

# Quality Report



Generated with Pix4Dmapper version 4.5.6



**Important:** Click on the different icons for:



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Additional information about the sections



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## Summary



Project	ML_20200721_doblegrilla y circulos
Processed	2020-07-28 04:59:42
Camera Model Name(s)	FC220_4.7_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	1.42 cm / 0.56 in
Time for Initial Processing (without report)	07h:07m:10s

## Quality Check



<b>Images</b>	median of 31419 keypoints per image	
<b>Dataset</b>	1569 out of 1569 images calibrated (100%), all images enabled	
<b>Camera Optimization</b>	1.54% relative difference between initial and optimized internal camera parameters	
<b>Matching</b>	median of 9309.25 matches per calibrated image	
<b>Georeferencing</b>	yes, no 3D GCP	

## Calibration Details



Number of Calibrated Images	1569 out of 1569
Number of Geolocated Images	1569 out of 1569

### Initial Image Positions

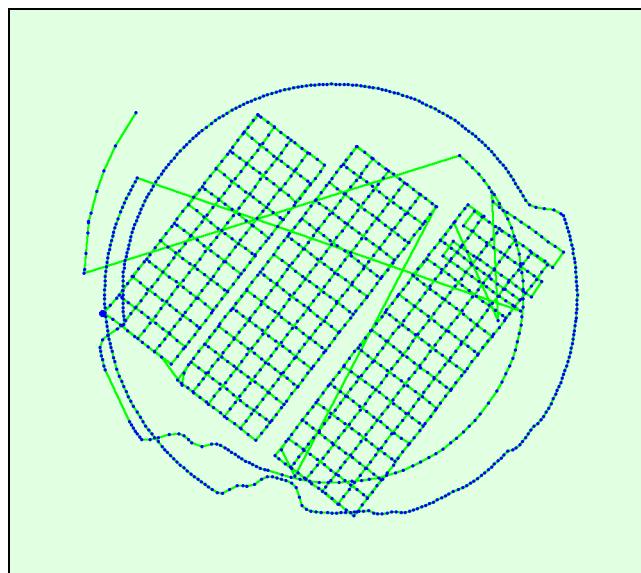
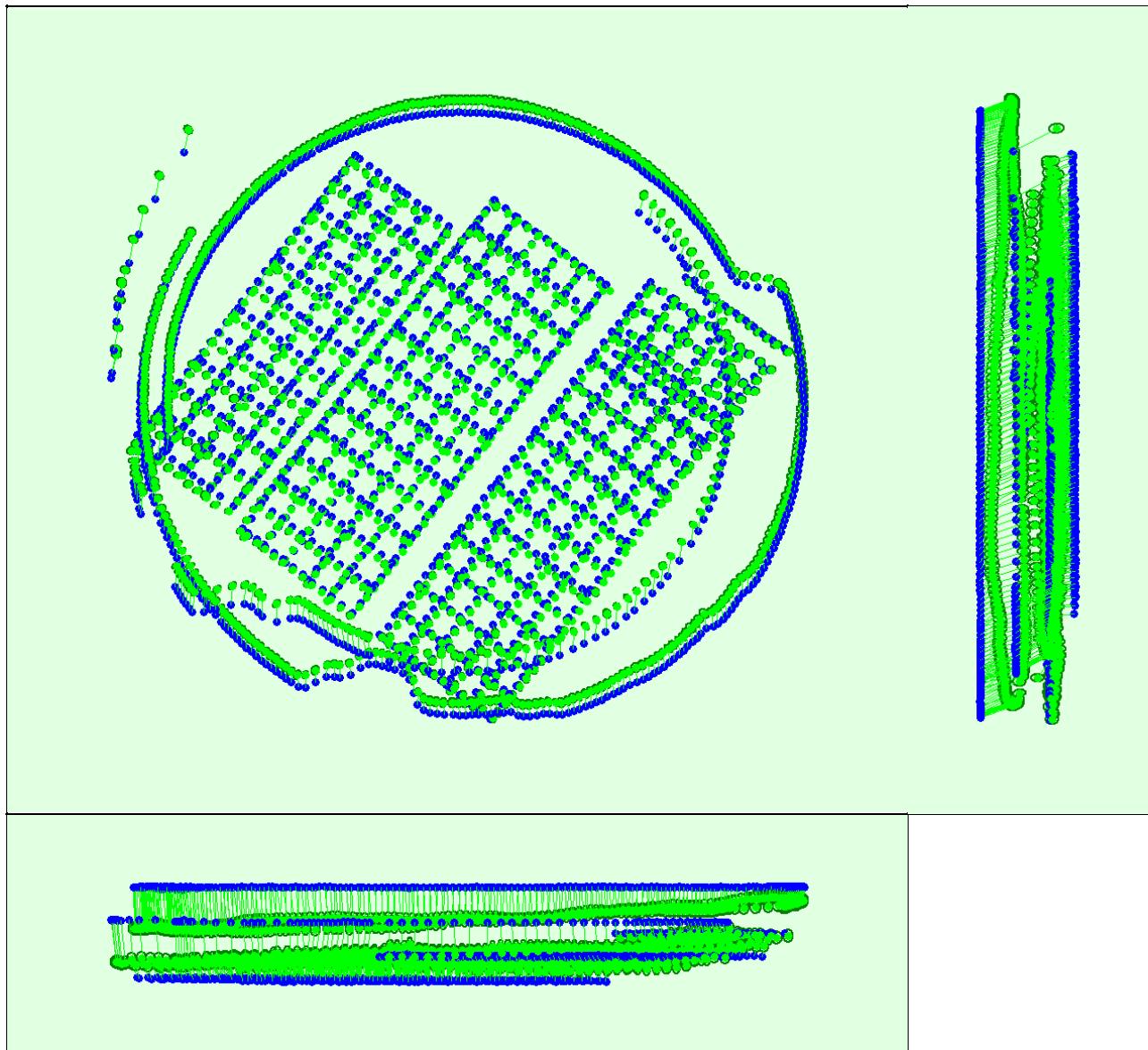


