3 YEARS MEMIN PROJECT – ACHIEVEMENTS AND OUTLOOK.

A. Deutsch[1], T. Kenkmann[2], K. Thoma[3], M. H. Poelchau[2], and the MEMIN team[4]. [1]Inst. f. Planetologie, Univ. Münster, D-48149 Münster, Germany. (deutsca@uni-muenster.de). [2]Geowissenschaften, Univ. Freiburg D-79104 Freiburg. [3]Fraunhofer Ernst-Mach-Insitut (EMI), Freiburg. [4]Museum f. Naturkunde Berlin, TU Munich, GFZ-Potsdam.

Goals: The MEMIN project (Multidisciplinary Experimental and Modeling Impact research Network; DFG research unit 887) brings together scientists specialized in certain fields of impact cratering; in the main focus is a better understanding of how porosity in geological materials effects the cratering process [1]. Porous targets not only occur on Earth (e.g., sedimentary rocks) but are common on all terrestrial planetary bodies (e.g., regolith, breccias), and icy satellites (various ice – silicate mixtures).

Achievements: Mesoscale cratering experiments with two different light-gas guns (EMI) form the core of the MEMIN project. We changed systematically several parameters in these experiments, namely (i) the projectile type, diameter *D*, and impact velocity v_i (Alu 55X G28JI, Steel AISI 4130, Steel D290-1, iron meteorite Campo del Cielo IAB; *D* 2.5 to 12 mm; v_i 2.5 to 7.8 km s^{-2}), and (ii) the target type (quartzite [2], sandstone, tuff [2]), porosity (<1, 23, 40 %) and water saturation (nominally dry, 44, 50 , and 90%, calculated from weight differences). The latter parameter study yielded for the first time quantitative data on the effect of pore water on the cratering process. Impact, excavation, and ejection were documented in all experiments by high speed framing cameras, newly designed ejecta catchers collected material in a close-to-quantitative manner. The rock cubes were characterized with ultrasound tomography prior to and after the experiment. Using 3D laser scanning technology we created digital elevation models of the experimental craters. In some experiments, the damage zone around and below the craters was analyzed by micro-tomography, optical, and advanced electron optical methods (EBSD). In combination, these analyses yielded a high spatial resolution of the damage zone. Mapping of ejecta imprints, grain size analysis, and shock petrography together with a graphical analysis of the high-speed movies yielded a deeper insight into the ejecta process. Geochemical and mineralogical studies of the ejecta revealed in addition, unexpected interaction of projectile with target materials.

Due to the very detailed pre-experiment, and post-mortem analyses, we provided input and control data for the numerical modelling. These combined, novel interdisciplinary efforts should meet in a data set closing the gap between small scale lab experiments with loose targets, and natural as well as experimental craters whose morphometry is mostly due to strength of the target rocks (e.g., Kamil crater, Wolfe Creek crater.

Outlook. The exciting results of the first 3-years MEMIN research period are currently compiled for a special MAPS volume. They form the solid basis for an even more specialized second period of experimental impact cratering research that may also include a field campaign

References: [1] Kenkmann T. et al. (2011) *MAPS 46,* 890-902. [2] Poelchau M. H. et al. (2012) this volume. [3] *MAPS 47*, Special MEMIN volume, in preparation.