How to characterize the fault setting from calcite twin analysis

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This study proposes how to identify the formation setting of the fault rock. The seismogenic fault is composed of various parts of deep slow-slip, asperity within brittle and shallow unconsolidated regions. The fault rock must have characteristic strain distribution in each region.
The calcite can deform at wide thermal condition, and it had been applied for stress/strain indicator from 1950’ s at marble and limestone area. Sakaguchi (2011) showed that calcite twin density (Dtw) is applicable to polymineralic rock in specific rock. Sakaguchi and Ando (2021) obtained relational expression from the Dtw to strain in various strength rocks. This can reveal stress distribution around the fault from deep to surface, and paleo-stress can be estimated in case of elastic region.
High Dtw was found at principal shear zone (PSZ) of the core sample penetrating the Nojima Fault at 529 m below surface. The Dtw decreases gradually in inverse proportion to the distance from the PSZ. This strain distribution can be explained by drag fold around the fault.
The pseudotachylyte bearing Okitsu Fault at Shimanto accretionary complex in Shikoku island has high Dtw at PSZ. The Dtw decays with -0.5 power of distance from the PSZ. This is corresponding to stress concentration rate around the fault during rupture propagation with elastic body. High Dtw condition around the PSZ also changes along the strike of the Okitsu Fault. This along strike variation of the Dtw possibly relate with partial fault strength difference such as an asperity.
The Nobeoka Thrust at Shimanto accretionary complex in Kyushu island had been undergone metamorphism correspond to thermal condition at lower limit of the seismogenic region along the plate subduction zone. High Dtw found at PSZ of the Nobeoka Thrust, and the decay rate of the Dtw is more gradual than the Okitsu Fault. This may be due to quasi-brittle failure at high thermal condition.

Keywords: stress/strain, fault rock, method

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