# Abies_alba_8N

**Processing Report**

**07 November 2018**

# Survey Data

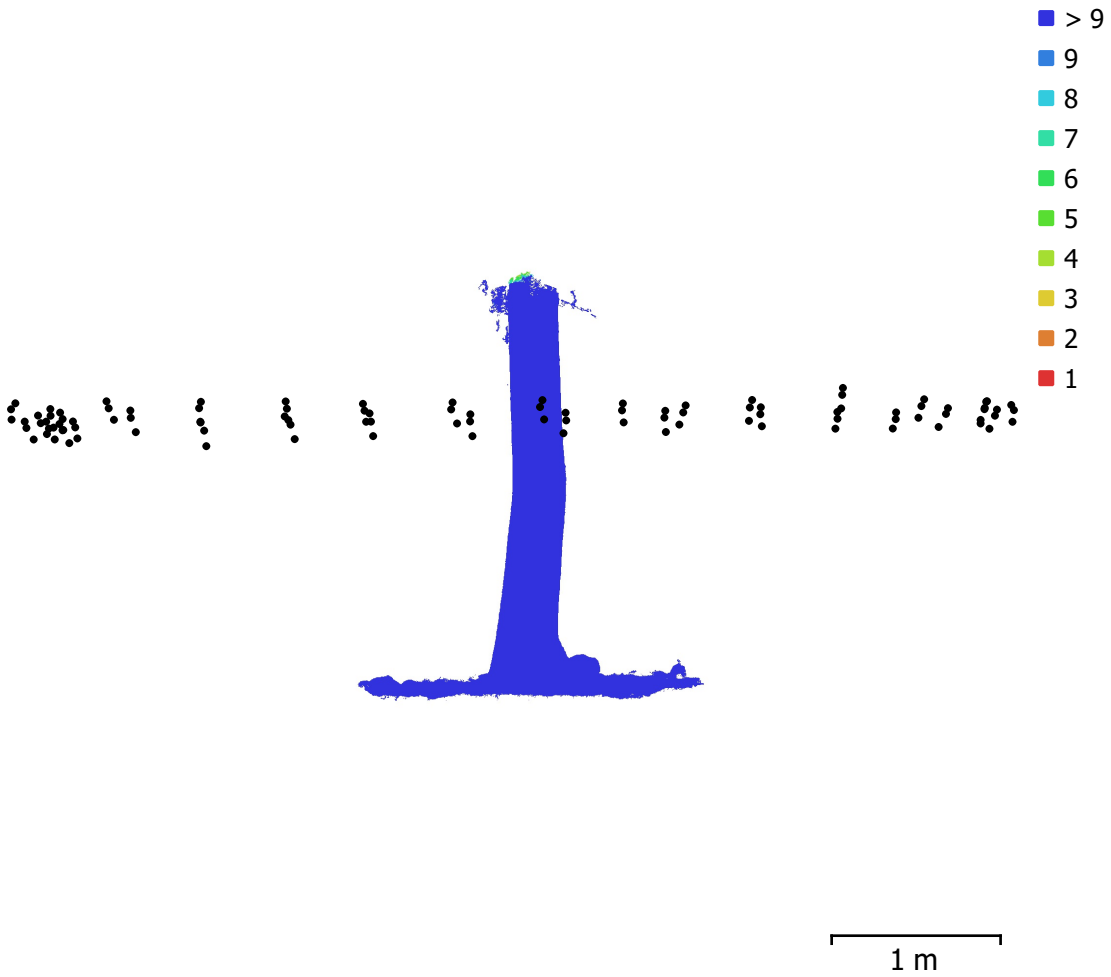


Fig. 1. Camera locations and image overlap.

| | | | |
|---|---|---|---|
| Number of images: | 102 | Camera stations: | 102 |
| Flying altitude: | 4.08 m | Tie points: | 99,679 |
| Ground resolution: | 0.327 mm/pix | Projections: | 346,623 |
| Coverage area: | 1.03 m² | Reprojection error: | 0.884 pix |

| Camera Model | Resolution | Focal Length | Pixel Size | Precalibrated |
|---|---|---|---|---|
| Canon EOS 70D (35 mm) | 5472 x 3648 | 35 mm | 4.17 x 4.17 µm | No |

Table 1. Cameras.

