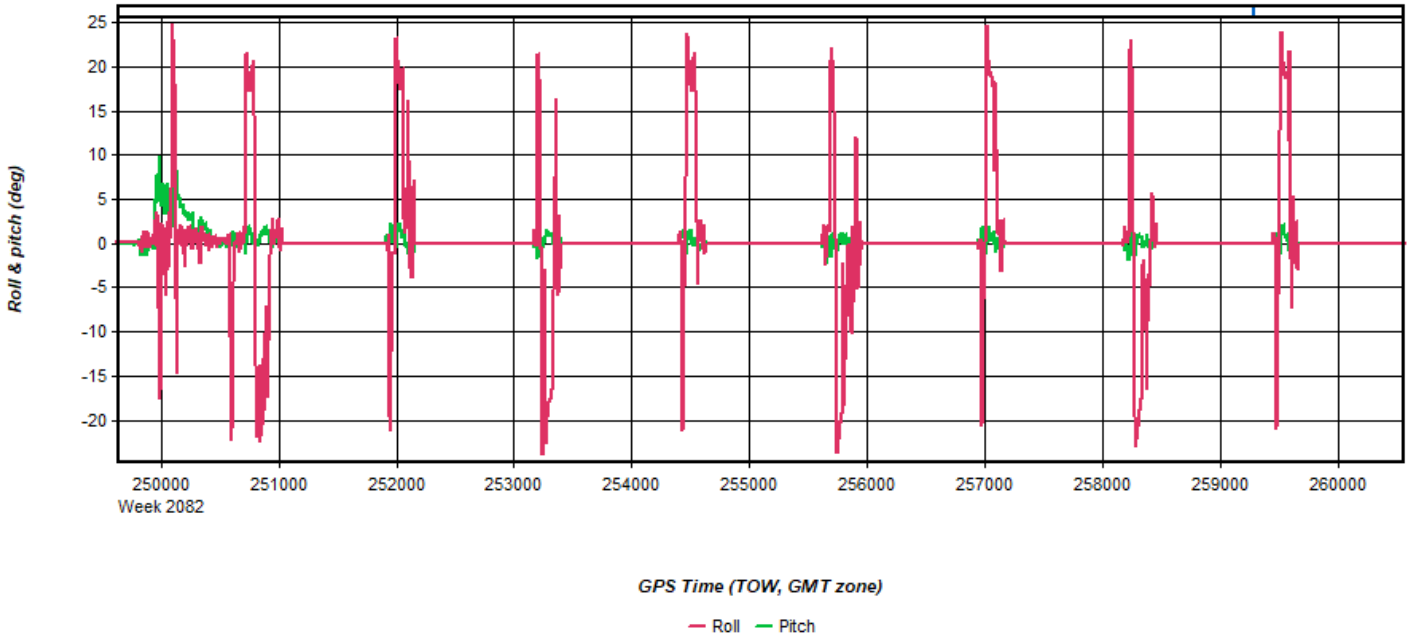

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 11: 20191203211932 [Smoothed TC Combined] - Azimuth Plot**



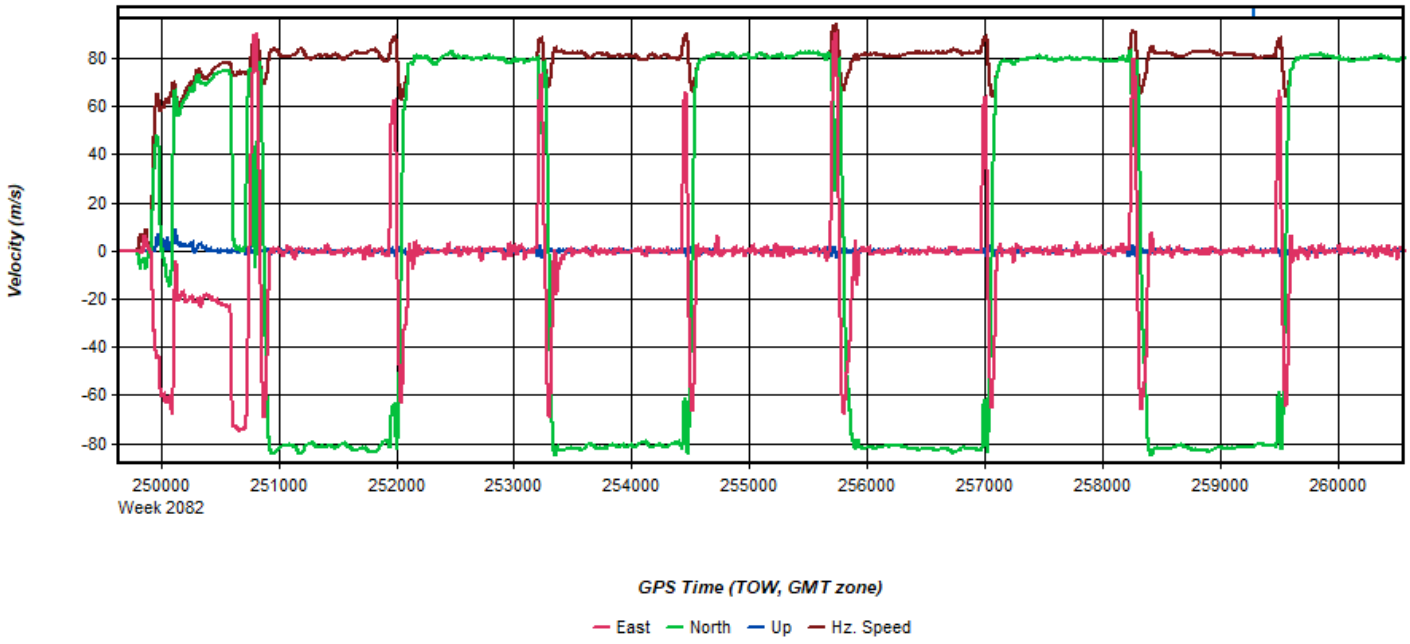

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 12: 20191203211932 [Smoothed TC Combined] - Roll & Pitch Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 13: 20191203211932 [Smoothed TC Combined] - Velocity Profile Plot**

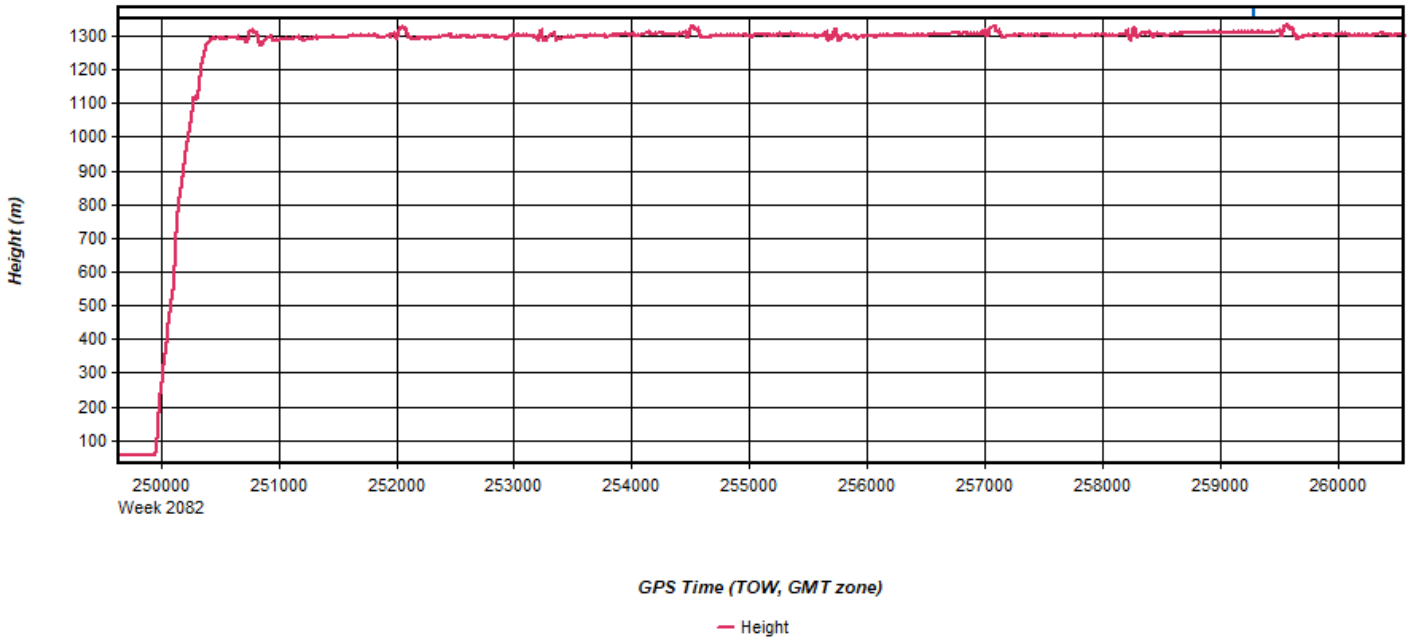



| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 14: 20191203211932 [Smoothed TC Combined] - Body Frame Velocity Plot**

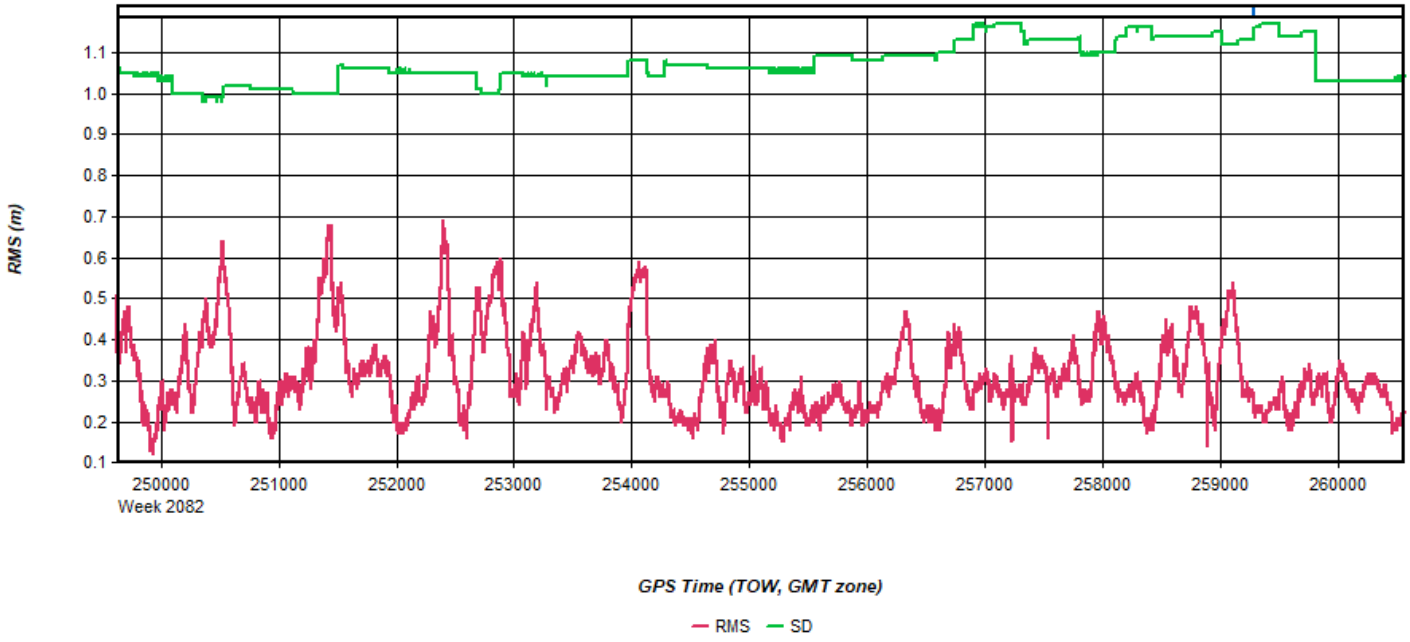

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 15: 20191203211932 [Smoothed TC Combined] - Height Profile Plot**



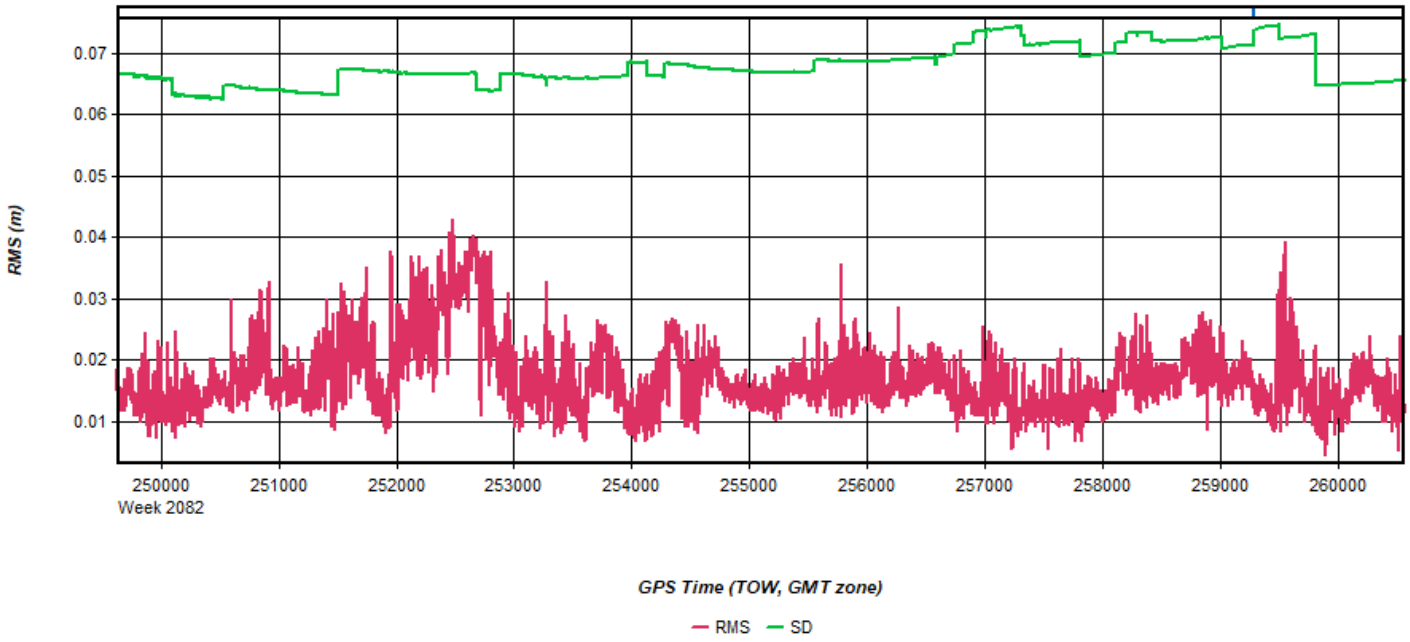

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 16: 20191203211932 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



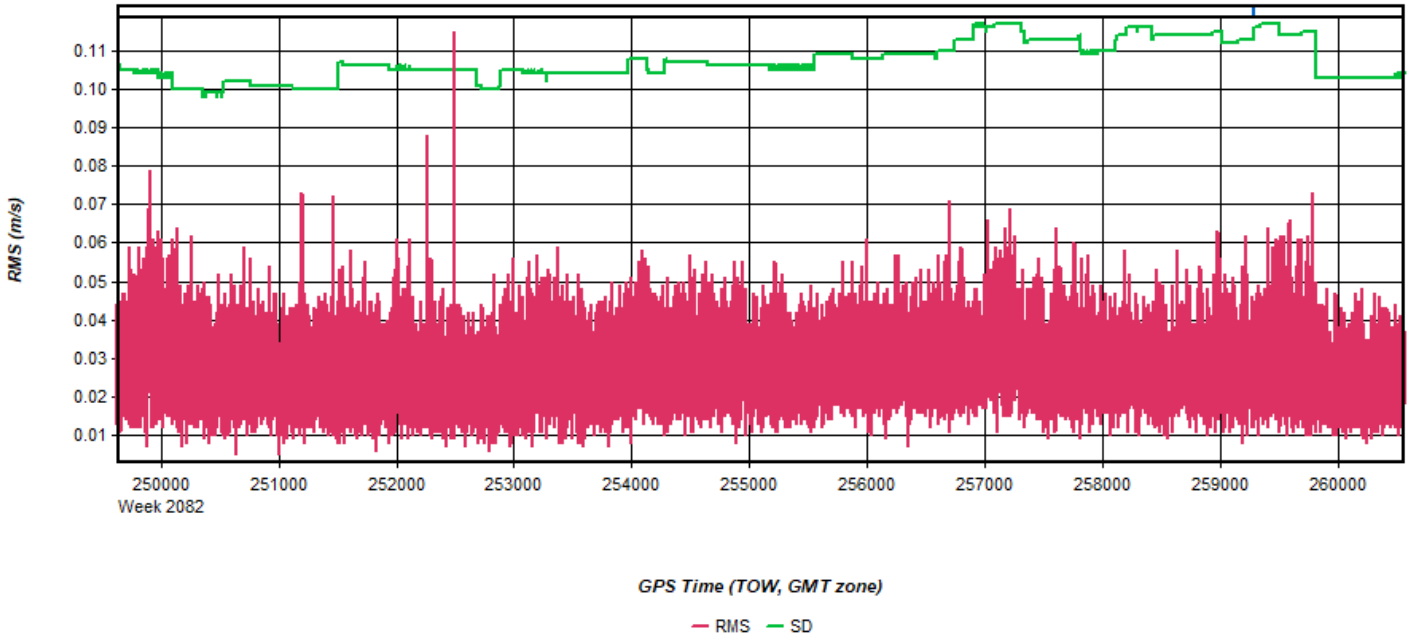

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 17: 20191203211932 [Smoothed TC Combined] - Carrier Residual RMS Plot**



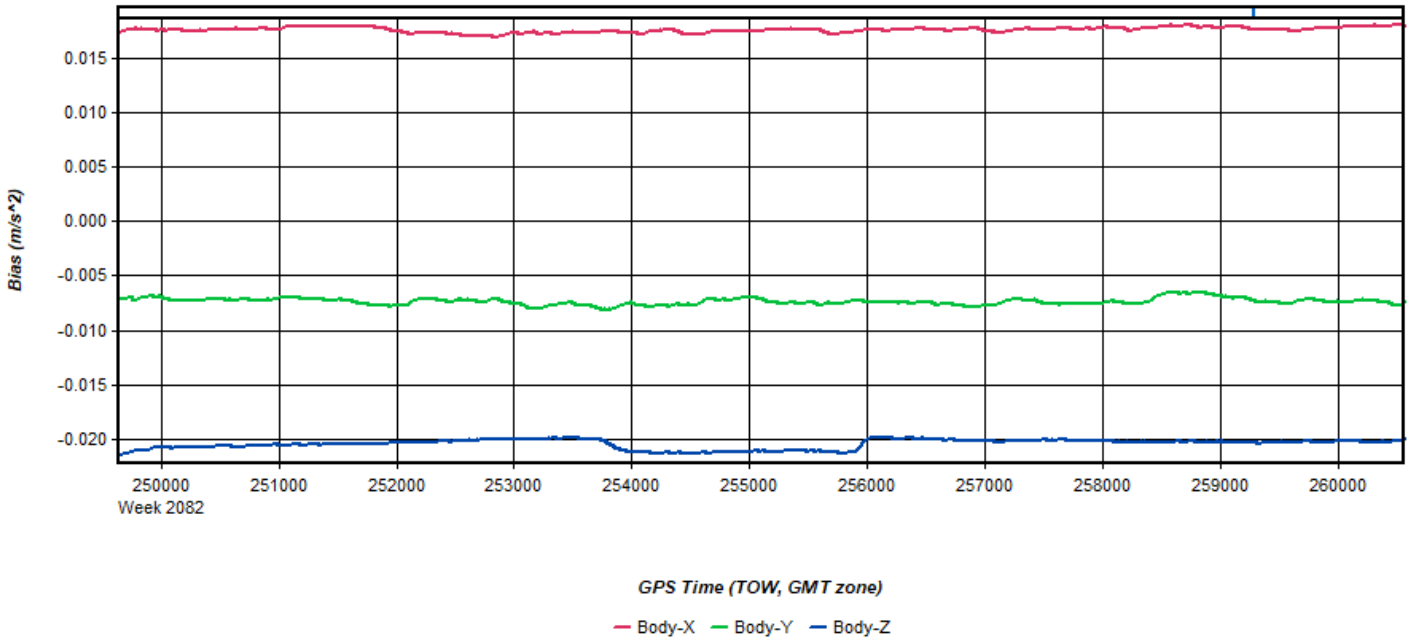

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 18: 20191203211932 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



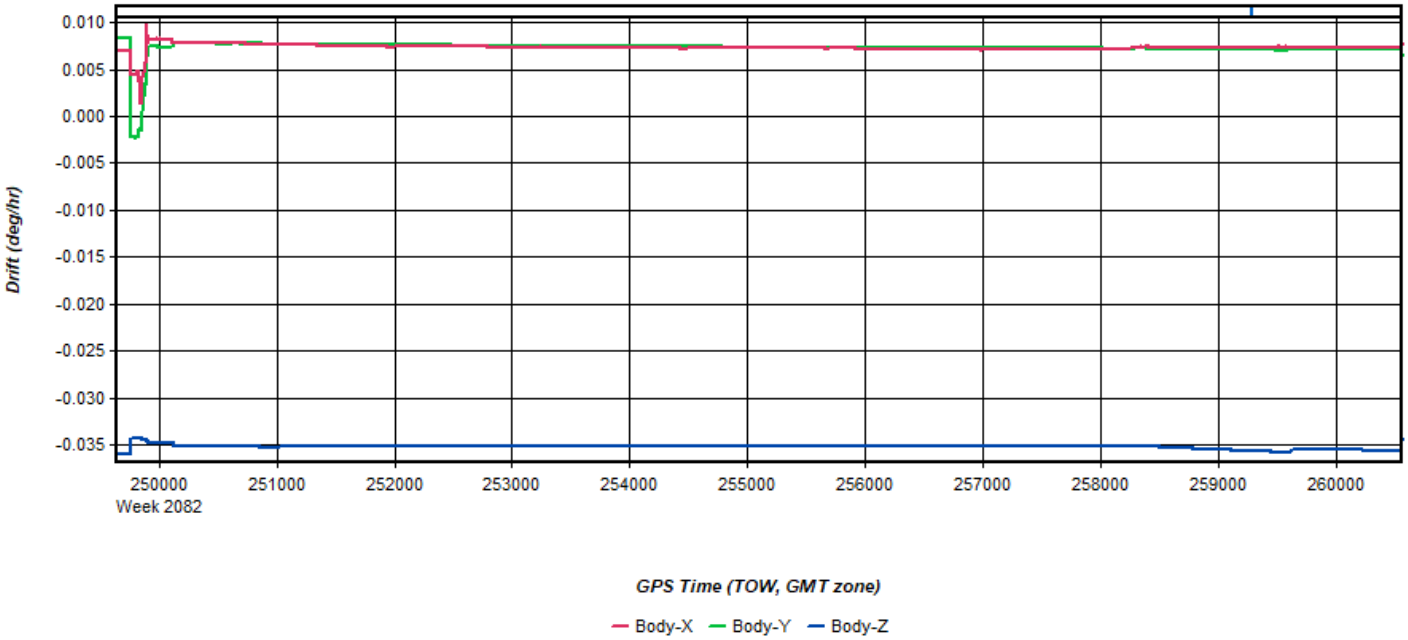

| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 19: 20191203211932 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

**Figure 20: 20191203211932 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191203211932 | by Unknown | on 12/13/2019 | at 16:40:21 |

# Output Results for 20191204151927

Inertial Explorer Version 8.80.2305
12/13/2019

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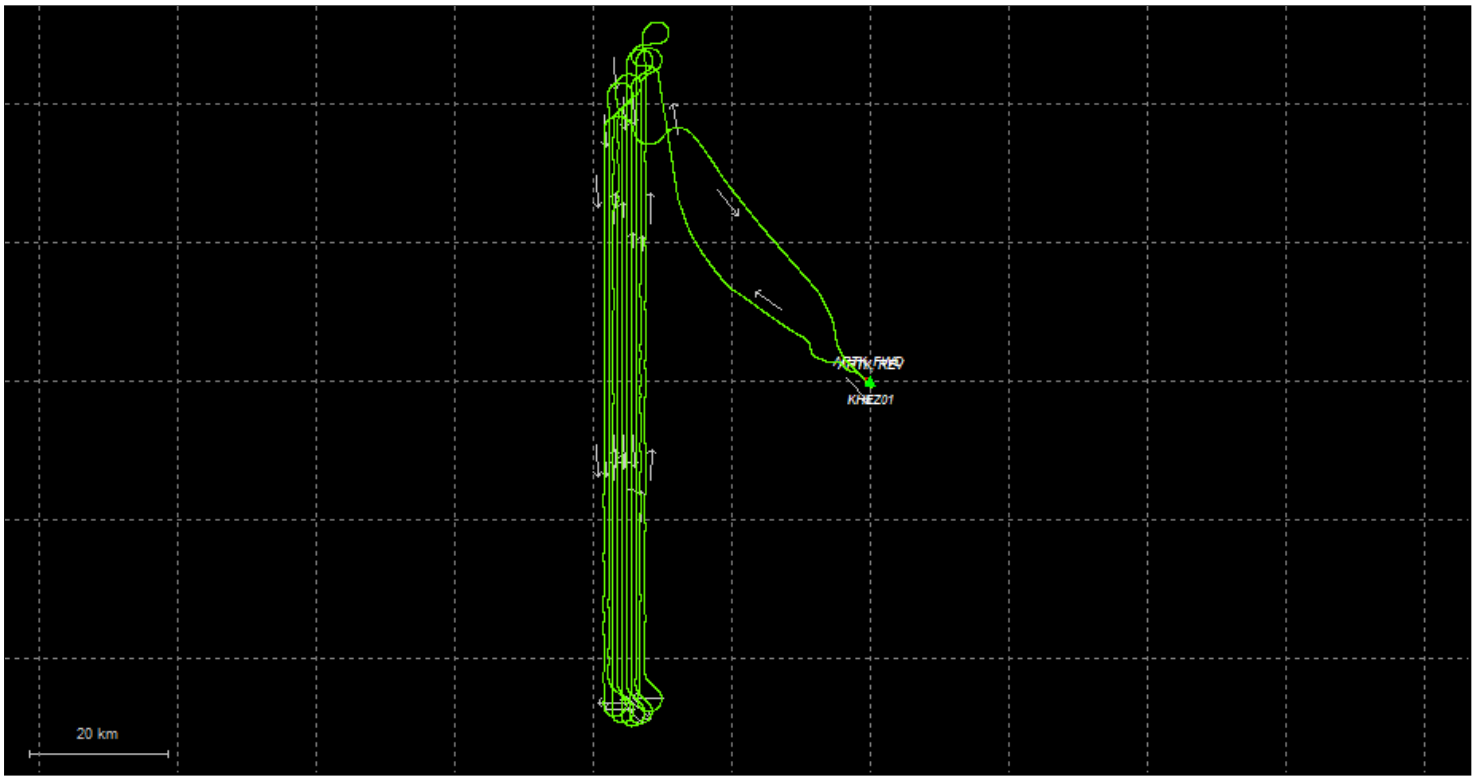
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |
|---|---|---|---|---|

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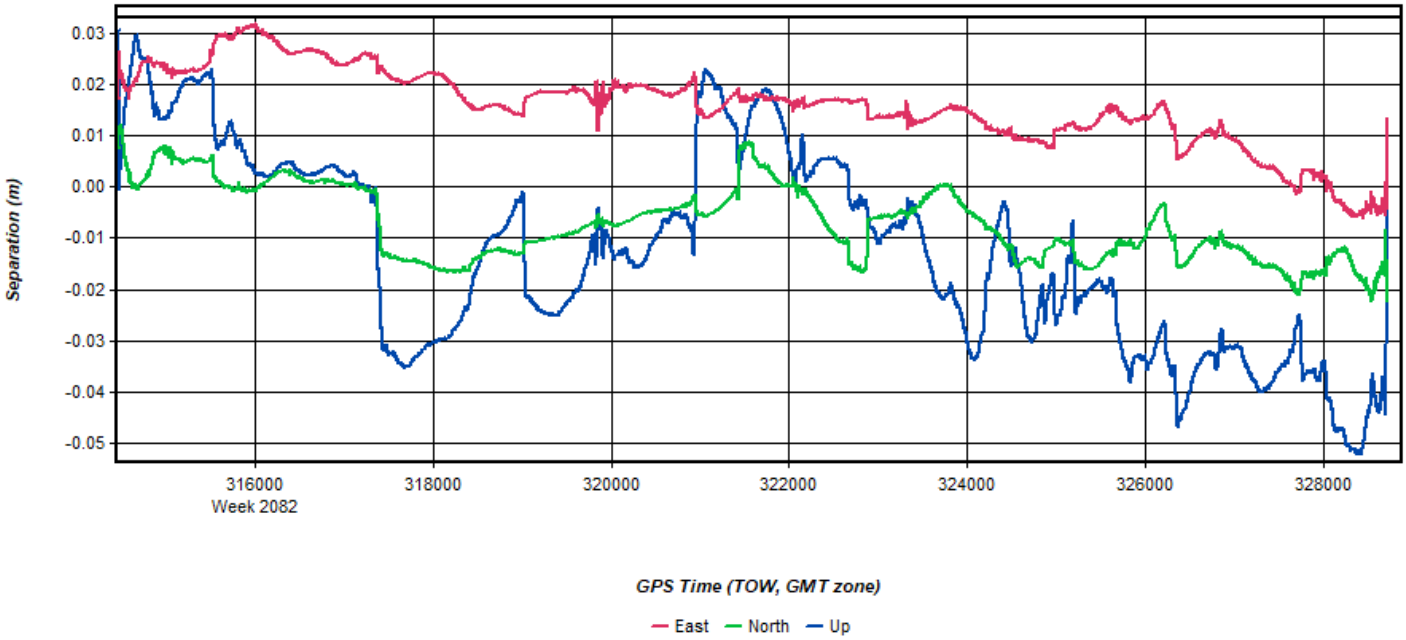
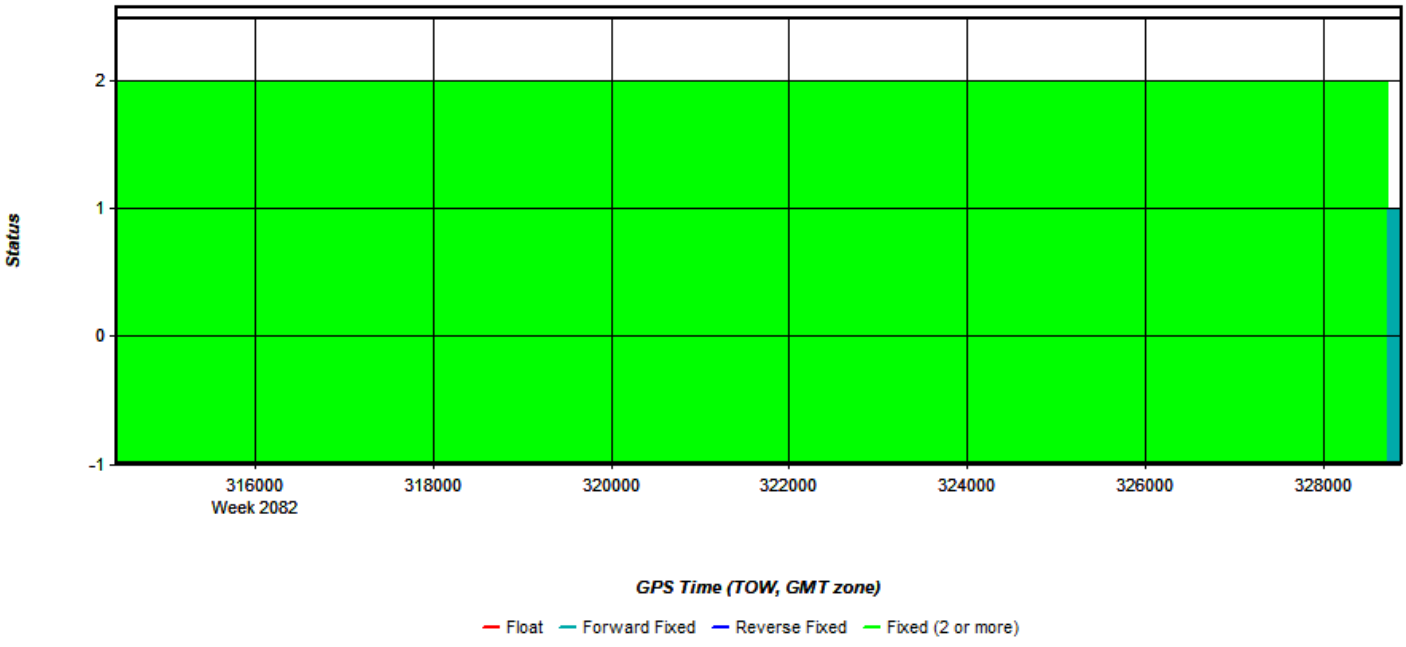
**Figure 2: 20191204151927 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



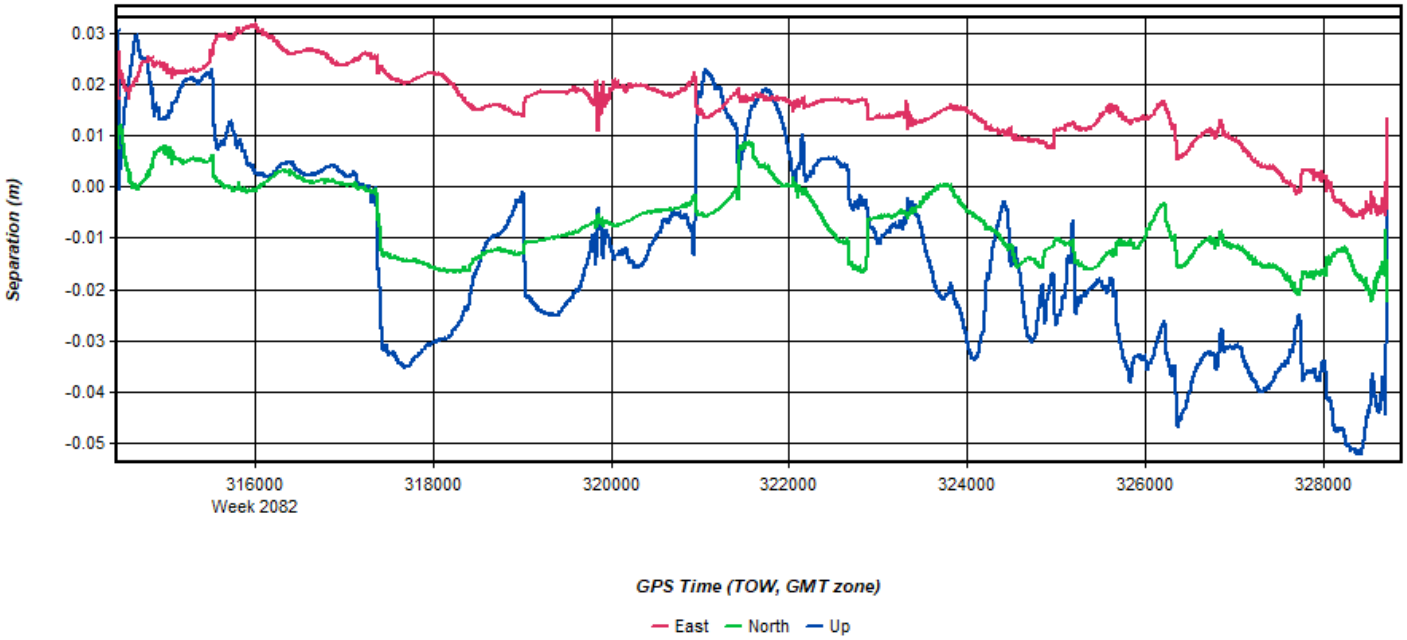

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 3: 20191204151927 [Smoothed TC Combined] - Float or Fixed Ambiguity**



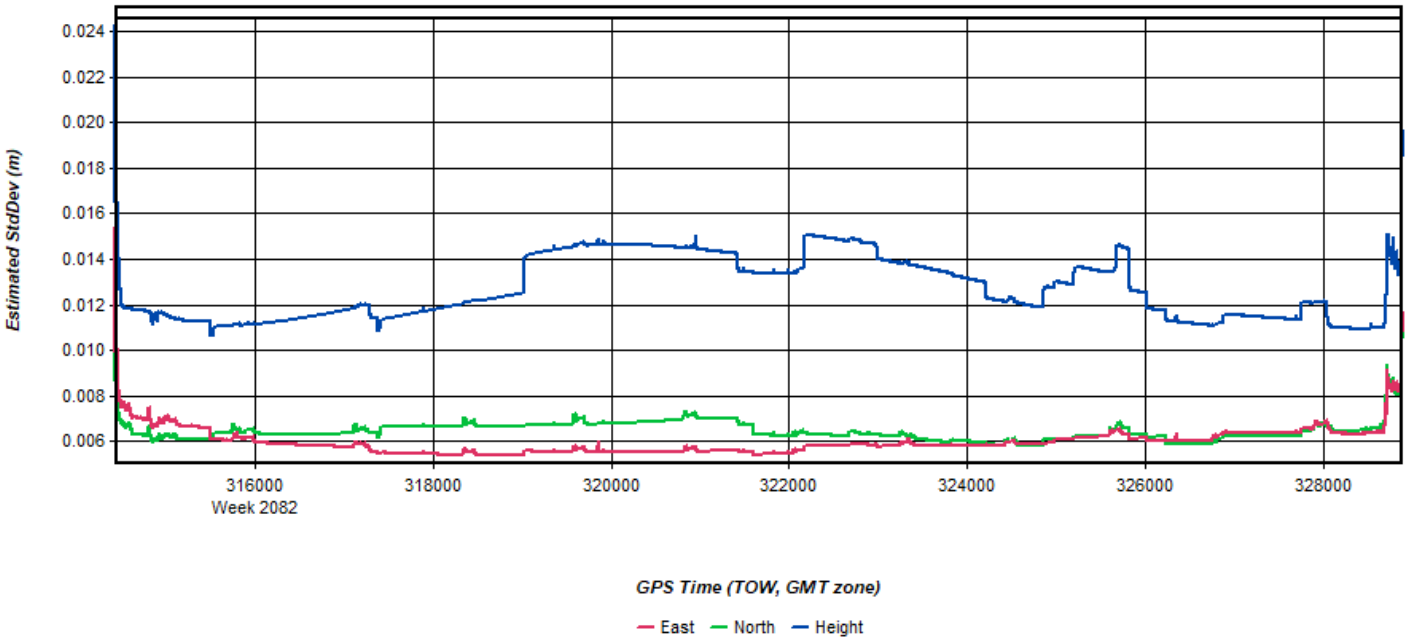

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 4: 20191204151927 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



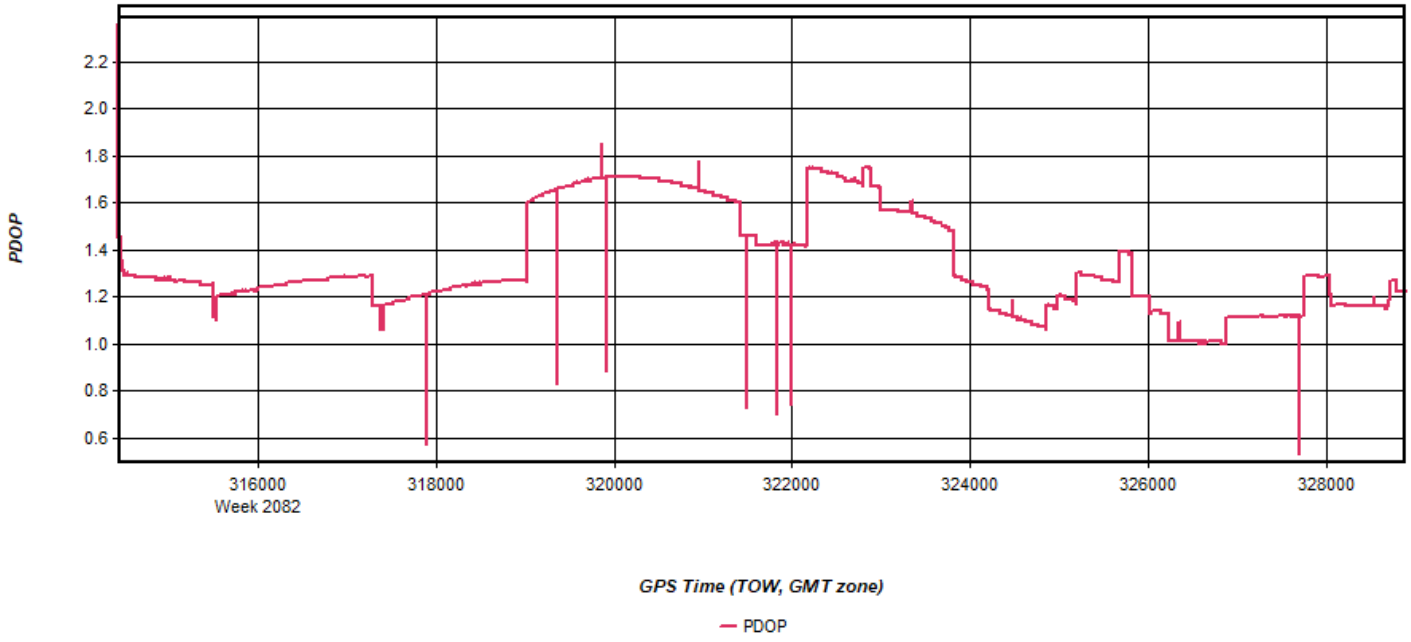

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 5: 20191204151927 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



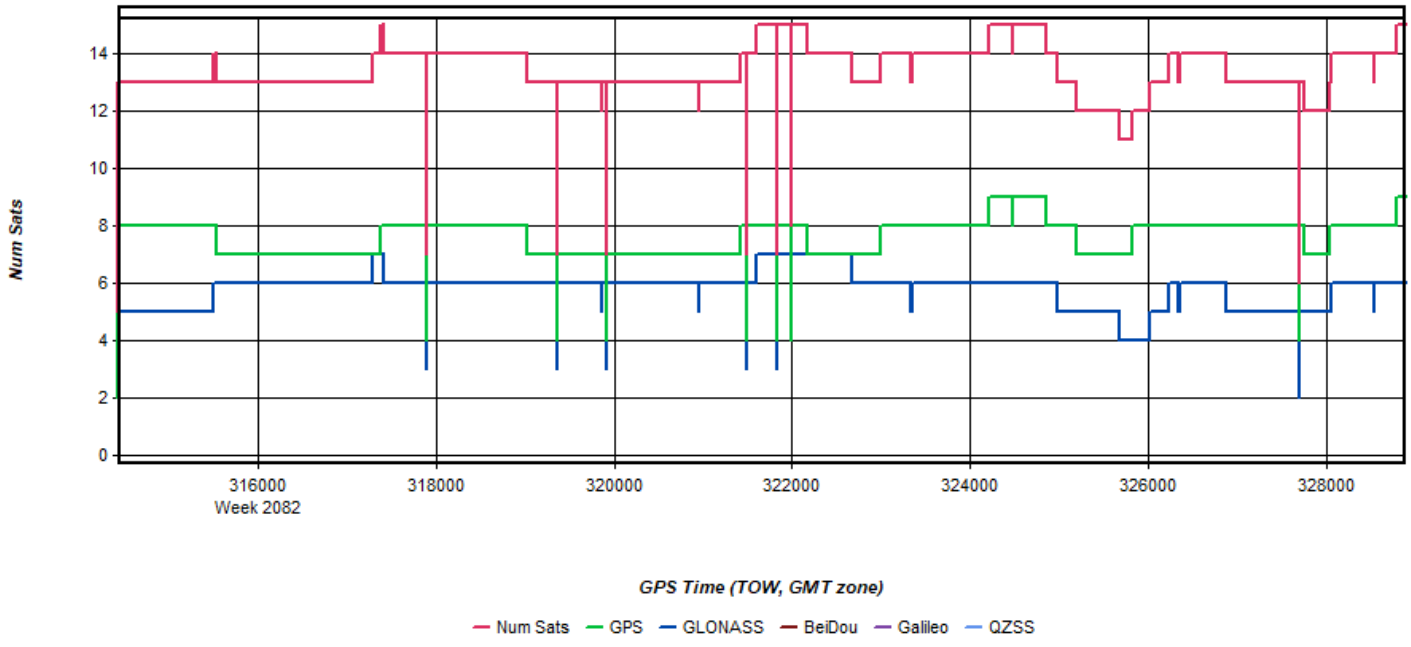

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 6: 20191204151927 [Smoothed TC Combined] - PDOP Plot**



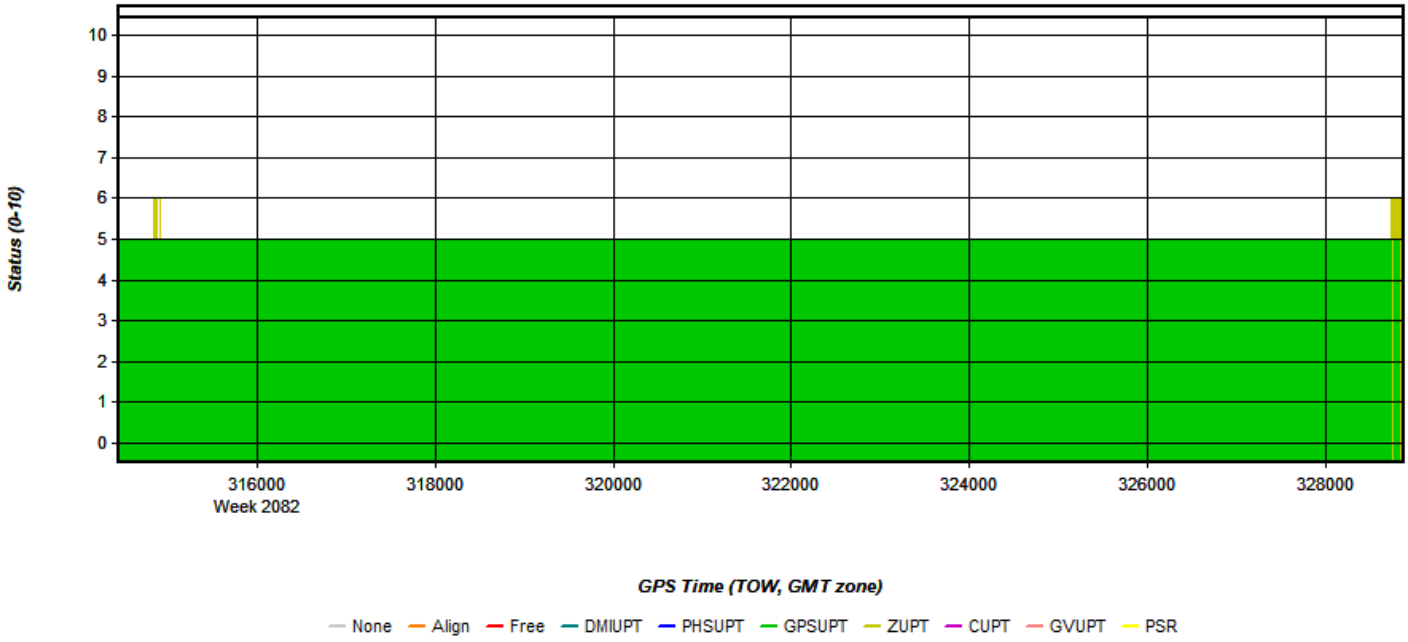

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 7: 20191204151927 [Smoothed TC Combined] - Number of Satellites Line Plot**



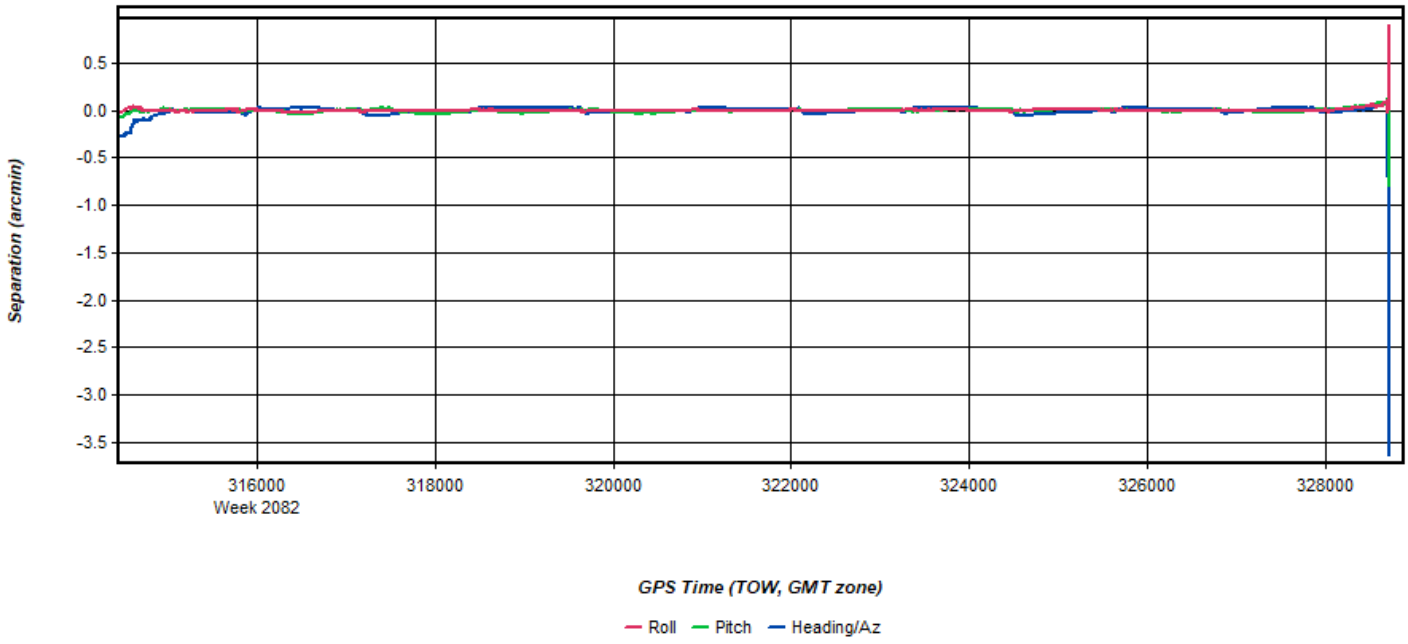

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 8: 20191204151927 [Smoothed TC Combined] - Status flag for IMU processing**



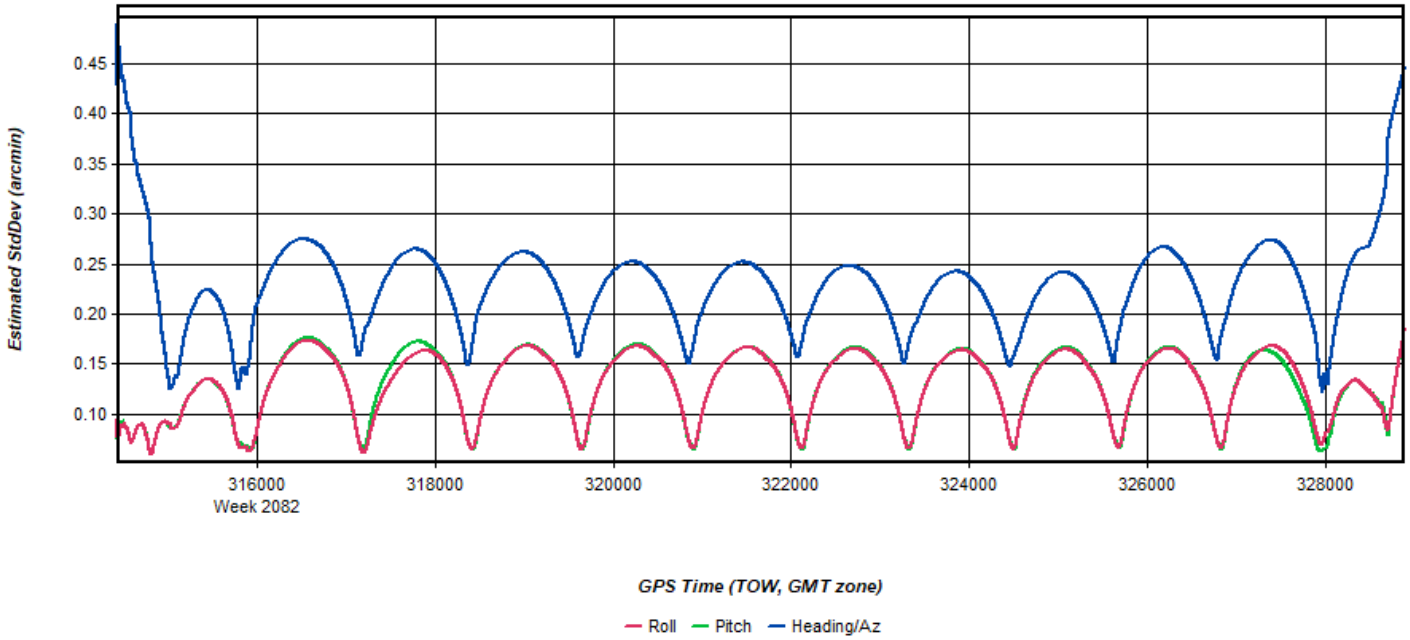

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 9: 20191204151927 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



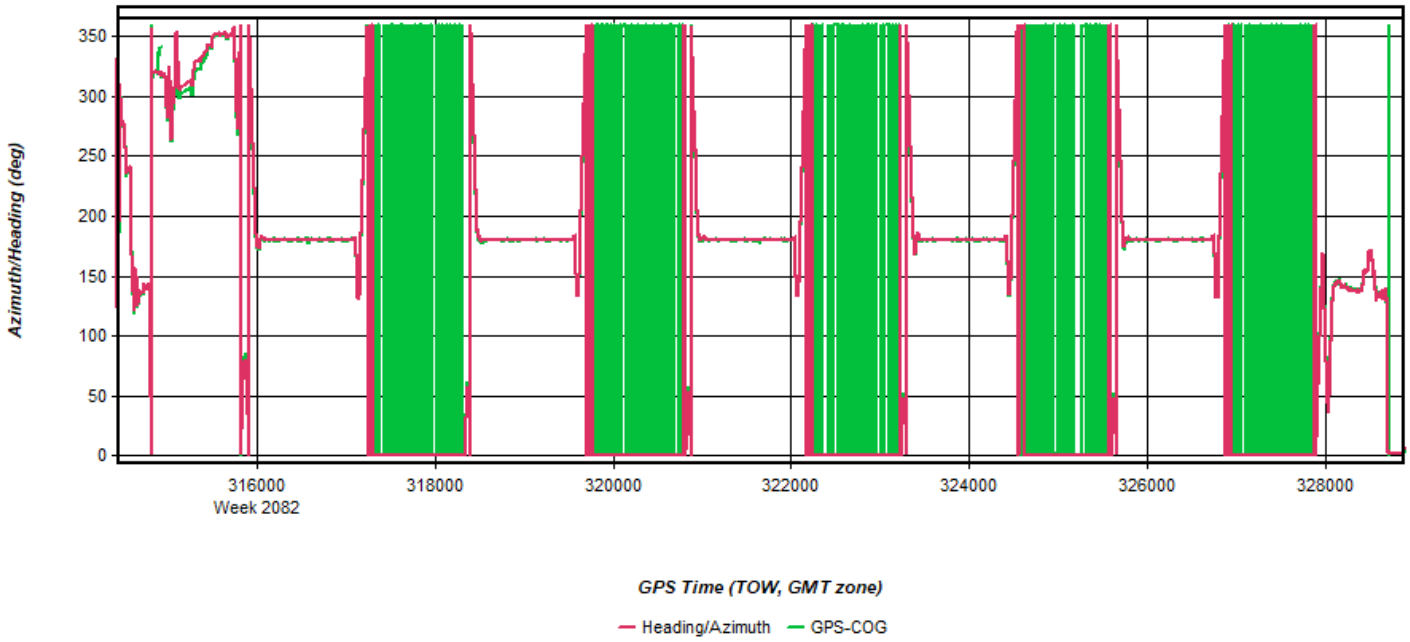

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 10: 20191204151927 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



