Stress field in the Western Tottori and Western Shimane regions deduced by the dense seismic observations

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We estimate the stress field in the Western Tottori and Western Shimane regions by precisely analyzing focal mechanisms from dense seismic observations installed in and around the seismic belt in the San-in district, Japan. In this region, we installed a Manten seismic observation network with 50 high-gain short period seismometers in 2009, and another Manten seismic observation network with 81 high-gain short period seismometers in 2015. In this study, we utilize data from these Manten seismic observation networks and nearby permanent seismic stations, and also those obtained by the group for the dense aftershock observations of the 2000 Western Tottori Prefecture earthquake. It was inferred by previous studies that the azimuths of the maximum compressional stress axis in the seismic belt are oriented in a WNW–ESE direction, while they are aligned in almost the EW direction i in the south of the seismic belt, in the inland plate along the Nankai Trough. This spatial change in the stress field in and around the seismic belt was qualitatively explained by the aseismic slip in a ductile fault zone in the lower crust beneath the seismic belt. The results obtained in this study are summarized as follows. In the region from the aftershock area of the Western Tottori prefecture earthquake to the vicinity of Sanbe-san, rotation of $\sigma 1$ direction was observed. On the south side of the region, the direction of $\sigma 1$ is N 90 ˚E to N 110 ˚E, whereas in the region it is N 100 ˚E to N 140 ˚E, which is a rotation of 20 to 30 ˚. Rotation is large on the west side of the aftershock area of the Western Tottori prefecture earthquake and in the vicinity of Sanbe-san and small between them. In the area around the Shinji Rift zone on the north side of this area, although the number of data is small, the direction of $\sigma 1$ is N 120 ˚E to N 140 ˚E, and the rotation is the largest among the entire area. In this way, in this area, the rotation of the direction of $\sigma 1$ is seen in the central part of the San-in earthquake zone, and among them, the rotation is locally large in the west side of the aftershock area of the Western Tottori prefecture earthquake and in the vicinity of Sanbe-san. In addition, $\sigma 1$ turns greatly around the Shinji Rift zone north of the seismic belt.

In the lower crust beneath the vicinity of the seismic belt, a low velocity zone of about 50 km in width is estimated at a depth of 25 km (Tsuda et al., 2017). In the upper crust, large low velocity anomalies are seen along the Shinji Rift Belt. The stress field in this area may be formed by shortening in the orthogonal direction of the Shinji groove belt in addition to the slow slip immediately beneath the seismic belt Kawanishi et al. (2009) estimated the stress field with the seismic zone as a region, but it became clear that there is an internal structure in it.

Keywords: stress, lower crust, focal mechanism, intraplate earthquake, seicmic observation

