

Lg-coda Q in the central part of the East European platform from small aperture array “Mikhnevo” data

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Abstract Whereas the quality factor Q is one of the basic parameters required in seismic hazard estimation, no systematic studies of seismic attenuation factors has been carried out in the central part of the East European Platform due to the lack of dense seismic network and a small number of regional earthquakes. The main part of the events, recorded by the small aperture array “Mikhnevo” 80 km to the south of Moscow, consists of industrial explosions of different magnitude. The idea of the paper is to apply conventional seismic methods to the analysis of seismic waveforms of the industrial explosions. The paper focuses on the Lg coda of the quarry blast in “Mikhailovsky” quarry 300 km from the array. Vertical components of the short-period and broad band records of the sensors positioned in the well at the depth 20 m are processed according to the SSR algorithm, suggested by Xie and Nuttli, 1988, and extensively used by Mitchell et al in different regions of the world. The advantages of the method imply exclusion of the source and site characteristics by taking spectral ratios of the successive time windows of the coda. Compared to the earthquake waveforms, the Lg coda of explosions is shorter, less regular and contains higher frequencies. The length of coda varies according to the noise level. We selected 14 events from the same quarry in different years, which demonstrate remarkable stability of the waveforms. All the events were processed individually to obtain the frequency dependence of Q in the form $Q(f)=Q_0f^\eta$, where Q_0 is the Q factor at the frequency 1 Hz and η is the power. To produce stable estimates of Q_0 and η individual values were averaged for frequency bands: 2-6 Hz, 2-7 Hz, 3-6 Hz, 3-7 Hz for different length of coda. The preferable frequency range for Lg coda Q studies of quarry blasts is suggested as 3-6 Hz, which avoids instability of coda in 1-3 Hz interval, presumably caused by local site effect, connected with the 3 km thick sedimentary layer. The Q estimate of $Q_0=584\pm 89$, $\eta=0.41\pm 0.06$ proves considerable heterogeneity of the upper crust in the region. Speaking about Q factor as an indicator of the tectonic activity, the studied area can be related to a region of moderate activity.

Keywords quality factor, Lg-coda, industrial explosions, East European Platform, SSR method.

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