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FINITE-DIFFERENCE SIMULATION OF SEISMIC NOISE IN SURFACE GEOLOGIC STRUCTURES

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The SESAME project, funded by the European Commission, has been undertaken as a partnership between various European teams in order to better assess the actual capabilities of microtremor-based site-effect investigation methods (H/V technique and array techniques). One part of this project is dedicated to the development of a numerical simulation technique, and its application to a series of representative "canonical models" and a few real sites. The presentation will focus on the description of the program package and on the preliminary results obtained for some representative models.

The program package "NOISE" consists of two codes - RANSOURCE and FDSIM. RANSOURCE is designed for random space-time generation of point sources controlled by several parameters (minimum source-source distance, minimum and maximum source-receiver distances, minimum and maximum numbers of sources acting at the same time, ratio between the numbers of delta-like and pseudo-monochromatic signals, maximum-amplitude distribution). RANSOURCE output files serve as input files for FDSIM. FDSIM is designed for simulation of seismic ground motion in a viscoelastic half-space with 3D surface heterogeneities. It is based on the heterogeneous 4th-order displacement-velocity-stress staggered-grid finite-difference (FD) scheme. A realistic attenuation is included based on rheology of the generalized Maxwell body, and new definitions of anelastic functions and their memory-efficient spatial distribution. The adjusted FD approximation technique is used to model planar free surface.

The effects of the parameters controlling the random space-time generation of noise sources for a homogeneous halfspace and single layer over halfspace will be shown and discussed. The source depth in particular is of crucial importance in case of 1D structures, for the composition of noise wavefield and the resulting H/V spectral ratio.

Then, the effects of geometrical and mechanical parameters (velocity contrast, Poisson's ratio, sediment thickness, sediment/basement interface geometry) will be discussed for a few selected canonical models of surface sedimentary structures

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