

Agisoft Metashape

Processing Report

24 August 2023



Survey Data

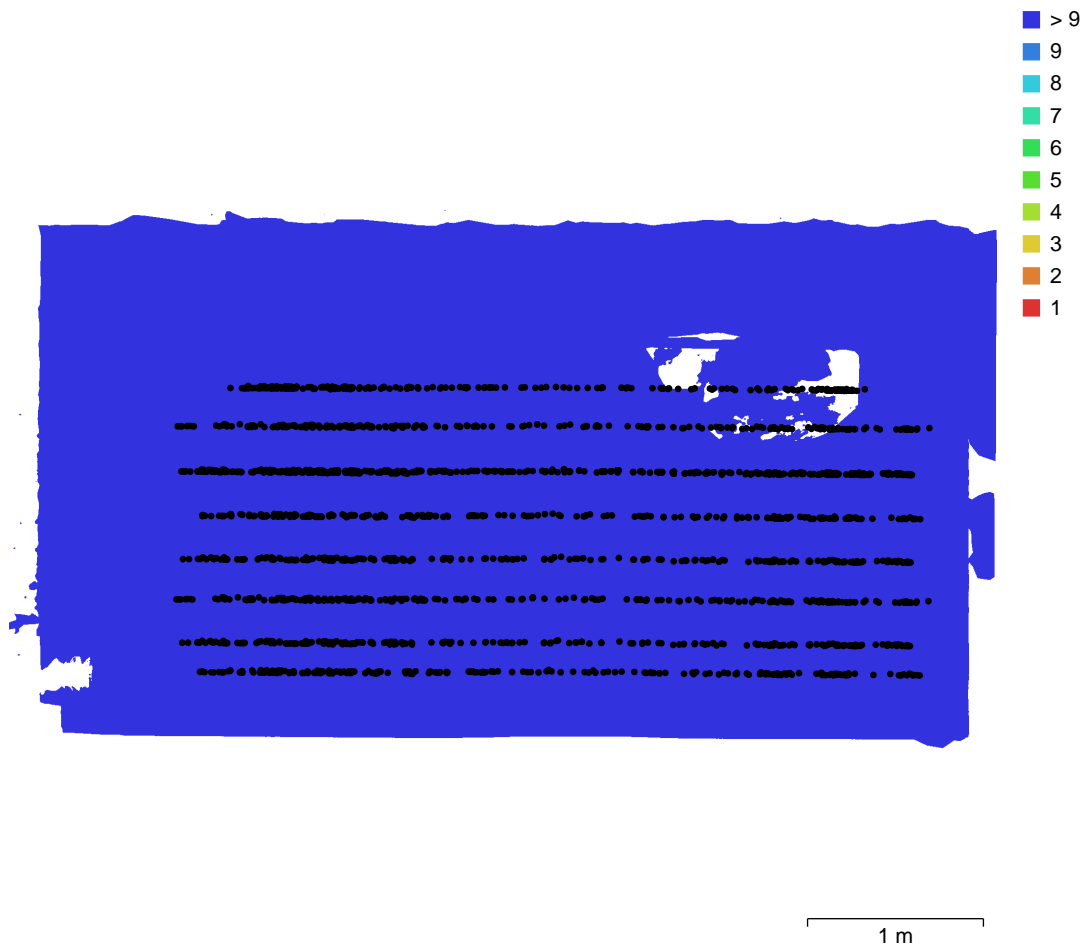


Fig. 1. Camera locations and image overlap.

Number of images:	2,097	Camera stations:	2,097
Flying altitude:	60.2 cm	Tie points:	1,564,190
Ground resolution:	0.257 mm/pix	Projections:	4,022,853
Coverage area:	15.5 m ²	Reprojection error:	1.05 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

