Geophysical Research Abstracts
Vol. 14, EGU2012-12696, 2012
EGU General Assembly 2012

Assessment of suspended and solute load in the proglacial Obersulzbach stream (Hohe Tauern, Austria)

M. Geilhausen (1), D. Morche (2), J.-C. Otto (1), and L. Schrott (1)

(1) University of Salzburg, Department of Geography and Geology, Salzburg, Austria (martin.geilhausen@sbg.ac.at), (2) Martin-Luther-University Halle-Wittenberg, Institute of Geosciences and Geography, Halle, Germany

Glacierized catchments are amongst the most dynamic geomorphic systems characterised by large amounts of glacially conditioned sediment, limited vegetation cover, recently exposed unstable surfaces and variable water sources. In addition sediment exhaustion and (re)deposition in both, the gravitational and glacifluvial domain with rapidly changing channel patterns contribute to this dynamic system. The quantification of sediment discharge delivers insights towards the dynamic and (in)stability of a proglacial landsystem. Within an ongoing research project, we investigate paraglacial landform adjustment following glacial retreat since the 'Little Ice Age' in two glacierized catchments in the Austrian Alps. The overall aim of this paper is to quantify the total amount and relative contribution of suspended and solute sediment discharge from the Obersulzbachkees landsystem.

An automated water sampler and a multi-parameter sensor registering turbidity and conductivity were permanently installed at a stable cross section with turbulent flow conditions near the outlet of the catchment during the ablation season in 2010 and 2011. Suspended and solute sediment concentrations were determined by standard gravimetric analysis, ion chromatography and atomic absorption spectrometry. Water level/discharge has been registered since 1989 in a 15 minute interval enabling sediment load calculations using suspended respectively solute sediment concentration vs. discharge rating curves. Since the end of the 1990ies, a proglacial lake (re)developed behind a bedrock barrier directly in front of the glacier (approx. 750 m upstream the monitoring station) having an area of approx. 95,000 m^2. With a maximum depth of 42 m and a volume of more than 2 Mio. m^3 derived from bathymetry surveys, this lake is a significant sink decoupling approx. 18.7 km^2 of the landsystem in terms of coarse sediment (mainly bed load) throughput.

A total of 360 samples were taken at the monitoring station with suspended sediment concentrations ranging from 71.3 mg/l to 702.3 mg/l with mean grain sizes of 66 selected samples between 3 to 9 μm. Twelve samples taken synchronously at the glacier snout (SSC: 4,284 - 9,320 mg/l, D50: 20 - 44.5 μm) and the monitoring station downstream the lake (SSC: 273.8 - 326 mg/l, D50: 6.24 - 6.4 μm) indicate an effective trap efficiency of the proglacial lake and a reduced connectivity between glacial sediment production and downstream sediment fluxes. Solute concentrations of 3.6 to 8.3 mg/l (n = 45) are generally low. Correlations between suspended sediment concentration and turbidity show a level of determination r^2 of 0.85 (0.63 in 2010 and 0.89 in 2011). Preliminary calculations of suspended sediment (SSL) and solute (SL) load during the melt season 2010 yielded diurnal variations of 15 - 7,400 kg/15 min SSL (Ø 550) and 2 -189 kg/15 min SL (Ø 24.3), daily loads of 2.4 - 327 t SSL (Ø approx. 52) and 0.3 - 10 t SL (Ø 2.3) and a sediment discharge of 8,400 t (96 % suspended load, 4 % solute load) of which approx. 80% occurred in June & July. Current work focuses on the improvement of event based and separated rising and falling limb discharge vs. suspended sediment concentration rating curves and the final quantification of suspended and solute sediment discharge for the two years period of investigation.