

# Quality Report



Generated with Pix4Denterprise version 4.5.2  
Preview



**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	Fields winter crop with the Duet M
Processed	2021-02-09 20:54:00
Camera Model Name(s)	S.O.D.A._10.6_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.89 cm / 1.14 in
Area Covered	0.419 km <sup>2</sup> / 41.9121 ha / 0.16 sq. mi. / 103.6206 acres
Time for Initial Processing (without report)	08m:35s

## Quality Check



<b>Images</b>	median of 50519 keypoints per image	
<b>Dataset</b>	182 out of 182 images calibrated (100%), all images enabled	
<b>Camera Optimization</b>	0.29% relative difference between initial and optimized internal camera parameters	
<b>Matching</b>	median of 16348.2 matches per calibrated image	
<b>Georeferencing</b>	yes, no 3D GCP	

## Preview

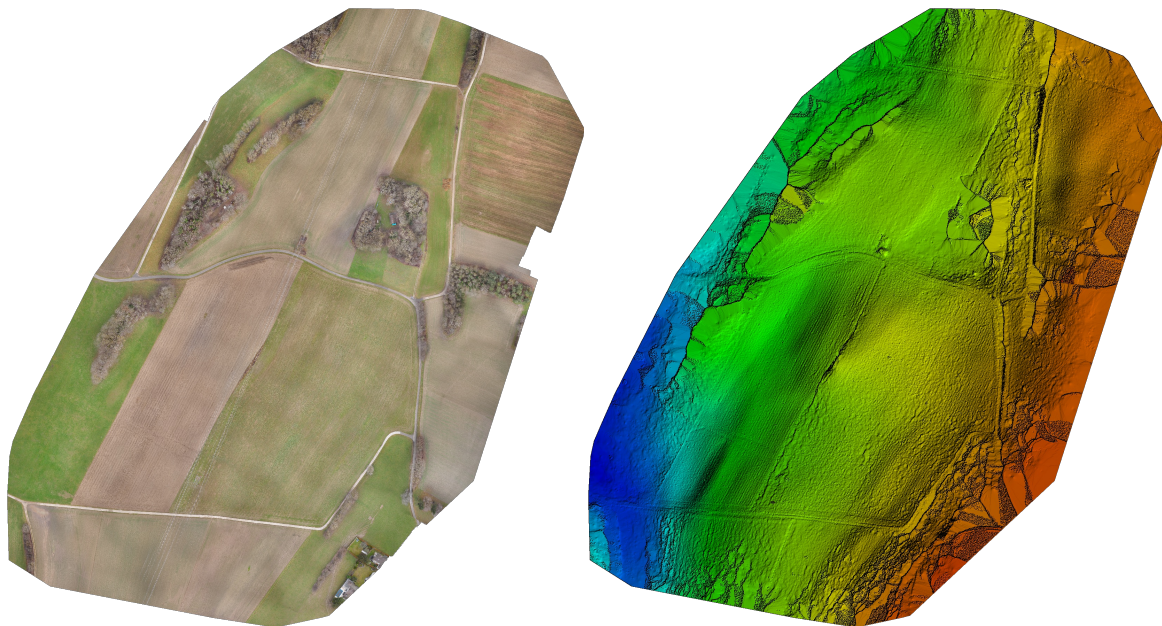


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

# Calibration Details



Number of Calibrated Images	182 out of 182
Number of Geolocated Images	182 out of 182

