Stress field in the Western Tottori and Eastern Shimane regions deduced by the Manten seismic observation

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We estimate the stress field in the Western Tottori and Eastern 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. In this study, we utilize data from this Manten seismic observation network 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, but quantitatively not. It was found that the rotations of the maximum compressional stress axis are too large to be generated only by the aseismic slip. In this study, we found that the rotations are larger to the north in the eastern part of the study area, and that there exist low velocity anomalies in the shallower part in the crust near the northern edge of the seismic belt. This suggests that stress concentration is generated by anelastic deformation in the low velocity anomalies, which are aligned along the seismic belt. Namely, the stress field in the Western Tottori and Eastern Shimane regions is explained both by the aseismic slip in the lower crust and by the anelastic deformation in the low velocity regions.

Keywords: stress field, lower crust, seimic belt, Manten project, Western Tottori earthquake

