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NLS GNSS SOFAMESA

GNSS Measurement Accuracy Analysis Software of the National Land Survey of Finland
Beta Version 1.10
2019-05-27

Measurement Report of the File:

20190524-A-99M5040-METHOD4-4



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Thank you for the help: Topi Rikkinen, Marko Ollikainen, Antti Laaksonen, Hannu Koivula, and Ari Huvinen.

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Statistics Behind the Figures

Parameter	Value
Total Number of Measurements	12089.0
Number of All Satellites Mean (No Outliers or Float Solutions Removed)	22.8
Number of All Satellites Min and Max (No Outliers or Float Solutions Removed)	Min: 15 and Max: 32
Number of GPS Satellites Mean (No Outliers or Float Solutions Removed)	9.6
Number of GLONASS Satellites Mean (No Outliers or Float Solutions Removed)	6.8
Number of GALILEO Satellites Mean (No Outliers or Float Solutions Removed)	6.4
Number of BEIDOU Satellites Mean (No Outliers or Float Solutions Removed)	0.0
Mean of HDOP Values (No Outliers or Float Solutions Removed)	0.6
Mean of VDOP Values (No Outliers or Float Solutions Removed)	1.1
Mean of PDOP Values (No Outliers or Float Solutions Removed)	1.2
Mean of TDOP Values (No Outliers or Float Solutions Removed)	nan
Mean of GDOP Values (No Outliers or Float Solutions Removed)	1.4
User-Defined Tolerance Values	North and East 0.1m, Height 0.2m
Number of Measurements Above the Set Tolerance Values	19
Above Tolerance Values Percentage	0.16%
Number of All Satellites Mean (Outliers Removed)	22.8
Number of Satellites Min and Max (Outliers Removed)	Min: 15 and Max: 26
Number of GPS Satellites Mean (Outliers Removed)	9.6
Number of GLONASS Satellites Mean (Outliers Removed)	6.8
Number of GALILEO Satellites Mean (Outliers Removed)	6.4
Number of BEIDOU Satellites Mean (Outliers Removed)	0.0
Mean of HDOP Values (Outliers Removed)	0.6
Mean of VDOP Values (Outliers Removed)	1.1
Mean of PDOP Values (Outliers Removed)	1.2
Mean of TDOP Values (Outliers Removed)	nan
Mean of GDOP Values (Outliers Removed)	1.4

Parameter	Precision (m)*	Accuracy (m)**
Horizontal RMSE***	0.006	0.019
Vertical RMSE****	0.015	0.063
Horizontal 2dRMSE***	0.012	0.039
Vertical 2dRMSE****	0.03	0.126
North Coordinate Standard Deviation	0.0041	
East Coordinate Standard Deviation	0.004	
Height Standard Deviation	0.015	
North Coordinate Mean	6687768.4048	
East Coordinate Mean	394444.8036	
Height Mean	25.0691	
North Coordinate Median	6687768.405	
East Coordinate Median	394444.803	
Height Median	25.069	

* The precision of the measurements = inner accuracy.

** The accuracy of the measurements = outer accuracy.

*** Horizontal RMSE is 63-68% of the measurements and it depends on the shape of the distribution. Horizontal 2dRMSE is 95-98% of the measurements and it also depends on the shape of the distribution.

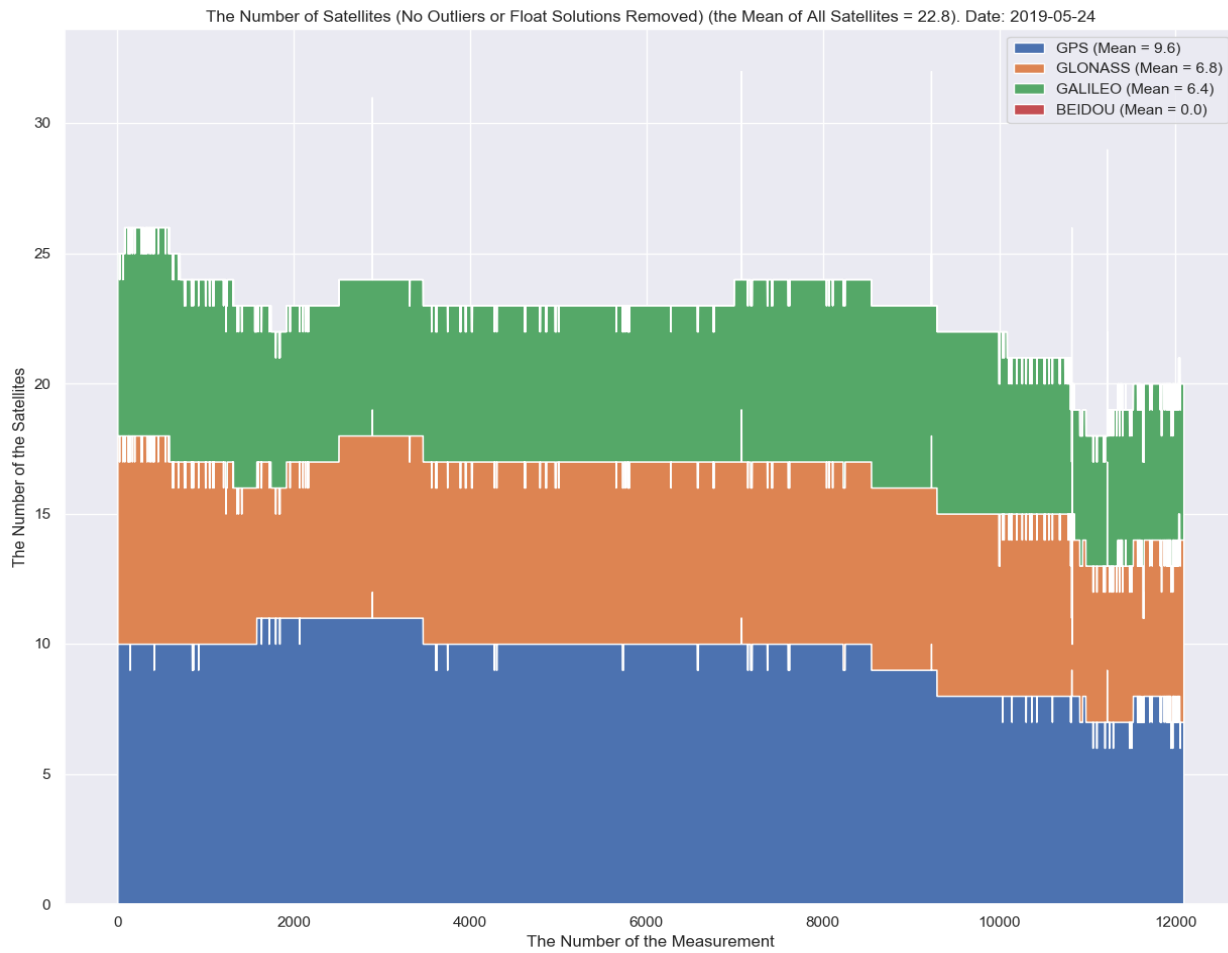
**** Vertical RMSE is 63-68% of the measurements and it depends on the shape of the distribution. Vertical 2dRMSE is 95-98% of the measurements and it also depends on the shape of the distribution.