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

## 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	0.068	0.066	0.111	0.059	0.040	0.052	0.004	0.004	0.007
Sigma	0.011	0.009	0.004	0.007	0.004	0.007	0.002	0.002	0.003

## Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	14169150
Number of 3D Points for Bundle Block Adjustment	4150220
Mean Reprojection Error [pixels]	0.188

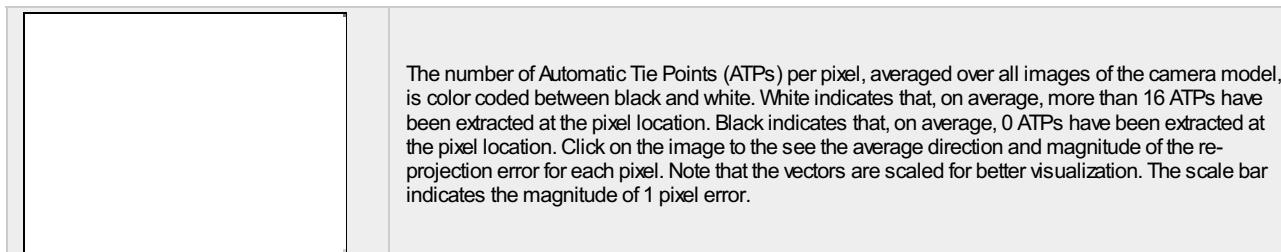
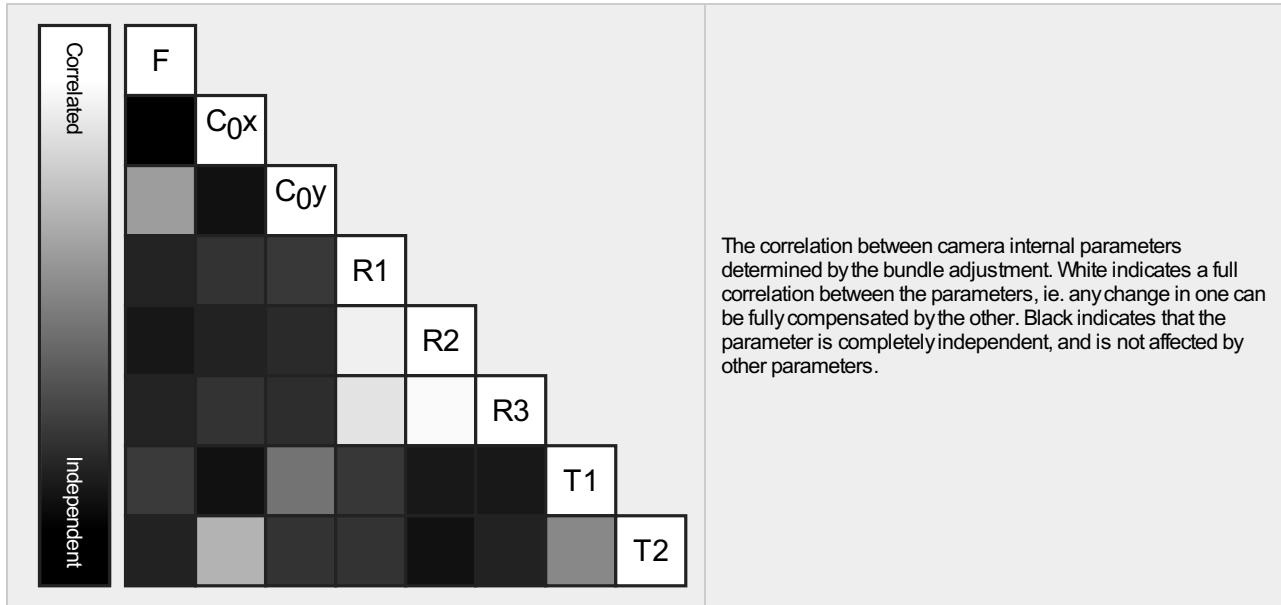
## 💡 Internal Camera Parameters

📝 FC220\_4.7\_4000x3000 (RGB). Sensor Dimensions: 6.327 [mm] x 4.745 [mm]



EXIF ID: FC220\_4.7\_4000x3000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3073.410 [pixel] 4.861 [mm]	1917.790 [pixel] 3.033 [mm]	1485.800 [pixel] 2.350 [mm]	0.033	-0.086	0.078	0.000	-0.001
Optimized Values	3026.072 [pixel] 4.786 [mm]	1987.555 [pixel] 3.144 [mm]	1512.298 [pixel] 2.392 [mm]	0.064	-0.169	0.165	0.000	0.000
Uncertainties (Sigma)	0.259 [pixel] 0.000 [mm]	0.186 [pixel] 0.000 [mm]	0.351 [pixel] 0.001 [mm]	0.000	0.000	0.000	0.000	0.000



## 💡 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	31419	9309
Mn	17101	718
Max	54952	14599
Mean	32723	9031

