



A new way of coupled 3D numerical modeling of surface processes and crustal deformation and evaluation of results using geomorphological data

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This study aims to investigate the interaction of recent surface processes and crustal deformation. We have currently developed a new 3D simulation tool combining landscape evolution modeling and mechanical finite element modeling of the lithosphere. It integrates the surface process model CASCADE into the commercial FE package ABAQUS. Its application is tested for our target area covering the southeastern Carpathians and its foreland in Romania. Surface process modeling is coupled with a 3D crustal model of the Carpathian region. This enables simulating surface processes and the subsequent mechanical response of the crust as well as the response of surface processes to crustal deformation. In order to compare the 3D surface modeling results to independent data (benchmarking) we use information on the present-day fluvial erosion and deposition pattern. This includes a study on the present-day river network and its characteristics. A morphometric analysis of the river system in the region is performed. The calculation of so-called geomorphic indices enables identification of river segments disrupted by tectonic deformation, characterization of lithological or tectonic controls on the morphology and drainage (stream gradient analysis) and information on channel stability (river sinuosity). Our work is still ongoing. Therefore, our contribution includes presentation of the methodological approach and discussion of first results.