Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SSS01-01 会場:104 時間:5 月 25 日 09:00-09:15

Earthquake statistics and probabilistic forecasting for the southern Kanto after the 2011 Mw9.0 Tohoku-Oki earthquake
Earthquake statistics and probabilistic forecasting for the southern Kanto after the 2011 Mw9.0 Tohoku-Oki earthquake

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After the 11 March 2011 Mw9.0 Tohoku-Oki earthquake, seismicity in the southern Kanto became active immediately after this event and then started a gradual decrease with time. Here we show that the seismicity is well correlated with the two fundamental laws that are valid for aftershocks: the Gutenberg-Richter (GR) law for the frequency-magnitude distribution and the Omori-Utsu (OU) law for the temporal decay of aftershock activity. Our dataset is the earthquake catalog maintained by the Japan Meteorological Agency. We cut this catalog available on 25 January 2012 to use data until 31 December 2011 in the region 35.0-36.5N and 139.3-140.8E with a depth range of 0-150 km. We found that the behavior of the GR frequency-magnitude distribution for post-quake seismicity is similar to that for pre-quake one. Only the annual frequency of earthquakes is higher for the former than for the latter: for example, it is about 4 times higher if we consider magnitude M4 or larger. We also found that the decay obtained by fitting the OU law is slow, relative to the decay of typical aftershock sequences. Both the activated seismicity and OU-like decay allow us to use the method for evaluating aftershock probability constituted by the Earthquake Research Committee (1998) and to evaluate the probability of a M7-class (M6.7-7.2) event in the southern Kanto. We found that the range of the probability significantly varies if we take into account the standard errors of the optimized parameters for the post-quake seismicity. Comparing with a report by the Earthquake Research Committee, we conclude that our probabilities as of 25 January 2012 are equal to or larger than the probabilities of the long-term evaluation in the southern Kanto.

キーワード: Earthquake interaction, forecasting, and prediction, Probability distributions, Computational seismology, Statistical analysis, Time series analysis, Dynamics: seismotectonics
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