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	newRSO
Processed	2020-06-13 09:23:21
Camera Model Name(s)	FC330_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	3.06 cm / 1.20 in
Area Covered	0.024 km^2 / 2.4312 ha / 0.01 sq. mi. / 6.0106 acres

Quality Check

Images	median of 44875 keypoints per image	✓
Dataset	30 out of 30 images calibrated (100%), all images enabled	✓
Camera Optimization	0.25% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 6795.84 matches per calibrated image	✓
Georeferencing	yes, 9 GCPs (9 3D), mean RMS error = 0.512 m	⚠

Preview

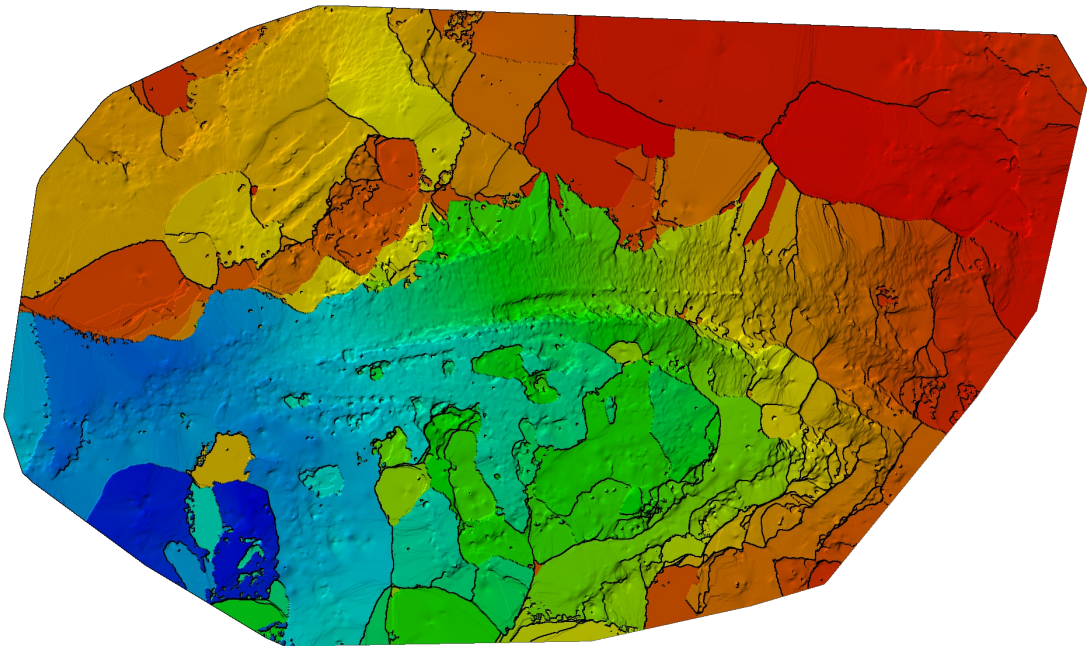


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	30 out of 30
Number of Geolocated Images	30 out of 30

