

- !** **Important:** Click on the different icons for:
- ?** Help to analyze the results in the Quality Report
  - i** Additional information about the sections

**💡** Click [here](#) for additional tips to analyze the Quality Report

## Summary



Project	Post process
Processed	2020-08-07 08:00:25
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)(1), FC6310R_8.8_5472x3648 (RGB)(2)
Average Ground Sampling Distance (GSD)	4.17 cm / 1.64 in
Area Covered	3.844 km <sup>2</sup> / 384.3862 ha / 1.48 sq. mi. / 950.3307 acres

## Quality Check



<b>?</b> Images	median of 22138 keypoints per image	<b>✓</b>
<b>?</b> Dataset	1770 out of 1770 images calibrated (100%), all images enabled	<b>✓</b>
<b>?</b> Camera Optimization	2.01% relative difference between initial and optimized internal camera parameters	<b>✓</b>
<b>?</b> Matching	median of 7032.25 matches per calibrated image	<b>✓</b>
<b>?</b> Georeferencing	yes, 18 GCPs (18 3D), mean RMS error = 0.059 m	<b>✓</b>

## **?** Preview

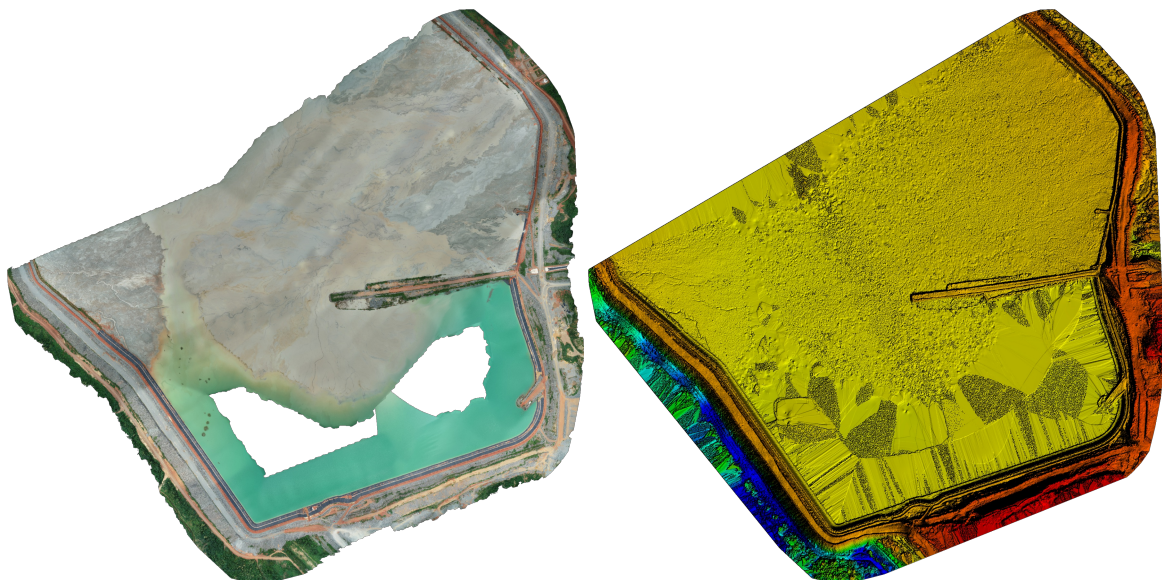


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

## Calibration Details



Number of Calibrated Images	1770 out of 1770
Number of Geolocated Images	1770 out of 1770

