

POLYGONAL IMPACT CRATERS ON MERCURY G. T. Weihs¹, J. J. Leitner^{1,2} and M. G. Firneis^{1,2}, ¹Institute of Astronomy, University of Vienna, Tuerkenschanzstrasse 17, A-1180 Vienna, Austria; ²Research Platform: ExoLife, University of Vienna, Austria; a6425059@unet.univie.ac.at

Introduction: A polygonal impact crater (PIC) is a crater, which shape in plan view is more or less angular, and the rims are composed of several straight segments [1]. Analyzing the images transmitted back to Earth by the spacecrafts Mariner 10 and MESSENGER, polygonal impact craters with at least two straight rim segments, were detected on Mercury.

PICs on Mercury: The search for polygonal impact craters was carried out, using the database in [2]: In a first step each of the 15 quadrangle-maps was optically scanned for impact craters with at least two straight rims. In a second step the data preparation was resulting in a set of two images per PIC, one with marked straight rims and an original one for the purpose of comparison.

Most impact craters are very old, so the rims are heavily degraded and the craters flooded. This fact made in several cases a clear identification impossible.

Results:

This study proves the existence of polygonal impact craters on Mercury. Furthermore the assumption was confirmed, that PICs are an integral part of impact craters and common on the Moon, all terrestrial planets and several asteroids and icy moons [1].

All 15 quadrangles of Mercury were examined and the PICs found were documented: a total number of 33 PICs out of 291 approved craters, is according to our expectation of 10 to 15% PICs out of all impact craters.

A complete list of all PICs found on Mercury is given in Table 1. The list additionally contains the crater's diameter and its coordinates. The PICs' diameters reach from 65 km to 240 km, on the average the diameter is about 120 km, the same value as for all Mercury's impact craters [2]. The angles between the straight rims are found in a range between 98° and 132°. The specific morphology of PICs on Mercury in general is of the type of complex craters with terraced rims. An assumed connection [1] between the structure of PICs and the structure of the geologic environment on the surface was not found at first sight.

Two examples for PICs on Mercury are given, one for quadrangle H01-Borealis - crater Nizami (Figure 1) and a second one for quadrangle H06-Kuiper - crater Mahler (Figure 2).

Statistics: Statistics was performed on the number of PICs per quadrangle (Figure 3), the distribution of diameters (Figure 4), and the angles between straight rims per quadrangle (Figure 5). The number per quadrangle does not show any significant connexion to the quadrangles, i.e. the distribution of PICs on the surface is not uniform.

Table 1: List of PICs found on Mercury

Quadr.	Crater	Diameter [km]	Latitude [°]	Longitude [°]
H01	Nizami	76.88	70.38	167.12
H01	Saikaku	64.06	71.89	178
H01	Van Dijck	101.23	75.48	166.89
H02	Monteverdi	133.57	64.5	80.88
H02	Rubens	158.79	60.81	78.27
H02	Stravinsky	129.07	51.97	78.91
H03	Verdi	144.55	64.25	169.62
H05	Hokusai	114.03	57.76	343.1
H06	Al-jahiz	82.86	1.42	21.66
H06	Chaikovskij	171.02	7.9	50.87
H06	Hiroshige	138.42	-13.33	26.97
H06	Kuiper	62.32	-11.32	31.4
H06	Lermontov	165.82	15.27	48.91
H06	Li Po	109.63	17.2	35.61
H06	Lu-Hsun	96.41	0.03	23.7
H06	Mahler	103.71	-19.79	18.64
H07	Drer	194.71	21.55	119.18
H07	Glinka	89.04	14.81	112.52
H08	Fet	79.48	-4.81	180.16
H08	Kalidasa	160.97	-18.33	179.7
H08	Liszt	78.64	-16.1	168.21
H08	Rublev	128.94	-15.1	156.99
H09	Kunisada	241.45	1.36	247.12
H09	Lange	176.23	6.39	259.4
H10	Firdousi	98.28	3.48	294.61
H11	Andal	108.55	-47.48	37.63
H11	Kenko	105.12	-21.29	16.23
H11	Rabelais	154.29	-60.44	61.84
H12	Milton	180.85	-26.12	175.01
H12	Rimbaud	78.23	-63.67	148.83
H13	Amaral	108.52	-26.54	242.2
H15	Callicrates	68.32	-66.49	30.36
H15	Dickens	77.31	-73.4	155.63

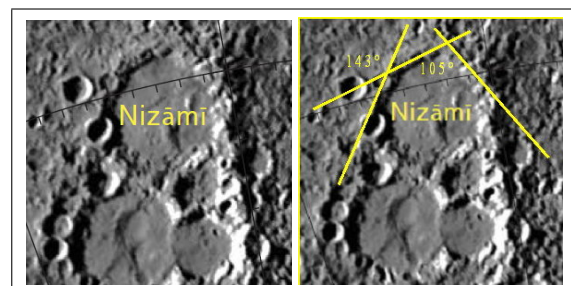


Figure 1: PIC in quadrangle H01-Borealis: Crater Nizami.

