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Regional uplift, localized uplift, rock control and erosional response – deciphering gross landform pattern of the Orlickie-Bystrzyckie Mountains Block, Bohemian Massif, Central Europe

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The basement block of the Orlickie and Bystrzyckie Mountains represents one of the largest morphostructural units in the entire Sudetes, which are the NE marginal mountain range of the Bohemian Massif. Despite its morphological distinctiveness, the area as a whole has never been studied from the tectonic geomorphology point of view. Thus the morphostructural pattern of the Orlickie and Bystrzyckie Mountains Block has remained poorly recognized. Availability of new sources of elevation data, obtained from airborne laser scanning of the Earth surface (LiDAR), and new tools and techniques offered by GIS software, have opened new research opportunities directed towards the recognition of spatial pattern of tectonic deformations which affected the area.

Quantitative studies of geomorphic expression of tectonic processes presented here are focused on different components of geomorphic systems, including fault-generated mountain fronts, drainage basins of streams crossing the base of these fronts, longitudinal stream profiles, and river valleys. Analyses were also carried out for the entire study area, without differentiation into individual drainage basins or physiographic units of lower order. The results of quantitative analysis were each time confronted with lithological diversity of the area and hence, strength and erosional resistance of different bedrock units. This exercise aimed to isolate signals resulting from non-tectonic controls of landform evolution. It was demonstrated that the influence of lithological diversity on quantitative attributes of landforms and characteristics of fluvial systems is of secondary importance.

In respect to morphometric indices considered as indicators of increasing or decreasing intensities of uplift it is concluded that the information potential of particular measures is not unequivocal. In particular, statistical and spatial correlations between indices calculated for drainage basins and the other indices are imperfect. Similarly, there are ambiguities and inconsistencies concerning inferred intensity of tectonic activity of mountain fronts on the eastern side of the mountain block, although it was possible to distinguish two groups of fronts, of higher and lower relative activity.

Despite partially ambiguous information, but in view of the demonstrated secondary role of lithological diversity in explaining values of morphometric parameters and indices applied in this study, an attempt was made to identify belts of tectonic deformation of relief on the western side

of the Orlickie and Bystrzyckie Mountains block. Identification criteria included spatial distribution of strong erosional signal recorded in morphometric attributes of the land surface, longitudinal stream profiles and valley morphology. Three such belts, elongated parallel to the morphological NNW–SSE axis of the mountain block, were recognized. The spatial pattern of variable intensity of endogenic processes is consistent with the geological situation of the region, especially with the distribution of remnants of sedimentary cover of Cretaceous age.

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