

Lithology or base level? – What controls the evolution of different landscapes in the northern Alpine Foreland?

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The evolution of topography is driven by a climate and tectonics, and strongly influenced by bedrock properties and different base levels. The contributions of these factors may vary in space and time and are thus difficult to constrain. Our study area in the northern Alpine Foreland, the Hausruck – Kobernauserwald range, has a rather uniform climatic and tectonic history, but is drained by rivers with different base levels and consists of contrasting sedimentary rocks, mainly due to different sedimentation environments. This makes them an ideal location to study the effects of lithology and base level on topography.

To decipher the roles of these influences, we used a high resolution digital elevation model and performed a series of morphometric analyses. Longitudinal river profiles indicate that all channels in the study area, independent from base level, bed rock and overall morphological expression, are well graded. Hypsometry shows no evidence for base level effects on the present topography, while variations in the hypsometric curves coincide with lithological differences. This is also reflected in contrasts of mean elevation and slope distributions. Lithology-dependent variations in channel concavity and catchment-wide hypsometric integrals show that lithology controls both channel incision and hillslope processes in the study area. Our results further indicate that variations in channel and catchment metrics are not linked to the prevalence of different rock types alone, but to different successions of lithological units within the channels and catchments. Variations in channel slope and geomorphological mapping suggest that a lithology-dependent landsliding is the dominant process, causing the observed large-scale landscape diversity in the Hausruck – Kobernauserwald range.