Shear-wave polarization anisotropy in the focal region of the 2000 Tottori-ken Seibu earthquake

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The 2000 Tottori-ken Seibu earthquake (Mjma7.3) occurred on October 6, 2000. We carried out an aftershock observation by using broadband strong-motion seismographs in and around the aftershock region, and analyzed shear-wave polarization anisotropy in this region by using the records of M2.5 to M3.5 aftershocks. Applying the cross-correlation method to the records, we found the leading shear-wave polarization directions (LSPD) are nearly east to west, which is almost identical with the P-axis of the mainshock. This suggests the exist of the shear-wave polarization anisotropy and shear-wave splitting in this region, which are caused by the preferred orientation of cracks due to the regional tectonic stress.

The 2000 Tottori-ken Seibu earthquake (Mjma7.3) occurred on October 6, 2000. We carried out an aftershock observation by using broadband strong-motion seismographs at two sites in and around the aftershock region for 55 days from October 8 to December 1, 2000. Stations FKB (N35.2584,E133.3993,244m) and RFJ (N35.2020,E133.4468,298m) are located southeast of the epicenter of the mainshock. We analyzed shear-wave polarization anisotropy in this region by using the records of M2.5 to M3.5 aftershocks of which the incident angles are less than 35 degree in consideration of the influence of free surface. We deduced the incident angles from the amplitudes of the P-wave first motion on the three components of records.

We used the cross-correlation method to analyze the shear-wave polarization anisotropy. The cross-correlation method gives the leading shear-wave polarization direction (LSPD) and the delay time between the split shear-waves. The number of events in this study is 40 for station FKB and 14 for station RFJ. The determined LSPD using the records of the both stations is N106.0E (N109.3E for FKB;N96.3E for RFJ). Mean value of the delay time per 1km for all records is 6.0msec (6.0msec for FKB records;6.7msec for RFJ records). We then conclude the exist of the shear-wave polarization anisotropy and shear-wave splitting in this region since the LSPD is aligned to a certain direction and the delay time is the adequate value to describe. The leading shear-wave polarization directions (LSPD) are nearly east to west, which is almost identical with the P-axis of the mainshock. This suggests that the preferred orientation of cracks caused by the regional tectonic stress brought about an anisotropic elastic medium in this region. The crack density is then estimated to be a mean value of 0.03 over all records (0.03 for FKB records;0.02 for RFJ records). We can also see that spatial variation of the delay time between the split shear-waves per unit path length:the value of crack density is higher for propagation paths crossing the fault zone of the mainshock compared with path not crossing it.