

Metadata Report

Project Name: SfM Topography of Stromboli volcano (Italy), 04 July 2024 – crater terrace.

Summary: Structure-from-Motion digital surface model (DSM) of Stromboli Volcano (Italy) produced by photogrammetry from UAS survey. Coverage includes the crater terrace.

Personnel

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Dates of Collection: July 04, 2024

Site Information

- Site description: Stromboli volcano, Aeolian Islands, Italy
- Site objective: the objective was to document at high resolution the morphological changes of the crater terrace at Stromboli volcano.
- Site location: 38.794, 15.211
- Site conditions: Volcanic plume affecting the upper portion of the Sciara del Fuoco and the crater terrace. Sunny to partially cloudy. Wind varied between light to strong breeze.

Survey Results

- Equipment used: DJI Mavic 3T RTK with infrared thermal camera.
- GPS solutions: data on camera position were collected using GNSS-RTK information embedded in the image metadata, with differential corrections sent in real-time by a local RTK network.
- Errors: camera location total error estimate is 8.4 cm.

Products

- Date of dataset collection: July 04, 2024.
- Coordinate system of datasets: Horizontal WGS 84 / UTM zone 33N [EPSG: 32633]; Vertical ITALGEO 2005 geoid.
- Spatial resolution: 50 cm/pixel.
- Data formats: .tif DSM geotiff.

