Crustal deformation in the Tokai region - Strain analysis of GEONET data -

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Unusual crustal movements have been observed by the dense GPS observation net of the Geographical Survey Institute (GEONET) in the Tokai region since 2000 and a slow slip is thought to occur under the Lake Hamana area. In this area, a big earthquake named Tokai Earthquake is predicted to occur in the near future and there is a possibility that this slip will trigger the big earthquake.

These crustal movements were obtained by subtracting the old crustal movements before June 2000 when the volcanic activity and earthquake swarm became active in the Izu Islands from the present movements. We obtained the strain rates from the GPS data because they do not depend on the choice of the reference station. We made triangulation nets by using the 57 GEONET stations in the Tokai district. We obtained the GEONET positioning data from the Web site of the Geographical Survey Institute, and calculated the yearly strains (principal strains, dilatations and maximum share strains) since 1996 from the baseline lengths of the stations. We smoothed the dilatation results by using a two-dimensional cubic function. The characteristics of the strains obtained are as follows.

1. Principal strain: Large strains were obtained in the area of Izu Peninsula and Omaezaki region between 1996 and 2000. Elongation was obtained in the whole area between 2000 and 2001, it was decreased between 2001 and 2002, and elongation was appeared again in the wide areas after 2002.

2. Maximum shear strain: Large shear strains were appeared in the area of Lake Hamana, Omaezaki and Izu Peninsula regions before 2000, and it moved to the areas of Aichi Prefecture and Suruga Bay after 2000.

3. Dilatation: Negative dilatations were obtained almost all areas before 2000 and positive dilatation were appeared in the coastal area and north area of Shizuoka Prefecture between 2000 and 2001, in the western area of Shizuoka Prefecture between 2001 and 2002, and western part of the area where we investigated in the present analysis between 2002 and 2003.

These results show that the situation of the crustal deformation did not change between 1996 and 2000, and a continuous deformation was obtained. This situation changed in the summer of 2000. Deformation changed from extension to contraction. This is consistent with the results of the velocity vector obtained by the Geographical Survey Institute. The tendency of dilatation changed with time and area. We obtained a large deformation between 2002 and 2003, but it may be an artificial change, such as the change of GPS antennas. We must examine the deformations more in detail with a careful attention.