Quality Report

Generated with Pix4Dmapper version 4.3.31

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	BAAM Cody
Processed	2018-10-24 06:25:13
Camera Model Name(s)	FC6310_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	1.24 cm / 0.49 in
Area Covered	0.019 km^2 / 1.9006 ha / 0.01 sq. mi. / 4.6988 acres
Time for Initial Processing (without report)	01m:53s

Quality Check

Images	median of 75431 keypoints per image	✓
Dataset	70 out of 70 images calibrated (100%), all images enabled	✓
Camera Optimization	2.52% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 11671.3 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

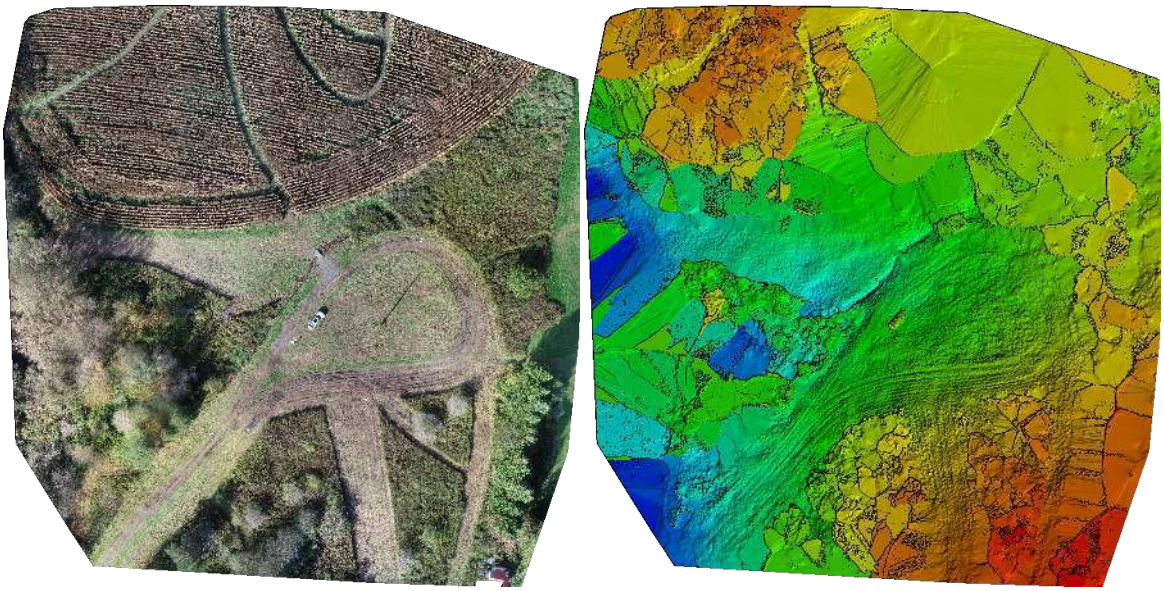


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	70 out of 70
Number of Geolocated Images	70 out of 70

