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Effects of extreme climate change on the erosion of non glaciated Alpine catchments during a glacial cycle

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The European Alps were largely covered by ice during full glacial conditions of the Pleistocene. Nevertheless, large parts of the southwestern and eastern Alps remained unglaciated or covered only by small valley glaciers during glacials. The impact of a climatic decline of such a dimension on fluvially dominated catchments is not clear so far. Lake infillings may give precise information of the last c. 15 ka but this methods is not appropriate to give information about full glacial times, not to mention of past interglacials. Fluvial terraces may give an idea how massive the impact of a full glacial even in nonglaciated catchments was, but these archives remain fragmentary.

In this study we present new data of the climatic impact on the denudation of two East Alpine catchments between mainly the last interglacial (MIS 5e) and the Holocene (MIS 1). The effects of climate on denudation are based on the sedimentary record of the alpine's largest active pull apart basin. Subsidence rates in the range of c. 0.5 mm/a provide sediment preservation with no or only minor hiatus since the last c. 250 ka. Information on climate is based on several hundred species of mainly terrestrial snails. Age control is provided by OSL and C-14 data. Results show that climate has a first order control on the denudation of the catchments. Strong, very distinct pulses of sediments during periods of glacial maxima coincide with alluvial fan formation. During periods of maximum cold, mechanical erosion reached highest values and sheetflow deposits on the bare fan surface dominate. The calculation of the fan volumes clearly shows the effects of increased denudation during the LGM. With the abrupt increase in temperature, overbank and soil development on fan surfaces dominate. During the height of the interglacials, these fans rapidly became inactive and were incised as soon as climate recovered. Although we cannot estimate erosion rates from the interglacial periods, the record of the fans and the entire basin show a strong decrease in sediment supply and change in sedimentary processes typically for rivers with low bedload.