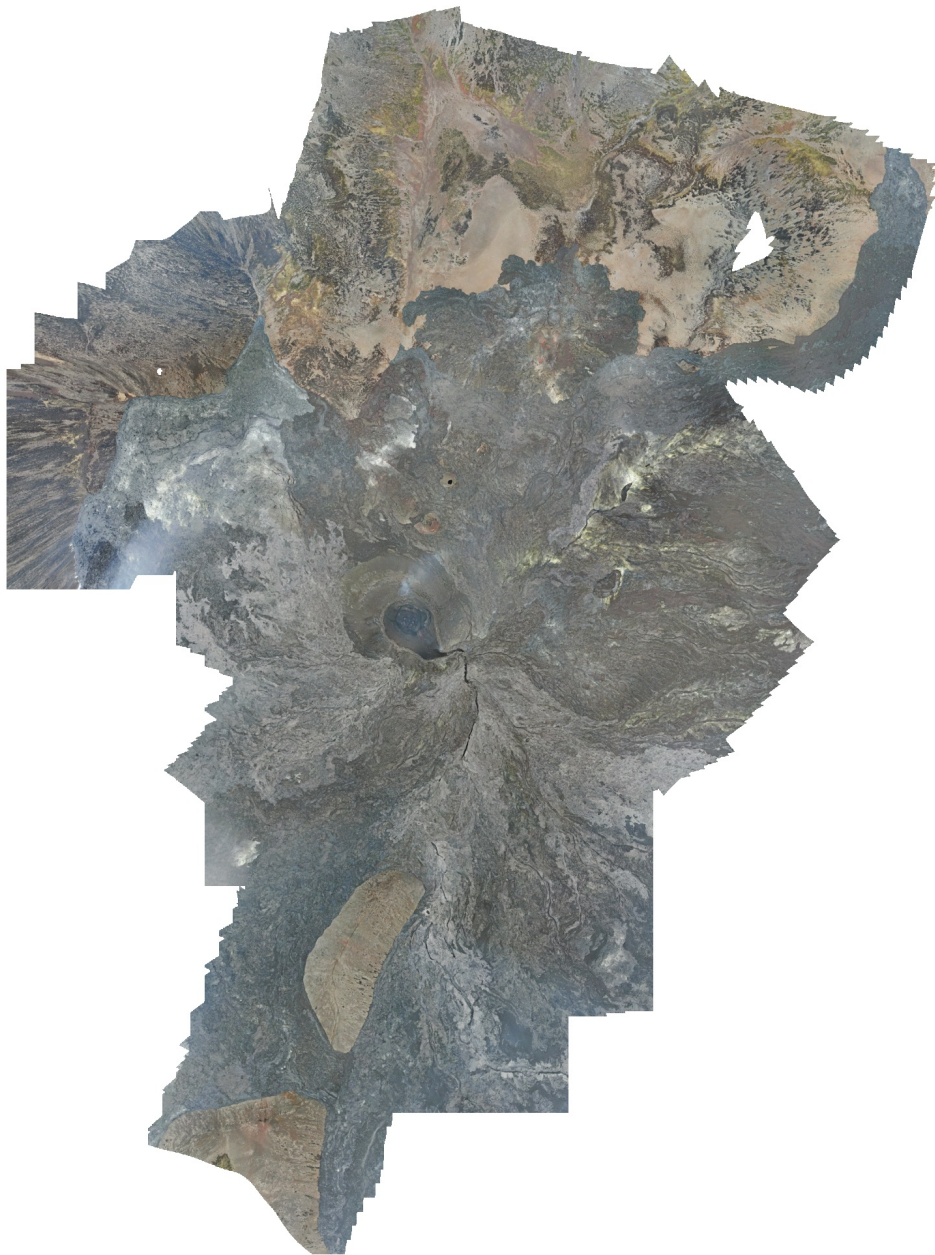


# 2021\_08\_28\_Report\_Vent

Processing Report

August 28, 2021  
Fagradalsfjall Vent Merged Model  
03 June 2022



# Survey Data

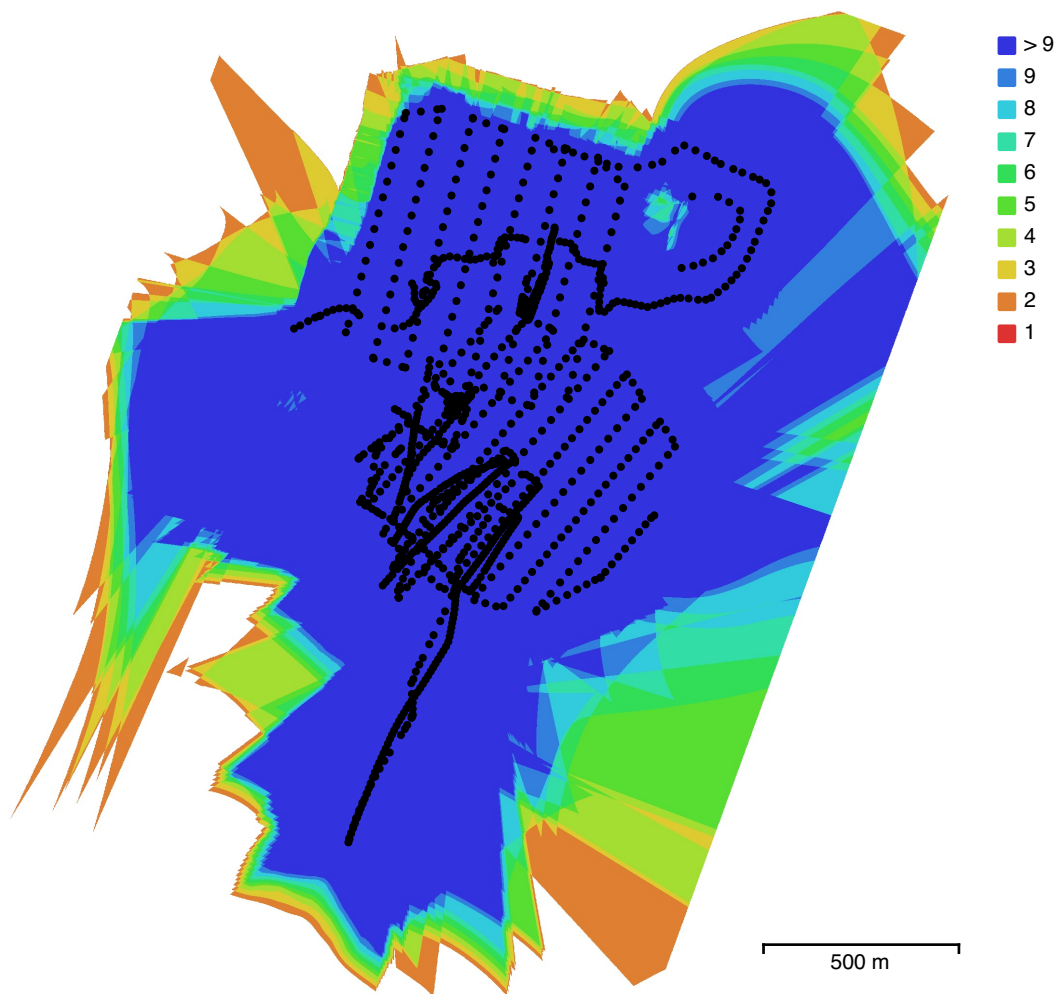


Fig. 1. Camera locations and image overlap.

Number of images:	1,115	Camera stations:	1,102
Flying altitude:	144 m	Tie points:	2,951,425
Ground resolution:	5.23 cm/pix	Projections:	9,519,554
Coverage area:	3.73 km <sup>2</sup>	Reprojection error:	0.676 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
ZH20 (4.5mm)	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu$ m	No
ZH20T (4.5mm)	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu$ m	No
ZH20T (4.5mm)	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu$ m	No
ZH20T (4.5mm)	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu$ m	No
ZH20 (4.5mm)	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu$ m	No

Table 1. Cameras.

