

Metadata Report

Project Name: High-Resolution SfM Topography of Stromboli volcano (Italy), 20 May 2022.

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

Personnel

- Pls: Riccardo Civico, Tullio Ricci (Istituto Nazionale di Geofisica e Vulcanologia, Italy).

Dates of Collection: May 20th 2022

Site Information

- Site description: Stromboli volcano, Aeolian Islands, Italy
- Site objective: The objective was to document at high resolution the morphological changes of the Sciara del Fuoco at Stromboli volcano.
- Site location: 38.795, 15.209
- Site conditions: Volcanic plume affecting, at times, the upper portion of the Sciara del Fuoco and the crater terrace. Mostly sunny. Wind varied between light to strong breeze.

Survey Results

- Equipment used: DJI Phantom 4 Pro V2.0.
- GPS solutions: data on camera position were collected using GNSS information embedded in the image metadata
- Errors: camera location total error estimate is approximately 1.7 m.



Products

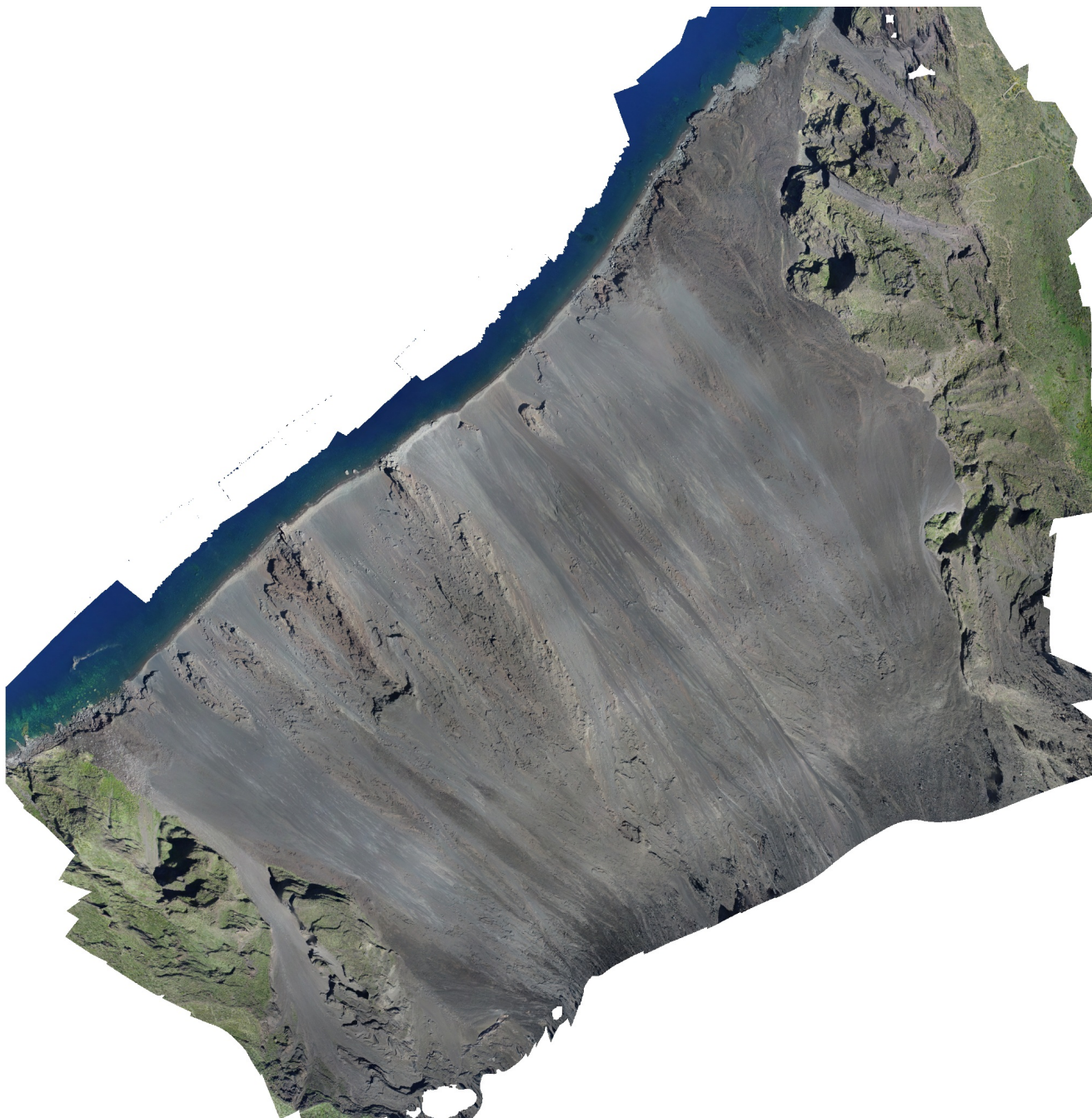
- Date of dataset collection: May 20, 2022.
- Coordinate system of datasets: Horizontal WGS 84 / UTM zone 33N [EPSG: 32633]; Vertical ITALGEO 2005 geoid.
- Spatial resolution: 20 cm/pixel.
- Data formats: .tif DSM geotiff.

