Geophysical Research Abstracts
Vol. 14, EGU2012-12656-1, 2012
EGU General Assembly 2012

Past, present & potential future dynamics of recently developed proglacial lakes - examples from the Hohe Tauern Mountain Range (Austria)

M. Geilhausen (1), H. Wiesenegger (2), H. Slupetzky (1), G. Seitlinger (3), and G. Kum (4)

(1) University of Salzburg, Department of Geography and Geology, Salzburg, Austria (martin.geilhausen@sbg.ac.at), (2) Regional government office of the Land Salzburg, Hydrographical Service, Austria, (3) Amt der Salzburger Landesregierung, Referat 7/03 Örtliche Raumplanung, Salzburg, Austria, (4) DWS Hydro-Ökologie GmbH, Vienna, Austria

Glacial retreat, accelerated by climate change, exposes landscapes with relief characteristics greatly differing from the former ice covered surfaces. If retreating glaciers expose natural basins, the topographical conditions meet the development of proglacial lakes. In general, such lakes have great influence on the downstream hydrological and geomorphological system due to discharge modifications, suspended sediment trapping, decoupling effects and long term sediment storage. The development of two proglacial lakes, the 'Unterer Eisbodensee' and the 'Obersulzbach-Gletschersee', both located in the Hohe Tauern Mountain Range in Austria, has been investigated using multi-temporal aerial image and orthophoto interpretation, repeated terrestrial laser scanning, bathymetry, ground penetrating radar and discharge measurements. At the 'Obersulzbach-Gletschersee', suspended sediment concentrations and turbidity have been measured since 2010.

The Obersulzbachkees glacier, situated in the uppermost part of the Obersulzbach valley, has receded in a narrow bedrock basin since the late 1990ies and a shallow lake, named 'Obersulzbach-Gletschersee', was first observed at the glacier snout in 1998. In 2009, the lake had an area of 95,000 m^2 with a shore line of 1,280 m of which 22% consisted of ice. With a maximum depth of 42 m, steep slope gradients of the lake floor to a depth of 30 m, and a volume of more than 2 Mio. m^3, the lake is a significant sediment sink decoupling approx. 18.7 km^2 of the landsystem. The nearly plain lake floor in the central and deeper part is dissected by a distinct ridge showing a typical sediment pattern in GPR profiles. Suspended sediment samples, taken synchronously at the glacier snout (4,284 - 9,320 mg/l, D50: 20 - 44.5 μm) and 600 m downstream the lake (273.8 - 326 mg/l, D50: 6.24 - 6.4 μm), indicate an effective trap efficiency of the lake and a reduced connectivity between glacial sediment production and downstream sediment fluxes.

The formation of the 'Unterer Eisbodensee' started in 1987 at an ice marginal position of the Stubacher Sonnblickkees and first bathymetry surveys, carried out in 1998, yielded a maximum depth of 8.7 m and an area of 7,150 m^2. In June 2006 the lake outlet shifted approx. 200 m towards south within 3 days, due to continuous glacial retreat and the lake level dropped approx. 6 m. In 2010, the lake had an area of 31,000 m^2 with a shore line of 1,362 m, a maximum depth of 20.3 m and a volume of 138,550 m^3. Within one year, the lake increased by 8,000 m^2 due to glacial retreat at its western shore line. Based on GPR surveys covering the lower glacier tongue, a subglacial surface elevation model was interpolated enabling predictions of the future lake development. A maximum potential lake area of 71,730 $\pm$ 800 m^2 and a volume of 497,130 $\pm$ 5,000 m^3 with a maximum depth of 22.3 $\pm$ 0.4 m have been calculated.