RECENT GEODYNAMICS OF THE KURIL SUBDUCTION ZONE

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The Kuril-Kamchatka subduction zone is one of the most seismically active regions in the northeast of Eurasia, where the rate of motion of the Pacific lithospheric plate under the North American (Okhotsk) plate reaches 8 cm/yr. The interaction of the lithospheric plates is accompanied by tectonic deformations which occur both at the border of the plates and in their surroundings. The deepest major tsunami-generating (amplitude more than 8) and deep (more than 600 km) earthquakes occur in the subduction zone.

In 2006 the geodynamic GNSS monitoring network was developed on the Kuril Islands (Prytkov et al., 2017). Today the network consists of 11 stations for continuous and regular recording, covering the island arc quite evenly. Fig. 1 shows the rates of the geodynamic network stations in relation to the North American plate. In the central part of the island arc, post-seismic shifts of the Earth's surface have been observed since the double Simushir earthquakes in 2006 Mw = 8.3 and in 2007 Mw = 8.1. They are oriented towards the deepwater trench. The fading transient process caused by viscoelastic stress relaxation in the asthenosphere and the upper mantle (Kogan et al., 2013) has continued for the past ten years.

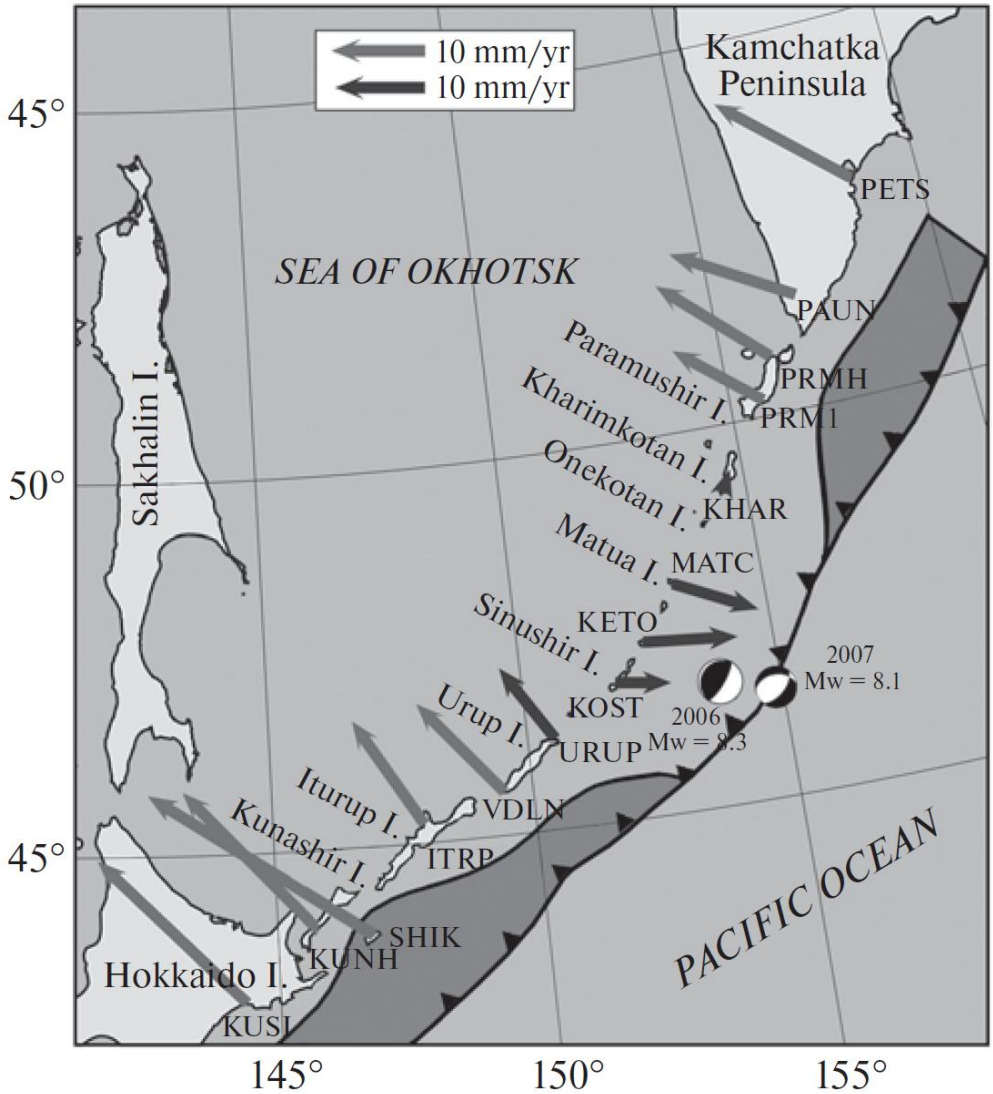

Fig. 1. GPS/GLONASS rates of stations of the Kuril geodynamic network and neighbouring districts. Light arrows show interseismic rates of stations of the Kuril geodynamic network for the period of 2007-2015. Dark arrows show station movements between June, 2014 and June, 2015. The rootmean-square errors of rate determinations do not exceed 2 mm. The solution of the geometry of lithosphere plate coupling is provided in the form of the width of the inclined contact zone approximated by the spline function. In the central part of the island arc the mechanisms of the sources of the Simushir earthquakes are shown.

The stations of the south and north of the Kuril Network for 2007-2015 have the northwestern direction of displacements, which testifies to the process of accumulation of tectonic stresses in these subduction zone areas. The values of the interseismic rates vary from 12 mm/yr at the PAR1 (Paramushir Island) station to 32 mm/yr at the SHIK (Shikotan Island) station.

The interseismic rates of displacements reflect the process of subduction of the Pacific plate under the North American (Okhotsk) plate in the conditions of a mechanically closed contact zone. The recent geometry of lithospheric plate coupling (Savage et al., 1999) was simulated for the stations in the south and north of the surveyed area. The solutions received for different parts of the Kuril-Kamchatka subduction zone are represented in the form of an inclined width of the contact of lithospheric plates approximated by a spline function.

The maximum contact of the Pacific and the North American (Okhotsk) plates was identified in the southern part of the subduction zone, where the highest width of the seismogenic area is observed. The depth of mechanical cohesion reaches 64 km, and its size (down dip) is 183 km. Reduction of the plate contact area occurs towards the central part of the island arc (to URUP station). Today the contact of the lithosphere plates is absent from Simushir to Kharimkotan Islands. Since the Simushir earthquakes, the fading process of postseismic movements has continued here. In the north of the surveyed area, the size of the contact zone increases from 75 km at the PRM1 (Paramushir Island) station to 126 km at the PETS (Petropavlovsk-Kamchatsky) station.

References

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