

Radioisotopic dating of the Ipolytarnóc fossil track site and its implications for the Proboscidean Datum

József PÁLFY¹, Roland MUNDIL², Paul R. RENNE², Raymond L. BERNOR³, László KORDOS⁴ & Mihály GASPARIK⁵

¹Research Group for Paleontology, Hungarian Academy of Sciences–Hungarian Natural History Museum, POB 137, Budapest, H-1431 Hungary;

²Berkeley Geochronology Center, 2455 Ridge Road, Berkeley, CA 94709, USA; ³College of Medicine, Department of Anatomy, Howard University, Washington, DC 20059, USA; ⁴Hungarian Geological Institute, Stefánia út 14, Budapest, H-1143 Hungary; ⁵Department of Geology and Paleontology, Hungarian Natural History Museum, POB 137, Budapest, H-1431 Hungary

Abundant Early Miocene vertebrate and bird tracks and a rich plant assemblage is preserved by the emplacement of an ignimbrite sheet of the Gyula-keszi Rhyolite Tuff Formation (GRTF) near Ipolytarnóc in northern Hungary. The tuff that overlies the track-bearing sandstone yielded a single-crystal zircon U-Pb age of 17.41 ± 0.04 Ma and a laser-fusion plagioclase $^{40}\text{Ar}/^{39}\text{Ar}$ age of 17.02 ± 0.14 Ma. An additional $^{40}\text{Ar}/^{39}\text{Ar}$ age of 16.99 ± 0.16 Ma was obtained from the equivalent rhyolite tuff near Nemti, where the underlying terrestrial clay yielded early proboscidean remains assigned to the MN4 mammal zone. The new, high-precision dates allow revision of the numeric age and correlation of the Ipolytarnóc fossil site and the GRTF, previously based on an average K-Ar age of 19.6 ± 1.4 Ma. The difference of 0.39 ± 0.15 Ma between the U-Pb and $^{40}\text{Ar}/^{39}\text{Ar}$ ages support the growing evidence for a systematic bias between the two isotopic systems due

to the inaccurately known ^{40}K decay constant but likely also includes an undetermined pre-eruptive residence time of zircon. Published biostratigraphic data from under- and overlying marine strata establish correlation with the NN3 nannoplankton zone and, together with the new radioisotopic ages, suggest assignment of the fossils and the tuff to the late Otnangian regional stage of the Central Paratethys. The $^{40}\text{Ar}/^{39}\text{Ar}$ age from Nemti provides a reliable correlation of the MN4 mammal zone in Central Europe with the numeric time scale and places a minimum constraint on the age of the regional Proboscidean Datum, the migration event of proboscideans from Africa to Europe through the emerging “*Gomphotherium* landbridge”. Contrary to suggestions for a significantly earlier European Proboscidean Datum, it appears that the originally suggested age of *c.* 17.5 Ma is realistic.