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Interactive comment on "Resolved stress analysis, failure mode, and fault-controlled fluid conduits in low-permeability strata" *by* David A. Ferrill et al.

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The paper "Resolved stress analysis, failure mode, and fault-controlled fluid conduits in low-permeability strata" by Ferril et al., is well organized and deals with the very interesting topic of mechanical models (generally speaking) where the authors are very expert. I really enjoyed reading it.

The paper follows some previous works extending theoretical models to real faults deeply studied previously by the same authors. In light of this, the boundary conditions of the applied mechanical model should be very well explained and constrained, in my opinion, in order to give to the reader all the instruments to completely understand the

meaning of the results. This is the part of the paper that I think should be improved.

In particular it is not clear to me for example what are the constrains for the hypothesized pore pressure, being this quite high (lambda over 0.7). The same for the mechanical properties of the involved lithologies proposed in Figure 6. No indication is reported along the paper about the source for the adopted mechanical data such as for example cohesion and coefficient of friction.

Keeping the focus on Fig.6 the proposed model is not clear to me. Since no bulid-up processes for fluid pressure are invoked along the text, if I well understand, rocks will fail in the initial stage, for a decrease of the sigma 3 being the system in an extensional regime. This bring mudrock to break first as showed in the model. Thus, at this time, a decrease in pore pressure is expected since, generally speaking, a rupture is related to an increase in permeability/porosity that lead to a decrease in pore pressure. However, following the model, a continuous process of build up for fluid pressure should be present in the system in order to overcome the sigma 3 and bring to hydraulic fractures on chalk. So I am wondering how can we reach the condition for high overpressure on chalk if a rupture already occurred on mudrock?.

That said, should we assume different boundary conditions for mudrock and chalks and reconsider figure 3?

In conclusion I think that this very interesting paper deserves some more rigorous constrains for the applied mechanical model. Moreover, a more comprehensive discussion on the model implication and on its evolution over time and space will strongly improve the paper together with a comparison with results form other authors (see line to line comments).

Some line to line notes are on the pdf attached file

Hope this helps

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Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2020-17/se-2020-17-RC2-supplement.pdf

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