Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)


SSS035-P26 Room:Convention Hall Time:May 25 14:00-16:30

# Paleostress from calcite twins and stress change with seismic cycle: Yokonami melange, Cretaceous Shimanto Belt, Kochi

Mio Eida[1*], Yoshitaka Hashimoto[1]

[1]Kochi University

A model that the stress within accretionary wedges can change with seismic cycles has suggested by Wang and Hu (2006). The model indicates that compression stress within wedges is expected at co-seismic slip due to higher shear friction along de-coellement and extensional stress can be existed in inter-seismic period because of low friction due to higher pore pressure along decollement.

Paleo-stress has been examined using regionally distributed micro-faults as well as calcite twins by stress inversion method. Because calcite twin density is considered to reflect paleo-maximum differential stress, the stress estimated from calcite twin might be at the time of the maximum differential stress, therefore at co-seismic period. In this study, we have compared between paleo-stresses for micro-faults in relatively regional melange zone, for micro-faults around seismogenic fault and for calcite twins within the mineral veins along micro-faults to examine the stress change between them.

The study area is the Yokonami melange, the Cretaceous Shimanto Belt, Kochi, SW Japan. Lithologies are mainly composed of sandstone blocks surrounded by shale matrices representing tectonic melange textures with minor varicolored shale, red shale, cherts and basalts. The Susaki formation and the Shimotsui formation are observed in the north and the south of the Yokonami melange, respectively. Those formations are coherent unit including mainly of sandstone and mudstone. The both boundaries are faults. Pseudotachylytes were found in the northern boundary fault (the Susaki fault), suggesting that the fault was a seismogenic fault. We obtained mineral veins along micro-faults as oriented samples. The micro-faults clearly cut the melange fabrics, indicating that the micro-faults were formed after melange formation. Distribution of the micro-fault suggests that the underplating was after the micro-fault formation. Temperature and pressure conditions for the micro-fault formation are about 200 degree C and about 180MPa, respectively on the basis of fluid inclusion thermometry.

In this study, we have treated the calcite twins as a micro-fault. Axes of calcite crystals and e-poles for calcite twin were measured by universal stage. From that, we can obtain the slip directions and twin plane orientations. We used HIM (Hough inversion method) by Yamaji et al. (2006). We can estimate the stress orientation and stress ratio by the method. Stress ratio (F) is defined as ($sigma_2$ - $sigma_3$) / ($sigma_1$ - $sigma_3$).

Also, we have examined stresses for the micro-faults distributing throughout the Yokonami melange and around the northern boundary of seismogenic fault (the Susaki fault).

Calcite twin data were measured from 20 samples from 200m of northern part of Yokonami melange. Total number of data from calcite twin is 829. The stresses from all twin data shows axial compression with F = 0.0446 and axial extension with F = 0.9125. The stresses from each sample also represent axial compression and extension stresses. On the other hand, the stress from micro-fault throughout the Yokonami melange indicates triaxial stress with F = 0.6071 and NW horizontal $sigma_1$.

The most of stresses from calcite twins for each sample shows higher angle of $sigma_1$ with axial compression of stress ratio. The stress from the all calcite twins indicates also a vertical maximum principal stress. This stress is consistent with the stress from micro-faults around the Susaki faults. Because the stress from Yokonami melange indicates almost horizontal maximum principal stress with triaxial stress ratio, both stresses from calcite twins and micro-fault around the Susaki fault are totally different from the stress from the Yokonami melange. This result suggested that the stresses from Susaki fault and calcite twins might reflect co-seismic stress and the stress from Yokonami melange might be for inter-seismic stress. Change in stress in seismic cycle can be identified in this study.

Keywords: calcite twin, paleo stress, subduction zone, seismic cycle, accretionary complex, seismogenic fault