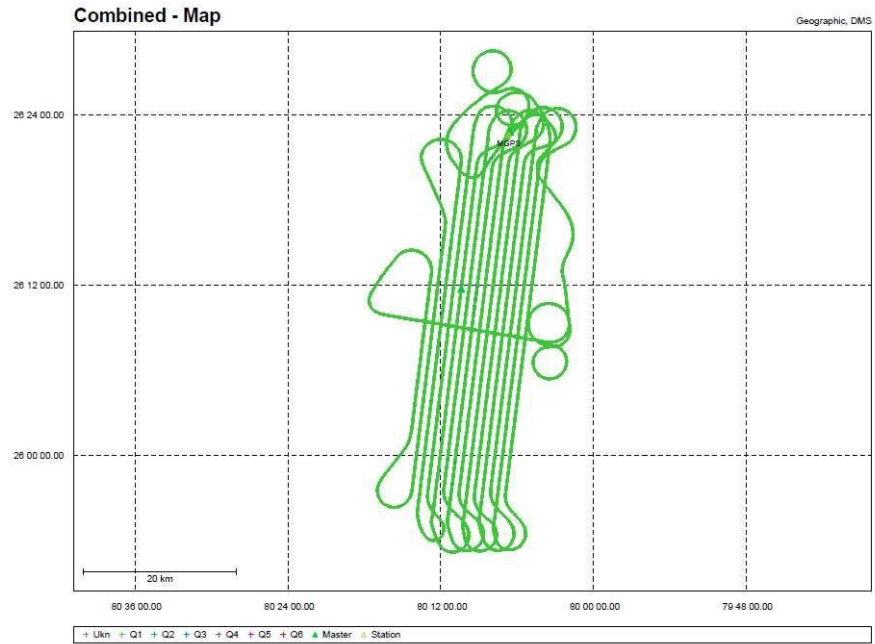


## **Appendix C: GNSS and IMU Processing Reports**

# 6218153a GNSS Processing

Project: 6218153a

GrafNav v8.50.4120

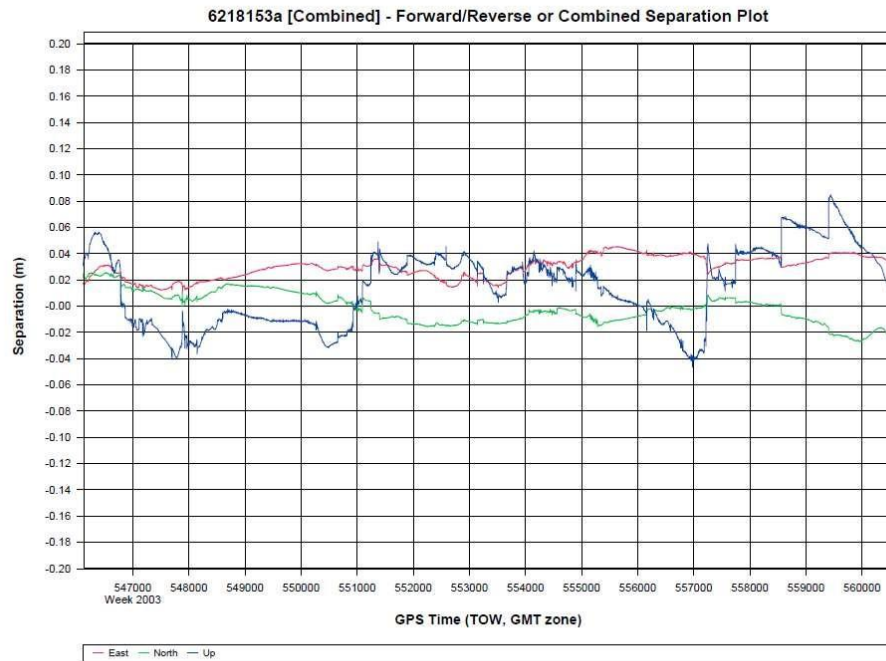


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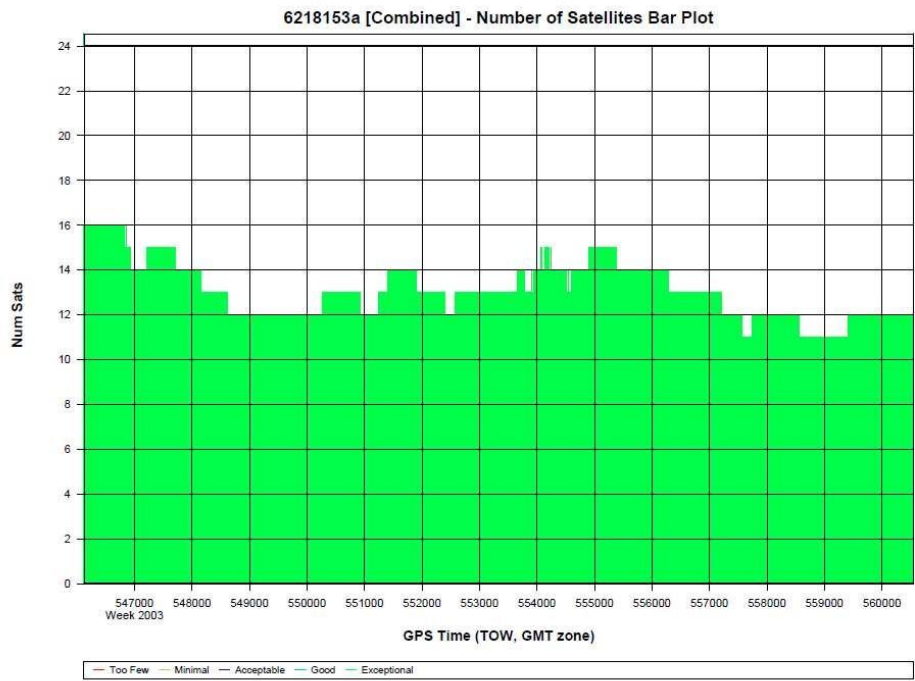
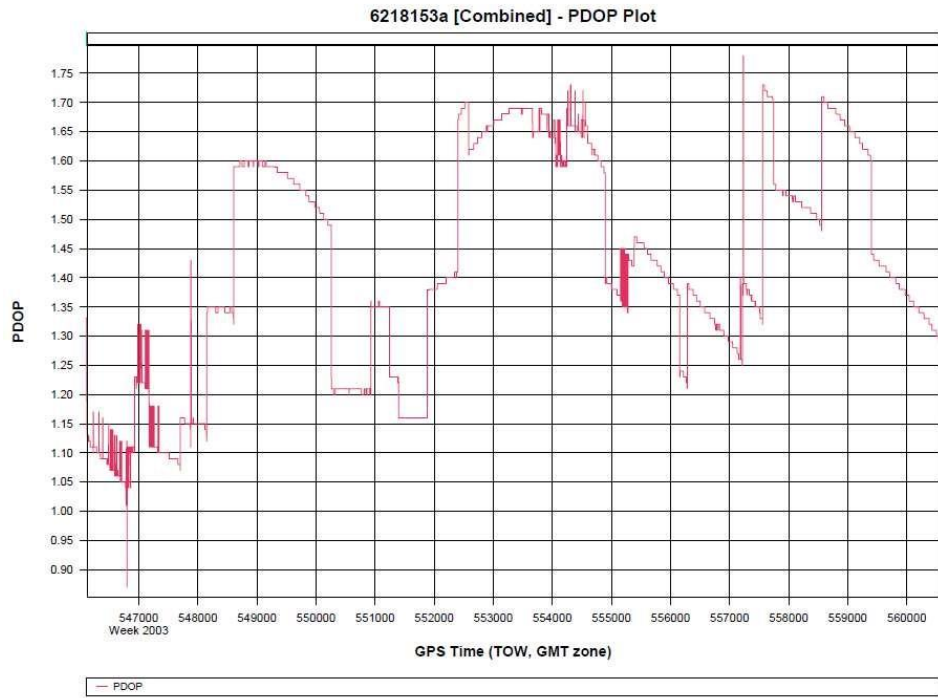
Project: 6218153a

GrafNav v8.50.4120



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## Processing Summary Information

Program: GrafNav

Version: 8.50.4120 Project: C:\projects\3149\_Dewberry\_FortLauderdale\_May-04-2018\LiDAR\6218153a\05\_INS-GPS\_PROC\01\_POS\GNSS\6218153a.gnv

Solution Type: Combined Number of Epochs:

Total in GPB file: 14436

No processed position: 0

Missing Fwd or Rev: 6

With bad C/A code: 0

With bad L1 Phase: 0 Measurement RMS

Values:

L1 Phase: 0.0231 (m)

C/A Code: 0.60 (m)

L1 Doppler: 0.028 (m/s) Fwd/Rev Separation

RMS Values:

East: 0.031 (m)

North: 0.012 (m)

Height: 0.032 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (14430 occurrences):

East: 0.031 (m)

North: 0.012 (m)

Height: 0.032 (m) Quality Number

Percentages:

Q 1: 99.5 %

Q 2: 0.5 %

Q 3: 0.0 %

Q 4: 0.0 %

Q 5: 0.0 %

Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %

0.10 - 0.30 m: 0.0 % 0.30 - 1.00 m:

0.0 % 1.00 - 5.00 m: 0.0 %

5.00 m + over: 0.0 %

Percentages of epochs with DD\_DOP over 10.00:

DOP over Tol: 0.0 % Baseline Distances:

Maximum: 45.234 (km)

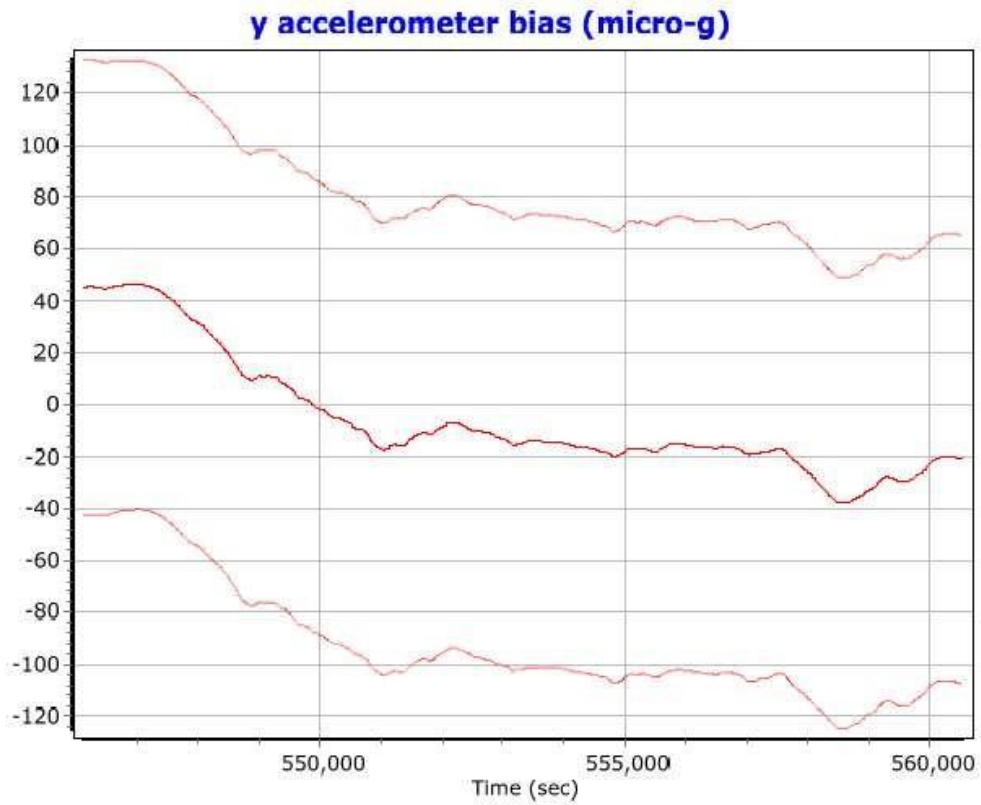
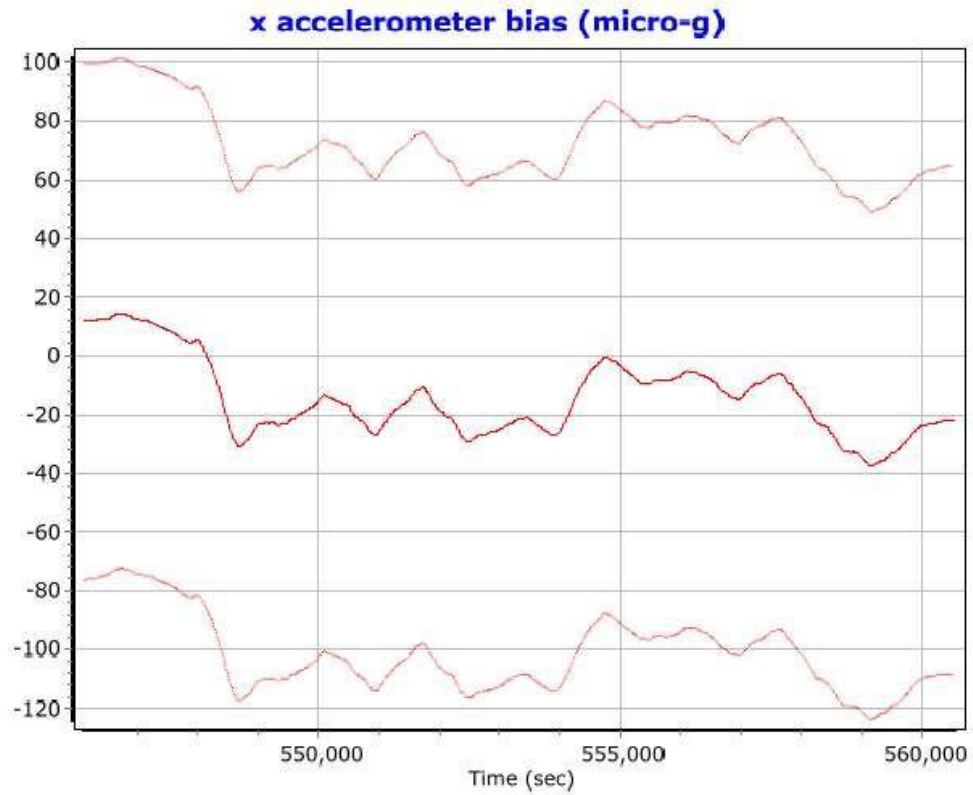
Minimum: 1.276 (km)

Average: 17.726 (km)

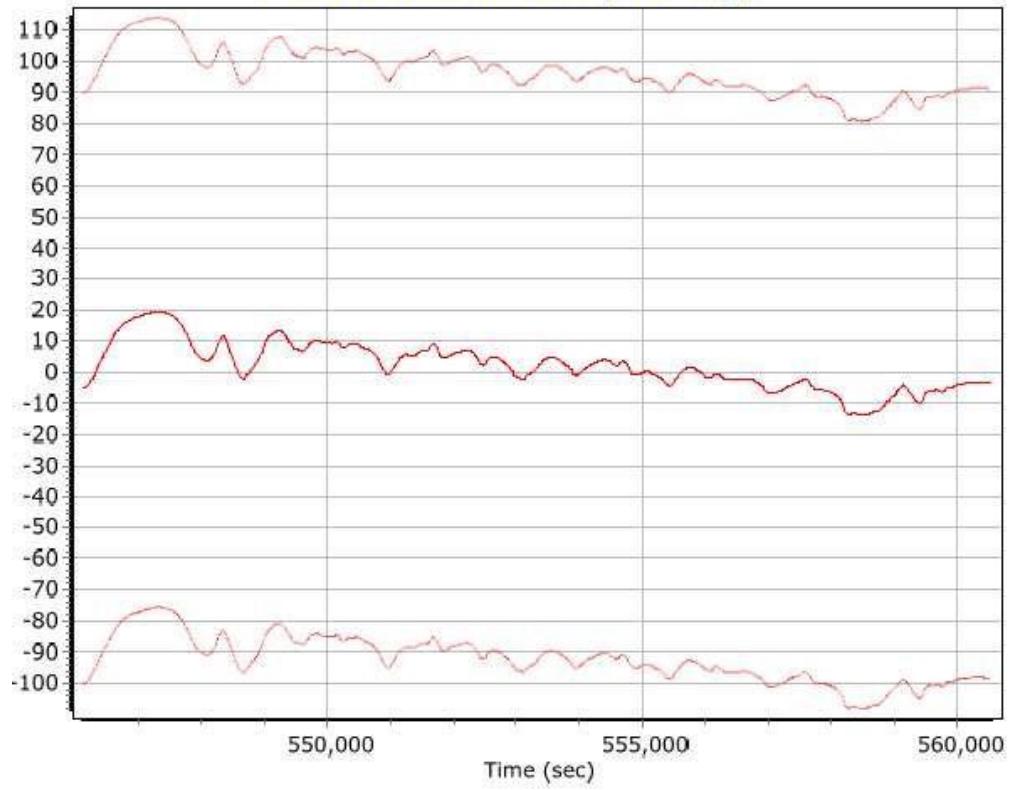
First Epoch: 10.002 (km)

Last Epoch: 9.679 (km)

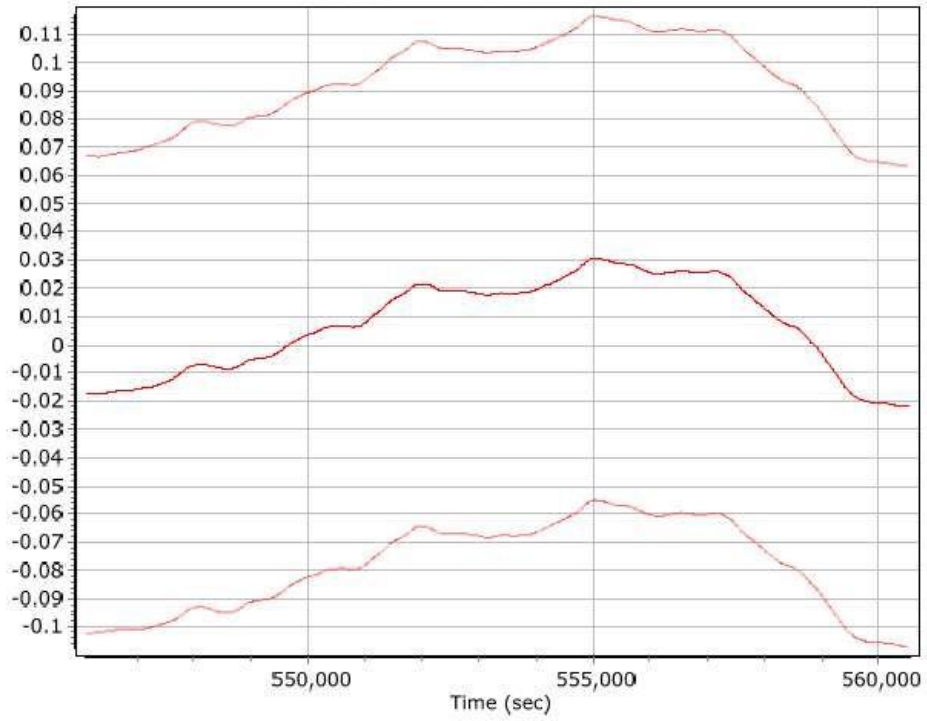
# Mission 1 – 6218153a Sensor Errors



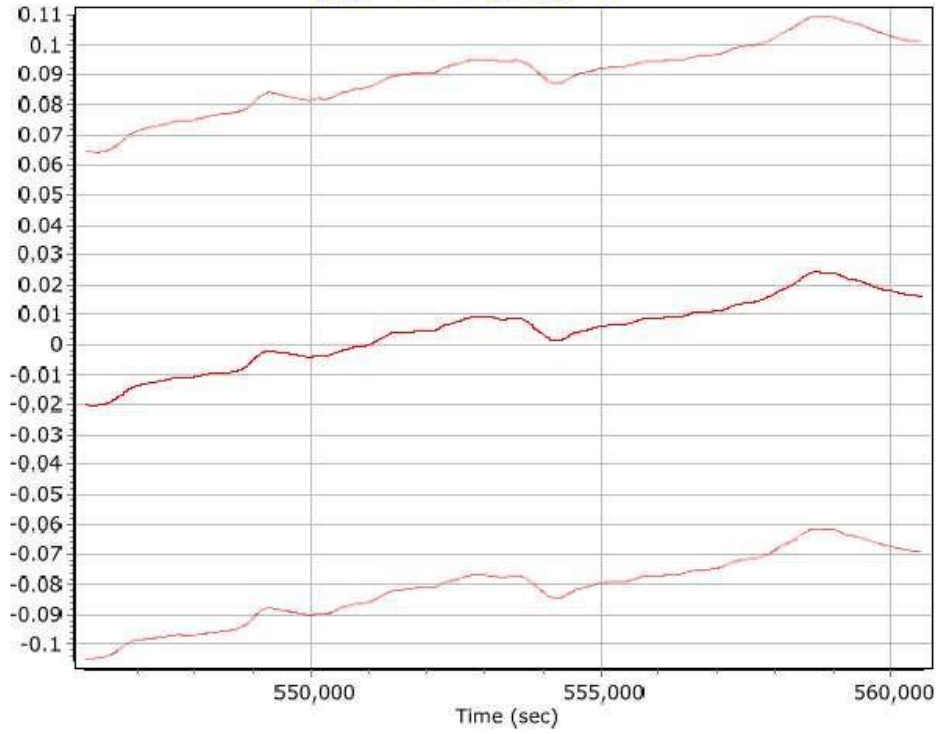
### z accelerometer bias (micro-g)



