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Spatially and temporally varying Quaternary uplift rates of the Gerecse Hills, Northern Pannonian Basin, using dated geomorphological horizons in the Danube valley

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The assessment of Quaternary vertical deformation rates of uplifted, low altitude hilly regions is based mainly on the dating of paleo-surfaces that can be related to reference levels through several stages of landscape evolution. Regarding the Gerecse Hills (NE part of the Transdanubian Range, Hungary), situated to the south of the incised Danube River the all-time base-level of the river provides a suitable reference level, because the intracontinental setting of the study area makes it insensitive of the global sea level changes.

The terrace sequences of the Hungarian part of the Danube valley preserve a record of varying tectonic uplift rates along the river course and throughout several climate stages. The Gerecse Hills consists mainly of Triassic carbonatic rocks and a thin Paleogene and Neogene siliciclastic cover. The Danube is escorted by a set of Quaternary river terraces and higher planation surfaces, which may be of Pliocene age. The terraces are covered by alluvial sediments frequently capped by travertine and/or loess. To establish the chronology of these terraces, we rely on U-series data of travertines and on new in situ produced cosmogenic nuclides data combined with luminescence (OSL and postIR-IRSL) ages from the lower terraces.

In situ produced cosmogenic ^{10}Be concentrations were measured in samples distributed along vertical depth profiles to enable the determination of both the exposure duration and the denudation rate at each studied locality. We used Monte Carlo approach to model the denudation rate-corrected exposure ages. Burial age determinations were performed using cosmogenic ^{26}Al/^{10}Be nuclide ratios. Post-IR IRSL measurements were carried out on K-feldspar and OSL measurements on quartz grains to determine the ages of sediment deposition.

The highest dated horizon (∼115 m above the river) provided a preliminary burial age of ∼2.7 Ma, which is in accordance with the possible time span of sedimentation deduced from the occurrence of *Mammuthus meridionalis* teeth in the sampled sediment, or slightly older. This leads to an average uplift rate of 0.04 mm/a over the last ∼2.7 Ma. On the other hand, U-series data of travertines over the last ∼450 ka suggests incision rates of ∼0.15-0.55 mm/a and published terrace chronologies as well as luminescence and ^{10}Be depth profile data lead to values between 0.1 and 0.2 mm/a suggesting a possible slight acceleration of uplift towards present. In addition, the presented data indicate that uplift rates in the Gerecse Hills are higher than those in the area to the west, pointing to structurally controlled eastward increasing uplift rates.

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