Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SSS034-P11 Room:Convention Hall Time:May 23 10:30-13:00

Anisotrophic medium structures above a deep low-frequency tremor zone in the southern Kii peninsula

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A dense seismic observation with a linear array was conducted from December 2009 to May 2010 above a low-frequency earthquakes (LFEs) belt in central Kii peninsula. We studied anisotropic medium structures of the crust and mantle wedge by shear-wave splitting analysis. To determine the azimuths of the fast direction of polarization and the delay times of the split shear waves, we applied the method of Silver and Chan (1991) to band-pass filtered (1-8 Hz) horizontal-component seismograms by a semi-automated grid-search inversion method. We obtained a total of 1934 pairs of optimized splitting parameters.

We obtain the fast direction of polarization parallel to the direction of the maximum horizontal compressive stress in the crust. This suggests that anisotropy originate from regional stress in the crust. Depth variation profiles for the delay time show a increase with the increasing hypocenter depth. The increase in the delay time with depth is remarkable in central Kii Peninsula where there is about 0.05 s increase between depths of 30 and 50 km. This suggests that anisotropy may exist not only in the upper crust but also in the lower crust, the mantle wedge, and/or the subducting slab beneath the Kii Peninsula.

Keywords: shear wave splitting, Kii Peninsula, deep low frequency earthquake, mantle wedge, seismometer array