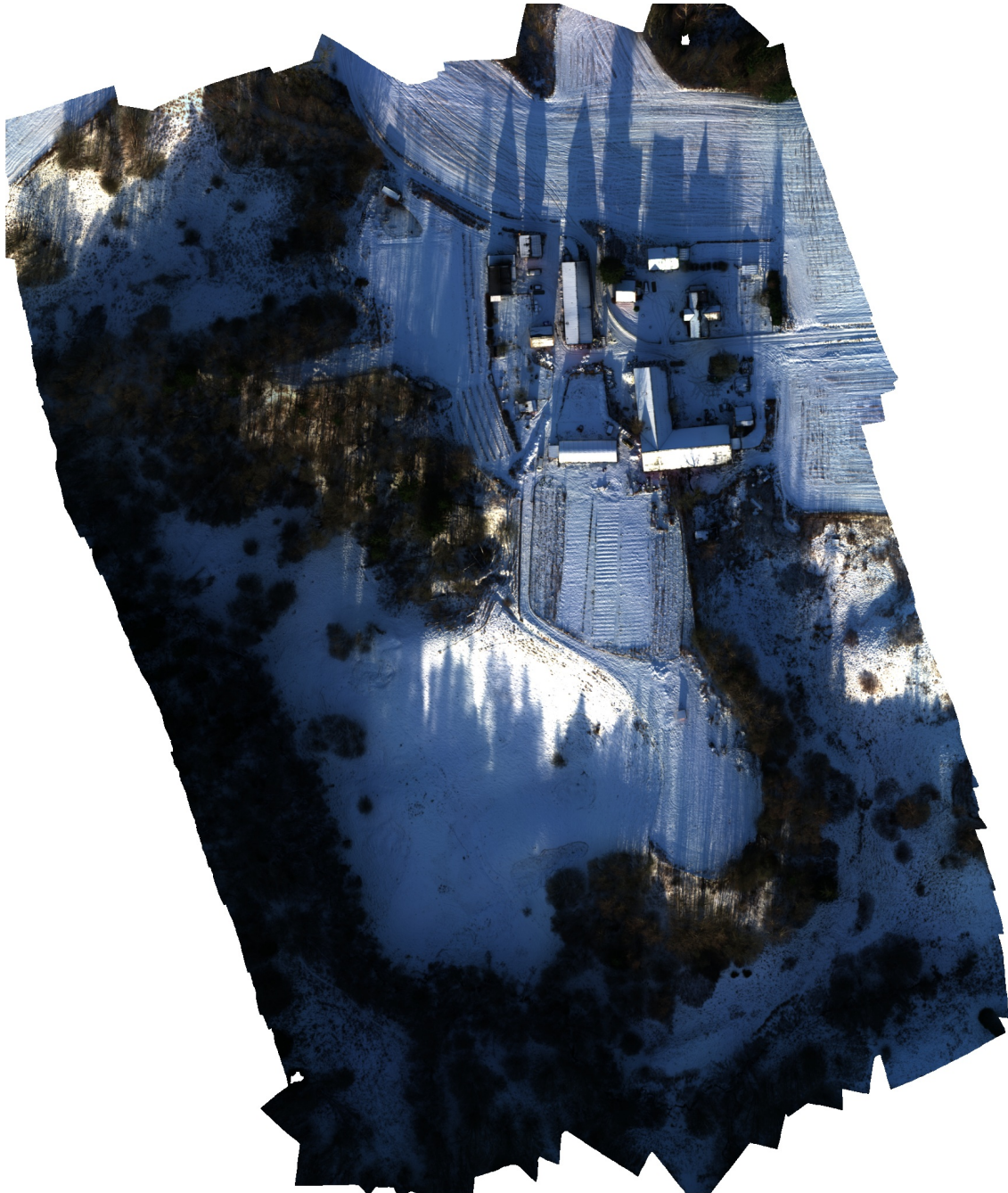


Sander_2024-12-09_AltumPT

Processing Report
10 December 2024



Survey Data

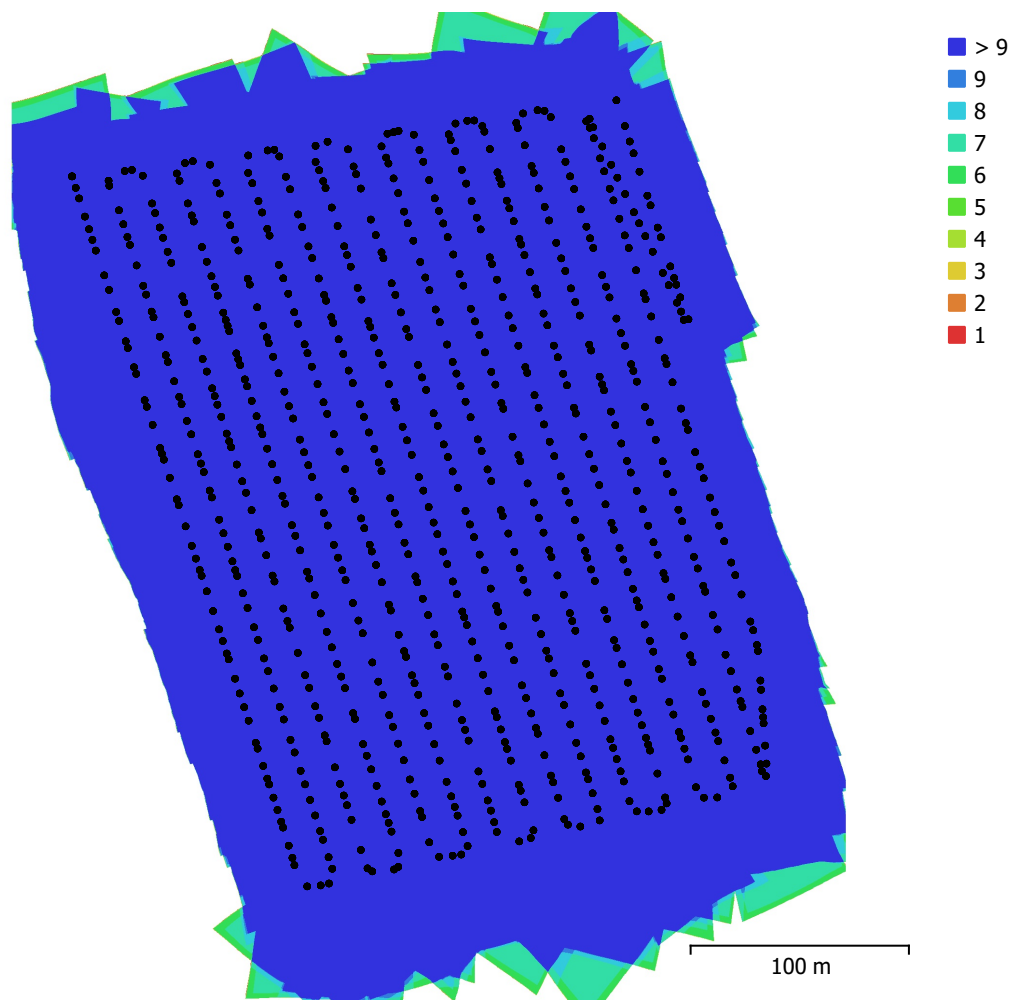


Fig. 1. Camera locations and image overlap.

Number of images:	5,628	Camera stations:	5,614
Flying altitude:	62.7 m	Tie points:	2,797,051
Ground resolution:	2.75 cm/pix	Projections:	13,902,449
Coverage area:	0.128 km ²	Reprojection error:	1.36 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Altum-PT, Blue (8mm)	2064 x 1544	8 mm	3.45 x 3.45 μm	Yes
Altum-PT, Green (8mm)	2064 x 1544	8 mm	3.45 x 3.45 μm	Yes
Altum-PT, Panchro (16.6...	4112 x 3008	16.6 mm	3.45 x 3.45 μm	Yes
Altum-PT, Red (8mm)	2064 x 1544	8 mm	3.45 x 3.45 μm	Yes
Altum-PT, Red edge (8m...	2064 x 1544	8 mm	3.45 x 3.45 μm	Yes

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Altum-PT, NIR (8mm)	2064 x 1544	8 mm	3.45 x 3.45 μm	Yes
Altum-PT, LWIR (4.5mm)	320 x 256	4.5 mm	12 x 12 μm	Yes

Table 1. Cameras.

