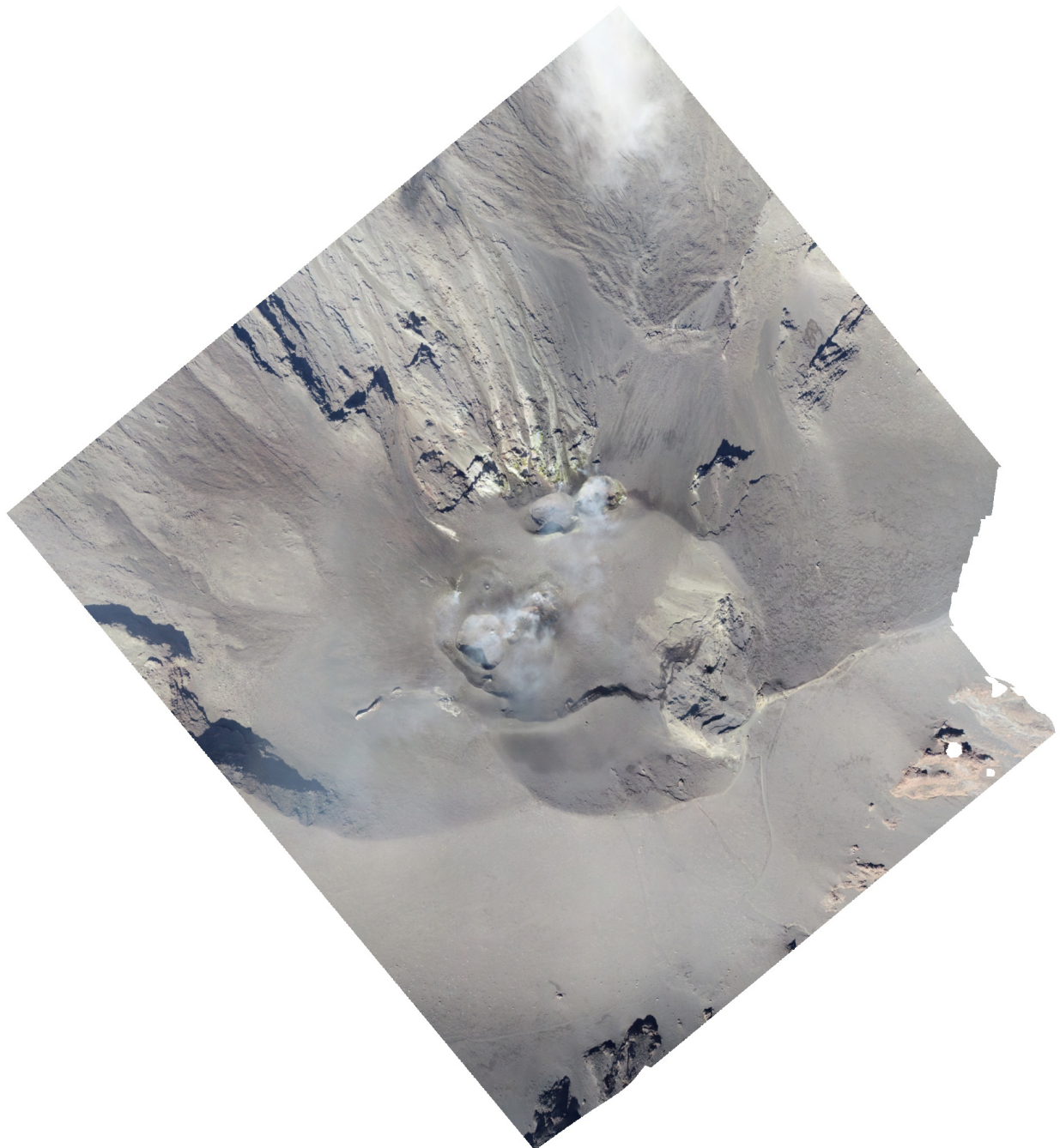


# Stromboli\_Sept12-2018

Processing Report

Stromboli Volcano, Italy  
Sept 12, 2018  
sUAS Survey (DJI M210, X4S)  
Coverage: Vents  
06 August 2019



