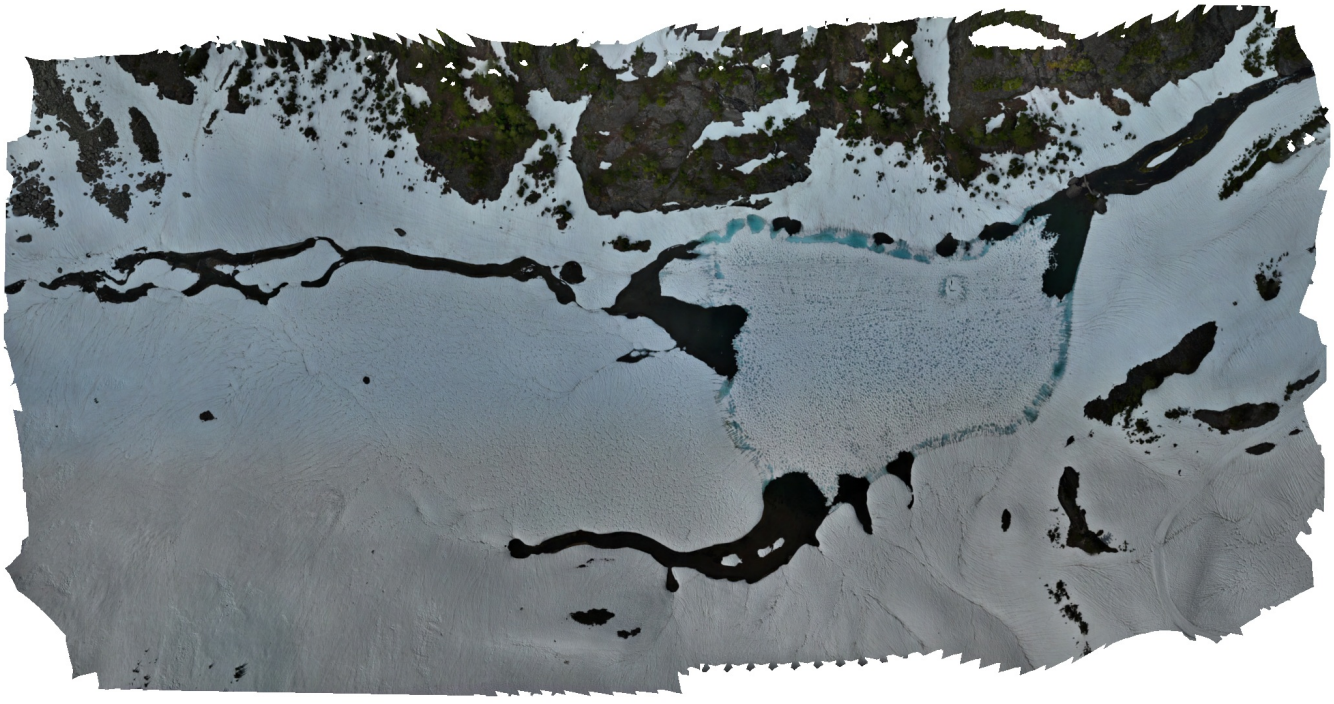
Agisoft Metashape Report - Bagley M3M RGB 2023-06-08

Processing Report
25 January 2024



Survey Data

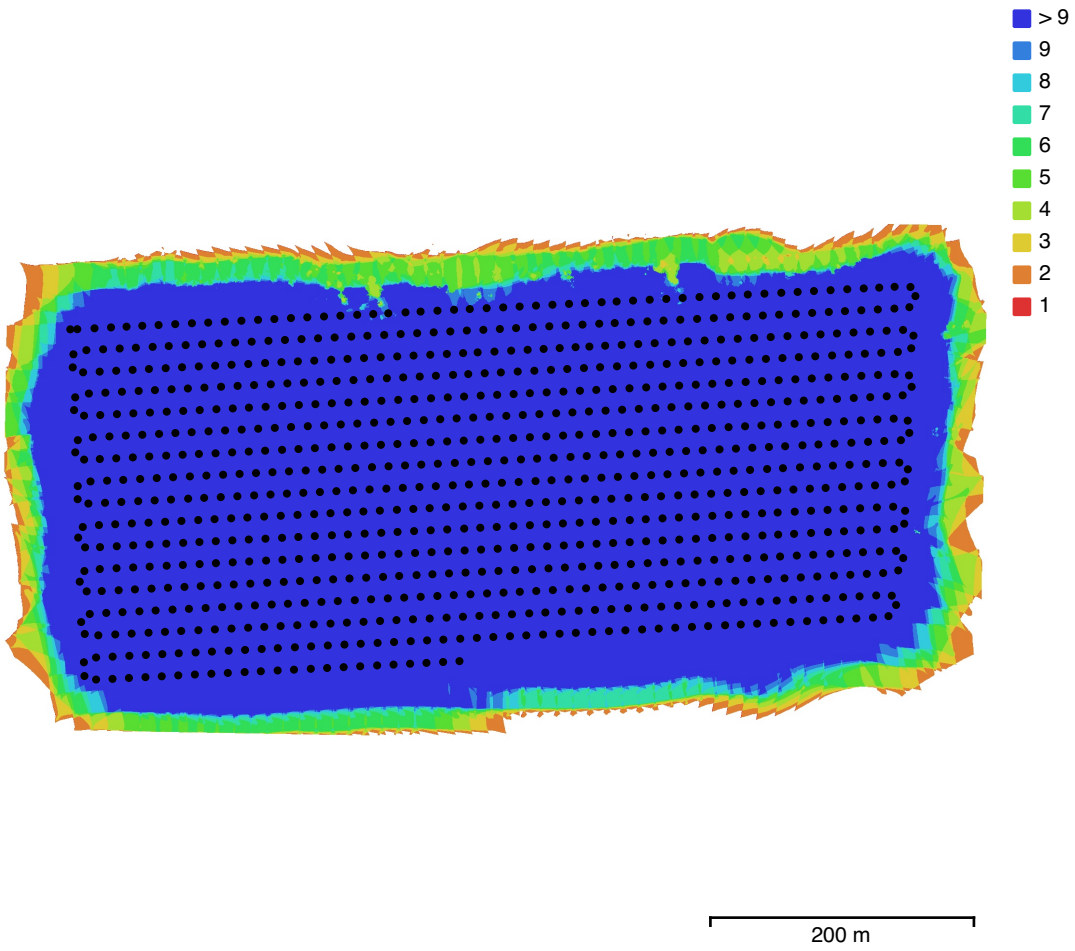


Fig. 1. Camera locations and image overlap.

Number of images:	853	Camera stations:	853
Flying altitude:	79.5 m	Tie points:	10,094,320
Ground resolution:	2.11 cm/pix	Projections:	61,880,713
Coverage area:	0.26 km²	Reprojection error:	0.648 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

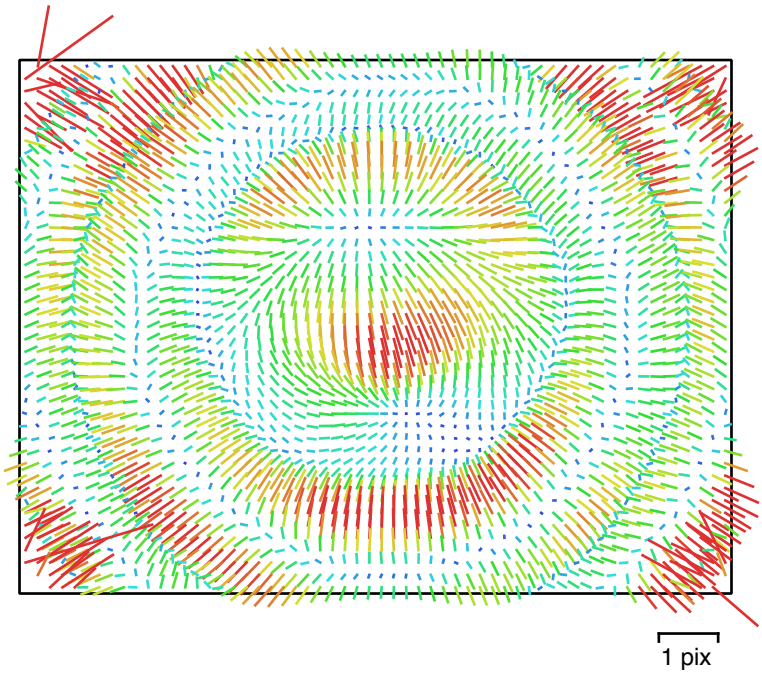


Fig. 2. Image residuals for M3M (12.29mm).

M3M (12.29mm)

853 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3704.9**	0.2	1.00	0.05	-0.11	0.03	-0.04	-0.86	-0.82	0.90	-0.95	-0.19	0.05
Cx	**31.841**	0.0019		1.00	-0.01	0.03	-0.08	-0.04	-0.04	0.05	-0.05	0.19	-0.00
Cy	**-23.6263**	0.0019			1.00	0.09	0.06	0.10	0.08	-0.09	0.09	0.01	0.05
B1	**-0.420853**	0.0012				1.00	-0.01	-0.02	-0.04	0.04	-0.04	-0.02	-0.04
B2	**0.203938**	0.0011					1.00	0.03	0.03	-0.03	0.04	0.02	-0.02
K1	**-0.0805074**	9.9e-06						1.00	0.43	-0.58	0.67	0.18	-0.04
K2	**-0.138848**	3.7e-05							1.00	-0.98	0.95	0.15	-0.04
K3	**0.242819**	8.7e-05								1.00	-0.99	-0.17	0.05
K4	**-0.156914**	7.1e-05									1.00	0.18	-0.05
P1	**-0.000133197**	8.6e-08										1.00	-0.01
P2	**-0.000110911**	7.6e-08											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

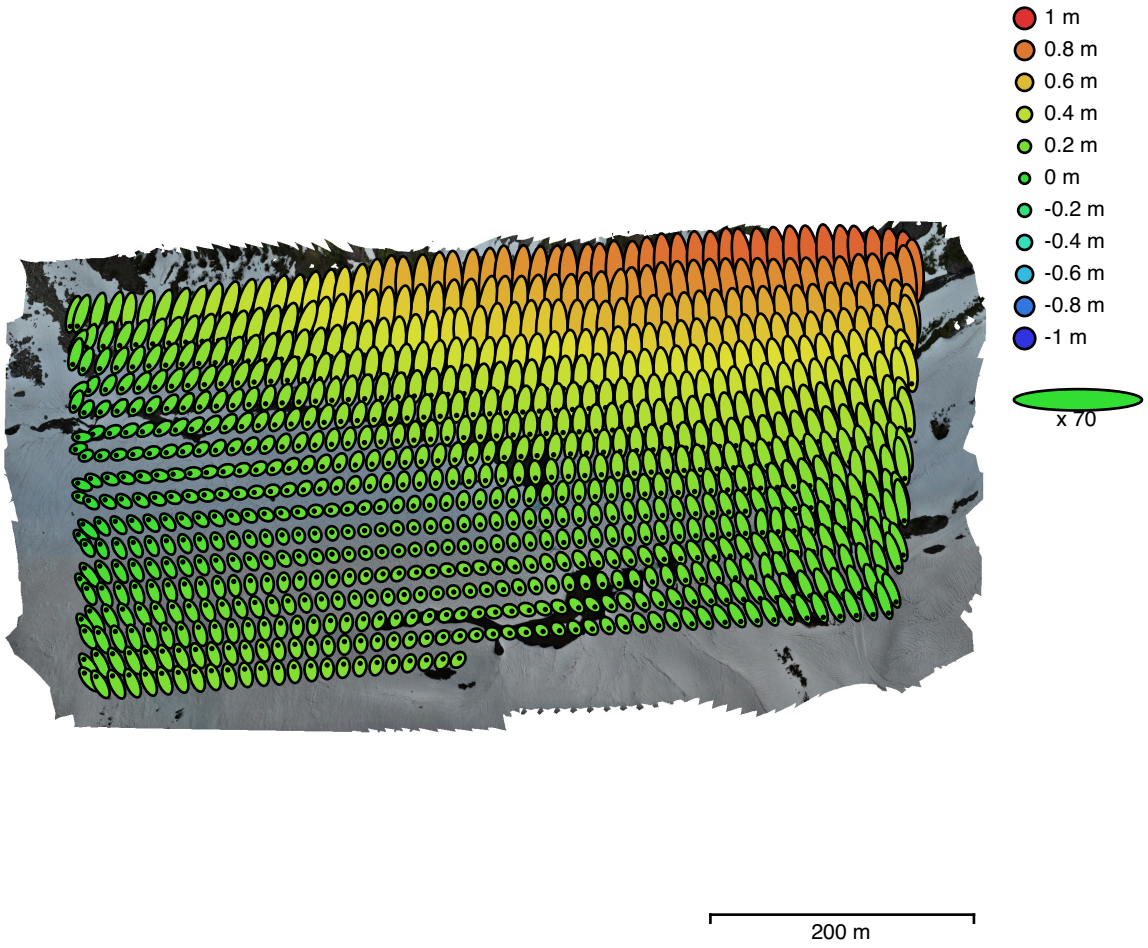


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
5.31577	23.7561	34.8987	24.3436	42.5503

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

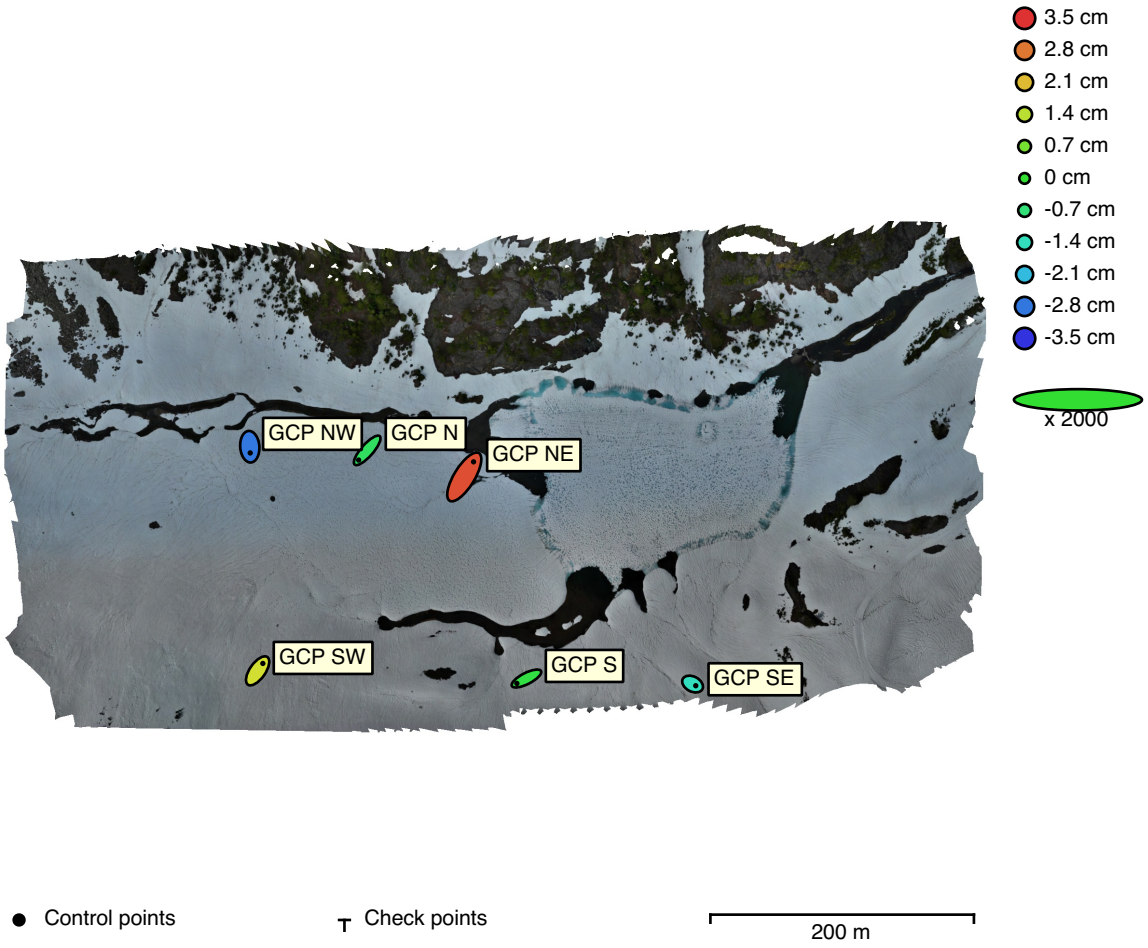


Fig. 4. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	0.526406	0.651061	1.96077	0.837248	2.13205

Table 4. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	0.239815	-0.125293	-1.42554	1.45099	2.301 (7)
GCP S	-0.727914	-0.371954	-0.183865	0.837863	1.358 (12)
GCP SW	0.397414	0.562348	1.6318	1.77114	0.870 (27)
GCP NW	0.0348409	-0.471166	-2.78751	2.82726	1.025 (56)
GCP N	-0.648279	-0.735323	-0.459479	1.08263	0.382 (30)
GCP NE	0.704153	1.14469	3.21835	3.48768	0.765 (39)
Total	**0.526406**	**0.651061**	**1.96077**	**2.13205**	**0.984**

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

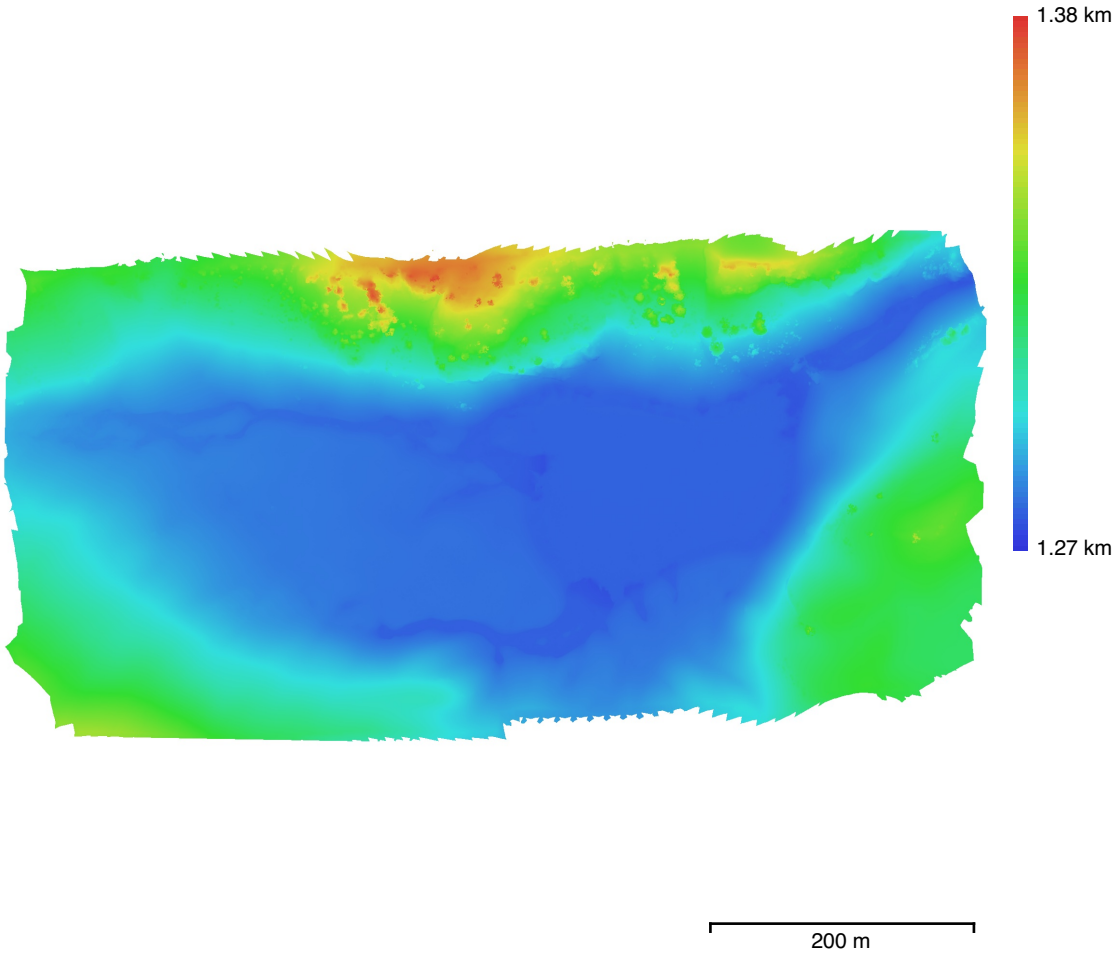


Fig. 5. Reconstructed digital elevation model.

Resolution:	4.21 cm/pix
Point density:	564 points/m²

Processing Parameters

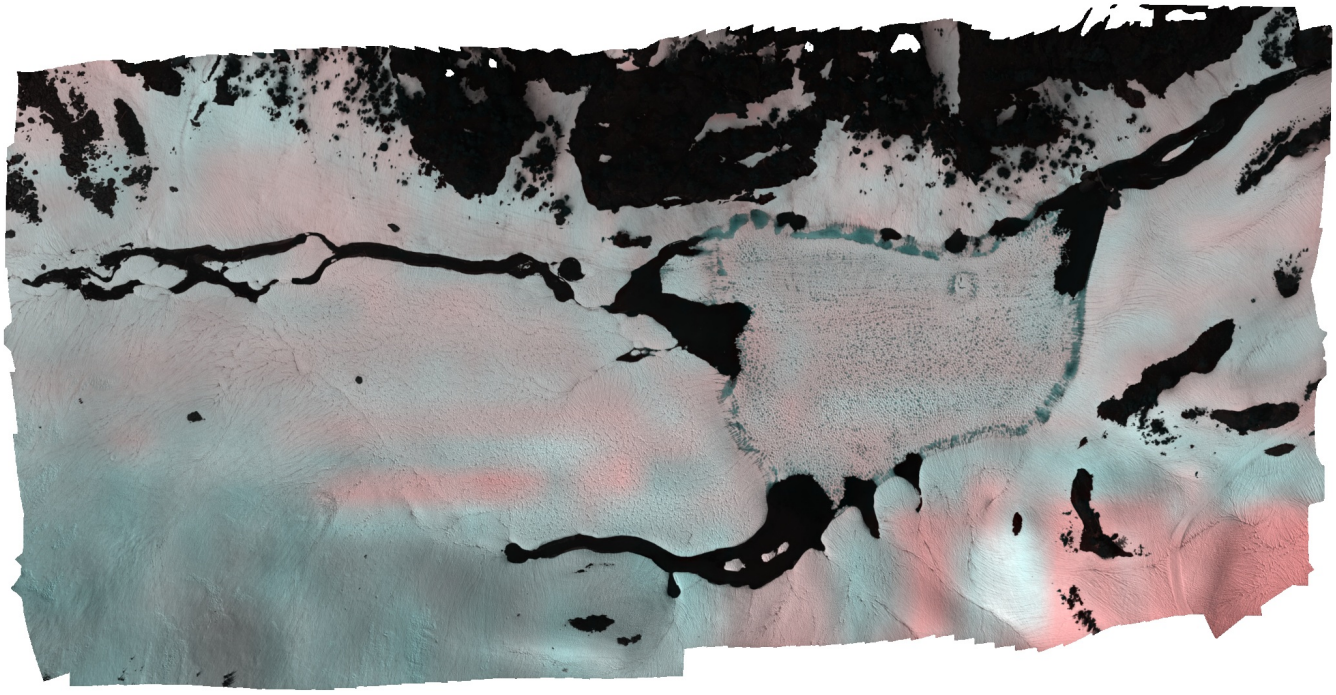
General	
Cameras	853
Aligned cameras	853
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	10,094,320 of 11,062,025
RMS reprojection error	0.19613 (0.647627 pix)
Max reprojection error	0.754488 (45.7481 pix)
Mean key point size	3.4247 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	7.64248
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	500,000
Tie point limit	0
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	4 hours 57 minutes
Matching memory usage	3.70 GB
Alignment time	2 hours 9 minutes
Alignment memory usage	7.37 GB
Optimization parameters	
Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	5 minutes 25 seconds
Date created	2023:06:10 03:10:11
Software version	1.6.4.10928
File size	1.52 GB
Depth Maps	
Count	853
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 8 minutes
Memory usage	6.31 GB
Date created	2024:01:25 02:18:26
Software version	2.1.0.17530
File size	6.46 GB
Point Cloud	
Points	185,062,496
Point attributes	
Color	3 bands, uint8
Normal	
Point classes	
Created (never classified)	185,062,496

Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 8 minutes
Memory usage	6.31 GB
Point cloud generation parameters	
Processing time	2 hours 40 minutes
Memory usage	7.55 GB
Date created	2024:01:25 04:58:40
Software version	2.1.0.17530
File size	2.38 GB
DEM	
Size	17,629 x 9,370
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	1 minutes 44 seconds
Memory usage	253.77 MB
Date created	2024:01:25 10:54:25
Software version	2.1.0.17530
File size	479.39 MB
Orthomosaic	
Size	35,258 x 18,740
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	17 minutes 0 seconds
Memory usage	2.91 GB
Date created	2024:01:25 11:08:06
Software version	2.1.0.17530
File size	16.08 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report DJI Mavic 3M Multispectral Cameras, Calibrated, Bagley Basin, Mt. Baker, WA, 2023-06-08

Processing Report

19 April 2024



Survey Data

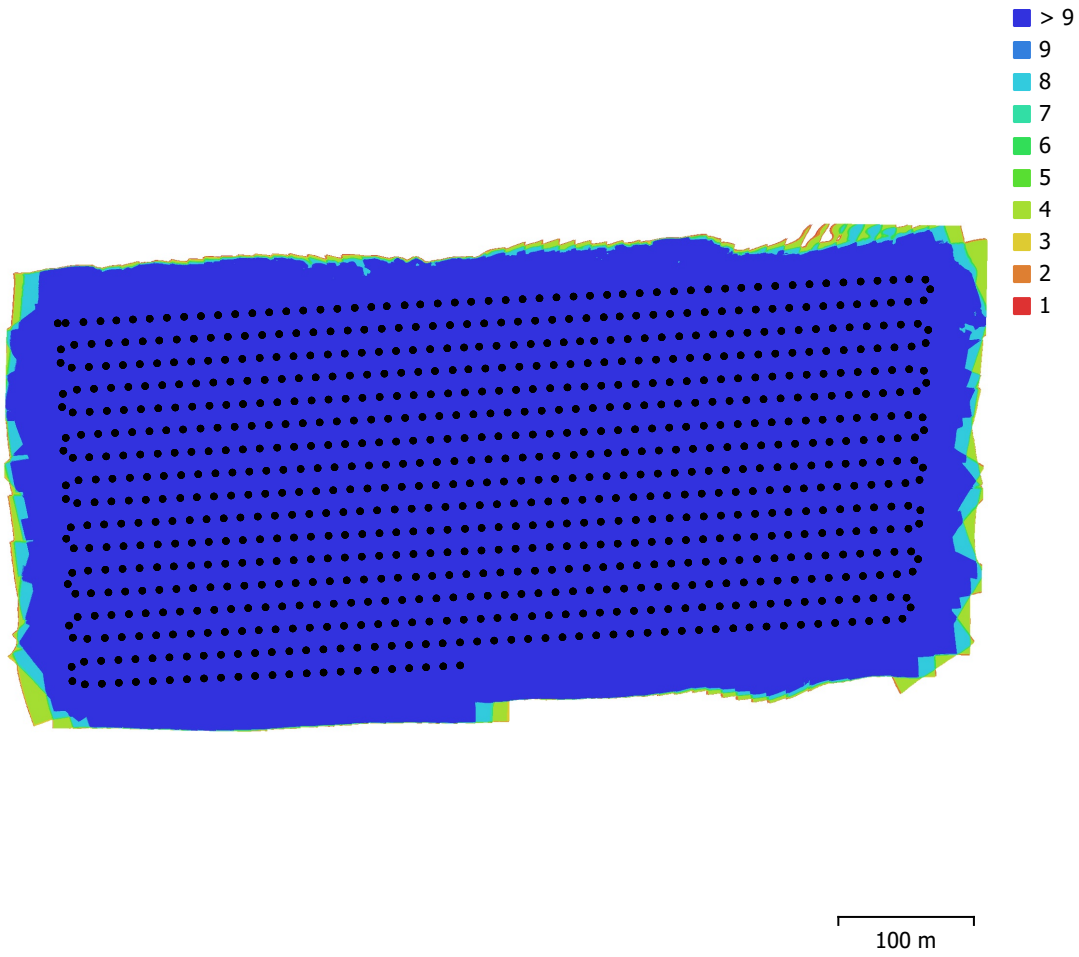


Fig. 1. Camera locations and image overlap.

Number of images:	3,412	Camera stations:	3,412
Flying altitude:	77.4 m	Tie points:	218,529
Ground resolution:	3.57 cm/pix	Projections:	5,539,162
Coverage area:	0.242 km²	Reprojection error:	0.414 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

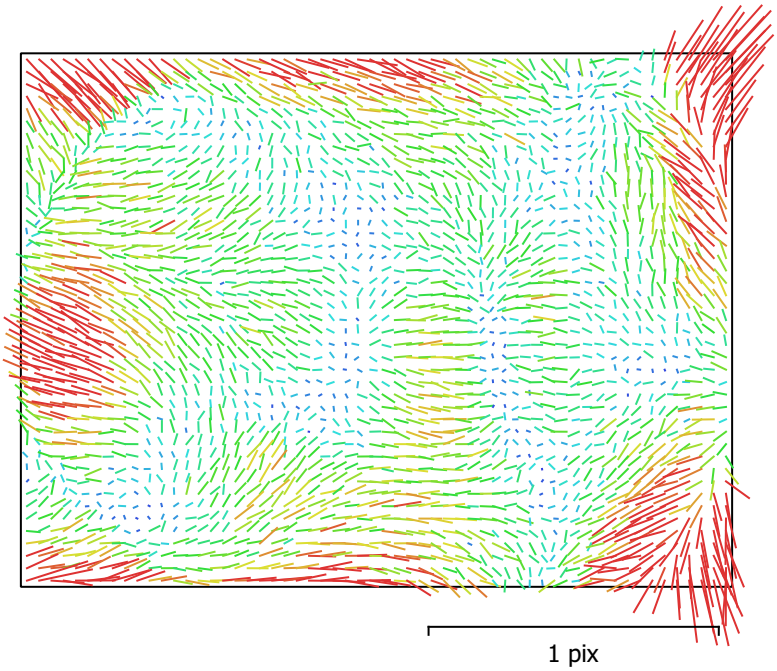


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

853 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**2147.53**	0.34	1.00	0.46	0.76	-0.04	0.08	0.07	-0.27	-0.12	-0.03	-0.11
Cx	**10.9514**	0.0075		1.00	0.35	-0.00	0.04	0.05	-0.15	-0.03	0.73	-0.06
Cy	**3.67722**	0.0082			1.00	-0.03	0.07	0.06	-0.21	-0.09	-0.04	0.39
B1	**-5.10802**	0.0084				1.00	0.01	-0.00	-0.00	0.01	0.00	-0.00
B2	**-1.00817**	0.0069					1.00	0.04	-0.02	-0.01	-0.01	0.00
K1	**0.0097875**	2.4e-05						1.00	-0.89	0.84	0.04	0.02
K2	**-0.0389008**	9.2e-05							1.00	-0.91	-0.02	0.03
K3	**-0.0144321**	0.00011								1.00	0.03	0.01
P1	**0.000260427**	1e-06									1.00	-0.00
P2	**-0.000190686**	8.1e-07										1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

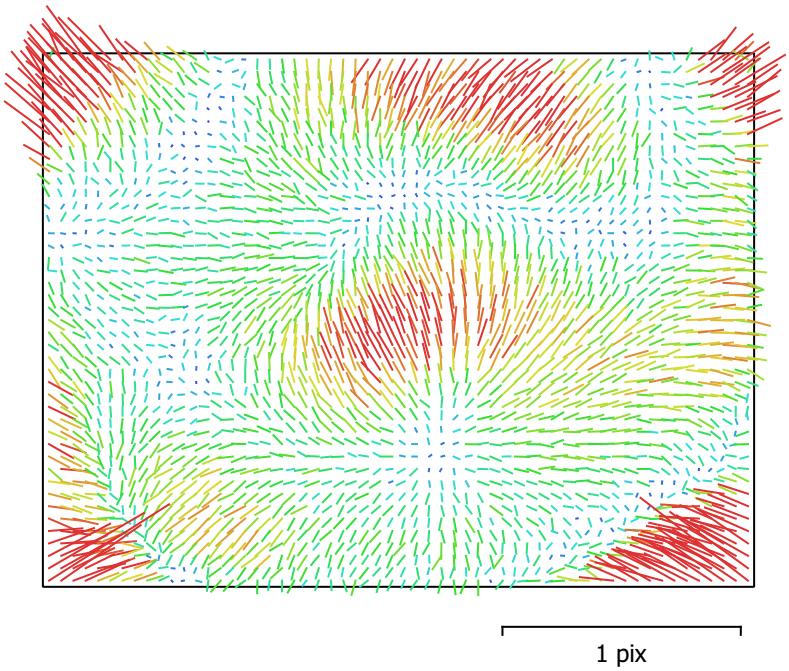


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

853 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2149.95**	0.34	1.00	0.01	0.71	-0.04	0.10	0.06	-0.13	0.07	-0.11	-0.05	0.03
Cx	**7.94071**	0.0067		1.00	0.00	0.00	0.01	-0.00	-0.00	-0.00	0.00	0.85	-0.01
Cy	**18.6167**	0.0077			1.00	-0.03	0.08	0.05	-0.10	0.05	-0.09	-0.04	0.54
B1	**-5.1962**	0.0084				1.00	0.00	0.00	-0.00	0.00	-0.00	0.00	-0.01
B2	**-0.534547**	0.0069					1.00	0.02	-0.01	0.01	-0.01	-0.01	0.01
K1	**0.0160657**	5e-05						1.00	-0.96	0.92	-0.88	-0.00	0.00
K2	**-0.0757922**	0.00033							1.00	-0.99	0.96	0.01	0.01
K3	**0.0751531**	0.00087								1.00	-0.99	-0.01	-0.01
K4	**-0.0807289**	0.00079									1.00	0.01	0.01
P1	**-0.000198797**	1e-06										1.00	-0.01
P2	**0.000473189**	8.1e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

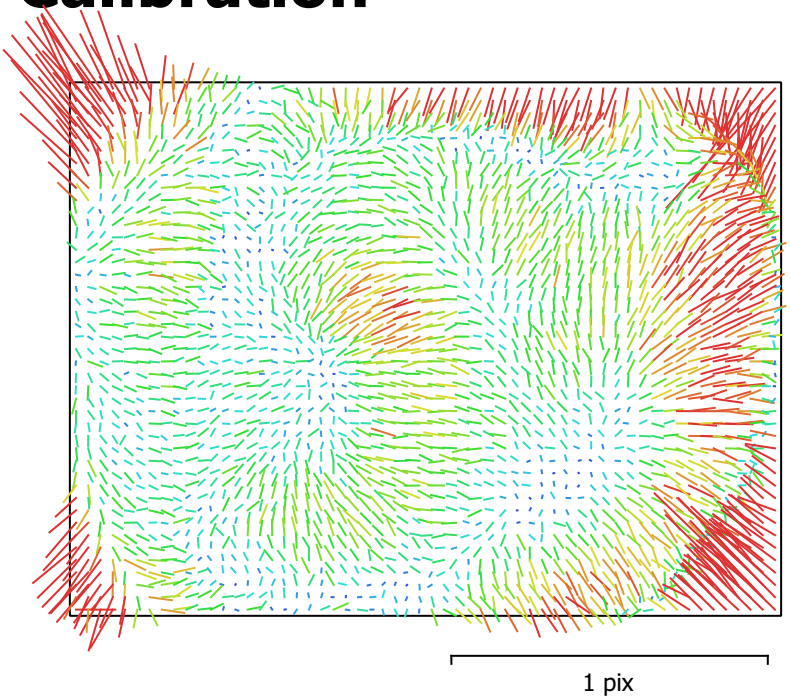


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

853 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2156.22**	0.34	1.00	-0.33	0.51	-0.05	0.11	0.06	-0.14	0.08	-0.12	0.19	0.07
Cx	**7.2912**	0.0071		1.00	-0.18	0.01	-0.04	-0.03	0.05	-0.03	0.05	0.72	-0.03
Cy	**15.3014**	0.0062			1.00	-0.03	0.06	0.04	-0.08	0.05	-0.07	0.08	0.67
B1	**-5.36988**	0.0084				1.00	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.01
B2	**-0.0259695**	0.0069					1.00	0.02	-0.02	0.01	-0.01	0.02	0.02
K1	**0.0158842**	5e-05						1.00	-0.96	0.92	-0.88	0.01	0.01
K2	**-0.0808111**	0.00033							1.00	-0.99	0.96	-0.03	-0.00
K3	**0.0863274**	0.00088								1.00	-0.99	0.02	-0.00
K4	**-0.085343**	0.0008									1.00	-0.02	0.00
P1	**0.00106232**	1e-06										1.00	0.00
P2	**0.000505303**	8.1e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

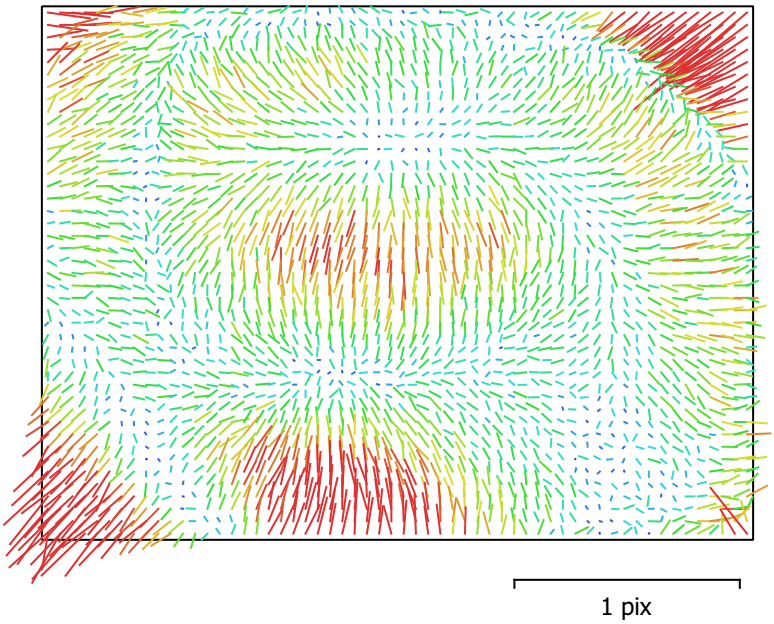


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

853 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2163.29**	0.34	1.00	-0.58	0.56	-0.04	0.11	0.07	-0.13	0.06	-0.10	0.16	0.09
Cx	**8.53796**	0.0085		1.00	-0.32	0.01	-0.07	-0.05	0.09	-0.05	0.07	0.60	-0.06
Cy	**-25.005**	0.0067			1.00	-0.02	0.06	0.05	-0.08	0.05	-0.06	0.08	0.67
B1	**-5.03235**	0.0085				1.00	0.00	0.00	-0.00	0.00	-0.00	-0.00	-0.00
B2	**-0.170068**	0.0069					1.00	0.02	-0.01	0.01	-0.01	-0.00	0.02
K1	**0.0165517**	5.1e-05						1.00	-0.96	0.92	-0.88	0.01	0.03
K2	**-0.0776805**	0.00035							1.00	-0.99	0.96	-0.02	-0.03
K3	**0.0699649**	0.00092								1.00	-0.99	0.01	0.02
K4	**-0.0681037**	0.00085									1.00	-0.01	-0.03
P1	**0.000641685**	1.1e-06										1.00	0.01
P2	**0.000682727**	8.4e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Locations

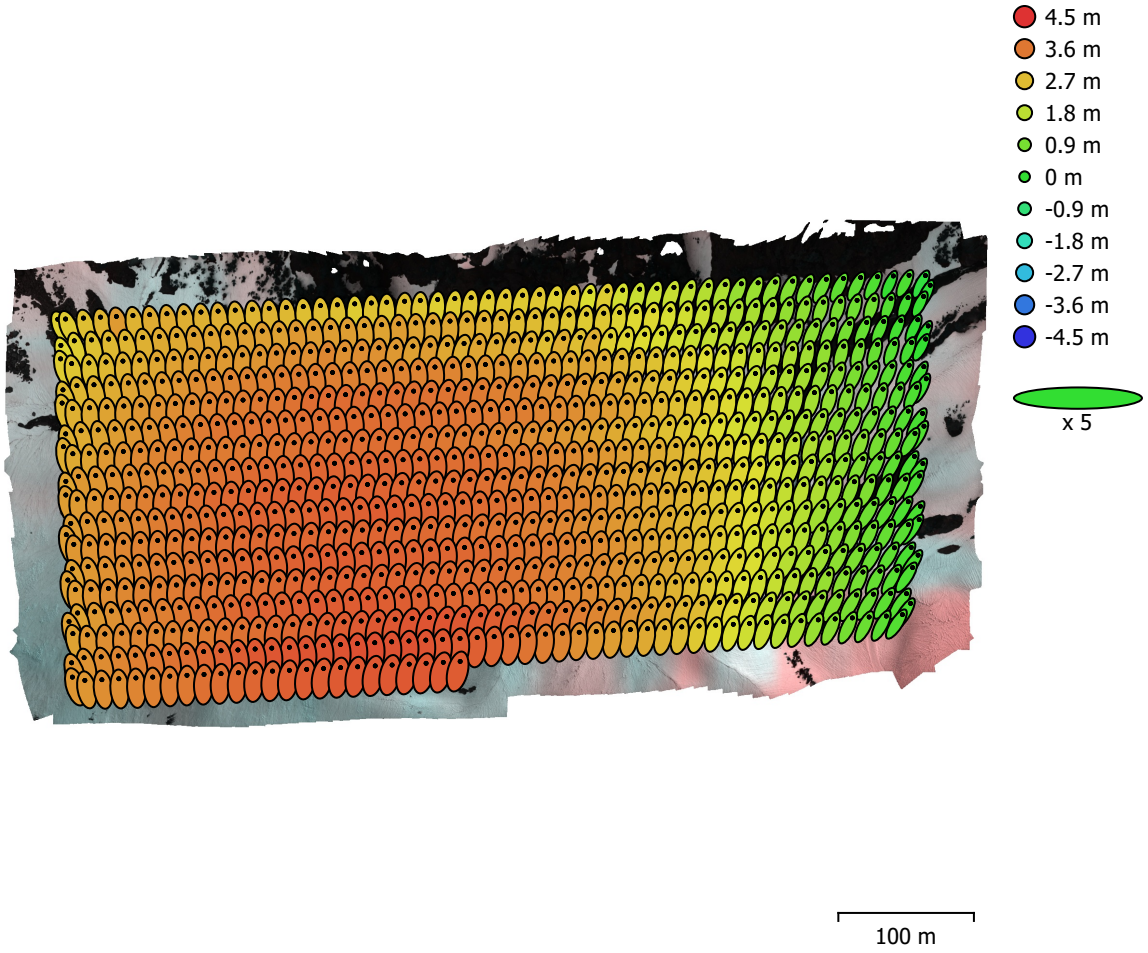


Fig. 6. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.733682	2.82307	3.01715	2.91685	4.19657

Table 6. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

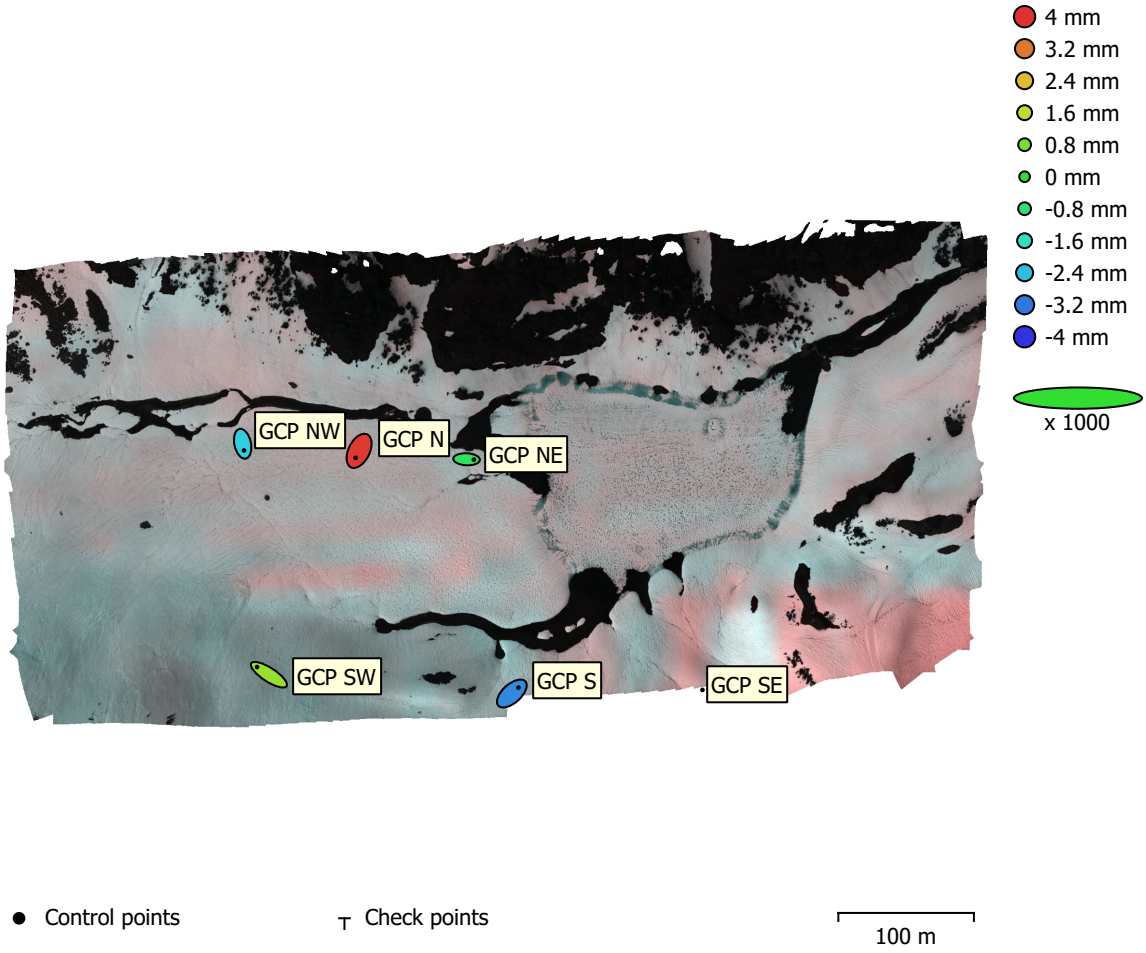


Fig. 7. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
5	1.04706	0.904442	0.24839	1.3836	1.40572

Table 7. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE					
GCP S	0.972617	0.874332	-0.29908	1.3416	0.942 (5)
GCP SW	-1.75296	1.13424	0.117681	2.09122	0.875 (10)
GCP NW	0.209824	-0.991433	-0.219915	1.03698	0.554 (10)
GCP N	-0.513114	-1.02645	0.392615	1.21286	0.812 (10)
GCP NE	1.07494	-0.0508614	-0.0517701	1.07739	0.376 (16)
Total	**1.04706**	**0.904442**	**0.24839**	**1.40572**	**0.686**

Table 8. Control points.

X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

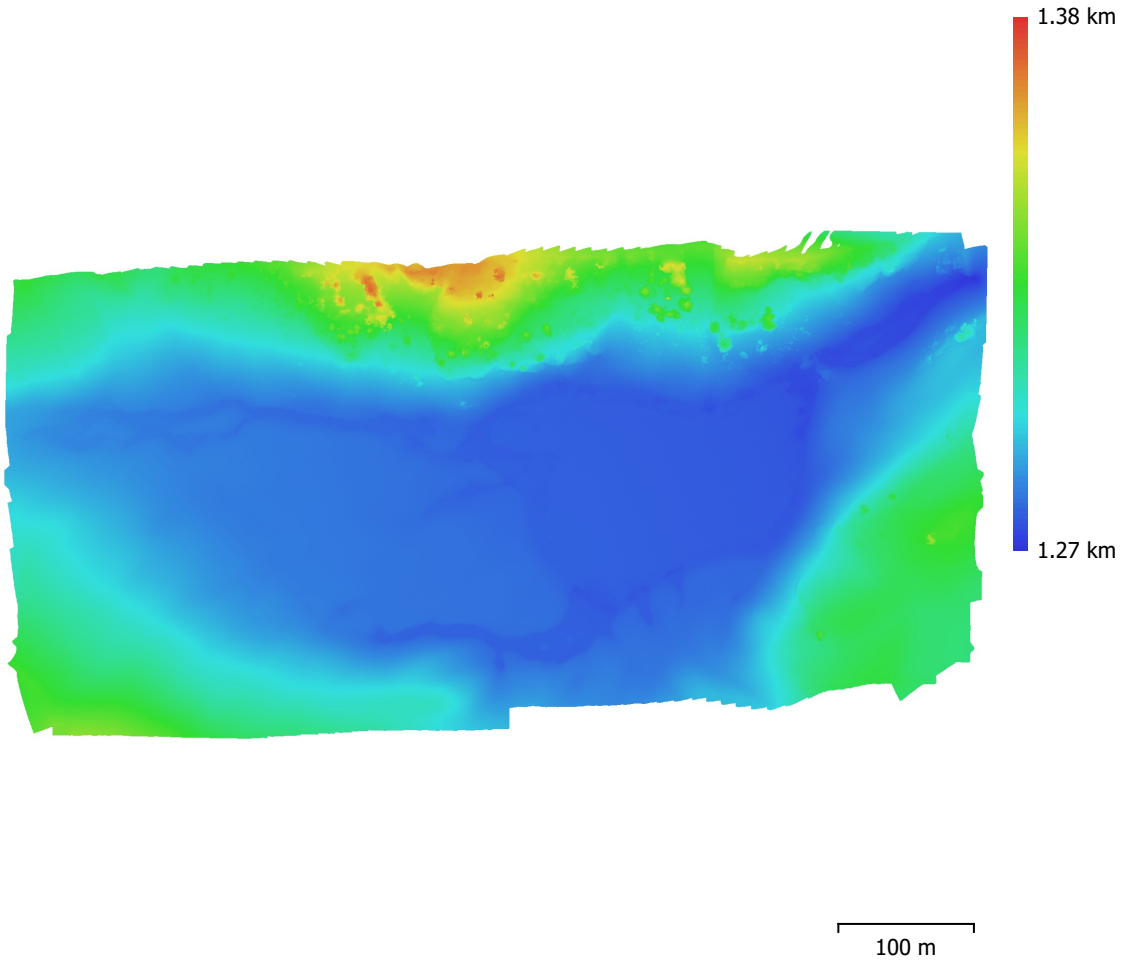


Fig. 8. Reconstructed digital elevation model.

Resolution:	7.15 cm/pix
Point density:	196 points/m²

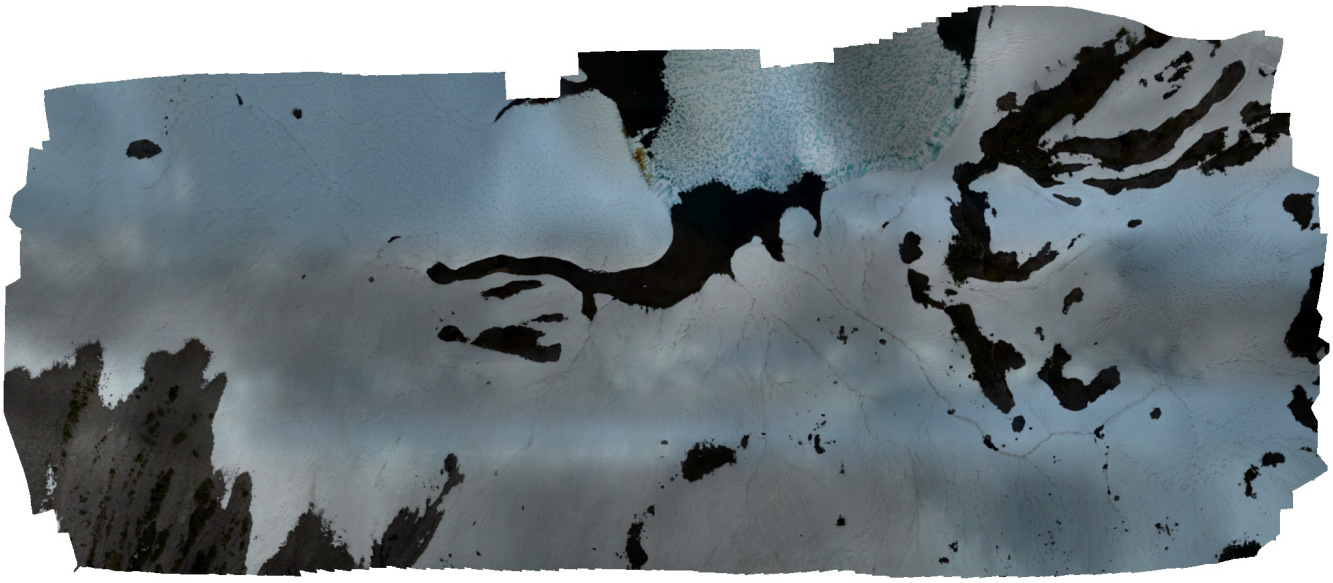
Processing Parameters

General	
Cameras	3412
Aligned cameras	3412
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	218,529 of 435,470
RMS reprojection error	0.141466 (0.413941 pix)
Max reprojection error	0.804682 (36.2919 pix)
Mean key point size	2.55028 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	43.7052
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	38 minutes 33 seconds
Matching memory usage	5.86 GB
Alignment time	48 minutes 29 seconds
Alignment memory usage	1.20 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	1 minutes 6 seconds
Date created	2024:01:23 12:24:05
Software version	2.1.0.17530
File size	296.69 MB
Depth Maps	
Count	853
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	28 minutes 27 seconds
Memory usage	1.44 GB
Date created	2024:01:23 14:42:40
Software version	2.1.0.17530
File size	1.50 GB
Point Cloud	
Points	57,582,506
Point attributes	
Color	4 bands, uint16

Normal	
Point classes	
Created (never classified)	57,582,506
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	28 minutes 27 seconds
Memory usage	1.44 GB
Point cloud generation parameters	
Processing time	24 minutes 27 seconds
Memory usage	4.57 GB
Date created	2024:01:23 15:07:07
Software version	2.1.0.17530
File size	1.11 GB
DEM	
Size	10,095 x 5,339
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	56 seconds
Memory usage	229.03 MB
Date created	2024:01:24 05:03:30
Software version	2.1.0.17530
File size	160.17 MB
Orthomosaic	
Size	20,190 x 10,678
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	10 minutes 44 seconds
Memory usage	1.65 GB
Date created	2024:04:19 11:02:04
Software version	2.1.1.17821
File size	55.46 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report - Bagley M3M RGB 2023-06-26

Processing Report
25 January 2024



Survey Data

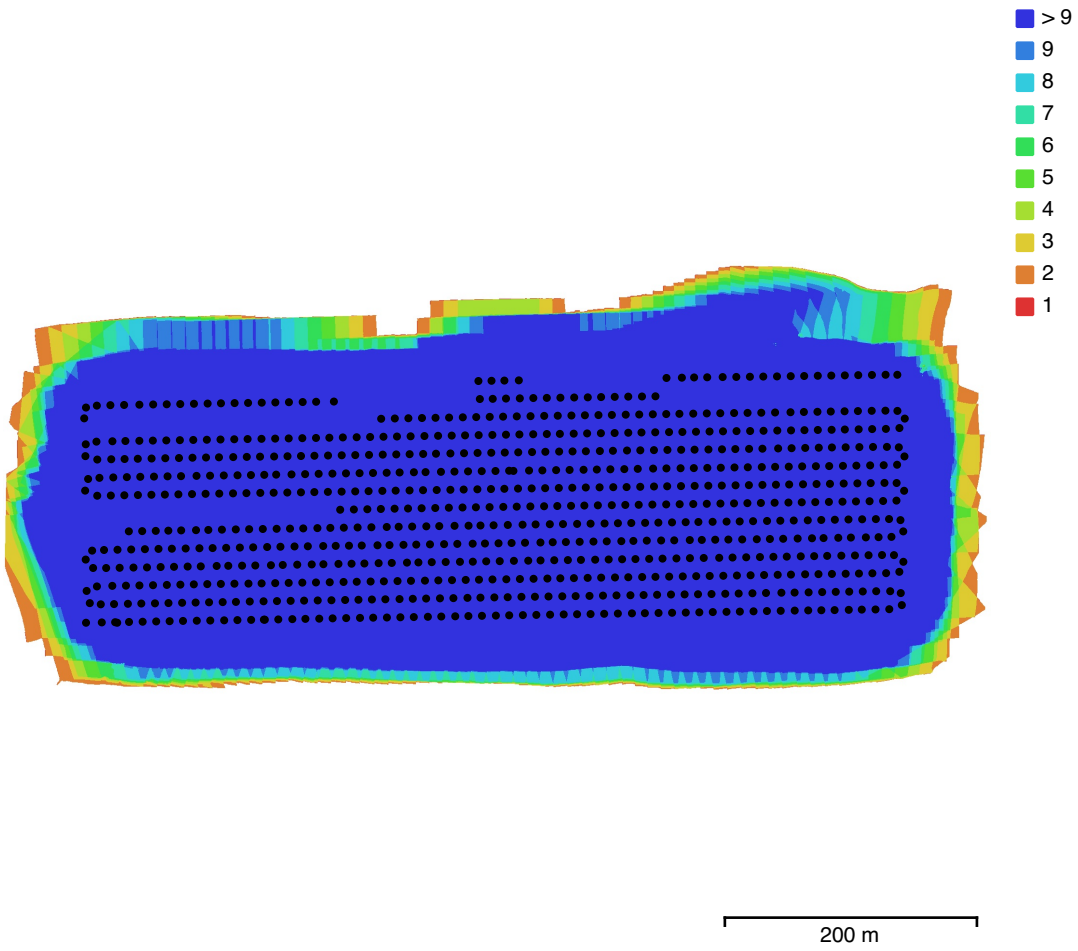


Fig. 1. Camera locations and image overlap.

Number of images:	750	Camera stations:	750
Flying altitude:	91.7 m	Tie points:	117,756
Ground resolution:	2.49 cm/pix	Projections:	1,745,763
Coverage area:	0.228 km²	Reprojection error:	0.926 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

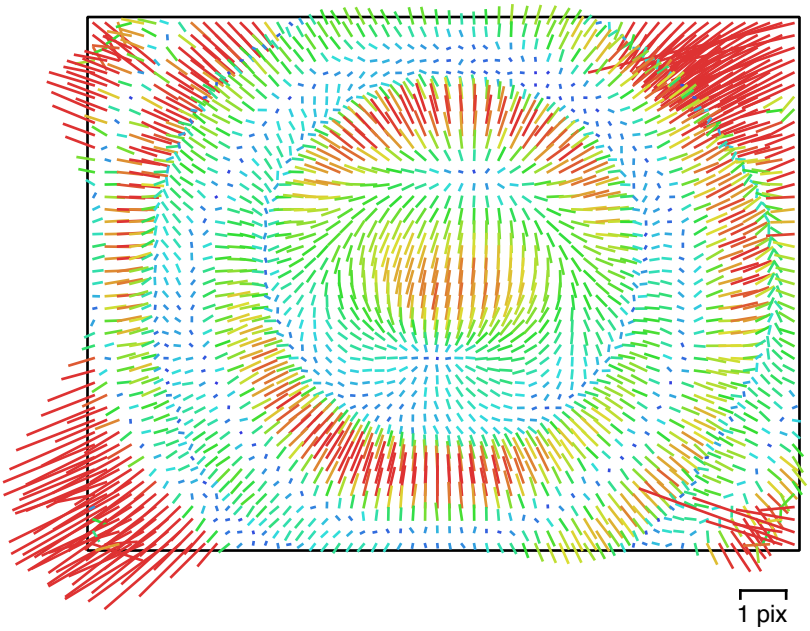


Fig. 2. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

747 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3702.94**	0.61	1.00	-0.15	0.22	-0.07	0.04	0.06	-0.65	0.73	-0.69	0.12	-0.14
Cx	**31.8741**	0.013		1.00	-0.04	0.03	0.03	-0.01	0.10	-0.12	0.11	0.74	0.09
Cy	**-22.1027**	0.011			1.00	-0.05	0.01	0.01	-0.14	0.16	-0.15	0.06	0.66
B1	**-0.443863**	0.0091				1.00	0.01	0.01	0.03	-0.04	0.04	0.02	0.02
B2	**0.0437158**	0.0085					1.00	-0.00	-0.02	0.02	-0.02	-0.01	0.01
K1	**0.0116644**	3.7e-05						1.00	-0.75	0.65	-0.65	0.00	-0.01
K2	**-0.240939**	0.00024							1.00	-0.99	0.97	-0.08	0.09
K3	**0.404956**	0.00054								1.00	-0.99	0.09	-0.10
K4	**-0.184172**	0.00035									1.00	-0.09	0.10
P1	**0.000753183**	9.7e-07										1.00	0.07
P2	**-0.000593339**	8.2e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

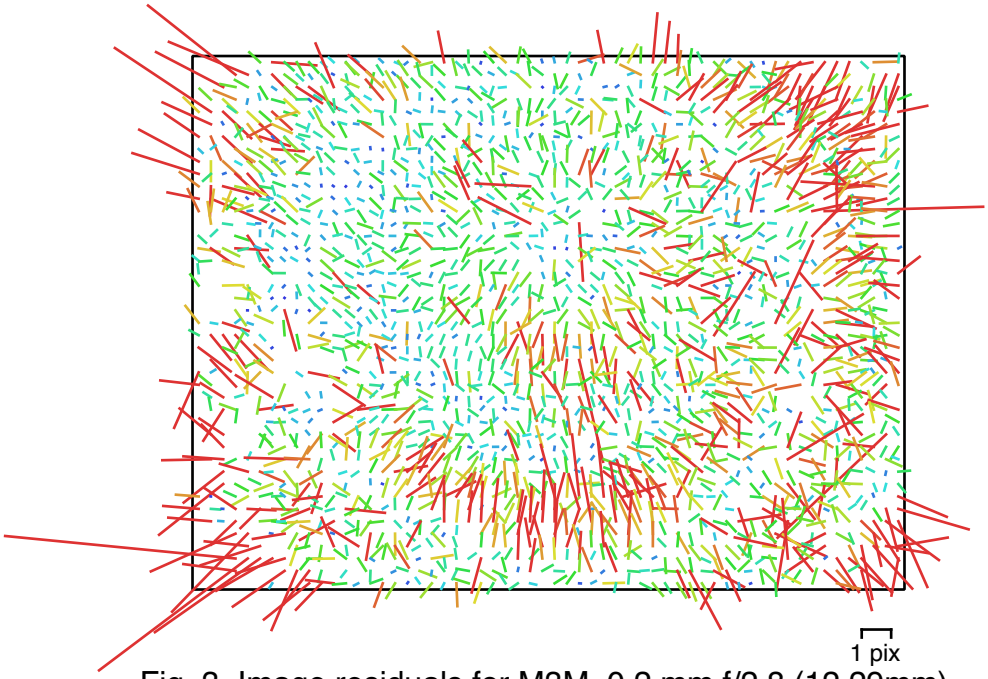


Fig. 3. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

3 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	**3709.07**	0.79	1.00	-0.09	-0.30	-0.19	0.06	0.07	0.06	-0.01
Cx	**31.8354**	0.22		1.00	0.03	0.03	-0.03	0.03	0.65	0.09
Cy	**-23.3593**	0.21			1.00	0.05	-0.01	-0.04	-0.10	0.48
K1	**-0.00639682**	0.0003				1.00	-0.97	0.90	0.04	-0.01
K2	**-0.132176**	0.00094					1.00	-0.98	-0.05	0.01
K3	**0.162437**	0.0009						1.00	0.06	-0.01
P1	**0.000720015**	1.6e-05							1.00	0.01
P2	**-0.000714281**	1.3e-05								1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Locations

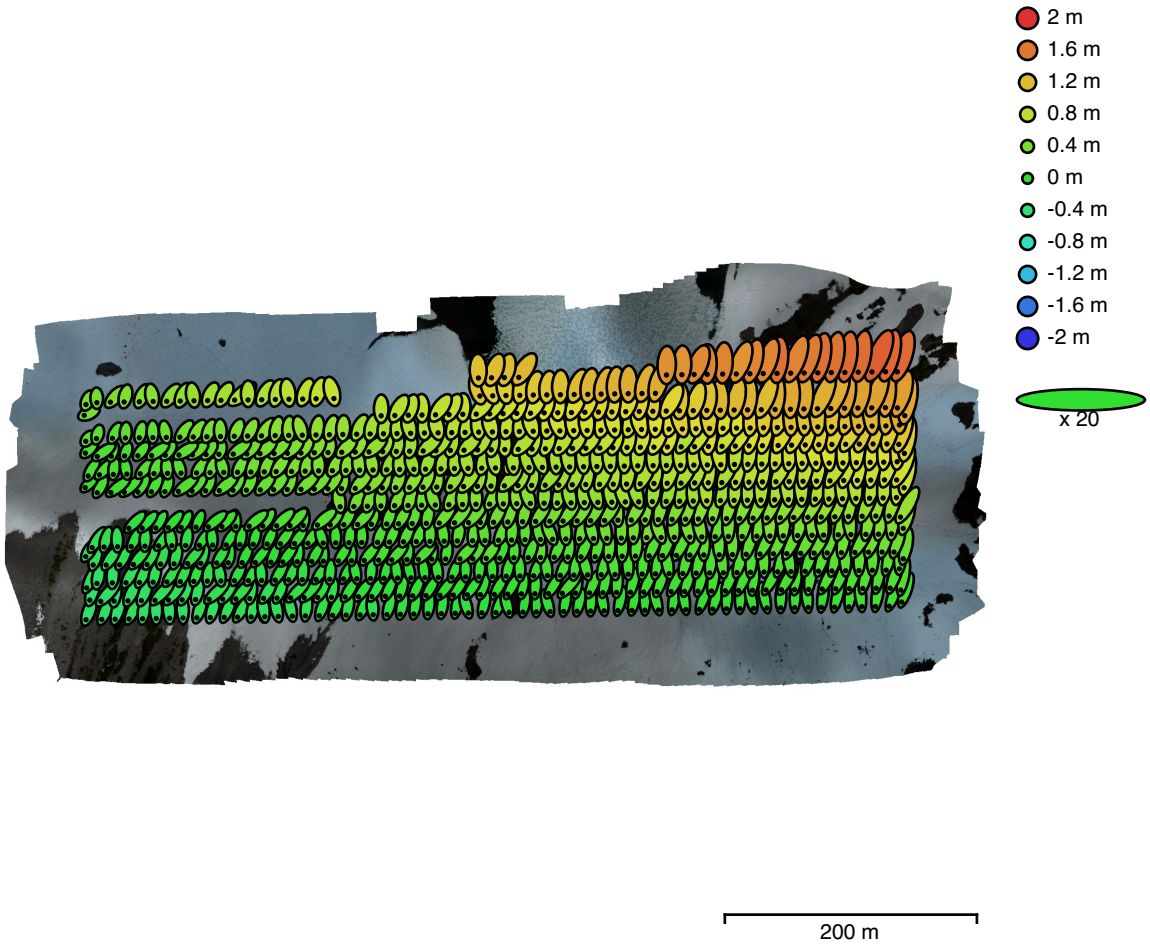


Fig. 4. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
26.5499	72.0277	62.217	76.7652	98.8122

Table 4. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

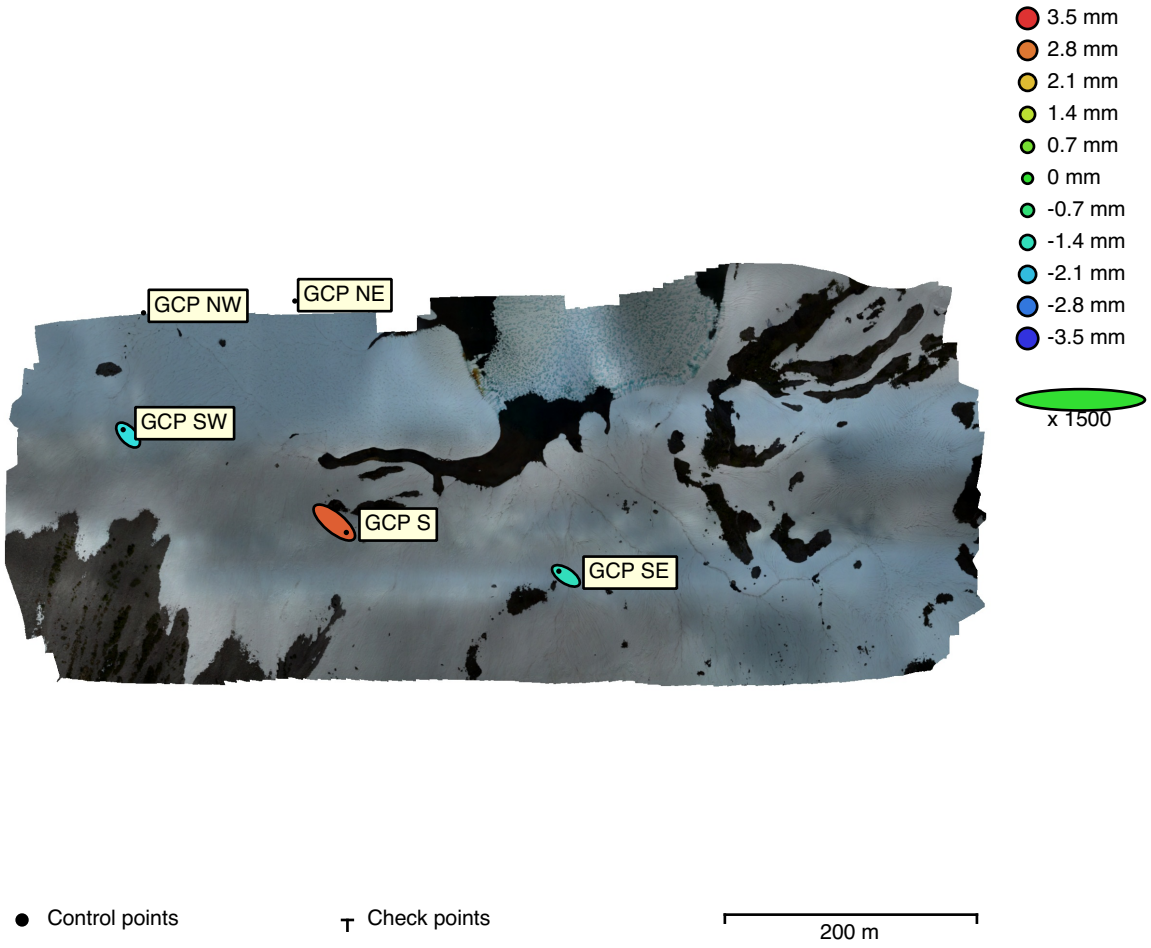


Fig. 5. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
3	0.905297	0.745186	0.218462	1.17255	1.19272

Table 5. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	-0.748348	0.493559	-0.139265	0.907205	0.396 (10)
GCP S	1.27482	-1.04866	0.30552	1.67875	0.538 (10)
GCP SW	-0.522984	0.567992	-0.174467	0.791559	0.418 (10)
GCP NW					
GCP NE					
Total	**0.905297**	**0.745186**	**0.218462**	**1.19272**	**0.455**

Table 6. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

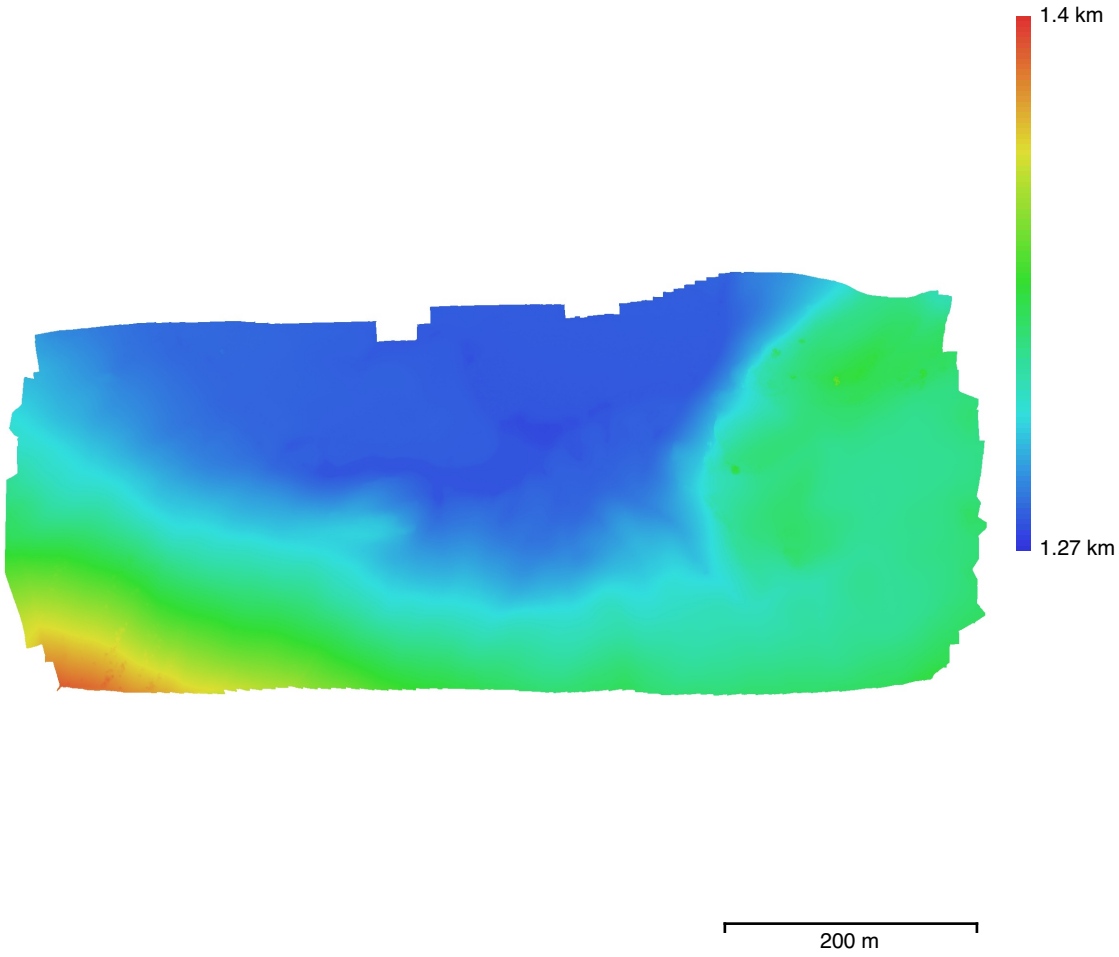


Fig. 6. Reconstructed digital elevation model.

Resolution:	4.97 cm/pix
Point density:	405 points/m²

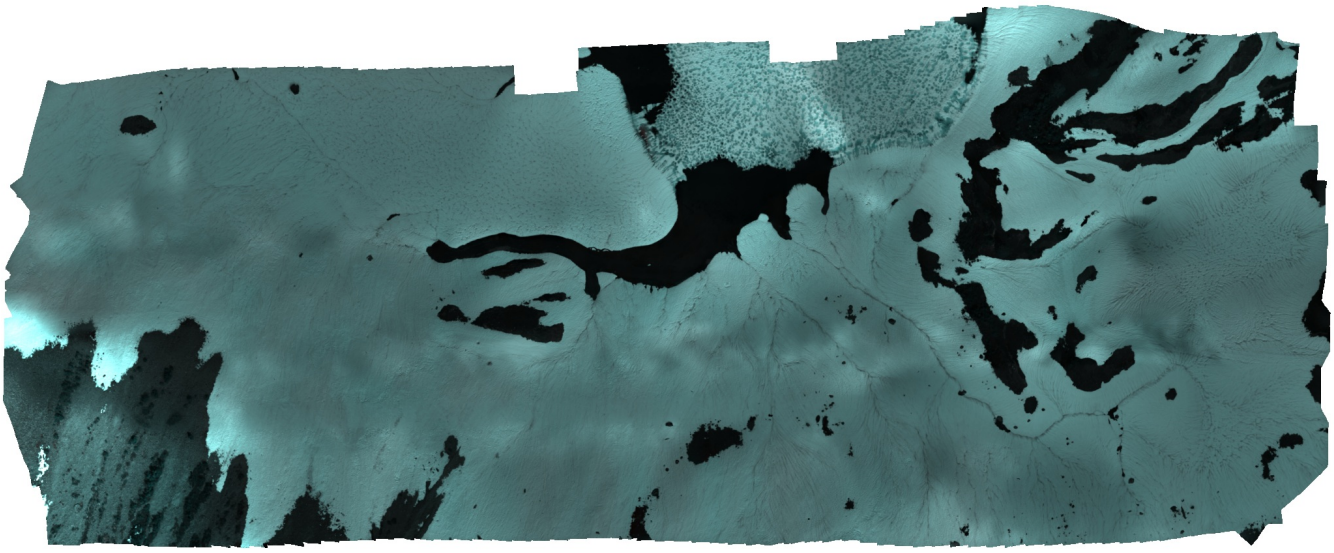
Processing Parameters

General	
Cameras	750
Aligned cameras	750
Markers	5
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	117,756 of 186,692
RMS reprojection error	0.24117 (0.925683 pix)
Max reprojection error	2.62882 (72.2899 pix)
Mean key point size	3.54533 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	21.363
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	8 minutes 55 seconds
Matching memory usage	5.29 GB
Alignment time	15 minutes 53 seconds
Alignment memory usage	196.59 MB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	27 seconds
Date created	2024:01:24 11:00:26
Software version	2.1.0.17530
File size	64.18 MB
Depth Maps	
Count	750
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 7 minutes
Memory usage	6.91 GB
Date created	2024:01:24 13:36:28
Software version	2.1.0.17530
File size	6.00 GB
Point Cloud	
Points	103,344,964
Point attributes	
Color	3 bands, uint8
Normal	

Point classes	
Created (never classified)	103,344,964
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 7 minutes
Memory usage	6.91 GB
Point cloud generation parameters	
Processing time	3 hours 44 minutes
Memory usage	7.05 GB
Date created	2024:01:24 17:20:44
Software version	2.1.0.17530
File size	1.33 GB
DEM	
Size	15,639 x 6,878
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	1 minutes 8 seconds
Memory usage	259.81 MB
Date created	2024:01:24 19:25:57
Software version	2.1.0.17530
File size	300.75 MB
Orthomosaic	
Size	31,277 x 13,755
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	8 minutes 18 seconds
Memory usage	1.56 GB
Date created	2024:01:24 23:57:04
Software version	2.1.0.17530
File size	11.00 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - Bagley M3M MS 2023-06-26

Processing Report
24 January 2024



Survey Data

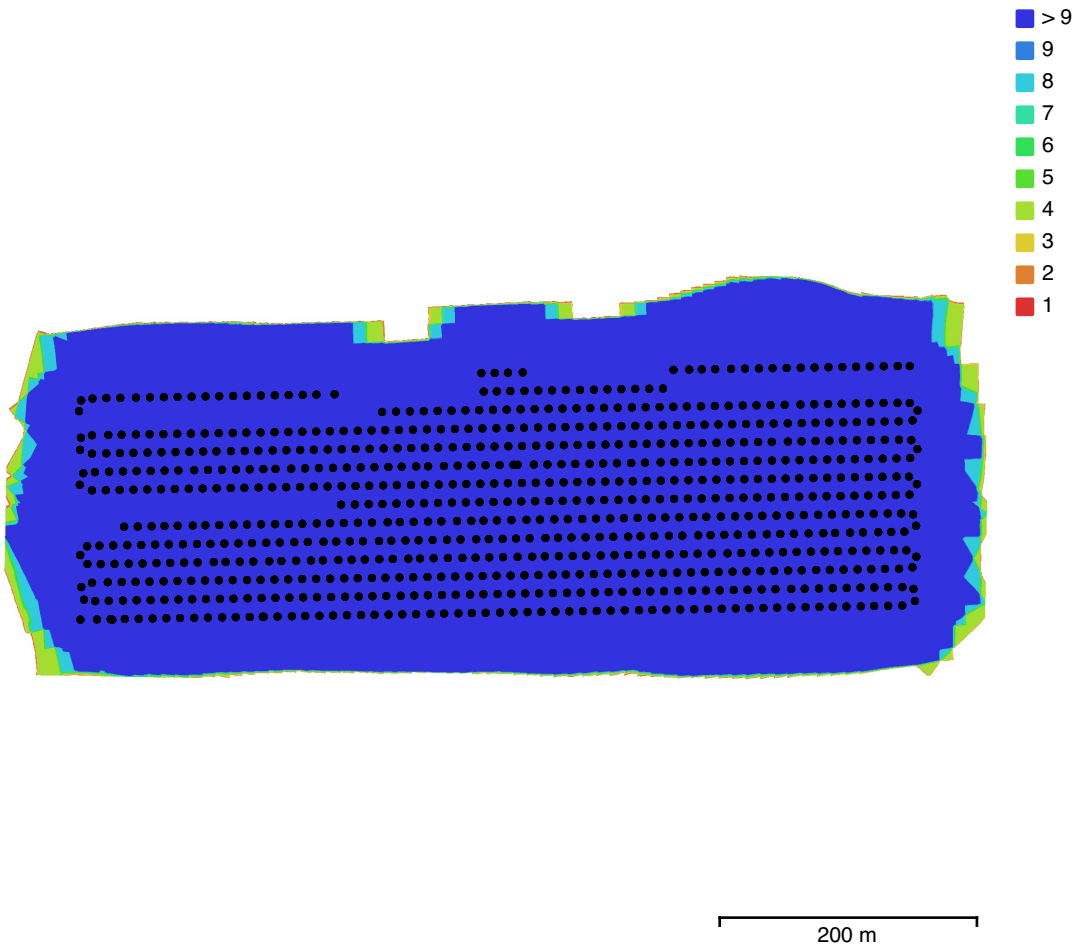


Fig. 1. Camera locations and image overlap.

