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# How stable are mountain torrent beds?

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The stability of mountain torrent bed structures is of high importance for the prognosis of coarse bedload transport rates in mountain torrents, which in turn is essential for defining natural hazard risk areas in alpine catchments. We report on investigations from a 1:1 coarse bedload flume in the laboratory and from the field, taking the example of the Schmiedlaine in the Bavarian Alps. A variety of fluvial structures can be differentiated. On the one hand, there are stable structures such as step-pool systems and ring structures that are created under undamped standing waves and on the other hand, there are meta-stable clusters and mega clusters created under damped standing waves. For the development of clusters and ring structures, floods with so-called random sediment transport paths are a pre-requisite but in contrast mega-clusters and step-pool systems are observed to result from floods with intensive and channel-wide sediment transport. Currently data is missing to improve our understanding on the mechanisms responsible for the switching of thresholds between the different phases of this self-stabilising system. This is mainly caused by a lack of observations of extreme events in nature. Analysis of the formation and destruction of ring structures in the laboratory and in the field has enabled a 2-D model of ring structures to be developed. The boundary conditions are analysed and related to bedload transport. By improving the analysis of the natural conditions necessary for the development of natural river beds, a lot can be learned on the recent development of trained river beds.