# Survey Data

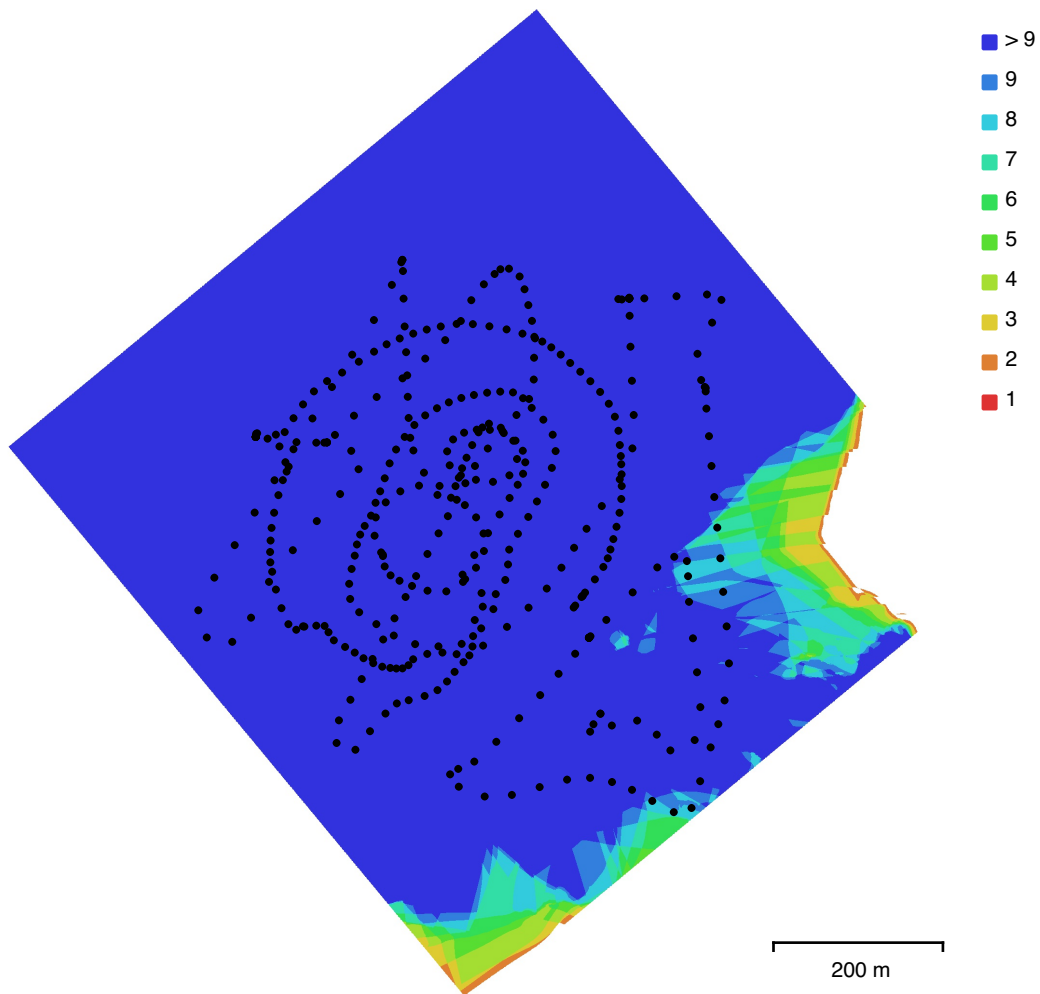


Fig. 1. Camera locations and image overlap.

Number of images:	379	Camera stations:	379
Flying altitude:	226 m	Tie points:	1,737,534
Ground resolution:	5.86 cm/pix	Projections:	6,552,091
Coverage area:	0.661 km <sup>2</sup>	Reprojection error:	0.593 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6510 (8.8mm)	5472 x 3078	8.8 mm	2.53 x 2.53 $\mu$ m	No

Table 1. Cameras.

