Agisoft PhotoScan
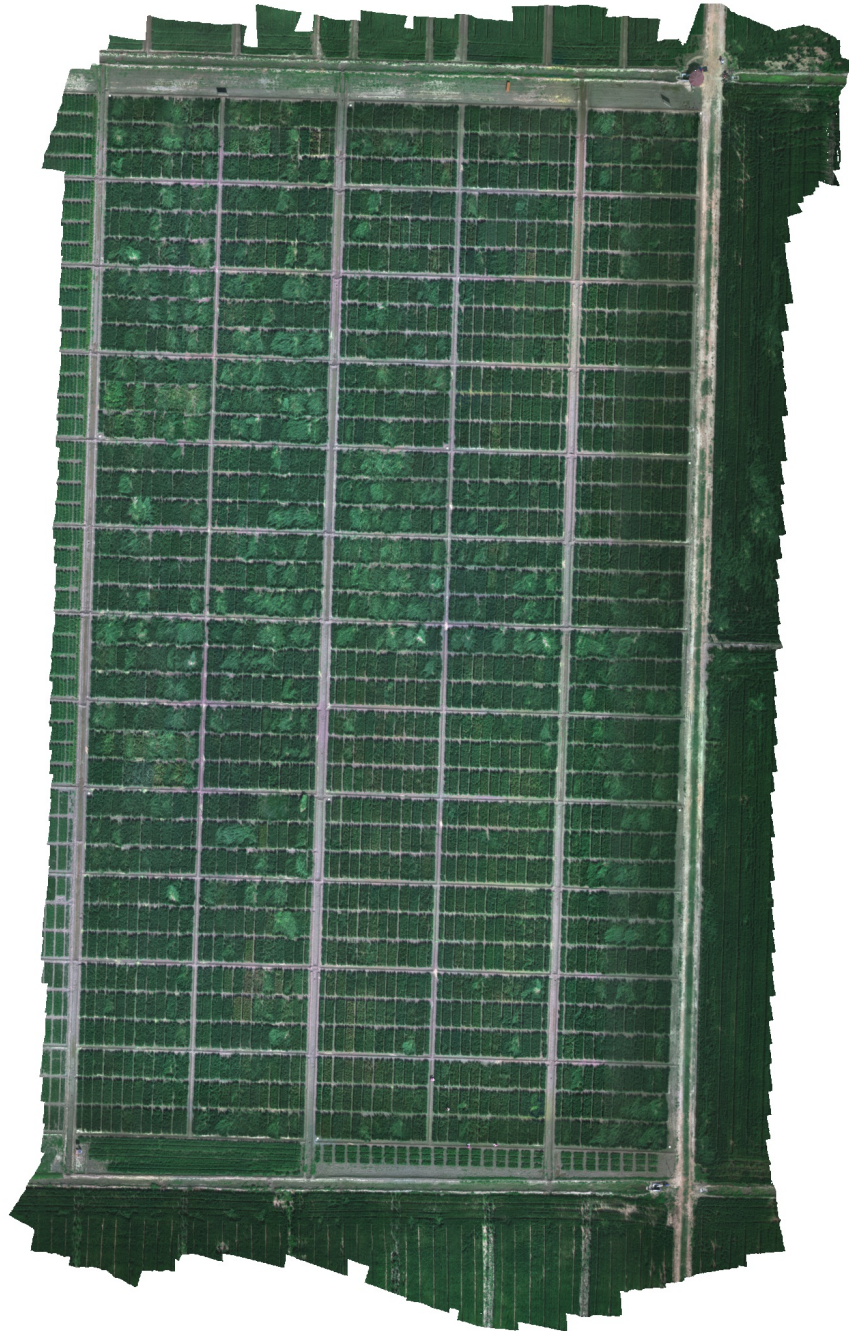
