

Quality Report



Generated with Pix4Dmapper version 4.6.3



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	3cm
Processed	2020-12-19 14:57:28
Camera Model Name(s)	FC6310_8.8_5472x3648 (af3db2b889473336bf5a97c5679ad478) (RGB)
Average Ground Sampling Distance (GSD)	2.99 cm / 1.18 in
Area Covered	0.198 km ² / 19.7861 ha / 0.08 sq. mi. / 48.9178 acres

Quality Check



Images	median of 24427 keypoints per image	
Dataset	110 out of 110 images calibrated (100%), all images enabled	
Camera Optimization	0.03% relative difference between initial and optimized internal camera parameters	
Matching	median of 11841.1 matches per calibrated image	
Georeferencing	yes, 5 GCPs (5 3D), mean RMS error = 0.379 m	

Preview

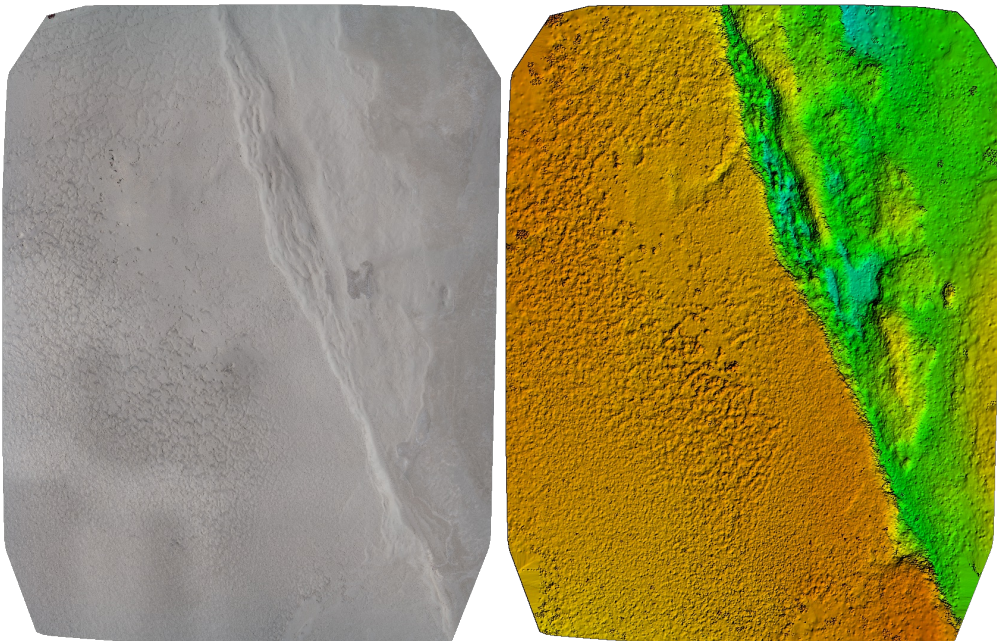


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



Number of Calibrated Images	110 out of 110
Number of Geolocated Images	110 out of 110

