Microstructural analysis and fluid flow of the paleo-seismogenic out-of-sequence thrust

Hideki Mukouyoshi[1], Arito Sakaguchi[2], Kenshiro Otsuki[3], Tetsuro Hirono[2], Wonn Soh[2]

[1] Geology., Kochi Univ, [2] JAMSTEC, [3] Earth Sci., Tohoku Univ.

An out-of-sequence thrust (OST) in subduction zone plays a great role in thickening of the accretionary prism, formation of forearc basin and tsunami generation. The purpose of this study is to know the lithology, texture and evolution of the seismogenic OST in the subduction zone, Shimanto accretionary prism, southwest Japan from the thermal structure analysis based on the vitrinite reflectance, microstructural analysis of the faultrock and the fluid inclusion studies along the fault zone.

It is pointed out that the sharp discontinuity of the thermal structure in east Shikoku is caused by an activity of the OST where possible seismogenic fault of the trench type earthquake (Ohmori et al, 1997). However it is uncertain that textural analysis of the fault rock.

This study aims to the detailed tectonics and the behavior of the seismogenic fault rock in similar discontinuity of the thermal structure, southwest Shikoku.

The regional thermal structure was cut by more than ten small thrusts developing within the zone, 1 km in width. They cut original geological structure with brittle fracture. Some of them were fractured recurring or high-velocity shearing. H2O-rich inclusion and CH4-rich inclusion trapped in the vein along the fault and the density depressurized from hostrock to shear zone.

These faults, altogether, slipped as many as it occurred thermal difference about 100C and they cut original geological structure. The fact indicates that these faults is OST likely occurred by a late stage of development of the accretionary prism. It exposed shallow part of the OST in this study area due to the area received lowest maximum temperature in the Shimanto belt. It indicates that the OST branched some of segment and fractured recurring with high-speed shearing at the shallow horizon where possible occurred inequality of the seafloor with tsunami generation. Decrease of the fluid density along the faut zone may occurred due to the fault zone operatedas a conduit and the pore fluid flowed above. Decrease of the pore fluid pressure means consolidation of the rock. Namely the rock be able to accumulate shear stress again.

It is revealed that the shallow part of the OST exposed in this study area and it branched some of segment. Each fault slipped edgingly and occurred large displacement by altogether. It suggested that the fault slipped with high-speed shearing and the pore fluid pressure decreased than the rock of periphery. Trench type earthquake occurred by recurring fault activity at the shallow subduction interface. It is significant that the fault zone operated as a conduit to active the fault recurringly.