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THE DEPTHS OF THE LARGEST IMPACT CRATERS ON VENUS; B. A. Ivanov, Institute for Dynamics of Geospheres, Russian Academy of Sciences, Moscow
P. G. Ford, Center for Space Research, Massachusetts Institute of Technology

The largest impact craters on Venus may be used as witnesses of various geological processes within the Venusian crust. We seek to continue the task (1), of constructing a data base for the further investigation of large craters on Venus (LCV), hoping to find evidence of crater relaxation that might constrain the thickness and thermal gradient of the crust, as proposed in (2). The current work concentrates on 27 impact craters with diameters (d) larger than 70 km, i.e., large enough that the footprint of the Magellan altimeter (3) has a good chance of sampling the true crater bottom. All altimeter echoes from points located within $(d/2)+70$ km from the crater center have been inspected.

In practice, many of the footprints studied contain multiple echoes. For this reason, the data for each crater were first arranged as a table containing the coordinates of each footprint, a main echo altitude, and, in cases where multiple echoes exist, two leading echo altitudes (preceding the main echo) and two trailing echo altitudes (following the main echo). The data were then analyzed by hand, locating the altimeter footprints on radar images of the craters. In many cases, this technique was useful in the interpretation of multiple-echo altimeter data. For instance, a leading echo might be identified as coming from the near-crater terrain and a delayed echo from the deeper crater floor.

n	*latitude (deg)*	*longitude (deg)*	*cycle 1 points*	*cycle 2 points*	*Official IAU crater name*	*d (km)*	*h (km)*
1	12.50	57.20	707	N/A	Mead	280	1.0
2	-29.70	204.10	400	398	Isabella	174	1.2
3	-55.90	321.80	N/A	140	Meitner	152	-
4	78.16	104.20	N/A	46	Klenova	139	-
5	-23.20	199.30	300	301	Stanton	110	0.9
6	9.80	288.80	279	N/A	Bonheur	100	0.9
7	51.90	143.30	513	N/A	Cochran	100	0.85
8	-1.60	62.40	230	N/A	Joliet Curie	100	0.75
9	23.40	140.30	320	N/A	Marie Celeste	99	0.8
10	65.90	7.00	516	N/A	Cleopatra	97	-
11	22.90	145.10	288	N/A	Greenaway	94	0.95
12	-36.10	127.00	366	47	Bonnevie	92	0.95
13	31.60	53.10	255	N/A	Potanina	90	0.85
14	-56.10	98.60	132	267	Addams	89	0.8
15	25.60	25.20	275	N/A	Mona Lisa	87	0.65
16	33.80	288.50	248	N/A	Sanger	86	0.7
17	24.50	228.80	217	N/A	O'Keeffe	82	0.75
18	-43.20	233.20	292	284	Stowe	80	0.8
19	61.40	223.00	195	N/A	Barsova	79	0.8
20	16.60	268.05	193	N/A	Wheatley	77	0.7
21	-51.90	145.90	127	258	Henie	78	0.7
22	-3.00	68.80	227	167	Andreianova	74	0.65
23	-26.50	99.30	77	197	Boulanger	73	0.8
24	-4.10	155.50	221	188	Franklin	72	0.75
25	-30.76	20.20	233	N/A	Stuart	71	0.8
26	24.40	220.05	133	N/A	Boleyn	70	0.9
27	48.30	195.30	235	N/A	Yablochkina	70	0.8

N/A = Not Available. Data for Meitner, Klenova, and Cleopatra are missing or ambiguous.

The measured crater depths (h), i.e., the average depths of their floors beneath the surrounding terrain, are shown in the rightmost column of the above Table. The depths shown here are generally smaller than those reported in (4). It appears that the Magellan altimeter cannot resolve either the crater rims themselves or any areas of deeper floor close to the inner rims—it may be necessary to use a stereo technique to locate them. Our preliminary results show that crater floors are typically horizontal, even when the surrounding terrain is very irregular or has some regional tilt. The measured RMS height variation of crater floors is typically 50 to 100 m—in only 5 cases

DEPTHS OF THE LARGEST IMPACT CRATERS ON VENUS: Ivanov, B. A. and Ford, P. G.

(Mead, Cochran, Marie Celeste, Mona Lisa and Sanger) is it higher—from 200 to 300 m. A general least-squares fit yields a depth-diameter relationship (h and d in km) of

$$h = 0.25\pm0.07\ d^{\,0.26\pm0.06}. \quad (1)$$

Using the exponent found earlier (5,6) for crater diameters of 8–60 km, we get the relationship

$$h = 0.17\pm0.04\ d^{\,0.34}, \quad (2)$$

in comparison with a rim-bottom depth relationship (5,6) of

$$h = 0.2\ d^{\,0.34}. \quad (3)$$

All craters in this study come within 100 m of obeying equation (1), and the residuals show no correlation with the emissivity of the crater interiors, a property which has been proposed to be related to crater age (7). At this time, it is hard to identify a parameter that can be used to search for crater relaxation on Venus.

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