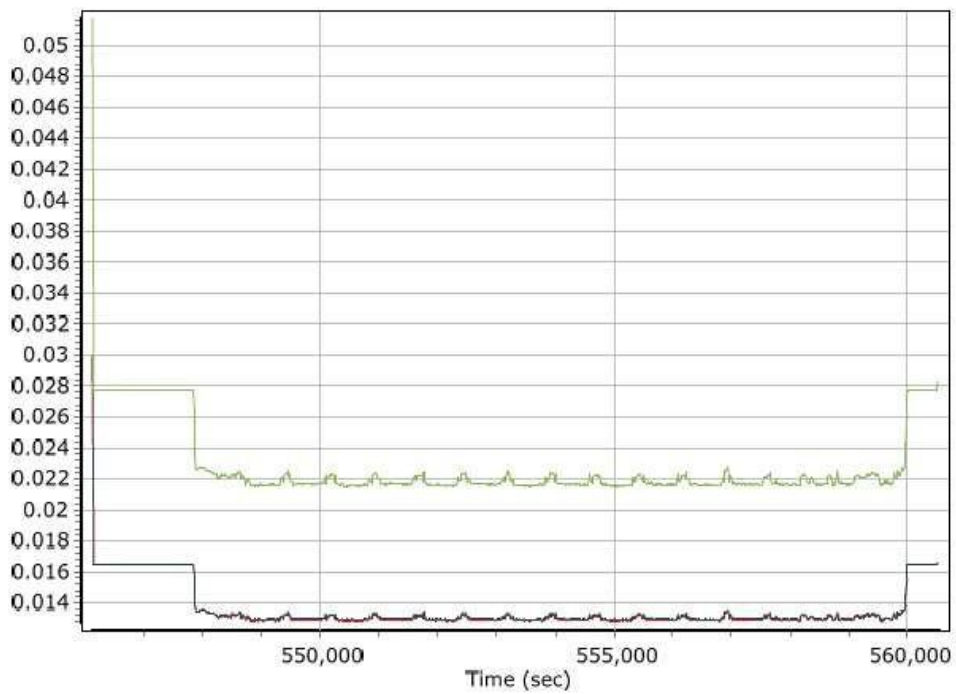
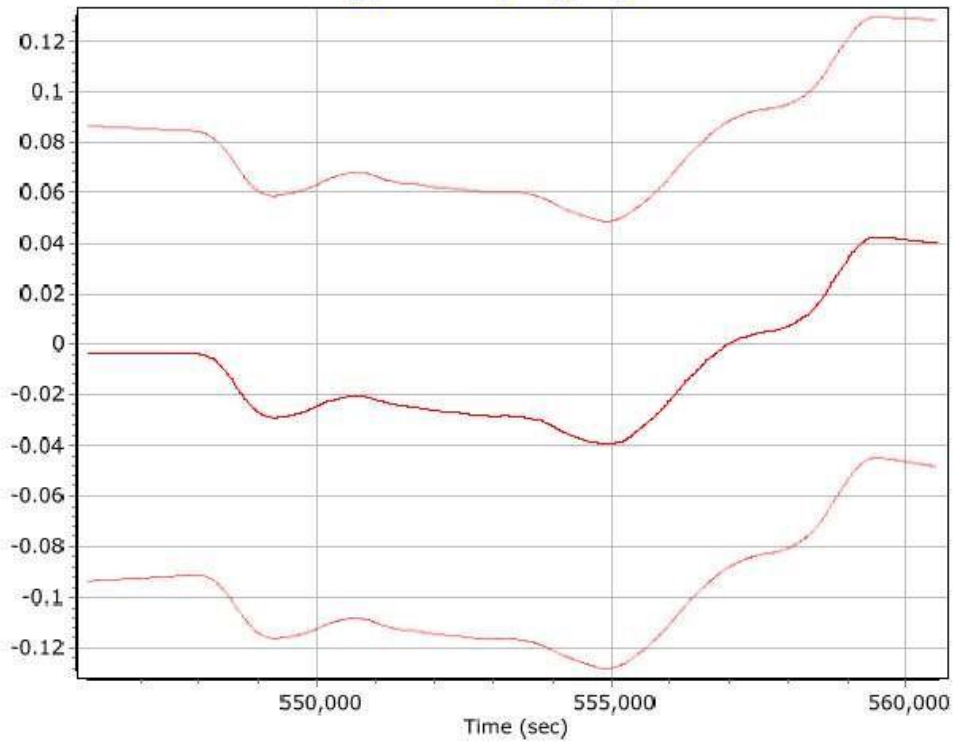
**x gyro bias (deg/hr)**



**y gyro bias (deg/hr)**



### z gyro bias (deg/hr)



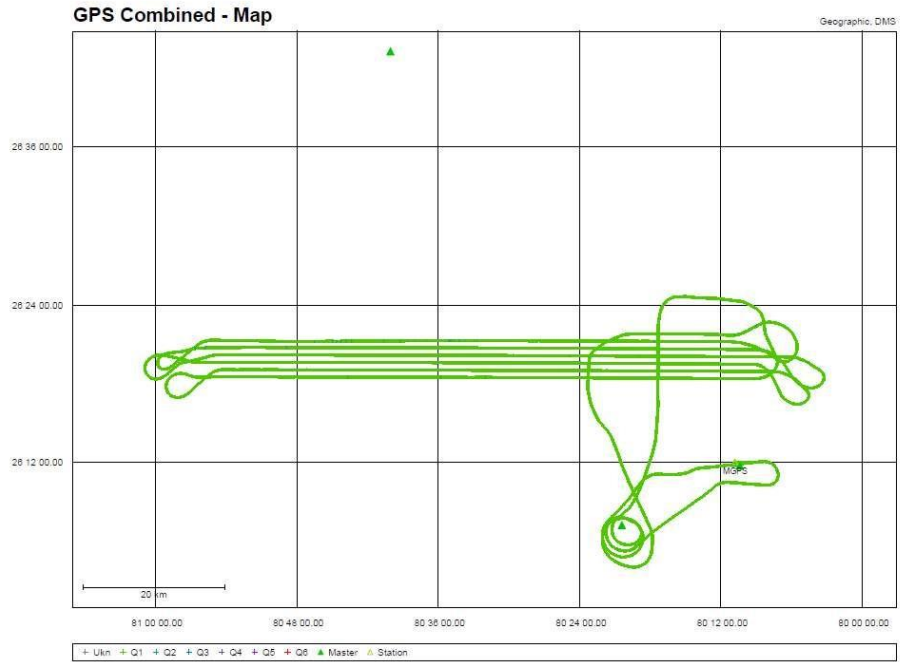
— North Position Error RMS (m) — East Position Error RMS (m)  
— Down Position Error RMS (m)



# 3818332a GNSS Processing

Project: 3818332a

GrafNav v8.50.4320

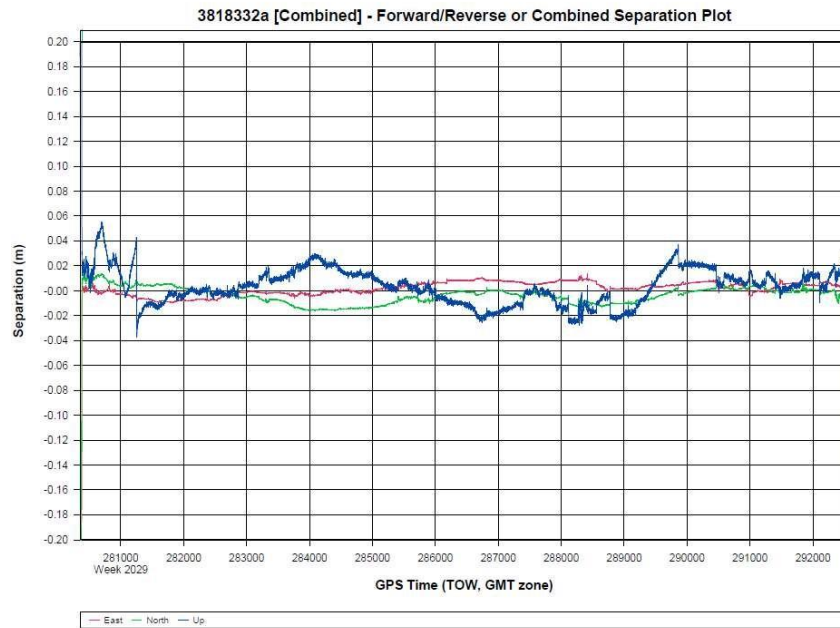


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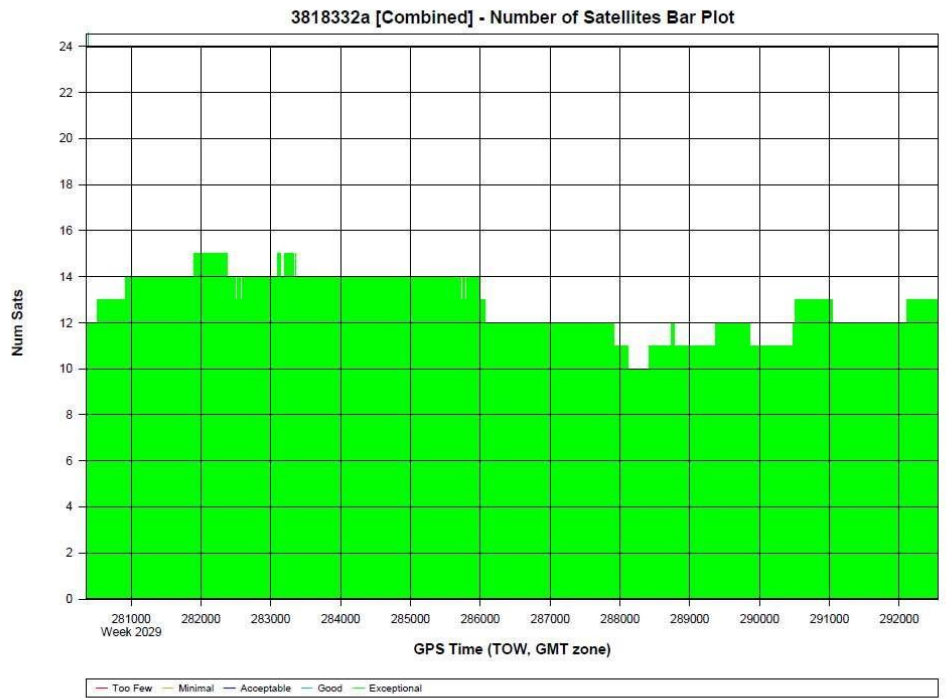
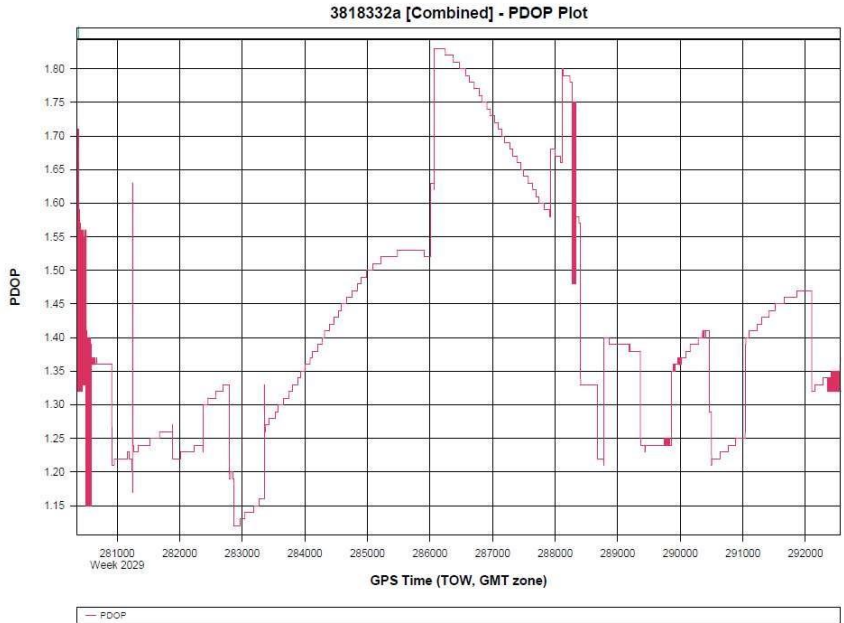
Project: 3818332a

GrafNav v8.50.4320



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Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\3149\_FortLauderdale\_From\_EX484a\FieldData\LIDAR\3818332a\05\_INS-GPS\_PROC\01\_POS\3818332a\3818332a\GNSS\3818332a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 12412  
No processed position: 197  
Missing Fwd or Rev: 4  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0176 (m)  
C/A Code: 0.76 (m)  
L1 Doppler: 0.534 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.018 (m)  
North: 0.014 (m)  
Height: 0.100 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (12179 occurrences):  
East: 0.005 (m)  
North: 0.007 (m)  
Height: 0.015 (m)

Quality Number Percentages:  
Q 1: 99.1 %  
Q 2: 0.9 %  
Q 3: 0.0 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

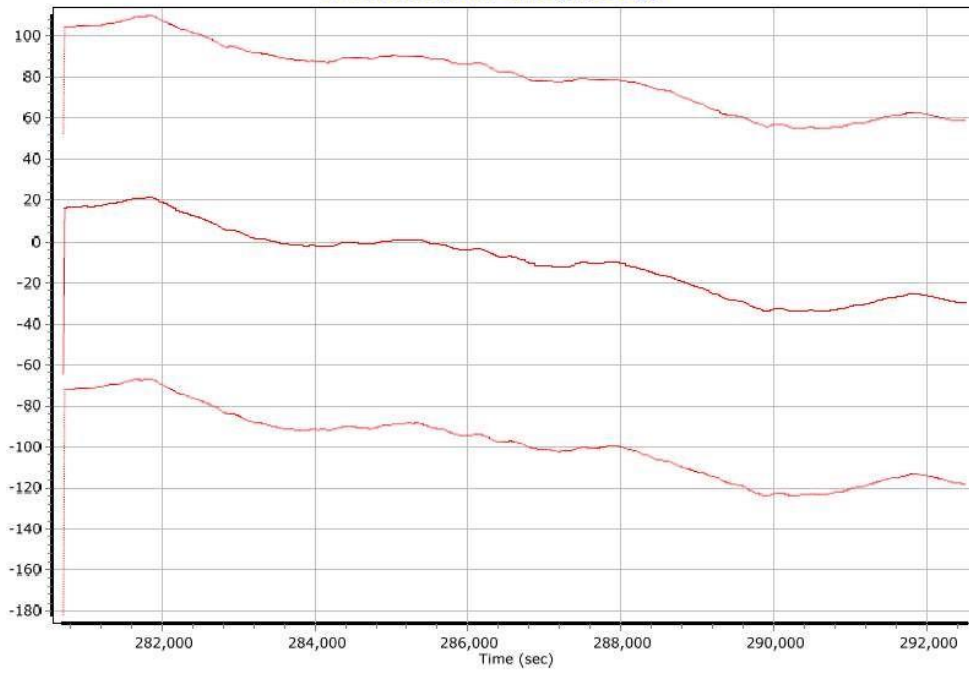
Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.30 m: 0.0 %  
0.30 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

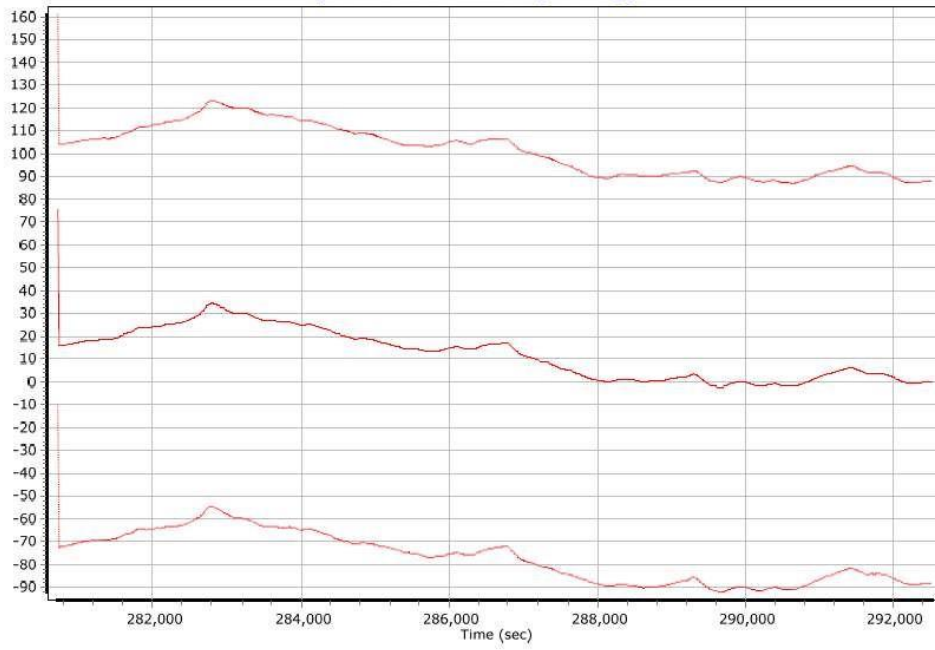
Baseline Distances:  
Maximum: 67.989 (km)  
Minimum: 1.607 (km)  
Average: 23.910 (km)  
First Epoch: 20.812 (km)  
Last Epoch: 18.836 (km)

# Mission 2 – 3818332a Sensor Errors

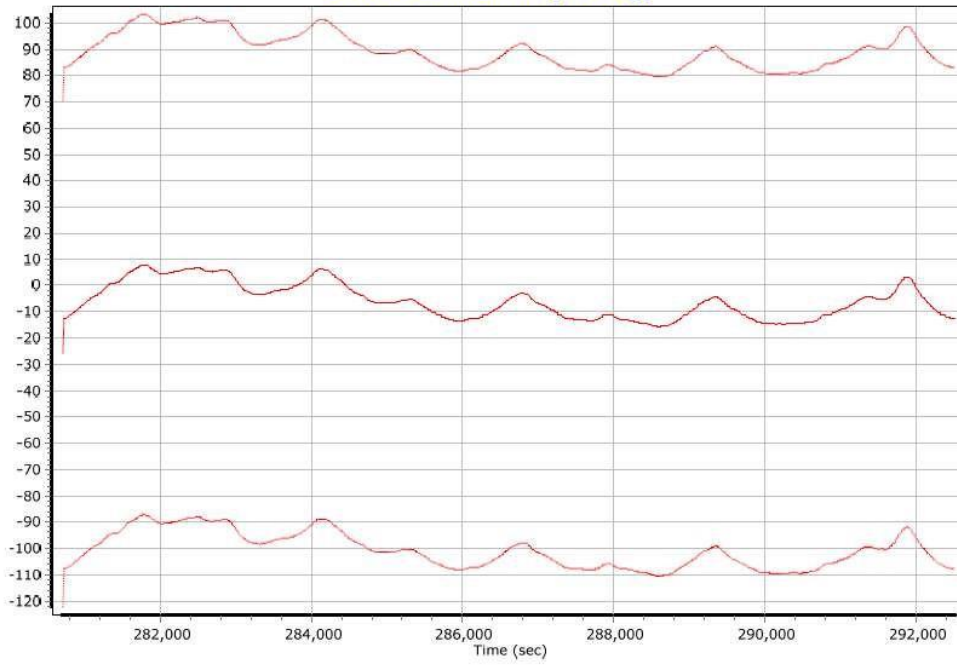
## x accelerometer bias (micro-g)



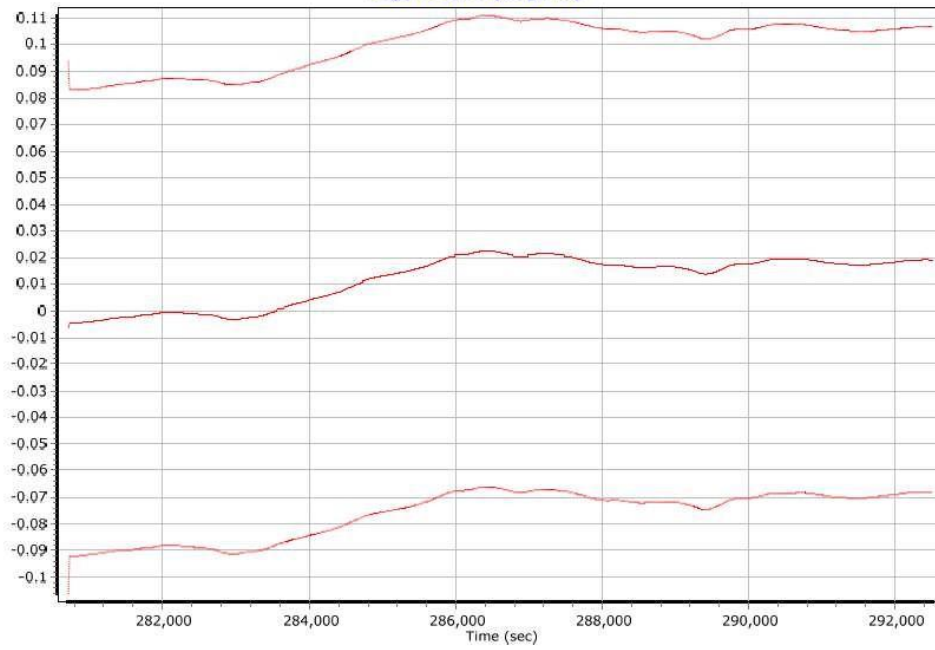
## y accelerometer bias (micro-g)