## ? Initial Image Positions

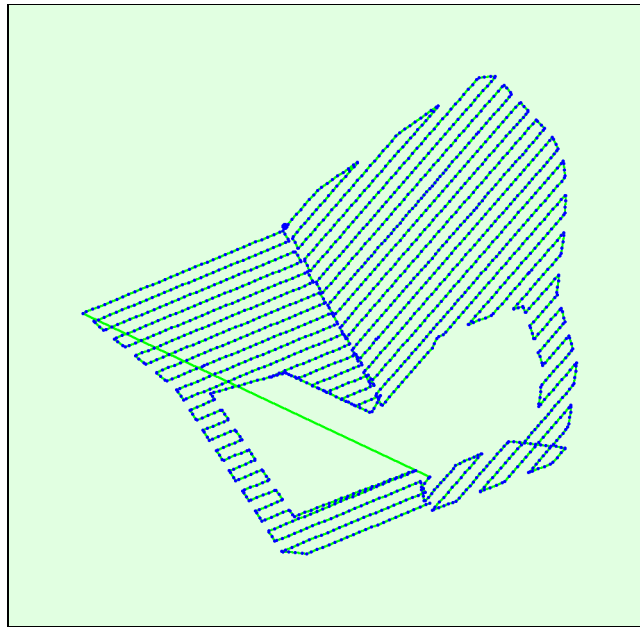
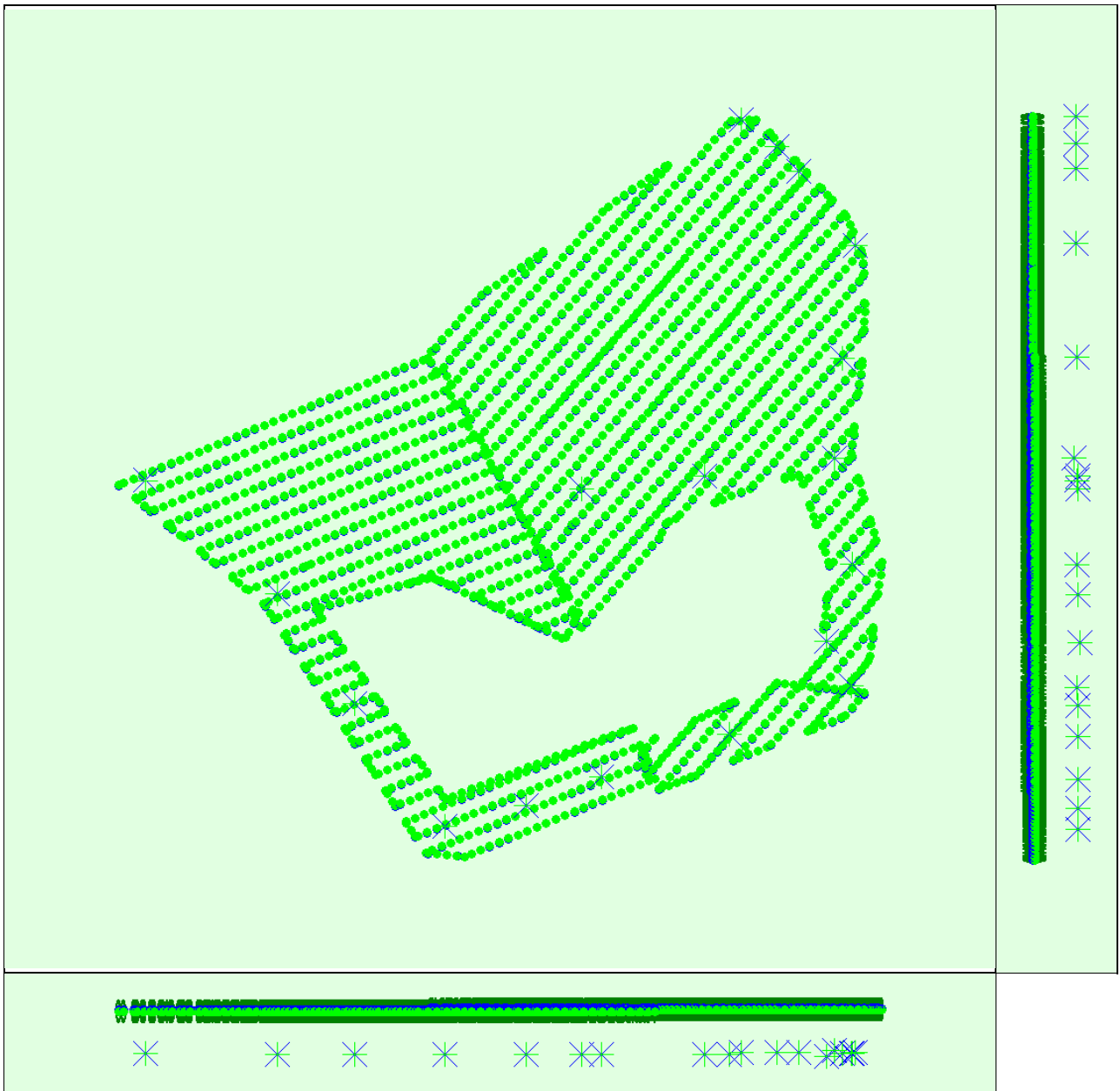


