Spatial variations of shallow very low-frequency earthquake activity along the Nankai Trough based on CMT inversion using the 3D heterogeneous model

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To reveal structural properties around the Philippine Sea plate boundary, we investigated spatial variation of shallow very low-frequency earthquake (SVLFE) activity along the Nankai Trough. By using F-net velocity seismograms for periods of 20-50s, we conducted centroid moment tensor (CMT) inversion of SVLFEs detected by array analysis of Asano et al. (2008 EPS). Our CMT method is basically same as in Takemura et al. (2018 GRL). Source grids were assumed on the boundary of the Philippine Sea plate at horizontal intervals of 0.1°. Green's functions from source grids to F-net stations were evaluated by finite-difference method simulations of seismic wave propagation within the 3D heterogeneous structure model of Takemura et al. (2019 PAGEOPH).

We applied our CMT method to SVLFEs occurred from June 2003 to May 2018. Almost of CMT solutions are low-angle thrust faulting mechanism occurred around the accretionary prism toe. We evaluated spatial variations of SVLFE activity along the Nankai trough by calculating cumulative moment at each source grid. The areas with large cumulative moments appeared near the trench axis of off the Cape Muroto, the Kii Channel and the southeastern Kii Peninsula. We found spatial correlations between cumulative moment, slip-deficit rate (Noda et al. 2018 JGR) and *S*-wave velocities (Tonegawa et al. 2017 Nature Comm.) around the Philippine Sea plate boundary. Such spatial correlations suggest that SVLFEs are effectively activated by mechanically weakening due to pore fluid at surrounding area of strongly locked zone of the Philippine Sea plate.

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NIED F-net broadband velocity seismograms were used. The catalogs of slow earthquakes were downloaded from the website of slow earthquake database (Kano et al., 2018 SRL). Finite-different method simulations were conducted on the Earth Simulator at the JAMSTEC.

Keywords: Nankai Trough, Shallow very low-frequency earthquake, CMT inversion, Pore fluid pressure, Slip deficit rate

