Quality Report

> **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	flaam_0405201_nr2
Processed	2021-05-06 11:23:04
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	4.43 cm / 1.74 in

Quality Check ⓘ

? **Images**	median of 53204 keypoints per image		✓
? **Dataset**	567 out of 567 images calibrated (100%), 56 images disabled, 2 blocks		⚠
? **Camera Optimization**	0.97% relative difference between initial and optimized internal camera parameters		✓
? **Matching**	median of 10959.7 matches per calibrated image		✓
? **Georeferencing**	yes, 3 GCPs (3 3D), mean RMS error = 0.01 m		✓

Calibration Details ⓘ

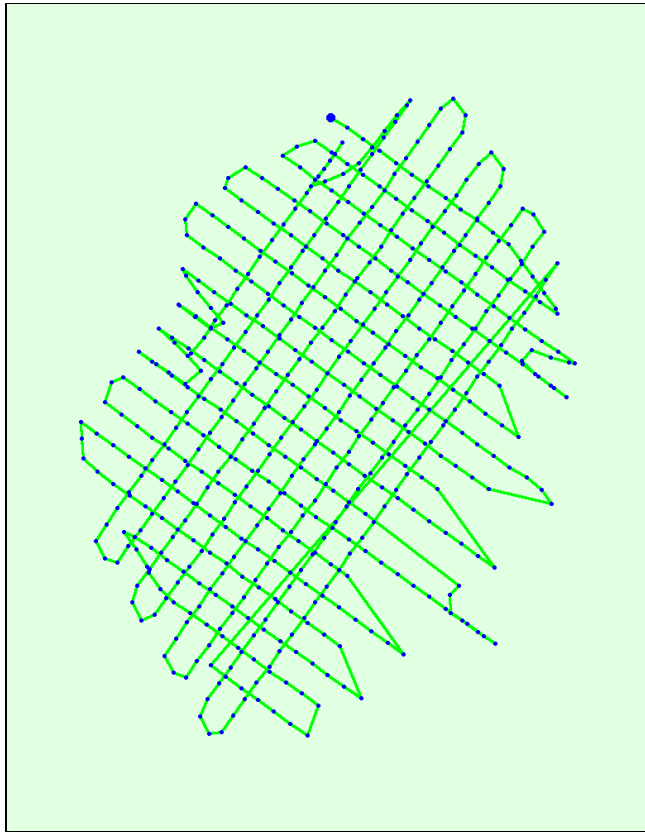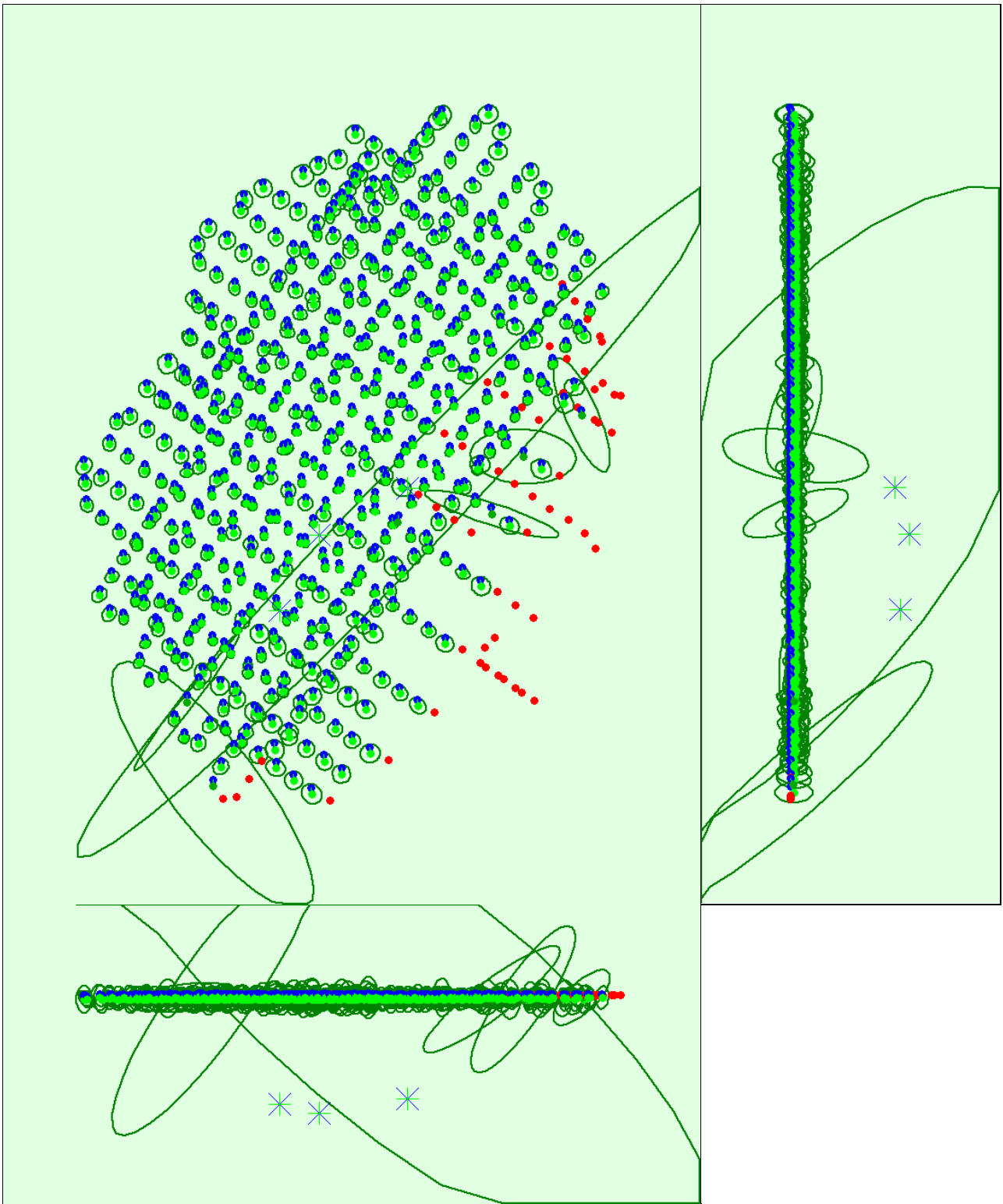|	
Number of Calibrated Images	567 out of 623
Number of Geolocated Images	623 out of 623

