New York State
Airborne LiDAR Acquisition Report

for

New York State Office of Information Technology Services
50 Wolf Road, 3-3
Albany, New York 12232

Project Number 15002-2

Lot 15, Madison-Otsego (KAS Acquisition)

by

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Section 1: Table of Contents

Section 2: Introduction

The New York State Office of Information Technology Services requested delivery of three dimensional classified point cloud and terrain data derived from LiDAR (Light Detection and Ranging) technology for the New York State LiDAR project area covering portions of Madison, Chenango, Oneida, Herkimer, Otsego and Delaware Counties. The data must meet Quality B standards as defined by the State. See Table 1 NYSOOITS LiDAR Quality Specification.

NYSDHSES LiDAR Quality Specification		
Parameter	**Quality A**	**Quality B**
Nominal Point Spacing (m)	1.5	0.7
Vertical Accuracy (cm)	18.5	9.25
Final DEM Spacing (m)	2.0	1.0

Table 1 NYSOOITS LiDAR Quality Specification

The point cloud is to include all returns from the sensor. Points are to be classified to differentiate between bare earth and other return sources using the following classes:

- 1 Processed, but unclassified
- 2 Bare-earth ground
- 7a Noise (low noise)
- 9 Water
- 11 Withheld (if the Withheld bit is not implemented in processing software)
- 12 Overlap
- 17 Bridges
- 18 High Noise

Data is to be stored in a non-proprietary format such as LAS and meet the requirements of "U.S. Geological Survey National Geospatial Program LiDAR Guidelines and Base Specifications, Techniques and Methods 11-B4 Version 1.2-Novermber 2014" except as specified by the governing contract.

The project area (Lot 15, Area 2) is located in central New York State, east of Syracuse, and covers approximately 1,841 square miles. The project area includes the city of Oneida and the village of Cooperstown. (See Figure 1 Location of Project Area) The project area measures approximately 64 miles from the eastern boundary to the western boundary and approximately 48 miles from the northern boundary to the southern boundary. (See Figure 2 Project Area)

LiDAR data was processed and projected to UTM Zone 18 North, referenced to the North American Datum 1983 (NAD83) (2011), in units of meters. The vertical datum used for the project is the North American Vertical Datum 1988 (NAVD88) in meters. Orthometric heights are to be determined using Geoid 12A.

The planning task took into account the various terrain changes and land surface configurations within the project area and created an overall plan that was efficient and complete.

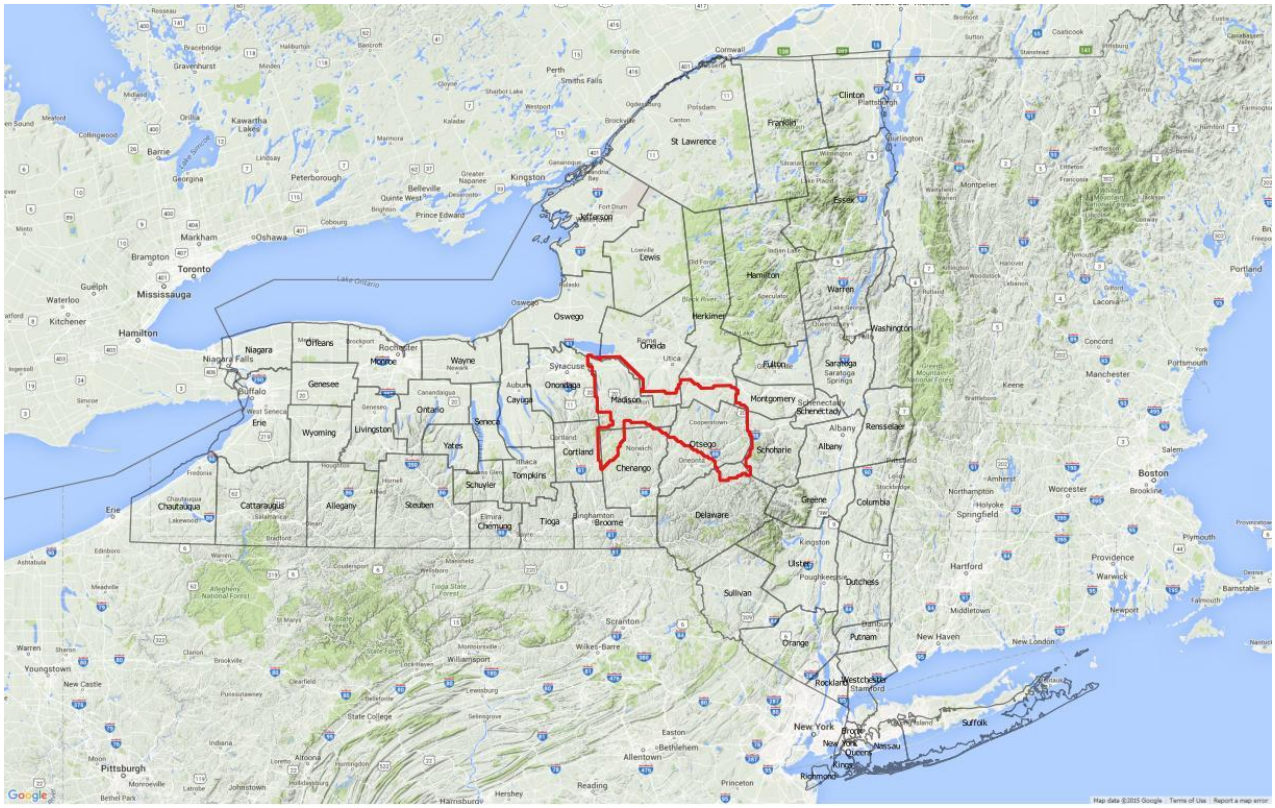


Figure 1: Location of Project Area

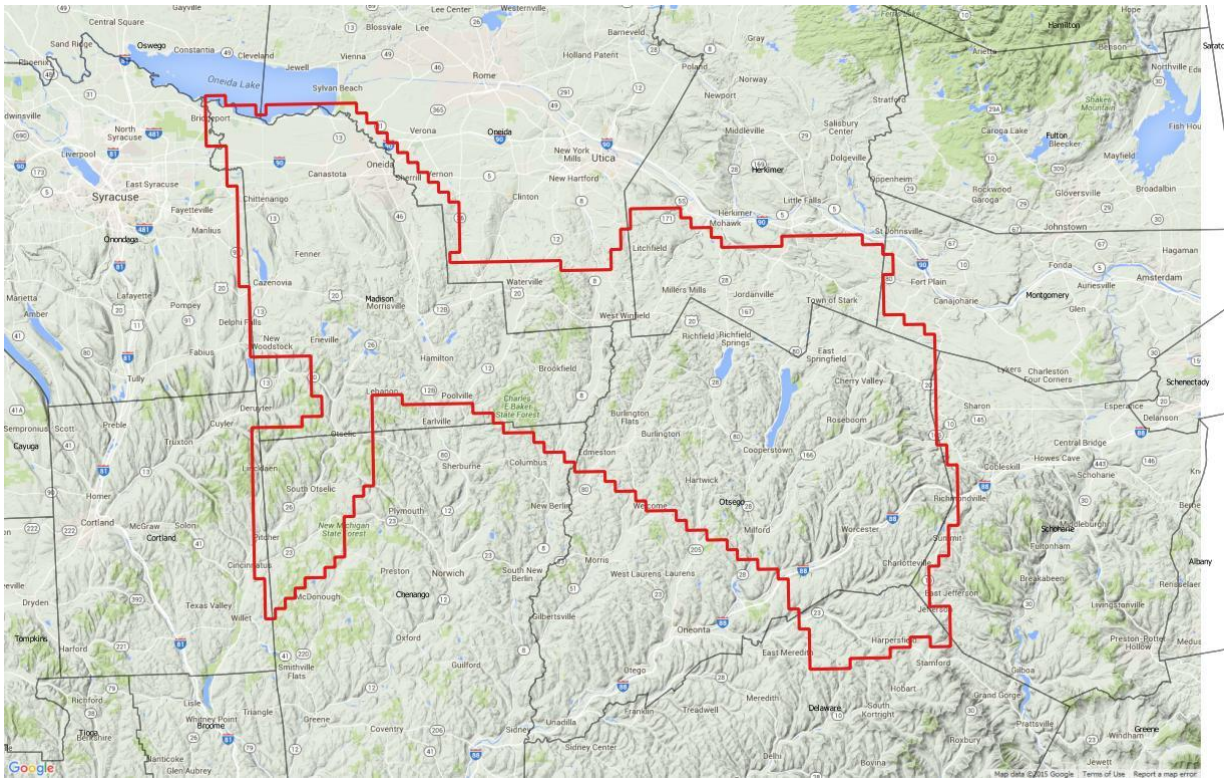


Figure 2: Project Area

Section 3: LiDAR Acquisition

3.1 Acquisition

Airborne LiDAR was acquired with 21 (21) flight missions. The LiDAR coverage is approximately 1,600 square miles or 4,145 square kilometers. Piper Navajo PA31 (N6098X) outfitted with Optech GEMINI LiDAR systems, owned and operated by Keystone Aerial Surveys, Inc., was deployed to acquire the LiDAR data.

Table 2 represents a list of the features and characteristics for the Optech GEMINI LiDAR system:

Table 1 – Optech GEMINI specifications.

Operating Altitude	150 - 4000 m, Nominal
Horizontal Accuracy	1/5,500 x altitude (m AGL); 1 sigma
Elevation Accuracy	5 - 30 cm; 1 sigma
Range Capture	Up to 4 range measurements, including 1st, 2nd, 3rd, last returns
Intensity Capture	12-bit dynamic range for all recorded returns, including last returns
Scan FOV	0 - 50 degrees; Programmable in increments of ±1degree
Scan Frequency	0 – 70 Hz
Scanner Product	Up to Scan angle x Scan frequency = 1000
Roll Compensation	±5 degrees at full FOV – more under reduced FOV
Pulse Rate Frequency	33 - 167 kHz
Position Orientation System	Applanix POS/AV 510 OEM includes embedded BD950 12-channel 10Hz GPS receiver
Laser Wavelength/Class	1047 nanometers / Class IV (FDA 21 CFR)
Beam Divergence nominal (full angle)	Dual Divergence 0.25 mrad (1/e) or 0.80 mrad (1/e)

Table 2: Optech Gemini Sensor Characteristics

3.2 Acquisition Details

Three Hundred ninety-one (391) passes were flown to cover of the project area in a series of adjacent flight lines. See Figure 3 Flight line Orientation. The flight plan included cross strip and calibration flight line collection to compensate and correct for the inherent IMU drift associated with all IMU systems. A single Novatel GPS base reference station was used in operation during all missions, sampling positions at 1Hz or higher frequency. The GPS baseline length to each flight mission area did not exceed 90km. Because SmartBase uses a combination of the Novatel GPS base station and the CORS base stations a GPS base length of 90 km or less to each flight mission was very accurate. This produced results for standard deviation values of position and height in the 1-2 cm range for each flight mission. Additionally, LiDAR data was only acquired when GPS PDOP was ≤4 and at least 6 satellites were in view.

Weather and atmospheric conditions were monitored and LiDAR missions conducted only when conditions existed that would not degrade sensor ability in the collection of data. The LiDAR sensors were calibrated at a designated site located at the Hamilton municipal Airport (VGC) located in Hamilton, NY and checked and adjusted to minimize corrections at project sites.

3.3 LiDAR Flightline Orientation

The following graphic represents the alignment of the flight-lines executed to provide coverage.

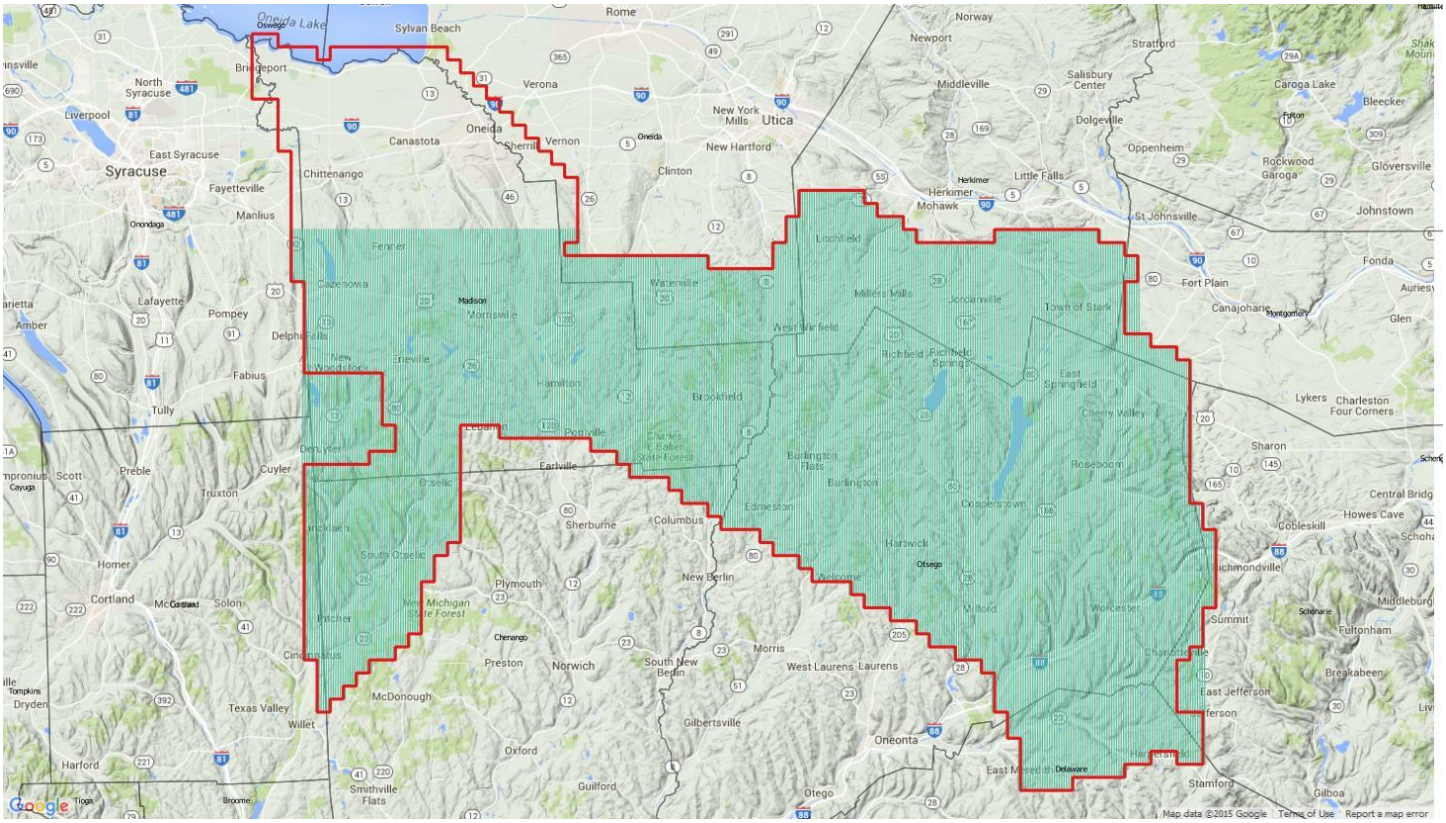


Figure 3: Flight line alignment

3.4 Acquisition Flight Summary

LiDAR acquisition missions were flown between April 16th, 2015 and May 5th, 2015. Flights were planned at various flying heights above 700 m AGL.

Date of Mission(s)	Lift Number	Mission Number	# of Lines Acquired	Mission Time (UTM)	Aircraft Tail Number
***April 16, 2015**	1	1	27	15:06:44-19:37:35	n6098x
***April 18, 2015**	2	2	16	02:19:30-05:43:10	n6098x
***April 19, 2015**	1	3	24	14:46:55-20:38:37	n6098x
April 25, 2015	1	4	20	15:38:33-20:29:38	n6098x
***April 25, 2015**	2	5	19	21:58:56-02:56:33	n6098x
April 26, 2015	1	6	25	14:09:11-19:28:16	n6098x
***April 26, 2015**	2	7	21	21:24:27-01:41:23	n6098x
***April 28, 2015**	1	8	9	13:58:48-15:35:48	n6098x
April 28, 2015	2	9	25	16:55:50-22:14:36	n6098x
April 28, 2015	3	10	19	23:50:00-03:22:05	n6098x
April 29, 2015	1	11	13	15:21:54-17:23:29	n6098x
May 01, 2015	1	12	31	12:32:36-17:37:01	n6098x
***May 01, 2015**	2	13	10	19:21:00-20:45:31	n6098x
***May 02, 2015**	1	14	39	12:54:36-18:14:40	n6098x
May 02, 2015	2	15	31	19:42:06-23:41:10	n6098x
May 03, 2015	1	16	47	13:22:38-19:10:12	n6098x
***May 03, 2015**	2	17	18	21:26:40-00:43:58	n6098x
May 04, 2015	1	18	28	13:57:11-19:27:31	n6098x
May 05, 2015	1	19	32	16:45:23-20:36:53	n6098x
May 05, 2015	2	20	35	22:00:14-01:39:38	n6098x
***June 7, 2015**	1	21	29	13:29:00-15:59:00	N5038J

Table 3: Acquisition Dates

***Indicates Mission Errors-See Section 3.6 for corrective measures taken**

Flight Logs for each acquisition mission are provided in Section 4 Flight Logs. Calibration lines were run at the beginning or end of the day and a cross strip running east or west was obtained at the end of each successful lift.

3.5 LiDAR System Acquisition Limitations

There are several limiting factors to LiDAR data acquisition which include weather, ground conditions, satellite configuration and equipment malfunctions.

During a LiDAR acquisition mission, there can be no clouds, rain, fog or excessive humidity between the sensor and the ground. Excessive, heavy winds, engaging the aircraft perpendicular to the line of flight, can result in "crab" of the aircraft which results in "gaps" or "slivers' in the data between flight lines. Ground conditions which include pools of standing water and ditches filled with moving water affect the accuracy of LiDAR returns. The number of satellites "visible" to the aircraft during acquisition is an important factor and a poor Global Positioning System (GPS) configuration will contribute to less than desired accuracy. Therefore, satellite configuration, measured by PDOP (Positional Dilution of Precision) is checked each morning to ensure acquisition occurs during the most favorable geometric configuration of the satellites. Finally, despite the best maintenance routines and practices, systems malfunction and fail. Operator awareness is key to identifying the exact moment when a system malfunctions. This enables the crew to stop acquisition and correct the issue before continuing. At times, lines acquired with anomalies will need to be re-acquired.

3.6 Acquisition Issues and Resolutions

Unfortunately, there were missions that experienced unexpected equipment malfunctions and weather delays. The following identifies the missions, the type of issue and the actions taken to overcome the problem. Keystone's QC procedure is to manually inspect the data to validate coverage. During this process gaps were identified. These data voids were then ingested into a new flight plan. Once the re-flight plan was generated it was sent out to the field crew for collection. The following identifies the missions, the type of issue and the actions taken to overcome the problem:

- April 16th, 2015, Mission 1-Small gaps were discovered post acquisition. These were filled in on the June 6th mission.
- April 18th, 2015, Mission 2-Flightline 24 was rejected twice and reflown a third time which completed the coverage. In addition, small gaps were discovered post acquisition. These were filled in on the June 6th mission.
- April 19th, 2015-Mission 3- Small gaps were discovered post acquisition. These were filled in on the June 6th mission.
- April 25th, 2015, Mission 5: This lift consisted of eighteen (18) lines, and two (2) cross ties. A failure occurred with the ALTM NAV during line 73 and was reflown within this lift.
- April 26th, 2015, Mission 7: This lift consisted of eighteen (19) lines, and two (2) cross ties. During line 123 rain occurred and a partial reflight was done within this lift. In addition, small gaps were discovered post acquisition. These were filled in on the June 6th mission.
- April 28th, 2015, Mission 8: This lift consisted of seven (7) lines, three (3) calibration lines. The system got shutdown when the pilot hit the breaker beginning at line 130. This was reflown April 28th, 2015, Mission 9.
- May 1st, 2015-Mission 13-Line 203 was flown twice due to a misalignment of the aircraft relative to the planned flight line. Rain was encountered during flight line 210. It was decided to relfy this line on the next mission.
- May 2nd,2015-Mission 14-Line 210 was reflown due to rain present on the prior day. In addition, small gaps were discovered post acquisition. These were filled in on the June 6th mission.
- May 3rd, 2015-Mission 17-The altm NAV unexpectedly shutdown after the end of Flightline 321. The system was restarted and the remaining flight lines were successfully captured.
- June 6, 2015-Reflights were conducted to fill in small voids and gaps discovered for Missions 1 (4-16-2015), 2 (4-18-2015), 3 (4-19-2015), 6 (4-26-2015), and 14 (5-2-2015). Twenty-nine (29) lines were flown for this mission.

3.7 LiDAR System Acquisition Parameters

LiDAR acquisition was planned to meet the following specifications:

Item	Parameter
System	Optech Gemini
Nominal Pulse Spacing (m)	0.68
Nominal Pulse Density (pls/m²)	2.18
Nominal Flight Height (MSL meters)	700
Nominal Flight Speed (kts)	150-160
Pass Heading (degree)	180,360
Sensor Scan Angle (degree)	15.6
Scan Frequency (Hz)	60.8
Pulse Rate of Scanner (kHz)	70
Line Spacing (m)	273.25
Pulse Duration of Scanner (ns)	4
Pulse Width of Scanner (m)	0.67
Central Wavelength of Sensor Laser (nm)	1047
Sensor Operated with Multiple Pulses	Yes
Beam Divergence (mrad)	0.25
Nominal Swath With (m)	390.36
Nominal Swath Overlap (%)	30
Scan Pattern	Sawtooth

Table 4 System Parameters for LiDAR Acquisition

3.8 CORS Reference Stations

The presence of a strong CORS (Continuously Operating Reference Station) and base station configuration allowed for the LiDAR to be acquired with Global Navigation Satellite System (GNSS) techniques and procedures. Table 5 and Figure 4 below contains a listing and graphic of the CORS and base stations that were used during the processing, their calculated latitude, longitude and ellipsoid height. Minor variations in position, due to changes in satellite availability, geometry and varying availability of the CORS stations, were observed, and are of millimeter level magnitude. These variations had no impact on system positioning and are unavoidable.

Point ID	Latitude	Longitude	Ellipsoidal Height
31060	N42°50'34.91002"	W75°33'41.08258"	311.657
31090	N42°50'34.91056"	W75°33'41.08153"	311.634
31091	N42°50'34.91067"	W75°33'41.08160"	311.64
31150	N42°50'34.91051"	W75°33'41.08165"	311.63
31160	N42°50'34.91062"	W75°33'41.08163"	311.637
31180	N42°50'34.91091"	W75°33'41.08169"	311.63
31190	N42°50'34.91091"	W75°33'41.08169"	311.63
31210	N42°50'34.91075"	W75°33'41.08154"	311.63
31220 (BASE)	N42°50'34.91075"	W75°33'41.08138"	311.627
31230 (BASE)	N42°50'34.91086"	W75°33'41.08131"	311.633
31240 (BASE)	N42°50'34.91055"	W75°33'41.08148"	311.627
31250 (BASE)	N42°50'34.91057"	W75°33'41.08125"	311.628
CTBR	N41°29'49.89723"	W73°25'05.69143"	52.088
CTDA	N41°03'57.10230"	W73°30'25.95975"	-14.527
CTEG	N41°55'24.38055"	W72°41'55.89783"	29.061
CTNE	N41°40'24.75057"	W72°42'52.26908"	40.502
CTWI	N41°53'51.94074"	W73°04'10.98590"	190.865
HAMP	N42°19'03.90646"	W72°38'22.42012"	41.137
HDF5	N43°16'14.97540"	W73°32'20.84147"	41.842
HDF6	N43°16'15.85529"	W73°32'20.73671"	42.637
KNGS	N44°13'07.28705"	W76°31'02.16609"	48.797
LAMT	N41°00'16.26552"	W73°54'32.07506"	88.907
LUMT	N40°36'05.77986"	W75°21'27.15330"	250.082
MABN	N42°40'12.02520"	W72°32'28.66101"	93.683
NJHC	N40°30'05.83659"	W74°54'04.03426"	94.652
NJI2	N40°44'29.33770"	W74°10'39.74475"	16.654
NJMT	N40°47'47.38215"	W74°28'59.35797"	99.857
NJSC	N41°03'31.70873"	W74°45'09.44860"	171.708
NJTP	N40°32'25.87343"	W74°28'04.15346"	-0.893
NJWC	N40°48'03.10410"	W75°04'52.54942"	78.551
NYBH	N42°06'35.12975"	W75°49'38.72403"	311.869
NYBP	N40°42'03.84912"	W74°00'51.56686"	-15.763
NYBR	N40°41'19.17693"	W74°00'04.59647"	-20.299
NYCL	N42°35'03.73985"	W76°12'40.81440"	329.695
NYCS	N42°40'02.86998"	W74°29'10.96749"	269.475
NYFV	N42°56'21.03156"	W74°21'12.03355"	103.483

Point ID	Latitude	Longitude	Ellipsoidal Height
NYHC	N41°57'30.01437"	W75°17'33.89642"	259.484
NYHS	N42°15'08.39277"	W73°45'27.17891"	20.848
NYIL	N43°46'57.67267"	W74°16'39.88212"	500.715
NYKT	N41°56'13.00454"	W74°01'52.23722"	29.118
NYLV	N43°47'47.27674"	W75°29'07.57608"	240.399
NYMX	N43°28'12.41201"	W76°13'54.90836"	89.995
NYON	N42°26'24.84807"	W75°06'42.52864"	305.853
NYRM	N43°10'40.06175"	W75°29'13.90347"	127.363
NYSB	N42°40'45.06563"	W75°30'47.49781"	295.895
NYST	N43°03'41.76909"	W73°48'15.02925"	68.431
NYWG	N42°21'03.82838"	W76°52'33.32270"	282.37
NYWL	N42°53'55.25987"	W76°51'07.32507"	108.78
NYWT	N44°01'41.69176"	W75°55'15.97089"	117.113
NYWV	N42°00'44.63247"	W76°31'17.69051"	220.959
OSPA	N43°27'53.59060"	W76°30'41.51993"	49.991
PABT	N41°46'45.35188"	W76°26'49.69405"	224.933
PAMS	N40°59'44.05681"	W75°15'03.85526"	192.585
PAPC	N41°45'51.89804"	W78°01'24.35321"	484.599
RVDI	N41°02'31.17956"	W73°34'52.39541"	-0.833
VTBE	N42°52'57.06337"	W73°11'59.66647"	182.697
VTD2	N42°55'06.14202"	W72°32'06.45878"	96.775
VTDA	N43°20'59.85010"	W72°59'42.86943"	192.78
VTMI	N43°59'55.05995"	W73°09'09.39915"	94.864
VTRU	N43°36'25.67442"	W72°58'45.92161"	160.269
WIL1	N41°18'18.94490"	W76°00'55.12087"	384.375

Table 5: GPS Reference Station Coordinates

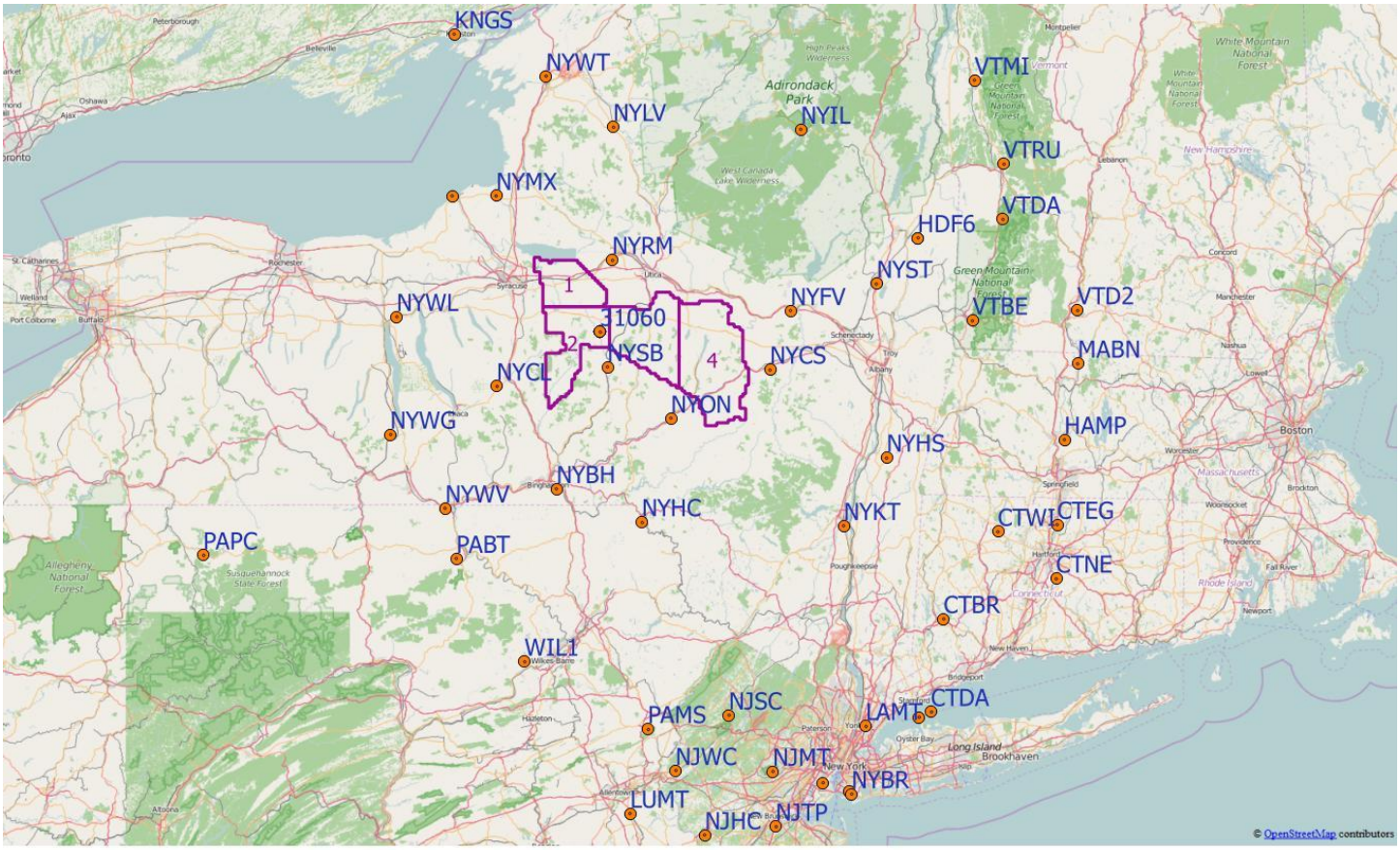


Figure 4: GPS Reference Stations

3.9 Airborne GPS Kinematic and Processing

Once a project/site has been flown, raw ABGPS/IMU data (in POS form) is delivered to the Keystone lab for processing. Keystone then utilizes the latest Applanix software packages (primarily POSPac) to perform post-processing of the ABGPS/IMU data. POSPac utilizes SmartBase software and IN-Fusion technology in performing direct georeferencing of airborne imaging sensors. This software is the industry standard package for post-processing airborne GPS and IMU data.

First, CORS stations from the area surrounding the AOI are downloaded and a "SmartBase quality check" (SBQC) is performed on the aforementioned stations. This evaluation details any gaps within the data, cycle-slips that occur during GPS signal transmission, the PDOP (Position Dilusion of Precision) of each reference station, among other measurables within the data collected from the stations. Upon examining the SBQC, one can remove any unwanted or unreliable stations during the construction of their CORS SmartBase network.

- The SmartBase Network allows for baselines between stations and aircraft position of over 200 km, while still maintaining ideal accuracy and effective corrections.
- The standard CORS/reference stations used range between 1, 5, 15, and 30 second data sampling rates.
- During evaluation of the CORS Network, any PDOP > 3 is normally removed.

Upon completion of the SBQC, the "Applanix SmartBase Processing" (ASB) phase begins, wherein various atmospheric and geometric errors are corrected within the network established to produce a set of reliable GNSS observables assigned to the remote receiver located on the aircraft.

Once the ASB has been performed, the "GNSS-Inertial Processing" begins, marking the final step taken during the actual processing phase of the flight data. It is in this step that the sbet and accuracy files that are used during the range data extraction process are created. This function utilizes IN-Fusion technology to post-process the GNSS observables (produced during ASB) and the data from the Inertial Measurement Unit (IMU) to simultaneously solve for the GNSS

ambiguities and position and orientation of the aircraft. After completing the final step in post-processing ABGPS/IMU data, several things are examined prior to putting the sbet and accuracy files to use. Specifically, the following criteria must be met.

- The PDOP of the flight should be less than 3.
- The processing mode should maintain “Fixed Narrow Lane” throughout the duration of flight.
- The desirable number of satellites used is > 5.
- The RMS values should be < 5 cm.

Base Station Processing:

The base station operated by Keystone Aerial Surveys is a Novatel 702 GG that collects at a 0.2 second rate (30 times a second). When using the data collected for airborne processing, several steps are taken to ensure precision. First, the data (.PDC format) is converted to RINEX to allow for ingestion into the NOAA OPUS utility. This service provides precise coordinates of the base station during time of collection to be manually entered upon processing. For the Madison-Otsego project the choice of the location of the base station prior to flight never exceeded 90 km from the furthest point of the AOI, per Keystone’s standard. The base station is often used in conjunction with the previously established SmartBase Network because the combined solution is typically more accurate than either by themselves.

GPS processing results for each lift are included in Section5: GPS Processing.

Section 4: Flight Logs

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	20150416-1			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	30.41	KVGC		2m	14:19	21:54
Hobbs Time Start:	10:45		Temp (ground)	57					
Hobbs Time Stop:	16:17		Temp (air)	50					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	21.9					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
test shot		15:06:44	15:07:03		test shot
cal	n	15:09:36	15:10:24	159	cal line
cal	e	15:13:45	15:14:12	159	cal line
1	s	15:31:45	15:34:46	142	
2	n	15:38:00	15:40:05	148	
3	s	15:42:54	15:45:07	155	

4	n	15:48:07	15:50:10	155	
5	s	15:53:11	15:55:22	159	
6	n	16:01:07	16:07:47	156	
7	s	16:10:42	16:17:11	160	
8	n	16:19:44	16:26:20	160	
9	s	16:29:01	16:35:57	158	
10	n	16:38:47	16:45:11	162	
11	s	16:50:40	17:00:41	139	
12	n	17:03:08	17:12:53	155	
13	s	17:15:27	17:25:48	147	
14	n	17:28:37	17:38:28	160	
15	s	17:41:21	17:51:24	158	
16	n	17:54:29	18:04:31	160	
17	s	18:07:53	18:18:16	127	
18	n	18:21:49	18:32:00	161	
19	s	18:35:00	18:48:08	157	
20	n	18:47:51	18:57:41	160	
21	s	19:00:18	19:10:22	160	
22	n	19:13:08	19:25:05	161	
23	s	19:25:29	19:37:35	160	
xtie	w	19:42:57	19:44:51	159	cross

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	20150418-2			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	30.12	KVGC		2m	01:41	06:14
Hobbs Time Start:	21:45		Temp (ground)	52					
Hobbs Time Stop:	02:10		Temp (air)	40					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	23					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									
Line/Heading	Start	End	Air Speed	Comments					

4	n	02:19:30	02:21:10	140	reflight
24	s	02:28:43	02:29:31		rejected
24	s	02:32:57	02:33:25		rejected
24	s	02:37:18	02:48:08	155	
25	n	02:51:27	03:02:38	143	
26	s	03:05:52	03:16:15	161	
27	n	03:19:35	03:30:49	156	
28	s	03:33:58	03:45:02	156	
29	n	03:48:00	03:59:31	142	
30	s	04:02:21	04:13:14	150	
31	n	04:17:10	04:28:48	140	
32	s	04:31:27	04:42:32	161	
33	n	04:45:38	04:59:05	144	
34	s	05:01:28	05:14:14	161	
35	n	05:17:19	05:30:36	154	
xtie		05:40:39	05:43:10	147	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	20150419-1				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	30.25	KVGC			2m	14:02	21:12
Hobbs Time Start:	10:21	Temp (ground)	48						
Hobbs Time Stop:	17:03	Temp (air)	40						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	30						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
cal2	339	14:46:55	14:47:50	163	cal line
cal2	159	14:50:40	14:51:30	151	cal line
cal1	70	14:53:41	14:54:07	153	cal line
36	s	15:09:54	15:22:49	157	
37	n	15:25:33	15:38:27	153	

38	s	15:40:51	15:54:14	147	
39	n	15:56:45	16:09:55	152	
40	s	16:12:46	16:26:27	145	
41	n	16:29:20	16:42:42	161	
42	s	16:45:37	16:59:10	164	
43	n	17:05:28	17:18:34	157	
44	s	18:21:27	17:35:03	161	
45	n	17:37:50	17:51:10	149	
46	s	17:53:47	18:07:15	161	
47	n	18:10:07	18:23:39	152	
48	s	18:26:15	18:34:51	159	
49	n	18:42:29	18:56:34	150	
50	s	18:58:37	19:12:30	156	
51	n	19:14:52	19:28:29	158	
52	s	19:34:26	19:48:18	160	
53	n	19:51:00	20:04:27	156	
54	s	20:10:28	20:24:10	153	
xtie	e	10:30:11	20:31:44	149	cross
xtie	w	20:37:08	20:38:37	153	cross

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	20150425-1			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	29.97	KVGC		2m	13:03	03:20
Hobbs Time Start:	11:10		Temp (ground)	40					
Hobbs Time Stop:	16:44		Temp (air)	32					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	26.1					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
55	s	15:38:33	15:52:33	161	
56	n	15:55:36	16:09:49	153	

57	s	16:13:15	16:26:56	150	
58	n	16:30:04	16:44:09	151	
59	s	16:47:18	17:00:53	156	
60	n	17:03:58	17:19:21	139	
61	s	17:22:50	17:31:59	143	
62	n	17:40:18	17:54:30	146	
63	s	17:57:29	18:11:17	157	
64	n	18:14:22	18:28:38	154	
65	s	18:31:28	18:45:20	150	
66	n	18:48:38	19:02:39	150	
67	s	19:05:22	19:19:09	150	
68	n	19:22:11	19:36:13	163	
69	s	19:38:57	19:52:51	154	
xtie	e	19:58:24	19:59:34	150	cross
xtie	w	20:06:32	20:07:41	143	cross
cal2	159	20:21:29	20:22:19	156	cal line
cal2	337	20:25:24	20:26:15	153	cal line
cal1	250	20:29:01	20:29:38	157	cal line

Project:	15002-2	Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	20150425-2			X	Y	Z
Location:	KVGC	Sensor Number	7213		GPS			
Pilot:	AZ				IMU			
Operator:	PJ	Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	29.79	KVGC		2m	13:03	03:20
Hobbs Time Start:	17:27	Temp (ground)	39					
Hobbs Time Stop:	23:18	Temp (air)	32					
Pre-Static:	5 minutes prior to takeoff	Dew Pt	26.1					
Post Static:	5 minutes after landing	Turbulence	Light					
Fwd Lap:		Visibility	10+					
Side Lap:								

Line/Heading		Start	End	Air Speed	Comments
70	s	21:58:56	22:12:57	157	
71	n	22:16:03	22:30:30	151	
72	s	22:33:11	22:46:56	161	

73	n	22:50:03	23:02:40	146	altm nav failure
		::	::		
73	n	23:07:33	23:15:19	154	completion of 73
74	s	23:18:07	23:32:02	150	
75	n	23:35:16	23:49:38	145	
76	s	29:52:31	00:06:24	160	
77	n	00:09:59	00:24:24	141	
78	s	00:27:51	00:41:49	152	
79	n	00:44:48	00:59:27	40	
80	s	01:03:17	01:17:14	149	
81	n	01:20:31	01:35:14	148	
82	s	01:38:10	01:52:07	140	
83	n	01:55:79	02:09:28	141	
84	s	02:12:06	02:25:48	159	
85	n	02:50:18	02:43:21	144	
xtie	e	02:47:50	02:48:58	153	cross
xtie	w	02:55:22	02:56:33	144	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	20150426-1				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	29.78	KVGC			2m	12:12	02:08
Hobbs Time Start:	09:49	Temp (ground)	43						
Hobbs Time Stop:	15:49	Temp (air)	42						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	22						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
cal2	159	14:09:11	14:10:02	154	
cal2	339	14:13:14	14:14:05	151	
cal1	70	14:16:46	14:17:21	155	
86	s	14:29:57	14:41:40	145	

87	n	14:44:49	14:57:50	153	
88	s	15:00:59	15:13:30	162	
89	n	15:16:41	15:29:34	149	
90	s	15:32:25	15:44:16	158	
91	n	15:49:05	15:59:19	143	
92	s	16:02:18	16:14:03	161	
93	n	16:16:56	16:29:26	139	
94	s	16:32:09	16:44:05	160	
95	n	16:47:22	16:59:53	151	
96	s	17:02:40	17:13:14	154	
97	n	17:16:14	17:27:24	146	
98	s	17:30:07	17:40:47	154	
99	n	17:43:54	17:54:46	142	
100	s	17:57:35	18:08:15	144	
101	n	18:11:49	18:22:24	161	
102	s	18:25:11	18:35:21	161	
103	n	18:38:28	18:49:03	153	
104	s	18:51:46	19:01:58	154	
105	n	19:05:02	19:15:30	150	
xtie	e	19:20:40	19:22:06	155	cross
xtie	w	19:26:37	19:28:16	139	cross

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	20150426-2			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	29.77	KVGC		2m	13:12	02:08
Hobbs Time Start:	17:02		Temp (ground)	49					
Hobbs Time Stop:	22:02		Temp (air)	40					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	30.9					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									
Line/Heading	Start	End	Air Speed	Comments					

106	s	21:24:27	21:34:54	161	
107	n	21:37:55	21:48:29	153	
108	s	21:51:21	22:01:35	162	
109	n	22:04:44	22:15:35	157	
110	s	22:18:40	22:29:00	160	
111	n	22:31:57	22:42:52	138	
112	s	22:45:32	22:55:48	157	
113	n	22:59:12	23:09:45	150	
114	s	23:12:26	23:22:31	157	
115	n	23:25:22	23:36:03	140	
116	s	23:38:51	23:48:59	150	
117	n	23:51:55	00:02:21	154	
118	s	00:05:06	00:15:02	155	
119	n	00:18:41	00:29:09	138	
120	s	00:32:14	00:42:16	152	
121	n	00:45:29	00:55:29	157	
122	s	00:58:39	01:08:52	151	
123	n	01:11:59	01:22:08	152	bad swath rain
123	s	01:27:07	01:28:13	161	partial reflight
xtie	e	01:33:21	01:34:43	149	cross
xtie	w	01:40:01	01:41:23	154	cross

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	20150428-1-2			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	29.93	KVGC		2m	13:34	03:47
Hobbs Time Start:	04:42		Temp (ground)	46					
Hobbs Time Stop:	12:04		Temp (air)	46					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	39					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									
Line/Heading	Start	End	Air Speed	Comments					

cal2	159	13:58:48	13:59:39	152	
cal2	339	14:02:47	14:03:40	148	
cal1	70	14:06:57	14:27:35	152	
124	s	14:17:52	14:27:28	156	
125	n	14:31:06	14:41:34	148	
126	s	14:44:52	14:55:08	152	
127	n	14:58:46	15:09:23	150	
128	s	15:12:50	15:22:22	155	
129	n	15:25:43	15:35:48	160	
130	s	::	::		system shutdown, pilot hit breaker

Project:	15002-2	Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	20150428-3			X	Y	Z
Location:	KVGC	Sensor Number	7213		GPS			
Pilot:	AZ				IMU			
Operator:	PJ	Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	29.93	KVGC		2m	13:34	03:47
Hobbs Time Start:	12:34	Temp (ground)	46					
Hobbs Time Stop:	18:32	Temp (air)	46					
Pre-Static:	5 minutes prior to takeoff	Dew Pt	37					
Post Static:	5 minutes after landing	Turbulence	Light					
Fwd Lap:		Visibility	10+					
Side Lap:								

Line/Heading		Start	End	Air Speed	Comments
130	s	16:55:50	17:05:39	144	
131	n	17:08:55	17:19:10	154	
132	s	17:22:06	17:32:10	151	
133	n	17:35:25	17:45:54	152	
134	s	17:48:33	17:58:45	162	
135	n	18:01:33	18:11:58	158	
136	s	18:14:44	18:24:52	152	
137	n	18:27:39	18:38:05	144	
138	s	18:41:00	18:51:00	161	
139	n	18:54:35	19:04:33	160	
140	s	19:07:27	19:17:05	154	

141	n	19:20:10	19:30:10	154	
142	s	19:33:48	19:43:24	154	
143	n	19:46:44	19:57:02	155	
144	s	19:59:49	20:09:37	166	
145	n	20:12:28	20:22:36	154	
146	s	20:25:25	20:35:21	153	
147	n	20:38:24	20:48:34	161	
148	s	20:50:48	21:00:58	161	
149	n	21:03:45	21:14:17	161	
150	s	21:65:50	21:26:48	150	
151	n	21:39:56	21:40:08	149	
152	s	21:42:53	21:52:45	157	
153	n	21:55:37	22:05:49	150	
xtie	w	22:12:35	22:14:36	162	cross

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	20150428-4			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	29.8	KVGC		2m	13:34	03:47
Hobbs Time Start:	19:30		Temp (ground)	50					
Hobbs Time Stop:	23:39		Temp (air)	46					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	39.9					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
154	s	23:53:25	00:03:35	157	
155	n	00:06:51	00:17:15	155	
156	s	00:20:02	00:29:44	158	
157	n	00:32:38	00:42:53	154	
158	s	00:45:57	00:55:46	154	
159	n	00:59:05	01:09:24	152	
160	s	01:15:41	01:25:22	160	

161	n	01:28:26	01:38:37	152	
162	s	01:41:53	01:51:23	143	
163	n	01:55:10	02:05:20	156	
164	s	02:08:22	02:18:09	166	
165	n	02:21:36	02:32:17	154	
166	s	02:35:48	02:45:45	151	
167	n	02:49:14	02:59:44	138	
168	s	03:02:29	03:12:08	170	
xtie	w	03:19:58	03:22:35	161	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	20150429-1				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	29.8	KVGC			2m	14:36	00:20
Hobbs Time Start:	10:55	Temp (ground)	54						
Hobbs Time Stop:	13:42	Temp (air)	50						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	42.1						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
cal2	159	15:21:54	15:22:44	155	cal line
cal2	339	15:25:48	15:26:40	151	cal line
cal1	70	15:28:59	15:29:33	153	cal line
169	s	15:38:07	15:48:04	147	
170	n	15:51:20	16:01:34	141	
171	s	16:04:06	16:13:55	153	
172	n	16:17:16	16:27:12	151	
173	s	16:30:06	16:39:30	162	
174	n	16:42:16	16:51:51	143	
175	s	16:54:39	17:04:07	142	
176	n	17:06:44	17:11:23	140	
xtie	w	17:22:02	17:23:29	145	cross

Project:	15002-2	Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201501-1			X	Y	Z
Location:	KVGC	Sensor Number	7213		GPS			
Pilot:	AZ				IMU			
Operator:	PJ	Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	29.91	KVGC		2m	12:04	21:06
Hobbs Time Start:	08:10	Temp (ground)	49					
Hobbs Time Stop:	13:50	Temp (air)	47					
Pre-Static:	5 minutes prior to takeoff	Dew Pt	42					
Post Static:	5 minutes after landing	Turbulence	Light					
Fwd Lap:		Visibility	10+					
Side Lap:								

Line/Heading		Start	End	Air Speed	Comments
cal2	338	12:32:36	12:33:32	137	cal line
cal2	159	12:36:37	12:37:29	146	cal line
cal1	70	12:40:09	12:40:49	147	cal line
129	s	12:51:17	13:01:15	155	reflight
177	n	13:05:25	13:11:04	144	
178	s	13:18:45	13:27:28	152	
179	n	13:30:04	13:30:36	154	
180	s	13:41:20	13:49:48	157	
181	n	13:52:22	14:01:01	151	
182	s	14:07:29	14:12:08	155	
183	n	14:15:01	14:22:54	147	
184	s	14:25:46	14:33:44	162	
185	n	14:36:29	14:44:27	152	
186	s	14:47:03	14:54:50	163	
187	n	14:57:39	15:05:29	154	
188	s	15:08:06	15:05:33	165	
189	n	15:18:21	15:25:32	151	
190	s	15:29:48	15:36:38	156	
191	n	15:39:24	15:46:24	159	
192	s	15:48:46	15:55:37	154	
193	n	15:58:33	16:25:44	148	

194	s	16:08:18	16:14:58	155	
195	n	16:17:50	16:24:46	151	
196	s	16:27:21	16:34:01	163	
197	n	16:36:50	16:43:44	157	
198	s	16:46:07	16:52:43	157	
199	n	16:55:33	17:02:26	158	
200	s	17:04:51	18:11:25	158	
201	n	17:13:38	17:20:53	148	
202	s	17:23:18	17:26:56	157	
xtie	w	17:35:07	17:37:01	160	cross

Project:	15002-2	Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201501-2			X	Y	Z
Location:	KVGC	Sensor Number	7213		GPS			
Pilot:	AZ				IMU			
Operator:	PJ	Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	29.95	KVGC		2m	12:04	21:06
Hobbs Time Start:	15:00	Temp (ground)	66					
Hobbs Time Stop:	17:00	Temp (air)	50					
Pre-Static:	5 minutes prior to takeoff	Dew Pt	42					
Post Static:	5 minutes after landing	Turbulence	Light					
Fwd Lap:		Visibility	10+					
Side Lap:								

Line/Heading		Start	End	Air Speed	Comments
203	s	19:21:00	19:21:37		rejected
203	s	19:24:25	19:31:14	141	
204	n	19:34:06	19:41:04	156	
205	s	19:43:30	19:50:10	163	
206	n	19:52:52	19:59:47	145	
207	s	20:02:04	20:08:44	168	
208	n	20:11:37	20:18:37	148	
209	s	20:21:16	20:27:54	158	
210	n	20:31:03	20:37:46	160	started to rain n end of line
xtie	e	20:44:44	20:45:31	155	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201502-1				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	30	KVGC			2m	12:20	23:57
Hobbs Time Start:	08:40	Temp (ground)	45						
Hobbs Time Stop:	14:30	Temp (air)	38						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	41						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
cal2	156	12:54:36	12:55:25	160	cal line
cal2	339	12:58:12	12:59:05	151	cal line
cal1	70	13:01:15	13:01:54	148	cal line
210	s	13:07:13	13:08:23	152	reflight
211	s	13:12:03	13:18:25	165	
212	n	13:21:01	13:27:32	154	
213	s	13:29:54	13:36:14	147	
214	n	13:38:55	13:45:44	151	
215	s	13:48:13	13:54:46	163	
216	n	13:57:58	14:04:16	158	
217	s	14:07:07	14:13:35	153	
218	n	14:16:20	14:22:39	157	
219	s	14:25:32	14:31:47	164	
220	n	14:34:27	14:40:48	162	
221	s	14:43:19	14:49:37	155	
222	n	14:52:12	14:58:31	164	
223	s	15:01:31	15:07:45	164	
224	n	15:10:07	15:16:24	154	
225	s	15:18:35	15:24:49	162	
226	n	15:27:46	15:24:06	156	
227	s	15:36:38	15:42:40	159	
228	n	15:45:21	15:51:25	161	

229	s	15:54:06	16:06:10	157	
230	n	16:02:46	16:08:59	160	
231	s	16:11:27	16:17:25	163	
232	n	16:20:16	16:25:59	155	
233	s	16:38:17	16:34:01	168	
234	n	16:36:28	16:42:08	160	
235	s	16:44:30	16:50:13	160	
236	n	16:52:59	16:58:43	158	
237	s	17:01:18	17:07:01	162	
238	n	17:09:58	17:15:46	159	
239	s	17:19:08	17:23:16	163	
240	n	17:33:33	17:33:20	154	
241	s	17:35:45	17:41:34	157	
242	n	17:44:06	17:49:56	150	
243	s	17:52:19	17:58:04	150	
244	n	18:00:47	18:06:44	157	
xtie	w	18:12:23	18:14:40	151	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201502-2				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	30	KVGC			2m	12:20	23:57
Hobbs Time Start:	15:25	Temp (ground)	45						
Hobbs Time Stop:	19:50	Temp (air)	40.2						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	41						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
245	s	19:42:06	19:48:44	160	
246	n	19:51:23	19:57:24	160	
247	s	19:59:45	20:05:33	147	
248	n	20:08:12	20:14:19	141	

249	s	20:16:50	20:22:28	164	
250	n	20:25:53	20:31:10	151	
251	s	20:33:50	20:39:13	162	
252	n	20:41:44	20:47:19	151	
253	s	20:49:48	20:55:15	149	
254	n	20:58:19	21:03:32	163	
255	s	21:05:47	21:10:55	158	
256	n	21:13:28	21:18:38	160	
257	s	21:20:58	21:23:03	167	
258	n	21:28:45	21:39:04	158	
259	s	21:36:22	21:41:22	154	
260	n	21:43:46	21:48:59	160	
261	s	21:51:22	21:56:23	163	
262	n	21:59:06	22:04:21	159	
263	s	22:06:24	22:11:29	165	
264	n	22:14:08	22:19:20	153	
265	s	22:21:24	22:26:08	167	
266	n	22:28:35	22:33:23	156	
267	s	22:35:24	22:40:08	155	
268	n	22:42:12	22:47:08	162	
269	s	22:49:58	22:55:05	160	
270	n	22:57:36	23:03:12	152	
271	s	23:05:22	23:10:40	157	
272	n	23:12:54	23:18:25	162	
273	s	23:20:39	23:26:01	151	
274	n	23:28:10	23:33:46	162	
xtie	w	23:39:12	23:41:10	155	cross

Project:	15002-2	Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201503-1			X	Y	Z
Location:	KVGC	Sensor Number	7213		GPS			
Pilot:	AZ				IMU			
Operator:	PJ	Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	30.09	KVGC		2m	12:20	23:57
Hobbs Time Start:	09:05	Temp (ground)						

Hobbs Time Stop:		15:30		Temp (air)	60					
Pre-Static:		5 minutes prior to takeoff		Dew Pt						
Post Static:		5 minutes after landing		Turbulence	Light					
Fwd Lap:				Visibility	10+					
Side Lap:										
Line/Heading		Start	End	Air Speed	Comments					
cal2	159	13:22:38	13:23:24	164	cal line					
cal2	339	13:26:17	13:27:11	136	cal line					
cal1	70	13:29:01	13:29:29	157	cal line					
275	N	13:35:30	13:41:01	161						
276	S	13:43:27	13:48:52	152						
277	N	13:51:29	13:57:04	156						
278	S	13:59:22	14:04:57	157						
279	N	14:07:40	14:13:16	158						
280	S	14:15:40	14:21:10	161						
281	N	14:23:36	14:29:06	155						
282	S	14:31:28	14:36:58	161						
283	N	14:39:41	14:45:11	155						
284	S	14:47:31	14:53:03	160						
285	N	14:55:28	15:00:55	162						
286	S	15:03:15	15:28:35	167						
287	N	15:11:13	15:16:37	157						
288	S	15:18:57	15:24:27	152						
289	N	15:28:13	15:33:33	162						
290	S	15:35:33	15:41:20	162						
291	N	15:44:13	15:49:36	166						
292	S	15:52:18	15:57:43	154						
293	N	16:00:25	16:05:49	158						
294	S	16:08:00	16:13:27	150						
295	N	16:15:49	16:21:14	162						
296	S	16:24:37	16:30:15	150						
297	N	16:32:45	16:38:18	145						
298	S	16:40:45	16:46:11	155						
299	N	16:48:36	16:54:02	158						
300	S	16:56:49	17:02:19	156						
301	N	17:04:45	17:10:09	151						

302	S	17:12:32	17:18:03	157	
303	N	17:20:37	17:26:01	164	
304	S	17:28:59	17:34:04	162	
305	N	17:36:35	17:41:44	159	
306	S	17:43:51	17:49:04	159	
307	N	17:51:57	17:57:03	157	
308	S	17:59:30	18:04:31	153	
309	N	18:06:46	18:11:56	161	
310	S	18:13:51	18:19:00	155	
311	N	18:21:13	18:26:28	154	
312	S	18:28:45	18:33:50	161	
313	N	18:36:04	18:41:16	154	
314	S	18:43:16	18:48:31	157	
315	N	18:50:30	18:55:43	153	
316	S	18:57:47	19:02:50	149	
317	N	19:05:02	19:10:12	151	
xtie	E	19:13:37	::	167	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201503-2				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	30.03	KVGC			2m	12:47	01:08
Hobbs Time Start:	17:10	Temp (ground)	78						
Hobbs Time Stop:	20:55	Temp (air)	60						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	38						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
318	s	21:26:40	21:34:40	151	
319	n	21:37:11	21:45:17	156	
320	s	21:47:24	21:55:25	152	
321	n	21:58:08	22:06:02	154	altm NAV shut down unexpected after line 321

