



Modern analogues of moraine formation and implications for palaeo-glacier dynamics

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A number of modern glacial landsystems analogues are identified from glacierized basins in arctic and alpine locations, from which moraine genesis can be inferred and then utilized in palaeoglaciological reconstructions. Potential seasonal signals can be identified in ancient push moraine sequences and can be clearly differentiated from former surging margins where glacetectonic thrust ridges have been constructed in association with other diagnostic landforms. More enigmatic are the wide morainic arcs of predominantly “hummocky terrain”, which have traditionally been interpreted as the products of ice stagnation. Of particular significance is the explanation of linearity in “hummocky” end moraine sequences in a wide variety of settings ranging from cirque basins to the former margins of ice sheets in continental interiors. This has not always been explained by marginal pushing, dumping or glacetectonic disruption but rather as the preservation of former englacial debris concentrations after complete ice melt-out. As such these landforms qualify as “controlled moraines”, where moraine form and pattern is controlled by englacial/supraglacial organization of debris concentrations. Such interpretations have significant implications for palaeoclimatic reconstructions in that glacier dynamics are inferred to be characterized by mass stagnation, even though the development of englacial structure is related to more dynamic behaviour such as englacial thrusting. Similarly, the impact of supraglacial reworking must be negligible in order to preserve moraine form. Only vertically or near vertically inclined debris concentrations may produce significant linear ridges. Assessment of the preservation potential of controlled moraine in the Quaternary landform record is accomplished through the analysis of the process-form relationships of re-

cently deglaciated terrains in Iceland, Svalbard and Ellesmere and Baffin islands in the Canadian arctic, where glacier snouts display clear controlled moraine development and historical moraine systems have evolved from the downwasting ice. It is apparent that englacial structure may be represented in only crude form as low amplitude moraine belts that lack the intricate crenulations of marginal push moraines.