



Investigation of the sediment transport processes using tracer stones in in alpine torrents

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Worldwide, every year numerous people die as a result of extreme weather conditions. Not only in less developed countries, also in Austria are we continuously facing the severe danger resulting from torrents. Therefore, risk prevention, risk analysis and forecast methods thus became more important. Geomorphological processes are often not easy to analyse. It is thus necessary to investigate the availability of sediments in the catchment area, the erosion processes of the sediment and the transport of the sediments along torrents.

A domestic example concerning extreme events constitutes the Schöttlbach in the Upper Styrian town Oberwölz, which turned in the year 2011 into a dangerous torrent after heavy rainfall with up to 140 l/s in 2.5 hours and caused enormous damage, which runs into the millions. Due to this event the project ClimCatch has been started in 2012 in order to investigate the behavior of mountain creeks in the alpine catchment area considering the aspect of the advancing climate change. The main goal of the project is to analyse the geomorphic processes determining sediment transport in the river system and the measurement of bed load output.

Several different methodologies are applied within the project to quantify river sediment dynamics. Discharge and sediment transport measurement equipment as well as hydrological stations are installed in the catchment area. For the observation and measurement of the sediment transport Large- and Small-Helley-Smith-Sampler and colour tracer stones are carried out. The measurements with the Small-Helley-Smith-Sampler determined a daily bed load of 1.5 t at the double mean discharge of about 900 l/s. The colour tracer stones, which are prepared as well characterized in the laboratory and exposed again in the river bed, gave information about the movement behaviour of these stones in case of flood events. Therefore, the position of the tracer stones were checked at regular intervals or after major rainfall in the catchment area. From this data the transport distance, the start of the sediment transport and the retrieval probability could be determined. For instance, in the Krumeggerbach a rainfall event with a peak discharge of 5.36 m³/s revealed a transport distance of 127 m for stones with a weight of 7 kg and 25 m for stones with a weight of 25 kg, respectively. This does not mean that 25 kg stones are only transported at a discharge higher than 5 m³/s. According observations the transport for 25 kg tracer stones starts at around 2.3 m³/s at the Krumeggerbach. This strongly depends on the particle shape and the embedding in the river bed.