

Sander_2021-10-14_Repeatability_P4RTK_0499

Processing Report
28 June 2024



Survey Data

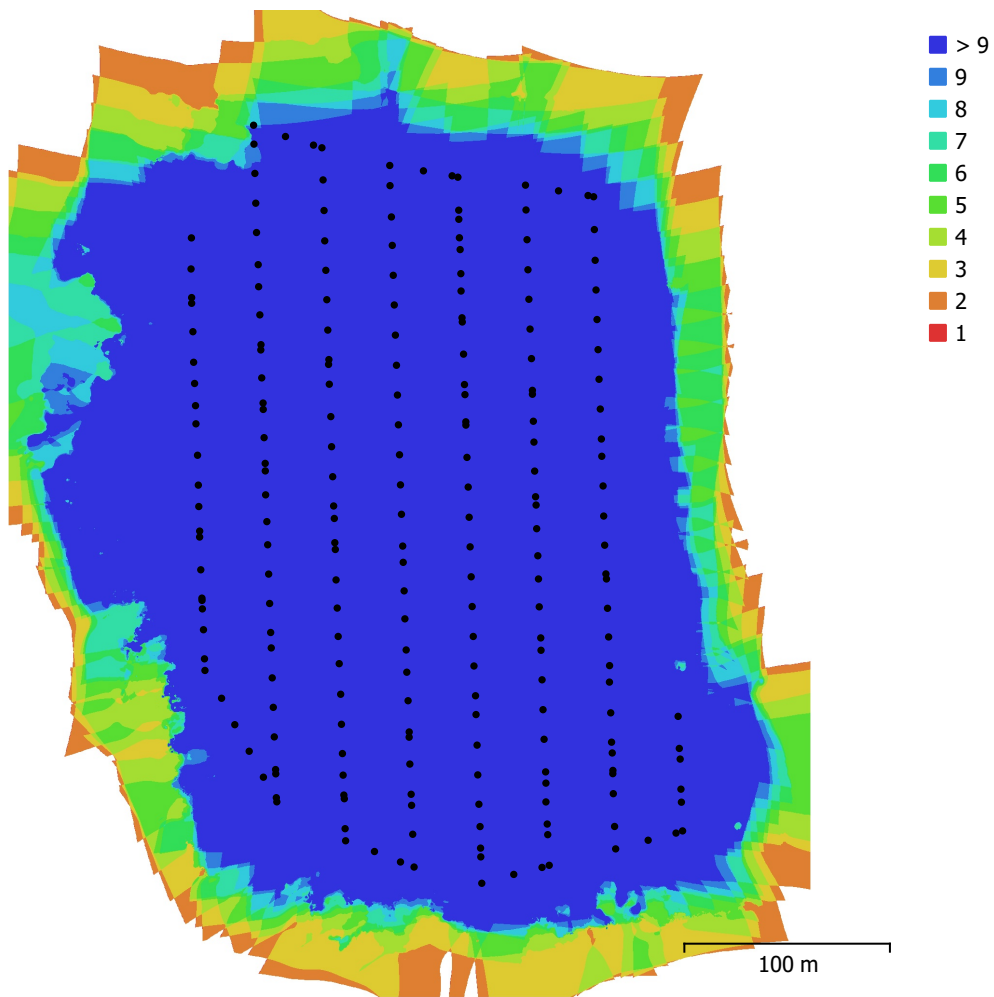


Fig. 1. Camera locations and image overlap.

Number of images:	216	Camera stations:	216
Flying altitude:	76.8 m	Tie points:	210,086
Ground resolution:	2.07 cm/pix	Projections:	756,234
Coverage area:	0.15 km ²	Reprojection error:	0.752 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6310R (8.8mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μ m	Yes

Table 1. Cameras.

