

CARMA 20170711_GFBay

Processing Report

24 March 2020



Survey Data

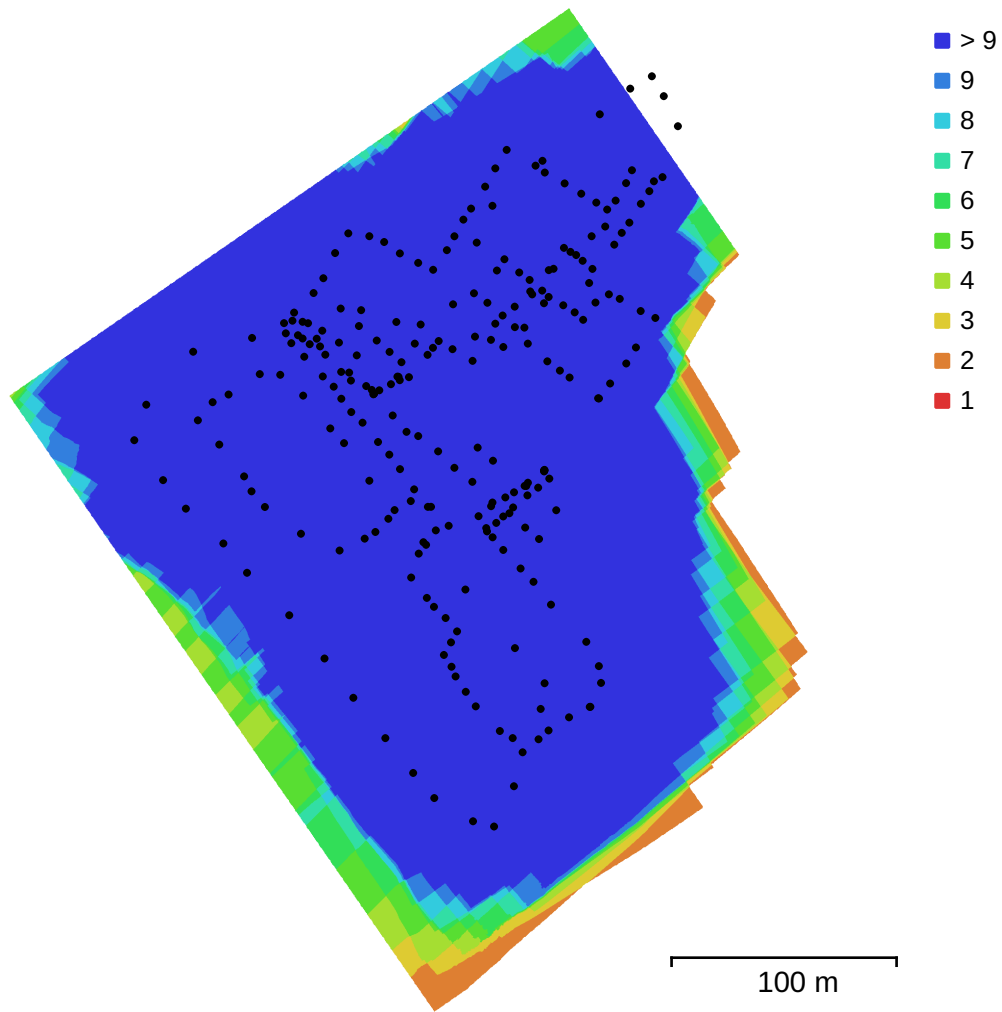


Fig. 1. Camera locations and image overlap.

Number of images:	251	Camera stations:	249
Flying altitude:	73.6 m	Tie points:	128,388
Ground resolution:	2.51 cm/pix	Projections:	437,505
Coverage area:	0.0858 km ²	Reprojection error:	0.323 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC300C (3.61mm)	4000 x 3000	3.61 mm	1.56 x 1.56 μm	No

Table 1. Cameras.

