

Agisoft Metashape

Processing Report

26 August 2023



Survey Data

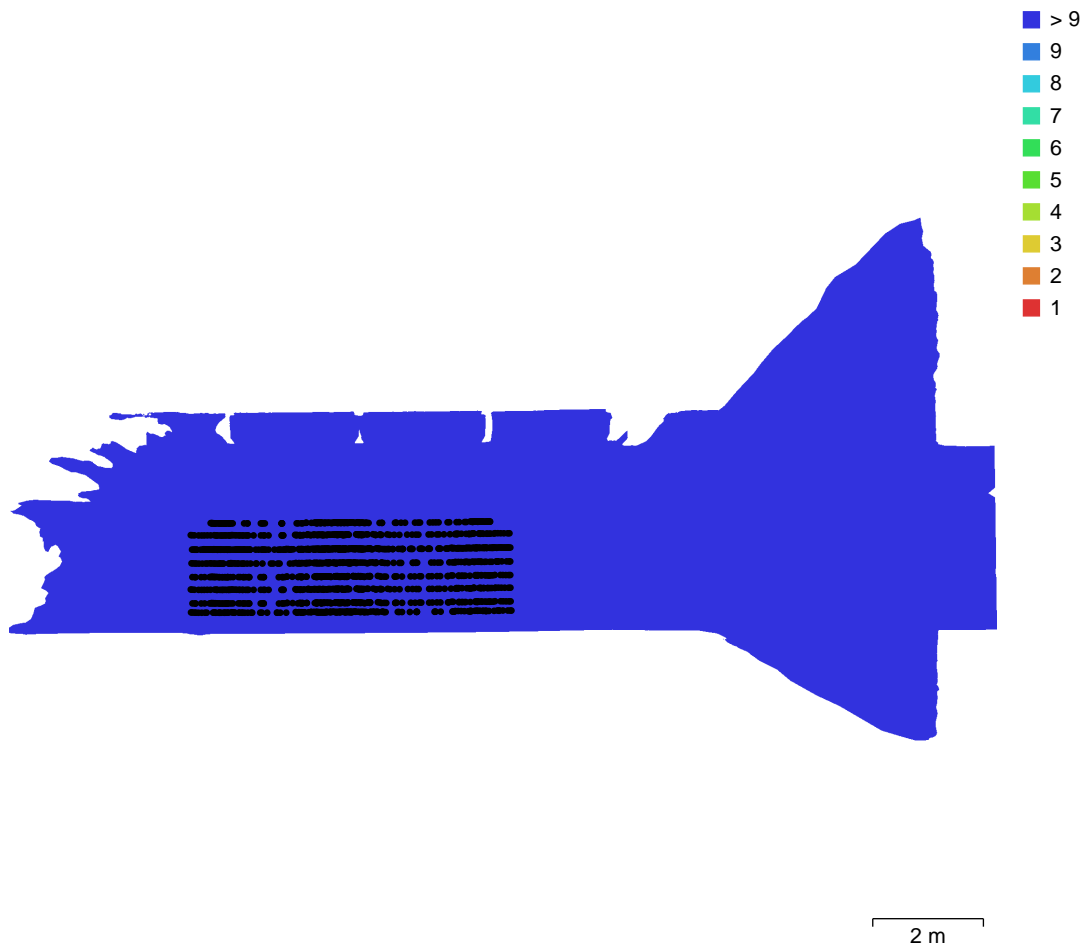


Fig. 1. Camera locations and image overlap.

Number of images:	1,512	Camera stations:	1,512
Flying altitude:	61.3 cm	Tie points:	1,637,727
Ground resolution:	0.495 mm/pix	Projections:	4,866,499
Coverage area:	78 m ²	Reprojection error:	1.01 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Camera 0	5784 x 8660	14 mm	4.17 x 4.17 um	No
Camera 1	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 2	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 3	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 4	5784 x 8660	12 mm	4.17 x 4.17 um	No

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Camera 5	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 6	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 7	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 8	5784 x 8660	12 mm	4.17 x 4.17 um	No

Table 1. Cameras.

