



TTLEM: Open access tool for building numerically accurate landscape evolution models in MATLAB

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Despite a growing interest in LEMs, accuracy assessment of the numerical methods they are based on has received little attention. Here, we present TTLEM which is an open access landscape evolution package designed to develop and test your own scenarios and hypothesises. TTLEM uses a higher order flux-limiting finite-volume method to simulate river incision and tectonic displacement. We show that this scheme significantly influences the evolution of simulated landscapes and the spatial and temporal variability of erosion rates. Moreover, it allows the simulation of lateral tectonic displacement on a fixed grid. Through the use of a simple GUI the software produces visible output of evolving landscapes through model run time. In this contribution, we illustrate numerical landscape evolution through a set of movies spanning different spatial and temporal scales. We focus on the erosional domain and use both spatially constant and variable input values for uplift, lateral tectonic shortening, erodibility and precipitation. Moreover, we illustrate the relevance of a stochastic approach for realistic hillslope response modelling. TTLEM is a fully open source software package, written in MATLAB and based on the TopoToolbox platform (topotoolbox.wordpress.com). Installation instructions can be found on this website and the therefore designed GitHub repository.