



Sedimentary and crustal structure from the Ellesmere Island and Greenland continental shelves onto the Lomonosov Ridge, Arctic Ocean

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Two wide-angle refraction/reflection lines were acquired jointly by the geological surveys of Denmark and Greenland (GEUS) and Canada (GCS) on the sea ice north of Ellesmere Island and Greenland. The aim was to investigate the junction of the Lomonosov Ridge with the polar margin, crossing from the continental shelf over a bathymetric trough out onto the Lomonosov Ridge. A 14 km deep sedimentary basin consisting of two layers interpreted to be part of the Arctic Continental Terrace Wedge and under these a 9 km thick layer interpreted to be continuation offshore of the Mesozoic to Paleozoic Sverdrup Basin sequence were found. Underneath the basin a layer with velocities consistent with metasedimentary rocks from the lower Paleozoic Franklinian Basin was modeled. The sedimentary basin and underlying metasedimentary rocks continue from the shelf out onto the Lomonosov Ridge. The underlying crust has velocities consistent with continental crust. On the shallow section of the Lomonosov Ridge, a basement high approaches the seafloor, creating the 220 km broad foot of the Ridge. Consistent with the wide-angle results, two short seismic reflection profiles in the vicinity penetrated only a thin veneer of sediments overlying basement. Furthermore, a pattern of radiating linear magnetic anomalies emanating from a circular high is coincident with the shallow basement. Onshore magnetic anomalies near north-western Ellesmere Island are reminiscent in pattern and amplitude to the anomaly on the southern end of the Ridge suggesting a similar source. In addition, the velocity structure is similar to that on the foot of the Ridge. Onshore, the anomalies are produced by the Hansen Point volcanic rocks. The proposed volcanic structure on the foot of the Ridge is by analogy to the Hansen Point volcanics and by its position in the velocity model is assumed to be intruded through continental crust, possibly as part of a failed rift zone preceding opening of the Eurasia Basin. The depth to the Moho is around 23 km on the shelf, shallowing to 17 km below the bathymetric trough between the shelf and the Lomonosov Ridge. The Moho under the trough is relatively flat and deepens northwards to 27 km beneath the foot of the Ridge. The continuation of the sedimentary, metasedimentary and crustal layers from the continental margin beneath the bathymetric trough and onto the Lomonosov Ridge suggests that the Ridge is attached to the continental margin. Therefore, plate reconstructions that require the Lomonosov Ridge to be attached to the North American and Greenland plates are consistent with our data.

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