MODELLING OF EXPLOSIVELY INDUCED GROUND SHOCK PROPAGATION IN SPATIALLY RANDOM GEOLOGIC MEDIA

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A series of small-scale field experiments conducted over the past several years has established that scattering by random geologic heterogeneity has a significant influence on explosively induced stress wave propagation. Existing physical models of stress wave propagation in the explosive effects community are, however, based on the assumption that the subsurface material can be divided into plane homogenous layers. This simplistic approach my be responsible for much of the discrepancy which remains between
the results of field experiments and calculational attempts at modeling these observations.
It is impossible to perform a site characterization effort in enough detail to eliminate each and every heterogeneity in the subsurface soil or rock. Therefore an attempt has been made to apply stochastic modeling techniques borrowed from the seismic and hydrologic communities to non-linear geologic material models. Using these techniques, the spatial variability in the material model is defined by 1: 1. The tape of statistical distribution (Gaussian, Exponential or Von Karman); 2. The scale or correlation length of the variability; 3. The standard deviation of the material property under consideration. For the particular site under study these statistical parameters have been defined by cone penetrometer testing, laboratory material property testing and seismic survey techniques.

The statistical properties are used to construct filters which modify the output of a random number generator. The output of this random geology generator is the used to produce a spatially variable material model for use in finite difference code simulations of explosively induced ground motion. The output of these stochastic calculations is being with the results of calculations utilizing plane homogenous layered models to determine the relative influence of spatial geologic variability on ground motions.