Exploring the impact of multiple grain sizes in numerical landscape evolution model

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Numerical evolution models have been widely developed in order to understand the evolution of landscape over different time-scales, but also the response of the topography to changes in external conditions, such as tectonics or climate, or to changes in the bedrock characteristics, such as its density or its erodability. Few models have coupled the evolution of the relief in erosion to the evolution of the related area in deposition, and in addition, such models generally do not consider the role of the size of the sediments reached the depositional domain.

Here, we present a preliminary work based on an enhanced version of Fastscape, a very-efficient model solving the stream power equation, which now integrates a sedimentary basin at the front of a relief, together with the integration of multiple grain sizes in the system.

Several simulations were performed in order to explore the impact of several grain sizes in terms of stratigraphy in the marine basin. A simple setting is considered, with uniform uplift rate, precipitation rate, and rock properties on-shore. The pros and cons of this approach are discussed with respect to similar simulations performed considering only flux.