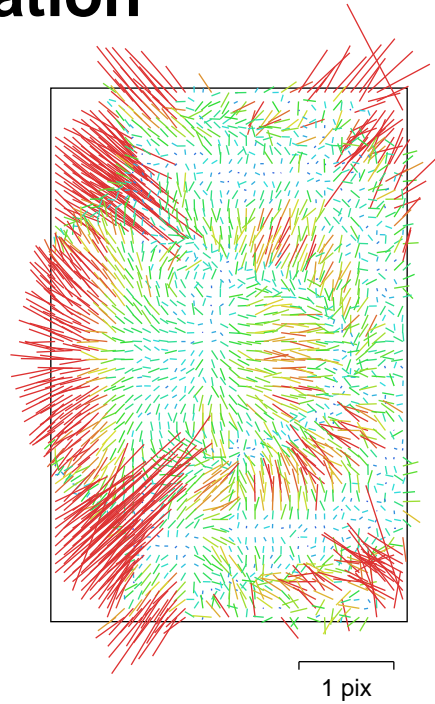


Fig. 2. Image residuals for Camera 0.

Camera 0

233 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	3360.05	0.031	1.00	0.03	0.01	-0.85	0.74	-0.66	-0.09	0.01
Cx	-4.78081	0.041		1.00	0.02	0.02	-0.01	0.00	-0.79	0.01
Cy	31.9446	0.04			1.00	-0.00	0.00	-0.00	-0.01	-0.69
K1	-0.0371831	2.4e-05				1.00	-0.97	0.91	-0.02	-0.01
K2	0.00432831	2.2e-05					1.00	-0.98	0.03	0.01
K3	-0.000898332	6.4e-06						1.00	-0.02	-0.00
P1	-0.000337751	1.6e-06							1.00	-0.02
P2	2.31734e-05	1e-06								1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

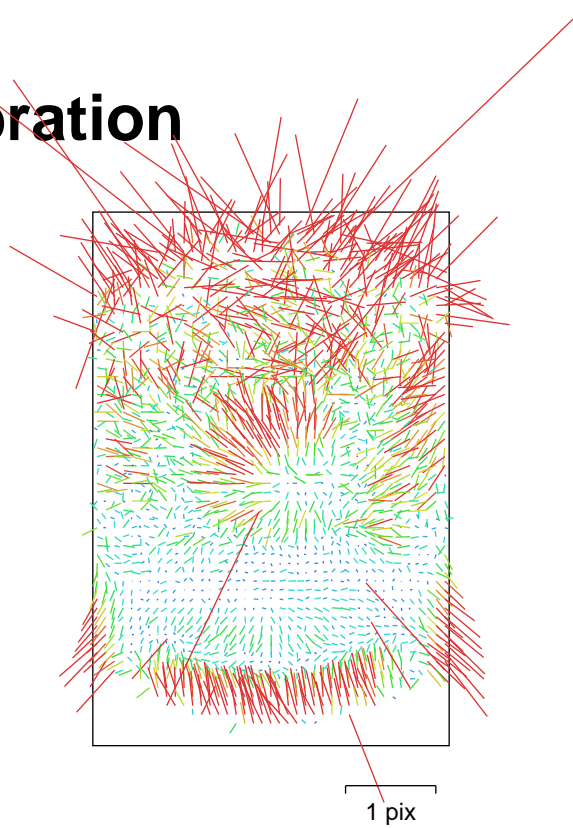


Fig. 3. Image residuals for Camera 1.

Camera 1

233 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	2903.23	0.033	1.00	0.04	-0.07	-0.84	0.74	-0.67	-0.01	0.20
Cx	23.0079	0.034		1.00	-0.02	-0.01	0.01	-0.00	-0.72	0.03
Cy	29.1982	0.037			1.00	0.03	-0.02	0.01	0.01	-0.68
K1	-0.0417018	2.7e-05				1.00	-0.97	0.92	0.00	-0.05
K2	0.00405686	2.4e-05					1.00	-0.99	0.01	-0.02
K3	-0.000590208	6.8e-06						1.00	-0.01	0.03
P1	0.000135799	1.2e-06							1.00	-0.01
P2	0.000329967	1.8e-06								1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