322	s	22:12:53	22:20:50	163	
323	n	22:25:17	22:33:57	135	
324	s	22:36:00	22:44:18	153	
325	n	22:46:52	22:55:14	149	
326	s	22:57:27	23:05:42	160	
327	n	23:08:11	23:16:27	151	
328	s	23:19:37	23:26:55	160	
329	n	23:29:05	23:38:05	139	
330	s	12:40:33	23:49:30	167	
331	n	23:52:04	00:01:00	163	
332	s	00:03:34	00:12:26	152	
333	n	00:15:07	00:24:01	157	
334	s	00:26:26	00:36:34	164	
xtie	e	00:42:39	00:43:58	151	cross

Project:	15002-2	Tail Number	N6098X			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201504-1				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure	30.02	KVGC			2m	13:27	21:12
Hobbs Time Start:	09:40	Temp (ground)	81						
Hobbs Time Stop:	15:40	Temp (air)	65						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	41						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
cal2	339	13:57:11	13:57:57	167	cal line
cal2	159	14:00:33	14:01:22	159	cal line
cal1	250	14:03:47	14:04:27	141	cal line
335	s	14:10:08	14:20:44	145	
336	n	14:23:27	14:33:30	155	
337	s	14:36:04	14:46:29	151	
338	n	14:48:46	14:58:50	164	

339	s	15:01:17	15:12:14	156	
340	n	15:14:36	15:24:50	165	
341	s	15:27:20	15:38:26	133	
342	n	15:40:44	15:51:06	155	
343	s	15:53:34	16:04:23	163	
344	n	16:07:47	16:18:08	155	
345	s	16:20:43	16:31:52	163	
346	n	16:34:11	16:44:47	157	
347	s	16:47:36	16:58:55	157	
348	n	17:01:13	17:11:47	160	
349	s	17:14:29	17:25:46	149	
350	n	17:28:01	17:38:52	142	
351	s	17:41:27	17:52:47	150	
352	n	17:55:12	18:05:48	157	
353	s	18:07:49	18:21:01	153	
354	n	18:23:30	18:34:13	153	
355	s	18:36:45	18:48:05	151	
356	n	18:50:21	19:01:15	163	
357	s	19:03:52	19:15:06	153	
xtie	e	19:19:47	19:21:25	151	cross
xtie	w	19:25:48	19:27:31	155	cross

Project:	15002-2		Tail Number	N6098X		Level Arm			
Flight Plan Name:	kas_15pa-248		Flight Date	201505-1			X	Y	Z
Location:	KVGC		Sensor Number	7213		GPS			
Pilot:	AZ					IMU			
Operator:	PJ		Weather		Base Station		ARP	Start	Stop
Sensor:	Optech Gemini		Pressure	30.29	KVGC		2m	16:11	
Hobbs Time Start:	12:15		Temp (ground)	65					
Hobbs Time Stop:	16:20		Temp (air)	80					
Pre-Static:	5 minutes prior to takeoff		Dew Pt	51					
Post Static:	5 minutes after landing		Turbulence	Light					
Fwd Lap:			Visibility	10+					
Side Lap:									
Line/Heading	Start	End	Air Speed	Comments					

cal2	159	16:45:23	16:46:14	154	cal line
cal2	337	16:48:50	16:49:39	154	cal line
cal1	250	16:51:30	16:52:07	149	cal line
358	s	16:58:48	17:10:00	143	
359	n	17:12:27	17:23:33	154	
360	s	17:26:01	17:37:08	161	
361	n	17:39:11	17:45:02	155	
361	n	17:46:42	17:50:30	155	
362	s	17:52:59	17:56:53	169	
362	s	17:58:30	18:04:10	161	
363	n	18:06:36	18:12:27	160	
363	n	18:14:09	18:17:59	162	
364	s	18:20:03	18:24:02	168	
364	s	18:25:42	18:31:21	163	
365	n	18:33:51	18:39:50	159	
365	n	18:41:22	18:45:09	167	
366	s	18:47:39	18:51:35	167	
366	s	18:53:05	18:59:02	159	
367	n	19:01:24	19:07:43	152	
367	n	19:09:22	19:13:07	167	
368	s	19:15:16	19:19:16	155	
368	s	19:20:51	19:26:53	148	
369	n	12:29:19	19:35:33	155	
369	n	19:37:13	19:41:02	160	
370	s	19:43:22	19:54:55	153	
370	s	19:48:58	20:03:44	149	
371	n	19:57:33	20:09:08	164	
371	n	20:05:21	20:05:21	158	
372	s	20:11:25	20:15:26	158	
372	s	20:17:05	20:23:15	166	
xtie	w	20:28:38	20:29:35	145	cross
xtie	e	20:35:44	20:36:53	154	cross

Project:	15002-2	Tail Number	N6098X	Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201505-2		X	Y	Z

Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	PJ	Weather		Base Station		ARP	Start	Stop	
Sensor:	Optech Gemini	Pressure	30.27	KVGC		2	16:11		
Hobbs Time Start:	17:30	Temp (ground)	59						
Hobbs Time Stop:	12:55	Temp (air)	50						
Pre-Static:	5 minutes prior to takeoff	Dew Pt	39						
Post Static:	5 minutes after landing	Turbulence	Light						
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
373	n	22:00:14	22:06:31	161	
373	n	22:08:23	22:12:20	163	
374	s	22:14:57	22:18:56	147	
374	s	22:20:41	22:26:55	149	
375	n	22:29:23	22:35:56	159	
375	n	22:37:30	22:41:26	154	
376	s	22:43:39	22:47:38	155	
376	s	22:49:21	22:55:32	157	
377	n	22:57:51	23:04:27	151	
377	n	23:06:02	23:09:55	165	
378	s	23:12:09	23:16:03	159	
378	s	23:17:44	23:23:53	157	
379	n	23:26:57	23:32:18	161	
379	n	23:34:00	23:37:50	161	
380	s	23:39:54	23:43:46	164	
380	s	23:44:08	23:46:54	156	
380	s	23:53:15	23:57:20	151	
381	n	23:59:48	00:05:08	149	
381	n	00:06:46	00:10:39	158	
382	s	00:13:28	00:17:12	161	
382	s	00:18:46	00:23:51	157	
383	n	00:26:27	00:31:51	151	
383	n	00:33:34	00:37:31	166	
384	s	00:39:40	00:43:36	155	

384	s	00:45:08	00:50:06	163	
385	n	00:54:52	00:56:28	148	
385	n	00:58:07	01:02:03	158	
386	s	01:04:31	01:06:21	165	
387	n	01:09:04	01:10:49	156	
388	s	01:13:16	01:14:57	162	
389	n	01:17:39	01:19:18	161	
390	s	01:22:15	01:23:56	167	
391	n	01:26:29	01:28:10	163	
xtie	e	01:30:57	01:32:48	262	cross
xtie	w	01:38:27	01:39:38	136	cross

Project:	15002-2	Tail Number	N5038J			Level Arm			
Flight Plan Name:	kas_15pa-248	Flight Date	201506-07				X	Y	Z
Location:	KVGC	Sensor Number	7213			GPS			
Pilot:	AZ					IMU			
Operator:	MLM	Weather		Base Station			ARP	Start	Stop
Sensor:	Optech Gemini	Pressure		KVGC			2	16:11	
Hobbs Time Start:	13:02	Temp (ground)							
Hobbs Time Stop:	16:07	Temp (air)							
Pre-Static:	5 minutes prior to takeoff	Dew Pt							
Post Static:	5 minutes after landing	Turbulence							
Fwd Lap:		Visibility	10+						
Side Lap:									

Line/Heading		Start	End	Air Speed	Comments
11	179	13:54	13:56	140	
11	359	13:58	13:59	130	
10	178	14:10	14:11	136	
10	358	14:13	14:14	135	
6	179	14:18	14:19	140	
12	179	14:22	14:23	140	
12	358	14:25	14:27	140	
8	179	14:29	14:30	135	
13	179	14:32	14:33	140	
13	359	14:36	14:38	140	

1	179	14:40	14:41	140	
1	359	14:43	14:144	120	
8	359	14:45	14:46	125	
9	180	14:48	14:50	130	
9	0	14:51	14:53	140	
7	359	14:54	14:56	140	
2	358	14:57	14:58	135	
5	180	15:01	15:02	130	
7	180	15:03	15:04	125	
6	359	15:06	15:09	140	
5	359	15:11	15:12	135	
4	180	15:14	15:16	140	
4	0	15:18	15:19	130	
3	180	15:21	15:22	130	
3	0	15:24	15:25	140	
14	180	15:27	15:29	110	
14	0	15:32	15:35	120	
2	180	15:37	15:39	140	

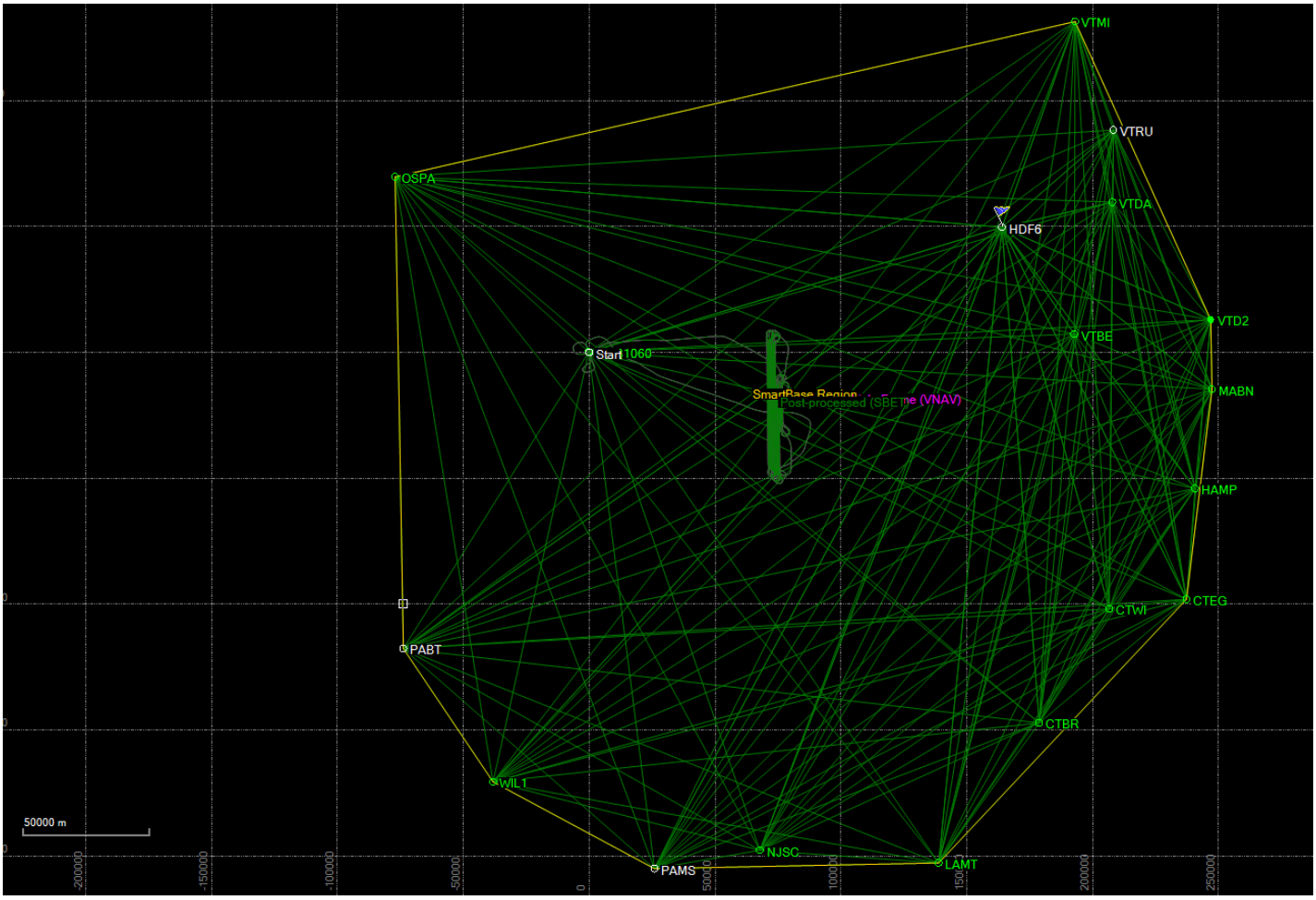
Section 5: GPS Processing Plots

POSPac MMS Version 7.1

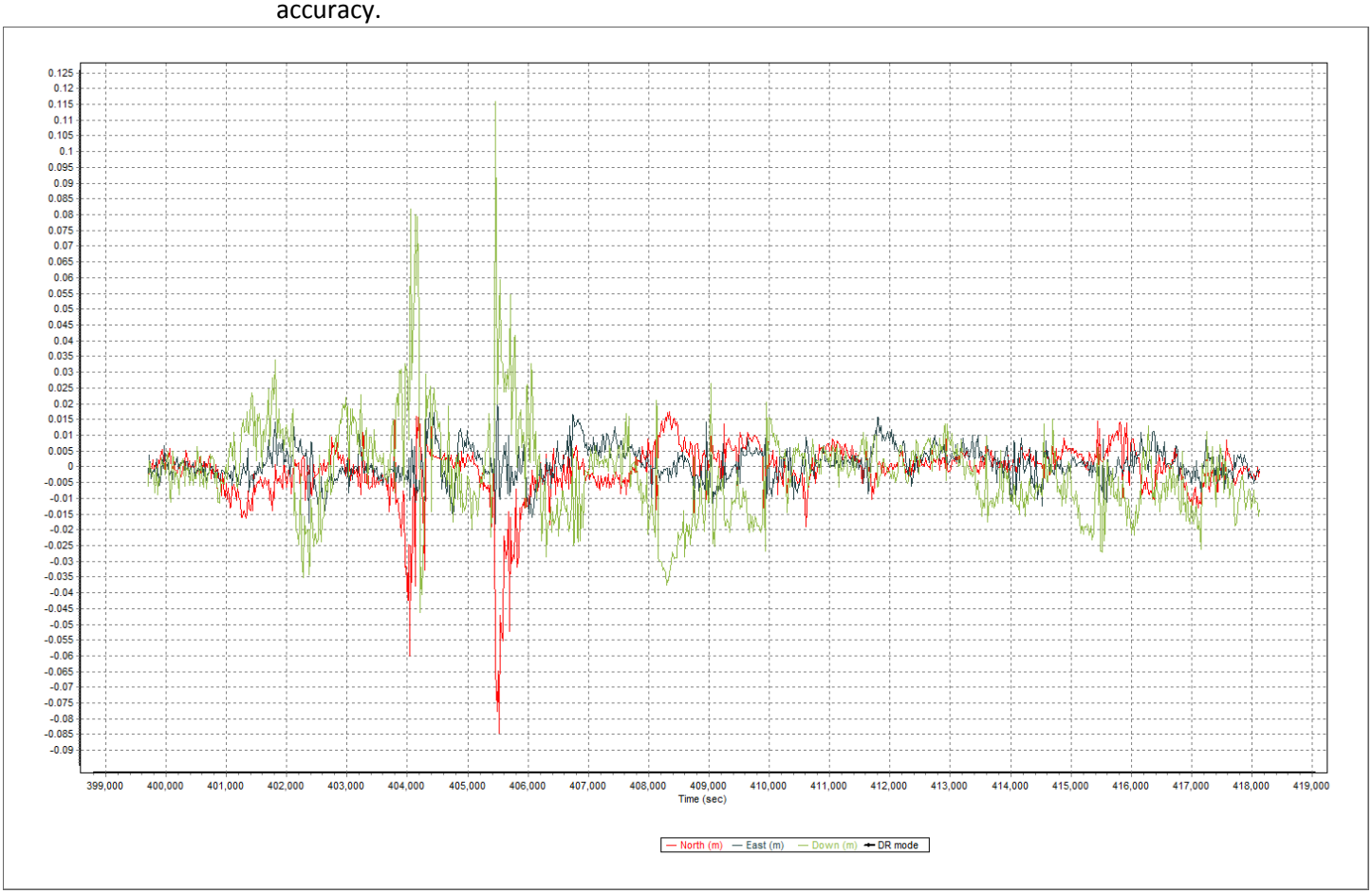
Plots by lift of the Coverage Map, Estimated Position Accuracy, Number of Satellites, Combined Separation, and PDOP.

20150416-1

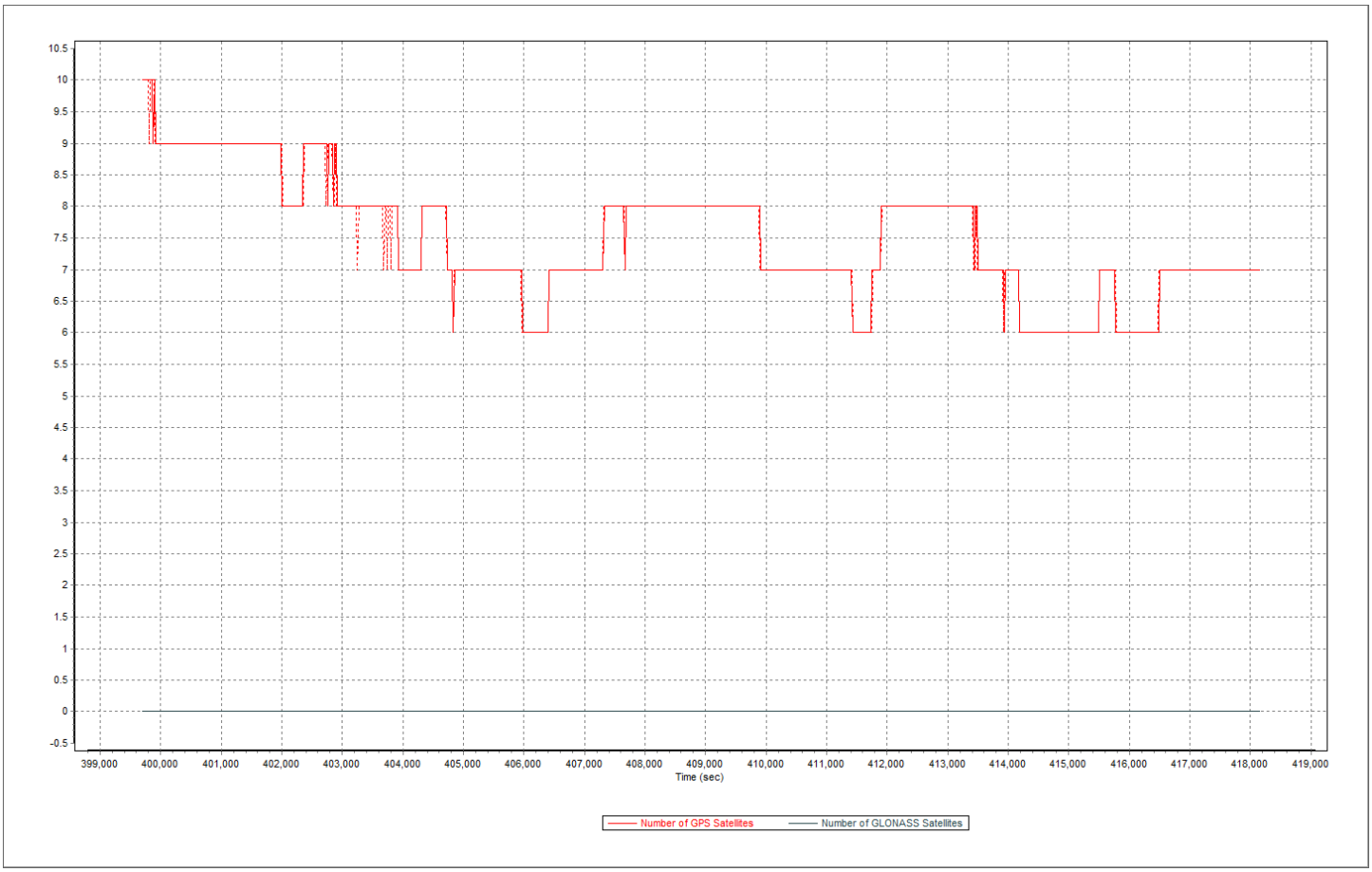
Coverage Map: The Coverage Map plot shows the Aircraft GPS-IMU Trajectory in reference to localized GPS Reference Stations.


VTMI
VTRU
OSPA
VTDA
HDF6
VTD2
VTBE
Start 1060
MABN
HAMP
CTEG
CTWI
PABT
CTBR
WIL1
50000 m
NJSC
PAMS
LAMT

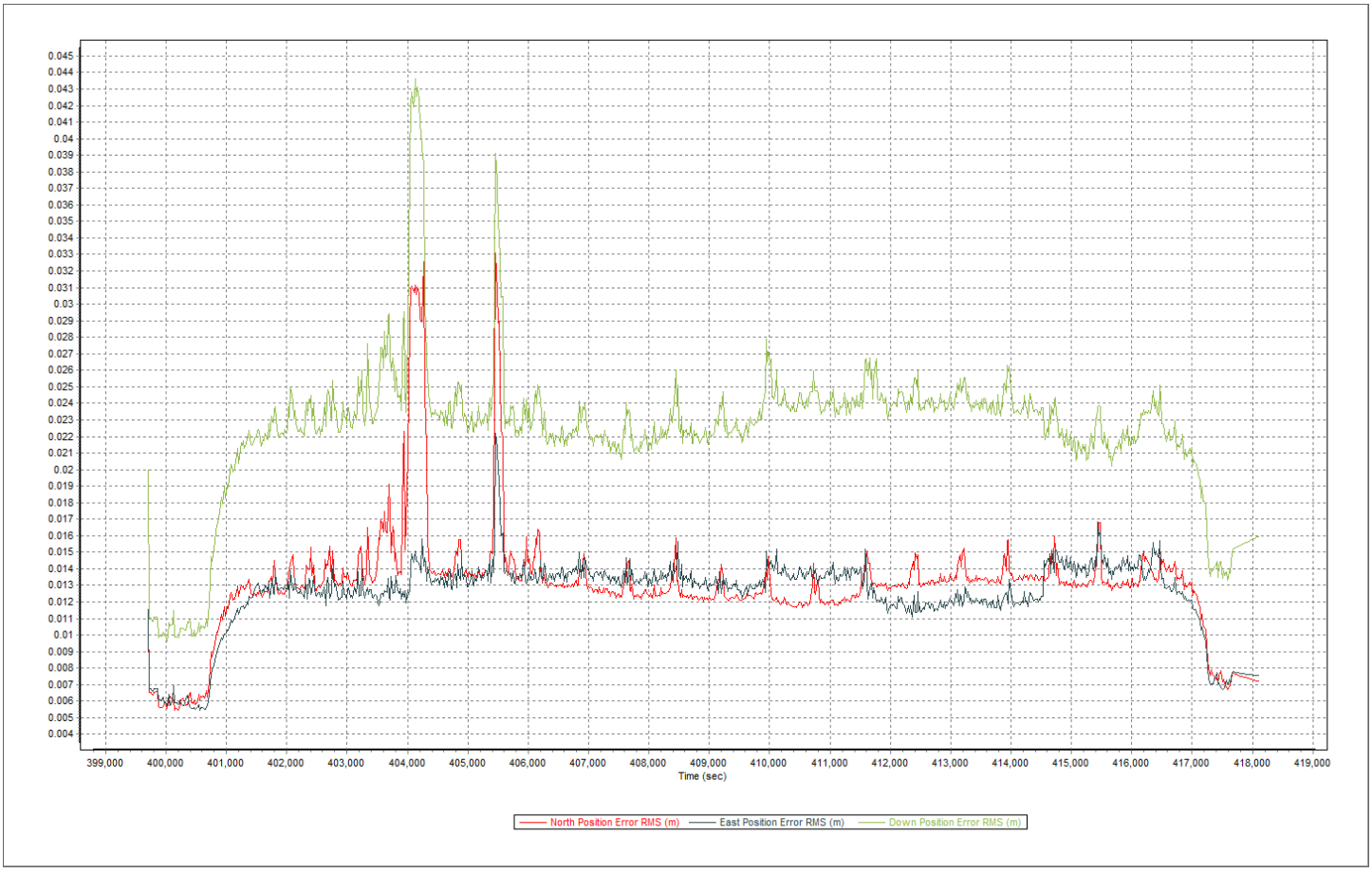
Combined Separation: Plots the north, east, and height position difference between any two solutions loaded into the project. This is most often the forward and reverse processing results, unless other solutions have been loaded from the Combine Solutions dialog. Plotting the difference between forward 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.



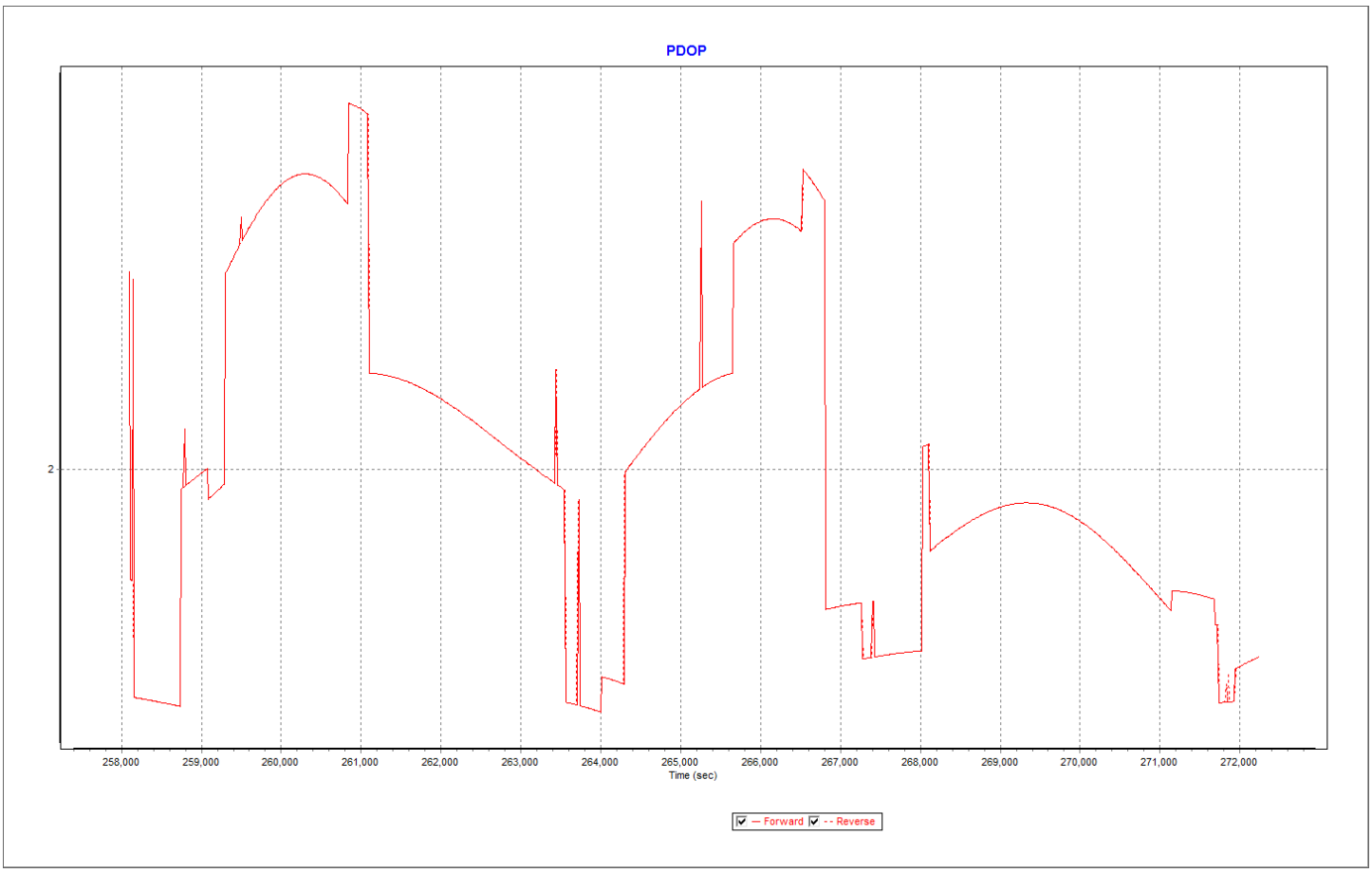
Number of Satellites: Plots the number of satellites used in the solution as a function of time. The number of GPS satellites, GLONASS satellites and the total number of satellites are distinguished with separate lines.



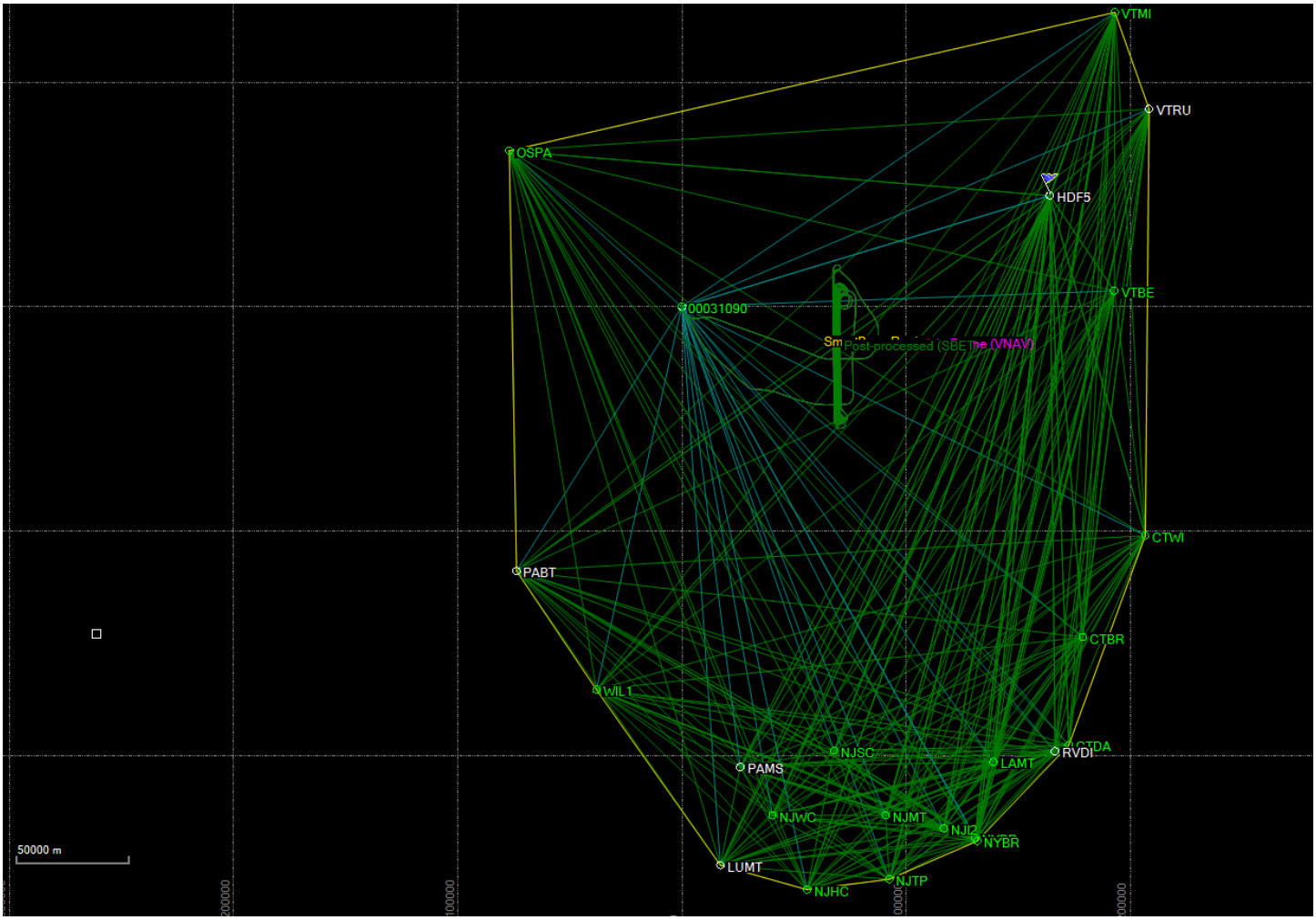
Estimated Position Accuracy: The Estimated Position Accuracy plot shows the standard deviations of the east, north, and up directions versus time for the solution.

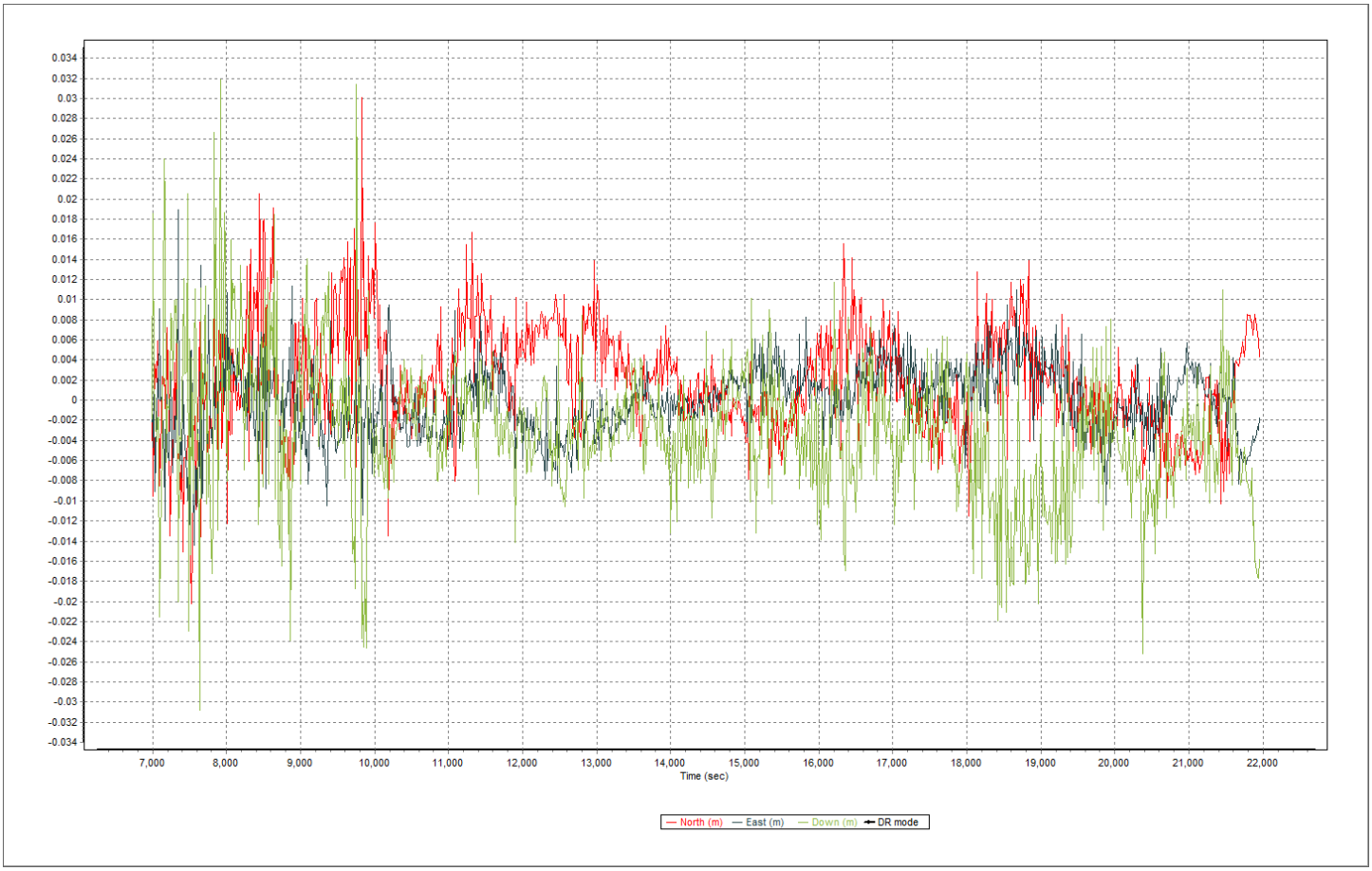


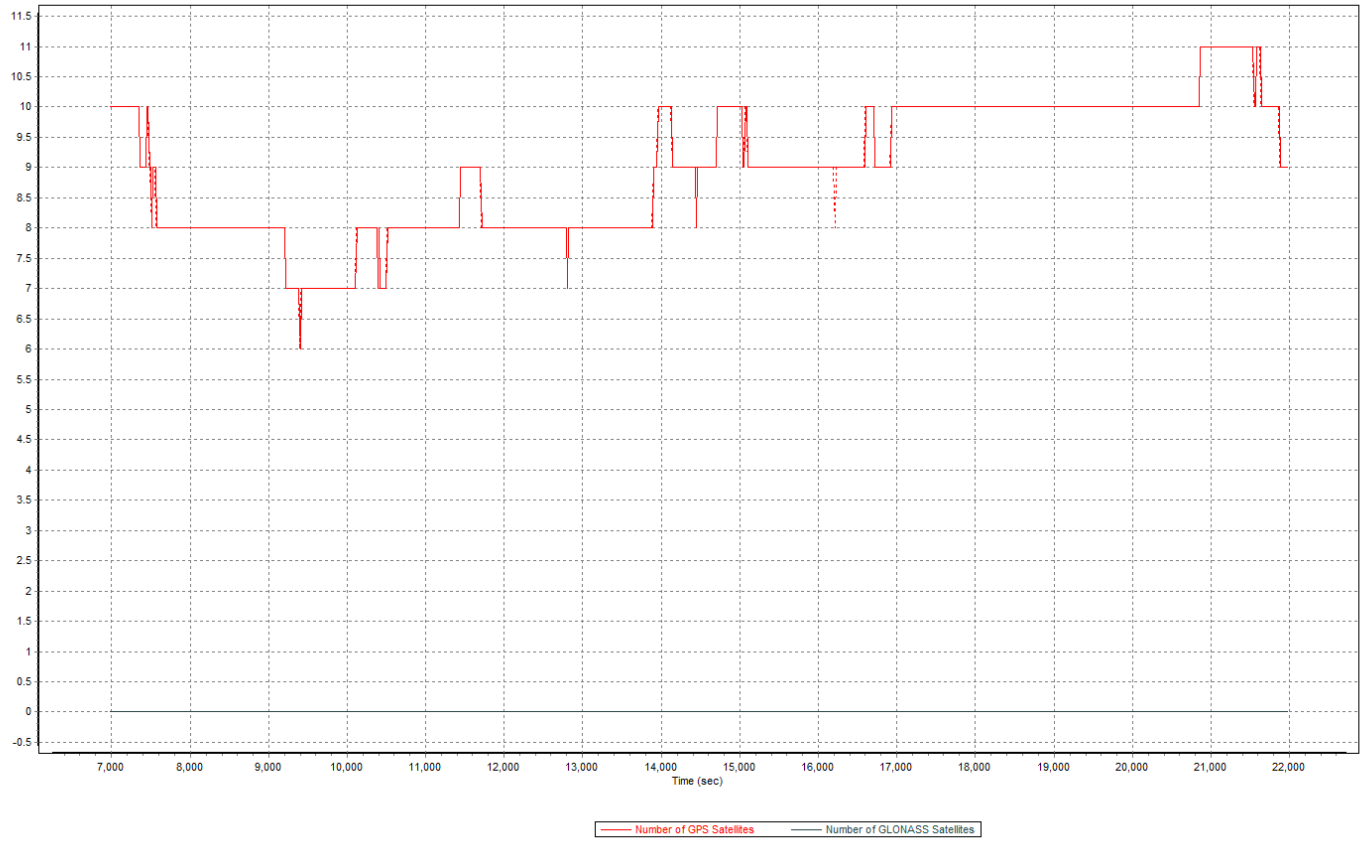
PDOP: PDOP is a unitless number which indicates how favorable the satellite geometry is to 3D positioning accuracy. A strong satellite geometry, where the PDOP is low, occurs when satellites are well distributed in each direction (north, south, east and west) as well as directly overhead. Values in the 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.

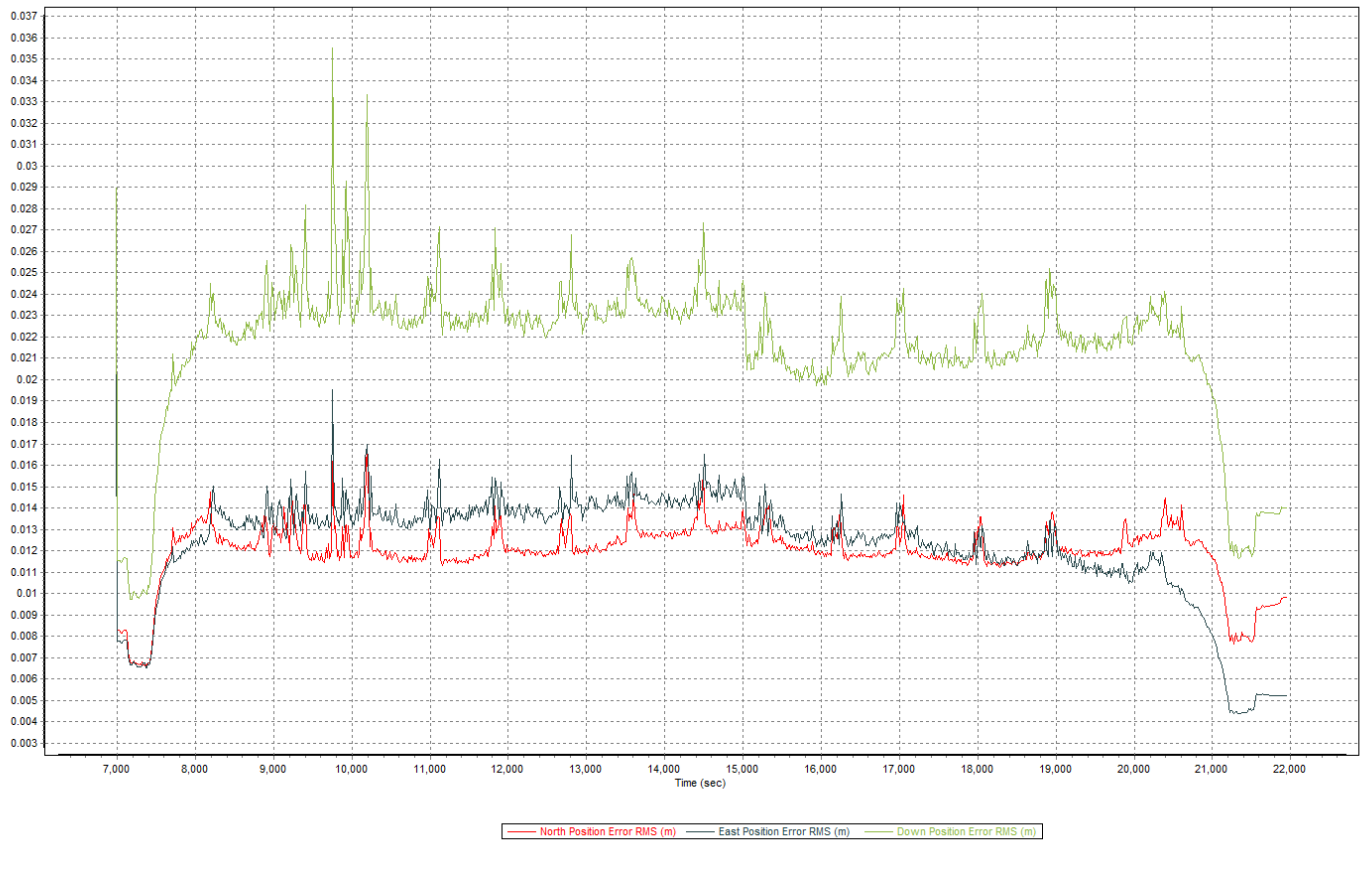


20150418-2


VTMI
VTRU
OSPA
HDF5
VTBE
00031090
Post-processed (SBET
me (VNAV)
CTWI
PABT
CTBR
WIL1
NJSC
RVDI
LAMT
PAMS
NJWC
NJMT
NJI2
NYBR
LUMT
NJTP
NJHC
50000 m


0.034
0.032
0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
-0.032
-0.034
7,000
8,000
9,000
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
19,000
20,000
21,000
22,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode


11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
7,000
8,000
9,000
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
19,000
20,000
21,000
22,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites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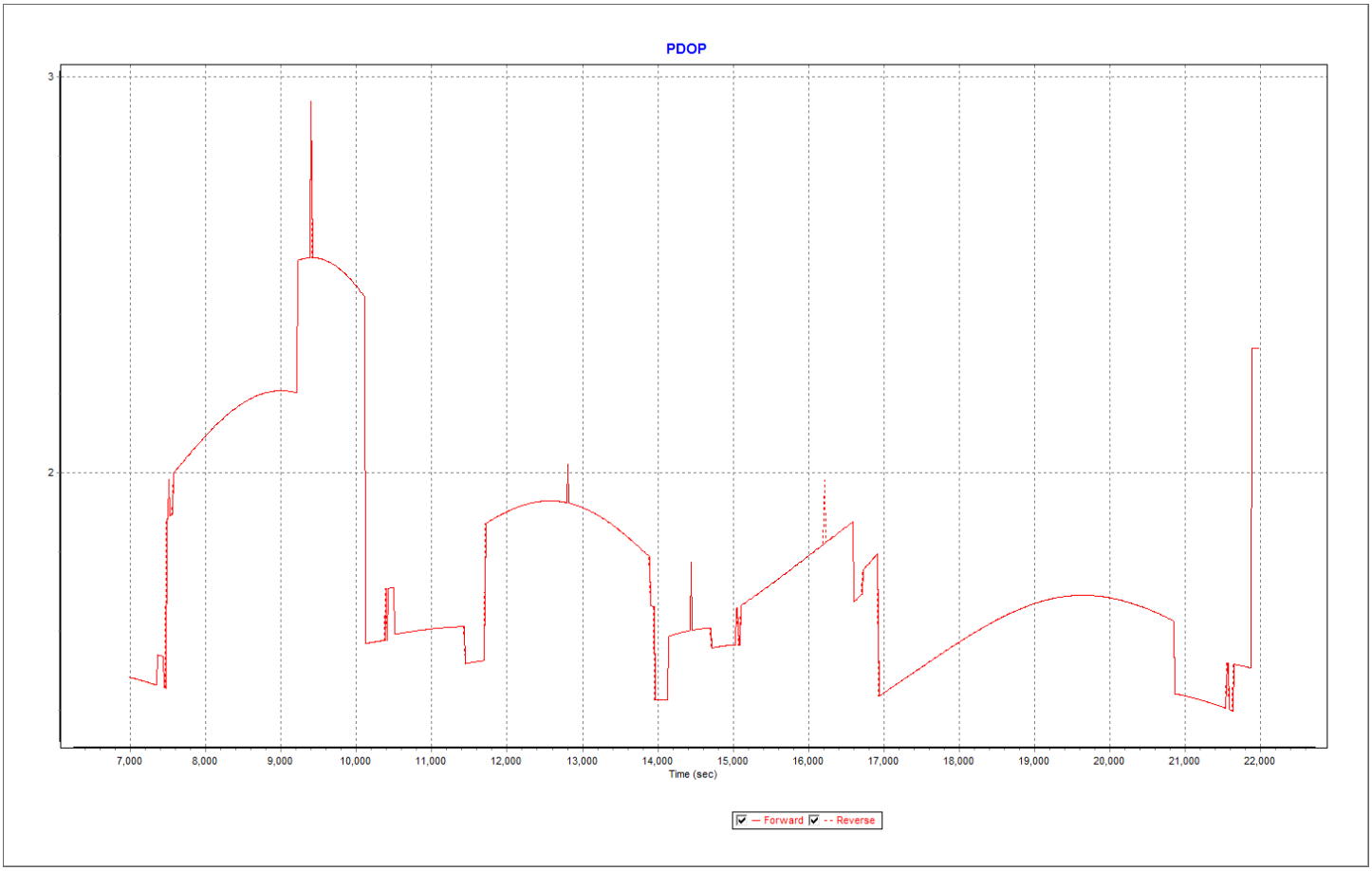
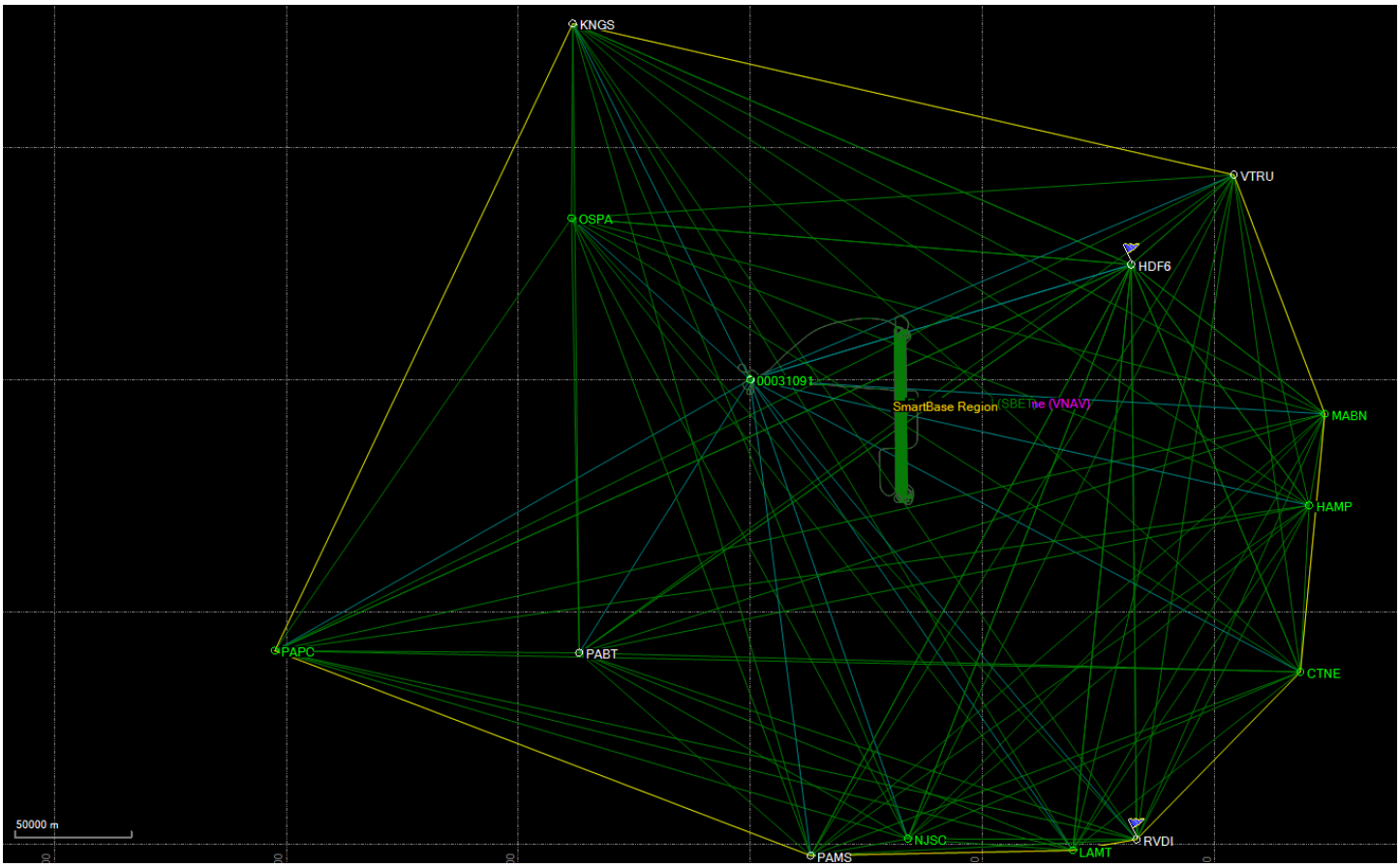
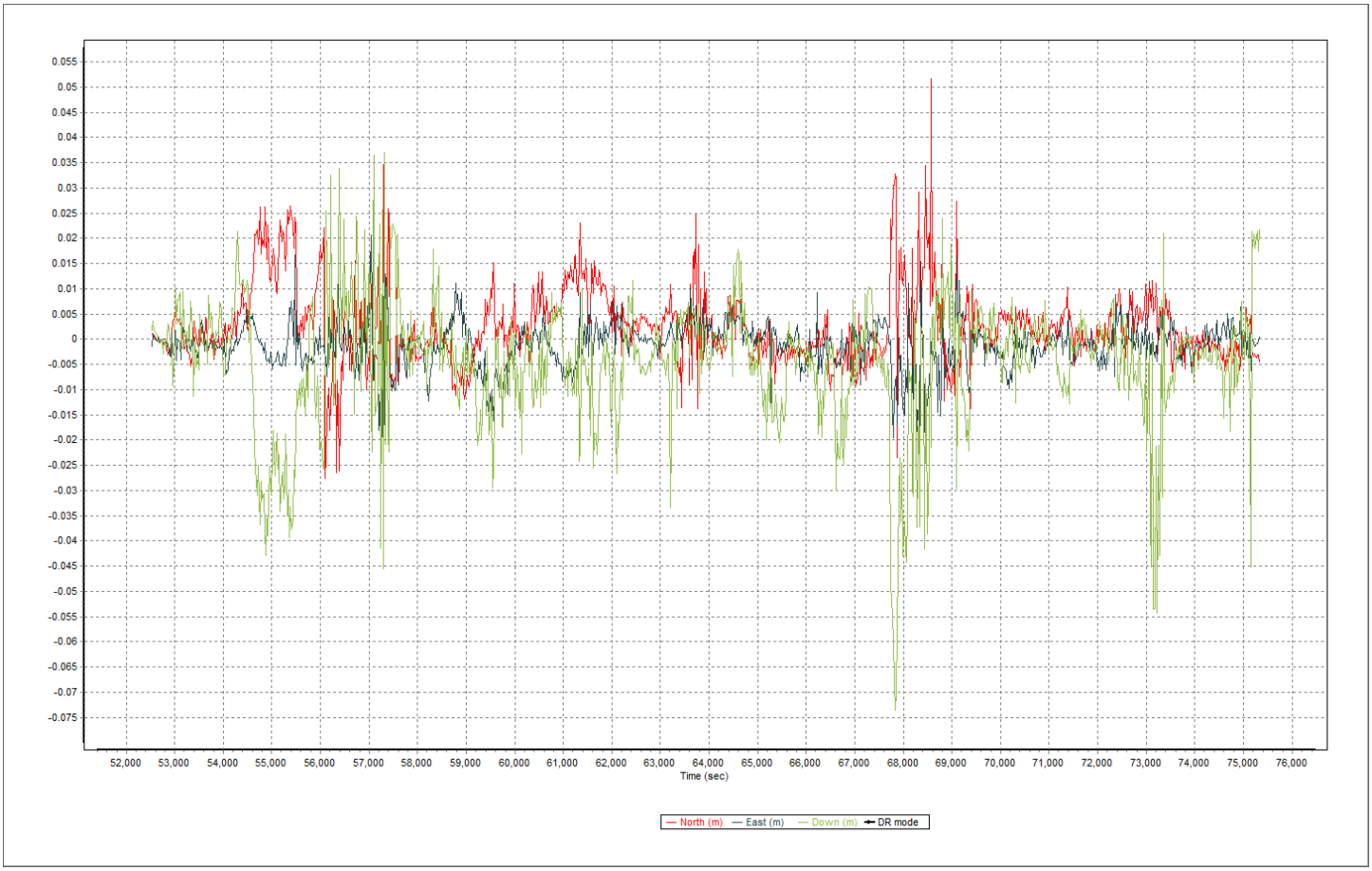
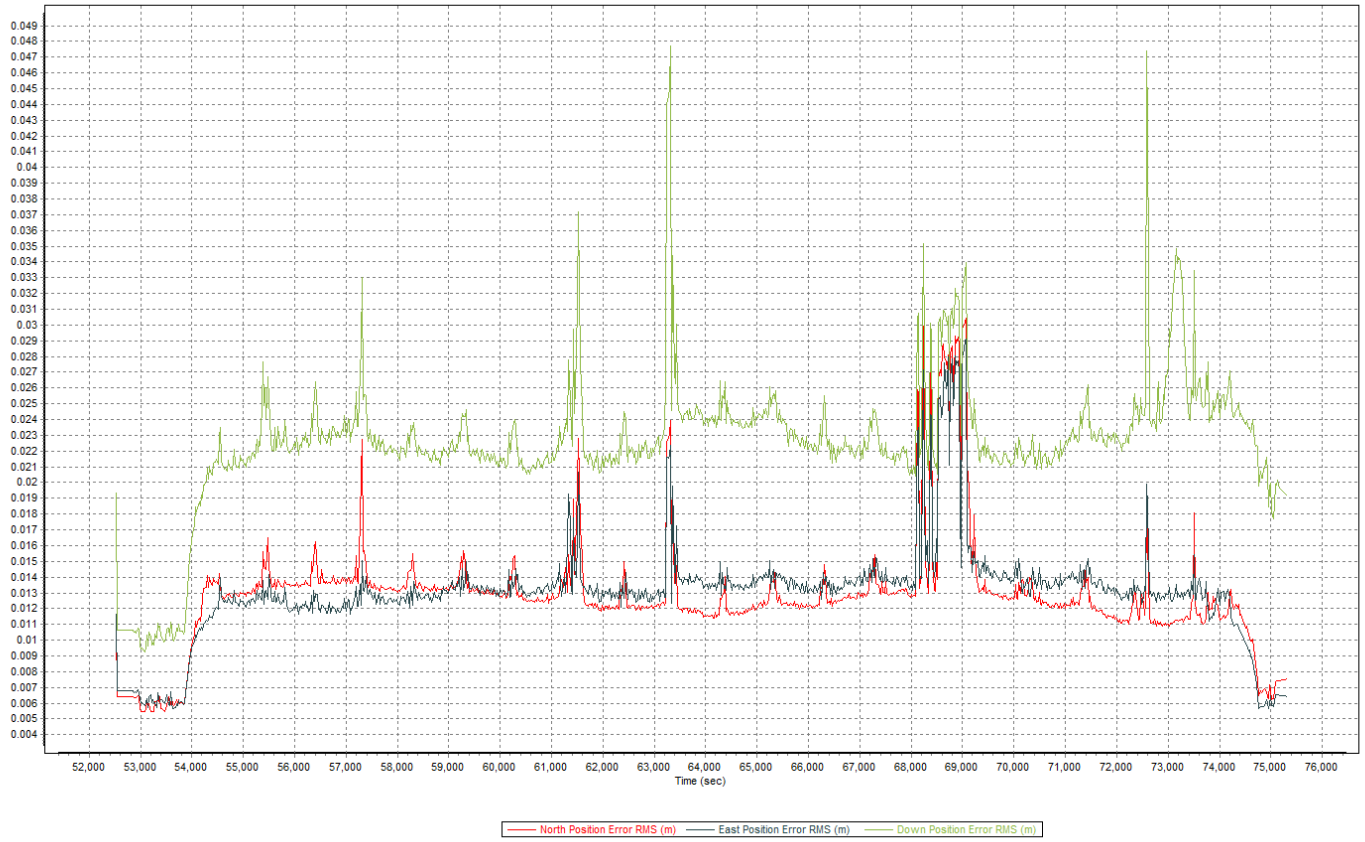
0.032
0.031
0.03
0.029
0.028
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
7,000
8,000
9,000
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
19,000
20,000
21,000
22,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)