## 💡 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	2264567
In 3 Images	806425
In 4 Images	390584
In 5 Images	218245
In 6 Images	133695
In 7 Images	86241
In 8 Images	58871
In 9 Images	41583

In 10 Images	30767
In 11 Images	22921
In 12 Images	17169
In 13 Images	13220
In 14 Images	10162
In 15 Images	8183
In 16 Images	6763
In 17 Images	5546
In 18 Images	4511
In 19 Images	3891
In 20 Images	3287
In 21 Images	2835
In 22 Images	2497
In 23 Images	2133
In 24 Images	1879
In 25 Images	1642
In 26 Images	1403
In 27 Images	1173
In 28 Images	1083
In 29 Images	884
In 30 Images	825
In 31 Images	700
In 32 Images	631
In 33 Images	614
In 34 Images	523
In 35 Images	457
In 36 Images	417
In 37 Images	369
In 38 Images	374
In 39 Images	299
In 40 Images	286
In 41 Images	270
In 42 Images	226
In 43 Images	209
In 44 Images	188
In 45 Images	156
In 46 Images	146
In 47 Images	116
In 48 Images	112
In 49 Images	114
In 50 Images	108
In 51 Images	88
In 52 Images	76
In 53 Images	66
In 54 Images	68
In 55 Images	53
In 56 Images	52
In 57 Images	41
In 58 Images	47
In 59 Images	35
In 60 Images	35
In 61 Images	37
In 62 Images	31
In 63 Images	25
In 64 Images	23
In 65 Images	22
In 66 Images	17
In 67 Images	19
In 68 Images	17

