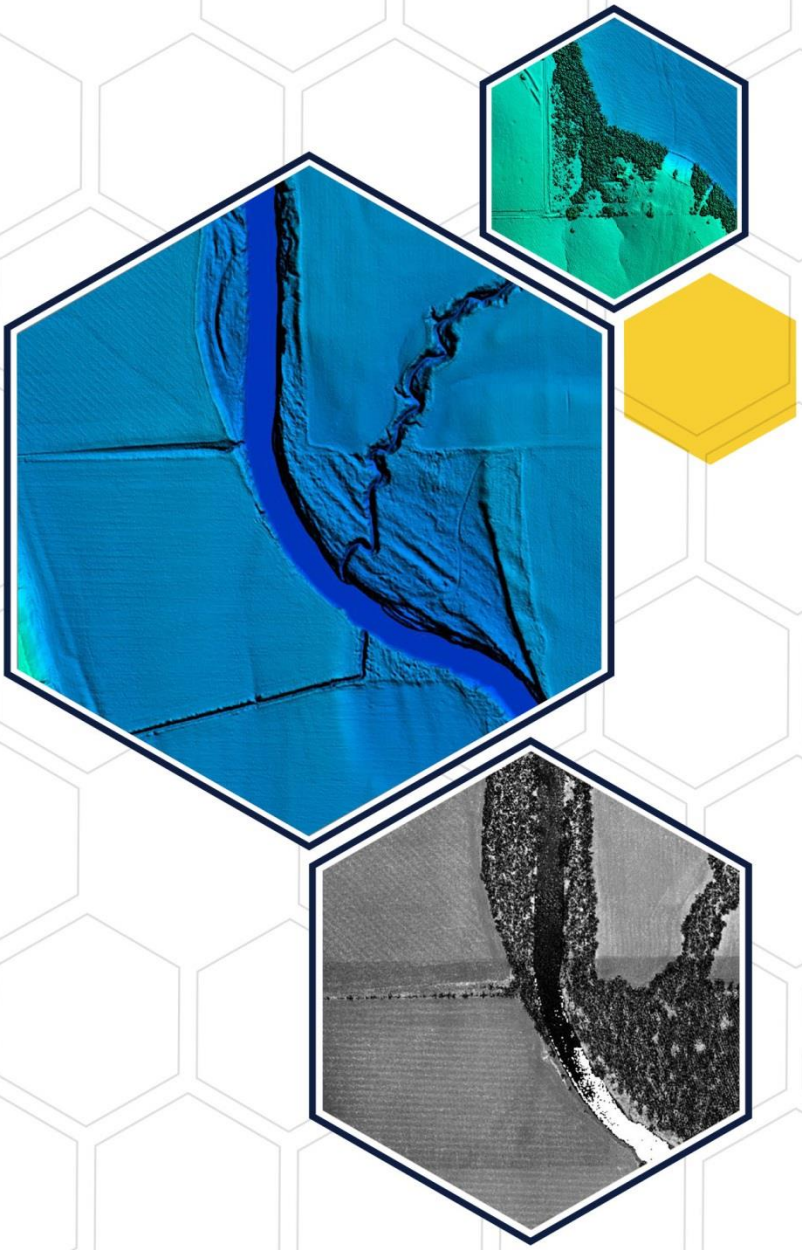

Aerial Lidar Report

16104
Kansas Department of Agriculture, 2017 Kansas Lidar
February 2018

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Section 1: Lidar Acquisition

1.1 Acquisition

The Atlantic Group, LLC (Atlantic) has successfully completed lidar acquisition for the State of Kansas Lidar Area of Interest (AOI). Lidar for this AOI was acquired in thirteen (13) flight mission completed on May 5th, 2017. The project area encompasses 213,121 acres, 8,625 square kilometers or 3,330 square miles.

1.2 Acquisition Status Report

Upon notification to proceed, the flight crew loaded the flight plans and validated the flight parameters. Atlantic's Director of Flight Operations contacted air traffic control and coordinated flight pattern requirements. Lidar acquisition began immediately upon notification that control base stations were in place. During flight operations, the flight crew monitored weather and atmospheric conditions. Lidar missions were flown only when no condition existed below the sensor that would affect the collection of data. The pilot constantly monitored the aircraft course, position, pitch, roll, and yaw of the aircraft. The sensor operator monitored the sensor, the status of the GNSS constellations, and performed the first QC review during acquisition. The flight crew constantly reviewed weather and cloud locations. Any flight lines impacted by unfavorable conditions were marked as invalid and re-flown at an optimal time.

1.3 Acquisition Details

Atlantic acquired one hundred and fifty (150) passes of the AOI as a series of perpendicular and/or adjacent flight-lines. Differential GNSS unit in aircraft recorded sample positions at 2 Hz or more frequency. Lidar data was only acquired when a minimum of 6 satellites were in view.

Atlantic lidar sensors are calibrated at a designated site located at the Fayetteville Municipal Airport (FYM) in Fayetteville, TN and are periodically checked and adjusted to minimize corrections at project sites.

1.4 Project Purpose

The primary purpose of the lidar survey was to establish measurements of the bare earth surface, as well as top surface feature data for providing geometric inputs for modeling, other numerical modeling and economic related assessments.

1.5 Lidar Flight-line Orientation

The following graphic represents the alignment of the project area of interest (AOI) and the flight-lines executed to provide AOI coverage.

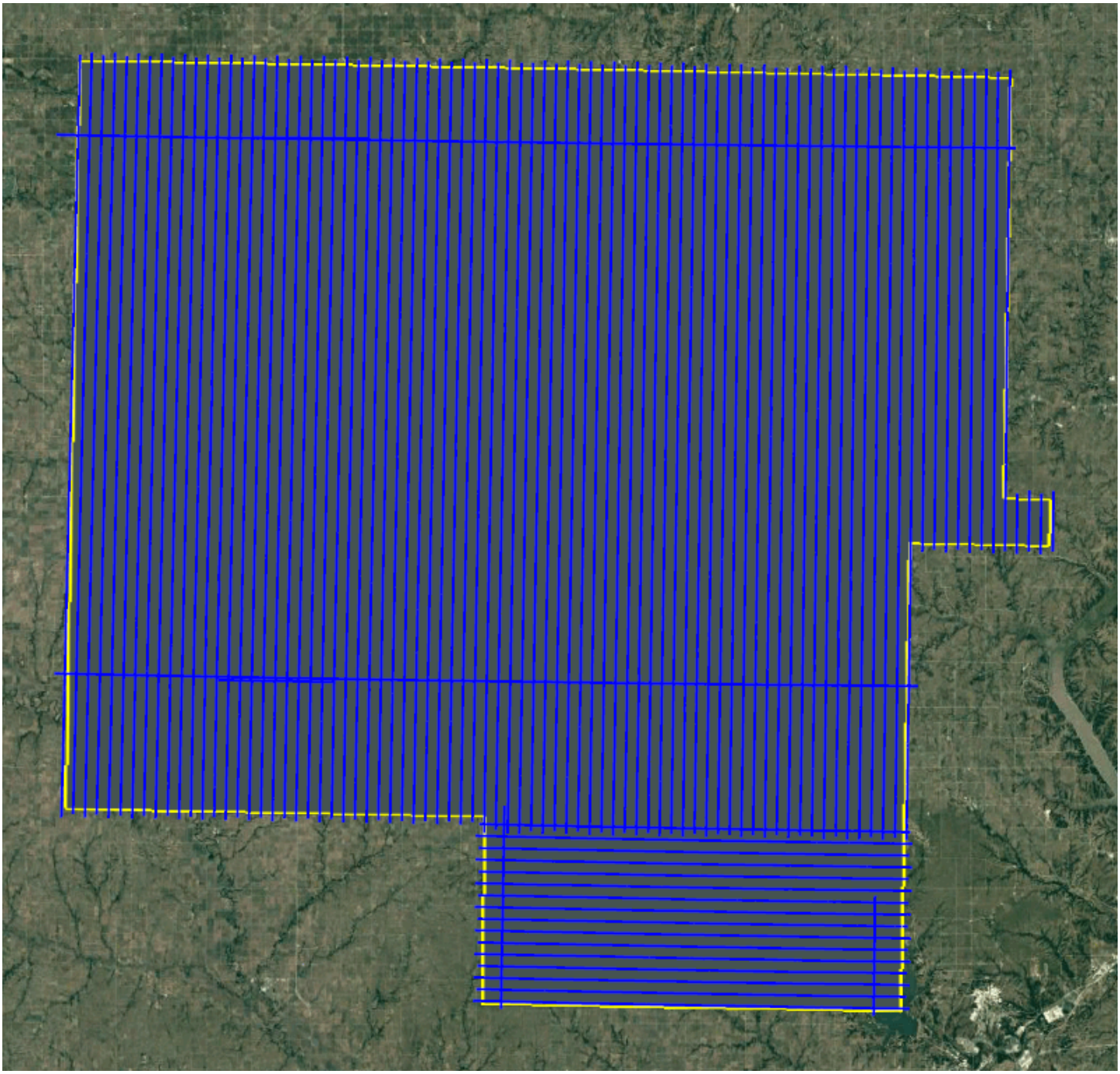


Figure 1: Trajectories as flown by Atlantic

1.6 Acquisition Equipment

Atlantic operated a Partenavia S.P.A P 68 C/TC (N775MW) and a Cessna T210L (N732JE) both outfitted with a Leica ALS70-

HP lidar system during the collection of the project area. Table 1 represents a list of the features and characteristics for the Leica ALS70-HP lidar system:

Atlantic's Sensor Characteristics		
Leica ALS70-HP		
Manufacturer	Leica	
Model	ALS70 - HP	
Platform	Fixed-Wing	
Scan Pattern	Sine, Triangle, Raster	
Maximum Scan Rate (Hz)	Sine	200
	Triangle	158
	Raster	120
Field of View (°)	0 - 75 (Full Angle, User Adjustable)	
Maximum Pulse rate (kHz)	500	
Maximum Flying height (m AGL)	3500	
Number of returns	Unlimited	
Number of Intensity Measurements	3 (First, Second, Third)	
Roll Stabilization (Automatic Adaptive, °)	75 - Active FOV	
Storage Media	Removable 500 GB SSD	
Storage Capacity (Hours @ Max Pulse Rate)	6	
Size (cm)	Scanner	37 W x 68 L x 26 H
	Control Electronics	45 W x 47 D x 36 H
Weight (kg)	Scanner	43
	Control Electronics	45
Operating Temperature	0 - 40 °C	
Flight Management	FCMS	
Power Consumption	927 @ 22.0 - 30.3 VDC	

Table 1: Atlantic Sensor Characteristics

1.7 Lidar System Acquisition Parameters

Table 2 illustrates Atlantic's system parameters for lidar acquisition on this project.

Lidar System Acquisition Parameters	
Item	**Parameter**
System	Leica ALS-70 HP
Nominal Pulse Spacing (m)	0.7
Nominal Pulse Density (pls/m²)	2.4
Nominal Flight Height (AGL meters)	2,390
Nominal Flight Speed (kts)	130
Pass Heading (degree)	Varies
Sensor Scan Angle (degree)	45
Scan Frequency (Hz)	35.1
Pulse Rate of Scanner (kHz)	264.8
Line Spacing (m)	1,225
Pulse Duration of Scanner (ns)	4
Pulse Width of Scanner (m)	0.53
Central Wavelength of Sensor Laser (nm)	1064
Sensor Operated with Multiple Pulses	Yes
Beam Divergence (mrad)	0.22
Nominal Swath Width (m)	1,663
Nominal Swath Overlap (%)	20
Scan Pattern	Triangle

Table 2: Atlantic Lidar System Acquisition Parameters

1.8 GNSS Reference Station(s)

Three (3) Continuously Operating Reference Stations (CORS) and Three (3) NGS Monuments and Three (3) set stations were used to control the lidar acquisition for the project area. The coordinates provided in Table 3 below are in NAD83 (2011), Geographic Coordinate System, Ellipsoid, Meters.

GPS Reference Station Coordinates					
Designation	**Type**	**PID**	**Latitude (N)**	**Longitude (W)**	**Elevation**
ATL1	SET		39 38 56.64637	097 48 01.72210	401.750
ATL2	SET		39 43 08.11994	097 08 35.95727	408.964
ATL4	SET		39 45 16.68372	096 56 37.98604	379.685
CONCORDIA	NGS	KF0937	39 31 23.00578	097 40 34.41882	460.732
CYWB	NGS	KF0792	39 22 57.85318	097 09 29.76503	340.282
KSU1	CORS	DI3428	39 06 02.67747	096 36 34.09348	326.620
NEFR	CORS	DN7500	40 08 53.35429	097 10 14.42453	413.539
NERC	CORS	DN5842	40 04 32.25406	098 31 05.27200	495.045
RYDAL_RESET	NGS	KF0927	39 47 05.67588	097 43 33.54713	443.199

Table 3: GNSS Reference Station Coordinates

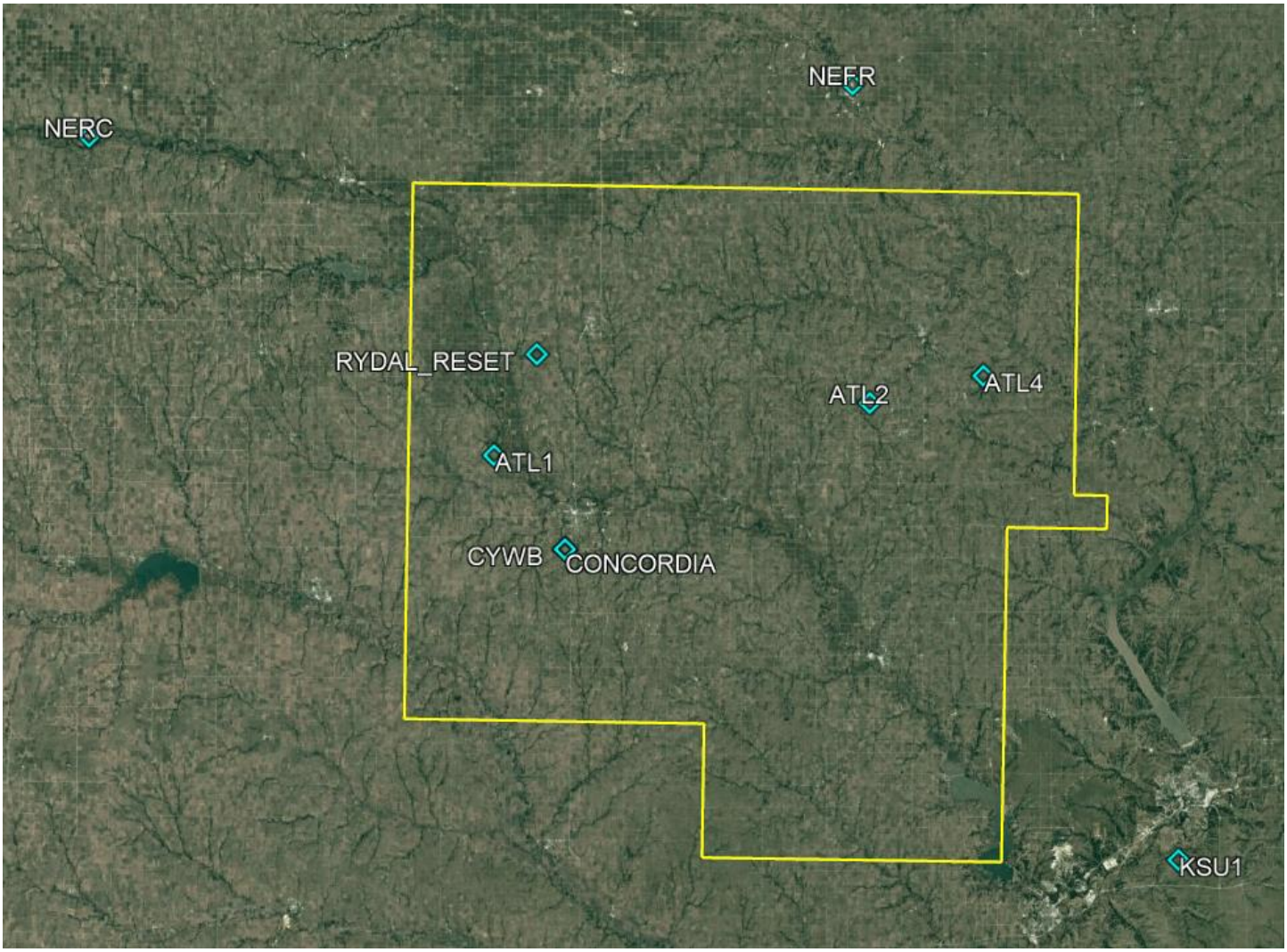


Figure 2: GNSS Reference Station(s)

1.9 Airborne GNSS Kinematic

Differential GNSS unit in aircraft collected positions at 2 Hz. Airborne GNSS data was processed using the Inertial Explorer (version 8.60.6717) software. Flights were flown with a minimum of 6 satellites in view (10° above the horizon).

For all flights, the GNSS data can be classified as good, with residuals of 3cm average or better but none larger than 10cm being recorded.

Data collected by the lidar unit is reviewed for completeness, acceptable density and to make sure all data is captured without errors or corrupted values. In addition, all GNSS, aircraft trajectory, mission information, and ground control files are reviewed and logged into a database.

GNSS processing results for each lift are included in **Section 5: GNSS Processing**.

Section 2: Lidar Processing

2.1 Lidar Point Cloud Generation

Atlantic used Leica software products to download the IPAS ABGNSS/IMU data and raw laser scan files from the airborne system. Waypoint Inertial Explorer is used to extract the raw IPAS ABGNSS/IMU data, which is further processed in combination with controlled base stations to provide the final Smoothed Best Estimate Trajectory (SBET) for each mission. The SBET's are combined with the raw laser scan files to export the Lidar ASCII Standard (*.las) formatted swath point clouds.

Figure 3: Lidar swath data showing complete coverage

2.2 Coordinate Reference System

Horizontal Datum: North American Datum of 1983 (HARN)
Coordinate System: Universal Transverse Mercator Zone 14 North
Vertical Datum: North American Vertical Datum of 1988
Geoid Model: Geoid12B
Units of Reference: Meters

2.3 Lidar Point Cloud Statistics

Table 4 illustrates the overall lidar point cloud statistics for this project.

Point Cloud Statistics	
Category	**Value**
Total Points	32,047,882,156
Nominal Pulse Spacing (m)	0.6211
Nominal Pulse Density (pls/m²)	2.59
Nominal Pulse Spacing (ft)	2.0376
Nominal Pulse Density (pls/ft²)	0.24
Aggregate Total Points	29,839,973,382
Aggregate Nominal Pulse Spacing (m)	0.5702
Aggregate Nominal Pulse Density (pls/m²)	3.08
Aggregate Nominal Pulse Spacing (ft)	1.8708
Aggregate Nominal Pulse Density (pls/ft²)	0.29

Table 4: Lidar Point Cloud Statistics

2.4 Expected Horizontal Positional Error

As described in Section 7.5 of the ASPRS Positional Accuracy Standards for Digital Geospatial Data the horizontal errors in lidar data are largely a function of GNSS positional error, INS angular error, and flying altitude. Therefore, lidar data collected with GNSS error of 8cm and the IMU error of 0.00427 degrees at an altitude of 2,390m; the expected radial horizontal positional error will be RMSEz = 33.8cm.

2.5 Smooth Surface Repeatability (Intraswath)

Departures from planarity of first returns within single swaths in non-vegetated areas were assessed at multiple locations with hard surface areas (parking lots or large rooftops) inside the project area. Each area was evaluated using signed difference rasters (maximum elevation – minimum elevation) at a cell size equal to 2 x ANPS, rounded to the next integer. The following graphic depicts a sample of the assessment.

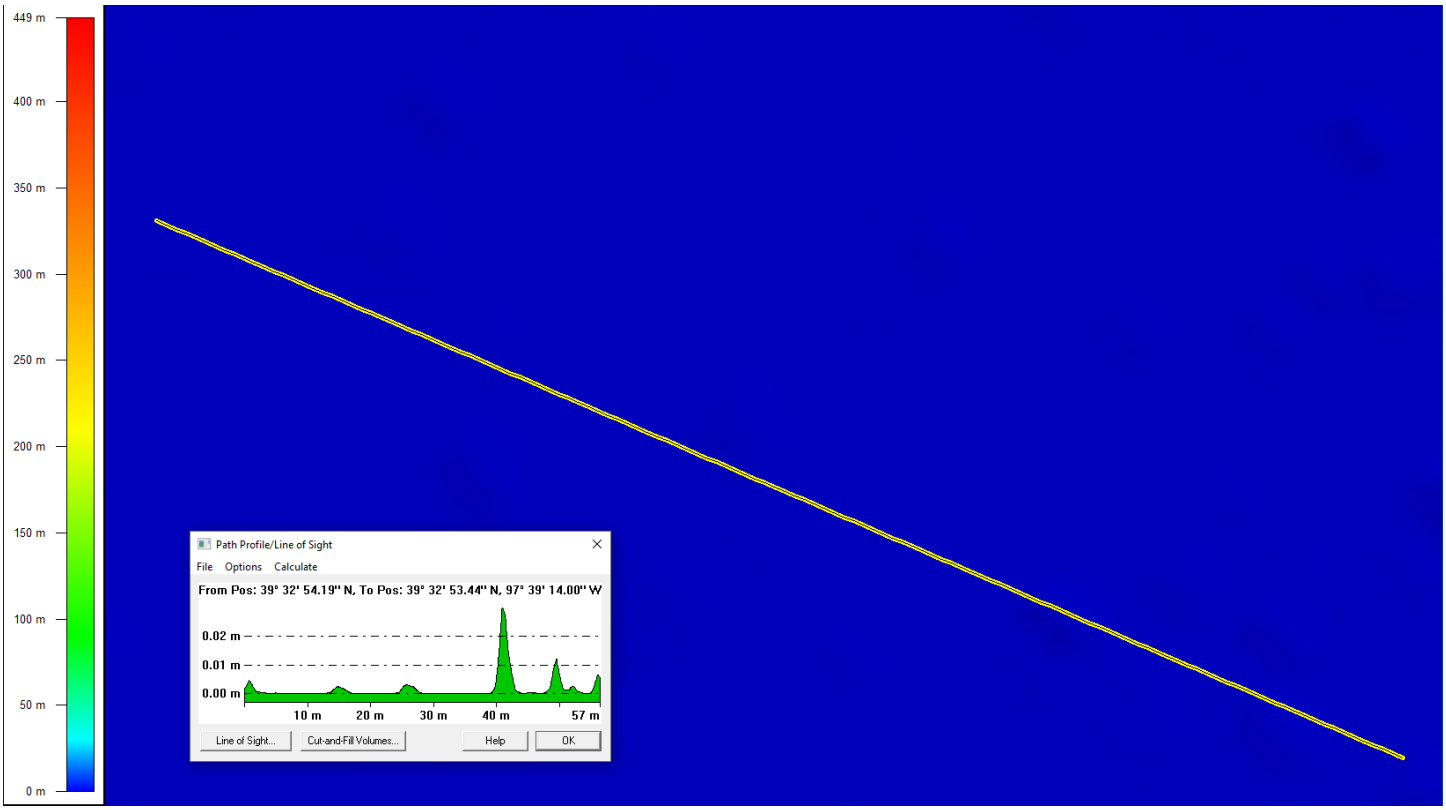


Figure 4: Smooth Surface Repeatability of ≤6cm

2.6 Lidar Calibration

Lidar ranging data were initially calibrated using previous best parameters for this instrument and aircraft. Using a combination of GeoCue, TerraScan and TerraMatch; the overlapping swath point clouds are corrected for any orientation or linear deviations to obtain the best fit swath-to-swath calibration. Relative calibration was evaluated using advanced plane-matching analysis and parameter corrections derived. This process was repeated interactively until residual errors between overlapping swaths, across all project missions, was reduced to ≤2cm. A final analysis of the calibrated lidar is preformed using a TerraMatch Tie Line report for an overall statistical model of the project area.

Upon completion of the data calibration, Atlantic runs a complete set of elevation difference intensity rasters (dZ Orthos). A user-defined color ramp is applied depicting the offsets between overlapping swaths based on project specifications. The dZ orthos provide an opportunity to review the data calibration in a qualitative manner. Atlantic assigns green to all offset values that fall below the required RMSDz requirement of the project. A yellow color is assigned for offsets that fall between the RMSDz value and 1.5x of that value. Finally, red values are assigned to all values that fall beyond 1.5x of the RMSDz requirements of the project.

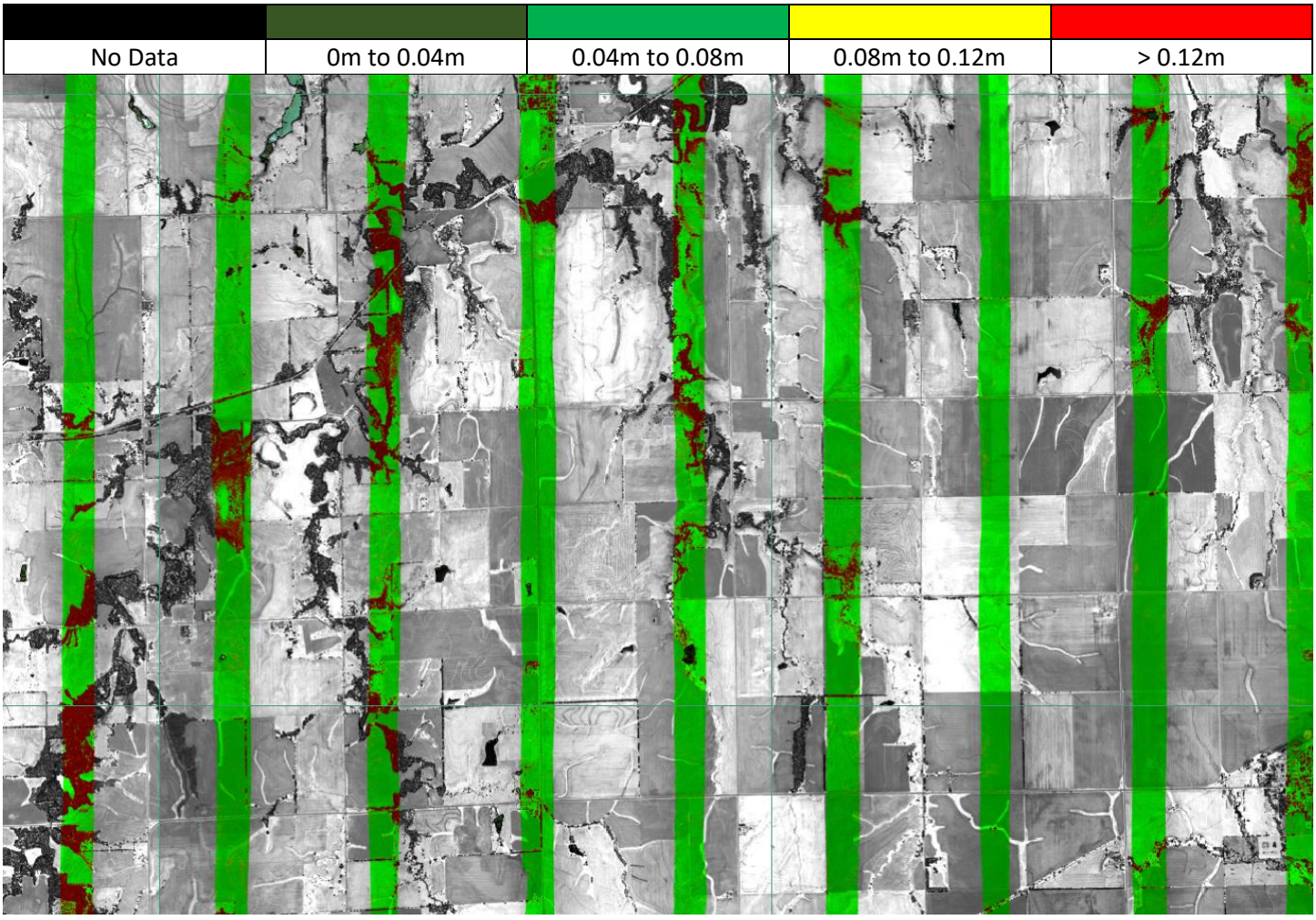


Figure 5: Swath Overlap Difference of ≤8cm, Maximum of ±16cm

2.7 Overlap Consistency (Interswath)

An overall statistical assessment of the relative accuracy using TerraMatch Tie Line Report between lidar swaths can be found in Tables 5, 6, 7, and 8 below. The values provided are in meters.

Average Magnitudes Per Line											
Line	X	Y	Z	Line	X	Y	Z	Line	X	Y	Z
1	0.016	0.04	0.02	51	0.065	0.028	0.017	103	0.019	0.023	0.016
2	0.02	0.015	0.012	52	0.066	0.028	0.015	104	0.021	0.022	0.016
3	0.018	0.016	0.014	53	0.041	0.025	0.016	105	0.027	0.021	0.017
4	0.016	0.017	0.013	54	0.01	0.012	0.015	106	0.024	0.016	0.017
5	0.029	0.018	0.014	55	0.008	0.025	0.017	107	0.025	0.012	0.015
6	0.012	0.012	0.013	56	0.012	0.029	0.016	108	0.025	0.015	0.016
7	0.022	0.038	0.018	57	0.024	0.019	0.014	109	0.023	0.022	0.013
8	0.014	0.023	0.013	58	0.022	0.028	0.016	110	0.016	0.018	0.017
9	0.023	0.017	0.013	59	0.019	0.043	0.014	111	0.017	0.021	0.016
10	0.025	0.017	0.014	60	0.01	0.027	0.016	112	0.014	0.018	0.019
11	0.017	0.016	0.013	61	0.021	0.028	0.014	113	0.023	0.024	0.02
12	0.039	0.016	0.014	62	0.031	0.017	0.021	114	0.026	0.03	0.02
13	0.029	0.032	0.014	63	0.025	0.029	0.014	115	0.028	0.033	0.021
14	0.027	0.033	0.015	64	0.029	0.032	0.014	116	0.035	0.032	0.02
15	0.019	0.018	0.014	65	0.046	0.024	0.019	117	0.02	0.033	0.021
16	0.026	0.025	0.014	66	0.035	0.035	0.013	118	0.041	0.031	0.015
17	0.022	0.026	0.015	67	0.055	0.046	0.015	119	0.012	0.013	0.022
18	0.021	0.026	0.015	68	0.022	0.021	0.015	120	0.032	0.033	0.015
19	0.025	0.022	0.016	69	0.023	0.021	0.013	121	0.023	0.03	0.018
20	0.022	0.02	0.016	70	0.027	0.033	0.017	123	0.02	0.042	0.022
21	0.045	0.023	0.015	73	0.019	0.026	0.016	124	0.018	0.029	0.016
22	0.06	0.027	0.014	74	0.038	0.038	0.018	125	0.023	0.024	0.017
23	0.018	0.024	0.016	75	0.033	0.038	0.014	126	0.023	0.023	0.017
24	0.018	0.022	0.016	76	0.03	0.056	0.015	127	0.022	0.014	0.016
25	0.04	0.029	0.012	77	0.027	0.021	0.013	128	0.023	0.013	0.017
26	0.052	0.016	0.012	78	0.03	0.024	0.016	129	0.023	0.024	0.016
27	0.032	0.058	0.012	79	0.019	0.018	0.012	130	0.043	0.012	0.016
28	0.016	0.04	0.011	80	0.018	0.018	0.013	131	0.026	0.089	0.019
29	0.014	0.015	0.011	81	0.03	0.045	0.013	132	0.026	0.02	0.017
30	0.03	0.023	0.012	82	0.03	0.05	0.015	133	0.018	0.021	0.014
31	0.039	0.023	0.017	83	0.028	0.024	0.015	134	0.015	0.013	0.014
32	0.03	0.034	0.013	84	0.029	0.03	0.018	135	0.022	0.035	0.019
33	0.053	0.058	0.012	85	0.028	0.042	0.02	136	0.013	0.014	0.013
34	0.081	0.046	0.013	86	0.026	0.057	0.012	137	0.015	0.025	0.019
35	0.04	0.032	0.012	87	0.026	0.022	0.019	138	0.016	0.01	0.013
36	0.025	0.027	0.014	88	0.028	0.038	0.018	139	0.011	0.01	0.012
37	0.027	0.024	0.014	89	0.028	0.05	0.017	140	0.013	0.012	0.013
38	0.045	0.019	0.013	90	0.017	0.04	0.02	141	0.02	0.013	0.013

39	0.044	0.027	0.012	**91**	0.033	0.04	0.019	**142**	0.016	0.013	0.013
40	0.03	0.026	0.014	**92**	0.06	0.025	0.019	**143**	0.023	0.053	0.018
41	0.033	0.022	0.013	**93**	0.033	0.014	0.018	**144**	0.031	0.017	0.014
42	0.026	0.032	0.015	**94**	0.027	0.022	0.02	**145**	0.037	0.017	0.016
43	0.01	0.028	0.015	**95**	0.026	0.027	0.018	**146**	0.031	0.033	0.015
44	0.024	0.02	0.016	**96**	0.032	0.019	0.019	**147**	0.054	0.03	0.016
45	0.015	0.026	0.013	**97**	0.039	0.033	0.019	**148**	0.028	0.017	0.017
46	0.018	0.034	0.015	**98**	0.033	0.031	0.02	**149**	0.021	0.014	0.02
47	0.035	0.017	0.015	**99**	0.028	0.027	0.02	**150**	0.019	0.013	0.016
48	0.06	0.02	0.016	**100**	0.025	0.029	0.022	**151**	0.02	0.017	0.018
49	0.037	0.026	0.015	**101**	0.026	0.025	0.02	**152**	0.013	0.035	0.022
50	0.028	0.03	0.016	**102**	0.014	0.02	0.016	**153**	0.013	0.022	0.025

Table 5: Average Tie Line Magnitudes per Line

Internal Observation Statistics			
Category	**X**	**Y**	**Z**
Average Magnitude	0.025	0.023	0.016
RMS Values	0.050	0.044	0.022
Maximum Values	0.112	0.084	0.090
Observation Weight	14226.0	14226.0	355754.0

Table 6: Tie Line Observation Statistics

Overall Relative Accuracy	
Category	**Mismatch**
Average 3D Mismatch	0.01727
Average XY Mismatch	0.04469
Average Z Mismatch	0.01588

Table 7: Relative Accuracy Results

TerraMatch Tie Lines	
Category	**Observations**
Section Lines	147,230
Roof Lines	6,845

Table 8: Total Tie Lines

2.8 Lidar Classification

Atlantic uses multiple automated filtering routines on the calibrated lidar point cloud identifying and extracting bare-earth and above ground features. GeoCue, TerraScan, and TerraModeler software was used for the initial batch processing and manual editing of the lidar point clouds. Atlantic utilized collected breakline data to preform classification for classes' 9-Water and 10-Ignored Ground in LP360. Outlined in Table 9 are the classification codes utilized for this project.

ASPRS Standard Lidar Point Classes	
Code	**Description**
1	Unclassified
2	Ground
7	Low Noise
9	Water
10	Ignored Ground
17	Bridges
18	High Noise
Flags	Overlap & Withheld

Table 9: Point Cloud Classification Scheme

Section 3: Lidar Accuracy

3.1 Ground Surveyed Check Points

Atlantic established a total of one-hundred and sixty-eight (168) check points for this project (93 NVA + 75 VVA). Point cloud data accuracy was tested against a Triangulated Irregular Network (TIN) constructed from lidar points in clear and open areas. A clear and open area can be characterized with respect to topographic and ground cover variation such that a minimum of 5 times the NPS exists with less than 1/3 of the $RMSE_Z$ deviation from a low-slope plane. Slopes that exceed 10 percent were avoided. Each land cover type representing 10 percent or more of the total project area were tested and reported with a VVA. In land cover categories other than dense urban areas, the tested points did not have obstructions 45 degrees above the horizon to ensure a sufficient TIN surface. The VVA value is provided as a target. It is understood that in areas of dense vegetation, swamps, or extremely difficult terrain, this value may be exceeded. The NVA value is a requirement that must be met, regardless of any allowed "busts" in the VVA(s) for individual land cover types within the project. Checkpoints for each assessment (NVA & VVA) are required to be well-distributed throughout the land cover type, for the entire project area.

3.2 Vertical Accuracy Requirements

Below are the vertical accuracy reporting requirements for this project:

Vertical Accuracy Reporting Requirements in Meters:

$RMSE_Z \leq 10.0$cm (Non-Vegetated Swath, DEM)
NVA ≤ 19.6cm 95% Confidence Level (Swath, DEM)
VVA ≤ 29.4cm 95^{th} Percentile (DEM)

*The terms NVA (Non-vegetated Vertical Accuracy) and VVA (Vegetated Vertical Accuracy) are from the ASPRS Positional Accuracy Standards for Digital Geospatial Data v1.0 (2014). The term NVA refers to assessments in clear, open areas (which

typically produce only single lidar returns); the term VVA refers to assessments in vegetated areas (typically characterized by multiple return lidar).

3.3 Check Point Distribution

The following graphics depict the location and distribution of NVA and VVA check points established for this project.

