

Plate motions at the transition from the Lomonosov Ridge to Eurasian Continental Shelf

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Distribution of the Cenozoic plate motions in the Amerasian Basin is a serious problem. Cenozoic opening of the Gakkel Ridge has resulted in the eastward drift of the Lomonosov Ridge and Podvodnikov Basin. According to a popular point of view these two structures are separated from the Eurasian continent by the Khatanga-Lomonosov Transform Fault. It is supposed that this fault with a right-lateral displacement of about 300 km begins at the southern end of the Gakkel Ridge, passes between the southern end of the Lomonosov Ridge and the Asian Shelf probably continuing further to the east into the Podvodnikov Basin.

During the last decade the area was covered by a number of seismic profiles. In 2007 reference profile A-7 was shot (Kazanin, Ivanov, UNCLOS Symposium, St.-Petersburg, May 26, 27 2014). This longitudinal profile 832 km long includes both seismic reflection and deep seismic profiling. It follows the eastern slope of the Lomonosov Ridge in the north and crosses the Asian Continental Rise and shelf of the Laptev Sea terminating near the Novosibirsk Islands in the south. The quality of the data is very high because at that time the area was completely free of ice.

Transform faults with large strike-slip displacement are crossing many sedimentary basins (Liemiszki, Brown, GSA Bull., 1988, v. 100, p. 665-676 and others). In such basins the structure of the sedimentary cover changes completely across the fault. Not only sedimentary beds become disrupted but the thicknesses of synchronous sedimentary units on the fault walls commonly appear to be quite different. This indicates that during their movement the units were far one from another.

The Khatanga-Lomonosov Transform Fault, if it exists, should cross profile A-7 in its middle part. The profile includes some normal faults slightly disrupting the sedimentary sequences. However, on both fault walls the thickness of the main units of the sedimentary cover separated by regional unconformities remains the same. This precludes significant strike-slip displacements along the faults during the Cenozoic.

In 2014 near to profile A-7 the seismic reflection profile A-25 was shot which shows the structure of the sedimentary cover down to the Cretaceous basement. In its northern part this profile should also cross the supposed Khatanga-Lomonosov Transform Fault. Actually, all the Cenozoic sedimentary beds are continuous there.

Numerous earthquakes occur in the western part of the Laptev Sea shelf on the continuation of the seismic belt of the Gakkel Ridge to the south. In contrast, the region between the Lomonosov Ridge and the eastern Laptev Shelf is completely aseismic. This indicates that both structures are located on the same lithospheric plate. The boundary separating it from the Eurasian Plate on the Gakkel Ridge continues into the western Laptev Shelf and then into the Moma Rift Zone farther to the south-east.

A large transform fault is sometimes supposed to exist in the Podvodnikov Basin to the east of the Lomonosov Ridge. Several seismic reflection profiles were recently shot in this region. All they show a continuity of Cenozoic beds in the basin.