Spatio-temporal clustering of successive earthquakes in Japan: analyses of JMA catalogue

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This study analyzes earthquakes closely occurring in space and time in Japan in order to clarify their characteristics. We group the earthquakes that occur in a given space-time window from a target earthquake into a cluster (i.e., a group of the earthquakes successively occurring), and count the number of the clusters. To examine whether or not these successive earthquakes occur randomly, we compare the results with simulations in which earthquakes are set to randomly occur in time (but same in locations). We analyze shallow earthquakes with depths of <= *70* km from Japanese Meteorological Agency catalogue (JMA) for the period from 1998 to 2017 with magnitudes *(5.0 <= Mw < 6.0)*, and compare the results to those that was previously determined from the global CMT catalogue for the period from 1976 to 2016 (Bantidi and Nishimura, JpGU 2019). The results show an eminent homogeneity of spatial clustering behaviors around Japan for both global and regional catalogues; and the spatio-temporal distribution of cumulative number of clusters exhibit similar features in logarithmic scale. Earthquakes in the magnitude range 5.5 <=Mw<6.0 , are found to be triggered at the distance between 60 - 190 km in JMA catalog and 70 –210 km in the CMT catalog within 365 days. Furthermore, within 365 days, the JMA catalogue shows that successive earthquakes occurring close to the target fault account for about 3% of the total number of earthquakes around Japan. These consistencies suggest that the JMA catalog can be used for the analyses of smaller earthquakes with magnitude of less than 5 which are not easily analyzed by using global data set.