



1.2. Long-term (1890-2020) quantitative analysis of erosion dynamics and land cover changes of a LIA lateral moraine section using historical terrestrial images and aerial orthophotos

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Abstract: The availability of area-wide aerial photographs in the European Alps only goes back to mid of the 20th century. This limits the quantitative analysis of long-term surface changes in proglacial areas. Thus, a gap exists of about 100 years until the end of the Little Ice Age (LIA). Using digital monopleotting and historical terrestrial images, we show quantitative surface changes of a LIA lateral moraine section back to the second half of the 19th century and hence a total study period of 130 years (1890 to 2020). In our study area in the proglacial area of Gepatschferner, in the Kauner Valley (Tyrol, Austria), glacier melting was completed around 1940. The (initial) gully system expanded nearly continuously over the entire study period up to 2020. By 1953, also the area covered with vegetation expanded (particularly scree communities, alpine grassland, and dwarf shrubs). Due to the renewed destabilisation of the system caused by the increase in temperature and the resulting thawing of the permafrost, these vegetation cover decreased again by 2020. With an investigation period of 130 years, we can contribute to a considerable improvement in the understanding of paraglacial slope adjustment processes by analysing the consequences of the early phase with ice exposure, but then also by showing the renewed destabilisation of the system due to advancing climate change.