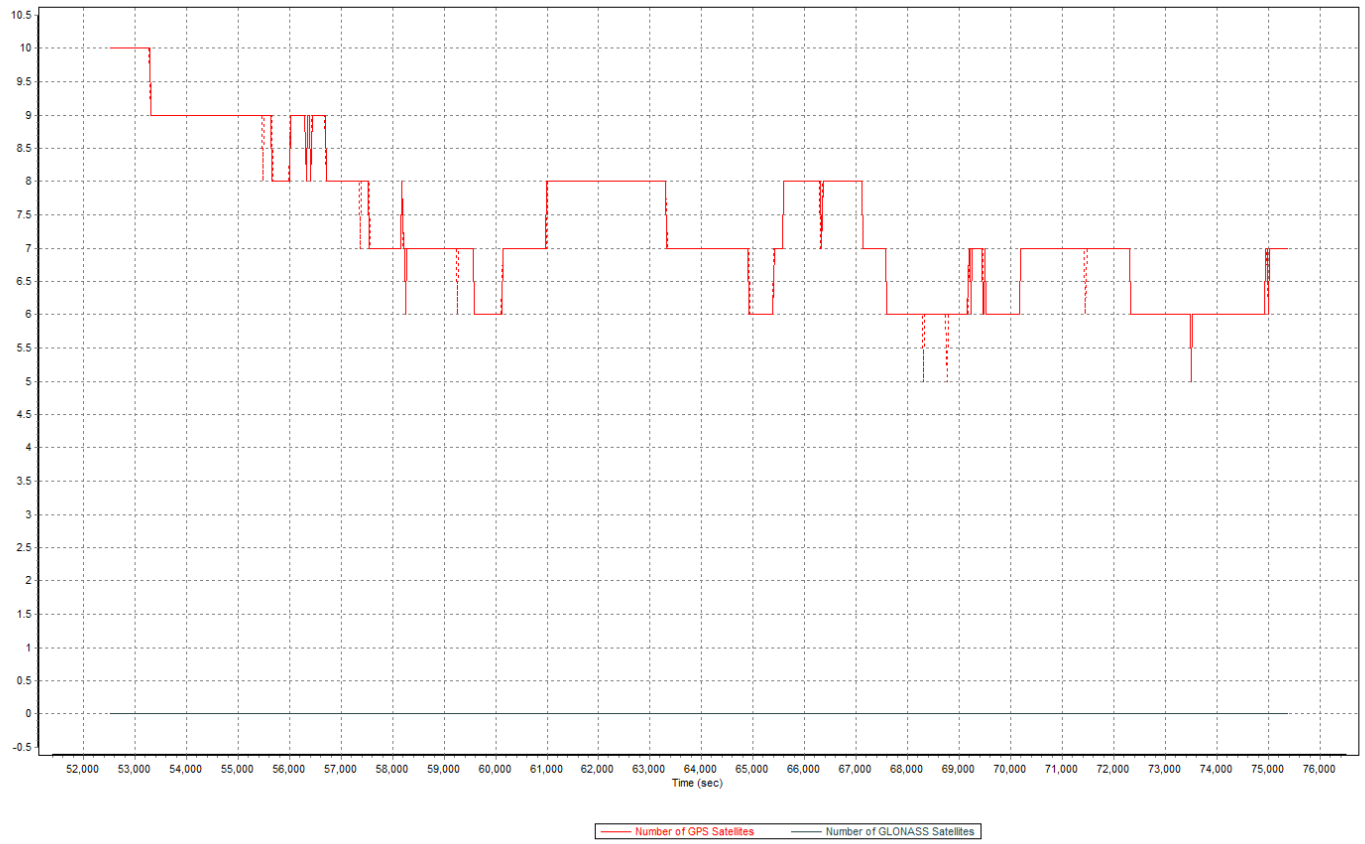

PDOP
3
2
7,000
8,000
9,000
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
19,000
20,000
21,000
22,000
Time (sec)
Forward
Reverse

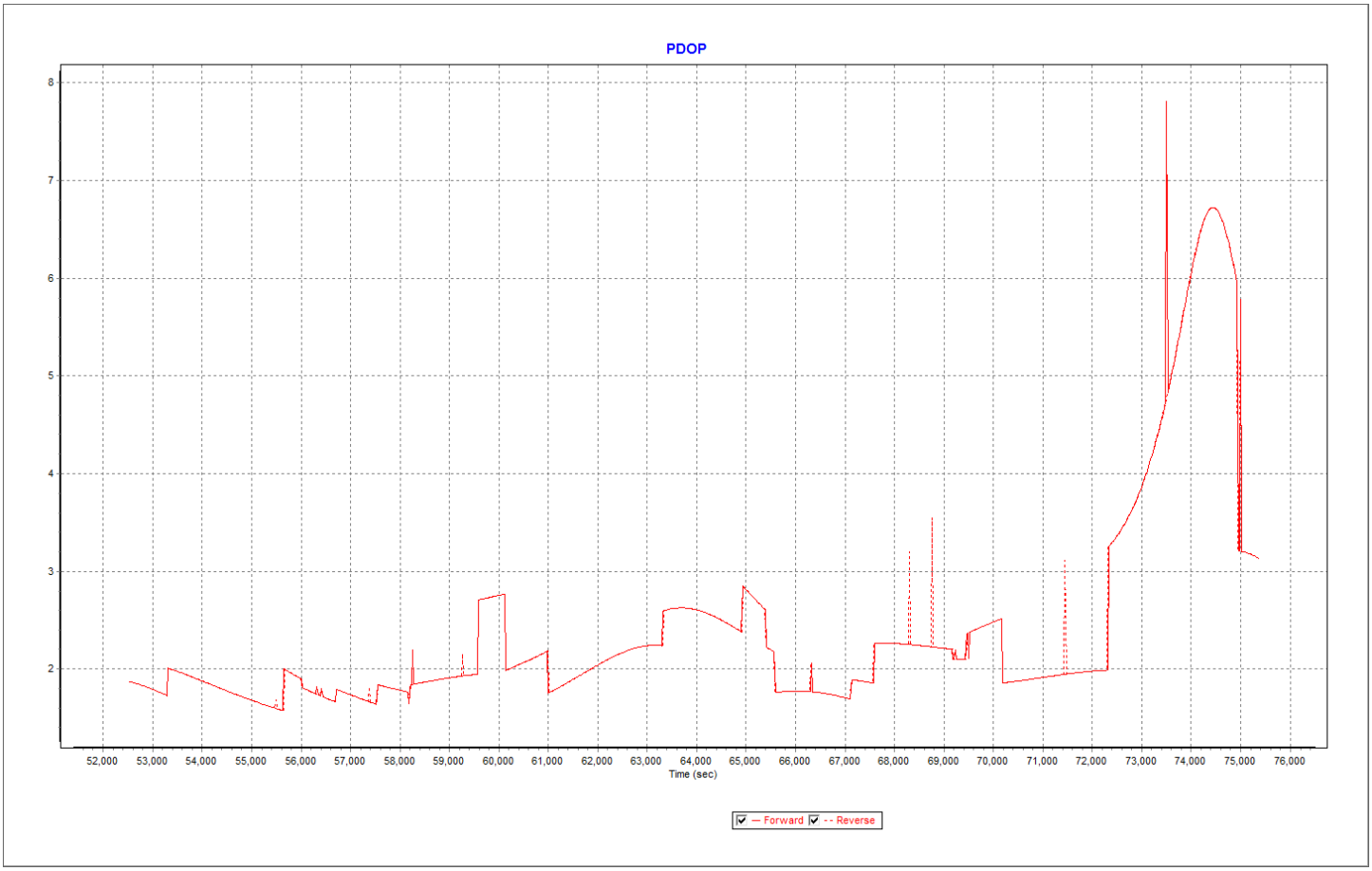
20150419-1


KNGS
VTRU
OSPA
HDF6
00031091
SmartBase Region
SBET ne (VNAV)
MABN
HAMP
PAPC
PABT
CTNE
50000 m
NJSC
RVDI
LAMT
PAMS

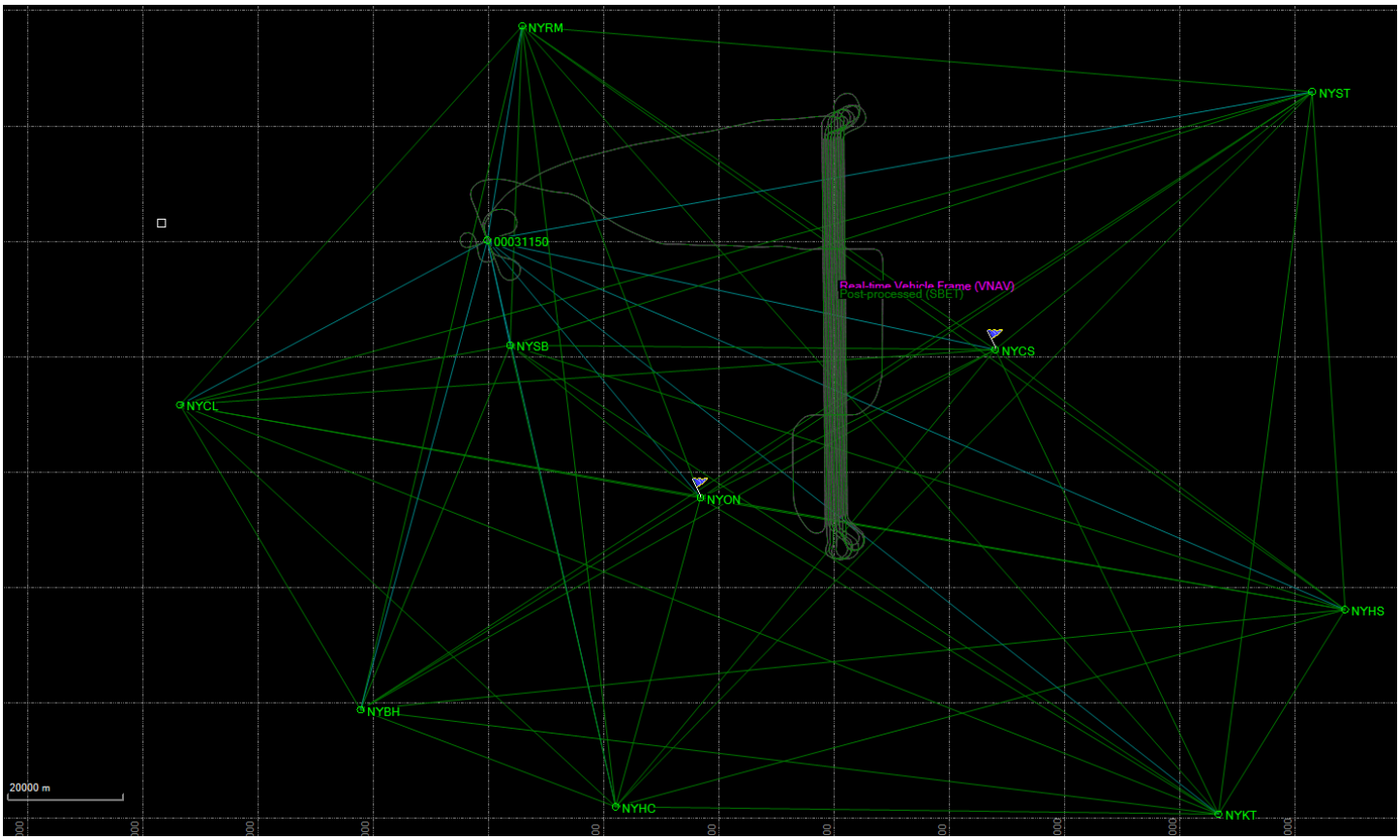

0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04
-0.045
-0.05
-0.055
-0.06
-0.065
-0.07
-0.075
52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000 72,000 73,000 74,000 75,000 76,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode

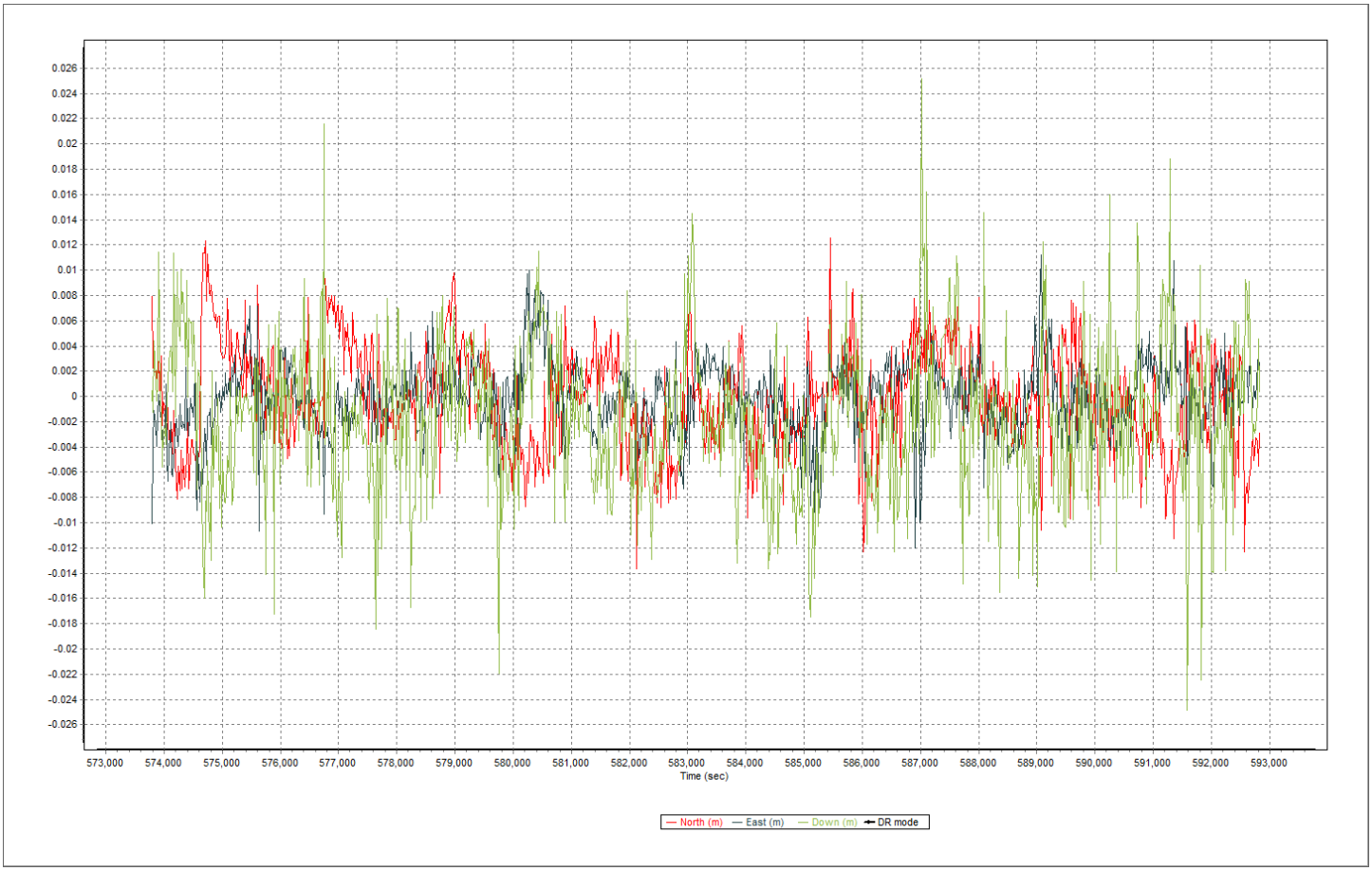

0.049
0.048
0.047
0.046
0.045
0.044
0.043
0.042
0.041
0.04
0.039
0.038
0.037
0.036
0.035
0.034
0.033
0.032
0.031
0.03
0.029
0.028
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000 72,000 73,000 74,000 75,000 76,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)

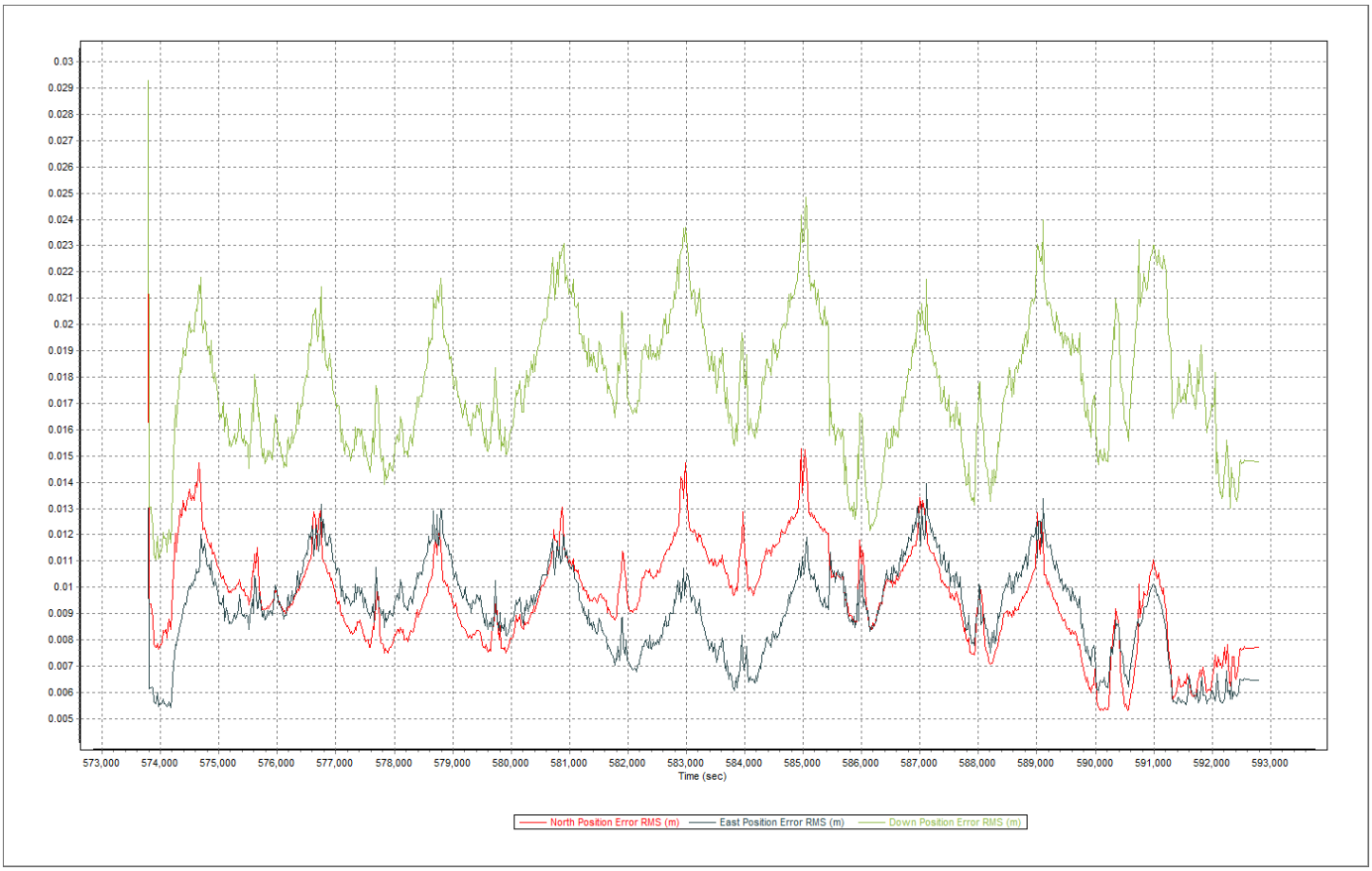

10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000 72,000 73,000 74,000 75,000 76,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites

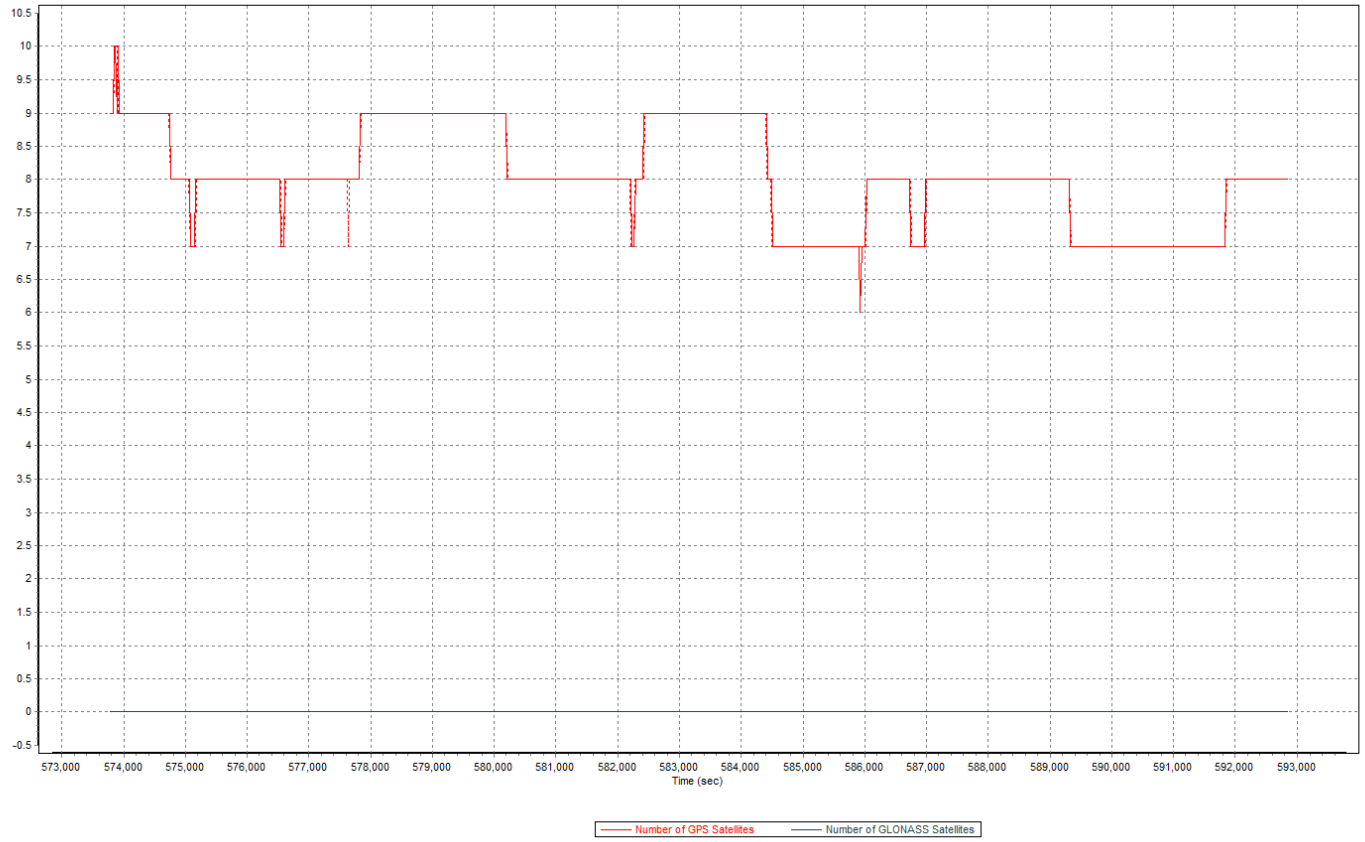

PDOP
8
7
6
5
4
3
2
52,000
53,000
54,000
55,000
56,000
57,000
58,000
59,000
60,000
61,000
62,000
63,000
64,000
65,000
66,000
67,000
68,000
69,000
70,000
71,000
72,000
73,000
74,000
75,000
76,000
Time (sec)
Forward
Reverse

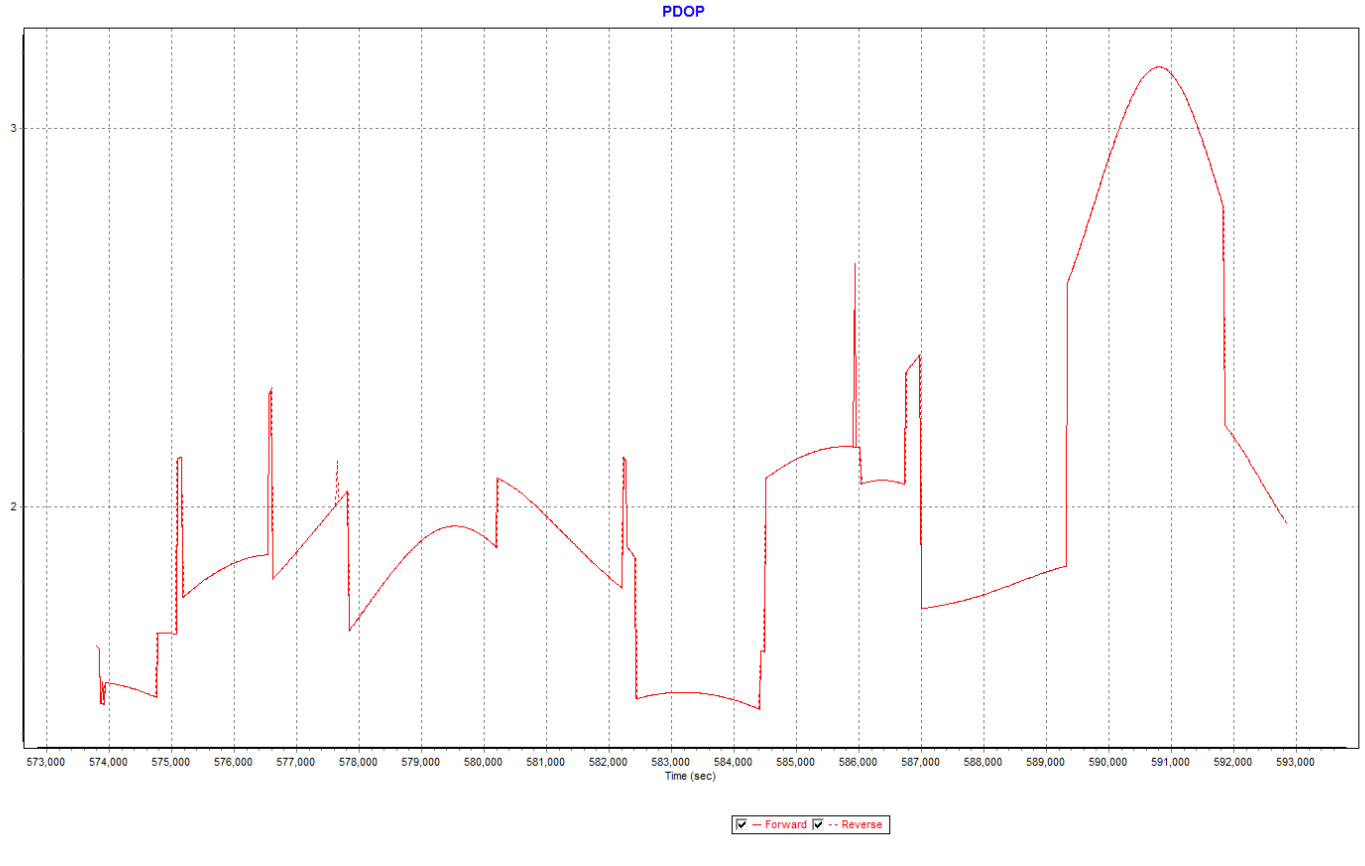
20150425-1


NYRM
NYST
00031150
Real-time Vehicle Frame (VNAV)
Post-processed (SBET)
NYSB
NYCS
NYCL
NYON
NYHS
NYBH
NYHC
NYKT
20000 m

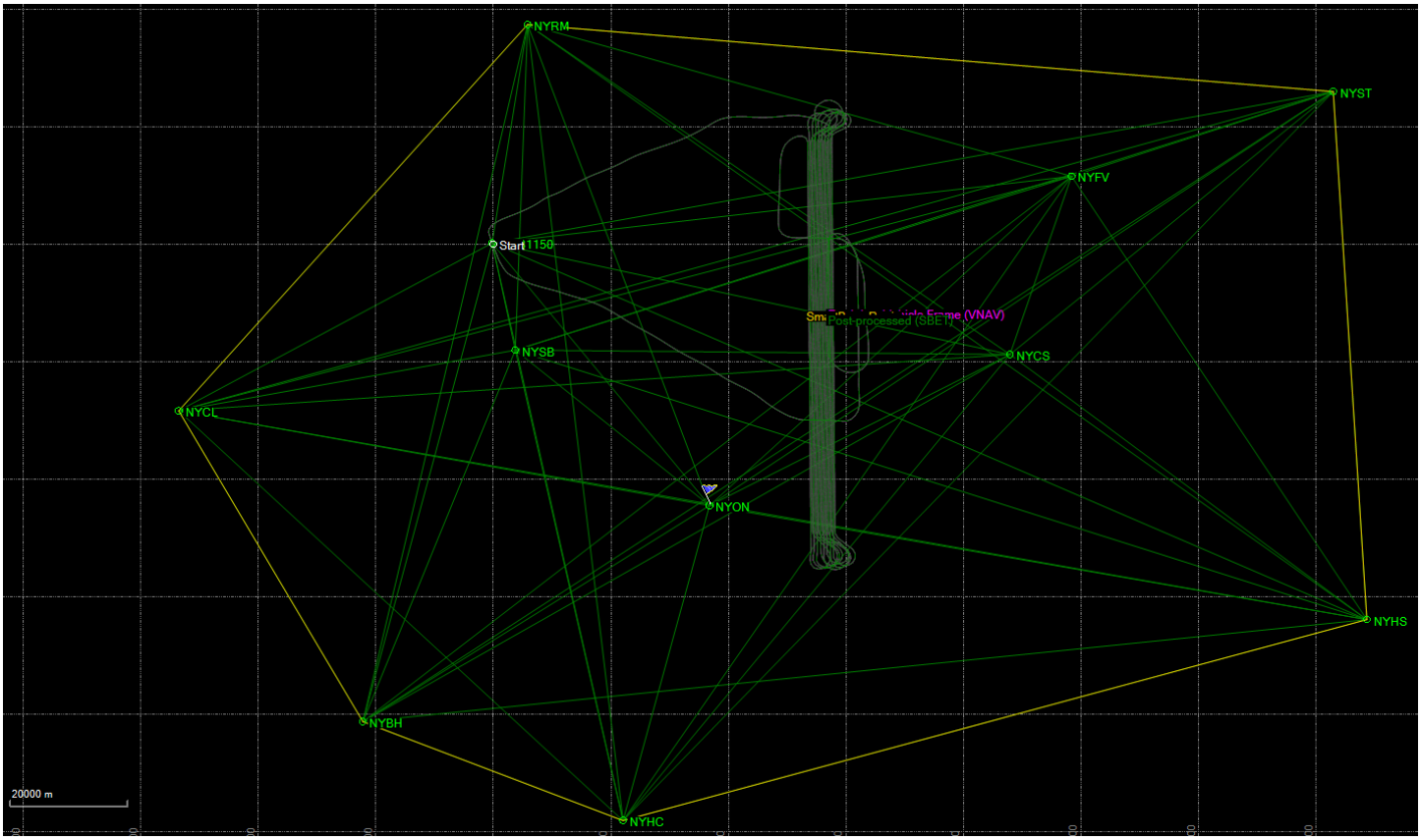

0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
573,000
574,000
575,000
576,000
577,000
578,000
579,000
580,000
581,000
582,000
583,000
584,000
585,000
586,000
587,000
588,000
589,000
590,000
591,000
592,000
593,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode

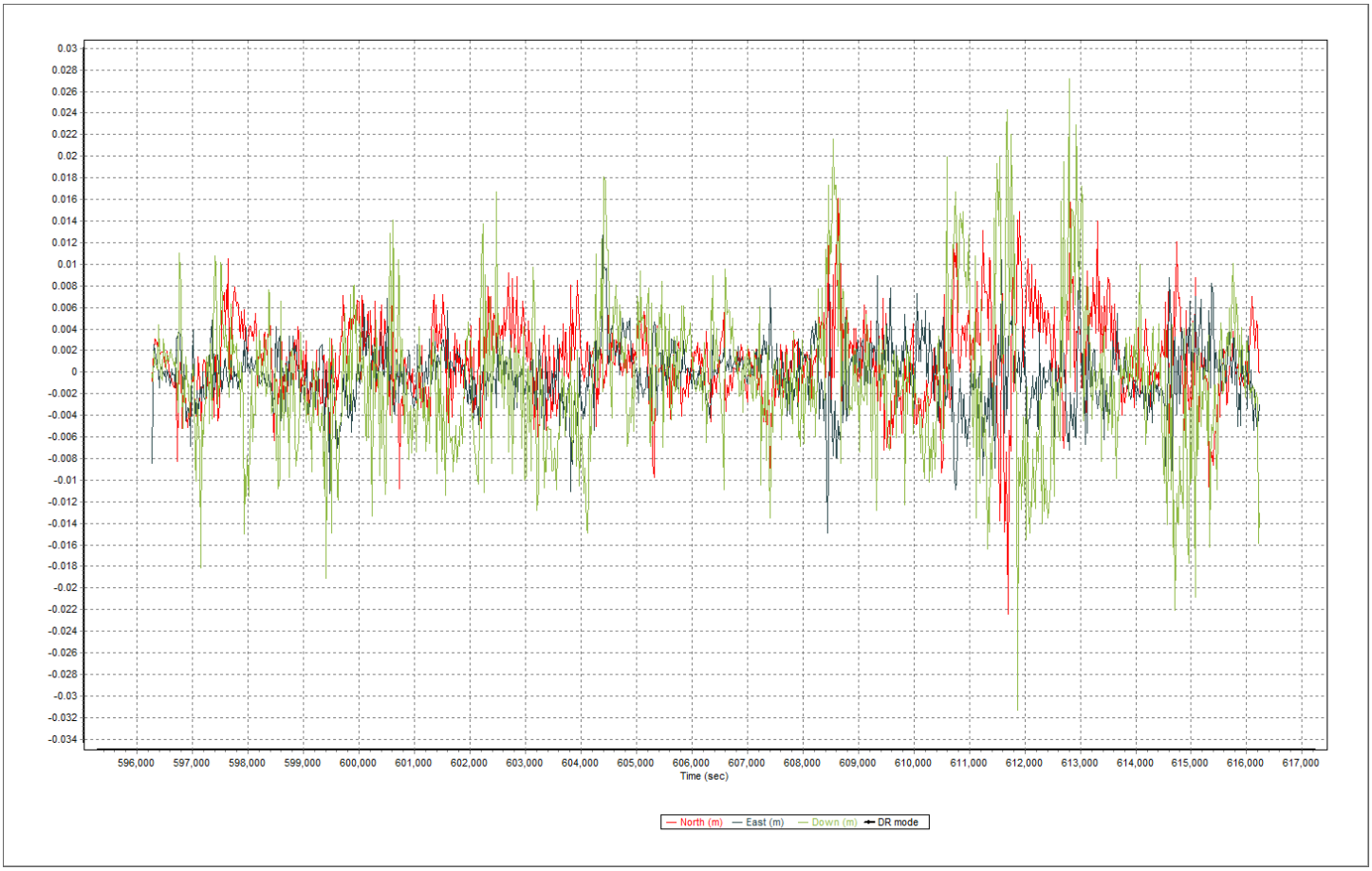

0.03
0.029
0.028
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
573,000
574,000
575,000
576,000
577,000
578,000
579,000
580,000
581,000
582,000
583,000
584,000
585,000
586,000
587,000
588,000
589,000
590,000
591,000
592,000
593,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
573,000 574,000 575,000 576,000 577,000 578,000 579,000 580,000 581,000 582,000 583,000 584,000 585,000 586,000 587,000 588,000 589,000 590,000 591,000 592,000 593,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
3
2
573,000 574,000 575,000 576,000 577,000 578,000 579,000 580,000 581,000 582,000 583,000 584,000 585,000 586,000 587,000 588,000 589,000 590,000 591,000 592,000 593,000
Time (sec)
Forward
Reverse

20150425-2


NYRM
NYST
NYFV
Start 1150
Post-processed (SBET)
NYSB
NYCS
NYCL
NYON
NYHS
NYBH
NYHC
20000 m


0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
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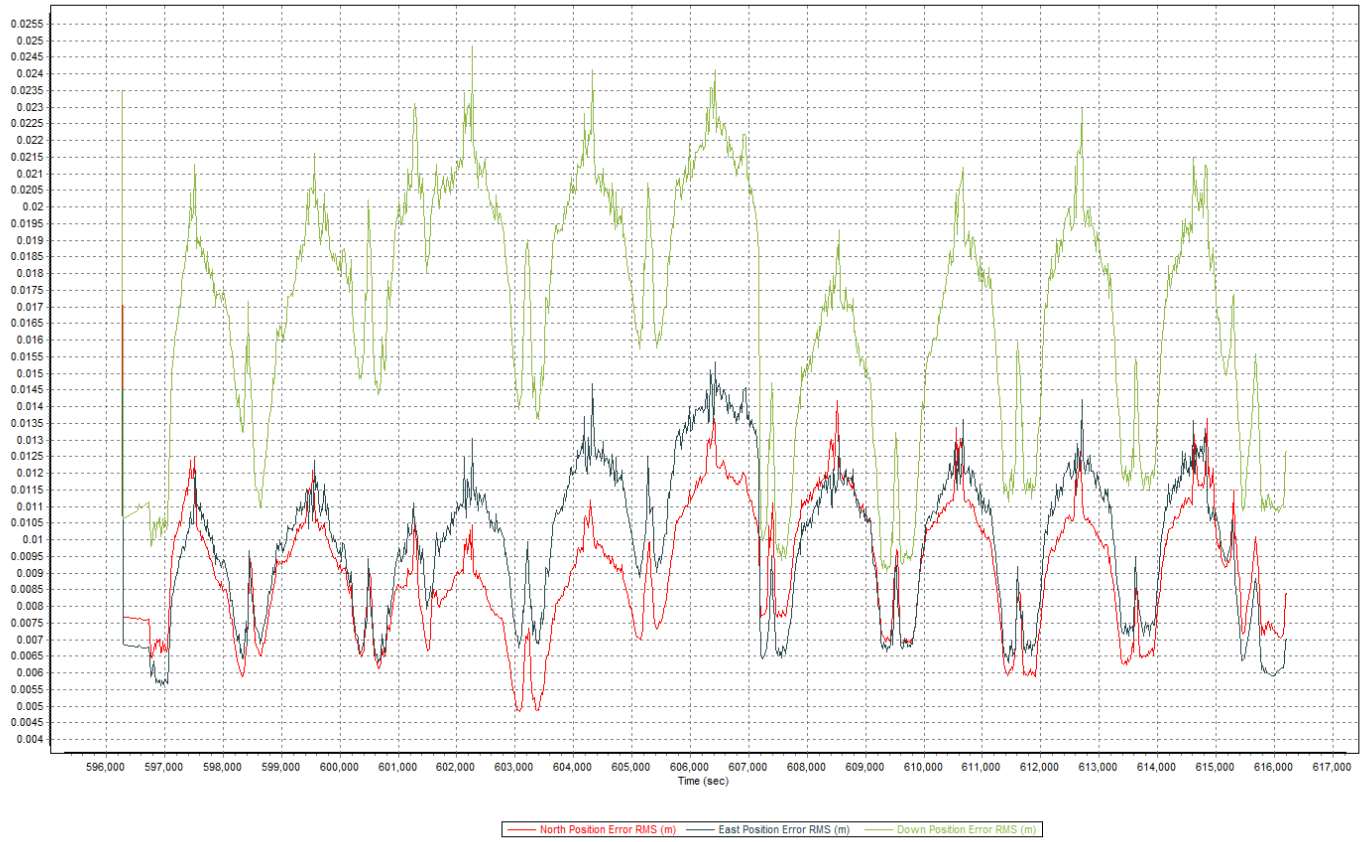
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
-0.032
-0.034
596,000
597,000
598,000
599,000
600,000
601,000
602,000
603,000
604,000
605,000
606,000
607,000
608,000
609,000
610,000
611,000
612,000
613,000
614,000
615,000
616,000
617,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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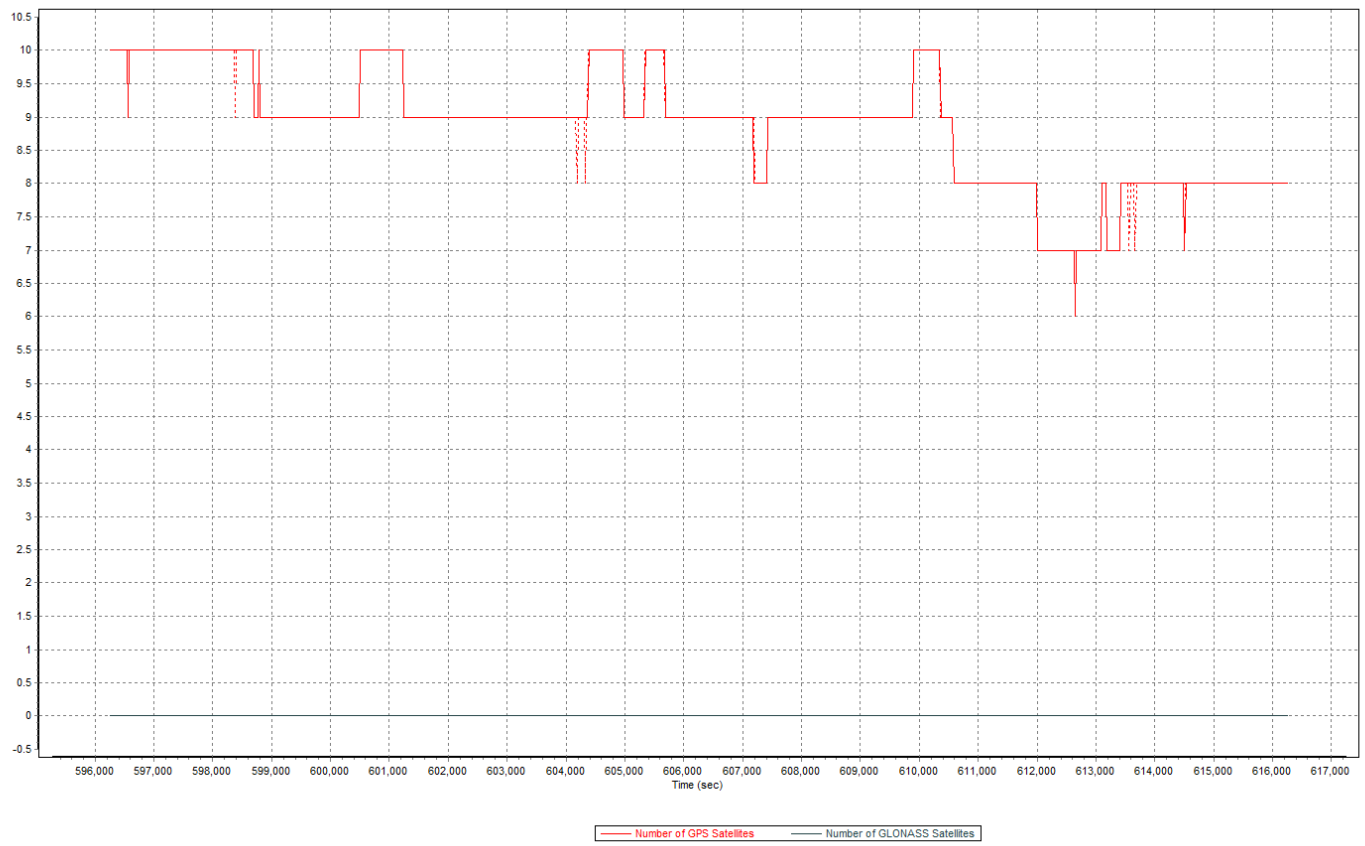
0.025
0.0245
0.024
0.0235
0.023
0.0225
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
0.004
596,000 597,000 598,000 599,000 600,000 601,000 602,000 603,000 604,000 605,000 606,000 607,000 608,000 609,000 610,000 611,000 612,000 613,000 614,000 615,000 616,000 617,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)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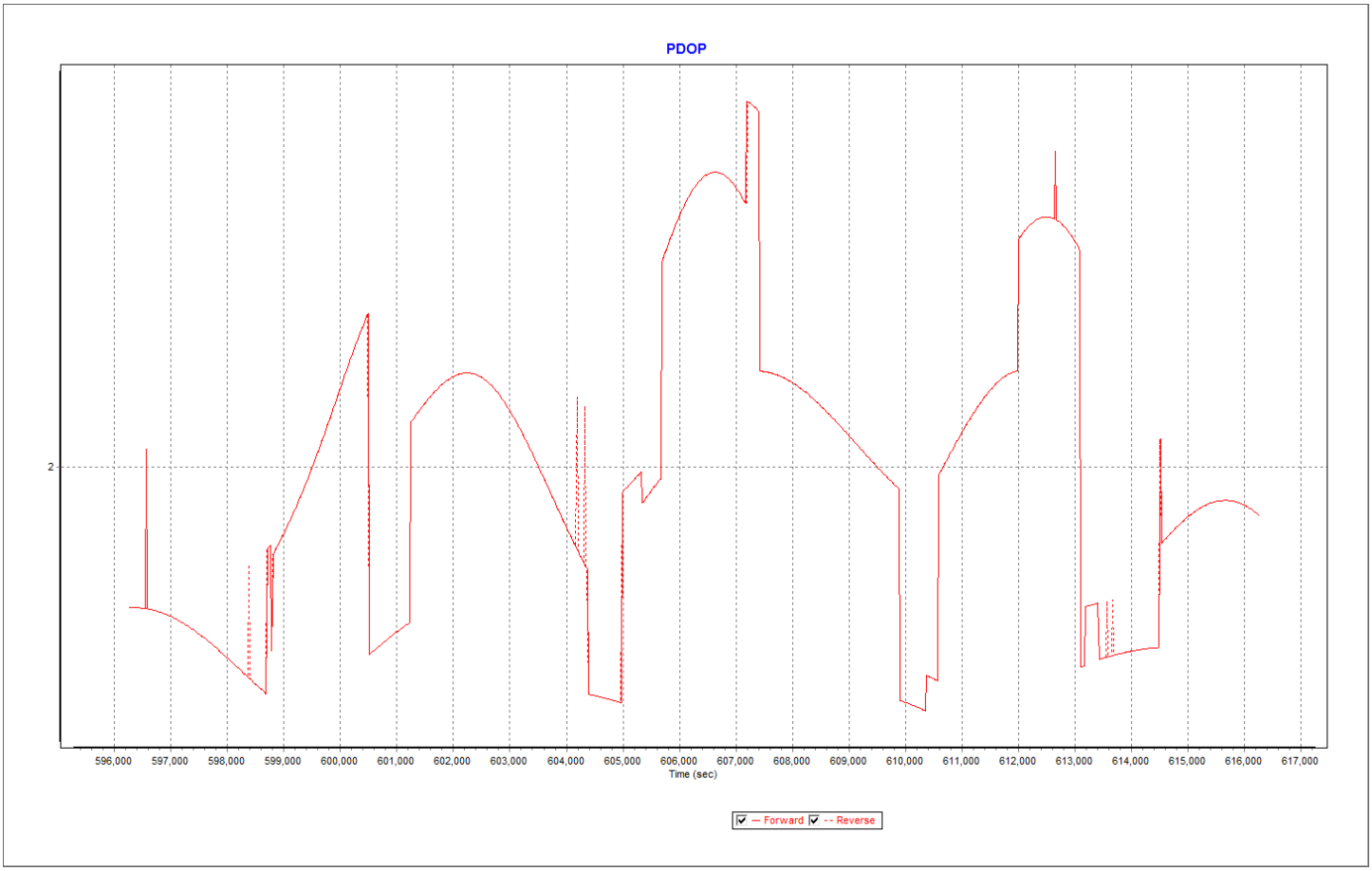
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
596,000 597,000 598,000 599,000 600,000 601,000 602,000 603,000 604,000 605,000 606,000 607,000 608,000 609,000 610,000 611,000 612,000 613,000 614,000 615,000 616,000 617,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2
596,000
597,000
598,000
599,000
600,000
601,000
602,000
603,000
604,000
605,000
606,000
607,000
608,000
609,000
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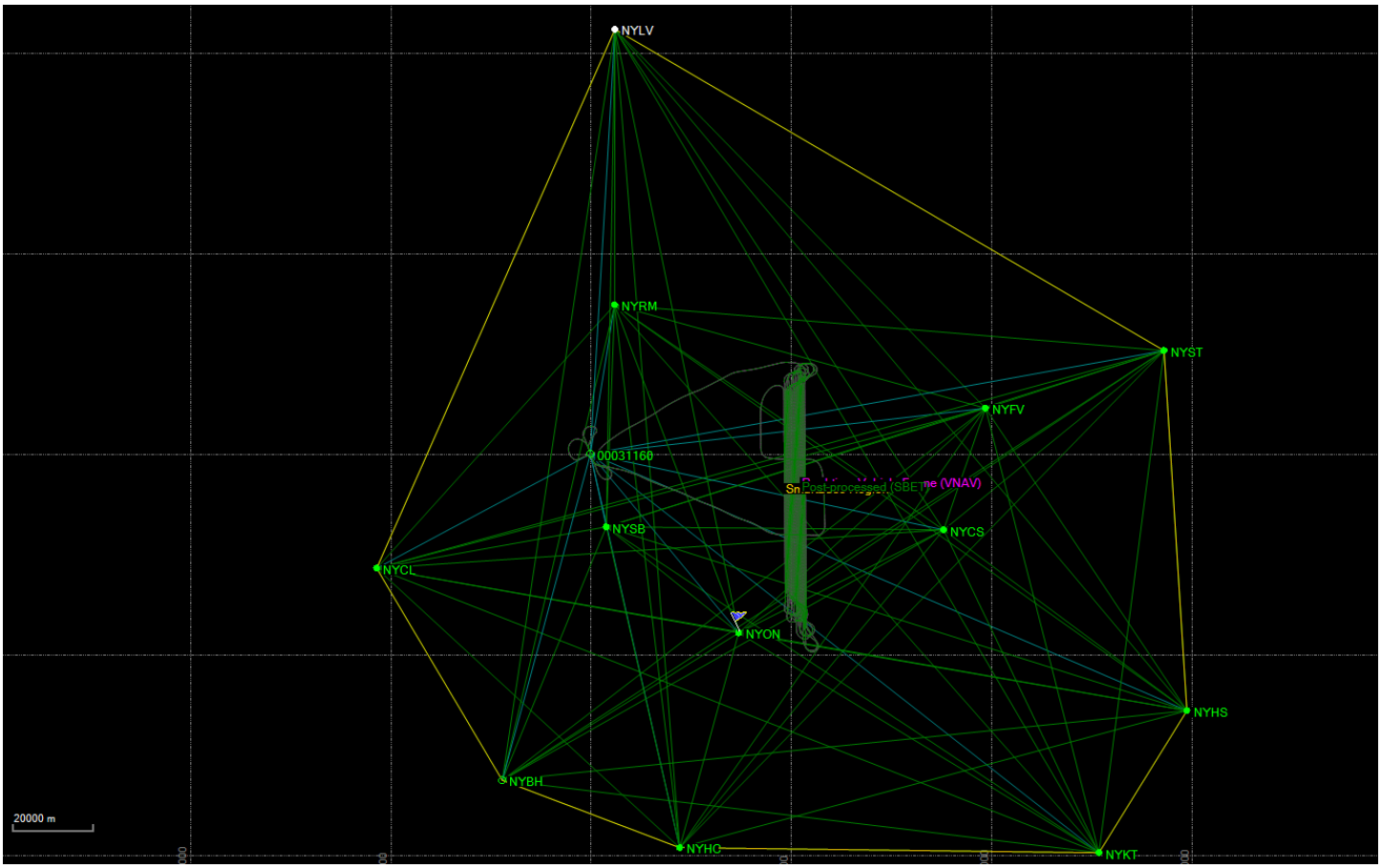
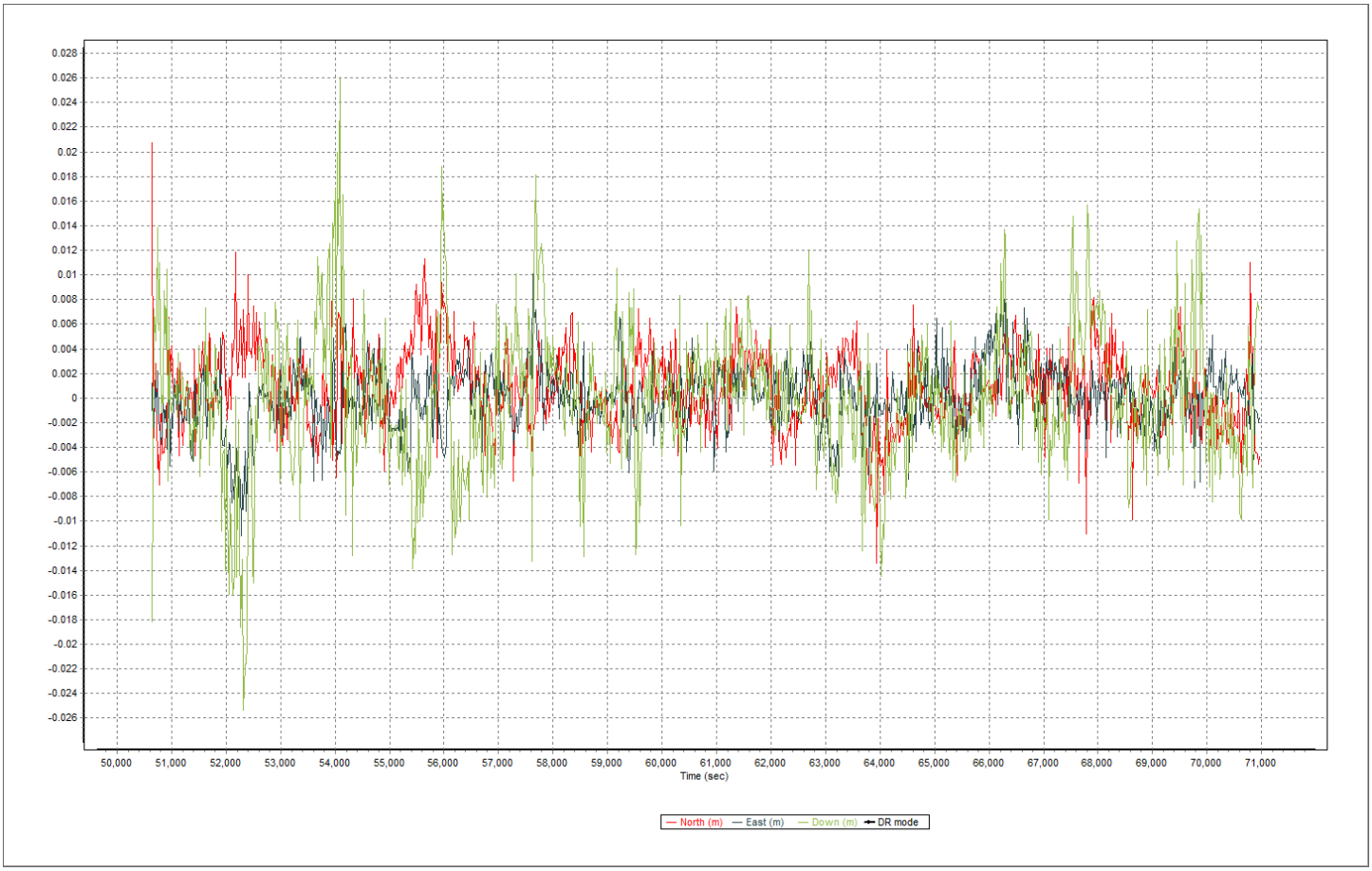
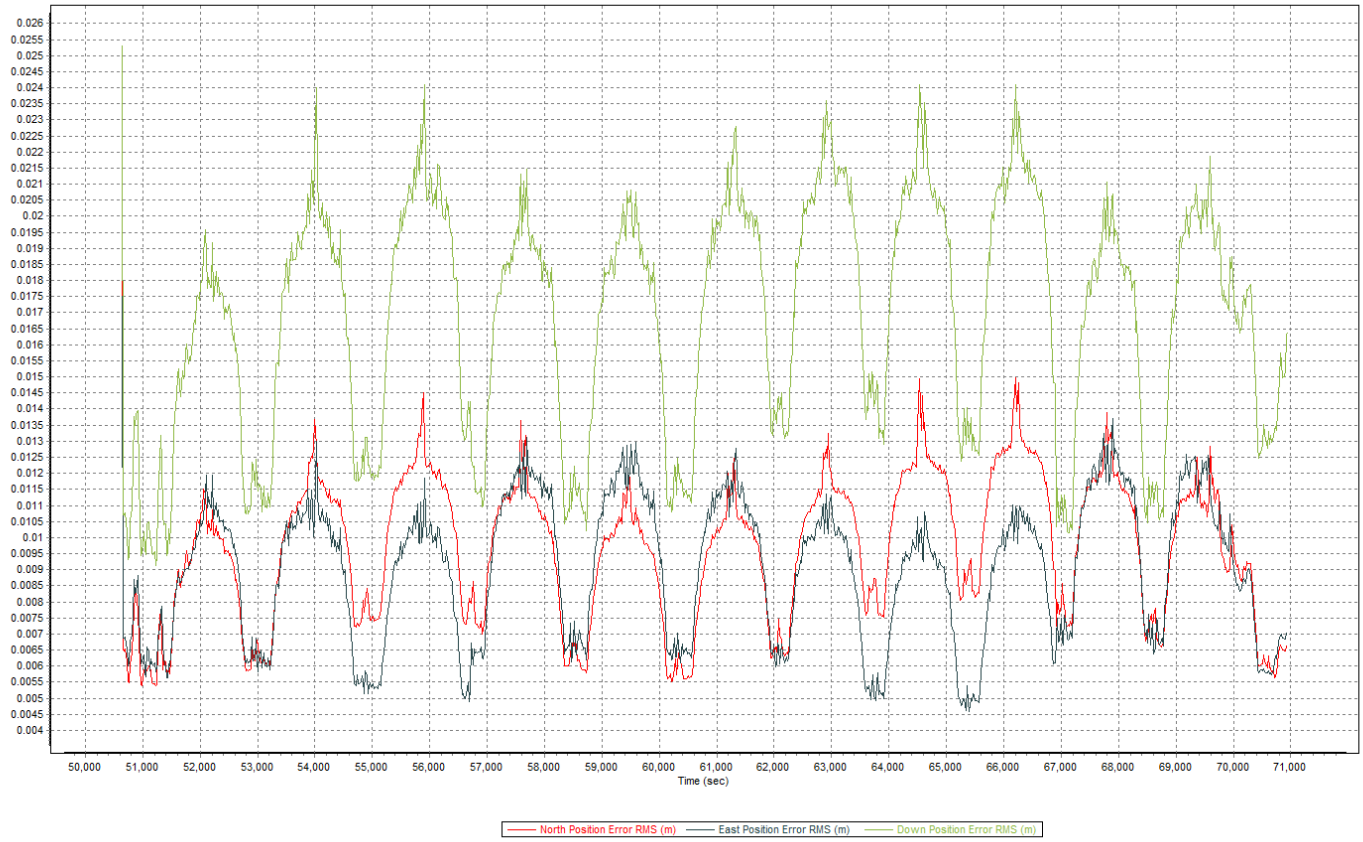
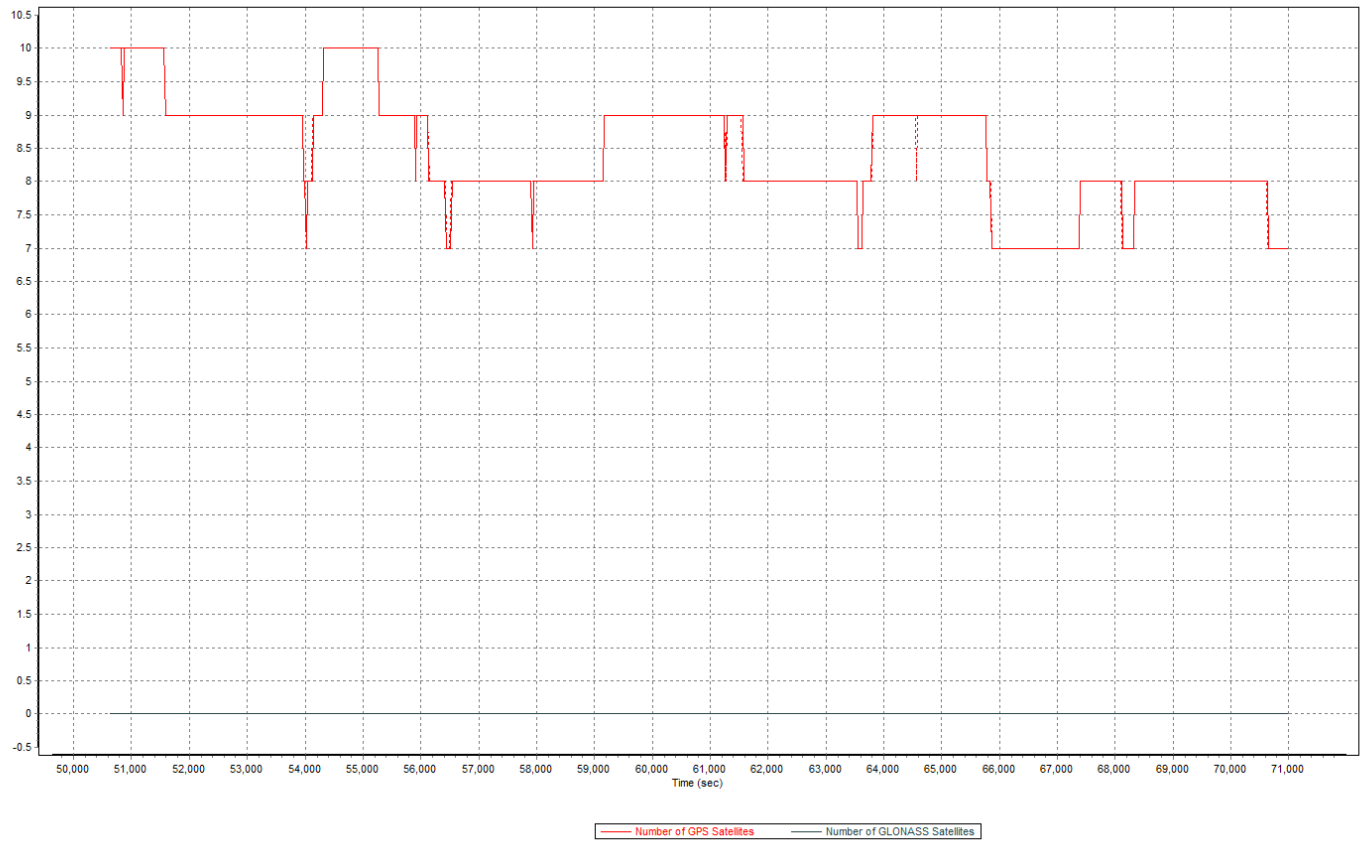
613,000
614,000
615,000
616,000
617,000
Time (sec)
Forward
Reverse

