The first results of estimating the depth of the Moho surface by the method of converted Ps–waves for the Azerbaijan part of the Greater Caucasus

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Abstract The methodology of the converted waves, or as it is commonly called, the "Receiver function" method, is well known and is widely used throughout the world to study the deep structure of the Earth up to 800 km. The method is based on the registration and interpretation of converted Ps waves. These studies were carried out as part of the International Seismotomographic Laboratory using a software package developed at the University of Missouri (USA). One of the best regions for studying the early stages of mountain building is the Greater Caucasus, where most of the volcanism and mountain building appears to be 5 million years. Of particular interest is the immersion zone of the Kura Basin beneath the Greater Caucasus, the so-called subduction zone, which has not been sufficiently studied to date. To this end, we began our studies of the depth of the Moho border with this region. Thus, for the first time on the basis of the analysis of the wave characteristics of distant earthquakes recorded at seismic and telemetric stations of the RSSC, within the framework of the international project "Transect", the depths of the Moho border for the Azerbaijan part of the Greater Caucasus were refined by the method of exchange reflected Ps waves ("Receiver function"). Seismograms of the selected earthquakes were processed using the Seismic Analysis Code (SAC) software package under the MacOs operating system. The study examined seismological data recorded by a network of telemetry stations (N=20) for 2009-2019. In total, 2428 earthquakes recorded at an epicenter distance of 35 to 90 degrees were analyzed. At the first stage, frequency filtering was carried out in order to eliminate oscillations that were too high, containing the effects of random scattering on inhomogeneities, and too low frequencies that reduce the resolution. The working range of the periods ranged from two to 10 seconds. Next, two-dimensional and three-dimensional rotation of the axes was carried out. The summation of all traces was carried out with time shifts relative to some reference epicentral distance, which is assumed to be 60 degrees. On the summarized Q-tracks of the receiving functions, the Moho boundary with a delay time of 4.0 sec is clearly distinguished. Thus, a map of isolines of the depths of the Moho surface was constructed and depths were determined for the territory of the Guba-Gusar region 48-50 km, the Zagatala-Balakan region 46-47 km, the Shamakhi-Ismayilli region 48-52 km. As it was said earlier, the first definitions of the depth of the surface of Moho in Azerbaijan were made based on the data from the state earthquake and the gravitational model of the Earth's crust. R.M. Gadzhiev in 1965 and E.Sh. Shikhalibeyli in 1996 built such models. The data obtained are consistent with the available data, but discrepancies have been received. Compared with the map constructed according to the GSZ-KMPV and gravimetric data by R.M. Gadzhiev (1965), the difference in the thickness of the earth's crust was from one to 15 km. Compared with the map constructed according to the FGP and gravimetric data by E.Sh Shikhalibeyli (1996), the difference in the thickness of the earth's crust varied from one to 10 km.

Keywords Moho surface, methodology of reflected waves, exchange Ps-waves.

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