Quality Report



Generated with PIX4Dmapper version 4.7.5



Important: Click on the different icons for:

- Plelp 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	Test_Process_by_code_PSN
Processed	2022-11-16 13:59:29
Camera Model Name(s)	ZenmuseP1_35.0_8192x5460 (RGB)
Average Ground Sampling Distance (GSD)	2.46 cm / 0.97 in
Area Covered	1.156 km ² / 115.5565 ha / 0.45 sq. mi. / 285.6942 acres
Time for Initial Processing (without report)	09m:07s

Quality Check



Images	median of 29277 keypoints per image	②
② Dataset	584 out of 584 images calibrated (100%), all images enabled	②
? Camera Optimization	0.07% relative difference between initial and optimized internal camera parameters	②
Matching	median of 10665.3 matches per calibrated image	②
@ Georeferencing	yes, no 3D GCP	<u> </u>

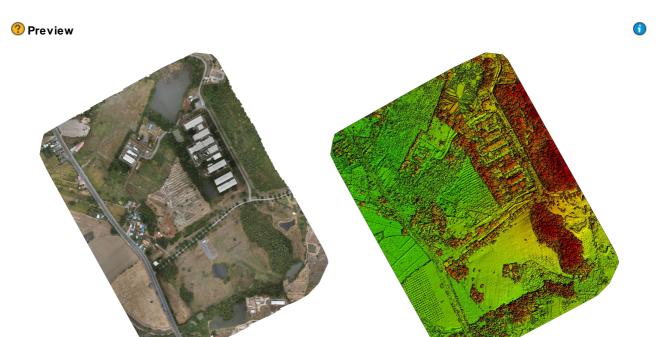


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



Number of Calibrated Images	584 out of 584
Number of Geolocated Images	584 out of 584

Initial Image Positions



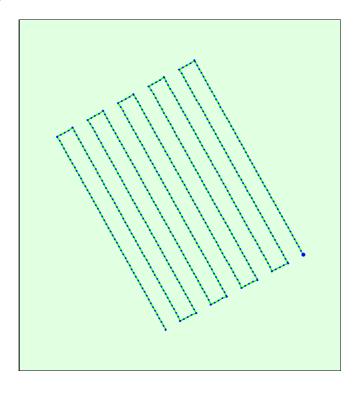
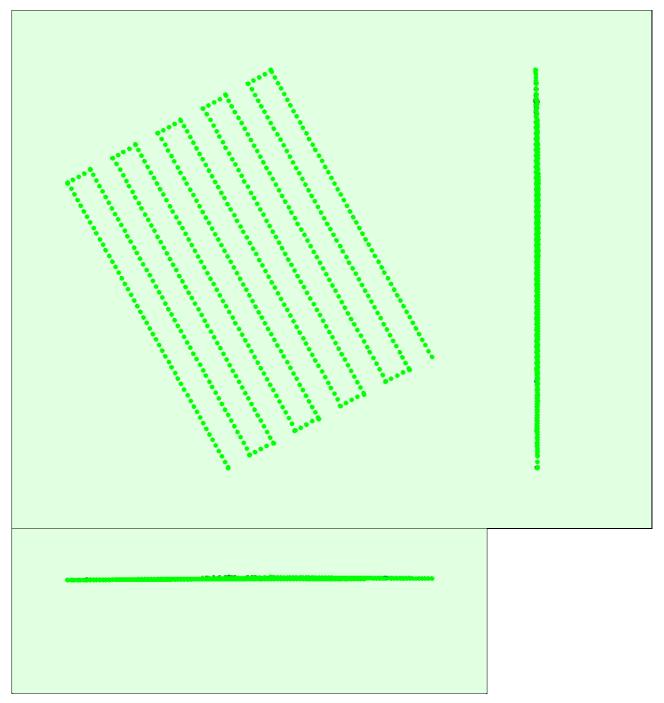


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

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.

② Absolute camera position and orientation uncertainties



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

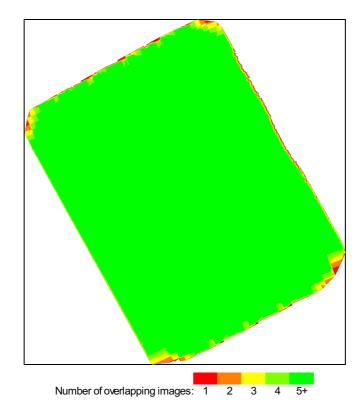


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.

