Quality Report

Generated with Pix4Dmapper version 4.5.6

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	Altyntobe-2016_process_2021
Processed	2021-05-04 18:19:23
Camera Model Name(s)	FC300X_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	2.38 cm / 0.94 in
Area Covered	0.352 km^2 / 35.1559 ha / 0.14 sq. mi. / 86.9170 acres
Time for Initial Processing (without report)	25m:42s

Quality Check

Images	median of 13298 keypoints per image	✓
Dataset	807 out of 807 images calibrated (100%), all images enabled	✓
Camera Optimization	1.4% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 4738.99 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

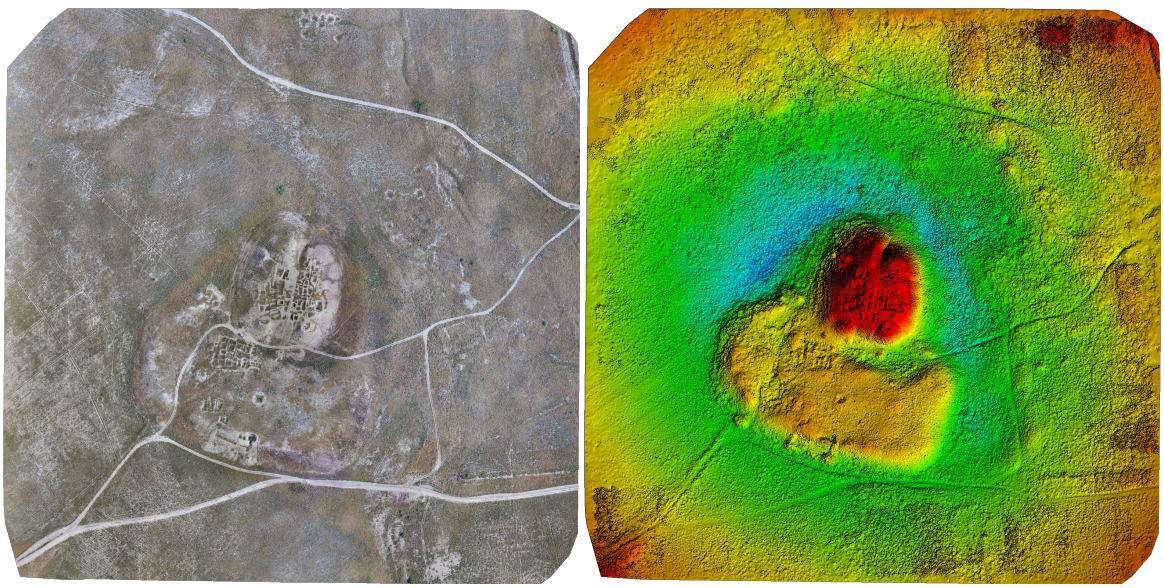


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	807 out of 807
Number of Geolocated Images	807 out of 807

