Galapagos Thermal Inertia Flights

Processing Report
Flight 1 TIR (scaled)

Sierra Negra Volcano
Isla Isabela, Galapagos Islands
October 22, 2018
DJI M210 UAS
Zenmuse XT Thermal Camera

01 September 2020

Survey Data

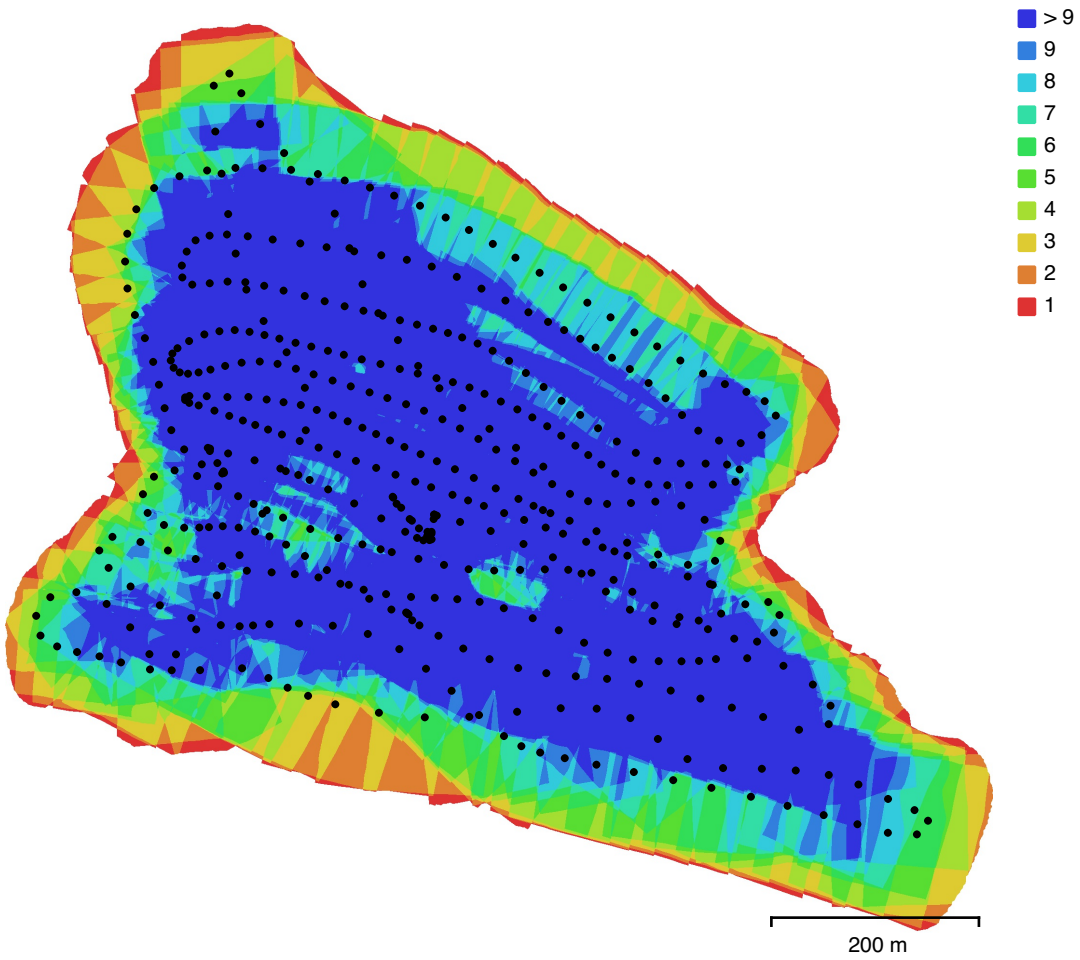

Fig. 1. Camera locations and image overlap.

Number of images:	474	Camera stations:	474
Flying altitude:	136 m	Tie points:	94,153
Ground resolution:	17.1 cm/pix	Projections:	408,166
Coverage area:	0.476 km²	Reprojection error:	0.462 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
unknown	640 x 512	unknown	unknown	No

Table 1. Cameras.

