Quality Report

Generated with PIX4Dmapper version 4.7.5

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	test____
Processed	2022-11-16 19:03:49
Camera Model Name(s)	ZenmuseP1_35.0_8192x5460 (RGB)
Average Ground Sampling Distance (GSD)	2.46 cm / 0.97 in
Area Covered	1.154 km^2 / 115.4019 ha / 0.45 sq. mi. / 285.3119 acres
Time for Initial Processing (without report)	12m:55s

Quality Check

Images	median of 29277 keypoints per image	✓
Dataset	584 out of 584 images calibrated (100%), all images enabled	✓
Camera Optimization	1.47% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 10625.7 matches per calibrated image	✓
Georeferencing	yes, 25 GCPs (25 3D), mean RMS error = 0.013 m	✓

Preview

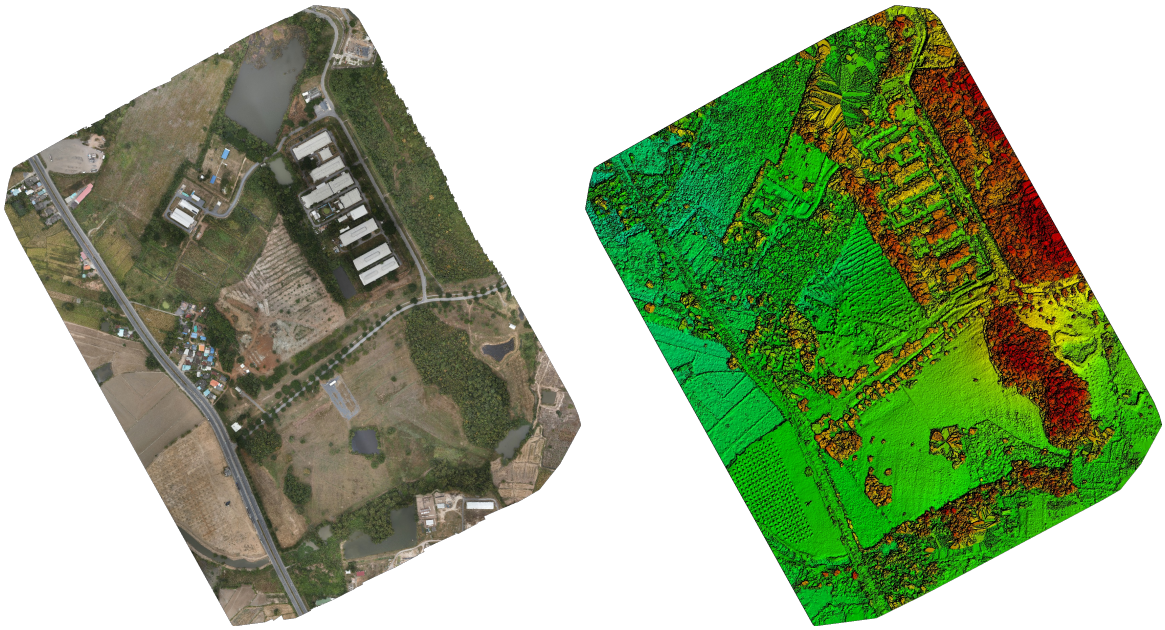


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	584 out of 584
Number of Geolocated Images	584 out of 584