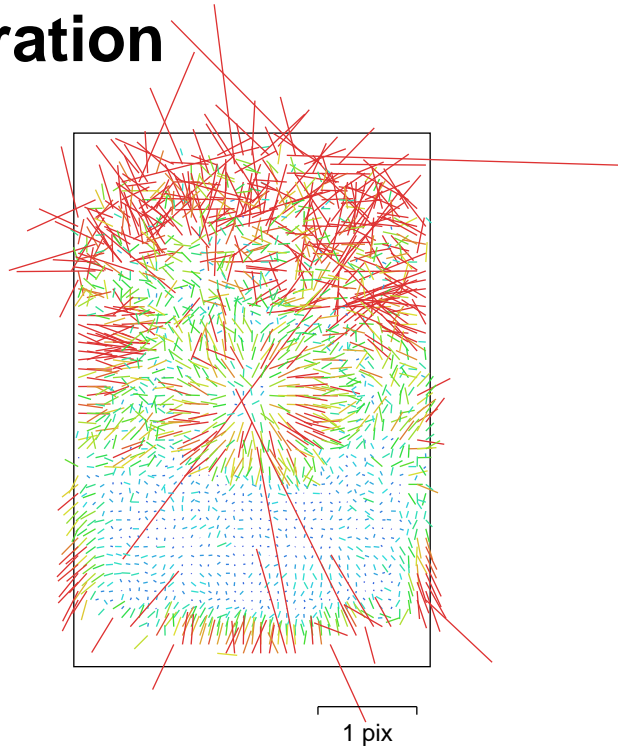


Fig. 4. Image residuals for Camera 2.

Camera 2

233 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	2901.62	0.035	1.00	0.03	-0.07	-0.86	0.76	-0.70	-0.02	0.23
Cx	-2.07038	0.033		1.00	0.01	-0.00	-0.00	0.01	-0.76	0.01
Cy	68.8888	0.04			1.00	0.04	-0.01	0.01	0.00	-0.70
K1	-0.0406344	2.5e-05				1.00	-0.97	0.92	-0.00	-0.11
K2	0.00368056	1.9e-05					1.00	-0.99	0.01	0.00
K3	-0.000527016	4.8e-06						1.00	-0.02	0.01
P1	-0.00010384	1.1e-06							1.00	-0.02
P2	0.000110486	1.9e-06								1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

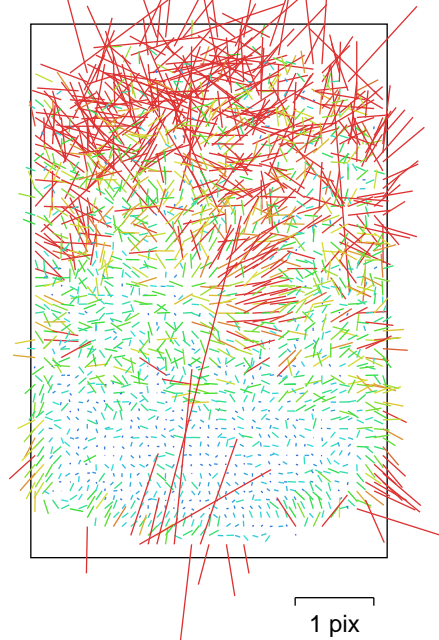


Fig. 5. Image residuals for Camera 3.

Camera 3

233 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	2926.1	0.052	1.00	-0.00	-0.04	-0.89	0.79	-0.73	0.02	0.17
Cx	-31.2066	0.033		1.00	-0.01	0.01	-0.01	0.01	-0.74	0.02
Cy	4.54522	0.044			1.00	0.00	0.03	-0.03	0.00	-0.69
K1	-0.0407118	3.5e-05				1.00	-0.97	0.93	-0.03	-0.06
K2	0.00388201	2.6e-05					1.00	-0.99	0.03	-0.05
K3	-0.000563789	6.3e-06						1.00	-0.03	0.07
P1	-0.000236375	1.3e-06							1.00	-0.01
P2	0.000336415	2.2e-06								1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

