

20170705_KFIsland

Processing Report
09 September 2022



Survey Data

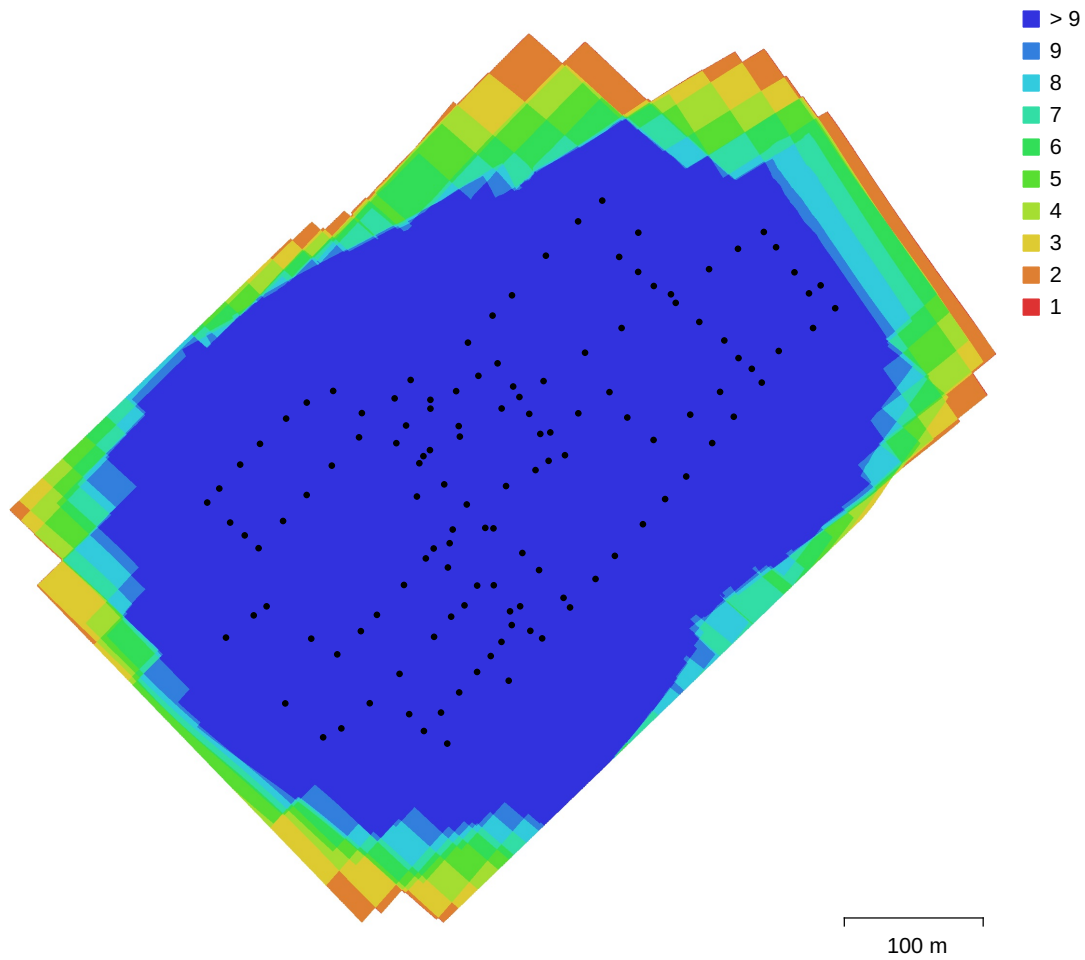


Fig. 1. Camera locations and image overlap.

| | | | |
|--------------------|-----------------------|---------------------|-----------|
| Number of images: | 128 | Camera stations: | 128 |
| Flying altitude: | 151 m | Tie points: | 335,271 |
| Ground resolution: | 5 cm/pix | Projections: | 1,247,380 |
| Coverage area: | 0.255 km ² | Reprojection error: | 0.301 pix |

| Camera Model | Resolution | Focal Length | Pixel Size | Precalibrated |
|-------------------------|-------------|--------------|---------------------|---------------|
| Flight1_FC300C (3.61mm) | 4000 x 3000 | 3.61 mm | 1.56 x 1.56 μ m | No |
| Fligh2_FC300C (3.61mm) | 4000 x 3000 | 3.61 mm | 1.56 x 1.56 μ m | No |

Table 1. Cameras.