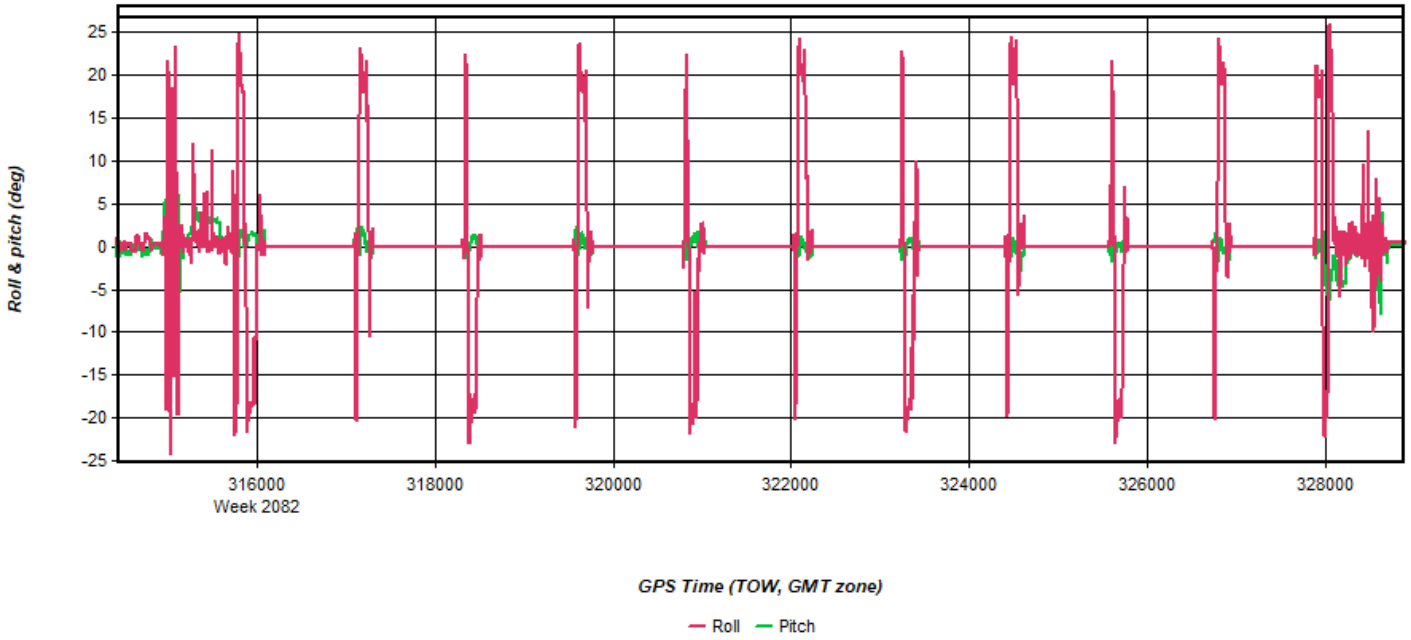

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 11: 20191204151927 [Smoothed TC Combined] - Azimuth Plot**



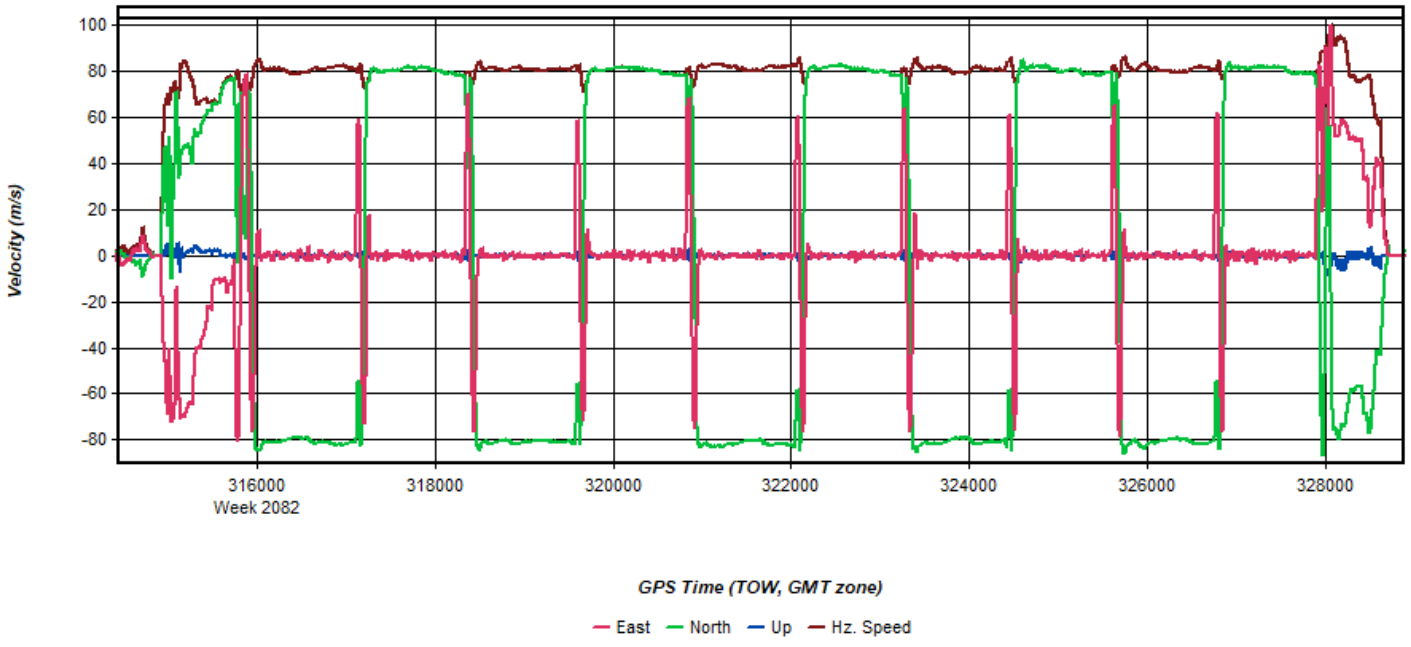

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 12: 20191204151927 [Smoothed TC Combined] - Roll & Pitch Plot**



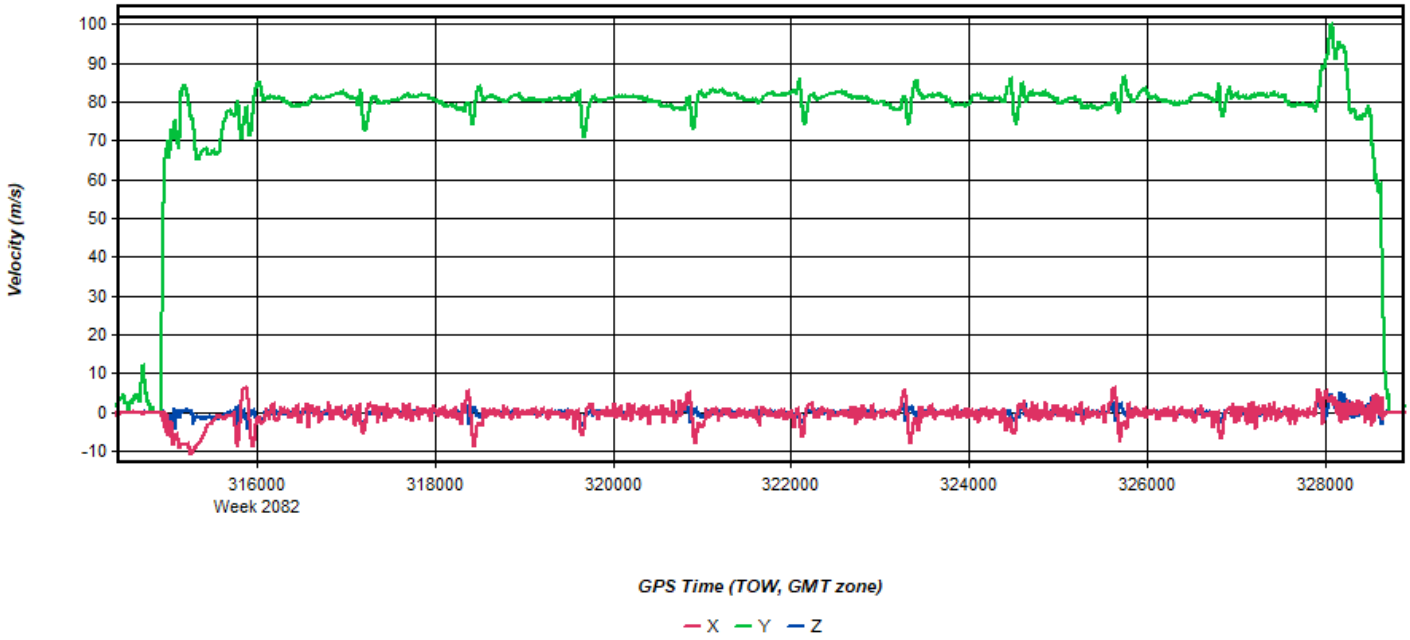

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 13: 20191204151927 [Smoothed TC Combined] - Velocity Profile Plot**



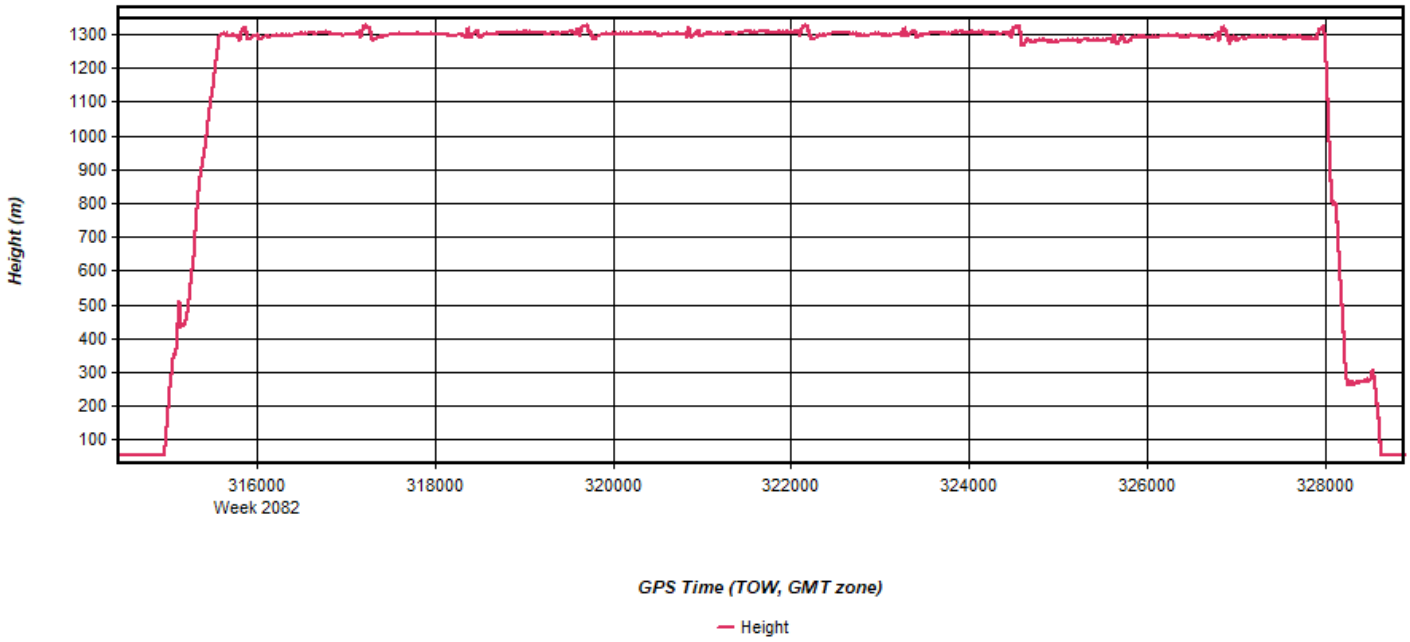

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 14: 20191204151927 [Smoothed TC Combined] - Body Frame Velocity Plot**



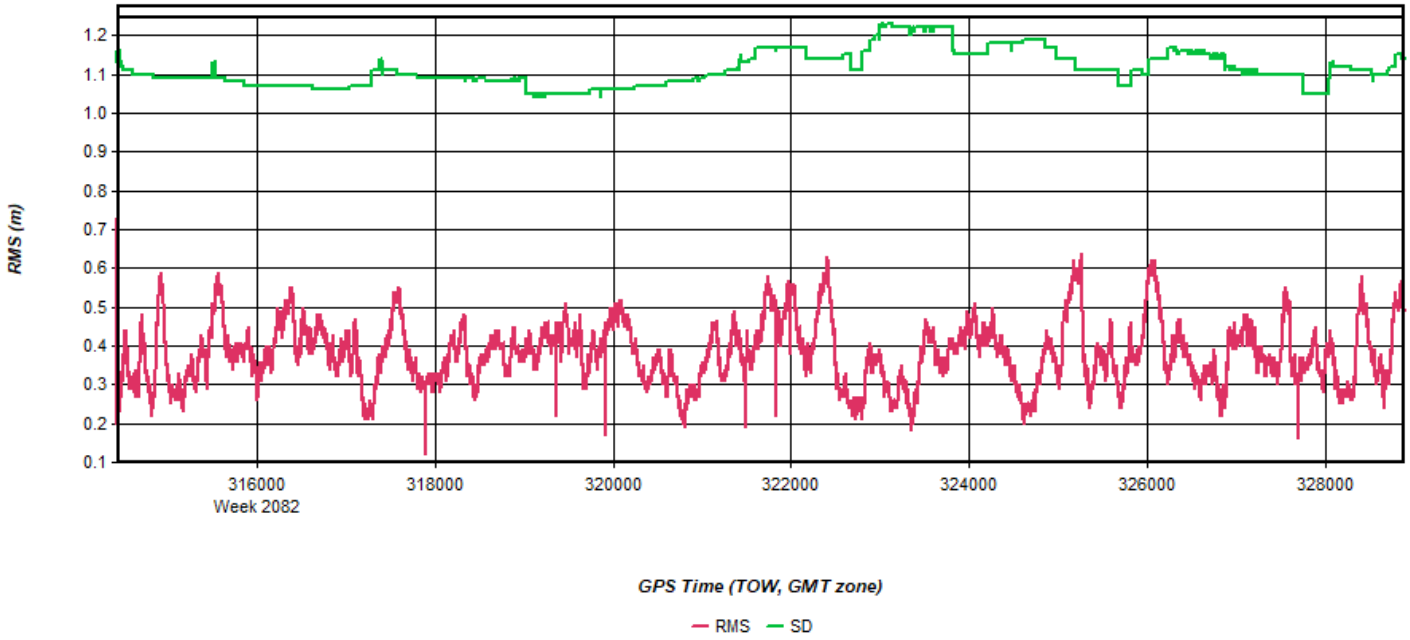

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 15: 20191204151927 [Smoothed TC Combined] - Height Profile Plot**



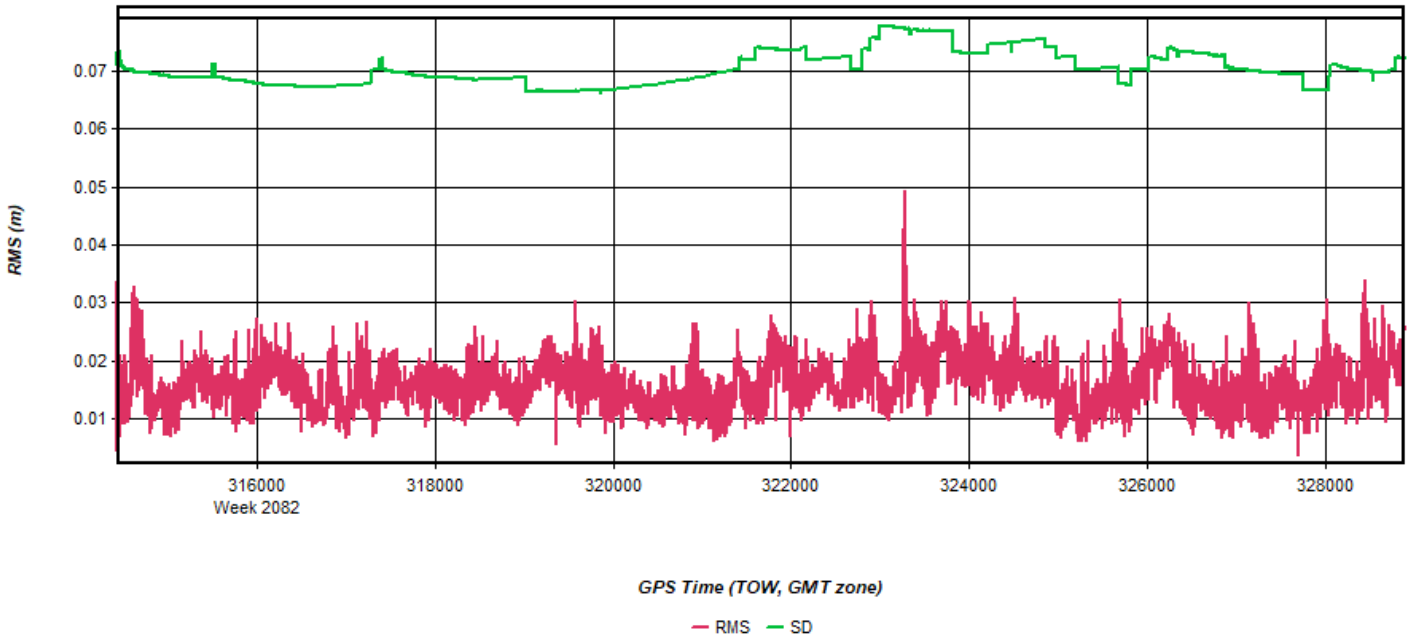

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 16: 20191204151927 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



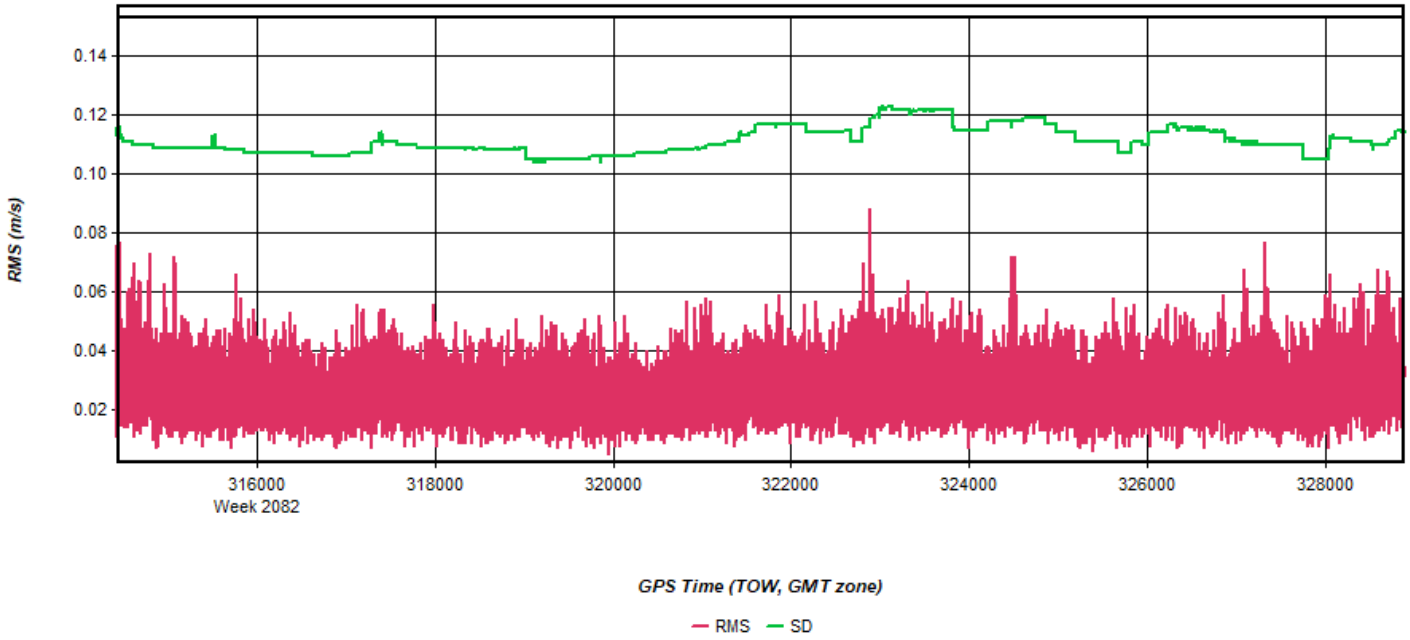

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 17: 20191204151927 [Smoothed TC Combined] - Carrier Residual RMS Plot**



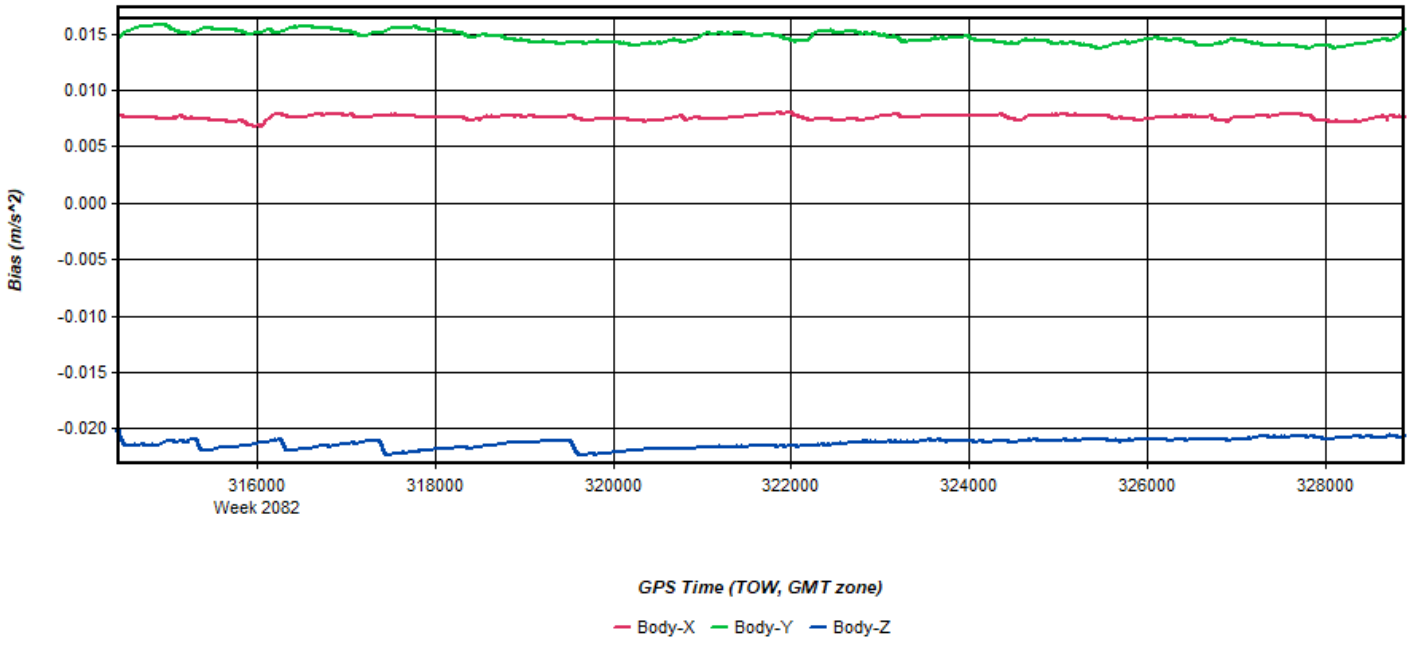

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 18: 20191204151927 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



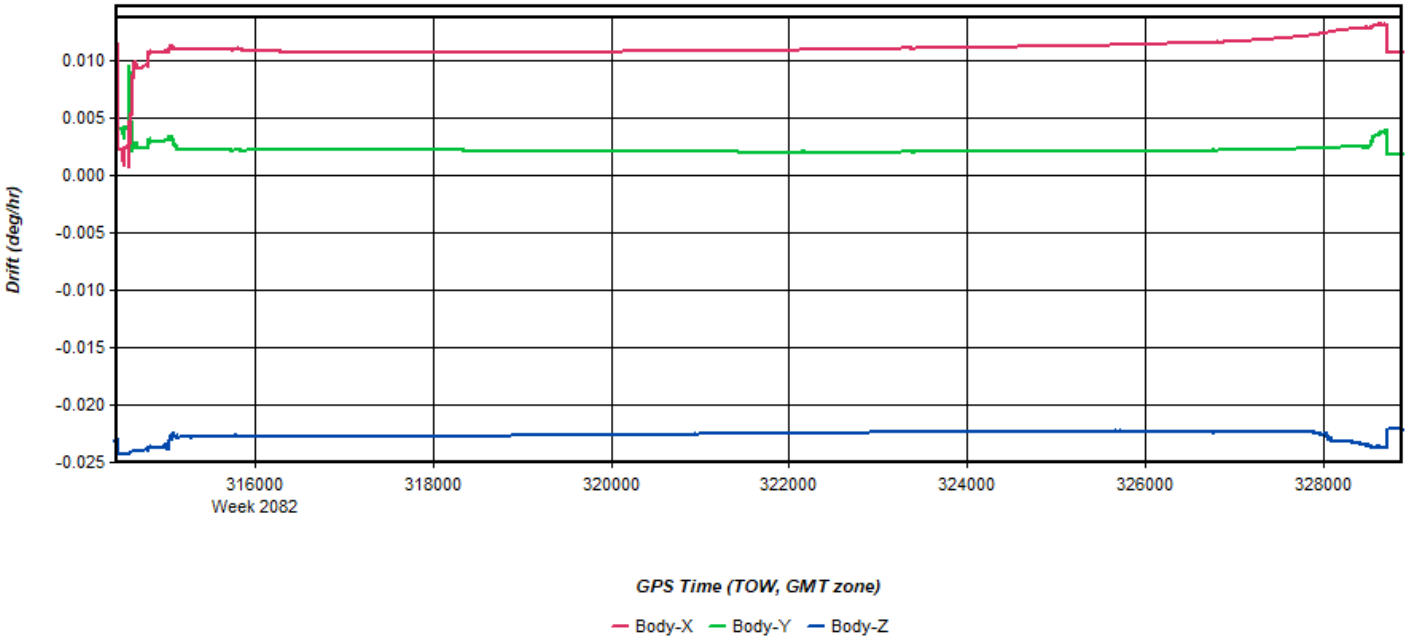

| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 19: 20191204151927 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

**Figure 20: 20191204151927 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191204151927 | by Unknown | on 12/13/2019 | at 18:12:06 |

# Output Results for 20191204205851

Inertial Explorer Version 8.80.2305
12/14/2019

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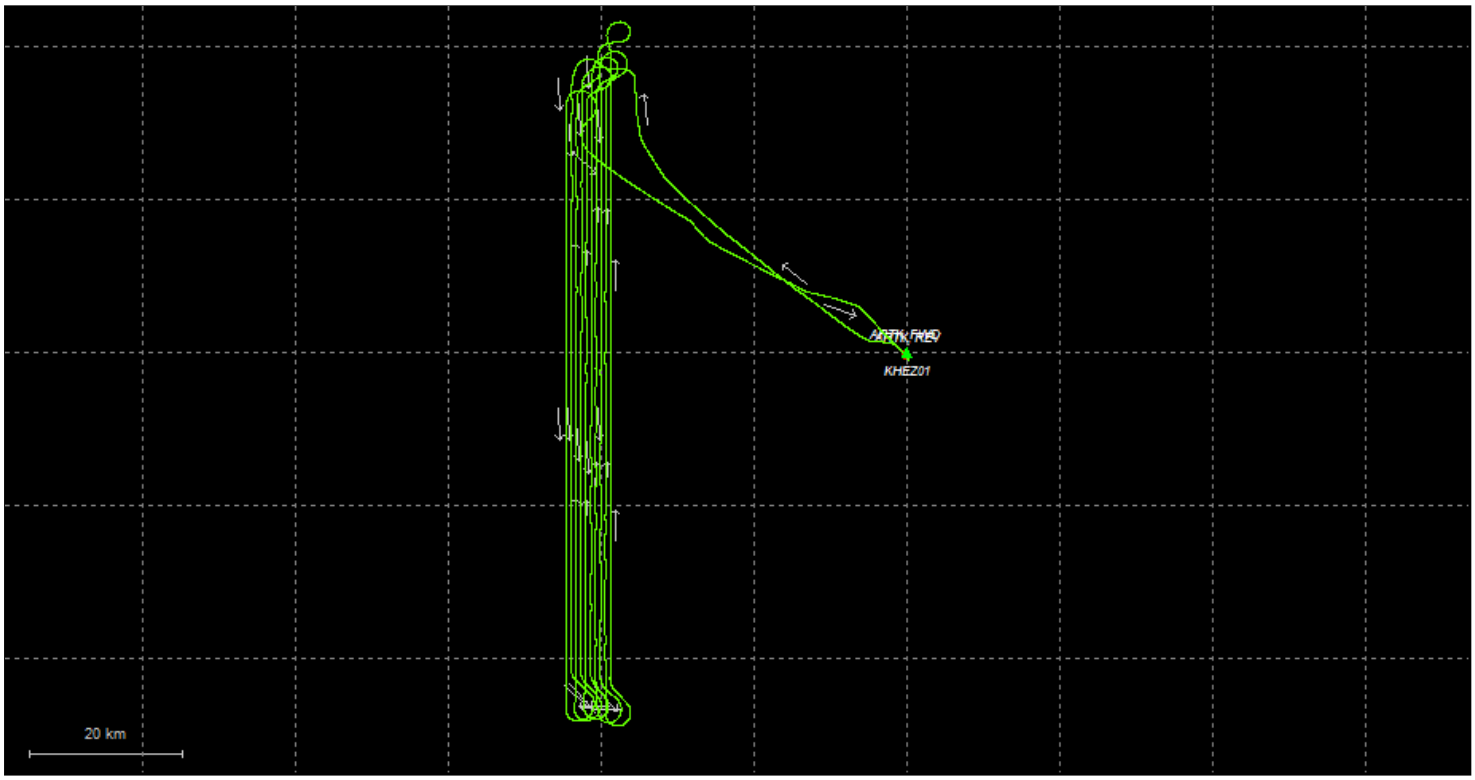
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |
|---|---|---|---|---|

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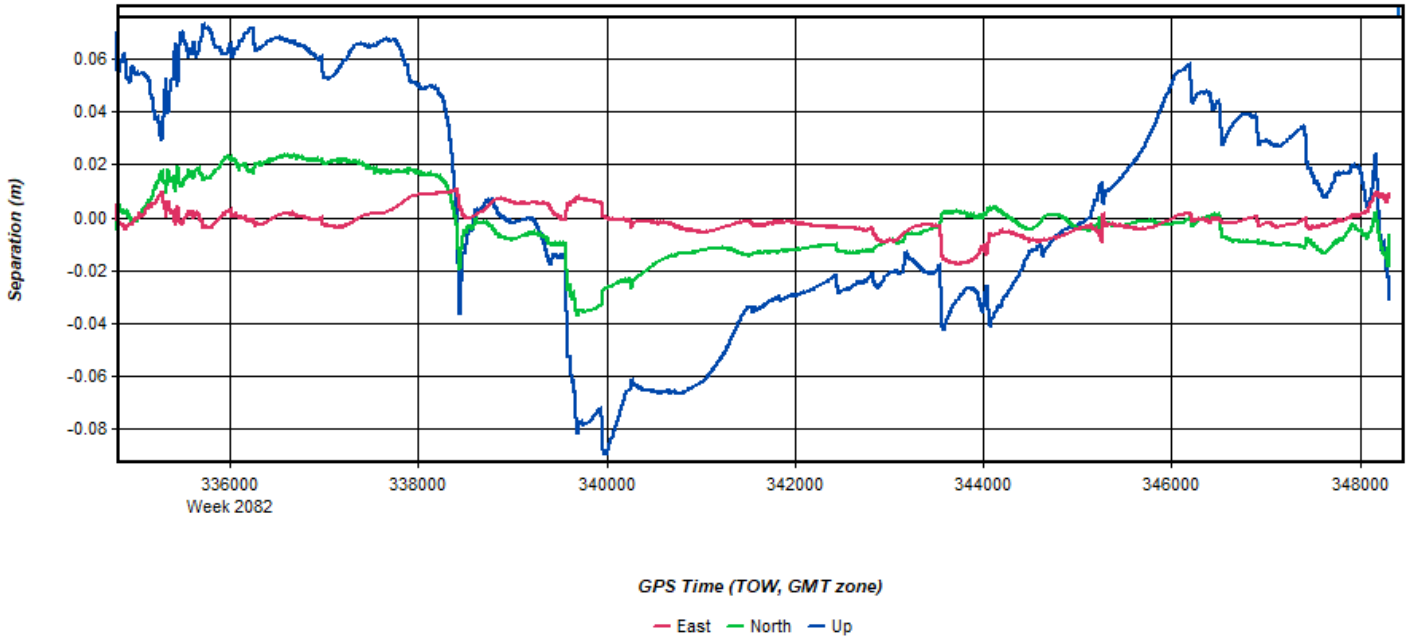
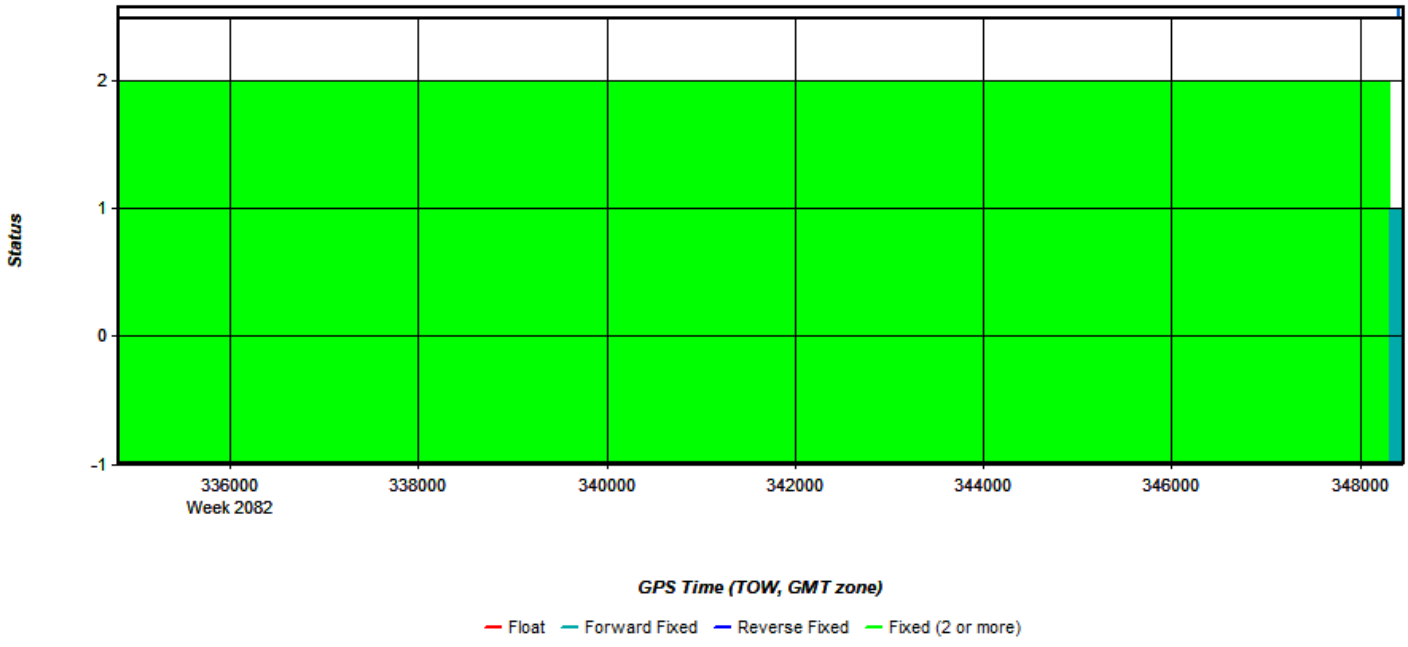
**Figure 2: 20191204205851 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



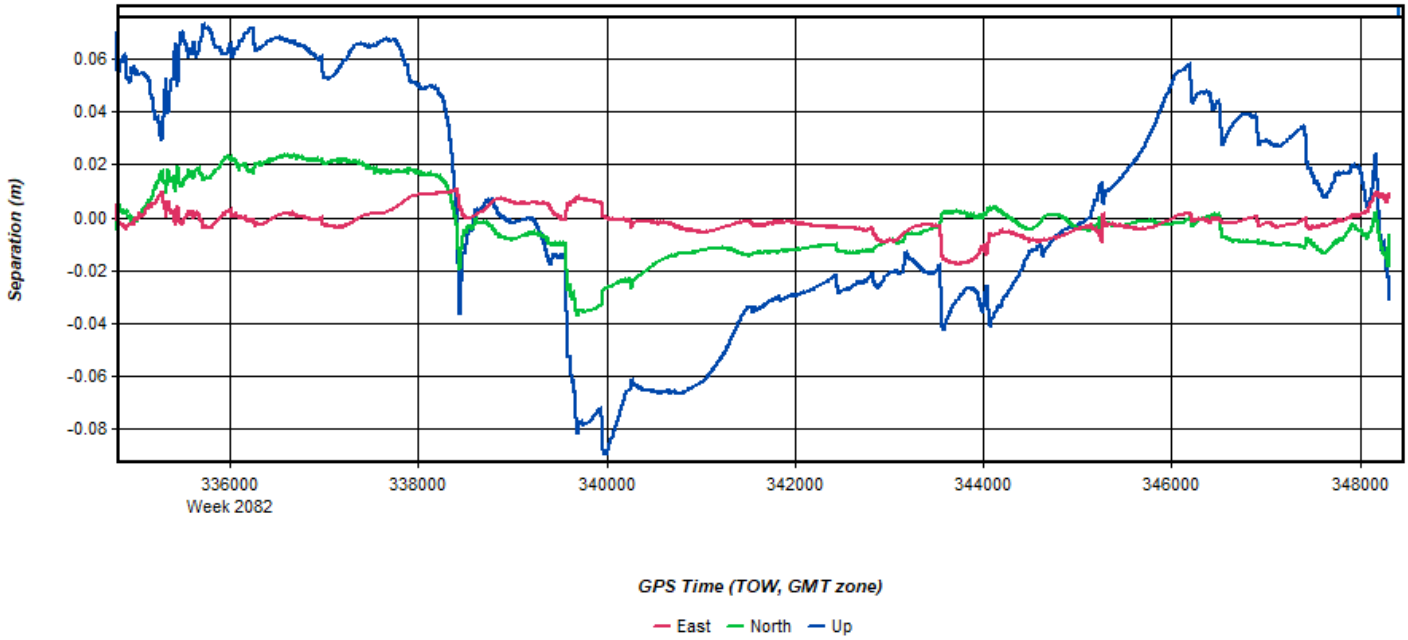

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 3: 20191204205851 [Smoothed TC Combined] - Float or Fixed Ambiguity**



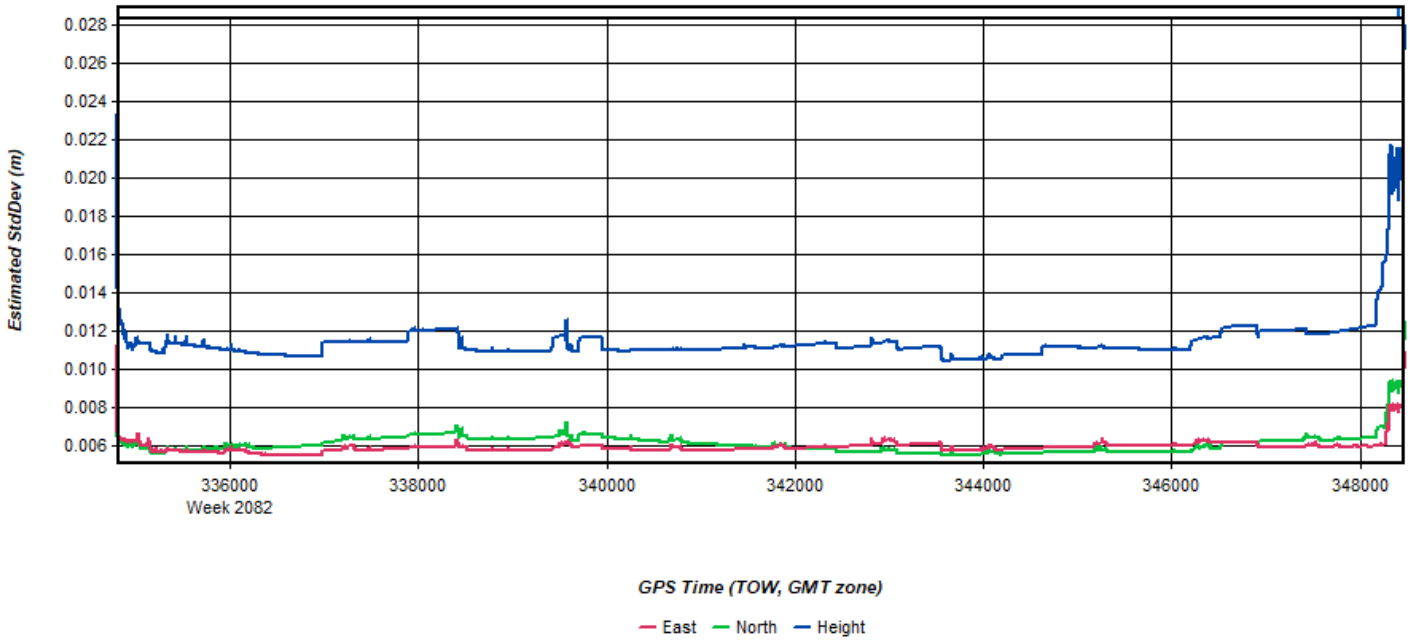

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 4: 20191204205851 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



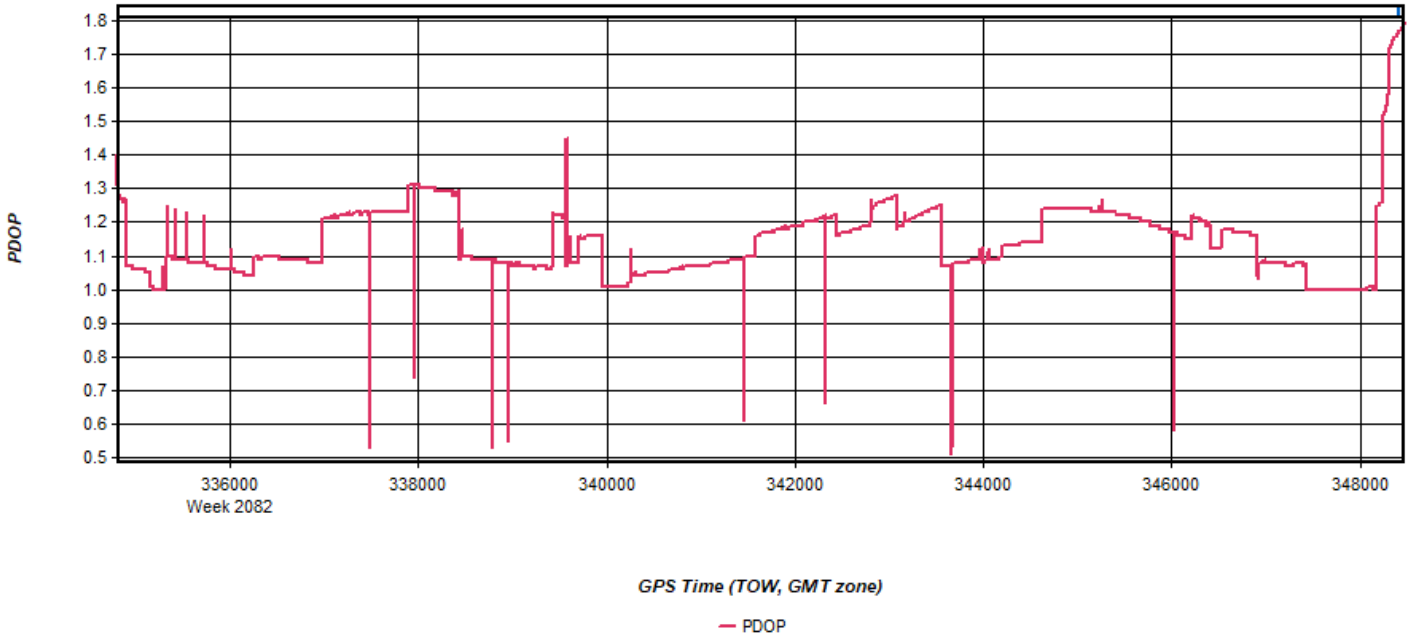

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 5: 20191204205851 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



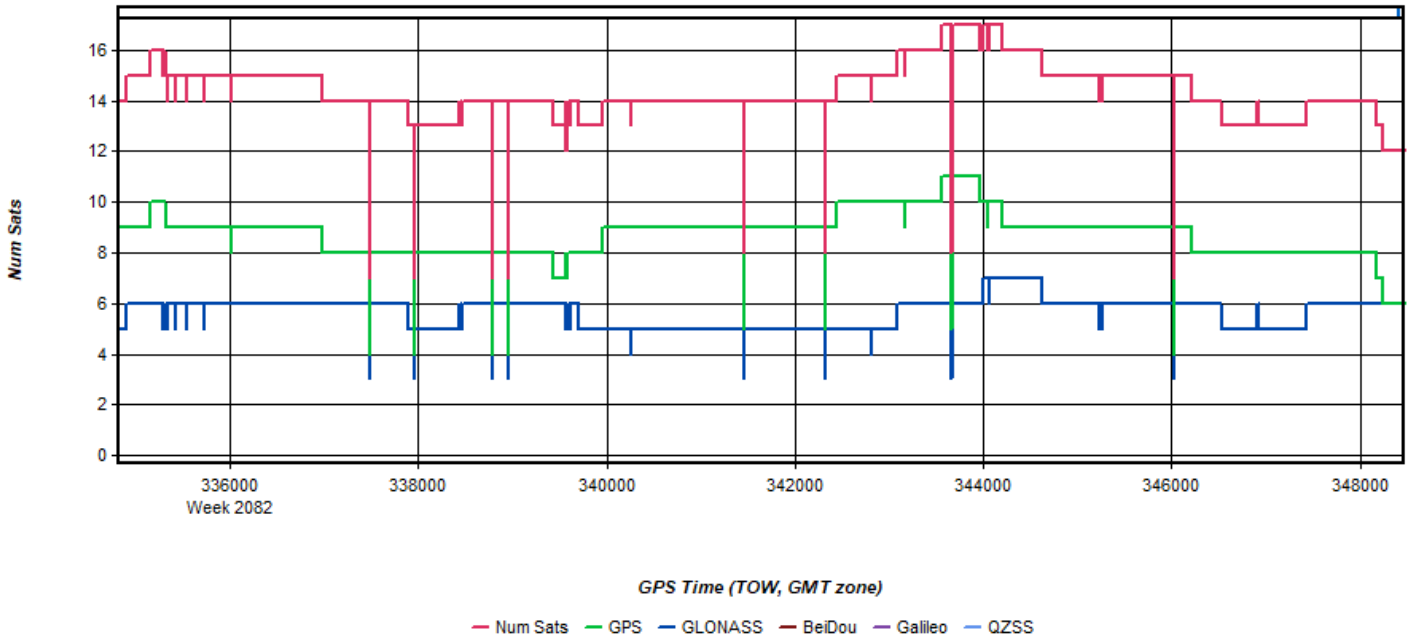

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 6: 20191204205851 [Smoothed TC Combined] - PDOP Plot**



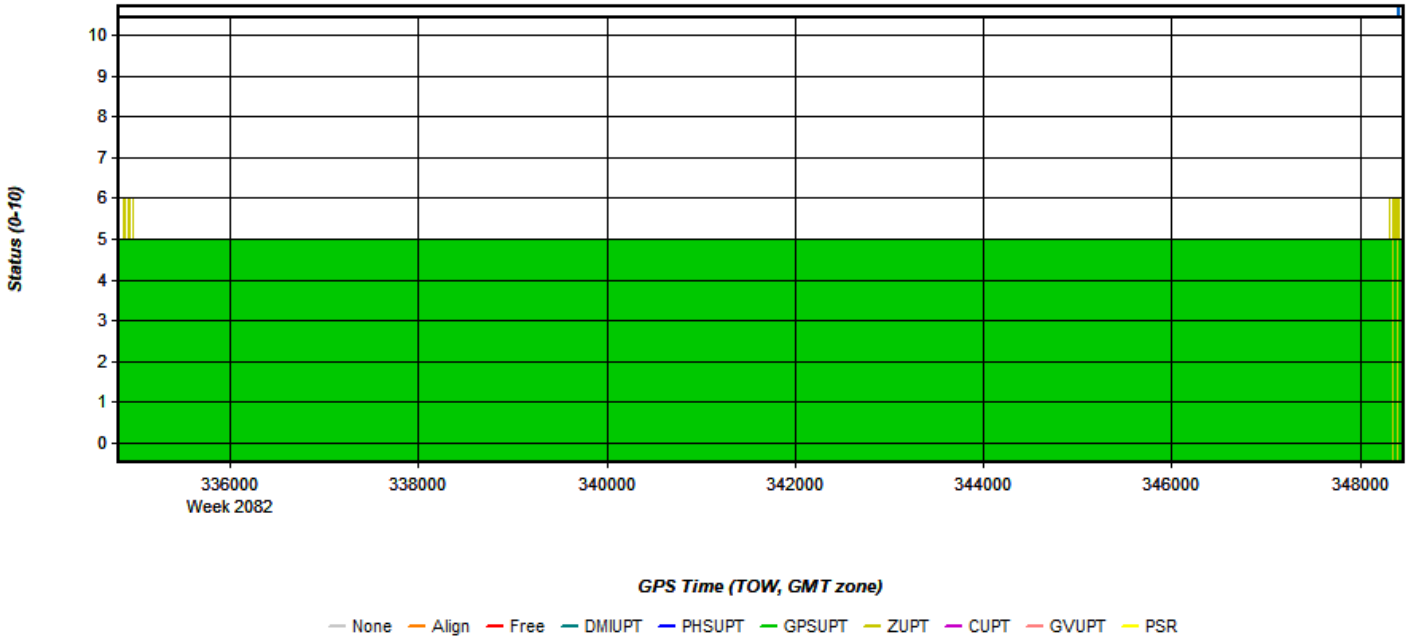

| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |
|---|---|---|---|---|

**Figure 7: 20191204205851 [Smoothed TC Combined] - Number of Satellites Line Plot**



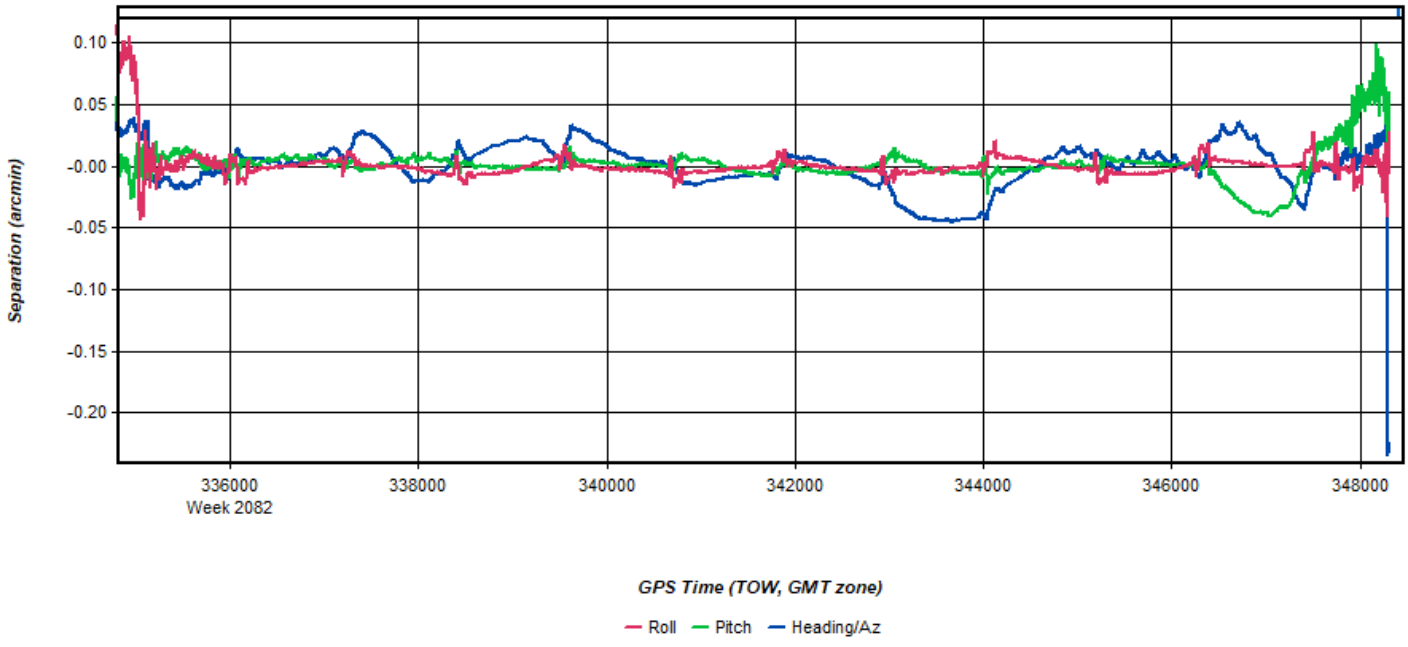

| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |
|---|---|---|---|---|

**Figure 8: 20191204205851 [Smoothed TC Combined] - Status flag for IMU processing**



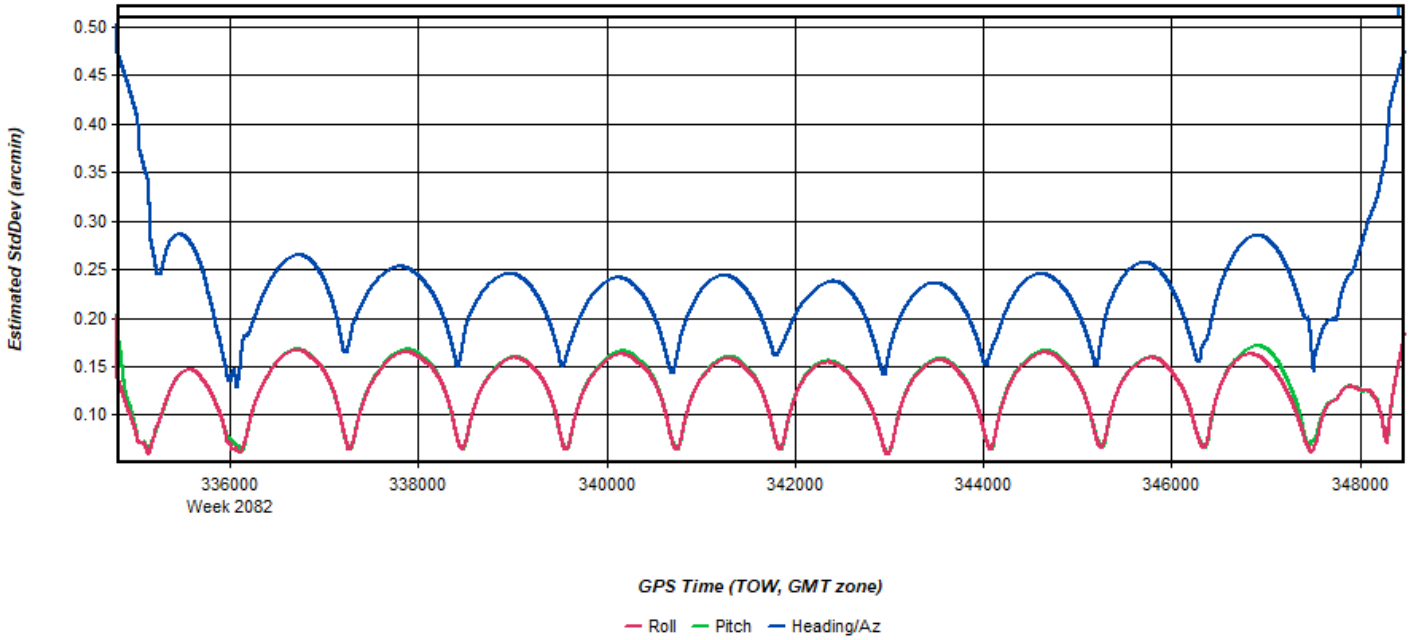

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 9: 20191204205851 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



