

INCREASED DEPTH-DIAMETER RATIOS IN THE MEDUSAE FOSSAE FORMATION DEPOSITS OF MARS. N. G. Barlow, Lunar and Planetary Institute, 3600 Bay Area Blvd., Houston, TX 77058.

Depth to diameter ratios for fresh impact craters on Mars are commonly cited as approximately 0.2 for simple craters and 0.1 for complex craters. Recent computation of depth-diameter ratios in the Amazonis-Memnonia region of Mars indicates that craters within the Medusae Fossae Formation deposits found in this region display greater depth-diameter ratios than expected for both simple and complex craters.

Photoclinometric and shadow length techniques have been used to obtain depths of craters within the Amazonis-Memnonia region. 37 craters in the 2 to 29 km diameter range and displaying fresh impact morphologies were identified in the area of study (9°S to 15°S latitude, 170°W to 180°W longitude). This region includes the Amazonian aged upper and middle members of the Medusae Fossae Formation (Amu and Amm) and Noachian aged cratered (Npl₁) and hilly (Nplh) units (1). The Medusae Fossae Formation is characterized by extensive, flat to gently undulating deposits of controversial origin (2, 3, 4). These deposits appear to vary from friable to indurated.

Early analysis of crater degradation in the Medusae Fossae region suggested that simple craters excavated to greater depths than expected based on the general depth-diameter relationships derived for Mars (5). However, too few craters were available in the initial analysis to estimate the actual depth-diameter ratios within this region. Although the analysis is continuing, we are now beginning to see a convergence towards specific values for the depth-diameter ratio depending on geologic unit.

The simple to complex transition diameter appears to occur around 5 km in this region, similar to values obtained by Pike for other regions of Mars (6). Fresh impact craters superposed on the Noachian aged units display similar depth-diameter ratios as those found for the planet on average: simple craters have a depth-diameter ratio of approximately 0.23 (± 4) whereas the ratio for complex craters is closer to 0.15 (± 3). However, both simple and complex craters within the Medusae Fossae Formation deposits are deeper than craters of similar size outside the deposits (Table 1). Within the Medusae Fossae Formation, simple craters display a depth-diameter ratio of approximately 0.29 (± 5) and complex craters have a ratio of 0.21 (± 4). Thus simple craters within the Medusae Fossae Formation deposits are approximately 79% deeper than similarly sized craters outside the deposits. Complex craters are 71% deeper in the deposits than in surrounding areas.

The increase in depth-diameter ratio for the impact craters within the Medusae Fossae Formation deposits is almost certainly the result of textural differences between these deposits and other geologic units on Mars. Geomorphic analysis of features within these deposits suggests that the material is fine-grained and easily erodible. Laboratory experiments suggest that impact into fine-grained material can dramatically alter the morphometric properties of the resulting impact craters (7). Continuing analysis of depth-diameter ratios across Mars will provide further insight into the areal variation of near-surface properties.

REFERENCES: (1) Scott, D.H. and Tanaka, K.L. (1986) *USGS Map I-1802-A*. (2) Scott, D.H. and Tanaka, K.L. (1982) *JGR*, **87**, 1179-1190. (3) Schultz, P.H. and Lutz, A.B. (1988) *Icarus*, **73**, 91-141. (4) Forsythe, R.D. and Zimbelman, J.R. (1990) *LPSC XXI*, 383-384. (5) Barlow, N.G. (1992) *LPSC XXIII*, 63-64. (6) Pike, R.J. (1988) *Mercury*, 165-273. (7) Schultz, P.H. (1992) *JGR*, **97**, 11623-11662.

DEPTH-DIAMETER IN MEDUSAE FOSSAE: Barlow, N.G.

TABLE 1
 DEPTHS AND DIAMETERS OF CRATERS IN ANALYSIS

DIAMETER (D) (KM)	DEPTH (d) (KM)	RATIO (d/D)
28.0*	1.35	0.05
6.0*	1.13	0.19
28.5	2.48	0.09
3.1	0.77	0.25
2.7	0.66	0.24
2.7	0.66	0.24
2.0	0.44	0.22
4.3*	1.16	0.27
8.2*	2.13	0.26
2.7*	0.95	0.35
10.0*	3.08	0.31
2.5*	0.98	0.39
2.5*	0.79	0.32
3.8*	0.98	0.26
3.8*	1.08	0.28
9.9*	2.25	0.23
10.8	1.35	0.13
6.8*	1.35	0.20
19.1	1.17	0.06
5.2	0.78	0.15
3.5	0.73	0.21
4.6	0.73	0.16
3.5	0.73	0.21
2.6	0.43	0.17
8.4	1.28	0.15
6.8	1.10	0.16
3.4	0.73	0.21
7.0	1.29	0.18
7.4	1.29	0.17
3.9	0.72	0.19
9.6	1.61	0.17
2.5	0.57	0.23
2.5	0.57	0.23
4.6	0.89	0.19
4.0	0.72	0.18
5.0	1.08	0.22
6.9	1.15	0.17

*Fresh impact craters within Medusae Fossae Formation Deposits.