Camera Calibration

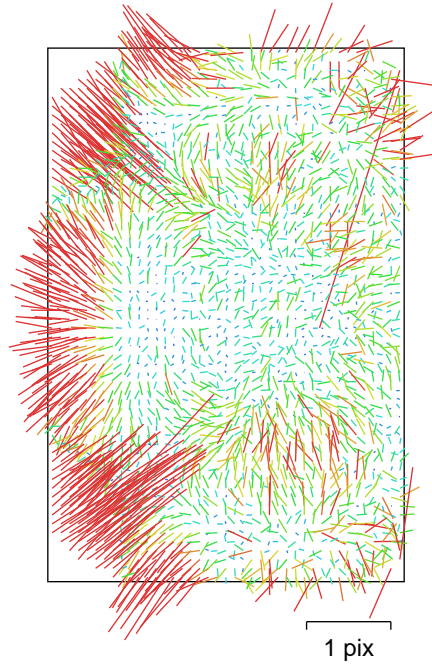


Fig. 2. Image residuals for Camera 0.

Camera 0

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	14 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	3345.32	0.03	1.00	0.04	-0.01	-0.88	0.78	-0.70	-0.14	0.00
Cx	-5.73717	0.035		1.00	0.03	0.06	-0.04	0.02	-0.75	0.00
Cy	35.0577	0.029			1.00	0.00	-0.00	0.00	-0.03	-0.51
K1	-0.0393627	2.5e-05				1.00	-0.97	0.92	-0.07	0.01
K2	0.00586655	2.3e-05					1.00	-0.98	0.09	-0.01
K3	-0.00129882	6.3e-06						1.00	-0.07	0.00
P1	-0.000738679	1.7e-06							1.00	-0.01
P2	9.11309e-05	6.9e-07								1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

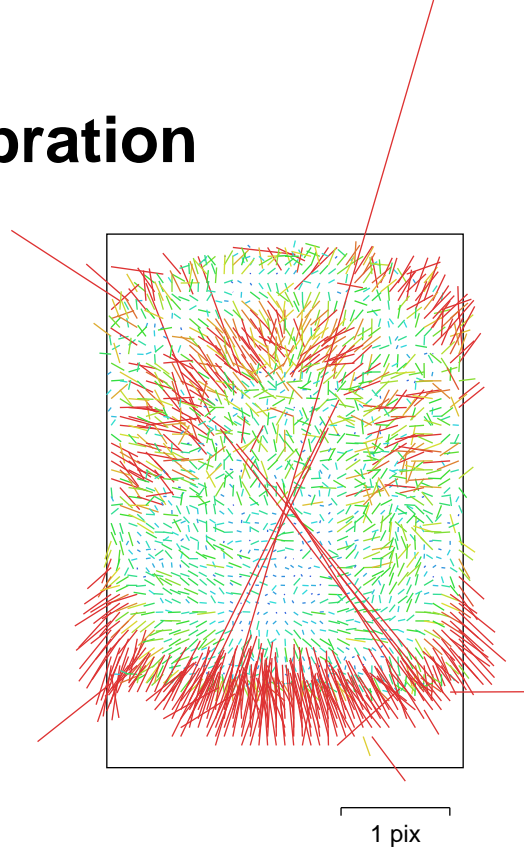


Fig. 3. Image residuals for Camera 1.

Camera 1

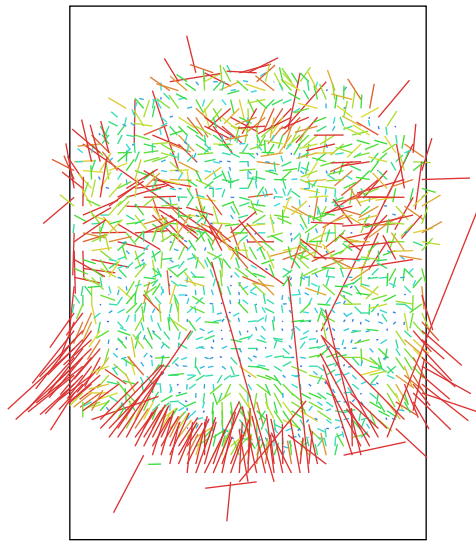
168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2915.3	0.024	1.00	0.01	-0.05	-0.86	0.78	-0.69	-0.01	0.19
Cx	19.6682	0.015		1.00	-0.02	-0.00	0.00	0.00	-0.57	0.02
Cy	26.4425	0.034			1.00	-0.03	0.02	-0.01	-0.00	-0.79
K1	-0.0446066	2e-05				1.00	-0.97	0.92	0.01	0.05
K2	0.00666487	1.6e-05					1.00	-0.98	-0.01	-0.08
K3	-0.00131495	4e-06						1.00	0.01	0.11
P1	0.000171953	7e-07							1.00	-0.00
P2	0.000588268	1.2e-06								1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration



