Bedrock incision: An analysis of rivers in the Versilia basin (Tuscany, Italy)

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ABSTRACT
Bedrock river incision rate is one of the fundamental parameters to be estimated in order to predict adequately the morphodynamic equilibrium configuration of bedrock streams. There are many ways to cause a river to incise into its own bedrock: wear caused as bedload particles strike bedrock; plucking, by which chunks of fractured bedrock are torqued out of the bed by the flow and broken up; macroabrasion, by which these chunks are further broken up as bedload particles strike them.
A monitoring activity to estimate the bedrock incision rate was started in the Versilia basin (Tuscany, Italy): the mountain stream of the Vezza River was found to offer large part of the bedrock exposed to bed-load abrasion, plucking, and seasonal wetting and drying; the hard and intact rock is usually comminute into plates or equal fragments that are removed by higher flows.
In the study site we chose a reach of uniform bedrock where we observed abrasion, folia or pervasive weathering features.
Following the field activity developed by Stock et al. (2005), we installed a series of cross-section lines with erosion pins to monitor short-term production rates.
The bedrock erosion in the Vezza River is modeled following an empirical approach, based either on the local shear stress or the stream power per unit bed area.