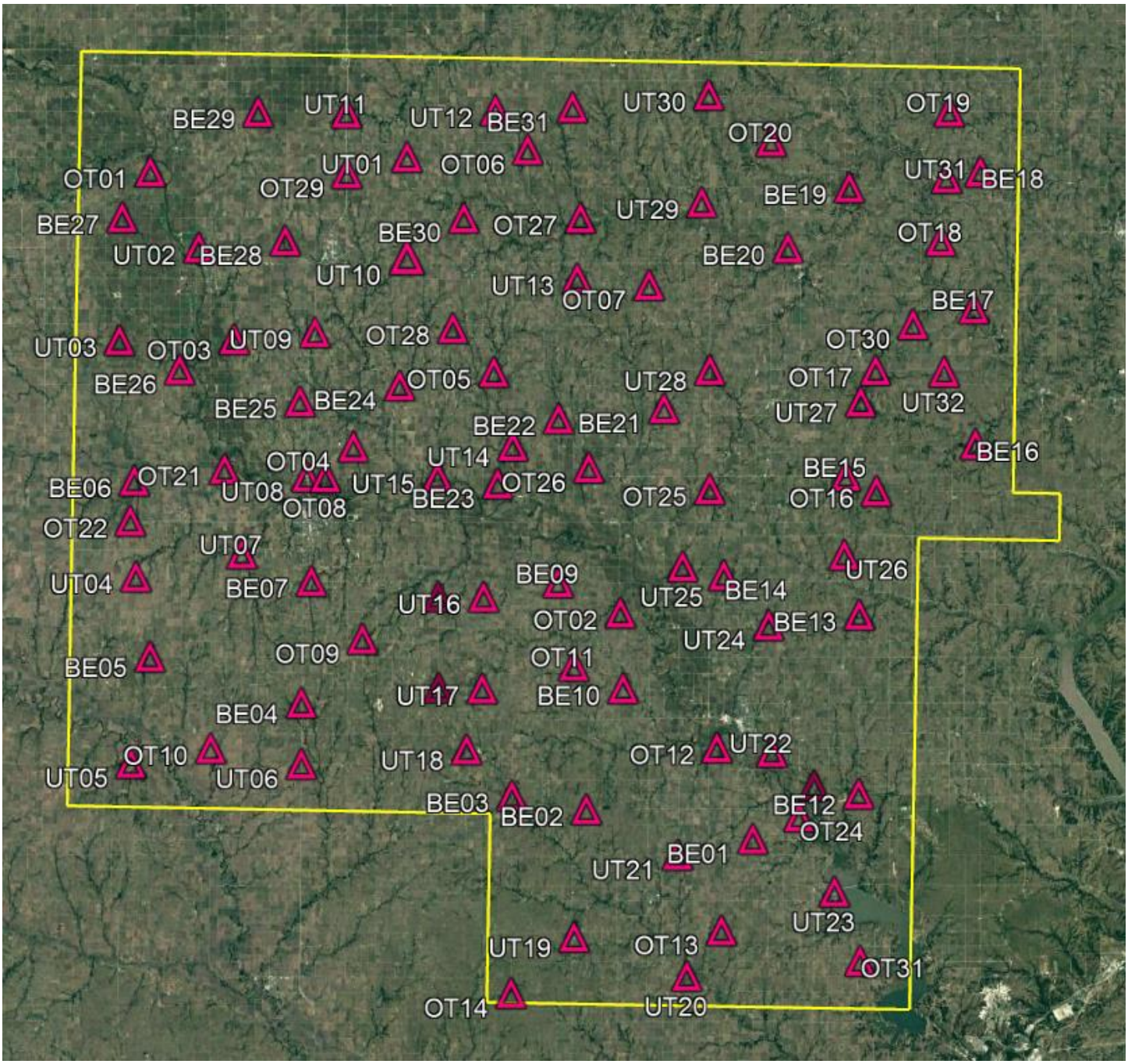


Figure 6: Non-vegetated Vertical Accuracy (NVA) Check Point Distribution

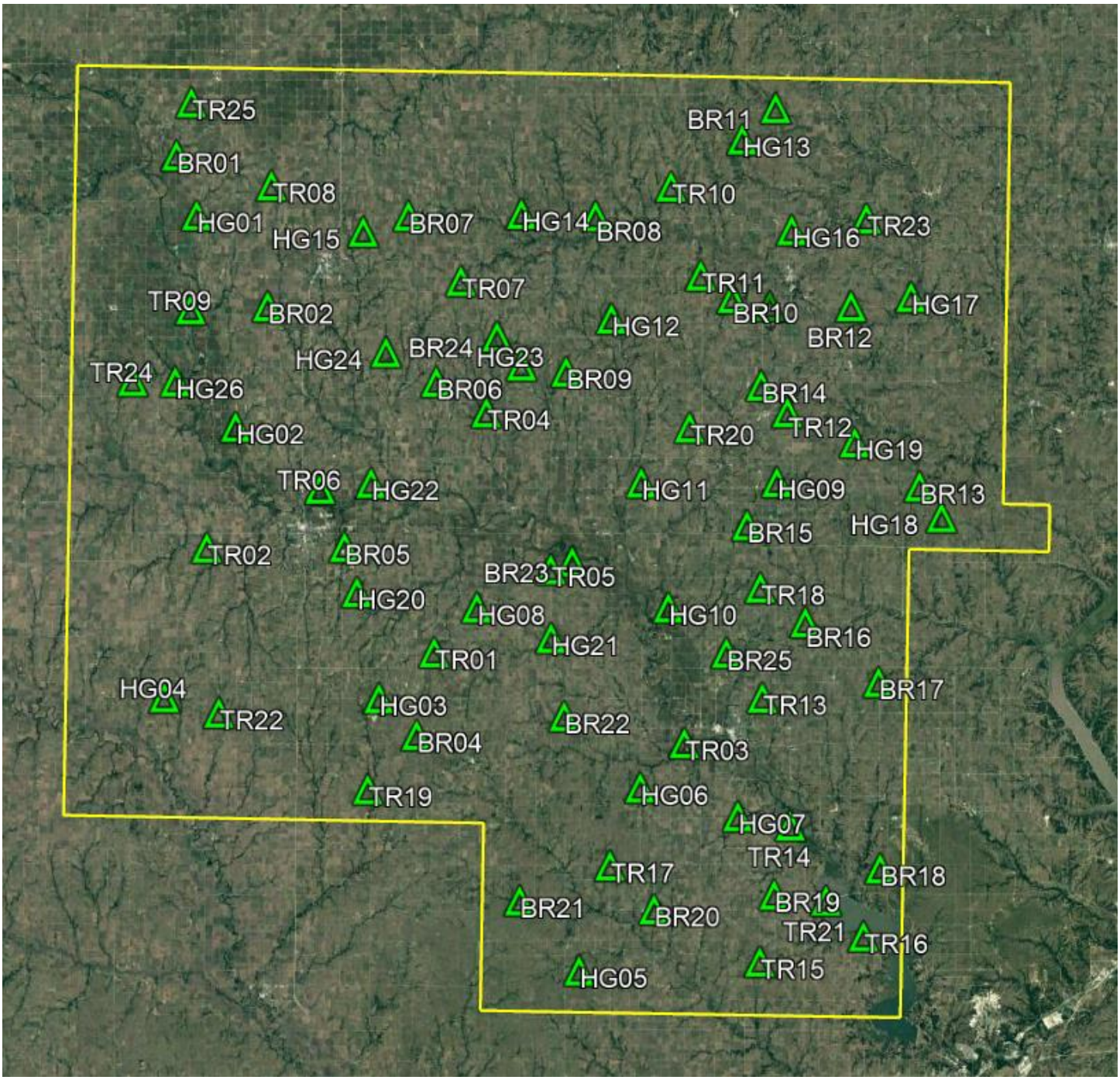


Figure 7: Vegetated Vertical Accuracy (VVA) Check Point Distribution

3.4 Vertical Accuracy Results

An overall statistical assessment of the check points can be found in Tables 10 and 11 below. The values provided are in meters.

Non-vegetated Vertical Accuracy (NVA) and Vegetated Vertical Accuracy (VVA)				
Broad Land Cover Type	**# of Points**	**RMSEz**	**95% Confidence Level**	**95th Percentile**
NVA of Point Cloud	93	0.062	0.122	
NVA of Bare Earth	93	0.061	0.119	
NVA of DEM	93	0.059	0.115	
VVA of Bare Earth	71	0.077		0.146

Table 10: Non-vegetated Vertical Accuracy (NVA) and Vegetated Vertical Accuracy (VVA)

Vegetated Vertical Accuracy (VVA) 5% Outliers > 95th Percentile (0.170m)						
PointID	**Easting**	**Northing**	**KnownZ**	**LaserZ**	**Description**	**DeltaZ**
HG12	647743.869	4403924.301	455.735	456.008	High Grass	0.273
HG23	638215.234	4398754.280	456.590	456.769	High Grass	0.179
TR08	611105.405	4417484.227	506.978	507.209	Trees	0.231
TR22	606497.208	4361217.350	443.836	444.036	Trees	0.200

Table 11: 5% Outlier Check Points

3.5 Check Point Assessment

A vertical accuracy assessment of the NVA & VVA check points against the lidar point cloud and bare-earth lidar can be found in Tables 12, 13, 14, and 15 below. The coordinates provided are in NAD83 (HARN), UTM Zone 14 North, NAVD88 (Geoid12B), Meters.

Non-vegetated Vertical Accuracy (NVA) Check Point Assessment (Point Cloud)						
PointID	**Easting**	**Northing**	**KnownZ**	**LaserZ**	**Description**	**DeltaZ**
BE01	663011.283	4347807.256	388.617	388.600	Open Terrain/Bare Earth	-0.017
BE02	645253.271	4350620.782	433.536	433.603	Open Terrain/Bare Earth	0.067
BE03	637332.474	4351937.619	402.843	402.777	Open Terrain/Bare Earth	-0.066
BE04	614778.153	4361341.006	470.417	470.451	Open Terrain/Bare Earth	0.034
BE05	598570.782	4365940.359	441.646	441.674	Open Terrain/Bare Earth	0.028
BE06	596563.668	4384545.394	432.808	432.898	Open Terrain/Bare Earth	0.090
BE07	615605.135	4374249.867	448.448	448.402	Open Terrain/Bare Earth	-0.046
BE08	629100.838	4372856.856	420.502	420.583	Open Terrain/Bare Earth	0.081
BE09	641831.261	4374587.897	414.688	414.723	Open Terrain/Bare Earth	0.035
BE10	648920.840	4363502.162	390.491	390.521	Open Terrain/Bare Earth	0.030
BE12	674181.130	4352776.237	386.726	386.733	Open Terrain/Bare Earth	0.007
BE13	673889.759	4371750.448	387.003	387.061	Open Terrain/Bare Earth	0.058
BE14	659410.235	4375671.500	405.238	405.295	Open Terrain/Bare Earth	0.057
BE15	672182.369	4386405.186	438.460	438.509	Open Terrain/Bare Earth	0.049
BE16	685937.984	4390047.104	373.759	373.775	Open Terrain/Bare Earth	0.016
BE17	685523.216	4404415.382	369.325	369.437	Open Terrain/Bare Earth	0.112
BE18	685949.526	4418945.311	414.760	414.810	Open Terrain/Bare Earth	0.050

BE19	672019.799	4417009.375	404.270	404.260	Open Terrain/Bare Earth	-0.010
BE20	665612.346	4410469.299	410.669	410.683	Open Terrain/Bare Earth	0.014
BE21	652732.952	4393214.078	420.666	420.617	Open Terrain/Bare Earth	-0.049
BE22	641555.767	4391935.827	417.488	417.557	Open Terrain/Bare Earth	0.069
BE23	635207.112	4384925.585	406.924	406.948	Open Terrain/Bare Earth	0.024
BE24	624608.282	4395127.802	412.060	412.128	Open Terrain/Bare Earth	0.068
BE25	614047.225	4393248.884	469.197	469.181	Open Terrain/Bare Earth	-0.016
BE26	601174.246	4396407.039	454.008	454.049	Open Terrain/Bare Earth	0.041
BE27	594744.379	4412421.712	469.910	469.981	Open Terrain/Bare Earth	0.071
BE28	612149.111	4410259.393	475.822	475.843	Open Terrain/Bare Earth	0.021
BE29	609009.577	4423857.428	509.876	509.888	Open Terrain/Bare Earth	0.012
BE30	631098.166	4412998.192	481.354	481.354	Open Terrain/Bare Earth	0.000
BE31	642428.358	4424927.443	486.909	486.952	Open Terrain/Bare Earth	0.043
OT01	597637.928	4417334.417	480.919	480.905	Open Terrain/Bare Earth	-0.014
OT02	648501.359	4371501.254	391.659	391.738	Open Terrain/Bare Earth	0.079
OT03	606913.237	4399700.006	440.590	440.632	Open Terrain/Bare Earth	0.042
OT04	619809.047	4388557.158	440.437	440.469	Open Terrain/Bare Earth	0.032
OT05	634585.581	4396728.693	431.280	431.374	Open Terrain/Bare Earth	0.094
OT06	637746.409	4420357.064	478.368	478.359	Open Terrain/Bare Earth	-0.009
OT07	650916.579	4406228.920	469.222	469.223	Open Terrain/Bare Earth	0.001
OT08	616903.805	4385267.607	418.660	418.673	Open Terrain/Bare Earth	0.013
OT09	621138.976	4368238.787	465.377	465.360	Open Terrain/Bare Earth	-0.017
OT10	605200.390	4356350.815	425.103	425.131	Open Terrain/Bare Earth	0.028
OT11	643652.078	4365789.666	420.461	420.474	Open Terrain/Bare Earth	0.013
OT12	659011.784	4357415.112	385.766	385.749	Open Terrain/Bare Earth	-0.017
OT13	659855.765	4338044.807	404.180	404.137	Open Terrain/Bare Earth	-0.043
OT14	637610.526	4331003.808	412.680	412.675	Open Terrain/Bare Earth	-0.005
OT15	669425.960	4353577.264	376.470	376.404	Open Terrain/Bare Earth	-0.066
OT16	675473.673	4384889.771	427.982	428.019	Open Terrain/Bare Earth	0.037
OT17	675169.712	4397672.224	428.701	428.708	Open Terrain/Bare Earth	0.007
OT18	681875.407	4411528.994	395.372	395.396	Open Terrain/Bare Earth	0.024
OT19	682535.853	4425277.581	400.661	400.665	Open Terrain/Bare Earth	0.004
OT20	663621.369	4421749.958	455.233	455.202	Open Terrain/Bare Earth	-0.031
OT21	606149.597	4385962.720	418.728	418.774	Open Terrain/Bare Earth	0.046
OT22	596214.001	4380282.325	457.913	457.933	Open Terrain/Bare Earth	0.020
OT23	629332.928	4363226.699	474.563	474.569	Open Terrain/Bare Earth	0.006
OT24	667890.271	4350252.643	368.526	368.537	Open Terrain/Bare Earth	0.011
OT25	657747.963	4384729.230	394.524	394.411	Open Terrain/Bare Earth	-0.113
OT26	644856.043	4386792.596	406.849	406.862	Open Terrain/Bare Earth	0.013
OT27	643483.955	4413220.615	443.223	443.444	Open Terrain/Bare Earth	0.221
OT28	630146.312	4401307.214	453.604	453.610	Open Terrain/Bare Earth	0.006
OT29	618570.006	4417484.037	498.006	498.082	Open Terrain/Bare Earth	0.076
OT30	679057.133	4402622.137	397.145	397.055	Open Terrain/Bare Earth	-0.090

OT31	674662.377	4335054.395	382.725	382.733	Open Terrain/Bare Earth	0.008
UT01	624943.335	4419337.216	497.574	497.627	Urban Terrain	0.053
UT02	602941.531	4409331.184	446.485	446.358	Urban Terrain	-0.127
UT03	594699.841	4399395.584	452.295	452.224	Urban Terrain	-0.071
UT04	596932.189	4374391.421	474.236	474.322	Urban Terrain	0.086
UT05	596727.938	4354618.215	418.531	418.566	Urban Terrain	0.035
UT06	614887.056	4354869.899	447.481	447.473	Urban Terrain	-0.008
UT07	608162.702	4377038.676	437.751	437.706	Urban Terrain	-0.045
UT08	614918.106	4385283.395	418.589	418.535	Urban Terrain	-0.054
UT09	615491.933	4400591.392	462.079	462.011	Urban Terrain	-0.068
UT10	625132.489	4408716.372	485.691	485.540	Urban Terrain	-0.151
UT11	618403.460	4423901.400	478.885	478.928	Urban Terrain	0.043
UT12	634240.464	4424450.023	481.859	481.748	Urban Terrain	-0.111
UT13	643256.292	4406792.000	484.654	484.686	Urban Terrain	0.032
UT14	636742.810	4388944.174	410.772	410.697	Urban Terrain	-0.075
UT15	628811.197	4385549.029	404.289	404.146	Urban Terrain	-0.143
UT16	633926.523	4372917.881	424.863	424.882	Urban Terrain	0.019
UT17	633960.058	4363214.316	441.304	441.212	Urban Terrain	-0.092
UT18	632414.133	4356741.982	424.614	424.552	Urban Terrain	-0.062
UT19	644195.137	4337082.993	411.326	411.274	Urban Terrain	-0.052
UT20	656255.727	4333149.081	369.552	369.498	Urban Terrain	-0.054
UT21	655042.483	4345965.652	408.583	408.454	Urban Terrain	-0.129
UT22	664861.229	4357039.651	361.694	361.635	Urban Terrain	-0.059
UT23	671798.720	4342359.015	360.152	360.121	Urban Terrain	-0.031
UT24	664275.369	4370469.149	396.730	396.745	Urban Terrain	0.015
UT25	655021.878	4376526.920	401.593	401.553	Urban Terrain	-0.040
UT26	672178.565	4378060.657	403.885	403.852	Urban Terrain	-0.033
UT27	673632.491	4394306.462	407.540	407.570	Urban Terrain	0.030
UT28	657535.532	4397357.155	424.436	424.467	Urban Terrain	0.031
UT29	656357.372	4415123.603	427.512	427.435	Urban Terrain	-0.077
UT30	656886.148	4426519.686	475.296	475.292	Urban Terrain	-0.004
UT31	682365.627	4418213.044	397.238	397.098	Urban Terrain	-0.140
UT32	682461.267	4397649.314	404.067	404.069	Urban Terrain	0.002

Table 12: Lidar Point Cloud NVA Assessment

Non-vegetated Vertical Accuracy (NVA) Check Point Assessment (Bare-Earth)						
PointID	**Easting**	**Northing**	**KnownZ**	**LaserZ**	**Description**	**DeltaZ**
BE01	663011.283	4347807.256	388.617	388.600	Open Terrain/Bare Earth	-0.017
BE02	645253.271	4350620.782	433.536	433.600	Open Terrain/Bare Earth	0.064
BE03	637332.474	4351937.619	402.843	402.741	Open Terrain/Bare Earth	-0.102
BE04	614778.153	4361341.006	470.417	470.441	Open Terrain/Bare Earth	0.024
BE05	598570.782	4365940.359	441.646	441.674	Open Terrain/Bare Earth	0.028

BE06	596563.668	4384545.394	432.808	432.955	Open Terrain/Bare Earth	0.147
BE07	615605.135	4374249.867	448.448	448.402	Open Terrain/Bare Earth	-0.046
BE08	629100.838	4372856.856	420.502	420.582	Open Terrain/Bare Earth	0.080
BE09	641831.261	4374587.897	414.688	414.712	Open Terrain/Bare Earth	0.024
BE10	648920.840	4363502.162	390.491	390.521	Open Terrain/Bare Earth	0.030
BE12	674181.130	4352776.237	386.726	386.726	Open Terrain/Bare Earth	0.000
BE13	673889.759	4371750.448	387.003	387.023	Open Terrain/Bare Earth	0.020
BE14	659410.235	4375671.500	405.238	405.246	Open Terrain/Bare Earth	0.008
BE15	672182.369	4386405.186	438.460	438.509	Open Terrain/Bare Earth	0.049
BE16	685937.984	4390047.104	373.759	373.775	Open Terrain/Bare Earth	0.016
BE17	685523.216	4404415.382	369.325	369.437	Open Terrain/Bare Earth	0.112
BE18	685949.526	4418945.311	414.760	414.810	Open Terrain/Bare Earth	0.050
BE19	672019.799	4417009.375	404.270	404.260	Open Terrain/Bare Earth	-0.010
BE20	665612.346	4410469.299	410.669	410.722	Open Terrain/Bare Earth	0.053
BE21	652732.952	4393214.078	420.666	420.617	Open Terrain/Bare Earth	-0.049
BE22	641555.767	4391935.827	417.488	417.557	Open Terrain/Bare Earth	0.069
BE23	635207.112	4384925.585	406.924	406.948	Open Terrain/Bare Earth	0.024
BE24	624608.282	4395127.802	412.060	412.128	Open Terrain/Bare Earth	0.068
BE25	614047.225	4393248.884	469.197	469.181	Open Terrain/Bare Earth	-0.016
BE26	601174.246	4396407.039	454.008	454.049	Open Terrain/Bare Earth	0.041
BE27	594744.379	4412421.712	469.910	469.981	Open Terrain/Bare Earth	0.071
BE28	612149.111	4410259.393	475.822	475.843	Open Terrain/Bare Earth	0.021
BE29	609009.577	4423857.428	509.876	509.888	Open Terrain/Bare Earth	0.012
BE30	631098.166	4412998.192	481.354	481.354	Open Terrain/Bare Earth	0.000
BE31	642428.358	4424927.443	486.909	486.911	Open Terrain/Bare Earth	0.002
OT01	597637.928	4417334.417	480.919	480.905	Open Terrain/Bare Earth	-0.014
OT02	648501.359	4371501.254	391.659	391.738	Open Terrain/Bare Earth	0.079
OT03	606913.237	4399700.006	440.590	440.632	Open Terrain/Bare Earth	0.042
OT04	619809.047	4388557.158	440.437	440.469	Open Terrain/Bare Earth	0.032
OT05	634585.581	4396728.693	431.280	431.374	Open Terrain/Bare Earth	0.094
OT06	637746.409	4420357.064	478.368	478.335	Open Terrain/Bare Earth	-0.033
OT07	650916.579	4406228.920	469.222	469.223	Open Terrain/Bare Earth	0.001
OT08	616903.805	4385267.607	418.660	418.673	Open Terrain/Bare Earth	0.013
OT09	621138.976	4368238.787	465.377	465.360	Open Terrain/Bare Earth	-0.017
OT10	605200.390	4356350.815	425.103	425.111	Open Terrain/Bare Earth	0.008
OT11	643652.078	4365789.666	420.461	420.474	Open Terrain/Bare Earth	0.013
OT12	659011.784	4357415.112	385.766	385.749	Open Terrain/Bare Earth	-0.017
OT13	659855.765	4338044.807	404.180	404.137	Open Terrain/Bare Earth	-0.043
OT14	637610.526	4331003.808	412.680	412.675	Open Terrain/Bare Earth	-0.005
OT15	669425.960	4353577.264	376.470	376.404	Open Terrain/Bare Earth	-0.066
OT16	675473.673	4384889.771	427.982	428.019	Open Terrain/Bare Earth	0.037
OT17	675169.712	4397672.224	428.701	428.691	Open Terrain/Bare Earth	-0.010
OT18	681875.407	4411528.994	395.372	395.396	Open Terrain/Bare Earth	0.024

OT19	682535.853	4425277.581	400.661	400.665	Open Terrain/Bare Earth	0.004
OT20	663621.369	4421749.958	455.233	455.202	Open Terrain/Bare Earth	-0.031
OT21	606149.597	4385962.720	418.728	418.774	Open Terrain/Bare Earth	0.046
OT22	596214.001	4380282.325	457.913	457.933	Open Terrain/Bare Earth	0.020
OT23	629332.928	4363226.699	474.563	474.569	Open Terrain/Bare Earth	0.006
OT24	667890.271	4350252.643	368.526	368.537	Open Terrain/Bare Earth	0.011
OT25	657747.963	4384729.230	394.524	394.411	Open Terrain/Bare Earth	-0.113
OT26	644856.043	4386792.596	406.849	406.860	Open Terrain/Bare Earth	0.011
OT27	643483.955	4413220.615	443.223	443.332	Open Terrain/Bare Earth	0.109
OT28	630146.312	4401307.214	453.604	453.609	Open Terrain/Bare Earth	0.005
OT29	618570.006	4417484.037	498.006	498.082	Open Terrain/Bare Earth	0.076
OT30	679057.133	4402622.137	397.145	397.055	Open Terrain/Bare Earth	-0.090
OT31	674662.377	4335054.395	382.725	382.720	Open Terrain/Bare Earth	0.005
UT01	624943.335	4419337.216	497.574	497.562	Urban Terrain	-0.012
UT02	602941.531	4409331.184	446.485	446.358	Urban Terrain	-0.127
UT03	594699.841	4399395.584	452.295	452.224	Urban Terrain	-0.071
UT04	596932.189	4374391.421	474.236	474.322	Urban Terrain	0.086
UT05	596727.938	4354618.215	418.531	418.566	Urban Terrain	0.035
UT06	614887.056	4354869.899	447.481	447.473	Urban Terrain	-0.008
UT07	608162.702	4377038.676	437.751	437.706	Urban Terrain	-0.045
UT08	614918.106	4385283.395	418.589	418.535	Urban Terrain	-0.054
UT09	615491.933	4400591.392	462.079	462.011	Urban Terrain	-0.068
UT10	625132.489	4408716.372	485.691	485.540	Urban Terrain	-0.151
UT11	618403.460	4423901.400	478.885	478.928	Urban Terrain	0.043
UT12	634240.464	4424450.023	481.859	481.748	Urban Terrain	-0.111
UT13	643256.292	4406792.000	484.654	484.686	Urban Terrain	0.032
UT14	636742.810	4388944.174	410.772	410.697	Urban Terrain	-0.075
UT15	628811.197	4385549.029	404.289	404.146	Urban Terrain	-0.143
UT16	633926.523	4372917.881	424.863	424.882	Urban Terrain	0.019
UT17	633960.058	4363214.316	441.304	441.212	Urban Terrain	-0.092
UT18	632414.133	4356741.982	424.614	424.523	Urban Terrain	-0.091
UT19	644195.137	4337082.993	411.326	411.274	Urban Terrain	-0.052
UT20	656255.727	4333149.081	369.552	369.498	Urban Terrain	-0.054
UT21	655042.483	4345965.652	408.583	408.454	Urban Terrain	-0.129
UT22	664861.229	4357039.651	361.694	361.635	Urban Terrain	-0.059
UT23	671798.720	4342359.015	360.152	360.121	Urban Terrain	-0.031
UT24	664275.369	4370469.149	396.730	396.745	Urban Terrain	0.015
UT25	655021.878	4376526.920	401.593	401.553	Urban Terrain	-0.040
UT26	672178.565	4378060.657	403.885	403.852	Urban Terrain	-0.033
UT27	673632.491	4394306.462	407.540	407.570	Urban Terrain	0.030
UT28	657535.532	4397357.155	424.436	424.425	Urban Terrain	-0.011
UT29	656357.372	4415123.603	427.512	427.435	Urban Terrain	-0.077
UT30	656886.148	4426519.686	475.296	475.292	Urban Terrain	-0.004

UT31	682365.627	4418213.044	397.238	397.098	Urban Terrain	-0.140
UT32	682461.267	4397649.314	404.067	403.974	Urban Terrain	-0.093

Table 13: Bare-Earth Lidar NVA Assessment

Non-vegetated Vertical Accuracy (NVA) Check Point Assessment (DEM)						
PointID	**Easting**	**Northing**	**KnownZ**	**DEMZ**	**Description**	**DeltaZ**
BE01	663011.283	4347807.256	388.617	388.600	Open Terrain/Bare Earth	0.017
BE02	645253.271	4350620.782	433.536	433.543	Open Terrain/Bare Earth	-0.007
BE03	637332.474	4351937.619	402.843	402.745	Open Terrain/Bare Earth	0.098
BE04	614778.153	4361341.006	470.417	470.438	Open Terrain/Bare Earth	-0.021
BE05	598570.782	4365940.359	441.646	441.687	Open Terrain/Bare Earth	-0.041
BE06	596563.668	4384545.394	432.808	432.937	Open Terrain/Bare Earth	-0.129
BE07	615605.135	4374249.867	448.448	448.392	Open Terrain/Bare Earth	0.056
BE08	629100.838	4372856.856	420.502	420.578	Open Terrain/Bare Earth	-0.076
BE09	641831.261	4374587.897	414.688	414.657	Open Terrain/Bare Earth	0.031
BE10	648920.840	4363502.162	390.491	390.482	Open Terrain/Bare Earth	0.009
BE12	674181.130	4352776.237	386.726	386.709	Open Terrain/Bare Earth	0.017
BE13	673889.759	4371750.448	387.003	387.023	Open Terrain/Bare Earth	-0.020
BE14	659410.235	4375671.500	405.238	405.223	Open Terrain/Bare Earth	0.015
BE15	672182.369	4386405.186	438.460	438.487	Open Terrain/Bare Earth	-0.027
BE16	685937.984	4390047.104	373.759	373.776	Open Terrain/Bare Earth	-0.017
BE17	685523.216	4404415.382	369.325	369.402	Open Terrain/Bare Earth	-0.077
BE18	685949.526	4418945.311	414.760	414.756	Open Terrain/Bare Earth	0.004
BE19	672019.799	4417009.375	404.270	404.276	Open Terrain/Bare Earth	-0.006
BE20	665612.346	4410469.299	410.669	410.709	Open Terrain/Bare Earth	-0.040
BE21	652732.952	4393214.078	420.666	420.619	Open Terrain/Bare Earth	0.047
BE22	641555.767	4391935.827	417.488	417.499	Open Terrain/Bare Earth	-0.011
BE23	635207.112	4384925.585	406.924	406.971	Open Terrain/Bare Earth	-0.047
BE24	624608.282	4395127.802	412.060	412.026	Open Terrain/Bare Earth	0.034
BE25	614047.225	4393248.884	469.197	469.167	Open Terrain/Bare Earth	0.030
BE26	601174.246	4396407.039	454.008	453.988	Open Terrain/Bare Earth	0.020
BE27	594744.379	4412421.712	469.910	469.963	Open Terrain/Bare Earth	-0.053
BE28	612149.111	4410259.393	475.822	475.834	Open Terrain/Bare Earth	-0.012
BE29	609009.577	4423857.428	509.876	509.891	Open Terrain/Bare Earth	-0.015
BE30	631098.166	4412998.192	481.354	481.355	Open Terrain/Bare Earth	-0.001
BE31	642428.358	4424927.443	486.909	486.904	Open Terrain/Bare Earth	0.005
OT01	597637.928	4417334.417	480.919	480.912	Open Terrain/Bare Earth	0.007
OT02	648501.359	4371501.254	391.659	391.727	Open Terrain/Bare Earth	-0.068
OT03	606913.237	4399700.006	440.590	440.565	Open Terrain/Bare Earth	0.025
OT04	619809.047	4388557.158	440.437	440.439	Open Terrain/Bare Earth	-0.002
OT05	634585.581	4396728.693	431.280	431.364	Open Terrain/Bare Earth	-0.084
OT06	637746.409	4420357.064	478.368	478.346	Open Terrain/Bare Earth	0.022

OT07	650916.579	4406228.920	469.222	469.222	Open Terrain/Bare Earth	0.000
OT08	616903.805	4385267.607	418.660	418.641	Open Terrain/Bare Earth	0.019
OT09	621138.976	4368238.787	465.377	465.331	Open Terrain/Bare Earth	0.046
OT10	605200.390	4356350.815	425.103	425.082	Open Terrain/Bare Earth	0.021
OT11	643652.078	4365789.666	420.461	420.485	Open Terrain/Bare Earth	-0.024
OT12	659011.784	4357415.112	385.766	385.751	Open Terrain/Bare Earth	0.015
OT13	659855.765	4338044.807	404.180	404.144	Open Terrain/Bare Earth	0.036
OT14	637610.526	4331003.808	412.680	412.659	Open Terrain/Bare Earth	0.021
OT15	669425.960	4353577.264	376.470	376.402	Open Terrain/Bare Earth	0.068
OT16	675473.673	4384889.771	427.982	428.018	Open Terrain/Bare Earth	-0.036
OT17	675169.712	4397672.224	428.701	428.681	Open Terrain/Bare Earth	0.020
OT18	681875.407	4411528.994	395.372	395.413	Open Terrain/Bare Earth	-0.041
OT19	682535.853	4425277.581	400.661	400.632	Open Terrain/Bare Earth	0.029
OT20	663621.369	4421749.958	455.233	455.194	Open Terrain/Bare Earth	0.039
OT21	606149.597	4385962.720	418.728	418.758	Open Terrain/Bare Earth	-0.030
OT22	596214.001	4380282.325	457.913	457.926	Open Terrain/Bare Earth	-0.013
OT23	629332.928	4363226.699	474.563	474.505	Open Terrain/Bare Earth	0.058
OT24	667890.271	4350252.643	368.526	368.515	Open Terrain/Bare Earth	0.011
OT25	657747.963	4384729.230	394.524	394.417	Open Terrain/Bare Earth	0.107
OT26	644856.043	4386792.596	406.849	406.858	Open Terrain/Bare Earth	-0.009
OT27	643483.955	4413220.615	443.223	443.319	Open Terrain/Bare Earth	-0.096
OT28	630146.312	4401307.214	453.604	453.622	Open Terrain/Bare Earth	-0.018
OT29	618570.006	4417484.037	498.006	498.057	Open Terrain/Bare Earth	-0.051
OT30	679057.133	4402622.137	397.145	397.052	Open Terrain/Bare Earth	0.093
OT31	674662.377	4335054.395	382.725	382.707	Open Terrain/Bare Earth	0.018
UT01	624943.335	4419337.216	497.574	497.550	Urban Terrain	0.024
UT02	602941.531	4409331.184	446.485	446.354	Urban Terrain	0.131
UT03	594699.841	4399395.584	452.295	452.214	Urban Terrain	0.081
UT04	596932.189	4374391.421	474.236	474.311	Urban Terrain	-0.075
UT05	596727.938	4354618.215	418.531	418.557	Urban Terrain	-0.026
UT06	614887.056	4354869.899	447.481	447.441	Urban Terrain	0.040
UT07	608162.702	4377038.676	437.751	437.726	Urban Terrain	0.025
UT08	614918.106	4385283.395	418.589	418.536	Urban Terrain	0.053
UT09	615491.933	4400591.392	462.079	461.984	Urban Terrain	0.095
UT10	625132.489	4408716.372	485.691	485.549	Urban Terrain	0.142
UT11	618403.460	4423901.400	478.885	478.925	Urban Terrain	-0.040
UT12	634240.464	4424450.023	481.859	481.770	Urban Terrain	0.089
UT13	643256.292	4406792.000	484.654	484.677	Urban Terrain	-0.023
UT14	636742.810	4388944.174	410.772	410.681	Urban Terrain	0.091
UT15	628811.197	4385549.029	404.289	404.142	Urban Terrain	0.147
UT16	633926.523	4372917.881	424.863	424.802	Urban Terrain	0.061
UT17	633960.058	4363214.316	441.304	441.196	Urban Terrain	0.108
UT18	632414.133	4356741.982	424.614	424.526	Urban Terrain	0.088

UT19	644195.137	4337082.993	411.326	411.274	Urban Terrain	0.052
UT20	656255.727	4333149.081	369.552	369.493	Urban Terrain	0.059
UT21	655042.483	4345965.652	408.583	408.452	Urban Terrain	0.131
UT22	664861.229	4357039.651	361.694	361.639	Urban Terrain	0.055
UT23	671798.720	4342359.015	360.152	360.118	Urban Terrain	0.034
UT24	664275.369	4370469.149	396.730	396.673	Urban Terrain	0.057
UT25	655021.878	4376526.920	401.593	401.535	Urban Terrain	0.058
UT26	672178.565	4378060.657	403.885	403.857	Urban Terrain	0.028
UT27	673632.491	4394306.462	407.540	407.520	Urban Terrain	0.020
UT28	657535.532	4397357.155	424.436	424.406	Urban Terrain	0.030
UT29	656357.372	4415123.603	427.512	427.438	Urban Terrain	0.074
UT30	656886.148	4426519.686	475.296	475.290	Urban Terrain	0.006
UT31	682365.627	4418213.044	397.238	397.103	Urban Terrain	0.135
UT32	682461.267	4397649.314	404.067	403.973	Urban Terrain	0.094

Table 14: Bare=Earth DEM NVA Assessment

Vegetated Vertical Accuracy (VVA) Check Point Assessment (Bare Earth)						
PointID	**Easting**	**Northing**	**KnownZ**	**LaserZ**	**Description**	**DeltaZ**
BR01	600853.785	4420517.311	463.787	463.893	Brush	0.106
BR02	610933.284	4404595.040	460.201	460.260	Brush	0.059
BR04	627711.538	4359218.177	470.544	470.669	Brush	0.125
BR05	619630.292	4379104.518	446.491	446.561	Brush	0.070
BR06	629130.870	4396858.931	471.977	472.100	Brush	0.123
BR07	625823.652	4414489.940	485.364	485.411	Brush	0.047
BR08	645855.137	4414832.891	424.044	424.021	Brush	-0.023
BR09	642995.648	4398191.838	469.518	469.521	Brush	0.003
BR10	660637.622	4406370.156	413.430	413.504	Brush	0.074
BR11	664923.654	4426740.194	408.365	408.335	Brush	-0.030
BR12	673355.037	4405738.836	411.627	411.647	Brush	0.020
BR13	681025.686	4386661.063	432.431	432.484	Brush	0.053
BR14	663892.395	4397088.756	442.882	443.017	Brush	0.135
BR15	662641.305	4382194.009	429.443	429.567	Brush	0.124
BR16	669069.437	4371991.031	423.151	423.313	Brush	0.162
BR17	677022.015	4365753.779	416.842	416.824	Brush	-0.018
BR18	677580.076	4345863.577	384.931	385.048	Brush	0.117
BR19	666270.126	4342870.441	398.498	398.596	Brush	0.098
BR20	653437.419	4341087.799	379.822	379.859	Brush	0.037
BR21	639035.688	4341782.288	403.989	404.047	Brush	0.058
BR22	643453.568	4361503.390	400.236	400.285	Brush	0.049
BR23	644020.201	4377987.496	397.785	397.895	Brush	0.110
BR24	635546.507	4401809.494	445.081	445.131	Brush	0.050
BR25	660687.167	4368565.879	398.963	399.105	Brush	0.142

HG01	603133.082	4414184.956	474.052	474.132	High Grass	0.080
HG02	607745.323	4391702.400	431.284	431.311	High Grass	0.027
HG03	623613.875	4363069.042	498.540	498.621	High Grass	0.081
HG04	600640.283	4362745.909	453.684	453.773	High Grass	0.089
HG05	645540.299	4334410.088	406.796	406.763	High Grass	-0.033
HG06	651723.265	4354041.705	401.270	401.380	High Grass	0.110
HG07	662229.213	4351164.328	368.174	368.239	High Grass	0.065
HG08	633910.570	4372911.379	424.043	424.022	High Grass	-0.021
HG09	665750.308	4386862.496	438.803	438.963	High Grass	0.160
HG10	654384.922	4373280.715	379.193	379.274	High Grass	0.081
HG11	651248.739	4386541.717	403.081	403.088	High Grass	0.007
HG13	661399.210	4423308.442	441.211	441.174	High Grass	-0.037
HG14	637912.820	4414924.724	446.860	446.912	High Grass	0.052
HG15	621016.299	4412727.605	471.416	471.459	High Grass	0.043
HG16	666871.541	4413736.820	415.999	416.025	High Grass	0.026
HG17	679776.032	4406853.115	371.699	371.865	High Grass	0.166
HG18	683448.908	4383438.546	414.522	414.543	High Grass	0.021
HG19	674005.131	4391240.728	424.125	424.261	High Grass	0.136
HG20	621051.688	4374325.098	463.140	463.210	High Grass	0.070
HG21	641895.918	4369812.369	410.802	410.930	High Grass	0.128
HG22	622348.106	4385976.733	421.856	421.849	High Grass	-0.007
HG24	623696.106	4399935.942	447.922	447.942	High Grass	0.020
HG25	664655.446	4405598.007	424.273	424.282	High Grass	0.009
HG26	601193.041	4396418.296	453.739	453.768	High Grass	0.029
TR01	629427.122	4368063.416	430.555	430.553	Trees	-0.002
TR02	604897.269	4378769.962	450.800	450.896	Trees	0.096
TR03	656357.619	4358872.302	370.902	370.809	Trees	-0.093
TR04	634542.778	4393715.273	422.371	422.433	Trees	0.062
TR05	641736.656	4377133.235	391.790	391.805	Trees	0.015
TR06	616911.385	4385260.215	418.358	418.507	Trees	0.149
TR07	631570.721	4407661.819	473.663	473.618	Trees	-0.045
TR09	602687.838	4404133.295	436.290	436.267	Trees	-0.023
TR10	653865.324	4418146.232	436.605	436.667	Trees	0.062
TR11	657213.369	4408713.211	432.721	432.646	Trees	-0.075
TR12	666741.241	4394318.852	437.493	437.534	Trees	0.041
TR13	664617.836	4363854.694	390.242	390.288	Trees	0.046
TR14	667881.979	4350268.053	369.146	369.202	Trees	0.056
TR15	664868.384	4335689.763	403.594	403.550	Trees	-0.044
TR16	675932.421	4338591.830	359.227	359.274	Trees	0.047
TR17	648636.078	4345679.148	399.031	399.052	Trees	0.021
TR18	664189.755	4375581.593	419.459	419.527	Trees	0.068
TR19	622580.969	4353342.031	422.593	422.527	Trees	-0.066
TR20	656304.381	4392496.078	439.355	439.359	Trees	0.004

TR21	671836.767	4342339.808	358.862	358.782	Trees	-0.080
TR23	674842.470	4415133.683	411.126	411.161	Trees	0.035
TR24	596611.498	4396391.365	457.061	457.136	Trees	0.075
TR25	602342.631	4426218.101	495.785	495.766	Trees	-0.019

Table 15: Bare-Earth Lidar VVA Assessment

Section 4: Certification

4.1 Limitations of Use

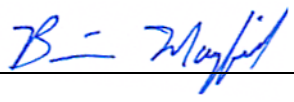
The accuracy assessment confirms that the data may be used for the intended applications stated in the **Project Purpose** section of this document. The dataset may also be used as a topographic input for other applications but the user should be aware that this lidar dataset was designed with a specific purpose and was not intended to meet specifications and/or requirements of users outside of the Kansas Department of Agriculture.