? Initial Image Positions

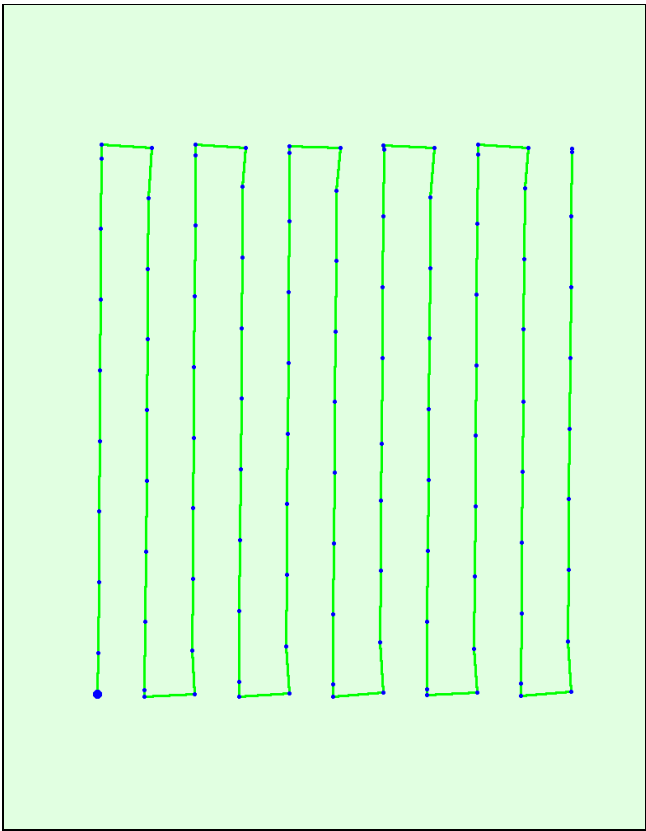
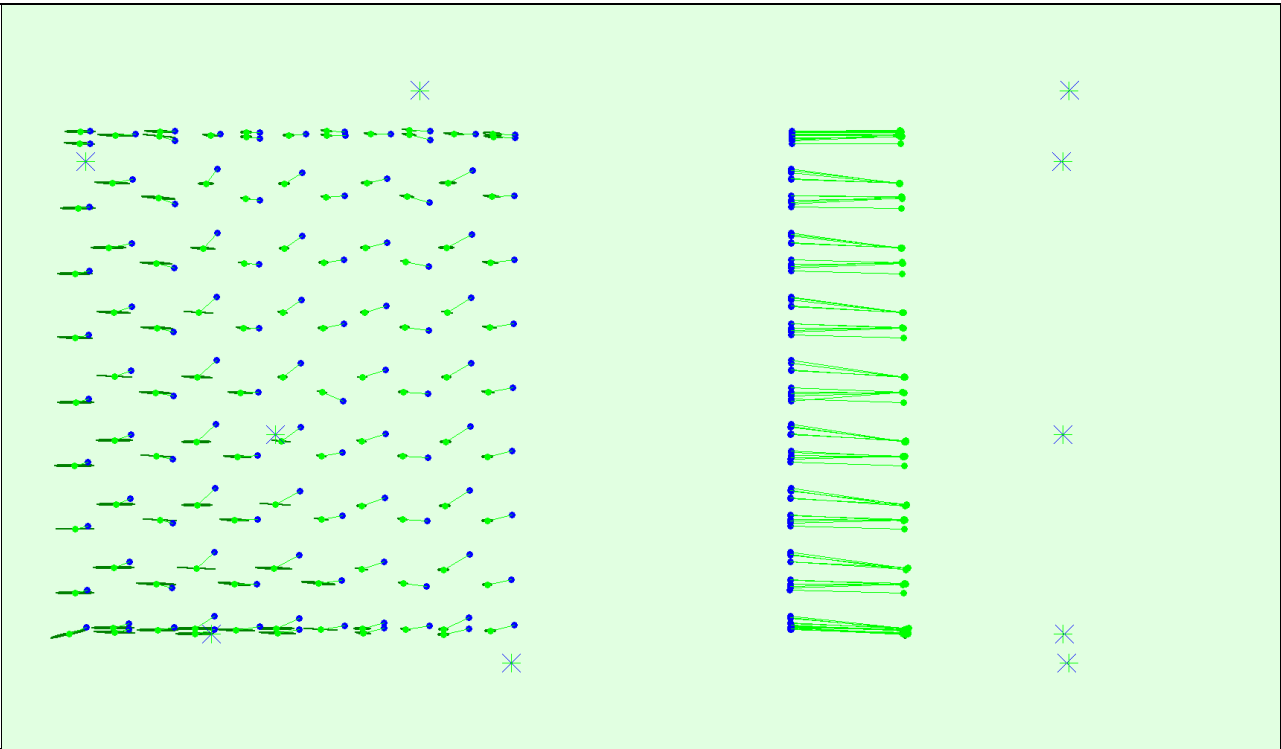
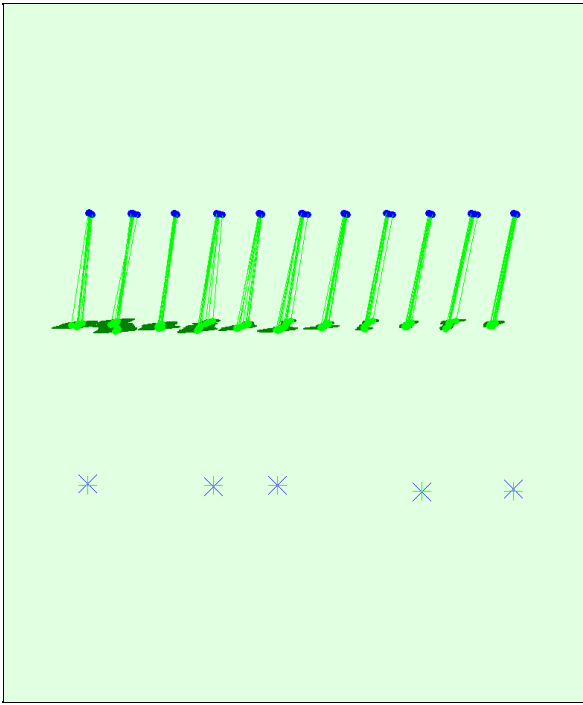


