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# 南海トラフ巨大分岐断層物質の中速摩擦特性
# Frictional properties of megasplay fault materials in the Nankai subduction zone for intermediate slip velocities

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Knowledge of frictional properties of fault materials for a wide range of velocities is essential for understanding mechanical behavior of faults. Here, we present results from a series of frictional experiments over a range of slip velocities from 0.0026 to 260 mm/s, with $>$ 250 mm of displacements on clay-rich fault materials from the major splay fault within the Nankai accretionary complex (a megasplay fault zone) for water saturated condition.

All of the samples tested in this study were collected at Sites C0001 and C0004 during the IODP expedition 316. Friction experiments were conducted on the samples using a rotary-shear, intermediate- to high-velocity friction testing machine. The experimental fault is composed of a 24.9 mm diameter granite cylinder assembled with an intervening thin layer of gouge (initial gouge thickness were 0.5 or 1.0 mm). A PTFE (Teflon) ring surrounds the fault in order to avoid gouge expulsion during rotation. The collected samples were disaggregated, oven dried at 50 degrees centigrade for 24 hours and then sieved in order to eliminate clasts larger than about 0.17 mm. Distilled water of 0.5 ml in volume was added to the 0.5 mm-thick gouge layer (1.0 ml for 1.0 mm gouge) in order to prepare saturated (wet) condition of the experimental gouge layer. The assembled gouge has been axially pre-compacted at the test condition (5 MPa) for half an hour.

Experimental results reveal that there are both velocity-weakening and velocity-strengthening fault materials for slip velocities from 0.026 to ˜26 mm/s. The velocity weakening behavior could provide a condition to initiate unstable fault motion at shallow depths along the splay fault. On the contrary, velocity strengthening behavior may affect to stabilize the propagation process of earthquake nuclei that emerges in the velocity weakening portion along the fault. For velocities v $>$ 260 mm/s, friction of all samples decreases dramatically with increase of the slip velocity.

The tested samples contain clays, quartz, plagioclase and calcite [Expedition 316 Scientists, 2009]. Variation of the clay content and composition of the clays may play an important role controlling the frictional velocity dependence of the megasplay fault at shallow depth conditions. For example, lithological unit that includes abundant ash layers would be a candidate of smectite-rich horizon, and this type of compositional variation along the fault may contribute to produce patch-like distribution of the frictional velocity dependence along the splay fault.

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