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Coupling bedrock and alluvial fluvial systems in landscape evolution modeling

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While temporary storage of sediment in bedrock channels can be neglected in long-term evolution models, deposition of material generated by the erosional decay of orogens plays a crucial role in piedmont evolution and rise of the erosion base level. Yet, coupling erosional and depositional systems in numerical models of longterm landscape evolution is challenging.

A probabilistic, Markov-type model is suggested to govern spatial sediment transfer. It allows the user to define physically based and other probabilistic rules of sediment transport and deposition. Numerically, the Markov-type model is coupled with a numerical model solving the stream power incision model and the diffusion equation for slope processes.

The numerical implementation of this model allows for transport over various grid cells during a single time step, which allows for a direct coupling of bedrock rivers and depositional areas along flow pathways. It may thus provide a simple tool to couple bedrock and alluvial fluvial systems in landscape evolution modelling.