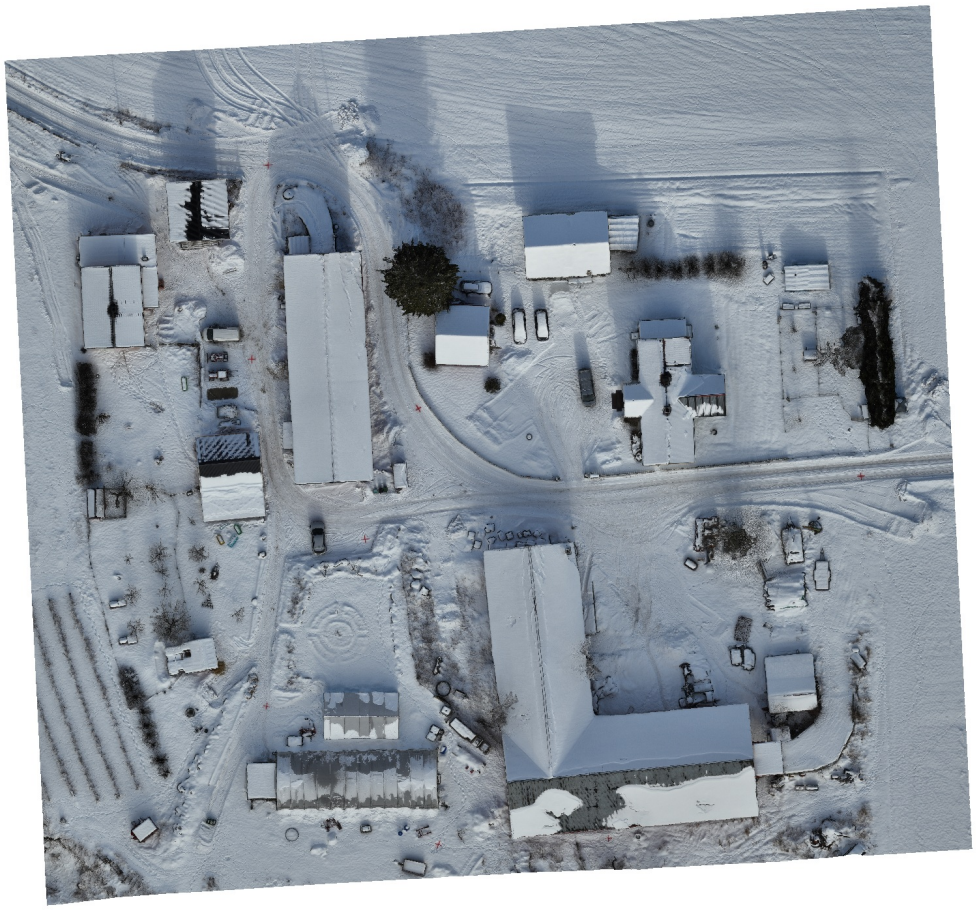
Sander 2026-02-19 SO

DJI Matrice 4E Smart Oblique
Flown byLuc Girod and Valérian Janquin
Kartverket NTRIP, 8 CPs
EUREF89 - UTM32N - NN2000

