Change in distances between Izu islands after the 2000 event and its tectonic implications

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In the summer of 2000 Oyama volcano in Miyake Island erupted and a gigantic earthquake swarm activity occurred in the sea region to the west of the Island. Crustal deformation at the time of the seismo-volcanic event (the 2000 Izu event) can be explained by a source model that is composed of dyke(s) and faulting slips between Miyake and Kozu Islands. Though the seismic activity decreased substantially in August 2000, appreciable crustal deformation continued rather a long time after the event. Using the GPS coordinate data of GEONET, we studied change in distances between Izu Islands and that between Izu Islands and Honshu arc by subtracting the displacement rate before the 2000 event which we considered to be representative of the steady state.

Followings are notable points of the deformation after the 2000 event

∗Baseline between the GPS stations in Niijima and Miyake Islands lengthened until the middle of 2002.

∗Distance between Hachijo Island and Ogata shortened about 2cm until 2002. The shortening rate was relatively large first and then decreased gradually.

∗Distance between Mikura Island and Ogata had shortened until 2002 similarly as that between Hachijo Island and Ogata, but the shortening continued until the middle of 2006.

∗Baseline between the GPS stations in Mikura and Hachijo Islands lengthened until 2005 decreasing the rate gradually. After that the changing rate of the baseline length has been the same as that in the steady state.

∗Changing rate of the distance between Niijima/Toshima Islands and Ogata has been the same as that in the steady state through the whole period.

Baseline length between the GPS stations in Niijima and Kozu Islands extended until the middle of 2002, which indicates that the dyke intrusion had been continuing. However, it is difficult to explain changes after that time by the same source. Distance between Hachijo Island and Ogata shortened until 2002 decreasing the shortening rate gradually. Although Hachijo Island was deformed at the time of the earthquake swarm near Hachijo Island in August 2002, the shortening of the distance between Hachijo Island and Ogata after the 2000 event is considered to have reflected a deformation in a broad area, because a similar movement is recognized in the GPS data by the Japan Coast Guard. Distance between Mikura Island and Ogata shortened till 2002 decreasing the shortening rate gradually and it has been shortening at a constant rate afterwards. Mikura Island is located near Miyake Island, but the shortening of the distance is too large to consider that it is produced by some source in Miyake Island. Directions of the movement in the southern part of the Izu Peninsula and Mikura Island after the 2000 event were the same as those at the 2000 event, but displacement in the southern part of the Boso Peninsula was not so large. Therefore, it is not possible to consider that the displacements in the Izu Peninsula and Miyake Island after the 2000 event were produced by the same source that caused the 2000 event. It is noteworthy that distances between Niijima/Toshima Islands and Ogata did not change after the 2000 event. This and the above-described spatial pattern of the movements in the northern Izu Islands region suggests that a block boundary exists to the south of Niijima and Toshima Islands and a deformation has been proceeded in the boundary zone after the 2000 event.