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	25marco_1
Processed	2019-03-26 16:12:31
Camera Model Name(s)	RP_imx219_3.0_3280x2464 (RGB)
Average Ground Sampling Distance (GSD)	0.95 cm / 0.38 in
Area Covered	undefined

Quality Check ⓘ

? **Images**	median of 2621 keypoints per image	✓
? **Dataset**	161 out of 162 images calibrated (99%), all images enabled	✓
? **Camera Optimization**	3.86% relative difference between initial and optimized internal camera parameters	✓
? **Matching**	median of 1264.86 matches per calibrated image	✓
? **Georeferencing**	no, no 3D GCP	⚠

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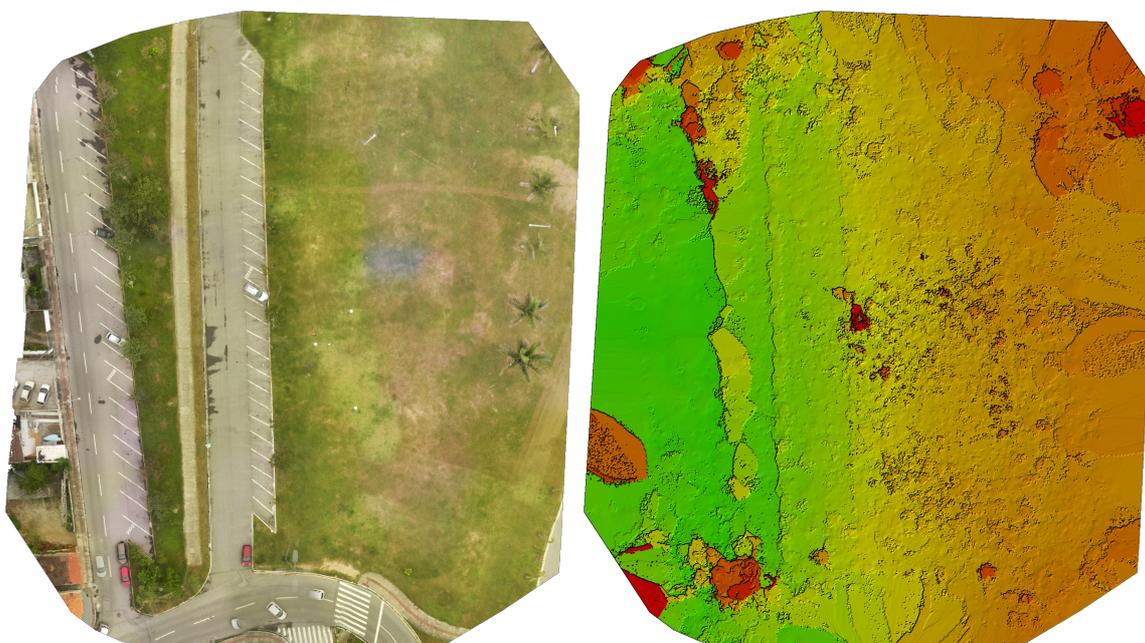
Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	161 out of 162
Number of Geolocated Images	162 out of 162