# Camera Calibration

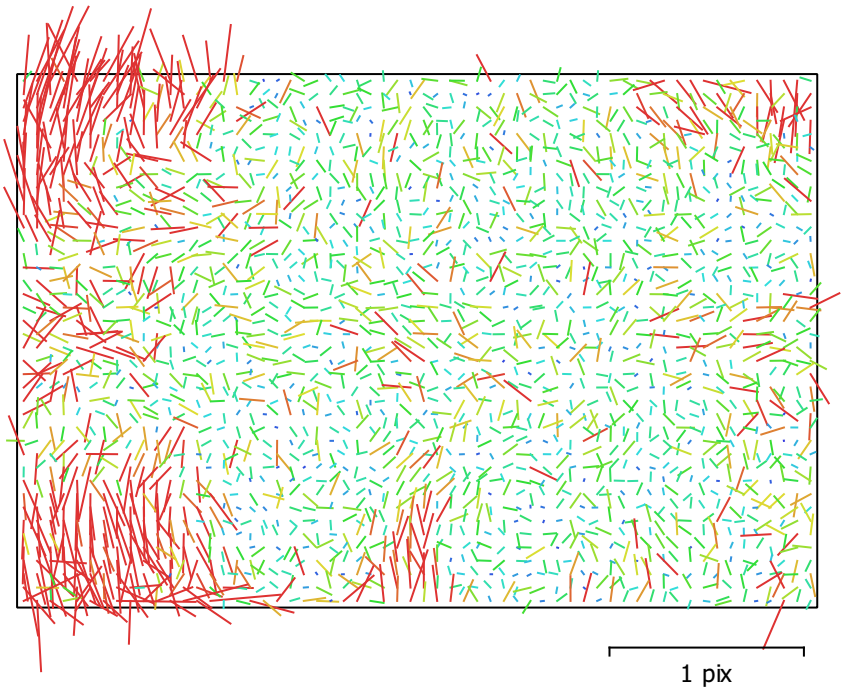


Fig. 2. Image residuals for Canon EOS 70D (35 mm).

**Canon EOS 70D (35 mm)**

102 images

| Type | Resolution | Focal Length | Pixel Size |
|---|---|---|---|
| **Frame** | **5472 x 3648** | **35 mm** | **4.17 x 4.17 µm** |

| | Value | Error | F | K1 | K2 | P1 | P2 |
|---|---|---|---|---|---|---|---|
| **F** | **8459.51** | 0.52 | 1.00 | 0.28 | 0.01 | -0.18 | 0.04 |
| **K1** | **-0.0771329** | 0.00012 | | 1.00 | -0.92 | -0.04 | 0.02 |
| **K2** | **0.0816994** | 0.00079 | | | 1.00 | -0.00 | -0.02 |
| **P1** | **0.000625473** | 4.6e-06 | | | | 1.00 | 0.02 |
| **P2** | **9.81055e-05** | 4.1e-06 | | | | | 1.00 |

Table 2. Calibration coefficients and correlation matrix.

