3D Simulation of Earthquake Ground Motion Using Locally Variable Time-Step Finite-Difference Method

Kang, Tae-Seob and Baag, Chang-Eob

School of Earth and Environmental Sciences
Seoul National University, Seoul 151-742, Korea
(강태섭, 박창업: 서울대학교 지구환경과학부)

Three-dimensional finite-difference simulation of earthquake ground motion is performed using a locally variable time-step (LVTS) scheme matching with discontinuous grids. Discontinuous grids in three directions and extension of the discontinuous grids' boundary to the free-surface in the LVTS scheme minimize the cost of both the computational memory and the CPU time for models like the localized sedimentary basin. A simplified model of sedimentary basin is dealt to show the feasibility and efficiency of the LVTS scheme. The basin parameters are examined to understand the main characteristics on ground-motion response in the basin. The results show that the seismic energy is concentrated on a marginal area of the basin far from the source. This focusing effect is mainly due to the constructive interference of the direct S-wave with the basin-edge induced surface waves. The ground-motion amplification over the deepest part of the basin is relatively lower than that above the shallow basin edge. Therefore the ground-motion amplification may be more related to the source azimuth or the direction of the incident waves into the basin rather than the depth of it.