

# Quality Report



Generated with Pix4Dmapper Pro version 4.2.27



**Important:** Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

## Summary



Project	sier_5k_1_x3
Processed	2018-09-23 19:04:46
Camera Model Name(s)	FC350_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	5.06 cm / 1.99 in
Area Covered	0.381 km <sup>2</sup> / 38.1156 ha / 0.15 sq. mi. / 94.2344 acres
Time for Initial Processing (without report)	21m:50s

## Quality Check



<b>Images</b>	median of 12365 keypoints per image	
<b>Dataset</b>	1097 out of 1101 images calibrated (99%), all images enabled	
<b>Camera Optimization</b>	0.66% relative difference between initial and optimized internal camera parameters	
<b>Matching</b>	median of 819.524 matches per calibrated image	
<b>Georeferencing</b>	yes, no 3D GCP	

## Preview

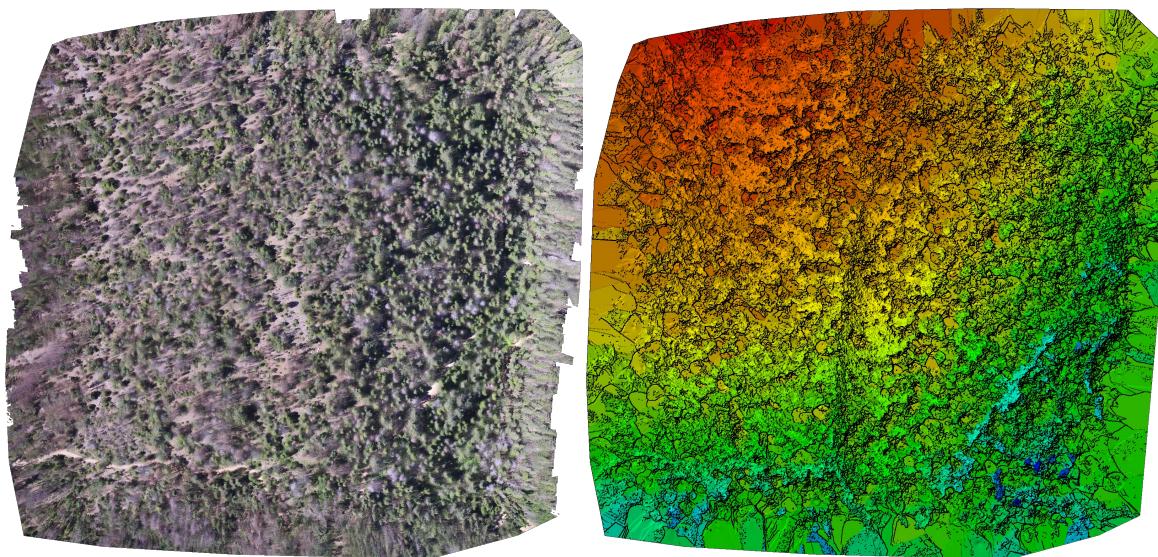


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

## Calibration Details



Number of Calibrated Images	1097 out of 1101
Number of Geolocated Images	1101 out of 1101