In 69 Images	15
In 70 Images	13
In 71 Images	18
In 72 Images	12
In 73 Images	5
In 74 Images	6
In 75 Images	9
In 76 Images	8
In 77 Images	9
In 78 Images	8
In 79 Images	7
In 80 Images	2
In 81 Images	3
In 82 Images	7
In 83 Images	2
In 84 Images	6
In 85 Images	2
In 86 Images	2
In 87 Images	2
In 88 Images	5
In 89 Images	4
In 90 Images	1
In 91 Images	2
In 92 Images	4
In 93 Images	1
In 94 Images	1
In 95 Images	2
In 96 Images	1
In 97 Images	1
In 98 Images	1
In 100 Images	1
In 101 Images	1
In 105 Images	3
In 120 Images	1
In 124 Images	1
In 142 Images	1
In 146 Images	1

 **2D Keypoint Matches**



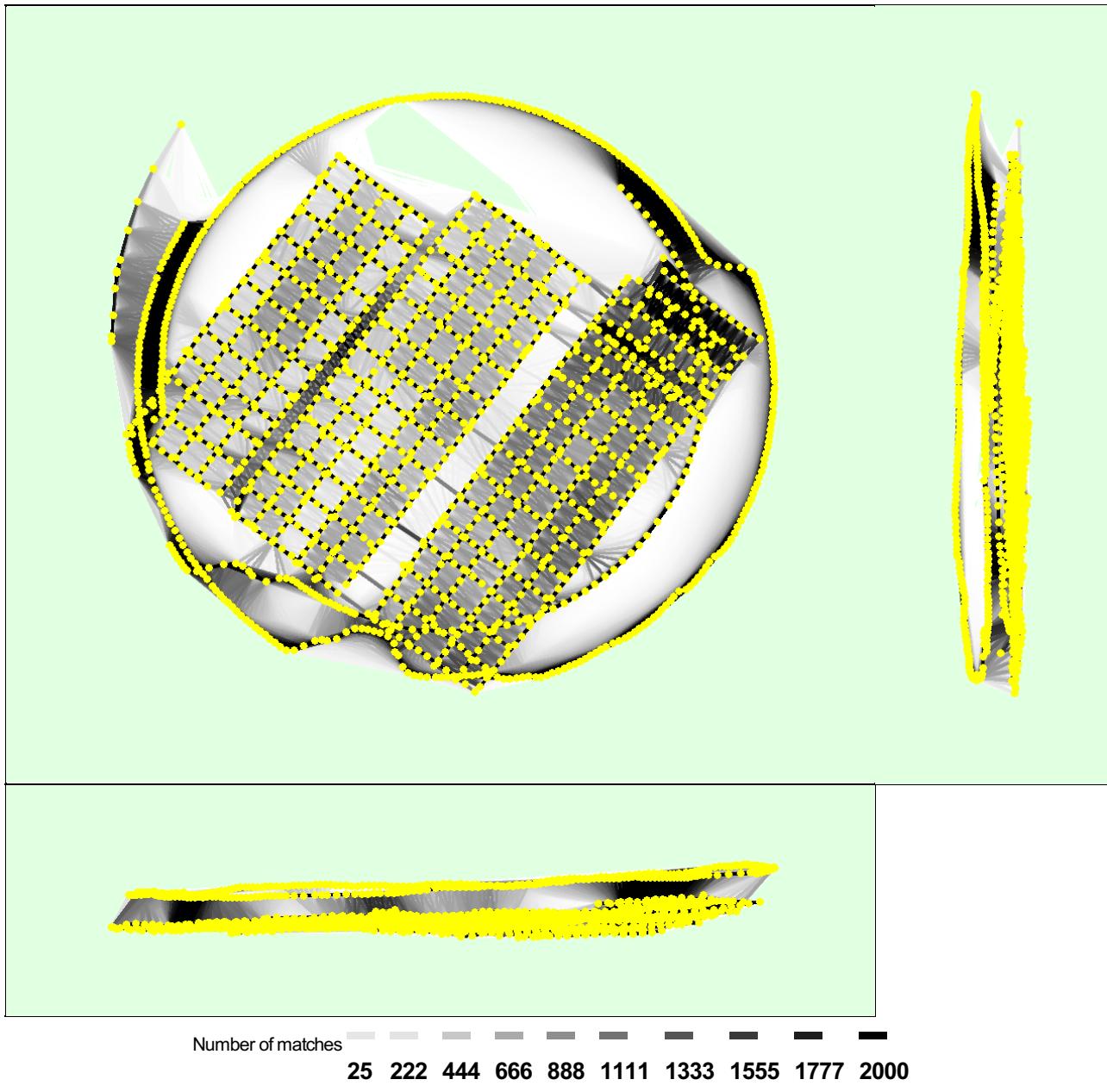


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

## Geolocation Details

### ⚠ 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	0.00	0.00
-9.00	-6.00	0.00	0.00	0.51
