

THE IMPACT project_ High Resolution Sediment Echosounding of Elgygytgyn Crater Lake and Correlations with the Paleorecord

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Lake Elgygytgyn, located in central Chukotka, NE Russia, fills a basin 12 km in diameter and 170 m deep. This basin today is asymmetrically located in the central and southeastern part of an impact crater of about 18 km in diameter. Since the lake is expected to have been never glaciated since its formation after the impact 3.6 ma ago, it is a unique archive for paleoclimate studies in arctic regions. Thus, sediments from a 12.7 m long piston core recovered 1998 in the deepest part of the lake basin provided information about the regional climate history of the past ca. 400 000 years, which also indicates teleconnections to that recorded in the GRIP/GISP ice cores from Greenland. As part of a multinational and multidisciplinary expedition during the summer 2000 (THE IMPACT), high resolution seismic studies using a 3.5 kHz echosounder were carried out in order (1) to detect mass movement processes and their origins, (2) to understand differing accumulation rates in the 1998 paleorecord, and (3) to carry out a pre-site survey for a future drillsite. Five seismic profiles across the lake exhibit the steep inclined northern and western sublacustrine slopes ($>25^\circ$) as major source areas for debris flows. Debris flows are acoustically structureless, have wedge or lenticular shaped geometries, and can reach several kilometers in length. Proximal thicknesses of the debris flows amount to ca. 20 m, those in distal areas are still in a range of up to 5 m in thickness. Preliminary lateral reflector correlation to the 1998 drillsite suggests that most of the debris flows occurred during interglacials, such as isotope stages 1, 5, 9 and 11. The reflection pattern on the 1998 coring location indicates mostly well stratified undisturbed sediments down to a sediment depth of about 50 m, the limit of the 3.5 kHz pulse penetration. Therefore, only very thin distal components of the debris flows may be present at the coring location which is consistent with slightly increased accumulation rates in the paleorecord during the interglacial periods.