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	6576724
Number of 3D Points for Bundle Block Adjustment	1779502
Mean Reprojection Error [pixels]	0.087

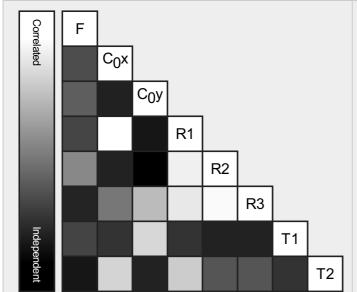
Internal Camera Parameters

☑ ZenmuseP1_35.0_8192x5460 (RGB). Sensor Dimensions: 35.000 [mm] x 23.328 [mm]



EXIF ID: ZenmuseP1_35.0_8192x5460

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8194.340 [pixel] 35.010 [mm]	4096.001 [pixel] 17.500 [mm]	2729.996 [pixel] 11.664 [mm]	-0.048	0.021	-0.097	0.002	-0.001
Optimized Values	8188.123 [pixel] 34.983 [mm]	4076.329 [pixel] 17.416 [mm]	2747.085 [pixel] 11.737 [mm]	-0.048	0.017	-0.091	0.001	-0.001
Uncertainties (Sigma)	2.561 [pixel] 0.011 [mm]	0.121 [pixel] 0.001 [mm]	0.112 [pixel] 0.000 [mm]	0.000	0.001	0.001	0.000	0.000



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



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 the see the average direction and magnitude of the reprojection 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	29277	10665
Min	12629	1414
Max	43463	24241
Mean	28734	11262

3D Points from 2D Keypoint Matches

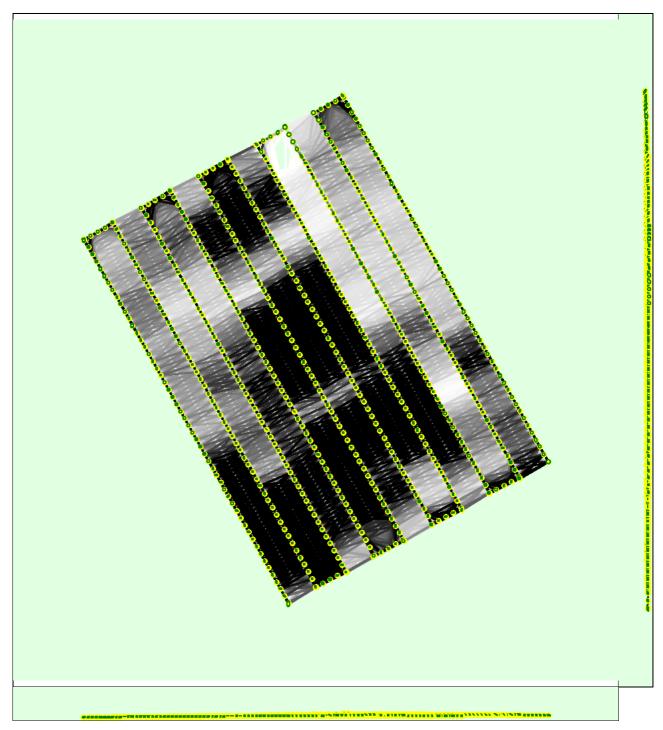


	Number of 3D Points Observed
In 2 Images	914996
In 3 Images	336681
In 4 Images	159948
In 5 Images	95961
In 6 Images	69327
In 7 Images	44384
In 8 Images	25082
In 9 Images	20586
In 10 Images	18364
In 11 Images	17260
In 12 Images	18168
In 13 Images	19730
In 14 Images	9703
In 15 Images	5196
In 16 Images	4567
In 17 Images	4319
In 18 Images	4305
In 19 Images	4797
In 20 Images	3871
In 21 Images	1235
In 22 Images	281
In 23 Images	252

In 24 Images	192
In 25 Images	149
In 26 Images	84
In 27 Images	46
In 28 Images	18

② 2D Keypoint Matches





Uncertainty ellipses 100x magnified

Number of matches

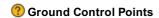
25 222 444 666 888 1111 1333 1555 1777 2000

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.

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.026	0.029	0.013	0.008	0.007	0.002
Sigma	0.006	0.006	0.004	0.002	0.002	0.001

Geolocation Details

6



(1)

0 out of 49 check points have been labeled as inaccurate.