## Initial Image Positions

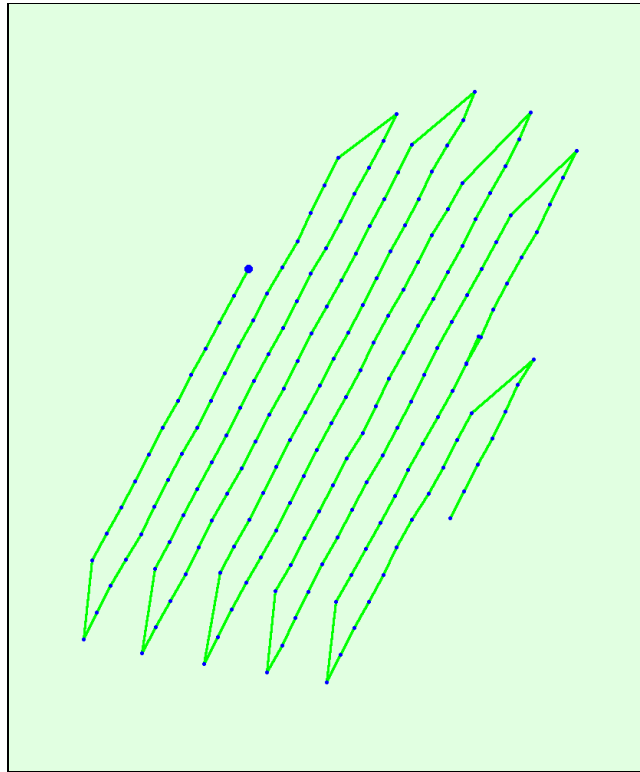
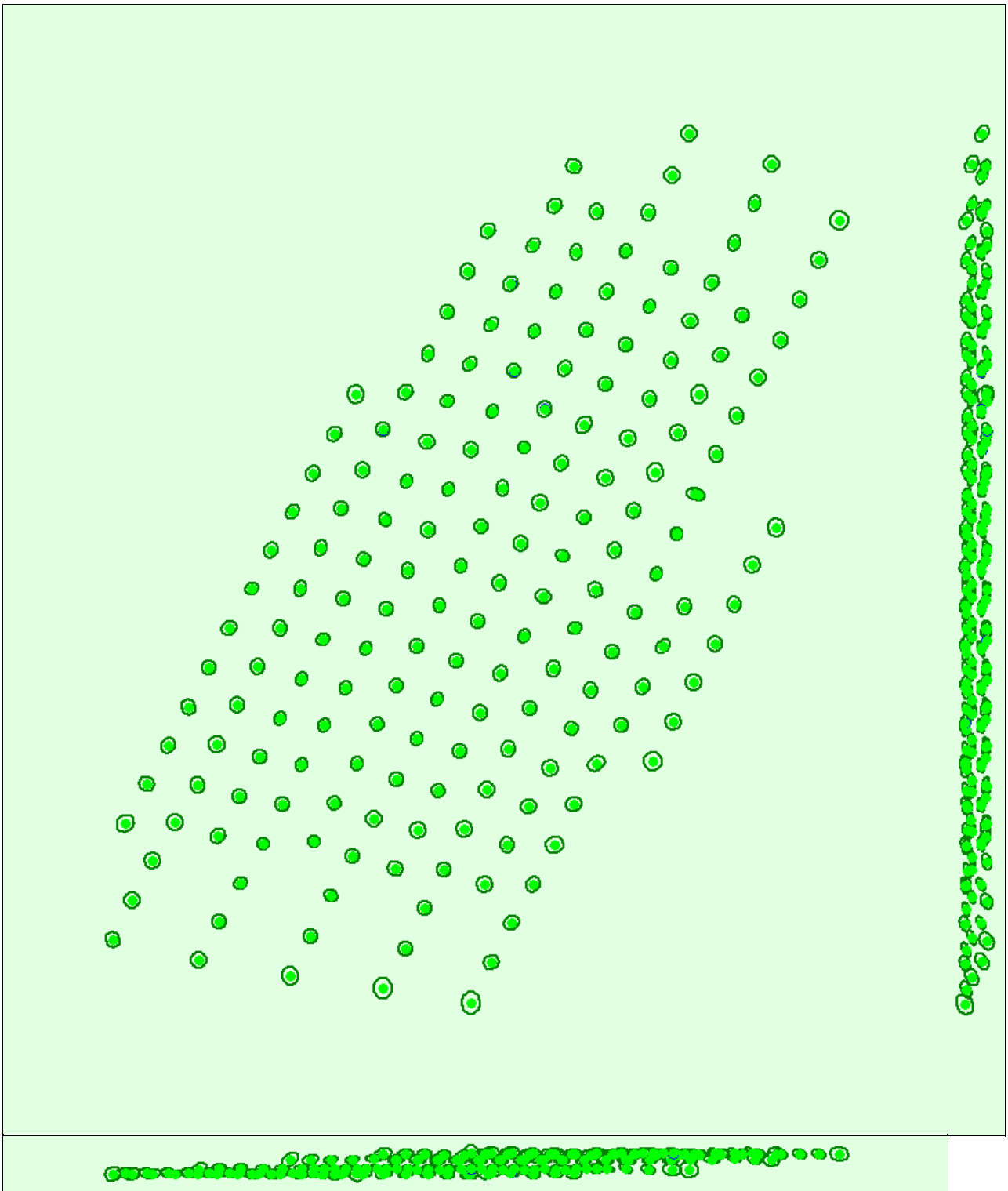


