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Identifying Dietary and Migratory Patterns of Illinois *Mammuthus primigenius* Populations Using Stable Isotope Analysis of Carbon, Oxygen, and Strontium

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**Abstract**

The extinct woolly mammoth (*Mammuthus primigenius*) ranged from Alaska to the Northeastern Seaboard throughout the Late Pleistocene (100-10 Ka). Although it is recognized that woolly mammoths coincided with and lived in a region heavily influenced by glacial ice sheets, little is known about their behavior with respect to activities like migration and dietary preferences in this environment. This study classifies and provides insight into the diet and mobility of Midwestern mammoths by analyzing stable isotopes of carbon, oxygen, and strontium preserved in the tooth enamel of these extinct elephants. A woolly mammoth tooth from Moline, IL, was bulk sampled and micromilled to extract the aforementioned isotopes from the base of the enamel. Dated to 16,410 ± 110 BP (20,085-19,530 calBP), measured δ13C (−12.6‰ to −11.1‰), and measured δ18O (−8.1‰, VPDB) values are less negative than should be expected. The ratios of 87Sr/86Sr isotopes retained in the tooth enamel of these extinct elephants is a strong indicator of climate conditions during the Late Pleistocene. The data reveals the climate and landscape during the terminal Pleistocene in western Illinois and how woolly mammoths responded to it.

**Methods**

**Bulk Sampling**
- 2mm Dremel bit was used to serially sample enamel perpendicular to the growth axis down the length of a plate at 6-7 mm intervals.
- Powdered enamel was chemically treated to remove impurities

**Micromilling Sampling**
- Controlled by a Newax 55G-3-axis motion controller using GalilTools on a PC
- 0.3mm Dremel bit was used to sample enamel at depth increments of 100µm until the dentin was reached
- Micromilled enamel was used to sample enamel perpendicular to the growth axis at 17mm intervals

**Isotope Analysis**
- δ13C and δ18O values were acquired at the Iowa State University Stable Isotope Lab on a ThermoFinnigan MAT Delta Plus XL mass spectrometer in continuous flow mode connected to a Gas Bench with a ConFlo IV autosampler
- 87Sr/86Sr values were acquired at the University of Kansas Isotope Geochemistry Laboratory measured on a Thermal Ionization Mass Spectrometer (TIMS), an automated VG sector, and a 6-collector system with a 10-sample turret

**Conclusions**

- V-405 most likely lived in the northerly-laten Pocket between the two ice lobes. The primary scenario assumes V-405 lived close to the ice sheets in the small south-eastern slivers of Figure 5.
- Secondary and more unlikely scenario assumes V-405 lived in the northern pocket between the two ice lobes. The secondary and more unlikely scenario assumes V-405 lived close to the ice sheets in the small south-eastern slivers of Figure 5.

**References**

Don Esker (Widga et al. 2017) Strontium isotope ratios reveal disparate geographic origins for Late Pleistocene mammoths from Missouri and Texas (USA) (Vertebrate Paleontology, Albuquerque, NM.)

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