? 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 1000x 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	0.002	0.002	0.003	0.003	0.002	0.002
Sigma	0.004	0.004	0.004	0.003	0.003	0.003

Bundle Block Adjustment Details

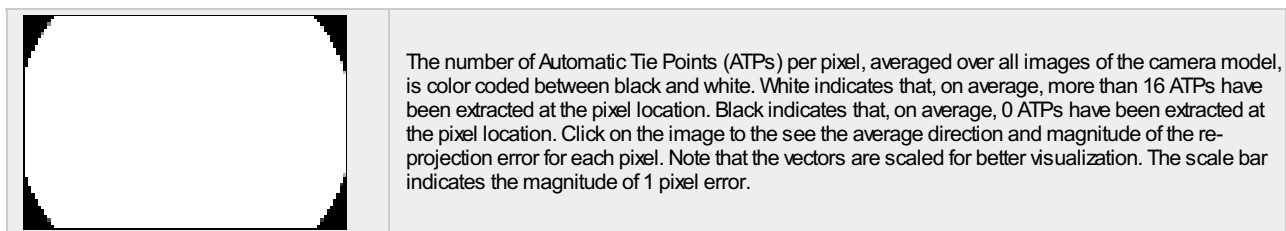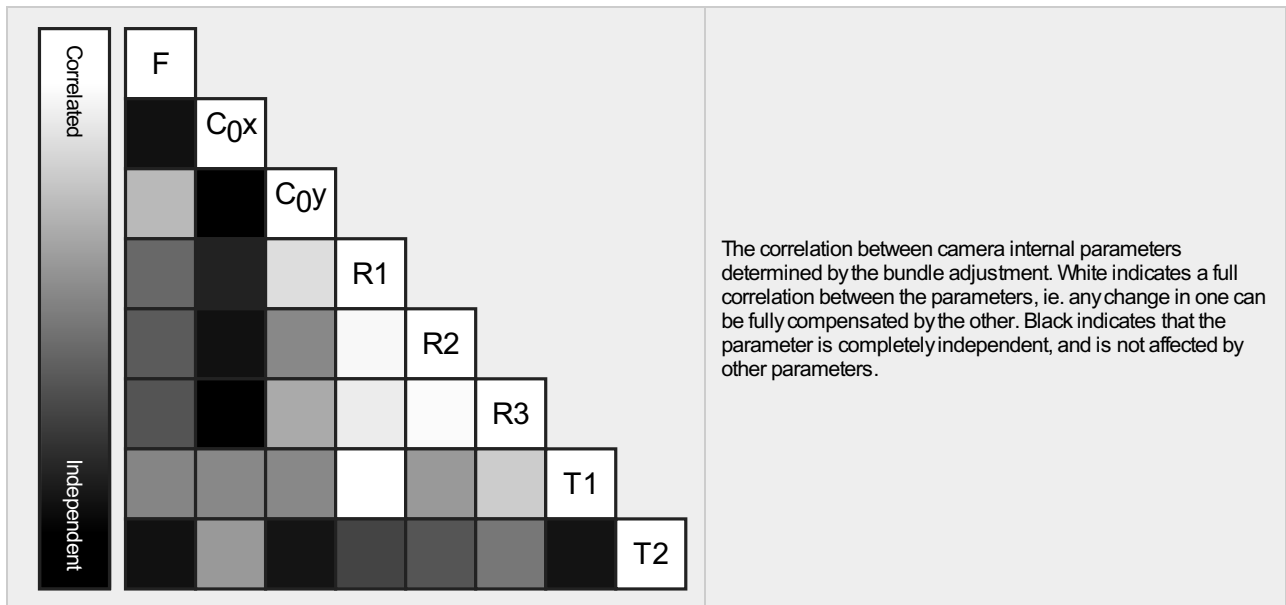|	
Number of 2D Keypoint Observations for Bundle Block Adjustment	6289372
Number of 3D Points for Bundle Block Adjustment	1608056
Mean Reprojection Error [pixels]	0.104

Internal Camera Parameters

FC6310R_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	3622.783 [pixel] 8.496 [mm]	2744.652 [pixel] 6.437 [mm]	1819.184 [pixel] 4.266 [mm]	-0.269	0.112	-0.033	0.000	-0.000
Uncertainties (Sigma)	0.043 [pixel] 0.000 [mm]	0.048 [pixel] 0.000 [mm]	0.058 [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	53204	10960
Min	30689	28
Max	69089	30378
Mean	51959	11092

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	812526
In 3 Images	305328

In 4 Images	156657
In 5 Images	91323
In 6 Images	58138
In 7 Images	39507
In 8 Images	28399
In 9 Images	20927
In 10 Images	15784
In 11 Images	12419
In 12 Images	9912
In 13 Images	8178
In 14 Images	6588
In 15 Images	5433
In 16 Images	4622
In 17 Images	3855
In 18 Images	3388
In 19 Images	2815
In 20 Images	2445
In 21 Images	2061
In 22 Images	1809
In 23 Images	1562
In 24 Images	1474
In 25 Images	1285
In 26 Images	1049
In 27 Images	939
In 28 Images	897
In 29 Images	770
In 30 Images	666
In 31 Images	586
In 32 Images	590
In 33 Images	480
In 34 Images	450
In 35 Images	453
In 36 Images	407
In 37 Images	299
In 38 Images	300
In 39 Images	301
In 40 Images	263
In 41 Images	227
In 42 Images	218
In 43 Images	176
In 44 Images	164
In 45 Images	165
In 46 Images	162
In 47 Images	126
In 48 Images	154
In 49 Images	115
In 50 Images	115
In 51 Images	106
In 52 Images	102
In 53 Images	89
In 54 Images	79
In 55 Images	88
In 56 Images	69
In 57 Images	64
In 58 Images	53
In 59 Images	57
In 60 Images	62
In 61 Images	43
In 62 Images	51

