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Late Quaternary development of the Storfjorden and Kveithola Trough Mouth Fans, northwestern Barents Sea

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The development of two Arctic Trough Mouth Fans (TMFs), the Storfjorden and Kveithola TMFs, is investigated by means of sub-bottom and seismic reflection profiles, multibeam bathymetry and sediment samples allowing their detailed stratigraphic architecture to be defined. We find that the TMFs mainly consist of an alternation of rapidly deposited glacigenic debris flows during glacial maxima and a sequence of well-layered plumites and hemipelagic sediments, which were mainly deposited during the deglaciation phase of the adjacent glacial trough. We have identified eight units above regional reflector R1, which indicate that the ice sheet reached the shelf edge within the Storfjorden Trough on at least three occasions during the last ∼200 ka. A shallow subsurface unit of glacigenic debris flows suggests that the ice sheet had a short re-advance over the northern and central part of Storfjorden after the Last Glacial Maximum. From stratigraphy, core and literature data, we estimate that ice sheets reached the shelf edge between 19.5 to 22.5 ka, 61 to 65 ka and 135 to 167 ka. Detailed seismic imaging allows us to refine the sedimentary model of Arctic TMFs. The main differences to previous models involve gully formation during not only the deglaciation phase, but also during interglacials by dense shelf water cascading, and a specific timing for the occurrence of slope failures (i.e. shortly after the deglaciation phase). High mean sedimentation rates during glacial maxima of up to 18 kg m-2 yr-1 likely allow excess pore pressure to develop in the water rich plumites and hemipelagic sediments deposited in the previous deglacial period, particularly where such plumites attain a significant thickness. The position of the submarine landslides in the stratigraphic record suggest that such excess pore pressure is not enough to trigger the slope failures and suggests that earthquakes related to isostatic rebound are likely involved in the final activation.