# Camera Calibration

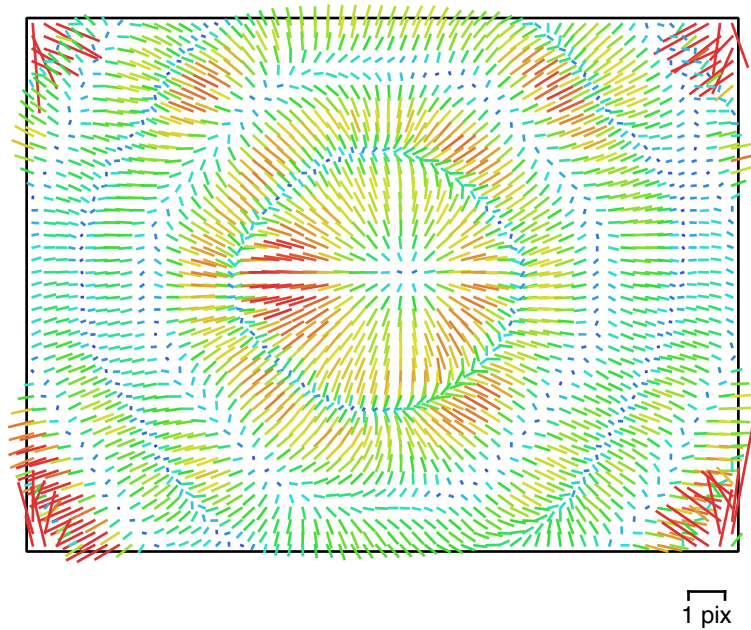


Fig. 2. Image residuals for ZH20 (4.5mm).

## ZH20 (4.5mm)

150 images

Type	Resolution	Focal Length	Pixel Size
Frame	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	2942.43	0.24	1.00	-0.01	-0.03	-0.12	0.07	0.42	-0.58	0.58	-0.58	0.02	0.05
Cx	-16.0631	0.03		1.00	-0.03	-0.02	0.05	0.01	-0.01	0.01	-0.01	-0.17	-0.01
Cy	-53.1591	0.025			1.00	-0.04	-0.04	-0.00	0.01	-0.01	0.01	-0.04	0.08
B1	-2.11295	0.0057				1.00	-0.01	-0.05	0.06	-0.06	0.07	-0.04	0.01
B2	0.392087	0.0055					1.00	0.03	-0.04	0.04	-0.04	-0.07	-0.01
K1	0.257223	9.3e-05						1.00	-0.97	0.94	-0.91	-0.01	0.04
K2	-1.03413	0.00056							1.00	-0.99	0.98	-0.00	-0.05
K3	1.44917	0.0012								1.00	-1.00	0.01	0.05
K4	-0.800839	0.00087									1.00	-0.01	-0.05
P1	-1.99829e-05	1.9e-06										1.00	0.03
P2	0.000845632	1.8e-06											1.00

Table 2. Calibration coefficients and correlation matrix.

# Camera Calibration

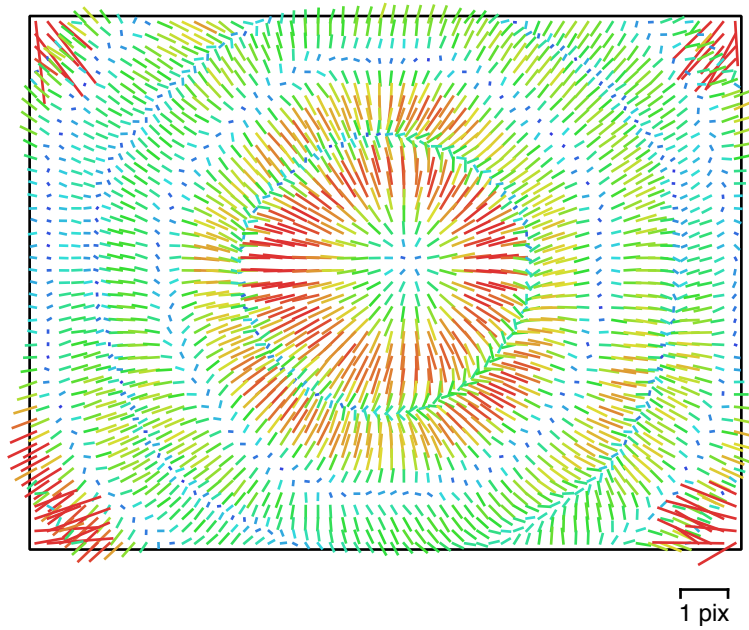


Fig. 3. Image residuals for ZH20T (4.5mm).