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

## ? 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[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]	Camera Displacement X[m]	Camera Displacement Y[m]	Camera Displacement Z[m]
Mean	0.004	0.004	0.034	0.003	0.003	0.003	0.006	0.007	0.012
Sigma	0.000	0.000	0.000	0.001	0.001	0.002	0.002	0.003	0.005

### ? Overlap



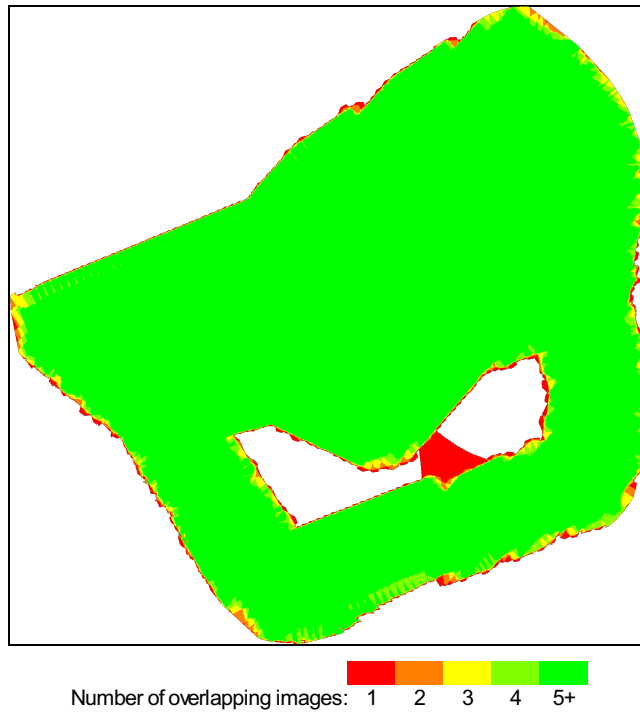


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

## Bundle Block Adjustment Details i

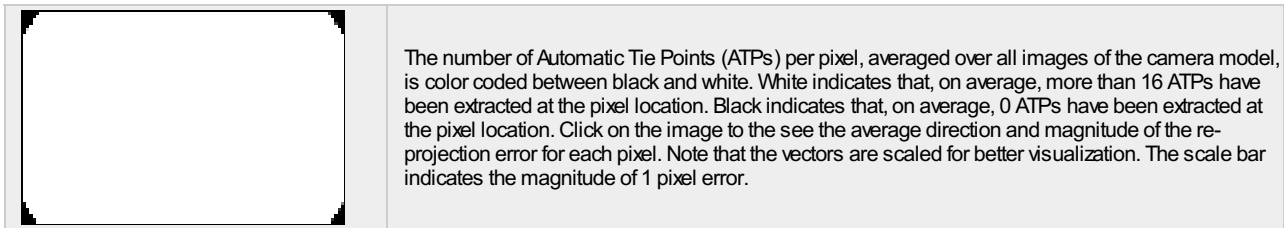
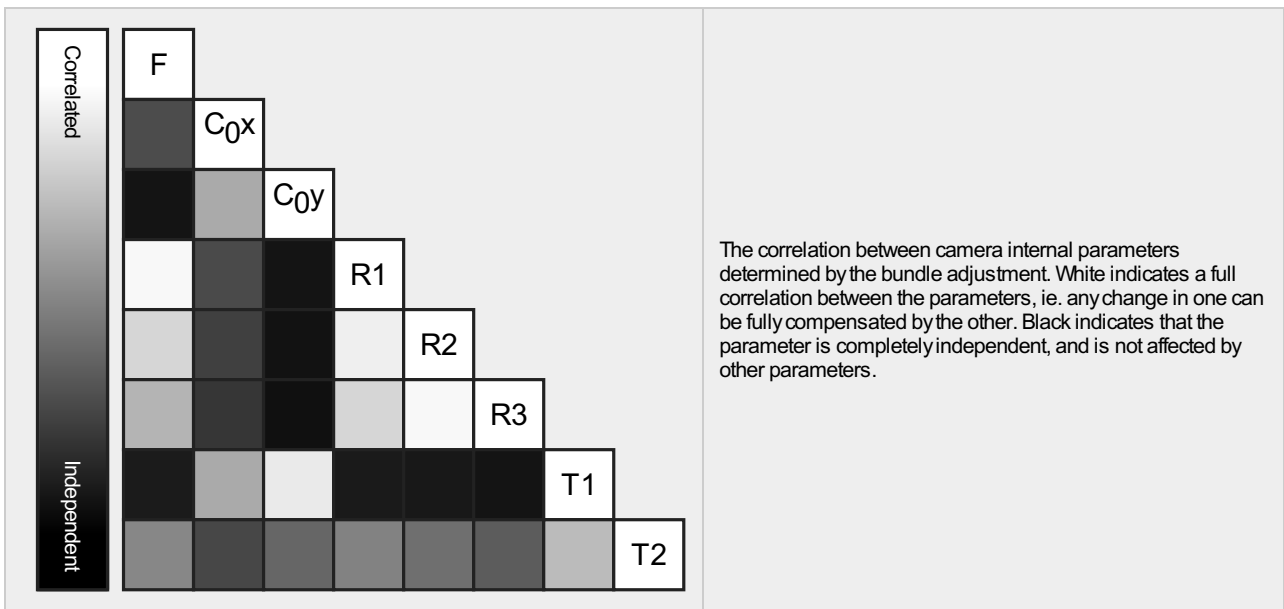
Number of 2D Keypoint Observations for Bundle Block Adjustment	18192613
Number of 3D Points for Bundle Block Adjustment	5546251
Mean Reprojection Error [pixels]	0.179

### ? Internal Camera Parameters

✎ FC6310R\_8.8\_5472x3648 (RGB)(1). Sensor Dimensions: 12.833 [mm] x 8.556 [mm] i

EXIF ID: FC6310R\_8.8\_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	3610.575 [pixel] 8.468 [mm]	2742.702 [pixel] 6.432 [mm]	1836.783 [pixel] 4.308 [mm]	-0.256	0.096	-0.024	-0.000	-0.000
Uncertainties (Sigma)	0.897 [pixel] 0.002 [mm]	0.034 [pixel] 0.000 [mm]	0.088 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000



