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紀伊半島沖付加体内部の間隙水圧分布：分岐断層とデコルマの関係
Pore pressure distribution in the Nankai Trough off Kumano: Potential rupture propagation from mega-splay to decollement

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The Nankai subduction zone has repeatedly generated great earthquakes in excess of Mw 8. Because great earthquakes at convergent plate margins are believed to occur both at the plate interface and on mega-splay faults, seismic reflection data were acquired to reveal the structure of these seismogenic faults. However, we cannot clearly interpret the evolution of such a mega-splay fault system from the reflectivity images alone because of the low signal-to-noise ratio at the landward side of the active mega-splay fault, which may be due to rock consolidation as well as multiple reflections. Furthermore, the transition zone between the landward mega-splay fault and the seaward decollement is unclearly imaged because of the topographic relief at the outer ridge. The structures and pressure conditions of the transition zone are critical to evaluate coseismic rupture propagation close to the trough axis that may lead to tsunami generation. The 1605 Keicho earthquake (Mw7.9) is well known as a tsunami earthquake in the Nankai Trough, and was characterized by coseismic rupture close to the trough axis. The tsunami of the 2011 Tohoku-oki earthquake was also generated because of rupture propagation close to the trench.

Kamei et al. [2012, EPSL] applied frequency-domain Waveform Tomography (WT) to controlled source Ocean Bottom Seismometer (OBS) data, and retrieved high-resolution P-wave velocity images of the mega-splay fault system. By exploiting recorded seismic waveforms beyond their first arrivals, the WT method achieves a much higher resolution than that of conventional traveltime tomography methods, and resolves the transition zone between mega-splay fault and seaward decollement. In this study, we explore the evolution of the mega-splay fault and its relationship to the decollement based on pore pressure distribution. We applied the methodology in Tsuji et al. [2008, JGR] in order to estimate the pore pressure around the Nankai mega-splay fault from the WT-derived seismic velocity model by integrating logging data and laboratory-derived data. Our results suggest that a high pore pressure zone at the footwall side of the deep mega-splay fault continues to the seaward region close to the trough axis. The normalized pore pressure ratio of the footwall of the basal mega-splay fault (abnormal pressure zone between the fault and crustal surface) have almost constant values. This high pore pressure distribution indicates the possibility of coseismic rupture propagation from the deep mega-splay fault to the seaward trough region.

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