Figures

Please find the figures, which NLS GNSS SOFAMESA produces, on the upcoming pages.

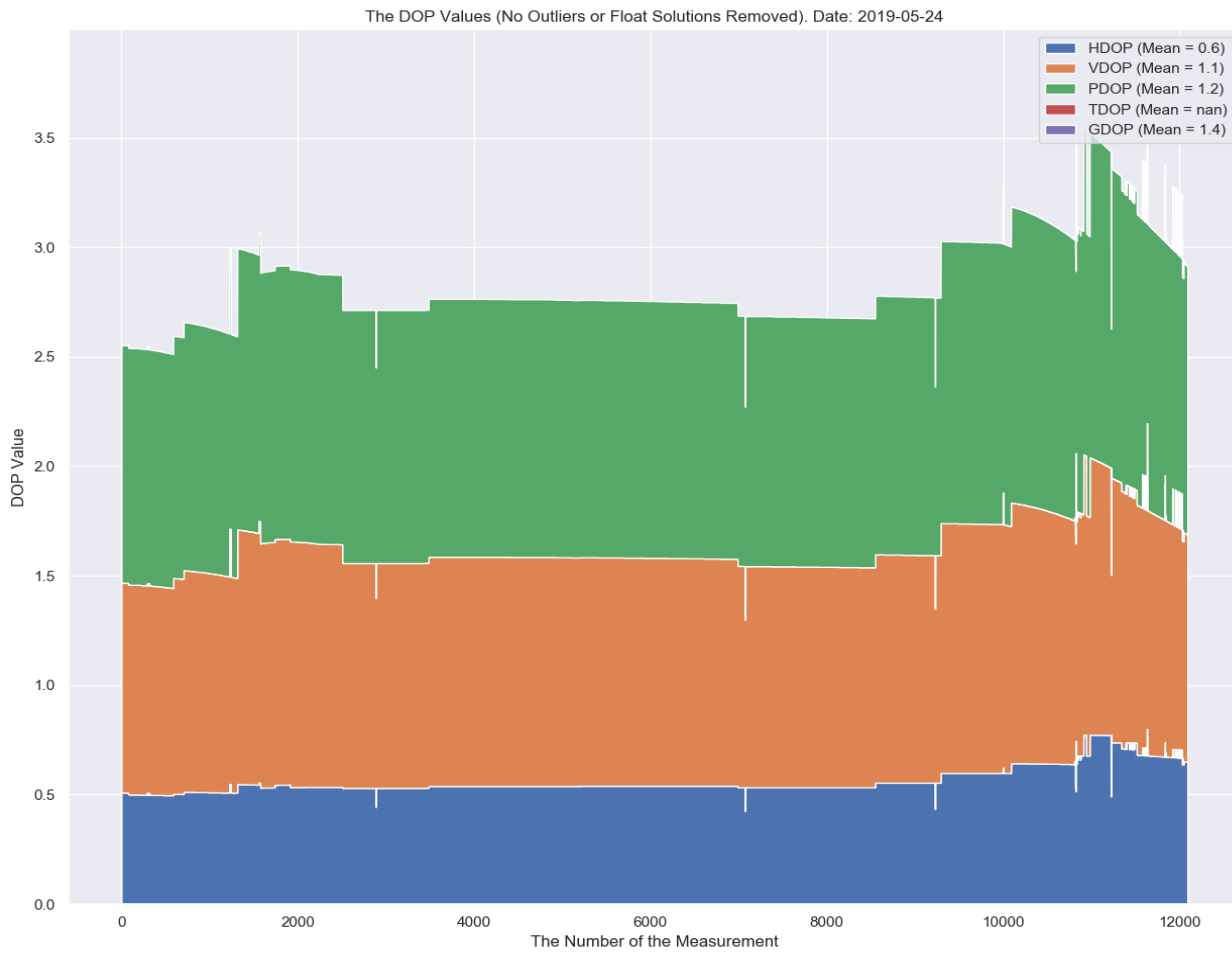
The Number of Satellites (No Outliers or Float Solutions Removed)

METHOD4



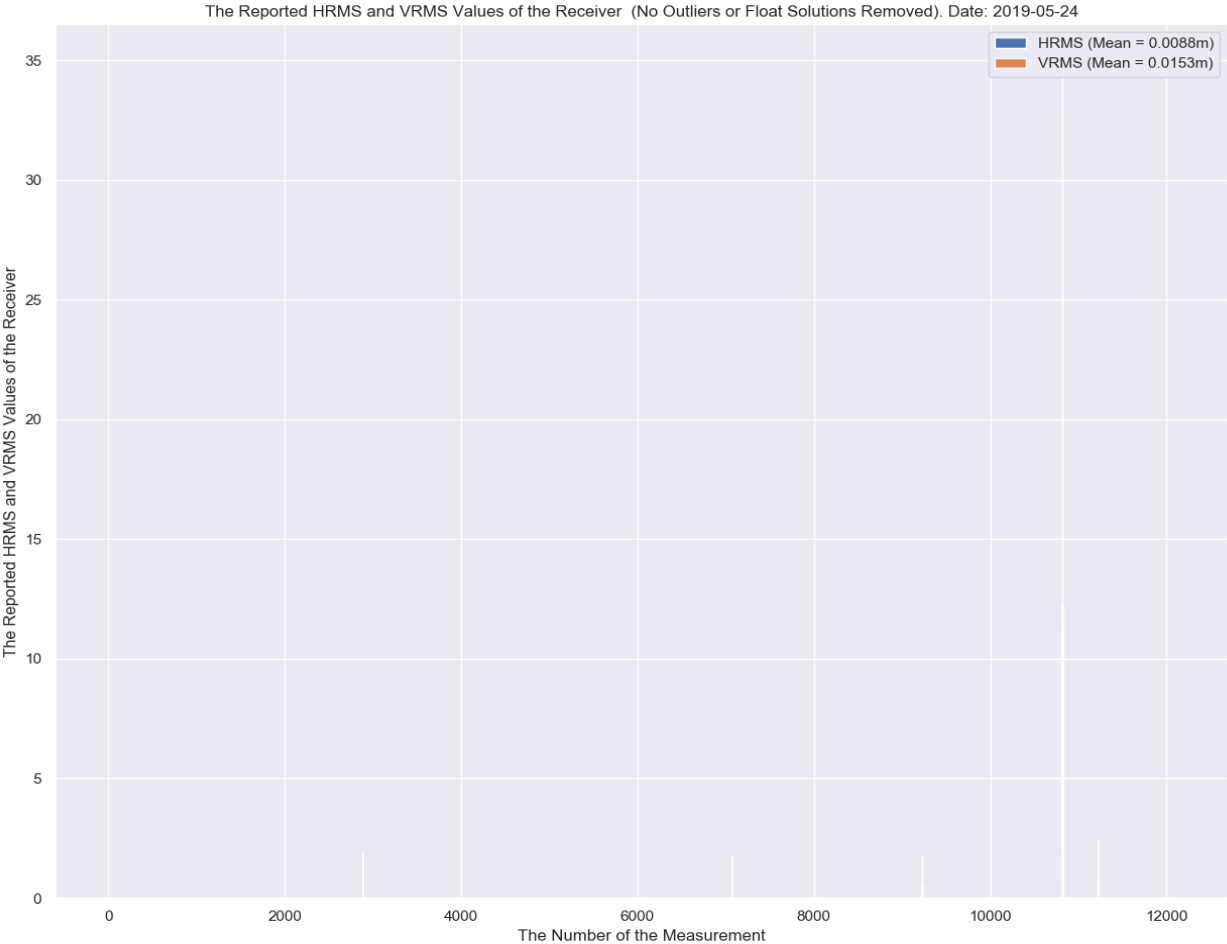
The DOP Values (No Outliers or Float Solutions Removed)

