How much is recent seismicity affected by changes of the CFF of previous large earthquakes ?

Takeo Ishibe[1]; Kunihiko Shimazaki[2]

[1] ERI. Univ. of Tokyo; [2] Earthq. Res. Inst., Univ. Tokyo

Since aftershock activity in a shallow crustal region continues for a century, as was exemplified by Utsu and other's study in 1995 on the Nobi earthquake of 1891, it may be possible to use changes of the Coulomb Failure Function (DCFF) for investigating source mechanism and location of a previous large event on the basis of recent activity. One example was shown by Muller and others in 2004, who suggested that the aftershock activities of the New Madrid earthquakes of 1811 to 1812 still continue at present.

We investigated whether correlation exists between DCFF and hypocentral distribution of recent instrumentally recorded earthquakes. We examined large crustal earthquakes such as the 1927 Tango earthquake (Mjma = 7.3), 1943 Tottori earthquake (Mjma= 7.2), 1948 Fukui earthquake (Mjma = 7.1), and 1995 Kobe earthquake (Mjma= 7.3), together with deep earthquakes such as the 1993 Kushiro-Oki earthquake (Mjma = 7.5) whose source process had been analyzed in detail. As a result, the DCFF calculated for some large earthquakes such as the 1943 Tottori and 1948 Fukui earthquakes well corresponds to the hypocentral locations of recent seismic activity although the correspondence varies from event to event. Earthquake detection capability and accuracy of hypocentral location for earlier events are much inferior to those in recent years and it is not easy to verify that all the recent events represent the aftershock activity. However, 70-80% of earthquakes occur in a region of positive DCFF, even if we assume a simple uniform-slip model, except for the adjacent region of the mainshock fault. These results suggest that it may be possible to estimate fault mechanism and fault geometry of historical large earthquakes from hypocentral distribution of recent earthquakes.