-6.00	-3.00	0.00	8.54	36.52
-3.00	0.00	50.67	20.91	16.44
0.00	3.00	49.33	70.49	21.99
3.00	6.00	0.00	0.06	10.13
6.00	9.00	0.00	0.00	14.40
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
<b>Mean [m]</b>		-0.000001	-0.000000	0.000023
<b>Sigma [m]</b>		0.550697	1.793188	4.273605
<b>RMS Error [m]</b>		0.550697	1.793188	4.273605

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



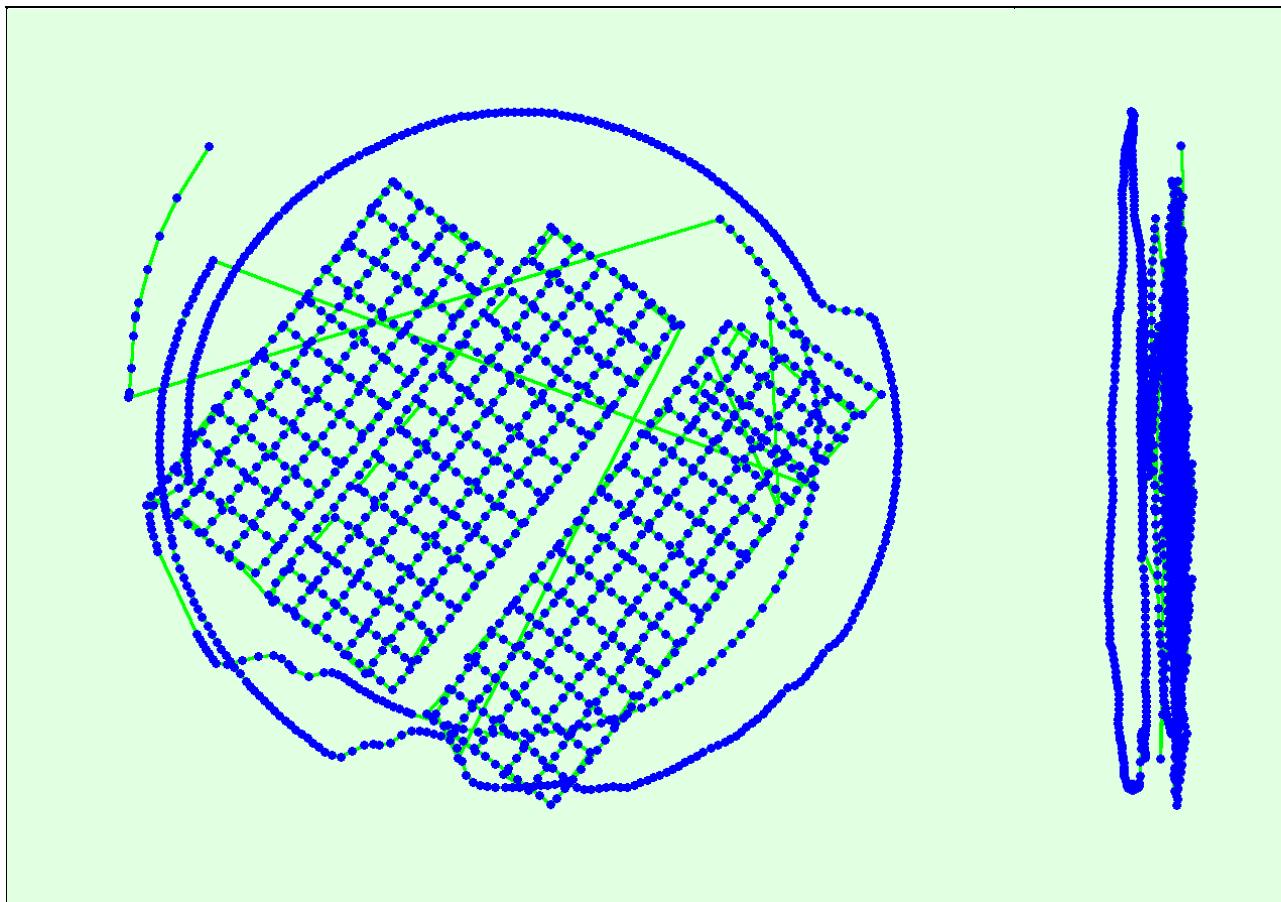
Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	100.00	100.00	100.00
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
<b>Mean of Geolocation Accuracy [m]</b>	5.000000	5.000000	10.000000
<b>Sigma of Geolocation Accuracy [m]</b>	0.000000	0.000000	0.000000

