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Variability of bedload transport in two Austrian mountain streams

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The Fischbach and the Ruetz are two mountain streams in Western Austria which have a snow- and glacier-melt dominated hydrologic regime resulting in frequent transport activity during the summer half year. Using the Swiss impact plate geophone system, continuous bedload transport measurements were made during the years 2008 to 2013 in these mountain streams. The sites are operated by the Tyrolean water power company (TIWAG) and also discharge data are available. The geophone sensors record the motion of bedload particles transported over a steel plate mounted flush with the channel bed.

This contribution discusses the variability of bedload transport for a given discharge, and the daily and seasonal variabilities observed for similar discharge variations in the two streams. These results are among the first reported for such a long period of continuous observations on bedload transport, since they rely on a surrogate measuring technique that has only recently been installed in a number of gravel-bed streams worldwide. Periods of days to weeks were identified which are associated with approximately constant Shields values that indicate quasi-stable bed conditions. Between these stable periods, the position of the bedload transport function varied while its steepness remained approximately constant. For integration time scales of several hours to one day, the fluctuations in bedload transport decreased and the correlation between bedload transport and water discharge increased. For integration times of about 70 to 100 days bedload transport is determined by discharge or shear stress to within a factor of about two, relative to the six year mean level. Bedload texture increased with increasing mean flow strength and mean transport intensity.