## ZH20T (4.5mm)

526 images

Type	Resolution	Focal Length	Pixel Size
Frame	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	2924.19	0.033	1.00	-0.03	-0.55	-0.04	-0.02	-0.38	0.33	-0.30	0.28	0.04	0.08
Cx	0.440749	0.02		1.00	0.03	-0.02	0.40	0.03	-0.03	0.03	-0.03	0.39	0.01
Cy	-37.6111	0.032			1.00	-0.47	0.05	-0.01	0.02	-0.02	0.01	-0.05	0.03
B1	-1.69753	0.012				1.00	-0.04	-0.01	-0.01	0.01	-0.00	0.03	0.48
B2	0.926446	0.01					1.00	0.02	-0.02	0.02	-0.02	-0.44	-0.02
K1	0.238162	7.7e-05						1.00	-0.98	0.93	-0.89	-0.01	-0.02
K2	-0.885278	0.00039							1.00	-0.99	0.96	0.00	-0.03
K3	1.12485	0.00078								1.00	-0.99	-0.00	0.03
K4	-0.569265	0.00055									1.00	-0.00	-0.03
P1	-0.000272637	1.6e-06										1.00	0.05
P2	0.000391163	2.5e-06											1.00

Table 3. Calibration coefficients and correlation matrix.

# Camera Calibration

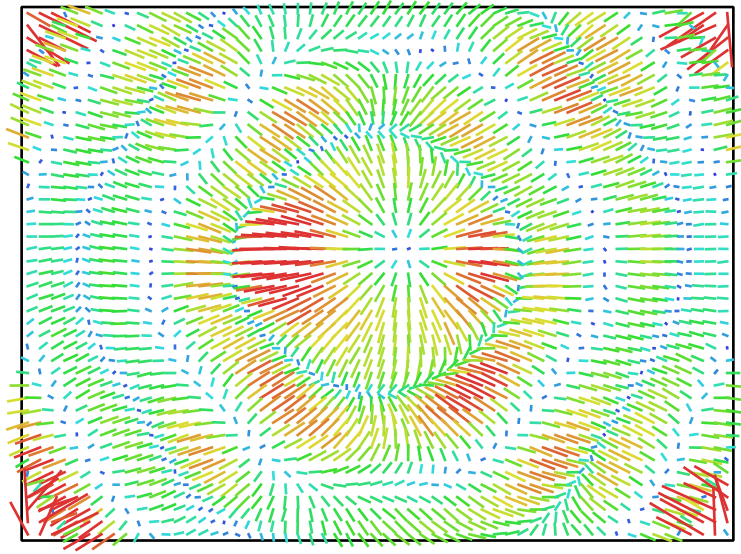


Fig. 4. Image residuals for ZH20T (4.5mm). 1 pix

## ZH20T (4.5mm)

235 images

Type	Resolution	Focal Length	Pixel Size
Frame	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	2919.67	0.075	1.00	-0.09	-0.02	-0.07	0.04	0.01	-0.10	0.11	-0.11	0.06	0.01
Cx	-0.863903	0.019		1.00	0.01	-0.00	-0.09	-0.01	0.02	-0.02	0.02	0.09	-0.02
Cy	-34.6468	0.019			1.00	0.09	0.03	-0.01	0.01	-0.01	0.01	-0.03	0.30
B1	-4.38214	0.0056				1.00	-0.00	0.01	-0.01	0.00	-0.00	-0.00	-0.04
B2	-0.0809036	0.0052					1.00	0.01	-0.01	0.01	-0.01	0.03	0.01
K1	0.254317	7.2e-05						1.00	-0.97	0.93	-0.89	-0.01	0.02
K2	-0.960636	0.00038							1.00	-0.99	0.96	-0.00	-0.02
K3	1.26774	0.00079								1.00	-0.99	0.00	0.02
K4	-0.665313	0.00056									1.00	-0.00	-0.02
P1	-0.000529724	1.5e-06										1.00	0.02
P2	0.000193905	1.6e-06											1.00

Table 4. Calibration coefficients and correlation matrix.