METHOD4



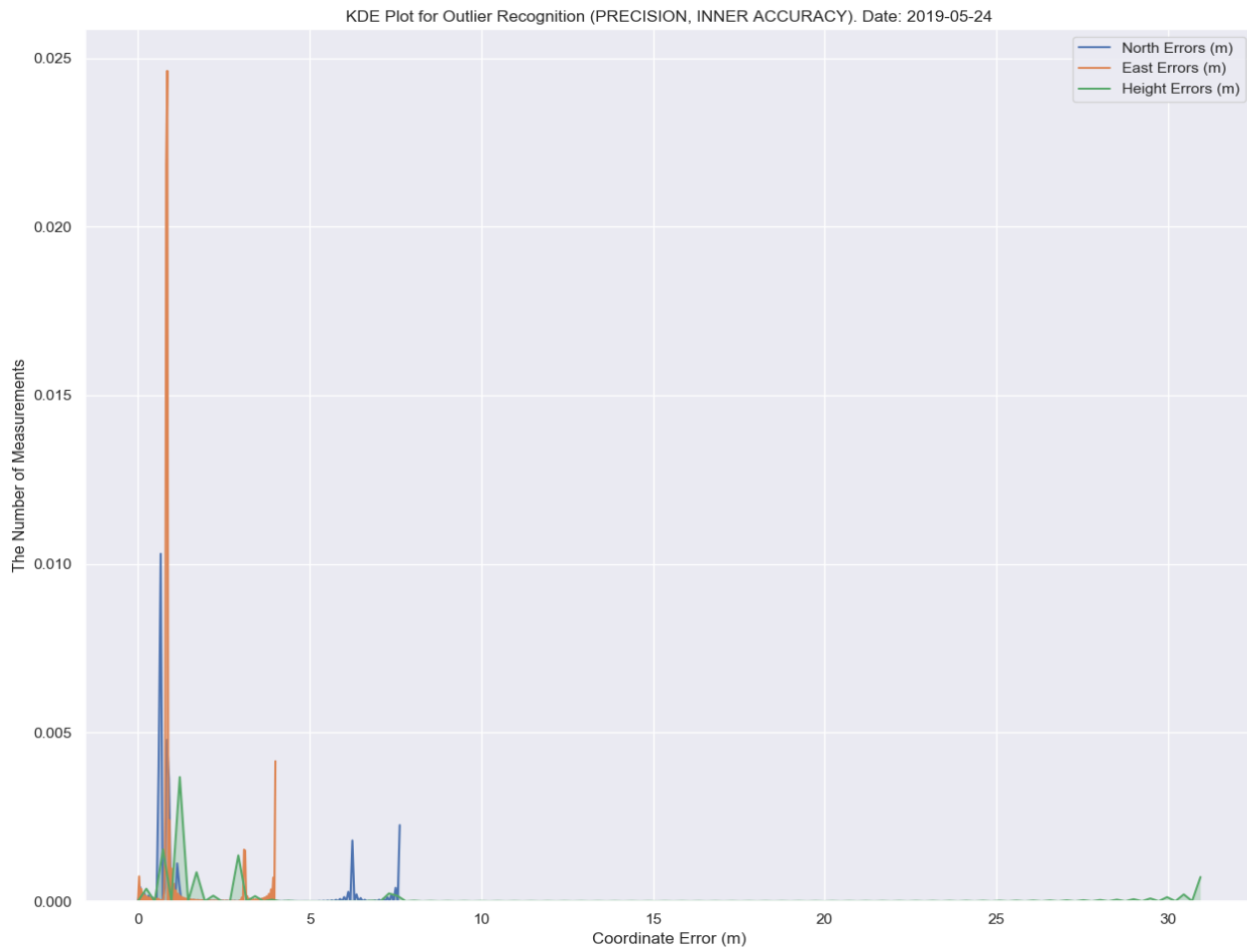
The Reported HRMS and VRMS Values of the Receiver (No Outliers or Float Solutions Removed)

METHOD4



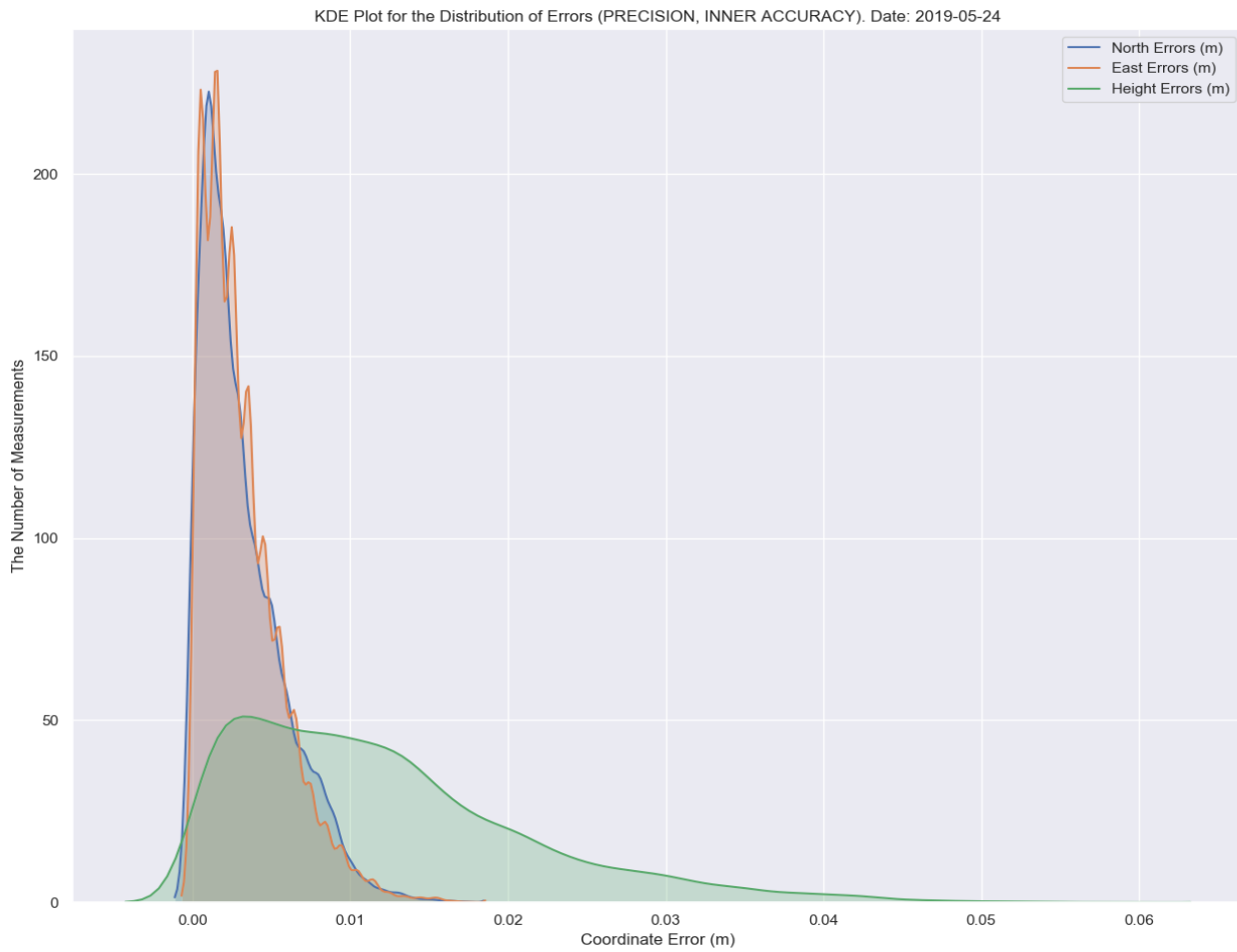
KDE Plot for Outlier Recognition (PRECISION, INNER ACCURACY)

