



The 2005 Lake Merzbacher GLOF event and status of future planned activities in the Tien Shan region

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The glaciated Tien Shan mountain chains of Kyrgyz Republic represent the main reservoir of water supply of large parts of Central Asia. The retreat of glaciation in this area, observed since the last two decades, caused changes in the dynamics of the glaciers. Hence, especially at the largest glacier lake of Central Asia - Lake Merzbacher - the number of glacial lake outburst floods (GLOFs) raised dramatically and caused massive damage of the infrastructure of the regions situated below the glacier outflow every year.

From July 22 to August 13, 2005 GeoForschungsZentrum Potsdam (GFZ), the Central Asian Institute of Applied Geosciences (CAIAG) in Bishkek and invited geoscientists from Europe jointly conducted the Inylshek 2005 expedition to Lake Merzbacher. The lake is situated at the lower end of the northern tributary valley by accumulation of melt water, blocked by the ice of Southern Inylchek glacier. A new ground-based remote observation technique utilizing GPS signals reflected from the lake's surface was installed beside the shoreline of Lake Merzbacher at 42.196°N, 79.847°E and a height of 3271 m above sea level in order to monitor changes of the lake level. Observations of the lake level showed that after the first drainage event the lake slowly refilled with measured rates of about 2-4 cm/h in water level change between July 28 and July 31.

During July 31 a second dam failure happened, resulting in a drop of the water level of almost 14 m within the first 4 days. Detailed geodetic GPS measurements on the ice dam and of the glacier flow, combined with interpretation of optical and radar satellite data from several subsequent years now provide insight into the post-drainage dam response and the changed ice dynamic conditions. It could be demonstrated that during high water levels in the lake a large part of the ice dam becomes afloat, lifting the ice surface up to almost 20 m in the central dam region. During this phase of extensive floatation strong calving is facilitated, which is supported by the high density of ice debris in the lake.

GFZ has teamed up with CAIAG and an international scientific team to plan the installation of a permanent service platform in the Inylchek glacier area. This platform is intended to provide the necessary infrastructure to run a wide range of instruments and communication systems to provide near real-time observations of short- and long term dynamics of the Inylshek Glacier system serving as model glacier region in an undisturbed high-mountain area. In a first step a local GPS network to monitor the ice dynamics of the glacier and a local network of meteorology and hydrology stations is planned. Additionally, an enhanced GPS reflectometry instrumentation is projected for monitoring the water level of Lake Merzbacher.