Camera Calibration

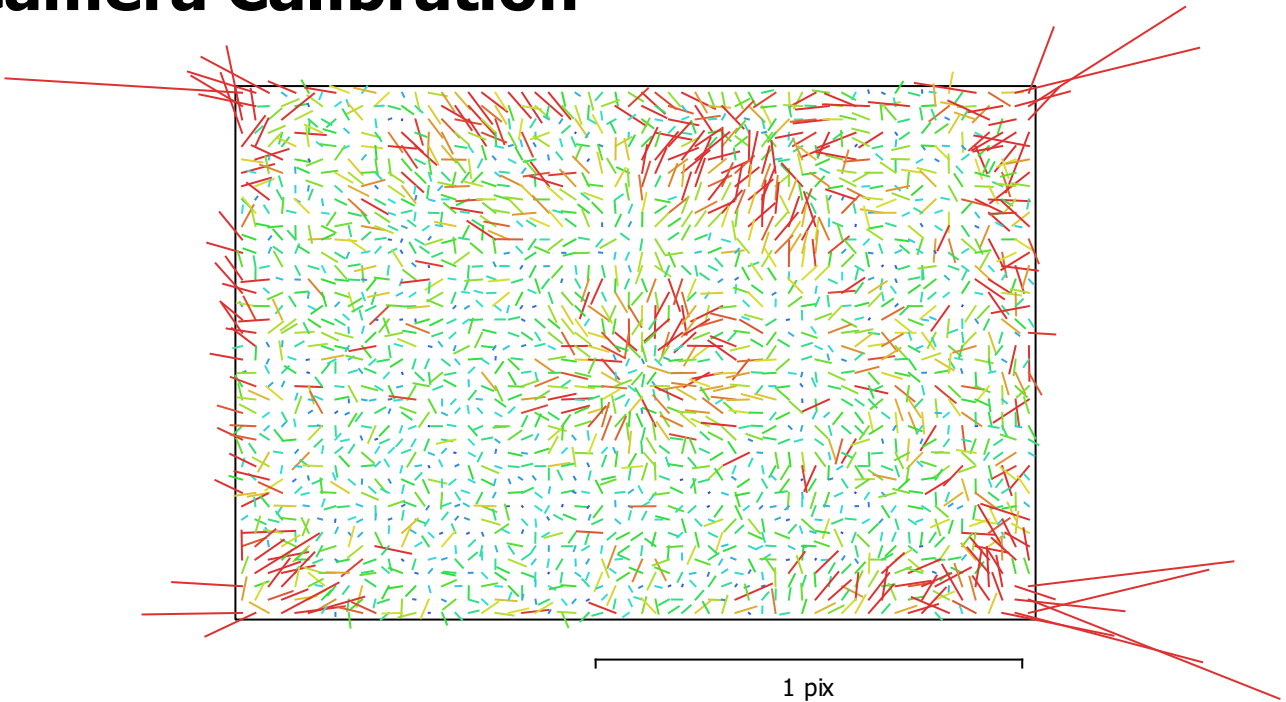


Fig. 2. Image residuals for FC6310R (8.8mm).

FC6310R (8.8mm)

216 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	5472 x 3648	8.8 mm	2.41 x 2.41 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	3701.99	0.24	1.00	0.14	0.03	-0.02	0.03	-0.79	0.35	-0.20	0.14	-0.20	-0.05
Cx	-18.5503	0.027		1.00	0.02	-0.04	-0.06	-0.10	0.04	-0.02	0.01	-0.30	-0.00
Cy	-16.5442	0.023			1.00	0.05	-0.06	-0.02	0.01	-0.00	0.00	0.01	-0.39
B1	0.289458	0.009				1.00	0.04	0.02	-0.03	0.03	-0.03	-0.00	-0.05
B2	0.400465	0.0087					1.00	-0.03	0.01	-0.01	0.00	0.01	-0.02
K1	-0.288168	5e-05						1.00	-0.83	0.70	-0.63	0.15	0.04
K2	0.146254	0.00012							1.00	-0.97	0.93	-0.07	-0.02
K3	-0.0673128	0.00016								1.00	-0.99	0.03	0.01
K4	0.015886	7.3e-05									1.00	-0.02	-0.01
P1	-6.15619e-05	1e-06										1.00	0.01
P2	-9.33644e-05	9.7e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