METHOD4



KDE Plot for the Distribution of Errors (PRECISION, INNER ACCURACY)

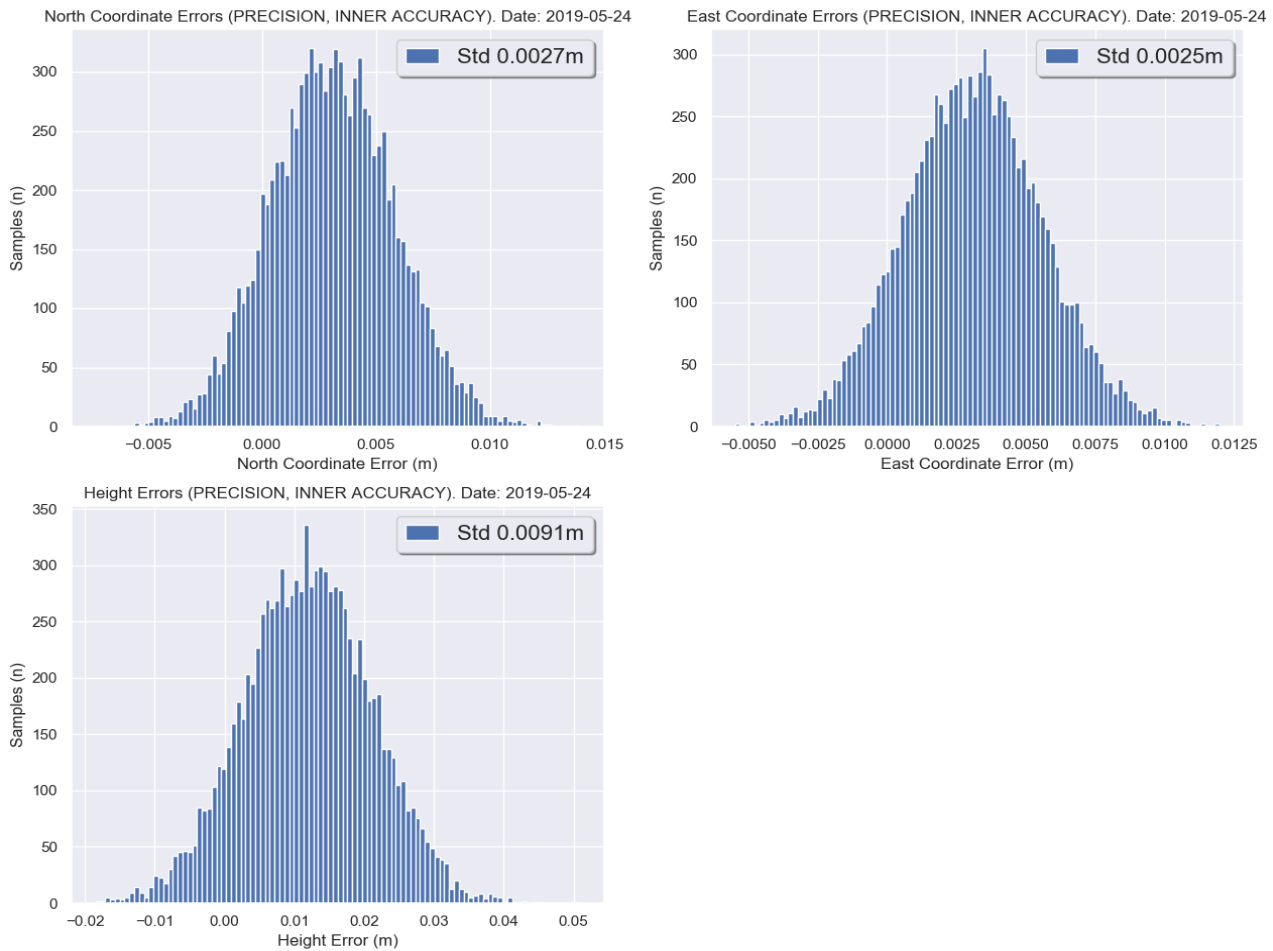
METHOD4



Gaussian Distribution Models for the Distributions of Errors (PRECISION, INNER ACCURACY)

