Time-to-failure analysis for the anomaly of the crustal movement in the Tokai Region

Masashi Kawamura[1], Koshun Yamaoka[2], Hitoshi Hirose[3], Naoyuki Fujii[4], Kazuro Hirahara[3]

[1] Sci.,Nagoya Univ, [2] RC. Seis. & Volc., Nagoya University, [3] Earth and Planetary Sci., Nagoya Univ., [4] RCSV, Grad. Sch. Sci., Nagoya Univ.

In July 2001, Geographical Survey Institute (GSI) announced that the trend of crustal movement in the Tokai Region had deviated from the ordinary one since April 2001. This phenomenon now continues and is the first in this region since the onset of GPS observation in 1994. In closer prospect of displacement data, for example, at Hamamatsu station, displacement acceleration is clearly seen. If this anomaly reflects some ongoing process resulting in failure, monitoring of such anomaly is very important for considering physics of earthquake occurrence. Assuming that this anomaly is a sign of failure, time-to-failure analysis, which is frequently used as a tool of predicting large event or explosive eruption, is attempted.

ANALYSIS

[1]Using the data from March 1996 to December 1999, secular variation is removed in advance by least square method.

[2]The data from 1999 is optimized with the model, which comprises annual change, step due to Miyake-Kozu events in 2000 (tangent hyperbolic) and power law component.

RESULT AND DISCUSSION

(1)It is likely that displacement acceleration began around Hamanako area in April 2001 because displacement acceleration was then extracted only at the stations around the area (e.g. Hamamatsu, Nukata stations).

(2)Displacement acceleration area is considered to have extended to the west since April 2001 because displacement acceleration around Nagoya began later than that around the Hamanako area.

(3)Displacement acceleration area have also probably extended to the east but more slowly than to the west because the onset of displacement acceleration around Omaezaki was later than that around Nagoya.

(4)Expected time of failure is 2003-2005 although it is different at different stations.

(5)The displacement acceleration is possibly being finished directly beneath Hamamatsu station judging from recent deviation of displacement-time plot from power law curve.

CONCLUSION (using 1999/01/01-2002/01/12 data)

After displacement acceleration was initiated around Hamanako area in April 2001, the area extended to the west faster than to the east. The degree of displacement acceleration at Hamamatsu station has been less and less since the middle of 2001. Expected time of failure is 2003-2005.