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Controls on the width of aggrading and degrading braided rivers: A micro-scale flume experiment

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Feedbacks between river width, sediment transport and morphological change are understood and represented poorly by existing theory, particularly in the case of multithread channel systems. Micro-scale experimental rivers (with flow depths in the order of few millimetres) have become increasingly popular in recent years and provide a means of quantifying these feedbacks. We present preliminary results from the application of micro-scale modelling to investigate changes in the hydraulic geometry and sediment transport capacity of braided channels subject to a series of aggradation and degradation events. Our experimental model is generic and is not scaled to a real world prototype. The laboratory flume tank used is 5 m long and 2.7 m wide, hence we consider situations where channel width is unrestricted by our experimental setup. River morphology was measured using high resolution laser profiling to quantify channel changes (fill, incision and lateral erosion) and section geometry. During all the runs, the evolution of the channel was recorded continuously using a Canon HG10 digital video camera and still imagery was collected at 5 minute intervals using Canon EOS10d digital cameras. All cameras were mounted overhead. The resulting data time series are used to elucidate controls on channel width evolution during aggradation and degradation. Topographic data are analysed to quantify changes in section shape and lateral flow variability that are known to represent a first order control on total sediment transport rate (Ferguson, 2003, Geomorphology, vol 56, 1-14). The purpose of this analysis is to develop simple statistical relationships that can act as width closures in models of braided river long profile evolution under non-equilibrium conditions.