Misc Notes

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

Stromboli Sciara 20220520 Phantom4

Processing Report
17 September 2024



Survey Data

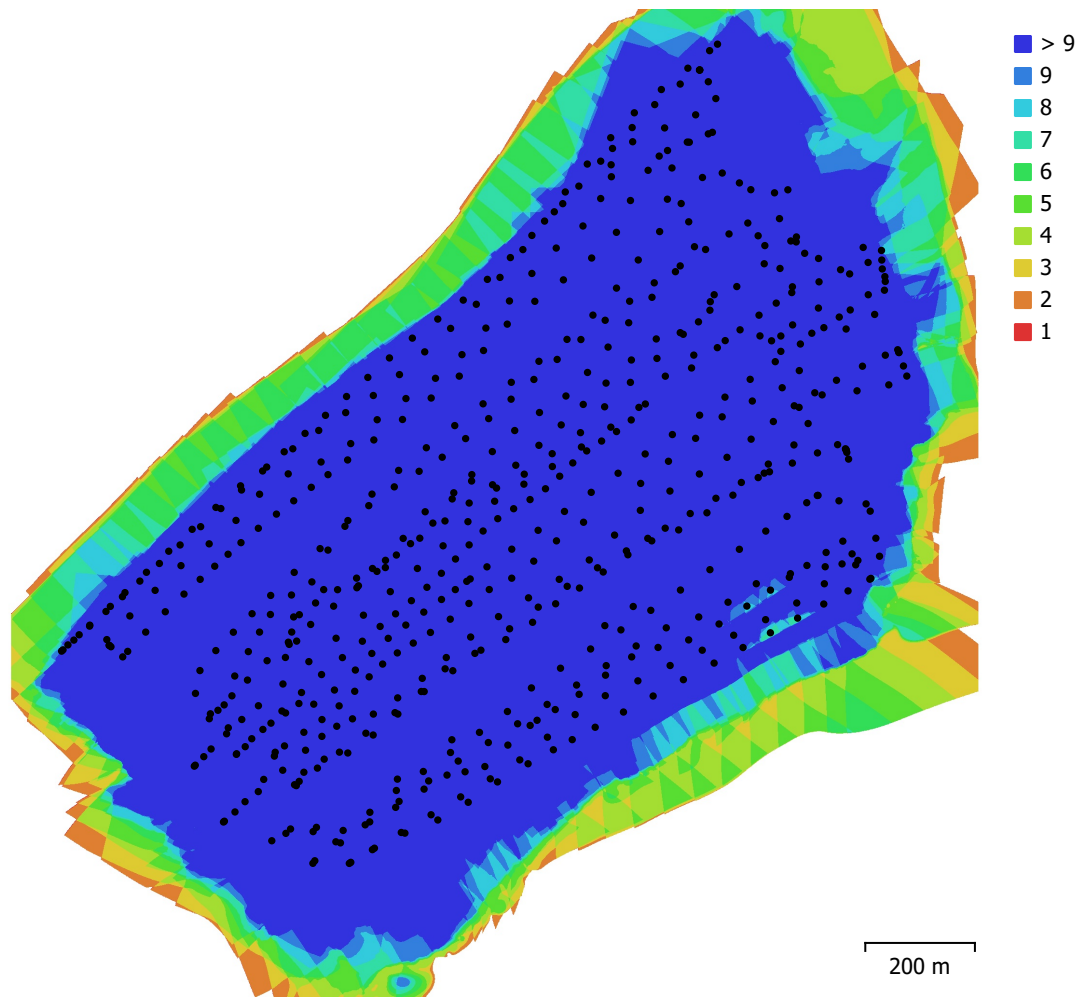


Fig. 1. Camera locations and image overlap.