19 February 2026



Survey Data

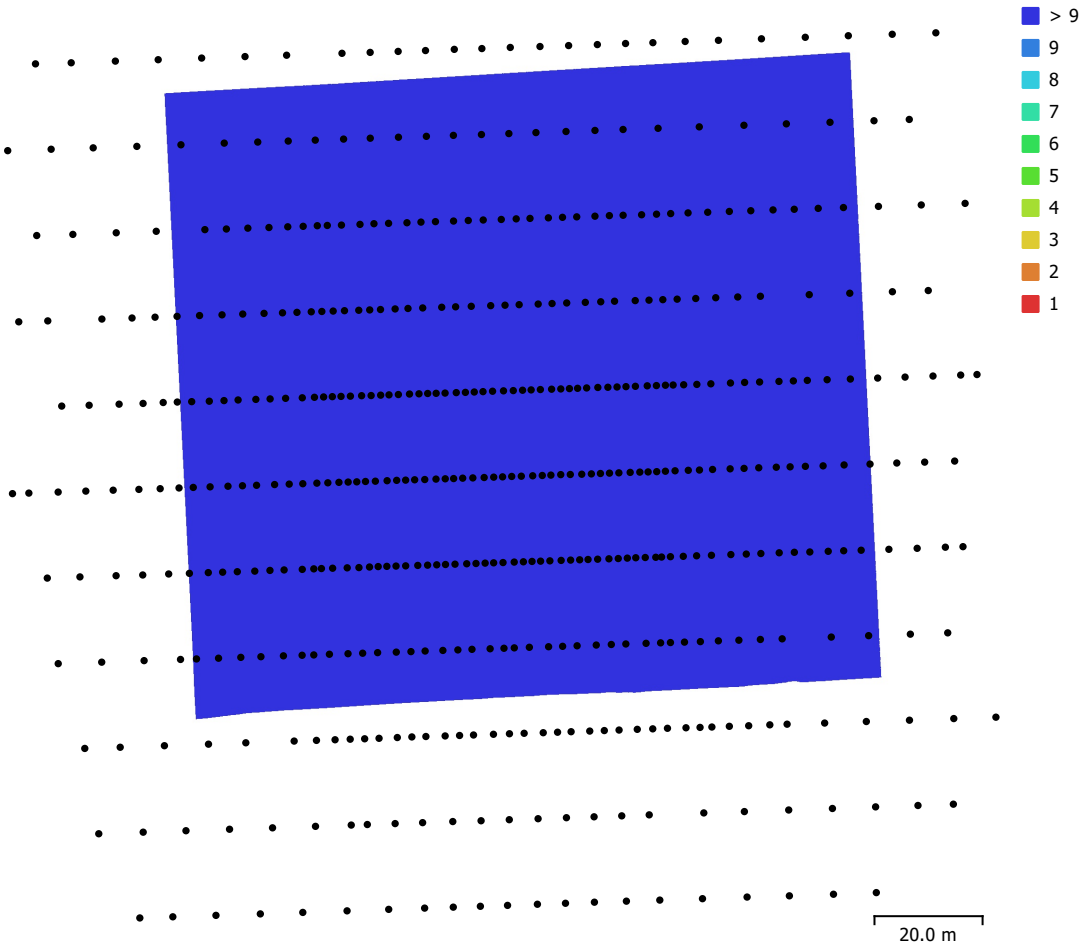


Fig. 1. Camera locations and image overlap.

Number of images:	480	Camera stations:	480
Flying altitude:	41.7 m	Tie points:	142,999
Ground resolution:	1.12 cm/pix	Projections:	1,468,356
Coverage area:	0.0146 km²	Reprojection error:	1.14 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M4E (12.29mm)	5280 x 3956	12.29 mm	3.36 x 3.36 µm	Yes

Table 1. Cameras.