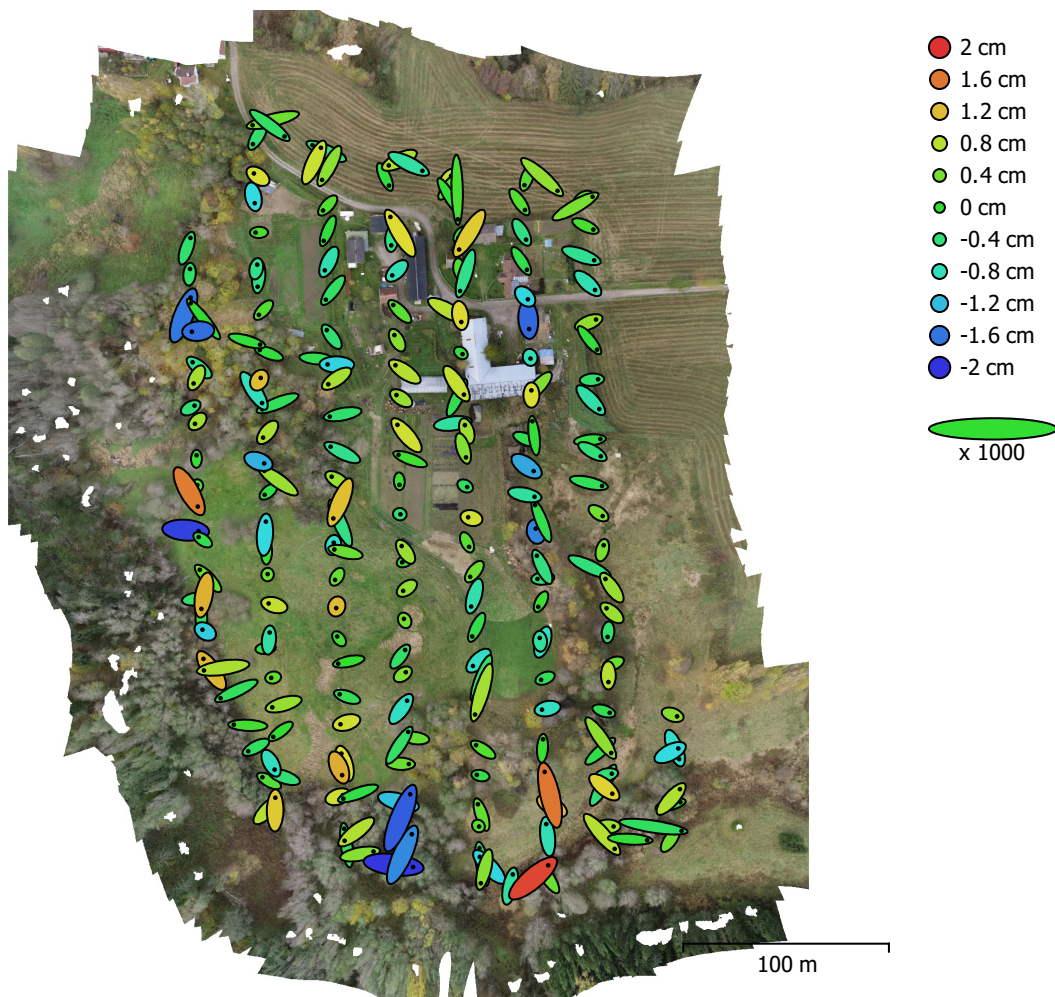


Fig. 3. Camera locations and error estimates.

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)
0.761847	0.828459	0.696263	1.1255	1.32346

Table 3. Average camera location error.

