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Discussions
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Interactive comment on "How does grid-resolution modulate the topographic expression of geomorphic processes?" *by* Stuart W. D. Grieve et al.

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Throughout this document the reviewer's comments are in **bold type** and our responses are in standard type.

The purpose of this work was to analyze the effectiveness of lower resolution topographic data to understand Earth surface processes. In detail, the relationship between curvature and grid resolution is considered, alongside the estimation of the hillslope sediment transport coefficient for each study area. The results suggested that although high resolution (e.g., 1 m) topographic data does yield exciting possibilities for geomorphic research, many key parameters

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Discussion paper

can be understood in lower resolution data, given careful consideration of how analyses are performed. The paper is interesting. Even if we are living in the "high-resolution topography age", still we can obtain benefits (in term of understanding Earth surface processes) from low-resolution topographic information.

We are pleased that the reviewer found the manuscript interesting and agree that even in this age of increased access to high resolution topography there is a lot of value in lower resolution data products. We hope that this contribution will assist in highlighting the utility of such datasets, as we continue to bridge the gap between locations with high resolution topography and those without. In responding to this review we have expanded the introduction to highlight that low resolution or downsampled high resolution data has utility as it can better capture processes which occur over larger length scales. We have also clarified the figure captions of a number of figures in order to ensure readers understand the spatial scales employed in visualizing topographic data. In making these changes we believe that the manuscript has the potential to reach a wider audience and has been enhanced by the comments contained in this review.

However, the reason to work with low-resolution data is not only because, as author stated, global lidar coverage cannot be achieved in the near future (I'm quite optimistic for the future, technology is evolving very fast and big data is one of the major challenges for this century. . ..). I believe that one reason is also because, with larger grid cell size, we can better represent the scale at which few processes occur. I suggest to highlight this in the text; the paper will be benefited from such discussion. I suggest also to read the work of Tarolli and Tarboton (2006), where it was found that, the slope calculated with 10 m DTM (from lidar) allowed a better performance of the shallow landslide model

they used. The slope calculated with 2 m DTM was not representative of the scale at which the analyzed shallow landslides occurred. Digital terrain model scales larger than 10 m result in loss of resolution that degrades the results, while for digital terrain model scales smaller than 10 m the physical processes responsible for triggering landslides are obscured by smaller scale terrain variability

We neglected to cover this concept fully within our original manuscript, several allusions were made to the scale dependence of processes and landforms, yet this idea was not clearly stated as a distinct point in the manuscript. We have added a section within the introduction explicitly highlighting this alternative use for low resolution data, using the suggested reference as a case study and tying it in to ideas of selecting window sizes for appropriate spatial averaging of topographic metrics.

The results of this work are in line with such findings: it is possible to estimate suitable sediment transport coefficients also from low-resolution topographic data. The paper is clear and it merits to be published.

I just suggest just few minor changes: - Improve a little the discussion on the grid cell size and the scale at which a physical process occur.

We have extended the introduction to clarify this point. See the response above for more detail.

Fig.1,2,3,6: add the scale bar

These figures are in UTM coordinates and so the axes act as the scale bar. We have not altered the figures, but have clarified this in each figure caption, to ensure that readers understand the scales at which we are representing spatial data.

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