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The cratering record of the major Saturnian satellites in comparison: First results from analysis of the Cassini ISS imaging data

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The two cameras aboard the Cassini spacecraft in orbit around Saturn since July 2004 have provided a wealth of new image data of the major Saturnian moons Mimas, Enceladus, Tethys, Dione, Rhea, Iapetus and Phoebe and of their cratering record [1][2]. With exception of some areas on Enceladus, their surfaces are heavily cratered and suggest ages of 4 Gyr or higher. Regional variations in crater frequency are found on each one of the satellites, caused by geological processes rather than by changes in the size-frequency distribution of impactors [e.g. 3, 4]. The lunar-like shape of crater size-frequency distributions measured on these satellites is compatible with a preferentially asteroidal source of impactors. If the underlying projectile distribution was, or still is, primarily due to cometary bodies derived from the Kuiper Belt, as suggested by e.g. [5], their collisional evolution must have been similar to that of the asteroids. The existence of two different projectile populations as suggested by [3, 4] cannot be seen in our data. Instead, the results imply a single population of impactors. Resurfacing by geological processes (such as basin-creating events) more likely explains the observed changes (kinks) in slope, otherwise interpreted as the effect of different impactor populations [e.g. 4]. The leftward shift in log-D of the lunar production function towards smaller crater diameters is, within the uncertainties of the still poorly understood crater scaling on icy bodies, in good agreement with differences in average impact velocities between the Moon and the Saturnian satellites derived by [6] and can mostly be reconciled with primarily planetocentric projectiles. The high crater frequencies and the

large basins imply a very high surface age, especially in the case of Iapetus, of at least 4 Gyr, probably close to 4.4 - 4.5 Gyr.

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