20150426-1


NYLV
NYRM
NYST
NYFV
00031160
NYSB
NYCS
NYCL
NYON
NYHS
NYBH
NYHC
NYKT
20000 m

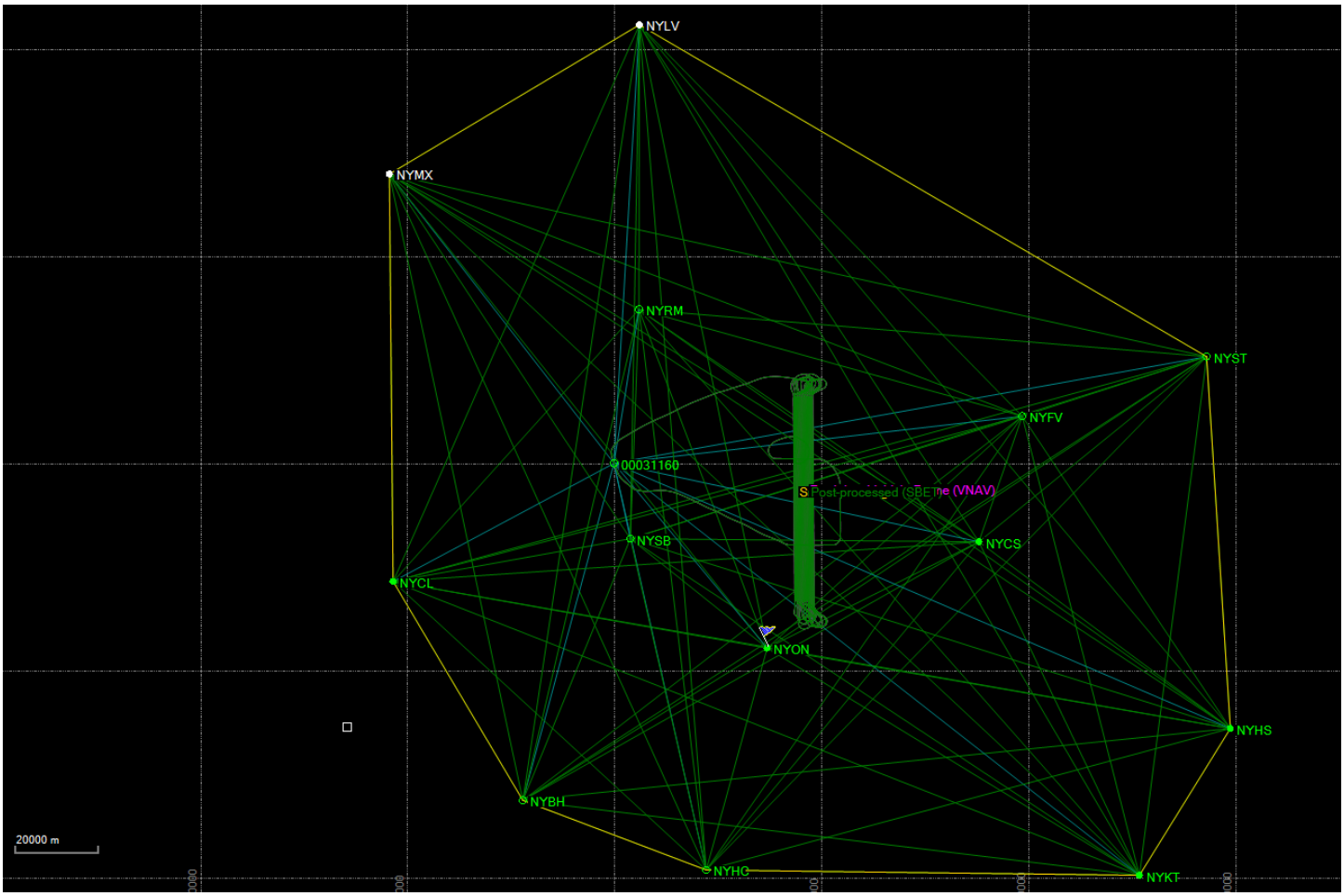

0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
50,000
51,000
52,000
53,000
54,000
55,000
56,000
57,000
58,000
59,000
60,000
61,000
62,000
63,000
64,000
65,000
66,000
67,000
68,000
69,000
70,000
71,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode

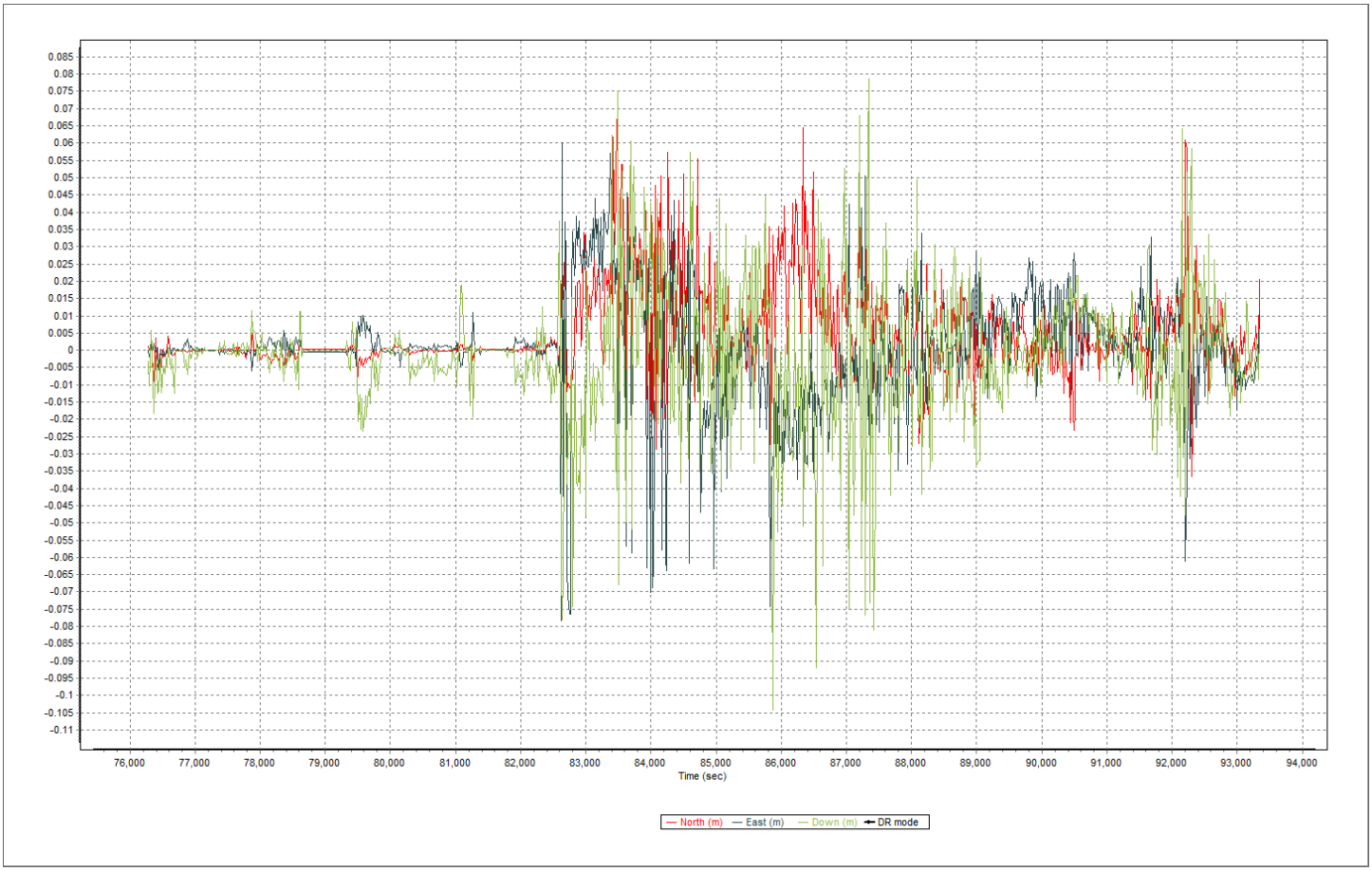

0.026
0.0255
0.025
0.0245
0.024
0.0235
0.023
0.0225
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
0.004
50,000 51,000 52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
50,000 51,000 52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2
50,000
51,000
52,000
53,000
54,000
55,000
56,000
57,000
58,000
59,000
60,000
61,000
62,000
63,000
64,000
65,000
66,000
67,000
68,000
69,000
70,000
71,000
Time (sec)
— Forward - - Reverse

20150426-2


NYLV
NYMX
NYRM
NYST
NYFV
00031160
Post-processed (SBE ne (VNAV)
NYSB
NYCS
NYCL
NYON
NYHS
NYBH
NYHC
NYKT
20000 m


0.085
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0.06
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0.045
0.04
0.035
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0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04
-0.045
-0.05
-0.055
-0.06
-0.065
-0.07
-0.075
-0.08
-0.085
-0.09
-0.095
-0.1
-0.105
-0.11
76,000
77,000
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82,000
83,000
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85,000
86,000
87,000
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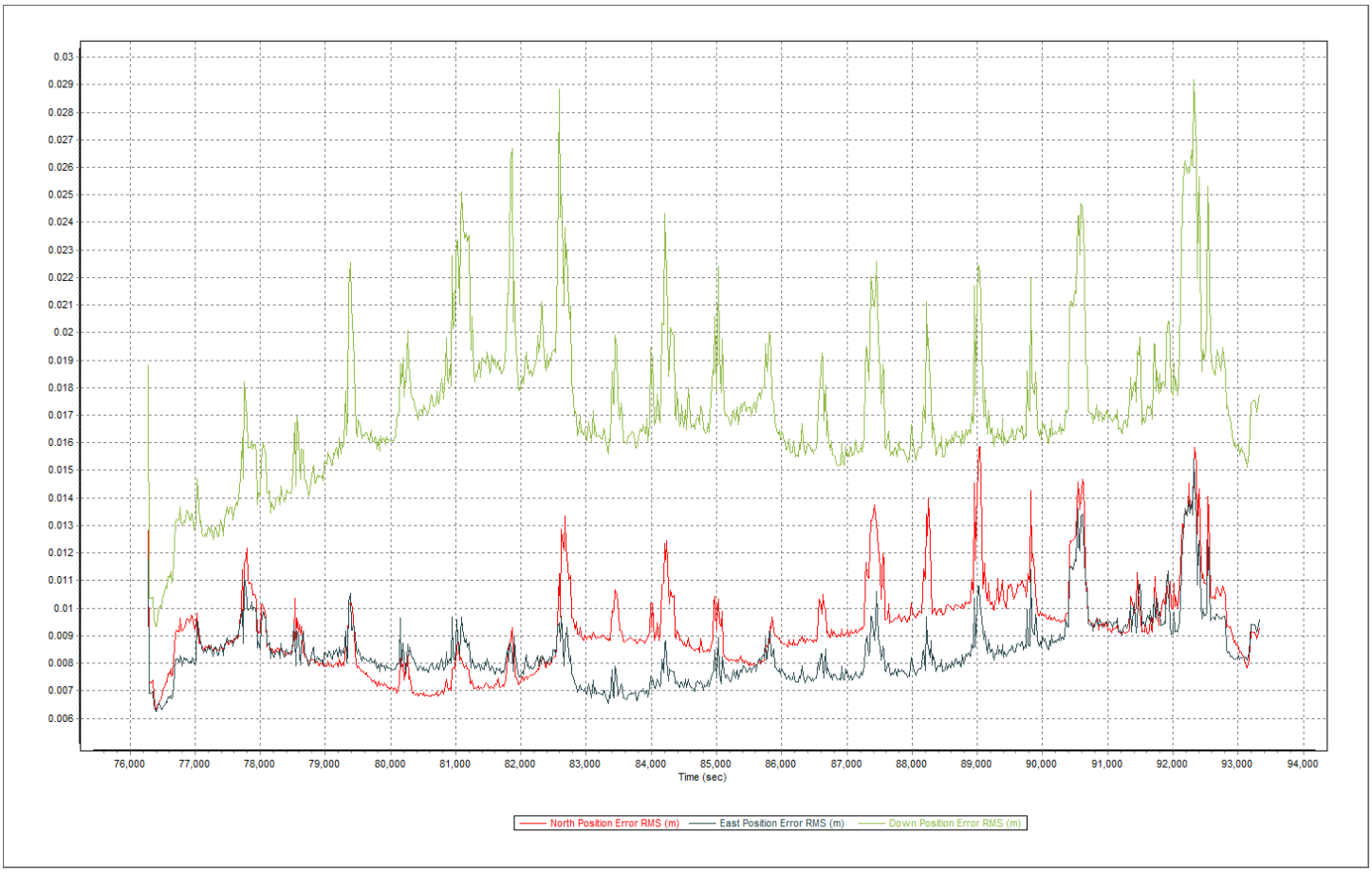
91,000
92,000
93,000
94,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode


0.03
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0.028
0.027
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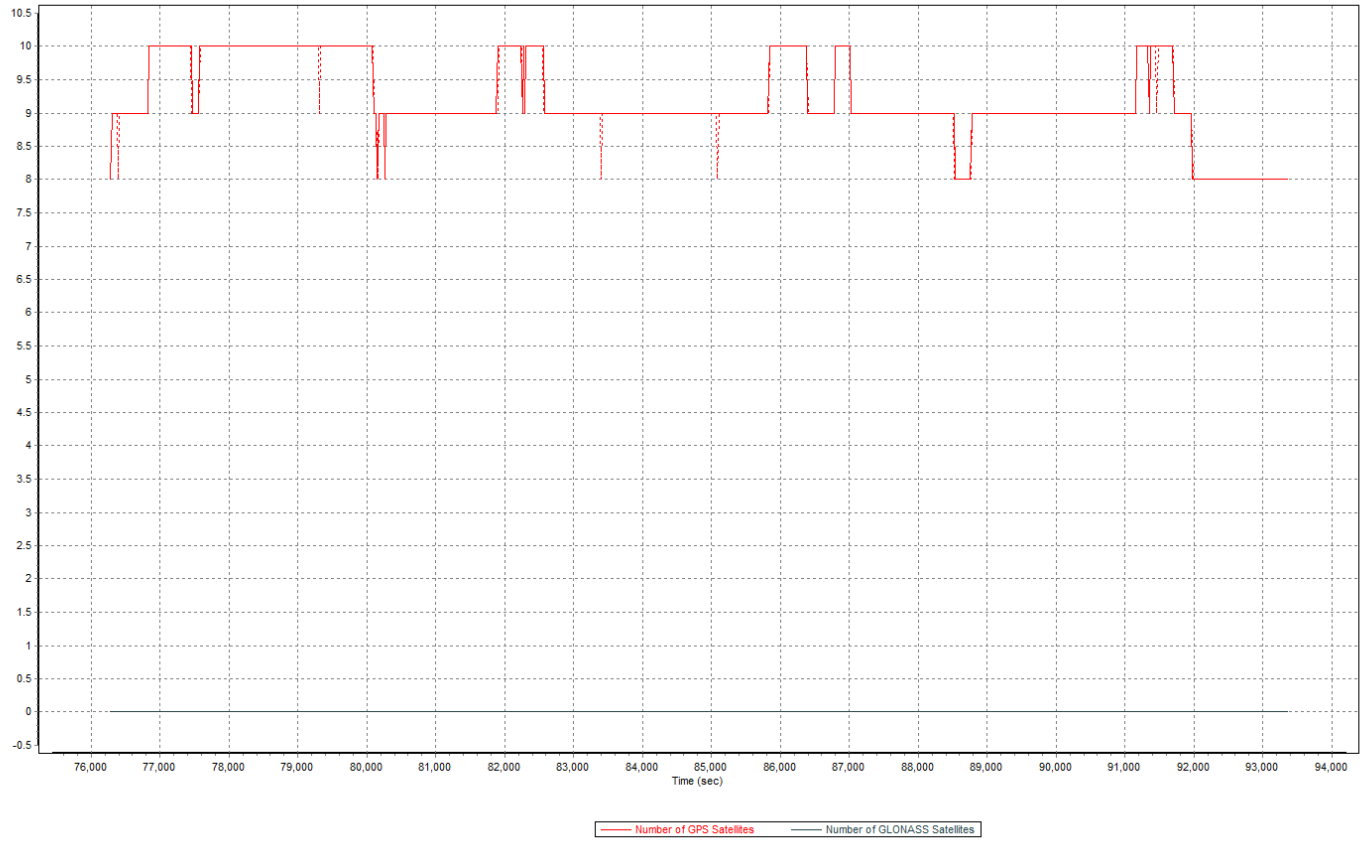
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
76,000
77,000
78,000
79,000
80,000
81,000
82,000
83,000
84,000
85,000
86,000
87,000
88,000
89,000
90,000
91,000
92,000
93,000
94,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
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9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
76,000
77,000
78,000
79,000
80,000
81,000
82,000
83,000
84,000
85,000
86,000
87,000
88,000
89,000
90,000
91,000
92,000
93,000
94,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2
76,000
77,000
78,000
79,000
80,000
81,000
82,000
83,000
84,000
85,000
86,000
87,000
88,000
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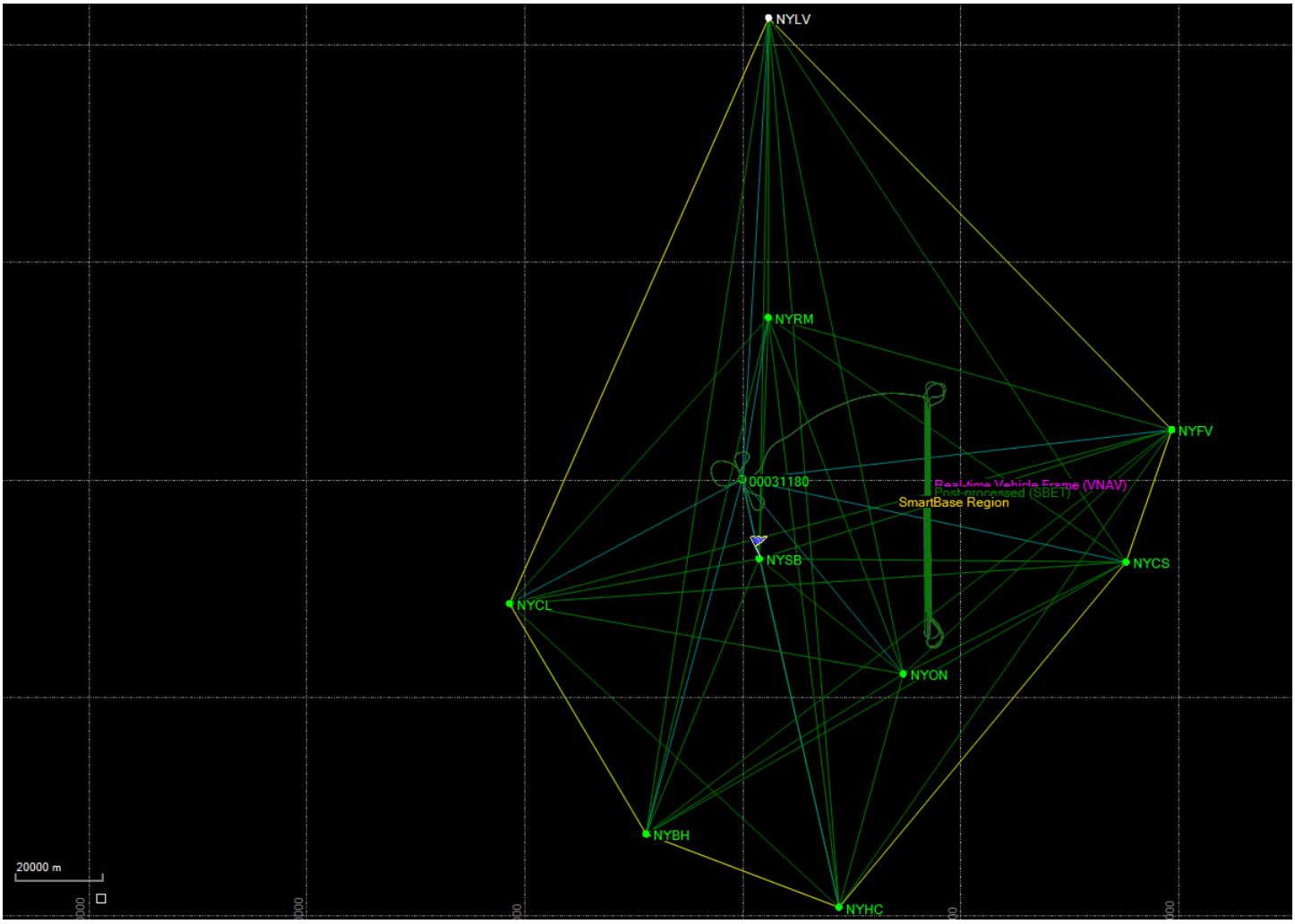
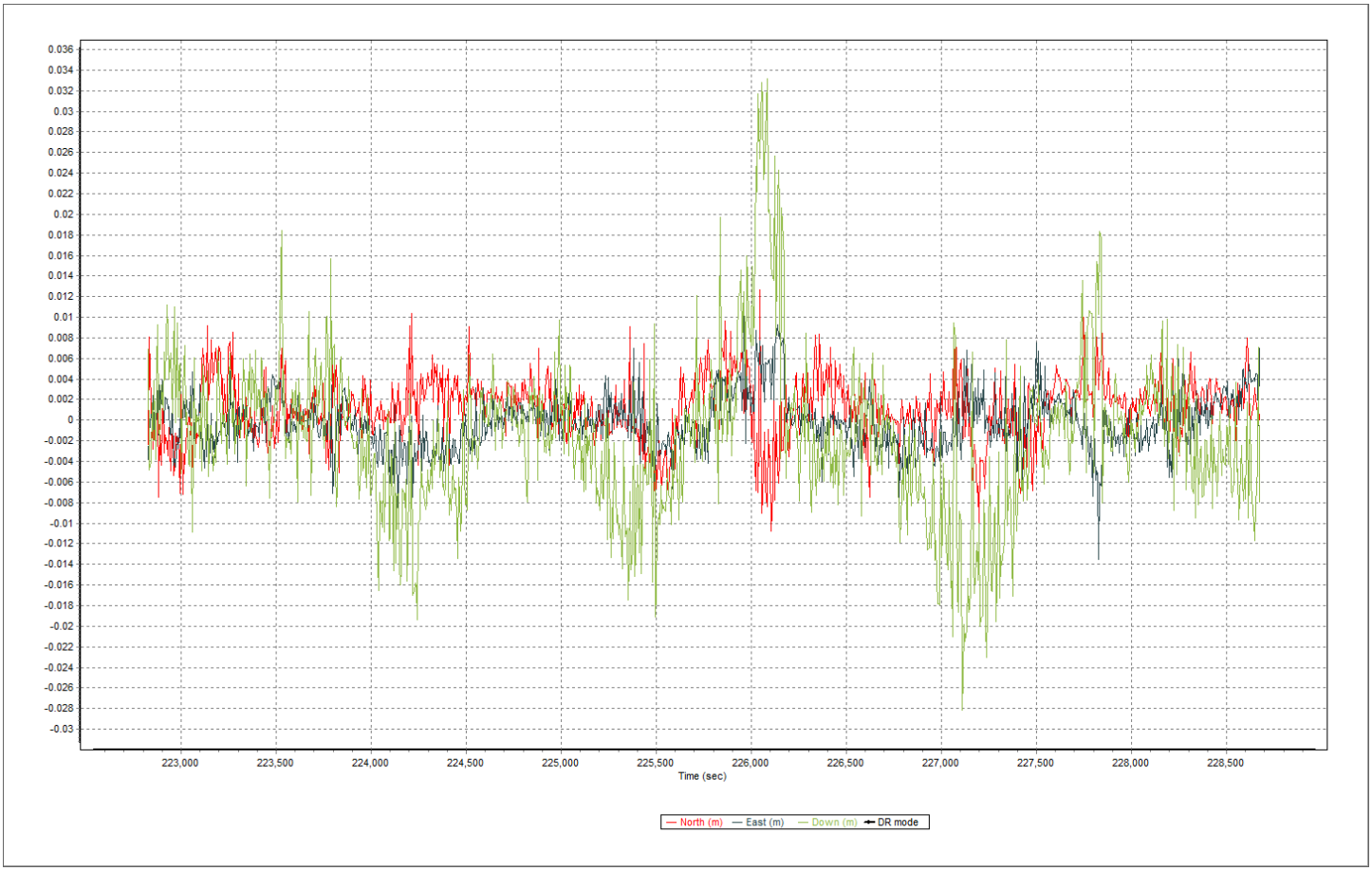
90,000
91,000
92,000
93,000
94,000
Time (sec)
Forward
Reverse

20150428-1-2


NYLV
NYRM
NYFV
00031180
Real-time Vehicle Frame (VNAV)
Post-processed (SBET)
SmartBase Region
NYSB
NYCS
NYCL
NYON
NYBH
NYHC
20000 m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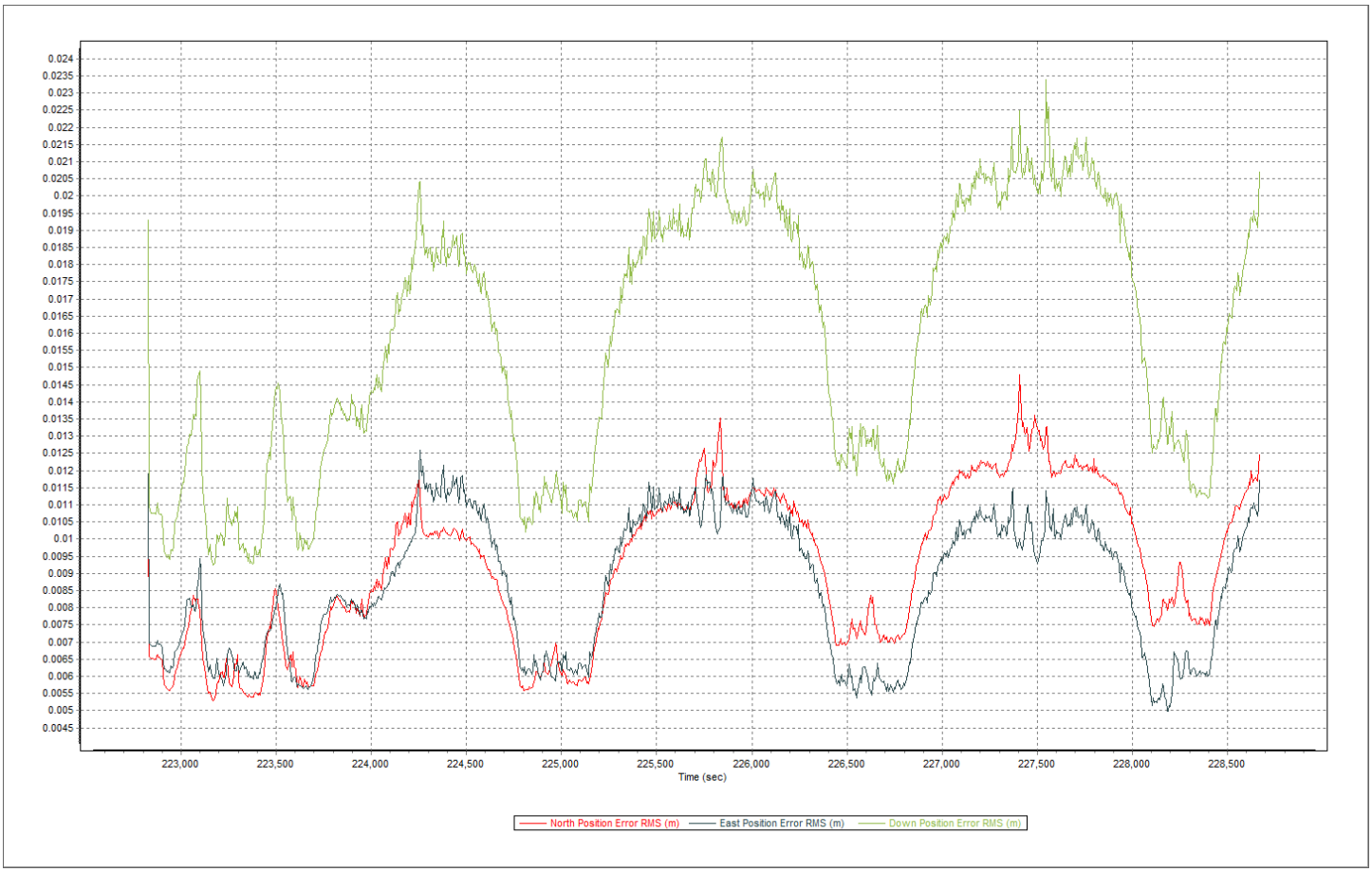
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
223,000
223,500
224,000
224,500
225,000
225,500
226,000
226,500
227,000
227,500
228,000
228,500
Time (sec)
North (m)
East (m)
Down (m)
DR mode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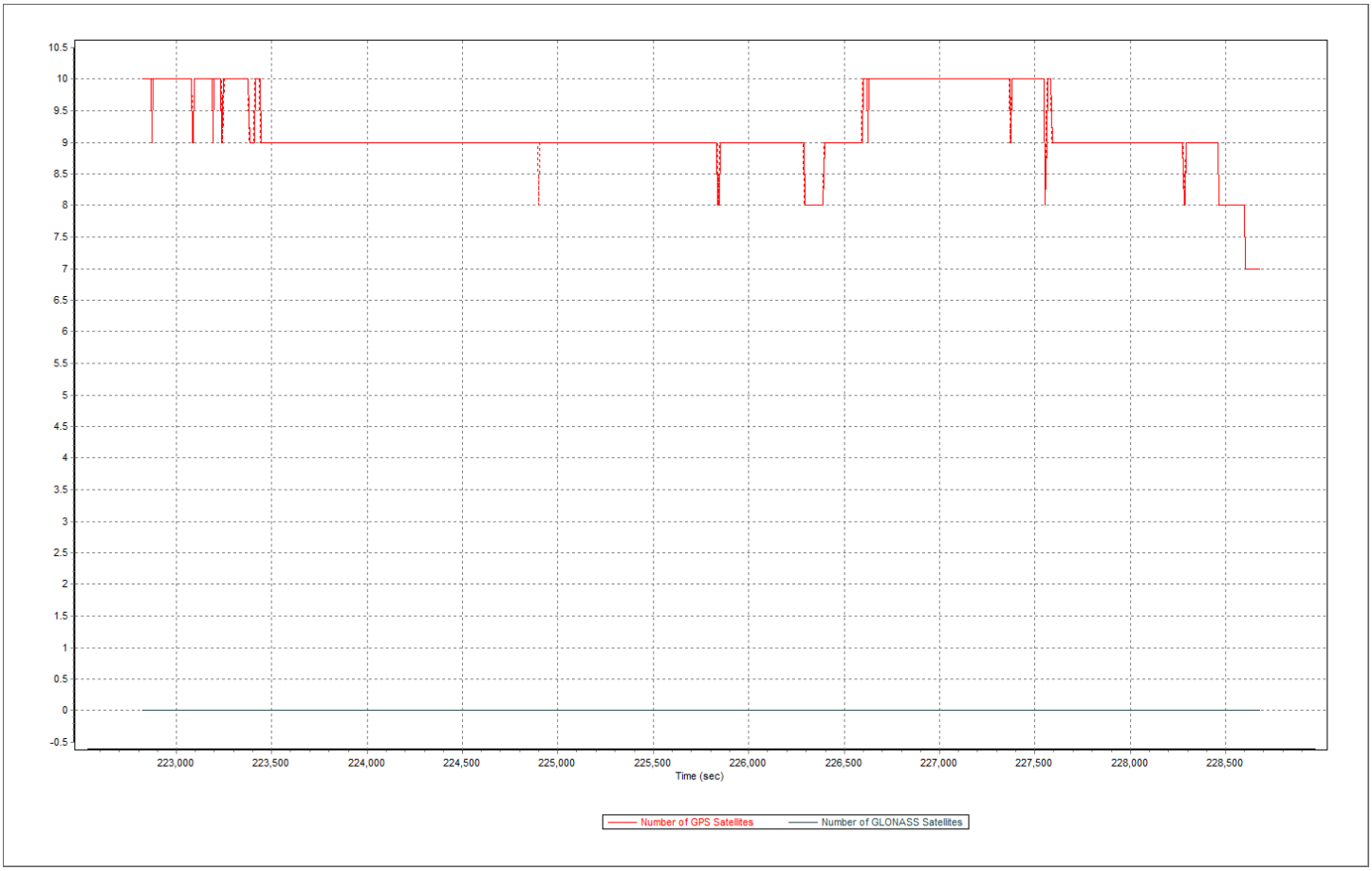
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
223,000
223,500
224,000
224,500
225,000
225,500
226,000
226,500
227,000
227,500
228,000
228,500
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)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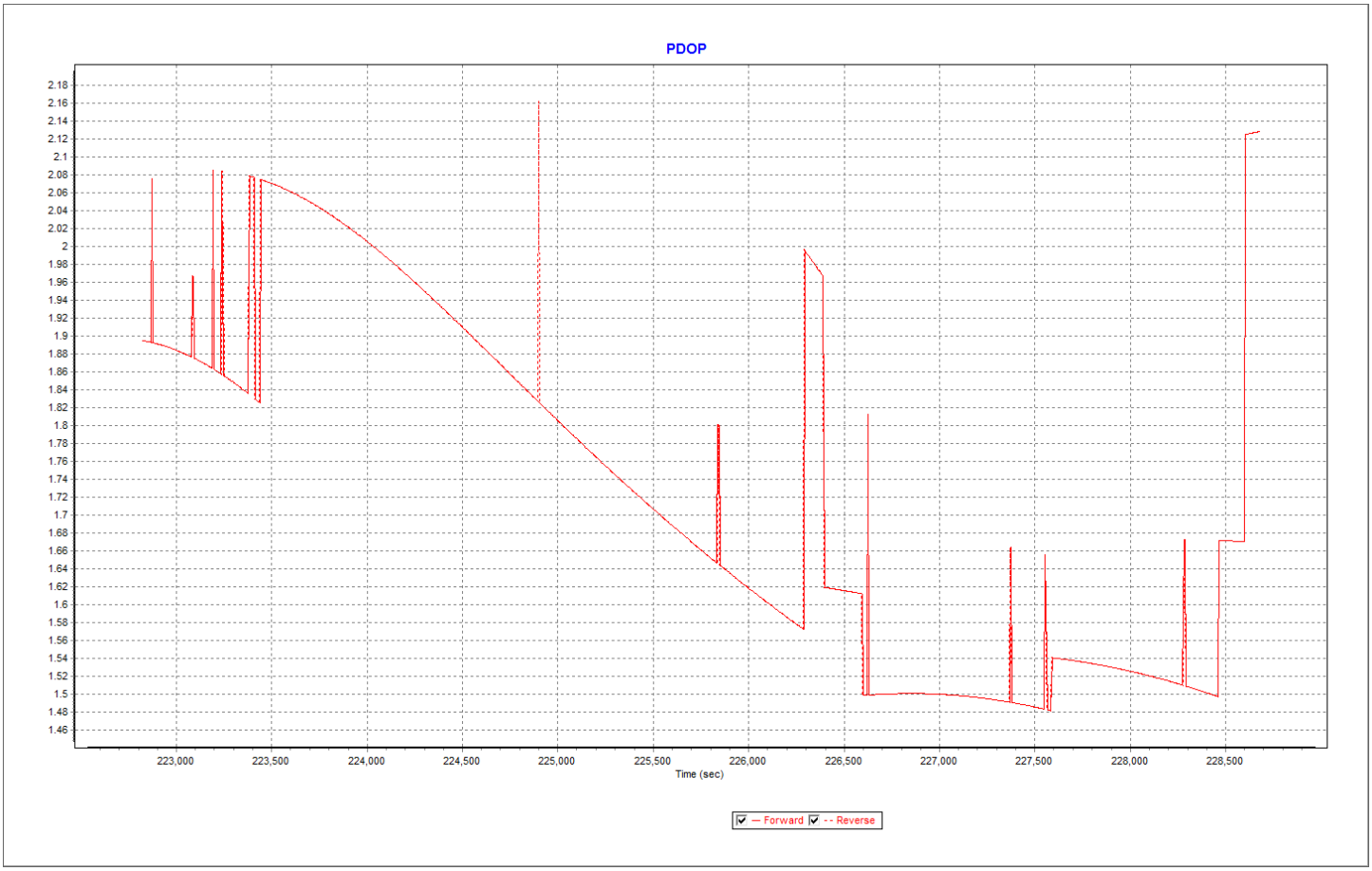
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
223,000
223,500
224,000
224,500
225,000
225,500
226,000
226,500
227,000
227,500
228,000
228,500
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2.18
2.16
2.14
2.12
2.1
2.08
2.06
2.04
2.02
2
1.98
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1.94
1.92
1.9
1.88
1.86
1.84
1.82
1.8
1.78
1.76
1.74
1.72
1.7
1.68
1.66
1.64
1.62
1.6
1.58
1.56
1.54
1.52
1.5
1.48
1.46
223,000
223,500
224,000
224,500
225,000
225,500
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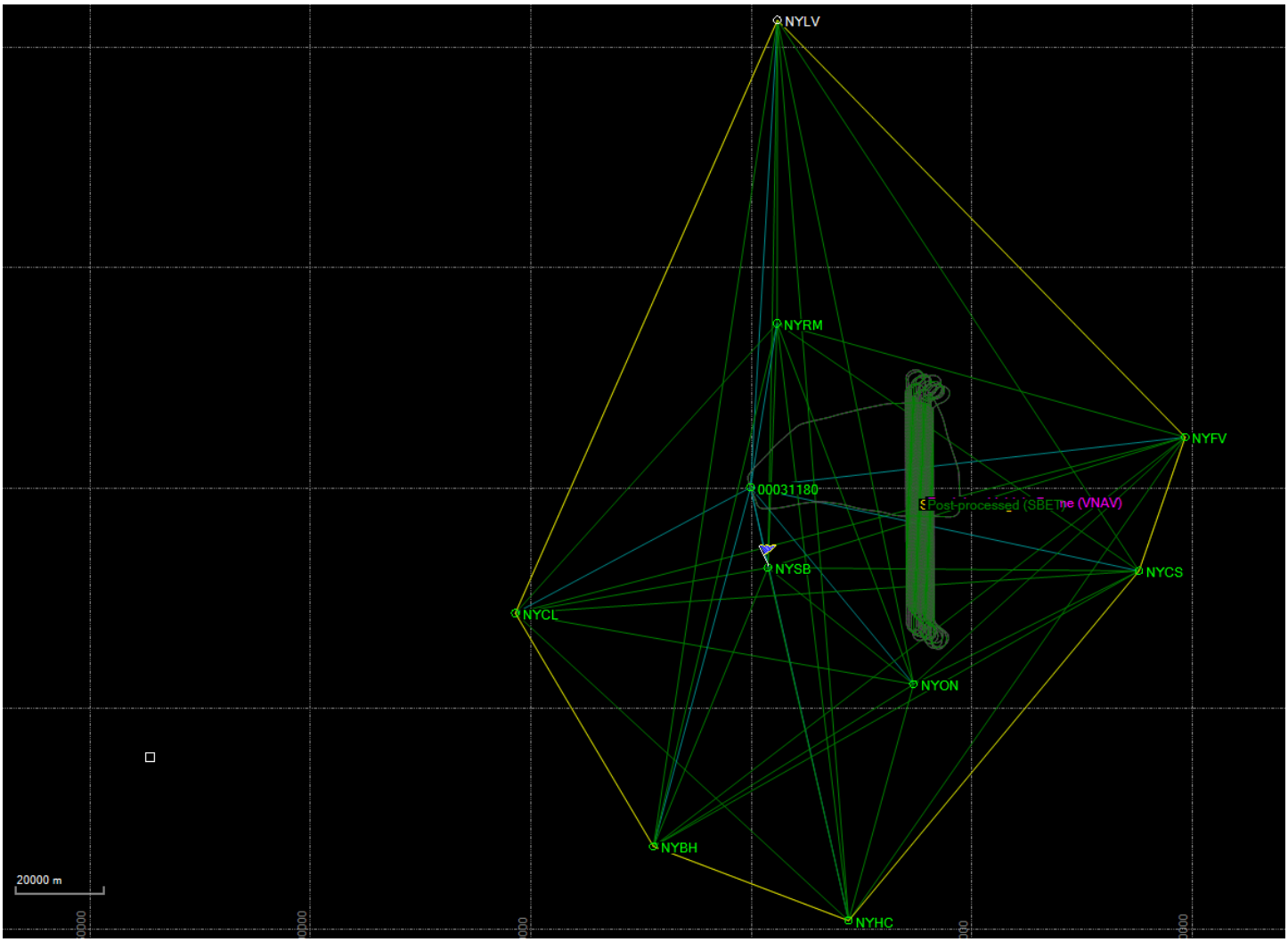
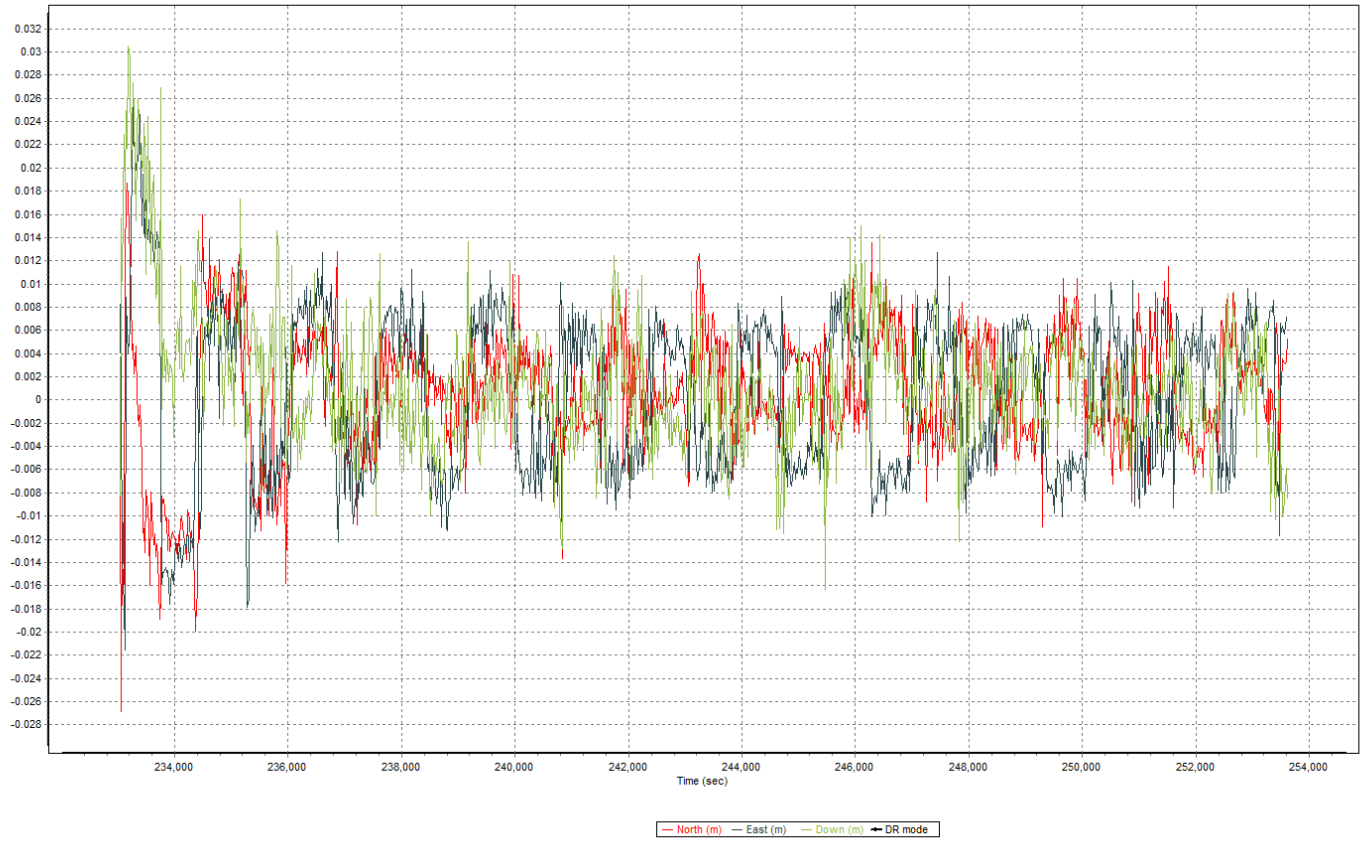
226,500
227,000
227,500
228,000
228,500
Time (sec)
Forward
Reverse

