RECONSTRUCTION OF TECTONIC STRESSES IN THE MANTLE UNDER THE TERRITORY OF PRIMORYE

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In the mantle under the Sea of Japan near the coast of Primorye (Russia) a large number of foci of strong deep-focus earthquakes are concentrated. These events relate to the continuation of the seismic focal zones falling under the continent from the Pacific: the southwestern flank of the Kurile-Kamchatka and the northwestern flank of Izu-Bonin.

According to modern concepts, confirmed seismic tomography data (Fukao at al., 2001; Huang, Zhao, 2006) the Pacific plate subducting beneath the continent of the Kuril-Kamchatka, Japan, Izu-Bonin and Mariana Trench. Mantle seismicity associated with the processes occurring in the subducting slab. At a depth of 500-600 km in the transition zone of the upper mantle, the plate loses elastic properties, seismicity in it ceases, although the high-speed structure continues to be traced in the mantle in the horizontal west direction for several hundred kilometers. Most of the substances that make up the slab are reflected from the lower boundary of the mantle at a depth of 660 km, some part may plunge across the border.

The publication presents results of reconstruction of recent stresses in the mantle of this region using the method of cataclastic analysis (MCA) of discontinuous displacements by Yu.L. Rebetsky (Rebetsky, 1996; 1997). The basis for the reconstruction of stresses was the catalog of the mechanisms of earthquake foci according to the data of the Sakhalin branch of the FRC GS RAS supplemented with information from GlobalCMT (Ekström et al., 2012) and USGS.

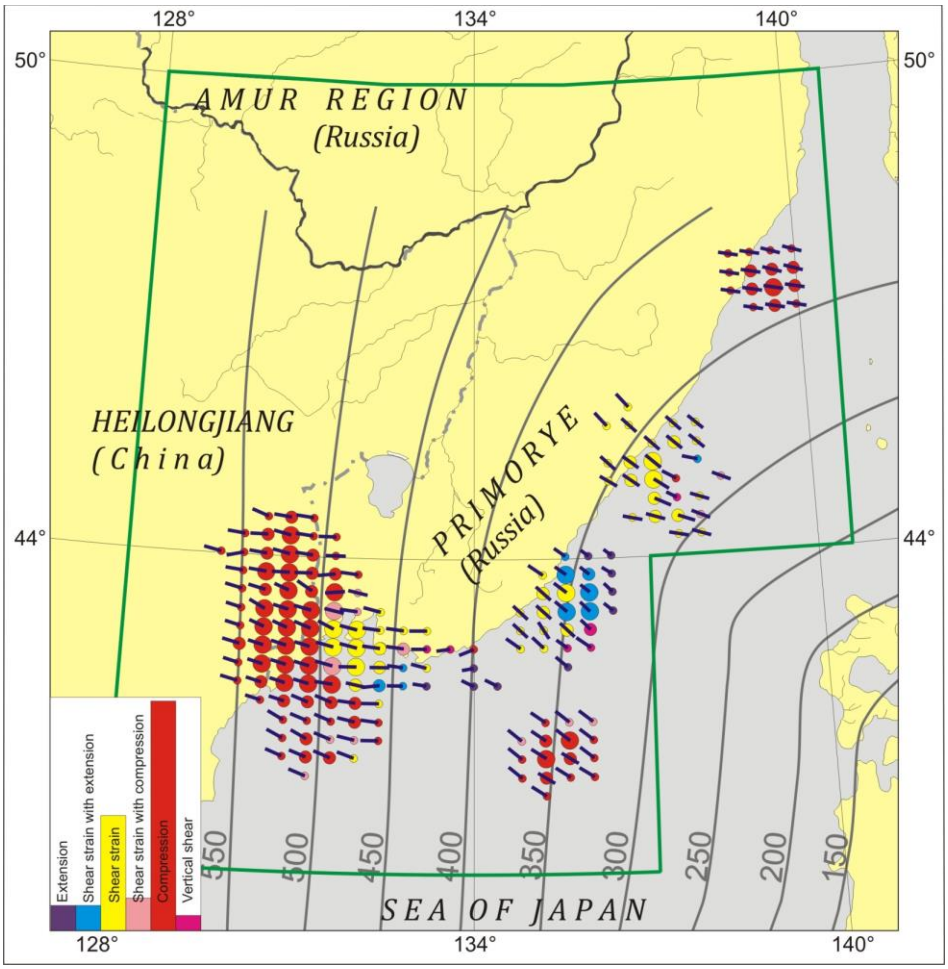

Fig. 1. Projections to the horizontal plane of axes of principal stresses σ_3 (maximum deviatoric compression) and the type of stress state for deep earthquakes. The center of the circle corresponds to the point for which the sample is made, the color to the

stress state type, the size is inversely proportional to the averaging area. The axes of the principal stresses are constructed in the direction of immersion, the length of the segment is proportional to the cosine of the angle of immersion, at an angle of immersion less than 19 degrees, the segment intersects the node. Green line - the boundaries of the studied region. Gray color shows the isolines of the average depth of earthquakes according to (Zhao, Hasegawa, 1993). The inset shows the distribution of the number of nodes by the type of stress state relative to the surface.

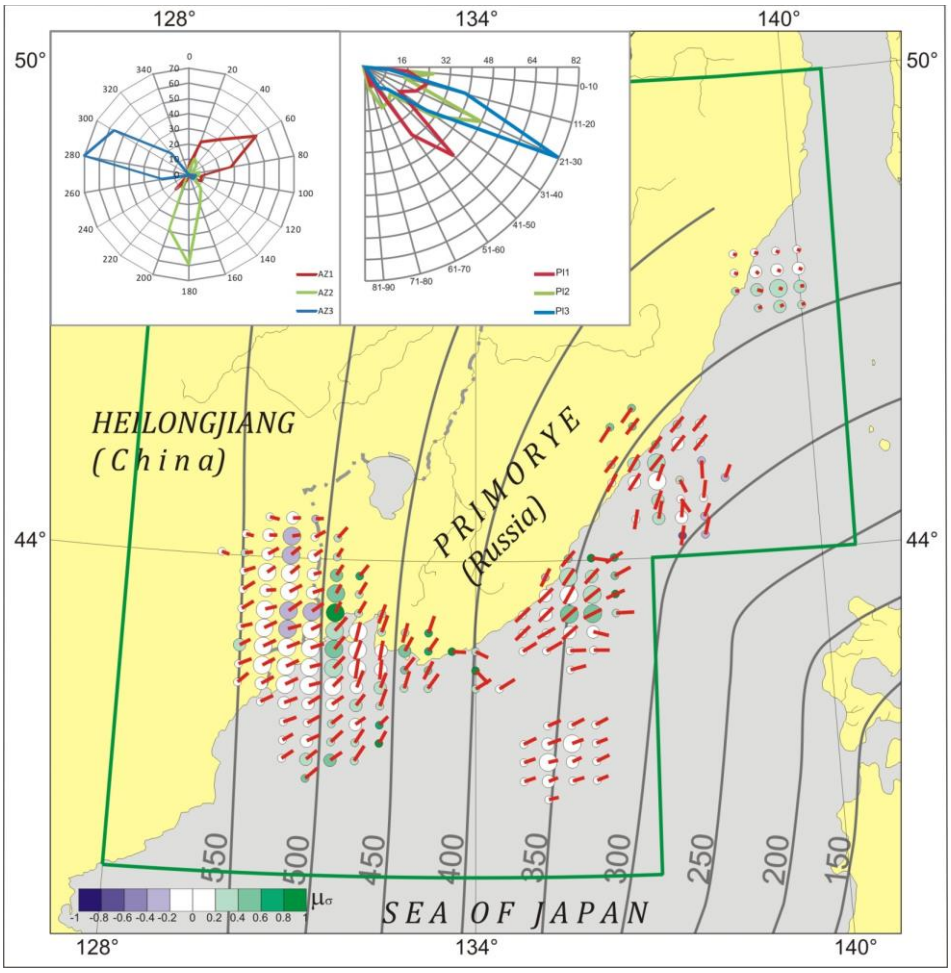

Fig. 2. Projections to the horizontal plane of the axes of principal stresses σ_1 (minimal deviatoric compression) and the Lode-Nadai coefficient. The center of the circle corresponds to the point for which the sample is made, the color to the Lode-Nadai coefficient μ_σ, the size is inversely proportional to the averaging area. The axes of the principal stresses are constructed in the direction of immersion, the length of the segment is proportional to the cosine of the angle of immersion, at an angle of immersion less than 19 degrees, the segment intersects the node. Green line - the boundaries of the studied region. Gray color shows the isolines of the average depth of earthquakes according to (Zhao, Hasegawa, 1993). The inset shows the distribution of the number of nodes along the azimuth and the angle of immersion of the main stress axes.

The reconstruction of the tectonic stress field was done three times with increasing averaging area.

The results show that sinking into the mantle material is under compression, the direction of the axis of which is close to the direction of immersion, or forms with it an acute angle (near the horizon). The incident direction of the compression axis - west-north-west, to the deepest sections it is close to the compression direction in the surface region of the contact plates in the region of trenches. However, the direction varies somewhat shallower where manifested subhorizontal stretching.

At the deepest depth, where seismic activity is still recorded, the conditions for reducing the area of the submerged slab (relative to the surface) are observed, probably caused by contact with the boundary at a depth of 660 km, at shallower depths there are areas where its projection to the surface increases. Perhaps on this site the converging Kuril-Okhotsk and Izu-Bonin slabs again diverge. This leads to stretching the submerged slab to the sides. This could explain such a significant penetration of the Benioff zone beneath the continent.

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