### Initial Image Positions

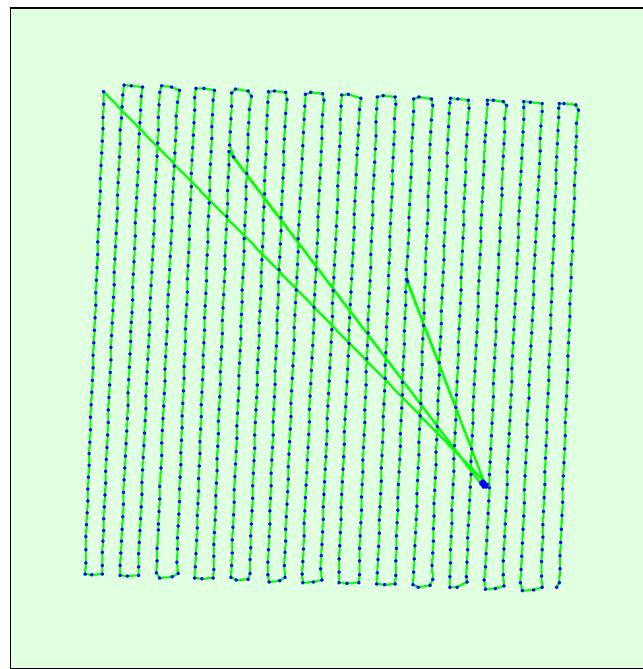
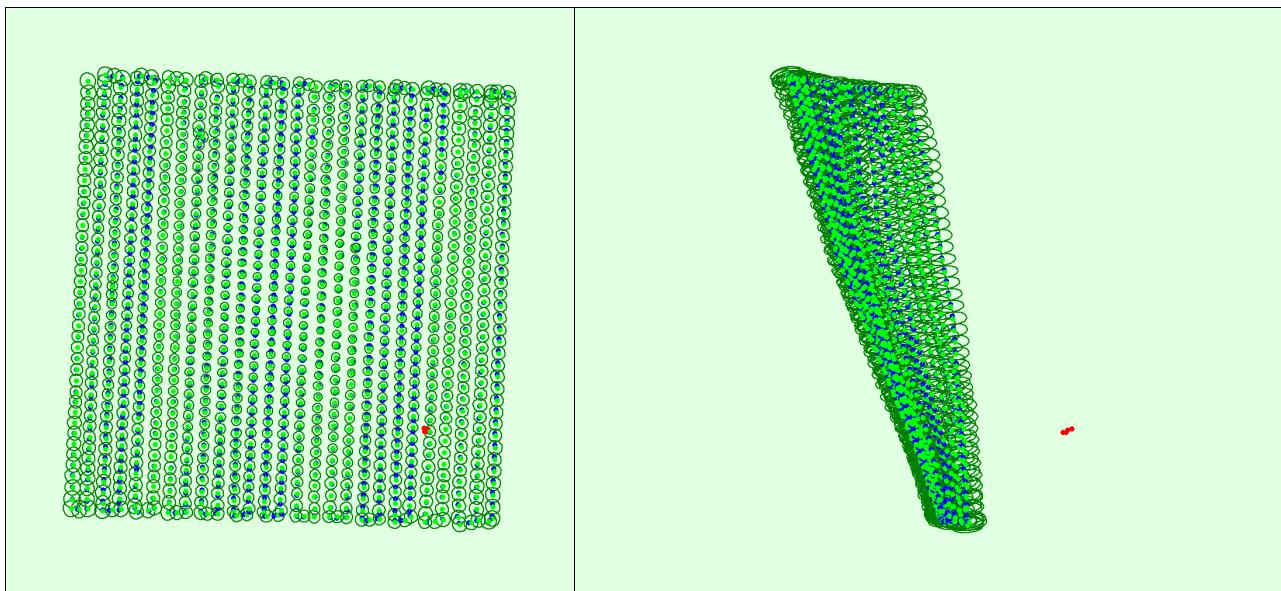
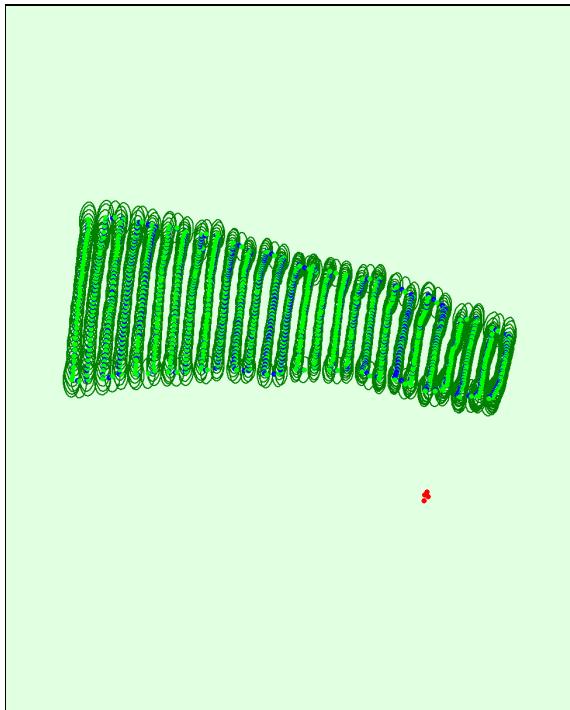


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

### Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 50x magnified

**Figure 3:** Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Red dots indicate disabled or uncalibrated images. Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

