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MARS SURFACE PROPERTIES: DARK MANTLES OF REGIONAL AND LOCAL EXTENT.

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When saltating sand impinges upon loose or moderately-indurated clay- and silt-sized particles, the finer grains are usually launched into suspension and carried away. This fact, combined with the observation that large martian eolian dune fields have low albedos, led to the notion that the low albedo regions of Mars (such as Syrtis Major) are surfaces in which loose sand is present and active in the modern environment. Following global dust storms, it was thought, bright dust that settles on such dark regions is removed via saltating sand. Mars Orbiter Camera images obtained 1997-1998 by Mars Global Surveyor revealed that some of the large, low albedo regions are not sandy, but instead are thickly mantled by dark material that drapes the landscape in a manner similar to terrestrial loess. In particular, Sinus Sabaeus and large portions of Sinus Meridiani exhibit these thick mantles. Parts of Syrtis Major are also mantled, although this region shows considerable spatial variability that also includes bare rock, eolian dunes, and lag surfaces. The lack of dark sand, combined with the persistence of these low albedo regions over the past four hundred years, suggests that fallout of bright dust from global dust storms might not be a spatially-uniform process. Low albedo wind streaks in western Arabia Terra also appear to be dark mantles, and their characteristics provide clues as to the nature of the mantling material. Craters associated with the wind streaks exhibit floors with pits, yardangs, and pedestal craters. Across the crater floors and out onto the downwind terrain there is a progression of eolian depositional landforms from megaripples to dunes to mantles. These observations indicate that granular material is deflated from the crater floor, transported by wind, and sorted by size and/or shape/density. The dark wind streaks most likely consist of silt-sized grains that have been briefly transported in suspension. The larger, regional-scale mantles in places like Sinus Sabaeus might have had a similar origin, or at least consist of similar fine-grained sediment. Cracks in the dark mantles of Sinus Sabaeus suggest that this deposit is presently immobile and indurated.

Mars, eolian, sedimentology, dust, sand