

Argon dating of paleoearthquake

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The author has dated the fault gouge materials and pseudotachylite in Japan with his colleagues using K-Ar and Ar-Ar methods since 1992 and considered a study to determine timing of paleoearthquake (Itaya et al., 1999) to apply a Grant-in Aid from the Japanese Ministry of Education, Sports, Culture, Science and Technology. It is to date the fault gouge materials and pseudotachylite that formed when earthquake happens in the crust. We have called the materials hypocentral region materials. The fault gouge and cataclastic materials of them contain the authigenic fine-grained phyllosilicates newly grown during the fault movement. We will be able to estimate the timing of paleoearthquake if we can separate the pure authigenic fine-grained phyllosilicates and date them. However, we have no technique to separate the pure authigenic fine-grained phyllosilicates from the materials so far. Then, many geochronologists using argon-dating method have tried to date the impure separates from the gouge materials and estimate the timing of fault movement for paleoearthquake with very specific techniques.

One of the techniques was the correlation diagram between the apparent age and the XRD analyses data of the separates. It was successful when the separates consist of two components of phyllosilicates (Tanaka et al., 1995; van der Pluijm et al., 2001). One is the authigenic fine-grained phyllosilicates and other, a phyllosilicate in host rock. In Tanaka et al. (1995) who studied the gouge from the Akaishi tectonic line, central Japan, the phyllosilicate in host rock was the phengite in the Sanbagawa schist. They used the correlation diagram between the apparent age and Kubler index of separated materials, a concave curve, which asymptotically approaches parallelism with the x-axis at approximately 15 Ma. On the other hand, in van der Pluijm et al. (2001) who treated the gouge from the Lewis thrust in the southernmost Canadian Rockies, the host rock was mudstone and bentonite unit that contain fortunately a phyllosilicate phase derived probably from a simple hinterland. They used the correlation diagram between the apparent age and the percentage of detrital illite in the separates, a straight line, which crosses the y-axis at 0 %, giving 52 Ma and 172 Ma at 100 %.

We have no methodology for the separates from the fault gouge and cataclastic materials that have complicated history, for three and more components of phyllosilicates so far. UV laser pinpoint argon dating of microcrystallines in pseudotachylite may be available methodology to estimate timing of paleoearthquake.

Itaya et al.(1999) A study to determine timing of paleoearthquake. *Gekkan Chikyu* 21 (1), 13-18.

Tanaka et al. (1995) Timing of the cataclastic along the Akaishi tectonic line, central Japan. *Contr. Mineral. Petrol.*, 120, 150-158.

van der Pluijm et al. (2001) The dating of shallow faults in the Earth's crust. *Nature*, 412, 172-175.