3D NONLINEAR GROUND MOTION SIMULATION FOR THE KINBURN BASIN USING A DETERMINISTIC APPROACH

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We have used the 3D staggered-grid finite difference scheme (AWP-ODC program) to model nonlinear ground motion for the Kinburn basin in Ottawa, Canada, with a very high (~20) shear-wave impedance contrast between bedrock and soil in comparison to typical impedance contrasts of 3–5 in many other places. Cyclic nonlinear models, which are mainly considered an elastoplastic constitutive behavior for soil deposits, determine the nonlinear stress-strain behavior of soil by following the actual stress-strain path during cyclic loading. In regular linear simulations, the shear modulus of an element in the model is assumed to be constant in the stress-strain relation. In the proposed method, the shear modulus is defined as a function of strain; thus, it would be modified according to the strain level that should be calculated for each time and each element in the model. Detailed geophysical information was used to model the study basin and modulus reduction equation. The focal mechanism associated with the M4.6 Ladysmith earthquake recorded on May 17th, 2013 was used as the source while the magnitude was scaled to 8.5 to study the effects of nonlinearity. In this simulation, the nonlinear viscoelastic ground motions were carried out in the frequency range of 0-1 Hz.