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	vjsuo
Processed	2018-05-18 14:08:51
Camera Model Name(s)	FC330_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	6.65 cm / 2.62 in
Area Covered	0.759 km^2 / 75.8828 ha / 0.29 sq. mi. / 187.6077 acres

Quality Check

Images	median of 58032 keypoints per image	✓
Dataset	603 out of 603 images calibrated (100%), all images enabled	✓
Camera Optimization	2.69% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 11458.5 matches per calibrated image	✓
Georeferencing	yes, 9 GCPs (9 3D), mean RMS error = 0.124 m	✓

Preview

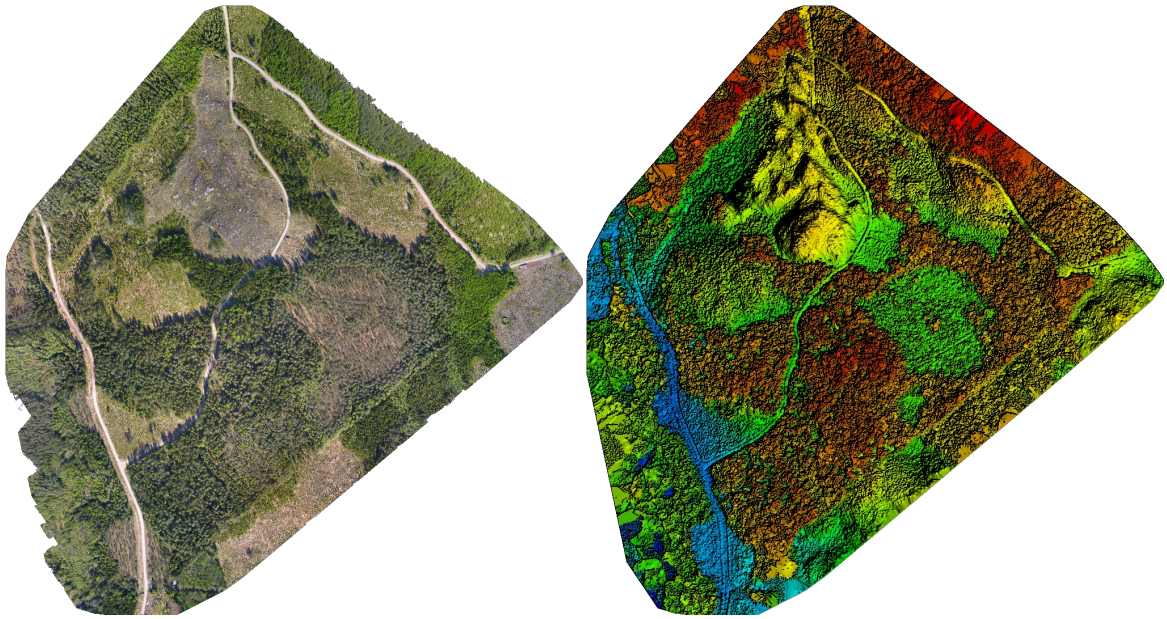


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	603 out of 603
Number of Geolocated Images	603 out of 603

