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Bank erosion and channel shift in braided networks

W. Bertoldi, M. Salvaro, M. Tubino

Department of Civil and Environmental Engineering, University of Trento, Via Mesiano 77 - 38100 Trento, Italy (walter.bertoldi@ing.unitn.it / +39-0461-882440)

A braided pattern develops when the stream is laterally unconstrained (as stated by Murray & Paola, 1994) and consequently it is characterized by comparable timescales of the bed and bank evolution. The quantification of bank erosion and of channel shift is therefore relevant in order to describe and predict the planform changes of a network. A laboratory model has been developed in the Hydraulic Laboratory of the University of Trento (Italy) in a wide flume filled with a well sorted quartz sand (d50 = 0.63 mm), with the aim to observe and measure the configuration and evolution of a braided stream at different spatial scales. Here the attention is focussed on the channel shifts, that have been monitored through series of frequent digital images, taken almost vertically. Two possible mechanisms of planimetric evolution have been observed:

- a lateral migration of the active channels, where active means with sediment transport (see Ashmore, 2001) mainly determined by the erosion of the outer bank, the branches displaying a weakly meandering pattern;
- a sudden rearrangement of the network configuration, related with changes in the water distribution at the nodes and with the bifurcations evolution.

We investigated the first mechanism measuring the bank erosion as a function of the water discharge, the stream power and the width of the single anabranches. This analysis allows us to compute a timescale that characterize the network evolution. Moreover, we observed that only few (say one or two) branches were simultaneously active (see also Stojic et al., 1998). This makes sounding the idea to analyse the system evolution referring to the theories developed for single thread, meandering channels (e.g. Zolezzi & Seminara, 2001). In particular we determined the main localization of erosive processes with respect to the point of maximum axis curvature, highlighting an upstream or downstream migration of the whole planimetric pattern.