



SCIENTIFIC ANNALS of the School of Geology,  
Aristotle University of Thessaloniki

**SPECIAL VOLUME 102**



## **ABSTRACT BOOK**

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**THESSALONIKI, MAY 2014**

## Maximum geographic extension of Holarctic *Mammuthus primigenius* during the Late Pleistocene

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From 900 ka onwards the global climatic cyclicity was dominated by a clear 100 ka periodicity. Correspondingly, prolonged climatic cycles, which appeared as extended glacial and interglacial phases, caused drastic changes in the faunistic structure of the Northern hemisphere (Kahlke et al., 2011). The first (pan-Eurasian) Mammoth Fauna formed about 460 ka BP during MIS 12 (Kahlke, 2013). This new type of mammal assemblage expanded and contracted its geographic extension, parallel to alternating environmental conditions of the subsequent late Middle to late Pleistocene period.

*Mammuthus primigenius* as a key species of Holarctic Mammoth Faunas reached its maximum distribution during the Late Pleistocene (MIS 5d - 2). Its habitats stretched from the Iberian Peninsula, North Western Europe, the southern

Independent to the successively evolving *M. primigenius* of northern latitudes, *M. trogontherii* survived in Central Asia probably until the Late Pleistocene (Tong, 2010). A corresponding phenomenon of coexisting mammoth species is known from the New World, where woolly mammoth was replaced by *M. columbi* (inclusive of *M. jeffersonii*) from the Southern Plains southwards. In both cases the separate evolution of sister taxa indicate significant ecological differences between inner continental steppe and tundra-steppe of more northern altitudes. Parallel advances of *M. primigenius* detected in Western Europe and Eastern Asia during the Late Pleistocene, were controlled by connected climatic processes in marine (North Atlantic, North Pacific) influenced areas.

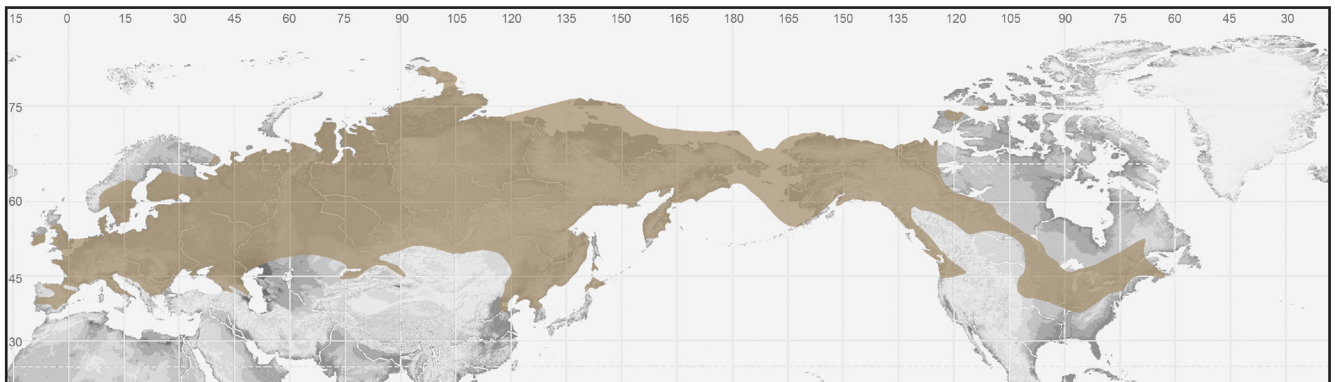


Fig. 1. Sketch of Holarctic maximum extension of *Mammuthus primigenius* during the Late Pleistocene (after Kahlke, 1999, 2013; Kahlke in Alvarez-Lao et al., 2009; additions concerning North America after Cooke et al., 1993; Burns, 1996; Hoyle et al., 2004 and Fisher in Larmer, 2013).

bight of the North Sea and Scandinavia via Central, Southern and South Eastern Europe, the Russian Plain, the Ukraine as far as the Black Sea, Transcaucasia, the Urals and Bashkiriya to south-eastern Kazakhstan, Xinjiang in westernmost China, northern Outer Mongolia, East Siberia, north-eastern China, the northernmost part of South Korea, Sakhalin and Hokkaido, to Yakutia and Kamchatka, as well as to Alaska and coastal British Columbia, the western part of the Canadian Arctic, across Northern Canada to the Great Lake region and the Northern Plains of the US. The Holarctic extension of Late Pleistocene woolly mammoths covered an area of up to 305 degrees of longitude and 44 degrees of latitude, thus comprising approximately 32.82 million km<sup>2</sup> (Fig. 1).

The maximum spread of the populations was primarily controlled by the following factors:

- (1) The replacement of tundra-steppe by other types of biomes, less suitable for *M. primigenius* (Central Asian core steppe, North American grasslands);
- (2) The exposure of continental shelf regions (e.g., Beringia, North Sea);
- (3) The configuration of marine shore lines on year round open water surfaces (e.g., Mediterranean, Black and Caspian Sea);
- (4) The configuration of semideserts and deserts (e.g., Hunger Steppe, Kysylkum, Taklamakan and Gobi deserts);
- (5) The configuration of high mountain chains without passable valleys (e.g., ridges of the Pyrenees, Alps, Altai, Transil- and Dzungarian Alatau); and
- (6) The configuration of inland glaciers (Eurasian, Laurentide and Cordilleran ice sheets).

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### Citation:

Kahlke, R.-D., 2014. Maximum geographic extension of Holarctic *Mammuthus primigenius* during the Late Pleistocene. Abstract Book of the VI<sup>th</sup> International Conference on Mammoths and their Relatives. S.A.S.G., Special Volume 102: 77.