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Earth Surface Dynamics Discussions

Interactive comment on "The periglacial engine of mountain erosion – Part 2: Modelling large-scale landscape evolution" *by* D. L. Egholm et al.

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In this reply we comment on all remarks given by the reviewer and present the associated changes to the manuscript. The comments from each review have been copied into this document in grey and are marked with C for comment and a sequential number. The corresponding response is marked with R.

Reviewer 5: C.B. Phillips

C-5.1: The manuscript by Egholm et al. and the companion paper by Andersen et al. present an interesting and compelling case for the role of periglacial processes in creating and maintaining low relief at high elevations. This comment is intended to be very brief and pertains to the introduction and some of the broader conclusions,

the editing of which would not (in my opinion) lessen the impact of this study. There has been a decent and growing body of work that indicates that global cooling in the late Cenozoic may not have caused greatly accelerated erosion rates (Schumer and Jerolmack, 2009; Schumer et al., 2011; Willenbring and von Blanckenburg, 2010). Perhaps the mechanism of enhanced periglacial processes can explain some of the global nature of increased erosion posed by Zhang et al. (2001) and Molnar (2004), but these studies need to be considered in light of Sadler (1981) and subsequent papers. The given references for accelerated erosion due to global cooling do not address the entirely general problem of bias in linear rates of erosion and deposition and these references have not demonstrated that their rates of increased erosion or deposition are not biased (see Gardner et al., 1987 for the generality of the problem; Finnegan et al., 2014; or Sadler and Jerolmack, 2014 for a broad overview and potential solution to the problem). It is not my intention to add additional length to a well written and illustrated manuscript, but the authors should consider the broader context they give for their work in light of the ongoing debate on enhanced erosion rates from climatic variability and global cooling. I look forward to final version in ESurf and I thank the authors for considering this comment.

Full references cited above for papers not already cited in the manuscript.

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Gardner, T. W., Jorgensen, D. W., Shuman, C. Lemieux, C. R. 1987. Geomorphic and tectonic process rates: effects of measured time interval. Geology, 15, 259–261.

Sadler, P. M. 1981. Sediment accumulation rates and the completeness of stratigraphic sections. Journal of Geology, 89, 569–584.

Sadler, P. M., Jerolmack, D. 2014. Sacling laws for aggradation, denudation and progradatin rates: the case for time-scale invariance at sediment sources and sinks. From: Smith, D. G., Bailey, R. J., Burgess, P.M. Fraser, A. J. (eds) Strata and Time:

Probing the Gaps in Our Understanding. Geological Society, London, Special Publications, 404, http://dx.doi.org/10.1144/SP404.7

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R-5.1: We understand that our introduction text did not fully acknowledge the ongoing debate on late Cenozoic erosion rates. We have rephrased the first part of the introduction, to make it more general, and we have added the references suggested by the reviewer. We thank the reviewer for making this useful point.

Interactive comment on Earth Surf. Dynam. Discuss., 3, 327, 2015.