



Even smaller than now - evidence for long lasting glacier retreat periods in the Alps during the Holocene

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Mountain glaciers are often used as indicators for the variability of climate in the past. Even the actually observable glacier retreat in the European Alps is in conformance with the current climatic evolution. Since Roman times the glacier extent in the Alps had never been as small as today. However, findings of peat and above all remains of trees near or at the actual tongue positions of some glaciers in the Swiss and Austrian Alps provide evidence for similar or even smaller glacier extents in the past. Tree remains were found with lengths up to 9.4 m and diameters up to 0.7 m. In some cases the melting out of such wooden remains could be observed directly. Dendrochronological analyses proved that these ancient trees lived up to some 800 years.

Based on the findings mentioned we established a Holocene record of long lasting glacier retreat periods for the Alps proving glacier extents smaller than today. This record has been mainly established by the dendrochronological analysis of some 130 sub-fossil tree remains found in different glacier forefields. Dating is established on radiocarbon dating and on a recently completed 9k-year long tree-ring chronology, respectively. The results show that most of the material investigated date into the early and middle Holocene. During these time periods Alpine glaciers were usually retreated beyond the current positions. Some of these retreat periods lasted at least up to 900 years. However, evidences for such long lasting glacier retreat periods with smaller glacier extents than today are widely lacking for the last 4000 years.