# Camera Calibration

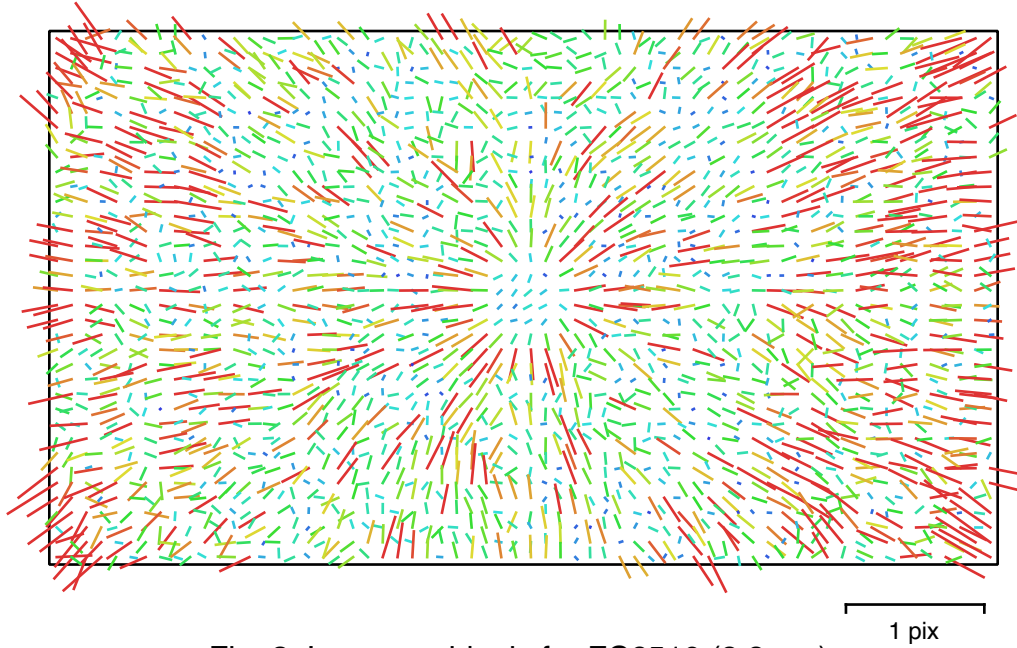


Fig. 2. Image residuals for FC6510 (8.8mm).

FC6510 (8.8mm)  
379 images

Type	Resolution	Focal Length	Pixel Size
Frame	5472 x 3078	8.8 mm	2.53 x 2.53 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	3679.34	0.019	1.00	-0.08	-0.65	0.06	-0.07	-0.18	0.19	-0.17	0.15	-0.04	-0.33
Cx	14.5965	0.0099		1.00	0.08	0.07	0.07	-0.01	0.01	-0.01	0.01	0.87	0.00
Cy	21.3927	0.01			1.00	-0.12	0.08	-0.05	0.02	-0.02	0.02	0.06	0.68
B1	-7.13555	0.0025				1.00	-0.01	-0.02	-0.03	0.03	-0.02	0.04	0.16
B2	0.304102	0.0023					1.00	-0.02	0.01	-0.01	0.01	-0.06	0.01
K1	0.0203292	2.3e-05						1.00	-0.97	0.92	-0.86	-0.01	-0.07
K2	-0.098975	0.00012							1.00	-0.99	0.95	0.01	0.01
K3	0.188034	0.00025								1.00	-0.99	-0.01	-0.01
K4	-0.11965	0.00018									1.00	0.01	0.01
P1	0.00184831	9.5e-07										1.00	0.03
P2	0.000171359	8.4e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