# Camera Calibration

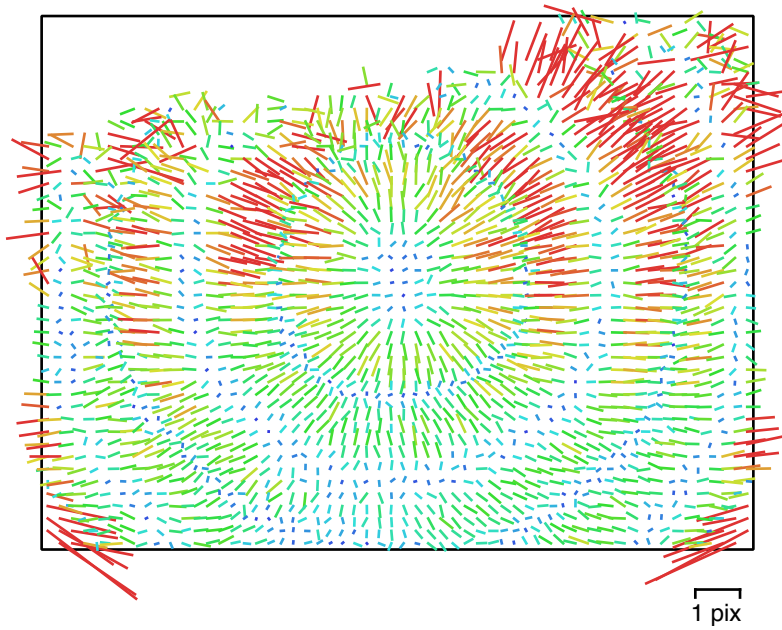


Fig. 5. Image residuals for ZH20T (4.5mm).

## ZH20T (4.5mm)

22 images

Type	Resolution	Focal Length	Pixel Size
Frame	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	2899.37	0.49	1.00	-0.15	0.02	-0.82	0.22	0.10	-0.11	0.12	-0.13	-0.14	-0.13
Cx	12.5722	0.15		1.00	0.11	0.04	0.26	-0.03	0.03	-0.02	0.03	0.10	-0.09
Cy	-49.3417	0.31			1.00	-0.44	-0.08	0.05	-0.08	0.09	-0.10	0.05	-0.27
B1	15.5118	0.38				1.00	-0.03	-0.18	0.18	-0.18	0.19	-0.02	0.50
B2	18.6102	0.4					1.00	0.06	-0.08	0.08	-0.08	-0.86	0.15
K1	0.29075	0.00042						1.00	-0.97	0.92	-0.88	-0.04	0.01
K2	-1.15606	0.0023							1.00	-0.99	0.96	0.06	-0.04
K3	1.66295	0.0049								1.00	-0.99	-0.06	0.04
K4	-0.931331	0.0036									1.00	0.06	-0.03
P1	-0.000811184	2.4e-05										1.00	-0.11
P2	0.00178087	3.5e-05											1.00

Table 5. Calibration coefficients and correlation matrix.

# Camera Calibration

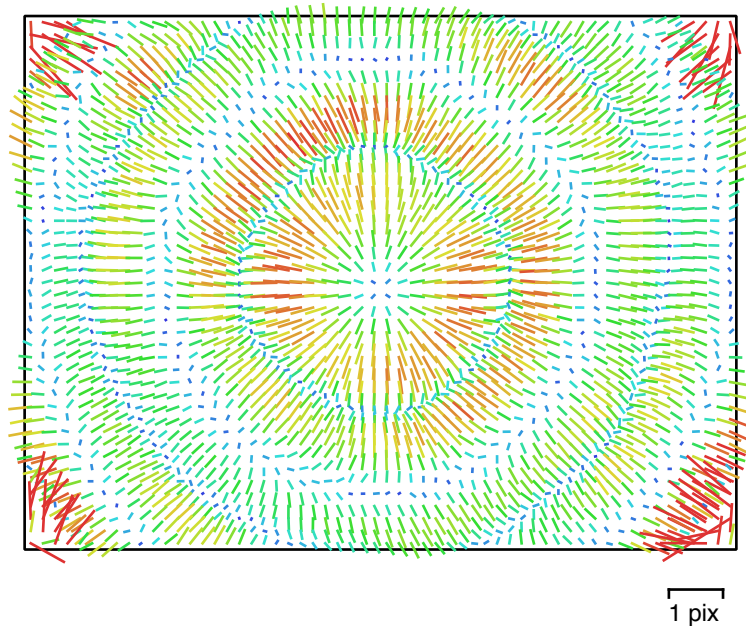


Fig. 6. Image residuals for ZH20 (4.5mm).

