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	sequ_5k_1_x3
Processed	2018-08-29 11:48:13
Camera Model Name(s)	FC350_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	5.09 cm / 2.01 in
Area Covered	0.609 km^2 / 60.8559 ha / 0.24 sq. mi. / 150.4562 acres
Time for Initial Processing (without report)	02h:09m:05s

Quality Check

Images	median of 11734 keypoints per image	✓
Dataset	1744 out of 1749 images calibrated (99%), all images enabled	✓
Camera Optimization	4.47% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 2390.26 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

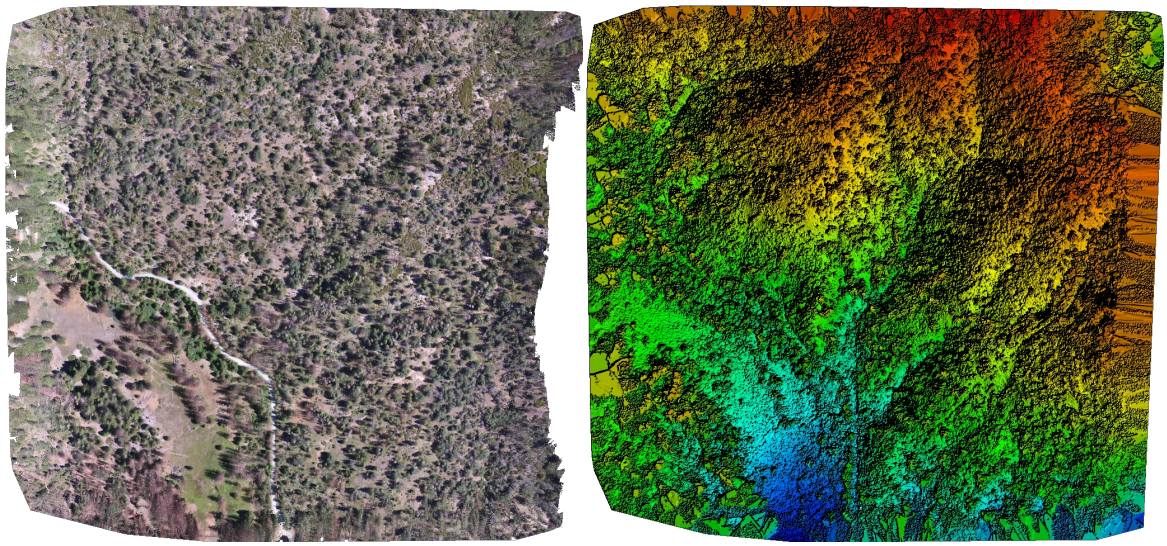


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	1744 out of 1749
Number of Geolocated Images	1749 out of 1749

