

Periodicity of seismic activity around Tokai area

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We report the periodicity of the seismic activity around Tokai-area from January 1980 to December 2000.

Igarashi reported the log-periodicity of the ground level of the base station No. 2595 relative to No. 140-1 (Geophysical Survey Institute (1999), Igarashi (2000)). It is important that the ground level reflecting the crustal strain shows the log-periodic oscillation and predicts the critical point. Sornette pointed out that such a log-periodic function should be proportional to energy emitted by an earthquake (Sornette (1995)). If the function is able to explain the ground level, released energy that is calculated from magnitude of earthquake should show the log-periodicity.

Source parameters from January 1980 to December 2000 were obtained from an earthquake catalog exposed by National Institute for Earth Science and Disaster Prevention. We selected source parameters which are contained in a region $137.8 \sim$ longitude ~ 138.5 , $34.5 \sim$ latitude ~ 35.2 , and $0 \text{ km} \sim$ depth $\sim 150 \text{ km}$. The accumulated frequency distribution had a linear slope from $M=1.0$ to $M=3.5$, here M is magnitude. Thus, we defined the low-energy earthquake ($1 \sim M \sim 2.25$) and the high-energy earthquake ($2.25 \sim M \sim 3.5$).

Apparent released energy was calculated by $E = \exp(4.8 + 1.5M)$. Further, we calculated the released energy by low-energy earthquakes EL , that by high-energy ones EH , and the ratio of them $rE = EH / (EH + EL)$. The rE value showed the clear periodic oscillation and decayed year-by-year. We fitted the rE value to the log-periodic function using the algorithm reported by Lasdon et al. (1992). We obtained the fractal dimension $m=0.939$, the critical point $t_c=2004.0 \pm 0.6$, and the frequency $w=19.5$, as best-fit results.

As a conclusion, time-series of released energy that is calculated from magnitude of earthquake represented the log-periodic oscillation.