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Uplift history of the Villány Hills (SW Hungary) based on paleontological data

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Villány Hills are the southernmost basement outcrop in Hungary, along the northern margin of the Drava Basin. They comprise part of a Cretaceous nappe in the Tisza structural unit. Data on their young tectonic evolution are scarce, mostly due to the almost complete lack of Cenozoic sediments. Though somewhat debated, indirect data suggest that most of the area was covered by Upper Miocene (Lake Pannon) clastic sediments. Uplift and exhumation of the basement was driven by Late Miocene to post-Miocene basin inversion. A unique opportunity to study the uplift history is offered by paleontological data, by small but numerous terrestrial vertebrate sites, which cover a long time span in the Pliocene and Pleistocene.

Faunas accumulated in fissure fillings of karstified limestone and thus provide a minimum age for the subaerial exposure (exhumation) of the bedrock at the given site. For some sites it has been proposed that water-linked species in the fauna refer to the existence of an alluvial plain on the clastic cover, in immediate proximity to the bedrock. If true, this would give an exact elevation of the surrounding terrain at the time indicated by the fauna. If exhumation of the basement happened during the time interval covered by the vertebrate faunas, then a relationship is expected to exist between the age and elevation of the the fossil sites, with the youngest faunas lying at lowest elevation. This relationship is expected to be strictly valid primarily in the case of water-linket faunas, but as a trend also for all fossil sites.

We collected the age data and ecological requirements of the reliably datable vertebrate faunas and their locations with the possible precision. Then the relationship between the elevation and age was studied and compared to the available geomorphological, sedimentological and tectonic data.

The age-elevation distribution of vertebrate faunas did not show the expected relationship. Based on the results, exhumation of the Villány Hills happened almost exclusively between the Late Miocene ($\sim$6.5 Ma, end of Lake Pannon sedimentation in the area) and the Late Pliocene (3.3 Ma, the oldest vertebrate fauna). This interval gives a denudation rate of $\sim$0.1 mm/year, which in this low-relief environment corresponds to basement uplift rate. Since the Late Pliocene, vertical movements are surprisingly slow, in the interval from 3.3 Ma to today the mean denudation (uplift) rate is 0.016 mm/y, and could not exceed 0.1 mm/y even in shorter periods. An explanation for these low rates can be that large-scale folding of the basement is supposed in the area, and the Villány Hills are located close to the inflection line of the fold limb, between the subsiding Drava Basin in the south and the uplifting Mecsek Mts. in the north.

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