Study on the evaluation method for fault displacement: Deterministic evaluation approach based three step considerations (part2).

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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 of characterized source model. We will construct a characterized source model that can reproduce strong ground motions of periods shorter than 10s near the fault.

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) Targeting a very narrow range of the ground surface (ex. few hundred meters to several kilometers), we consider a very soft and discontinuous nature of the surface, and evaluate surface displacement by a combination of the finite element method (FEM) and the particle method(SPH).

In accordance with the above flow, we tried conducted a tentative analysis for the 1999 Chi-Chi earthquake as one of the reverse fault (Tonagi et al., 2017). In this report, we tried a tentative analysis for the 2010 Darfield earthquake as one of the strike-slip fault, and compared displacement of observed records and analysis result.

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