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

? 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]	Camera Displacement X[m]	Camera Displacement Y[m]	Camera Displacement Z[m]
Mean	0.745	0.059	0.070	0.022	0.380	0.033	0.027	0.009	0.362
Sigma	0.404	0.027	0.030	0.015	0.212	0.022	0.018	0.002	0.198

? Overlap

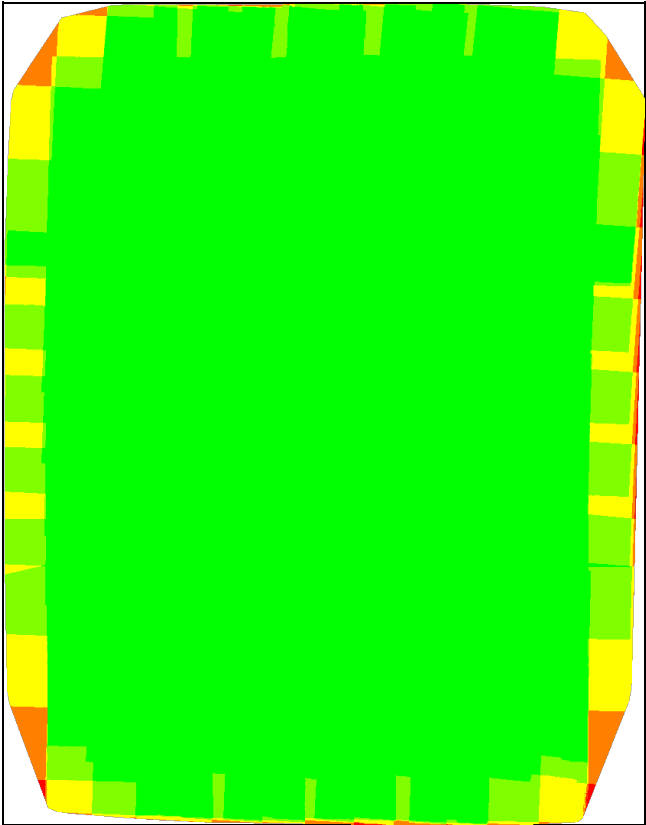




Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

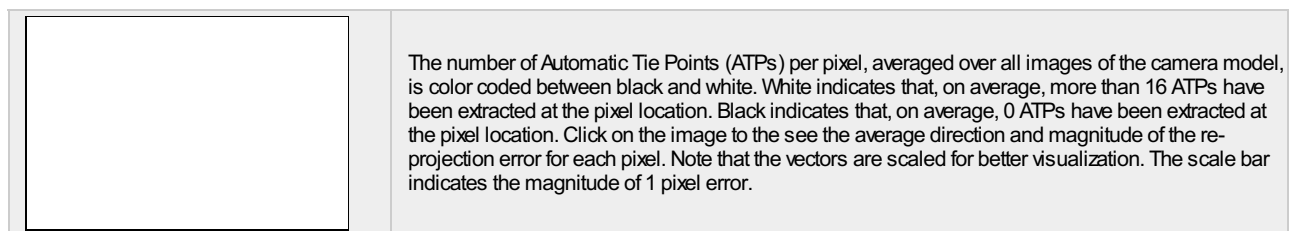
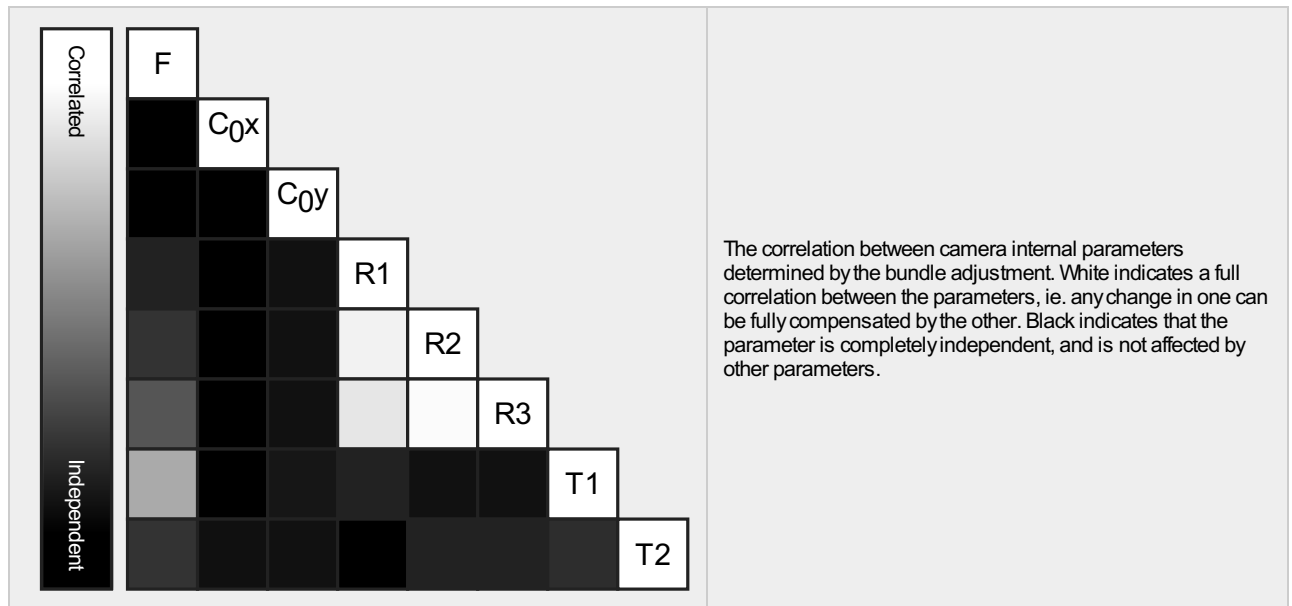
Number of 2D Keypoint Observations for Bundle Block Adjustment	1510546
Number of 3D Points for Bundle Block Adjustment	390927
Mean Reprojection Error [pixels]	0.216

Internal Camera Parameters

FC6310_8.8_5472x3648 (af3db2b889473336bf5a97c5679ad478) (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3752.230 [pixel] 8.800 [mm]	2736.000 [pixel] 6.417 [mm]	1824.000 [pixel] 4.278 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	3753.511 [pixel] 8.803 [mm]	2733.977 [pixel] 6.412 [mm]	1822.854 [pixel] 4.275 [mm]	-0.001	-0.007	0.007	-0.004	-0.001
Uncertainties (Sigma)	1.139 [pixel] 0.003 [mm]	1.135 [pixel] 0.003 [mm]	1.137 [pixel] 0.003 [mm]	0.000	0.001	0.001	0.000	0.000



