

# 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



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## Summary



Project	eldo_4k_1_x3
Processed	2018-08-19 22:23:01
Camera Model Name(s)	FC350_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	5.61 cm / 2.21 in
Area Covered	0.668 km <sup>2</sup> / 66.7988 ha / 0.26 sq. mi. / 165.1489 acres
Time for Initial Processing (without report)	01h:01m:11s

## Quality Check



<b>Images</b>	median of 12975 keypoints per image	
<b>Dataset</b>	1871 out of 1876 images calibrated (99%), all images enabled	
<b>Camera Optimization</b>	0.73% relative difference between initial and optimized internal camera parameters	
<b>Matching</b>	median of 1394.76 matches per calibrated image	
<b>Georeferencing</b>	yes, no 3D GCP	

## Preview

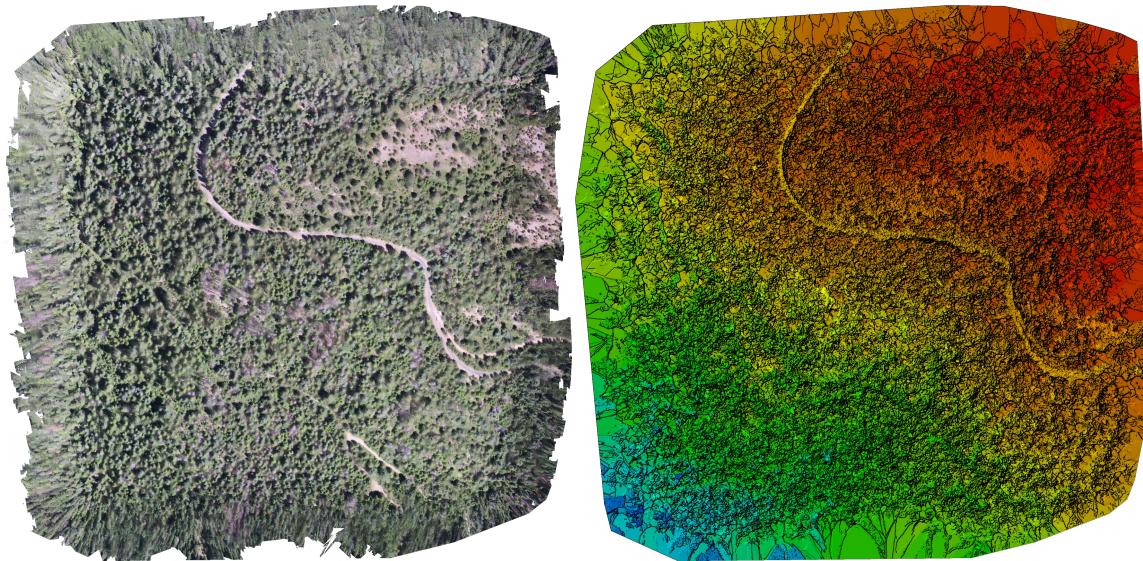


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

## Calibration Details



Number of Calibrated Images	1871 out of 1876
Number of Geolocated Images	1876 out of 1876

