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Quantification of Ridge-weathering Effects on the Simulated Ground Motion Characteristics Across 2D and 3D Topography Models

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Abstract

This paper quantifies the impact of ridge-weathering on the simulation of ground motion across 2D and 3D topographical models. The models are excited with plane wave-fronts of Gabor-wavelet. The seismic responses of a 3D ellipsoidal ridge topography having shape ratio 1.0 and one of its cross-section (2D model) are simulated for different thickness and velocity of weathered layer. The SH- and SV-waves responses of a 2D cross-section of 3D topography are computed to understand the effect of dimensionality on the amplification pattern. The analysis of simulated responses reveals very large spectral amplifications and ASA in the case of 3D topography as compared to 2D. An increase of weathering effect on ground motion is inferred with an increase of weathering-thickness and a decrease of weathering-velocity. A considerable variation of topography amplification with elevation is obtained. Finally, it is concluded that the shape of ridge-topography, rheological parameters of the weathering layer should be taken in to account for the quantification of topographical effects on the ground motion characteristics.

Keywords: 3D topography effect, Finite difference method, Azimuth effect, Weathering effect