Geophysical Research Abstracts
Vol. 18, EGU2016-3463-1, 2016
EGU General Assembly 2016

Time varying feedbacks and coevolution of alluvial channel morphology, flow distribution and vegetation.

Jose F. Rodriguez (1), Esmaeel Bayat (1), Elham Vahidi (1), Gustavo de Almeida (2), and Sam Gorrick (1)
(1) School of Engineering, University of Newcastle, Callaghan, Australia, (2) University of Southampton, Southampton, UK

Alluvial channel dynamics is the result of the coevolution of channel morphology, flow distribution and vegetation. Even though these processes interact on a variety of time and spatial scales, local detailed analysis can provide valuable insights on mechanisms and feedbacks that can affect the long-term evolution of the system. The three-dimensional, time varying flow distribution can be considered the main driving force, but is affected by the channel geometry as a result of stream curvature, stream width changes and in-stream topographic steering. In-stream vegetation also affects flow distribution in a similar way, either reinforcing or attenuating geometric forcing. But as these systems are the result of coevolution, flow patterns in turn affect sediment transport fluxes, erosion and deposition which eventually modify some aspects of the topography, sediment size distribution and vegetative cover. This contribution presents different studies in which a variety of situations are covered, where the interplay and feedbacks between flow mechanisms are different. We analyse the effects of curvature, width changes and bedform and vegetation steering on sediment transport and sorting and the resulting changes in flow patterns. We study how three-dimensional flow patterns are stage dependent and how that impacts sediment transport and vegetation distribution. We also analyse self-maintenance feedbacks of flow-related features under different time-varying flow conditions. We present cases of straight and meandering reaches, reaches with pools and riffles, and reaches with riparian vegetation within a common framework. We cover both gravel-bed and sand-bed streams.