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Radiocarbon Dating of Mammoth from Russian Permafrost at Nagoya AMS Facility

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Seven samples consist of soft tissue and body hairs that are collected from Russian mammoths were measured for radiocarbon (^{14}C) age with the AMS system at the Center for Chronological Research, Nagoya University. Sample materials and sites of sample collection are 5 body soft tissue samples from Yukagir, Os. Bol'shoy Lyakhouskiy, Saiga-Yuriakh, Khatanga, in East Siberia, one body soft tissue sample from Yamal and one body hair sample from Turibey in West Siberia.

The samples were cleaned with warm distilled water on an electric oven for more than a week, and dried at 80 C. Several mg of the samples were combusted to CO_2 and finally converted to graphite, whose carbon isotopic ratios ($^{14}C/^{12}C$ and $^{13}C/^{12}C$) were measured with an accelerator mass spectrometry (AMS) system at Nagoya University. From the measured carbon isotope ratios, ^{14}C ages of the samples were calculated as well as one-sigma errors. The obtained ^{14}C ages diverged from 9950BP to >49,500BP.

The obtained ages were compared with the ages measured so far for the respective samples. A soft tissue sample from the Yukagir mammoth, that was displayed at the 2005 World Exhibition, Aichi, Japan, was also measured. The measured ^{14}C age of 18,420±40 BP is consistent with ^{14}C ages already dated by other groups: 18,510±80 BP for rib bone; 18,510±100 BP for body skin, 18,680±100 BP for body hair measured by Groningen University, the Netherlands, and 18,160±110 BP for rib bone by University of Arizona, USA, as shown in Table 1.

The ^{14}C ages of five mammoth samples are compared with the ages measured previously by other dating groups. The ^{14}C ages measured by the conventional methods have errors much larger than those by the AMS method. Some ^{14}C ages are consistent between the two methods, but some are not.

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According to a compilation of ^{14}C age for mammoth samples from Siberian permafrost in Eurasian continent, all ^{14}C ages of the mammoth samples (older than 10,370±70BP) belong to the period of still cold just after the last glacial period. However, a mammoth sample from Wrangel Island in the Siberian Arctic showed much younger ages (5900±90BP(NUTA-6292), 6870±130BP(NUTA-6357), from Ohta et al. (2001)), in mid-Holocene. Although mammoth lived in Eurasian continent disappeared completely early Holocene , but mammoth in the isolated islands survive till mid Holocene (Vartanyan et al. 1993).

Table 1. Comparison of ^{14}C ages dated by three different AMS laboratories for the Yukagir mammoth

No.	**^{14}C age (BP, ±1s error),**	**Lab code**	**Material dated**	**Site**
1	18,420±40,	NUTA2-9152	soft tissue	Yukagir
2	18,510±80,	GrN-28258	bone (rib)	Yukagir
3	18,510±100,	GrN-28259	skin	Yukagir
4	18,680±100,	GrN-24288	hair	Yukagir
5	18,160±110,	AA-59602	bone (rib)	Yukagir

Nos. 2 and 5 are from a single bone piece. NUTA2:Nagoya, GrN:Groningen, AA:Arizona

References:

Vartanyan S.L. et al. (1993) Holocene dwarf mammoths from Wrangel Island in the Siberian Arctic. Nature, 362:337-340.

Ohta, K. et al. (2001) Holocene dwarf mammoth teeth from Wrangel Island in the Siberian Arctic, Warth Science, 55, 6, 357-360.

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