

# Rebuttal v2 for egosphere-2025-4168: Automated forward and adjoint modelling of viscoelastic deformation of the solid Earth

William Scott<sup>1</sup>, Mark Hoggard<sup>1</sup>, Thomas Duvernay<sup>1</sup>, Sia Ghelichkhan<sup>1,2</sup>, Angus Gibson<sup>1</sup>, Dale Roberts<sup>1</sup>, Stephan C. Kramer<sup>3</sup>, and D. Rhodri Davies<sup>1</sup>

<sup>1</sup>Research School of Earth Sciences, The Australian National University, Canberra, ACT, Australia.

<sup>2</sup>Institute for Water Futures, The Australian National University, Canberra, ACT, Australia.

<sup>3</sup>Department of Earth Science and Engineering, Imperial College London, London, UK.

**Correspondence:** William Scott (william.scott1@anu.edu.au)

**We thank the Topic Editor for their additional feedback. We have responded to their two comments as described below. We have also corrected some minor errors associated with an out-of-date version of Figure 8 and added a sentence on the potential for convective instabilities to occur in compressible simulations (please see manuscript diff PDF provided). Thank you for your careful attention to our manuscript during the review process.**

5 *From the changes, it seems that Section 2.4 may suffer from minor inconsistencies in terminology regarding which solving strategy is applied to the outer/inner solver. Most likely this occurred while reformulating the sentences after making your system symmetric which allowed you to use more performant solver (CG instead GMRES). Please revise this section and make sure the logical flow holds with the new formulation and terminology.”*

**We agree that this section of our revision was confusing and have extensively revised it to clarify the solver strategy. To be clear, we do still use GMRES to handle the coupled solve of the momentum and internal variable system, but within each iteration, the two individual equations are still symmetric and so can be solved using CG. We have run this revised text past others in our group and believe that it now properly conveys our solver strategy.**

15 *One additional minor suggestion could be to add the specific version of G-ADOPT you developed for and are using in this study to the title in order to clearly inform the reader about it, e.g., "Automated forward and adjoint modelling of viscoelastic deformation of the solid Earth (G-ADOPT v4.1)".*

**We would prefer not to make this suggested change to the title as there are multiple changes that go into each G-ADOPT version release and they are not just limited to glacial isostatic adjustment (the framework also covers mantle convection and groundwater modelling at the moment). We have, however, made a new version release to accompany publication of this paper. The version number is linked in our revised code availability statement and we have also placed all associated runscripts and model outputs from the study in a dedicated Zenodo repository.**