

Seasonal woolly mammoth migration recorded by Sr isotope composition of molar tooth enamel

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Tooth enamel, as highly resistant to post-mortem alterations and as an incrementally growing tissue, provides an excellent opportunity for reconstructing life history of extinct species. We utilised this feature in order to reconstruct potential migration paths of a woolly mammoth from the Gravetian (Upper Paleolithic) Spadzista site in S-Poland. We used a well preserved molar which was subjected to detailed histological studies combined with high resolution Sr and O isotope composition measurements. Laser ablation MC ICP-MS isotope composition measurements of Sr recovered from a mammoth's molar show cyclic pattern interpreted as resulting from seasonal migration between two regions of distinct isotopic signature. The obtained time resolution of our analyses was shorter than one month which allows resolving not only seasonal but also sub-seasonal changes. Our results suggest ca. 11 years of a single plate formation and only about 1-2 years longer time for the entire molar formation. Estimates based on Sr isotopes record are in excellent agreement with our histological studies. The proposed seasonal migration pattern is further substantiated by high resolution record of oxygen isotope composition which shows reversed correlation with ⁸⁷Sr/⁸⁶Sr pattern.