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

Ground Control Points

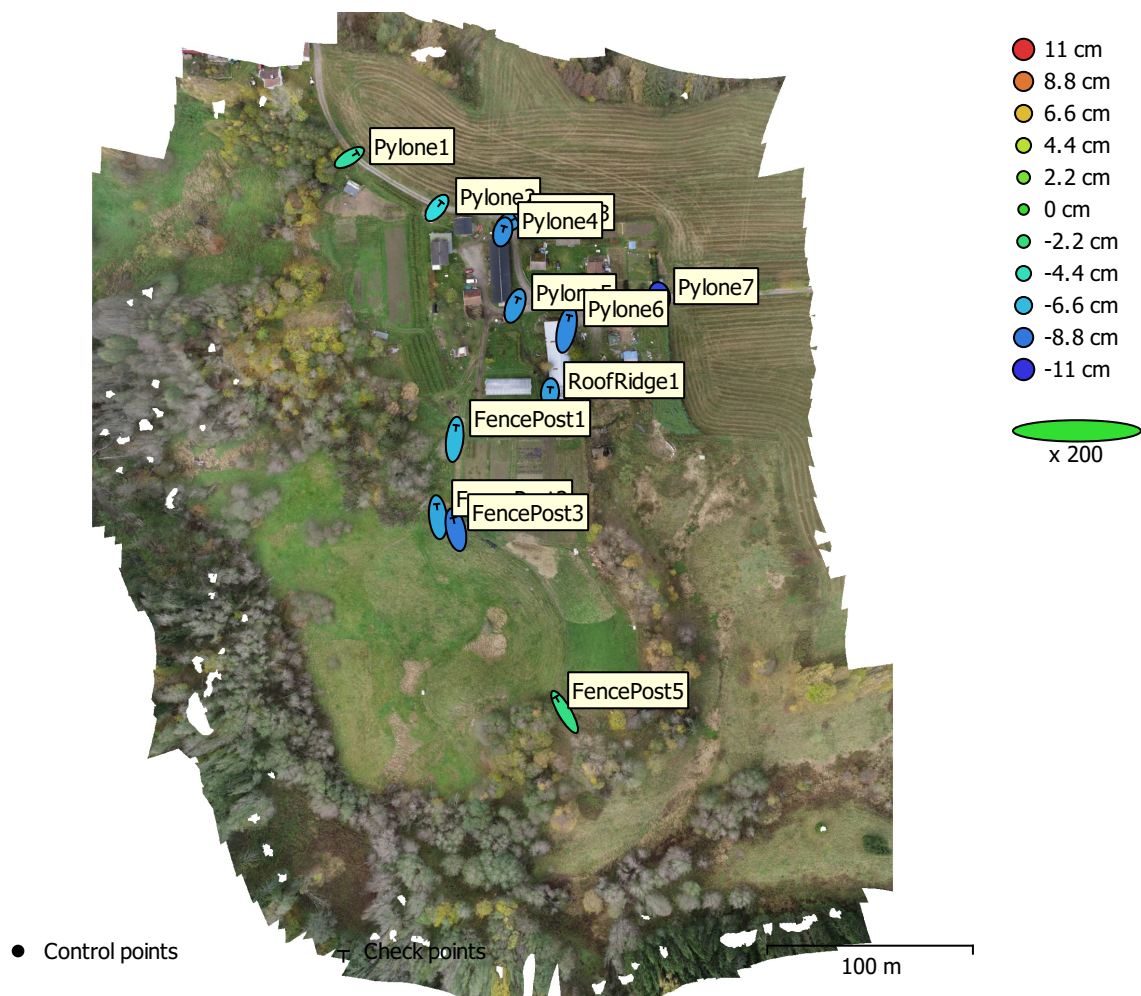


Fig. 4. GCP locations and error estimates.

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)
12	2.12682	4.77039	7.26781	5.22302	8.94992

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)
Pylone1	3.99119	2.41995	-3.62202	5.90802	0.269 (6)
Pylone2	2.31587	2.89776	-5.54527	6.6716	0.126 (10)
Pylone3	2.59351	1.59269	-7.56031	8.14992	0.189 (10)
Pylone4	0.707455	2.66303	-7.9859	8.44789	0.434 (9)
Pylone5	1.51285	3.9202	-7.73493	8.80261	0.824 (10)
Pylone6	1.45988	6.84225	-8.16038	10.7489	0.434 (11)
Pylone7	-0.438593	1.8464	-10.4109	10.5824	0.837 (11)
FencePost1	0.780142	6.85483	-6.66293	9.59125	0.589 (8)
FencePost2	-0.653284	6.39928	-7.26418	9.70288	0.264 (11)
FencePost3	-1.30326	5.83411	-8.58905	10.4646	0.155 (5)
FencePost5	-4.2859	7.36628	-2.6349	8.92041	0.437 (8)
RoofRidge1	0.212777	2.71405	-7.50776	7.9861	0.980 (9)
Total	2.12682	4.77039	7.26781	8.94992	0.553

