A Series of Studies on Amplification Characteristics of Ground Motions and Elucidation of Seismic Behavior of Soil and Structures

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Structural damage to buildings during the massive Kobe earthquake in 1995 was closely related to the amplification of the ground motions caused by unique soil conditions. To reduce the impact of earthquakes on buildings, it is necessary to elucidate the amplification characteristics of ground motions and the seismic response of subsurface soil and upper structures, along with the development of numerical codes that can be used in the simulations based on recorded motions. This study consists of the following three sections. First, in the development of analytical procedures for the evaluation of strong motions and site amplification, a calculation theory and codes were developed for the 2.5-D FEM analysis, a theoretical solution for dislocation sources based on the 3-D thin layer element method, and a 3-D finite difference method with enhanced computational efficiency. Second, the elucidation of mechanism for ground motion amplification adjacent to abrupt irregularity of seismic bedrock dealt with the amplification mechanism of the ground motions referring to the damaged belt during the 1995 Kobe earthquake. Third, the study on structural response evaluation considering the dynamic soil-structure interaction focused on the nonlinear SSI effects of the dynamic structural response and the SSI phenomena in irregularly layered soil.