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Cold regions geomorphology - towards an integrated approach

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High latitude and high altitude areas, here collectively called “cold regions”, have experienced extreme geomorphological changes in the past and are likely to do so in the future. This is because cold regions are characterized by steeper horizontal and vertical gradients of the atmospheric variables, which ultimately control surface processes in general and cryospheric processes in particular, compared to other regions. Therefore, integrated reconstructions as well as present-day investigations of glacial and periglacial landforms and processes are highly suitable for a more complete understanding the geomorphology of cold regions.

From our research experience, we are convinced that the best results in the study of cold regions geomorphology can only be achieved when all different cryospheric components are combined together in a multi-disciplinary approach. Given the present separation between these sub-fields, this is likely to be best accomplished by an active collaboration between scientists of different disciplines. In this contribution we will present examples from our own work that illustrate how integration of traditionally-disparate approaches employed by the periglacial and glacial communities can be effectively and successfully combined. Examples include current activity in high-Arctic glacier forelands as well as glacier-permafrost interaction in the Alps.

The central hypothesis presented here is that the classic glacial or periglacial studies of the past describe nothing but end-members of a continuum of climatically-controlled processes operating in high-latitude and high-altitude areas. This continuum covers regions that range from entirely glaciated to deglaciated and from continuous permafrost to permafrost-free environments, with many transitional stages in between. Changes in the thermal state lead to reactions in periglacial and glacial processes – both with different reaction times – and modulate the landscape in different but related ways. An integrated approach in palaeo-settings thus needs to consider modern analogues in geomorphology to ensure that such complexities are accounted for in interpretations of palaeo-environments.

The approach we advocate is not new, but from reviewing the literature and our experience as session conveners we believe that it has rarely been exploited to its full potential. We thus view this contribution (and our session) as a renewed effort to bring together people working in the closely-related fields of cold regions geomorphology to share concepts, methods and knowledge across traditional boundaries within this field.