It should also be noted that lidar points do not represent a continuous surface model. Lidar points are discrete measurements of the surface and any values derived within a triangle of three lidar points are interpolated. As such, the user should not use the resultant lidar dataset for vertical placement of a planimetric feature such as a headwall, building footprint or any other planimetric feature unless there is an associated lidar point that can be reasonably located on this structure.

Consideration should be given by the end user of this dataset to the fact that this lidar dataset was developed differently and that previous lidar datasets that may be available for this geographic location. It is likely that the data in this project was created using different geodetic control, a different Geoid, newer lidar technology and more up-to-date processing techniques. As such, any direct comparative analysis performed between this dataset and previous datasets could result in misleading or inaccurate results. Users are encouraged to proceed with caution while performing this type of comparative analysis and to completely understand the variables that make each of these datasets unique and not corollary.

It is encouraged that the user refers to the full FGDC Metadata and project reports for a complete understanding on the content of this dataset.

I, hereby, certify to the extent of my knowledge that the statements and statistics represented in this document are true and factual.



Brian J. Mayfield, ASPRS Certified Photogrammetrist #R1276

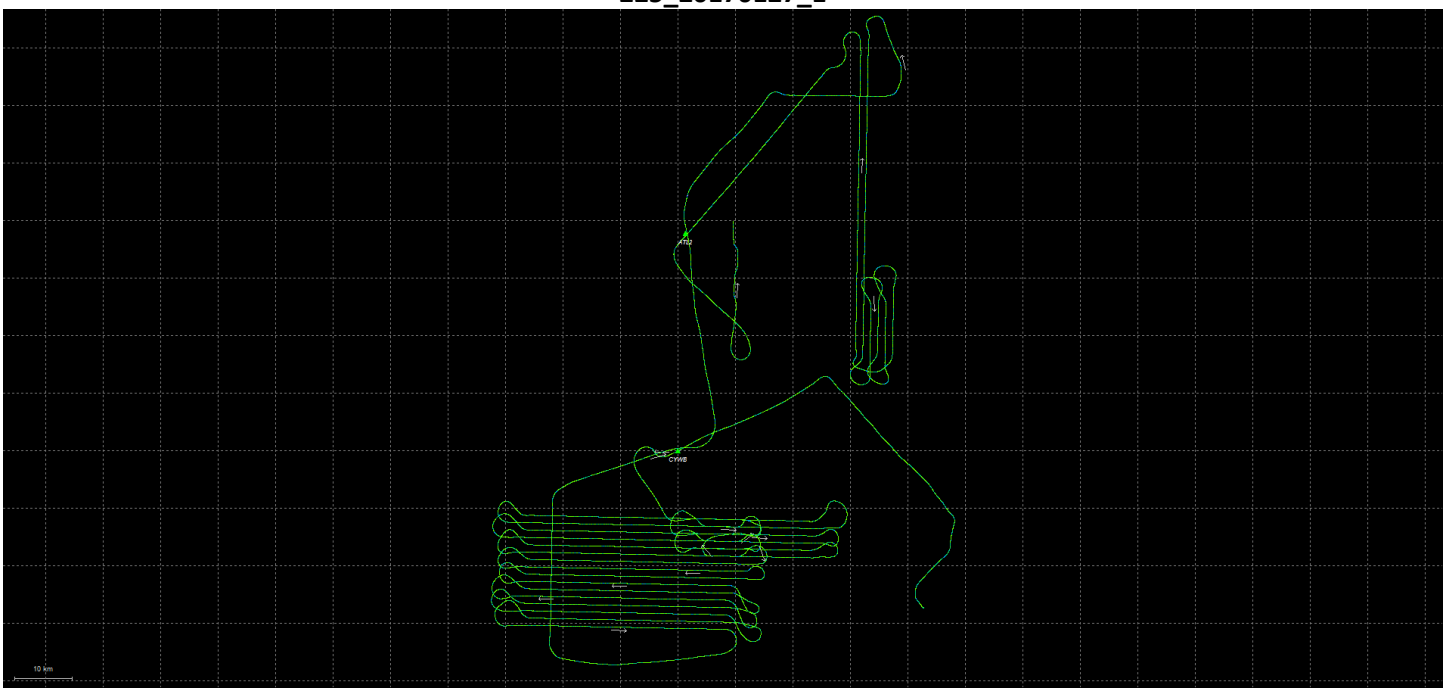
Section 5: GNSS Processing

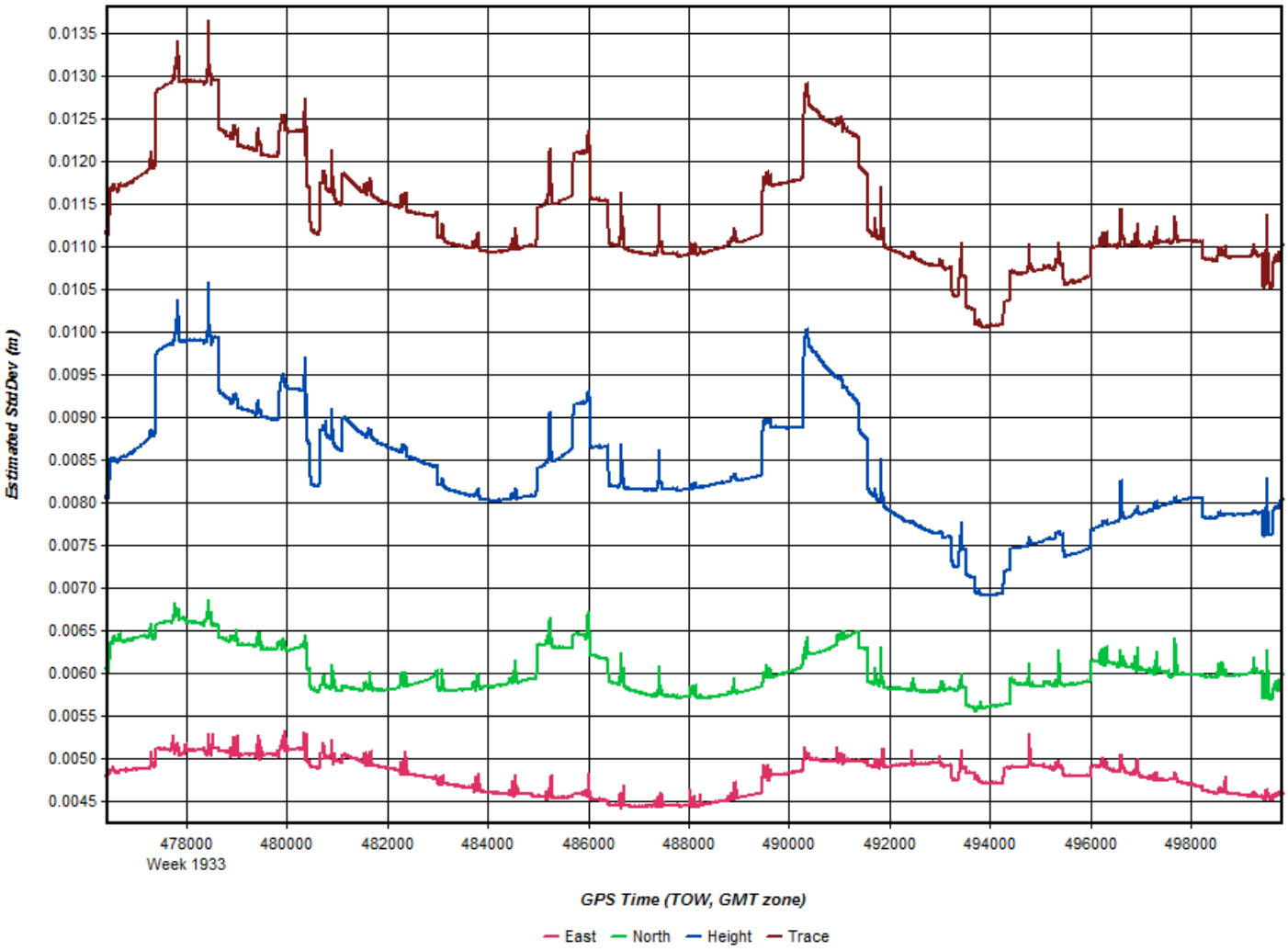
Inertial Explorer version 8.60.6717

Plots by Mission: Coverage Map, Estimated Position Accuracy, Number of Satellites, Combined Separation, and PDOP.

Coverage Map	The Coverage Map plot shows the Aircraft GNSS-IMU Trajectory in reference to localized GNSS Reference Stations.
Estimated Position Accuracy	The Estimated Position Accuracy plot shows the standard deviations of the east, north, and up directions versus time for the solution. The total standard deviation with a distance dependent component is also plotted.
Number of Satellites	Plots the number of satellites used in the solution as a function of time. The number of GPS satellites, GLONASS satellites, and the total number of satellites are distinguished with separate lines.
Combined Separation	Plots the north, east, and height position difference between any two solutions loaded into the project. This is most often the forward and reverse processing results, unless other solutions have been loaded from the Combine Solutions dialog. Plotting the difference between forward and reverse solutions can be very helpful in quality checking. When processing both directions, no information is shared between forward and reverse processing. Thus both directions are processed independently of each other. When forward and reverse solutions agree closely, it helps provide confidence in the solution. To a lesser extent, this plot can also help gauge solution accuracy.
PDOP	PDOP is a unit less number which indicates how favorable the satellite geometry is to 3D positioning accuracy. A strong satellite geometry, where the PDOP is low, occurs when satellites are well distributed in each direction (north, south, east and west) as well as directly overhead. Values in the range of 1-2 indicate very good satellite geometry, 2-3 are adequate in the sense that they do not generally, by themselves, limit positioning accuracy. Values between 3 and 4 are considered marginal, and values approaching or exceeding 5 can be considered poor. PDOP spikes can occur on aircraft turns were the antenna angle is unfavorable, these spikes while aesthetically unfavorable do not generally reduce the accuracy of the acquired data.

225_20170127_1

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Week 1933
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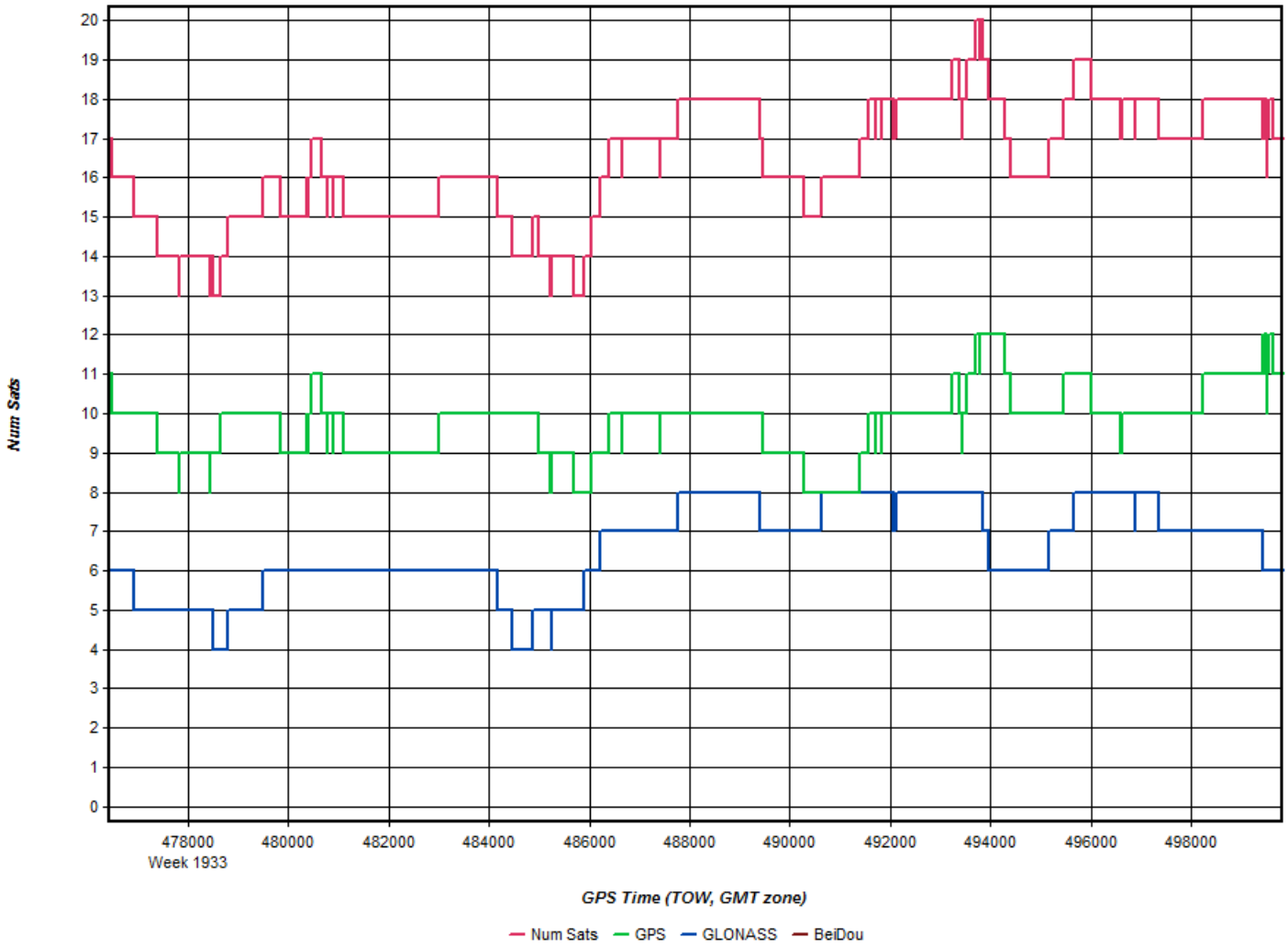
East
North
Height
Trace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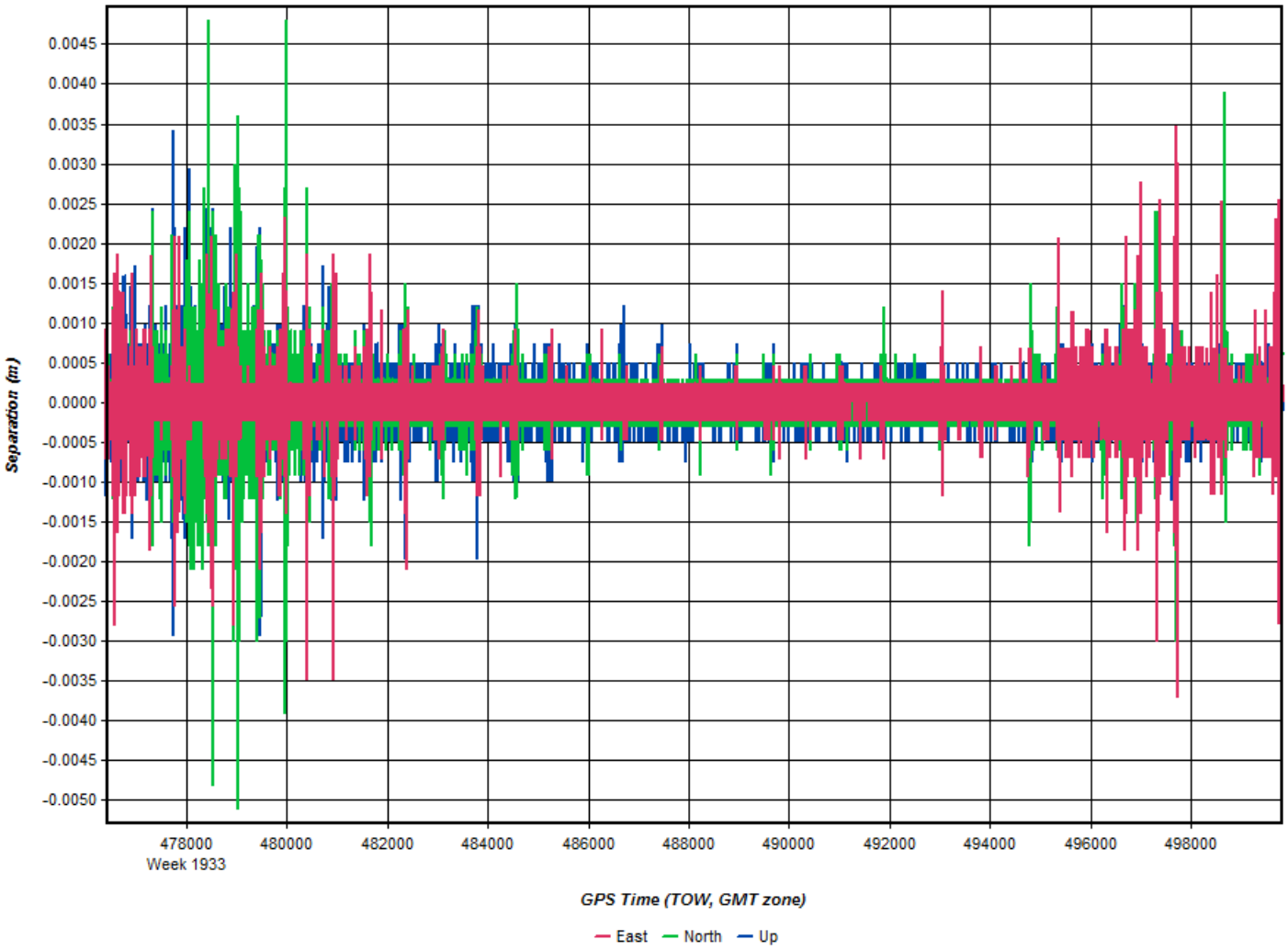
Num Sats
GPS
GLONASS
BeiDou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-0.0050
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Week 1933
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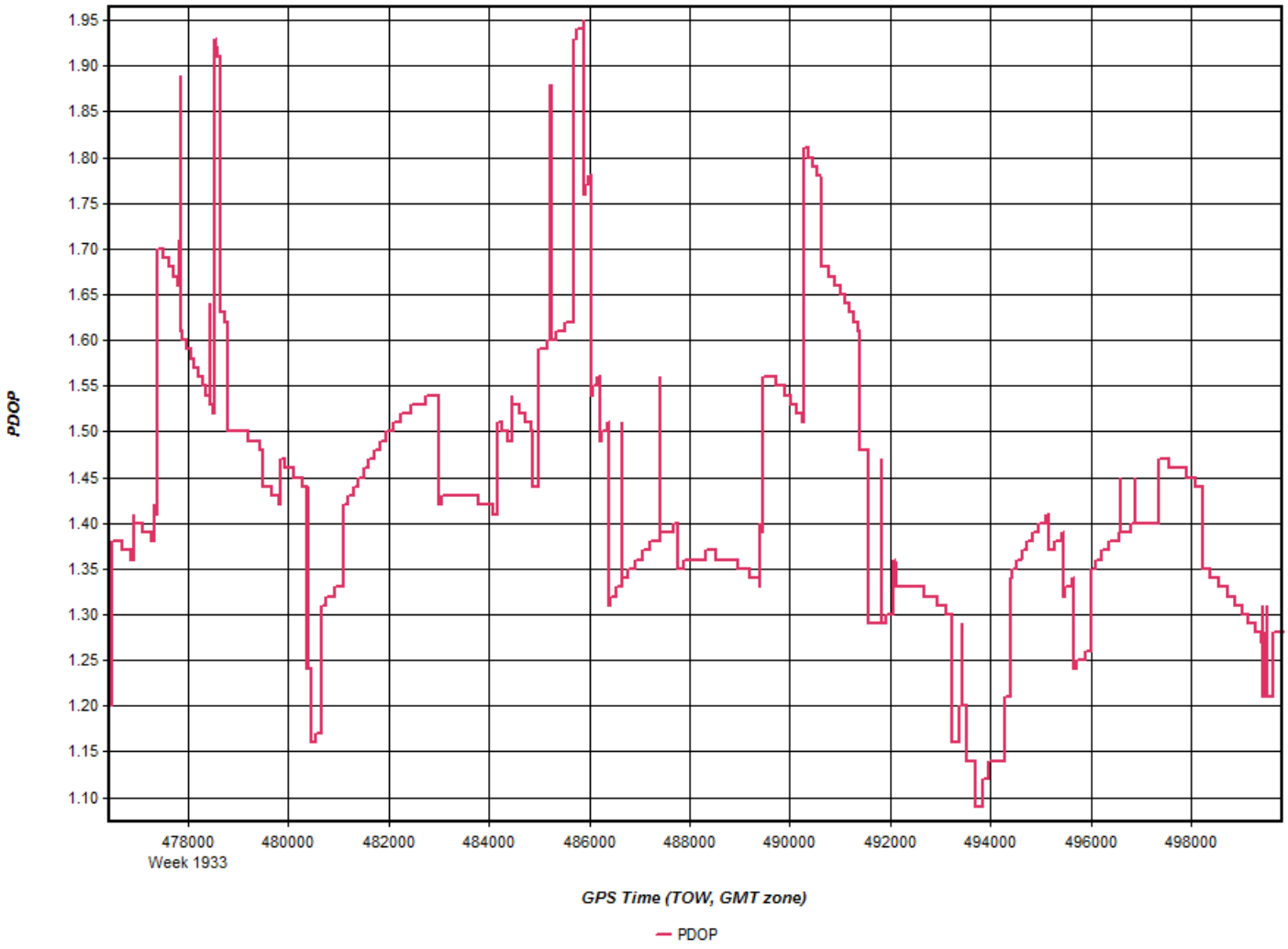
GPS Time (TOW, GMT zone)
East
North
Up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1.35
1.30
1.25
1.20
1.15
1.10
478000
Week 1933
480000
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494000
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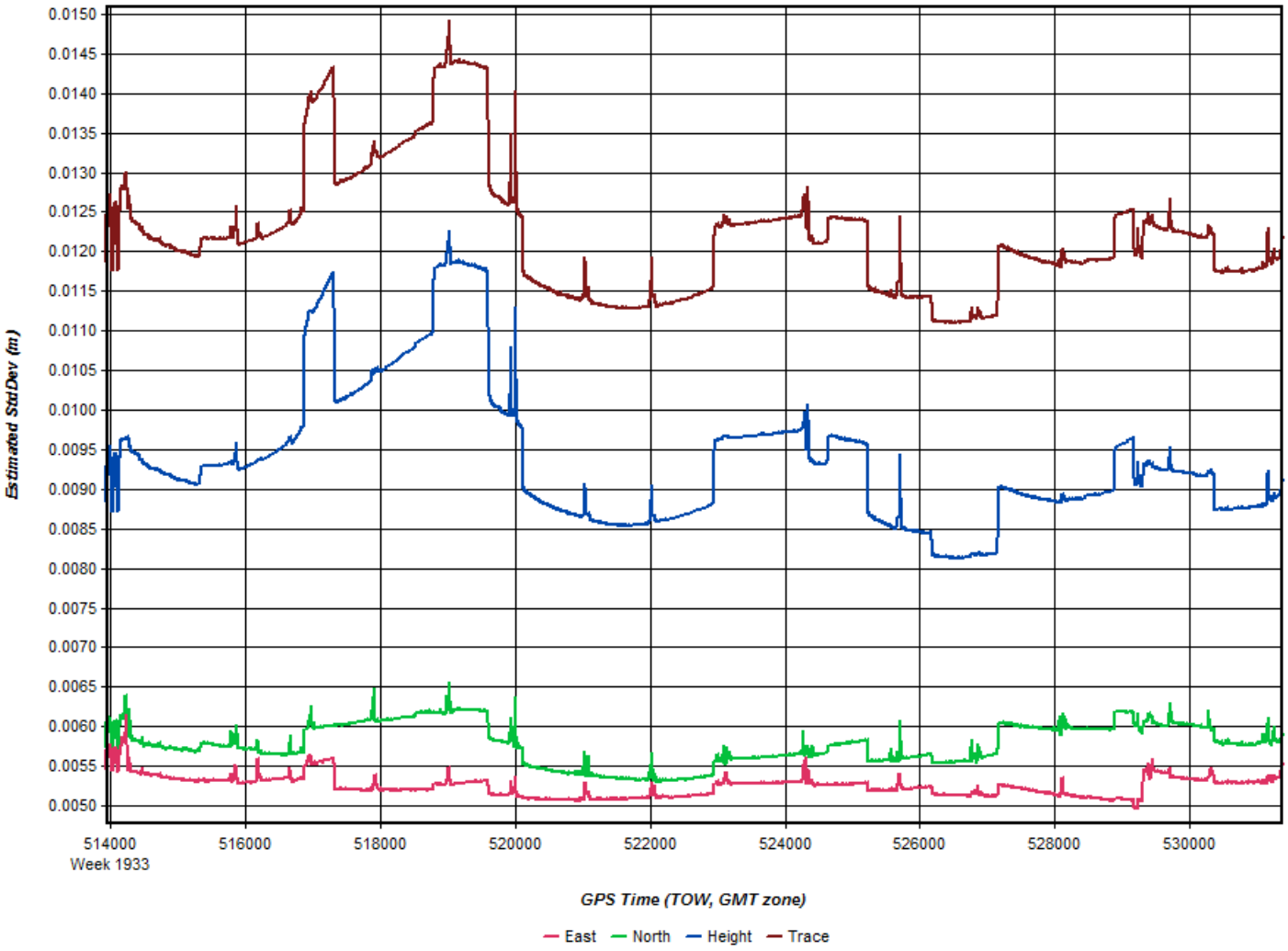
498000
GPS Time (TOW, GMT zone)
PDOP

225_20170127_2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0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
514000
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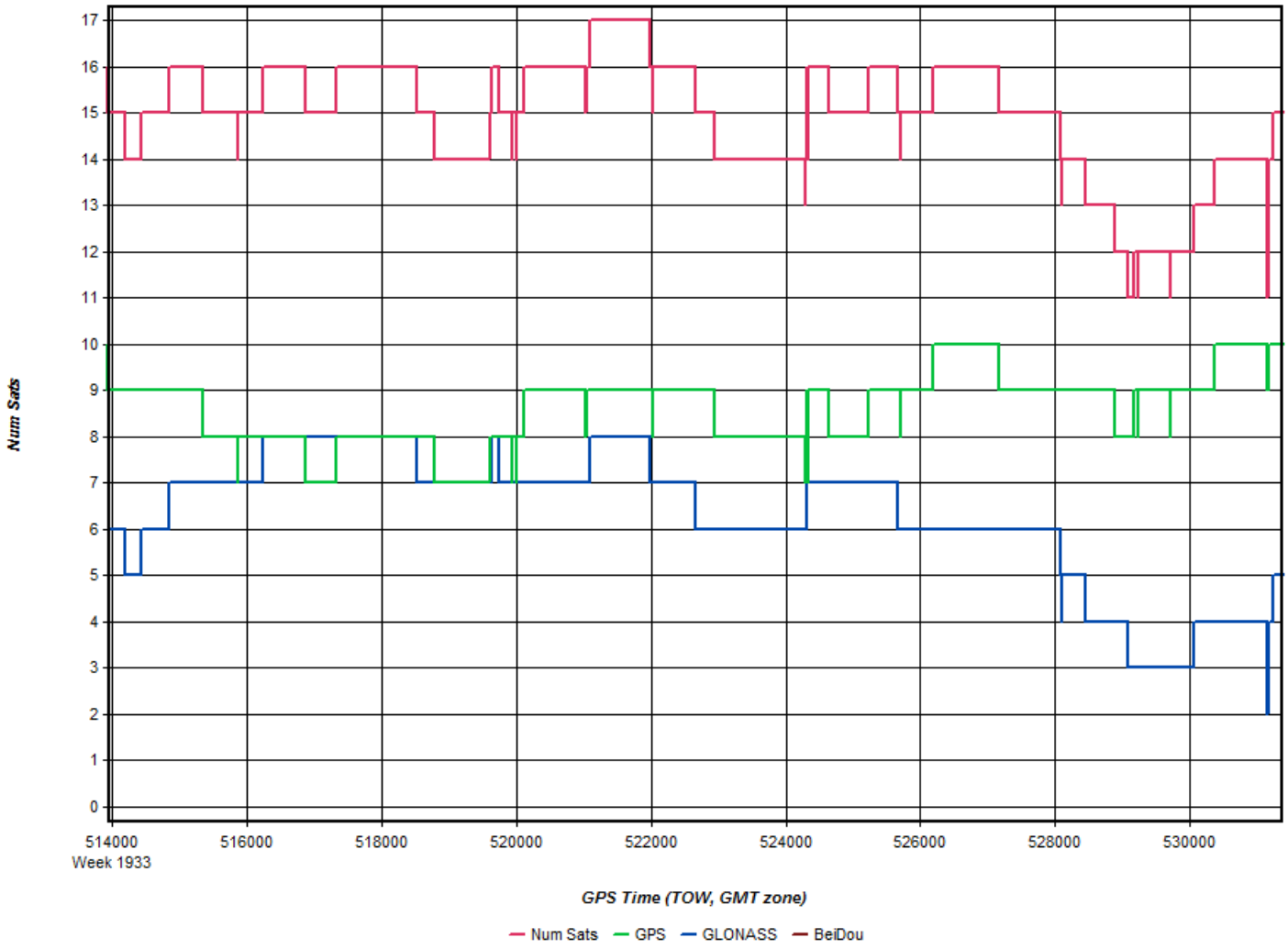
530000
GPS Time (TOW, GMT zone)
East
North
Height
Trace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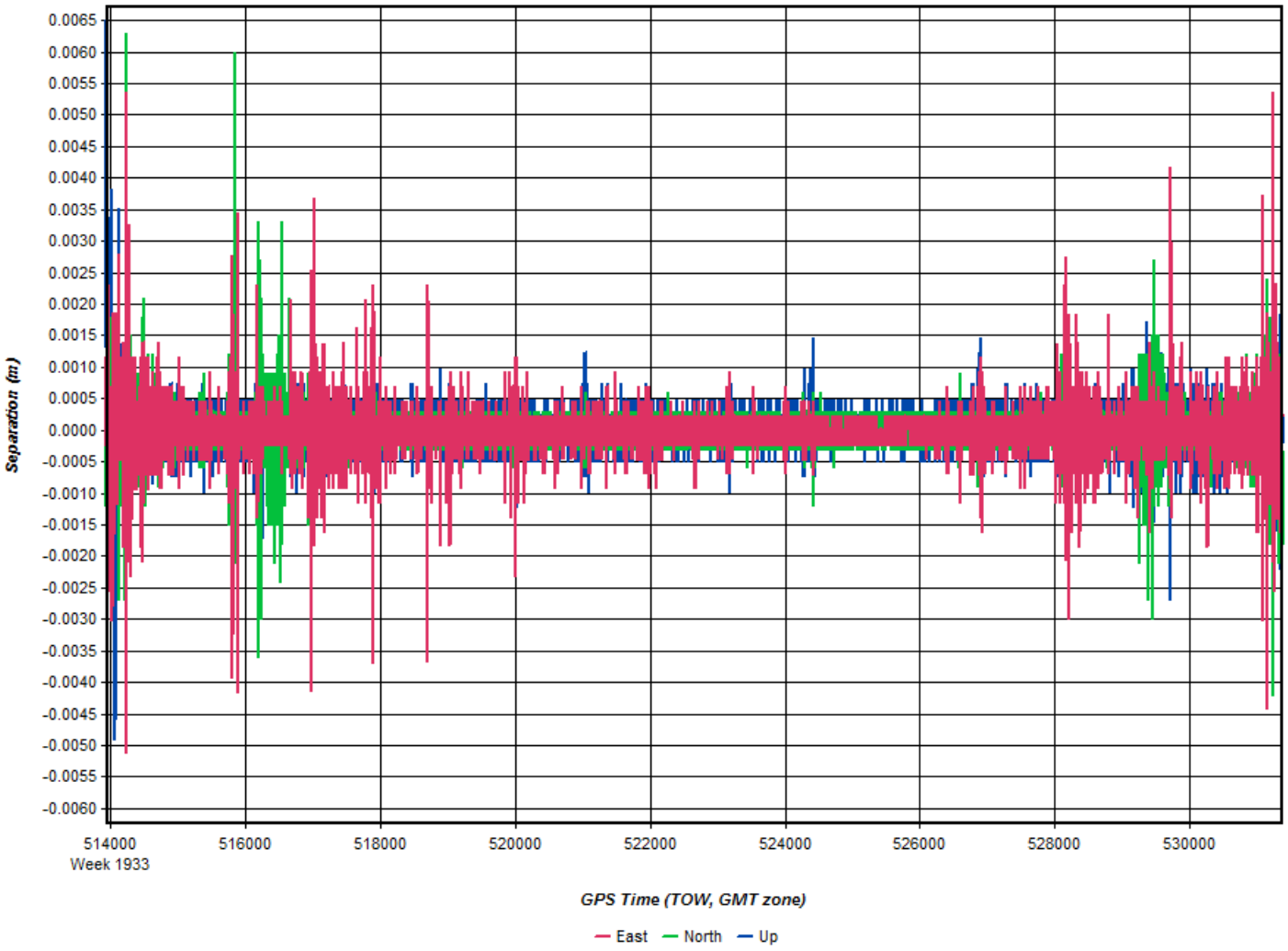
Num Sats
GPS
GLONASS
BeiDou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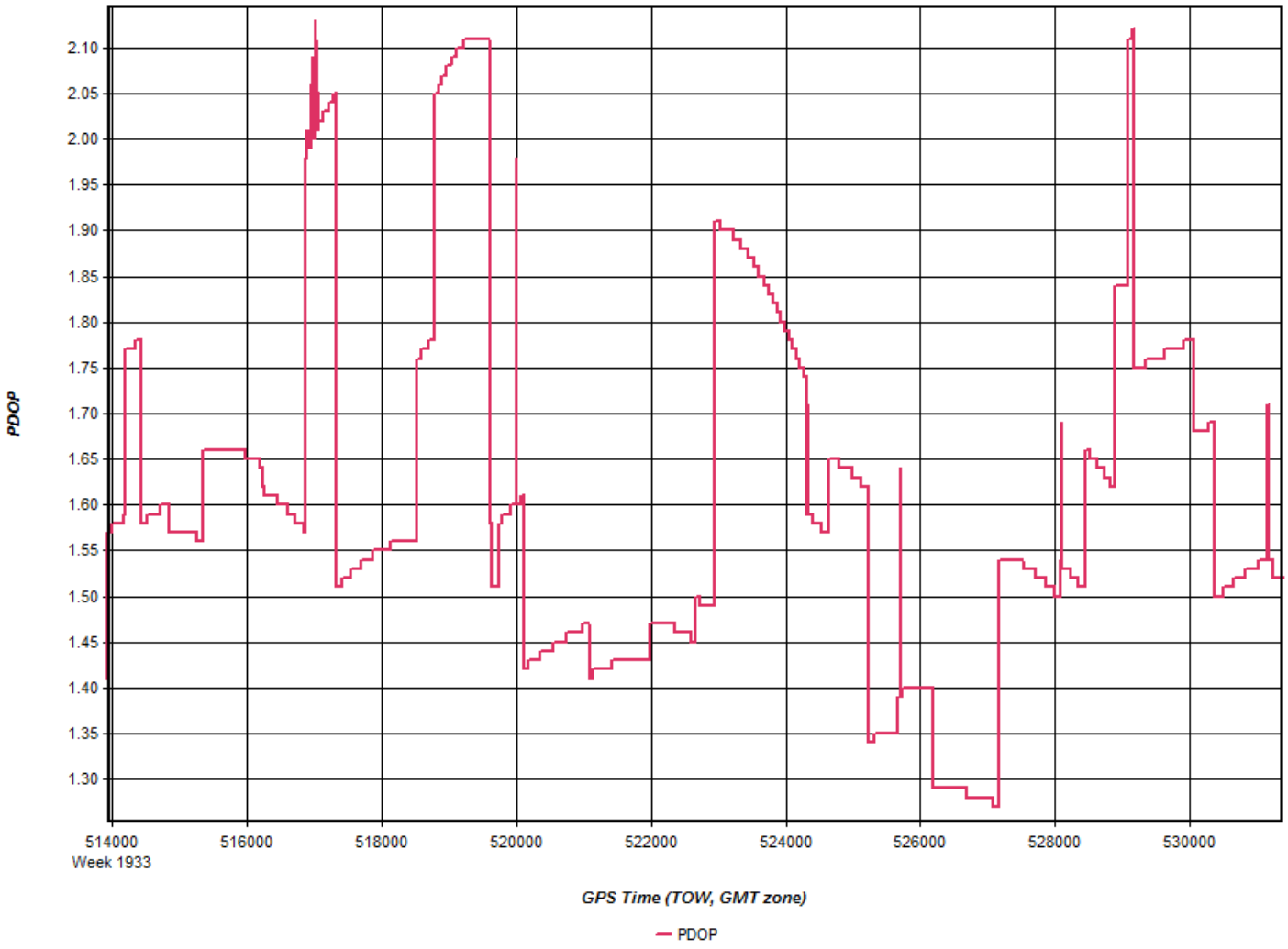
East
North
Up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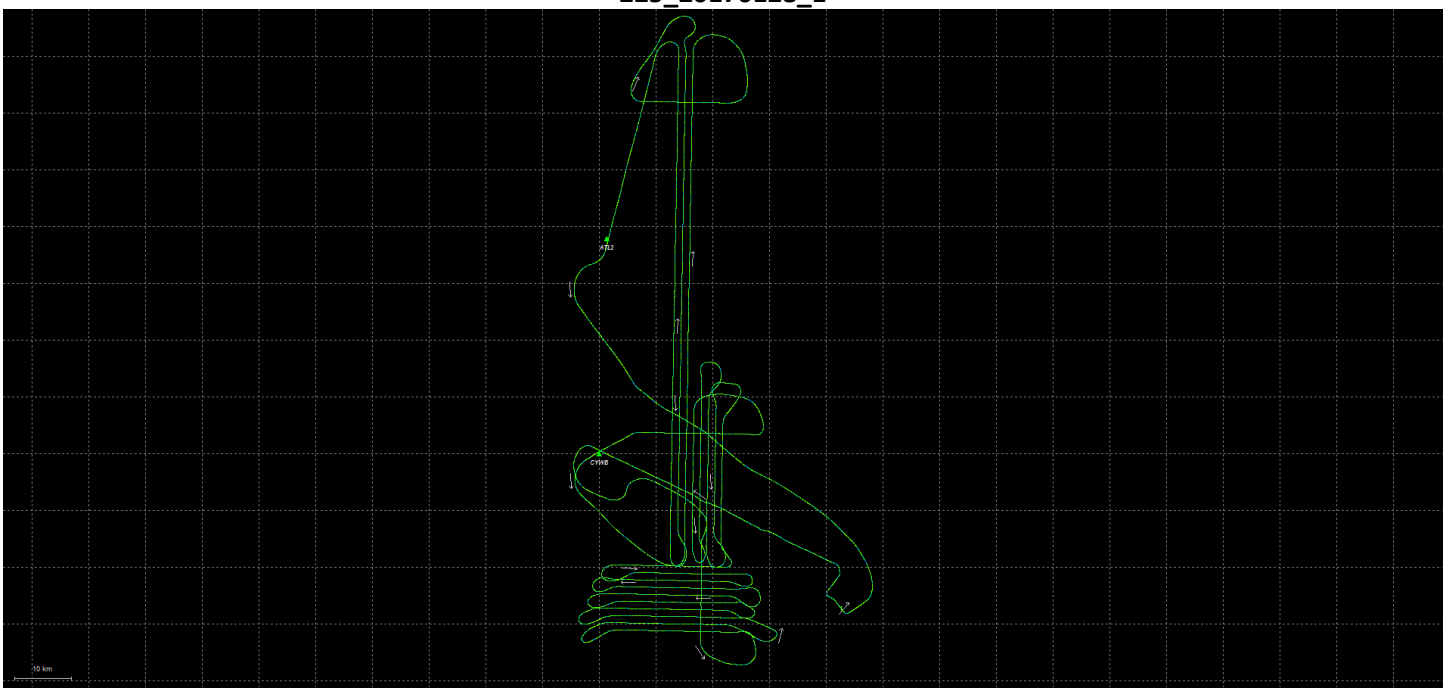

