

Multitemporal D9

2016/10/04 - Canon S100, 50m

30 December 2017



Survey Data

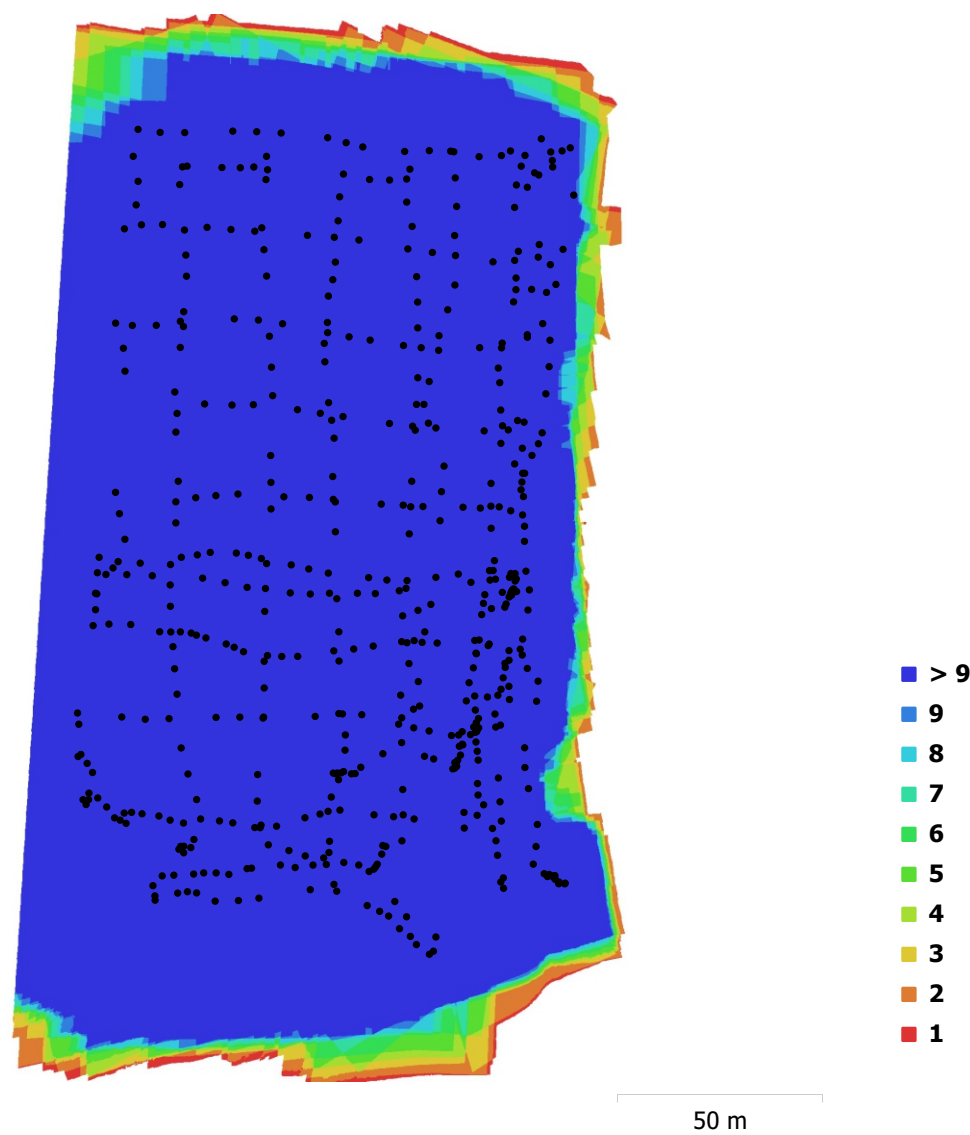


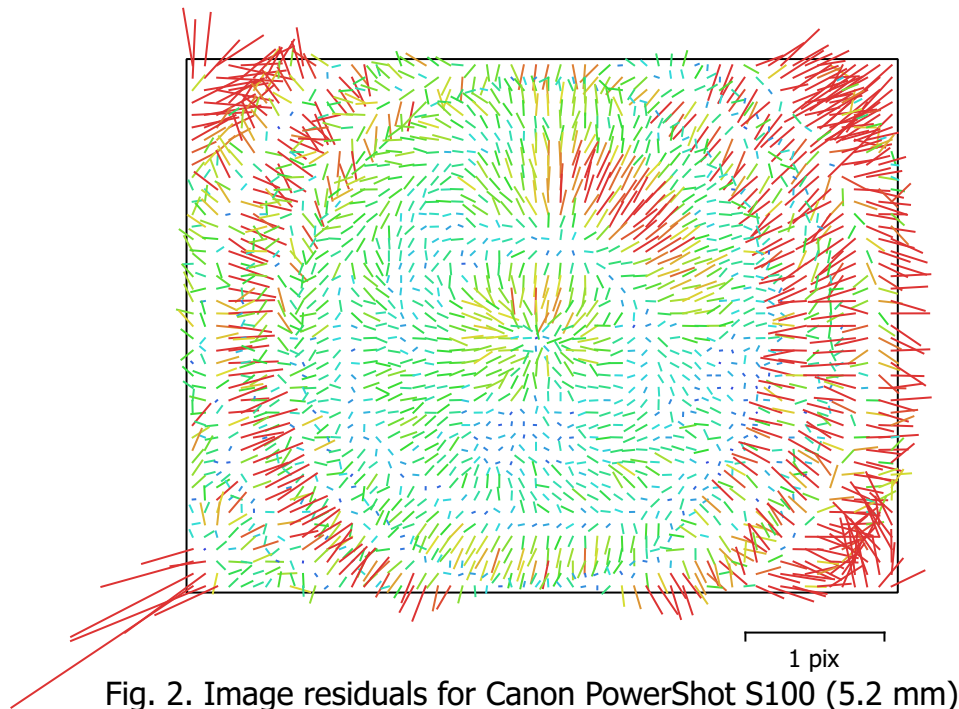
Fig. 1. Camera locations and image overlap.

Number of images:	536	Camera stations:	532
Flying altitude:	41.8 m	Tie points:	152,325
Ground resolution:	1.34 cm/pix	Projections:	1,223,581
Coverage area:	0.0338 km²	Reprojection error:	0.889 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Canon PowerShot S100 (5.2 mm)	4000 x 3000	5.2 mm	1.86 x 1.86 µm	Yes

Table 1. Cameras.

Camera Calibration



Canon PowerShot S100 (5.2 mm)

536 images, precalibrated

Type	Resolution	Focal Length	Pixel Size
Frame	4000 x 3000	5.2 mm	1.86 x 1.86 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2	P3	P4
F	2927.14	0.096	1.00	-0.20	-0.42	0.06	-0.10	-0.14	0.10	-0.09	0.09	0.06	-0.02	0.01	-0.01