Initial Image Positions

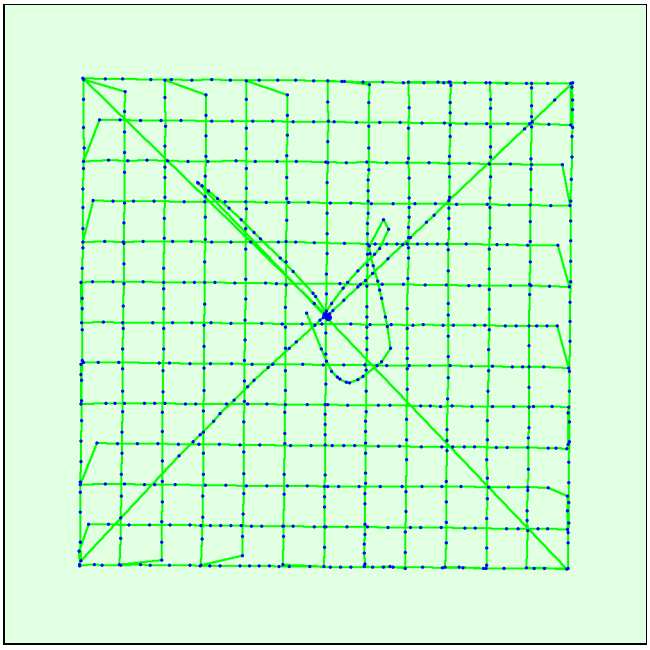
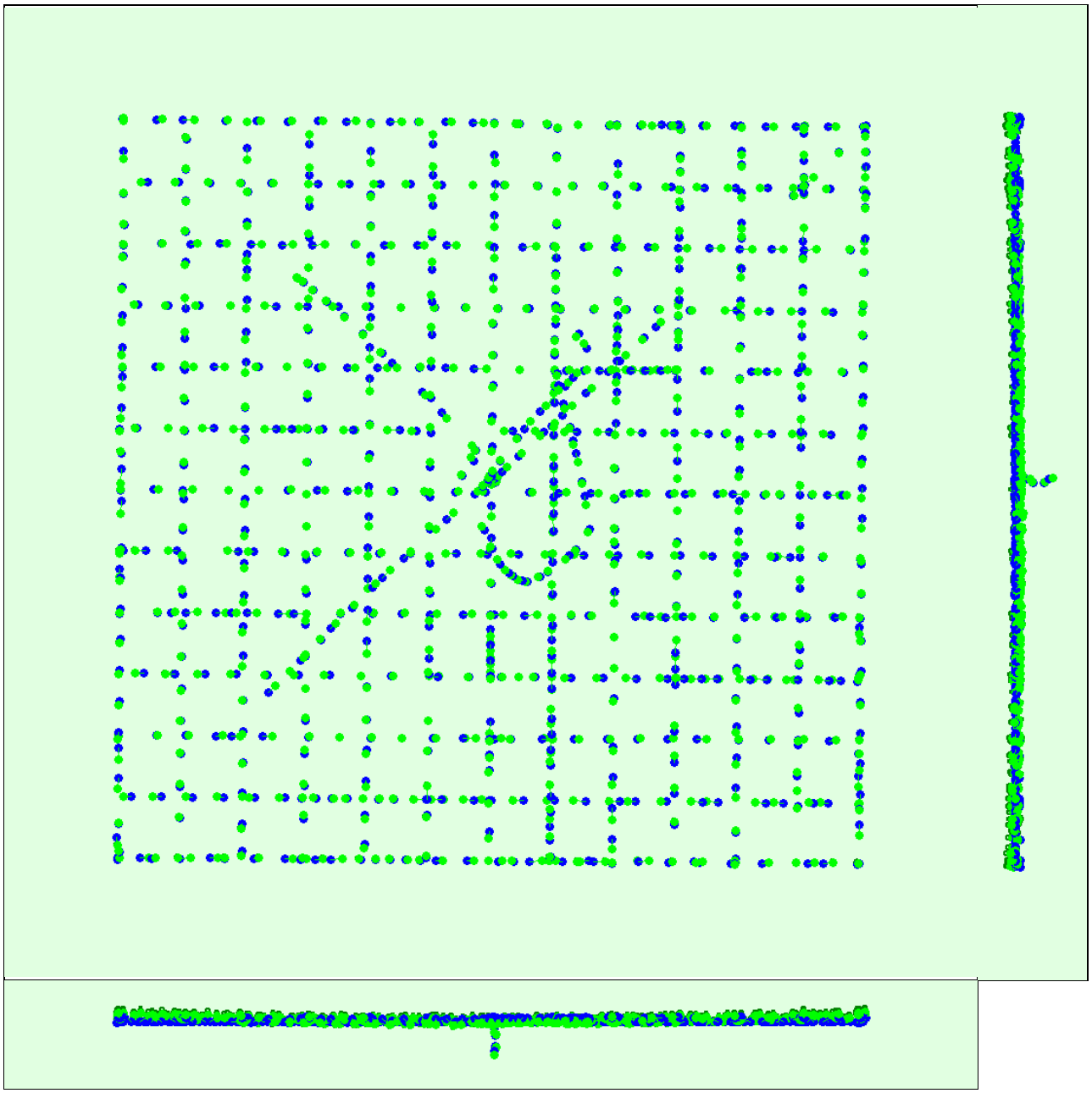


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 10x 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	0.144	0.144	0.277	0.062	0.062	0.030
Sigma	0.026	0.026	0.045	0.008	0.008	0.003