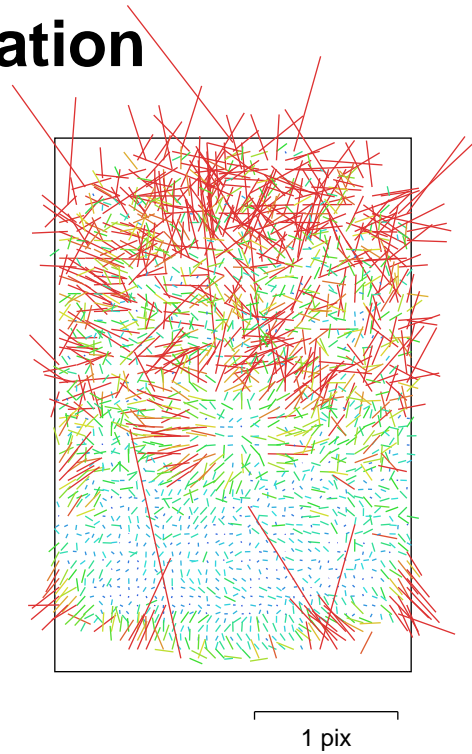


Fig. 6. Image residuals for Camera 4.

Camera 4

233 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	2946.13	0.033	1.00	0.01	-0.00	-0.87	0.79	-0.72	-0.01	0.12
Cx	-4.01399	0.025		1.00	-0.01	-0.00	0.00	-0.00	-0.72	0.02
Cy	14.4597	0.043			1.00	-0.05	0.05	-0.04	0.01	-0.78
K1	-0.0403349	2.4e-05				1.00	-0.97	0.93	0.00	-0.00
K2	0.00352073	1.8e-05					1.00	-0.99	-0.00	-0.07
K3	-0.000457617	4.3e-06						1.00	0.00	0.07
P1	0.000161351	9.6e-07							1.00	-0.03
P2	8.34162e-05	1.7e-06								1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

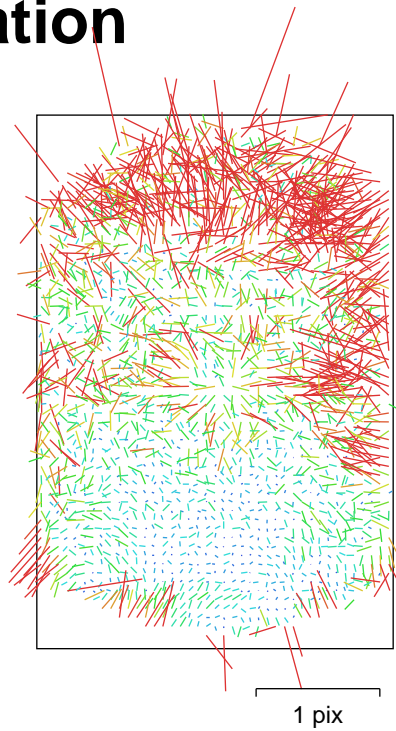


Fig. 7. Image residuals for Camera 5.

Camera 5

233 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	2863.76	0.033	1.00	0.02	0.04	-0.88	0.80	-0.74	-0.02	0.05
Cx	43.6911	0.025		1.00	0.02	-0.02	0.01	-0.01	-0.75	-0.00
Cy	-8.24235	0.045			1.00	-0.06	0.06	-0.05	-0.01	-0.81
K1	-0.0408958	2.4e-05				1.00	-0.98	0.94	0.02	0.02
K2	0.00366116	1.8e-05					1.00	-0.99	-0.01	-0.07
K3	-0.000496071	4e-06						1.00	0.01	0.07
P1	0.000233965	9.7e-07							1.00	-0.01
P2	-0.000222601	1.7e-06								1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