Initial Image Positions

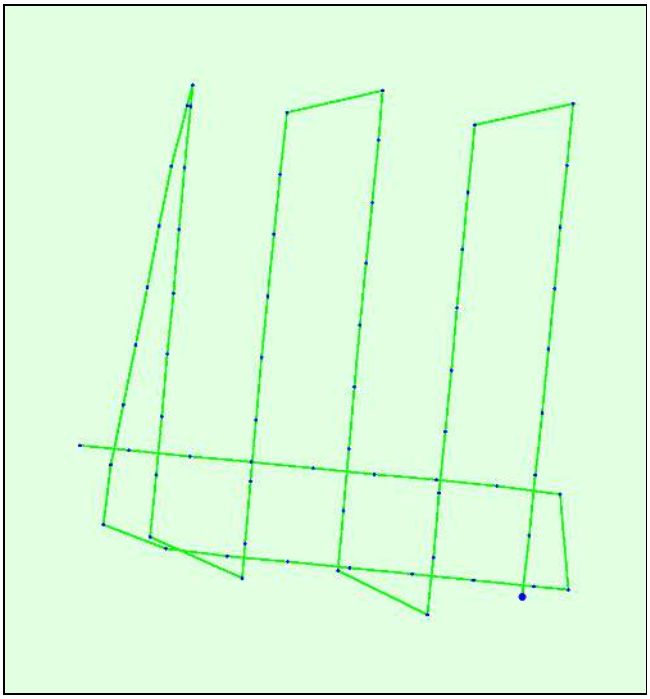
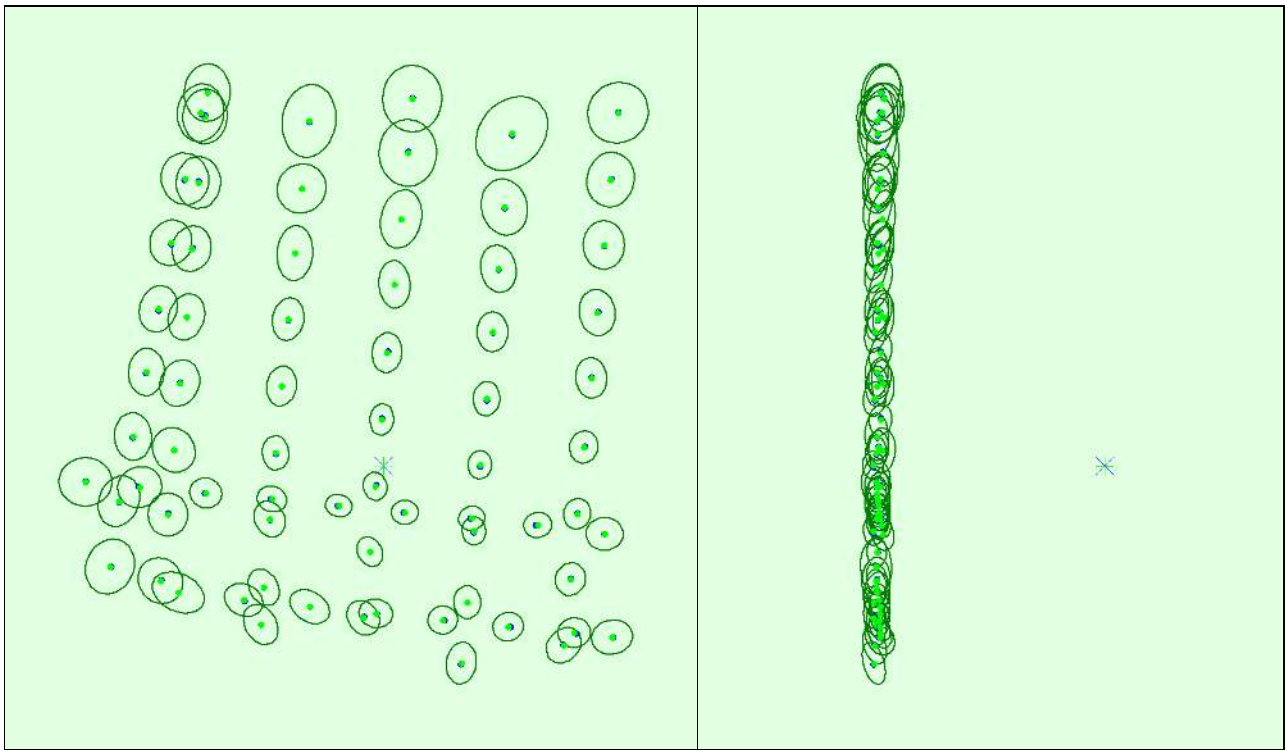
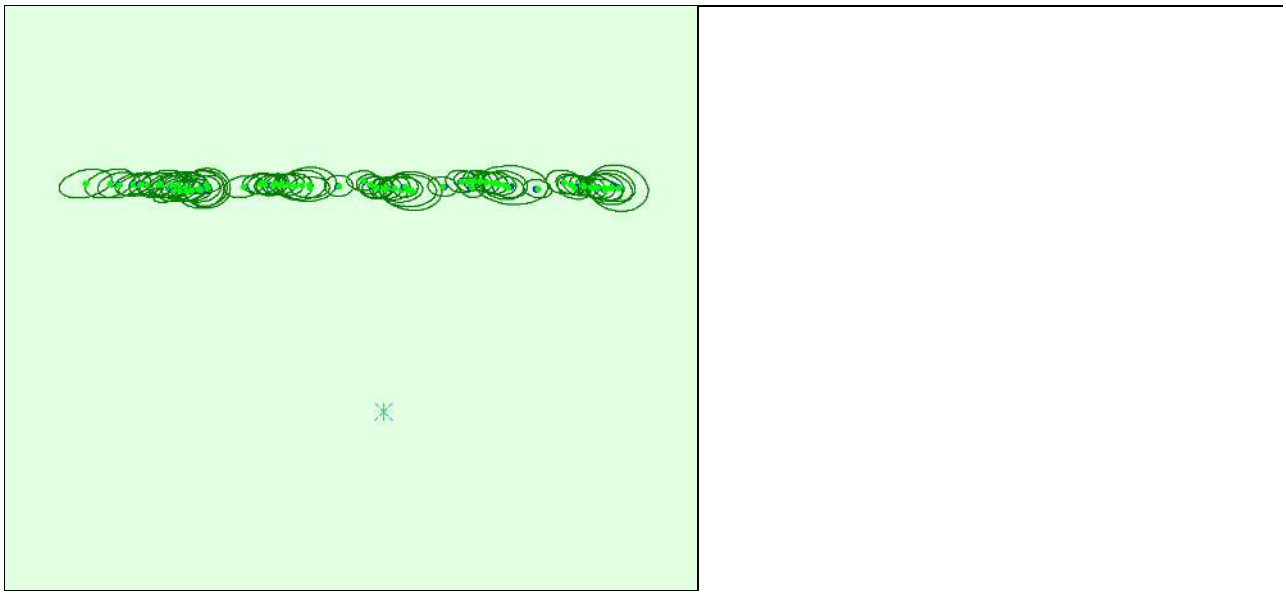