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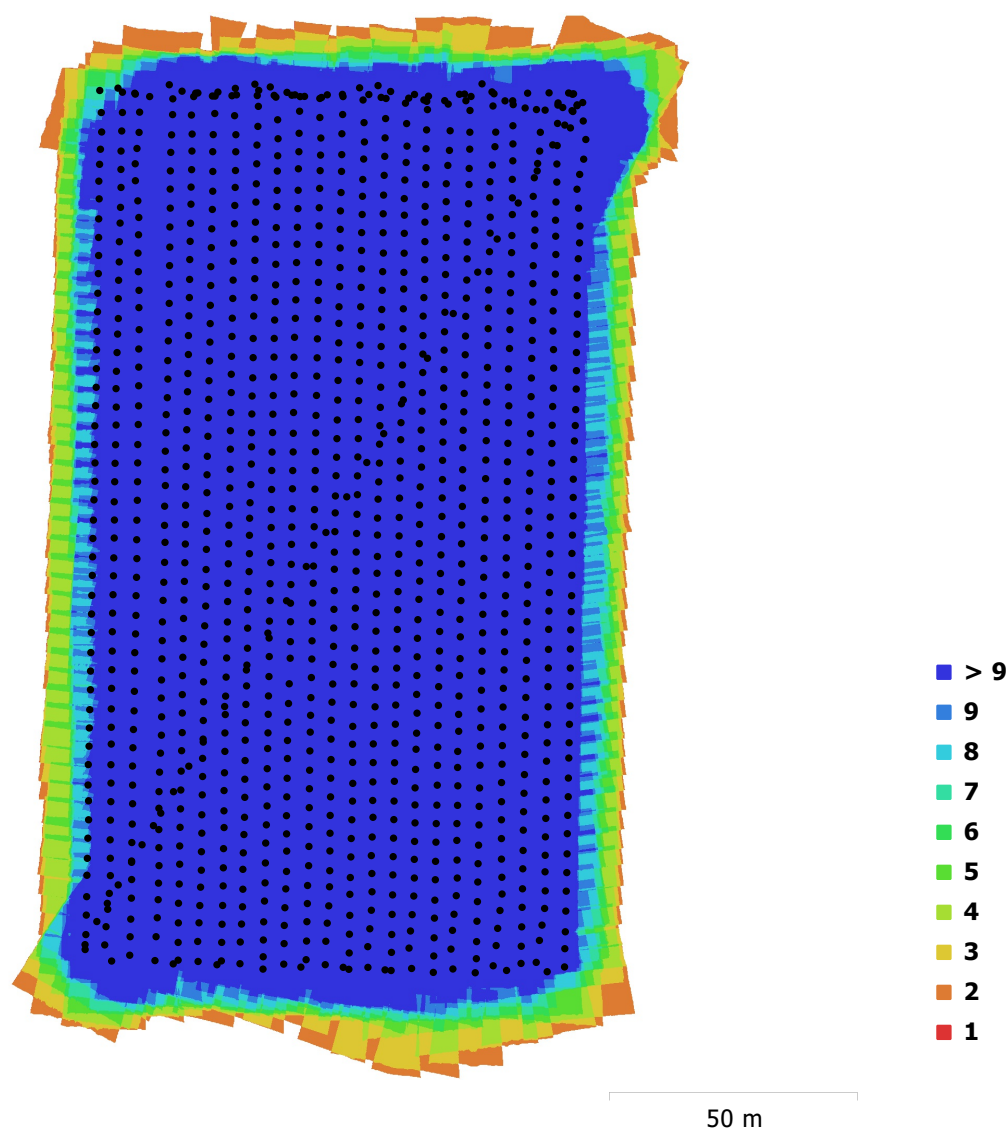# Survey Data