Initial Image Positions

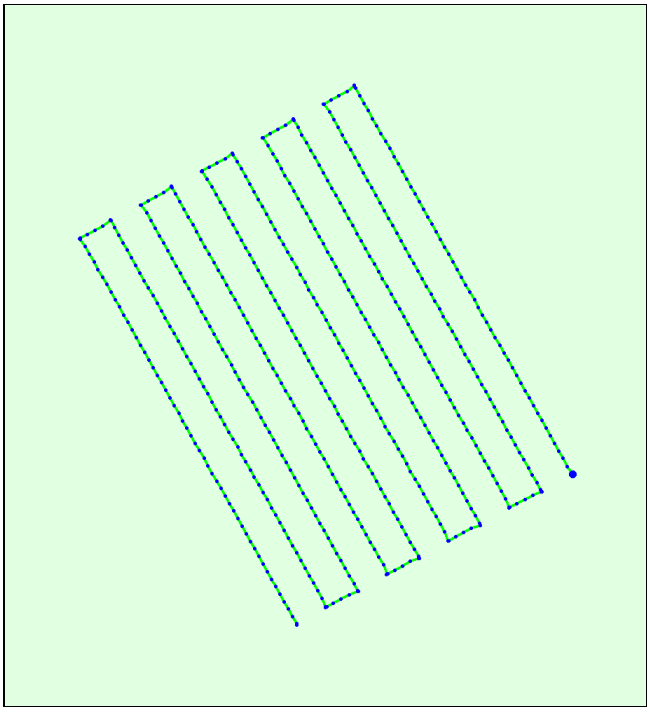
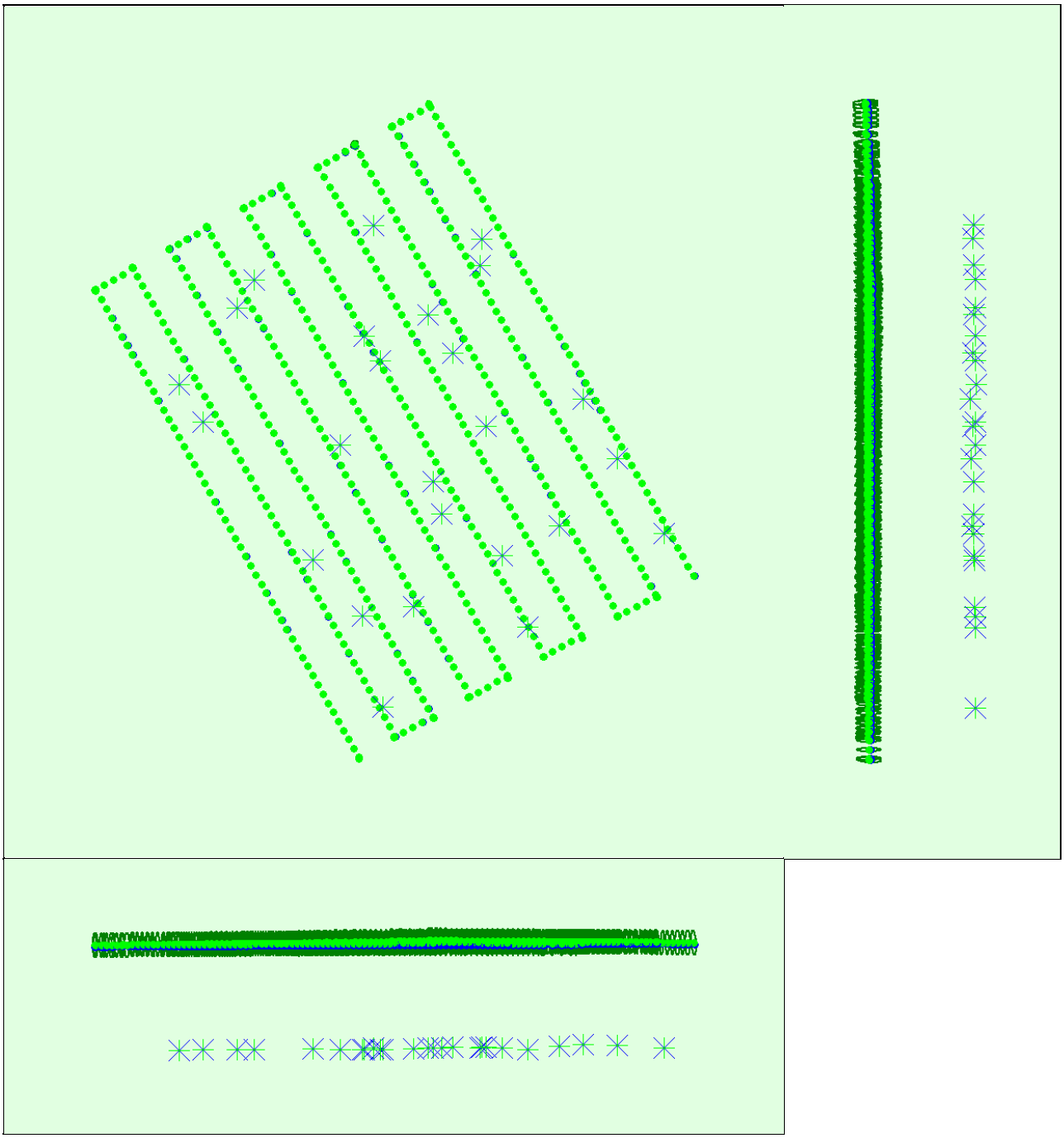


