

Summary

Project	11_28_18
Processed	2018-11-29 17:04:07
Camera Model Name(s)	FC6310_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.49 cm / 0.98 in
Area Covered	0.194 km ² / 19.4415 ha / 0.08 sq. mi. / 48.0659 acres
Time for Initial Processing (without report)	48m:39s

Quality Check

Images	median of 55814 keypoints per image	✓
Dataset	213 out of 213 images calibrated (100%), all images enabled	✓
Camera Optimization	169.41% relative difference between initial and optimized internal camera parameters	⚠
Matching	median of 30301.4 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

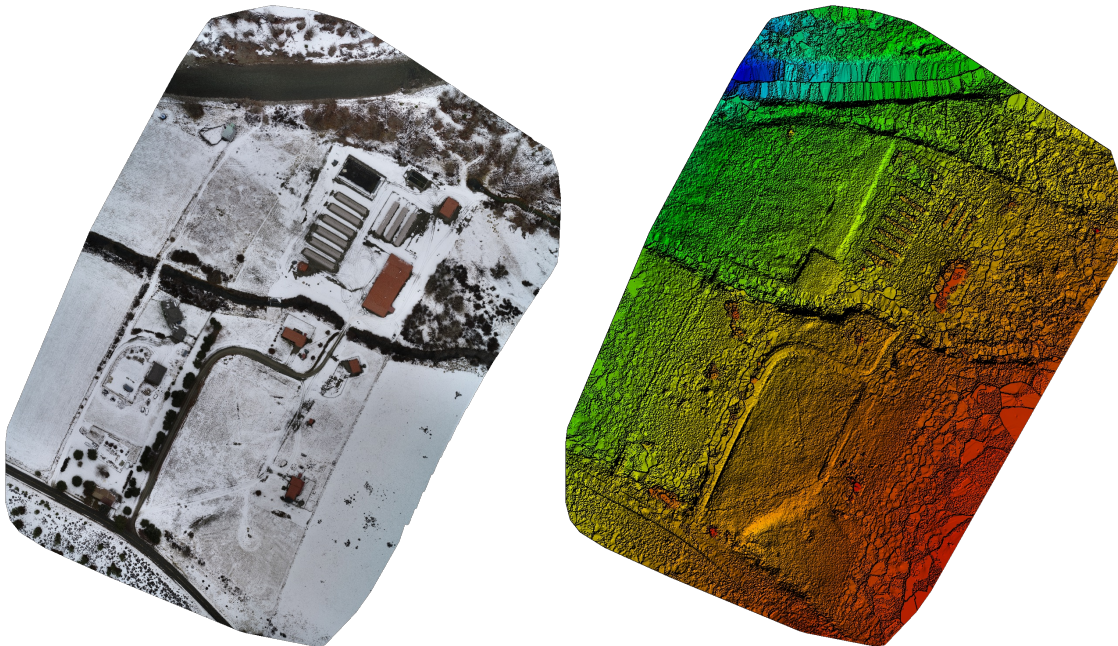


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	213 out of 213
Number of Geolocated Images	213 out of 213

