# Seismic Wave Amplification in 3D Alluvial Basins: Aggravation factors from Fast Multipole BEM Simulations

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In this work, we study seismic wave amplification in alluvial basins having 3D canonical geometries through the Fast Multipole Boundary Element Method in the frequency domain. We investigate how much 3D amplification differs from the 1D (horizontal layering) and the 2D cases. Considering synthetic incident wave-fields, we examine the relationships between the amplification level and the most relevant physical parameters of the problem (impedance contrast, 3D aspect ratio, vertical and oblique incidence of plane waves). The FMBEM results show that the most important parameters for wave amplification are the impedance contrast and equivalent shape ratio. Using these two parameters, we derive simple rules to compute the fundamental frequency for different 3D basin shapes and the corresponding 3D aggravation factor for 5% damping.Effects on amplification due to 3D basin asymmetry are also studied and incorporated in the derived rules.