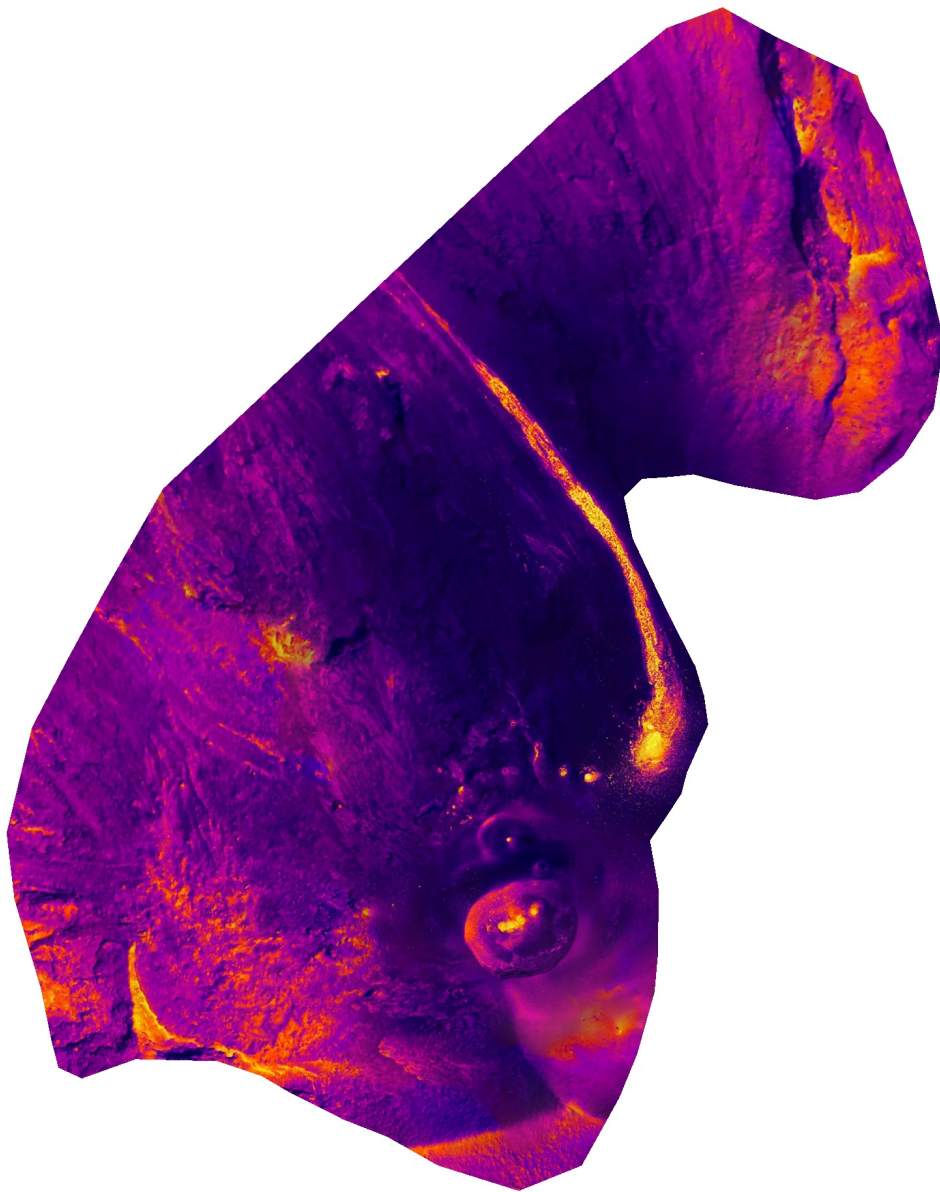
Misc Notes

Please refer to the Agisoft Metashape report attached for additional information and details on survey and processing.

Stromboli Terrace 20240704 M3T

Processing Report

30 October 2024



Survey Data

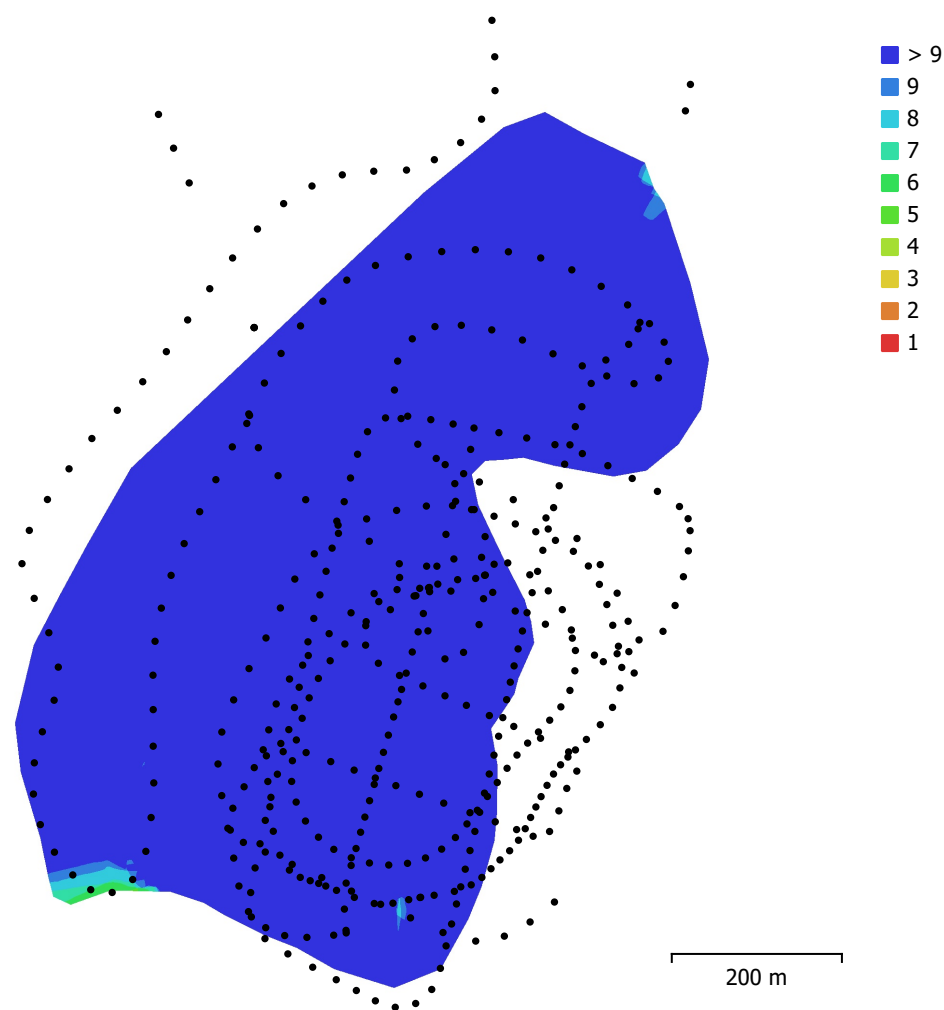


Fig. 1. Camera locations and image overlap.

Number of images:	433	Camera stations:	415
Flying altitude:	212 m	Tie points:	174,046
Ground resolution:	37.3 cm/pix	Projections:	615,031
Coverage area:	0.458 km ²	Reprojection error:	0.573 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
M3T (9.1mm)	640 x 512	9.1 mm	12 x 12 μm	No

Table 1. Cameras.