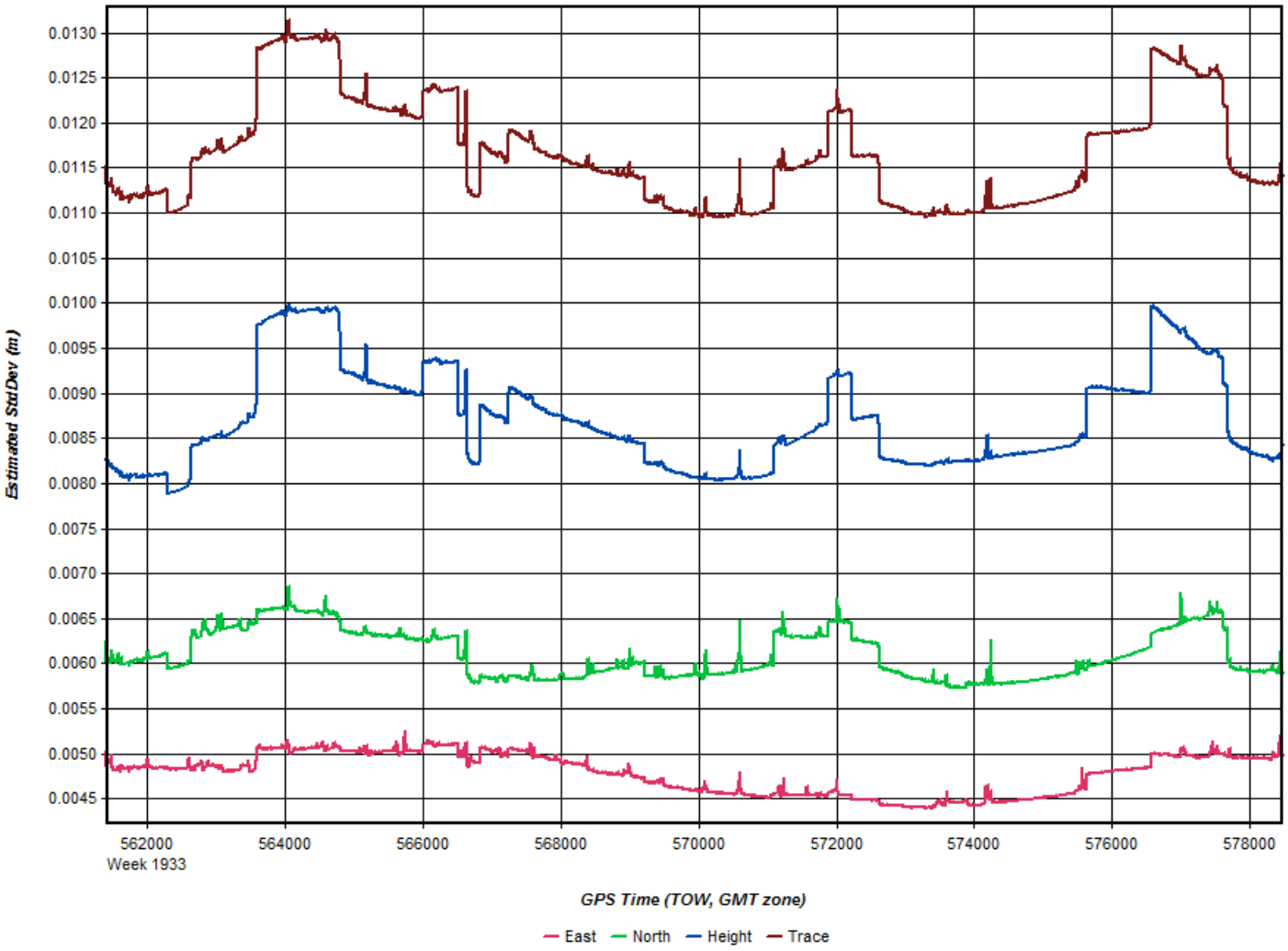
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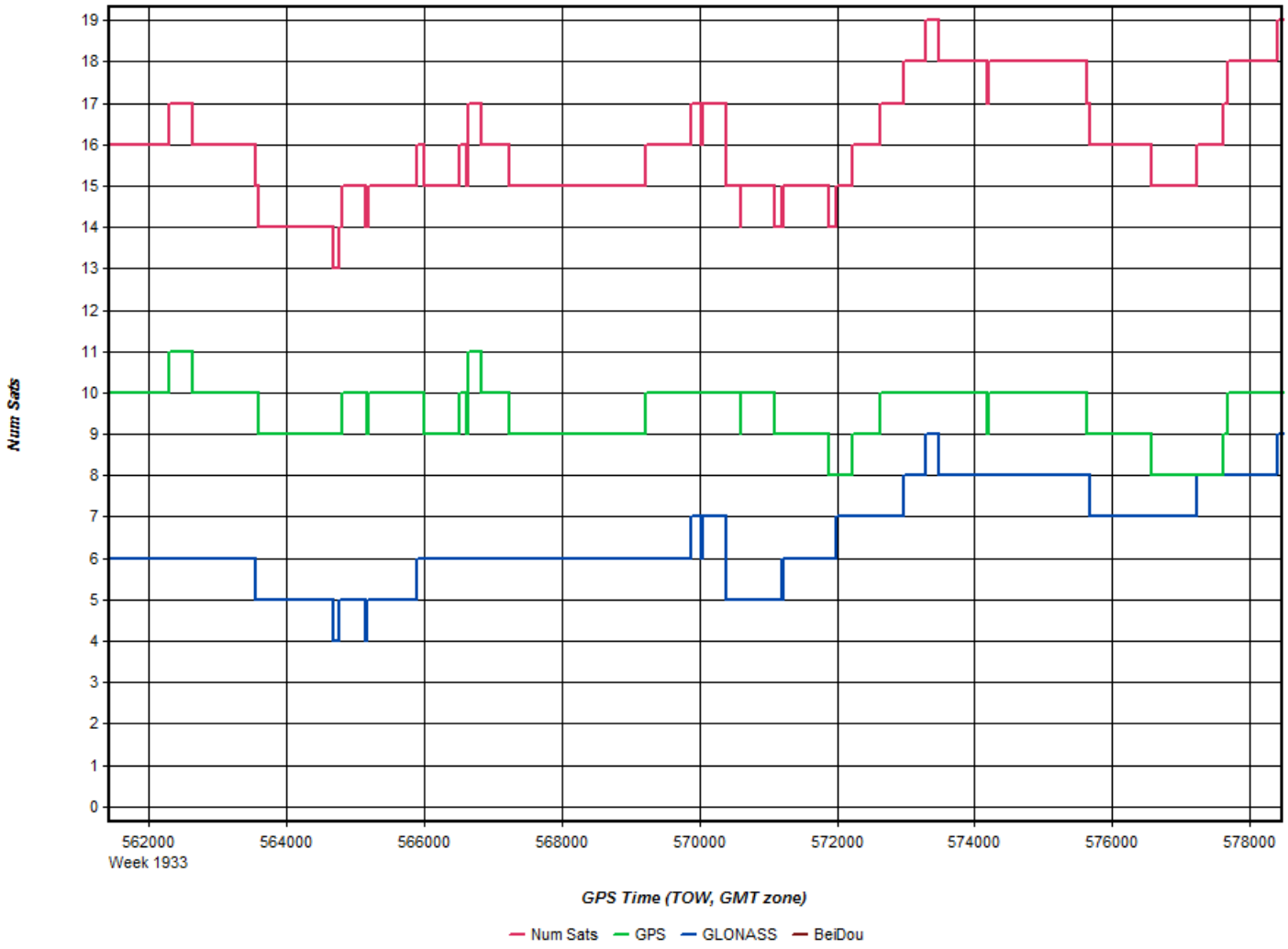
North
Height
Trace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GPS
GLONASS
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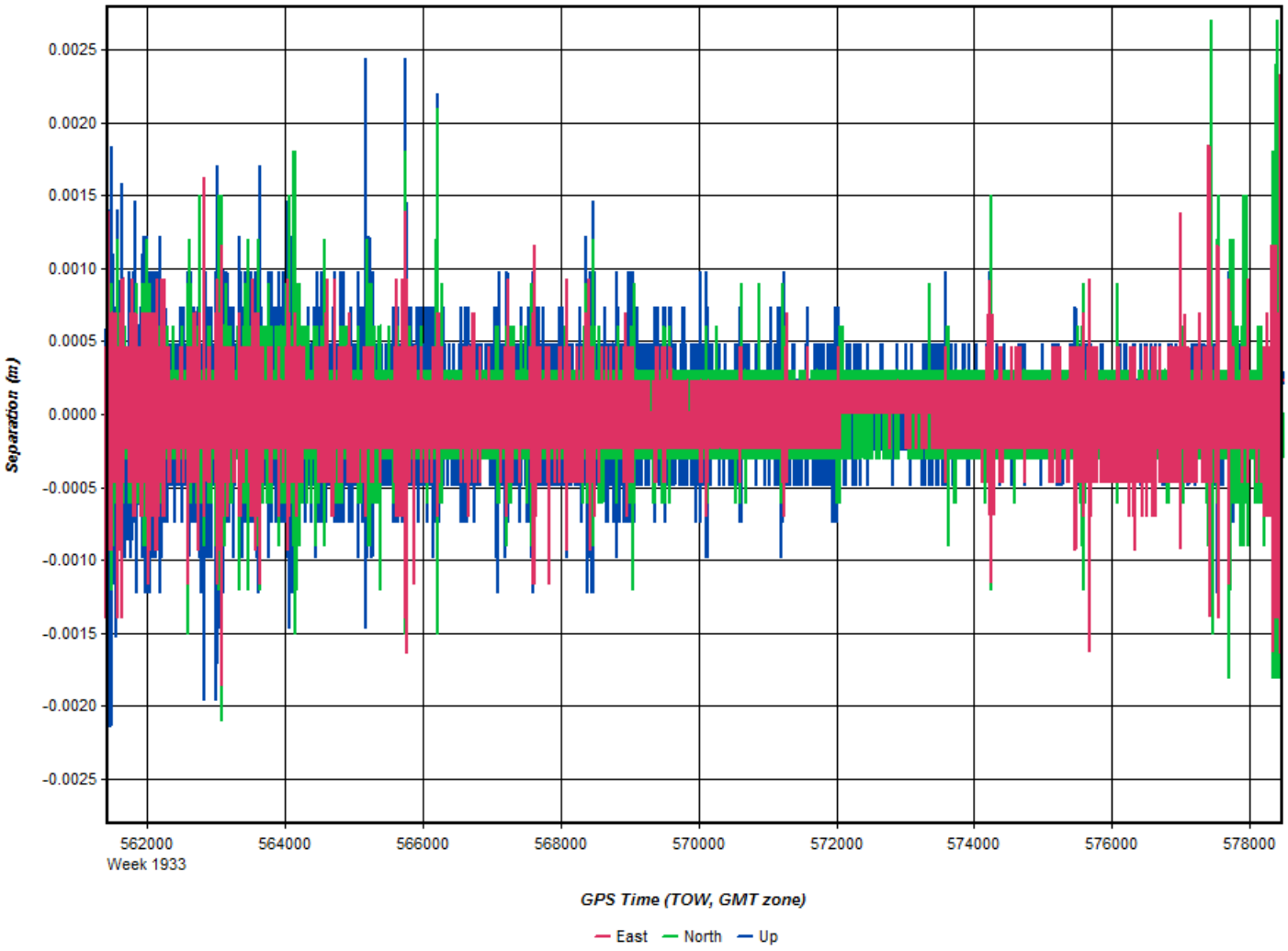
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Separation (m)
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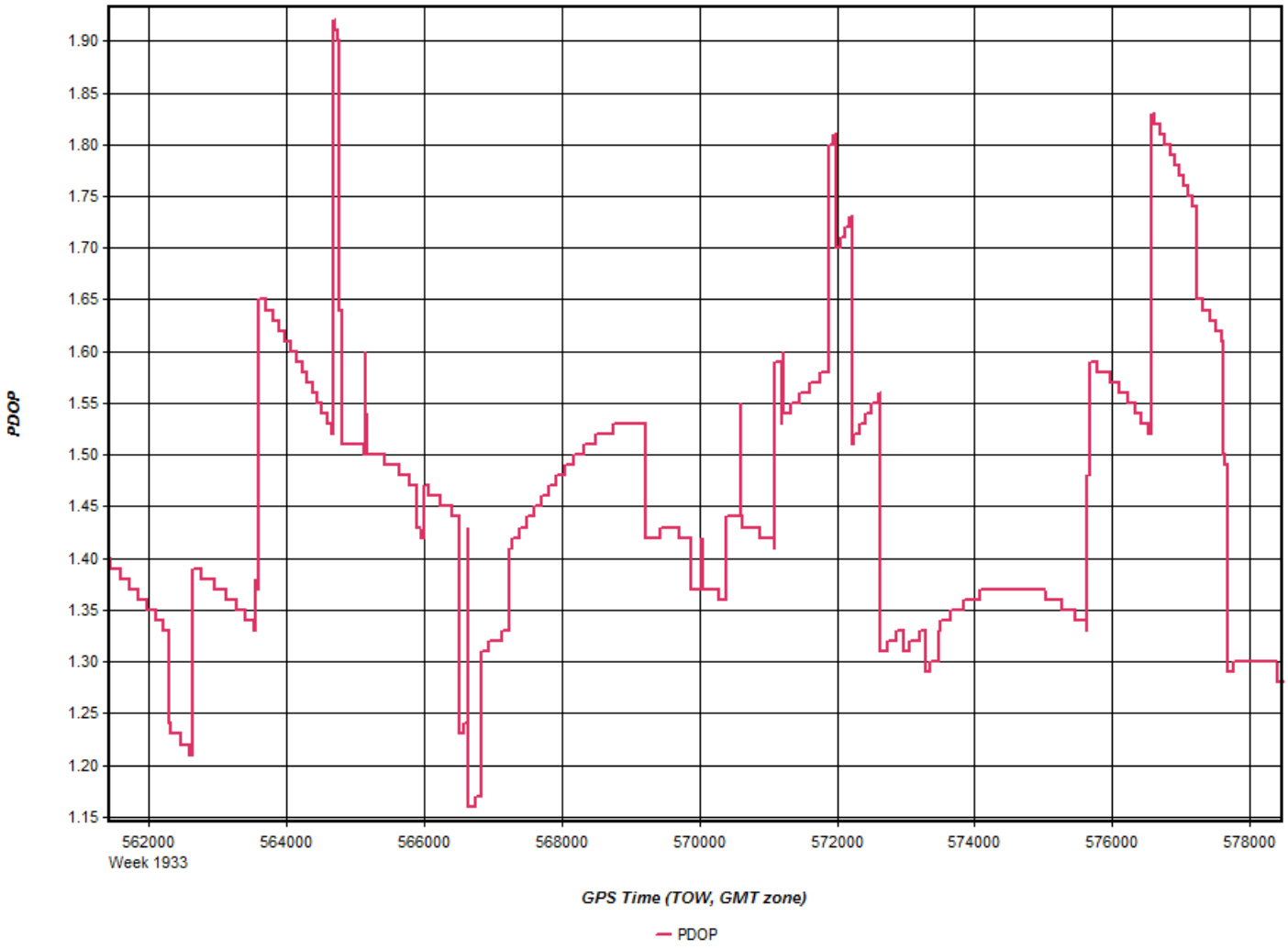
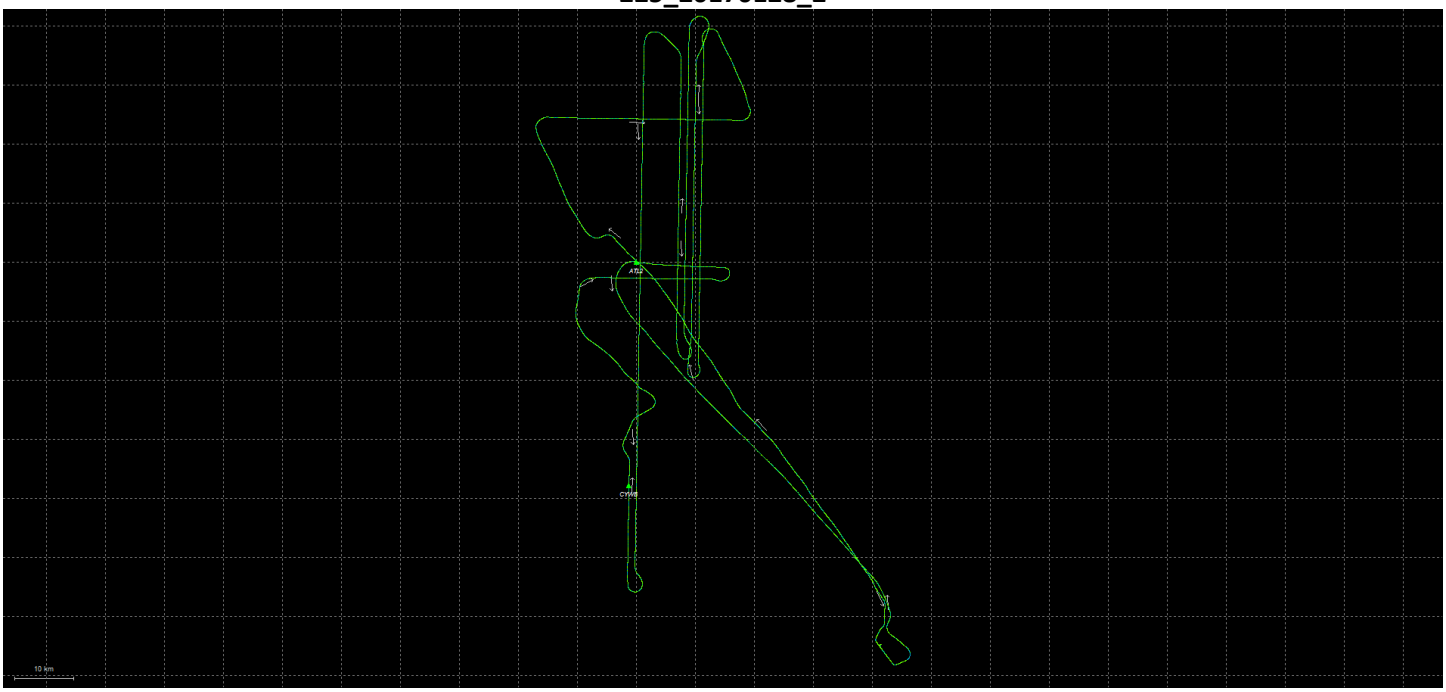
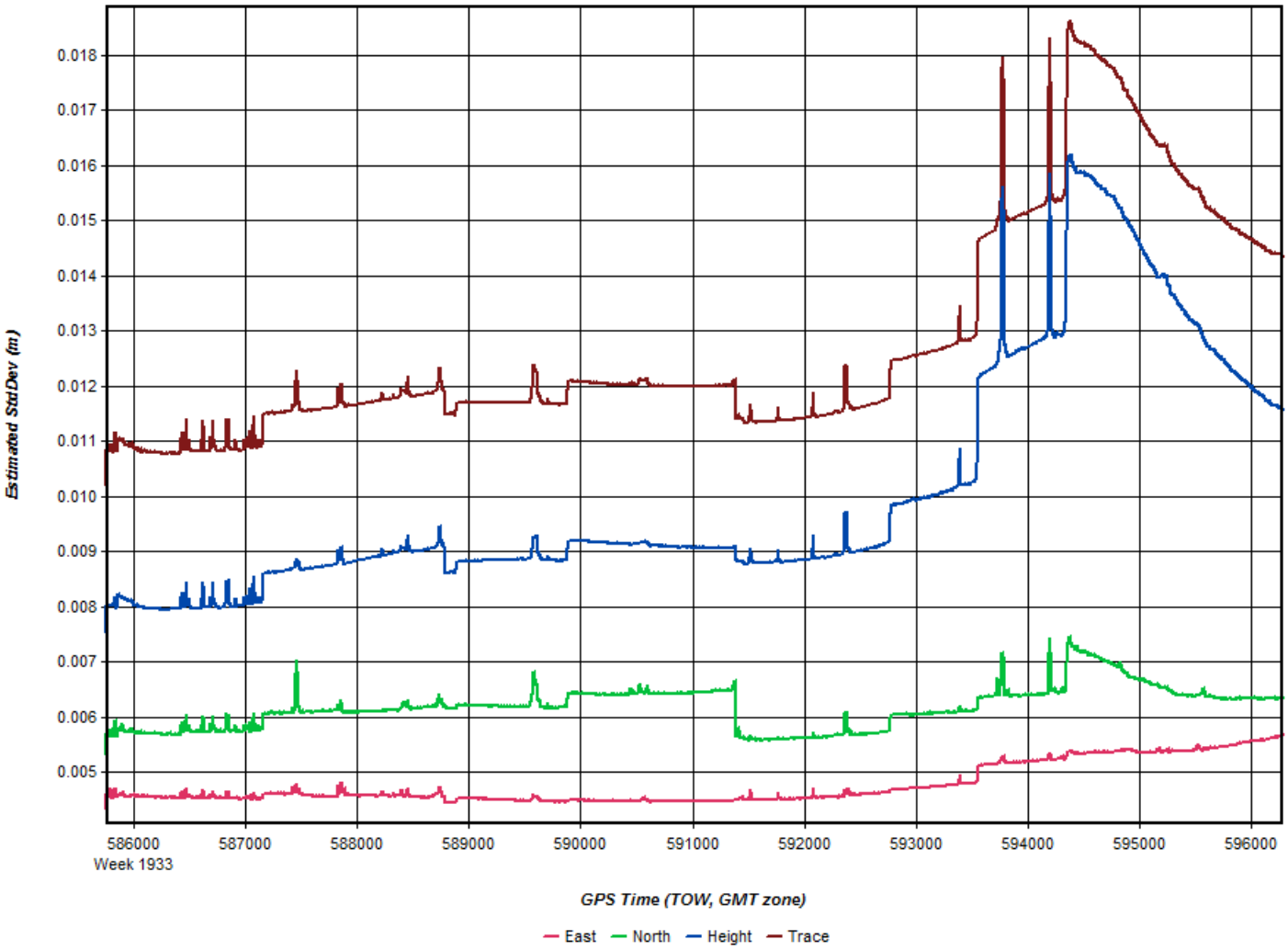
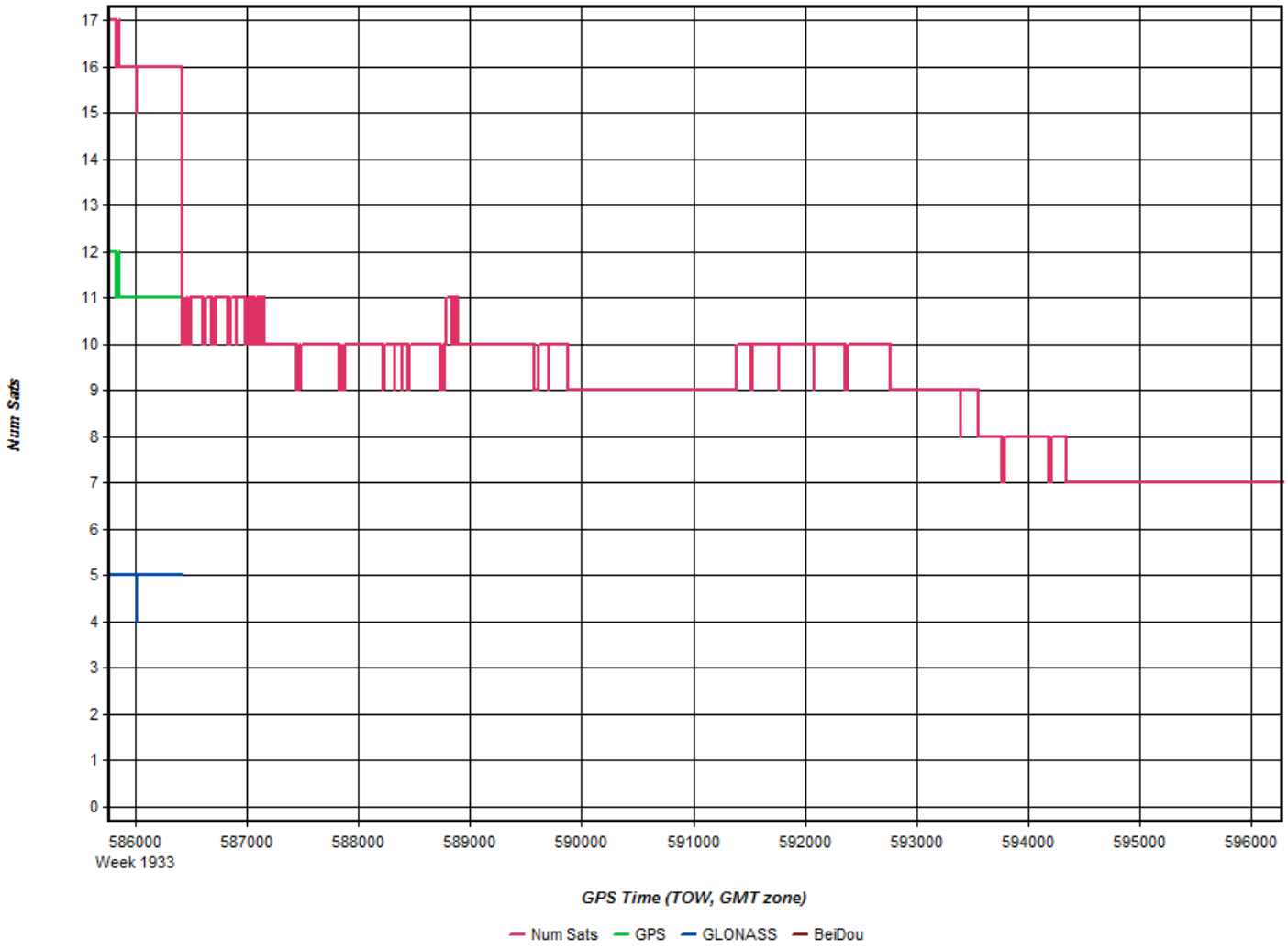
Week 1933
564000
566000
568000
570000
572000
574000
576000
578000
GPS Time (TOW, GMT zone)
East
North
Up

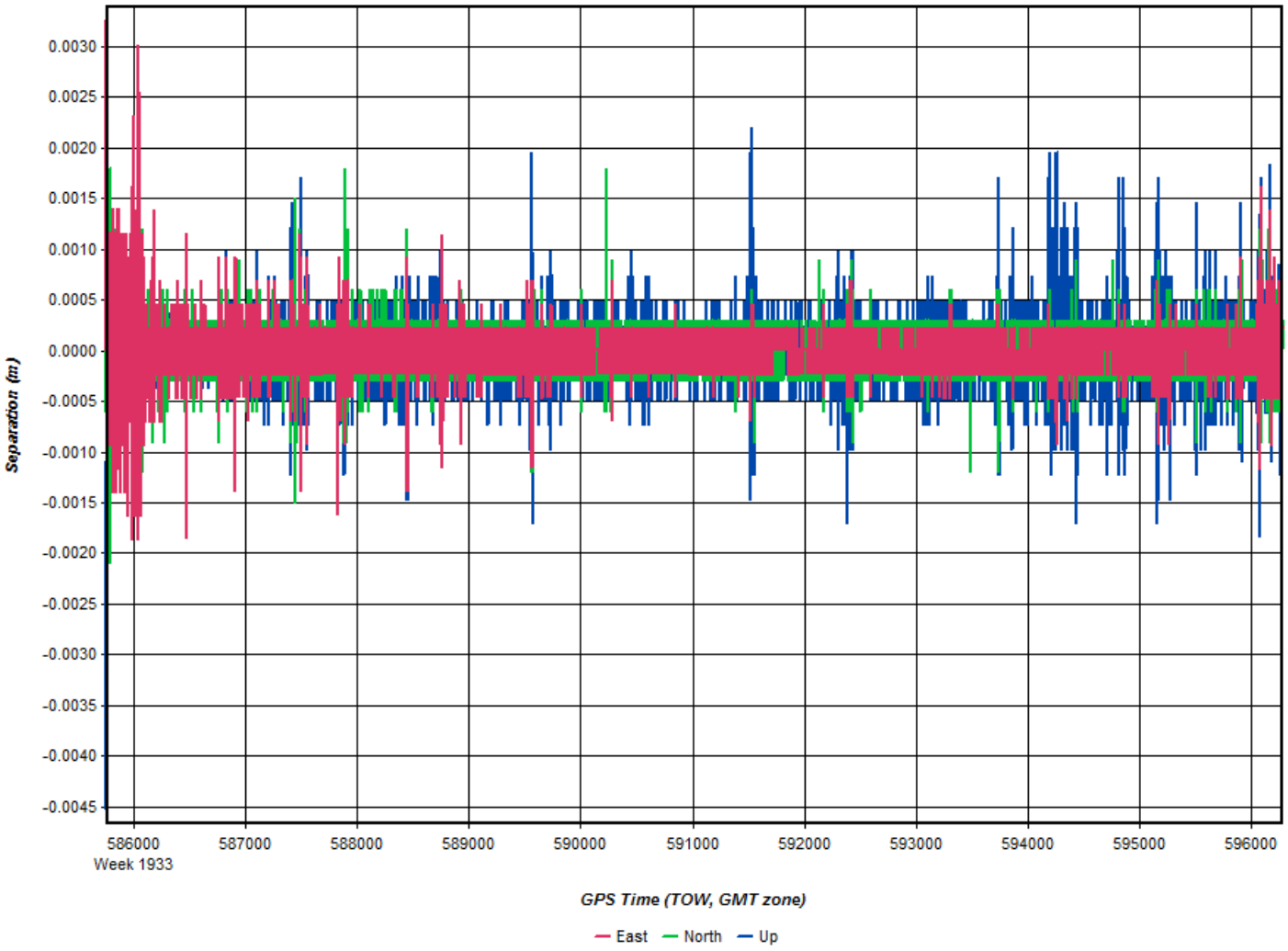

PDOP
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
562000
Week 1933
564000
566000
568000
570000
572000
574000
576000
578000
GPS Time (TOW, GMT zone)
PDOP

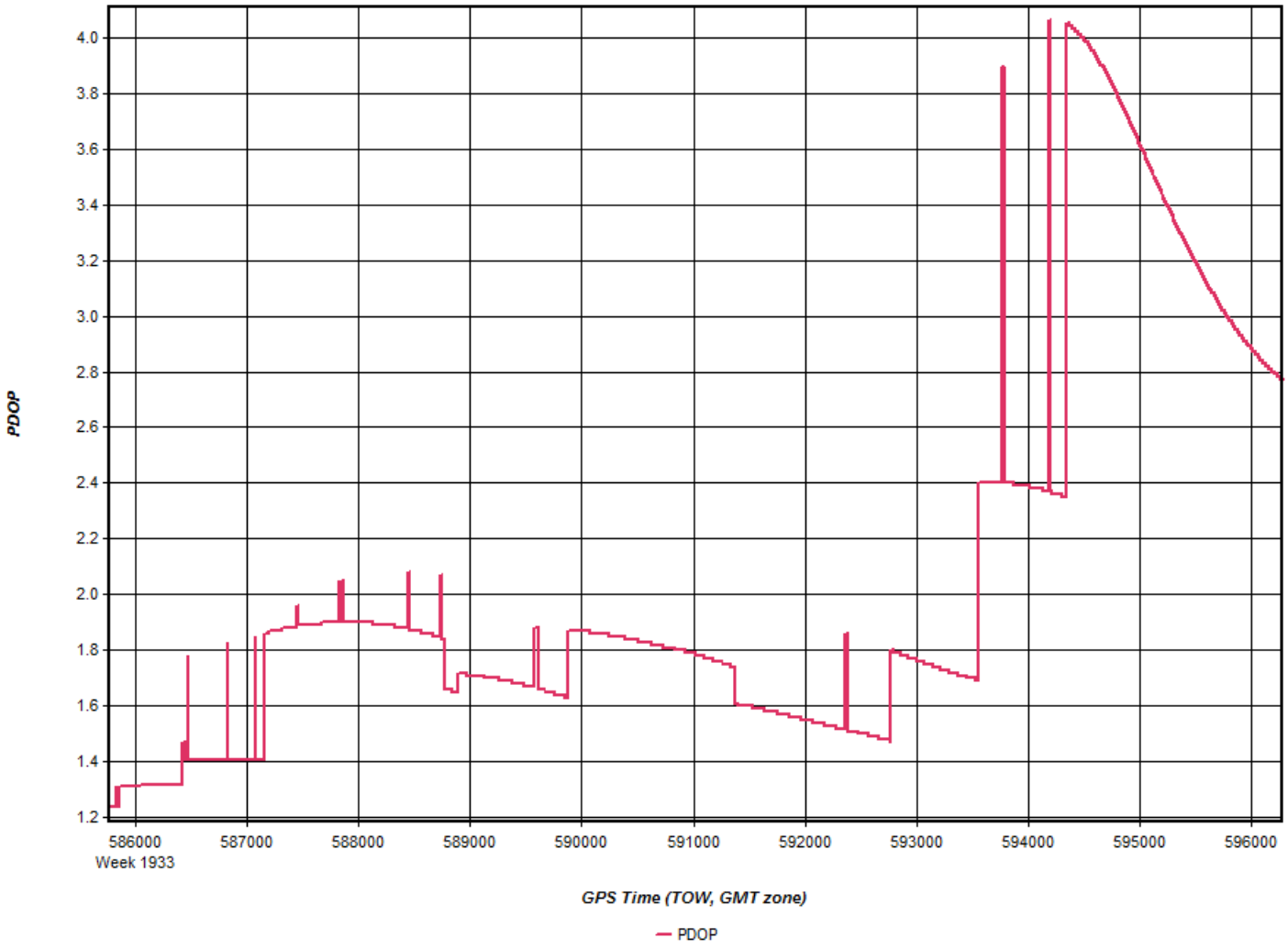
225_20170128_2



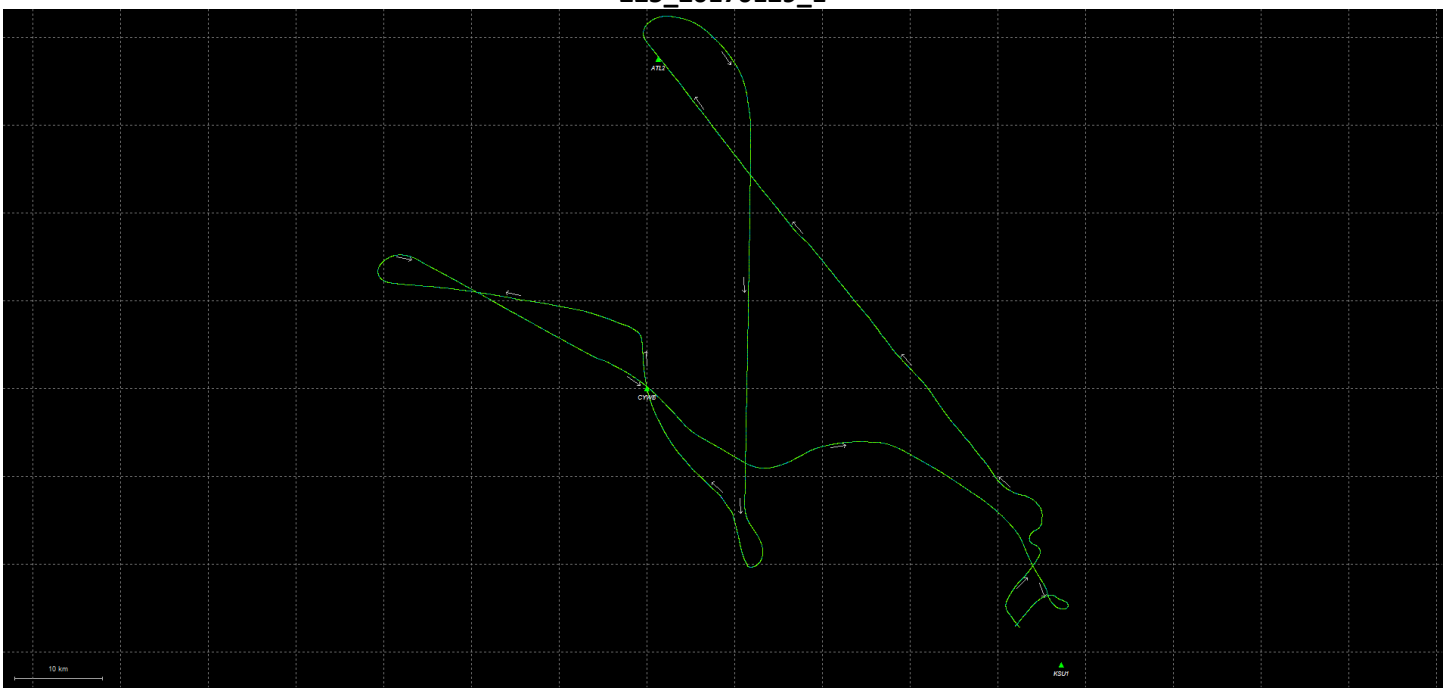

Estimated StdDev (m)
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
586000
Week 1933
587000
588000
589000
590000
591000
592000
593000
594000
595000
596000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

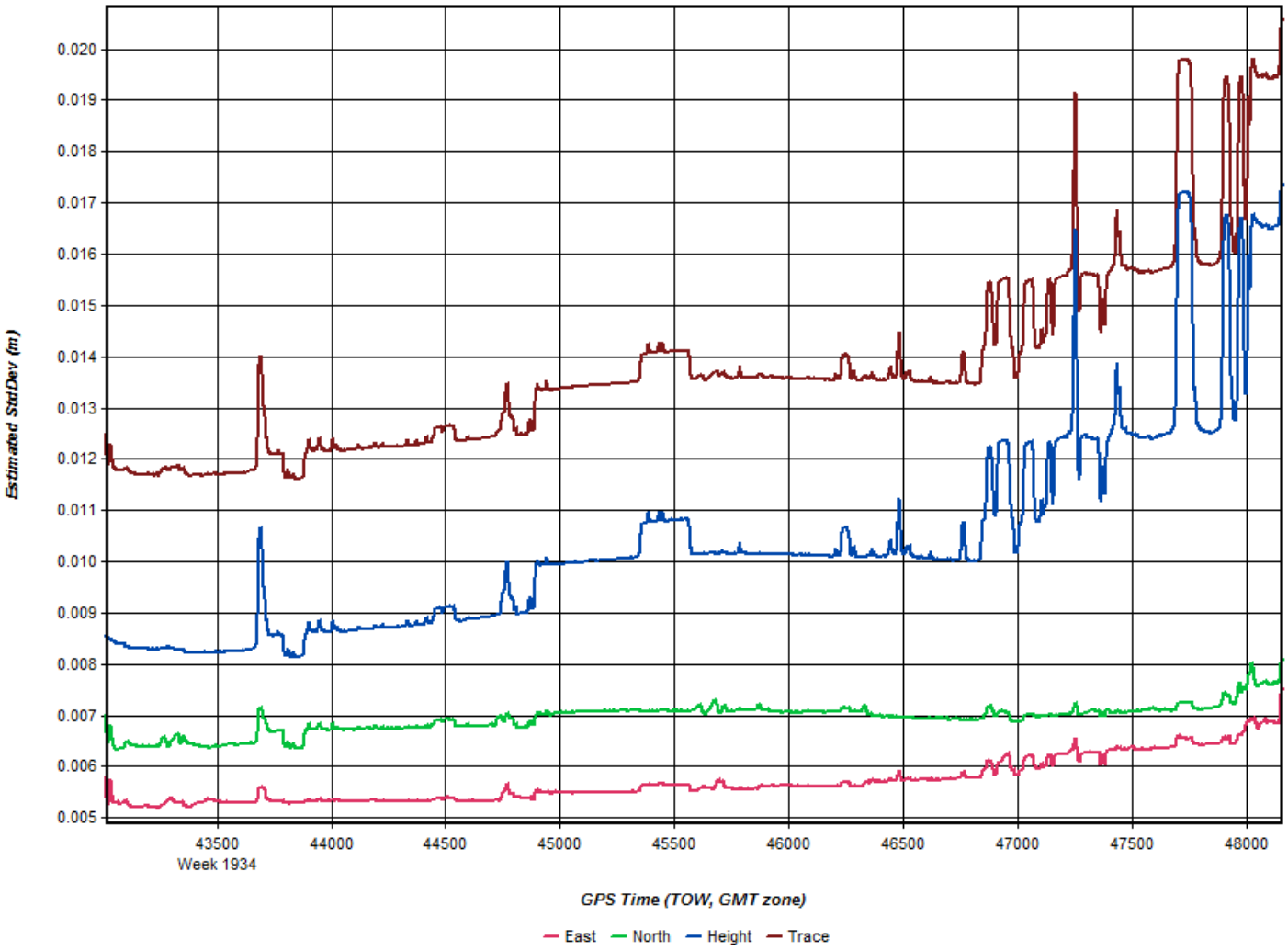

Num Sats
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
586000
Week 1933
587000
588000
589000
590000
591000
592000
593000
594000
595000
596000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

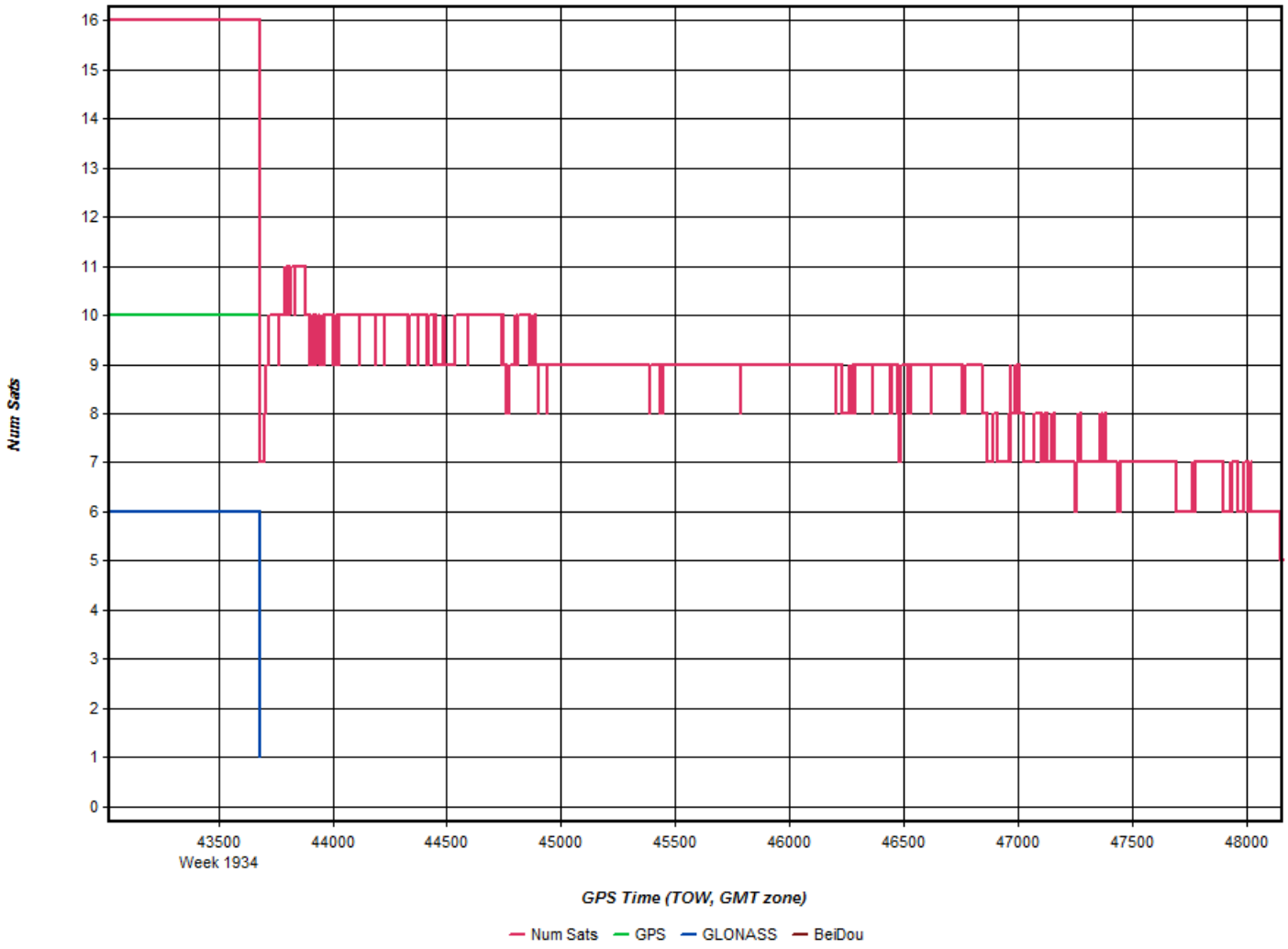

Separation (m)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
-0.0020
-0.0025
-0.0030
-0.0035
-0.0040
-0.0045
586000
Week 1933
587000
588000
589000
590000
591000
592000
593000
594000
595000
596000
GPS Time (TOW, GMT zone)
East
North
Up

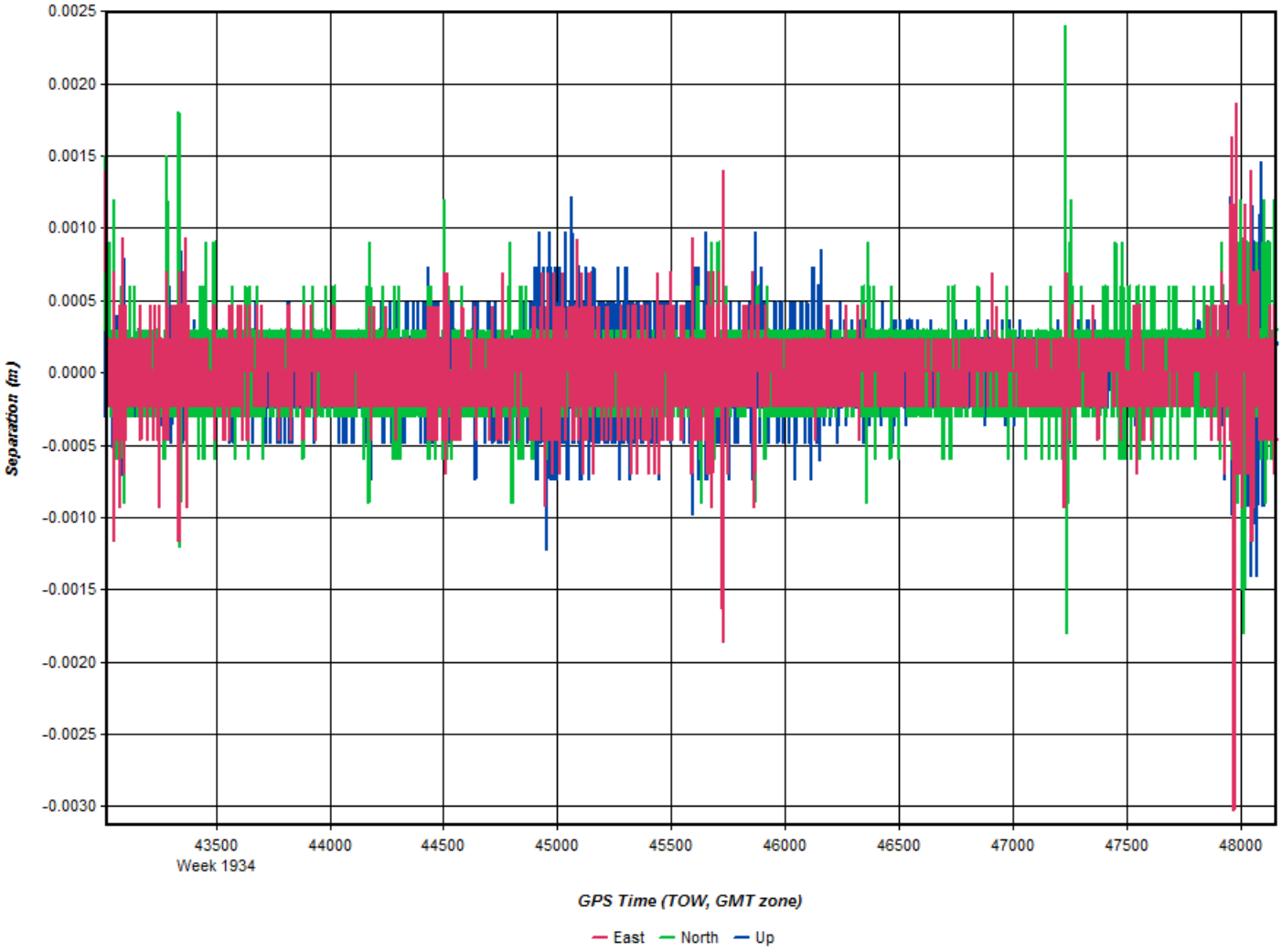

PDOP
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
586000
Week 1933
587000
588000
589000
590000
591000
592000
593000
594000
595000
596000
GPS Time (TOW, GMT zone)
PDOP

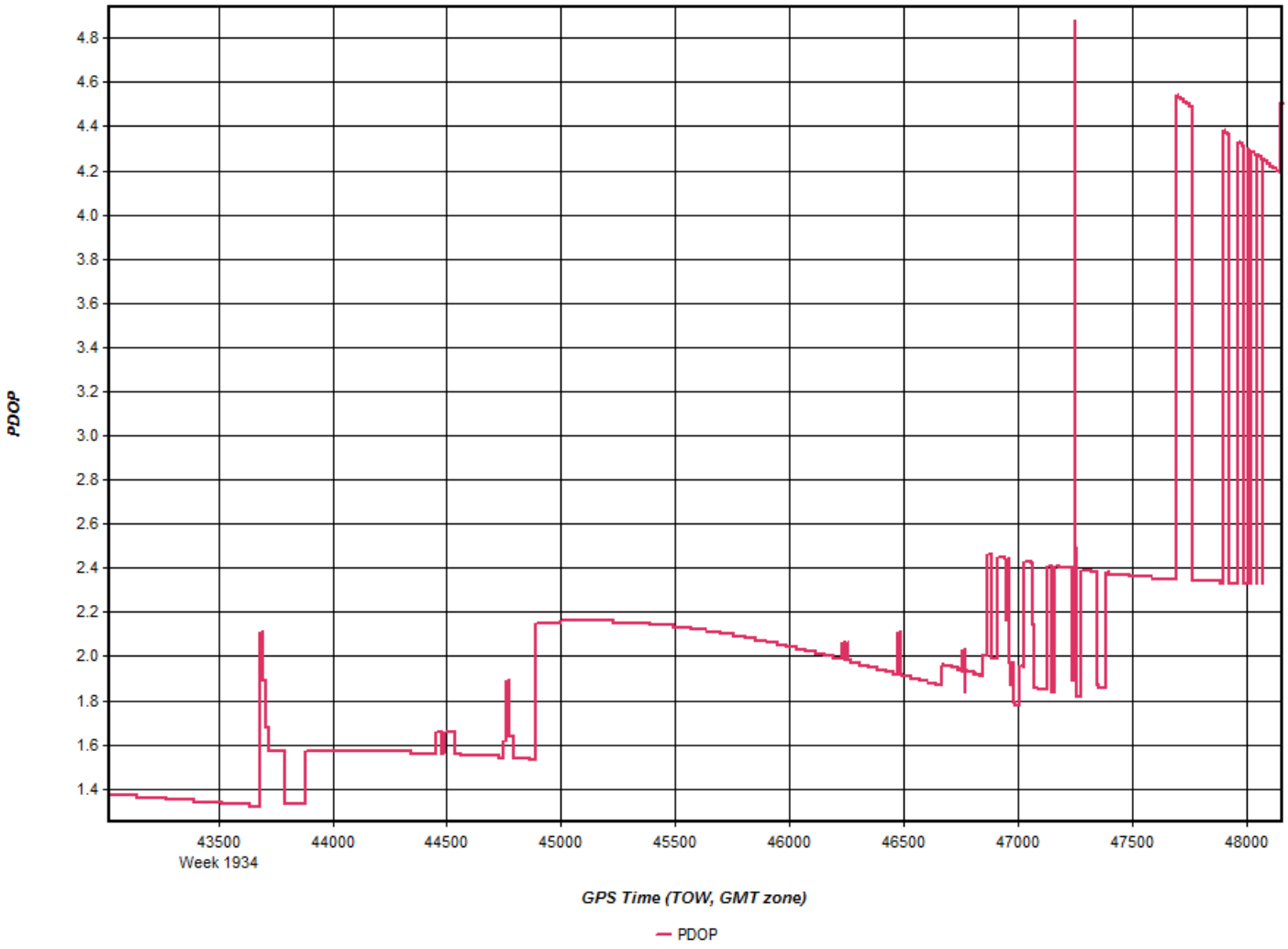
225_20170129_1



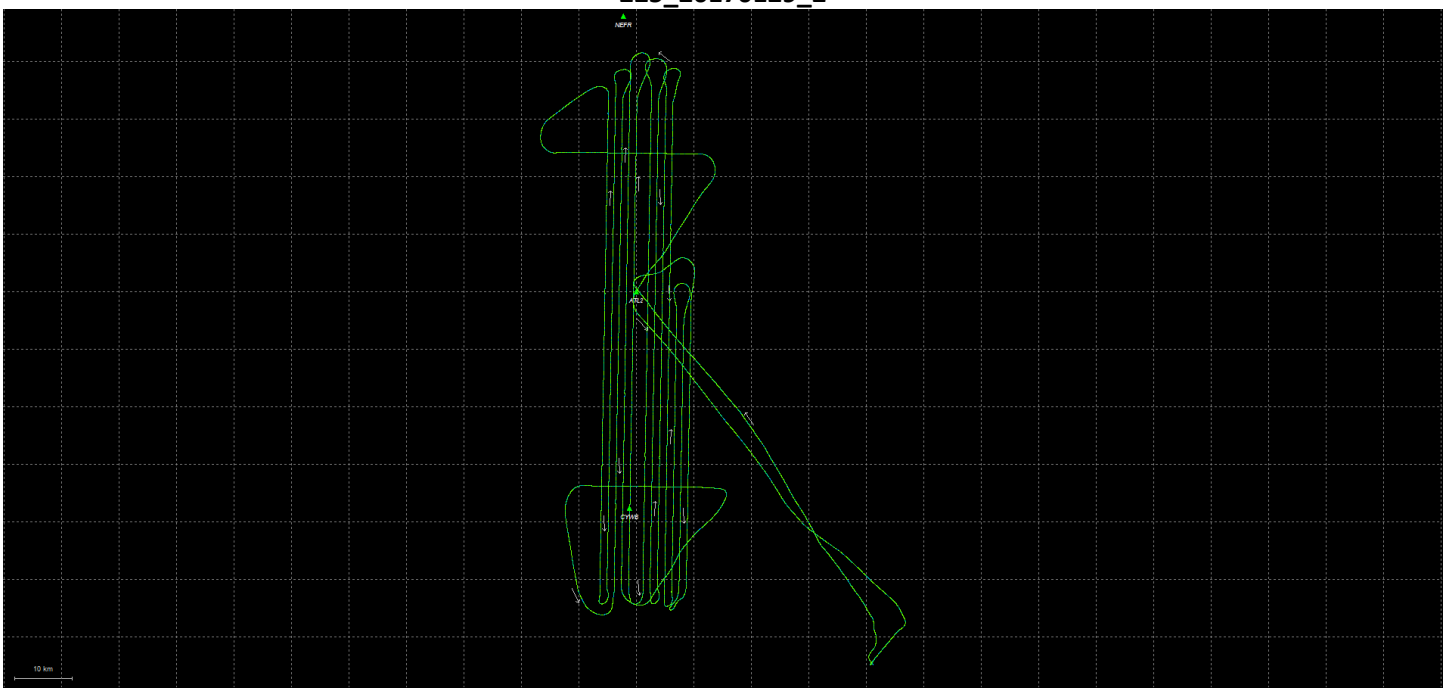

Estimated StdDev (m)
0.020
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
43500
Week 1934
44000
44500
45000
45500
46000
46500
47000
47500
48000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

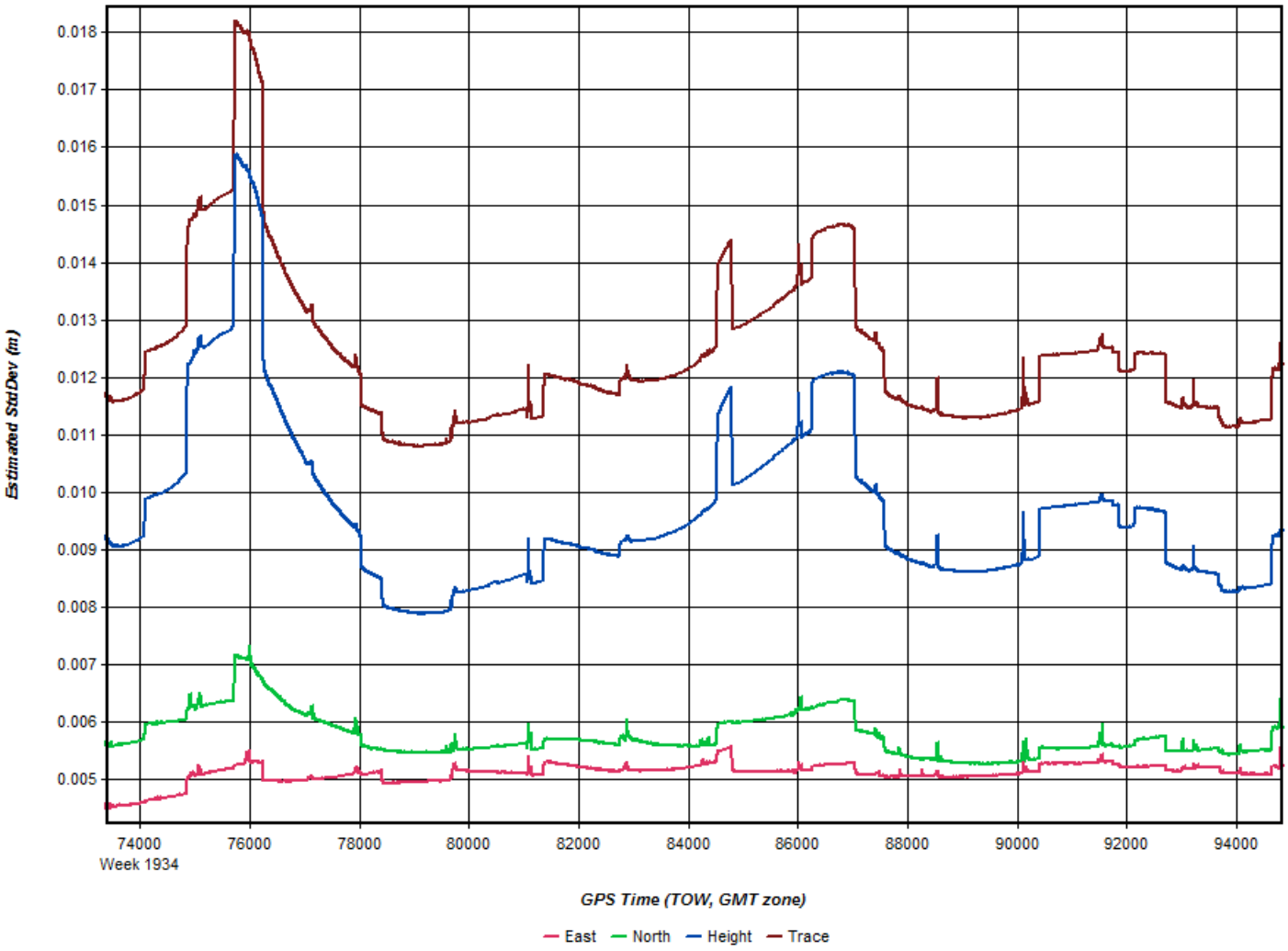

Num Sats
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
43500
Week 1934
44000
44500
45000
45500
46000
46500
47000
47500
48000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

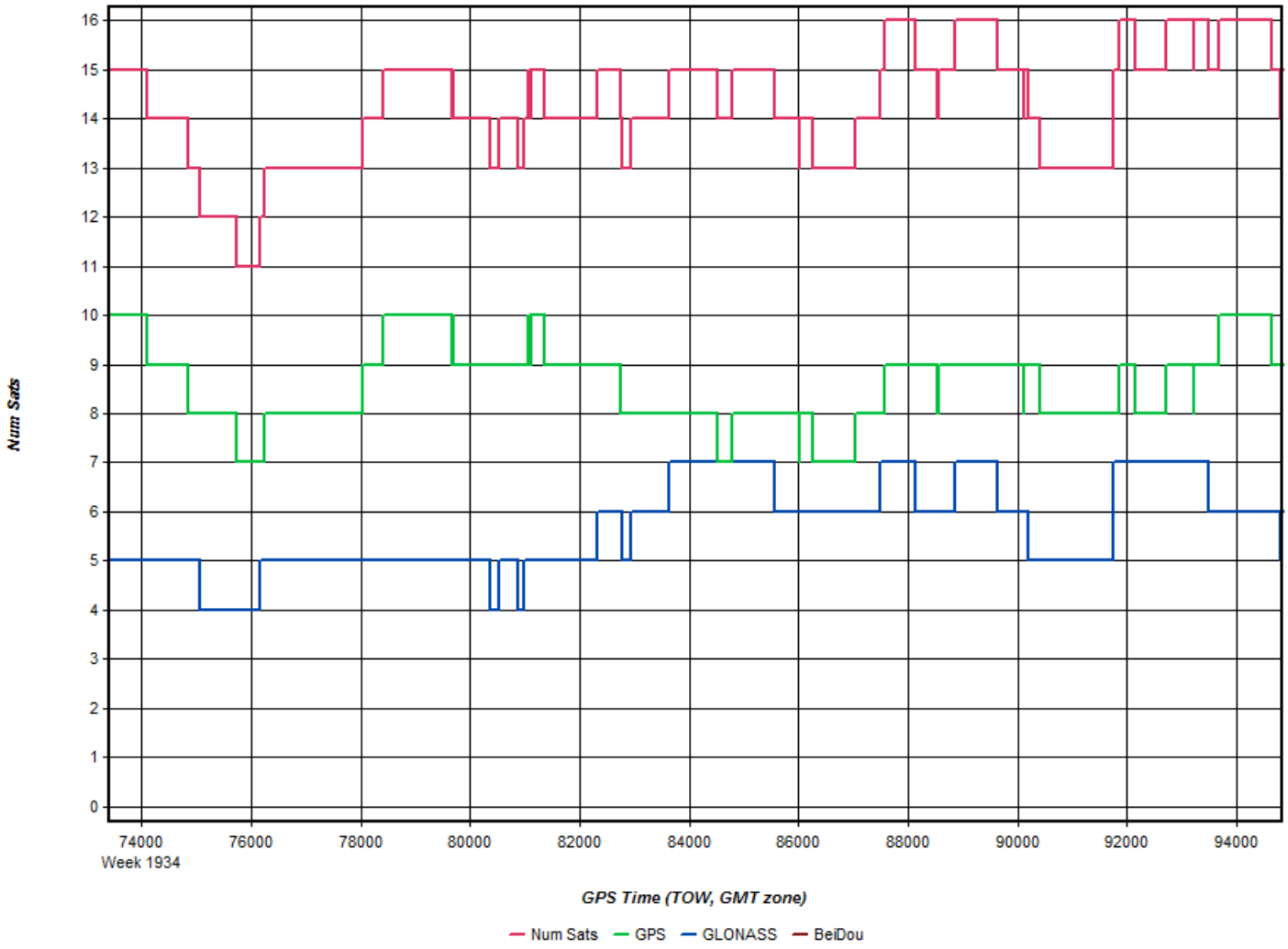

0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
-0.0020
-0.0025
-0.0030
Separation (m)
43500
Week 1934
44000
44500
45000
45500
46000
46500
47000
47500
48000
GPS Time (TOW, GMT zone)
East
North
Up

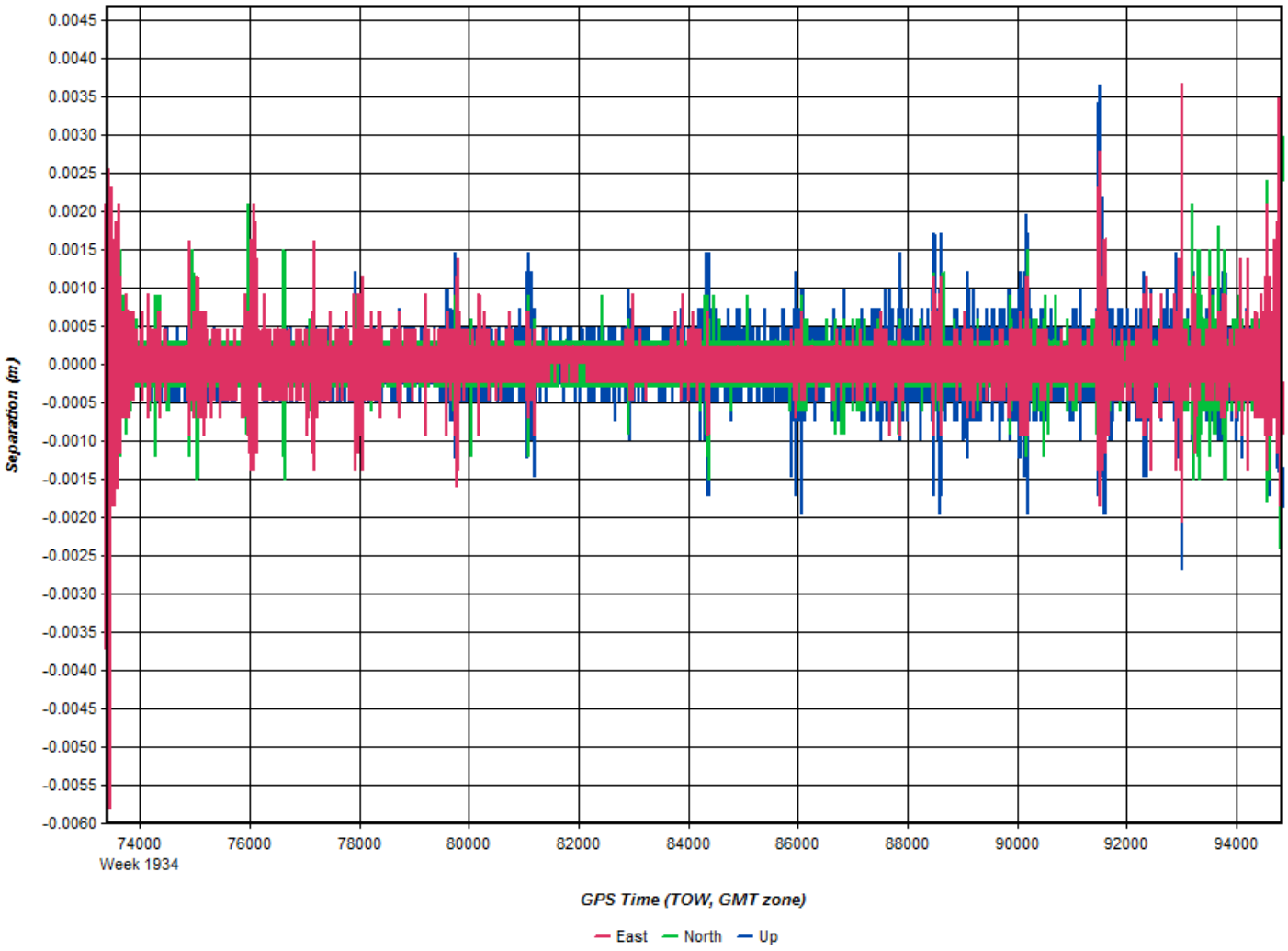

PDOP
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
43500
Week 1934
44000
44500
45000
45500
46000
46500
47000
47500
48000
GPS Time (TOW, GMT zone)
PDOP

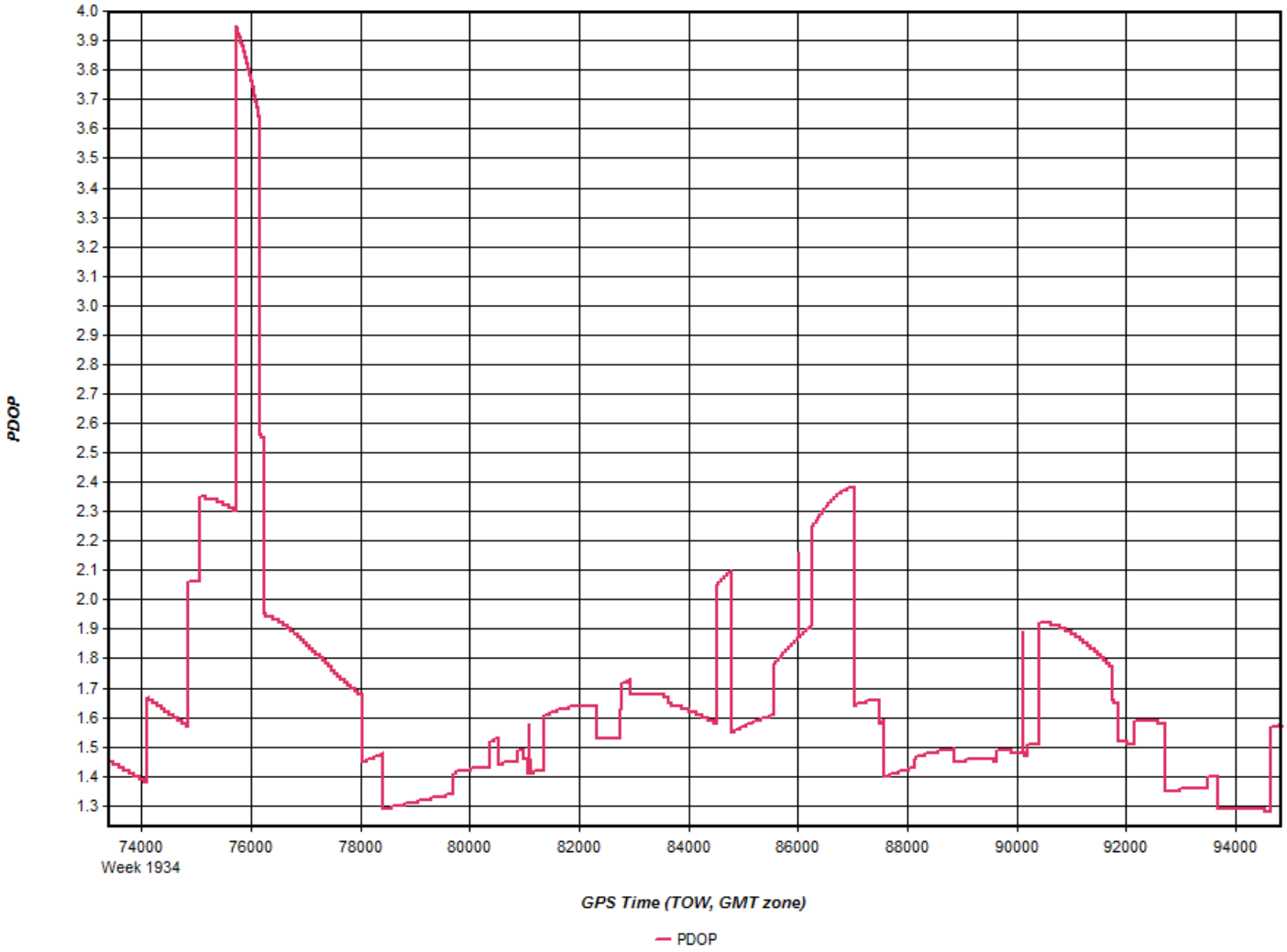
225_20170129_2



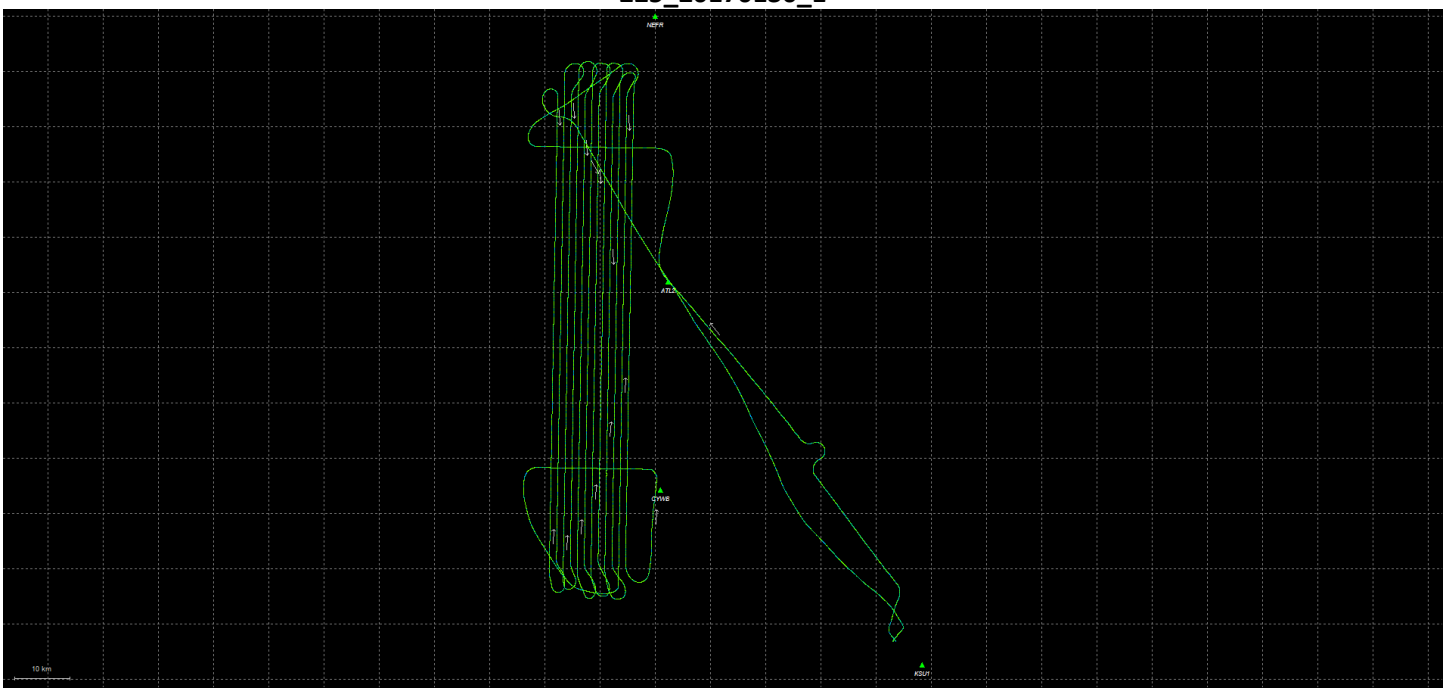

Estimated StdDev (m)
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
74000
Week 1934
76000
78000
80000
82000
84000
86000
88000
90000
92000
94000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

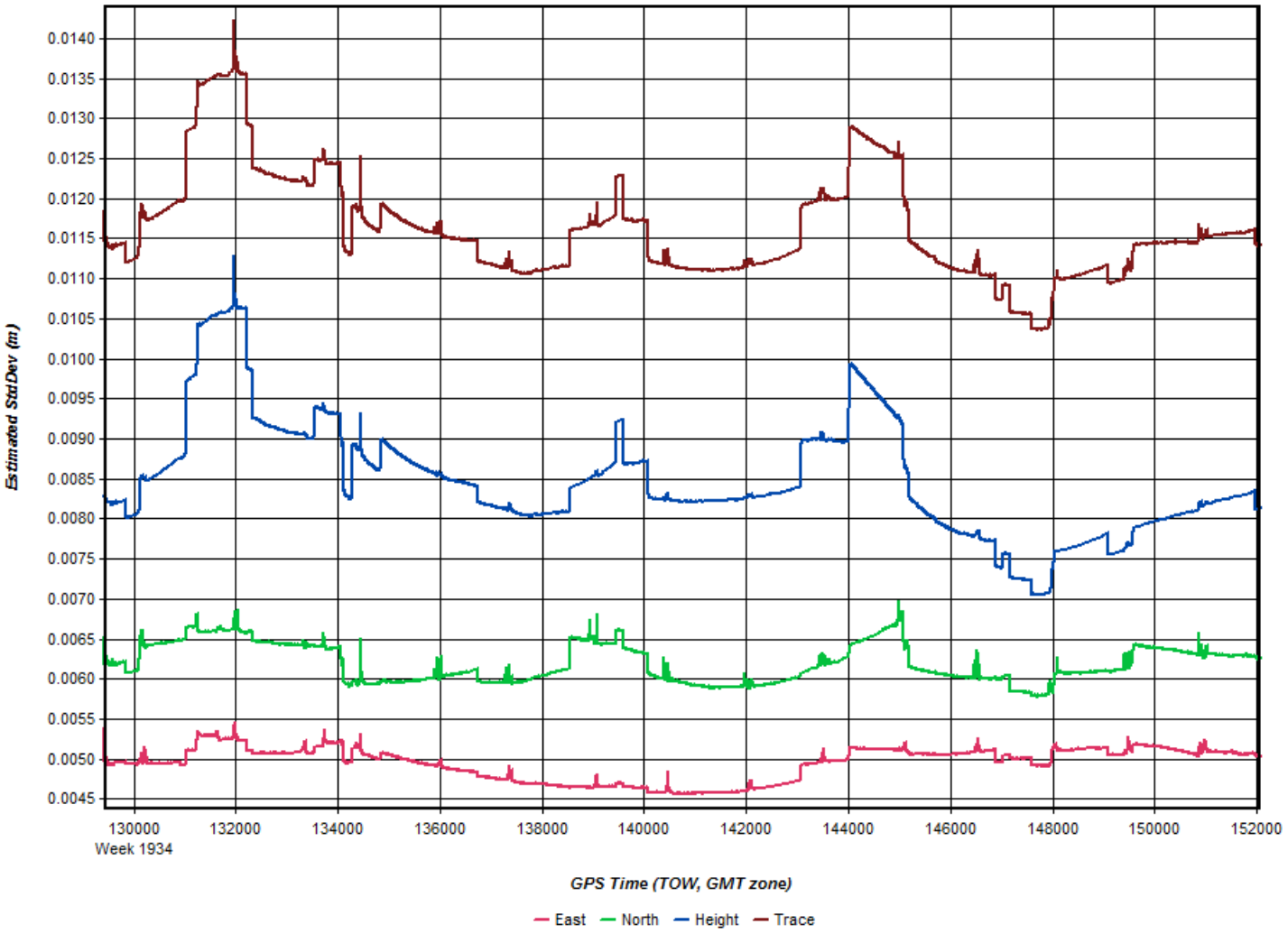

Num Sats
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
74000
Week 1934
76000
78000
80000
82000
84000
86000
88000
90000
92000
94000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