Number of images:	3,000	Camera stations:	3,000
Flying altitude:	90.5 m	Tie points:	163,258
Ground resolution:	4.22 cm/pix	Projections:	4,703,799
Coverage area:	0.212 km²	Reprojection error:	0.585 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

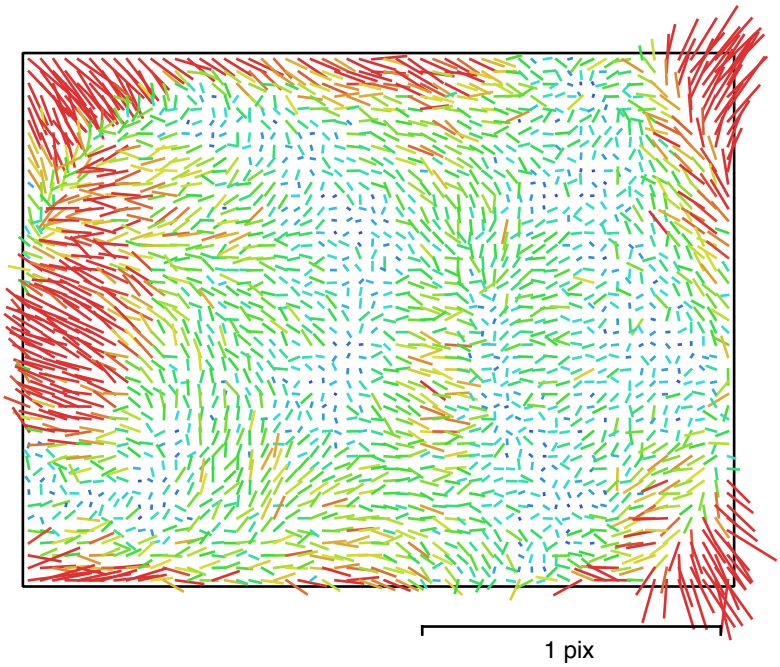


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

747 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**2170.25**	0.26	1.00	0.21	0.64	-0.12	0.01	0.03	-0.14	-0.06	-0.00	-0.06
Cx	**11.123**	0.0096		1.00	0.09	-0.02	0.04	0.03	-0.06	0.01	0.88	-0.04
Cy	**4.29427**	0.0096			1.00	-0.10	0.01	0.03	-0.10	-0.03	-0.04	0.59
B1	**-3.80268**	0.0078				1.00	-0.01	0.02	-0.00	0.03	0.00	0.01
B2	**-0.99704**	0.0063					1.00	0.00	0.00	-0.00	-0.00	0.00
K1	**0.00939397**	3.4e-05						1.00	-0.93	0.87	0.03	0.02
K2	**-0.0416169**	0.00013							1.00	-0.96	-0.03	0.01
K3	**-0.0141697**	0.00016								1.00	0.03	0.01
P1	**0.000248917**	1.4e-06									1.00	-0.02
P2	**-0.000182834**	1.2e-06										1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

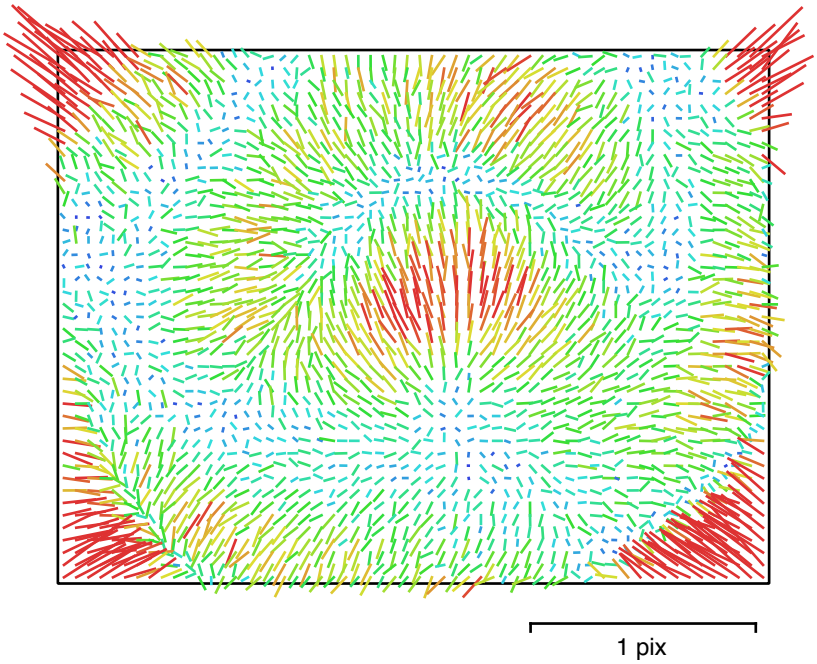


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

747 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**2173.18**	0.26	1.00	-0.06	0.58	-0.13	0.02	0.04	-0.15	-0.06	-0.01	0.01
Cx	**7.92503**	0.0096		1.00	-0.08	0.00	0.04	0.01	-0.00	0.02	0.90	-0.03
Cy	**19.2738**	0.0093			1.00	-0.09	0.01	0.03	-0.10	-0.03	-0.04	0.67
B1	**-4.02553**	0.0078				1.00	-0.01	0.01	-0.00	0.03	-0.00	0.00
B2	**-0.651642**	0.0063					1.00	-0.00	-0.00	-0.00	0.01	-0.00
K1	**0.0111994**	3.4e-05						1.00	-0.93	0.87	0.01	0.03
K2	**-0.0460212**	0.00014							1.00	-0.96	-0.01	-0.01
K3	**-0.0134626**	0.00017								1.00	0.02	0.01
P1	**-0.000197544**	1.5e-06									1.00	-0.02
P2	**0.000456731**	1.2e-06										1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

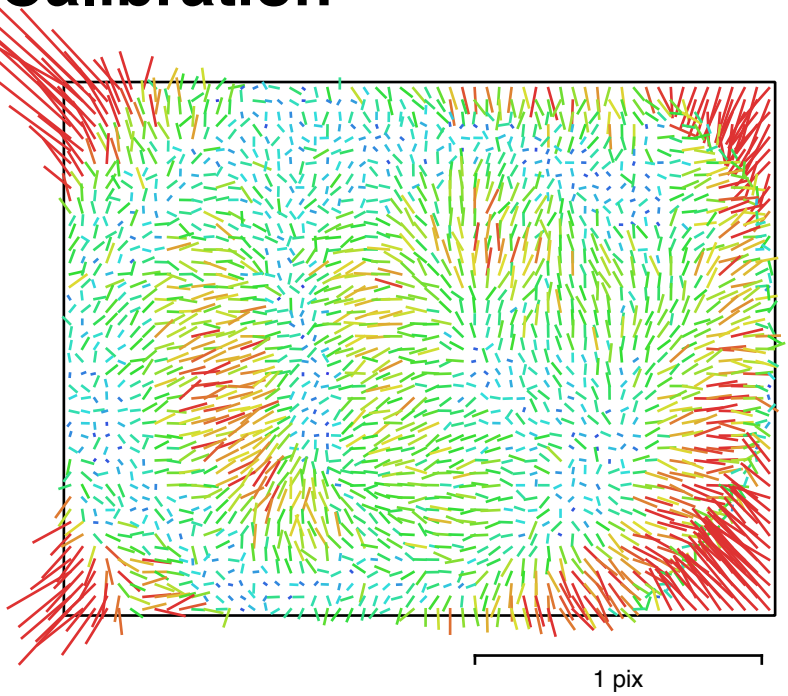


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

747 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**2179.57**	0.26	1.00	-0.25	0.43	-0.13	0.04	0.04	-0.16	-0.04	0.11	0.03
Cx	**7.25401**	0.0098		1.00	-0.16	0.03	0.03	-0.00	0.03	0.02	0.84	-0.04
Cy	**15.6781**	0.0083			1.00	-0.08	0.01	0.02	-0.08	-0.01	0.01	0.75
B1	**-4.22839**	0.0078				1.00	-0.02	0.02	0.00	0.02	-0.01	-0.00
B2	**-0.193662**	0.0064					1.00	0.00	-0.00	-0.00	0.01	0.00
K1	**0.0106079**	3.4e-05						1.00	-0.93	0.88	0.01	0.02
K2	**-0.0490065**	0.00014							1.00	-0.97	-0.04	-0.01
K3	**-0.00692438**	0.00017								1.00	0.02	0.01
P1	**0.00109311**	1.5e-06									1.00	-0.02
P2	**0.000489753**	1.2e-06										1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

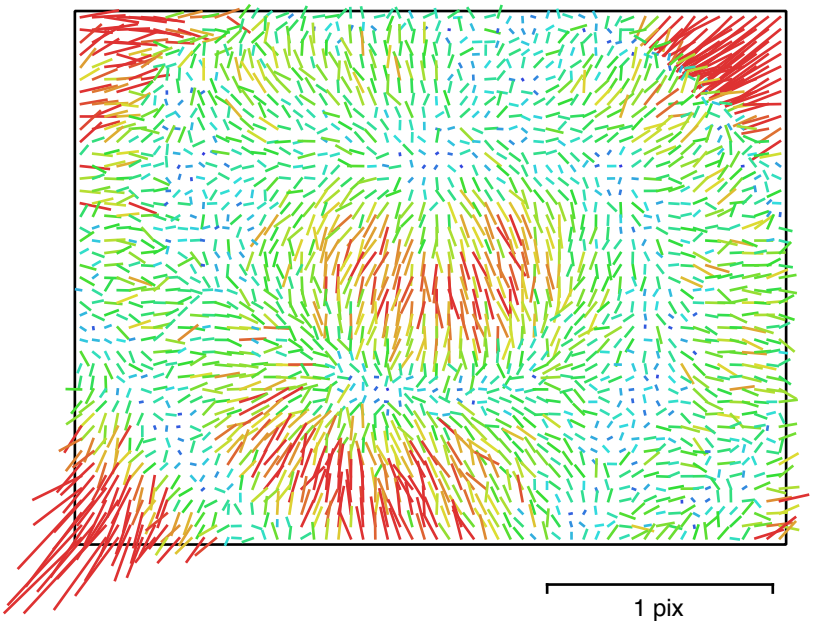


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

747 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**2186.74**	0.26	1.00	-0.39	0.46	-0.13	0.04	0.04	-0.16	-0.03	0.10	0.05
Cx	**8.6626**	0.011		1.00	-0.22	0.04	0.01	-0.01	0.06	0.02	0.79	-0.04
Cy	**-24.3406**	0.0089			1.00	-0.08	0.01	0.03	-0.08	-0.01	0.02	0.75
B1	**-3.87325**	0.0078				1.00	-0.02	0.02	-0.00	0.02	-0.01	0.01
B2	**-0.324765**	0.0064					1.00	0.00	-0.00	-0.00	-0.01	0.00
K1	**0.0122204**	3.6e-05						1.00	-0.93	0.88	0.00	0.01
K2	**-0.053005**	0.00015							1.00	-0.97	-0.03	-0.00
K3	**-0.00396444**	0.00018								1.00	0.02	-0.01
P1	**0.000749085**	1.6e-06									1.00	-0.02
P2	**0.000699618**	1.3e-06										1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

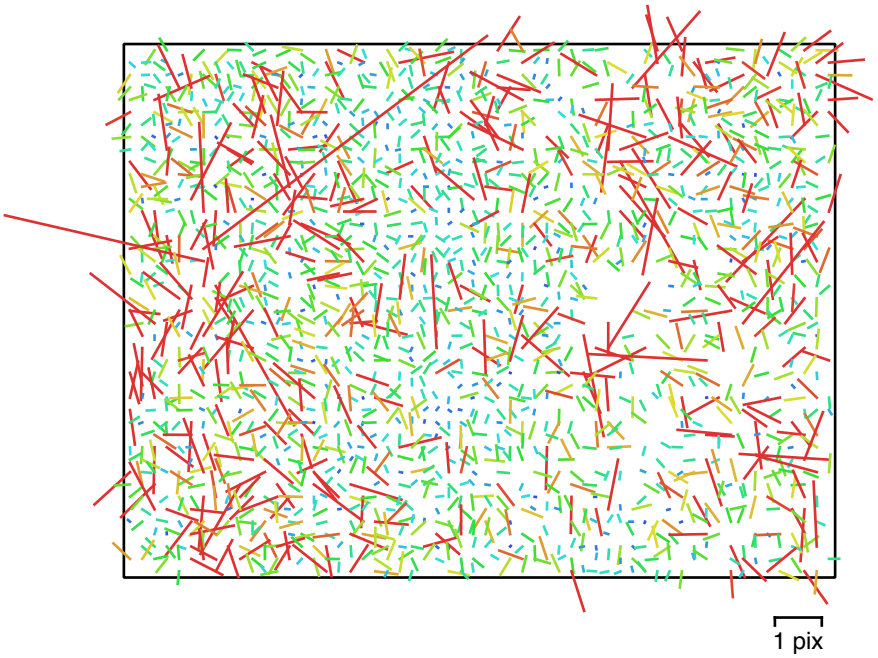


Fig. 6. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

3 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2169.11**	0.41	1.00	-0.23	-0.21	0.16	0.10	-0.14	0.06	-0.06	0.04
Cx	**10.72**	0.2		1.00	-0.02	0.17	-0.05	0.01	0.01	0.82	-0.08
Cy	**1.96671**	0.15			1.00	-0.19	0.10	0.04	-0.01	-0.08	0.67
B1	**-3.89377**	0.035				1.00	0.06	-0.16	0.09	0.06	-0.05
B2	**-1.42828**	0.032					1.00	-0.03	0.02	-0.06	0.01
K1	**0.0116663**	0.00021						1.00	-0.96	0.05	0.01
K2	**-0.0520909**	0.0004							1.00	-0.02	0.01
P1	**0.00022088**	2.7e-05								1.00	-0.05
P2	**-0.000207832**	2.1e-05									1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

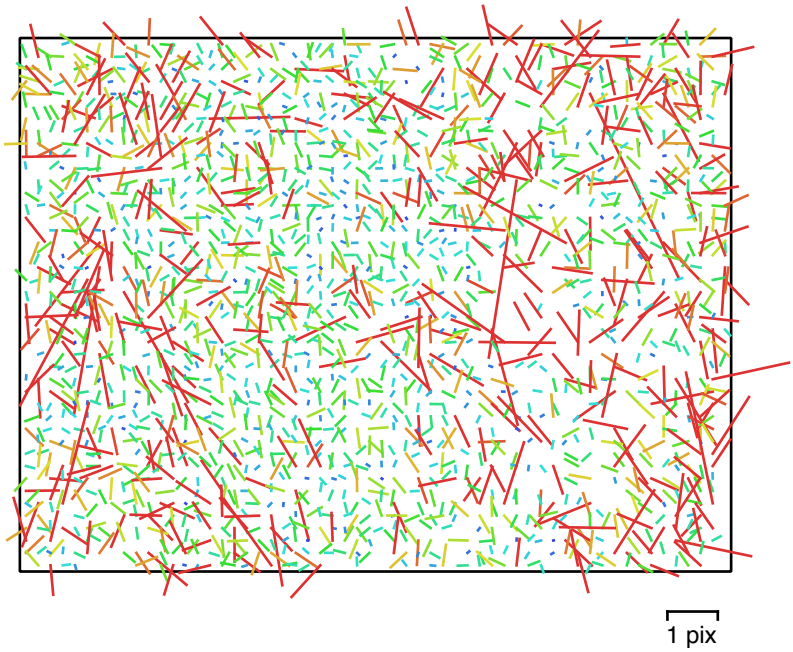


Fig. 7. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

3 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2171.96**	0.41	1.00	-0.25	-0.21	0.16	0.09	-0.13	0.04	-0.06	0.05
Cx	**7.64345**	0.2		1.00	-0.01	0.16	-0.01	-0.00	0.03	0.82	-0.07
Cy	**17.2812**	0.15			1.00	-0.21	0.10	0.03	-0.00	-0.07	0.67
B1	**-4.03793**	0.035				1.00	0.06	-0.16	0.09	0.05	-0.07
B2	**-1.16442**	0.033					1.00	-0.03	0.03	-0.03	0.00
K1	**0.0133543**	0.00022						1.00	-0.96	0.05	0.02
K2	**-0.0560118**	0.0004							1.00	-0.01	0.00
P1	**-0.000202694**	2.7e-05								1.00	-0.04
P2	**0.000497814**	2.1e-05									1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

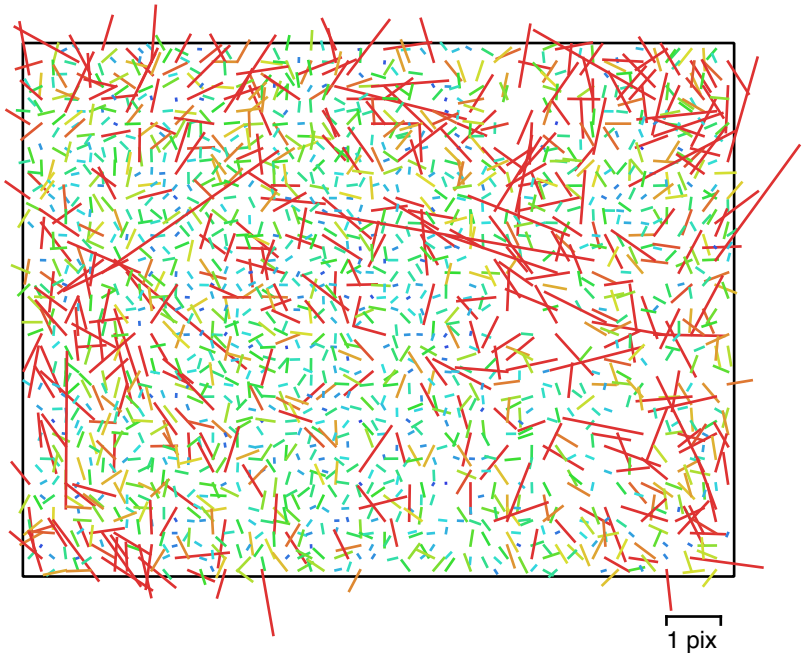


Fig. 8. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

3 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2178.46**	0.41	1.00	-0.26	-0.23	0.15	0.08	-0.12	0.04	-0.06	0.04
Cx	**6.80748**	0.2		1.00	0.00	0.20	-0.02	-0.01	0.03	0.81	-0.06
Cy	**13.5107**	0.16			1.00	-0.20	0.13	0.04	-0.01	-0.07	0.67
B1	**-4.36976**	0.036				1.00	0.06	-0.16	0.09	0.09	-0.05
B2	**-0.720385**	0.033					1.00	-0.05	0.04	-0.04	0.03
K1	**0.0118885**	0.00022						1.00	-0.96	0.05	0.04
K2	**-0.0543552**	0.00041							1.00	-0.02	-0.02
P1	**0.00104991**	2.7e-05								1.00	-0.05
P2	**0.000531507**	2.1e-05									1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

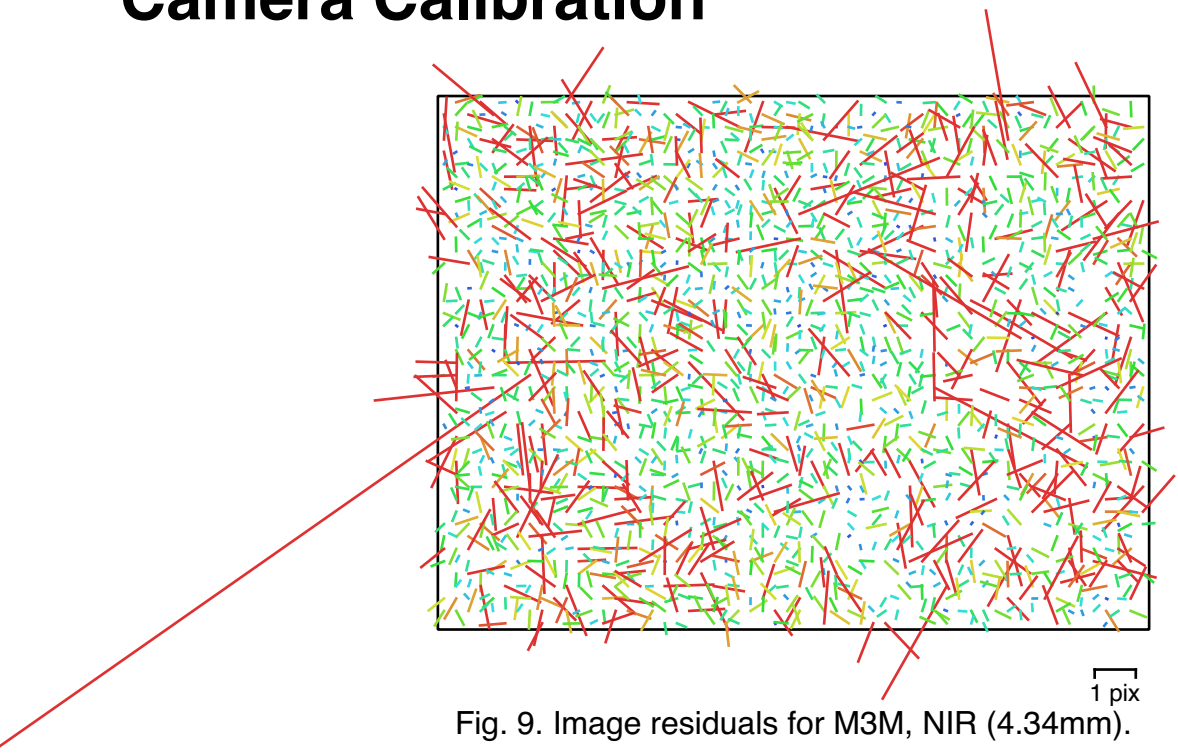


Fig. 9. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

3 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2185.74**	0.41	1.00	-0.26	-0.24	0.17	0.06	-0.14	0.06	-0.04	0.02
Cx	**7.52426**	0.2		1.00	0.06	0.14	-0.02	0.01	0.02	0.81	-0.00
Cy	**-27.1957**	0.16			1.00	-0.14	0.12	0.05	-0.03	-0.02	0.68
B1	**-4.07902**	0.036				1.00	0.07	-0.15	0.09	0.04	0.04
B2	**-0.902459**	0.033					1.00	-0.03	0.02	-0.08	0.02
K1	**0.0129203**	0.00022						1.00	-0.96	0.05	0.05
K2	**-0.0556352**	0.00043							1.00	-0.01	-0.04
P1	**0.000613721**	2.8e-05								1.00	-0.01
P2	**0.000677162**	2.1e-05									1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Locations

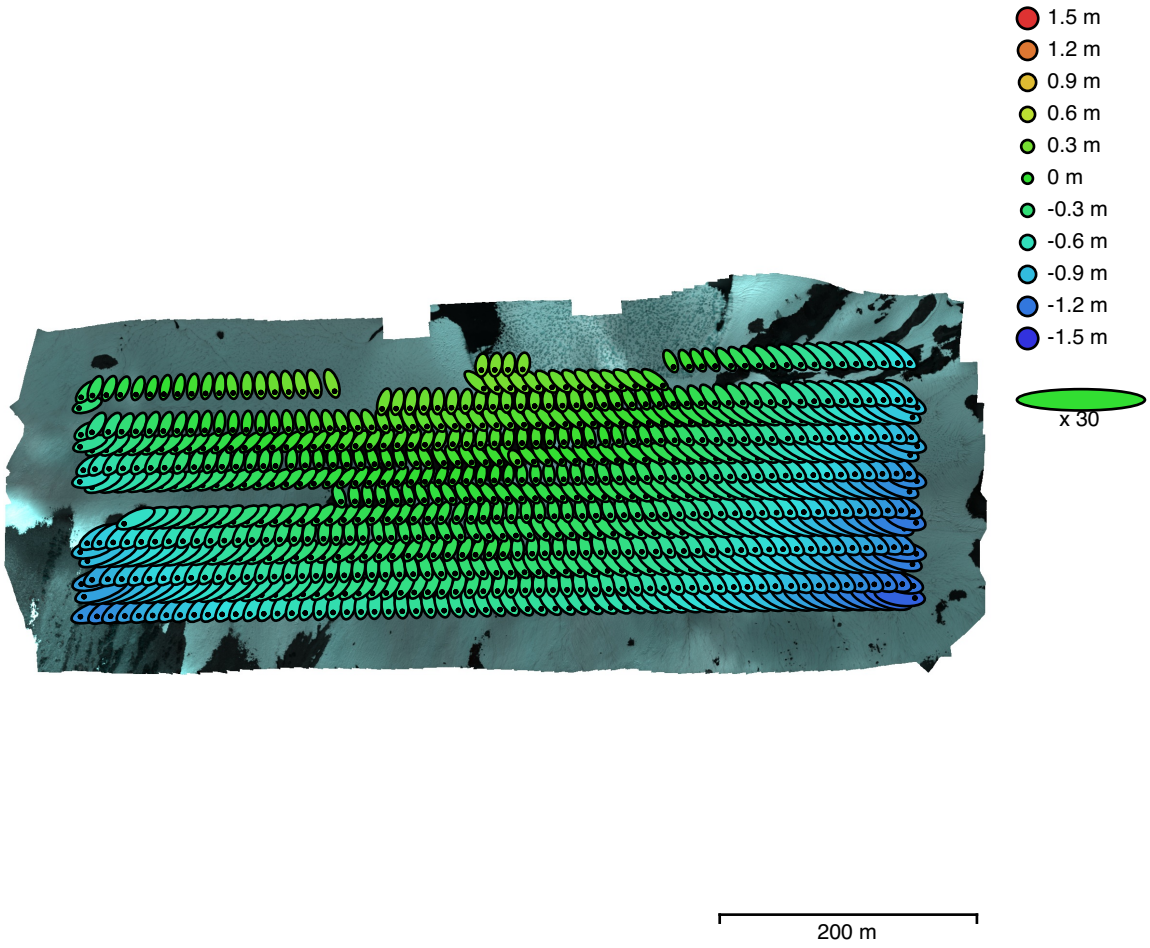


Fig. 10. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
39.1897	32.2093	51.588	50.7274	72.3505

Table 10. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

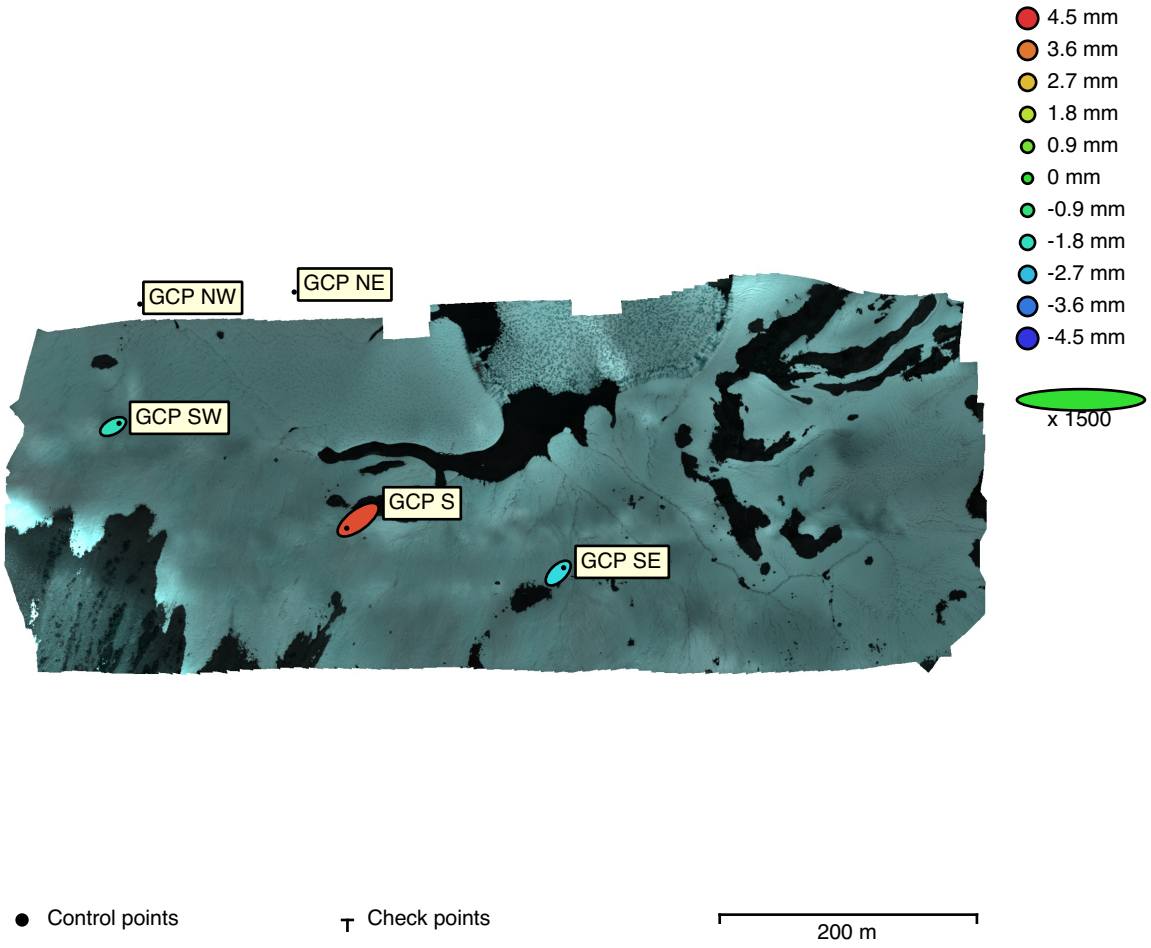


Fig. 11. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
3	0.833877	0.631392	0.292911	1.04595	1.08619

Table 11. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	0.562161	0.552568	-0.231028	0.82142	0.454 (10)
GCP S	-1.17959	-0.88208	0.415367	1.53037	0.617 (10)
GCP SW	0.615296	0.335513	-0.177446	0.722942	0.431 (10)
GCP NW					
GCP NE					
Total	**0.833877**	**0.631392**	**0.292911**	**1.08619**	**0.507**

Table 12. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

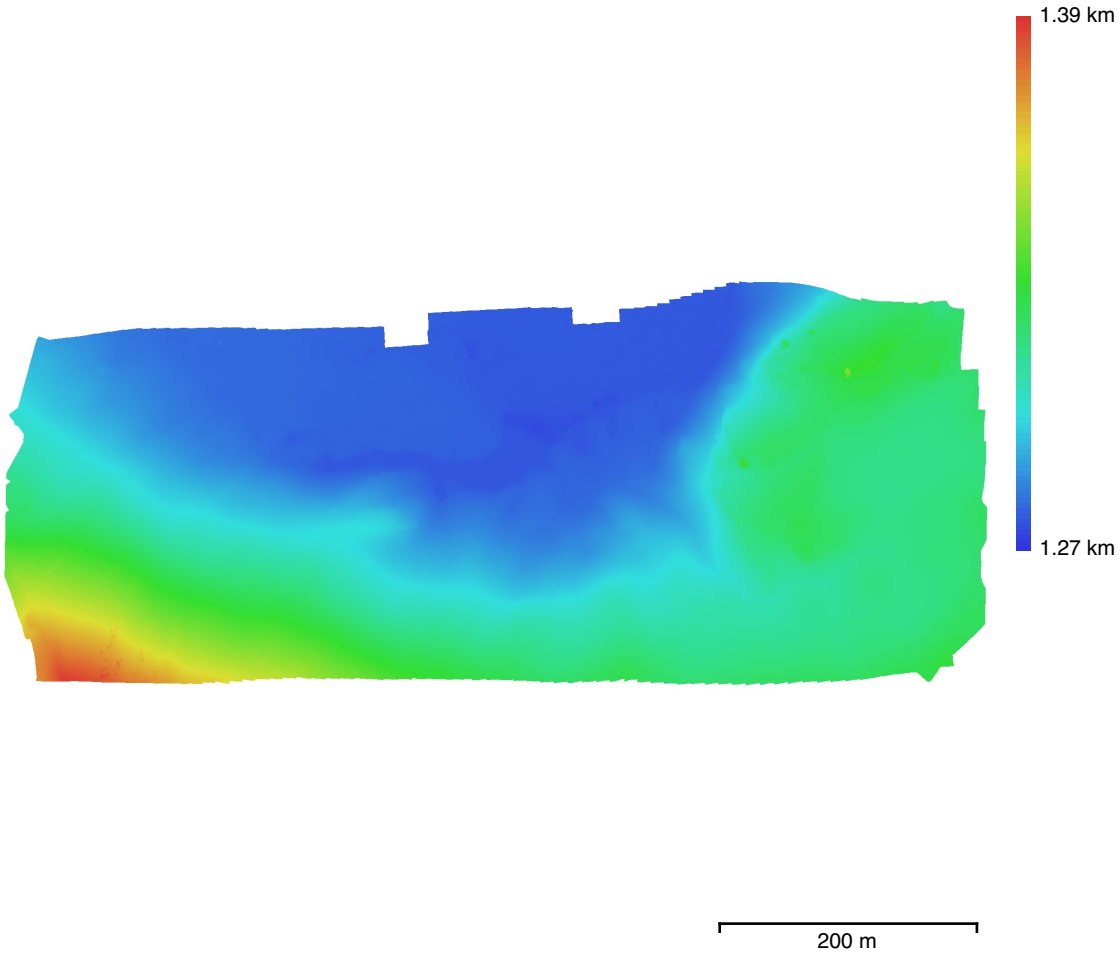


Fig. 12. Reconstructed digital elevation model.

Resolution:	8.45 cm/pix
Point density:	140 points/m²

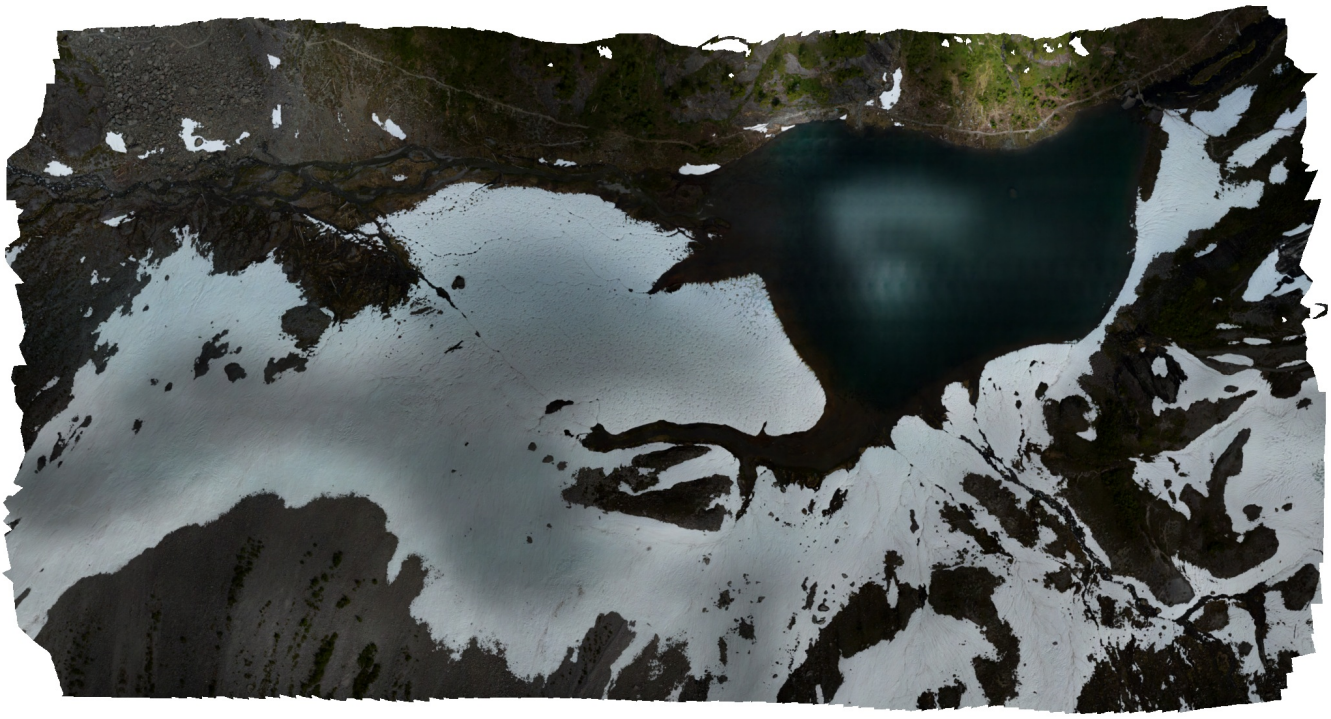
Processing Parameters

General	
Cameras	3000
Aligned cameras	3000
Markers	5
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	163,258 of 360,584
RMS reprojection error	0.177475 (0.584936 pix)
Max reprojection error	0.882156 (46.0978 pix)
Mean key point size	2.8587 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	56.1962
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	38 minutes 5 seconds
Matching memory usage	5.85 GB
Alignment time	38 minutes 4 seconds
Alignment memory usage	1.12 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	1 minutes 23 seconds
Date created	2024:01:24 18:44:07
Software version	2.1.0.17530
File size	932.01 MB
Depth Maps	
Count	750
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	26 minutes 34 seconds
Memory usage	2.24 GB
Date created	2024:01:24 20:20:23
Software version	2.1.0.17530
File size	1.38 GB
Point Cloud	
Points	32,033,406
Point attributes	
Color	4 bands, uint16
Normal	

Point classes	
Created (never classified)	32,033,406
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	26 minutes 34 seconds
Memory usage	2.24 GB
Point cloud generation parameters	
Processing time	27 minutes 7 seconds
Memory usage	2.67 GB
Date created	2024:01:24 20:47:31
Software version	2.1.0.17530
File size	637.44 MB
DEM	
Size	9,019 x 3,787
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	39 seconds
Memory usage	16.00 KB
Date created	2024:01:24 20:49:14
Software version	2.1.0.17530
File size	100.42 MB
Orthomosaic	
Size	18,037 x 7,573
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	8 minutes 20 seconds
Memory usage	1.64 GB
Date created	2024:01:24 21:04:58
Software version	2.1.0.17530
File size	49.43 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - Bagley M3M RGB 2023-07-05

Processing Report
26 January 2024



Survey Data

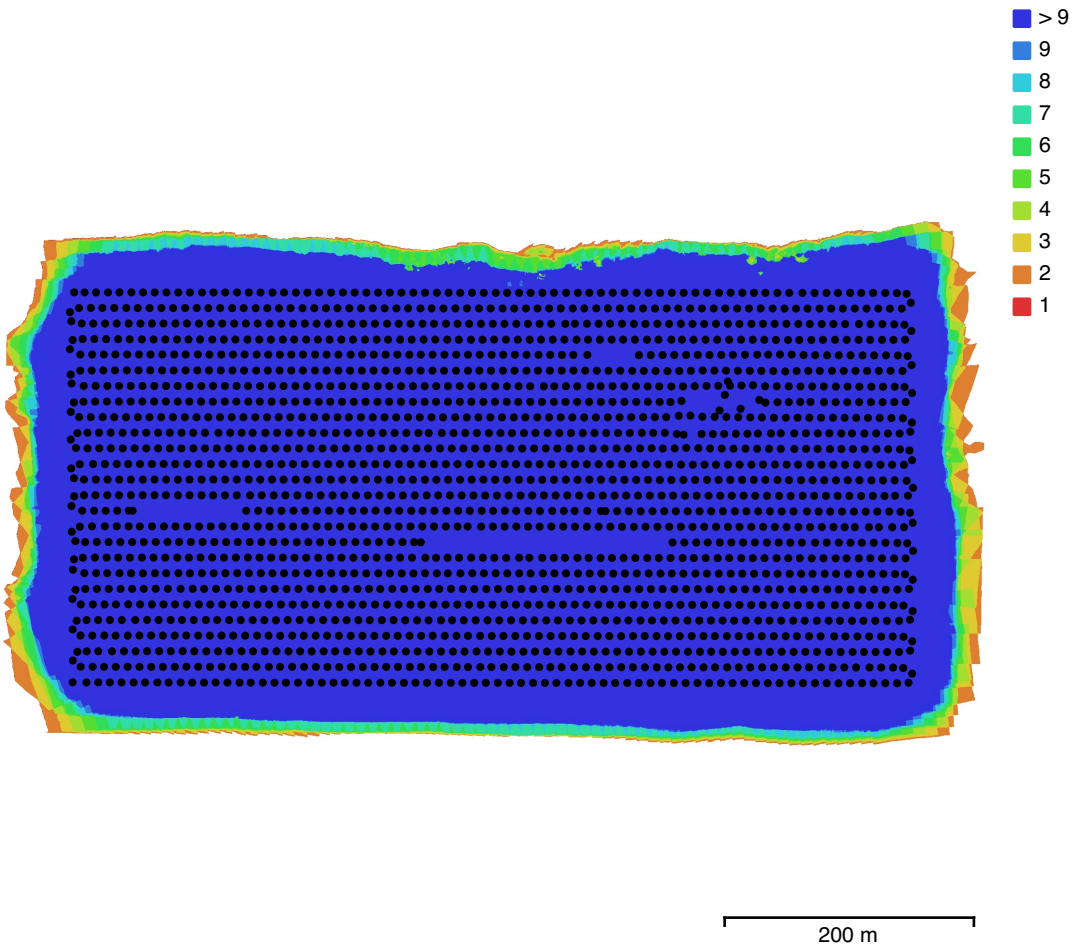


Fig. 1. Camera locations and image overlap.

Number of images:	1,856	Camera stations:	1,855
Flying altitude:	76.5 m	Tie points:	248,165
Ground resolution:	2.07 cm/pix	Projections:	3,349,077
Coverage area:	0.305 km²	Reprojection error:	0.868 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

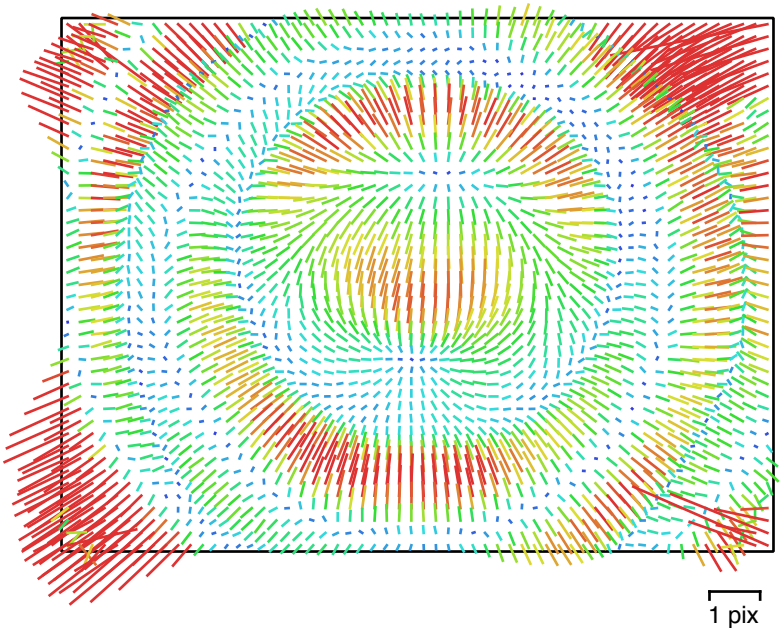


Fig. 2. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

1854 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3697.25**	0.35	1.00	-0.16	0.16	-0.05	0.04	0.07	-0.60	0.69	-0.64	0.16	-0.18
Cx	**31.9523**	0.008		1.00	0.04	0.04	0.01	-0.01	0.10	-0.12	0.11	0.77	0.13
Cy	**-22.7264**	0.007			1.00	-0.01	0.02	0.02	-0.10	0.11	-0.10	0.10	0.71
B1	**-0.489997**	0.0053				1.00	-0.00	0.01	0.02	-0.02	0.02	0.02	0.02
B2	**0.192803**	0.0049					1.00	0.00	-0.02	0.03	-0.03	0.00	0.01
K1	**0.00909012**	2.3e-05						1.00	-0.79	0.70	-0.69	0.02	-0.01
K2	**-0.225989**	0.00014							1.00	-0.99	0.97	-0.10	0.11
K3	**0.375679**	0.00031								1.00	-0.99	0.12	-0.13
K4	**-0.166099**	0.0002									1.00	-0.11	0.12
P1	**0.000745504**	6.2e-07										1.00	0.08
P2	**-0.000619628**	5.3e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

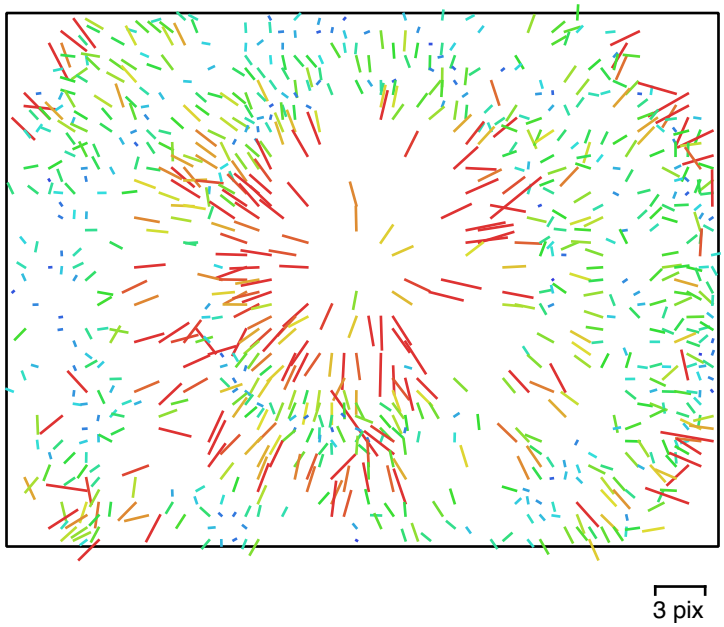


Fig. 3. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

2 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	K1	K2	P1	P2
F	**3717.77**	1.1	1.00	0.55	0.41	-0.02	0.14	-0.06	0.21
Cx	**28.1388**	0.46		1.00	0.27	0.09	-0.02	0.61	0.18
Cy	**-16.9515**	0.38			1.00	0.09	0.01	0.02	0.69
K1	**-0.0566981**	0.00023				1.00	-0.97	0.09	0.02
K2	**0.034455**	0.00031					1.00	-0.10	0.02
P1	**0.000401971**	2.8e-05						1.00	0.05
P2	**-0.00032478**	2.3e-05							1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Locations

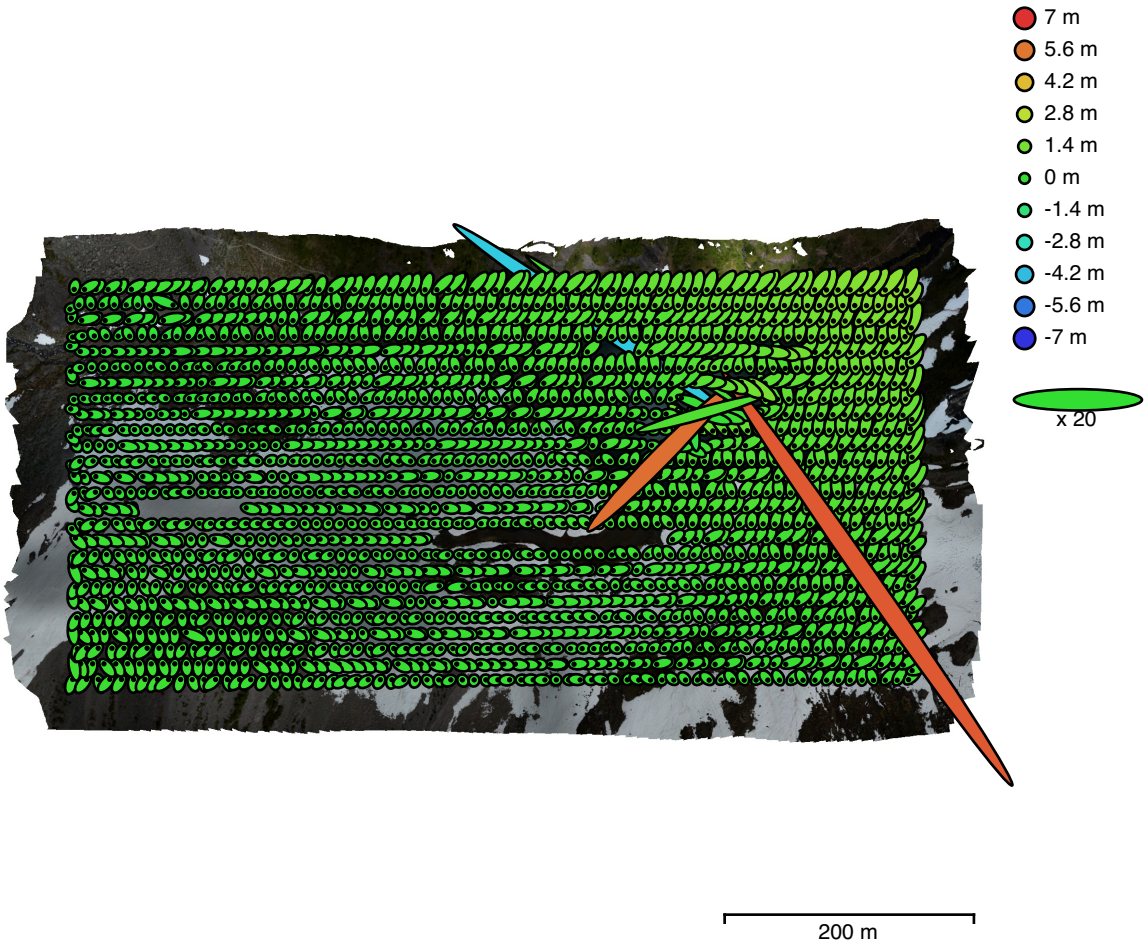


Fig. 4. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
51.3367	53.1071	52.0371	73.8636	90.3531

Table 4. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

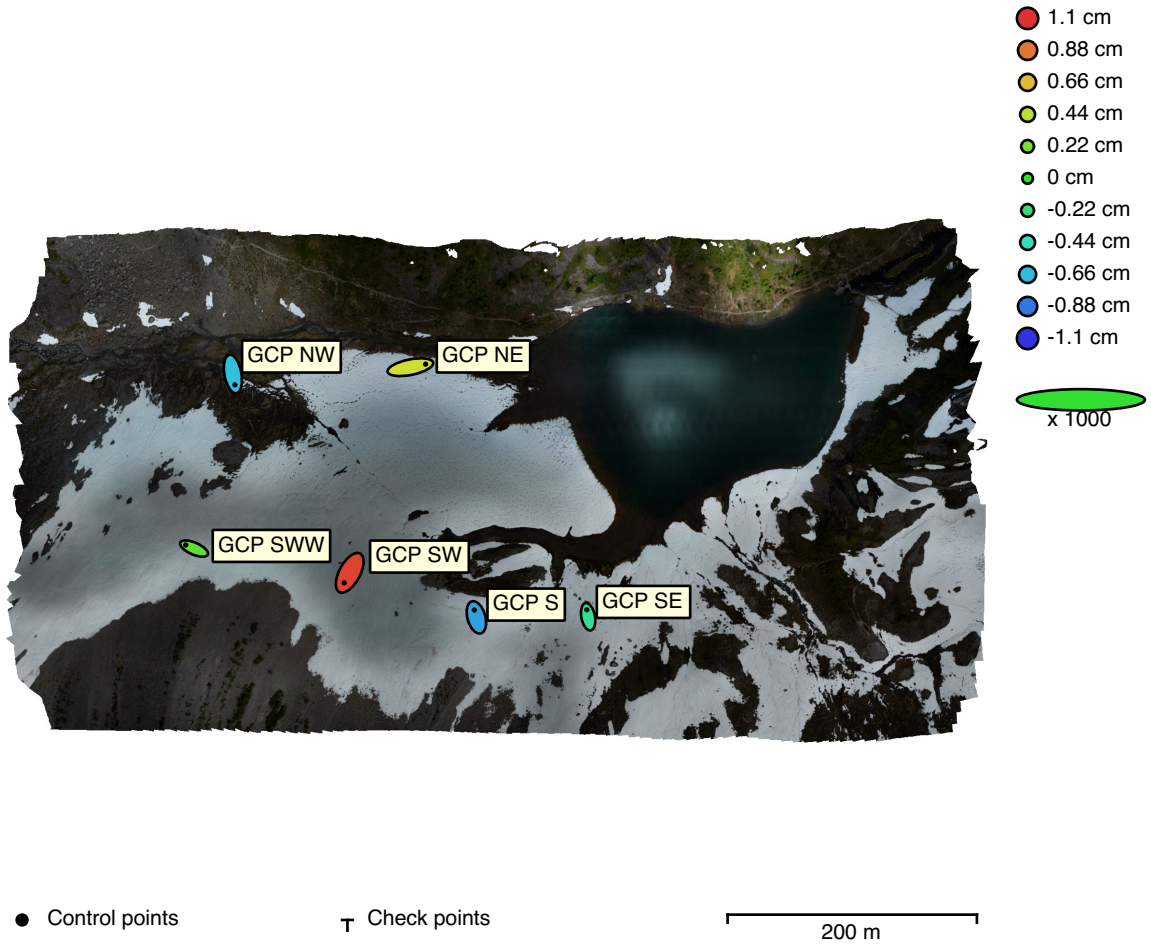


Fig. 5. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	1.20745	1.21713	0.636594	1.71445	1.82883

Table 5. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	-0.216975	1.11931	-0.304776	1.18018	0.411 (10)
GCP S	-0.334421	1.18226	-0.74668	1.43775	0.535 (10)
GCP SW	-0.876197	-1.61768	1.04621	2.1164	0.604 (10)
GCP SWW	-1.32748	0.57975	0.136942	1.45501	0.522 (10)
GCP NW	0.32175	-1.74542	-0.64628	1.88883	0.982 (10)
GCP NE	2.44035	0.488204	0.500098	2.53846	0.848 (10)
Total	**1.20745**	**1.21713**	**0.636594**	**1.82883**	**0.680**

Table 6. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

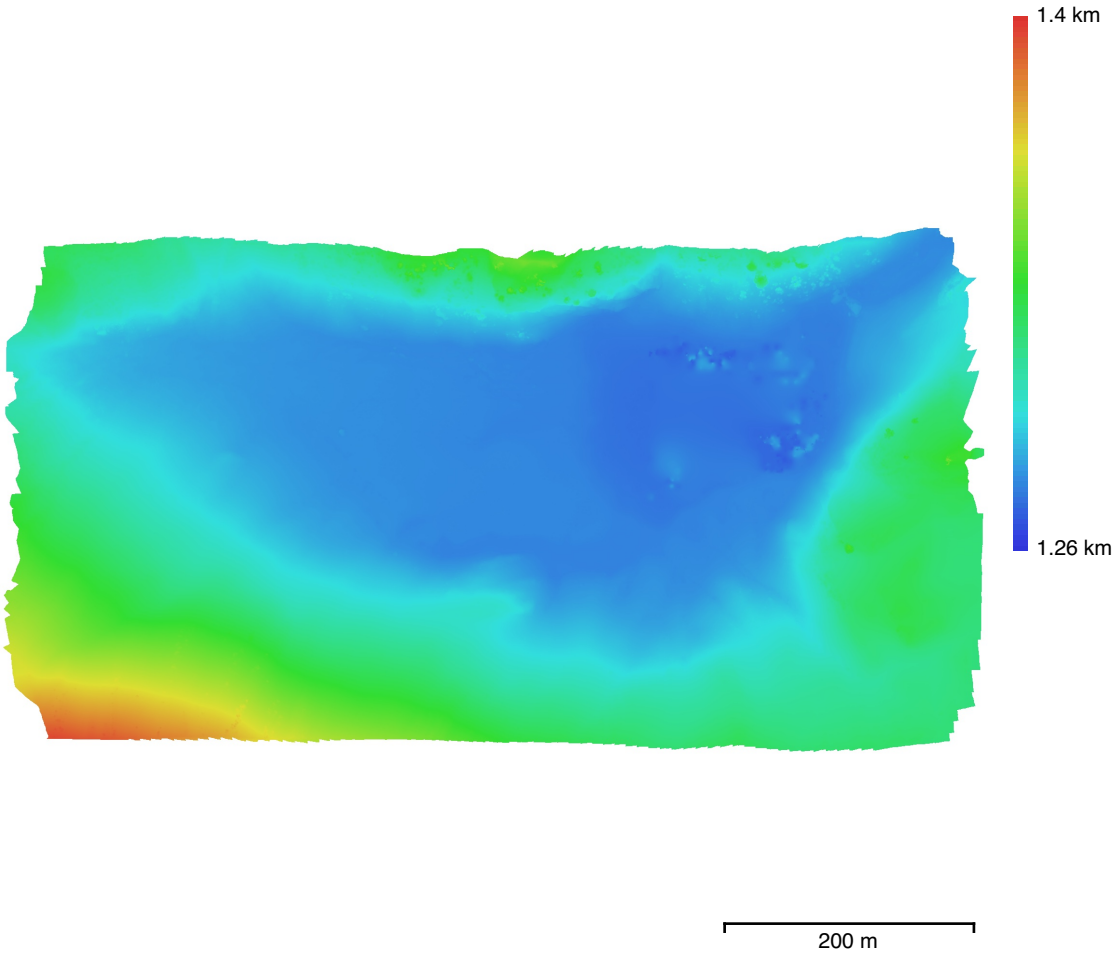


Fig. 6. Reconstructed digital elevation model.

Resolution:	4.15 cm/pix
Point density:	582 points/m²

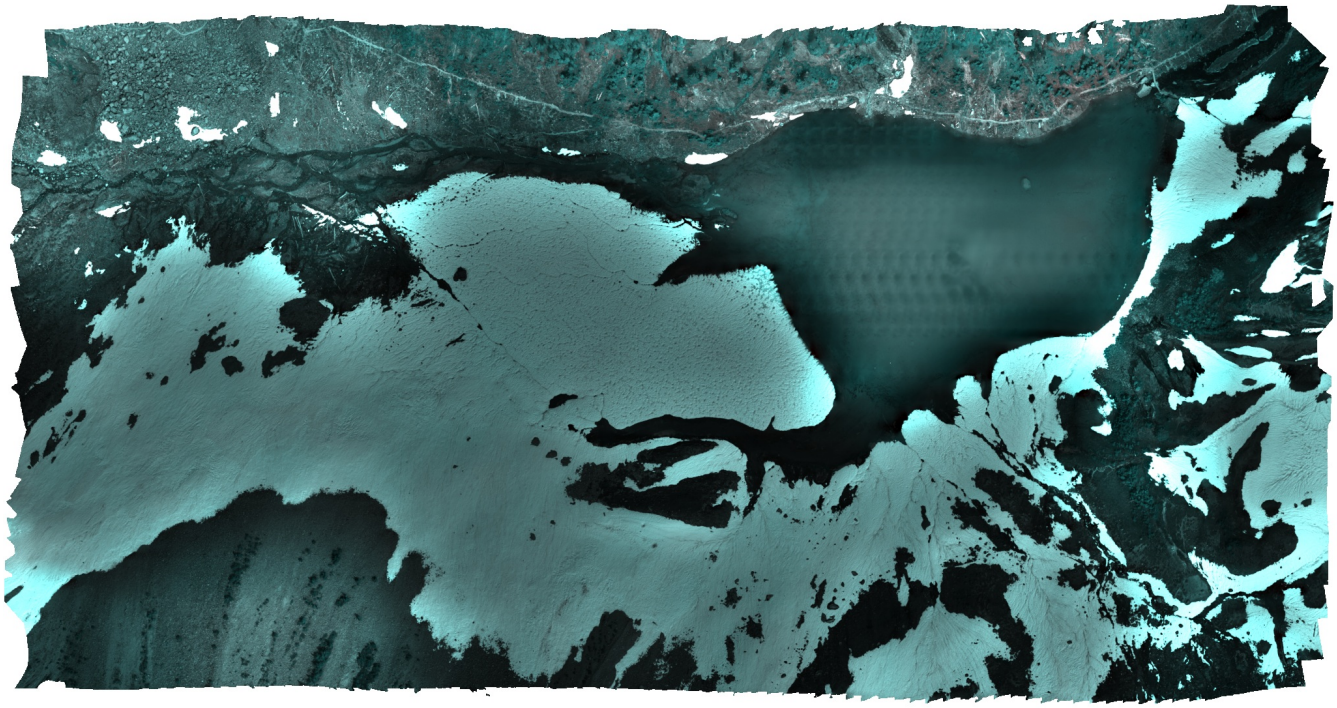
Processing Parameters

General	
Cameras	1856
Aligned cameras	1855
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	248,165 of 438,447
RMS reprojection error	0.208832 (0.868014 pix)
Max reprojection error	2.79977 (50.6281 pix)
Mean key point size	3.876 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	24.9954
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	19 minutes 17 seconds
Matching memory usage	3.44 GB
Alignment time	1 hours 5 minutes
Alignment memory usage	1.40 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	2 minutes 38 seconds
Date created	2024:01:25 12:12:00
Software version	2.1.0.17530
File size	508.60 MB
Depth Maps	
Count	1845
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	20 hours 11 minutes
Memory usage	5.60 GB
Date created	2024:01:26 09:39:18
Software version	2.1.0.17530
File size	13.16 GB
Point Cloud	
Points	217,705,960
Point attributes	
Color	3 bands, uint8
Normal	

Point classes	
Created (never classified)	217,705,960
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	20 hours 11 minutes
Memory usage	5.60 GB
Point cloud generation parameters	
Processing time	7 hours 17 minutes
Memory usage	7.77 GB
Date created	2024:01:26 16:56:36
Software version	2.1.0.17530
File size	2.79 GB
DEM	
Size	18,925 x 10,172
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	1 minutes 59 seconds
Memory usage	60.41 MB
Date created	2024:01:26 17:13:56
Software version	2.1.0.17530
File size	579.50 MB
Orthomosaic	
Size	37,850 x 20,344
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	20 minutes 55 seconds
Memory usage	1.34 GB
Date created	2024:01:26 17:31:03
Software version	2.1.0.17530
File size	28.16 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - Bagley M3M MS 2023-07-05

Processing Report
27 January 2024



Survey Data

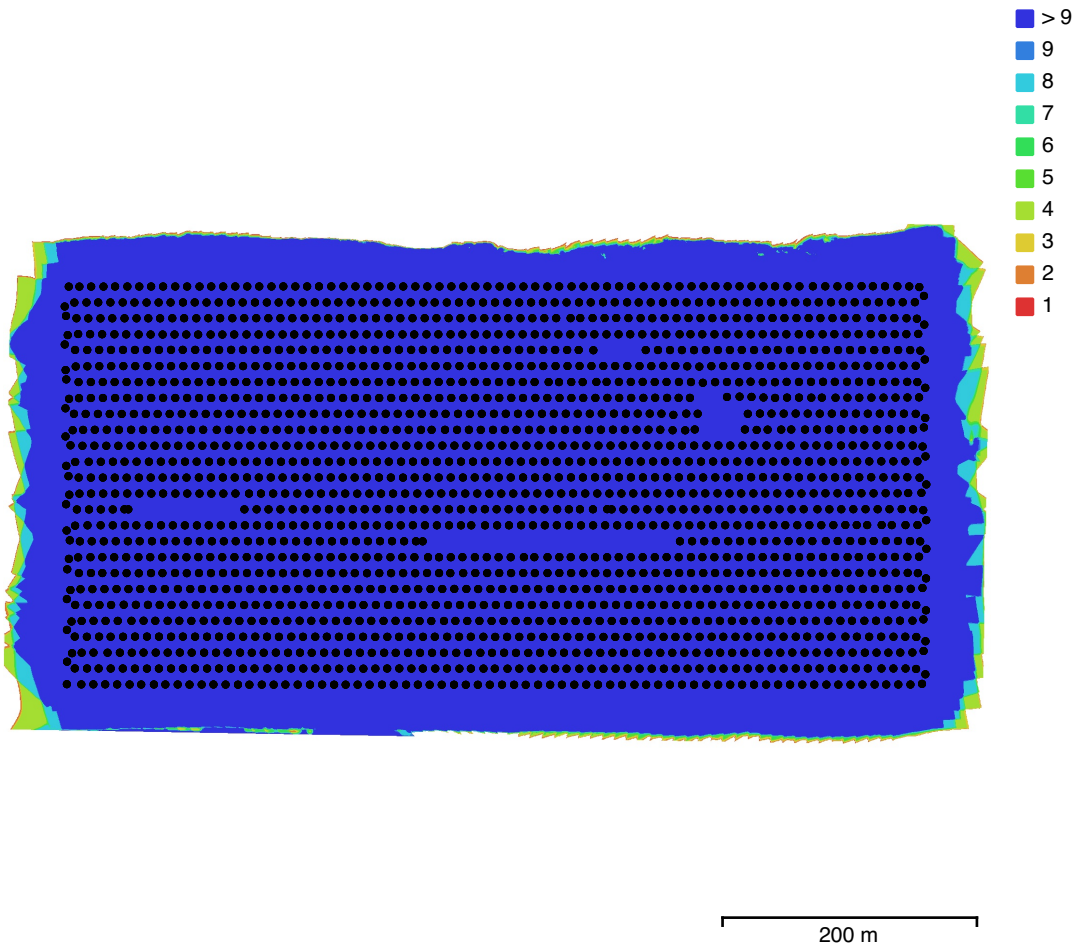


Fig. 1. Camera locations and image overlap.

Number of images:	7,424	Camera stations:	7,392
Flying altitude:	76.7 m	Tie points:	668,404
Ground resolution:	3.52 cm/pix	Projections:	11,882,968
Coverage area:	0.297 km²	Reprojection error:	0.466 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

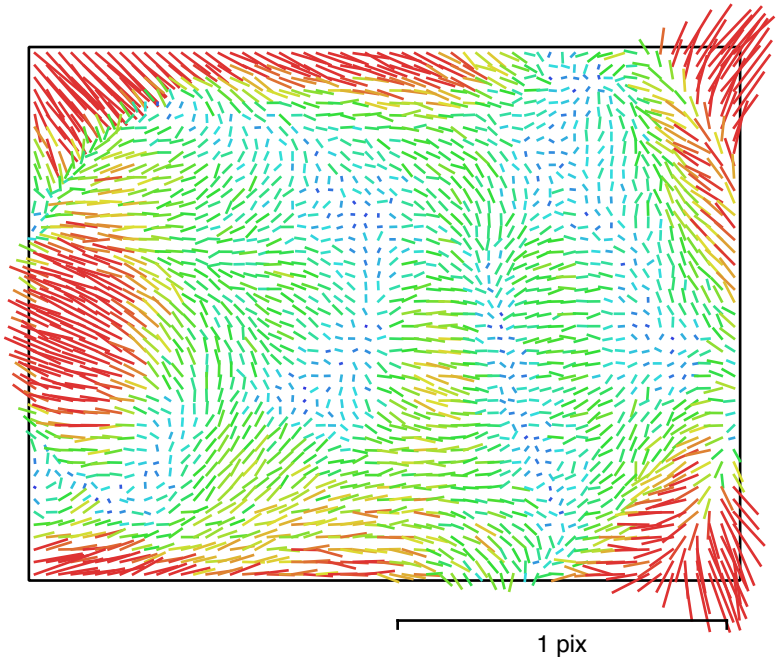


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

1854 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2172.03		
Cx:	11.0896	B1:	-4.17769
Cy:	4.20524	B2:	-0.83062
K1:	0.00892839	P1:	0.000247917
K2:	-0.0412624	P2:	-0.000200024
K3:	-0.0147891	P3:	0
K4:	0	P4:	0

Camera Calibration

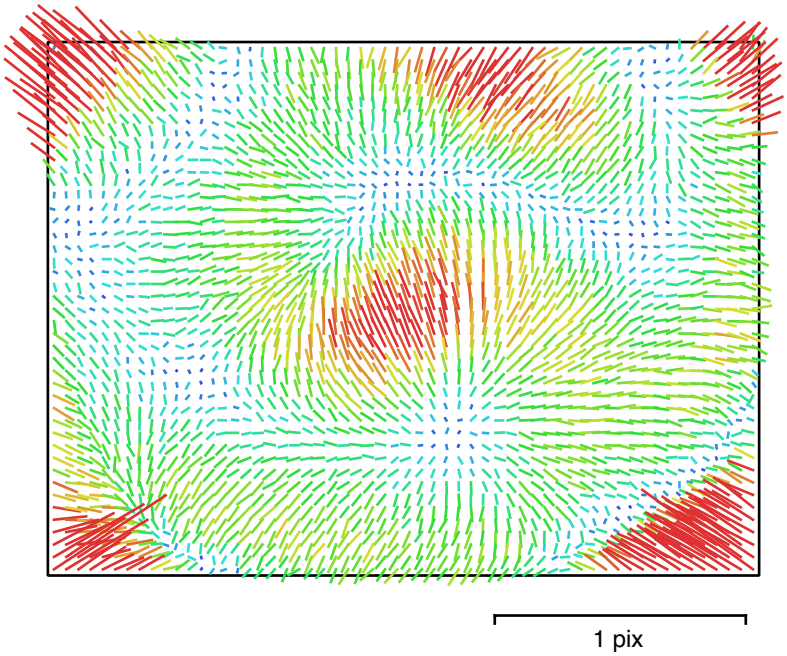


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

1854 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2174.46		
Cx:	7.63064	B1:	-4.35414
Cy:	19.261	B2:	-0.380545
K1:	0.0152061	P1:	-0.00022247
K2:	-0.0785702	P2:	0.000462368
K3:	0.0767478	P3:	0
K4:	-0.0833162	P4:	0

Camera Calibration

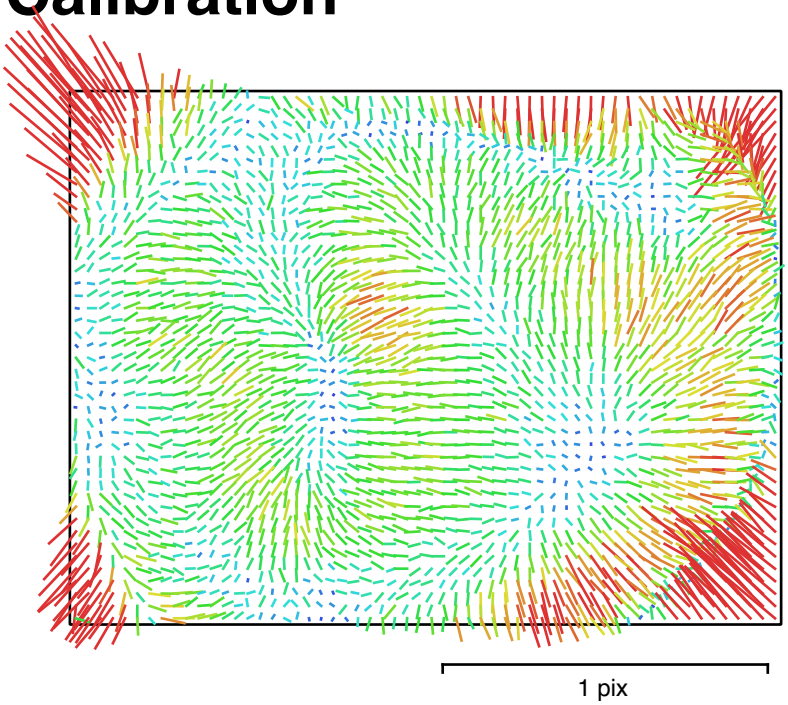


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

1854 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2180.89		
Cx:	6.93544	B1:	-4.54301
Cy:	15.5178	B2:	0.107306
K1:	0.0146501	P1:	0.00109066
K2:	-0.0809066	P2:	0.000490092
K3:	0.0811343	P3:	0
K4:	-0.0819735	P4:	0

Camera Calibration

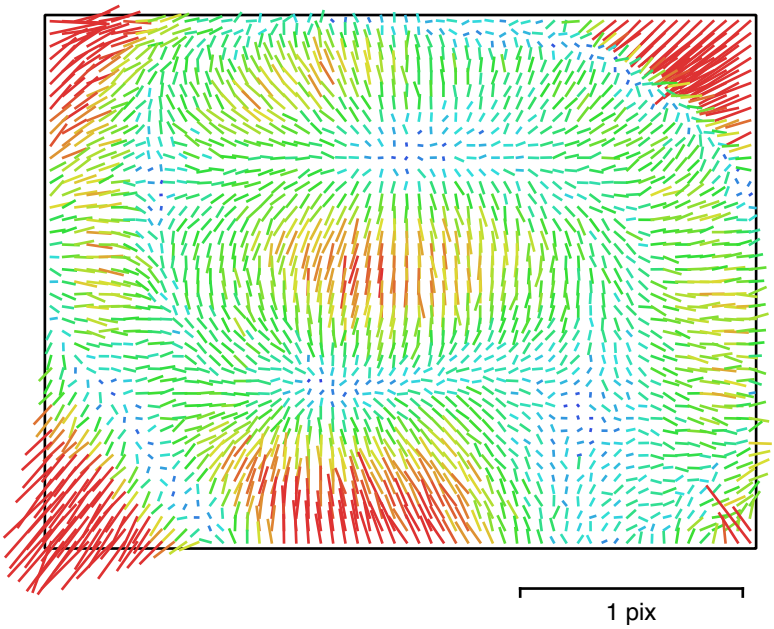


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

1854 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2188.1		
Cx:	8.52802	B1:	-4.18862
Cy:	-24.6297	B2:	-0.0575839
K1:	0.0152891	P1:	0.00070527
K2:	-0.0790897	P2:	0.000672561
K3:	0.0697801	P3:	0
K4:	-0.0700438	P4:	0

Camera Calibration

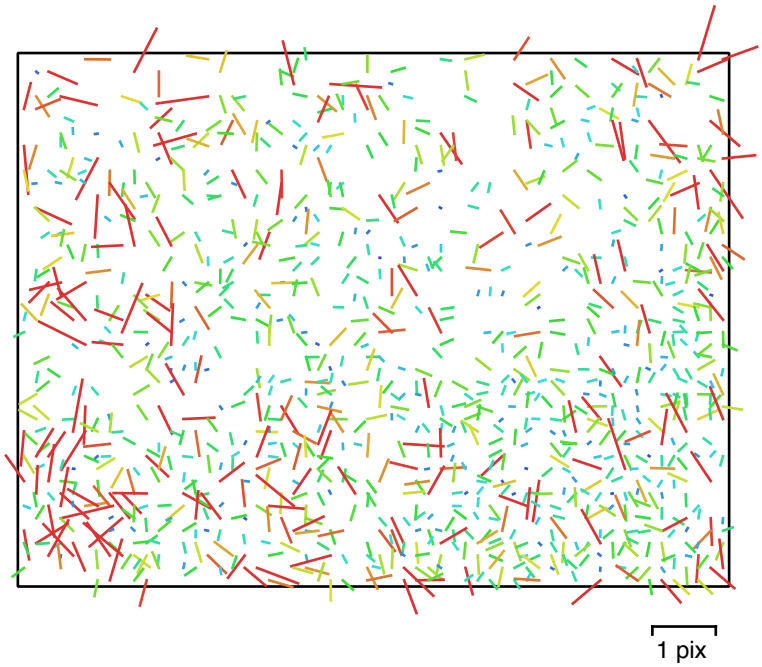


Fig. 6. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2172.82		
Cx:	12.5752	B1:	-4.20422
Cy:	4.53557	B2:	-0.721247
K1:	0.0115547	P1:	0.000457495
K2:	-0.0531126	P2:	-0.000197192
K3:	0	P3:	0
K4:	0	P4:	0

Camera Calibration

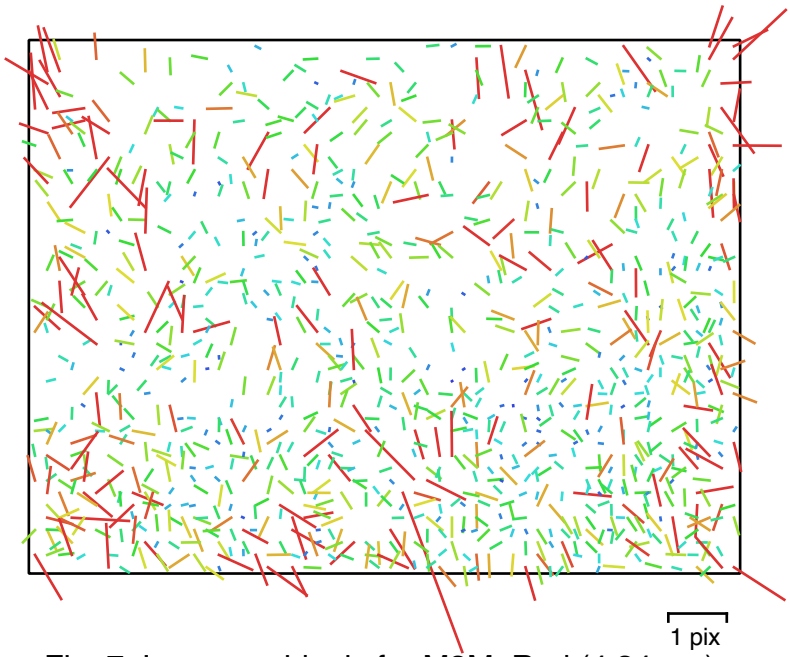


Fig. 7. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2175.58		
Cx:	8.85741	B1:	-4.29358
Cy:	19.365	B2:	0
K1:	0.0126628	P1:	-5.79069e-05
K2:	-0.0550112	P2:	0.000454342
K3:	0	P3:	0
K4:	0	P4:	0

Camera Calibration

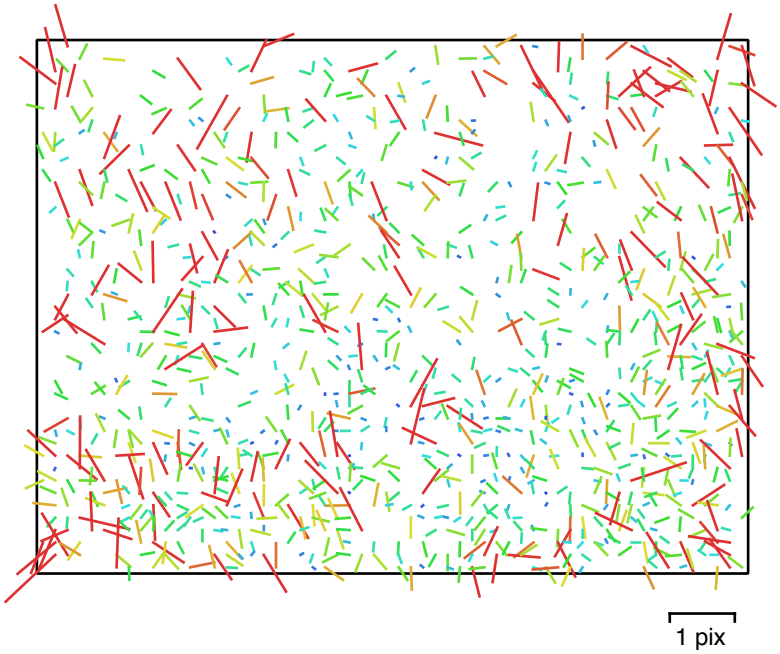


Fig. 8. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2182.37		
Cx:	8.03368	B1:	-4.44621
Cy:	15.803	B2:	0
K1:	0.0102509	P1:	0.00124221
K2:	-0.0518186	P2:	0.000510775
K3:	0	P3:	0
K4:	0	P4:	0

Camera Calibration

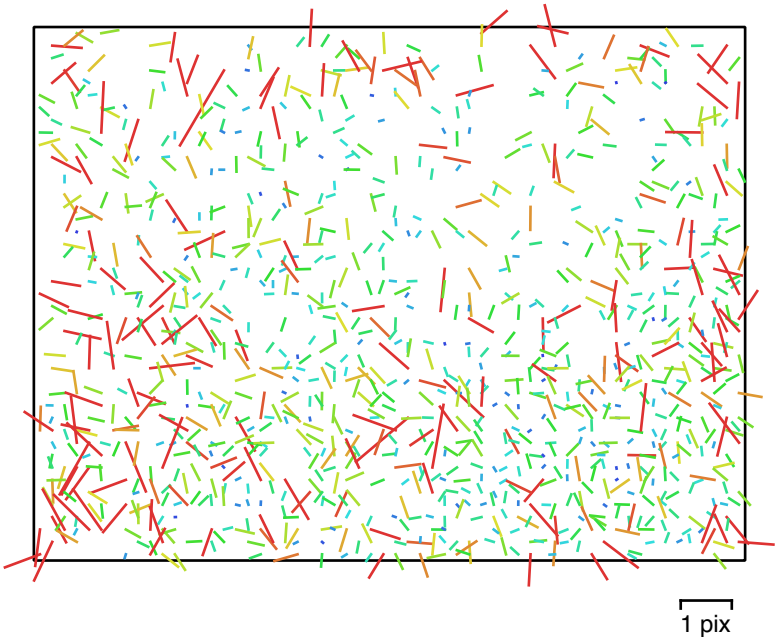


Fig. 9. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2189.77		
Cx:	9.90265	B1:	-4.26435
Cy:	-24.5268	B2:	0
K1:	0.01174	P1:	0.000883935
K2:	-0.0551373	P2:	0.000644077
K3:	0	P3:	0
K4:	0	P4:	0

Camera Locations

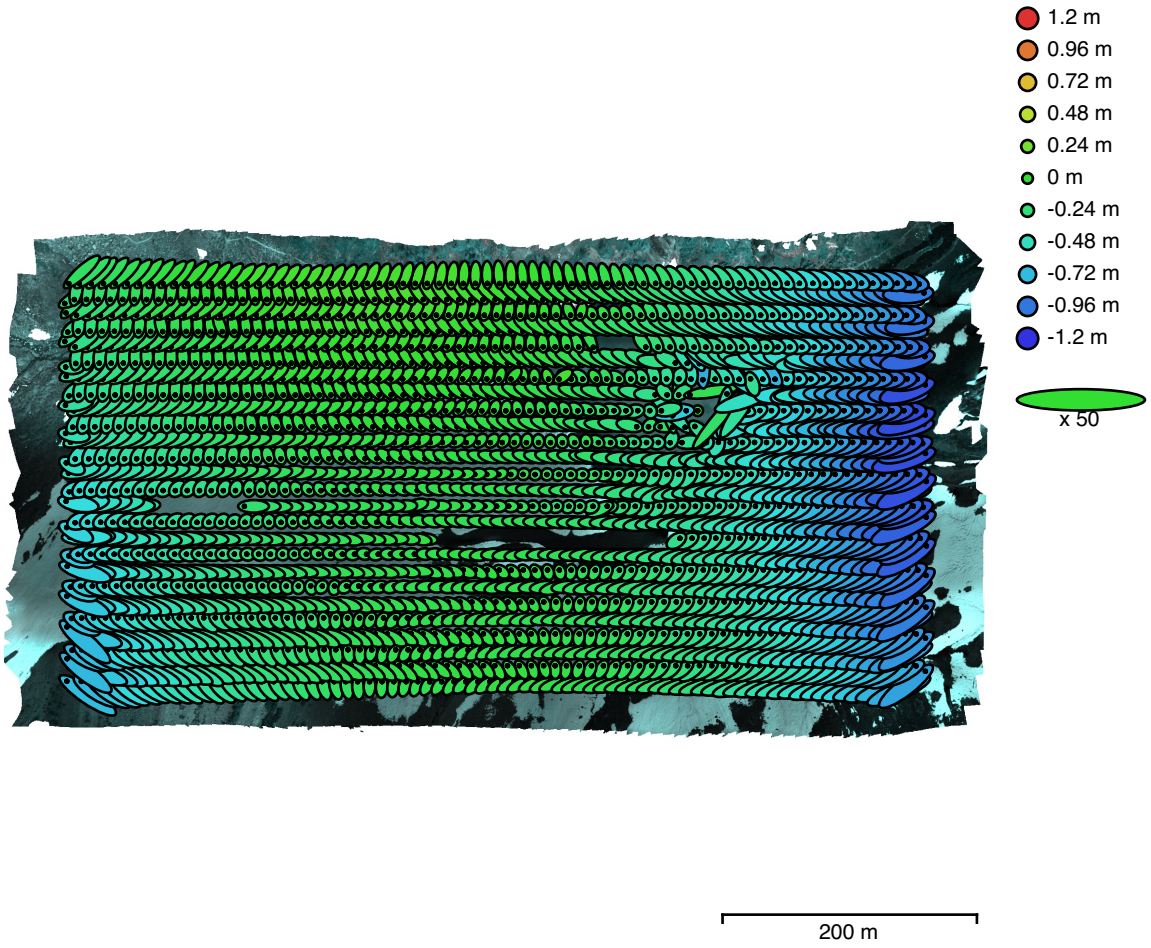


Fig. 10. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
30.2648	14.5844	40.5401	33.5956	52.6513

Table 2. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

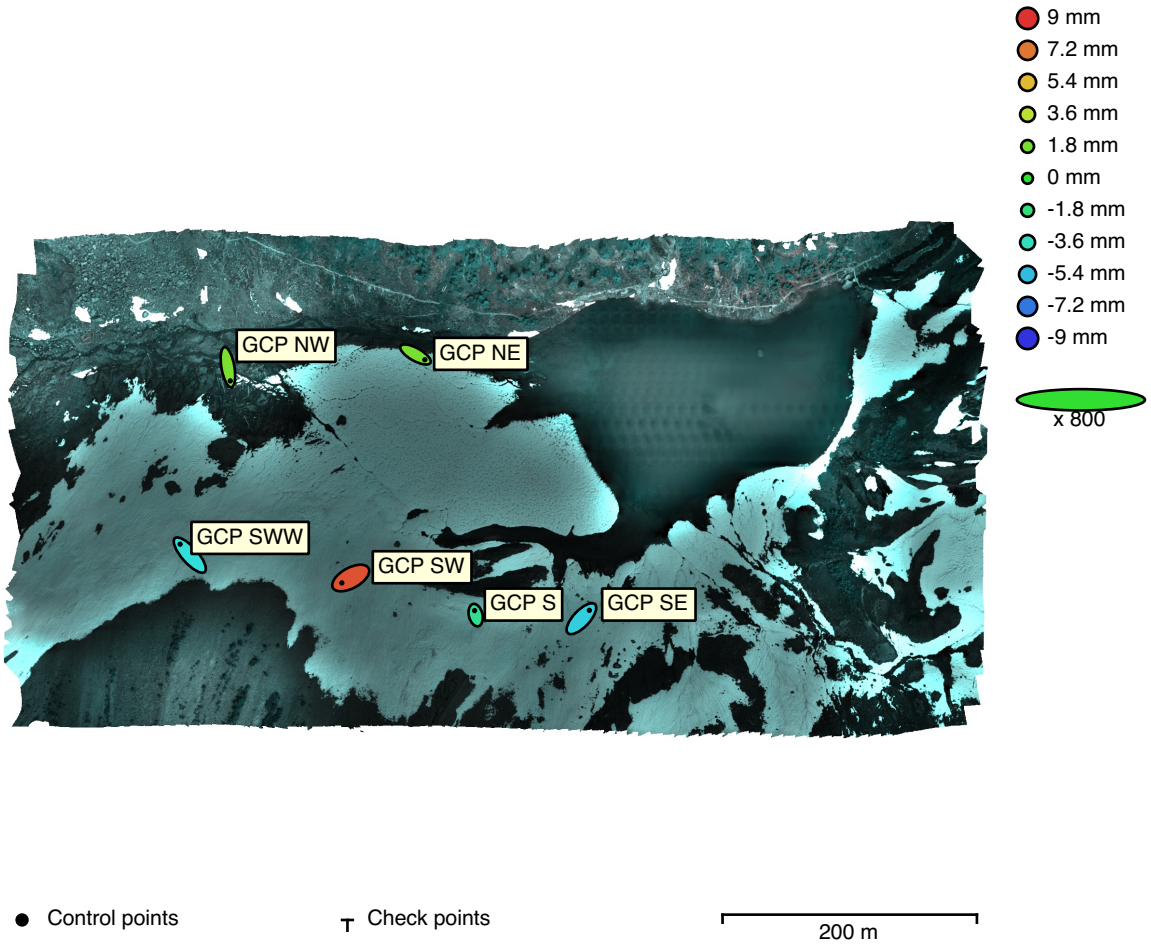


Fig. 11. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	1.45678	1.69741	0.455053	2.23683	2.28265

Table 3. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	1.55638	1.64994	-0.492183	2.32096	0.828 (10)
GCP S	-0.21454	0.88631	-0.249401	0.945396	0.340 (10)
GCP SW	-1.74948	-0.965442	0.820917	2.16024	0.935 (10)
GCP SWW	-1.8994	2.14158	-0.440188	2.89617	1.185 (10)
GCP NW	0.464426	-2.68389	0.194865	2.73074	0.855 (12)
GCP NE	1.83871	-1.0284	0.179863	2.11443	0.974 (10)
Total	**1.45678**	**1.69741**	**0.455053**	**2.28265**	**0.889**

Table 4. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

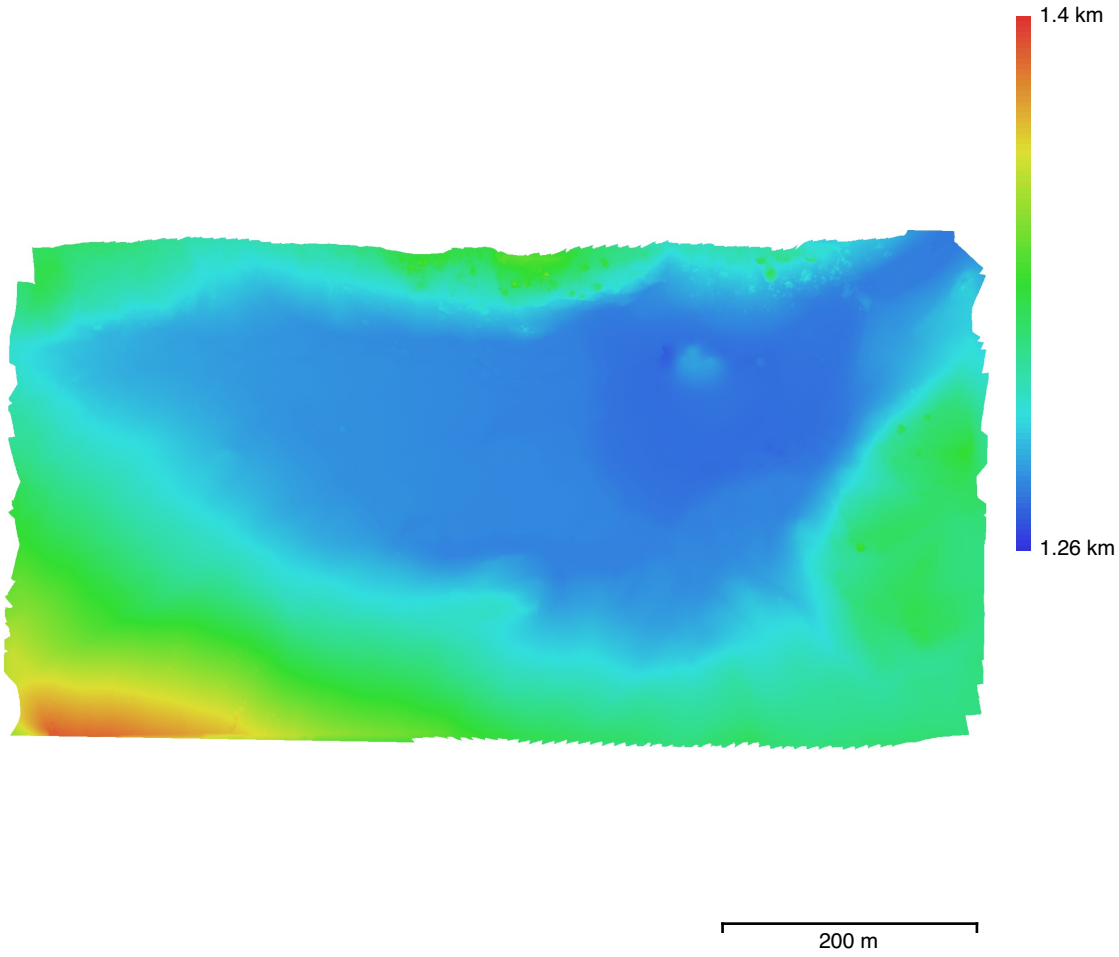


Fig. 12. Reconstructed digital elevation model.

