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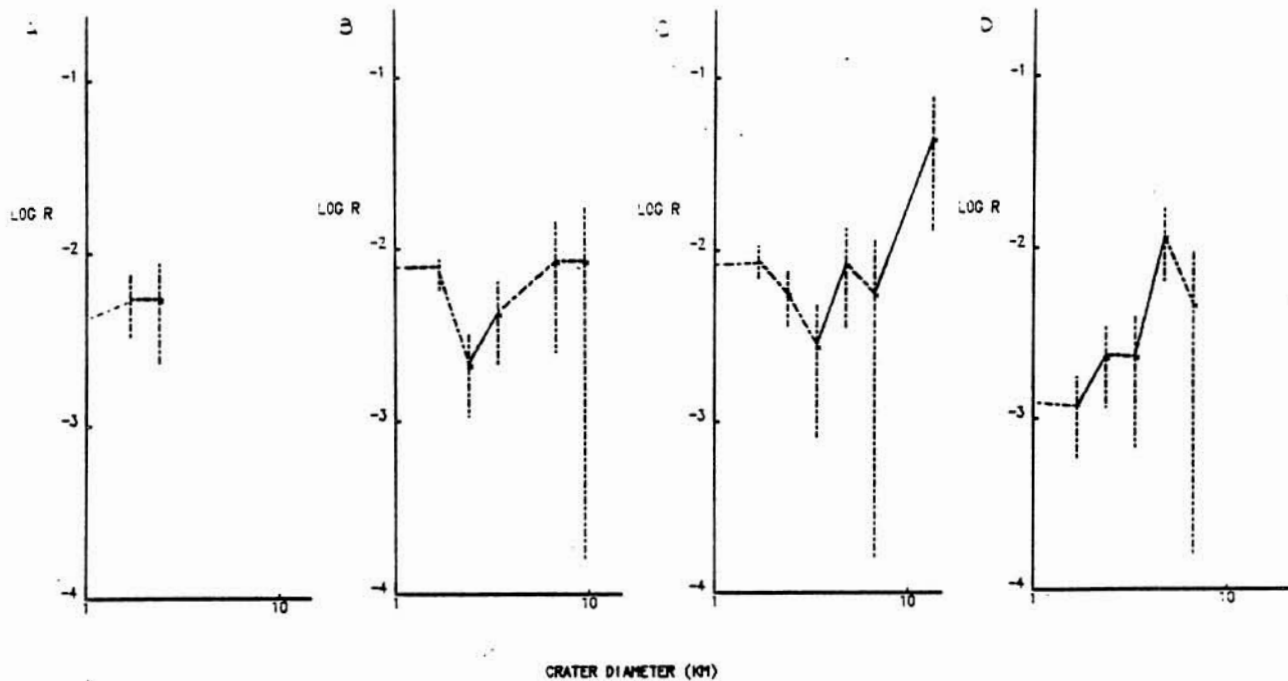
Without returned samples from the martian surface, relative age chronologies and stratigraphic relationships provide the best information for determining the ages of geomorphic features and surface regions. We measured crater-size frequency distributions of six recently mapped geologic units of Elysium Mons to establish their relative ages [1,2].

Most of the craters on Elysium Mons and the adjacent plains units are between 500 and 1000 meters in diameter. However, only craters 1 km in diameter or larger were used because of inadequate spatial resolution of some of the Viking images and to reduce probability of counting secondary craters. The six geologic units include all of the Elysium Mons construct and a portion of the plains units west of the volcano. The surface area of the units studied is approximately 128,000 km². We used four of the geologic units to create crater distribution curves. There are no craters larger than 1 km within the Elysium Mons caldera. Craters that lacked raised rims, were irregularly shaped, or were arranged in a linear pattern were assumed to be endogenic in origin and not counted.

Three of the crater distribution curves (Figs. A,B,C) show that the ages of the surface units of Elysium Mons are near the heavy bombardment-post heavy bombardment transition. This is consistent with the ages found by Barlow [3]. These three units appear to have been emplaced at nearly the same time. The fourth curve (Fig. D) indicates that the upper flank material is slightly younger; this unit shows considerably fewer craters in the 1.0 to 2.8 km diameter size range. This lack of small diameter craters could have resulted from unusual erosion on the upper eastern flank of Elysium Mons or from the burial of the surface by a later volcanic deposit. In contrast to the undifferentiable, braided lava flows of the western flank, the upper flank is smooth and slightly hummocky at 150 m/pixel. A few craters appear mantled by some surficial deposit. The upper eastern flank has been interpreted as an ash deposit by Mouginis-Mark [4] and McBride and Zimbelman [2] because of its smooth, mantled appearing morphology.

Additional crater frequency distribution analysis is in progress and includes relative age chronologies for adjacent surface units, west of Elysium Mons, to determine the geologic history of Elysium Mons.

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Figures: Relative crater-size frequency distribution curves. (A) Lower/Middle Flank Material. (B) Undifferentiated Flow Material. (C) Plains Unit. (D) Upper Flank Material.

REFERENCES: [1] McBride et al., LPI Tech. Rpt., 89-04, p. 56-58, 1989. [2] K. McBride and J. R. Zimbelman, LPSC 20, p. 651, 1989. [3] N. G. Barlow, Icarus 75, p. 285-305, 1988. [4] P. J. Mouginis-Mark, LPSC 12, p. 726-728, 1981.