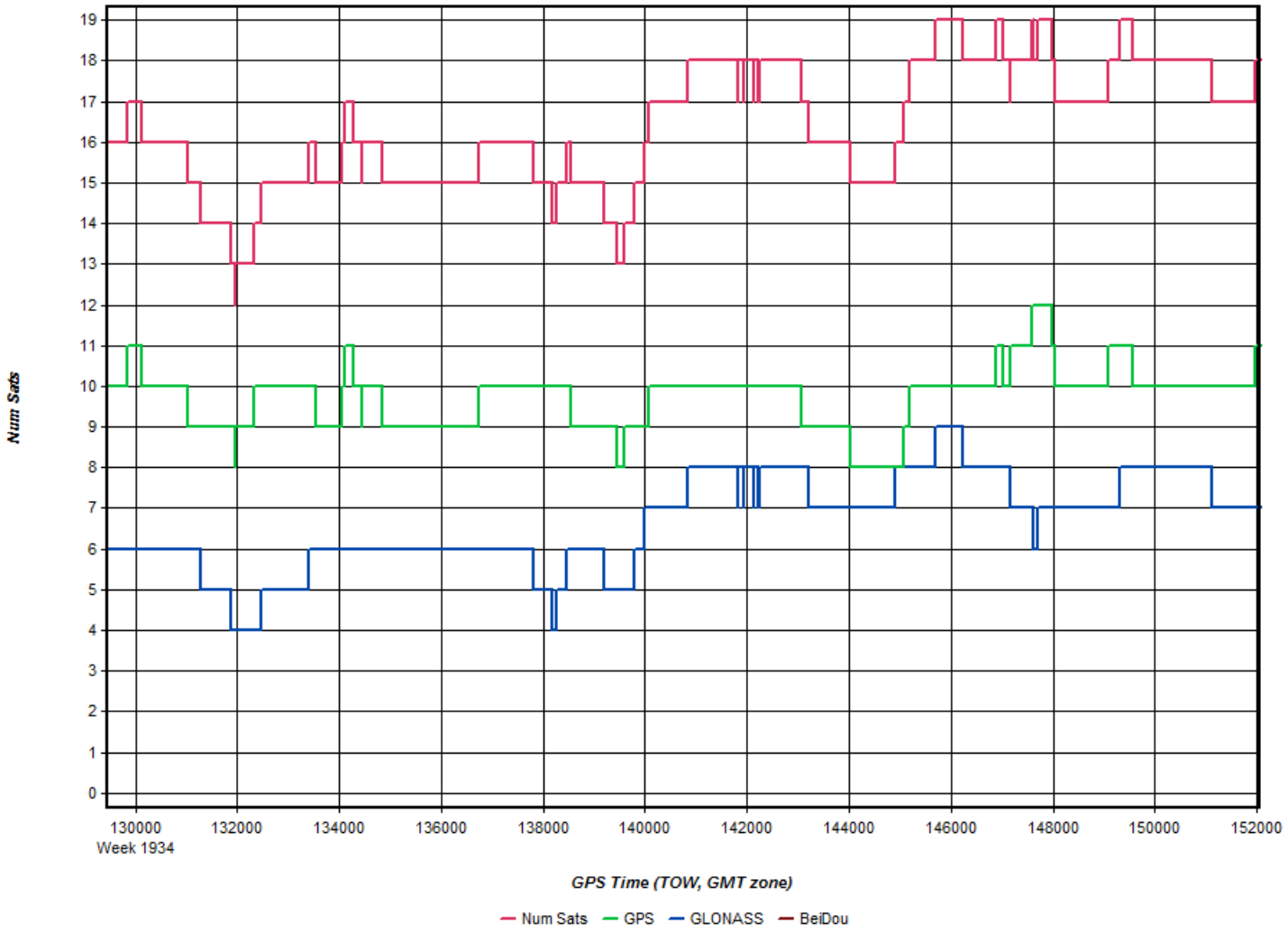

0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
-0.0020
-0.0025
-0.0030
-0.0035
-0.0040
-0.0045
-0.0050
-0.0055
-0.0060
Separation (m)
74000
Week 1934
76000
78000
80000
82000
84000
86000
88000
90000
92000
94000
GPS Time (TOW, GMT zone)
East
North
Up

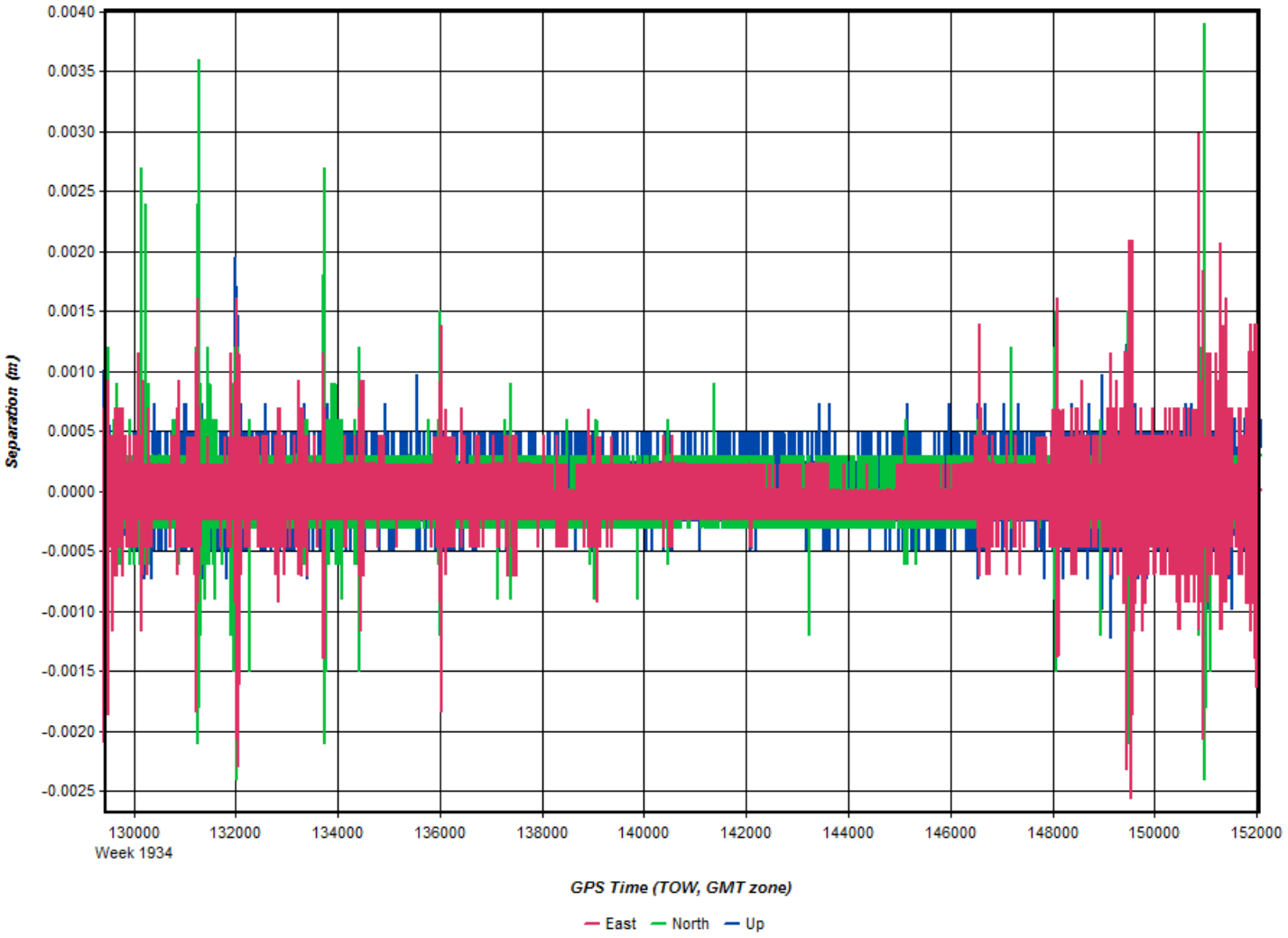

PDOP
4.0
3.9
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
74000
Week 1934
76000
78000
80000
82000
84000
86000
88000
90000
92000
94000
GPS Time (TOW, GMT zone)
PDOP

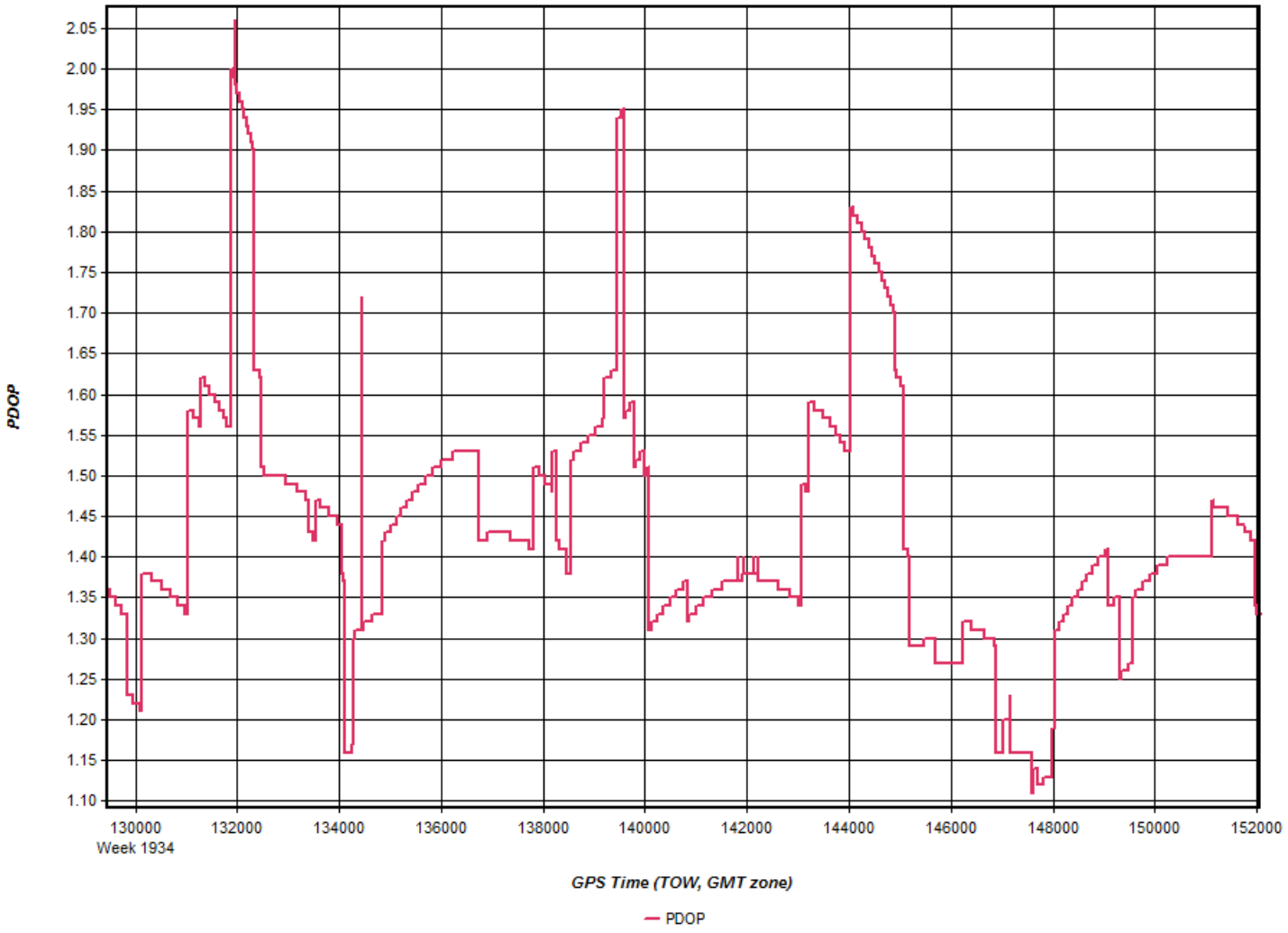
225_20170130_1



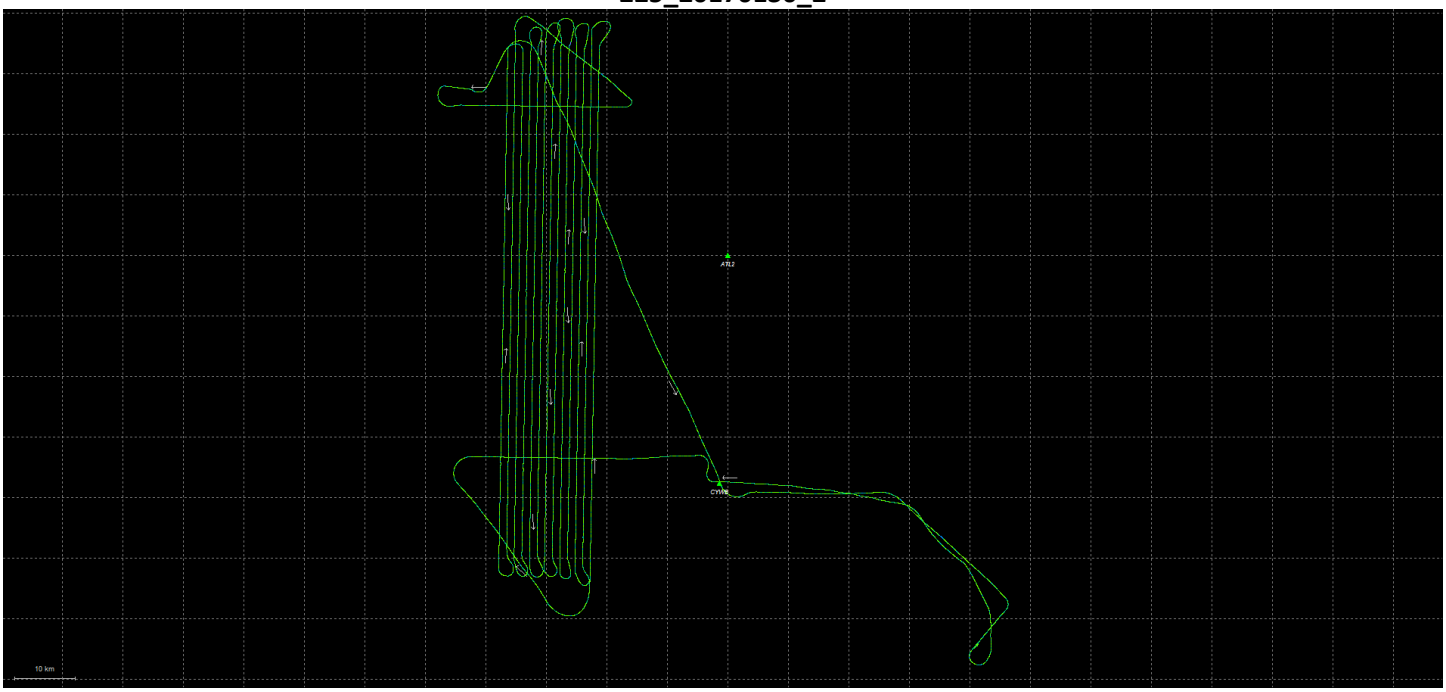

Estimated StdDev (m)
0.0140
0.0135
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
130000
Week 1934
132000
134000
136000
138000
140000
142000
144000
146000
148000
150000
152000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

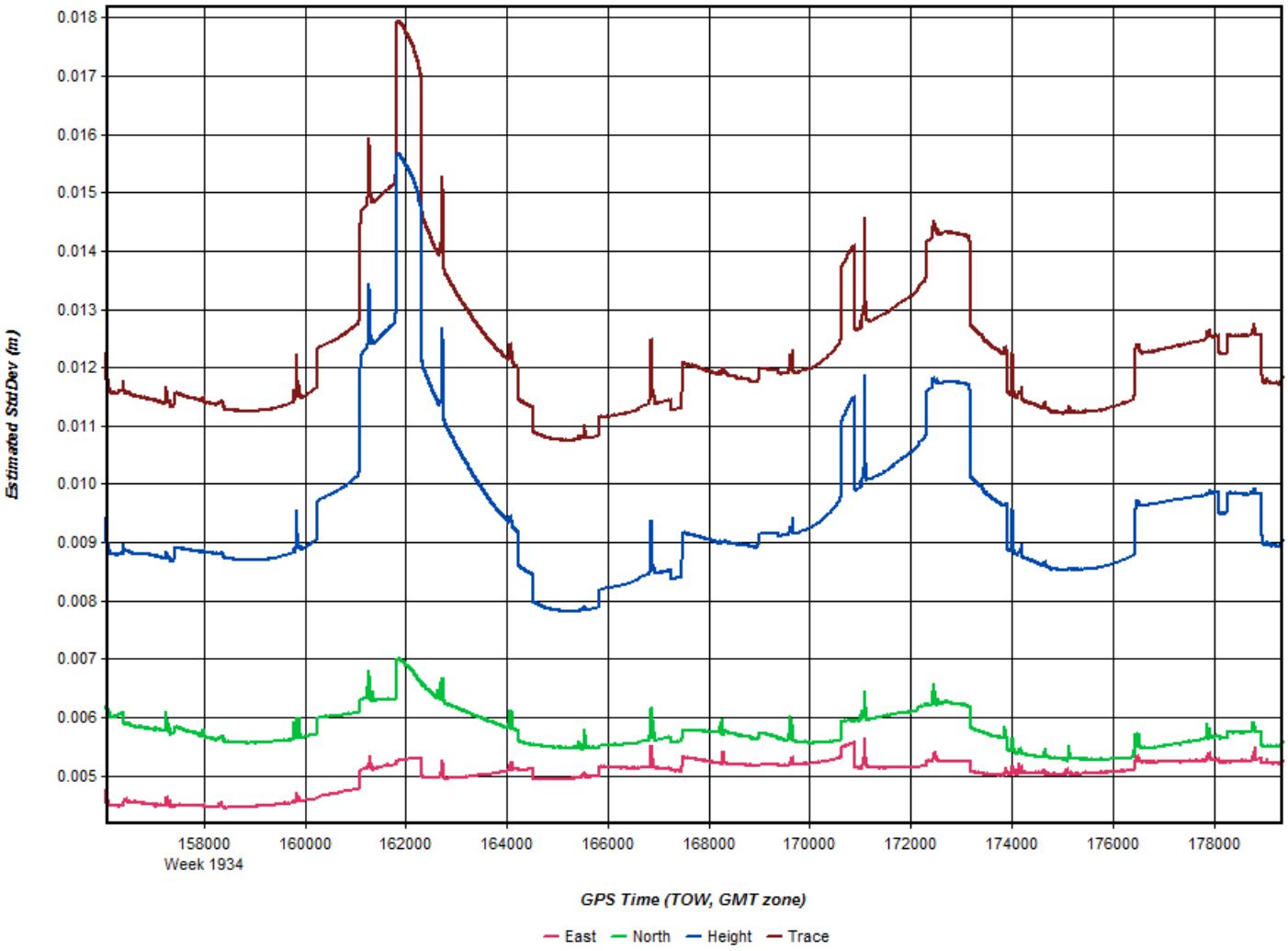

Num Sats
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
130000
Week 1934
132000
134000
136000
138000
140000
142000
144000
146000
148000
150000
152000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

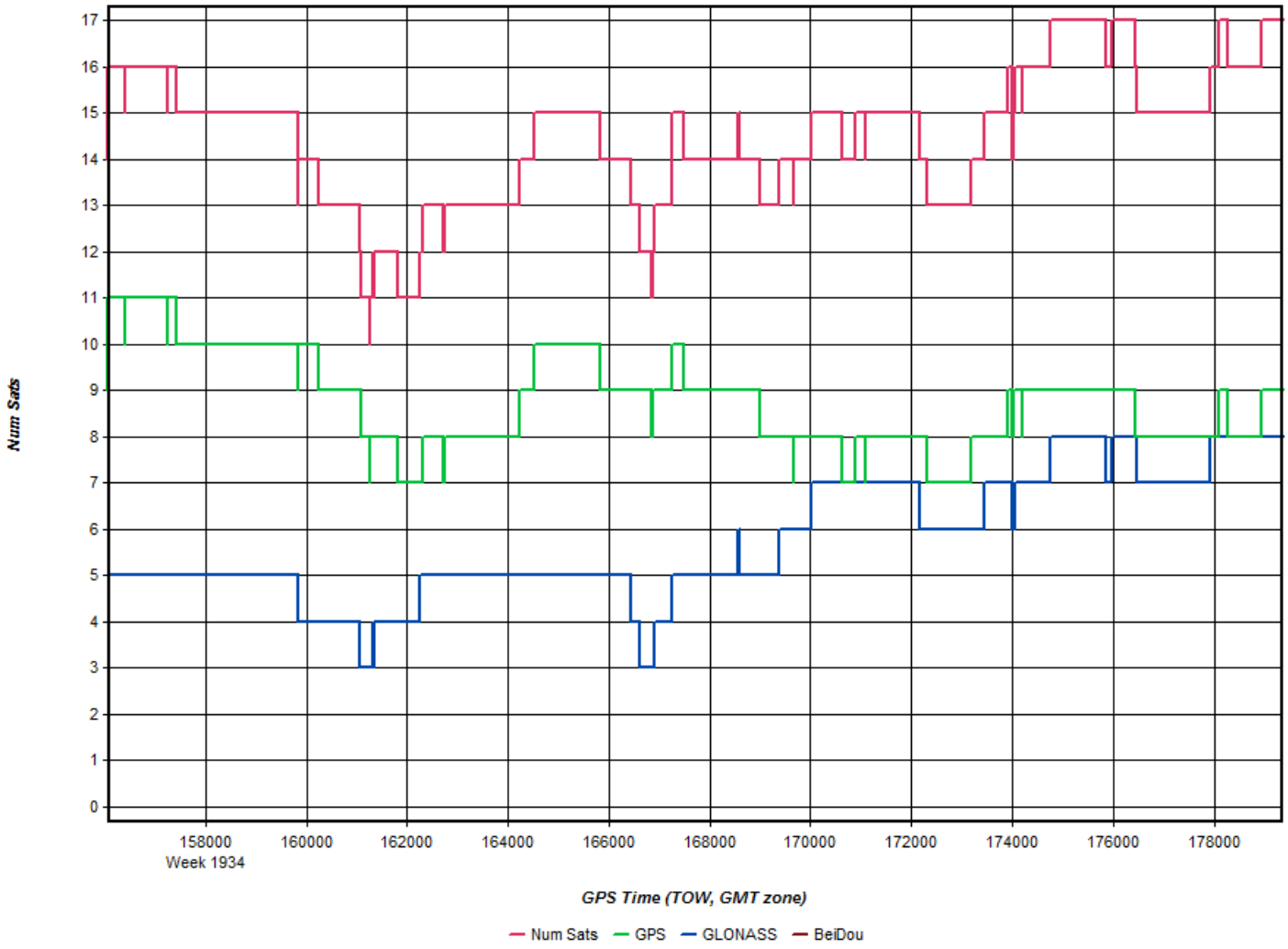

0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
-0.0020
-0.0025
Separation (m)
130000
Week 1934
132000
134000
136000
138000
140000
142000
144000
146000
148000
150000
152000
GPS Time (TOW, GMT zone)
East
North
Up

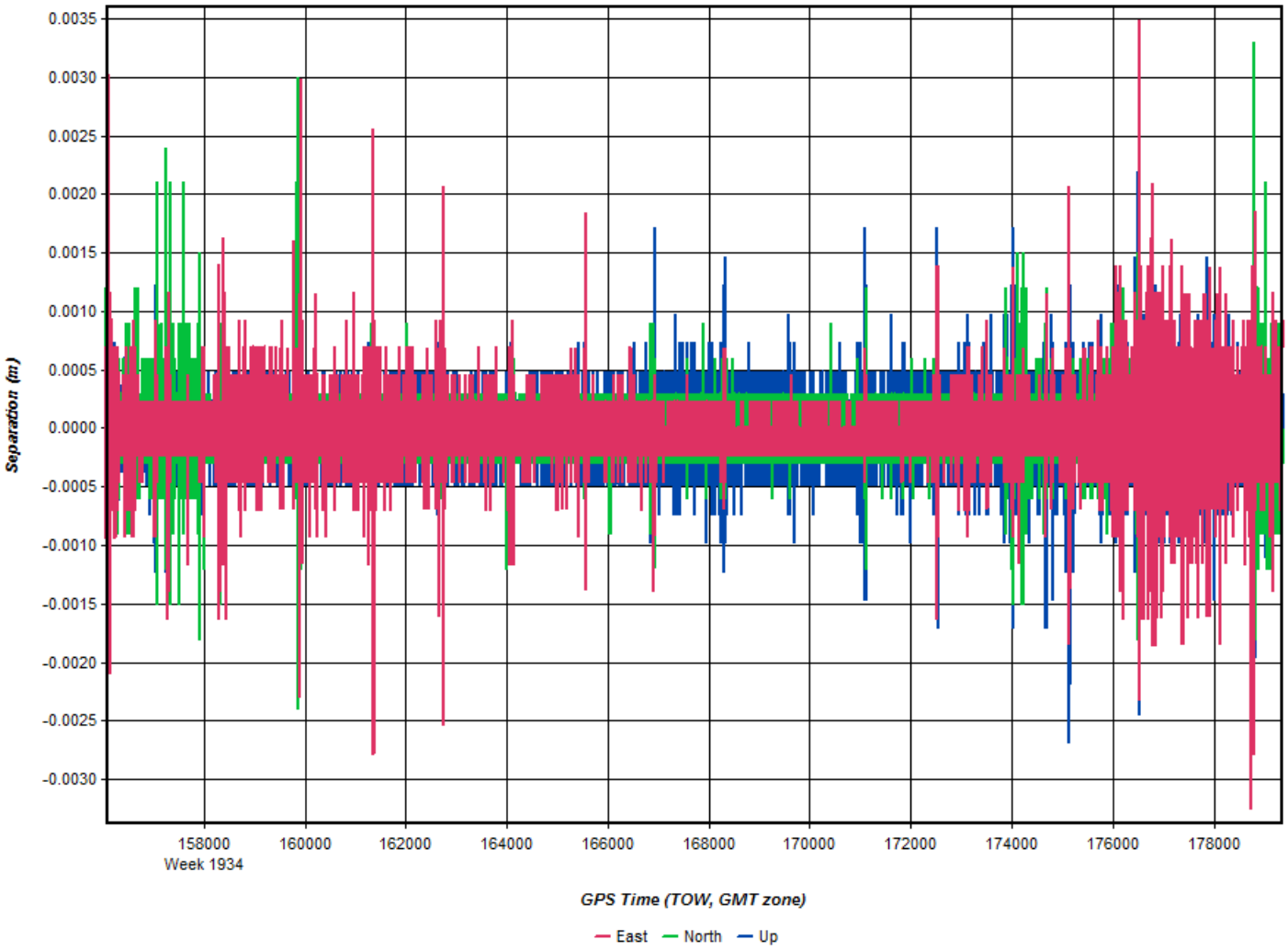

PDOP
2.05
2.00
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
130000
Week 1934
132000
134000
136000
138000
140000
142000
144000
146000
148000
150000
152000
GPS Time (TOW, GMT zone)
PDOP

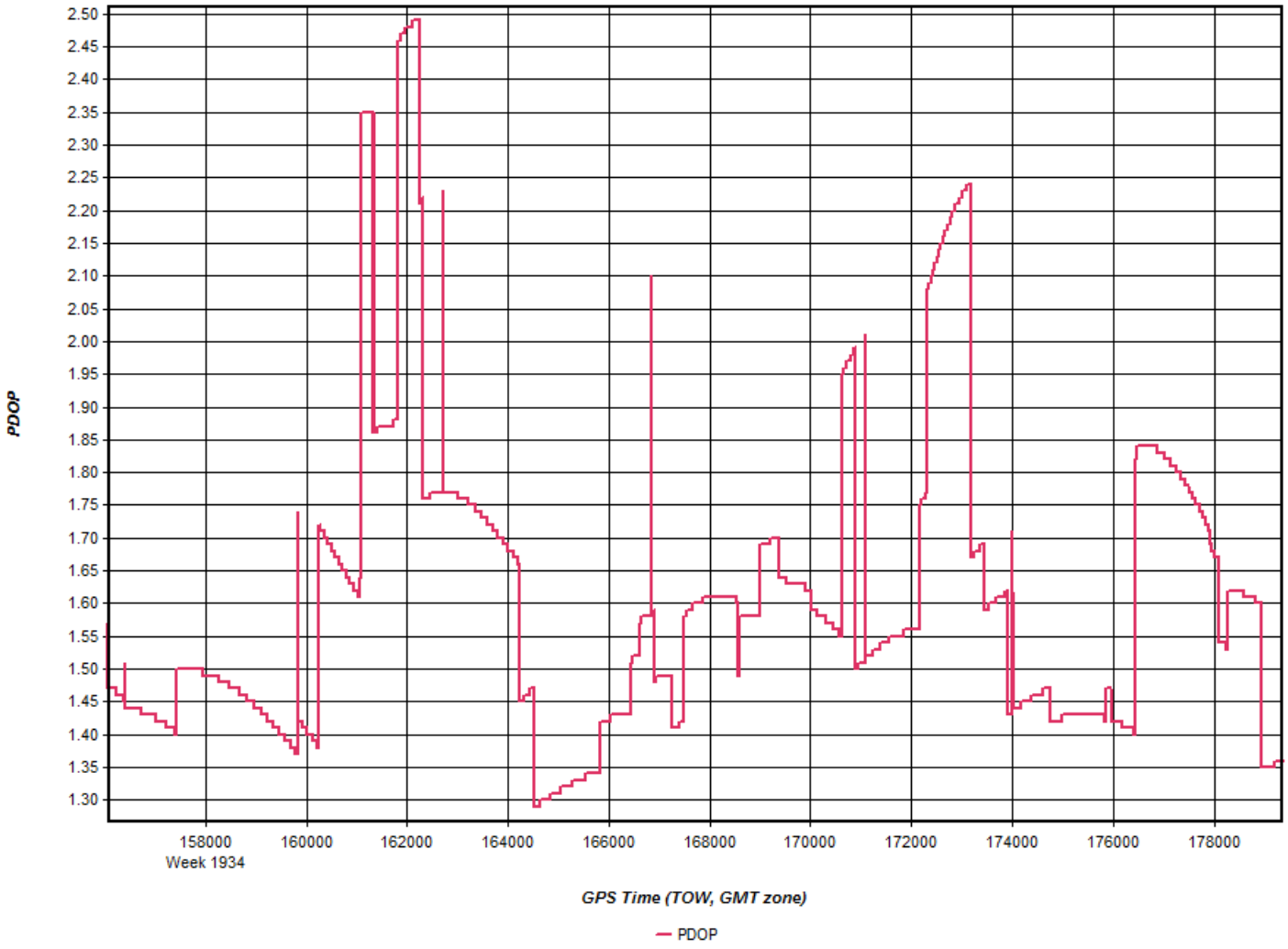
225_20170130_2



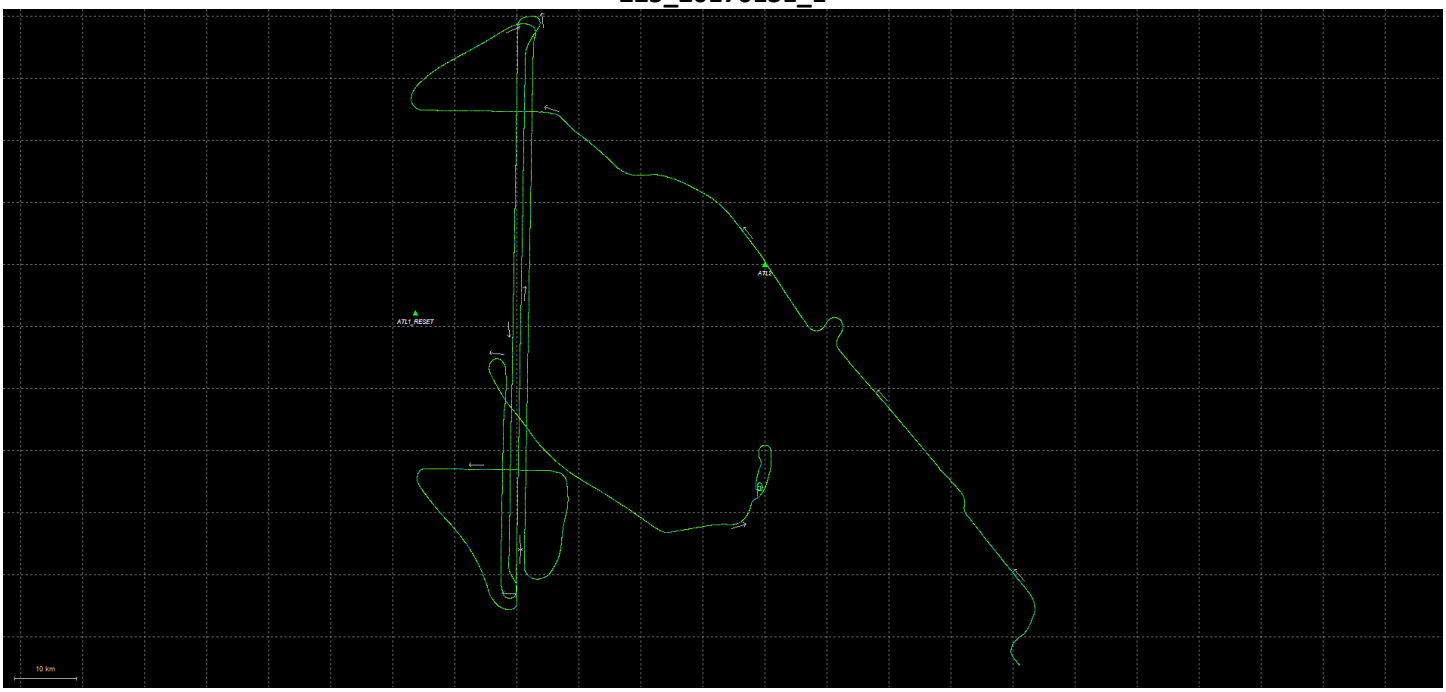

Estimated StdDev (m)
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
158000
Week 1934
160000
162000
164000
166000
168000
170000
172000
174000
176000
178000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

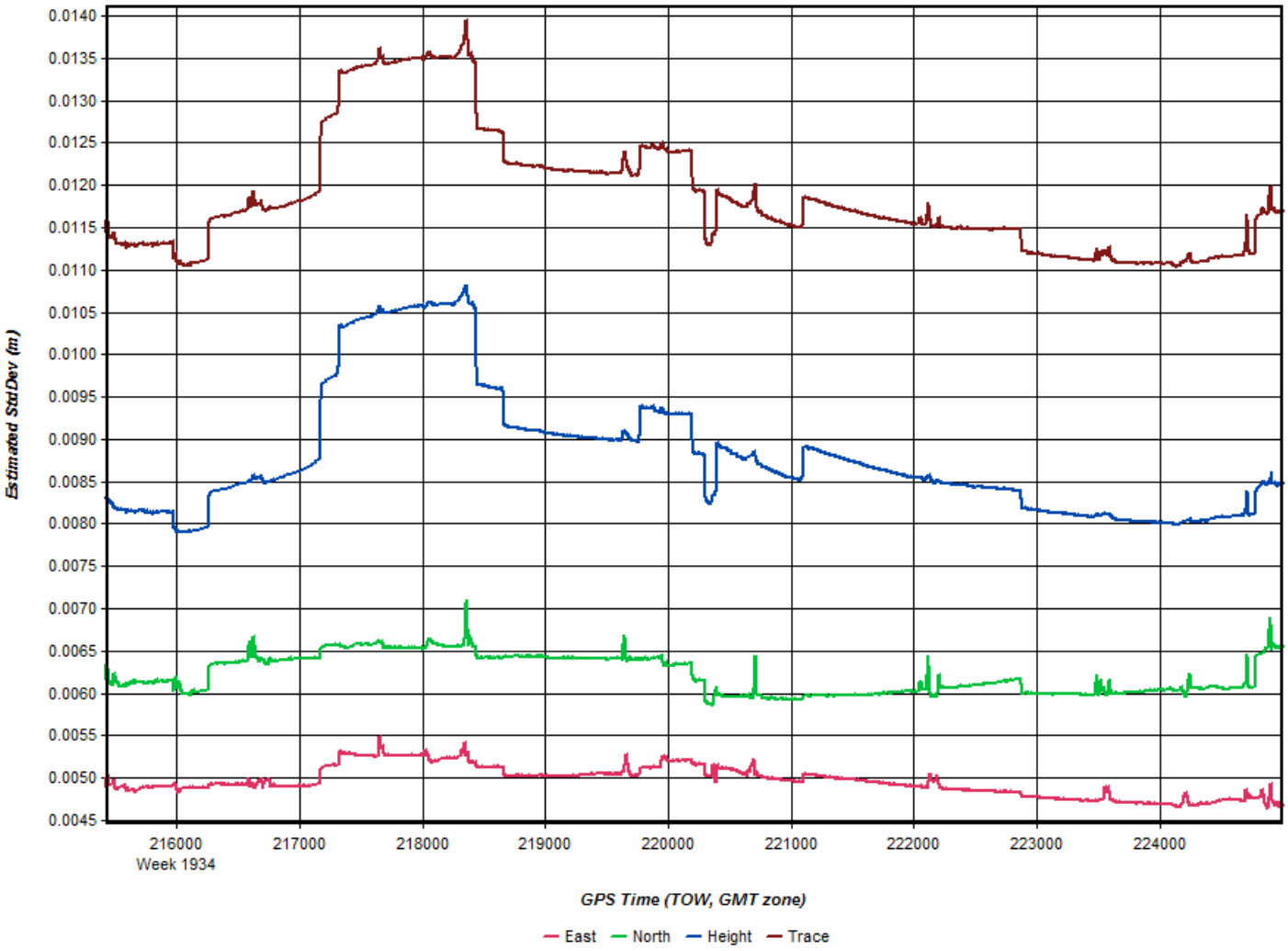

Num Sats
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
158000
Week 1934
160000
162000
164000
166000
168000
170000
172000
174000
176000
178000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

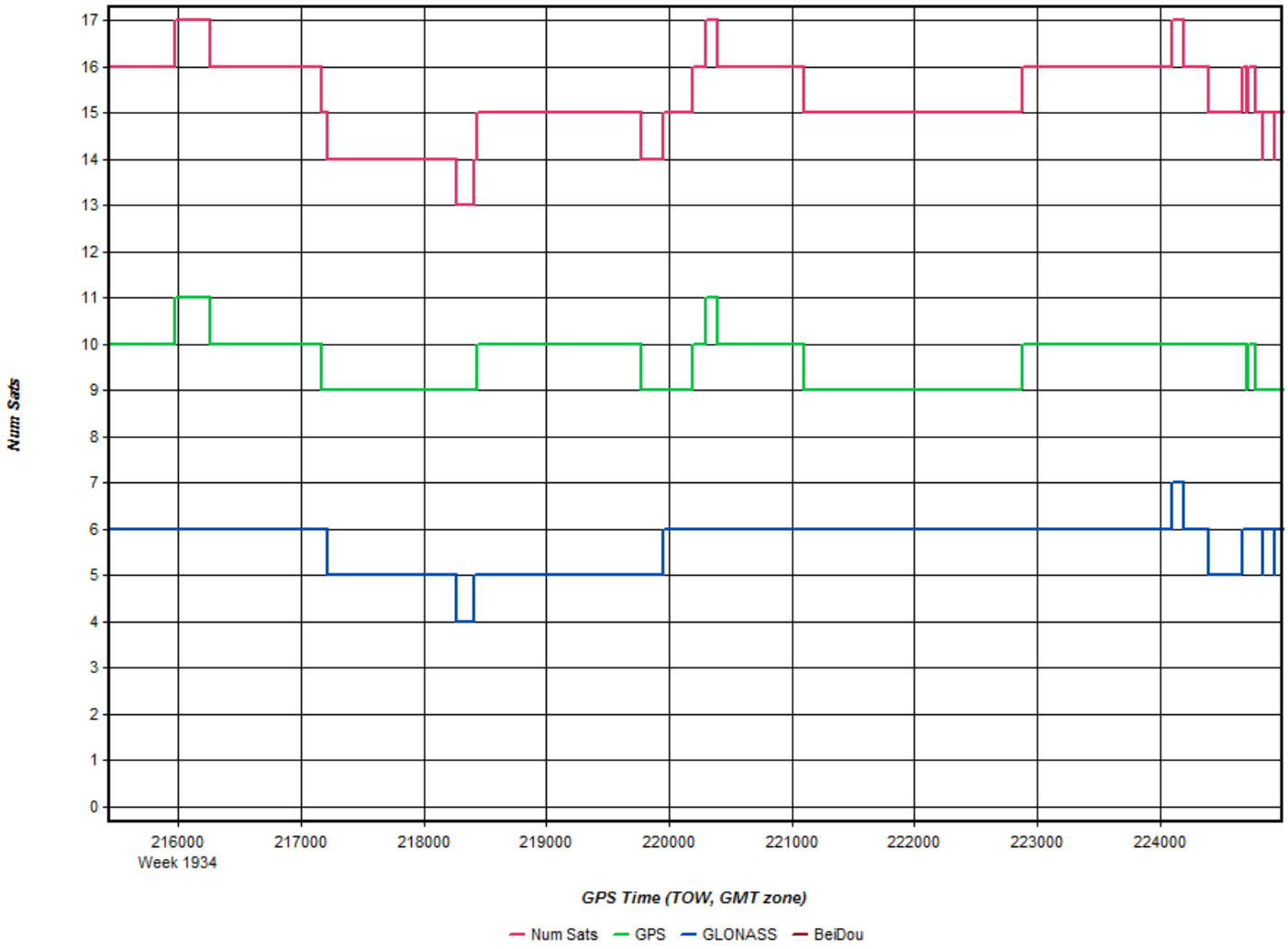

0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
-0.0020
-0.0025
-0.0030
Separation (m)
158000
Week 1934
160000
162000
164000
166000
168000
170000
172000
174000
176000
178000
GPS Time (TOW, GMT zone)
East
North
Up

