



Seismic investigation of Lake Issyk-Kul, Kyrgyzstan

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Lake Issyk-Kul is located in an intramontane basin of the Tien Shan mountains in Kyrgyzstan, Central Asia. It has formed in a tectonically active region with W-E striking major thrust zones north and south of the lake. The lake's modern surface level is at 1607 m above sea level, maximum depth in the central basin of the lake is roughly 670 m, and the total water volume is around 1736 km³. The lake is elongated with 180 km in west-east and 60 km in south-north direction. With a surface area of 6232 km², Lake Issyk-Kul is the second largest lake in the higher altitudes. The lake is characterized by two large delta areas at its western and eastern end, with the deltaic area being as wide as up to 60 km in the eastern and 40 km in the western part, and by steep slopes at the northern and southern shore with only a rather narrow shallower shelf area. The lake contains the sediments of the past up to several million years, and has been proposed as a future target for deep drilling within ICDP.

Three seismic surveys by Russian and Belgian groups in 1982, 1997 and 2001 revealed a thick sediment infill in Lake Issyk-Kul. At both the western and the eastern end of the lake, large delta systems were formed by actual and previous inlets, namely the Tyup and Djyrgalan rivers in the eastern part of the lake (still active) and the Chu River at the western end (currently bypassing the lake). Large sub-aquatic channel systems are visible in the lake's bathymetry in the shallower part of the delta systems close to the river mouths. They were quite likely formed by these rivers during a former lake level lowstand. The delta system consists of stacked prograding delta lobes with a characteristic topset-foreset-bottomset configuration. These lobes together with sub-aerial terraces found at several spots around the lake witness lake level fluctuations of up to >400 m.

The sediments in the central plain of Lake Issyk-Kul are mainly well-layered with many turbiditic sequences intercalated with pelagic background sedimentation. Sediments are slightly inclined towards south with increasing angles with depth, suggesting a halfgraben structure of the lake basin. Mass transport deposits such as debris flows are a common feature close to the steeper flanks around the central plain.

The southern flank is characterized by many small terraces and several canyons that are related to the small inlets at the southern shore. The northern flank, however, shows a small, shallow shelf area of 25 to 30 m water depth. This area is characterized by glacial outwash sediments brought to the lake by small rivers that drain the large terminal moraines which are located north of the lake.