Camera Calibration

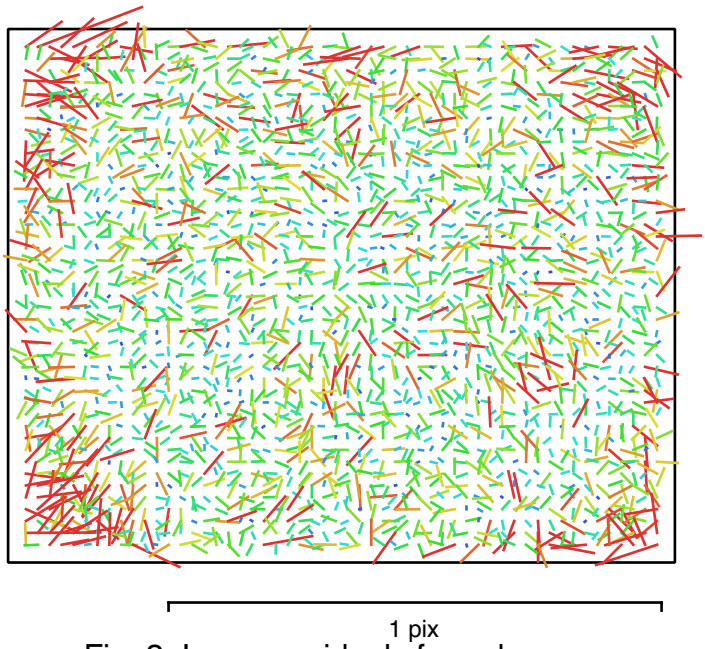

Fig. 2. Image residuals for unknown.

unknown
474 images

Type	Resolution	Focal Length	Pixel Size
Frame	640 x 512	unknown	unknown

	Value	Error	F	B1	B2	K1	K2	P1	P2
F	772.743	0.14	1.00	-0.09	0.01	0.01	0.35	0.00	0.10
B1	-1.78015	0.02		1.00	-0.11	-0.60	-0.09	0.23	0.81
B2	0.183469	0.012			1.00	0.11	0.02	-0.32	-0.15
K1	-0.0697457	0.00038				1.00	-0.52	-0.19	-0.70
K2	0.429035	0.0011					1.00	-0.04	-0.07
P1	0.000359562	1.4e-05						1.00	0.28
P2	-0.000973599	6.1e-05							1.00

Table 2. Calibration coefficients and correlation matrix.

