



Landscapes Recording Past Ice Dynamics Hidden Beneath the Antarctic Ice Sheet

Stewart Jamieson (1), Chris Stokes (1), Neil Ross (2), David Rippin (3), Robert Bingham (4), Douglas Wilson (5), Martin Margold (1), and Michael Bentley (1)

(1) Durham University, Department of Geography, Durham, DH1 3LE, UK (Stewart.Jamieson@dur.ac.uk), (2) Department of Geography, Newcastle University, Daysh Building, Claremont Road, Newcastle Upon Tyne, NE1 7RU, UK, (3) Environment Department, University of York, Heslington, York, YO10 5DD, UK, (4) Department of Geography, School of Geosciences, University of Edinburgh, Drummond St., Edinburgh, EH8 9XP, UK, (5) Department of Earth Science and Marine Science Institute, University of California Santa Barbara, California, USA

In 1976 David Sugden and Brian John developed a classification for Antarctic landscapes of glacial erosion based upon exposed and eroded coastal topography, providing insight into the past glacial dynamics of the Antarctic Ice Sheets. We aim to extend this classification to cover the continental interior of Antarctica by analysing the geometry of the subglacial landscape using a recently released dataset of bed topography (BEDMAP2). In doing this, the idea is to recognise that not all records of the past fluctuations of Antarctica must come from coastal areas or from exposed landscapes. Instead, we assume that the subglacial landscape of Antarctica records changes in ice-sheet configuration that may have occurred much earlier in its history, perhaps prior to the development of a continental-scale ice sheet, or perhaps during periods of large-scale ice sheet fluctuations.

We use the existing classification as a basis for first developing a low-resolution description of landscape evolution under the ice sheet before using this to build a more detailed classification of patterns of glacial erosion. Our key findings are that a more widespread distribution of ancient, preserved alpine landscapes may survive beneath the Antarctic ice sheets than has been previously recognised. Furthermore, landscapes of selective erosion are suggested to exist further inland than might be expected, and may reflect the presence of thinner, less extensive ice in the past. Much of the selective nature of erosion may be controlled by pre-glacial topography, and especially by the large-scale tectonic structure and fluvial valley network. The hypotheses of landscape evolution presented here can be tested during future surveys of the Antarctic Ice Sheet bed.