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Interactive comment on "Analysis of deformation bands associated with the Trachyte Mesa intrusion, Henry Mountains, Utah: implications for reservoir connectivity and fluid flow around sill intrusions" *by* Penelope I. R. Wilson et al.

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Thank you Craig for your positive commentary on the paper, and for yours ideas, which we will certainly take into account in our revisions.

Below are responses to the 3 points raised.

(1) The monoclinal fold model that you describe does not appear to be a good representation of the deformation along the intrusion margin at Trachyte Mesa, because most of the deformation structures observed are shear rather than tensile fractures.

The strain is, therefore, not taken up by outer-arc extension, but by conjugate shear faults/deformation bands, e.g. compare images C and D in Figure 21.18 in Ramsay and Huber (Modern Structural Geology, Vol. 2 – Folds and Fractures).

Inclined sill sheets are observed at the Trachyte Mesa intrusion, but only along intrusion margins where over-accretion of sill sheets is observed, resulting in a stepped-geometry. Along such margins, due to a two-stage emplacement mechanism for individual sheets – with initial propagation of a thin sill sheet, followed by secondary inflation – syn-emplacement faults develop at the inflating sill tip during inflation (see Wilson et al., 2016). As highlighted in Wilson et al. (2016), if these faults dip towards the intrusion (i.e. reverse movement), magma propagation can occur upwards along the fault plane. However, magma is unable to propagate along 'normal' faults, as the stress is non-optimal for magma propagation as the fault/ fractures remain closed. See Fig. 15 in Wilson et al. (2016).

We do not observe any inclined sill sheets along the transect studied in this manuscript as this transect crosses a segment of the margin where sill sheets have been emplaced through under- (and mid-) accretion (as highlighted in the discussion), and therefore development of these sill-tip faults is inhibited by the overlying sill sheets, resulting in a monoclinal, rather than stepped margin.

(2) Fully agree, porosity reduction within the host rock (dominantly by compaction, cataclasis and the formation of deformation bands) will accommodate a percentage of additional magma volume, so surface analysis alone will underestimate the total volume of magma emplaced.

(3) Cross-cutting relationships of brittle structures are very challenging and often difficult to discern. As highlighted above, the deformation here is dominantly via conjugate shear fractures/ deformation bands, and so even within a single deformation pulse we will naturally see cross-cutting structures. Y-nodes may, therefore, represent a cross-cutting fracture, but they can just as easily represent a fracture termination against a

pre-existing structure.

In our comparison of a forced fold above a normal fault versus a series of stacked sill sheets (Fig. 9), we propose that deformation is likely to be progressive (equivalent to multiple slip events on a normal fault as it grows) and so identification of discrete events will be challenging. Without additional fracture characteristics (such as mineral precipitates associated with individual sheets) it will be very difficult to differentiate discrete events.

Having said this, this is something that will certainly be worth further investigation.

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