Initial Image Positions

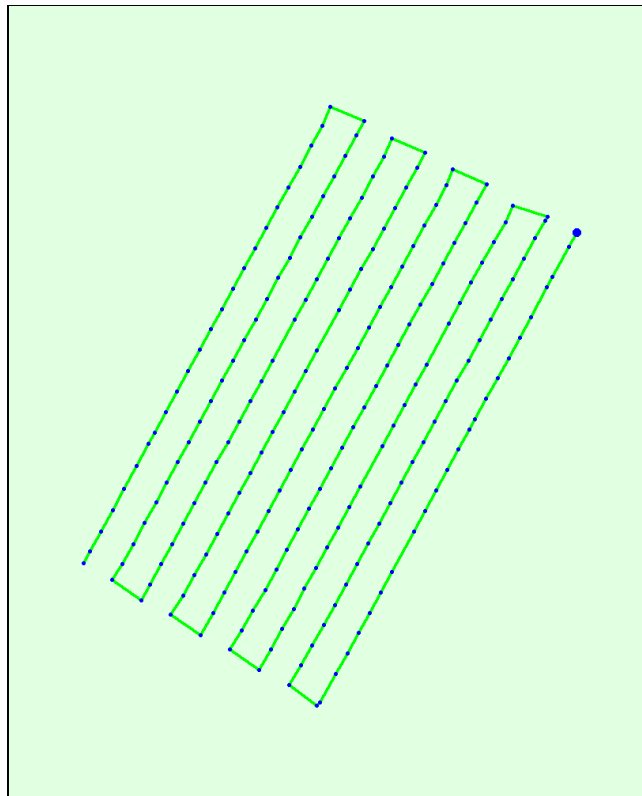
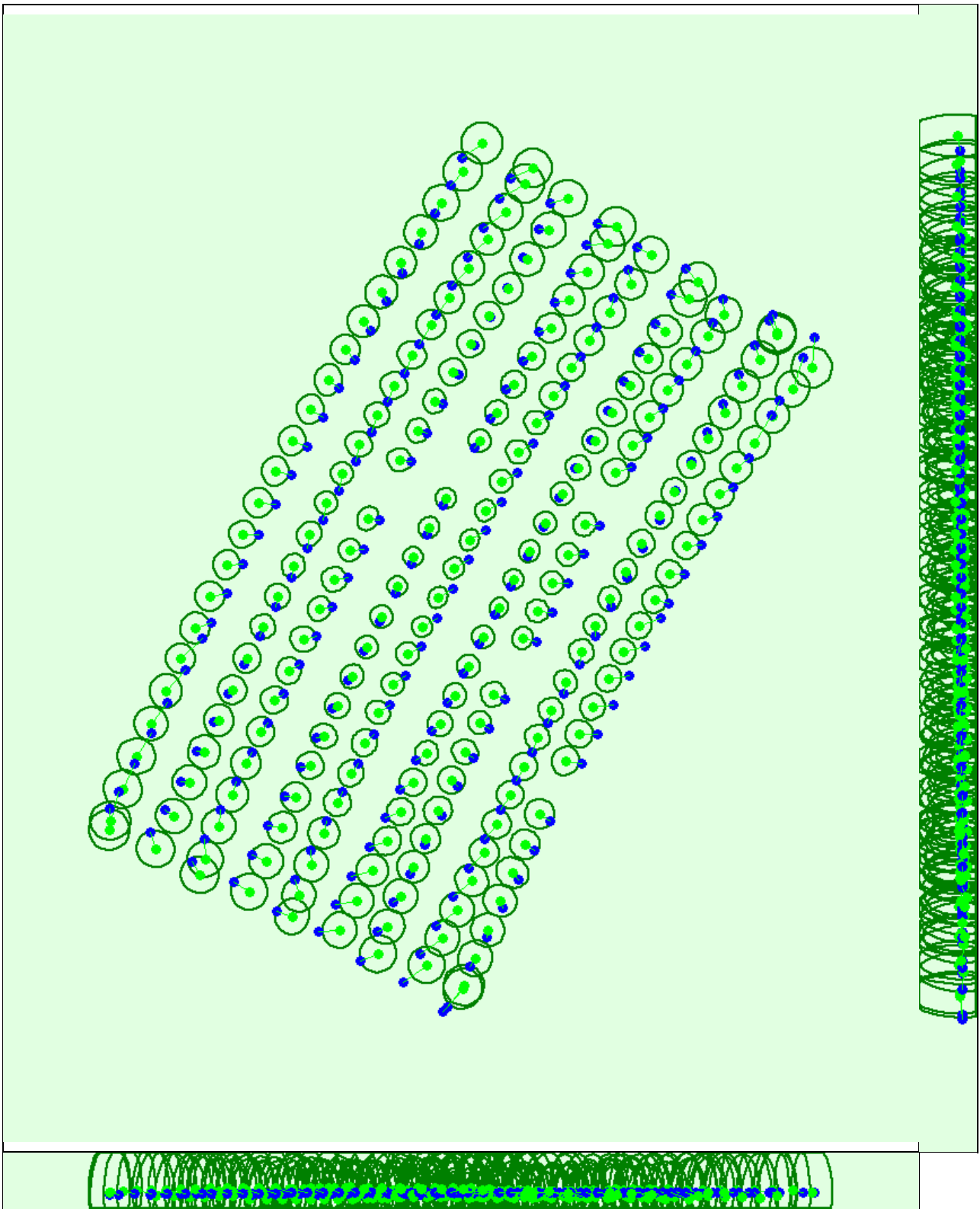


