G210-P006 **Room: Poster Session Hall** **Time: May 25**

Group feature of the cracks and its importance on fluid transportat: a case in the Kanto Mountains, the Sambagawa metamorphic belt

Masayuki Tamahara[1]; mitsuhiro toriumi[2]

[1] DCSE,GSFS,UT; [2] GSFS,Univ.Tokyo

http://www.gaea.k.u-tokyo.ac.jp/

Fluid in the crust usually flows in rocks. As a path, porous flow and crack flow are considered. Crack flows have been investigated based on the fact that there are many sealed-cracks (veins) in the subduction related metamorphic belts (e.g. Toriumi and Yamaguhi (2000)). Group feature of the cracks, especially clustering property, is important for fluid flows in the crust.

Toriumi and Hara (1995) elucidated the manner of sealed-cracks in natural system and reported width (thickness), length, and spacing frequency distributions take power-law forms. Thus cracks in the crust are expected to make highly clustered structure. Toriumi and Yamaguchi (2000) described the temporal and space developing model of the crack systems, in which the master equation of number density of the cracks have a non-linear term and scale- and time-invariant solutions of two-thirds power exponents. The clustering property predicted by the model is comparable to the result, 0.7-0.9 fractal dimensions in 1-D for spacing, by Toriumi and Hara (1995). In the clustering crack systems, the power exponents D among width, length and spacing are expected to have correlation relations similar to those of earthquakes among fractal dimension Dc, p-value of modified Omori formula and b-value of Gutenberg-Richter relation. Whether the correlation patterns in the crack systems are consisted in natural system is also important for the scale problem of fracture phenomenon.

In this study the details of distributions of width, length, and spacing of clustered sealed-cracks within pelitic schist in some places ranging chlorite to biotite zone of metamorphic grade, in the Kanto Mountains, the Sambagawa metamorphic belt are investigated. The correlation relations among width, length, and spacing of sealed-cracks are also done.

Cumulative frequency distributions of width and length take power-law forms in all places. The power exponents of width range 0.5-1.7, and length 0.8-1.2. The positive correlation of power exponents between width and length is clearly seen. The fractal dimensions of sealed-cracks in 1-D range 0.6-1.0, but 0.7-0.9 mostly. The negative correlation between the fractal dimension and the power exponents of width are also seen. Thus the clustering of cracks has an effect on width, length, and spacing simultaneously.

The shape of the sealed-cracks in each place has a relation $W=kL^{m}$. If the value of m is large, the shape is fat. Due to $dW/dL=kmL^{m-1}$, the growth velocity of width increases as length for m greater than 1 and decreases for m smallaer than 1. The value of m seems to change with not only the metamorphic grade or depth but also the degree of clustering.

The thermal effects indicated by metamorphic grade on the crack shape and clustering property are also investigated. Characteristics of fabric in the crack sealed mainly by quartz don't change significantly in all places. Mean grain size of quartz in the sealed-cracks has a linear relation with width. This pattern doesn't change with metamorphic grade. The depletion of silica in both sides of the sealed-cracks also doesn't change with metamorphic grade. The cause of differences of shape and clustering property of the sealed-cracks with metamorphic grade may be thought to be not thermal effect but simply depth.

From those facts, crack growth and propagation in the crust are affected by depth and clustering. Fluid transport may also be in the same way. Positive feed back in crack flow are strongly indicated. Model applicability and the importance of clustering of cracks on fluid transport are concluded.