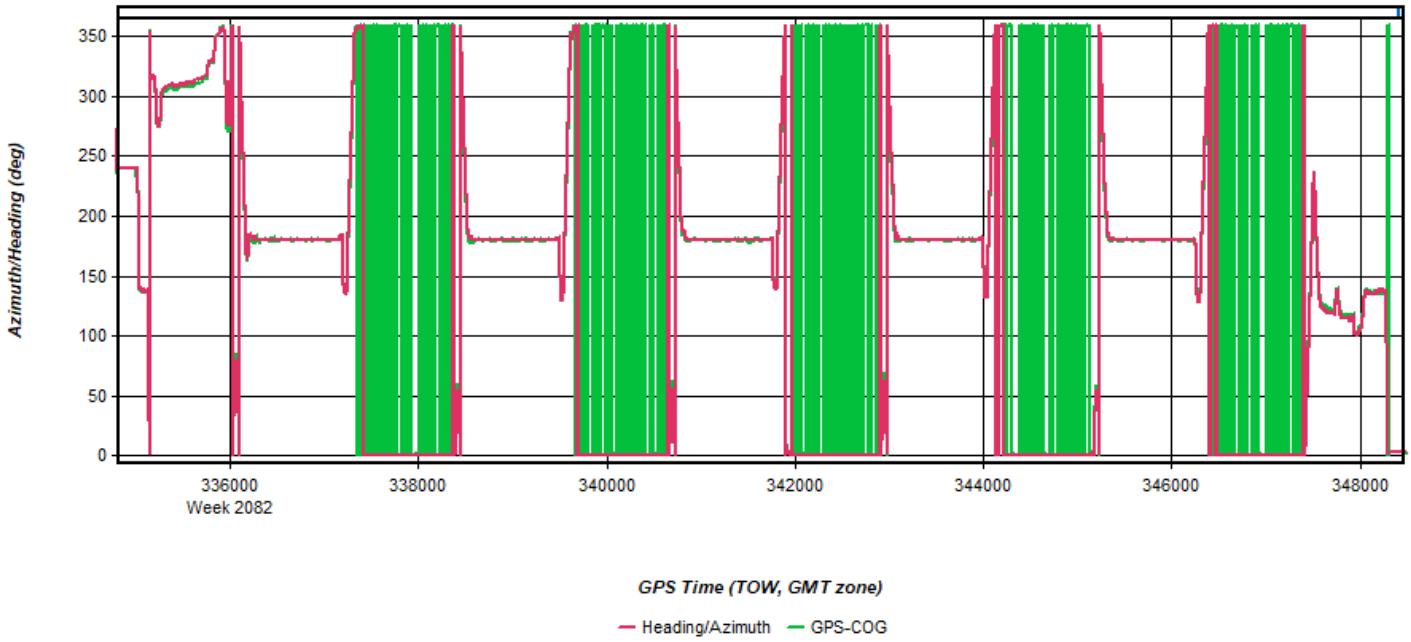

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 10: 20191204205851 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



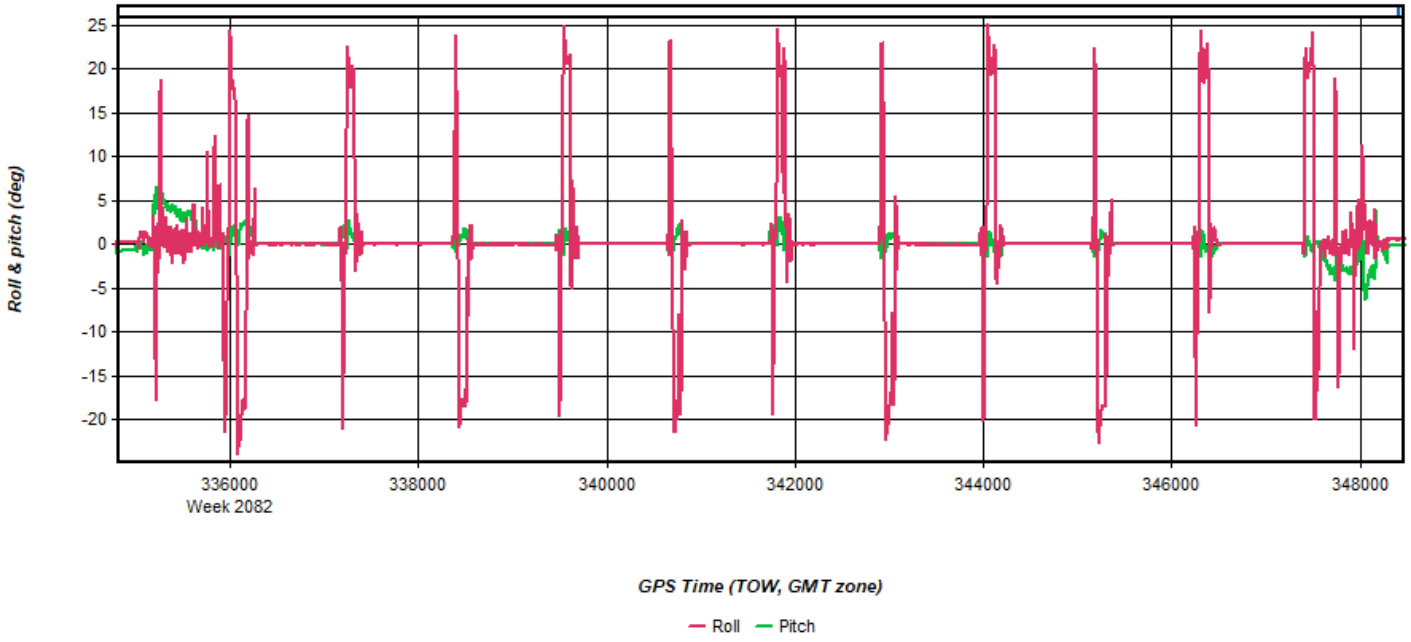

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 11: 20191204205851 [Smoothed TC Combined] - Azimuth Plot**



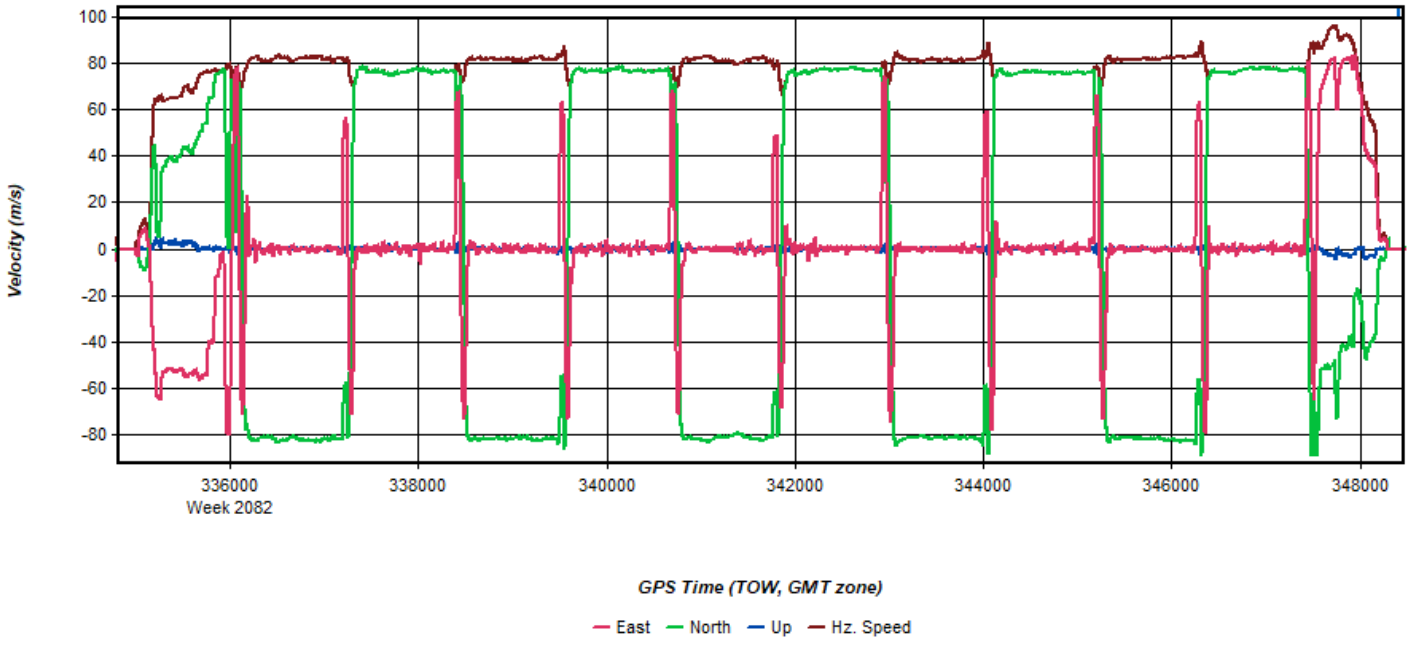

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 12: 20191204205851 [Smoothed TC Combined] - Roll & Pitch Plot**



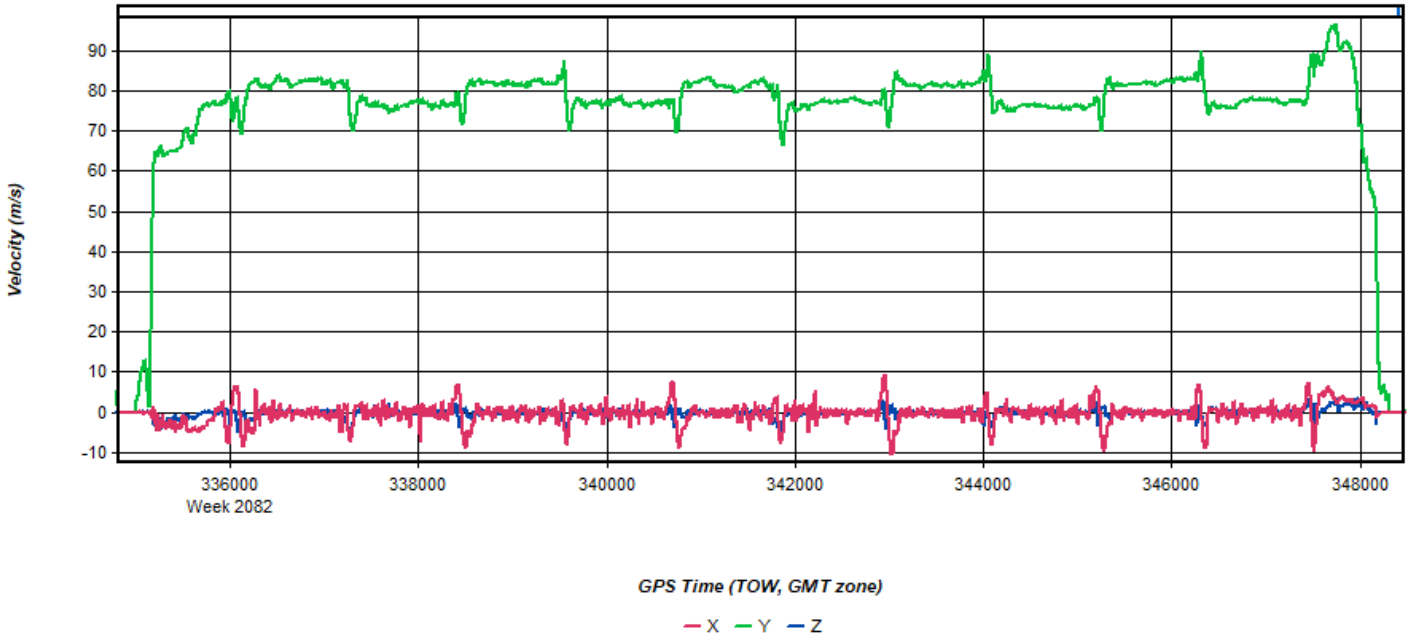

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 13: 20191204205851 [Smoothed TC Combined] - Velocity Profile Plot**



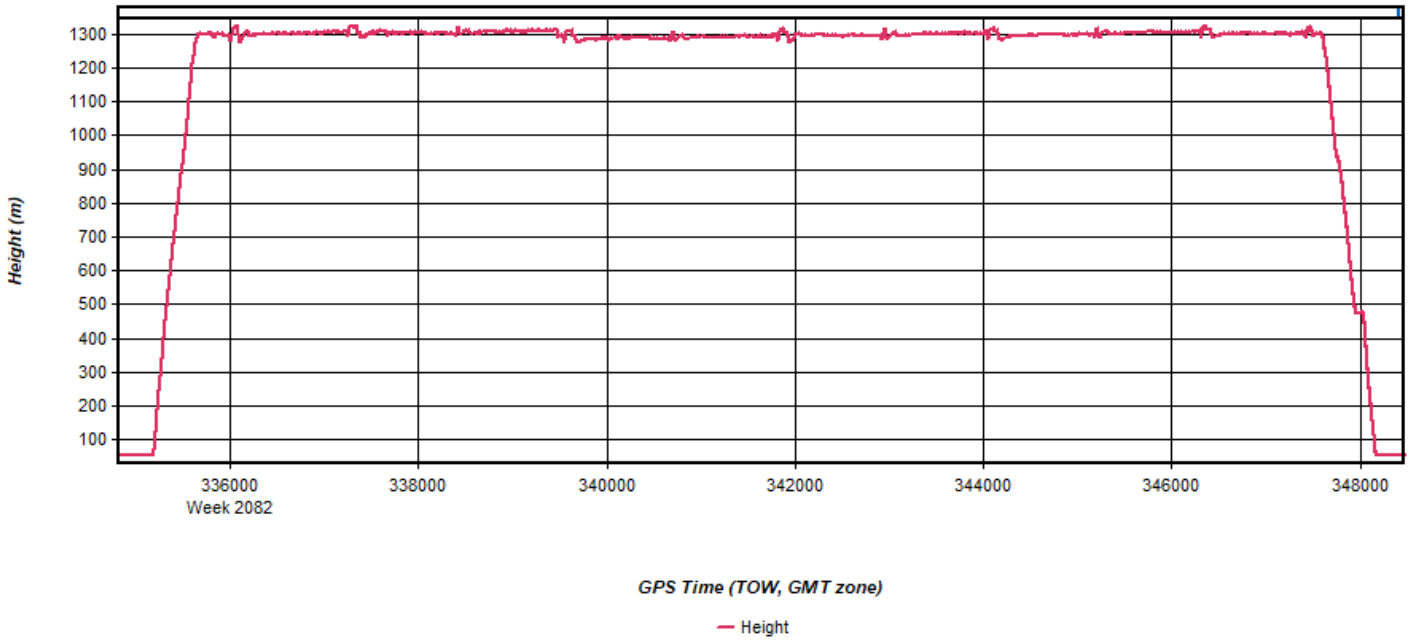

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 14: 20191204205851 [Smoothed TC Combined] - Body Frame Velocity Plot**



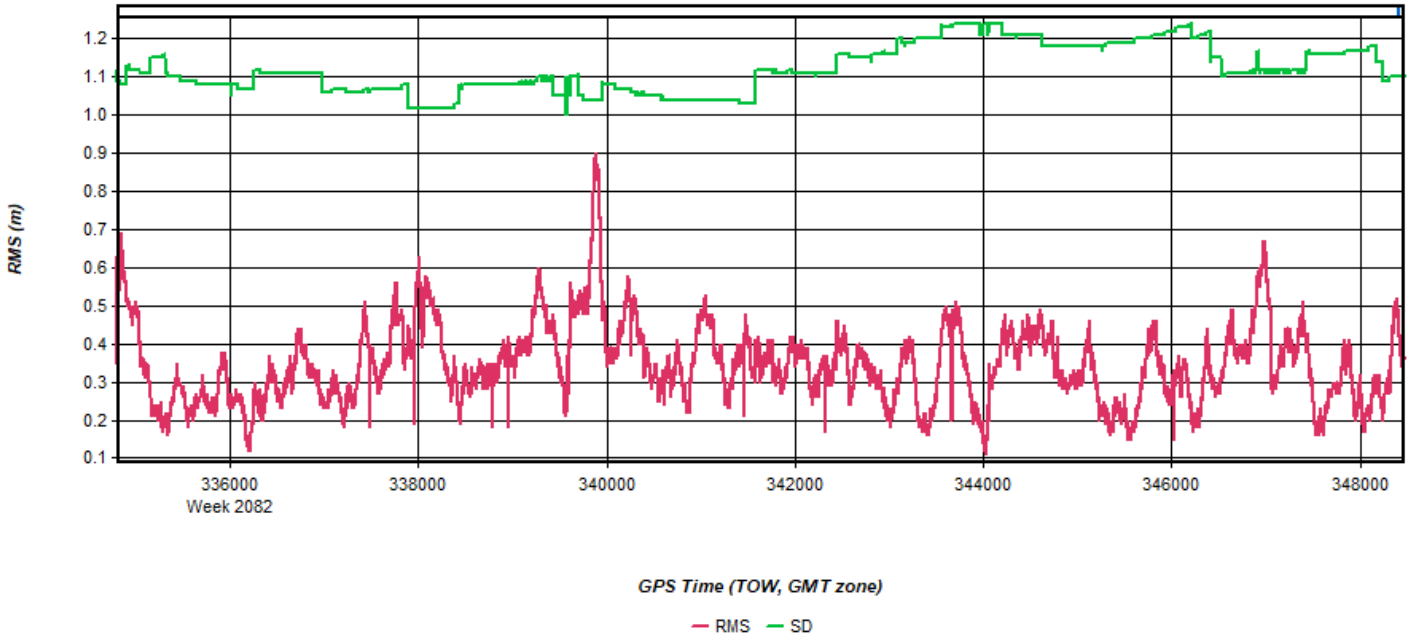

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 15: 20191204205851 [Smoothed TC Combined] - Height Profile Plot**



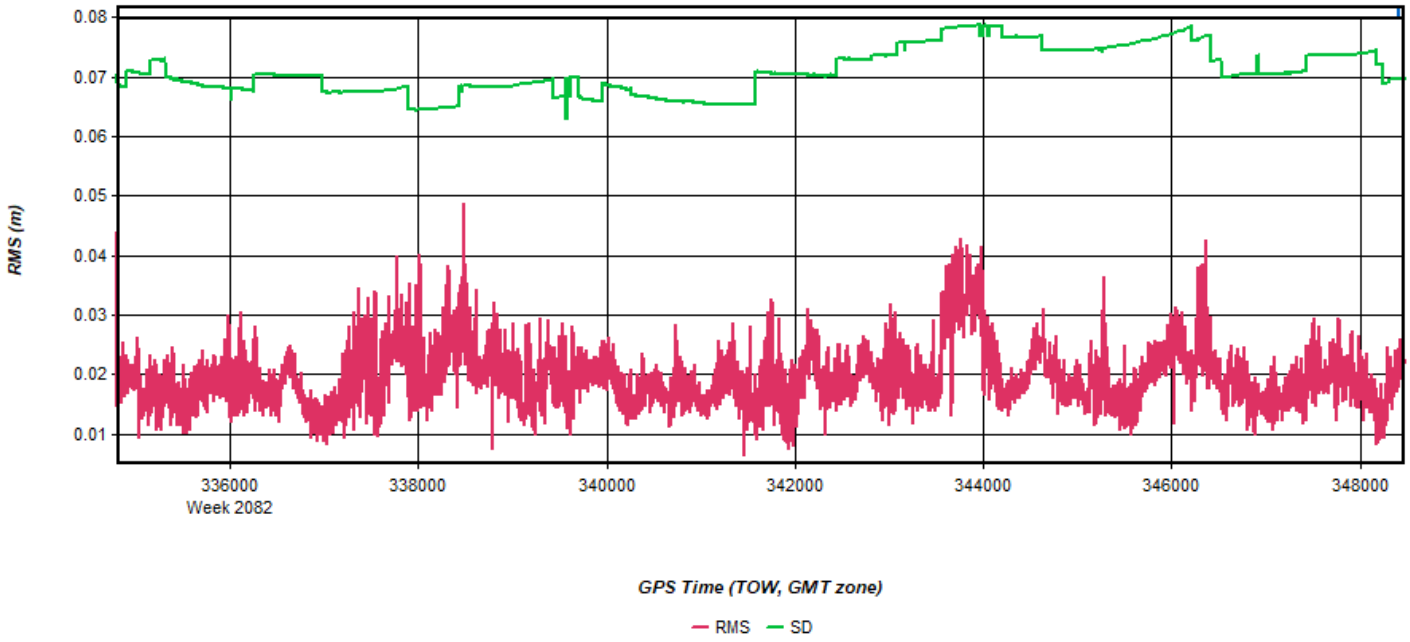

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 16: 20191204205851 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



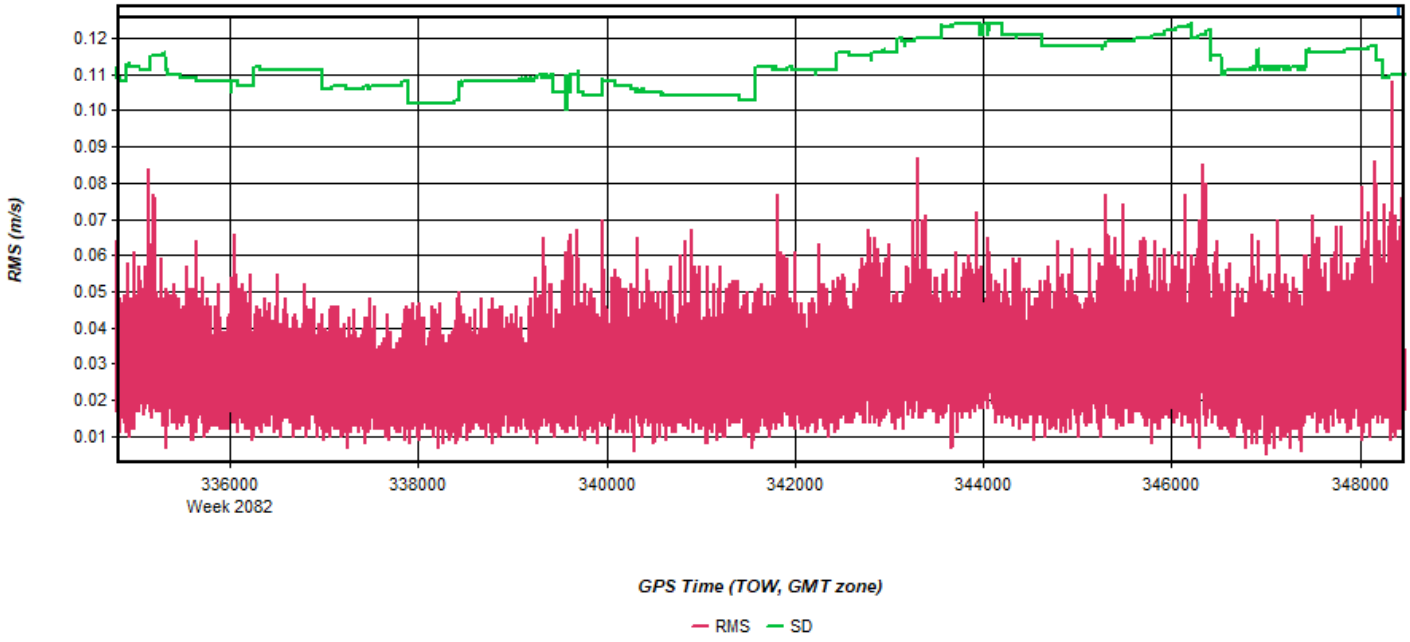

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 17: 20191204205851 [Smoothed TC Combined] - Carrier Residual RMS Plot**



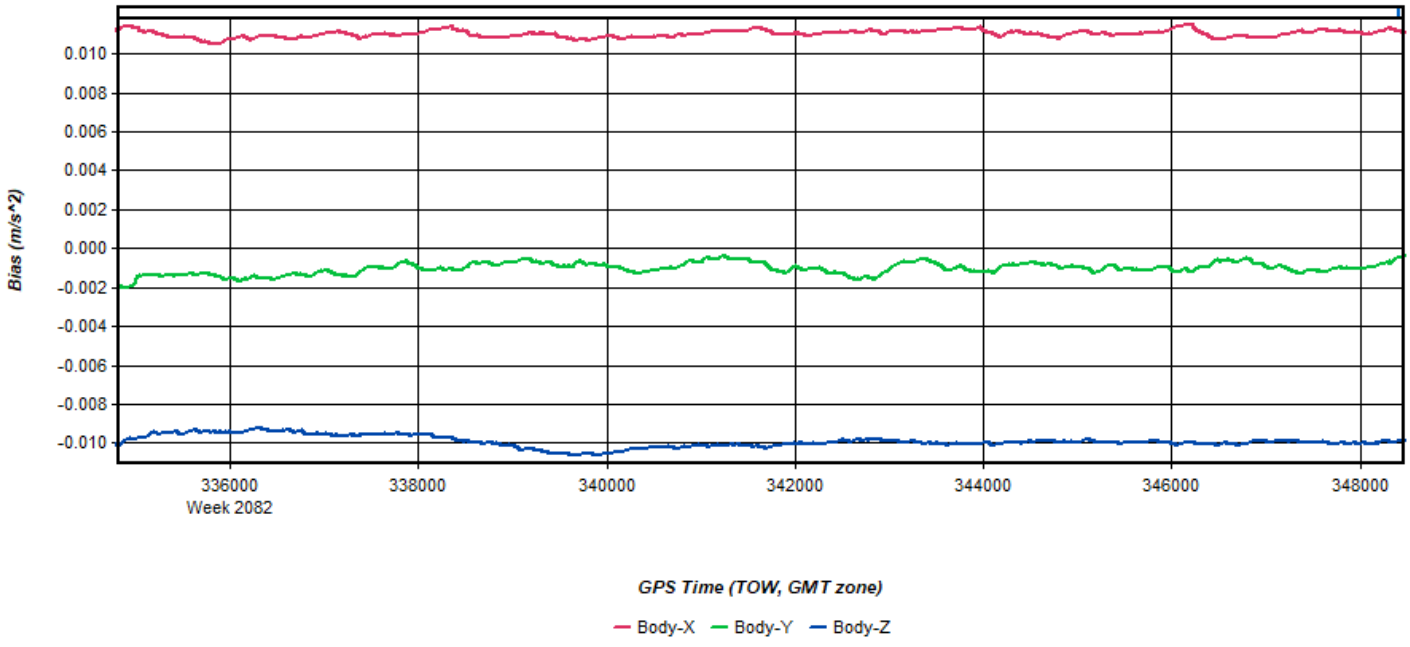

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 18: 20191204205851 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



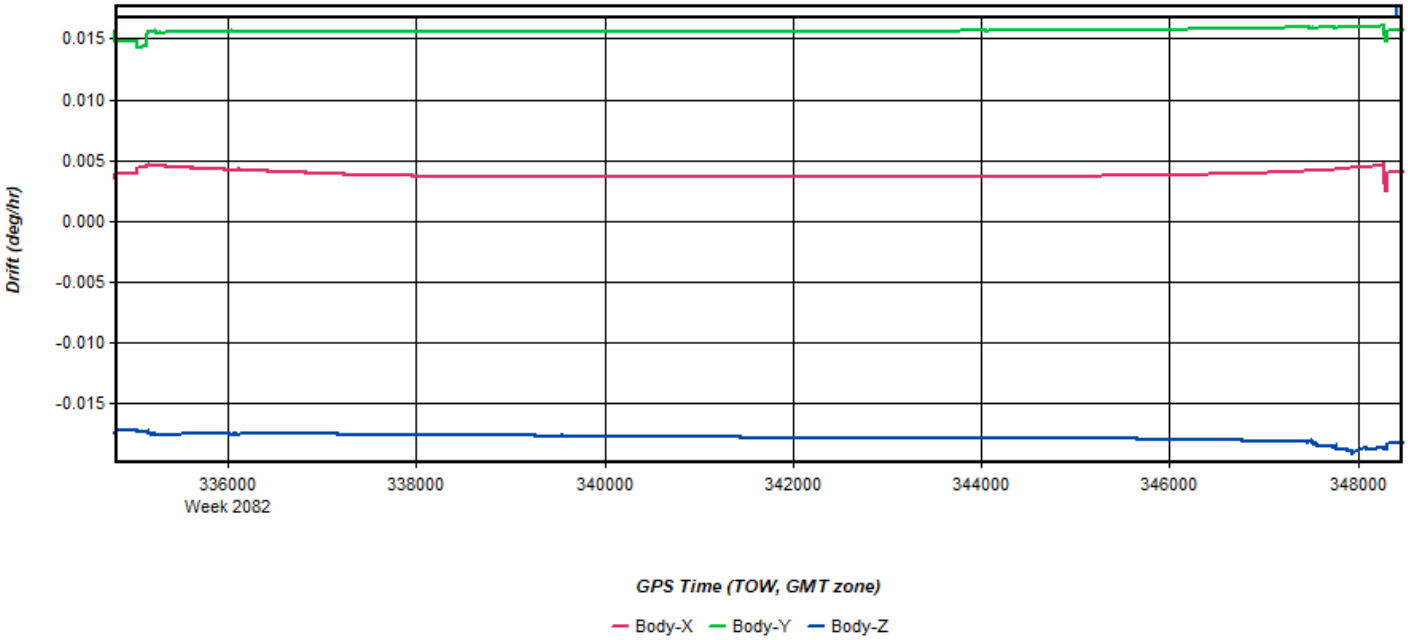

| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 19: 20191204205851 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

**Figure 20: 20191204205851 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191204205851 | by Unknown | on 12/13/2019 | at 20:13:15 |

# Output Results for 20191211235253

Inertial Explorer Version 8.80.2305
12/18/2019

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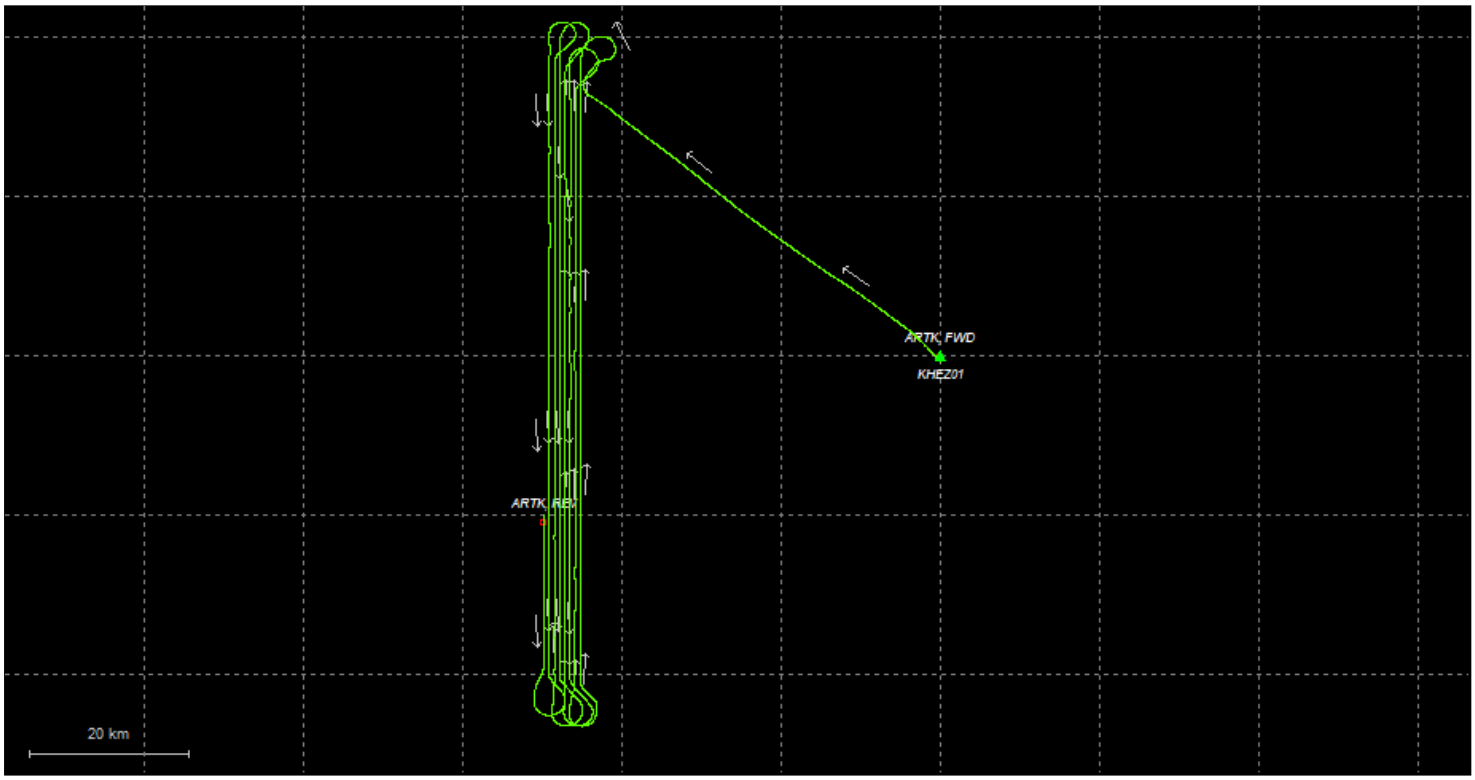
**Figure 1: Smoothed TC Combined - Map**




| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

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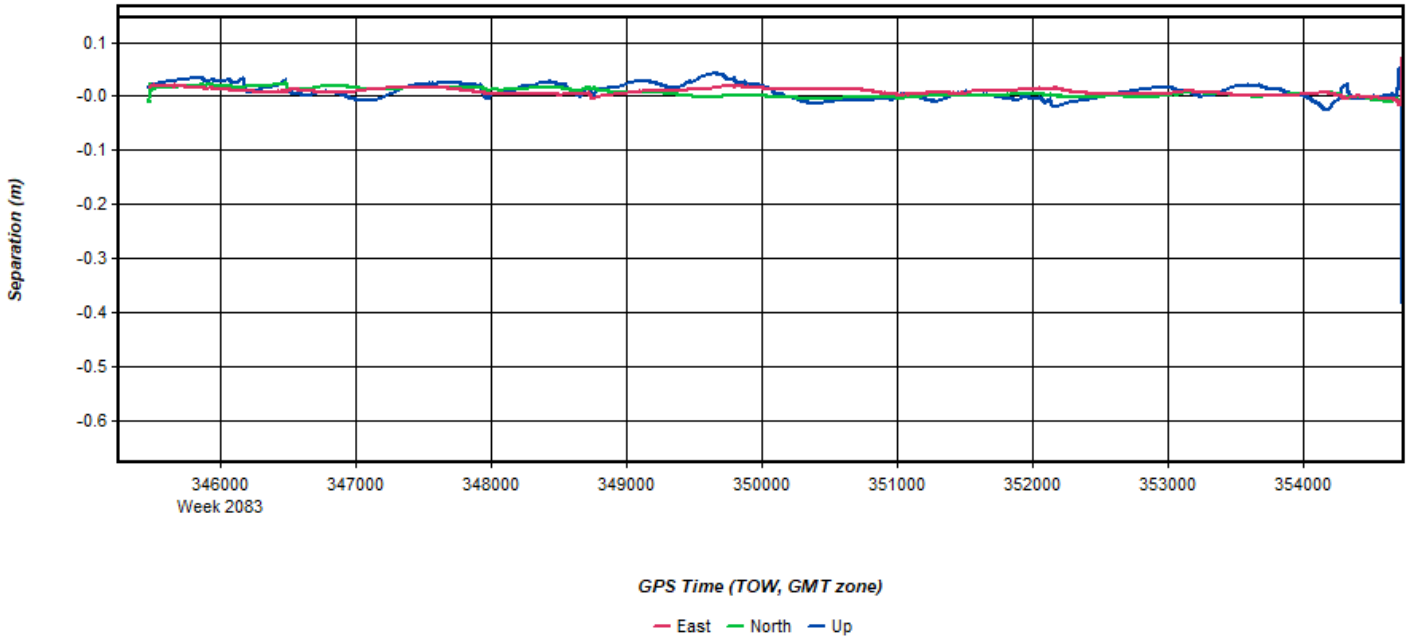
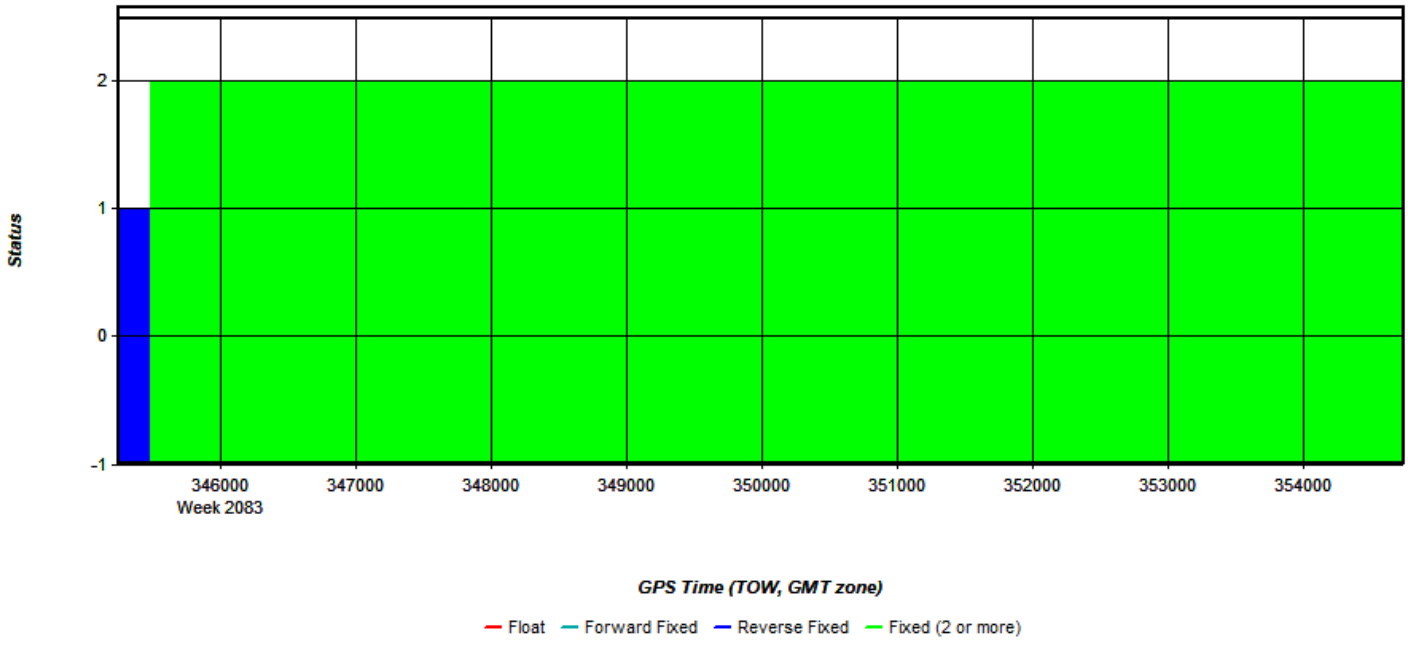
**Figure 2: 20191211235253 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



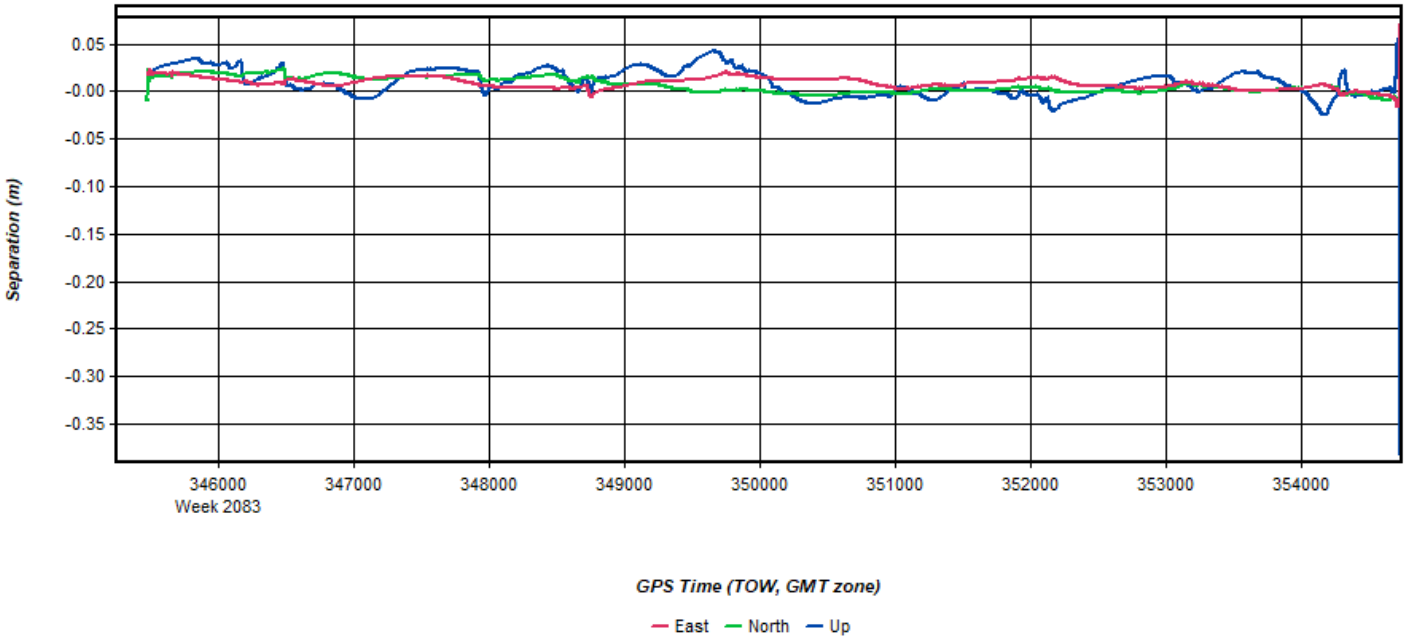

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 3: 20191211235253 [Smoothed TC Combined] - Float or Fixed Ambiguity**



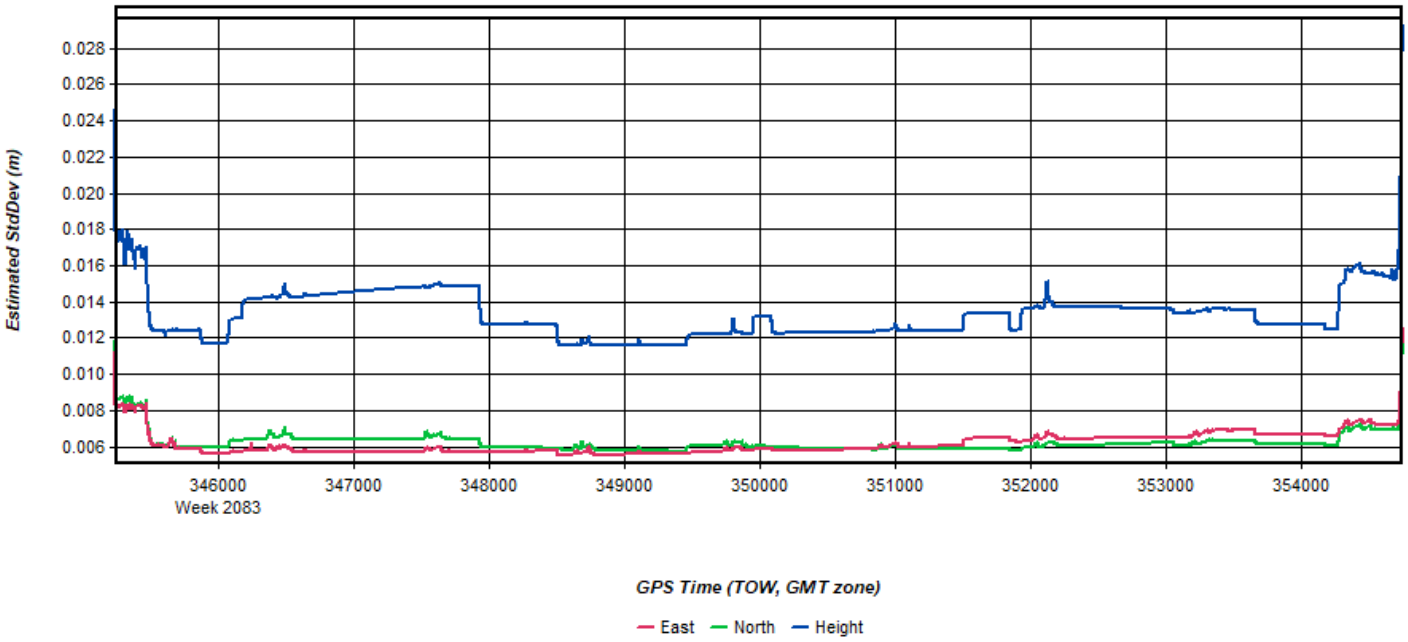

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 4: 20191211235253 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



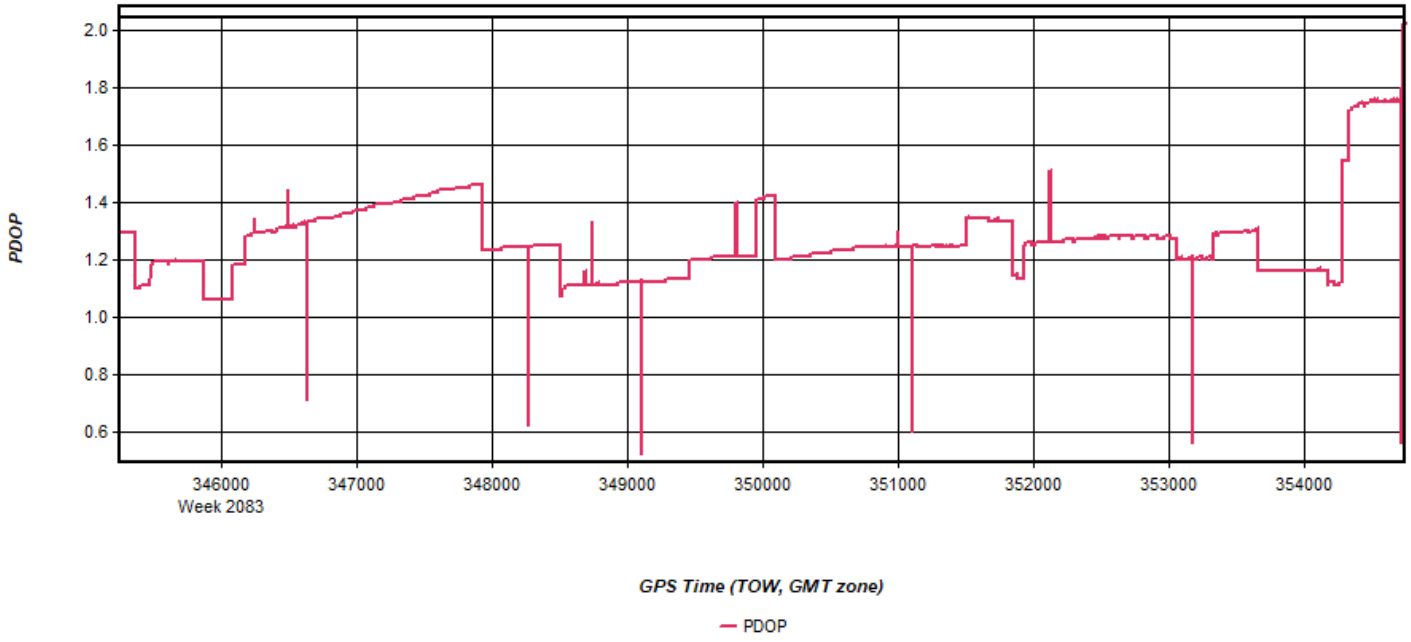

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 5: 20191211235253 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



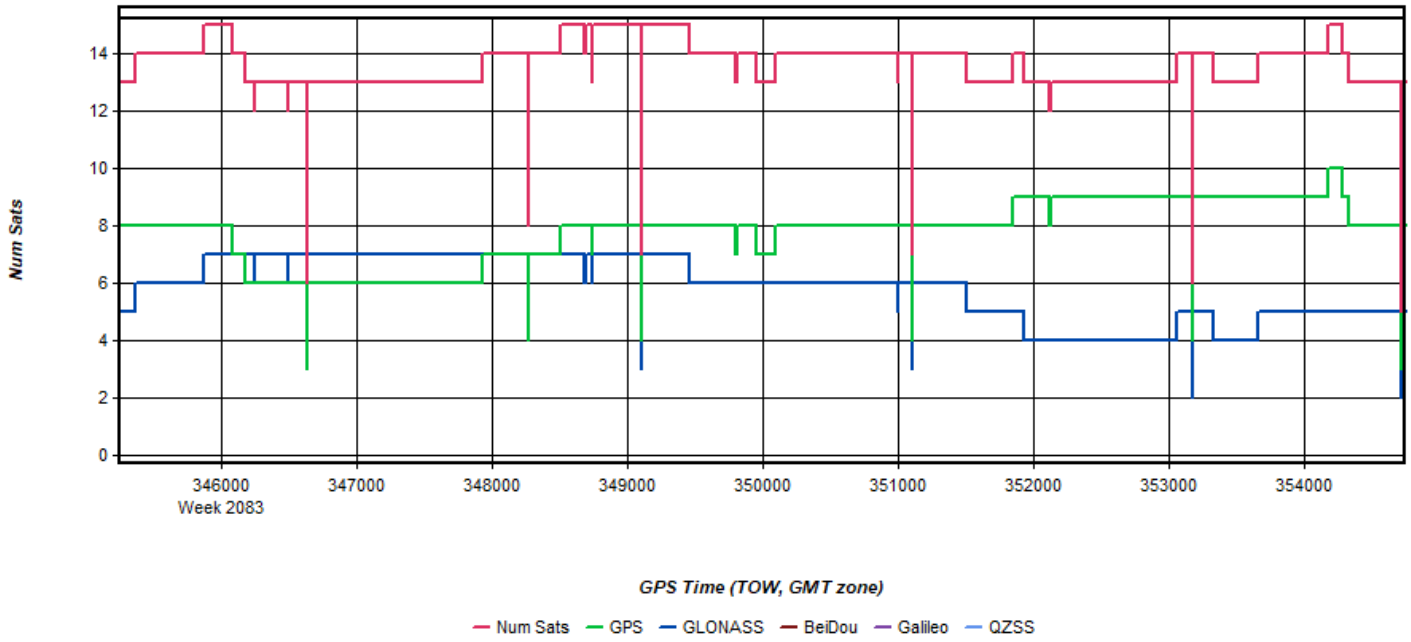

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 6: 20191211235253 [Smoothed TC Combined] - PDOP Plot**