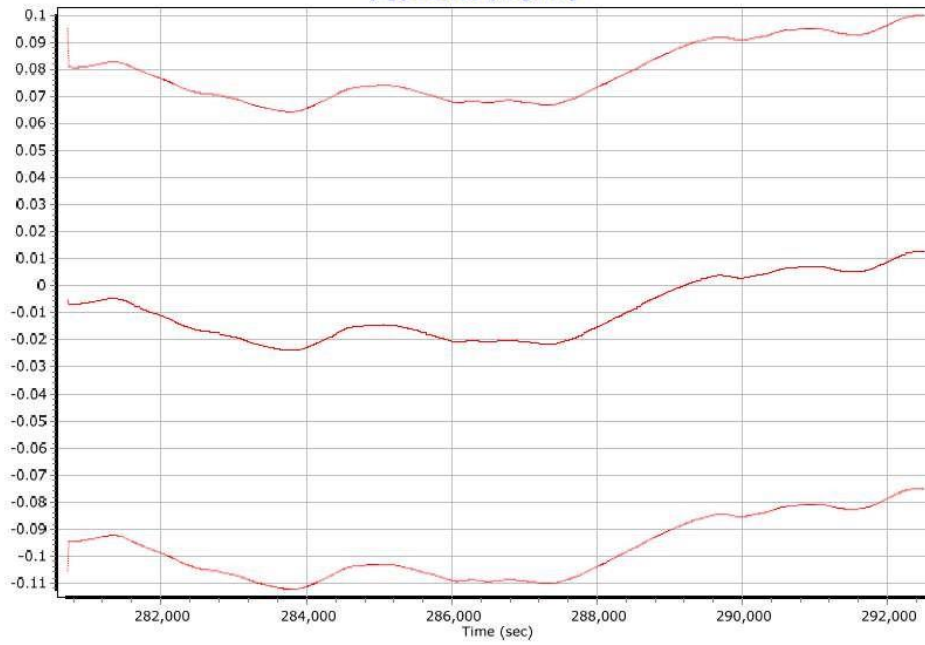
**z accelerometer bias (micro-g)**



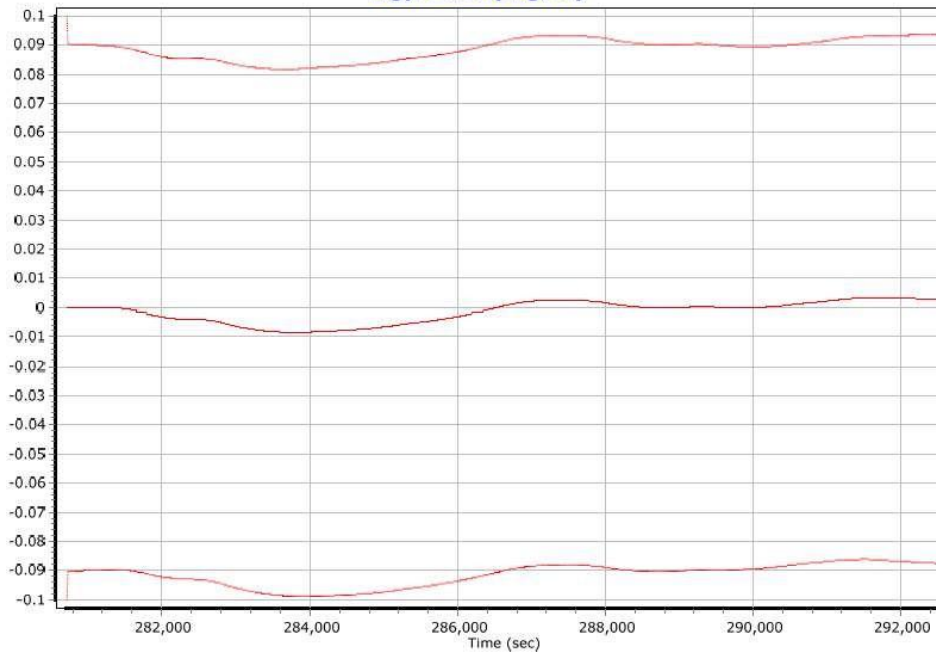
**x gyro bias (deg/hr)**

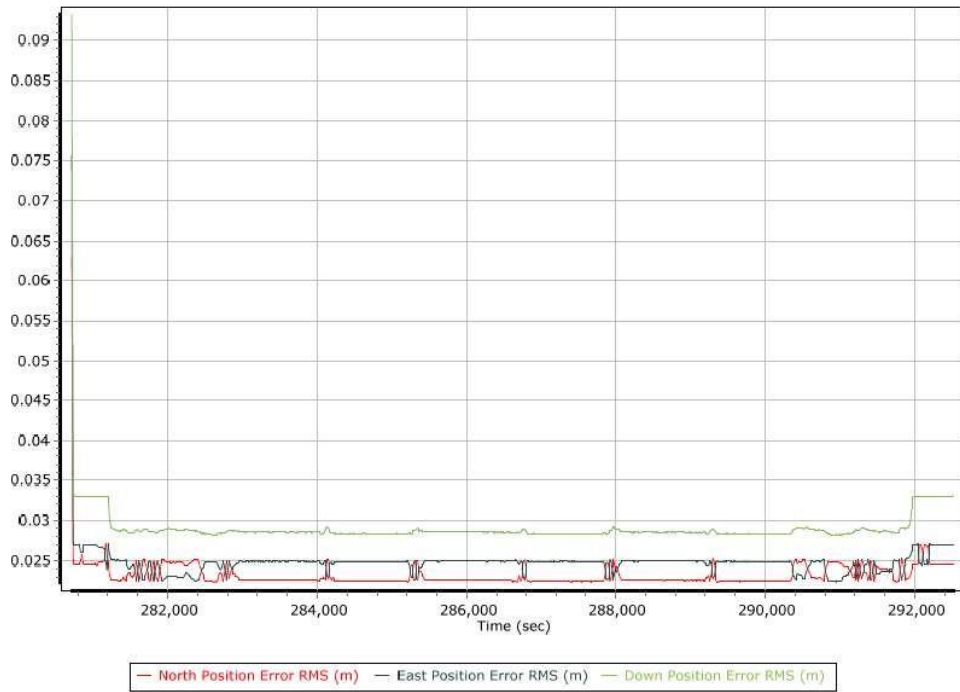


**y gyro bias (deg/hr)**



**z gyro bias (deg/hr)**

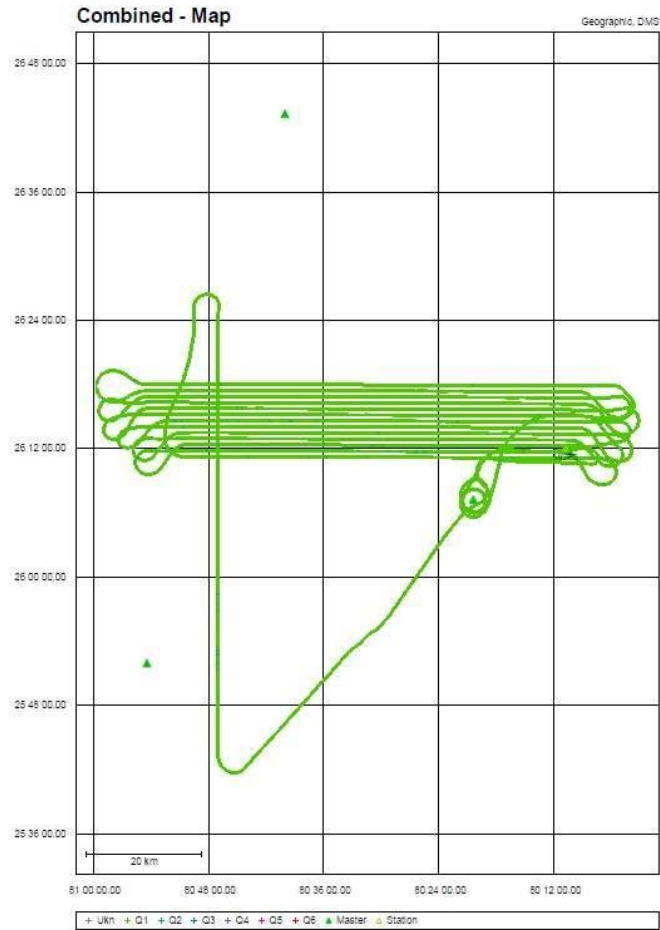




# 3818333a GNSS Processing

Project: 3818333a

GrafNav v8.50.4320

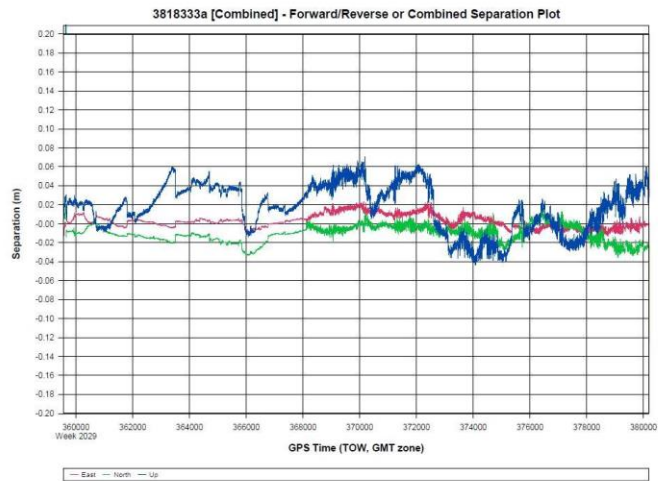


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Project: 3818333a

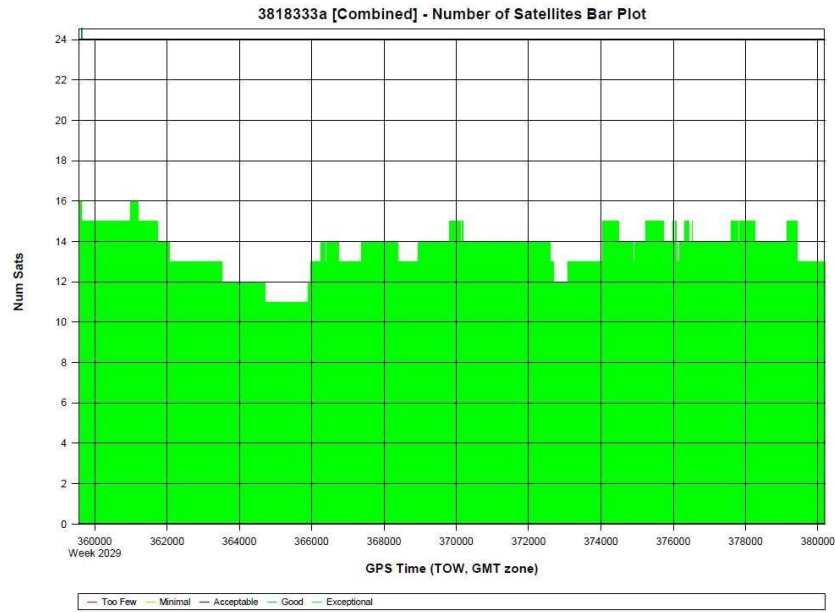
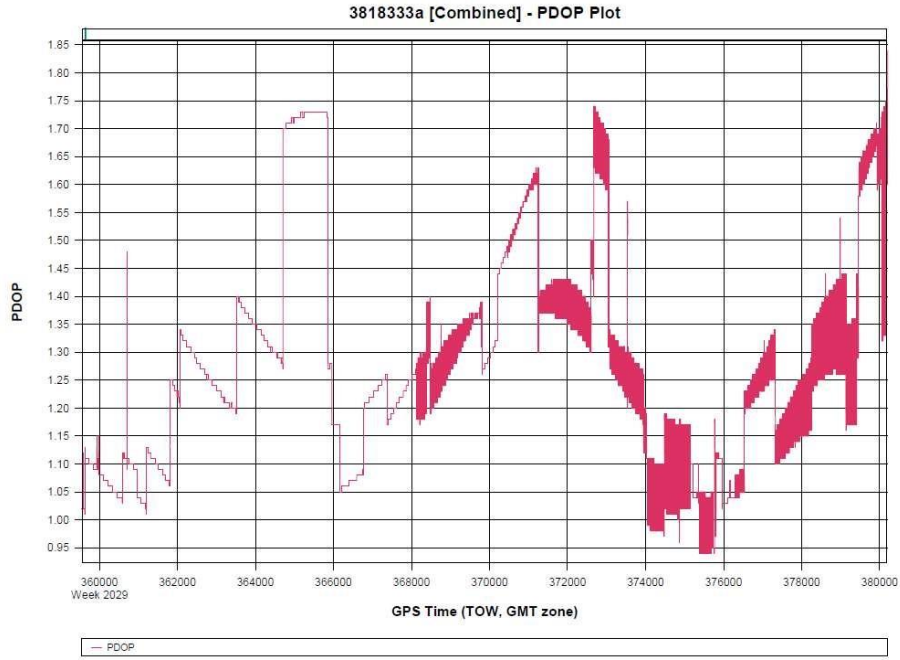
GrafNav v8.50.4320



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## Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\2149\_FortLauderdale\_From\_EX484a\FieldData\LiDAR\3818333a\05\_INS-GPS\_PROC\01  
\_POB\3818333a\3818333a\GNSS\3818333a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 20658  
No processed position: 0  
Missing Fwd or Rev: 8  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0196 (m)  
C/A Code: 0.79 (m)  
L1 Doppler: 0.527 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.008 (m)  
North: 0.014 (m)  
Height: 0.030 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (20649 occurrences):  
East: 0.008 (m)  
North: 0.014 (m)  
Height: 0.030 (m)

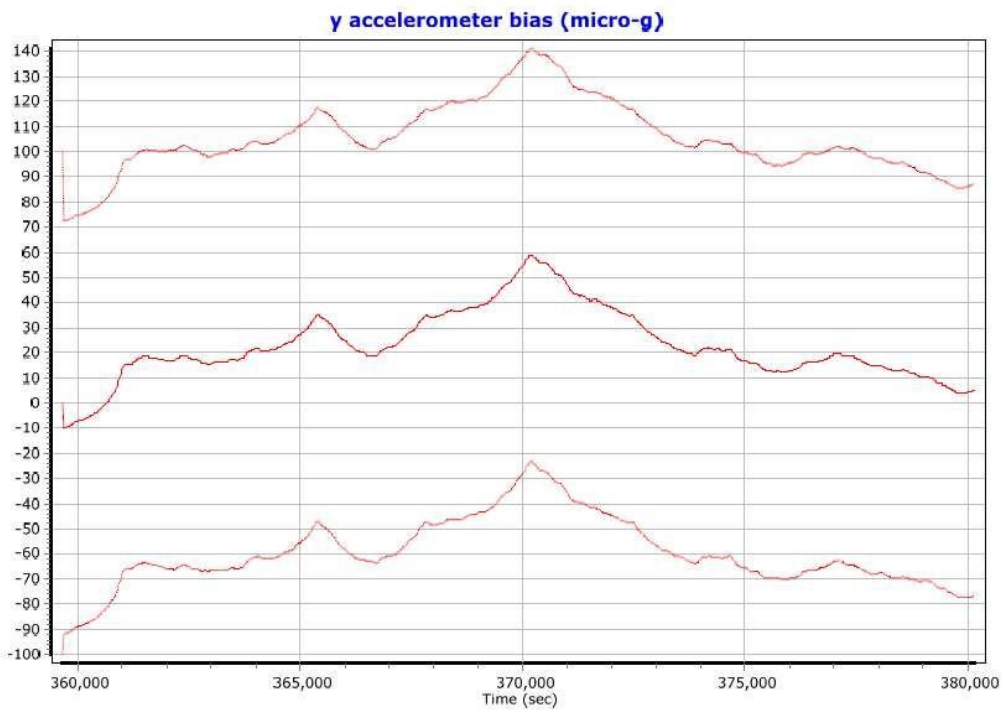
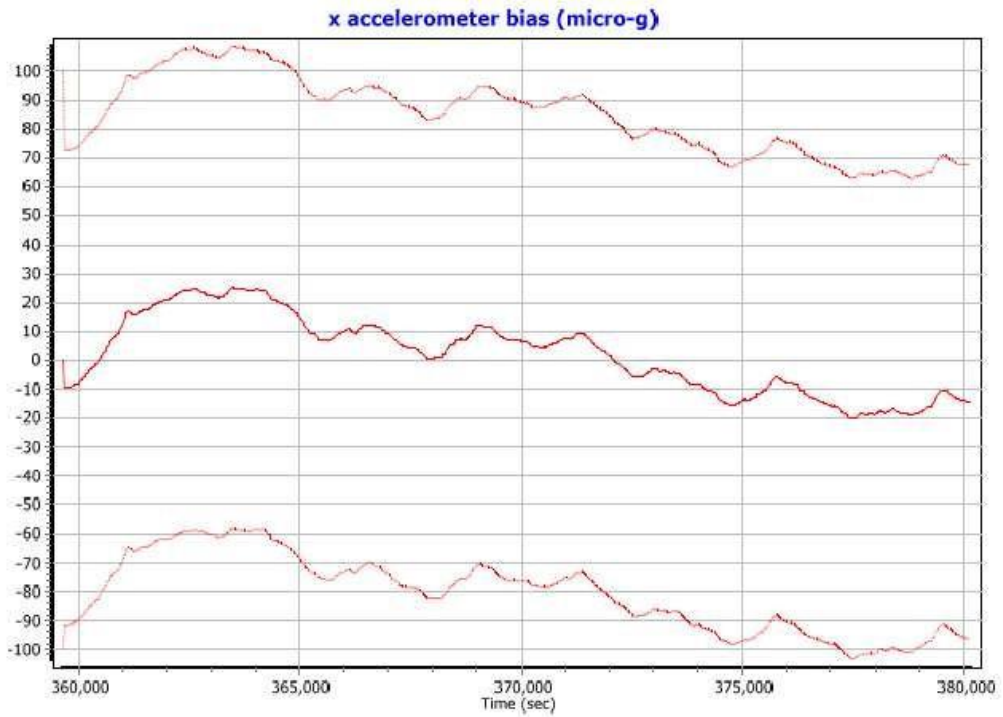
Quality Number Percentages:  
Q 1: 96.6 %  
Q 2: 1.4 %  
Q 3: 0.0 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.20 m: 0.0 %  
0.20 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

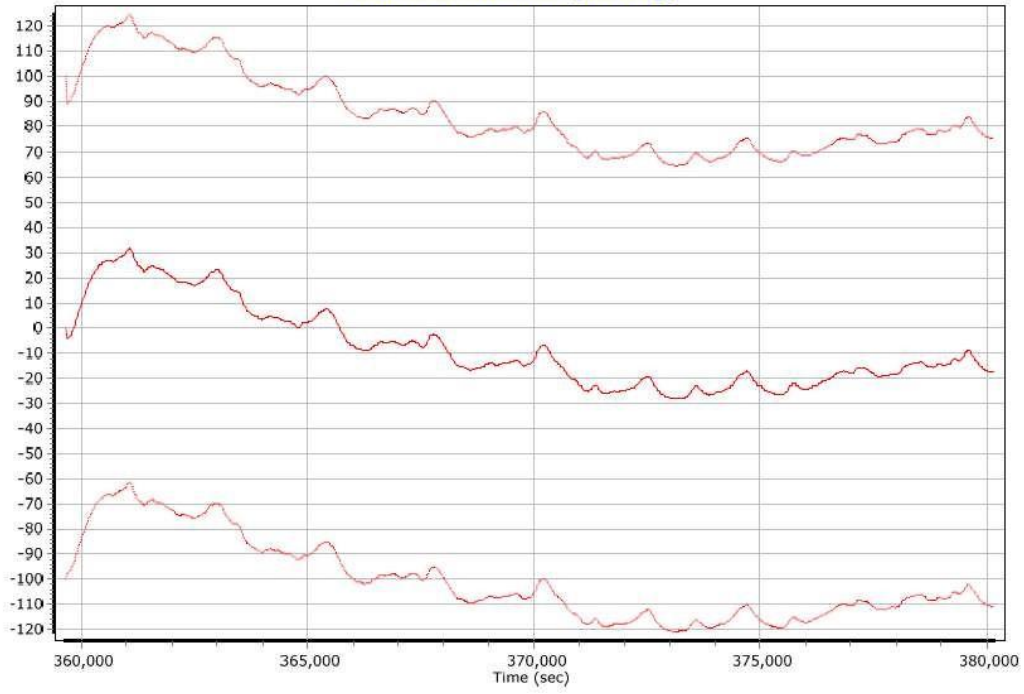
Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

Baseline Distances:  
Maximum: 64.965 (km)  
Minimum: 1.402 (km)  
Average: 26.251 (km)  
First Epoch: 26.252 (km)  
Last Epoch: 27.125 (km)

