

ESR and OSL geochronology of the East Milford, Nova Scotia, Canada, mastodon locality, and the timing of the Illinoian-Sangamon transition

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The final results of a multidisciplinary geochronological study of sediments and the fossil remains from the East Milford, Nova Scotia mastodon locality, are reported. The unconsolidated sediments containing the fossil were dated using optical dating (OSL), the fossil dental enamel was dated using electron spin resonance (ESR), and the fossil bone collagen was dated using ^{14}C dating. Analyses of two sediment samples, based on added radiation doses of up to 2400 Gy, yielded statistically indistinguishable ages of 127 ± 13 ka (EMM1) and 143 ± 16 ka (EMM2), with an average of 135 ± 15 ka. This suggests that the sediments mantling the wall of the cavity in which the mastodon foundered were deposited during late Illinoian deglaciation (end of oxygen isotope stage 6), or at the beginning of the Sangamon Interglacial (oxygen isotope stage 5). Pollen data confirm an interglacial climate, which provides a low-precision, independent geochronological support for the early onset of stage 5 suggested by the Devil's Hole data of Winograd and others.

The fossil dental enamel was ESR dated at 74.5 ± 6.9 ka, and indicates death at the end of oxygen isotope stage 5a, when the climatic cooling leading to the Wisconsinan glaciation had already begun. Fission track analysis of the tooth showed minimal U uptake, restricted to <10 to $25 \mu\text{m}$ in enamel and to 100 to $300 \mu\text{m}$ in dentine. Some U uptake in the much more porous bulk bone was present. We suggest that the gypsum geochemistry and very long residence at subzero temperatures during the Wisconsinan inhibited U mobility. This direct age indicates that the specimen became mired in a cavity that was already infilled with much older, probably waterlogged, sediments. The dosimetric ages are in agreement with independent, non-finite radiocarbon ages on the mastodon and fossil wood from an overlying organic horizon. Our results also confirm that pre-Sangamon glacial and interglacial sediments are preserved in Nova Scotia, and that finite absolute ages for them can be obtained using luminescence dating techniques.