

HIGH

**Processing Report
22 June 2022**



Survey Data

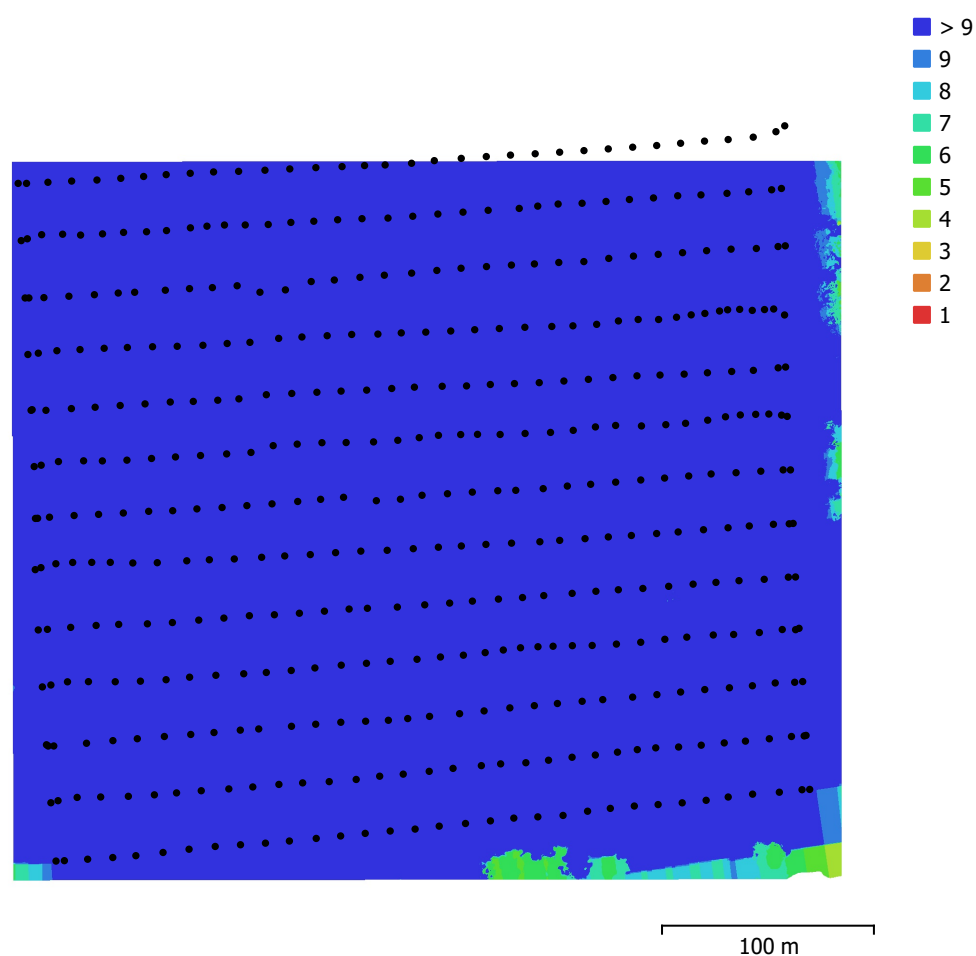


Fig. 1. Camera locations and image overlap.

Number of images:	453	Camera stations:	453
Flying altitude:	46.4 m	Tie points:	531,867
Ground resolution:	2.46 cm/pix	Projections:	1,240,657
Coverage area:	0.132 km ²	Reprojection error:	0.862 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC330 (3.61mm)	4000 x 3000	3.61 mm	1.56 x 1.56 μm	No

Table 1. Cameras.