Resolution:	7.05 cm/pix
Point density:	201 points/m²

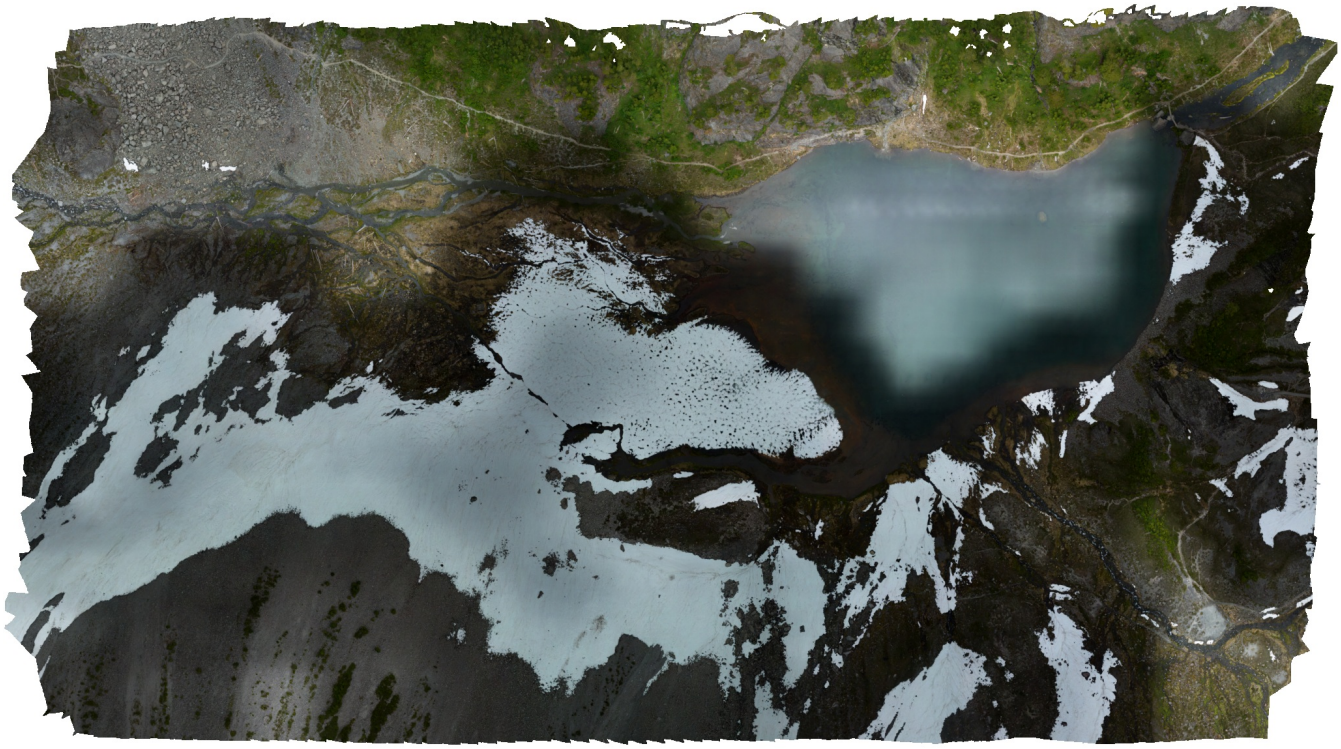
Processing Parameters

General	
Cameras	7424
Aligned cameras	7392
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	668,404 of 1,234,431
RMS reprojection error	0.140923 (0.466059 pix)
Max reprojection error	0.913343 (32.1297 pix)
Mean key point size	2.81215 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	40.7811
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	1 hours 14 minutes
Matching memory usage	6.84 GB
Alignment time	2 hours 56 minutes
Alignment memory usage	3.32 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	5 minutes 19 seconds
Date created	2024:01:26 19:25:40
Software version	2.1.0.17530
File size	2.27 GB
Depth Maps	
Count	1831
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 2 minutes
Memory usage	1.21 GB
Date created	2024:01:27 00:13:33
Software version	2.1.0.17530
File size	2.90 GB
Point Cloud	
Points	70,709,803
Point attributes	
Color	4 bands, uint16
Normal	

Point classes	
Created (never classified)	70,709,803
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 2 minutes
Memory usage	1.21 GB
Point cloud generation parameters	
Processing time	58 minutes 30 seconds
Memory usage	6.35 GB
Date created	2024:01:27 01:12:04
Software version	2.1.0.17530
File size	1.36 GB
DEM	
Size	10,913 x 5,805
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	1 minutes 28 seconds
Memory usage	200.44 MB
Date created	2024:01:27 08:27:36
Software version	2.1.0.17530
File size	203.12 MB
Orthomosaic	
Size	21,825 x 11,609
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	19 minutes 9 seconds
Memory usage	565.14 MB
Date created	2024:01:27 08:45:39
Software version	2.1.0.17530
File size	119.45 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - Bagley M3M RGB 2023-07-10

Processing Report
28 January 2024



Survey Data

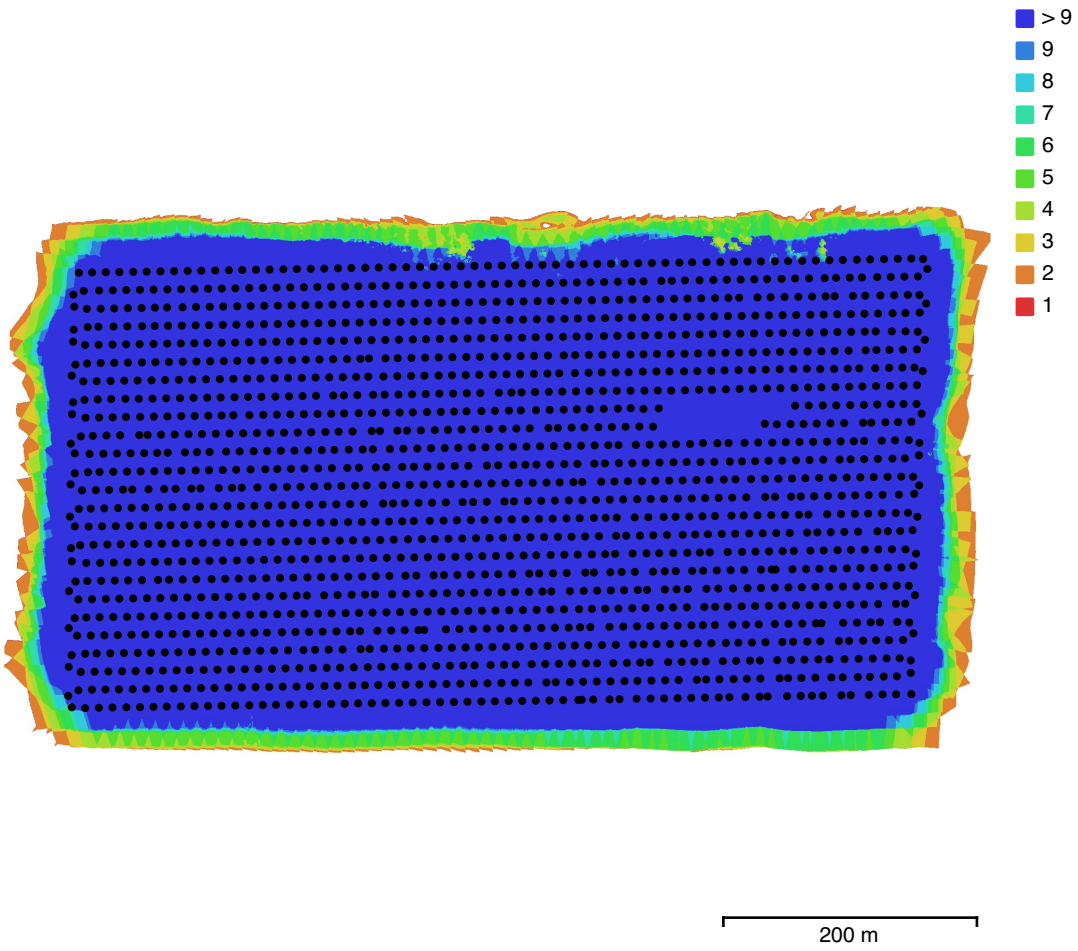


Fig. 1. Camera locations and image overlap.

Number of images:	1,581	Camera stations:	1,565
Flying altitude:	65.3 m	Tie points:	336,712
Ground resolution:	1.81 cm/pix	Projections:	3,584,889
Coverage area:	0.313 km²	Reprojection error:	0.893 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

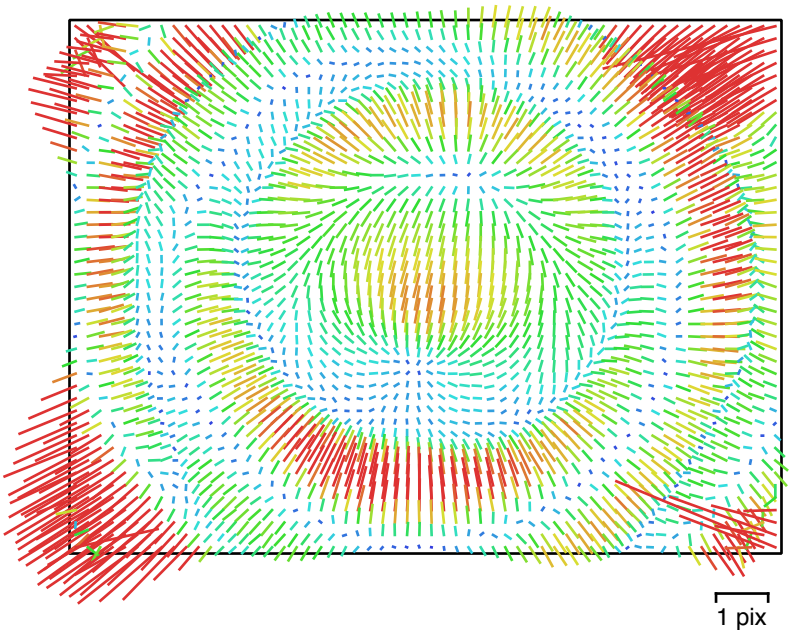


Fig. 2. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

1581 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3657.86**	0.32	1.00	0.18	-0.47	0.02	0.08	0.12	-0.57	0.65	-0.61	0.11	-0.06
Cx	**31.665**	0.0076		1.00	-0.03	0.03	0.03	0.03	-0.10	0.11	-0.10	0.80	0.08
Cy	**-20.6459**	0.0073			1.00	-0.02	-0.02	-0.06	0.27	-0.31	0.29	0.02	0.67
B1	**-0.591545**	0.005				1.00	0.00	0.01	-0.02	0.02	-0.02	0.02	0.01
B2	**-0.0437146**	0.0047					1.00	0.00	-0.05	0.05	-0.05	0.00	0.01
K1	**0.0117051**	2.2e-05						1.00	-0.86	0.77	-0.76	0.03	-0.01
K2	**-0.226443**	0.00014							1.00	-0.99	0.97	-0.08	0.04
K3	**0.371235**	0.00029								1.00	-0.99	0.08	-0.04
K4	**-0.165188**	0.00019									1.00	-0.08	0.04
P1	**0.000724985**	6.1e-07										1.00	0.09
P2	**-0.000586253**	5.1e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

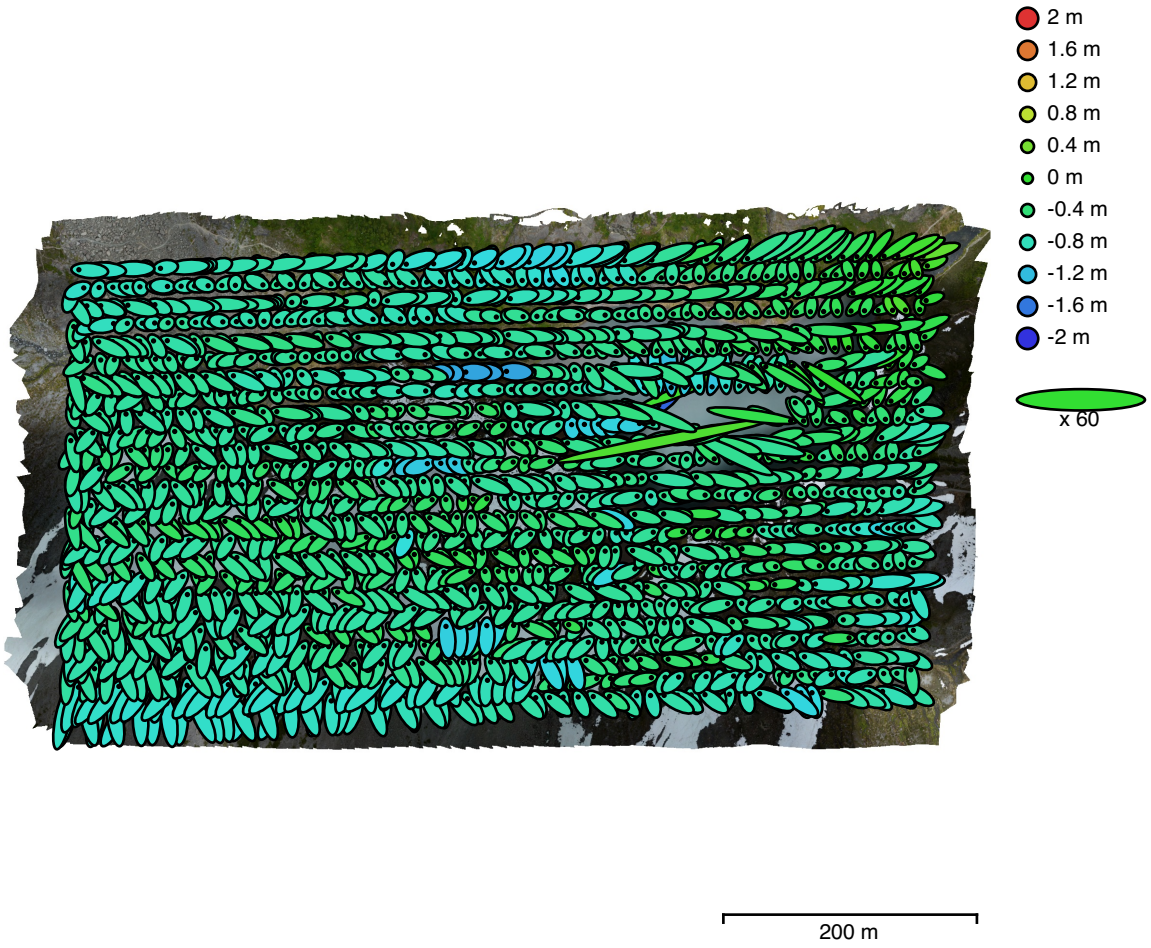


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
20.5084	16.6705	61.2012	26.4291	66.664

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

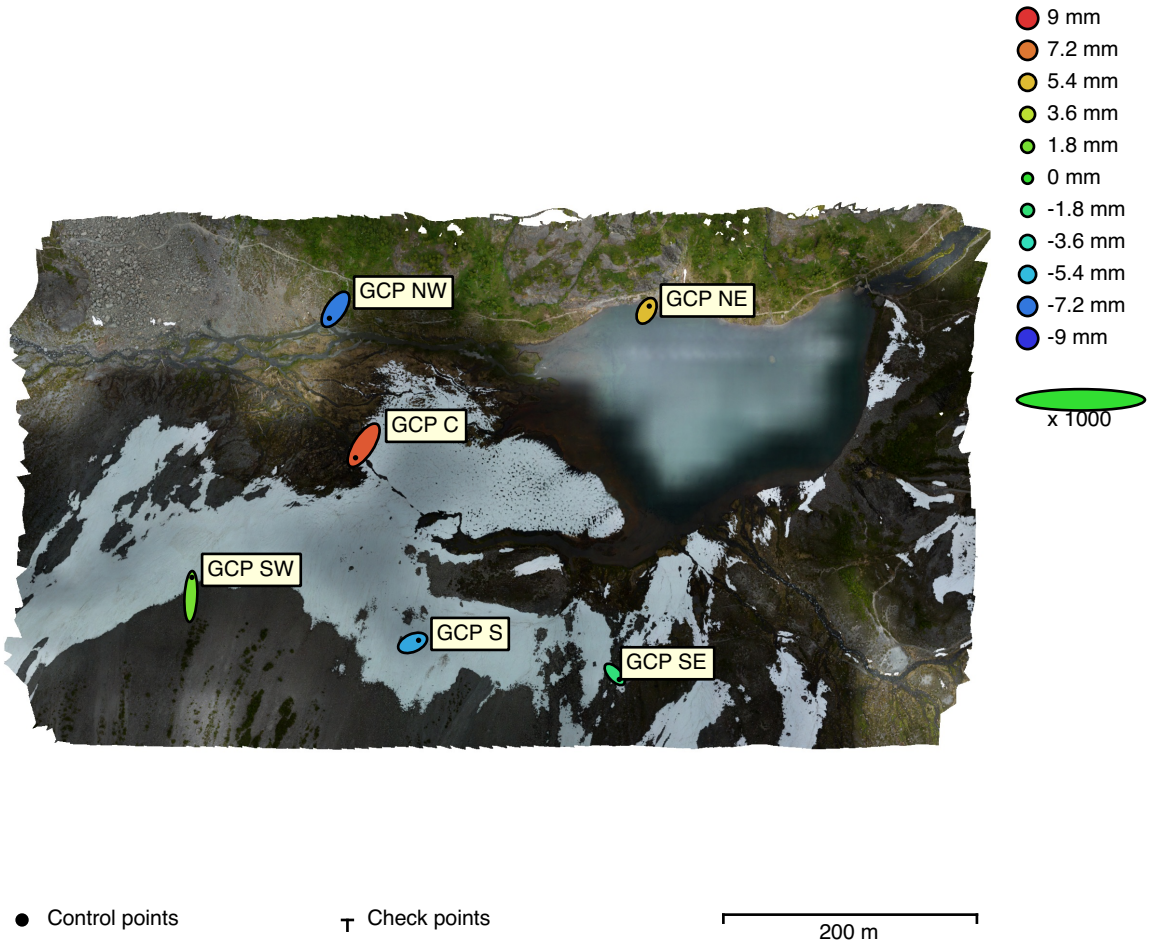


Fig. 4. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	0.833026	1.65064	0.555646	1.84893	1.93062

Table 4. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	0.72353	-0.793531	-0.18871	1.09032	0.523 (10)
GCP S	0.936836	0.410261	-0.594954	1.18319	0.434 (10)
GCP SW	0.165485	3.01882	0.17509	3.02842	0.891 (10)
GCP C	-1.27699	-1.97529	0.801238	2.48485	0.721 (10)
GCP NW	-0.964247	-1.40741	-0.707874	1.84707	0.610 (10)
GCP NE	0.417812	0.744118	0.537726	1.00868	1.445 (10)
Total	**0.833026**	**1.65064**	**0.555646**	**1.93062**	**0.840**

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

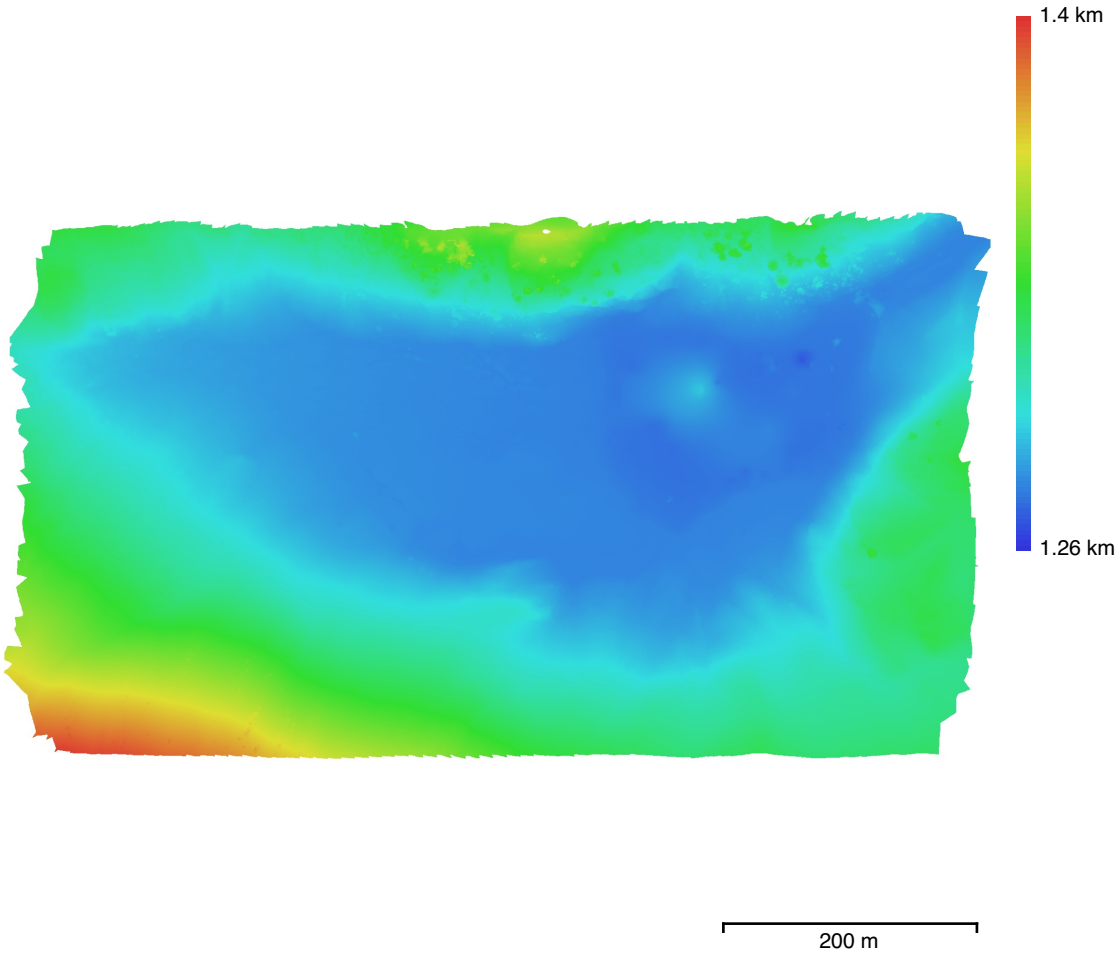


Fig. 5. Reconstructed digital elevation model.

Resolution:	3.62 cm/pix
Point density:	764 points/m²

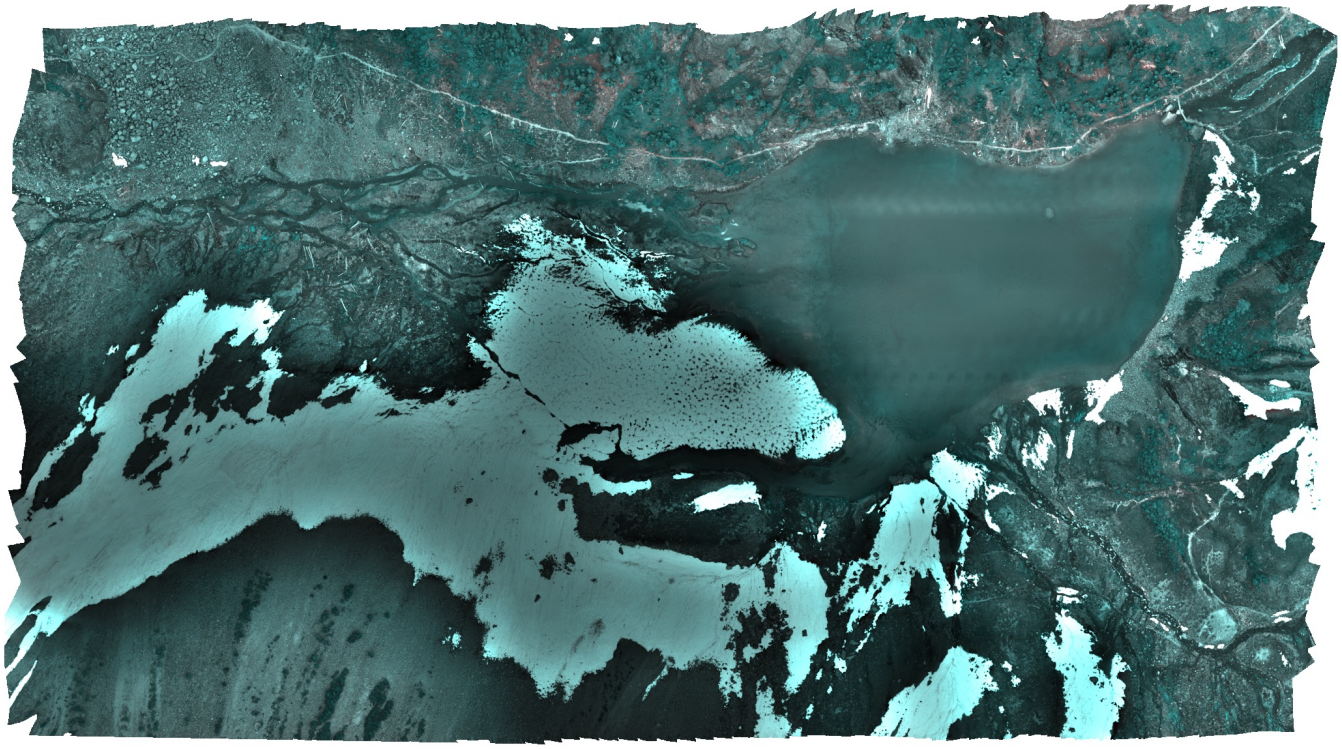
Processing Parameters

General	
Cameras	1581
Aligned cameras	1565
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	336,712 of 494,242
RMS reprojection error	0.213335 (0.893032 pix)
Max reprojection error	3.1414 (57.3801 pix)
Mean key point size	3.91326 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	15.8363
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	15 minutes 19 seconds
Matching memory usage	2.30 GB
Alignment time	21 minutes 34 seconds
Alignment memory usage	1.95 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	1 minutes 12 seconds
Date created	2024:01:27 16:25:06
Software version	2.1.0.17530
File size	128.76 MB
Depth Maps	
Count	1558
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	3 hours 43 minutes
Memory usage	3.93 GB
Date created	2024:01:27 22:00:43
Software version	2.1.0.17530
File size	11.17 GB
Point Cloud	
Points	304,758,401
Point attributes	
Color	3 bands, uint8
Normal	

Point classes	
Created (never classified)	304,758,401
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	3 hours 43 minutes
Memory usage	3.93 GB
Point cloud generation parameters	
Processing time	4 hours 49 minutes
Memory usage	7.30 GB
Date created	2024:01:28 02:50:21
Software version	2.1.0.17530
File size	3.88 GB
DEM	
Size	21,314 x 12,114
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 22 seconds
Memory usage	272.14 MB
Date created	2024:01:28 06:59:55
Software version	2.1.0.17530
File size	766.65 MB
Orthomosaic	
Size	42,627 x 24,227
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	18 minutes 26 seconds
Memory usage	1.32 GB
Date created	2024:01:28 07:21:15
Software version	2.1.0.17530
File size	27.18 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - Bagley M3M MS 2023-07-10

Processing Report
27 January 2024



Survey Data

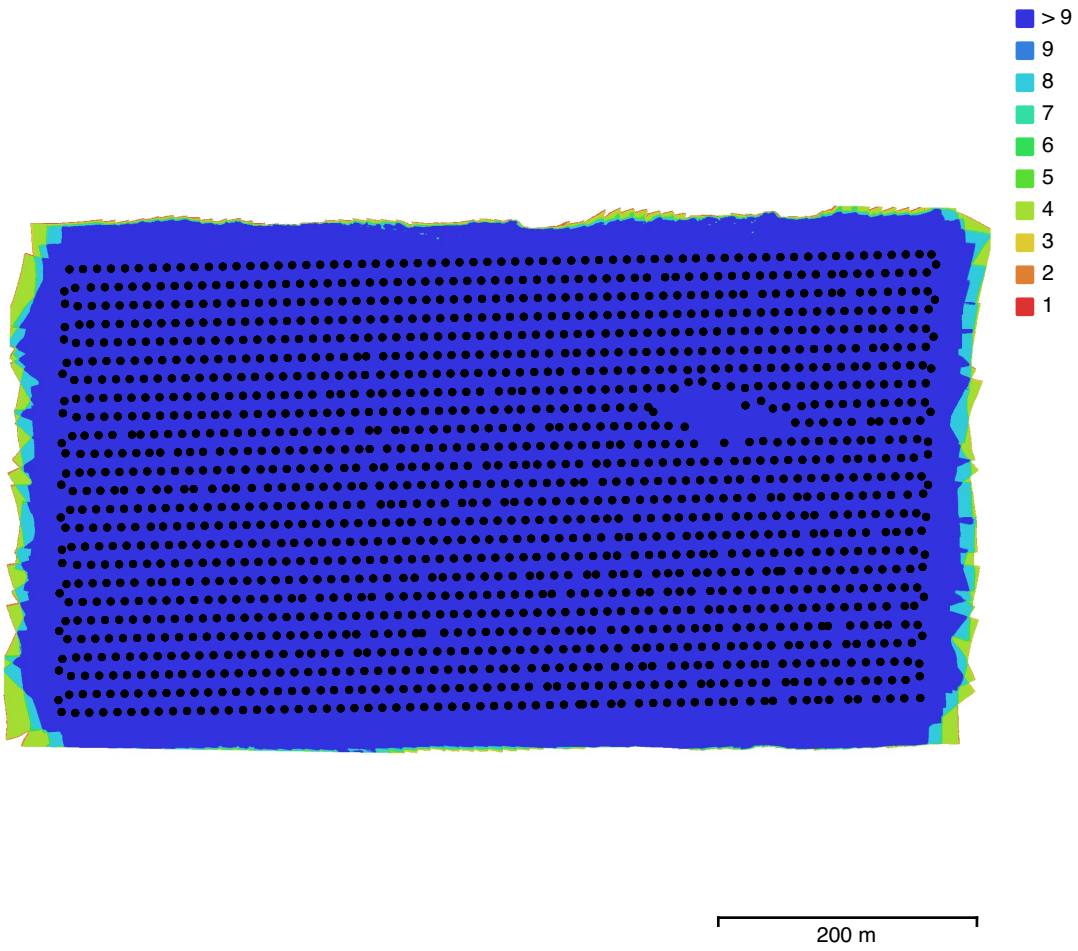


Fig. 1. Camera locations and image overlap.

Number of images:	6,324	Camera stations:	6,268
Flying altitude:	66.1 m	Tie points:	866,741
Ground resolution:	3.08 cm/pix	Projections:	14,864,053
Coverage area:	0.305 km²	Reprojection error:	0.566 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

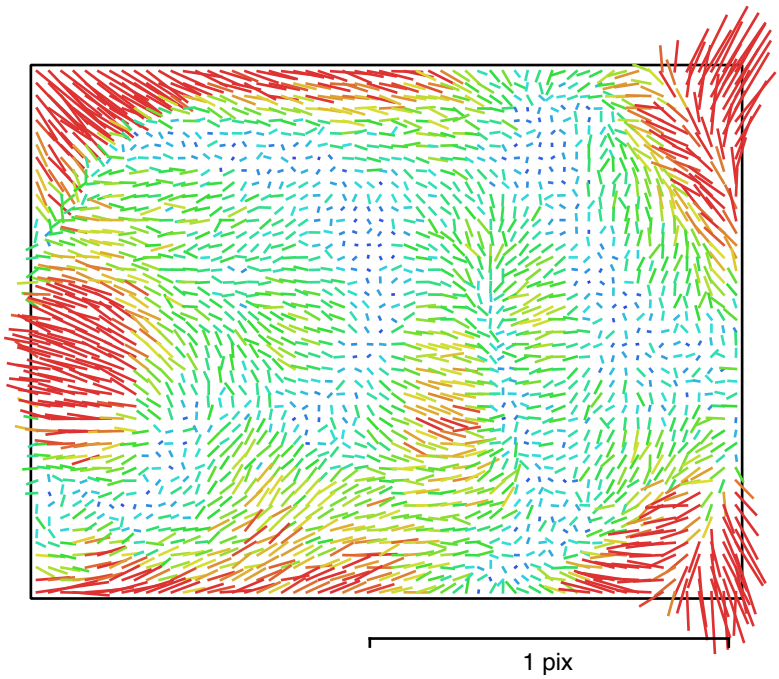


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

1581 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2181.4		
Cx:	11.9749	B1:	-5.09279
Cy:	3.41456	B2:	-0.949748
K1:	0.0091721	P1:	0.000203798
K2:	-0.0431044	P2:	-0.000200593
K3:	-0.0131634	P3:	0
K4:	0	P4:	0

Camera Calibration

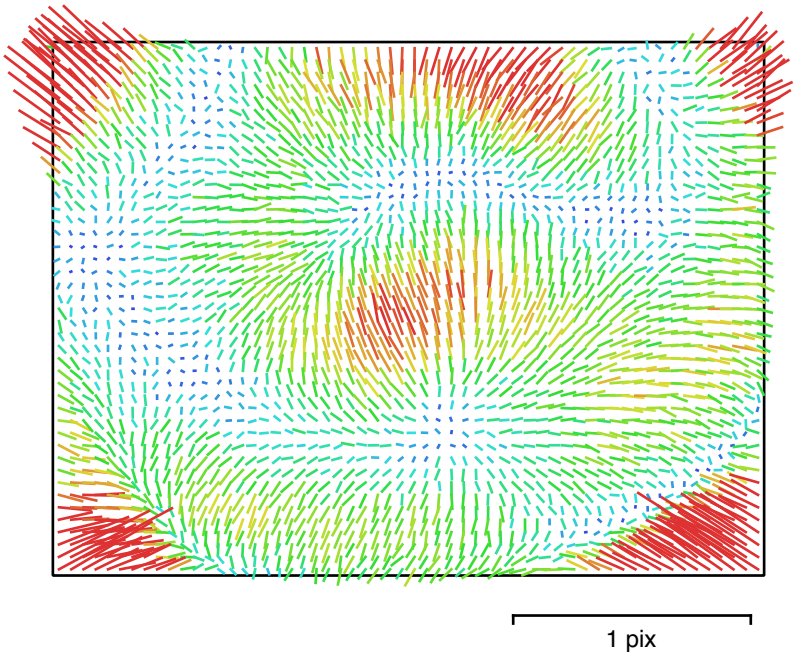


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

1581 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2184.18		
Cx:	8.1854	B1:	-5.23384
Cy:	19.6982	B2:	-0.602832
K1:	0.0155759	P1:	-0.000177726
K2:	-0.0816623	P2:	0.000447262
K3:	0.0819505	P3:	0
K4:	-0.0877308	P4:	0

Camera Calibration

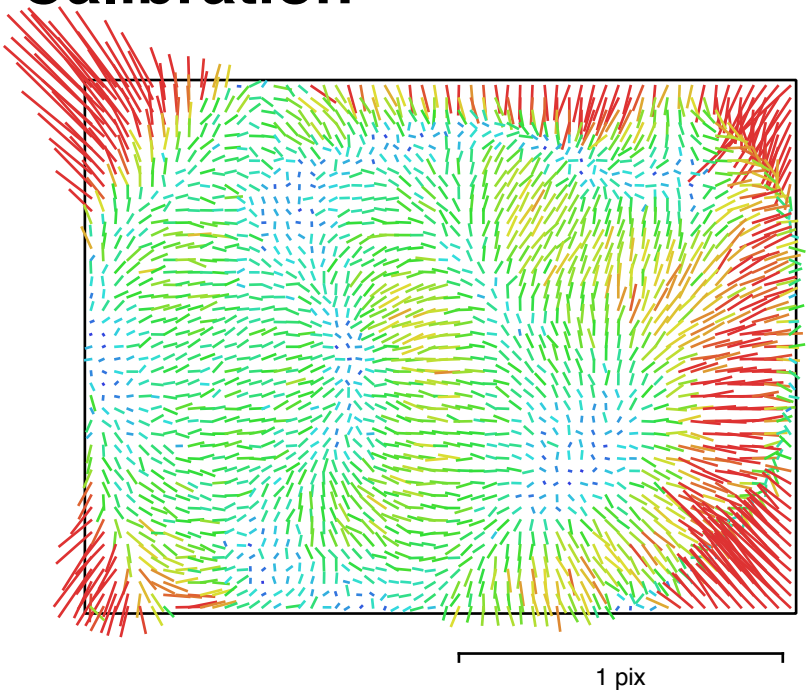


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

1581 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2190.61		
Cx:	7.68097	B1:	-5.39513
Cy:	15.6443	B2:	-0.138651
K1:	0.0149232	P1:	0.00110343
K2:	-0.0829155	P2:	0.000485876
K3:	0.0803298	P3:	0
K4:	-0.0785965	P4:	0

Camera Calibration

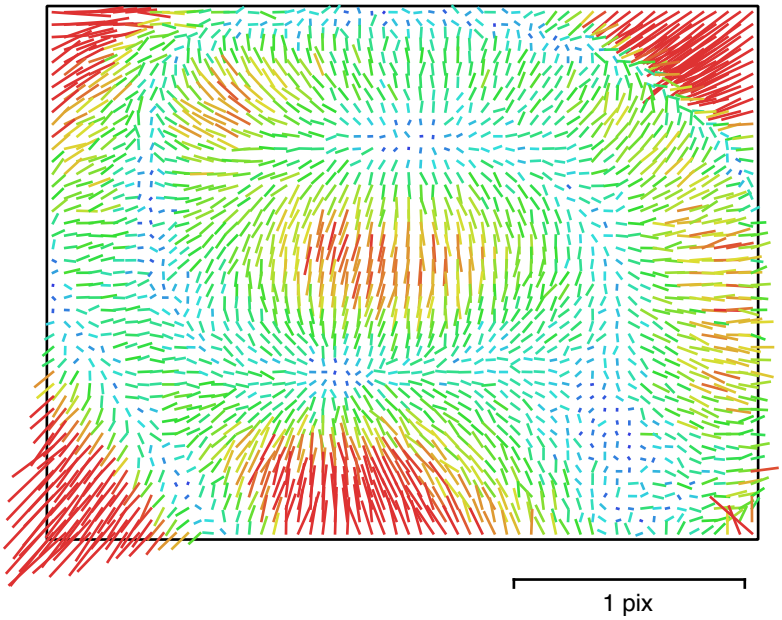


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

1581 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2197.87		
Cx:	7.88143	B1:	-5.04105
Cy:	-25.2383	B2:	-0.223672
K1:	0.0155698	P1:	0.000758018
K2:	-0.0809025	P2:	0.000690626
K3:	0.06984	P3:	0
K4:	-0.0679903	P4:	0

Camera Locations

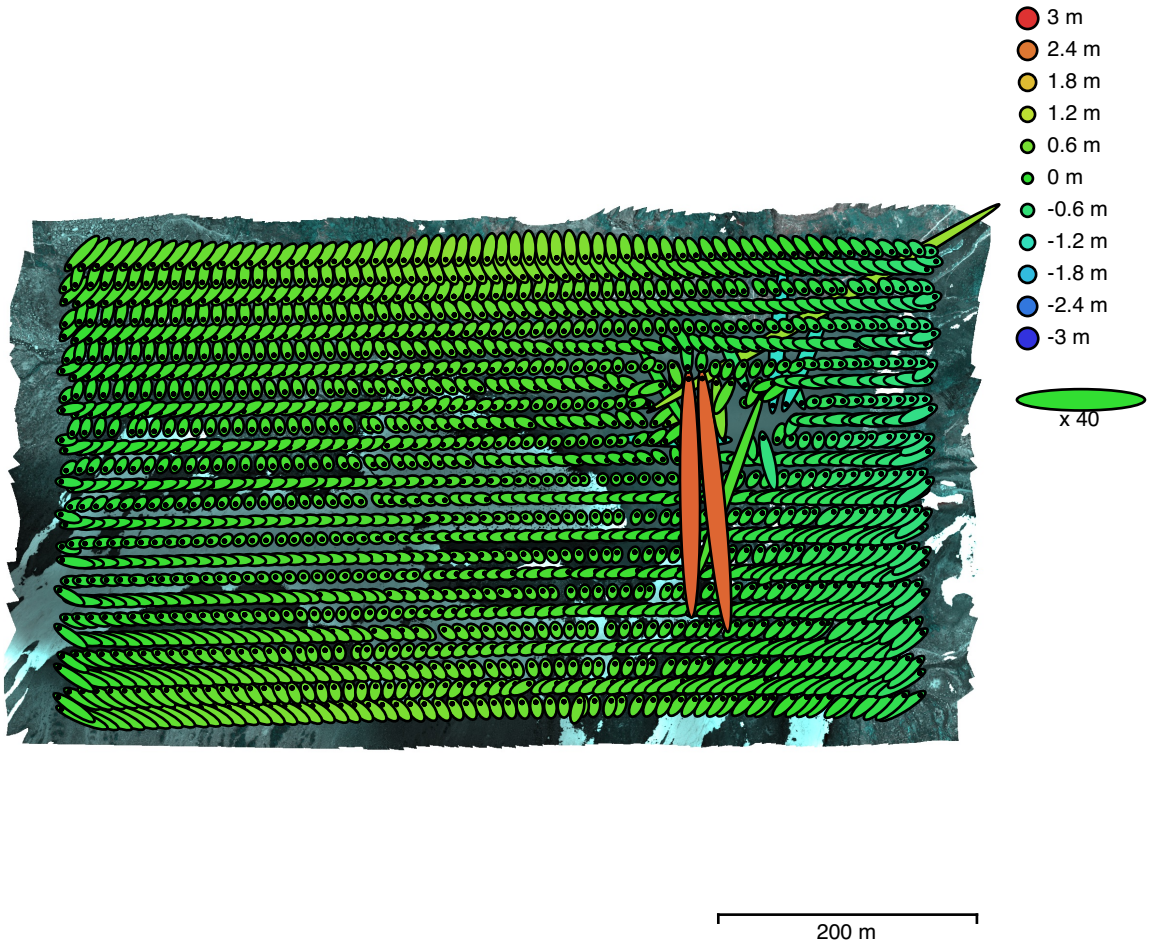


Fig. 6. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
31.498	28.7078	33.9158	42.6176	54.466

Table 2. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

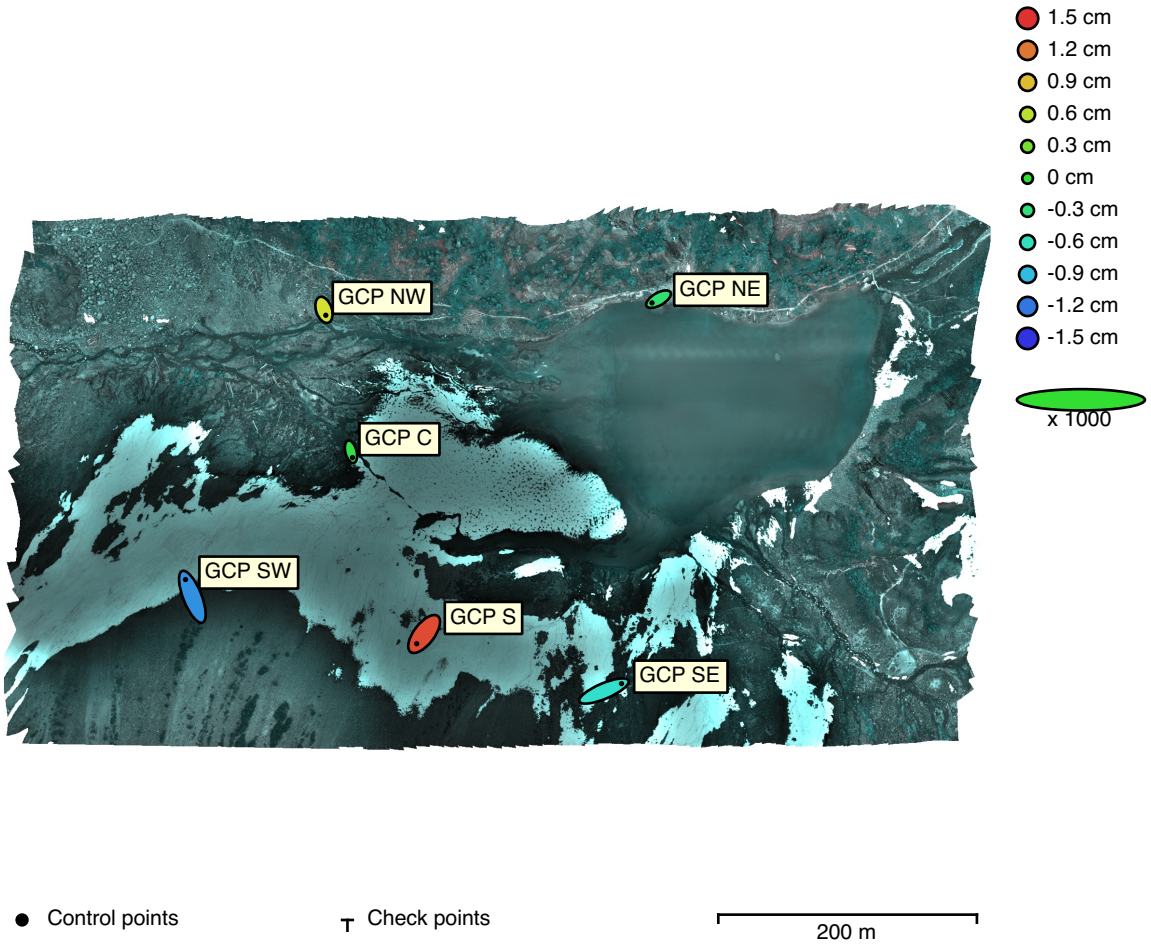


Fig. 7. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	1.34815	1.44497	0.832562	1.97622	2.14444

Table 3. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	2.70435	1.1452	-0.672738	3.0129	0.846 (10)
GCP S	-1.14858	-1.5057	1.3923	2.3505	1.132 (10)
GCP SW	-1.05595	2.66816	-1.08756	3.0687	1.049 (10)
GCP C	0.228369	-0.890212	-0.0830093	0.922778	0.333 (10)
GCP NW	0.28324	-0.837229	0.71225	1.13511	1.140 (10)
GCP NE	-1.01241	-0.580106	-0.266234	1.19682	0.559 (10)
Total	**1.34815**	**1.44497**	**0.832562**	**2.14444**	**0.896**

Table 4. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

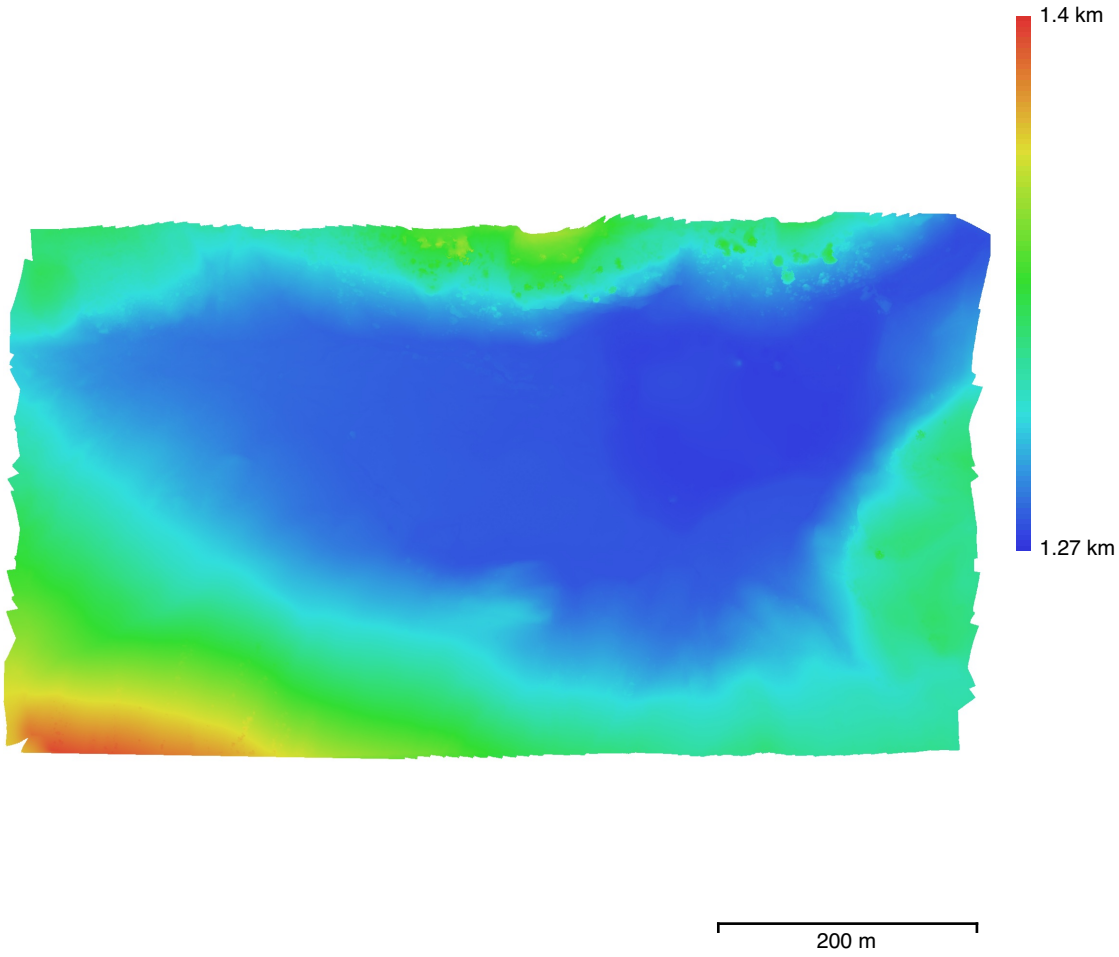


Fig. 8. Reconstructed digital elevation model.

Resolution:	6.15 cm/pix
Point density:	264 points/m²

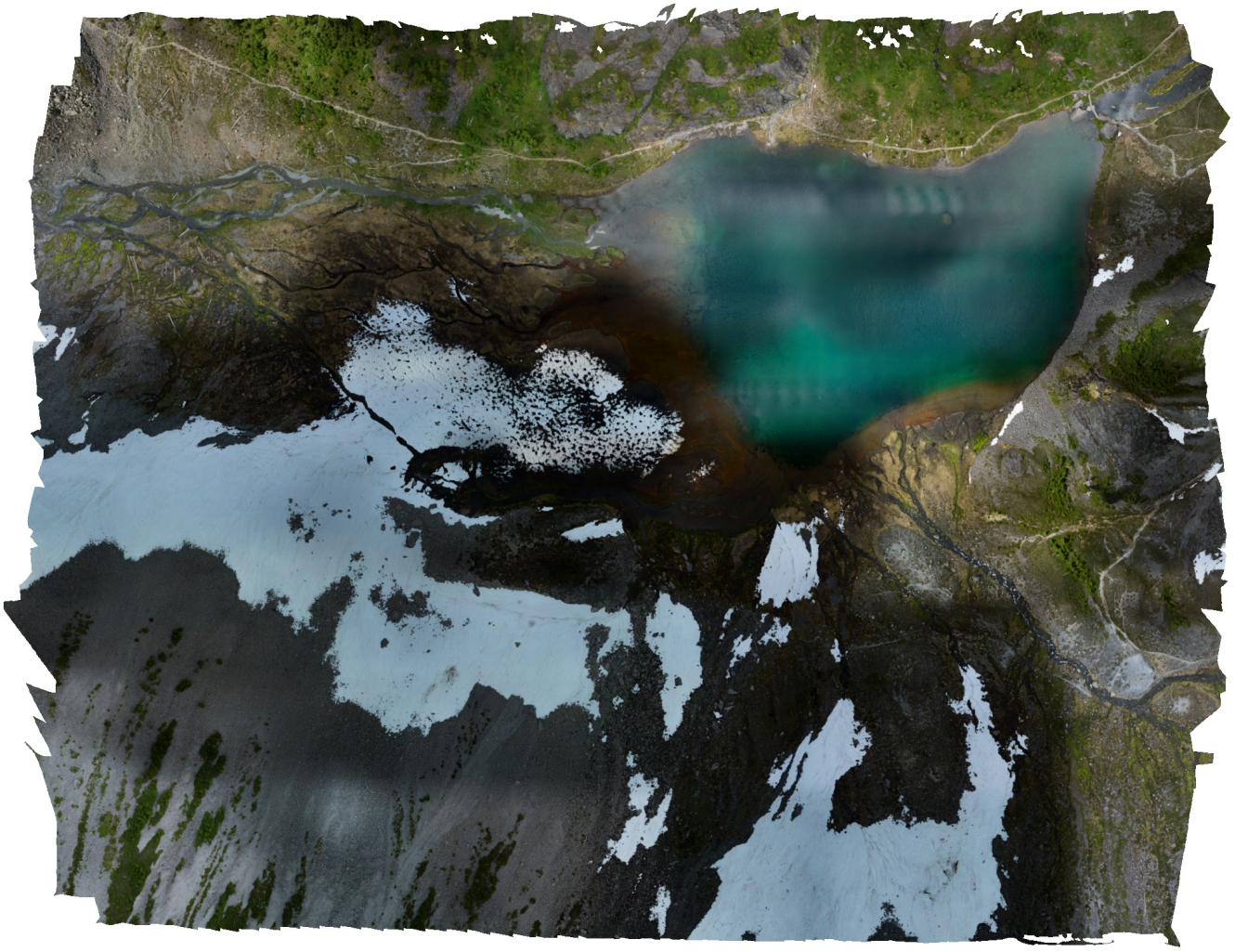
Processing Parameters

General	
Cameras	6324
Aligned cameras	6268
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	866,741 of 1,433,705
RMS reprojection error	0.166862 (0.56596 pix)
Max reprojection error	1.52254 (49.3112 pix)
Mean key point size	2.9526 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	27.4285
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	59 minutes 39 seconds
Matching memory usage	5.61 GB
Alignment time	2 hours 12 minutes
Alignment memory usage	1.46 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	3 minutes 39 seconds
Date created	2024:01:27 11:01:49
Software version	2.1.0.17530
File size	1.78 GB
Depth Maps	
Count	1554
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	51 minutes 42 seconds
Memory usage	1.77 GB
Date created	2024:01:27 14:33:21
Software version	2.1.0.17530
File size	2.64 GB
Point Cloud	
Points	99,543,408
Point attributes	
Color	4 bands, uint16
Normal	

Point classes	
Created (never classified)	99,543,408
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	51 minutes 42 seconds
Memory usage	1.77 GB
Point cloud generation parameters	
Processing time	44 minutes 12 seconds
Memory usage	6.34 GB
Date created	2024:01:27 15:17:34
Software version	2.1.0.17530
File size	1.90 GB
DEM	
Size	12,290 x 6,969
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	1 minutes 34 seconds
Memory usage	225.11 MB
Date created	2024:01:27 15:24:15
Software version	2.1.0.17530
File size	271.30 MB
Orthomosaic	
Size	24,579 x 13,937
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	17 minutes 25 seconds
Memory usage	117.41 MB
Date created	2024:01:27 15:39:59
Software version	2.1.0.17530
File size	105.46 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - Bagley M3M RGB 2023-07-13

Processing Report
28 January 2024



Survey Data

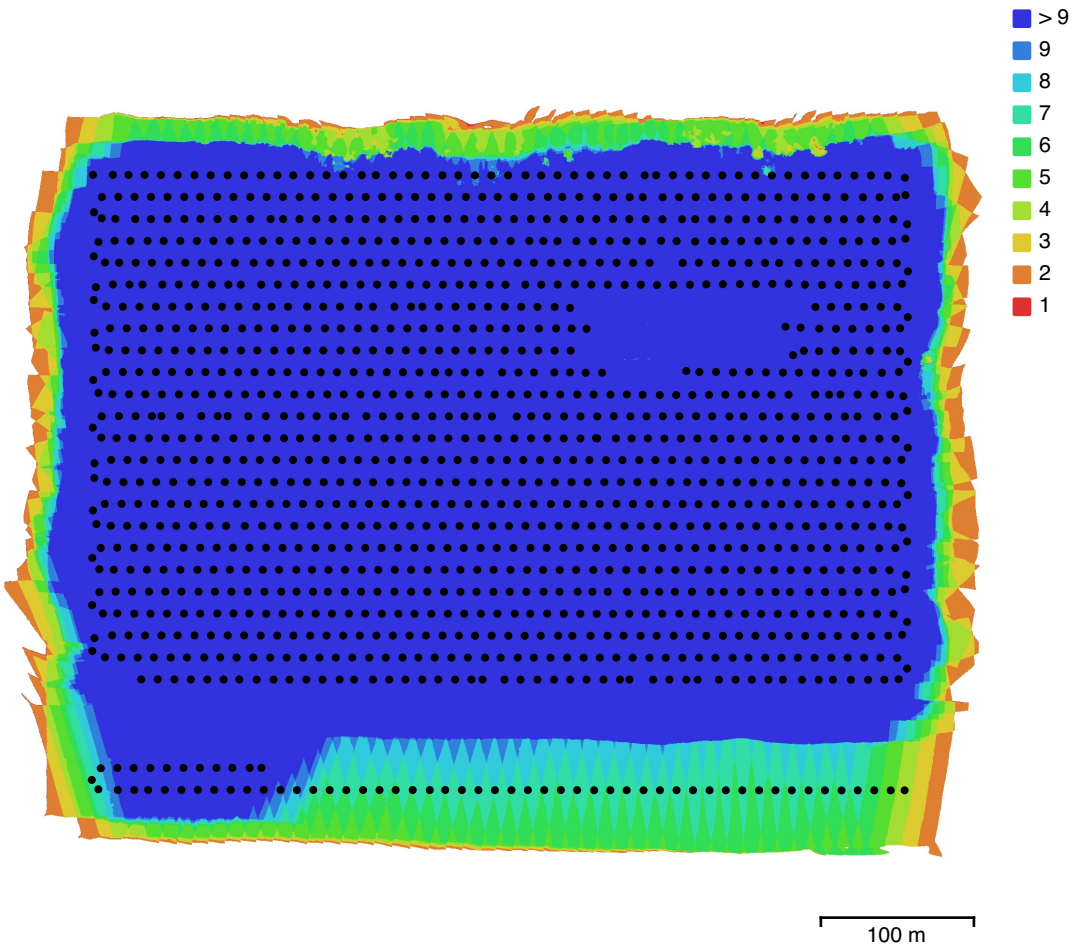


Fig. 1. Camera locations and image overlap.

Number of images:	1,269	Camera stations:	1,227
Flying altitude:	65.1 m	Tie points:	336,851
Ground resolution:	1.79 cm/pix	Projections:	2,837,697
Coverage area:	0.289 km²	Reprojection error:	0.854 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

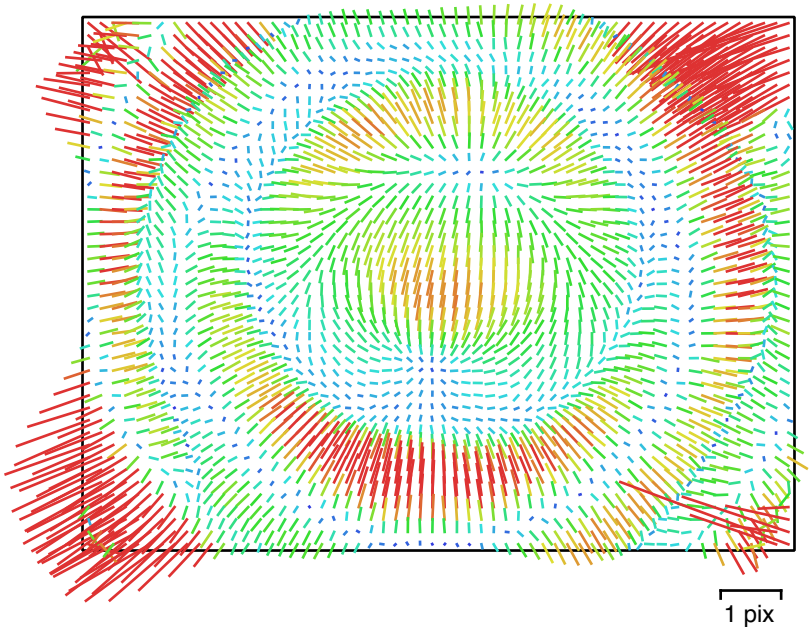


Fig. 2. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

1268 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3673.49**	0.41	1.00	-0.02	-0.55	-0.06	0.05	0.03	-0.61	0.70	-0.65	0.12	-0.01
Cx	**31.6516**	0.009		1.00	0.05	0.01	-0.04	-0.01	0.02	-0.02	0.02	0.76	0.08
Cy	**-21.0608**	0.0094			1.00	0.07	-0.03	-0.02	0.34	-0.39	0.36	-0.02	0.59
B1	**-0.580284**	0.0049				1.00	-0.02	0.02	0.03	-0.03	0.03	0.01	0.00
B2	**0.0568971**	0.0047					1.00	0.00	-0.03	0.04	-0.04	-0.00	0.02
K1	**0.0108091**	2.5e-05						1.00	-0.77	0.67	-0.67	0.02	-0.02
K2	**-0.221948**	0.00016							1.00	-0.99	0.97	-0.09	0.01
K3	**0.365829**	0.00035								1.00	-0.99	0.10	-0.01
K4	**-0.162396**	0.00022									1.00	-0.09	0.01
P1	**0.000756023**	7e-07										1.00	0.08
P2	**-0.000584946**	6e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

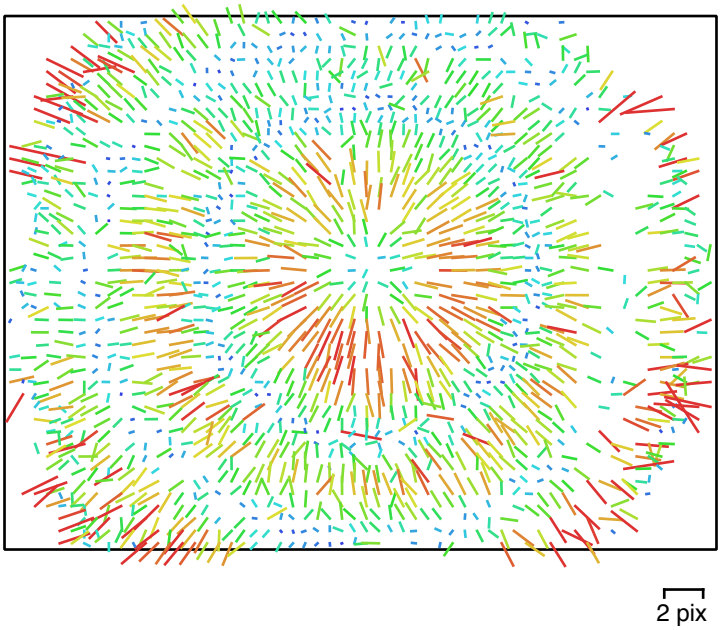


Fig. 3. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

1 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	K1	K2	P1	P2
F	**3709.12**	1.6	1.00	0.95	0.78	-0.06	0.04	-0.13	-0.12
Cx	**44.8007**	1.1		1.00	0.81	-0.00	-0.01	0.04	-0.10
Cy	**-18.6819**	0.28			1.00	-0.02	0.01	-0.10	0.35
K1	**-0.0441017**	0.00014				1.00	-0.97	-0.08	0.00
K2	**0.0177282**	0.00021					1.00	0.10	-0.02
P1	**0.000570412**	1.8e-05						1.00	0.05
P2	**-0.000624087**	1.4e-05							1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Locations

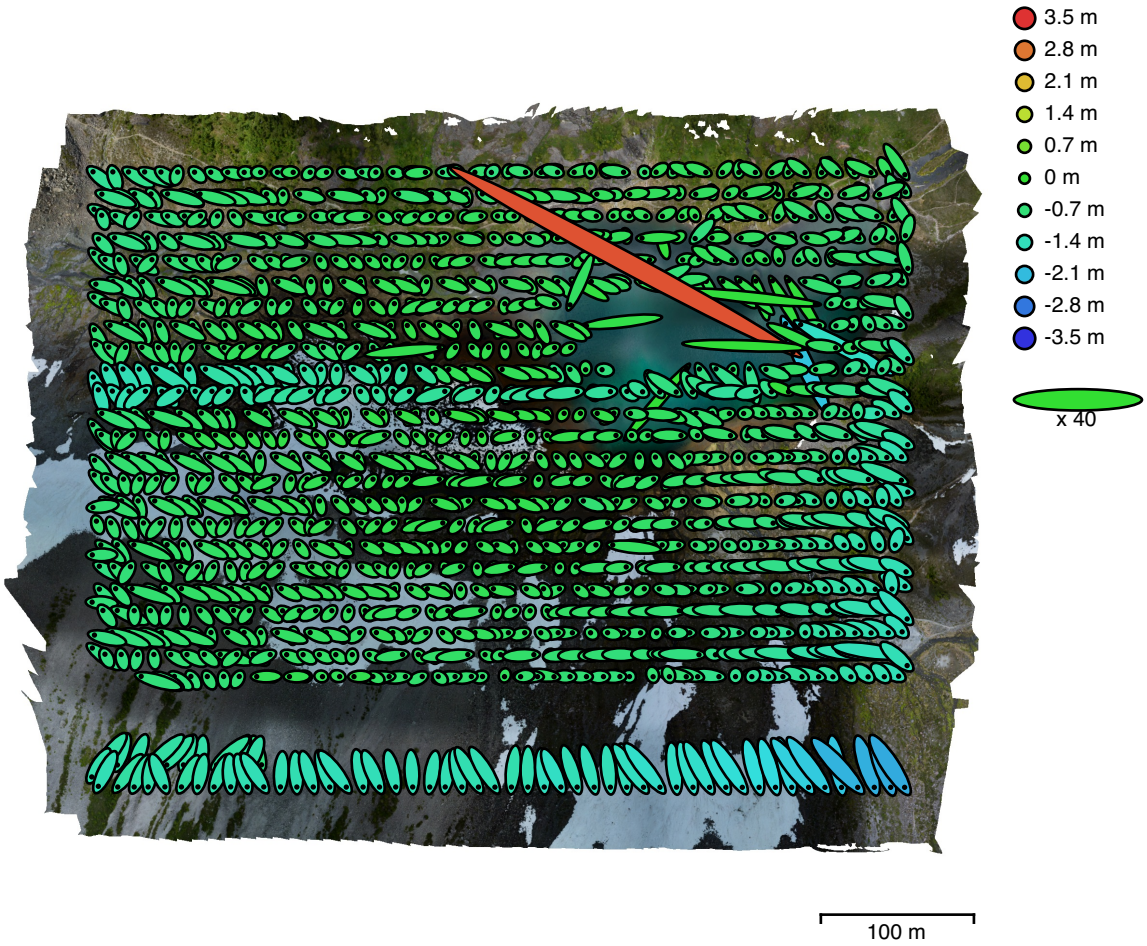


Fig. 4. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
30.5494	19.8912	72.8653	36.4544	81.4756

Table 4. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

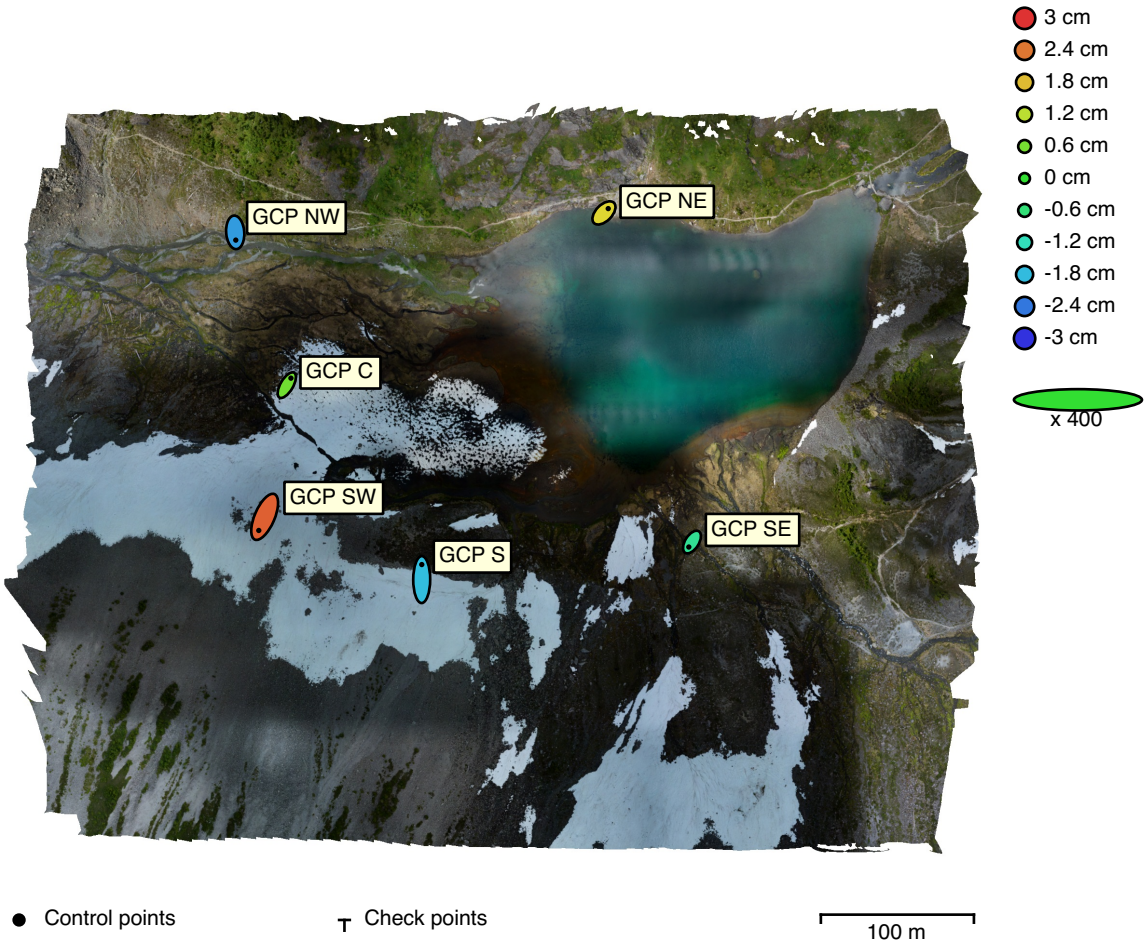


Fig. 5. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	1.1942	3.16254	1.71929	3.3805	3.79259

Table 5. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	-1.03509	-1.62409	-0.847832	2.10425	0.885 (10)
GCP S	0.0192363	4.90051	-1.77307	5.21144	0.784 (10)
GCP SW	-1.91826	-4.44314	2.59739	5.49251	1.173 (10)
GCP C	1.35162	2.2835	0.546632	2.70925	0.844 (10)
GCP NW	0.188557	-2.53074	-2.08217	3.28263	1.430 (10)
GCP NE	1.39384	1.4131	1.57878	2.53618	1.171 (10)
Total	**1.1942**	**3.16254**	**1.71929**	**3.79259**	**1.073**

Table 6. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

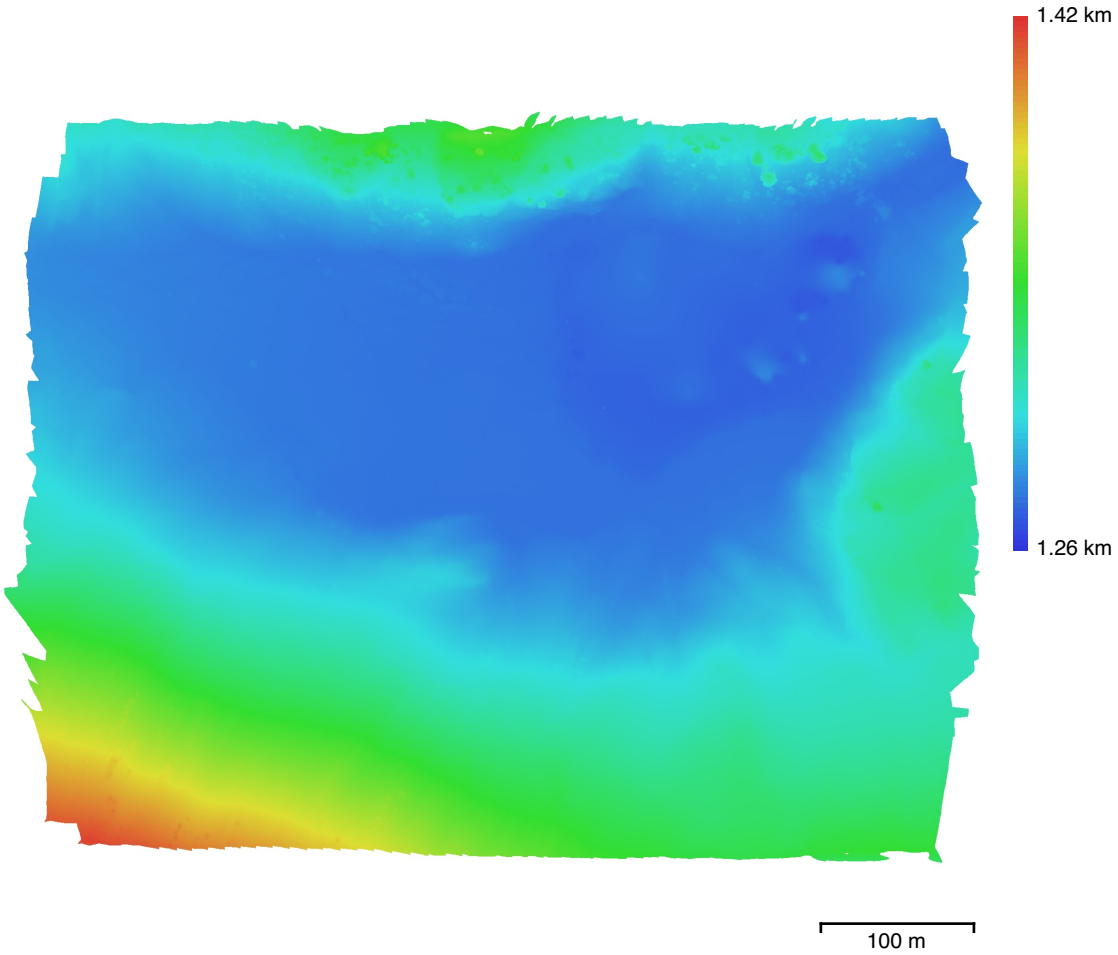


Fig. 6. Reconstructed digital elevation model.

Resolution:	3.59 cm/pix
Point density:	776 points/m²

Processing Parameters

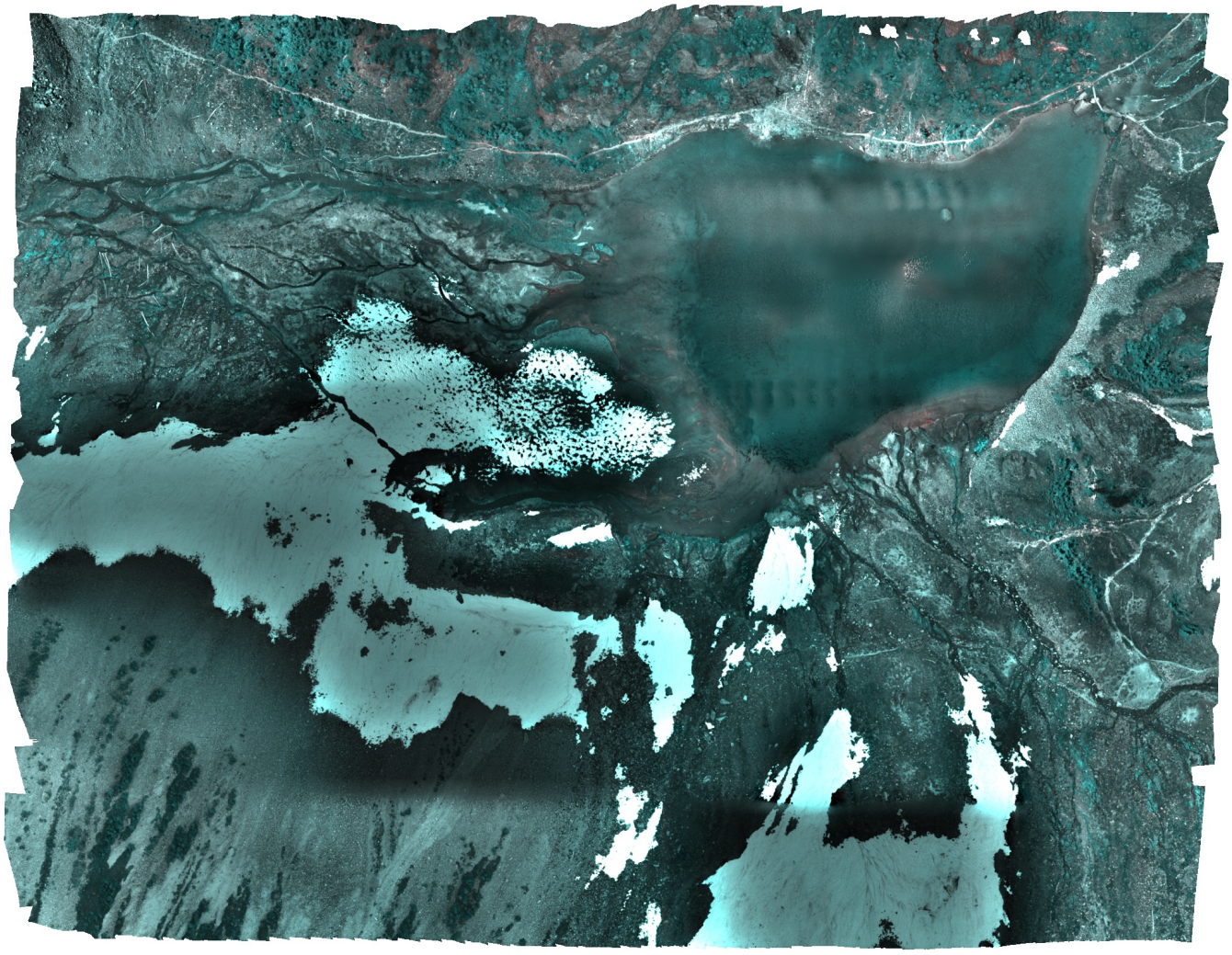
General	
Cameras	1269
Aligned cameras	1227
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	336,851 of 453,817
RMS reprojection error	0.204539 (0.853802 pix)
Max reprojection error	3.16861 (42.4596 pix)
Mean key point size	3.75895 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	12.045
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	12 minutes 6 seconds
Matching memory usage	6.39 GB
Alignment time	15 minutes 59 seconds
Alignment memory usage	1.54 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	42 seconds
Date created	2024:01:28 10:21:33
Software version	2.1.0.17530
File size	92.58 MB
Depth Maps	
Count	1221
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 54 minutes
Memory usage	4.81 GB
Date created	2024:01:28 13:40:47
Software version	2.1.0.17530
File size	8.59 GB
Point Cloud	
Points	279,715,906
Point attributes	
Color	3 bands, uint8
Normal	

Point classes	
Created (never classified)	279,715,906
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 54 minutes
Memory usage	4.81 GB
Point cloud generation parameters	
Processing time	3 hours 41 minutes
Memory usage	7.11 GB
Date created	2024:01:28 17:22:03
Software version	2.1.0.17530
File size	3.56 GB
DEM	
Size	17,733 x 13,582
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 10 seconds
Memory usage	269.42 MB
Date created	2024:01:28 19:26:16
Software version	2.1.0.17530
File size	720.02 MB
Orthomosaic	
Size	35,466 x 27,164
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	14 minutes 58 seconds
Memory usage	1.25 GB
Date created	2024:01:28 19:41:30
Software version	2.1.0.17530
File size	23.85 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report DJI Mavic 3M Multispectral Cameras, Bagley Basin, Mt. Baker, WA, 2023-07-13

Processing Report

03 May 2024



Survey Data

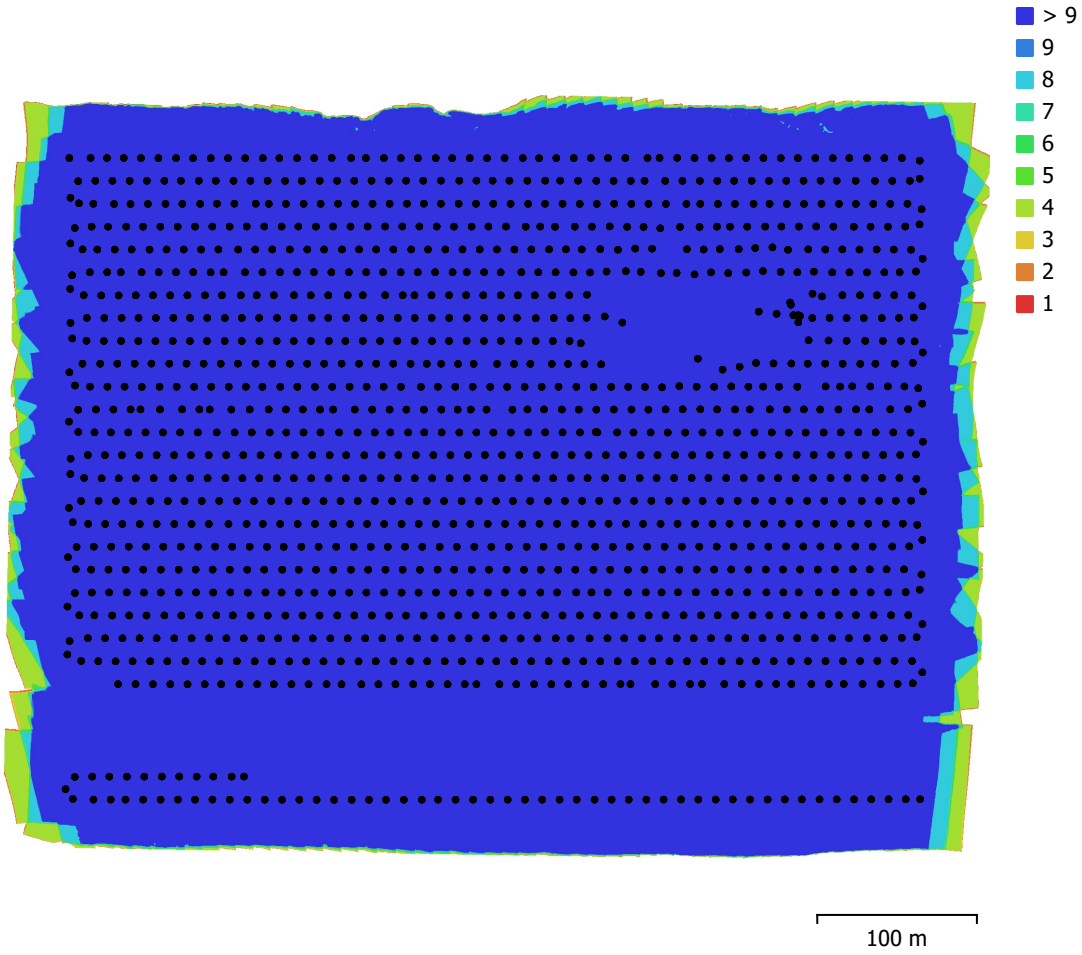


Fig. 1. Camera locations and image overlap.

