Landscape rejuvenation in the Bohemian Massif

Robl, Jörg[1]; Stüwe, Kurt[2]; Dremel, Fabian[1]; Wetzlinger, Klaus[1]; Liebl, Moritz[1]; von Hagke, Christoph[1]; Fabel, Derek[3]

1 Department of Environment & Biodiversity, University of Salzburg, Hellbrunnerstraße 34, A-5020 Salzburg, Austria; 2 Institute for Earth Sciences, University of Graz, A-8010 Graz, Austria; 3 Scottish Universities Environmental Research Centre, Isotope Geoscience Unit, East Kilbride, G75 0QF, UK.

The Bohemian Massif represents the relic of a major Paleozoic mountain range, which was eroded and levelled in the Permian but experienced relief rejuvenation during the last few million years. The landscape is characterized by rolling hills and extended planation surfaces above an elevation of about 500 m. However, at lower elevations deeply incised gorges confined by steep hillslopes are abundant and contrast impressively with the low relief landscapes above. Rivers with a bimodal morphology (i.e. steep at lower elevations and gentle at higher elevations) drain either to the north into the Vltava River or to the south into the Danube River. Hence, a continental drainage divide runs through the Bohemian Massif and changes in the course of the divide eventually control the Central European drainage pattern. In this study we aim quantifying spatial and temporal variations of landscape change in the Bohemian Massif. To characterize the two contrasting landscape states, we computed landscape metrics derived from digital elevation models (e.g. normalized steepness index, geophysical relief). To determine the rate landscape change we are currently computing catchment-wide erosion rates from the concentration of cosmogenic ^{10}Be in river sands. Results show that the landscape is characterized by out-of-equilibrium river profiles with migrating knickpoints currently at elevations between 450 and 550 m. Knickpoints are separating steep channel segments at lower elevations from less steep channels at higher elevations. Hypsometric maxima at or close above knickpoint elevations along with high and low values in geophysical relief downstream and upstream of major knickpoints support the idea of landscape bimodality with higher erosion rates in steep low-lying portions of the catchments. Furthermore, we found a strong drainage divide asymmetry, which evidences for the reorganization of the drainage network of the region. Across-divide gradients in channel steepness predict the northward migration of the Danube-Vltava drainage divide including growth and shrinkage of tributary catchments at the north and south of the drainage divide, respectively. For the first time we will present catchment-wide erosion rates from 20 catchments spread across the Bohemian Massif and discuss whether erosion rates are consistent with landscape metrics and related predictions.