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FOUR MARS YEARS OF SURFACE ALBEDO CHANGES OBSERVED BY THE MARS RECONNAISSANCE ORBITER MARCI INVESTIGATION

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The Mars Color Imager (MARCI) wide-angle camera aboard the Mars Reconnaissance Orbiter (MRO) has gathered over four Mars years' worth of observations at up to approximately 1 km/pixel scale. The spacecraft's near-polar orbit and the near-180° field of view of the MARCI instrument allows it to collect almost daily observations of large portions of the planet in five visible/near-infrared bands, producing a synoptic dataset amenable to studying regional surface albedo changes. These surface albedo changes, caused by aeolian redistribution of bright dust covering the darker underlying substrate, provide information on near-surface atmospheric conditions on a regional and global scale. Continuous, multiyear coverage is essential for understanding the timing, frequency, and variability of surface changes, establishing a baseline of typical interannual changes, and recognizing significant departures that may indicate unusual atmospheric conditions. We have produced time-lapse animations of sections of the Martian surface from calibrated, map-projected, and mosaicked MARCI observations, altogether comprising the surface of Mars within +/- 65 degrees of the equator. These animations show that many albedo changes have occurred on the surface since 2006 on a variety of timescales. We present a descriptive classification of the types and locations of surface albedo changes observed on Mars over the course of the MRO mission (2006-present), including the frequency, timing, and extent of such changes. Regions previously recognized to be variable from telescopic and prior spacecraft observations, such as Syrtis Major, Solis Lacus, and regions of Amazonis, have undergone frequent changes that represent alterations between dust deposition and removal under normal near-surface conditions. Many changes take place episodically, followed by periods of stasis and recurring somewhat irregularly in appearance from year to year. Other areas have been observed to change secularly, not reverting in appearance over the course of MARCI observations. Dust storm activity influences the occurrence and magnitude of changes. These observations can be used to test global and mesoscale climate model predictions of regional wind patterns, as well as to provide constraints on surface albedo as a climate model input parameter.

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