Camera Calibration

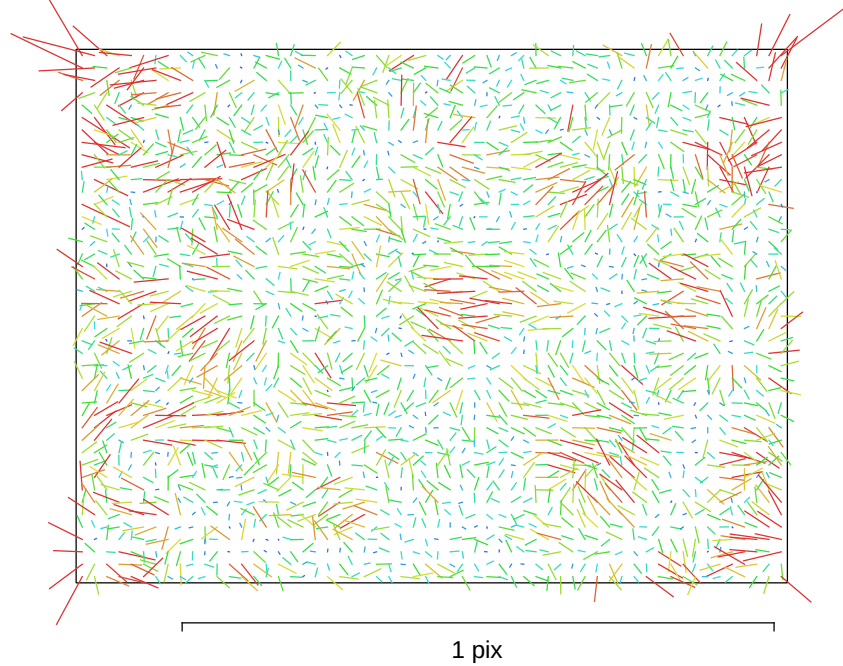


Fig. 2. Image residuals for Flight1_FC300C (3.61mm).

Flight1_FC300C (3.61mm)

87 images, rolling shutter

| Type | Resolution | Focal Length | Pixel Size |
|-------|--------------------|----------------|---|
| Frame | 4000 x 3000 | 3.61 mm | 1.56 x 1.56 μm |

| | Value | Error | F | Cx | Cy | B1 | B2 | K1 | K2 | K3 | K4 | P1 | P2 |
|-----------|---------------------|---------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| F | 2716.26 | 0.38 | 1.00 | -0.10 | -0.02 | -0.14 | 0.04 | -0.67 | 0.53 | -0.29 | 0.27 | 0.04 | 0.07 |
| Cx | 17.9723 | 0.032 | | 1.00 | -0.03 | 0.04 | 0.11 | 0.00 | -0.04 | 0.02 | -0.03 | -0.26 | 0.00 |
| Cy | 13.8467 | 0.032 | | | 1.00 | -0.13 | -0.03 | 0.08 | -0.01 | -0.00 | 0.01 | 0.00 | -0.18 |
| B1 | 6.5807 | 0.032 | | | | 1.00 | -0.03 | 0.08 | -0.07 | 0.05 | -0.05 | -0.09 | 0.24 |
| B2 | -2.74666 | 0.03 | | | | | 1.00 | -0.04 | 0.03 | -0.02 | 0.02 | -0.22 | -0.11 |
| K1 | -0.147332 | 5.5e-05 | | | | | | 1.00 | -0.87 | 0.74 | -0.68 | -0.02 | -0.06 |
| K2 | 0.164816 | 0.00017 | | | | | | | 1.00 | -0.95 | 0.92 | -0.01 | 0.03 |
| K3 | -0.0896412 | 0.00026 | | | | | | | | 1.00 | -0.99 | 0.02 | -0.00 |
| K4 | 0.0356485 | 0.00015 | | | | | | | | | 1.00 | -0.03 | 0.00 |
| P1 | -0.000412067 | 7.4e-06 | | | | | | | | | | 1.00 | 0.01 |
| P2 | 0.000208172 | 7.6e-06 | | | | | | | | | | | 1.00 |

Table 2. Calibration coefficients and correlation matrix.