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions





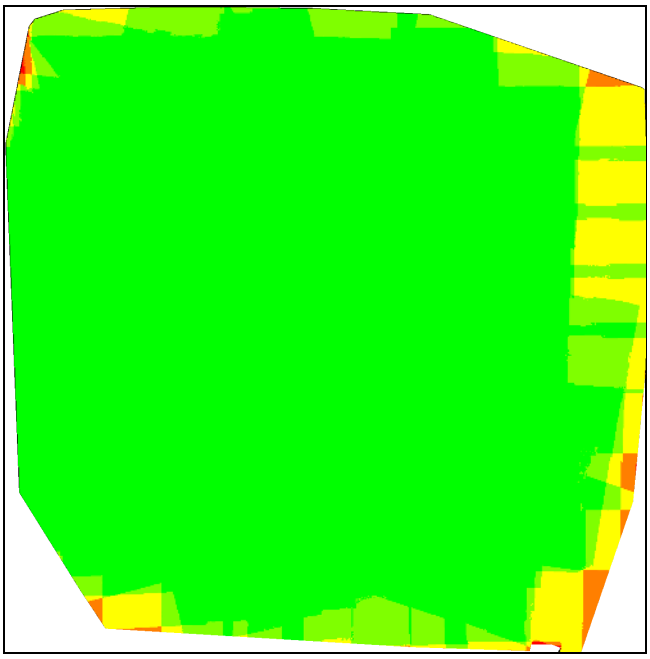
Uncertainty ellipses 1000x magnified

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

Absolute camera position and orientation uncertainties

	X [US survey foot]	Y [US survey foot]	Z [US survey foot]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.013	0.014	0.008	0.006	0.005	0.003
Sigma	0.003	0.004	0.002	0.002	0.002	0.001

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

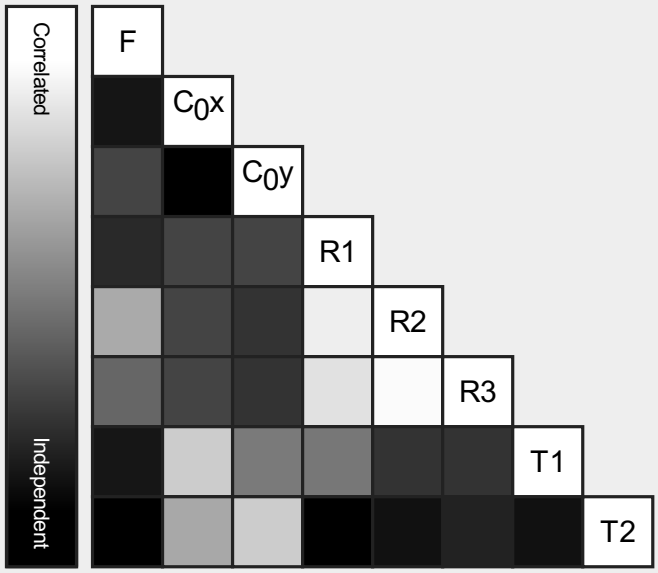
Number of 2D Keypoint Observations for Bundle Block Adjustment	954451
Number of 3D Points for Bundle Block Adjustment	364583
Mean Reprojection Error [pixels]	0.183

Internal Camera Parameters

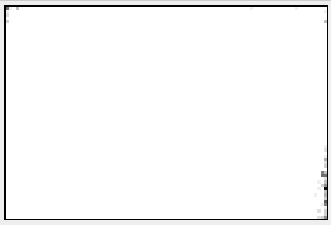
FC6310_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310S_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3752.229 [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	3657.534 [pixel] 8.578 [mm]	2724.243 [pixel] 6.389 [mm]	1823.490 [pixel] 4.277 [mm]	-0.004	-0.007	0.007	0.002	-0.001
Uncertainties (Sigma)	0.567 [pixel] 0.001 [mm]	0.118 [pixel] 0.000 [mm]	0.107 [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

