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Tectonic geomorphometric studies in the surroundings of Rechnitz tectonic window, Eastern Alps

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The various elements of geomorphometric toolkit of surface analysis, proved to be useful in tectonic geomorphology (Marple & Talwani 2000; Keller & Pinter 2002) have been applied to analyse our study area situated between the still uplifting Eastern Alps and the subsiding Danube Basin. (For detailed description of the study area see Kovács, in this volume). In this paper, we studied young (Late Miocene) deformations that exhibit vertically small scale topographic variations and vertical displacements. These are hardly observable in existing industrial seismic sections due to the low (~30 m) vertical resolution. Further on, existing seismic profiles explore only some parts of the study area. Rock outcrops are scarce due to the intense vegetation. Even a qualitative visual comparison may reveal differences among parts of the study area, however Digital Elevation Model (DEM) based geomorphometry is required for an in-depth study of these differences.

DEM was analyzed in order to compare subunits of the area. Average elevation, general tilt of the envelope surface, slope and aspect distributions proved to be very efficient in this analysis (Fig. 1). These methods revealed significant differences among subunits that are partly caused by tectonics. Topographic swath profile analysis is considered to be an improved, DEM-based version of traditional cross-section analysis. To avoid arbitrariness of simple line profiles, the swath method horizontally expands the cross section line into a rectangular swath. Commonly, profile Z values are calculated as statistical parameters (minimum, mean, maximum, etc.) of elevation values being at the same distance from the baseline of the swath (Telbisz *et al.*, 2013). Topographic swath analyses applied for the surface and for Pleistocene gravel terraces distinctly, revealed the post-sediment tilting of different blocks (Telbisz *et al.*, 2013; Kovács & Telbisz, 2013). A robust DEM segmentation method has been developed by Székely et al. (in review) for various geoscientific applications. The algorithm takes DEM pixels as a point cloud as input and is searching for planar features that fulfill certain criteria controlled by user-defined parameters (number of points to calculate local normal vectors, point-to-plane distance, angular tolerance, etc.). Although the segmentation is often sensitive to the initial parameters, in many cases many fitted planes are stable. Many planes tend to outline geomorphic features of the study area and therefore they are suitable for further geomorphometric analysis.

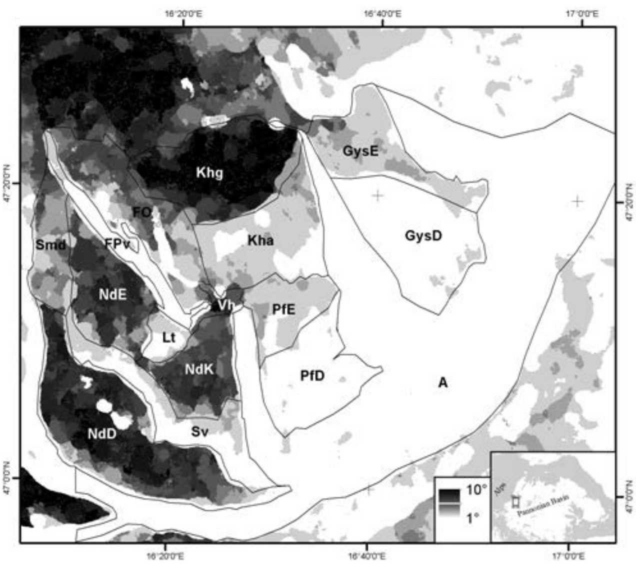

Fig. 1. Differences of mode of slope in the study area with the delineated subunits. Accuracy is 1°, window size 1000 m. For location see the inset.

River style investigation (RSI) is a widely used method (Holbrook & Schumm, 1999; Keller & Pinter, 2002; Marple & Talwani, 2002) proved to be efficient in neotectonic investigation applied to different parts of the Pannonian Basin (Petrovszki & Timár, 2010; Zámolyi et al., 2010; Gál *et al.*, 2010; Petrovszki *et al.*, 2012). Sinuosity calculation of meandering segments is a frequently used component of RSI. In our study, it was complemented with the identification of other river styles such as straight, incised, anastomosing and braided ones. Rivers rapidly, and more importantly, very sensitively react to even small slope changes of the valley floor by switching their river style. As river gradient increases, the pattern may become more sinuous or even braided, whereas decreasing gradient segments become less sinuous, straight or anastomosing. Thus, these changes are reflected in the morphology (Ouchi, 1985). In the totally flat southeastern area streams turn left sharply in some cases where aspect map suggest gentle folding. River style in that cases