Camera Calibration

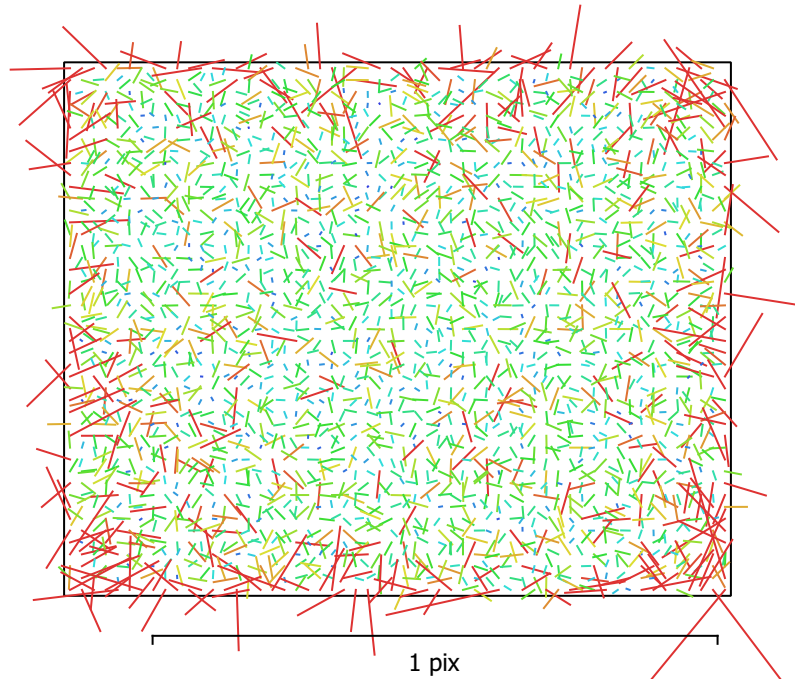


Fig. 2. Image residuals for M3T (9.1mm).

M3T (9.1mm)

433 images, additional corrections

Type	Resolution	Focal Length	Pixel Size
Frame	640 x 512	9.1 mm	12 x 12 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	763.158	0.84	1.00	-0.02	-0.07	0.05	0.02	-0.99	0.98	-0.96	0.94	-0.03	-0.08
Cx	-2.55867	0.32		1.00	-0.01	-0.06	-0.13	0.02	-0.02	0.02	-0.02	0.69	-0.00
Cy	-5.40981	0.37			1.00	0.08	-0.05	0.07	-0.07	0.07	-0.08	-0.03	0.83
B1	0.893343	0.026				1.00	0.00	-0.01	-0.03	0.06	-0.07	-0.03	0.10
B2	0.396714	0.018					1.00	-0.02	0.02	-0.02	0.02	-0.10	-0.05
K1	-0.395923	0.02						1.00	-1.00	0.99	-0.97	0.03	0.08
K2	0.438398	0.14							1.00	-1.00	0.99	-0.03	-0.09
K3	-1.06276	0.43								1.00	-1.00	0.03	0.09
K4	1.13027	0.48									1.00	-0.03	-0.10
P1	0.000291565	3.7e-05										1.00	-0.02
P2	7.96657e-05	4.2e-05											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

