Dynamic strain energy as new evaluation item of a seismogenic fault

*Arito Sakaguchi[1], Masato Ichiki[2], Kikka Takiguchi[1]

1. Yamaguchi Univ., 2. SANO TAISEIKISO ENGINEERING Co.Ltd

Since earthquake is stress response of the crust, the stress-strain record of the host rock around the fault tell us significant clue of the seismic mechanism. During inter-seismic period, host rock around the asperity deformed elastically to cause the earthquake. Immediately before the earthquake, a rupture propagates from deep nucleation point, and high stress must concentrate at tip of the fracture. This stress concentration causes elastic strain momentary in host rock of the fault, and high stress area moves with rupture propagation.

The strain energy of these event can be estimated from paleo-stress distribution around the fault. It is expected that the highest peak of stress must be appeared at fault center, and stress level will decrease with distance from the fault. The area under the stress decay curve in the stress-distance graph indicates strain energy of the host rock.

Paleo-stress of ancient fault rock can be estimated from elastic rebounded rock using calcite twin method (Sakaguchi et al., 2011).

The Okitsu Fault in Shimanto accretionary complex, southwest Japan is ancient seismogenic fault of plate subduction zone. This fault involves pseudotachylyte and can be observed more than 10 km along the strike of the fault. Higher stress than the background stress of regional Shimanto accretionary complex was found around the Okitsu Fault. This may be due to dynamic stress concentration during rupture propagation. The value of estimated dynamic strain energy is approximately 390 MJm^-2 at eastern tip of the Okitsu Fault. The strain energy along the strike of the fault decreases toward west and disappears at 2 km from the eastern tip. The strain energy along the fault increases again to several MJm^-2 at 9 km from the eastern tip. This strain energy variation may show existence of some locked asperities along the strike of the fault.

Keywords: stress, subduction zone, seismogenic fault