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 50x 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	0.177	0.179	0.421	0.125	0.182	0.049
Sigma	0.031	0.031	0.090	0.013	0.007	0.001

Overlap

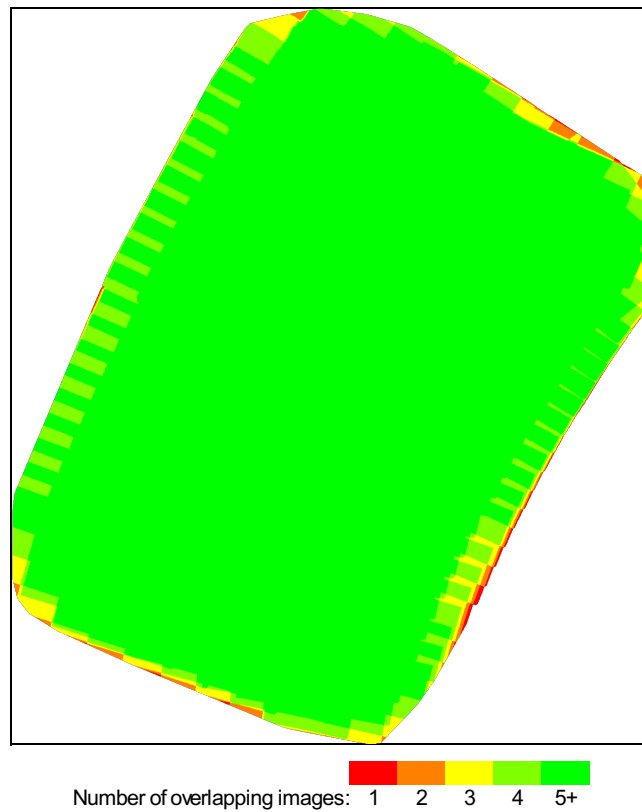


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

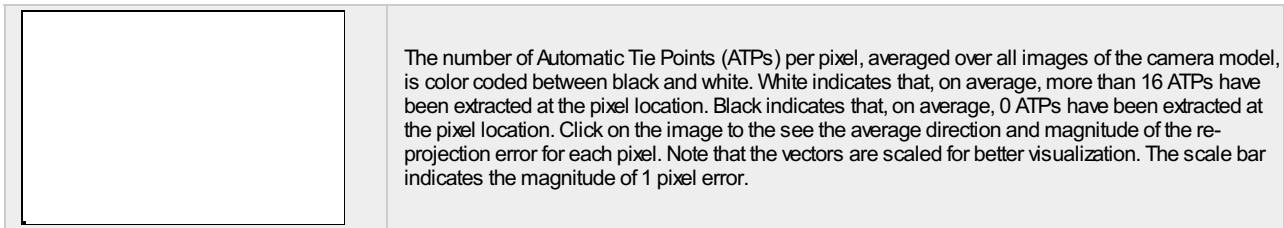
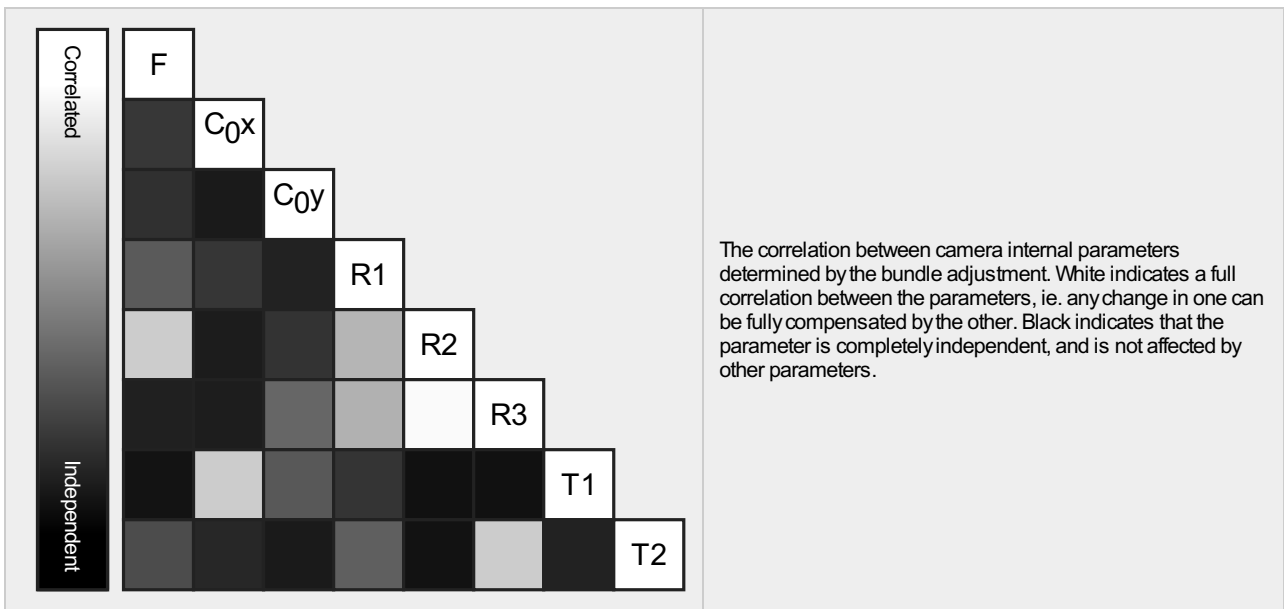
Number of 2D Keypoint Observations for Bundle Block Adjustment	6650297
Number of 3D Points for Bundle Block Adjustment	1669852
Mean Reprojection Error [pixels]	0.325

