



Regional differences in bone collagen carbon- and nitrogen-isotope ratios of Pleistocene mammoths: Implications for paleoecology of the mammoth steppe

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In this study, we present bone collagen carbon- and nitrogen-isotope values from a large set of Pleistocene woolly mammoths (*Mammuthus primigenius*) from Siberia, Alaska and Yukon (n=58). Overall, results for mammoth specimens from eastern Beringia (Alaska and Yukon) significantly differ, for both carbon- and nitrogen-isotope values, from those from western Beringia (northeastern Siberia). In agreement with palynological, entomological, and physiographic data from the same regions, these isotopic differences strongly imply that the 'mammoth steppe', the extensive ice-free region spanning northern Eurasia and northwestern North America, was ecologically variable along its east-west axis to a significant degree. Prior to the Last Glacial Maximum (LGM), the high-latitude portions of Siberia and the Russian Far East appear to have been colder and more arid than central Alaska and Yukon, which were ecologically more diverse. During the LGM itself, however, isotopic signatures of mammoths from eastern Beringia support the argument that this region also experienced an extremely cold and arid climate. In terms of overall temporal trend, Beringia thus went from a condition prior to the LGM of greater ecological variability in the east to one of uniformly cold and dry conditions during the LGM.