Overlap

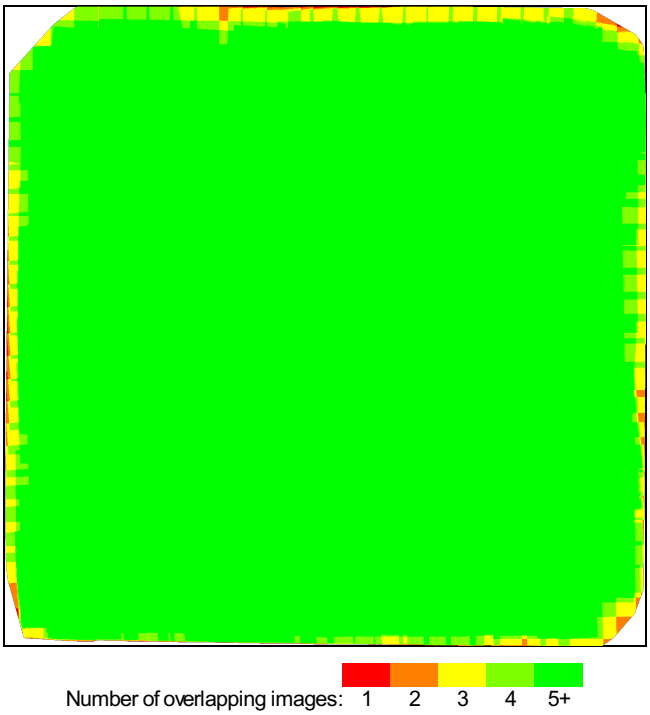


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

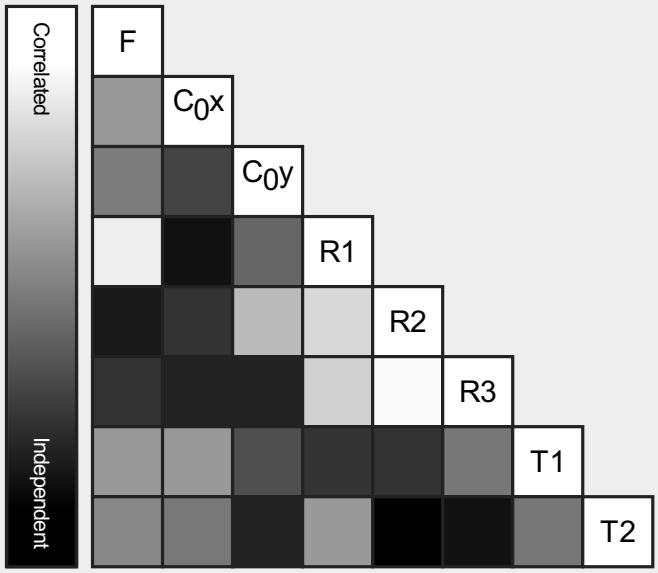
Number of 2D Keypoint Observations for Bundle Block Adjustment	3928771
Number of 3D Points for Bundle Block Adjustment	1269881
Mean Reprojection Error [pixels]	0.188

Internal Camera Parameters

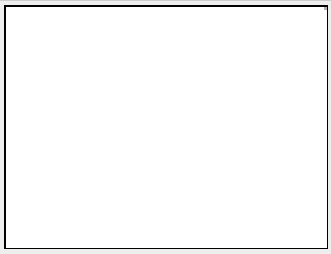
FC300X_3.6_4000x3000 (RGB). Sensor Dimensions: 6.317 [mm] x 4.738 [mm]

EXIF ID: FC300X_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]	-0.014	0.013	-0.000	0.001	0.000
Optimized Values	2317.933 [pixel] 3.661 [mm]	2015.920 [pixel] 3.184 [mm]	1495.321 [pixel] 2.362 [mm]	-0.015	0.010	0.004	-0.000	0.000
Uncertainties (Sigma)	0.745 [pixel] 0.001 [mm]	0.177 [pixel] 0.000 [mm]	0.201 [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	13298	4739
Min	10482	661
Max	21394	14267
Mean	13287	4868

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	746540
In 3 Images	244609
In 4 Images	108993
In 5 Images	57547
In 6 Images	33975
In 7 Images	21373
In 8 Images	14274
In 9 Images	9990
In 10 Images	7486
In 11 Images	5841
In 12 Images	4615
In 13 Images	3882
In 14 Images	2946
In 15 Images	2243
In 16 Images	1733
In 17 Images	1220
In 18 Images	880
In 19 Images	592
In 20 Images	372
In 21 Images	248
In 22 Images	148

In 23 Images	135
In 24 Images	72
In 25 Images	51
In 26 Images	58
In 27 Images	18
In 28 Images	16
In 29 Images	4
In 30 Images	11
In 31 Images	5
In 33 Images	2
In 35 Images	1
In 36 Images	1

