Geophysical Research Abstracts
Vol. 16, EGU2014-16629, 2014
EGU General Assembly 2014

Historic human impact on low order mountain streams – what role did the dams play?

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The historic damming of central European rivers is extensive, with the highest density concentrated on low-order streams. Construction of dams started mostly in medieval times ($\sim$ 1200 years ago) and peaked in the early nineteenth century, resulting in shifting dam densities with different ages and types. Early dams were mainly build for energy , but later their primary purpose shifted to floodplain irrigation . This legacy highlights the intense alteration of small streams by humans in a short time period relative to their Holocene evolution. However, our understanding of the impact of such high number of dams on the ecology, river morphology and sediment storage over longer time periods remains very limited. This knowledge gap becomes critical to address as dam removal and river restoration expands under the implementation of the Water Framework Directive, a European-wide legislative framework. In order to explore the possible effects of this framework on small order streams, we examine the changes that have occurred to a fluvial system since the onset of historic dam building. We combine the analysis of historic maps, chrono-stratigraphy and hydraulic modeling to understand the influence of the large number of dams along the low-order streams in two representative mountain catchments of 3rd and 4th order streams (Elsava and Sinn river in the Spessart and Rhön mountains, Germany). The datings and stratigraphical analysis indicate that the rivers were likely influenced by valley bottom damming before hillslope agriculture caused erosion and an increase of sediment delivery to the streams. Future work will examine the hydraulic behavior of the streams with and without dams in order to better understand their role in floodplain development.