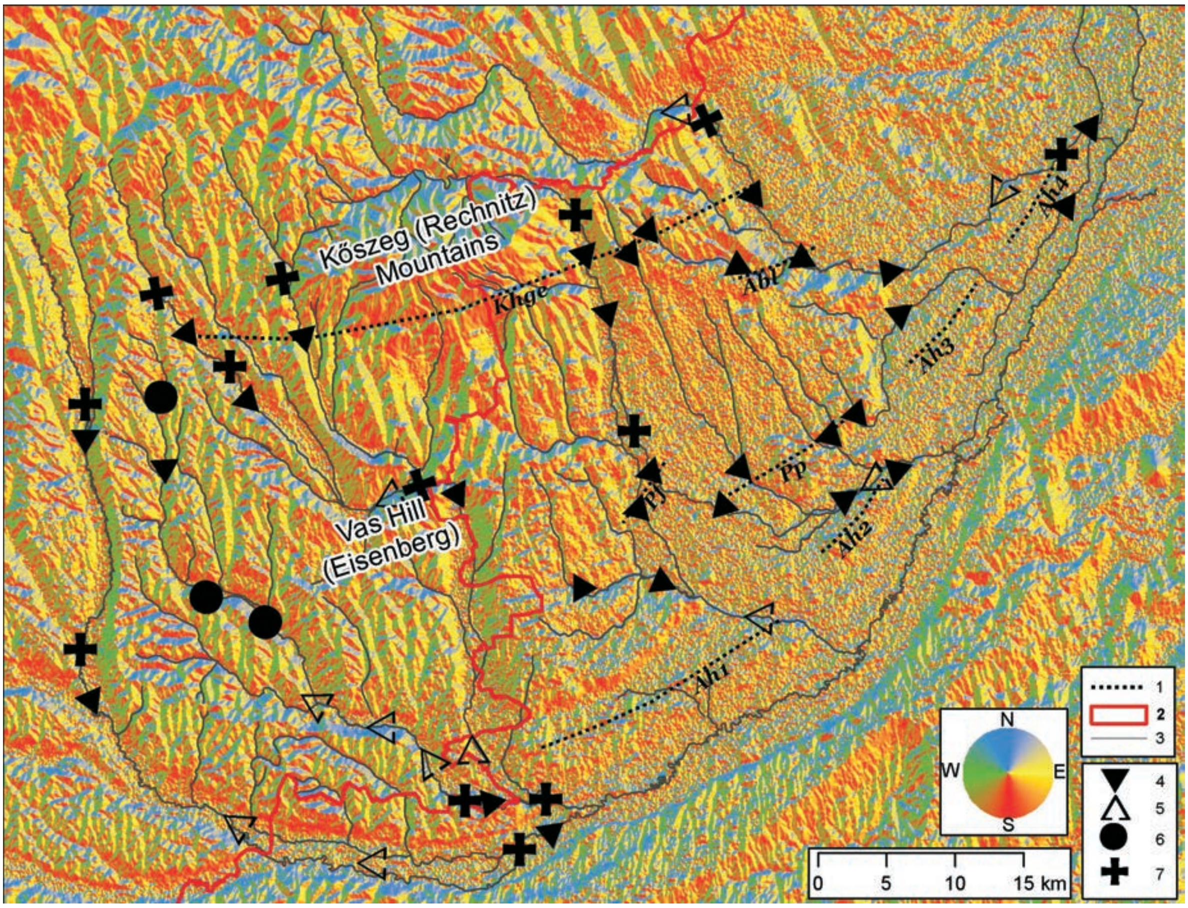

Fig. 2. Aspect map of the study area with river style investigation results and derived lineaments (for location see Fig. 1). 1 – derived lineaments, supposed fold axes; 2 – national border between Austria and Hungary; 3 – main streams; 4 – increasing stream gradient; 5 – decreasing stream gradient; 6 – presumably structurally preformed valley; 7 – relative uplift.

reflect the same: the gradient of the valley floor decreases where streams approach this folded structure, and it increases where streams leave the axis of this structure (Fig. 2).

The results referring to the Eastern foreland of the Eastern Alps are described is Kovács (in this volume).

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