Initial Image Positions

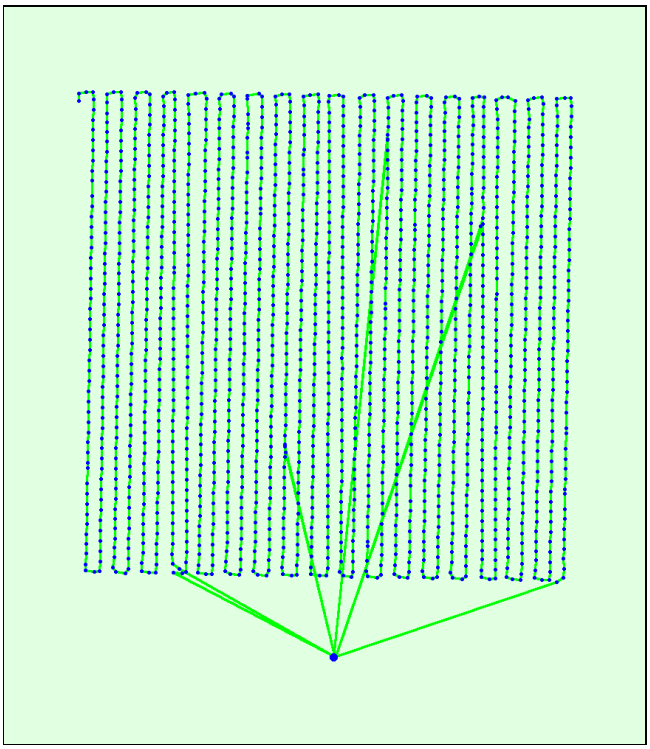
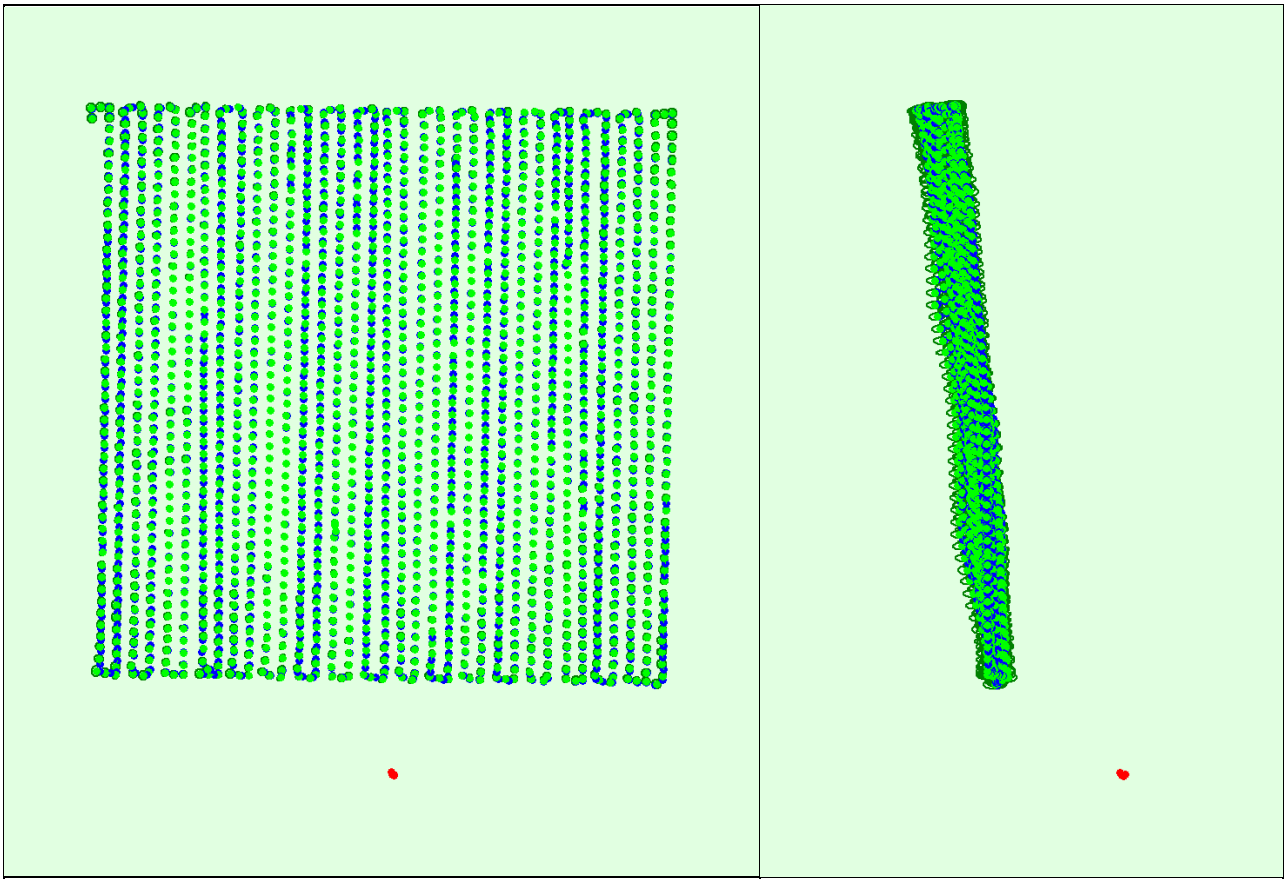
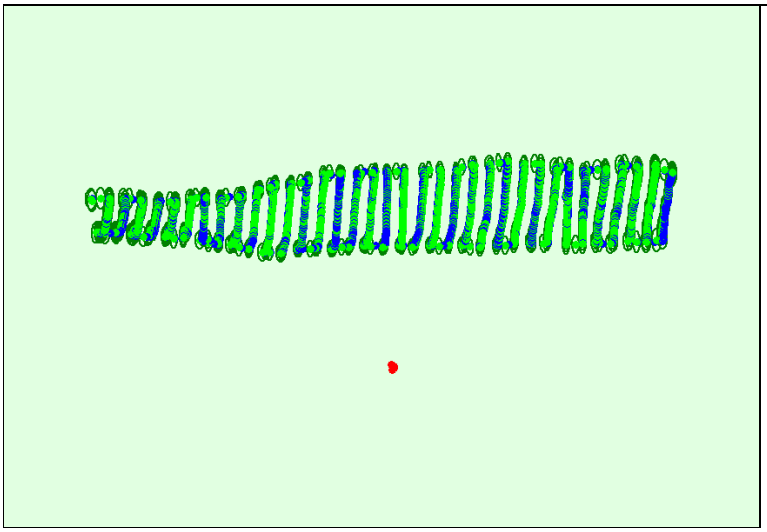