Fig. 1. Camera locations and image overlap.

Number of images:	1,177	Camera stations:	1,177
Flying altitude:	25.1 m	Tie points:	4,301,679
Ground resolution:	1.67 cm/pix	Projections:	15,190,714
Coverage area:	0.0242 km²	Reprojection error:	0.656 pix

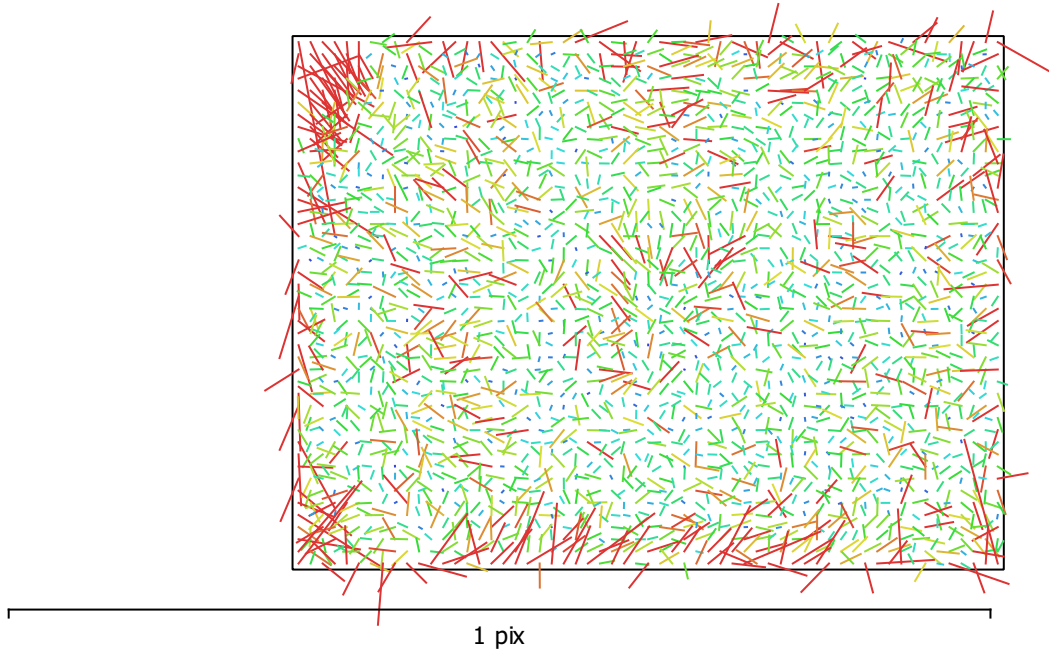| Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
RedEdge (5.5 mm)	1280 x 960	5.5 mm	3.75 x 3.75 μm	No

Table 1. Cameras.

Camera Calibration

1 pix

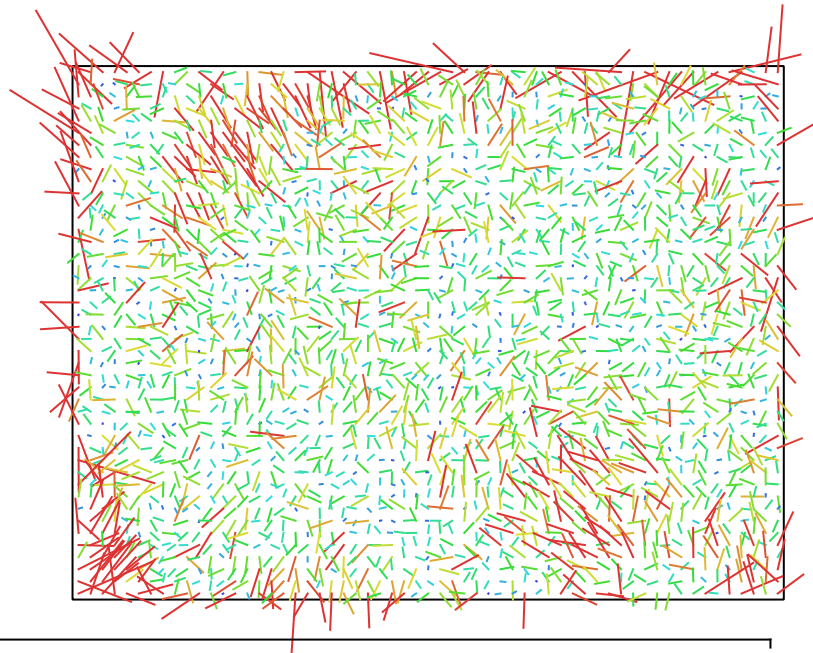Fig. 2. Image residuals for RedEdge (5.5 mm).

RedEdge (5.5 mm) (1/5)

1177 images

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	**1450**	0.052	1.00	-0.09	0.04	-0.06	0.09	-0.16	0.13	-0.10	0.02	0.01
Cx	**6.66842**	0.023		1.00	-0.03	-0.03	-0.05	0.00	0.00	-0.00	0.71	-0.02
Cy	**-0.465692**	0.02			1.00	0.09	-0.08	-0.00	-0.00	0.00	-0.01	0.52
B1	**0.0950013**	0.0048				1.00	0.05	0.02	-0.03	0.04	0.02	0.03
B2	**0.191264**	0.0047					1.00	-0.00	0.00	0.00	-0.02	0.00
K1	**-0.0979297**	0.00012						1.00	-0.97	0.92	-0.01	-0.01
K2	**0.167318**	0.0009							1.00	-0.98	0.00	0.00
K3	**-0.0653728**	0.0021								1.00	-0.00	-0.00
P1	**5.74696e-05**	3.9e-06									1.00	-0.01
P2	**-0.000344779**	3.2e-06										1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

Fig. 3. Image residuals for RedEdge (5.5 mm).

