ON SCALING GROUND MOTIONS AND IMPLICATIONS FOR SIMULATION FIDELITY

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This paper draws upon -studies of DNA's Data Analysis Working Group (chaired by the author) to summarize recent improvements in our understanding of ground motions from surface explosions and discusses implications for the validity of high-explosive field trials in simulating nuclear induced ground motions. Particular emphasis is given to the discussion of outrunning ground motions where recent comparisons between analytical studies, finite difference calculations and experimental data suggest that the surface motions observed on several recent high-explosive experiments can be qualitatively and sometimes quantitatively understood in terms of wave propagation in layered elastic media. These Studies suggest that the magnitude and waveforms of relatively far-field motions are strong functions of the geologic layering and can, in a significant way, be decoupled from source region properties and closer-in ground motions which are strongly influenced by the highly non-linear crater-forming processes.

These motions also seem to be largely intensive to the close-in airblast loading conditions. Thus, high explosive field trials probably a high fidelity simulation of outrunning ground motions from nuclear explosions at least to the extent that the test-site geology represents a prototype geology of interest. At closer ranges, the fidelity of the simulation is expected to deteriorate because of differences between nuclear and high-explosive produced airblast and cratering phenomena. The source region phenomenology for high-explosive and nuclear sources are briefly compared and implications for simulation fidelity are indicated.