Quality Report

> ⚠ **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	benzonia
Processed	2016-09-23 16:27:14
Camera Model Name(s)	E-PM2_OLYMPUSM.25mmF1.8_25.0_4608x3456 (RGB)
Average Ground Sampling Distance (GSD)	0.61 cm / 0.24 in
Area Covered	0.0017 km^2 / 0.1728 ha / 0.0007 sq. mi. / 0.4272 acres
Time for Initial Processing (without report)	04m:14s

Quality Check

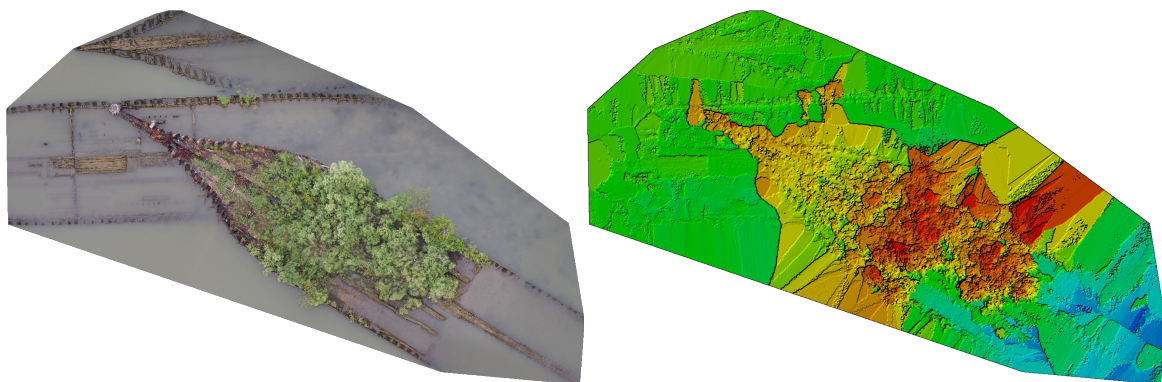| ❓ **Images**	median of 24040 keypoints per image	✅
❓ **Dataset**	79 out of 91 images calibrated (86%), all images enabled	⚠
❓ **Camera Optimization**	0.2% relative difference between initial and optimized internal camera parameters	✅
❓ **Matching**	median of 5792.02 matches per calibrated image	✅
❓ **Georeferencing**	yes, no 3D GCP	⚠

❓ Preview

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

Calibration Details

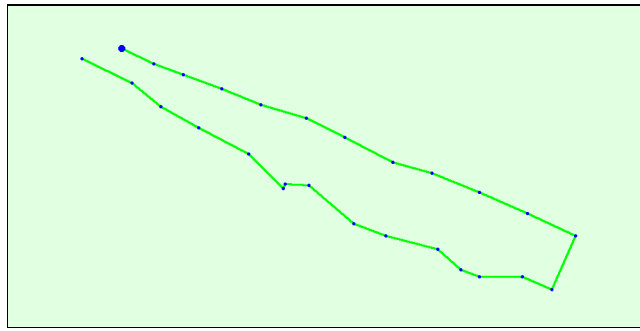| Number of Calibrated Images	79 out of 91
Number of Geolocated Images	91 out of 91

❓ 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.

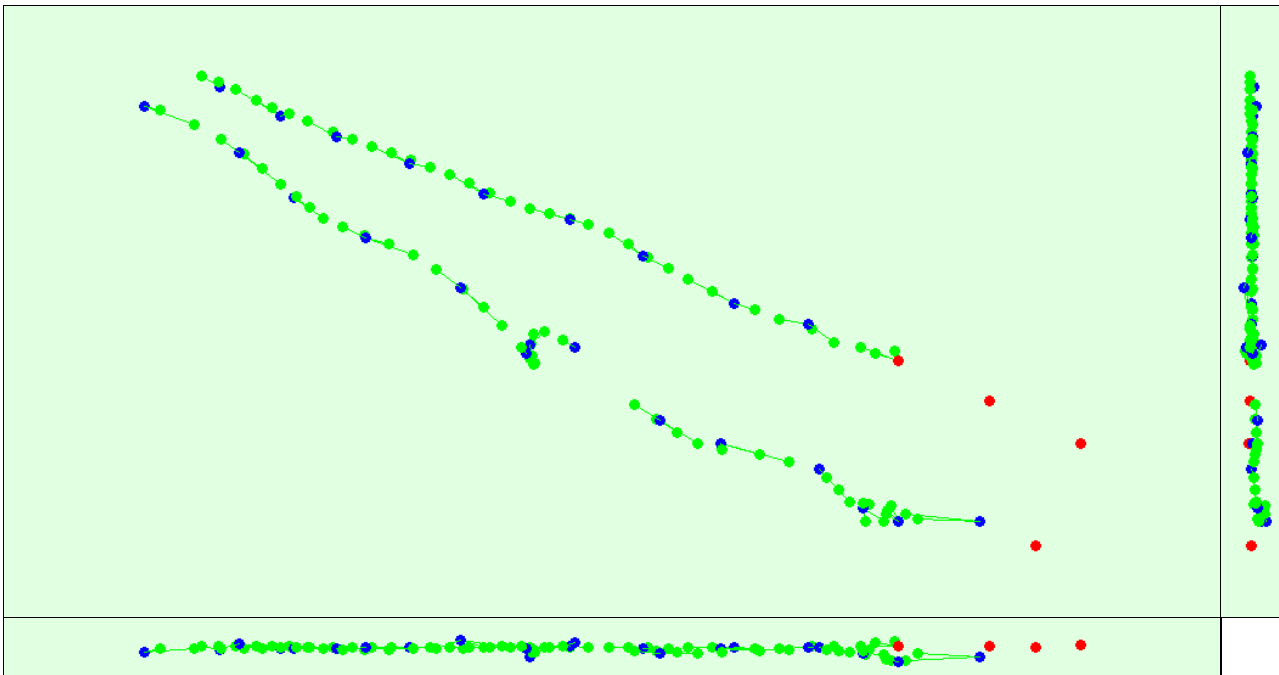## ❓ Computed Image/GCPs/Manual Tie Points Positions ℹ