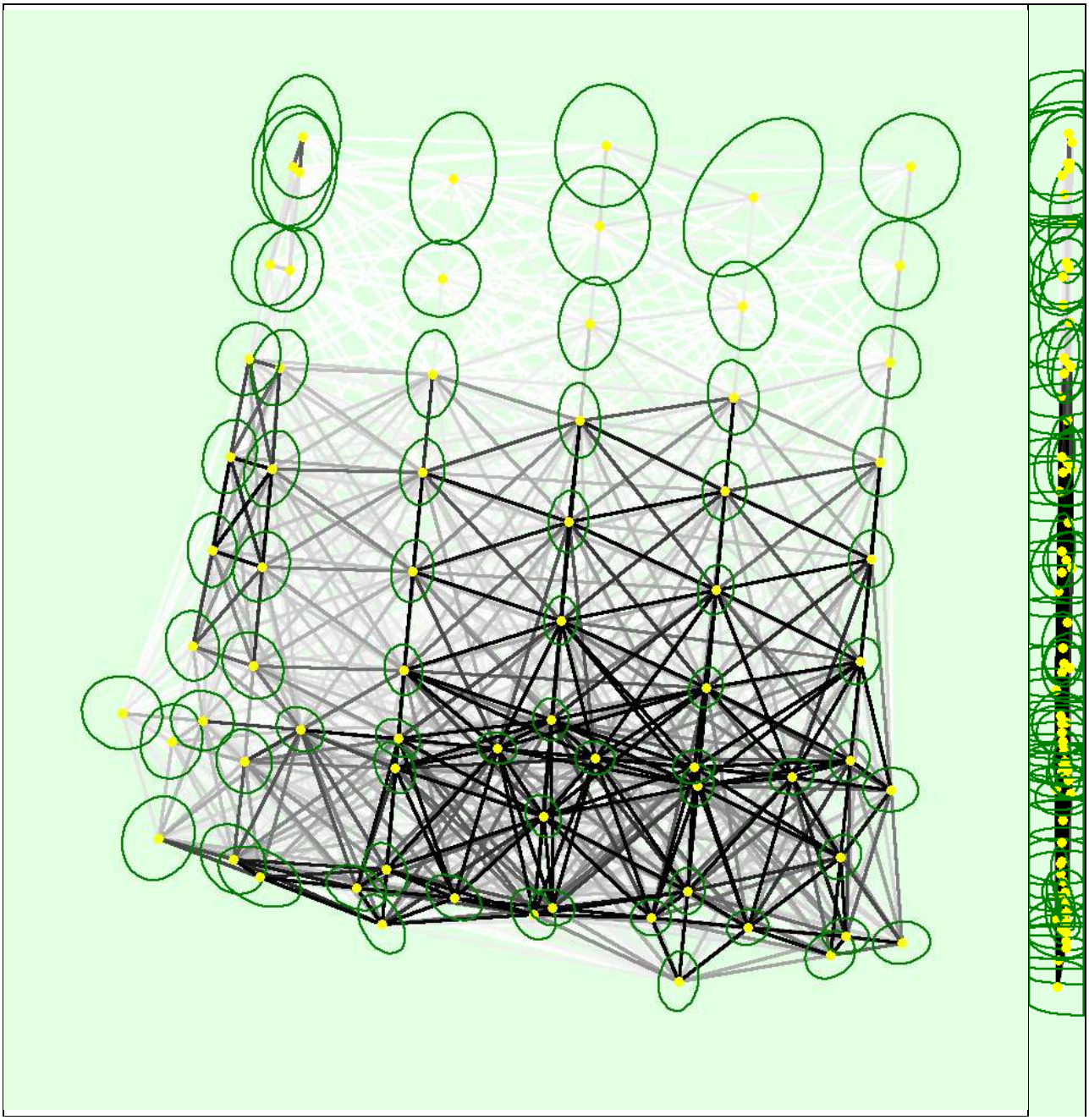
	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	75431	11671
Min	69966	651
Max	86843	36443
Mean	76460	13635

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	260624

In 3 Images	55560
In 4 Images	21517
In 5 Images	10747
In 6 Images	5860
In 7 Images	3594
In 8 Images	2222
In 9 Images	1468
In 10 Images	966
In 11 Images	673
In 12 Images	470
In 13 Images	350
In 14 Images	203
In 15 Images	126
In 16 Images	95
In 17 Images	61
In 18 Images	30
In 19 Images	10
In 20 Images	5
In 21 Images	2

