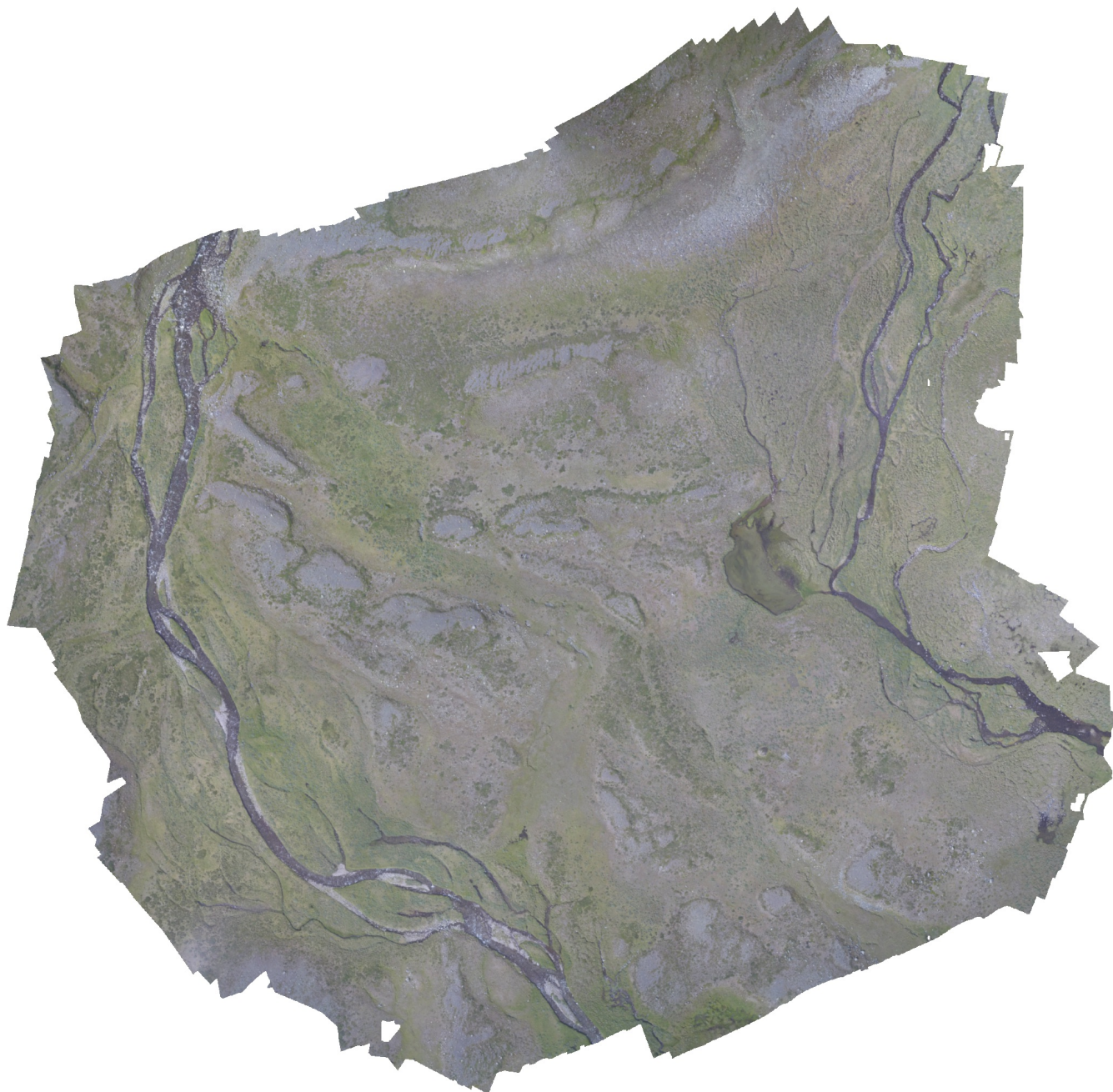


# Agisoft Metashape

Processing Report  
24 November 2022



# Survey Data

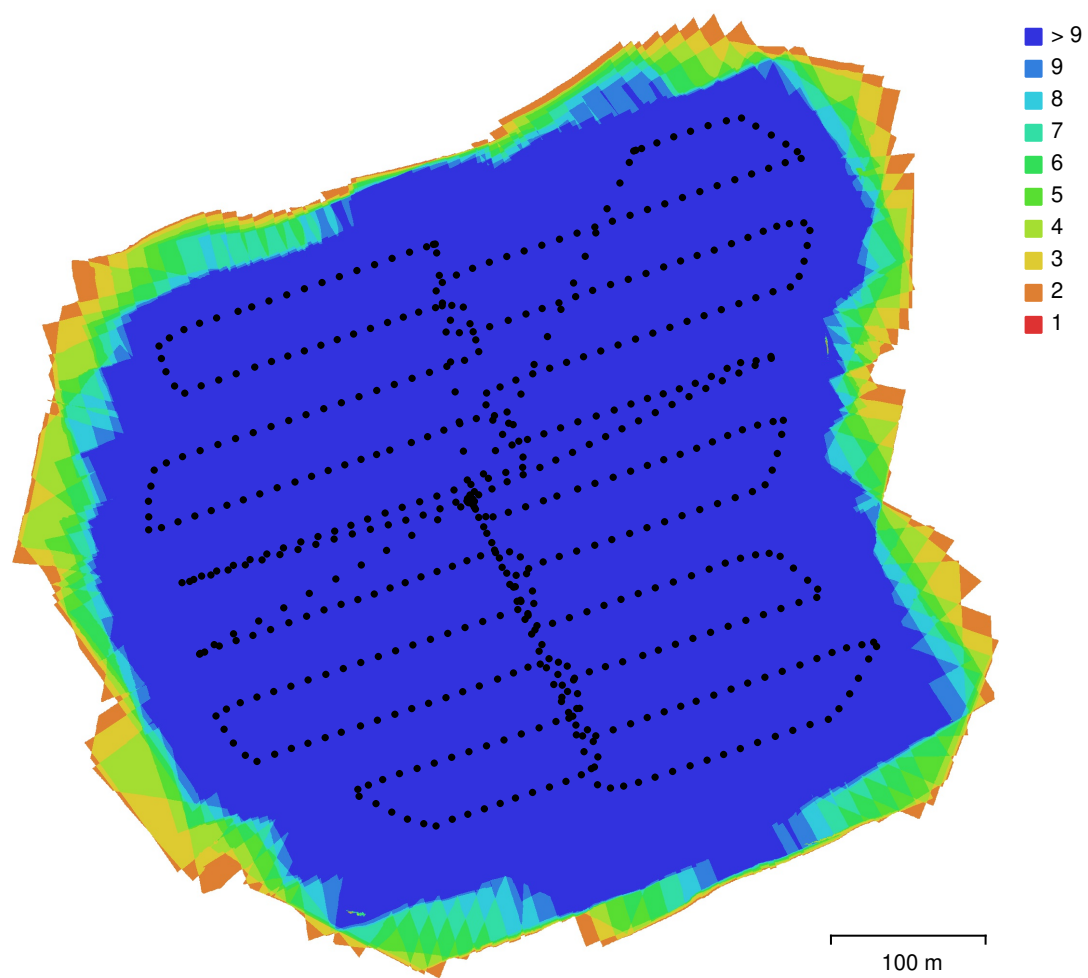


Fig. 1. Camera locations and image overlap.

Number of images:	702	Camera stations:	702
Flying altitude:	83.8 m	Tie points:	430,978
Ground resolution:	3.23 cm/pix	Projections:	2,828,875
Coverage area:	0.275 km <sup>2</sup>	Reprojection error:	0.785 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
HERO4 Black (3mm)	4000 x 3000	3 mm	1.73 x 1.73 $\mu$ m	No

Table 1. Cameras.

