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INVESTIGATION AND MODELLING OF LARGE SCALE CRATERING EVENTS - LESSONS LEARNT FROM EXPERIMENTAL ANALYSIS

Abstract

Gained through the 2010 Spin Your Thesis, a new ESA Education initiative, a group from the University of Glasgow Space Advanced Research Team (SpaceART) successfully conducted a series of impact cratering experiment under a highly accelerated reference frame. This aimed to [1] reproduce and define the physical conditions of large-scale cratering events onto highly porous asteroids; [2] provide cratering response data for the validation and advancement of numerical models and [3] support the generation of a reliable scaling theory for cratering events. Impact cratering is a fundamental process that has shaped and continues to shape the formation and evolution of our solar system and other planetary systems. Although much is known on the impact dynamics of rocky, brittle bodies, such as asteroids, little is known on the physical response of highly porous bodies. Consequently the physical response of porous bodies can not be compared to conventional models. Therefore throughout the experiment campaign, variation into the influence of target material porosity and projectile density was examined. All in-situ measurements were recorded relative to the crater's morphological profile and ejecta distribution. This occurred under increasing levels of acceleration, thereby validating that the experiment occurs within the crater dominated gravity regime. This paper will therefore detail the programmatics issues of the initiative, experiences and lessons learnt from the student perspective. From its initial proof-of-concept the Spin Your Thesis campaign provided a solid foundation for the development of an experimental idea; enabling high scientific return and personal development.