

Review of manuscript by Sklar et al. for Earth Surf. Dynamics

This paper proposes two new metrics to quantify landscape morphology based on the distribution of elevation and travel-distance, brought together in the concept of catchment power. Three examples of catchments with different morphologies are explored and a method is proposed by which artificial catchments with specified source-area power distributions can be synthesised.

The paper's methods are certainly novel and raise some important questions about the formation of landscapes and the topic will be of broad interest to readers of ESurf. The manuscript is well written and carefully presented. I suggest that the manuscript is suitable for publication in ESurf, subject to satisfactory additional clarification and discussion of the following points.

General Comments

1. The paper concludes by stating that its major contribution is to offer a “fresh perspective”. That's fine, but it would be better in my view to explain what new knowledge is available through the use of the new landscape metrics. The reader is left unclear on how this particular set of metrics might shed light on important problems in geomorphology.
2. The calculation of stream power (line 224) takes as the relevant slope the mean slope along the path to the catchment outlet. If the actual slope is close to the mean slope then this may be a good approximation. If not (for example, if the pathway might involve a very steep upper section with a long flat floodplain, or alternatively a high elevation plateau with a steep ravine descending from it) then the virtual velocity of sediment through the system will differ substantially, with important implications for residence time of sediment in floodplains etc (which is itself relevant geochemical residence times in the catchment, cosmogenic methods, and carbon sequestration). This warrants some further discussion.
3. In section 3 (line 243 onwards) the notation switches from the generic subscripts i, j to w and s for water and sediment, and the dimensionless ratio ω^* is defined as the ratio of source-area power of water per mass of sediment. The intuitive/conceptual significance of this ratio is not clear, which makes it hard to interpret the values 36–653 in the subsequent paragraph.

Specific comments / Minor points

Line 86 Tarbotton -> Tarboton