Ground Control Points

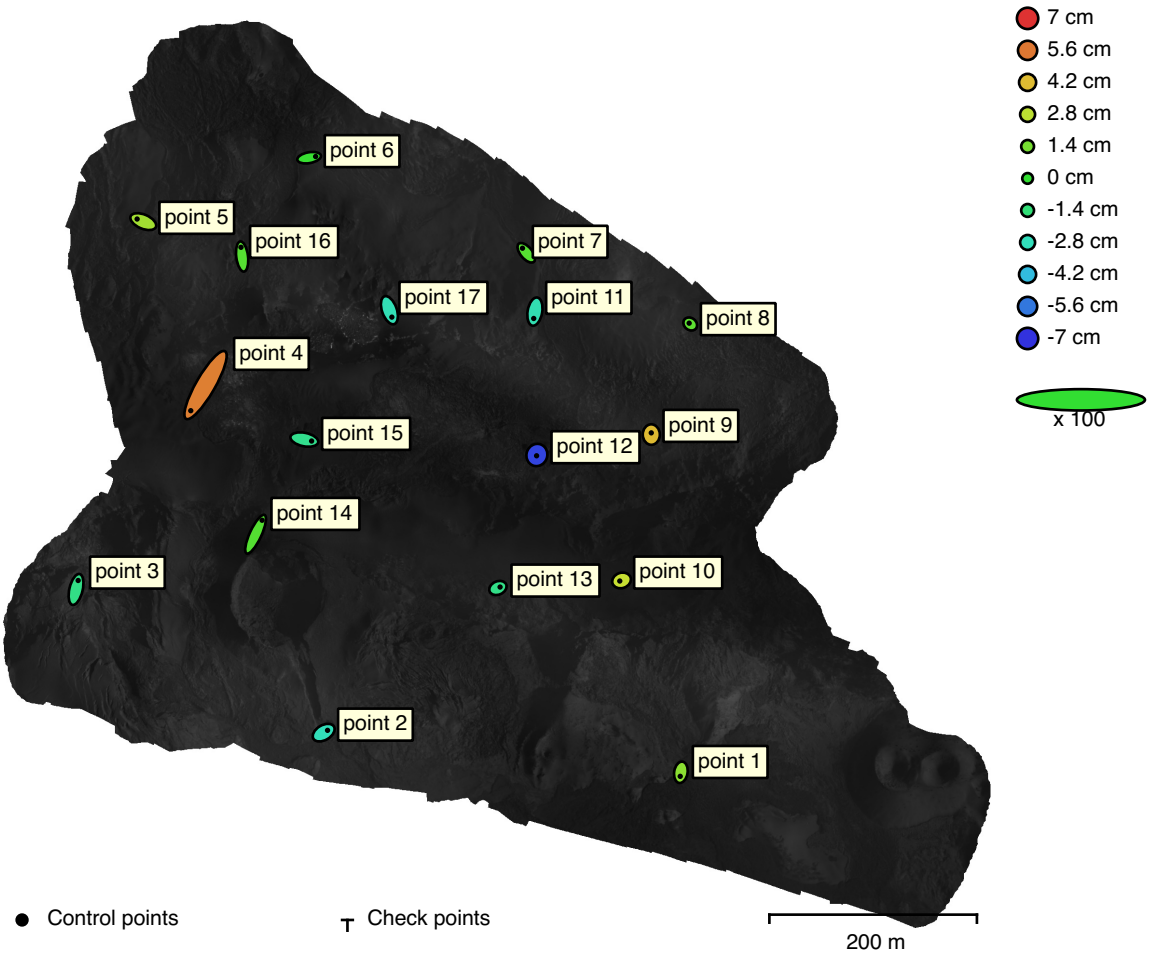

Fig. 3. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
17	9.85716	15.981	2.89364	18.7765	18.9982

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)
point 1	-1.25092	-7.74352	1.8064	8.04922	1.576 (6)
point 2	7.45596	4.4247	-2.76106	9.09905	2.605 (3)
point 3	4.08143	17.2878	-1.70123	17.8444	2.218 (5)
point 4	-28.4574	-49.3265	5.4361	57.2056	1.542 (23)
point 5	-11.8368	5.0159	2.28873	13.0579	1.239 (7)
point 6	12.5166	2.28203	0.114632	12.7235	1.515 (7)
point 7	-7.30988	8.77243	0.727034	11.442	1.144 (8)
point 8	-2.03688	1.57513	0.891838	2.72494	0.428 (5)
point 9	-0.0642962	3.29943	4.22264	5.3592	0.463 (16)
point 10	-3.44545	-1.12406	3.04632	4.73441	0.644 (10)
point 11	-2.28534	-13.2582	-2.58452	13.6997	0.921 (11)
point 12	-0.532596	-1.54269	-6.63972	6.83736	0.780 (15)
point 13	4.16419	1.80786	-1.73022	4.85824	0.585 (6)
point 14	12.4896	26.9223	0.68731	29.6862	1.540 (9)
point 15	13.994	-2.85271	-1.85363	14.4016	0.661 (15)
point 16	-2.21023	17.7848	0.72112	17.9361	0.959 (14)
point 17	4.72799	-13.3248	-2.67176	14.389	0.681 (15)
Total	9.85716	15.981	2.89364	18.9982	1.143