20150428-3


NYLV
NYRM
NYFV
00031180
Post-processed (SBET
ne (VNAV)
NYSB
NYCS
NYCL
NYON
NYBH
NYHC
20000 m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0.028
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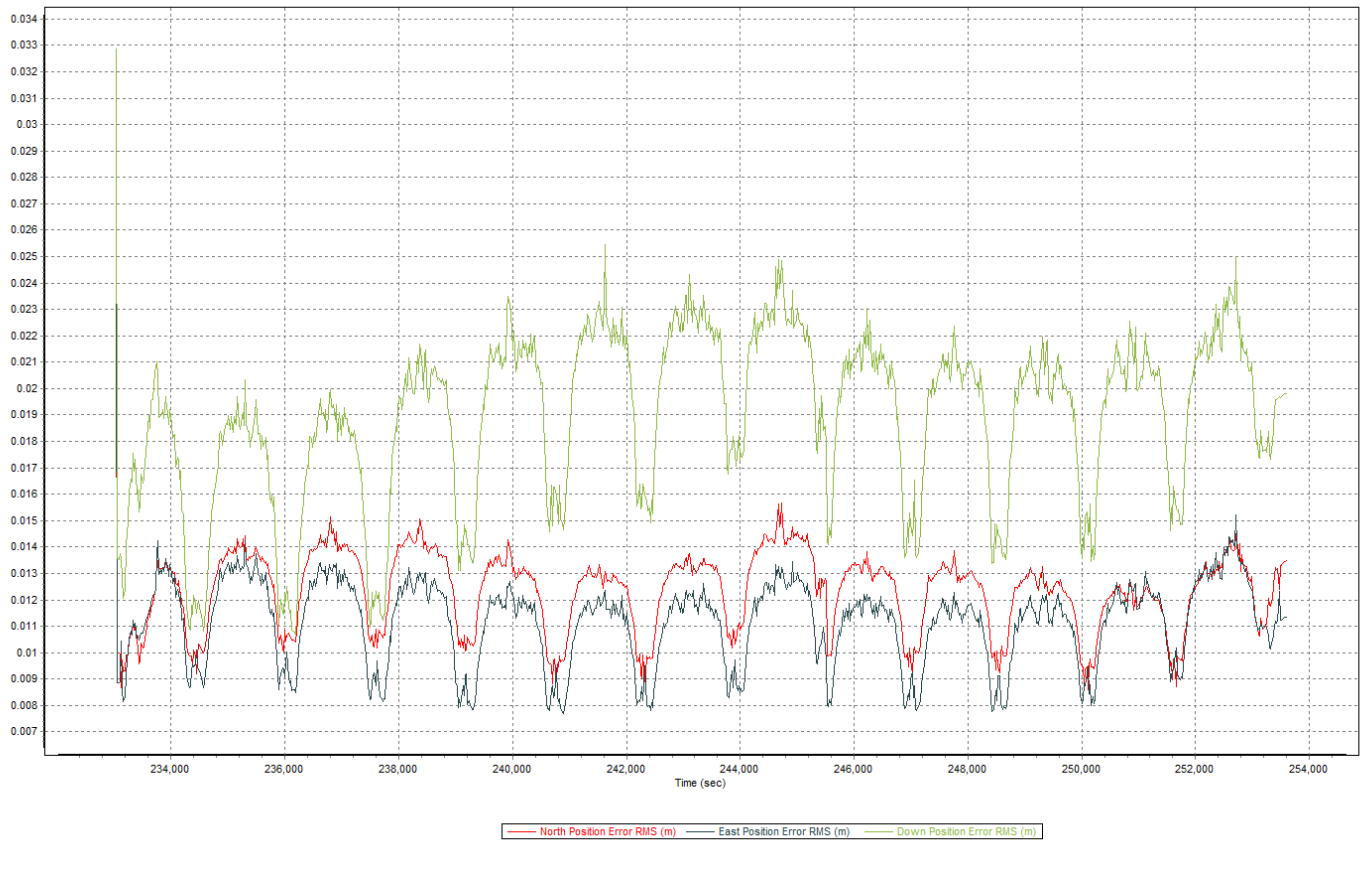
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
234,000
236,000
238,000
240,000
242,000
244,000
246,000
248,000
250,000
252,000
254,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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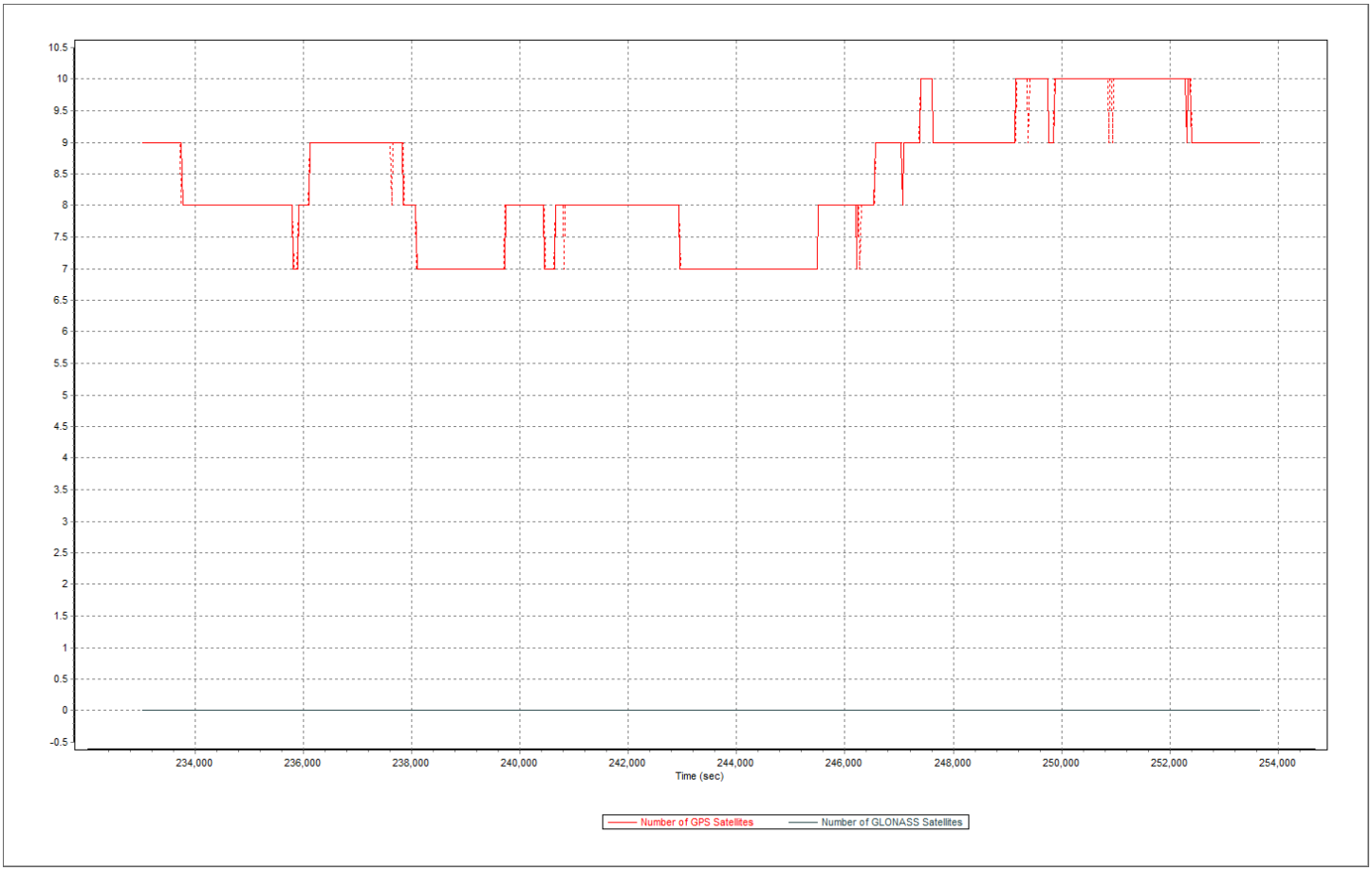
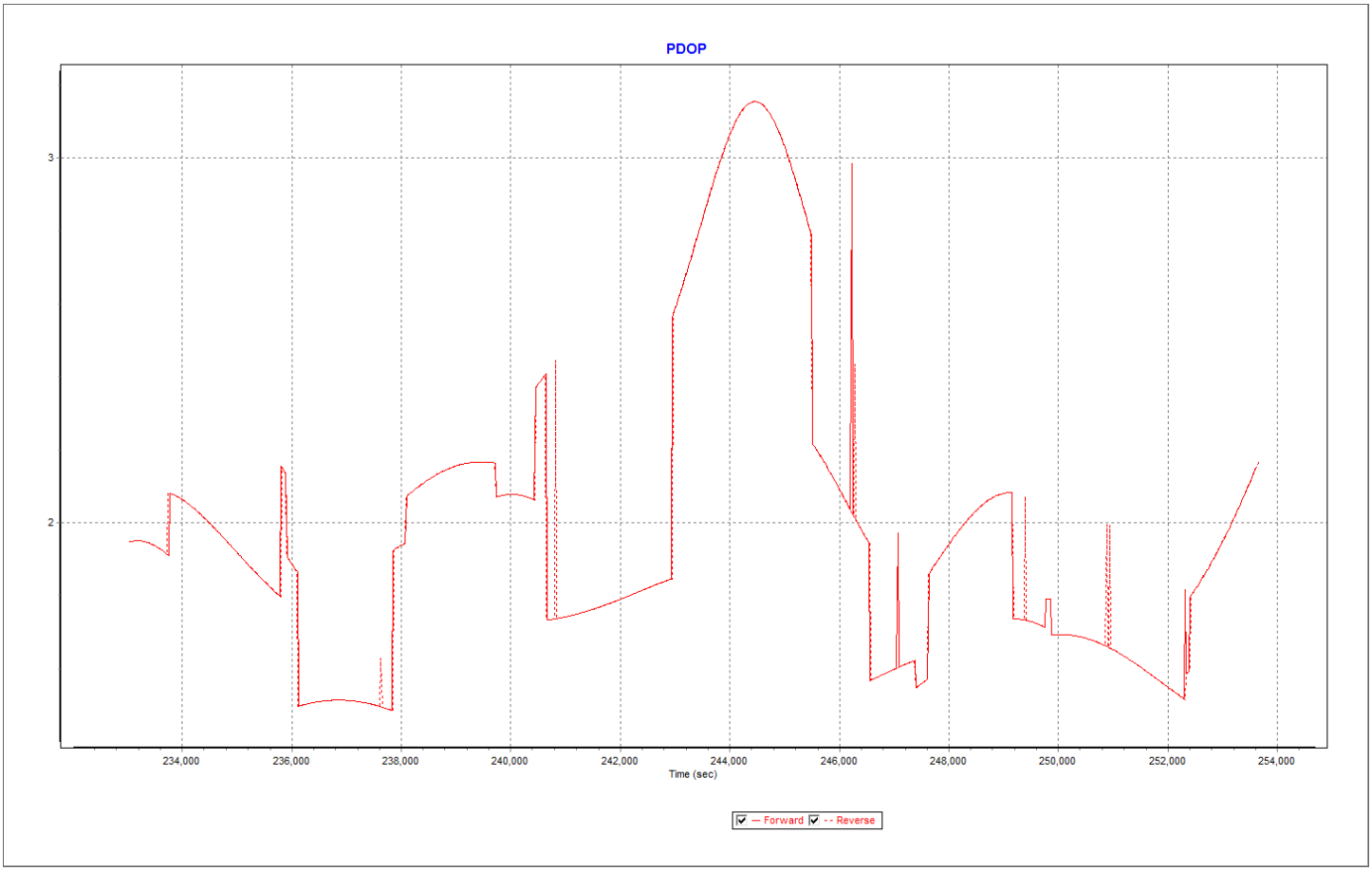
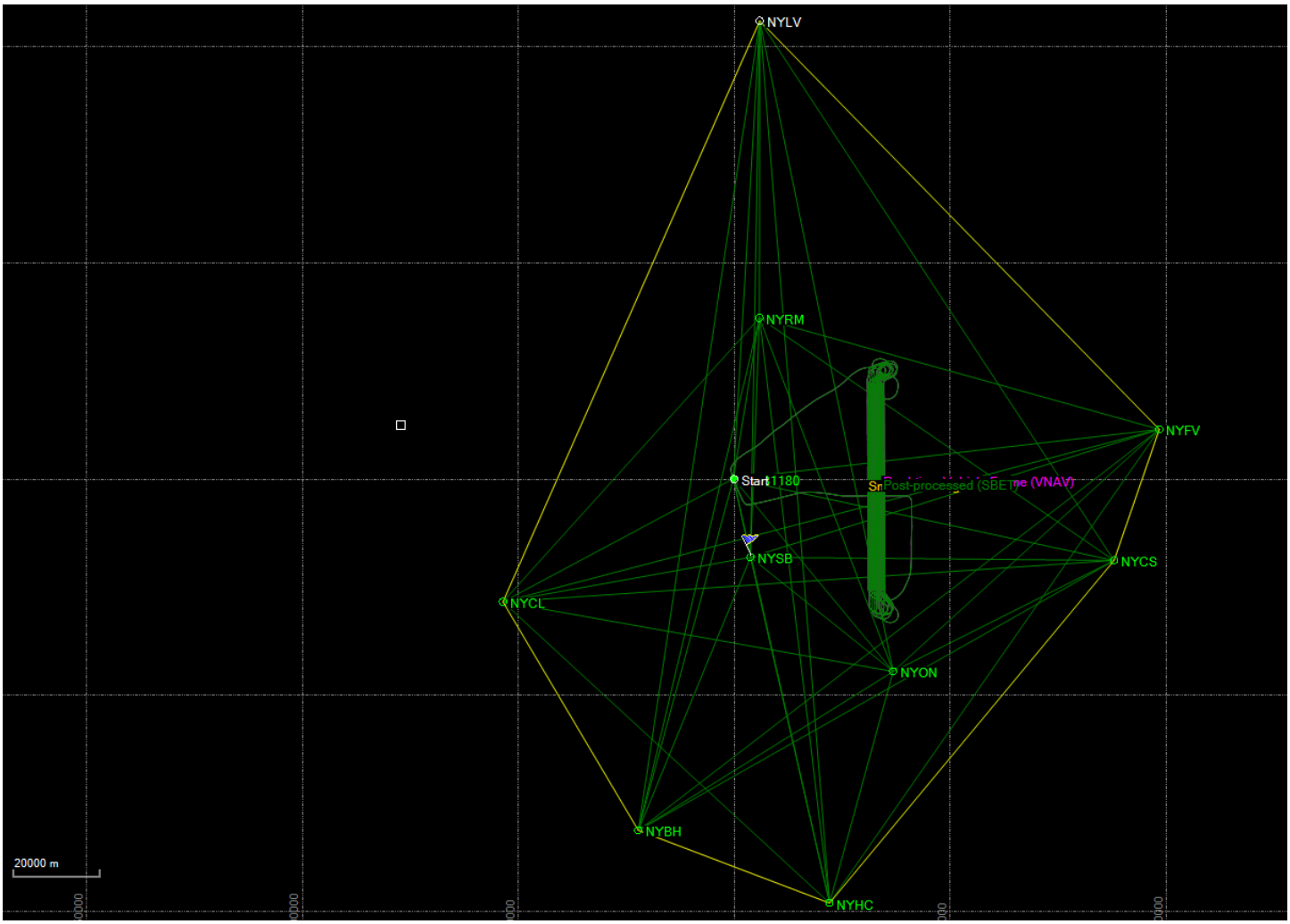
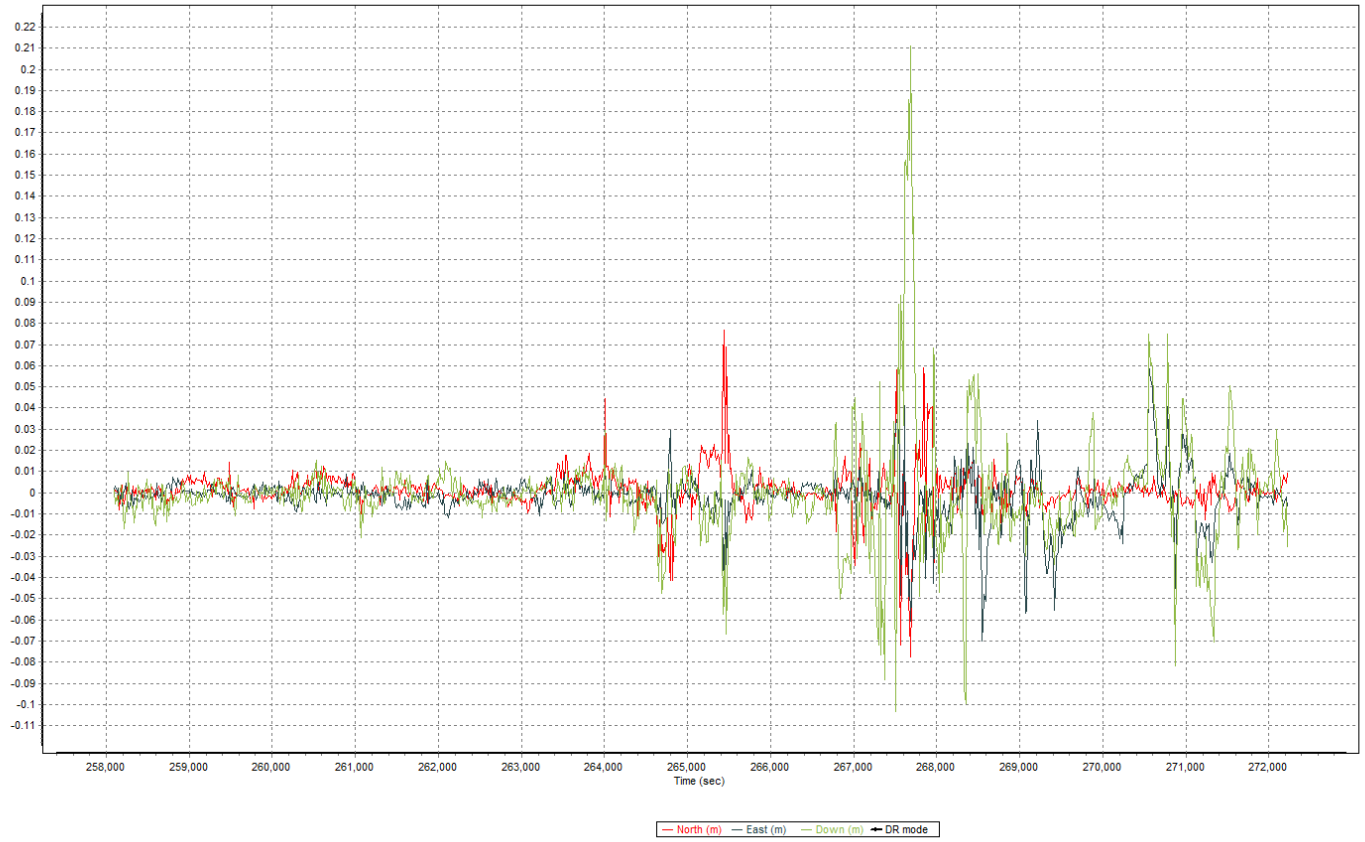
0.032
0.031
0.03
0.029
0.028
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
234,000
236,000
238,000
240,000
242,000
244,000
246,000
248,000
250,000
252,000
254,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
234,000
236,000
238,000
240,000
242,000
244,000
246,000
248,000
250,000
252,000
254,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
3
2
234,000
236,000
238,000
240,000
242,000
244,000
246,000
248,000
250,000
252,000
254,000
Time (sec)
— Forward - - Reverse

20150428-4


NYLV
NYRM
NYFV
Start1180
NYSB
NYCS
NYCL
NYON
NYBH
NYHC
20000 m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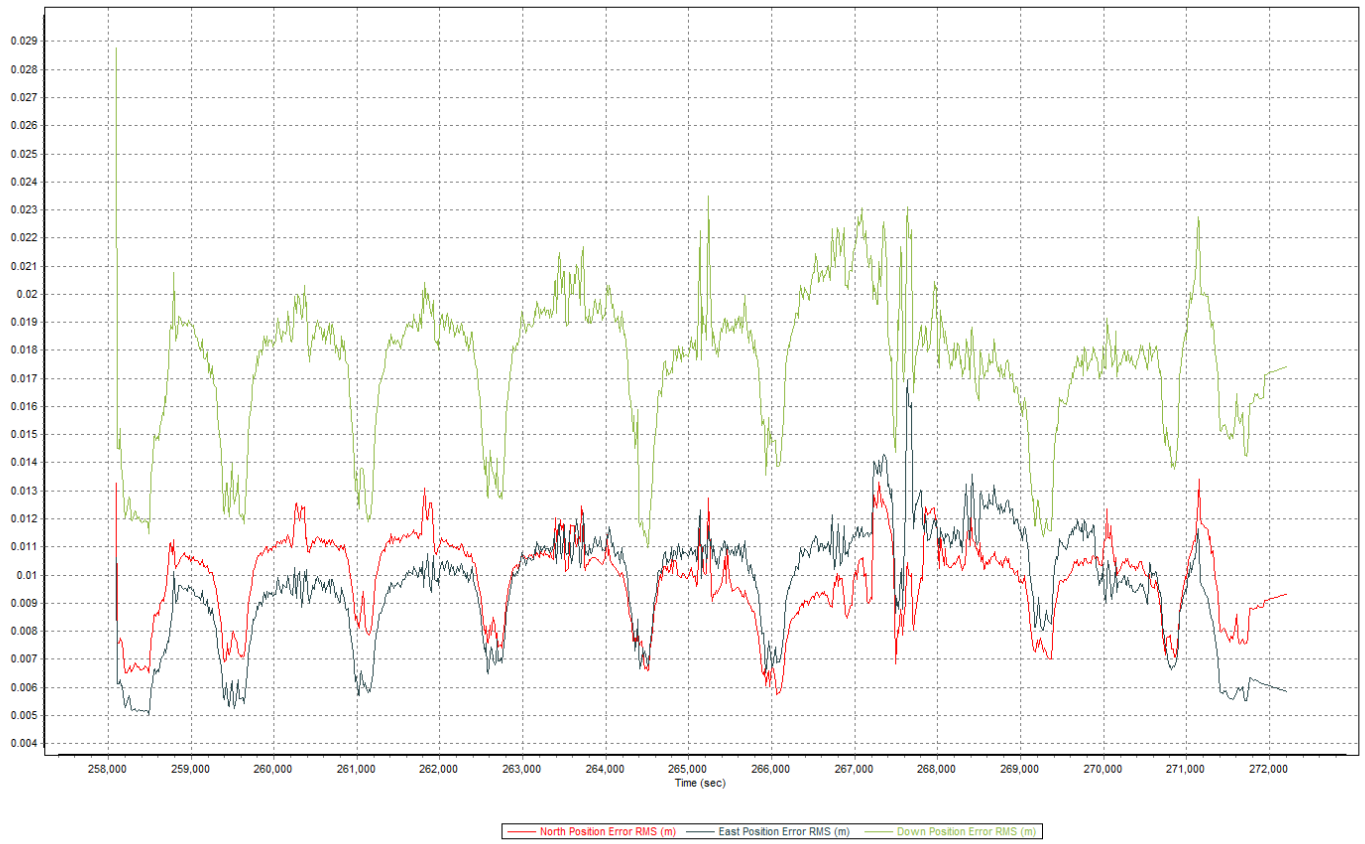
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.08
-0.09
-0.1
-0.11
258,000
259,000
260,000
261,000
262,000
263,000
264,000
265,000
266,000
267,000
268,000
269,000
270,000
271,000
272,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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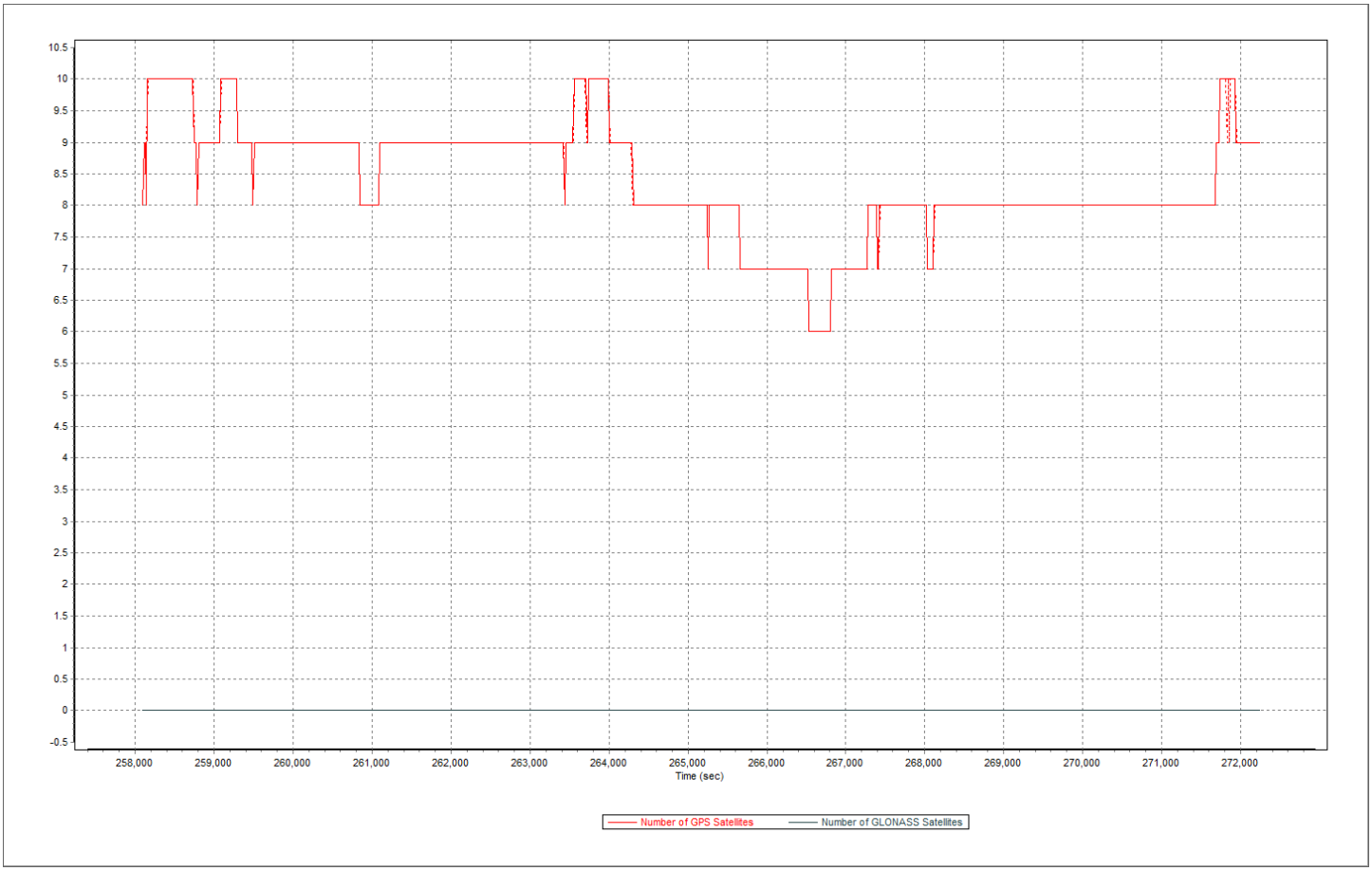
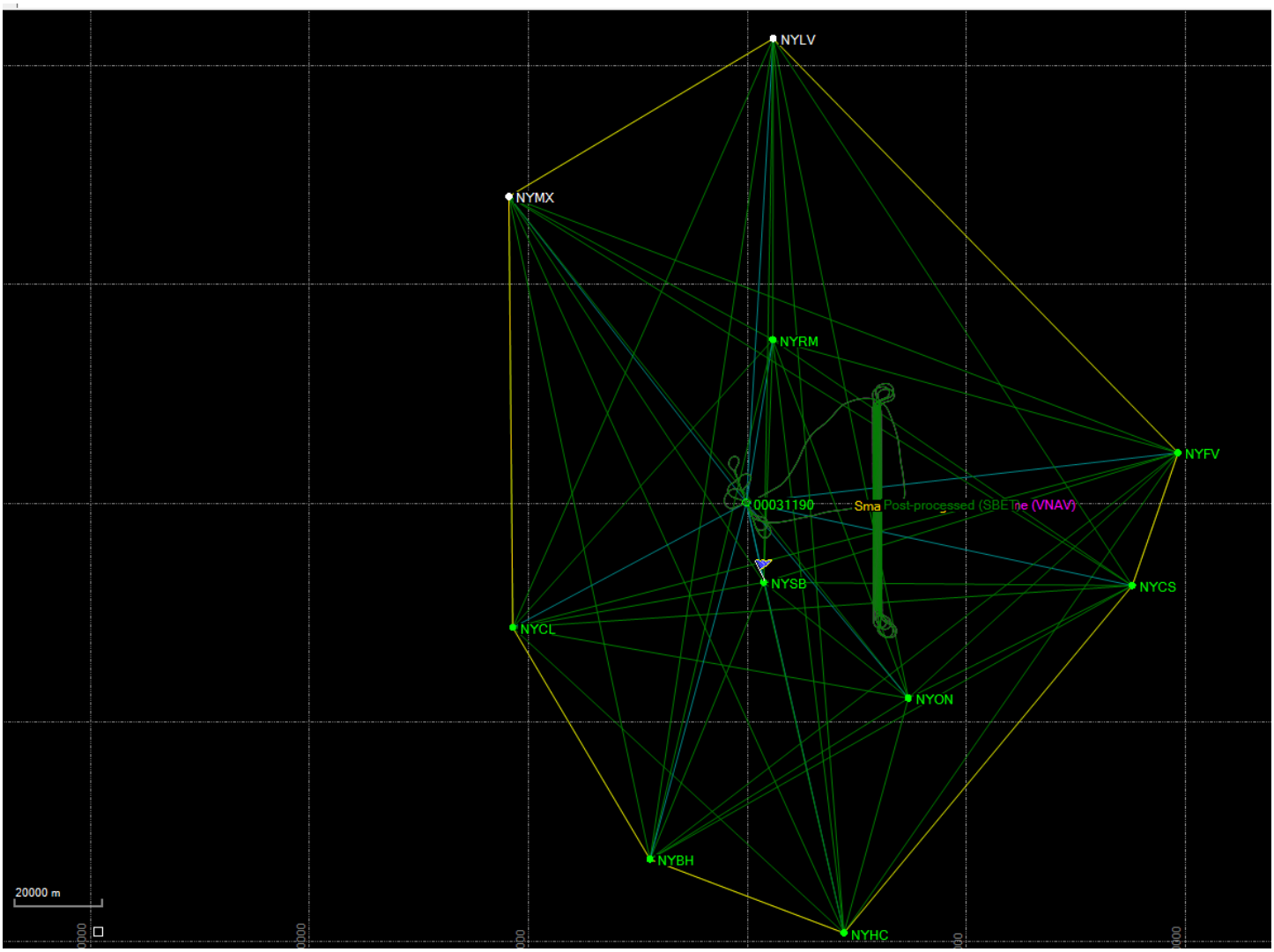
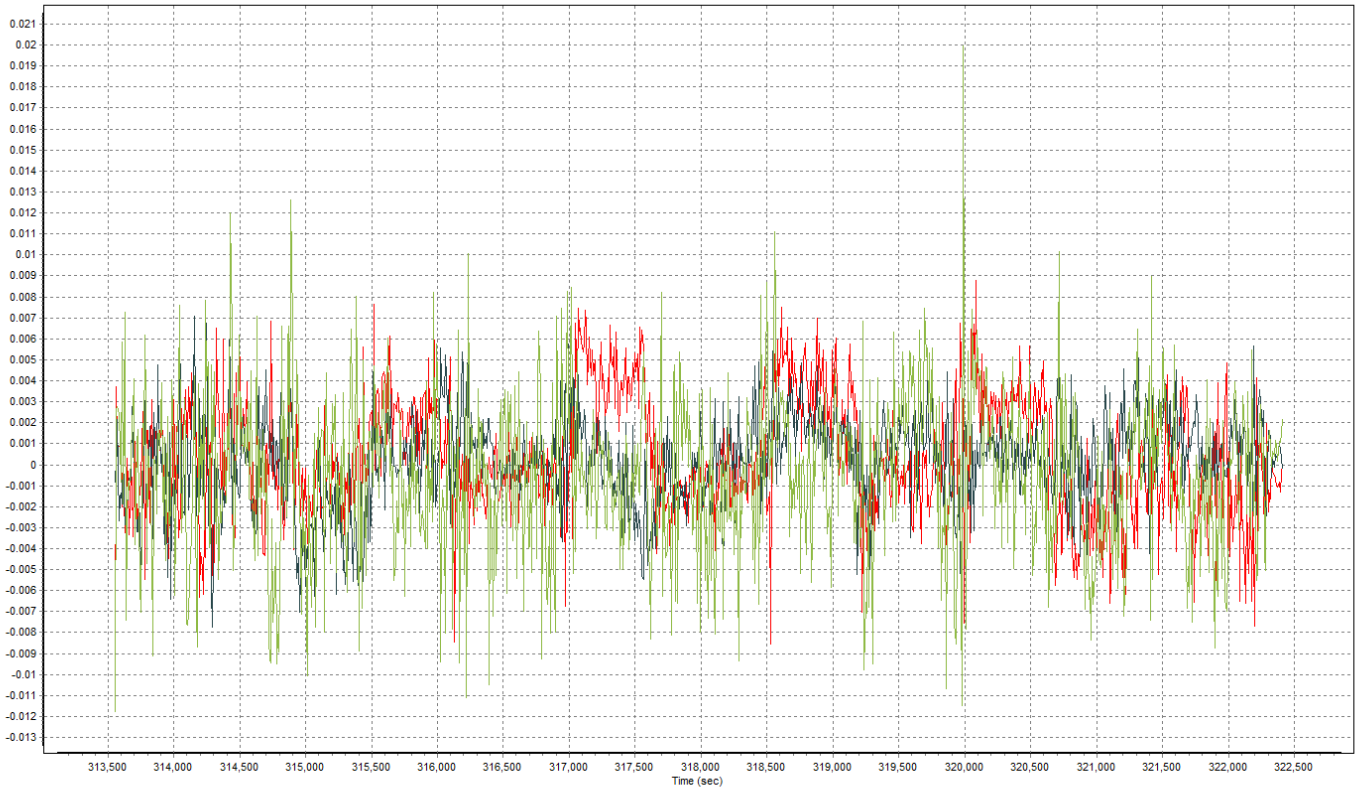
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
258,000
259,000
260,000
261,000
262,000
263,000
264,000
265,000
266,000
267,000
268,000
269,000
270,000
271,000
272,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
258,000
259,000
260,000
261,000
262,000
263,000
264,000
265,000
266,000
267,000
268,000
269,000
270,000
271,000
272,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites

20150429-1


NYLV
NYMX
NYRM
NYFV
00031190
Sma
Post-processed (SBET
ne (VNAV)
NYSB
NYCS
NYCL
NYON
NYBH
NYHC
20000 m


0.021
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0.017
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0.014
0.013
0.012
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0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
-0.001
-0.002
-0.003
-0.004
-0.005
-0.006
-0.007
-0.008
-0.009
-0.01
-0.011
-0.012
-0.013
313,500
314,000
314,500
315,000
315,500
316,000
316,500
317,000
317,500
318,000
318,500
319,000
319,500
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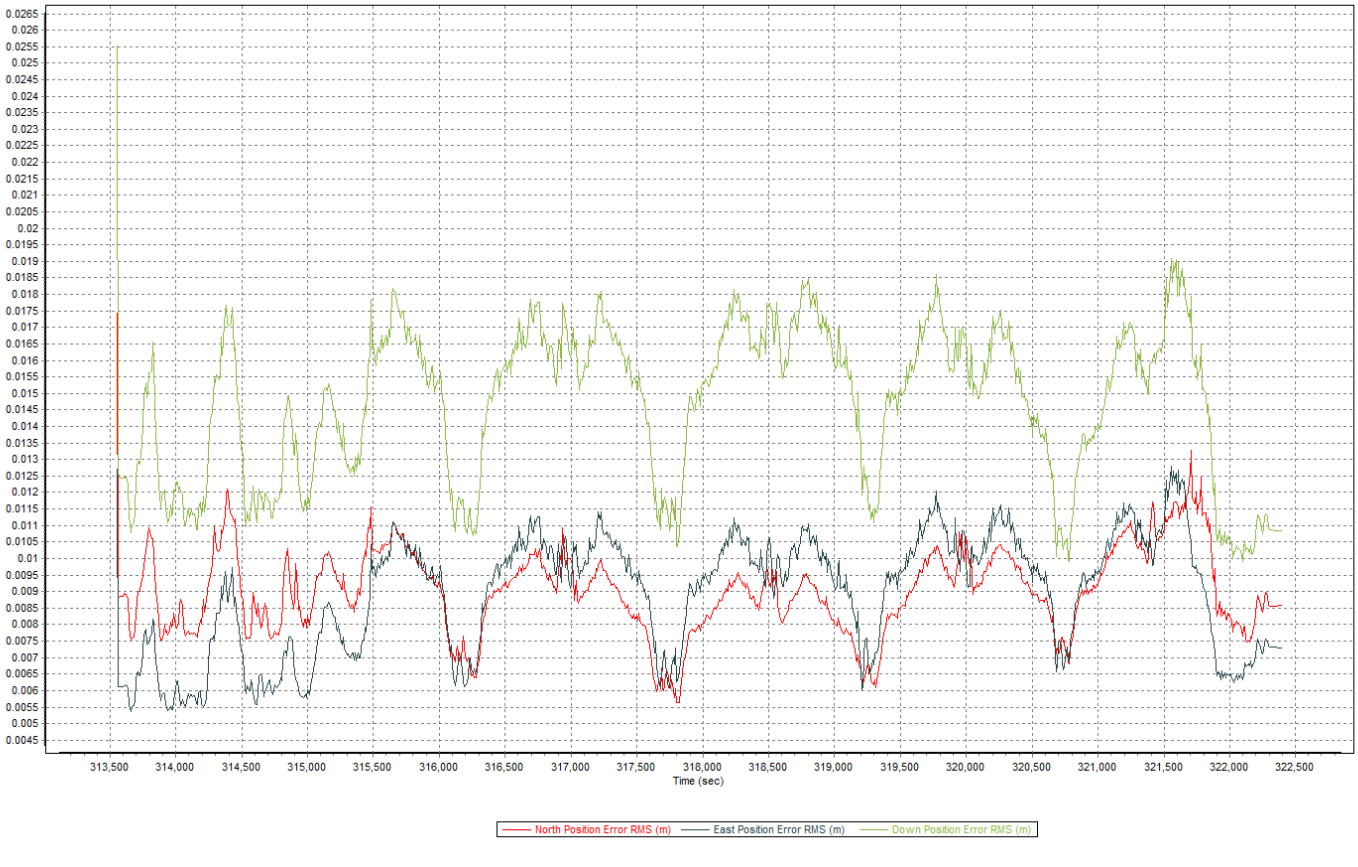
320,500
321,000
321,500
322,000
322,500
Time (sec)
North (m)
East (m)
Down (m)
DR mode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0.0225
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
313,500
314,000
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315,000
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317,000
317,500
318,000
318,500
319,000
319,500
320,000
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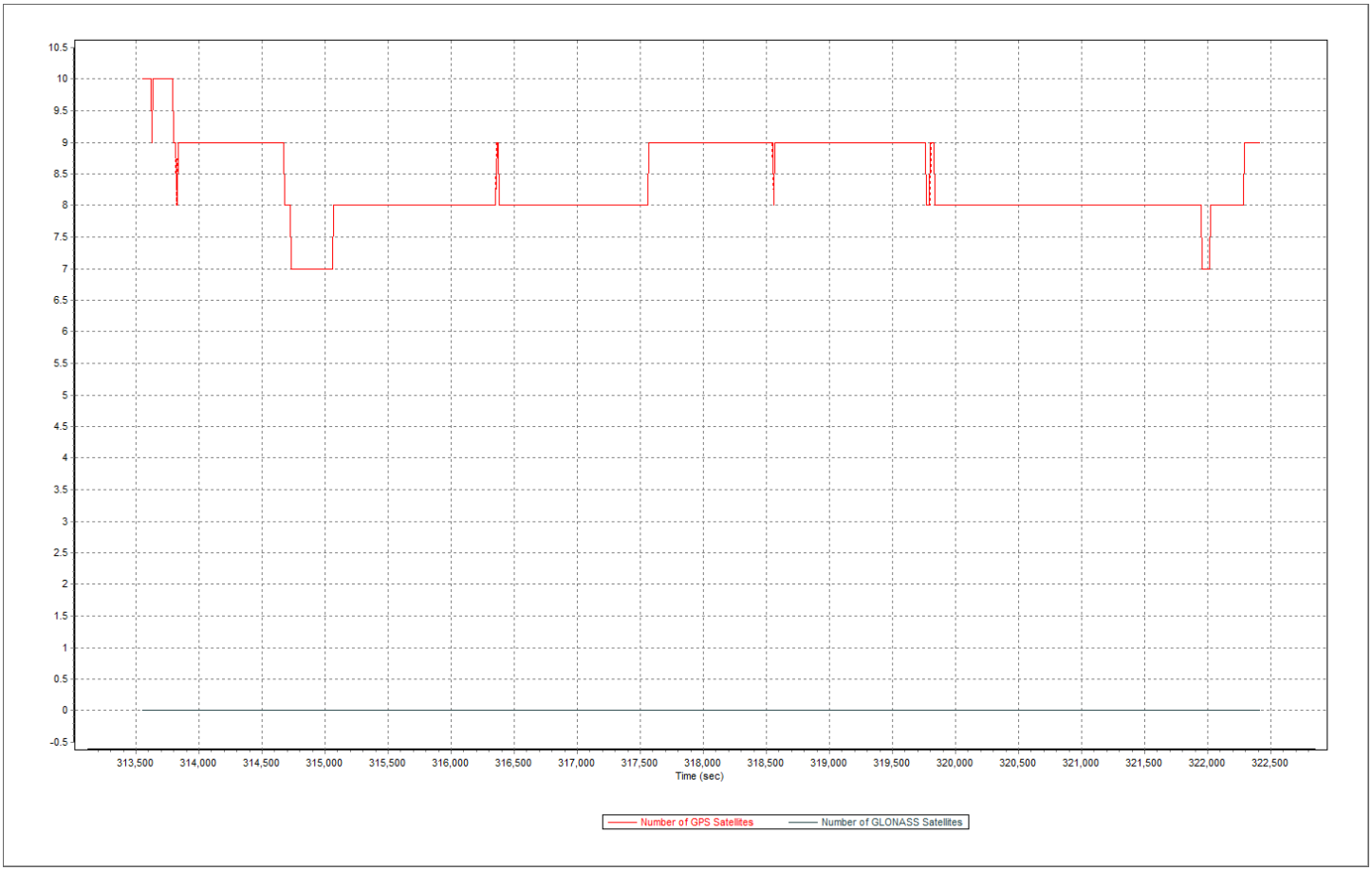
321,500
322,000
322,500
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)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9.5
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8.5
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7.5
7
6.5
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5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
313,500
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317,000
317,500
318,000
318,500
319,000
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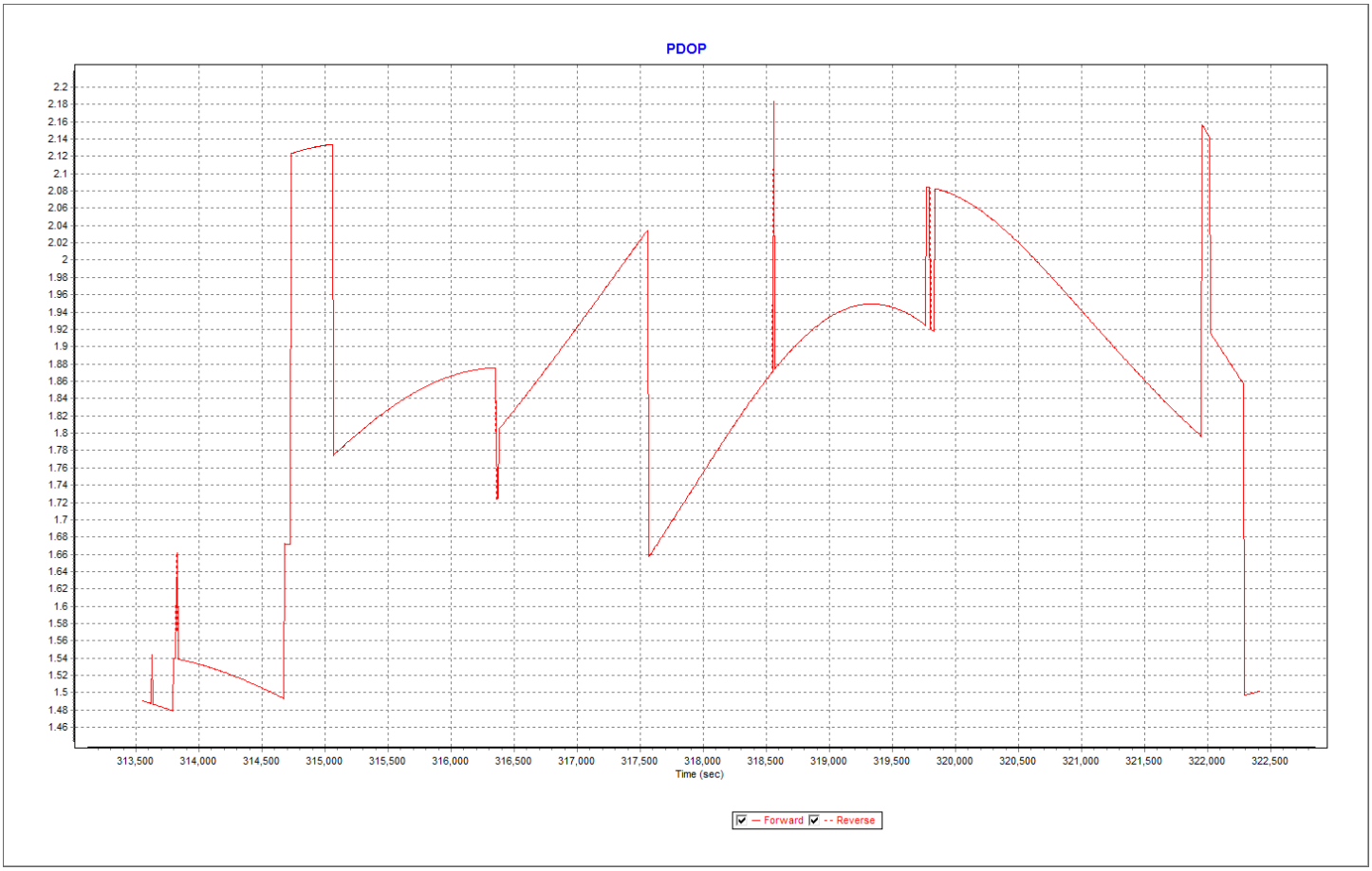
320,500
321,000
321,500
322,000
322,500
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2.2
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2.16
2.14
2.12
2.1
2.08
2.06
2.04
2.02
2
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1.96
1.94
1.92
1.9
1.88
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1.84
1.82
1.8
1.78
1.76
1.74
1.72
1.7
1.68
1.66
1.64
1.62
1.6
1.58
1.56
1.54
1.52
1.5
1.48
1.46
313,500
314,000
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315,500
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316,500
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317,500
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318,500
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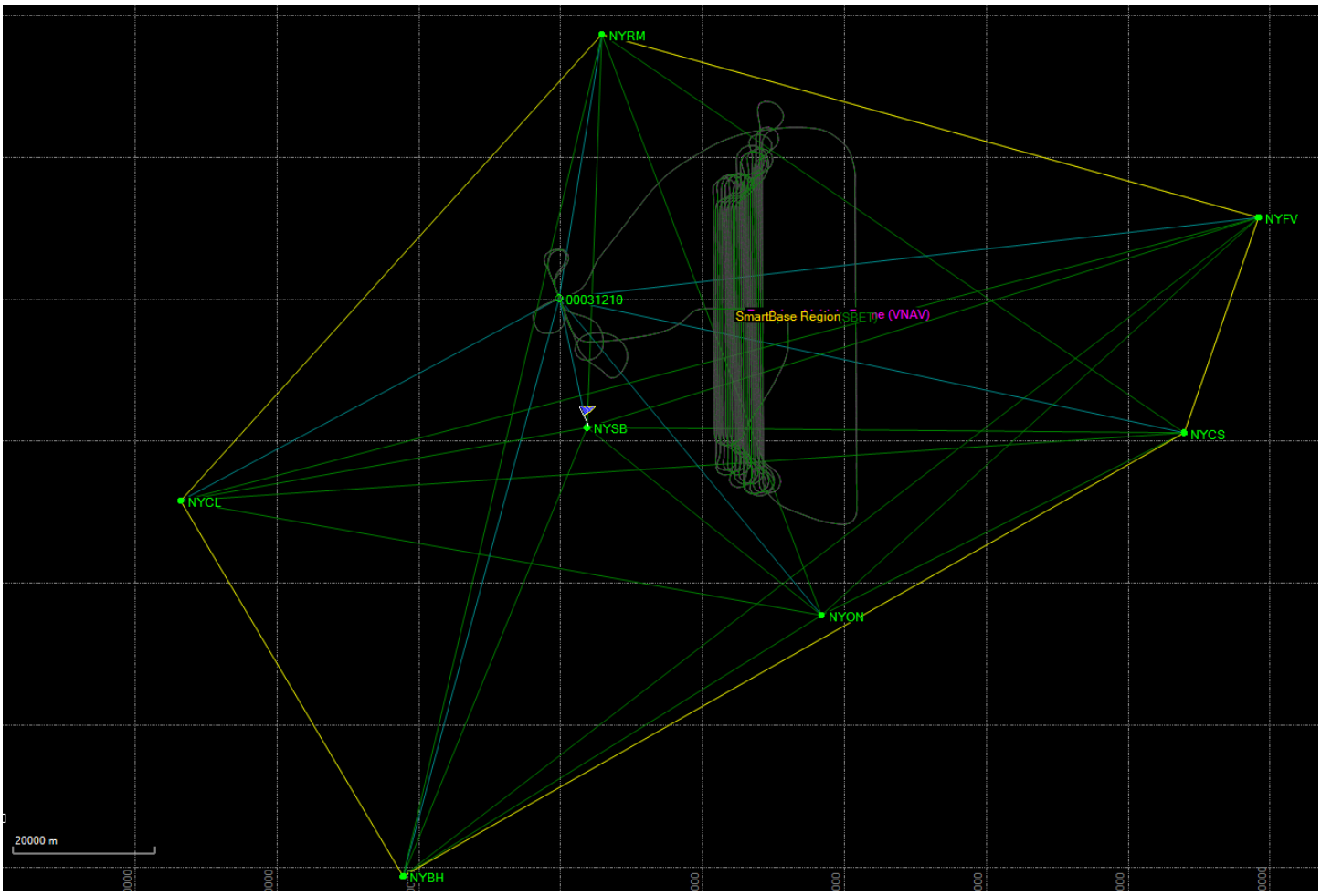
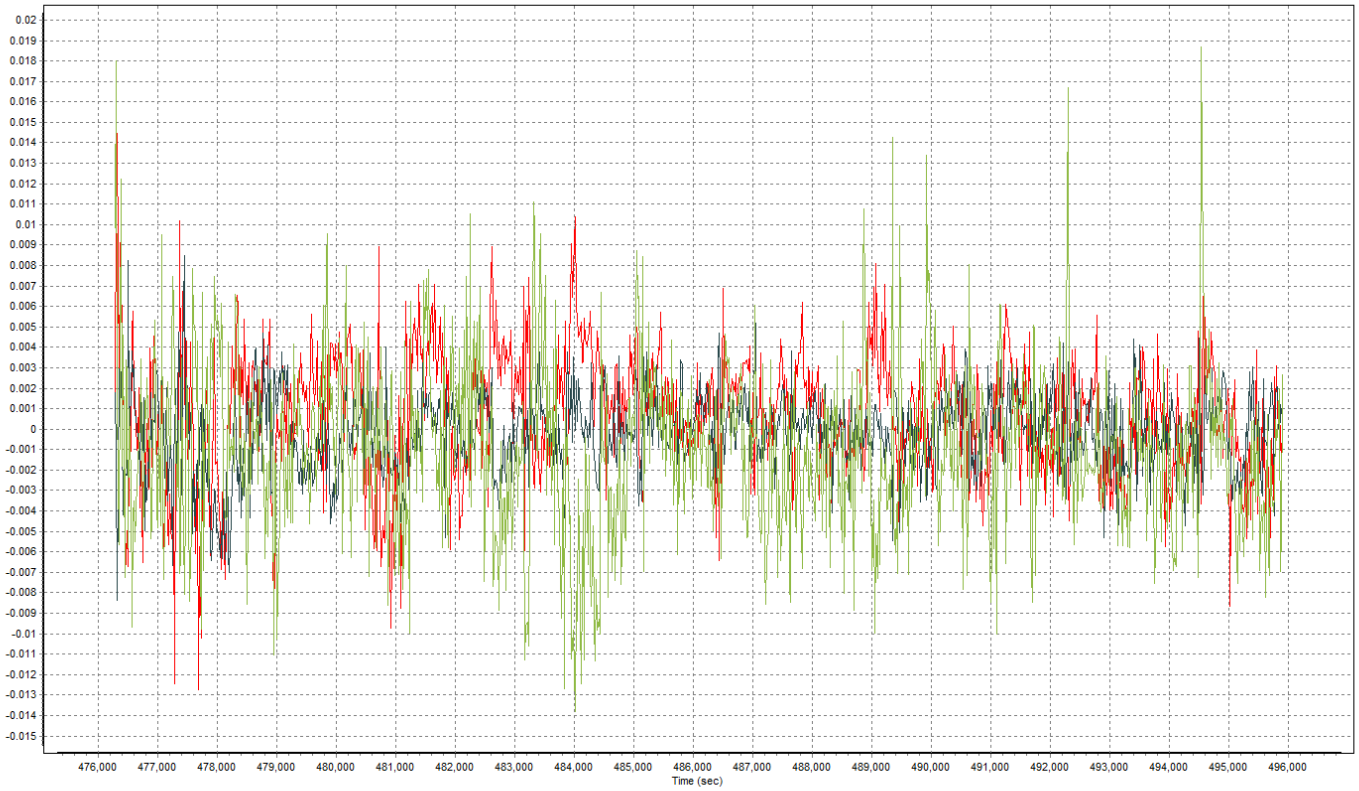
322,500
Time (sec)
— Forward - - Reverse

20150501-1


NYRM
NYFV
00031210
SmartBase Region SBET (VNAV)
NYSB
NYCS
NYCL
NYON
NYBH
20000 m


0.02
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0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
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0.009
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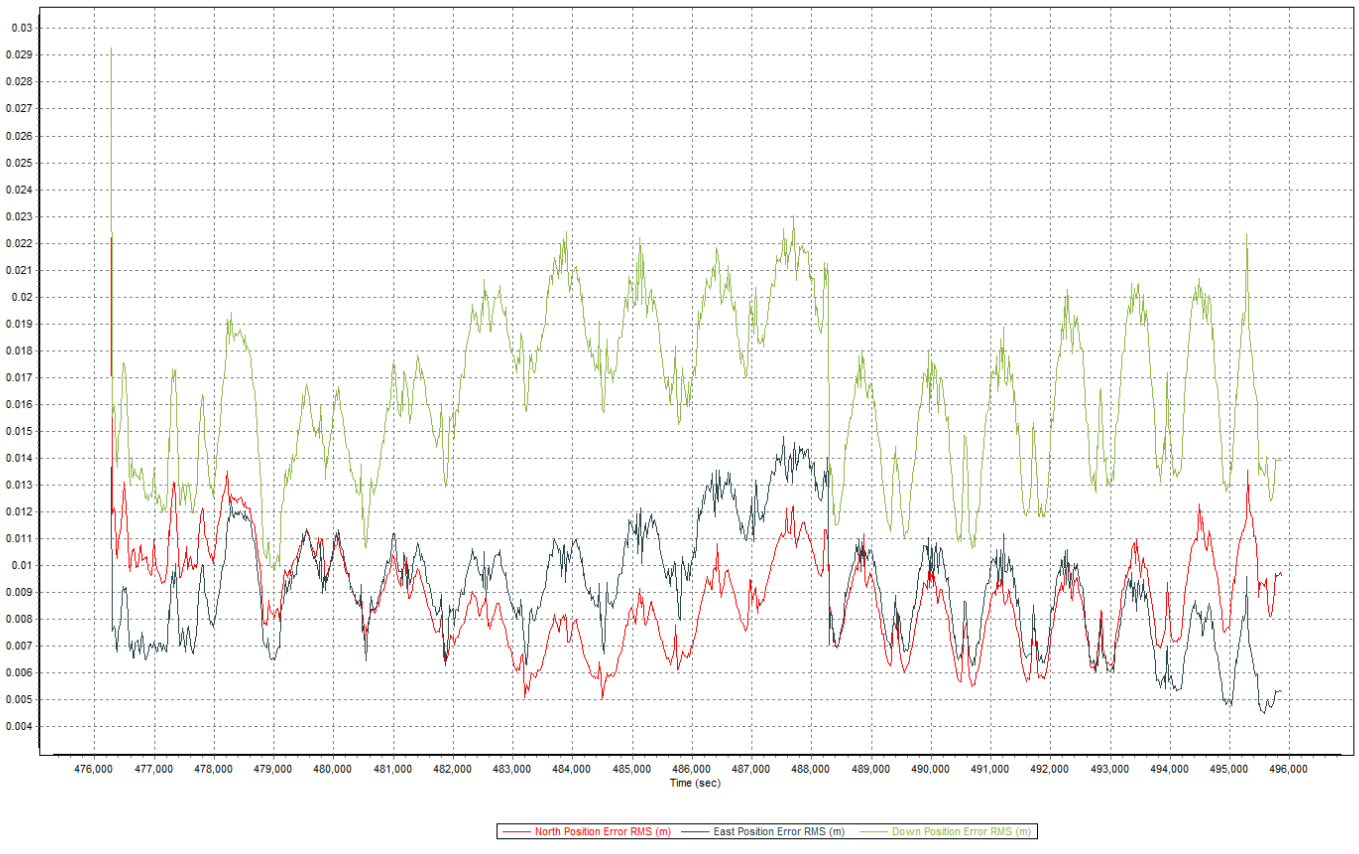
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
-0.001
-0.002
-0.003
-0.004
-0.005
-0.006
-0.007
-0.008
-0.009
-0.01
-0.011
-0.012
-0.013
-0.014
-0.015
476,000 477,000 478,000 479,000 480,000 481,000 482,000 483,000 484,000 485,000 486,000 487,000 488,000 489,000 490,000 491,000 492,000 493,000 494,000 495,000 496,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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0.025
0.024
0.023
0.022
0.021
0.02
0.019
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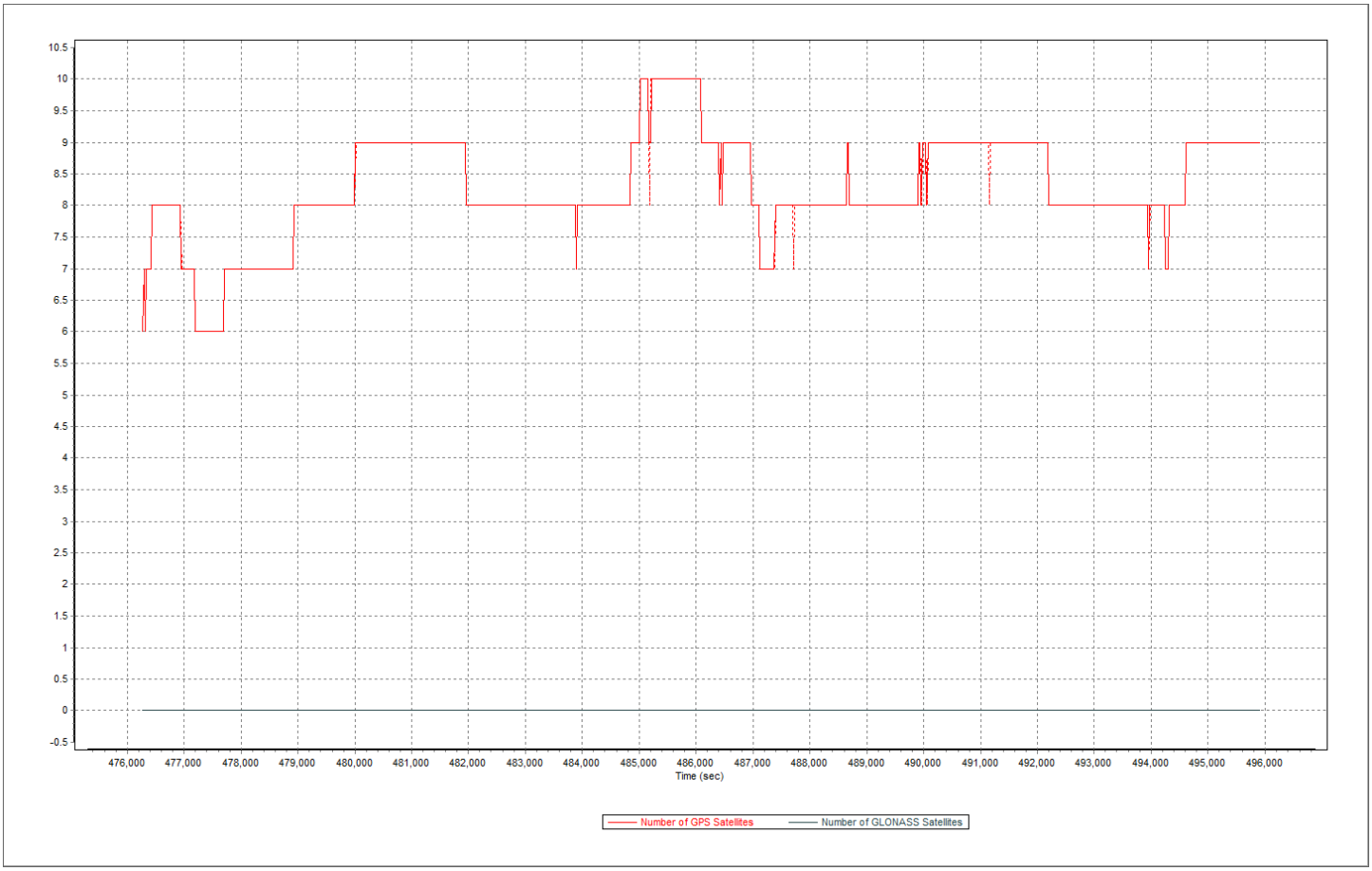
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
476,000 477,000 478,000 479,000 480,000 481,000 482,000 483,000 484,000 485,000 486,000 487,000 488,000 489,000 490,000 491,000 492,000 493,000 494,000 495,000 496,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
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9.5
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8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
476,000
477,000
478,000
479,000
480,000
481,000
482,000
483,000
484,000
485,000
486,000
487,000
488,000
489,000
490,000
491,000
492,000
493,000
494,000
495,000
496,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2
476,000
477,000
478,000
479,000
480,000
481,000
482,000
483,000
484,000
485,000
486,000
487,000
488,000
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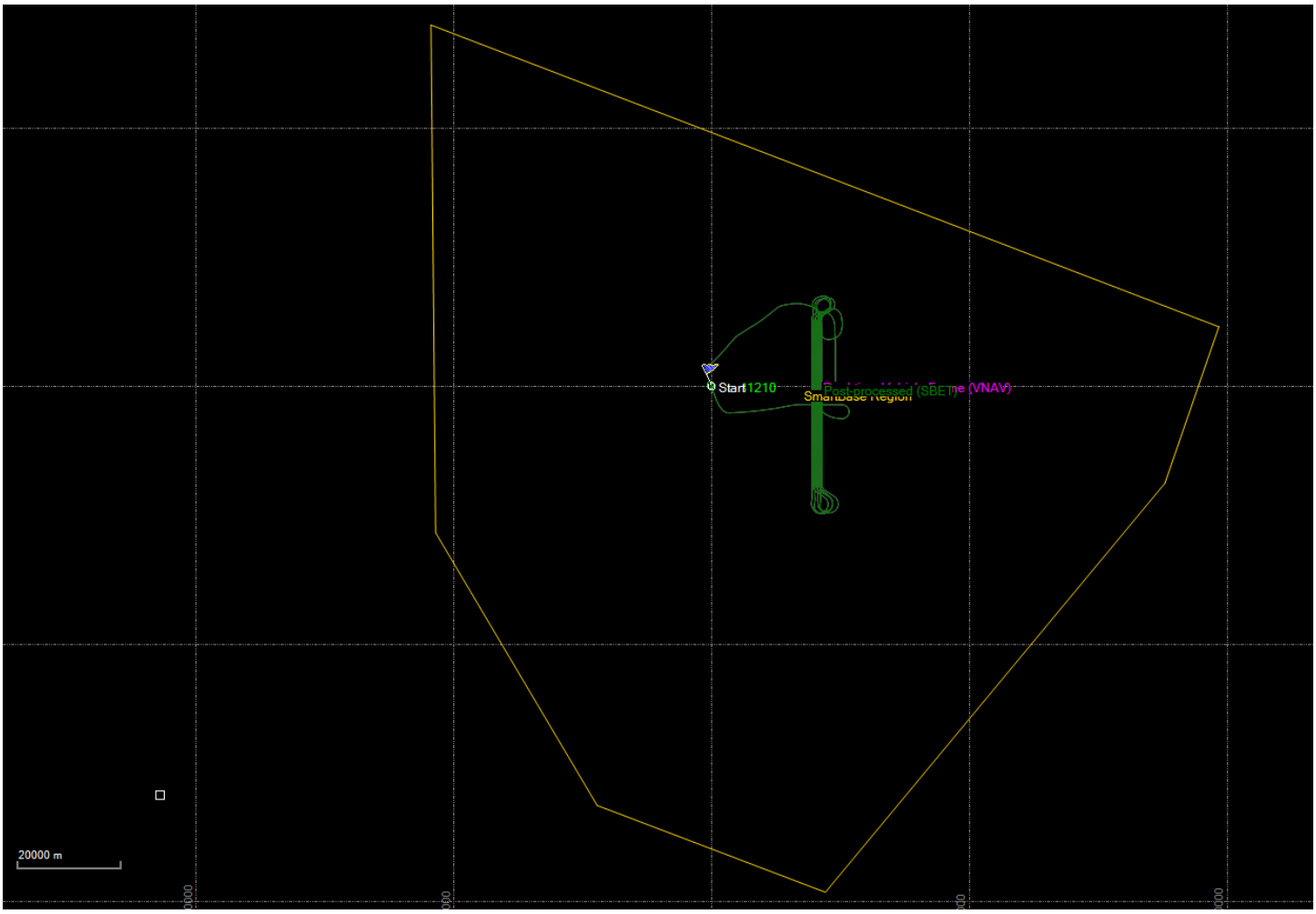
493,000
494,000
495,000
496,000
Time (sec)
— Forward - - Reverse

