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Earth Surface Dynamics Discussions

Interactive comment on "Colluvial deposits as a possible weathering reservoir in uplifting mountains" *by* Sébastien Carretier et al.

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I have now had the opportunity to read your manuscript in detail, before examining the comments made by the three referees. My apologies for the delay in posting these comments online. The referees and I are in broad agreement – this is a worthwhile contribution, providing novel insight into the role of colluvium (and alluvium) in setting weathering fluxes at the river catchment scale in mountains. The modelling framework has caveats, but in general these are well explained, and the numerical experiments provide impetus for future field, laboratory and modelling based studies into the links between tectonics, climate and the carbon cycle. The work is a very good fit for Earth Surface Dynamics.

The three reviews contain very thoughtful and detailed comments. These need to all be considered thoroughly in your revision. In some cases, moderate to major modifications may be necessary, some are quick fixes. Please provide a detailed point-by-point reply to the referees' comments.

While all the referee comments are valid and need to be considered, the ones which come to the front, based on my own reading of the paper and the reviews are:

- revising the abstract to better explain the numerical experiments which have been run, and thus provide more context to the wider implications. As it is, it tends to simplify and generalise a bit too much some of the discussion elements, and caveats.

- In the main text, making it more clear what experiments were run, and why these were run (i.e. justifying them).

- explaining better the role of physical breakdown of particles (during weathering, but also during transport) and its absence from the model (?)

- commenting on glacial/periglacial processes (given that even without cooling the lapse rate of 6 degrees/km would mean sub-zero temperatures at $\sim$4.1km elevation). This is in terms of some classic papers on this from a weathering perspective, and in terms of particle production (e.g. frost shattering etc,.).

A final additional minor comment which I have, which I did not see made by the referees, regarded the relief of the simulations. 7 km seemed quite high. Comparisons to the Andes and Himalaya are broadly fair, but these regions have longer-wavelength topography which contribute to these peak elevations. Mountain ranges with faults at sea level, such as Taiwan and the Southern Alps, tend to have much lower peak elevations ($\sim$4 km). This comment also relates to the glacial/periglacial processes issue.

Thank you for submitting to ESurf, and I look forward to seeing the revised manuscript.

Best regards, Bob Hilton AE ESurf

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