

# Quality Report



Generated with Pix4Denterprise version 4.8.3  
Preview

- !** **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	212706-Project-2023-07-23T04:10:08.204Z
Processed	2023-07-23 06:53:36
Camera Model Name(s)	FC3411_8.4_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.43 cm / 0.96 in
Area Covered	0.155 km <sup>2</sup> / 15.5414 ha / 0.06 sq. mi. / 38.4235 acres
Time for Initial Processing (without report)	30m:11s

## Quality Check



<b>?</b> <b>Images</b>	median of 68670 keypoints per image	<b>✓</b>
<b>?</b> <b>Dataset</b>	220 out of 220 images calibrated (100%), all images enabled	<b>✓</b>
<b>?</b> <b>Camera Optimization</b>	80.99% relative difference between initial and optimized internal camera parameters	<b>⚠</b>
<b>?</b> <b>Matching</b>	median of 23461.5 matches per calibrated image	<b>✓</b>
<b>?</b> <b>Georeferencing</b>	yes, no 3D GCP	<b>⚠</b>

## **?** Preview

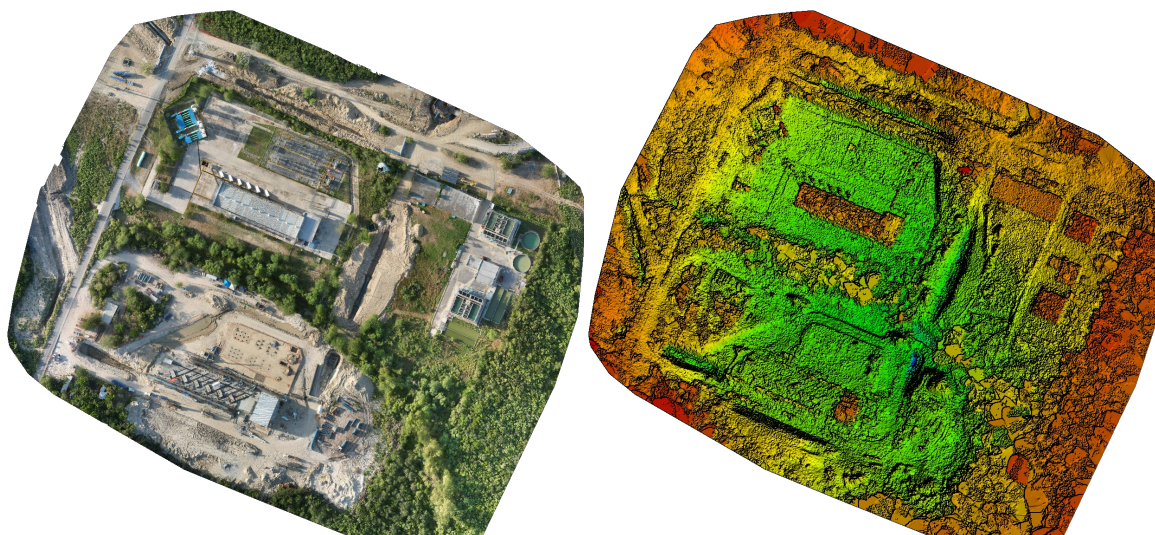


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

## Calibration Details



Number of Calibrated Images	220 out of 220
Number of Geolocated Images	220 out of 220

