

Crush Zone Drilling Project for Development of Fault Activity Evaluation Methods

MIYAWAKI, Masahiro^{1*} ; UCHIDA, Jun-ichi¹

¹Regulatory Standard and Research Department, Secretariat of Nuclear Regulation Authority (S/NRA/R)

Fault activity is often revealed from trench excavating investigations that clarify the cross-cutting relationship and depositional age of overlying sediments. However, in some area, these methods cannot be applied because of the lack of overlying sediments and samples indicating depositional age. In such case, fault activity is evaluated on the basis of identification of depositional age and/or characteristics of the crush zone, however, these fault activity evaluation methods with sufficient resolution have not been established yet. For example, material sampled from surface or near surface outcrops of crush zone indicates sometimes older active age than actual one. Considering this situation, S/NRA started up a crush zone drilling project to improve fault activity evaluation methods.

This project consists of borehole surveys, dating analysis, laboratory tests, and integrated analysis. In borehole surveys we conduct a deep borehole drilling, physical logging, various borehole tests, and structural analysis by use of borehole and borehole core samples through the crush zone of a target fault with known activities to reveal the physical (temperature and pressure) and geological conditions in which the sample with a reliable dating can be acquired. We are implementing the crush zone drilling project in Gomura-Yamada Faults and Nojima Fault. Gomura-Yamada Faults ruptured during the 1927 Kita-Tango Earthquake and Nojima Fault ruptured during the 1995 Hyogo-ken Nanbu Earthquake. In each drilling site, the target depth of drilling is 1,000-2,000m to understand the conditions in which fault activation age estimated from fault gouge is initiated. In dating analysis, we plan to apply luminescent and ESR dating methods to sample from crush zone in the vicinity of the latest active fault plane in the zone. Furthermore, in laboratory tests, rotary-shear high-velocity friction tests using natural fault gouge under water-pressure conditions will be able to estimate frictional behavior of faulting and condition of initiation of fault activation age estimated from fault gouge in our plan. In addition, we will also study how to improve the conventional method of fault activity evaluations based on qualitative characteristics of the crush zone. Combining some results from multi-methods, integrated analysis on fault activity will be performed.

We will principally investigate fault activity research focused on the crush zone and attempt to get practical results within the next few years.

Keywords: Crush Zone Drilling, Fault Activity Evaluation, Nojima Fault, Gomura-Yamada Faults