

The impact of local topography on glacial geomorphological records in West Greenland

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The Holocene glacial record of Lyngmarksbræen, an ice cap in West Greenland, has been used to explore the impacts of local topography on landform generation and preservation. It is well-established that glacial response to regional climate drivers may be locally modulated by local-scale topography, but there has been little systematic investigation of its impacts on the geomorphological record. Establishing the relative influence of regional and local-scale drivers on landform development is important as it will allow us to make more robust reconstructions of past ice dynamics.

Detailed geomorphological analysis of seven outlet valleys from Lyngmarksbræen, Disko Island has been undertaken. Satellite imagery and field mapping have been used to explore the topographic variations of neighbouring valleys, and the resulting geomorphological record. Comparisons between valleys are made on the basis of existing morphostratigraphic correlations (Ingólfsson, 1990) and recent surface exposure ages (Lane et al., In prep), which indicate that the majority of the landforms were deposited during the Little Ice Age (LIA).

The valleys draining Lyngmarksbræen vary considerably in terms of geometry, landform characteristics (type, size, location), and ice extent (Holocene to present day). This allows us to explore geomorphological dynamics in contrasting, but geographically proximal, settings. During the LIA, ice extended up to 3 km beyond the present ice margins. In all outlets, glacial landforms are confined to the radial valleys and there is only limited evidence of deposition in the larger trunk valleys. To the north and east of Lyngmarksbræen, large latero-frontal moraines are well-preserved and often impound small proglacial lakes. In the west, the LIA and present day ice margins are more diffuse, and there is evidence of ice-cored moraine, kettle holes, and buried ice. To the south of the ice cap, landform preservation is limited. We discuss the extent to which these variations are conditioned by valley topography, ice-cap wide climate gradients, and glacier behaviour. Our analysis demonstrates that the glacial geomorphological record of individual outlet glaciers is not necessarily representative of ice cap-wide dynamics. This has important implications for our understanding of landform development and preservation within contrasting topographic settings.