Geophysical Research Abstracts
Vol. 14, EGU2012-7783, 2012
EGU General Assembly 2012

Landscape self organisation: Modelling Sediment trains

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Rivers tend to develop towards an equilibrium length profile, independently of exogenous factors. In general, although still under debate, this so-called self-organisation is assumed to be caused by simple feedbacks between sedimentation and erosion. Erosion correlates positively with gradient and discharge and sedimentation negatively. With the LAPSUS model, which was run for the catchment of the Sabinal, a small river in the South of Spain, this interplay of erosion and sedimentation results in sediment pulses (sequences of incision and sedimentation through time). These pulses are visualised in a short movie (see http://www.youtube.com/watch?v=V5LDUMvYZxU). In this case the LAPSUS model run did not take climate, base level nor tectonics into account. Therefore, these pulses can be considered independent of them. Furthermore, different scenarios show that the existence of the pulses is independent of precipitation, erodibility and sedimentation rate, although they control the number and shape of the pulses. A fieldwork check showed the plausibility of the occurrence of these sediment pulses. We conclude that the pulses as modelled with LAPSUS are indeed the consequence of the feedbacks between erosion and sedimentation and are not depending on exogenous factors.

Keywords: Landscape self-organisation, Erosion, Deposition, LAPSUS, Modelling