

Morphology of the Knipovich Ridge Area

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Knipovich Ridge is the northernmost part of the Mid-Atlantic Ridge system. It is located between Mohns and Molloy spreading centers in the Greenland Sea. The scientific team of the R/V "Akademik Nikolaj Strakhov" (Geological Institute RAS, Russia) surveyed this area in 2006, 2007, 2009 and 2010 using the deep-water multibeam echosounder RESON Seabat 7150 with working frequency 12 kHz. The total surveyed area is up to 82000 km² including 65000 km² covering rift valley and flanges of the ridge.

Knipovich ridge is classified as an ultra-slow oblique spreading center with spreading rate around 1,4 cm/y. Its large-scale morphological features are reduced in number comparing to other mid-ocean ridges. Eastern flange is buried under the continental slope sediments and only the rare highest peaks rise above this cover. Western flange is fully developed and consists of several ridges prolonged parallel to the rift valley. Ridges are supplemented with individual highs. Rift valley is 20-40 km wide and 500 km long. Its depth is 3300-3700 m. Valley slopes have terraces and ledges of different amplitudes. The bottom of the valley is echeloned by 5 volcanic axial highs rising 400 - 1000 m above it.

Spreading obliquity is imprinted in the ridge morphology. The global models predict a plate motion vector of 307°. The main ridge axis has general orientation of 350°. Rift valley follows this direction from the South, and on the half way to the North turns to azimuth of 2°. The detailed bathymetry shows that small-scale features orientation differs from that of the large-scale. Rift axial highs and individual flange highs are prolonged NW-SE under azimuth 30°. This orientation is sub-perpendicular to the plate motion vector (83°) and oblique to the ridge axes (40°). The multibeam bathymetry shows no sign of transform faults or non-transform discontinuities along the Knipovich ridge rift valley. There is one strong lineation in the northern part of the ridge. It includes flange and axial highs and continues from the eastern flange through the second northern axial high to the western flange under the azimuth of 320°. It is an indication of long-term magmatic activity in this segment.

Detailed bathymetry reveals small-scale features that are important for the understanding of the ridge nature.