In 63 Images	44
In 64 Images	24
In 65 Images	26
In 66 Images	29
In 67 Images	28
In 68 Images	30
In 69 Images	29
In 70 Images	31
In 71 Images	21
In 72 Images	24
In 73 Images	21
In 74 Images	20
In 75 Images	17
In 76 Images	18
In 77 Images	11
In 78 Images	14
In 79 Images	15
In 80 Images	17
In 81 Images	16
In 82 Images	11
In 83 Images	10
In 84 Images	12
In 85 Images	9
In 86 Images	6
In 87 Images	7
In 88 Images	11
In 89 Images	8
In 90 Images	7
In 91 Images	4
In 92 Images	9
In 93 Images	9
In 94 Images	7
In 95 Images	3
In 96 Images	7
In 97 Images	6
In 98 Images	4
In 99 Images	1
In 100 Images	2
In 101 Images	4
In 102 Images	6
In 103 Images	5
In 104 Images	5
In 105 Images	5
In 106 Images	2
In 107 Images	6
In 108 Images	3
In 109 Images	1
In 110 Images	3
In 111 Images	1
In 112 Images	1
In 113 Images	4
In 114 Images	1
In 115 Images	2
In 116 Images	8
In 118 Images	1
In 119 Images	4
In 120 Images	7
In 121 Images	2
In 122 Images	2

In 123 Images	4
In 124 Images	1
In 125 Images	1
In 126 Images	2
In 129 Images	1
In 130 Images	1
In 131 Images	1
In 133 Images	2
In 134 Images	2
In 135 Images	4
In 136 Images	1
In 137 Images	1
In 138 Images	2
In 139 Images	1
In 144 Images	1
In 145 Images	1
In 147 Images	1
In 149 Images	2
In 153 Images	2
In 154 Images	1
In 158 Images	1
In 159 Images	1
In 160 Images	1
In 161 Images	1
In 164 Images	1
In 165 Images	1
In 166 Images	1
In 169 Images	1
In 170 Images	1
In 172 Images	1
In 176 Images	1
In 178 Images	1
In 199 Images	1

2D Keypoint Matches
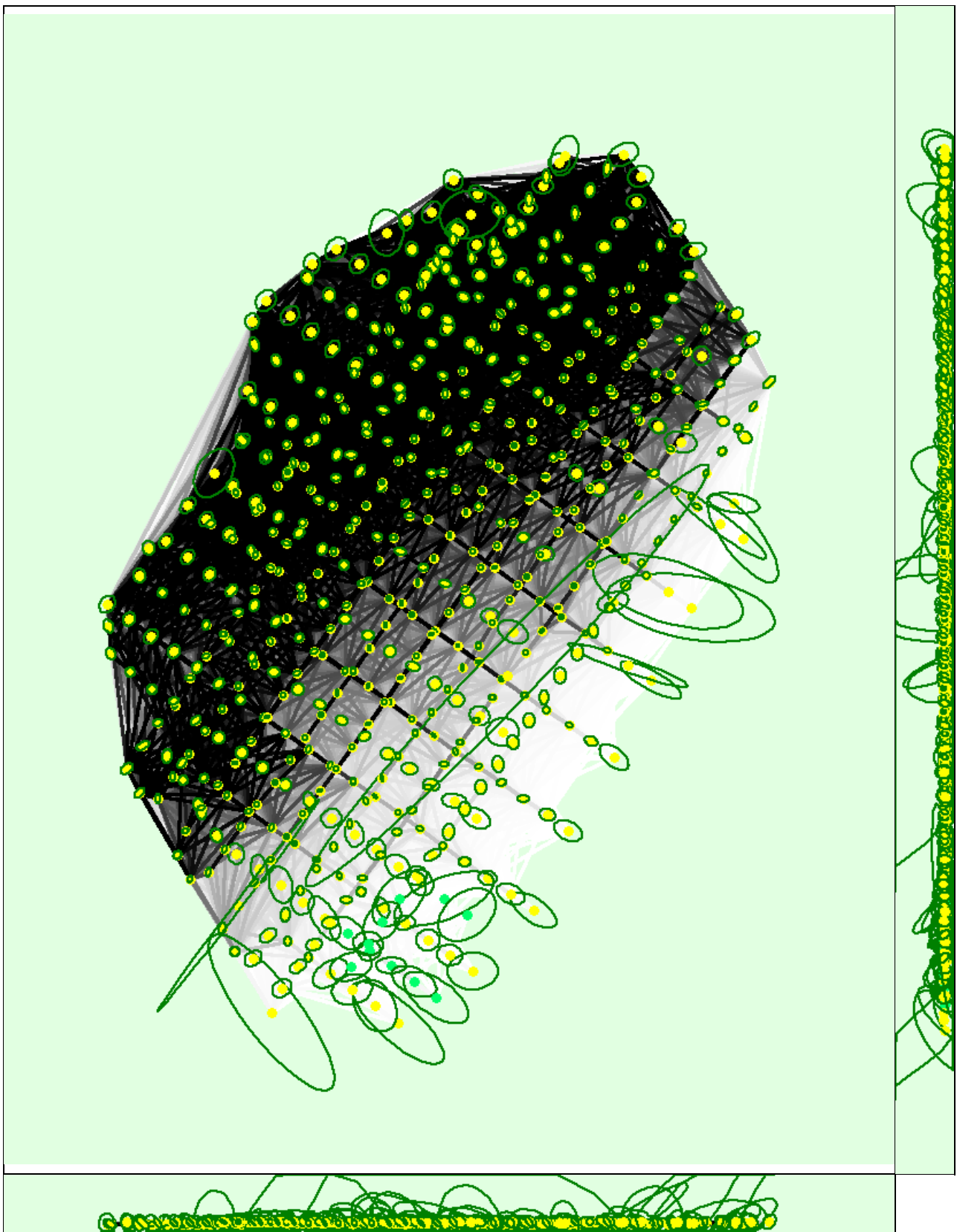
Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.003	0.003	0.003	0.004	0.003	0.003

