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THE CHANGING SURFACE OF MARS FROM RECENT SPACE-BASED OBSERVATIONS

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Mars has undergone dramatic changes in albedo over the last ~40 years of modern space-based observations. Measuring and characterizing the detailed spatial and temporal variability of these changes can advance our understanding of the causes of seasonal and secular variations in the distribution of mobile surface materials (dust, sand) in the current climate regime. These changes also provide important observational inputs for global and mesoscale climate models. Here we summarize the recent historic record of surface changes on Mars, and characterize the nature of these changes in terms of various hypothesized surface/atmospheric interaction processes. This record comes from synoptic-scale global imaging from the Viking, MGS, Hubble, and MRO missions.

New work described here focuses especially on images from the MRO Mars Color Imager (MARCI), a wide-angle multi-band detector capable of acquiring almost daily coverage of large portions of the martian surface at up to 1 km/pixel near the centerline of each image swath. MARCI has been in orbit around the planet since 2006, providing over five Mars years of surface and atmospheric observations. MARCI observations show that, while many of the most significant changes in the surface albedo are the result of large dust storms, other regions experience seasonal darkening events that repeat with different degrees of regularity from one Mars year to the next. Some of these are associated with local dust storm activity, while in other cases, frequent surface changes take place with no associated dust clouds, suggesting action by seasonally variable winds. Discrete areas located across widely separated regions of the Tharsis rise, the slopes of some of the large volcanoes, and portions of Solis Lacus and Syrtis Major are included in this latter category. Deposition following the annual dusty season plays a significant role in maintaining the cyclic nature of these changes, while these and other historical observations show that major regional or planet-encircling dust storms produce unique changes that may require several Mars years to reverse. We have produced regional time-lapse MARCI mosaics for much of the martian surface that minimize atmospheric dust and clouds while clearly showing the seasonal patterns of surface changes on Mars.

Session No. 4

T16. New Developments in the Geology and Geochemistry of Mars: In Memory of Nathan T. Bridges
Tuesday, 23 May 2017: 8:30 AM-11:50 AM

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