# Camera Locations

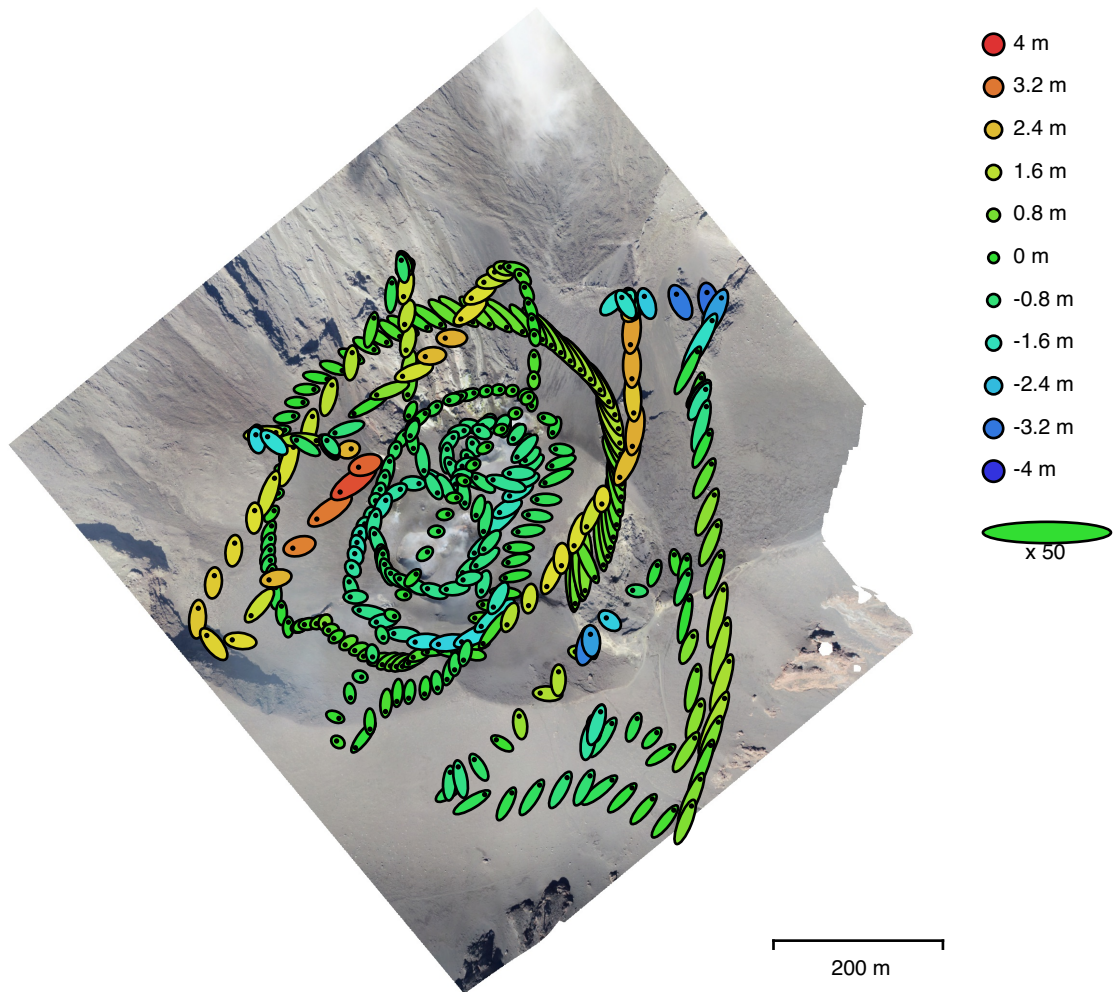


Fig. 3. Camera locations and error estimates.  
 Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.  
 Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
0.289778	0.452577	1.15852	0.537399	1.27709

Table 3. Average camera location error.  
 X - Longitude, Y - Latitude, Z - Altitude.

