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Physical properties, downhole logging and seismic data from deep drilling in Lake El'gygytgyn, Chukotka, NE Siberia – initial results

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Lake El'gygytgyn is an impact crater lake that formed 3.6 million years ago in Chukotka, northeastern Siberia. The lake has a mean diameter of 12 km and is bowl-shaped with a maximum water depth of approximately 170 m. At present, the lake is ice covered most of the year with an ice-free period of roughly 3 months. Pilot cores retrieved in 1998 and 2003 have shown that the lake sediments are highly susceptible to climate change; the lake has the unique potential to unravel 3.6 million years of Arctic climate history. It has thus become one of the major sites for the International Continental Drilling Program (ICDP) during the past few years.
In January 2009, thickening of the lake ice cover was carried out to allow to handle a drill rig from the ice. From February on, DOSECC started to build up a modified GLAD800 rig to drill the lake sediments and further into the bedrock. By the end of April 2009, three holes were drilled at one site, reaching as far down as 517.3 m below lake floor with a total recovery of 75 %. The cores penetrated 315 m of lacustrine sediments before they hit the suevite bedrock that was initially formed by the meteorite impact 3.6 million years ago. While the upper part of the sediments were rather fine-grained intercalated with some smaller mass transport deposits as expected from the pilot cores, the lower part of the lacustrine sediments was much coarser. During the drilling campaign, magnetic susceptibility of the whole cores was measured in order to correlate the three cores of the drilled site and to get a first impression of the physical properties of the drilled material. Drilling was stopped 4 times to allow for carrying out a downhole logging survey.
After the drilling campaign, all cores (permafrost as well as lacustrine/impact rock) were shipped from Siberia to Germany. Core opening and sampling of the lacustrine cores is presently carried out at the University of Cologne. The composite profile is defined while opening the cores, and samples are taken continuously every 2 cm with 9 subsamples.
Here we present the field magnetic susceptibility of the cores, downhole logging data and first results from the ongoing core opening campaign along with the seismic record of the lake. Whole core magnetic susceptibility data show a high correlation between the cores of the different holes, and a perfect match with the downhole magnetic susceptibility data. Deep drilling confirmed the seismic boundary between lacustrine sediments and the suevite at approximately 315 to 330 m below lake floor, but moved the boundary between rather fine-grained, well-laminated sediments in the upper part and seismically more chaotic, coarser sediments in the lower part that was visible in the seismic reflection data up by 10 m to approximately 150 m below lake floor.