Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2019-284-RC1, 2019

Geoscientific Model Development Discussions

Interactive comment on "On the calculation of normalized viscous-plastic sea ice stresses" *by* Jean-François Lemieux and Frédéric Dupont

Anonymous Referee #1

Received and published: 9 December 2019

The note "On the calculation of normalized viscous-plastic sea ice stresses" by Lemieux and Dupont describes how to compute normalised viscous-plastic sea ice stress properly. They also describe two common traps one can fall into when computing this quantity. This is a valuable (small) contribution that would have saved me from trying to figure out things myself (and wasting a lot of time on that). The text is clearly written, there are a few small comments to consider, see below. The representation is convincing and the explanation of the procedure and the common errors are clear.

I have one small ussue. I would like the authors to revisit the derivation of their equation (6). First, one needs eqs(1,3,4,5) (and not just 1 and 5) and Delta to arrive at an expression like this; second, it only works if P_p in eq(1) is replaced by the replacement pressure P (that's not immediately clear from the text). If one does not want to use

the replacement pressure P (and there are reasons to do so), the derivation ends up with with P_p instead of P on the rhs, because in eq(1) P_p is on the rhs. This is important because eq(10) with then have a "1" instead of P/P_p and in eq(16) it would be P_p/P instead of "1". This has implications for the interpretation (but not for the general conclusions, as far as I can see). Adding a treatment of the no-replacement pressure case would be very helpful for the generality of the paper, so I recommend that the paper be published only after addressing this issue.

Minor comments and suggestions:

page 1 l21 large spatial

l24 Unfortunately, . . . I would add how that leads to misunderstandings in order to formulate a "problem statement". If we all assume we know what we are doing then there's no problem. E.g., Subtle mistakes in calculating stresses can lead to a complete misinterpretation of the state of convergence. Or similar . . .

page 2 l40: I prefer to write Delta als sqrt((e11+e22)ˆ2 + eˆ{-2}((e11-e22)ˆ2+4e12ˆ2)), because it is also more straightforward to implement . . .

page 3 l63: such as a Picard solver . . . ow with a Newton solver

l65: Kimmritz et al 2015 use the terminology of "modified" EVP. "revised" EVP was used by Bouillon et al 2013.

l76 a Picard solver

page 5 l117: remove: that could be done by modelers

l122: truely?

page 6 l140: remove "that could be made by modelers"

l145 rephrase sentence: This is the equation of an ellipse we obtain if the principal stresses are normalized by the replacement pressure.

l149, but why only for the elliptical yield curve and not for th Coulombic and Diamond yield curves?

page 7 l166: gives

page 10 Figure 2: I think the caption is misleading. It should start with the statement that sigma is computed based on uˆk only.

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