J169-011 **Room: 302** **Time: May 17 14:24-14:36**

Frictional properties of chert rock at middle to high velocity and associated change of sliding surfaces

Nao Hayashi[1]; Akito Tsutsumi[2]

[1] Department of Geology & Mineralogy, Kyoto Univ.; [2] Graduate School of Science, Kyoto University

Recent experimental studies on rock friction revealed that novaculite, a quartz-dominated rock showed a drastic degree of velocity weakening in the range of the sliding velocity from 1 mm/s to 100 mm/s (Goldsby and Tullis, 2002; Di Toro et al., 2004). At 100 mm/s, steady state value of friction was extraordinary low at about 0.2. From the observations that the extraordinary low friction was accomplished after several meters of sliding and that the degree of low friction became larger for higher sliding velocities, it was proposed that the extraordinary low friction was accomplished by silica gel formation at the sliding surface and their thixotropic behavior. Here, we conducted a series of frictional experiments on a chert, a major quartz-dominated component of accretionary complexes, to see whether the low friction observed for novaculite is observed for chert, and to examine whether the sliding surfaces are covered with silica gel.

Experiments have been performed on a pair of cylindrically shaped chert samples, at sliding velocities from 2.6 mm/s to 130 mm/s and at 0.45 MPa of normal stress, in the room temperature and room humidity conditions with a rotary-shear frictional testing machine. Test samples are very siliceous rocks of chert from the Tamba belt (a Jurassic accretionary complex), northern part of Kyoto prefecture. Blocks of the chert sample collected in the field were shaped into solid cylinders with diameter of 25 mm.

The results of the experiments show that the tested chert exhibits an extraordinary low value of friction at about 0.2 at higher velocities than 80 mm/s. We conducted a Fourier transform infrared spectroscopy (FTIR) and a X-ray diffraction (XRD) analysis on the wear materials formed on the sliding surfaces, which have experienced the sliding at 44 mm/s at 0.90 MPa of normal stress. From FTIR analysis, it is revealed that hydrated materials exist in the wear materials. Results from the XRD analysis shows that the wear materials are the mixture of amorphous materials and quartz. From the results, it is suggested that these wear materials probably form a mixture of silica gel and quartz particles derived from the chert sample. A SEM observation of the sliding surface of the tested sample reveals that the observed fault surface is made of rough zones and smooth zones. These zones constitute a concentric pattern. The smooth zone is similar in appearance to the texture of the tribochemically weared surface of ceramics such as the SiC tested in water. Similar to the case for tibochemically weared ceramics, tribochemical reaction of SiO_2, and the production of amorphous materials on the sliding surfaces could offer a possible mechanism to cause the ultra-low friction of chert sample.