Geophysical Research Abstracts,
Vol. 11, EGU2009-4428, 2009
EGU General Assembly 2009

The surface age of Titan

R. Jaumann (1,2) and G. Neukum (2)

(1) DLR, Inst. of Planetary Research, Berlin, Germany (ralf.jaumann@dlr.de, +49 3067055402), (2) Free University of Berlin, Dept. of Earth Sciences, Inst. of Geosciences, Berlin Germany

So far five impact craters have been confirmed on Titan's surface and 42 possible impact-like features have been identified [1-9]. In general, they are circular and appear to have elevated rims and interiors. Many of the larger of these features show evidence of having been significantly eroded. Others are partially or nearly completely covered by dunes, fluvial channels have cut a few, and many are surrounded by talus. As on Earth there are multiple processes on Titan that can erode craters and significantly alter their appearance. The overall shape of the frequency distribution of both, the confirmed and putative ones, is relatively flat compared to those of other icy satellites, especially at smaller crater diameters. However, the cumulative crater frequency for larger diameters remarkably fits that of the basins on Iapetus for craters down to about 80 km diameter, although the number of craters is lower by about an order of magnitude. The crater frequency at sizes < 80 km is far lower by about a factor of up to 200. Compared to the crater frequency distribution on Earth, Titan shows a similar shape, however, the density is about 5 to 10 times higher. The absolute age models according to [10,11] assumes a lunar-like impactor flux mainly of main-belt asteroids, whereas [12,13] assume a constant impactor flux of cometary objects, either with a size distribution of Jupiter family comets (JFC) (case A), or with a size distribution of small comets in the Neptunian System (case B). According to the [10,11]-age model Titan's surface is as old as 3.9 Ga as derived from the larger-crater (> 80 km) frequencies. The [12,13]-age model yields surface ages of 3.5 Ga in case A and 1.4 Ga in case B. If only smaller craters, e.g. 10 km-sized craters, are taken into account for age determination, surface ages are 100 Ma according to the [10,11]-age model, 8 Ma according to [12,13]-age model case A, and 2 Ma for case B. Although the statistical precision of the Titan cratering results is not very high and cratering models for absolute ages are controversial, it is obvious that Titan's surface is partly as old as the other Saturnian satellites reflecting an early crust, still preserved, and has been partly modified and heavily resurfaced even in recent times. References: [1] Porco, C.C. et al., (2005) Nature, 434, 159-168. [2] Elachi, C. et al., (2005) Science, 308, 970–974. [3] Wood C.A., et al., (2006), LPSC XXXVII,#1659. [4] Lorenz R., et al., (2007), Geophys. Res. Lett., 34. [5] Jaumann R., et al., (2009), in Titan after Cassini-Huygens (R.H. Brown et al. (eds)), Springer, London, subm.. [6] Perry et., Sat. of the Outer Solar System, #6064. [7] Lorenz, R.D. et. Al., Sat. of the Outer Solar System, #6012. [8] Soderblom, L., et al., PSS 44, 2035-2036. [9] Rodrigues, S., et al., PSS 54, 1510-1523. [10] Neukum, G., (1985), Adv. Space Res. 5, 107-116. [11] Neukum, G., et al., (2005), Lunar Planet. Sci. Conf. 36th, abstract 2034. [12] Zahnle, K., et al., (2003), Icarus 163, 263-289. [13] Korycansky, D.G., and Zahnle, K.J., (2005), Planet. Space Sci. 52, 695-710.