1 pix

Fig. 4. Image residuals for Camera 2.

Camera 2

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2361.79	0.026	1.00	-0.01	-0.03	-0.89	0.82	-0.75	0.00	0.15
Cx	2.31399	0.016		1.00	-0.05	0.01	-0.01	0.01	-0.63	0.03
Cy	70.9356	0.029			1.00	-0.02	0.01	-0.00	0.03	-0.83
K1	-0.0473836	2.6e-05				1.00	-0.98	0.94	0.00	0.02
K2	0.00557102	2e-05					1.00	-0.99	0.00	-0.04
K3	-0.000805226	4.9e-06						1.00	-0.00	0.05
P1	-0.000135413	7.9e-07							1.00	-0.01
P2	0.000231973	1.3e-06								1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

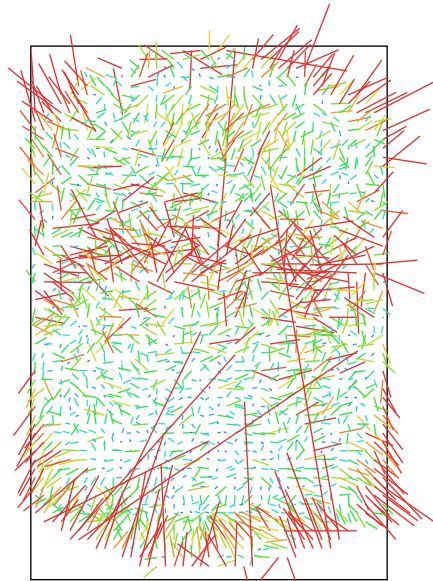


Fig. 5. Image residuals for Camera 3.

Camera 3

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2940.03	0.026	1.00	-0.01	-0.01	-0.90	0.82	-0.76	0.01	0.11
Cx	-30.526	0.017		1.00	0.01	0.01	-0.01	0.01	-0.65	-0.01
Cy	2.08429	0.037			1.00	-0.04	0.02	-0.01	-0.01	-0.86
K1	-0.0428459	2e-05				1.00	-0.98	0.94	-0.00	0.02
K2	0.00528969	1.6e-05					1.00	-0.99	0.00	-0.03
K3	-0.000842282	3.7e-06						1.00	-0.00	0.04
P1	-0.000338722	7e-07							1.00	0.02
P2	0.000565854	1.1e-06								1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

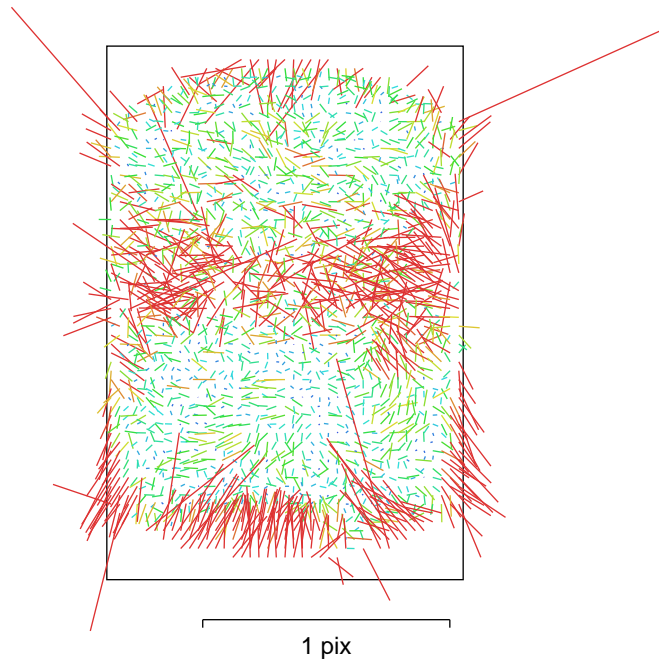


Fig. 6. Image residuals for Camera 4.

