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LAPSUS: modelling river capture and complex response to local base level change.

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To understand long term landscape evolution, quantification of landscape processes and landscape response to driving forces is important. This quantification is usually impossible to obtain from fieldwork alone. Landscape Evolution Modelling (LEM) is a promising tool for this purpose, as it has the potential to reveal interactions of different drivers and the resulting complex response of a landscape.

We will use LEM LAPSUS (Landscape Process Modelling at Multi-Dimensions and Scales, Schoorl et al., 2002, Temme et al., 2009) to further explore the potential of LEM. LAPSUS is a multi-process LEM in which the following processes can be used: runoff erosion and sedimentation, landslide erosion and deposition, tillage soil redistribution, dust deposition, creep, solifluction, biological and frost weathering. Calibration and validation of LAPSUS and LEM's in general requires data of drivers and processes acting upon a real landscape for both contemporary landscape as well as palaeolandscapes.

In the Kula basin, Western Turkey, two neighbouring tributary catchments of the Gediz river (Geren and Hudut) show remarkably different landscape expression as a result of apparently similar external drivers and having evolved from broadly similar Late Pleistocene paleolandscapes. The Geren catchment consists of badlands and the Hudut catchment shows low-relief topography despite both of them being developed in the same Miocene parent material. Consequently, both catchments show signs of adaptation to changes in catchment size and origin e.g. river capture. Additionally, evidence of different phases of response to local base-level changes, probably due to damming by lava flows, is present.

These fieldwork results, in the form of sediment sequences, will be used as calibration and validation data for LAPSUS, together with age control from basalts and sediments, and DEM information about palaeolandscapes. The other way around, LAPSUS will be used to investigate how the Geren and Hudut catchments evolved since the Late Pleistocene into their present state, under conditions of local base level change, climate variability, river capture, and, for the most recent part of their evolution, land use change. Furthermore, we aim to add sub-surface flow and piping to the list of available processes in LAPSUS.

References

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