Camera Calibration

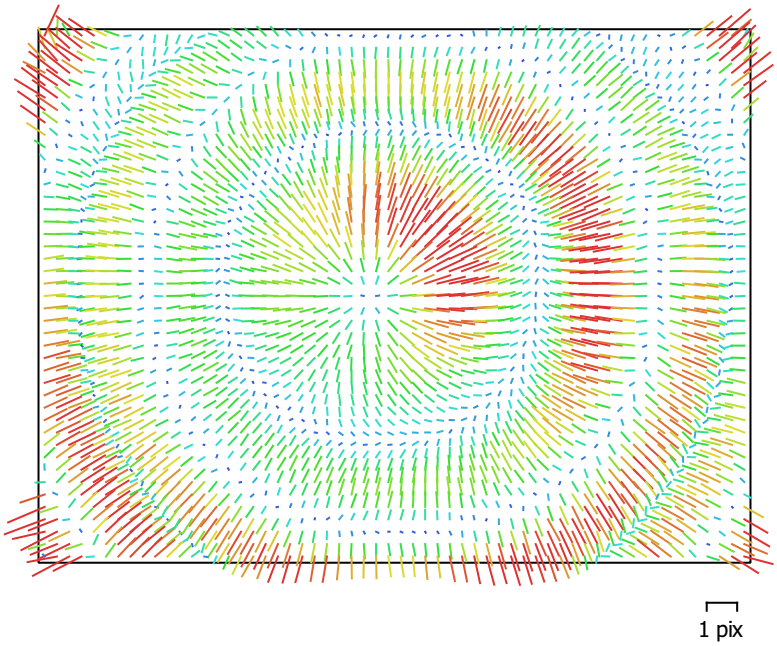


Fig. 2. Image residuals for M4E (12.29mm).

M4E (12.29mm)

480 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	K2	K3	P1	P2
F	**3718.99**	0.013	1.00	0.02	-0.06	-0.49	0.41	-0.36	0.00	0.04
Cx	**17.81**	0.014		1.00	0.01	-0.01	0.01	-0.01	0.72	0.01
Cy	**-18.6735**	0.011			1.00	-0.01	0.02	-0.03	0.01	0.41
K1	**-0.1008**	1.8e-05				1.00	-0.97	0.92	-0.02	-0.07
K2	**-0.0145868**	4.7e-05					1.00	-0.98	0.02	0.07
K3	**-0.0077741**	3.7e-05						1.00	-0.02	-0.08
P1	**-0.000319795**	6.7e-07							1.00	-0.00
P2	**-0.000391371**	6.5e-07								1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