Camera 4

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2868.71	0.021	1.00	-0.00	0.01	-0.90	0.84	-0.78	-0.01	0.07
Cx	-18.9236	0.015		1.00	0.01	0.02	-0.02	0.01	-0.66	0.00
Cy	-0.832069	0.036			1.00	-0.07	0.05	-0.04	-0.00	-0.91
K1	-0.0430056	1.6e-05				1.00	-0.98	0.94	-0.01	0.03
K2	0.00483109	1.2e-05					1.00	-0.99	0.01	-0.04
K3	-0.000704344	2.8e-06						1.00	-0.00	0.03
P1	0.000109287	5.9e-07							1.00	-0.01
P2	0.000166999	1.1e-06								1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

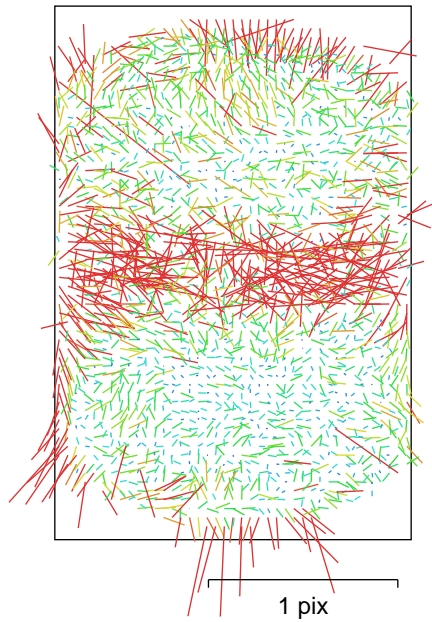


Fig. 7. Image residuals for Camera 5.

Camera 5

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2882.25	0.021	1.00	0.01	0.03	-0.90	0.84	-0.79	-0.01	0.03
Cx	46.9704	0.017		1.00	0.03	0.00	-0.00	0.00	-0.68	-0.02
Cy	-10.2218	0.038			1.00	-0.05	0.03	-0.02	-0.02	-0.93
K1	-0.0426978	1.7e-05				1.00	-0.98	0.94	-0.00	0.03
K2	0.0046339	1.2e-05					1.00	-0.99	0.00	-0.03
K3	-0.000697767	2.8e-06						1.00	-0.00	0.02
P1	0.000222954	6.2e-07							1.00	0.01
P2	-0.000128913	1.1e-06								1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

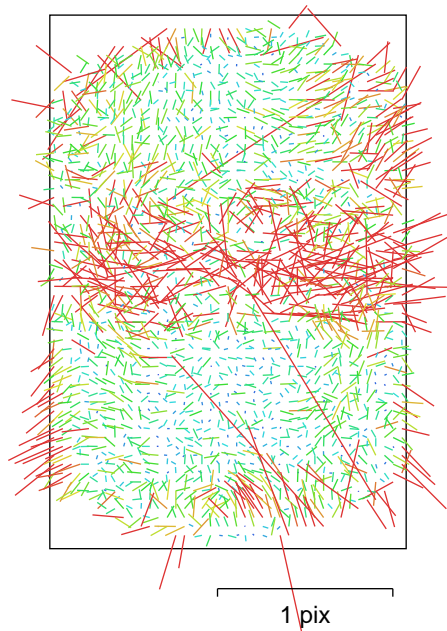


Fig. 8. Image residuals for Camera 6.