### Initial Image Positions

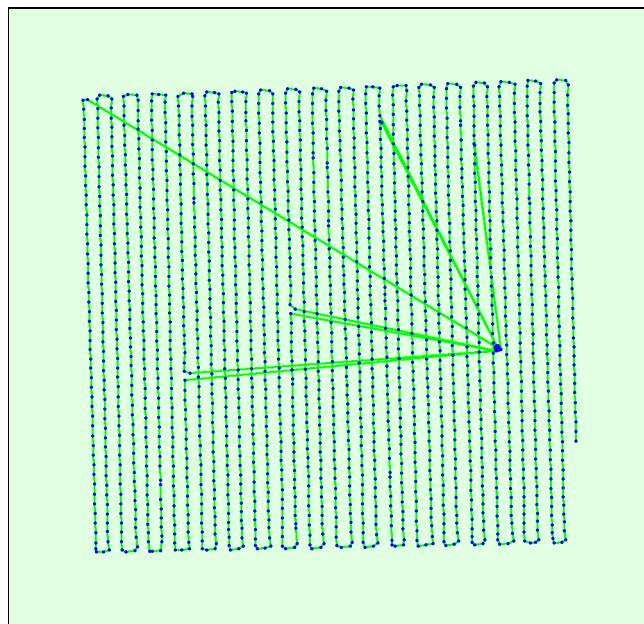
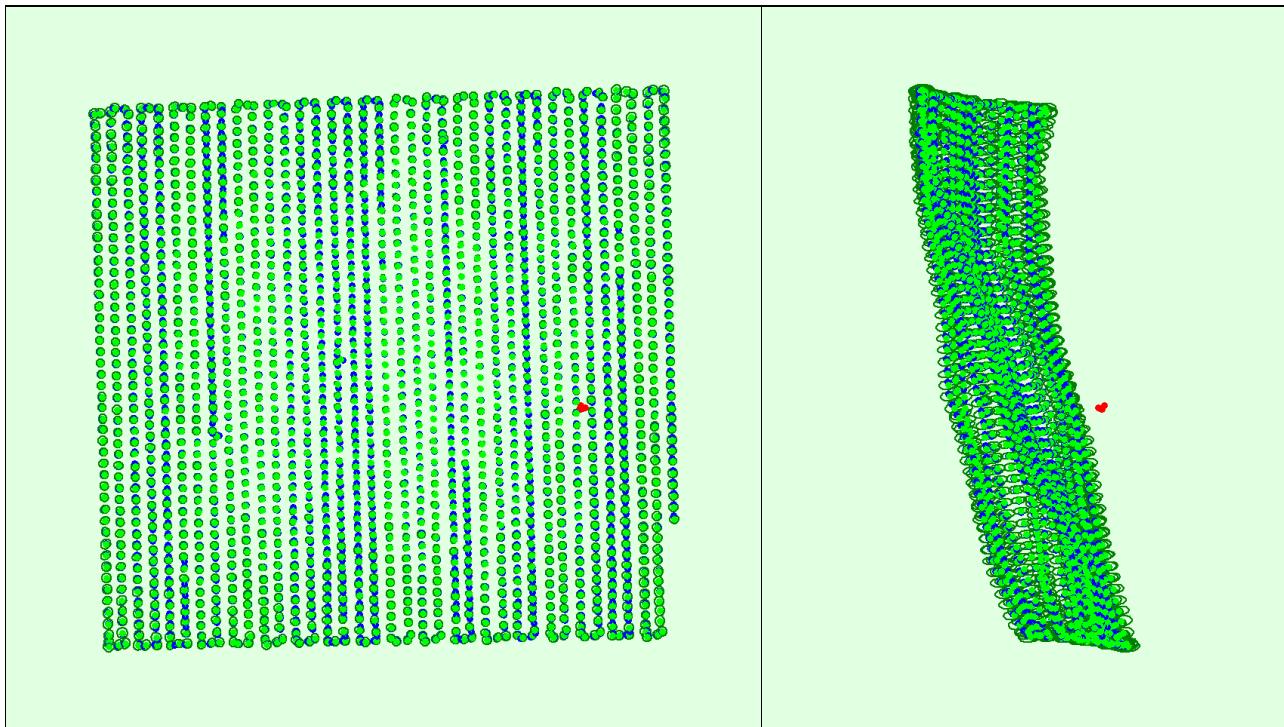
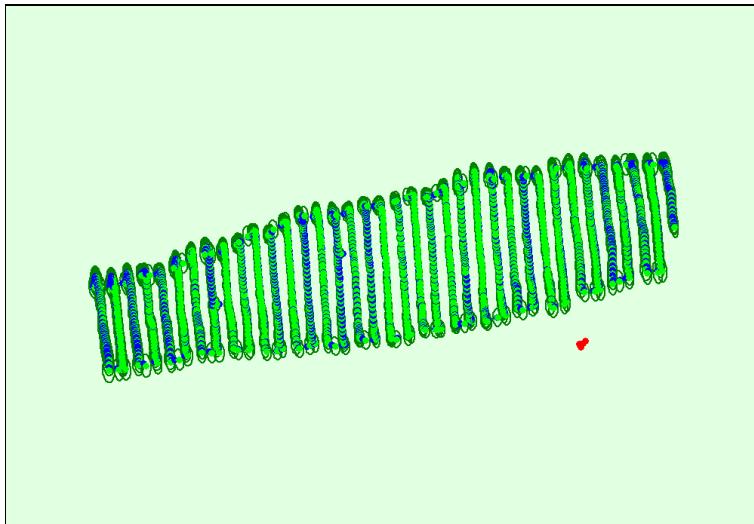


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

### 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	0.080	0.081	0.167	0.034	0.033	0.014
Sigma	0.013	0.012	0.033	0.002	0.002	0.001