Camera Calibration

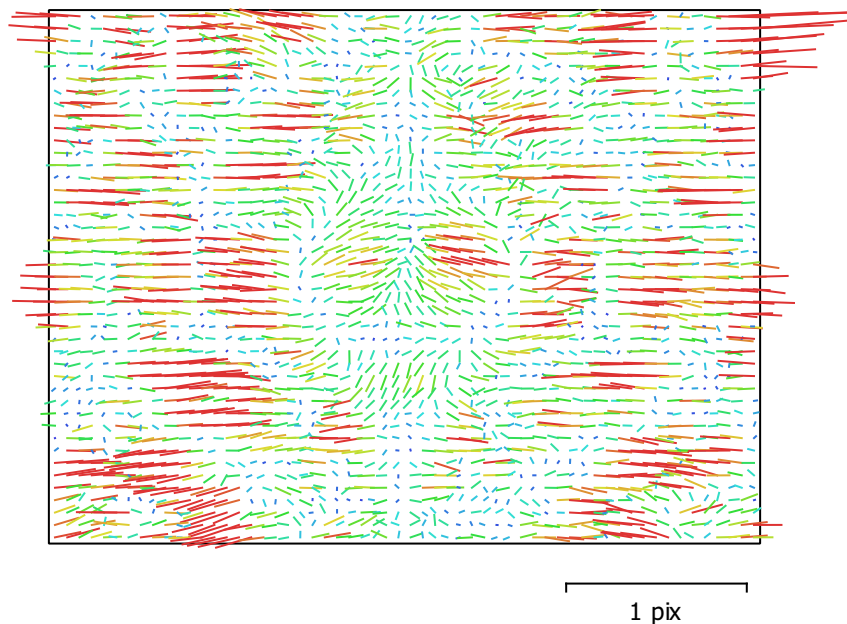


Fig. 2. Image residuals for FC330 (3.61mm).

FC330 (3.61mm)

453 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	P1	P2
F	1665.61	1.9	1.00	-0.11	-0.06	-0.08	-0.17	0.01	-0.28	0.20	-0.13	-0.43
Cx	-134.696	0.99		1.00	-0.04	0.01	-0.10	-0.01	0.09	-0.09	-0.17	0.05
Cy	-67.5896	1			1.00	0.18	-0.05	-0.07	-0.00	-0.01	-0.06	0.04
B1	0.780848	0.092				1.00	-0.04	-0.01	0.01	-0.01	-0.44	0.18
B2	-17.3961	0.11					1.00	0.05	0.06	-0.04	0.20	0.46
K1	0.0023144	3e-05						1.00	-0.58	0.54	0.15	-0.05
K2	-0.00114502	1.8e-05							1.00	-0.97	0.05	0.13
K3	0.000144319	5e-06								1.00	-0.05	-0.09
P1	-0.00119418	1.2e-05									1.00	0.01
P2	-0.00485219	1.6e-05										1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