# Ground Control Points

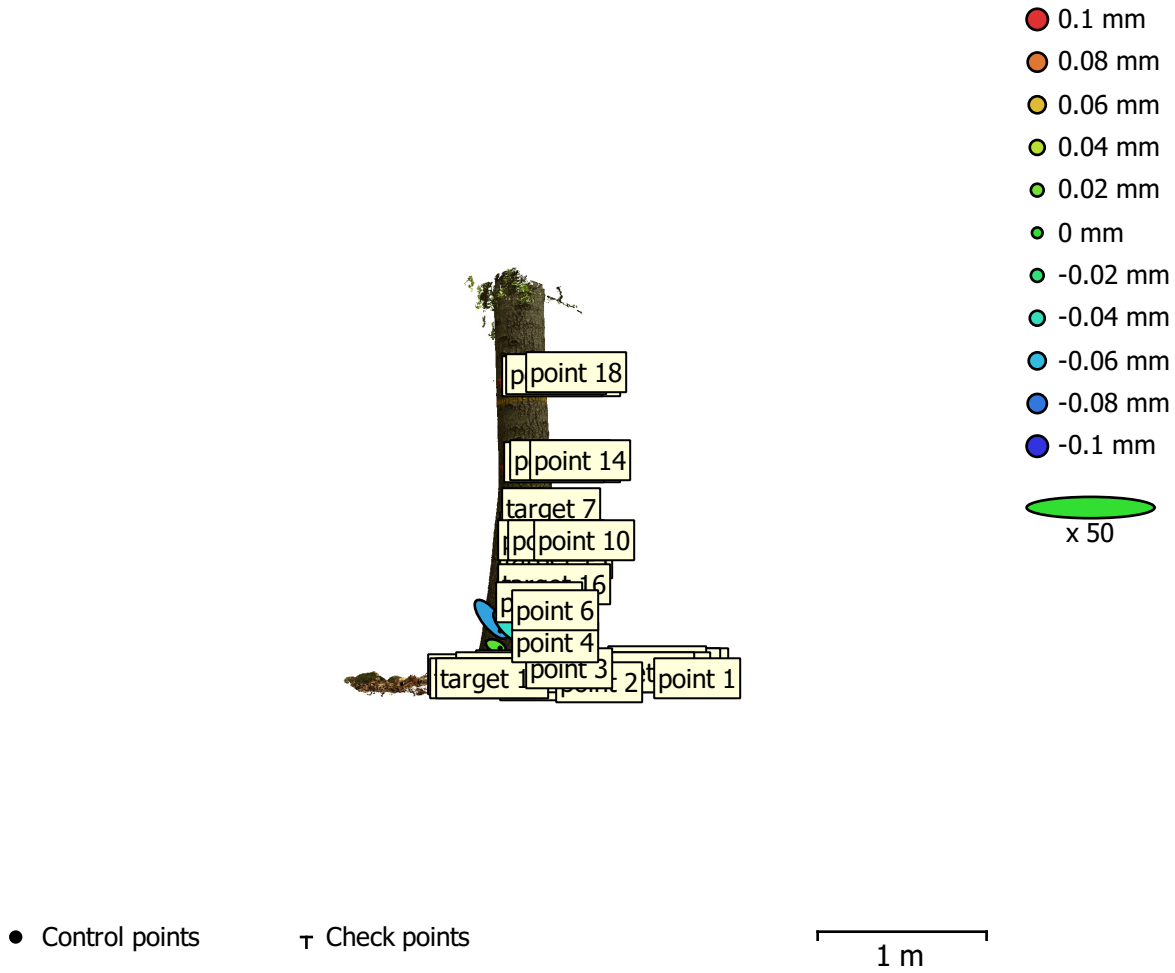


Fig. 3. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

| Count | X error (mm) | Y error (mm) | Z error (mm) | XY error (mm) | Total (mm) |
|---|---|---|---|---|---|
| 4 | 1.67052 | 1.83455 | 0.0642581 | 2.48117 | 2.482 |

Table 3. Control points RMSE.

| Label | X error (mm) | Y error (mm) | Z error (mm) | Total (mm) | Image (pix) |
|---|---|---|---|---|---|
| point 3 | -1.29486 | 1.09862 | 0.0998123 | 1.70106 | 0.004 (53) |
| point 4 | 1.02165 | -0.47422 | 0.0114027 | 1.12641 | 0.004 (56) |
| point 5 | 2.18641 | -2.74471 | -0.067487 | 3.50976 | 0.004 (56) |
| point 6 | -1.91357 | 2.1206 | -0.0432366 | 2.85667 | 0.004 (63) |
| **Total** | **1.67052** | **1.83455** | **0.0642581** | **2.482** | **0.004** |

Table 4. Control points.

| Label | X error (mm) | Y error (mm) | Z error (mm) | Total (mm) | Image (pix) |
|---|---|---|---|---|---|
| target 1 | | | | | 0.845 (12) |
| target 2 | | | | | 0.046 (2) |
| target 4 | | | | | 0.777 (7) |
| target 5 | | | | | 1.332 (7) |
| target 6 | | | | | 1.546 (21) |
| target 8 | | | | | 1.104 (3) |
| target 9 | | | | | 1.059 (14) |
| target 10 | | | | | 1.631 (19) |
| target 11 | | | | | 1.651 (21) |
| target 12 | | | | | 0.625 (17) |
| target 13 | | | | | 1.153 (24) |
| target 15 | | | | | 1.653 (11) |
| target 16 | | | | | 2.323 (11) |
| target 7 | | | | | 0.004 (34) |
| target 14 | | | | | 0.004 (57) |
| point 1 | | | | | 0.227 (27) |
| point 2 | | | | | 5.478 (27) |
| point 7 | | | | | 0.004 (101) |
| point 8 | | | | | 0.004 (101) |
| point 9 | | | | | 0.004 (102) |
| point 10 | | | | | 0.004 (102) |
| point 11 | | | | | 0.004 (68) |
| point 12 | | | | | 0.004 (68) |

| Label | X error (mm) | Y error (mm) | Z error (mm) | Total (mm) | Image (pix) |
|---|---|---|---|---|---|
| point 13 | | | | | 0.004 (68) |
| point 14 | | | | | 0.004 (68) |
| point 15 | | | | | 0.004 (62) |
| point 16 | | | | | 0.003 (64) |
| point 17 | | | | | 0.003 (61) |
| point 18 | | | | | 0.004 (61) |
| **Total** | | | | | |

Table 5. Check points.