#### Overlap

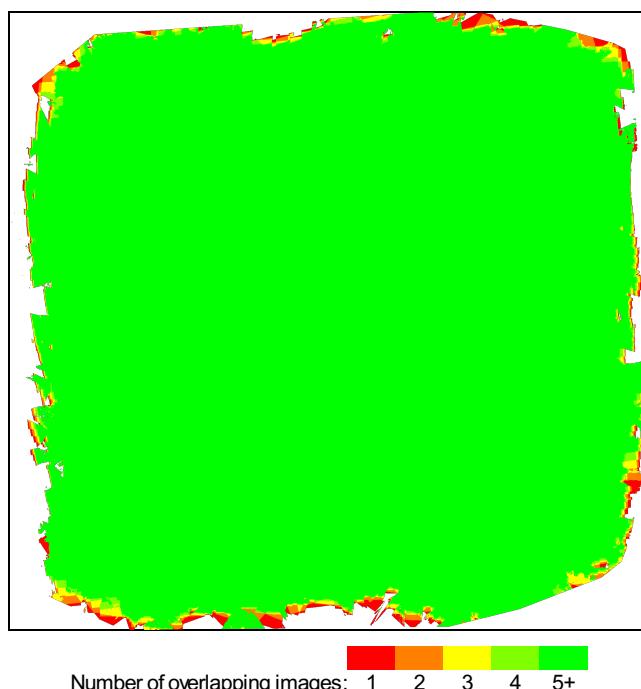


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

2646082

Number of 3D Points for Bundle Block Adjustment	996669
Mean Reprojection Error [pixels]	0.122

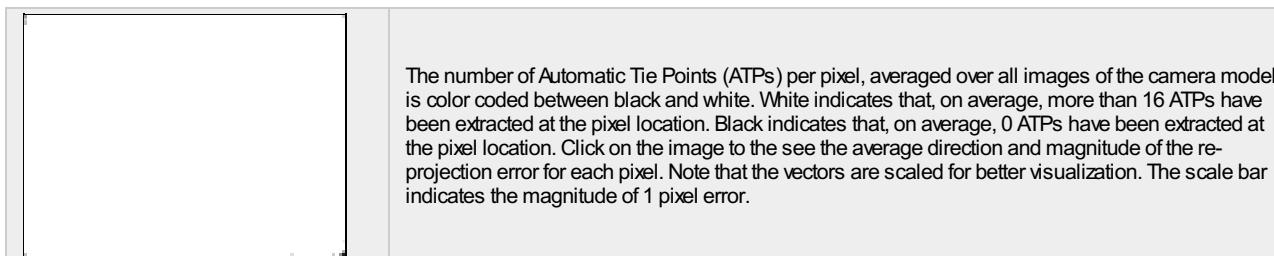
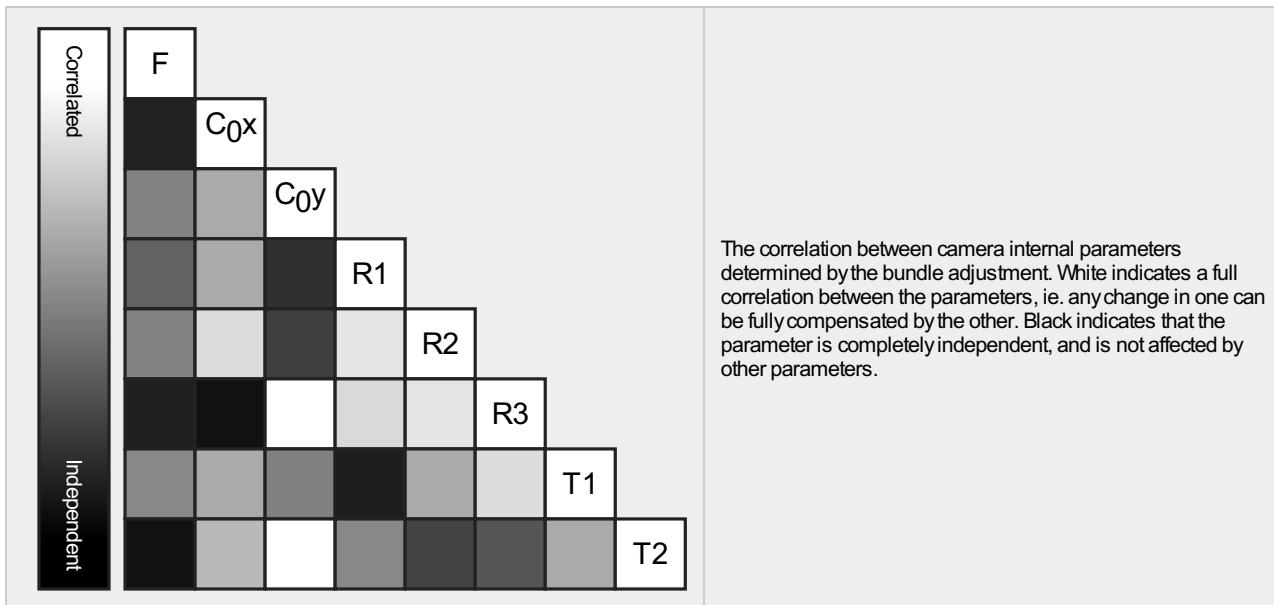
## 💡 Internal Camera Parameters