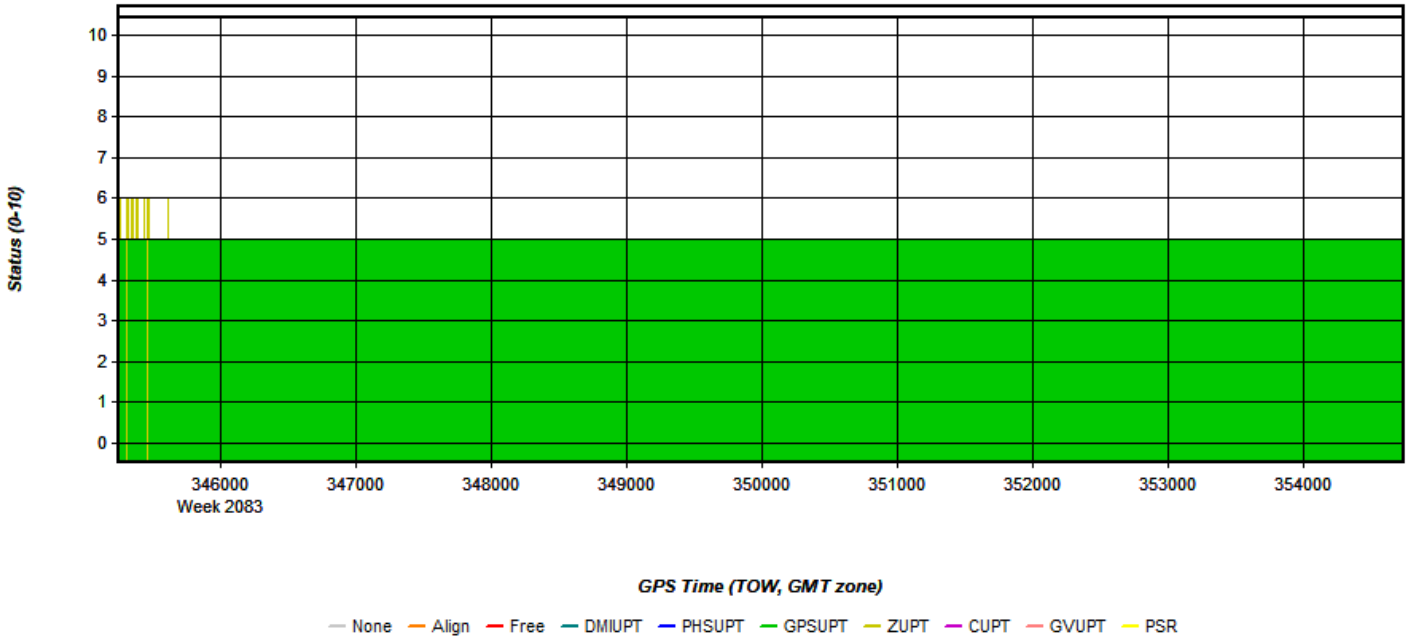

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 7: 20191211235253 [Smoothed TC Combined] - Number of Satellites Line Plot**



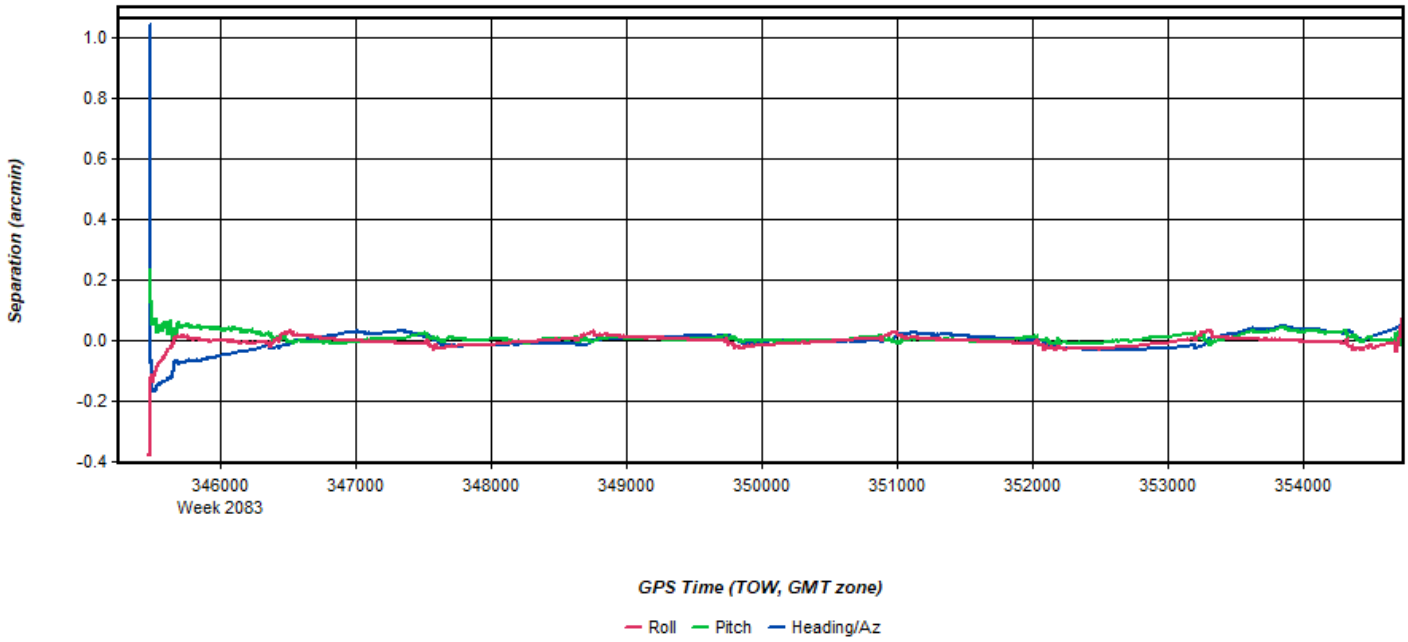

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 8: 20191211235253 [Smoothed TC Combined] - Status flag for IMU processing**



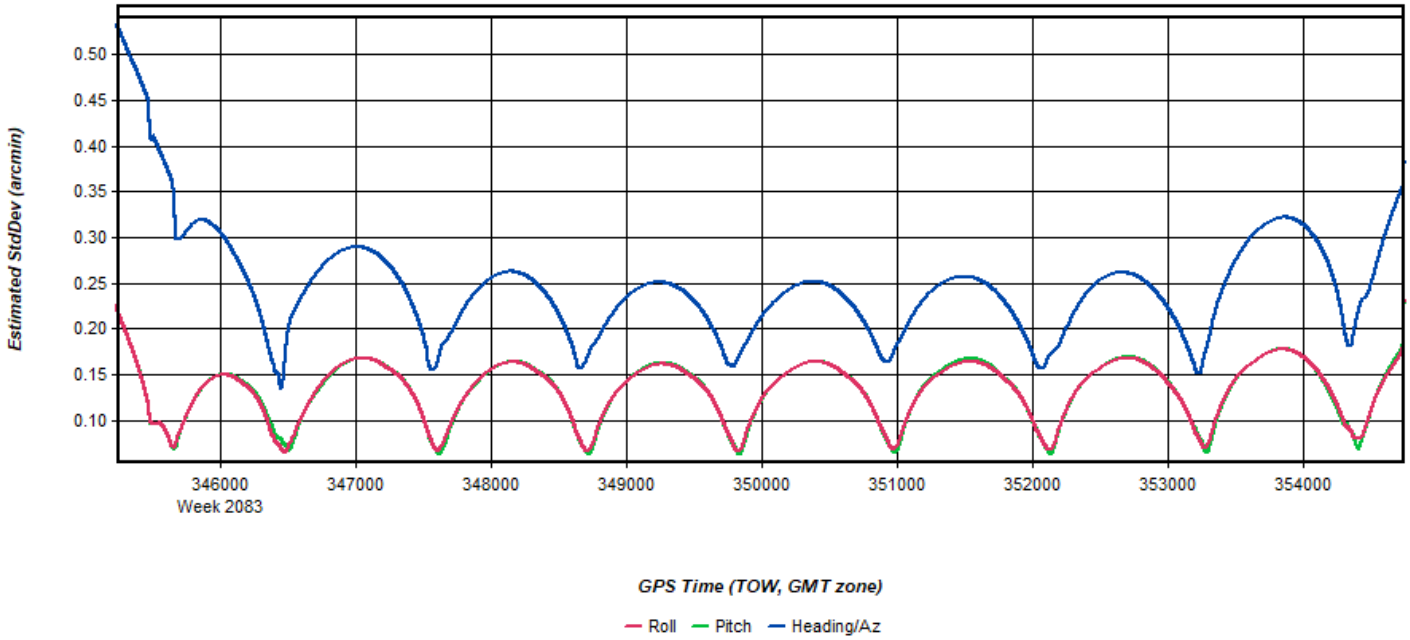

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 9: 20191211235253 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



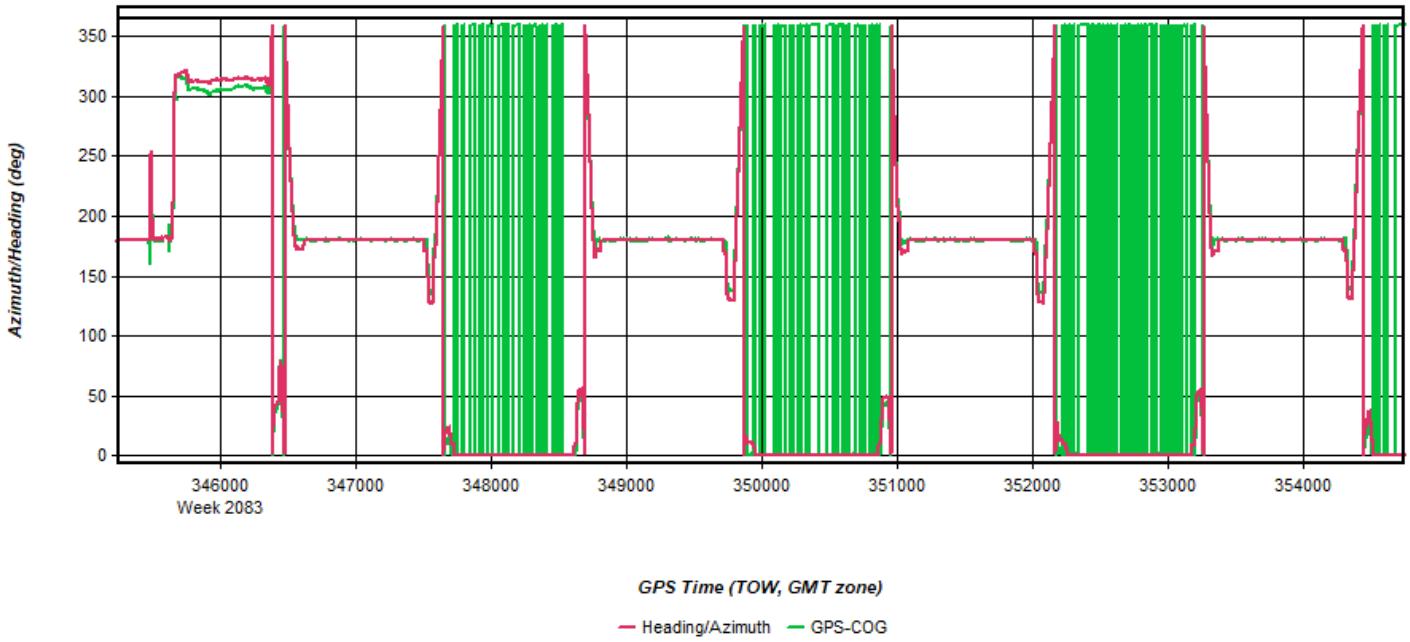

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 10: 20191211235253 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



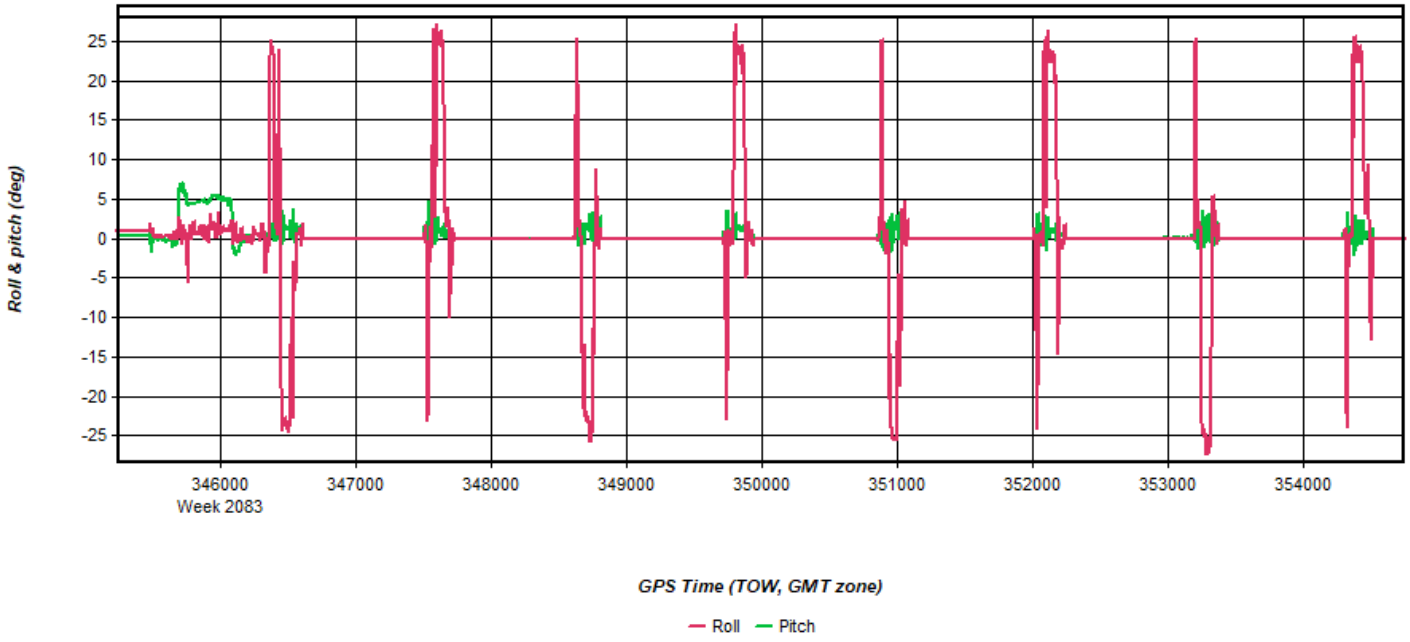

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 11: 20191211235253 [Smoothed TC Combined] - Azimuth Plot**



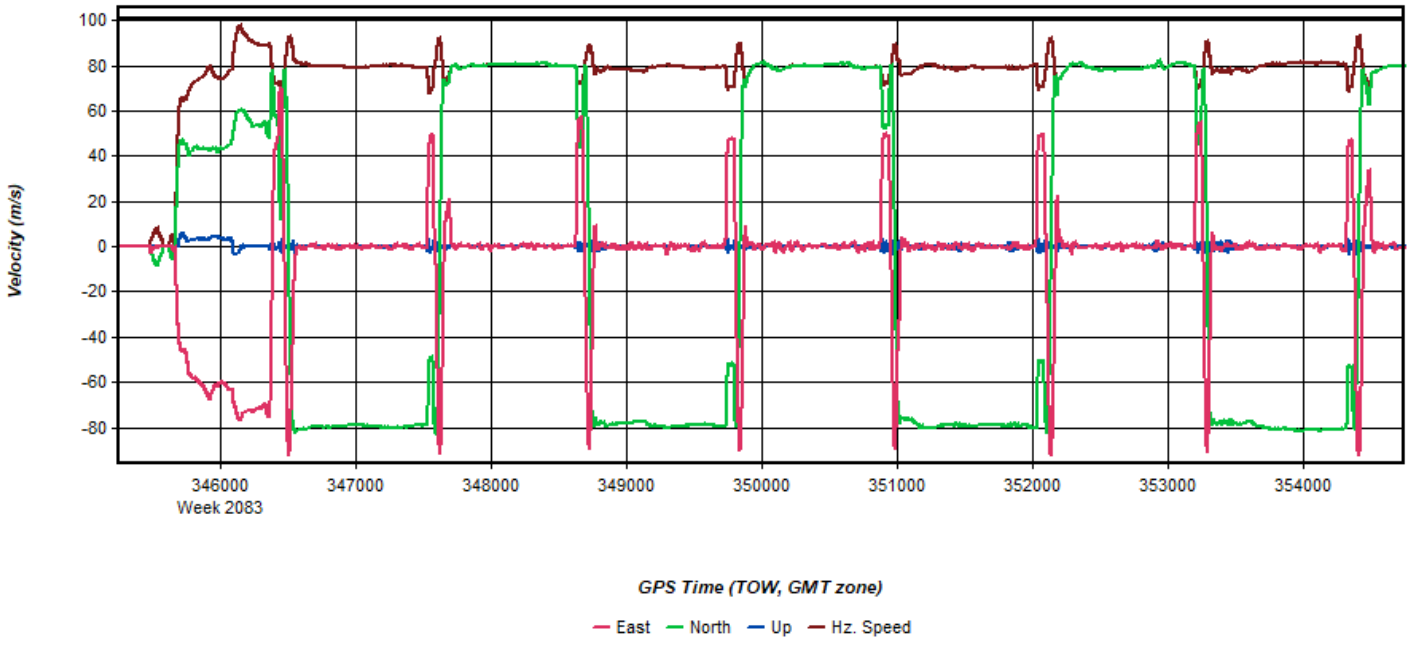

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 12: 20191211235253 [Smoothed TC Combined] - Roll & Pitch Plot**



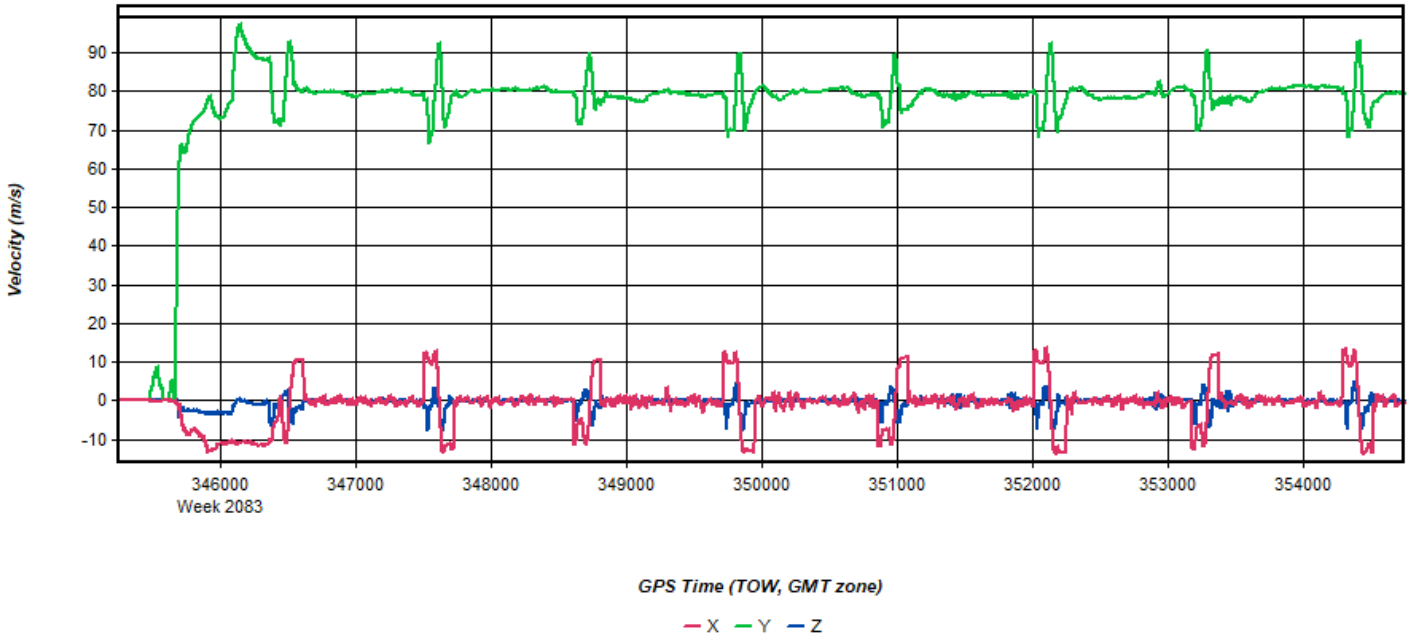

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 13: 20191211235253 [Smoothed TC Combined] - Velocity Profile Plot**



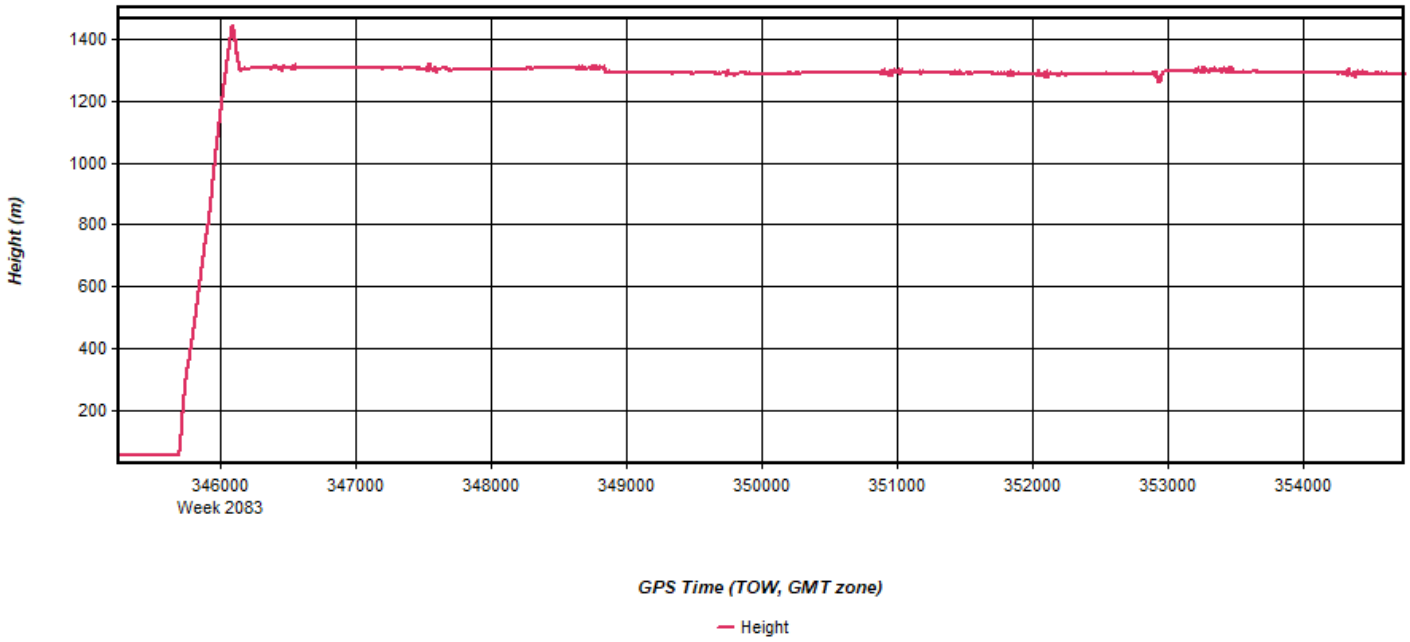

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 14: 20191211235253 [Smoothed TC Combined] - Body Frame Velocity Plot**



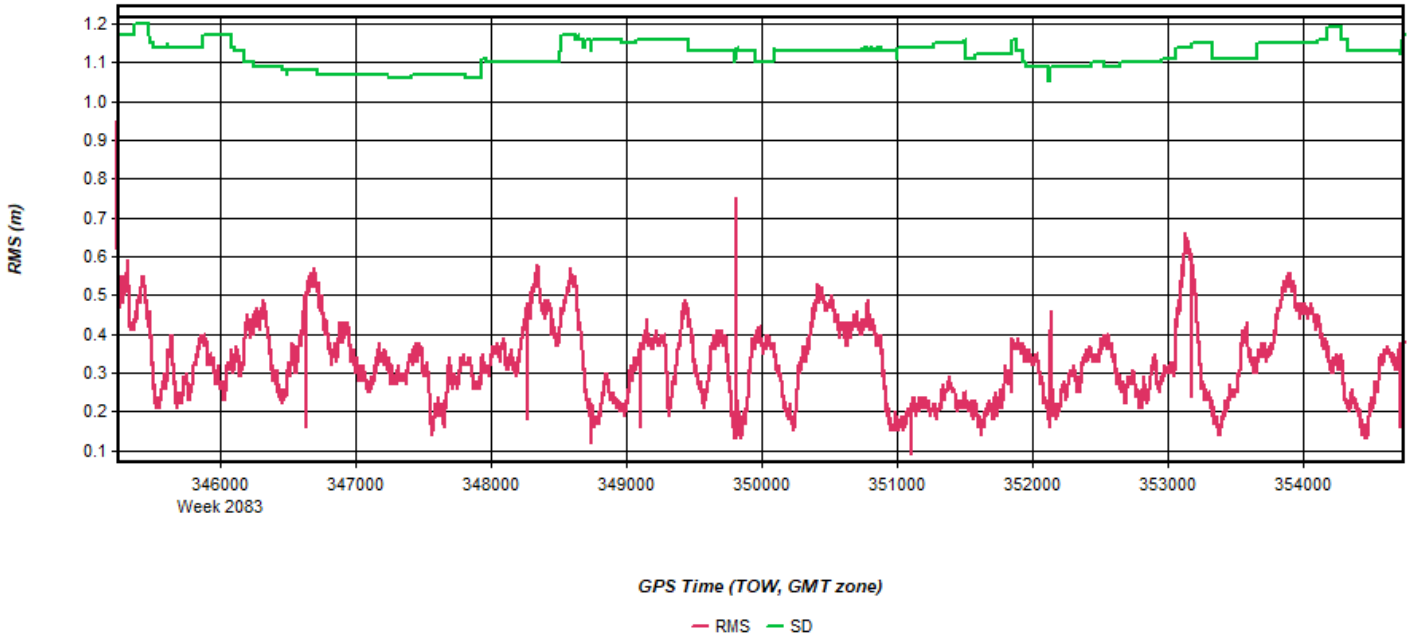

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 15: 20191211235253 [Smoothed TC Combined] - Height Profile Plot**



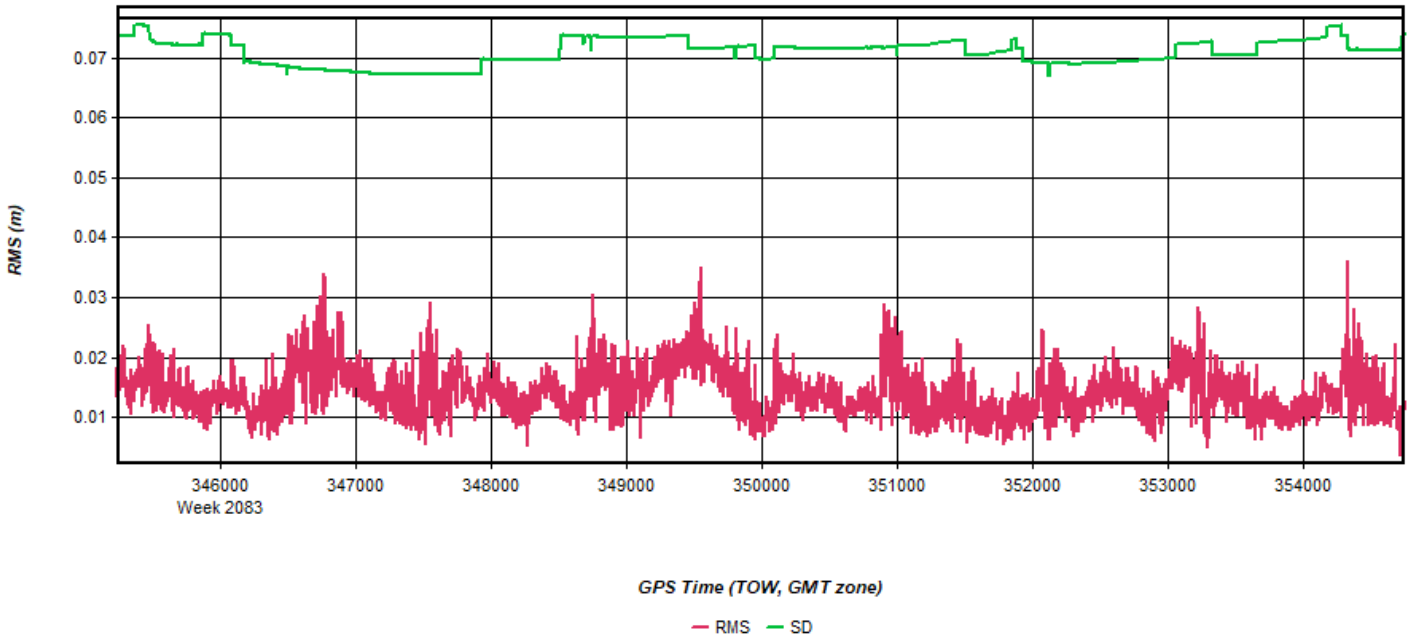

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 16: 20191211235253 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



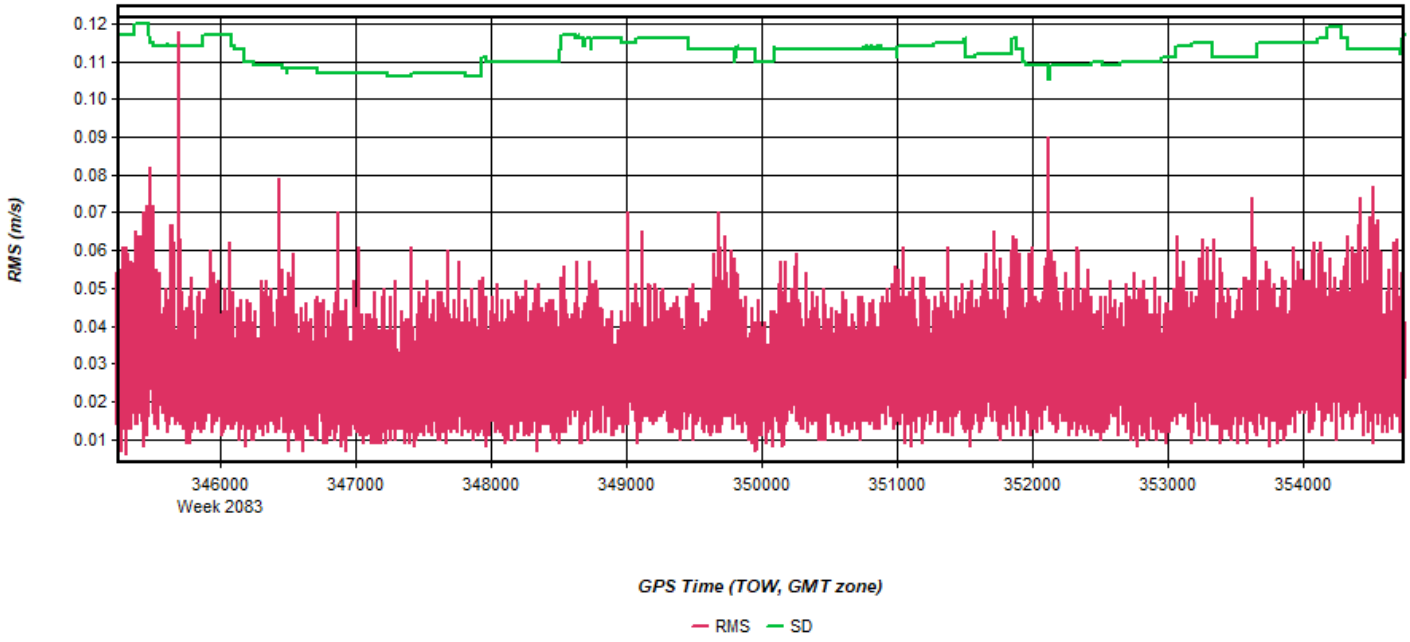

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 17: 20191211235253 [Smoothed TC Combined] - Carrier Residual RMS Plot**



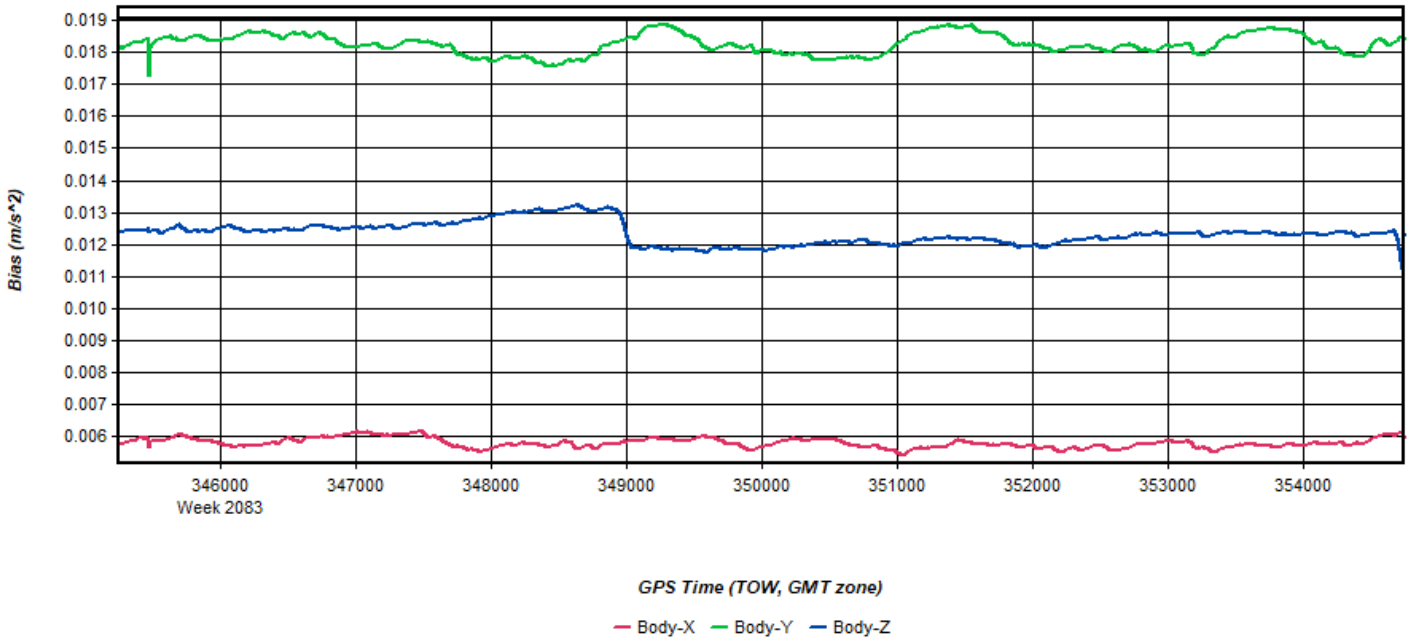

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 18: 20191211235253 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



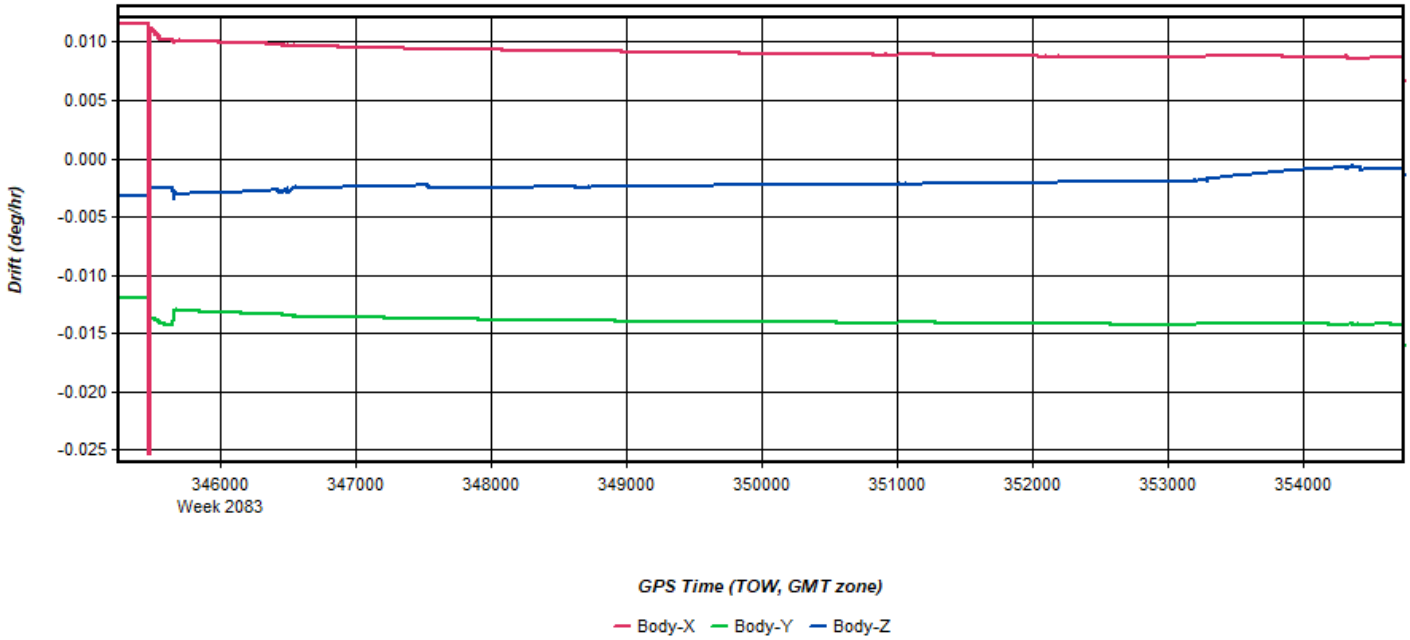

| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 19: 20191211235253 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

**Figure 20: 20191211235253 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191211235253 | by Unknown | on 12/18/2019 | at 12:56:45 |

# Output Results for 20191212150331

Inertial Explorer Version 8.80.2305
12/24/2019

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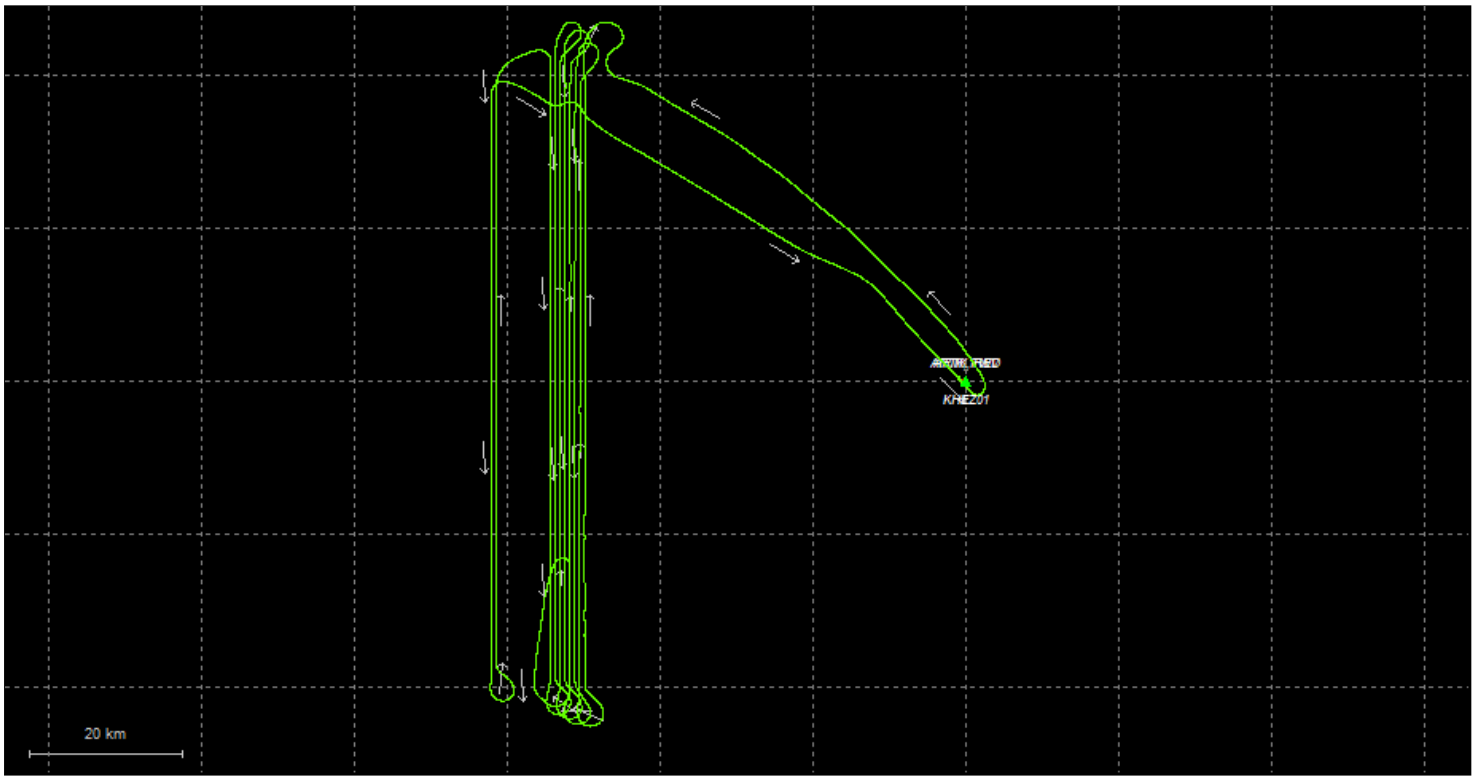
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |
|---|---|---|---|---|

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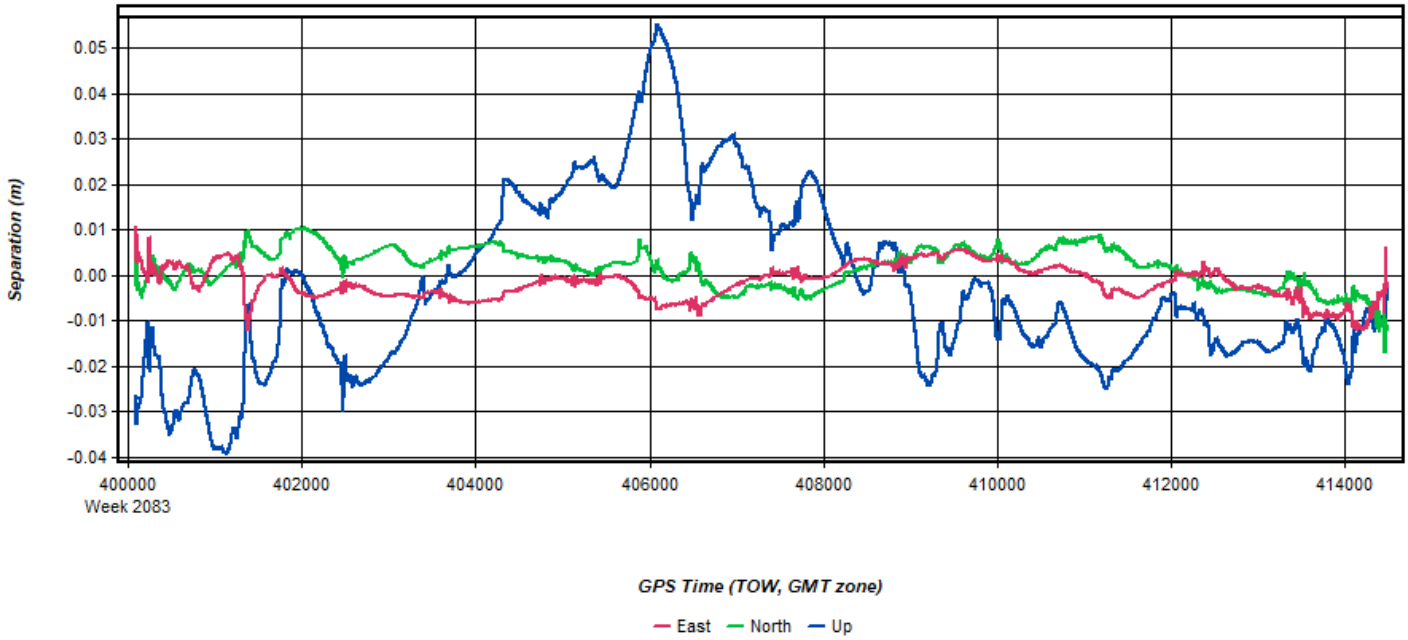
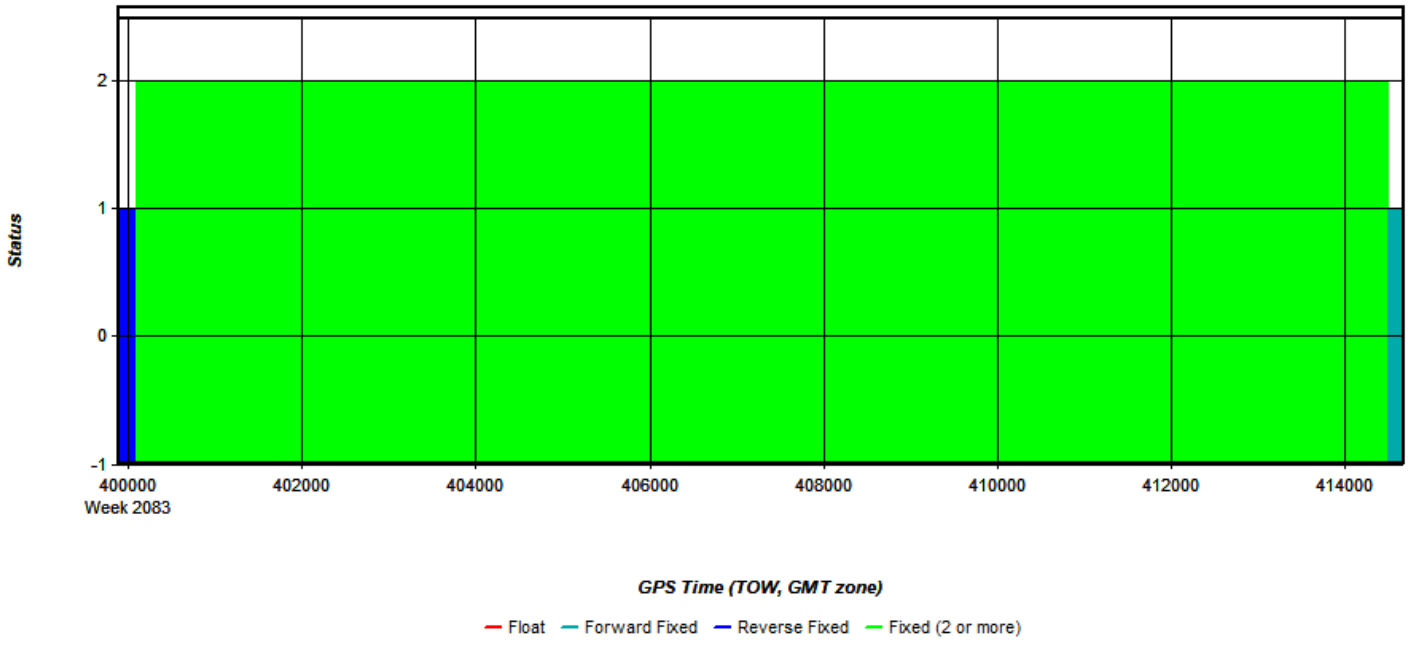
**Figure 2: 20191212150331 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



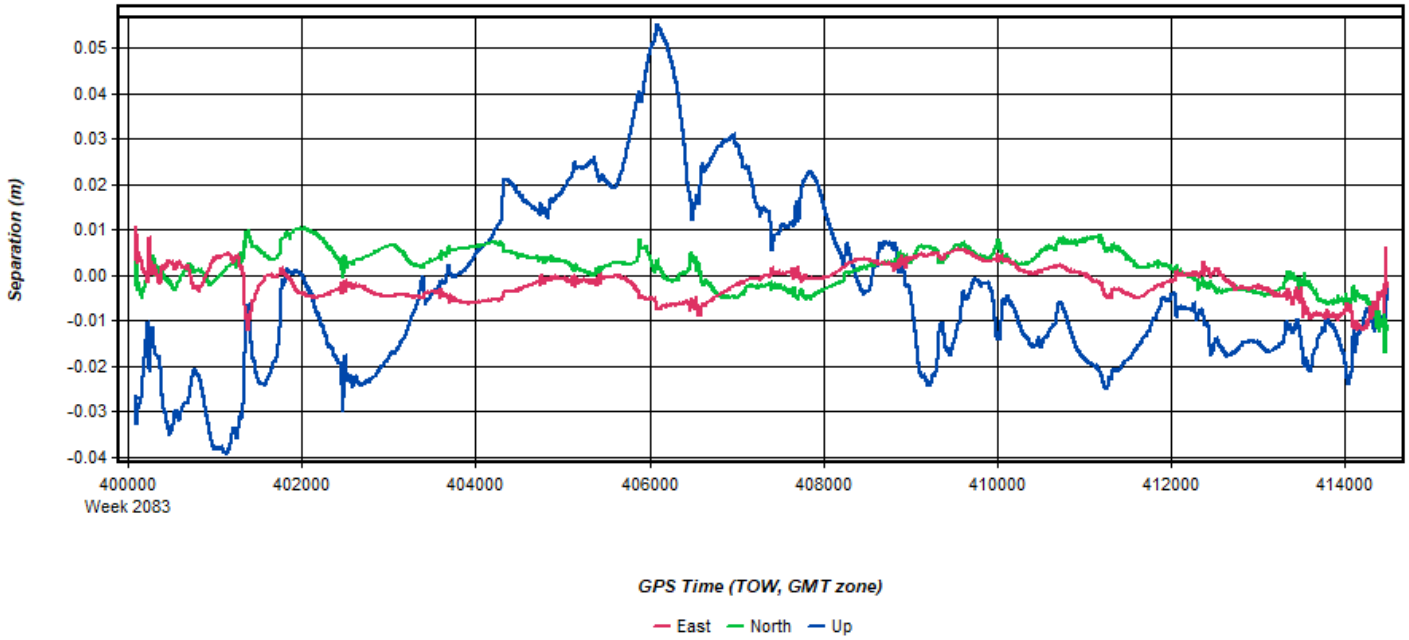

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 3: 20191212150331 [Smoothed TC Combined] - Float or Fixed Ambiguity**



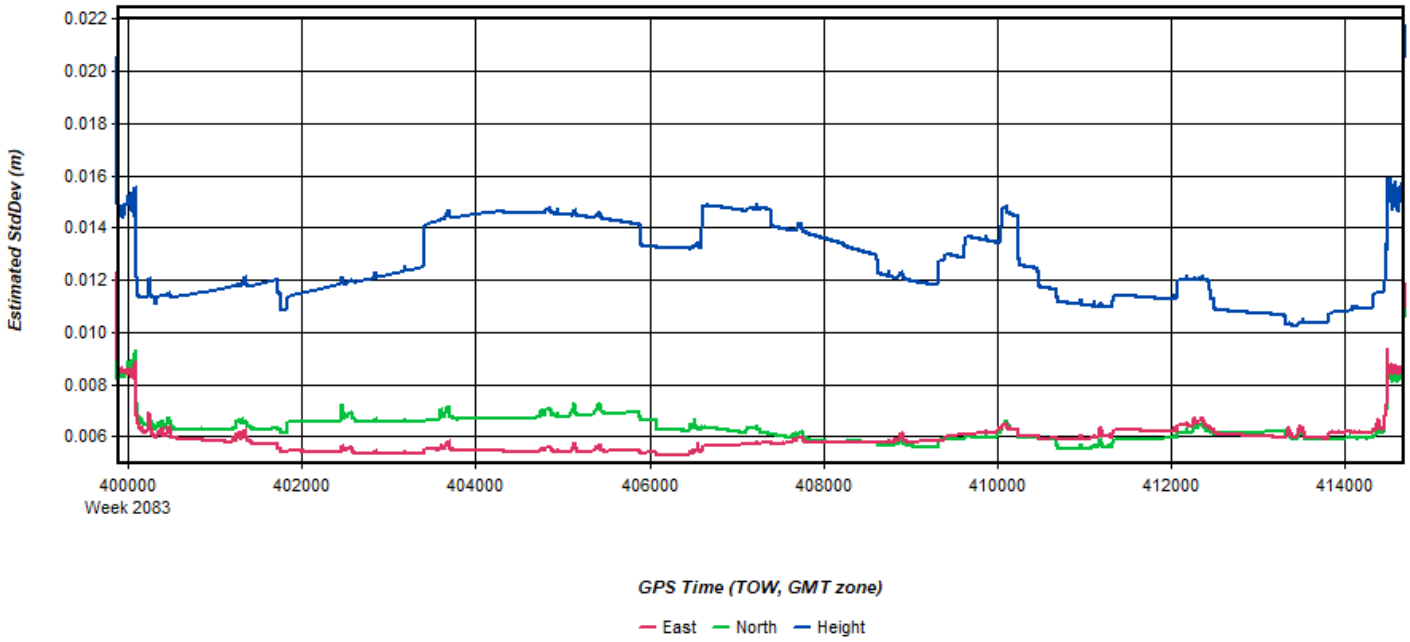

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 4: 20191212150331 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



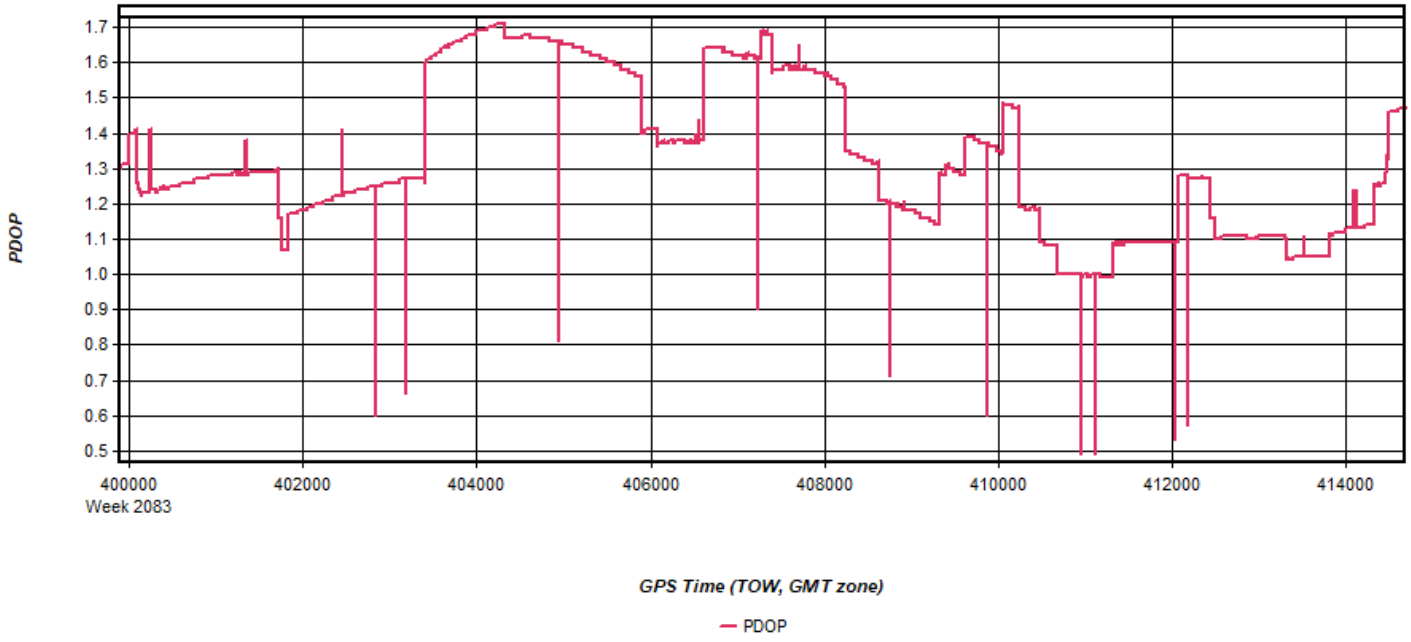

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 5: 20191212150331 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