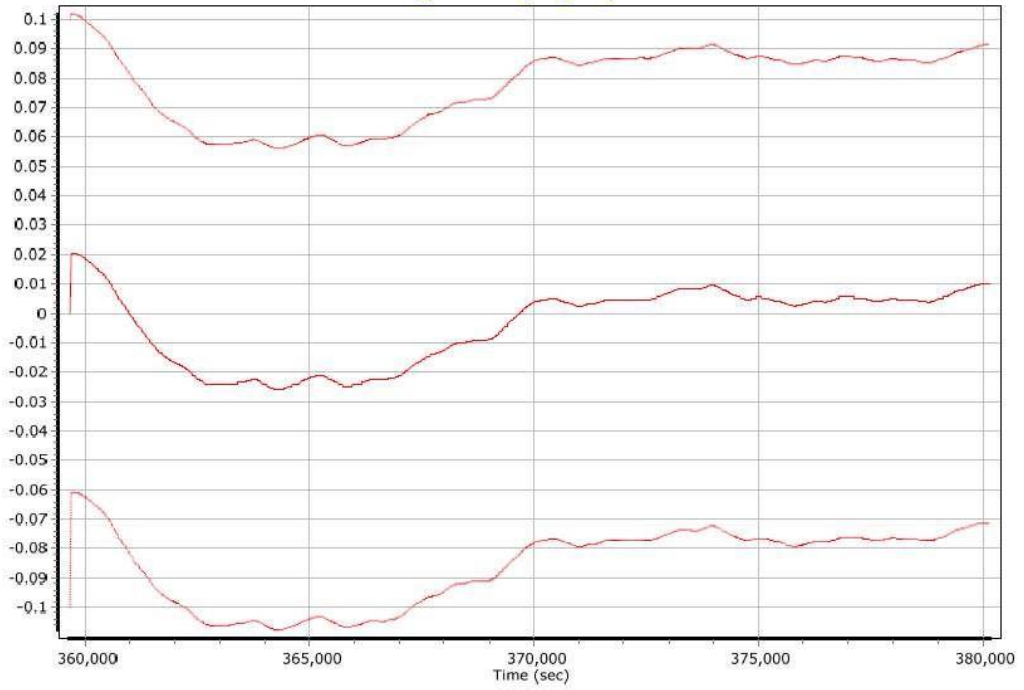
## Mission 3 – 3818333a Sensor Errors



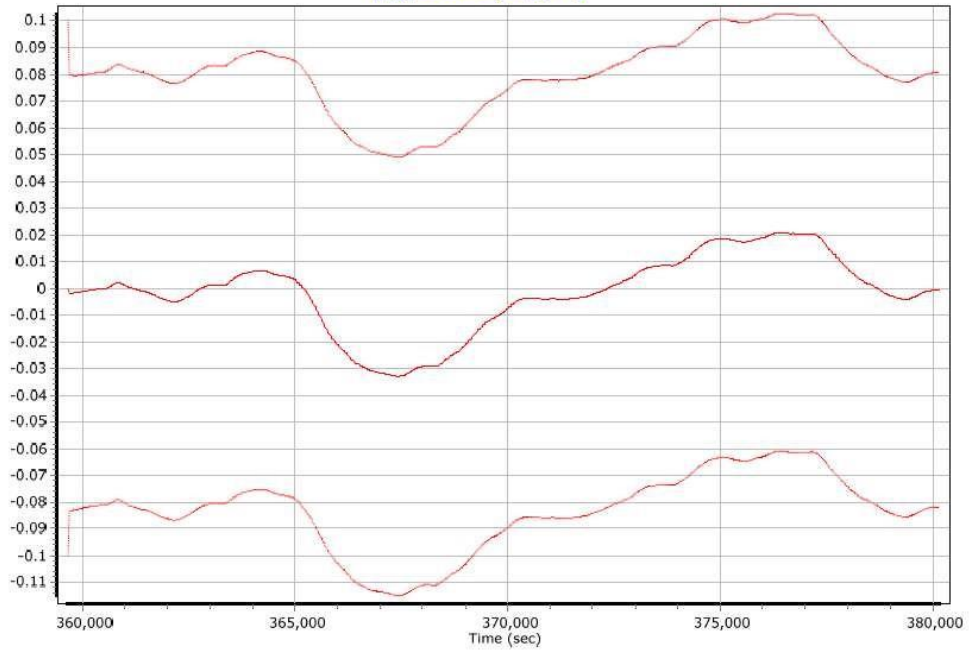
**z accelerometer bias (micro-g)**



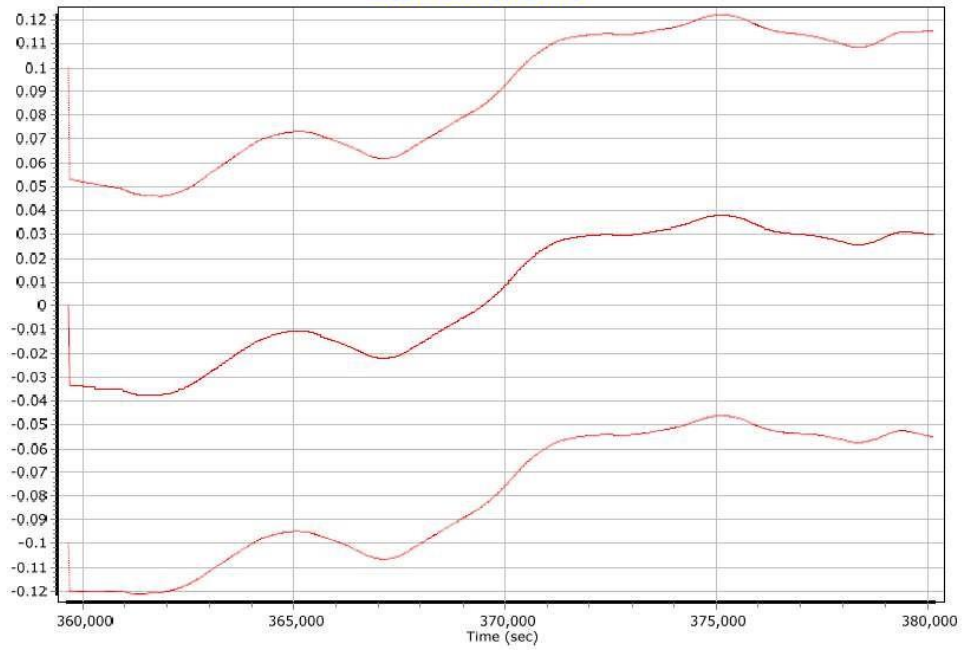
**x gyro bias (deg/hr)**

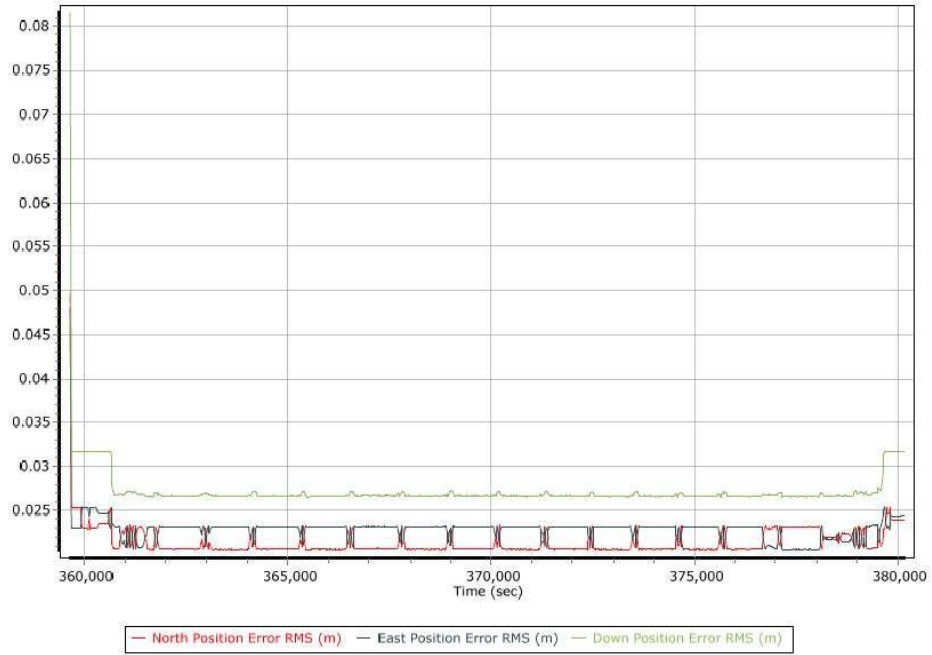


**y gyro bias (deg/hr)**



**z gyro bias (deg/hr)**

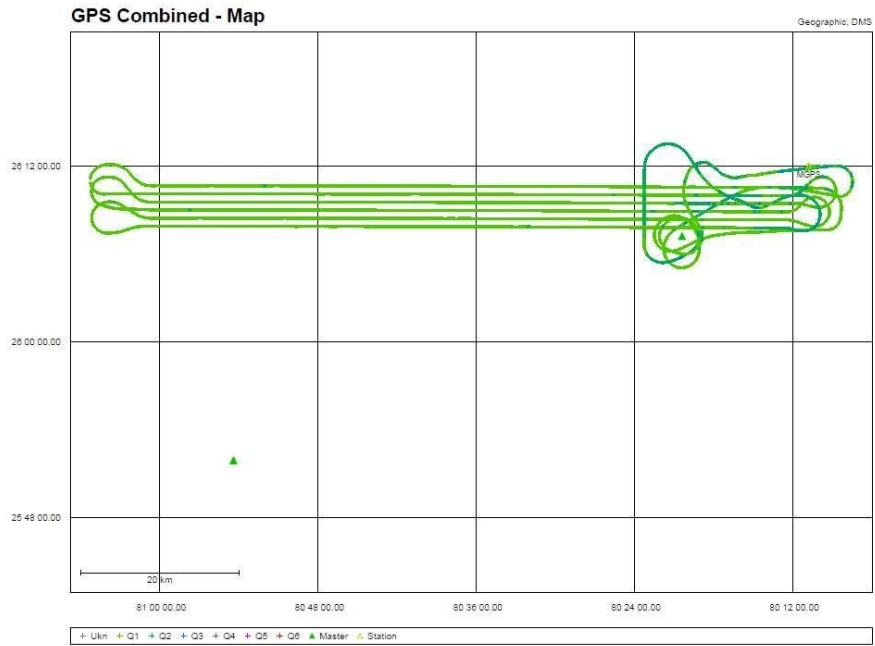




# 3818334a GNSS Processing

Project: 3818334a

GrafNav v8.50.4320

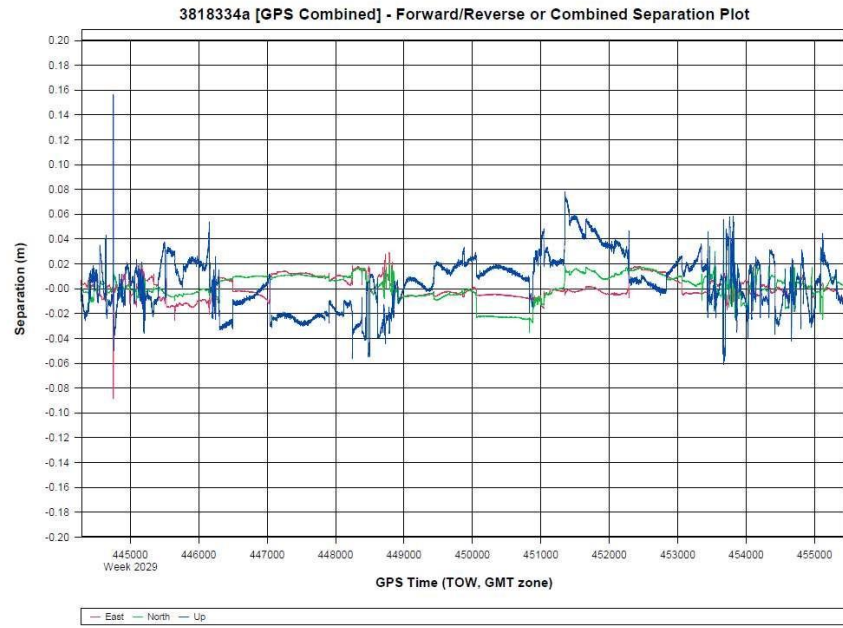


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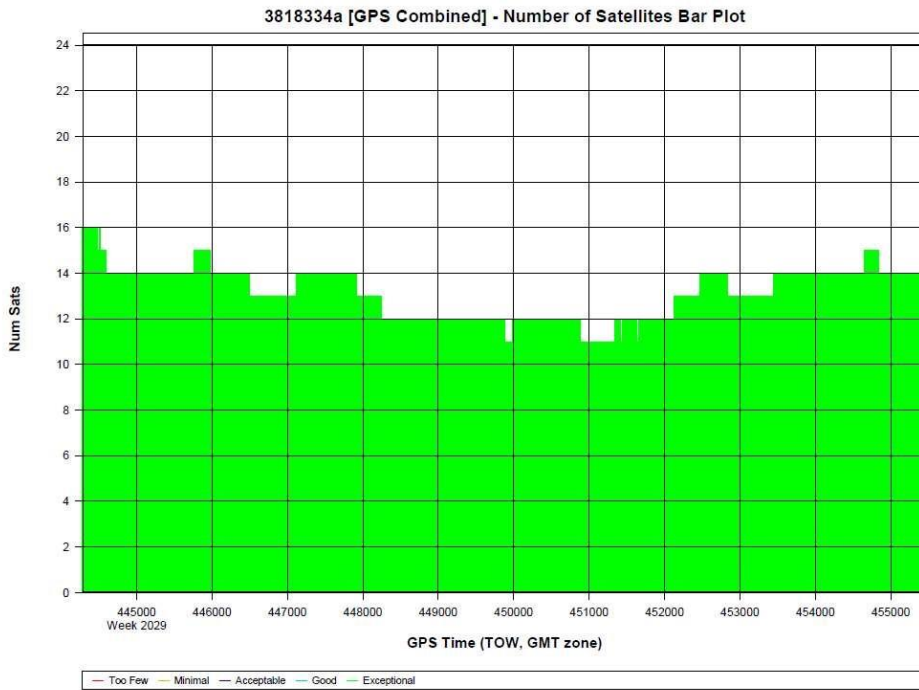
Project: 3818334a

GrafNav v8.50.4320



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## Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\3149 FortLauderdale From EX484a\FieldData\LIDAR\3818334a\05\_INS-GPS\_PROC\01\_POS\3818334a\3818334a\GNSS\3818334a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 11197  
No processed position: 0  
Missing Fwd or Rev: 6  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0176 (m)  
C/A Code: 0.73 (m)  
L1 Doppler: 0.547 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.008 (m)  
North: 0.010 (m)  
Height: 0.022 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (11190 occurrences):  
East: 0.008 (m)  
North: 0.010 (m)  
Height: 0.022 (m)

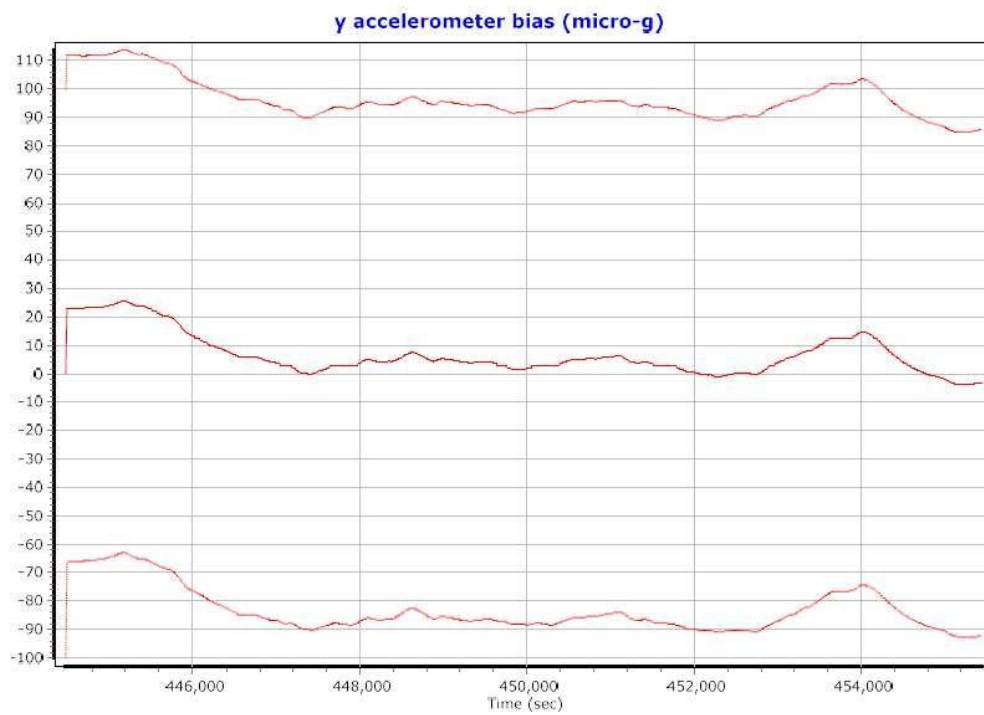
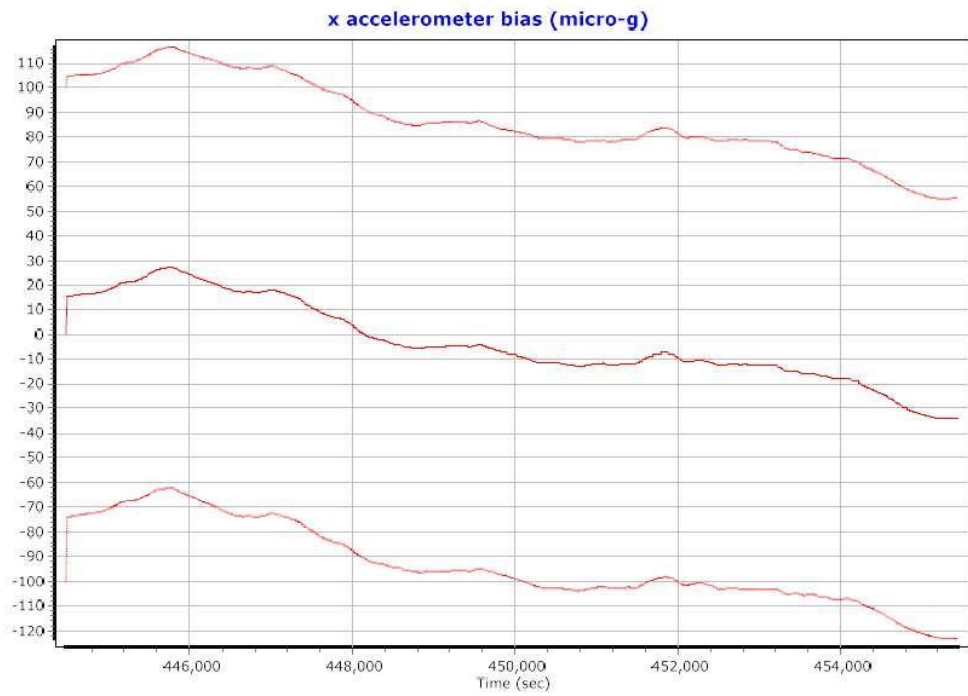
Quality Number Percentages:  
Q 1: 80.3 %  
Q 2: 19.3 %  
Q 3: 0.4 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.30 m: 0.0 %  
0.30 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

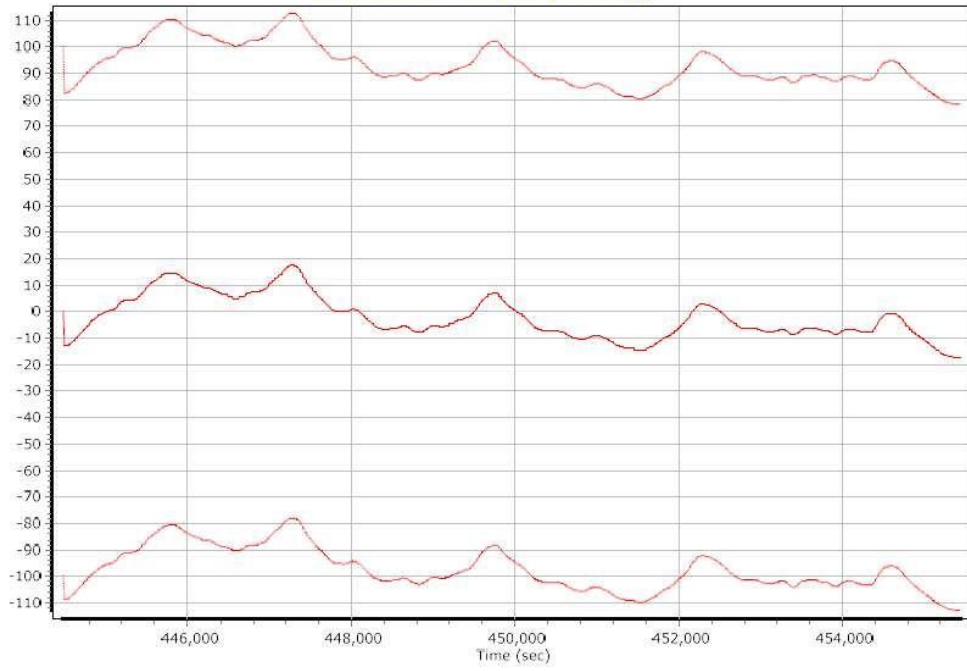
Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

Baseline Distances:  
Maximum: 65.054 (km)  
Minimum: 6.710 (km)  
Average: 28.323 (km)  
First Epoch: 32.982 (km)  
Last Epoch: 33.071 (km)