## Initial Image Positions

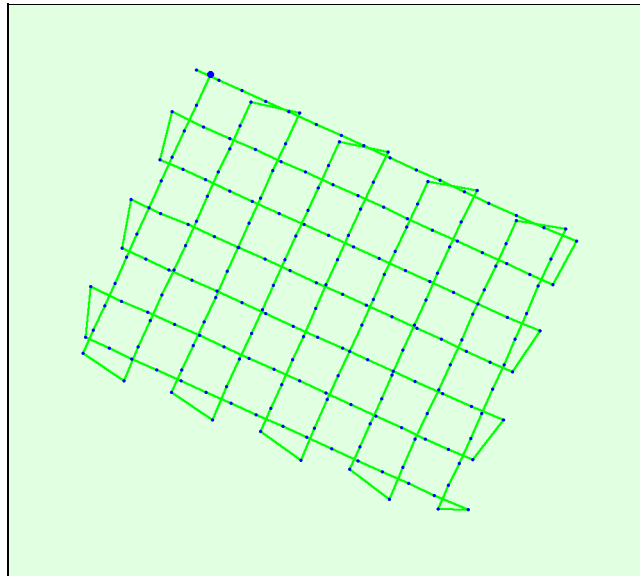
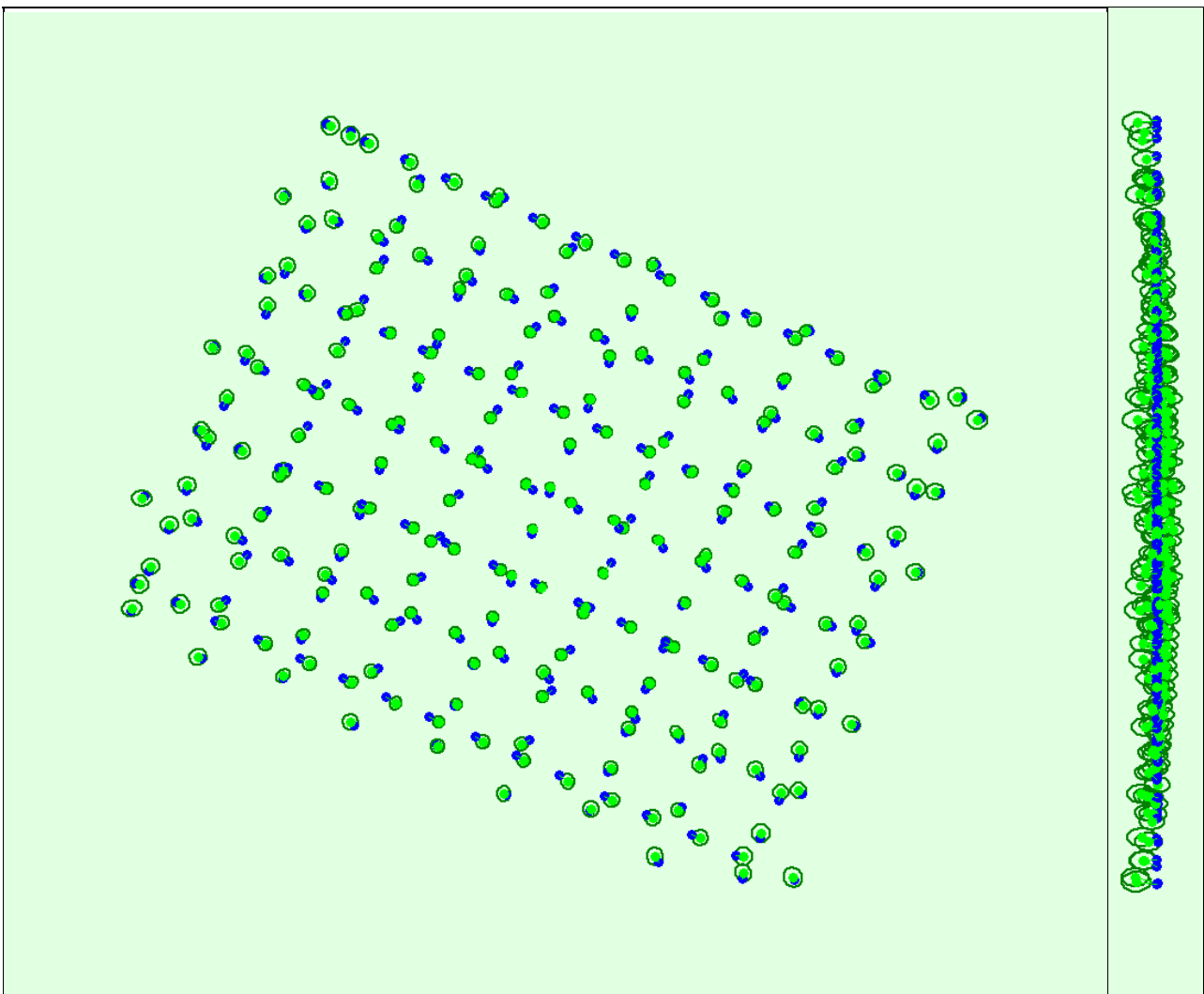
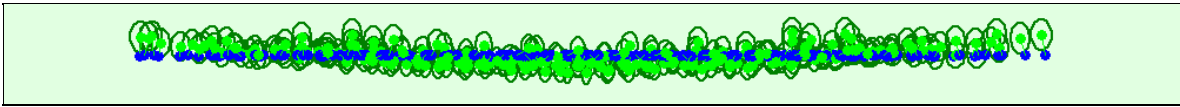