# Camera Calibration

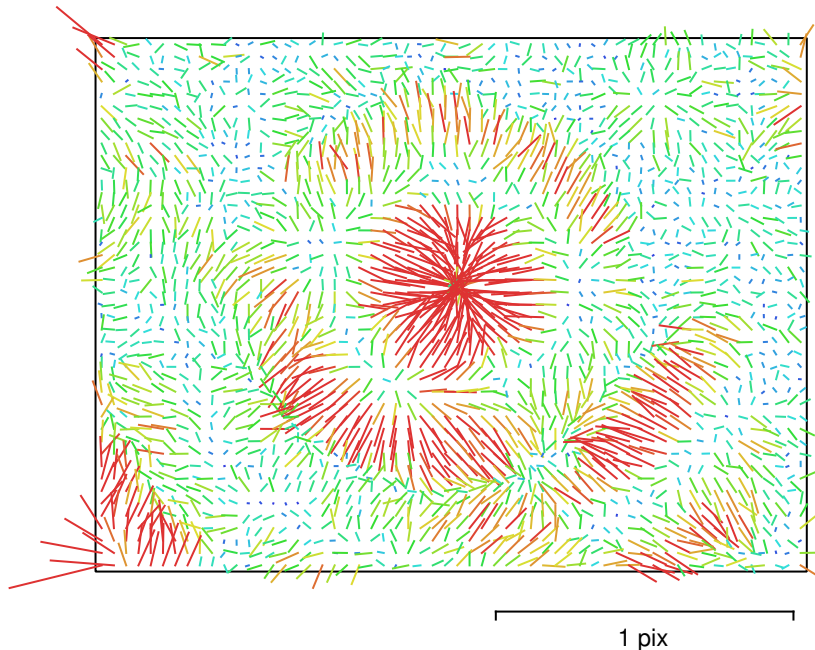


Fig. 2. Image residuals for HERO4 Black (3mm).

## HERO4 Black (3mm)

702 images

Type  
Frame

Resolution  
4000 x 3000

Focal Length  
3 mm

Pixel Size  
1.73 x 1.73  $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
<b>F</b>	<b>2163.98</b>	0.18	1.00	0.18	-0.28	0.13	-0.17	0.67	-0.77	0.62	-0.06	0.02
<b>Cx</b>	<b>26.0643</b>	0.016		1.00	-0.01	-0.14	0.08	0.13	-0.15	0.13	0.05	0.02
<b>Cy</b>	<b>-76.5201</b>	0.016			1.00	-0.18	-0.08	-0.20	0.23	-0.20	-0.01	0.17
<b>B1</b>	<b>-2.00138</b>	0.0034				1.00	-0.02	0.10	-0.13	0.12	0.07	0.01
<b>B2</b>	<b>-0.207332</b>	0.0033					1.00	-0.12	0.13	-0.11	-0.03	0.03
<b>K1</b>	<b>0.0688455</b>	1.7e-05						1.00	-0.96	0.92	-0.03	-0.01
<b>K2</b>	<b>-0.0775505</b>	3.2e-05							1.00	-0.97	0.04	-0.00
<b>K3</b>	<b>0.0179322</b>	1.4e-05								1.00	-0.02	-0.00
<b>P1</b>	<b>-9.05802e-06</b>	8.5e-07									1.00	-0.02
<b>P2</b>	<b>-0.000413972</b>	7.3e-07										1.00

Table 2. Calibration coefficients and correlation matrix.



