

Interactive comment on “Ice flow models and glacial erosion over multiple glacial–interglacial cycles” by R. M. Headley and T. A. Ehlers

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We thank the anonymous referees for their useful feedback on our work. Overall, referees 2 and 3 both feel that the work is well motivated and relevant, while referee 1 feels that the relevance is lacking but provides motivating questions.

Individual responses have been provided to the more specific details discussed by referees 1 and 2. Referee 3's review was positive and had no further revisions necessary. In response to overarching comments and questions, a number of additions have been made to a revised manuscript, including additional subsections in the discussion section, to strengthen the details and add more conclusive interpretations:

1. More details are provided with regard to the model domains, including the spatial

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and temporal scales. The spatial scales particularly are discussed in the section 2. In section 4.1, we include discussion on how the glaciations in the model might best relate to real-world, long-term glaciations, with the emphasis on landscape development over geologic time scales, versus any single glaciation.

2. We further emphasize how and where the choice of model will be most important, building off of the current introductory paragraphs to section 4.

3. In the discussion section, we have added more discussion of the processes, namely sliding, and how these are ultimately what lead to the differences between the two models. In our model, sliding has a strong dependence on the basal shear stress and the erosion rate is directly proportional to the sliding velocity, the basal sliding is the dominant glacial process directly influencing the topography.

4. With regard to our choice of the models' simplifications (i.e., no thermomechanical coupling, simplified subglacial hydrology, choice of erosion law), these are discussed in section 4.3, and the revision contain more detailed discussion motivated by questions from the referees.

5. Both referees 1 and 2 state that the cumulative growth of differences due to erosion is a foregone conclusion. While it is also not surprising, it does not seem completely obvious that the cumulative effects would always get larger over time to the extent seen. Deposition and other forms of spatially variable erosion could have acted to moderate the topography. In addition, moderation might have also been expected due to feedbacks among lowered topography (or enhanced topography due to deposition), the ice mass balance, and climate.

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