Cx	43.3239	0.018		1.00	0.01	0.17	-0.00	-0.00	0.02	-0.02	0.02	0.51	-0.24	-0.22	0.18
Cy	-42.9682	0.017			1.00	-0.02	0.18	0.02	-0.01	0.01	-0.01	-0.21	0.47	0.16	-0.13
B1	0.183198	0.0035				1.00	-0.03	0.03	-0.03	0.02	-0.02	0.09	0.03	-0.02	0.02
B2	-0.819791	0.0035					1.00	0.00	0.00	-0.00	0.00	-0.10	0.09	0.05	-0.05
K1	-0.04648	5.3e-05						1.00	-0.97	0.92	-0.87	-0.05	0.04	0.08	-0.08
K2	0.0334816	0.00028							1.00	-0.99	0.95	0.07	-0.07	-0.11	0.12
K3	-0.0414406	0.00058								1.00	-0.99	-0.09	0.10	0.14	-0.15
K4	0.0320038	0.0004									1.00	0.12	-0.12	-0.18	0.20
P1	0.00434703	3.2e-06										1.00	-0.76	-0.84	0.75
P2	-0.00363757	2.7e-06											1.00	0.81	-0.73
P3	0.168246	0.0025												1.00	-0.97
P4	-0.139223	0.0029													1.00

Table 2. Calibration coefficients and correlation matrix.