📄 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	2302.484 [pixel] 3.636 [mm]	1985.909 [pixel] 3.136 [mm]	1503.361 [pixel] 2.374 [mm]	-0.125	0.106	-0.012	0.001	0.000
Uncertainties (Sigma)	0.566 [pixel] 0.001 [mm]	0.034 [pixel] 0.000 [mm]	0.035 [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	12975	1395
Min	11851	564
Max	14607	2924
Mean	13013	1414

## 💡 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	707868
In 3 Images	160281
In 4 Images	59376
In 5 Images	27467
In 6 Images	14372

In 7 Images	8370
In 8 Images	5226
In 9 Images	3498
In 10 Images	2405
In 11 Images	1685
In 12 Images	1187
In 13 Images	914
In 14 Images	661
In 15 Images	506
In 16 Images	402
In 17 Images	348
In 18 Images	303
In 19 Images	232
In 20 Images	177
In 21 Images	156
In 22 Images	140
In 23 Images	120
In 24 Images	107
In 25 Images	87
In 26 Images	69
In 27 Images	54
In 28 Images	53
In 29 Images	61
In 30 Images	46
In 31 Images	42
In 32 Images	39
In 33 Images	31
In 34 Images	14
In 35 Images	25
In 36 Images	23
In 37 Images	24
In 38 Images	20
In 39 Images	24
In 40 Images	13
In 41 Images	15
In 42 Images	10
In 43 Images	13
In 44 Images	10
In 45 Images	9
In 46 Images	12
In 47 Images	13
In 48 Images	11
In 49 Images	7
In 50 Images	4
In 51 Images	4
In 52 Images	9
In 53 Images	3
In 54 Images	9
In 55 Images	8
In 56 Images	5
In 57 Images	6
In 58 Images	10
In 59 Images	2
In 60 Images	7
In 61 Images	2
In 62 Images	1
In 63 Images	3
In 64 Images	4
In 65 Images	1

In 66 Images	2
In 69 Images	3
In 70 Images	3
In 71 Images	5
In 72 Images	1
In 73 Images	3
In 74 Images	5
In 75 Images	1
In 76 Images	2
In 77 Images	2
In 78 Images	1
In 79 Images	4
In 80 Images	1
In 83 Images	1
In 85 Images	3
In 86 Images	1
In 87 Images	1
In 88 Images	1
In 89 Images	1
In 92 Images	2
In 97 Images	2
In 99 Images	2
In 100 Images	1
In 102 Images	2
In 103 Images	1
In 104 Images	2
In 105 Images	1
In 107 Images	1
In 111 Images	2
In 112 Images	1
In 115 Images	1
In 116 Images	1
In 128 Images	1
In 130 Images	1
In 149 Images	2
In 151 Images	1