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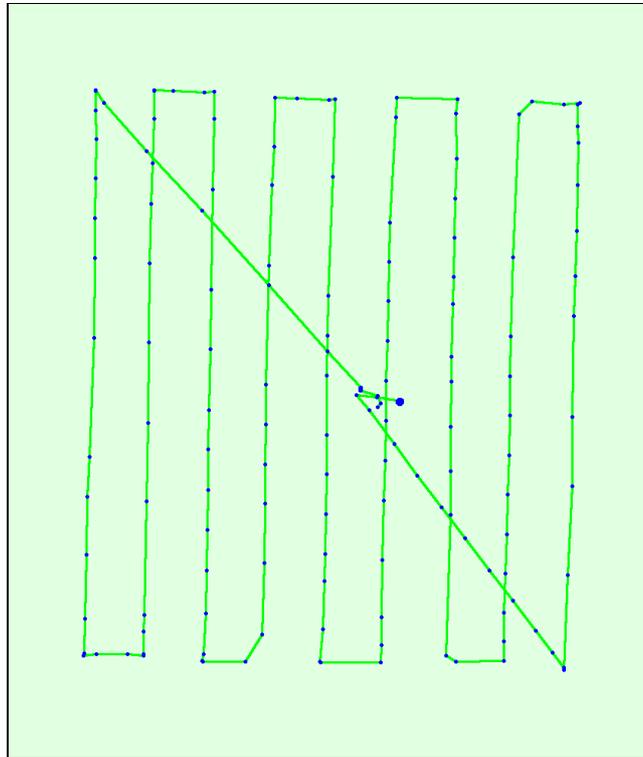
Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions
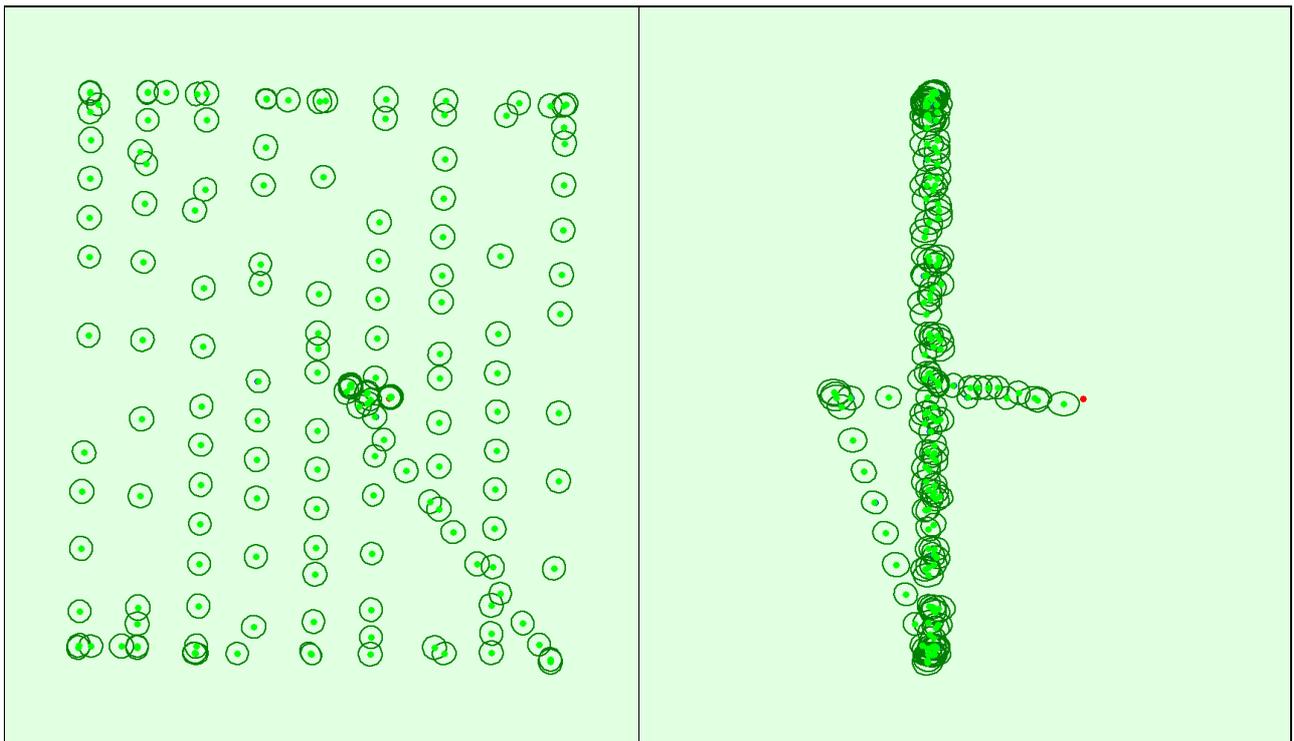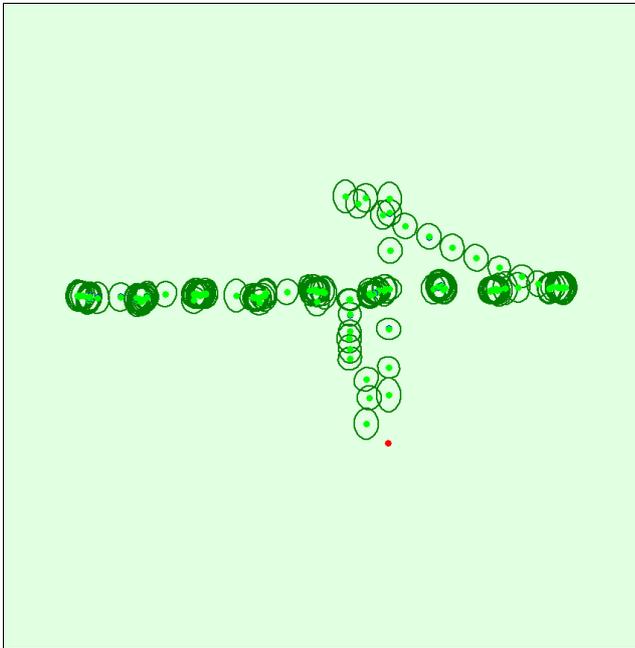
Uncertainty ellipses 1000x magnified