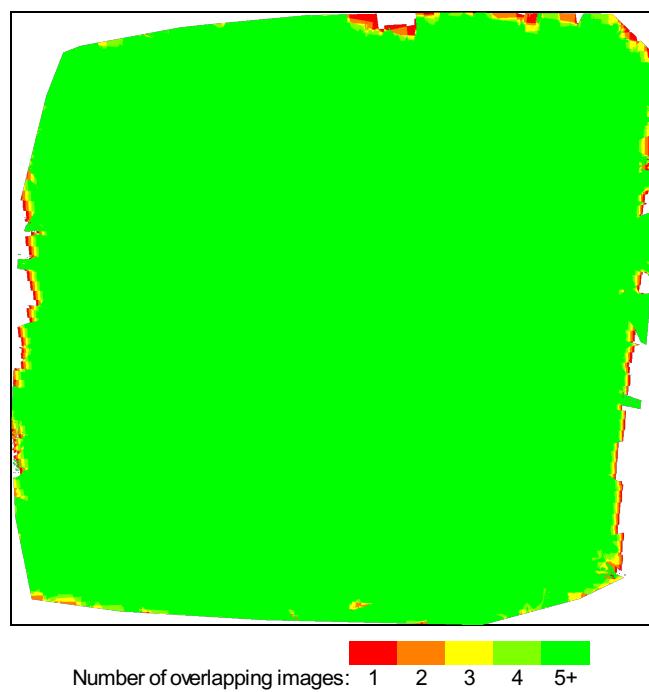
### ⚠️ Absolute camera position and orientation uncertainties

ⓘ

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.118	0.120	0.249	0.060	0.062	0.027
Sigma	0.020	0.020	0.049	0.002	0.002	0.001

### ⚠️ Overlap

ⓘ



**Figure 4:** Number of overlapping images computed for each pixel of the orthomosaic.  
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).

# Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	925553
Number of 3D Points for Bundle Block Adjustment	346860
Mean Reprojection Error [pixels]	0.131

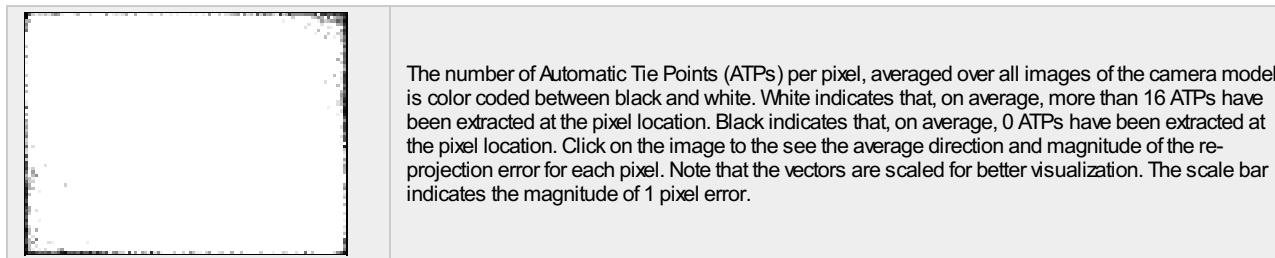
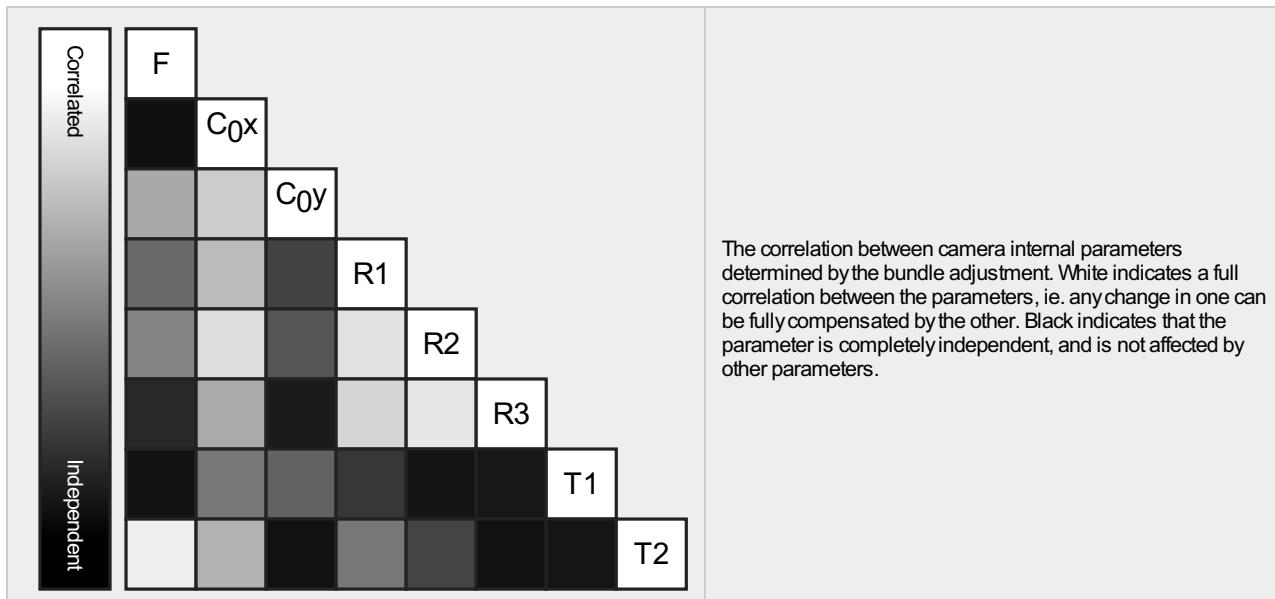
## Internal Camera Parameters