2D Keypoints Table

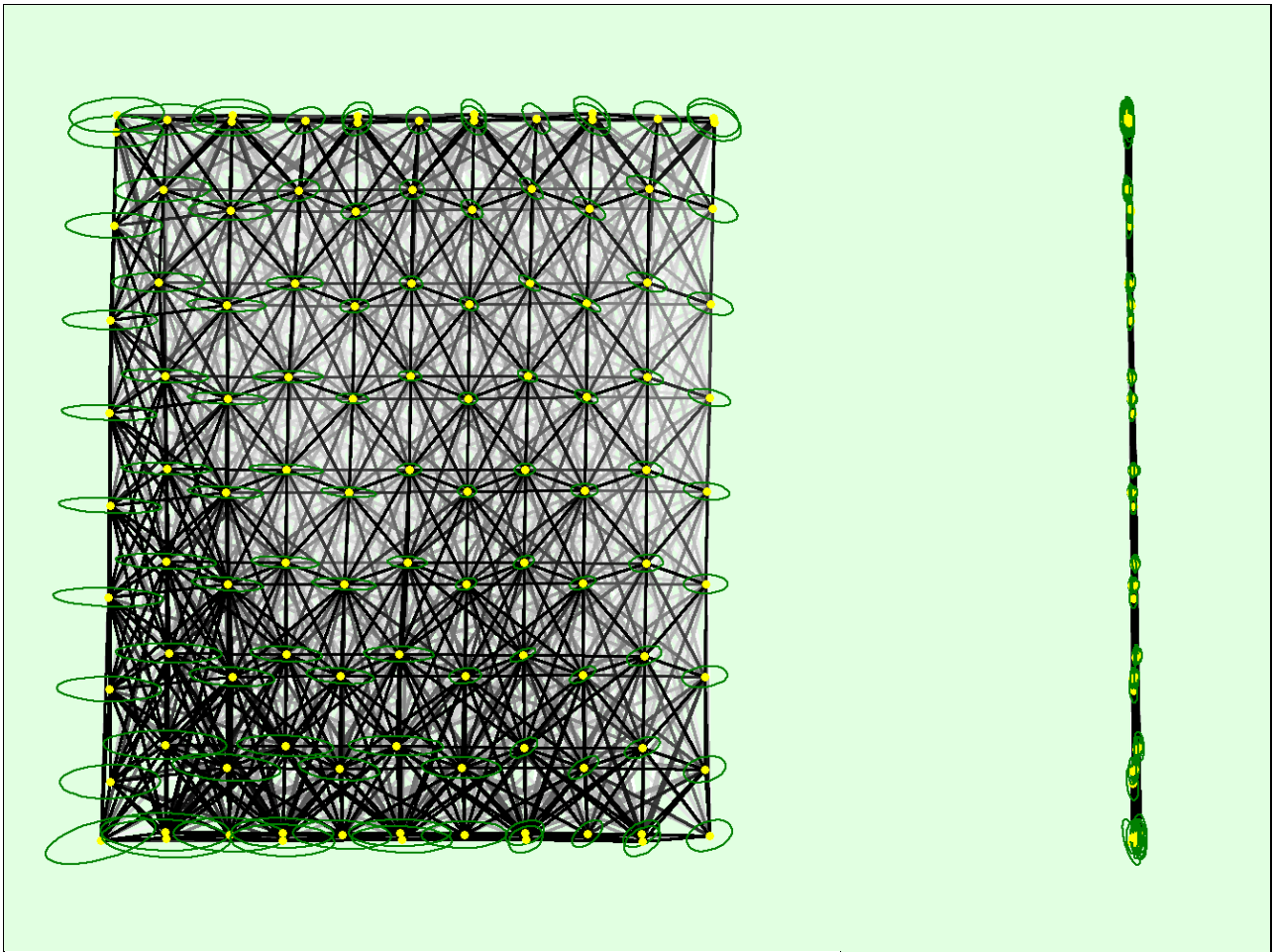
	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24427	11841
Mn	20036	6235
Max	37467	26625

Mean	25431	13732
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3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	159860
In 3 Images	77335
In 4 Images	46887
In 5 Images	30785
In 6 Images	22067
In 7 Images	16672
In 8 Images	11558
In 9 Images	8426
In 10 Images	6257
In 11 Images	4143
In 12 Images	2836
In 13 Images	1755
In 14 Images	1160
In 15 Images	584
In 16 Images	367
In 17 Images	148
In 18 Images	87

