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Possible periodicity of seismic activity

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Earthquake forecast models are now under testing in Japan. Referring to the seismicity in the past, activity at respective locations can be forecast on the average. However, there are large fluctuations in the actual activity. Although it reflects the fact that a large earthquake will accompany many aftershocks, it is desired to forecast them as much as possible.

In order to evaluate the temporal change in activity, a possibility of periodicity was examined. In the area of all Japan designated by the Japanese test center of CSEP, for example, earthquakes with a magnitude of 5 or greater and a depth of 0 to 100km fairly increased nearly every 10 years, e.g. in 1923, 1933, 1943 and 1952 (the data was based on the Japan Meteorological Agency). Excepting the period around 1963, the activity became remarkable again in 1973, 1982-1983, 1994-1995, and 2003-2004. In most of these periods, there occurred large earthquakes with a magnitude of 8 or close to it.

Considering this periodicity of about 10 years, the next active period may be around 2012-2014. Incidentally, there were exceptional years such as in 1938 and 1968 when the activity was extremely high. Although a forecast model considering the present periodicity improves the likelihood on the average, there is a limitation to the accuracy of the forecast.

The periodical occurrence of earthquakes seems to be found in various regions in the world. But the time and the interval of their active periods are different with each other, suggesting that there are no particular common phenomena with a periodicity same as the occurrence of earthquakes. The length of the interval of active period may correlate with an accumulation rate of elastic strain and its release in the respective regions. According to the discussion for many years more than a century, a periodicity of earthquake occurrence seems not to be accepted widely. However, based on the accumulated reliable data, it may be valuable to consider the possibility and its physical meaning.

Keywords: seismic activity, periodicity, CSEP, Japan, likelihood, strain