Characteristics of inactive section of the Median Tectonic Line from drillcore samples in Shikoku, southwestern Japan

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The Median Tectonic Line (MTL) is a geological boundary fault that divides southwestern Japan into Inner and Outer zones. The MTL is generally considered to be a long-lived fault system from the middle Cretaceous, although the details of the movement history are complex. On the other hand, it has been revealed from geomorphological and paleo-seismological surveys that the MTL from Shikoku to western Kii Peninsula has caused right-lateral slip during Quaternary. Therefore, the part of the MTL is active, and called as the Median Tectonic Line active fault system (MTLAFS) (e.g., Ikeda et al.,2017). To estimate present seismic condition (or environment) of the MTLAFS, we should understand details of its paleo-activities. However, outcrops widely exposed for geological survey about paleo-activities inactive MTL are limited. In this study, we obtained a geological core sample (125 m-long) penetrating the MTL and conducted downhole logging in Saijyo city, Ehime prefecture.
We focused on three points as follows. Firstly, we observed and described the core samples in detail. Secondly, we obtained structural data from the geological core and a borehole image data in order to predict paleo-stress conditions. Finally, we estimated physical properties around a fracture zone of the MTL based on the geological and geophysical data.

[Description of fault rocks]
The fault plane of the MTL is at about 109.45 m-depth in the borehole. The hanging wall and footwall of the fault system are Izumi Group (mainly alternating beds of mud and sand) and Sanbagawa metamorphic rocks (mainly pelitic schist), respectively. Orientation of the fault plane of the MTL is NE-SW strike with moderate-angle northwest dipping in our study area, and its fault zone is approximately 4m-width. The fault zone is composed of fault gouge, fault breccia and cataclasite. The altered dikes that is Ishizuchi volcanic rocks erupted in c.a. 15 Ma distribute in the fault zone. The MTL in this region reactivated after 15 Ma, because the altered dikes are fragmentated in the fault zone.

[Structural analysis]
Orientations of bedding planes of Izumi Group and schistosity planes of Sanbagawa metamorphic rocks are generally N–S strike with low-angle east dipping and ENE–WSW strike with low-angle north dipping. The dikes intrude into the fault zone in orientation of NE–SW strike with moderate-angle northwest dipping. Orientations of fractures concentrate in N–S strike with east dipping and E–W strike with north dipping based on the borehole camera data.
Moreover, we conducted paleo-stress analysis based on fault orientations and slickenlines and slickensteps on the fault surfaces. We adopted Hough transform inverse method (Sato, 2006) to estimate paleo-stress conditions of the MTL. As the result, a stress condition around the MTL is dominantly normal-faulting stress-regime, however strike-slip and reverse-faulting stress-regimes are also recognized.

[Physical properties]
There is a remarkable trend of the elastic wave velocity data around the fracture zone. P-wave velocity *Vp* in fracture zone (95–109.5 m-depth) drastically decreases as compared with host rock in the upper zone due to intensive crack and lower elastic moduli. On the other hand, S-wave velocity *Vs* does not change in

the fracture zone such as the trend of *Vp*.

The paleo-stress condition data are useful information for inactiveness of the MTL. And the physical properties are also crucial to understand the physical conditions what the MTL in this region have experienced. Therefore, the information derived in this study could contribute to understand fault evolution processes and activities of the MTL.

Keywords: Median Tectonic Line, fault rocks, paleostress field, physical property