# Ground Control Points

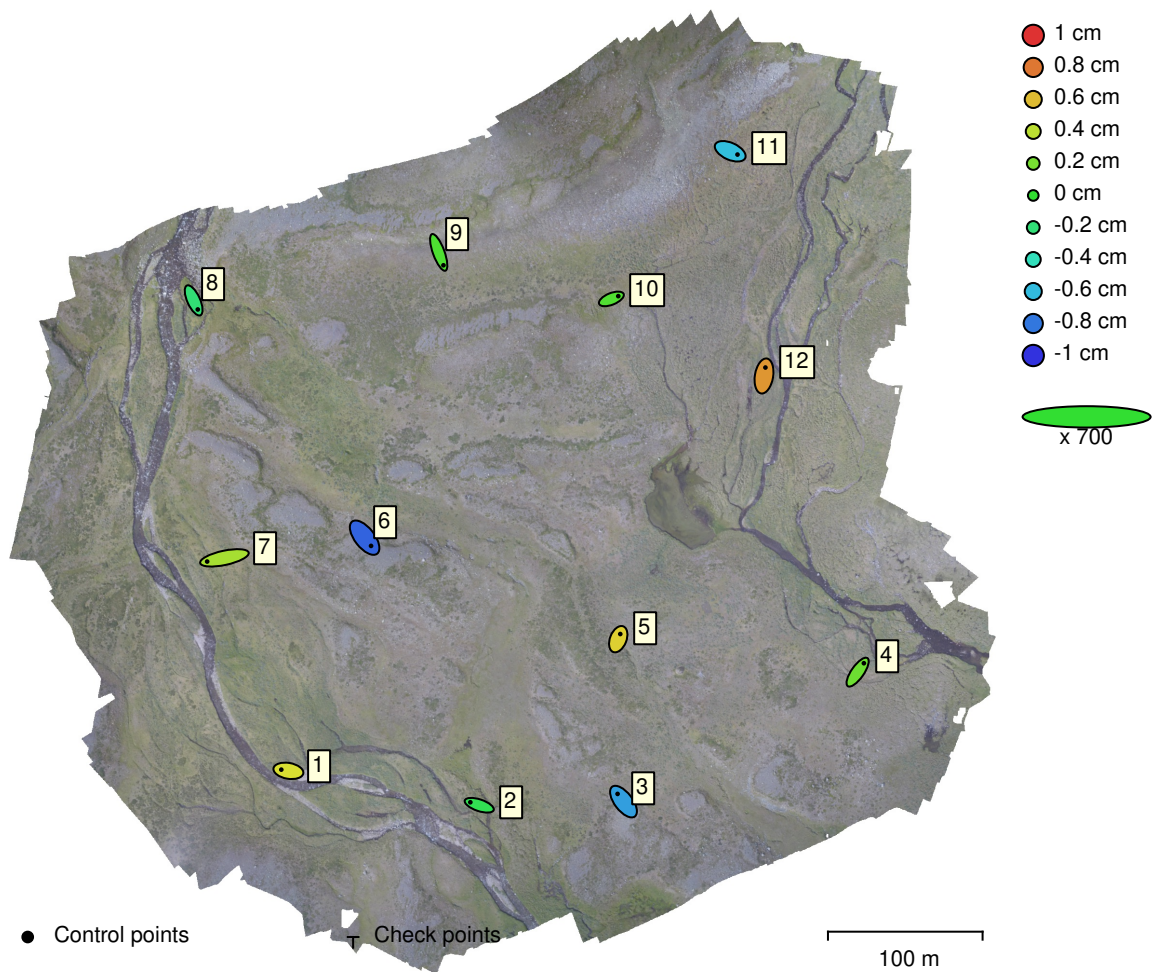


Fig. 3. GCP locations and error estimates.

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)
12	1.40096	1.30098	0.482121	1.91187	1.97172

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)
1	-1.31042	0.221589	0.486105	1.41513	1.565 (11)
2	-1.64465	0.549762	-0.0951496	1.73671	1.285 (10)
3	-1.09174	1.42383	-0.684757	1.92044	0.888 (10)
4	1.15621	1.64514	0.169656	2.01795	2.333 (19)
5	0.376702	0.950844	0.543212	1.15805	0.635 (7)
6	1.18962	-1.52295	-0.857728	2.1143	1.319 (12)
7	-3.19289	-0.681301	0.338425	3.28226	1.437 (11)
8	0.762874	-1.67675	-0.193829	1.85231	1.820 (10)
9	0.874673	-2.37805	0.0819326	2.53513	1.000 (17)
10	1.27283	0.51193	0.0903559	1.37489	0.534 (10)
11	1.34735	-0.604138	-0.588328	1.58949	2.423 (10)
12	0.259476	1.56333	0.708786	1.73601	1.160 (8)
<b>Total</b>	<b>1.40096</b>	<b>1.30098</b>	<b>0.482121</b>	<b>1.97172</b>	<b>1.548</b>

