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On how sediment supply impacts step-pool bedload transport

A. Recking
IRSTEA, ETNA, St Martin d'Hères, France (alain.recking@cemagref.fr)

Bedload transport in a river reach depends on the competence of the flow to transport the bed sediment in presence. In many streams, the grain size distribution comprises cobble and boulders, and, except for large floods, flows are competent for transporting sand and fine gravels only. When compared to sand bed rivers, these streams can consequently be considered supply limited in reference to these size fractions. But occasionally, sand and gravels stored in the bed can be released when the coarse surface layer is destroyed by a large flood, reactivating the transport activity for a period following this large flood. These successive periods of inactive and active transport are more evident in the upstream end channels, close to the production zones, where the sediment is not supplied from the bed itself (as is the case for lowland rivers), but directly from surrounding watersheds (Lenzi 2001; Lenzi et al. 2004; Turowski et al. 2009).
In these high gradient streams, which are often step-pools, hillslope processes and the flood regime can be intrinsically connected, as was decribed by Molnar et al (2010). But hillsopes are not always active. For instance in highly vegetated watershed, colluvions production can be zero and the associated sediment supply to the channel very limited. In a recent work (Recking et al. 2011) field measurements and hydrological analysis have shown that step-pools stability and geometry can differ significantly, depending if they are connected or not to a sediment source. The work presented here aims to investigate how these effects also impact transport rates in step-pool systems.