Number of images:	5,076	Camera stations:	4,952
Flying altitude:	64.7 m	Tie points:	1,292,631
Ground resolution:	3.06 cm/pix	Projections:	13,043,520
Coverage area:	0.282 km²	Reprojection error:	0.784 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

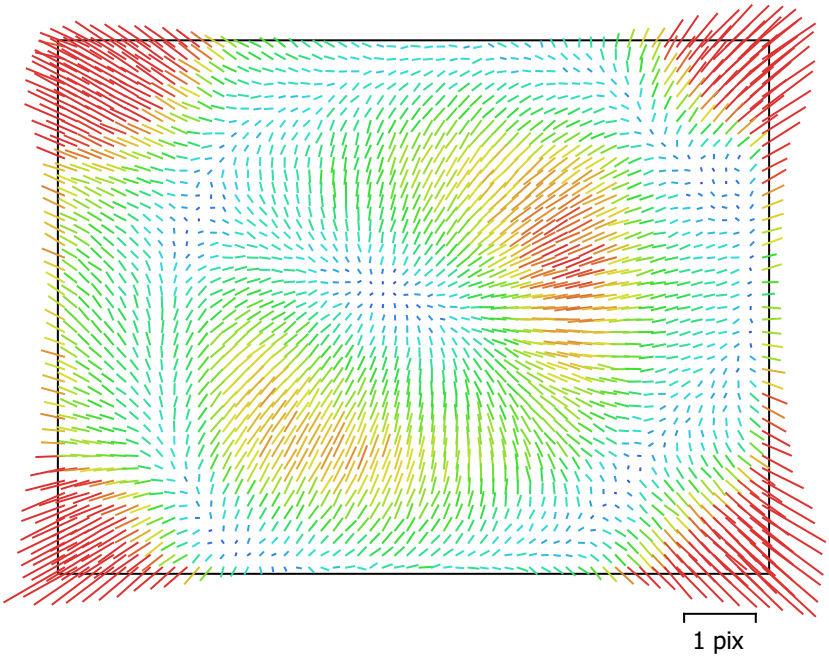


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

1268 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2167.58		
Cx:	11.3463	B1:	0
Cy:	3.812	B2:	0
K1:	0.0147952	P1:	0.000229353
K2:	-0.0425844	P2:	-0.000203688
K3:	-0.0122909	P3:	0
K4:	0	P4:	0

Camera Calibration

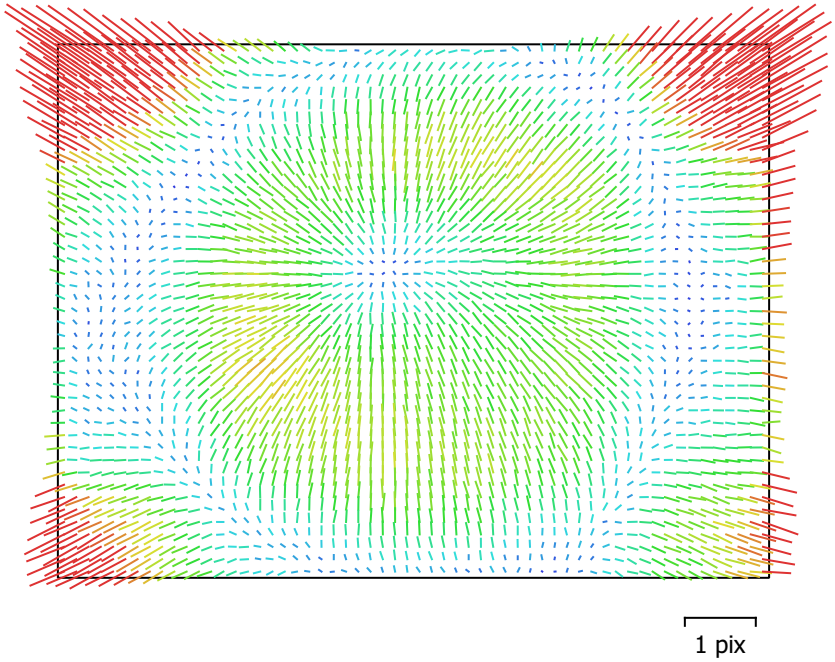


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

1268 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2170.38		
Cx:	8.11417	B1:	0
Cy:	19.7707	B2:	0
K1:	0.0170797	P1:	-0.000169268
K2:	-0.0495724	P2:	0.000421195
K3:	-0.00827554	P3:	0
K4:	0	P4:	0

Camera Calibration

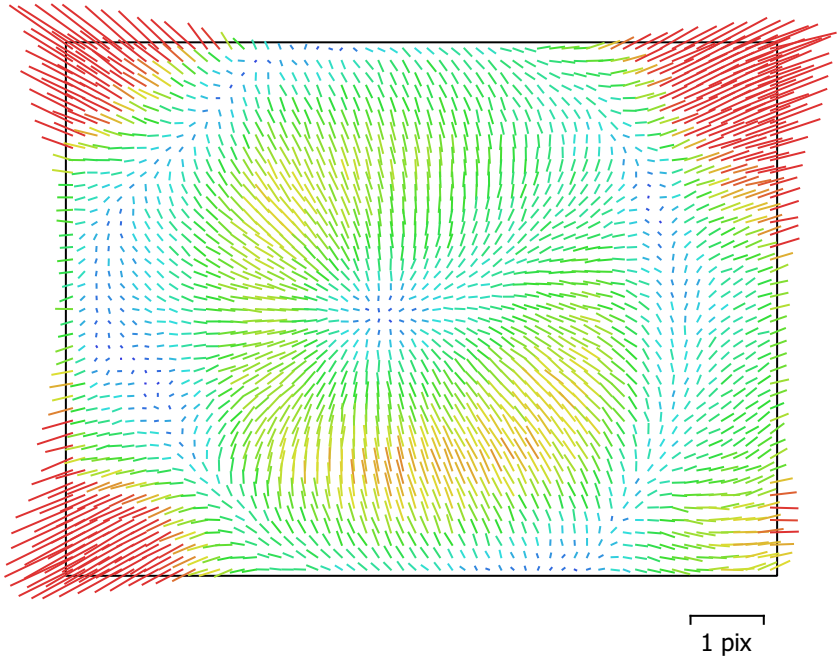


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

1268 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2176.66		
Cx:	7.67571	B1:	0
Cy:	15.8391	B2:	0
K1:	0.0168786	P1:	0.0011275
K2:	-0.054609	P2:	0.000431836
K3:	0.000516218	P3:	0
K4:	0	P4:	0

Camera Calibration

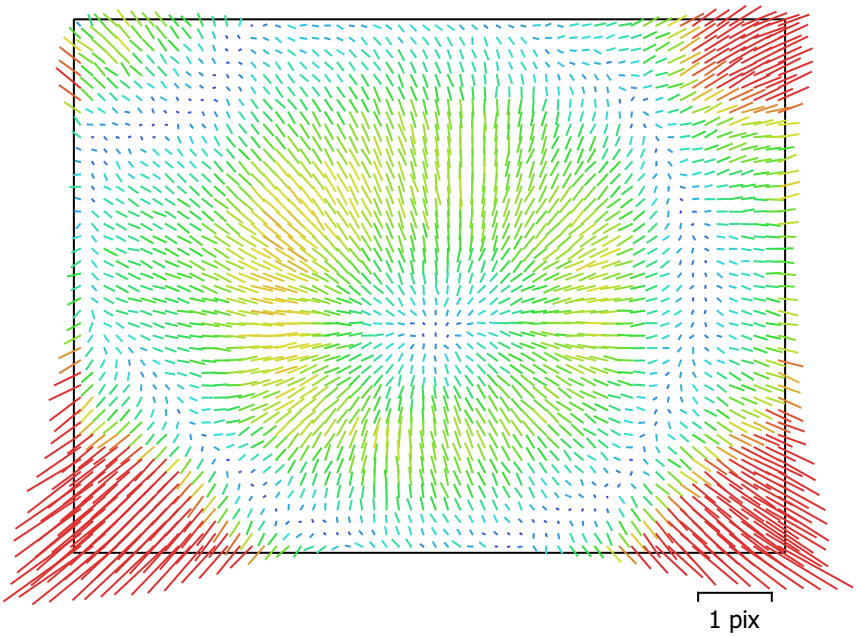


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

1268 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2184.02		
Cx:	8.41255	B1:	0
Cy:	-24.6166	B2:	0
K1:	0.017839	P1:	0.000745306
K2:	-0.0545028	P2:	0.00070012
K3:	-0.00198688	P3:	0
K4:	0	P4:	0

Camera Calibration

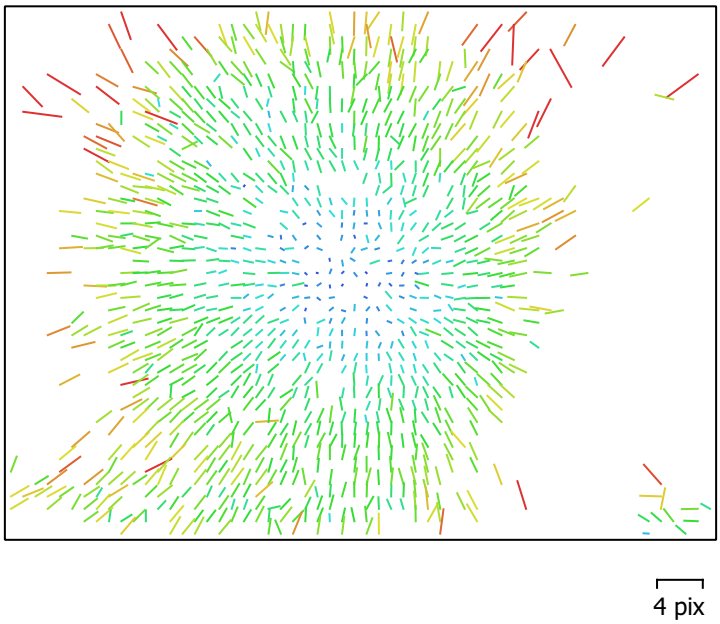


Fig. 6. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

1 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2161.76		
Cx:	10.1043	B1:	0
Cy:	3.20038	B2:	0
K1:	0.0129237	P1:	0.000356681
K2:	-0.0529089	P2:	-0.000273003
K3:	0	P3:	0
K4:	0	P4:	0

Camera Calibration

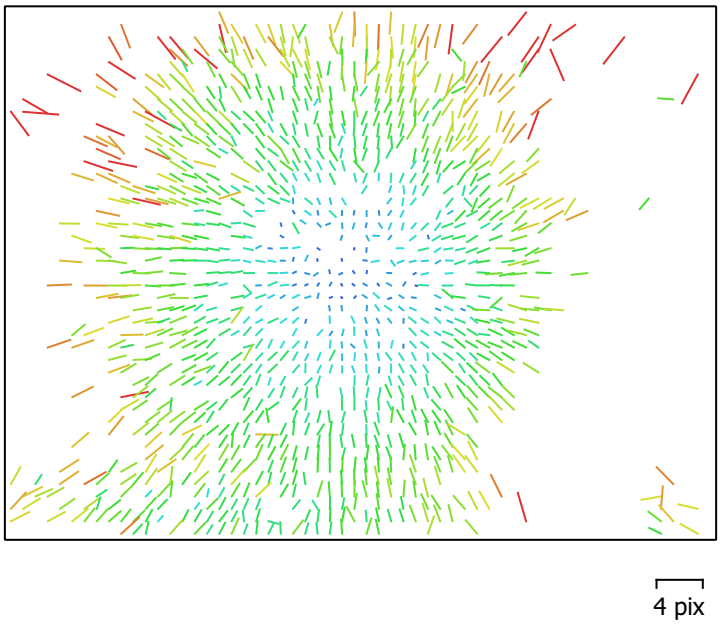


Fig. 7. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

1 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2164.77		
Cx:	6.71386	B1:	0
Cy:	19.5061	B2:	0
K1:	0.0144618	P1:	-1.38914e-05
K2:	-0.0565396	P2:	0.000413904
K3:	0	P3:	0
K4:	0	P4:	0

Camera Calibration

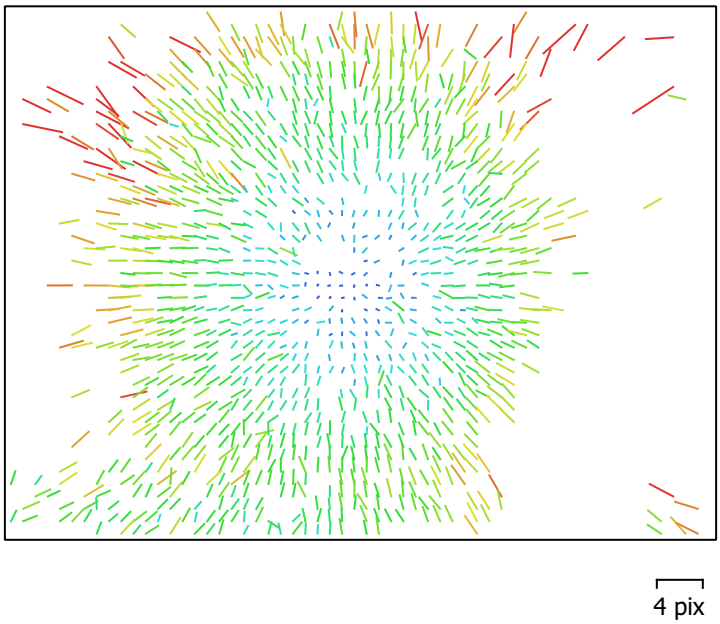


Fig. 8. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

1 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2171.3		
Cx:	6.18711	B1:	0
Cy:	15.5886	B2:	0
K1:	0.0127198	P1:	0.00124438
K2:	-0.0545492	P2:	0.000415631
K3:	0	P3:	0
K4:	0	P4:	0

Camera Calibration

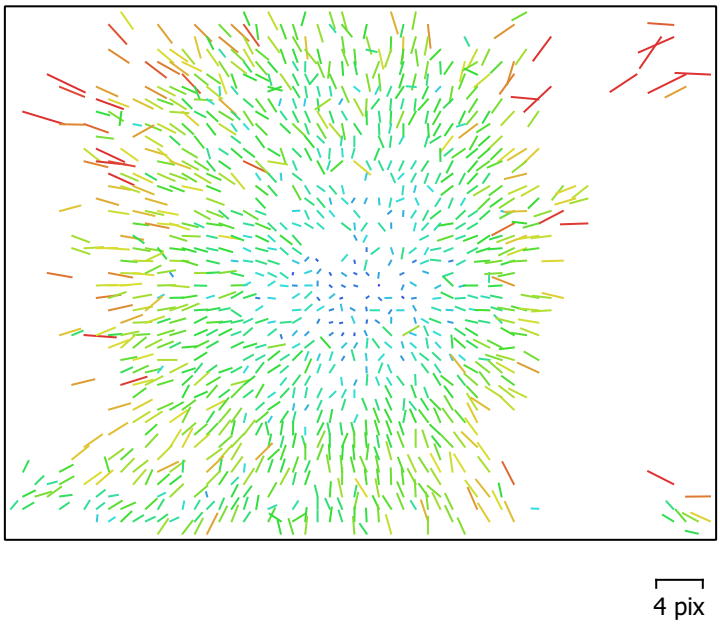


Fig. 9. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

1 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

F:	2178.69		
Cx:	6.82998	B1:	0
Cy:	-24.8499	B2:	0
K1:	0.0147629	P1:	0.000855499
K2:	-0.0577314	P2:	0.000616997
K3:	0	P3:	0
K4:	0	P4:	0

Camera Locations

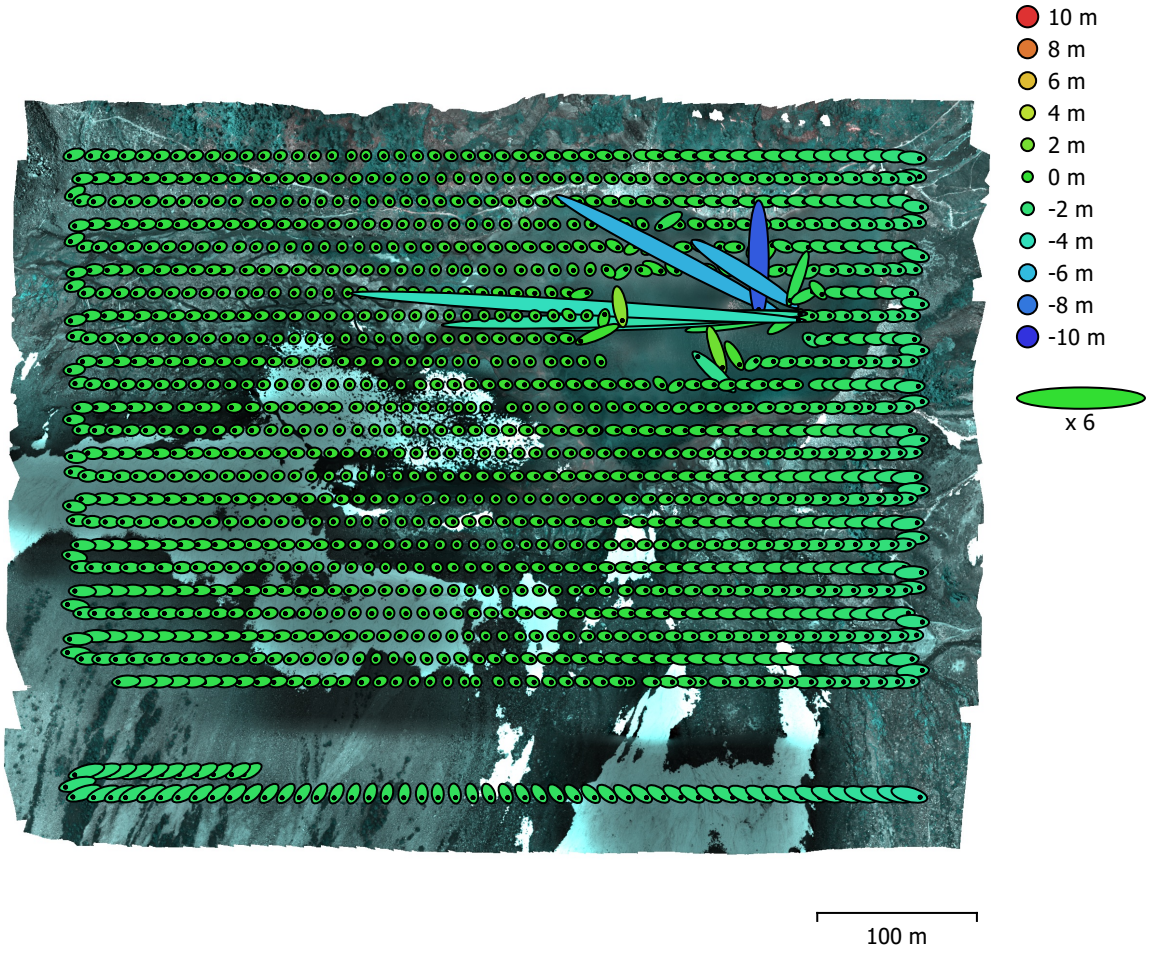


Fig. 10. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
2.1566	0.577788	1.00869	2.23266	2.44994

Table 2. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

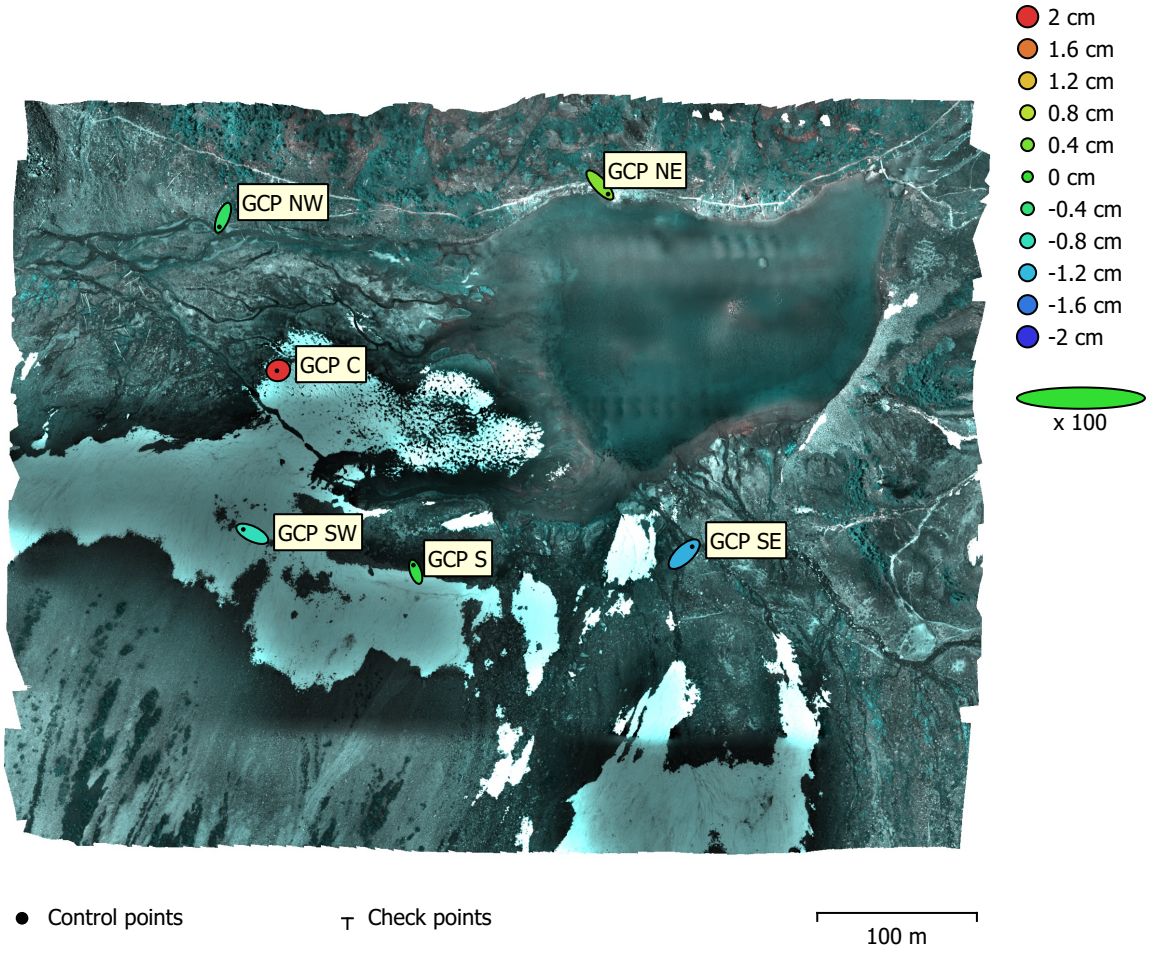


Fig. 11. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	7.77893	8.61813	1.04495	11.6096	11.6566

Table 3. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	10.0288	9.34145	-1.27217	13.7644	4.587 (10)
GCP S	-2.87435	8.35109	-0.0975737	8.83245	2.891 (10)
GCP SW	-11.2728	5.47811	-0.794106	12.5585	3.565 (10)
GCP C	-1.60908	-0.433767	1.99547	2.59984	2.722 (10)
GCP NW	-4.49675	-11.4096	-0.290084	12.2672	3.917 (10)
GCP NE	10.215	-11.3248	0.476354	15.2586	5.130 (10)
Total	**7.77893**	**8.61813**	**1.04495**	**11.6566**	**3.898**

Table 4. Control points.

X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

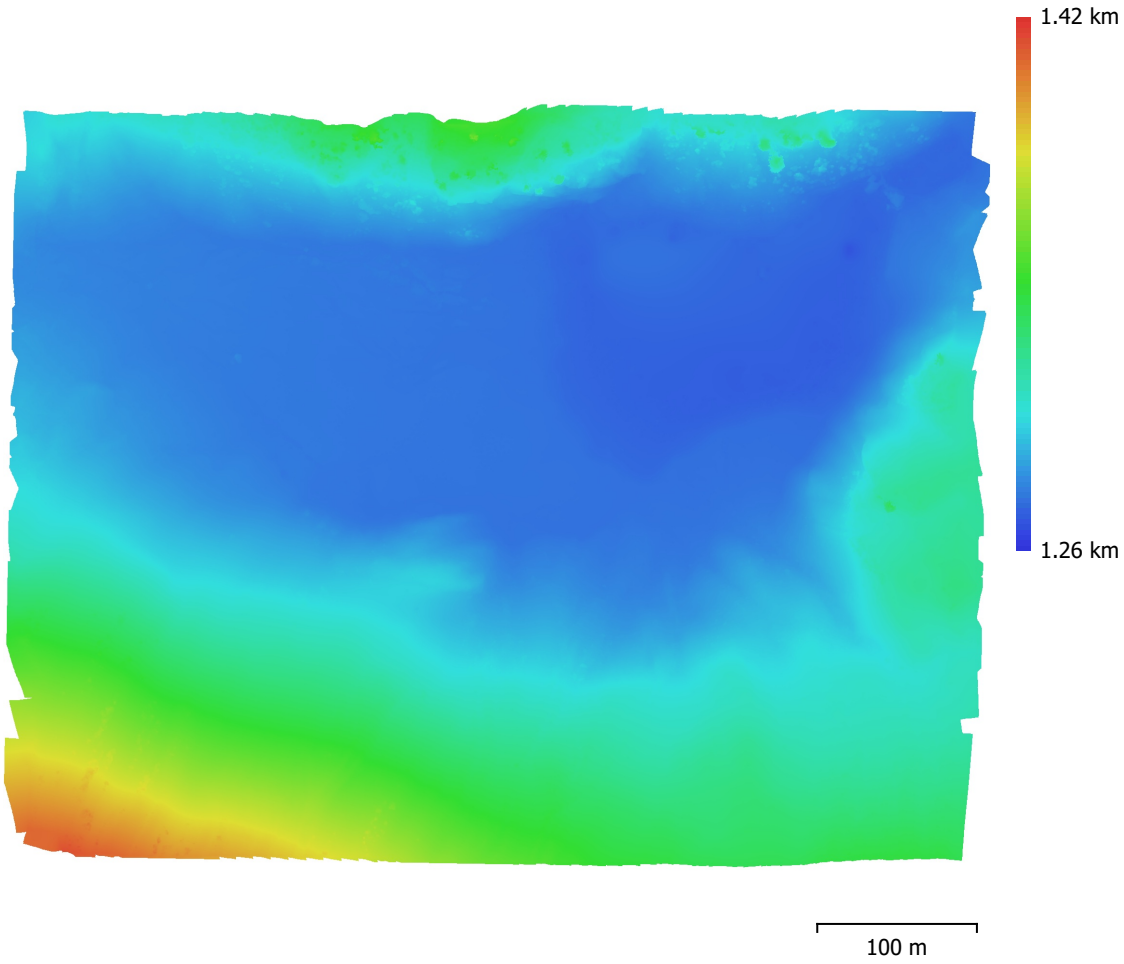


Fig. 12. Reconstructed digital elevation model.

Resolution:	6.12 cm/pix
Point density:	267 points/m²

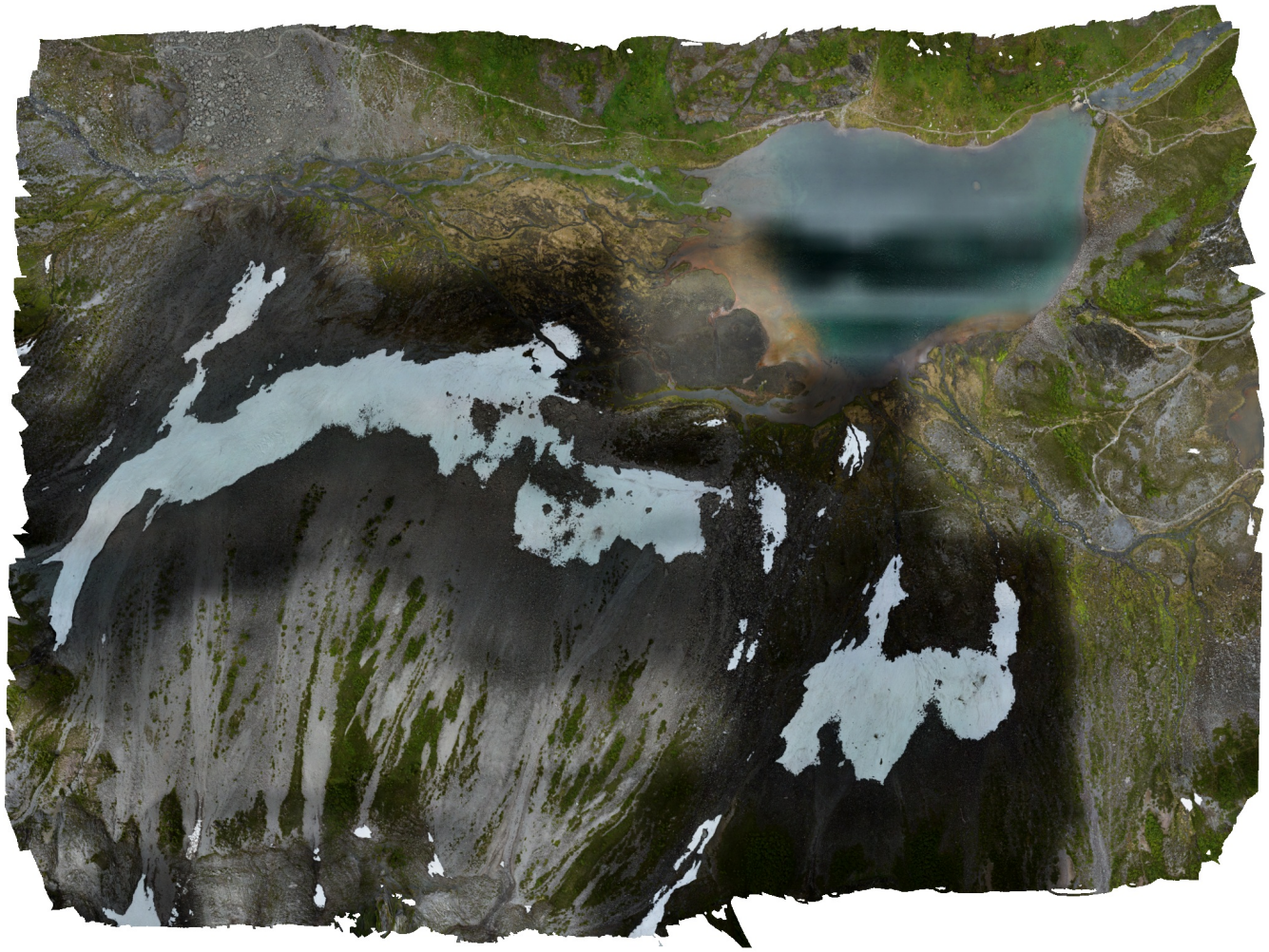
Processing Parameters

General	
Cameras	5076
Aligned cameras	4952
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	1,292,631 of 1,784,259
RMS reprojection error	0.252452 (0.783636 pix)
Max reprojection error	0.769995 (42.1819 pix)
Mean key point size	2.94771 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	16.4338
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	51 minutes 11 seconds
Matching memory usage	4.45 GB
Alignment time	1 hours 37 minutes
Alignment memory usage	1.06 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	3 minutes 20 seconds
Date created	2024:01:28 16:00:08
Software version	2.1.0.17530
File size	481.28 MB
Depth Maps	
Count	1216
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	40 minutes 41 seconds
Memory usage	1.43 GB
Date created	2024:01:28 19:27:27
Software version	2.1.0.17530
File size	2.05 GB
Point Cloud	
Points	89,955,613
Point attributes	
Color	4 bands, uint16

Normal	
Point classes	
Created (never classified)	89,955,613
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	40 minutes 41 seconds
Memory usage	1.43 GB
Point cloud generation parameters	
Processing time	33 minutes 57 seconds
Memory usage	5.38 GB
Date created	2024:01:28 20:01:25
Software version	2.1.0.17530
File size	1.72 GB
DEM	
Size	9,967 x 7,770
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	1 minutes 22 seconds
Memory usage	282.36 MB
Date created	2024:01:29 03:56:47
Software version	2.1.0.17530
File size	250.15 MB
Orthomosaic	
Size	19,933 x 15,539
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	44 minutes 57 seconds
Memory usage	1.72 GB
Date created	2024:05:01 12:22:24
Software version	2.1.1.17821
File size	82.28 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report - Bagley M3M RGB 2023-07-17

Processing Report
30 January 2024



Survey Data

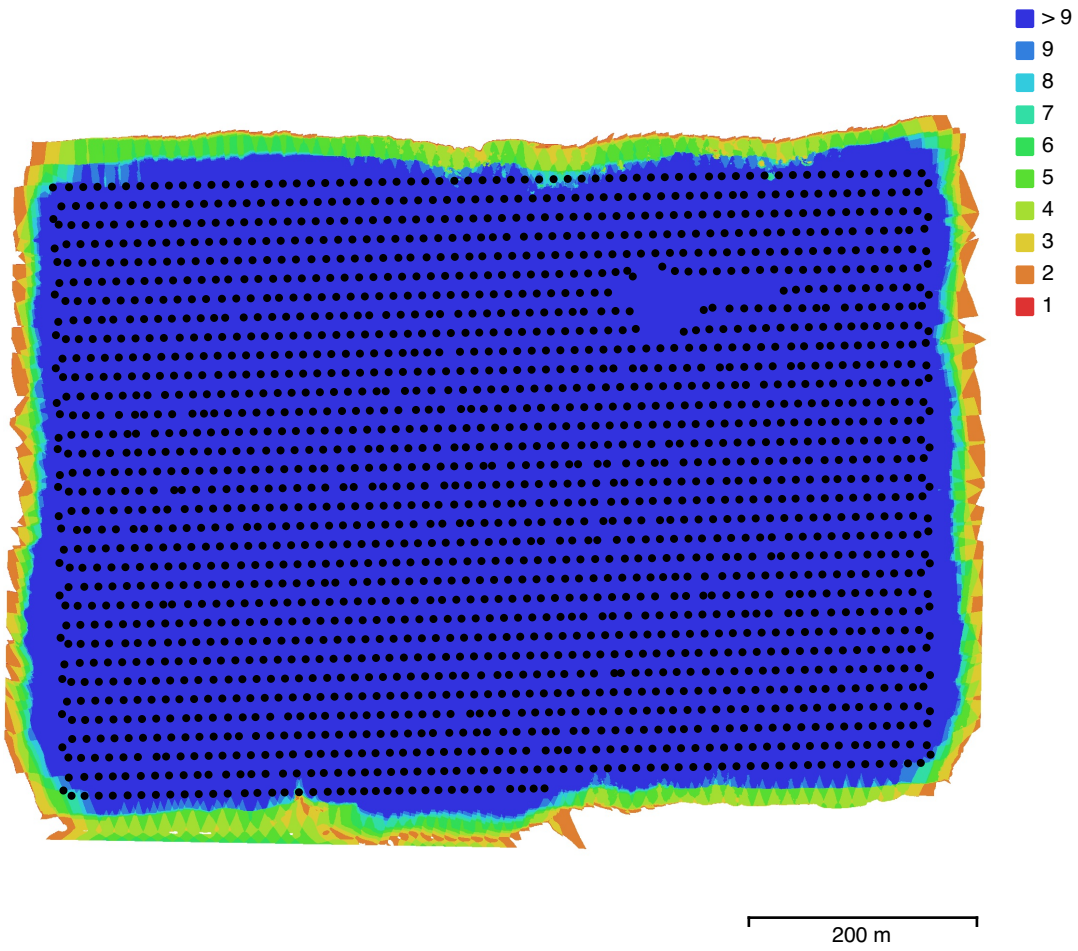


Fig. 1. Camera locations and image overlap.

Number of images:	2,035	Camera stations:	2,018
Flying altitude:	65.8 m	Tie points:	484,499
Ground resolution:	1.89 cm/pix	Projections:	4,802,361
Coverage area:	0.508 km²	Reprojection error:	0.732 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

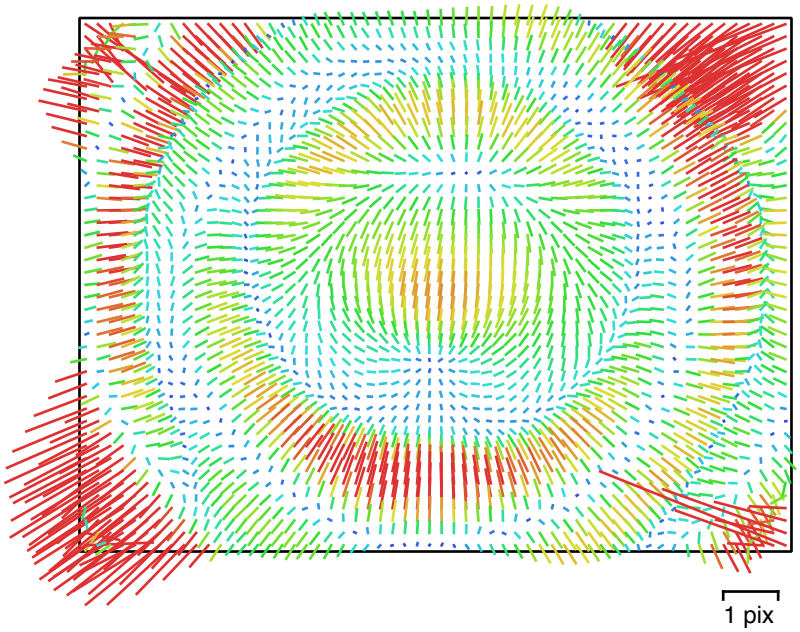


Fig. 2. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

2035 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3677.64**	0.22	1.00	0.17	-0.48	-0.02	-0.05	0.06	-0.50	0.58	-0.53	0.09	-0.03
Cx	**31.2568**	0.0058		1.00	-0.03	0.02	-0.07	0.01	-0.08	0.10	-0.09	0.80	0.06
Cy	**-20.9565**	0.0056			1.00	0.06	0.04	-0.03	0.24	-0.28	0.26	0.01	0.68
B1	**-0.673957**	0.0043				1.00	0.01	0.01	-0.00	-0.00	0.00	0.00	0.01
B2	**-0.0386949**	0.0041					1.00	-0.00	0.02	-0.03	0.03	-0.01	0.00
K1	**0.0127027**	1.8e-05						1.00	-0.87	0.78	-0.77	0.02	-0.01
K2	**-0.233421**	0.00011							1.00	-0.99	0.97	-0.06	0.02
K3	**0.387557**	0.00023								1.00	-0.99	0.07	-0.02
K4	**-0.176462**	0.00015									1.00	-0.06	0.02
P1	**0.000706769**	4.9e-07										1.00	0.06
P2	**-0.000607053**	4.2e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

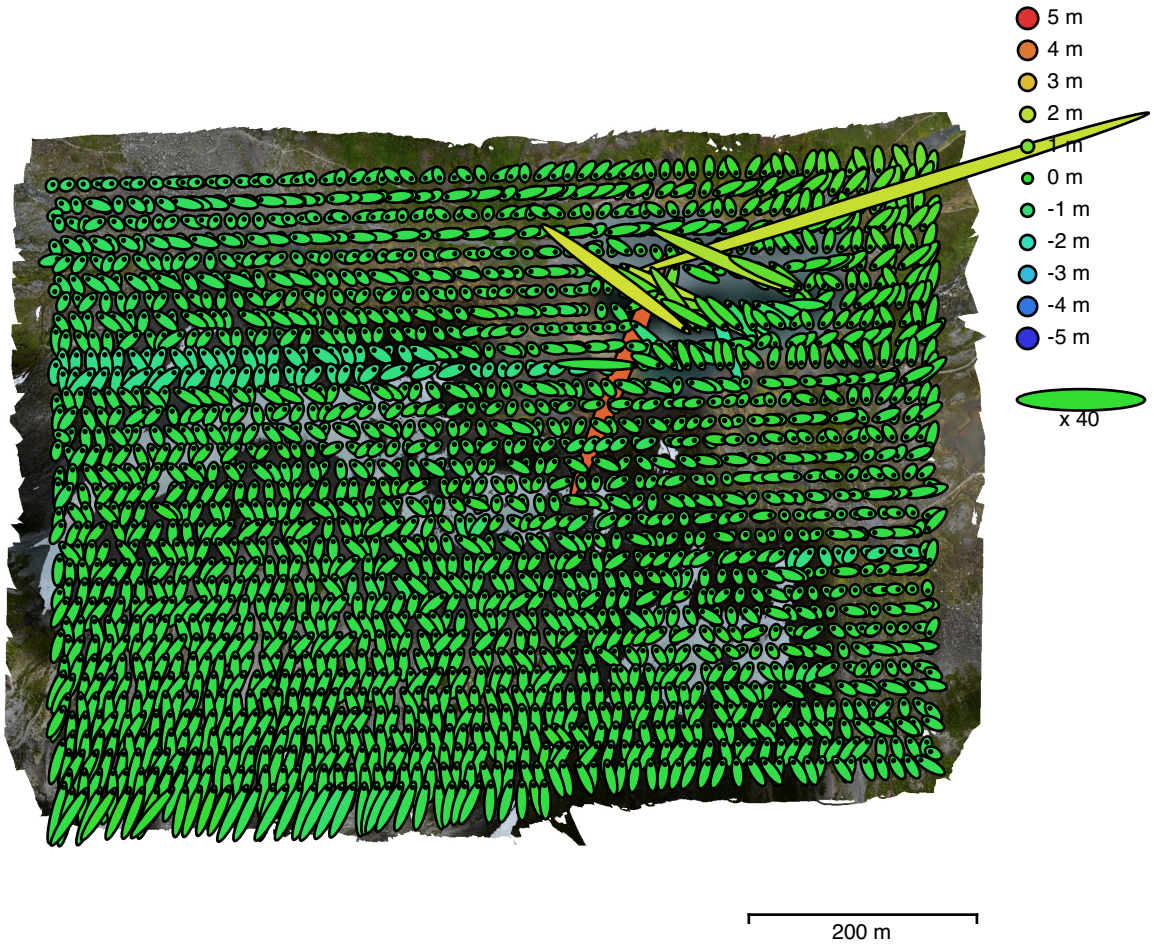


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
35.7975	39.0205	42.0928	52.9534	67.6452

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

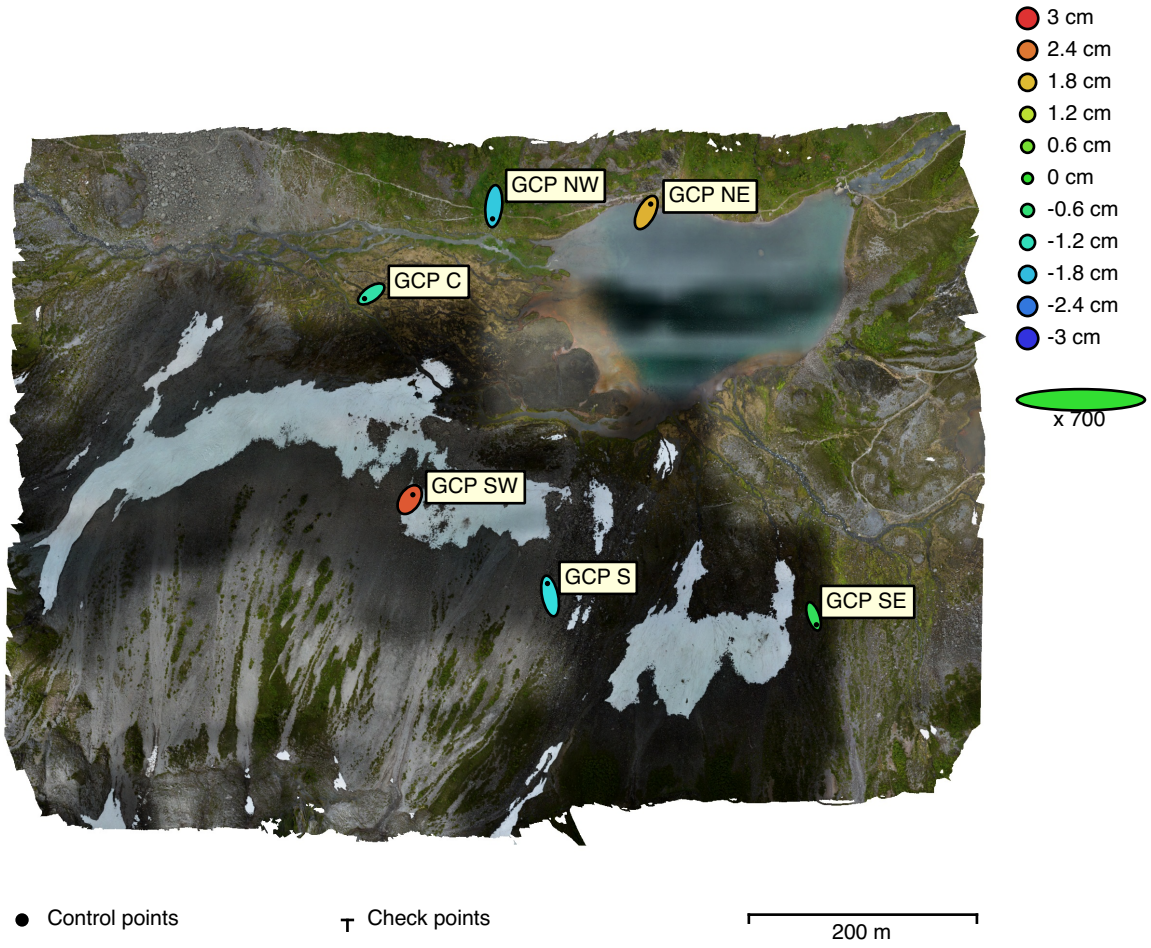


Fig. 4. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	0.974819	2.29861	1.67961	2.49677	3.00914

Table 4. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	0.719001	-2.11227	-0.34342	2.25756	0.799 (10)
GCP S	-0.6479	3.11919	-1.49345	3.51845	1.330 (10)
GCP SW	0.803259	1.22182	2.6666	3.04119	1.749 (10)
GCP C	-1.67266	-1.16903	-1.02345	2.28296	1.067 (10)
GCP NW	-0.30806	-3.18829	-1.68437	3.61901	1.117 (10)
GCP NE	1.10769	2.11798	1.89286	3.04889	1.342 (10)
Total	**0.974819**	**2.29861**	**1.67961**	**3.00914**	**1.268**

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

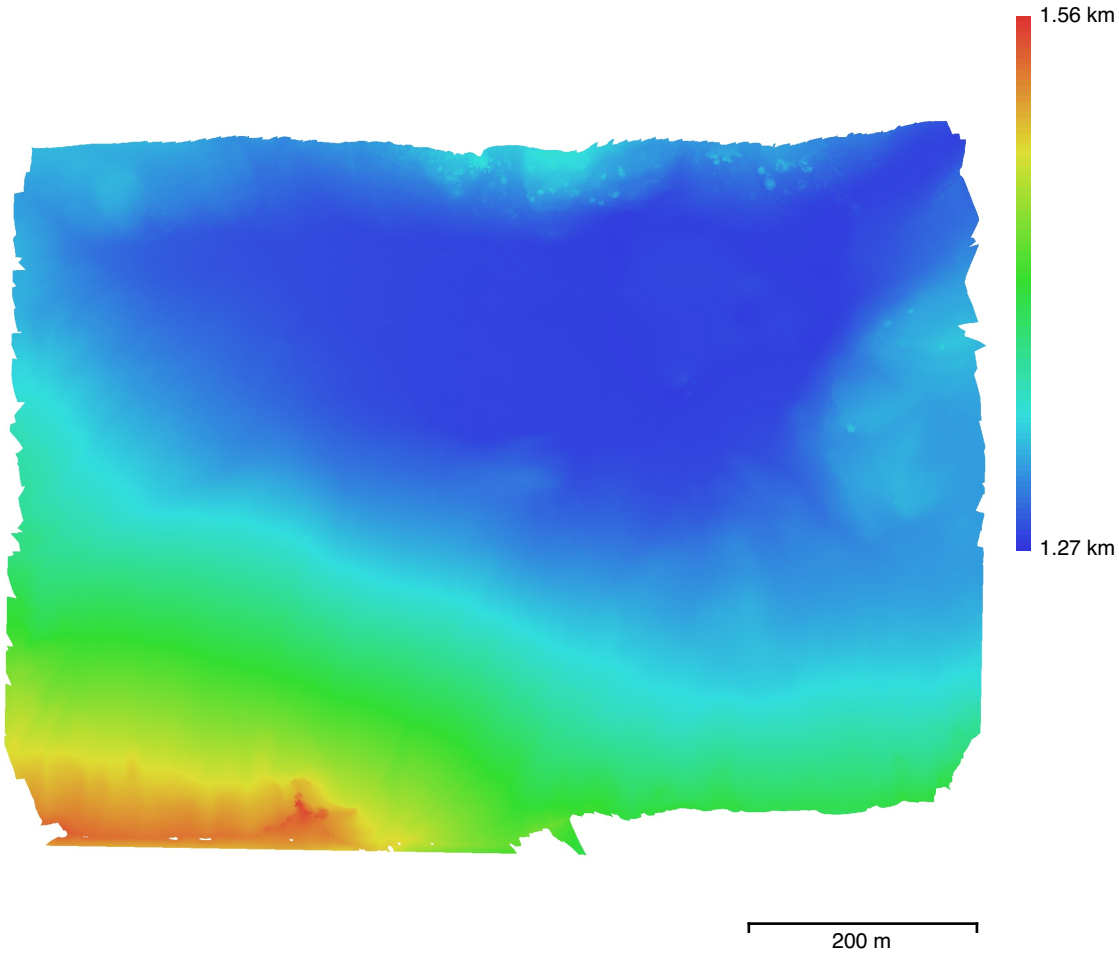


Fig. 5. Reconstructed digital elevation model.

Resolution:	3.79 cm/pix
Point density:	698 points/m²

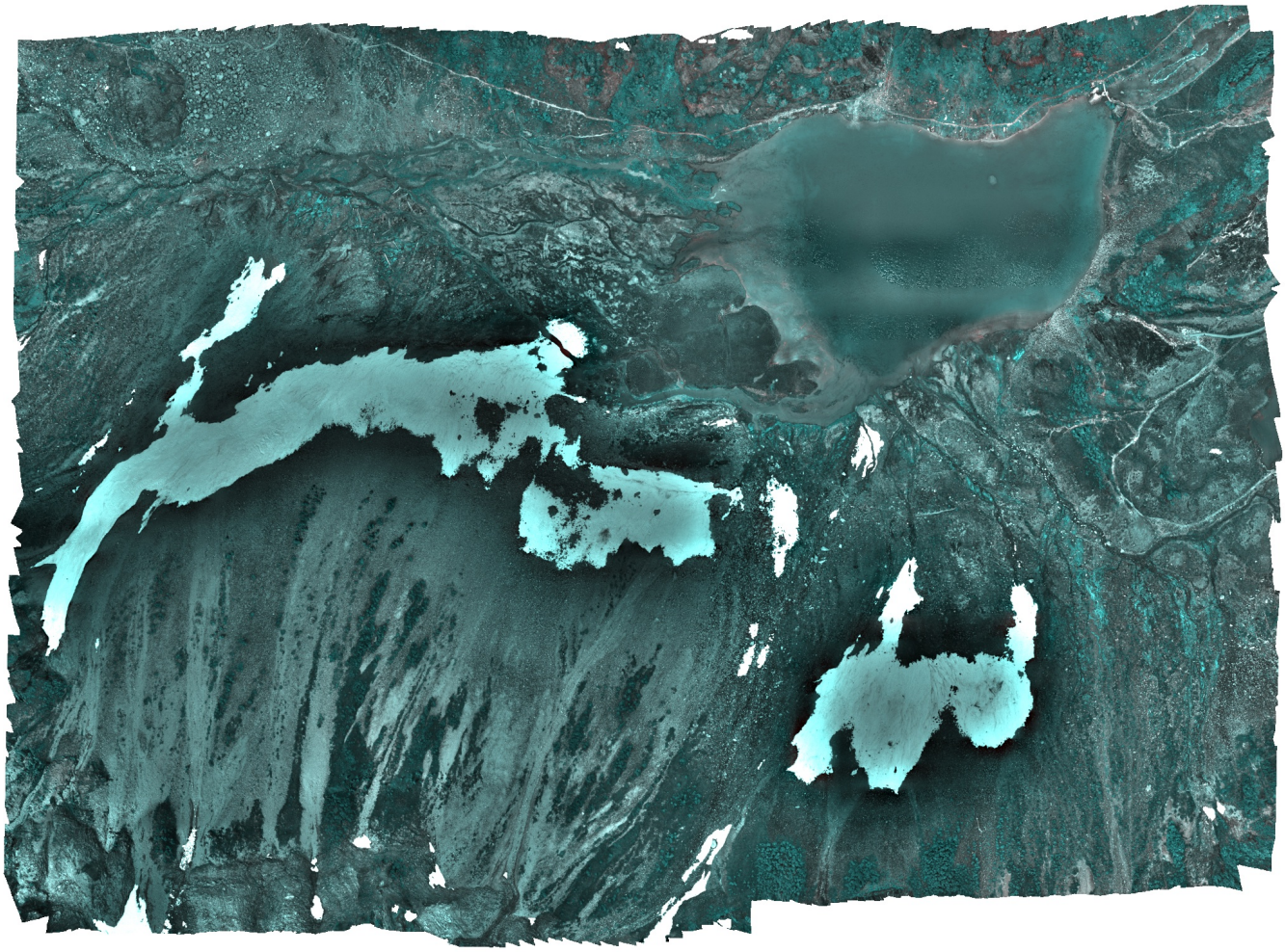
Processing Parameters

General	
Cameras	2035
Aligned cameras	2018
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	484,499 of 702,849
RMS reprojection error	0.21375 (0.731994 pix)
Max reprojection error	3.36655 (42.215 pix)
Mean key point size	3.21935 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	14.3193
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	23 minutes 17 seconds
Matching memory usage	2.46 GB
Alignment time	36 minutes 1 seconds
Alignment memory usage	2.11 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	1 minutes 48 seconds
Date created	2024:01:29 11:57:00
Software version	2.1.0.17530
File size	473.81 MB
Depth Maps	
Count	2013
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	4 hours 52 minutes
Memory usage	4.29 GB
Date created	2024:01:29 20:15:29
Software version	2.1.0.17530
File size	14.61 GB
Point Cloud	
Points	489,477,043
Point attributes	
Color	3 bands, uint8
Normal	

Point classes	
Created (never classified)	489,477,043
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	4 hours 52 minutes
Memory usage	4.29 GB
Point cloud generation parameters	
Processing time	6 hours 26 minutes
Memory usage	7.43 GB
Date created	2024:01:30 02:41:55
Software version	2.1.0.17530
File size	6.20 GB
DEM	
Size	22,571 x 17,133
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	3 minutes 29 seconds
Memory usage	209.31 MB
Date created	2024:01:30 11:58:00
Software version	2.1.0.17530
File size	1.14 GB
Orthomosaic	
Size	45,142 x 34,266
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	28 minutes 51 seconds
Memory usage	2.46 GB
Date created	2024:01:30 12:20:37
Software version	2.1.0.17530
File size	49.16 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report - MS Bagley M3M 2023-07-17

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31 January 2024



Survey Data

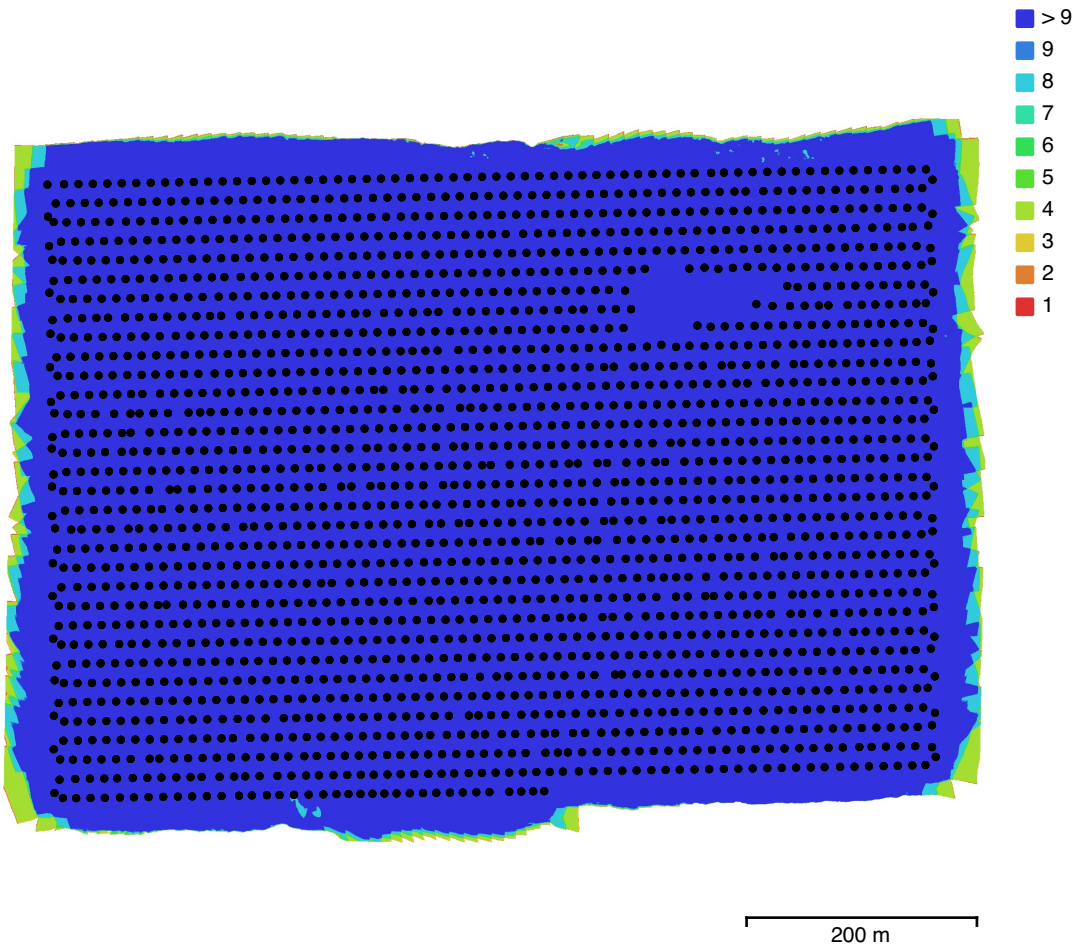


Fig. 1. Camera locations and image overlap.

Number of images:	8,140	Camera stations:	8,044
Flying altitude:	66.3 m	Tie points:	1,345,798
Ground resolution:	3.19 cm/pix	Projections:	23,321,487
Coverage area:	0.499 km²	Reprojection error:	0.498 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

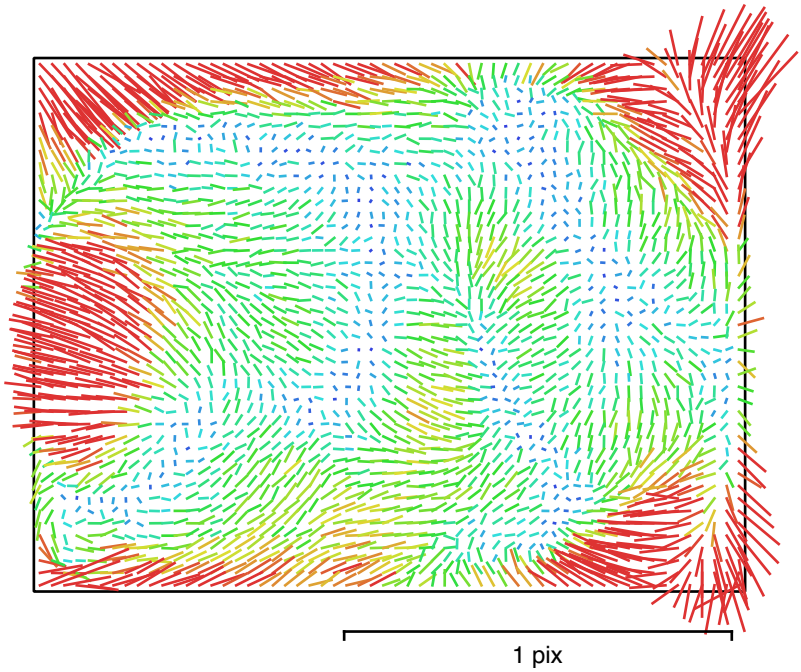


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

2035 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2177.29**	0.097	1.00	0.35	0.18	-0.01	-0.05	0.00	-0.01	-0.02	0.01	-0.00	-0.03
Cx	**12.0629**	0.0043		1.00	0.04	0.03	-0.03	0.00	-0.01	-0.01	0.01	0.85	-0.04
Cy	**3.16718**	0.0032			1.00	0.03	0.02	0.00	-0.01	0.00	-0.00	-0.03	0.80
B1	**-5.46121**	0.0045				1.00	0.02	0.01	-0.01	0.01	-0.01	0.01	0.00
B2	**-0.773364**	0.0035					1.00	-0.00	0.00	-0.00	0.00	-0.00	0.01
K1	**0.0106338**	3.1e-05						1.00	-0.97	0.93	-0.89	-0.00	-0.01
K2	**-0.0526953**	0.00021							1.00	-0.99	0.96	0.01	0.01
K3	**0.0134316**	0.00059								1.00	-0.99	-0.01	-0.01
K4	**-0.0233081**	0.00055									1.00	0.02	0.01
P1	**0.000178694**	6.4e-07										1.00	-0.02
P2	**-0.000223511**	5.2e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

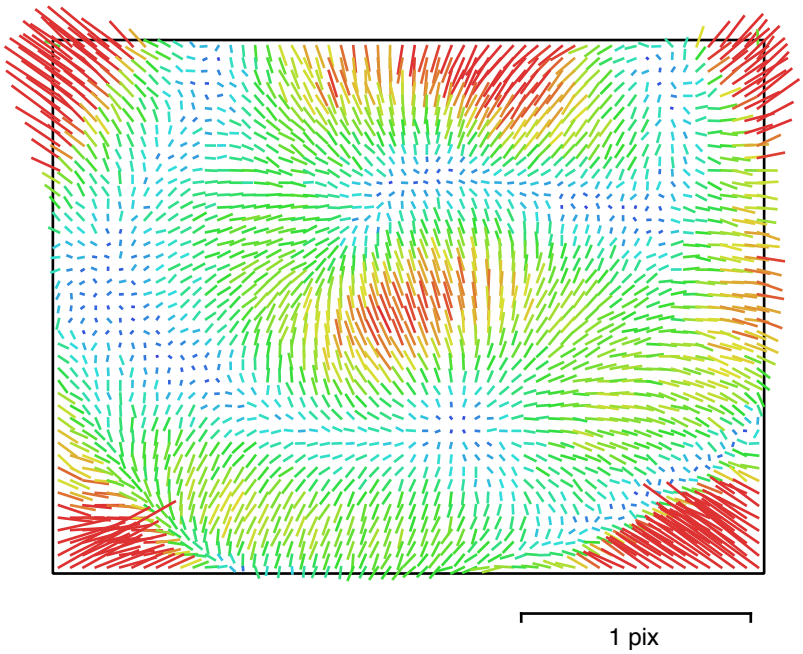


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

2035 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2180.17**	0.097	1.00	0.13	0.11	-0.01	-0.04	0.02	-0.04	0.01	-0.03	-0.01	0.03
Cx	**8.18207**	0.004		1.00	-0.01	0.02	-0.02	0.00	-0.00	-0.00	0.00	0.90	-0.02
Cy	**19.8446**	0.0032			1.00	0.03	0.02	0.00	-0.01	0.00	-0.00	-0.02	0.82
B1	**-5.59773**	0.0045				1.00	0.01	0.01	-0.01	0.01	-0.01	0.00	-0.00
B2	**-0.443655**	0.0035					1.00	-0.00	0.00	-0.00	0.00	0.01	0.00
K1	**0.0158583**	3.1e-05						1.00	-0.97	0.93	-0.89	-0.00	-0.01
K2	**-0.0819164**	0.00021							1.00	-0.99	0.96	0.00	0.01
K3	**0.0819545**	0.00059								1.00	-0.99	-0.01	-0.01
K4	**-0.0858577**	0.00055									1.00	0.01	0.02
P1	**-0.000187118**	6.4e-07										1.00	-0.02
P2	**0.000430872**	5.2e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

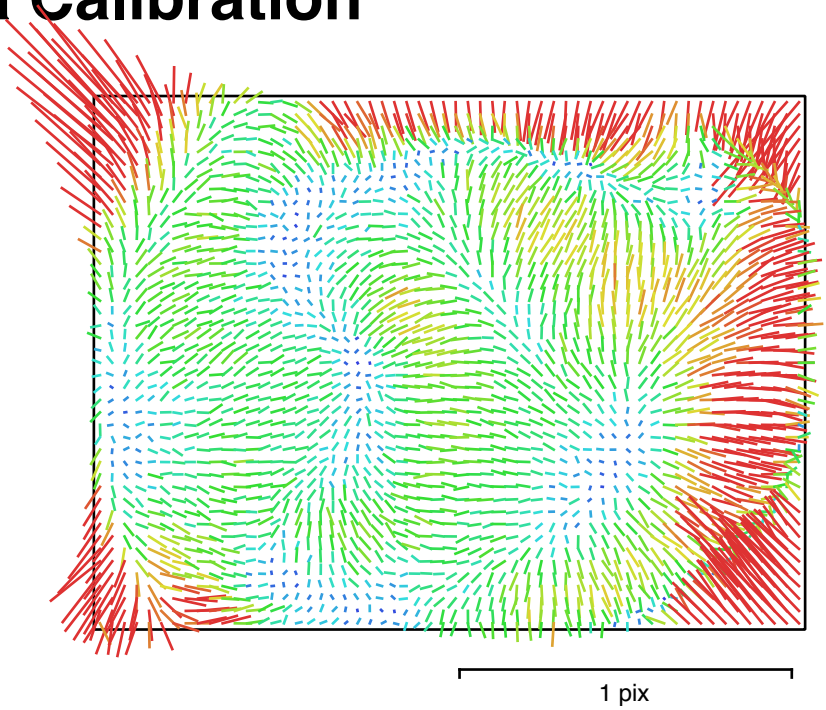


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

2035 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2186.62**	0.098	1.00	-0.04	-0.11	-0.01	-0.04	0.01	-0.04	0.01	-0.02	0.10	0.04
Cx	**7.89476**	0.0041		1.00	-0.02	0.01	-0.01	-0.01	0.01	-0.01	0.01	0.90	-0.03
Cy	**15.7826**	0.0032			1.00	0.03	0.02	-0.00	0.01	-0.00	0.00	-0.04	0.81
B1	**-5.76316**	0.0045				1.00	0.01	0.01	-0.01	0.01	-0.01	0.01	0.00
B2	**0.00198253**	0.0035					1.00	-0.00	0.00	-0.00	0.00	-0.00	0.01
K1	**0.0151438**	3.1e-05						1.00	-0.97	0.93	-0.89	0.00	-0.00
K2	**-0.0824129**	0.00022							1.00	-0.99	0.96	-0.00	0.00
K3	**0.07752**	0.00061								1.00	-0.99	-0.00	-0.01
K4	**-0.0737044**	0.00057									1.00	0.00	0.01
P1	**0.00111402**	6.5e-07										1.00	-0.02
P2	**0.000474488**	5.2e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

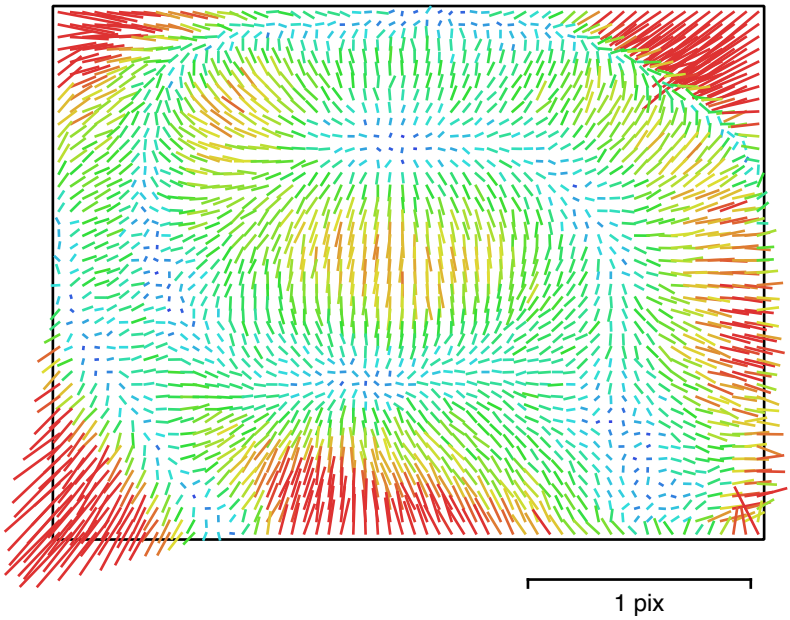


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

2035 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2193.78**	0.098	1.00	-0.21	-0.05	-0.01	-0.04	0.01	-0.03	0.00	-0.02	0.08	0.06
Cx	**7.80445**	0.0044		1.00	-0.00	0.01	-0.02	-0.01	0.02	-0.01	0.02	0.87	-0.03
Cy	**-25.268**	0.0034			1.00	0.03	0.02	0.00	0.00	0.00	-0.00	-0.02	0.82
B1	**-5.37801**	0.0045				1.00	0.00	0.01	-0.01	0.01	-0.01	0.01	0.01
B2	**-0.0588637**	0.0035					1.00	-0.00	0.00	-0.00	0.00	-0.01	0.01
K1	**0.0160063**	3.3e-05						1.00	-0.97	0.93	-0.89	-0.00	0.02
K2	**-0.0822199**	0.00023							1.00	-0.99	0.96	-0.00	-0.02
K3	**0.0724676**	0.00065								1.00	-0.99	-0.00	0.02
K4	**-0.0683215**	0.00062									1.00	0.01	-0.02
P1	**0.000763518**	6.8e-07										1.00	-0.01
P2	**0.00068845**	5.5e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Locations

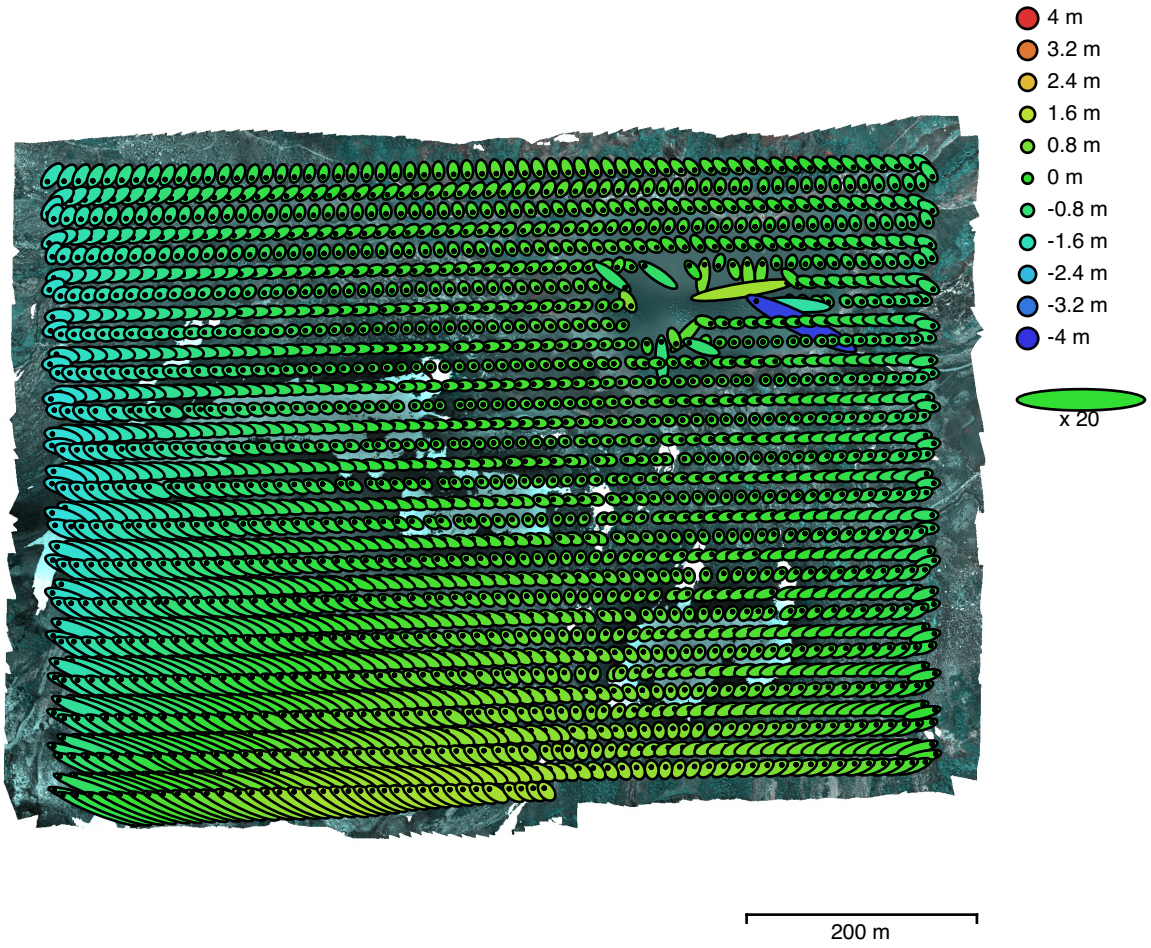


Fig. 6. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.801793	0.351717	0.672182	0.875544	1.10381

Table 6. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

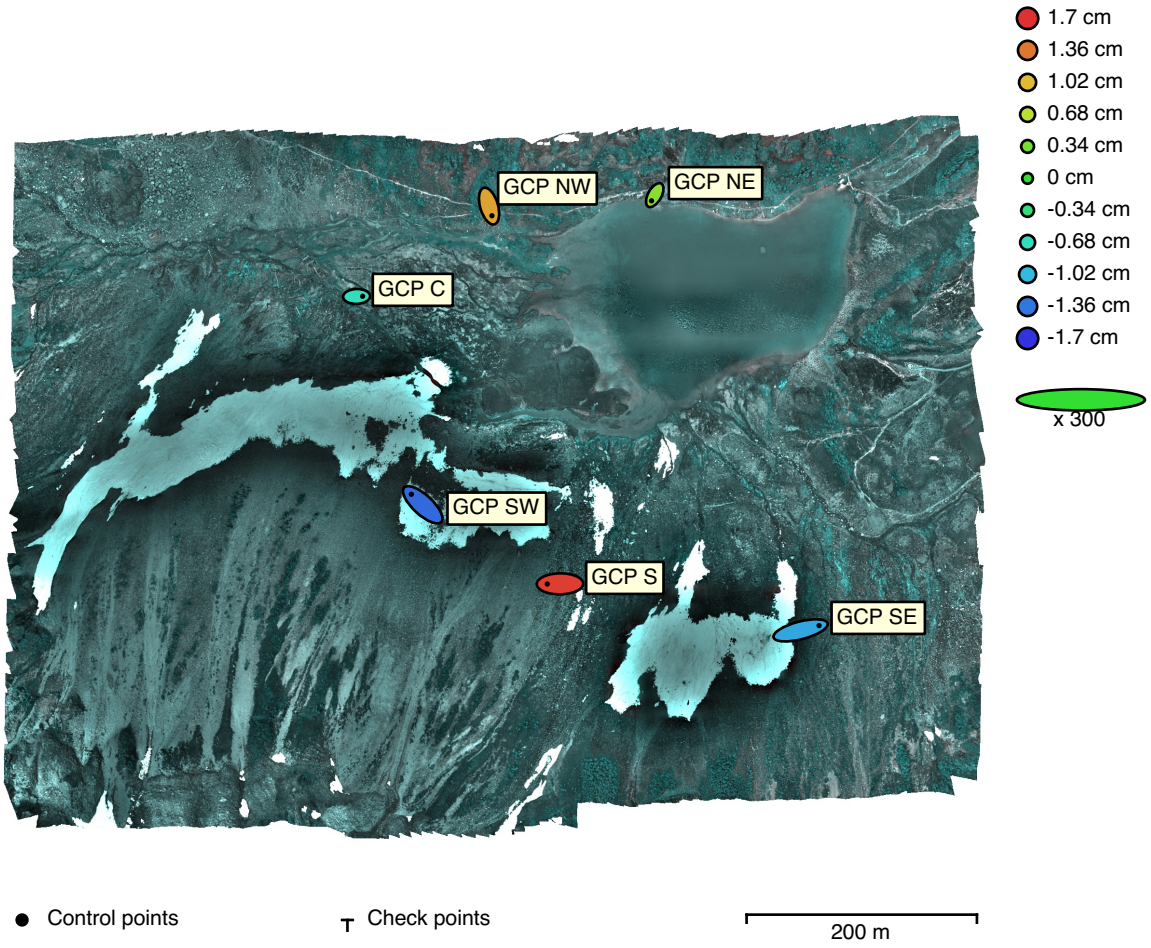


Fig. 7. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	6.19559	3.80678	1.15312	7.27165	7.36251

Table 7. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP SE	10.6849	2.76995	-1.12617	11.0954	3.442 (10)
GCP S	-7.35998	-0.0918176	1.6497	7.54316	2.698 (10)
GCP SW	-6.59832	6.09175	-1.42566	9.09283	2.713 (10)
GCP C	3.4996	0.114523	-0.67483	3.56591	1.428 (10)
GCP NW	1.65127	-5.58752	1.14459	5.93778	2.474 (10)
GCP NE	-1.86133	-3.30539	0.436239	3.81844	1.622 (10)
Total	**6.19559**	**3.80678**	**1.15312**	**7.36251**	**2.493**

Table 8. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

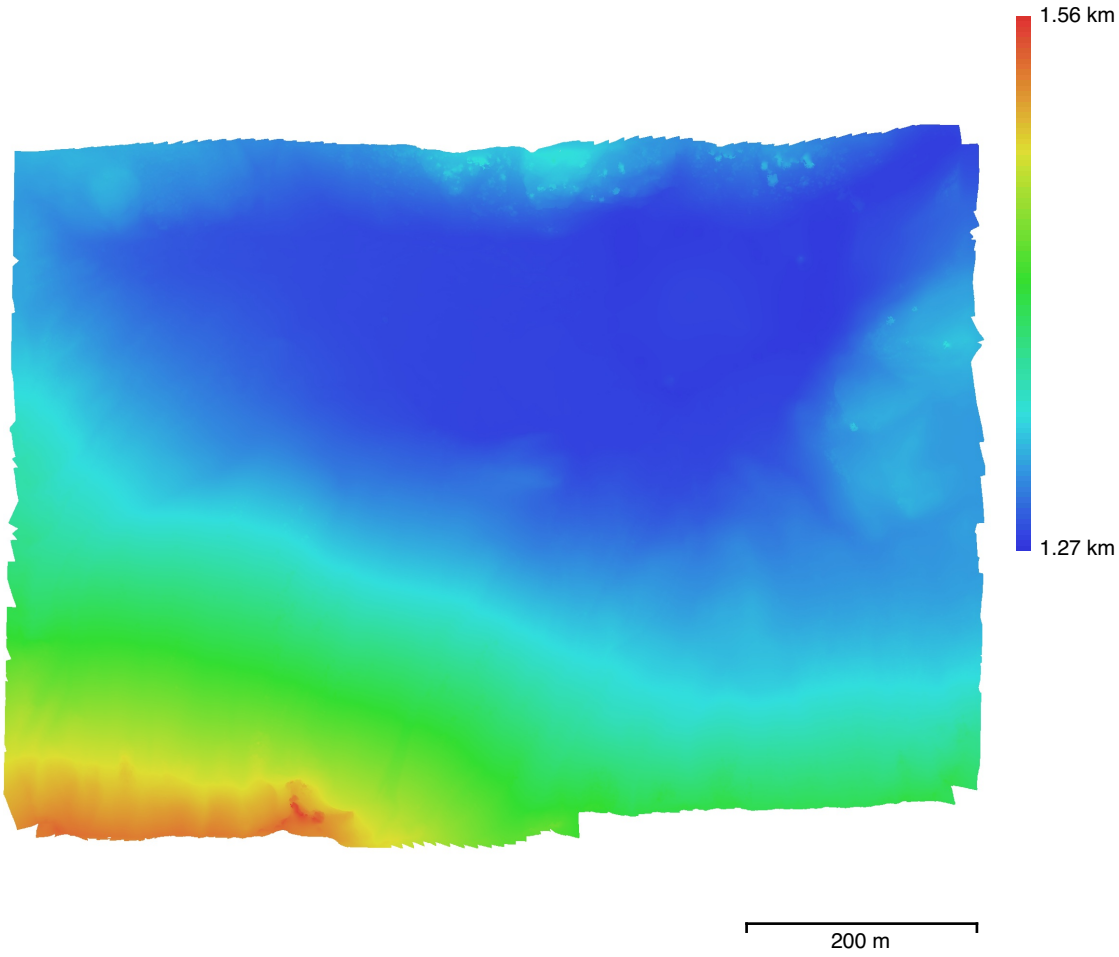


Fig. 8. Reconstructed digital elevation model.