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

## Computed Image/GCPs/Manual Tie Points Positions





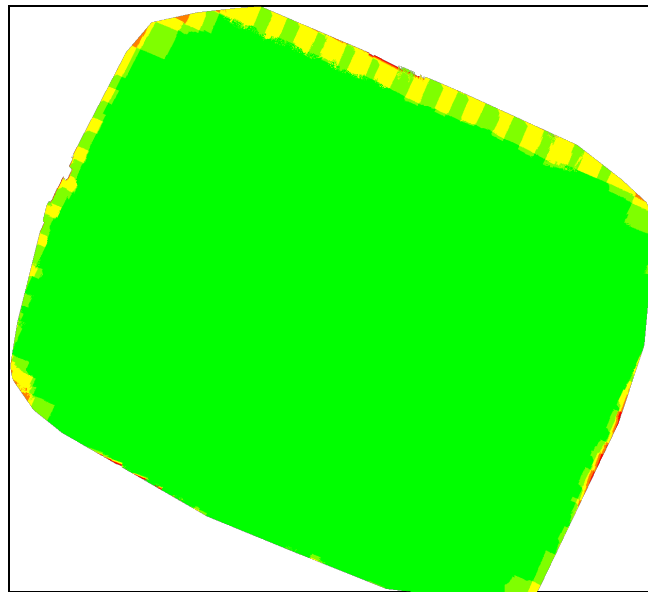
Uncertainty ellipses 10x magnified

**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 i

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.319	0.316	0.540	0.136	0.132	0.097
Sigma	0.050	0.048	0.047	0.002	0.002	0.002

### ? Overlap i



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 i

Number of 2D Keypoint Observations for Bundle Block Adjustment	4928758
Number of 3D Points for Bundle Block Adjustment	1635532
Mean Reprojection Error [pixels]	0.459

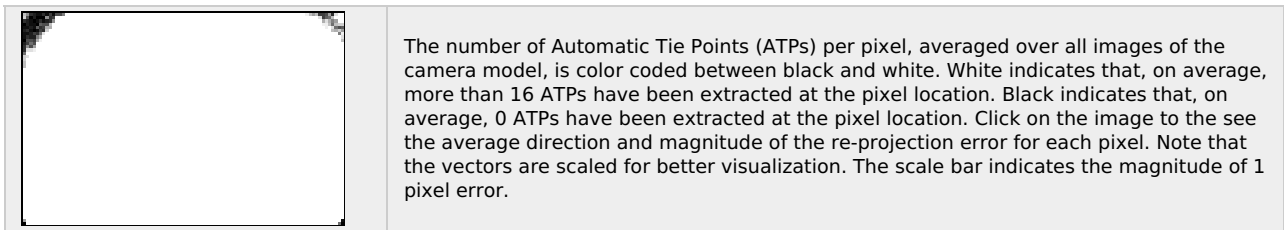
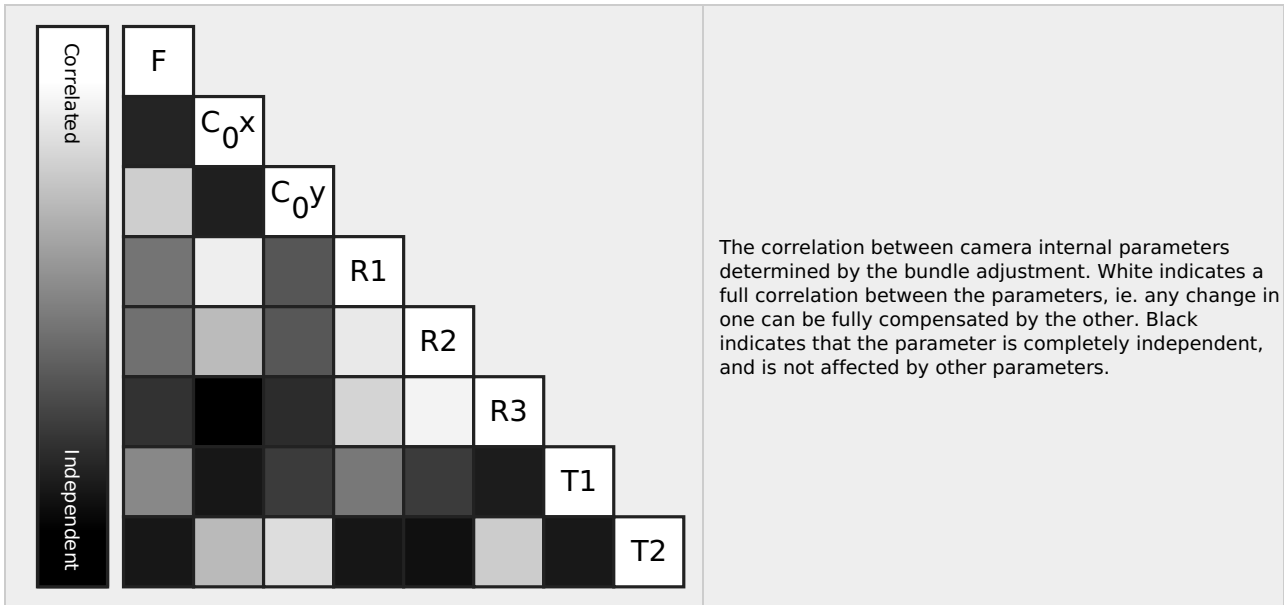
### ? Internal Camera Parameters