Camera Calibration

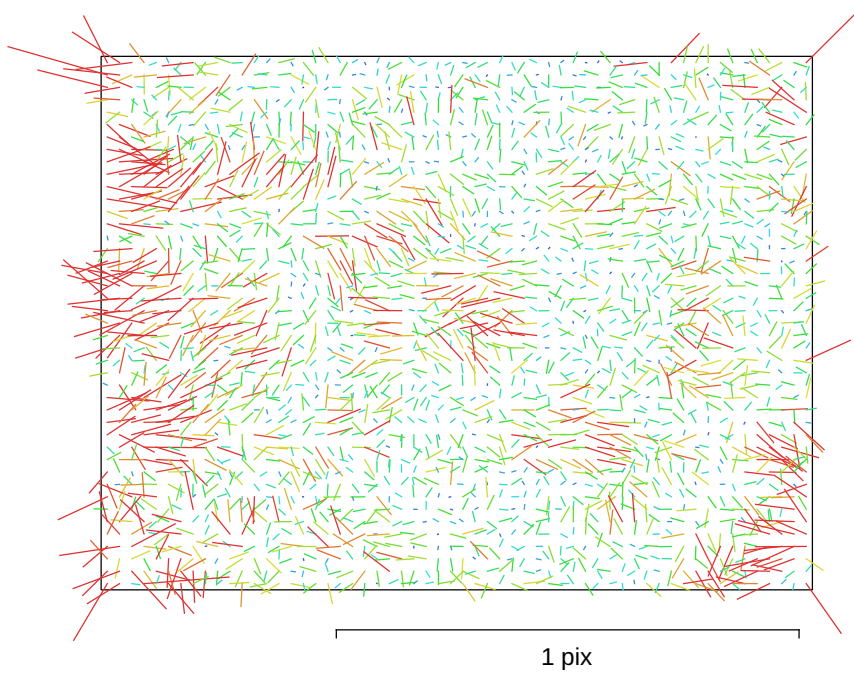


Fig. 3. Image residuals for Fligh2_FC300C (3.61mm).

Fligh2_FC300C (3.61mm)

41 images, rolling shutter

| | | | |
|-------|--------------------|----------------|---|
| Type | Resolution | Focal Length | Pixel Size |
| Frame | 4000 x 3000 | 3.61 mm | 1.56 x 1.56 μm |

| | Value | Error | F | Cx | Cy | B1 | B2 | K1 | K2 | K3 | K4 | P1 | P2 |
|-----------|---------------------|---------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| F | 2716.55 | 0.37 | 1.00 | 0.03 | 0.02 | -0.09 | 0.07 | -0.56 | 0.38 | -0.20 | 0.18 | 0.00 | 0.06 |
| Cx | 17.7022 | 0.034 | | 1.00 | -0.05 | 0.02 | 0.14 | -0.05 | 0.02 | -0.00 | -0.00 | -0.20 | 0.01 |
| Cy | 14.3657 | 0.036 | | | 1.00 | -0.16 | -0.01 | 0.07 | -0.01 | 0.01 | -0.01 | 0.01 | -0.10 |
| B1 | 4.868 | 0.031 | | | | 1.00 | -0.05 | 0.04 | -0.03 | 0.02 | -0.02 | -0.10 | 0.23 |
| B2 | -3.60613 | 0.031 | | | | | 1.00 | -0.05 | 0.04 | -0.03 | 0.03 | -0.23 | -0.15 |
| K1 | -0.147421 | 6.8e-05 | | | | | | 1.00 | -0.90 | 0.81 | -0.76 | 0.01 | -0.02 |
| K2 | 0.165176 | 0.00025 | | | | | | | 1.00 | -0.97 | 0.94 | -0.02 | 0.01 |
| K3 | -0.090096 | 0.0004 | | | | | | | | 1.00 | -0.99 | 0.03 | 0.00 |
| K4 | 0.035804 | 0.00024 | | | | | | | | | 1.00 | -0.03 | -0.01 |
| P1 | -0.000236216 | 7.5e-06 | | | | | | | | | | 1.00 | 0.02 |
| P2 | 0.000137298 | 7.7e-06 | | | | | | | | | | | 1.00 |

Table 3. Calibration coefficients and correlation matrix.