FC350\_3.6\_4000x3000 (RGB). Sensor Dimensions: 6.317 [mm] x 4.738 [mm]



EXIF ID: FC350\_3.6\_4000x3000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2285.722 [pixel] 3.610 [mm]	2000.006 [pixel] 3.159 [mm]	1500.003 [pixel] 2.369 [mm]	-0.130	0.106	-0.016	-0.000	0.000
Optimized Values	2300.896 [pixel] 3.634 [mm]	1985.524 [pixel] 3.136 [mm]	1503.584 [pixel] 2.375 [mm]	-0.128	0.108	-0.014	0.001	0.000
Uncertainties (Sigma)	0.895 [pixel] 0.001 [mm]	0.057 [pixel] 0.000 [mm]	0.068 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000



## 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	12365	820
Min	11549	353
Max	13812	2133
Mean	12348	844

## 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
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In 2 Images	246145
In 3 Images	54085
In 4 Images	20534
In 5 Images	9957
In 6 Images	5402
In 7 Images	3274
In 8 Images	2081
In 9 Images	1387
In 10 Images	994
In 11 Images	714
In 12 Images	536
In 13 Images	371
In 14 Images	284
In 15 Images	213
In 16 Images	159
In 17 Images	139
In 18 Images	113
In 19 Images	80
In 20 Images	55
In 21 Images	53
In 22 Images	57
In 23 Images	47
In 24 Images	35
In 25 Images	25
In 26 Images	22
In 27 Images	15
In 28 Images	7
In 29 Images	9
In 30 Images	7
In 31 Images	5
In 32 Images	4
In 33 Images	4
In 34 Images	8
In 35 Images	5
In 36 Images	5
In 37 Images	2
In 38 Images	6
In 39 Images	1
In 40 Images	2
In 41 Images	6
In 42 Images	3
In 43 Images	1
In 44 Images	1
In 46 Images	1
In 50 Images	2
In 51 Images	1
In 52 Images	1
In 55 Images	1
In 62 Images	1