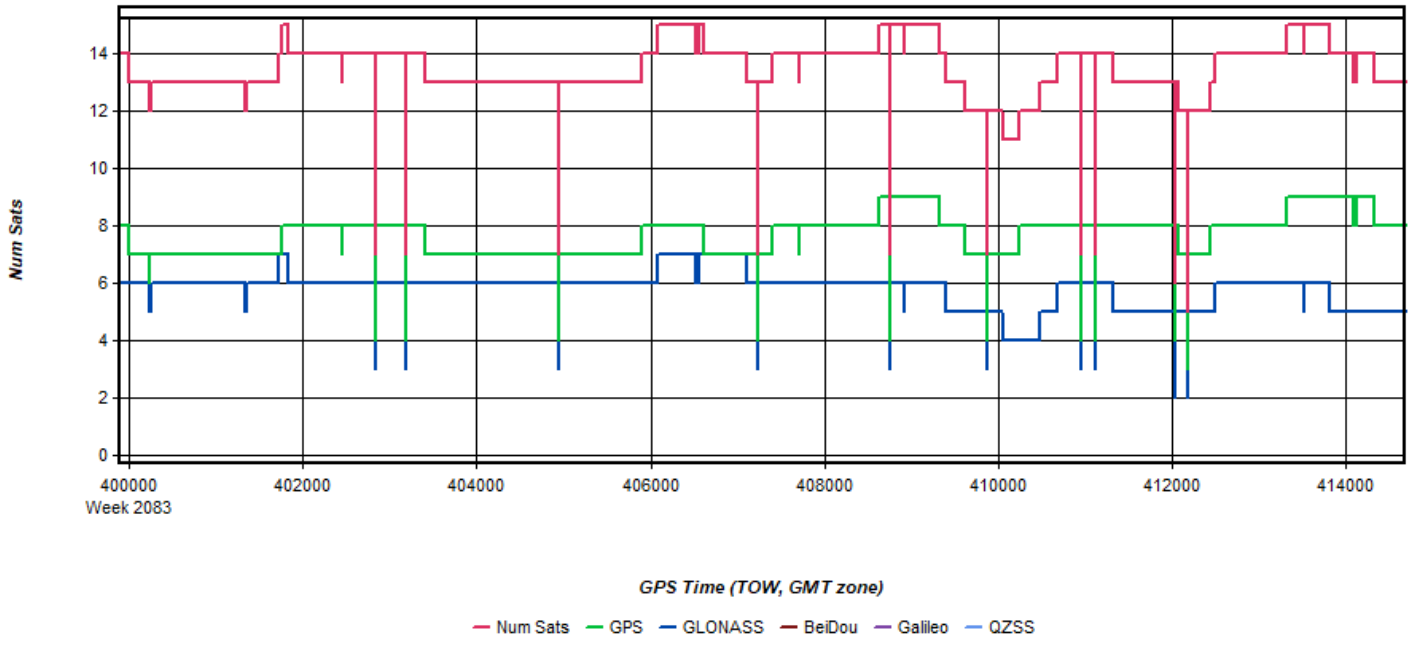

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 6: 20191212150331 [Smoothed TC Combined] - PDOP Plot**



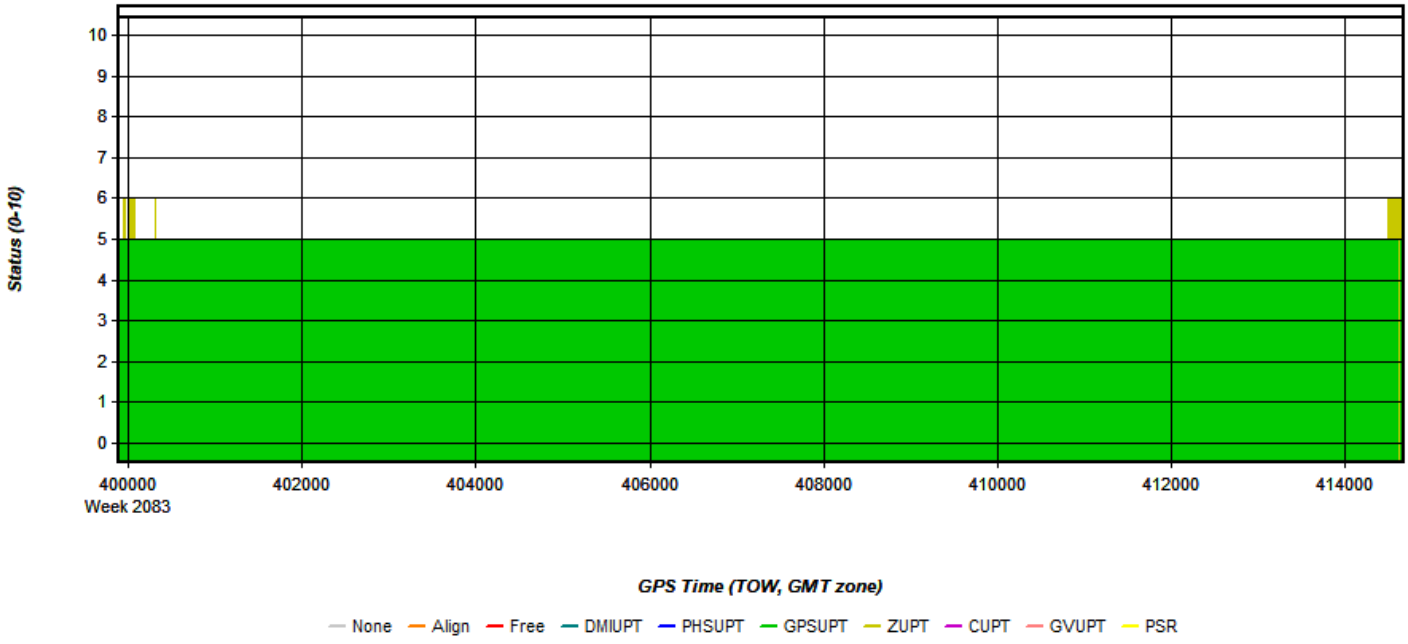

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 7: 20191212150331 [Smoothed TC Combined] - Number of Satellites Line Plot**



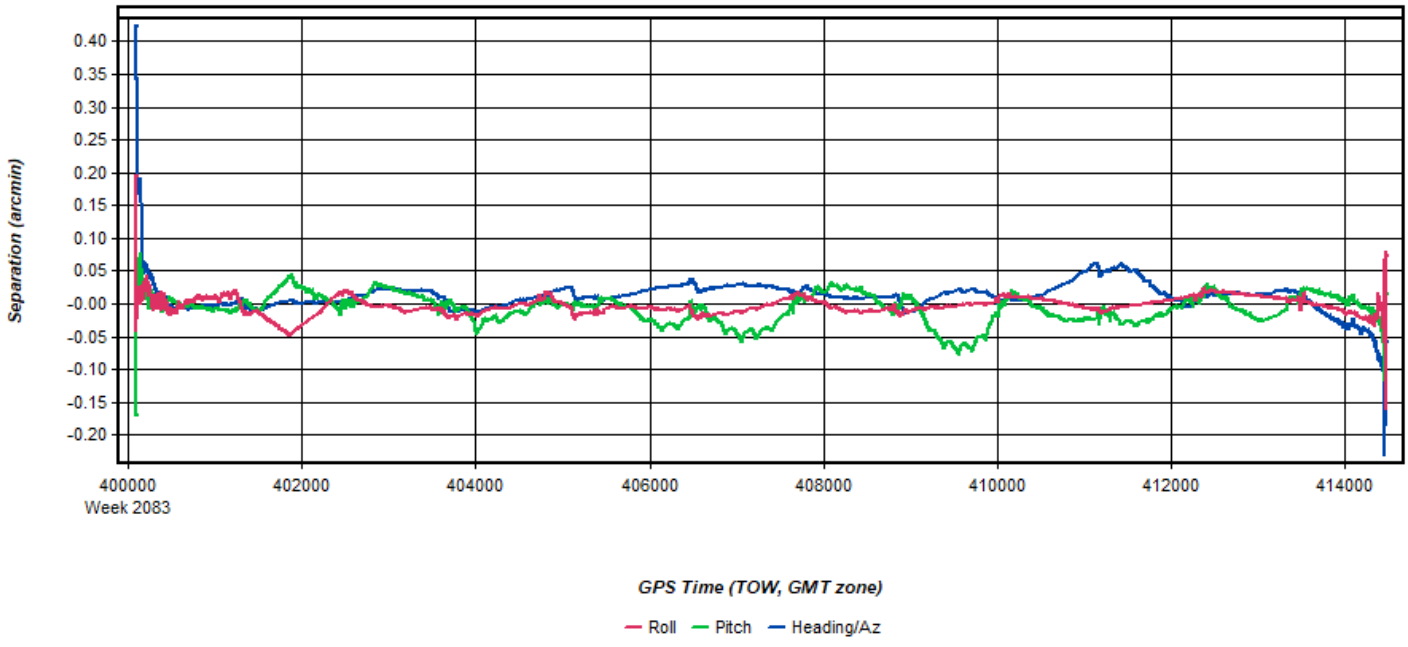

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 8: 20191212150331 [Smoothed TC Combined] - Status flag for IMU processing**



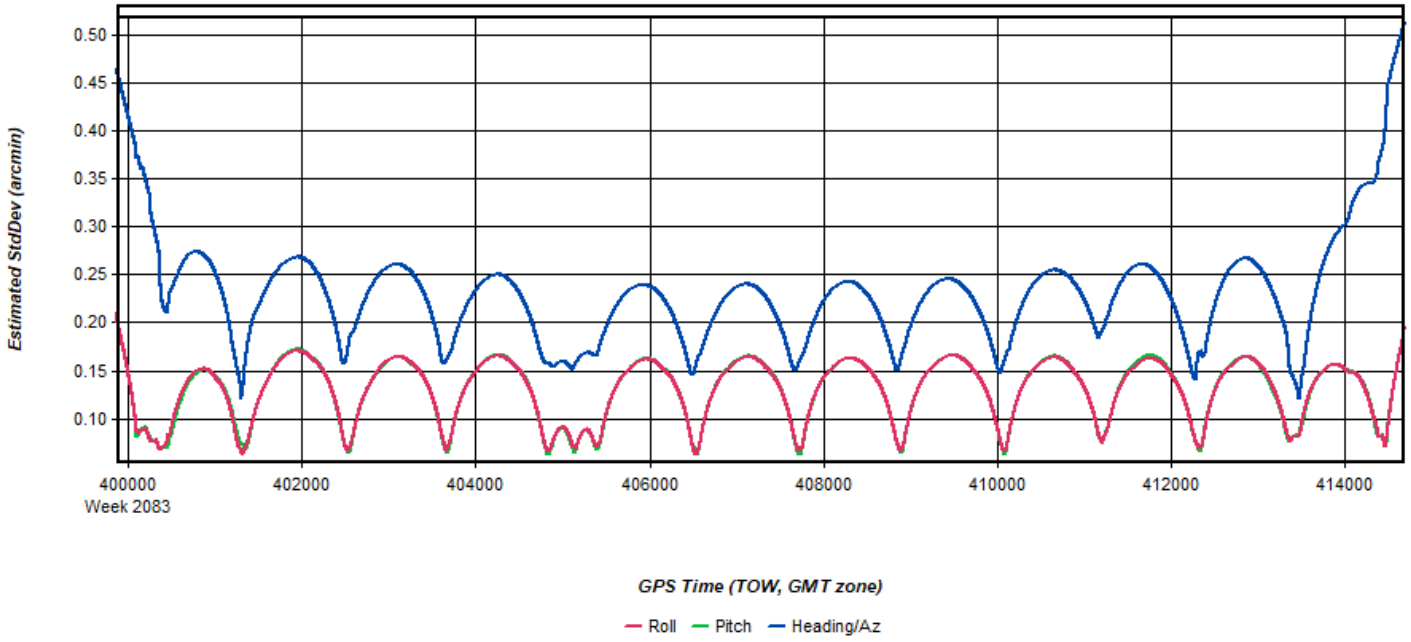

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 9: 20191212150331 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



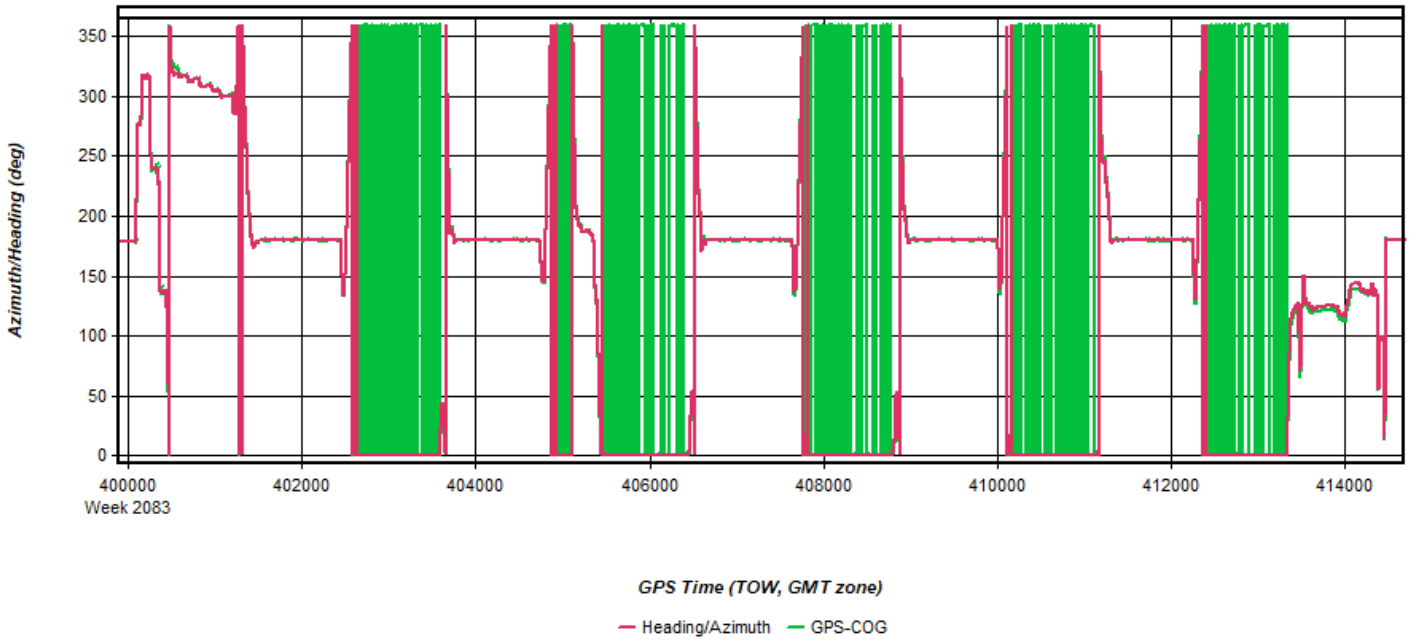

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 10: 20191212150331 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



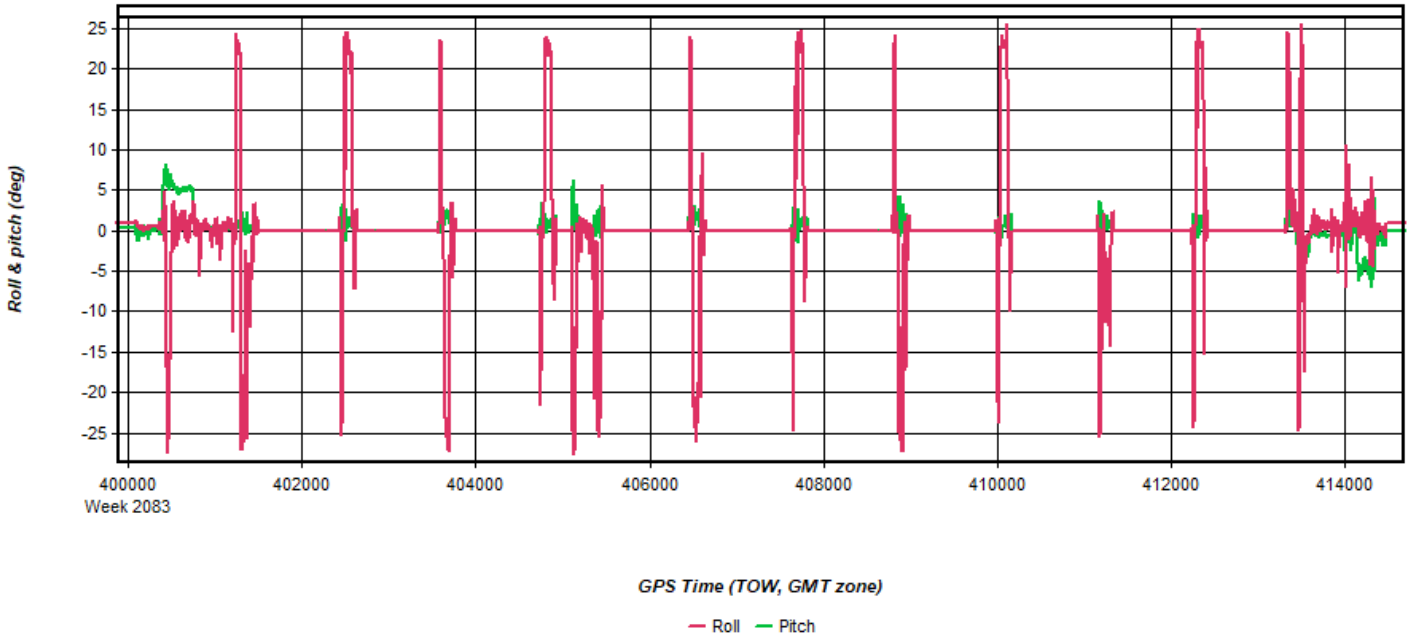

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 11: 20191212150331 [Smoothed TC Combined] - Azimuth Plot**



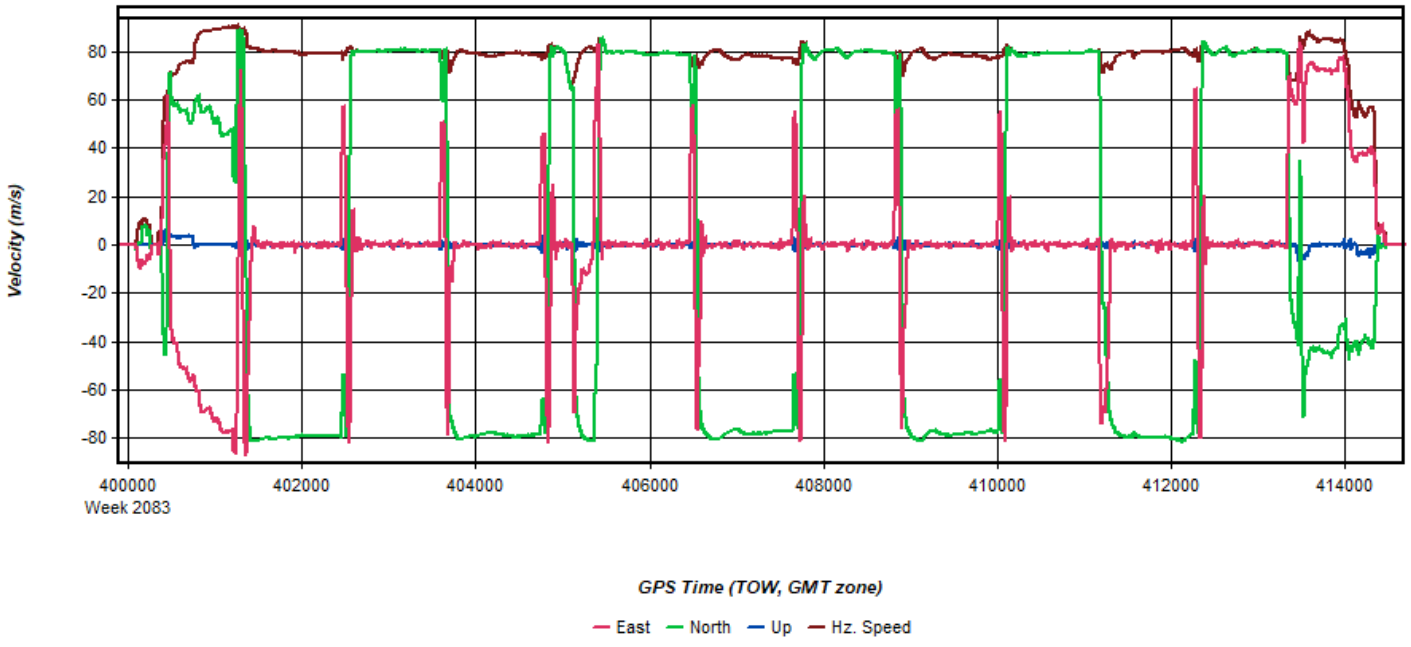

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 12: 20191212150331 [Smoothed TC Combined] - Roll & Pitch Plot**



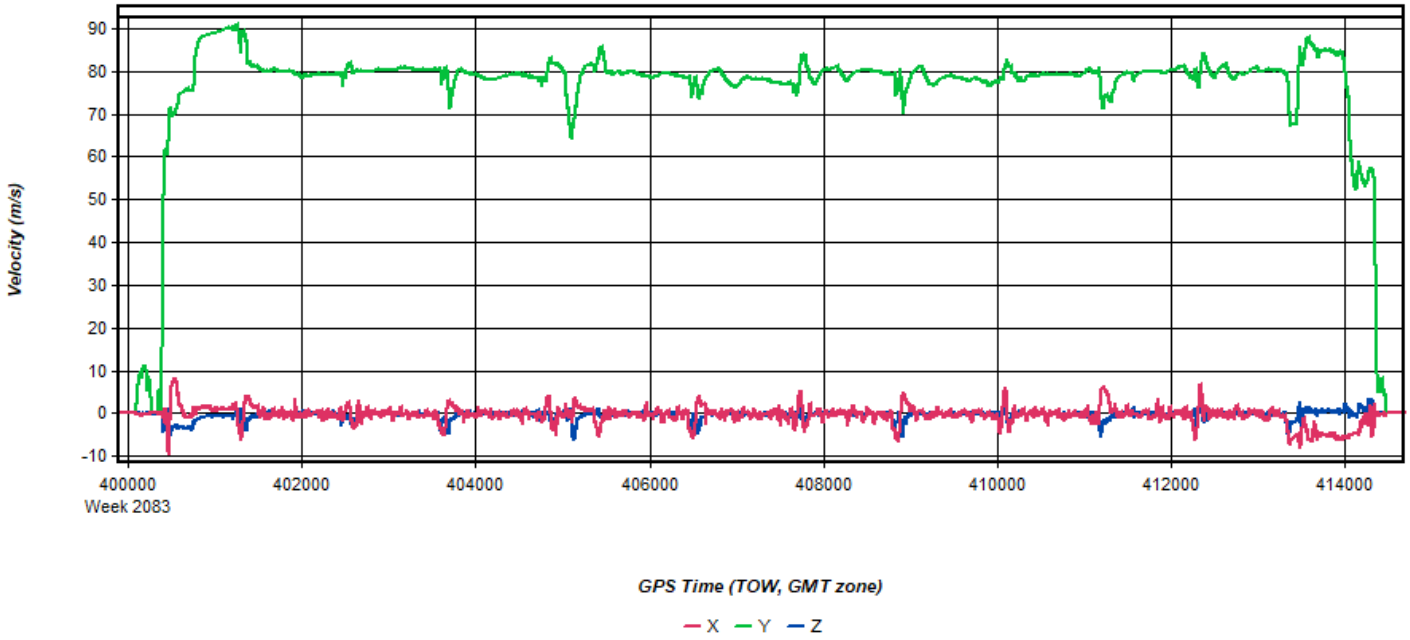

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 13: 20191212150331 [Smoothed TC Combined] - Velocity Profile Plot**



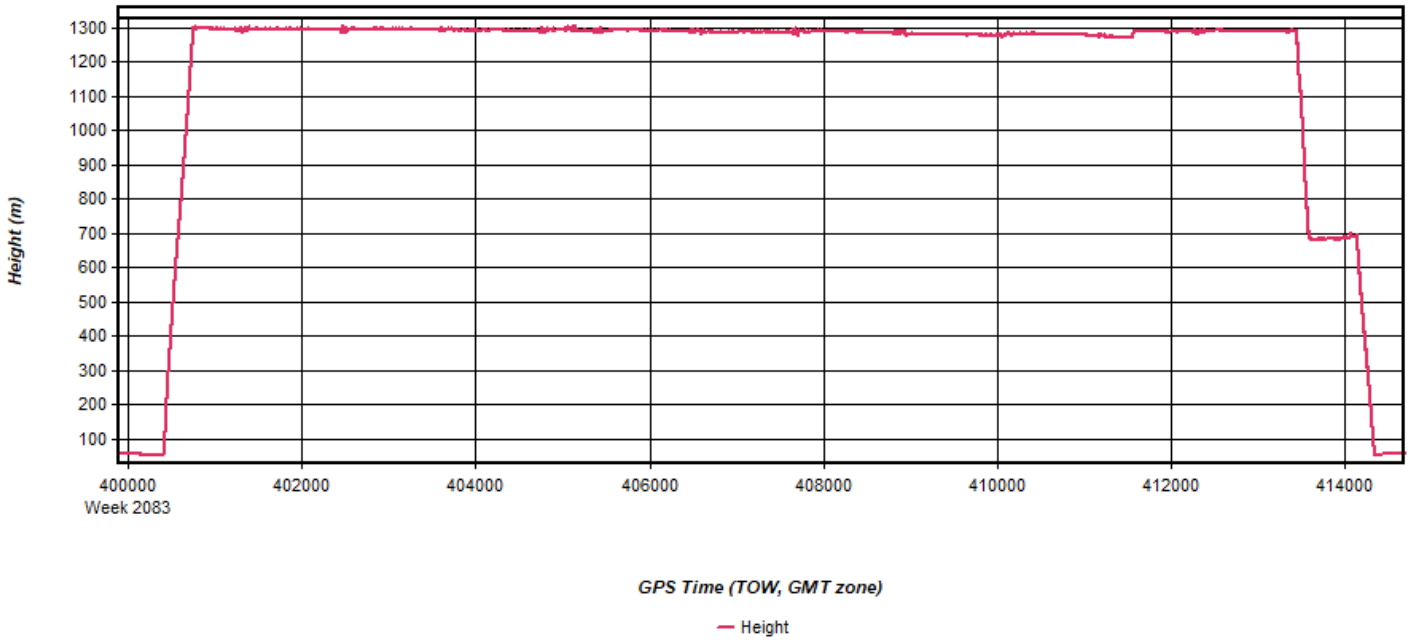

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 14: 20191212150331 [Smoothed TC Combined] - Body Frame Velocity Plot**



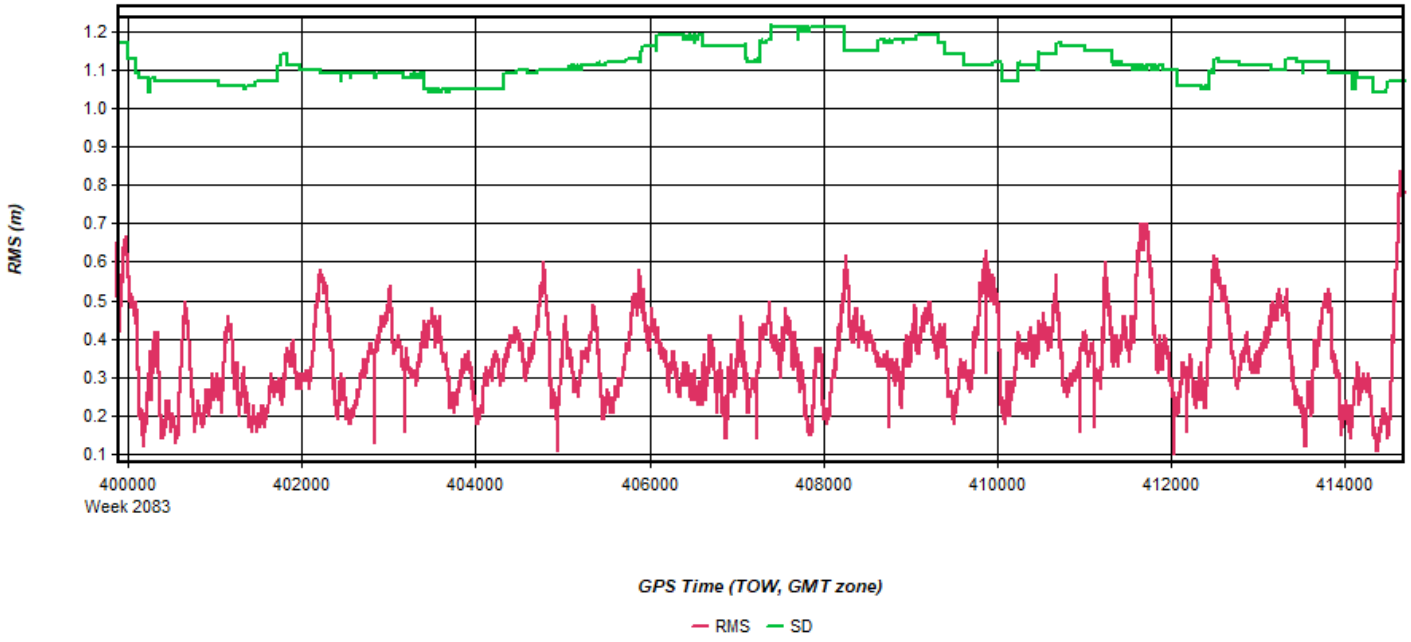

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 15: 20191212150331 [Smoothed TC Combined] - Height Profile Plot**



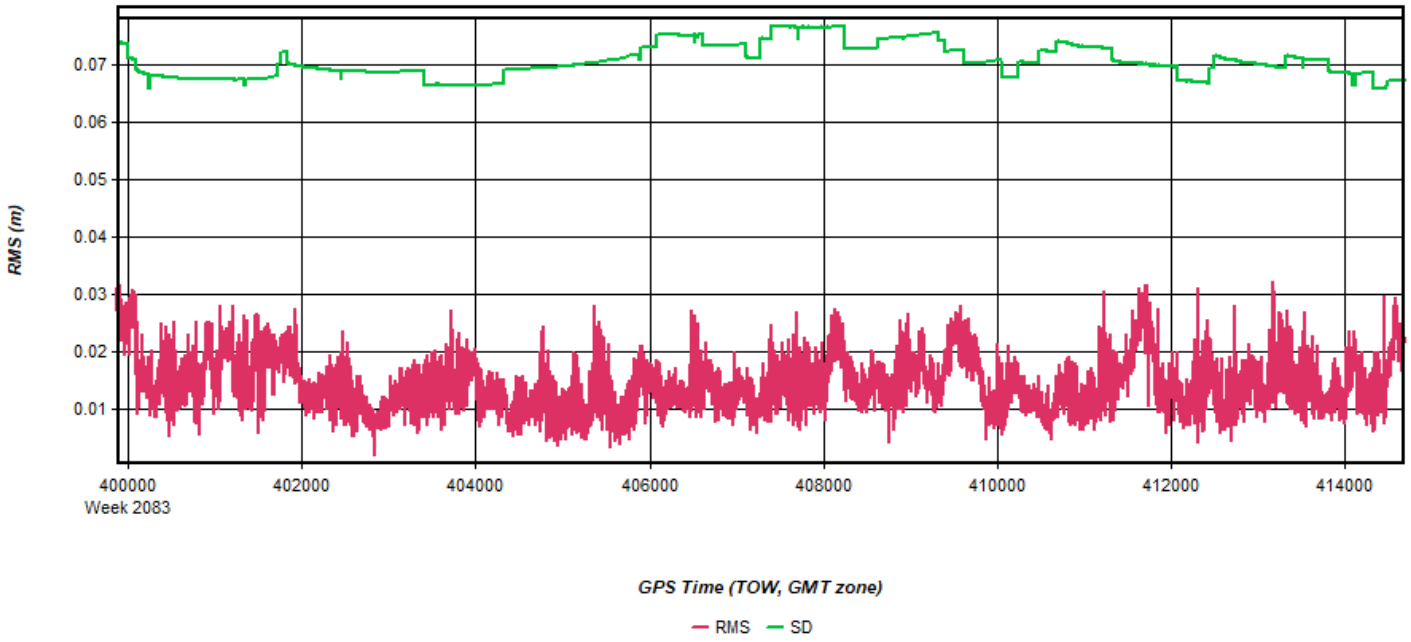

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 16: 20191212150331 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



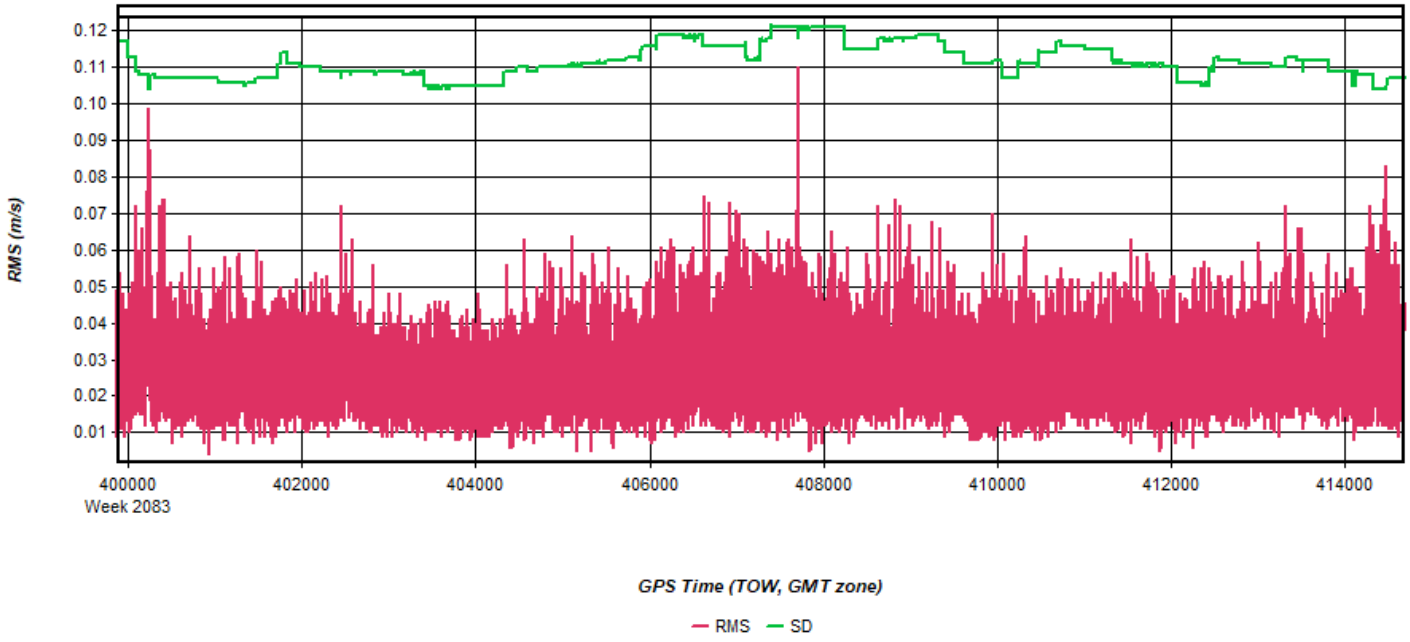

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 17: 20191212150331 [Smoothed TC Combined] - Carrier Residual RMS Plot**



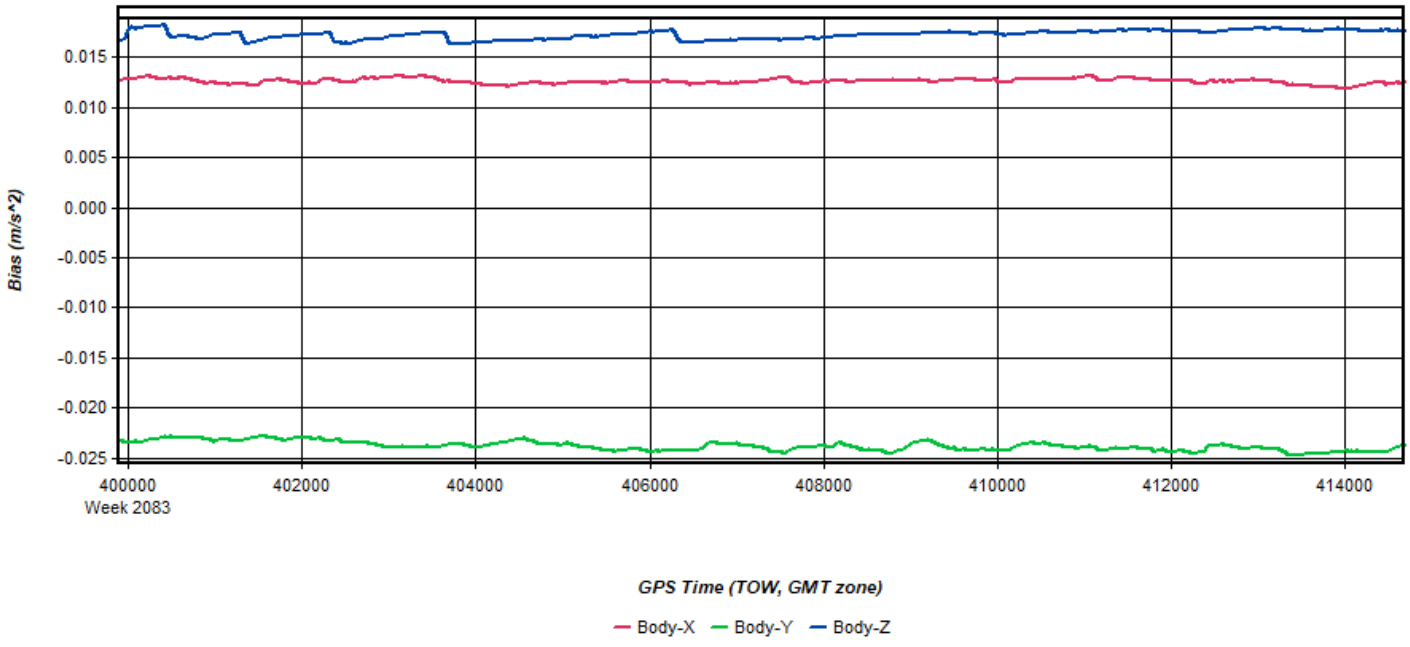

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 18: 20191212150331 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



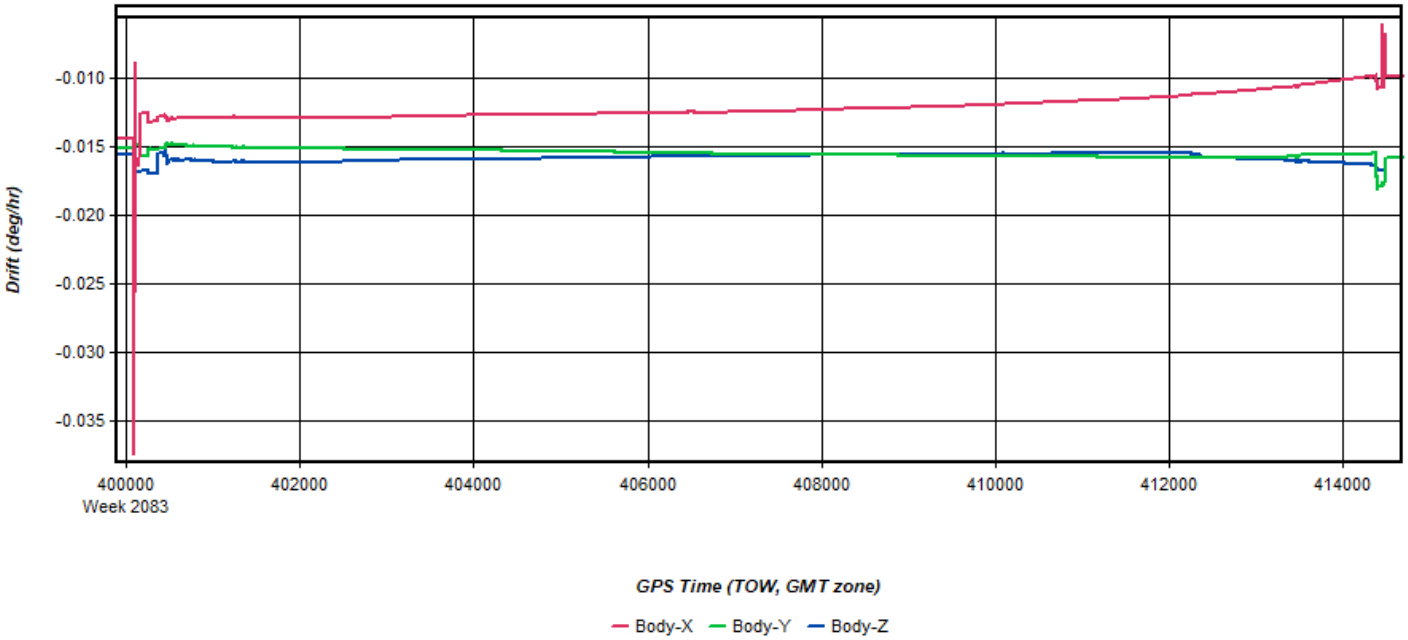

| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 19: 20191212150331 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

**Figure 20: 20191212150331 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191212150331 | by Unknown | on 12/24/2019 | at 10:43:06 |

# Output Results for 20191212193215

Inertial Explorer Version 8.80.2305
12/24/2019

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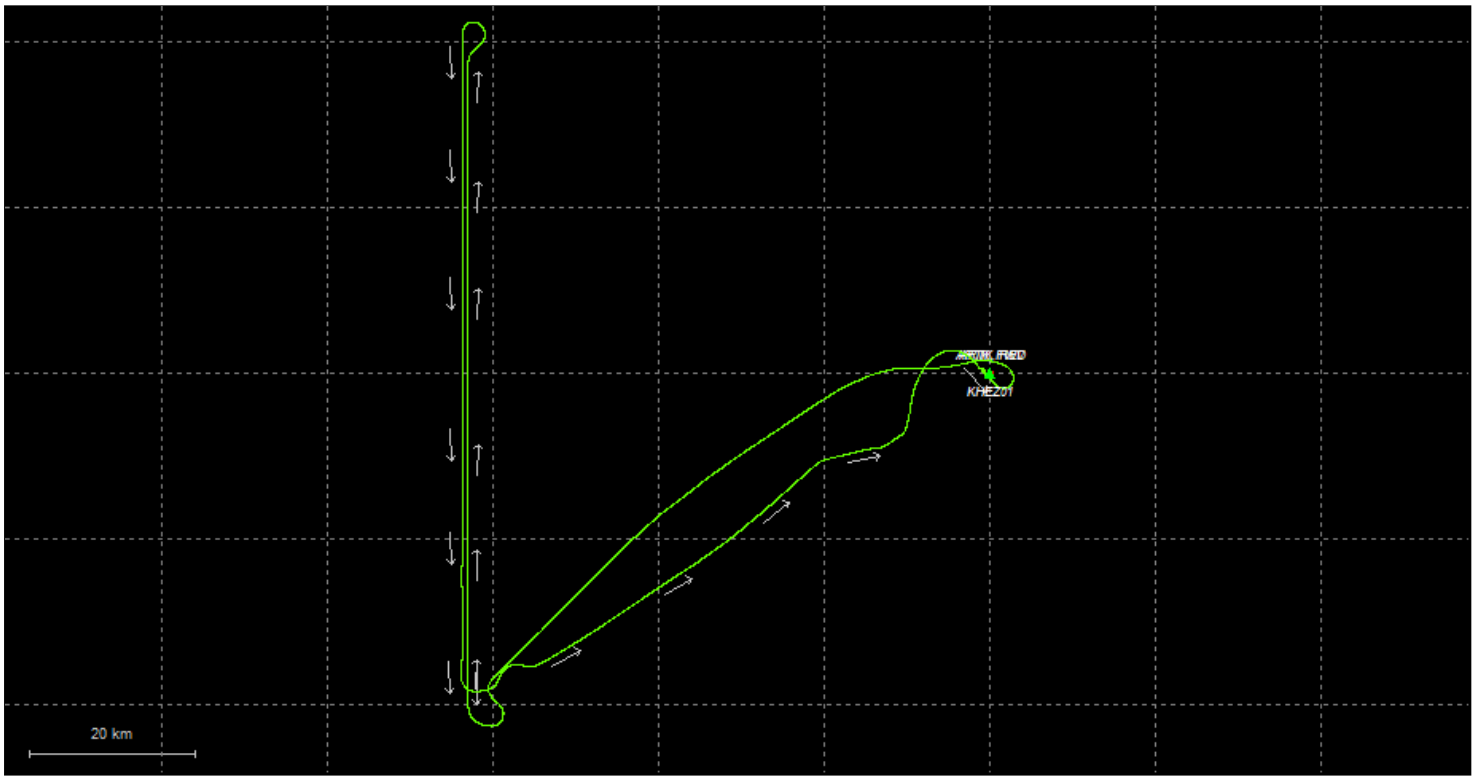
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |
|---|---|---|---|---|

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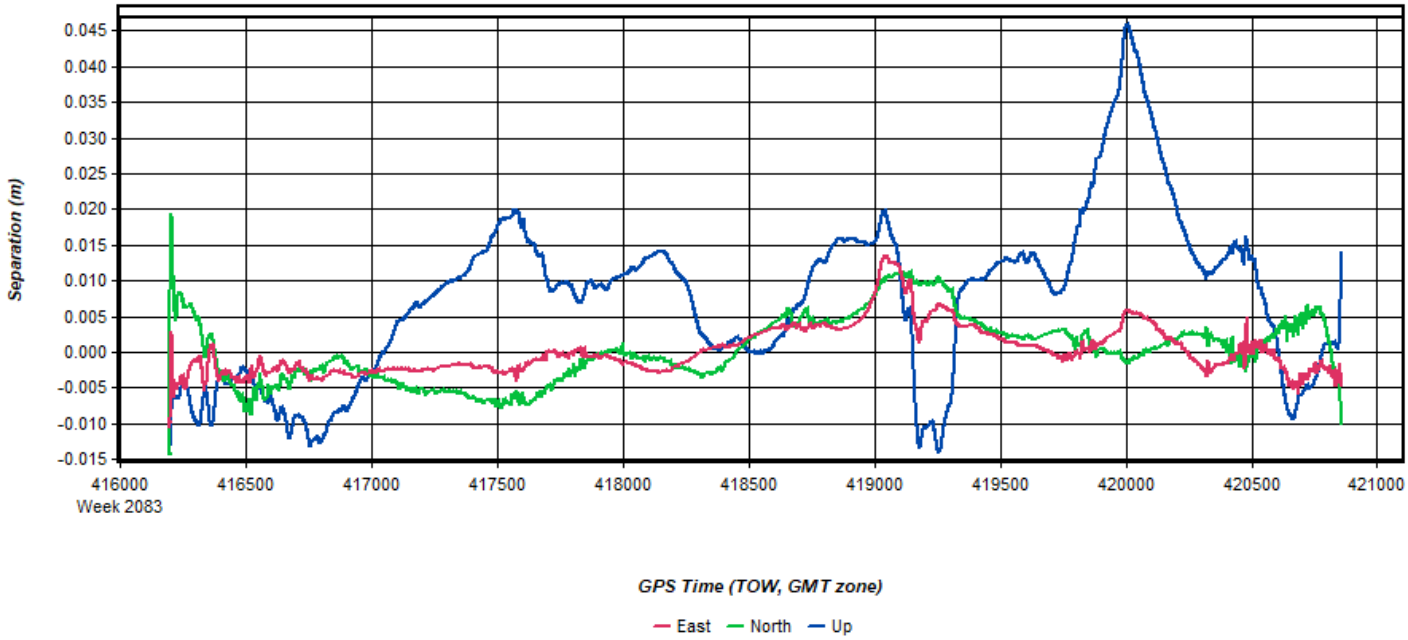
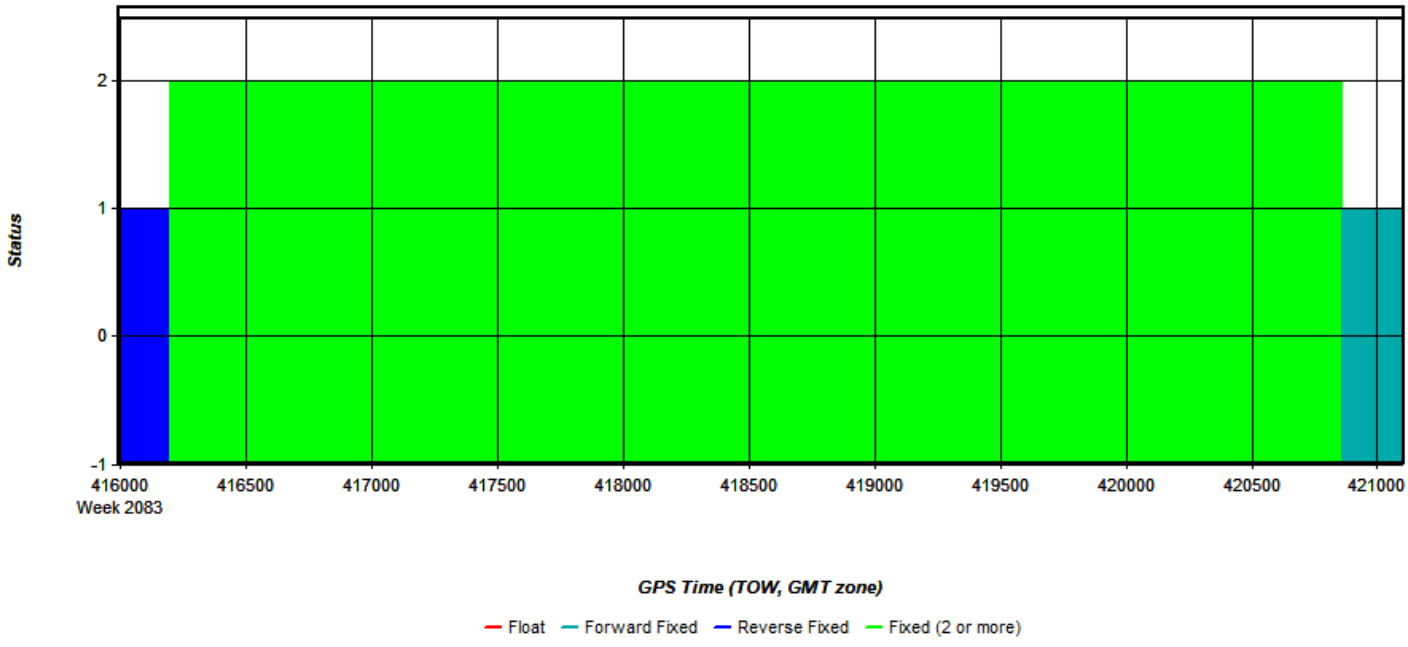
**Figure 2: 20191212193215 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



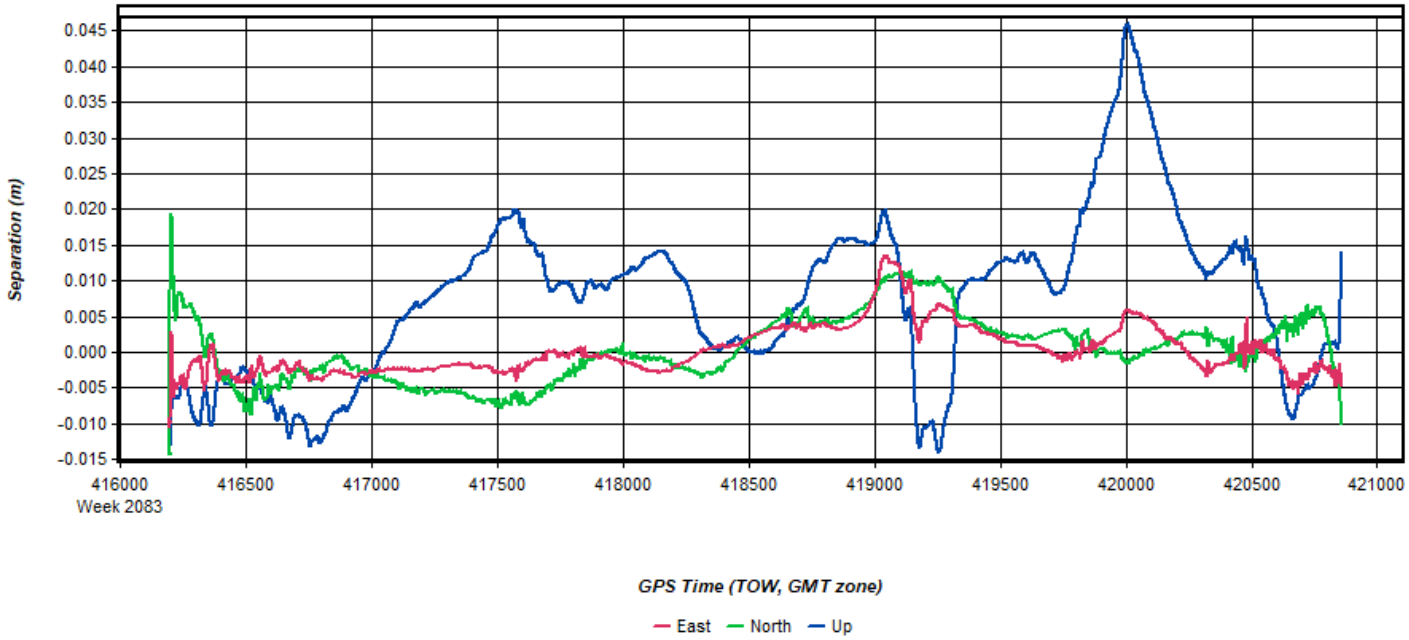

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 3: 20191212193215 [Smoothed TC Combined] - Float or Fixed Ambiguity**



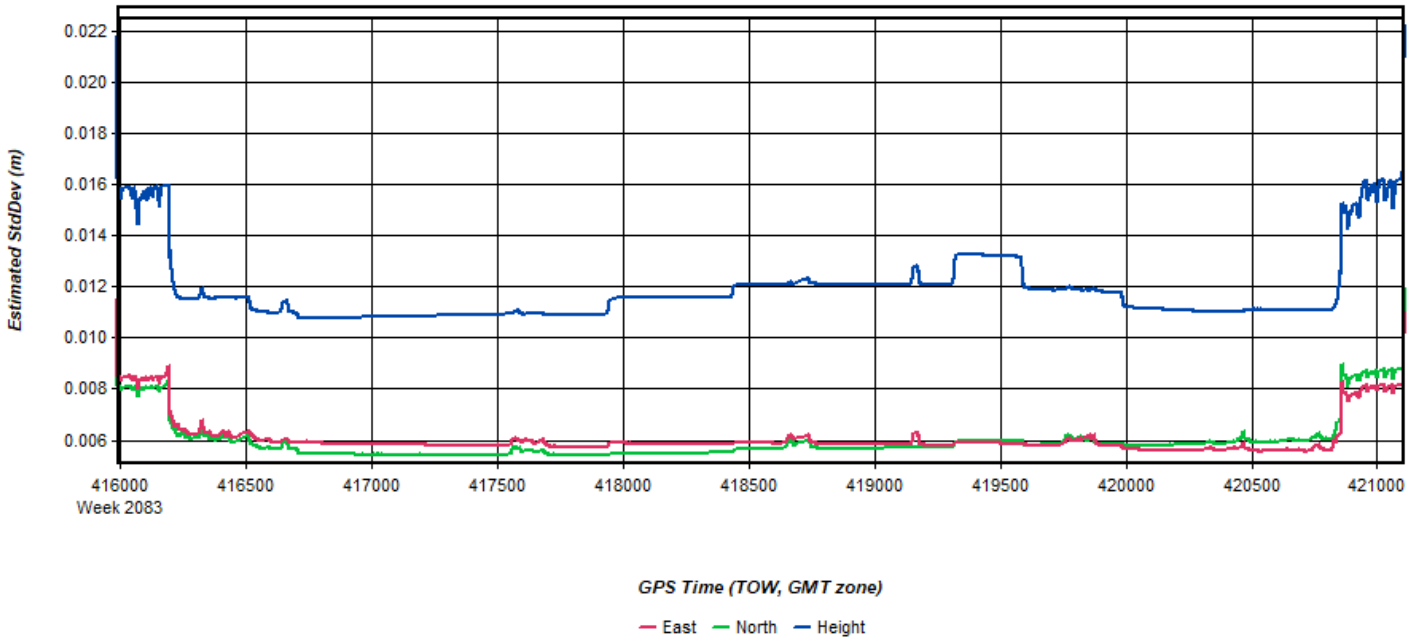

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 4: 20191212193215 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



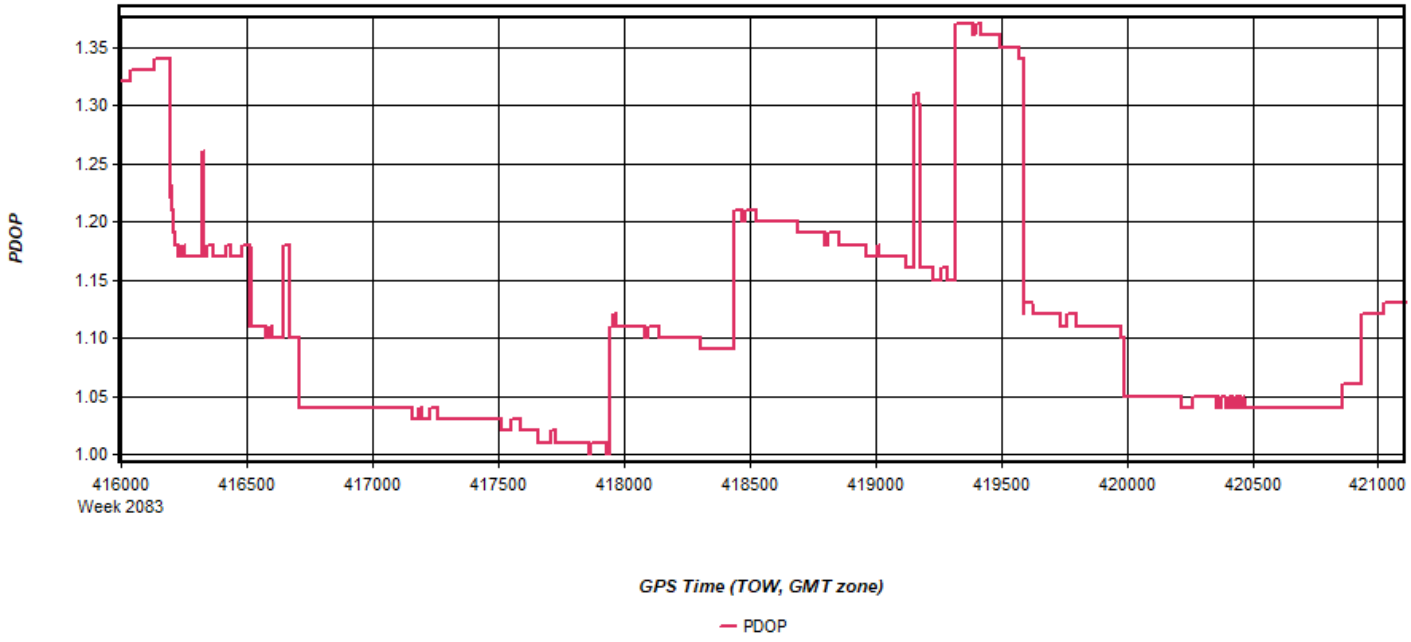

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 5: 20191212193215 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



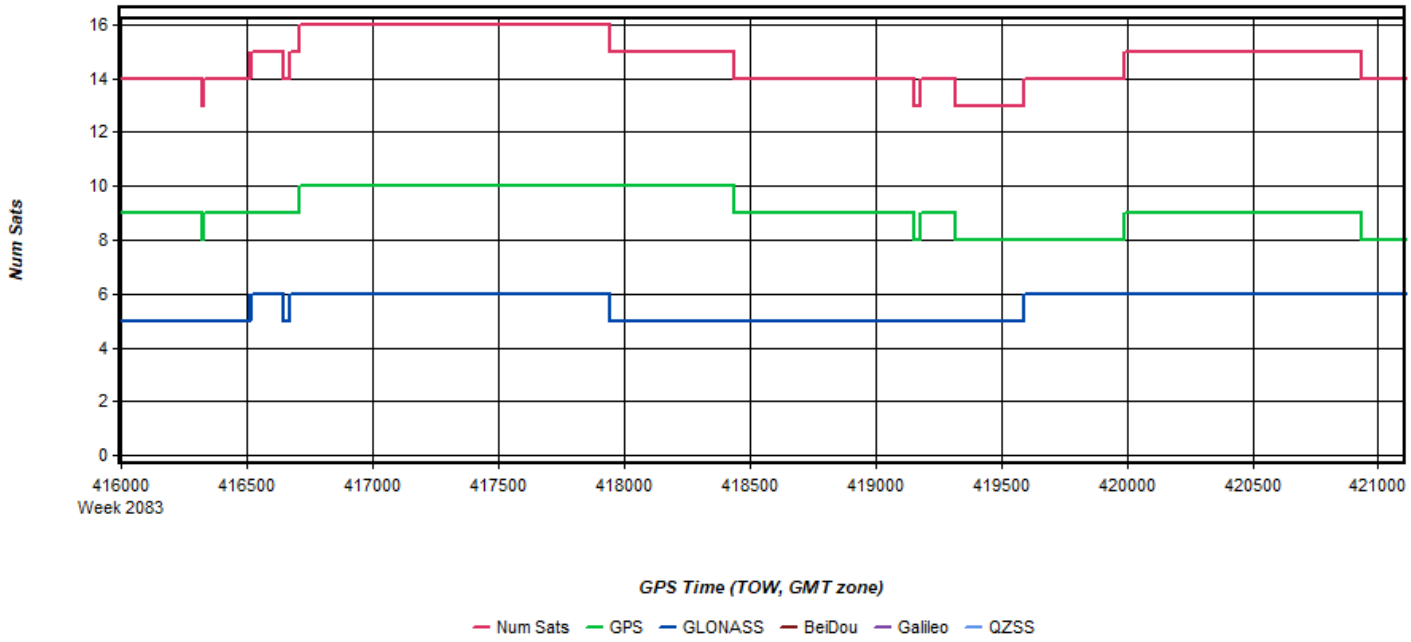

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 6: 20191212193215 [Smoothed TC Combined] - PDOP Plot**



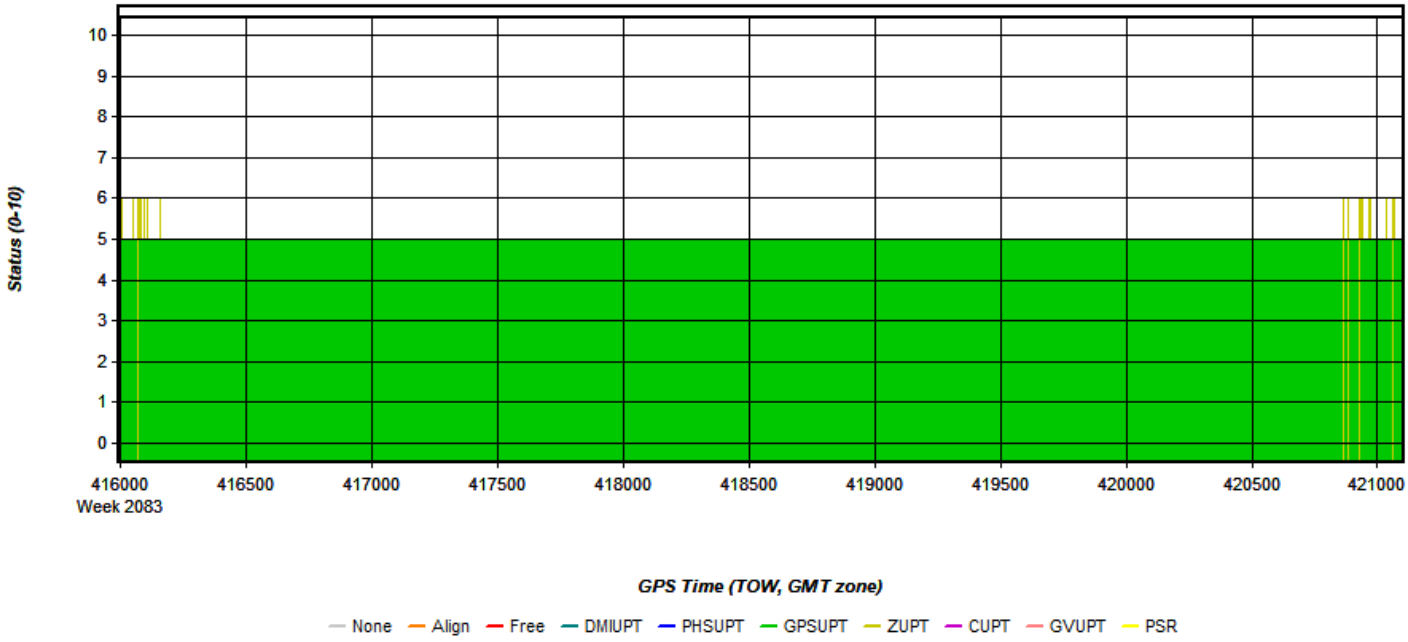

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 7: 20191212193215 [Smoothed TC Combined] - Number of Satellites Line Plot**



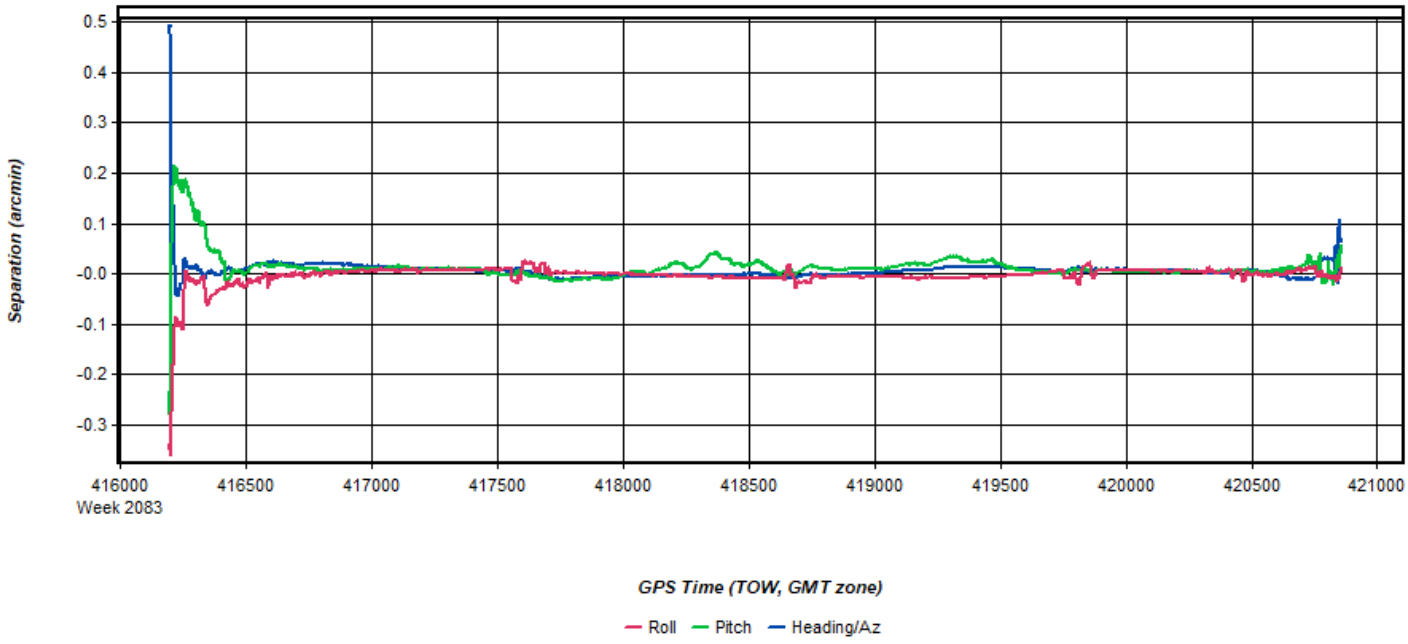

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 8: 20191212193215 [Smoothed TC Combined] - Status flag for IMU processing**



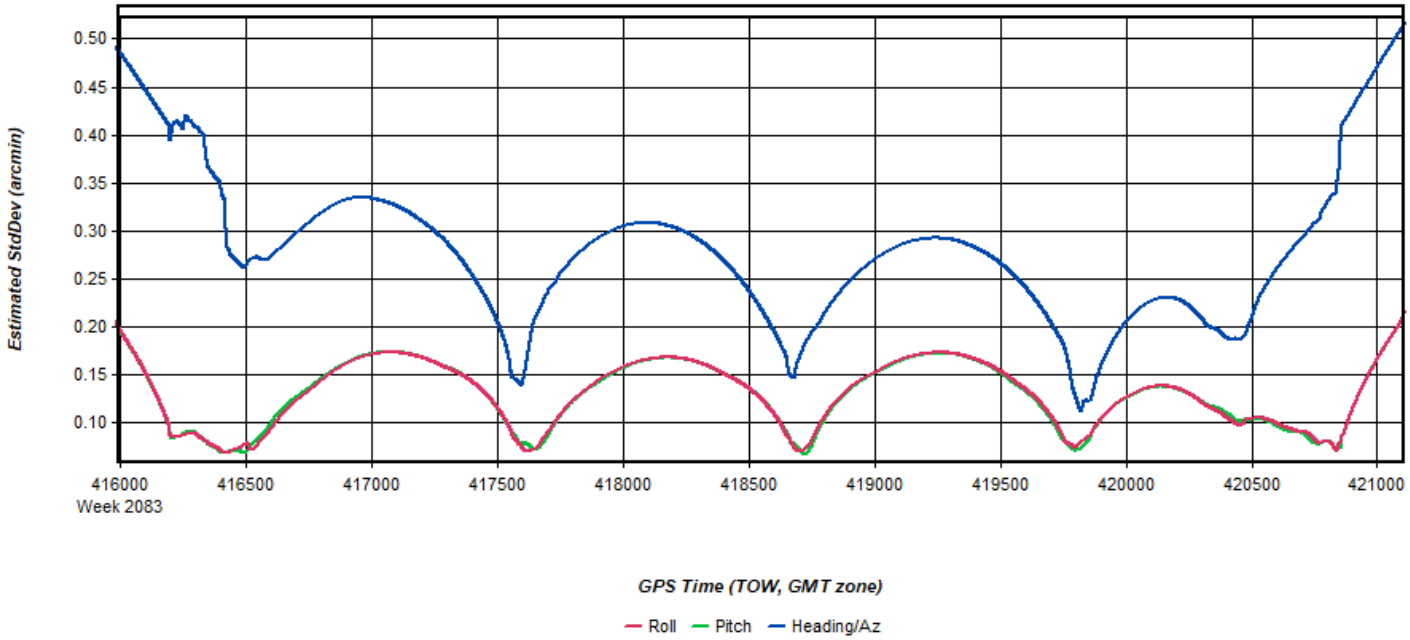

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 9: 20191212193215 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



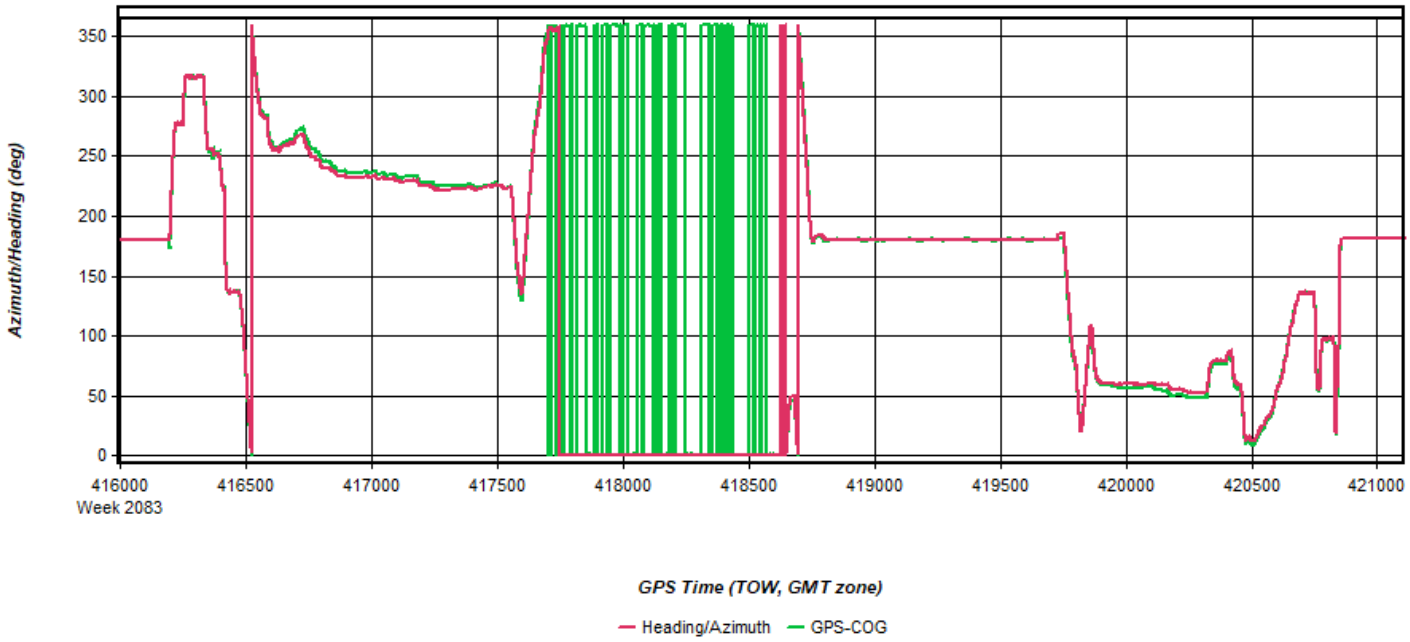

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 10: 20191212193215 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



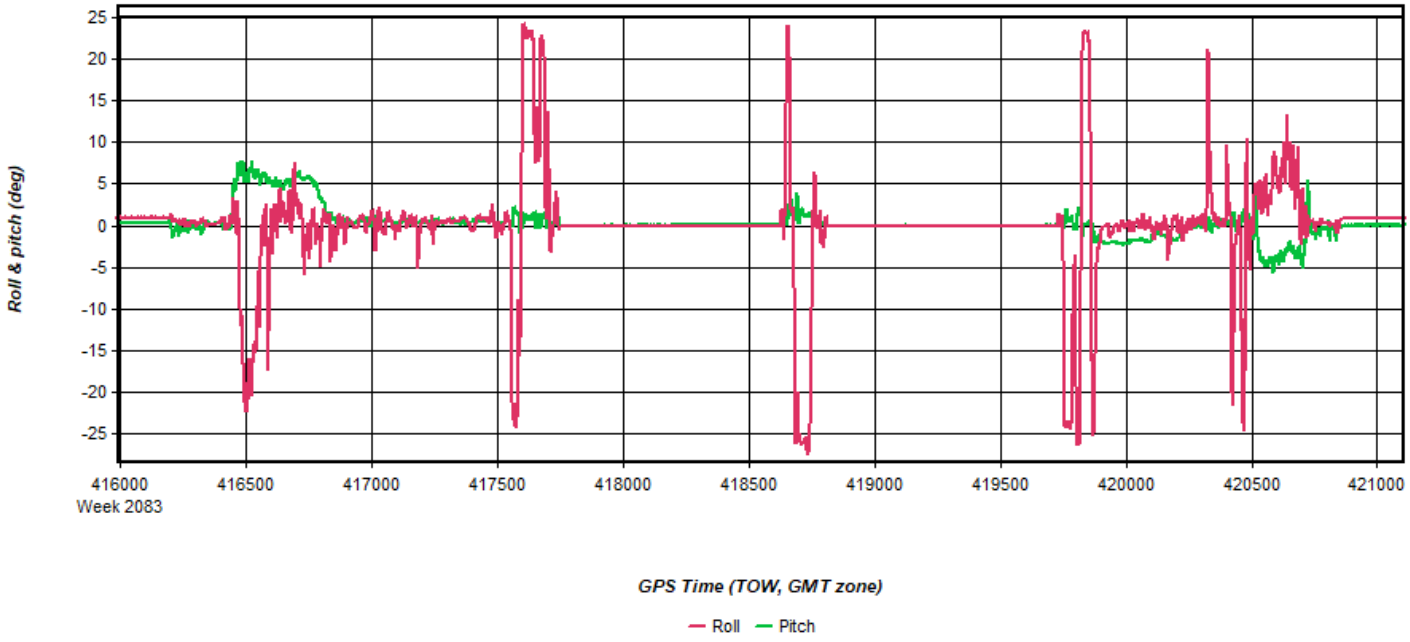

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 11: 20191212193215 [Smoothed TC Combined] - Azimuth Plot**



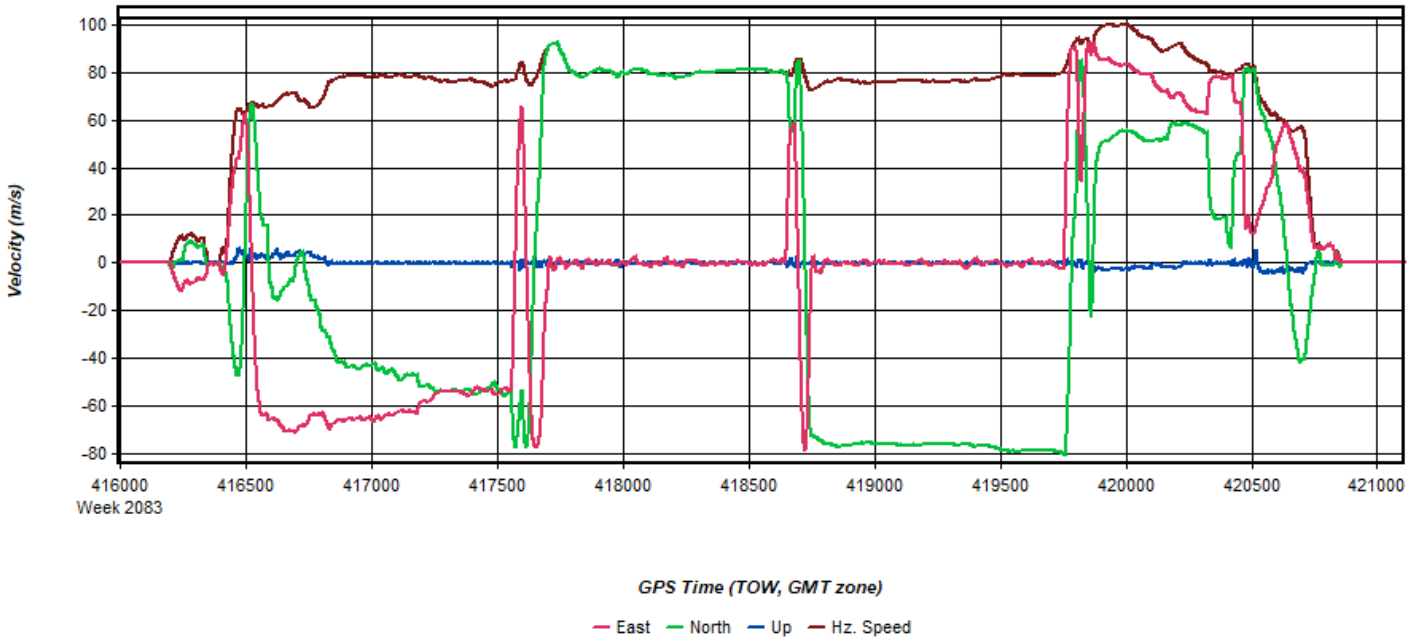

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 12: 20191212193215 [Smoothed TC Combined] - Roll & Pitch Plot**



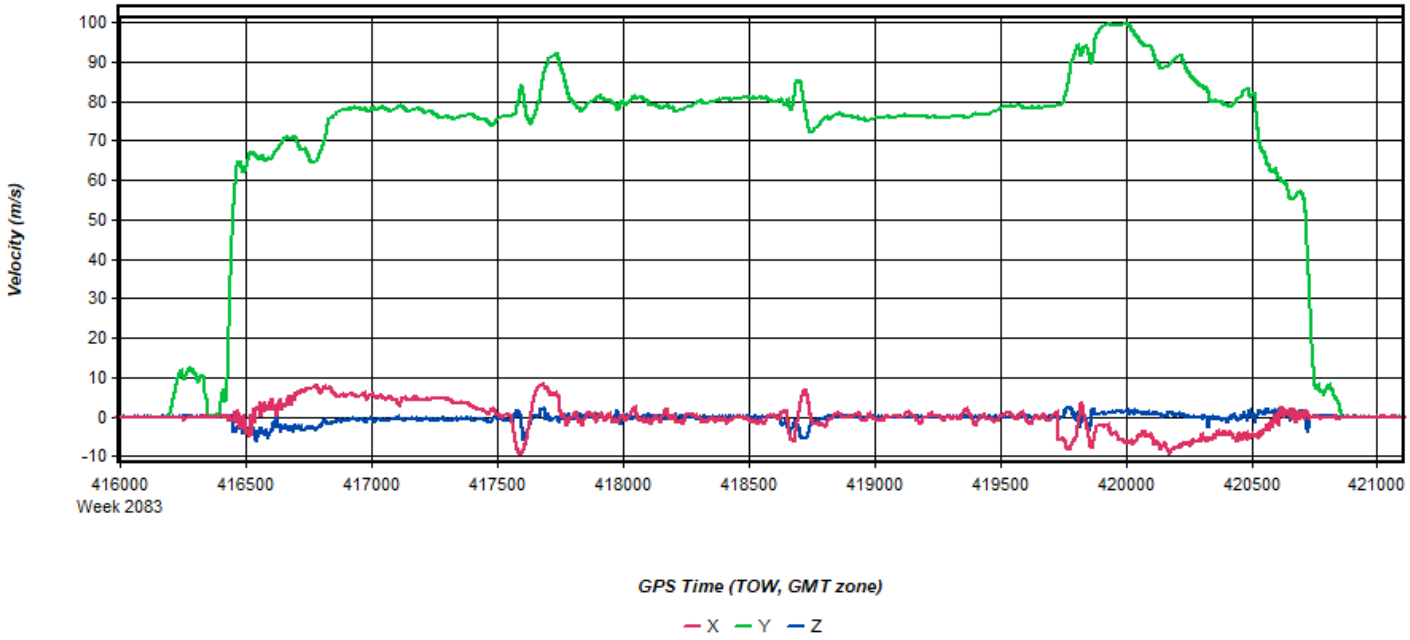

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 13: 20191212193215 [Smoothed TC Combined] - Velocity Profile Plot**



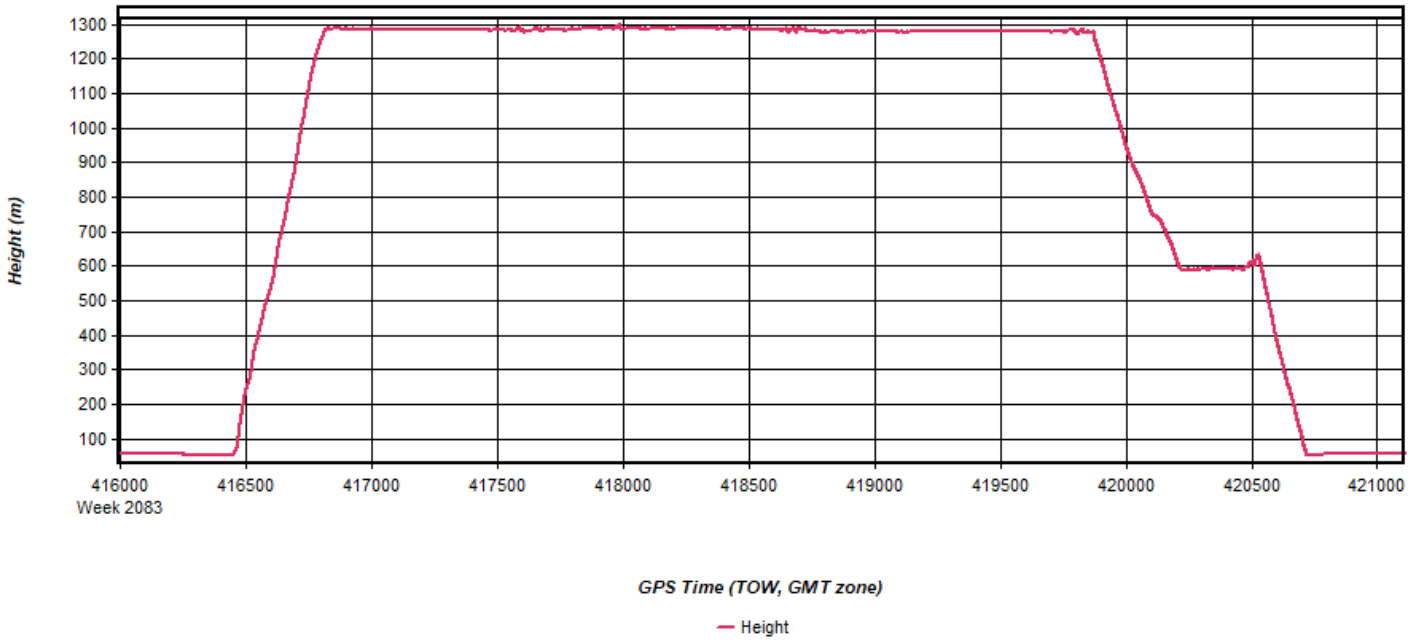

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 14: 20191212193215 [Smoothed TC Combined] - Body Frame Velocity Plot**



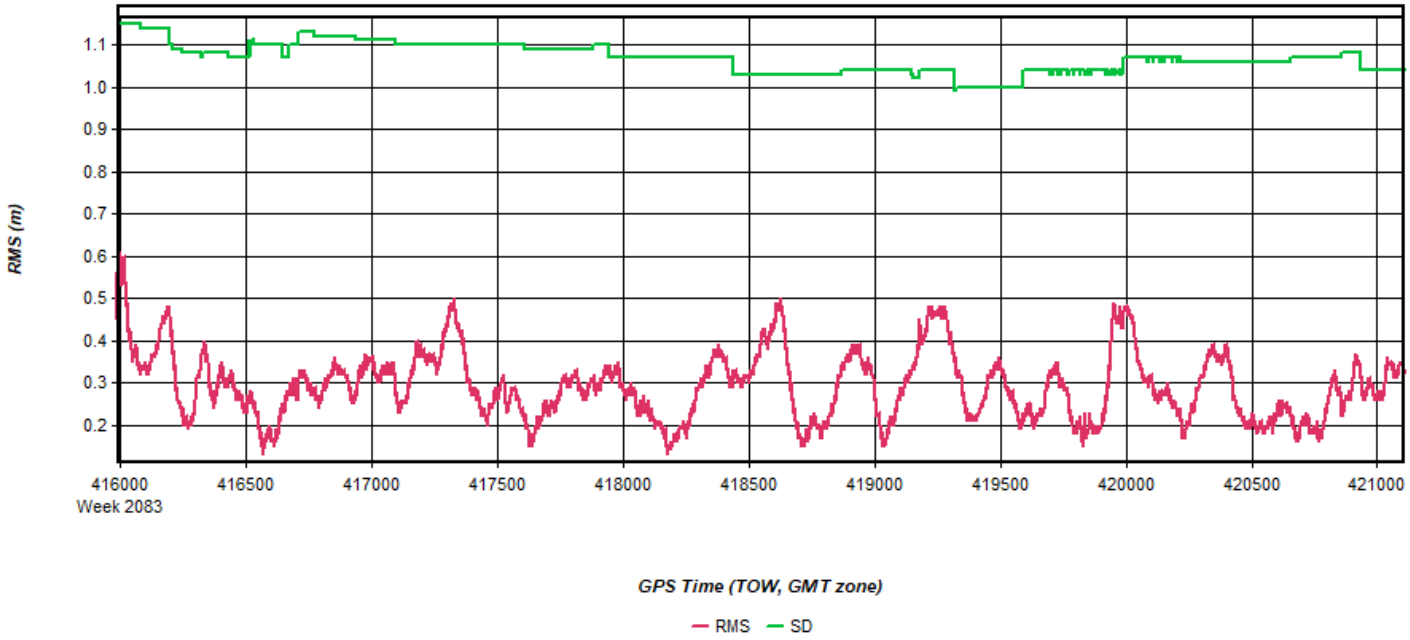

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 15: 20191212193215 [Smoothed TC Combined] - Height Profile Plot**



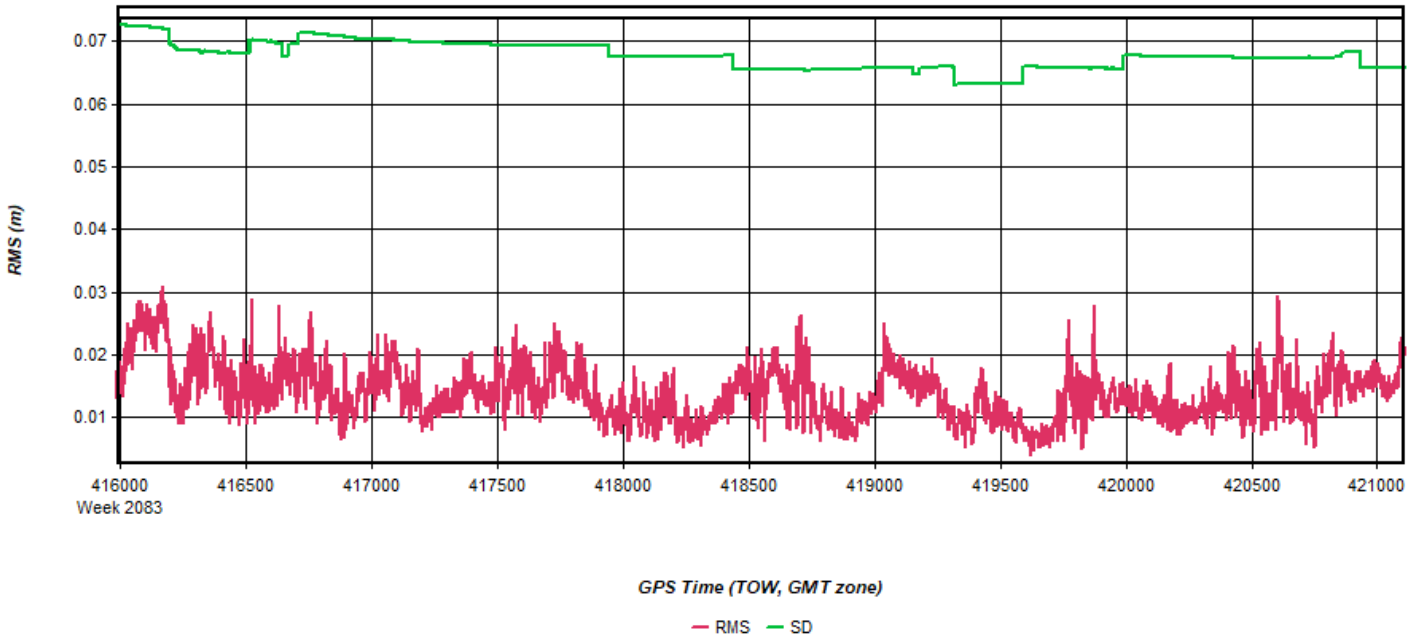

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 16: 20191212193215 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



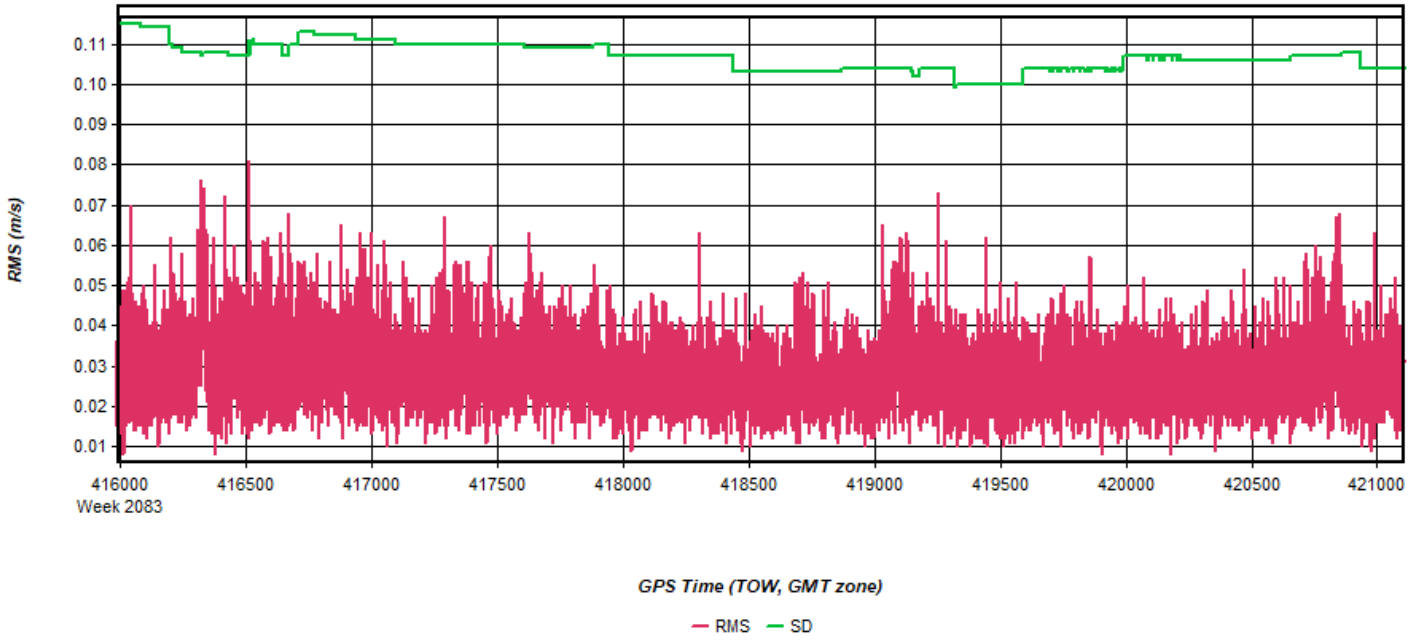

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 17: 20191212193215 [Smoothed TC Combined] - Carrier Residual RMS Plot**



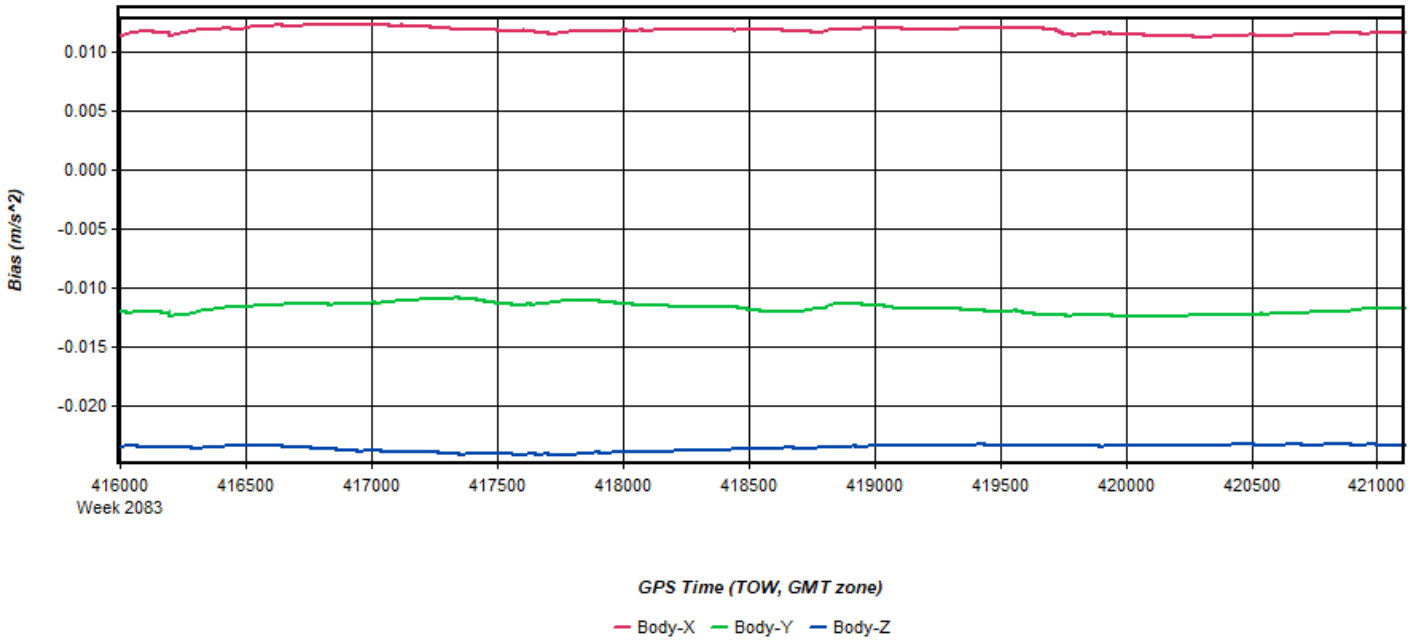

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 18: 20191212193215 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



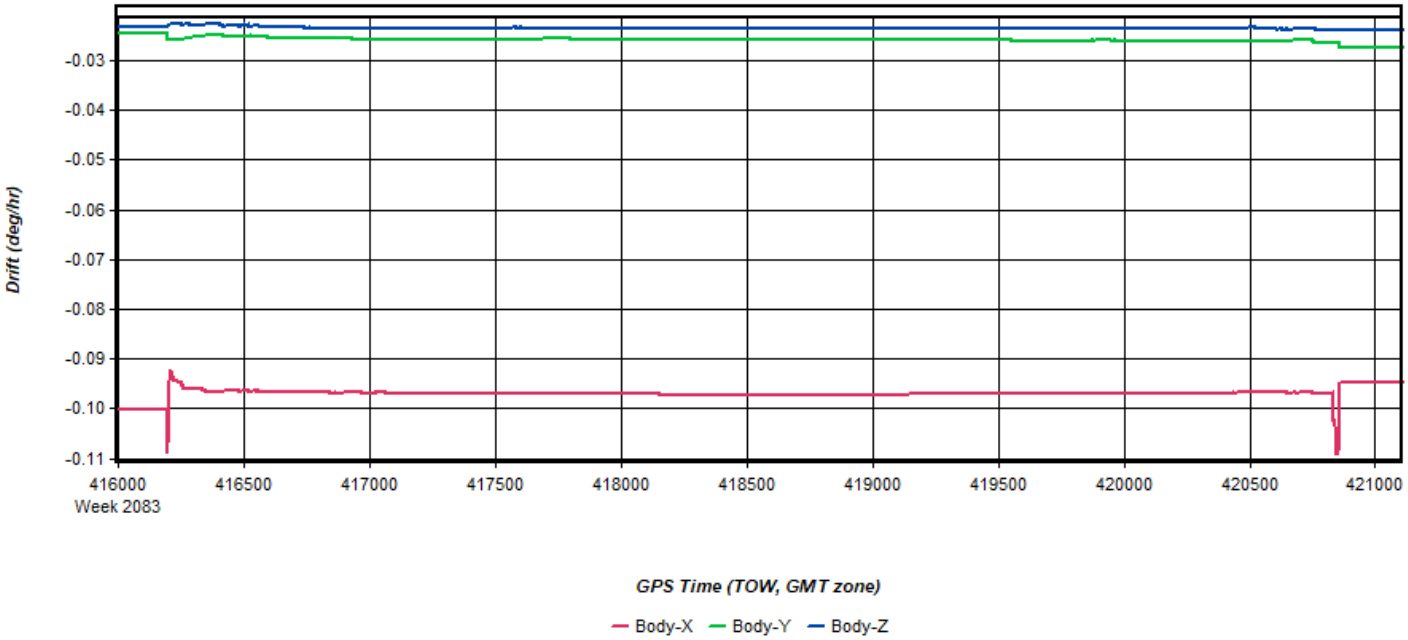

| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 19: 20191212193215 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

**Figure 20: 20191212193215 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191212193215 | by Unknown | on 12/24/2019 | at 14:12:55 |

# Output Results for 20191214204650

Inertial Explorer Version 8.80.2305
12/24/2019

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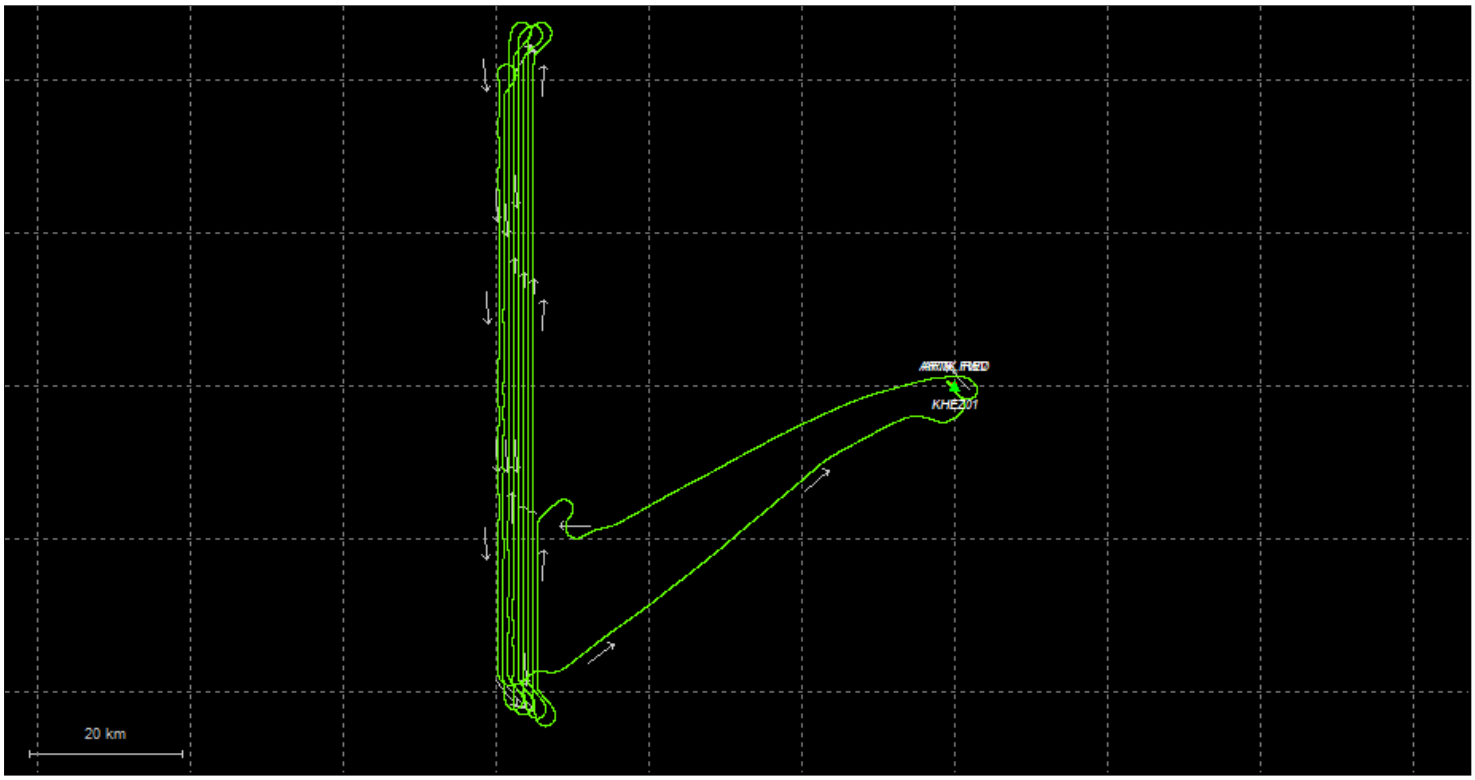
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |
|---|---|---|---|---|

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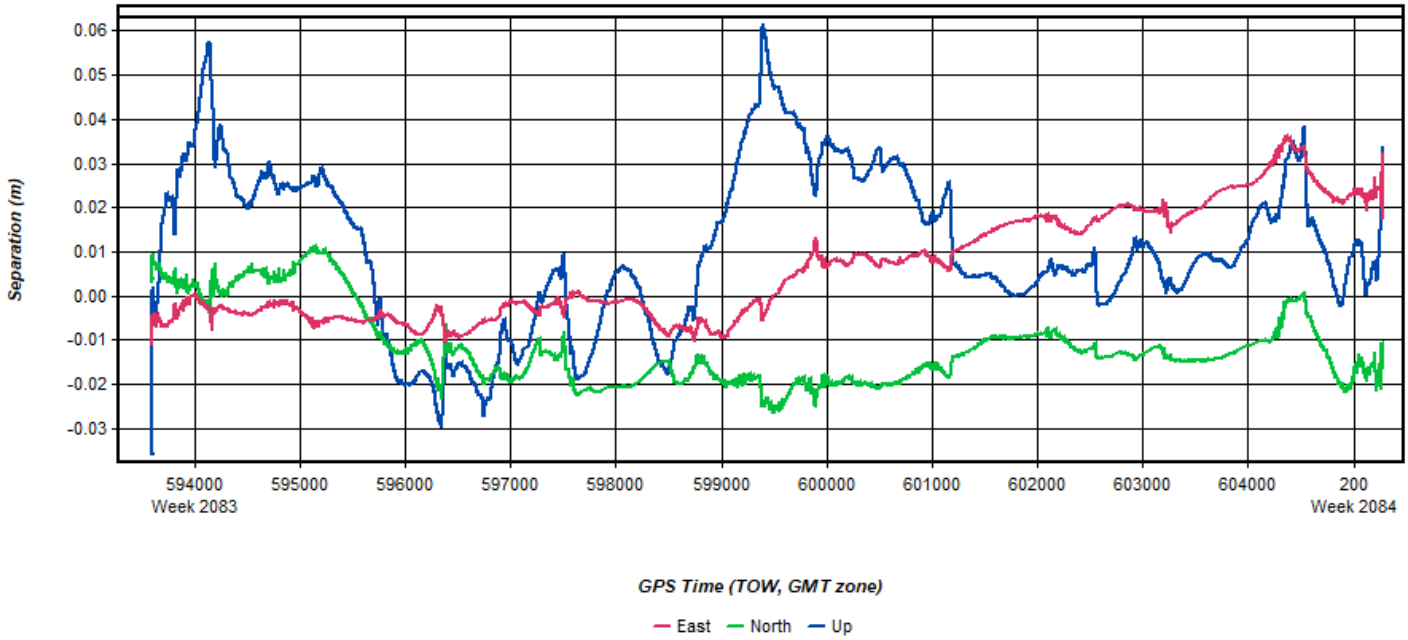
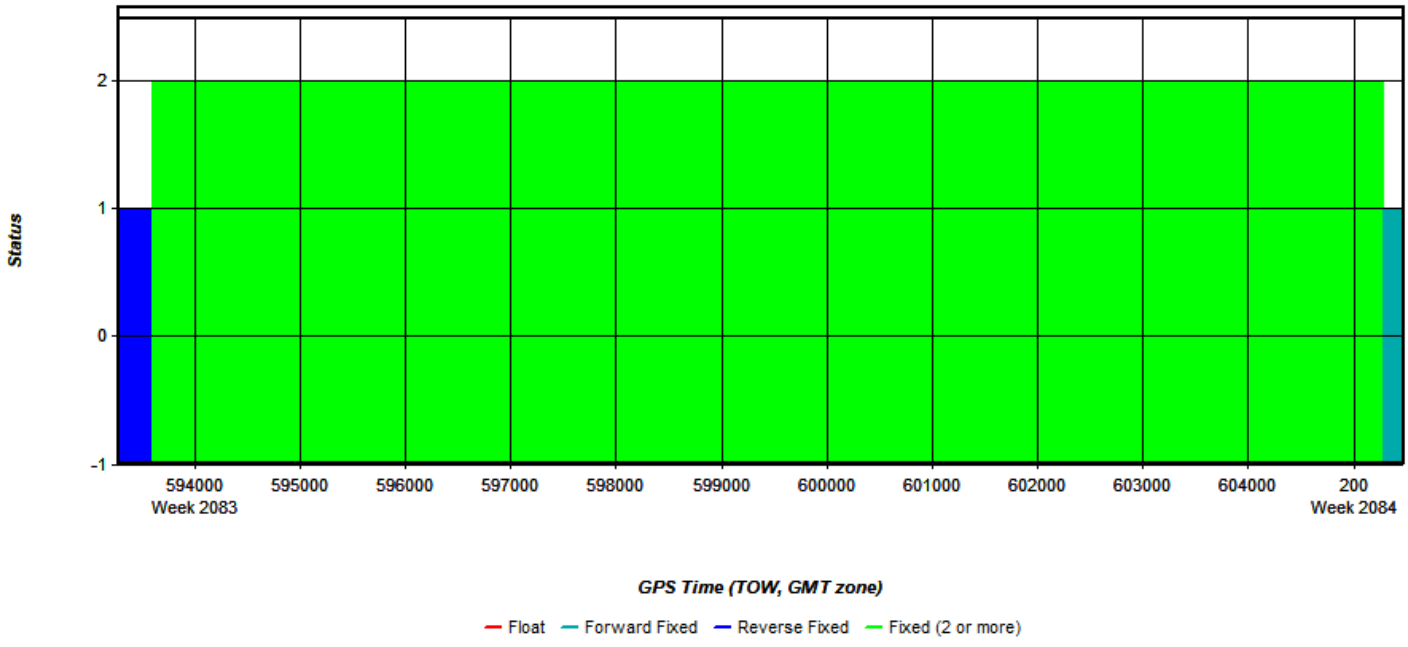
**Figure 2: 20191214204650 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