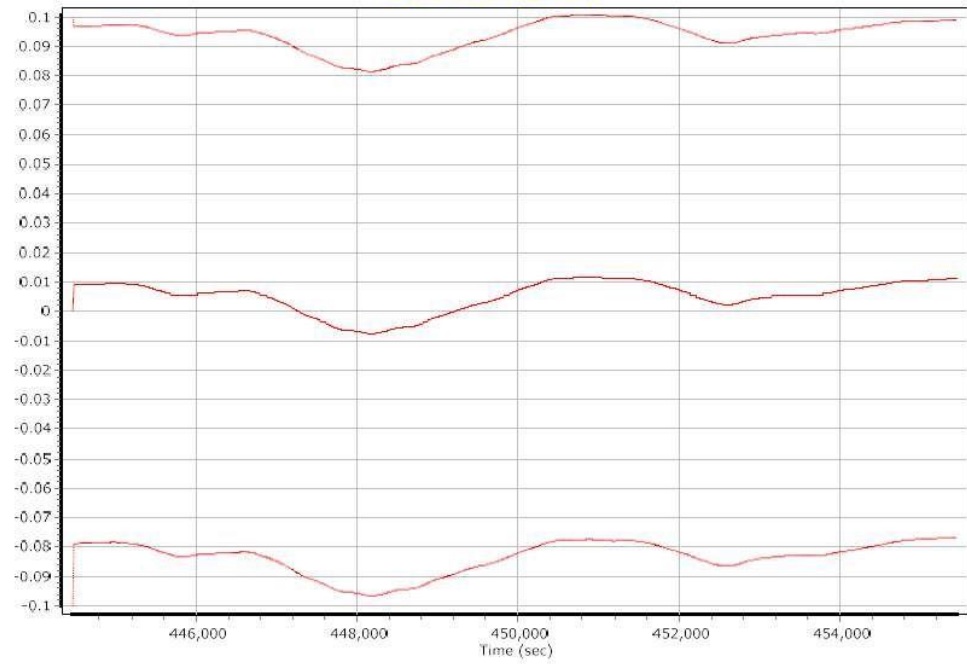
# Mission 4 – 3818334a Sensor Errors



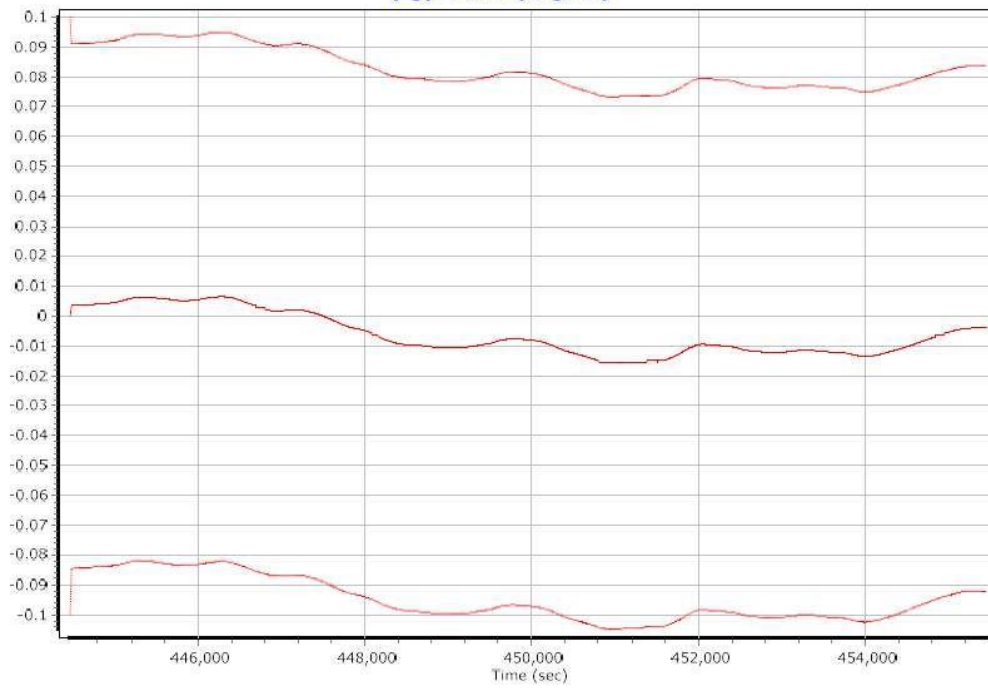
**z accelerometer bias (micro-g)**



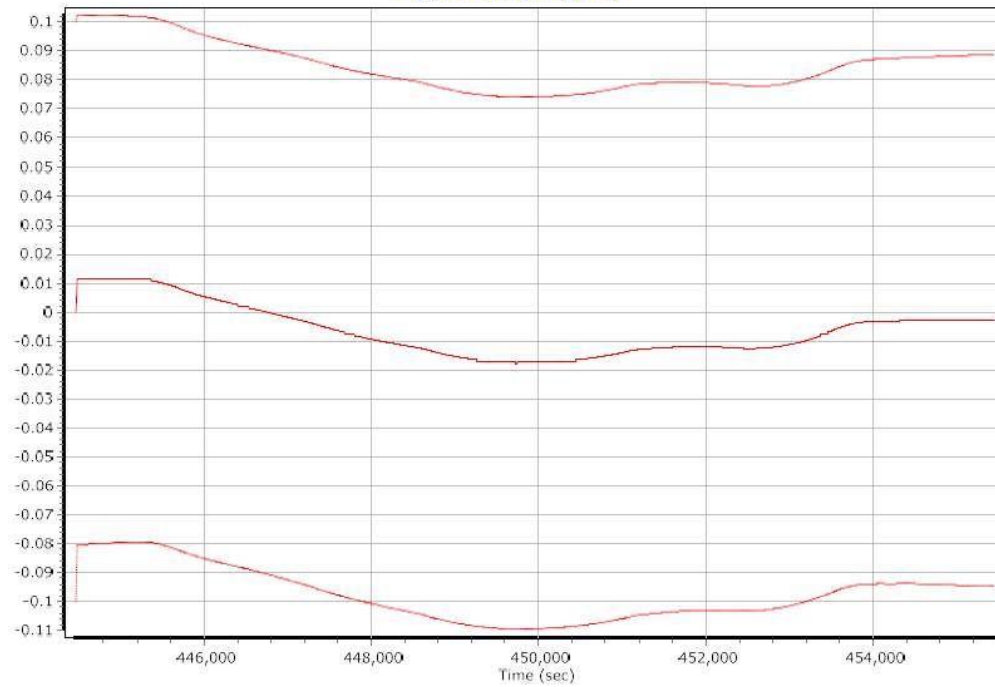
**x gyro bias (deg/hr)**

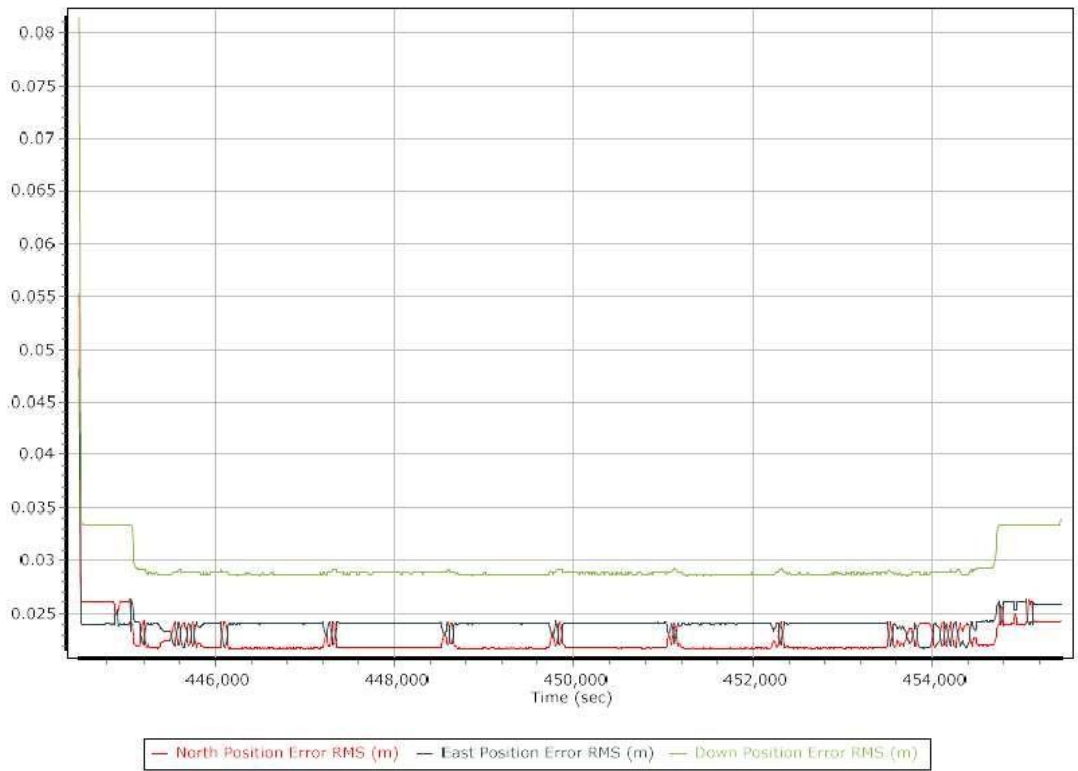


**y gyro bias (deg/hr)**



**z gyro bias (deg/hr)**

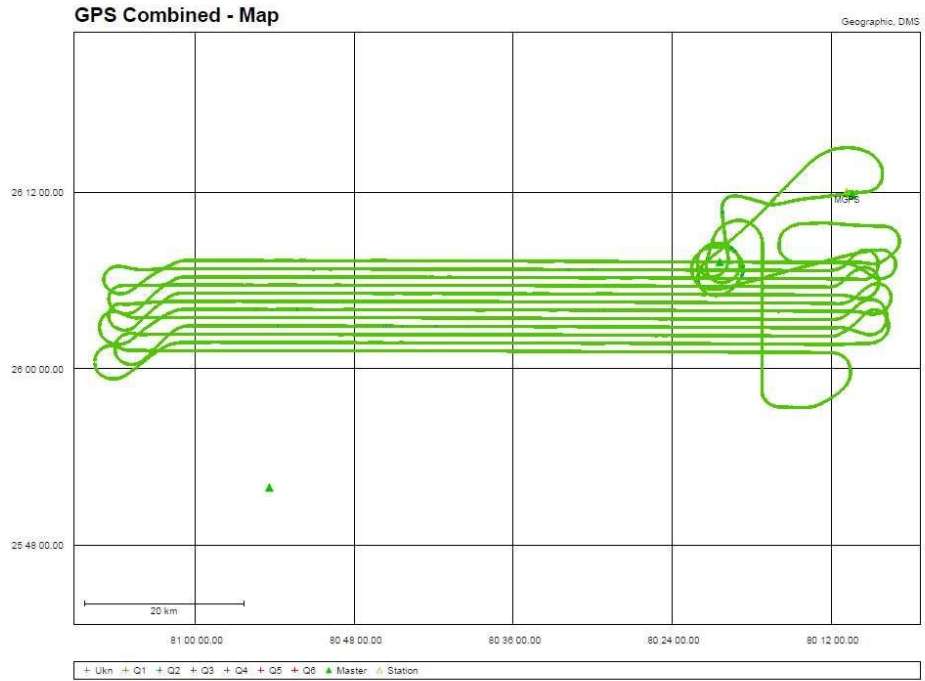




# 3818340a GNSS Processing

Project: 3818340a

GrafNav v8.50.4320

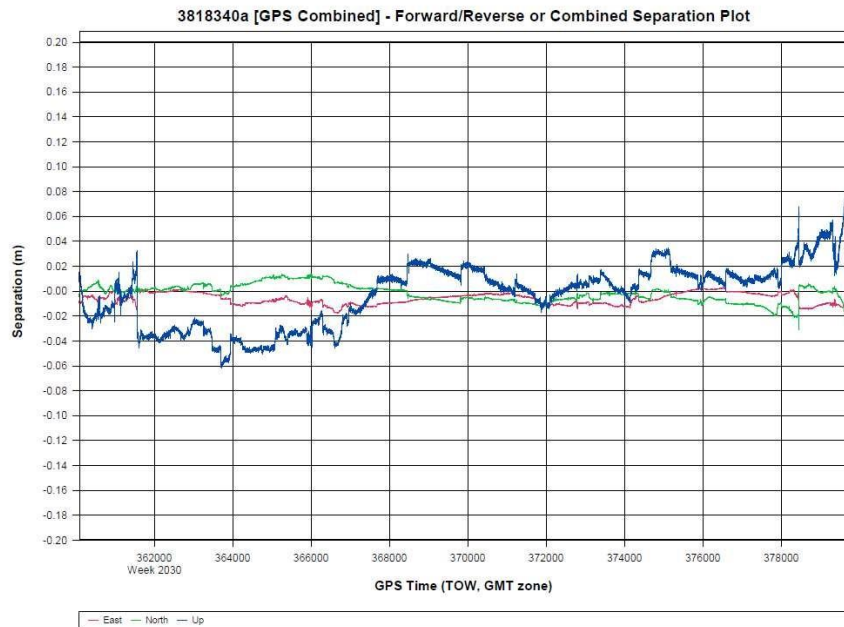


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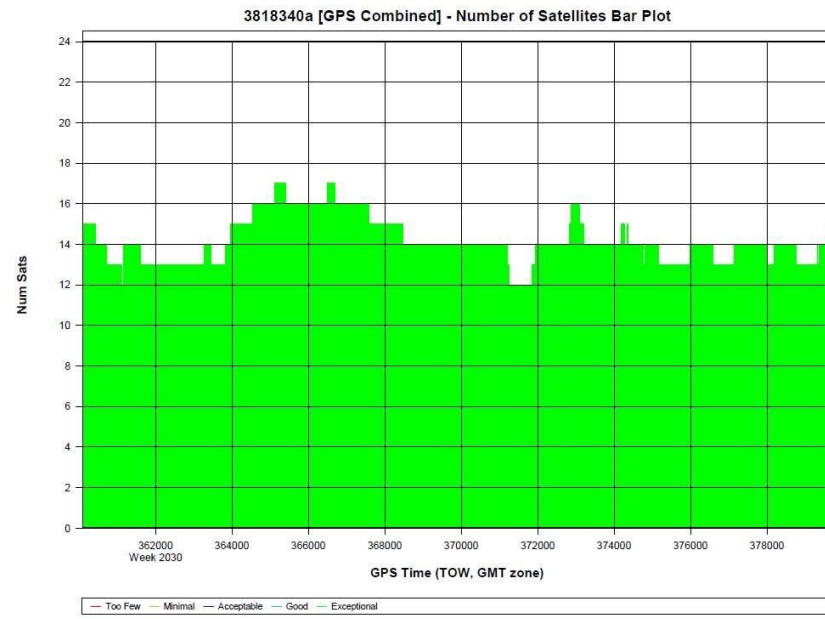
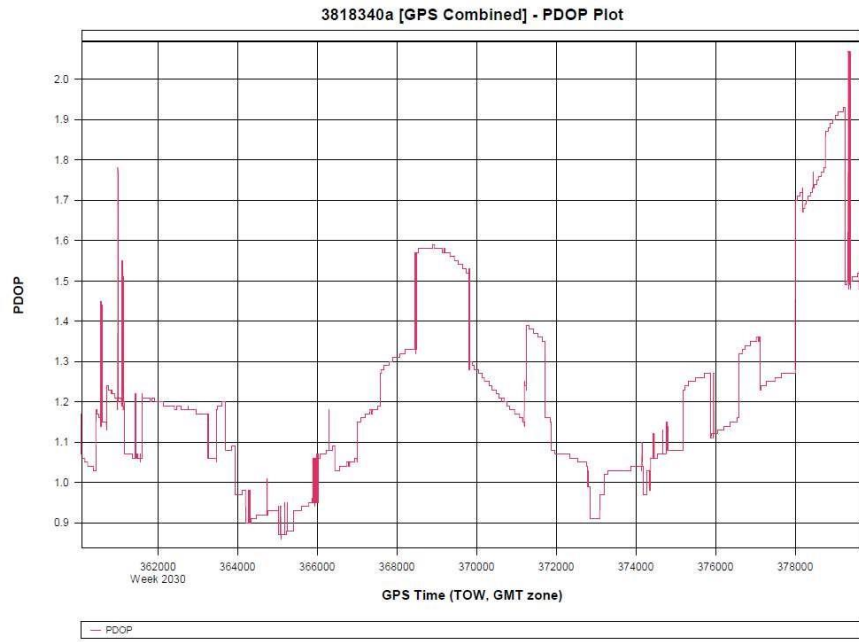
Project: 3818340a

GrafNav v8.50.4320



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## Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\3149\_FortLauderdale\_From\_EX484a\FieldData\LiDAR\3818340a\05\_INS-GPS\_PROC\01\_POS\3818340a\3818340a\GNSS\3818340a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 19626  
No processed position: 1  
Missing Fwd or Rev: 6  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0201 (m)  
C/A Code: 0.77 (m)  
L1 Doppler: 0.618 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.008 (m)  
North: 0.007 (m)  
Height: 0.025 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (19619 occurrences):  
East: 0.008 (m)  
North: 0.007 (m)  
Height: 0.025 (m)

Quality Number Percentages:  
Q 1: 99.5 %  
Q 2: 0.5 %  
Q 3: 0.0 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

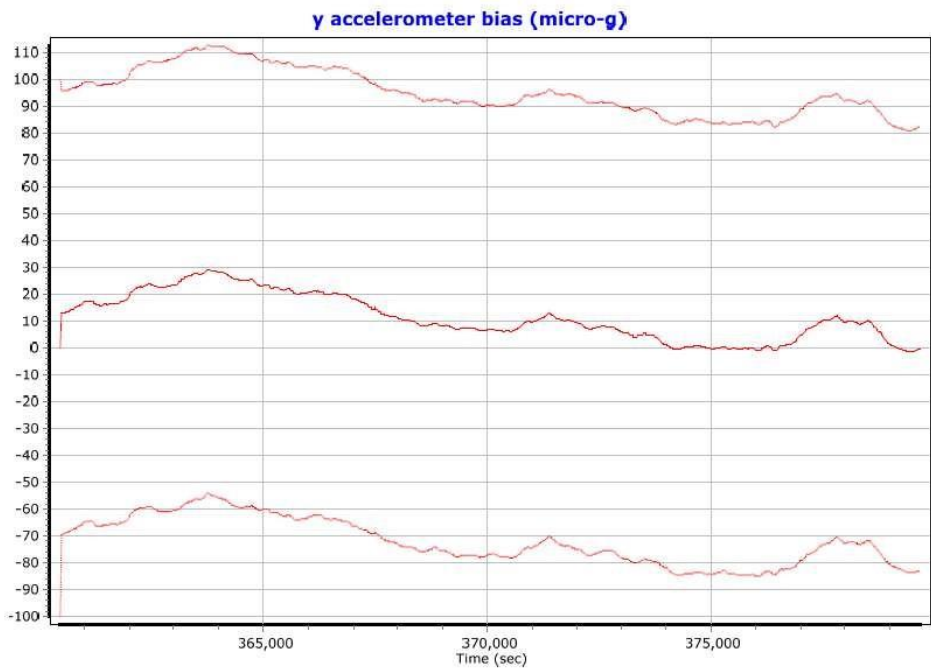
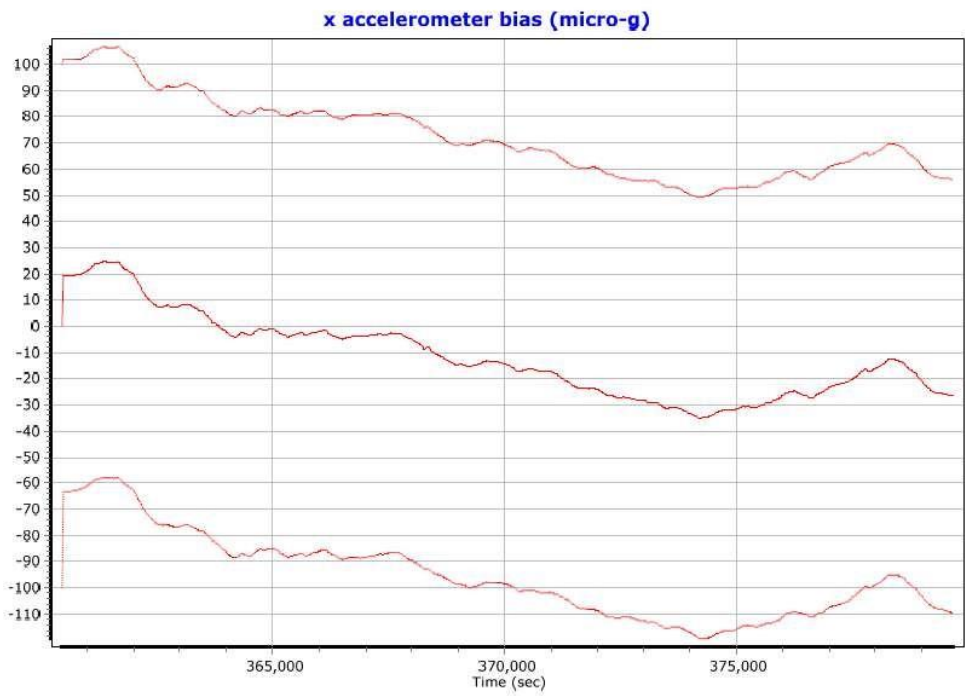
Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.30 m: 0.0 %  
0.30 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

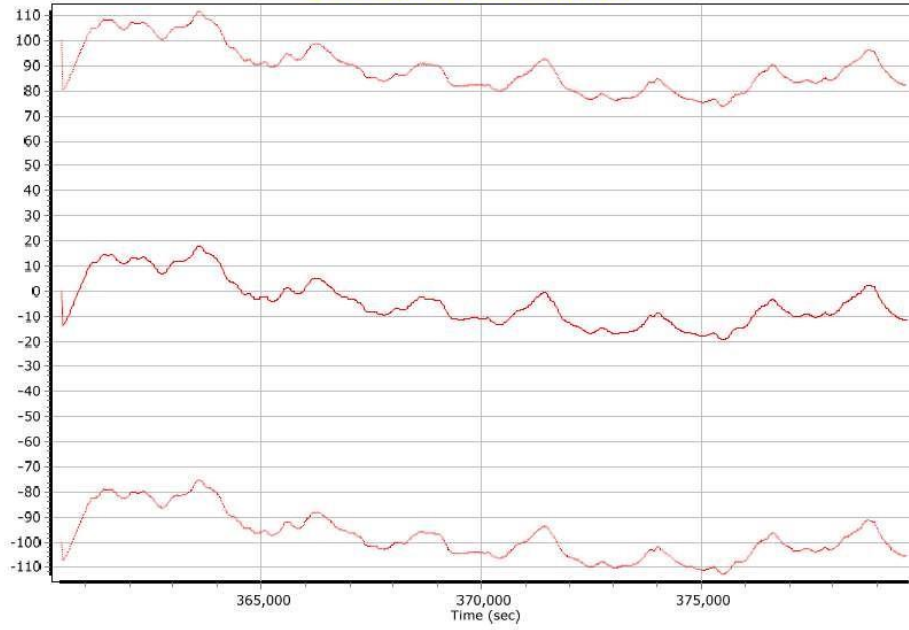
Baseline Distances:  
Maximum: 73.922 (km)  
Minimum: 1.339 (km)  
Average: 28.251 (km)  
First Epoch: 25.293 (km)  
Last Epoch: 25.088 (km)