RedEdge (5.5 mm) (2/5)

1177 images

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	**1446.78**	0.052	1.00	-0.08	0.04	-0.06	0.09	-0.15	0.12	-0.09	0.02	0.02
Cx	**4.55548**	0.022		1.00	-0.03	-0.02	-0.03	0.01	-0.00	0.00	0.69	-0.02
Cy	**11.4884**	0.019			1.00	0.07	-0.08	-0.00	0.00	-0.00	-0.00	0.49
B1	**0.165729**	0.0047				1.00	0.05	0.02	-0.03	0.04	0.03	0.01
B2	**0.0901385**	0.0046					1.00	-0.00	0.00	0.00	-0.00	0.01
K1	**-0.0977619**	0.00011						1.00	-0.97	0.92	0.00	-0.00
K2	**0.147008**	0.00084							1.00	-0.98	-0.00	-0.00
K3	**-0.0351622**	0.002								1.00	0.00	0.00
P1	**0.000393969**	3.7e-06									1.00	-0.01
P2	**0.00042635**	3e-06										1.00

Table 3. Calibration coefficients and correlation matrix.

Camera Calibration
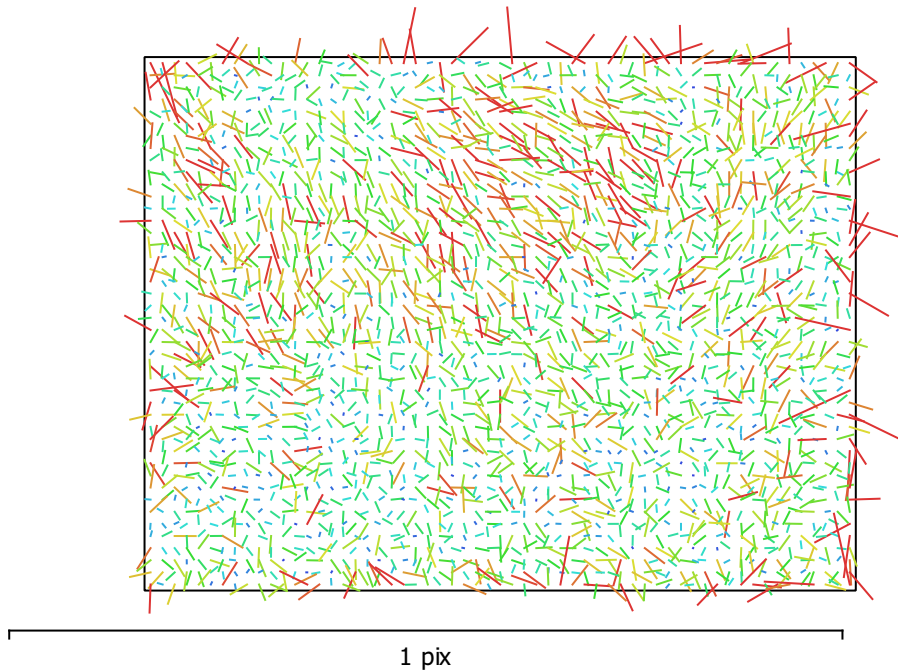

Fig. 4. Image residuals for RedEdge (5.5 mm).

RedEdge (5.5 mm) (3/5)

1177 images

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	**1447.35**	0.052	1.00	-0.08	0.06	-0.05	0.09	-0.16	0.13	-0.10	0.02	-0.00
Cx	**-5.66535**	0.023		1.00	-0.03	-0.01	-0.05	0.00	-0.00	0.00	0.71	-0.02
Cy	**16.9382**	0.02			1.00	0.09	-0.07	-0.01	0.01	-0.01	-0.01	0.52
B1	**0.174799**	0.0048				1.00	0.05	0.01	-0.03	0.04	0.03	0.01
B2	**-0.139858**	0.0047					1.00	-0.00	-0.00	0.00	-0.01	0.01
K1	**-0.0993174**	0.00012						1.00	-0.97	0.92	-0.00	-0.00
K2	**0.150049**	0.00092							1.00	-0.98	0.00	0.00
K3	**-0.0403514**	0.0021								1.00	-0.00	0.00
P1	**0.000556644**	3.9e-06									1.00	-0.01
P2	**-0.000770575**	3.2e-06										1.00

Table 4. Calibration coefficients and correlation matrix.

