

## Comment on **essd-2022-196 - Slip Tendencies**

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Community comment on "In situ stress database of the greater Ruhr region (Germany) derived from hydrofracturing tests and borehole logs" by Michal Kruszewski et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-196-CC1>, 2022

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When going through the paper a few questions opened up to me - I'd appreciate your input there!

The stress polygon in Figure 6 only displays absolute stress values, correct? The stresses come from Table 3 (which gives absolute stresses), and result in absolute stress ratios. I am asking because I am accustomed to just use stresses for the stress polygon, not stress ratios (I know that the latter is often used). In your plot the stresses all land below the  $\mu = 0.6$  line, but that's for absolute stresses if I understand it right. I was thus wondering where your stresses would plot when using effective stresses, based on  $(S1-Pp)/(S3-Pp) = [(\mu^2+1)^{1/2} + \mu]^2$ . I isolated  $\mu$  in this equation to calculate the  $\mu$  at which a fault would fail for a given S1, S3 and Pp (i.e. the maximum theoretical slip tendency), and used the stresses you proposed in your paper (1200 m depth, Fig. 9). This would result in a slip tendency of 0.88 for most critically oriented fault, which is quite a lot ( $\mu$  would have to be higher to prevent fault slip). Plotted it in a stress polygon, for  $\mu=0.8$  and 1200m depth, this would mean that the stresses you provide would be unstable (also for a  $\mu = 0.85$  as proposed by Hinzen (2003, doi:10.1016/j.tecto.2003.10.004) for depths <9km). However, the value of 0.88 matches well with the slip tendencies in your Figure 9, which appears to use effective stresses.

My main question now is how you can explain the very high "effective" slip tendencies (which are higher than most typical friction coefficients), and how you compare them to the slip tendencies below  $\mu=0.6$  in your absolute-stress stress polygon in Figure 6. A possible solution would be to reduce the pore pressure gradient, which would lead to stable conditions (max. slip tendency = 0.75 for grad.Pp = 10 MPa/km).

Best wishes, Daniel