 **2D Keypoint Matches**



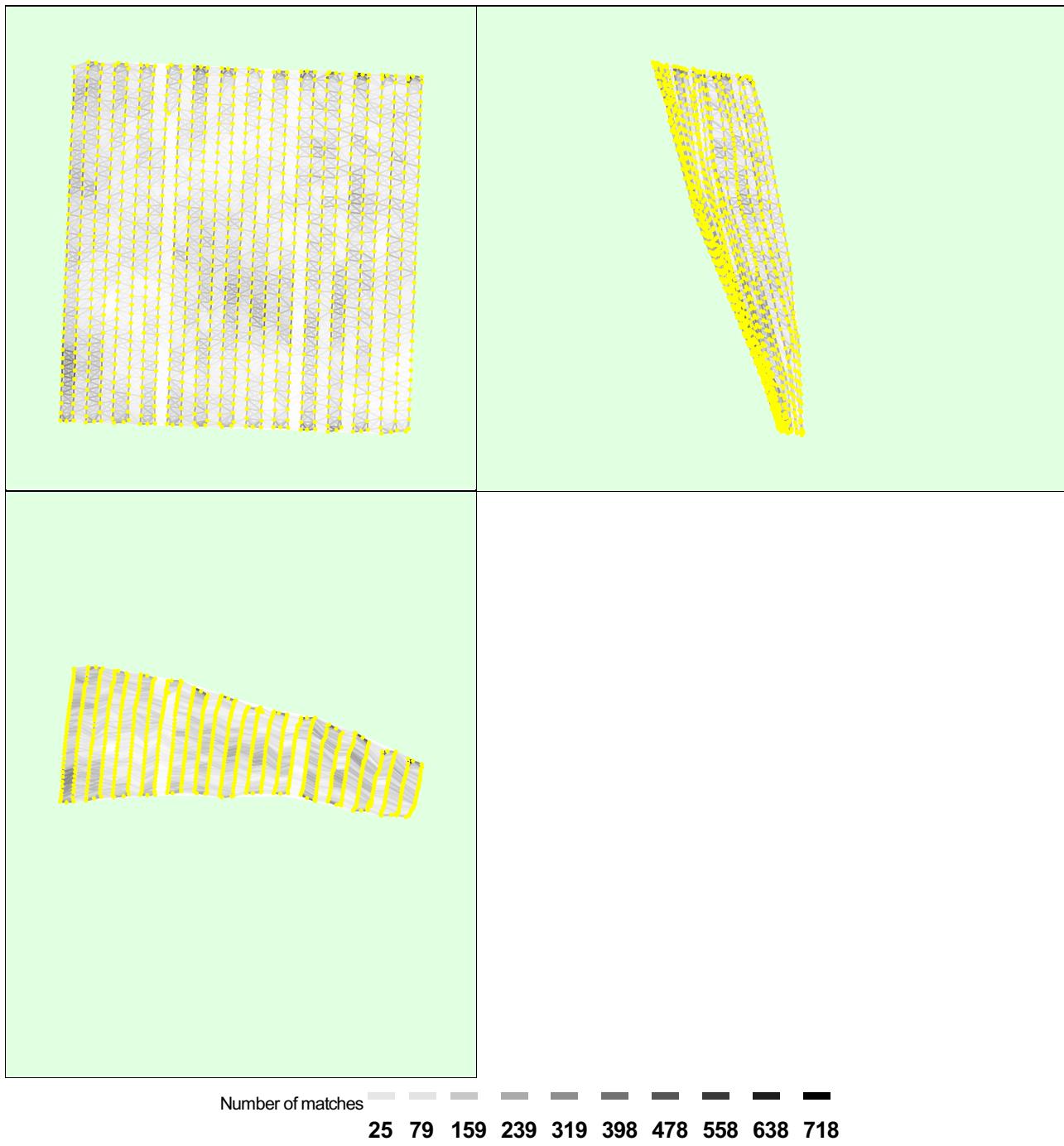


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

## Geolocation Details



### ? Absolute Geolocation Variance



Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.00	0.00	0.00
-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	0.91	14.68	0.00
-3.00	0.00	44.30	34.64	50.41
0.00	3.00	54.79	38.74	49.23
3.00	6.00	0.00	11.85	0.36

6.00	9.00	0.00	0.09	0.00
9.00	12.00	0.00	0.00	0.00
12.00	15.00	0.00	0.00	0.00
15.00	-	0.00	0.00	0.00
<b>Mean [m]</b>		-0.000000	-0.000000	0.000000
<b>Sigma [m]</b>		0.604452	2.360566	0.960280
<b>RMS Error [m]</b>		0.604452	2.360566	0.960280

Min Error and Max Error represent geolocation error intervals between -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the initial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

## Relative Geolocation Variance i

Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	100.00	99.09	100.00
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
<b>Mean of Geolocation Accuracy [m]</b>	5.000000	5.000000	10.000000
<b>Sigma of Geolocation Accuracy [m]</b>	0.000000	0.000000	0.000000

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]
Omega	0.945
Phi	1.030
Kappa	5.829

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

## Initial Processing Details i

### System Information i

Hardware	CPU: Intel(R) Core(TM) i7-8700K CPU @ 3.70GHz RAM: 64GB GPU: NVIDIA GeForce GTX 1080 Ti (Driver: 24.21.13.9882), Intel(R) UHD Graphics 630 (Driver: 22.20.16.4758)
Operating System	Windows 10 Education, 64-bit

### Coordinate Systems i

Image Coordinate System	WGS84 (egm96)
Output Coordinate System	WGS 84 / UTMzone 11N (egm96)

### Processing Options i

Detected Template	No Template Available
Keypoints Image Scale	Custom, Image Scale: 0.5
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, no

## Point Cloud Densification details



### Processing Options



Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	03h:03m:05s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	23m:28s

### Results



Number of Generated Tiles	4
Number of 3D Densified Points	45303056
Average Density (per m <sup>3</sup> )	22.18

## DSM, Orthomosaic and Index Details



### Processing Options



DSM and Orthomosaic Resolution	1 x GSD (5.06 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Triangulation Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Time for DSM Generation	04m:03s
Time for Orthomosaic Generation	08h:39m:22s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s