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 100x 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). 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	0.023	0.027	0.227	0.007	0.006	0.001
Sigma	0.007	0.008	0.002	0.002	0.002	0.001

Overlap

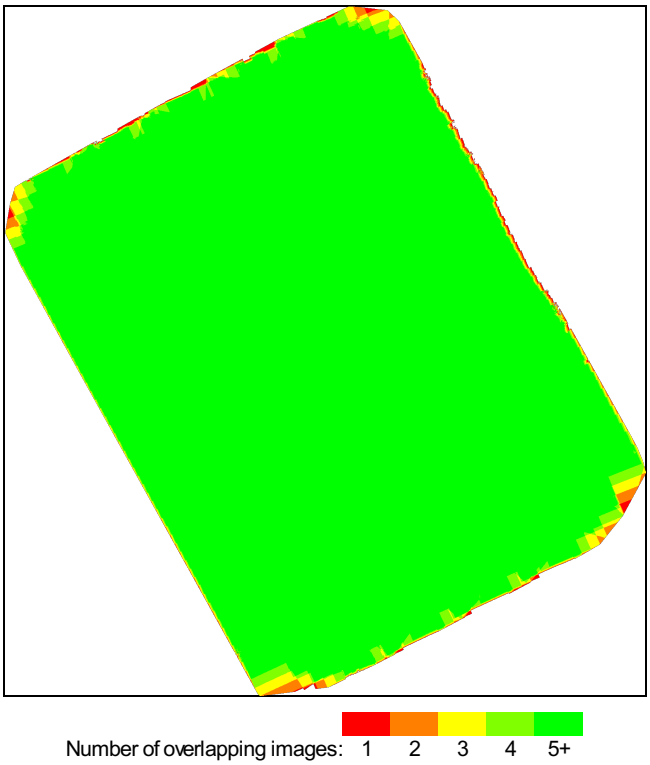


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

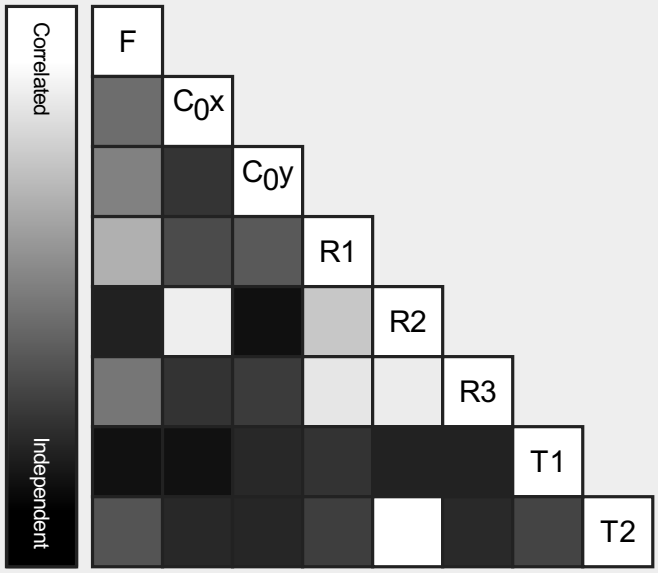
Number of 2D Keypoint Observations for Bundle Block Adjustment	6553461
Number of 3D Points for Bundle Block Adjustment	1773985
Mean Reprojection Error [pixels]	0.087