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). Red dots indicate disabled or uncalibrated images.

❓ Overlap ℹ

Number of overlapping images: 1 2 3 4 5+
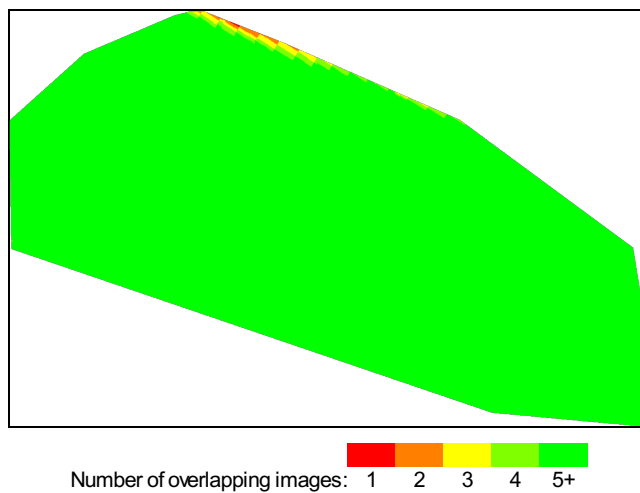
Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).

Bundle Block Adjustment Details

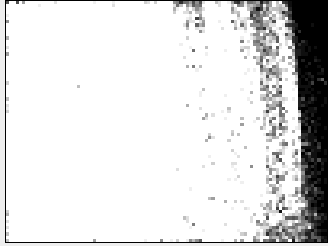|	
Number of 2D Keypoint Observations for Bundle Block Adjustment	482173
Number of 3D Points for Bundle Block Adjustment	162562
Mean Reprojection Error [pixels]	0.170

Internal Camera Parameters

E-PM2_OLYMPUSM.25mmF1.8_25.0_4608x3456 (RGB). Sensor Dimensions: 17.300 [mm] x 12.975 [mm]

EXIF ID: E-PM2_OLYMPUSM.25mmF1.8_25.0_4608x3456

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	6658.960 [pixel] 25.000 [mm]	2304.000 [pixel] 8.650 [mm]	1728.000 [pixel] 6.487 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	6645.026 [pixel] 24.948 [mm]	2300.466 [pixel] 8.637 [mm]	1717.699 [pixel] 6.449 [mm]	-0.100	0.139	0.232	-0.003	-0.002

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, in average, more than 16 ATPs are extracted at this pixel location. Black indicates that, in average, 0 ATP has been extracted at this pixel location. Click on the image to the see the average direction and magnitude of the reprojection error for each pixel. Note that the vectors are scaled for better visualization.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24040	5792
Min	20119	74
Max	37678	19811
Mean	26113	6103

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	106396
In 3 Images	25379
In 4 Images	11322
In 5 Images	6025
In 6 Images	3727
In 7 Images	2544
In 8 Images	1983
In 9 Images	1406
In 10 Images	957
In 11 Images	656
In 12 Images	520
In 13 Images	379
In 14 Images	289
In 15 Images	199
In 16 Images	189
In 17 Images	175
In 18 Images	127
In 19 Images	111
In 20 Images	74

