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Glacimarine sedimentation in Petermann Fjord and Nares Strait, NW Greenland

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Here we build on preliminary results from 6500 line-km of high-resolution chirp sub-bottom profiles (2-7 kHz) acquired in Petermann Fjord and Nares Strait during the Petermann 2015 Expedition of the Swedish icebreaker Oden. We map the unlithified sediment cover in Peterman Fjord, which consists of up to 3 conformable “drape” units and calculate volumes of this assumed “post-glacial” fill. In Nares Strait we have mapped sediment volumes in local basins just beyond the sill at the Petermann Fjord-mouth: do these sediments represent material flushed out from the grounding zone of Petermann Glacier when it was grounded at the sill? In this vein, and interestingly, some of the thickest sediments that we observe are found close to a grounding-zone wedge (GZW) in Nares Strait that represents a former grounding zone of ice retreating southwards through the strait. We also map conformable units across Nares Strait and consider the similarities between these and the sediment units in the fjord. Do the strong reflections between the units represent the same climatic, oceanographic or process-shift both inside and outside the fjord?

We also aim to tie our new acoustic stratigraphy to sediment-core data (lithofacies, dates) and, therefore, to comment on the age of the mapped sediment units and present ideas on the glacimarine flux of material to the Petermann-Nares system. Primary sediment delivery to the seafloor in this environment is thought to be predominantly through sedimentation from meltwater plumes but also of iceberg-rafted debris (IRD). However, sediment redeposition by slope failures on a variety of scales also occurs and has focussed sediments into discrete basins where the seafloor is rugged. This work – which aims to relate past sediment, meltwater and iceberg fluxes to changes in climate - will help us to identify how the system has responded to a past global warming event, namely the last deglaciation. This is particularly relevant in light of the recent thinning and acceleration of NW Greenland’s marine-terminating outlet glaciers.