Solid Earth Discuss.,
https://doi.org/10.5194/se-2020-71-SC1, 2020

Solid Earth Discussions

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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Received and published: 2 July 2020

Dear authors,

This, in my opinion, is an excellent paper and I thoroughly enjoyed reading through it. How fluid flow around intrusions is affected by syn-emplacement structures is something I've been pondering for a while so I'm glad to see you've already taken a good step towards understanding this. The science is solid and the paper well-written and beautifully illustrated. I just wanted to put forth some ideas I had that may be worth

exploring and could perhaps, in a small way, strengthen the paper even further:

1) During such monoclinal folding above intrusion tips, there is plenty of evidence to suggest that outer-arc stretching promotes tensile failure and that these fractures are exploited by intruding magma and facilitate the transgression of inclined limbs. As far as I'm aware, no such inclined sill limbs are seen at Trachyte Mesa. Are such tensile fractures observed though near the sill margin where flexure is greatest? If not, why might there be no outer-arc stretching structures?

2) I suspect this comment may partly answer the questions in my previous comment but...it seems that magma emplacement was accommodated by both uplift and 'compaction' of the Entrada Sandstone, perhaps with the latter significant enough that sufficient outer-arc stresses could not build-up? I think it worth highlighting that the synchronous occurrence of these space-making mechanisms means that the amplitude/volume of the is less than the thickness/volume of the intrusion; i.e. deformation could not be described as purely elastic. This is yet further evidence that inverting ground deformation data, to recover intrusion geometries and locations, using elastic models is likely inappropriate in some scenarios.

3) Trachyte Mesa comprises multiple sheets. A key outstanding question I think in these sorts of intrusions is how long did each injection event last and what was the duration between each intrusion? This is very hard to get at with geochronology if time differences are small but, and this may be my ignorance speaking here, is there anyway to use deformation band / fracture sets to identify different pulses and reconstruct the strain rate from their microstructures (assuming strain rate effectively equals intrusion rate)?

I look forward to seeing the published version!

Kind regards, Craig Magee

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