

Response to Volker Klemann.

Thank you for your careful and transparent rebuttal and the resulting improvements of the manuscript. Regarding my point 5, it was a small typo, 'do' instead of 'doi' in <https://dx.doi.org/10.2312/polfor.2016.005> .

[Thank you for your thorough review of the original manuscript, which greatly improved it. We now acknowledge the noted paper on page 2 of the revised manuscript \[line 41\].](#)

Response to the second reviewer.

We thank the authors for responding to our original review and we are overall happy with the revisions made to address these comments. We have minor comments that we believe will strengthen the manuscript.

We appreciate that the changes to the title make the scope of the paper more clear, and we appreciate the new articulation of the scope and limits of the proposed method. We believe the addition of a discussion on solid Earth models is a useful reference for ice sheet modelers aiming to better understand how variations in solid Earth structure translate into their estimates of bedrock deformation.

[Thank you for your constructive review of the original manuscript, which helped improve it substantially.](#)

Given that this approach offers a simplification for ice sheet modelers, we believe it could be useful to add a sentence or two that explains any advantages to this proposed method compared to ELRA, a simplification for bedrock deformation often employed in ice sheet model. Could you enunciate in what ways it might be advantageous to adopt the proposed method? I can imagine that proposed method allows for better self-consistency in comparing predictions using different Earth structures with full GIA models (as elastic/viscous parameters are not as to compare in ELRA to those used in GIA predictions using Maxwell rheology). Since the audience is intended to be ice sheet modelers, we feel like such a discussion would be appropriate and help modelers decide when to use this approach.

[We have added several sentences highlighting the advantages of the proposed method relative to the ELRA framework \[page 3, lines 58–65 of the revised manuscript\]. We agree that this clarification will help end users select an appropriate modeling approach depending on their scientific objectives. We thank the reviewer for raising this important point.](#)

Line 69: in news limitations paragraph, please also include rotation as a process that is not included in this approach

[Done. See page 3 \[line 68\].](#)

line 135: the change to a curly G instead of a G for Green function is not an appropriate change in response to our comments as curly G is also a variable used in the sea level equation,

denoting the geoid response to loading (not including $\Delta\Phi/g$). Instead, this variable should be GF, to avoid confusion for those familiar with using the sea level equation.

We agree that using G or curly G may cause confusion with the geoid Green's function sometimes used in sea-level theory. We also think that "GF" functions more as a textual abbreviation than a mathematical symbol and appears somewhat awkward in equations. Instead, we have replaced this notation with K , which is commonly used to denote Green's kernels in the literature. We hope this addresses the reviewer's concern satisfactorily.

Line 141: Lloyd et al. 2020 does not capture 3-D variability in the crust beneath Antarctica, additional references to papers that actually image crustal structure are needed, such as Chaput et al. (2014). Additionally, other studies that investigate solid Earth structure in Antarctica should be cited, including e.g., Chua & Levedev (2025), Hansen & Emry (2025), Lucas et al. (2020). This is not a comprehensive list of studies that image Earth structure in Antarctica, so add an "e.g.," here.

Agreed. We have now added these citations [page 6, lines 149-150].

Line 142: add reference to An et al. (2015) – "Temperature, lithosphere-asthenosphere boundary, and heat flux beneath the Antarctic Plate inferred from seismic velocities" along with the Wiens et al. (2023) and Brown & Fisher (2025) references.

Now added on page 6 [line 151].

Line 143: Add reference to Hazzard et al. (2023) – "Probabilistic Assessment of Antarctic Thermomechanical Structure: Impacts on Ice Sheet Stability" – which also characterized mantle viscosity using seismic constraints. Also reference Gomez et al. (2024) and Lucas et al. (2025), which both develop viscoelastic models for GIA modeling in Antarctica based on seismic imaging.

Now added these references [page 6, lines 152].

Line 159: Here, I think it needs to be specified that observational constraints on "lithospheric thickness and mantle viscosity from geodetic data" are strongest in ...not "observational constraints on solid Earth structure"

Agreed. Changes made [page 7, line 169].

line 162: I don't feel it is appropriate to use bullet points for this section. Text should be written out in paragraph form. It is also not necessary to include information that is in the reference on love numbers. It feels like a lot of this information might be repeated from Adhikari & Caron (2024). Please reference the paper whenever that is the case for ease of readability!

We have now rewritten these points as a single paragraph [page 6, lines 138-148]. None of these statements appear in the cited reference, which is in fact a data repository rather than a paper. FYI - we included this text in response to the first reviewer's comment.

Line 167: do you mean “Amery” by “Emery”?

Yes. Now corrected on page 7 [line 177].

Line 315: awkward phrasing, should be ability to, not ability in

Now corrected on page 13 [line 274].

Please include the figures shown for 2150 in the supplement. It seems like a strong point that your method accuracy is better for 2150 compared to the 2300 figures included in the main text. You could highlight that method accuracy degrades with larger ice loading changes, and therefore your predictions are more accurate in the nearer future.

Sure. We have now added this figure in Appendix C (Figure C3, page 22) and reference it in the main text [page 11, Figure 4 caption; page 12, lines 250-251].