# Conditioned stable sliding region inferred from similar earthquake activity

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On the basis of rate and state dependent frictional law, the existence of conditioned stable sliding region is predicted where unstable sliding could occur when slip velocity increase rapidly, while stable sliding is occurring during period of constant slip rate (Sholz, 1990). Because unstable sliding would occur in such region when the small change of slip rate that is, change of state of stress distribution, in surrounding area takes place, such region could be high sensitive indicator which monitors temporal change of plate slip rate. We investigated similar earthquakes whose waveforms are extremely similar, and most of these events are thought to be caused by repeating slips on the small asperity surrounded by stable sliding area (Kimura et al., 2003). In this study, we examined the existence of conditioned stable sliding area using these results.

In order to search similar earthquakes which would be caused by neighboring large and middle earthquakes, we selected similar earthquakes which are close to large and middle earthquakes spatially and temporally. Search area is set to double of fault size basically, but triple, in consideration of fluctuation of characteristics such as fault size, scale of afterslip or slip amount for each event. We searched similar earthquakes which were closer than 0.1 degree in horizontal distance, closer than 10 km in vertical distance from main event and expanded search area three times as magnitude of main event increased by 1.0. Furthermore, to exclude similar earthquakes which take place continually, we selected similar earthquakes which do not occur before main event and occur within 1.0 year after occurrence of main event. In this analysis, we used events which have adequate analyzing period before main event to avoid the influence of limit of analyzing period. In this way, we searched similar earthquakes for 190 main events which is larger than M5.0.

The largest event which was accompanied by two or more similar earthquakes which satisfies conditions mentioned above is Mjma6.1 event which occurred near Choshi on Mar 6. 1989, 23:39(JST). Most aftershocks were distributed in the area 10 km east to location of initial rupture. Similar earthquakes in this area are activated for about 1 year after main event indicating occurrence of afterslip. Similar earthquakes satisfying conditions mentioned above occurred in neighboring area where similar earthquakes are activated. The existence of continual similar earthquakes with almost constant time spacing shows stable sliding is occurring on the plate boundary. From these observations, it is shown that on asperities of similar earthquakes detected in this research, unstable sliding does not take place while plate slip rate in surrounding area is constant but does when plate slip in surrounding area is accelerated.