

Characteristic Earthquake Sequences off Taneichi after the 2011 off the Pacific Coast of Tohoku Earthquake

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The earthquake clusters of the middle-scale characteristic earthquakes had been detected off the Pacific coast of Tohoku in Japan, where the 2011 off the Pacific coast of Tohoku earthquake with M9.0 occurred on March 11. Characteristic earthquake is distributed in the same region. Seismic activity of characteristic earthquakes off Taneichi which is in the eastern Japan after the 2011 off the Pacific coast of Tohoku earthquake has been investigated. In this area, there are 2 characteristic earthquakes called group A and group B, the magnitude of these groups is around M6.0 and the strain of the group B has been thought to be fully accumulated. The events of group B occurred in 1960, 1976, 1993 had been recognized. In this region, a new event (M5.7) occurred on May 8, 2011. To examine whether the event is the members of the group B, correlation coefficient were computed with waveforms. The data of waveforms of 1960, 1976, 1993 were recorded on the smoke paper. The smoke paper records at Morioka and Hachinohe stations were picked by hand and converted the analog waveforms to digital waveforms. In result, the events of group B and the 2011 event show high correlation coefficient from 0.72 to 0.92. This suggests that the last event (M5.7) occurred on May 8, 2011 was the newest member of the group B after the 2011 off the Pacific coast of Tohoku earthquake.

By the way, the correlation coefficient at Hachinohe between group A and group B also were very high, from 0.75 to 0.85, and this had made difficult to distinguish 2 groups. The reason is estimated that the direction of the destruction of earthquakes of group A and B are to the Hachinohe station. In fact, the waveforms of Hachinohe station contain high frequency component more than that of in Morioka station. The after slip of the 2011 off the Pacific Coast of Tohoku Earthquake seems to influence the magnitude. The coupling rates of group B seems to be smaller after suffering the after slips of near larger earthquakes and the magnitudes became smaller. The group B is estimated to include the co-seismic slip area and aseismic slip area, and the aseismic slip area would be expanded because of the influence of the after slip. Therefore, co-seismic slip area would become smaller.

The next group B earthquake will occur from October 2026 to May 2029 with 70% probability, using the small-sample theory with a log-normal distribution model. The occurrence of the next group B event may be accelerated by the after slip of the 2011 off the Pacific Coast of Tohoku Earthquake, on the other hand, after slip effect on only expanding of the aseismic area which would cause smaller magnitude than the average of the member of the group B.

Keywords: Characteristic Earthquake, the 2011 off the Pacific Coast of Tohoku Earthquake, after slip, probability, off Taneichi, correlation