Initial Image Positions

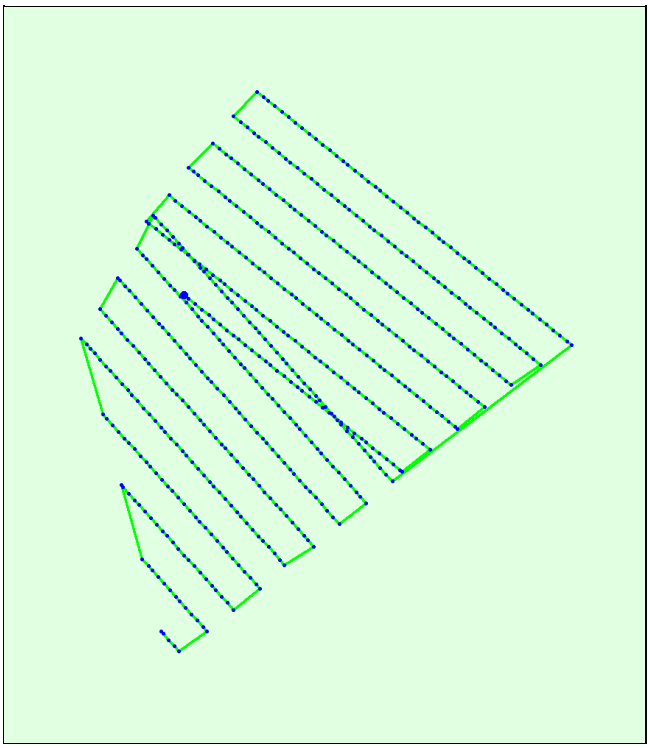


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions

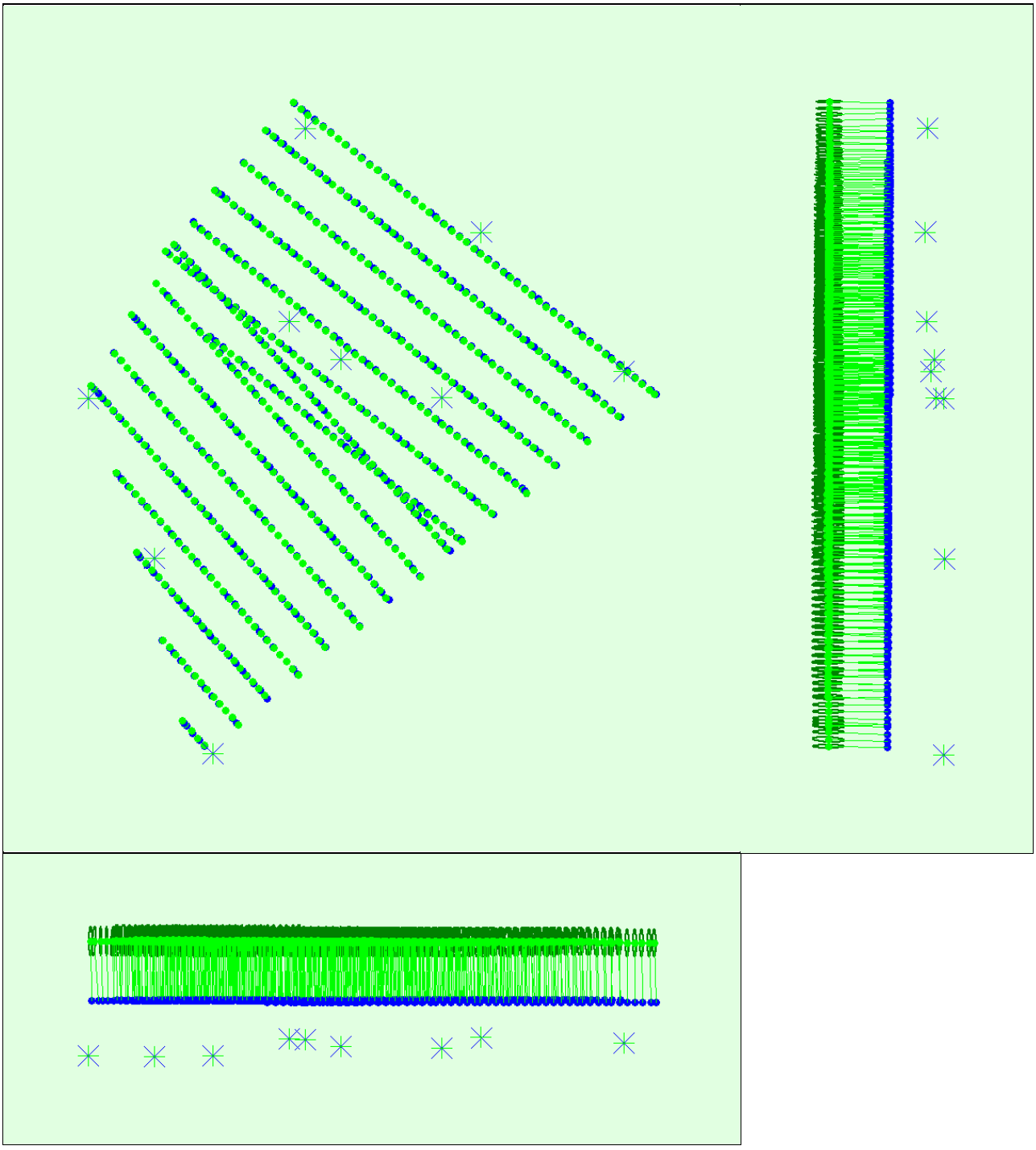


Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Dark green ellipses 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	0.022	0.022	0.209	0.007	0.007	0.002
Sigma	0.007	0.005	0.010	0.002	0.002	0.001

