Geophysical Research Abstracts
Vol. 20, EGU2018-8210, 2018
EGU General Assembly 2018


# Double and Multiple Craters on the Satellites of Saturn and Jupiter and their Implications on Impactor Size Distributions

Roland J. Wagner (1), Nico Schmedemann (2), Stephanie C. Werner (3), Boris A. Ivanov (4), Thomas Roatsch (1), Elke Kersten (1), and Ralf Jaumann (1)

(1) German Aerospace Center (DLR), Institute of Planetary Research, Berlin, Germany (roland.wagner@dlr.de), (2) Max Planck Institute for Solar System Research, Göttingen, Germany (schmedemann@mps.mpg.de), (3) CEED, University of Oslo, Norway (stephanie.werner@geo.uio.no), (4) Institute for Dynamics of Geospheres, Moscow, R.F. (baivanov@idg.chph.ras.ru)

Double and multiple craters (clusters) are impact features which occur on the terrestrial planets as well as on the icy satellites in the outer Solar System. While most clusters or rays of craters at sizes smaller than ~5 km represent secondary impact craters formed by material ejected in a major impact event, some of these features originate from the nearly simultaneous impacts of a binary or a disintegrated impactor [1][2][3]. The following mechanisms are responsible for creating crater doublets or multiple craters: (a) break-up of a mechanically weak body by tidal forces of a planet, or (b) binary impactors, (bodies of similar sizes, or a large and a small body, e.g., an asteroid with a moon). Criteria for identifying double or multiple impacts are common crater rims, and similarities in morphology and the state of degradation of craters in close proximity. The degree of uncertainty if two similar craters were formed in a double impact increases with their separation. In turn, a contact does not necessarily imply a nearly simultaneous origin as has been verified recently for the two terrestrial impact craters Clearwater West and East [4]. In a previous study [5][6], we used Cassini ISS camera data to investigate a comparably large number of crater clusters on the Saturnian satellites Enceladus and Dione to recalculate the original size distribution of projectiles prior to disintegration. This investigation was based on a comparably simple crater scaling law [7], and under the assumption that craters in a cluster were formed from an originally single impactor. We found that the shape of the crater distribution and, hence, derived ages, are considerably affected if more than a 10% percentage of craters originate from split projectiles [6]. In this continuing study we use a more sophisticated crater scaling law [8, and ref's therein] to derive the original size of the single impactor and extend our investigations to the Jovian satellites Ganymede and Callisto using Voyager and Galileo SSI images. 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, Cambridge, U.K. [3] Boehnhardt H. (2004), in: Comets II (M. C. Festou, H. U. Keller, and H. A. Weaver, eds.), p. 301-316, Univ. of Arizona Press, Tucson/Az., USA. [4] Biren M. B. et al. (2016), Earth Planet. Sci. Lett. 453, 56-66. [5] Wagner R. et al. (2012a), Lunar Planet. Sci. Conf. XLIII, abstr. No. 2469. [6] Wagner R. et al., (2012b), European Planet. Sci. Congr. 2012, abstr. No. EPSC2012-888. [7] Zahnle K. et al. (2003) Icarus 163, 263-289. [8] Hiesinger H. et al., Science 353, aaf4759-1 - aaf4759-8.