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

## 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.

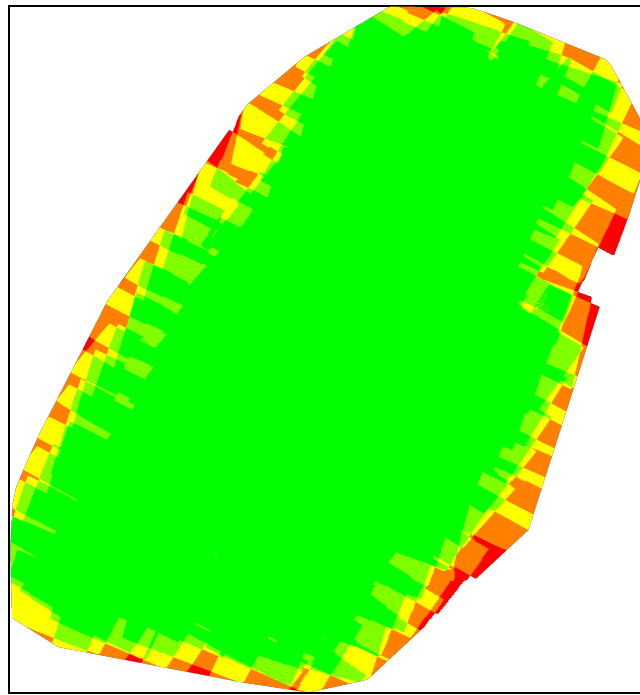
**? Absolute camera position and orientation uncertainties**



	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.007	0.007	0.004	0.004	0.003	0.002
Sigma	0.001	0.001	0.001	0.000	0.000	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

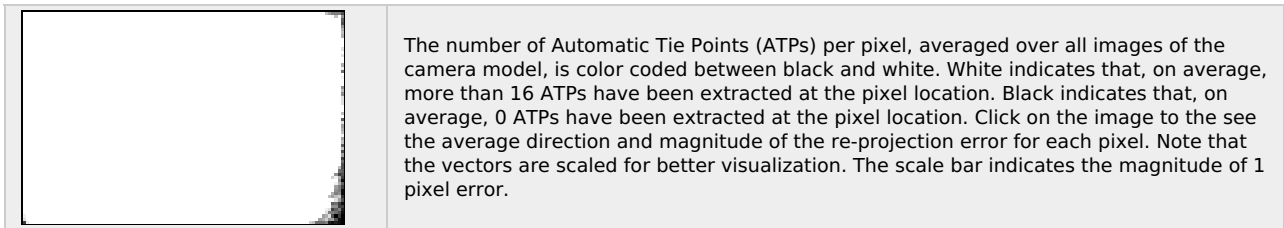
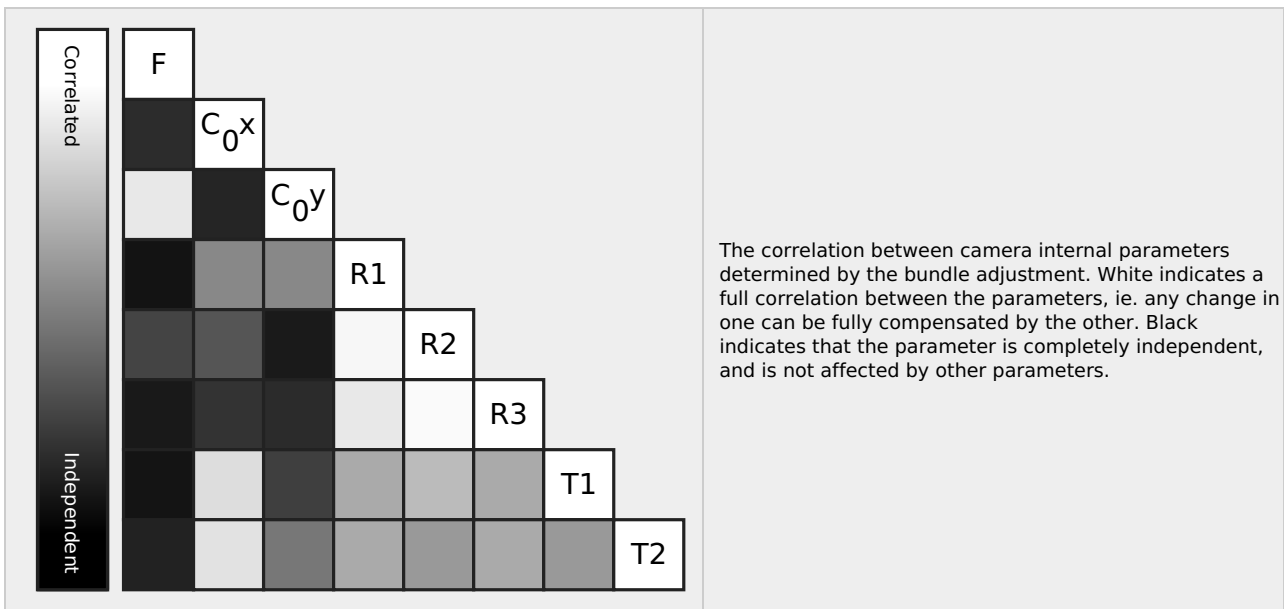
Number of 2D Keypoint Observations for Bundle Block Adjustment	3184325
Number of 3D Points for Bundle Block Adjustment	1251481
Mean Reprojection Error [pixels]	0.148

