# Stress field and anisotropy structure in the focal area of the 2004 Niigata-ken Chuetsu earthquake

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A large earthquake with a magnitude of 6.8 occurred in the central part (Chuetsu district) of Niigata Prefecture, central Japan, on October 23, 2004. A temporary seismic network composed of 54 stations was installed by Tohoku University two days after the main shock. The observation lasted for about a month and many small aftershocks were detected. We analyze shear wave splitting using the waveform data obtained by the aftershock observation and investigate anisotropy structure around the focal area of the main- and after-shocks. We also focus on the difference between the anisotropy within an earthquake fault zone and that in the surrounding area.

We use the earthquakes with magnitudes larger than 1.5 that have incident angle of less than 35 degrees. The leading shear wave polarization direction (fast direction) and the lag time of two quasi shear waves (DT) are obtained by applying the cross-correlation method (e.g. Ando et al., 1983). Seismograms are band-pass filtered at 2-8 Hz at the cross-correlation computation. We search for the optimizing pair of fast direction and DT from the two horizontal component of each seismogram using a grid search, in the range of 0-180 degree with increments of 5 degrees for fast direction, and in the range of 0-1s with increments of 0.01s for DT. We set the time windows of the cross-correlation computation to be the first one cycle of the shear wave for each seismogram.

We observed shear wave splitting at 37 stations, and the obtained results showed different pattern of shear wave splitting between the northeastern and southwestern parts of the study area. Fast directions are E-W or ESE-WNW at many stations in the southwestern part of the study area. This direction is consistent with the direction of the maximum principal stress inferred by stress tensor inversion calculation. However, NE-SW fast directions are dominant at stations in the vicinity of the epicenter of the mainshock, inconsistent with the regional stress field. We calculated the spatial average of the splitting parameter to show spatial variation of anisotropy using the method of Audoine et al. (2004) and compared it with the seismic velocity structure of the study area determined by Okada et al. (2005). We found that the high-Vp region near the fault zone has almost NE-SW fast directions and small DTs and the low-Vp region in the southwestern and northeastern part of the study area have E-W fast directions and relatively large DTs. We infer that the anisotropy in the focal area estimated in this study is closely related to the seismic velocity structure.