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SEISMIC MOMENT TENSORS OF THE PRIBAİKALYE EARTHQUAKES AND SEİSMOTECTONİC DEFORMATİONS OF THE CRUST

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Due to a lack of information on seismic moment tensors of earthquakes in the Pribaikalye region the method of the surface wave amplitude spectra inversion has been implemented and tested. We have expanded the dataset of the source parameters of the regional seismic events and have considered the practical applications of the results obtained. We have considered the moderate-sized earthquakes occurred in the region in 2000–2013.

The data used for this study were records of the earthquakes at the IRIS, GEOSCOPE and GEOFON broad-band digital stations. We selected only the signals with high signal/noise ratio and normal polarization. To extract the fundamental modes of Love and Rayleigh waves we applied a frequency-time analysis procedure (Levshin et al., 1989). Surface wave amplitude spectra were calculated for the period range from 30 to 110 s for the entire set of the seismic events. To estimate the source parameters we used the inversion of surface wave amplitude spectra, based on the method described by Bukchin (1990). The reliability of this method in source mechanism determination of large and medium seismic events occurred in different regions has already been demonstrated (Lasserre et al., 2001; Seredkina and Melnikova, 2013). Assumptions of the method (an instantaneous pure double-couple point seismic source with known origin time and epicentral location and medium with weak lateral inhomogeneity) allow us to completely define a seismic source by its double-couple depth, its seismic moment M_0 and its focal mechanism parameters (strike, dip and slip angles of the nodal planes or directions of the principal compression and tension axes). Moment magnitudes M_w of the earthquakes were calculated from the seismic moments estimated during the inversion. To constrain the uniqueness of the solutions we additionally used *P*-wave first-motion polarities obtained from the records at the short-period seismic stations of the Baikal regional network. Finally the seismic moment tensors have been calculated for 41 earthquakes with M_w=4.3–6.3. For 19 earthquakes we have compared the estimated source parameters to the data of the world seismological centers (Global CMT, NEIC, USGS), the firs-motion focal mechanism solutions (the data of the Baikal Branch of the Geophysical Survey SB RAS) and the results by Emmerson et al. (2006) and Barth and Wenzel (2010). Generally most of the focal mechanisms as well as the estimates of the scalar seismic moments and the moment magnitudes obtained with different approaches are in a good agreement with each other.

On the basis of the data obtained we estimated seismotectonic deformations of the crust using the method by Yunga (1990) for two seismoactive areas – the Northern Pribaikalye and the northeastern flank of the Baikal rift zone. It was determined that the subhorizontal northwestern extension and the strike-slip regime are dominated in these areas respectively on a level of the moderate-sized seismic events. The peculiarities obtained reflect the long-term characteristics of the stress field of the crust and agree with structural features the studied areas.

The results of this paper show that the method applied can improve the quality of focal mechanism estimates in the cases when the solutions provided by other methods are ambiguous. It

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promotes significantly to expand the data on the source parameters of the regional earthquakes of medium magnitudes. In conclusion we note that the results obtained improve the reliability of the detailed studies of the stress-strain state of the crust and promote to construct the most feasible models of the geodynamical settings in the Baikal region.

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