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The topographic pattern of the Sudetes and the tectonic message it conveys

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The Sudetes in Central Europe are part of an intraplate belt of highlands and mountains that extends north of the Alps, being also the highest (1602 m a.s.l.) and one of topographically most complex geomorphic units within this belt. The Sudetes consist of numerous semi-isolated mountain massifs, dissected uplands, intramontane troughs and basins, forming a seemingly disordered patchwork of high and low relief. This topographic pattern has developed upon lithologically diverse bedrock, suggesting at least some degree of superposition of different controls. Although specific areas within the Sudetes were subject to analysis focused on the recognition of tectonic imprint in the present-day topography, attempts to disentangle this landscape complexity across the entire Sudetes range were rare and largely inconclusive. Here we approach the problem from the perspective of multidimensional analysis of regional topography, using high-resolution digital elevation data as the primary background material. The building blocks used in the exercise are spatial distribution of altitude and relief, spatial pattern of erosional (dissection) hot spots, position of the main water divide and second-order divides, geometry of main mountain fronts, spatial distribution of surfaces of low relief, considered as inherited planation surfaces, selected features of the regional drainage pattern such as the position of gorges, dominant directions, geometric anomalies etc., and spatial pattern of intramontane basins. Topography is compared with lithology, following an assumption that high strength of a rock unit may also result in considerable elevation and relief, without the necessity to have active tectonics involved. An overlay of these various topographic features allows us to propose intra-regional differentiation of the Sudetes into units typified by different topographic signatures and to separate relief features, both linear and areal, primarily controlled by uplift and subsidence from those reflecting other controls. As an end-result, tectonic interpretation of the contemporary topography is offered.

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