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Mars: Temporal and Geographical Variation in Eolian Environments

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The eolian environment of Mars has been regarded as fairly simple due to the thin atmosphere and lack of complications from oceans and rainfall, with a few distinct materials segregated into suspension and saltation loads. Temporal variations have been ascribed chiefly to periodic, astronomically-driven variations in Mars' orbit and spin vector. The high resolution views obtained by the Mars Orbiter Camera on the Mars Global Surveyor spacecraft show a great variety of materials moved by the wind, and examples of changes in wind regime not easily associated with periodic, astronomically driven changes. In non-polar latitudes a variety of materials of different albedos makes up both saltating and suspended materials, and are exposed in sequences that suggest secular changes in available sediment supply. Some dunes in both polar and midlatitude locales appear to be currently active (shedding material as well as slumping on slipfaces). Other dunes appear cemented and subject to erosion. Multiple effective wind regimes are seen on local scales in dunes and wind streaks, but unimodal transport of sand dune materials remains dominant when considering global scales. Deposits most likely associated with period climate variations, layers in polar deposits, are expressed in exposures on gentle slopes as ridges and troughs with complex fracture and ablational patterns; distinctive marker layers can be followed for over 100 km in polar troughs, and vertical sequences appear largely non-repetitive. The stratigraphy of eolian deposits on Mars is only beginning to be unraveled. MGS has shown Mars to be a full-fledged planet in its variety of sedimentary environments and in the difficulty of predicting surface characteristics in one area from observations of other areas.