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Extensive ice stream activity on the North-East Greenland Continental Shelf

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Even though approximately 20% of the modern day Greenland ice sheet is drained via the North-East Greenland Continental Shelf (NEGCS), its submarine geomorphology is only poorly resolved. Acting as the main export region for Arctic sea-ice transported southward by the cold East Greenland Current, the NEGCS shows year-round harsh ice conditions that limit the accessibility for research vessels to conduct swath bathymetric surveys. While studies based on radiocarbon dating were arguing if the ice sheet reached on the shelf during full-glacial periods, two studies using high-resolution swath bathymetric data from single cruise tracks showed submarine glacial seafloor features, including mega-scale glacial lineations and retreat moraines that gave direct marine evidence of past ice stream activity at least to the middle shelf in Westwind Trough.

We have newly processed swath bathymetry and sub-bottom profiler data of 18 cruises of RV Polarstern from 1985 until 2014. This data was investigated for submarine glacial seafloor features to better constrain the past ice sheet configuration, including its maximum extent and retreat history. Amongst others, we have now first marine evidence for ice stream activity in Norske Trough and in general a more intense ice streaming activity on the shelf. In addition, our data indicates that possibly a small separate ice sheet was present offshore the modern day Greenland coast.