Impacts of ring structures during phases of extreme erosion in mountain torrents

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Extreme erosion in a torrential river during flood events causes danger for inhabitants in downstream areas. An example for such an event is the flood on 23/4/99 in Upper Bavaria. To protect people form flood risks, check dams were installed. The potential contribution of natural self protecting mechanisms in gravel bed rivers is largely an open question.
Analysing stable river bed structures like step pool systems and clusters, another stable structure called ring structure was detected in torrential river beds. After elaborating the stability of rings and their local stabilising effects, the focus of work turned to their maximum stability under extreme conditions. Using field data of the Schmiedlaine basin a comparison between two extreme flood events was made for cases with and without ring structures. Concerning critical boundary conditions for erosion of ring structures it can be proved that these structures protect local sections of gravel bed rivers from erosion processes and that it is possible to describe these processes with a 2D Erosion model. Taking into account that ring structures are only one component of self-stabilising systems in mountain torrents the total local effect for river bed protection by sedimentary structures can be enormous.
Therefore next step of work will aim at the combined effects of all self-stabilising features in the river bed to arrive at an assessment of their potential local protection capacity.