Open Access Earth System Science Data Discussions

Earth Syst. Sci. Data Discuss., author comment AC1
https://doi.org/10.5194/essd-2022-143-AC1, 2022

Reply on RC1

Peter Betlem et al.

Author comment on "High-resolution digital outcrop model of the faults, fractures, and stratigraphy of the Agardhfjellet Formation cap rock shales at Konusdalen West, central Spitsbergen" by Peter Betlem et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-143-AC1, 2022

Dear Dr. David Tanner,

Thank you for taking the time to review our submission and provide us with constructive feedback.

Please see below how we have implemented and addressed your suggestions.
Specified line numbers refer to the original document.

Best regards,

Peter Betlem on behalf of all authors.

1. The title is a bit misleading. It's not just a DOM of faults and fractures, but also stratigraphic units. Please adjust accordingly.

>>>

Agreed. We have changed the title to *High resolution digital outcrop model of the faults, fractures, and stratigraphy of the Agardhfjellet Formation caprock shales at Konusdalen West, central Spitsbergen*.

2. It is tantalising to see a small portion of the orthomosaic and the fractures within. There should be a figure of just faults/and fractures, without stratigraphic units.

>>>

We have revised Figure 7B to include a larger section of the DOM, and have removed stratigraphic unit boundaries and other markers from the subfigure. Note that digital fracture sets have only been mapped locally for data-usage illustration purposes, and not across the entire model. Nonetheless, Figure 7C has been revised to include a "raw" section (now Figure 7D), with the locally annotated fractures shown in the new Figure 7E. Please find the revised Figure 7 and caption attached.

3. Some handmade strike and dip of fractures are given in Table C1. Why not produce a stereonet figure, with measurements made in the field and measurements made in the DOM?

>>>

We agree with this very good point and have included measurements in stereonets (faults as planes, fractures measured across sub-vertical sections as poles) and a rose diagram (for fracture orientations measured on flat surfaces and across sub-vertical sections) in Figure 7C and 7F. The following section has been added below line 174 in the original manuscript to clarify the methodology:

Fracture sets were analysed and classified through use of the NetworkGT software (Nyberg et al., 2018). Dip angles were calculated from the interpolated planes through line traces with at least 3 points, i.e., 3D data. The same methodology was applied to along-fault groupings of dGNSS field measurements (Table C1) to obtain interpolated fault planes and structural information.

Table C1 only includes strike and dip measurements for faults. We have updated the table caption to better clarify this. The new table caption reads:

Table C1: Structural measurements and ground truthing of selected faults, acquired summer 2021. Easting and Northing given in the WGS 84/UTM zone 33N (EPSG:32633) projection. The calculated orthogonal heights use the Earth Gravitational Model 2008 (Pavlis et al., 2008). Interpolation point set indicates point groupings used for the calculation of GNSS-based fault measurements.

Finally, Betlem (2022c) will be updated with the relevant scripts and Jupyter Lab workflow to document the structural analysis in detail.

4. Line 72-75. Please revise the last line of this paragraph, as it is it doesn't make sense. Make it in to two sentences.

>>>

We have revised 72-75 to the following:

Geological constraints and inputs are needed to ascertain what may happen following injection. The Konusdalen West outcrop, covering the lower part of the caprock, is ideally suited for this and forms an important analog to assess the impact of faults and fractures on fluid flow in mudstone-dominated sequences (e.g., Ogata et al., 2012).

Please also note the supplement to this comment:
https://essd.copernicus.org/preprints/essd-2022-143/essd-2022-143-AC1-supplement.pdf