

Study on the evaluation method for fault displacement: Deterministic evaluation approach based three step considerations.

*Tonagi Masao¹, Tsutomu Takahama¹, Yasuhiro Matsumoto¹, Naoto Inoue², Kojiro Irikura³, LUIS ANGEL DALGUER³

1. KOZO KEIKAKU Engineering Inc., 2. Geo-Research Institute, 3. Aichi Institute of Technology

Fault displacement hazards are very important to enhance seismic safety of nuclear installations. In Japan, important nuclear facilities must be installed in the ground where there is no risk of displacement. And also IAEA Specific Safety Guide (SSG) -9 provides guidelines and procedures for assessing the potential for fault displacement (capability) at or near the site for both new and existing nuclear power plants. Under such background, we are investigating the possibility of evaluation by both deterministic evaluation method and probabilistic evaluation method as to whether or not fault displacement occurs on the ground surface when earthquake occurs.

In this paper, we focus on fault displacement and introduce the concept of deterministic evaluation methods for fault displacement.

We are planning to evaluate fault displacement will occur on the ground surface due to earthquake occurrence by the following three steps.

step1) Construction characterized source models. We will construct a characterized source models that can reproduce strong ground motion near the seismic source with for less than period of 10 seconds.

step2) Consider conduct dynamic rupture simulation with each parameter of the characterized source model constructed in step 1 as input. By dynamic rupture simulation, evaluate the permanent displacement appearing on the ground surface due to the displacement of principal fault. (In step 2, consider calculation area that wide area including the principal fault is taken into both the depth direction and the horizontal direction.)

step3) in step3, targeting a very narrow range of the ground surface (ex. few hundred meters to several kilometers), we consideration a very soft and discontinuous nature of the surface, evaluate displacement by numerical analysis method represented in the finite element method, or the like. In this study, we have conducted a combination of the finite element method (FEM) and the particle method (SPH) method for the analysis method.

In accordance with the above flow, we conducted a tentative analysis for the 1999 Chi-Chi earthquake and compared displacement of observation records and analysis result.

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