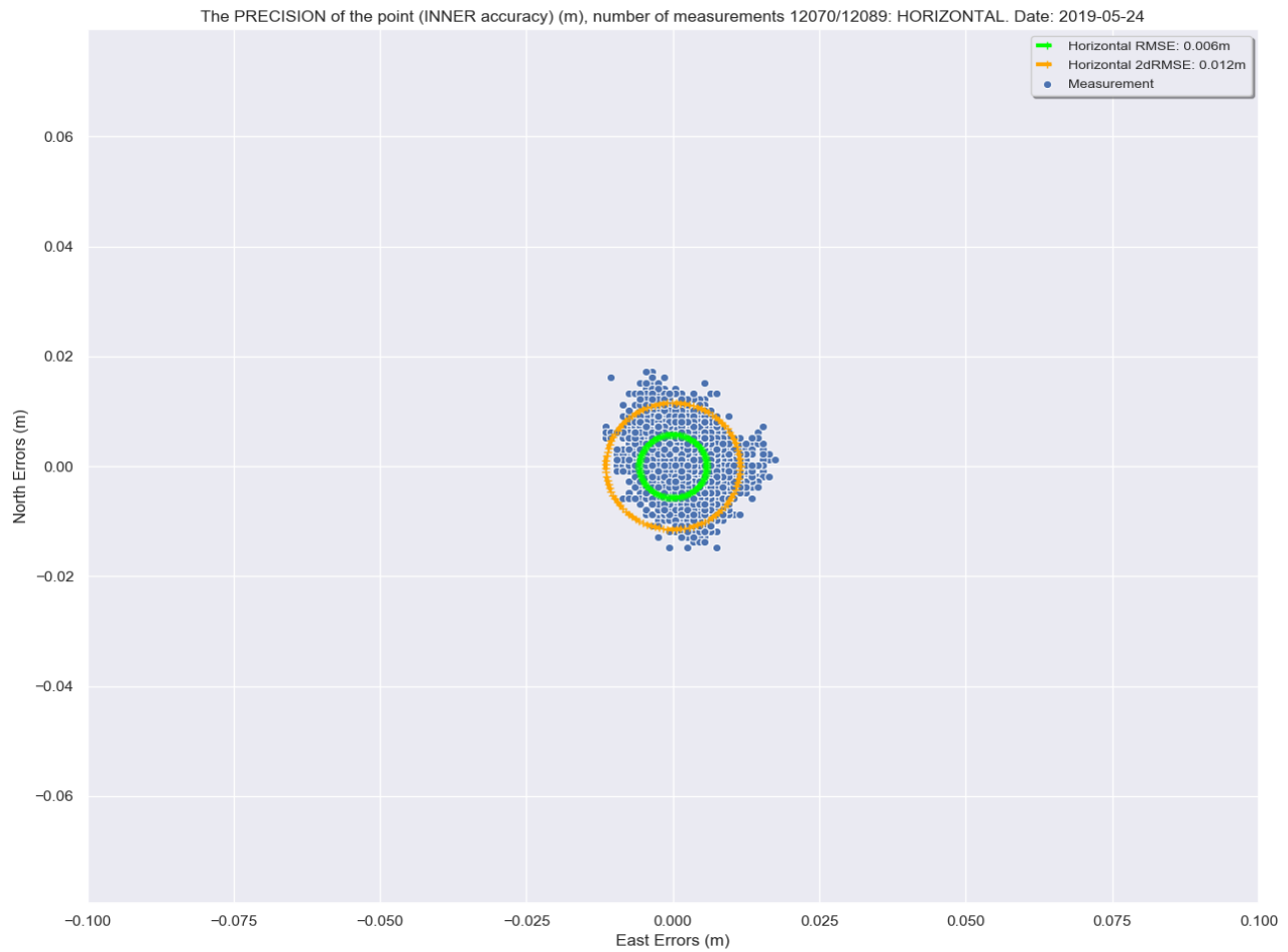
METHOD4

Gaussian Distribution Models for North and East Coordinate Errors, and Height Errors. Precision (Inner Accuracy):
User-Defined Sample Size (n): 10000



The PRECISION of the point (INNER accuracy) (m) HORIZONTAL

METHOD4



The PRECISION of the point (INNER accuracy) (m) NORTH

METHOD4



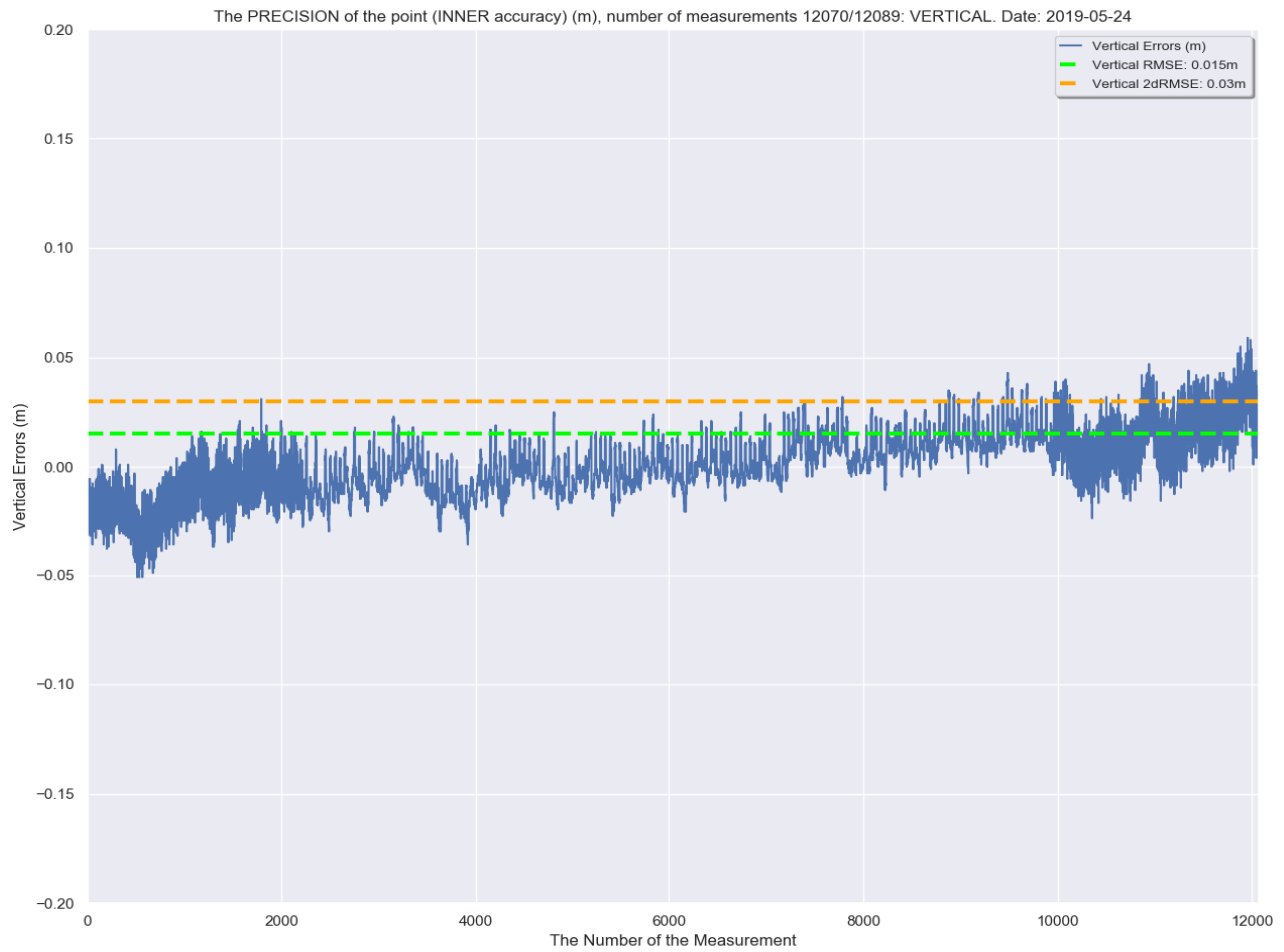
The PRECISION of the point (INNER accuracy) (m) EAST