Camera Calibration

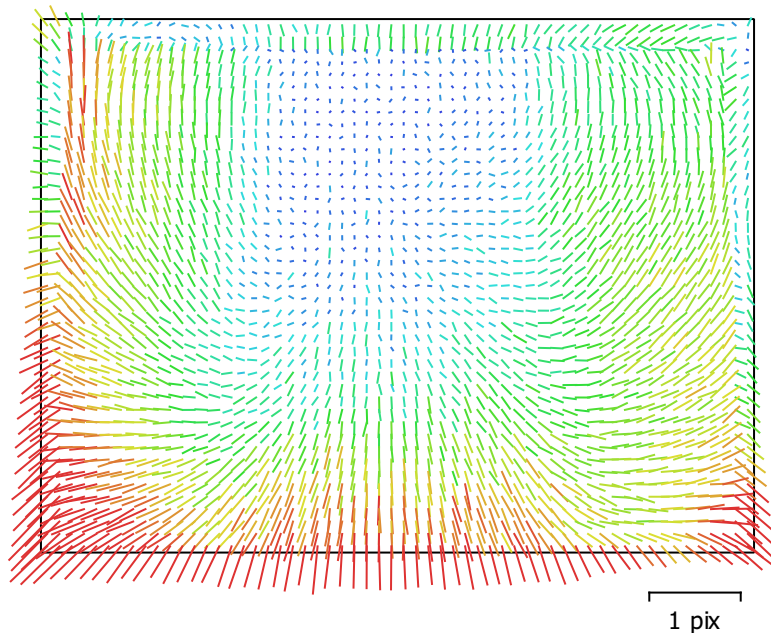


Fig. 2. Image residuals for Altum-PT, Blue (8mm).

Altum-PT, Blue (8mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	2064 x 1544	8 mm	3.45 x 3.45 μm

F:	2280.72		
Cx:	3.51884	B1:	0
Cy:	-10.0551	B2:	0
K1:	-0.126301	P1:	0.000300633
K2:	0.13629	P2:	-7.73514e-05
K3:	0.00121852	P3:	0
K4:	0	P4:	0

Fixed parameters: All

Camera Calibration

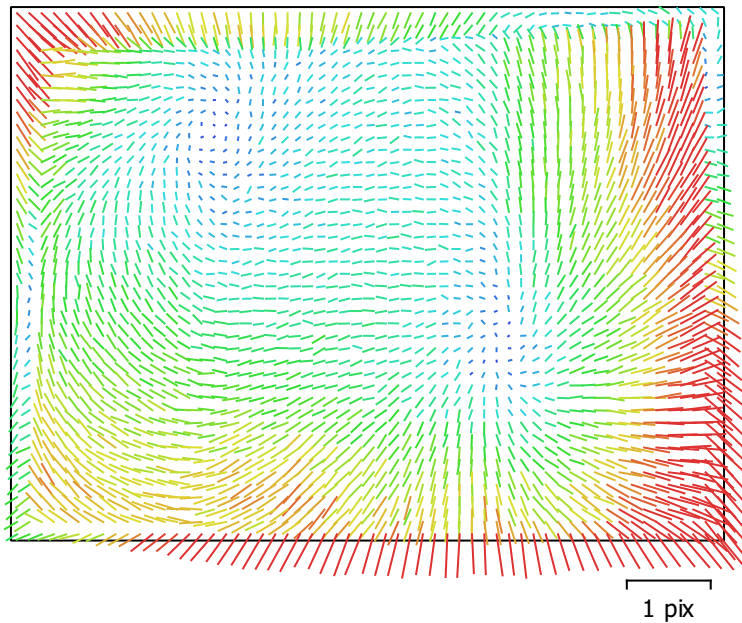


Fig. 3. Image residuals for Altum-PT, Green (8mm).

Altum-PT, Green (8mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	2064 x 1544	8 mm	3.45 x 3.45 μm

F:	2280.79		
Cx:	-2.41739	B1:	0
Cy:	3.35652	B2:	0
K1:	-0.130453	P1:	-8.43061e-05
K2:	0.154025	P2:	-1.98192e-05
K3:	-0.0481255	P3:	0
K4:	0	P4:	0

Fixed parameters: All

Camera Calibration

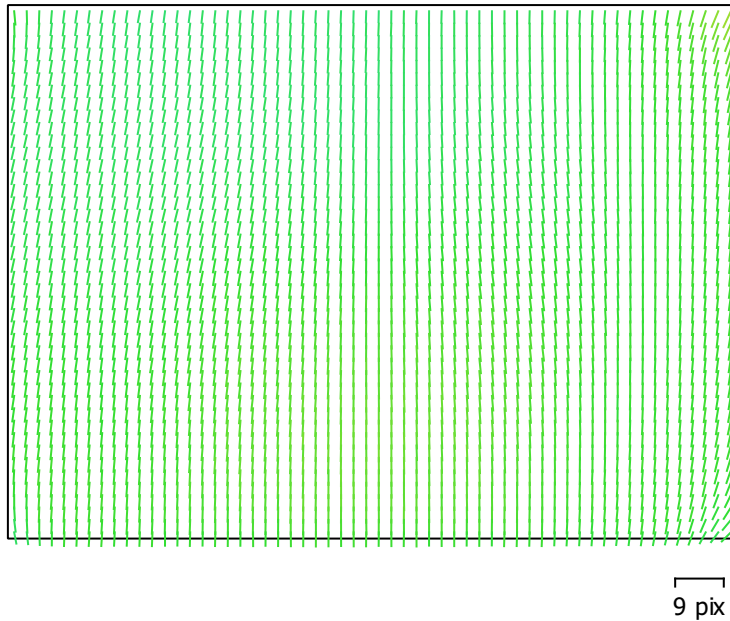


Fig. 4. Image residuals for Altum-PT, Panchro (16.6mm).