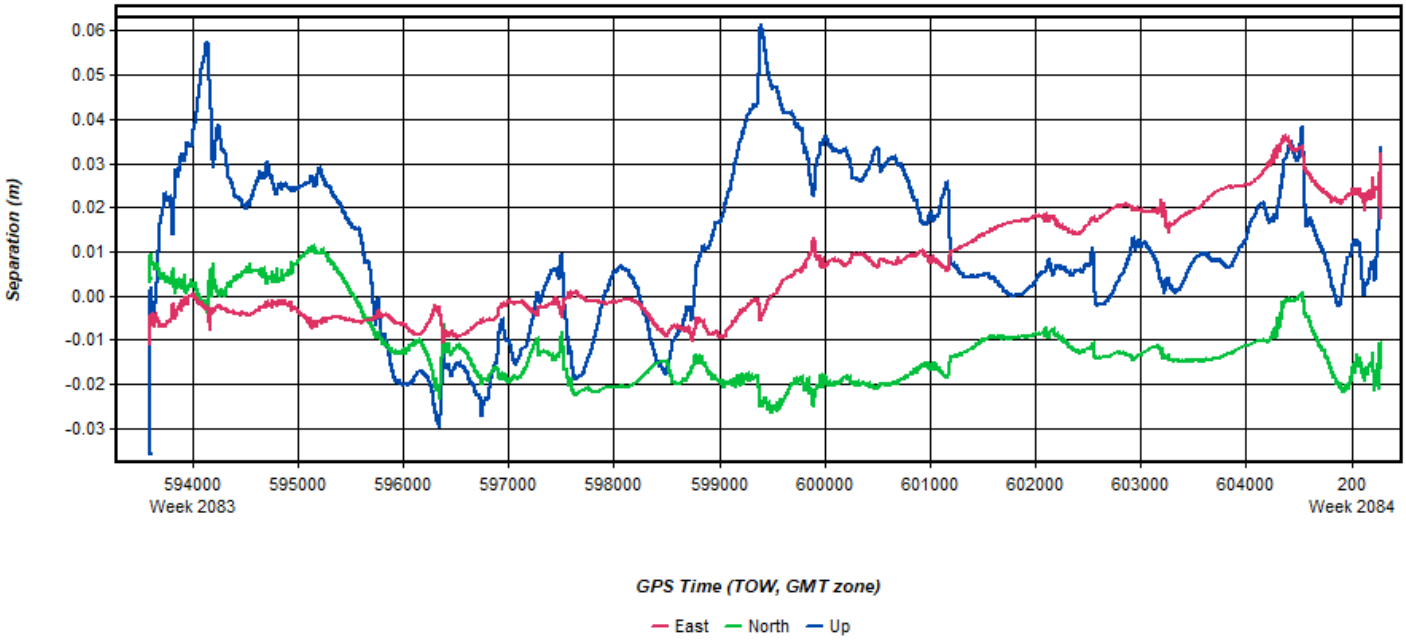

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 3: 20191214204650 [Smoothed TC Combined] - Float or Fixed Ambiguity**



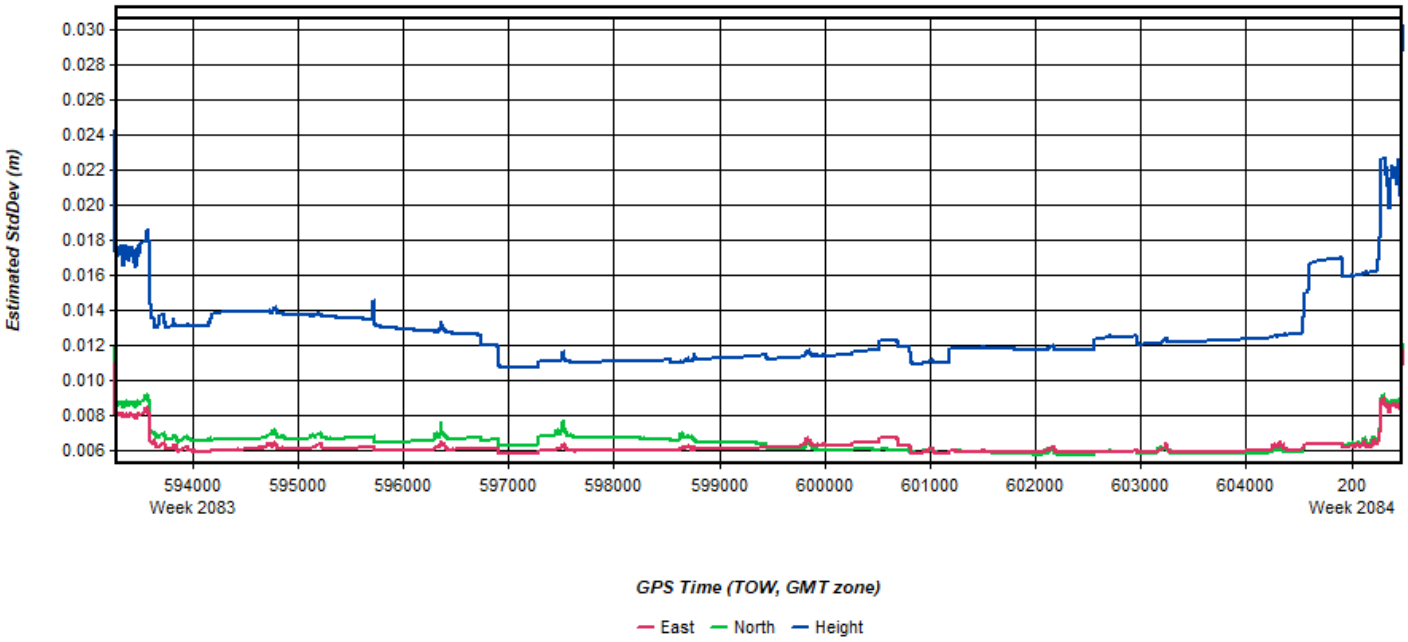

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 4: 20191214204650 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



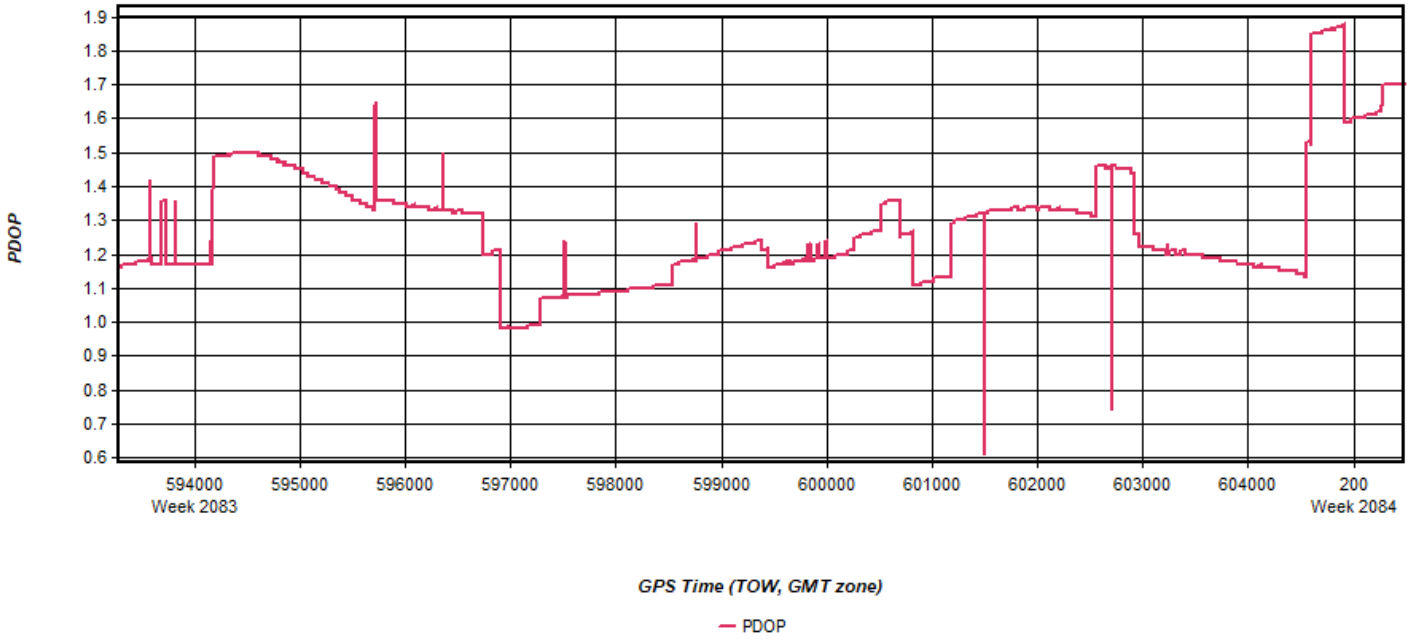

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 5: 20191214204650 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



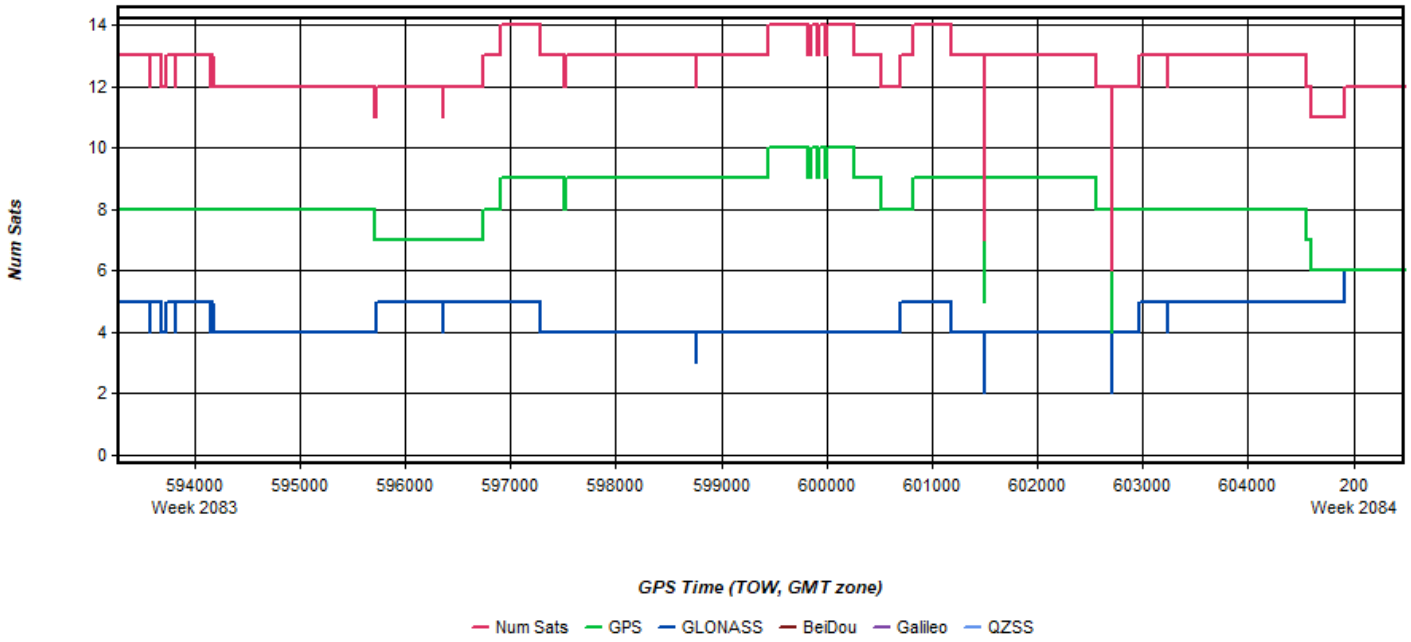

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 6: 20191214204650 [Smoothed TC Combined] - PDOP Plot**



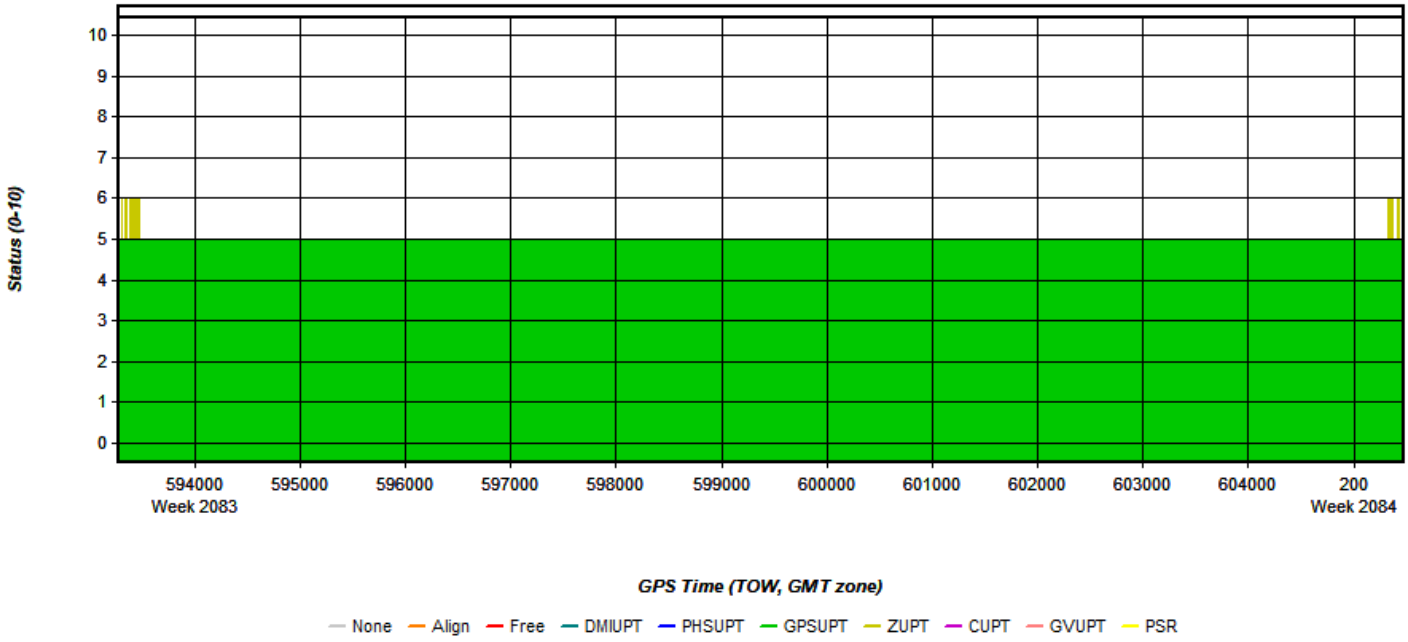

| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |
|---|---|---|---|---|

**Figure 7: 20191214204650 [Smoothed TC Combined] - Number of Satellites Line Plot**



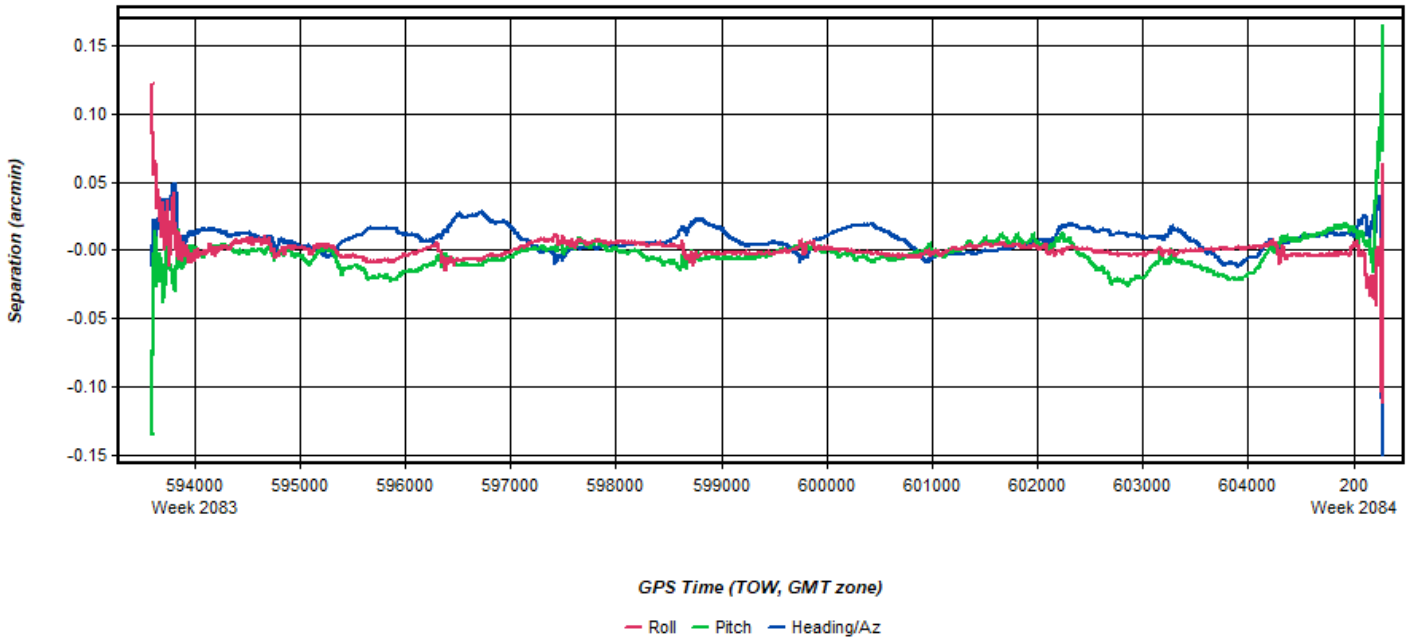

| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |
|---|---|---|---|---|

**Figure 8: 20191214204650 [Smoothed TC Combined] - Status flag for IMU processing**



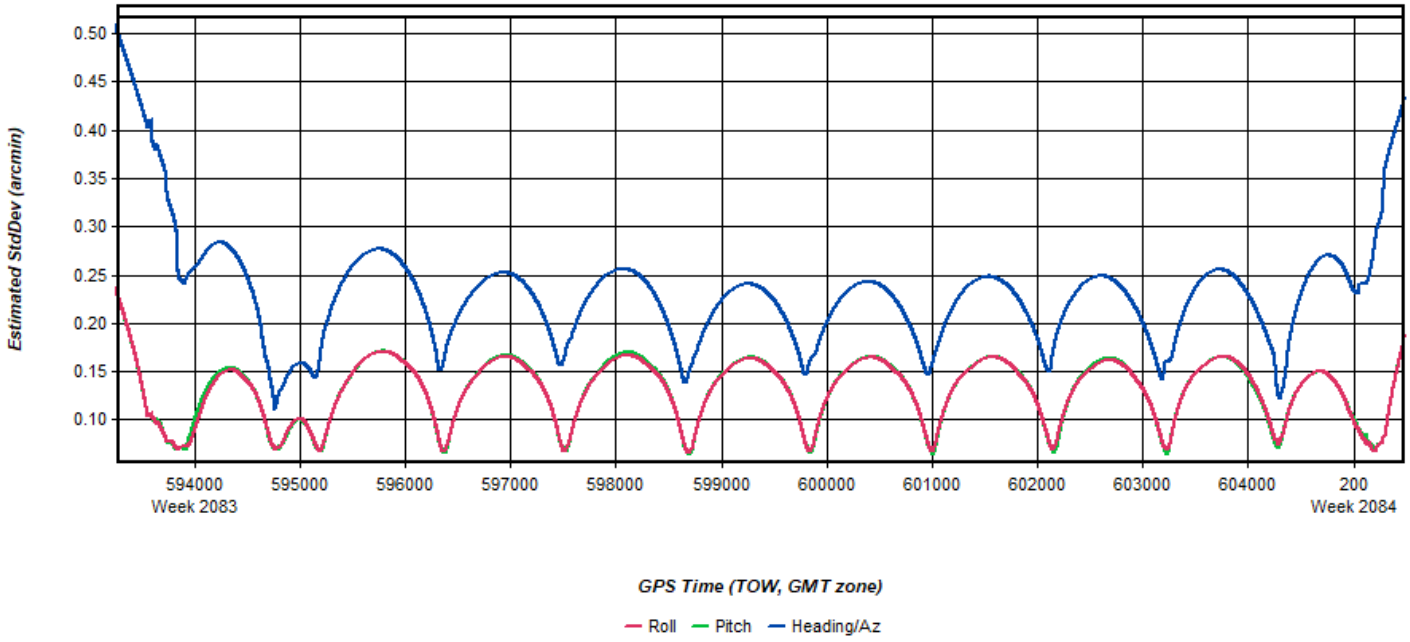

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 9: 20191214204650 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



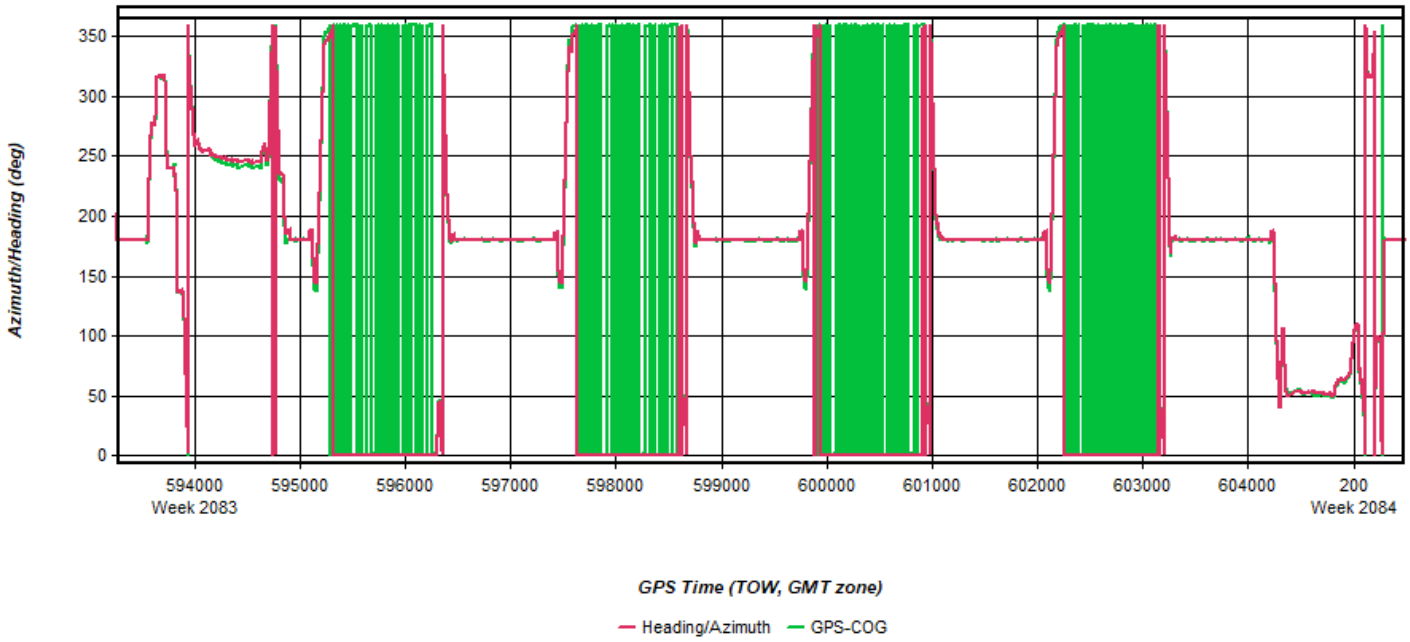

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 10: 20191214204650 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



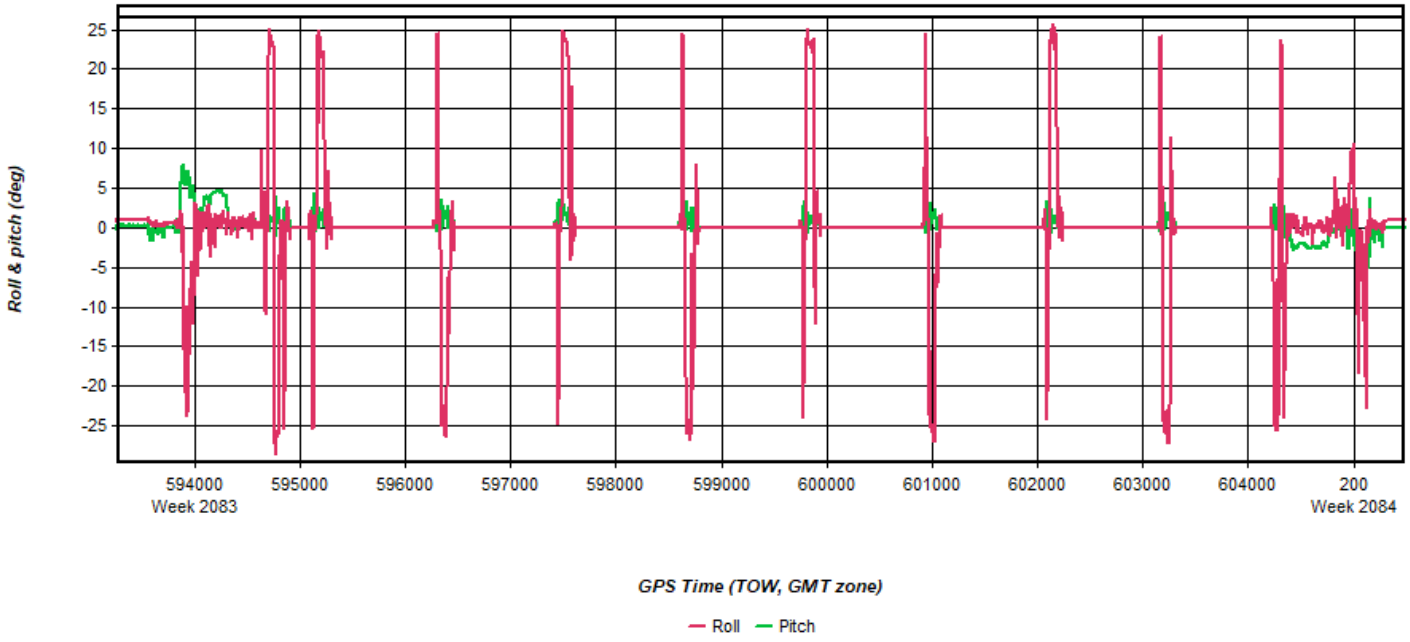

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 11: 20191214204650 [Smoothed TC Combined] - Azimuth Plot**



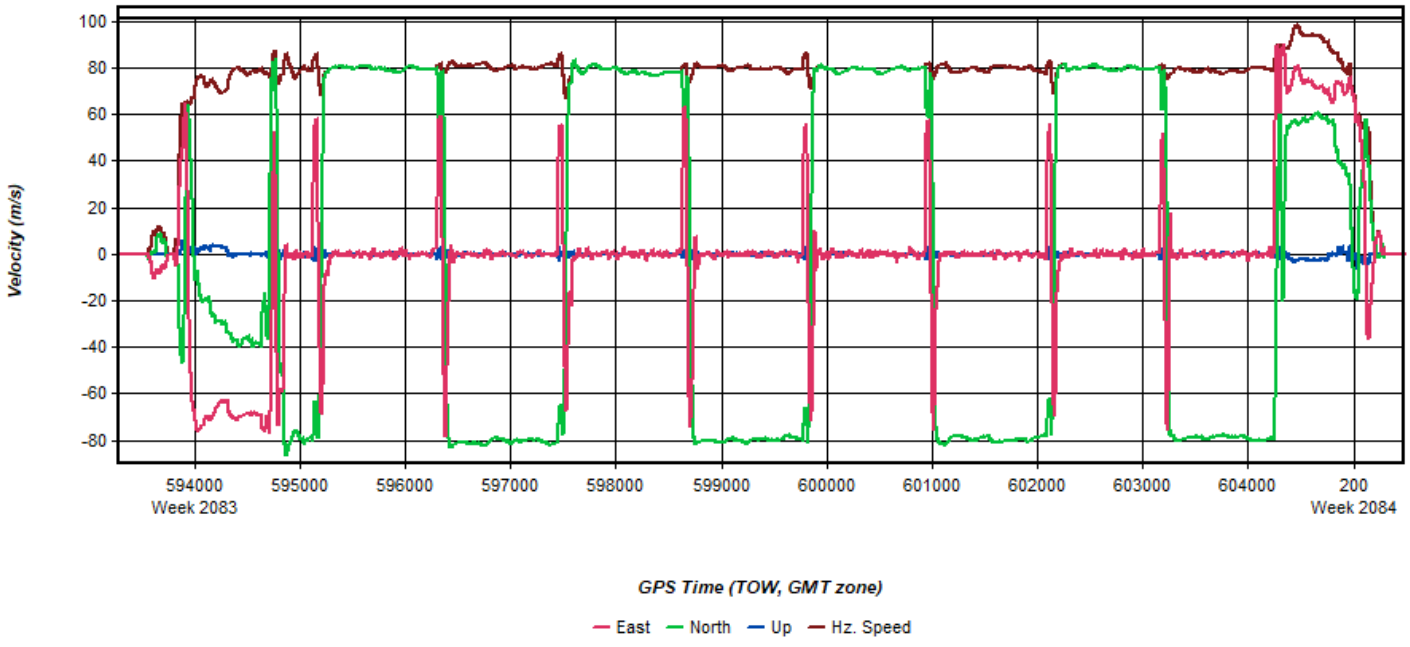

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 12: 20191214204650 [Smoothed TC Combined] - Roll & Pitch Plot**



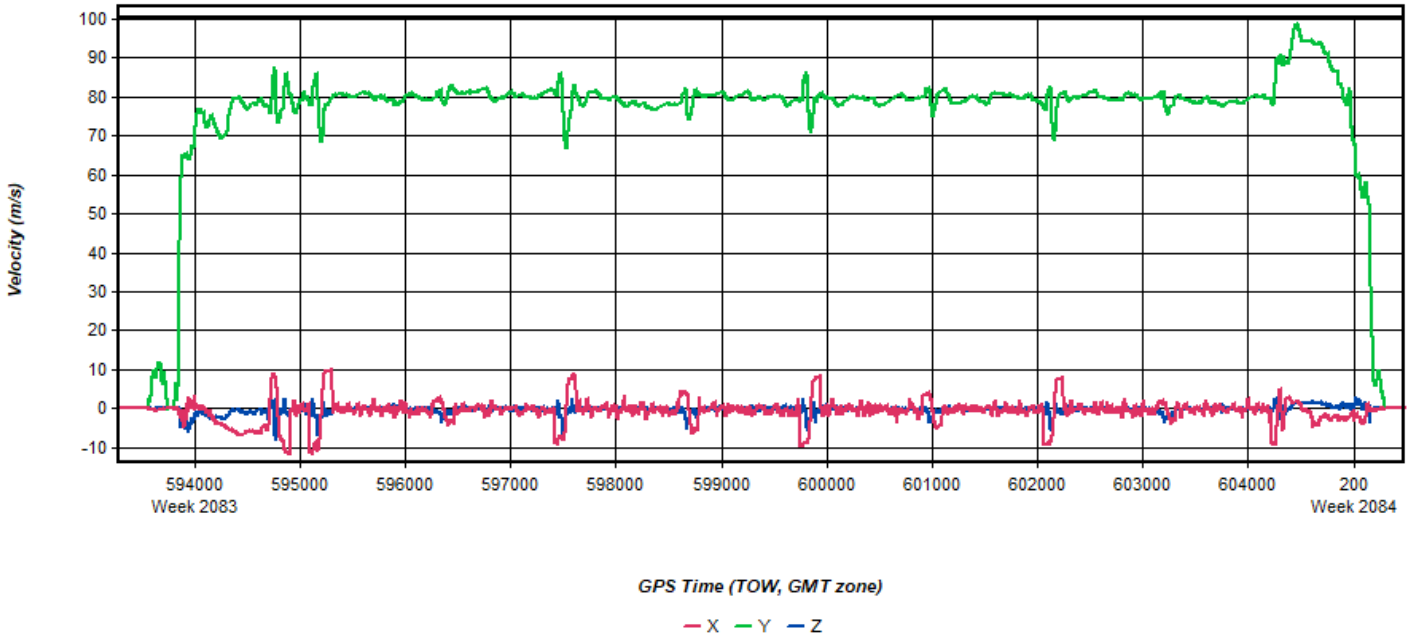

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 13: 20191214204650 [Smoothed TC Combined] - Velocity Profile Plot**



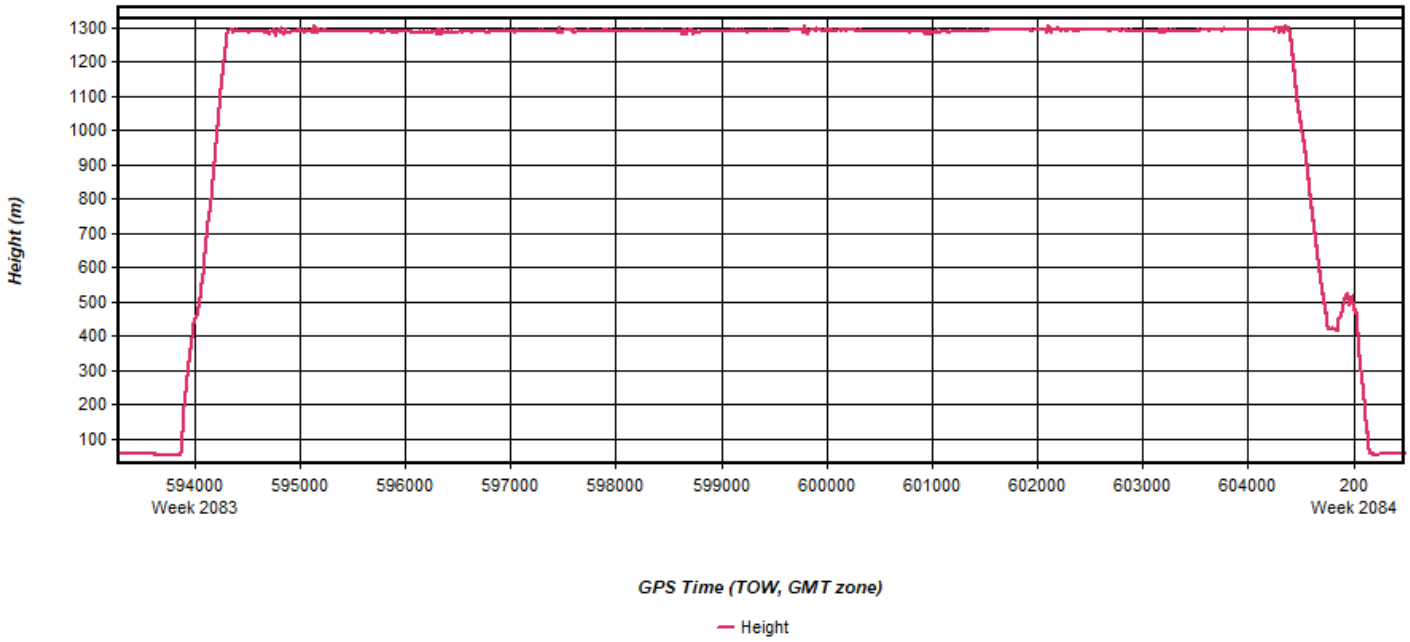

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 14: 20191214204650 [Smoothed TC Combined] - Body Frame Velocity Plot**



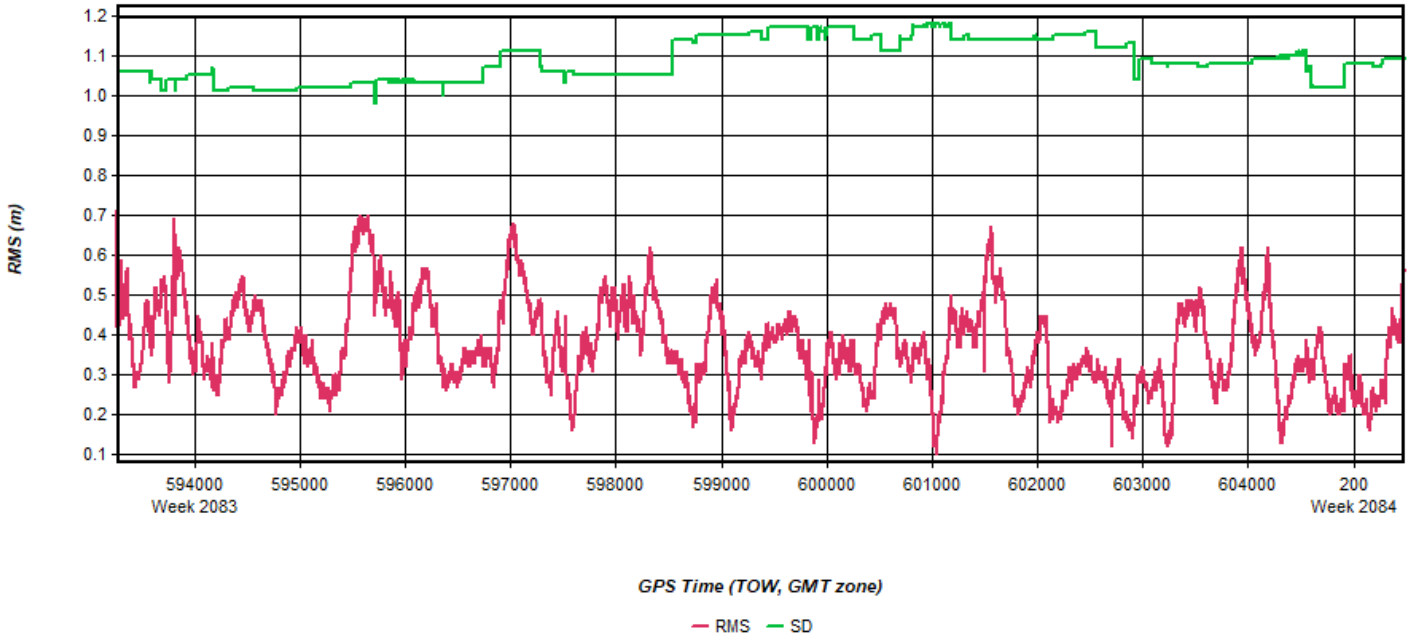

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 15: 20191214204650 [Smoothed TC Combined] - Height Profile Plot**



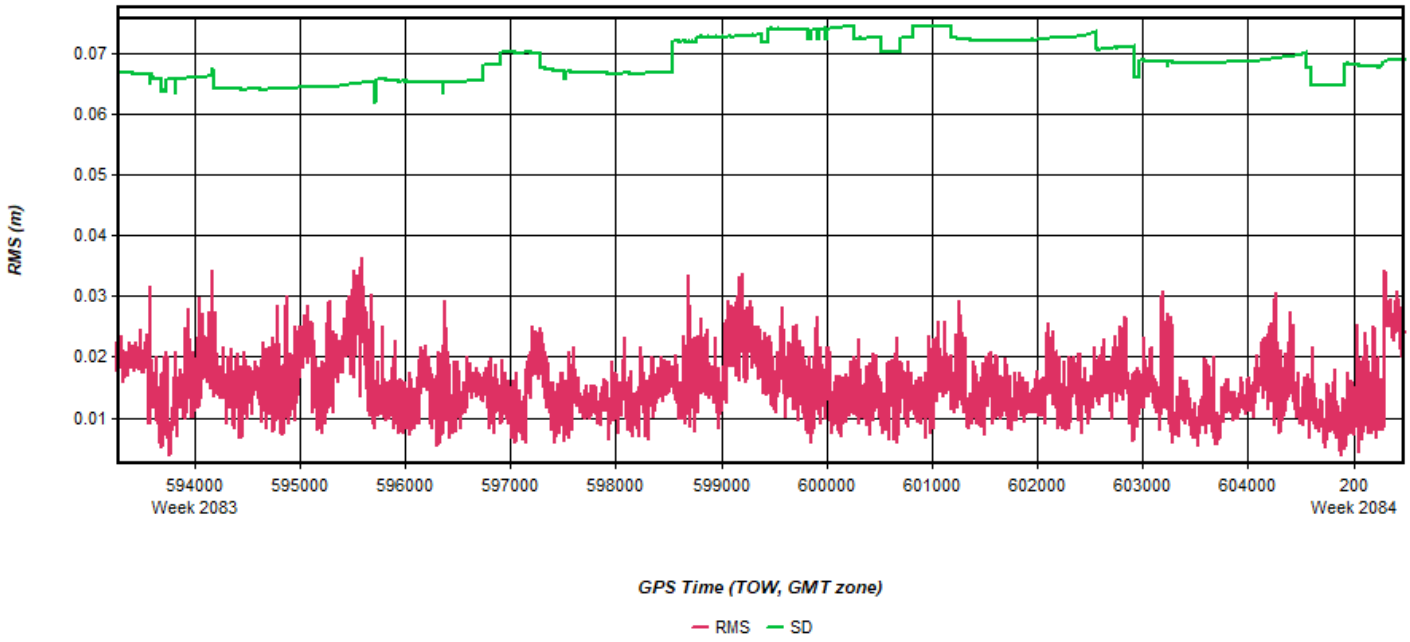

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 16: 20191214204650 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



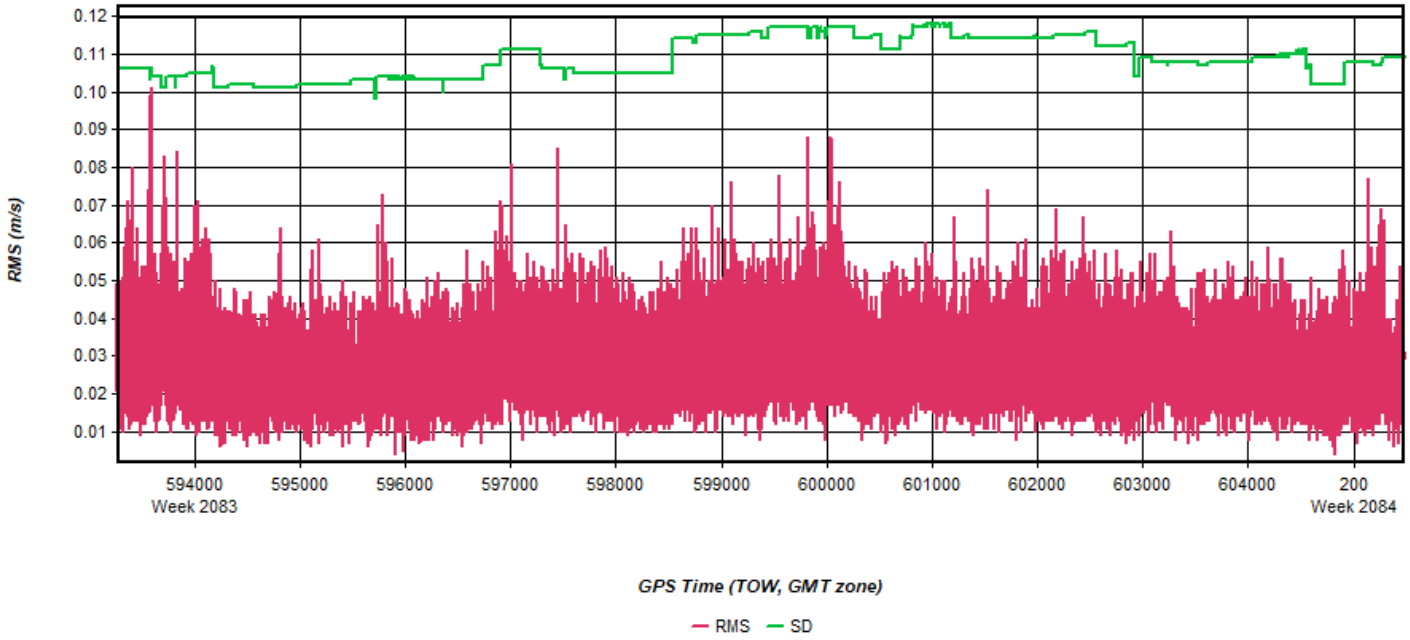

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 17: 20191214204650 [Smoothed TC Combined] - Carrier Residual RMS Plot**



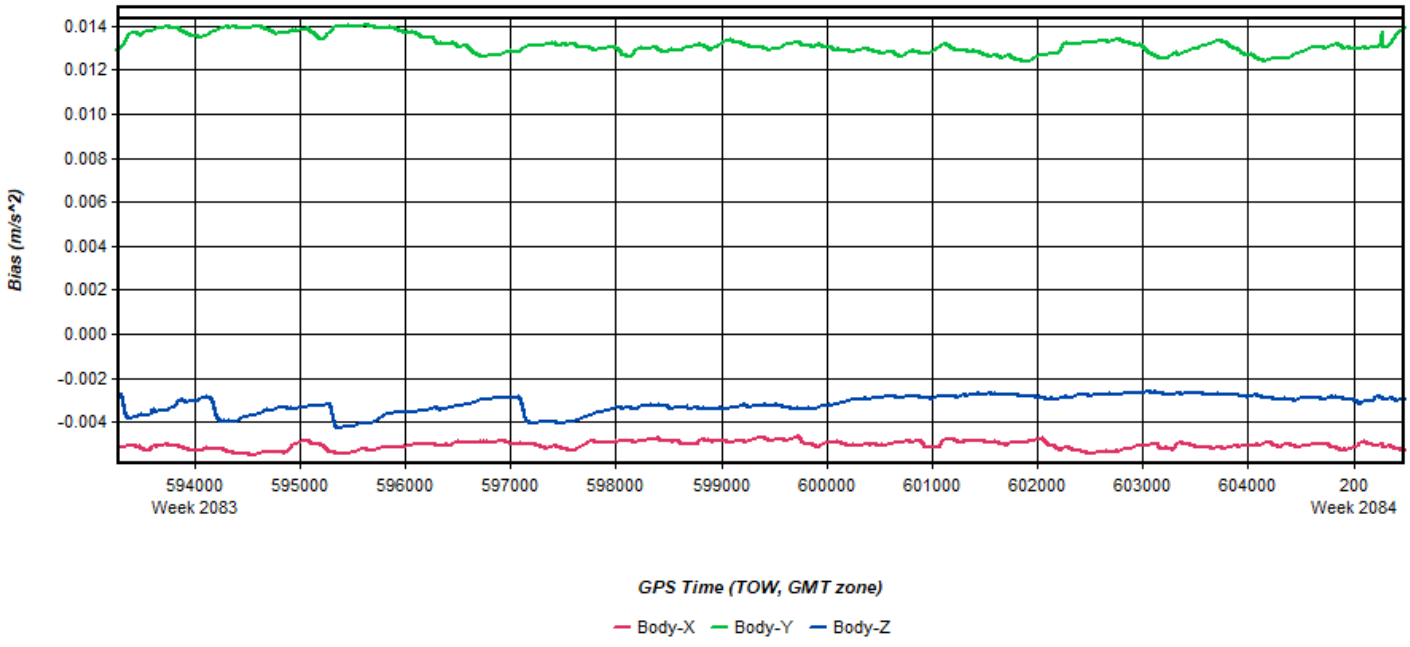

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 18: 20191214204650 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



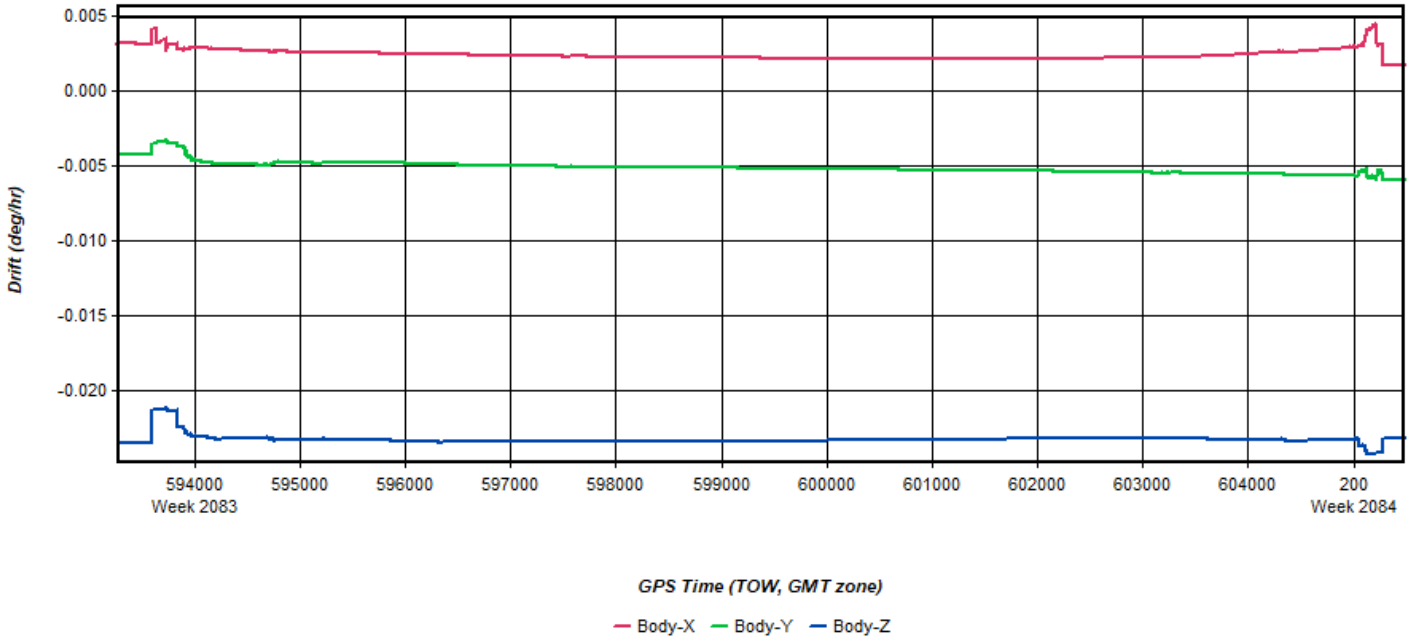

| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 19: 20191214204650 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

**Figure 20: 20191214204650 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191214204650 | by Unknown | on 12/24/2019 | at 15:05:42 |

# Output Results for 20191215004501

Inertial Explorer Version 8.80.2305
12/24/2019

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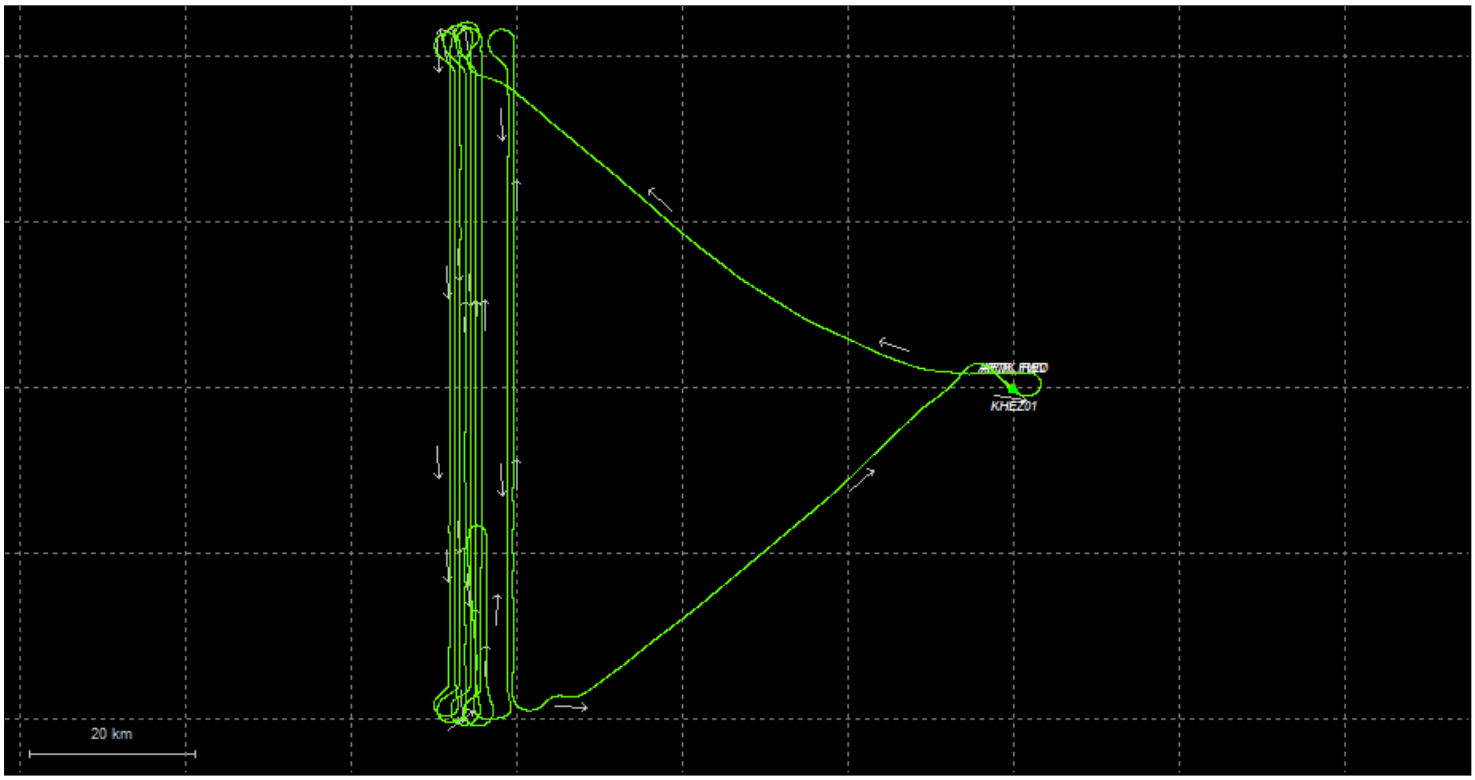
**Figure 1: Smoothed TC Combined - Map**




| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |
|---|---|---|---|---|

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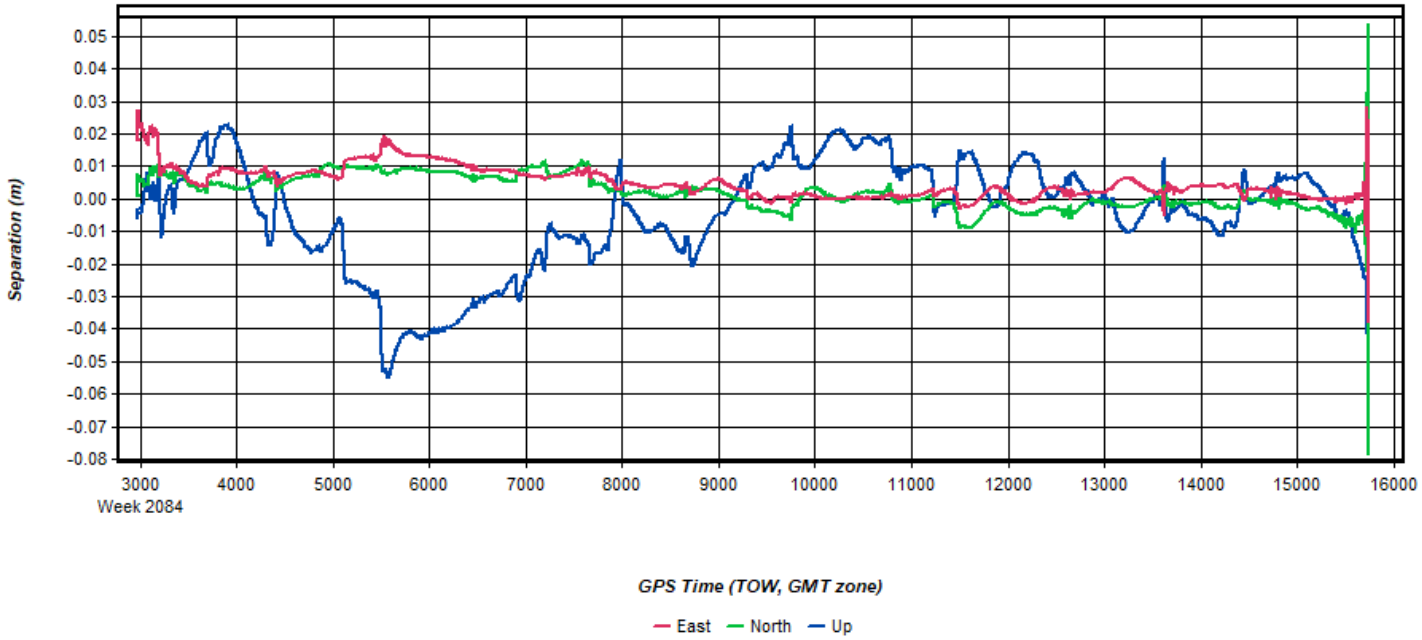
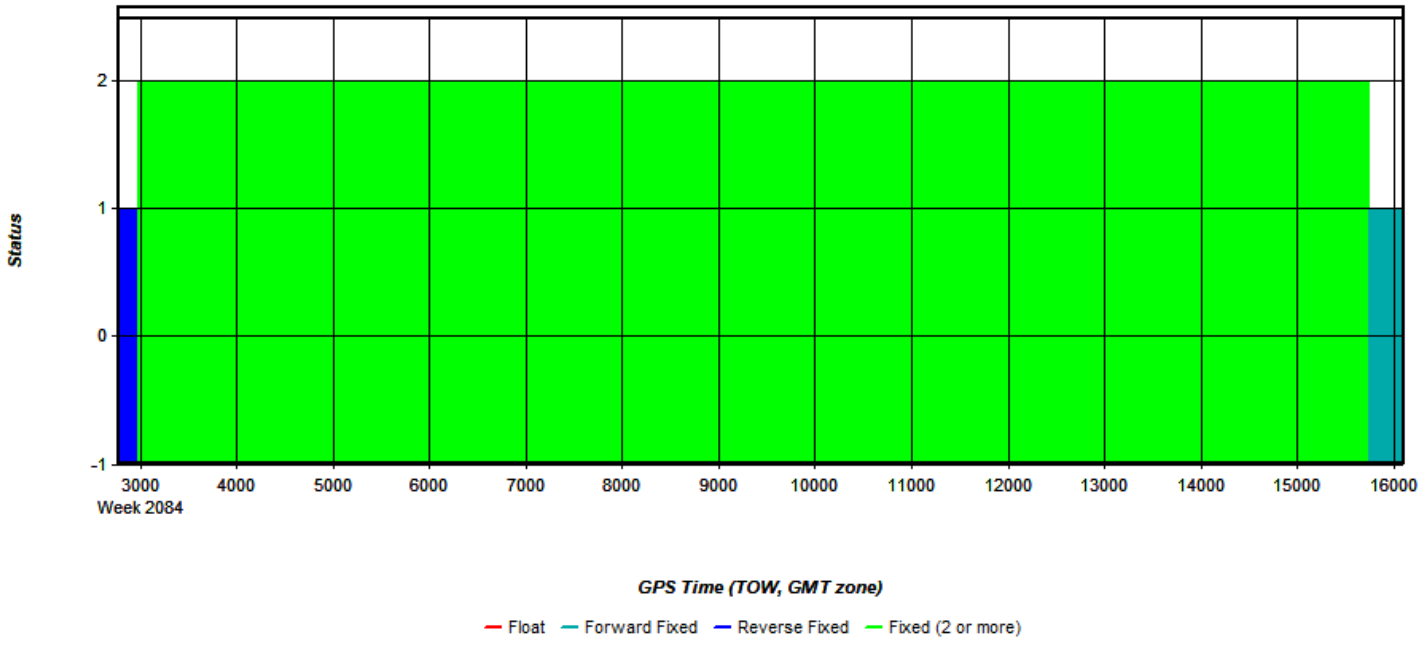
**Figure 2: 20191215004501 [Smoothed TC Combined] - Forward/Reverse or Combined Separation Plot**



