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Discussions

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Interactive comment on "Mechanical models to estimate the paleostress state from igneous intrusions" *by* Tara L. Stephens et al.

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First of all, I enjoyed reading this paper. It is well written and to the point, I guess a lot of work has already been done to reach this quality. Figures are self-explanatory. The authors develop based on previous work (Jolly et Sanderson 1997) to define their method to better quantify the paleostress state from horizontal magma intrusions (sill). This work is based on one of the co-author recent publications (Walker 2016, Walker et al. 2017), nonetheless this methodology adds very interesting new tools to better decipher the interaction between tectonic and magmatic systems.

Major comments: Despite being short, I think the paper lacks references especially on the role of pre-existing fractures on magma intrusions, and on the mechanics of fracture

propagation. Line 328: "Failure of intact rock requires a higher fluid pressure than for reactivation of pre-existing structures". I don't agree with that. As you said yourself in the paper it depends on the magma pressure and the orientation of the fractures, as well as if it sealed or not. In addition, the propagation of the tip of a crack would tend to have a fracture to not reopen pre-exiting ones due to their angular orientations with the local stress (or maybe on short distance [Gaffney et al., 2007]).

Minor comment: Line 57: "dilation of a fluid-filled pre-existing...". I think there is a mistake here. I don't believe you mean to dilate a fracture with liquid in it?

Gaffney, E. S., B. Damjanac, and G. A. Valentine (2007), Localization of volcanic activity: 2. Effects of pre-existing structure, Earth and Planetary Science Letters, 263(3-4), 323-338.

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