SEISMIC CALIBRATION EXPERIMENT IN JOINTED ROCK

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ABSTRACT

The Defense Threat Reduction Agency recently conducted a well instrumented ground shock test in jointed volcanic rock. The purpose of the test was to calibrate near-source and seismic ground motions produced by a fully contained explosive source in medium porosity in situ rock. Strong motion instrumentation consisted of twenty-seven triaxial accelerometers aligned at charge depth along three radials from the near-source region to the seismic regime. 3-D surface seismic instrumentation extended from the outermost strong motion gages to more than an order of magnitude beyond the range of the furthest strong motion measurements. The instrumentation radials were oriented such that one was parallel to the principal joint set, one perpendicular to the principal joint set and the third bisecting the joints. The test provided a wealth of valuable data that will enable analysts to relate characteristics observed in the seismic regime to influences of the geologic structure in the near-source region. The effect of the joints on the near-source response is clearly seen; with displacements into the elastic regime 3 times those in less porous isotropic rock and with transverse late-time displacements in the counterclockwise direction on two radials and in the clockwise direction on the third radial.

The data are being used to improve numerical models of jointed rock masses. An Eulerian finite element computer program was used to simulate the test. The material models required modifications to account for joint closure response extending over a wide range in the test bed (i.e. 3kbar close-in to 1 bar at the further ranges). Once the models were updated, the predictions reproduced the experimental data quite well.