Analysis of deformation condition of the Hatagawa fault zone, NE Japan

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The Hatagawa Fault Zone (HFZ) is located in the eastern part of the Abukuma Mountains, NE Japan. It extends in a NNW-SSE direction for up to 100km. The fault activity of the HFZ started as a mylonitization with a sinistral sense of shear after the intrusion of granitic rocks in 126+/-6 Ma and terminated as a cataclasis before 98.1+/-2.5 Ma.

The main cataclasite zone, which is considered to be the core of the HFZ, extends continuously in an N-S direction and has a width of about 100m. Mylonite zones with a sinistral sense of shear partially surround the cataclasite zone and have a maximum width of 1 km. Small-scale shear zones, with widths ranging from a few mm to a few meters, are distributed in the surrounding granitoids. Plastic deformation and brittle deformation are often closely associated in the shear zones.

Shigematsu and Yamagishi (2002) categorized quartz microstructure in the mylonites in the HFZ into two groups; microstructure A characterized by core and mantle structures and microstructure B characterized by sutured grain boundaries, smaller aspect ratios and less striking undulatory extinction comparing to A. The deformation conditions are estimated to be below 360 C for the mylonite with microstructure A and above 360 C for the mylonite with microstructure B based on the two feldspar thermometry. Garnet-biotite-plagioclase geothermobarometry for mylonite with microstructure B indicates high geothermal gradient (400 C, 2kb). The mineral assemblages of cataclasite indicate that the cataclasite was formed at temperatures higher than 220 to 300 C.

These, together with the limited duration of the activity of the HFZ, suggest that the fault activity gradually changed from mylonitization to cataclasis.