

CONTROL ID: 1811628

TITLE: Three-and-a-Half Mars Years of Surface Albedo Changes Observed by the Mars Reconnaissance Orbiter MARCI Investigation

AUTHORS (FIRST NAME, LAST NAME): Danika Wellington¹, James F Bell¹

INSTITUTIONS (ALL): 1. School of Earth and Space Exploration, Arizona State University, Tempe, AZ, United States.

ABSTRACT BODY: The Mars Color Imager (MARCI) wide-angle camera aboard the Mars Reconnaissance Orbiter (MRO) has gathered over three-and-a-half Mars years' worth of observations at approximately 1 km/pixel resolution. The MARCI instrument has seven bands in the ultraviolet, visible, and near-infrared, five of which (the longer wavelength 420, 550, 600, 650, and 750 nm bands) are amenable to observations of surface albedo (the two short-wave ultraviolet bands are primarily intended for ozone measurements). MRO's near-polar orbit and MARCI's wide angle field-of-view (180°) allows it to make almost daily observations of large portions of the planet. As a global multi-year dataset, the MARCI observations are well-suited to examining surface albedo changes on both local and regional scales, including investigating any repeatability and seasonality in such changes. Because Mars displays considerable interannual variability, long-term continuous observations such as MARCI's are necessary in order to adequately describe and distinguish typical surface variance from unusual and longer-term secular changes.

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 many albedo changes that have occurred on the surface since 2006, including changes in traditionally variable regions such as Syrtis Major, Alcyonius, Hyblaeus, and Cerberus, as well as a dramatic brightening of Proponitis and variations in the appearance and orientation of mesoscale linear streaks in Amazonis. Many regions show alternating periods of dust deposition and removal that, while not producing a persistent change in the surface albedo, nevertheless yield information on the local near-surface conditions that drive these variations.

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 nature, seasonal timing, and extent of such changes. The surface albedo features are shown to vary quasi-seasonally, with changes sometimes in concurrence with local or regional dust storms. Dust storm events typically brighten the surface and are followed by months of subsequent darkening, though occasionally an associated darkening or brightening may persist. Changes in the boundaries of albedo features usually occur in discrete episodes, followed by periods of stasis, and often affect regions with historical precedent for variability. These observations and analyses can yield information on near-surface wind conditions, which can be used to test existing atmospheric circulation and climate models. Furthermore, changes in surface albedo markings can provide constraints on surface albedo as an important input parameter to global and mesoscale climate models.

INDEX TERMS: 6225 PLANETARY SCIENCES: SOLAR SYSTEM OBJECTS Mars.

(No Image Selected)

(No Table Selected)

Additional Details

Previously Presented Material: A similar but much smaller project, covering perhaps 5% of the current material, was presented at the 2012 AGU Fall Meeting.

Contact Details

CONTACT (NAME ONLY): Danika Wellington

CONTACT (E-MAIL ONLY): danika.wellington@gmail.com

TITLE OF TEAM: