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Analysis of a morphometric indicator subject to abrupt change in the sediment supply in a braided stream: an experimental study

Daniel Vito Papa and Christophe Ancey
EPFL, Lausanne, Switzerland (danielvito.papazang@epfl.ch)

Braiding is a complex fluvial process in which sediment-laden water flows are split into multiple threads. Thread joining and splitting at the nodes occurs continuously in the floodplain. Understanding how braiding responds to external factors is a key issue. A number of braided-pattern intensity indices have been proposed to characterize the degree of braiding. Due to the inherent complexity of their dynamics braided rivers exhibit a complex morphology that is difficult to study using simple indices.

In this study, we propose a series of experiments to investigate the influence of sediment supply in the evolution of the braiding patterns. To that end, we use a set of morphological indicators, including the index proposed by Redolfi et al. (2016). The experiments are carried out in a 4-m-long and 1-m-wide flume. The bed is made of moderately sorted sand grains whose median diameter is 1 mm. A classic braided pattern configuration composed of various channels, confluences and bifurcations is observed.

The experiments satisfy the Froude similarity criterion. Each run starts from an initial straight channel with rectangular cross section. After a certain time (approximately 40 hours) the system reaches equilibrium. This equilibrium is then perturbed by suddenly increasing the sediment feeding until a new point of equilibrium is reached (this takes approximately 40 hours again). During the whole run, bed elevation and water height are measured optically using laser sheets projected on the bed surface. Cross sections are calculated at 2 cm intervals from each others. The entire morphology is then obtained from these cross sections every hour. Sediment is feeded at the flume inlet and sediment transport rates are measured every 15 minutes at the flume outlet.