Camera 6

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2915.47	0.023	1.00	-0.00	0.03	-0.90	0.84	-0.79	0.00	0.03
Cx	14.9566	0.017		1.00	-0.02	0.01	-0.01	0.01	-0.67	0.01
Cy	1.32421	0.039			1.00	-0.04	0.03	-0.02	0.01	-0.92
K1	-0.0432019	1.7e-05				1.00	-0.98	0.94	0.00	0.02
K2	0.00490862	1.3e-05					1.00	-0.99	-0.00	-0.02
K3	-0.000785625	3e-06						1.00	-0.00	0.01
P1	-0.000145408	6.5e-07							1.00	-0.01
P2	-2.04411e-05	1.1e-06								1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

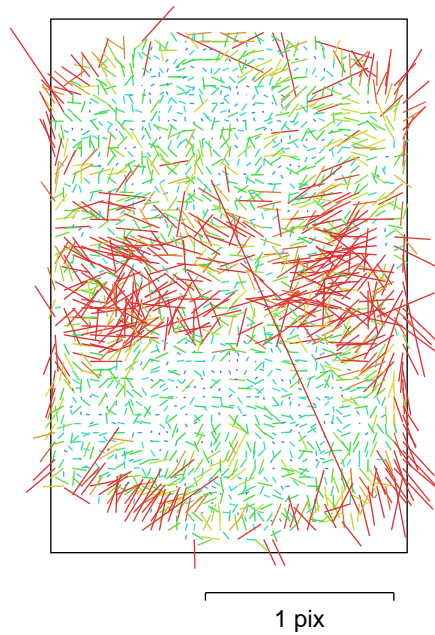


Fig. 9. Image residuals for Camera 7.

Camera 7

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2894.22	0.031	1.00	0.00	0.01	-0.91	0.85	-0.80	-0.00	0.03
Cx	7.05269	0.02		1.00	-0.03	-0.01	0.01	-0.01	-0.67	0.02
Cy	6.4097	0.042			1.00	0.01	-0.01	0.02	0.02	-0.89
K1	-0.0433614	2.4e-05				1.00	-0.98	0.94	0.02	-0.03
K2	0.00488152	1.8e-05					1.00	-0.99	-0.01	0.02
K3	-0.000768218	4.3e-06						1.00	0.01	-0.02
P1	-5.13427e-05	8.4e-07							1.00	-0.01
P2	0.000145991	1.3e-06								1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Calibration

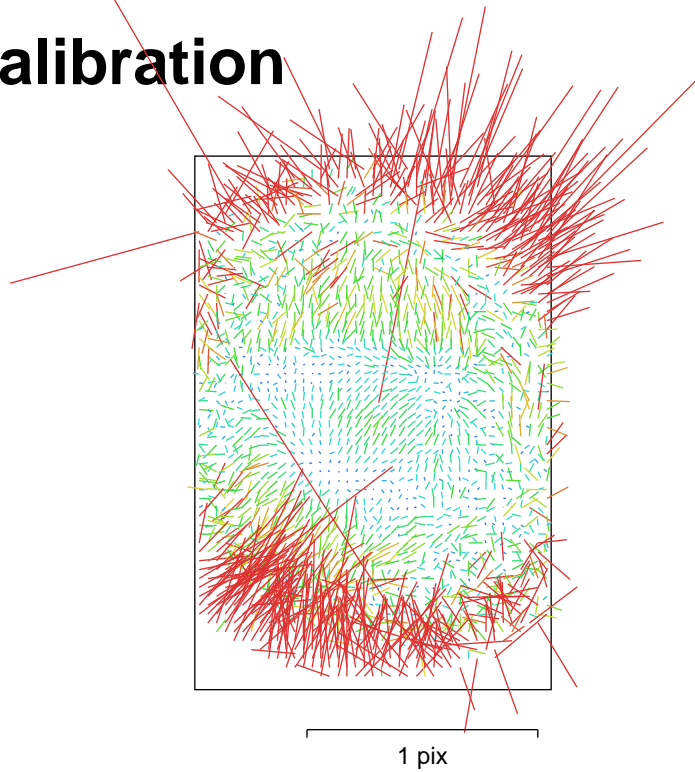


Fig. 10. Image residuals for Camera 8.