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	0.002	0.010	0.010	0.011
Sigma	0.000	0.000	0.000	0.003	0.003	0.006

ⓘ Overlap
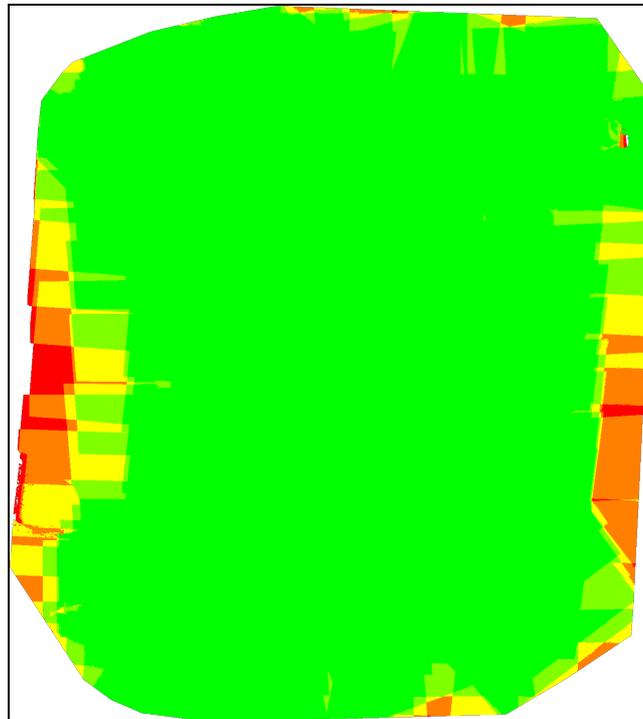
Number of overlapping images: 1 2 3 4 5+

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	199005
Number of 3D Points for Bundle Block Adjustment	72386
Mean Reprojection Error [pixels]	0.138

Internal Camera Parameters

RP_imx219_3.0_3280x2464 (RGB). Sensor Dimensions: 3.674 [mm] x 2.760 [mm]

EXIF ID: RP_imx219_3.0_3280x2464

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2713.970 [pixel] 3.040 [mm]	1642.860 [pixel] 1.840 [mm]	1232.140 [pixel] 1.380 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	2608.962 [pixel] 2.922 [mm]	1644.480 [pixel] 1.842 [mm]	1239.058 [pixel] 1.388 [mm]	0.206	-0.585	0.494	-0.000	-0.000
Uncertainties (Sigma)	0.327 [pixel] 0.000 [mm]	0.289 [pixel] 0.000 [mm]	0.254 [pixel] 0.000 [mm]	0.001	0.004	0.005	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.
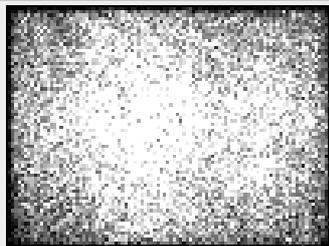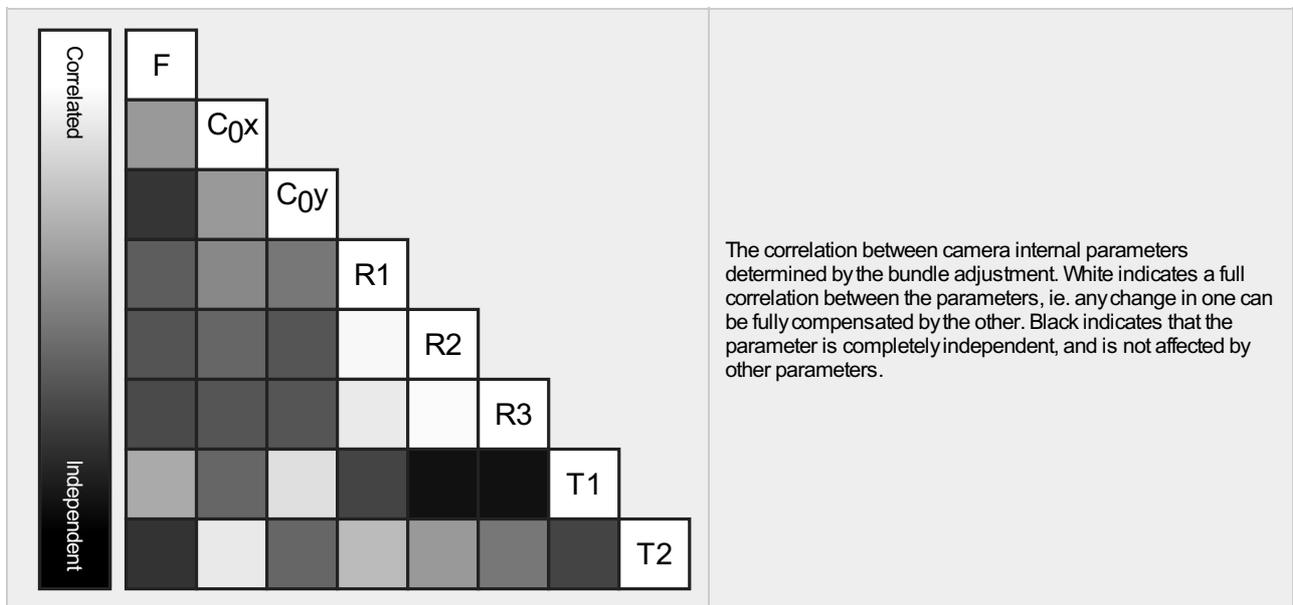
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the 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	2621	1265
Min	2064	275
Max	3076	1973
Mean	2596	1236