Overlap

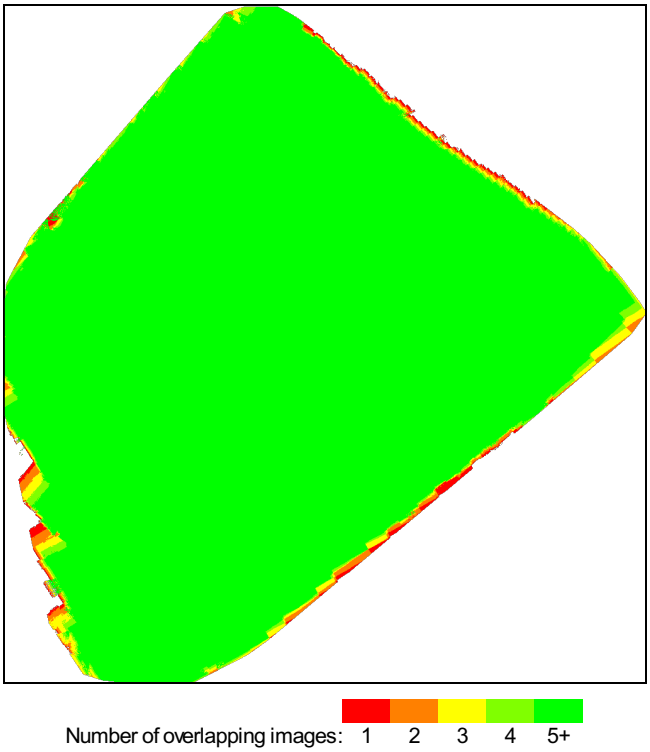


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

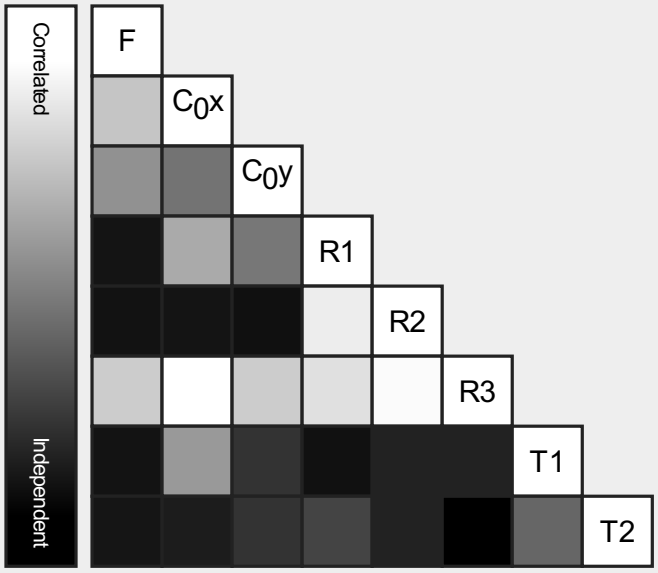
Number of 2D Keypoint Observations for Bundle Block Adjustment	7696877
Number of 3D Points for Bundle Block Adjustment	2190558
Mean Reprojection Error [pixels]	0.130

Internal Camera Parameters

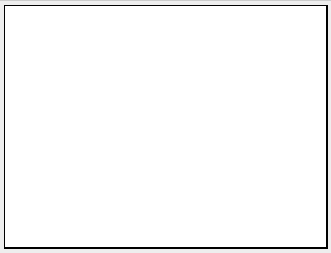
FC330_3.6_4000x3000 (RGB). Sensor Dimensions: 6.317 [mm] x 4.738 [mm]

EXIF ID: FC330_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]	-0.001	-0.002	0.000	-0.001	-0.001
Optimized Values	2347.344 [pixel] 3.707 [mm]	2017.449 [pixel] 3.186 [mm]	1470.935 [pixel] 2.323 [mm]	-0.001	-0.002	0.000	-0.000	-0.000
Uncertainties (Sigma)	3.073 [pixel] 0.005 [mm]	0.138 [pixel] 0.000 [mm]	0.099 [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	58032	11459
Min	52340	1820
Max	64555	29230
Mean	58076	12764

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1242251
In 3 Images	390629
In 4 Images	187426
In 5 Images	106027
In 6 Images	66581
In 7 Images	45073
In 8 Images	32015
In 9 Images	23326
In 10 Images	17776
In 11 Images	13905
In 12 Images	10747
In 13 Images	8755
In 14 Images	6899
In 15 Images	5463
In 16 Images	4230
In 17 Images	3519
In 18 Images	3024
In 19 Images	2705
In 20 Images	2289
In 21 Images	1975
In 22 Images	1784