20150501-2




0.036
0.034
0.032
0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
501,000
501,500
502,000
502,500
503,000
503,500
504,000
504,500
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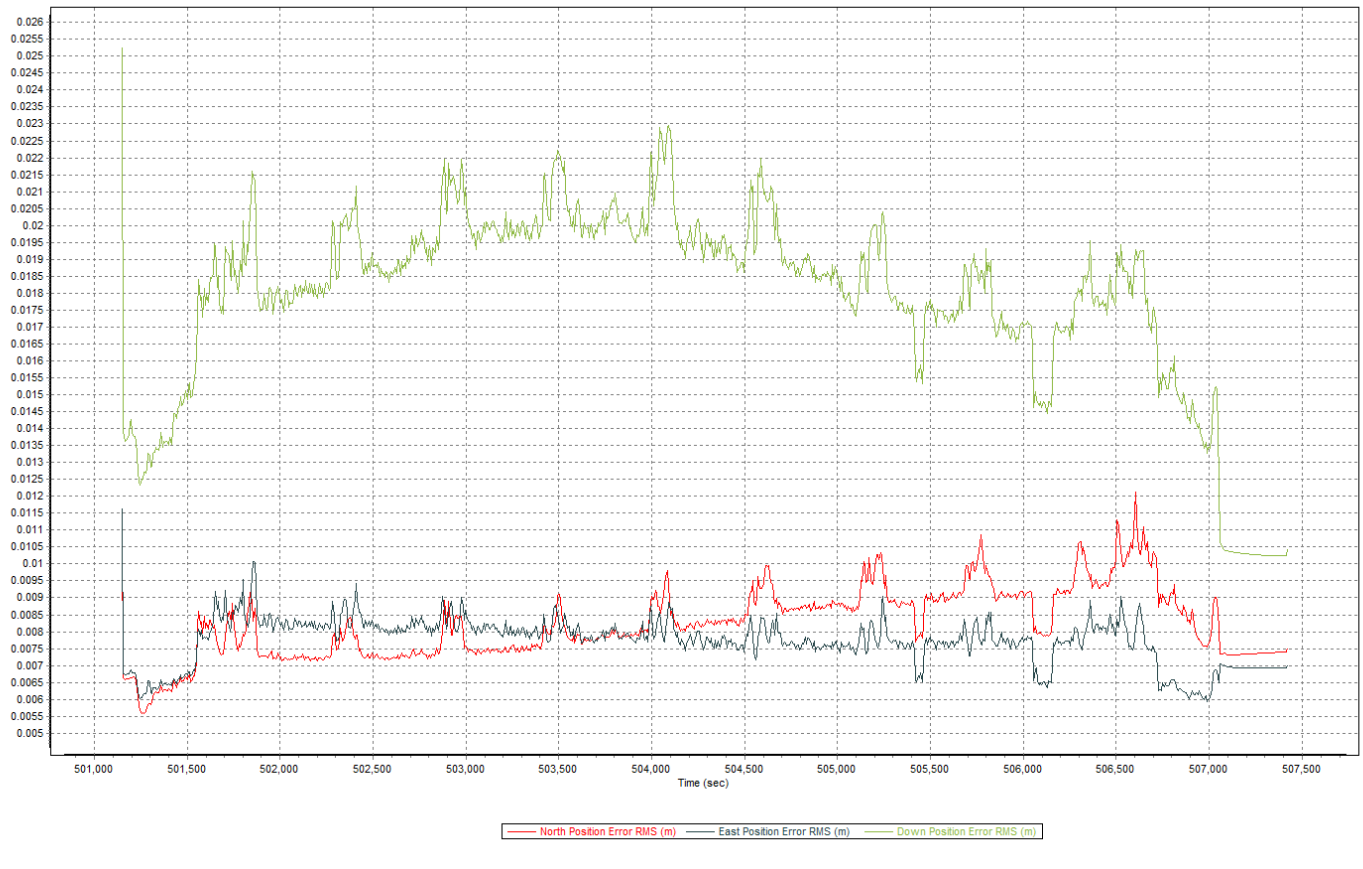
506,000
506,500
507,000
507,500
Time (sec)
North (m)
East (m)
Down (m)
DR mode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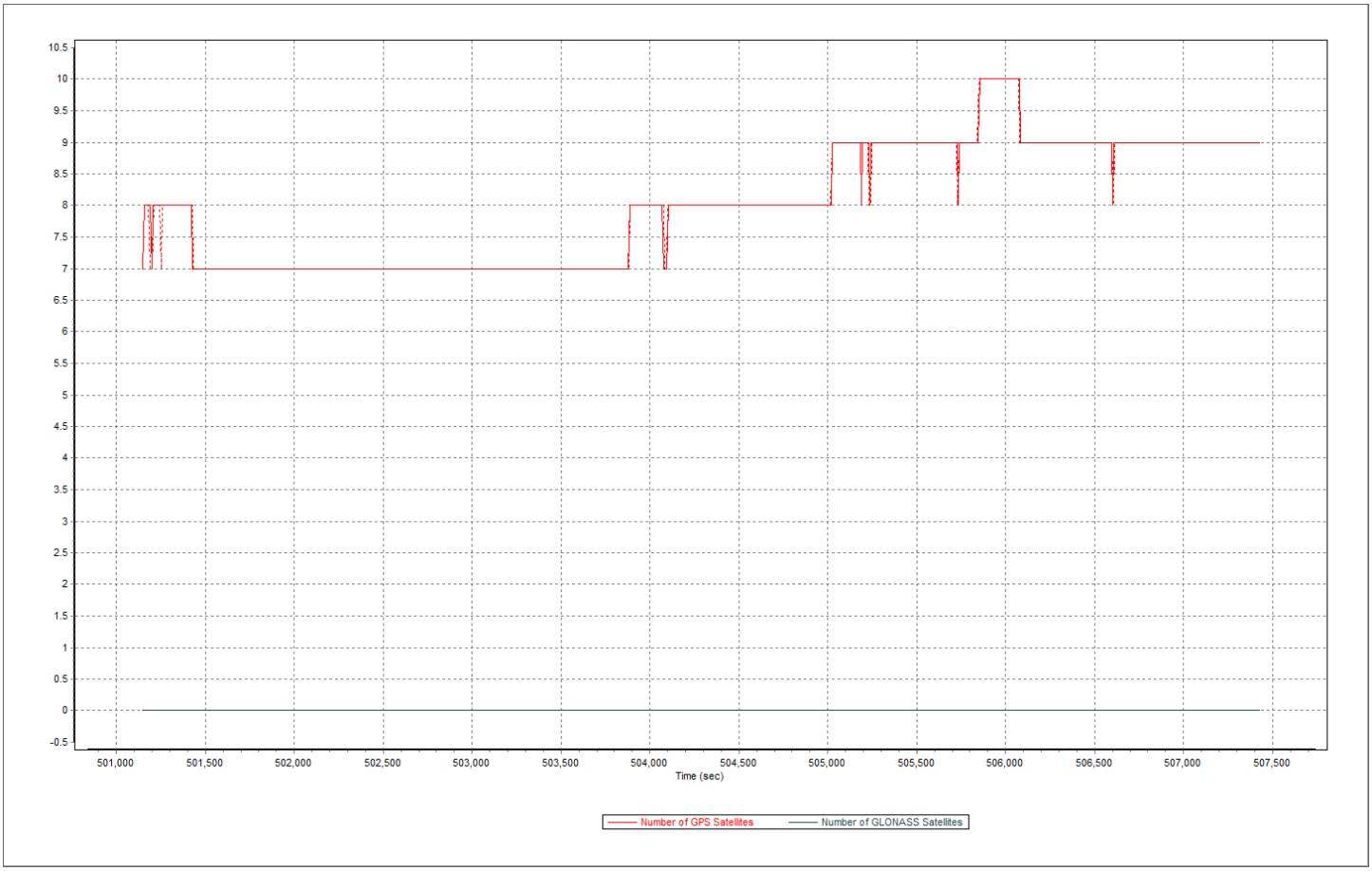
0.0255
0.025
0.0245
0.024
0.0235
0.023
0.0225
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
501,000
501,500
502,000
502,500
503,000
503,500
504,000
504,500
505,000
505,500
506,000
506,500
507,000
507,500
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
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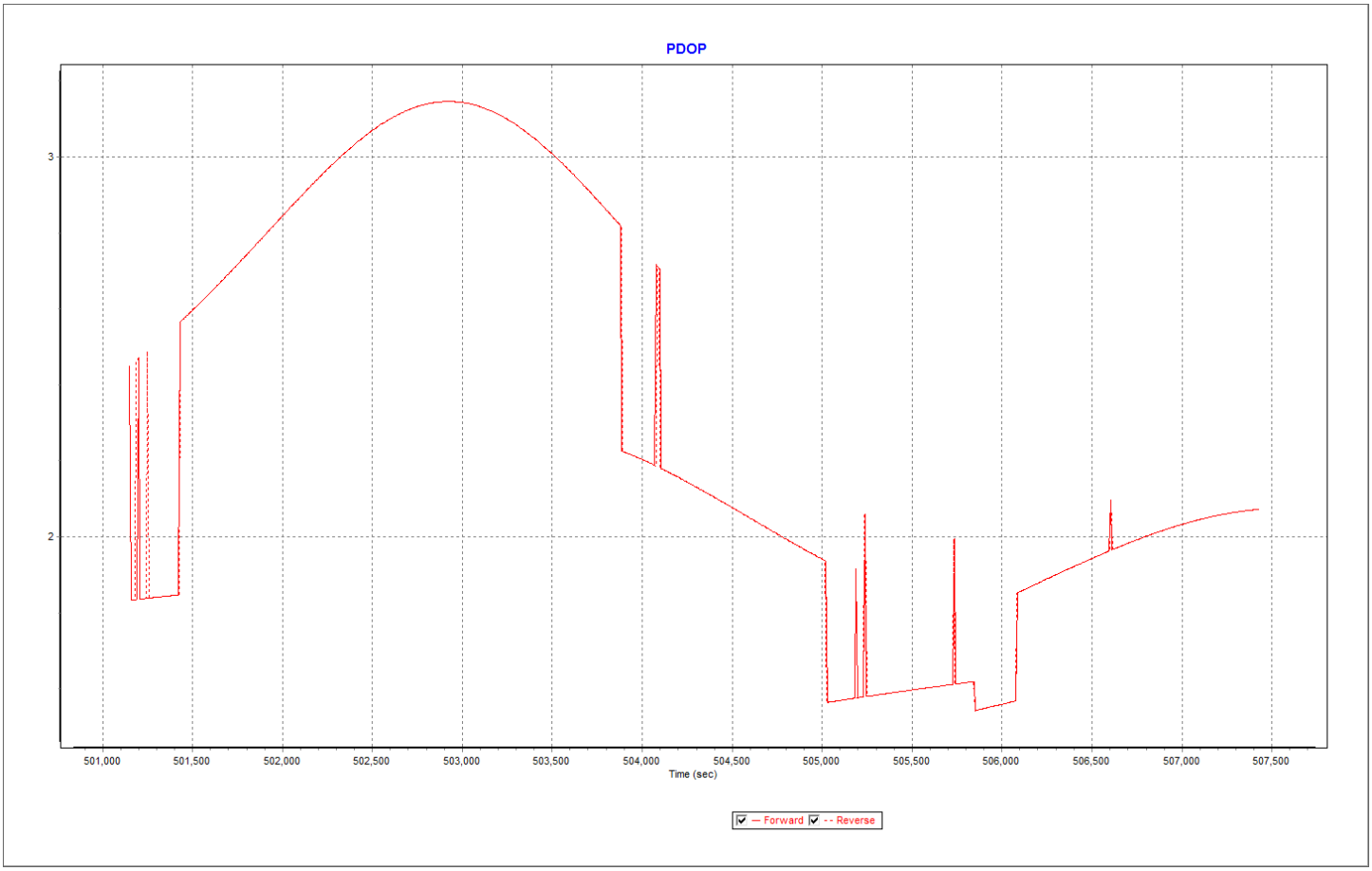
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
501,000
501,500
502,000
502,500
503,000
503,500
504,000
504,500
505,000
505,500
506,000
506,500
507,000
507,500
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
3
2
501,000
501,500
502,000
502,500
503,000
503,500
504,000
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505,500
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506,500
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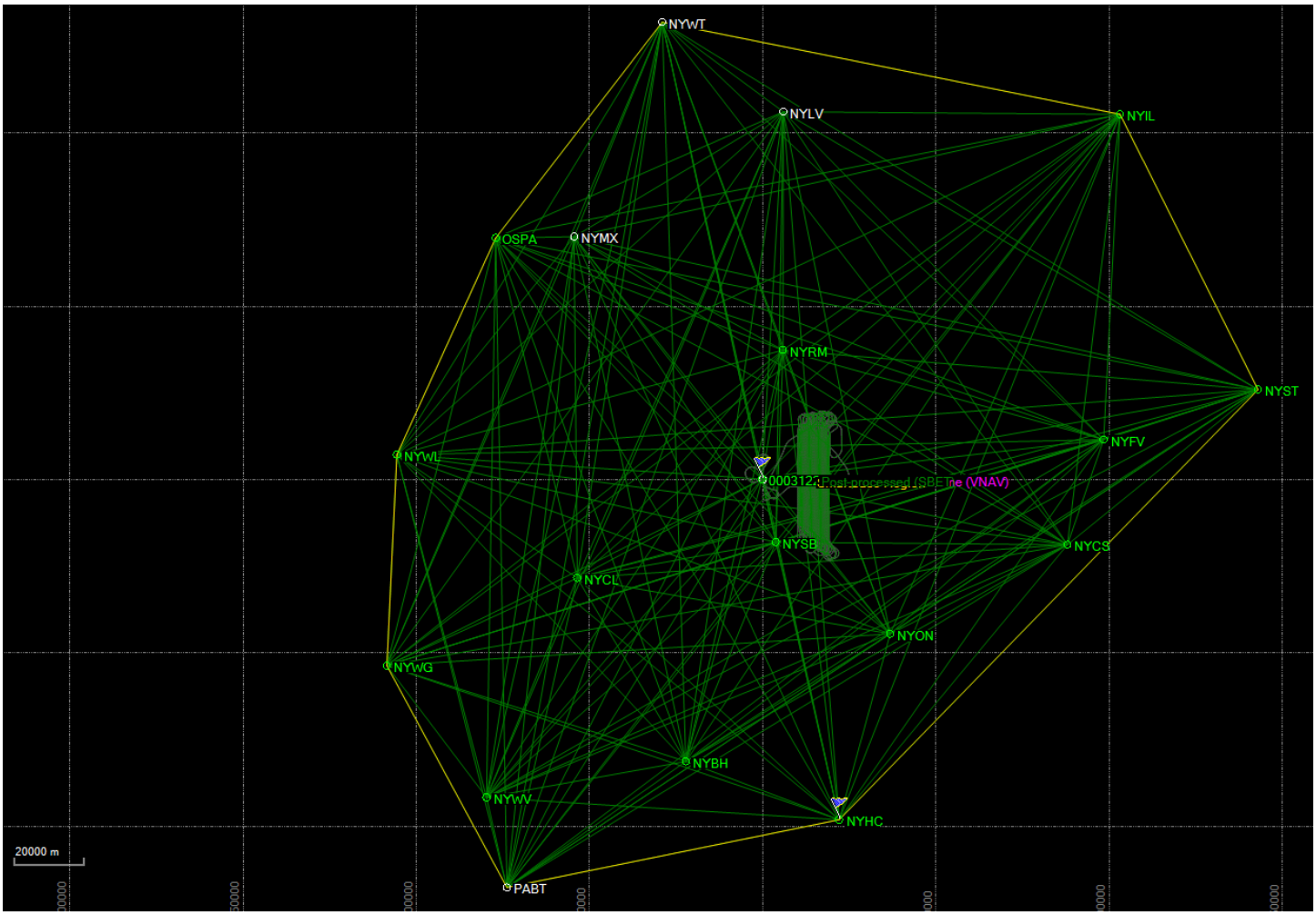
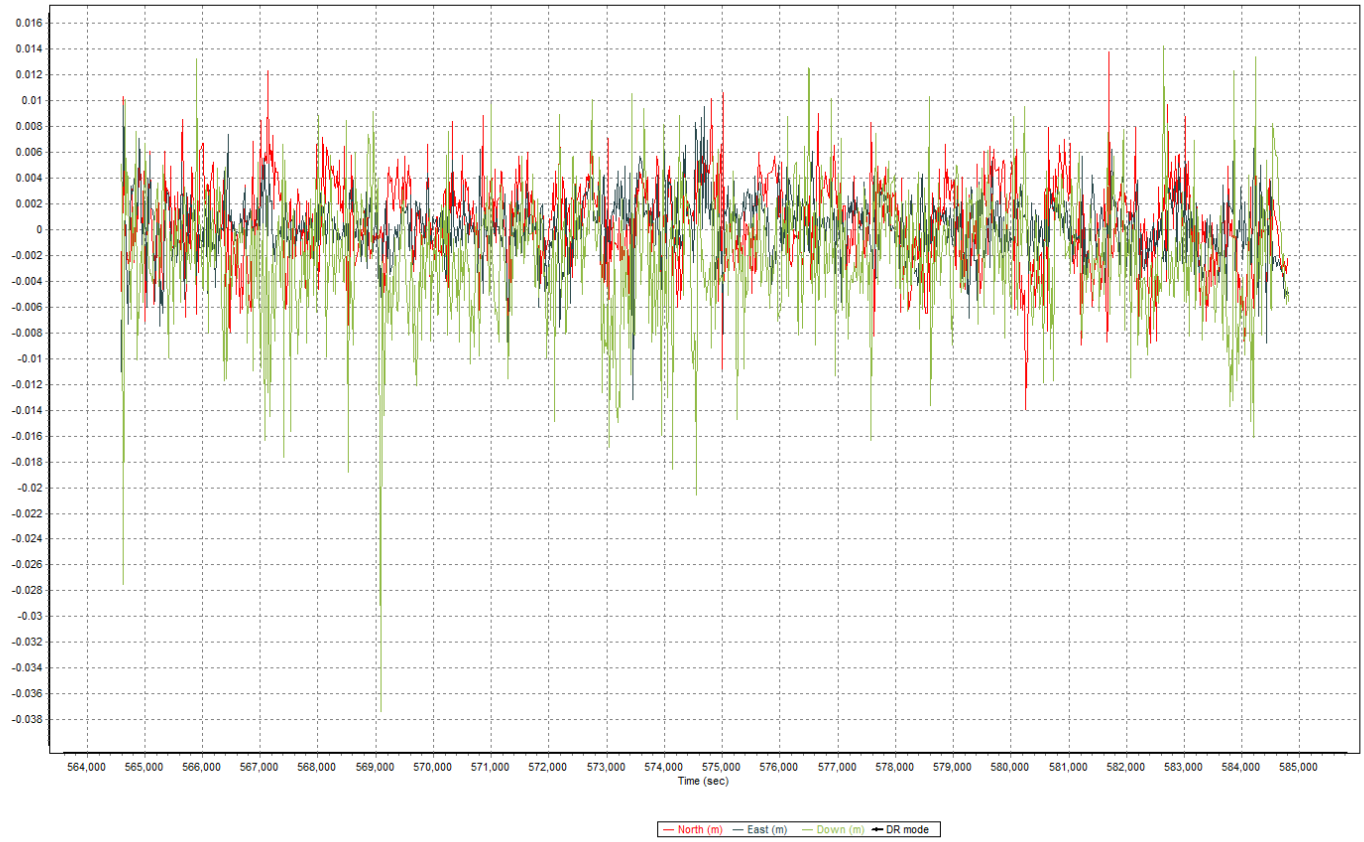
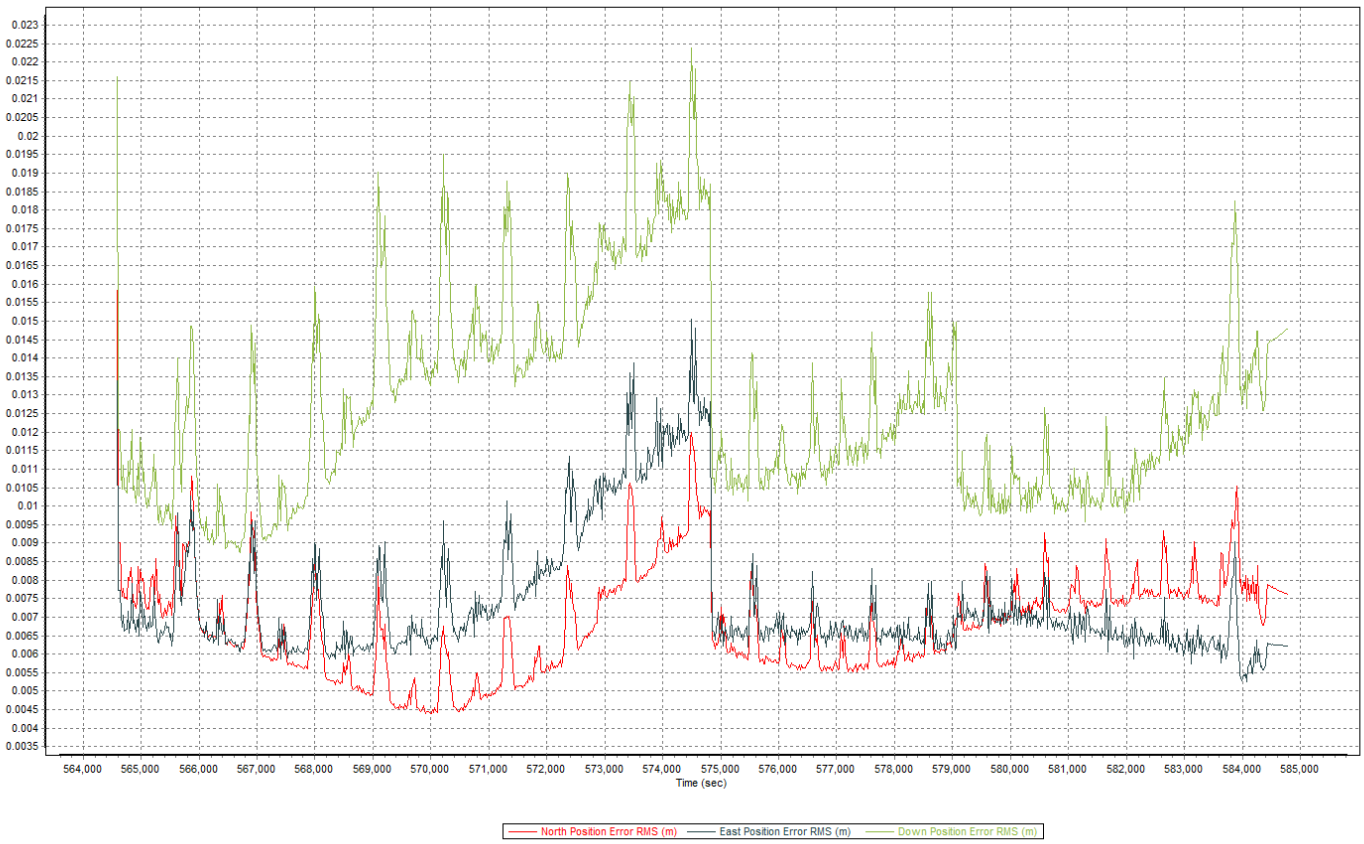
507,500
Time (sec)
— Forward - - Reverse

20150502-1


NYWT
NYLV
NYIL
OSPA
NYMX
NYRM
NYST
NYFV
NYWL
NYSB
NYCS
NYCL
NYON
NYWG
NYBH
NYWV
NYHC
PABT
20000 m


0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
-0.032
-0.034
-0.036
-0.038
564,000 565,000 566,000 567,000 568,000 569,000 570,000 571,000 572,000 573,000 574,000 575,000 576,000 577,000 578,000 579,000 580,000 581,000 582,000 583,000 584,000 585,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode


0.023
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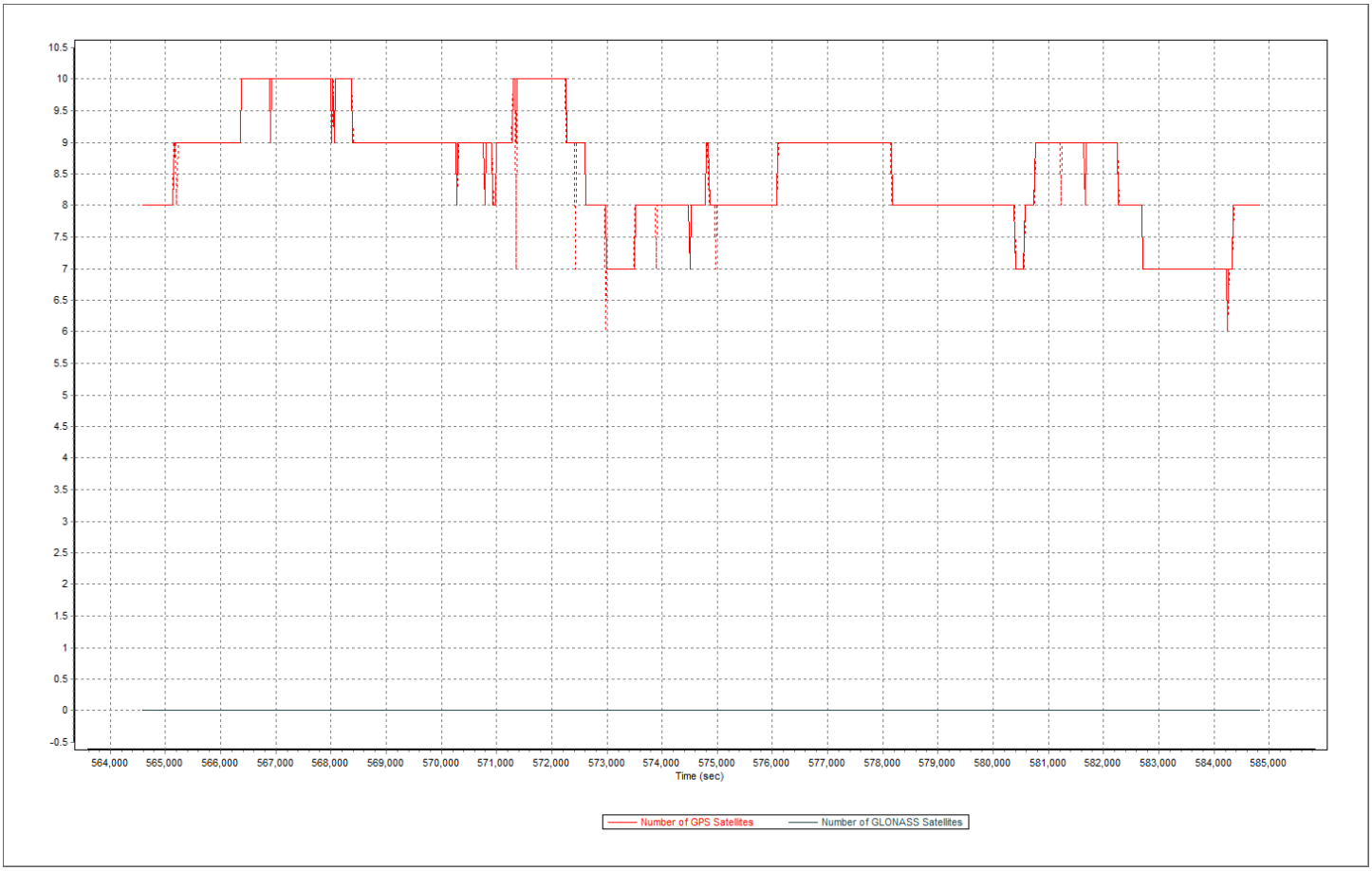
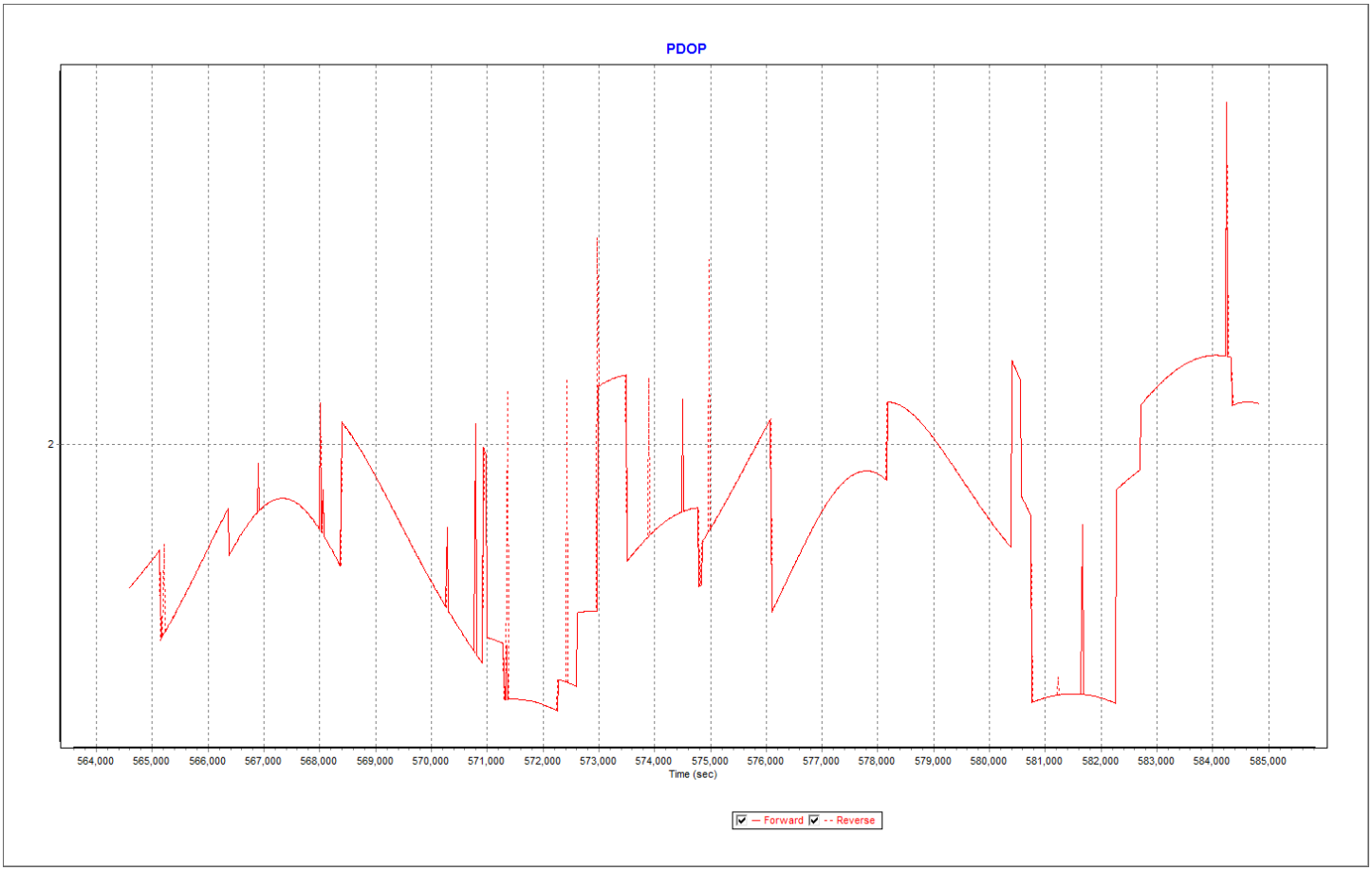
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
0.004
0.0035
564,000 565,000 566,000 567,000 568,000 569,000 570,000 571,000 572,000 573,000 574,000 575,000 576,000 577,000 578,000 579,000 580,000 581,000 582,000 583,000 584,000 585,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
564,000
565,000
566,000
567,000
568,000
569,000
570,000
571,000
572,000
573,000
574,000
575,000
576,000
577,000
578,000
579,000
580,000
581,000
582,000
583,000
584,000
585,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2
564,000
565,000
566,000
567,000
568,000
569,000
570,000
571,000
572,000
573,000
574,000
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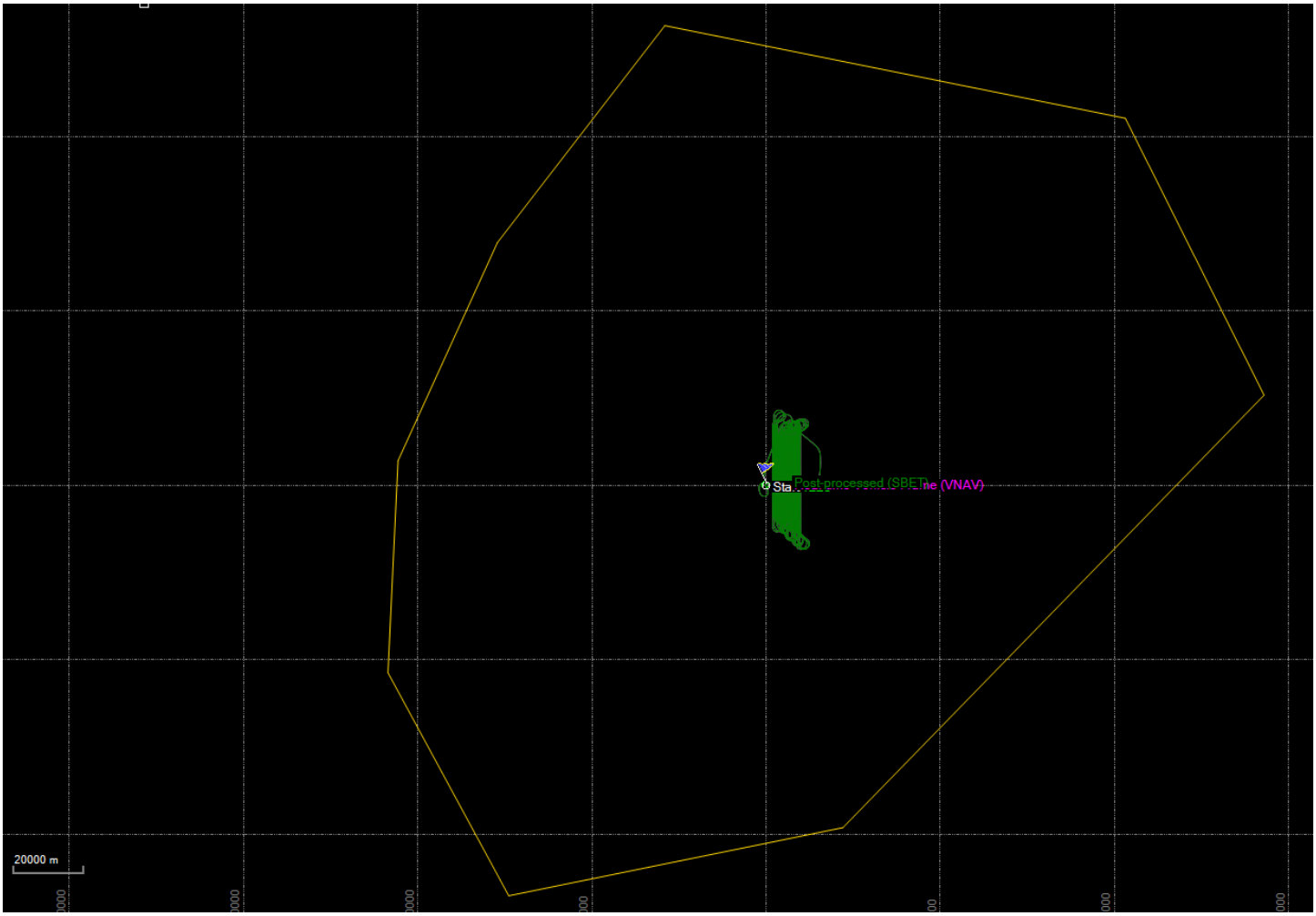
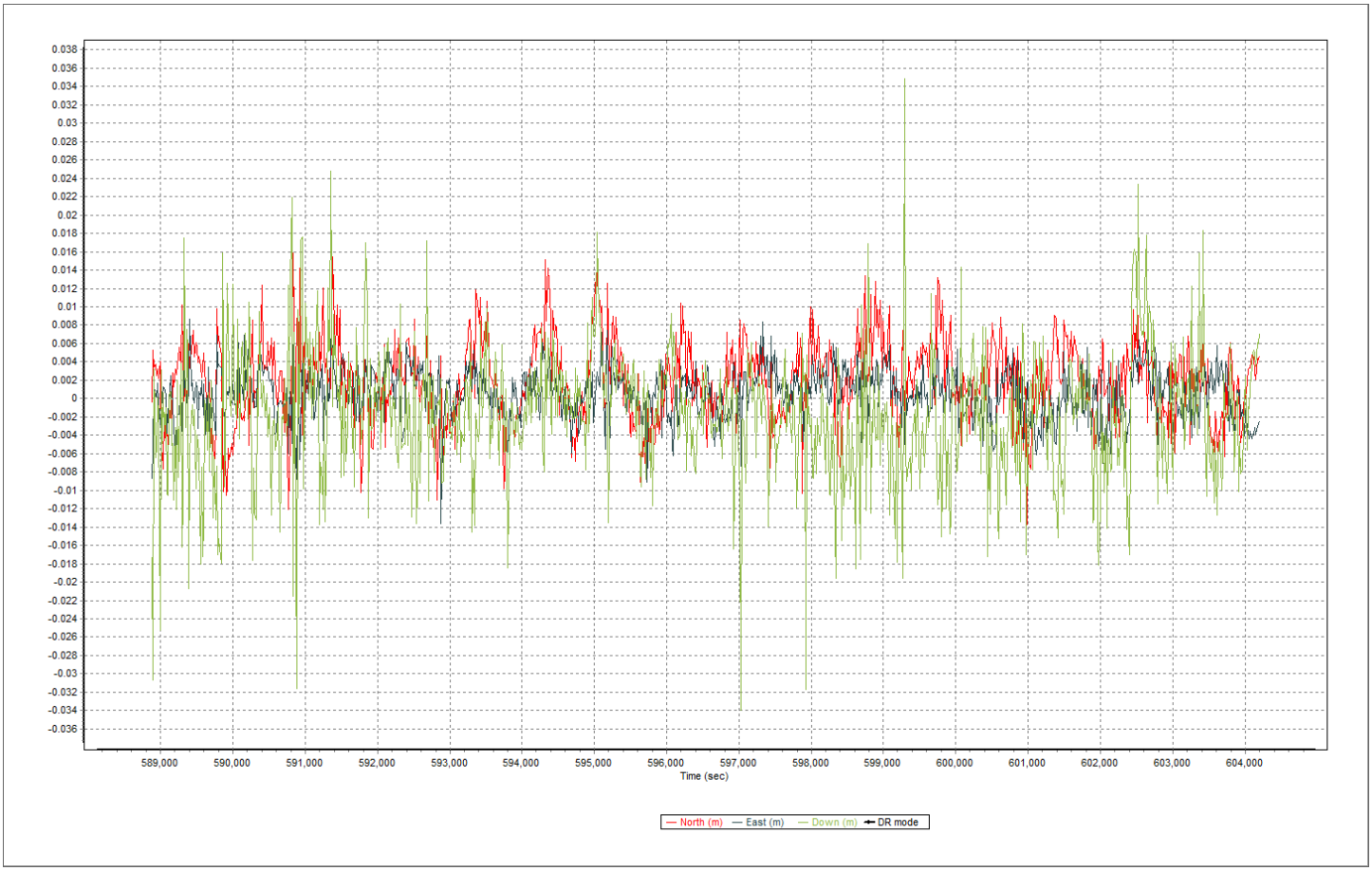
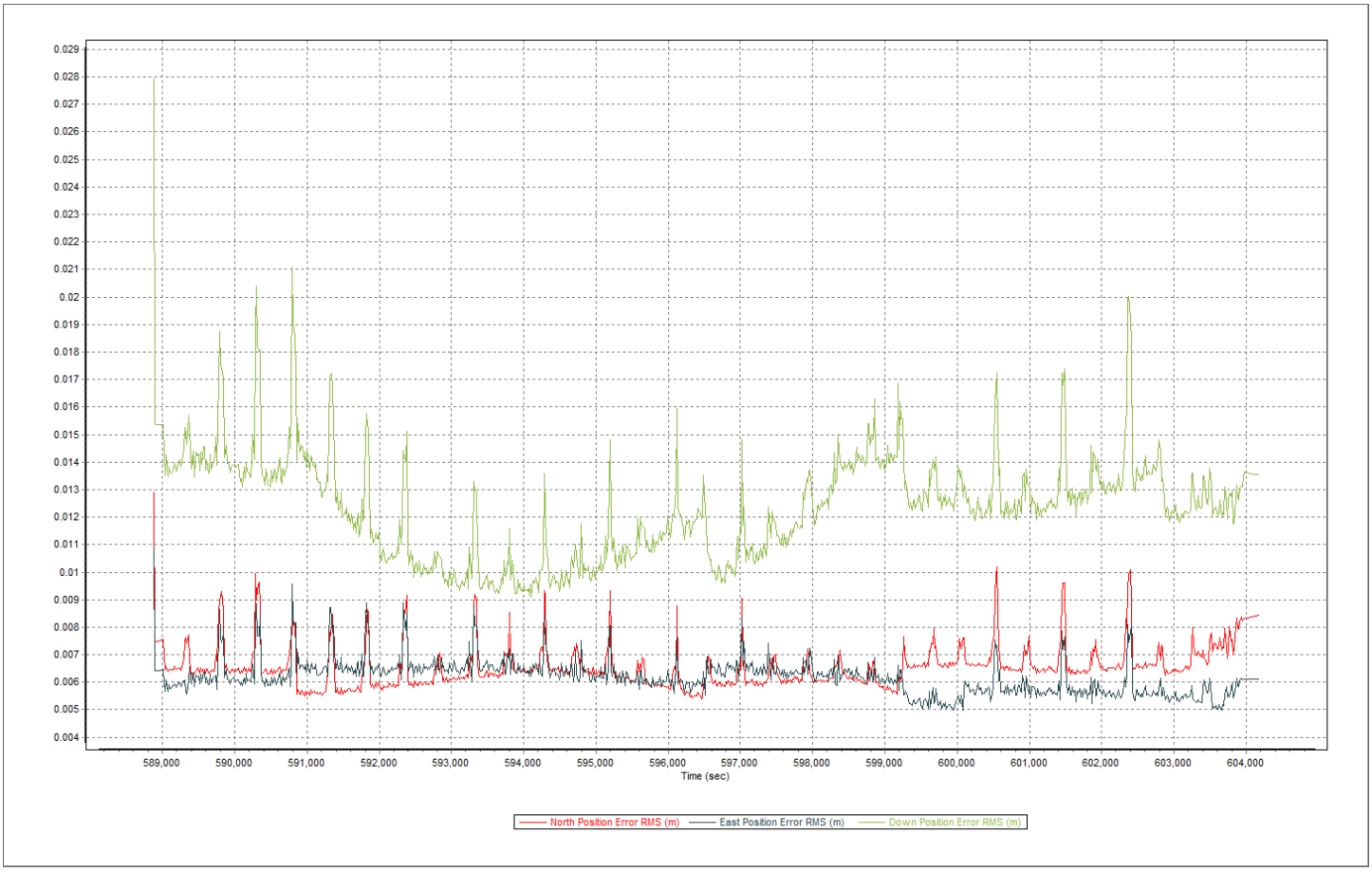
576,000
577,000
578,000
579,000
580,000
581,000
582,000
583,000
584,000
585,000
Time (sec)
— Forward - - Reverse

20150502-2




0.038
0.036
0.034
0.032
0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
-0.032
-0.034
-0.036
589,000
590,000
591,000
592,000
593,000
594,000
595,000
596,000
597,000
598,000
599,000
600,000
601,000
602,000
603,000
604,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode


0.029
0.028
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
589,000
590,000
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592,000
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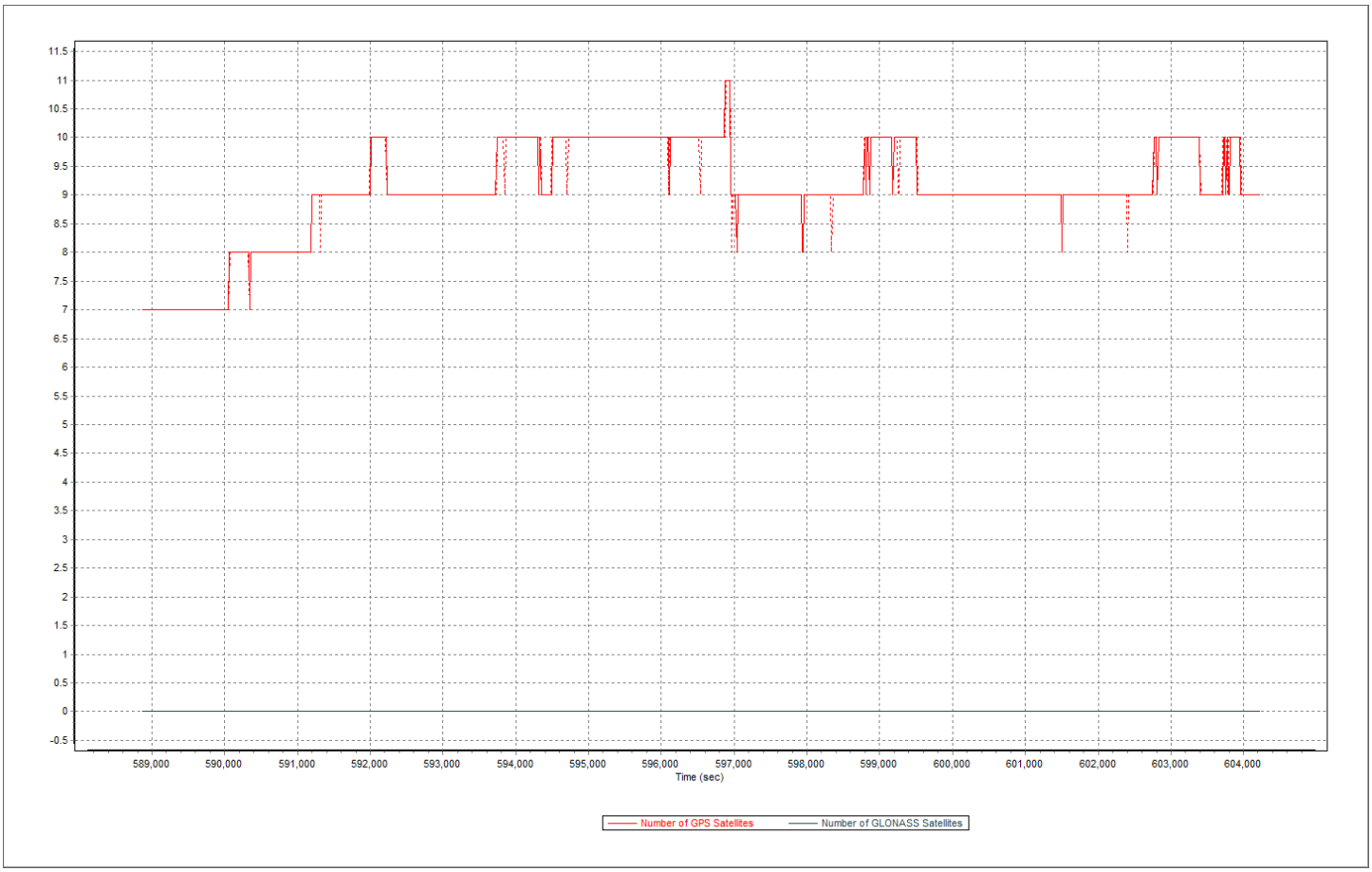
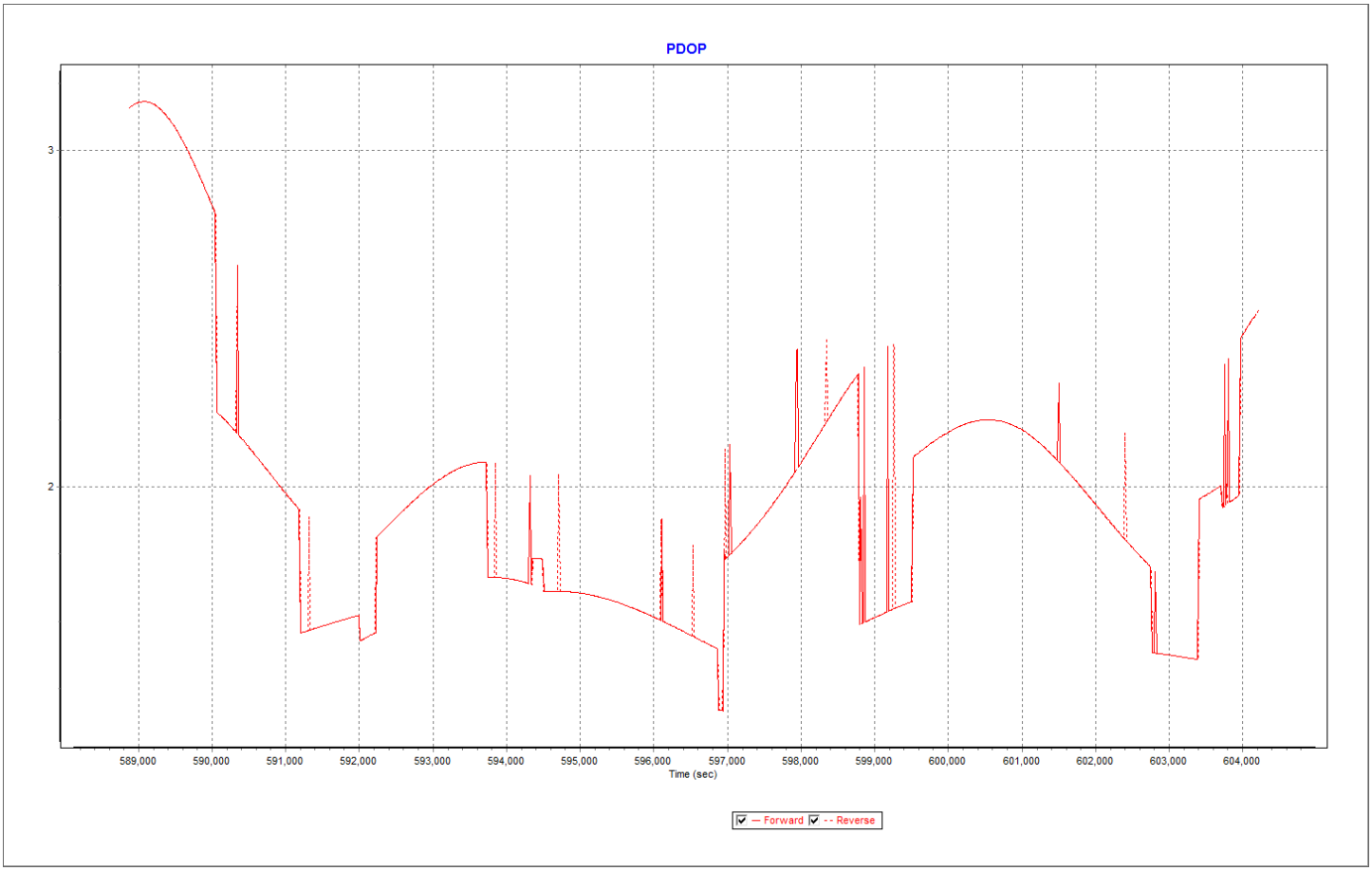
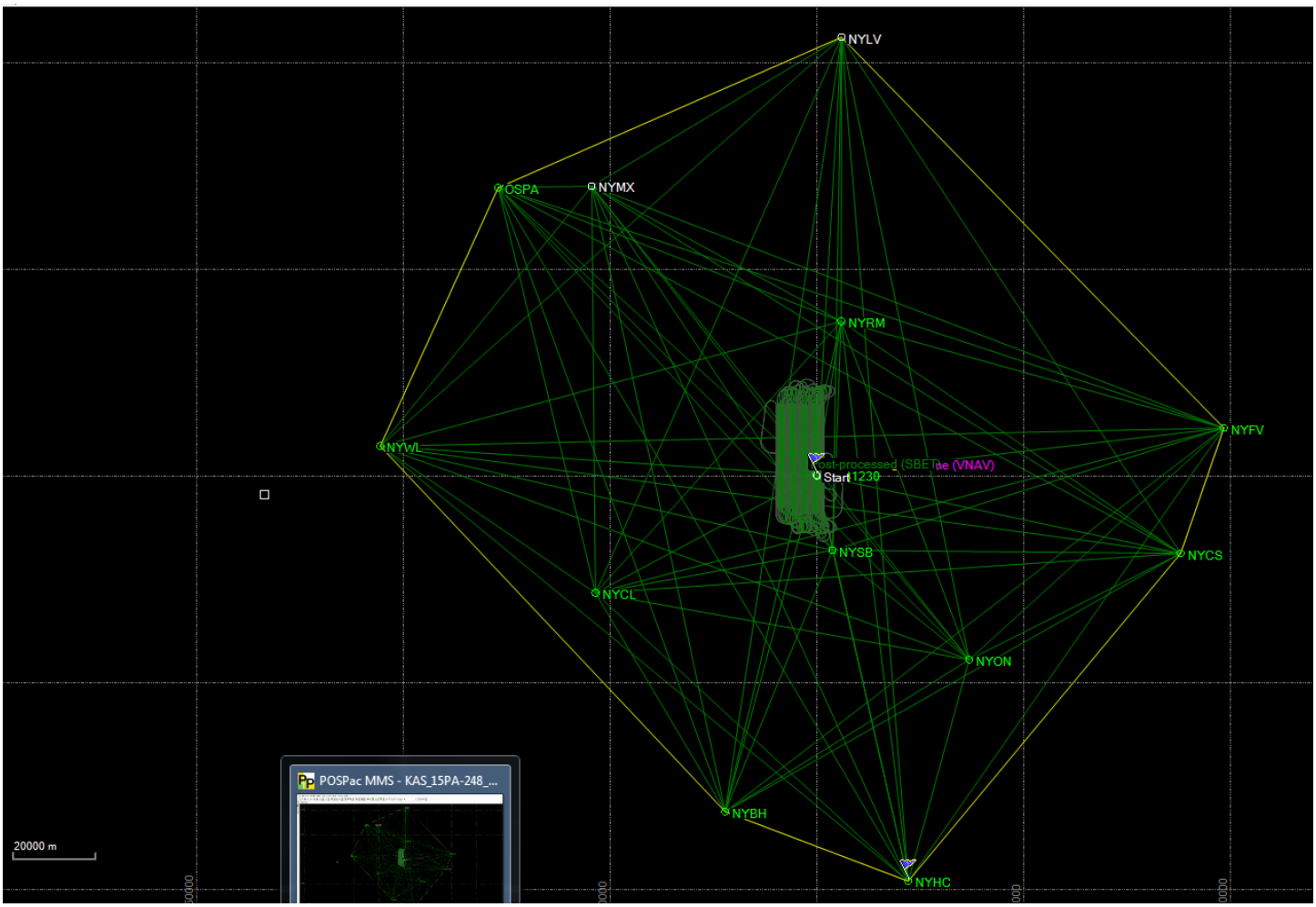
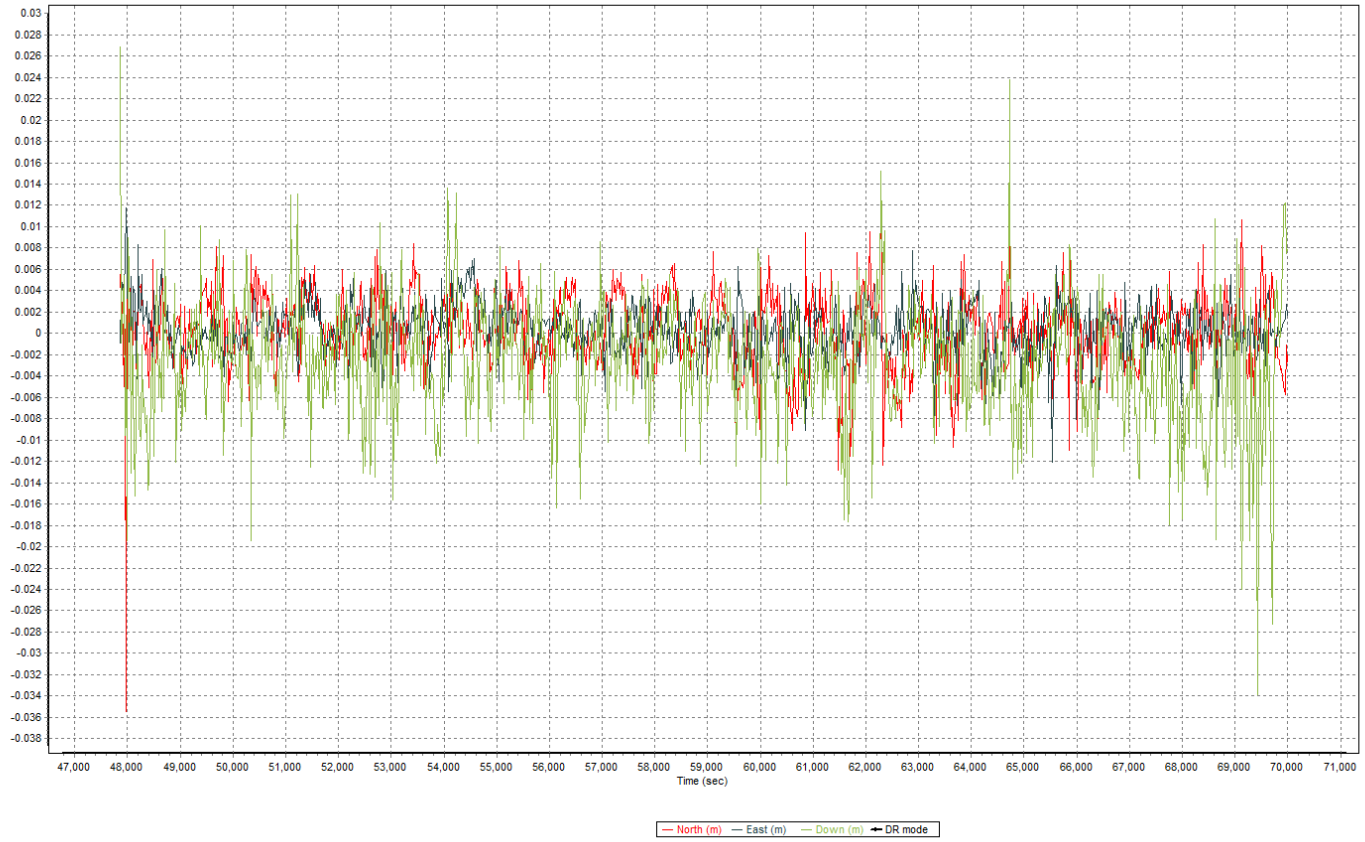
594,000
595,000
596,000
597,000
598,000
599,000
600,000
601,000
602,000
603,000
604,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)

