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GRAIN SIZE CHARACTERISTICS OF EOLIAN DEPOSITS IN SOUTHWESTERN EGYPT: IMPLICATIONS FOR THE SURFACE OF MARS. Ted A. Maxwell and Farouk El-Baz, National Air and Space Museum, Smithsonian Institution, Washington, D. C. 20560

Seasonal dust storms, wind streaks, dunes and streamlined erosional remnants indicate the present-day dominance of an eolian regime on the surface of Mars. In addition to distinct dune types that are visible on orbital images of both Earth and Mars (1,2), large regions of terrestrial deserts are composed of relatively featureless sand sheets. When viewed from orbit, however, these areas exhibit subtle color variations that can be related to changes in the desert pavement surface. It is likely that wind-dominated regions on the surface of Mars may be composed of lag deposits similar to those of Earth. Field investigations of desert surface characteristics in southwestern Egypt indicate that variations in desert color as viewed from orbit are influenced by local bedrock and topographic effects on the distribution of light-colored sand (3). In sand sheets, these variations can be related to differences in the size, spacing and lithology of lag deposits.

The sand sheets of southern Egypt are stratified into 1-2 cm layers of medium to fine sand separated by lag granules. Dark streaks of desert pavement in the lee of hills are composed of local material which decreases in grain size downwind from the source. On sand sheets, however, lag granules are relatively uniform in size (-1.0 to -2.0ϕ; 2-4mm) and are composed of frosted quartz grains. Based on the sorting within the sand-size fraction, it is possible to distinguish between sand-sheet sand (excluding lag granules), and that of longitudinal dunes and barchans. Both dune types exhibit much better sorting than sand sheet samples (Figure 1), which are skewed to both fine and coarse grain sizes. This is consistent with the less frequent, high velocity winds needed to move the protective lag surface as opposed to the more frequent wind speeds needed to preserve dune shapes.

In addition to grain-size differences, the color of sand-sheet sand is lighter than that of the lag granules. Consequently, during periods of high wind velocity, light-colored sand would move higher above the ground than the near-surface rolling (and saltation?) of lag granules. A similar situation may exist on Mars where certain relatively stable dark streaks might be composed of locally-derived lag deposits. This suggestion is supported by recent spectral observations that indicate a uniform composition for light-colored dust, but varied compositions for dark materials (4).

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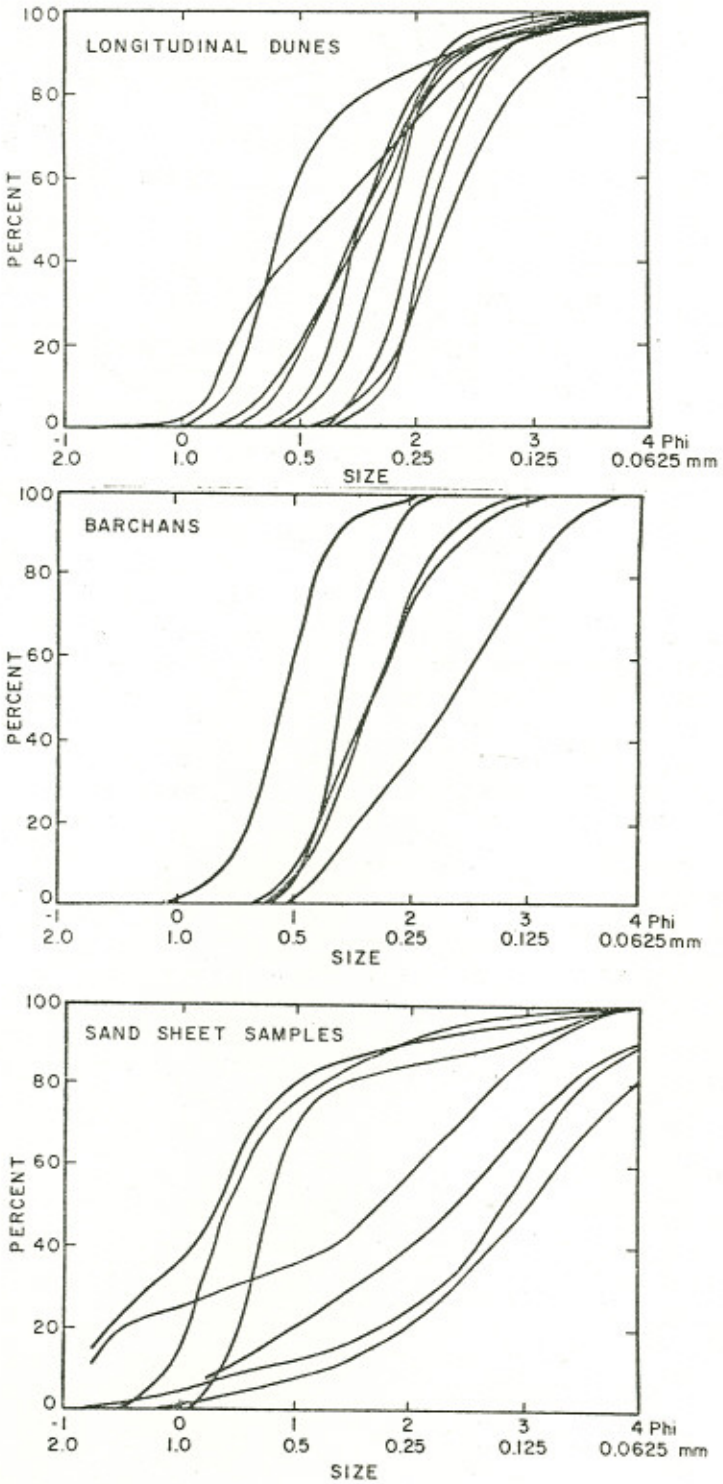

Figure 1. Cumulative size distribution curves for sand samples from southwestern Egypt. Both longitudinal dunes and barchans exhibit better sorting in the sand size fraction than do sand sheets.