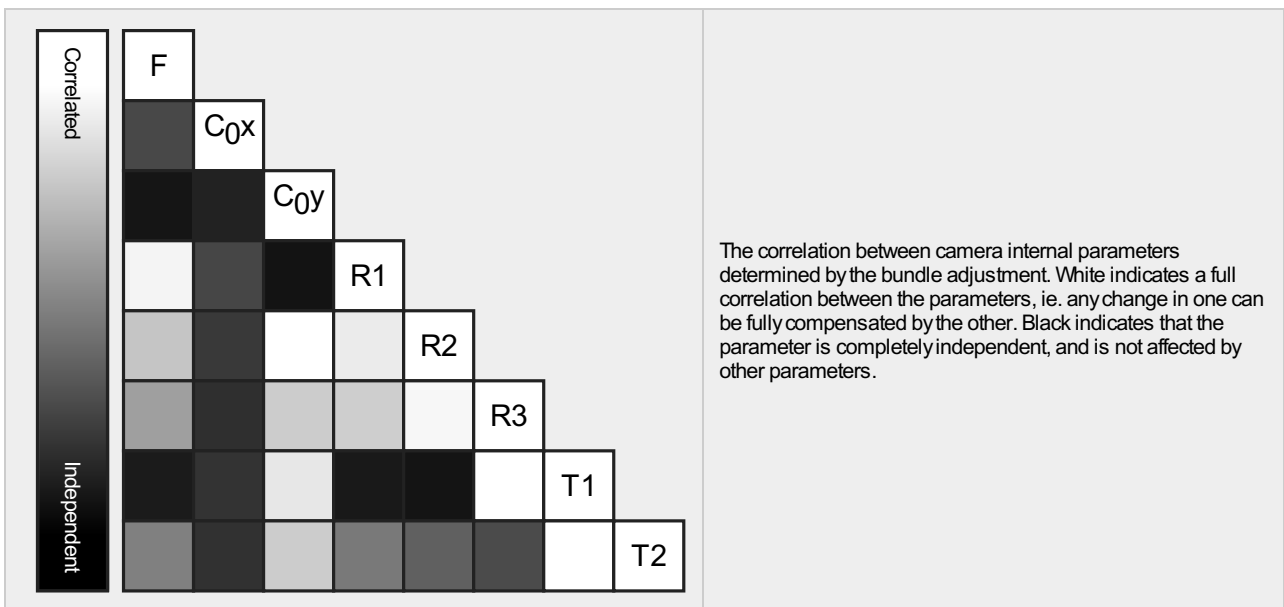
**Internal Camera Parameters**

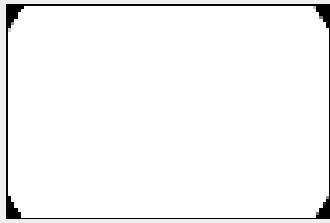
**FC6310R\_8.8\_5472x3648 (RGB)(2). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]**



EXIF ID: FC6310R\_8.8\_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	3758.264 [pixel] 8.814 [mm]	2744.769 [pixel] 6.437 [mm]	1837.648 [pixel] 4.310 [mm]	-0.278	0.113	-0.030	-0.000	-0.000
Uncertainties (Sigma)	0.956 [pixel] 0.002 [mm]	0.050 [pixel] 0.000 [mm]	0.109 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000





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 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	22138	7032
Mn	16665	192
Max	66110	37847
Mean	27104	10278

### 2D Keypoints Table for Camera FC6310R\_8.8\_5472x3648 (RGB)(1)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	22171	7946
Mn	19650	431
Max	54530	29975
Mean	25753	9757

### 2D Keypoints Table for Camera FC6310R\_8.8\_5472x3648 (RGB)(2)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	21889	6438
Mn	16665	192
Max	66110	37847
Mean	29126	11058

### Median / 75% / Maximal Number of Matches Between Camera Models

	FC6310R_8.8_...(RGB)(1)	FC6310R_8.8_...(RGB)(2)
FC6310R_8.8_5472x3648 (RGB)(1)	181 / 596 / 17559	2 / 4 / 37
FC6310R_8.8_5472x3648 (RGB)(2)		191 / 666 / 27029

## ? 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	3347623
In 3 Images	941588
In 4 Images	414549
In 5 Images	231736
In 6 Images	146020
In 7 Images	102656
In 8 Images	76389
In 9 Images	58375
In 10 Images	45078
In 11 Images	35395
In 12 Images	28537
In 13 Images	23712
In 14 Images	19613
In 15 Images	15892
In 16 Images	12541
In 17 Images	10534
In 18 Images	8868
In 19 Images	7184

In 20 Images	5381
In 21 Images	4194
In 22 Images	3079
In 23 Images	2355
In 24 Images	1642
In 25 Images	1135
In 26 Images	796
In 27 Images	607
In 28 Images	333
In 29 Images	213
In 30 Images	132
In 31 Images	60
In 32 Images	24
In 33 Images	7
In 34 Images	3

