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POSSIBLE AEOLIAN MEGARIPPLES ON MARS; S. H. Williams, Lunar and Planetary Institute, Houston, TX 77058

Images with sufficiently high spatial resolution are required for the accurate remote identification of surface units and landforms and the determination of the geologic history of a region. Less than 1% of the Viking orbiter image dataset has spatial resolutions less than 10 meters/pixel (1). The lower-resolution images contain much useful information; however, information that would otherwise be invisible is revealed in the higher-resolution images (1). The point is well illustrated in the Acheron Fossae region of Mars by one of the highest-resolution Viking image sequences (Figure 1). There, valleys are filled with what was interpreted as smooth layers of debris mass wasted from the valley walls, based on 57 m/pxl images from the Viking primary mission (2,3). Viking frames 442B01-10, at 8 m/pxl resolution, show that the valley floors are not smooth at all, but rather are covered with mounds of material interpreted as dunes (1). The morphology of the mounds closely resembles both the eroded remnants of a once more extensive covering layer (Figure 2) and the dunes associated with some terrestrial *draa* (4). Contrast enhancement and detailed analysis of the images in the sequence may lead to a slightly different conclusion: the mounds may be yardangs; erosional, not depositional, features. The mounds for the most part parallel the valleys, as would be expected from wind erosion.

Striations oriented perpendicular to the valley axis can be seen in several locations (Figure 1). The are spaced approximately 50 m apart and are most common at the valley wall/floor junction, although they are also found among the mounds in the middle of the valley. The striations are here interpreted to be aeolian megaripples formed from debris weathered from the yardangs. Terrestrial aeolian megaripples have wavelengths up to 25 m (5); it is not unreasonable that larger megaripples might form under favorable martian conditions, given the wind speeds available and the lower martian gravity. If the megaripple interpretation is correct, then by terrestrial analog the deposit in which they occur has a bimodal particle size distribution (5,6). One size will undergo saltation, the other, concentrated at the crests of the megaripples, is too large and/or too dense to be put into saltation (6). For Mars, the former is sand-sized (a few hundred microns), the latter, gravel-sized, provided the materials have typical densities. The presence of megaripples constrains models of surface erosion; particles of specific sizes and local wind speeds on the order of 100 m/s are required (5). The presence of megaripples among the mounds supports the notion that the latter are erosional features, as it is less likely that two different-sized bedforms in loose material would superimpose into the observed pattern. Further, megaripples indicate that the particles in the ripples are strong enough to withstand being transported at least short distances by the wind and being exposed to frequent saltation impact.

The megaripples of Acheron Fossae exist because of a favorable combination of conditions: regional wind pattern, topographic control of local winds and sediment transport, and overall sediment supply and mobility. Similar conditions must prevail in many places on Mars; we see only these few because of limited photographic coverage. Improved data from future missions raises the exciting prospect of assessing in more detail the degree of aeolian modification of the martian surface.

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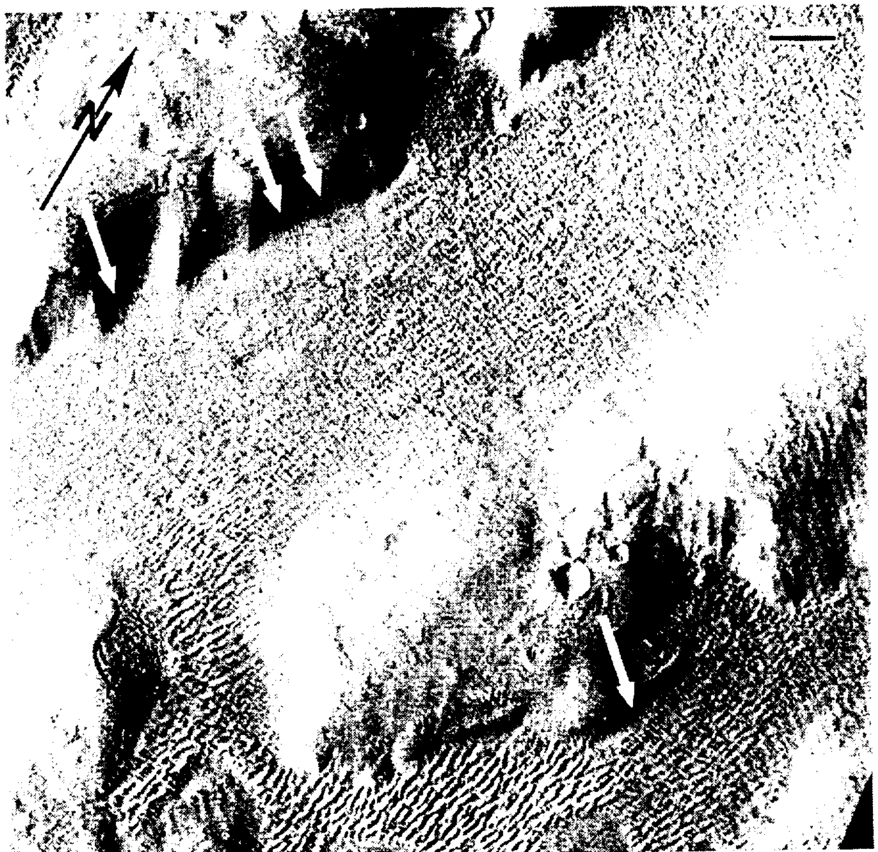

Figure 1. Wind erosion and deposition features in Acheron Fossae. The larger mounds in the valleys are probably erosional, the smaller striations (white arrows) are probably aeolian megaripples. Part of Viking orbiter frame 442B10, NGF orthographic version with maximum contrast enhancement by a simple linear stretch. The scale bar is 1 km long.

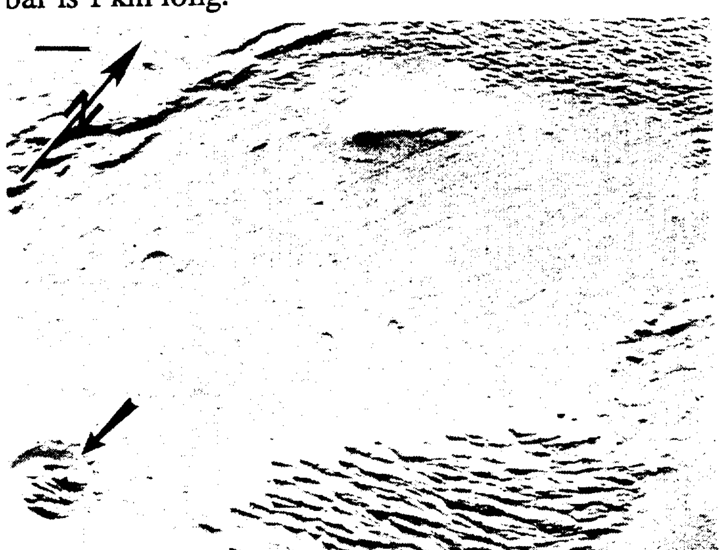

Figure 2. Erosional remnants of an older cover persist as yardangs in topographically-protected locations, here a crater undergoing erosional exhumation. Part of Viking orbiter frame 728A62, NGF rectilinear version. The scale bar is 1 km long.