IMPACT CRATERING EXPERIMENTS INTO QUARTZITE AND TUFF: FIRST RESULTS FROM THE MEMIN RESEARCH UNIT.

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Introduction: The MEMIN research unit is focused on performing and evaluating impact cratering experiments into geological materials. A series of impact experiments into quartzite and tuff targets is planned for June 2012. We intend to have completed a preliminary evaluation of these experiments for this conference. The research unit has already successfully performed 18 impact experiments into sandstone where 2.5 to 12 mm diameter projectiles were accelerated to velocities of 2.5-7.8 km/s. The projectiles impacted into blocks of dry or water-saturated sandstone (e.g. [1]).

Planned experiments: The aim of the planned experimental campaign is to study the effects of porosity on the cratering process in more detail. The cratering results we have obtained from sandstone (23% porosity) will be compared to experiments performed on low-porosity and high-porosity targets. We will use a quartzite (*Taunus Quarzit*) with <~1% porosity and a tuff (*Weiberner Tuff*) with ~40% porosity. Impact experiments will be performed at the SLGG accelerator of the Fraunhofer Ernst-Mach-Institute in Freiburg, Germany. 2.5 mm diameter steel spheres will be accelerated to 5 km/s and impact into cube-shaped targets with an edge-length of 20 cm. After the experiments, crater morphology will be quantified, and ejection angles and other dynamic behavior will be characterized and quantified from high-speed videos and catcher imprints.

Expected outcome: When comparing experiments with the same impact conditions (projectile mass, density and velocity) the crater volume will most likely be affected by the target's strength and porosity. An increase in either value reduces crater size. Interestingly, rock strength is usually reduced for increasing porosity values, following a power law, e.g. [2]. Thus, crater volumes may actually show only little variation between non-porous quartzite, sandstone, and highly-porous tuff. Porosity is expected to affect the behavior of the ejection process. In experiments with sandstone, saturation of the sandstone's pore space led to the formation of much narrower ejecta cones [1]. It is currently not clear if this is an effect of the water itself or the reduction of porosity. The planned experiments will help to clarify this. Furthermore, strength and porosity of the targets will influence the ejection velocity and transient crater growth. The results can be used to better constrain current scaling laws for crater size and ejecta behavior.

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