

Crustal deformation in Kyushu derived from GEONET data and its tectonic origin

Hiromi Takayama[1]; Akio Yoshida[2]

[1] Meteorological Research Institute, Japan Meteor. Agency; [2] Magnetic Observatory

Horizontal displacement field in Kyushu was investigated using GEONET data during the period from 1998 through 2002. To avoid influences of seasonal variation we took differences between monthly mean of the coordinates of each GPS station in April 1998 and that in April 2002.

Characteristics of crustal deformation in Kyushu are apparently different between northern, central and southern parts. The displacement field in the area to the north of around the Beppu-Shimabara graben is very similar to that in the Chugoku district, which may reflect a movement of the Amurian plate. In the central part, especially in the Pacific coastal region of Oita and Miyazaki Prefectures from Beppu Bay to Nichinan coast, an anti-clockwise rotation is conspicuous. On the other hand, a remarkable movement directed to southeast is seen in the southern part. Overlapping to that a dilatational deformation is recognized around Sakurajima volcano. Because that local deformation is a disturbance in the study of displacement field of tectonic origin of a larger scale, we removed it by calculating the most suitable solution for that using the Mogi model.

The movement in southern Kyushu seems somewhat larger in the eastern side around the Osumi Peninsula than that around the Satsuma Peninsula. However, a notable spatial pattern is that the magnitude does not change much from the western end to the eastern end of Kagoshima Prefecture, which feature implies that it is almost impossible to explain the movement by any source located in Hyuga-nada. Then, we first tried to evaluate the movement quantitatively on the basis of an idea by Seno (1999) that the crust in southern Kyushu is dragged to southeast by a flow in the mantle. It was found, however, that the dragging force was not enough. A problem was that we could not extend the area where the dragging effects work to the east-off sea region because of the existence of the subducting Philippine Sea slab. Consequently, we took into consideration effects of a forward-slip on the plate interface. The idea is not unreasonable, for the plate coupling in the Nansei-shoto Trench is weak. It is shown that if we include influences of the plate coupling in the northern part of Hyuga-nada in addition to the above-described effects, the displacement field in central and southern Kyushu could be explained fairly well.