Geophysical Research Abstracts
Vol. 15, EGU2013-9606, 2013
EGU General Assembly 2013

Verification of structural control on landforms in the transition zone between Pannonian Basin and Eastern Alps

Gábor Kovács (1), László Fodor (2), Szilvia Kövér (2), Gábor Molnár (1), Balázs Székely (1), Gábor Timár (1), and Tamás Telbisz (3)

(1) Dept. of Geophysics and Space Sciences, Eötvös Loránd University, Budapest, Hungary (s_kovacs_gabor@hotmail.com), (2) Geological, Geophysical and Space Science Research Group of the Hungarian Academy of Sciences, Eötvös Loránd University, Budapest, Hungary, (3) Dept. of Physical Geography, Eötvös Loránd University, Budapest, Hungary

Steep, rectilinear slopes are frequently considered as being controlled by structural elements. A number of studies automatically take the linearity of landforms as prove for structural, most frequently fault control. However, this logical but not unequivocal conclusion needs careful verification, because divers geomorphic process alone can also result in straight valley sides, river stretches etc. Structural control on such landforms can be difficult to prove, because of poor outcrop conditions, and the lack of adequate surface and subsurface data sets. It is particularly true for landforms within the Pannonian Basin, central Europe, which offers poor outcrops for both geological and geomorphological analyses, landforms are vegetated and sometimes anthropogenetically modified.

Structural control can be derived from either inherited elements or active deformation. In the former case, the controlling structural element was formed somewhat before the time of landscape evolution steps. Divers denudation process can passively exhume the structure, which, on its two sides, has rocks with different resistance against erosion; this led to contrasting rate of denudation in the two fault blocks. In that scenario, the spatial coincidence, similarity in direction of the older structural element and the landform should be carried out. Demonstration of active (neotectonic) control on landform can be more complicated, while the young age of deformation could be hard to prove. Although a number of geomorphic indices can be evaluated and used as indications for active deformation, undoubted demonstration of the age of the structure and thus the controlled landform remains elusive.

Demonstration of structural control on a specific landform may involve variable methods and data sets. One successful example form the Pannonian Basin, Ruszkiczay-Rüdiger et al. (2007, 2009) used a complex surface and subsurface data sets (to infer structurally constrained landforms). In our study we partly follow this line of combined methodology, but use different subsurface and surface data sets. The success of the study of Ruszkiczay-Rüdiger et al. (2009) mainly depended on the availability of industrial seismic profiles. However, this is not the case in the presented study area. Instead of seismic data, we used other types of geophysical methods, namely 2D geoelectric tomography, 1D vertical electric sounding. Relatively dense network of shallow boreholes permitted the construction of cross sections and could be compared to geophysical data. Finally, surface fault-slip data was important for characterisation of fault geometry and fault kinematics.

All these data permitted to build a 3D model for a particular drainage anomaly located in the western Pannonian Basin, its transition to the Eastern Alps. The combined data set suggest that en echelon normal or oblique-normal faults controlled linear ENE trending segments of the Arany creek, which is almost perpendicular to the general flow direction. The en echelon faults could be part of a sinistral shear zone, which occur between the Rechnitz and Eisenberg windows of the Penninicum. If this fault was kinematically connected to others at the window's margin, their tectonic exhumation might have continued after the main early to mid-Miocene phase. The fault zone could be initiated in the late Miocene (Pannonian) around 9 Ma, and was active afterword. Exact timing of this deformation was not determined neither neotectonic activity proved. However, our study shows that the Late Miocene basin fill of the Pannonian Basin was deformed considerably. The other issue of our work is that the combination of diverse methods is useful, sometimes inevitable for checking the potential structural control and landform and landscape evolution.

Ruszkiczay-Rüdiger, Z.; Fodor, L. & Horváth, E. 2007: Neotectonic and landscape evolution of the Gödöllő Hills, Central Pannonian Basin. - Global and Planetary Change, 58, 181-196

Ruszkiczay-Rüdiger, Z.; Fodor, L.; Horváth, E. & Telbisz, T. 2009: Discrimination of [U+FB02]uvial, eolian and neotectonic features in a low hilly landscape: A DEM-based morphotectonic analysis in the Central Pannonian Basin, Hungary. - Geomorphology, 104, 203-217