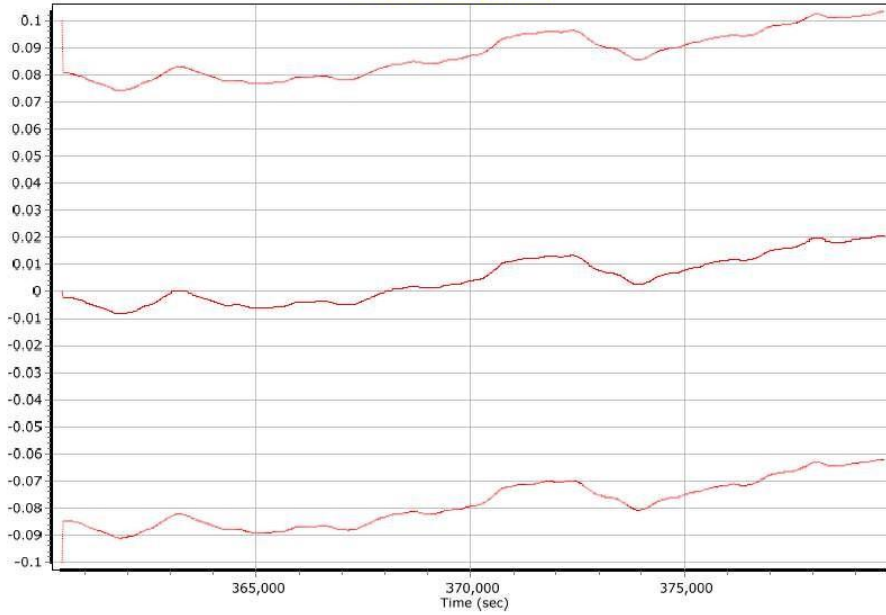
# Mission 5 – 3818340a Sensor Errors



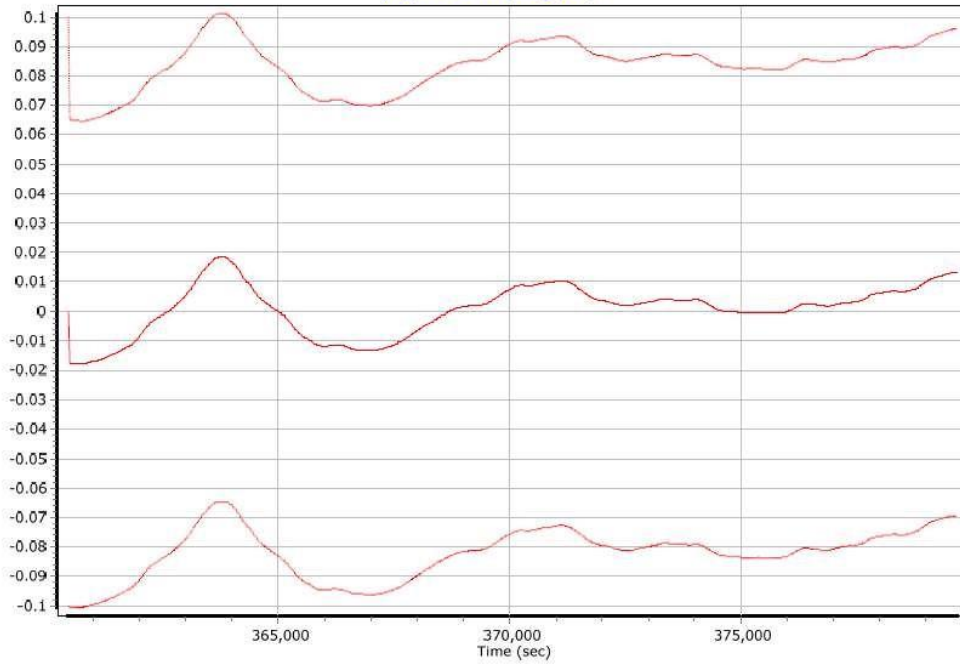
**z accelerometer bias (micro-g)**



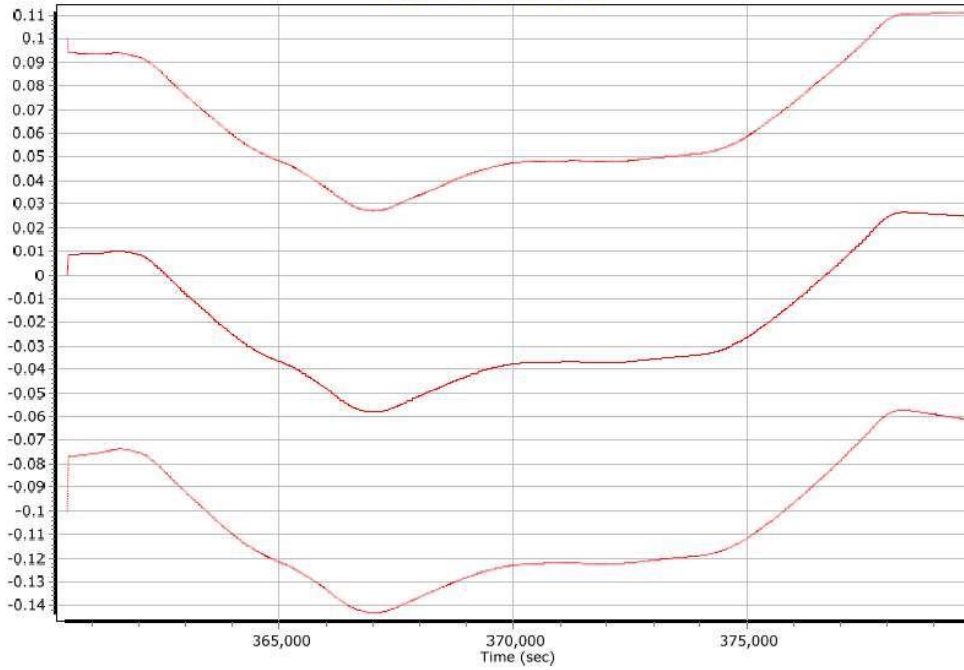
**x gyro bias (deg/hr)**

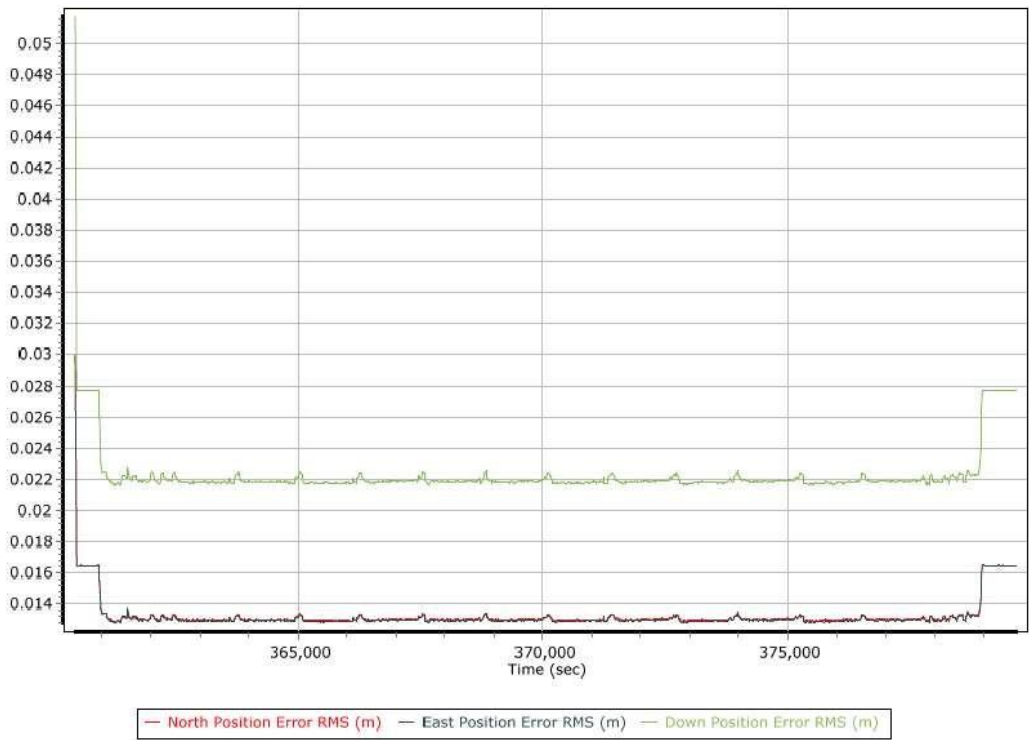


**y gyro bias (deg/hr)**

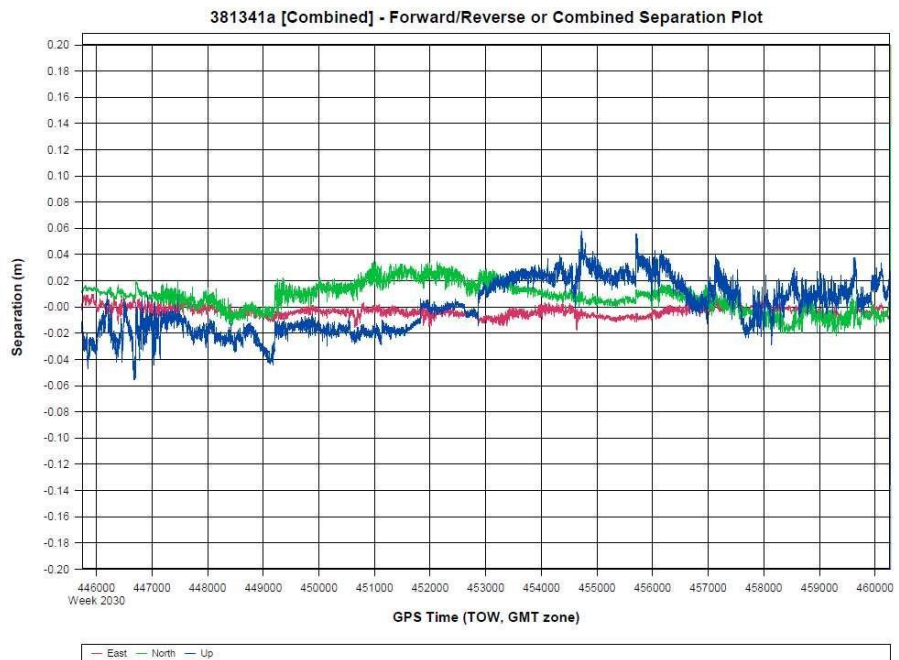
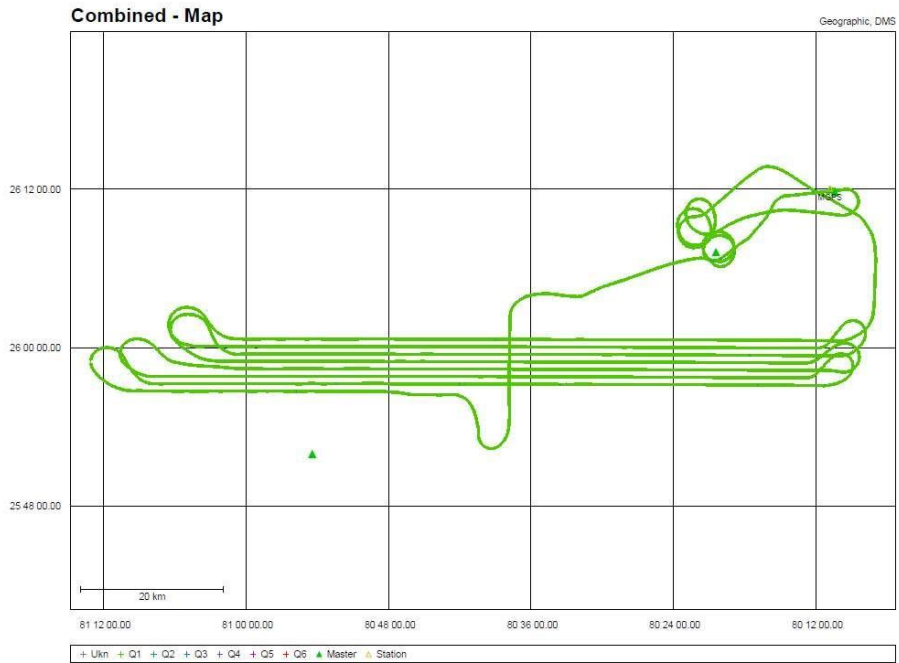


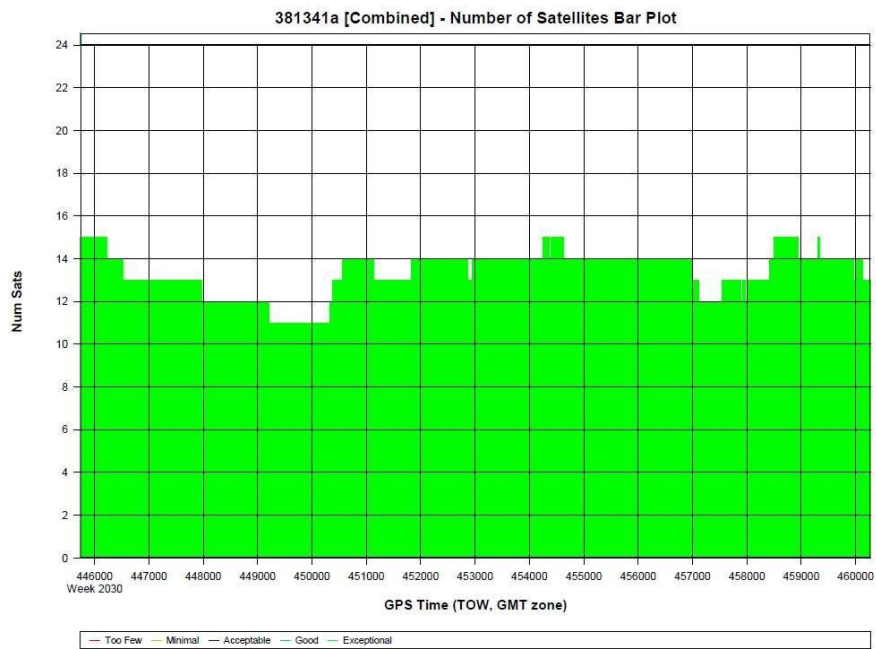
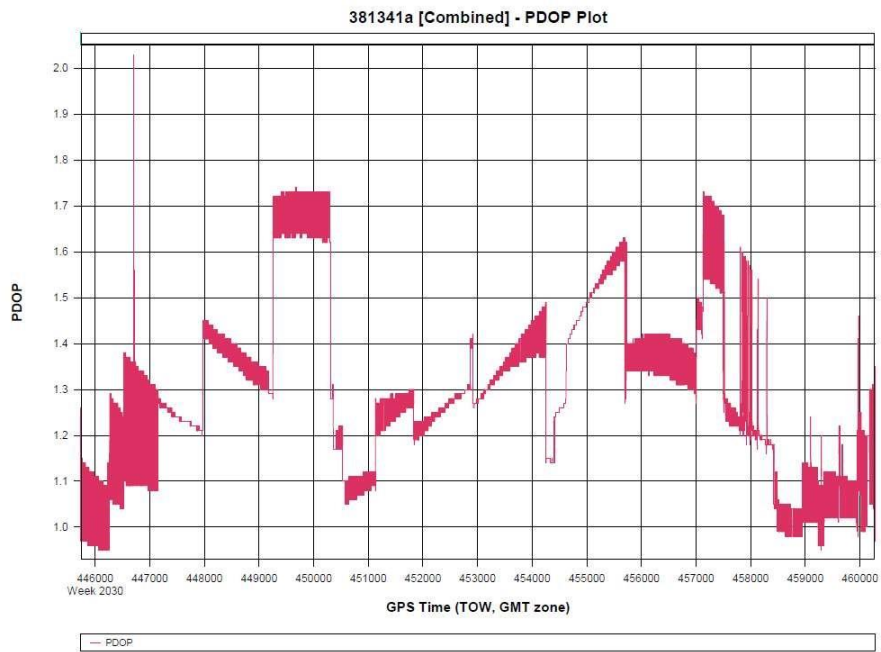
**z gyro bias (deg/hr)**





# 3818341a GNSS Processing





## Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\3149 FortLauderdale From EX484a\FieldData\LiDAR\3818341a\05\_INS-GPS\_PROC\01  
\_POS\3818341a\3818341a\GNSS\3818341a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 14546  
No processed position: 0  
Missing Fwd or Rev: 4  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0182 (m)  
C/A Code: 0.74 (m)  
L1 Doppler: 0.566 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.005 (m)  
North: 0.013 (m)  
Height: 0.020 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (14541 occurrences):  
East: 0.005 (m)  
North: 0.013 (m)  
Height: 0.020 (m)

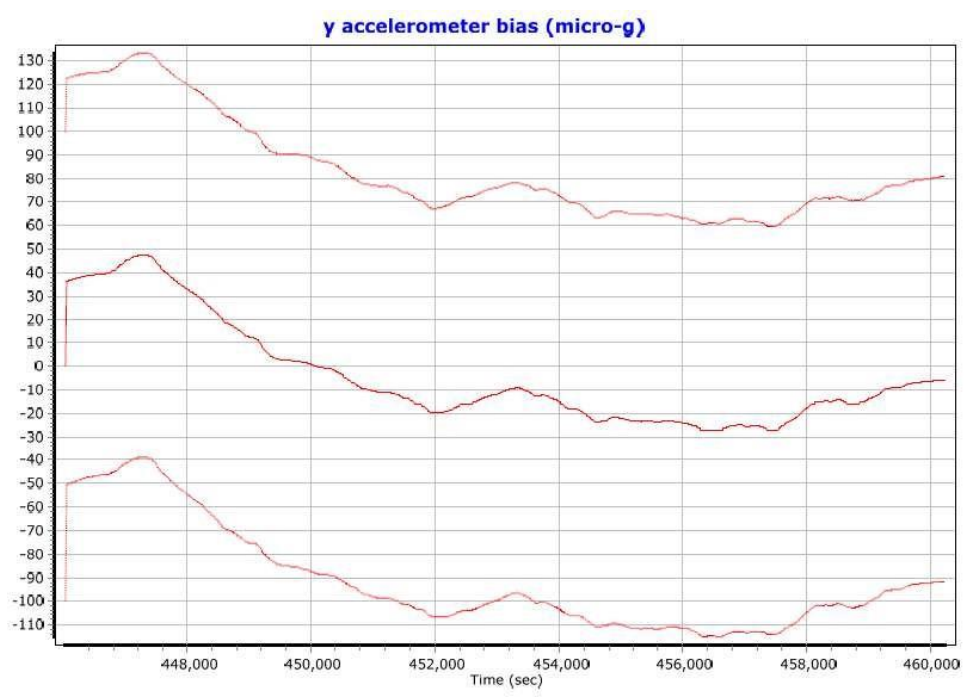
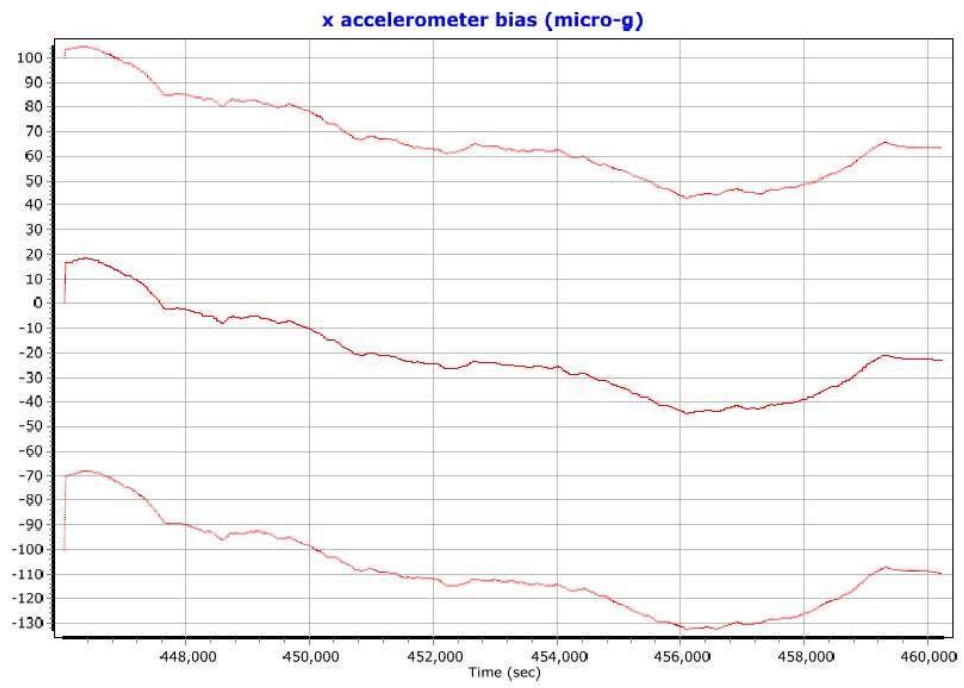
Quality Number Percentages:  
Q 1: 98.9 %  
Q 2: 1.1 %  
Q 3: 0.0 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.30 m: 0.0 %  
0.30 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

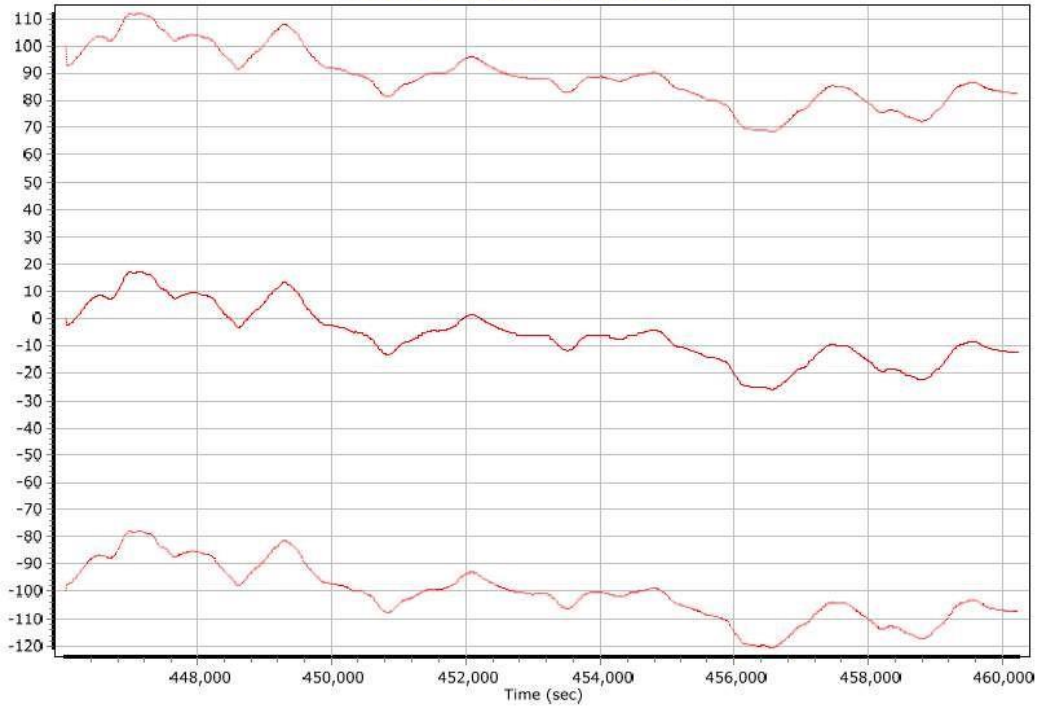
Baseline Distances:  
Maximum: 82.633 (km)  
Minimum: 1.351 (km)  
Average: 31.911 (km)  
First Epoch: 25.241 (km)  
Last Epoch: 25.227 (km)

