

Modelling large-scale landform-evolution with a stream-power law for glacial erosion (OpenLEM v37): Benchmarking experiments against a more process-based description of ice flow (iSOSIA v3.4.3)

This is an interesting manuscript with a that compares a recently developed empirical stream power law for glacier erosion with erosion patterns estimated from a process-based model of glacial erosion. Overall I find that the manuscript is well written and that the methods of comparing the models are sound as well. It is exciting that a more efficient method for simulating glacier erosion in 2D is being developed!

Places for improvement:

I found that the manuscript was a bit long, so any effort to contract the sections would be helpful. Shortening and synthesizing the results of the experiments would be welcome from my point of view as I found myself trying to find the benefits and negatives of each model but struggled to ID them. I note there is Section 7 which outlines Scope, limitations, and perspectives, but shortening before this would really improve the experience of the reader.

In some areas statements should have citations to support statements of fact. See line-by-line comments below.

As a more technical note: It is not clear to me why including internal deformation in an erosion model would matter. Basal sliding is the only way that glaciers physically erode the bed. Motion at the bed due to internal deformation by definition is zero. For that reason I suggest that suggestions throughout that link internal deformation to basal erosion be updated.

Line-by-line comments:

Line 23. I suggest 'addressed' here instead of 'attacked'

41. drop 'the'

70. In this paragraph I am a bit confused about what Hergarten does differently from Deal and Prasicek and how that related the stream power law for rivers and new laws for glaciers.

97. drop 'that'

98. drop 'that'

104. drop 'in order'

127. add 's' after 'equation'

134. Only sliding contributes to basal erosion by glaciers. Motion via internal deformation goes to zero at the bed. So I am not sure about this portion of the sentence: 'and even dominates glacial erosion.'

176. I don't understand how neglecting internal deformation limits the applicability to thick glaciers since internal deformation does not erode glacier beds.

250. This paragraph could use more citations.

338. A few more citations here would be good.

588. there is an extra ')' here.