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed

In 2 Images	51617
In 3 Images	9586
In 4 Images	4241
In 5 Images	2326
In 6 Images	1432
In 7 Images	1016
In 8 Images	703
In 9 Images	463
In 10 Images	278
In 11 Images	188
In 12 Images	146
In 13 Images	99
In 14 Images	64
In 15 Images	52
In 16 Images	35
In 17 Images	37
In 18 Images	26
In 19 Images	19
In 20 Images	11
In 21 Images	10
In 22 Images	9
In 23 Images	7
In 24 Images	6
In 25 Images	5
In 26 Images	2
In 27 Images	2
In 28 Images	1
In 29 Images	1
In 30 Images	2
In 31 Images	2

2D Keypoint Matches

Uncertainty ellipses 100x magnified

Number of matches

25 87 175 262 350 437 525 612 700 788
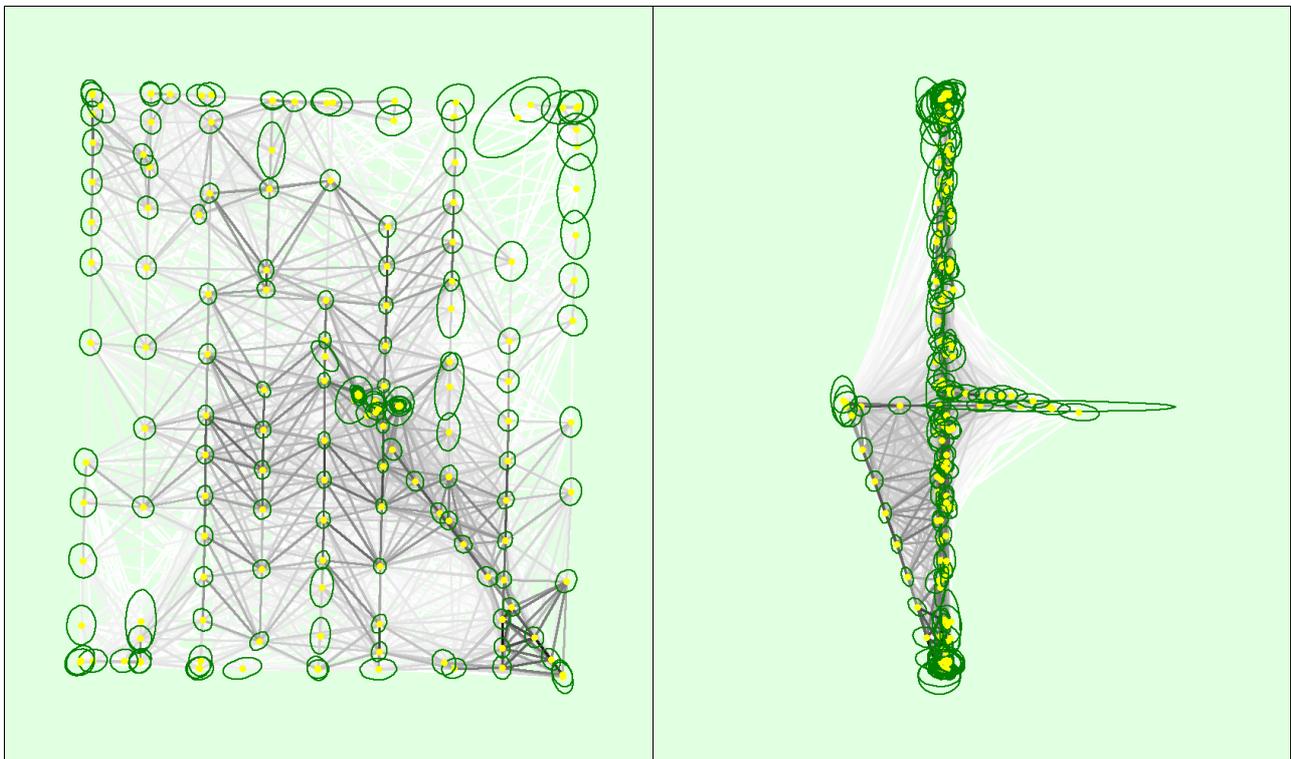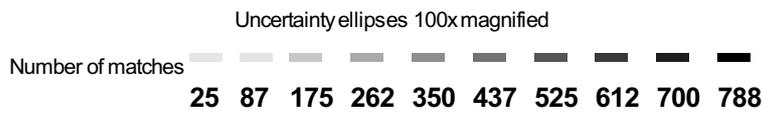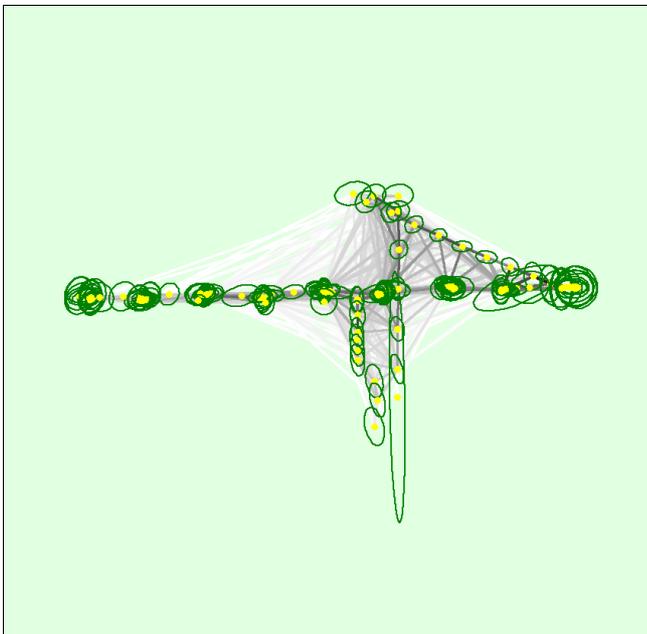
Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.017	0.019	0.017	0.063	0.052	0.016
Sigma	0.007	0.008	0.015	0.027	0.024	0.007

Geolocation Details

Ground Control Points

0 out of 3 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
0		0.037	-0.006	0.033	1.115	6 / 6
1		0.002	0.001	0.007	0.278	8 / 8
2		0.046	0.001	-0.009	0.967	4 / 4
Mean [m]		0.028395	-0.001189	0.010477		
Sigma [m]		0.018662	0.003377	0.017228		