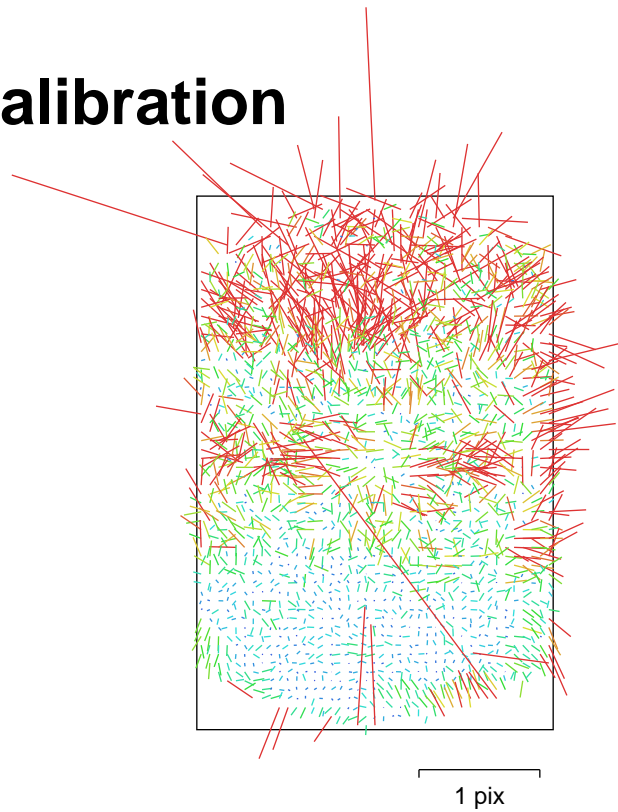


Fig. 8. Image residuals for Camera 6.

Camera 6

233 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	2932.09	0.034	1.00	0.01	0.04	-0.88	0.80	-0.74	-0.01	0.05
Cx	23.8905	0.026		1.00	0.03	-0.02	0.01	-0.01	-0.74	-0.02
Cy	0.50043	0.046			1.00	-0.06	0.06	-0.05	-0.02	-0.80
K1	-0.0410953	2.4e-05				1.00	-0.98	0.94	0.02	0.02
K2	0.00384024	1.8e-05					1.00	-0.99	-0.01	-0.07
K3	-0.000571445	4.1e-06						1.00	0.01	0.07
P1	-0.000128051	9.9e-07							1.00	-0.01
P2	-0.000107766	1.7e-06								1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

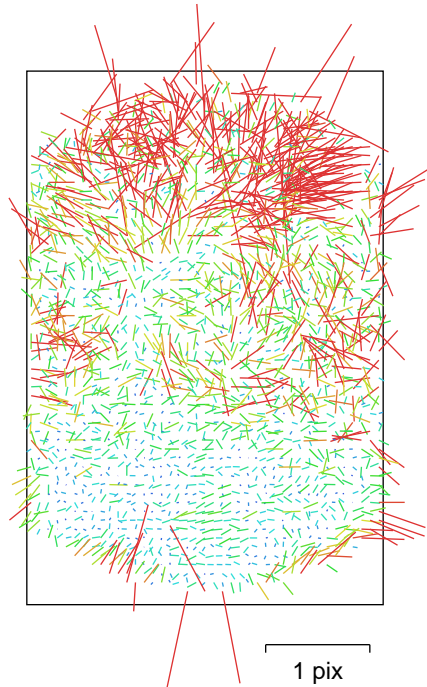


Fig. 9. Image residuals for Camera 7.

Camera 7

233 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	2848.09	0.047	1.00	0.01	0.03	-0.88	0.80	-0.74	-0.01	-0.03
Cx	15.1809	0.032		1.00	0.01	-0.02	0.02	-0.01	-0.72	-0.01
Cy	3.29572	0.051			1.00	-0.03	0.03	-0.02	-0.01	-0.77
K1	-0.0413405	3.4e-05				1.00	-0.98	0.94	0.02	0.05
K2	0.00372323	2.6e-05					1.00	-0.99	-0.02	-0.09
K3	-0.000511401	5.8e-06						1.00	0.02	0.09
P1	-9.15238e-05	1.3e-06							1.00	-0.01
P2	3.58762e-05	2.1e-06								1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Calibration