METHOD4



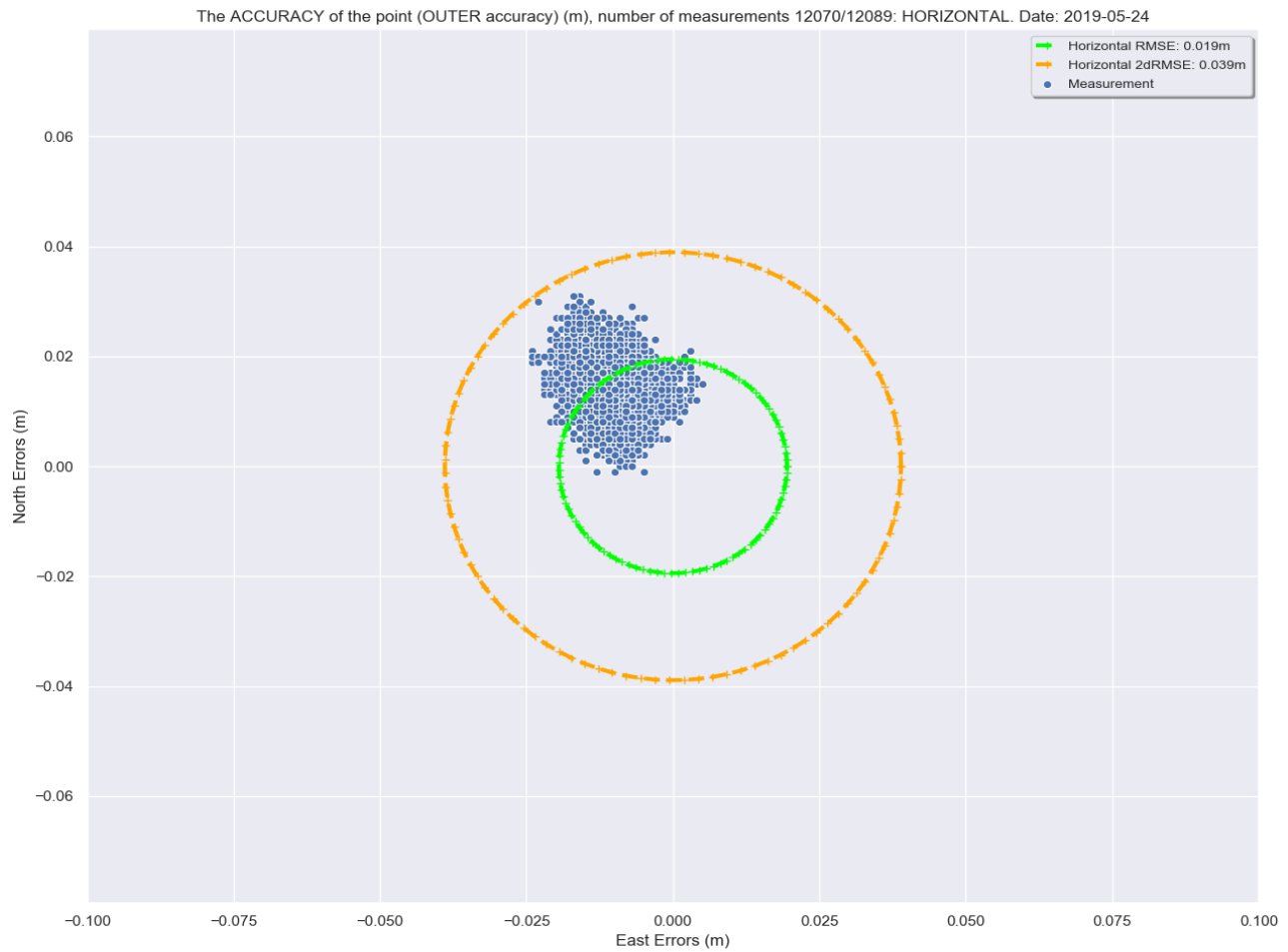
The PRECISION of the point (INNER accuracy) (m) VERTICAL

METHOD4



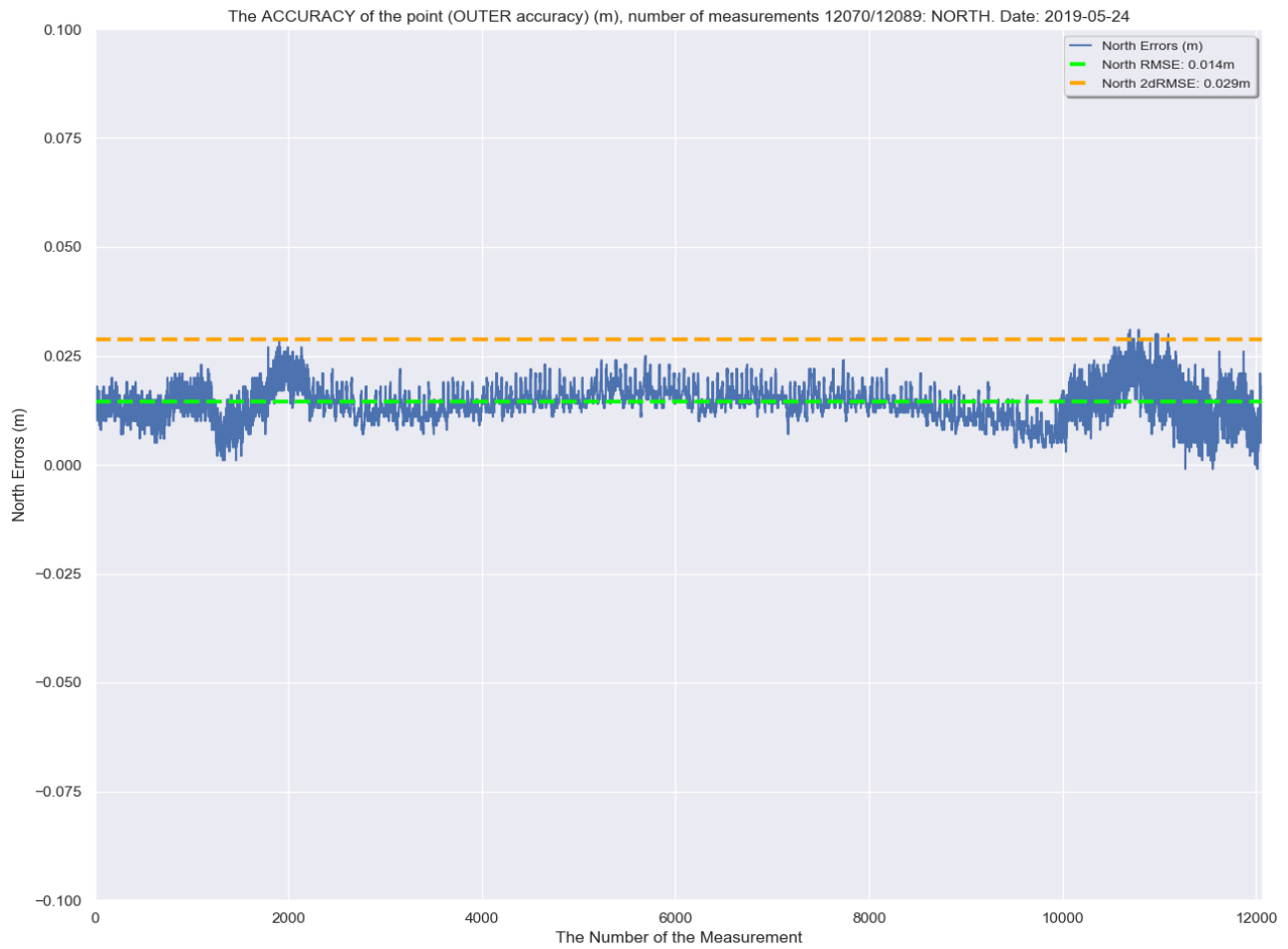
The ACCURACY of the point (OUTER accuracy) (m) HORIZONTAL

