



## **Glacier-dammed lake outburst events of Gornersee, Switzerland**

**M. Huss, A. Bauder, S. Sugiyama, M. Werder and M. Funk**

Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie, ETH Zürich, Switzerland,  
(mhuss@vaw.baug.ethz.ch / phone: +41446324122)

Gornersee is an ice marginal lake, which fills annually to 1-4 mio. m<sup>3</sup> in the course of the melting season. The lake drains subglacially within a few days producing peak discharges of up to 40 m<sup>3</sup> s<sup>-1</sup>. Since 1970 continuous discharge measurements close to the glacier snout are available. In 2004 and 2005 we conducted intensive field studies. Lake level variations were recorded, water pressure was measured in several boreholes and motion of ice was determined with GPS and theodolite. We present the analysis of the lake outburst events 1970-2005 as well as the results of detailed investigations in 2004 and 2005.

A distributed temperature-index model is used to calculate discharge from the catchment of Gornergletscher. Temporal and spatial distribution of snow and ice melt is computed with temperature and precipitation data from a nearby weather station and potential clear sky radiation. We compare modeled and measured discharge at the outlet stream in the last three decades and detect annual outburst events. Trends in timing and drainage volume are identified. Peak discharges lie significantly below the empirical relation proposed by Clague and Mathews (1973).

Lake geometry and evolution are known for 2004 and 2005. By comparing the lake outflow with the drainage hydrograph at the glacier terminus we calculate a temporary lake water storage in the glacial system of ≈1.5 mio. m<sup>3</sup> in 2004 and of ≈0.7 mio. m<sup>3</sup> in 2005, respectively. Temporal evolution of glacier surface uplift and sub- or englacially stored lake water stand in good agreement. Pressure records in boreholes demonstrate a close interaction of water level fluctuations with the lake outburst. The shapes of 2004 and 2005 lake outflow hydrographs differ substantially proposing different drainage mechanisms.