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

SSS035-P28 Room:Convention Hall Time:May 25 14:00-16:30

Change in stress with seismic cycles identified at an out of sequence thrust: The Nobeoka thrust, Shimanto Belt, Kyusyu

Mika Yamaguchi[1*], Yoshitaka Hashimoto[1], Asuka Yamaguchi[2], Gaku Kimura[2]

[1]Kochi University, [2]University of Tokyo

Seismic surveys along Nankai trough have revealed that the out-of sequence thrusts (OSTs) are commonly developed within the accretionary wedge branching from seismogenic subduction plate boundaries. The OSTs are also recognized in on-land accretionary complexes as large thrust faults cutting paleo-thermal structures. The Nobeoka fault is one of the OSTs recognized in on-land accretionary complex, the Shimato Belt, Kyusyu. The fault bounds the northern and the southern Shiamnto Belt and the gap in paleo-thermal temperature is up to 70 degree C.

The Nobeoka thrust strikes almost EW at coastline close to Nobeoka city. The Cretaceous Makimine formation and Paleogene Kitagawa formation are located at the hanging wall of the fault, comprising mainly of pelitic schist. The footwall of the fault is the Paleogene Hyuga formation composed mainly of shale. A lot of micro-faults are well developed just below the thrust for a few hundred meters to the south. Those micro faults are considered to be related to the Nobeoka thurst because slip direction and sense of the micro-fault is consistent with that of the Nobeoka thrust. The micro-faults are commonly accompanied with mineral veins of quartz and ankerite. Yamaguchi et al. (2010) suggested that the differences of mineral veins are possibly related to the seismic cycle.

In this study, we conducted stress inversion analysis for the micro-faults to examine the change in stress, which might be related to the seismic cycle.

We divided the micro-fault into two as a micro-fault with quartz vein and that with ankerite veins. From the micro-fault, we obtained the slip direction from slicken lines and slip sense by slicken steps. We used HIM (hough inversion method) by Yamaji et al. (2006) to estimate the stress for each. The stress ratio (F) is expressed as (sigma2 - sigma3) / (sigam1 ? sigma 3).

Two stress orientations and three stress orientations are observed in the results for ankerite veins and quartz veins, respectively. For ankerite veins, SE oriented and relatively higher dipping sigma3 with axial extension of F and SE oriented and relatively lower dipping sigma1 with axial compression are identified. For quartz veins, SE oriented and relatively higher dipping sigma3 with axial extension, NE oriented and almost horizontal sigma1 with triaxial stress ratio, and NW oriented and lower dipping sigma1 with axial compression are observed. After examination to detect reasonable stresses from them, we concluded that the NW-SE oriented and lower dipping sigma1 with axial compression is the most adequate stress for ankerite and quartz veins.

In comparison between the two stresses for ankerite veins and quartz veins, the angle of sigma1 is relatively higher in quartz veins and the stress ratio is also larger for quartz veins. Those differences between them are pretty well consistent with the dynamic Coulomb model suggested by Wang and Hu (2006). The model predicts that the stress within accretionary wedge can be change with seismic cycle, horizontal sigma1 with axial compression at the co-seismic slip and relatively higher dipping sigma1 with relatively triaxial stress in inter-seimsic period.

The result from the study can be explained by the dynamic Coulomb wedge model.

Keywords: out of sequence thrust, stress inversion method, seismic cycle, subduction plate boundary, accretionary complex