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Geomorphic characterization of hilly relief in the north alpine foreland basin: The Hausruck- and Kobernaußerwald region

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The area of the Hausruck and Kobernaußerwald represents the highest relief of the Molasse Basin in Upper Austria. The region is characterized by a dissected landscape with elevation differences of 400 m and peaks reaching up to 800 m. The latest marine influence of this realm is dated to 11 Ma before present and constrains the onset of the inversion of the peripheral alpine foreland basin. Since that time the relief evolution is controlled by surface uplift and fluvial erosion. The Hausruck-Kobernaußerwald region forms a local watershed and is drained by three drainage systems that are tributaries of the Inn River, the Traun River and the Trattnach River. The Danube River represents the base level for all these streams. In contrary to the nearby Eastern Alps the study area shows no evidence for local deformation or glacial overprint. Therefore, the Hausruck- Kobernaußerwald region represents a perfect testing ground to explore the evolution of relief in a setting of regional uplift and relative base level lowering. This is done by characterizing the fluvial and hillslope system and exploring the effect of contrasting lithology and different base levels. We further give constraints on the geomorphological state of equilibrium and provide a discussion about the spatial position of the highest relief within the Molasse Basin in Upper Austria.

Therefore, we have performed a series of morphometric analyses on a high resolution LiDAR digital elevation model. This includes longitudinal channel profiles, the best fit concavity index, the steepness and the normalized steepness index, the slope-area relationship, the slope elevation distribution and hypsometric curves of all individual catchments.

All longitudinal channel profiles are graded and show a concave form without any natural knickpoints with best fit concavity indices in the range of 0.35 and 0.55. All observed knick points in the channel profiles could be traced back to an anthropogenic impact like bridges or culverts. Interestingly, the transition from one lithological unit to another does not influence the channel slopes in the profiles suggesting that the erodibility of different rock types is in the same order of magnitude. The contributing drainage area and channel slope for all catchments of the study area follow a power law relationship as proposed by Hack. The transition from hillslope- to fluvial processes is observed in channel slope-drainage area plots and is consistently identified in longitudinal channel profiles at very small drainage areas ($A < 0.05$ km^2). Hypsometric curves commonly show a S-shaped form with hypsometric integrals close to 0.5 suggesting a topographic steady-state of the study area.