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# Pronival ramparts, moraines, rockglaciers or slope failures? Distinctions and palaeoclimatic pitfalls of misidentification.

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Pronival ramparts comprise accumulations of debris formed at the downslope edges of permanent or semi-permanent snowbeds. They are therefore likely to be in similar positions with respect to adjacent steep slopes and to have a similar form to other landforms (moraines, slope failures and proto-rockglaciers). To avoid incorrect palaeoclimatic interpretations, therefore, ramparts should not be confused with other possible origins, as is apparent in the research literature. Prior to the 1980s, it had been a tacit assumption that ramparts formed simply by debris falling, sliding and bouncing across a static snowbed surface. This simple concept of how ramparts form gave birth to apparently straightforward diagnostic criteria for distinguishing, in particular, ramparts from moraines. However, this view was based on a combination of imagined rather than observed processes and the characteristics of supposed exemplar fossil ramparts, many of which proved subsequently to have had different origins. Moreover, from the 1980s, when observations of actively-forming ramparts began, a range of alternative processes were reported (e.g. debris flow, solifluction, snow push, snow avalanche). Confusion over origins and nomenclature still echo around the literature, which serves only to prolong misunderstanding of the position, origin, form and scale of this deceptively simple landform. Correct diagnosis is critical to avoid misleading palaeoclimatic interpretation, particularly in areas of marginal glaciation. Furthermore, a clear set of terms and diagnostic criteria to distinguish pronival ramparts from related and unrelated depositional landforms also needs to be established to avoid proliferation of current confusion.