The Cryosphere Discussions

The Cryosphere Discuss., author comment AC1
https://doi.org/10.5194/tc-2020-354-AC1, 2021

Reply on RC4

Mathieu Plante and L. Bruno Tremblay

Author comment on "A generalized stress correction scheme for the Maxwell elasto-brittle 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-AC1, 2021

It is correct that the stress correction Ψ is a scalar, but the reviewer missed the fact that we use a decohesive stress tensor (σ_D) to bring the stress back onto the yield curve, and which depends on the correction path angle (see Eqs 18-20, discussion on L150-161, Fig 1, and derivation below).

Therefore, the corrected normal stress invariant reads:

$\sigma_{Ic} = \Psi\sigma'_I + \sigma_{ID}$,

rather then $\sigma_{Ic} = \Psi\sigma'_I$, which was the reviewer's concern.

The components of the decohesive stress tensor are then retrieved using the yield criterion, such that:

$(c - \sigma_{IIc})/\mu = \Psi\sigma'_I + \sigma_{ID}$,

or,

$\sigma_{ID} = (c - \sigma_{IIc})/\mu - \Psi\sigma'_I$,

Using the relation $\sigma_{IIc} = \Psi\sigma'_{II}$ (by construction, see Fig. 1), we get Eq. 19 (where there was a typo):

$\sigma_{ID} = (c - \Psi(\sigma'_{II} + \sigma'_I))/\mu$,

In which Ψ depends on the correction path angle. We can provide a more complete derivation in this thread if desired.