Table 4. Control points.
X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

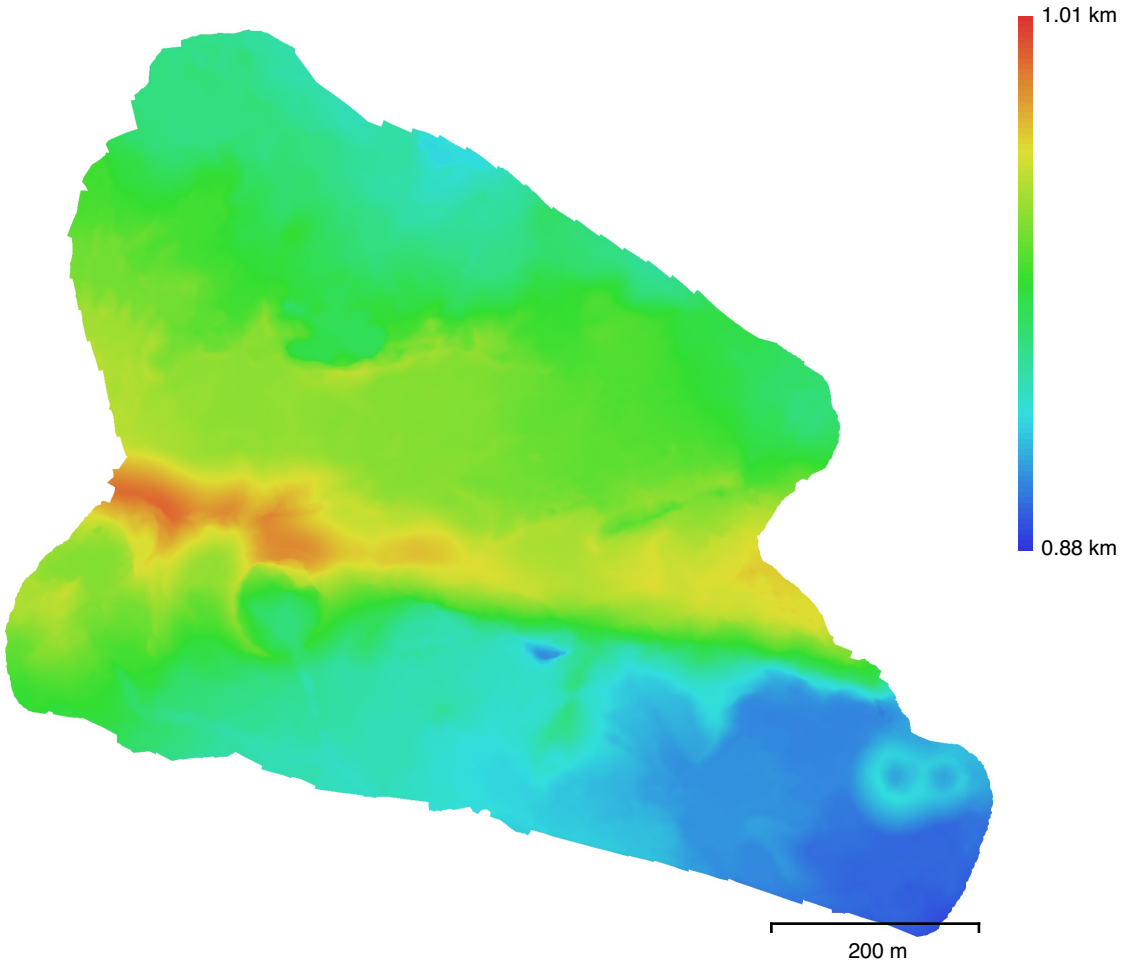

Fig. 4. Reconstructed digital elevation model.

Resolution:	34.1 cm/pix
Point density:	8.59 points/m²

Processing Parameters

General	
Cameras	474
Aligned cameras	474
Markers	17
Coordinate system	WGS 84 / UTM zone 15S (EPSG::32715)
Rotation angles	Yaw, Pitch, Roll
Point Cloud	
Points	94,153 of 120,758
RMS reprojection error	0.146555 (0.461616 pix)
Max reprojection error	0.526347 (6.16662 pix)
Mean key point size	3.06944 pix
Point colors	1 bands, uint16
Key points	No
Average tie point multiplicity	5.18362
Alignment parameters	
Accuracy	High
Generic preselection	No
Key point limit	0
Tie point limit	0
Matching time	10 minutes 5 seconds
Optimization parameters	
Parameters	f, b1, b2, k1, k2, p1, p2
Adaptive camera model fitting	No
Optimization time	5 seconds
Dense Point Cloud	
Points	4,861,830
Point colors	1 bands, uint16
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Processing time	19 minutes 42 seconds
Dense cloud generation parameters	
Processing time	25 seconds
Model	
Faces	972,366
Vertices	487,430
Vertex colors	1 bands, uint16
Texture	8,192 x 8,192, 2 bands, uint16
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Reconstruction parameters	
Surface type	Arbitrary
Source data	Dense cloud
Interpolation	Enabled
Processing time	5 minutes 49 seconds
Texturing parameters	
Mapping mode	Orthophoto
Blending mode	Mosaic
Texture size	8,192
Enable hole filling	Yes

General	
Enable ghosting filter	No
UV mapping time	5 seconds
Blending time	36 seconds
Orthomosaic	
Size	5,574 x 5,125
Coordinate system	WGS 84 / UTM zone 15S (EPSG::32715)
Colors	1 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	Mesh
Enable hole filling	Yes
Processing time	44 seconds
Software version	1.6.1.10009
System	
Software name	Agisoft Metashape Professional
Software version	1.6.1 build 10009
OS	Mac OS 64 bit
RAM	16.00 GB
CPU	Intel(R) Core(TM) i7-4870HQ CPU @ 2.50GHz
GPU(s)	None