

Quick estimation of moment magnitude M_w for tsunami warning using waveform data provided with LISS

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We propose an empirical formula for quick estimation of the moment magnitude, M_w , of large earthquakes in the world for tsunami warning purposes using velocity waveform data provided by Live Internet Seismic Server (LISS, supported by USGS) and the Buffer of Uniform Data (BUD of IRIS). The mean square amplitude, E_v , in vertical component of STS-1 seismographs in the period of first four minutes is adapted as the measure of ground motion. Supposing linear dependence of $\log(E_v)$ on M_w , we determined seven parameters in the formula of $\log(E_v)$ variation with epicentral distance by the least square method in consideration of rapid attenuation of seismic wave in shallow layers and refraction along the mantle-core boundary.

Matsushiro Seismological Observatory, MSO, has been routinely determining the new magnitude, M_{LISS} , for large earthquakes around the globe since November 2004. The difference between M_{LISS} and M_w of Harvard University is usually 0.3 or less, and its standard deviation is 0.225. MSO informed JMA headquarter a M_{LISS} of 8.8 for the great Sumatra earthquake of 24 December 2004 within 15 minutes after the earthquake origin. The new scale M_{LISS} , covering 6 to 9 in M_w accurately, is so effective to use in operational tsunami warning system.