In 21 Images	48
In 22 Images	24
In 23 Images	19
In 24 Images	13

⑦ 2D Keypoint Matches

Uncertainty ellipses 10x magnified

Number of matches

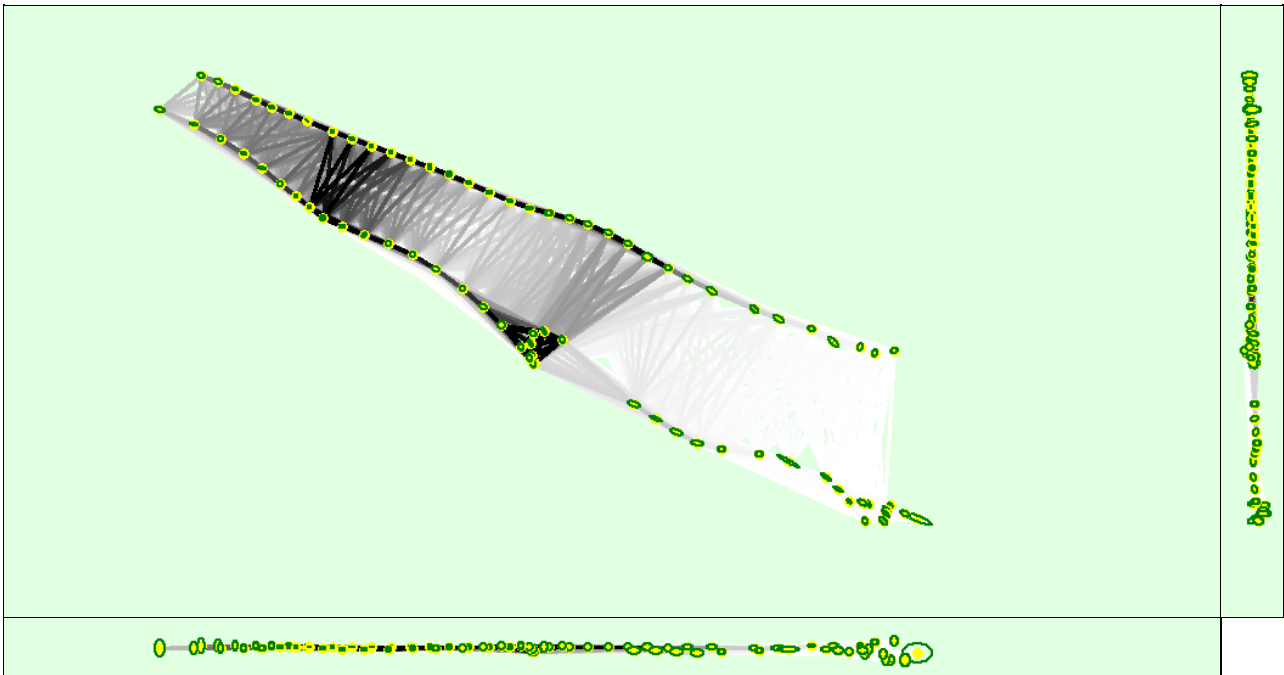**25 222 444 666 888 1111 1333 1555 1777 2000**

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.

⑦ Relative camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.035	0.027	0.033	0.103	0.164	0.051
Sigma	0.018	0.010	0.015	0.052	0.069	0.023

Geolocation Details

⑦ 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	0.00
-9.00	-6.00	1.27	0.00	0.00
-6.00	-3.00	7.59	0.00	0.00
-3.00	0.00	46.84	55.70	53.16
0.00	3.00	32.91	41.77	46.84
3.00	6.00	10.13	2.53	0.00
6.00	9.00	1.27	0.00	0.00

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
Mean [m]		-0.000001	0.000000	-0.000011
Sigma [m]		2.480217	1.290392	0.311183
RMS Error [m]		2.480217	1.290392	0.311183

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 intial 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]	96.20	100.00	100.00
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	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) Core(TM) i7-4820K CPU @ 3.70GHz RAM: 48GB GPU: NVIDIA GeForce GTX 970 (Driver: 10.18.13.5891)
Operating System	Windows 10 Enterprise, 64-bit

Coordinate Systems ⓘ

Image Coordinate System	WGS84 (egm96)
Output Coordinate System	WGS84 / UTM zone 18N (egm96)

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, 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
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1 Maximum Number of Triangles per Leaf: 8
Advanced: Matching Window Size	7x7 pixels
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Advanced: Limit Camera Depth Automatically	no
Time for Point Cloud Densification	19m:53s
Time for 3D Textured Mesh Generation	03m:55s

Results ⓘ

Number of Generated Tiles	1
Number of 3D Densified Points	4315860
Average Density (per m^3)	6243.31

DSM, Orthomosaic and Index Details ⓘ

Processing Options ⓘ

DSM and Orthomosaic Resolution	1 x GSD (0.615 [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: yes Google Maps Tiles and KML: yes
Time for DSM Generation	05m:59s
Time for Orthomosaic Generation	08m:03s