### Internal Camera Parameters

S.O.D.A.\_10.6\_5472x3648 (RGB). Sensor Dimensions: 13.133 [mm] x 8.755 [mm]

EXIF ID: S.O.D.A.\_10.6\_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	4430.420 [pixel] 10.633 [mm]	2725.000 [pixel] 6.540 [mm]	1811.670 [pixel] 4.348 [mm]	0.033	-0.209	0.315	0.000	0.000
Optimized Values	4417.178 [pixel] 10.601 [mm]	2719.882 [pixel] 6.528 [mm]	1777.662 [pixel] 4.266 [mm]	0.041	-0.228	0.335	-0.002	-0.000
Uncertainties (Sigma)	0.377 [pixel] 0.001 [mm]	0.097 [pixel] 0.000 [mm]	0.186 [pixel] 0.000 [mm]	0.000	0.001	0.001	0.000	0.000



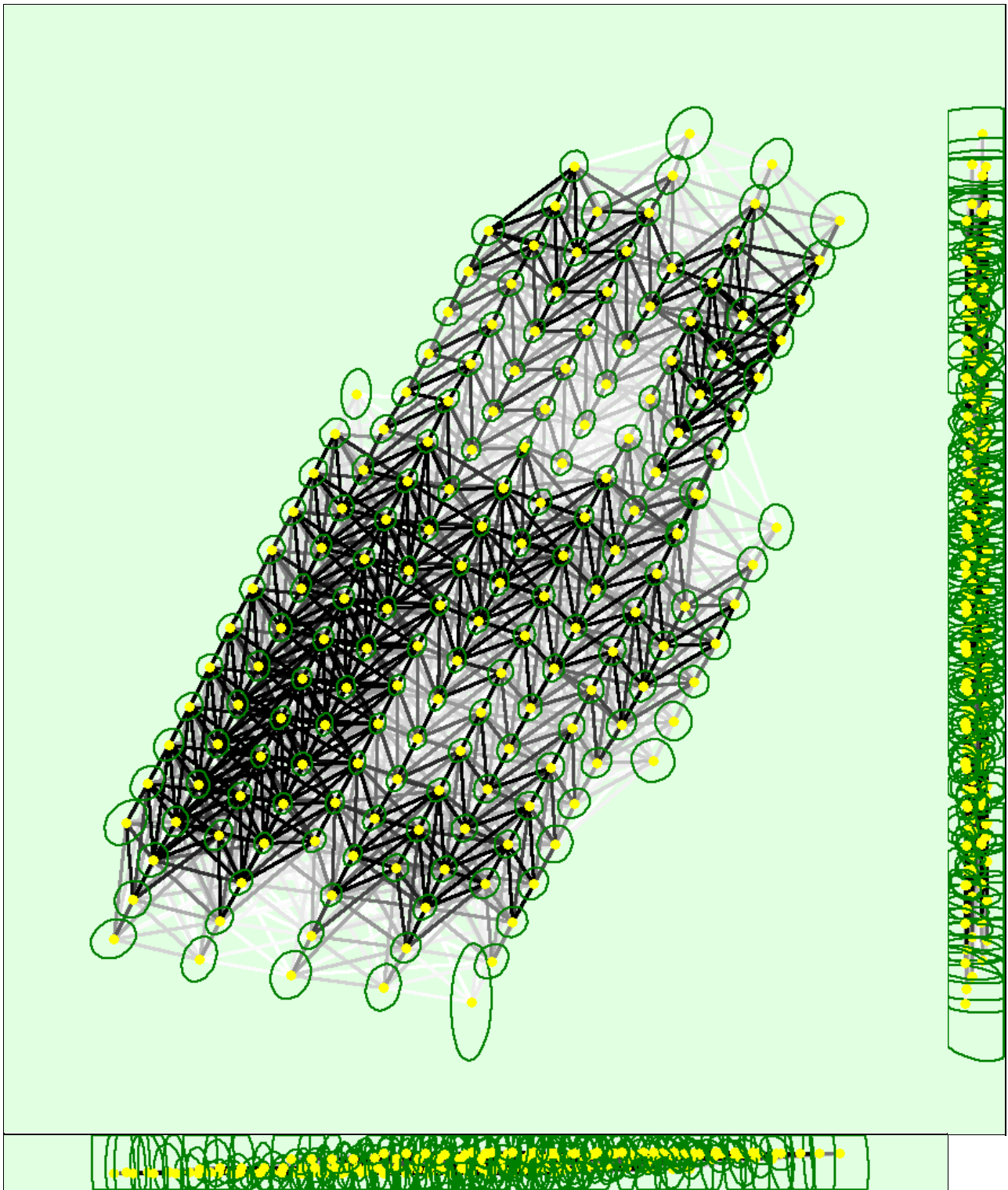
## 2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	50519	16348
Min	20038	1794
Max	78343	40245
Mean	50836	17496

