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Earth Surface Dynamics Discussions

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

Anonymous Referee #2

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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 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.

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.

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

Reference Tarolli, P., Tarboton, D.G., (2006). A New Method for Determination of Most Likely Landslide Initiation Points and the Evaluation of Digital Terrain Model Scale in Terrain Stability Mapping, Hydrol. Earth Syst. Sci., 10, 663-677, doi:10.5194/hess-10-663-2006.

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