GC2024-SG029

Source parameters of earthquakes in the Laptev Sea (1996, 1997 and 2023) from surface wave records

Anastasia S. Fomochkina[1,2] , Alena I. Filippova[3,2]

[1] National University of Oil and Gas “Gubkin University”, Russia
[2] Institute of Earthquake Prediction Theory and Mathematical Geophysics, Russian Academy of Sciences
[3] Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radiowave Propagation of the Russian Academy of Sciences

nastja_f@bk.ru

In this study we consider three earthquakes that occurred in the Laptev Sea: June 22, 1996 (Mw=5.8), April 19, 1997 (Mw=5.5) and July 13, 2023 (Mw=5.3). Records of surface waves, registered at teleseismic distances, were used as initial data. For each of the seismic events under the study, records of Rayleigh and Love waves were filtered and their amplitude spectra were calculated using a frequency-time analysis procedure [1]. The source parameters were calculated by minimizing a misfit between observed and calculated surface wave amplitude spectra in an instant point source approximation [2]. As a result, we have obtained scalar seismic moments, corresponding moment magnitudes, source depths and a focal mechanisms (strike, dip, and slip angles of earthquake nodal planes). To constrain a unique solution of an earthquake focal mechanism, additional data were used, such as P-wave first-motion polarities or surface wave phase spectra. Integral characteristics of the earthquake sources, describing their development in space and time, were also estimated from surface wave amplitude spectra [3]. For this purpose, an earthquake source is modeled as a plane elliptical dislocation.

Our results were compared with the data by seismological agencies and available geological and geophysical information about the considered region.

The study was supported by the Russian Science Foundation, Grant No. 21-77-10070.

[1] A.L. Levshin , T.B. Yanovskaya, A.V. Lander, B.G. Bukchin, M.P. Barmin, L.I. Ratnikova, E.N. Its, Recording, identification, and measurement of surface wave parameters. In: Keilis-Borok, V.I. (Ed.), Seismic surface waves in a laterally inhomogeneous Earth. Modern Approaches in Geophysics, vol. 9,1989, pp. 131–182. doi:10.1007/978-94-009-0883-3_5

[2] B.G. Bukchin, Determination of source parameters from surface wave recording allowing for uncertainties in the properties of medium, Izvestiya Akad. Nauk SSSR. Fizika Zemli 25, 1990, pp. 723–728.

[3] B.G. Bukchin, Determination of stress glut moments of total degree 2 from teleseismic surface wave amplitude spectra, Tectonophysics, 248, 1995, pp. 185–191. doi:10.1016/0040-1951(94)00271-A