



Historic hydro-bio-morphological change (1855-2010) and control factors on an upper alpine valley floor (Guil river, Southern French Alps)

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Much research carried out along mountain rivers has concluded that the general trend of decreasing bedload supply is primarily a result of human action, and only secondarily a response to changes in climate and vegetation. In contrast, we have recently shown that, in the upper reaches of alpine valleys, the shaping of active channels has been mostly dependent upon hydroclimatic variability, at least during the last fifty years. We propose to apply this hypothesis within a broader temporal framework so as to include the Little Ice Age period. The upper Guil river extends in the internal, « schistes lustrés » part of the Alps, and it is characterized by a strong hillslope-channel coupling, and by alternating sequences of fluvial and/or debris-flow. Our analysis rests on several types of data: longitudinal and cross profiles, old topographical maps, and aerial photographs. We took account of active channel width and area, sinuosity and incision index, and engineering structures. We used dendrochronology to improve constraints upon the age of terraces and to help to assess the impact of high magnitude floods on riparian forest development. We assert that, whereas the general trend is dominated by channel incision (tectonic uplift, reforestation), the overall instability of the active channel is mainly controlled by the passage of high-magnitude low-frequency hydroclimatic events (1897, 1957, 2000, 2002). We go on to show that, provided that flood control structures are generally efficient, the last 50-years of land-use changes have reduced the channel capacity of the Guil, and so have increased the vulnerability of human installations to damage.