## 3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	885881
In 3 Images	207411
In 4 Images	78829
In 5 Images	37742
In 6 Images	20491
In 7 Images	11423
In 8 Images	5705
In 9 Images	2598
In 10 Images	1063
In 11 Images	311
In 12 Images	27

## 2D Keypoint Matches



Uncertainty ellipses 1000x magnified

Number of matches

25 222 444 666 888 1111 1333 1555 1777 2000

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	0.013	0.014	0.027	0.014	0.009	0.003
Sigma	0.003	0.004	0.018	0.007	0.004	0.002

# Geolocation Details



## Absolute Geolocation Variance



Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.08	0.55	0.00	0.00
-0.08	-0.06	0.00	0.00	0.00
-0.06	-0.05	0.55	0.55	0.00
-0.05	-0.03	0.55	1.10	1.65
-0.03	-0.02	7.69	7.14	12.09
-0.02	0.00	36.26	42.31	38.46
0.00	0.02	46.15	40.66	30.77
0.02	0.03	7.69	6.04	15.38
0.03	0.05	0.00	1.65	1.65
0.05	0.06	0.00	0.00	0.00
0.06	0.08	0.55	0.55	0.00
0.08	-	0.00	0.00	0.00
<b>Mean [m]</b>		0.000017	-0.000014	0.000156
<b>Sigma [m]</b>		0.014337	0.013862	0.014917
<b>RMS Error [m]</b>		0.014337	0.013863	0.014918

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]	98.35	98.35	99.45
[-2.00, 2.00]	98.90	99.45	100.00
[-3.00, 3.00]	100.00	100.00	100.00
<b>Mean of Geolocation Accuracy [m]</b>	0.034946	0.034946	0.039351
<b>Sigma of Geolocation Accuracy [m]</b>	0.000720	0.000720	0.002509

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

Geolocation Orientational Variance	RMS [degree]
Omega	2.115
Phi	2.347
Kappa	13.265

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 5.4.0-1037-aws x86_64

## Coordinate Systems



Image Coordinate System	WGS 84
Output Coordinate System	WGS 84 / UTM zone 32N

## 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	06m:10s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	11m:32s

### Results



Number of Generated Tiles	1
Number of 3D Densified Points	28899290
Average Density (per m <sup>3</sup> )	146.8

## DSM, Orthomosaic and Index Details



### Processing Options



DSM and Orthomosaic Resolution	1 x GSD (2.89 [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	04m:42s
Time for Orthomosaic Generation	09m:04s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s