REGIONAL LONG-PERIOD MAGNITUDE SCALES
AND THEIR CAPABILITIES FOR THE TSUNAMI WARNING

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Abstract. The tsunami warning system at the Russian Far East employs medium-period magnitude M_S (*BB*) after Vaniek–Solovyev. With its use, inadequate, understated estimates of tsunamigenic potential of an occurred earthquakes are possible. This can happen in case of a so-called «tsunami-earthquake». This kind of earthquakes with non-standard spectrum was revealed by Kanamori in 1972. To overcome this problem, a longer-period magnitude scale is needed. In the present study, a technique is developed for determination of magnitudes at regional distances (from 70–4500 km) based on amplitudes of surface waves of periods 40 and 80 s. At distances 70–250 km, the amplitude of the joint group of shear and surface waves is used. For the new magnitudes, designated $M_S(40)$ and $M_S(80)$, experimental calibration curves are constructed using more than 1250 three-component records at 12 stations of the region. Magnitudes are calibrated so as to produce unbiased estimate of moment magnitude M_w in the critical range $M_w = 7.5$–8.8. RMS error of a single-station M_w estimate is about 0.27. At distances below 250 km and $M_w \geq 8.3$, the estimate of M_w obtained by the proposed technique will saturate at the M_w level about 8.3; this is acceptable at operative analysis as do not result in missed alarms. The technique can be used in the operative tsunami warning based on seismological data. This can markedly decrease the number of false alarms.

Keywords: earthquake, tsunamigenic, calibration curve, long-period, magnitude, tsunami warning.