**FC3411\_8.4\_5472x3648 (RGB). Sensor Dimensions: 13.332 [mm] x 8.888 [mm]** i

EXIF ID: FC3411\_8.4\_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3515.260 [pixel] 8.564 [mm]	2707.320 [pixel] 6.596 [mm]	1847.530 [pixel] 4.501 [mm]	-0.072	0.043	0.027	0.000	0.000

Optimized Values	6362.325 [pixel] 15.501 [mm]	2737.109 [pixel] 6.669 [mm]	1532.445 [pixel] 3.734 [mm]	-0.284	0.716	-0.385	0.008	-0.001
Uncertainties (Sigma)	4.750 [pixel] 0.012 [mm]	0.370 [pixel] 0.001 [mm]	0.590 [pixel] 0.001 [mm]	0.001	0.005	0.010	0.000	0.000



## 2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	68670	23461
Min	51154	1265
Max	79919	36059
Mean	68243	22403

## 3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1068739
In 3 Images	259227
In 4 Images	110498
In 5 Images	58340
In 6 Images	36861
In 7 Images	24996
In 8 Images	17275
In 9 Images	12779
In 10 Images	9877
In 11 Images	7533
In 12 Images	6067
In 13 Images	4784
In 14 Images	3941
In 15 Images	3238
In 16 Images	2642
In 17 Images	2221
In 18 Images	1750
In 19 Images	1421

In 20 Images	1100
In 21 Images	901
In 22 Images	610
In 23 Images	406
In 24 Images	224
In 25 Images	63
In 26 Images	28
In 27 Images	9
In 28 Images	2

