Quantitative evaluation of seismic activity related to active faults

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In this study, we analyze seismic activity related to active faults, which are the dominant structures of the heterogeneous crust. The quantitative evaluation of seismic activity is indispensable for the basis of seismological research and earthquake prediction. First, seismic activity around major strike-slip active faults in southwestern Japan is evaluated using the microearthquake data from the D.P.R.I., Kyoto University. Next, in order to investigate the spatial and temporal properties of seismic activity for 98 major active faults in Japan, the same analysis is carried out with the JMA catalogue. Using these results, we can estimate and discuss the accumulation and release processes of tectonic stress for wide area.

It is important to objectively evaluate seismic activity. In this study, we analyze seismic activity related to active faults, which are some of the dominant structures of the heterogeneous crust. The quantification of seismic activity is indispensable for the basis of seismological research and earthquake prediction.

First, seismic activity around 11 major strike-slip active faults in southwestern Japan is evaluated by using the THANKS microearthquake data from the D.P.R.I., Kyoto University. The number of earthquakes, the fractured area, and the radiated energy of earthquakes are quantified as a function of distance from each active fault. Seismic activity concentrates, on average, within 5 km from the fault, and this distance is thought to be the range of influence for an active fault.

Next, in order to investigate the spatial and temporal properties of seismic activity for 98 major active faults in Japan, the same analysis used for microearthquakes is carried out with the JMA catalogue. For strike-slip faults, the influence range of active faults is assumed to be 5 km. For dip-slip faults, a modified method considering the fault plane inclination is proposed. From the results of seismic activity evaluation, seismic activity from the Tohoku to Kanto districts is comparatively low. In contrast, that in the Chubu and Kinki districts is high. It may depend on the difference of slip types of active faults. Also, it is thought that the stress due to the Pacific plate which subducts westward in northeast Japan is not reflected well in the seismic activity of the shallow part of the crust, and that the stress due to the eastward moving Amurian plate largely affects the seismic activity in southwestern Japan.

The relation between the lapse time after the last large earthquake and the present seismic activity around active faults is studied. Judging from the JMA catalogue, it is seen that the average seismic activity decreases with a lapse time from the last large earthquake (M is over 6.4).

Using these results, we can estimate and discuss the accumulation and release processes of tectonic stress for wide area in Japan.