



# ***Interactive comment on “Coupled dynamics and evolution of primordial and recycled heterogeneity in Earth’s lower mantle” by Anna Johanna Pia Gülcher et al.***

**Anna Johanna Pia Gülcher et al.**

anna.guelcher@erdw.ethz.ch

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Dear Prof. Craig O'Neill,

We sincerely thank you for your valuable input and constructive suggestions for this manuscript. We believe that most suggestions will help us improve our manuscript, as we are currently preparing it for re-submission. As a summary, we are currently incorporating your comments about the presentation of the results, the structure of the related text, sequence of the figures, background material that appears in the discussion section, and a more detailed discussion of some key model limitations. In particular, we

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Discussion paper

will better clarify the possible effects of our assumptions in terms of rheology and heat sources in the mantle, and we will enhance the discussion of our 2D approximation. Finally, we will move a subset of our results (i.e., model suite 1) to the supplementary material, also to make room for a better presentation of the more important model suite 2 in the main text.

Specific responses to each individual comment will be given when we re-submit our manuscript. As we are currently running a couple of additional models with much higher resolution (a thorough resolution test is requested by the other referee Prof. Shije Zhong), we expect our re-submission to be ready in a few weeks. We aim to address all comments raised by both reviewers, including the minor ones not mentioned above.

We appreciate your efforts and hope that, once our manuscript will be re-submitted, you will find that the revised manuscript will properly accommodate the points you raised.

Yours sincerely,

Anna Gülcher, Maxim Ballmer, and Paul Tackley.

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