Geophysical Research Abstracts
Vol. 17, EGU2015-10863, 2015
EGU General Assembly 2015

Effects of low velocity impacts on basaltoids

Dagmara Oszkiewicz (1), Monika Nowak (2), Tomas Kohout (3), Kathryn McDermott (4), Lukasz Marciniak (5), Karri Muinonen (6), and Antti Penttila (2)

(1) Institute Astronomical Observatory, Faculty of Physics, A. Mickiewicz University, Poznan, Poland, (2) Institute of Geology, Faculty of Geographical and Geological Sciences, A. Mickiewicz University, Poznan, Poland, (3) Institute of Geophysics and Astronomy, Department of Physics, University of Helsinki, Helsinki, Finland, (4) School of Physical Sciences, University of Kent, Canterbury, England, (5) Institute of Low Temperature and Structural Research, Polish Academy of Science, Wroclaw, Poland, (6) Finnish Geodetic Institute, Masala, Finland

According to Antarctic Meteorite Collection (ANSMET program) less than 1% of collected meteorites belong to the so-called HED (howardite- eucrite-diogenite) meteorite group. Those meteorites have been identified to originate from asteroid (4) Vesta - the only currently known differentiated and intact asteroid in the Main Asteroid Belt. Few of the known HED meteorites cannot be chemically linked to Vesta, the most prominent ones include Ibitira and NWA011. Those meteorites among with other evidence suggest that additional differentiated bodies existed in the Solar System at some point during its history. The observational proofs for those bodies are however missing. This mismatch between in-situ meteoritic and observational asteroidal evidence is known as the "missing dunite" problem [Burbine et al., 1996]. Several observational, dynamical, chemical and geological hypothesis were put forward to explain the mismatch. For example [Burbine et al., 1996] suggested that the basaltic asteroids were "battered to bits" and are curently beyond our spectroscopic reach. More recently [Weiss et al., 2013] showed that partial differentiation is possible, creating an alternative formation hypothesis for those bodies. Few of the hypothetical explanations of the missing dunite problem (such as modification of V-type spectra by space weathering or impact shocking) could be tested experimentally in laboratories. Ideally experimental studies require multiple trials on large amounts of various materials. The samples are often permanently altered or even damaged during the experiments. Given the scarcity of HED meteorites the best solution would be to perform the studies on analogue materials. In this research we explore the possibility of using the Earth basalts and peridotites as analogues to HED meteorites. In particular we analyze the differences and similarities in chemical composition, mineralogy, reflectance spectra and matterial shock induced changes in the selected Earth basalts. We perform low velocity impacts ($\sim$4-7 km/s) into the selected basaltoids using the two stage light gas gun facilities based at the University of Kent. We next investigate the spectra and shock iduced changes in the samples. The conclusion of this experiments may be applicable to HED meteorites and the topic of altering the surfaces of basaltoid-like planetary bodies.

Acknowledgement
MN was supported by Polish National Science Center, grant number NN307039740.
DAO was supported by Polish National Science Center, grant number 2012/04/S/ST9/00022.

References
[Burbine et al., 1996] Burbine, Thomas H., Anders Meibom, and Richard P. Binzel 1996, Meteoritics & Planetary Science 31.5: 607-620.
[Weiss et al., 2013] Weiss, B. P., Elkins-Tanton, L. T., Barucci, M. A., et al. 2012, Planetary and Space Science 66(1), 137-146