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Discussions

Interactive comment on "Simulating the evolution of the topography-climate coupled system" *by* Kyungrock Paik and Won Kim

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This paper is very interesting for the landscape evolution community. It is well written.

In my opinion, this is an interesting and valuable contribution to geomorphology. I have minor comments for the paper.

L172-173. "Whole landscape evolution modeling usually runs over the geologic time scale. Accordingly, calculation time interval is usually greater than a year. On the other hand, a storm event lasts at best a few days."

Landscape evolution models not necessarily work on annual time scale. Currently, there are modelling examples run on hourly precipitation and daily precipitation intervals (e.g., Yetemen et al. 2015).

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Discussion paper

L196-197. “For the purpose of this study, an ideal simulation target can be a high and active mountain range (such as Andes and Himalaya) where orographic effect appears clearly.”

Orographically enhanced precipitation can be more obvious in these mountain range; however, it can be effective in intracontinental semiarid locations too (Wainwright, 2005).

Wainwright, J. (2005). Climate and climatological variations in the Jornada experimental range and neighbouring areas of the US southwest. Advanced Environmental Monitoring and Modelling, 2, 39–110.

L208-210. “The initial topography is nearly flat with a very mild slope imposed to make sure surface water flows toward the ocean. The given random perturbation is tiny enough relative to the given initial valley gradient, and so no depression zone forms in the initial topography.”

A bit more clarification is needed!

What is the direction of flow, D8-steepest descent? So, the perturbation must ensure the some of the side slopes of the cells must be steeper than those of the profile slope. Otherwise, all flow drains straight downward, and you cannot generate meandering or dendritic channels!

L213. “No-feedback simulation results are obtained by running the LEGS model with spatially uniform rainfall, invariant over time.”

Do the authors mean that a single precipitation pulse is repeating during the entire simulation?

L277. For Figure 2b, can the authors provide/add 3D (oblique) view of the landscape? I am very curious to see this simulated topography. Following figure, 3b, 2D figure shows the densification in the counter lines but too black and height is not clear!

The mean elevation profile of Figure 2b is extremely asymmetric! Huge cliff on the leeward side, just about 5 km length. I am very surprised to see such asymmetric behavior when I compare with previous papers (Goren et al. 2014; Han et al., 2014; Han et al., 2015). Is it artifact of the model?

Goren et al. 2014. Coupled numerical–analytical approach to landscape evolution modeling. Earth Surf. Process. Landforms 39, 522–545.

L296-7. “This leads to the downward peak migration and a steeper slope on the lee side (Figure 4c)”.

This definition can be valid for bare soil (as seen in lab experiments of Bonnet and Crave, 2003); however, in vegetated environment this may not be correct. Enhanced vegetation on the windward side as a result of more rainfall may impede erosion. The steepest side is defined by the competition between the erosion inhibition by vegetation and enhanced erosive power of increasing rainfall!

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