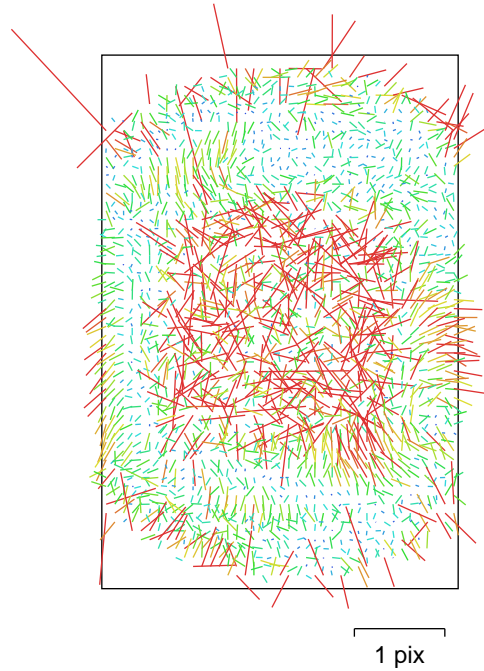


Fig. 10. Image residuals for Camera 8.

Camera 8

233 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	2891.82	0.17	1.00	-0.01	0.01	-0.85	0.71	-0.63	0.04	-0.03
Cx	13.3674	0.025		1.00	0.02	0.01	-0.01	0.01	-0.76	-0.01
Cy	8.62241	0.036			1.00	-0.00	0.01	-0.01	-0.02	-0.80
K1	-0.038451	9.5e-05				1.00	-0.97	0.93	-0.05	0.02
K2	0.00360617	6.8e-05					1.00	-0.99	0.05	-0.02
K3	-0.000817906	1.6e-05						1.00	-0.04	0.02
P1	-0.000425401	1.5e-06							1.00	0.02
P2	8.0288e-05	1.5e-06								1.00

Table 10. Calibration coefficients and correlation matrix.

Scale Bars

Label	Distance (m)	Error (m)
003. 7-8	0.250043	-1.70508e-05
006. 15-16	0.250079	4.89805e-05
009. 23-24	0.250106	-1.35911e-05
002a. 4-5	0.249989	-1.08448e-05
002b. 5-6	0.249956	5.5618e-05
005a. 12-13	0.249944	-3.58658e-05
005b. 13-14	0.249736	-0.000154033
008a. 20-21	0.250103	7.34506e-05
008b. 21-22	0.249931	5.08105e-05
Total		6.58912e-05

Table 11. Control scale bars.