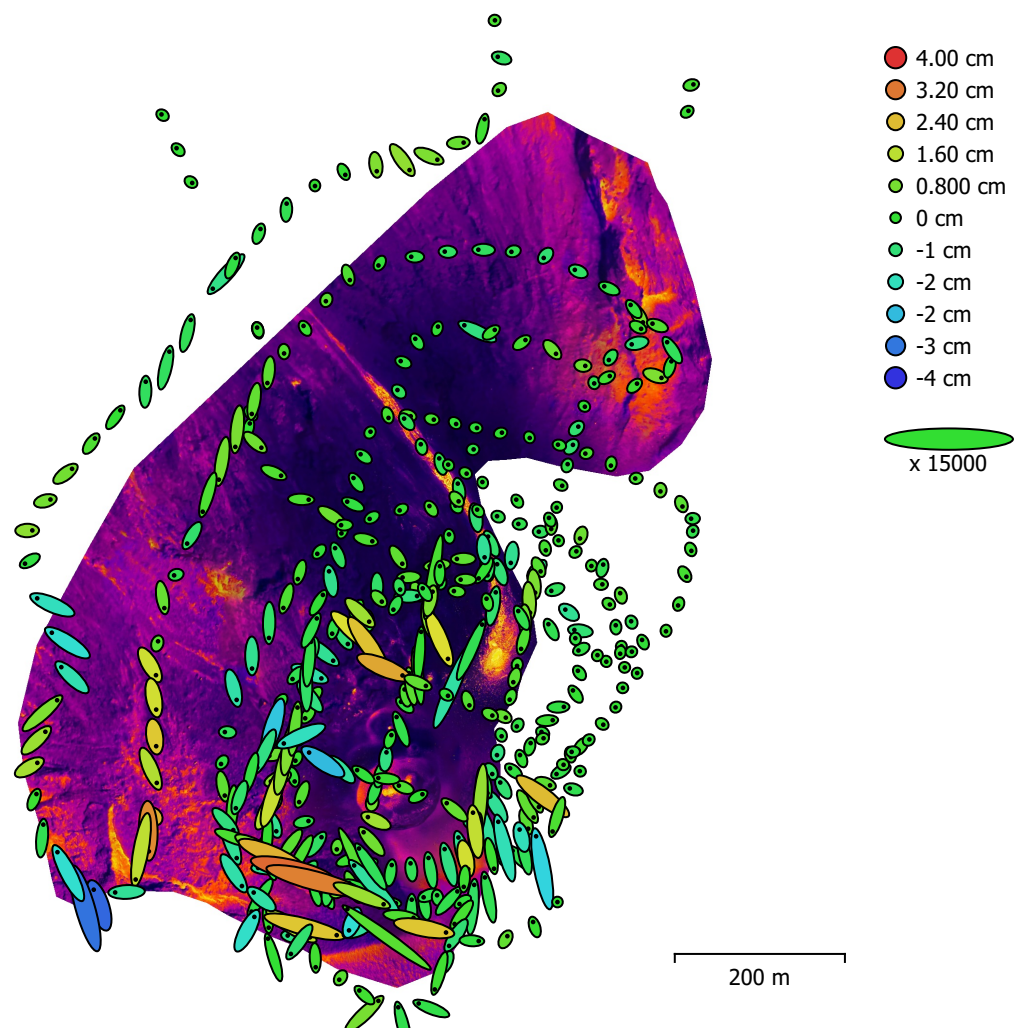


Fig. 3. Camera locations and error estimates.

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 (mm)	Y error (mm)	Z error (mm)	XY error (mm)	Total error (mm)
1.03433	1.4671	8.24583	1.79505	8.43895

Table 3. Average camera location error.

