Geophysical Research Abstracts
Vol. 15, EGU2013-1885, 2013
EGU General Assembly 2013


# Glacial lake outburst floods from Kyagar Glacier, Karakoram, P. R. China

Christoph Haemmig (1), Matthias Huss (1,2), Hansrudolf Keusen (1), Josef Hess (3), Urs Wegmüller (4), Zhigang Ao (5), and Wubuli Kulubayi (6)

(1) GEOTEST AG, Zollikofen, Switzerland, (2) Department of Geosciences, University of Fribourg, Fribourg, Switzerland (matthias.huss@unifr.ch), (3) Federal Office for the Environment, Bern, Switzerland, (4) Gamma Remote Sensing AG, Gümligen, Switzerland, (5) Xinjiang Office for Flood Control, Urumqi, P. R. China, (6) Xinjiang Kashgar Hydrographic and Water Resources Survey Bureau, Kashgar, P. R. China

Kyagar Glacier is located in the Karakoram Mountains in the southwest of Xinjiang Uygur Autonomous Region, P.R. China. The glacier tongue entirely blocks the riverbed of the upper Shaksgam Valley and impounds a glacial lake at 4750 m a.s.l., which was the source of several violent and disastrous Glacial Lake Outburst Floods (GLOF) over the past decades. The spontaneous floods are a threat to over 1 mio. inhabitants in the floodplains of the Yarkant River.

A GLOF early warning system, combining satellite remote sensing and two terrestrial observation and warning stations at Kyagar Lake and 200 km downstream, was implemented in 2011 and 2012. The stations provide daily images based on automatic cameras, water level measurements, and are equipped with weather sensors to monitor local climate. We discuss the GLOF early warning system and present first measurement series of melt-water runoff and meteorological conditions from one of the remotest regions of the Karakoram mountains.

The ongoing project also elaborates scenario-based forecasts of future glacier lake developments, considering the ice-flow dynamics of Kyagar Glacier as well as surface mass-balance response to climate change. Comparison of two high-resolution Digital Elevation Models (DEMs) for the ice dam show surface lowering rates of more than $4\,\mathrm{m\,a^{-1}}$ between 2002 and 2011 leading to a significant reduction in lake volume and hence, a decreasing GLOF hazard potential. Glacier melt modelling using climate scenarios indicates a rapid retreat of the glacier tongue over the next decades. However, two DEMs covering the entire glacier for 2000-2008 show small elevation changes in the accumulation area and even a slight mass gain in the central part. This is supported by the observation of a moderate ice-flow speed-up in this region. This pattern is typical for surge-type glaciers and is consistent with the numerous documented glacier surges in the Karakoram. Furthermore, the displacement rate of the glacier surface between 2011 and 2012 is analyzed based on feature tracking of synthetic aperture radar images in high temporal and spatial resolution. We present an integrative analysis of recent changes in mass-balance and ice-flow dynamics of Kyagar Glacier. These assessments are crucial for estimating the future GLOF hazard potential of Kyagar Glacier Lake and improving risk management in the floodplain.