# Digital Elevation Model

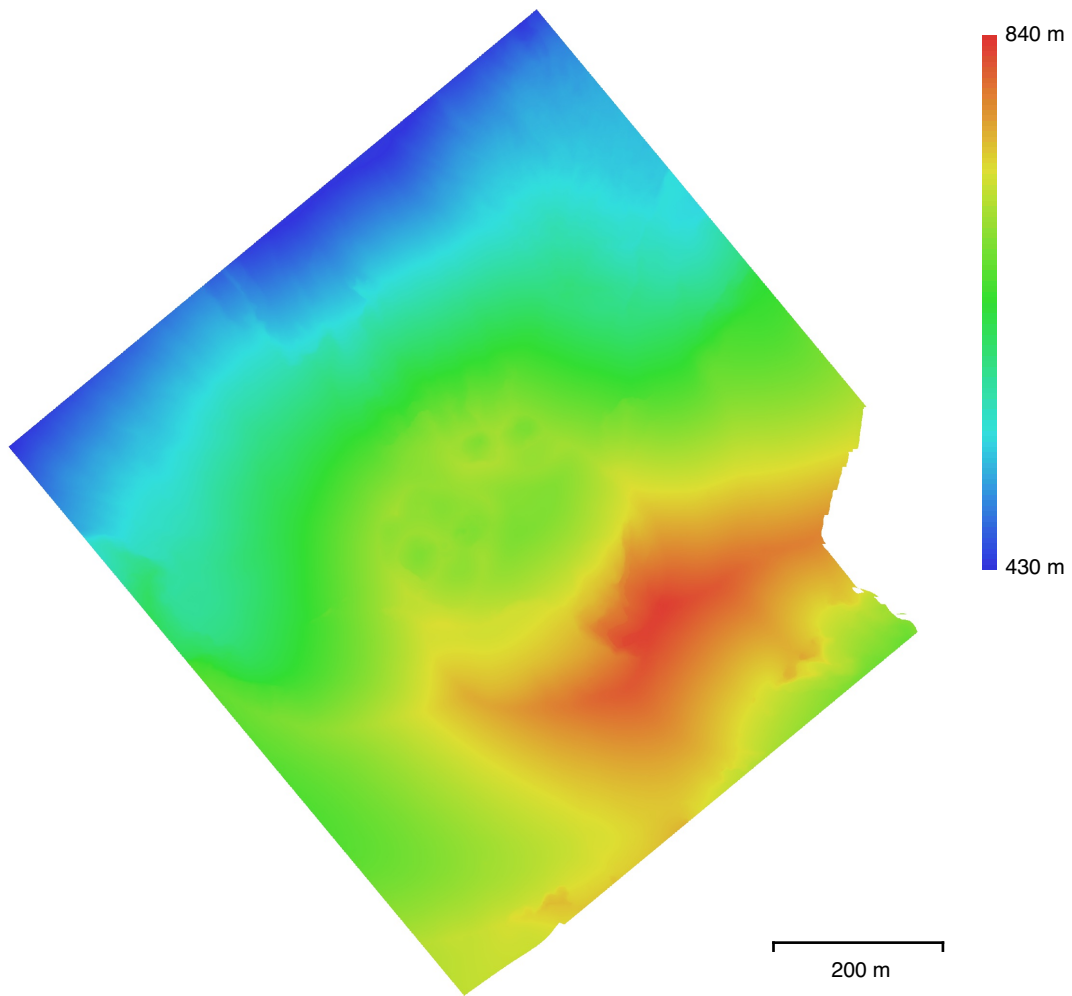


Fig. 4. Reconstructed digital elevation model.

Resolution: 11.7 cm/pix  
Point density: 72.9 points/m<sup>2</sup>

# Processing Parameters

## General

Cameras	379
Aligned cameras	379
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

## Point Cloud

Points	1,737,534 of 2,069,837
RMS reprojection error	0.167251 (0.592919 pix)
Max reprojection error	0.51078 (27.1432 pix)
Mean key point size	3.35621 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	4.35838

## Alignment parameters

Accuracy	High
Generic preselection	No
Reference preselection	Yes
Key point limit	0
Tie point limit	0
Filter points by mask	Yes
Matching time	39 minutes 33 seconds

## Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	44 seconds

## Dense Point Cloud

Points	73,083,405
Point colors	3 bands, uint8
Reconstruction parameters	
Quality	High
Depth filtering	Aggressive
Depth maps generation time	12 hours 36 minutes
Dense cloud generation time	12 hours 46 minutes

## Model

Faces	14,616,430
Vertices	7,316,528
Vertex colors	3 bands, uint8
Texture	8,192 x 8,192, 4 bands, uint8

## Reconstruction parameters

Surface type	Arbitrary
Source data	Dense
Interpolation	Enabled
Quality	High
Depth filtering	Aggressive
Face count	14,616,431
Processing time	1 hours 11 minutes

## Texturing parameters

Mapping mode	Orthophoto
Blending mode	Mosaic
Texture size	8,192 x 8,192
Enable hole filling	Yes

General	
Enable ghosting filter	No
UV mapping time	29 seconds
Blending time	22 minutes 14 seconds
DEM	
Size	9,971 x 10,020
Coordinate system	WGS 84 (EPSG::4326)
Reconstruction parameters	
Source data	Dense cloud
Interpolation	Enabled
Processing time	1 minutes 22 seconds
Orthomosaic	
Size	18,318 x 19,896
Coordinate system	WGS 84 (EPSG::4326)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Processing time	4 minutes 22 seconds
Software	
Version	1.5.1 build 7618
Platform	Mac OS 64