Internal Camera Parameters

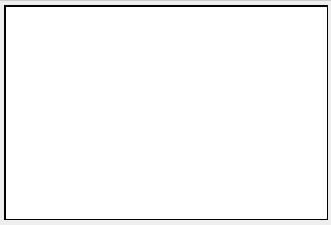
ZenmuseP1_35.0_8192x5460 (RGB). Sensor Dimensions: 35.000 [mm] x 23.328 [mm]

EXIF ID: ZenmuseP1_35.0_8192x5460

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8194.340 [pixel] 35.010 [mm]	4096.001 [pixel] 17.500 [mm]	2729.996 [pixel] 11.664 [mm]	-0.048	0.021	-0.097	0.002	-0.001
Optimized Values	8314.895 [pixel] 35.525 [mm]	4083.762 [pixel] 17.448 [mm]	2748.326 [pixel] 11.742 [mm]	-0.050	0.018	-0.101	0.001	-0.001
Uncertainties (Sigma)	9.315 [pixel] 0.040 [mm]	0.331 [pixel] 0.001 [mm]	0.269 [pixel] 0.001 [mm]	0.000	0.001	0.002	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	29277	10626
Min	12629	550
Max	43463	24007
Mean	28734	11222

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	912770
In 3 Images	335216
In 4 Images	159110
In 5 Images	96060
In 6 Images	69137
In 7 Images	44736
In 8 Images	24951
In 9 Images	20314
In 10 Images	18208
In 11 Images	16989
In 12 Images	18004
In 13 Images	19317
In 14 Images	9741
In 15 Images	5251
In 16 Images	4534
In 17 Images	4374
In 18 Images	4314
In 19 Images	4848
In 20 Images	3866
In 21 Images	1227
In 22 Images	290
In 23 Images	251

In 24 Images	191
In 25 Images	148
In 26 Images	72
In 27 Images	52
In 28 Images	14

