



Results from an ICDP-related deep seismic pre-site survey campaign at Lake Issyk-Kul, Kyrgyz Republic

Anna Reusch (1), Volkhard Spiess (1), Hanno Keil (1), Catalina Gebhardt (2), and Kanatbek Abdrakhmatov (3)

(1) University of Bremen, Bremen, Germany (anna.reusch@uni-bremen.de), (2) Alfred-Wegener-Institut, Germany, (3) National Academy of Sciences of the Republic of Kyrgyzstan, Kyrgyzstan

Lake Issyk-Kul, located in the Kyrgyz Republic, is one of the deepest and largest lakes in the world. The lake floor is between 600 and 700 m deep. It occupies a deep basin within the Tien Shan mountain range in Central Asia, which is presently one of the Earth's tectonically most active intra-continental mountain belts. Up to 3500 m of terrestrial sediments have been deposited in the basin, including glacial, fluvioglacial, fluvial and lacustrine formations (Fortuna, 1993), of which the oldest are believed to date back to Oligocene – Miocene times (Abdrakhmatov et al., 1993; Chedia, 1986).

Lake Issyk-Kul's sediments comprise a promising record of tectonic events and past climate changes in the Tien Shan region, potentially ranging back to Miocene times. A multichannel airgun seismic dataset acquired in 2013 allows to investigate the lake history further back in time than the previously available single-channel seismic data of the lake with seismic penetration down to ~ 300 ms TWT (~ 225 m, partly even deeper). The airgun seismic lines indicate seismic penetration down to 500 ms TWT in shelf areas (~ 350 m) and down to the first multiple at ~ 1.8 s (~ 675 m) below lakefloor in the basin. However, the acoustic basement has not been reached yet and the sedimentary infill may potentially be much deeper.

The sedimentary infill of the lake basin shows a typical turbiditic succession with a flat horizontal lake floor, indicating efficient sediment dispersal in the basin. Reconstruction of the tectonic evolution reveals an anticline structure as well as a significant southward tilt within the basin to great sediment depths at least down to the first multiple, probably deeper. The southward tilt is gradually and smoothly increasing with depth, comprising a half graben. A rough estimate of the subsidence is presented with 145 m of subsidence occurring during deposition of 580 m of sediments. However, in the western part of the lake, the southward tilt is not very distinctive, showing the asymmetric tectonic nature of the lake basin. A longitudinal seismic profile shows a basin-filling geometry, with thicker sedimentary units towards the north-east. However, this longitudinal profile runs southwest – northeast and is the only longitudinal profile in the whole seismic dataset of Lake Issyk-Kul, therefore more longitudinal profiles are needed to reconstruct the geometry of the sedimentary infill. Lake Issyk-Kul furthermore revealed extreme lake level variations by > 400 meters (Gebhardt et al., 2017). It can be expected that a drop in lake level, which changes the terrestrial sediment delivery system and shifts shorelines will lead to coarser material being deposited in the basin, and thus a high amplitude seismic facies. We test the hypothesis if a cyclic amplitude change may be correlated to the lake-level reconstruction.

We furthermore present the scientific program for a future lake campaign, in which we focus on geophysical data collection (i) in the central deep basin, (ii) on the anticline and (iii) dedicated survey grids focused on specific targets of a complimentary sedimentary proposal.