

Solid Earth Discuss., referee comment RC3
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Comment on se-2021-14

Laurent Montesi (Referee)

Referee comment on "101 geodynamic modelling: how to design, interpret, and communicate numerical studies of the solid Earth" by Iris van Zelst et al., Solid Earth Discuss., <https://doi.org/10.5194/se-2021-14-RC3>, 2021

This manuscript serves as a well-designed guide for modeling mantle and crustal-scale processes. As is necessarily the case with an exercise of the sort, it does in place reflect the personal experience and opinions of the authors, but it overall does a very nice job of remaining neutral, and even the more engaged sections are full of important information that will be useful for moving the field forward. I particularly appreciated the discussions of figure accessibility and Section 9 "Software, data, and resource management". There are also some very important discussions of the objectives of modeling, in particular the difference between "specific" and "generic" modeling. Both are presented as equally valuable, which is an important message to pass to both modeling and non-modeling communities.

Although the paper is already well organized and well written, I do have a few suggestions that could lead to significant rewriting, as detailed in the attached PDF. These include 1) make clearer that the focus of the paper is on geodynamic modeling of the mantle and the crust. 2) emphasize the importance of hypotheses in the model design process. 5) emphasize the role of constitutive relations 6) explain how brittle failure can be implemented. 7) better contrast FEM and FDM. 10) clarify what an "unphysical behavior" is. My biggest concern, though is with section 8.1 "Structure of a geodynamic modelling manuscript" that I find overly prescriptive. Other comments can be seen as minor.

Please note that most of my suggestions can be seen as a matter of personal preference and should not stand in the way of the publication of the paper (even 8.1!). The authors have produced an important manuscript that will many gain a better understanding of geodynamic modeling. That said, there is room in our discipline for personal preferences, and I welcome continued discussion of the topic. More of us should take an occasional pause from the pace of research to reflect on the higher objectives of our work, in this case geodynamic modeling. This paper is a great way to get the conversation started. Thank you for putting it together.

Please also note the supplement to this comment:

<https://se.copernicus.org/preprints/se-2021-14/se-2021-14-RC3-supplement.pdf>