Camera Calibration
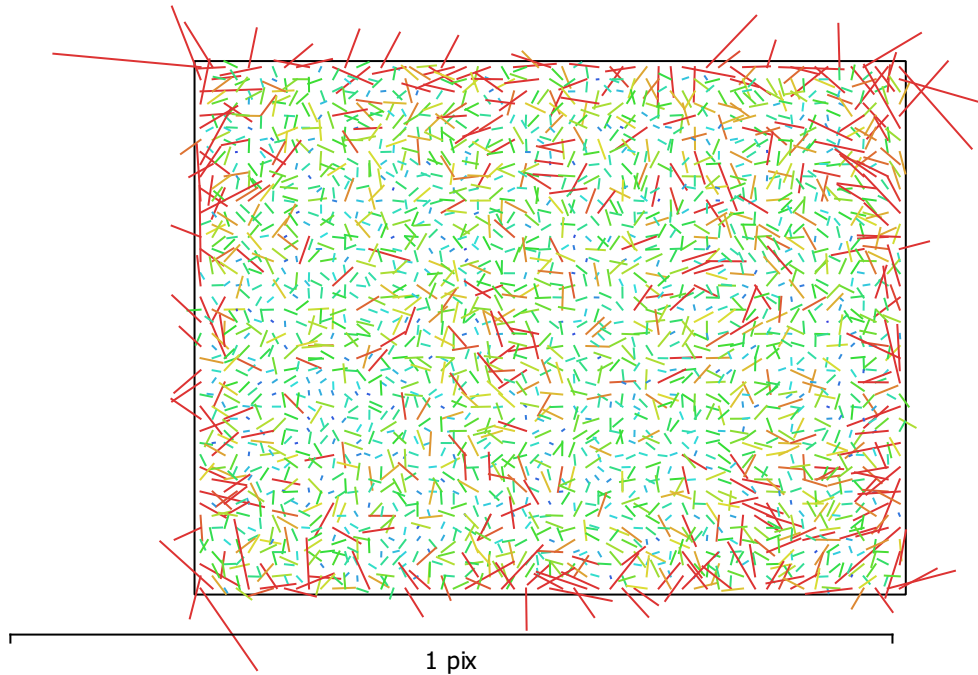

Fig. 5. Image residuals for RedEdge (5.5 mm).
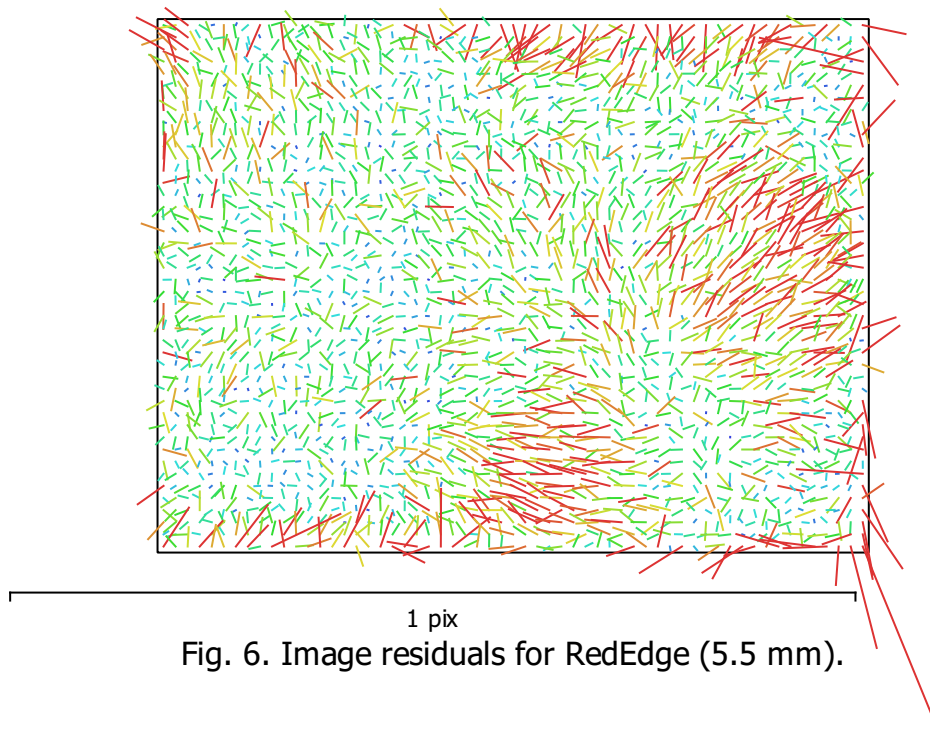
RedEdge (5.5 mm) (4/5)

