



## **ICDP Deep Drilling 2008/09 at Lake El'gygytgyn, NE Siberia: Operational Success and First Results**

Martin Melles (1), Julie Brigham-Grette (2), Pavel Minyuk (3), Christian Koeberl (4), and Lake Elgygytgyn Scientific Party (5)

(1) University of Cologne, Institute of Geology and Mineralogy, Germany (mmelles@uni-koeln.de), (2) University of Massachusetts, Dept of Geosciences, Amherst, USA (juliebg@geo.umass.edu), (3) Northeast Interdisciplinary Scientific Research Institut, Magadan, Russia (Minyuk@neisri.ru), (4) University of Vienna, Center for Earth Science, Austria (christian.koeberl@univie.ac.at), (5) ca. 39 scientists from 7 countries

Lake El'gygytgyn is located 100 km north of the Arctic Circle (67°30' N, 172°05' E) in a crater of 18 km diameter that was formed 3.6 Ma ago by a meteorite impact event. From Oct. 2008 until Mai 2009 an ICDP drilling campaign was conducted at Lake Elgygytgyn, achieving its three major objectives.

First of all, drilling from the ice cover in the lake center penetrated the entire, 315 m thick lake sediment succession in 170 m water depth. The sediments show no indications for hiatuses due to glaciation or desiccation. Hence, their temporal length and geologic significance is absolutely unprecedented, for the first time providing deep and widely continuous insights into the climatic and environmental evolution of the terrestrial Arctic since Pliocene times. This is particularly true for the lowermost 40 m and uppermost 100 m of the sequence, which were drilled with almost 100 % recovery and, taking the chronological information as yet available, likely reflect the initial lake stage during the Pliocene and the last ca. 2.0 Ma, respectively. In between, the quality of the record is restricted due to lower recovery in consequence of technical problems and/or sequences of coarse sand and gravel interbedded with lacustrine mud.

Second, a ca. 200 m thick, almost complete section of impact breccias was recovered underneath the lake sediments, consisting of a 60 m thick suevite layer above broken and fractured volcanic basement rocks. Investigation of this core sequence promises new information concerning the El'gygytgyn impact event, including the composition and nature of the meteorite, the energy released, and the shock behaviour of the volcanic basement rocks.

And third, a 142 m long sequence was recovered from the permafrost deposits in the western lake catchment, only a few hundred meters from the lake shore. The core consists of sandy and gravelly alluvial fan deposits, which are continuously frozen and rich in ground ice. The sediment and ice composition promises to provide information complementary to the lake sediment record, in particular with respect to the regional climatic history and Late Quaternary lake-level fluctuations. Besides, a thermistor chain installed in the drill hole as part of the "Thermal State of Permafrost Network" of the International Permafrost Association will contribute to the understanding of the permafrost behaviour under the currently changing climatic settings.

In summary, the drilling operation at Lake El'gygytgyn in winter 2008/09 has kept behind the expectations with respect to the quantity of core material, however, it is regarded as great success taking the potential the high-quality material has to address the three major scientific goals of the project. The presentation will summarize the operational success of the drilling campaign and highlight the scientific results obtained so far based on the limited onsite and ongoing offsite core processing.