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

Digital Elevation Model

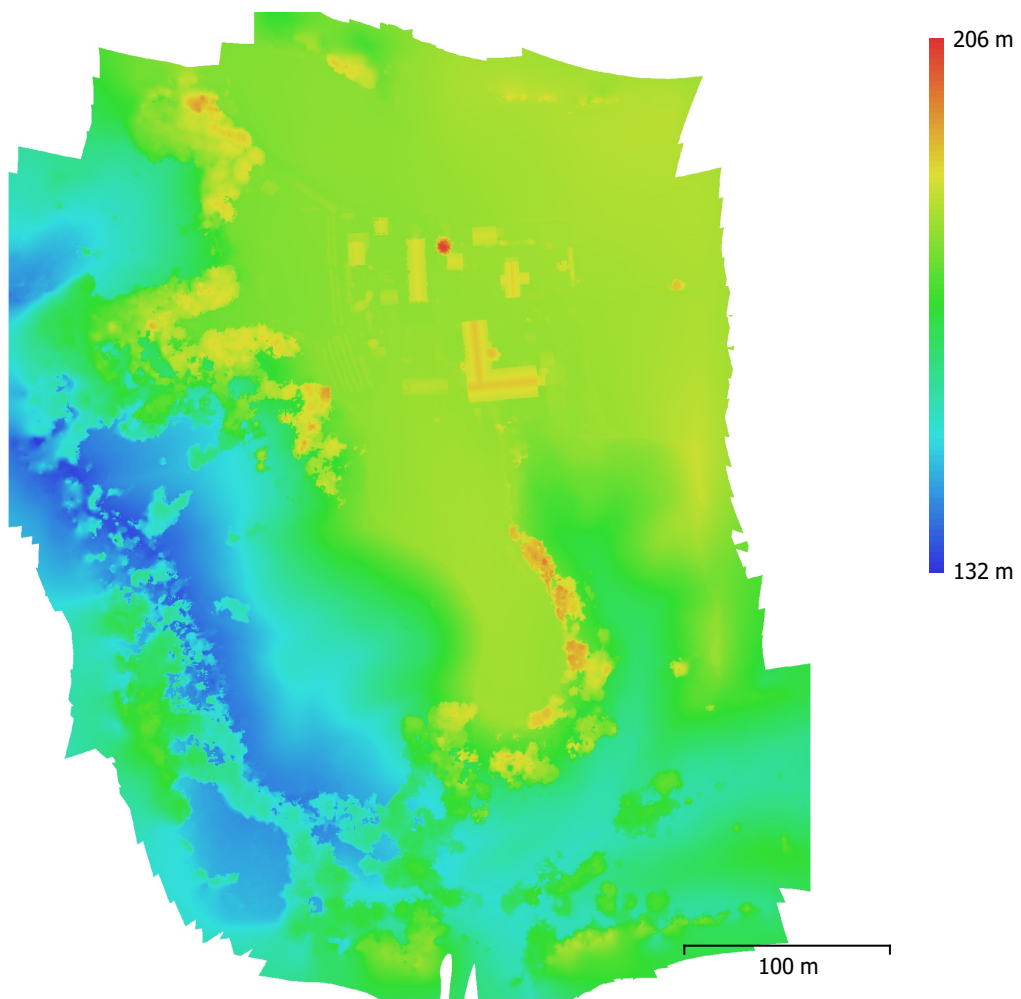


Fig. 5. Reconstructed digital elevation model.

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

Processing Parameters

General

Cameras	216
Aligned cameras	216
Markers	13
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Rotation angles	Yaw, Pitch, Roll

Tie Points

Points	210,086 of 231,334
RMS reprojection error	0.16275 (0.751545 pix)
Max reprojection error	1.09648 (51.2282 pix)
Mean key point size	3.86325 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	3.80524

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 minutes 16 seconds
Matching memory usage	548.01 MB
Alignment time	43 seconds
Alignment memory usage	215.02 MB

Optimization parameters

Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	2 seconds
Date created	2024:06:27 16:11:01
Software version	2.1.0.17532
File size	45.77 MB

Depth Maps

Count	216
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Depth maps generation parameters

Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	7 minutes 30 seconds
Memory usage	4.01 GB
Date created	2024:06:28 09:17:15
Software version	2.1.0.17532
File size	1.41 GB

DEM

Size	7,789 x 9,602
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)

Depth maps generation parameters

Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	7 minutes 30 seconds
Memory usage	4.01 GB
Reconstruction parameters	
Source data	Depth maps
Interpolation	Enabled
Processing time	5 minutes 24 seconds
Memory usage	8.44 GB
Date created	2024:06:28 09:22:40
Software version	2.1.0.17532
File size	258.61 MB
Orthomosaic	
Size	15,560 x 19,200
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	2 minutes 53 seconds
Memory usage	2.11 GB
Date created	2024:06:28 09:42:59
Software version	2.1.0.17532
File size	4.41 GB
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