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

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	0.062	0.063	0.142	0.031	0.031	0.010
Sigma	0.010	0.009	0.029	0.002	0.003	0.000

Overlap

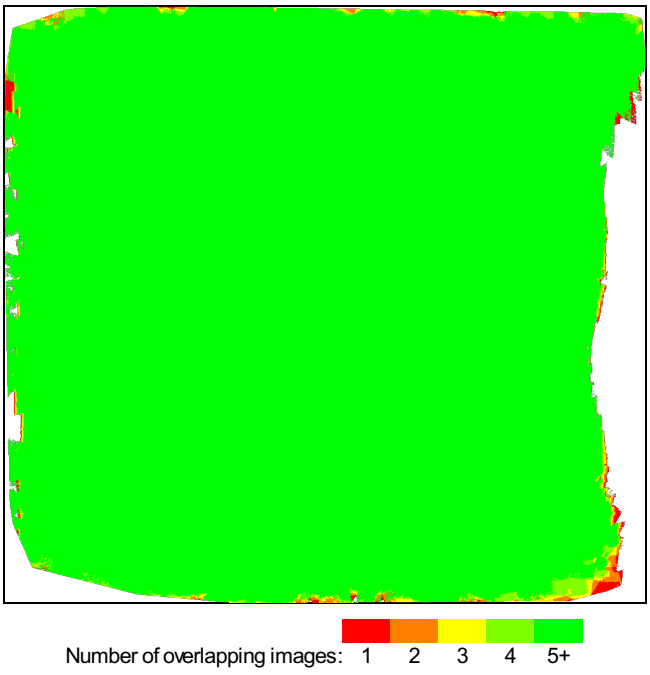


**Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint 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	4200843

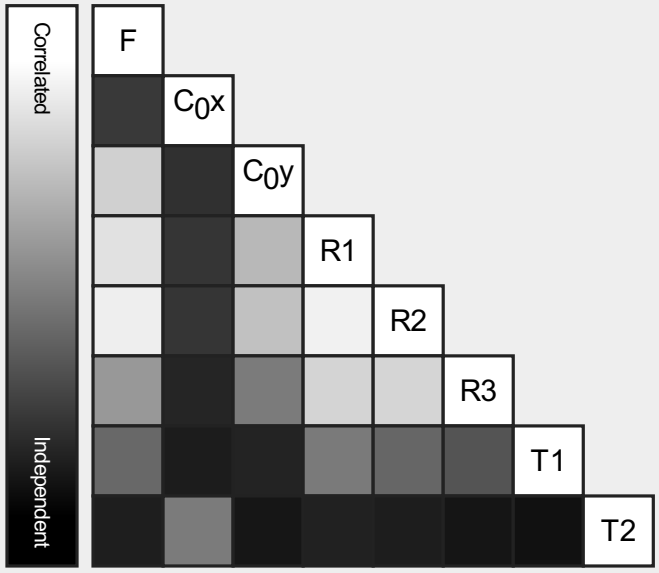
Number of 3D Points for Bundle Block Adjustment	1157383
Mean Reprojection Error [pixels]	0.136

Internal Camera Parameters

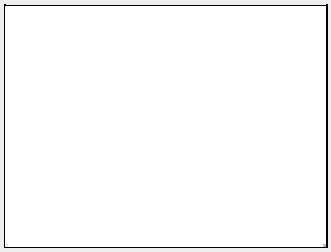
FC350_3.6_4000x3000 (RGB). Sensor Dimensions: 6.317 [mm] x 4.738 [mm]

