AREAS OF GULLIED TERRAIN AND POSSIBLE VOLCANIC DEPOSITS IN THE MARTIAN UPLANDS; D. E. Wilhelms and C. J. Hayden, U.S. Geological Survey (MS 946), Menlo Park, CA 94025

As part of a study of upland deposits on Mars [1], we have measured the areas occupied by four types of geologic units in seven regions (Fig. 1). The three most extensive and distinctive units are: (a) dark, smooth plains that retain sharp-rimmed impact craters and that we interpret as lava; (b) light-colored ridged plains, of uncertain origin but commonly also assumed to be volcanic because they are wrinkled like the lunar maria; and (c) gullied deposits--gullying is alternatively thought to have an atmospheric or an endogenic cause [refs. in 1]. "Other" terrain consists mostly of basin massifs (common in east third of Fig. 1), extensive ungullied crater deposits, and crater interiors unoccupied by dark or ridged plains.

Areas of the possible volcanic materials and the gullied deposits (Fig. 2) were measured to test the idea that internal heating by magma intrusion caused the gullying by melting ice contained in the deposits. The areas of dark plains (mostly in craters) and gullied terrain correlate positively, but not enough to demonstrate a genetic relation; a least-squares relation yields a correlation coefficient of only 0.61, not statistically significant at the 95%-confidence level. The great region-to-region variation in areas of gullied terrain correlates much more closely with the thickness of upland deposits than with evident surface volcanism [1]. Also, most of the mappable dark plains postdate the gullying. Thus, if internal heating caused the gullying, the source of this heat was probably not the magmas that reached the surface. Ridged plains (abundant both outside and inside craters) show no areal correlation with either dark plains or gullies.

An additional gully-related type of upland terrain, with faint traces of gullies, seems to have been smeared out by flow. We found this terrain in three regions: part of region 2, near Hesperia Planum; more abundantly in region 5, near the large Ma'adim and Al-Qahira Valles, which have many tributary gullies; and in the part of MC-23 NW near the upland-lowland front that was not studied quantitatively. We suggest that a more intense stage of the endogenic process which formed the many gullies of regions 1 and 3 has formed the Ma'adim-Al Qahira systems and mobilized the upland deposits.

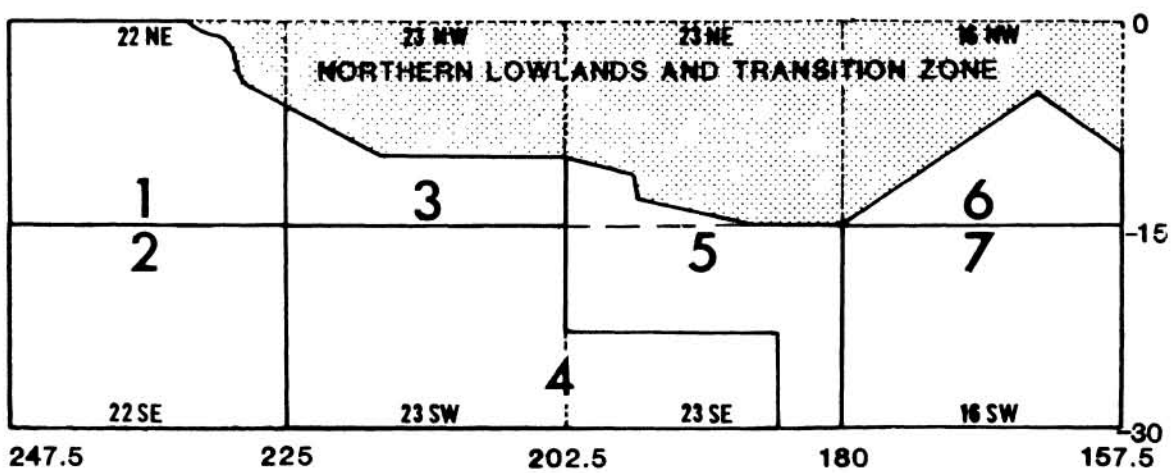

Fig. 1. Study area, divided into seven regions in parts of eight 1:2-million-scale Mars Chart photomosaics (MC). Northern lowlands and transition zone were excluded from study. Chart MC-23 SE was divided into two geologically dissimilar parts, which were combined with geologically similar adjacent regions.

