THE TRUTH ABOUT MARTIAN DUST: GROUND-TRUTHING THE TES DUST COVER INDEX AND ITS SIGNIFICANCE TO LANDING SITE SELECTION . S. W. Ruff[1], [1]Arizona State University Department of Geological Sciences, Tempe, AZ 85287-6304, steve.ruff@asu.edu.

Introduction: An index of the relative abundance of spectrally obscuring dust across the Martian surface was developed by [1] using data from the Mars Global Surveyor Thermal Emission Spectrometer (TES). While closely correlated with albedo, the TES dust cover index (DCI) is a more direct metric for the presence or absence of dust on a particular surface and is independent of albedo. This becomes important for the types of light-toned layered deposits and surfaces that likely will be among the candidates for the MSL landing site.

The two Mars Exploration Rover (MER) landing sites that currently are being explored provide ground truth for the orbital DCI measurements. In addition, because the two landing sites are so different in the distribution of surface dust, they provide the opportunity to assess the significance of dust to science and rover operations. The lack of solar panels on the MSL rover and its different payload of science instruments may negate concern over the presence of surface dust. But this topic should be addressed directly and considered fully during the process of selecting a landing site.

Ground Truth of the DCI: The orbital DCI is based on the fact that fine particulate silicates (<40 μm particles) have a pronounced decrease in emissivity in the wavelengths between ~5-8 μm (~2000-1300 cm^{-1}) compared to coarser material. The TES-derived spectrum of Martian surface dust [2] clearly demonstrates this characteristic and now with the advent of Mini-TES spectra from the MERs, this spectral characteristic is firmly established [3]. The DCI values for the Meridiani Planum landing site suggest surfaces with minimal dust cover, which is well established by Mini-TES spectra and Pancam images from the Opportunity rover. In contrast, the Gusev landing site displays DCI values that fall in a range from dust-covered to nearly dust-free. Observations from the Spirit rover demonstrate this range of surface dust.

Albedo vs. DCI: The long-standing interest from the community in various light-toned layered deposits has recently been heightened by discoveries of sulfate and phyllosilicate occurrences associated with some of these deposits [e.g., 4,5]. In these and similar places, albedo fails as a metric for dust cover. The DCI in such cases can serve as a more reliable indicator of the extent to which surface activities by the MSL rover will be impacted by dust. For example, the apparent phyllosilicate occurrences in the vicinity of Mawrth Vallis [4] coincide with TES-derived albedo values reaching 0.2, typically consistent with a thin or patchy distribution of dust like Gusev crater (Fig. 1). However, the DCI values (>0.96) indicate surfaces that are comparable to the low abundance of dust in Meridiani Planum. So in this case, albedo data provide an incorrect assessment of dust cover.

Discussion Point: Presumably, landing sites that have only minimal dust cover are more desirable than those with significant dust cover. The capacity to evaluate from orbit the extent and distribution of surface dust is now well established and available for the assessment of MSL sites. The extent to which dusty sites should be avoided is a matter for discussion.

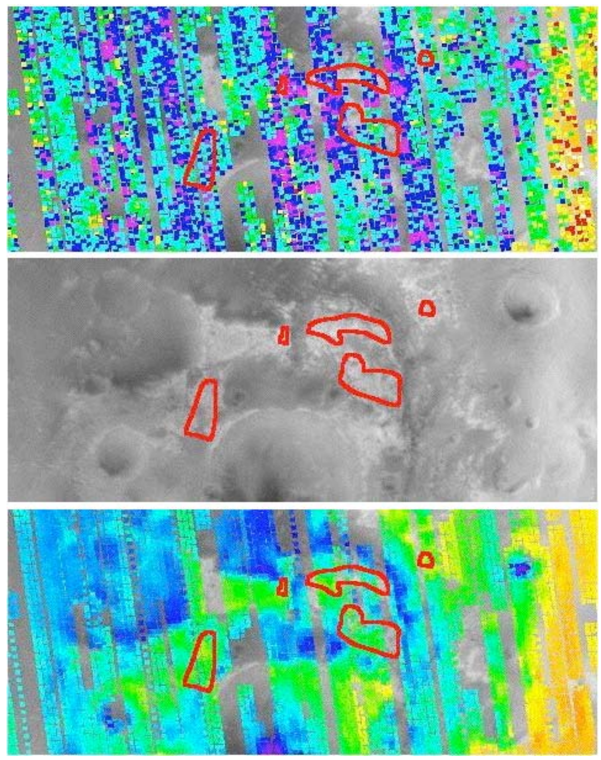

Figure 1. TES DCI (top) compared to MOC WA (middle) and TES albedo (bottom) of the Mawrth Vallis region containing OMEGA-identified phyllosilicates (red outlines after [5]). Despite their relatively high albedo, these surfaces have DCI values comparable to Meridiani Planum, i.e., nearly dust-free.

References: [1] Ruff S. W. and Christensen P. R.. (2002) *JGR, 107,* 5127. [2] Bandfield J. L. and Smith M. D. (2003) *Icarus., 161,* 47-65. [3] Christensen et al. (2004) *Science, 305,* 837-842. [4] Gendrin A. et al. (2005) *Science, 307,*1587-1591. [5] Poulet F. et al. (2005) *Nature, 438*, 623-627.