G L A N A M

Glaciated North Atlantic Margin

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This issue

Jens Karstens in Lofoten during a visit to Torbjörn Dahlgren and Statoil in Harstad

Past Gateways 4th International Conference

Katharina Streuff

Talk (requested), “Submarine Landforms and Glacimarine Sedimentary Processes in Lomfjorden, Svalbard.

Oscar Fransner

Poster, "Morphology and sedimentary processes on the continental shelf edge and slope north of Nordaustlandet, Svalbard"

Anne Flink

Poster, ” Glacial dynamics in Mohnbukta east Spitsbergen inferred from the submarine landform record”

Elena Grimoldi

Talk (requested), “Geophysical investigation of the western North Sea”.

William Smith Meeting 2016 - Glaciated Margins: The Sedimentary & Geophysical Archive

Katharina Streuff

Talk, “The Holocene geomorphological and sedimentary record of Jakobshavn Isbræ, West Greenland” in the session: Arctic and the Northern Hemisphere III (Ice dynamics and retreat signatures).

Lara Pérez

Talk “Large-scale evolution of the central-east Greenland glaciated margin from late Miocene to present” in the session “Arctic and the Northern Hemisphere II (Glaciated margin architecture & processes)”

Kevin Schiele

Poster, “Onshore-offshore correlations on the western margin of the last British-Irish Ice Sheet”

Kasper Weilbach

Poster, "Late Quaternary Ice sheet retreat over the continental shelf offshore of North West Ireland, from the shelf break to Donegal Bay"

Elena Grimoldi

Poster, “Seismic stratigraphy and sedimentary signature of Pleistocene glaciations in the western North Sea”

GLANAM turnout at 2016 conferences

Formation of mega-scale glacial lineations on the Bjørnøyrenna Palaeo-Ice Stream bed: an MSGL-ploughmark continuum?

Identifying processes involved in the generation of landforms on the beds of former ice streams is crucial for understanding how ice streams interact with the underlying substrate, and how this coupling affects ice stream vigour and stability. Empirical record of palaeo-ice stream flow can then aid in the numerical modelling and prediction of future changes in contemporary ice sheets (Patton et al., 2015).

The bed of former Bjørnøyrenna Ice Stream in the SW Barents Sea – considered as the past analogue for modern West Antarctic ice streams – reveals an extensive record of mega-scale glacial lineations (MSGLs). MSGLs are ridge-groove elongated bedforms aligned in the direction of the ice flow, tens of kilometers long and hundreds of meters wide. Despite their widespread distribution on the beds of former and present ice streams, the origin of MSGLs is still unclear (e.g. King et al., 2009; Stokes et al., 2013; Spagnolo et al., 2016). Within a large assemblage of ~900 MSGLs in central Bjørnøyrenna, a MSGL - ploughmark bedform continuum has been documented, which is the conclusive support for the groove-ploughing theory of MSGLs formation (Fig.1). This theory states that MSGLs are formed by keels of ice, that plough the underlying substrate producing a carved surface, as the ice stream moves over weak till (Clark et al., 2003). Based on the evidence it has been inferred that these keels may continue ploughing the seafloor once they have calved from the ice margin (Fig. 1 a-d). Not all MSGLs continue into ploughmarks, which suggests that ploughing is not the only mechanism of MSGLs formation, and/or that the complete MSGL - ploughmark bedform continuum is not always preserved.