## ZH20 (4.5mm)

182 images

Type	Resolution	Focal Length	Pixel Size
Frame	4056 x 3040	4.5 mm	1.6 x 1.6 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	2943.77	0.26	1.00	-0.10	-0.26	-0.05	0.37	0.44	-0.60	0.61	-0.63	0.08	0.20
Cx	-0.439087	0.047		1.00	0.01	0.29	0.29	-0.01	0.03	-0.04	0.04	-0.48	0.01
Cy	-61.8699	0.053			1.00	-0.34	0.12	-0.10	0.15	-0.15	0.15	0.09	-0.47
B1	-0.702525	0.024				1.00	-0.03	-0.00	-0.00	-0.00	0.00	-0.34	0.45
B2	1.32979	0.025					1.00	0.19	-0.25	0.25	-0.25	-0.33	-0.12
K1	0.278027	0.0001						1.00	-0.96	0.93	-0.90	0.01	0.09
K2	-1.16013	0.00064							1.00	-0.99	0.98	-0.03	-0.14
K3	1.7359	0.0014								1.00	-1.00	0.04	0.14
K4	-1.01913	0.0011									1.00	-0.04	-0.15
P1	-0.000248426	5.5e-06										1.00	-0.13
P2	0.0010866	5.2e-06											1.00

Table 6. Calibration coefficients and correlation matrix.

# Ground Control Points

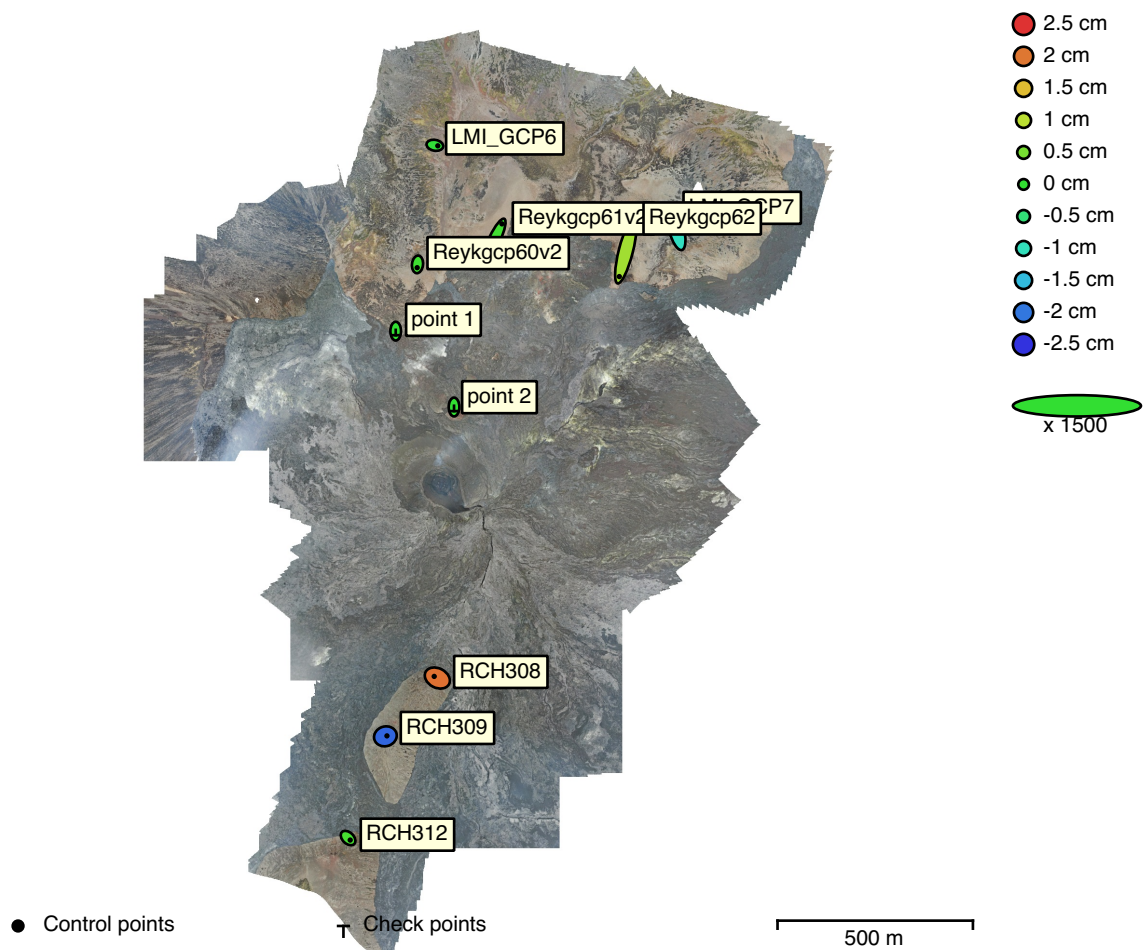


Fig. 7. GCP locations and error estimates.