Camera 8

168 images

Type	Resolution	Focal Length	Pixel Size
Fisheye	5784 x 8660	12 mm	4.17 x 4.17 um

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	2900.43	0.045	1.00	0.01	0.04	-0.75	0.47	-0.34	-0.02	-0.09
Cx	10.0927	0.0078		1.00	0.02	-0.01	0.00	0.00	-0.60	-0.01
Cy	6.97068	0.0086			1.00	-0.02	0.01	-0.02	-0.01	-0.55
K1	-0.0414382	2.2e-05				1.00	-0.91	0.79	0.00	0.07
K2	0.00331777	2e-05					1.00	-0.97	0.01	-0.05
K3	-0.000475109	6e-06						1.00	-0.01	0.05
P1	-0.000358279	4.4e-07							1.00	0.01
P2	7.0898e-05	3.7e-07								1.00

Table 10. Calibration coefficients and correlation matrix.

Scale Bars

Label	Distance (m)	Error (m)
003. 7-8	0.250075	1.52017e-05
006. 15-16	0.249981	-4.94354e-05
009. 23-24	0.250183	6.32246e-05
002a. 4-5	0.249997	-3.23527e-06
002b. 5-6	0.250015	0.000114722
005a. 12-13	0.249853	-0.000126935
005b. 13-14	0.249628	-0.00026181
008a. 20-21	0.250505	0.000474595
008b. 21-22	0.249707	-0.000172662
Total		0.000199876

Table 11. Control scale bars.

