Possible fluid effects on megathrust fault in the coseismic rupture zone of the 2011 Tohoku-oki earthquake

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Among the wide range of hydrological, and structural factors that potentially affect tsunami earthquakes, the fluid effect on rupture along the shallow plate boundary fault is also one among those of the most importance. Previous studies suggested that the relationship between the rupture propagation and the fluid effect is closely associated with tsunami earthquake generation at subduction zones such as the Nankai Trough. Similar to all other known catastrophic giant earthquakes, the coseismic rupture of the 2011 Tohoku-oki earthquake has propagated along a shallow plate-boundary fault nearly all the way to the Japan Trench: therefore, the event of Tohoku-oki might offer an example for role of fluid that can cause the rupture propagation. However, the fluid influence on the rupture propagation beneath the Japan Trench margin and fluid-involved mechanism for tsunami earthquakes are poorly understood.

In order to estimate a possible fluid influence on accreted structure landward of the Japan Trench, we processed and analyzed multichannel seismic (MCS) reflection data that extend across the forearc slope of the Japan Trench. Preliminary MCS results show a wedge-shaped unit under the upper slope, a strong reflection zone overlying a prominent reflector with reverse polarity under the middle slope, indicating the possible effects of fluid on the megathrust fault. A comparison between post-stack time migrated profile and pre-stack depth migrated profile demonstrates the tectonic structures suggesting the fluid distribution.

Keywords: tectonic structure, rupture zone, fluid

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