Initial Image Positions

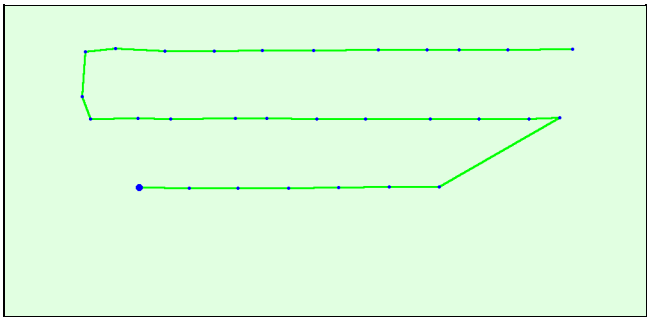
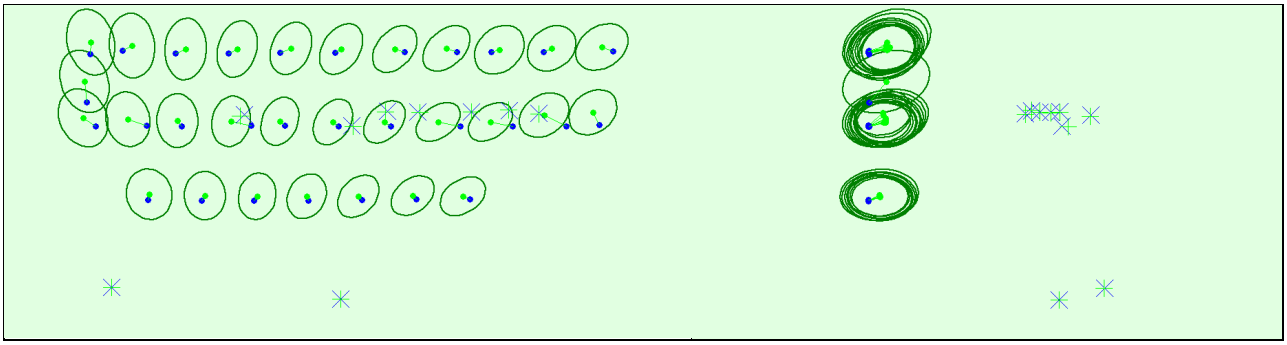
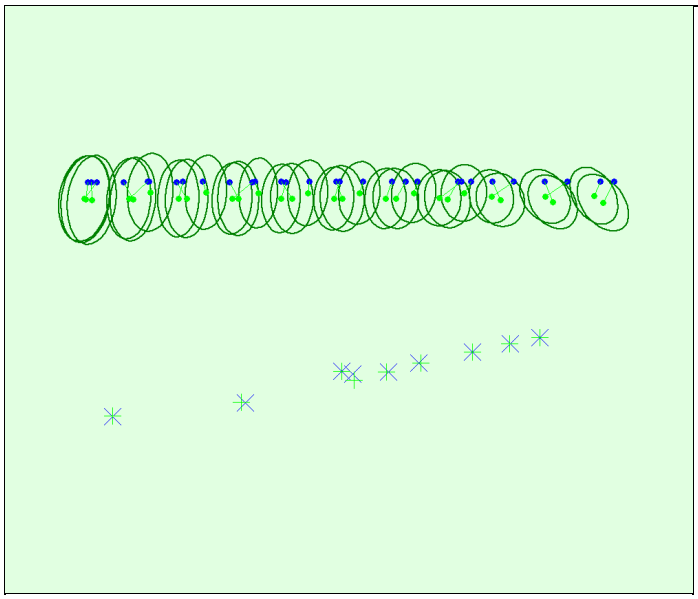


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

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	0.077	0.086	0.117	0.045	0.051	0.023
Sigma	0.007	0.013	0.019	0.013	0.019	0.008

