Mass transfer by fluid flow through a shear zone in Ryoke older granite

Kuniyo Kawabata[1]; Hidemi Tanaka[2]

[1] Earth and Planetary Sci., Tokyo Univ; [2] Dept. of Earth and Planet Sci., Univ. Tokyo

Mass transfer by water-rock interaction through fault zone and ductile deformation zone is important for change of properties controlling cycle of fracture as fault weakening or strengthening of deformation zones (e.g. O'Hara, 1988). Especially, mass transfer in ductile shear zone such as mylonite zone leads understanding of structural and chemical change as initial stage of fault evolution. Evidence for mass transfer with fluid flow though fault zone in upper and mid- crustal depth have been indicated by changes in bulk rock chemistry relative to their protolith chemistry. In this poster we concentrated on a particular aspect of fluid-rock interaction within fault in ductile deformation zone that is the mass changes resulting from water-rock interaction as dissolution, precipitation and transport of elements. Crustal-scale faults have often a complex structure, resulting from multiple events of slip and deformation. To circumvent this difficulty, we chose in this work a small-scale fault zone developed in the Ryoke older granite whose relatively simple structure enabled us to assess mass/volume variations of preliminary stage of fault evolution.

The mylonite zone in the Ryoke older granite includes wide quartz veins in its core, suggesting large fluid flow and mineral precipitation concomitant with deformation. Results of detailed mesoscopic and microscopic observations show that various degrees of mylonitization are distributed along the fault zone. Temperature condition of the deformation is evaluated on the basis of contrasted rheology of quartz and feldspar as ranging from 250 to 400 ^{0}C, i.e. around seismogenic depth. Estimation of mass change using Grant's isocon method (Grant, 1986) indicates that large mass changes (-40 % ˜+ 112 %) occurred only in the vicinity of the fault zone. Almost all samples except for quartz vein present mass decrease. Mineral composition analysis shows that the mass changes were caused mainly by quartz precipitation or dissolution. The mass changes are not related to degree of mylonitization. Analyzing the geometry of the fault zone, we showed that most samples presenting mass loss are situated in tension field, implying that variation of mass changes might be brought by variation of the stress field.

O'Hara, K. 1988. Fluid flow and volume loss during mylonitization: an origin for phyllonite in an overthrust setting, North Carolina, U.S.A. *Tectonophysics* 156, 21-36.

Grant, J. A. 1986. The Isocon Diagram - a Simple Solution to Gresens Equation for Metasomatic Alteration. *Economic Geology* 81(8), 1976-1982