



The Role of Morphotectonics in Gully Formation: Two Case Studies in Semiarid Areas

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Tectonic activities significantly contribute to the formation of the existing drainage systems and hence, to landscape evolution. In this study we assessed the influence of morphotectonics in two semiarid catchments in the Zagros range in Southwestern Iran and in the Makuyuni/ Lake Manyara area in Northern Tanzania. Soil erosion and severe gully erosion affect large parts of both study catchments. Earthquake activities and associated uplifting, fracturing and faulting are still active in large parts of the Zagros range. Tectonic processes in the East African Rift System have significantly contributed to the formation of the current drainage systems and landforms.

This study focuses on the morphotectonics with an analysis of topography, drainage networks, stream longitudinal profiles and lineaments. A specific objective is to study the effects of morphotectonic processes and their effects on gully erosion. The TecDEM software identifies knickpoints showing abrupt changes in the river profiles, hence indicates tectonic activity in turn changing the drainage network.

An investigation of base level and statistical moments of the hypsometric curves provides evidences for the spatial distribution of gully erosion phenomena. The knickpoints act as local erosion base level, and any changes in the knickpoint location leads to a response of erosional processes in the watershed above the knickpoints. Hence gully systems might indicate morphotectonic activities as one of the triggering factors in gully formation. The results of regional tectonic instability suggest that tectonic processes are a significant factor for the current landscape evolution in the two basins. We illustrate that severe gully erosion is strongly related to these tectonic processes, especially in the Southwest of the Mazayjan catchment (Iran) and in the Northeastern and Northern part of the Makuyuni catchment (Tanzania).