Ground Control Points

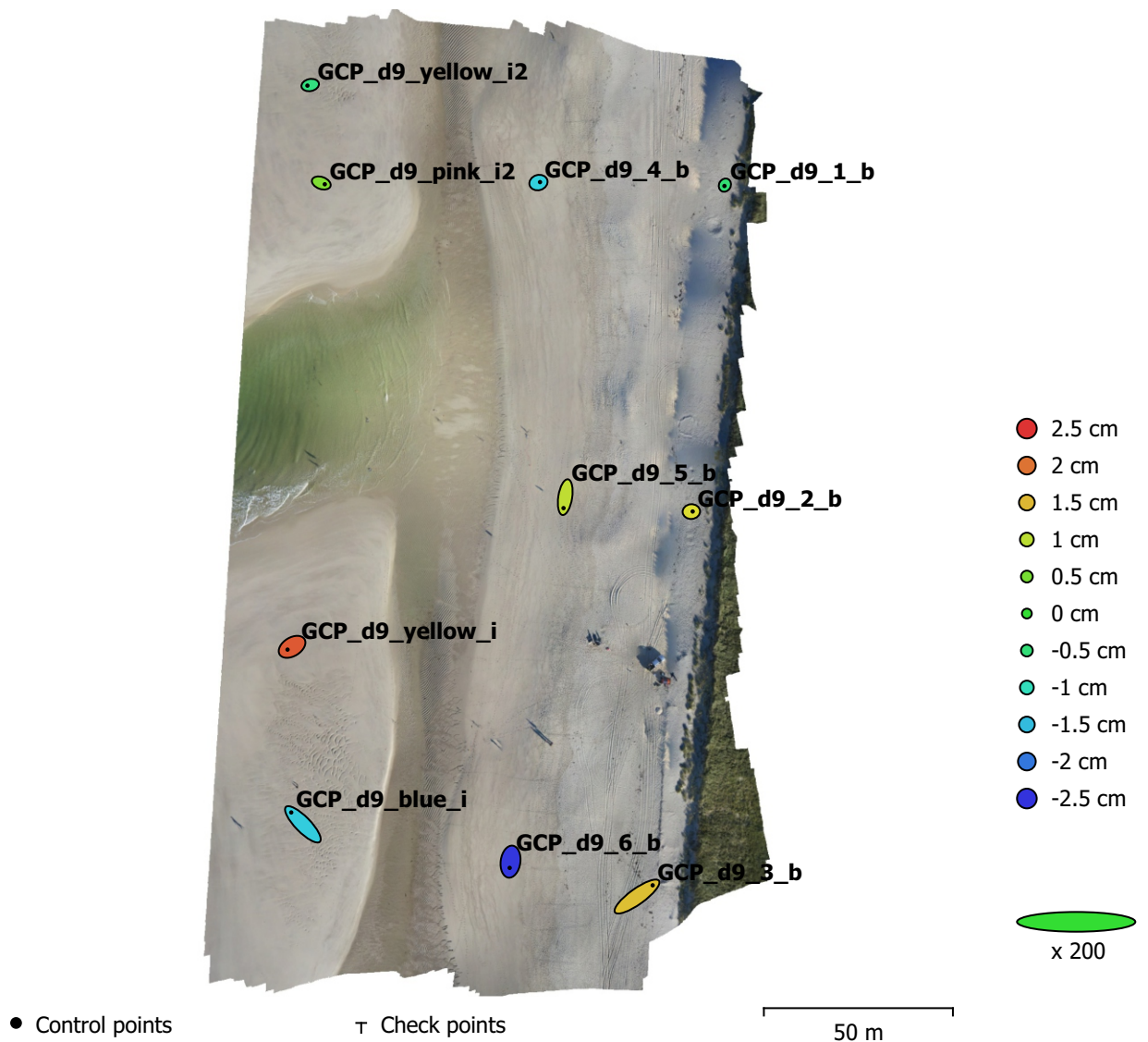


Fig. 3. GCP locations and error estimates.

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)
10	1.73347	1.75015	1.42522	2.46332	2.84591

Table 3. Control points RMSE.

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

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP_d9_4_b	0.410404	0.12084	-1.3577	1.42351	0.432 (40)
GCP_d9_2_b	0.353002	0.0286093	1.24143	1.29096	0.444 (29)
GCP_d9_5_b	-0.447223	-2.90209	1.02037	3.10859	0.494 (75)
GCP_d9_1_b	-0.120319	-0.22287	-0.479533	0.542309	0.446 (14)
GCP_d9_pink_i2	0.928673	-0.33071	0.561727	1.13461	0.238 (28)
GCP_d9_yellow_i	-1.20132	-0.741935	2.19577	2.61056	0.331 (45)
GCP_d9_blue_i	-3.07683	3.14231	-1.38607	4.6111	0.369 (47)
GCP_d9_6_b	-0.223269	-1.64948	-2.48905	2.99432	0.472 (46)
GCP_d9_3_b	4.14579	2.97772	1.44462	5.30484	0.446 (17)
GCP_d9_yellow_i2	-0.729271	-0.146859	-0.562574	0.932681	0.257 (7)
Total	1.73347	1.75015	1.42522	2.84591	0.420

Table 4. Control points.