In 23 Images	1534
In 24 Images	1360
In 25 Images	1121
In 26 Images	1046
In 27 Images	854
In 28 Images	736
In 29 Images	660
In 30 Images	620
In 31 Images	488
In 32 Images	492
In 33 Images	433
In 34 Images	372
In 35 Images	318
In 36 Images	321
In 37 Images	301
In 38 Images	289
In 39 Images	263
In 40 Images	224
In 41 Images	200
In 42 Images	176
In 43 Images	167
In 44 Images	160
In 45 Images	152
In 46 Images	131
In 47 Images	97
In 48 Images	127
In 49 Images	114
In 50 Images	114
In 51 Images	109
In 52 Images	104
In 53 Images	101
In 54 Images	79
In 55 Images	76
In 56 Images	83
In 57 Images	73
In 58 Images	56
In 59 Images	64
In 60 Images	52
In 61 Images	44
In 62 Images	43
In 63 Images	40
In 64 Images	48
In 65 Images	36
In 66 Images	41
In 67 Images	36
In 68 Images	30
In 69 Images	38
In 70 Images	30
In 71 Images	30
In 72 Images	18
In 73 Images	14
In 74 Images	13
In 75 Images	2
In 76 Images	7
In 77 Images	1
In 78 Images	8
In 79 Images	3
In 80 Images	1
In 81 Images	1