Resolution:	6.39 cm/pix
Point density:	245 points/m²

Processing Parameters

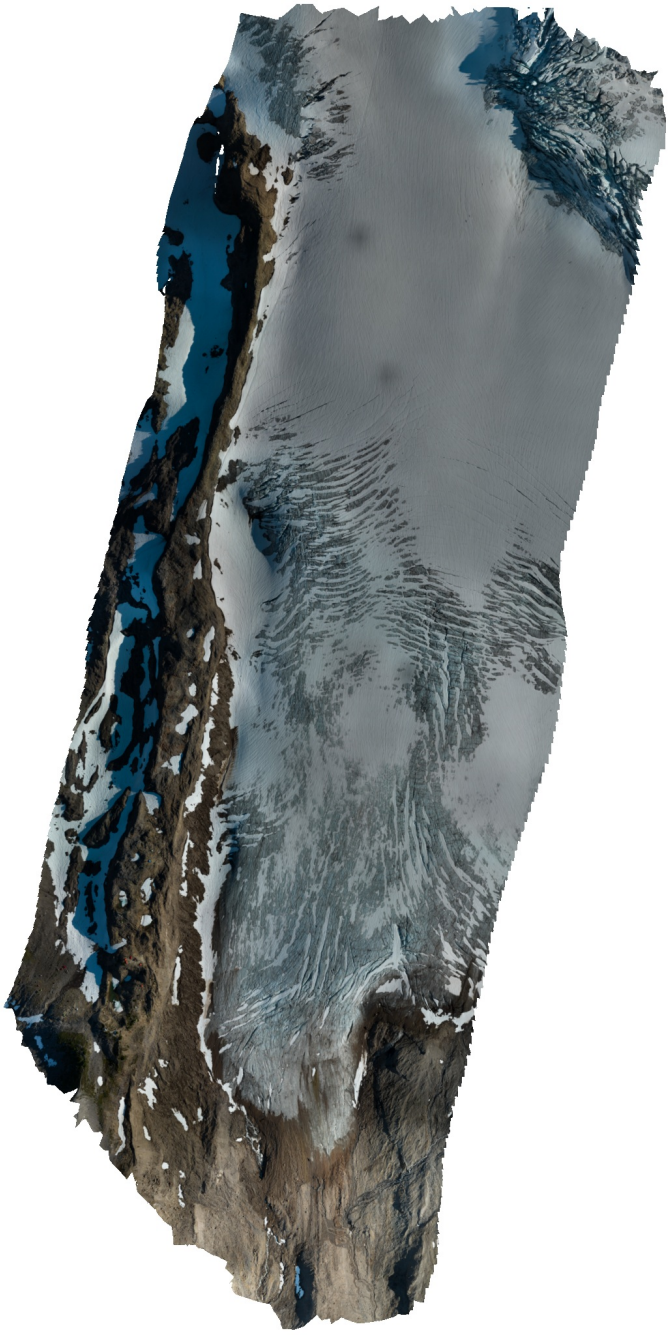
General	
Cameras	8140
Aligned cameras	8044
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	1,345,798 of 2,048,262
RMS reprojection error	0.172051 (0.498012 pix)
Max reprojection error	1.05164 (30.9245 pix)
Mean key point size	2.65616 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	23.6612
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	1 hours 30 minutes
Matching memory usage	3.53 GB
Alignment time	2 hours 13 minutes
Alignment memory usage	3.88 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	3 minutes 22 seconds
Date created	2024:01:30 08:44:30
Software version	2.1.0.17530
File size	775.28 MB
Depth Maps	
Count	1997
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 6 minutes
Memory usage	3.76 GB
Date created	2024:01:31 01:06:56
Software version	2.1.0.17530
File size	3.39 GB
Point Cloud	
Points	163,318,706
Point attributes	
Color	4 bands, uint16
Normal	

Point classes	
Created (never classified)	163,318,706
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 6 minutes
Memory usage	3.76 GB
Point cloud generation parameters	
Processing time	56 minutes 31 seconds
Memory usage	7.97 GB
Date created	2024:01:31 02:03:28
Software version	2.1.0.17530
File size	3.10 GB
DEM	
Size	13,249 x 9,957
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 11 seconds
Memory usage	291.20 MB
Date created	2024:01:31 11:27:58
Software version	2.1.0.17530
File size	417.31 MB
Orthomosaic	
Size	26,498 x 19,914
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	25 minutes 4 seconds
Memory usage	1.33 GB
Date created	2024:01:31 11:48:59
Software version	2.1.0.17530
File size	146.43 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17530
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	
GPU(s)	Apple M1 Pro

Agisoft Metashape Report DJI Mavic 3M RGB Cameras, Easton Glacier, Mt. Baker, WA, 2023-07-20

Processing Report

03 April 2024



Survey Data

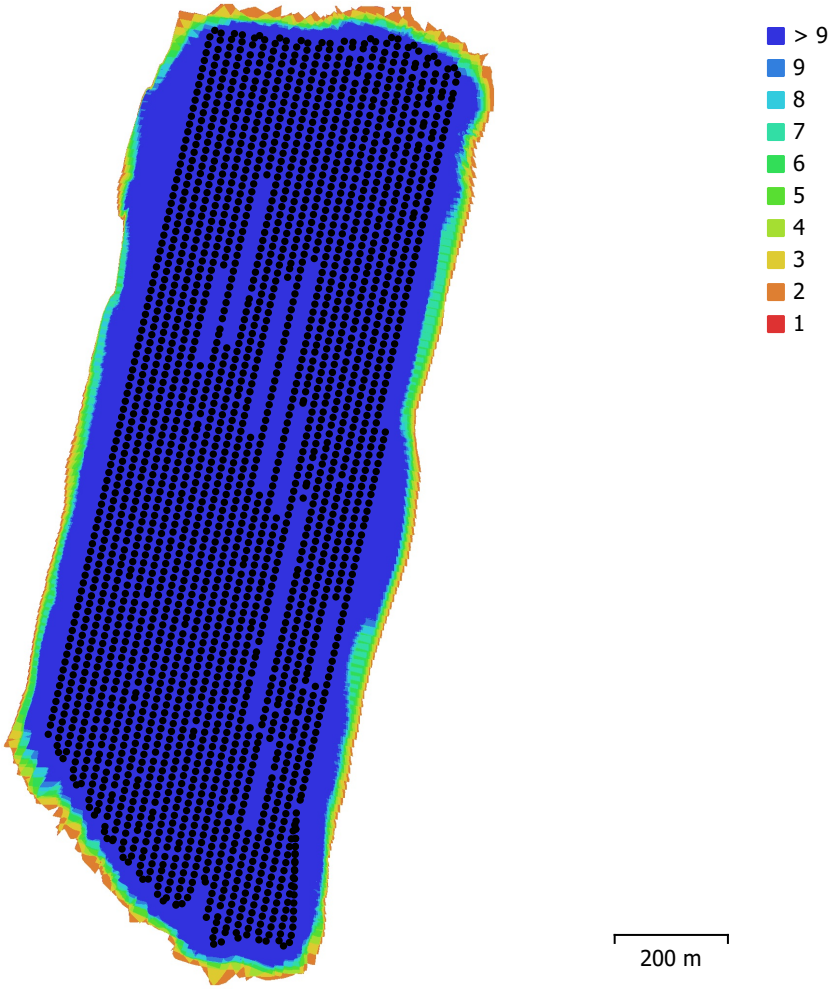


Fig. 1. Camera locations and image overlap.

Number of images:	2,471	Camera stations:	2,471
Flying altitude:	85.4 m	Tie points:	344,635
Ground resolution:	2.37 cm/pix	Projections:	6,269,580
Coverage area:	0.953 km²	Reprojection error:	0.708 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No
M3M, 0.2 mm f/2.8 (12.29…	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

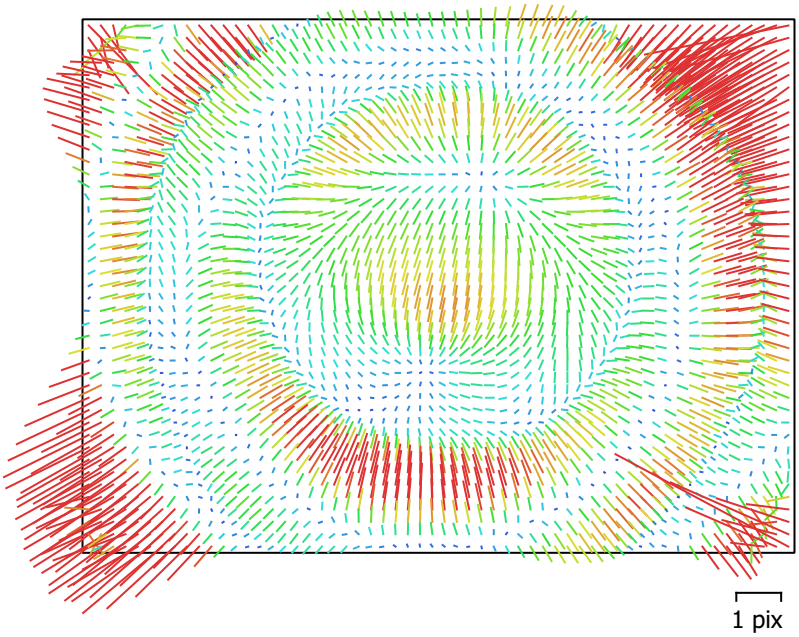


Fig. 2. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

2465 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3675.57**	0.27	1.00	0.03	-0.60	-0.03	0.03	0.10	-0.64	0.73	-0.69	0.14	-0.06
Cx	**31.2887**	0.0049		1.00	0.09	0.00	-0.00	-0.01	-0.01	0.01	-0.01	0.79	0.14
Cy	**-21.5026**	0.0049			1.00	0.01	-0.03	-0.08	0.40	-0.45	0.42	0.05	0.54
B1	**-0.404981**	0.0045				1.00	0.01	0.01	0.00	-0.01	0.01	0.01	0.00
B2	**-0.065771**	0.0044					1.00	0.00	-0.02	0.02	-0.02	-0.00	0.01
K1	**0.0100584**	1.6e-05						1.00	-0.78	0.68	-0.68	0.03	-0.03
K2	**-0.225581**	0.0001							1.00	-0.99	0.98	-0.10	0.04
K3	**0.374176**	0.00023								1.00	-0.99	0.11	-0.04
K4	**-0.166468**	0.00014									1.00	-0.10	0.04
P1	**0.000765933**	4.2e-07										1.00	0.14
P2	**-0.000589062**	3.3e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

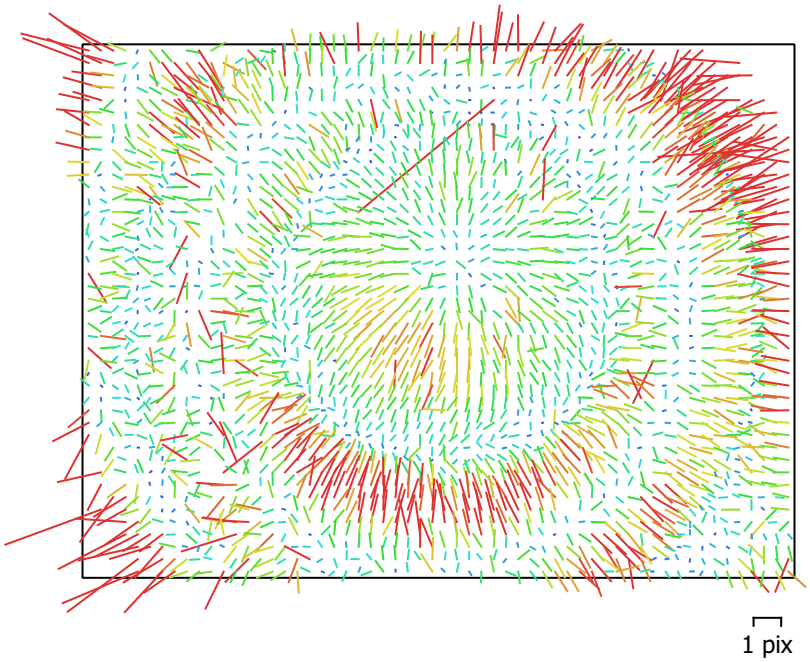


Fig. 3. Image residuals for M3M, 0.2 mm f/2.8 (12.29mm).

M3M, 0.2 mm f/2.8 (12.29mm)

6 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B2	K1	K2	K3	P1	P2
F	**3677.49**	0.49	1.00	-0.01	0.65	0.14	-0.13	-0.02	0.17	0.00	-0.15
Cx	**30.6927**	0.14		1.00	0.06	-0.67	0.03	-0.03	0.04	0.51	0.08
Cy	**-21.6415**	0.15			1.00	0.03	-0.03	-0.06	0.15	0.04	0.11
B2	**0.270814**	0.038				1.00	-0.01	0.00	0.00	0.06	-0.00
K1	**-0.0159891**	0.00016					1.00	-0.96	0.89	0.04	-0.03
K2	**-0.0926058**	0.00046						1.00	-0.98	-0.04	0.03
K3	**0.116995**	0.00042							1.00	0.04	-0.04
P1	**0.000837213**	8.7e-06								1.00	0.16
P2	**-0.000526657**	6.7e-06									1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Locations

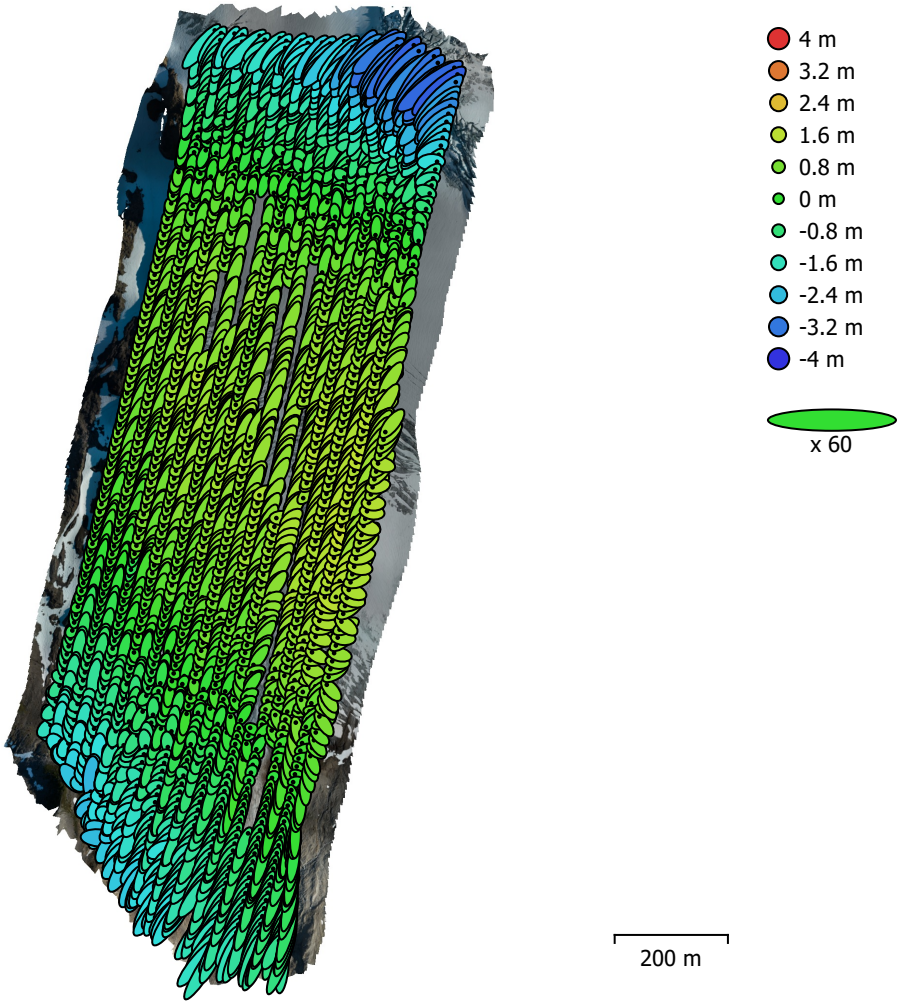


Fig. 4. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.312185	0.520492	1.11727	0.606936	1.27148

Table 4. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

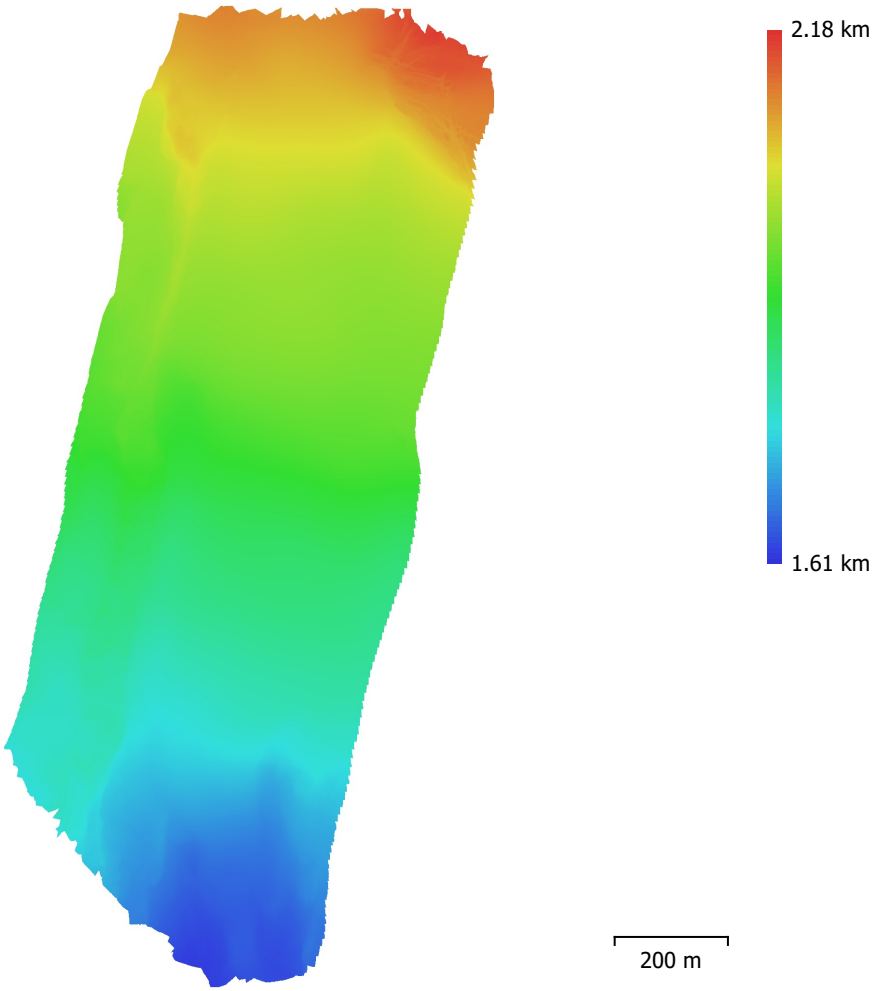


Fig. 5. Reconstructed digital elevation model.

Resolution:	4.74 cm/pix
Point density:	446 points/m²

Processing Parameters

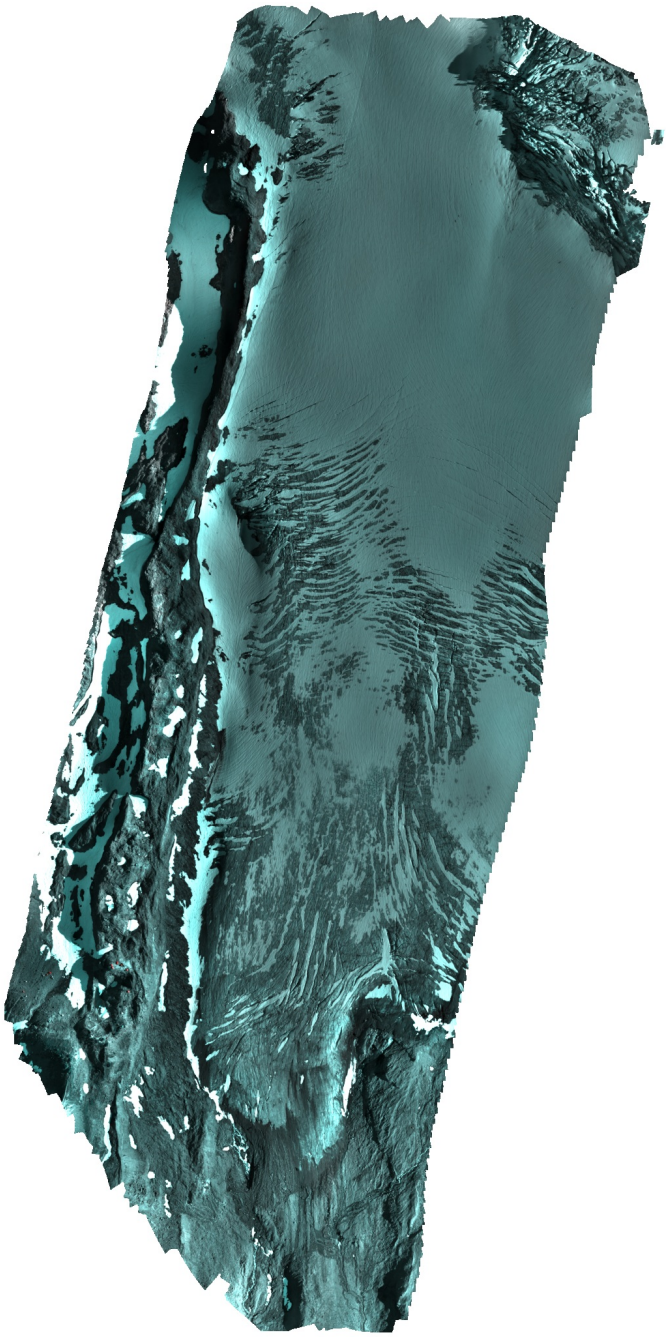
General	
Cameras	2471
Aligned cameras	2471
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	344,635 of 612,648
RMS reprojection error	0.24718 (0.707617 pix)
Max reprojection error	3.8602 (55.2656 pix)
Mean key point size	2.75426 pix
Point colors	3 bands, uint16
Key points	No
Average tie point multiplicity	22.7979
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	46 minutes 30 seconds
Matching memory usage	5.17 GB
Alignment time	14 minutes 39 seconds
Alignment memory usage	1.95 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	39 seconds
Date created	2024:04:02 09:46:59
Software version	2.1.0.17532
File size	224.84 MB
Depth Maps	
Count	2471
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 50 minutes
Memory usage	13.58 GB
Date created	2024:04:02 14:48:55
Software version	2.1.0.17532
File size	18.24 GB
Point Cloud	
Points	527,295,562
Point attributes	
Color	3 bands, uint16
Normal	

Confidence	1 - 67
Point classes	
Created (never classified)	527,295,562
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 50 minutes
Memory usage	13.58 GB
Point cloud generation parameters	
Processing time	3 hours 9 minutes
Memory usage	20.57 GB
Date created	2024:04:02 17:58:42
Software version	2.1.0.17532
File size	9.48 GB
DEM	
Size	17,860 x 36,530
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 56 seconds
Memory usage	331.46 MB
Date created	2024:04:03 11:33:25
Software version	2.1.0.17532
File size	1.36 GB
Orthomosaic	
Size	35,720 x 73,060
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	1 hours 4 minutes
Memory usage	3.37 GB
Date created	2024:04:03 12:52:33
Software version	2.1.0.17532
File size	563.63 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17532
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report DJI Mavic 3M Multispectral Cameras, Easton Glacier, Mt. Baker, WA, 2023-07-20

Processing Report

04 April 2024



Survey Data

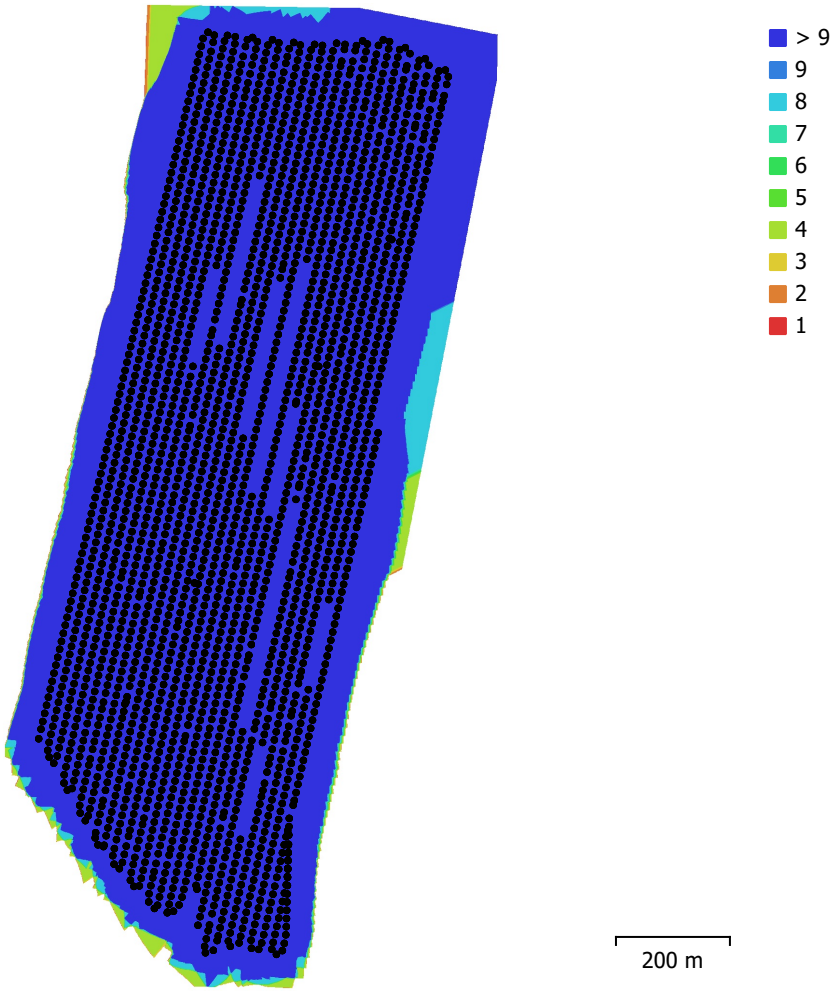


Fig. 1. Camera locations and image overlap.

Number of images:	9,908	Camera stations:	9,900
Flying altitude:	85.7 m	Tie points:	395,056
Ground resolution:	4.01 cm/pix	Projections:	21,911,051
Coverage area:	0.958 km²	Reprojection error:	0.332 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

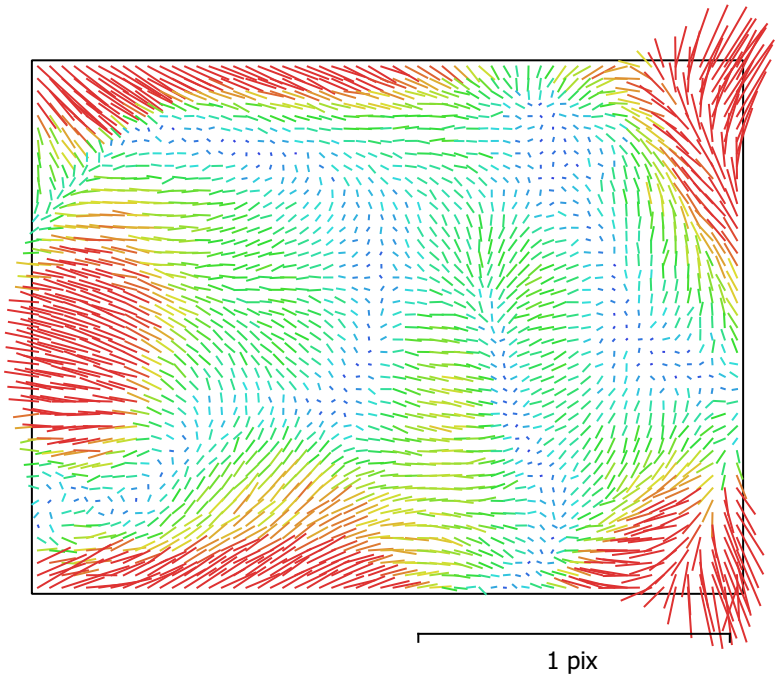


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

2471 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2171.83**	0.087	1.00	0.33	0.25	-0.08	0.06	0.02	-0.03	-0.02	0.01	-0.01	-0.03
Cx	**11.3957**	0.003		1.00	0.11	0.09	0.02	0.01	-0.01	-0.01	0.01	0.84	0.00
Cy	**3.56686**	0.0023			1.00	0.00	0.12	0.01	-0.01	-0.00	0.00	0.02	0.75
B1	**-4.58591**	0.0054				1.00	0.03	0.00	-0.00	0.00	-0.00	-0.00	0.00
B2	**-0.600011**	0.0041					1.00	0.00	-0.00	0.00	-0.00	-0.00	-0.00
K1	**0.00891029**	2.2e-05						1.00	-0.97	0.93	-0.88	0.00	-0.01
K2	**-0.0491686**	0.00015							1.00	-0.99	0.96	0.01	0.01
K3	**0.00573741**	0.0004								1.00	-0.99	-0.01	-0.01
K4	**-0.0168152**	0.00037									1.00	0.01	0.01
P1	**0.000214312**	4.4e-07										1.00	0.02
P2	**-0.000200522**	3.5e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

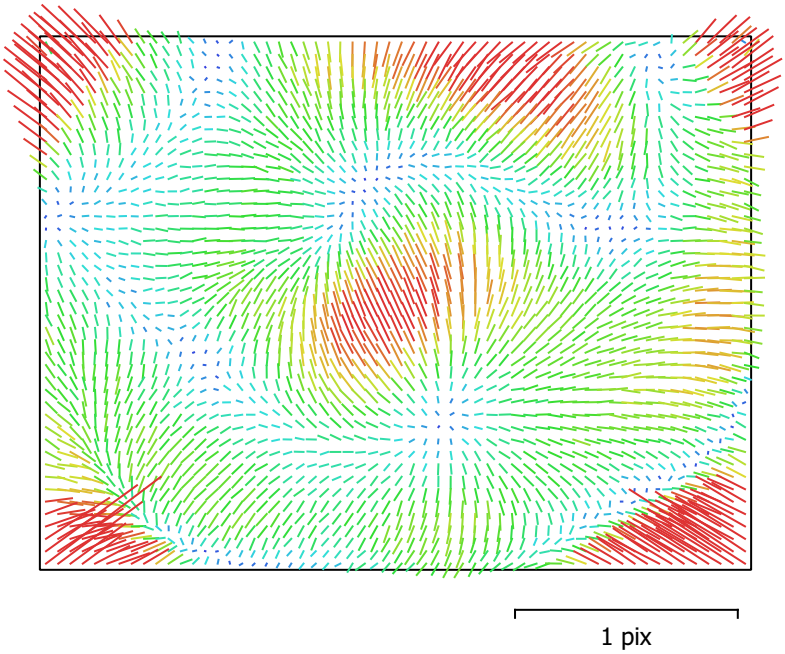


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

2471 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2174.35**	0.087	1.00	0.05	0.15	-0.08	0.06	0.04	-0.06	0.02	-0.05	-0.02	0.05
Cx	**7.90008**	0.0028		1.00	0.04	0.10	0.01	-0.00	-0.00	-0.00	0.00	0.89	0.02
Cy	**19.6571**	0.0022			1.00	0.01	0.11	0.01	-0.01	0.00	-0.01	0.03	0.78
B1	**-4.74714**	0.0054				1.00	0.02	0.00	-0.00	0.00	0.00	-0.01	0.00
B2	**-0.229233**	0.0041					1.00	0.00	-0.01	0.00	-0.00	-0.00	0.00
K1	**0.0143419**	2.2e-05						1.00	-0.97	0.93	-0.88	-0.00	-0.01
K2	**-0.0793522**	0.00015							1.00	-0.99	0.96	0.01	0.01
K3	**0.0771154**	0.00041								1.00	-0.99	-0.01	-0.02
K4	**-0.081992**	0.00038									1.00	0.01	0.02
P1	**-0.000184072**	4.4e-07										1.00	0.02
P2	**0.000431384**	3.5e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

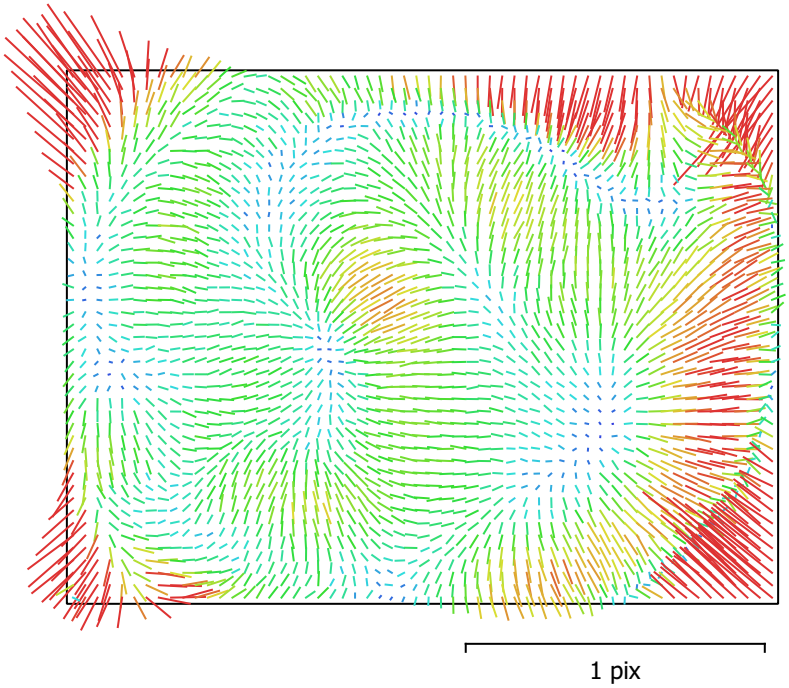


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

2471 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2180.78**	0.087	1.00	-0.16	-0.12	-0.08	0.07	0.04	-0.06	0.03	-0.05	0.12	0.07
Cx	**7.57587**	0.0029		1.00	0.05	0.10	-0.01	-0.01	0.02	-0.01	0.02	0.86	0.00
Cy	**15.6743**	0.0022			1.00	0.03	0.08	-0.01	0.01	-0.01	0.01	0.01	0.77
B1	**-4.94575**	0.0054				1.00	0.02	0.00	-0.00	0.00	0.00	-0.01	0.00
B2	**0.243517**	0.0041					1.00	0.00	-0.01	0.00	-0.00	0.01	0.01
K1	**0.0138795**	2.2e-05						1.00	-0.97	0.93	-0.88	0.01	-0.00
K2	**-0.0830049**	0.00015							1.00	-0.99	0.96	-0.01	0.00
K3	**0.0857457**	0.00042								1.00	-0.99	0.00	-0.01
K4	**-0.0844201**	0.00039									1.00	-0.00	0.01
P1	**0.00113363**	4.5e-07										1.00	0.02
P2	**0.000488713**	3.6e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

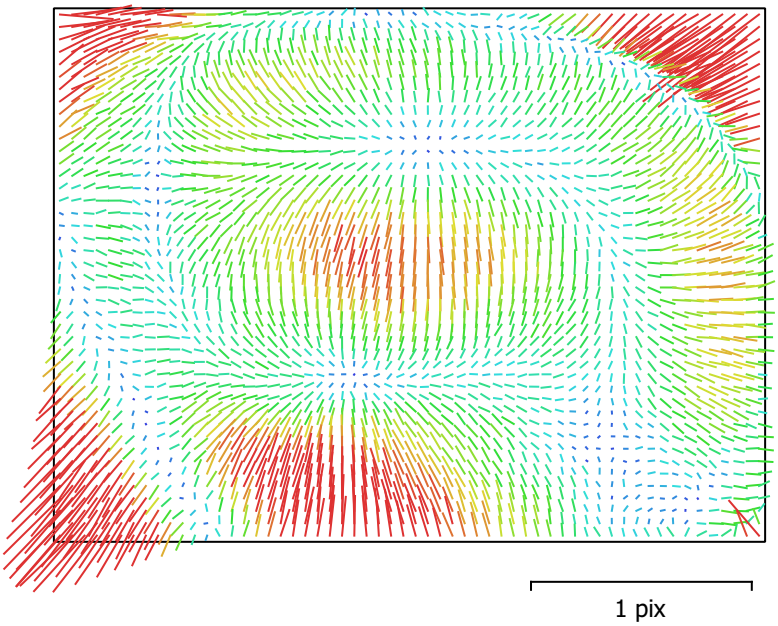


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

2471 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2188.31**	0.088	1.00	-0.35	-0.05	-0.08	0.07	0.04	-0.05	0.01	-0.02	0.10	0.09
Cx	**8.54311**	0.0031		1.00	0.06	0.10	-0.04	-0.02	0.03	-0.01	0.02	0.80	-0.01
Cy	**-24.3116**	0.0023			1.00	0.03	0.08	-0.00	0.01	-0.00	0.00	0.03	0.78
B1	**-4.56639**	0.0054				1.00	0.02	0.00	-0.00	0.00	0.00	-0.01	0.01
B2	**0.130771**	0.0041					1.00	0.00	-0.00	0.00	-0.00	-0.01	0.01
K1	**0.0139604**	2.3e-05						1.00	-0.97	0.93	-0.88	0.00	0.02
K2	**-0.0758905**	0.00016							1.00	-0.99	0.96	-0.01	-0.02
K3	**0.0577455**	0.00044								1.00	-0.99	0.00	0.02
K4	**-0.0556827**	0.00041									1.00	-0.00	-0.02
P1	**0.000776682**	4.6e-07										1.00	0.03
P2	**0.000714899**	3.7e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

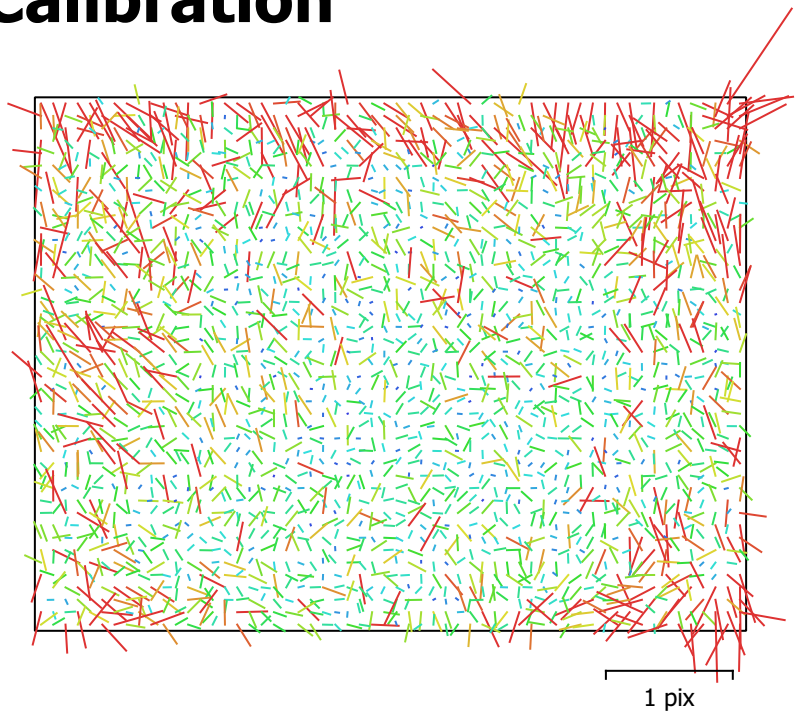


Fig. 6. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

6 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2169.96**	0.18	1.00	0.13	0.65	0.21	-0.06	-0.07	-0.06	-0.03	-0.13
Cx	**11.3618**	0.062		1.00	0.07	-0.02	-0.41	-0.02	0.01	0.70	-0.06
Cy	**2.99557**	0.082			1.00	0.53	-0.13	0.00	-0.10	-0.07	0.20
B1	**-4.60981**	0.014				1.00	-0.05	-0.07	0.01	-0.01	-0.09
B2	**-0.729188**	0.013					1.00	0.01	0.01	0.05	0.06
K1	**0.0101606**	6.7e-05						1.00	-0.96	-0.03	-0.05
K2	**-0.0520916**	0.00012							1.00	0.04	0.06
P1	**0.000235804**	8e-06								1.00	-0.03
P2	**-0.000149329**	6.4e-06									1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

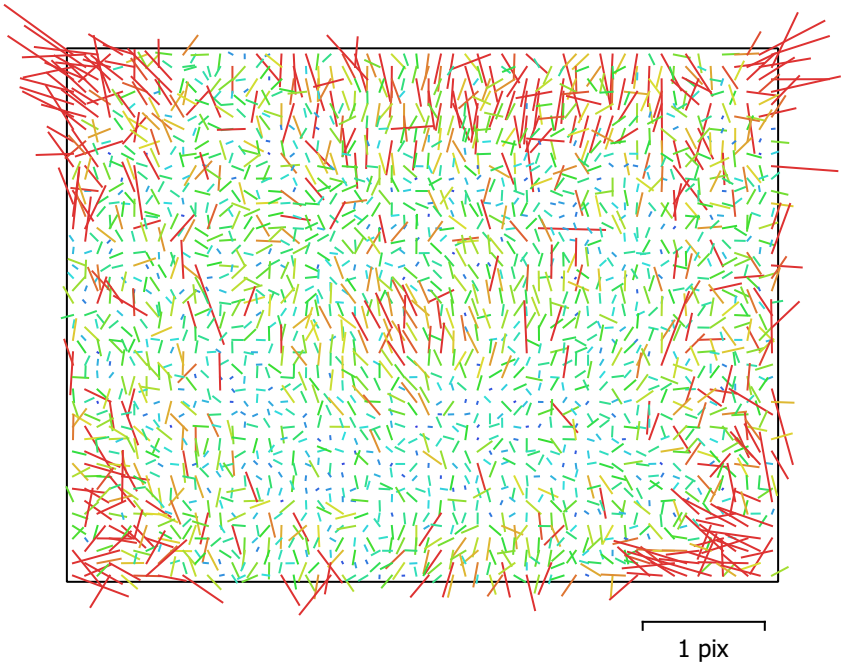


Fig. 7. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

6 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2172.78**	0.18	1.00	0.11	0.65	0.20	-0.05	-0.07	-0.06	-0.04	-0.12
Cx	**7.81081**	0.061		1.00	0.06	-0.04	-0.38	-0.01	-0.01	0.70	-0.05
Cy	**18.9911**	0.082			1.00	0.51	-0.13	-0.01	-0.09	-0.07	0.21
B1	**-4.76968**	0.014				1.00	-0.04	-0.07	0.01	-0.02	-0.10
B2	**-0.199532**	0.013					1.00	-0.00	0.01	0.08	0.04
K1	**0.0118966**	6.7e-05						1.00	-0.96	-0.01	-0.07
K2	**-0.0558195**	0.00013							1.00	0.02	0.07
P1	**-0.00017976**	7.9e-06								1.00	-0.01
P2	**0.00046622**	6.4e-06									1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

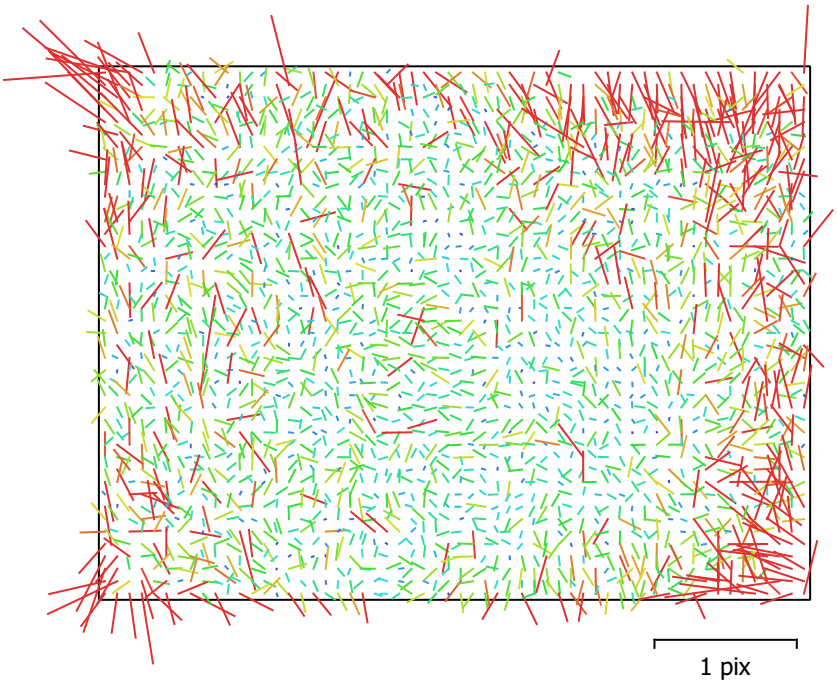


Fig. 8. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

6 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2179.43**	0.18	1.00	0.09	0.64	0.19	-0.01	-0.08	-0.06	-0.02	-0.12
Cx	**7.5052**	0.062		1.00	0.05	-0.01	-0.38	-0.01	0.01	0.71	-0.04
Cy	**15.1598**	0.081			1.00	0.51	-0.07	-0.01	-0.09	-0.05	0.21
B1	**-4.96933**	0.014				1.00	-0.03	-0.07	0.02	0.01	-0.09
B2	**0.313278**	0.012					1.00	0.00	0.00	0.07	0.06
K1	**0.0101605**	6.8e-05						1.00	-0.96	-0.02	-0.07
K2	**-0.0537731**	0.00013							1.00	0.03	0.07
P1	**0.00114492**	8e-06								1.00	-0.01
P2	**0.000535517**	6.4e-06									1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

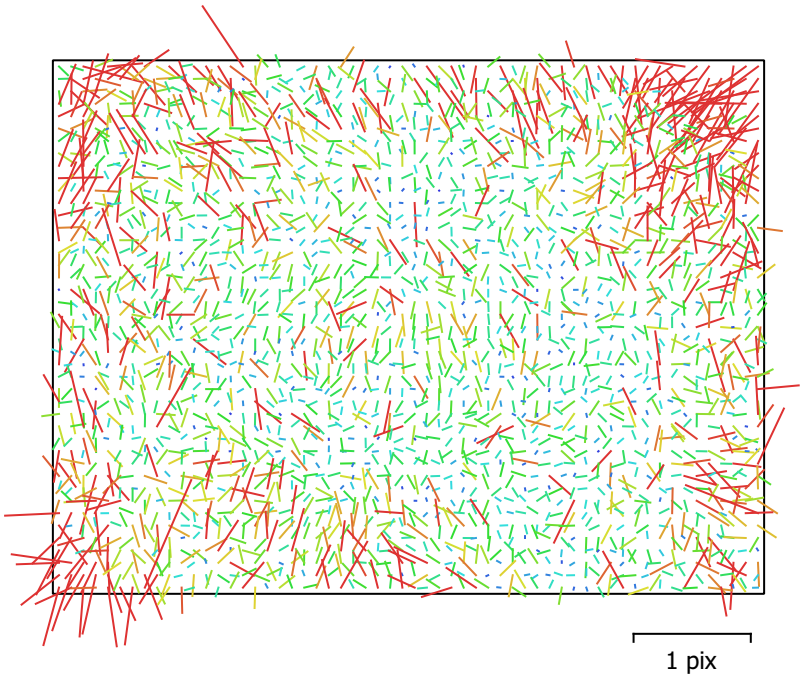


Fig. 9. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

6 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2187.06**	0.18	1.00	0.07	0.64	0.19	-0.00	-0.06	-0.08	-0.03	-0.12
Cx	**8.62822**	0.062		1.00	0.04	-0.02	-0.40	-0.01	0.00	0.71	-0.02
Cy	**-24.7665**	0.082			1.00	0.51	-0.06	0.02	-0.12	-0.05	0.22
B1	**-4.66695**	0.014				1.00	-0.02	-0.06	0.00	-0.01	-0.06
B2	**0.175201**	0.013					1.00	0.00	0.00	0.03	0.05
K1	**0.0113299**	6.8e-05						1.00	-0.96	-0.01	-0.05
K2	**-0.0559141**	0.00013							1.00	0.03	0.04
P1	**0.000802309**	8e-06								1.00	0.00
P2	**0.000738614**	6.5e-06									1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Locations

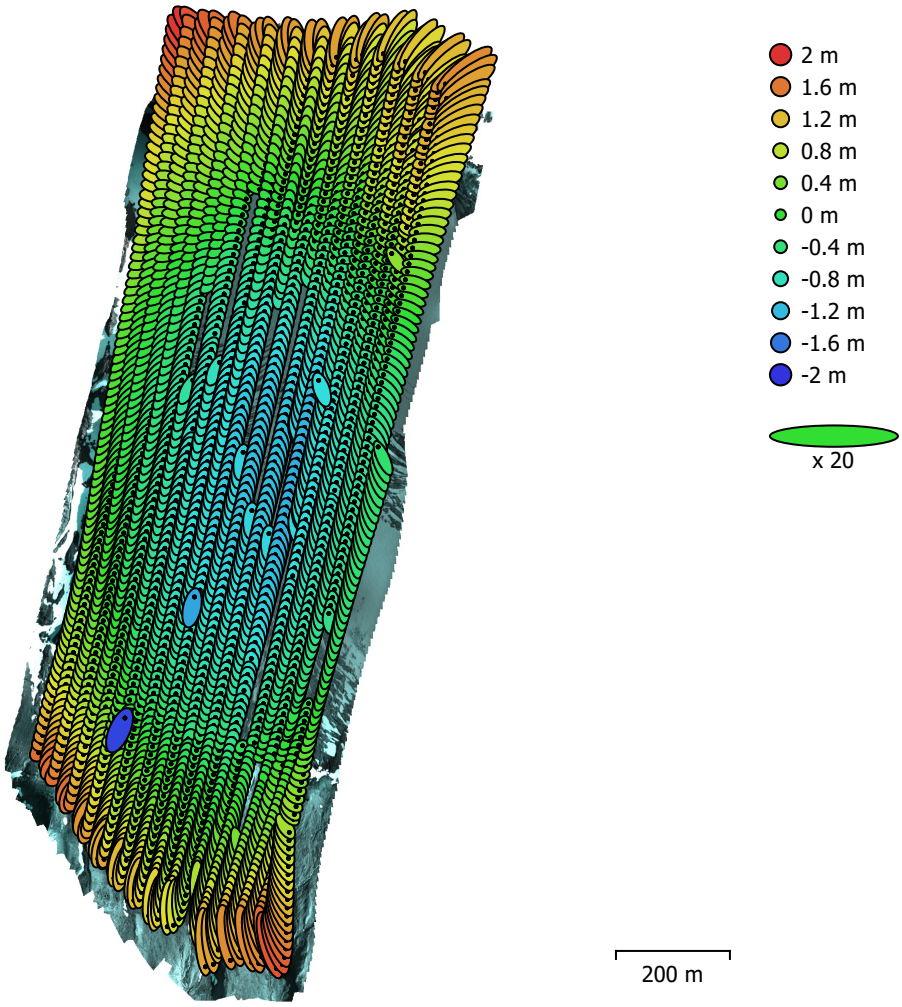


Fig. 10. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.864863	1.45535	0.743885	1.69293	1.84916

Table 10. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

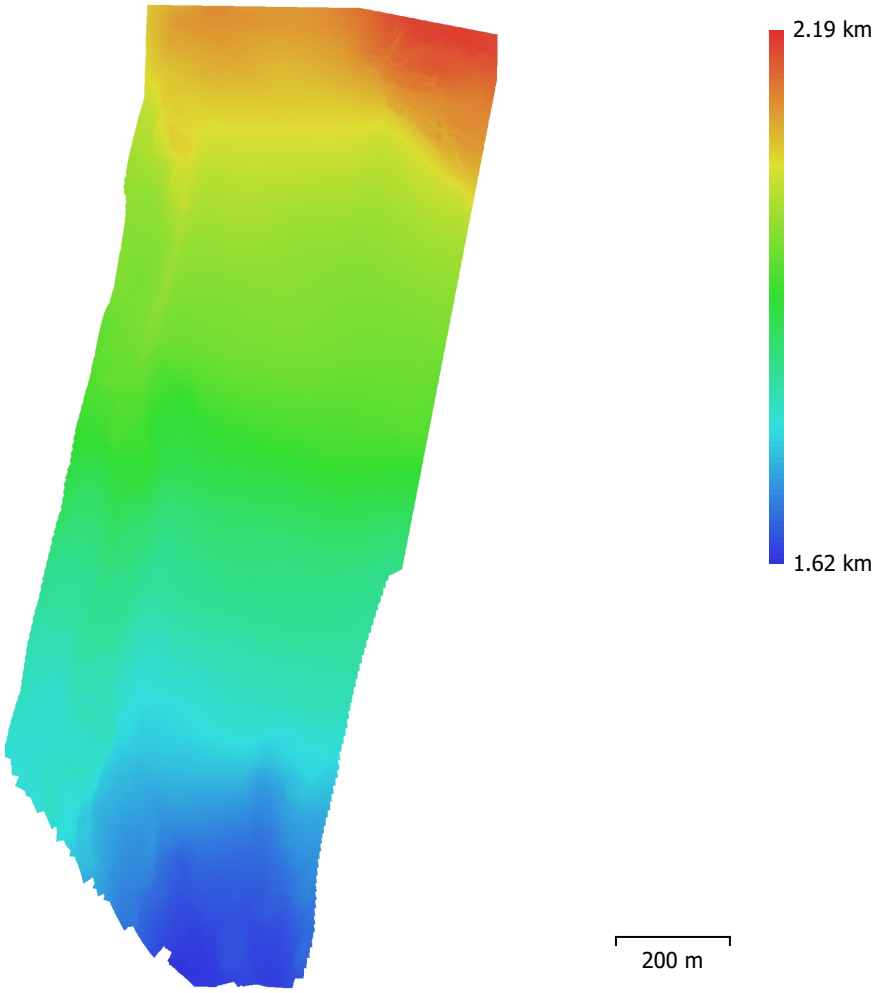


Fig. 11. Reconstructed digital elevation model.

Resolution:	8.02 cm/pix
Point density:	156 points/m²

Processing Parameters

General	
Cameras	9908
Aligned cameras	9900
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	395,056 of 1,061,648
RMS reprojection error	0.130517 (0.331686 pix)
Max reprojection error	1.03517 (29.7232 pix)
Mean key point size	2.39805 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	62.7208
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	1 hours 30 minutes
Matching memory usage	21.32 GB
Alignment time	1 hours 13 minutes
Alignment memory usage	9.28 GB
Optimization parameters	
Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	Yes
Optimization time	53 seconds
Date created	2024:04:03 15:14:05
Software version	2.1.0.17532
File size	2.99 GB
Depth Maps	
Count	2475
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	24 minutes 35 seconds
Memory usage	3.10 GB
Date created	2024:04:04 14:20:34
Software version	2.1.0.17532
File size	4.35 GB
Point Cloud	
Points	170,983,444
Point attributes	
Color	4 bands, uint16
Normal	

Confidence	1 - 49
Point classes	
Created (never classified)	170,983,444
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	24 minutes 35 seconds
Memory usage	3.10 GB
Point cloud generation parameters	
Processing time	43 minutes 53 seconds
Memory usage	13.92 GB
Date created	2024:04:04 15:04:28
Software version	2.1.0.17532
File size	3.54 GB
DEM	
Size	10,536 x 21,450
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 34 seconds
Memory usage	311.33 MB
Date created	2024:04:04 15:36:16
Software version	2.1.0.17532
File size	516.30 MB
Orthomosaic	
Size	21,072 x 42,900
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	27 minutes 19 seconds
Memory usage	2.11 GB
Date created	2024:04:04 16:13:17
Software version	2.1.0.17532
File size	174.27 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17532
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report DJI Mavic 3M RGB Cameras, Easton Glacier, Mt. Baker, WA, 2023-08-01

Processing Report

18 April 2024



Survey Data

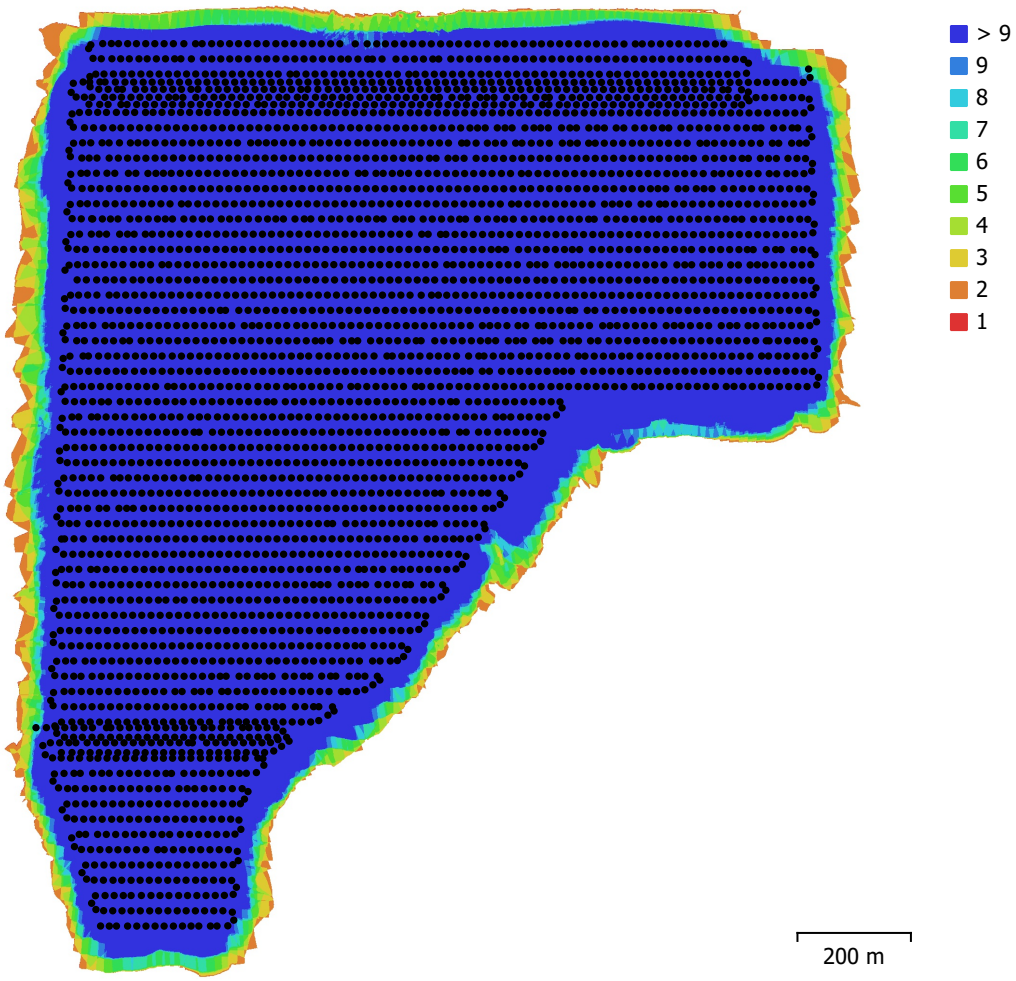


Fig. 1. Camera locations and image overlap.

Number of images:	3,447	Camera stations:	3,447
Flying altitude:	95 m	Tie points:	797,950
Ground resolution:	2.67 cm/pix	Projections:	11,589,015
Coverage area:	1.7 km²	Reprojection error:	0.846 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

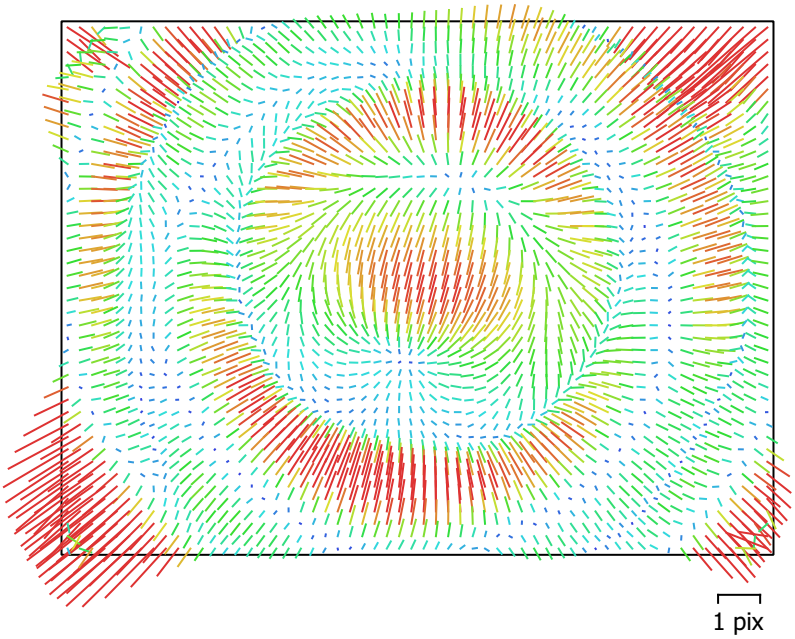


Fig. 2. Image residuals for M3M (12.29mm).

M3M (12.29mm)

3447 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3663.84**	0.21	1.00	0.15	-0.44	-0.08	-0.05	0.25	-0.47	0.64	-0.71	0.18	-0.17
Cx	**31.1884**	0.0041		1.00	-0.05	0.00	-0.04	0.03	-0.06	0.09	-0.10	0.78	-0.03
Cy	**-20.4641**	0.004			1.00	0.07	0.02	-0.12	0.21	-0.28	0.31	-0.07	0.68
B1	**-0.548825**	0.0031				1.00	0.03	-0.01	0.03	-0.04	0.05	-0.01	0.01
B2	**-0.1052**	0.0031					1.00	-0.01	0.02	-0.03	0.03	-0.01	0.01
K1	**0.0342454**	1.6e-05						1.00	-0.93	0.84	-0.78	0.05	-0.07
K2	**-0.183466**	8.9e-05							1.00	-0.97	0.93	-0.09	0.09
K3	**0.389432**	0.00021								1.00	-0.99	0.12	-0.12
K4	**-0.245267**	0.00016									1.00	-0.14	0.13
P1	**0.00113225**	4.3e-07										1.00	-0.04
P2	**-0.000852073**	3.4e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

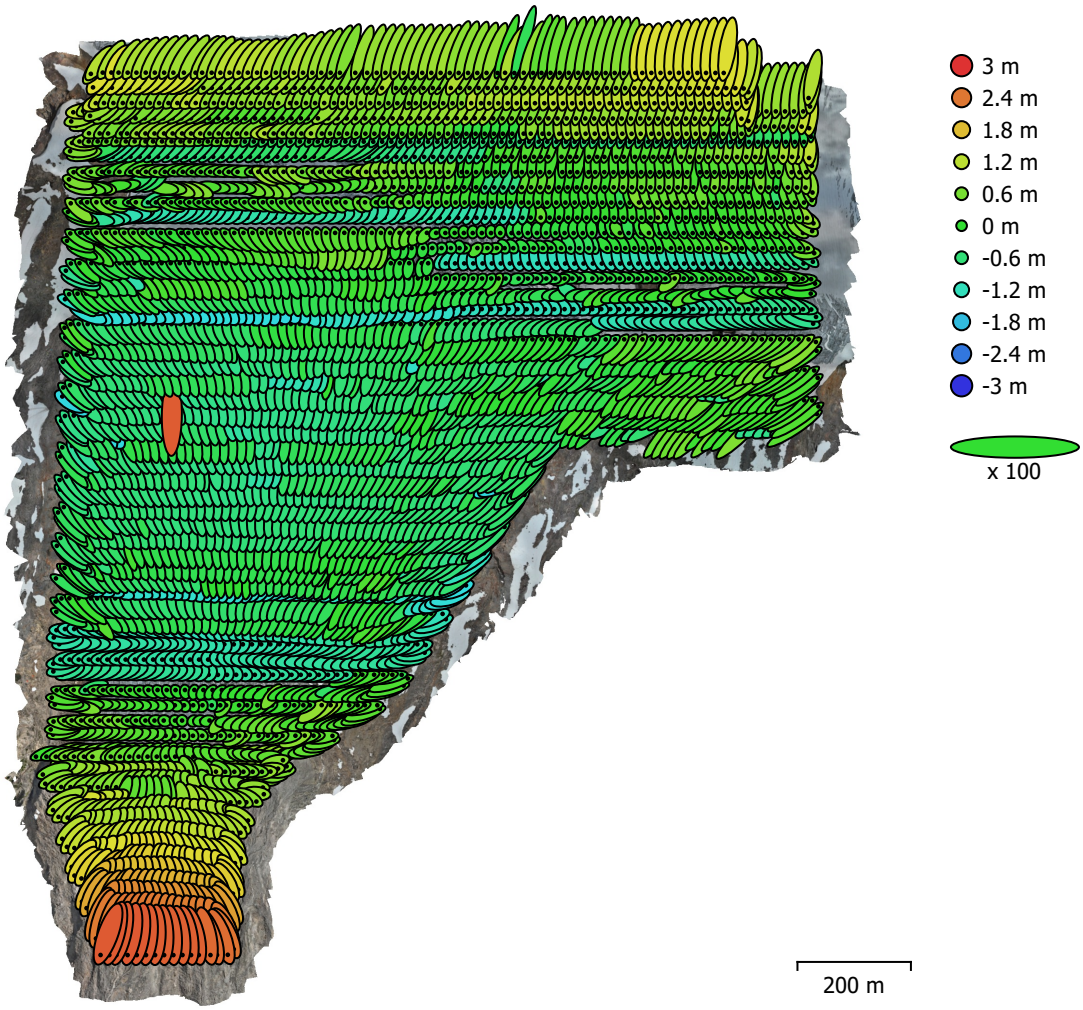


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
24.9461	37.355	76.1657	44.9188	88.4246

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

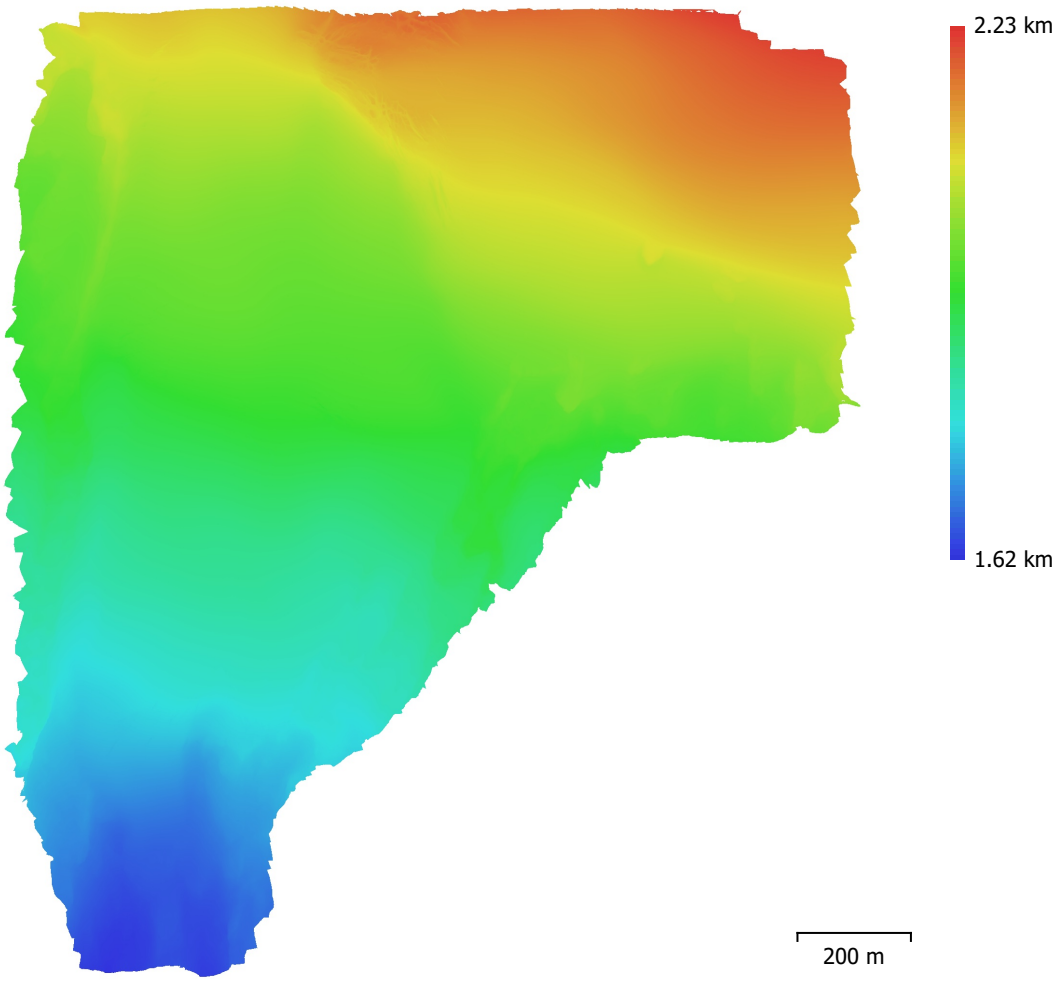


Fig. 4. Reconstructed digital elevation model.

Resolution:	5.35 cm/pix
Point density:	349 points/m²

Processing Parameters

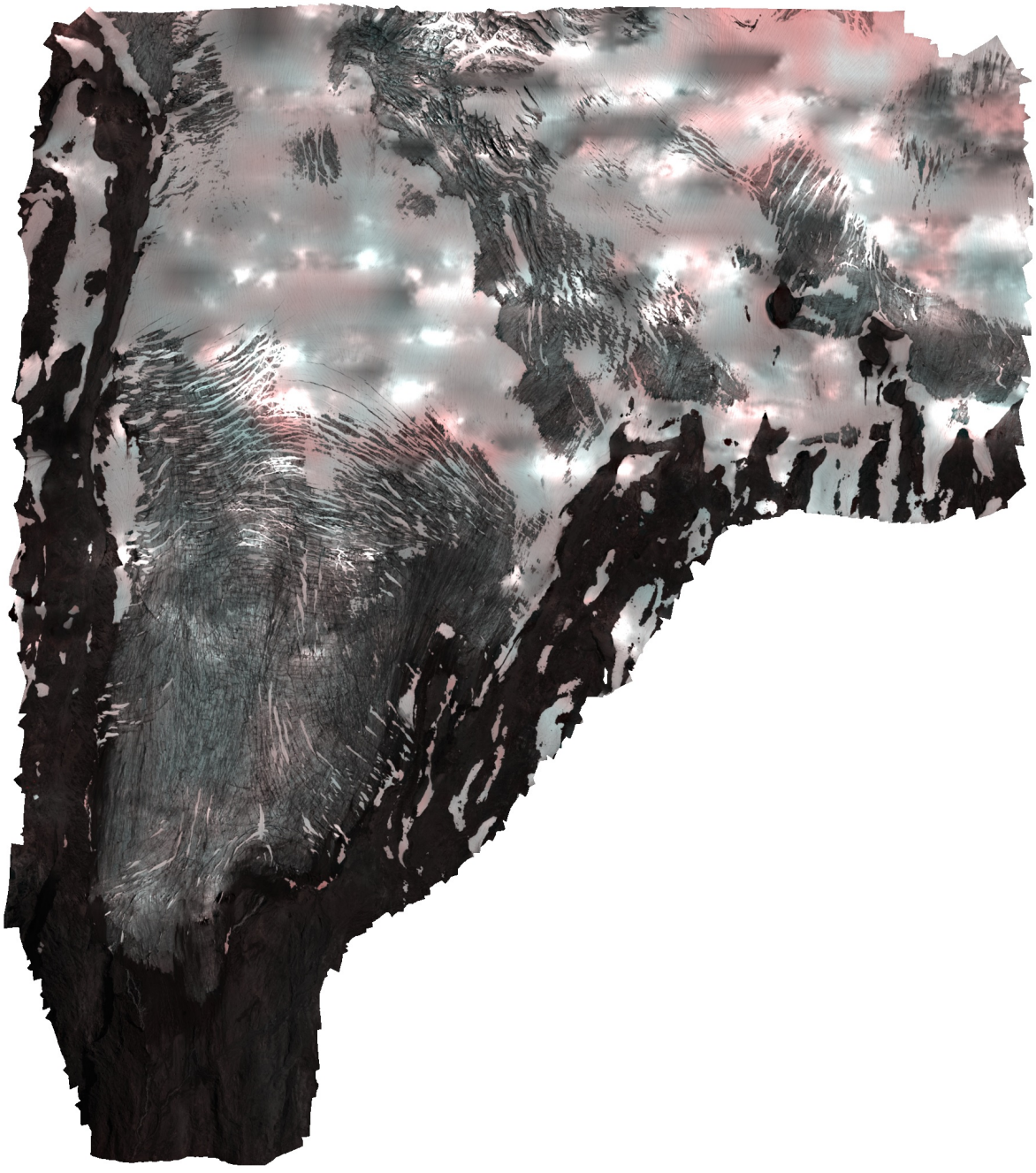
General	
Cameras	3447
Aligned cameras	3447
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	797,950 of 1,034,904
RMS reprojection error	0.280206 (0.846486 pix)
Max reprojection error	3.07039 (49.9108 pix)
Mean key point size	2.94708 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	16.5607
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	37 minutes 39 seconds
Matching memory usage	5.93 GB
Alignment time	18 minutes 12 seconds
Alignment memory usage	2.83 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	58 seconds
Date created	2024:04:12 11:25:04
Software version	2.1.1.17821
File size	283.19 MB
Depth Maps	
Count	3447
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 1 minutes
Memory usage	7.51 GB
Date created	2024:04:12 16:26:40
Software version	2.1.1.17821
File size	27.32 GB
Point Cloud	
Points	752,684,543
Point attributes	
Color	3 bands, uint8
Normal	

Confidence	1 - 76
Point classes	
Created (never classified)	752,684,543
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 1 minutes
Memory usage	7.51 GB
Point cloud generation parameters	
Processing time	4 hours 32 minutes
Memory usage	19.70 GB
Date created	2024:04:12 20:59:40
Software version	2.1.1.17821
File size	10.65 GB
DEM	
Size	28,190 x 32,091
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	3 minutes 57 seconds
Memory usage	328.26 MB
Date created	2024:04:16 13:25:20
Software version	2.1.1.17821
File size	1.87 GB
Orthomosaic	
Size	56,379 x 64,181
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	22 minutes 41 seconds
Memory usage	2.00 GB
Date created	2024:04:16 13:41:39
Software version	2.1.1.17821
File size	25.96 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report DJI Mavic 3M Multispectral Cameras, Easton Glacier, Mt. Baker, WA, 2023-08-01

Processing Report

18 April 2024



Survey Data

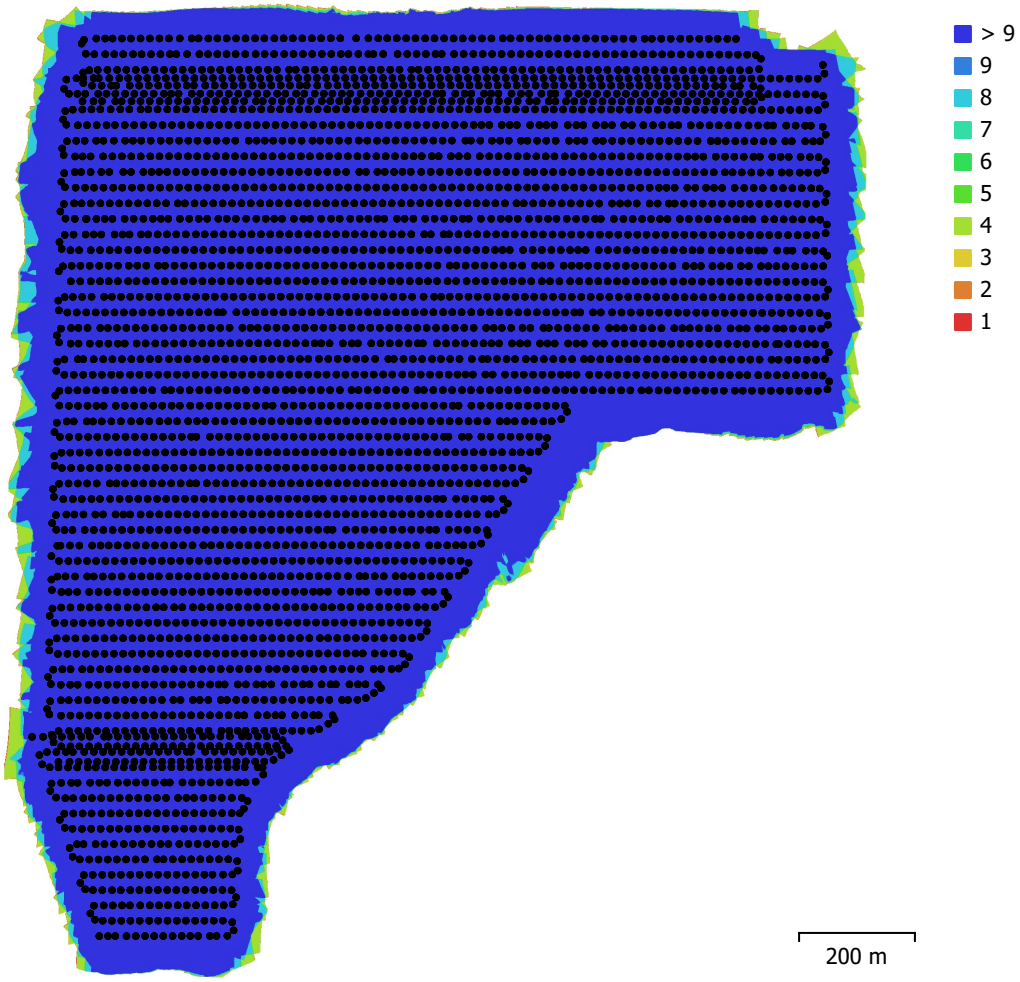


Fig. 1. Camera locations and image overlap.

Number of images:	13,788	Camera stations:	13,788
Flying altitude:	95 m	Tie points:	1,567,605
Ground resolution:	4.52 cm/pix	Projections:	36,226,758
Coverage area:	1.66 km²	Reprojection error:	0.61 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

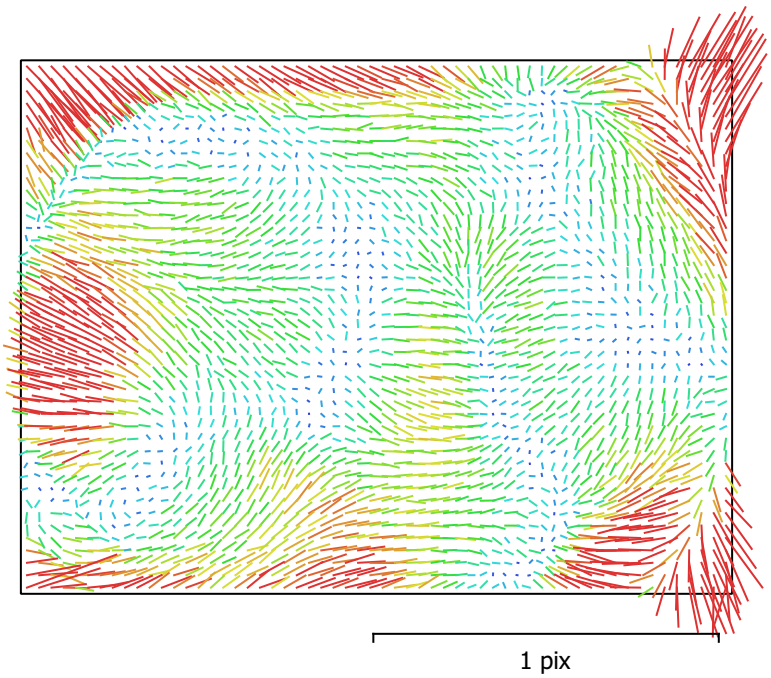


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

3447 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2183.1**	0.1	1.00	0.40	0.30	-0.13	-0.07	0.02	-0.02	-0.02	0.01	0.00	-0.04
Cx	**11.7622**	0.0037		1.00	0.10	-0.04	-0.02	0.01	-0.01	-0.01	0.01	0.82	-0.04
Cy	**3.15789**	0.0028			1.00	-0.05	-0.02	0.01	-0.01	-0.00	-0.00	-0.02	0.74
B1	**-4.82908**	0.0032				1.00	0.08	0.01	-0.01	0.01	-0.01	0.01	0.00
B2	**-0.836093**	0.0024					1.00	-0.00	0.00	0.00	0.00	0.00	0.01
K1	**0.0109465**	2.6e-05						1.00	-0.97	0.93	-0.88	0.00	-0.00
K2	**-0.0497418**	0.00018							1.00	-0.99	0.96	0.01	0.01
K3	**0.00572544**	0.0005								1.00	-0.99	-0.01	-0.01
K4	**-0.018438**	0.00046									1.00	0.01	0.01
P1	**0.000191438**	5.4e-07										1.00	-0.02
P2	**-0.000197158**	4.4e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

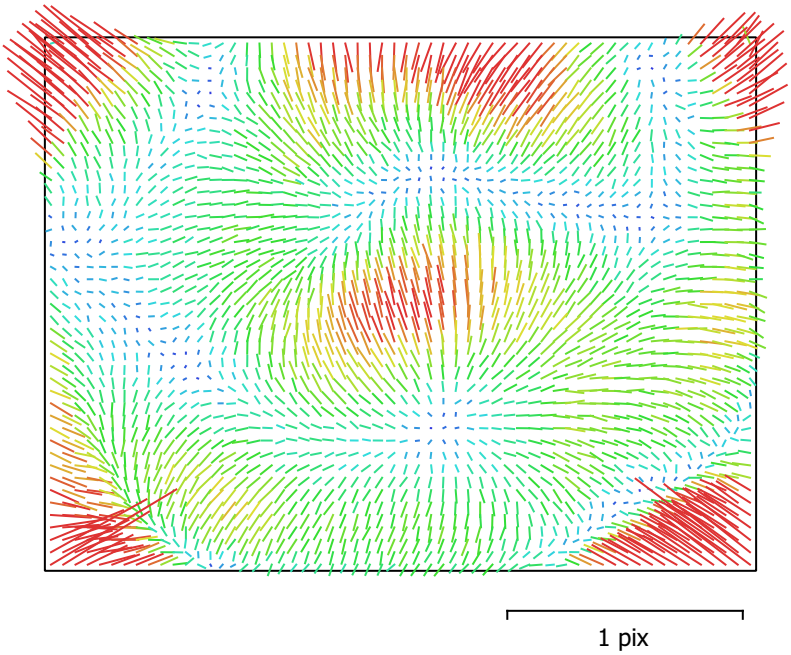


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

3447 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2185.8**	0.1	1.00	0.13	0.22	-0.13	-0.06	0.04	-0.06	0.02	-0.05	-0.01	0.03
Cx	**7.98725**	0.0034		1.00	0.02	-0.01	0.01	0.01	-0.01	0.00	-0.00	0.88	-0.02
Cy	**20.0123**	0.0027			1.00	-0.04	-0.01	0.01	-0.02	0.01	-0.01	-0.02	0.78
B1	**-4.95113**	0.0032				1.00	0.07	0.00	-0.00	0.01	-0.00	0.00	-0.01
B2	**-0.490693**	0.0024					1.00	-0.00	0.00	-0.00	0.00	0.01	0.00
K1	**0.0165392**	2.7e-05						1.00	-0.97	0.93	-0.88	0.00	-0.01
K2	**-0.0819567**	0.00019							1.00	-0.99	0.96	0.00	0.01
K3	**0.0834747**	0.00051								1.00	-0.99	-0.01	-0.01
K4	**-0.0902149**	0.00048									1.00	0.01	0.02
P1	**-0.000188318**	5.4e-07										1.00	-0.02
P2	**0.000454318**	4.4e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

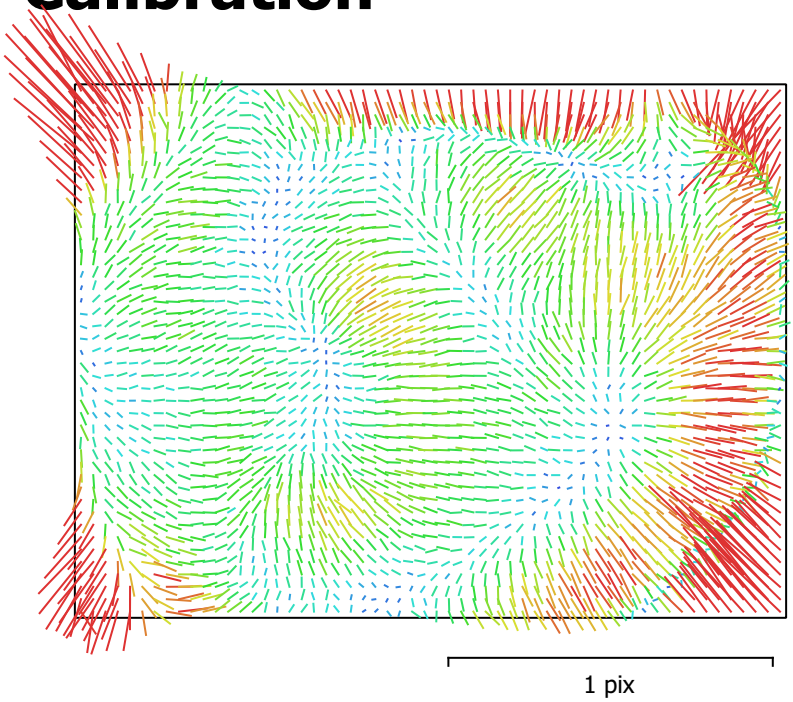


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

3447 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2192.25**	0.1	1.00	-0.07	-0.05	-0.14	-0.05	0.04	-0.06	0.03	-0.05	0.12	0.05
Cx	**7.65488**	0.0034		1.00	-0.01	0.01	0.02	-0.01	0.01	-0.01	0.01	0.88	-0.03
Cy	**15.6289**	0.0027			1.00	-0.01	0.00	-0.00	0.00	-0.00	0.00	-0.03	0.79
B1	**-5.14156**	0.0032				1.00	0.07	0.00	-0.00	0.01	-0.00	-0.01	-0.01
B2	**-0.0116619**	0.0024					1.00	-0.00	0.00	-0.00	0.00	0.00	0.01
K1	**0.0159284**	2.7e-05						1.00	-0.97	0.93	-0.88	0.01	-0.00
K2	**-0.0844917**	0.00019							1.00	-0.99	0.96	-0.01	0.00
K3	**0.0880335**	0.00052								1.00	-0.99	0.00	-0.01
K4	**-0.0882046**	0.00049									1.00	-0.00	0.01
P1	**0.00111092**	5.5e-07										1.00	-0.02
P2	**0.000475018**	4.4e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

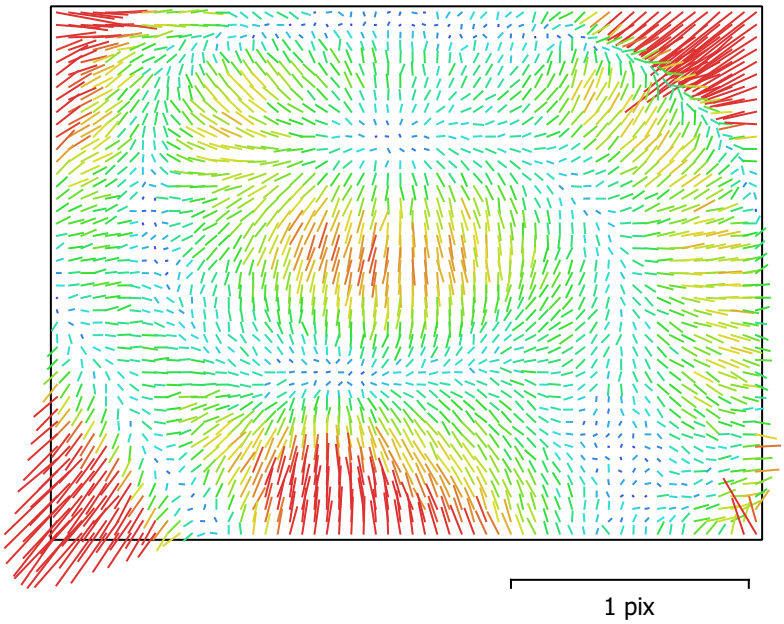


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

3447 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2199.83**	0.1	1.00	-0.26	0.03	-0.13	-0.05	0.04	-0.05	0.02	-0.03	0.10	0.06
Cx	**8.05214**	0.0037		1.00	-0.01	0.03	0.01	-0.02	0.02	-0.01	0.02	0.84	-0.03
Cy	**-24.4804**	0.0028			1.00	-0.01	-0.01	0.00	-0.00	0.00	-0.00	-0.01	0.80
B1	**-4.7528**	0.0032				1.00	0.07	0.00	-0.00	0.01	-0.00	-0.00	-0.00
B2	**-0.0809655**	0.0025					1.00	-0.00	0.00	-0.00	0.00	-0.01	0.00
K1	**0.0166127**	2.8e-05						1.00	-0.97	0.93	-0.88	0.00	0.02
K2	**-0.0828967**	0.0002							1.00	-0.99	0.96	-0.01	-0.02
K3	**0.0771798**	0.00055								1.00	-0.99	0.00	0.02
K4	**-0.0763192**	0.00053									1.00	0.00	-0.02
P1	**0.000751881**	5.8e-07										1.00	-0.01
P2	**0.000722807**	4.6e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Locations

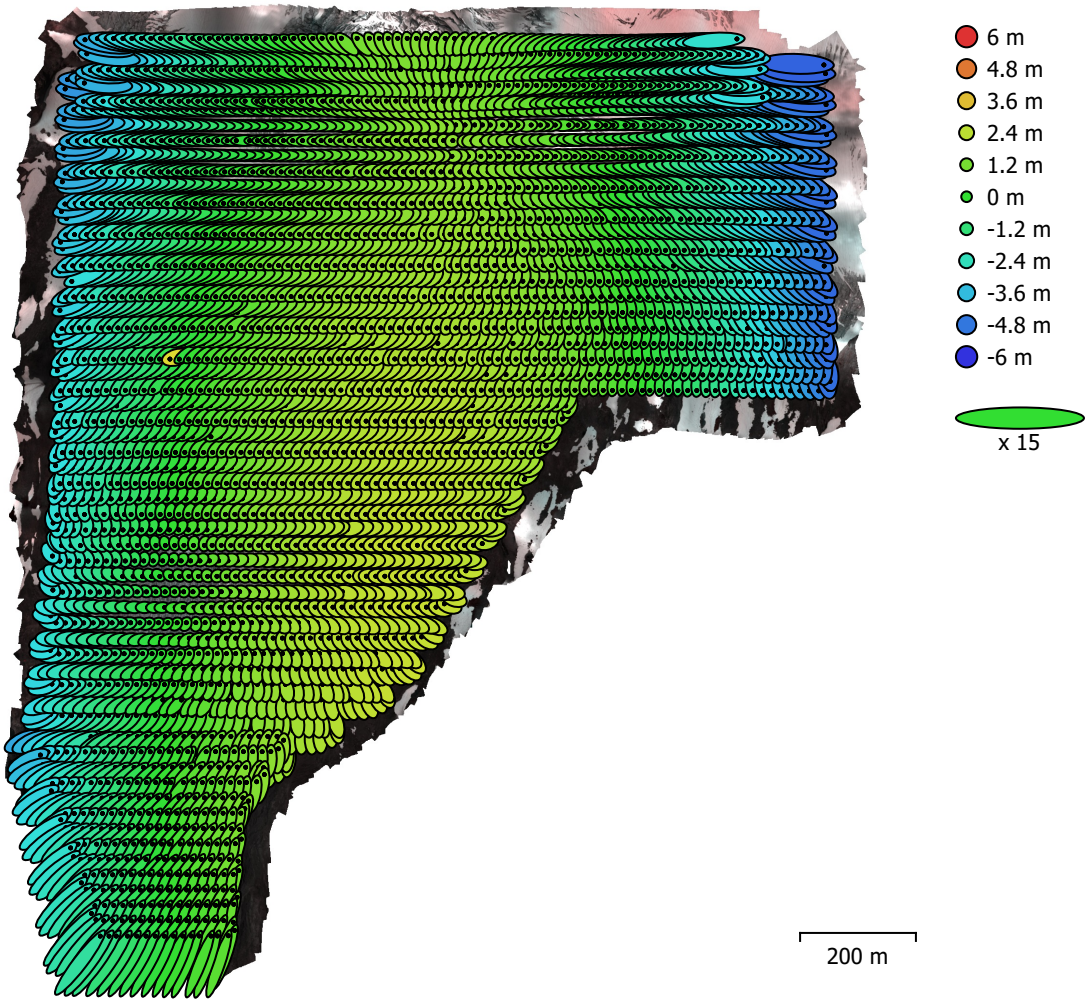


Fig. 6. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
2.09668	1.45646	1.84909	2.55291	3.15221

Table 6. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

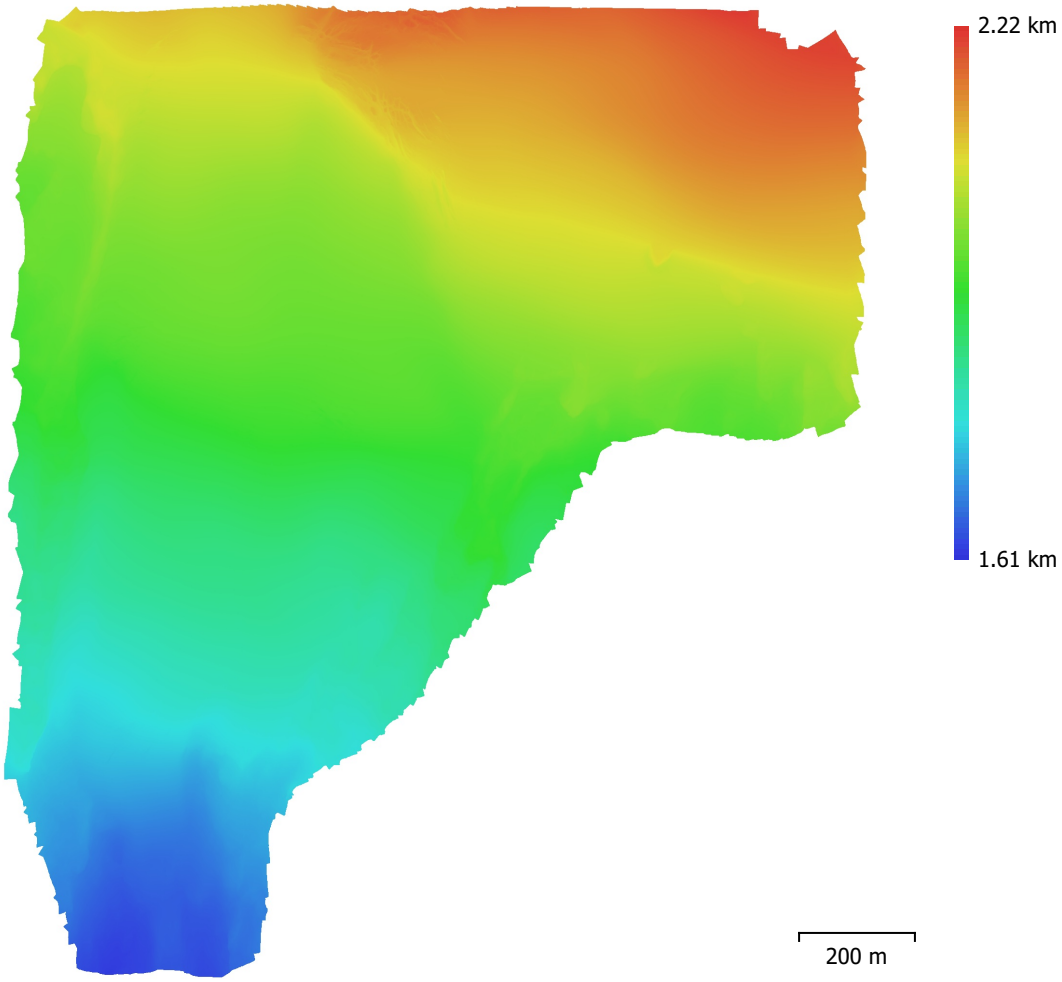


Fig. 7. Reconstructed digital elevation model.

