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Bathymetry and seismic stratigraphy of East Greenland fjords and sounds

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Swath bathymetry and high-resolution penetration echo sounder (chirp) data from fjords and sounds between Kong Oscars Fjord (∼72°30') and Bredefjord (∼75°30'), East Greenland, reveal a variety of sedimentary processes related to glacial activity and mass wasting, as well as evidence of tectonic activity.
The large-scale bathymetry of most fjords and sounds is characterized by sills that occasionally are shallower than 30 m, and basins reaching maximum water depths of more than 760 m. Multiple "steps", some more than 250 meters high and with gradients exceeding 60° (e.g. in Bredefjord) are most probably related to vertical movements along tectonic lineaments. The basin floors are typically smooth suggesting sedimentation predominantly from suspension settling. However, an approx. 100 m wide and 5 m deep channel in Kempefjord provides evidence of gravity-flow erosion sub-parallel to the fjord axis. Multiple sediment lobes along the fjord sides reflect repeated mass wasting.
Relatively straight linear features oriented parallel to the fjord axes are interpreted to be glacial lineations that were formed beneath fast-flowing ice draining the Greenland Ice Sheet. They occur rarely on shallower plateaus and are often overlain by transverse ridges. In Youngsund, such ridges are typically 1-2 m high, 50 m wide and the distances between crests are most often approx. 100 m. The ridges are most probably 'retreat moraines' that were deposited during minor halts and/or re-advances during the last deglaciation. More curvilinear and randomly oriented furrows with raised rims are most probably iceberg ploughmarks that were formed from grounded icebergs calving off the Greenland Ice Sheet during the last deglaciation (e.g. in Rudis Bugt).
Elongated to round, randomly distributed depressions of up to >10 m depth and >200 m width occur, e.g. in the inner parts of Tyrolerfjord. They are often filled with acoustically stratified sediments and we assume that they might have resulted from post-glacial tectonic activity.
Up to 180 ms two-way travel time thick acoustically stratified sequences dominate the fjord-fill and sound-fill stratigraphies. These deposits are suggested to reflect repeatedly changing physical conditions in a glacimarine environment where deposition occurred from suspension fall-out, ice rafting from icebergs and sea ice, as well as smaller-scale mass wasting. An acoustically transparent drape overlies these deposits rarely (e.g. in Rudis Bugt). Multiple acoustically transparent bodies with irregular geometries intercalated within the stratified deposits are suggested to reflect repeated larger-scale mass wasting, either from slope failures along fjord sides or related to glacier advances (e.g. in Nordfjord). Occasional distortions and blanking of reflections (e.g. in Nordfjord and Kong Oscar Fjord) might be related to relatively recent tectonic activity and fluid flow/gas expansion.