## Digital outcrop models

Seven digital outcrop models (DOMs) supplemented the interpretation and elucidation of the sediment intrusion into the Middle Jurassic to Lower Cretaceous Agardhfjellet Formation in central Spitsbergen (Svalbard).

Note that some of the models feature erroneous location and orientation data that complicates a quantitative structural correlation beyond the individual model domain, limiting the usability for some of the models to qualitative aspects only.

The erroneous location and orientation data in question were recorded by the iPhone’s built-in GNSS units which apparently failed to update the location metadata frequently enough.

DOMs with correct georeferencing were contributed to the Svalbox Digital Model Database under Svalbox DOM identifiers 2020-0040 [(Birchall et al., 2022)](https://www.zotero.org/google-docs/?rDHwDg) and 2019-23 [(Betlem et al., 2022)](https://www.zotero.org/google-docs/?2XHP2O).

Input data, processing projects, processing reports and exported model data have been made available as data packages and are supplemented by the description that follows.

### Svalbox DOM\_2020-0040 (https://doi.org/10.5281/zenodo.6559233):

Images were taken on 21 September 2020 using an unmanned aerial vehicle (UAV; Mavic 2 Pro, 20MP Hasselblad camera). Structure-from-motion photogrammetric [(e.g., Westoby et al., 2012)](https://www.zotero.org/google-docs/?iWSGnK) processing using Agisoft Metashape (formerly PhotoScan, v1.7.2.12040). The photo alignment steps (highest setting, upscaled-image scale) resulted in the alignment of 2307 photos. The dense cloud (half-image scale, ‘mild’ filtering) was confidence-based trimmed (removing level <= 5) and used as input for mesh (trimmed to 5 M) and tiled model generation. Georeferencing of the model relied on five ground control points [(Bradski, 2000; Garrido-Jurado et al., 2014)](https://www.zotero.org/google-docs/?IesgJA) measured using a LEICA Viva GS16 receiver with LEIGS antenna (pole length: 1.800 m). Each ground control point was measured for at least 30 seconds and calibrated against the long observation base station in Longyearbyen (78° 13' 43.77" N, 15° 23' 50.32" E, and 495.682 m WGS84 ellipsoidal height) using a post-processing static approach (Leica Infinity software package; v3.6.0.35318; 64bit).

### Svalbox DOM\_2019-0023 (https://doi.org/10.5281/zenodo.6562961)

Images were taken on 19 August 2019 using an unmanned aerial vehicle (UAV; Mavic 2 Pro, 20MP Hasselblad camera) in manual flight. Structure-from-motion photogrammetric processing using Agisoft Metashape (v1.7.2.12040) was conducted following the method of Over et al. [(2021)](https://www.zotero.org/google-docs/?zNfpCr). Photo alignment (upscaled-image scale) resulted in the alignment of 442 photos. Sparse cloud data were filtered on reconstruction uncertainty (level = 12), projection accuracy (level = 3), and reprojection error (level = 0.3) while further and repeated tightening of the tie point accuracy was skipped. The dense cloud (half-image scale, ‘mild’ filtering) was confidence-based trimmed (removing level <= 10) and used as input for textured mesh and tiled model generation. Georeferencing of the model relied on the drone-mounted GNSS.

### Models l1, L2, l3, and l4

Data for Models l1, L2, l3 and l4 has been made available through the Zenodo repository under <https://www.doi.org/10.5281/zenodo.6536024> [(Ogata et al., 2022)](https://www.zotero.org/google-docs/?OVWEnT).

Table DR3.1. Acquisition and processing metadata/parameters for Models l1, L2, l3 and l4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | Camera model | Acq. date | # Aligned images | Sparse cloud filter (reconstruction uncertainty) | Sparse cloud filter (projection accuracy) | Sparse cloud filter (reprojection error) | Dense cloud filter (Confidence range) |
| l1 | Apple iPhone 6 | 5 July 2018 | 791 | 15 | 2 | 0.3 | 1-255 |
| L2 | Apple iPhone SE | 5 July 2018 | 123 | 15 | 3 | 0.3 | 1-255 |
| l3 | Apple iPhone SE | 4 July 2018 | 363 | 10 | 2 | 0.3 | 1-255 |
| l4 | Apple iPhone SE | 4 July 2018 | 94 | 10 | 3 | 0.3 | 1-255 |

Image acquisition took place over a two-day period (4-5 July 2018) using either an Apple iPhone SE or iPhone 6 with built-in GNSS. Structure-from-motion photogrammetric processing using Agisoft Metashape (v1.7.2.12040) was conducted following the method of Over et al. [(2021)](https://www.zotero.org/google-docs/?ztvIpm) with specific parameters and results listed in Table XX. Photo alignment implemented the upscaled-image scale. Sparse cloud data were filtered on reconstruction uncertainty, projection accuracy, and reprojection error while further tightening of the tie point accuracy was skipped. The dense cloud (half-image scale, ‘mild’ filtering) was confidence-based trimmed and used as input for textured mesh and tiled model generation. Georeferencing of the models relied on the camera’s built-in GNSS.

### Models L3.x

Data for Models L3.x has been made available through the Zenodo repository under <https://www.doi.org/10.5281/zenodo.6536024> (Ogata et al., 2022).

Table DR3.2. Number of aligned images for the four Models L3.x.

|  |  |
| --- | --- |
| Model | # Aligned images |
| L3.1 | 121 |
| L3.2 | 19 |
| L3.3 | 85 |
| L3.4 | 90 |

Image acquisition took place on 5 July 2018 using an Apple iPhone SE with built-in GNSS. Structure-from-motion photogrammetric processing using Agisoft Metashape (v1.7.2.12040) was conducted. Photo alignment implemented the full-image scale. No filtering of sparse and dense cloud data was conducted. The dense cloud (half-image scale, ‘aggressive’ filtering) was used as input for textured mesh generation. Georeferencing of the models relied on the camera’s built-in GNSS.

### Bibliography

[Betlem, P., Birchall, T., Ogata, K., Weert, A., and Senger, K., 2022, Svalbox-DOM\_2019-0023 [data set], doi:10.5281/zenodo.6562961.](https://www.zotero.org/google-docs/?n6a25M)

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[Ogata, K., Betlem, P., Weert, A., Senger, K., and Birchall, T., 2022, Shallow and deep subsurface sediment remobilization and intrusion in the Middle Jurassic to Lower Cretaceous Agardhfjellet Formation (Svalbard) [Supplementary material/digital model data] [data set], doi:10.5281/zenodo.6536024.](https://www.zotero.org/google-docs/?n6a25M)

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