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Inter- and intra-annual variability of fluvial sediment transport in the proglacial river Riffler Bach (Weißseeferner, Ötztal Alps, Tyrol)

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The hydrology of a proglacial river is strongly affected by glacier melting. Due to glacier retreat the effects of snow melt and rain storms will become more important in future decades. Additionally, the development of periglacial landscapes will play a more important role in the hydrology of proglacial rivers. The importance of paraglacial sediment sources in sediment budgets of glacier forefields is increasing, while the role of glacial erosion is declining.
In two consecutive ablation seasons the fluvial sediment transport of the river Riffler Bach in the Kaunertal (Tyrol/Austria) was quantified. The catchment area of this station is 20 km^2 with an altitudinal range from 1929 m to 3518 m above msl. The "Weißseeferner" glacier (2.34 km^2 in 2012) is the greatest of the remaining glaciers. An automatic water sampler (AWS 2002) and a probe for water level were installed were installed at the outlet of the catchment. In order to calculate annual stage-discharge-relations, discharge (Q) was repeatedly measured with current meters. Concurrent to the discharge measurements bed load was collected using a portable Helley-Smith sampler. Bed load (BL) samples were weighted and sieved in the laboratory to gain annual bed load rating curves and grain size distributions. In 2012, 154 water samples were sampled during 7 periods and subsequently filtered to quantify suspended sediment concentrations (SSC). A Q-SSC-relation was calculated for every period due to the high variability in suspended sediment transport. In addition, the grain size distribution of the filtered material was determined by laser diffraction analysis. In 2013, the same procedure was performed for 232 water samples which were collected during 9 periods.
Meteorological data were logged at the climate station "Weißsee", which is located in the centre of the study area. First results show a high variability of discharge and solid sediment transport both at the inter-annual as well as at the intra-annual timescale. In 2012, a larger amount of sediment was transported compared to 2013. A higher runoff during the snowmelt period 2012 and a heavy rain fall event in late August 2012 were the main reasons. Only 8 of 16 Q-SSC-relations show causal dependency. Thus, indicating that sediment transport strongly depends on the availability of sediment and the coupling of sediment sources to the fluvial system.