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Characteristics of Polygonal Craters on (1) Ceres

Katharina A. Otto (1), Ralf Jaumann (1,2), Katrin Krohn (1), Debra L. Buczkowski (3), Isabel von der Gathen (1), Elke Kersten (1), Scott C. Mest (4), Andrea Naß (1), Adrian Neesemann (2), Frank Preusker (1), Thomas Roatsch (1), Stefan E. Schröder (1), Fanziska Schulzeck (1), Jennifer E. C. Scully (5), Katrin Stephan (1), Roland Wagner (1), David A. Williams (6), Carol A. Raymond (5), and Chistopher T. Russell (7)

(1) German Aerospace Center (DLR), Institute of Planetary Research, Berlin, Germany (katharina.otto@dlr.de), (2) Freie Universität Berlin, Planetary Science and Remote Sensing, Germany, (3) Johns Hopkins University, Applied Physics Laboratory, Laurel, MD, USA, (4) Planetary Science Institute, Tucson, AZ, USA, (5) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA, (6) Arizona State University, Tempe, AZ, USA, (7) University of California LA, Institute of Geophysics, Los Angeles, CA, USA

The Dawn spacecraft arrived at Ceres in March 2015. There, the on-board Framing Camera (FC) collects image data with a resolution of up to 35 m/pixel, which reveal a large variety of impact crater morphologies including polygonal craters. Polygonal craters show straight rim sections aligned to form an angular shape. They are commonly associated with fractures in the target material, which may be preserved as linear structures on Ceres [3, 4]. On Ceres, we find polygonal craters with a size ranging between 5 km and 280 km in diameter. However, the majority of polygonal craters have diameters ranging between 10 km and 50 km diameter. A preferential hexagonal shape is observed and some polygonal craters exhibit central peaks or relaxed crater floors.
On average there are eight to ten polygonal craters per 100,000 km^2, however the northern latitudes have a slightly higher and the southern latitudes a slightly lower polygonal crater density. This may hint at an older and younger age of the northern (> 60° N) and southern regions (> 60° S) compared to the mid latitudes, respectively. Alternatively, the relaxation of craters may be advanced in the mid latitudes which are generally warmer than the poles and thus support the relaxation of depressions. Also, the southern region harbors relatively large craters which may have altered or destroyed preexisting structures in the crust which are necessary for the formation of polygonal craters.
Most polygonal craters have six or seven straight rim sections; however, there is a tendency for fewer edges with decreasing crater size. Although this observation may be biased due to the map resolution, it is also possible that the impactor creating a relatively small polygonal crater embeds less energy and thus forms the straight rim sections during the excavation stage. This may result in fewer straight rim sections compared to more energetic impactors which form their polygonal shape during the modification stage.
Straight rim sections and edges of polygonal craters often align with linear features associated with Ceres' tectonics. Small and medium-sized polygonal crater rims tend to align with the general direction of linear features, whereas very large polygonal crater edges tend to be intersected by the linear features. This may hint at the different formation processes of polygonal craters depending on the embedded energy. In contrast, polygonal craters are also present in areas with no obvious tectonic features. These polygonal craters may be produced by subresolution or subsurface fractures.
[3] Buczkowski, D. et al., GSA 2015, 1-4 November 2015, Baltimore, MD, USA, #282-8, 2015 [4] von der Gathen, I. et al., GSA 2015, 1-4 November 2015, Baltimore, MD, USA, #282-9, 2015