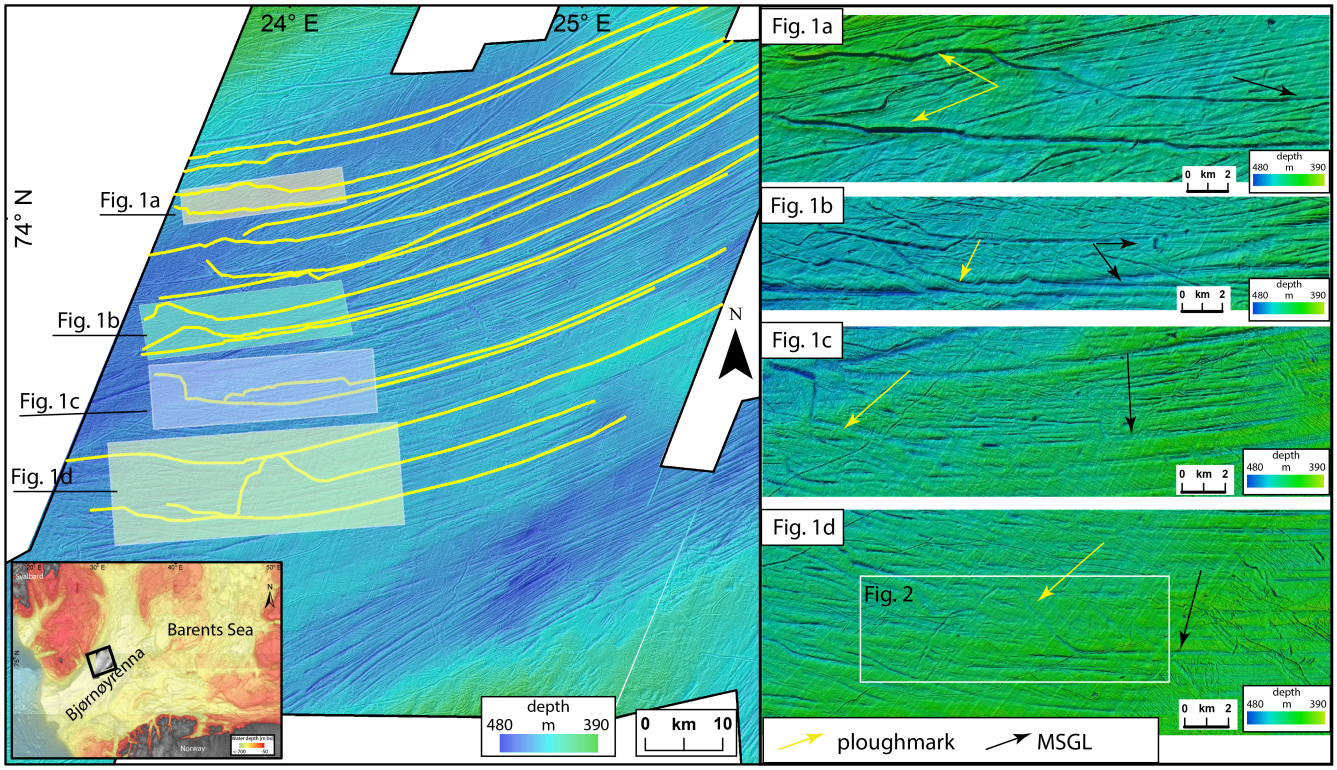

Fig. 1. The bed of Bjørnøyrenna Palaeo-Ice Stream shows the first record of MSGLs transitioning into iceberg ploughmarks, which supports the concept of MSGLs formation by ploughing of ice keels at the base of the ice stream and provides the evidence of ploughmarks being the last member of subglacial bedform continuum.

The examples of MSGLs transitioning into ploughmarks presented here are consistent with the assumptions of the groove-ploughing theory, two of which provide stronger support for the theory: 1) the parallel grooves abruptly shift direction at the inferred ice grounding line and continue downstream in a sinuous manner and 2) the grooves become shallower downstream, which implies melting of the keel through strain heating as it ploughs the sediments (Fig. 2). Groove-ploughing may therefore be one of the mechanisms of MSGLs formation and iceberg ploughmarks could in certain settings be considered as the last member of the bedform continuum concept (ribbed moraine-drumlin-MSGL) of Cofaigh and Stokes (2008).

