Geophysical Research Abstracts, Vol. 9, 04897, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04897

Climatically-driven variation in the magnitude of jökulhlaups

Felix Ng (1), Shiyin Liu (2), and Bulat Mavlyudov (3)

(1) Department of Geography, University of Sheffield, UK, (2) Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou, China, (3) Institute of Geography, Russian Academy of Sciences, Moscow, Russia (Email: f.ng@shef.ac.uk / Phone: +44 114 2227949)

Jökulhlaups (subglacial outburst floods) today can unleash as much as several cubic kilometres of floodwater, but the problem of predicting their timing and peak discharge is notoriously difficult. We use a 40-year jökulhlaup record from Merzbacher Lake in the Tian Shan to study how environmental factors control the flood magnitude. Recurring floods from this ice-marginal lake have debouched on China's Silk Road roughly every year since the 1950s. By extending Nye's (1976) model of jökulhlaup evolution, we show that the mean air temperature during each flood strongly modulates its peak discharge by influencing the lake's meltwater supply and water temperature. The flood devastation potential thus depends sensitively on weather, and this dependence provides the physical link between regional climate warming and the rising trend of peak magnitudes in our dataset. These results elucidate how a variable and self-regulating sequence of floods can emerge under long-term climate from jökulhlaup physics. They also suggest that, for marginal lakes worldwide, warming trends will promote more catastrophic jökulhlaups by raising the probability of warm weather during their occurrence, unless flood-initiation physics lower initial lake levels at the same time to counterbalance this effect.