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Tectonically influenced landscape evolution in the Hernad-valley region (NE Hungary)

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The Hernád-valley region is located to the northwest of the units of the Bükk mountains and to the west of the Zemplén mountains. Tectonically, the region belongs to the northern part of the ALCAPA terrane that can be correlated with Austroalpine units (Csontos, 1995). On the surface, a major NNE-SSW striking valley with highly dissected sides attracts geomorphologic interest. The eastern side of the Hernad valley, for instance, consists of several planation surfaces at different heights arranged in a staged manner along the Hernád river.
According to Csontos et al. (1992) major wrench systems were active in the intra-Carpathian area during the closure of the outer Carpathian flysch trough. A prominent candidate of wrench faults accommodating this deformation is the Mid-Hungarian line. This fault zone is depicted on maps in several publications (e.g. Tari, 1991; Csontos et al., 1992; Lőrincz et al., 2002; Csontos and Vörös 2004). However the NE-wards continuation of this fault zone is not always clearly marked.
The study area is located along a N-striking branch of the Mid-Hungarian shear zone. In this area a two-week geophysics practice conducted in close cooperation between academia and industry aimed at locating hot spots for active faulting. Seismic interpretation of subsurface strata was done on a grid of 2D industrial seismic lines. Detailed investigation of near-surface areas with possible surface-breaking faults was carried out using shallow seismic methods, vertical electrical sounding and multi-electrode resistivity measurements.
In the industrial 2D seismic data, a main formation top, the top Upper Pannonian could be identified from borehole data. Another well mappable horizon consists of the acoustic basement formed by Mesozoic limestones. It has a high topography with onlap and drape structures. Neogene strata above the acoustic basement are cut by large-scale negative flower structures and several sets of normal step faults. When looking at the general dip of each of the mapped horizons, different trends in dip direction can be observed: (i) the basement shows a rough dip-trend towards E, while (ii) a Neogene marker horizon clearly shows a mean dip towards S. Above a certain marker horizon, sedimentation seems to be undisturbed and mainly concordant. However, drape structures prevail from basement up to the top Upper Pannonian horizon and even the surface level indicating on-going deformation along basement structures. This fact is further supported by the results of near surface geophysical methods that show fault tips reaching the surface at certain locations. Preliminary results show the general trend of (i) fault tips reaching surface in the area of staged planation surfaces possibly older than the modern valley infill close to the river, and (ii) no clear indication of surface breaking faults at the lowest valley infill level near the Hernád river.

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