## 2D Keypoint Matches

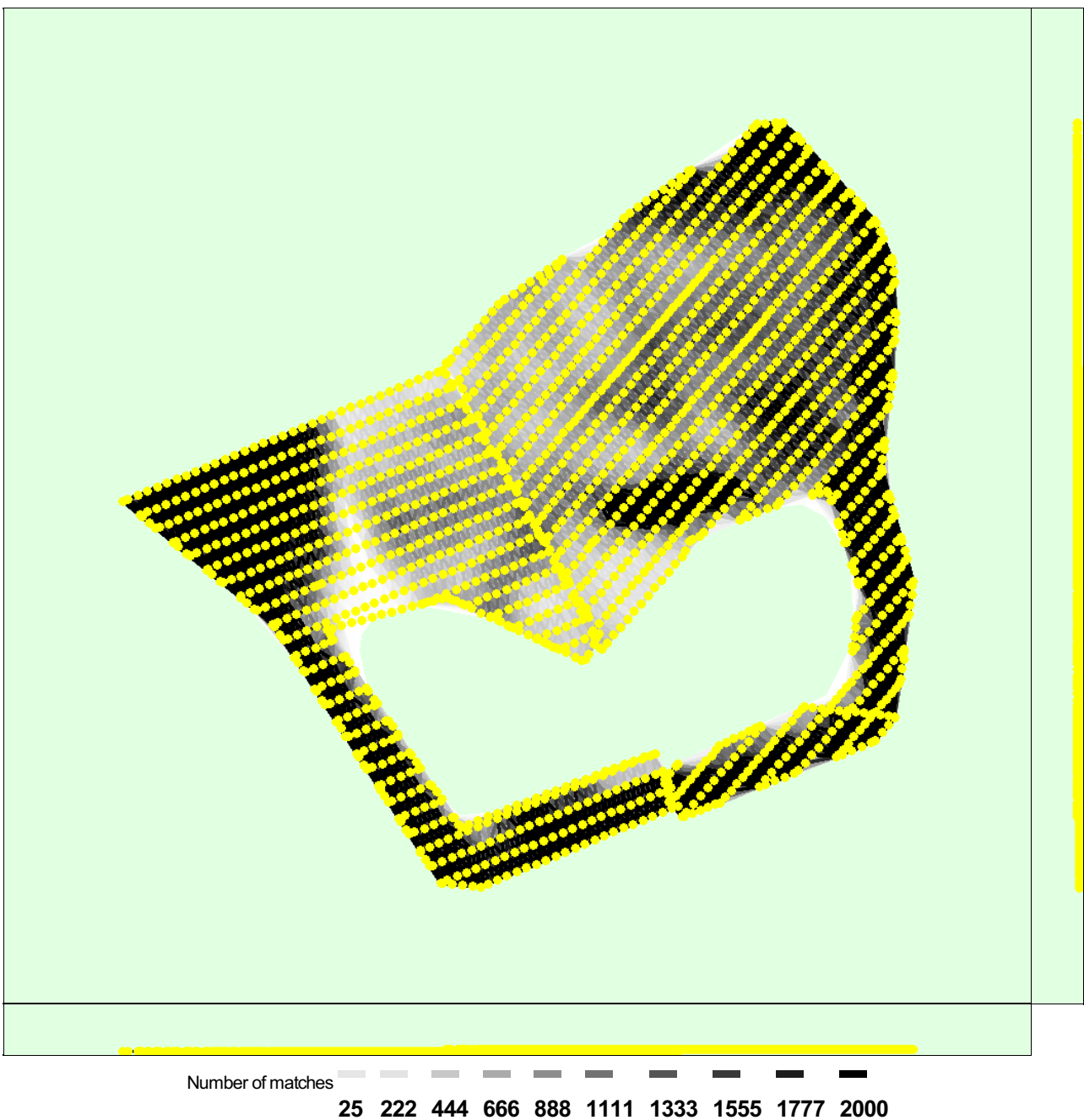


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

# 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
CP2 (3D)	0.020/ 0.020	0.045	-0.058	-0.014	0.558	24 / 24
CP3 (3D)	0.020/ 0.020	0.042	-0.064	-0.007	0.586	26 / 26
CP4 (3D)	0.020/ 0.020	0.027	-0.081	-0.012	0.685	28 / 28
CP5 (3D)	0.020/ 0.020	0.042	-0.040	0.020	0.521	15 / 15
CP6 (3D)	0.020/ 0.020	-0.025	-0.062	-0.055	0.559	25 / 25
CP7 (3D)	0.020/ 0.020	0.004	-0.034	-0.010	0.520	28 / 28
CP8 (3D)	0.020/ 0.020	-0.019	0.026	-0.005	0.461	24 / 24
CP9 (3D)	0.020/ 0.020	-0.057	0.131	-0.034	0.663	27 / 27
CP10 (3D)	0.020/ 0.020	-0.131	0.227	0.019	0.727	29 / 29
CP11 (3D)	0.020/ 0.020	-0.101	0.207	-0.014	0.593	21 / 21
CP12 (3D)	0.020/ 0.020	-0.054	0.112	0.012	0.580	16 / 16
CP22 (3D)	0.020/ 0.020	0.030	-0.039	0.056	0.503	14 / 14
CP23 (3D)	0.020/ 0.020	0.003	-0.064	0.020	0.644	19 / 19
CP24 (3D)	0.020/ 0.020	0.077	-0.058	-0.011	0.441	19 / 19
CP25 (3D)	0.020/ 0.020	0.029	-0.073	0.014	0.661	18 / 18
CP26 (3D)	0.020/ 0.020	0.055	-0.055	0.016	0.548	24 / 24
CP27 (3D)	0.020/ 0.020	0.057	-0.103	0.031	0.585	21 / 21