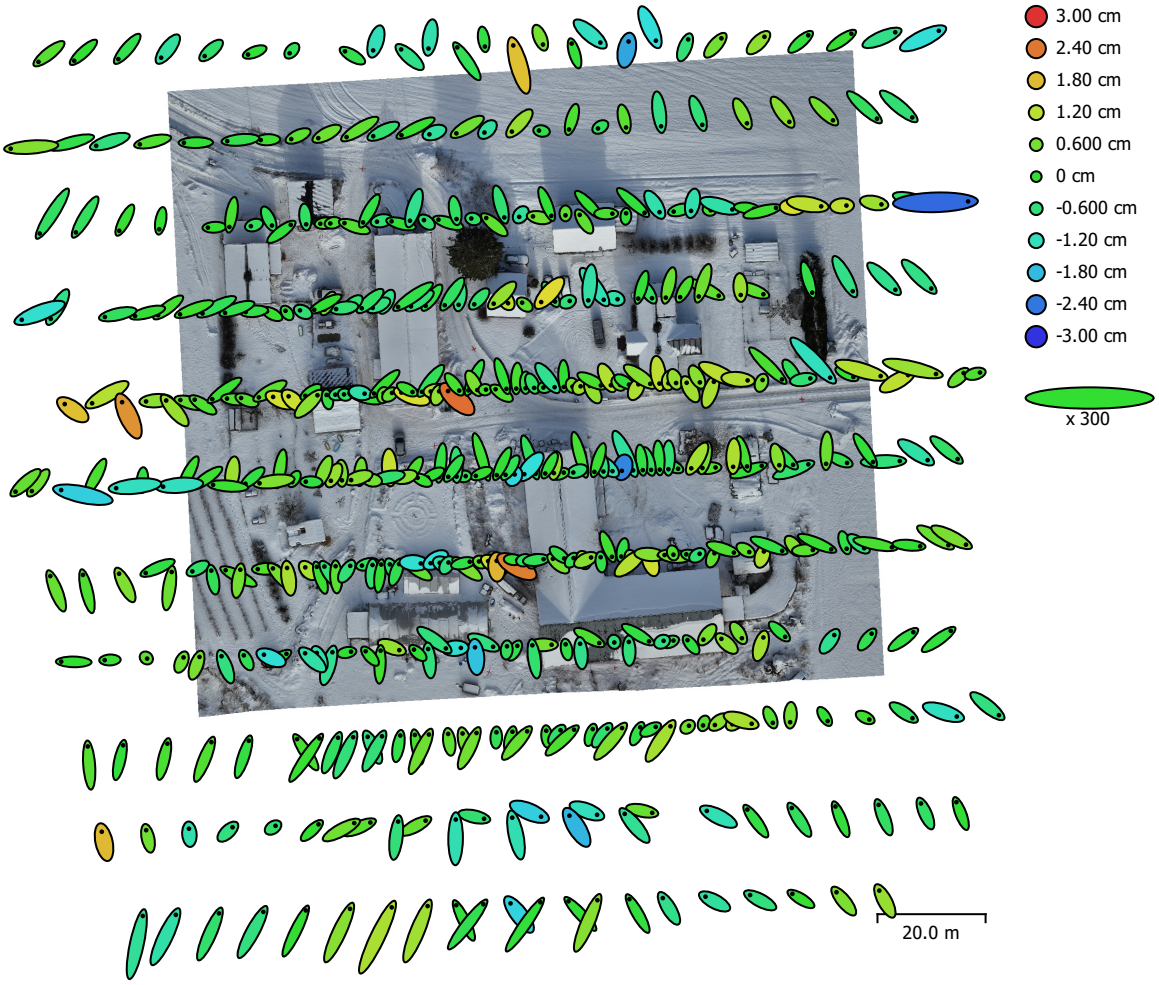


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
0.952323	1.06448	0.707934	1.4283	1.59411

Table 3. Average camera location error.
X - Easting, Y - Northing, Z - Altitude.

