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Detection of M5 level recurrent earthquakes associated with the Boso slow slip events

Yoshiomi Hasegawa[1*], Akio Katsumata[2], Masami Okada[2], Noriko Kamaya[1]

[1]Meteorological College, [2]Meteorological Research Institute, JMA

M5 level recurrent earthquakes on the plate boundary between the North American plate and the Phillipine Sea plate around the Boso peninsula have been detected by waveform correlation. The similarity of the waveforms among six M5 level earthquakes on October 20, 1955, 2 events on July 14, 1966, December 30, 1990 and 2 events on August 18, 2007 at Tokyo station has been confirmed by relatively high correlation coefficient. In particular, three of them which occurred on December 30, 1990 and August 18, 2007 have had similar waveforms at Yokohama station and Tateyama station. The epicenters of three recent M5 level earthquakes on December 30, 1990 and August 18, 2007 have been located within a radius of 2.5 km and the depth range is 20 - 37 km. This means that these M5 level earthquakes are recurrent earthquakes which result from repeated slip of the same asperity patch on the plate boundary. In addition, it has become clear that the waveforms of these M5 level earthquakes and M4.5 earthquake on May 22, 1983 look similar. Taking this and two cases of two repeating earthquakes occurred on same day into account, this asperity patch may be ruptured at once or at least twice which are divided into main-event and sub-event. Main-events have about 17-year recurrence time, and this suggests that the stick ratio of this asperity is estimated about 90%. Four recent recurrent earthquakes had occurred in the earthquake swarm activities with the Boso slow slip event(SSE). This means that the earthquake swarm activities with the Boso SSE might also occur in October, 1955 and July, 1966. Main-events of M5 level recurrent earthquakes may occur in every third the earthquake swarm activities with the Boso SSE. The event probability of the next main-event of M5 level recurrent earthquake within 20 years is estimated to be 73 - 77% by small sampling theory and the renewal model with lognormal distribution.

Keywords: Boso slow slip event, Earthquake swarm, Recurrent earthquake, Waveform correlation, Asperity, Probabilistic prediction