Overlap

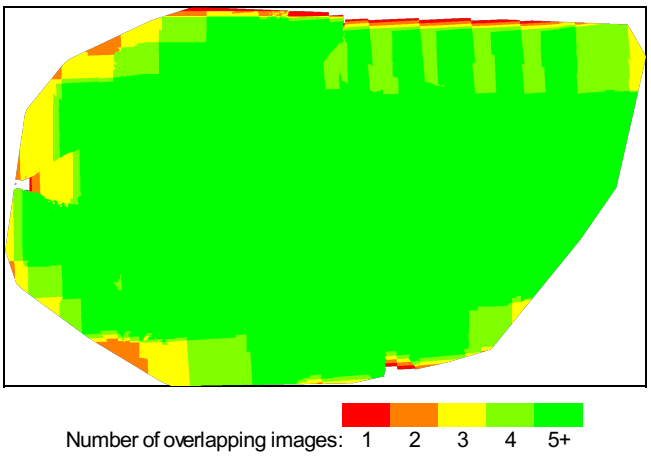


**Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

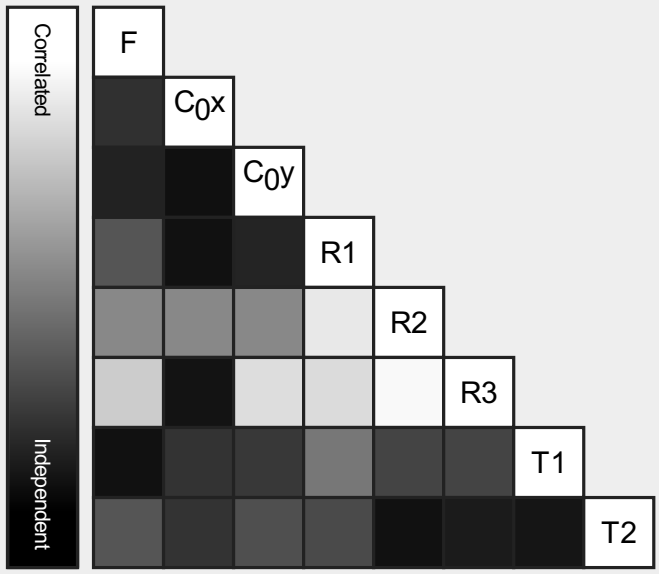
Number of 2D Keypoint Observations for Bundle Block Adjustment	173901
Number of 3D Points for Bundle Block Adjustment	63720
Mean Reprojection Error [pixels]	0.226

Internal Camera Parameters

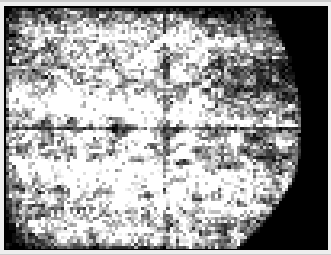
FC330_3.6_4000x3000 (RGB). Sensor Dimensions: 6.317 [mm] x 4.738 [mm]

EXIF ID: FC330_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]	-0.001	-0.002	0.000	-0.001	-0.001
Optimized Values	2291.495 [pixel] 3.619 [mm]	2035.765 [pixel] 3.215 [mm]	1462.583 [pixel] 2.310 [mm]	-0.009	0.008	0.004	0.004	0.003
Uncertainties (Sigma)	4.004 [pixel] 0.006 [mm]	2.526 [pixel] 0.004 [mm]	2.366 [pixel] 0.004 [mm]	0.001	0.002	0.001	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	44875	6796
Min	42109	1135
Max	50529	9041
Mean	45282	5797

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	44953
In 3 Images	9479
In 4 Images	3731
In 5 Images	1856
In 6 Images	1112
In 7 Images	686
In 8 Images	549
In 9 Images	375
In 10 Images	238
In 11 Images	189

In 12 Images	175
In 13 Images	109
In 14 Images	90
In 15 Images	76
In 16 Images	37
In 17 Images	30
In 18 Images	30
In 19 Images	5