References

- [1] M. Aittola, T. Öhman, J. J. Leitner, V.-P. Kostama, and J. Raitala. (2010), *Icarus*, 205, 256–363.
- [2] IAU/NASA/USGS:Planetary-Database. (2011), <http://planetarynames.wr.usgs.gov/>.

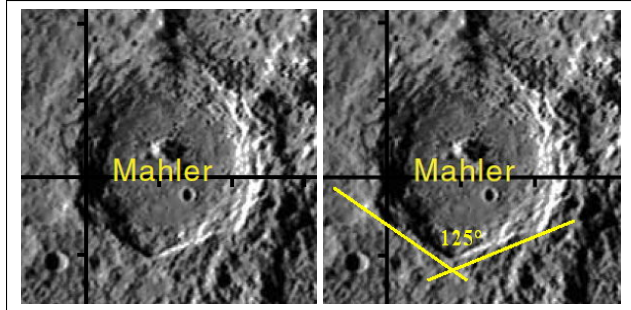


Figure 2: PIC in quadrangle H06-Kuiper: Crater Mahler.

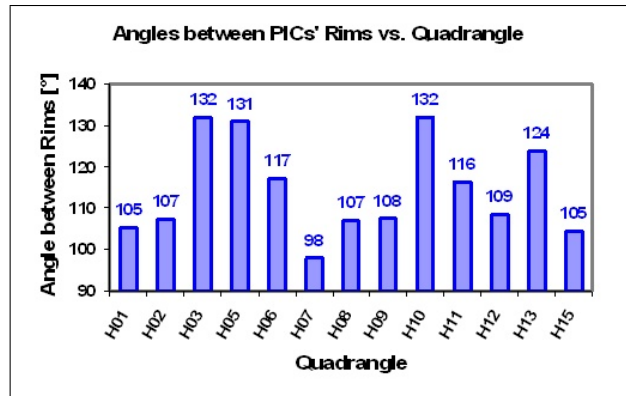


Figure 5: Angles between the PICs' rims vs. Quadrangles. The PICs' angles lie within a small range between 98° and 132°.

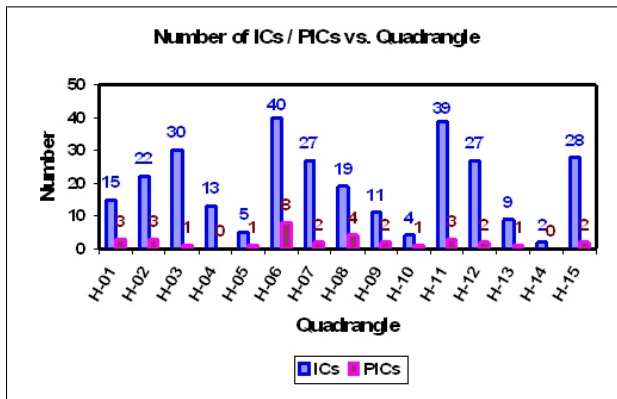


Figure 3: Number of ICs / PICs vs. Quadrangle. The number per quadrangle does not show any significant connex to the quadrangles.

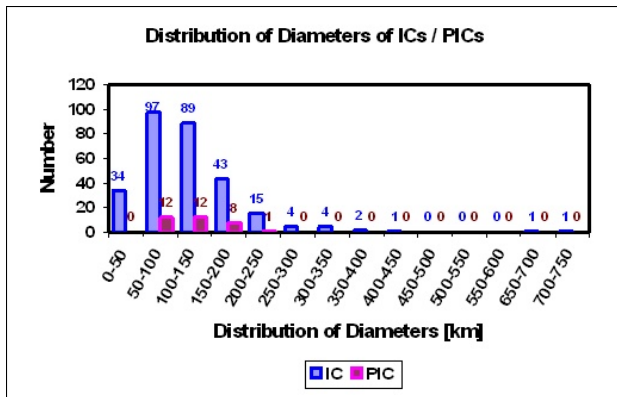


Figure 4: Distribution of Diameters of ICs / PICs. The PICs' diameter range lies between 65 km and 240 km.