METHOD4



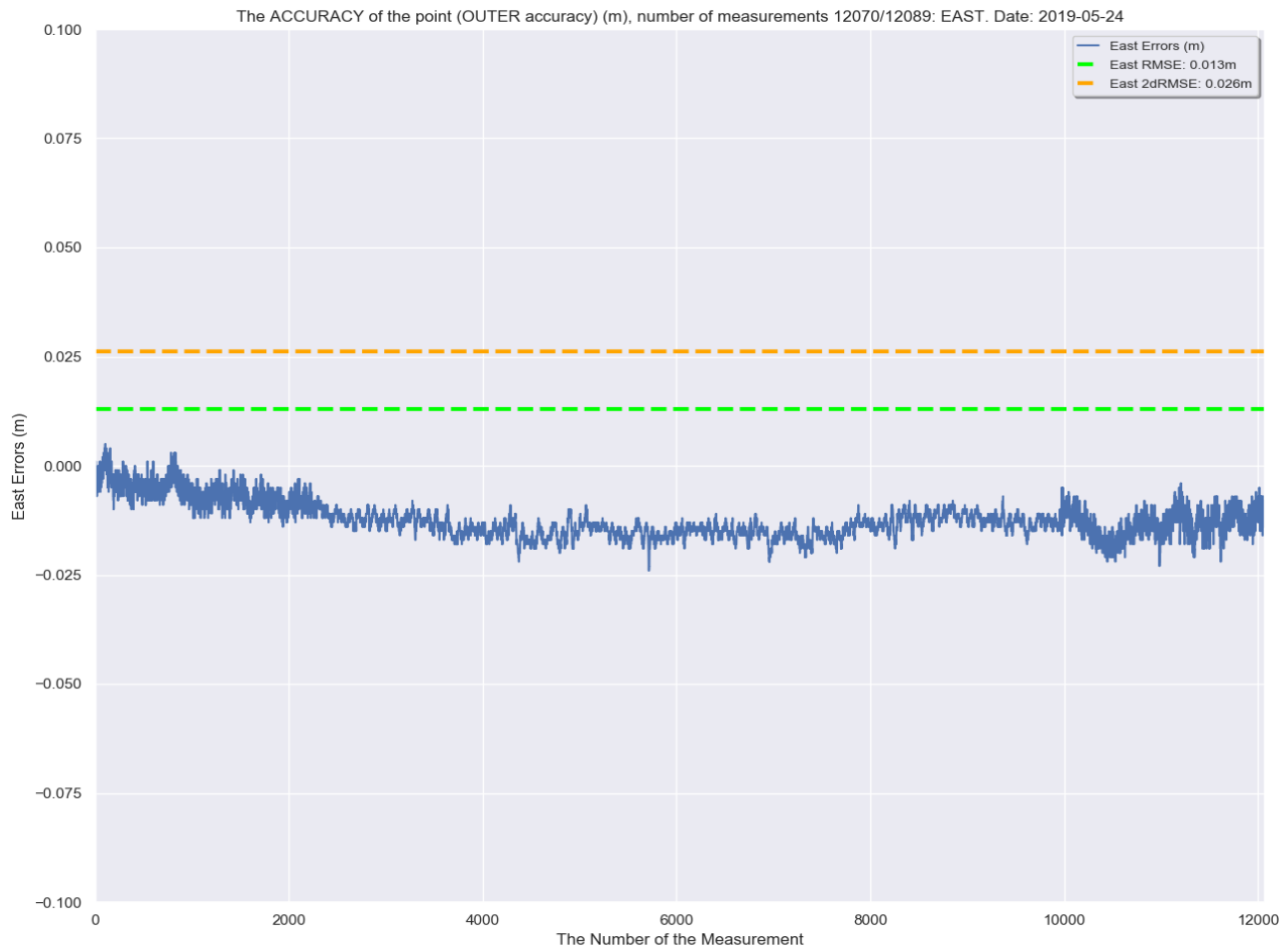
The ACCURACY of the point (OUTER accuracy) (m) NORTH