Digital Elevation Model

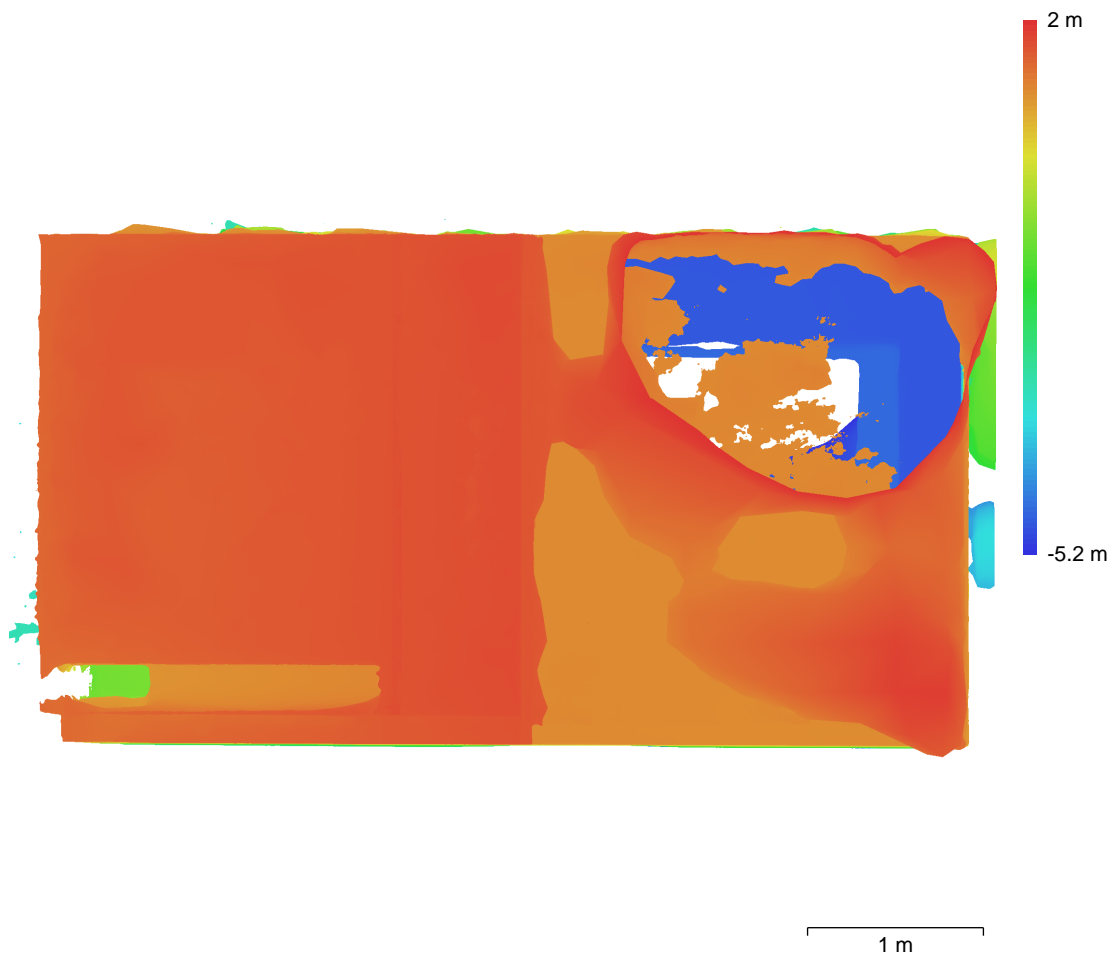


Fig. 11. Reconstructed digital elevation model.

Resolution: 4.03 mm/pix
Point density: 6.15 points/cm²

Processing Parameters

General

Cameras	2097
Aligned cameras	2097
Markers	15
Scale bars	9
Coordinate system	Local Coordinates (m)
Rotation angles	Yaw, Pitch, Roll

Tie Points

Points	1,564,190 of 2,820,632
RMS reprojection error	0.38287 (1.05379 pix)
Max reprojection error	1.37861 (10.2575 pix)
Mean key point size	2.68595 pix
Point colors	3 bands, uint8
Key points	9.94 GB
Average tie point multiplicity	3.30699

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	29 minutes 9 seconds
Matching memory usage	4.16 GB
Alignment time	6 minutes 15 seconds
Alignment memory usage	9.73 GB

Optimization parameters

Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	No
Optimization time	9 seconds
Date created	2023:08:24 18:02:12
Software version	2.0.2.16404
File size	222.10 MB

Depth Maps

Count	2019
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Depth maps generation parameters

Quality	Medium
Filtering mode	Mild
Max neighbors	16
Processing time	35 minutes 20 seconds
Memory usage	5.26 GB
Date created	2023:08:24 19:58:21
Software version	2.0.2.16404
File size	4.80 GB

Point Cloud

Points	221,017,936
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Point attributes

Color	3 bands, uint8
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Normal

Point classes

Created (never classified) 221,017,936

Depth maps generation parameters

Quality Medium
Filtering mode Mild
Max neighbors 16
Processing time 35 minutes 20 seconds
Memory usage 5.26 GB

Point cloud generation parameters

Processing time 4 hours 6 minutes
Memory usage 59.22 GB
Date created 2023:08:25 00:05:59
Software version 2.0.2.16404
File size 2.92 GB

Model

Faces 1,930,695
Vertices 968,461
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 35 minutes 20 seconds
Memory usage 5.26 GB

Reconstruction parameters

Surface type Arbitrary
Source data Depth maps
Interpolation Enabled
Strict volumetric masks No
Processing time 12 minutes 4 seconds
Memory usage 11.04 GB

Texturing parameters

Mapping mode Generic
Blending mode Mosaic
Texture size 16,384
Enable hole filling Yes
Enable ghosting filter Yes
UV mapping time 3 minutes 20 seconds
UV mapping memory usage 2.01 GB
Blending time 15 minutes 4 seconds
Blending memory usage 11.13 GB
Blending GPU memory usage 7.56 GB
Date created 2023:08:25 00:18:44
Software version 2.0.2.16404
File size 295.56 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