Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG57-P27 Room:Convention Hall Time:May 27 18:15-19:30

Analysis of fault rocks along Median Tectonic Line in Tsukide, Itaka town, Matsusaka city, Mie prefecture

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Median Tectonic Line (MTL) is extended more than 800 km in the East-West direction in Southwest Japan, and it is the largest fault, which defines the boundary between Sambagawa belt belonging to the Outer Zone of Southeast Japan and Ryoke belt belonging to the Inner Zone of Southeast Japan. Cracks are initiated when the accumulated strain exceeds the strength of rocks, and we call the displacement along cracks faulting, which could generate earthquakes. However, it is difficult to directly observe presently occurring fault movement in the underground. Therefore, it is very important to observe the outcrop of faults, which were active in the past for understanding the development of fractures along faults. In this study, we described geological map around the MTL, which is distributed in Tsukide, Iitaka town, Matsusaka-city, Mie-prefecture, and carried out rock descriptions. Then, we showed brittle fracture formed by faulting along the MTL, and the development of geological structures related to the faulting.

In this study, we mapped (i.e. investigated lithology) five valleys in high resolution using a 50 m scale, which extend approximately 150m in N-S direction, in the area spanning 900m in E-W direction, including the MTL. As a result of field study, it has been found that the MTL dips north at high angles. We showed that around the MTL four kinds of rocks are structurally overlain in order of the Sambagawa pelitic schist (50m+), pelitic schist derived from chert-laminite (90m), cataclasite (80m), and protomylonite derived from Ryoke Granitoids (15m+). We sliced the cataclasite samples and the protomylonite ones, and observed them under a microscope. Then, we observed the gradual alteration of plagioclase to muscovite, and chlorite deposited in cracks from the fluids which percolated along brittle fractures. We classified deformed granitic rock samples into four groups: not fractured, weakly, moderately, and strongly fractured rocks based on the degree of cataclasis. The schistosities of Sambagawa metamorphic rocks in the study area strike East-West directions, and the boundaries between Sambagawa metamorphic rocks and Ryoke Granitoids are also traced in the East-West directions. Therefore, we can show that the MTL generally strikes the East-West directions. Minor faults in Sambagawa metamorphic rocks strike NE-SW and dip north at moderate angles. Therefore, they are interpreted to be Riedel shears formed in relation to large-scale, left-lateral shear along the MTL in the East-West direction. Based on our detailed geological mapping in this area, it has been found that the trace of the MTL is displaced by 70m in the North-South direction in the center of this area, which could indicate a fault jog (step). Faults generally exhibit non-monotonous structures (fault jog) such as bending, echelon arrangement, and junction. Fault jogs are the end areas or the stop areas of fracturing, and it is considered that there are asperities which indicates the area greatly slipped just adjacent to them (e.g. Sugiyama et al,. 2003). In the future study, we must investigate the structures of fault jog in detail. Further, we showed that the rocks are strongly fractured near the MTL, and are moderately fractured far from the MTL. The degree of alteration of plagioclase conforms to this result. From these results, it can be inferred that the fracturing along the MTL propagated from the rocks in direct vicinity to the MTL to the remote ones, and the cataclasite zone grew over time.

Keywords: Median Tectonic Line, fault rock, cataclasite