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Geodynamic models of the deep structure of the natural disaster regions of the Earth

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Investigation of the deep structure and creation of geodynamic models of natural disaster regions are important for understanding of the nature of such phenomena as earthquakes, eruptions of volcanoes, tsunami and others. Carrying out of such researches is necessary for definition of areas of potential risk, forecasting and the prevention of negative consequences of acts of nature. Research region is active continental margins of the Sea of Okhotsk, and especially the area of Neftegorsk earthquake which has occurred on May, 28th 1995 in the North Sakhalin and caused many victims and destructions. The geodynamic model of the lithosphere in the region of Neftegorsk earthquake has been constructed along the profile crossing the North Sakhalin Basin, Deryugin Basin and ophiolite complex between them. The Deryugin Basin was formed at the site of an ancient deep trench after the subduction of the Okhotsk Sea Plate under Sakhalin. The basin is located above a hot plume in the mantle at a depth of 25 km. The ophiolite belt of ultramafic magmatic rocks is an ancient (K2-Pg) paleosubduction zone separating the Deryugin basin from the North Sakhalin Basin. The thickness of the ancient seismic focal zone is 80 km. It is probably that the structures of the North Sakhalin have been formed in the following way. In the Late Cretaceous the oceanic Okhotsk Sea Plate subducted under Sakhalin, the eastern part of which was an andesite island arc. Approximately in Miocene the subduction of the plate apparently ceased. In that time the Tatar Rift Strait was formed. Ophiolite rocks of the subduction zones as a result of compression have been squeezed out on a surface. The ophiolite complex combined by the ultrabasic rocks, fixes position of ancient subduction zone. It is probable that the manifestation of the Neftegorsk earthquake was a result of activization of this ancient subduction zone. On a surface the subduction zone manifests itself as deep faults running along Sakhalin. The center of the Neftegorsk earthquake was directly formed by burst of activity of this ancient subduction zone. From a position of the ancient subduction zone under Sakhalin, which is a cause of strong earthquakes here, it follows that the region is one of seismic dangerous in Russia. Constructed on the basis of complex interpretation of the geologic-geophysical data the geodynamic models of natural disaster regions give the chance: to study a deep structure under seismic dangerous zones; to investigate a role of deep processes in the upper mantle in formation of structures of earth crust; to relate the geological features, tectonomagmatic, hydrothermal activity with the processes in the upper mantle; to plot maps in detail with zones of increasing risks to prevent active building or other economic activities in such dangerous regions.