



EGUsphere, author comment AC1  
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## Reply on RC1

Stefan Hergarten and Alexa Pietrek

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Author comment on "Self-organization of channels and hillslopes in models of fluvial landform evolution and its potential for solving scaling issues" by Stefan Hergarten and Alexa Pietrek, EGU sphere, <https://doi.org/10.5194/egusphere-2022-605-AC1>, 2022

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Dear Alan Howard,

thank you very much for your review! Please allow us some short responses before addressing all aspects in more detail in a revised manuscript.

Detachment-limited erosion:

Of course, the reference to your 1994 paper does not refer to the lack of sediment transport. However, it seems that this paper was the first to specify the transport-limited end-member of fluvial erosion explicitly, while the concept was used implicitly in earlier work, e.g., on optimal channel networks. Anyway, if you can provide an earlier reference to this term, we will be happy.

Scaling problems:

We are a bit wary concerning your statement "If processes are scaled correctly, there should not be cell size dependence". If it refers to your 1994 paper, we have to keep in mind that it was hardly possible to check such a hypothesis numerically at that time. Reconciling the approaches mentioned in our manuscript (including your suggested scaling of the detachment-limited term with channel width) with Hack's relation for the concavity of rivers is difficult. If sediment transport is taken into account, it is even worse since two parallel channels with half the discharge have not the same total transport capacity as a single channel. So considering both fluvial erosion and hillslope processes in each cell and assuming one channel per cell is clearly not free of scaling issues, so that we disagree to your statement.

Abrupt transition from bedrock reaches to alluvial reaches:

OpenLEM can also switch to a fully transport-limited model as soon as sediment aggradation takes place. In its spirit, the concept is similar to your 1994 paper, but simpler. In the shared stream-power formalism, it is just setting the parameter  $K_d$  to infinity. This topic was recently addressed in an own paper (Hergarten 2022, doi 10.5194/esurf-10-672-2022), but it does not contribute much to the topic of the recent manuscript.

Best regards,  
Stefan Hergarten and Alexa Pietrek

