Geophysical Research Abstracts, Vol. 8, 05519, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05519

Lake El´gygytgyn, NE Siberia: deep drilling in 2007/08 for the first continuous 3.6 Mio year paleoclimate record in the terrestrial Arctic

M. Melles (1), J. Brigham-Grette (2), P. Minyuk (3), C. Koeberl (4) and Elgygytgyn Scientific Party

(1) University of Leipzig, Germany, (2), University of Massachusetts, USA, (3) Northeast Interdisciplinary Scientific Research Institute Magadan, Russia, (4) University of Vienna, Austria, and Elgygytgyn Scientific Party (melles@rz.uni-leipzig.de / Fax: +49 341 9732 809 / Phone: +49 341 9732 902)

Lake El´gygytgyn, located in central Chukotka, NE Siberia, is a 3.6 million year old impact crater lake with a diameter of 12 km and a water depth of 170 m. During the last 8 years the sedimentary record of the lake has become a major focus of multi-disciplinary multi-national paleoclimatic research. Recently, the International Continental Scientific Drilling Program (ICDP) has provided funding for a drilling operation on the lake and in its permafrost catchment in winter 2007/08.

A full-length sediment core from Lake El´gygytgyn would yield a complete record of Arctic climate evolution, back one million years prior to the first major glaciation of the Northern Hemisphere. Geomorphological evidence from the catchment suggests that the crater was never glaciated during the entire Late Cenozoic. A 12.9 m long sediment core retrieved from the deepest part of the lake in 1998 revealed a basal age of approx. 250 ka, confirmed the lack of glacial erosion, and underlined the sensitivity of this lacustrine environment to reflect high-resolution climatic change on Milankovitch and sub-Milankovitch time scales. Four sediment units were distinguished, reflecting relatively warm, peak warm, cold and dry, and cold but more moist climates. A 16.7 m long sediment core taken in 2003 confirmed the reproducibility of the record and dates to nearly 300 ka. Additional cores from the western lake have shown that the formation of debris flows at the slope is associated with partial erosion of the underlying sediments. This leads to the development of suspension clouds, whose deposition

generally takes place all over the lake as ´pelagic rain´ without erosion. Hence, the sediment records deposited in the central lake during at least the past 300 ka are continuous, and the existing cores represent the longest continuous climate records as yet available from the Arctic continent.

Seismic investigation carried out during expedtions in 2000 and 2003 revealed a depth-velocity model of brecciated bedrock overlain by a suevite layer, in turn overlain by two lacustrine sedimentary units up to 350 m in thickness. The upper well-stratified sediment unit appears undisturbed apart from intercalation with the debris flows near the slopes. Based on extrapolation of sedimentation rates the entire Quaternary and possibly parts of the late Tertiary record are reflected by the 170 m thick unit one, whilst the earliest history of the lake is presumably represented with a higher sedimentation rate by unit two. There is no evidence for glacial erosion or complete lake drying in the entire sedimentary record.

Coring objectives include replicate cores of 630 m length to retrieve a continuous paleoclimate record from the deepest part of the lake and into the underlying impact breccias and bedrock. Studies of the impact rocks offers the planetary community with the opportunity to study a well preserved crater uniquely found in igneous rocks like those on Mars. One additional core to ca. 200 m into permafrost from the adjacent catchment will allow us to test ideas about arctic permafrost history and sediment supply to the lake since the time of impact.