Digital Elevation Model

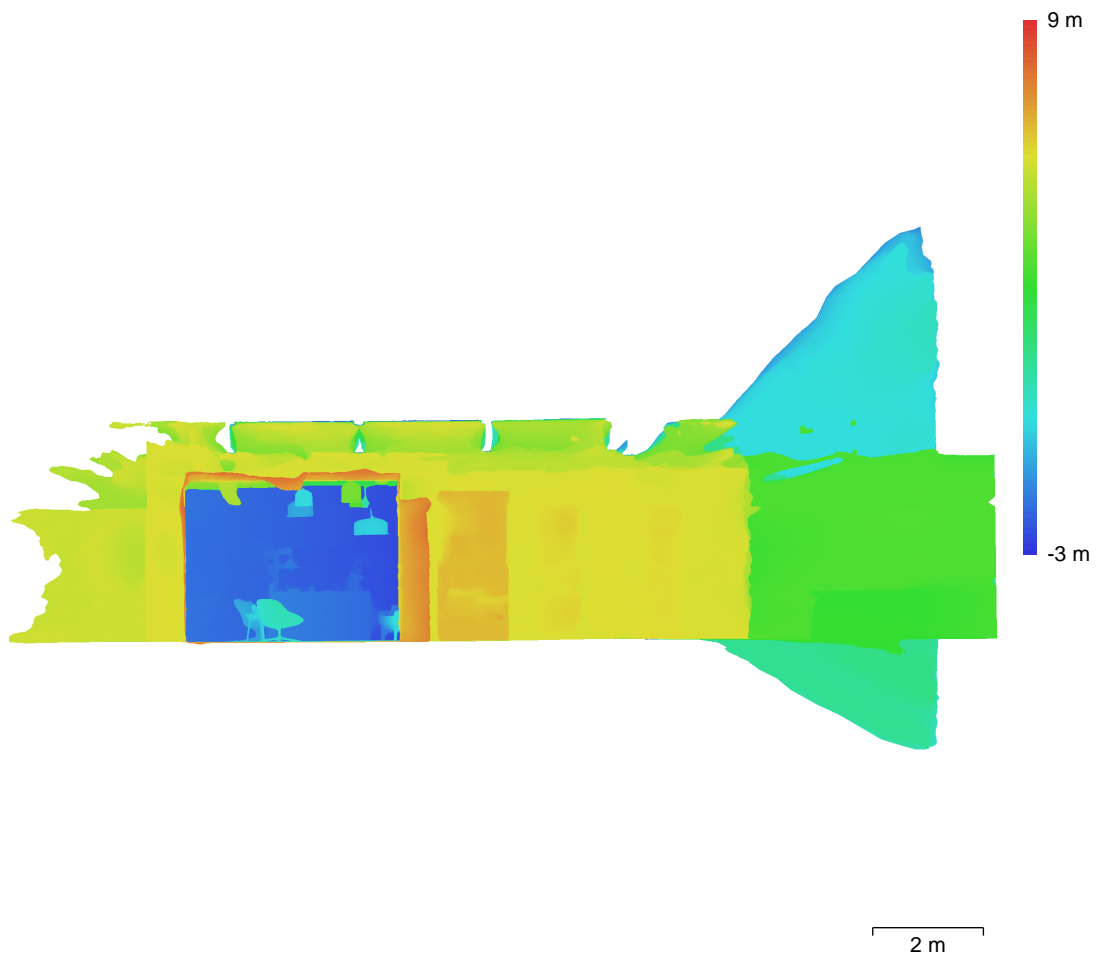


Fig. 11. Reconstructed digital elevation model.

Resolution: 4.59 mm/pix
Point density: 4.74 points/cm²

Processing Parameters

General

Cameras	1512
Aligned cameras	1512
Markers	15
Scale bars	9
Coordinate system	Local Coordinates (m)
Rotation angles	Yaw, Pitch, Roll

Tie Points

Points	1,637,727 of 3,570,081
RMS reprojection error	0.371431 (1.00923 pix)
Max reprojection error	1.39139 (11.7451 pix)
Mean key point size	2.55363 pix
Point colors	3 bands, uint8
Key points	7.16 GB
Average tie point multiplicity	5.16423

Alignment parameters

Accuracy	Highest
Generic preselection	Yes
Reference preselection	Estimated
Key point limit	60,000
Key point limit per Mpx	1,000
Tie point limit	0
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	No
Matching time	19 minutes 1 seconds
Matching memory usage	3.91 GB
Alignment time	15 minutes 25 seconds
Alignment memory usage	15.35 GB

Optimization parameters

Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	No
Optimization time	12 seconds
Date created	2023:08:25 16:12:48
Software version	2.0.2.16404
File size	399.58 MB

Depth Maps

Count	1512
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Depth maps generation parameters

Quality	Medium
Filtering mode	Mild
Max neighbors	16
Processing time	30 minutes 1 seconds
Memory usage	5.11 GB
Date created	2023:08:26 03:59:33
Software version	2.0.2.16404
File size	5.54 GB

Point Cloud

Points	181,365,532
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Point attributes

Color	3 bands, uint8
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Normal

Point classes

Created (never classified) 181,365,532

Depth maps generation parameters

Quality Medium
Filtering mode Mild
Max neighbors 16
Processing time 30 minutes 1 seconds
Memory usage 5.11 GB

Point cloud generation parameters

Processing time 4 hours 53 minutes
Memory usage 58.44 GB
Date created 2023:08:26 08:54:24
Software version 2.0.2.16404
File size 2.39 GB

Model

Faces 1,960,169
Vertices 981,233
Vertex colors 3 bands, uint8
Texture 16,384 x 16,384, 4 bands, uint8

Depth maps generation parameters

Quality Medium
Filtering mode Mild
Max neighbors 16
Processing time 30 minutes 1 seconds
Memory usage 5.11 GB

Reconstruction parameters

Surface type Arbitrary
Source data Depth maps
Interpolation Enabled
Strict volumetric masks No
Processing time 9 minutes 35 seconds
Memory usage 7.36 GB

Texturing parameters

Mapping mode Generic
Blending mode Mosaic
Texture size 16,384
Enable hole filling Yes
Enable ghosting filter Yes
UV mapping time 2 minutes 50 seconds
UV mapping memory usage 1.83 GB
Blending time 10 minutes 56 seconds
Blending memory usage 10.53 GB
Blending GPU memory usage 7.56 GB
Date created 2023:08:26 09:04:47
Software version 2.0.2.16404
File size 302.79 MB

System

Software name Agisoft Metashape Professional
Software version 2.0.2 build 16404
OS Windows 64 bit
RAM 255.87 GB
CPU AMD Ryzen Threadripper 3970X 32-Core Processor
GPU(s) NVIDIA GeForce RTX 3090
NVIDIA GeForce RTX 3090
NVIDIA GeForce RTX 3090