Number of images:	656	Camera stations:	614
Flying altitude:	238 m	Tie points:	1,242,738
Ground resolution:	6.51 cm/pix	Projections:	4,966,027
Coverage area:	2.02 km ²	Reprojection error:	0.765 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6310S (8.8mm)	4864 x 3648	8.8 mm	2.61 x 2.61 μ m	No

Table 1. Cameras.

Camera Calibration

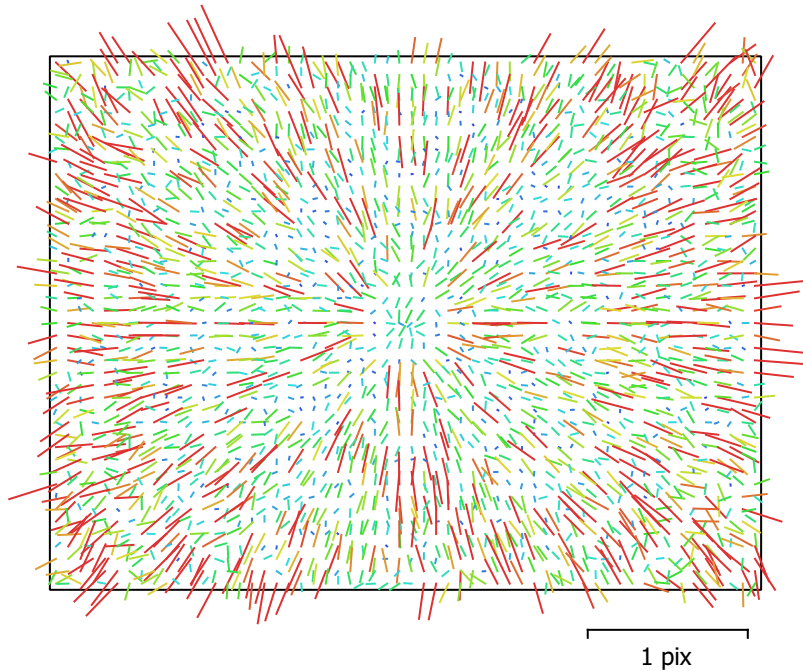


Fig. 2. Image residuals for FC6310S (8.8mm).

FC6310S (8.8mm)

656 images, additional corrections

Type	Resolution	Focal Length	Pixel Size
Frame	4864 x 3648	8.8 mm	2.61 x 2.61 μm

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	3705.51	0.073	1.00	-0.01	-0.11	-0.94	0.92	-0.89	-0.00	-0.07
Cx	-18.5649	0.053		1.00	-0.02	-0.00	-0.00	0.00	0.95	-0.02
Cy	6.03168	0.05			1.00	0.02	-0.02	0.01	-0.01	0.92
K1	-0.0213712	0.00013				1.00	-0.99	0.98	-0.01	0.01
K2	0.0221876	0.00031					1.00	-1.00	0.01	-0.01
K3	-0.00785134	0.00023						1.00	-0.01	0.01
P1	-0.00236879	7.1e-06							1.00	-0.01
P2	-0.000532874	6.2e-06								1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