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	2388.083 [pixel] 3.772 [mm]	1985.118 [pixel] 3.135 [mm]	1500.797 [pixel] 2.370 [mm]	-0.136	0.124	-0.017	0.001	0.000
Uncertainties (Sigma)	1.552 [pixel] 0.002 [mm]	0.033 [pixel] 0.000 [mm]	0.052 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	11734	2390
Min	10276	981
Max	12668	4291
Mean	11688	2409

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	664039
In 3 Images	202744
In 4 Images	94175
In 5 Images	53520
In 6 Images	33350

In 7 Images	23039
In 8 Images	16417
In 9 Images	12411
In 10 Images	9154
In 11 Images	7437
In 12 Images	5923
In 13 Images	4737
In 14 Images	3977
In 15 Images	3206
In 16 Images	2733
In 17 Images	2193
In 18 Images	1991
In 19 Images	1699
In 20 Images	1530
In 21 Images	1224
In 22 Images	1170
In 23 Images	1005
In 24 Images	870
In 25 Images	777
In 26 Images	661
In 27 Images	622
In 28 Images	574
In 29 Images	507
In 30 Images	463
In 31 Images	382
In 32 Images	394
In 33 Images	355
In 34 Images	328
In 35 Images	291
In 36 Images	261
In 37 Images	207
In 38 Images	230
In 39 Images	201
In 40 Images	174
In 41 Images	150
In 42 Images	162
In 43 Images	150
In 44 Images	128
In 45 Images	122
In 46 Images	130
In 47 Images	96
In 48 Images	102
In 49 Images	86
In 50 Images	104
In 51 Images	76
In 52 Images	73
In 53 Images	75
In 54 Images	60
In 55 Images	59
In 56 Images	45
In 57 Images	47
In 58 Images	41
In 59 Images	37
In 60 Images	43
In 61 Images	30
In 62 Images	35
In 63 Images	37
In 64 Images	25
In 65 Images	30

In 66 Images	18
In 67 Images	24
In 68 Images	21
In 69 Images	22
In 70 Images	20
In 71 Images	21
In 72 Images	32
In 73 Images	15
In 74 Images	21
In 75 Images	23
In 76 Images	19
In 77 Images	8
In 78 Images	14
In 79 Images	14
In 80 Images	12
In 81 Images	5
In 82 Images	6
In 83 Images	5
In 84 Images	6
In 85 Images	7
In 86 Images	9
In 87 Images	6
In 88 Images	4
In 89 Images	9
In 90 Images	9
In 91 Images	3
In 92 Images	7
In 93 Images	5
In 94 Images	9
In 95 Images	6
In 96 Images	8
In 97 Images	5
In 98 Images	4
In 99 Images	4
In 100 Images	3
In 101 Images	4
In 102 Images	4
In 103 Images	3
In 104 Images	1
In 106 Images	3
In 107 Images	4
In 108 Images	2
In 109 Images	3
In 110 Images	1
In 111 Images	1
In 112 Images	2
In 113 Images	3
In 114 Images	2
In 115 Images	2
In 116 Images	1
In 117 Images	2
In 118 Images	2
In 119 Images	2
In 121 Images	2
In 122 Images	1
In 126 Images	1
In 127 Images	1
In 128 Images	1
In 129 Images	3

In 131 Images	2
In 132 Images	1
In 133 Images	1
In 134 Images	1
In 136 Images	1
In 139 Images	1
In 140 Images	1
In 145 Images	1
In 146 Images	1
In 150 Images	1
In 153 Images	1
In 158 Images	1
In 161 Images	1