# Mission 6 – 3818341a Sensor Errors

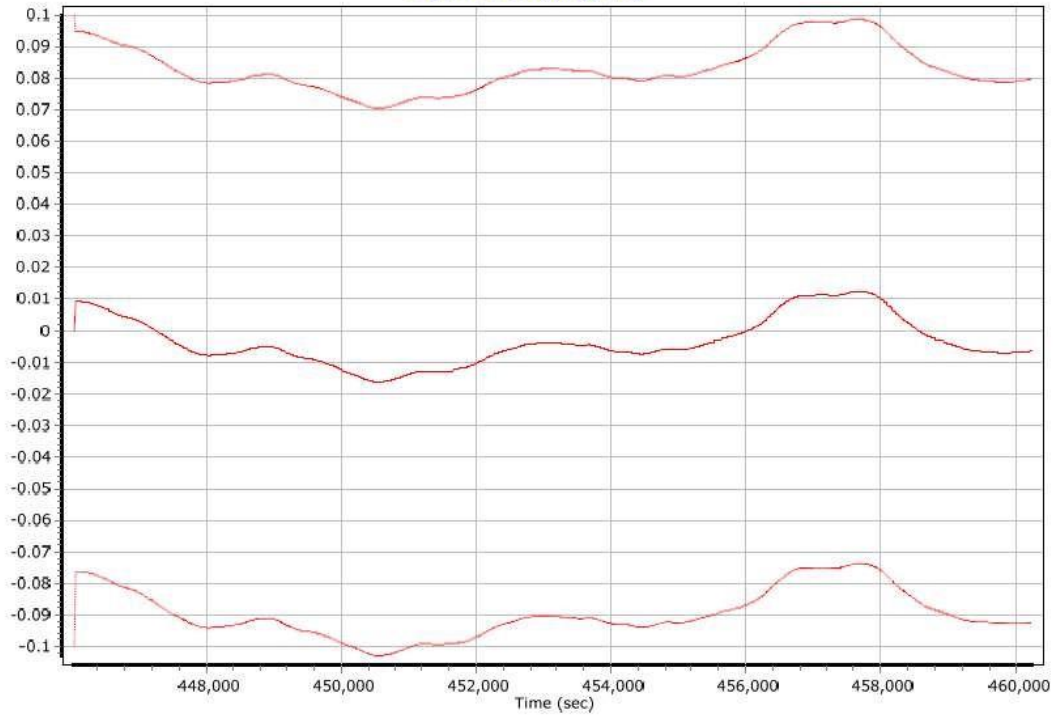




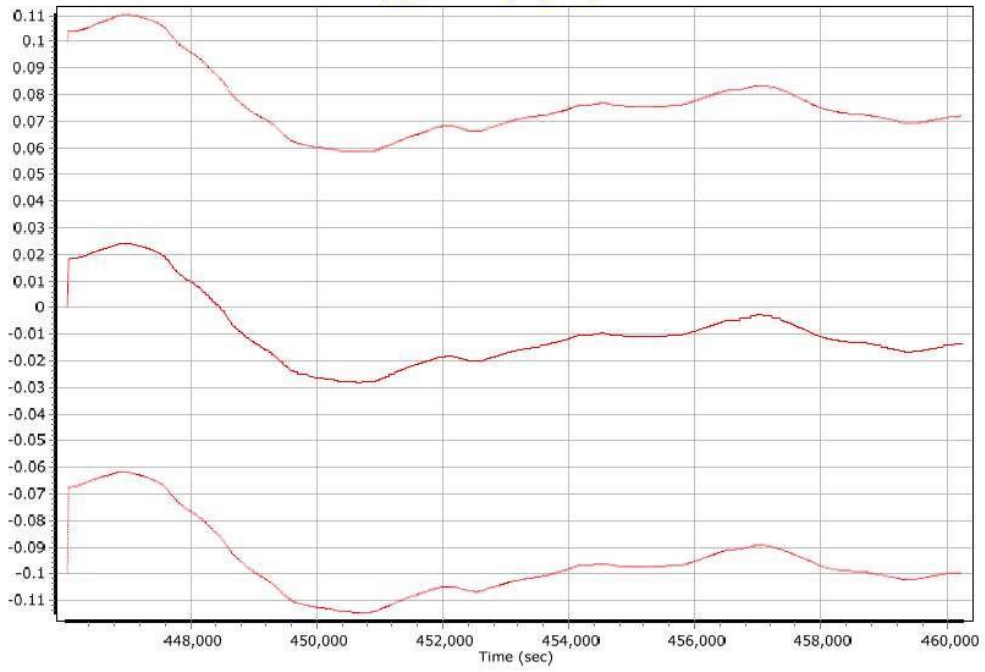
**z accelerometer bias (micro-g)**



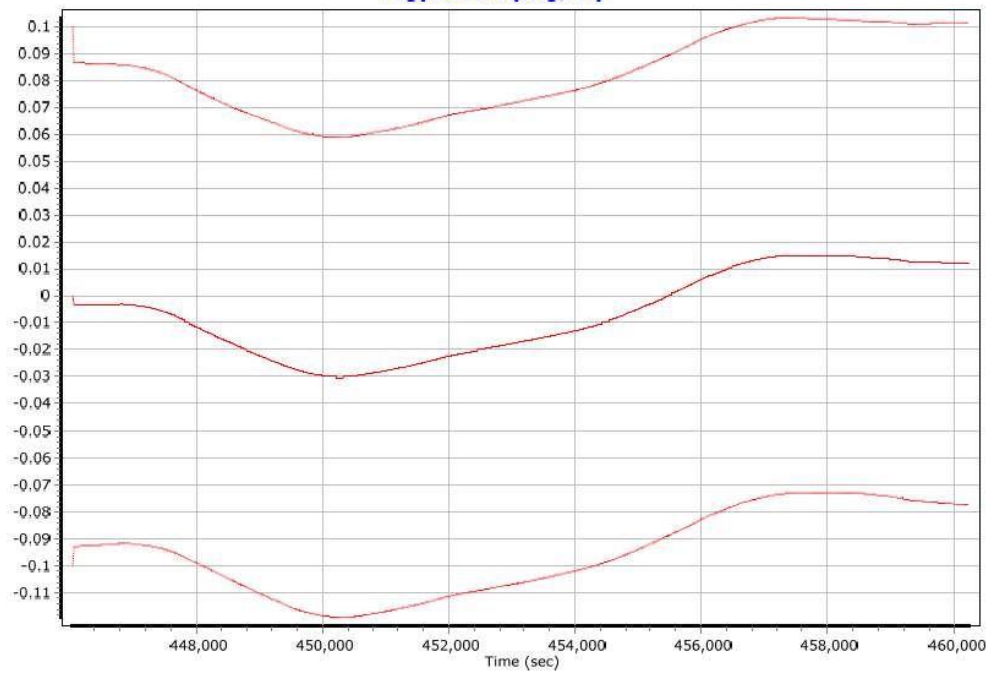
**x gyro bias (deg/hr)**

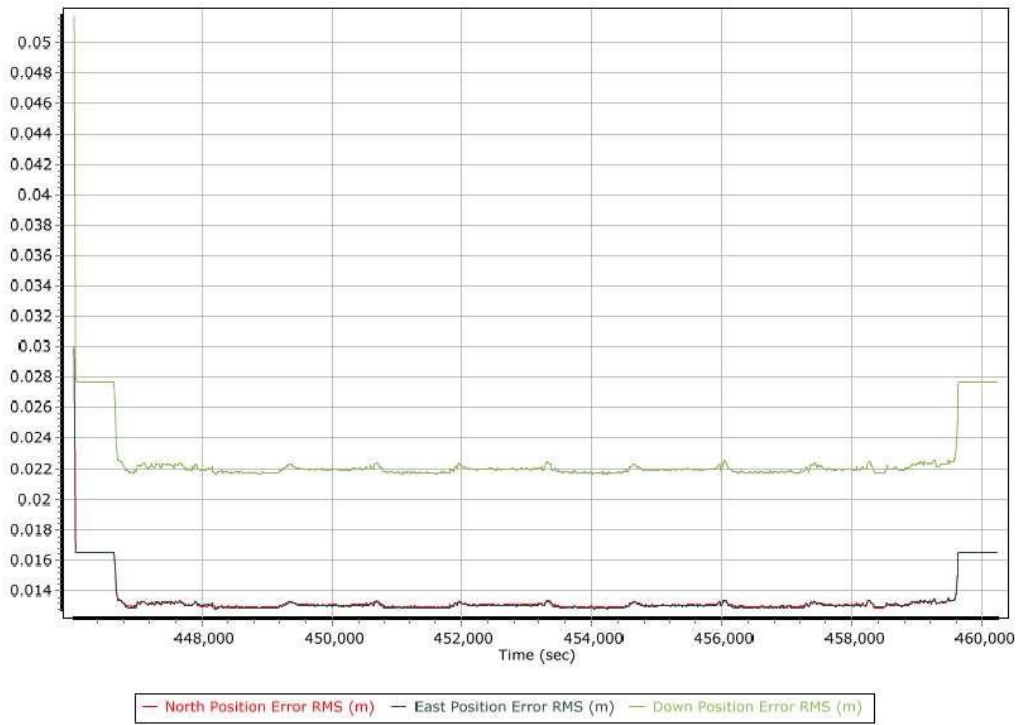


**y gyro bias (deg/hr)**



**z gyro bias (deg/hr)**

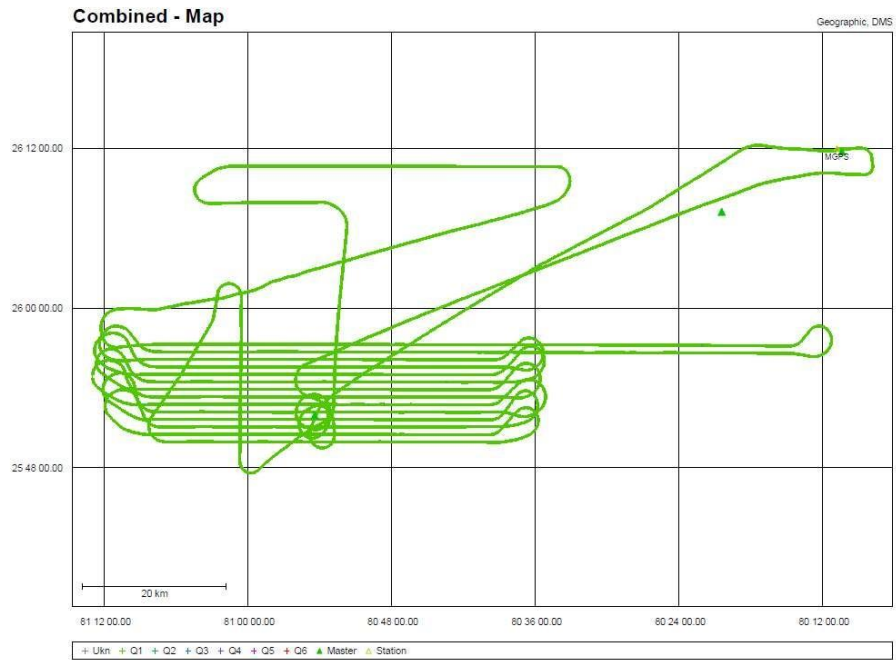




# 3818346a GNSS Processing

Project: 3818346a

GrafNav v8.50.4320

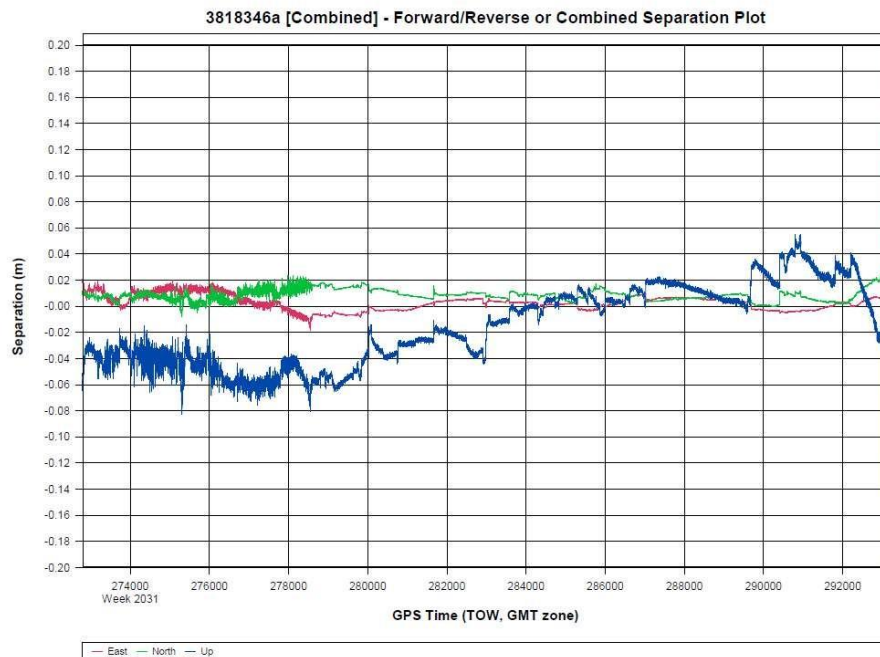


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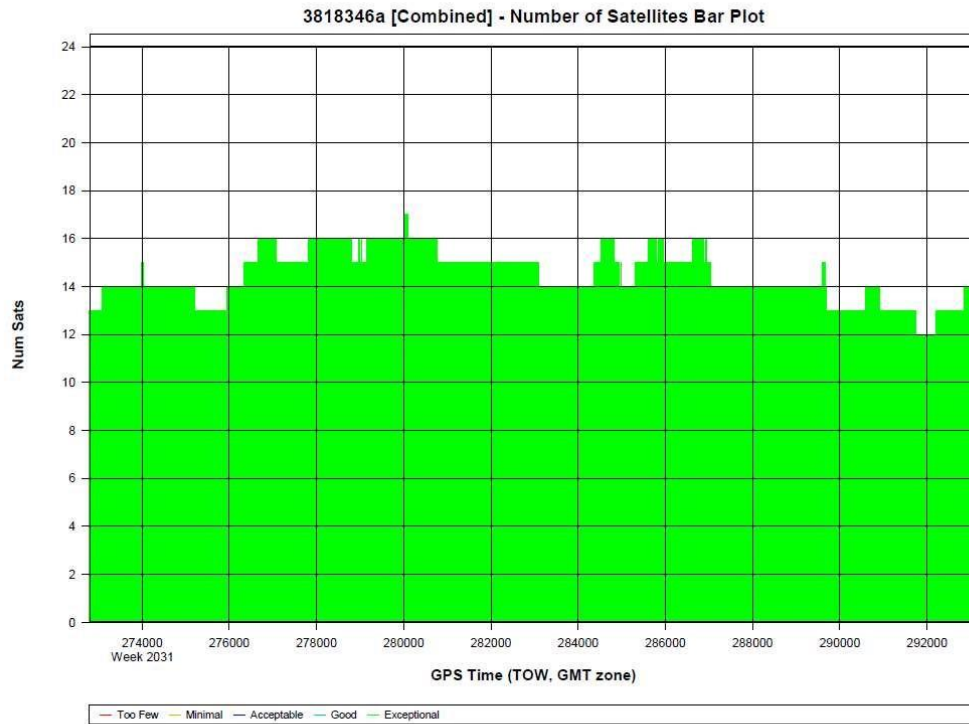
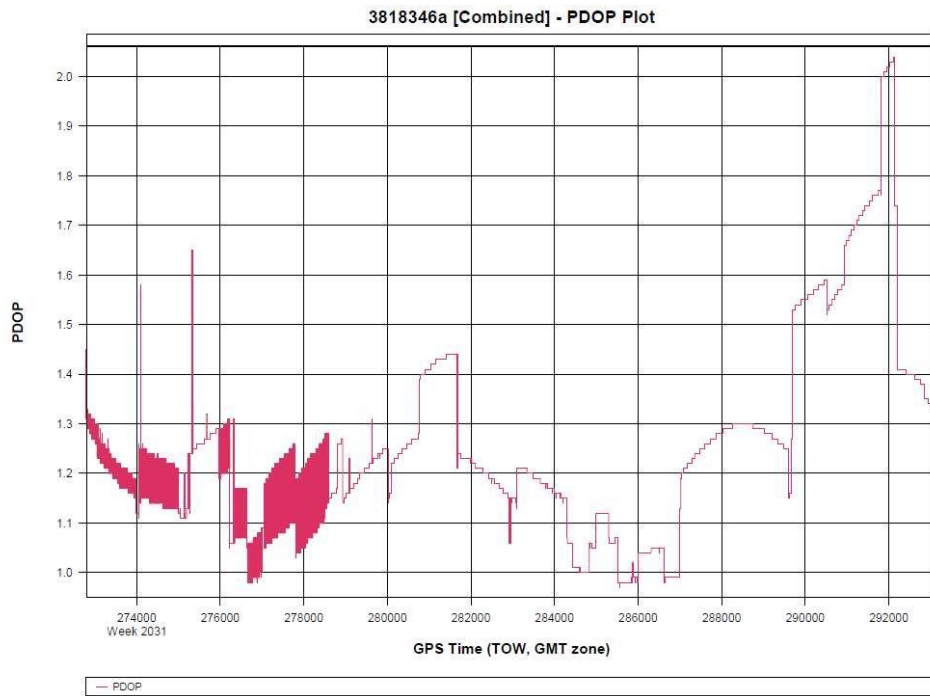
Project: 3818346a

GrafNav v8.50.4320



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## Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\3149\_FortLauderdale\_From\_EX484a\FieldData\LiDAR\3818346a\05\_INS-GPS\_PROC\01  
\_POS\3818346a\3818346a\GNSS\3818346a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 20368  
No processed position: 0  
Missing Fwd or Rev: 4  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0222 (m)  
C/A Code: 0.72 (m)  
L1 Doppler: 0.588 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.007 (m)  
North: 0.011 (m)  
Height: 0.039 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (20363 occurrences):  
East: 0.006 (m)  
North: 0.010 (m)  
Height: 0.034 (m)

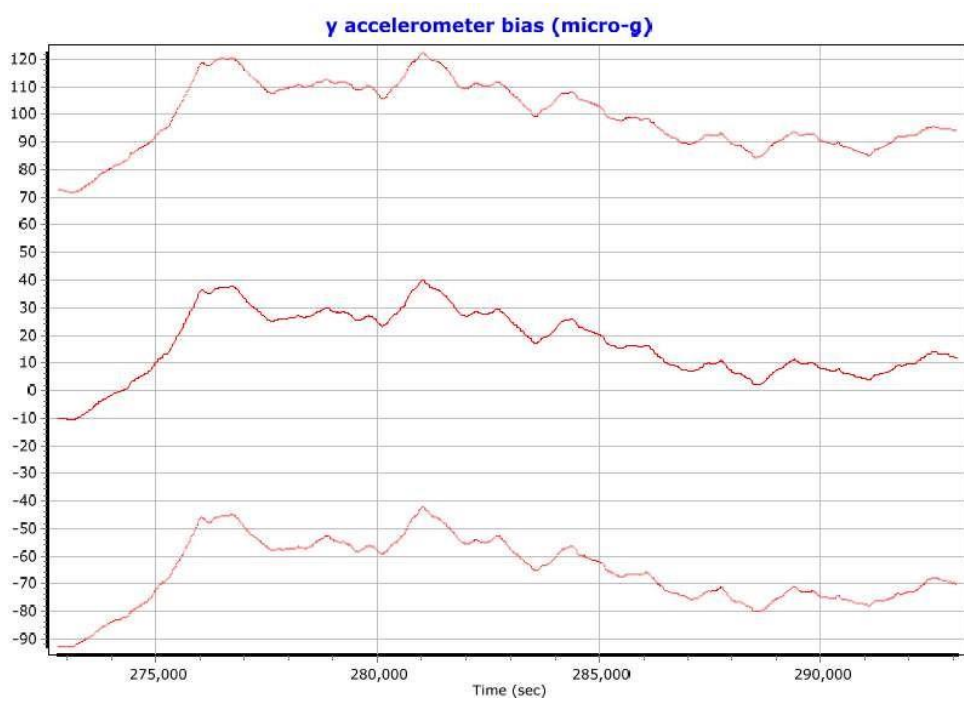
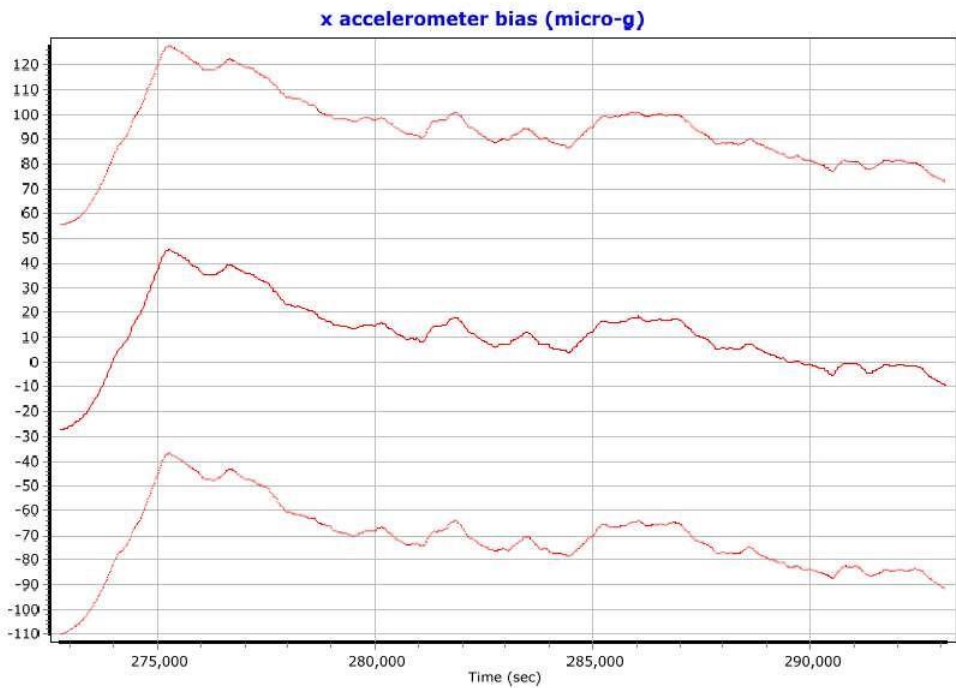
Quality Number Percentages:  
Q 1: 99.9 %  
Q 2: 0.1 %  
Q 3: 0.0 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.30 m: 0.0 %  
0.30 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

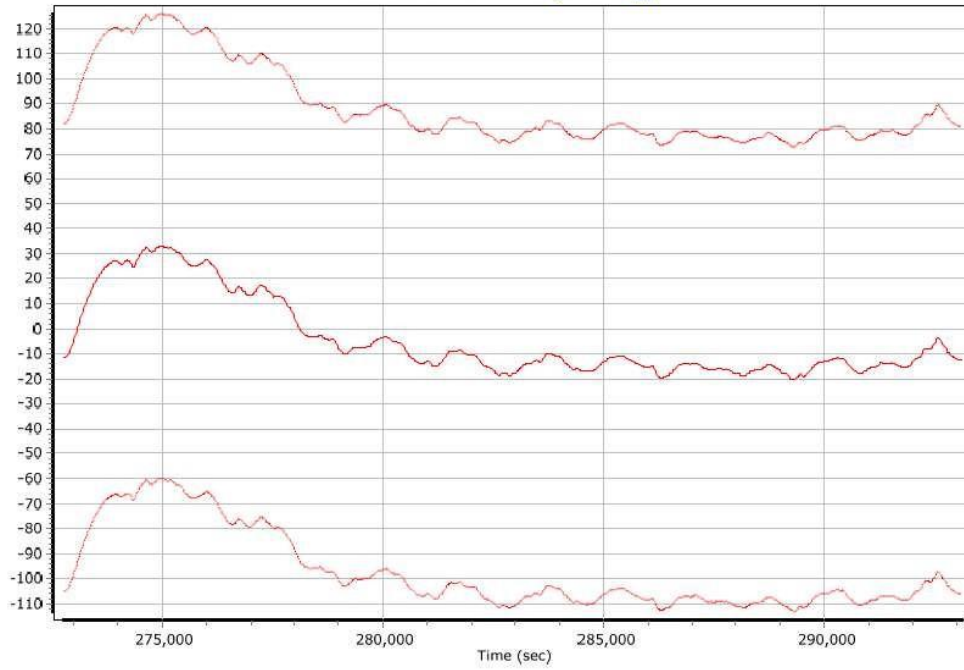
Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

Baseline Distances:  
Maximum: 75.850 (km)  
Minimum: 3.295 (km)  
Average: 41.218 (km)  
First Epoch: 32.957 (km)  
Last Epoch: 33.898 (km)