Emilia Piasecka

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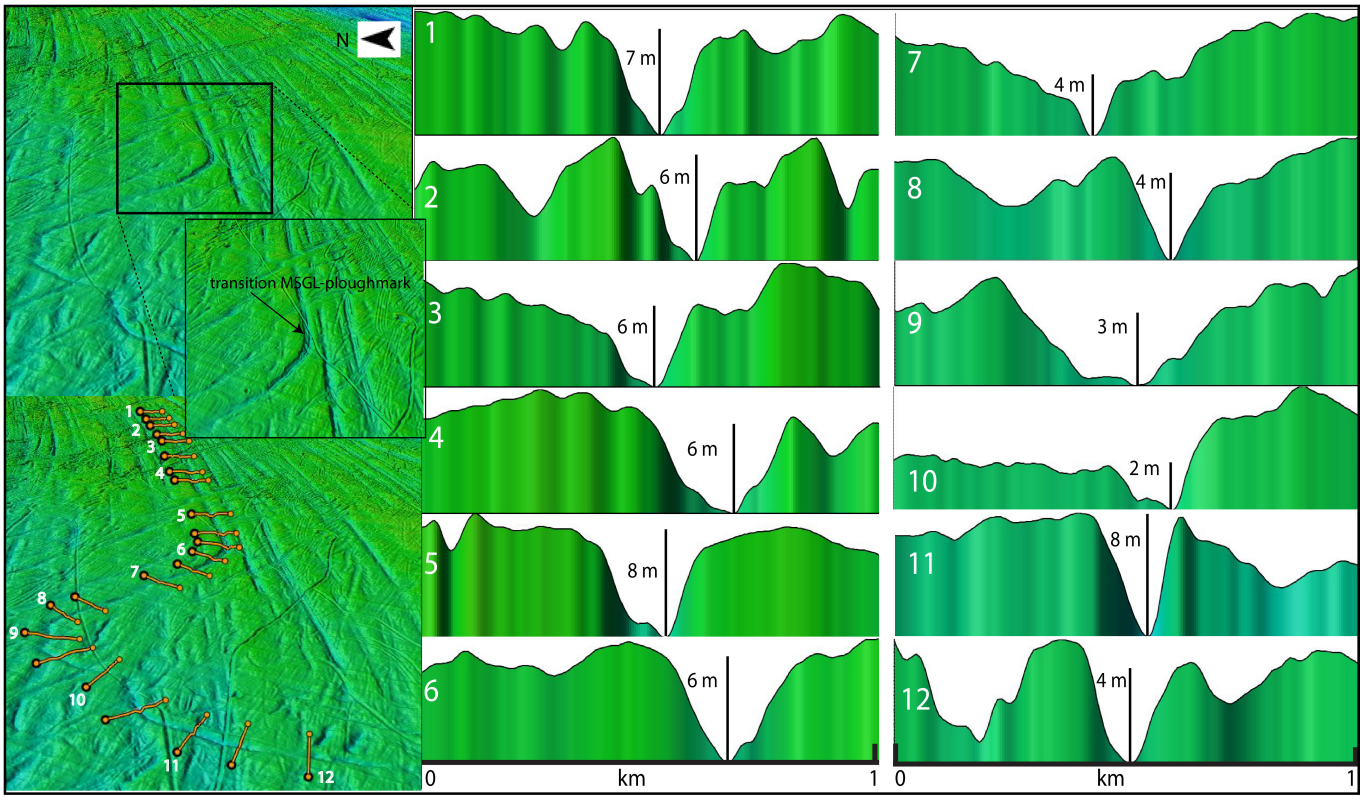

Fig. 2. Example of an MSGL transitioning into a ploughmark (left). Profiles 1-12 (orange lines) show cross-sections along the ridge-groove bedform. The groove is deeper (~7m) in the distal part of the ice stream, which indicates to longer keels at the base, shallower towards the downstream part – due to melting of the keels through strain heating as they plough the sediments and deepens again at the transition point – as the iceberg calves. Note the lack of ice marginal sediment accumulations, which suggest that calving occurred at the grounded ice stream front.

Introducing Jens Karstens

Hello, my name is Jens and I joined GLANAM in September 2015, taking up my first Postdoc position. I completed my PhD studies focusing on the geophysical analysis of fluid flow in marine sediment at the Geomar Centre in Kiel last June. I am now located in Bergen and my research deals with the impact of glaciation on marine gas hydrate systems in the Nyegga (mid-Norwegian margin) and Bjørnoyrenna (Barents Sea) areas. Gas hydrates are ice-like solids which forms under low temperature and high pressure conditions in the marine environment. Gas hydrates are sensitive to climatic changes, and their instability can cause sea-level and bottom water temperature fluctuations, as well as the erosion or deposition of sediments.

In the Nyegga area I investigate the impact of increased sedimentation, associated with the decay of the Fennoscandian ice sheet after the LGM, on gas hydrate dissociation. In order to do so I create numerical gas hydrate stability simulations. These simulations are constrained by a high-resolution three-dimensional sedimentation rate reconstruction, which I compiled by integrating chrono-stratigraphic information derived from sediments cores into a seismo-stratigraphic framework (Fig. 2). This analysis aims to explain the timing and location of focused methane discharge of the Nyegga pockmark field. For this study, I mainly work together with Haflidi Haflidason, Lukas Becker and Sverre Planke.

In the Barents Sea, I try to constrain the thermal properties and erosion history of three exploration wells by reconstructing measured temperature profiles. The results will then be integrated in a sub-surface temperature reconstruction for the last 50,000 years, which will be the base of a gas hydrate stability field reconstruction during and after ice-stream activity in Bjørnoyrenna. My main GLANAM collaborators for this study are Torbjörn Dahlgren and Haflidi Haflidason.

I enjoy my work and life in Norway and look forward to meet you all at the GLANAM meeting in June.

Jens Karstens

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