TSF7 (3D)	0.020/ 0.020	-0.006	0.017	0.007	0.423	23 / 23
<b>Mean [m]</b>		0.000938	-0.000622	0.001881		
<b>Sigma [m]</b>		0.055230	0.098309	0.024640		
<b>RMS Error [m]</b>		0.055238	0.098311	0.024711		

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 [%]
-	-0.04	0.00	0.06	1.75
-0.04	-0.04	0.00	0.11	1.41
-0.04	-0.03	0.11	0.45	3.56
-0.03	-0.02	0.45	1.13	5.88
-0.02	-0.01	2.66	3.16	11.86
-0.01	0.00	49.21	38.25	25.76
0.00	0.01	44.01	52.71	26.44
0.01	0.02	3.22	3.11	12.37
0.02	0.03	0.23	0.79	4.58
0.03	0.04	0.06	0.23	2.49
0.04	0.04	0.06	0.00	1.19
0.04	-	0.00	0.00	2.71
<b>Mean [m]</b>		-0.000700	-1.322525	4.844457
<b>Sigma [m]</b>		0.004616	0.005939	0.019511
<b>RMS Error [m]</b>		0.004669	1.322538	4.844496

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]	-0.000632	-1.322679	4.844477



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]	95.76	93.45	82.15
[-2.00, 2.00]	99.60	98.42	95.54
[-3.00, 3.00]	99.94	99.72	98.42
<b>Mean of Geolocation Accuracy [m]</b>	0.011039	0.011039	0.022083
<b>Sigma of Geolocation Accuracy [m]</b>	0.000604	0.000604	0.001387

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]
Omega	0.713
Phi	0.553
Kappa	2.217