Check Point Name	Accuracy XY/Z [m]	Error X[m]	Error Y[m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
LCP-01		-0.047	-0.006	0.027	0.191	8/8
LCP-02		-0.056	-0.029	0.060	0.265	8/8
LCP-03		-0.077	-0.012	0.028	0.187	8/8
LCP-04		-0.033	-0.048	0.031	0.200	8/8
LCP-05		-0.077	-0.046	-0.010	0.204	8/8
LCP-06		-0.058	-0.001	0.007	0.193	8/8
LCP-07		-0.024	0.011	0.082	0.279	8/8
LCP-08		-0.049	-0.012	0.077	0.233	8/8
LCP-09		-0.066	-0.049	0.052	0.189	8/8
LCP-10		-0.049	-0.107	0.048	0.143	8/8
LCP-11		-0.016	-0.019	0.017	0.283	8/8
LCP-12		-0.022	-0.017	0.054	0.219	8/8
LCP-13		-0.081	-0.031	0.072	0.189	8/8
LCP-14		-0.038	-0.027	0.026	0.218	8/8
LCP-15		-0.046	-0.031	0.007	0.142	8/8
LCP-16		-0.040	-0.004	0.005	0.254	8/8
LCP-17		-0.047	-0.023	0.015	0.275	8/8
LCP-18		0.035	-0.039	0.042	0.235	8/8
LCP-19		-0.056	-0.035	0.031	0.169	8/8
LCP-20		-0.086	-0.031	0.032	0.270	8/8
LCP-21		-0.043	0.000	0.042	0.247	8/8
LCP-22		-0.070	-0.008	0.087	0.148	8/8
LCP-23		-0.063	-0.026	-0.002	0.317	8/8
LCP-24		-0.072	-0.016	0.092	0.210	8/8
LCP-25		-0.094	-0.041	0.042	0.167	8/8
LCP-26		-0.054	-0.017	0.002	0.230	8/8
LCP-27		-0.048	0.004	0.058	0.217	8/8
LCP-28		-0.077	0.006	0.019	0.201	8/8
LCP-29		-0.090	0.010	0.028	0.191	8/8
LCP-30		-0.057	-0.025	-0.008	0.241	8/8
LCP-32		-0.069	0.028	0.035	0.156	8/8
GCP-01		-0.060	0.000	-0.068	0.286	8/8
GCP-02		-0.072	-0.006	-0.055	0.381	8/8
GCP-03		-0.026	0.000	-0.050	0.195	8/8
GCP-04		-0.068	-0.005	-0.033	0.253	8/8
GCP-05		-0.091	-0.058	0.008	0.270	8/8
GCP-06		-0.046	-0.000	-0.074	0.226	8/8
GCP-07		-0.057	-0.028	0.019	0.289	8/8
GCP-08		-0.034	-0.019	0.010	0.305	8/8
GCP-09		-0.067	-0.027	-0.026	0.395	8/8
GCP-10		-0.061	-0.031	0.013	0.221	8/8
GCP-11		-0.032	-0.020	-0.024	0.342	8/8
GCP-12		-0.056	-0.026	0.037	0.142	8/8
GCP-13		-0.023	-0.028	-0.026	0.353	8/8
GCP-14		-0.039	-0.034	0.007	0.483	8/8

GCP-15	-0.066	-0.045	-0.033	0.186	8/8
GCP-16	-0.038	-0.031	-0.017	0.263	8/8
GCP-17	-0.071	-0.055	0.005	0.183	8/8
GCP-18	-0.072	-0.014	-0.071	0.342	8/8
Mean [m]	-0.054084	-0.021788	0.014575		
Sigma [m]	0.022938	0.022061	0.040171		
RMS Error [m]	0.058747	0.031006	0.042733		

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 [%]
-	-0.08	0.00	0.00	0.00
-0.08	-0.06	0.00	0.00	0.00
-0.06	-0.05	0.00	0.00	0.00
-0.05	-0.03	0.00	0.00	0.68
-0.03	-0.01	0.00	0.00	4.62
-0.01	0.00	48.29	51.20	42.64
0.00	0.01	51.71	48.80	47.09
0.01	0.03	0.00	0.00	4.97
0.03	0.05	0.00	0.00	0.00
0.05	0.06	0.00	0.00	0.00
0.06	0.08	0.00	0.00	0.00
0.08	-	0.00	0.00	0.00
Mean [m]		0.000000	-0.000000	0.00000
Sigma [m]		0.002358	0.002092	0.009411
RMS Error [m]		0.002358	0.002092	0.009411

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
Mean of Geolocation Accuracy [m]	0.020000	0.020000	0.050000
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) i9-10900F CPU @ 2.80GHz RAMt 64GB GPU: NVIDIA GeForce RTX 2070 SUPER (Driver: 30.0.15.1277)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84 (2D)
Output Coordinate System	WGS 84 / UTM zone 47N (2D)

Processing Options



Detected Template	∃ 3D Maps
Keypoints Image Scale	Full, Image Scale: 0.5
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