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	1.39267	4.0109	1.1414	4.2458	4.39655

Table 7. Control points RMSE.  
X - Easting, Y - Northing, Z - Altitude.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
2	0.000165692	1.38789	2.23816e-05	1.38789	1.38789

Table 8. Check points RMSE.  
X - Easting, Y - Northing, Z - Altitude.

<b>Label</b>	<b>X error (cm)</b>	<b>Y error (cm)</b>	<b>Z error (cm)</b>	<b>Total (cm)</b>	<b>Image (pix)</b>
Reykgcp60v2	-0.118054	-1.12812	0.0888861	1.13776	1.952 (31)
Reykgcp61v2	2.43701	5.17408	0.113275	5.7204	2.827 (41)
LMI_GCP6	1.00479	-0.180386	-0.0491815	1.02203	0.974 (15)
LMI_GCP7	-1.27695	4.84421	-1.03313	5.11511	5.696 (8)
RCH308	-1.07065	0.55762	2.04106	2.37132	1.715 (35)
RCH309	0.527916	0.15584	-2.11998	2.19027	1.464 (43)
RCH312	0.72564	-0.685347	0.154251	1.00997	1.095 (15)
Reykgcp62	-2.2297	-8.7379	0.804819	9.05373	3.451 (29)
<b>Total</b>	<b>1.39267</b>	<b>4.0109</b>	<b>1.1414</b>	<b>4.39655</b>	<b>2.427</b>

Table 9. Control points.  
X - Easting, Y - Northing, Z - Altitude.

<b>Label</b>	<b>X error (cm)</b>	<b>Y error (cm)</b>	<b>Z error (cm)</b>	<b>Total (cm)</b>	<b>Image (pix)</b>
point 1	-0.000189016	-1.38786	1.40959e-06	1.38786	0.000 (69)
point 2	-0.000138493	-1.38793	3.1621e-05	1.38793	0.000 (106)
<b>Total</b>	<b>0.000165692</b>	<b>1.38789</b>	<b>2.23816e-05</b>	<b>1.38789</b>	<b>0.000</b>

Table 10. Check points.  
X - Easting, Y - Northing, Z - Altitude.