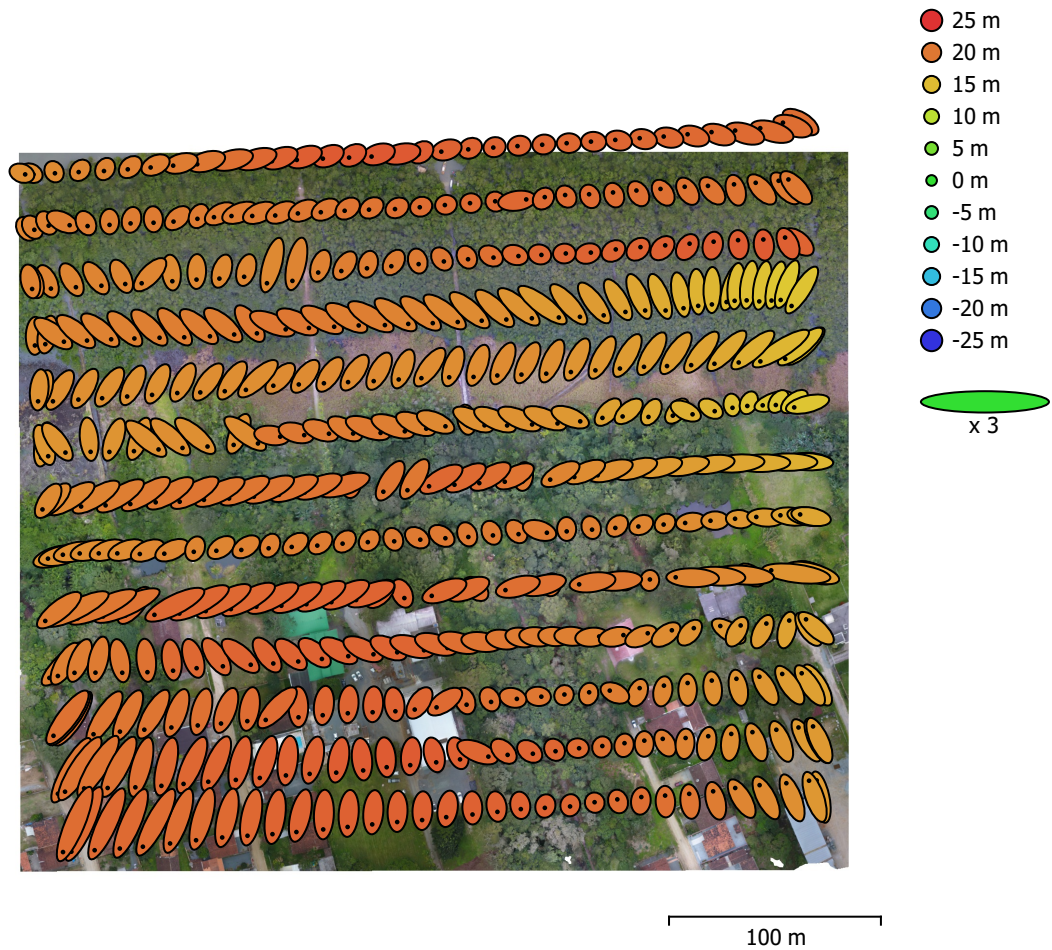


Fig. 3. Camera locations and error estimates.

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)
2.66302	2.84093	19.4685	3.89391	19.8541

Table 3. Average camera location error.