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

Geolocation Orientational Variance	RMS [degree]
Omega	3.277
Phi	3.714
Kappa	4.874

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

### ⓘ Rolling Shutter Statistics



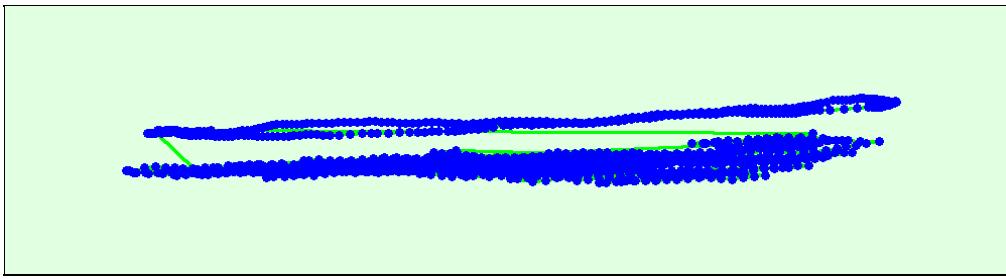


Figure 6: Camera movement estimated by the rolling shutter camera model. The green line follows the computed image positions. The blue dots represent the camera position at the start of the exposure. The blue lines represent the camera motion during the rolling shutter readout, re-scaled by a project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

Median Camera Speed	1.0967 [m/s]
Median Camera Displacement During Sensor Readout)	0.0934 [m]
Median Rolling Shutter Readout Time	92.7267 [ms]

## Initial Processing Details



### System Information



Hardware	CPU: Intel(R) Xeon(R) CPU E5-2630 v3 @ 2.40GHz RAM: 16GB GPU: RDPUDD Chained DD (Driver: unknown)
Operating System	Windows Server 2012 R2 Standard, 64-bit

### Coordinate Systems



Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 21S (EGM96 Geoid)

### Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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

## Point Cloud Densification details



### Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum 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	12h:49m:39s
Time for Point Cloud Classification	NA

**Results**

Number of Processed Clusters	28
Number of Generated Tiles	4
Number of 3D Densified Points	71347211
Average Density (per m <sup>3</sup> )	2795.84