Altum-PT, Panchro (16.6mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	4112 x 3008	16.6 mm	3.45 x 3.45 μm
F:	4815.75		
Cx:	-19.0696	B1:	0
Cy:	-24.9855	B2:	0
K1:	-0.160796	P1:	0.000515965
K2:	0.287458	P2:	0.000455527
K3:	0.378497	P3:	0
K4:	0	P4:	0

Camera Calibration

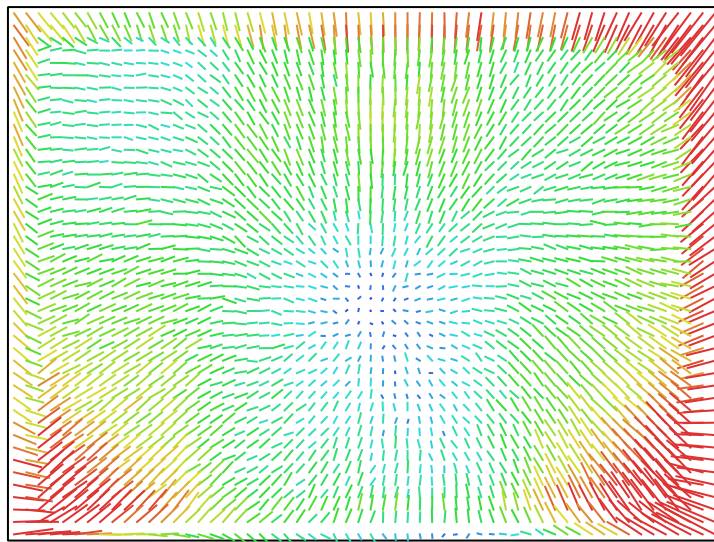


Fig. 5. Image residuals for Altum-PT, Red (8mm). 1 pix

Altum-PT, Red (8mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	2064 x 1544	8 mm	3.45 x 3.45 μm
F:	2284.66		
Cx:	-3.27247	B1:	0
Cy:	0.663767	B2:	0
K1:	-0.135505	P1:	6.78116e-05
K2:	0.165092	P2:	-0.000221294
K3:	-0.0775957	P3:	0
K4:	0	P4:	0

Fixed parameters: All

Camera Calibration

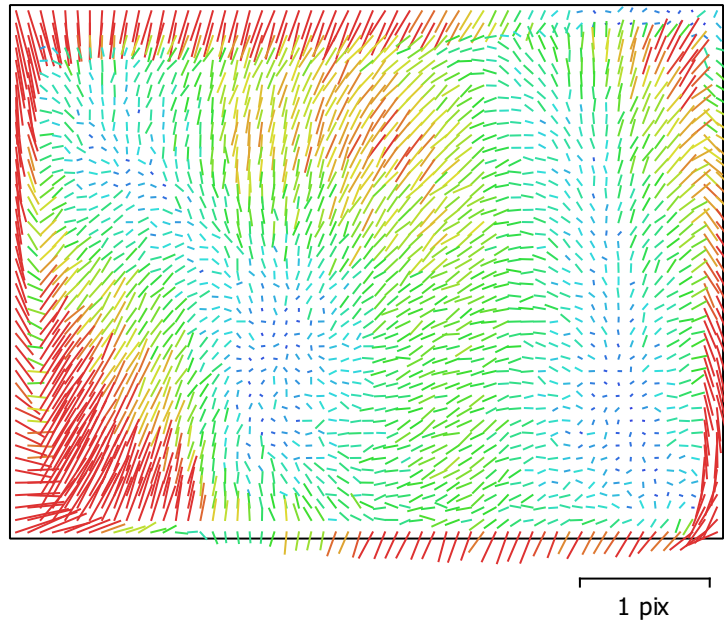


Fig. 6. Image residuals for Altum-PT, Red edge (8mm).

Altum-PT, Red edge (8mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	2064 x 1544	8 mm	3.45 x 3.45 μm
F:	2284.54		
Cx:	-10	B1:	0
Cy:	2.82319	B2:	0
K1:	-0.137464	P1:	6.80596e-05
K2:	0.167568	P2:	-6.20674e-05
K3:	-0.0734226	P3:	0
K4:	0	P4:	0

