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Results from new marine shallow seismic and core data acquired during the NorthGreen2017 expedition in the Young Sound fjord system, NE Greenland

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The Young Sound fjord system in NE Greenland generally consists of two sub-regions: the outer region is wider (up to 7 km wide) and relatively shallower (<200 m), whereas the inner fjord is narrower (ca. 2 km wide) and deeper (300-400 m water-depth). The inner part is also known as the Young Sound Deep (YSD). The fjord system has been extensively surveyed for marine, terrestrial and meteorological data since 1994 (Bendtsen 2014 et al.), and while there is unpublished bathymetric data of the underlying seafloor, the subsurface sediments have to our knowledge only been mapped superficially. In this study, we present preliminary results from seismic mapping and sediment coring in the Young Sound fjord system. The dataset consists of 400 km of shallow seismic sub-bottom profiles and four sediment cores acquired during the NorthGreen2017 expedition in September 2017 and represent the first detailed marine seismic study of the geological development of the fjord system.

Our results from the seismic interpretations show a clear distinction in seafloor morphology and subsurface geology from the YSD towards the outer part of the fjord.
In the central parts of the YSD we have mapped a thick sediment package (of ca. 40-50 m) which consists of parallel to subparallel high-amplitude continuous reflections interlayered with thinner units of more chaotic and discontinuous reflection patterns. Furthermore, at least five generations of larger submarine landslides (mass transport complexes, MTCs) and several smaller MTCs have been mapped. The MTCs represent periods of preserved rapid localized sedimentation, and the large MTCs are typically 300-450 m wide and 1-4 m in height with the deepest (and oldest) MTCs being the largest. Near the edges of the fjord, the seismic data consists of very low amplitude to transparent reflections, which we interpret to result from submarine rock-falls, which scatter the seismic energy and hinder imaging of the sediments below the rocks.
In the outer part of Young Sound, we have also mapped a number of smaller MTCs which appear to be more abundant near the transition to YSD.

The sediment cores have been CT-scanned, analyzed for lithology and sedimentology, XRF-scanned for trace elements, and sampled for 14C dating and foraminiferal analyses. By combining the sub-bottom profiler data with the core data we are able to make a more detailed description of the subsurface, which in turn can tell us something about the late Quaternary and Holocene geological development of the fjord, including variations in sedimentation rate, erosion, freshwater fluxes and changing ice cover.

Reference

Bendtsen, Jørgen, John Mortensen, and Søren Rysgaard. "Seasonal surface layer dynamics and sensitivity to runoff in a high Arctic fjord (Young Sound/Tyrolerfjord, 74 N)." Journal of Geophysical Research: Oceans 119.9 (2014): 6461-6478.