Resolution:	9.04 cm/pix
Point density:	122 points/m²

Processing Parameters

General	
Cameras	13788
Aligned cameras	13788
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	1,567,605 of 2,689,512
RMS reprojection error	0.180356 (0.609863 pix)
Max reprojection error	1.43531 (55.4494 pix)
Mean key point size	2.86069 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	32.0745
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	2 hours 22 minutes
Matching memory usage	25.95 GB
Alignment time	1 hours 52 minutes
Alignment memory usage	13.27 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	2 minutes 53 seconds
Date created	2024:04:17 19:41:38
Software version	2.1.1.17821
File size	1.33 GB
Depth Maps	
Count	3447
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	34 minutes 2 seconds
Memory usage	3.49 GB
Date created	2024:04:17 23:33:05
Software version	2.1.1.17821
File size	6.59 GB
Point Cloud	
Points	244,318,993
Point attributes	
Color	4 bands, uint16
Normal	

Confidence	1 - 60
Point classes	
Created (never classified)	244,318,993
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	34 minutes 2 seconds
Memory usage	3.49 GB
Point cloud generation parameters	
Processing time	1 hours 1 minutes
Memory usage	16.45 GB
Date created	2024:04:18 00:34:19
Software version	2.1.1.17821
File size	5.08 GB
DEM	
Size	16,259 x 18,597
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	3 minutes 20 seconds
Memory usage	315.14 MB
Date created	2024:04:18 09:35:29
Software version	2.1.1.17821
File size	686.37 MB
Orthomosaic	
Size	32,517 x 37,193
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	34 minutes 7 seconds
Memory usage	1.59 GB
Date created	2024:04:18 10:04:05
Software version	2.1.1.17821
File size	232.51 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape

Processing Report

16 August 2023



Survey Data

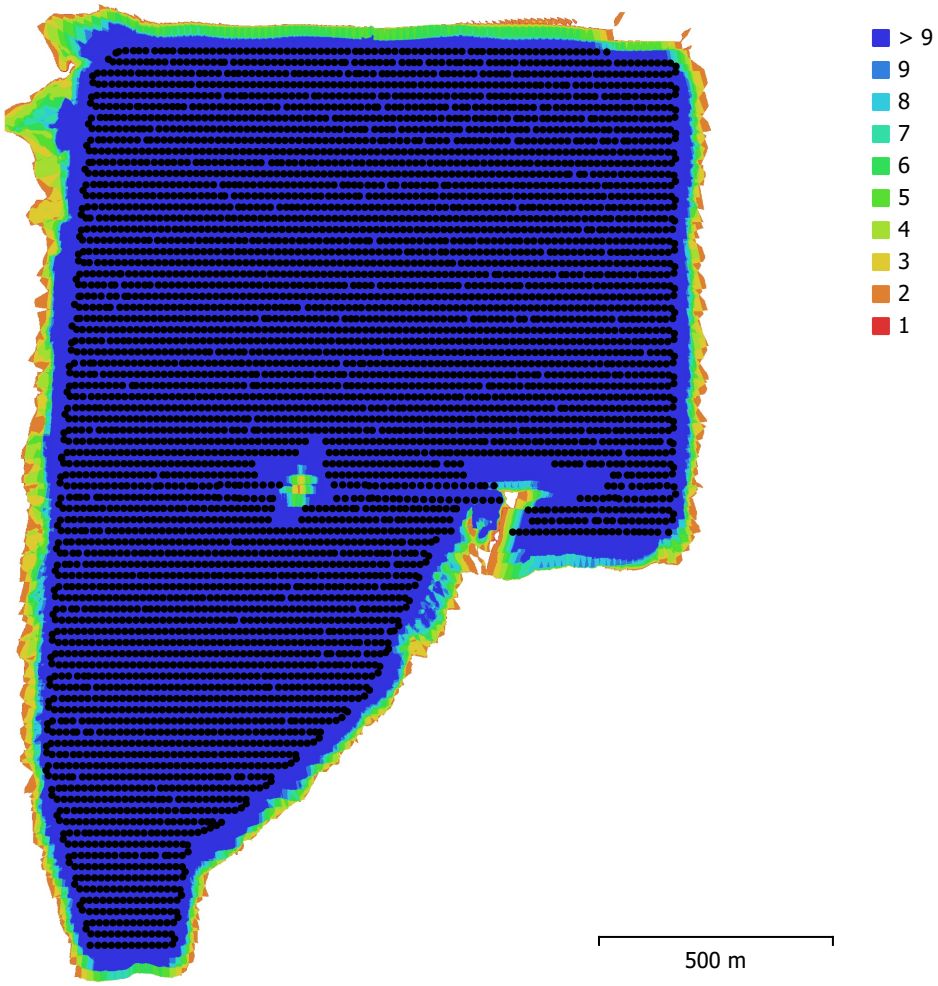


Fig. 1. Camera locations and image overlap.

Number of images:	5,350	Camera stations:	5,204
Flying altitude:	82.3 m	Tie points:	66,526,670
Ground resolution:	2.38 cm/pix	Projections:	259,442,987
Coverage area:	2.19 km²	Reprojection error:	0.812 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

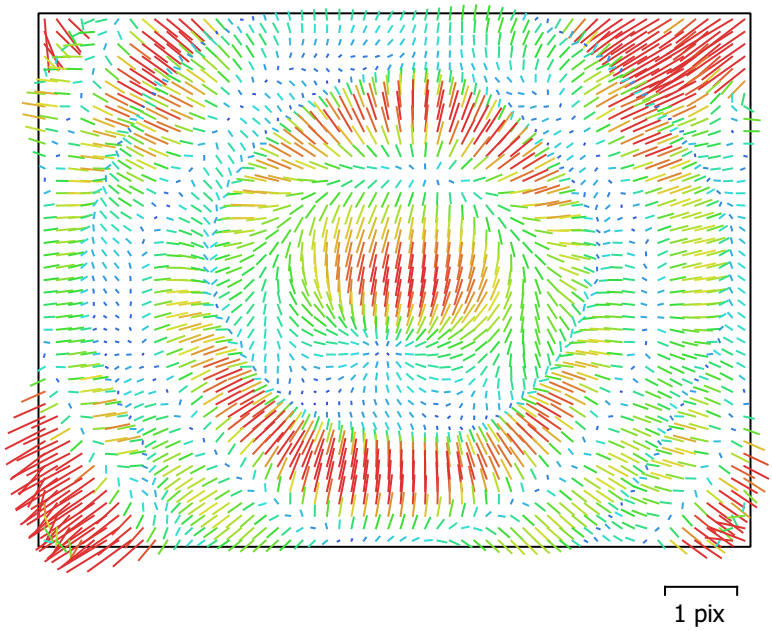


Fig. 2. Image residuals for M3M (12.29mm).

M3M (12.29mm)

5350 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3583.27**	0.096	1.00	0.10	-0.65	-0.08	-0.04	0.41	-0.70	0.84	-0.88	0.30	-0.28
Cx	**31.5773**	0.001		1.00	-0.03	0.02	-0.07	0.03	-0.07	0.08	-0.09	0.73	0.02
Cy	**-20.2288**	0.0011			1.00	0.10	0.04	-0.27	0.46	-0.54	0.57	-0.15	0.69
B1	**-0.493451**	0.00082				1.00	0.00	-0.03	0.05	-0.06	0.07	-0.02	0.01
B2	**-0.00723603**	0.00077					1.00	-0.02	0.03	-0.03	0.04	-0.03	0.01
K1	**0.0287221**	3.8e-06						1.00	-0.89	0.79	-0.73	0.13	-0.15
K2	**-0.149118**	2.3e-05							1.00	-0.97	0.94	-0.22	0.21
K3	**0.305718**	5.8e-05								1.00	-0.99	0.26	-0.24
K4	**-0.183367**	4.5e-05									1.00	-0.27	0.25
P1	**0.00113982**	1e-07										1.00	-0.05
P2	**-0.000801132**	8.6e-08											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

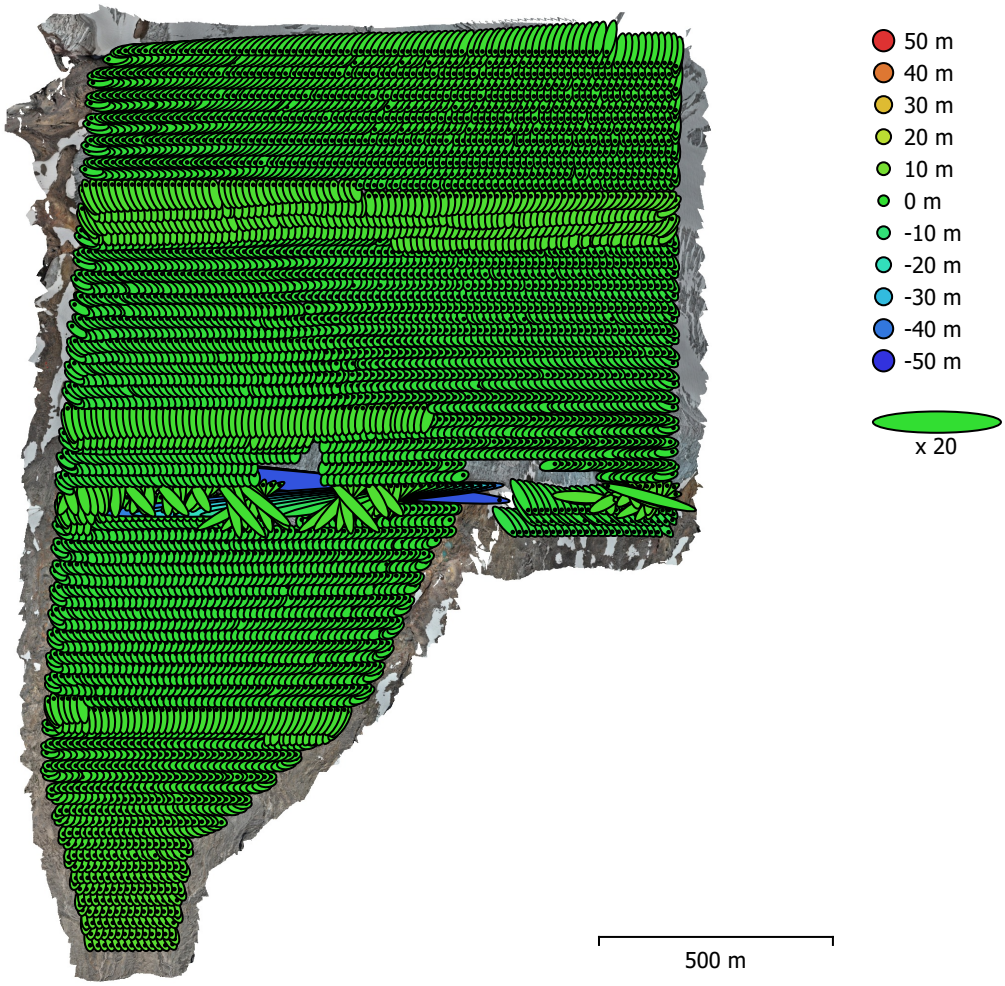


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
1.90349	1.11953	2.19103	2.20831	3.11082

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

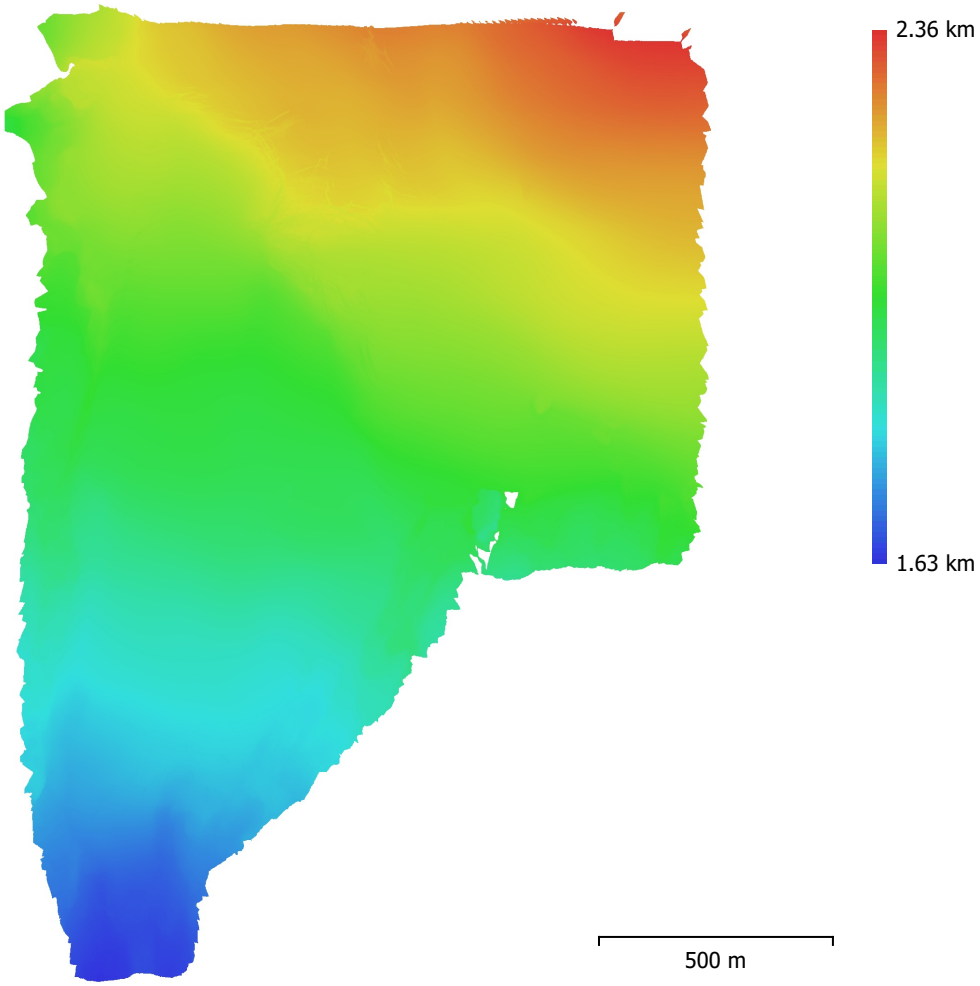


Fig. 4. Reconstructed digital elevation model.

Resolution:	4.76 cm/pix
Point density:	442 points/m²

Processing Parameters

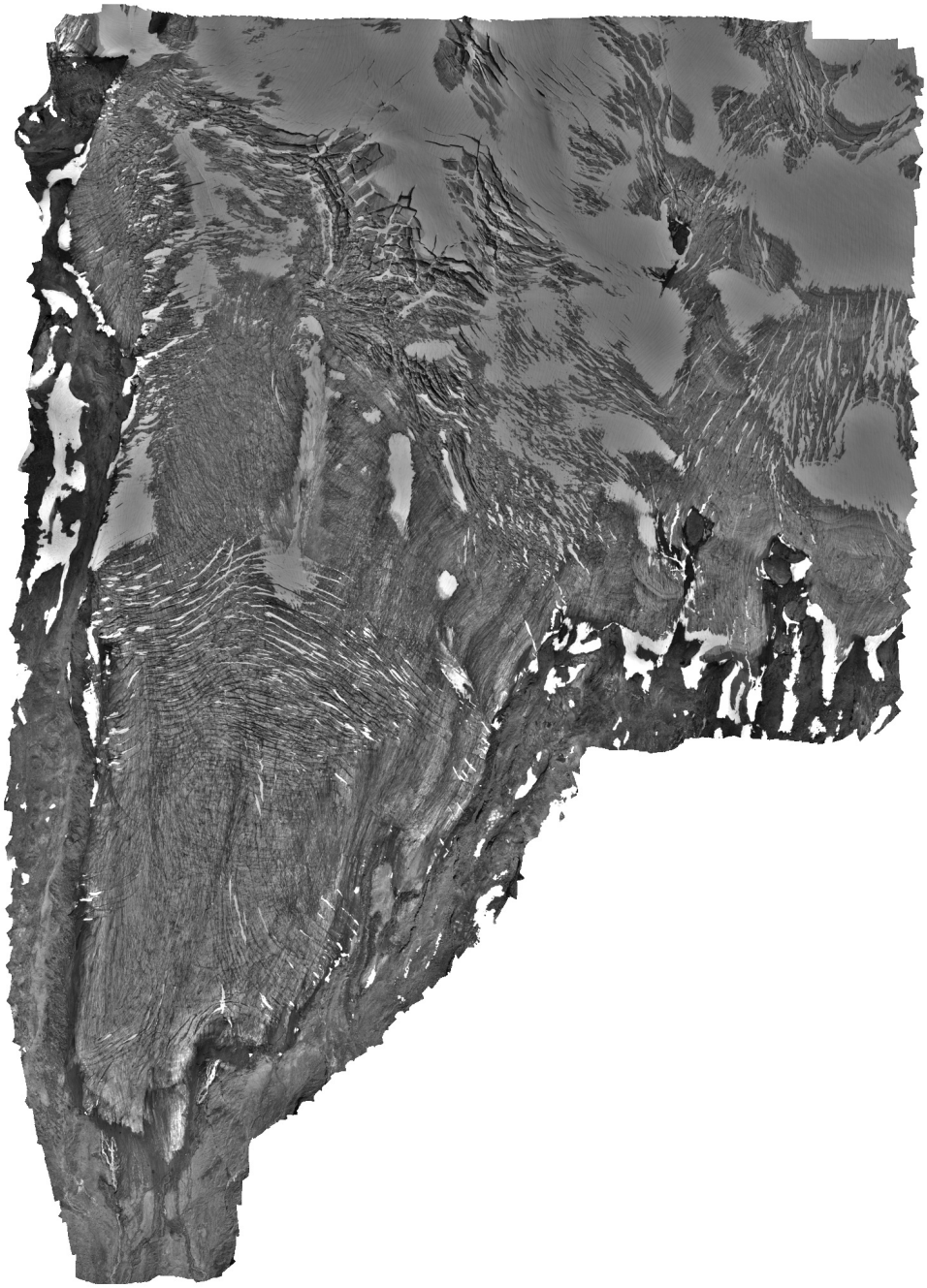
General	
Cameras	5350
Aligned cameras	5204
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	66,526,670 of 97,741,880
RMS reprojection error	0.189985 (0.81218 pix)
Max reprojection error	3.1857 (54.4633 pix)
Mean key point size	3.79659 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	6.53199
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	500,000
Key point limit per Mpx	1,000
Tie point limit	0
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	2 hours 18 minutes
Matching memory usage	111.32 GB
Alignment time	14 hours 7 minutes
Alignment memory usage	54.91 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	11 minutes 33 seconds
Date created	2023:08:15 03:10:40
Software version	2.0.2.16404
File size	11.27 GB
Depth Maps	
Count	5204
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	4 hours 13 minutes
Memory usage	14.50 GB
Date created	2023:08:16 19:40:07
Software version	2.0.2.16404
File size	38.87 GB
Point Cloud	
Points	1,284,842,291
Point attributes	
Color	3 bands, uint8
Normal	

Point classes	
Created (never classified)	1,284,842,291
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	4 hours 13 minutes
Memory usage	14.50 GB
Point cloud generation parameters	
Processing time	6 hours 40 minutes
Memory usage	21.82 GB
Date created	2023:08:17 02:20:33
Software version	2.0.2.16404
File size	16.55 GB
DEM	
Size	31,754 x 43,848
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	6 minutes 54 seconds
Memory usage	332.15 MB
Date created	2023:08:17 02:30:53
Software version	2.0.2.16404
File size	3.07 GB
Orthomosaic	
Size	63,507 x 87,695
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	45 minutes 14 seconds
Memory usage	2.55 GB
Date created	2023:08:17 03:09:27
Software version	2.0.2.16404
File size	110.35 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.0.2 build 16404
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	Intel(R) UHD Graphics 770 NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape

Processing Report

17 November 2023



Survey Data

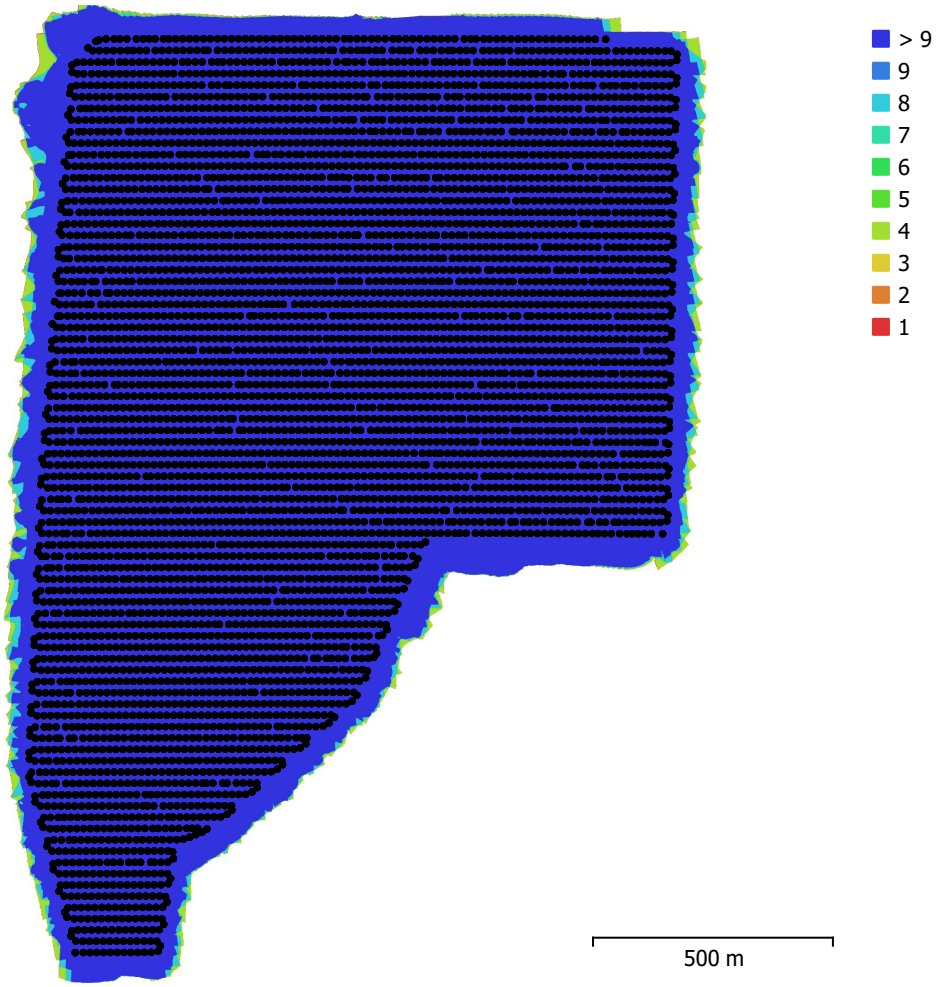


Fig. 1. Camera locations and image overlap.

Number of images:	21,400	Camera stations:	21,400
Flying altitude:	84.9 m	Tie points:	1,002,933
Ground resolution:	4.01 cm/pix	Projections:	54,093,906
Coverage area:	2.12 km²	Reprojection error:	0.424 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

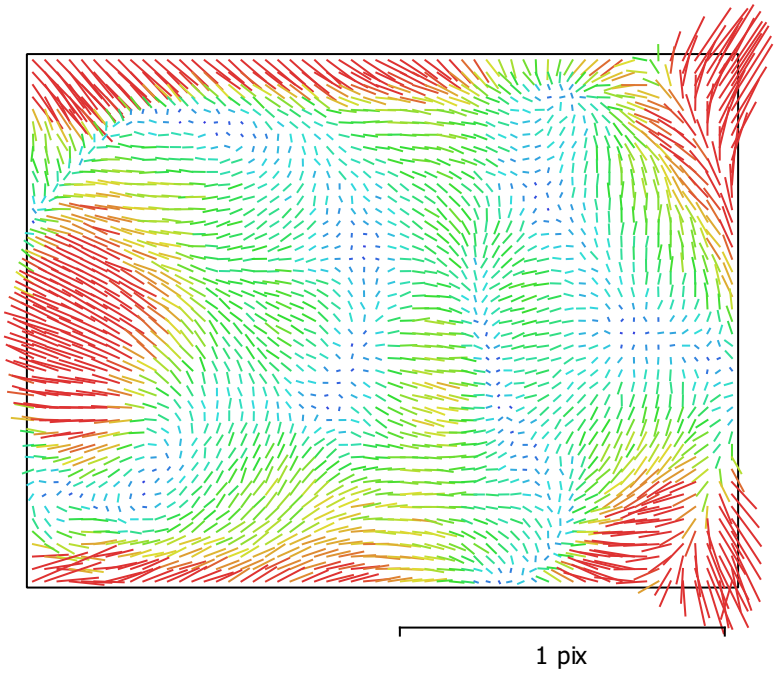


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

5350 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2186.04**	0.11	1.00	0.49	0.55	-0.11	-0.05	0.05	-0.07	-0.01	-0.02	-0.02	-0.07
Cx	**11.4344**	0.0026		1.00	0.26	-0.03	-0.03	0.03	-0.04	-0.00	-0.00	0.77	-0.06
Cy	**3.47399**	0.0021			1.00	-0.05	-0.01	0.03	-0.04	0.00	-0.01	-0.03	0.62
B1	**-4.88213**	0.0034				1.00	0.09	0.00	0.00	0.00	-0.00	0.00	0.01
B2	**-0.82933**	0.0025					1.00	-0.00	0.00	-0.00	0.00	0.00	0.01
K1	**0.0110816**	1.8e-05						1.00	-0.97	0.93	-0.88	0.00	-0.01
K2	**-0.0524134**	0.00012							1.00	-0.99	0.96	0.01	0.01
K3	**0.012005**	0.00034								1.00	-0.99	-0.01	-0.01
K4	**-0.0248836**	0.00032									1.00	0.01	0.01
P1	**0.000208896**	3.6e-07										1.00	-0.02
P2	**-0.000199198**	2.9e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

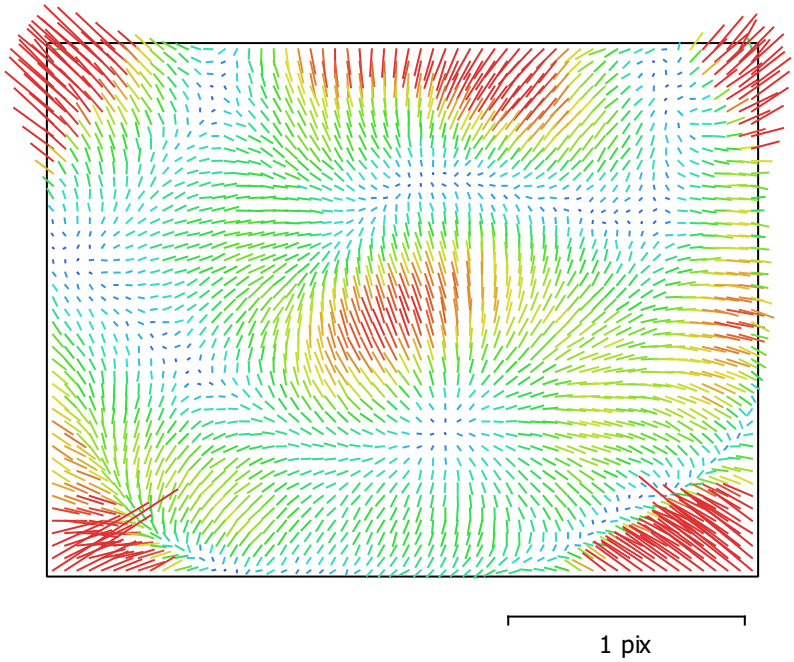


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

5350 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2188.47**	0.11	1.00	0.07	0.44	-0.12	-0.04	0.08	-0.12	0.06	-0.11	-0.04	0.05
Cx	**7.79069**	0.0023		1.00	0.02	0.00	-0.00	0.00	-0.01	0.00	-0.00	0.89	-0.02
Cy	**19.9124**	0.002			1.00	-0.03	-0.01	0.04	-0.06	0.03	-0.05	-0.03	0.73
B1	**-5.05341**	0.0035				1.00	0.08	-0.00	0.01	-0.00	0.01	0.00	-0.01
B2	**-0.428042**	0.0025					1.00	-0.00	0.00	-0.00	0.00	0.01	0.00
K1	**0.016617**	1.8e-05						1.00	-0.97	0.93	-0.89	-0.00	-0.00
K2	**-0.0844286**	0.00013							1.00	-0.99	0.96	0.01	0.01
K3	**0.0903508**	0.00035								1.00	-0.99	-0.01	-0.01
K4	**-0.0974584**	0.00033									1.00	0.01	0.01
P1	**-0.000228239**	3.6e-07										1.00	-0.02
P2	**0.000454347**	2.9e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

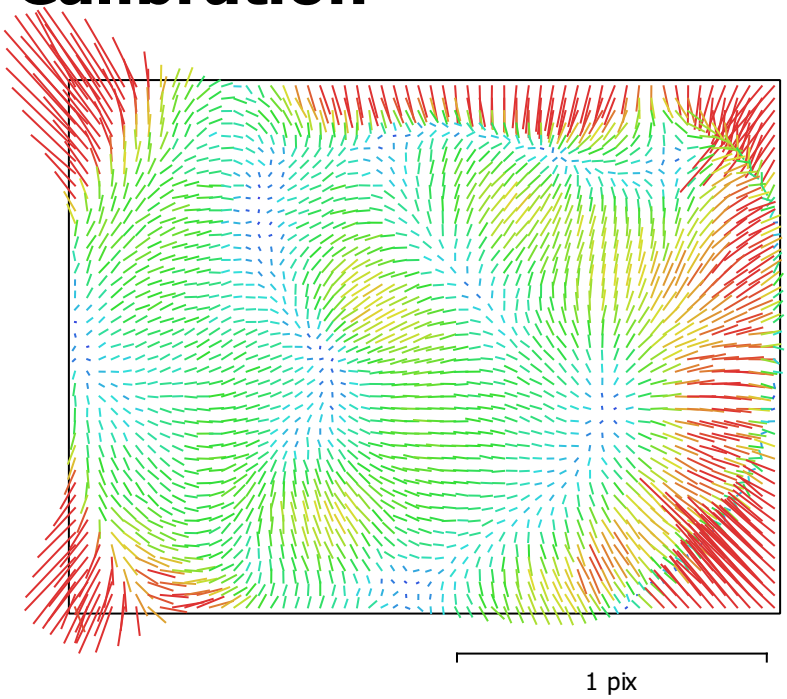


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

5350 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2194.96**	0.11	1.00	-0.28	0.04	-0.12	-0.03	0.08	-0.13	0.07	-0.11	0.18	0.08
Cx	**7.27614**	0.0023		1.00	-0.03	0.03	0.00	-0.03	0.04	-0.03	0.04	0.80	-0.05
Cy	**15.5813**	0.0018			1.00	0.01	0.00	0.00	-0.01	0.00	-0.00	-0.01	0.79
B1	**-5.2808**	0.0035				1.00	0.07	-0.00	0.01	-0.00	0.01	-0.02	-0.01
B2	**0.0602785**	0.0025					1.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
K1	**0.0160423**	1.8e-05						1.00	-0.97	0.93	-0.89	0.02	0.00
K2	**-0.0872321**	0.00013							1.00	-0.99	0.96	-0.02	-0.00
K3	**0.0960521**	0.00035								1.00	-0.99	0.01	-0.00
K4	**-0.0965258**	0.00034									1.00	-0.02	-0.00
P1	**0.00109686**	3.7e-07										1.00	-0.01
P2	**0.000484324**	2.9e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

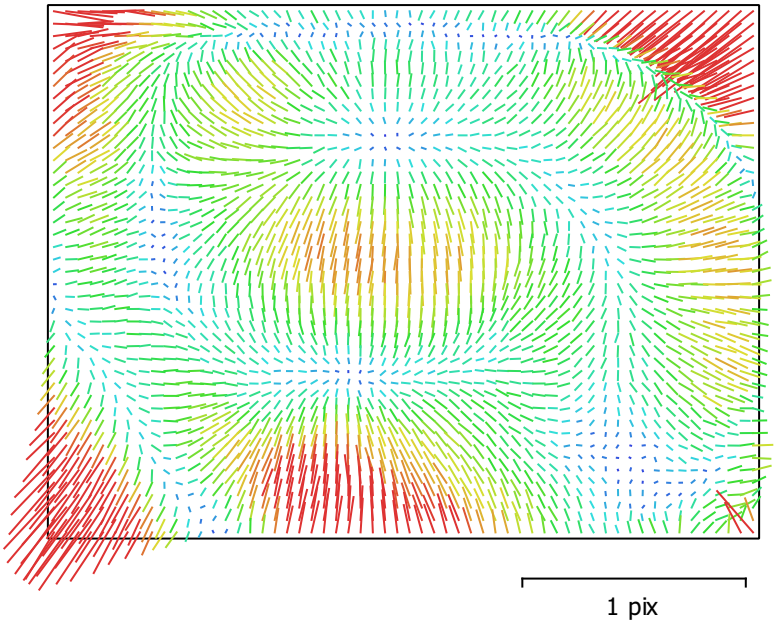


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

5350 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2202.59**	0.11	1.00	-0.52	0.16	-0.12	-0.03	0.08	-0.11	0.05	-0.08	0.15	0.11
Cx	**8.2266**	0.0028		1.00	-0.09	0.05	0.00	-0.05	0.07	-0.04	0.05	0.68	-0.07
Cy	**-24.2456**	0.0019			1.00	0.00	-0.00	0.02	-0.02	0.01	-0.02	0.02	0.80
B1	**-4.90907**	0.0035				1.00	0.07	-0.00	0.01	-0.00	0.01	-0.01	-0.00
B2	**-0.04031**	0.0025					1.00	-0.00	0.01	-0.00	0.00	-0.01	0.00
K1	**0.0164647**	1.9e-05						1.00	-0.97	0.93	-0.89	0.01	0.02
K2	**-0.0833869**	0.00013							1.00	-0.99	0.96	-0.02	-0.03
K3	**0.0781327**	0.00037								1.00	-0.99	0.01	0.02
K4	**-0.0776344**	0.00036									1.00	-0.01	-0.03
P1	**0.000727537**	3.8e-07										1.00	0.00
P2	**0.000732586**	3e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Locations

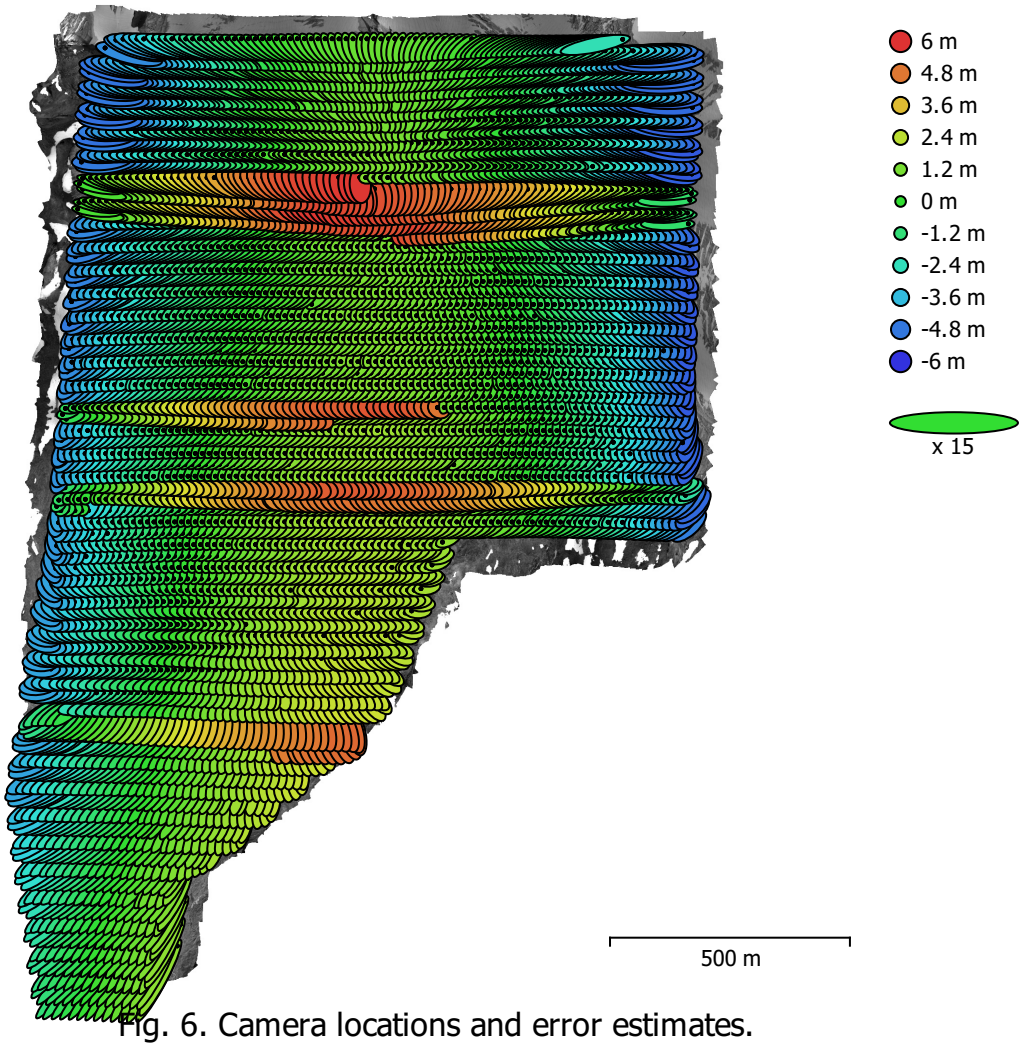


Fig. 6. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
2.75665	2.06417	2.33038	3.44382	4.1582

Table 6. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

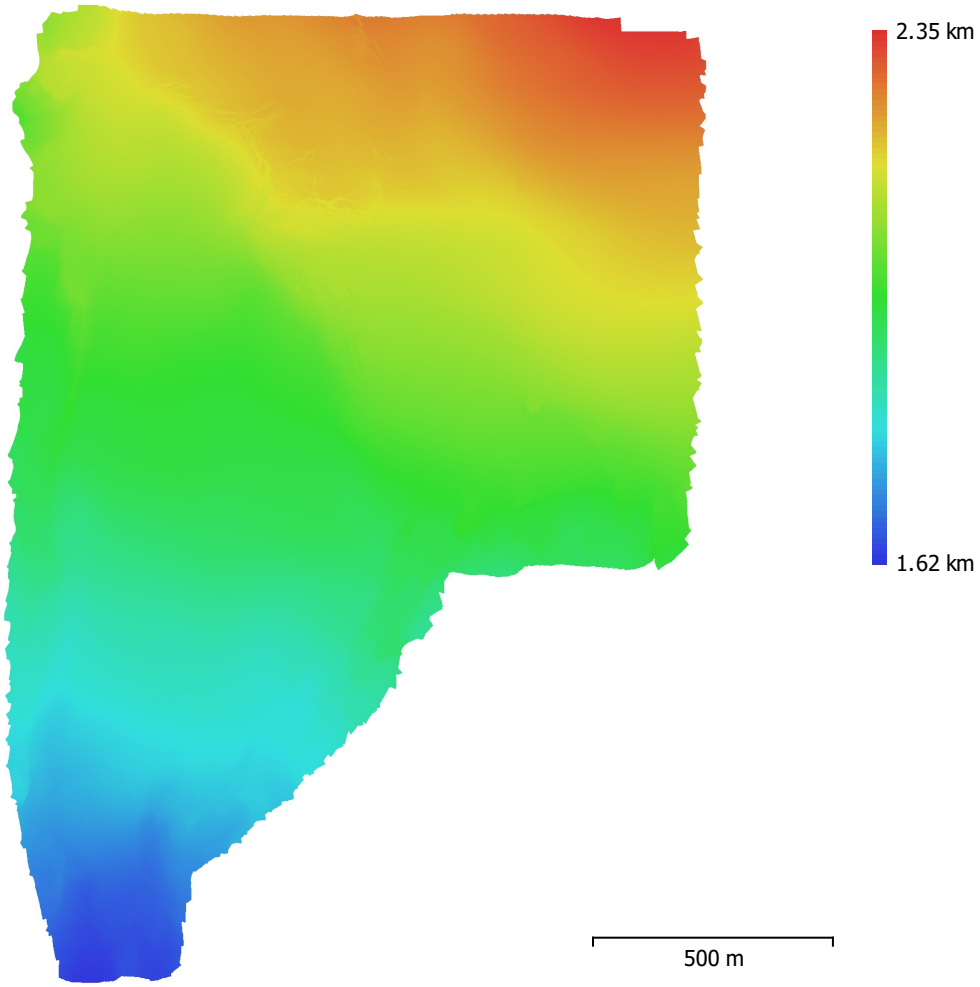


Fig. 7. Reconstructed digital elevation model.

Resolution:	8.02 cm/pix
Point density:	156 points/m²

Processing Parameters

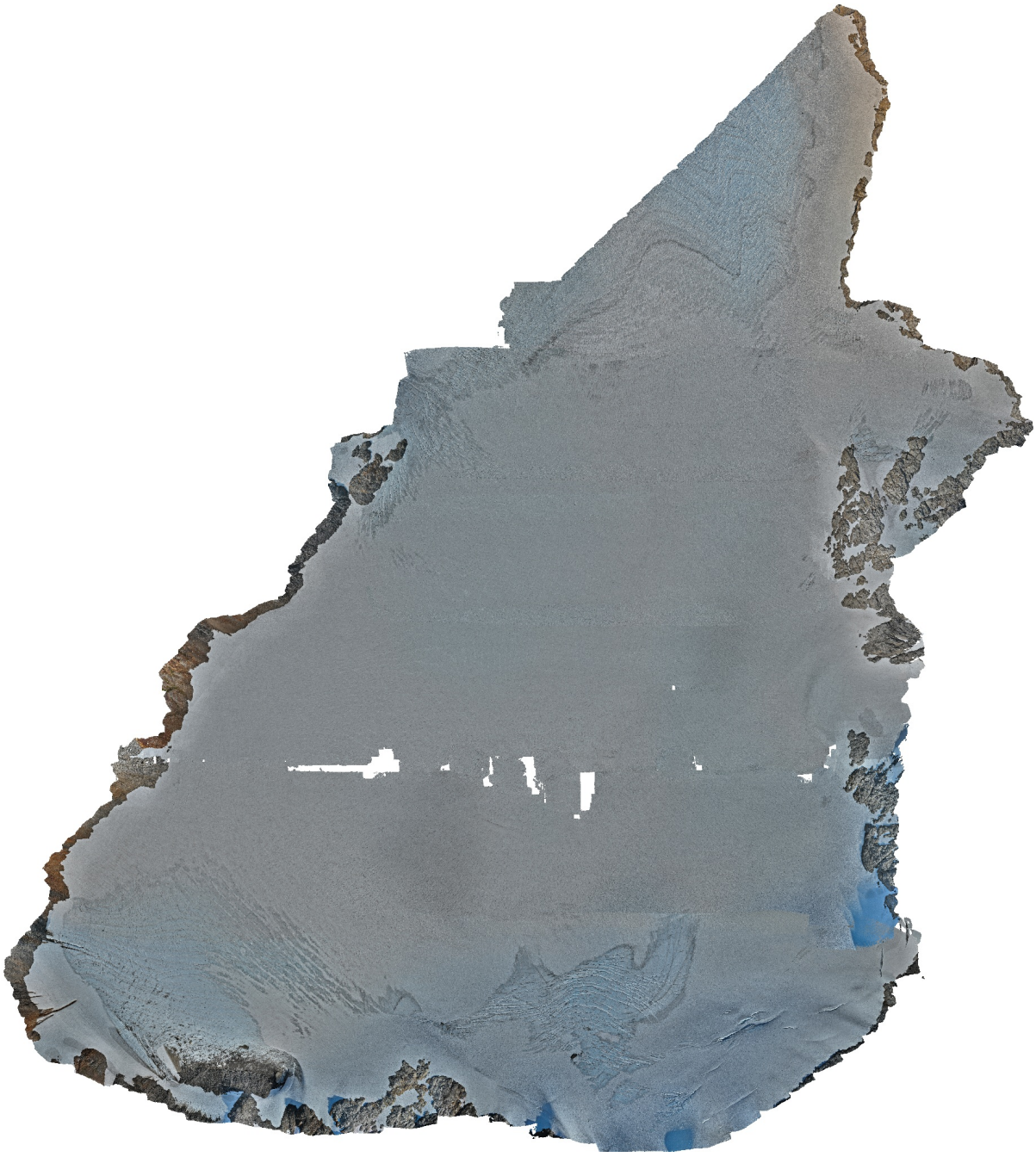
General	
Cameras	21400
Aligned cameras	21400
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	1,002,933 of 2,472,357
RMS reprojection error	0.155344 (0.423506 pix)
Max reprojection error	1.10259 (36.7722 pix)
Mean key point size	2.6111 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	57.8585
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	No
Matching time	2 hours 44 minutes
Matching memory usage	28.20 GB
Alignment time	4 hours 35 minutes
Alignment memory usage	10.60 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	5 minutes 5 seconds
Date created	2023:11:16 21:21:19
Software version	2.0.1.16069
File size	2.16 GB
Depth Maps	
Count	5350
Depth maps generation parameters	
Quality	High
Filtering mode	Disabled
Max neighbors	16
Processing time	1 hours 27 minutes
Memory usage	2.74 GB
Date created	2023:11:17 05:02:45
Software version	2.0.1.16069
File size	9.83 GB
Point Cloud	
Points	421,545,610
Point attributes	
Color	4 bands, uint16
Normal	

Point classes	
Created (never classified)	421,545,610
Depth maps generation parameters	
Quality	High
Filtering mode	Disabled
Max neighbors	16
Processing time	1 hours 27 minutes
Memory usage	2.74 GB
Point cloud generation parameters	
Processing time	2 hours 40 minutes
Memory usage	13.60 GB
Date created	2023:11:17 07:43:11
Software version	2.0.1.16069
File size	8.18 GB
DEM	
Size	18,001 x 25,389
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	6 minutes 39 seconds
Memory usage	314.14 MB
Date created	2023:11:17 08:29:47
Software version	2.0.1.16069
File size	1.09 GB
Orthomosaic	
Size	36,001 x 50,777
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	1 hours 16 minutes
Memory usage	2.24 GB
Date created	2023:11:17 09:32:28
Software version	2.0.1.16069
File size	382.13 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17018
OS	Windows 64 bit
RAM	127.77 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report DJI Mavic 3M RGB Cameras, Lemon Creek, 2023

Processing Report

24 September 2024



Survey Data

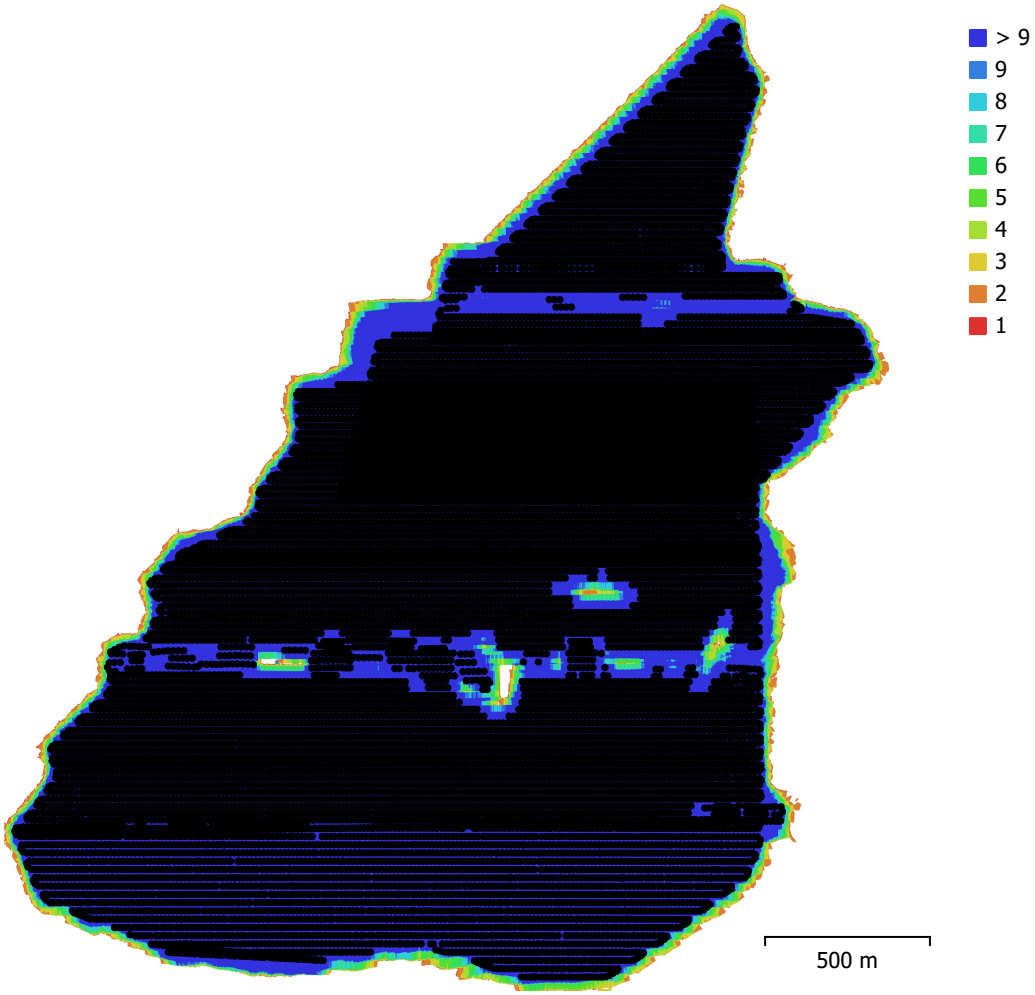


Fig. 1. Camera locations and image overlap.

Number of images:	18,301	Camera stations:	17,318
Flying altitude:	79.7 m	Tie points:	1,769,448
Ground resolution:	2.25 cm/pix	Projections:	41,471,095
Coverage area:	4.42 km²	Reprojection error:	0.67 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No

Table 1. Cameras.

Camera Calibration

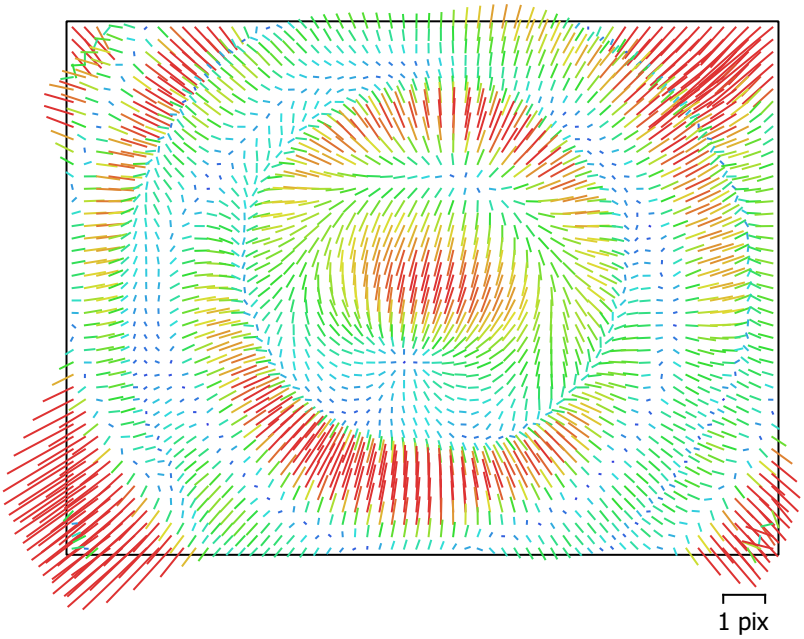


Fig. 2. Image residuals for M3M (12.29mm).

M3M (12.29mm)

18301 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**3674.04**	0.15	1.00	-0.01	-0.51	-0.06	-0.01	0.39	-0.65	0.80	-0.85	0.26	-0.24
Cx	**31.2927**	0.0021		1.00	0.01	0.03	0.02	-0.02	0.02	-0.02	0.01	0.67	0.03
Cy	**-20.0491**	0.0023			1.00	0.01	0.04	-0.20	0.34	-0.41	0.43	-0.11	0.61
B1	**-0.473011**	0.0017				1.00	0.01	-0.02	0.03	-0.04	0.04	-0.01	0.02
B2	**-0.0255499**	0.0016					1.00	-0.01	0.01	-0.01	0.01	-0.01	0.01
K1	**0.0348956**	7.4e-06						1.00	-0.93	0.83	-0.77	0.09	-0.11
K2	**-0.1886**	4.7e-05							1.00	-0.97	0.94	-0.16	0.17
K3	**0.403604**	0.00012								1.00	-0.99	0.20	-0.20
K4	**-0.256121**	9.8e-05									1.00	-0.22	0.21
P1	**0.00113196**	1.9e-07										1.00	-0.04
P2	**-0.000842839**	1.5e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

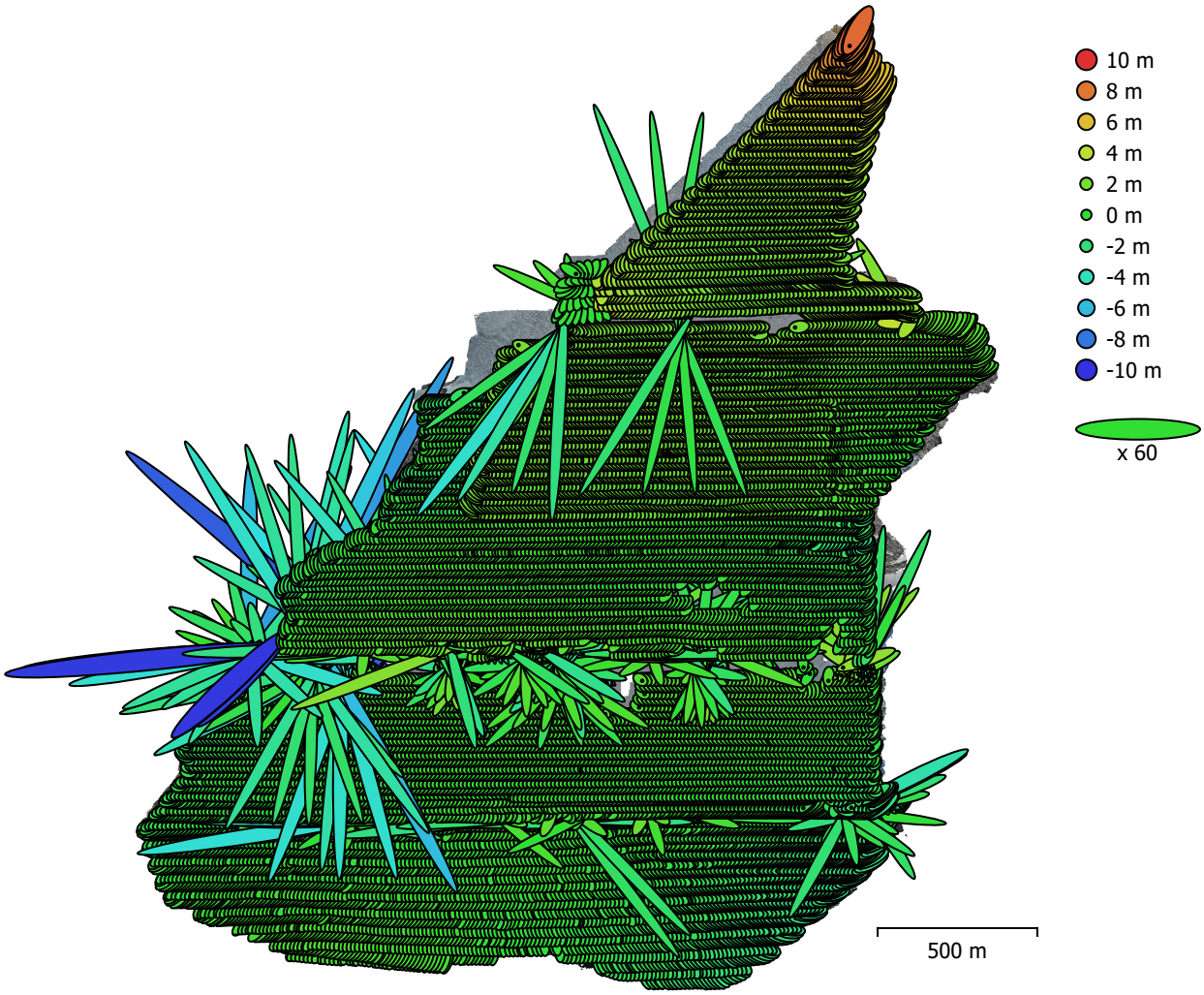


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.738754	0.811168	1.2742	1.09716	1.68147

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

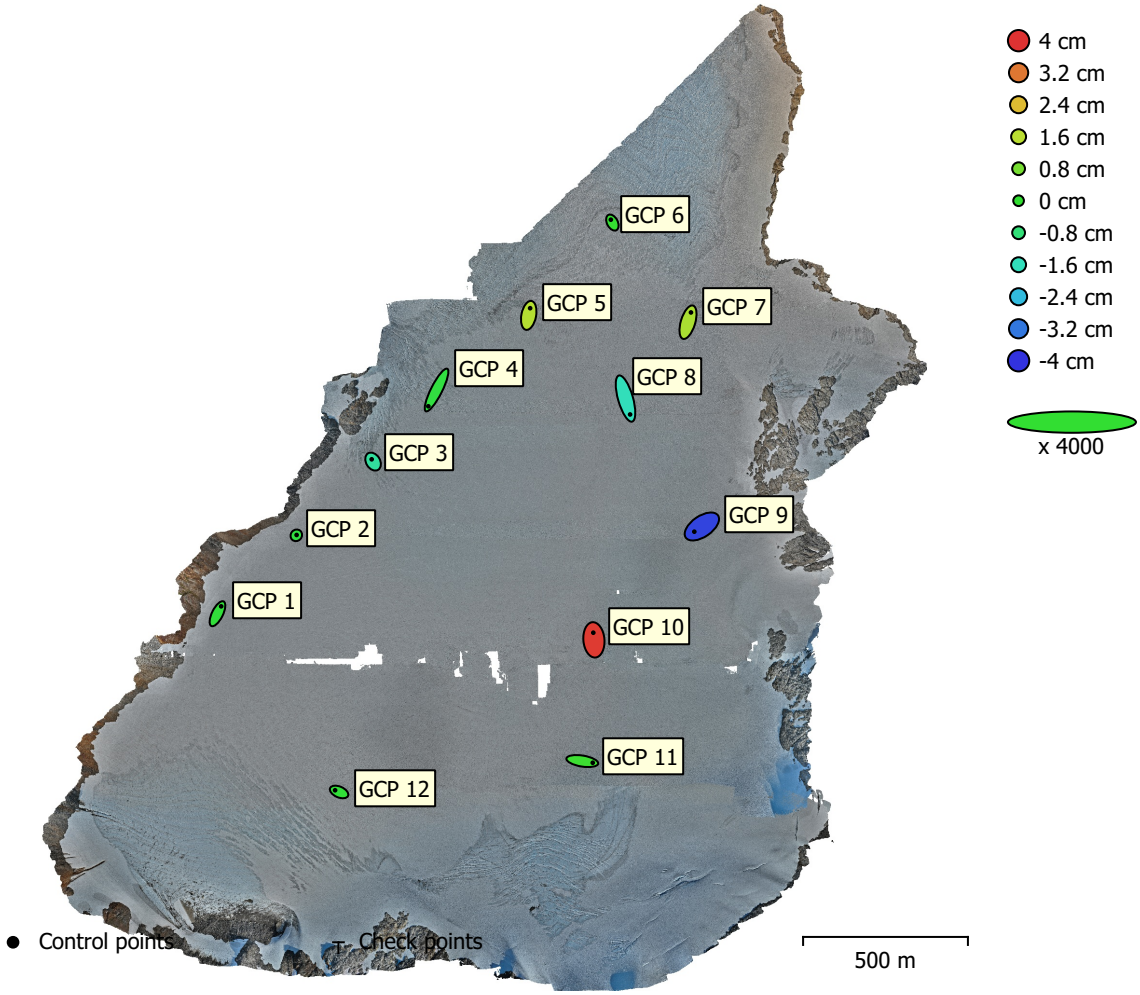


Fig. 4. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
12	0.758682	1.2513	1.78075	1.46334	2.30487

Table 4. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP 1	0.560618	1.11966	-0.0971861	1.25594	0.596 (10)
GCP 2	0.0489061	0.0529713	-0.166936	0.181839	0.478 (10)
GCP 3	-0.213824	0.345276	-1.24154	1.30628	0.882 (11)
GCP 4	-1.24823	-2.46967	-0.1755	2.77275	1.016 (10)
GCP 5	0.212206	1.09172	1.51185	1.87686	0.875 (10)
GCP 6	-0.231059	0.436402	0.0355444	0.495074	0.642 (10)
GCP 7	0.446659	1.4789	1.39101	2.07884	1.347 (10)
GCP 8	0.696091	-2.41115	-1.58578	2.96865	1.925 (10)
GCP 9	-1.14794	-0.785855	-3.79971	4.04638	2.871 (10)
GCP 10	-0.0920047	1.08607	3.90499	4.05425	3.136 (10)
GCP 11	1.58397	-0.255796	0.125703	1.60941	0.546 (10)
GCP 12	-0.607472	0.26185	-0.0662207	0.664811	0.507 (14)
Total	**0.758682**	**1.2513**	**1.78075**	**2.30487**	**1.494**

Table 5. Control points.

X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

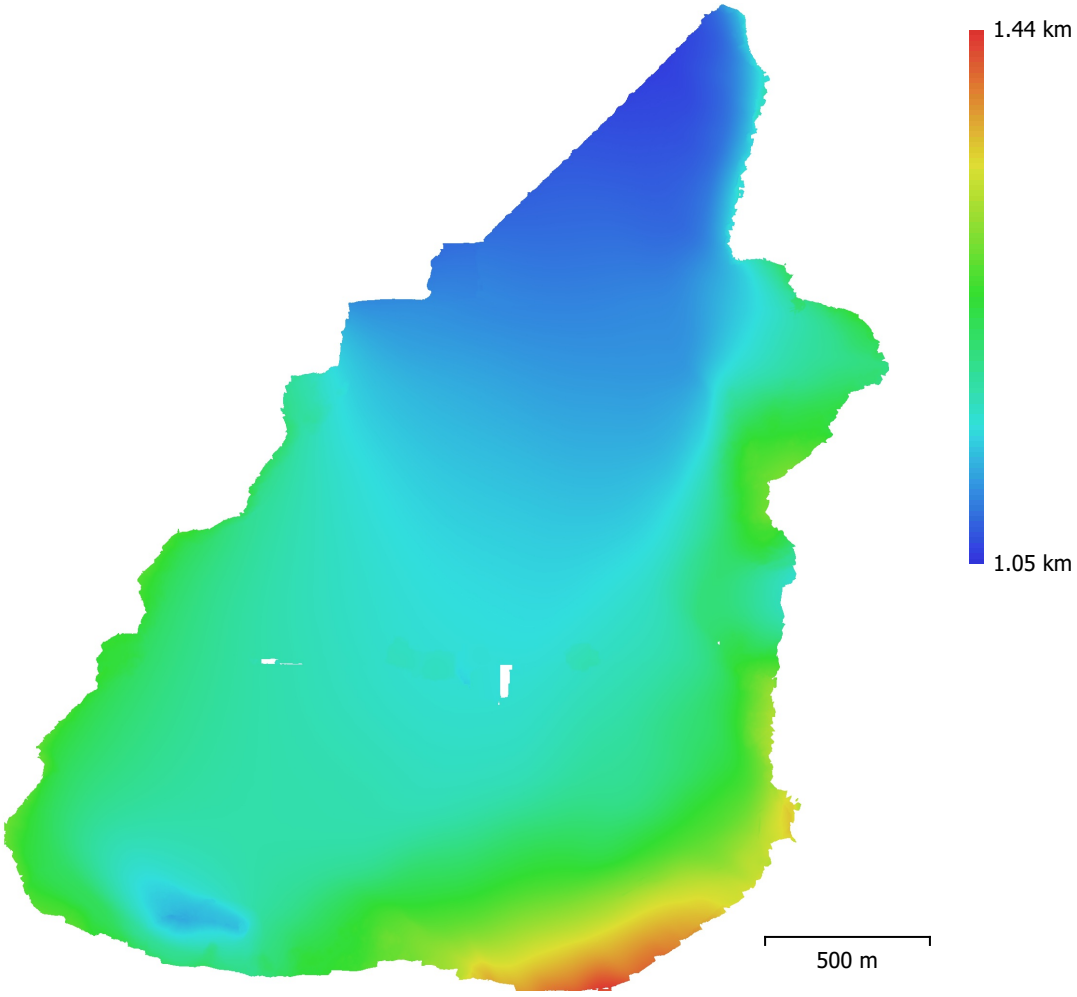


Fig. 5. Reconstructed digital elevation model.

Resolution:	4.51 cm/pix
Point density:	492 points/m²

Processing Parameters

General	
Cameras	18301
Aligned cameras	17318
Markers	12
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	1,769,448 of 3,259,359
RMS reprojection error	0.248904 (0.669727 pix)
Max reprojection error	4.95245 (49.1374 pix)
Mean key point size	2.63565 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	30.2897
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	1 hours 8 minutes
Matching memory usage	32.81 GB
Alignment time	3 hours 33 minutes
Alignment memory usage	12.61 GB
Optimization parameters	
Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	Yes
Optimization time	5 minutes 25 seconds
Date created	2023:10:04 21:37:46
Software version	2.0.2.16404
File size	1.52 GB
Depth Maps	
Count	17011
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	11 hours 11 minutes
Memory usage	12.80 GB
Date created	2023:10:08 06:56:32
Software version	2.0.3.16960
File size	127.59 GB
Point Cloud	
Points	2,563,295,779
Point attributes	
Color	3 bands, uint8

Normal	
Point classes	
Created (never classified)	2,563,295,779
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	11 hours 11 minutes
Memory usage	12.80 GB
Point cloud generation parameters	
Processing time	23 hours 33 minutes
Memory usage	34.94 GB
Date created	2023:10:09 06:30:11
Software version	2.0.3.16960
File size	33.05 GB
DEM	
Size	59,166 x 66,504
Coordinate system	WGS 84 / UTM zone 8N (EPSG::32608)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	24 minutes 5 seconds
Memory usage	287.63 MB
Date created	2023:10:09 09:56:25
Software version	2.0.3.16960
File size	6.70 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report DJI Mavic 3M Multispectral Camera Lemon Creek Glacier, AK, 2023

Processing Report

24 September 2024



Survey Data

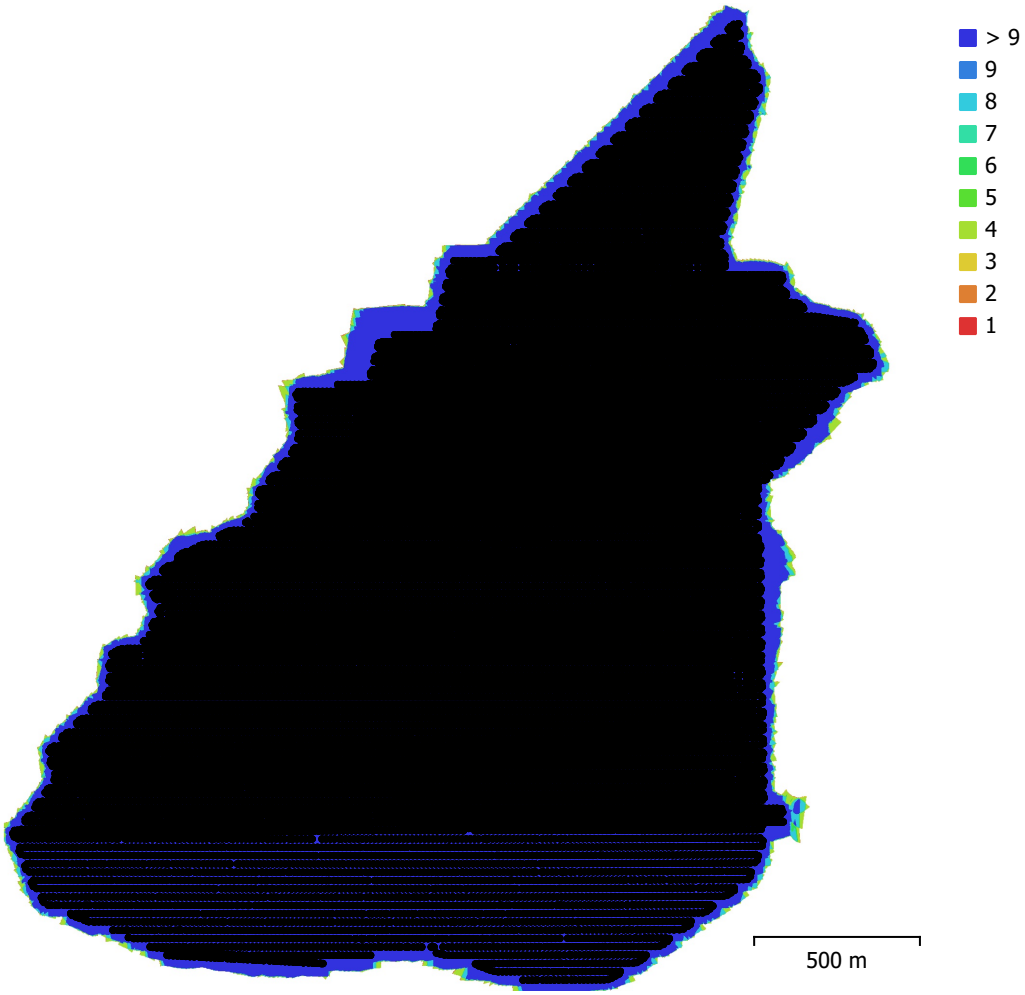


Fig. 1. Camera locations and image overlap.

Number of images:	75,952	Camera stations:	75,948
Flying altitude:	79.7 m	Tie points:	2,043,668
Ground resolution:	3.8 cm/pix	Projections:	144,984,297
Coverage area:	4.39 km²	Reprojection error:	0.322 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

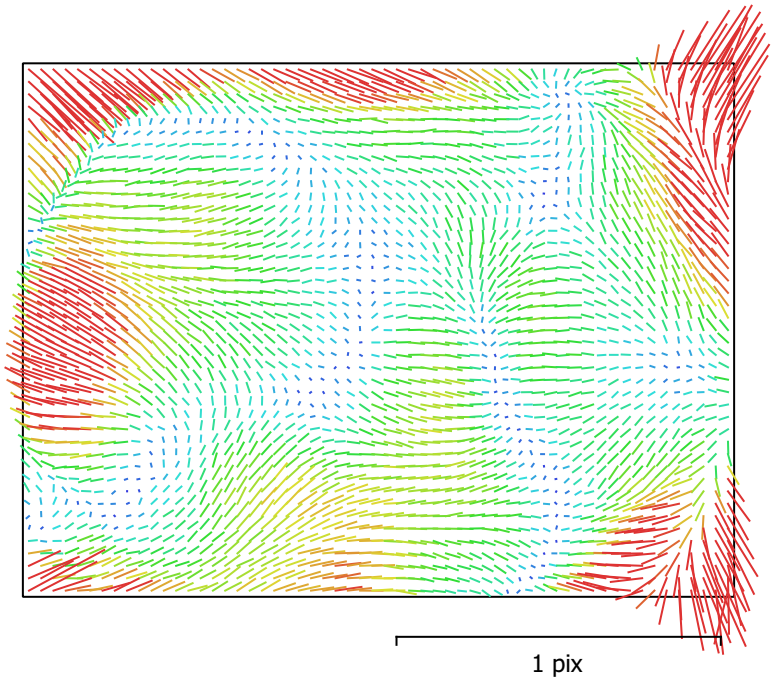


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

6593 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2192.73**	0.1	1.00	0.51	0.59	-0.04	-0.01	0.07	-0.08	-0.01	-0.01	-0.01	-0.09
Cx	**12.2016**	0.0022		1.00	0.31	0.02	0.04	0.04	-0.04	-0.01	-0.00	0.72	-0.02
Cy	**2.83729**	0.002			1.00	-0.06	0.02	0.05	-0.05	-0.00	-0.01	0.02	0.53
B1	**-3.92448**	0.0031				1.00	0.03	0.00	-0.00	0.00	-0.00	0.00	0.00
B2	**-1.04347**	0.0024					1.00	-0.00	0.00	0.00	-0.00	-0.00	0.01
K1	**0.010002**	1.4e-05						1.00	-0.97	0.92	-0.88	-0.00	-0.01
K2	**-0.0495161**	0.0001							1.00	-0.98	0.96	0.01	0.02
K3	**0.00274124**	0.00028								1.00	-0.99	-0.01	-0.01
K4	**-0.0163574**	0.00026									1.00	0.01	0.01
P1	**0.000228655**	2.9e-07										1.00	0.03
P2	**-0.000233458**	2.4e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

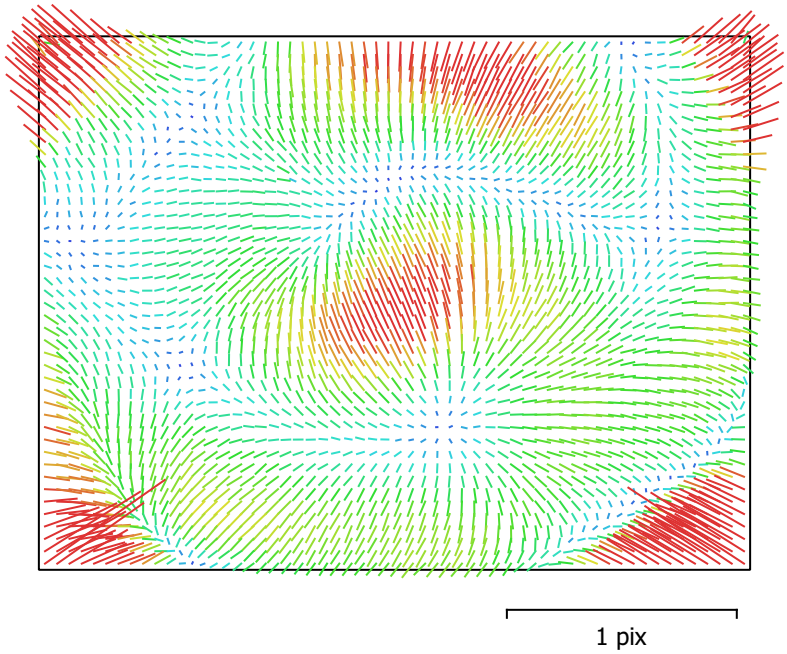


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

6593 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2195.45**	0.1	1.00	0.03	0.51	-0.04	-0.00	0.11	-0.14	0.07	-0.11	-0.03	0.05
Cx	**7.71982**	0.0019		1.00	0.03	0.02	0.05	0.00	-0.00	-0.00	0.00	0.84	0.03
Cy	**20.4016**	0.0018			1.00	-0.06	0.02	0.06	-0.07	0.04	-0.06	0.01	0.66
B1	**-4.07181**	0.0031				1.00	0.02	0.00	-0.00	0.00	-0.00	-0.00	0.00
B2	**-0.69899**	0.0024					1.00	-0.00	-0.00	0.00	-0.00	0.00	0.00
K1	**0.0156184**	1.4e-05						1.00	-0.97	0.93	-0.89	-0.01	-0.00
K2	**-0.0816737**	0.0001							1.00	-0.99	0.96	0.01	0.01
K3	**0.0797935**	0.00028								1.00	-0.99	-0.01	-0.01
K4	**-0.0877452**	0.00027									1.00	0.01	0.01
P1	**-0.000189428**	2.9e-07										1.00	0.02
P2	**0.000460494**	2.4e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

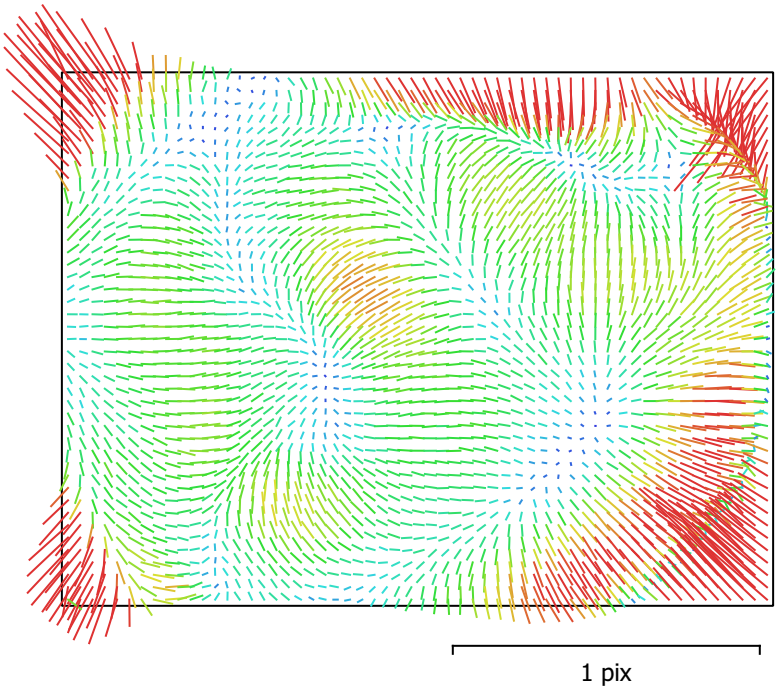


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

6593 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2201.97**	0.1	1.00	-0.33	0.12	-0.05	0.01	0.10	-0.14	0.07	-0.11	0.22	0.09
Cx	**7.4192**	0.0021		1.00	-0.03	0.03	0.04	-0.04	0.05	-0.03	0.04	0.70	-0.01
Cy	**15.8331**	0.0016			1.00	-0.06	0.02	0.01	-0.02	0.01	-0.01	0.04	0.74
B1	**-4.28343**	0.0031				1.00	0.02	0.00	-0.00	0.00	0.00	-0.01	-0.00
B2	**-0.232719**	0.0024					1.00	-0.00	-0.00	0.00	-0.00	0.00	0.01
K1	**0.0148642**	1.5e-05						1.00	-0.97	0.93	-0.89	0.02	0.00
K2	**-0.0836067**	0.0001							1.00	-0.99	0.96	-0.03	-0.00
K3	**0.0834693**	0.00029								1.00	-0.99	0.01	-0.00
K4	**-0.0852588**	0.00027									1.00	-0.02	0.00
P1	**0.00114793**	3e-07										1.00	0.04
P2	**0.000497034**	2.4e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

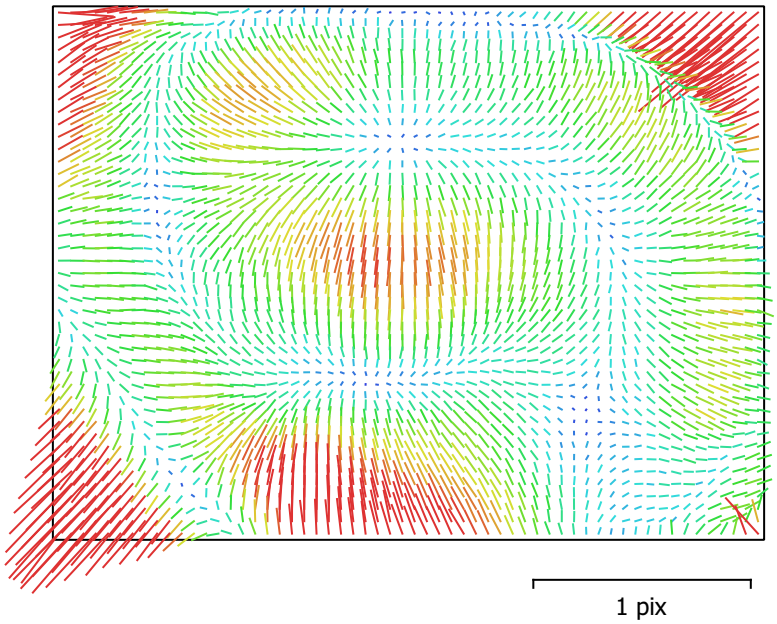


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

6593 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2209.37**	0.11	1.00	-0.58	0.24	-0.04	0.00	0.11	-0.13	0.05	-0.08	0.19	0.13
Cx	**7.88657**	0.0024		1.00	-0.13	0.03	0.03	-0.07	0.08	-0.04	0.05	0.56	-0.05
Cy	**-23.9395**	0.0017			1.00	-0.06	0.01	0.03	-0.03	0.02	-0.02	0.07	0.74
B1	**-3.89383**	0.0031				1.00	0.02	0.00	-0.00	0.00	-0.00	-0.00	0.01
B2	**-0.285393**	0.0024					1.00	-0.00	-0.00	0.00	-0.00	-0.01	0.01
K1	**0.0154321**	1.5e-05						1.00	-0.97	0.93	-0.88	0.02	0.03
K2	**-0.0798467**	0.00011							1.00	-0.98	0.96	-0.03	-0.03
K3	**0.0648869**	0.0003								1.00	-0.99	0.01	0.02
K4	**-0.0648527**	0.00029									1.00	-0.01	-0.03
P1	**0.000769066**	3e-07										1.00	0.04
P2	**0.000737783**	2.4e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

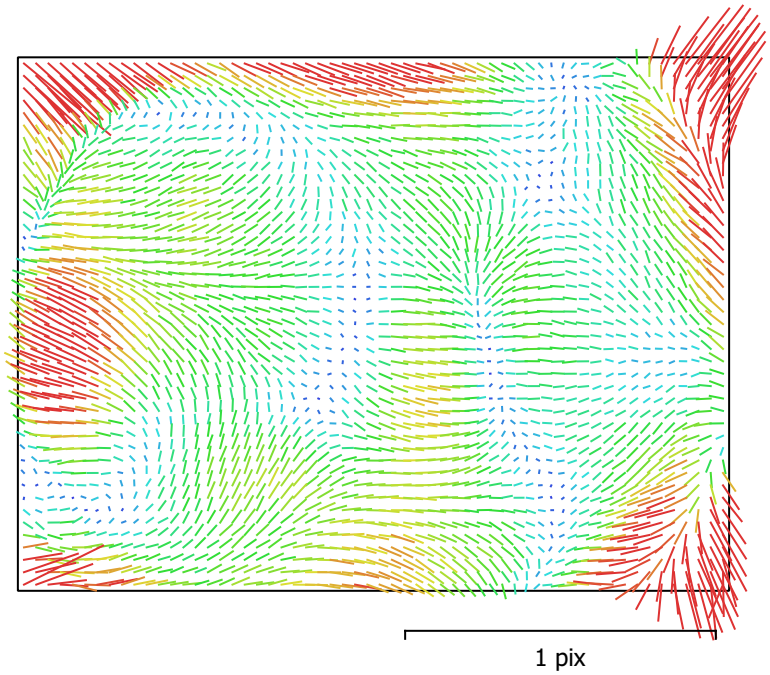


Fig. 6. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

6621 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2192.36**	0.081	1.00	0.37	0.15	-0.09	0.02	0.04	-0.05	-0.02	-0.00	-0.02	-0.04
Cx	**12.0016**	0.0024		1.00	0.06	-0.01	-0.01	0.01	-0.02	-0.01	0.00	0.68	-0.01
Cy	**2.66699**	0.002			1.00	0.04	0.02	0.01	-0.01	-0.00	-0.00	0.00	0.57
B1	**-4.96153**	0.0029				1.00	0.06	0.00	-0.00	0.00	-0.00	0.01	-0.00
B2	**-1.21386**	0.0025					1.00	-0.00	-0.00	-0.00	-0.00	0.01	0.00
K1	**0.00943101**	1.5e-05						1.00	-0.98	0.93	-0.89	-0.01	-0.01
K2	**-0.0482693**	0.00011							1.00	-0.99	0.96	0.01	0.01
K3	**0.000619828**	0.00029								1.00	-0.99	-0.01	-0.01
K4	**-0.0152435**	0.00027									1.00	0.01	0.01
P1	**0.000230041**	3e-07										1.00	0.00
P2	**-0.000215348**	2.4e-07											1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

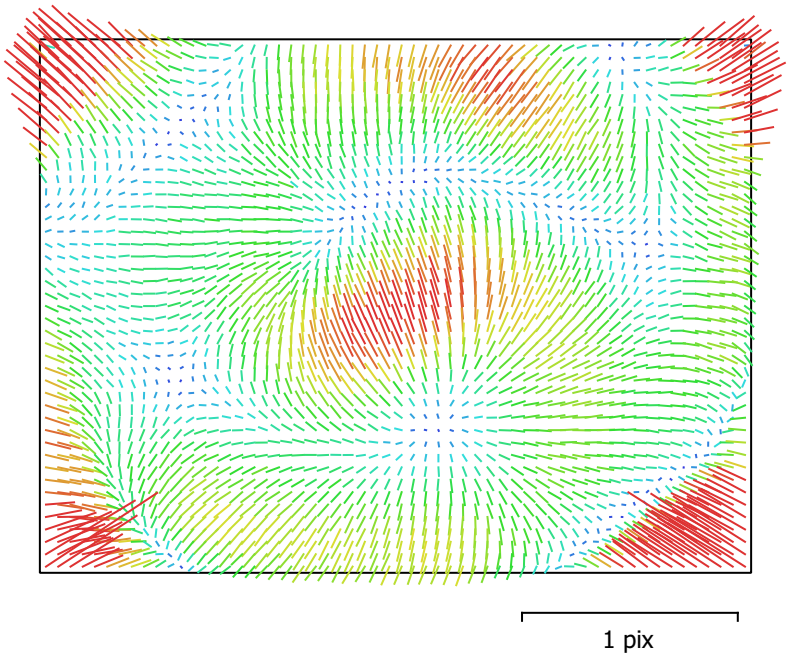


Fig. 7. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

6621 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2195.07**	0.081	1.00	0.04	0.05	-0.09	0.03	0.06	-0.09	0.04	-0.07	-0.03	0.06
Cx	**7.56778**	0.0023		1.00	0.01	0.01	-0.02	-0.00	0.00	-0.00	0.00	0.74	0.01
Cy	**20.0604**	0.002			1.00	0.05	0.01	0.00	-0.00	-0.00	0.00	0.01	0.58
B1	**-5.14502**	0.0029				1.00	0.05	0.00	0.00	0.00	0.00	0.00	-0.01
B2	**-0.838395**	0.0025					1.00	0.00	-0.00	0.00	-0.00	0.01	0.00
K1	**0.0148746**	1.5e-05						1.00	-0.98	0.93	-0.89	-0.01	-0.01
K2	**-0.0792597**	0.00011							1.00	-0.99	0.96	0.01	0.01
K3	**0.0747872**	0.0003								1.00	-0.99	-0.01	-0.01
K4	**-0.0838413**	0.00028									1.00	0.01	0.01
P1	**-0.000189079**	3e-07										1.00	0.00
P2	**0.000455159**	2.5e-07											1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

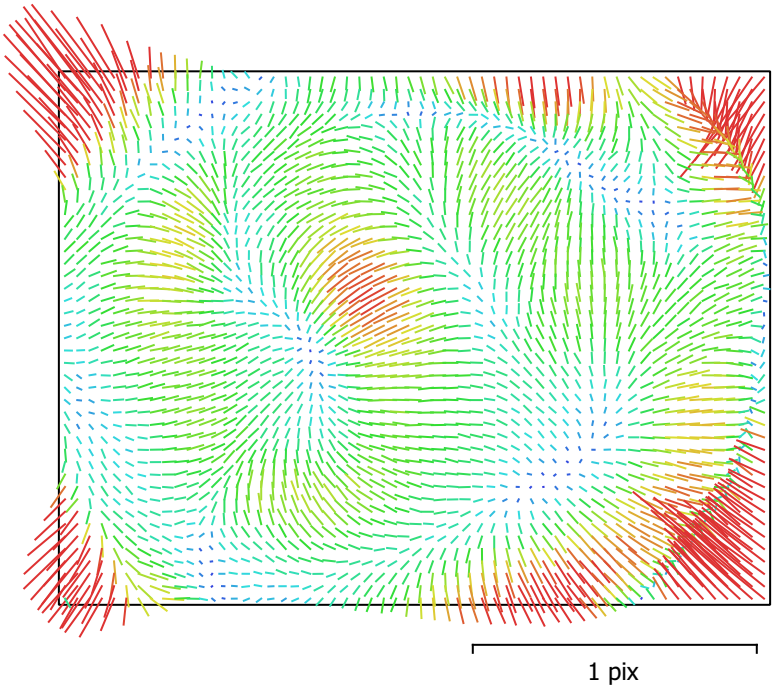


Fig. 8. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

6621 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2201.56**	0.082	1.00	-0.21	-0.24	-0.09	0.03	0.06	-0.10	0.04	-0.07	0.16	0.09
Cx	**7.36141**	0.0024		1.00	0.05	0.03	-0.03	-0.02	0.03	-0.02	0.02	0.68	-0.02
Cy	**15.5732**	0.002			1.00	0.07	-0.01	-0.02	0.03	-0.02	0.02	-0.04	0.54
B1	**-5.37009**	0.0029				1.00	0.05	0.00	0.00	0.00	0.00	-0.01	-0.01
B2	**-0.356332**	0.0025					1.00	0.00	-0.00	0.00	-0.00	0.02	0.01
K1	**0.0142926**	1.6e-05						1.00	-0.98	0.93	-0.89	0.01	0.00
K2	**-0.0814239**	0.00011							1.00	-0.99	0.96	-0.01	-0.00
K3	**0.0774241**	0.00031								1.00	-0.99	0.00	-0.00
K4	**-0.079386**	0.00029									1.00	-0.01	0.00
P1	**0.00113625**	3.1e-07										1.00	0.01
P2	**0.000496771**	2.5e-07											1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

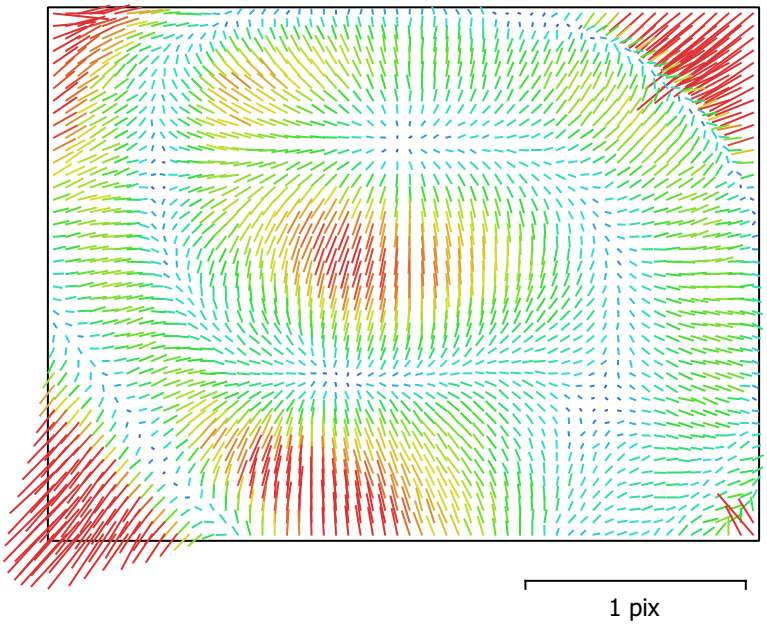


Fig. 9. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

6621 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2208.94**	0.082	1.00	-0.41	-0.15	-0.09	0.03	0.06	-0.09	0.03	-0.05	0.13	0.12
Cx	**7.9935**	0.0026		1.00	0.07	0.04	-0.04	-0.04	0.05	-0.02	0.03	0.62	-0.04
Cy	**-23.9734**	0.002			1.00	0.07	-0.00	-0.01	0.01	-0.01	0.01	-0.01	0.57
B1	**-4.965**	0.0029				1.00	0.05	0.00	0.00	0.00	0.00	-0.00	-0.00
B2	**-0.425101**	0.0025					1.00	0.00	-0.00	0.00	-0.00	0.00	0.01
K1	**0.0148056**	1.6e-05						1.00	-0.98	0.93	-0.89	0.00	0.02
K2	**-0.0776887**	0.00011							1.00	-0.99	0.96	-0.01	-0.03
K3	**0.0601993**	0.00032								1.00	-0.99	-0.00	0.02
K4	**-0.061407**	0.0003									1.00	-0.00	-0.02
P1	**0.000762459**	3.2e-07										1.00	0.02
P2	**0.000756922**	2.6e-07											1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Calibration

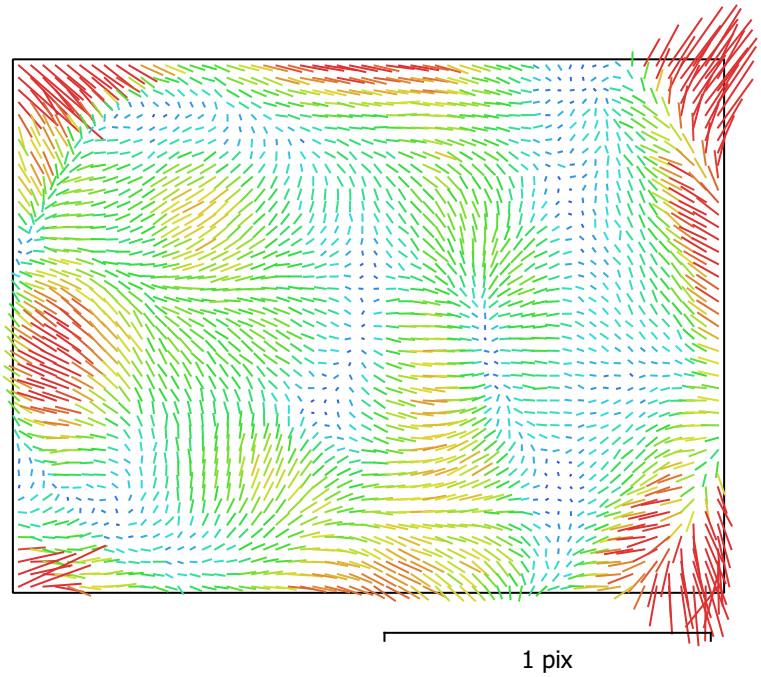


Fig. 10. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

5774 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2157.34**	0.13	1.00	0.49	0.31	-0.03	-0.00	0.08	-0.09	-0.02	-0.01	-0.02	-0.07
Cx	**11.9935**	0.0026		1.00	0.13	-0.01	-0.07	0.04	-0.04	-0.01	0.00	0.63	-0.03
Cy	**2.13267**	0.0021			1.00	0.12	0.03	0.03	-0.03	-0.00	-0.00	-0.01	0.52
B1	**-4.53591**	0.0028				1.00	0.01	0.00	-0.01	0.01	-0.01	0.01	-0.00
B2	**-0.936944**	0.0022					1.00	-0.00	0.00	-0.00	0.00	0.00	0.00
K1	**0.00898499**	1.5e-05						1.00	-0.98	0.93	-0.89	-0.01	-0.01
K2	**-0.0425454**	0.0001							1.00	-0.98	0.96	0.01	0.01
K3	**-0.00560218**	0.00027								1.00	-0.99	-0.01	-0.01
K4	**-0.00882154**	0.00024									1.00	0.01	0.01
P1	**0.000216112**	3.1e-07										1.00	0.00
P2	**-0.000217038**	2.5e-07											1.00

Table 10. Calibration coefficients and correlation matrix.

Camera Calibration

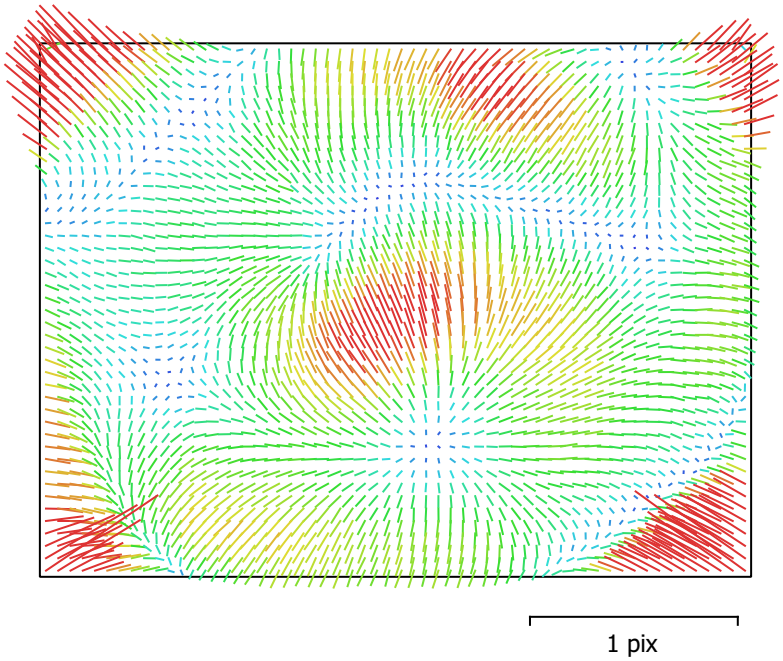


Fig. 11. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

5774 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2160.08**	0.13	1.00	-0.02	0.18	-0.04	0.00	0.12	-0.17	0.08	-0.14	-0.03	0.11
Cx	**7.60436**	0.0023		1.00	-0.02	-0.00	-0.07	-0.00	0.01	-0.01	0.01	0.73	0.00
Cy	**20.055**	0.002			1.00	0.12	0.03	0.02	-0.03	0.01	-0.02	-0.01	0.57
B1	**-4.66872**	0.0028				1.00	0.00	0.00	-0.00	0.00	-0.00	0.01	-0.01
B2	**-0.628955**	0.0022					1.00	-0.00	0.00	-0.00	-0.00	0.01	-0.00
K1	**0.0145612**	1.5e-05						1.00	-0.98	0.93	-0.89	-0.01	0.00
K2	**-0.0740019**	0.0001							1.00	-0.98	0.96	0.01	-0.00
K3	**0.067601**	0.00027								1.00	-0.99	-0.01	-0.01
K4	**-0.0739181**	0.00025									1.00	0.01	0.00
P1	**-0.000164736**	3.1e-07										1.00	-0.00
P2	**0.000455454**	2.5e-07											1.00

Table 11. Calibration coefficients and correlation matrix.

Camera Calibration

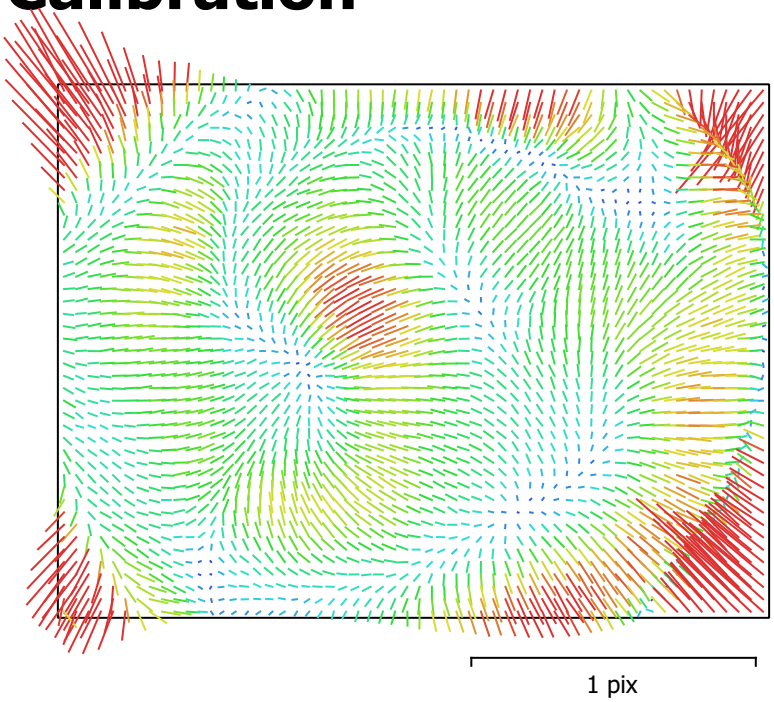


Fig. 12. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

5774 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2166.44**	0.13	1.00	-0.39	-0.28	-0.04	0.01	0.12	-0.17	0.09	-0.14	0.26	0.15
Cx	**7.86155**	0.0025		1.00	0.09	0.01	-0.07	-0.05	0.07	-0.04	0.06	0.56	-0.06
Cy	**15.6184**	0.0021			1.00	0.14	0.02	-0.04	0.05	-0.03	0.04	-0.08	0.50
B1	**-4.87948**	0.0028				1.00	0.00	0.00	-0.00	0.00	-0.00	0.00	-0.01
B2	**-0.172884**	0.0022					1.00	-0.00	-0.00	-0.00	-0.00	0.01	0.00
K1	**0.0141787**	1.6e-05						1.00	-0.98	0.93	-0.89	0.03	0.01
K2	**-0.0776027**	0.00011							1.00	-0.98	0.96	-0.04	-0.02
K3	**0.0743069**	0.00028								1.00	-0.99	0.02	0.00
K4	**-0.0735914**	0.00026									1.00	-0.03	-0.01
P1	**0.00110686**	3.2e-07										1.00	0.04
P2	**0.000479378**	2.5e-07											1.00

Table 12. Calibration coefficients and correlation matrix.

Camera Calibration

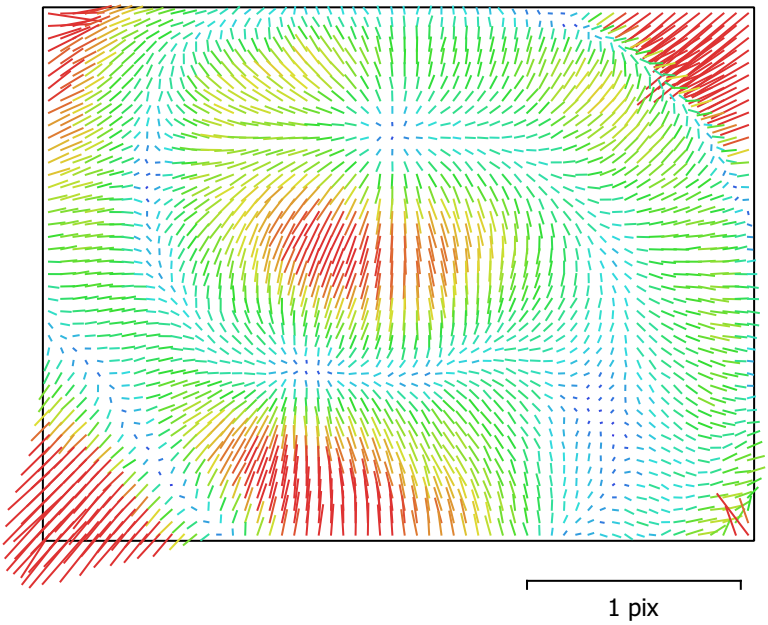


Fig. 13. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

5774 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2173.73**	0.13	1.00	-0.63	-0.16	-0.03	0.01	0.12	-0.16	0.06	-0.09	0.22	0.19
Cx	**8.25114**	0.003		1.00	0.09	0.01	-0.07	-0.09	0.11	-0.05	0.07	0.42	-0.12
Cy	**-24.0995**	0.002			1.00	0.13	0.02	-0.02	0.02	-0.01	0.01	-0.03	0.53
B1	**-4.46814**	0.0028				1.00	0.00	0.00	-0.01	0.01	-0.00	0.01	-0.00
B2	**-0.204329**	0.0023					1.00	-0.00	-0.00	-0.00	0.00	-0.00	0.00
K1	**0.0146972**	1.6e-05						1.00	-0.98	0.93	-0.89	0.03	0.04
K2	**-0.0731078**	0.00011							1.00	-0.98	0.96	-0.03	-0.05
K3	**0.054919**	0.00029								1.00	-0.99	0.01	0.03
K4	**-0.0541578**	0.00027									1.00	-0.02	-0.04
P1	**0.000734292**	3.2e-07										1.00	0.05
P2	**0.000725881**	2.6e-07											1.00

Table 13. Calibration coefficients and correlation matrix.

Camera Locations

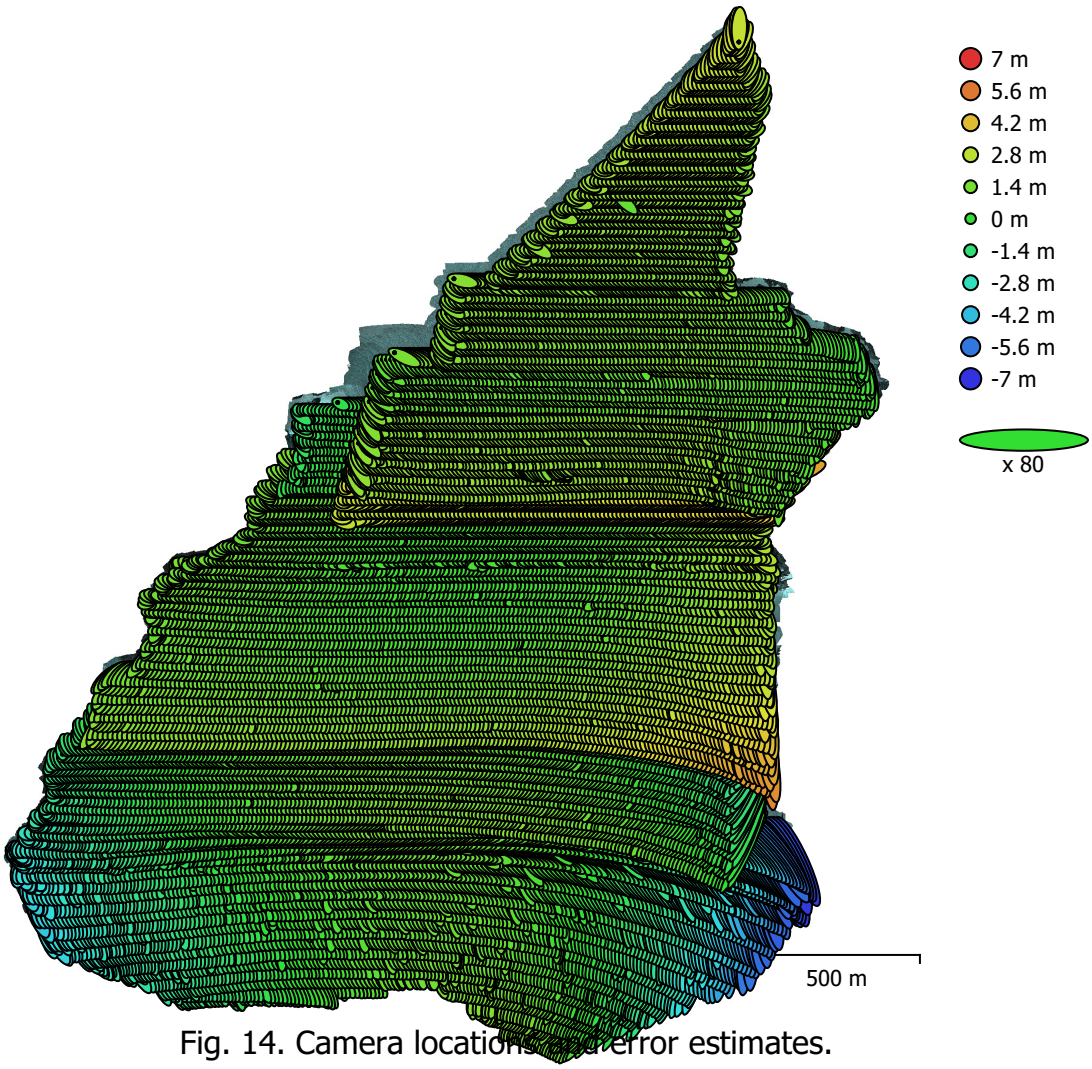


Fig. 14. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.436386	0.703201	1.64	0.827602	1.83699

Table 14. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

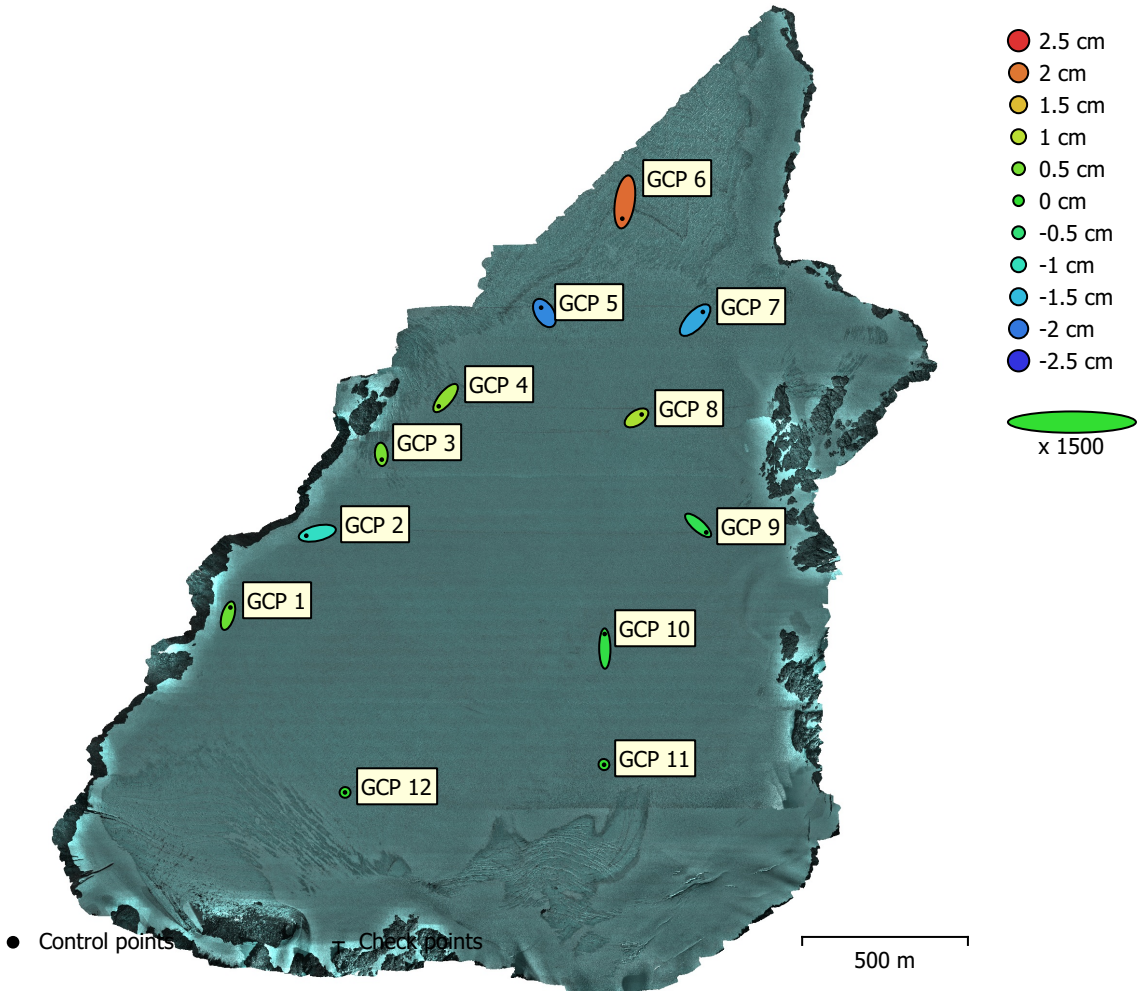


Fig. 15. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
12	2.15818	3.3238	1.05697	3.96301	4.10154

Table 15. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP 1	0.982631	3.29695	0.403897	3.4639	0.435 (40)
GCP 2	-4.44086	-1.0127	-1.06063	4.67672	0.686 (40)
GCP 3	0.182799	-2.12426	0.50256	2.19054	0.864 (40)
GCP 4	-2.75639	-3.32171	0.665444	4.36741	0.547 (40)
GCP 5	-1.33524	2.14611	-1.87558	3.14745	0.553 (40)
GCP 6	-1.01471	-6.74448	2.08832	7.13293	0.828 (40)
GCP 7	3.13084	3.29455	-1.64744	4.83428	0.632 (40)
GCP 8	2.07695	1.36093	0.870587	2.63131	0.517 (40)
GCP 9	3.26166	-2.84003	-0.22781	4.33083	0.570 (40)
GCP 10	-0.0627606	5.85293	-0.139229	5.85492	0.545 (40)
GCP 11	0.0500866	-0.086903	0.021589	0.102601	0.150 (40)
GCP 12	-0.0438456	-0.00734035	0.0169487	0.047577	0.165 (40)
Total	**2.15818**	**3.3238**	**1.05697**	**4.10154**	**0.580**

Table 16. Control points.

X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

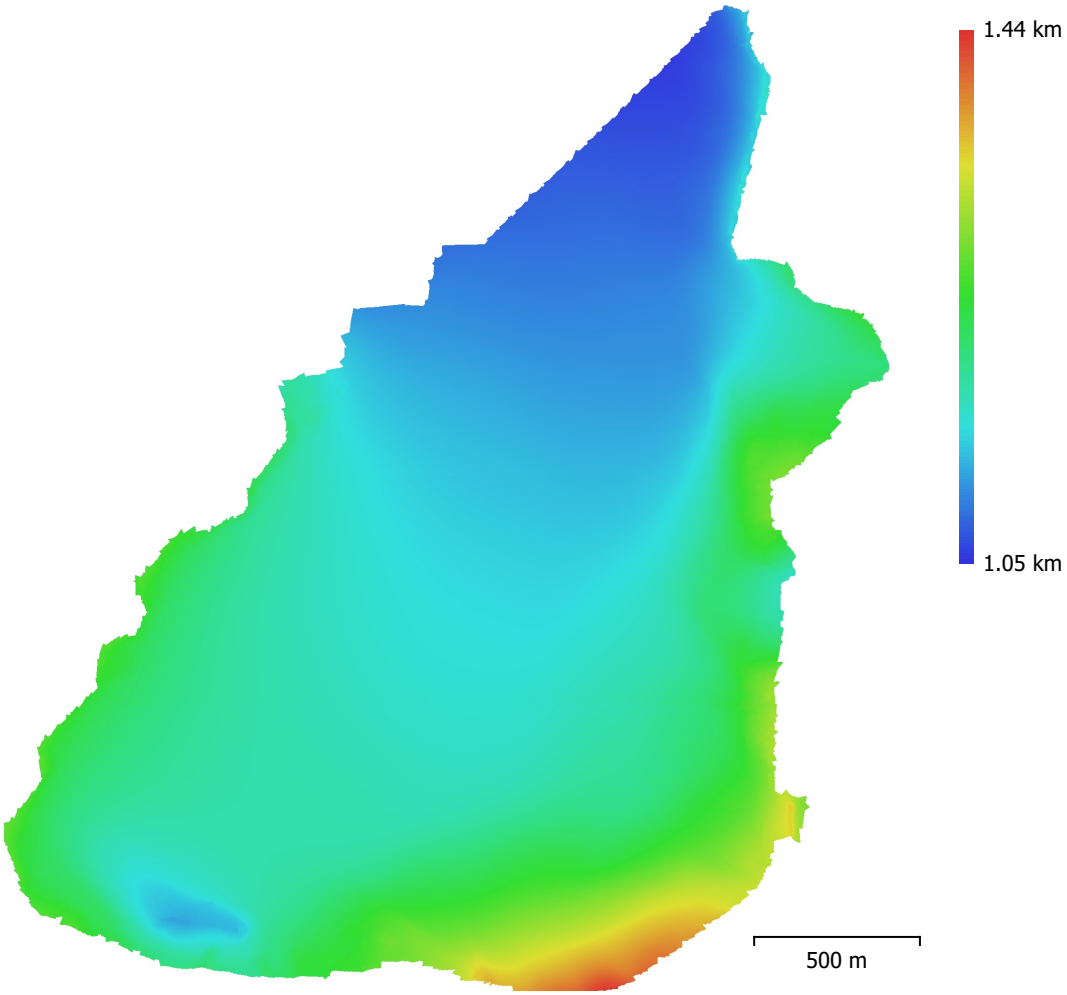


Fig. 16. Reconstructed digital elevation model.

Resolution:	7.59 cm/pix
Point density:	173 points/m²

Processing Parameters

General	
Cameras	75952
Aligned cameras	75948
Markers	12
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	2,043,668 of 5,438,549
RMS reprojection error	0.136888 (0.322313 pix)
Max reprojection error	1.26809 (19.8967 pix)
Mean key point size	2.28134 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	84.3574
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	10 minutes 37 seconds
File size	6.90 GB
Depth Maps	
Count	18951
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	4 hours 41 minutes
Memory usage	6.38 GB
Date created	2023:10:26 23:27:46
Software version	2.1.0.17018
File size	32.94 GB
Point Cloud	
Points	867,625,026
Point attributes	
Color	4 bands, uint16
Normal	
Confidence	1 - 114
Point classes	
Created (never classified)	867,625,026
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	4 hours 41 minutes
Memory usage	6.38 GB
Point cloud generation parameters	
Processing time	6 hours 17 minutes
Memory usage	28.49 GB
Date created	2023:10:27 05:45:02
Software version	2.1.0.17018
File size	17.84 GB

DEM

Size	34,943 x 39,281
Coordinate system	WGS 84 / UTM zone 8N (EPSG::32608)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	36 minutes 39 seconds
Memory usage	322.91 MB
Date created	2023:10:27 09:47:36
Software version	2.1.0.17018
File size	2.43 GB

Raster Transform

Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768

System

Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Metashape Report: Lemon Creek Glacier, Micasense, 2023-08-21 through 2023-08-23 No Reflectance Panels

Processing Report

16 April 2024



Survey Data

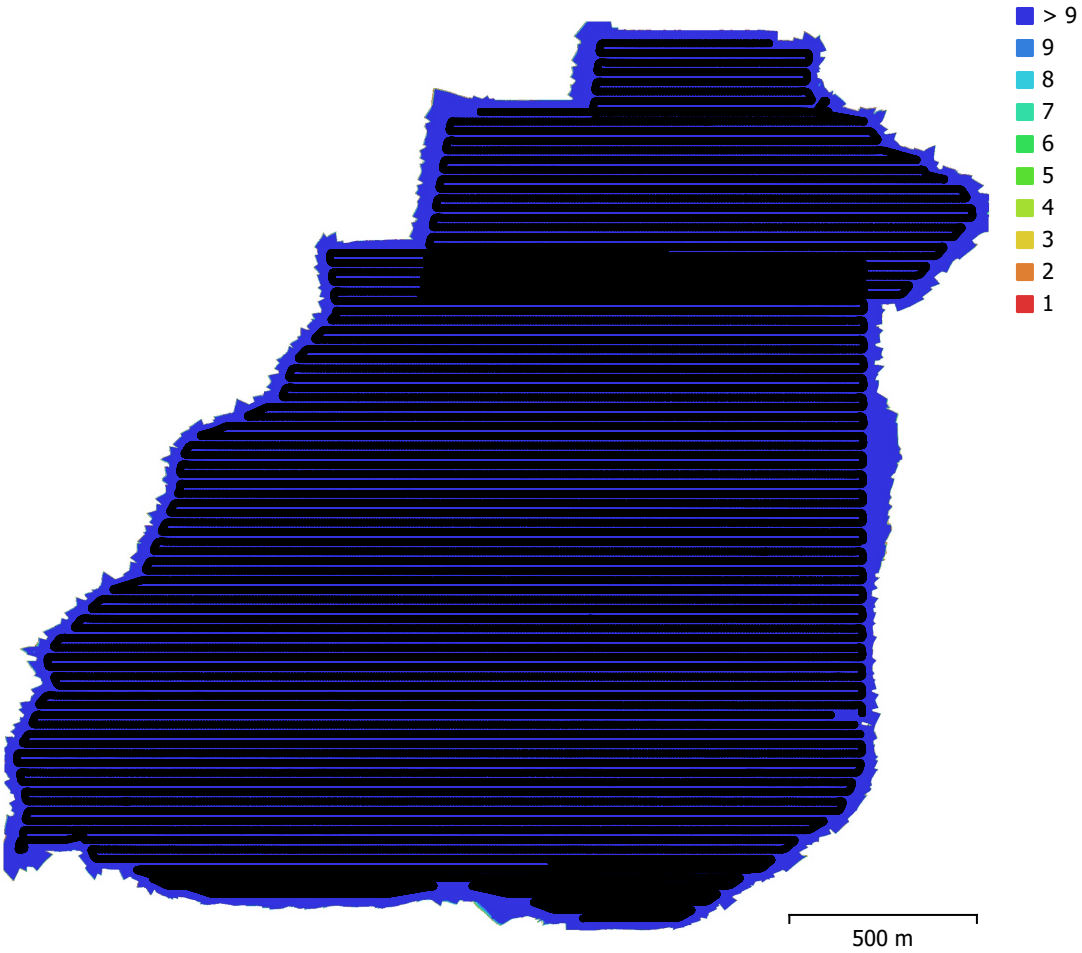


Fig. 1. Camera locations and image overlap.

Number of images:	228,120	Camera stations:	227,770
Flying altitude:	75.7 m	Tie points:	11,110,118
Ground resolution:	4.92 cm/pix	Projections:	328,599,328
Coverage area:	4.16 km²	Reprojection error:	0.384 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
RedEdge-M, Blue-444 (5.5…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Blue (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Green-531 (5.…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Green (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red-650 (5.5…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
RedEdge-M, Red (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red edge-705…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red edge (5.…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red edge-740…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, NIR (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Blue-444 (5.5…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Blue (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Green-531 (5.…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Green (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red-650 (5.5…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red edge-705…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red edge (5.…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, Red edge-740…	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes
RedEdge-M, NIR (5.5mm)	1280 x 960	5.5 mm	3.75 x 3.75 µm	Yes

Table 1. Cameras.

Camera Calibration

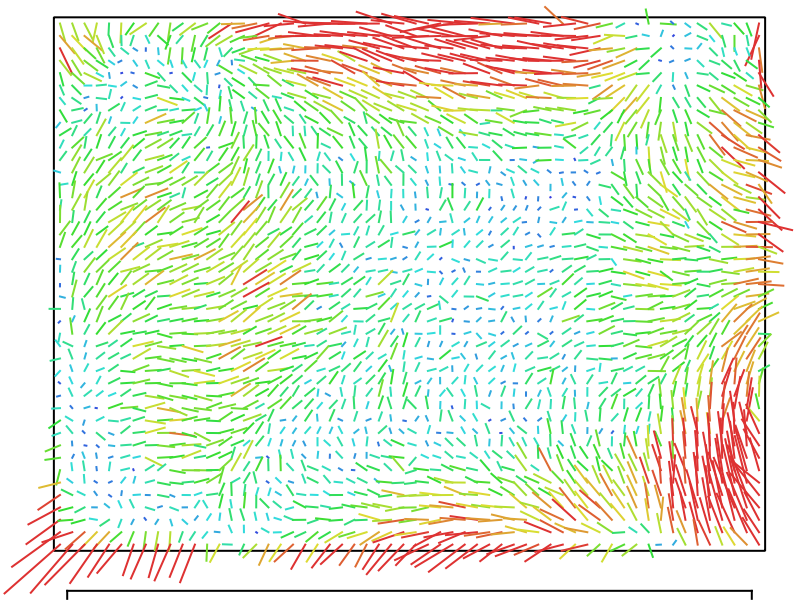


Fig. 2. Image residuals for RedEdge-M, Blue-444 (5.5mm).

RedEdge-M, Blue-444 (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1462.75**	0.0076	1.00	-0.01	-0.11	-0.02	-0.09	-0.19	0.16	-0.15	0.13	-0.00	0.02
Cx	**1.85156**	0.0024		1.00	0.01	-0.02	0.00	0.00	-0.00	0.00	-0.00	0.88	-0.01
Cy	**-16.2797**	0.0019			1.00	-0.00	0.00	-0.00	0.01	-0.01	0.01	-0.01	0.79
B1	**0.00373106**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	0.00	0.03
B2	**-0.0125697**	0.0011					1.00	0.00	-0.00	0.00	-0.00	-0.02	-0.00
K1	**-0.0979413**	3.5e-05						1.00	-0.98	0.94	-0.89	0.00	0.01
K2	**0.182053**	0.00045							1.00	-0.99	0.96	-0.00	-0.01
K3	**-0.196238**	0.0022								1.00	-0.99	0.00	0.01
K4	**0.264464**	0.0038									1.00	-0.00	-0.01
P1	**-0.000193741**	5.1e-07										1.00	-0.01
P2	**0.000522128**	4.2e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

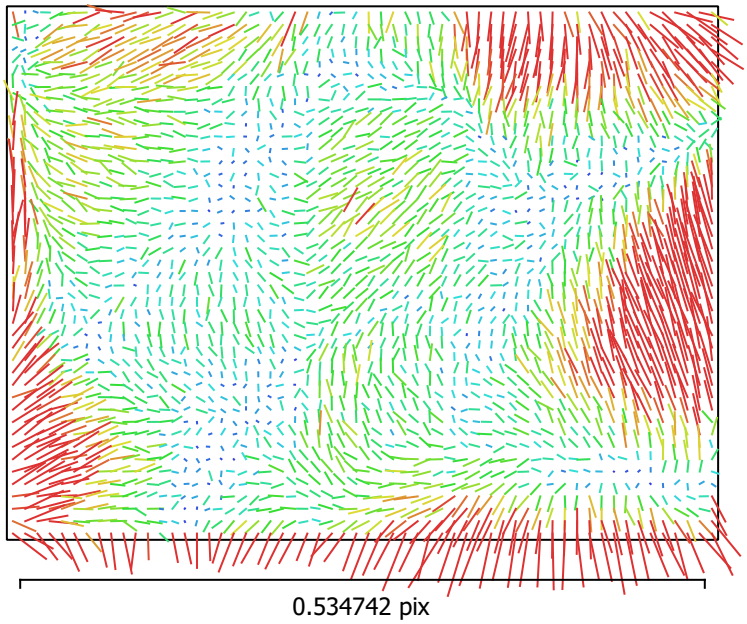


Fig. 3. Image residuals for RedEdge-M, Blue (5.5mm).

RedEdge-M, Blue (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1452.39**	0.0076	1.00	-0.01	-0.06	-0.02	-0.09	-0.19	0.16	-0.14	0.13	-0.00	0.01
Cx	**12.5803**	0.0024		1.00	0.02	-0.01	0.00	0.01	-0.01	0.01	-0.01	0.88	0.00
Cy	**-8.85761**	0.0019			1.00	-0.00	-0.00	-0.00	0.00	-0.00	0.01	-0.00	0.79
B1	**-0.118071**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	0.01	0.02
B2	**-0.0272929**	0.001					1.00	-0.00	0.00	-0.00	0.00	-0.02	0.00
K1	**-0.0953209**	3.5e-05						1.00	-0.98	0.94	-0.89	0.00	0.00
K2	**0.156778**	0.00043							1.00	-0.99	0.96	-0.00	-0.01
K3	**-0.081321**	0.0021								1.00	-0.99	0.00	0.01
K4	**0.0876675**	0.0035									1.00	-0.00	-0.01
P1	**-4.56734e-06**	5.2e-07										1.00	0.00
P2	**-2.34159e-05**	4.2e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

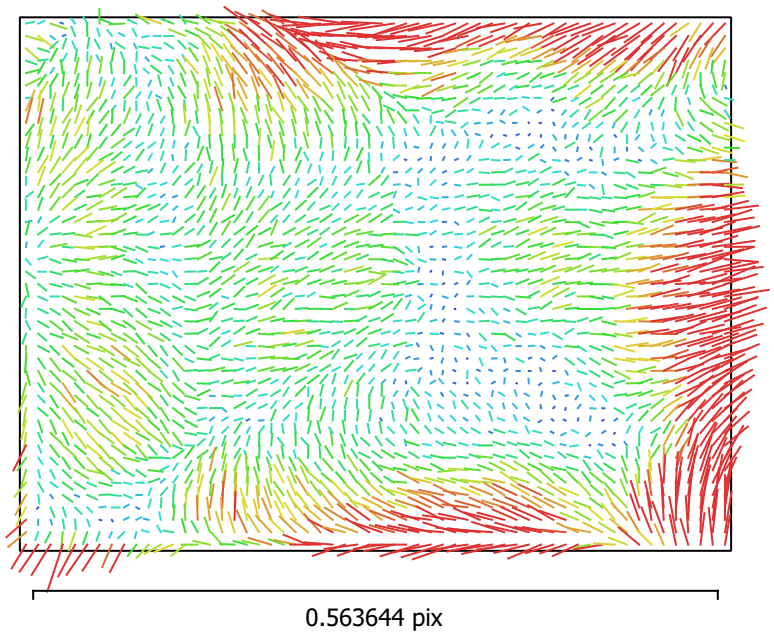


Fig. 4. Image residuals for RedEdge-M, Green-531 (5.5mm).

RedEdge-M, Green-531 (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1449.02**	0.0076	1.00	-0.03	-0.08	-0.02	-0.09	-0.19	0.16	-0.14	0.13	-0.00	0.02
Cx	**11.8648**	0.0024		1.00	0.02	-0.02	0.01	0.01	-0.01	0.01	-0.01	0.88	-0.01
Cy	**-6.92654**	0.0019			1.00	-0.00	-0.00	0.00	0.00	-0.00	0.00	-0.01	0.79
B1	**0.0382399**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	0.01	0.02
B2	**0.0190117**	0.001					1.00	0.00	0.00	-0.00	0.00	-0.01	0.00
K1	**-0.101454**	3.5e-05						1.00	-0.98	0.94	-0.89	0.01	0.00
K2	**0.158675**	0.00043							1.00	-0.99	0.96	-0.01	-0.01
K3	**-0.070078**	0.0021								1.00	-0.99	0.01	0.01
K4	**0.0529128**	0.0034									1.00	-0.00	-0.01
P1	**-0.000121185**	5.1e-07										1.00	-0.00
P2	**0.000483493**	4.1e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

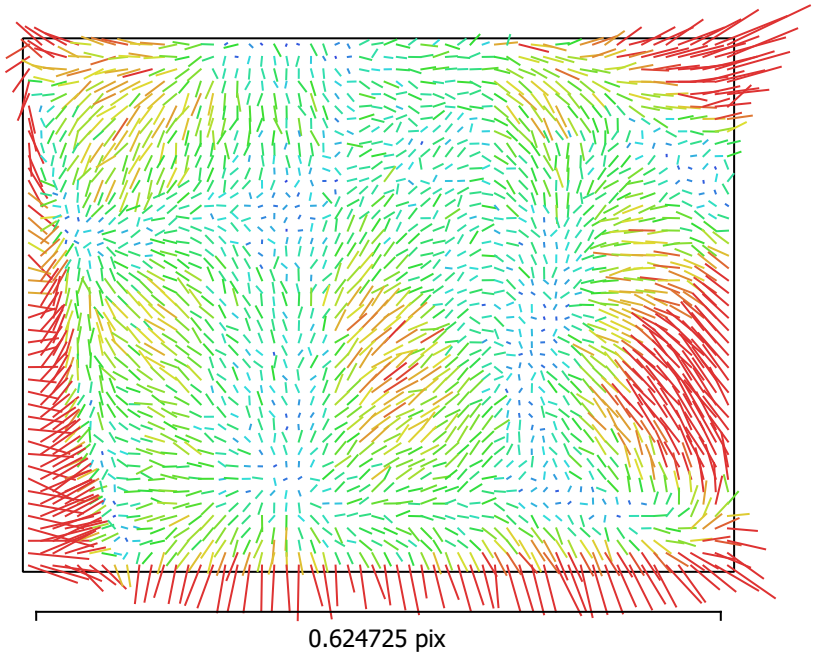


Fig. 5. Image residuals for RedEdge-M, Green (5.5mm).

RedEdge-M, Green (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1451.02**	0.0075	1.00	-0.05	-0.04	-0.01	-0.09	-0.17	0.14	-0.10	-0.00	0.02
Cx	**21.4564**	0.0024		1.00	0.02	-0.02	0.01	0.00	0.00	-0.01	0.88	-0.00
Cy	**-10.9457**	0.0019			1.00	-0.00	-0.00	0.01	-0.01	0.01	-0.01	0.79
B1	**-0.172575**	0.001				1.00	0.02	0.01	-0.02	0.02	0.01	0.02
B2	**0.0168851**	0.001					1.00	0.00	-0.00	0.00	-0.01	0.01
K1	**-0.101156**	1.6e-05						1.00	-0.97	0.92	0.01	-0.01
K2	**0.144201**	0.00012							1.00	-0.99	-0.01	0.00
K3	**-0.0219037**	0.00026								1.00	0.01	-0.00
P1	**-0.000234906**	5.1e-07									1.00	-0.00
P2	**0.0003031**	4.1e-07										1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

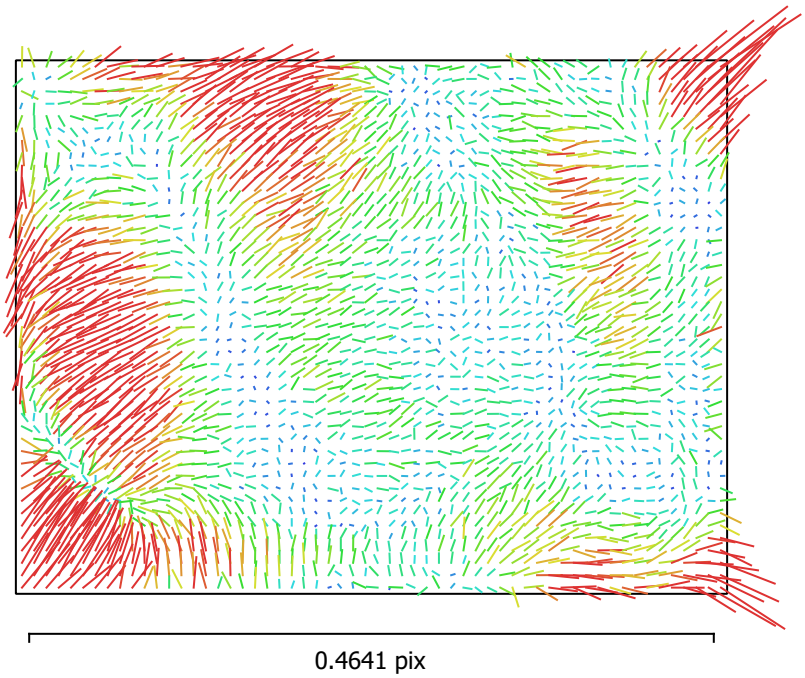


Fig. 6. Image residuals for RedEdge-M, Red-650 (5.5mm).

RedEdge-M, Red-650 (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1460.79**	0.0076	1.00	-0.04	-0.09	-0.01	-0.09	-0.16	0.13	-0.10	-0.00	0.02
Cx	**14.5162**	0.0024		1.00	0.03	-0.02	0.01	0.00	0.00	-0.01	0.88	0.01
Cy	**-6.17394**	0.0018			1.00	-0.01	-0.00	0.01	-0.01	0.01	0.01	0.78
B1	**0.0648039**	0.001				1.00	0.02	0.01	-0.02	0.02	0.00	0.02
B2	**0.0221443**	0.001					1.00	0.00	-0.00	0.00	-0.01	0.00
K1	**-0.0986829**	1.6e-05						1.00	-0.97	0.93	0.01	-0.00
K2	**0.132466**	0.00012							1.00	-0.99	-0.01	0.00
K3	**-0.00435755**	0.00026								1.00	0.01	-0.00
P1	**-0.000412414**	5e-07									1.00	0.01
P2	**5.70223e-05**	4e-07										1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

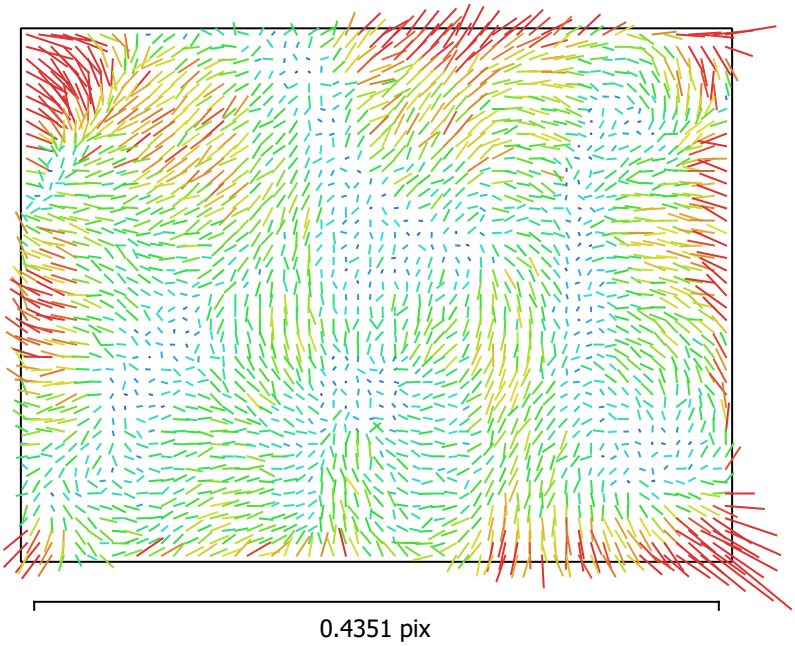


Fig. 7. Image residuals for RedEdge-M, Red (5.5mm).

RedEdge-M, Red (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1461.31**	0.0076	1.00	-0.04	-0.05	-0.01	-0.09	-0.19	0.16	-0.14	0.13	0.00	0.01
Cx	**15.5466**	0.0023		1.00	0.00	-0.02	0.01	0.01	-0.01	0.01	-0.01	0.87	-0.02
Cy	**7.6731**	0.0018			1.00	-0.01	-0.00	0.00	-0.00	0.00	-0.00	-0.02	0.78
B1	**0.0799265**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	0.01	0.01
B2	**0.0281154**	0.001					1.00	0.00	-0.00	0.00	-0.00	-0.00	0.01
K1	**-0.104154**	3.4e-05						1.00	-0.98	0.94	-0.89	0.01	-0.01
K2	**0.151974**	0.00042							1.00	-0.99	0.96	-0.01	0.01
K3	**-0.0601361**	0.0021								1.00	-0.99	0.00	-0.01
K4	**0.0580108**	0.0034									1.00	-0.00	0.01
P1	**6.3404e-05**	4.8e-07										1.00	-0.01
P2	**-0.000288843**	3.9e-07											1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

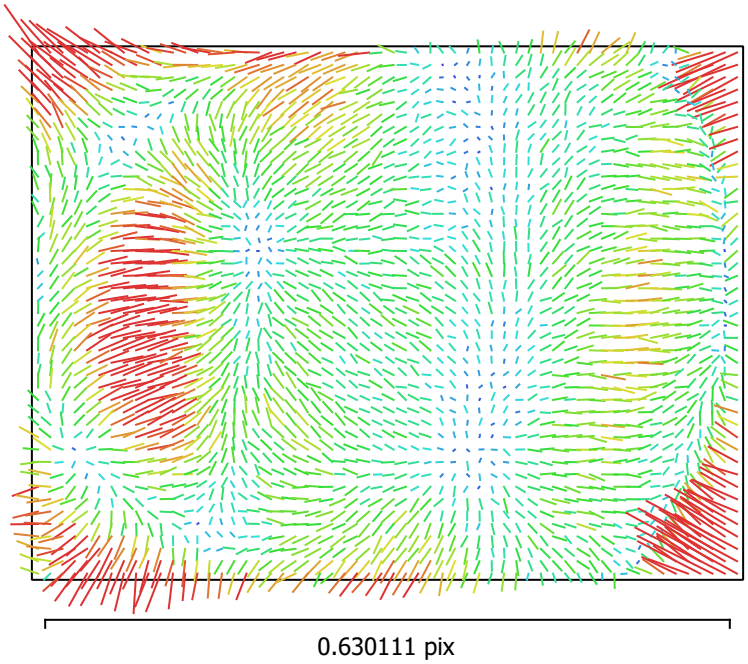


Fig. 8. Image residuals for RedEdge-M, Red edge-705 (5.5mm).

RedEdge-M, Red edge-705 (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1449.48**	0.0076	1.00	-0.03	-0.17	-0.02	-0.09	-0.19	0.16	-0.14	0.13	0.00	0.01
Cx	**14.9339**	0.0023		1.00	0.04	-0.01	-0.00	0.01	-0.01	0.01	-0.01	0.87	0.01
Cy	**-8.8802**	0.0018			1.00	-0.01	0.01	0.00	0.00	-0.01	0.01	0.01	0.77
B1	**-0.0679856**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	0.01	0.02
B2	**0.153585**	0.001					1.00	-0.00	0.00	-0.00	0.00	-0.02	0.01
K1	**-0.101585**	3.3e-05						1.00	-0.98	0.94	-0.89	0.01	0.00
K2	**0.141737**	0.00041							1.00	-0.99	0.96	-0.01	-0.01
K3	**-0.00553048**	0.002								1.00	-0.99	0.00	0.01
K4	**-0.0679372**	0.0032									1.00	-0.00	-0.01
P1	**0.000119077**	4.9e-07										1.00	0.01
P2	**-0.000695637**	4e-07											1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

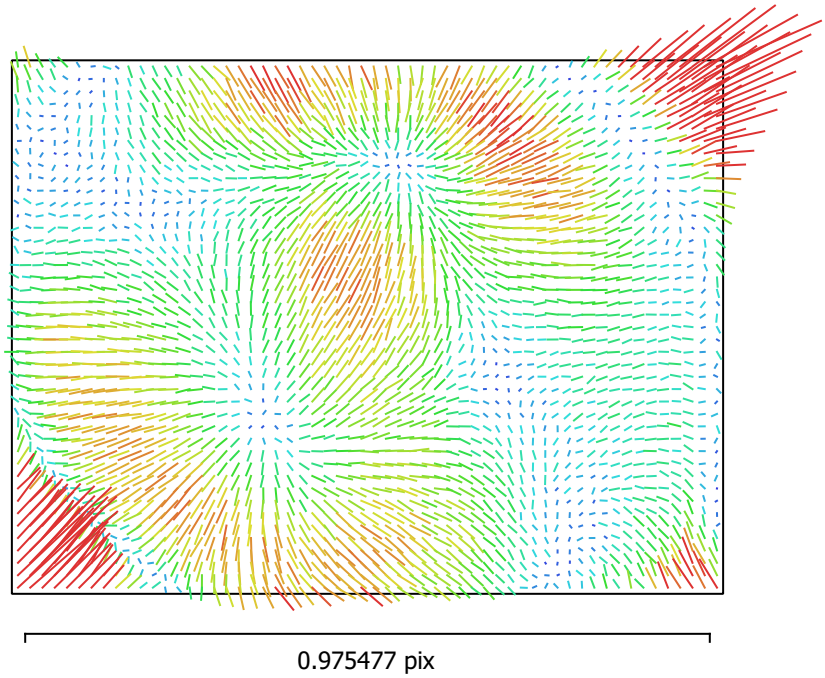


Fig. 9. Image residuals for RedEdge-M, Red edge (5.5mm).

RedEdge-M, Red edge (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1457.03**	0.0076	1.00	0.00	-0.11	-0.01	-0.09	-0.19	0.16	-0.14	0.13	-0.00	0.03
Cx	**-17.3957**	0.0024		1.00	0.00	-0.03	0.00	-0.00	0.01	-0.01	0.01	0.88	-0.02
Cy	**-18.3219**	0.0019			1.00	-0.01	-0.00	-0.00	0.01	-0.01	0.01	-0.02	0.77
B1	**-0.0394808**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	-0.02	0.02
B2	**-0.110649**	0.001					1.00	0.00	-0.00	0.00	-0.00	-0.01	-0.02
K1	**-0.103929**	3.4e-05						1.00	-0.98	0.93	-0.89	-0.00	0.01
K2	**0.136648**	0.00042							1.00	-0.99	0.96	0.00	-0.01
K3	**0.0165894**	0.002								1.00	-0.99	-0.00	0.01
K4	**-0.0830754**	0.0034									1.00	0.00	-0.01
P1	**-0.000314417**	4.9e-07										1.00	-0.01
P2	**0.000920398**	4.1e-07											1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Calibration

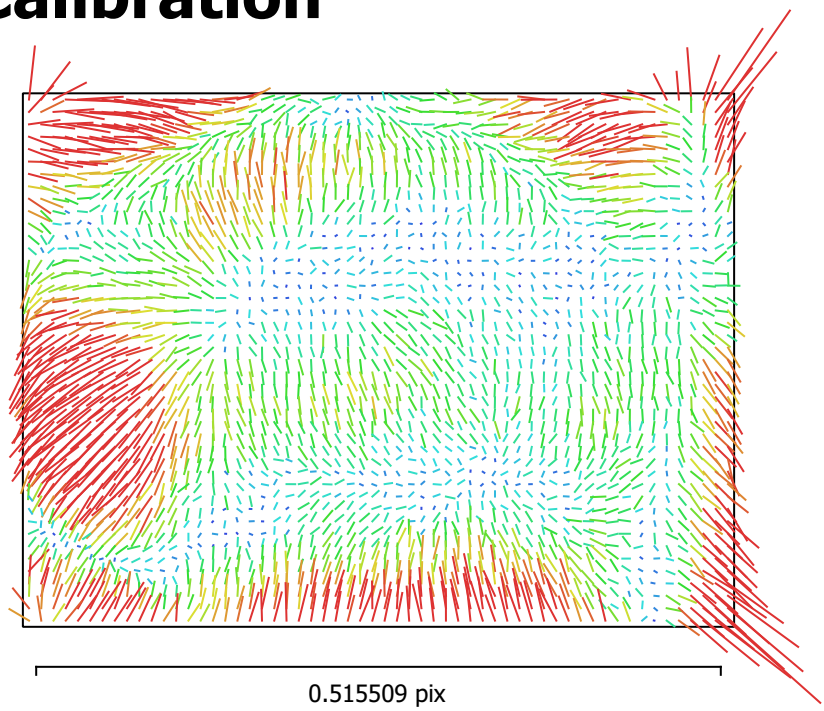


Fig. 10. Image residuals for RedEdge-M, Red edge-740 (5.5mm).

RedEdge-M, Red edge-740 (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1460.56**	0.0076	1.00	-0.01	-0.08	-0.01	-0.09	-0.17	0.13	-0.10	-0.00	0.02
Cx	**12.8637**	0.0024		1.00	0.02	-0.02	0.02	-0.00	0.00	-0.01	0.87	-0.00
Cy	**14.6016**	0.0018			1.00	-0.02	0.00	-0.01	0.01	-0.01	-0.00	0.78
B1	**0.277287**	0.001				1.00	0.02	0.01	-0.02	0.02	0.01	0.00
B2	**0.0263652**	0.001					1.00	0.00	-0.00	-0.00	0.00	0.00
K1	**-0.106014**	1.6e-05						1.00	-0.97	0.93	0.01	0.00
K2	**0.145961**	0.00012							1.00	-0.99	-0.01	-0.00
K3	**-0.0187618**	0.00026								1.00	0.01	0.01
P1	**-0.00024693**	4.9e-07									1.00	0.00
P2	**0.000371926**	4e-07										1.00

Table 10. Calibration coefficients and correlation matrix.

Camera Calibration

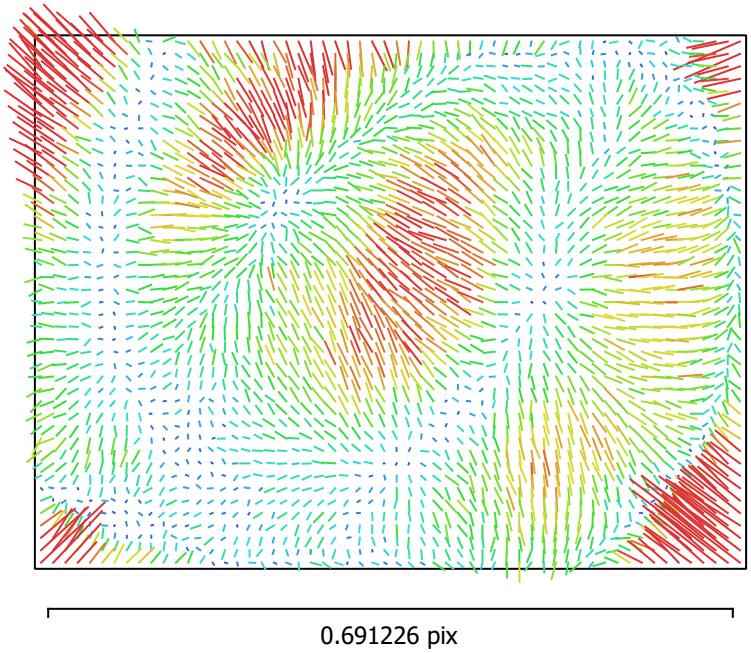


Fig. 11. Image residuals for RedEdge-M, NIR (5.5mm).

RedEdge-M, NIR (5.5mm)

14855 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1462.39**	0.0076	1.00	-0.03	-0.06	-0.02	-0.09	-0.18	0.15	-0.13	0.12	-0.00	0.03
Cx	**22.3033**	0.0023		1.00	0.01	-0.01	0.02	0.01	-0.01	0.01	-0.01	0.87	-0.01
Cy	**8.31416**	0.0018			1.00	-0.02	0.00	0.00	-0.00	0.00	-0.00	-0.01	0.78
B1	**0.140471**	0.001				1.00	0.02	0.02	-0.02	0.02	-0.02	0.02	0.00
B2	**0.0508458**	0.001					1.00	0.00	-0.00	0.00	-0.00	0.00	0.01
K1	**-0.103214**	3.2e-05						1.00	-0.98	0.93	-0.89	0.01	-0.00
K2	**0.131391**	0.00039							1.00	-0.99	0.96	-0.01	0.01
K3	**0.0649232**	0.0019								1.00	-0.99	0.01	-0.01
K4	**-0.208783**	0.0032									1.00	-0.00	0.01
P1	**-2.85612e-05**	4.8e-07										1.00	-0.00
P2	**0.000653753**	3.9e-07											1.00

Table 11. Calibration coefficients and correlation matrix.

Camera Calibration

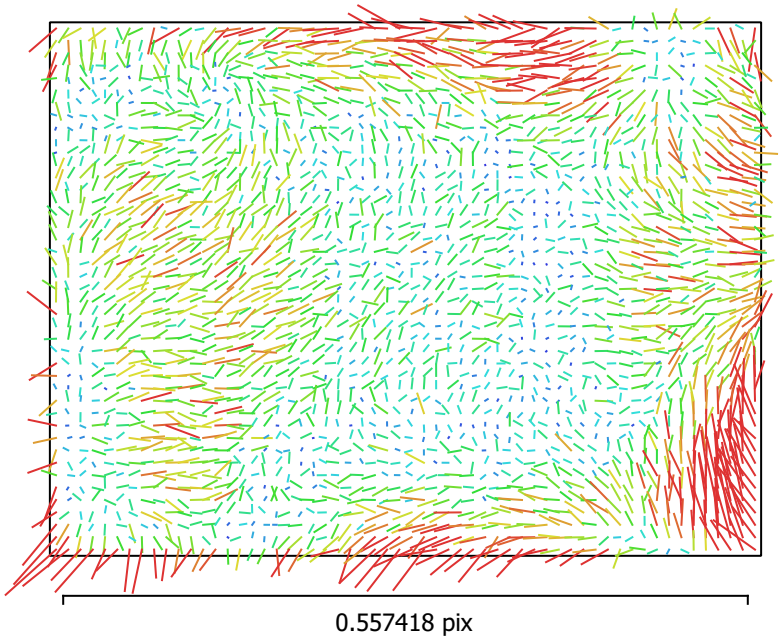


Fig. 12. Image residuals for RedEdge-M, Blue-444 (5.5mm).

RedEdge-M, Blue-444 (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1462.8**	0.0099	1.00	-0.03	-0.12	0.03	-0.03	-0.22	0.19	-0.17	0.16	0.00	0.03
Cx	**2.10866**	0.0037		1.00	0.01	-0.00	0.02	0.00	-0.00	0.00	-0.00	0.88	0.00
Cy	**-16.0419**	0.0029			1.00	-0.03	0.01	-0.00	0.01	-0.01	0.01	0.00	0.76
B1	**0.0159555**	0.00089				1.00	0.00	0.03	-0.03	0.03	-0.03	-0.01	0.04
B2	**-0.0204956**	0.00088					1.00	-0.00	0.00	-0.00	0.00	-0.03	-0.01
K1	**-0.0978304**	5.4e-05						1.00	-0.98	0.94	-0.89	0.00	0.01
K2	**0.180676**	0.00068							1.00	-0.99	0.96	-0.00	-0.01
K3	**-0.189731**	0.0034								1.00	-0.99	0.00	0.01
K4	**0.255335**	0.0058									1.00	-0.00	-0.01
P1	**-0.000164619**	7.8e-07										1.00	0.00
P2	**0.000579478**	6.3e-07											1.00

Table 12. Calibration coefficients and correlation matrix.

Camera Calibration

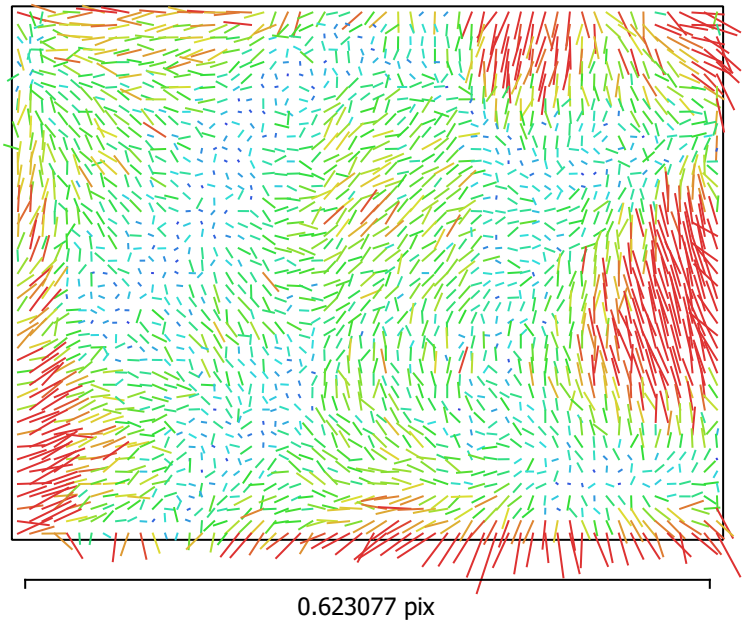


Fig. 13. Image residuals for RedEdge-M, Blue (5.5mm).

RedEdge-M, Blue (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1452.42**	0.0097	1.00	-0.02	-0.09	0.03	-0.02	-0.18	0.15	-0.12	0.00	0.02
Cx	**12.3871**	0.0036		1.00	0.02	0.01	0.01	-0.00	0.00	-0.01	0.88	0.01
Cy	**-9.13423**	0.0029			1.00	-0.02	0.02	0.01	-0.01	0.01	0.01	0.76
B1	**-0.0767146**	0.00088				1.00	0.00	0.02	-0.04	0.04	0.00	0.04
B2	**-0.0308308**	0.00087					1.00	0.00	-0.00	0.00	-0.03	0.00
K1	**-0.0946659**	2.4e-05						1.00	-0.97	0.93	0.00	-0.01
K2	**0.147329**	0.00018							1.00	-0.99	-0.01	0.01
K3	**-0.0306275**	0.00041								1.00	0.01	-0.00
P1	**-3.86176e-05**	7.8e-07									1.00	0.01
P2	**-9.34185e-05**	6.3e-07										1.00

Table 13. Calibration coefficients and correlation matrix.

Camera Calibration

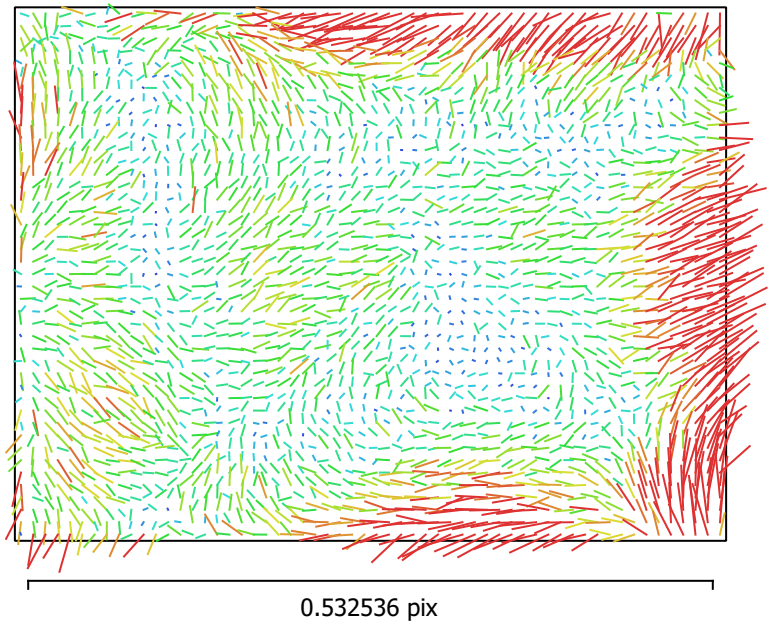


Fig. 14. Image residuals for RedEdge-M, Green-531 (5.5mm).

RedEdge-M, Green-531 (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1449.06**	0.0097	1.00	-0.04	-0.10	0.03	-0.03	-0.18	0.15	-0.12	0.01	0.03
Cx	**11.9758**	0.0036		1.00	0.02	0.01	0.03	0.00	0.00	-0.00	0.88	0.01
Cy	**-6.86112**	0.0029			1.00	-0.03	0.02	0.01	-0.01	0.01	0.01	0.75
B1	**0.049089**	0.00088				1.00	0.00	0.02	-0.04	0.04	0.00	0.03
B2	**0.0206074**	0.00087					1.00	0.00	-0.00	0.00	-0.02	0.00
K1	**-0.101078**	2.4e-05						1.00	-0.97	0.93	0.01	-0.01
K2	**0.152915**	0.00018							1.00	-0.99	-0.01	0.00
K3	**-0.039222**	0.0004								1.00	0.01	-0.00
P1	**-0.000135137**	7.7e-07									1.00	0.01
P2	**0.00052497**	6.2e-07										1.00

Table 14. Calibration coefficients and correlation matrix.

Camera Calibration

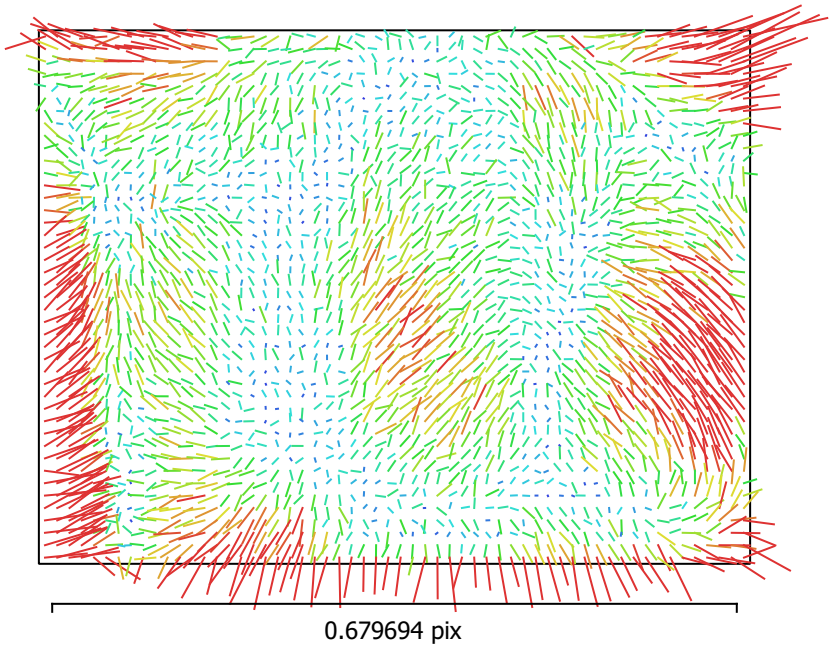


Fig. 15. Image residuals for RedEdge-M, Green (5.5mm).

RedEdge-M, Green (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1451.08**	0.0097	1.00	-0.06	-0.08	0.03	-0.03	-0.18	0.15	-0.12	0.01	0.02
Cx	**21.1048**	0.0037		1.00	0.02	0.01	0.02	0.00	0.00	-0.01	0.88	0.01
Cy	**-11.3398**	0.0029			1.00	-0.02	0.02	0.01	-0.01	0.01	0.01	0.75
B1	**-0.133773**	0.00088				1.00	0.00	0.01	-0.03	0.04	0.00	0.04
B2	**0.0236984**	0.00087					1.00	0.00	-0.00	0.00	-0.03	0.01
K1	**-0.101316**	2.4e-05						1.00	-0.97	0.93	0.01	-0.01
K2	**0.145795**	0.00018							1.00	-0.99	-0.01	0.00
K3	**-0.0251285**	0.00039								1.00	0.01	-0.00
P1	**-0.000315496**	7.7e-07									1.00	0.01
P2	**0.000221314**	6.2e-07										1.00

Table 15. Calibration coefficients and correlation matrix.

Camera Calibration

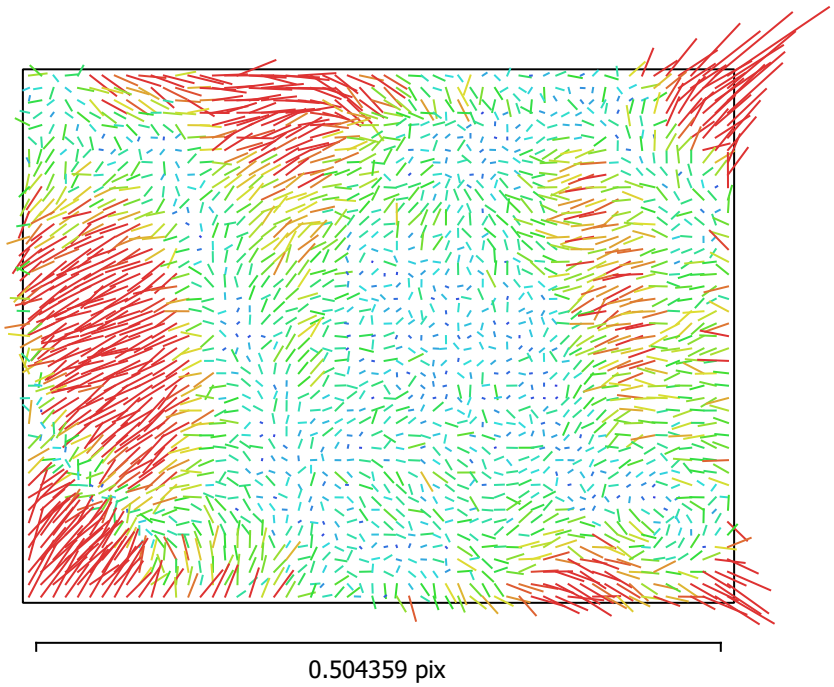


Fig. 16. Image residuals for RedEdge-M, Red-650 (5.5mm).

RedEdge-M, Red-650 (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1460.85**	0.0098	1.00	-0.05	-0.11	0.04	-0.03	-0.18	0.14	-0.11	0.00	0.03
Cx	**14.7865**	0.0037		1.00	0.03	-0.00	0.02	0.00	0.00	-0.01	0.88	0.02
Cy	**-5.88104**	0.0029			1.00	-0.03	0.02	0.01	-0.01	0.01	0.02	0.75
B1	**0.0778848**	0.00088				1.00	0.00	0.02	-0.04	0.04	-0.01	0.03
B2	**0.0408374**	0.00087					1.00	0.00	-0.00	0.00	-0.02	-0.00
K1	**-0.0987076**	2.4e-05						1.00	-0.97	0.93	0.01	-0.00
K2	**0.13259**	0.00018							1.00	-0.99	-0.01	0.00
K3	**-0.00444441**	0.00041								1.00	0.01	-0.00
P1	**-0.00039404**	7.6e-07									1.00	0.02
P2	**0.000121425**	6.2e-07										1.00

Table 16. Calibration coefficients and correlation matrix.

Camera Calibration

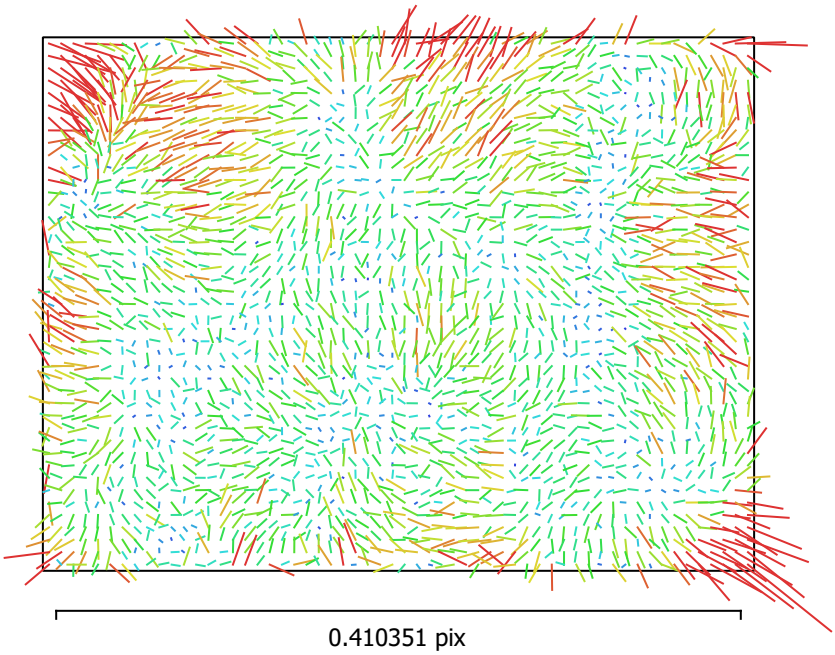


Fig. 17. Image residuals for RedEdge-M, Red (5.5mm).

RedEdge-M, Red (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1461.34**	0.0098	1.00	-0.05	-0.08	0.03	-0.02	-0.18	0.14	-0.11	0.01	0.02
Cx	**15.4139**	0.0036		1.00	0.01	0.01	0.03	0.00	0.00	-0.01	0.87	0.00
Cy	**7.5347**	0.0028			1.00	-0.04	0.02	-0.00	0.01	-0.01	0.00	0.75
B1	**0.0990688**	0.00088				1.00	0.00	0.01	-0.03	0.04	-0.00	0.01
B2	**0.0598935**	0.00087					1.00	-0.00	0.00	-0.00	-0.01	0.00
K1	**-0.103639**	2.4e-05						1.00	-0.97	0.93	0.01	-0.00
K2	**0.145115**	0.00018							1.00	-0.99	-0.01	-0.00
K3	**-0.0253164**	0.0004								1.00	0.01	0.00
P1	**1.88254e-05**	7.5e-07									1.00	0.00
P2	**-0.00034423**	6e-07										1.00

Table 17. Calibration coefficients and correlation matrix.

Camera Calibration

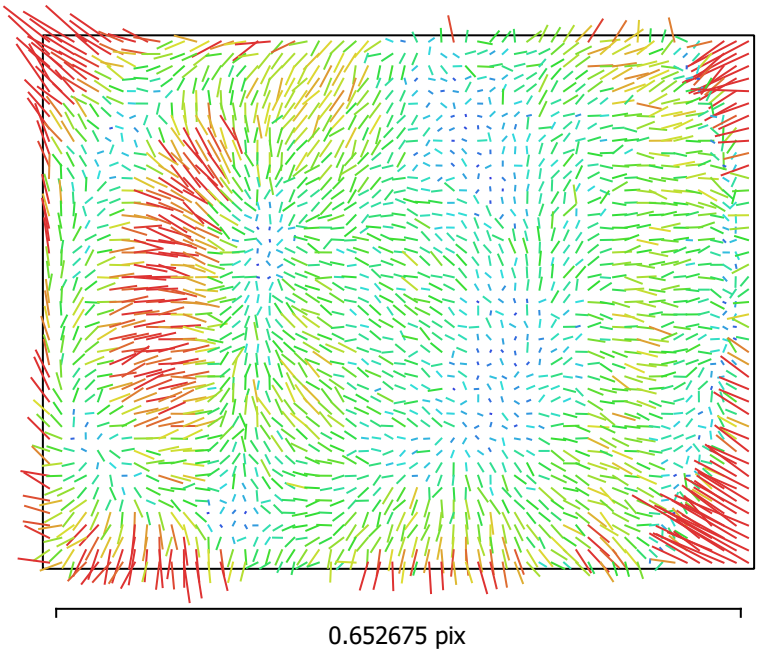


Fig. 18. Image residuals for RedEdge-M, Red edge-705 (5.5mm).

RedEdge-M, Red edge-705 (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1449.56**	0.0097	1.00	-0.04	-0.18	0.04	-0.03	-0.18	0.15	-0.12	0.01	0.03
Cx	**15.2856**	0.0036		1.00	0.04	0.02	0.01	0.00	0.00	-0.00	0.87	0.03
Cy	**-8.50975**	0.0029			1.00	-0.03	0.03	0.01	-0.01	0.01	0.02	0.74
B1	**-0.0695044**	0.00088				1.00	0.00	0.01	-0.03	0.04	0.01	0.04
B2	**0.179726**	0.00087					1.00	0.00	-0.00	0.00	-0.04	0.01
K1	**-0.102102**	2.3e-05						1.00	-0.97	0.93	0.01	-0.01
K2	**0.149158**	0.00017							1.00	-0.99	-0.01	0.01
K3	**-0.0448516**	0.00038								1.00	0.01	-0.01
P1	**0.00016863**	7.5e-07									1.00	0.02
P2	**-0.000624968**	6e-07										1.00

Table 18. Calibration coefficients and correlation matrix.

Camera Calibration

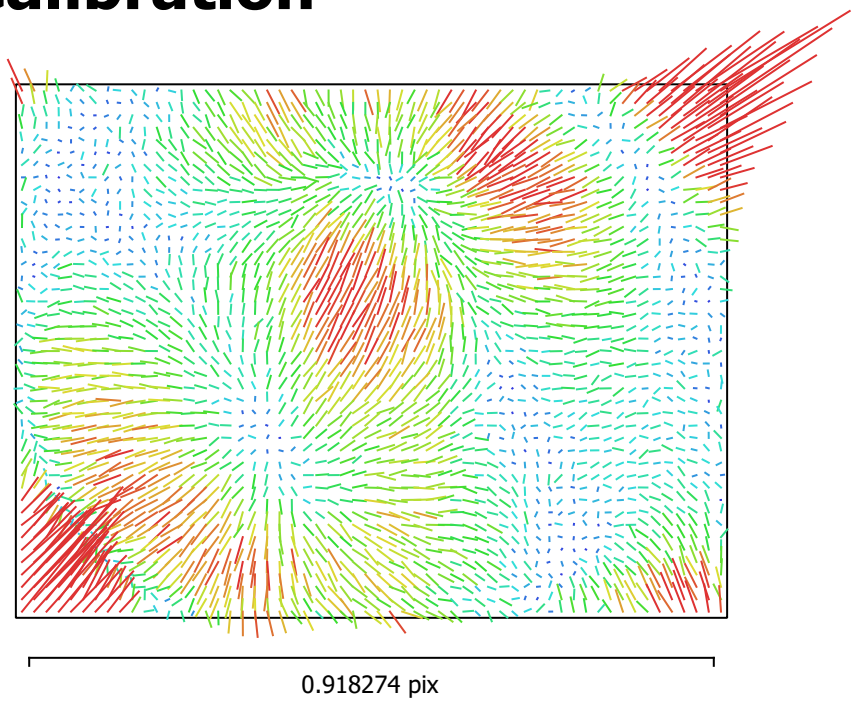


Fig. 19. Image residuals for RedEdge-M, Red edge (5.5mm).

RedEdge-M, Red edge (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1457.11**	0.0097	1.00	-0.02	-0.13	0.04	-0.03	-0.19	0.15	-0.12	0.00	0.04
Cx	**-17.5826**	0.0037		1.00	0.01	-0.03	0.02	0.01	-0.00	0.01	0.87	0.00
Cy	**-18.5286**	0.0029			1.00	-0.04	-0.00	0.02	-0.02	0.02	0.00	0.74
B1	**-0.0271001**	0.00088				1.00	-0.00	0.01	-0.03	0.04	-0.04	0.04
B2	**-0.0668884**	0.00087					1.00	-0.00	0.00	-0.01	-0.02	-0.04
K1	**-0.104621**	2.4e-05						1.00	-0.97	0.93	0.00	-0.01
K2	**0.146319**	0.00018							1.00	-0.99	0.00	0.01
K3	**-0.0328463**	0.00039								1.00	-0.01	-0.01
P1	**-0.000357706**	7.6e-07									1.00	0.00
P2	**0.00085492**	6.1e-07										1.00

Table 19. Calibration coefficients and correlation matrix.

Camera Calibration

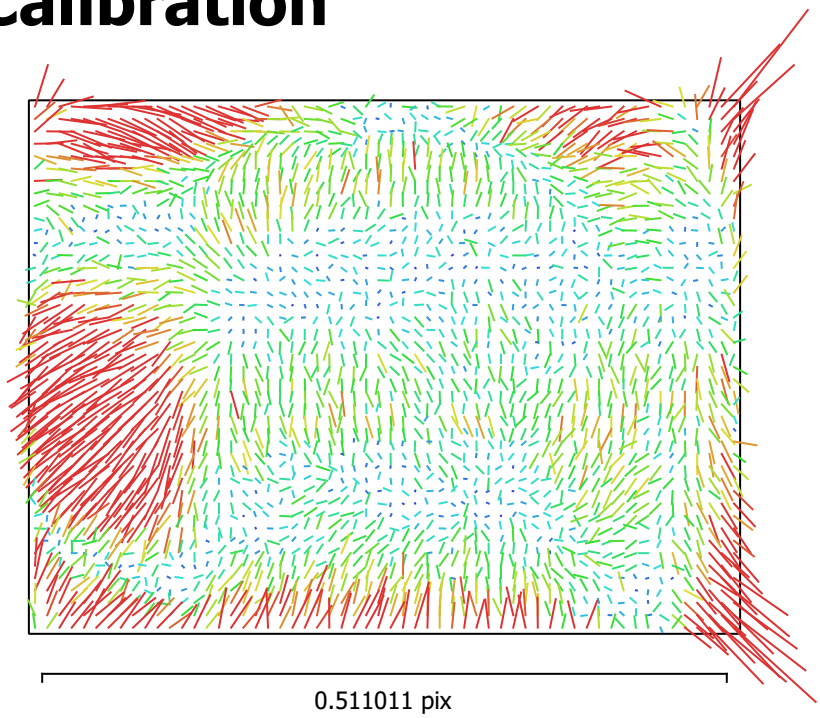


Fig. 20. Image residuals for RedEdge-M, Red edge-740 (5.5mm).

RedEdge-M, Red edge-740 (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	**1460.61**	0.0097	1.00	-0.02	-0.10	0.04	-0.02	-0.18	0.14	-0.11	0.00	0.03
Cx	**13.1255**	0.0037		1.00	0.03	0.01	0.05	-0.00	0.00	-0.01	0.87	0.02
Cy	**14.8434**	0.0029			1.00	-0.05	0.02	-0.01	0.01	-0.02	0.02	0.74
B1	**0.284596**	0.00088				1.00	0.00	0.02	-0.04	0.04	0.00	-0.01
B2	**0.0597181**	0.00087					1.00	-0.00	0.00	-0.01	0.01	0.00
K1	**-0.10596**	2.4e-05						1.00	-0.97	0.93	0.01	0.00
K2	**0.145535**	0.00018							1.00	-0.99	-0.01	-0.00
K3	**-0.0178659**	0.0004								1.00	0.01	0.01
P1	**-0.00021991**	7.5e-07									1.00	0.02
P2	**0.000414447**	6.1e-07										1.00

Table 20. Calibration coefficients and correlation matrix.

Camera Calibration

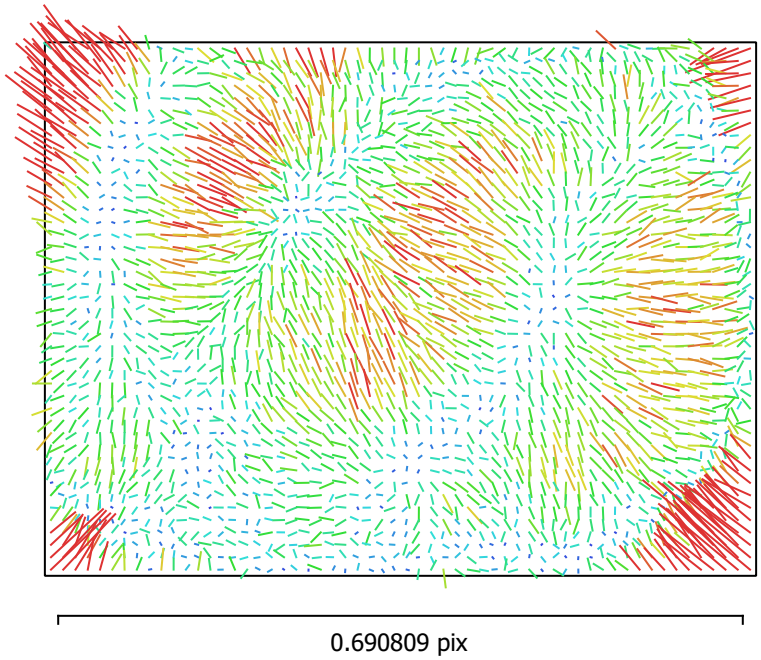


Fig. 21. Image residuals for RedEdge-M, NIR (5.5mm).

RedEdge-M, NIR (5.5mm)

7957 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**1280 x 960**	**5.5 mm**	**3.75 x 3.75 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**1462.44**	0.0099	1.00	-0.04	-0.09	0.03	-0.03	-0.21	0.18	-0.16	0.14	0.01	0.03
Cx	**22.32**	0.0036		1.00	0.02	0.03	0.05	0.01	-0.01	0.01	-0.01	0.87	0.01
Cy	**8.26019**	0.0028			1.00	-0.05	0.03	0.00	-0.00	0.00	-0.01	0.01	0.74
B1	**0.163264**	0.00088				1.00	0.00	0.03	-0.03	0.03	-0.03	0.02	-0.00
B2	**0.0872283**	0.00087					1.00	0.00	-0.00	0.01	-0.01	0.01	0.01
K1	**-0.103276**	4.9e-05						1.00	-0.98	0.93	-0.89	0.01	-0.01
K2	**0.132382**	0.00061							1.00	-0.99	0.96	-0.01	0.01
K3	**0.0595752**	0.003								1.00	-0.99	0.01	-0.01
K4	**-0.199562**	0.0049									1.00	-0.01	0.01
P1	**-3.57186e-05**	7.3e-07										1.00	0.01
P2	**0.000596526**	5.9e-07											1.00

Table 21. Calibration coefficients and correlation matrix.

Camera Locations

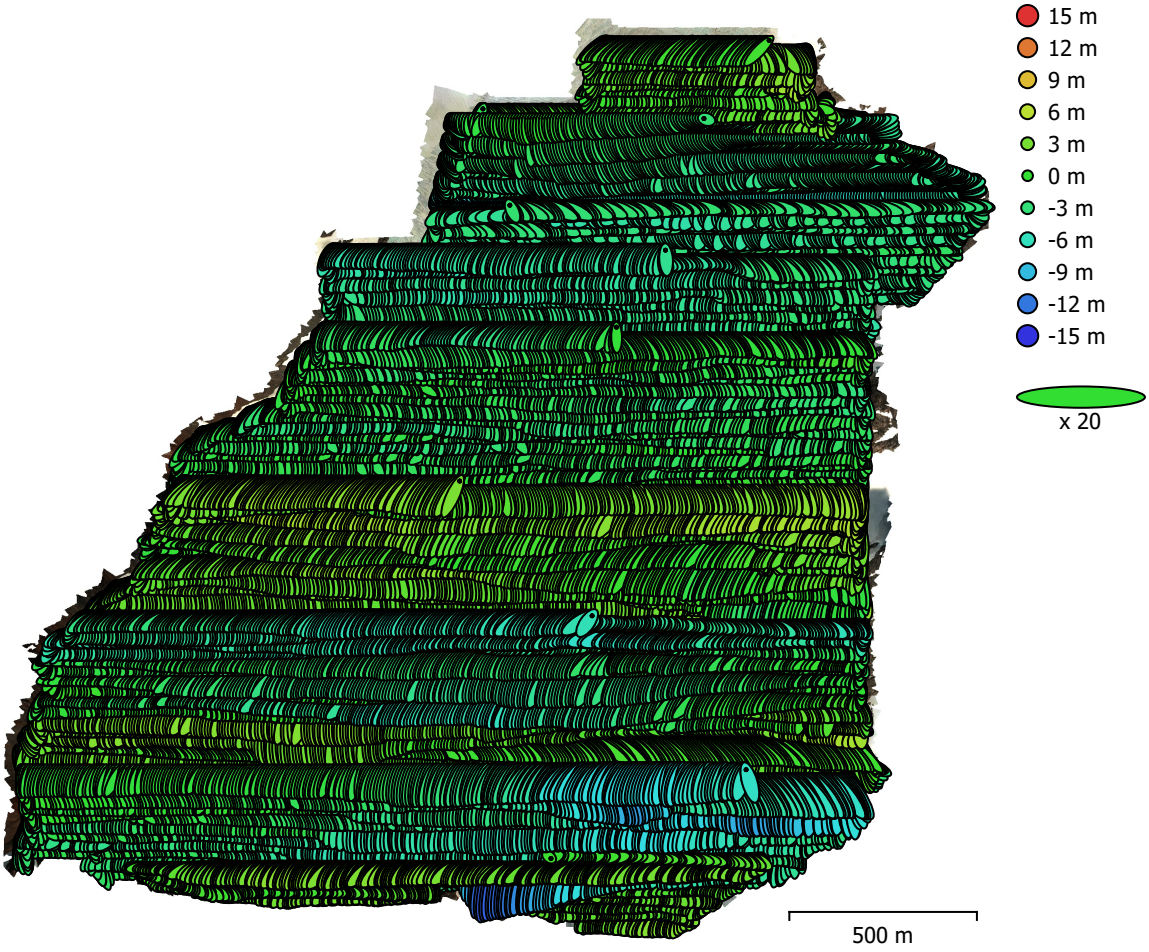


Fig. 22. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
1.75142	2.39743	3.07328	2.96904	4.2732

Table 22. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

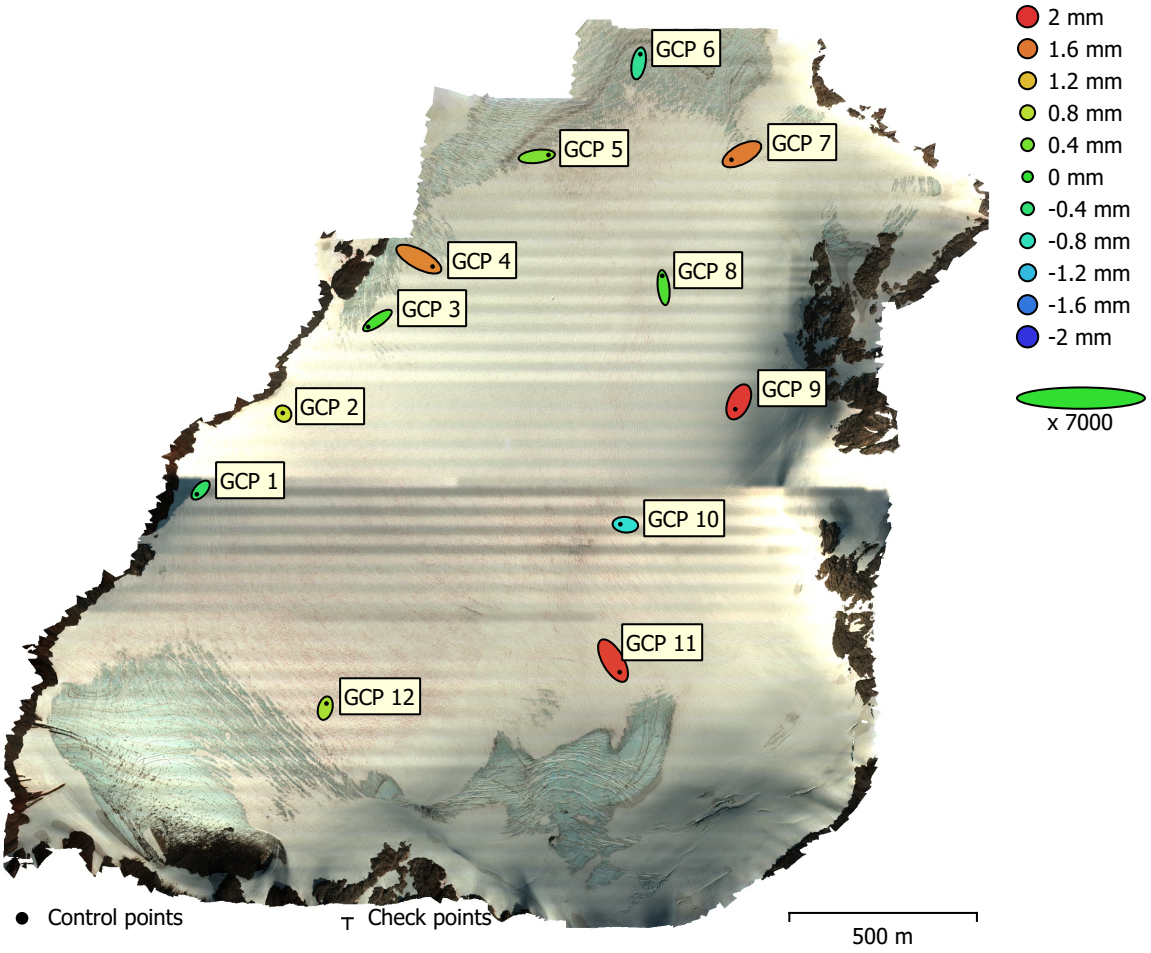


Fig. 23. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (mm)	Y error (mm)	Z error (mm)	XY error (mm)	Total (mm)
12	5.48777	5.28286	1.11988	7.61736	7.69924

Table 23. Control points RMSE.
X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (mm)	Y error (mm)	Z error (mm)	Total (mm)	Image (pix)
GCP 1	-2.88404	-3.12735	-0.29503	4.26439	0.227 (11)
GCP 2	-0.432238	0.515601	0.88879	1.11473	0.262 (20)
GCP 3	-7.05974	-4.88949	0.134929	8.58867	0.267 (19)
GCP 4	10.5111	-5.62534	1.51875	12.0181	0.279 (27)
GCP 5	8.87129	1.10144	0.439606	8.95021	0.410 (13)
GCP 6	1.28103	6.98712	-0.564923	7.12601	0.384 (13)
GCP 7	-7.93791	-4.22428	1.57612	9.12903	0.341 (19)
GCP 8	-1.01529	8.93951	0.172338	8.99863	0.211 (33)
GCP 9	-2.63021	-5.60227	1.96182	6.49247	0.540 (13)
GCP 10	-3.79701	0.376064	-0.916923	3.92421	0.273 (13)
GCP 11	5.09329	-8.79307	1.91798	10.3411	0.487 (14)
GCP 12	0.949042	3.55931	0.673268	3.74468	0.181 (18)
Total	**5.48777**	**5.28286**	**1.11988**	**7.69924**	**0.320**

Table 24. Control points.

X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

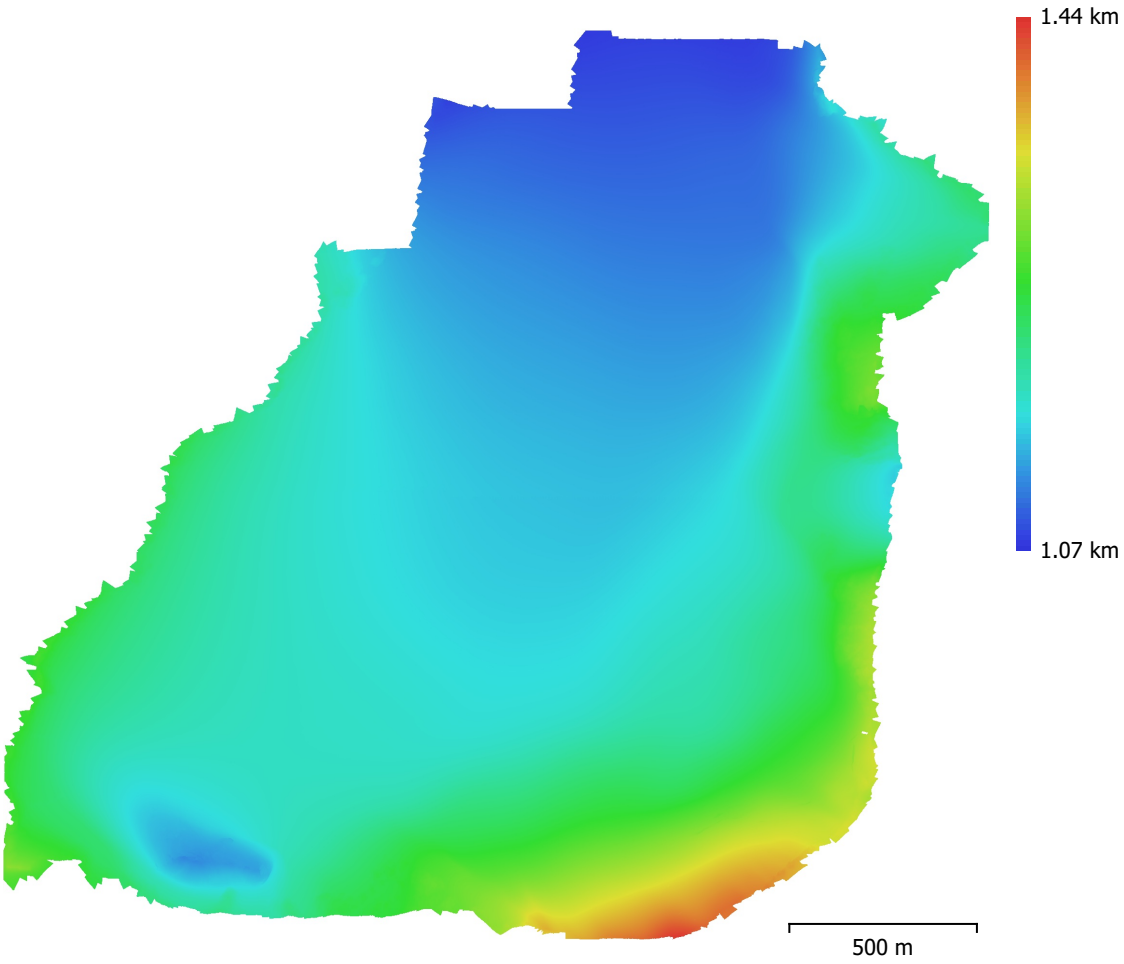


Fig. 24. Reconstructed digital elevation model.

Resolution:	9.86 cm/pix
Point density:	103 points/m²

Processing Parameters

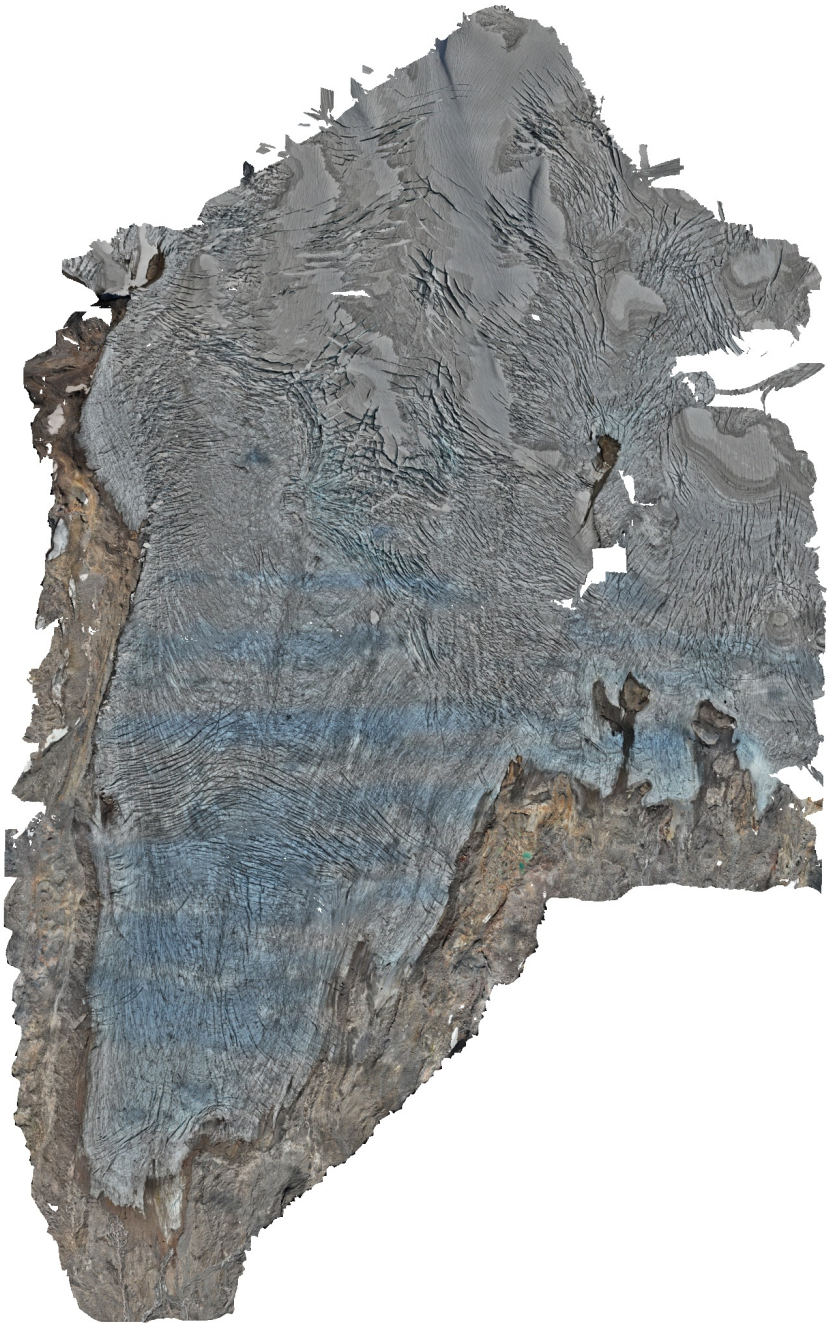
General	
Cameras	228120
Aligned cameras	227770
Markers	12
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	11,110,118 of 18,957,394
RMS reprojection error	0.110726 (0.383767 pix)
Max reprojection error	0.460829 (22.2975 pix)
Mean key point size	2.76141 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	48.8596
File size	14.11 GB
Depth Maps	
Count	22777
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Software version	2.1.0.17532
File size	9.99 GB
Point Cloud	
Points	460,770,534
Coordinate precision	2.46 cm
Point attributes	
Color	3 bands, uint8
Normal	
Confidence	1 - 53
Point classes	
Created (never classified)	460,770,534
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
File size	16.47 GB
DEM	
Size	26,430 x 24,532
Coordinate system	WGS 84 / UTM zone 8N (EPSG::32608)
File size	1.44 GB
Orthomosaic	
Size	52,956 x 49,155
Coordinate system	WGS 84 / UTM zone 8N (EPSG::32608)
Colors	10 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	4 hours 14 minutes

Memory usage	5.54 GB
Date created	2024:04:15 21:13:22
Software version	2.1.1.17821
File size	984.08 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768; B5 / 32768; B6 / 32768; B7 / …
System	
Software name	Agisoft Metashape Professional
Software version	2.1.1 build 17821
OS	Windows 64 bit
RAM	127.77 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	Intel(R) UHD Graphics 770
	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report M3M RGB Cameras, Easton Glacier, Mt. Baker, WA, 2023-09-08

Processing Report

30 March 2024



Survey Data

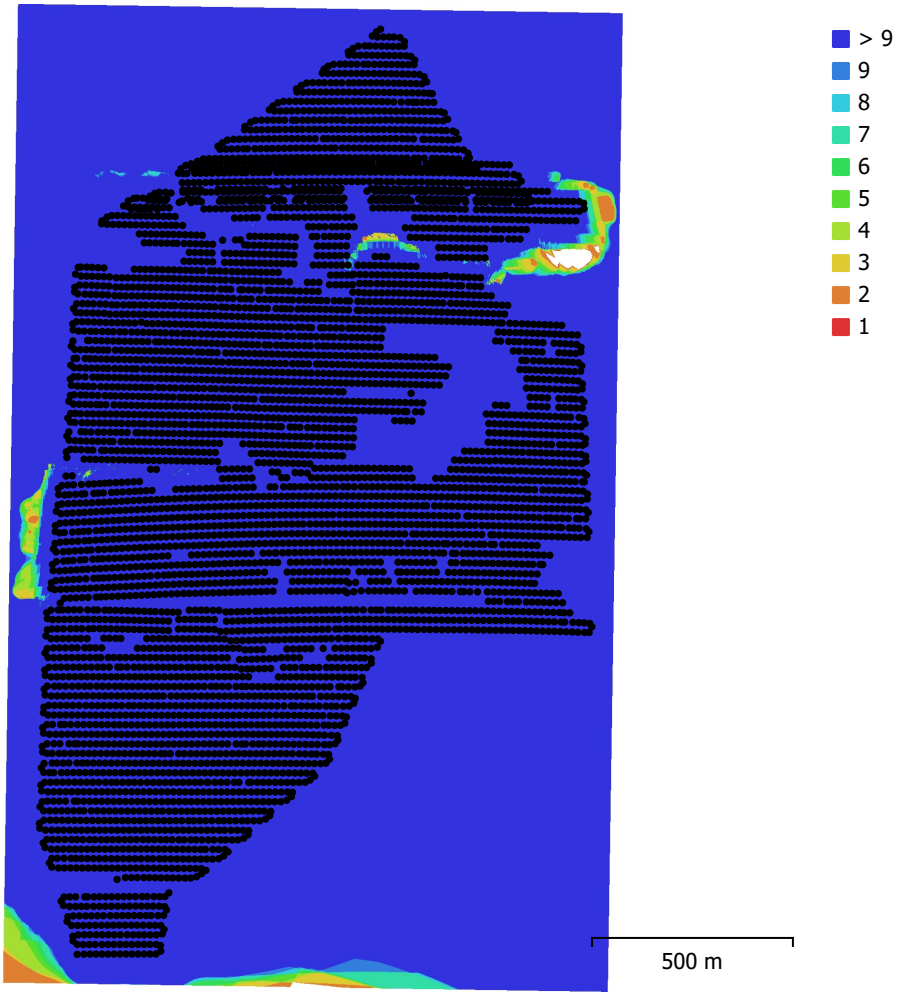


Fig. 1. Camera locations and image overlap.

Number of images:	6,180	Camera stations:	5,453
Flying altitude:	28.7 m	Tie points:	414,063
Ground resolution:	2.42 cm/pix	Projections:	5,674,424
Coverage area:	3.65 km²	Reprojection error:	1.63 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	No
M3M (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	Yes

Table 1. Cameras.

Camera Calibration

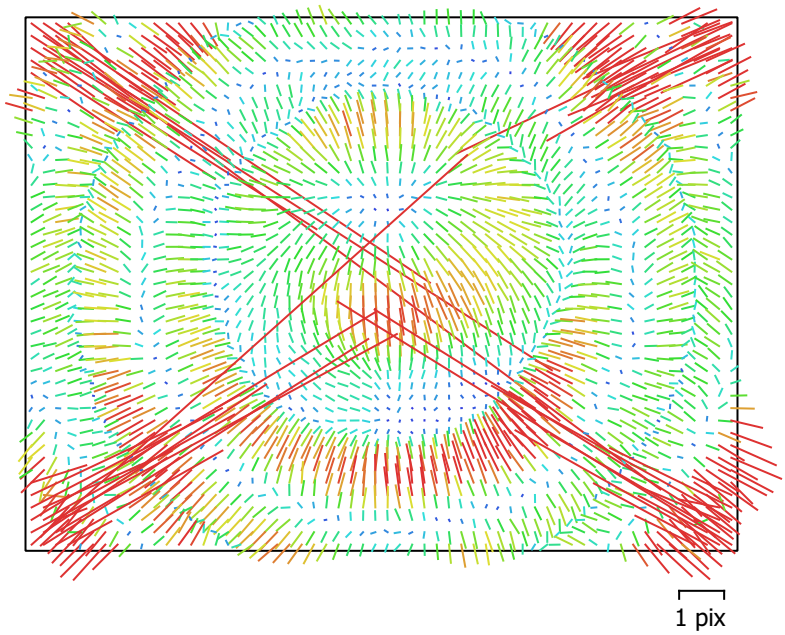


Fig. 2. Image residuals for M3M (12.29mm).

M3M (12.29mm)

6178 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**442.991**	1	1.00	0.03	-0.22	0.42	0.43	-0.99	-0.98	0.99	-1.00	0.20	-0.89
Cx	**27.1753**	0.0066		1.00	-0.01	0.04	-0.09	-0.03	-0.03	0.03	-0.03	-0.39	-0.04
Cy	**0.643281**	0.0069			1.00	0.01	-0.08	0.22	0.22	-0.22	0.22	-0.01	0.02
B1	**0.202817**	0.0011				1.00	0.20	-0.42	-0.41	0.42	-0.42	0.08	-0.38
B2	**0.196292**	0.001					1.00	-0.42	-0.42	0.42	-0.42	0.12	-0.38
K1	**-0.00115646**	5.3e-06						1.00	0.96	-0.98	0.98	-0.20	0.88
K2	**-2.0118e-05**	1.9e-07							1.00	-1.00	1.00	-0.20	0.87
K3	**4.7909e-07**	6.6e-09								1.00	-1.00	0.20	-0.88
K4	**-4.38967e-09**	8e-11									1.00	-0.20	0.88
P1	**1.14034e-05**	1.2e-07										1.00	-0.19
P2	**-9.61504e-05**	2.4e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

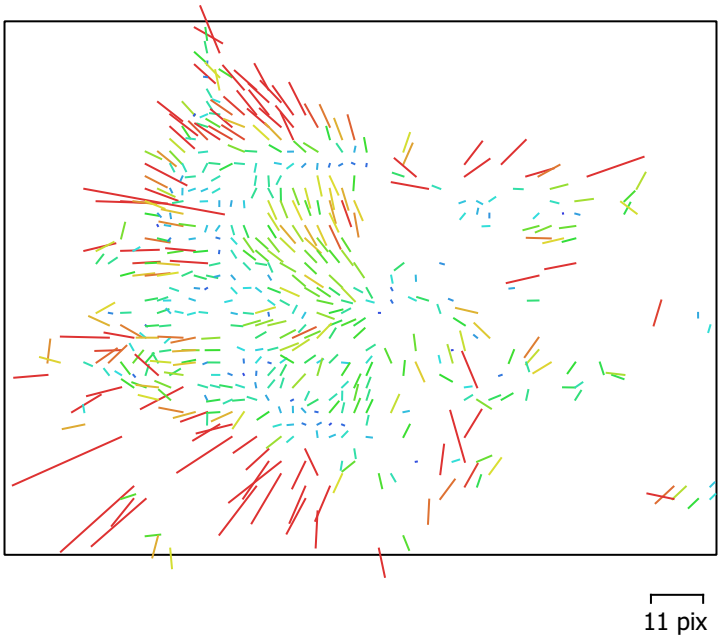


Fig. 3. Image residuals for M3M (12.29mm).

M3M (12.29mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**5280 x 3956**	**12.29 mm**	**3.36 x 3.36 µm**

	Value	Error	F	Cx	Cy	K1	P1	P2
K2	**0.0148744**							
K3	**-0.0270641**							
F	**2670.59**	6.3	1.00	0.94	-0.36	-0.89	-0.36	-0.20
Cx	**555.393**	3.3		1.00	-0.31	-0.78	-0.15	-0.08
Cy	**-19.6298**	1			1.00	0.35	0.29	0.63
K1	**-0.0373965**	0.00048				1.00	0.65	0.22
P1	**-0.00825094**	0.00011					1.00	0.32
P2	**-0.00210159**	7.8e-05						1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Locations

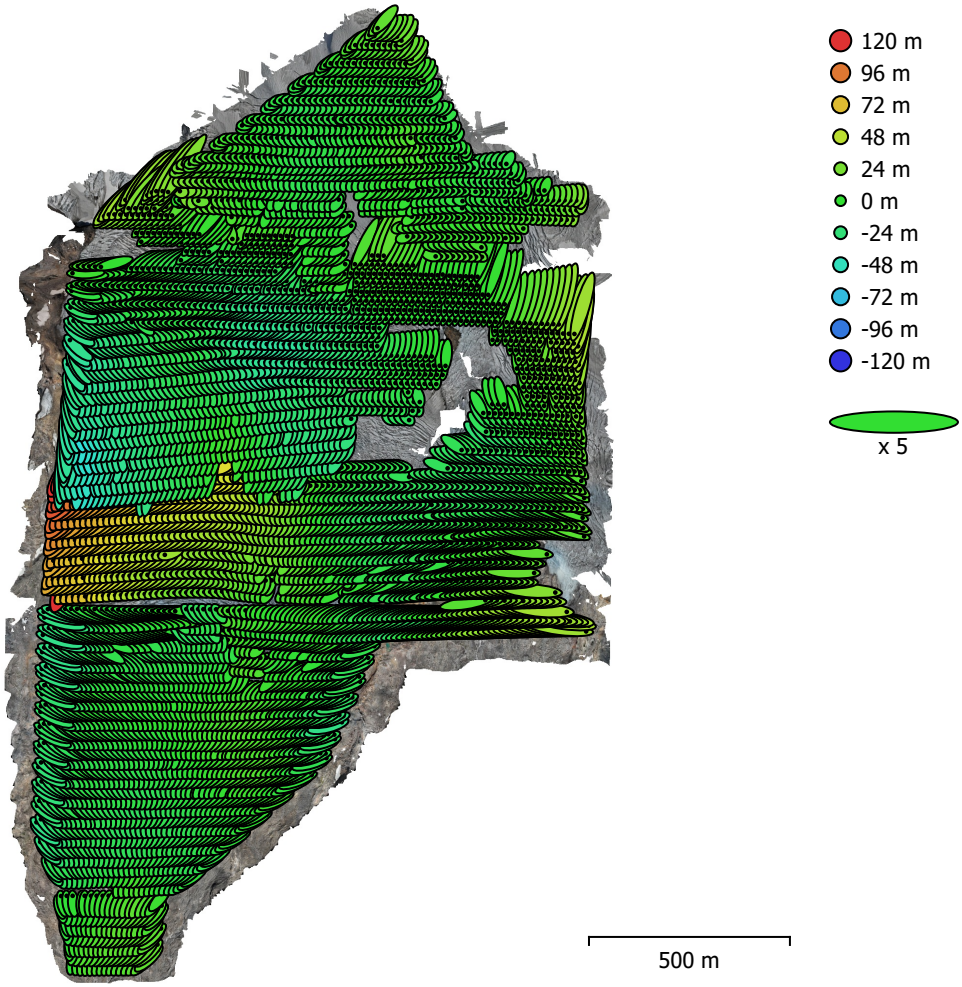


Fig. 4. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
8.07049	8.38507	22.0749	11.638	24.9548

Table 4. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

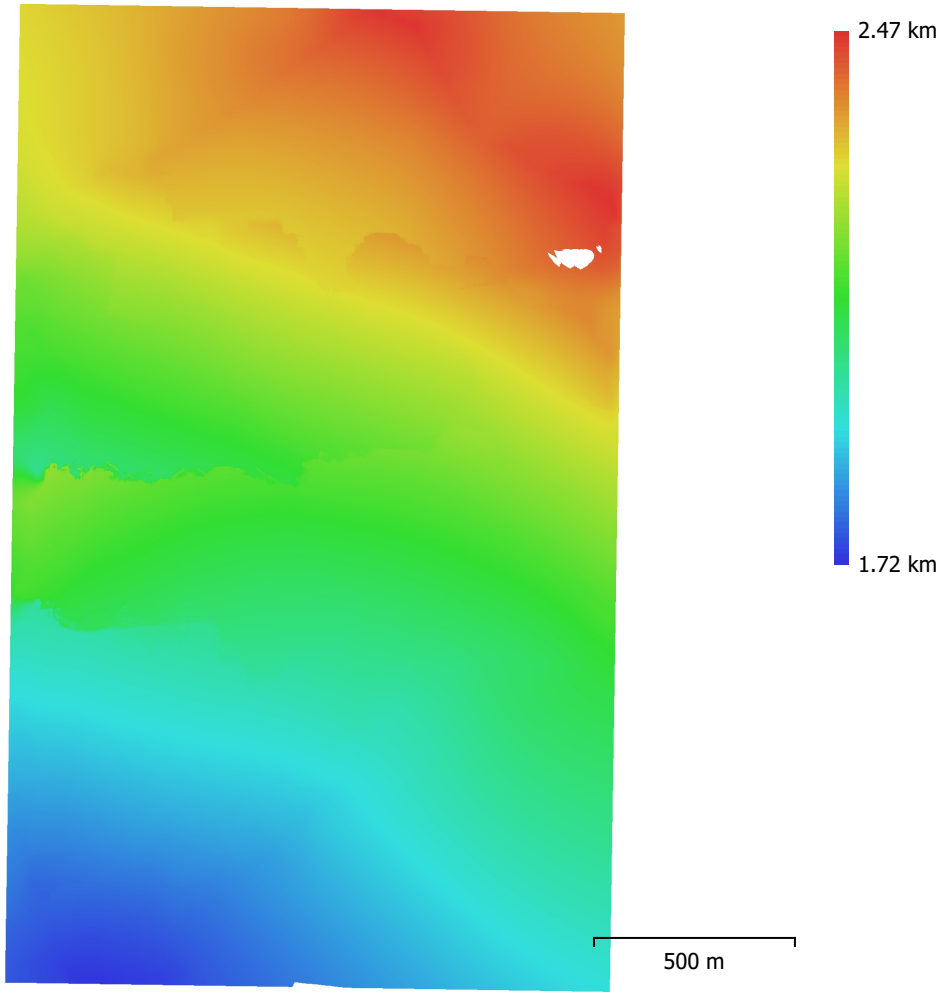


Fig. 5. Reconstructed digital elevation model.

Resolution:	4.85 cm/pix
Point density:	426 points/m²

Processing Parameters

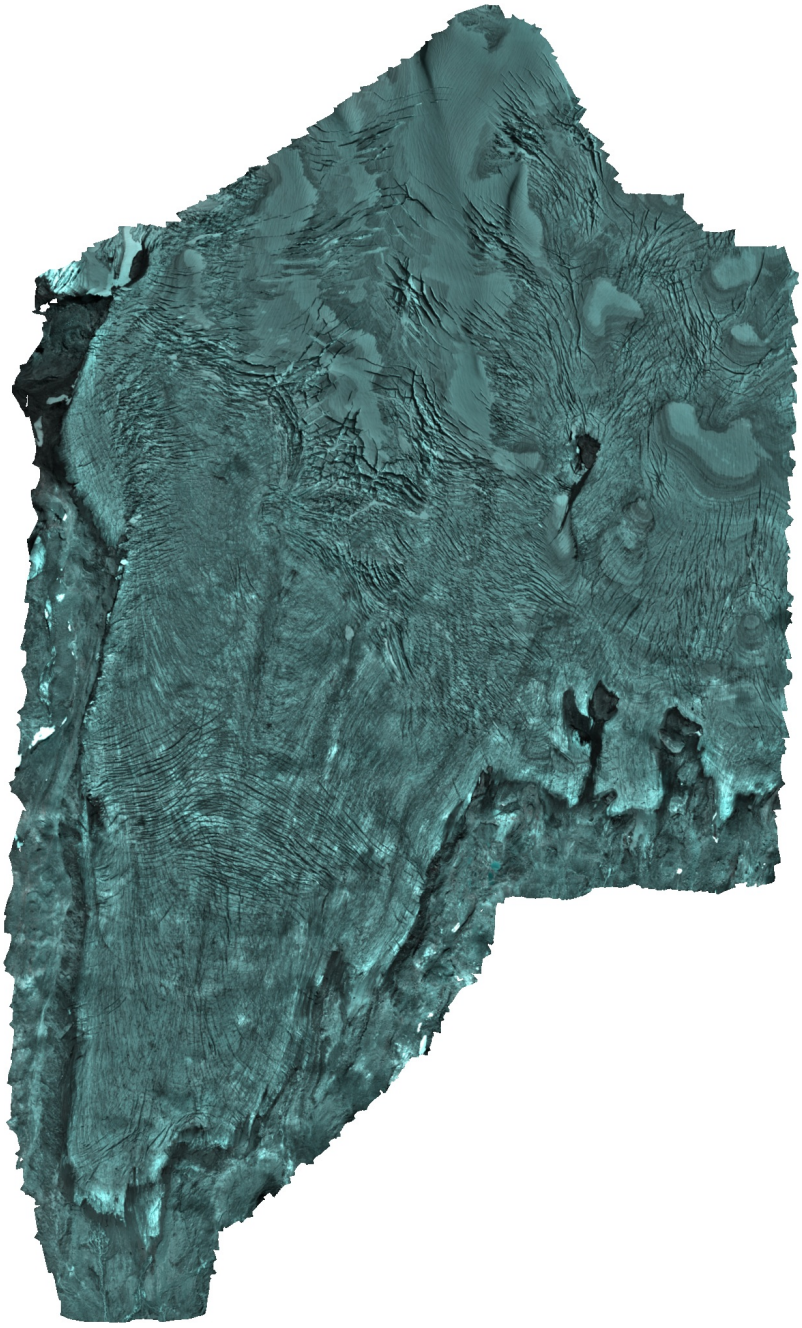
General	
Cameras	6180
Aligned cameras	5453
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	414,063 of 1,508,545
RMS reprojection error	0.554709 (1.63028 pix)
Max reprojection error	13.1537 (73.2302 pix)
Mean key point size	2.87787 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	21.9427
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	23 minutes 52 seconds
Matching memory usage	11.48 GB
Alignment time	56 minutes 55 seconds
Alignment memory usage	4.63 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	3 minutes 46 seconds
Date created	2024:03:22 01:49:53
Software version	2.1.0.17532
File size	519.69 MB
Depth Maps	
Count	5000
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 56 minutes
Memory usage	6.52 GB
Date created	2024:03:22 16:03:44
Software version	2.1.0.17532
File size	42.38 GB
Point Cloud	
Points	1,145,654,215
Point attributes	
Color	3 bands, uint8
Normal	

Confidence	1 - 62
Point classes	
Created (never classified)	1,145,654,215
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 hours 56 minutes
Memory usage	6.52 GB
Point cloud generation parameters	
Processing time	4 hours 15 minutes
Memory usage	20.66 GB
Date created	2024:03:22 20:19:09
Software version	2.1.0.17532
File size	16.54 GB
DEM	
Size	31,009 x 50,207
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	13 minutes 48 seconds
Memory usage	331.91 MB
Date created	2024:03:29 19:25:17
Software version	2.1.0.17532
File size	5.05 GB
Orthomosaic	
Size	62,017 x 100,413
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	2 hours 35 minutes
Memory usage	2.41 GB
Date created	2024:03:29 22:34:27
Software version	2.1.0.17532
File size	139.41 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17532
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti

Agisoft Metashape Report M3M Multispectral Cameras, Easton Glacier, Mt. Baker, WA, 2023-09-08

Processing Report

29 March 2024



Survey Data

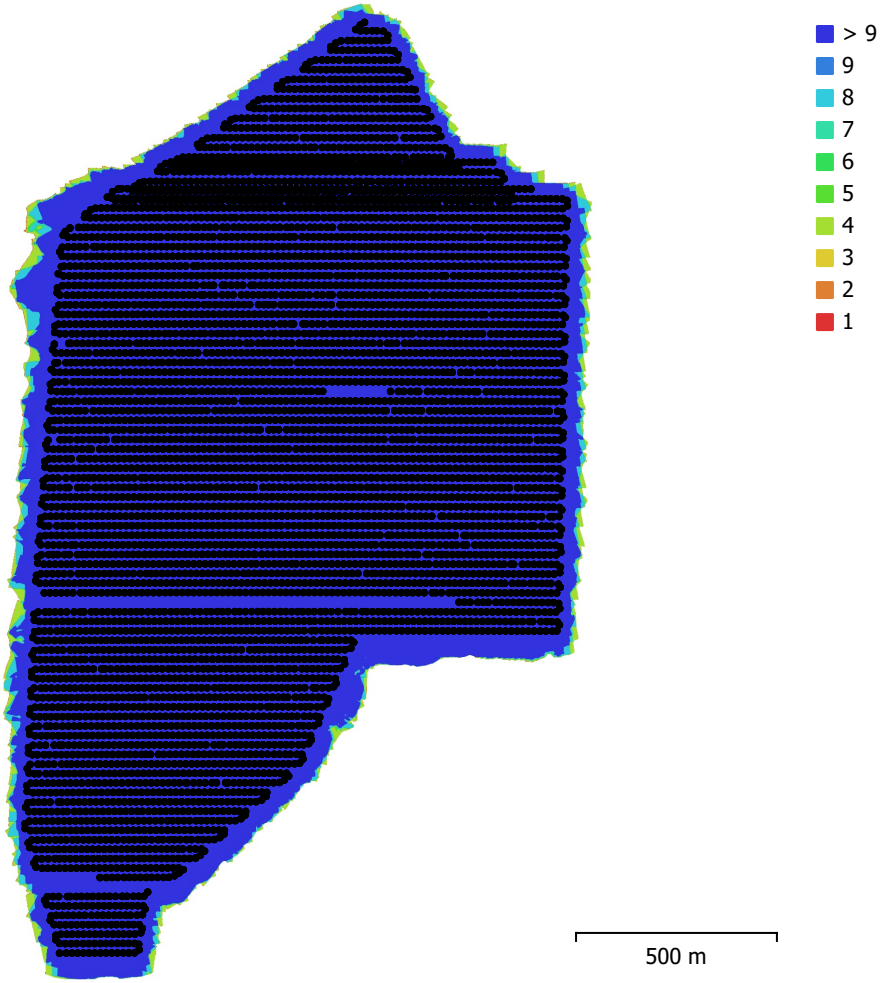


Fig. 1. Camera locations and image overlap.

Number of images:	24,720	Camera stations:	24,720
Flying altitude:	85.2 m	Tie points:	1,020,050
Ground resolution:	4.02 cm/pix	Projections:	63,828,477
Coverage area:	2.39 km²	Reprojection error:	0.352 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, Green (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3M, Red (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, RedEdge (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes
M3M, NIR (4.34mm)	2592 x 1944	4.34 mm	2 x 2 µm	Yes

Table 1. Cameras.

Camera Calibration

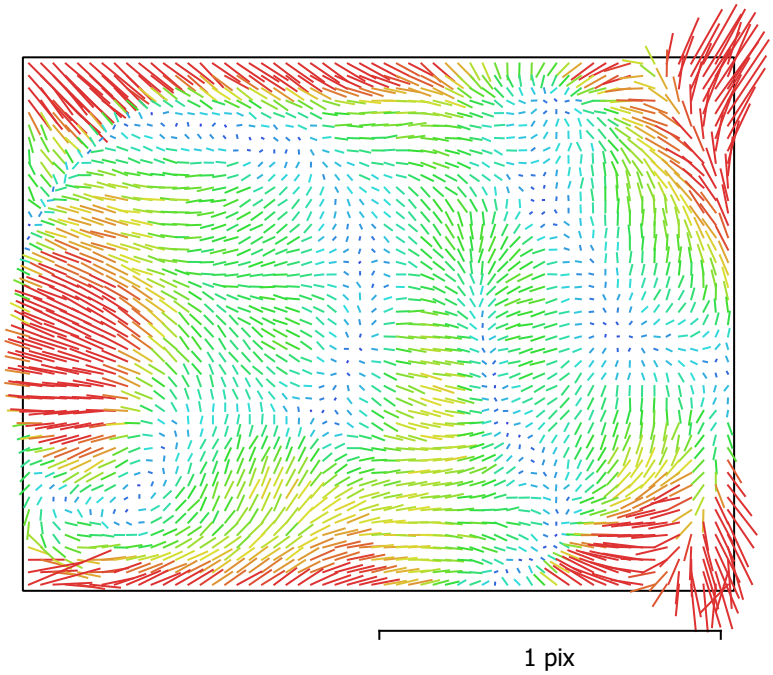


Fig. 2. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

6178 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2172.37**	0.079	1.00	0.51	0.29	-0.09	-0.03	0.04	-0.05	-0.01	-0.00	-0.03	-0.05
Cx	**12.1027**	0.002		1.00	0.13	-0.02	-0.02	0.03	-0.03	-0.00	-0.00	0.75	-0.06
Cy	**2.29717**	0.0015			1.00	-0.02	0.01	0.01	-0.02	-0.00	-0.00	-0.03	0.74
B1	**-4.75683**	0.0032				1.00	0.04	0.00	0.00	0.00	-0.00	0.00	0.00
B2	**-0.58401**	0.0022					1.00	-0.00	0.00	-0.00	0.00	0.00	0.01
K1	**0.0108928**	1.4e-05						1.00	-0.97	0.93	-0.88	0.00	-0.00
K2	**-0.0498089**	9.6e-05							1.00	-0.99	0.96	0.01	0.01
K3	**0.00723835**	0.00026								1.00	-0.99	-0.01	-0.00
K4	**-0.0183626**	0.00024									1.00	0.01	0.00
P1	**0.000177435**	2.9e-07										1.00	-0.03
P2	**-0.000199709**	2.3e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

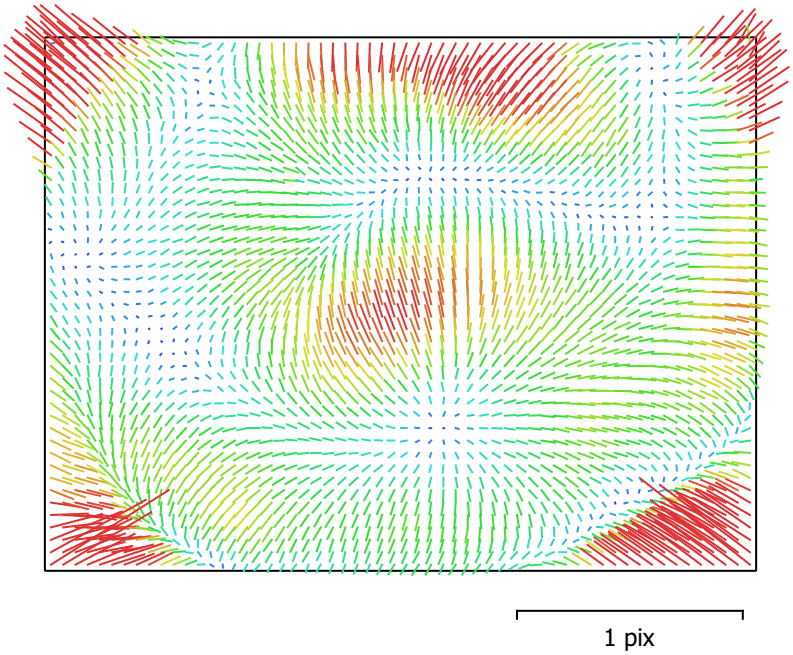


Fig. 3. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

6178 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2175.17**	0.079	1.00	0.13	0.17	-0.10	-0.03	0.07	-0.10	0.05	-0.08	-0.04	0.06
Cx	**7.25749**	0.0018		1.00	0.01	-0.00	-0.01	0.01	-0.01	0.01	-0.01	0.88	-0.02
Cy	**20.1986**	0.0014			1.00	-0.01	0.01	0.01	-0.02	0.01	-0.01	-0.03	0.78
B1	**-4.8913**	0.0032				1.00	0.03	-0.00	0.00	-0.00	0.00	0.00	-0.00
B2	**-0.260514**	0.0022					1.00	-0.00	0.00	-0.00	0.00	0.00	0.00
K1	**0.016219**	1.4e-05						1.00	-0.97	0.93	-0.89	0.00	-0.00
K2	**-0.0797064**	9.7e-05							1.00	-0.99	0.96	0.00	0.01
K3	**0.077688**	0.00026								1.00	-0.99	-0.00	-0.01
K4	**-0.0825442**	0.00025									1.00	0.01	0.01
P1	**-0.000192059**	2.8e-07										1.00	-0.02
P2	**0.00044954**	2.3e-07											1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration

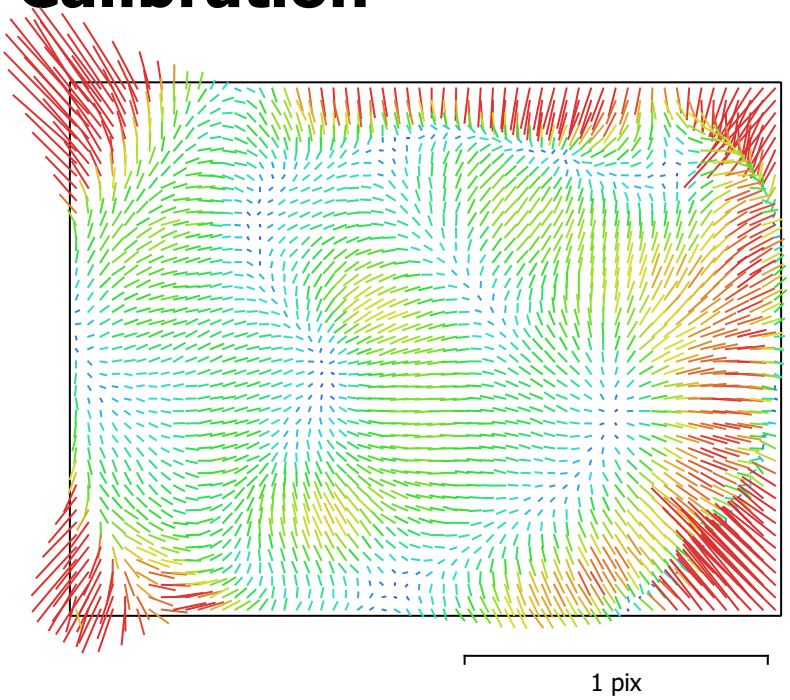


Fig. 4. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

6178 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2181.58**	0.079	1.00	-0.17	-0.23	-0.10	-0.02	0.07	-0.10	0.05	-0.08	0.15	0.09
Cx	**7.71273**	0.0018		1.00	0.02	0.01	-0.01	-0.01	0.02	-0.01	0.02	0.84	-0.05
Cy	**15.5731**	0.0014			1.00	0.03	0.01	-0.02	0.03	-0.02	0.02	-0.06	0.74
B1	**-5.12301**	0.0032				1.00	0.03	-0.00	0.00	-0.00	0.00	-0.01	-0.01
B2	**0.210707**	0.0022					1.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
K1	**0.0156425**	1.4e-05						1.00	-0.97	0.93	-0.89	0.02	-0.00
K2	**-0.0825788**	9.9e-05							1.00	-0.99	0.96	-0.02	-0.00
K3	**0.0831258**	0.00027								1.00	-0.99	0.01	-0.00
K4	**-0.0812162**	0.00025									1.00	-0.01	0.00
P1	**0.00110621**	2.9e-07										1.00	-0.01
P2	**0.000466295**	2.3e-07											1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration

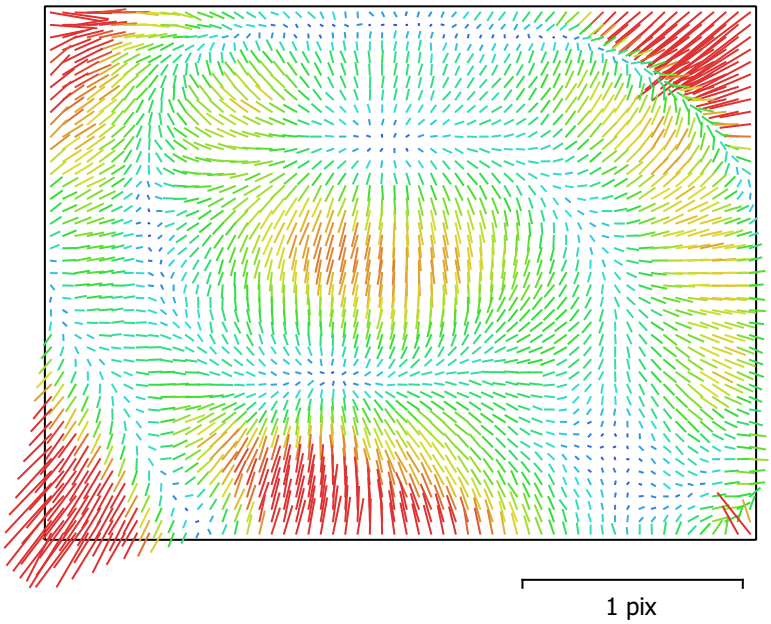


Fig. 5. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

6178 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	**2189.2**	0.079	1.00	-0.43	-0.11	-0.09	-0.02	0.07	-0.10	0.04	-0.06	0.13	0.12
Cx	**7.93533**	0.002		1.00	0.04	0.03	-0.01	-0.04	0.05	-0.03	0.04	0.75	-0.07
Cy	**-24.238**	0.0015			1.00	0.02	0.00	-0.01	0.01	-0.01	0.01	-0.02	0.76
B1	**-4.73404**	0.0032				1.00	0.02	-0.00	0.00	0.00	0.00	-0.01	-0.00
B2	**0.148589**	0.0022					1.00	-0.00	0.00	-0.00	0.00	-0.01	0.00
K1	**0.0161502**	1.5e-05						1.00	-0.97	0.93	-0.89	0.01	0.02
K2	**-0.079792**	0.0001							1.00	-0.99	0.96	-0.01	-0.03
K3	**0.0697614**	0.00028								1.00	-0.99	0.00	0.02
K4	**-0.0675904**	0.00027									1.00	-0.00	-0.03
P1	**0.000747046**	3e-07										1.00	0.00
P2	**0.000756263**	2.4e-07											1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

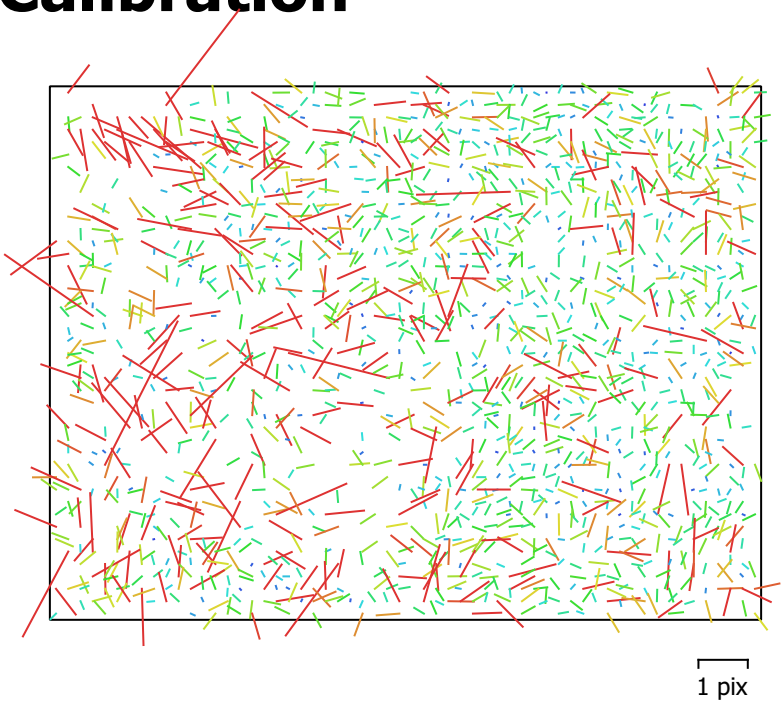


Fig. 6. Image residuals for M3M, Green (4.34mm).

M3M, Green (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2175.19**	0.18	1.00	0.32	-0.29	0.06	0.16	-0.31	0.25	-0.02	-0.09
Cx	**13.6863**	0.16		1.00	-0.27	-0.26	0.19	-0.06	0.02	0.80	-0.17
Cy	**1.93045**	0.13			1.00	-0.10	-0.20	0.04	-0.02	-0.15	0.74
B1	**-5.07174**	0.039				1.00	-0.03	0.02	-0.04	-0.05	0.10
B2	**-0.409489**	0.032					1.00	0.06	-0.03	-0.04	-0.06
K1	**0.0119673**	0.0002						1.00	-0.97	-0.06	0.08
K2	**-0.0527769**	0.00037							1.00	0.01	-0.06
P1	**0.000250119**	2.4e-05								1.00	-0.11
P2	**-0.000110072**	1.9e-05									1.00

Table 6. Calibration coefficients and correlation matrix.

Camera Calibration

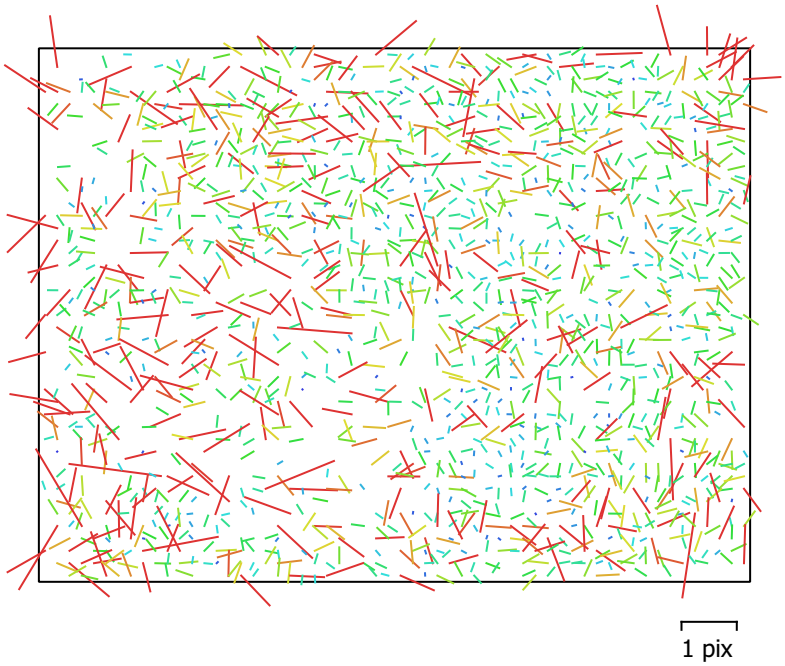


Fig. 7. Image residuals for M3M, Red (4.34mm).

M3M, Red (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	K1	K2	P1	P2
F	**2178.19**	0.18	1.00	0.31	-0.31	0.08	-0.33	0.26	-0.02	-0.06
Cx	**9.04422**	0.15		1.00	-0.27	-0.26	-0.07	0.02	0.81	-0.15
Cy	**19.9133**	0.13			1.00	-0.12	0.06	-0.02	-0.16	0.70
B1	**-5.15643**	0.039				1.00	0.02	-0.04	-0.06	0.08
K1	**0.0142389**	0.0002					1.00	-0.97	-0.05	0.07
K2	**-0.0573366**	0.00037						1.00	-0.01	-0.05
P1	**-0.000103887**	2.4e-05							1.00	-0.12
P2	**0.000515988**	1.9e-05								1.00

Table 7. Calibration coefficients and correlation matrix.

Camera Calibration

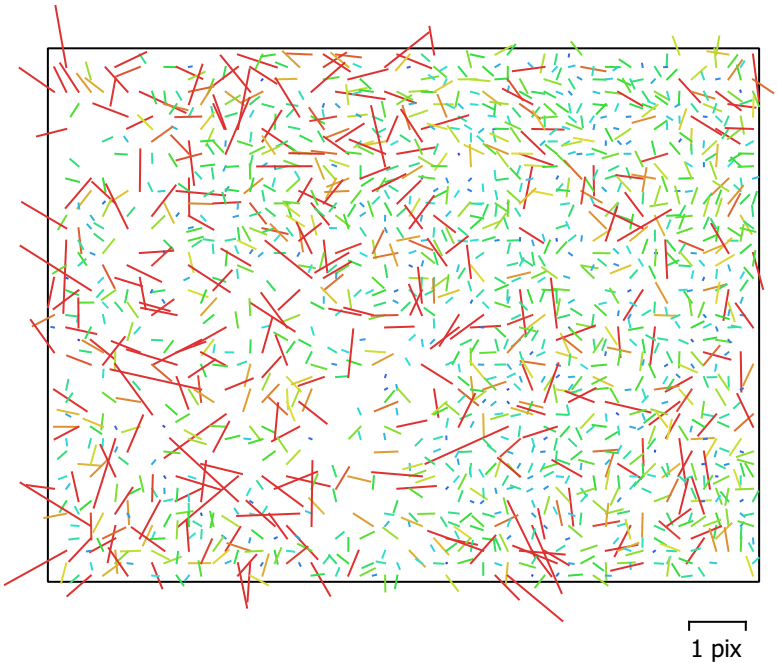


Fig. 8. Image residuals for M3M, RedEdge (4.34mm).

M3M, RedEdge (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2184.77**	0.18	1.00	0.30	-0.31	0.08	0.16	-0.31	0.25	-0.02	-0.09
Cx	**9.41317**	0.15		1.00	-0.26	-0.26	0.21	-0.03	-0.01	0.80	-0.16
Cy	**15.2055**	0.13			1.00	-0.12	-0.20	0.04	-0.01	-0.14	0.74
B1	**-5.28576**	0.039				1.00	-0.04	0.01	-0.03	-0.06	0.10
B2	**0.389623**	0.032					1.00	0.07	-0.05	-0.03	-0.07
K1	**0.0120746**	0.0002						1.00	-0.97	-0.04	0.08
K2	**-0.0541885**	0.00037							1.00	-0.02	-0.06
P1	**0.00117723**	2.4e-05								1.00	-0.11
P2	**0.000541975**	1.9e-05									1.00

Table 8. Calibration coefficients and correlation matrix.

Camera Calibration

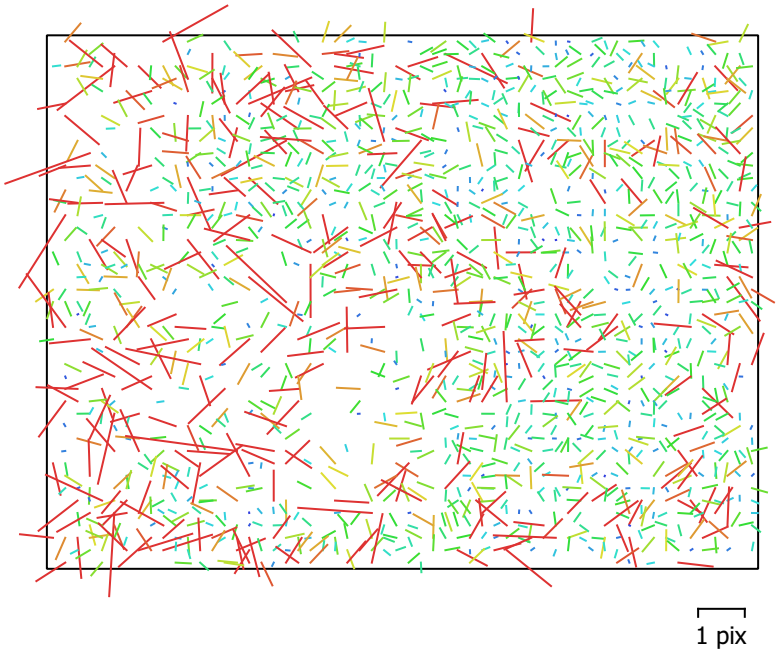


Fig. 9. Image residuals for M3M, NIR (4.34mm).

M3M, NIR (4.34mm)

2 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	**2592 x 1944**	**4.34 mm**	**2 x 2 µm**

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	P1	P2
F	**2192.17**	0.18	1.00	0.29	-0.30	0.09	0.15	-0.32	0.25	-0.01	-0.09
Cx	**10.8075**	0.16		1.00	-0.25	-0.23	0.18	-0.05	0.01	0.81	-0.16
Cy	**-24.7937**	0.13			1.00	-0.12	-0.20	0.05	-0.03	-0.15	0.74
B1	**-4.81423**	0.039				1.00	-0.04	0.01	-0.03	-0.04	0.10
B2	**0.379247**	0.032					1.00	0.08	-0.06	-0.06	-0.08
K1	**0.0136515**	0.00021						1.00	-0.97	-0.06	0.09
K2	**-0.0570292**	0.0004							1.00	0.01	-0.09
P1	**0.000977021**	2.5e-05								1.00	-0.11
P2	**0.000798462**	1.9e-05									1.00

Table 9. Calibration coefficients and correlation matrix.

Camera Locations

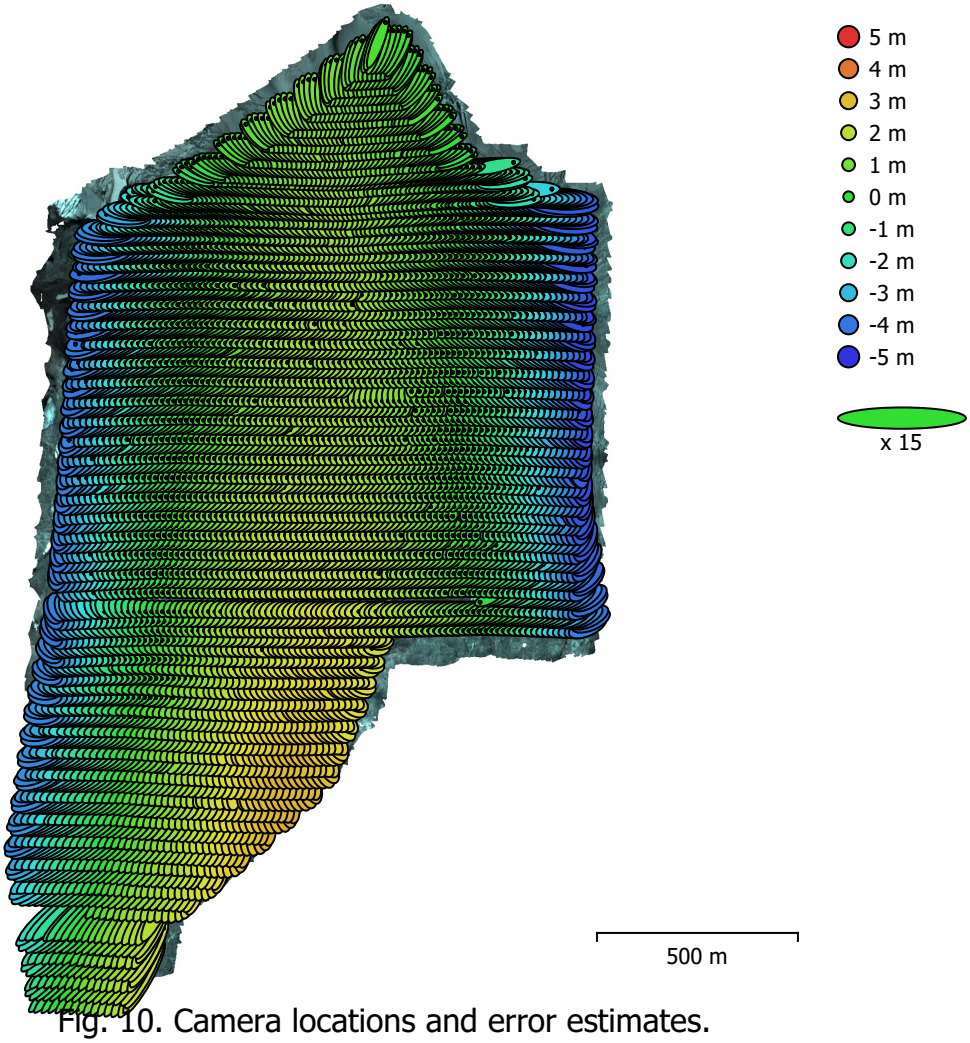


Fig. 10. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
2.67396	2.3575	1.82238	3.56481	4.00361

Table 10. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

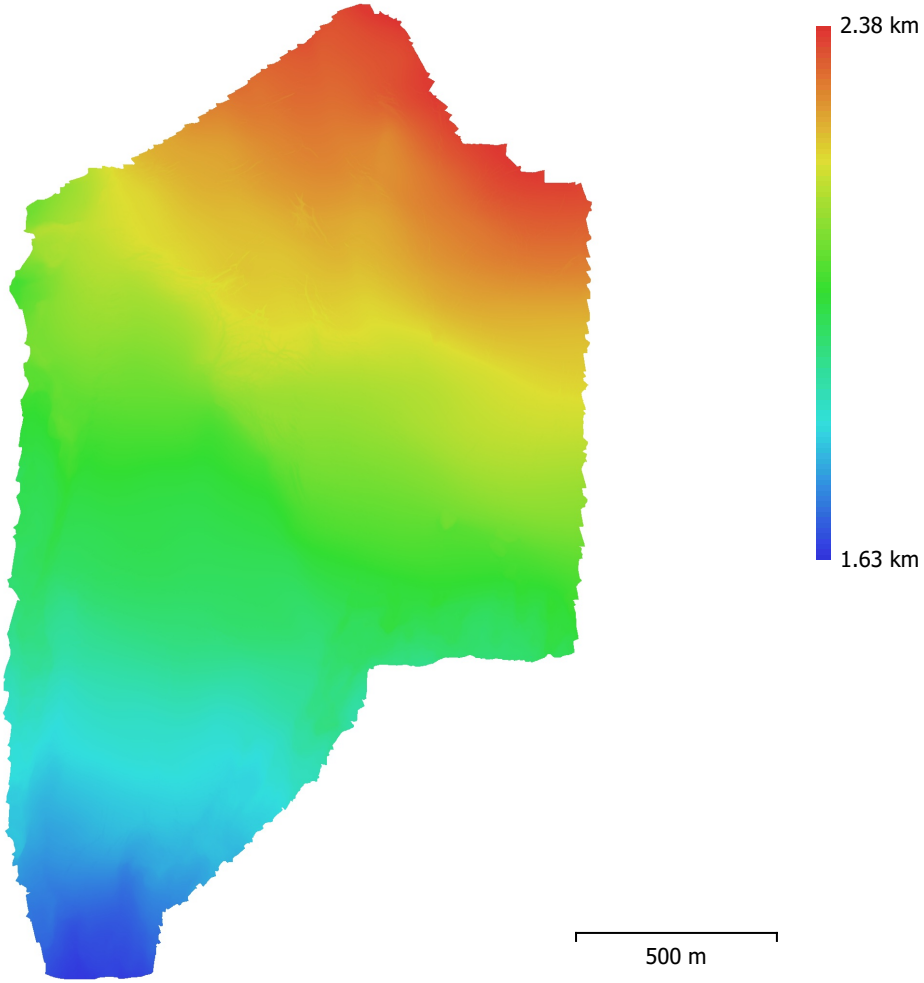


Fig. 11. Reconstructed digital elevation model.

Resolution:	8.04 cm/pix
Point density:	155 points/m²

Processing Parameters

General	
Cameras	24720
Aligned cameras	24720
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	1,020,050 of 2,656,503
RMS reprojection error	0.137141 (0.352499 pix)
Max reprojection error	0.499974 (9.94033 pix)
Mean key point size	2.52228 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	64.031
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	5 hours 45 minutes
Matching memory usage	58.58 GB
Alignment time	3 hours 49 minutes
Alignment memory usage	23.67 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	5 minutes 1 seconds
Date created	2024:03:27 02:34:10
Software version	2.1.0.17532
File size	2.57 GB
Depth Maps	
Count	6180
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 5 minutes
Memory usage	3.69 GB
Date created	2024:03:28 02:15:51
Software version	2.1.0.17532
File size	11.20 GB
Point Cloud	
Points	526,550,876
Point attributes	
Color	4 bands, uint16
Normal	

Confidence	1 - 51
Point classes	
Created (never classified)	526,550,876
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	1 hours 5 minutes
Memory usage	3.69 GB
Point cloud generation parameters	
Processing time	1 hours 52 minutes
Memory usage	17.39 GB
Date created	2024:03:28 04:08:46
Software version	2.1.0.17532
File size	10.79 GB
DEM	
Size	17,954 x 30,297
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	7 minutes 6 seconds
Memory usage	320.51 MB
Date created	2024:03:29 13:59:32
Software version	2.1.0.17532
File size	1.23 GB
Orthomosaic	
Size	35,907 x 60,593
Coordinate system	WGS 84 / UTM zone 10N (EPSG::32610)
Colors	4 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	1 hours 8 minutes
Memory usage	1.89 GB
Date created	2024:03:29 15:02:35
Software version	2.1.0.17532
File size	440.48 GB
Raster Transform	
Expression	B1 / 32768; B2 / 32768; B3 / 32768; B4 / 32768
System	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17532
OS	Windows 64 bit
RAM	127.78 GB
CPU	13th Gen Intel(R) Core(TM) i9-13900K
GPU(s)	NVIDIA GeForce RTX 4070 Ti