Fixed parameters: All

Camera Calibration

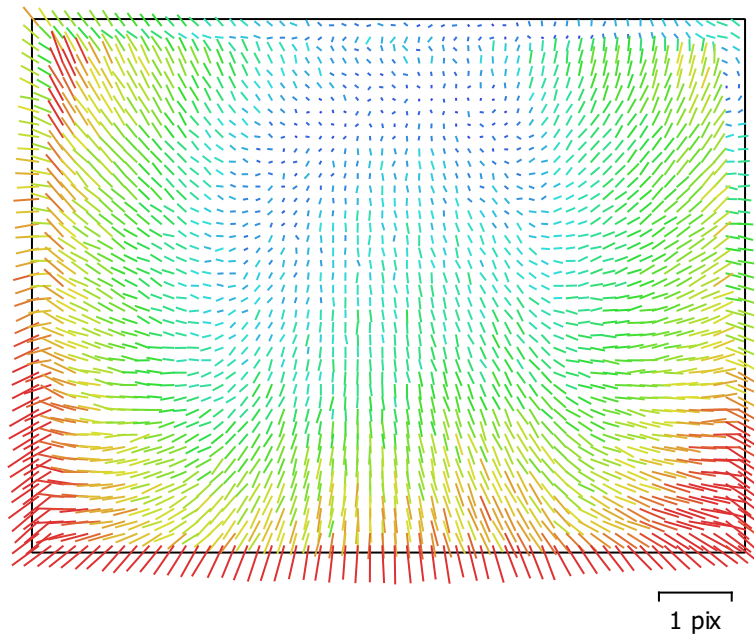


Fig. 7. Image residuals for Altum-PT, NIR (8mm).

Altum-PT, NIR (8mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	2064 x 1544	8 mm	3.45 x 3.45 μm

F:	2288.24		
Cx:	0.921737	B1:	0
Cy:	-0.472465	B2:	0
K1:	-0.138366	P1:	-0.00013569
K2:	0.157954	P2:	-0.000403219
K3:	-0.0527024	P3:	0
K4:	0	P4:	0

Fixed parameters: All

Camera Calibration

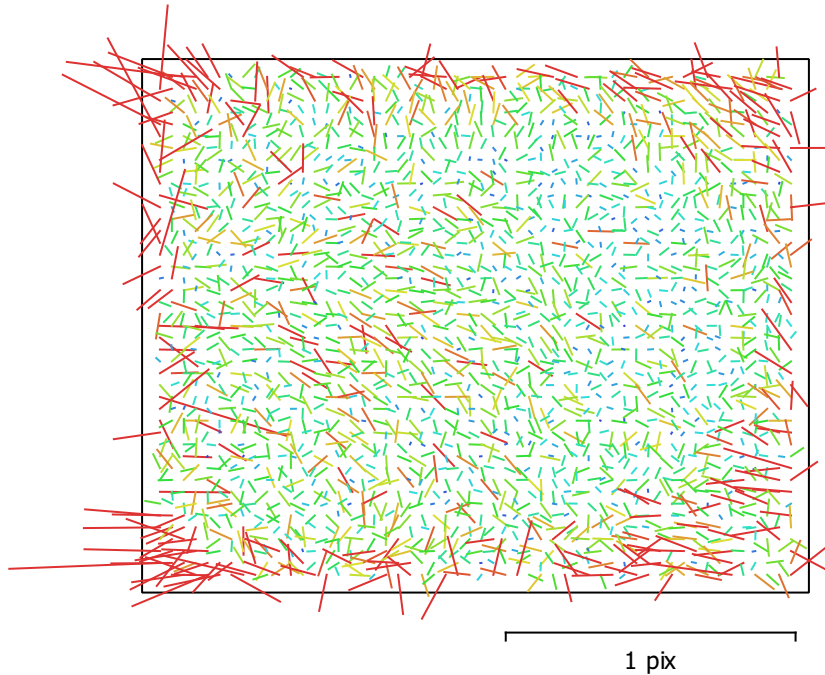


Fig. 8. Image residuals for Altum-PT, LWIR (4.5mm).

Altum-PT, LWIR (4.5mm)

804 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	320 x 256	4.5 mm	12 x 12 μm
F:	371.018		
Cx:	2.42583	B1:	0
Cy:	-11.2858	B2:	0
K1:	-0.400371	P1:	-0.00159823
K2:	0.0198036	P2:	0.000298518
K3:	0.4258	P3:	0
K4:	0	P4:	0