METHOD4



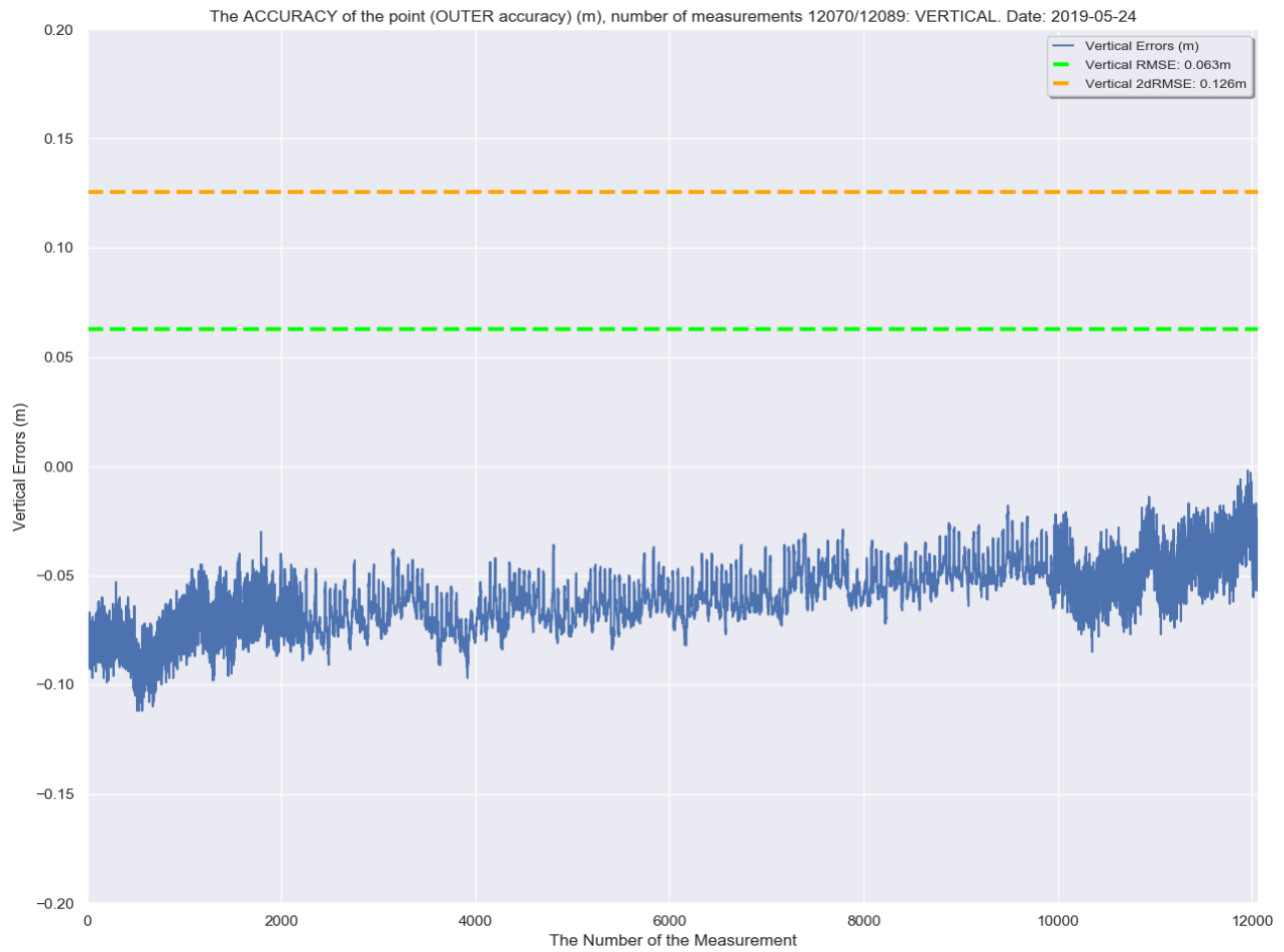
The ACCURACY of the point (OUTER accuracy) (m) EAST

METHOD4



The ACCURACY of the point (OUTER accuracy) (m) VERTICAL

METHOD4



The Horizontal PRECISION of the point (INNER accuracy) (m) with DOP values

METHOD4

The Horizontal PRECISION of the point (INNER accuracy) (m) with DOP values, number of measurements 12070/12089: HORIZONTAL. Date: 2019-05-24



The 3D PRECISION of the point (INNER accuracy) (m) with DOP values

METHOD4

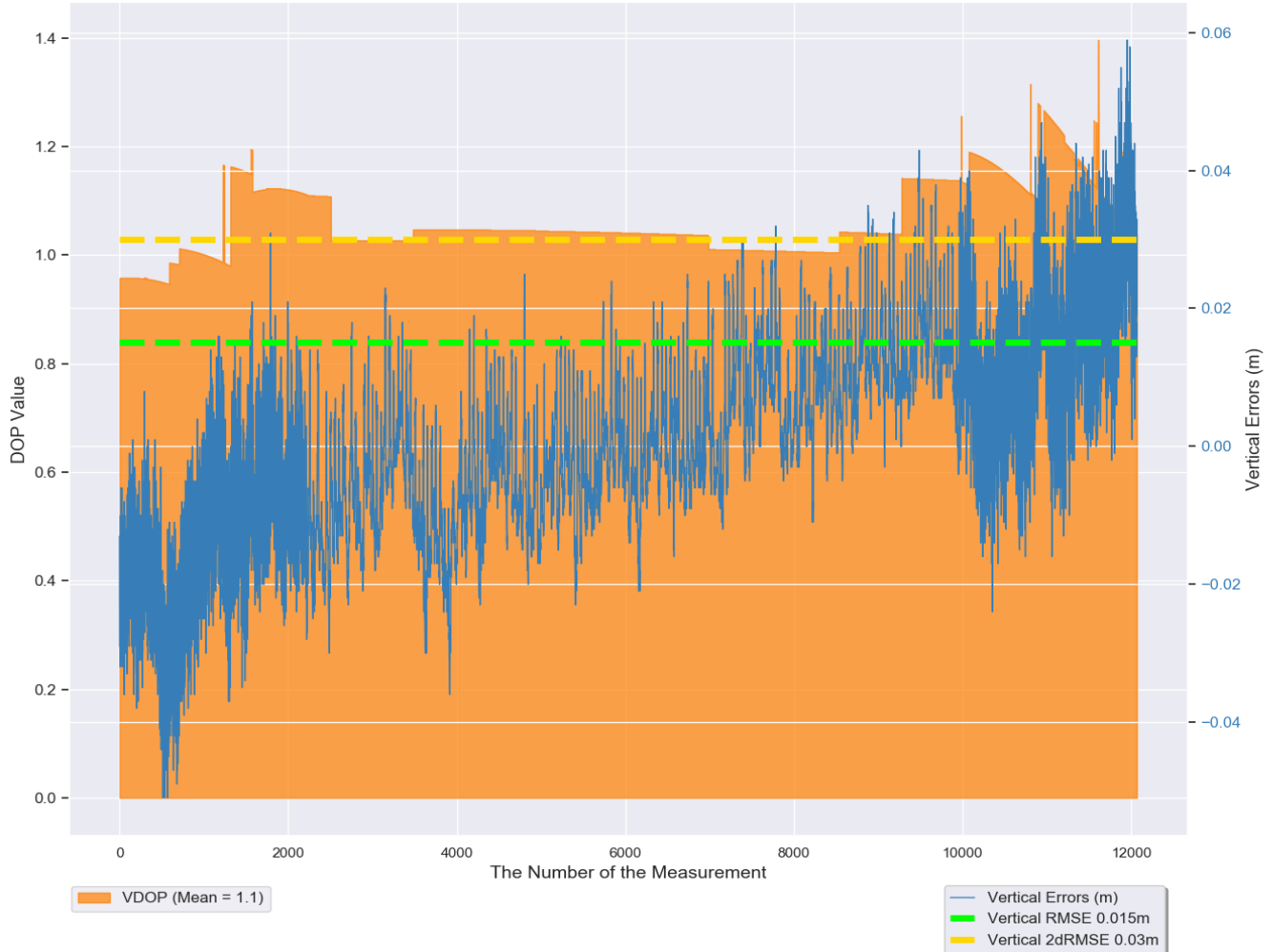
The 3D PRECISION of the point (INNER accuracy) (m) with DOP values, number of measurements 12070/12089: 3D. Date: 2019-05-24



The Vertical PRECISION of the point (INNER accuracy) (m) with DOP values

METHOD4

The Vertical PRECISION of the point (INNER accuracy) (m) with DOP values, number of measurements 12070/12089: VERTICAL. Date: 2019-05-24



Conclusions

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