PHYSICAL PROPERTIES OF MERIDIANI SINUS-TYPE UNITS IN THE CENTRAL EQUATORIAL REGION OF MARS:

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Classification and mapping of surficial units in the central equatorial region of Mars (30°N - 20°S, 57°E-75°W) using enhanced color images and Mars Consortium data (1, 2) identified four major color/albedo units in the dark, reddish-gray regions that form the classical dark albedo markings of Mars, including Meridiani Sinus. The darkest, least red (relatively "blue") materials form splotches (some with dune forms) in craters, inter-crater depressions, and parts of Valles Marineris. These form the "Dark Blue" Meridiani unit. Abundant materials that have higher albedos and are somewhat redder than the "Dark Blue" unit have uniquely high green/(violet+red) color ratios in Viking Orbiter images. These materials, named "Green-blue" Meridiani, surround and mix with "Dark Blue" Meridiani patches and are abundant on crater rims and local elevations. Discontinuous, patchy deposits with still higher albedos and much redder colors have morphologies characteristic of the *Type Ib* bright depositional dust streaks and sheets that were classified by Thomas *et al.* (3) These dust deposits, which appear to be optically thin and patchy and are darker and not as red as other *Type Ib* dust deposits on Mars, and their Meridiani substrates, were designated the "Red" Meridiani unit. Distinctive deposits that form highly eroded mesas and escarpments in northern Meridiani Sinus were named "Light Blue" Meridiani since they are not as red as other materials with moderately high albedos. Large areas dominated by these units form Meridiani Province (2) in the central equatorial region of Mars. This abstract presents a systematic interpretation of these units' properties based on currently available remote sensing data.

Meridiani Province is dominated by dark, relatively "blue" and unoxidized mafic materials, probably derived from basalt or other mafic rocks. Exposed surfaces are usually partially coated with a mixture of a spectrally distinct weathering product (4), probably derived from the Meridiani materials, plus some of the globally distributed "red" dust. Surface thermal emissivities are variable and are highly correlated with albedo: visible amounts of the "red" dust and the weathering coatings sharply increase emissivity over the circa. 0.9 values (5) of the "Dark Blue" unit's.

The darkest and least "red" surfaces of the "Dark Blue" Meridiani unit may be nearly free of the weathering coatings and dust because a highly mobile surface component, most likely fine sand, ejects dust and abrades any weathered grain coatings. The "Dark Blue" unit accumulates in topographic lows, and photometric data (6) indicates that it is smoother than most units in the study area, consistent with most deposits being dunes and sand sheets. The darkest splotches have unusually high thermal inertias (7), but do not have high rock abundances. The highest observed inertias require that those splotches contain particles from coarse sand to pebbles in size or are partially cemented, but the splotches' ability to eject dust indicates that a highly mobile finer component is present

The "Green-blue" and "Red" Meridiani units' colors are attributed to the presence of abundant but optically thin "green" weathering coatings (4) and "red" dust, respectively. Their thermal inertias are not distinctive in the available data. The "Green-blue" Meridiani present in the Oxia-region *Type II* splotch-related crater streaks is apparently mobile and was probably deflated from source splotches of "Dark Blue" Meridiani (8). It may be finer grained, possibly well sorted, and may contain considerable amounts of the "green" weathering product despite its mobility. "Green-blue" and especially the "Red" units within Meridiani Province may be relatively immobile, and may be fine-grained but weakly cemented material that does not readily eject dust or weathering coatings. Other deposits of these units could be coarse lag deposits, depleted of mobile fine-grained sand and equally unable to eject dust. Both deposits' photometric properties (6) indicate that they are rougher than "Dark Blue" Meridiani, consistent with partially cemented and then eroded sand or coarse lag deposits.

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Thermal inertias of Meridiani surfaces decrease with elevation considerably more than expected for unbonded sediments (9). This could be due to elevation-dependent particle size sorting, but data outside the study area suggests that high inertia materials are under-represented at relatively high elevations in the study area. Rock abundances (10) are highly variable, but high abundances are not characteristic of the province within the study area. Small amounts of afternoon cooling are consistent with small or locally restricted thermal inertia increases in the top centimeters of Meridiani surfaces (11), but not the widespread presence of bedrock under less than about 10 cm of sand.

"Light Blue" Meridiani, found only within northern Sinus Meridiani, is a high inertia, probably partially lithified, eolian deposit. It mixes with "Green-blue" Meridiani, and while relatively "red", has higher violet albedos than the "Red" Meridiani dust. The pure "Light Blue" unit may not have been sampled at kilometer resolution in available colorimetric data (12). Therefore, it is unclear whether it is a spectrally distinctive "blue" unit with a high albedo and unusually low green color-ratios (the reverse of the "Green-blue" unit), or a very high albedo "red" dust-related material exposed in at most a 50-50 (or so) mosaic with the "Green-blue" unit. The only color/albedo unit with major topographic relief in the study area, this highly distinctive material deserves concentrated study.

The bulk of the Meridiani Province materials show no systematic regional color/albedo variations suggestive of regional composition variations. This could mean that the bulk of these materials have been transported and mixed on at least sub-global scales and are not locally derived. However, discrimination of small color/albedo differences between Meridiani materials from different igneous sources may be impossible with Viking-like color cameras in the presence of the overwhelming contamination of weathering products and dust deposits. Until the mapping spectrometers of the Mars Observer and other future missions start returning data, earthbased spectral observations, and possibly Viking color observations of the darkest, least contaminated splotches, may be the only means, of searching for regional composition variations of Meridiani-type mafic sediments on Mars.

More rewarding work clearly possible with Viking data is research directed at understanding the relation between the thermal properties of Meridiani materials and their morphology, mobility, colors, and photometric properties. Within Meridiani Province, thermal inertias are uniquely poorly correlated with albedos, except for the high inertias of many intra-crater "Dark Blue" Meridiani splotches. It should be possible to discriminate between the proposed physical models of "Green-blue" and "Red" Meridiani with Viking data. It should also be possible to characterize and better understand the currently obscure causes of the regional and global variations in thermal inertias and rock abundances of the non-splotch Meridiani materials.

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