1177 images

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	**1459**	0.053	1.00	-0.08	0.07	-0.06	0.08	-0.16	0.12	-0.10	0.01	0.00
Cx	**21.7893**	0.025		1.00	-0.03	-0.02	-0.05	-0.01	0.01	-0.02	0.73	-0.02
Cy	**3.92069**	0.022			1.00	0.09	-0.06	-0.00	-0.00	0.00	-0.01	0.54
B1	**0.130622**	0.0051				1.00	0.04	0.02	-0.04	0.05	0.03	0.02
B2	**-0.192867**	0.005					1.00	-0.00	-0.00	0.01	-0.02	0.03
K1	**-0.0970996**	0.00013						1.00	-0.97	0.92	-0.01	-0.01
K2	**0.111917**	0.001							1.00	-0.98	-0.00	0.00
K3	**0.0280372**	0.0025								1.00	0.01	-0.00
P1	**-0.000439668**	4.4e-06									1.00	-0.01
P2	**-0.000168429**	3.6e-06										1.00

Table 5. Calibration coefficients and correlation matrix.

Camera Calibration

1 pix

Fig. 6. Image residuals for RedEdge (5.5 mm).

RedEdge (5.5 mm) (5/5)

1177 images

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	**1452.05**	0.052	1.00	-0.09	0.07	-0.06	0.09	-0.16	0.13	-0.10	0.02	0.01
Cx	**-15.7083**	0.022		1.00	-0.04	-0.03	-0.04	0.01	-0.01	0.01	0.69	-0.02
Cy	**12.4982**	0.02			1.00	0.08	-0.08	-0.01	0.01	-0.01	-0.01	0.49
B1	**0.445639**	0.0048				1.00	0.05	0.01	-0.03	0.04	0.01	0.00
B2	**0.243591**	0.0047					1.00	-0.00	-0.00	0.00	-0.00	-0.00
K1	**-0.10157**	0.00011						1.00	-0.97	0.92	-0.00	-0.00
K2	**0.145402**	0.00087							1.00	-0.98	0.00	-0.00
K3	**-0.0217452**	0.002								1.00	-0.00	0.00
P1	**8.1346e-06**	3.7e-06									1.00	-0.02
P2	**0.00010559**	3.1e-06										1.00