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

Ground Control Points

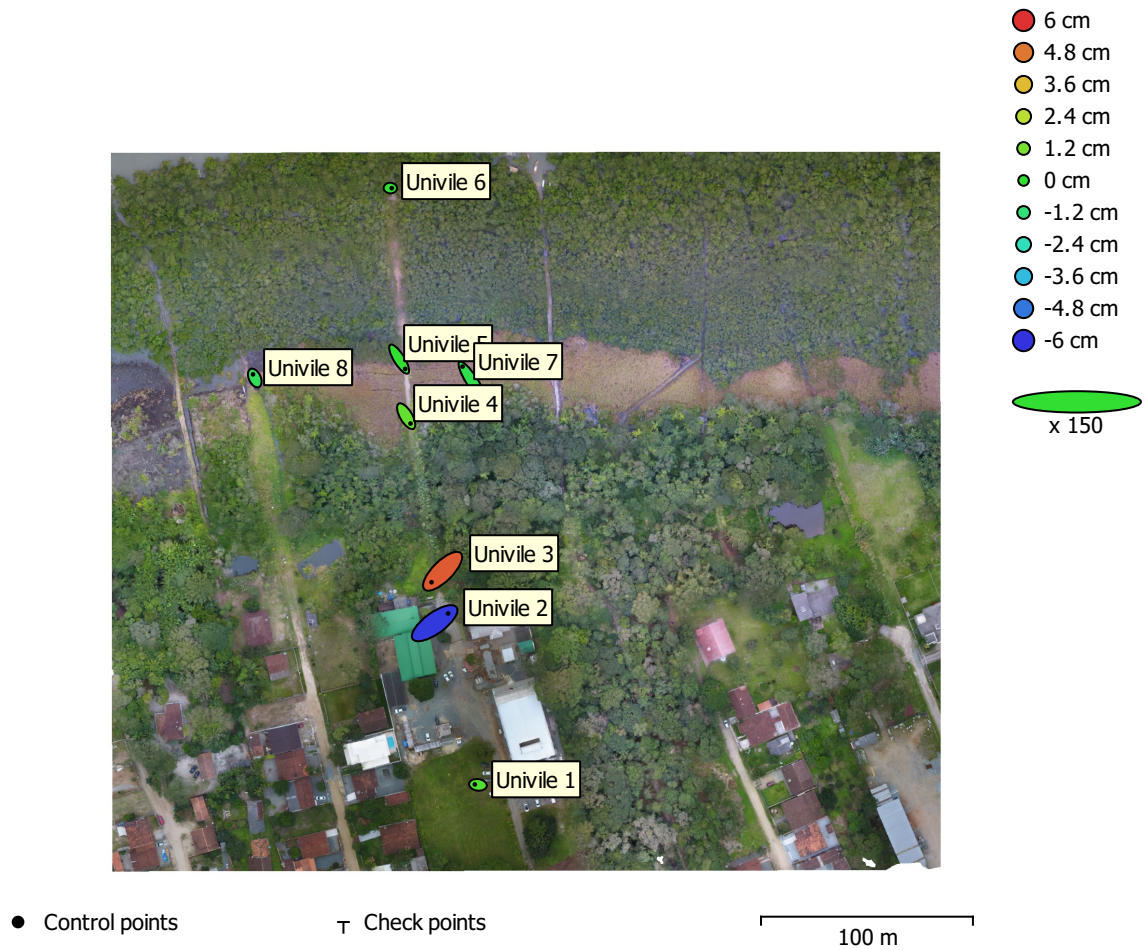


Fig. 4. GCP locations and error estimates.

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	4.75978	5.37177	2.83484	7.17715	7.71672

Table 4. Control points RMSE.

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

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
Univile 1	-1.96255	0.258176	0.517273	2.04593	0.612 (19)
Univile 2	8.43538	6.11229	-5.86692	11.9556	2.743 (20)
Univile 3	-6.95827	-6.90302	5.31441	11.1495	2.122 (27)
Univile 4	2.73802	-4.58363	0.879027	5.41102	3.796 (20)
Univile 5	3.80161	-6.15942	0.0060743	7.23815	4.238 (27)
Univile 6	0.876784	-0.0551297	-0.00320021	0.878521	0.724 (17)
Univile 7	-5.82187	9.02256	-0.438184	10.7468	2.411 (31)
Univile 8	-1.09863	2.32624	-0.628079	2.64818	1.021 (28)
Total	4.75978	5.37177	2.83484	7.71672	2.593