Internal Camera Parameters

📷 FC6310_8.8_5472x3648 (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	3668.759 [pixel] 8.604 [mm]	2736.001 [pixel] 6.417 [mm]	1823.999 [pixel] 4.278 [mm]	0.003	-0.008	0.008	-0.000	0.000
Optimized Values	9884.013 [pixel] 23.181 [mm]	2846.096 [pixel] 6.675 [mm]	1665.966 [pixel] 3.907 [mm]	0.013	-0.389	2.766	-0.017	-0.061
Uncertainties (Sigma)	13.413 [pixel] 0.031 [mm]	3.053 [pixel] 0.007 [mm]	2.941 [pixel] 0.007 [mm]	0.001	0.016	0.094	0.000	0.000



2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	55814	30301
Mn	21221	9786
Max	79710	53902
Mean	55843	31222

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	840283
In 3 Images	288929
In 4 Images	147250
In 5 Images	89252
In 6 Images	60581
In 7 Images	45077
In 8 Images	35727
In 9 Images	28723
In 10 Images	23430
In 11 Images	19454
In 12 Images	16449
In 13 Images	14024
In 14 Images	11953
In 15 Images	10335
In 16 Images	9445
In 17 Images	8640
In 18 Images	6800
In 19 Images	5097
In 20 Images	3579
In 21 Images	2386
In 22 Images	1384
In 23 Images	732

