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MEMIN impact cratering experiments into tuff and quartzite: First results.

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Impact experiments into quartzite, dry tuff and water-saturated tuff targets were performed at the facilities of the Ernst Mach Institute, Freiburg. Steel projectiles (2.5 mm) were accelerated to velocities of 5 km/s. Depth-diameter ratios of craters in quartzite have similar values to granites and to water-saturated sandstone targets. Ratios increase in wet tuff and are even higher in dry tuff. This mainly reflects the effect of porosity on the crater shape caused by deeper projectile penetration. Saturating pore space with water counteracts this effect. Crater volumes show surprisingly little variation when dry tuff, quartzite and dry sandstone targets are compared. This is mainly due to the inverse relationship of strength and porosity in geological materials [1]. Saturation of the tuff's pore space with water leads to an increase in crater volume, as seen in previous experiments with dry and water-saturated sandstones. Water reduces the dampening effect of porosity on the shock wave, leading to more effective crater excavation.

[1] Palchik, V. (2006) Int. J. Rock Mech. & Mining Sci. 43,1153–1162.

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