



Peaceful nuclear explosions in Eastern Siberia and the republic of Sakha on the base of Baikal regional seismic data

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During 1976–1987 in the former USSR in the territory of Irkutsk and Chita area (the Eastern Siberia) and Sakha republic (Yakutia) ten peaceful nuclear explosions (PNE) were conducted in scientific and commercial applications (yields in the range of 3.2 to 15 kT [Sultanov et al., 1999]). PNEs were measured by regional analog seismic stations located in the Baikal rift system and surroundings at epicentral distances from 246 to 1407 km. The present study shows the first results of the treatment of these seismograms. Regional travel time curves for the both crustal and mantle seismic phases (Pn, Pg, Sn and Sg) were constructed using arrival times of these explosions. Based on these data the regional velocities of seismic waves were determined: $VPn = 8.25$ km/s, $VPg = 6.12$ km/s, $VSn = 4.57$ km/s, $VSg = 3.58$ km/s. The velocities obtained are well correlated with the data known on the velocity structure of the Baikal rift system.

According to the PNEs records obtained on the Yakutia seismic station network (Neva serial), in the earlier works, the P and S wave velocities in the crust and upper mantle of the Siberian Craton were calculated: $Pn=8.313$ km/s, $Pg=6.158$ km/s, $Sn=4.695$ km/s and $Sg=3.594$ km/s [Mackey et al. 2005] and $Pn=8.27$ km/s, $Pg=6.20$ km/s, $Sn=4.67$ km/s and $Sg=3.55$ km/s [Burkhard et al. 2016]. It can be seen that the values of the velocities of seismic waves in the upper mantle obtained in this work for the same events at the stations of the Baikal region are much lower: $\sim 0.2\text{--}0.8\%$ for P waves and $\sim 0.4\text{--}2.7\%$ for S waves, while in the crust, on the contrary, they are higher – $0.6\text{--}1.3\%$. Such a spatial distribution of the velocities of seismic waves agrees well with the SibCrust model [Cherepanova et al. 2013].

Low velocities of seismic waves indicate the presence of low-velocity anomalies in the region under the crust. Earlier, the presence of anomalously low velocities of seismic waves under the Moho in the Baikal rift system was noted according to the deep seismic sounding data [Krylov et al. 1981]. Also, the layer of high attenuation of seismic waves under the crust of the northeast flank of the Baikal rift system has been detected by the seismic quality factor calculations [Dobrynina et al. 2016]. The presence of such a layer was associated with the possible partial melting of matter under the crust of the northeast flank of the Baikal rift system [Pospeev 2012].

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