In 24 Images	289
In 25 Images	32
In 26 Images	1

2D Keypoint Matches

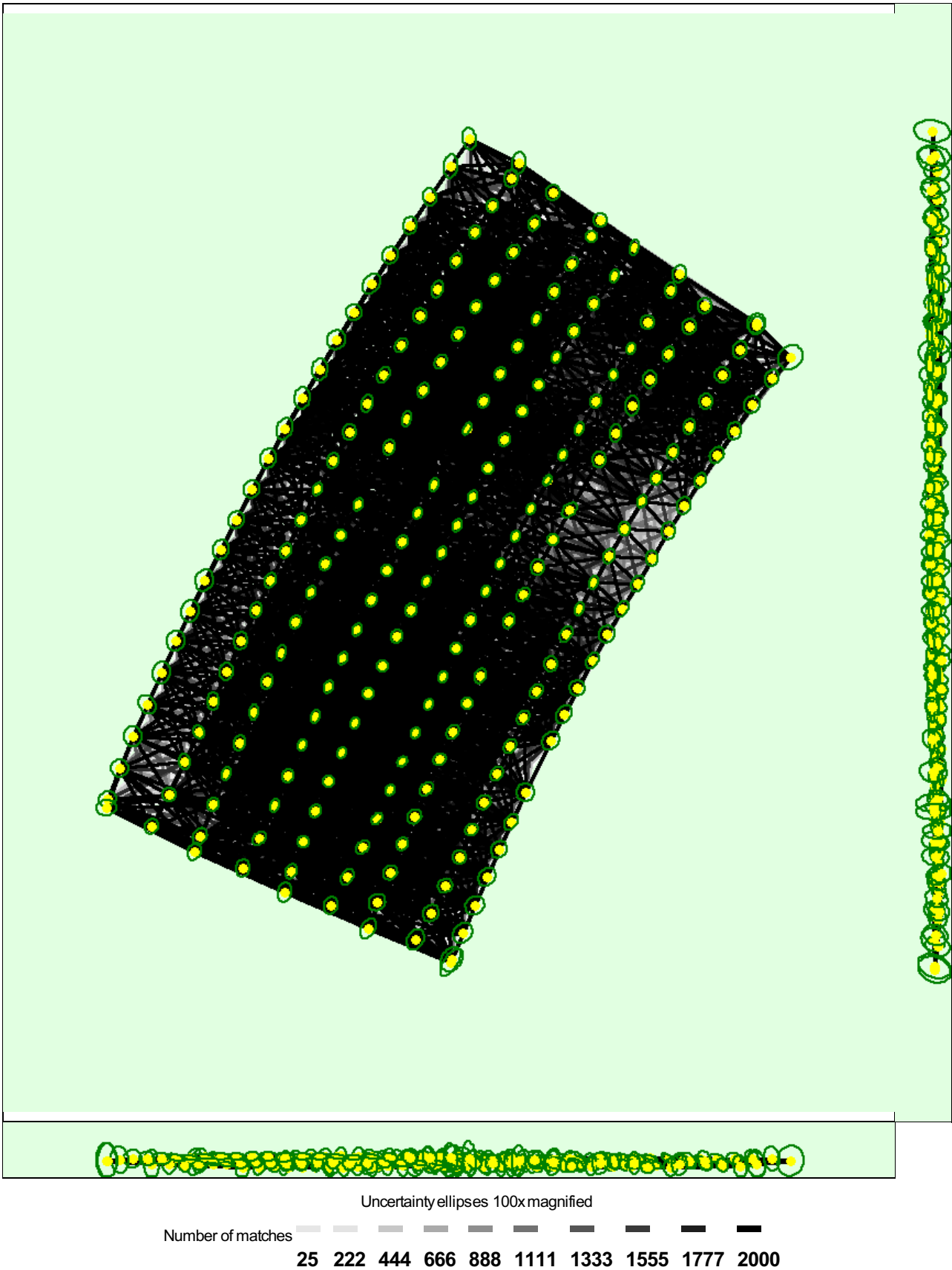


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.041	0.047	0.042	0.038	0.025	0.008
Sigma	0.008	0.009	0.022	0.018	0.012	0.003

Geolocation Details

Absolute Geolocation Variance

Mn Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.47	0.00	0.00
-15.00	-12.00	4.69	0.94	0.00
-12.00	-9.00	7.51	7.51	0.00
-9.00	-6.00	7.51	7.04	0.00
-6.00	-3.00	12.68	20.19	3.29
-3.00	0.00	21.60	20.19	48.83
0.00	3.00	9.39	12.21	40.85
3.00	6.00	8.92	14.55	7.04
6.00	9.00	17.37	8.92	0.00
9.00	12.00	7.98	3.76	0.00
12.00	15.00	1.88	2.35	0.00
15.00	-	0.00	2.35	0.00
Mean [m]		0.000031	-0.000017	-0.001233
Sigma [m]		6.935840	6.389830	1.991906
RMS Error [m]		6.935840	6.389830	1.991906

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]	44.60	57.75	100.00
[-2.00, 2.00]	85.92	88.73	100.00
[-3.00, 3.00]	99.53	97.65	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.

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Xeon(R) CPU X5672 @ 3.20GHz RAM: 144GB GPU: NVIDIA Quadro P4000 (Driver: 23.21.13.9133)
Operating System	Windows 10 Enterprise, 64-bit

Coordinate Systems

Image Coordinate System	GCS_WGS_1984 (EGM96 Geoid)
Output Coordinate System	WGS_1984_UTM_Zone_10N (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 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	no
LOD	Generated: no
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	41m:05s
Time for Point Cloud Classification	05m:16s
Time for 3D Textured Mesh Generation	NA

Results

Number of Generated Tiles	1
Number of 3D Densified Points	25353379
Average Density (per m ³)	144.61

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (2.49 [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
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (2.49 [cm/pixel])
Time for DSM Generation	16m:44s
Time for Orthomosaic Generation	27m:00s

Time for DTM Generation	16m:24s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s