



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

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Dear Prof. Shije Zhong,

We sincerely thank you for your valuable input and constructive suggestions for this manuscript. You raised some fair concerns regarding choices in our model set-up, and we are currently in the process of addressing these concerns to improve our manuscript for re-submission.

As a summary, we are improving our study and manuscript along the following lines:  
(i) we aim to address your main concern by including a substantial resolution test, and

discussing the effects of resolution on our estimates for heterogeneity preservation in the mantle; (ii) we will discuss in more detail the limitations of our models and choices made regarding the model set-up, and their possible influence upon our conclusions. In particular, these include the absence of internal heating (concern also raised by co-referee prof. Craig O'Neill), 2D vs. 3D geometry, and rheological parameters (both raised by co-referee); (iii) finally, we are currently re-structuring the presentation of our main results and supplementary material (raised by co-referee), to give priority to the models that are most relevant to Earth, and are primarily addressed in our Discussion (i.e., model suite 2).

As we are currently running high-resolution models as requested, it may take several weeks to finalize our re-submission. Specific responses to each individual comment from both reviewers will be given along with the resubmission of our manuscript. 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 is re-submitted, you will find that the revised manuscript will comply with the points you raised.

Yours sincerely,

Anna Gülcher, Maxim Ballmer, and Paul Tackley.

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