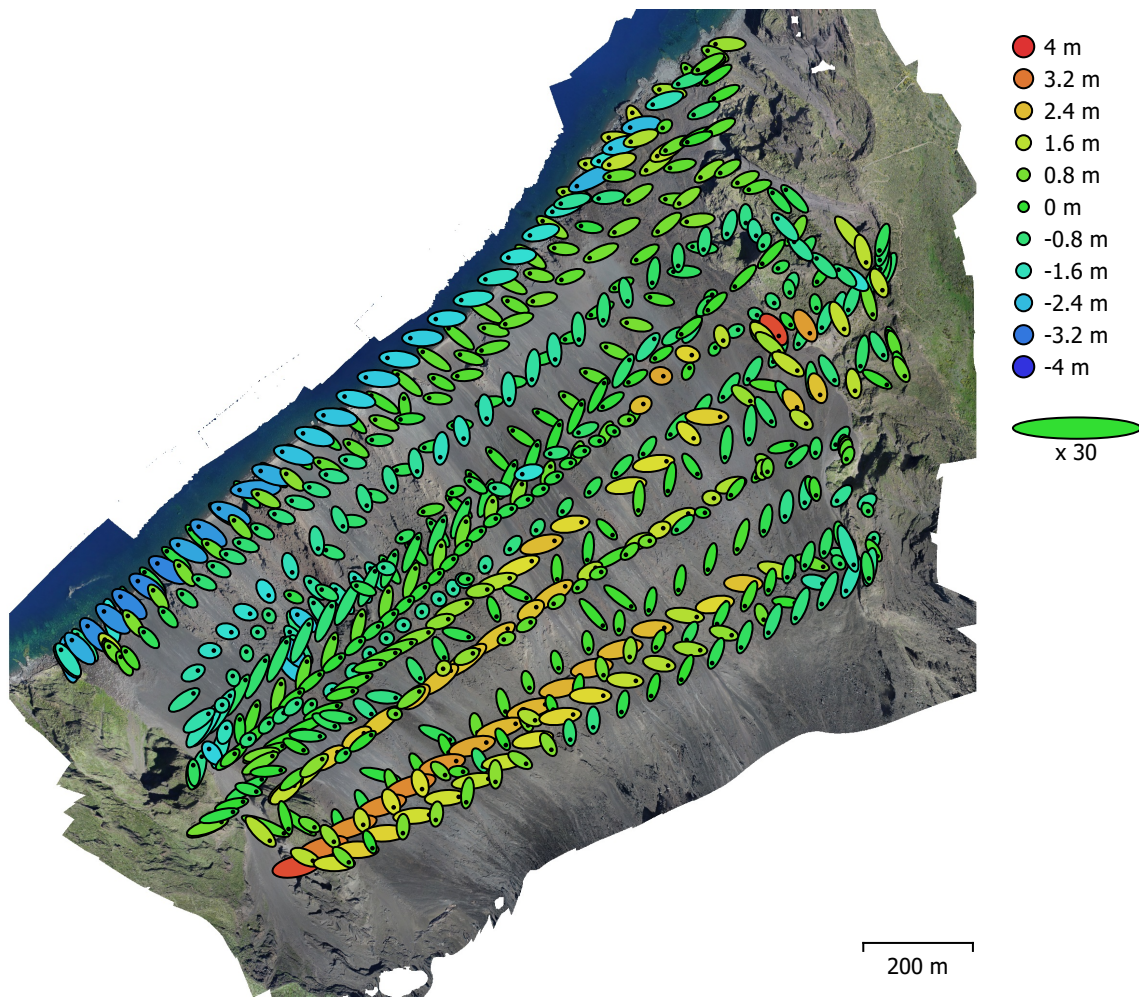


Fig. 3. Camera locations and error estimates.

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)
0.918882	0.817623	1.17112	1.22998	1.69835

Table 3. Average camera location error.