# Digital Elevation Model

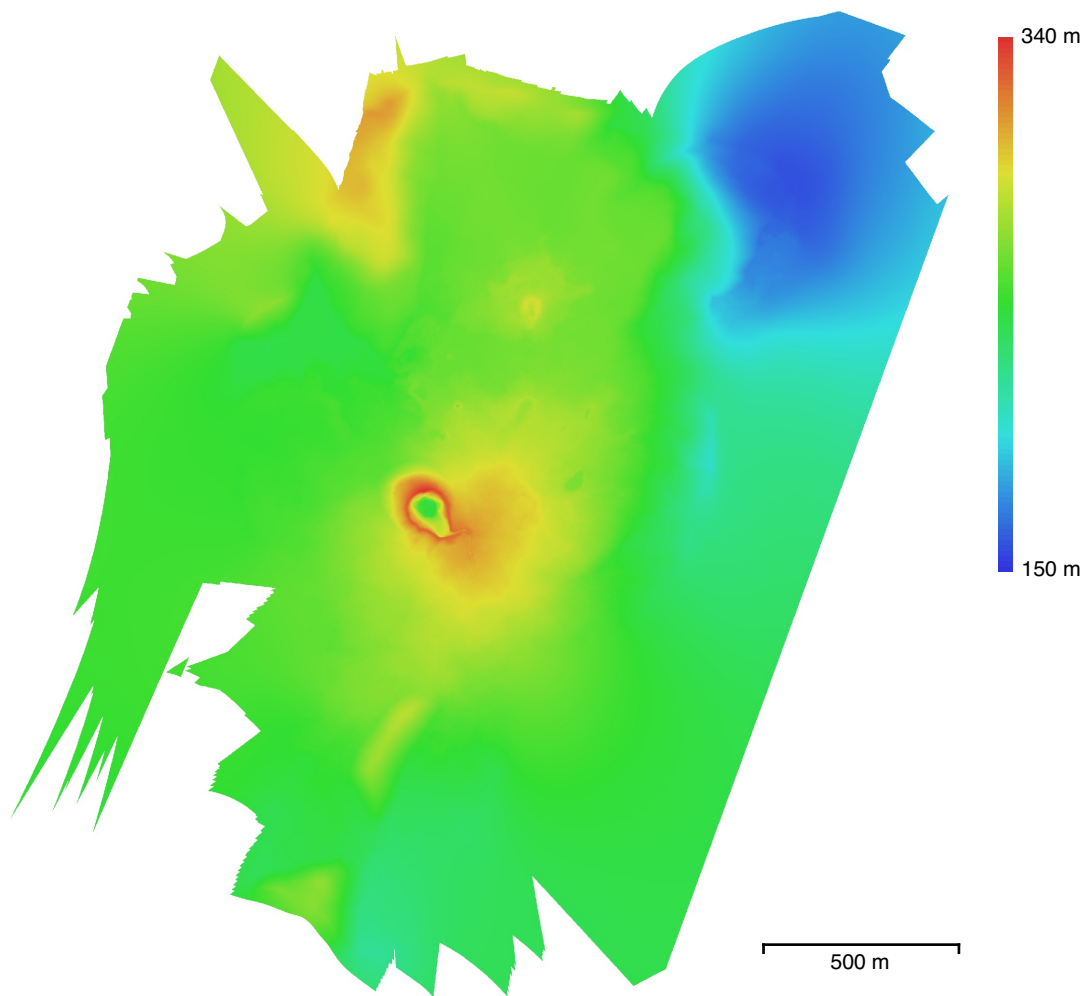


Fig. 8. Reconstructed digital elevation model.

Resolution: 10.5 cm/pix  
Point density: 91.5 points/m<sup>2</sup>

# Processing Parameters

## General

Cameras	1115
Aligned cameras	1102
Markers	10
Coordinate system	WGS 84 / UTM zone 27N (EPSG::32627)
Rotation angles	Yaw, Pitch, Roll

## Point Cloud

Points	2,951,425 of 7,781,993
RMS reprojection error	0.253688 (0.676384 pix)
Max reprojection error	3.22199 (28.2819 pix)
Mean key point size	2.6452 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	3.87178

## Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	60,000
Key point limit per Mpx	1,000
Tie point limit	0
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	No
Matching time	56 minutes 13 seconds
Matching memory usage	941.22 MB
Alignment time	2 hours 0 minutes
Alignment memory usage	4.85 GB

## Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	1 minutes 10 seconds
Date created	2022:05:04 20:18:07
Software version	1.8.1.13915
File size	549.71 MB

## Depth Maps

Count	1098
<b>Depth maps generation parameters</b>	
Quality	High
Filtering mode	Moderate
Max neighbors	16
Processing time	2 days 5 hours
Memory usage	1.28 GB
Date created	2022:05:09 04:20:13
Software version	1.8.1.13915
File size	5.65 GB

## Dense Point Cloud

Points	148,977,755
Point colors	3 bands, uint8

## Depth maps generation parameters

Quality	High
---------	------

Filtering mode	Moderate
Max neighbors	16
Processing time	2 days 5 hours
Memory usage	1.28 GB
<b>Dense cloud generation parameters</b>	
Processing time	5 hours 42 minutes
Memory usage	15.69 GB
Date created	2022:05:09 10:02:43
Software version	1.8.1.13915
File size	3.45 GB
<b>DEM</b>	
Size	26,350 x 31,985
Coordinate system	WGS 84 / UTM zone 27N (EPSG::32627)
<b>Reconstruction parameters</b>	
Source data	Dense cloud
Interpolation	Enabled
Processing time	5 minutes 44 seconds
Memory usage	12.00 KB
Date created	2022:05:18 23:55:36
Software version	1.8.1.13915
File size	1.31 GB
<b>Orthomosaic</b>	
Size	45,963 x 48,307
Coordinate system	WGS 84 / UTM zone 27N (EPSG::32627)
Colors	3 bands, uint8
<b>Reconstruction parameters</b>	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	42 minutes 7 seconds
Memory usage	156.77 MB
Date created	2022:05:19 00:42:43
Software version	1.8.1.13915
File size	21.86 GB
<b>System</b>	
Software name	Agisoft Metashape Professional
Software version	1.8.1 build 13915
OS	Mac OS 64 bit
RAM	64.00 GB
CPU	
GPU(s)	None