Ground Control Points

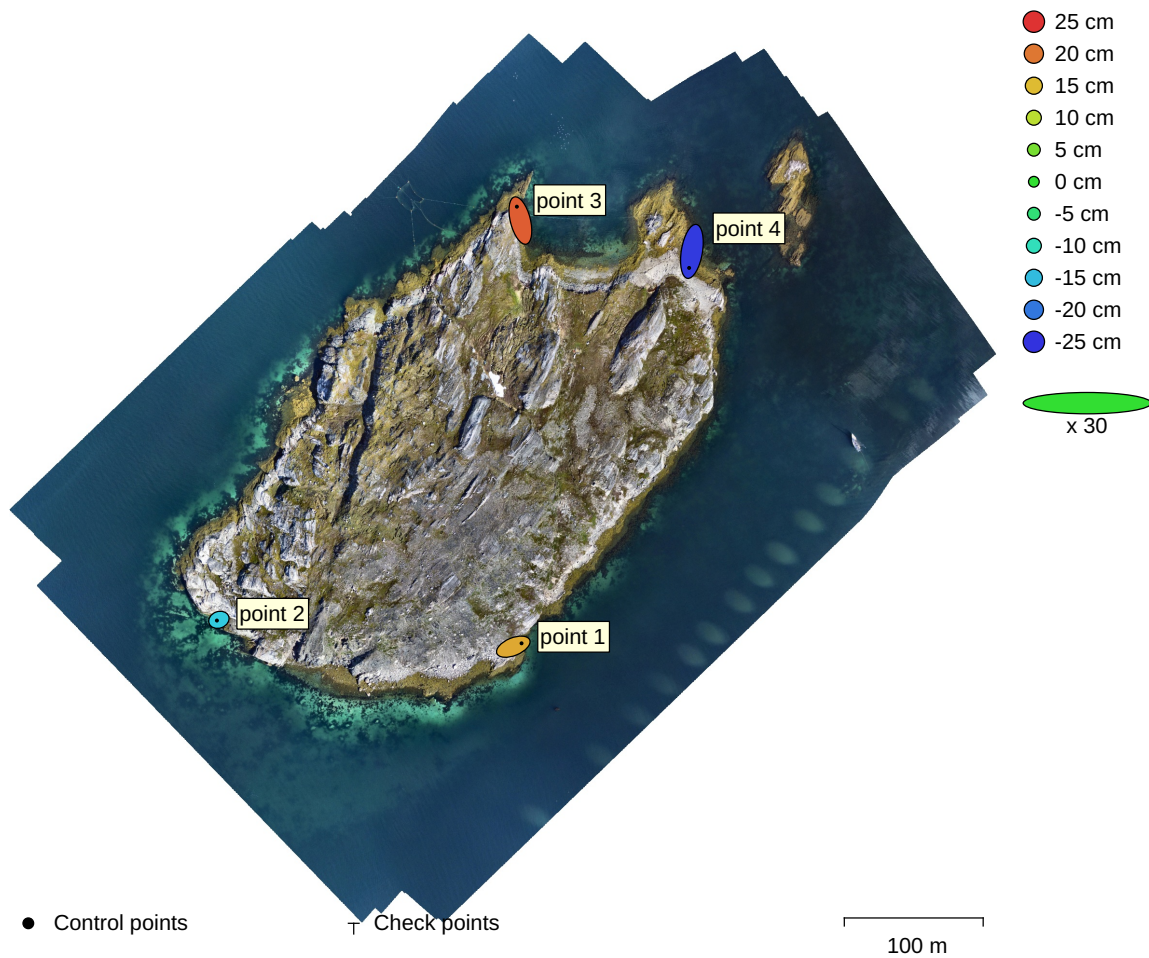


Fig. 4. GCP locations and error estimates.

