



A study of crater morphologies on Phoebe using Cassini-ISS images

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In June 2004, the Cassini spacecraft encountered the small Saturnian satellite Phoebe (mean radius 107 km) at a minimum range of 2071 km. During this flyby, the Cassini Imaging Science Subsystem (ISS) on board took series of images showing craters over a wide size range on the surface of Phoebe. Their morphologies bear information on properties like strength or layering of the surface material. We used ISS-stereo images with resolutions better than 200 m/pxl to derive topographic models of the surface. These models have resolutions in the range of 0.5-1 km and cover approx. 1/3 of the surface. One of the most striking features is a conically shaped 13 km crater with an unusually high depth-to-diameter ratio of 1:4. The crater appears to be fresh and has a sharp rim in most parts. Typically, small fresh craters are bowl-shaped. Shadowed areas in the images have prevented us from getting stereo models of more cone craters. However, the shadow contours of some craters suggest that there are likely several more. The cone craters on Phoebe seem not to be unique. Based on shadow contours, potential cone craters can also be found in NEAR-images of Eros and in Lunar Orbiter images of the Earth's Moon. This suggests that merely the impact mechanics under low-gravity conditions cannot explain the observations. Hints to the formation of cone craters may come from explosion experiments (Piekutowski, 1977). Explosions performed in sandbeds produced large cone-shaped craters when the sand was loose and smaller bowl-shaped craters in case of more dense sand. Thus the cone craters on Phoebe may hint to low compaction near surface material, which could have formed by former large impacts.