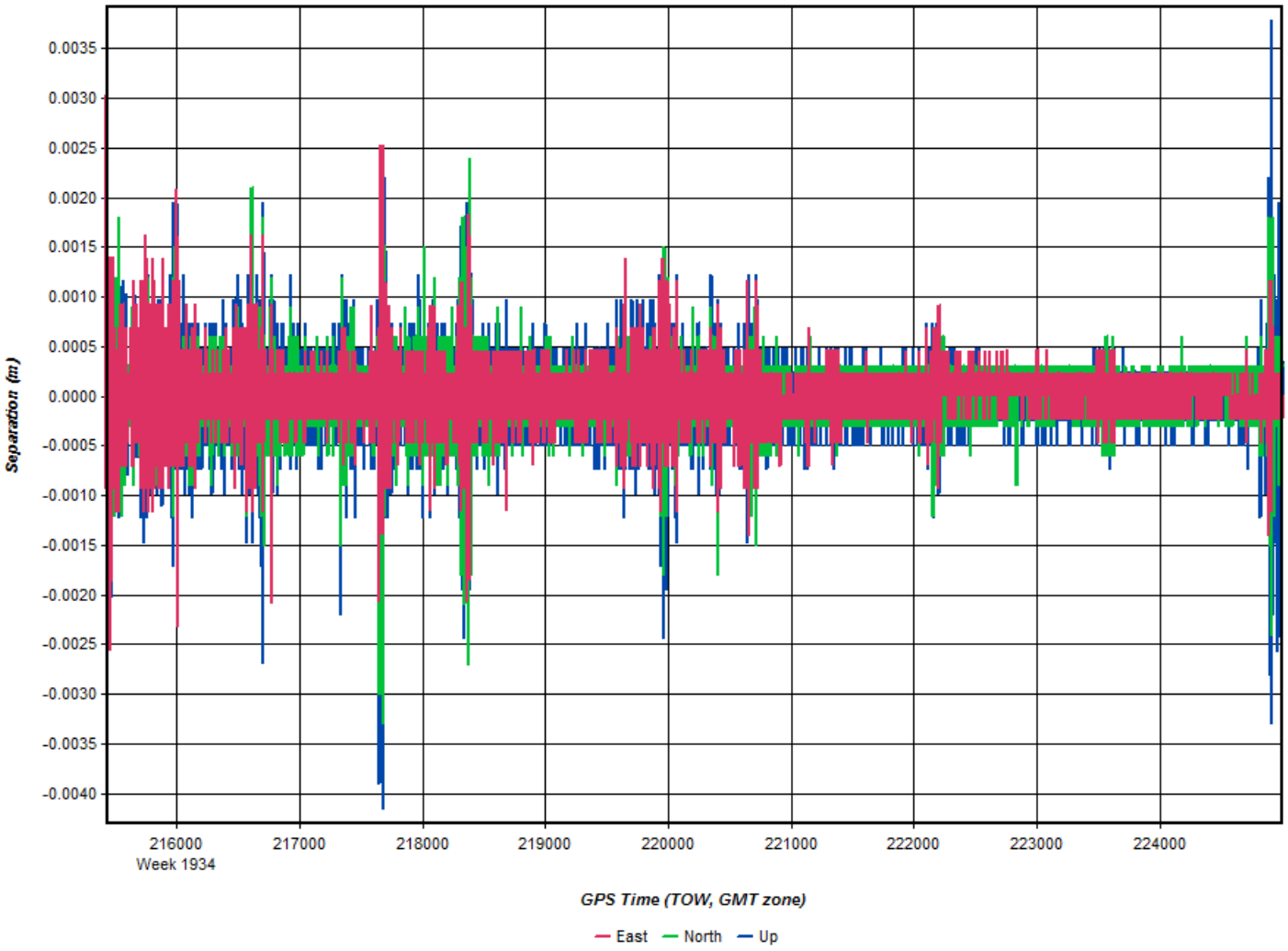

PDOP
2.50
2.45
2.40
2.35
2.30
2.25
2.20
2.15
2.10
2.05
2.00
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
158000
Week 1934
160000
162000
164000
166000
168000
170000
172000
174000
176000
178000
GPS Time (TOW, GMT zone)
PDOP

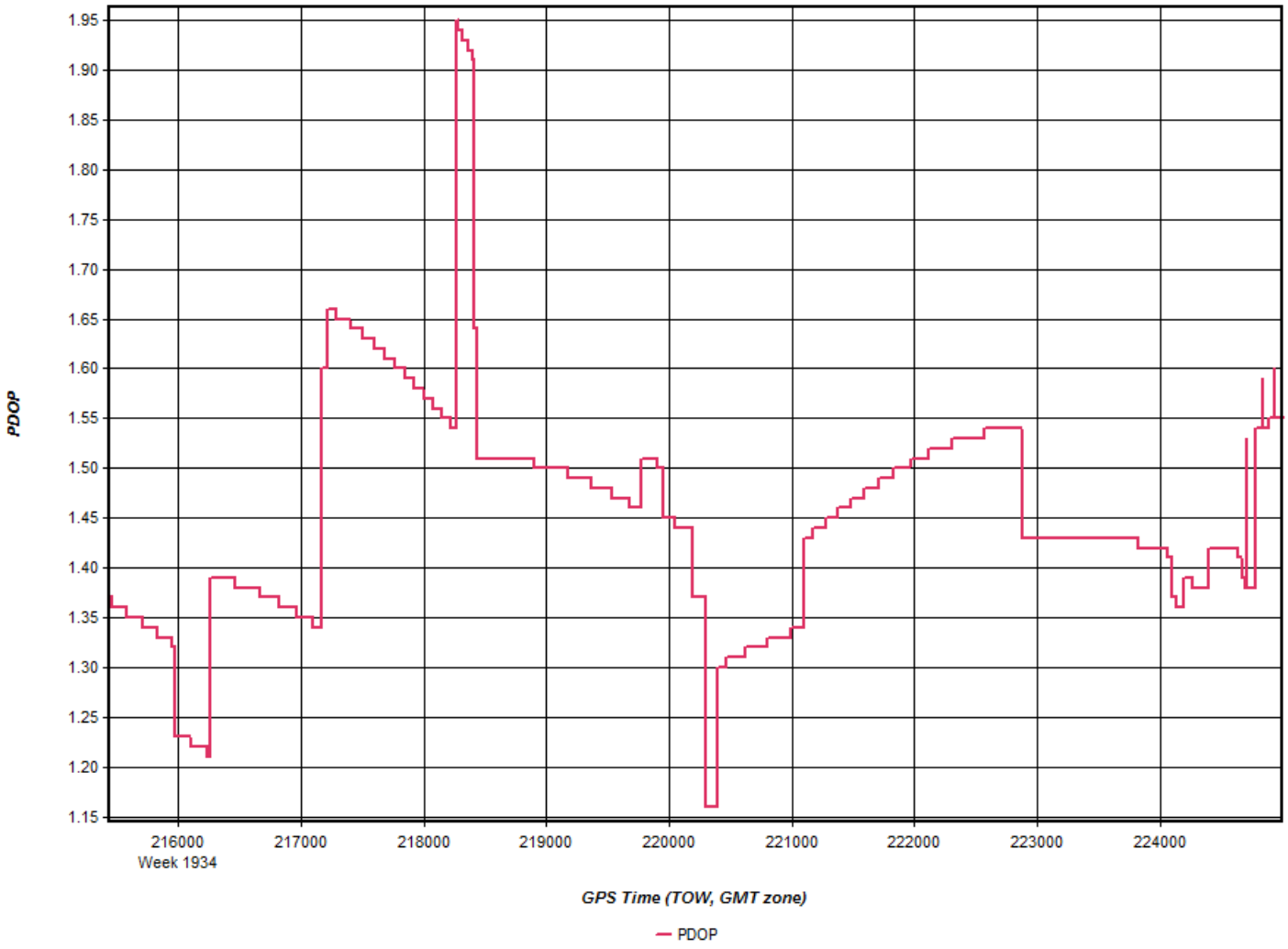
225_20170131_1



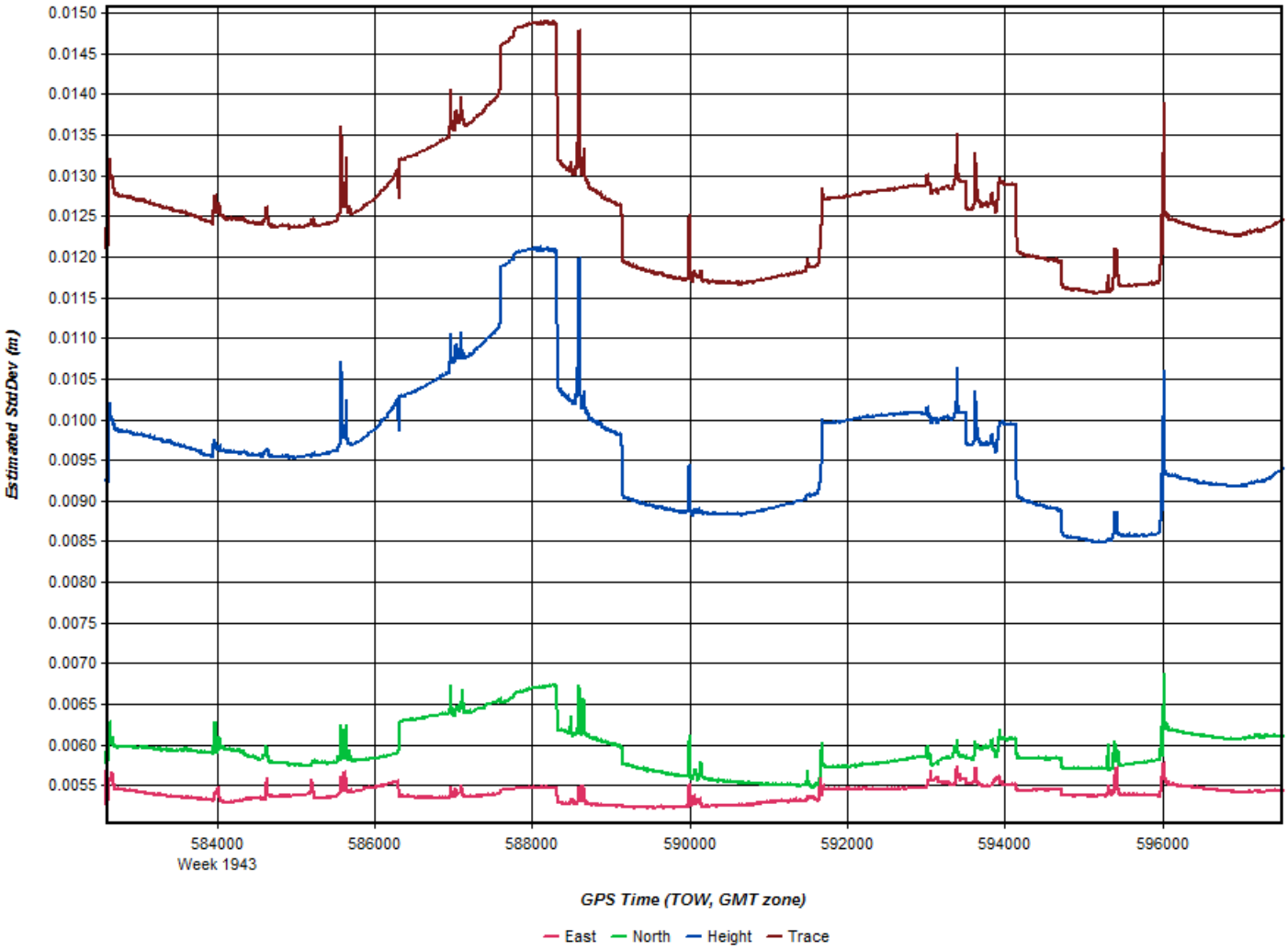

Estimated StdDev (m)
0.0140
0.0135
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
216000
Week 1934
217000
218000
219000
220000
221000
222000
223000
224000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

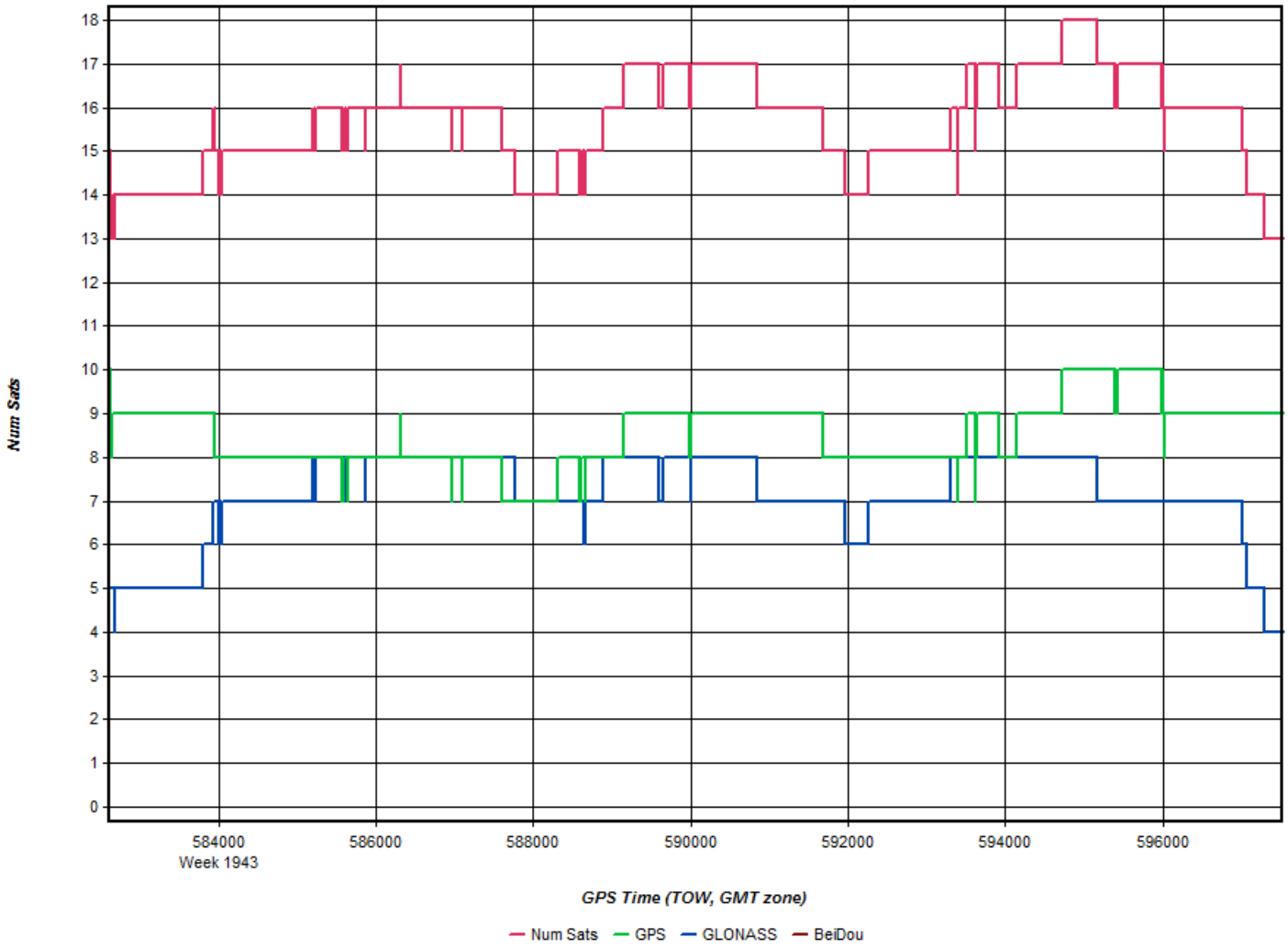

Num Sats
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
216000
Week 1934
217000
218000
219000
220000
221000
222000
223000
224000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

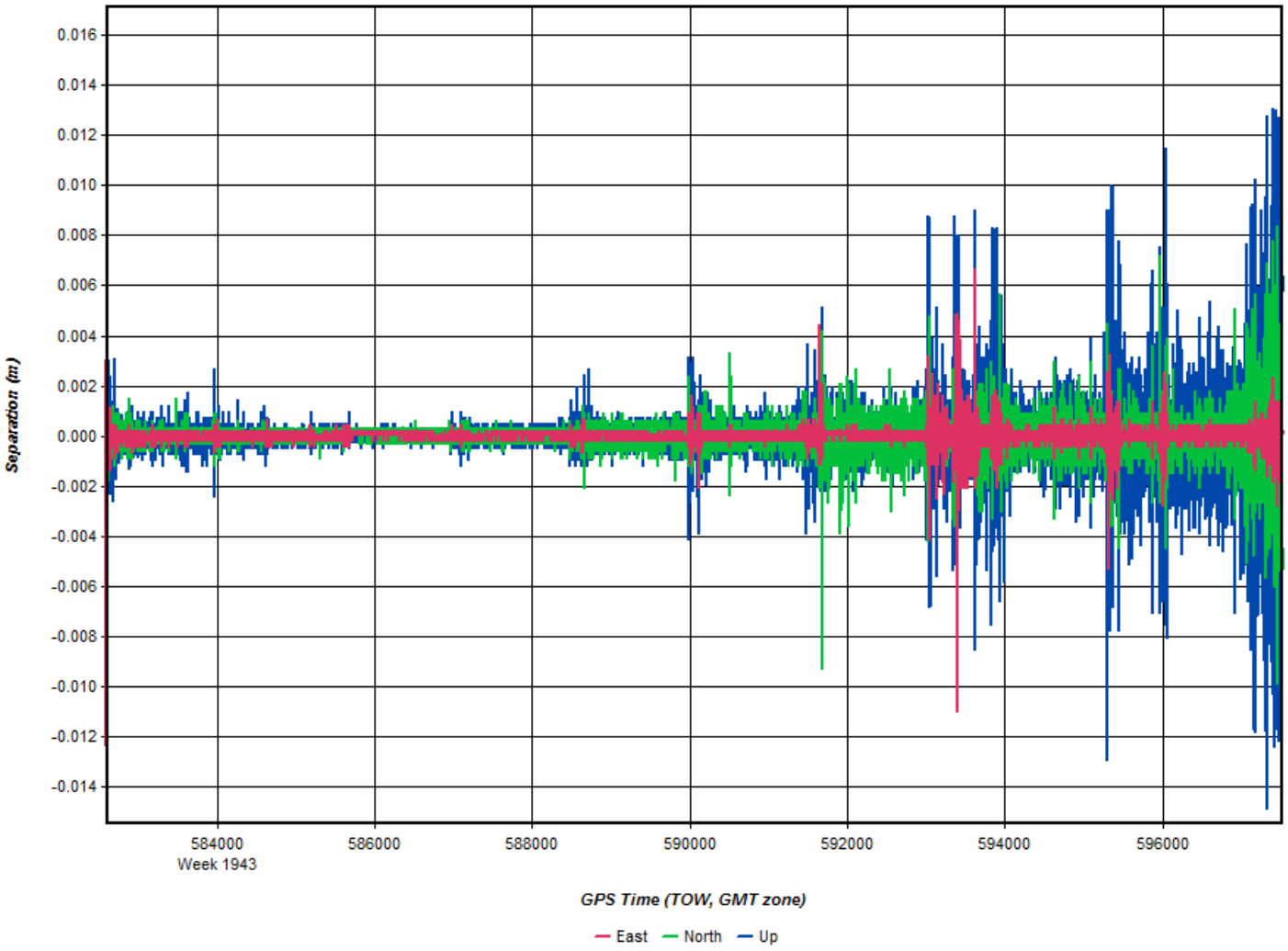

0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
-0.0020
-0.0025
-0.0030
-0.0035
-0.0040
Separation (m)
216000
Week 1934
217000
218000
219000
220000
221000
222000
223000
224000
GPS Time (TOW, GMT zone)
East
North
Up

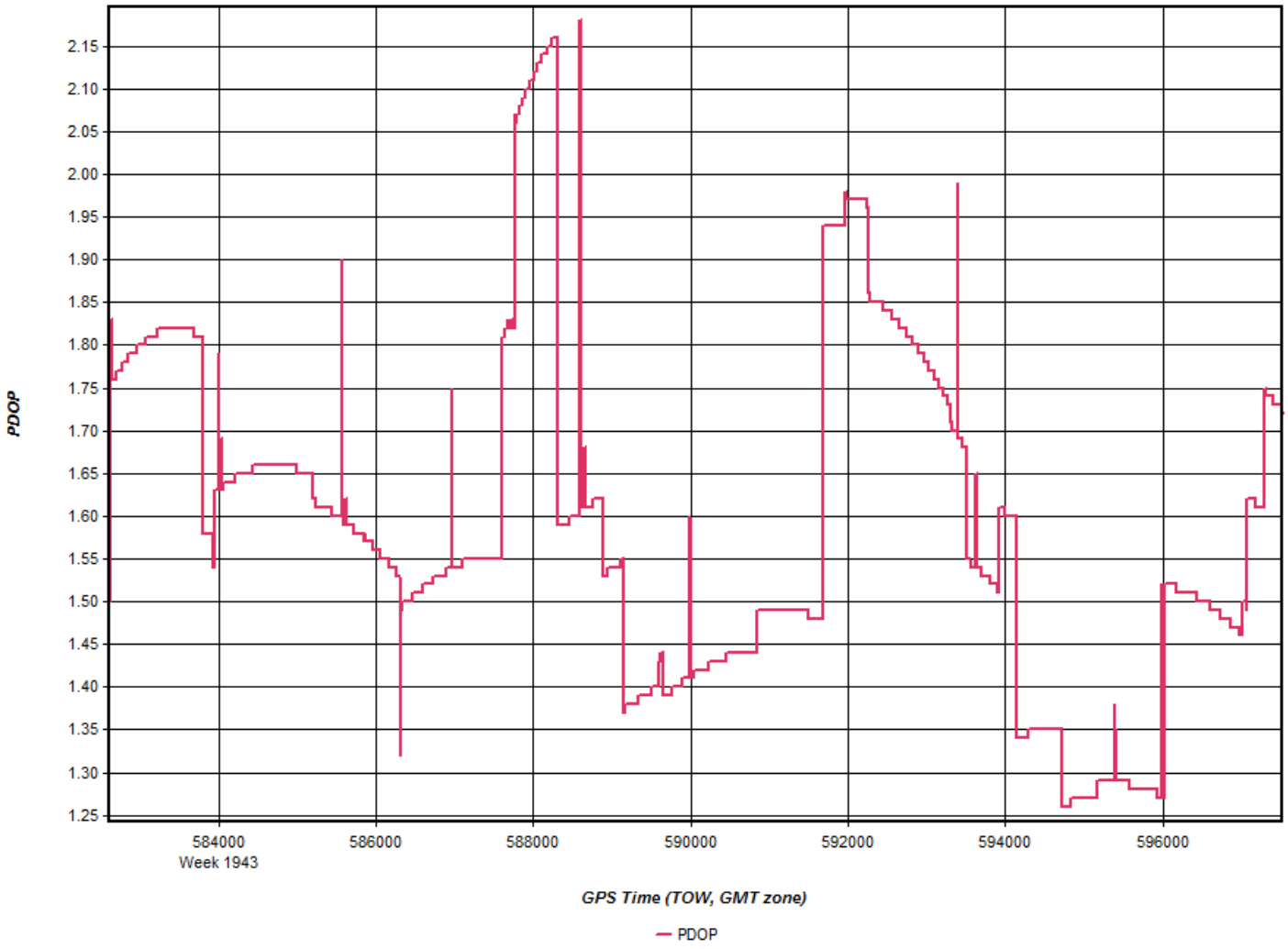

PDOP
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
216000
Week 1934
217000
218000
219000
220000
221000
222000
223000
224000
GPS Time (TOW, GMT zone)
PDOP

225_20170408_1

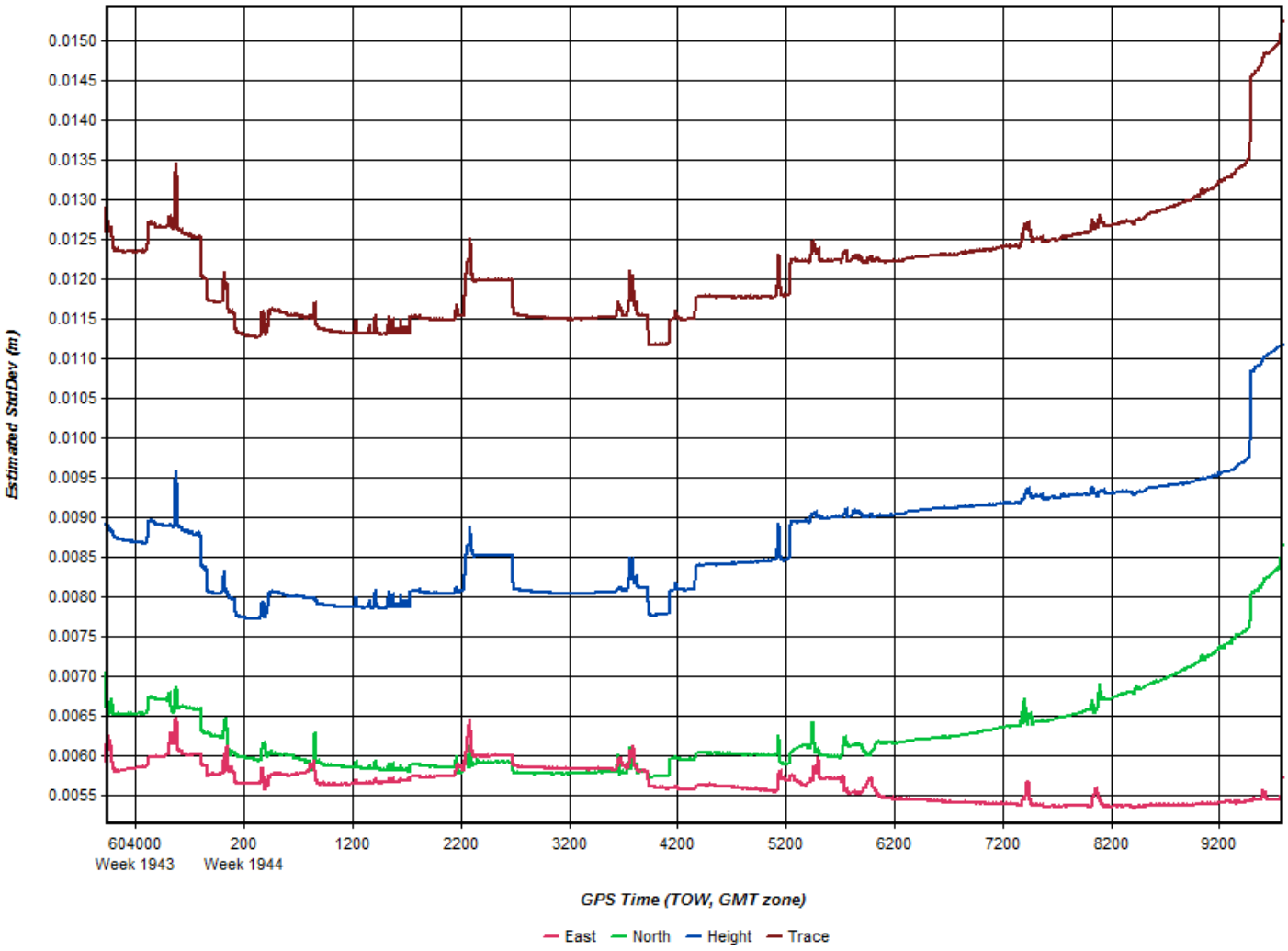

Estimated StdDev (m)
0.0150
0.0145
0.0140
0.0135
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
584000
Week 1943
586000
588000
590000
592000
594000
596000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

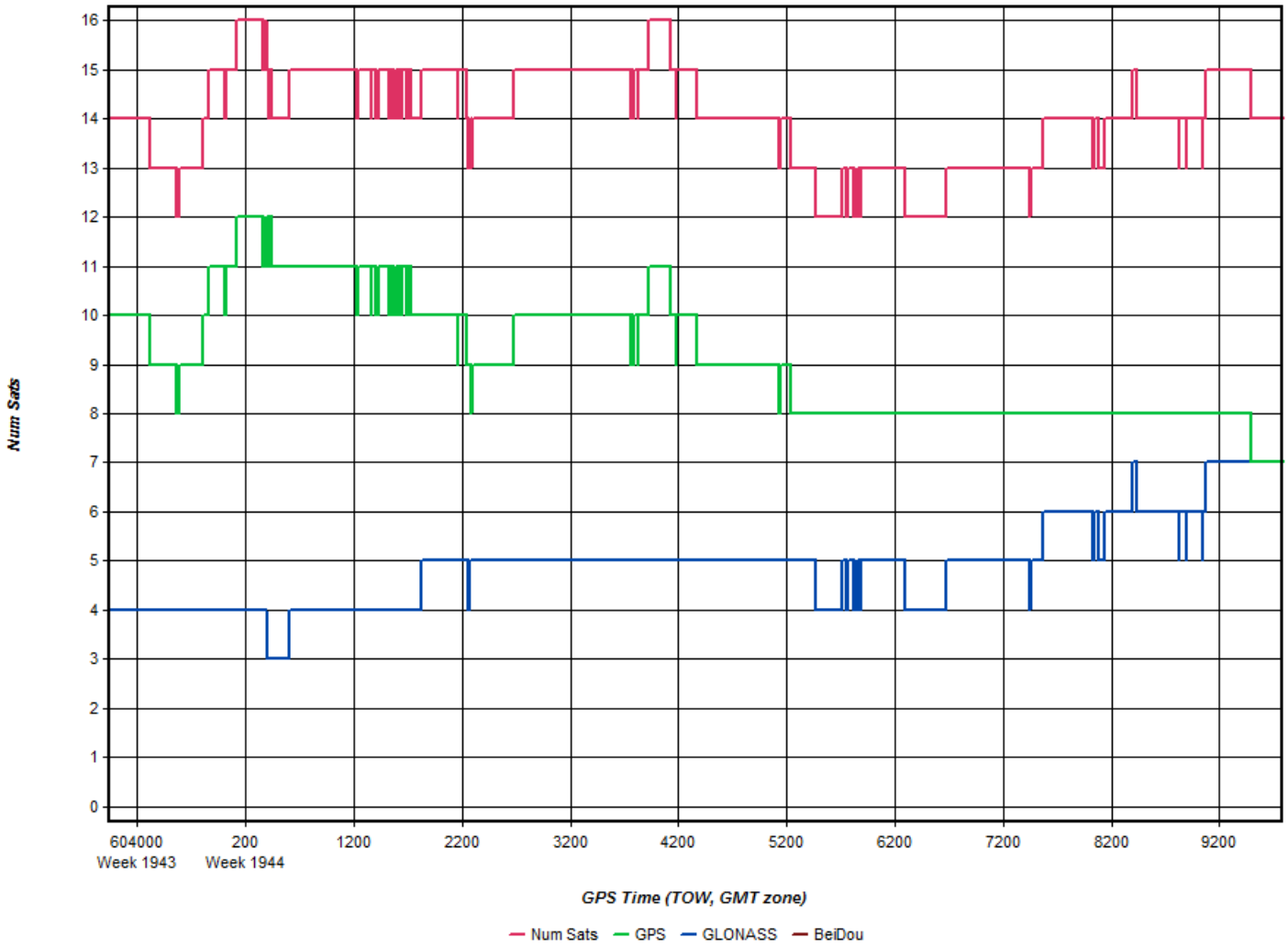

Num Sats
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
584000
Week 1943
586000
588000
590000
592000
594000
596000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

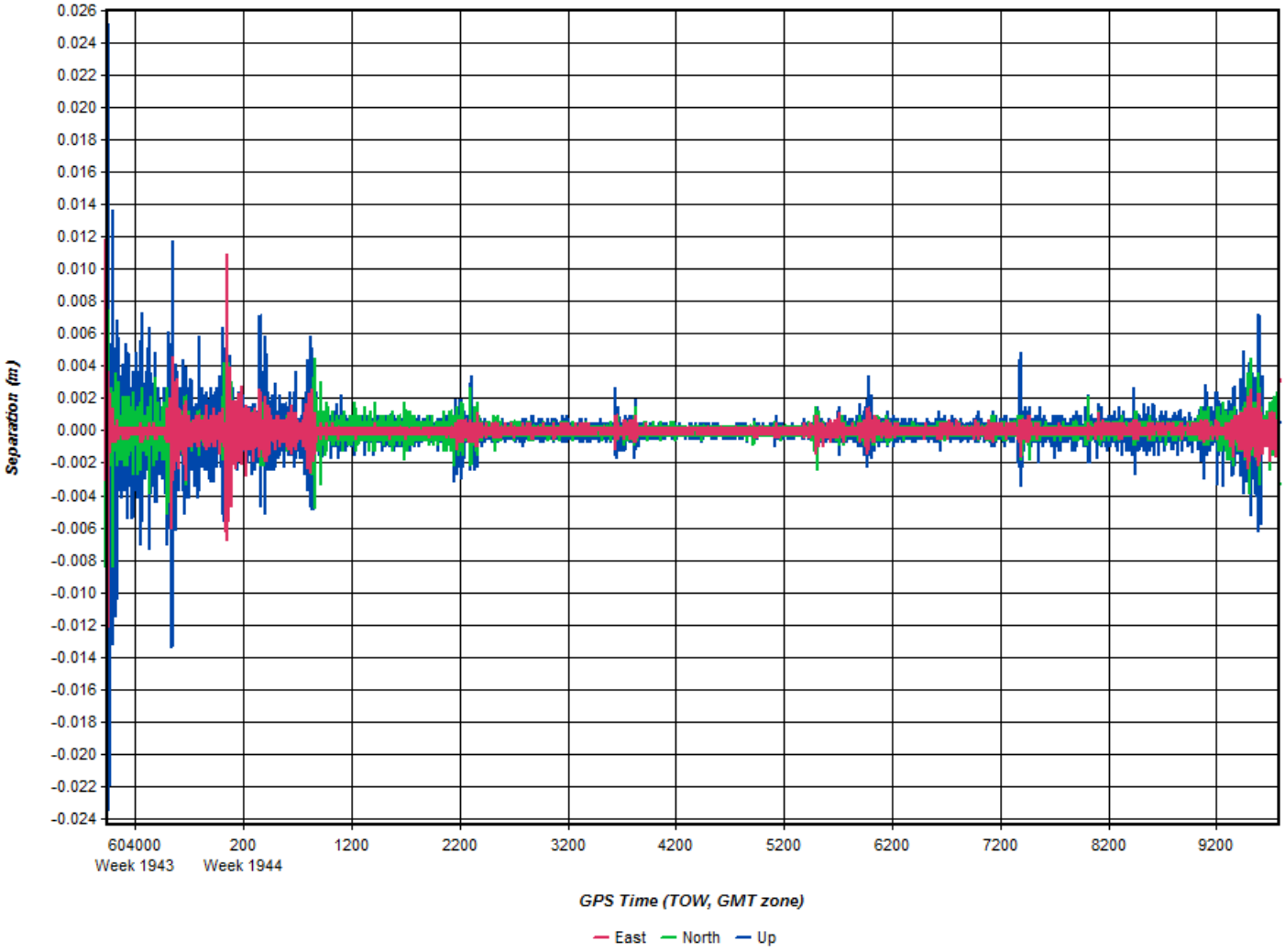

0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
-0.002
-0.004
-0.006
-0.008
-0.010
-0.012
-0.014
Separation (m)
584000
Week 1943
586000
588000
590000
592000
594000
596000
GPS Time (TOW, GMT zone)
East
North
Up

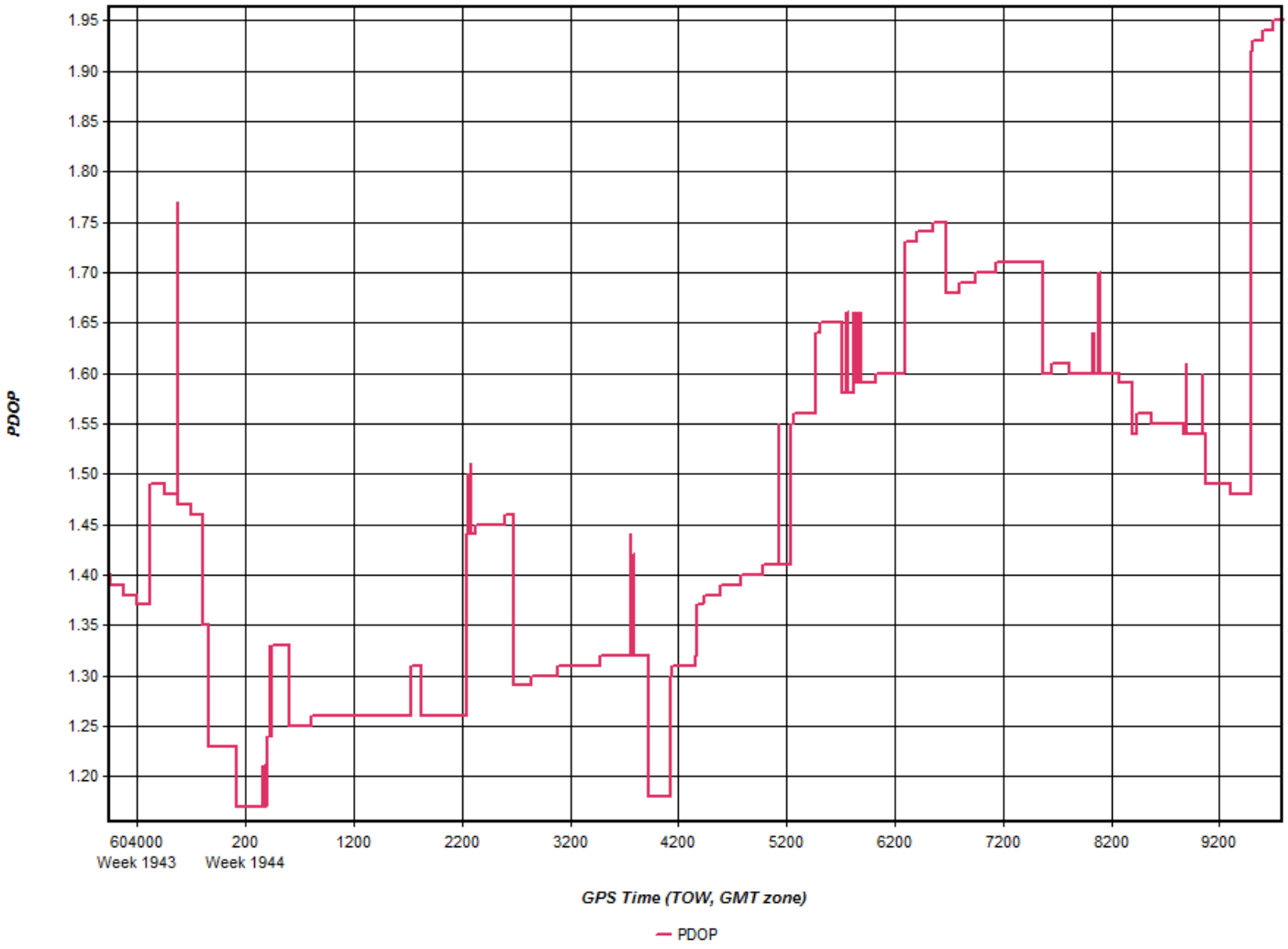

PDOP
2.15
2.10
2.05
2.00
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
584000
Week 1943
586000
588000
590000
592000
594000
596000
GPS Time (TOW, GMT zone)
PDOP