Fixed parameters: All

Camera Locations

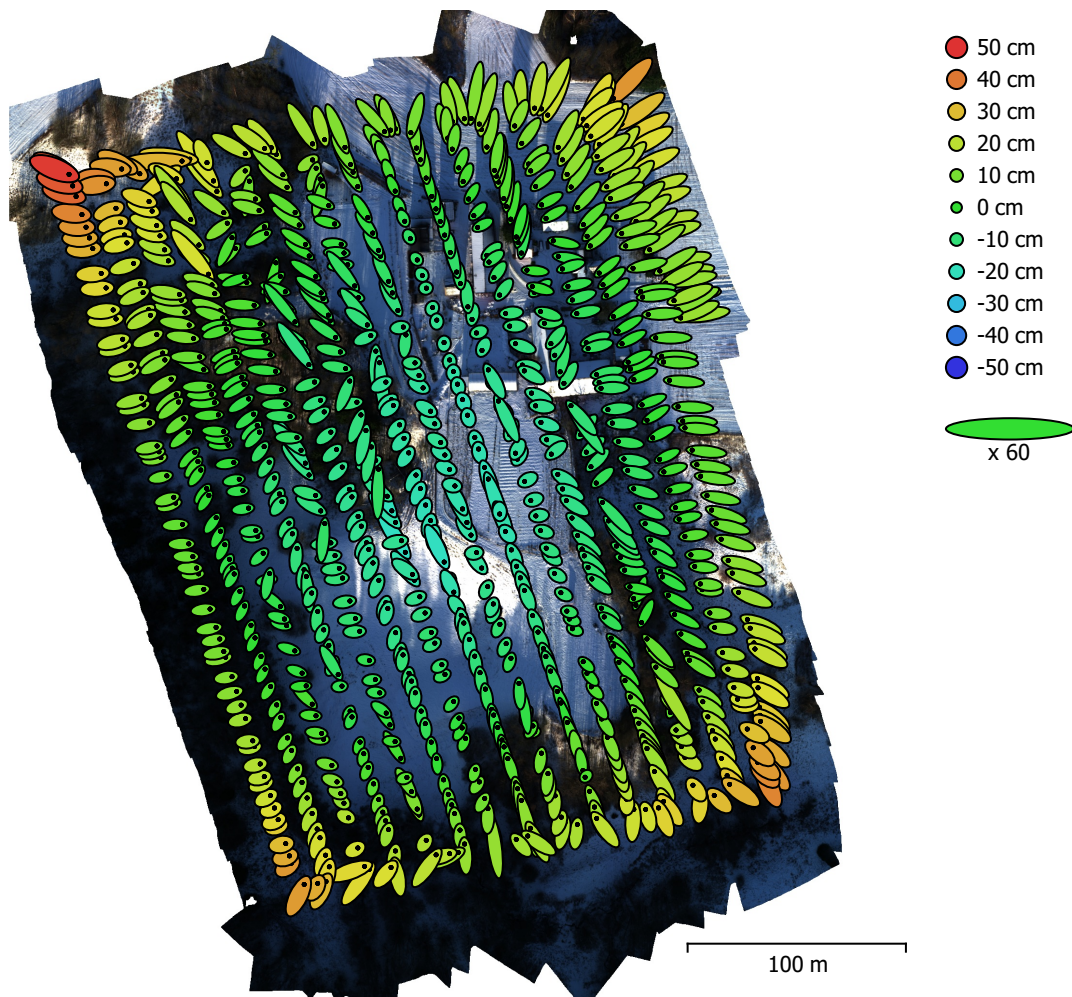


Fig. 9. Camera locations and error estimates.

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)
12.0809	12.0517	14.0997	17.0643	22.1358

Table 2. Average camera location error.

X - Easting, Y - Northing, Z - Altitude.

