Comparison of earthquake classification systems in local magnitudes ML in some regions of Northern Eurasia

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Abstract The ML local magnitudes of the earthquakes of Armenia, Azerbaijan, the Arctic and the Baltic Shield (KOGSR and FCIAR station networks), the Urals and Altai and Sayan were analyzed. The regional dependences of ML on the mb_{ISC} "external" magnitude are established. It is shown that the magnitudes ML of weak and moderate seismic events registered by the seismic stations of these regions, with the exception of Altai and Sayan, are close at the same mb_{ISC} both among themselves and to ML according to the NAO, HEL, DDA, TEH networks of neighboring countries. For all regions, except for Altai and Sayan, a general dependence is established in the form: $ML_{av}=1.06 \cdot mb_{ISC}-0.34$. A significant overestimation of the ML of Altai and Sayan earthquakes recorded by the regional network is found relative to other data. For the main group of data, the excess of local magnitudes $ML=f(K_R)$ over magnitude M in the known T.G. Rautian ratio, $K_R=lgE=1.8 \cdot M+4$, by $\Delta M=0.2 \div 0.4$ in the magnitude range of $ML=1.0 \div 6.0$ is shown. For Altai and Sayan earthquakes, the overestimation of local magnitudes is more significant and should be taken into account when calculating seismic energy using the regional ratio $K_R=f(ML)$. In general, magnitudes in the ratio $K_R=1.8 \cdot M+4$ for weak and moderate earthquakes are closer to local magnitudes ML, and for strong events with $K_R>13$ ($Ms>5.0$) — to surface wave magnitudes Ms.

Keywords Local magnitude, surface wave magnitude, network of seismic stations, seismic energy, orthogonal regression.

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