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

Digital Elevation Model

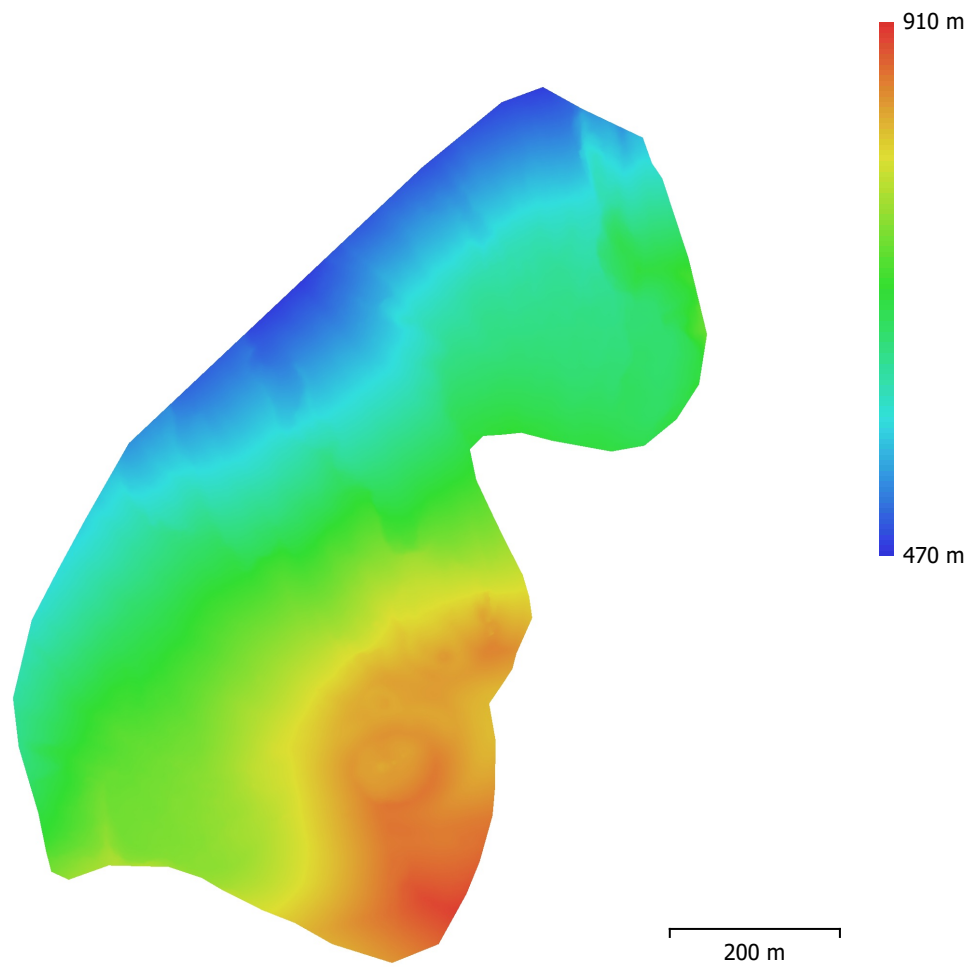


Fig. 4. Reconstructed digital elevation model.

Resolution: 37.3 cm/pix
Point density: 7.20 points/m²

Processing Parameters

General

Images	433
Aligned images	415
Coordinate system	WGS 84 / UTM zone 33N (EPSG::32633)
Camera coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Shapes

Polygon	1
Coordinate system	WGS_1984_UTM_Zone_33N

Tie Points

Points	174,046 of 242,272
Point colors	3 bands, uint8
RMS reprojection error	0.265007 (0.5728 pix)
Max reprojection error	0.771156 (12.8382 pix)
Mean key point size	2.04341 pix
Key points	No
Average tie point multiplicity	4.71643

Alignment parameters

Accuracy	Highest
Generic preselection	No
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	40,000
Tie point limit	10,000
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	No
Matching time	56 seconds
Matching memory usage	159.50 MB
Alignment time	1 minutes 20 seconds
Alignment memory usage	605.83 MB

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Fit additional corrections	Yes
Adaptive camera model fitting	No
Exclude corners	No
Optimization time	6 seconds
Date created	2024:07:31 09:59:02
Software version	2.1.2.18358
File size	22.17 MB

Depth Maps

Count	412
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Depth maps generation parameters

Quality	Ultra High
Filtering mode	Aggressive
Max neighbors	16
Processing time	2 minutes 6 seconds
Memory usage	409.19 MB
Date created	2024:07:31 10:12:41
Software version	2.1.2.18358

File size	185.16 MB
Point Cloud	
Points	7,089,014
Point attributes	
Color	3 bands, uint8
Normal	
Confidence	4 - 82
Point classes	
Created (never classified)	7,089,014
Depth maps generation parameters	
Quality	Ultra High
Filtering mode	Aggressive
Max neighbors	16
Processing time	2 minutes 6 seconds
Memory usage	409.19 MB
Point cloud generation parameters	
Source data	Depth maps
Processing time	4 minutes 18 seconds
Memory usage	2.82 GB
Date created	2024:07:31 10:17:00
Software version	2.1.2.18358
File size	185.06 MB
DEM	
Size	2,507 x 3,344
Resolution	37.3 cm/pix
Coordinate system	WGS 84 / UTM zone 33N (EPSG::32633)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	36 seconds
Memory usage	113.56 MB
Date created	2024:08:20 12:51:39
Software version	2.1.2.18358
File size	37.80 MB
Orthomosaic	
Size	2,507 x 3,344
Resolution	37.3 cm/pix
Coordinate system	WGS 84 / UTM zone 33N (EPSG::32633)
Colors	3 bands, uint8
Orthophotos	97.86 MB
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	Yes
Processing time	24 seconds
Memory usage	5.20 GB
Date created	2025:01:02 13:02:21
Software version	2.2.0.19853
File size	103.50 MB
System	
Software name	Agisoft Metashape Professional
Software version	2.2.0 build 19853
OS	Windows 64 bit
RAM	63.71 GB
CPU	Intel(R) Core(TM) i9-14900HX

GPU(s)

NVIDIA GeForce RTX 4080 Laptop GPU