2D Keypoint Matches

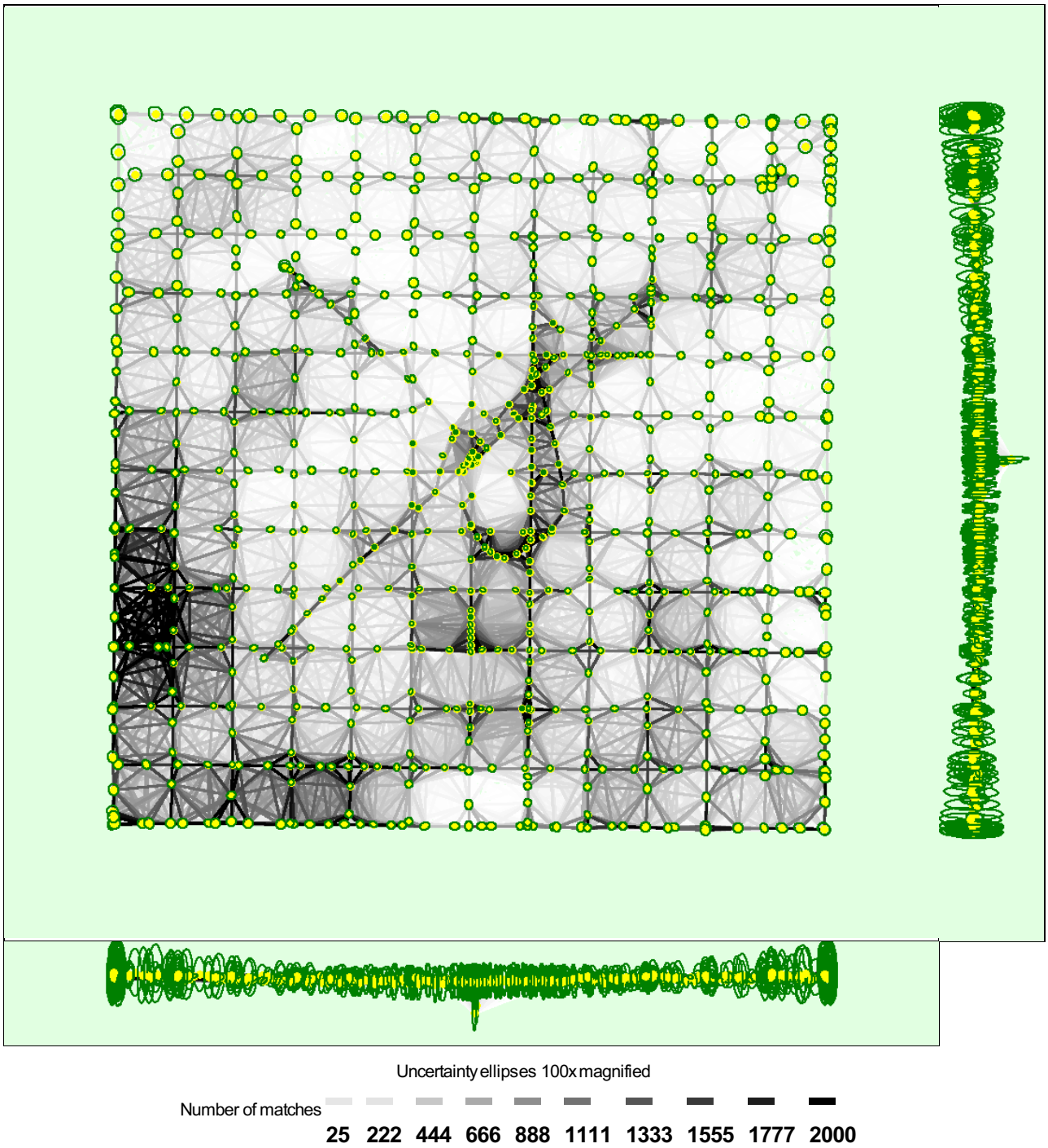


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.026	0.026	0.076	0.047	0.045	0.010
Sigma	0.009	0.008	0.045	0.022	0.022	0.004

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	0.12	0.74	0.00
-9.00	-6.00	6.44	3.47	0.25
-6.00	-3.00	7.81	6.57	10.29
-3.00	0.00	18.46	58.12	38.04
0.00	3.00	55.02	18.71	40.27
3.00	6.00	5.95	6.57	11.15
6.00	9.00	5.95	5.70	0.00
9.00	12.00	0.25	0.12	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]		3.256376	3.034671	2.329649
RMS Error [m]		3.256376	3.034671	2.329649

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]	83.40	86.62	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	1.150
Phi	1.202
Kappa	2.192

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: AMD Ryzen Threadripper 1920X 12-Core Processor RAM: 128GB GPU: NVIDIA GeForce GTX 1070 (Driver: 27.21.14.6627)
Operating System	Windows 10 Enterprise, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 42N (EGM96 Geoid)

Processing Options

Detected Template	No Template Available
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: High Resolution Color Balancing: yes
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	46m:35s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	01h:27m:40s

Results

Number of Generated Tiles	4
Number of 3D Densified Points	67794582
Average Density (per m^3)	289.82

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (2.38 [cm/pixel])

DSM Filters	Noise Filtering: no Surface Smoothing: no
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Time for DSM Generation	25m:27s
Time for Orthomosaic Generation	18m:07s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s