Ground Control Points

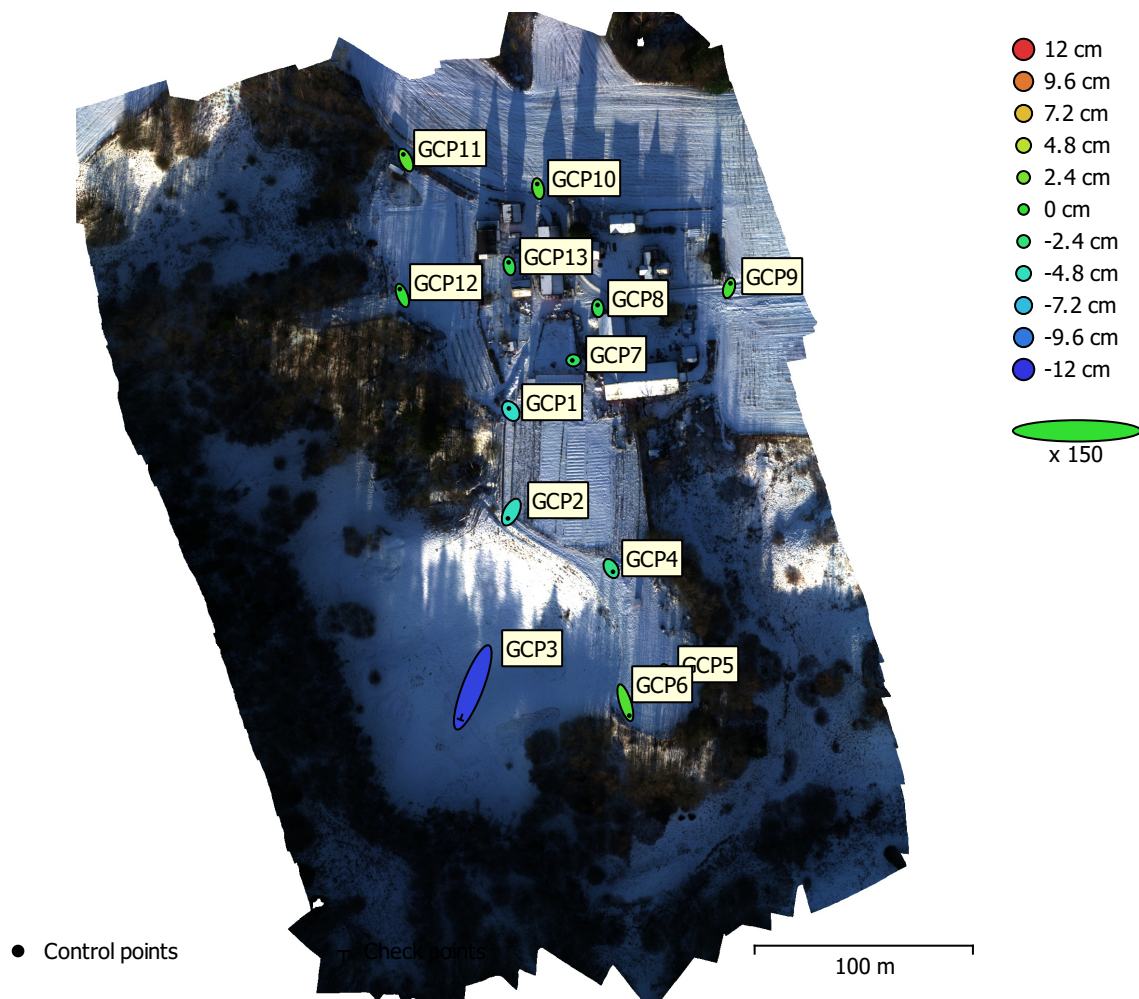


Fig. 10. GCP locations and error estimates.

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	1.62838	3.85624	2.47993	4.18596	4.86542

Table 3. Control points RMSE.
 X - Easting, Y - Northing, Z - Altitude.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
1	7.57162	19.718	11.4612	21.1217	24.0309

Table 4. Check points RMSE.
 X - Easting, Y - Northing, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP1	-1.12722	1.61799	-5.29255	5.64798	1.201 (7)
GCP2	-2.06381	-3.85343	-4.92027	6.58159	1.434 (6)
GCP4	1.12009	-1.98569	-2.89323	3.68352	1.055 (6)
GCP5	3.53491	-6.614	1.83818	7.72136	0.764 (6)
GCP6	2.44548	-7.82422	1.06635	8.26655	0.621 (6)
GCP7	-0.737314	-0.0279244	-1.57344	1.73785	0.912 (6)
GCP8	-0.191393	1.88654	-1.20776	2.24819	0.563 (6)
GCP9	0.849928	2.81012	0.650944	3.00714	0.540 (6)
GCP10	-0.539794	2.86848	1.14536	3.1355	0.760 (6)
GCP11	-1.57347	3.47423	1.37803	4.05525	1.016 (6)
GCP12	-1.50463	3.93841	-0.21041	4.22128	0.538 (7)
GCP13	-0.47453	2.19275	-1.03951	2.47264	0.658 (6)
Total	1.62838	3.85624	2.47993	4.86542	0.884

Table 5. Control points.
X - Easting, Y - Northing, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP3	-7.57162	-19.718	-11.4612	24.0309	0.512 (10)
Total	7.57162	19.718	11.4612	24.0309	0.512

