

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.

Penelope I. R. Wilson et al.

p.wilson@kingston.ac.uk

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Dear Reviewer 1

Many thanks for your positive and constructive comments on the manuscript. We've tried to address all items you have raised, and think that the updates make for a much improved manuscript

Please find below our responses to the various points you raise. We have a word document with tracked changes, should you wish to see it.

Kind regards, Dr Penelope Wilson

Review Comment – Specific Comments: One specific area that I would like to see developed a bit further is the conceptual model (Fig 9) presented in the final discussion (Sections 5.1 and 5.2). You compare the patterns of deformation you observe at Trachyte Mesa (9b) to those in a forced fold above a normal fault (9a). I hope you can expand this discussion to address how differences between the processes might be reflected in the patterns of deformation observed. The sills have intruded laterally underneath the entire mesa (i.e. see Fig. 12 in Morgan et al., 2008), whereas the forced fold formed over either an upward or laterally propagating fault tip (e.g. White and Crider, 2006). One might therefore expect a structural density greater than the background above the intrusion but not above the footwall of the normal fault. Although your sample transect doesn't appear to extend far enough to directly address this question, it would be nice if you speculated on it a bit in the discussion. Perhaps there might also be differences in the orientations of structures?

Author Response – Unfortunately there are limited host rock exposures overlying the intrusion top surface, as ideally we would have liked to have extended the transect onto the top surface as you suggest. We agree in order to accommodate the additional volume of magma we would expect to see some form of compaction and/or deformation in the host rocks above the intrusion. The few outcrops we did find during our wider field studies did not appear to exhibit significant deformation band structures; however, the host rock did appear to exhibit reduced porosity in outcrop (either compaction of thermal). When studying the neighbouring intrusion host rock outcrops at Maiden Creek, host rock outcrops did show evidence for stylolite development. We may, therefore, speculate that these may also have been present above Trachyte Mesa. We have added some extra text in the paper to address the points you have raised, and have also modified the final Figure (see attached) to highlight some potential deformation above the intrusion top surface.

Review Comment – I also found it a bit confusing that you mention that Sanderson



and Nixon (2015) argue for use of branch attributes (vs length) when characterizing fracture networks (lines 142-143), but then proceeded to focus on length attributes in your discussion of the results (lines 186-189). Perhaps you should drop this point from the earlier discussion or else recast your results to emphasize branch attributes?

Author Response – Agree, we have reworded the results section so that we refer predominantly to branch data in the first instance.

Review Comment – Line 45 an ‘n’ is missing from Sternlof

Author Response – good spot, corrected

Review Comment – Line 56 ‘implication for’ rather than ‘on’

Author Response – Done

Review Comment – Lines 114-116. Please add some estimate of the average (central tendency) orientation of deformation bands and analysis sections here.

Author Response – We’ve included a contoured stereonet in Figure 1d show the orientation of deformation bands is predominantly perpendicular to the transect orientation and cite the Wilson et al., 2016 for further orientation analysis. Hopefully this will suffice.

Review Comment – Fig 1 caption. Change ‘outlines’ to ‘areas’.

Author Response – Done

Review Comment – Fig. 6c. It would be nice to have the B22 values for each point annotated somewhere on the plot, either in the legend or with the point labels.

Author Response – Good idea, we’ve added B22 values in the key in Fig. 6c to aid the reader in comparing locations in the trip plot against this locality attribute.

Review Comment – Figure 6 caption: Instead of using “log-linear”, which implies that the station numbers have quantitative meaning, reword to “Summary plots showing the

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log of various fracture attributes at each station”

Author Response – Done.

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-71>, 2020.

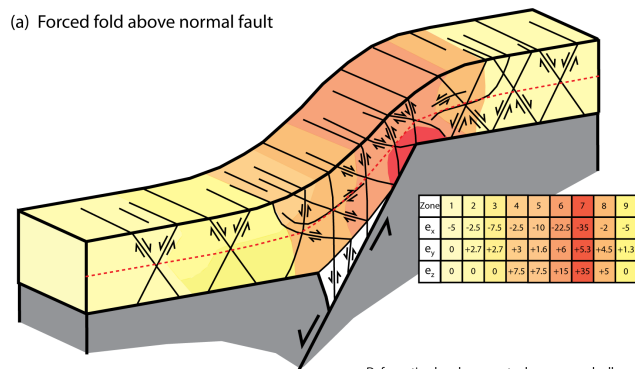
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Deformation bands appear to decrease markedly above intrusion (though outcrop exposure is limited)

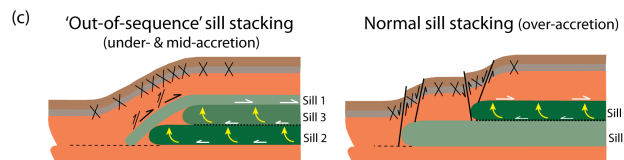
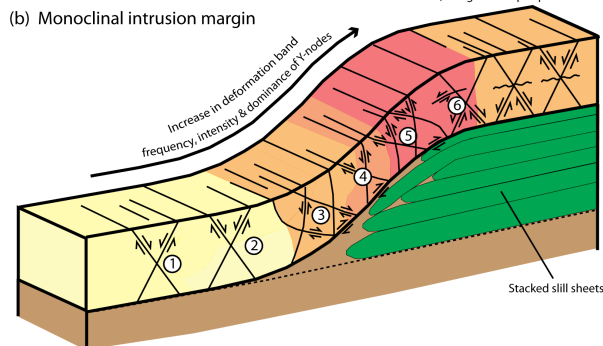


Fig. 1.