Geophysical Research Abstracts
Vol. 19, EGU2017-1403, 2017
EGU General Assembly 2017

A millennial-scale record of tidewater glacier advance and retreat, SW Greenland.

Danni Pearce (1), Doug Mair (2), Brice Rea (1), Ed Schofield (1), James Lea (2), Iestyn Barr (3), Nick Kamenos (4), and Kate Schoenrock (5)

(1) University of Aberdeen, School of Geosciences, Aberdeen, U.K. (d.pearce@abdn.ac.uk), (2) University of Liverpool, School of Environmental Sciences, Liverpool, U.K., (3) Queens University Belfast, School of Geography, Archology and Palaeoecology, Elmwood Avenue, U.K., (4) University of Glasgow, School of Geographical and Earth Sciences, Glasgow, U.K., (5) National University of Ireland, Galway, School of Natural Sciences, Galway, Ireland

Tidewater glaciers (TWGs) exert a major control on the short- and long-term mass balance of the Greenland Ice Sheet (GrIS) and have experienced widespread retreat over the last century. However, in many cases inferences on their dynamics, prior to this, are poorly constrained due to a lack of observations and paucity of mapped or mappable deglacial geomorphology. Especially lacking is evidence associated with TWG advance during the Little Ice Age (LIA, AD c. 1300 to 1850). Such data are crucial for numerical model calibration and validation in order to more confidently forward model ice sheet dynamics and projection future sea-level rise. Therefore, empirical data constraints from the palaeo-record, that span such timescales (decadal to millennial), are essential.

Kangiata Nunaata Sermia (KNS) is the most dynamic TWG in SW Greenland, located c. 100 km inland from Nuuk, at the head of Godthabsfjord. KNS has received considerable research attention over the last decade but glacial geomorphological and numerical dating investigations have been limited. However, the adjacent topography and geomorphology presents a unique opportunity to reconstruct the advance and retreat dynamics over the LIA.

We present detailed glacial geomorphological mapping for KNS, which followed a morphostratigraphic approach, using a combination of aerial photos, Landsat, a DEM and field mapping. This identified a three landsystems, which are associated with the LIA, pre-LIA and neoglacial. From the mapping inferences on rapid changes in meltwater routing have been inferred. When KNS reached its LIA maximum (c. 1761), the calving front was c. >22 km further along the fjord than present and a number of ice-dammed lakes were formed. We present new 14C dating from peat underlying lake sediments associated with an ice-dammed lake and buried palaeosols resulting from meltwater re-routing over topographic spillways. The ages support an early and rapid LIA advance phase, with advance rates being comparable with published data from Columbia Glacier during the LIA (Nick et al., 2007, JGR). This centennial to millennial timescale record of TWG dynamics, will provide a dataset for numerical model calibration and validation linking calving glacier dynamics to atmospheric and oceanic forcing.