2D Keypoint Matches

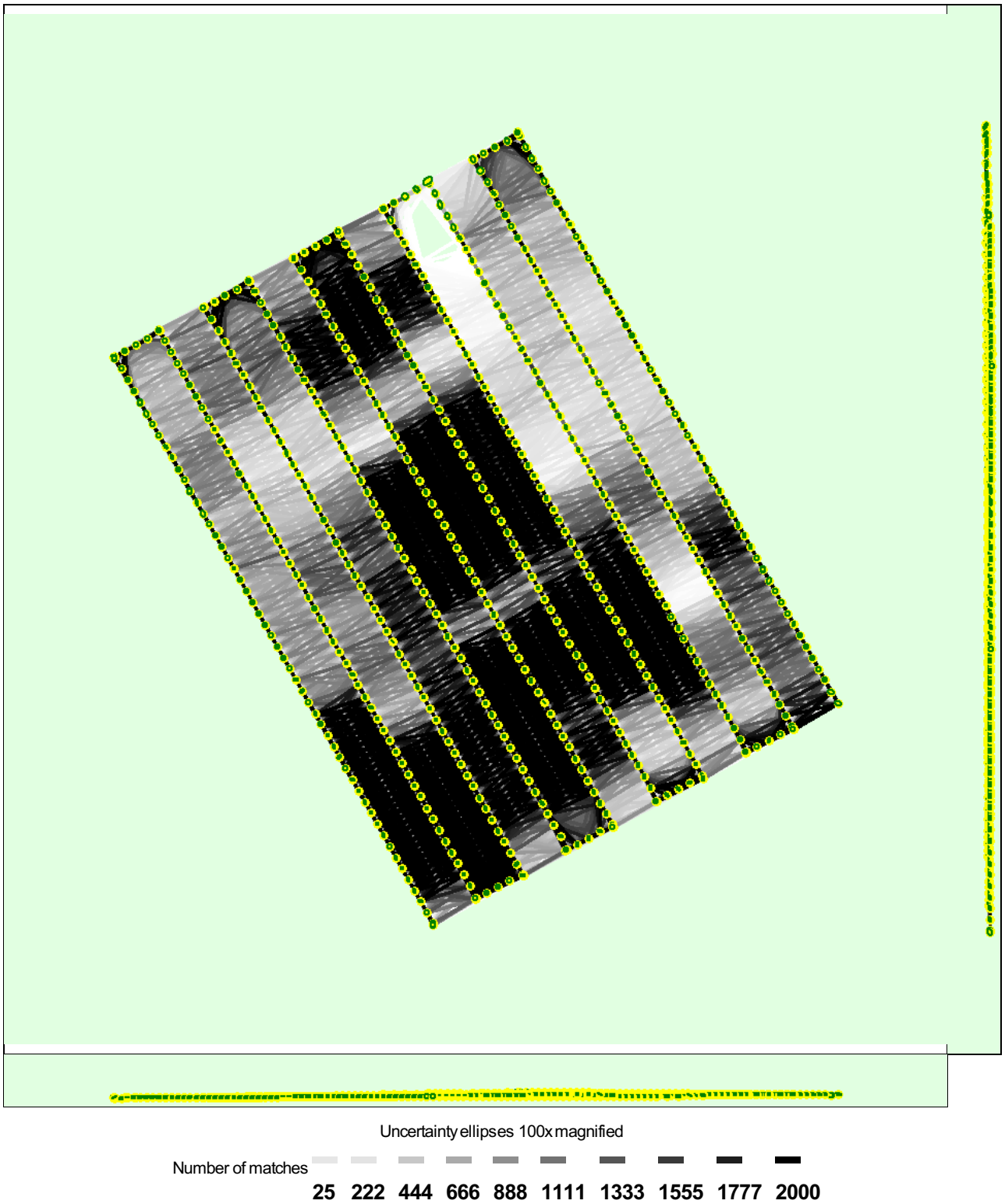


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.026	0.030	0.014	0.008	0.007	0.002
Sigma	0.006	0.006	0.005	0.002	0.002	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
LCP-01 (3D)	0.020/ 0.050	-0.008	-0.003	-0.001	0.135	8 / 8
LCP-03 (3D)	0.020/ 0.050	-0.005	0.001	0.005	0.139	8 / 8
LCP-05 (3D)	0.020/ 0.050	0.001	0.003	0.001	0.195	8 / 8
LCP-07 (3D)	0.020/ 0.050	0.018	0.019	0.031	0.240	8 / 8
LCP-09 (3D)	0.020/ 0.050	-0.002	-0.015	0.010	0.161	8 / 8
LCP-11 (3D)	0.020/ 0.050	0.016	0.003	-0.003	0.246	8 / 8
LCP-13 (3D)	0.020/ 0.050	-0.021	-0.006	0.040	0.161	8 / 8
LCP-15 (3D)	0.020/ 0.050	0.001	-0.002	0.005	0.130	8 / 8
LCP-17 (3D)	0.020/ 0.050	0.004	-0.002	0.006	0.256	8 / 8
LCP-19 (3D)	0.020/ 0.050	0.006	-0.010	0.007	0.151	8 / 8
LCP-21 (3D)	0.020/ 0.050	0.005	0.003	0.012	0.200	8 / 8
LCP-23 (3D)	0.020/ 0.050	-0.006	-0.001	-0.023	0.282	8 / 8
LCP-25 (3D)	0.020/ 0.050	-0.008	-0.006	0.018	0.178	8 / 8
LCP-27 (3D)	0.020/ 0.050	0.002	0.008	0.035	0.190	8 / 8
LCP-29 (3D)	0.020/ 0.050	-0.016	0.016	0.016	0.261	8 / 8
LCP-32 (3D)	0.020/ 0.050	-0.003	0.034	0.025	0.137	8 / 8
GCP-01 (3D)	0.020/ 0.050	-0.005	0.006	-0.032	0.307	8 / 8
GCP-03 (3D)	0.020/ 0.050	0.009	0.002	-0.016	0.178	8 / 8
GCP-05 (3D)	0.020/ 0.050	-0.009	-0.012	-0.020	0.219	8 / 8
GCP-07 (3D)	0.020/ 0.050	0.009	-0.006	-0.013	0.279	8 / 8
GCP-09 (3D)	0.020/ 0.050	-0.006	-0.004	-0.027	0.383	8 / 8
GCP-13 (3D)	0.020/ 0.050	0.012	-0.013	-0.027	0.323	8 / 8
GCP-14 (3D)	0.020/ 0.050	0.018	-0.009	-0.005	0.440	8 / 8
GCP-15 (3D)	0.020/ 0.050	-0.003	-0.003	-0.012	0.174	8 / 8
GCP-18 (3D)	0.020/ 0.050	-0.009	-0.002	-0.034	0.336	8 / 8
Mean [m]		-0.000005	0.000005	-0.000109		
Sigma [m]		0.009838	0.010508	0.020563		
RMS Error [m]		0.009838	0.010508	0.020563		