225_20170408_2

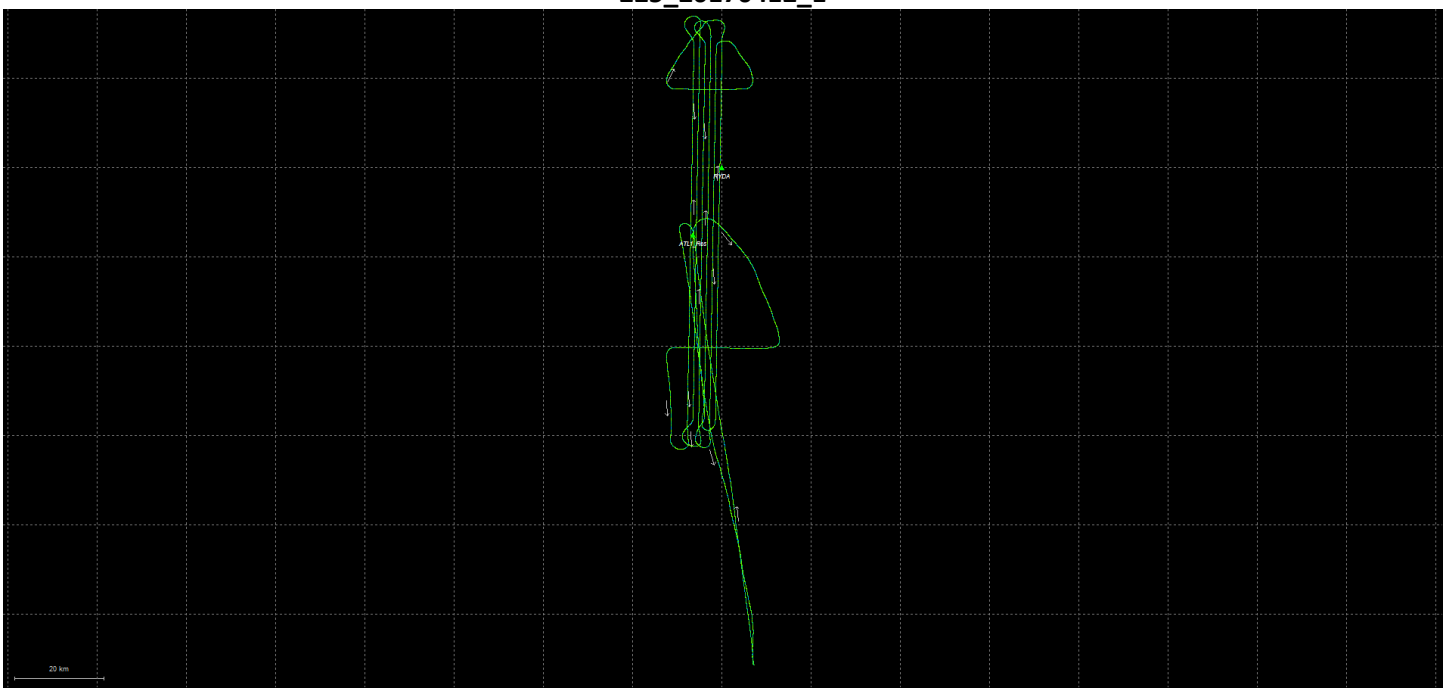

Estimated StdDev (m)
0.0150
0.0145
0.0140
0.0135
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
604000
Week 1943
200
Week 1944
1200
2200
3200
4200
5200
6200
7200
8200
9200
GPS Time (TOW, GMT zone)
East
North
Height
Trace

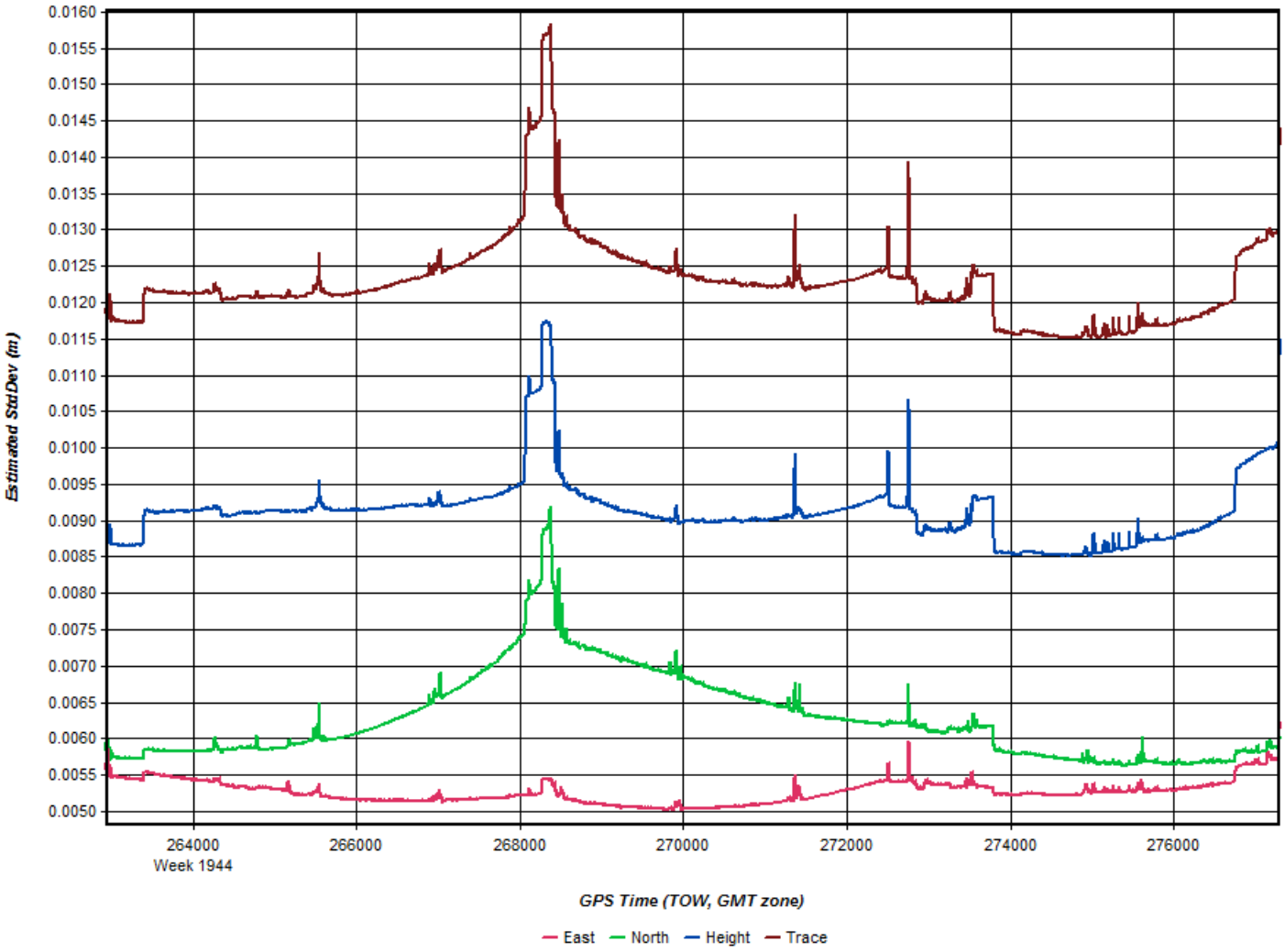

Num Sats
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
604000
Week 1943
200
Week 1944
1200
2200
3200
4200
5200
6200
7200
8200
9200
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

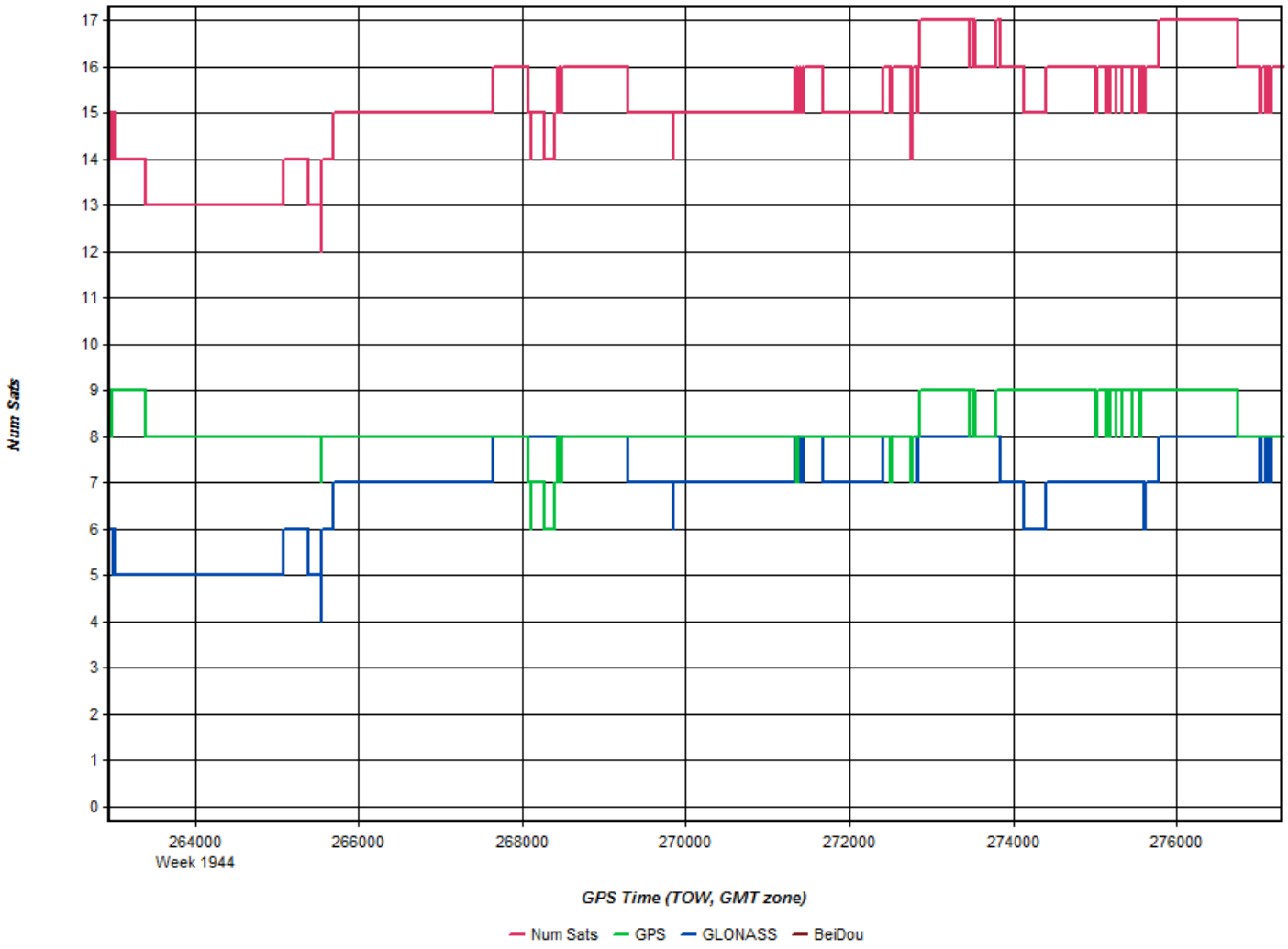

Separation (m)
0.026
0.024
0.022
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
-0.002
-0.004
-0.006
-0.008
-0.010
-0.012
-0.014
-0.016
-0.018
-0.020
-0.022
-0.024
604000
Week 1943
200
Week 1944
1200
2200
3200
4200
5200
6200
7200
8200
9200
GPS Time (TOW, GMT zone)
East
North
Up

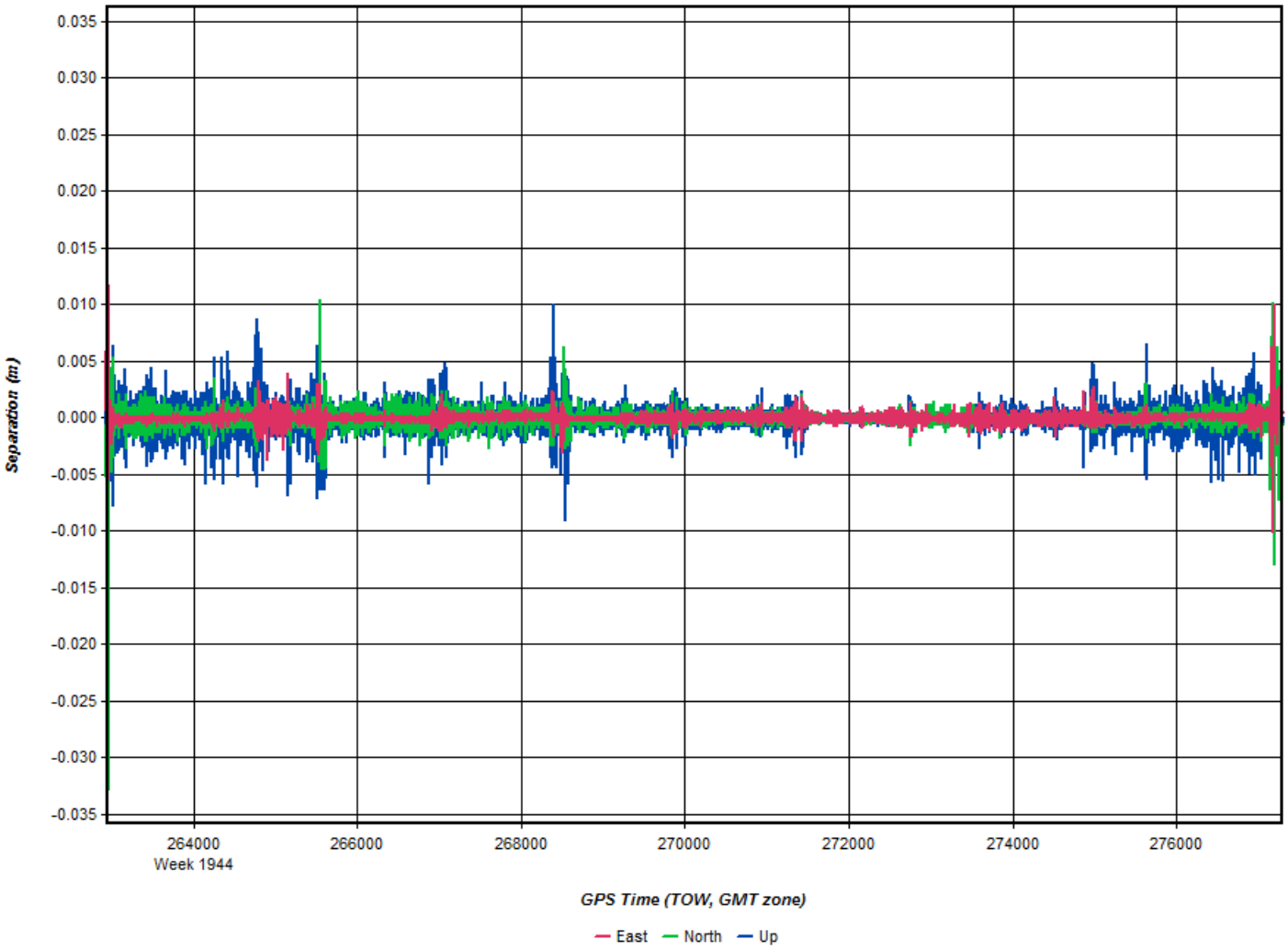

PDOP
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
604000
Week 1943
200
Week 1944
1200
2200
3200
4200
5200
6200
7200
8200
9200
GPS Time (TOW, GMT zone)
PDOP

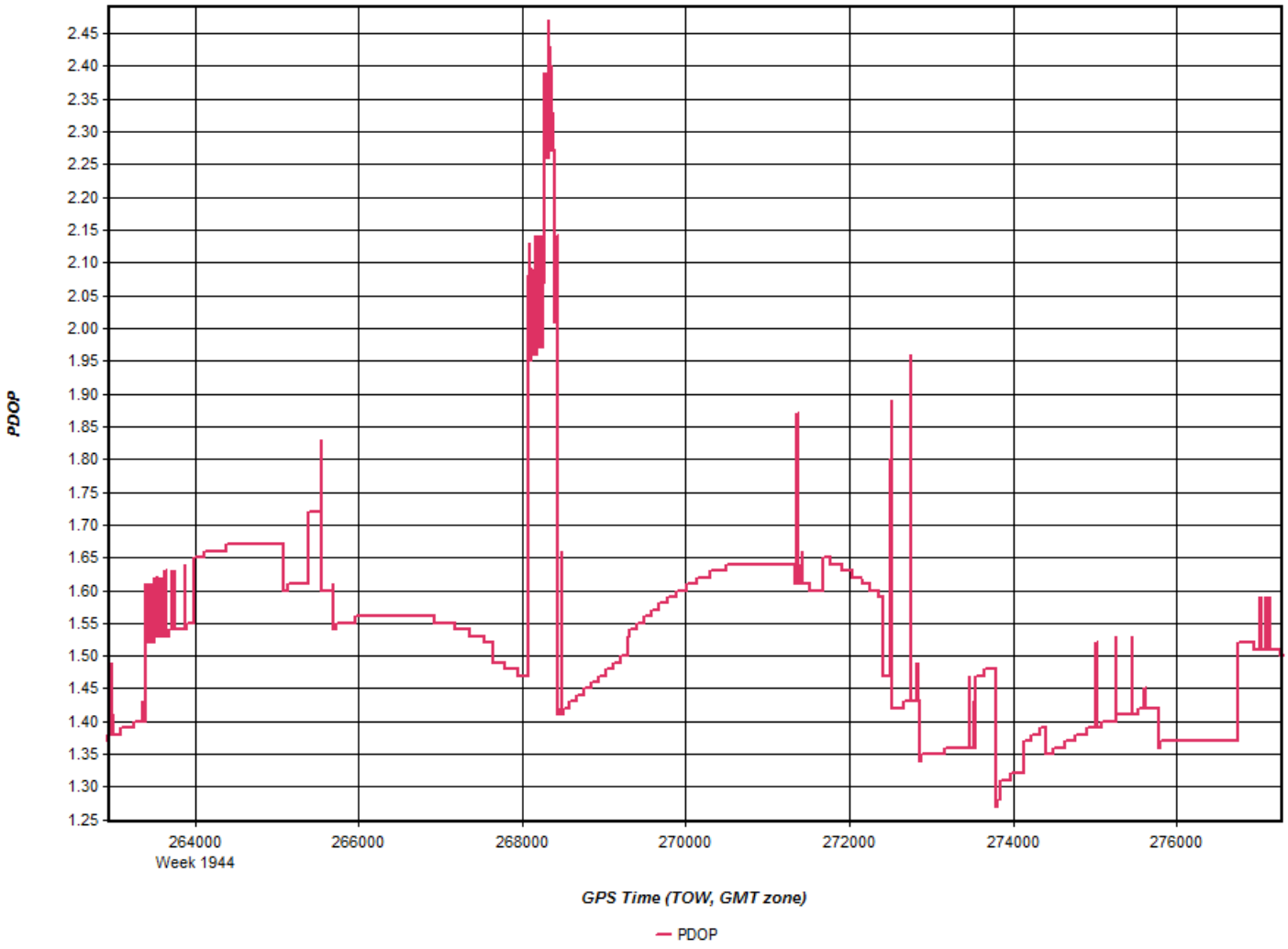
225_20170412_1



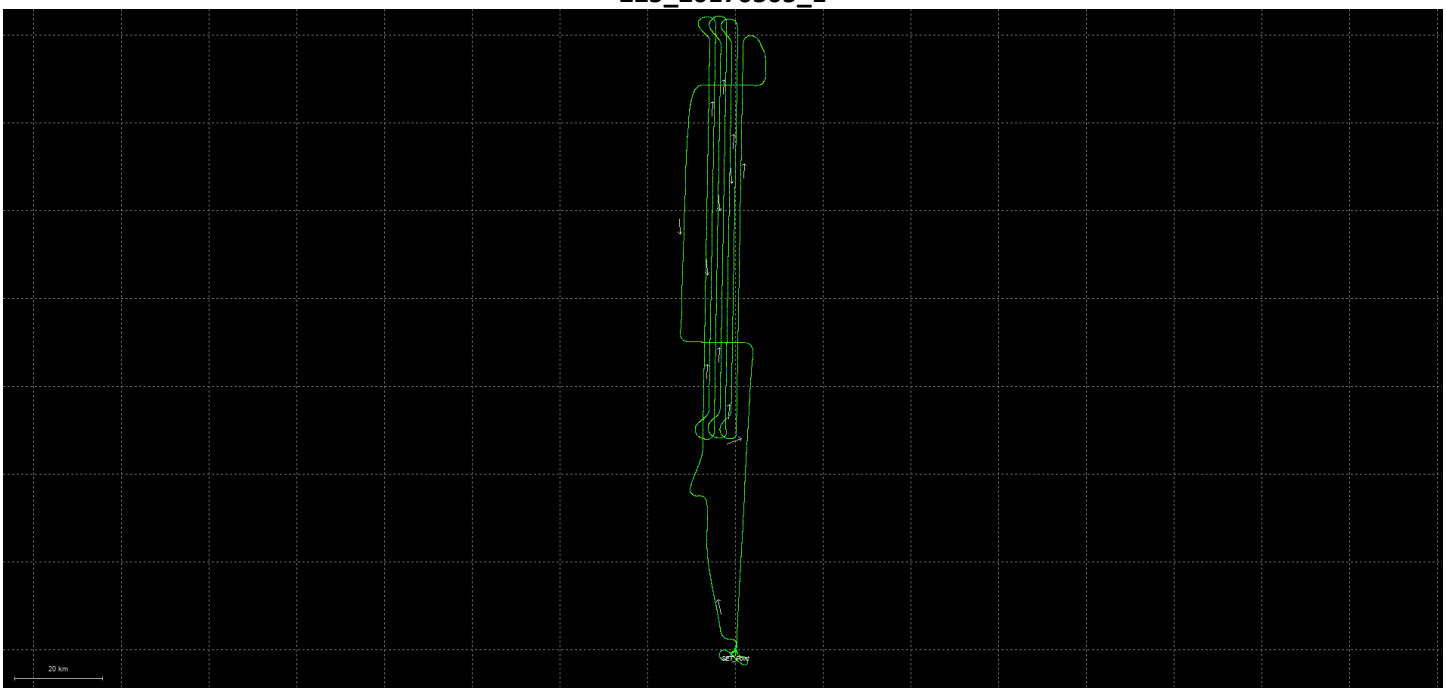

Estimated StdDev (m)
0.0160
0.0155
0.0150
0.0145
0.0140
0.0135
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
264000
Week 1944
266000
268000
270000
272000
274000
276000
GPS Time (TOW, GMT zone)
East
North
Height
Trace

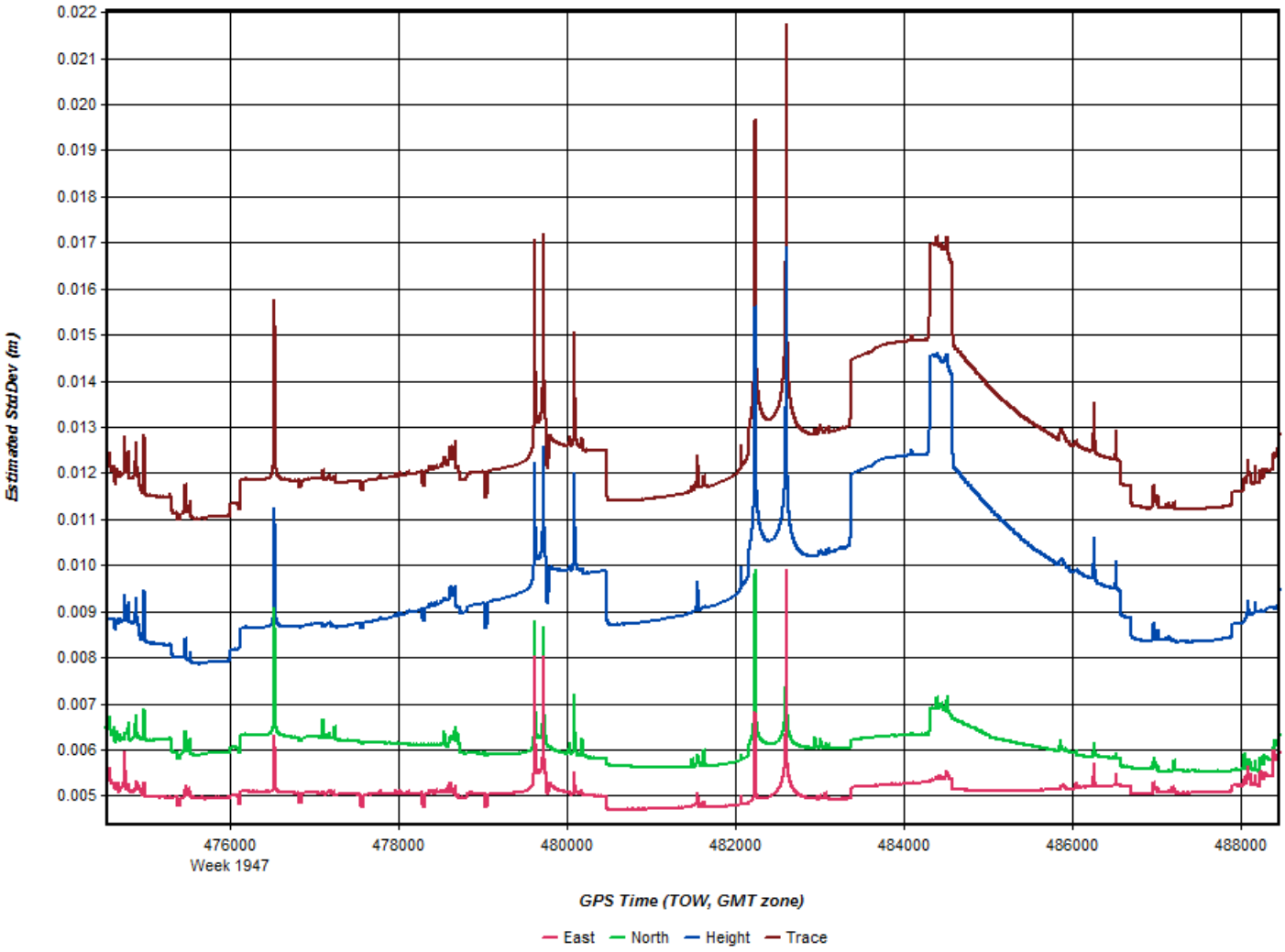

Num Sats
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
264000
Week 1944
266000
268000
270000
272000
274000
276000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou

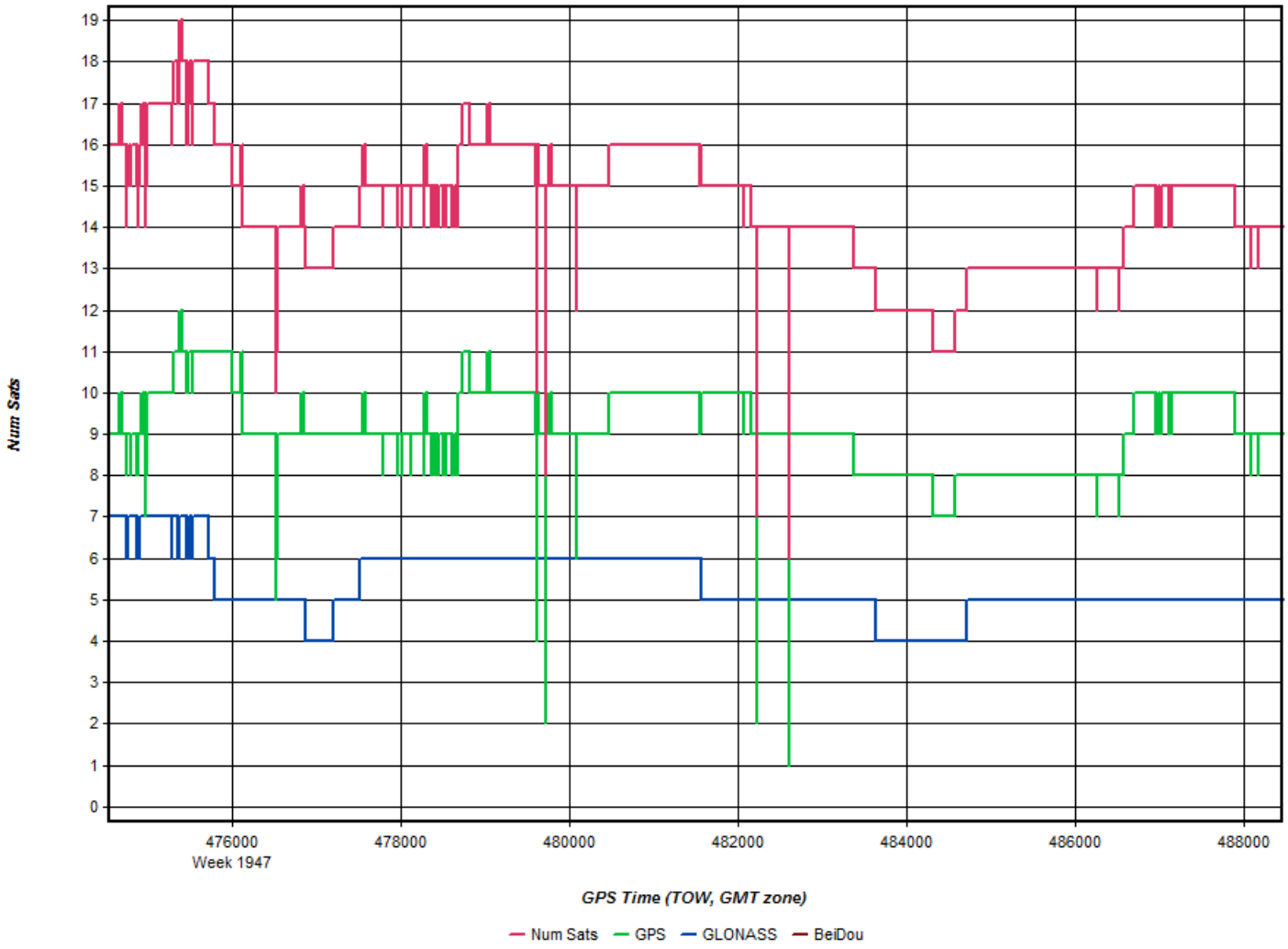

0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010
-0.015
-0.020
-0.025
-0.030
-0.035
Separation (m)
264000
Week 1944
266000
268000
270000
272000
274000
276000
GPS Time (TOW, GMT zone)
East
North
Up

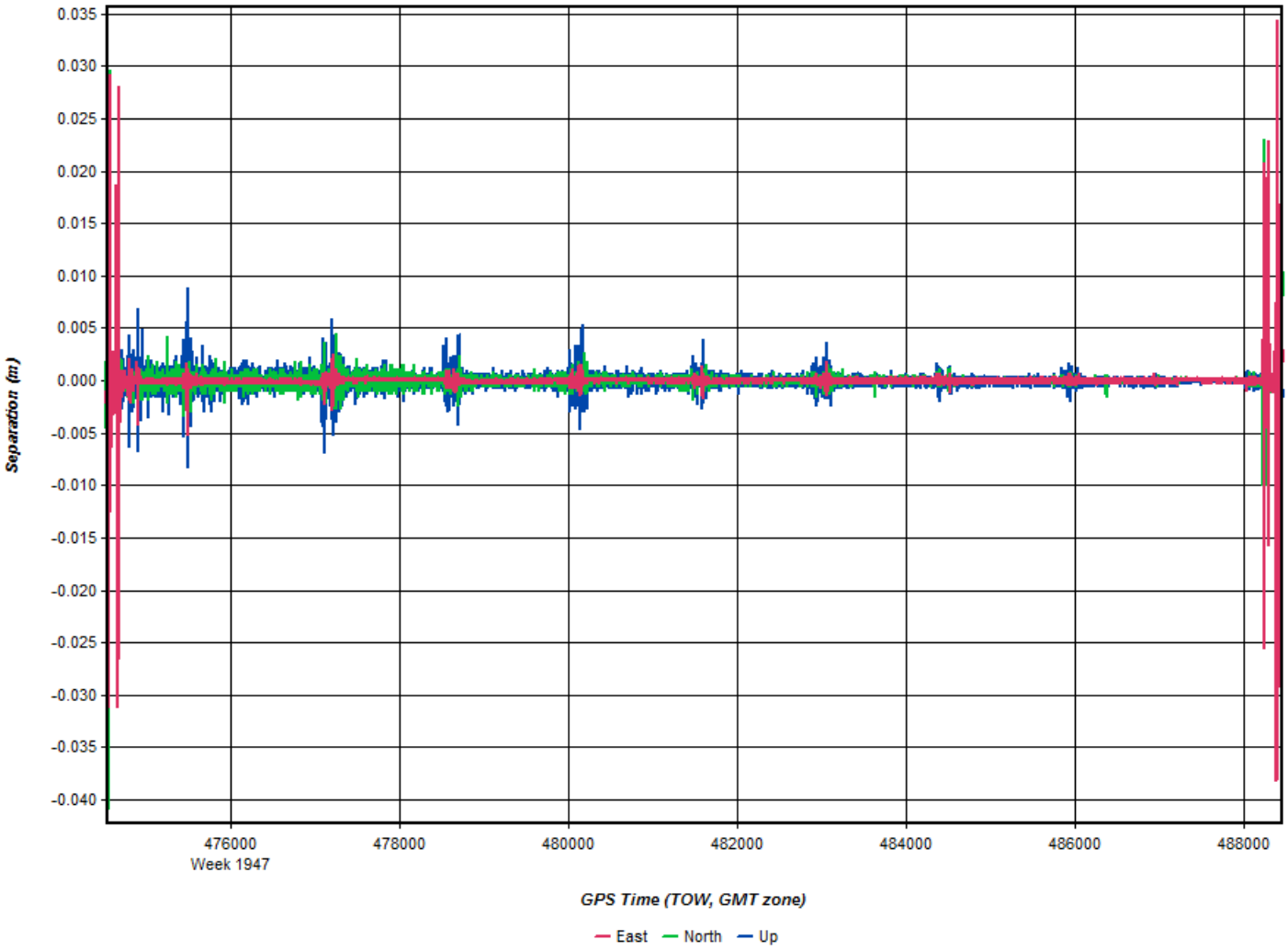

PDOP
2.45
2.40
2.35
2.30
2.25
2.20
2.15
2.10
2.05
2.00
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
264000
Week 1944
266000
268000
270000
272000
274000
276000
GPS Time (TOW, GMT zone)
PDOP

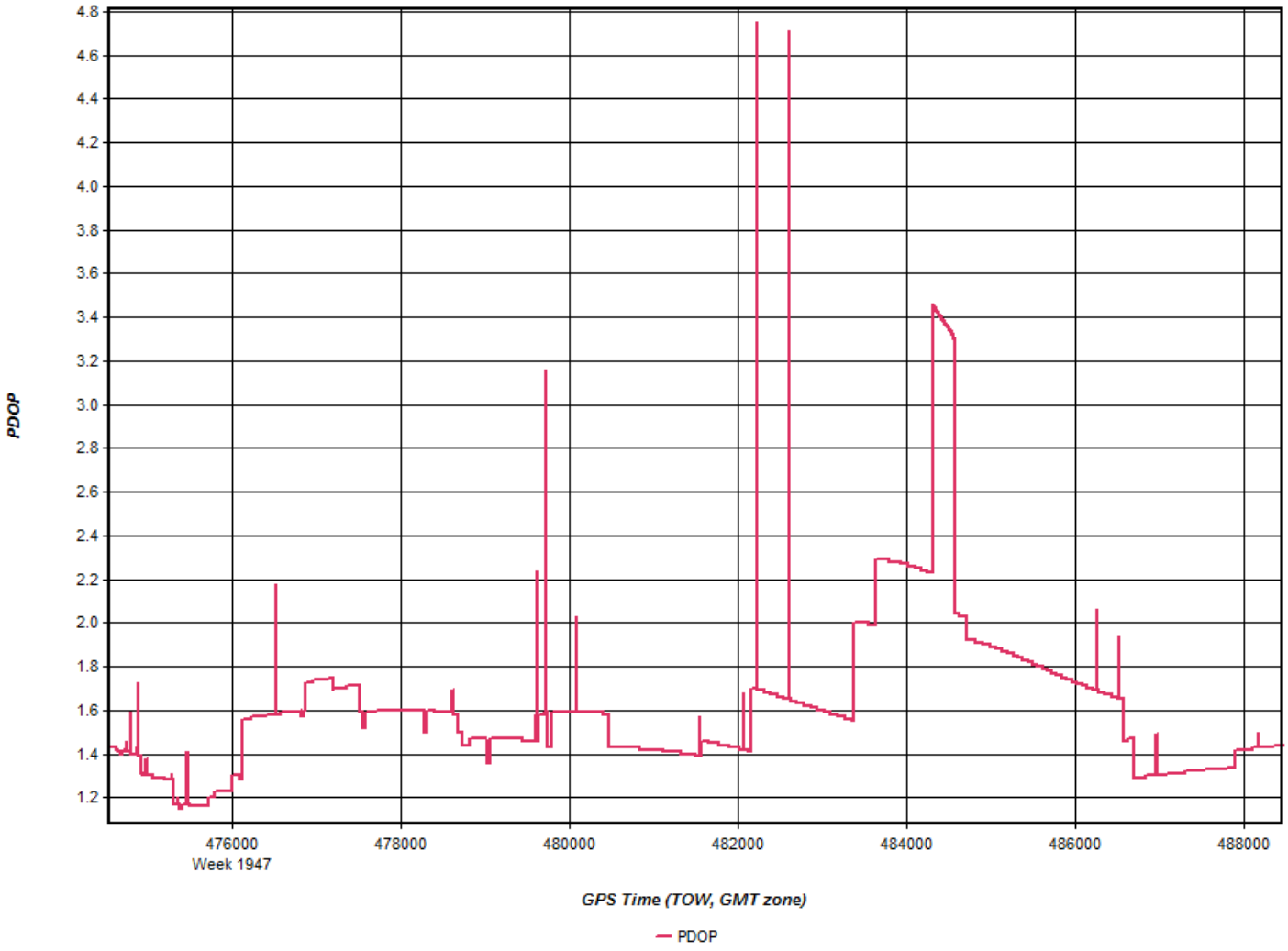
225_20170505_1




Estimated StdDev (m)
0.022
0.021
0.020
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
476000
Week 1947
478000
480000
482000
484000
486000
488000
GPS Time (TOW, GMT zone)
East
North
Height
Trace


Num Sats
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
476000
Week 1947
478000
480000
482000
484000
486000
488000
GPS Time (TOW, GMT zone)
Num Sats
GPS
GLONASS
BeiDou


0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010
-0.015
-0.020
-0.025
-0.030
-0.035
-0.040
Separation (m)
476000
Week 1947
478000
480000
482000
484000
486000
488000
GPS Time (TOW, GMT zone)
East
North
Up


PDOP
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
476000
Week 1947
478000
480000
482000
484000
486000
488000
GPS Time (TOW, GMT zone)
PDOP