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

Digital Elevation Model

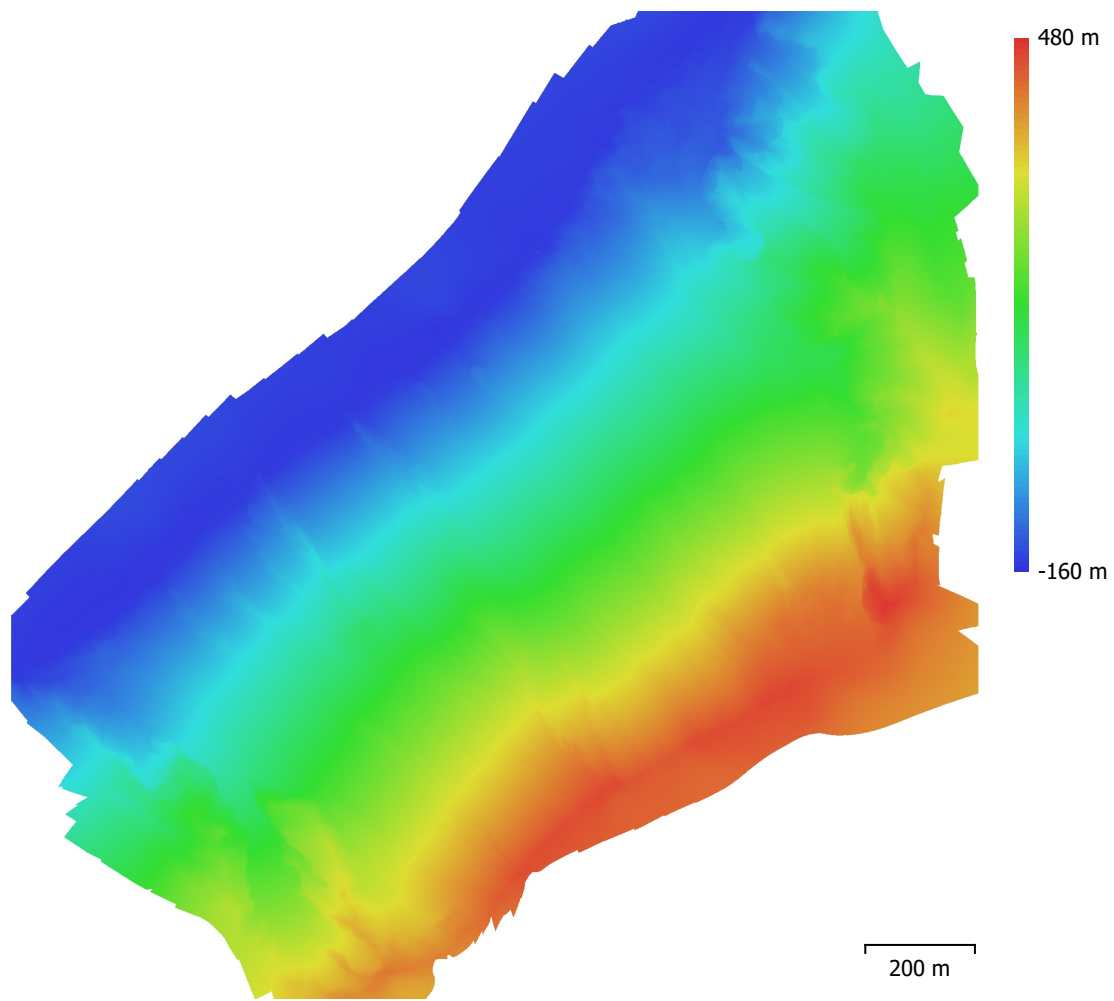


Fig. 4. Reconstructed digital elevation model.

Resolution: 13 cm/pix
Point density: 59 points/m²

Processing Parameters

General

Images	656
Aligned images	614
Coordinate system	WGS 84 / UTM zone 33N (EPSG::32633)
Camera coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Tie Points

Points	1,242,738 of 1,457,421
RMS reprojection error	0.175854 (0.765035 pix)
Max reprojection error	0.525032 (41.9651 pix)
Mean key point size	3.55555 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	4.35014

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
Filter points by mask	Yes
Mask tie points	No
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	No
Matching time	2 minutes 6 seconds
Matching memory usage	786.32 MB
Alignment time	2 minutes 16 seconds
Alignment memory usage	1.50 GB

Optimization parameters

Parameters	f, cx, cy, k1-k3, p1, p2
Fit additional corrections	Yes
Adaptive camera model fitting	No
Exclude corners	No
Optimization time	36 seconds
Date created	2024:07:30 18:28:56
Software version	2.1.2.18358
File size	129.43 MB

Depth Maps

Count	614
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	14 minutes 31 seconds
Memory usage	4.86 GB
Date created	2024:07:30 19:16:35
Software version	2.1.2.18358
File size	4.09 GB

Point Cloud

Points	149,381,978
Point attributes	
Color	3 bands, uint8
Normal	
Confidence	4 - 61
Point classes	
Created (never classified)	149,381,978
Depth maps generation parameters	
Quality	High
Filtering mode	Aggressive
Max neighbors	16
Processing time	14 minutes 31 seconds
Memory usage	4.86 GB
Point cloud generation parameters	
Processing time	53 minutes 21 seconds
Memory usage	12.15 GB
Date created	2024:07:30 20:09:57
Software version	2.1.2.18358
File size	2.45 GB

DEM

Size	13,542 x 13,835
Resolution	13 cm/pix
Coordinate system	WGS 84 / UTM zone 33N (EPSG::32633)

Reconstruction parameters

Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 54 seconds
Memory usage	310.01 MB
Date created	2024:07:30 20:29:54
Software version	2.1.2.18358
File size	564.21 MB

Orthomosaic

Size	27,083 x 27,669
Resolution	6.51 cm/pix
Coordinate system	WGS 84 / UTM zone 33N (EPSG::32633)
Colors	3 bands, uint8

Reconstruction parameters

Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	Yes
Processing time	20 minutes 45 seconds
Memory usage	25.42 GB
Date created	2024:07:30 20:36:22
Software version	2.1.2.18358
File size	4.61 GB

System

Software name	Agisoft Metashape Professional
Software version	2.1.2 build 18358
OS	Windows 64 bit
RAM	63.72 GB
CPU	Intel(R) Core(TM) i9-14900KF
GPU(s)	NVIDIA GeForce RTX 4090