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Differential vertical movements along the Vienna Basin Transform Fault (Austria) indicated by burial dating of Danube terraces

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The terraces south of the Danube River have been strongly dissected by faults related to the sinistral movement of the Vienna Basin Transform Fault System (VBTF, Decker et al., 2005). Each fault block displays a slightly different succession of terraces whose altitudes ranging between 25 and 130 m and might be offset. However, fault-related vertical displacements along the Danube have not yet been quantified.

In this study the ^{26}Al and ^{10}Be cosmogenic nuclide pair has been used to quantify the burial duration in a terrace at Haslau and at Rauchenwarth, which are ∼40 m and ∼75 m above the river and considered as Middle- and Early Pleistocene, respectively. These terraces and the related outcrops are located to the east and west of the VBTF. Determining their emplacement ages might help to quantify the differential vertical movement of the Arbesthal and Rauchenwarth blocks.

The sample set from the Haslau terrace consisted of quartzite cobbles taken at two subsurface depths (5.5 m and 11.8 m) for isochron burial dating (Balco and Rovey, 2008). After crushing and sieving, the samples were divided between the cosmogenic nuclide laboratories at Vienna and Budapest and duplicate samples were processed independently. The results demonstrate that the laboratory background allows secure in-situ produced cosmogenic ^{10}Be and ^{26}Al extraction at both laboratories. At Rauchenwarth, quartzite cobbles and a sand sample were taken at 11 m depth.

The mean minimum burial age (assuming no post-burial production) at Haslau is 0.8±0.1 Ma (n=8) and 1.0±0.2 Ma at Rauchenwarth (n=4). The maximum uplift rate calculated using the minimum ages is 65-100 m/Ma at Rauchenwarth and 40-55 m/Ma at Haslau

Interestingly, the numerical age of the Haslau terrace is older, and that of the Rauchenwarth Plateu is younger than previously suggested. However, at Haslau, outliers with both higher and lower ^{26}Al/^{10}Be ratios requires further consideration of the burial duration. Significant scatter of the ^{26}Al/^{10}Be nuclide ratio suggest that part of the terrace sediment may originate from older terraces, which would violate the main requirement for isochron burial dating of all clasts sharing a similar ^{26}Al/^{10}Be ratio at the time of deposition.

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References

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