# Frictional behavior of a mudstone sample cored from the shallow Nankai-Trough accretionary prism during the IODP Exp. 315

# Kanae Iwanabe[1]; Kyuichi Kanagawa[2]; Masao Nakatani[3]; Hiromine Mochizuki[4]

[1] Earth Sciences, Chiba Univ.; [2] Dept. Earth Sci., Chiba Univ.; [3] ERI; [4] Earthquake Research Institute University of Tokyo

We have examined frictional behavior of a mudstone sample cored from the shallow Nankai-Trough accretionary prism by D/V 'Chikyu' during the IODP Exp. 315. The mudstone sample has been taken from the depth of 264.8 mbsf at site C0001. The in-situ pressure and temperature are estimated to be ˜26 MPa and ˜13 degrees C. Friction experiments have been conducted using an oil-medium triaxial apparatus at Earthquake Research Institute, University of Tokyo. In each experiment, a ˜2 mm thick layer of mudstone gouge was placed between a pair of cylindrical Berea sandstone blocks with a diameter of 30 mm and sawcut with an angle of 30 degrees to the cylinder axis. Experimental conditions were 50 MPa confining pressure, room temperature and 1 or 10 micron/s axial displacement rate. 50 MPa confining pressure corresponds to the pressure at a depth of ˜1500 mbsf, while room temperature to the temperature at a depth of ˜500 mbsf. Although these experimental pressure and temperature are different from the in-situ pressure and temperature of the sample, they still provide a reasonable condition corresponding to shallow levels of the Nankai-Trough accretionary prism. We have done a friction experiment on dry gouge at a constant axial displacement rate of 10 micron/s, while we have done a velocity-stepping experiment on wet gouge in which the axial displacement rate was oscillated between 1 micron/s and 10 micron/s.

Steady-state frictional strength and coefficient of friction at 10 micron/s axial displacement rate were ˜46 MPa and ˜0.6 for dry gouge, while ˜28MPa and ˜0.42 for wet gouge. The reason for these differences in frictional strength and coefficient of friction between dry and wet gouges is unknown at present, and further study is needed. It may be due to a pore pressure generated during the wet experiment, but remains uncertain because of pore pressure data unavailable.

(a-b) values during a velocity-stepping experiment were always positive, and 0.003-0.005 in case of friction dependent on a common logarithmic function of sliding velocity. Thus mudstone at shallow levels of the Nankai-Trough accretionary prism exhibits velocity-strengthening behavior. Faulting at shallow levels of the Nankai-Trough accretionary prism is therefore stable and aseismic. Further friction experiments on deeper accretionary sediments at in-situ conditions may eventually reveal the depth where frictional behavior changes from velocity-strengthening to velocity-weakening, and hence the upper limit of seismogenic zone.