Camera Calibration

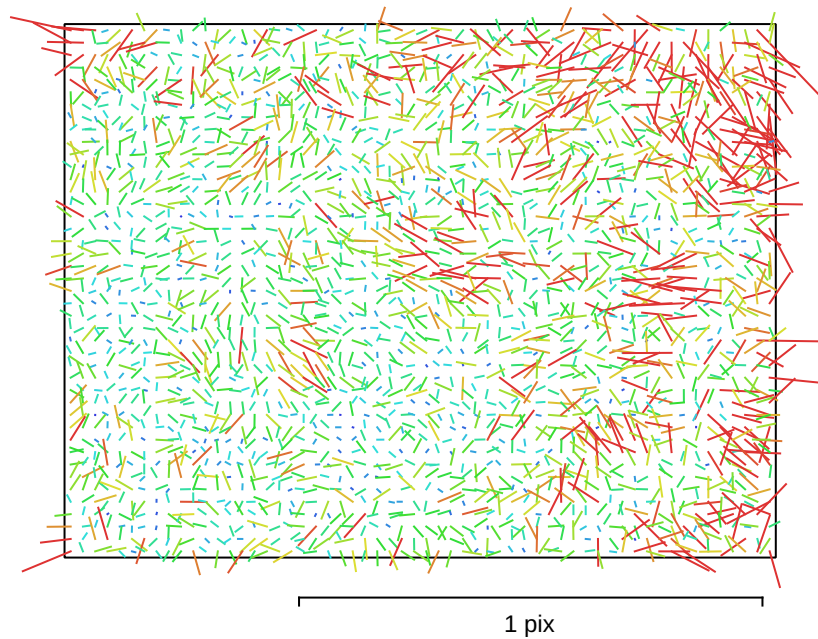


Fig. 2. Image residuals for FC300C (3.61mm).

FC300C (3.61mm)

251 images

Type	Resolution	Focal Length	Pixel Size
Frame	4000 x 3000	3.61 mm	1.56 x 1.56 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2	P3	P4
F	2718.8	0.72	1.00	0.43	-0.25	-0.31	-0.13	-0.69	0.57	-0.32	0.30	-0.44	0.11	-0.43	0.28
Cx	17.175	0.21		1.00	-0.59	-0.34	0.31	-0.30	0.23	-0.10	0.08	-0.33	0.19	-0.73	0.30
Cy	14.5834	0.085			1.00	0.23	-0.13	0.27	-0.14	0.07	-0.05	0.29	0.17	0.47	-0.21
B1	-0.221253	0.042				1.00	-0.03	0.26	-0.19	0.11	-0.10	0.51	0.18	0.38	-0.28
B2	-3.74188	0.041					1.00	0.08	-0.09	0.06	-0.07	-0.22	0.45	-0.28	0.15
K1	-0.147783	9.8e-05						1.00	-0.88	0.75	-0.69	0.42	-0.10	0.36	-0.29
K2	0.165323	0.0003							1.00	-0.95	0.91	-0.28	0.06	-0.29	0.24
K3	-0.0897669	0.00044								1.00	-0.99	0.16	-0.01	0.16	-0.15
K4	0.0352029	0.00025									1.00	-0.13	-0.00	-0.10	0.09
P1	-0.000437742	1.5e-05										1.00	-0.18	0.68	-0.68
P2	0.00012119	1e-05											1.00	-0.26	0.22
P3	0.274507	0.052												1.00	-0.85
P4	-0.12442	0.032													1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