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

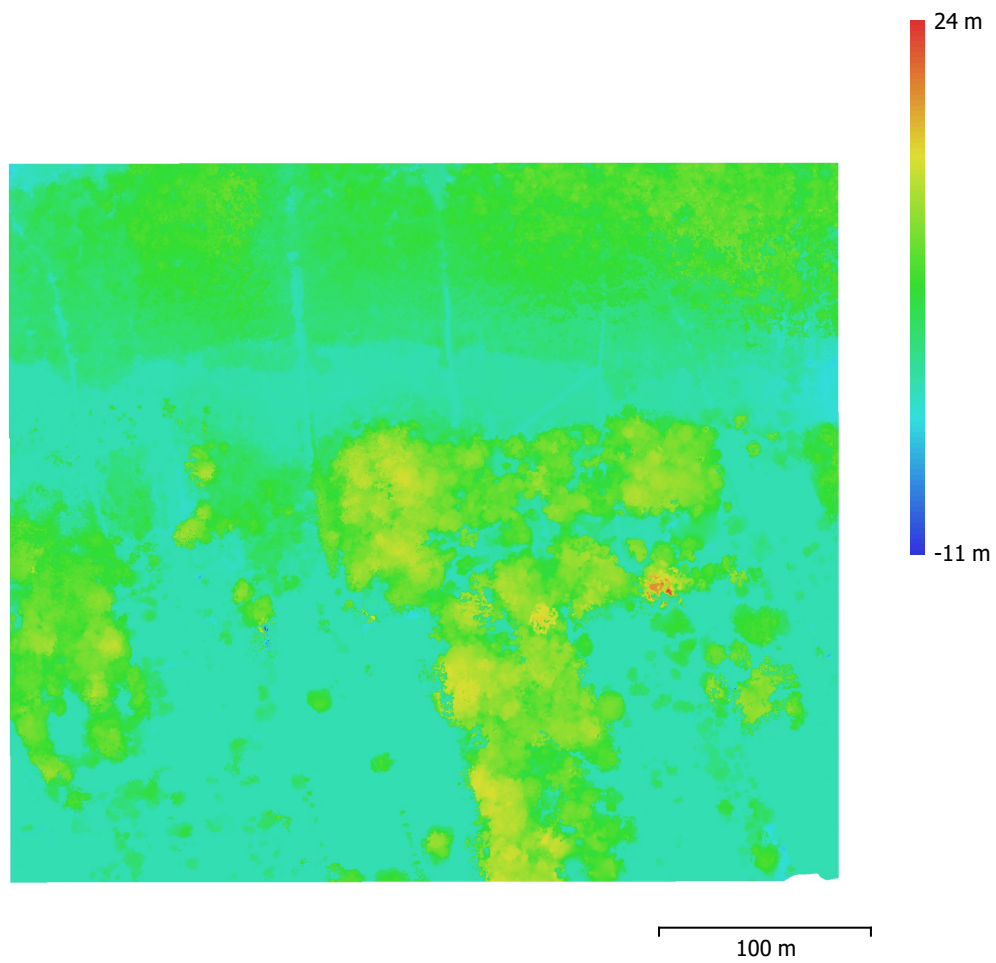


Fig. 5. Reconstructed digital elevation model.

Resolution: 4.92 cm/pix
Point density: 413 points/m²

Processing Parameters

General

Cameras	453
Aligned cameras	453
Markers	8

Shapes

LineString	43
Polygon	1
Coordinate system	SIRGAS 2000 (EPSG::4674)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	531,867 of 806,451
RMS reprojection error	0.138975 (0.862401 pix)
Max reprojection error	1.84868 (33.8532 pix)
Mean key point size	4.64403 pix
Point colors	3 bands, uint8
Key points	1.45 GB
Average tie point multiplicity	2.88664

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	10,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	16 minutes 54 seconds
Matching memory usage	835.30 MB
Alignment time	19 minutes 6 seconds
Alignment memory usage	284.36 MB

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	No
Optimization time	15 seconds
Date created	2022:05:11 16:58:08
Software version	1.8.3.14331
File size	58.95 MB

Depth Maps

Count	453
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Depth maps generation parameters

Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	1 hours 32 minutes
Memory usage	3.55 GB
Date created	2022:05:12 21:26:34
Software version	1.8.3.14331
File size	1.59 GB

Dense Point Cloud

Points	113,796,733
Point colors	3 bands, uint8
Depth maps generation parameters	
Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	1 hours 32 minutes
Memory usage	3.55 GB
Dense cloud generation parameters	
Processing time	1 hours 13 minutes
Memory usage	7.91 GB
Ground points classification parameters	
Max angle (°)	7.5
Max distance (m)	0.1
Cell size (m)	100
Classification time	8 minutes 35 seconds
Classification memory usage	7.38 GB
Date created	2022:05:12 22:40:15
Software version	1.8.3.14331
File size	1.51 GB
Model	
Faces	2,257,121
Vertices	1,129,024
Vertex colors	3 bands, uint8
Depth maps generation parameters	
Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	1 hours 32 minutes
Memory usage	3.55 GB
Reconstruction parameters	
Surface type	Height field
Source data	Dense cloud
Interpolation	Enabled
Strict volumetric masks	No
Processing time	1 minutes 39 seconds
Memory usage	0 B
Date created	2022:06:22 11:51:13
Software version	1.8.3.14331
File size	44.13 MB
DEM	
Size	7,946 x 6,889
Coordinate system	SIRGAS 2000 (EPSG::4674)
File size	229.33 MB
Orthomosaic	
Size	18,924 x 18,631
Coordinate system	SIRGAS 2000 (EPSG::4674)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	Mesh
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	30 minutes 53 seconds
Memory usage	1.57 GB
Date created	2022:05:14 11:50:13

Software version	1.8.3.14331
File size	5.34 GB
System	
Software name	Agisoft Metashape Professional
Software version	1.8.3 build 14331
OS	Windows 64 bit
RAM	31.89 GB
CPU	Intel(R) Core(TM) i7-4700MQ CPU @ 2.40GHz
GPU(s)	Intel(R) HD Graphics 4600 Quadro K3100M