

## **Holocene Activity of the Petermann Glacial System**

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Large calving events of the Petermann Ice Tongue, Northwest Greenland, in 2010 and 2012 seem unprecedented in the context of the limited historic record, dating back to the 1875-1876 British Arctic Expedition led by Sir Nares, and more recent satellite observations of the last two decades. Modern studies demonstrate that this marine terminating sector of the Greenland Ice Sheet is especially sensitive to oceanic forcing, but paleo data are required to provide a more holistic context of these changes. We present a suite of analyses on sediment cores collected during the international and interdisciplinary 2015 expedition to Nares Strait and Petermann Fjord onboard the Swedish Icebreaker Oden, documenting new perspectives of the early Holocene deglaciation of Nares Strait and a new high resolution record of mid to late Holocene dynamics of the Petermann glacial system. CT scans allow for clear identification of a number of glaciomarine depositional environments and for high resolution quantification of >2 mm clasts. The distinct local carbonate bedrock surrounding Petermann Fjord and crystalline basement rocks excavated by the inland Greenland Ice Sheet are tracked using Q-mode factor analysis of scanning XRF data, displaying strong gradients in sediment composition between the Ca-rich sediments proximal to tidewater glaciers of the local ice cap and sediments proximal to the grounding-line of Petermann Glacier. Paleomagnetic measurements isolate a strong and stable characteristic magnetization, which show remarkable similarity to Paleosecular Variation (PSV) recorded in nearby mid to late Holocene varved lakes on Ellesmere Island. Together, this non-destructive dataset provides robust correlations, indicating a coherent and dynamic record of changes in the Petermann glacial system during the late Holocene, including evidence for at least two significant grounding-line retreats followed by the late Holocene growth and relative paleo-extent of the modern Petermann Ice Shelf observed by Sir Nares.