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# Quantifying long-term sediment dynamics of a proglacial river in an alpine catchment

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Alpine rivers have experienced considerable changes in channel morphology over the last century. The main problem of current studies is the lack of information over a longer period. In order to reliably assess the magnitude of the channel change processes and/or their frequencies due to recent climate change, the investigation period needs to be extended to the last century, ideally back to the end of the Little Ice Age. In addition, a high temporal resolution is required to account for the history of changes in channel morphology and for better detection and interpretation of related processes.

The increasing availability of digitized historical aerial images, together with advances in digital photogrammetry, provides the basis for reconstructing and assessing the long-term evolution of the surface, both in terms of mapping of historic planimetric position and generation of historical digital elevation models (DEMs). We use photogrammetric analysis of recent and historical images, together with LiDAR and drone-based photogrammetric DEMs, to quantify channel changes and the net sediment balance of a main alpine river in a glaciated catchment (Kaunertal, Austria) over nineteen periods from 1953 to 2019. Based on DEMs of difference, we estimate the spatio-temporal patterns of erosion and deposition. We show that geomorphic changes are mainly driven by deglaciation, i.e. glacier retreat, and sediment delivery from recently deglaciated steep lateral moraines, and from extreme runoff events. Overall, this work contributes to better understanding the main factors influencing river changes and the links between channel changes and climatic factors.