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# The response of polar glaciers to Late Holocene climate change reconstructed from terrestrial geomorphological evidence on Svalbard

Sven Lukas (1), Douglas I. Benn (2), Maria Temminghoff (3), Clare M. Boston (1), Tris Irvine-Fynn (4), Philip R. Porter (5), Nick E. Barrand (6), Lindsey I. Nicholson (7), Fionna H. Ross (8), and Ole Humlum (9)

(1) Queen Mary, University of London, Department of Geography, London, United Kingdom (s.lukas@qmul.ac.uk), (2) University Centre in Svalbard (UNIS), P.O. Box 156, Longyearbyen N-9171, Norway, (3) Geographisches Institut, Ruhr-Universität Bochum, 44801 Bochum, Germany , (4) Department of Geography, University of Sheffield, Sheffield S10 2TN, UK, (5) Division of Geography and Environmental Sciences, University of Hertfordshire, Hatfield AL10 9AB, UK, (6) Department of Earth & Atmospheric Sciences, University of Alberta, Edmonton, T6G 2E3. Canada, (7) Center for Climate and Cryosphere, Institut für Geographie, Universität Innsbruck, 6020 Innsbruck, Austria , (8) Aberdeen Asset Management, Edinburgh EH2 2BY, Scotland , (9) Department of Physical Geography, University of Oslo, 0316 Oslo, Norway

Arctic ice masses are likely to experience some of the most dramatic changes in the context of projected atmospheric warming. Understanding how quickly and in what form these changes will manifest themselves is important in order to be able to predict future impacts, through feedback mechanisms, on the climate at different spatial scales, ranging from local to global. In addition to this, it is also important to consider various temporal scales to obtain a longer-term perspective beyond historical and instrumental records.

In order to assess modes of glacier response against this background we present results from four terrestrial glaciers on Svalbard, three of which are located in a semi-arid climate and one in a maritime setting with a humid climate. We have employed a multi-disciplinary approach comprising geomorphological mapping, sedimentological logging and analyses, process observations, differences between digital elevation models constructed for different years and DC resistivity surveys of glacier snouts and forelands to arrive at a holistic process understanding of glacier response to Late Holocene climate change and to tease apart climatic controls on their response.

Our results show that the presence of debris overlying buried ice blocks and continuous glacier ice bodies in a continuous permafrost environment complicates the relationship between climatic warming and glacier response. Processes in foreland evolution are intimately linked to debris thickness and distribution on the one hand and to the evolution and reorganisation of the sub-, en- and proglacial drainage system which controls where material evacuation and thus debris-cover thinning and removal takes place. In our contribution, we will discuss the processes in detail and will develop a conceptual model that will allow the response of arctic glaciers to be placed into a wider framework that incorporates neoglacial and current times.