Modeling of Displacement Velocity Field in the NKTZ due to a Slip in the Lower Crust

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The Geographical Survey Institute performs geodetic surveys in the GEONET. The GEONET reveals a high strain rate in the NKTZ. The NKTZ attributes to a flow of the lower crust. We estimated a slip rate of the lower crust by comparing the calculated displacements on the ground and the GPS observations.

We investigated a displacement velocity field in the NKTZ using the GPS data during the period of January, 1997, to June, 2000. Annual changes were removed from the observed displacements by the least-square method. Displacement velocity was obtained as a gradient of a linear trend of the residuals.

Maximum shear strain calculated using the displacement velocities is large in the narrow zone from Niigata to Kobe. In particular, maximum shear strain in the Niigata-Toyama region is a large value of 10-4/year. It is seemed that the NKTZ is divided in the direction of Japan Sea and the direction of Lake Biwa at the western part of Toyama. Maximum shear strain in the region of Kobe also indicates a large value of 10-4/year, although the NKTZ in Kinki region reveals

small maximum shear strain.

The large maximum shear strain in the NKTZ is occurred by a right lateral slip in the northwest-southeast direction. Lateral displacements in the southeastern region indicate an exponential change according to a distance from the NKTZ, although lateral displacements are nearly uniform in the northwestern region. Vertical displacements have no large gaps around the NKTZ.

Miyazaki and Heki (2001) suggested that the NKTZ attributed to a contraction due to a collision between the Amurian Plate and the North American Plate. The observed displacements in the southwest direction are occurred by a flow of the Amurian Plate in the lower crust. We estimated a slip rate of the lower crust on the profile every longitudes and investigated distribution of the slip rates along the NKTZ.