CRATER SIMULATIONS IN SUBSCALE JOINTED ROCK: PRELIMINARY RESULTS

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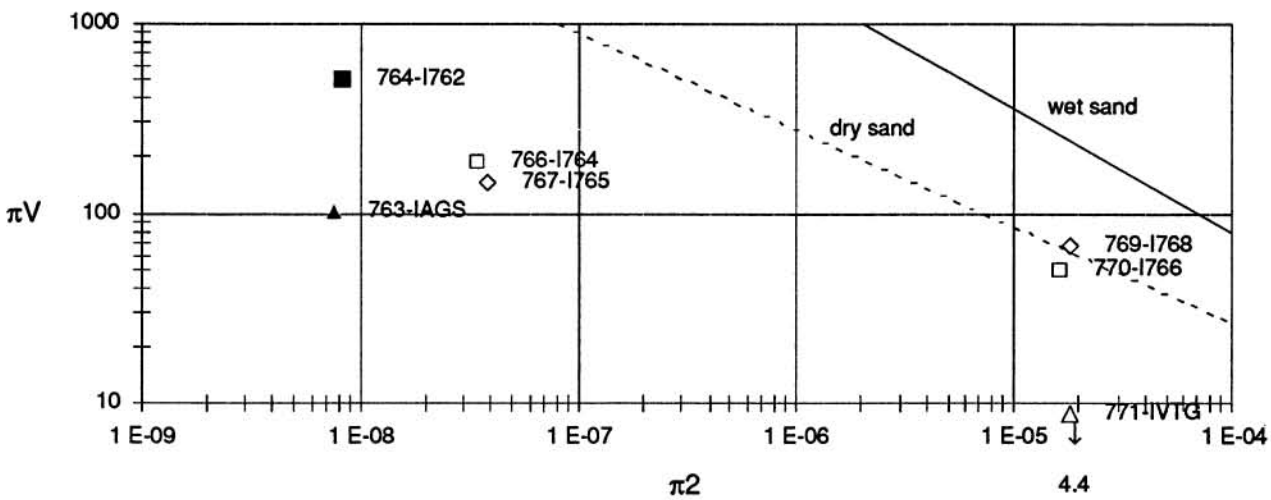
There is much conjecture about the effect of joint spacing on the effective strength of rock and its consequences on scaling. To date, all impact experiments in rock have been conducted in small, and therefore rather homogeneous, samples. The problem with such experiments is that they don't correctly model the joint/fracture characteristics of rocky materials involved in large scale impacts. In order to simulate large events, it is necessary to fabricate samples which are fractured at the appropriate spacing and have the low porosity associated with rock. This requirement has presented a difficult experimental hurdle. The approach being investigated here is to use targets consisting of layers of prefractured tempered glass plates. The layers provide a controlled vertical spacing of fractures. Additionally, the plates can be prefractured with a small explosive charge buried deep enough so as not to significantly disturb the sample surface. This abstract presents a summary of some preliminary experiments designed to test this method of sample fabrication. Seven impact tests have been performed, some using prefractured glass plates and some using "virgin" plates for comparison.

Brief description of experiments: All impactors were 6.35 mm diameter. **763-IAGS** Al sphere, 3.6 km/s, 1G. Target was alternating layers of 2.3 mm thick annealed glass and 1.5 mm thick layers of basalt fines that passed a #100 sieve. Test of virgin glass soil model. **764-I762** Al sphere, 3.5 km/s, 1G. Target same as shot 763, but had been rubblized by a buried charge forming a crater which was later filled back in. Provided a comparison of rubblized targets with virgin glass soil model. **766-I764** Al cylinder, 1.8 km/s, 1G into same rubblized target as shot 764 above, where again the crater was filled back in. Tested effect of impact velocity on rubblized target. **770-I766** Al cylinder, 1.9 km/s and 523G into same rubblized target as shot 766 above, where the crater was yet again filled back in. Tested effect of gravity on rubblized target. **767-I765** Al cylinder, 1.7 km/s, 1G. Target was 3.3 mm thick layers of tempered glass, previously fractured but not cratered by a very deeply buried explosive charge. Only a slight mound was evident on the surface. Tested effect of prefracturing the glass model. **769-I768** Al cylinder, 1.8 km/s, 520G. Target prepared as described for 767. Test effect of gravity on prefractured glass. **771-IVTG** Al cyl., 1.8 km/s, 520G. Target was 3.3 mm thick layers of virgin tempered glass. Compare with 769 for effect of prefracture.

The figure below shows how the cratering efficiency for the various shots compares with the previous results for dry sand and wet sand. It appears that interlocking of joints and block overturning might provide a significant strength even when materials are highly fractured.

To validate the suitablity of any of the jointed rock simulants, comparison is also being made with existing explosive events that have been performed in rock in the field. Of particular interest is the cratering series conducted at Buckboard Mesa in a jointed basalt on the Nevada Test Site.



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