Ground Control Points

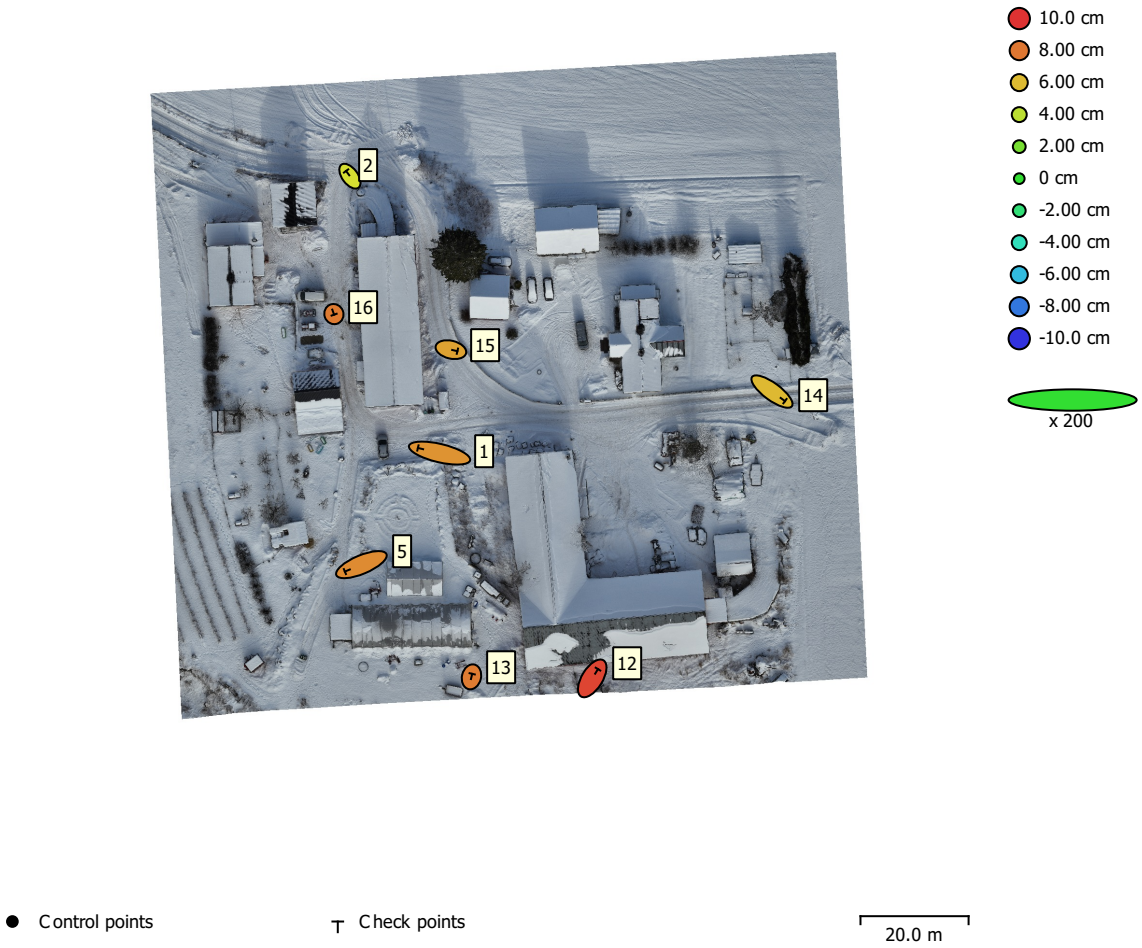


Fig. 4. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
8	2.07056	1.11354	7.27939	2.35099	7.64962

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)
1	-4.00738	0.946196	7.17105	8.26912	0.728 (8)
2	-0.712546	0.961586	4.73961	4.88838	1.058 (8)
5	-3.05685	-1.27922	7.40034	8.10837	0.714 (8)
12	1.06272	1.71408	9.44989	9.6627	0.708 (8)
13	0.131746	0.557044	7.85482	7.87565	0.788 (8)
14	2.4072	-1.7672	6.08441	6.77773	0.532 (8)
15	1.20153	-0.284307	6.72796	6.84032	1.038 (8)
16	0.038286	-0.106125	7.8727	7.87351	0.860 (8)
Total	**2.07056**	**1.11354**	**7.27939**	**7.64962**	**0.820**

Table 5. Check points.