2D Keypoint Matches



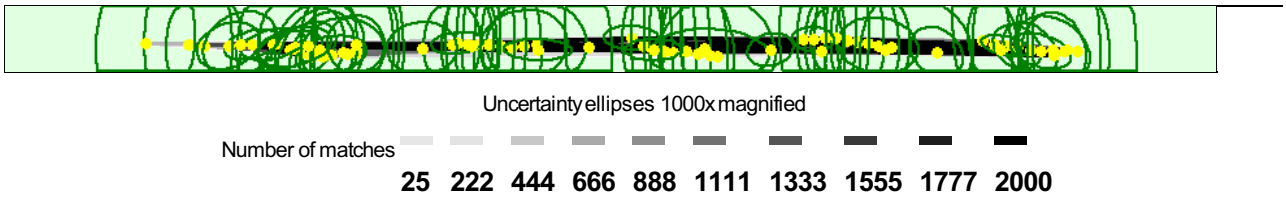


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty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

Relative camera position and orientation uncertainties

	X [US survey foot]	Y [US survey foot]	Z [US survey foot]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.013	0.015	0.023	0.023	0.022	0.002
Sigma	0.004	0.006	0.014	0.012	0.012	0.001

Geolocation Details

Ground Control Points

GCP Name	Accuracy XY/Z [US survey foot]	Error X [US survey foot]	Error Y [US survey foot]	Error Z [US survey foot]	Projection Error [pixel]	Verified/Marked
GCP1 (3D)	0.020/ 0.020	0.003	0.006	-0.003	0.710	5 / 5

0 out of 5 check points have been labeled as inaccurate.

Check Point Name	Accuracy XY/Z [US survey foot]	Error X [US survey foot]	Error Y [US survey foot]	Error Z [US survey foot]	Projection Error [pixel]	Verified/Marked
GCP2		0.010	-0.025	0.055	0.572	6 / 6
GCP3		0.061	-0.087	-0.092	0.503	6 / 6
GCP4		0.139	0.008	0.099	0.579	6 / 6
GCP5		0.022	0.090	0.101	0.819	6 / 6
BASE		0.042	-0.002	-0.043	1.238	5 / 5
Mean [US survey foot]		0.054676	-0.003380	0.024084		
Sigma [US survey foot]		0.045445	0.056957	0.077883		
RMS Error [US survey foot]		0.071097	0.057057	0.081521		

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 [US survey foot]	Max Error [US survey foot]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.20	18.57	28.57	1.43
-0.20	-0.16	1.43	1.43	1.43
-0.16	-0.12	7.14	7.14	5.71
-0.12	-0.08	5.71	2.86	10.00
-0.08	-0.04	8.57	4.29	10.00
-0.04	0.00	1.43	2.86	20.00
0.00	0.04	5.71	4.29	18.57
0.04	0.08	4.29	5.71	20.00
0.08	0.12	18.57	8.57	7.14
0.12	0.16	8.57	0.00	2.86
0.16	0.20	0.00	0.00	2.86
0.20	-	20.00	34.29	0.00
Mean [US survey foot]		-0.004110	-0.008902	-0.000938
Sigma [US survey foot]		0.439424	0.522154	0.078424
RMS Error [US survey foot]		0.439443	0.522230	0.078430

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]	50.00	31.43	92.86
[-2.00, 2.00]	68.57	47.14	100.00
[-3.00, 3.00]	75.71	55.71	100.00
Mean of Geolocation Accuracy [US survey foot]	0.131233	0.131233	0.131233
Sigma of Geolocation Accuracy [US survey foot]	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	0.497
Phi	0.495
Kappa	6.596

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) i7-6950X CPU @ 3.00GHz RAM: 64GB GPU: NVIDIA GeForce GTX 1080 (Driver: 23.21.13.8813)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (+31.527m)
Output Coordinate System	NAD83(2011) / New York Central (ftUS) (2D)

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 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	6
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	03m:45s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	02m:01s

Results

Number of Generated Tiles	1
Number of 3D Densified Points	3594445

Average Density (per US survey foot^3)	38.25

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (1.24 [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: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Grid DSM	Generated: yes, Spacing [cm]: 200
Contour Lines Generation	Generated: yes Contour Base [US survey foot]: 115 Elevation Interval [US survey foot]: 0.5 Resolution [cm]: 100 Minimum Line Size [vertices]: 20
Time for DSM Generation	01m:52s
Time for Orthomosaic Generation	06m:04s
Time for DTM Generation	00s
Time for Contour Lines Generation	10s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s