Table 6. Calibration coefficients and correlation matrix.
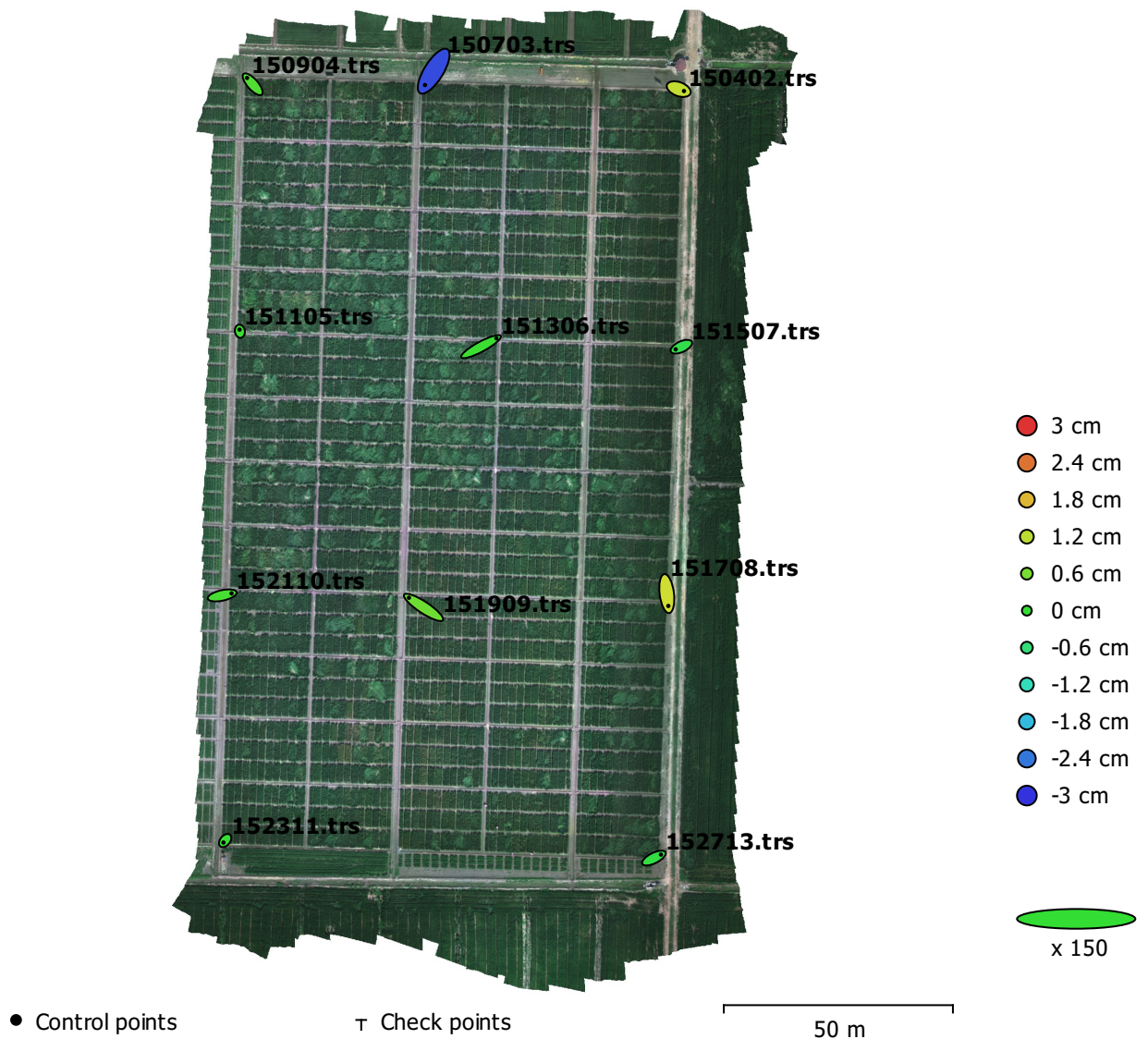
Ground Control Points

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)
11	2.41565	2.11296	1.02804	3.20935	3.36999

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)
150402.trs	1.52033	-0.561333	1.2398	2.04049	0.236 (4)
150703.trs	-2.51665	-4.02946	-2.79621	5.51261	0.183 (3)
150904.trs	-1.62903	1.84015	0.247828	2.47009	0.172 (4)
151105.trs	-0.0838398	0.47541	0.0413966	0.484518	0.151 (3)
151306.trs	4.48279	2.41547	0.0397514	5.0923	0.285 (3)
151507.trs	-1.65379	-0.762801	-0.257987	1.83942	0.102 (4)
151708.trs	0.449828	-3.59938	1.35596	3.87253	0.777 (3)
151909.trs	-4.251	2.80351	0.491152	5.11585	0.123 (4)
152110.trs	2.72279	0.596864	0.18494	2.79357	0.048 (3)
152311.trs	-0.488636	-0.579586	0.0193832	0.758328	0.121 (4)
152713.trs	2.03153	1.01135	-0.154679	2.27461	0.127 (3)
Total	**2.41565**	**2.11296**	**1.02804**	**3.36999**	**0.271**

Table 8. Control points.

