

The Cryosphere Discuss., referee comment RC4
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Amendment to RC3

Anonymous Referee #3

Referee comment on "A generalized stress correction scheme for the MEB rheology: impact on the fracture angles and deformations" by Mathieu Plante and L. Bruno Tremblay, The Cryosphere Discuss., <https://doi.org/10.5194/tc-2020-354-RC4>, 2021

Please consider this an amendment to my review, RC3.

I now realise that the paper is fundamentally flawed and should be rejected/withdrawn.

The authors propose that super-critical stress be relaxed onto the failure envelope via a path different from the shortest distance to the origin in (σ_I, σ_{II}) space - as per figure 1. In order to do so they propose calculating the damage factor Ψ via equation (17) or (25, which has a typo). This, however, will not have the desired effect, because Ψ scales d , which then scales *all* the components of σ *equally*. Please consider equations (12), (8), (9), and (5) to see how changing d affects σ .

In other words, as long as d is a scalar, and not a tensor, then any form of Ψ will reduce the stress towards the origin - Ψ only determines how fast this happens.

For a more concrete example consider the stress change $\sigma' \rightarrow \sigma_c$ in figure 1a. In order to change the stress in this manner, we need to reduce the shear stress but *increase* (in absolute value) the normal stress. This cannot be done by increasing d .

A generalised stress correction scheme, therefore, requires d to be a tensor, so that different components of the stress can change differently. This is not done here, and the scheme proposed simply does not do what the authors claim it does. Instead of taking a different path to the failure envelope, the proposed scheme takes the same path as the standard scheme but increases the damage too little for the stress to cease being super-critical. The proposed scheme is thus not usable and a paper discussing it is not warranted.