Floor Fractured Craters around Syrtis Major, Mars M. Bamberg[1,2], R. Jaumann[2] and H. Asche[1] [1]University Potsdam, Department of Geography, Geo-Information Section, Germany (Marlene.Bamberg@dlr.de/ Fax: +49 30 670 55 402) [2]German Aerospace Center, Institute of Planetary Research, Berlin, Germany

Introduction: High Resolution Stereo Camera (HRSC) and Mars Reconnaissance Context Camera (CTX) images revealed that the region around Syrtis Major exhibits morphologies related to volcanism and fluvial erosion. Craters around Syrtis Major are eroded and/or refilled. Additionally the crater floors are shaped by wind and fluvial activity generating highly weathered morphologies. Basaltic deposits originating from nearby Syrtis Major cover the floor of impact craters. Furthermore in three areas can be found floor fractured craters. All these features are closely concentrated spatially and seem also to be correlated stratigraphically.

Geologic Overview: Syrtis Major is one of the large Hesperian-aged volcanic regions on Mars [1]. The basaltic shield volcano has a basal diameter of 1100km, a maximal height of 2300m [2, 3], and exhibits all volcanic landforms such as lava flows, calderas and wrinkle ridges. Erosional landforms indicate modification of the area [4]. The southern volcano region borders the oldest highlands on Mars covered with large and old impact craters. Craters at the southern flank of Syrtis Major (-6°N to 6°N and 65°E to 80°E) are eroded by wind and fluvial activity. Some of these craters are filled with basaltic material, so that the crater floor is completely covered. In particular some craters exhibit a fractured floor. Our work is focussed on this special crater type.

FFC Areas: There are three areas around Syrtis Major were FFC's can be detected (Fig.1). The first area (a) is located in the south-eastern part of Syrtis Major, it borders to the highlands. Volcanic features like lava flow fronts, lava flows and wrinkle ridges dominate in this region. The crater floor is separated in sharp-edged plates and the interior seems to be flooded by basaltic material from the Syrtis Major volcano. The second area (b) is in the north of Syrtis Major and the passage to the chaotic terrain further north. Nearby the dichotomy boundary fluvial activity was the decisive process. The crater rims are highly eroded, channels are cutting through the crater area and the crater floor is dissected and separated in several plates with a smooth and rounded shape. These features show the presence and activity of water. In the north-west of the volcano the third area (c) can be found. Fluvial and volcanic features can be detected there.

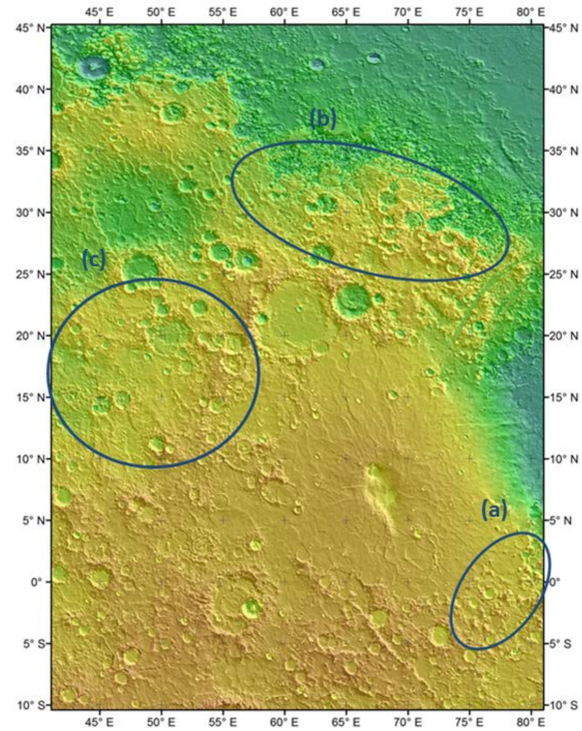

Fig.1: Topography of the volcano Syrtis Major. In three areas (a,b,c) floor fractured craters have been detected. (MOLA)

Erosion Processes: The appearance of the craters depends on the erosion processes, which differs between the three areas. Crater rim and the shape of the fractured plates are indicators for the geologic environment. Figure 2 shows the slopes of a crater in the volcanic region in the south of Syrtis Major. The crater rim is steep and well preserved, the interior is flat, except the central peak, the plates are clearly visible with sharp borders. The crater in Figure 3 is located in the north of Syrtis Major, nearby the dichotomy border and the chaotic terrain. A steep crater rim is not preserved and the interior appears to be orderless. The fractured plates can not be identified definitely. Lots of slopes (up to 15°) dominate the crater floor, straight and squared features are rare. Round structures are common, which display the presence of water and fluvial activity. So the appearance between the two craters is diverse. The reason for this can be found in the area and the associated erosion processes.