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

Digital Elevation Model
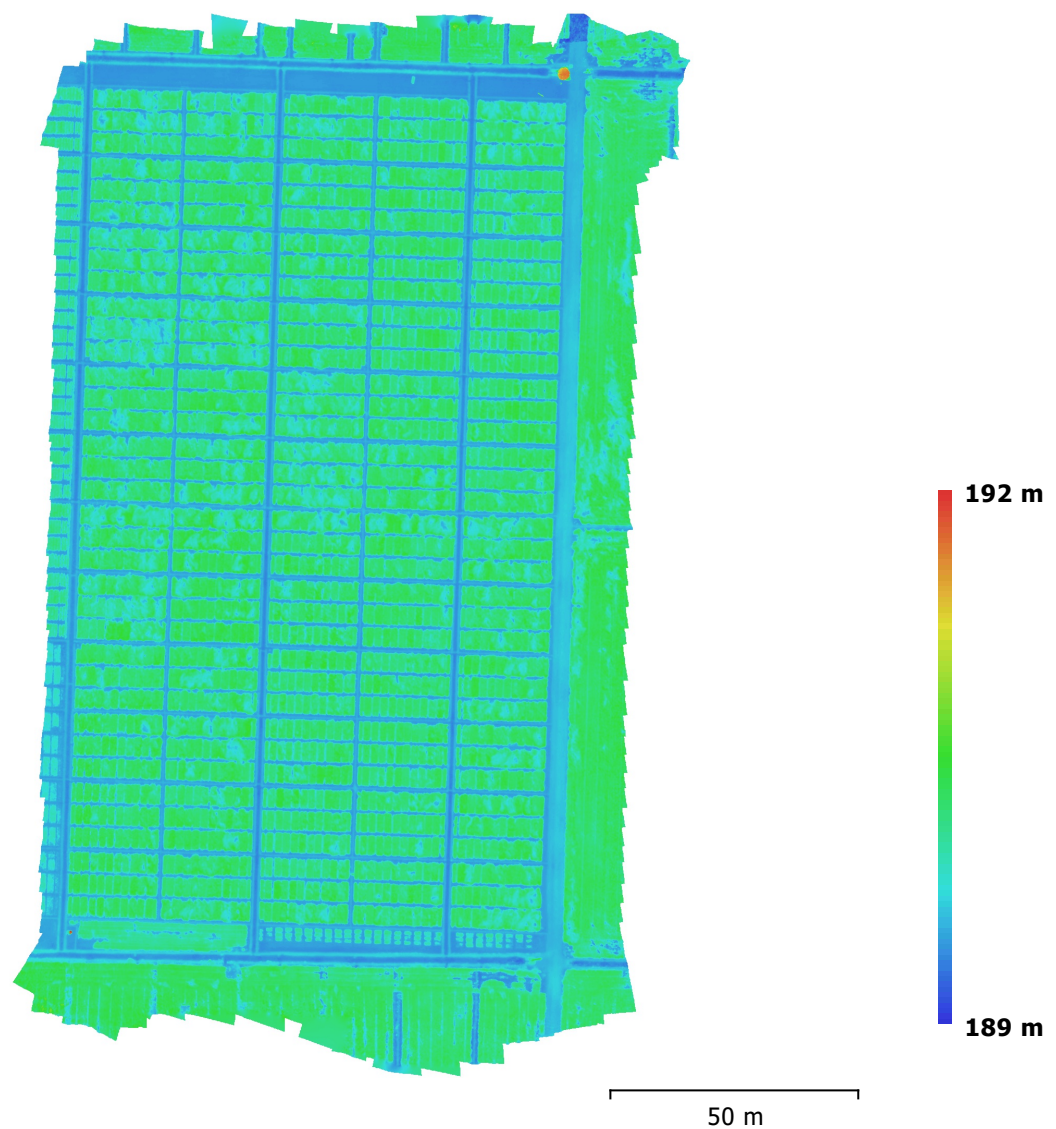
Fig. 8. Reconstructed digital elevation model.

Resolution:	3.35 cm/pix
Point density:	893 points/m²

Processing Parameters

General

Cameras	1177
Aligned cameras	1177
Markers	11
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	4,301,679 of 4,795,978
RMS reprojection error	0.159333 (0.655961 pix)
Max reprojection error	0.646231 (21.7027 pix)
Mean key point size	3.36955 pix
Effective overlap	4.73608

Alignment parameters

Accuracy	High
Generic preselection	No
Reference preselection	Yes
Key point limit	10,000
Tie point limit	0
Adaptive camera model fitting	Yes
Matching time	1 hours 1 minutes
Alignment time	50 minutes 40 seconds

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k3, p1, p2
Fit rolling shutter	No
Optimization time	1 minutes 59 seconds

Dense Point Cloud

Points	31,241,997

Reconstruction parameters

Quality	High
Depth filtering	Moderate
Depth maps generation time	34 minutes 54 seconds
Dense cloud generation time	25 minutes 24 seconds

DEM

Size	4,206 x 6,449
Coordinate system	WGS 84 / UTM zone 43N (EPSG::32643)

Reconstruction parameters

Source data	Dense cloud
Interpolation	Enabled
Processing time	56 seconds

Orthomosaic

Size	8,105 x 12,808
Coordinate system	WGS 84 / UTM zone 43N (EPSG::32643)
Channels	5, uint16

Reconstruction parameters

Blending mode	Mosaic
Surface	DEM
Enable color correction	No
Enable hole filling	No
Processing time	5 minutes 50 seconds

Software

Version	1.3.1 build 4030
Platform	Windows 64