Geophysical Research Abstracts
Vol. 14, EGU2012-10505, 2012
EGU General Assembly 2012

Identification, mapping and size distribution of double and multiple craters on satellites of Saturn

R. J. Wagner (1), G. Neukum (2), and N. Schmedemann (2)

(1) German Aerospace Center (DLR), Institute of Planetary Research, Berlin, Germany (roland.wagner@dlr.de), (2) Institute of Geosciences, Freie Universitaet Berlin, Germany

Double and multiple craters can be identified on the terrestrial planets as well as on the icy satellites of Jupiter and Saturn, originating from the nearly simultaneous impacts of two or more projectiles [1][2][3]. Doublet craters, chains and clusters can form in the following cases: (a) impacts of projectiles created by the break-up of a weak body by tidal forces when encountering a planet, or (b) impacts of mutually orbiting bodies of similar sizes, or of a larger body orbited by a smaller one (e.g., an asteroid moon) [1][2][3]. Double or multiple craters are identified by two characteristic features [4]: common rims of individual craters in a group of two or more craters, indicating they may have been formed by a cluster of projectiles, and similar morphology and degradational state of craters in a cluster. Crater clusters identified in Cassini ISS images of the Saturnian satellites may be grouped into the following classes [4]: (1) doublet craters, (2) linear crater chains, and (3) multiple craters. Assuming that crater clusters originated from a cluster of impactors derived from a former unsplit projectile, we investigate how measuring craters in a cluster as if each crater was formed in a separate impact event could influence the shape of a distribution and possibly the determination of surface ages in a given geologic unit. Areas with multiple craters are mapped and the craters in each cluster are counted individually. Then, a scaling law [5, and ref's therein] is applied to each crater in a specific cluster to derive the projectile mass and diameter of the unsplit projectile and to recalculate the crater diameter as it would have been formed by un unsplit impactor. These diameters are included in the size distribution of the craters measured outside the clusters and compared to a measurement where all craters are counted regardless if they are members of a cluster or not. For a specific densely cratered test area on Saturn's moon Enceladus and impact condition the two size distributions are identical within the error bars, despite the comparably large number of clustered impacts in this region. Further impact conditions and test areas on selected Saturnian satellites, especially on Enceladus and Dione, are examined whether measurement of crater size distributions and extraction of surface ages are significantly affected by not taking into account the impactor size distribution prior to projectile splitting. References: [1] Bottke W. F. and Melosh H. J. (1996) Icarus, 124, 372-391. [2] Schenk P. M. et al. (2004) in: Jupiter (F. Bagenal, T. E. Dowling, and W. B. McKinnon, eds.), p. 427-456, Cambridge Univ. Press, U.K. [3] Boehnhardt H. (2004) in: Comets II (M. C. Festou, H. U. Keller, and H. A. Weaver, eds.), p. 301-316, UofA Press, Tucson, Az. [4] Wagner R. J. et al. (2010) EPSC Abstr., Vol. 5, abstr. No. EPSC2010-676. [5] Zahnle K. et al. (2003) Icarus, 163, 263-289.