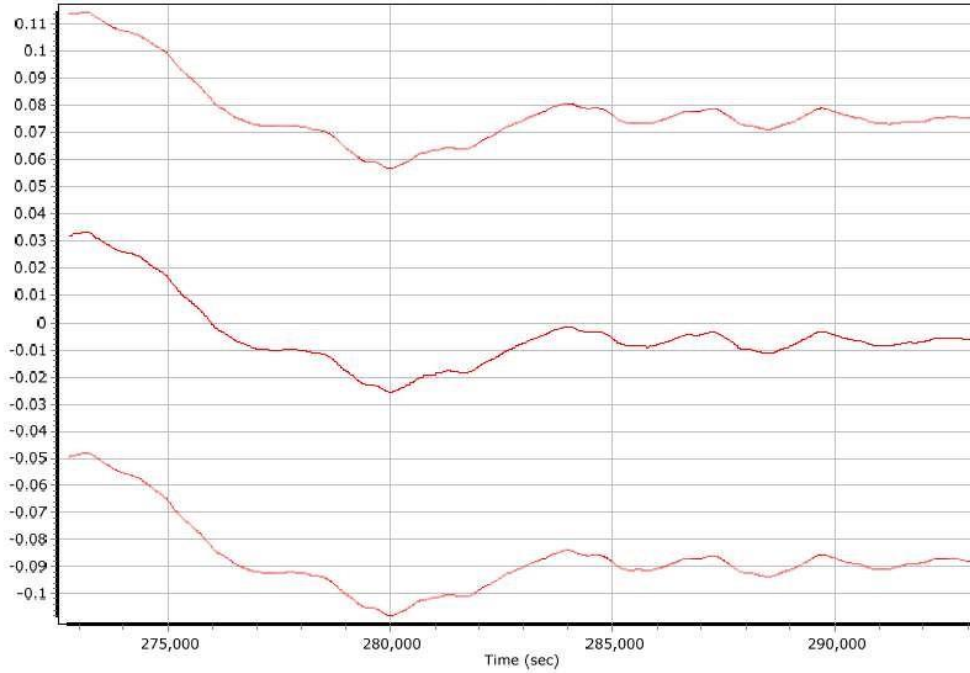
# Mission 7 – 3818346a Sensor Errors



**z accelerometer bias (micro-g)**

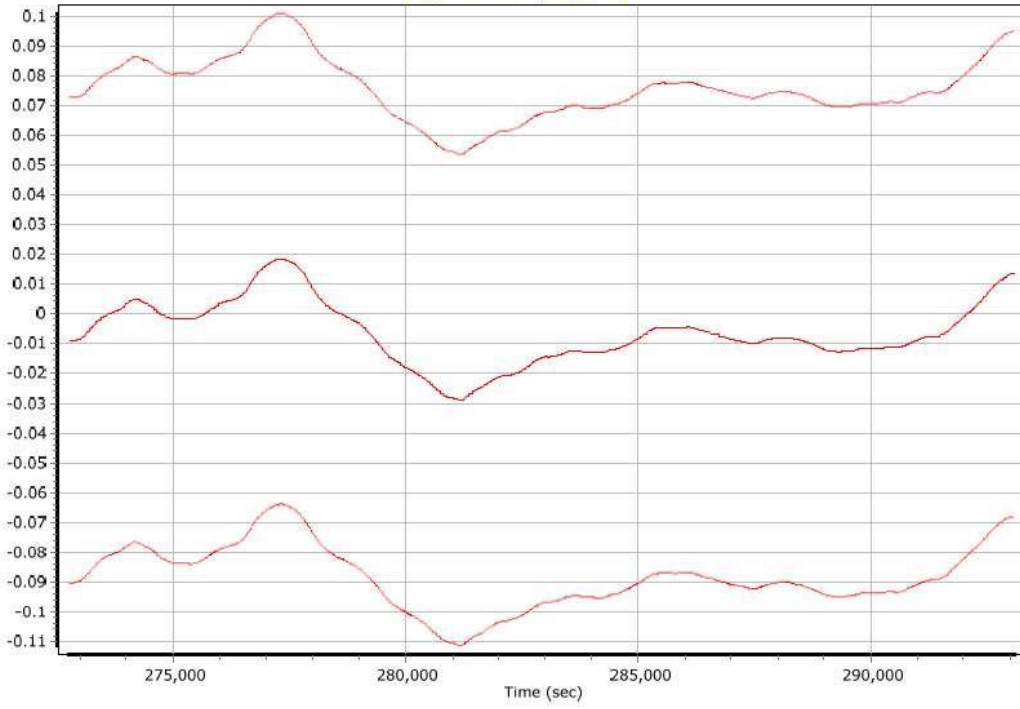


**x gyro bias (deg/hr)**

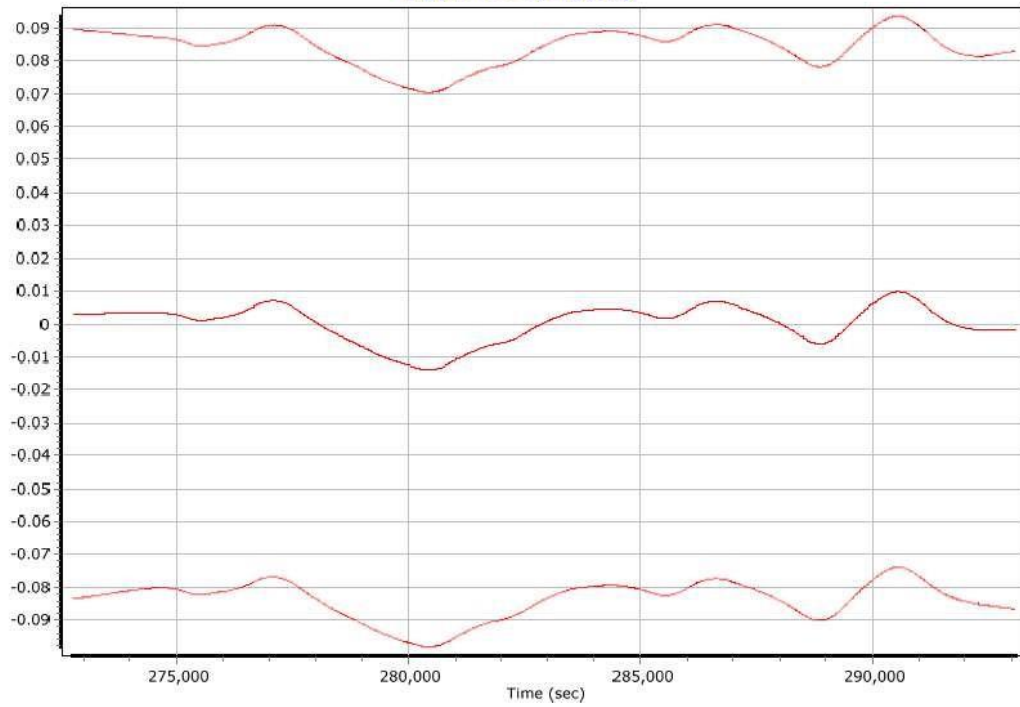




**y gyro bias (deg/hr)**



**z gyro bias (deg/hr)**

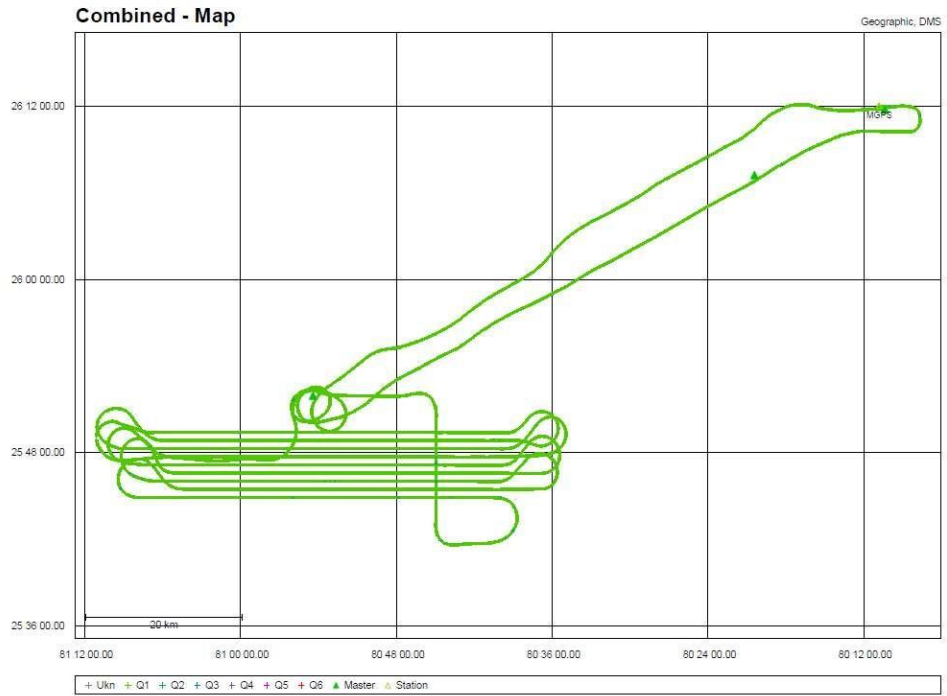




# 3818351a GNSS Processing

Project: 3818351a

GrafNav v8.50.4320

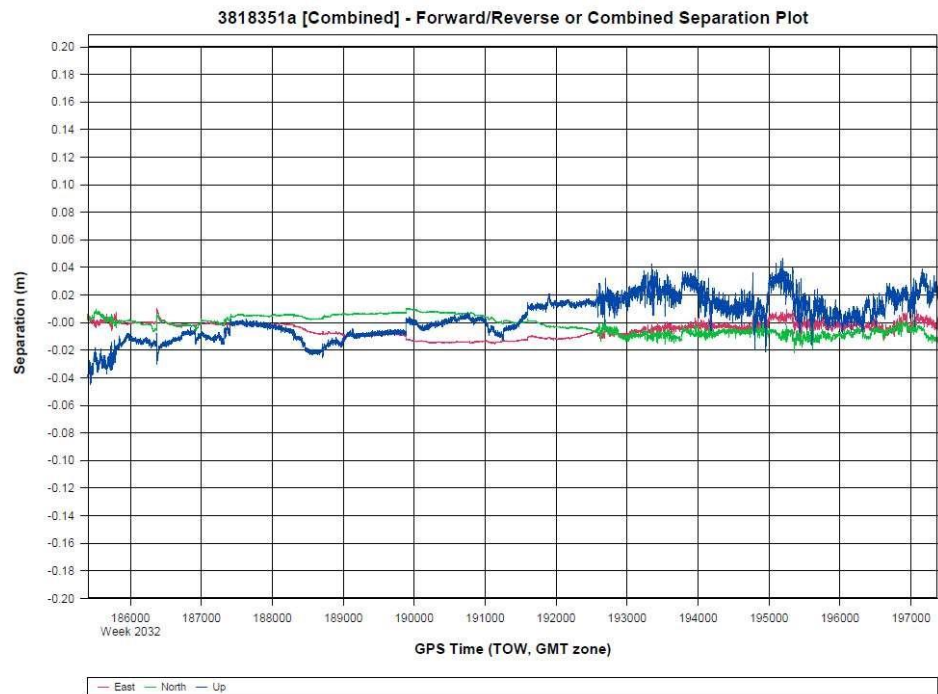


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Project: 3818351a

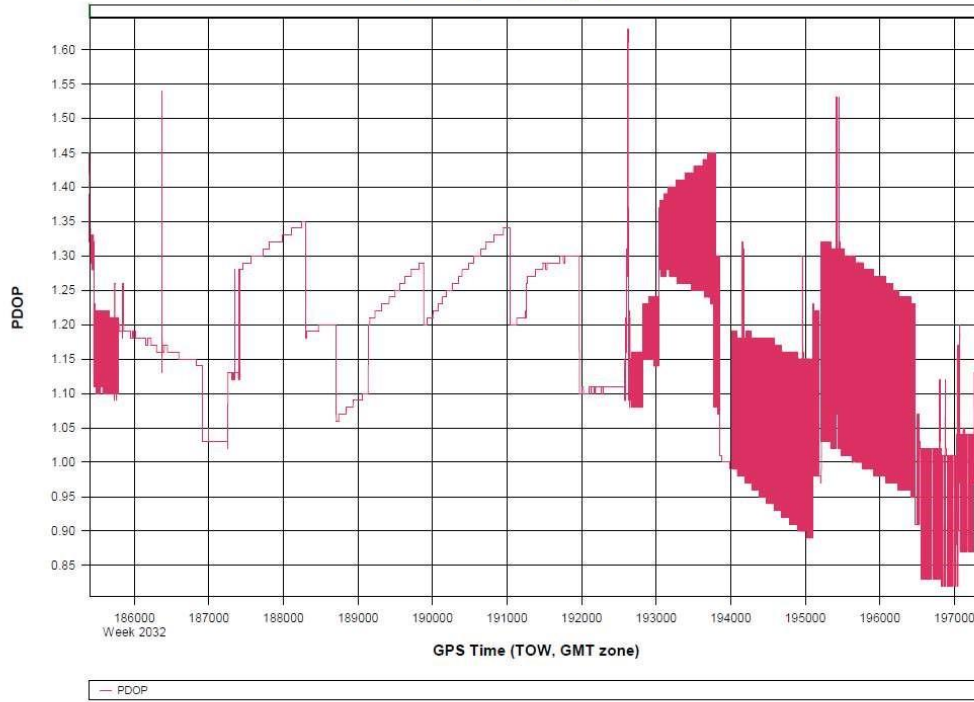
GrafNav v8.50.4320



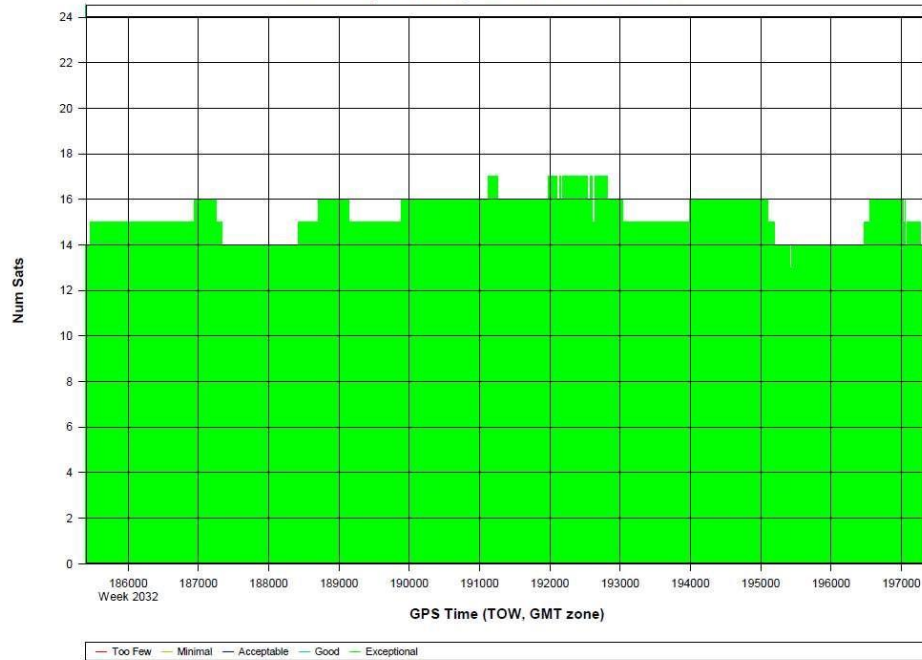
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3818351a [Combined] - PDOP Plot



3818351a [Combined] - Number of Satellites Bar Plot



## Processing Summary Information

Program: GrafNav  
Version: 8.50.4320  
Project: P:\3149\_FortLauderdale\_From\_EX484a\FieldData\LiDAR\3818351A\05\_INS-GPS\_PROC\01\_POS\3818351a\3818351a\GNSS\3818351a.gnv

Solution Type: Combined

Number of Epochs:  
Total in GPB file: 11989  
No processed position: 0  
Missing Fwd or Rev: 5  
With bad C/A code: 0  
With bad L1 Phase: 0

Measurement RMS Values:  
L1 Phase: 0.0171 (m)  
C/A Code: 0.74 (m)  
L1 Doppler: 0.641 (m/s)

Fwd/Rev Separation RMS Values:  
East: 0.007 (m)  
North: 0.007 (m)  
Height: 0.015 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (11984 occurrences):  
East: 0.007 (m)  
North: 0.007 (m)  
Height: 0.015 (m)

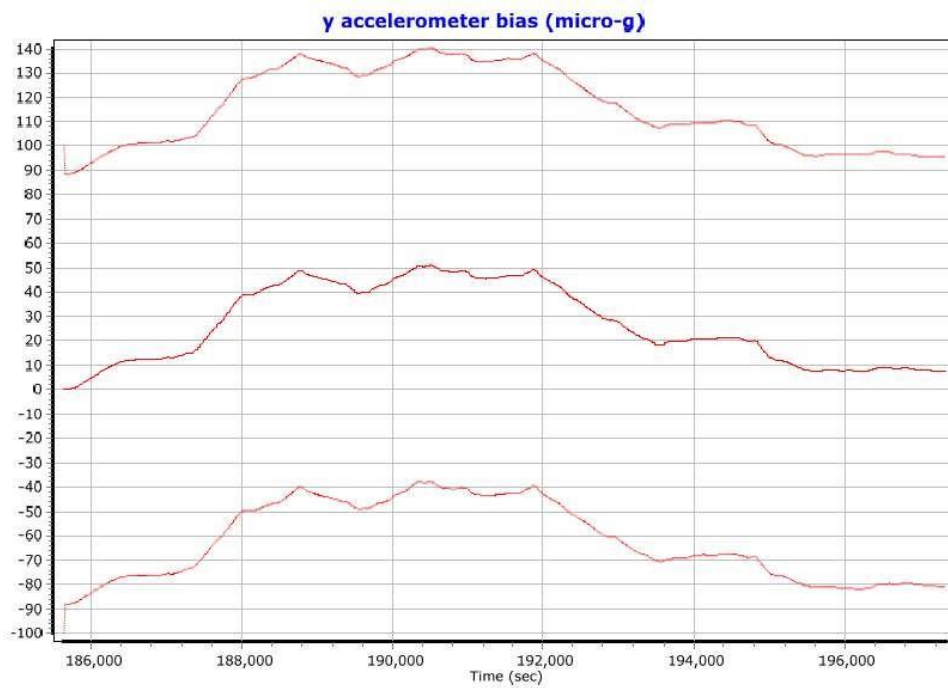
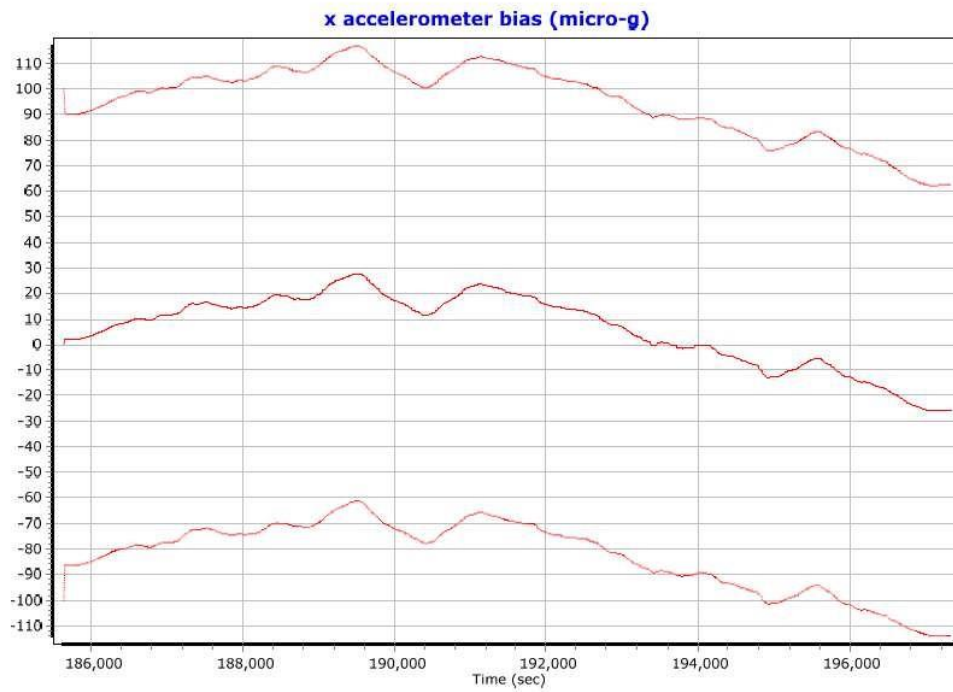
Quality Number Percentages:  
Q 1: 98.7 %  
Q 2: 1.3 %  
Q 3: 0.0 %  
Q 4: 0.0 %  
Q 5: 0.0 %  
Q 6: 0.0 %

Position Standard Deviation Percentages:  
0.00 - 0.10 m: 100.0 %  
0.10 - 0.30 m: 0.0 %  
0.30 - 1.00 m: 0.0 %  
1.00 - 5.00 m: 0.0 %  
5.00 m + over: 0.0 %

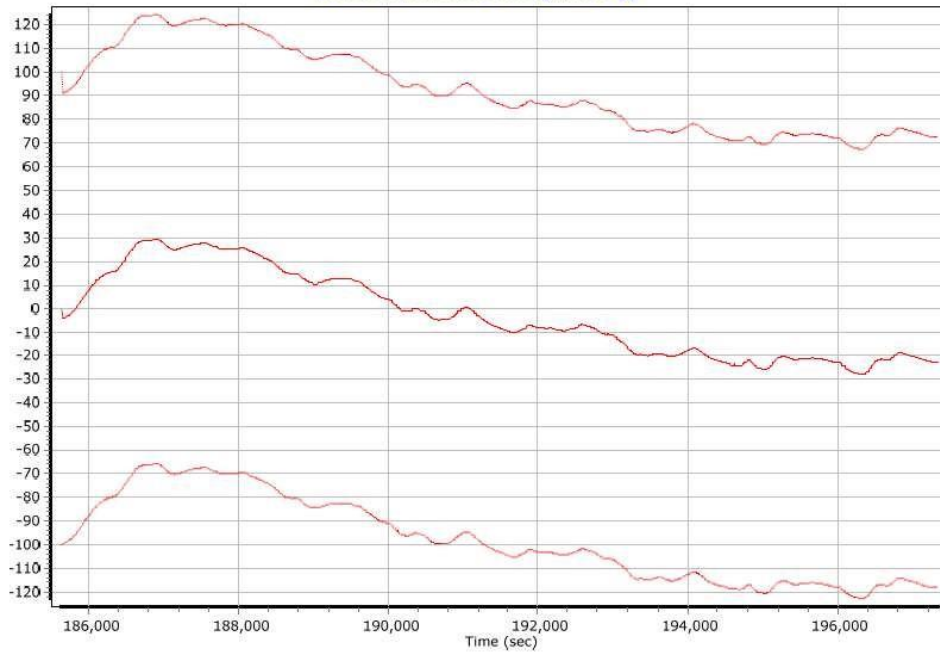
Percentages of epochs with DD\_DOP over 10.00:  
DOP over Tol: 0.0 %

Baseline Distances:  
Maximum: 85.668 (km)  
Minimum: 1.336 (km)  
Average: 48.481 (km)  
First Epoch: 24.704 (km)  
Last Epoch: 23.768 (km)

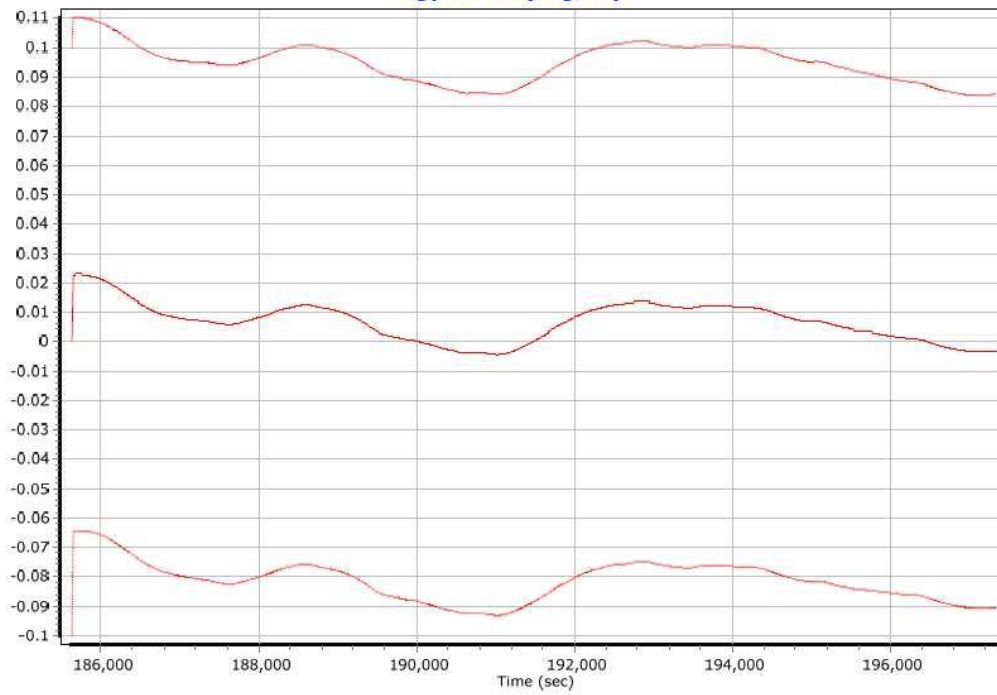
# Mission 8 – 3818351a Sensor Errors



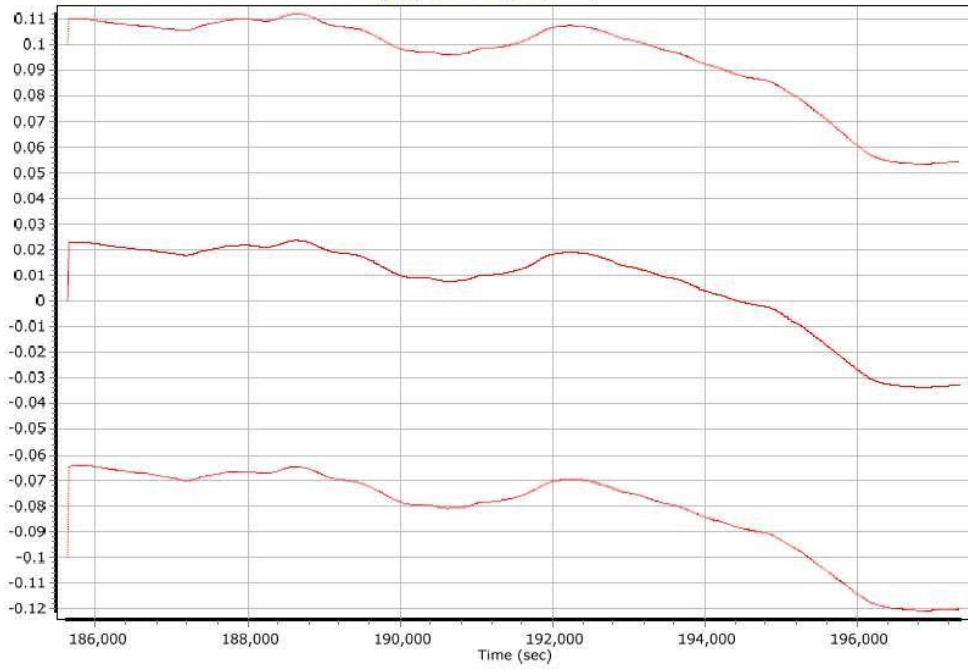
**z accelerometer bias (micro-g)**



**x gyro bias (deg/hr)**



**y gyro bias (deg/hr)**



**z gyro bias (deg/hr)**