 **2D Keypoint Matches**



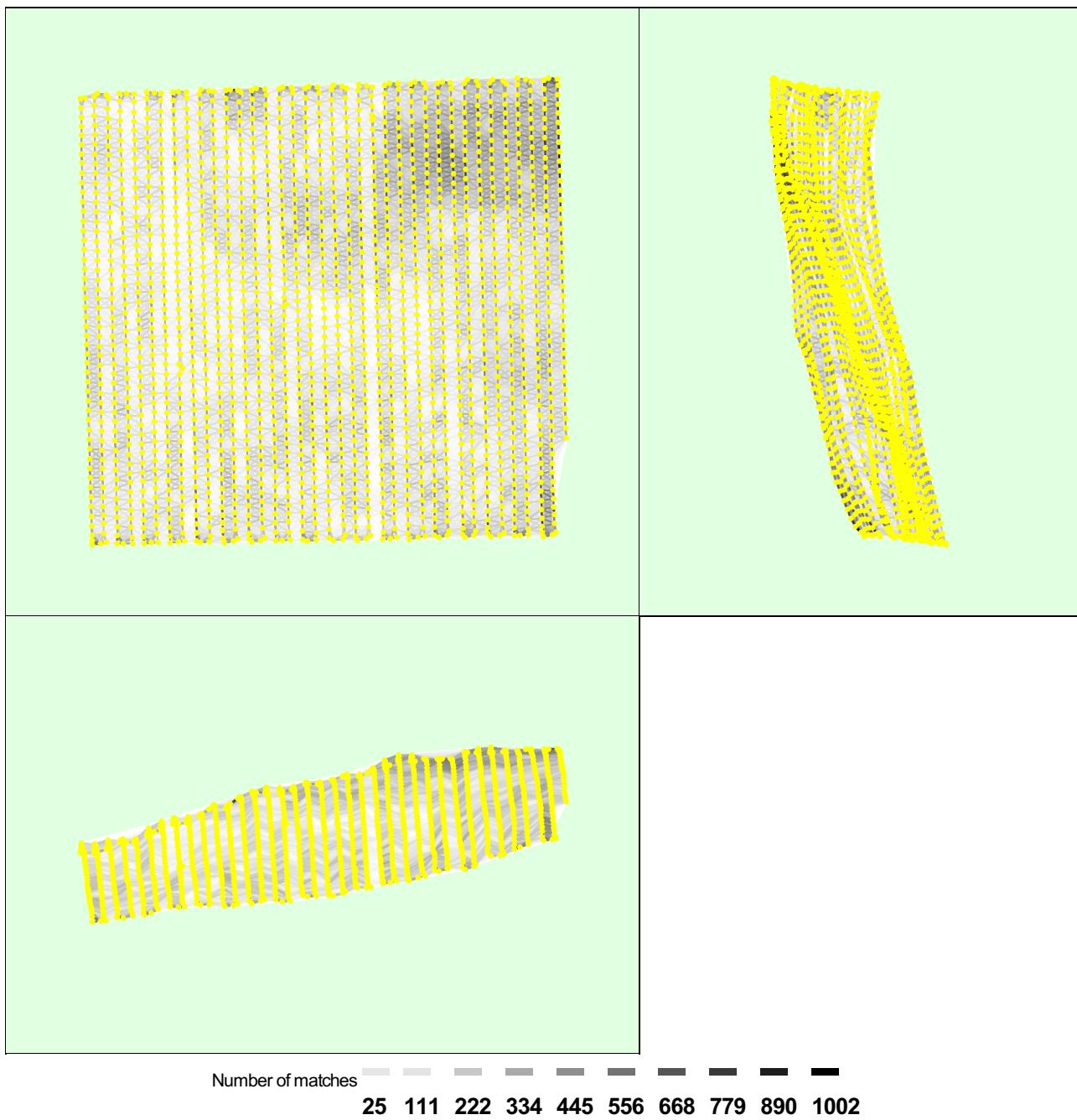


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

## 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	0.05	0.00
-6.00	-3.00	0.75	14.43	0.21
-3.00	0.00	42.28	36.02	48.42
0.00	3.00	56.97	35.49	50.94
3.00	6.00	0.00	13.95	0.43
6.00	9.00	0.00	0.05	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>		0.585488	2.425945	1.104493
<b>RMS Error [m]</b>		0.585488	2.425945	1.104493

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



Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	100.00	98.50	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	0.711
Phi	1.018
Kappa	5.502

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

## Initial Processing Details



### System Information



Hardware	CPU: Intel(R) Core(TM) i7-8700K CPU @ 3.70GHz RAM: 64GB GPU: NVIDIA GeForce GTX 1080 Ti (Driver: 23.21.13.9125), Intel(R) UHD Graphics 630 (Driver: 22.20.16.4758)
Operating System	Windows 10 Education, 64-bit

### Coordinate Systems



Image Coordinate System	WGS84 (egm96)
Output Coordinate System	WGS 84 / UTM zone 10N (egm96)

### Processing Options



Detected Template	RGB Local structure bark beetle severity*
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	07h:21m:35s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	37m:22s

### Results



Number of Generated Tiles	4
Number of 3D Densified Points	73130895
Average Density (per m <sup>3</sup> )	20.87

## DSM, Orthomosaic and Index Details



### Processing Options



DSMand Orthomosaic Resolution	1 x GSD (5.61 [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	09m:21s
Time for Orthomosaic Generation	12h:32m:49s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s