Material science database for Tokai Slow Slip region -What is the cause of high Poisson's ratio ?

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The dense GPS observation system has revealed various styles of slip at subduction plate boundaries such as slow slip and after slip. They occur at the deeper part of large earthquake asperities. In order to understand the seismotectonics at subduction plate boundaries, we must clarify the cause of diversity of slip through constituent materials, physical conditions and physical properties of materials. The first step is to infer the constituent material and physical conditions from geophysical observation, geological and petrological knowledge, physical properties of rocks and numerical modeling.

Kamiya and Kobayashi (2002) reported a detailed tomographic image around Tokai Slow Slip region, and found a high Poisson's ratio region (0.30-0.35) at Tokai Slow Slip region. They attributed the observed high Poisson's ratio to the existence of serpentinite. On the other hand, Kodaira et al. (2004) attributed the high Poisson's ratio to the high pressure pore fluid in the oceanic crust.

Using P-wave velocity as a constraint to constituent materials, we think the high-temperature type serpentinites (containing antigorite) is most probable to exist at Tokai Slow Slip region. P-wave velocity is 6.8-7.0 km/s in the high Poisson's ratio region. The typical P-wave velocity of basalts (oceanic crust) is around 6.0 km/s, and the pore fluids will reduce the velocity. On the other hand, our measurements on serpentinites have shown that the high-temperature type serpentinites satisfy both the P-wave velocity of 6.8 km/s and Poisson's ratio higher than 0.30.