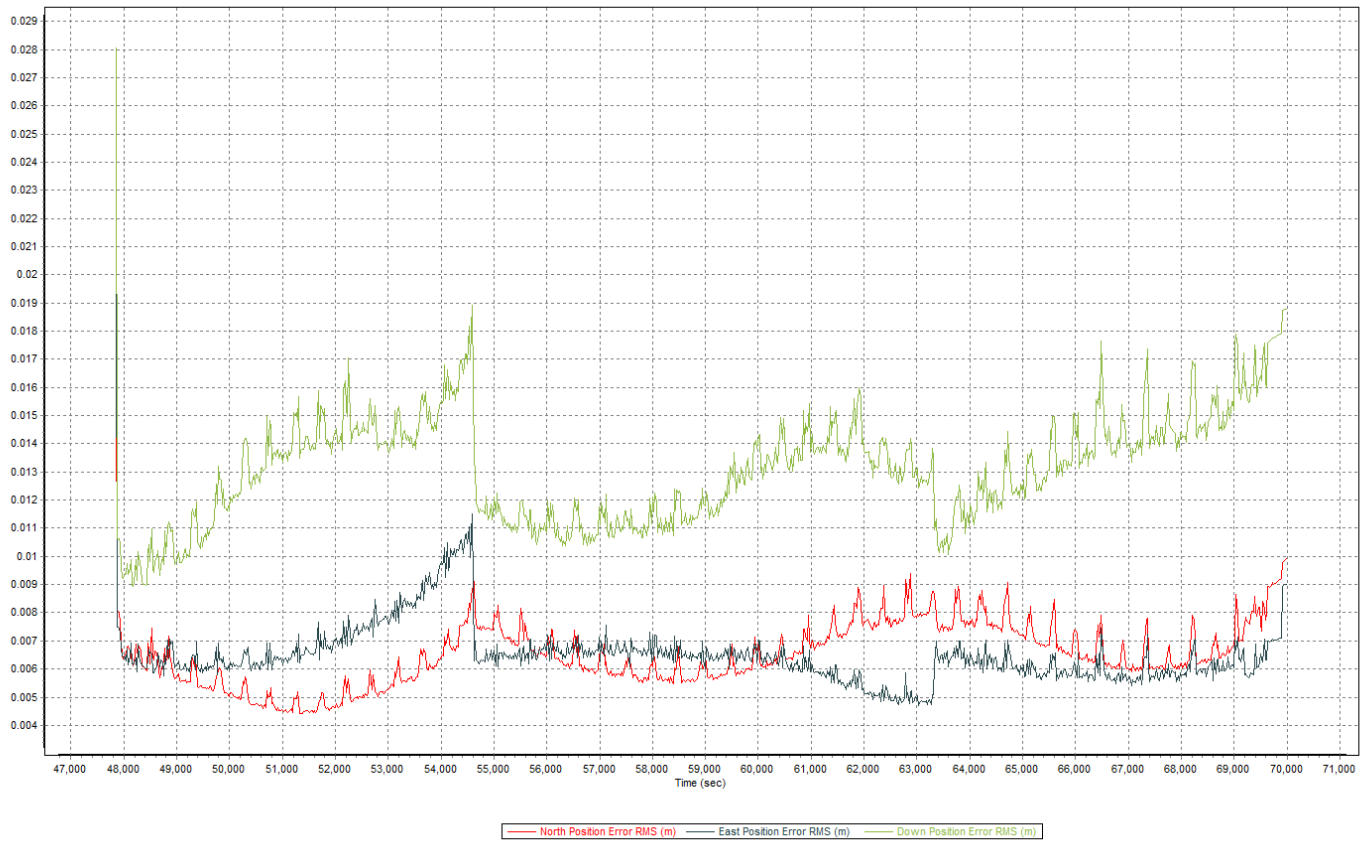

11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
589,000
590,000
591,000
592,000
593,000
594,000
595,000
596,000
597,000
598,000
599,000
600,000
601,000
602,000
603,000
604,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites

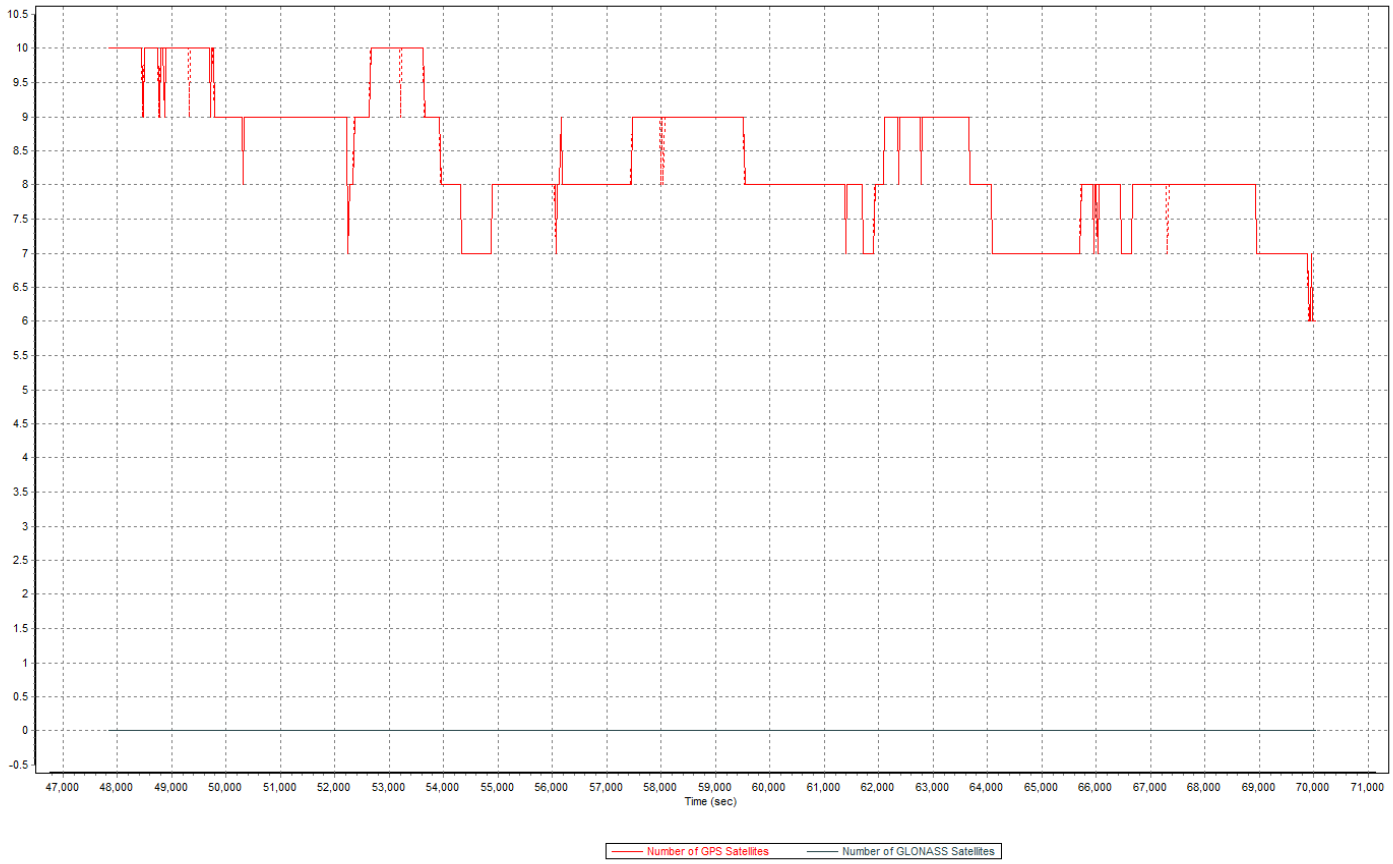

PDOP
3
2
589,000
590,000
591,000
592,000
593,000
594,000
595,000
596,000
597,000
598,000
599,000
600,000
601,000
602,000
603,000
604,000
Time (sec)
— Forward - - Reverse

20150503-1


NYLV
OSPA
NYMX
NYRM
NYFV
NYWL
Post-processed (SBET) (VNAV)
Start 1230
NYSB
NYCS
NYCL
NYON
NYBH
NYHC
POSPac MMS - KAS_15PA-248_...
20000 m


0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
-0.032
-0.034
-0.036
-0.038
47,000 48,000 49,000 50,000 51,000 52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode


0.029
0.028
0.027
0.026
0.025
0.024
0.023
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
47,000 48,000 49,000 50,000 51,000 52,000 53,000 54,000 55,000 56,000 57,000 58,000 59,000 60,000 61,000 62,000 63,000 64,000 65,000 66,000 67,000 68,000 69,000 70,000 71,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
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9.5
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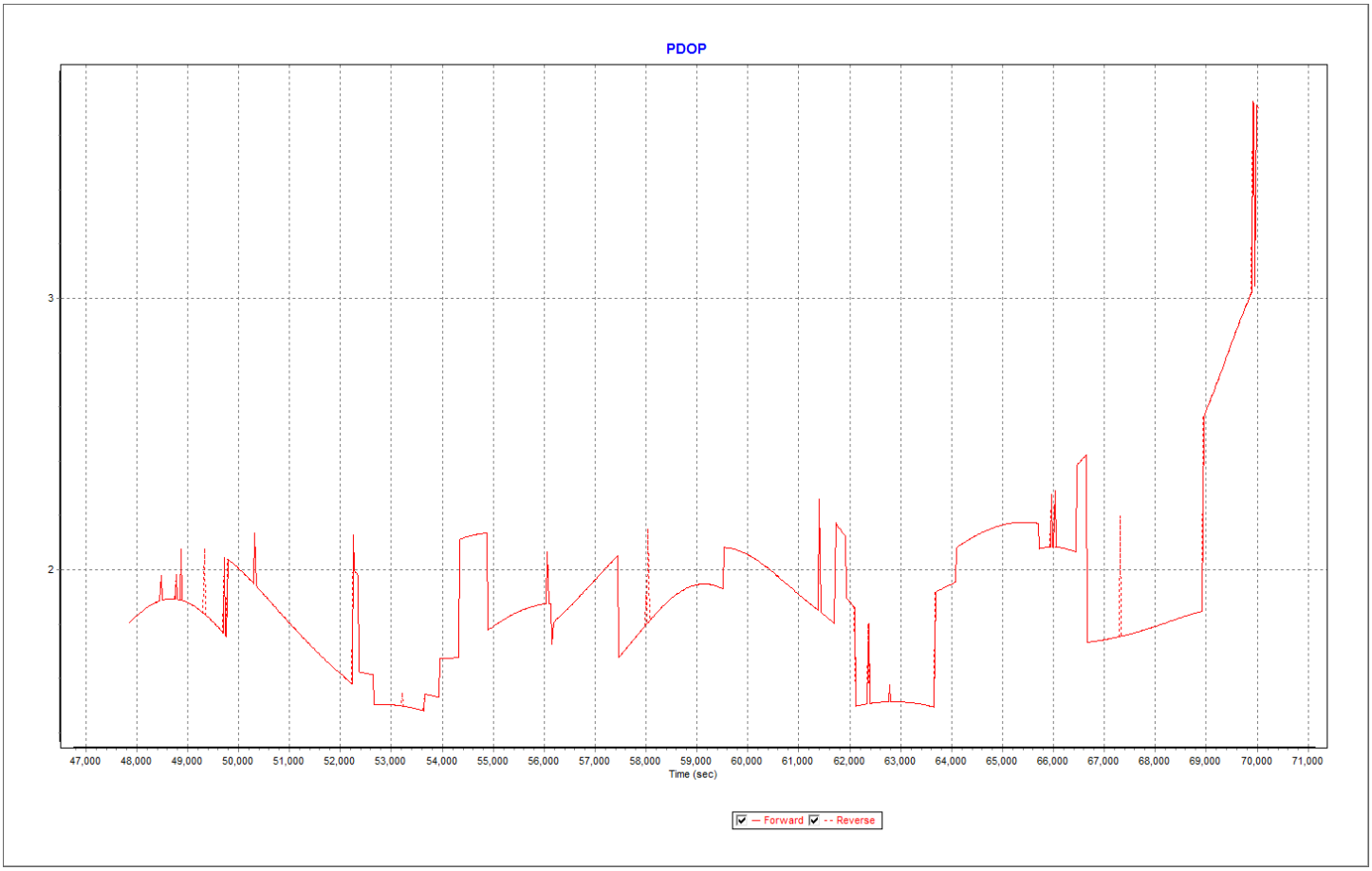
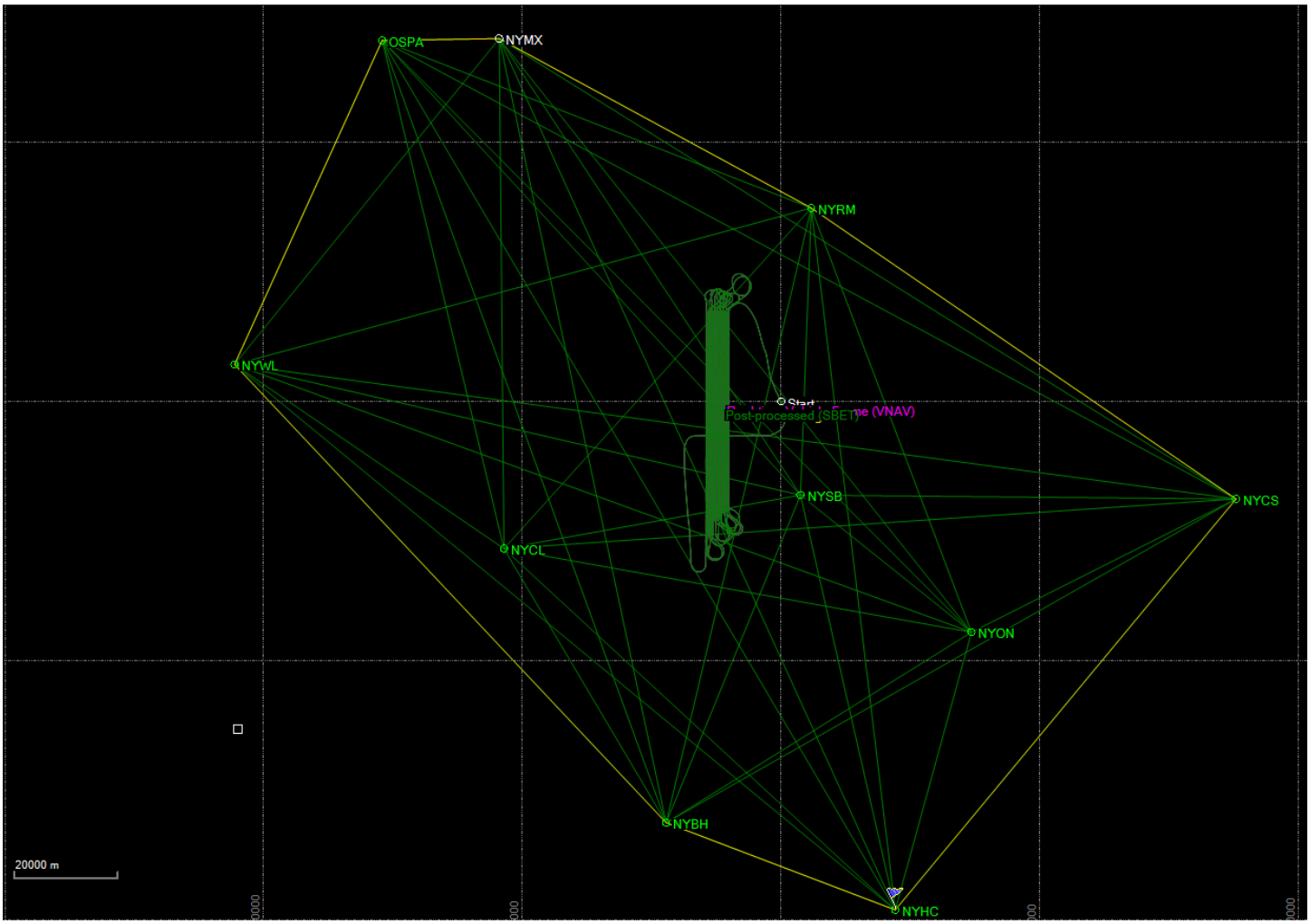
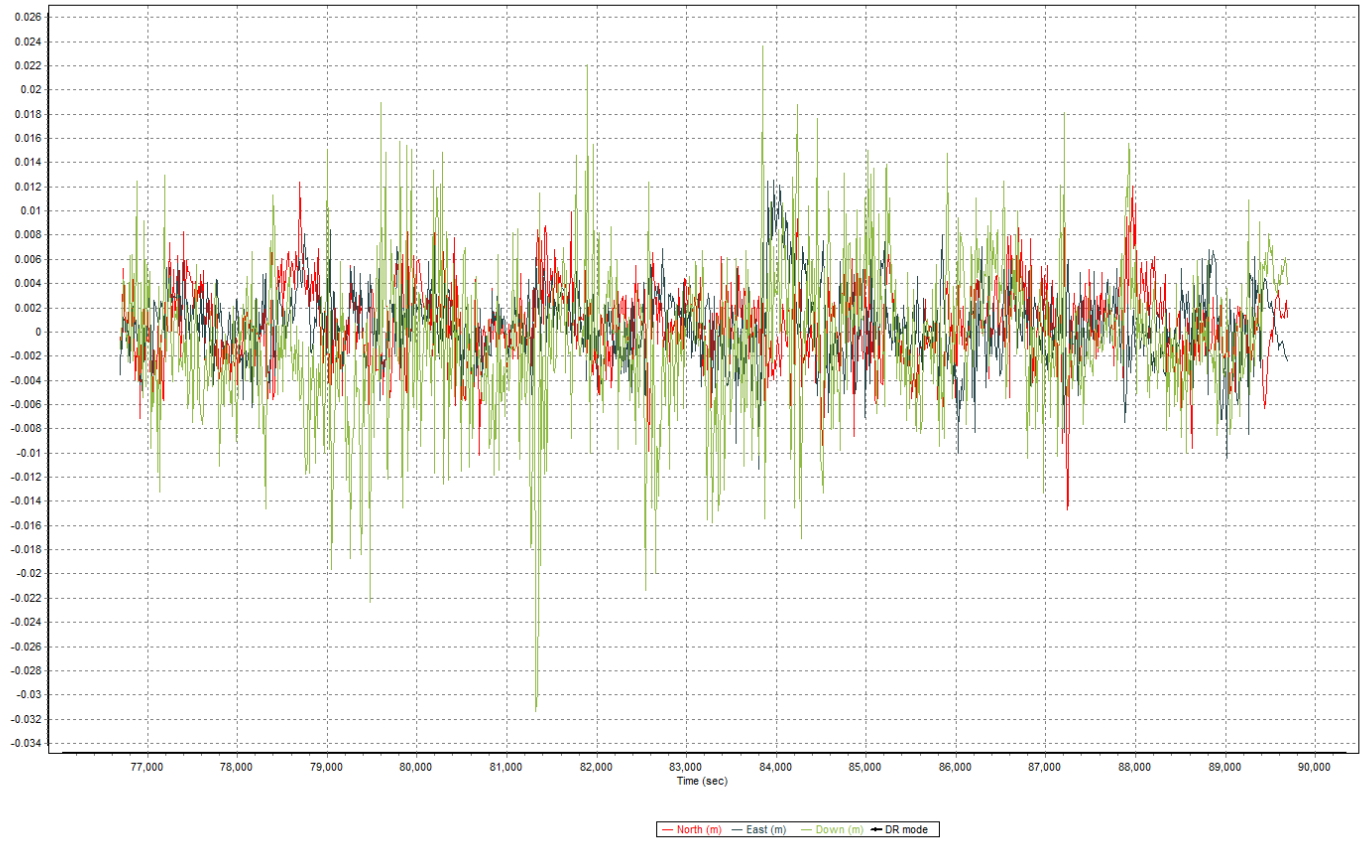
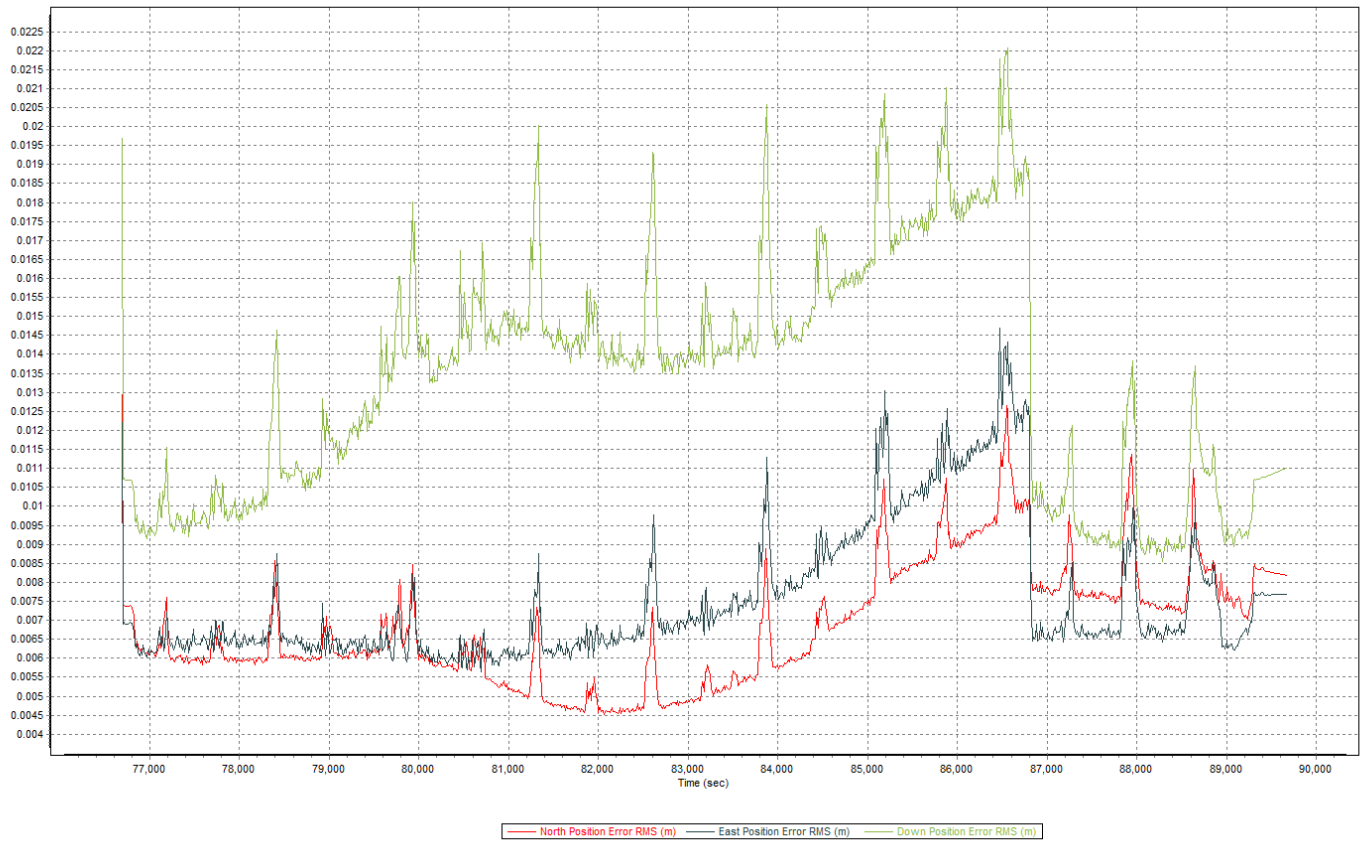
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
47,000
48,000
49,000
50,000
51,000
52,000
53,000
54,000
55,000
56,000
57,000
58,000
59,000
60,000
61,000
62,000
63,000
64,000
65,000
66,000
67,000
68,000
69,000
70,000
71,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites

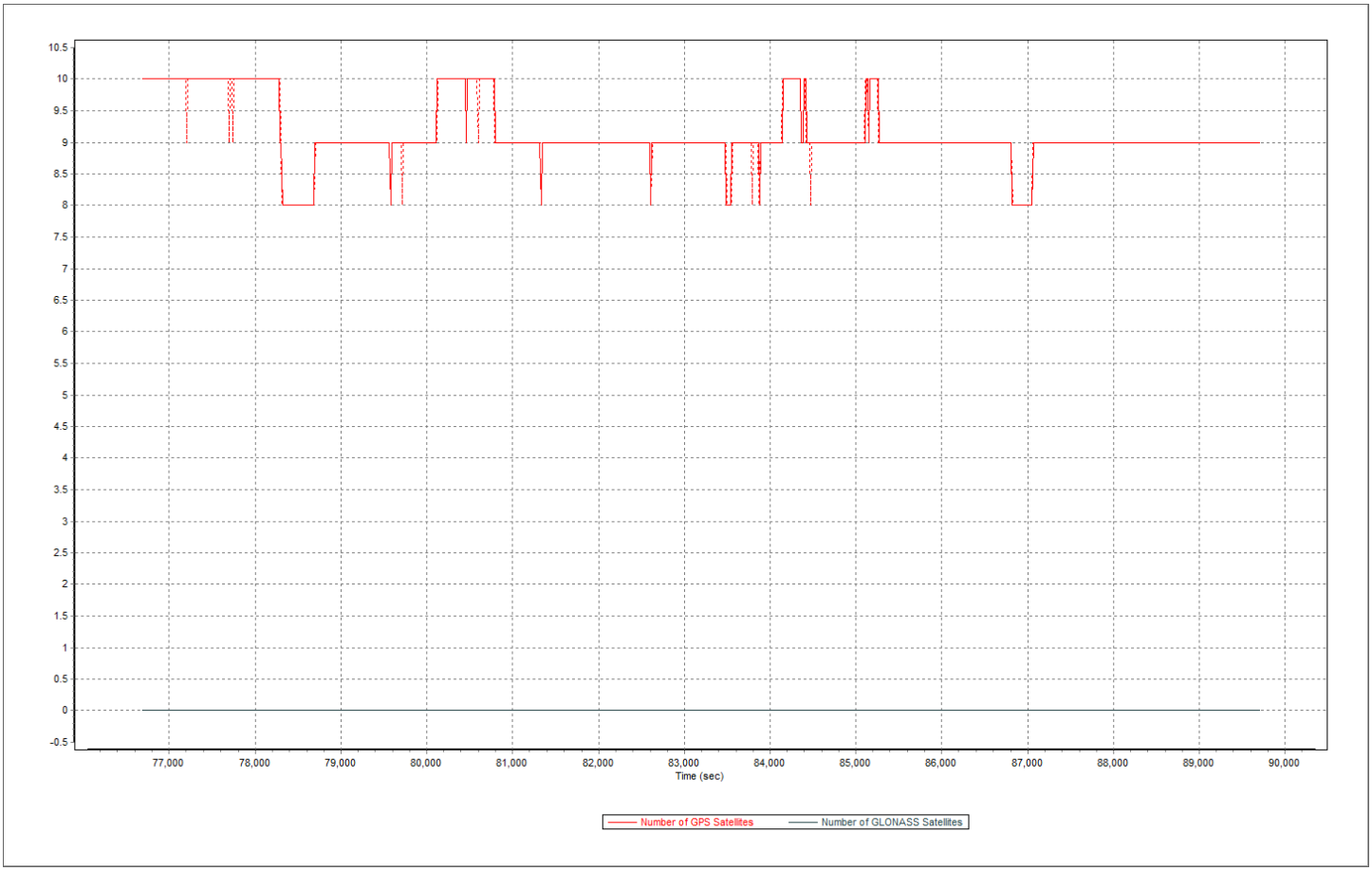

PDOP
3
2
47,000
48,000
49,000
50,000
51,000
52,000
53,000
54,000
55,000
56,000
57,000
58,000
59,000
60,000
61,000
62,000
63,000
64,000
65,000
66,000
67,000
68,000
69,000
70,000
71,000
Time (sec)
— Forward - - Reverse

20150503-2


OSPA
NYMX
NYRM
NYWL
Start
Post-processed SBET
e (VNAV)
NYSB
NYCS
NYCL
NYON
NYBH
NYHC
20000 m

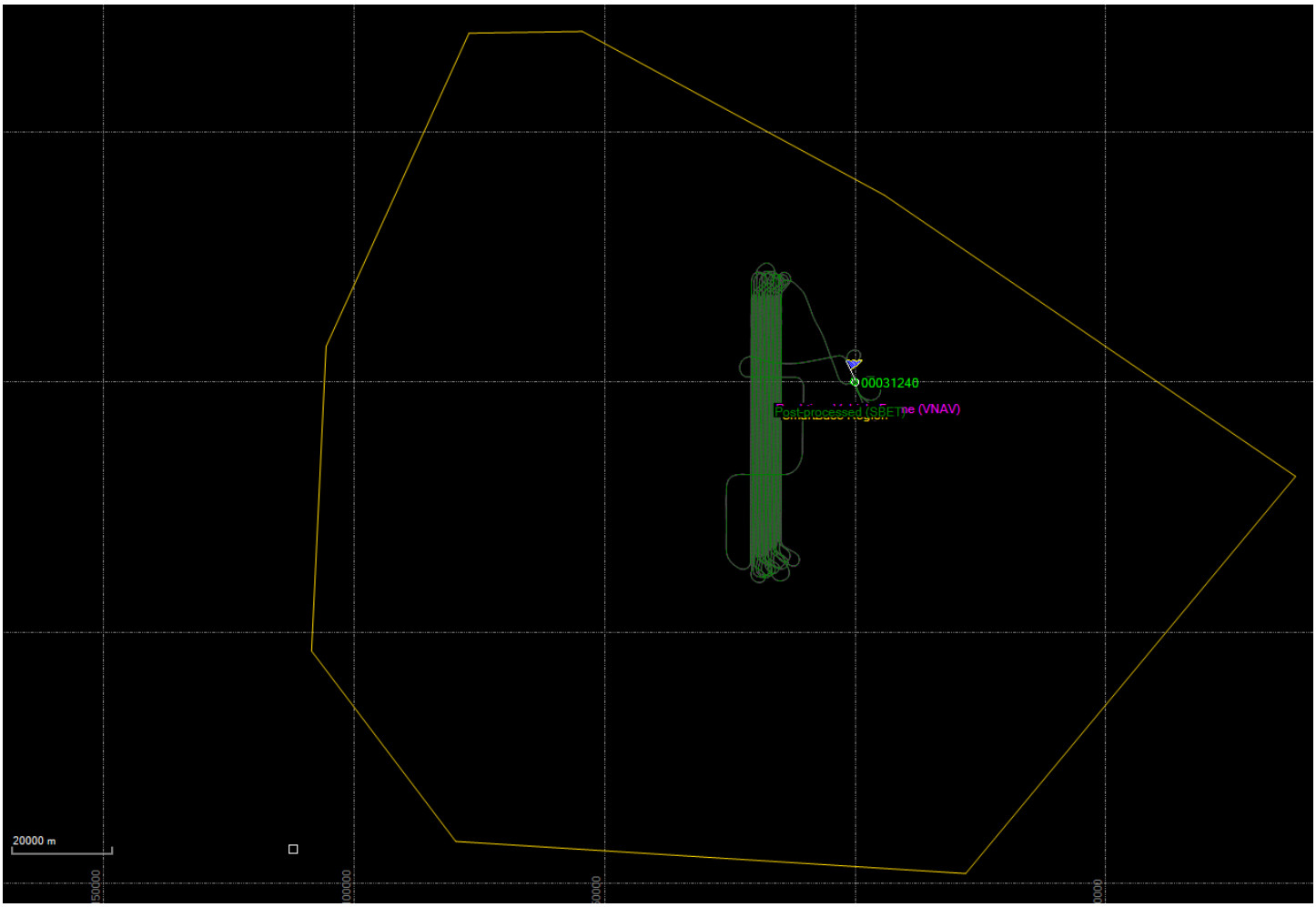

0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
-0.032
-0.034
77,000
78,000
79,000
80,000
81,000
82,000
83,000
84,000
85,000
86,000
87,000
88,000
89,000
90,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode

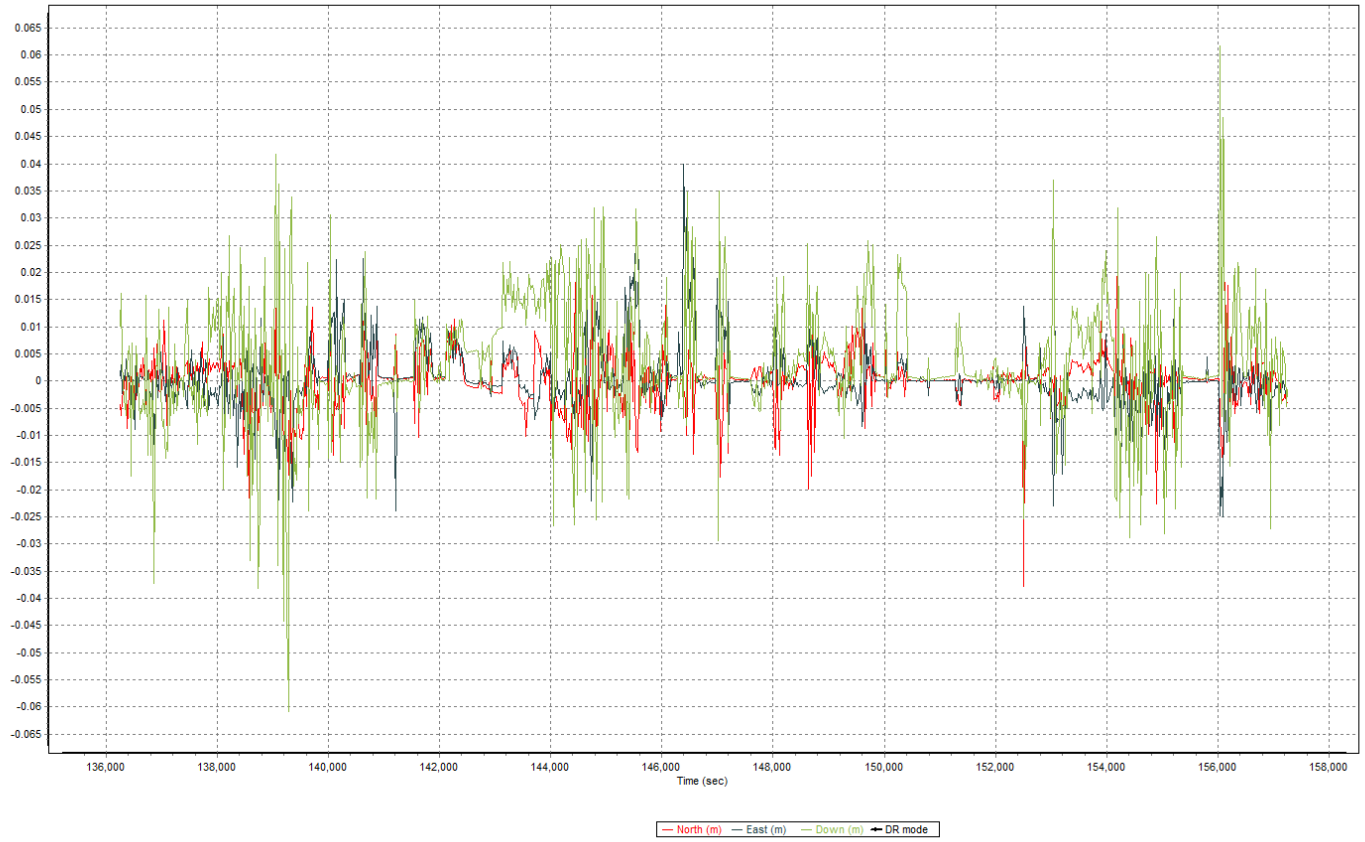

0.0225
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
0.0115
0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
0.004
77,000
78,000
79,000
80,000
81,000
82,000
83,000
84,000
85,000
86,000
87,000
88,000
89,000
90,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
77,000
78,000
79,000
80,000
81,000
82,000
83,000
84,000
85,000
86,000
87,000
88,000
89,000
90,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
2
76,500 77,000 77,500 78,000 78,500 79,000 79,500 80,000 80,500 81,000 81,500 82,000 82,500 83,000 83,500 84,000 84,500 85,000 85,500 86,000 86,500 87,000 87,500 88,000 88,500 89,000 89,500 90,000
Time (sec)
— Forward - - Reverse

20150504-1

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0.06
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0.045
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0.035
0.03
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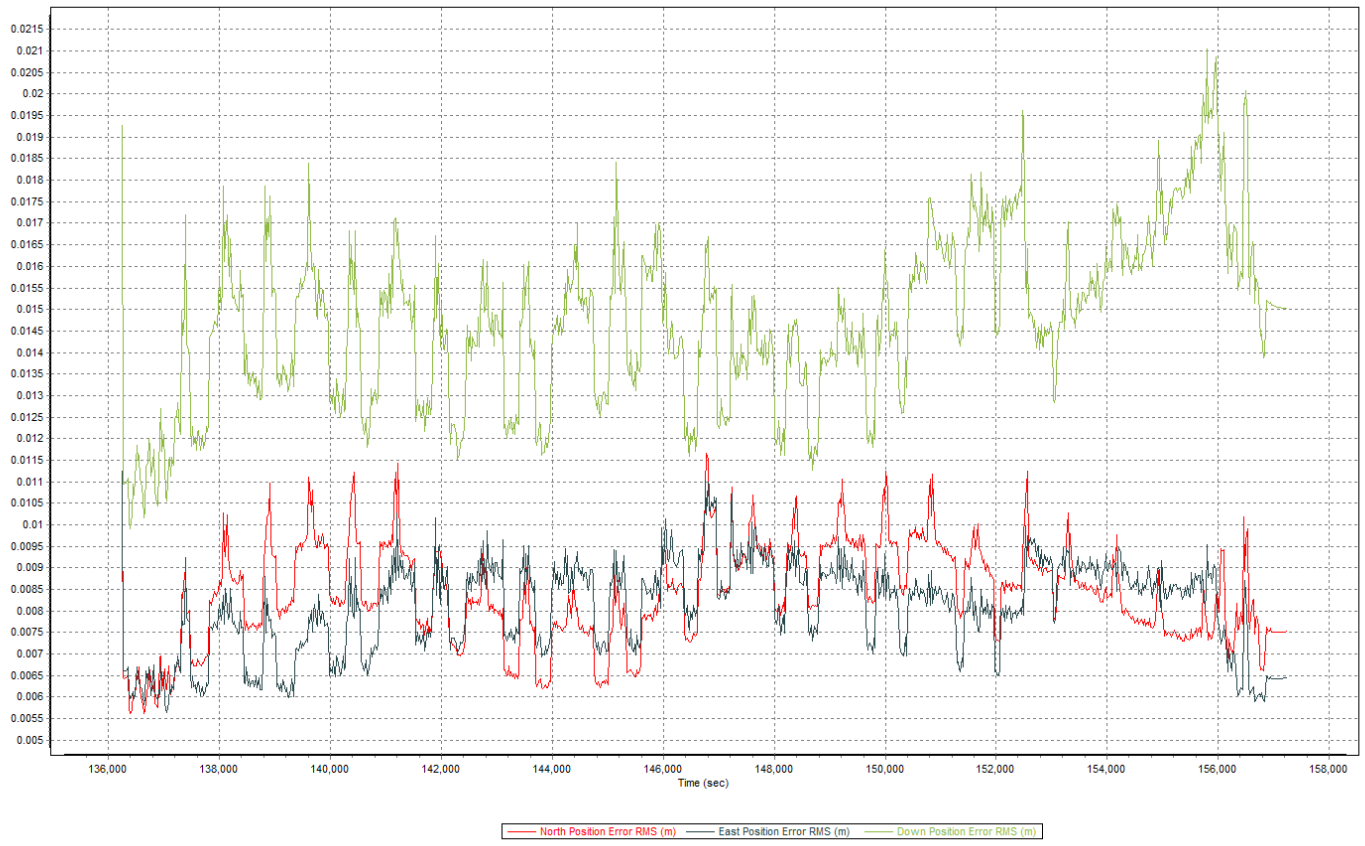
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04
-0.045
-0.05
-0.055
-0.06
-0.065
136,000
138,000
140,000
142,000
144,000
146,000
148,000
150,000
152,000
154,000
156,000
158,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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0.021
0.0205
0.02
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0.011
0.0105
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
136,000
138,000
140,000
142,000
144,000
146,000
148,000
150,000
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154,000
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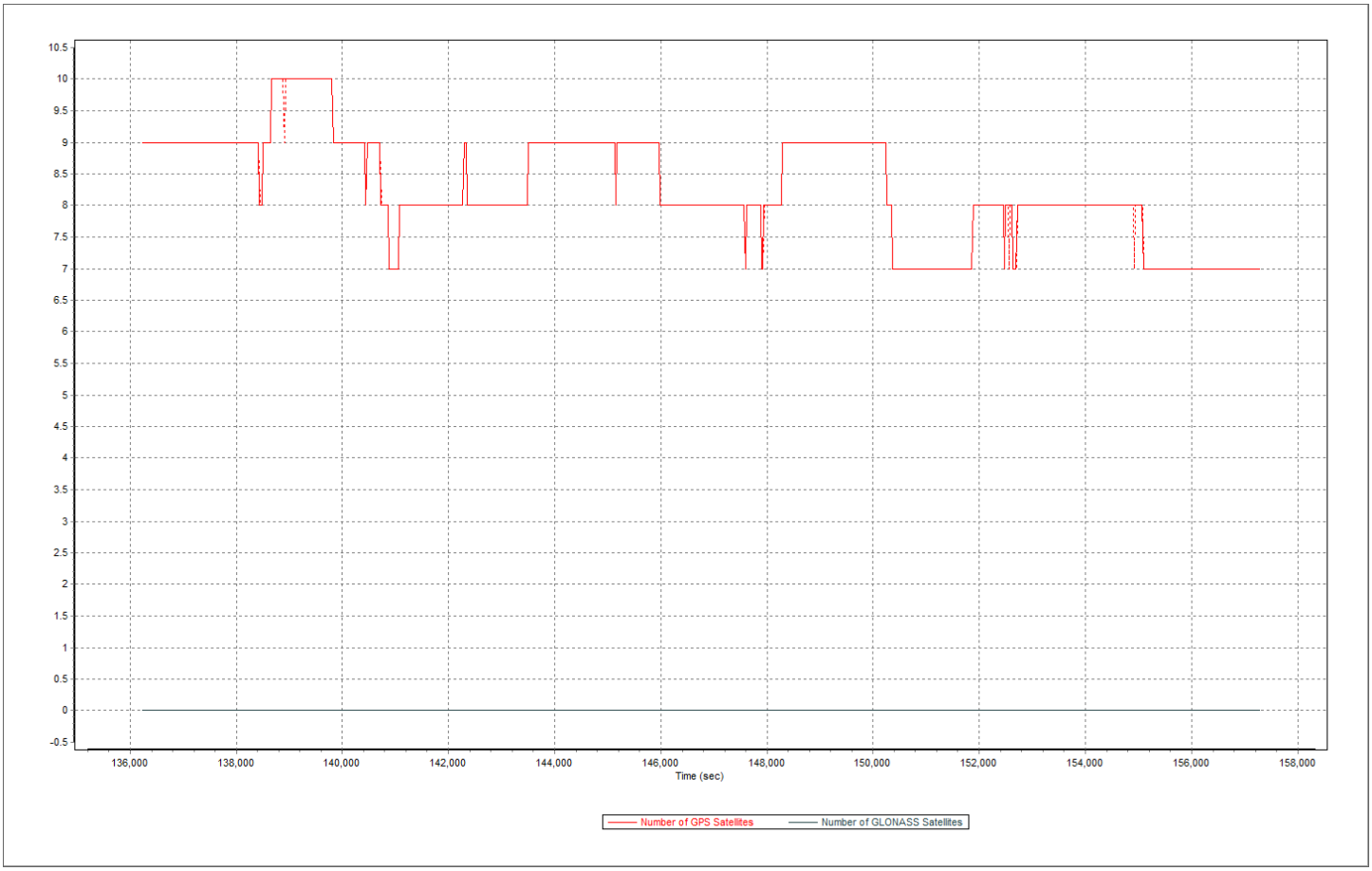
158,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)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9.5
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8.5
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7.5
7
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6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
136,000
138,000
140,000
142,000
144,000
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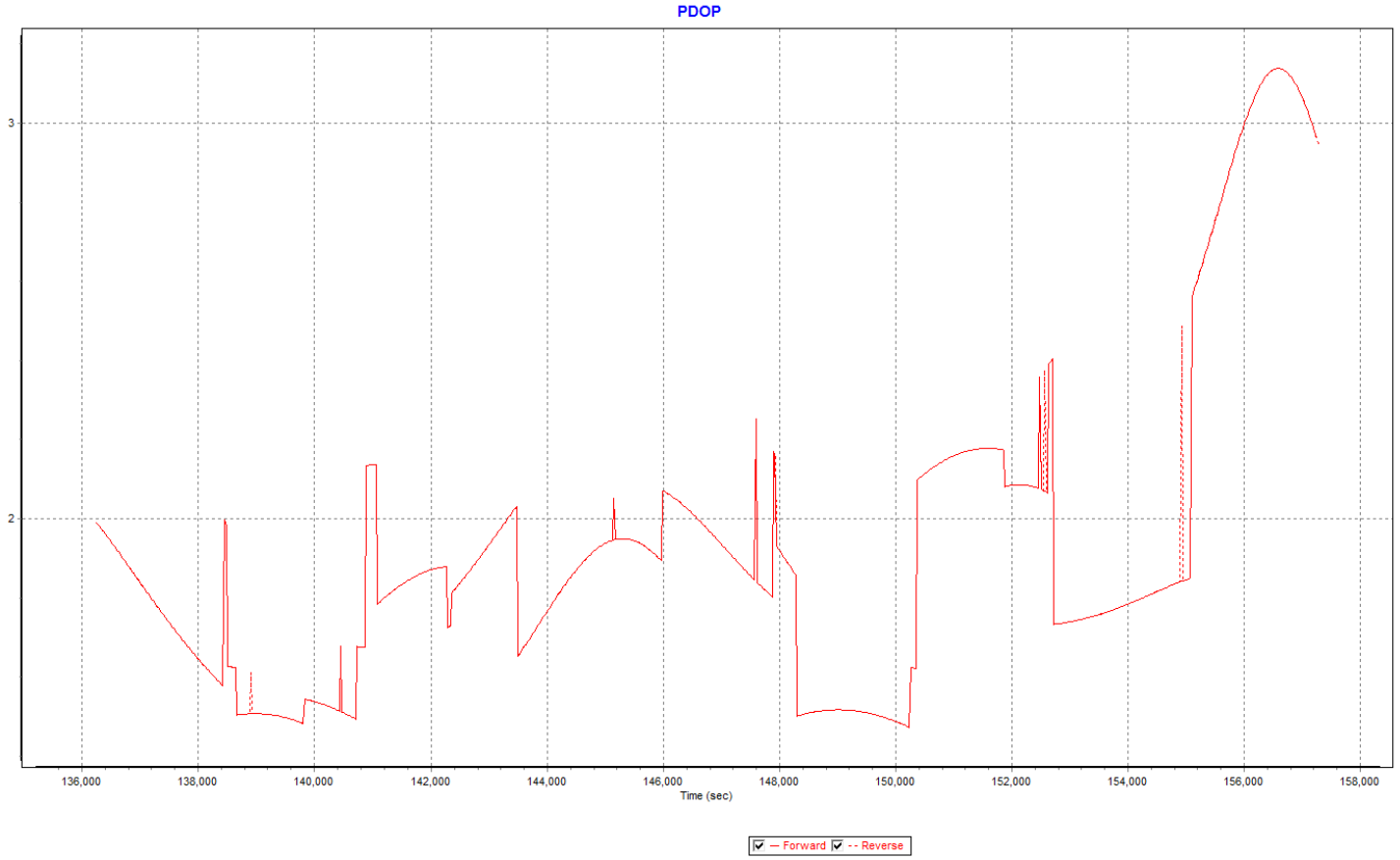
148,000
150,000
152,000
154,000
156,000
158,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
3
2
136,000
138,000
140,000
142,000
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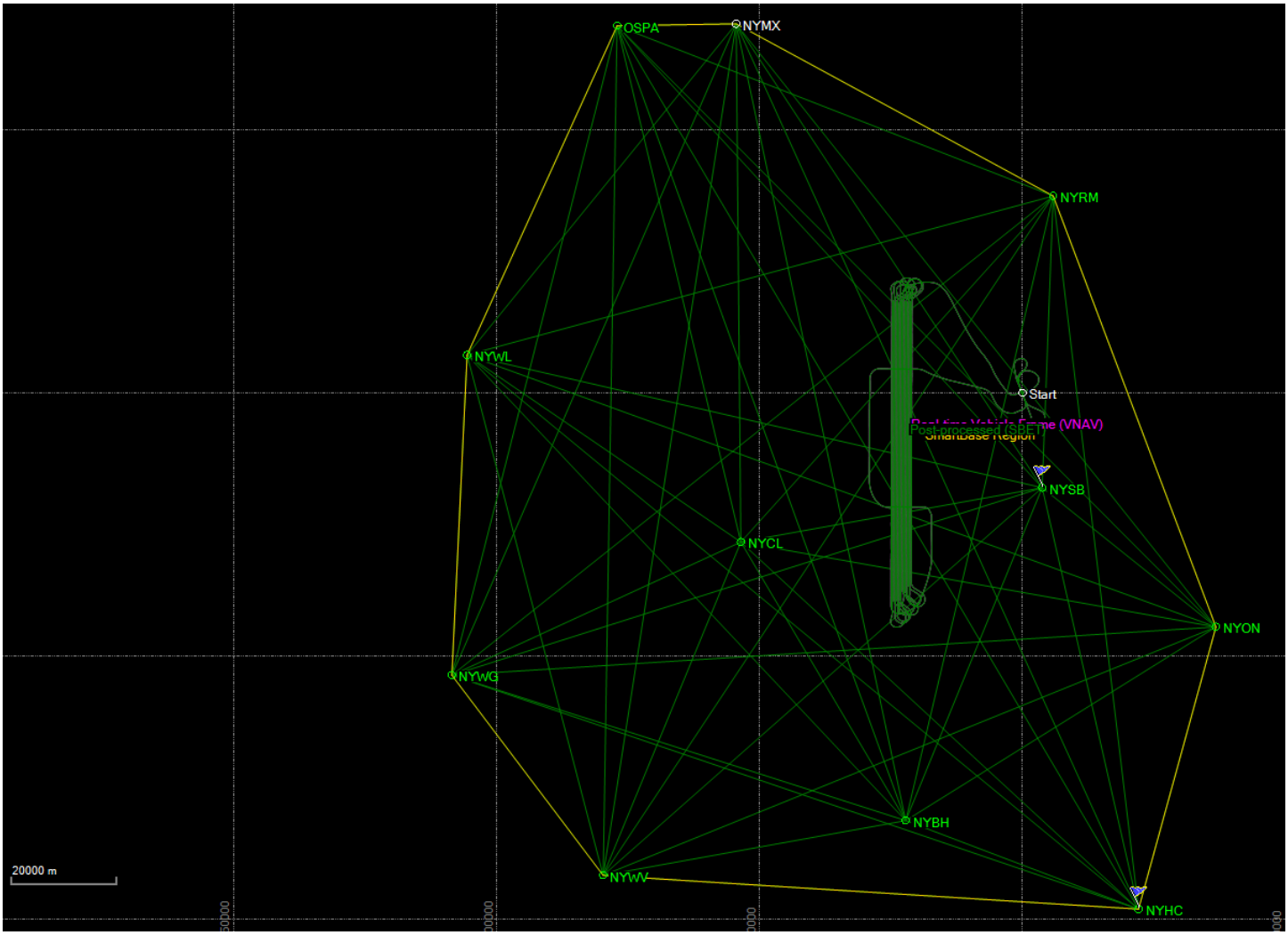
146,000
148,000
150,000
152,000
154,000
156,000
158,000
Time (sec)
Forward
Reverse

