# Fault evolution process related to stress field transition around the Byobuyama fault, central Japan

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The central Japan is one of the concentrated area of active faults, which consist of the complicated fault geometry system. It has been reported that the origin of such fault zones can be traced back to the formation of cataclasite zone in late Cretaceous to early Paleogene (Oohashi and Kobayashi, 2008; Niwa et al., 2011). But, the fault development history reported in previous researches has lower resolution than the plate motion history, especially in Neogene period. Therefore, we performed structural study focused on the Byobuyama fault, central Japan. The Byobuyama fault is suitable for constraining the age of fault movement because Miocene Mizunami group and Pliocene-Pleistocene Toki Sand and Gravel formation are located around the fault. To reconstruct the history of the fault movement, we performed a detailed investigation along the Byobuyama fault and collected samples for structural and chemical analyses. To understand structural history, paleo-stress fields analysis using the Multiple Inverse Method (Yamaji, 2000) were performed. Chemical analysis with XRD, XGT, SEM-EDS and EPMA-WDS analyses also conducted. Based on these analyses, following results were obtained.

**< Stress Fields >**

Comparing the data of cross-cutting relationship with the result of paleo-stress analysis, the following transition history details were obtained. Cataclasite formation under WNW-ESE trending compression, vertical trending extension (Stress A) →Fault gouge formation under NNE-SSW trending compression, vertical trending extension (Stress B) →Fault gouge formation under ENE-WSW trending compression, NNW-SSE trending extension (Stress C) →Fault gouge formation under WSW-ESE trending compression, NNE-SSW trending extension (Stress D).

**< Deformation and Alteration >**

The cataclasites which received stronger deformation were formed at the later stage. Proto cataclasite is composed stilbite vein and ortho cataclasite composed calcite vein. The matrix of the Stress B gouge is composed mainly of illite. In contrast, smectite is abundant in the Stress C and D gouges.

From the above results, it is evident that the Byobuyama fault has experienced tectonic activities of several stages under different stress states, and significant differences in the deformation and alteration mechanisms exist between these stages. It is considered that the timing of the cataclasite formation correspond to Eocene because Stress A condition matches the convergence direction of the Pacific plate at the time (Maruyama et al., 1997). In previous studies within the Tsukiyoshi fault which adjacent to the Byobuyama fault, a reverse fault movement was detected during deposition of the Mizunami group under N-S compression (Khoriya et al., 2003). It is observed that Stress B also corresponds to this event and related to the collision of Izu-Bonin arc (Tsunakawa, 1986). Since Toki sand and gravel formation not experienced Stress C deformation, it is speculated that this event occurred around Pliocene. Finally, it is identified that Stress D correspond to an active fault event because 1) Toki sand and gravel formation encounter the deformation, 2) Stress D state is consistent with the current stress field. These results with high-resolution tectonic history is considered to be an important achievement on constructing structural evolution history of central Japan.

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