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Multidisciplinary analyses of the detachment zones of periglacial rock fall events in the European Alps

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Numerous rock fall events have taken place in periglacial areas of the European Alps throughout history. This is mainly a consequence of the steep topography of these areas, their geological and geomechanical characteristics, climatic factors such as intense freeze-thaw activity and erosion of steep slopes by glaciers. Such high-mountain rock walls are often characterized by the occurrence of hanging glaciers and firn fields covering extensive parts of the rock wall as well as large-area permafrost occurrence. Changes in surface and sub-surface ice, caused by the present and ongoing atmospheric warming, may have a strong influence on the stability of steep perennially frozen and glacierised rock walls, especially in combination with unfavourable geological and geomechanical conditions. Therefore, the identification and a better understanding of the parameters and mechanisms determining slope stability in steep high-mountain rock walls is a key factor for hazard assessment and needs basic research.

The primary objective of the presented study is the investigation of possible glaciological and geological disposition factors controlling high-mountain wall stability. To this aim, data on past periglacial rock falls in the European Alps are collected and analysed in order to assess the main triggering and controlling factors of such slope instabilities. Therefore, the conditions of the detachment zones of the rock fall events are investigated in a multidisciplinary approach by analysing different factors such as the topography (slope angle, slope curvature, exposition, altitude), geology, geomechanics, permafrost distribution and glaciation (-history) at the detachment zones of each known rock fall event. Based on these analyses, the influence of the different factors and processes on slope failures will be assessed.