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

Digital Elevation Model

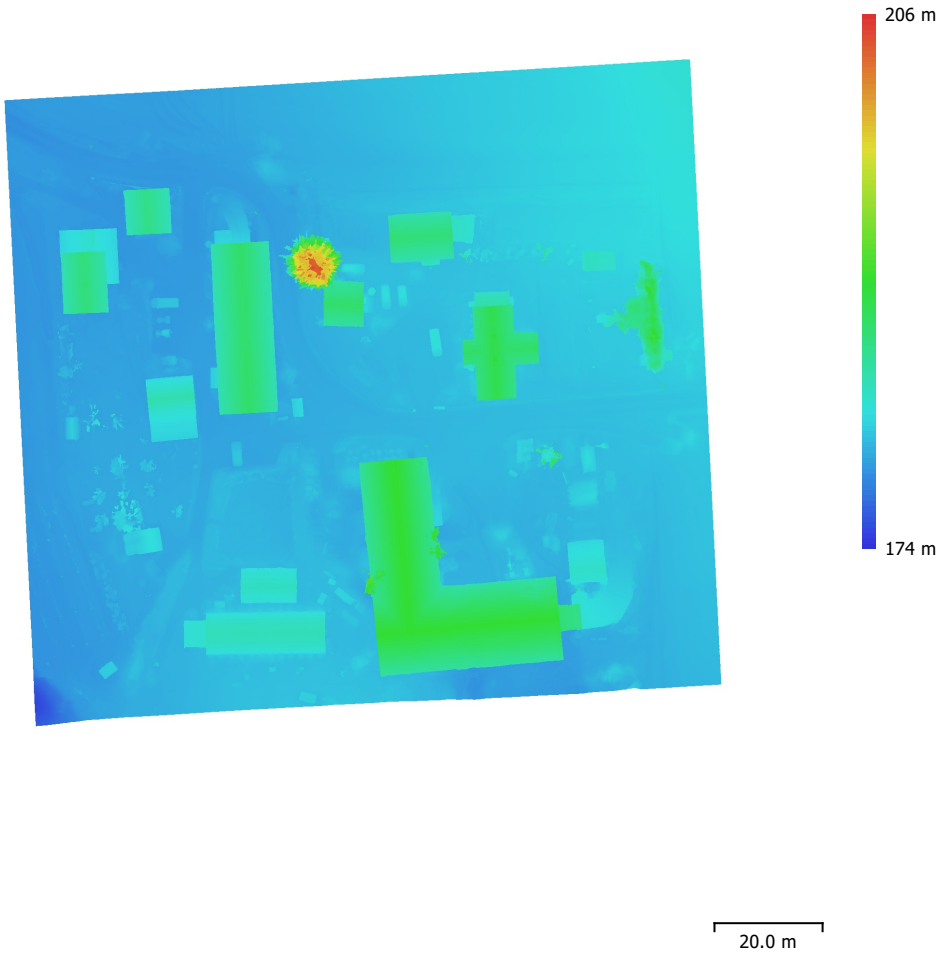


Fig. 5. Reconstructed digital elevation model.

Resolution:	4.94 cm/pix
Point density:	410 points/m²

Processing Parameters

General	
Images	480
Aligned images	480
Markers	8
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Rotation angles	Yaw, Pitch, Roll
Tie Points	
Points	142,999 of 180,331
RMS reprojection error	0.269835 (1.14086 pix)
Max reprojection error	1.02909 (59.2332 pix)
Mean key point size	4.06351 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	13.3056
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	2 minutes 16 seconds
Matching memory usage	767.93 MB
Alignment time	1 minutes 30 seconds
Alignment memory usage	368.25 MB
Optimization parameters	
Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	No
Exclude corners	No
Optimization time	4 seconds
Date created	2026:02:19 15:08:18
Software version	2.2.1.20641
File size	131.93 MB
Depth Maps	
Count	480
Depth maps generation parameters	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	16 minutes 28 seconds
Memory usage	7.63 GB
Date created	2026:02:19 16:30:02
Software version	2.2.1.20641
File size	3.47 GB
Model	
Faces	4,794,140
Vertices	2,404,775
Vertex colors	3 bands, uint8
Texture	8,192 x 8,192 x 6, 3 bands, uint8
Depth maps generation parameters	
Quality	High

Filtering mode	Moderate
Max neighbors	16
Processing time	16 minutes 28 seconds
Memory usage	7.63 GB
Reconstruction parameters	
Surface type	Arbitrary
Source data	Depth maps
Interpolation	Enabled
Strict volumetric masks	No
Processing time	9 minutes 55 seconds
Memory usage	6.31 GB
Texturing parameters	
Mapping mode	Generic
Blending mode	Mosaic
Texture size	8,192
Pixel size (m)	0.01
Enable hole filling	Yes
Enable ghosting filter	Yes
UV mapping time	1 minutes 31 seconds
UV mapping memory usage	1.12 GB
Blending time	2 minutes 0 seconds
Blending memory usage	10.82 GB
Blending GPU memory usage	9.82 GB
Date created	2026:02:19 17:03:56
Software version	2.2.1.20641
File size	568.81 MB
System	
Software name	Agisoft Metashape Professional
Software version	2.2.1 build 20641
OS	Windows 64 bit
RAM	127.15 GB
CPU	AMD Ryzen 9 7950X 16-Core Processor
GPU(s)	NVIDIA GeForce RTX 4080 SUPER