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

Digital Elevation Model

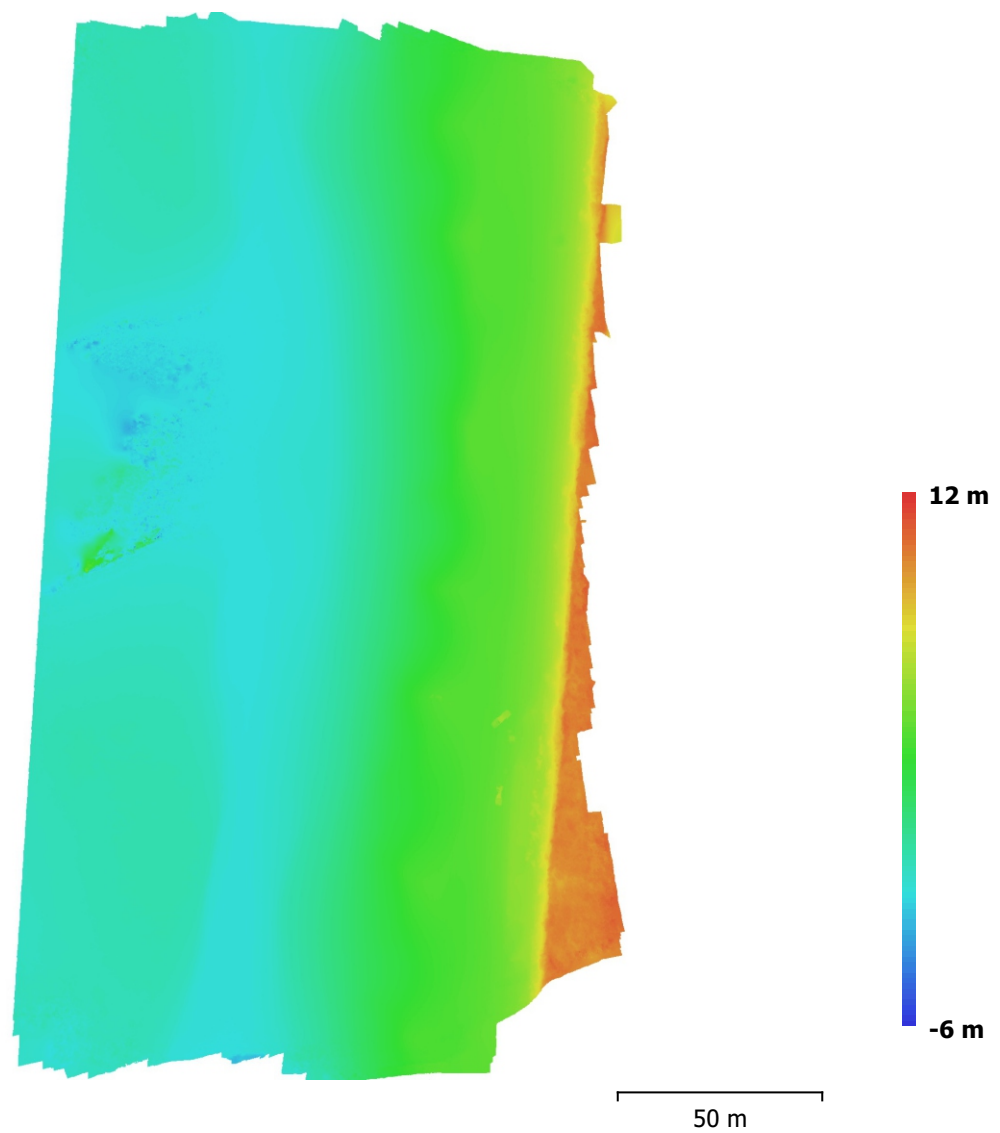


Fig. 4. Reconstructed digital elevation model.

Resolution: 2.67 cm/pix
Point density: 14 points/cm²

Processing Parameters

General

Cameras	536
Aligned cameras	532
Markers	10
Coordinate system	ETRS89 / UTM zone 32N (EPSG::25832)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	152,325 of 290,507
RMS reprojection error	0.239802 (0.888622 pix)
Max reprojection error	0.649995 (28.1933 pix)
Mean key point size	3.68802 pix
Effective overlap	9.60971

Alignment parameters

Accuracy	Highest
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Tie point limit	4,000
Adaptive camera model fitting	Yes
Matching time	15 minutes 45 seconds
Alignment time	8 minutes 18 seconds

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1-p4
Fit rolling shutter	No
Optimization time	55 seconds

Depth Maps

Count	519
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Reconstruction parameters

Quality	High
Filtering mode	Aggressive
Processing time	1 hours 25 minutes

Dense Point Cloud

Points	52,743,396
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Reconstruction parameters

Quality	High
Depth filtering	Aggressive
Depth maps generation time	1 hours 25 minutes
Dense cloud generation time	4 hours 42 minutes

DEM

Size	6,769 x 11,807
Coordinate system	ETRS89 / UTM zone 32N (EPSG::25832)

Reconstruction parameters

Source data	Dense cloud
Interpolation	Enabled
Processing time	2 minutes 21 seconds

Orthomosaic

Size	11,413 x 19,535
Coordinate system	ETRS89 / UTM zone 32N (EPSG::25832)
Channels	3, uint8

Reconstruction parameters

Blending mode	Mosaic
Surface	DEM
Enable color correction	No
Enable hole filling	Yes
Processing time	6 minutes 20 seconds

Software

Version
Platform

1.3.4 build 5067
Windows 64