Spatial variation of shear wave anisotropy in the focal region of the 1997 northwestern Kagoshima earthquakes.

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In the focal region of the 1997 northwestern kagoshima earthquakes, shear wave polarization anisotropy was shown by Watanabe et. al. (1999). In present study, we analysed more events to investigate it in detail and to guess the origin. Since most of LSPD is identical with the maximum pressure axis of horizontal stress in this region, we suppose that the origin of anisotropy except in the northwestern part of the focal region is aligned microcracks caused by the tectonic stress. In the northwestern part of the focal region, LSPD is parallel to the distribution of aftershocks, which suggests the origin of anisotropy here is the fracture generated when the first main shock occurred. And we found spatial variation of the crack density correspond to the asperity of main shocks.

In 1997, two moderate earthquakes occurred in the northwestern part of Kagoshima prefecture, Japan (Mjma6.5 on March 26 and Mjma6.3 on May 13). Two days after the first main shock occurred, Kyushu University has started observing after shocks at SIBI, one of the seismic stations of Kagoshima University. Watanabe et. al.(1999) found shear wave polarization anisotropy in the focal region of the 1997 northwestern Kagoshima earthquakes. In this study, we analysed more events to investigate it in detail and to guess the origin of anisotropy.

The leading shear-wave polarization directions of most events except those in the northwestern part of the focal region are identical with the maximum pressure axis of horizontal stress in this region. In the northwestern part, the leading shear-wave polarization directions are not parallel to the maximum pressure axis of horizontal stress but the direction of the distribution of aftershocks. We suppose the origin of anisotropy except the northwestern part is aligned microcracks caused by the tectonic stress, and in the northwestern part, that is the fractures generated when the first main shock occurred.

Using the crack model of Hudson(1981), we estimated the crack density. The results suggest that crack should be dry rather than wet. And we found spatial variation of the crack density in the focal region. The crack density is low around the hypocenter of the main shocks, while it is high near the end of the focal region. We interpret that the low crack density part was caused by closing of cracks generated by tectonic stress. Comparing our results with P-wave velocity structure in this region derived by Miyamachi et. al.(1999), the low crack density part corresponds with the low velocity zone and the high crack density part corresponds with the high velocity zone. We might be able to see the asperity of the main shocks by the crack density.