Table 6. Check points.
X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

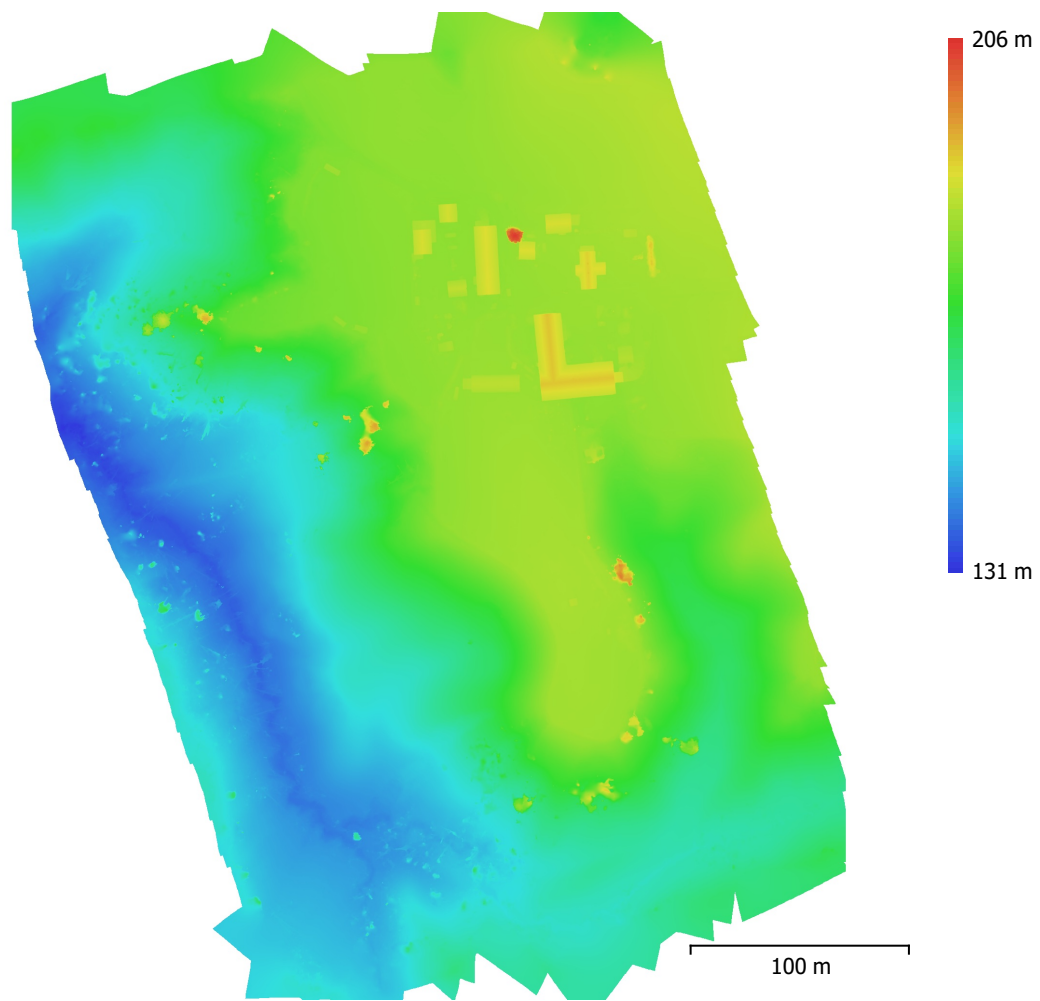


Fig. 11. Reconstructed digital elevation model.

Resolution: 5 cm/pix
Point density: 400 points/m²

Processing Parameters

General

Cameras	5628
Aligned cameras	5614
Markers	14
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Rotation angles	Yaw, Pitch, Roll

Tie Points

Points	2,797,051 of 3,166,966
RMS reprojection error	0.60329 (1.36316 pix)
Max reprojection error	3.66919 (75.6573 pix)
Mean key point size	1.79878 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	7.12568

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
Filter points by mask	No
Mask tie points	No
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	No
Matching time	23 minutes 0 seconds
Matching memory usage	8.71 GB
Alignment time	19 minutes 46 seconds
Alignment memory usage	9.31 GB
Date created	2024:12:09 17:06:53
Software version	2.1.0.17532
File size	1.08 GB

Depth Maps

Count	802
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	20 minutes 12 seconds
Memory usage	1.59 GB
Date created	2024:12:09 21:09:59
Software version	2.1.0.17532
File size	843.99 MB

DEM

Size	7,632 x 9,050
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate

Max neighbors 16
Processing time 20 minutes 12 seconds
Memory usage 1.59 GB

Reconstruction parameters

Source data Depth maps
Interpolation Enabled
Processing time 30 minutes 45 seconds
Memory usage 6.39 GB
Date created 2024:12:09 21:40:45
Software version 2.1.0.17532
File size 215.98 MB

Orthomosaic

Size 15,240 x 18,080
Coordinate system ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Colors 7 bands, uint16

Reconstruction parameters

Blending mode Mosaic
Surface DEM
Enable hole filling Yes
Enable ghosting filter No
Processing time 12 minutes 22 seconds
Memory usage 2.53 GB
Date created 2024:12:10 15:11:31
Software version 2.1.0.17532
File size 71.82 GB

Raster Transform

Expression B1/32768; B2/32768; B4/32768; B5/32768; B6/32768; B3/32768; B7/100-...

System

Software name Agisoft Metashape Professional
Software version 2.1.0 build 17532
OS Windows 64 bit
RAM 127.15 GB
CPU AMD Ryzen 9 7950X 16-Core Processor
GPU(s) NVIDIA GeForce RTX 4080 SUPER