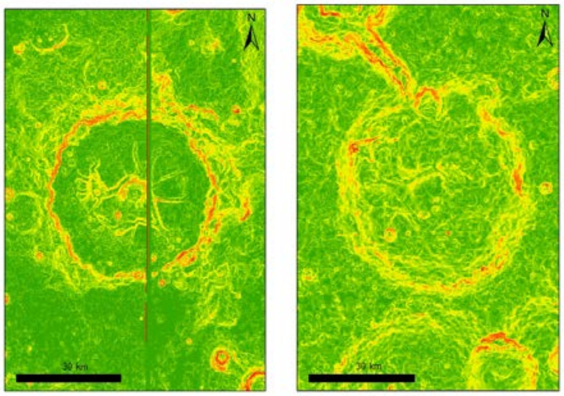

Fig.2,3: The left crater is located in area (a) at 79,92°E and -0,31°N. Volcanic processes dominate this region (HRSC images h0944_0009.dt4, h0933_0000.dt4, ESA/DLR/FU Berlin). The image on the right side is part of area (b) and located at 68,34°E and 29,18°N (HRSC images h1391_0000.dt4, ESA/ DLR/FU Berlin). Visible are the slopes of the elevation model. Green areas are flat and red are steep.

FFC Types: Floor Fractured Craters can be divided in types. The grade of erosion and the geologic process, which formed the crater, can be different. In the following classification the geologic processes, which modified the craters after the formation of the fracturing are not taken into account.

Type 1: Crater floor affected by pit chains or narrow crevices which are sometimes discontinuous (Fig.4).

Type 2: More developed and dense networks of crevices than type 1. Crevices are wide and deep enough to be detected. A circular moat starts to develop as crevices concentrate along the rim.

Type 3: Mainly distinguished from type 2 by the presence of a fully developed circular moat. The flat central part is divided into several blocks by crevices (Fig.5).

Type 4: They show also a continuous moat along the rim but the central part consists of many flat-top blocks and small conical mounds.

Type 5: Crater floor has many mounds of irregular sizes, but the flattop blocks are absent. It should be noted that the knobby surface shows typical characteristics of chaotic terrains and could be alternatively classified as such. [5]

Type 6: Crater without a circular moat, crevices are not fully developed, flat-top blocks are present. Fractured floor could have been reshaped through geologic processes.

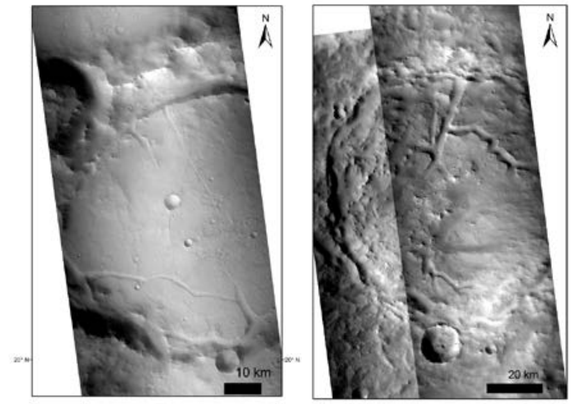

Fig.4,5: The left crater is located at 49,13°E and 20,42°N. It is an example for type 1 crater (CTX image P11_005500_ 2006_XN_20N311W, NASA/JPL). The crater to the right is located at 41,87°E and 15,13°N. It is an example for type 3 craters (CTX images P08_004063_1952_XN_ 15N318W, P14_0066 87_1928_XN_12N318W, NASA/JPL).

Summary and Conclusion: Floor fractured craters can be found in three main areas around Syrtis Major. The appearance of the craters is diverse, so it is likely that they were formed and modified by different geologic processes. Floor fractured craters can be developed in volcanic or water-rich areas. The appearance and shape of the crater features is diverse and an indicator for the environment. The roundness of the fractured plates can be measured and a tool for crater classification. Furthermore the 5 known crater types by Sato [5] are not sufficient to classify all floor fractured craters around Syrtis Major. New types have to be defined, especially for craters in volcanic areas.

References: [1] Greeley R. and Guest J. E. (1987) Map I-1802-B, *U.S.Geol. Surv*. [2] Schaber G.G.(1982) *JGR*, *87*, 9852-9866 [3] Hiesinger H. and Head J. L. (2004) *JGR*, *109*, E1004, doi: 10.1029/ 2003JE002143. [4] Jaumann R., Nass A., Tirsch D., Reiss D., Neukum G. (2010) *Space Sci. 294*. [5] Sato H., Kurita K., Baratoux D. (2010) *Icarus 207*, 248-264.