0 out of 24 check points have been labeled as inaccurate.

Check Point Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
LCP-02		-0.0052	-0.0277	0.0106	0.2530	8 / 8
LCP-04		0.0476	-0.0183	0.0146	0.1678	8 / 8
LCP-06		-0.0239	0.0107	-0.0142	0.1552	8 / 8
LCP-08		0.0073	0.0096	0.0608	0.2156	8 / 8
LCP-10		0.0183	-0.0645	0.0504	0.1214	8 / 8
LCP-12		0.0223	0.0025	0.0436	0.1716	8 / 8
LCP-14		0.0205	-0.0029	-0.0131	0.2042	8 / 8
LCP-16		0.0090	0.0191	-0.0154	0.2067	8 / 8
LCP-18		0.0914	-0.0182	0.0465	0.2072	8 / 8
LCP-20		-0.0206	-0.0158	0.0578	0.2561	8 / 8
LCP-22		-0.0191	0.0076	0.0843	0.1028	8 / 8
LCP-24		-0.0077	0.0047	0.0436	0.1995	8 / 8
LCP-26		-0.0197	-0.0088	0.0337	0.1696	8 / 8
LCP-28		-0.0156	0.0158	-0.0036	0.1673	8 / 8
LCP-30		-0.0052	0.0069	-0.0151	0.2025	8 / 8
GCP-02		0.0022	0.0040	-0.0619	0.3667	8 / 8

GCP-04		-0.0065	0.0054	-0.0363	0.2331	8 / 8
GCP-06		0.0027	0.0124	-0.0909	0.1600	8 / 8
GCP-08		0.0119	0.0039	-0.0140	0.2557	8 / 8
GCP-10		-0.0065	-0.0122	0.0187	0.2063	8 / 8
GCP-11		0.0208	0.0007	-0.0324	0.3078	8 / 8
GCP-12		0.0034	0.0010	-0.0007	0.1323	8 / 8
GCP-16		0.0146	-0.0266	-0.0674	0.2221	8 / 8
GCP-17		0.0169	-0.0219	0.0051	0.1628	8 / 8
Mean [m]		0.006616	-0.004688	0.004360		
Sigma [m]		0.024354	0.018157	0.042856		
RMS Error [m]		0.025237	0.018752	0.043077		

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	0.00	0.00
-6.00	-3.00	0.00	0.00	0.00
-3.00	0.00	44.86	48.80	64.38
0.00	3.00	55.14	51.20	35.62
3.00	6.00	0.00	0.00	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]		0.033000	-0.034464	-3.189011
Sigma [m]		0.136427	0.148344	0.062241
RMS Error [m]		0.140361	0.152295	3.189619

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]	0.033000	-0.034464	-3.189011

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]	100.00	100.00	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.

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Core(TM) i9-10900F CPU @ 2.80GHz RAM: 64GB GPU: NVIDIA GeForce RTX 2070 SUPER (Driver: 30.0.15.1277)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (2D)
Ground Control Point (GCP) Coordinate System	WGS 84 / UTM zone 47N (2D)
Output Coordinate System	WGS 84 / UTM zone 47N (2D)

Processing Options

Detected Template	3D Maps
Keypoints Image Scale	Full, 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