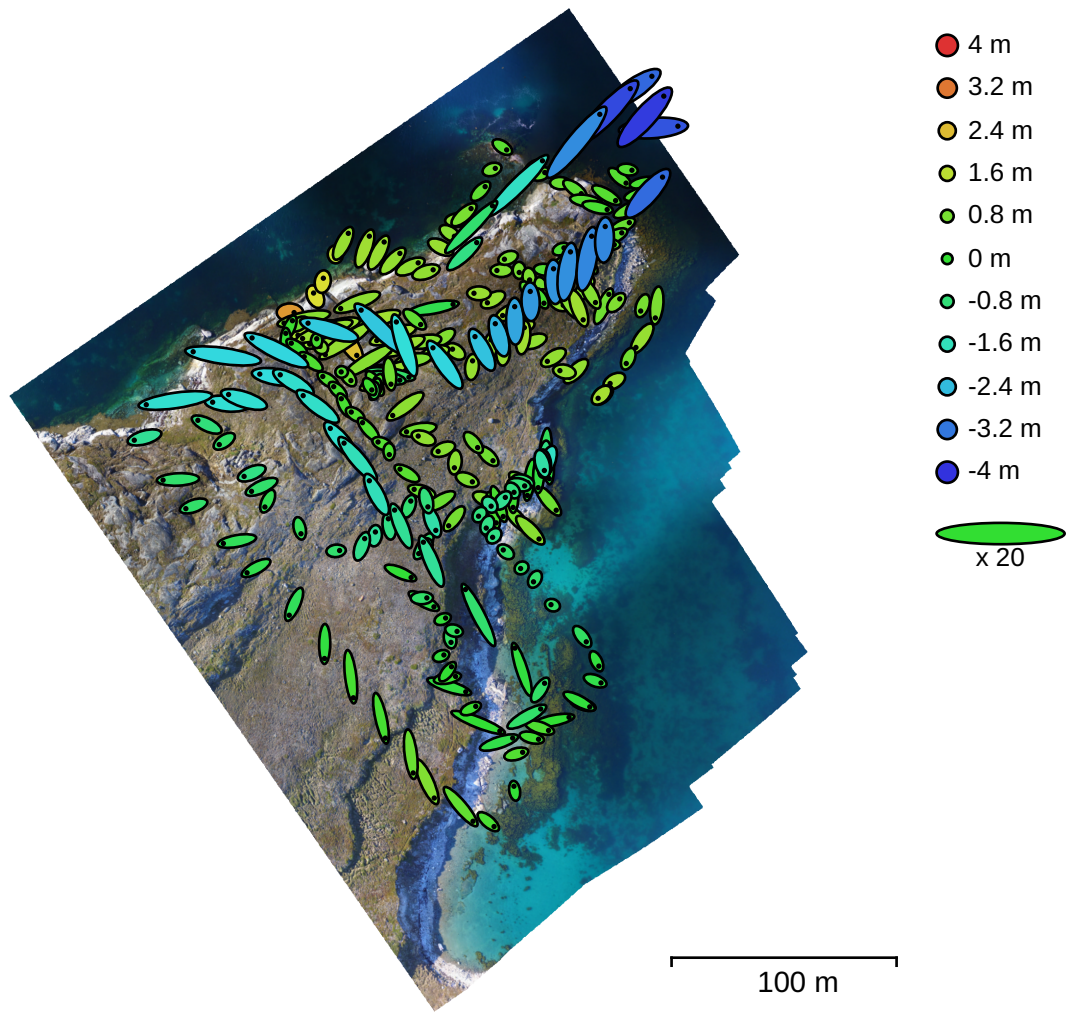


Fig. 3. Camera locations and error estimates.

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 (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.409683	0.381459	1.20009	0.559778	1.32422

Table 3. Average camera location error.