## 2D Keypoint Matches

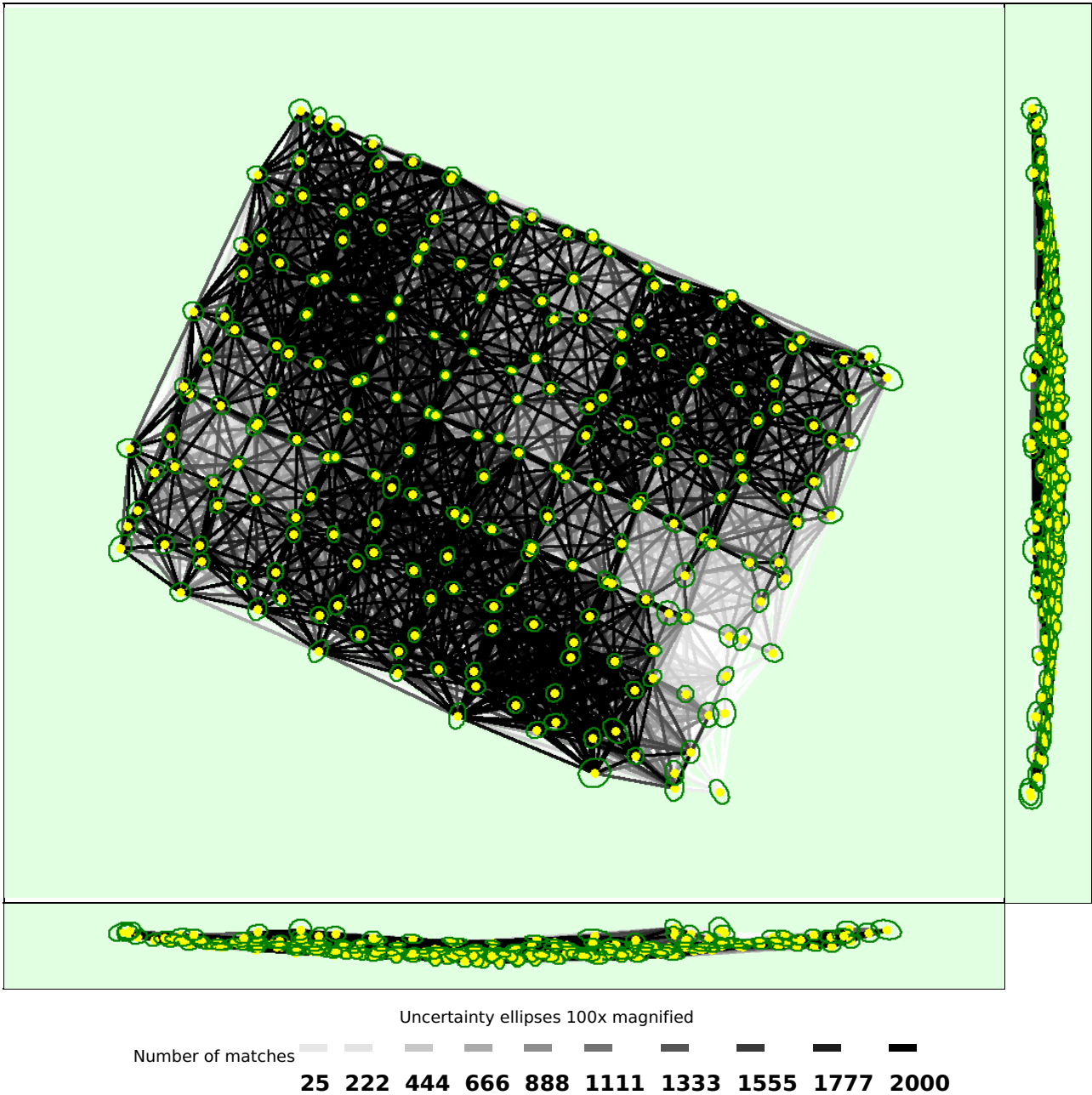


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty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

## Relative camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.041	0.042	0.021	0.023	0.025	0.006
Sigma	0.008	0.009	0.009	0.008	0.010	0.002

# Geolocation Details



## 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	1.36
-9.00	-6.00	0.00	0.00	5.91
-6.00	-3.00	17.73	12.27	14.09
-3.00	0.00	34.55	38.18	30.00
0.00	3.00	33.64	39.09	21.82
3.00	6.00	14.09	10.45	22.73
6.00	9.00	0.00	0.00	4.09
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>		0.000000	-0.000000	-0.000000
<b>Sigma [m]</b>		2.633696	2.500221	3.756406
<b>RMS Error [m]</b>		2.633696	2.500221	3.756406

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]	99.55	99.55	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	3.935
Phi	4.285
Kappa	9.422

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) Xeon(R) Platinum 8124M CPU @ 3.00GHz RAM: 69GB GPU: no info (Driver: unknown)
Operating System	Linux 5.15.0-1039-aws x86_64

## Coordinate Systems



Image Coordinate System	WGS 84 (EGM 96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 14N (EGM 96 Geoid)

## Processing Options



Detected Template	cloud-3d-maps-1*
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	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	10m:58s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	12m:29s

### Results



Number of Generated Tiles	1
Number of 3D Densified Points	27463004
Average Density (per m <sup>3</sup> )	143.91

## DSM, Orthomosaic and Index Details



### Processing Options



DSM and Orthomosaic Resolution	1 x GSD (2.43 [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

Time for DSM Generation	05m:17s
Time for Orthomosaic Generation	10m:11s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s