Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07922, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07922
EGU General Assembly 2008

Seismic investigation of impact crater Lake El'gygytgyn, NE Siberia

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Lake El'gygytgyn is located in Chukotka, NE Siberia, and was formed 3.6 million years ago by a meteorite impact. It has a diameter of about 12 km and is bowl shaped with a maximum depth of about 170 m. The lake sediments most probably contain a complete, continuous 3.6 million years climate archive and the lake thus has been recognized as a key site in unraveling the paleoclimate history of the northern high latitudes. The sediments will be drilled in winter/spring 2009 by the International Continental Scientific Drilling Program. A seismic refraction and reflection pre-site survey was carried out during two expeditions in 2000 and 2003. In combination with the echosounder (3.5 kHz) data, the seismic profiles allowed a first study on the characteristics of the lacustrine sediments and on the crater geometry. The lacustrine sediments can be subdivided into two major units (I and II). The upper unit I is well-stratified in the central parts of the lake and intercalated with mass movement deposits in the proximal parts of the lake. Unit II is acoustically more chaotic and massive. The lake's sedimentary history shows three stages associated with two shifts in the sedimentation regime: (i) sediments were dominated by mass movement deposits and the lake was likely concentric with the crater rim during an initial stage. Enhanced weathering in the western part of the crater probably due to a weaker bedrock or a higher initial relief led to a displacement of the lake towards the southeastern part of the crater; (ii) a bipolar sedimentation mode with pelagic sedimentation in the distal parts of the lake and mass movement deposits in its proximal areas was established without a significant further displacement of the shoreline; (iii) a gradual decrease in mass movement deposits in the proximal areas points at lower erosion rates in the surroundings and,

thus, a more stable situation of the catchment relief.