2D Keypoint Matches



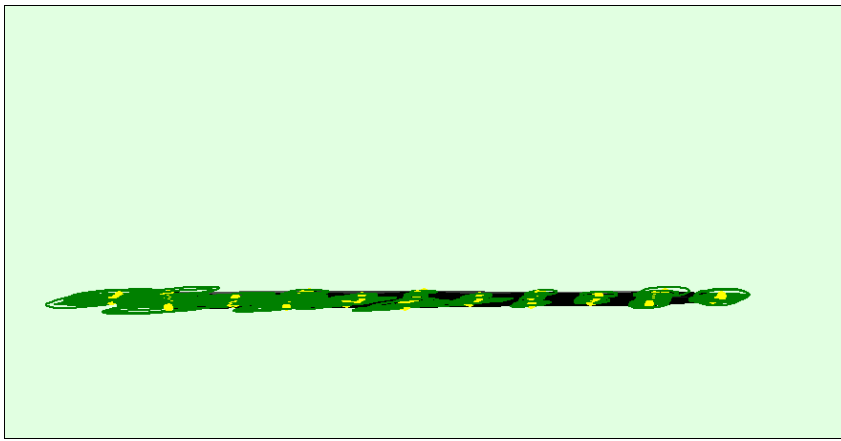


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty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

Relative camera position and orientation uncertainties

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]	Camera Displacement X[m]	Camera Displacement Y[m]	Camera Displacement Z[m]
Mean	0.284	0.105	0.031	0.038	0.151	0.034	0.066	0.037	0.142
Sigma	0.154	0.039	0.014	0.007	0.087	0.008	0.006	0.009	0.082

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
WtoDroneMTP1 (3D)	0.020/ 0.020	0.055	-0.144	1.165	1.503	7 / 7
WtoDroneMTP2 (3D)	0.020/ 0.020	0.095	0.228	-0.569	0.388	9 / 9
WtoDroneMTP3 (3D)	0.020/ 0.020	-0.351	0.376	1.153	0.528	5 / 5
WtoDroneMTP4 (3D)	0.020/ 0.020	0.022	-0.136	-0.537	1.143	10 / 10
WtoDroneMTP5 (3D)	0.020/ 0.020	-0.004	-0.003	0.036	0.417	15 / 15
Mean [m]		-0.036389	0.064049	0.249537		
Sigma [m]		0.160722	0.205997	0.772979		
RMS Error [m]		0.164789	0.215724	0.812260		

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 v.s. manually marked.

Absolute Geolocation Variance

Mn 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	0.91	0.00
-9.00	-6.00	2.73	3.64	0.00
-6.00	-3.00	14.55	23.64	6.36

-3.00	0.00	30.00	31.82	42.73
0.00	3.00	33.64	18.18	42.73
3.00	6.00	19.09	7.27	8.18
6.00	9.00	0.00	14.55	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]		13.648748	3.124216	78.609544
Sigma [m]		2.945950	4.288856	2.013925
RMS Error [m]		13.963056	5.306130	78.635337

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]	13.648748	3.124216	78.609544

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]	93.64	68.18	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	1.271
Phi	3.806
Kappa	2.205