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

# Digital Elevation Model

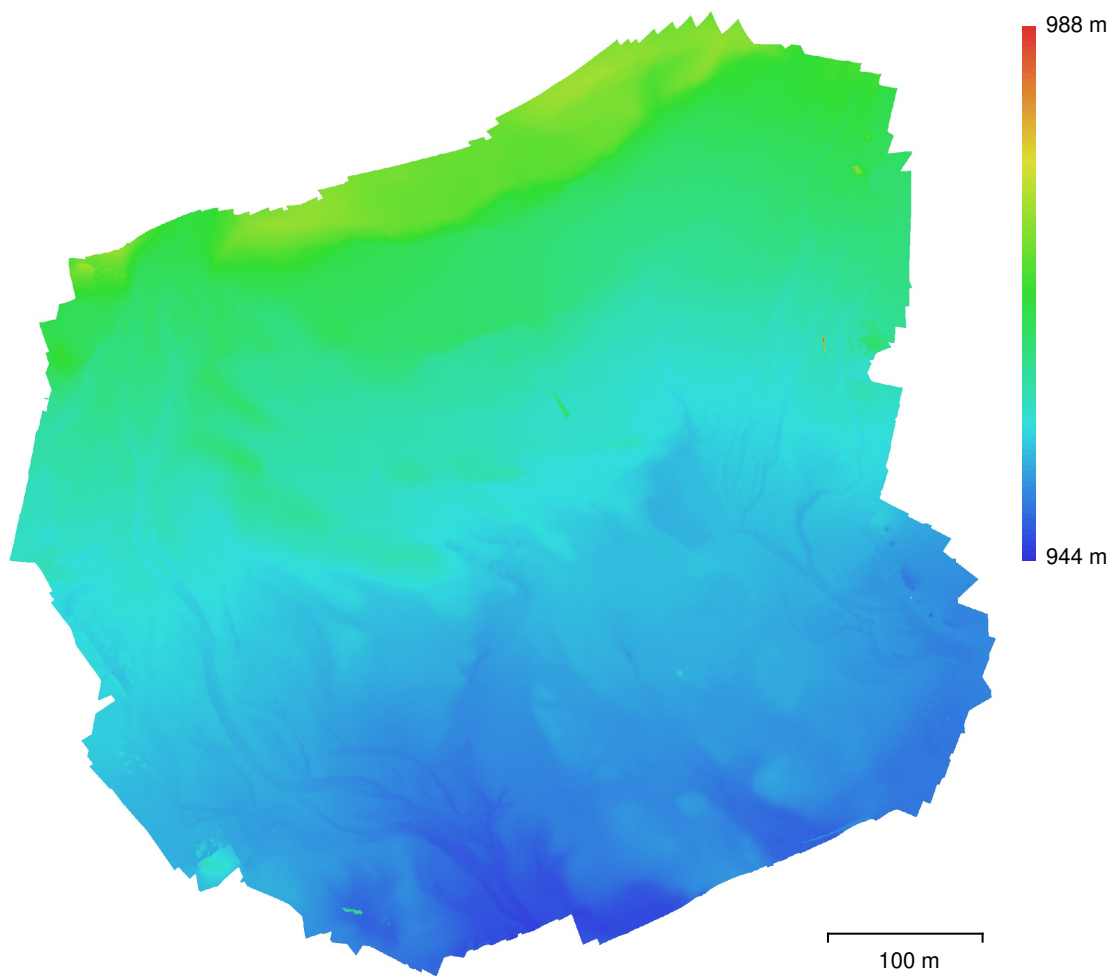


Fig. 4. Reconstructed digital elevation model.

Resolution: 6.46 cm/pix  
Point density: 240 points/m<sup>2</sup>

# Processing Parameters

## General

Cameras	702
Aligned cameras	702
Markers	12
Coordinate system	SWEREF99 TM (EPSG::3006)
Rotation angles	Yaw, Pitch, Roll

## Point Cloud

Points	430,978 of 681,662
RMS reprojection error	0.207638 (0.785093 pix)
Max reprojection error	3.11955 (23.5808 pix)
Mean key point size	3.64475 pix
Point colors	3 bands, uint8
Key points	2.20 GB
Average tie point multiplicity	11.3105

### Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	No
Key point limit	40,000
Tie point limit	10,000
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	6 minutes 20 seconds
Matching memory usage	913.44 MB
Alignment time	13 minutes 3 seconds
Alignment memory usage	1.40 GB

### Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	No
Optimization time	11 seconds
Software version	1.6.2.10247

## Depth Maps

Count	702
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### Depth maps generation parameters

Quality	High
Filtering mode	Aggressive
Processing time	2 hours 29 minutes
Software version	1.6.2.10247

## Dense Point Cloud

Points	64,456,762
Point colors	3 bands, uint8

### Depth maps generation parameters

Quality	High
Filtering mode	Aggressive
Processing time	2 hours 29 minutes

### Dense cloud generation parameters

Processing time	43 minutes 50 seconds
Software version	1.6.2.10247

## DEM

Size	17,309 x 17,362
Coordinate system	SWEREF99 TM (EPSG::3006)

<b>Reconstruction parameters</b>	
Source data	Dense cloud
Interpolation	Enabled
Processing time	1 minutes 38 seconds
Software version	1.6.2.10247
<b>Orthomosaic</b>	
Size	19,771 x 19,333
Coordinate system	SWEREF99 TM (EPSG::3006)
Colors	3 bands, uint8
<b>Reconstruction parameters</b>	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Processing time	6 minutes 48 seconds
Software version	1.6.2.10247
<b>System</b>	
Software name	Agisoft Metashape Professional
Software version	1.6.2 build 10247
OS	Linux 64 bit
RAM	1007.60 GB
CPU	Intel(R) Xeon(R) CPU E5-2690 v4 @ 2.60GHz
GPU(s)	Tesla P100-PCIE-16GB