2D Keypoint Matches

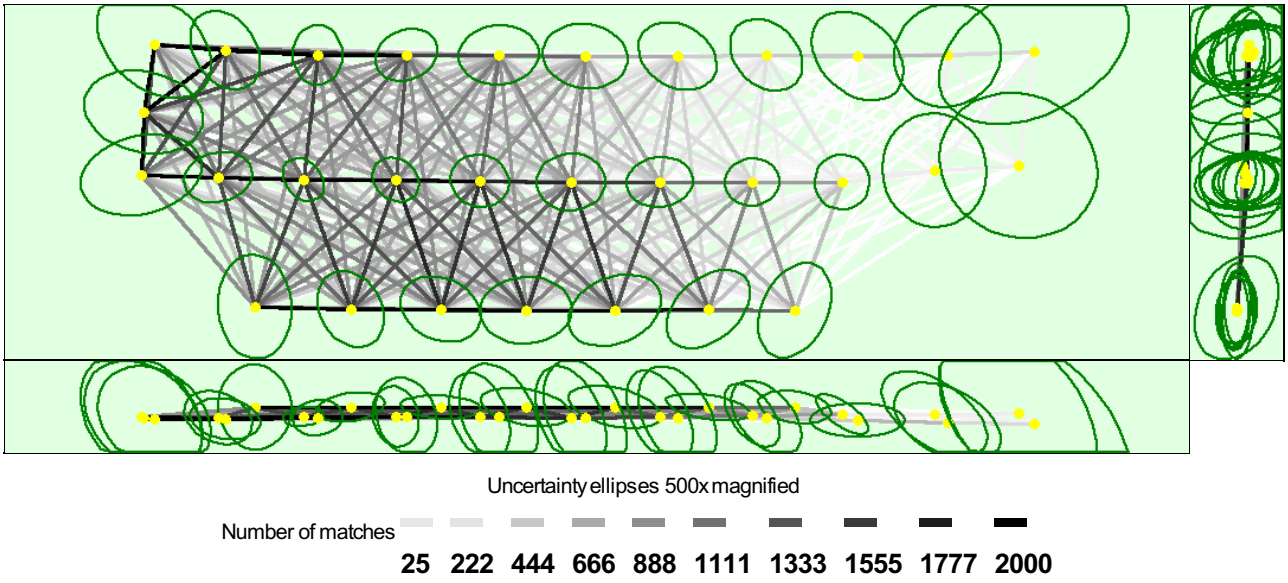


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.017	0.015	0.015	0.030	0.052	0.020
Sigma	0.006	0.005	0.009	0.006	0.015	0.008

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
GCP1 (3D)	0.020/ 0.020	-0.052	0.078	-0.021	1.556	5 / 5
GCP2 (3D)	0.020/ 0.020	0.170	-0.266	0.009	9.485	8 / 8
GCP3 (3D)	0.020/ 0.020	-0.046	0.006	0.006	2.308	12 / 12
GCP4 (3D)	0.020/ 0.020	-0.456	0.308	2.077	0.725	15 / 15
GCP5 (3D)	0.020/ 0.020	-0.878	0.313	-0.064	0.837	6 / 6
GCP6 (3D)	0.020/ 0.020	0.594	0.303	-0.013	0.719	9 / 9
GCP7 (3D)	0.020/ 0.020	-0.061	-0.068	-0.153	0.282	3 / 3
GCP8 (3D)	0.020/ 0.020	1.504	0.556	-0.168	0.723	21 / 21
GCP9 (3D)	0.020/ 0.020	-0.011	0.022	0.020	1.060	5 / 5
Mean [m]		0.085030	0.139080	0.188122		
Sigma [m]		0.629352	0.235884	0.671074		

RMS Error [m]		0.635071	0.273833	0.696943		

0 out of 8 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
VP10		0.0560	0.1286	-0.0551	1.4640	12 / 12
VP11		1.0003	0.4745	-0.0647	0.8019	14 / 14
VP12		-9.7753	2.7001	-4.1883	0.7674	16 / 16
VP13		-11.6674	3.9600	-3.6765	0.8606	18 / 18
VP14		1.4043	0.1268	-4.2657	0.8091	20 / 20
VP16		0.0704	2.4186	-1.2270	0.6960	17 / 17
VP17		8.6085	3.5625	-0.3936	1.4797	8 / 8
VP18		7.3281	4.2125	-0.8658	0.3857	4 / 4
Mean [m]		-0.371882	2.197958	-1.842088		
Sigma [m]		6.720920	1.615096	1.750908		
RMS Error [m]		6.731201	2.727555	2.541450		

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	23.33	3.33	0.00
-3.00	0.00	26.67	23.33	33.33
0.00	3.00	33.33	73.33	66.67
3.00	6.00	6.67	0.00	0.00
6.00	9.00	10.00	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]		1.365676	-1.861332	5.472691
Sigma [m]		3.479261	1.280766	0.957098
RMS Error [m]		3.737690	2.259407	5.555752

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]	1.365676	-1.861332	5.472691

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]	80.00	96.67	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	2.730
Phi	0.535
Kappa	3.560

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) i3-8130U CPU @ 2.20GHz RAM: 4GB GPU: Intel(R) UHD Graphics 620 (Driver: 26.20.100.7372)
Operating System	Windows 10 Home Single Language, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (EGM96 Geoid)
Ground Control Point (GCP) Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 47N (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: no
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