20150505-1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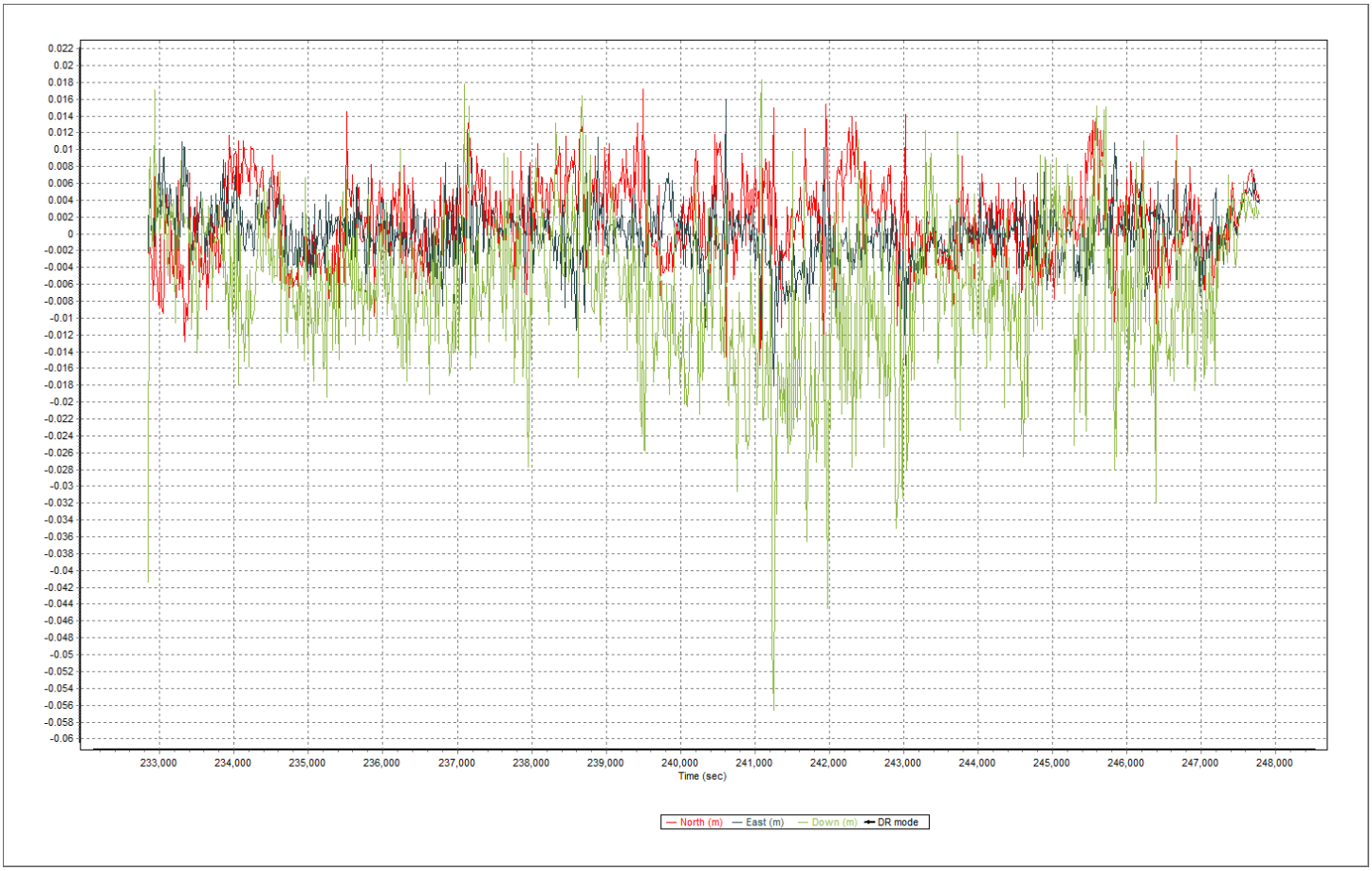
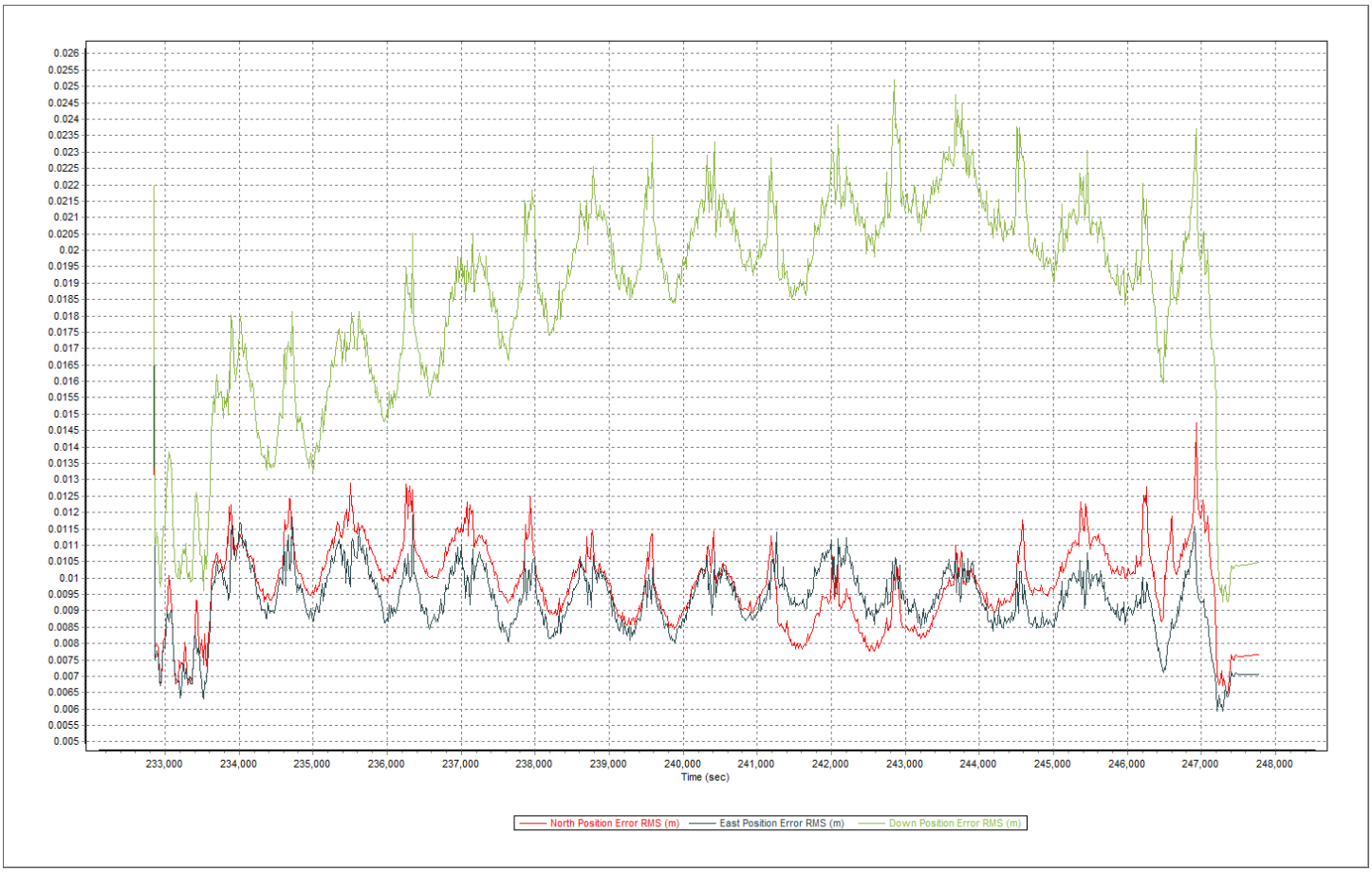
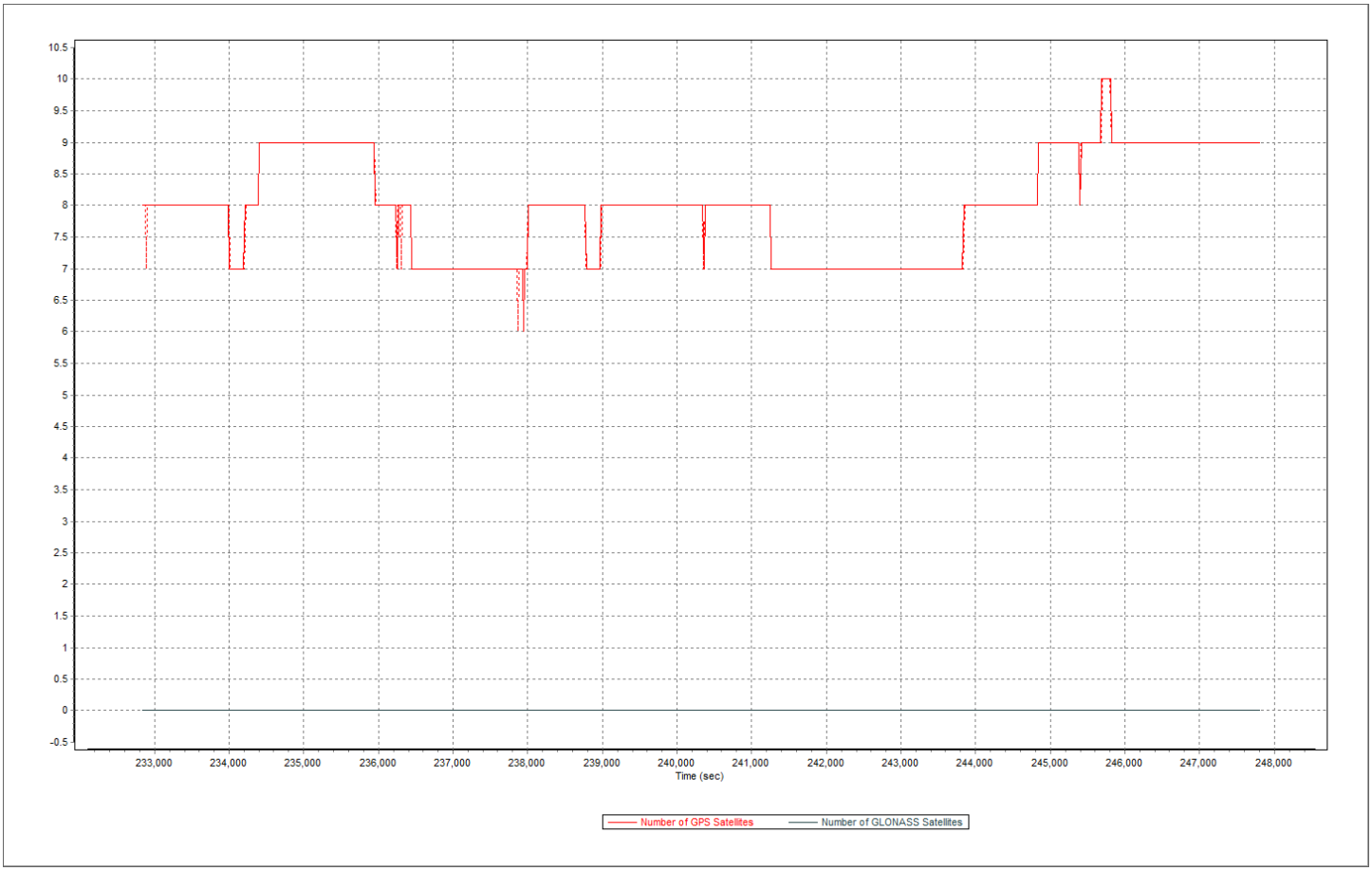
NYMX
NYRM
NYWL
Start
Post-processed (SBET
(VNAV)
NYSB
NYCL
NYON
NYWG
NYBH
NYWV
NYHC
20000 m


Time (sec)
North (m)
East (m)
Down (m)
DR mode


Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)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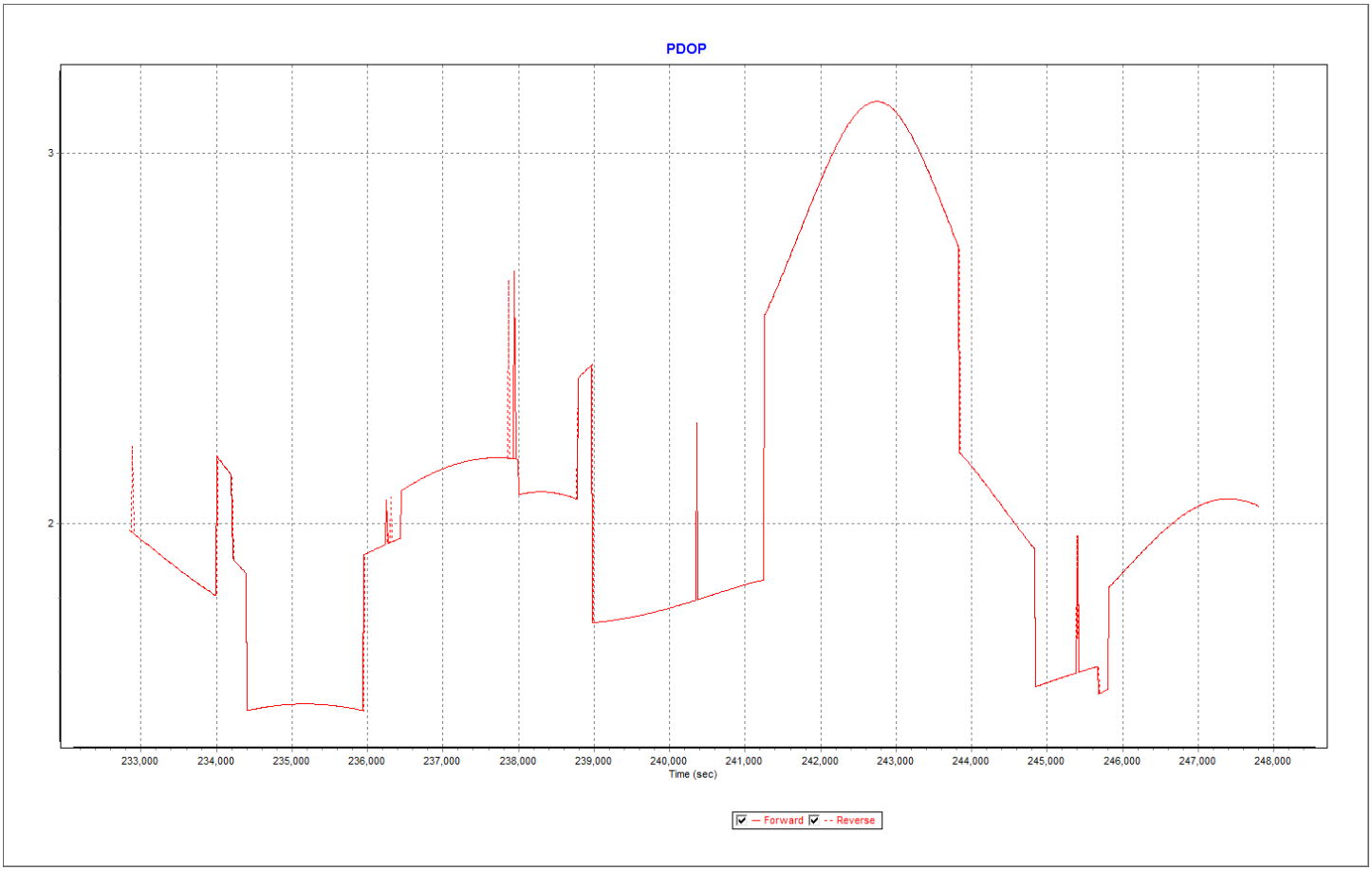
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
233,000
234,000
235,000
236,000
237,000
238,000
239,000
240,000
241,000
242,000
243,000
244,000
245,000
246,000
247,000
248,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites


PDOP
3
2
233,000
234,000
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236,000
237,000
238,000
239,000
240,000
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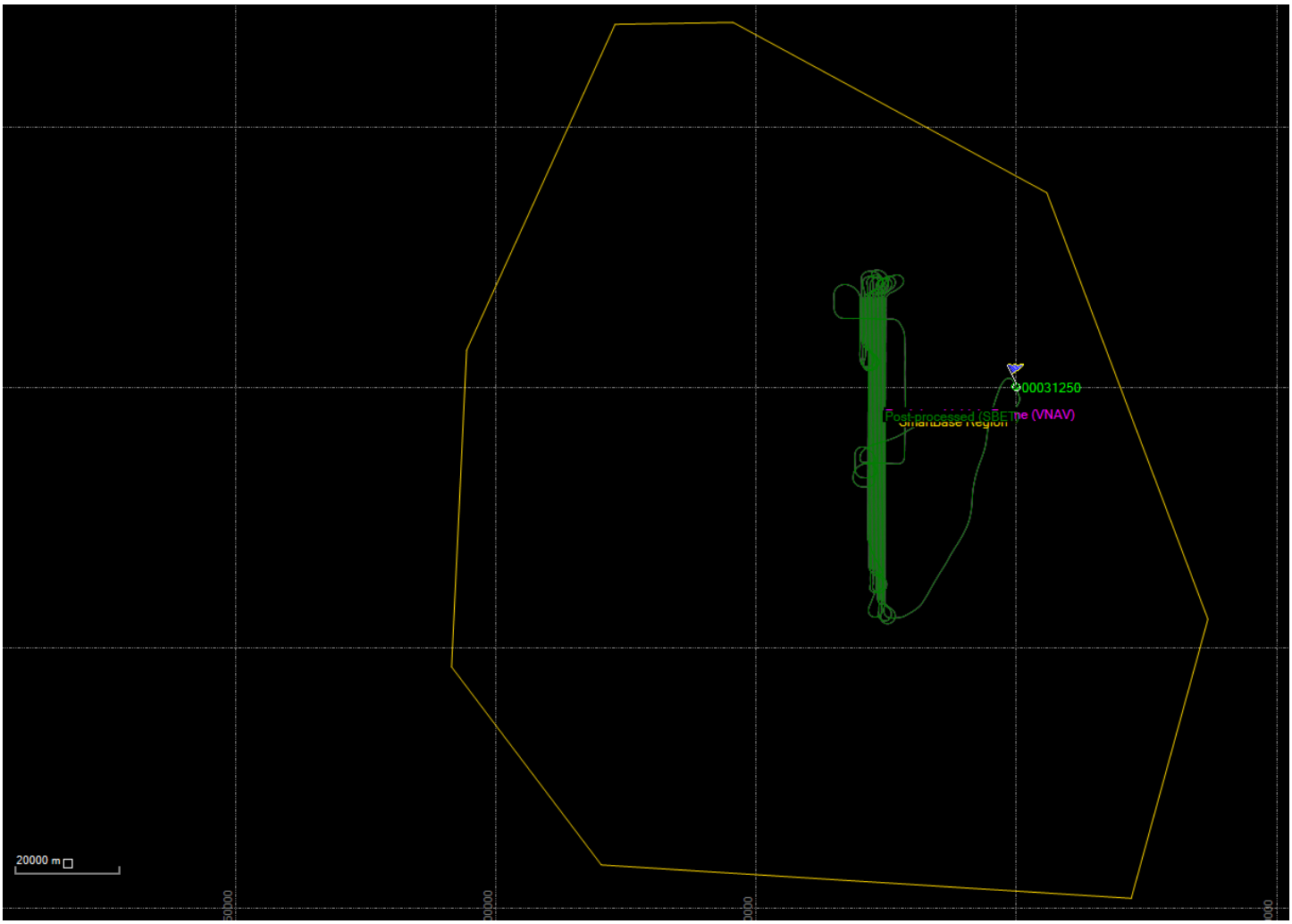
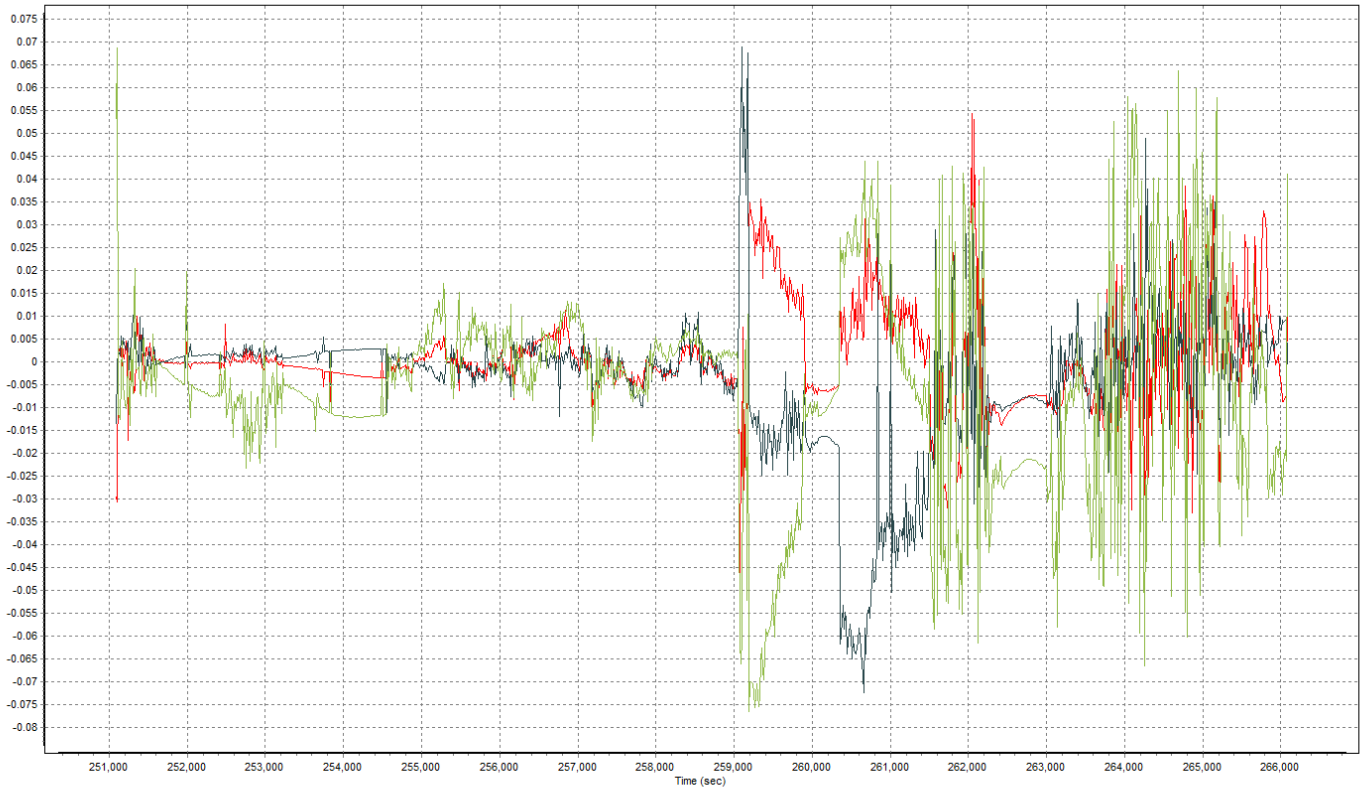
246,000
247,000
248,000
Time (sec)
Forward
Reverse

20150505-2

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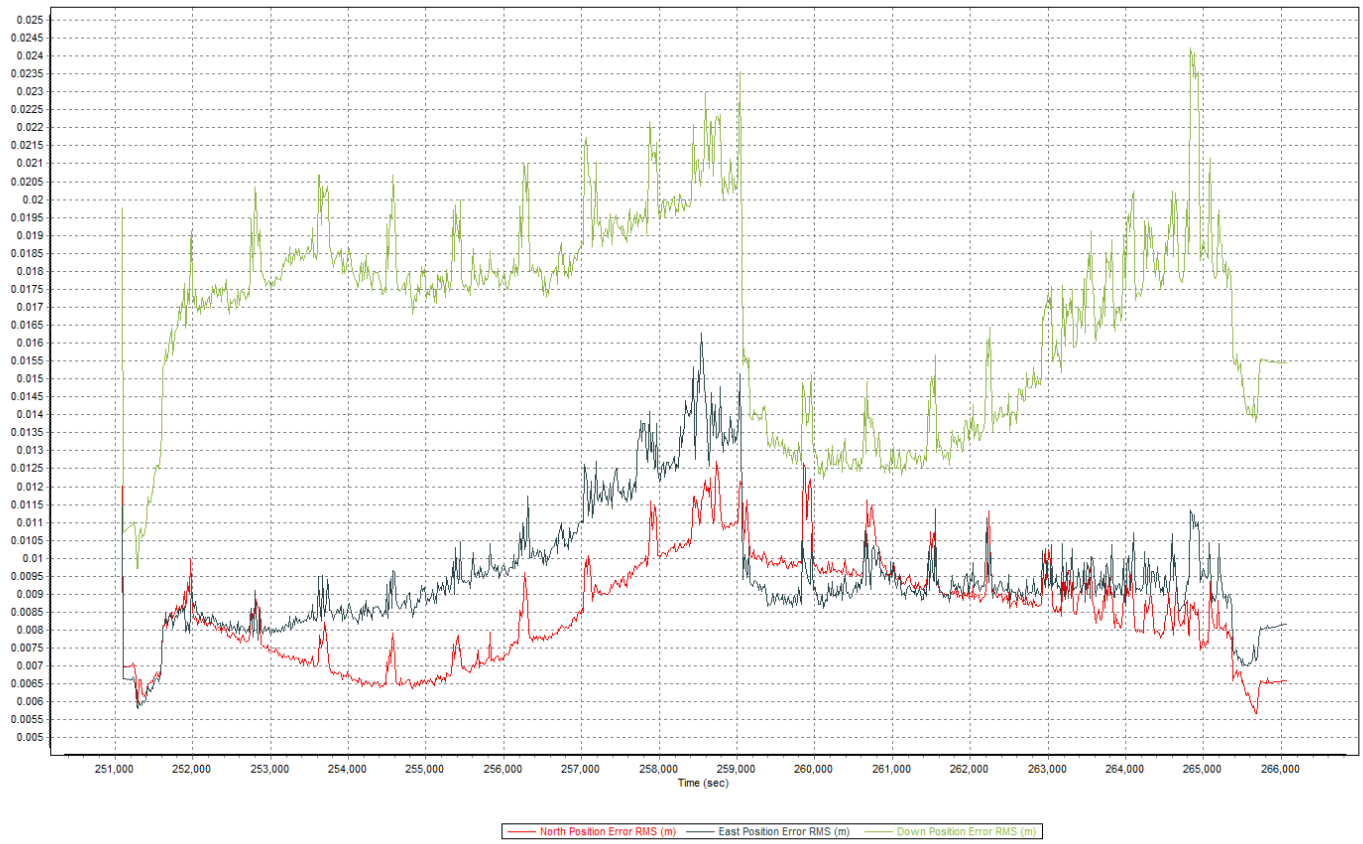
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04
-0.045
-0.05
-0.055
-0.06
-0.065
-0.07
-0.075
-0.08
251,000
252,000
253,000
254,000
255,000
256,000
257,000
258,000
259,000
260,000
261,000
262,000
263,000
264,000
265,000
266,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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0.024
0.0235
0.023
0.0225
0.022
0.0215
0.021
0.0205
0.02
0.0195
0.019
0.0185
0.018
0.0175
0.017
0.0165
0.016
0.0155
0.015
0.0145
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0.0135
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0.0065
0.006
0.0055
0.005
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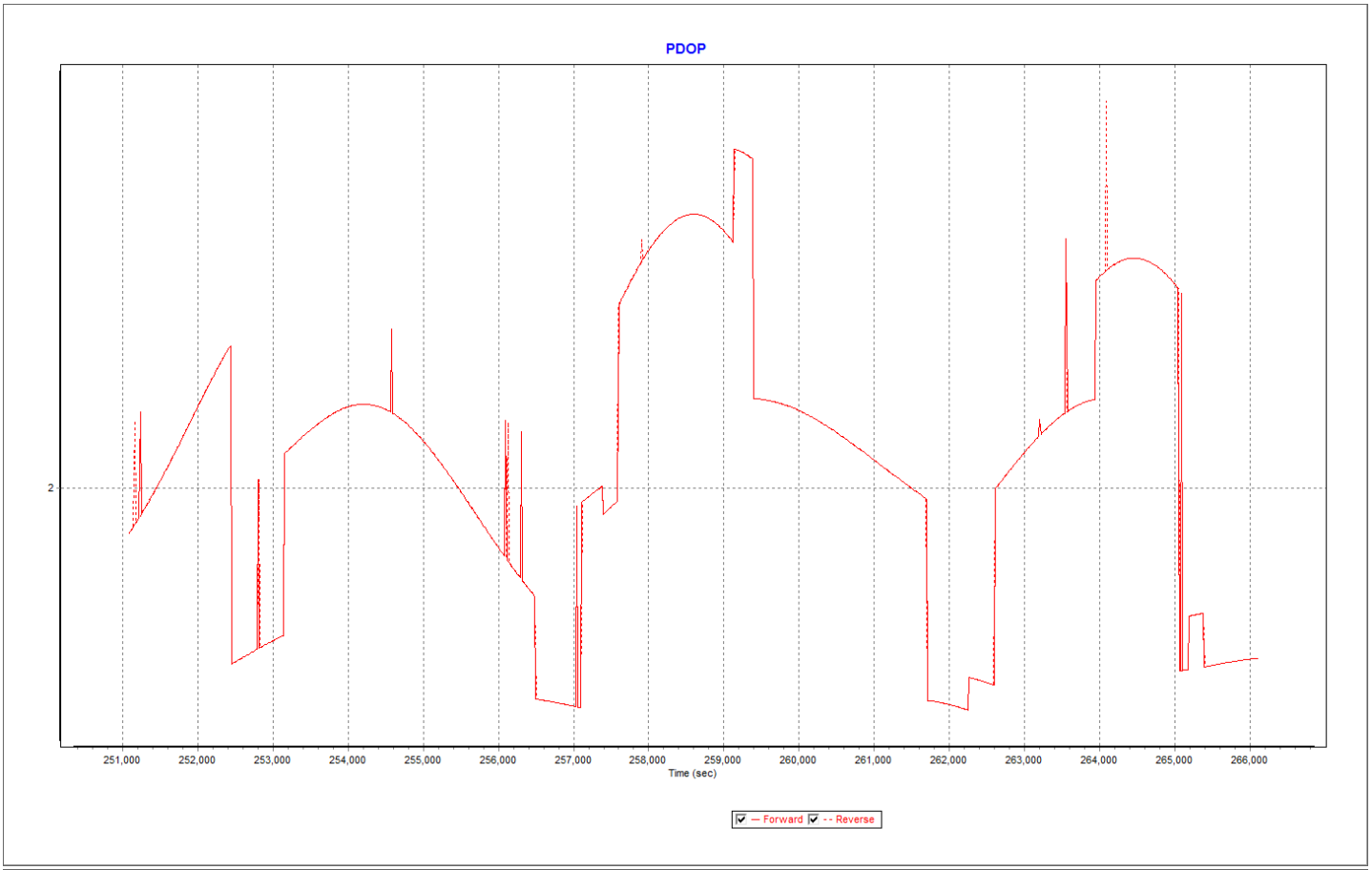
264,000
265,000
266,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


PDOP
2
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252,000
253,000
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255,000
256,000
257,000
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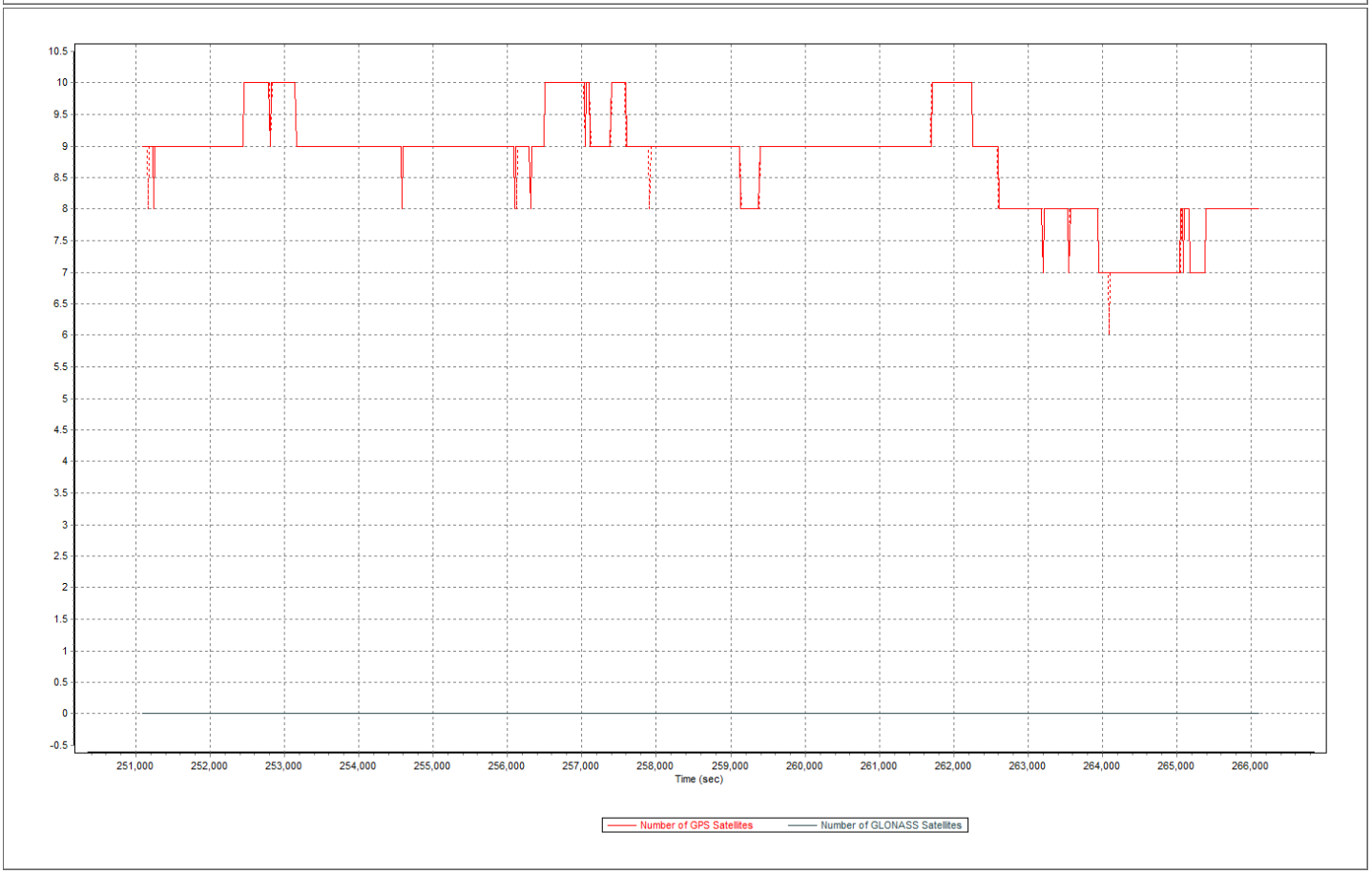
260,000
261,000
262,000
263,000
264,000
265,000
266,000
Time (sec)
Forward
Reverse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9.5
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8.5
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7.5
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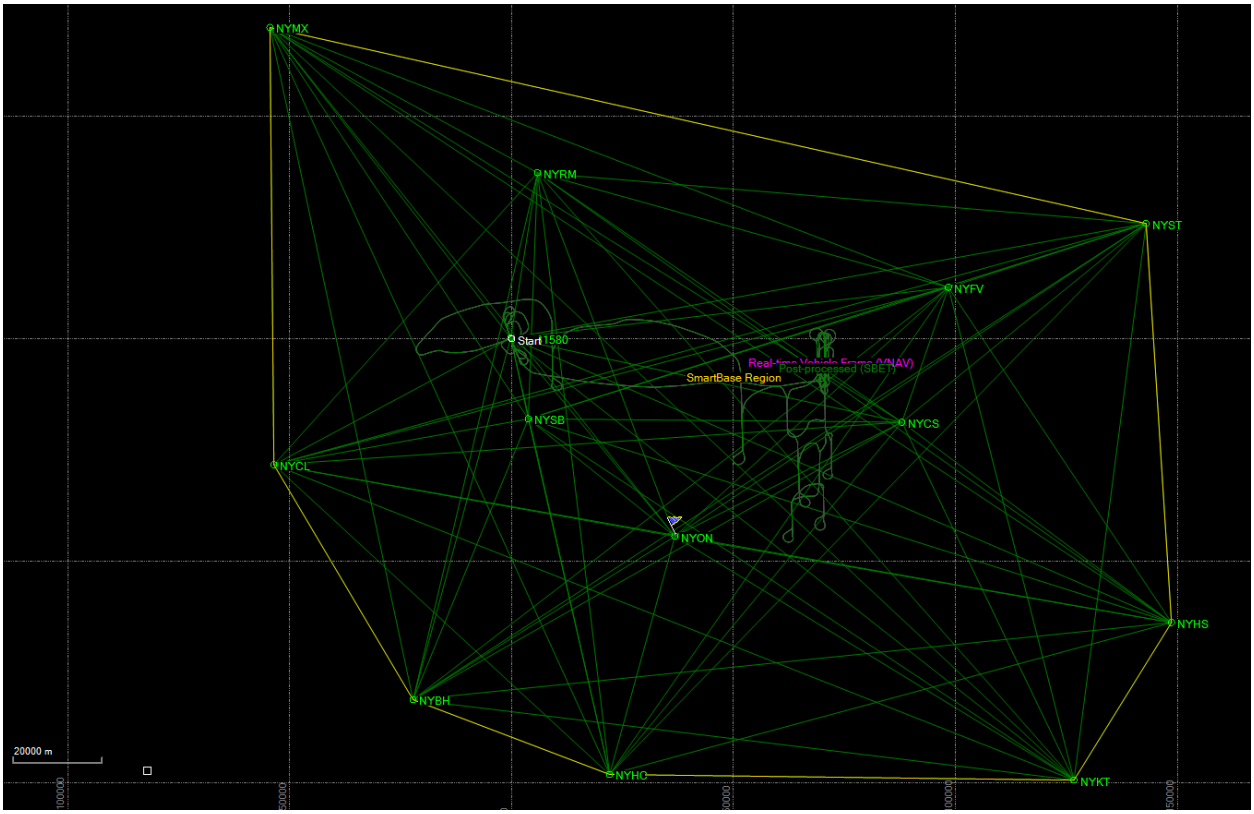
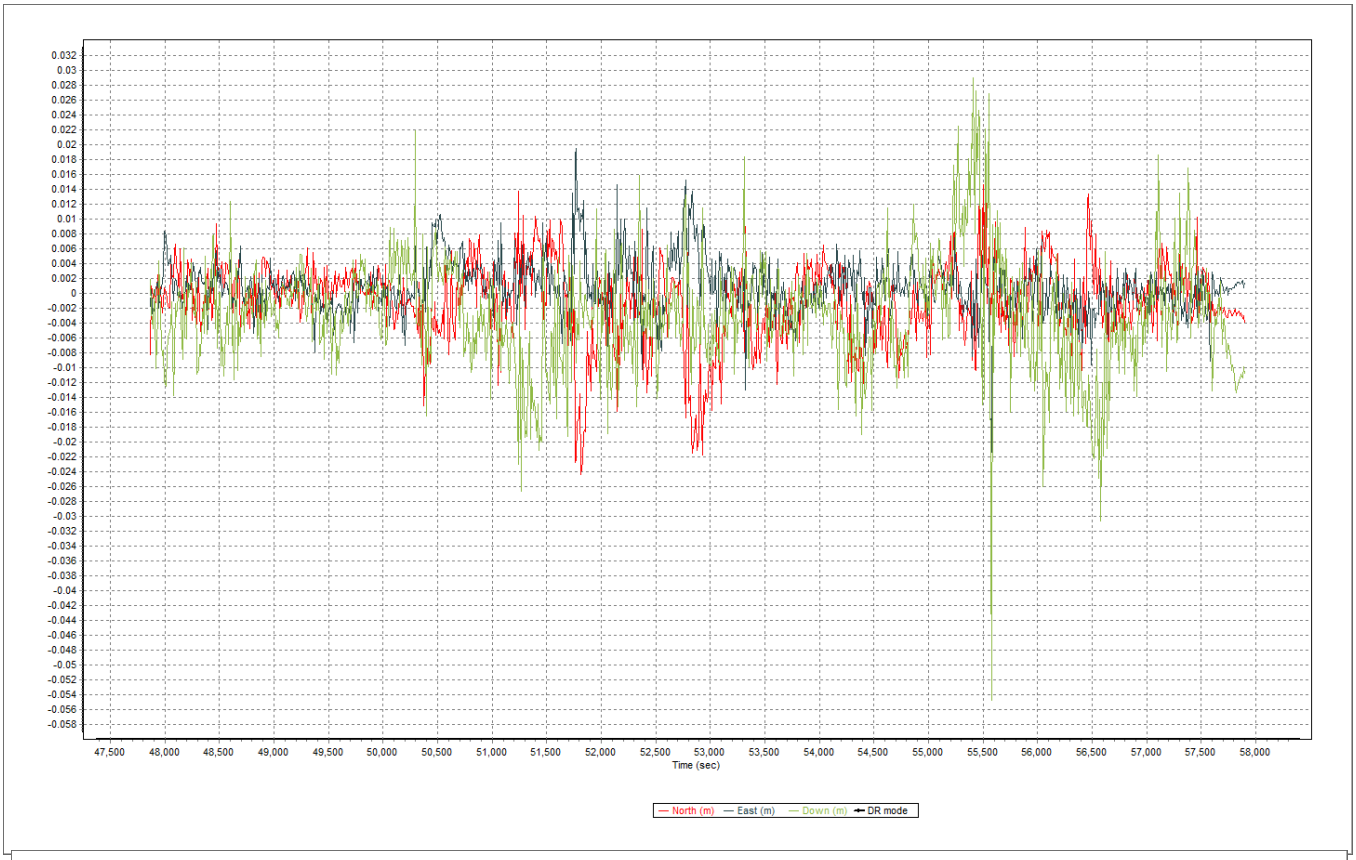
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
251,000
252,000
253,000
254,000
255,000
256,000
257,000
258,000
259,000
260,000
261,000
262,000
263,000
264,000
265,000
266,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites

Mission 21 (6-7-2015) Reflight

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0.018
0.016
0.014
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0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
-0.012
-0.014
-0.016
-0.018
-0.02
-0.022
-0.024
-0.026
-0.028
-0.03
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-0.038
-0.04
-0.042
-0.044
-0.046
-0.048
-0.05
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-0.056
-0.058
47,500
48,000
48,500
49,000
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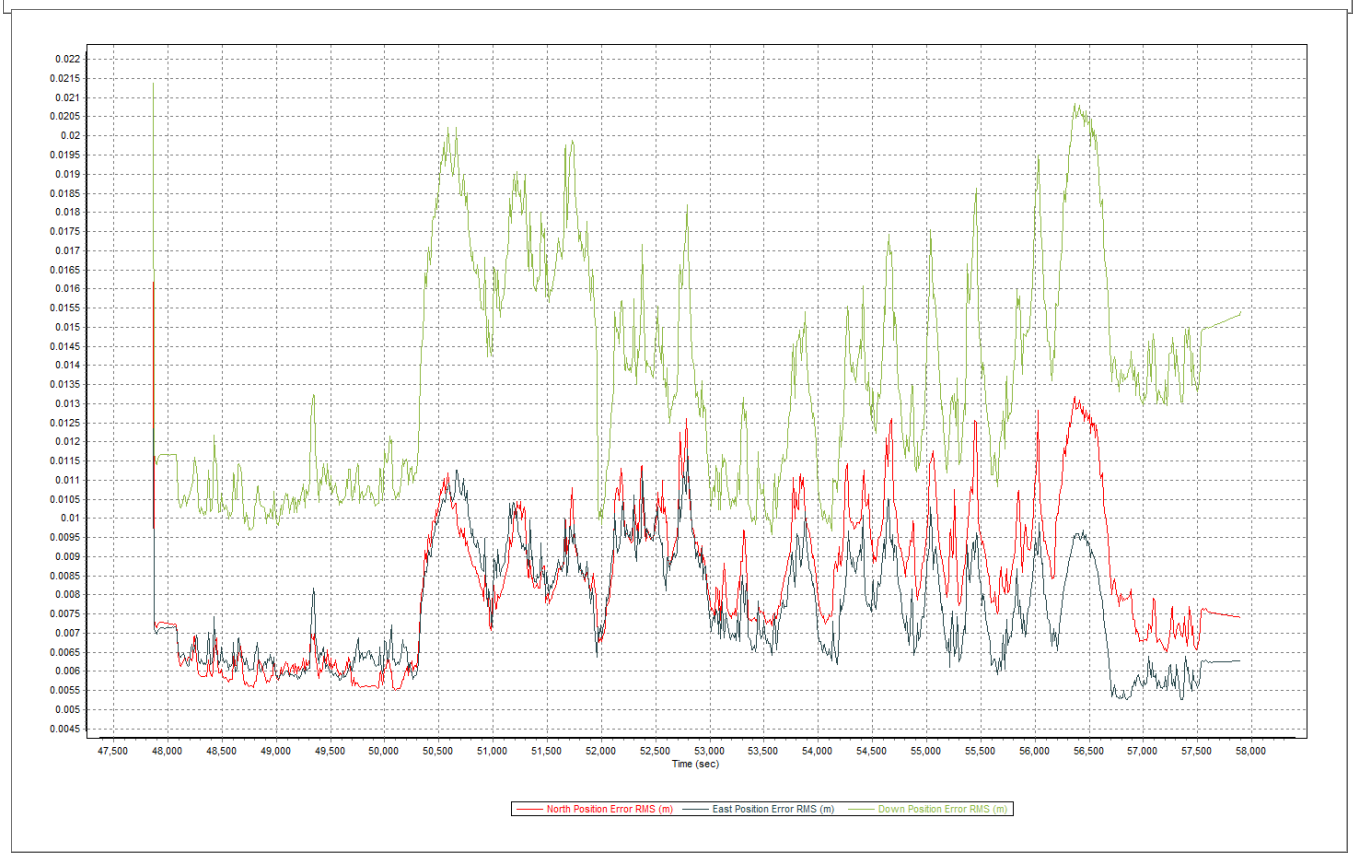
56,000
56,500
57,000
57,500
58,000
Time (sec)
North (m)
East (m)
Down (m)
DR mode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0.021
0.0205
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0.0195
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0.0185
0.018
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0.016
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0.015
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0.0135
0.013
0.0125
0.012
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0.0105
0.01
0.0095
0.009
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0.008
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0.006
0.0055
0.005
0.0045
47,500
48,000
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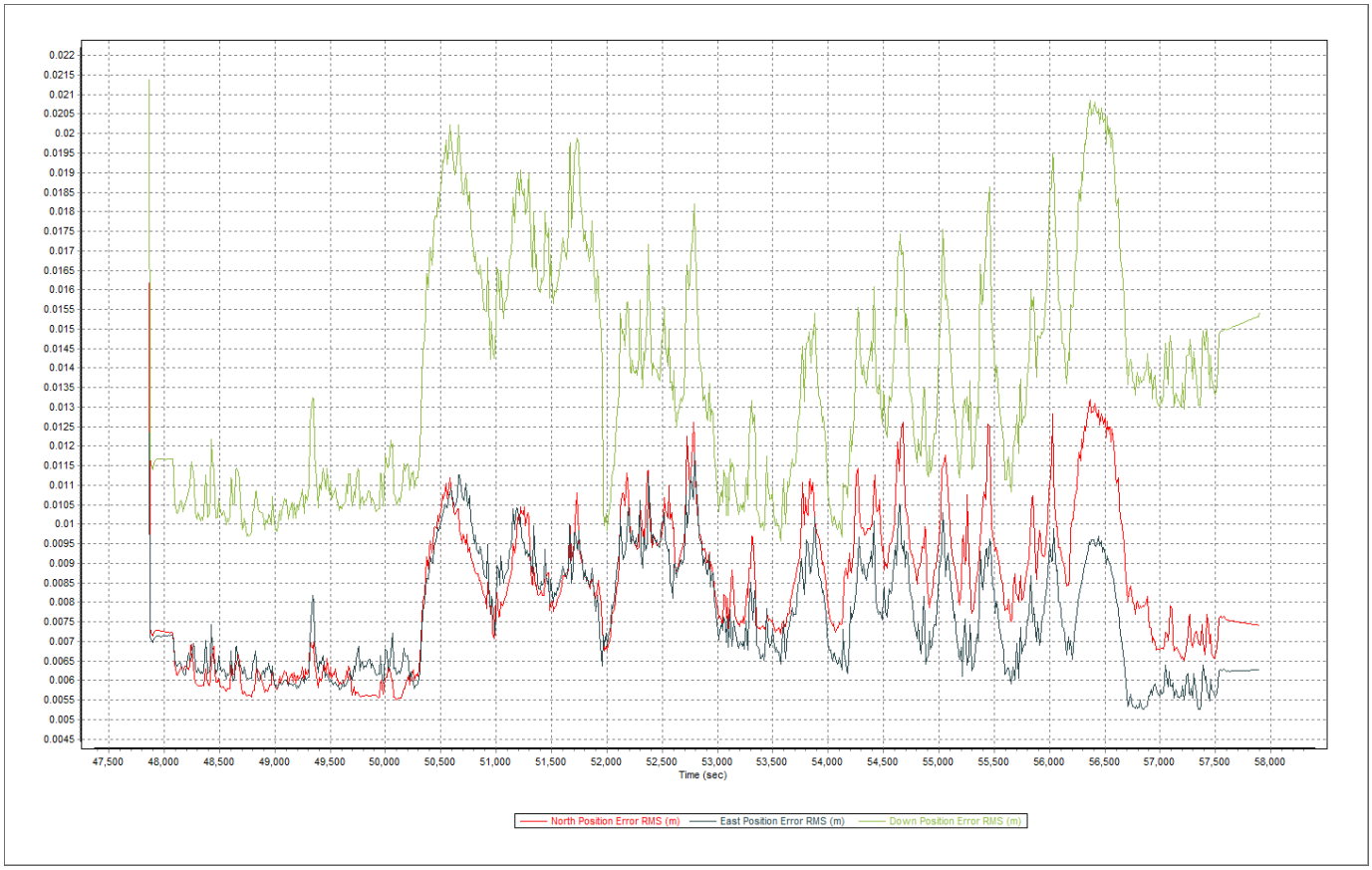
57,000
57,500
58,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


0.022
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0.021
0.0205
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0.018
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0.0165
0.016
0.0155
0.015
0.0145
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0.0135
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0.0125
0.012
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0.011
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0.01
0.0095
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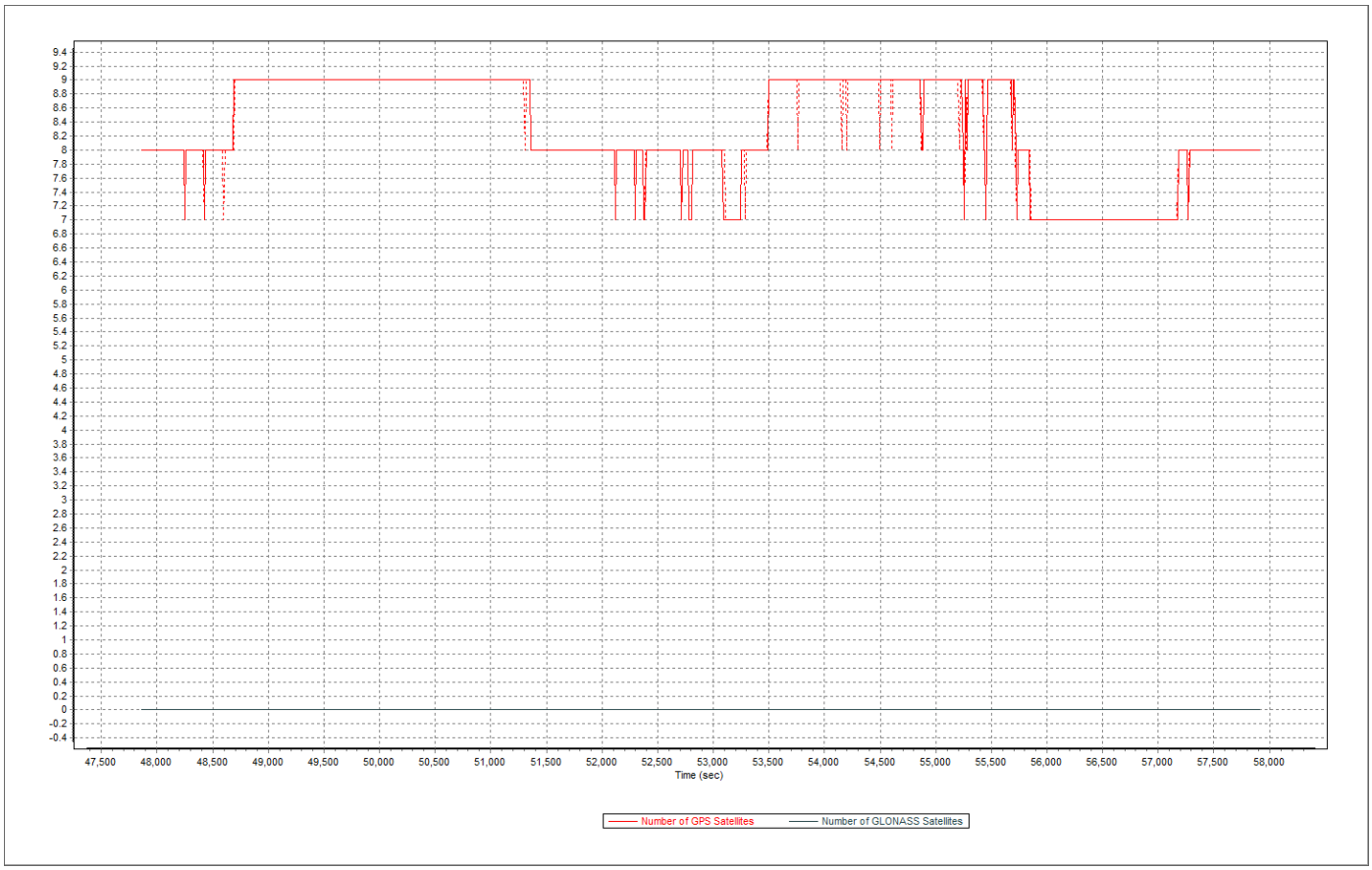
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
47,500 48,000 48,500 49,000 49,500 50,000 50,500 51,000 51,500 52,000 52,500 53,000 53,500 54,000 54,500 55,000 55,500 56,000 56,500 57,000 57,500 58,000
Time (sec)
North Position Error RMS (m)
East Position Error RMS (m)
Down Position Error RMS (m)


9.4
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8.4
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7.8
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6.8
6.6
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6.2
6
5.8
5.6
5.4
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5
4.8
4.6
4.4
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3.8
3.6
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3.2
3
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2.6
2.4
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2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
47,500 48,000 48,500 49,000 49,500 50,000 50,500 51,000 51,500 52,000 52,500 53,000 53,500 54,000 54,500 55,000 55,500 56,000 56,500 57,000 57,500 58,000
Time (sec)
Number of GPS Satellites
Number of GLONASS Satellites