Sigma	0.005	0.005	0.004	0.009	0.005	0.005

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
GCP2 (3D)	0.013/ 0.026	0.002	-0.007	-0.026	1.282	5 / 5
GCP3 (3D)	0.012/ 0.022	-0.004	0.015	0.000	0.804	5 / 5
GCP4 (3D)	0.011/ 0.021	0.002	-0.007	0.019	0.572	5 / 5
Mean [m]		-0.000043	0.000732	-0.002275		
Sigma [m]		0.003086	0.010328	0.018195		
RMS Error [m]		0.003086	0.010354	0.018336		

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 [%]
-	-0.04	0.00	0.00	0.00
-0.04	-0.03	0.00	0.00	0.18
-0.03	-0.02	0.00	0.00	1.43
-0.02	-0.02	0.18	0.36	7.31
-0.02	-0.01	4.81	6.95	17.11
-0.01	0.00	49.55	45.63	22.99
0.00	0.01	35.29	35.12	21.57
0.01	0.02	9.45	11.41	15.86
0.02	0.02	0.71	0.53	8.73
0.02	0.03	0.00	0.00	4.46
0.03	0.04	0.00	0.00	0.36
0.04	-	0.00	0.00	0.00
Mean [m]		-0.134168	1.739665	1.013593
Sigma [m]		0.005470	0.005759	0.012379
RMS Error [m]		0.134280	1.739674	1.013669

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]	-0.134237	1.739598	1.012744

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]	95.90	94.30	93.40
[-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]	0.010793	0.010793	0.022554
Sigma of Geolocation Accuracy [m]	0.000378	0.000378	0.001310

Geolocation Orientational Variance	RMS [degree]
Omega	1.500
Phi	1.027
Kappa	2.304

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) i7-8550U CPU @ 1.80GHz RAM: 16GB GPU: Intel(R) UHD Graphics 620 (Driver: 24.20.100.6286)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	WGS 84 / UTM zone 32N (EGM 2008 Geoid)
Output Coordinate System	WGS 84 / UTM zone 32N (EGM 2008 Geoid)

Processing Options

Detected Template	3D Models
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	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	02h:18m:56s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	26m:33s

Results

Number of Processed Clusters	5
Number of Generated Tiles	1
Number of 3D Densified Points	14875127
Average Density (per m^3)	107.2