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Effects of alluvial knickpoint migration on floodplain ecology and geomorphology

Annegret Larsen (1,2) and Jan-Hendrick May (3)

(1) Earth Surface Dynamics, University of Lausanne, Lausanne, Switzerland, (3) Earth and Environmental Sciences, University of Freiburg, Germany, (2) Geography and Environmental Management, University of Queensland, Brisbane, Australia

Alluvial knickpoints are well described as erosional mechanism within discontinuous ephemeral streams in the semi-arid SW USA. However, alluvial knickpoints occur globally in a wide range of settings and of climate zones, including temperate SE Australia, subtropical Africa, and tropical Australia. Much attention has been given in the scientific literature to the trigger mechanisms of alluvial knickpoints, which can be summarized as: i) threshold phenomena, ii) climate variability and iii) land-use change, or to a combination of these factors. Recently, studies have focused on the timescale of alluvial knickpoint retreat, and the processes, mechanisms and feedbacks with ecology, geomorphology and hydrology. In this study, we compile data from a global literature review with a case study on a tropical river system in Australia affected by re-occurring, fast migrating (140 myr-1) alluvial knickpoint. We highlight the importance of potential water table declines due to channel incision following knickpoint migration, which in turn leads to the destabilization of river banks, and a shift in floodplain vegetation and fire incursion. We hypothesize that the observed feedbacks might also help to understand the broader impacts of alluvial knickpoint migration in other regions, and might explain the drastic effects of knickpoint migration on land cover and land-use in semi-arid areas.