In 82 Images	3
In 83 Images	2
In 84 Images	1
In 85 Images	1
In 87 Images	1

2D Keypoint Matches

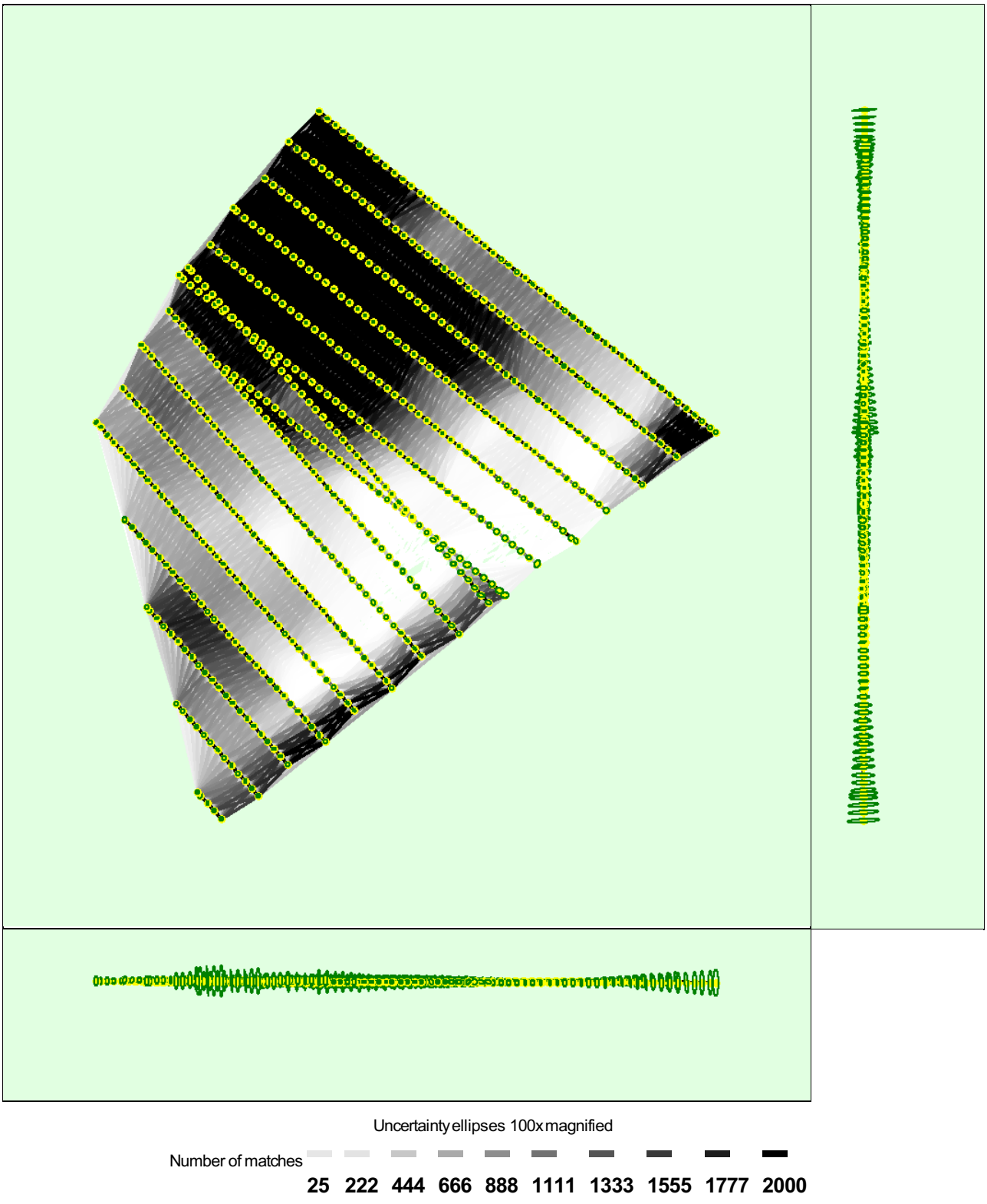


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

Relative camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.020	0.020	0.051	0.020	0.023	0.003
Sigma	0.007	0.006	0.035	0.012	0.014	0.001

Geolocation Details

Ground Control Points

GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
0 (3D)	0.100/ 0.150	0.243	-0.060	0.068	0.419	8 / 8
1 (3D)	0.100/ 0.150	-0.084	0.192	-0.083	0.398	10 / 10
2 (3D)	0.100/ 0.150	0.176	0.207	-0.022	0.162	8 / 8
3 (3D)	0.100/ 0.150	-0.045	0.023	-0.119	0.520	8 / 8
4 (3D)	0.100/ 0.150	0.018	-0.112	-0.027	0.585	10 / 10
5 (3D)	0.100/ 0.150	-0.184	-0.001	0.209	0.344	12 / 12
6 (3D)	0.100/ 0.150	-0.161	0.024	0.091	0.339	9 / 9
7 (3D)	0.100/ 0.150	-0.024	-0.047	-0.172	0.273	12 / 12
8 (3D)	0.100/ 0.150	0.060	-0.215	0.042	0.257	8 / 8
Mean [m]		-0.000142	0.001231	-0.001630		
Sigma [m]		0.134701	0.127034	0.110593		
RMS Error [m]		0.134701	0.127040	0.110605		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

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	0.17	0.00
-6.00	-3.00	3.98	4.98	0.00
-3.00	0.00	46.10	43.45	41.63
0.00	3.00	46.77	49.09	58.37
3.00	6.00	3.15	2.32	0.00
6.00	9.00	0.00	0.00	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]		0.908916	0.060241	-88.430691
Sigma [m]		1.768187	1.757237	0.925240
RMS Error [m]		1.988119	1.758269	88.435531

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.

Geolocation Bias	X	Y	Z
Translation [m]	0.908916	0.060241	-88.430691

Bias between image initial and computed geolocation given in output coordinate system.

Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	99.83	99.83	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	0.378
Phi	1.150
Kappa	10.673

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) i7-7700K CPU @ 4.20GHz RAM: 64GB GPU: NVIDIA GeForce GTX 1080 (Driver: 23.21.13.8795), Intel(R) HD Graphics 630 (Driver: 22.20.16.4749)
Operating System	Windows 10 Enterprise, 64-bit

Coordinate Systems

Image Coordinate System	WGS84 (egm96)
Ground Control Point (GCP) Coordinate System	ETRS89 / TM35FIN(E,N) (egm96)
Output Coordinate System	ETRS89 / TM35FIN(E,N) (egm96)

Processing Options

Detected Template	sfm*
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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	no
LOD	Generated: no
Advanced: Image Groups	group1

Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	03h:00m:22s
Time for Point Cloud Classification	10m:22s
Time for 3D Textured Mesh Generation	NA

Results

Number of Generated Tiles	4
Number of 3D Densified Points	37293911
Average Density (per m^3)	9.86

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	10 [cm/pixel]
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: yes Google Maps Tiles and KML: yes
Index Calculator: Reflectance Map	Generated: yes Resolution: 10 [cm/pixel] Merge Tiles: no
Index Calculator: Indices	grayscale
Time for DSM Generation	13m:22s
Time for Orthomosaic Generation	54m:24s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	04h:33m:12s
Time for Index Map Generation	03m:23s