# Scale Bars

| Label | Distance (m) | Error (m) |
|---|---|---|
| target 5_target 6 | 0.147699 | -0.000300966 |
| target 8_target 7 | 0.149899 | 0.00189874 |
| target 9_target 10 | 0.148053 | 5.29806e-05 |
| target 11_target 12 | 0.147678 | -0.00032212 |
| target 15_target 16 | 0.148161 | 0.000161225 |
| target 13_target 14 | 0.146016 | -0.00198355 |
| point 1_point 2 | 0.610151 | |
| point 3_point 4 | 0.0980316 | |
| point 3_point 5 | 0.200795 | |
| point 3_point 6 | 0.281828 | |
| **Total** | | **0.00113746** |

Table 6. Check scale bars.

# Digital Elevation Model

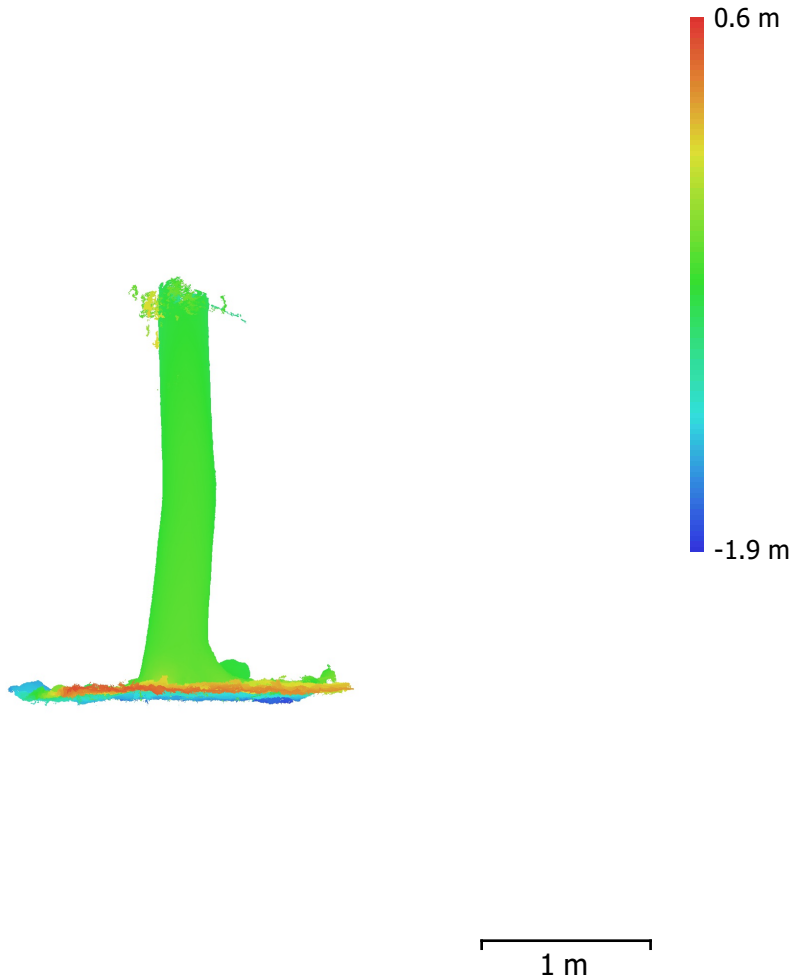


Fig. 4. Reconstructed digital elevation model.

| | |
|---|---|
| Resolution: | unknown |
| Point density: | unknown |

# Processing Parameters

| | |
|---|---|
| **General** | |
| Cameras | 102 |
| Aligned cameras | 102 |
| Markers | 34 |
| Scale bars | 10 |
| Coordinate system | Local Coordinates (m) |
| Rotation angles | Yaw, Pitch, Roll |
| **Point Cloud** | |
| Points | 99,679 of 123,855 |
| RMS reprojection error | 0.157158 (0.883719 pix) |
| Max reprojection error | 0.477364 (23.0835 pix) |
| Mean key point size | 5.53012 pix |
| Point colors | 3 bands, uint8 |
| Key points | No |
| Average tie point multiplicity | 3.76351 |
| **Alignment parameters** | |
| Accuracy | High |
| Generic preselection | Yes |
| Key point limit | 40,000 |
| Tie point limit | 4,000 |
| Adaptive camera model fitting | Yes |
| Matching time | 41 minutes 32 seconds |
| Alignment time | 45 seconds |
| **Depth Maps** | |
| Count | 102 |
| **Reconstruction parameters** | |
| Quality | Medium |
| Filtering mode | Aggressive |
| Processing time | 5 hours 29 minutes |
| **Dense Point Cloud** | |
| Points | 4,523,920 |
| Point colors | 3 bands, uint8 |
| **Reconstruction parameters** | |
| Quality | Medium |
| Depth filtering | Aggressive |
| Depth maps generation time | 5 hours 29 minutes |
| Dense cloud generation time | 23 minutes 31 seconds |
| **Software** | |
| Version | 1.4.4 build 6848 |
| Platform | Windows 64 |