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

## Rolling Shutter Statistics

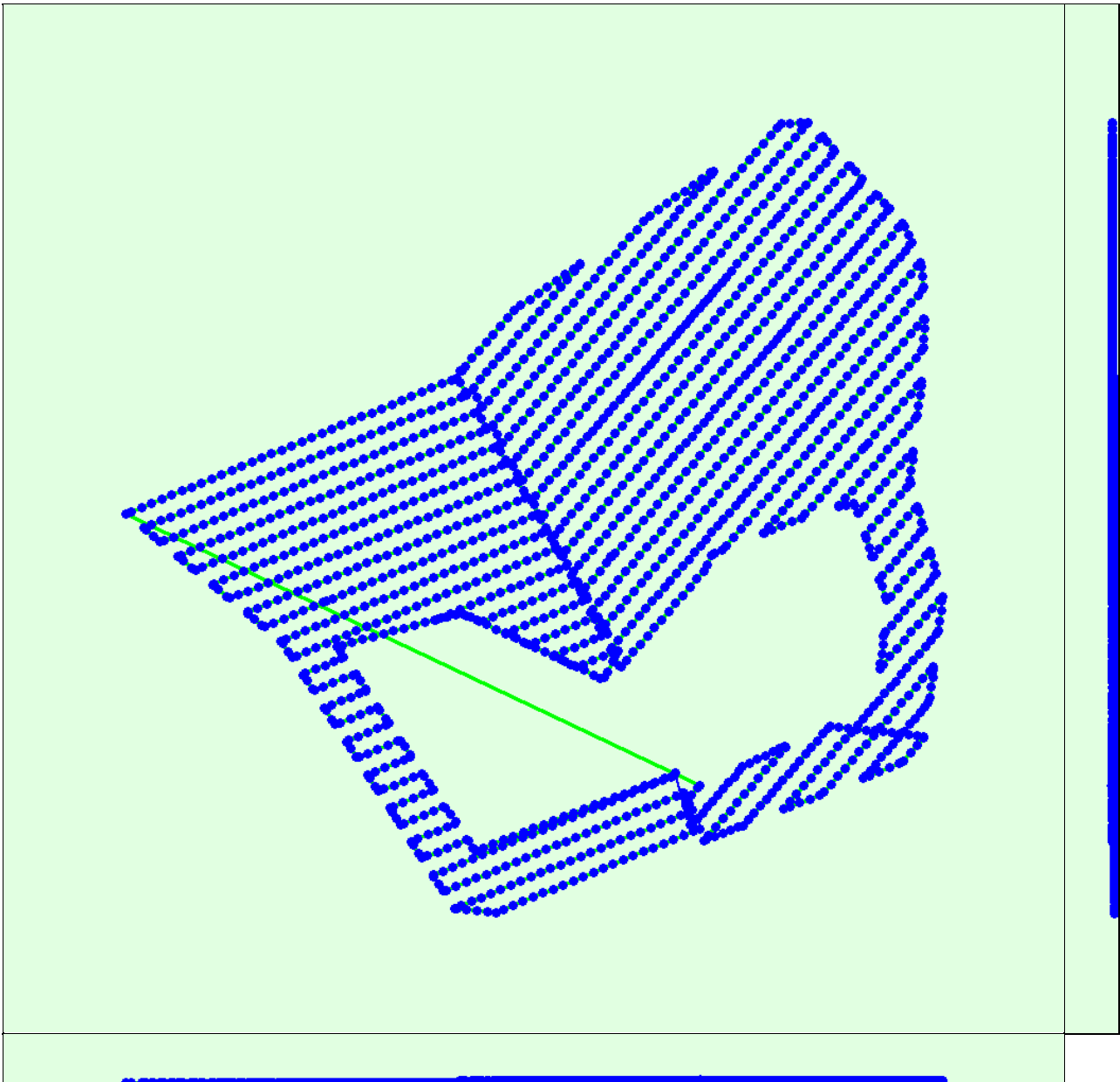


Figure 6: Camera movement estimated by the rolling shutter camera model. The green line follows the computed image positions. The blue dots represent the camera position at the start of the exposure. The blue lines represent the camera motion during the rolling shutter readout, re-scaled by a project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

Median Camera Speed	10.4019 [m/s]
Median Camera Displacement During Sensor Readout)	0.2492 [m]
Median Rolling Shutter Readout Time	28.1491 [ms]

## Initial Processing Details



### System Information



Hardware	CPU: Intel(R) Core(TM) i9-7900X CPU @ 3.30GHz RAM: 32GB GPU: NVIDIA GeForce GTX 1080 Ti (Driver: 26.21.14.3200)
Operating System	Windows 10 Pro, 64-bit

### Coordinate Systems



Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	Leigon / Ghana Metre Grid
Output Coordinate System	Leigon / Ghana Metre Grid

### Processing Options



Detected Template	Newmont Ahafo TSF*
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, no