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) |
|-------|--------------|--------------|--------------|---------------|------------|
| 4 | 23.0241 | 52.5055 | 19.6043 | 57.3318 | 60.5909 |

Table 4. Control points RMSE.

X - Longitude, Y - Latitude, Z - Altitude.

| Label | X error (cm) | Y error (cm) | Z error (cm) | Total (cm) | Image (pix) |
|--------------|---------------------|---------------------|---------------------|-------------------|--------------------|
| point 1 | 39.622 | 16.2855 | 16.4189 | 45.877 | 0.679 (36) |
| point 2 | -9.52278 | -3.52158 | -13.8256 | 17.1532 | 0.439 (20) |
| point 3 | -16.8915 | 66.6529 | 21.8683 | 72.1537 | 0.157 (16) |
| point 4 | -13.2107 | -79.417 | -24.4616 | 84.1424 | 0.027 (28) |
| Total | 23.0241 | 52.5055 | 19.6043 | 60.5909 | 0.457 |

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

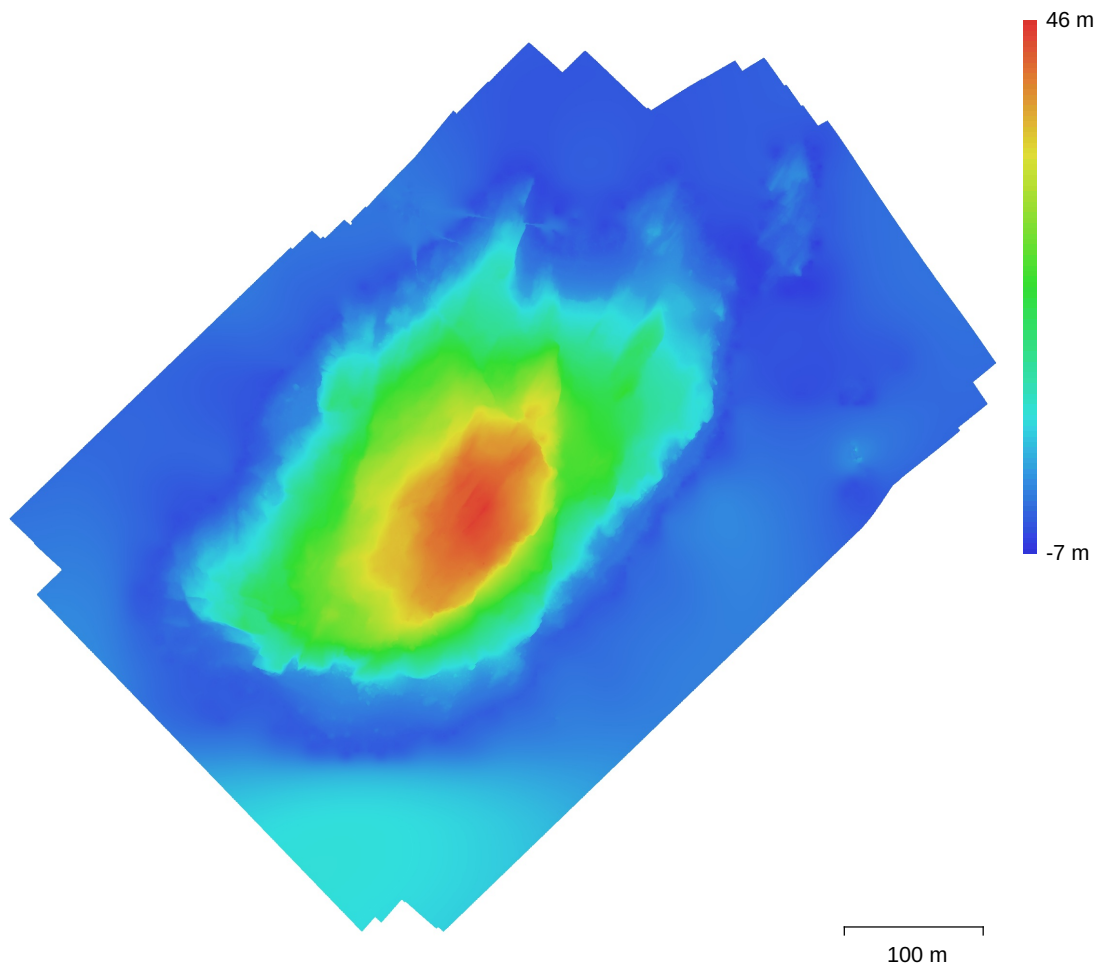


Fig. 5. Reconstructed digital elevation model.

