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# Brittle-ductile transitional zone in the Tohoku-oki interplate thrust fault

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BBefore the 2011 Tohoku earthquake (M9), the interplate coupling in NE Japan, where a cold slab of the Pacific plate is subducting, had been believed to be weak.

A strength envelope is proposed for the plate boundary megathrust that generated the 2011 Tohoku earthquake. It is assumed that the frictional properties of the plate interface is governed by subducting oceanic crust materials and sediments in the accretionary prism. For siliceous oceanic sediments, a dislocation creep flow law wet quartz (Paterson and Luan, 1990) was applied. The hypocenter of the M9 event is located at a depth the deepest part of the island arc crust or the uppermost part of the wedge mantle. The pressure and temperature conditions at this depth corresponds to to the upper limit of the brittle-ductile transitional zone of wet quartz. The rupture of this high-strength zone at mainshock of the 3.11 event is possibly triggered by the collapse of the subducted seamount. The M7-class asperity of the Miyagi-oki earthquake in 1978 is considered as a seamount, which has subducted to the depth of the mantle wedge. The conditionally stable nature of their matrix is understood by the velocity-dependence of viscous/frictional properties in the brittle-ductile transitional zone.

Keywords: The 2011 off the Pacific coast of Tohoku Earthquake, asperity, rheology, subduction zone, brittle-ductile transition, quartz