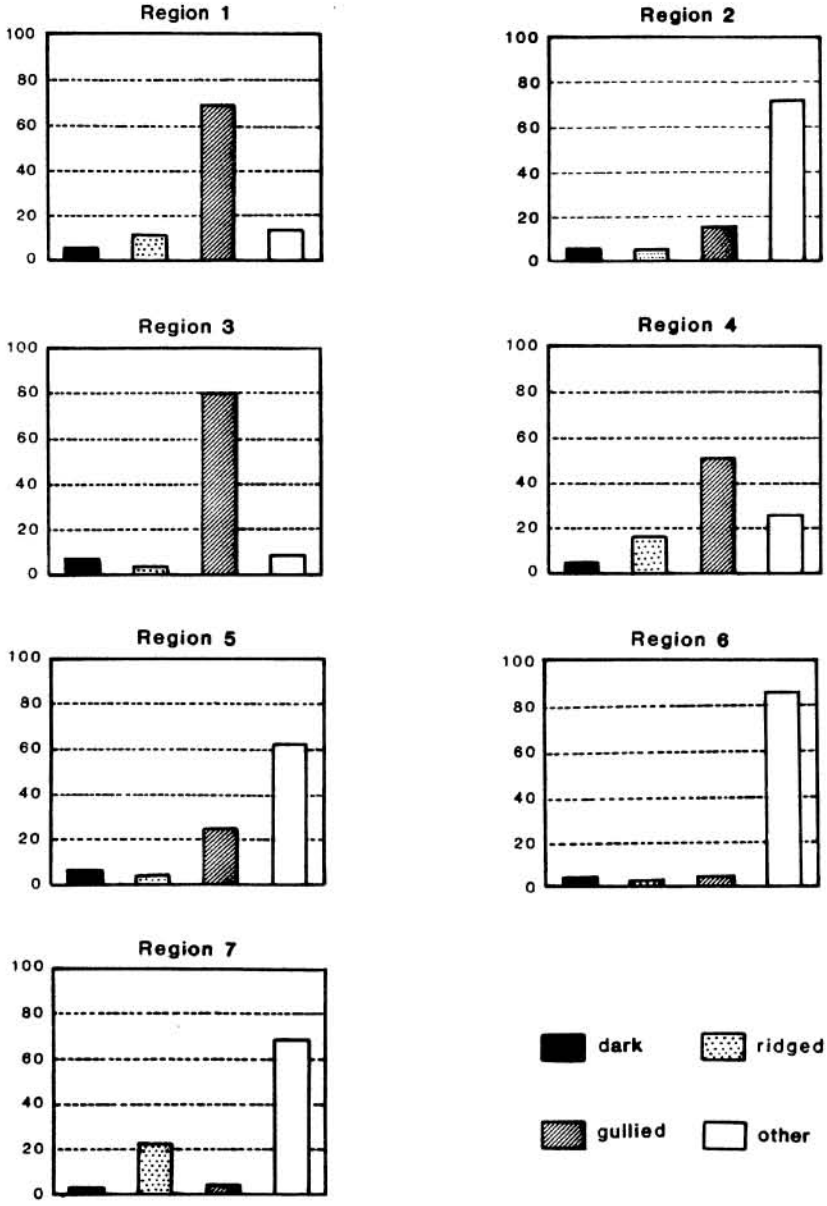

Fig. 2. Percentages of the seven regions of Fig. 1 occupied by four types of units.

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[1] Wilhelms D.E. and Baldwin R.J. (abstract, this conference).