2D Keypoint Matches

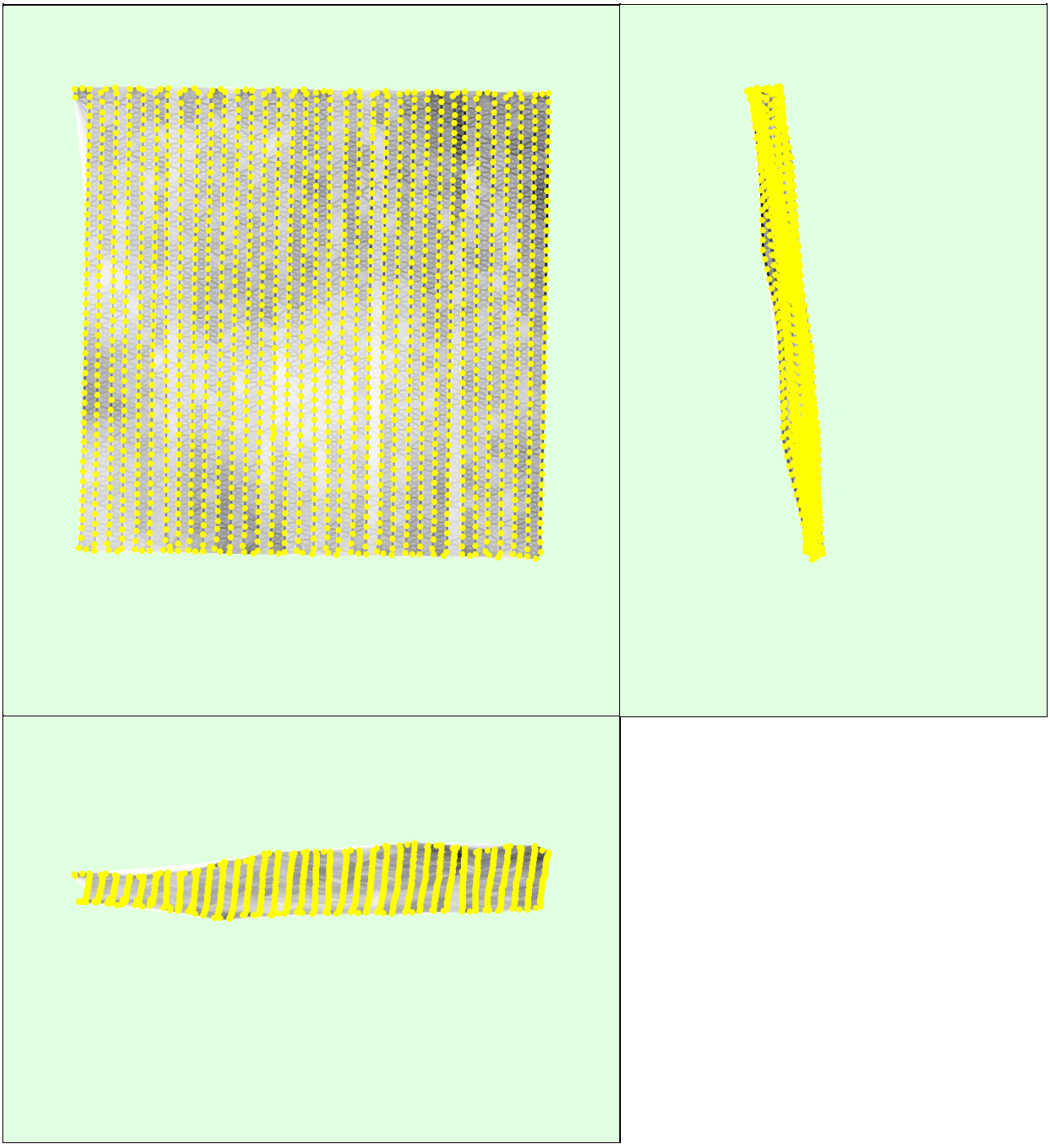


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the

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	0.11	0.00
-6.00	-3.00	0.00	16.46	0.63
-3.00	0.00	51.32	36.18	46.85
0.00	3.00	47.82	29.87	52.52
3.00	6.00	0.86	17.32	0.00
6.00	9.00	0.00	0.06	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
Mean [m]		0.000000	0.000000	0.000000
Sigma [m]		0.637664	2.626718	0.852831
RMS Error [m]		0.637664	2.626718	0.852831

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]	99.89	98.11	100.00
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	5.000000	5.000000	10.000000
Sigma of Geolocation Accuracy [m]	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	0.967
Phi	0.684
Kappa	4.561

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: 24.21.13.9882), 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 11N (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	05h:59m:26s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	35m:46s

Results

Number of Generated Tiles	4
Number of 3D Densified Points	78534834
Average Density (per m^3)	35.76

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (5.09 [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:46s
Time for Orthomosaic Generation	05h:28m:06s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s