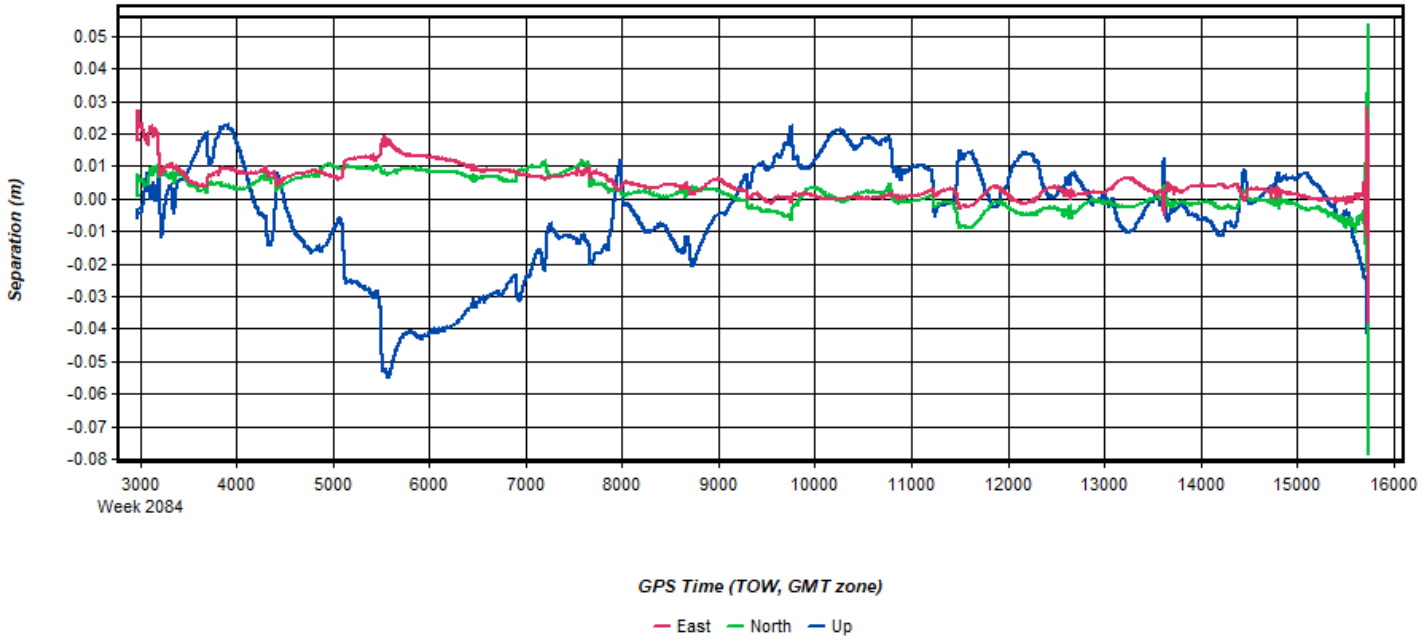

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 3: 20191215004501 [Smoothed TC Combined] - Float or Fixed Ambiguity**



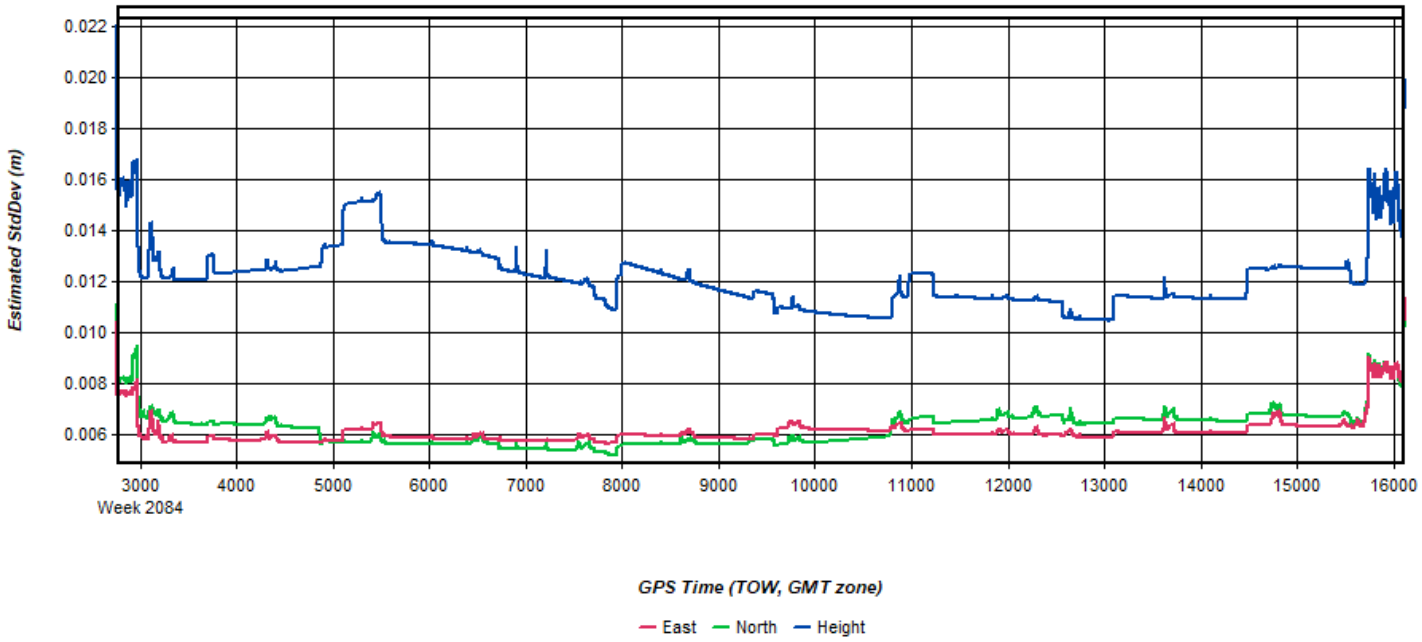

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 4: 20191215004501 [Smoothed TC Combined] - Forward/Reverse Separation Plot (Fixed)**



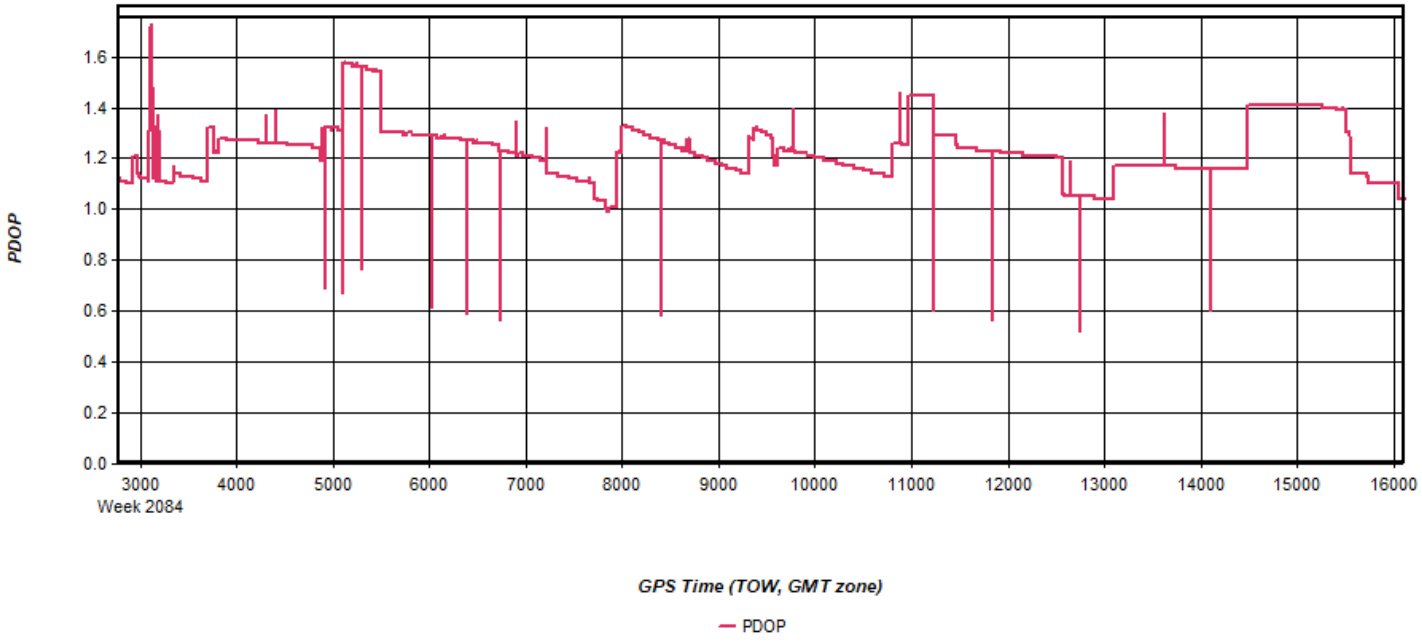

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 5: 20191215004501 [Smoothed TC Combined] - Estimated Position Accuracy Plot**



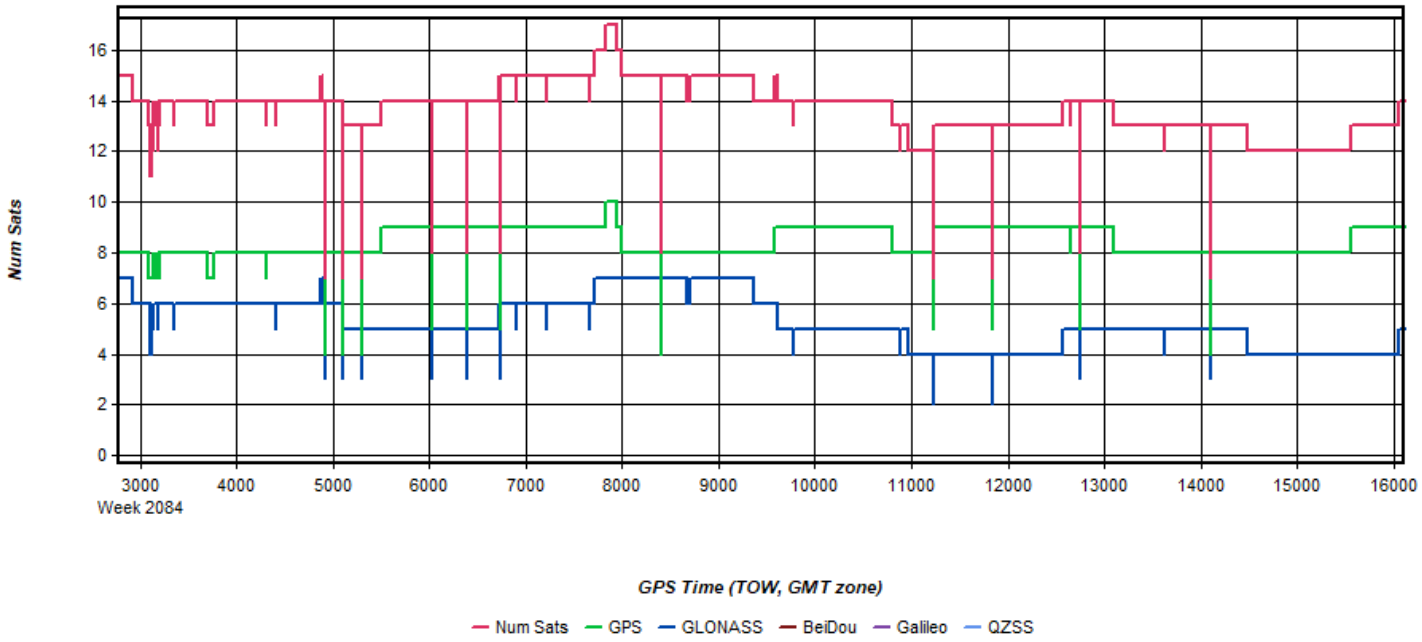

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 6: 20191215004501 [Smoothed TC Combined] - PDOP Plot**



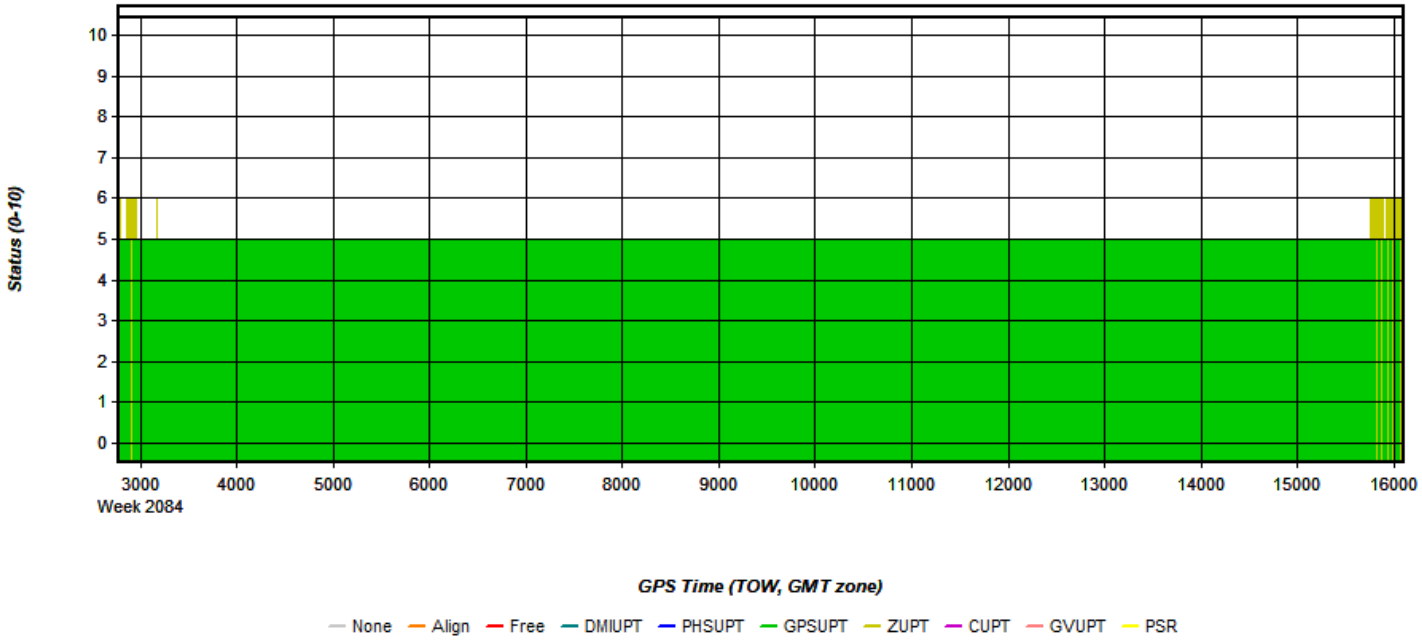

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 7: 20191215004501 [Smoothed TC Combined] - Number of Satellites Line Plot**



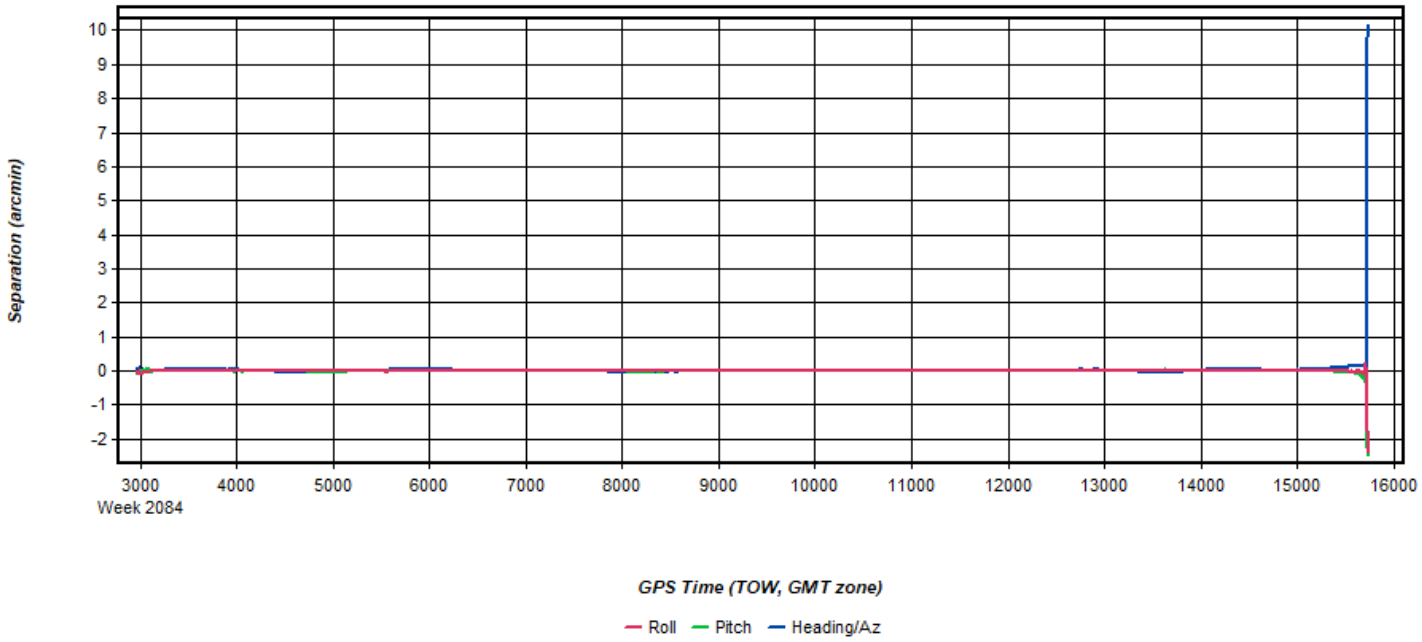

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 8: 20191215004501 [Smoothed TC Combined] - Status flag for IMU processing**



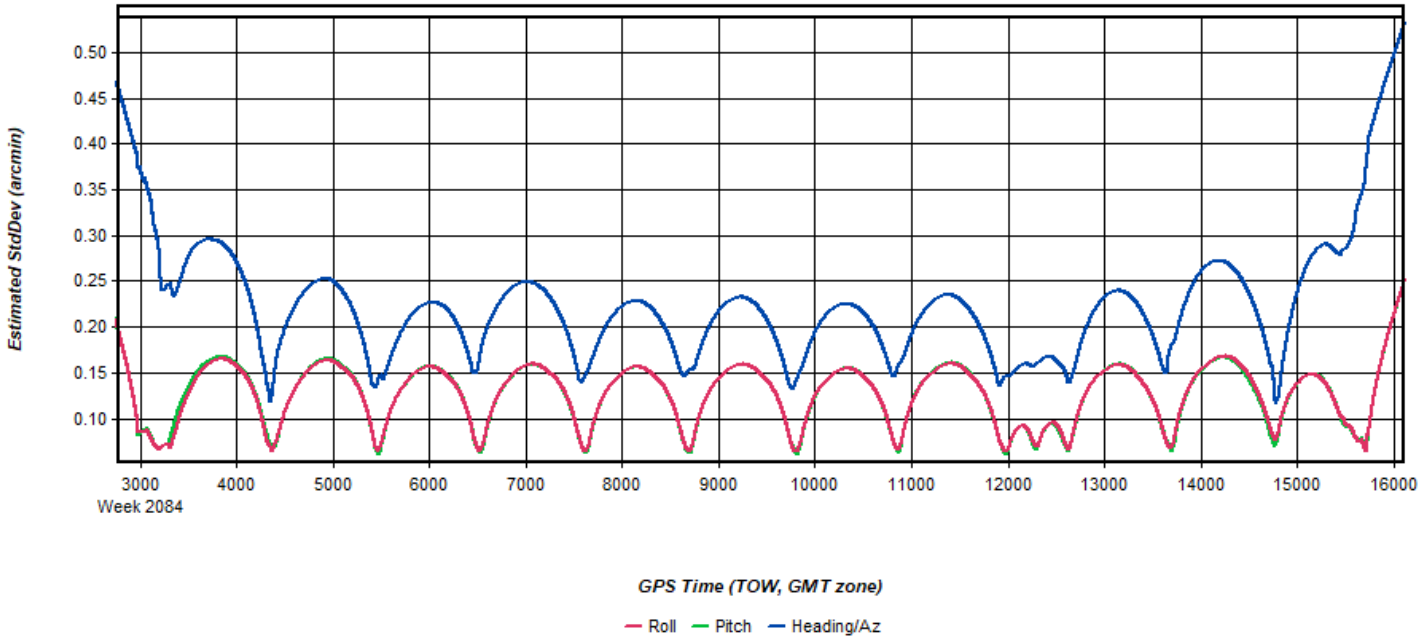

| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |
|---|---|---|---|---|

**Figure 9: 20191215004501 [Smoothed TC Combined] - Fwd/Rev Attitude Separation Plot**



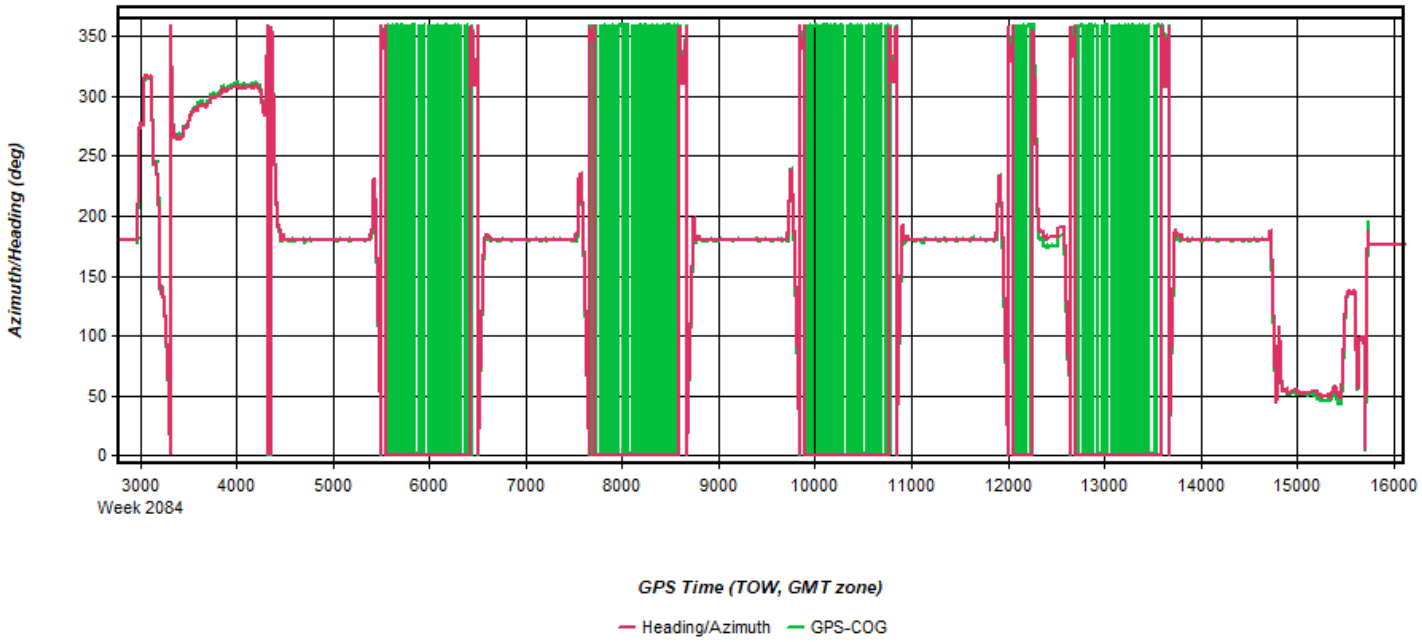

| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |
|---|---|---|---|---|

**Figure 10: 20191215004501 [Smoothed TC Combined] - Estimated Attitude Accuracy Plot**



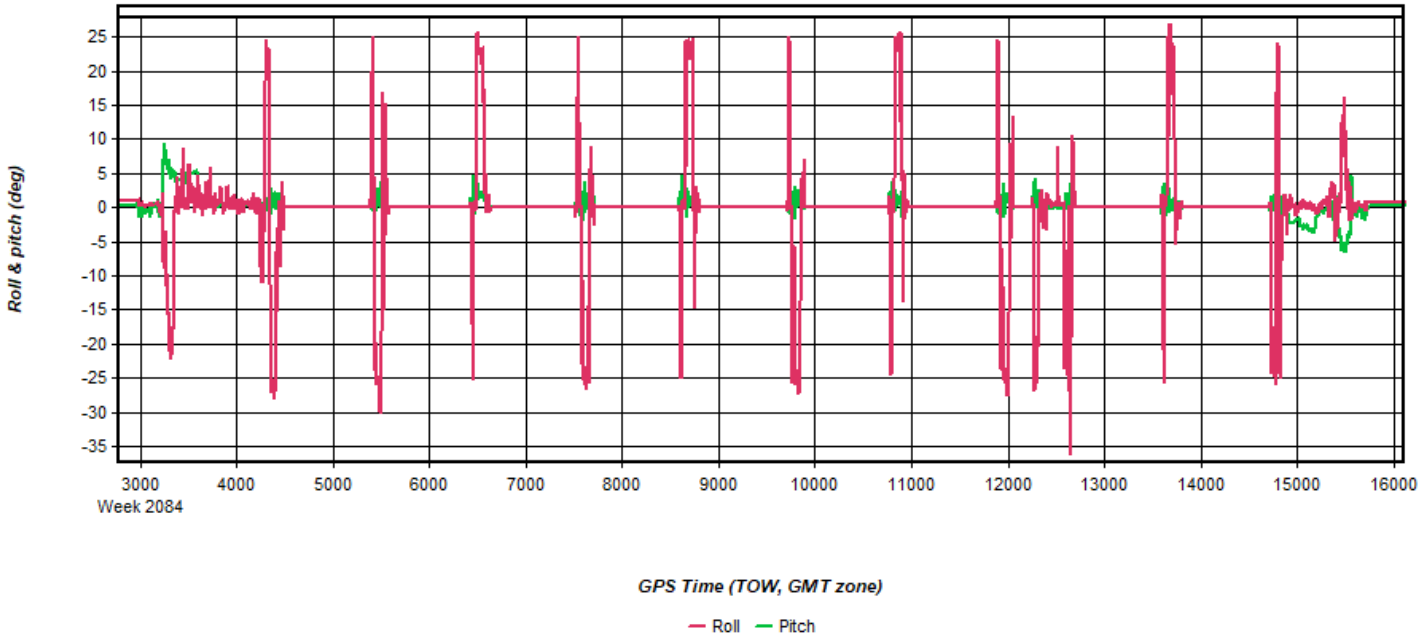

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 11: 20191215004501 [Smoothed TC Combined] - Azimuth Plot**



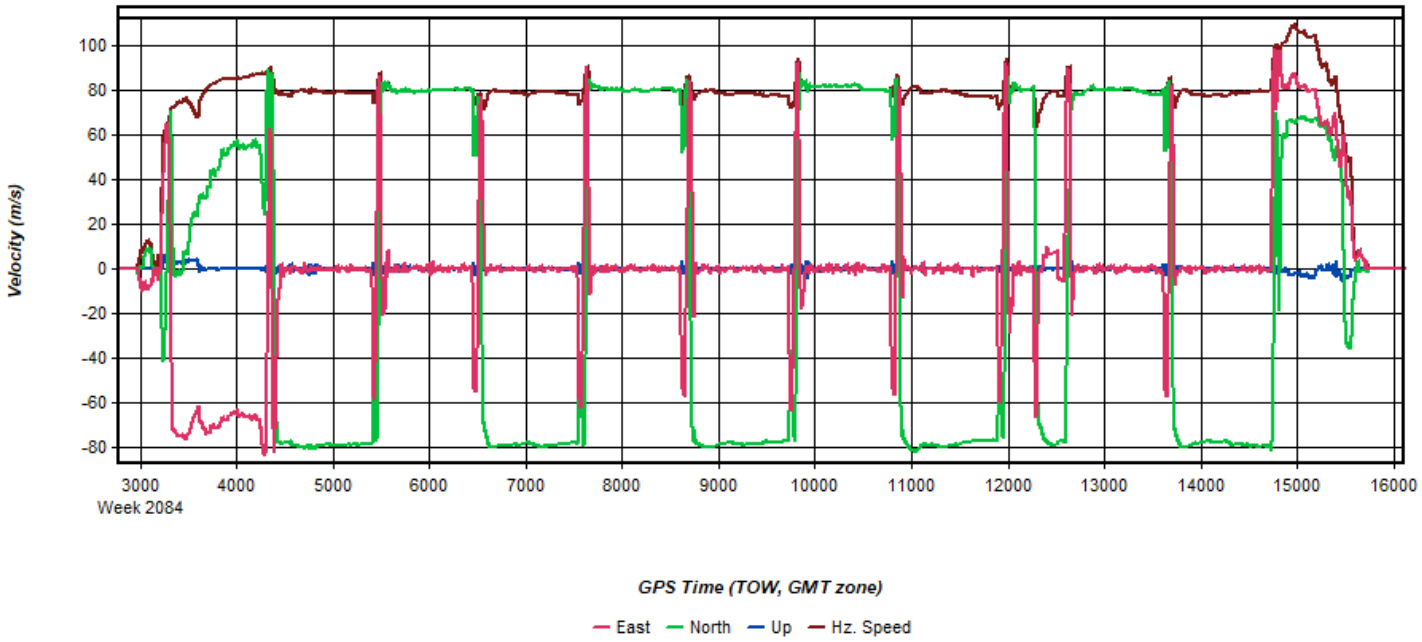

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 12: 20191215004501 [Smoothed TC Combined] - Roll & Pitch Plot**



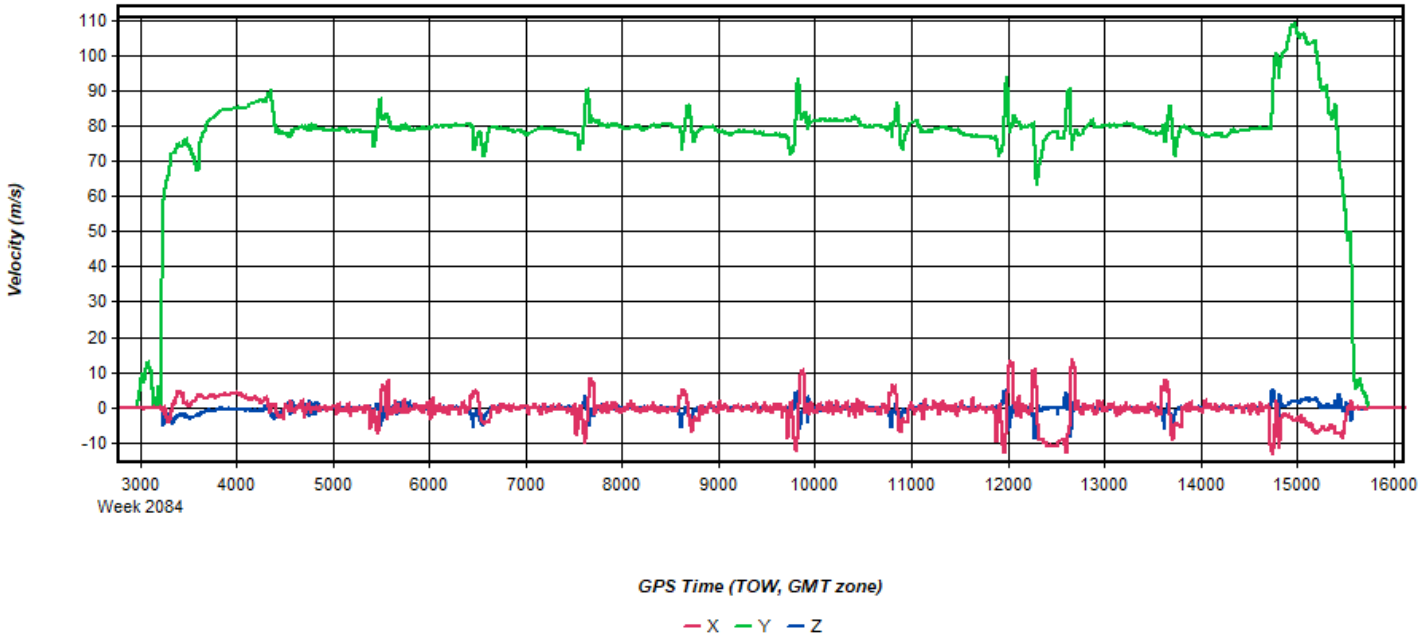

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 13: 20191215004501 [Smoothed TC Combined] - Velocity Profile Plot**



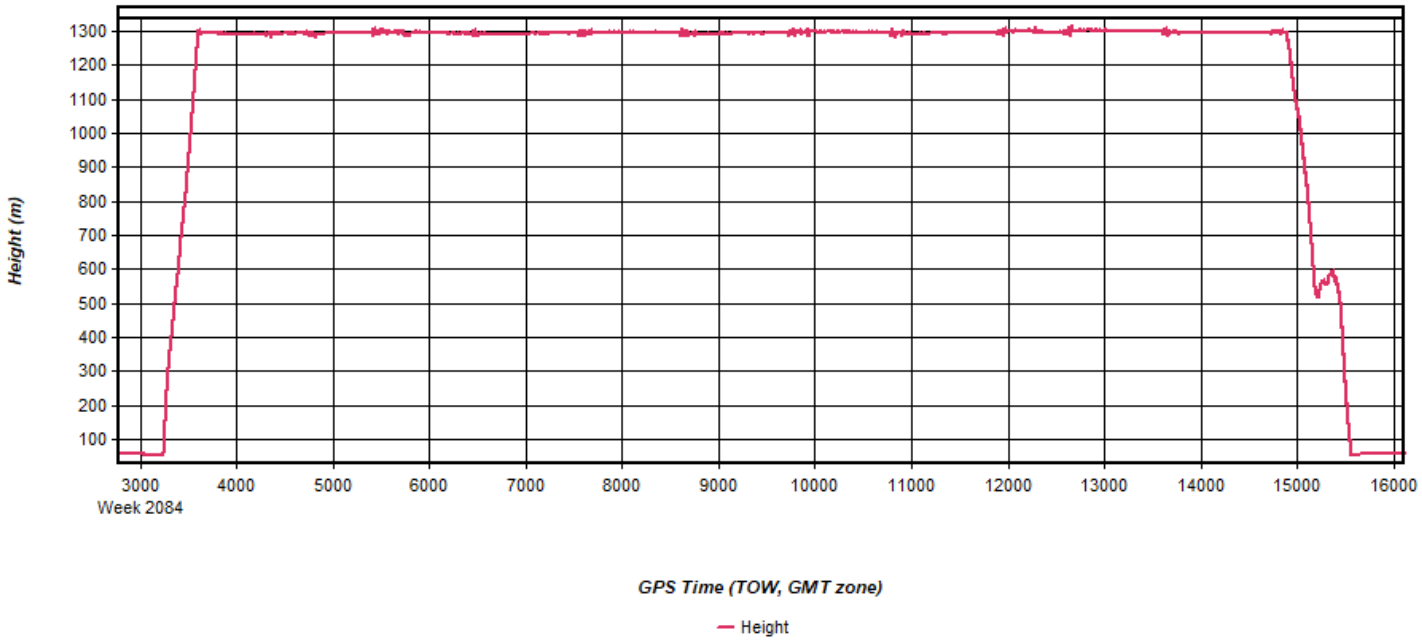

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 14: 20191215004501 [Smoothed TC Combined] - Body Frame Velocity Plot**



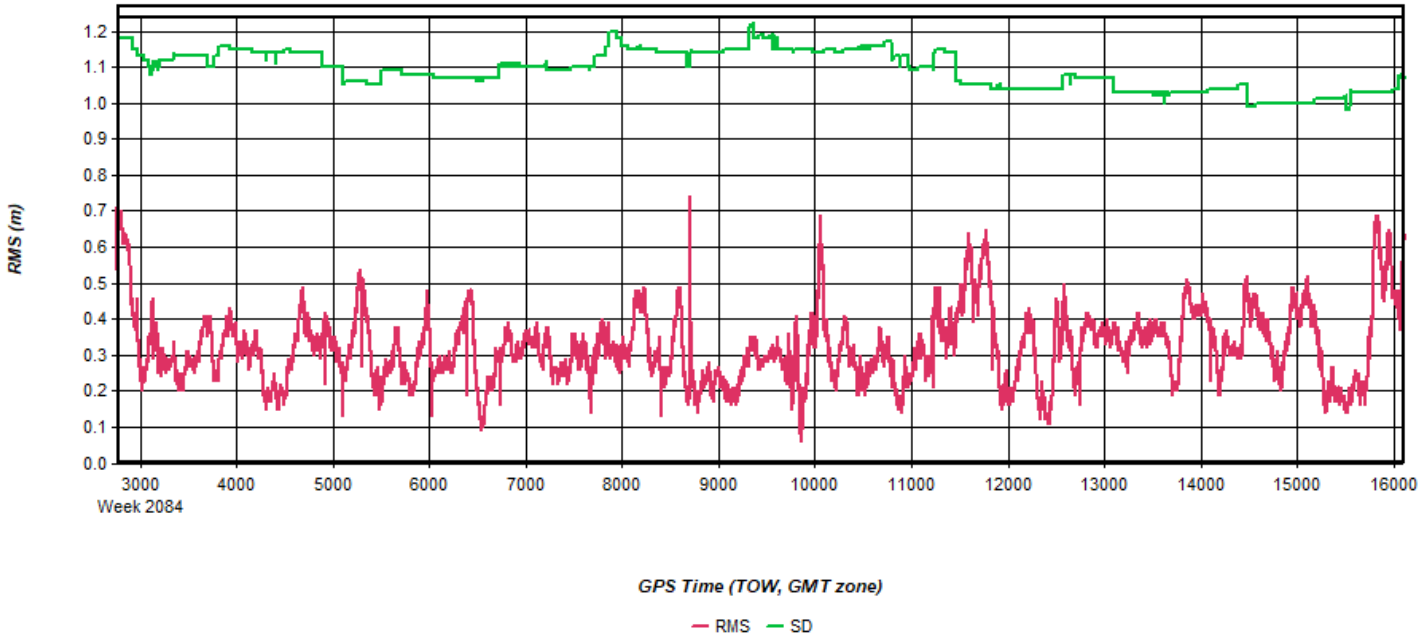

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 15: 20191215004501 [Smoothed TC Combined] - Height Profile Plot**



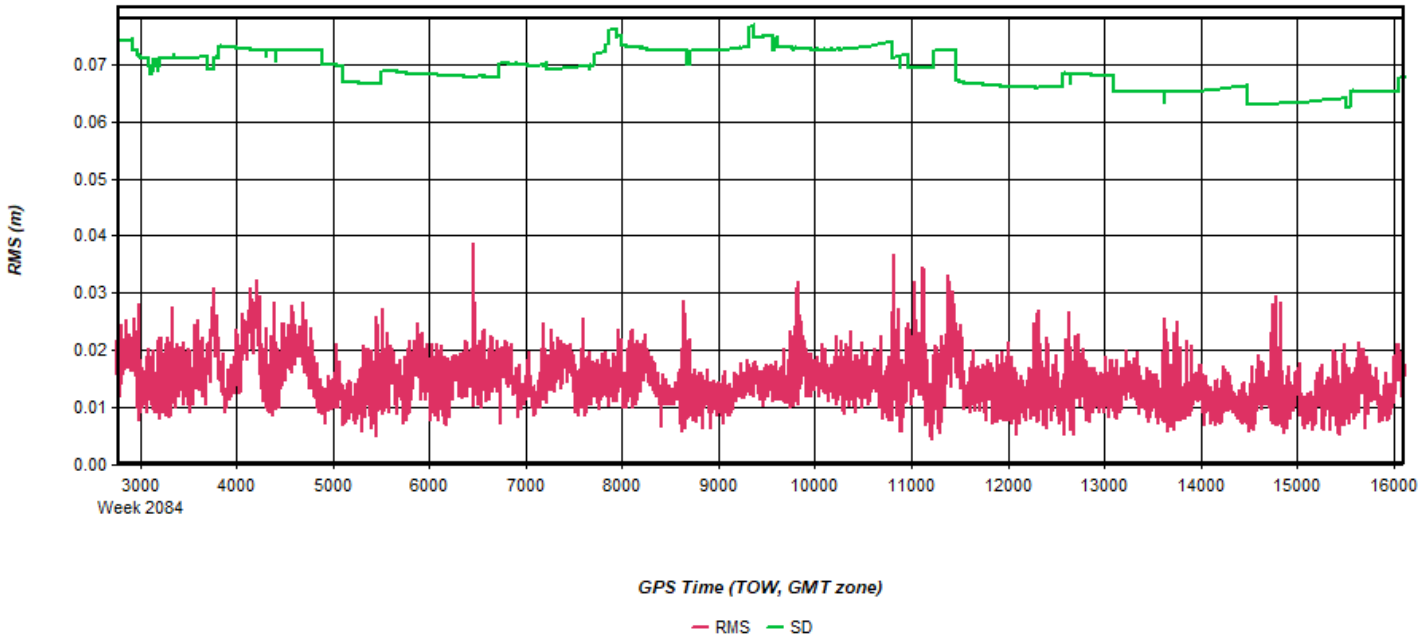

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 16: 20191215004501 [Smoothed TC Combined] - C/A Code Residual RMS Plot**



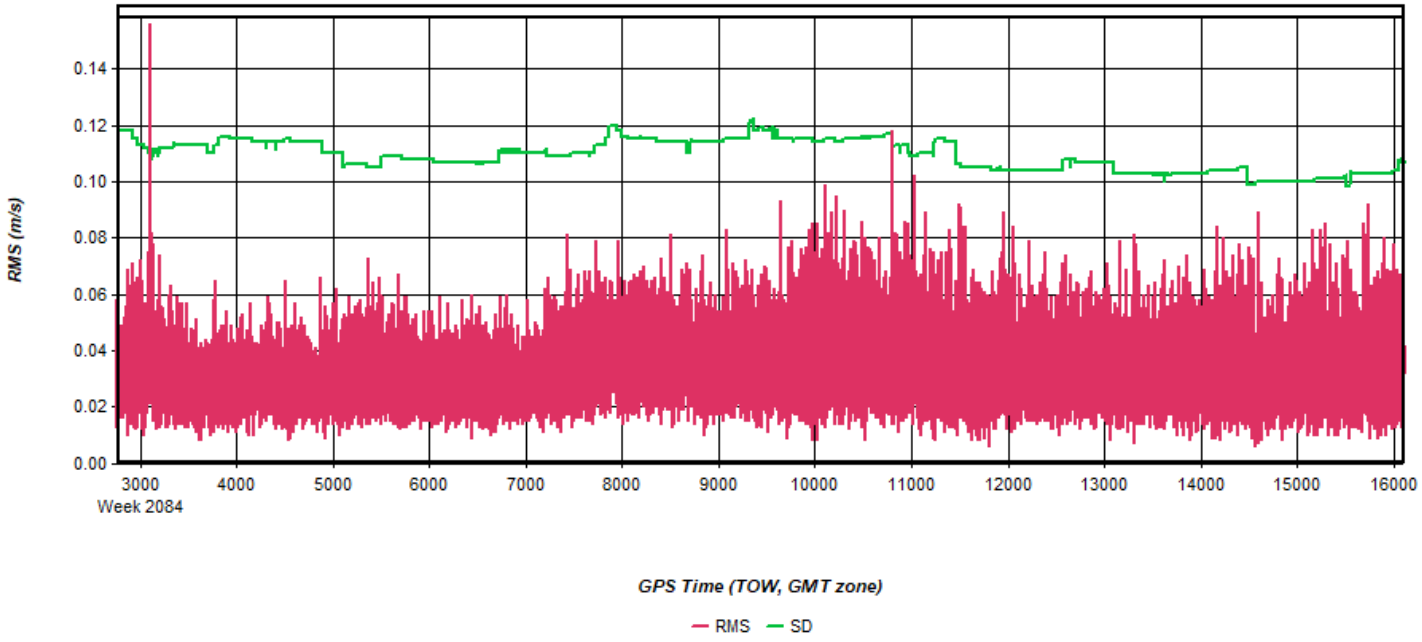

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 17: 20191215004501 [Smoothed TC Combined] - Carrier Residual RMS Plot**



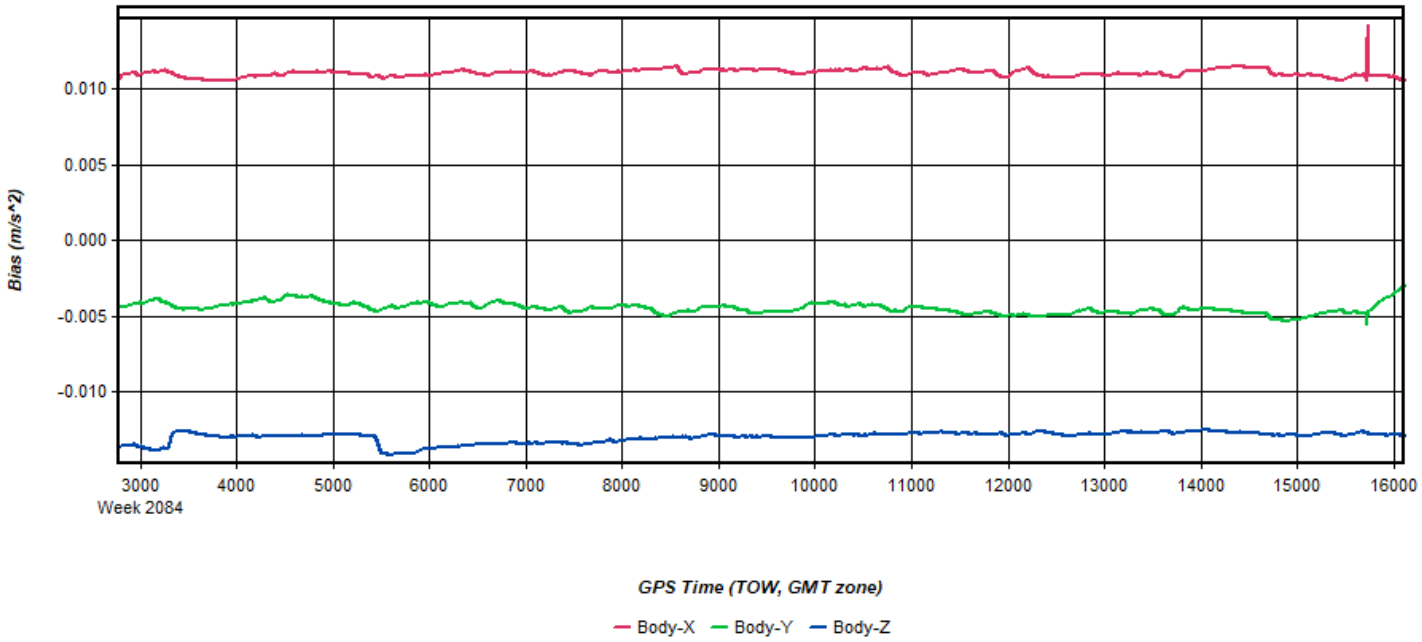

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 18: 20191215004501 [Smoothed TC Combined] - L1 Doppler Residual RMS Plot**



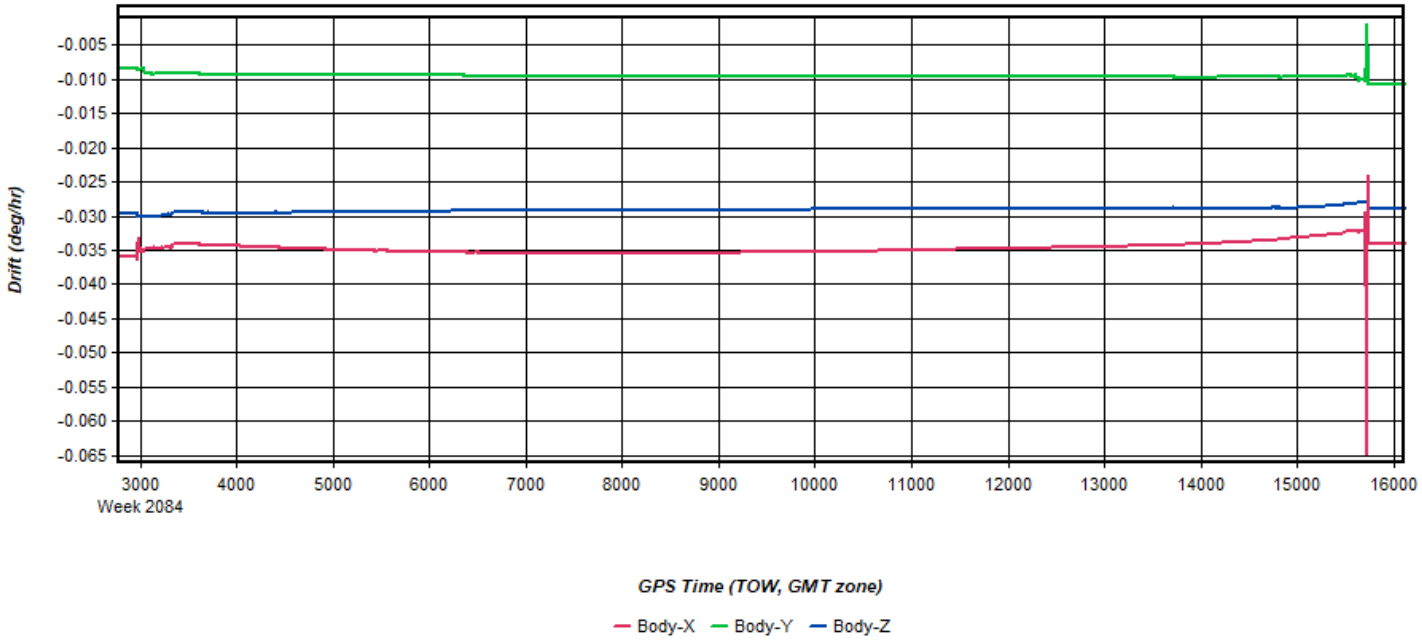

| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 19: 20191215004501 [Smoothed TC Combined] - Accelerometer Bias Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |

**Figure 20: 20191215004501 [Smoothed TC Combined] - Gyro Drift Plot**




| | | | | |
|---|---|---|---|---|
| Process | 20191215004501 | by Unknown | on 12/24/2019 | at 15:49:40 |