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Reconstruction of Pleistocene landforms and quantification of long-term erosion in southwestern Germany using digital elevation models

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Since at least Neogene times landscape in southwestern Germany has been sculptured by the river Danube, producing a southeasterly-oriented low-gradient river system. Rhenish high-gradient tributaries incised into these ancient landforms, producing reversed oversteepened profiles. The capture of Danubian tributaries advanced in southwesterly direction. The present divide between Rhine and Danube is situated on a karstificated scarpland of Upper Jurassic carbonates *(Schwäbische Alb)*.

North of the *Schwäbische Alb* and outside the actual Danubian catchment area remnants of old Danubian landforms are locally well preserved. Relics of Danubian quartz-rich braided river sediments (*Goldshöfer Sande*) are 50 to 90 m higher than the corresponding river level of Rhenish tributaries. The *Goldshöfer Sande* are a "last-minute" inheritance from the slow-down phase of Danubian erosion just before the Rhenish tributaries captured all major tributaries and deflected the minor ones. Biostratigraphy and morphological, morphometrical as well as palaeomagnetic correlations point to an age between 800 and 600 ka. Absolute age determination of these sediments using cosmogenic nuclides is in progress.

Remnants of sandy river terraces preserved along some of the deeply incised Rhenish tributaries testify episodes of choking of valley-floors with sand and gravel in an overall regime of rapid headward erosion. These terraces are situated at 60 m, 30 m, and 0 to 10 m above present river levels; they correspond to Alpine glaciations at 415 ka, 126 to 400 ka, and 11.5 to 115 ka.

The goal of our study is to determine the volume of material eroded by Rhenish erosion and the rates of river incision since cessation of Danubian activity. As a working base we have created a high-resolution (5 m) DEM covering an area of 1.700 km^2. The base of Danubian sediments, analysed from borehole and literature data, determines palaeo-valley gradients. We model the Danubian landscape using well-preserved relics of Danubian landforms as blueprints and valley directions as well as palaeo-valley gradients as boundary conditions. The difference between the Danubian DEM and the actual DEM is the volume extracted by Rhenish erosion. This results in a mean erosion rate; changes in Pleistocene erosion rates can be estimated by reconstructing the younger Rhenish valley floors based on remnants of Rhenish river terraces.