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Rolling Shutter Statistics



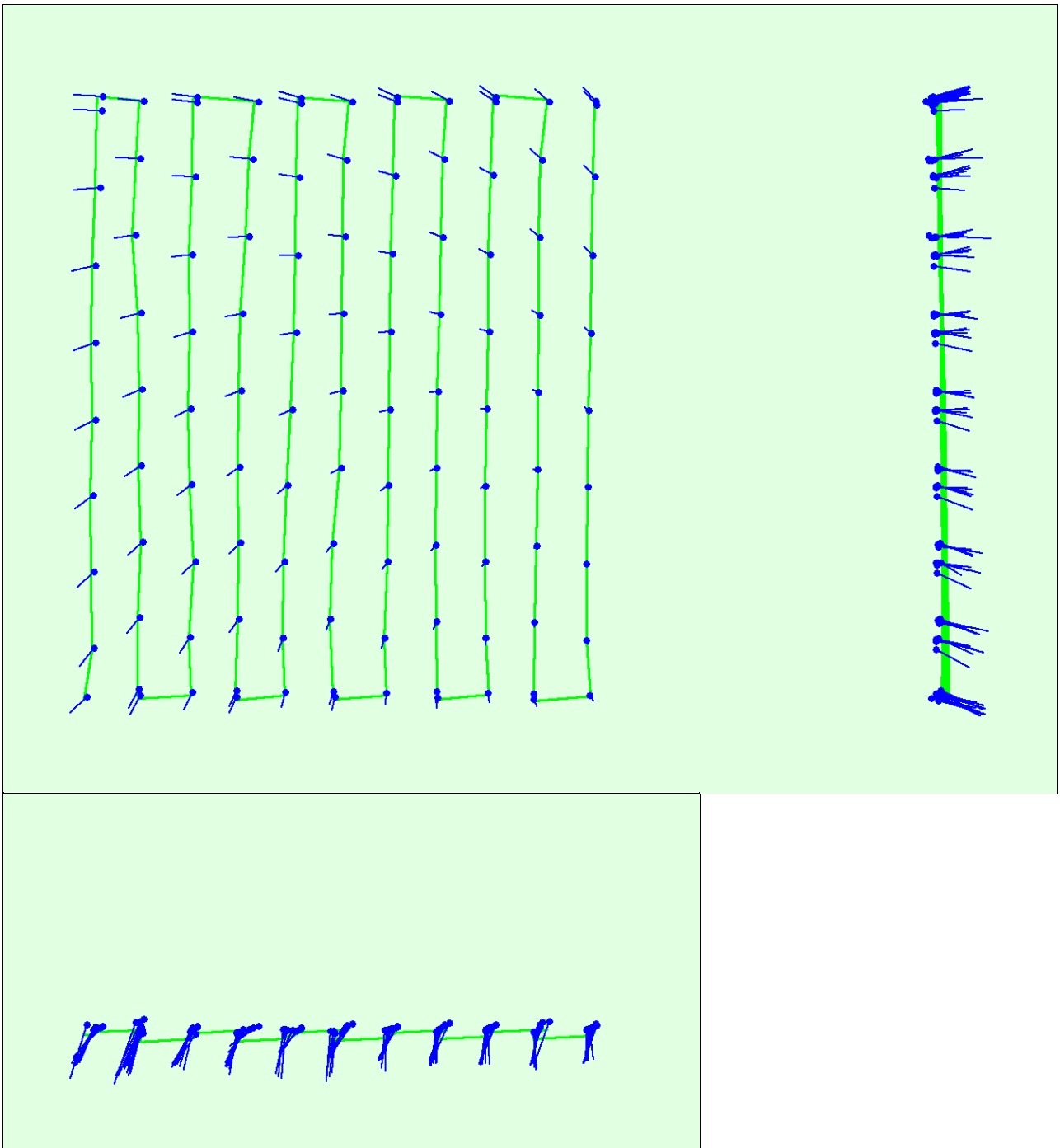


Figure 6: Camera movement estimated by the rolling shutter camera model. The green line follows the computed image positions. The blue dots represent the camera position at the start of the exposure. The blue lines represent the camera motion during the rolling shutter readout, re-scaled by a project dependant scaling factor for better visibility.

Median Camera Speed	8.9294 [m/s]
Median Camera Displacement During Sensor Readout)	8.3802 [m]
Median Rolling Shutter Readout Time	982.3022 [ms]

Initial Processing Details

System Information

Hardware	CPU: AMD Ryzen 5 2600 Six-Core Processor RAM: 16GB GPU: Radeon RX550/550 Series (Driver: 27.20.12033.1007)
Operating System	Windows 10 Education, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84 (EGM96 Geoid)
Ground Control Point (GCP) Coordinate System	WGS 84 / UTMzone 19S (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTMzone 19S (EGM96 Geoid)

Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All prior External Parameters Optimization: All Rematch: Auto, yes

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: 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	46m:48s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	05m:54s

Results



Number of Generated Tiles	1
Number of 3D Densified Points	15700741
Average Density (per m ³)	132.8

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (2.99 [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: no GeoTIFF Without Transparency: no Google Maps Tiles and KML: yes

Index Calculator: Reflectance Map	Generated: yes Resolution: 1 x GSD (2.99 [cm/pixel]) Merge Tiles: yes
Index Calculator: Indices	grayscale
Time for DSM Generation	08m:17s
Time for Orthomosaic Generation	24m:39s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	01h:07m:59s
Time for Index Map Generation	02m:46s