Resolution: 5 cm/pix
Point density: 400 points/m²

Processing Parameters

General

| | |
|-------------------|-----------------------|
| Cameras | 128 |
| Aligned cameras | 128 |
| Markers | 4 |
| Coordinate system | WGS 84 + EGM96 height |
| Rotation angles | Yaw, Pitch, Roll |

Point Cloud

| | |
|--------------------------------|-------------------------|
| Points | 335,271 of 612,323 |
| RMS reprojection error | 0.110605 (0.301218 pix) |
| Max reprojection error | 0.252871 (1.67907 pix) |
| Mean key point size | 2.67418 pix |
| Point colors | 3 bands, uint8 |
| Key points | No |
| Average tie point multiplicity | 5.71865 |

Alignment parameters

| | |
|-------------------------------|----------------------|
| Accuracy | High |
| Generic preselection | Yes |
| Reference preselection | Source |
| Key point limit | 60,000 |
| Tie point limit | 0 |
| Exclude stationary tie points | No |
| Guided image matching | No |
| Adaptive camera model fitting | No |
| Matching time | 2 minutes 22 seconds |
| Matching memory usage | 969.79 MB |
| Alignment time | 6 minutes 16 seconds |
| Alignment memory usage | 561.18 MB |

Optimization parameters

| | |
|-------------------------------|--------------------------|
| Parameters | f, cx, cy, k1-k3, p1, p2 |
| Adaptive camera model fitting | Yes |
| Optimization time | 8 seconds |
| Software version | 1.7.1.11797 |
| File size | 62.87 MB |

Depth Maps

| | |
|---|--------------------|
| Count | 128 |
| Depth maps generation parameters | |
| Quality | Ultra High |
| Filtering mode | Mild |
| Processing time | 1 hours 27 minutes |
| Memory usage | 5.40 GB |
| Software version | 1.7.1.11797 |
| File size | 1.52 GB |

Dense Point Cloud

| | |
|--------------|----------------|
| Points | 49,709,120 |
| Point colors | 3 bands, uint8 |

Depth maps generation parameters

| | |
|-----------------|--------------------|
| Quality | Ultra High |
| Filtering mode | Mild |
| Processing time | 1 hours 27 minutes |
| Memory usage | 5.40 GB |

Dense cloud generation parameters

| | |
|----------------------------------|--|
| Processing time | 28 minutes 56 seconds |
| Memory usage | 18.46 GB |
| Software version | 1.7.1.11797 |
| File size | 801.80 MB |
| DEM | |
| Size | 15,447 x 15,333 |
| Coordinate system | WGS 84 + EGM96 height |
| Reconstruction parameters | |
| Source data | Dense cloud |
| Interpolation | Enabled |
| Processing time | 43 seconds |
| Memory usage | 298.89 MB |
| Software version | 1.7.1.11797 |
| File size | 508.85 MB |
| Orthomosaic | |
| Size | 14,210 x 12,803 |
| Coordinate system | WGS 84 + EGM96 height |
| Colors | 3 bands, uint8 |
| Reconstruction parameters | |
| Blending mode | Mosaic |
| Surface | DEM |
| Enable hole filling | Yes |
| Enable ghosting filter | No |
| Processing time | 6 minutes 4 seconds |
| Memory usage | 5.97 GB |
| Software version | 1.7.1.11797 |
| File size | 2.34 GB |
| System | |
| Software name | Agisoft Metashape Professional |
| Software version | 1.7.1 build 11797 |
| OS | Linux 64 bit |
| RAM | 125.62 GB |
| CPU | Intel(R) Core(TM) i7-9800X CPU @ 3.80GHz |
| GPU(s) | Quadro P1000 |