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Will mountain regions dominated by small headwater glaciers experience the same paraglacial response as large valley systems?

Martin P. Kirkbride (1) and Philip Deline (2)

(1) Geography, School of Social Science, University of Dundee, Dundee, Scotland, UK (m.p.kirkbride@dundee.ac.uk), (2) EDYTEM Lab, Université Savoie Mont Blanc, CNRS, Le Bourget du Lac, France (pdeli@univ-smb.fr)

Rapid 20th Century and early 21st Century retreat of cirque glaciers in the western European Alp has revealed extensive forelands across and onto which a variety of thermal, slope and fluvial process operate. These effect a transition from a subglacial to a proglacial landsystem, by reworking sediment and reorganising drainage networks. The landsystem achieves a state of preservation once no more adjustment is possible due to buffering by channel network evolution, channel armouring, vegetation growth, and (rarely) sediment exhaustion. We find that no consistent trajectory of change across all sites. Rather, paraglacial responses in the cirque environment show differences from the classical valley-glacier landscape response model, involving variable slope-channel coupling. Reasons for diverse and site-specific behaviour include inherited landforms of deglaciation (glacier ice core survival and degradation), scale and gradient, and surface materials (bedrock, fine till, and/or blocky till). At some cirques, these are anticipated to restrict the downstream propagation of a paraglacial "signal" of diffusion of fluvial-transported sediment through the catchment. At others, such a signal may be propagated from the headwater basin. However a high proportion of glacial material generally remains within the glacier foreland, due to some combination of (1) formation of proglacial basin sediment traps; (2) inefficiency of disorganised fluvial networks, (3) armouring of cirque floors by coarse melt-out-tills, and (4) locking of streams into rock-controlled channels. These effects appear to be more pronounce for the early 21st century paraglacial landsystems than they were for the post-"Little Ice Age" maximum landsystems of the late 19th Century at the same sites. The long-term preservation potential of most recent primary glacial deposits and within-cirque paraglacial landforms appears to be high. These landform assemblages represent the dramatic termination from the long-term advanced glacier positions of the Little Ice Age.