Geophysical Research Abstracts
Vol. 16, EGU2014-2879, 2014
EGU General Assembly 2014

The East Greenland Ridge – a continental sliver along the Greenland Fracture Zone

Joanna Gerlings (1), Thomas Funck (2), Carlos F. Castro (3), and John R. Hopper (4)

(1) GEUS, Geophysics, Copenhagen K, Denmark (jge@geus.dk), (2) GEUS, Geophysics, Copenhagen K, Denmark (tf@geus.dk), (3) GEUS, Geophysics, Copenhagen K, Denmark, (4) GEUS, Geophysics, Copenhagen K, Denmark (jrh@geus.dk)

The East Greenland Ridge (EGR), situated along the Greenland Fracture Zone in the northern part of the Greenland-Norwegian Sea, is a NW-SE trending 250-km-long and up to 50-km-wide bathymetric high that separates the Greenland Basin in the south from the Boreas Basin in the north. Previous seismic work established that the EGR is primarily continental in nature. Detailed swath bathymetric data revealed a complex internal structure of the ridge with two main overstepping ridge segments. These segments were not adequately covered by the GEUS2002NEG seismic survey as the detailed structure was not known at that time. The crustal affinity of the northwestern, landward-most ridge segment, and how it is attached to the Northeast Greenland continental shelf, remained unclear. The GEUS-EAGER2011 survey was designed to address these issues and to provide further constraints on the structural development of the EGR.

During the GEUS-EAGER2011 survey, additional seismic refraction and reflection data were acquired on the EGR and the Northeast Greenland shelf. The data set consists of two strike lines covering the seaward-most part of the Northeast Greenland shelf and the landward-most part of the EGR, and one cross line extending from the Boreas Basin, across the ridge and into the Greenland Basin. A total of 15 ocean bottom seismometers and 46 sonobuoys were deployed along the three seismic refraction lines. P-wave velocity models for the crust and upper mantle were derived by forward and inverse modelling of the travel times of the observed seismic phases using the raytracing algorithm RAYINVR. Seismic reflection data, coinciding with the seismic refraction data were used to guide the modelling of the sedimentary layers down to basement. The velocity models confirm that the crust has a continental nature along both ridge segments with a velocity structure that significantly differs from that of normal oceanic crust. The models also show that the crust of the EGR is linked to the continental crust of the Northeast Greenland shelf. Velocities of $\sim$7.3 km/s below the 2 to 5-km-thick crust of the northwestern ridge segment indicate that the mantle is partially serpentinized. The results furthermore display a slight difference in thickness and velocity between the two ridge segments. The southern-most part of the Boreas Basin is characterized by a 1-km-thick basement layer with velocities between 6.2 and 6.4 km/s. The velocities could either be interpreted as highly extended continental crust or partially serpentinized mantle. Velocities of 7.3 km/s below this layer indicate that the mantle here is also partially serpentinized. Crustal velocities in the Greenland Basin are compatible with oceanic crust. This is in agreement with the clear magnetic anomalies that are observed in this basin. The crustal structures derived from the seismic refraction and reflection data together with the bathymetric data indicate stretching and transtension of the EGR crust.