

A relaxation of seismic anisotropy in the shallower crust strengthened by a moderate size earthquake

Hiroshi Honma[1], Yoshihiro Hiramatsu[2], Muneyoshi Furumoto[1], Tooru Ooida[3]

[1] Dept. Earth Sci., Kanazawa Univ., [2] Natural Sci., Kanazawa Univ., [3] RCSV, Nagoya Univ.

Shear wave splitting is a useful tool to investigate the stress in the crust where the preferred alignment of cracks, governed by the stress, generates seismic anisotropy. Saiga et al. (2003) investigated a temporal variation in the crustal anisotropy in the Tokai region, Central Japan, before or after the Aichi-ken Tobu earthquake ($M=5.7$) in 1997. They reported that the time delay between two splitted waves at the station STN increased after the earthquake. On the other hand the time delay at the station INU showed no change. They explained that the change is possibly caused by the increasing of crack density and pore fluid pressure using ΔCFF . We report here a relaxation process of seismic anisotropy strengthened by the Aichi-ken Tobu earthquake from a temporal variation in the crustal anisotropy in the region.

We use a total of 47 high-quality waveform data recorded from August 1999 to December 2002 by the micro-earthquake observation network of the Research Center for Seismology and Volcanology, Nagoya University. We estimate the leading shear wave polarized direction and the time delay by the method of Silver and Chan (1991).

Most of the leading shear wave polarized direction show E-W or ENE-WSW at the station STN, and ESE-WNW at the station INU. These results agree well with those of Saiga et al. (2003). We find that the time delays increasing after the Aichi-ken Tobu earthquake decrease, and are back to the values before the earthquake in summer of 1999. This variation is recognized for both the events in the crust and those on the upper plate of the subducting Philippine Sea plate, suggesting that the seismic anisotropy in shallower crust has changed. On the other hand the temporal variation in time delay at the station INU shows constant. We can consider that the crack density and the pore fluid pressure in the shallower crust increasing after the Aichi-ken Tobu earthquake around the station STN decrease to the state before the earthquake in 1997 for about two years. In other words it means that cracks heal with the relaxation time of approximately two years.