COMPUTER SIMULATION OF GROUND SHOCK PHENOMENA AND CRATERING FOR THE PRE-GONDOLA EXPERIMENTS

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Progress in our understanding of the detailed mechanisms associated with ground shock propagation and cratering resulting from chemical or nuclear explosions is demonstrated by our successes in modeling these phenomena computationally. Simulation of the Pre-Gondola cratering experiments have been accomplished with the computer codes, CSQII and CRATER. CSQII is a two-dimensional, Eulerian computer wavecode for description of material motion, including explosive detonation and material strength properties. Computation of an explosive event is performed with CSQII until medium flow fields are established and stress transients have propagated out of the domain of interest. CSQII results are then coupled into CRATER which then computes motion of ejecta under the influence of the gravitational field and determines final crater profiles.

All four Pre-Gondola cratering experiments have been simulated. The explosive source in each experiment was a twenty ton sphere of nitromethane and the geologic medium was a weak, water saturated shale. Burst Depths were 13, 14, 16 and 17.3m.

Calculated results for ground shock arrival time, stresshistories and velocity histories are in good agreement with measurements. Comparisons of predicted and observed apparent crater radii and depths are excellent (<10% differences). Computed crater volumes are within a factor of two of measured volumes and the dependence of burst depth on crater volume is correctly described. Less satisfactory agreement is observed between measured and calculated crater lip parameters. Discussions will include an analysis of those features and approximations in the computer simulation which are responsible for the good agreement or lack of it.