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

Digital Elevation Model

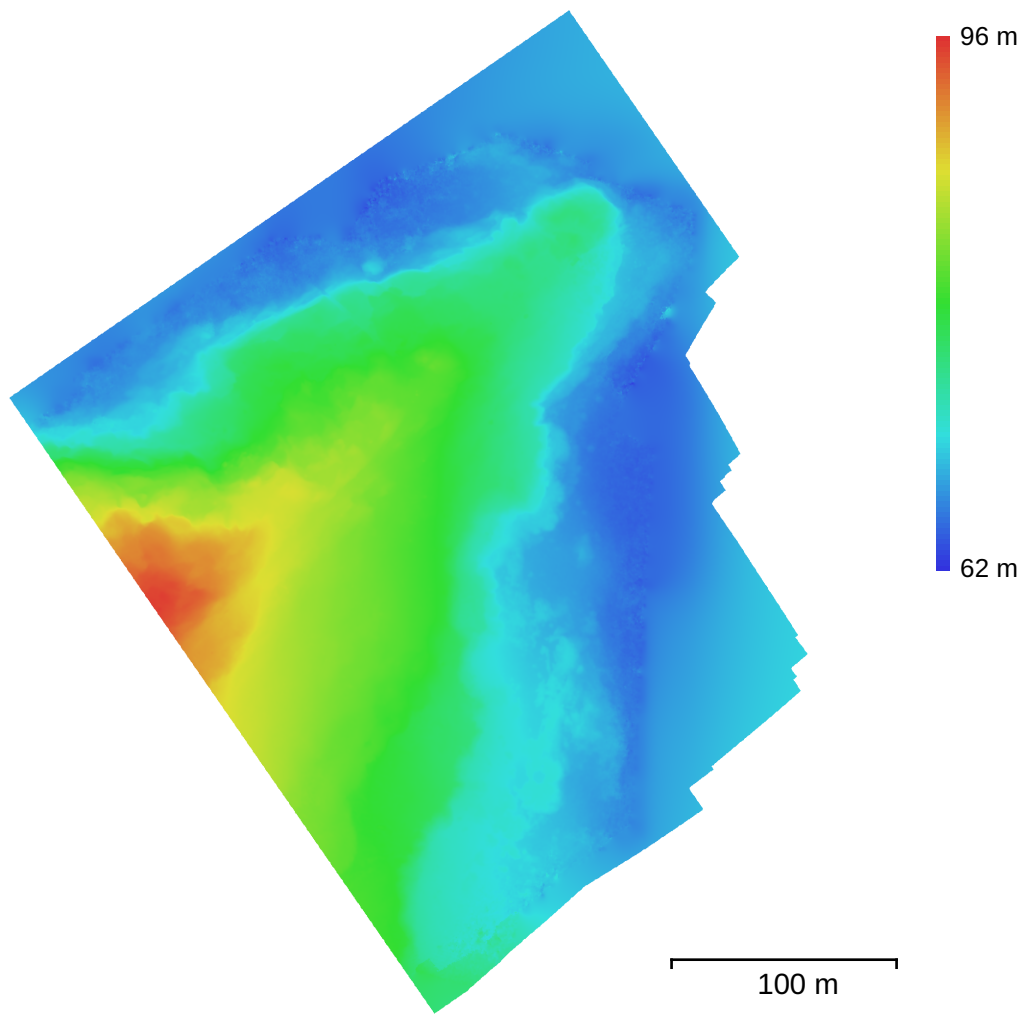


Fig. 4. Reconstructed digital elevation model.

Resolution: 10.1 cm/pix
Point density: 98.8 points/m²

Processing Parameters

General

Cameras	251
Aligned cameras	249
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	128,388 of 1,096,133
RMS reprojection error	0.168708 (0.322525 pix)
Max reprojection error	0.399949 (1.05358 pix)
Mean key point size	1.90694 pix
Point colors	3 bands, uint8
Key points	Yes
Average tie point multiplicity	6.8372

Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Yes
Key point limit	60,000
Tie point limit	0
Adaptive camera model fitting	No
Matching time	19 minutes 39 seconds
Alignment time	13 minutes 9 seconds

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1-p4
Adaptive camera model fitting	No
Optimization time	4 seconds

Dense Point Cloud

Points	8,547,491
Point colors	3 bands, uint8

Reconstruction parameters

Quality	Medium
Depth filtering	Aggressive
Depth maps generation time	9 minutes 23 seconds
Dense cloud generation time	7 minutes 15 seconds

DEM

Size	4,359 x 4,436
Coordinate system	WGS 84 (EPSG::4326)

Reconstruction parameters

Source data	Dense cloud
Interpolation	Enabled
Processing time	7 seconds

Orthomosaic

Size	14,120 x 17,724
Coordinate system	WGS 84 (EPSG::4326)
Colors	3 bands, uint8

Reconstruction parameters

Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Processing time	3 minutes 12 seconds

Software

Version	1.4.4 build 6848
Platform	Linux 64