



Depression structures in Martian impact craters

J. Kortenieniemi, M. Aittola, H. Lahtela, V.-P. Kostama, J. Raitala

Division of Astronomy, Department of Physical Sciences, University of Oulu, Oulu, Finland
(jarmo.kortenieniemi@oulu.fi / Fax: +358 8 553 1934)

Martian impact craters exhibit a wide range of interior morphologies, e.g. central peaks, central pits, flat floors, fractured floors (“FFs”) and irregular pits/depressions (“IDs”). The creation of FFs and IDs is caused by processes which only use the impact structure as an easy access outlet. This study categorizes some of these post-impact crater floor deformations, and intends to provide preliminary means to recognize the processes which take advantage of the pre-existing impact crater structure.

IDs are often small and have layered walls, revealing sedimentary origin of the surrounding materials. Some walls are straight; 1) radial/concentric to the parent crater, or 2) parallel with each other within a cluster of ID-craters. This may indicate that there is not only crater-related but also regional control over the ID formation. The FFs exhibit narrow crater-radial and -concentric cracks, which give the crater floor a web-like appearance. Well-developed FFs are considered to be chaotic.

The craters with depressions occur in three main clusters on Mars: 1) Arabia Terra, 2) Xanthe-Margaritifer Terrae and 3) Hellas-Noachis-Argyre regions. The Arabia population is most diverse, with both irregular depressions in the outskirts, fractured floors near and chaotic craters at the dichotomy boundary. Thus a preliminary developmental sequence can be obtained: pit-fracture-chaos. Only chaotic and fractured craters occur in Xanthe-Margaritifer, and only depressed ones in Hellas-Noachis-Argyre. New observations [Kortenieniemi et al., 2005] have revealed fracture development on the craters inside the Hellas basin. This is the first time FFs were found away from the dichotomy or areas of strong tectonic deformations, and may reveal that there is a connection also between the Hellas region IDs and FFs.

Kortenieniemi, Lahtela, Raitala (2005), Anomalous depressions on the circum-Hellas crater floors as seen in the first year MEX HRSC images, LPSC 36, #1669.