

PRISTINE AND DEGRADED SEGMENTS OF SMALL VALLEY NETWORKS ON MARS. Victor R. Baker* and John B. Partridge, Department of Geosciences, University of Arizona, Tucson, AZ 85721. *Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721

Detailed mapping studies of small valley networks in the Martian heavily cratered terrain have revealed a general distinction between relatively fresh-appearing (here termed "pristine") and relatively degraded valley systems (Figure 1). Carr and Clow (1) and Pieri (2) distinguished these networks by their areal association with different terrain units. The pristine networks occur on intercrater plains units, while the more degraded networks occur in the older cratered plateau areas. Carr and Clow (1) attribute the range in network preservation to the formation of networks in association with high rates of cratering.

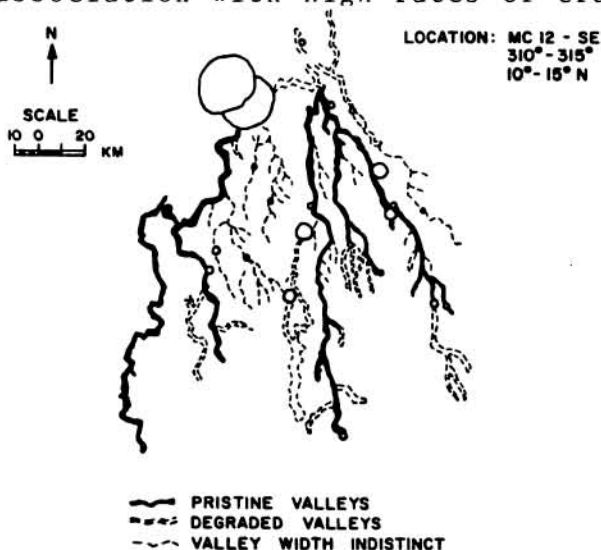


Figure 1. Comparison of drainage efficiency between pristine and degraded valley network systems.

In this study we mapped networks that display both pristine and degraded segments within the same overall system. Valleys displaying steep, vertical walls with distinct wall-to-wall width relationships were classed as pristine. Valleys showing rounded, scalloped or eroded wall relationships; incomplete connectedness; and general indistinct appearance (perhaps caused by mantling) were classed as degraded. Stream length ratios (R_L) were calculated for these systems as follows: $R_L = L_T/L_P$, where L_T is the total length of the network (pristine plus degraded segments) and L_P is the length of the pristine portion of the same network. The average ratio for 16 high-density networks selected for other morphometric studies (3) was 2.48. The range of ratios was from 1.17 to 3.68.

Crater counts were performed to compare pristine and degraded networks. Craters on valley floors, craters intersecting valley walls, and craters with ejecta burying network segments were interpreted as post-dating valley formation. Crater counts

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on individual networks had large error bars because of the limited areal extent of the networks (1). Problems were encountered in resolving the smallest craters (1-2 km), in distinguishing secondary from primary craters, and in distinguishing superimposed from pre-dating craters along valley walls. We used a conservative counting approach, so the data are probably biased toward lower than actual counts, especially for the smallest craters. The total counts for pristine versus degraded networks were combined to generate larger sample areas and plotted for comparison to previous cumulative curves (Figure 2).

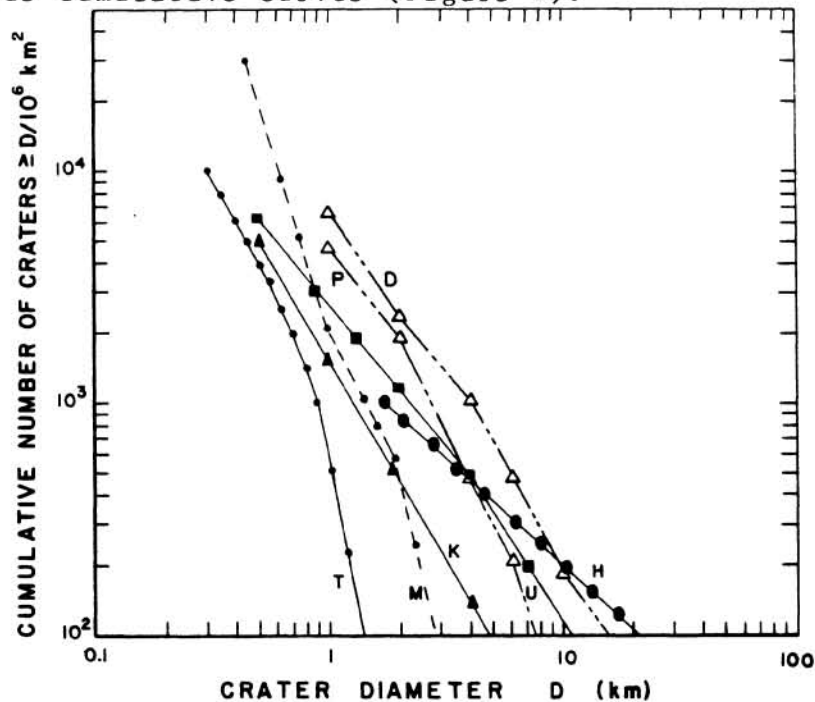


Figure 2. Crater frequency curves comparing the counts on degraded (D) and pristine (P) valley networks with curves for the following areas on Mars: T - Tiu Vallis (4), M - Maja Vallis (4), K - Kasei Vallis (5), U - Lunae Planum upland near Kasei Vallis (5), and H - Heavily cratered upland (4). Error bars for crater counts on degraded valley networks range from ± 83 craters $\geq 1 \text{ km}/10^6 \text{ km}^2$ to ± 9 craters $\geq 20 \text{ km}/10^6 \text{ km}^2$.

The crater numbers for the pristine and degraded network populations are 5000 and 7000 respectively. These values confirm counts by Carr (6) and Pieri and indicate probable formation during the heavy bombardment phase of Martian history.

Reference: (1) Carr M.H. and Clow G.D. (1981) *Icarus*, **48**, 91-117. (2) Pieri D.C. (1980) NASA TM-81979, 1-160. (3) Baker V.R. and Partridge J.B. (1984) in *Lunar and Planetary Science XV*, this volume. (4) Masursky H., Boyce J.M., Dial A.L., Schaber G.G. and Strobell M.E. (1977) *Jour. Geophys. Res.*, **82**, 4016-4038. (5) Baker V.R. and Kochel R.C. (1979) *Jour. Geophys. Res.*, **84**, 7961-7983. (6) Carr M.H. (1979) *Jour. Geophys. Res.*, **84**, 2995-3007.