Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SSS018-03 Room: IC Time: May 25 11:15-11:30

A hybrid BEM for seismogram synthesis in a multilayered half-space with irregularities: 2-D SH case

Zhenghua Qian[1*], Hiroaki Yamanaka[1], Sohichi Hirose[1]

[1]Tokyo Institute of Technology

Seismogram synthesis is an important tool to study the site effects of strong ground motion and seismic wave propagation in the Earth. In classical seismology, the Earth is often modeled as a laterally homogeneous structure. However, the real Earth is full of heterogeneities of different scales in all directions. The lateral inhomogeneity, though usually weaker than the vertical one, often cannot be ignored and in some cases play an important role. The study of wave excitation and propagation in laterally inhomogeneous media has thus become increasingly important in seismology. In this paper, we study the transient SH-wave propagation in a multilayered medium composed of irregular interfaces based on a hybrid boundary element method (BEM). This method is kind of a combination of the traditional BEM and the global matrix propagator method. The boundary integral equation for each individual layer is formulated by the traditional BEM using the full-space Green's function. And the global matrix propagators are adopted to gather information from "top and bottom" to the "source" layer. Finally, the simultaneous system of equations is solved in the source layer. The wave fields in the other layers can then be obtained recursively by the global matrix propagators. This method can prevent excessive requirements of both computer memory and central processing unit (CPU) time which appear in the traditional BEM for seismogram synthesis as the number of layers in a stratified model increases. Numerical examples for some models with typical irregularities are calculated, which validates the efficiency and accuracy of the method introduced in this paper.

Keywords: Seismogram synthesis, SH-wave, Hybrid BEM, Multilayered media, Irregularity