RMS Error [m]		0.033978	0.003580	0.020163		

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 [%]
-	-0.01	0.00	0.00	9.32

-0.01	-0.01	0.00	0.00	4.97
-0.01	-0.01	0.00	0.00	2.48
-0.01	-0.01	0.00	0.00	6.21
-0.01	-0.00	3.73	3.11	12.42
-0.00	0.00	47.83	44.10	4.97
0.00	0.00	44.72	49.69	14.91
0.00	0.01	3.11	3.11	11.80
0.01	0.01	0.62	0.00	13.04
0.01	0.01	0.00	0.00	8.70
0.01	0.01	0.00	0.00	5.59
0.01	-	0.00	0.00	5.59
Mean [m]		0.000000	0.000000	-0.000000
Sigma [m]		0.001669	0.001691	0.011646
RMS Error [m]		0.001669	0.001691	0.011646

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	100.00	65.84
[-2.00, 2.00]	100.00	100.00	91.93
[-3.00, 3.00]	100.00	100.00	98.14
Mean of Geolocation Accuracy [m]	0.007000	0.007000	0.010000
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) i5-3470 CPU @ 3.20GHz RAM: 8GB GPU: Intel(R) HD Graphics (Driver: 10.18.10.5059)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 22S (EGM96 Geoid)

Processing Options

Detected Template	3D Maps - Rapid/Low Res
Keypoints Image Scale	Rapid, Image Scale: 0.25
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, yes

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	4 x GSD (0.954 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp