On nature of the well-known seismic boundary observed at the 70-km depth.

B. Levin (1,2), M. Rodkin (3), E. Sasorova (2)

(1) Institute of Marine Geology and Geophysics, Far East Branch of the RAS, Yuzhno-Sakhalinsk, Russia, (2) P. Shirshov Institute of Oceanology RAS, Moscow, Russia, (3) Geophysical Center RAS, Moscow, Russia

(levinbw@mail.ru / Fax:+7 4242-791517 / Phone: +7 914-7502935)

Realized statistic analysis of the earthquake catalogs (ISC, NEIC, 1960-2004; Harvard Catalog, 1976-2005) showed that the seismic boundary at the 70-km depth marked out often as a real boundary, is dividing all events into two separate classes. The first part is non-deep seismic events (about 85% of all events) which respond to external perturbation effects, and the second one is deep-focus events non-responded to an outer influence.

It was shown [Sasorova, Zhuravlev, 2006] that the within year irregularity exists in the most cases for shallow EQ with the depth of the source less than Htr (Htr=70 km.) and it does not observed for deep EQ with the depth of the source more than Htr.

The availability of the nonrandom component in the earthquake distribution between the northern and southern part of the Pacific was investigated [Levin, Sasorova, 2005; Sasorova et al, 2006]. It was found also that nonrandom component does not exist for deep earthquakes. On the contrary it is clearly manifested in time distributions of the shallow events. In both cases it was used the procedure of the optimal selection for the Htr value. We let Htr vary from 15 up to 300 km and we could find the best Htr value for each case. It was determined as Htr=70 km.

The drastic change of earthquake source parameter values via hypocenter depth was observed near the 70-km depth boundary also. Revealed parameter change is connecting with difference in the deep fluid behavior. The equation of state for water was analyzed and it was established for the first time that water stays on a free state only at the depth less than 70 km. This depth value is corresponding to the pressure equal to 2,000 MPa. A water-saturated rock is medium with non-linear response to periodic effects. The weak effects of tidal forces are accumulated in such water-containing medium. In rocks where free state water is absent, tidal effects can not be accumulated and non-linear mechanism of deformation storage is not realized.