**THEMIS CHARACTERIZATION OF THE MER GUSEV CRATER LANDING SITE.** K. A. Milam[1], K. R. Stockstill[1], J. E. Moersch[1], H. Y. McSween, Jr.[1], L. L. Tornabene[1], A. Ghosh[1], M. B. Wyatt[2], and P. R. Christensen[2], [1]University of Tennessee, Planetary Geosciences Institute, Department of Geological Sciences, Knoxville, TN 37996-1410 (kmilam@utk.edu), [2]Department of Geological Sciences, Arizona State University, Moeur Building, Tempe, Arizona 85287

**Introduction:** Gusev crater is a 160 km diameter complex impact structure (at 14.64°S 175.36°E in the Aeolis Quadrangle) that has been proposed as a candidate landing site for one of the Mars Exploration Rovers (MER). The crater lies at the terminus of Ma'adim Vallis, a 900 km fluvial system that dissects the martian highlands, and at the southern highland/ northern lowland transition. Others have interpreted Gusev as the depocenter for the Ma'adim Vallis fluvial lacustrine system [1-4], making it a site for potential preservation of hydrological activity and possible biomarkers [5]. Although much suggests an ancient lacustrine environment at Gusev, no unequivocal evidence has been found to confirm the proposed hypothesis. With this in mind, we take a first look at new data from the Mars Odyssey Thermal Emission Imaging System (THEMIS), supplemented by data from the Thermal Emission Spectrometer (TES), Mars Orbiter Camera (MOC), and Mars Orbiter Laser Altimeter (MOLA) to characterize the geology of Gusev crater.

**Methods:** Day and nighttime thermal infrared (TIR) data from THEMIS (100 m/pixel) and TES were used to map units based on qualitative/quantitative comparisons of albedos and thermal inertias. These units were classified as *thermophysical* units, defining laterally extensive areas with similar albedos and thermal inertias. THEMIS visible (20m/pixel) and MOC high-resolution (1.5-5 m/pixel) visible images were used to observe changes in morphology and to determine crater densities. Laterally extensive units with homogeneous surface textures were mapped as *morphologic* units. MOLA data were used to identify unit contacts, thicknesses, and stratigraphic relationships. Data sets were then combined to construct a surface unit map and stratigraphic sequence for Gusev crater.

**Thermophysical Units.** Eight thermophysical units were identified within Gusev crater by distinguishing albedo and thermal inertia properties. TES data were used to classify units with relatively 'low' (<0.23), 'moderate' (0.23-0.26), and 'high' (>0.26) albedos. THEMIS day/night TIR data was used to qualitatively classify thermophysical units based on relative day/night thermal inertias (categories: 'high', 'intermediate', and 'low'). TES thermal inertia was use to quantify thermal inertias for several units.

**Morphological Units.** Eight morphological units were identified in Gusev crater based on distinguishing morphologic textures. Many morphologic units correspond to those identified with thermophysical unit mapping; however, several differences become apparent by a comparison of both maps. Visible images also reveal multiple layers within each mapped morphologic unit, suggesting multiple depositional episodes.

**Surface Unit Map and Stratigraphy.** Because of the strong correlation between thermophysical and morphologic units, thermophysical, morphological, topographic, and crater density age data were combined to produced a surface unit map and stratigraphic for Gusev crater (Figure 1). *Surface* units are defined as rock or sediment that (1) are laterally extensive or mappable, (2) express similar surface morphologies, (3) possess similar thermophysical qualities, and (4) occur over consistent elevation ranges. Because TIR and albedo data only represent the uppermost surface of mapped units (possibly even regolith) and thermophysical properties can vary laterally across a single unit, delineation of surface units by morphology was preferred. Crater density ages were considered lastly, due to mapping in an area showing evidence of erosion and deposition (which gives units younger apparent ages). Eight surface units were identified in Gusev, mostly Hesperian in age, but 2 showing evidence of later modification (Amazonian) and post-Viking redistribution.

**Geologic Diversity of the MER-A Gusev Crater Landing Site.** The surface unit map for Gusev attests to the geologic diversity of this site, showing 6 (and possibly more) of the 8 mapped surface units occurring within the MER-A landing ellipse. This provides a higher probability of sampling multiple surface units during MER surface operations. The presence of a MER rover in Gusev would also provide the opportunity to examine depositional hypotheses [6], determine stratigraphic relationships, and derive lithologies of surface units.

**References.** [1] Schneeberger, D.M. (1989) *LPS XX*, 964-965. [2]Cabrol et al. (1993) *LPS XIV*, 201-202. [3] Cabrol et al. (1998) *Icarus*, 133, 98-108. [4] Grin E.A. and Cabrol N.A. (1997) *Icarus*, 130, 461-474. [5] Farmer J. D. and Des Marais D. (1999) *JGR*, 104, 26977-26995. [6] Milam et al. (2003) *LPS XXXIV*, submitted abstract.

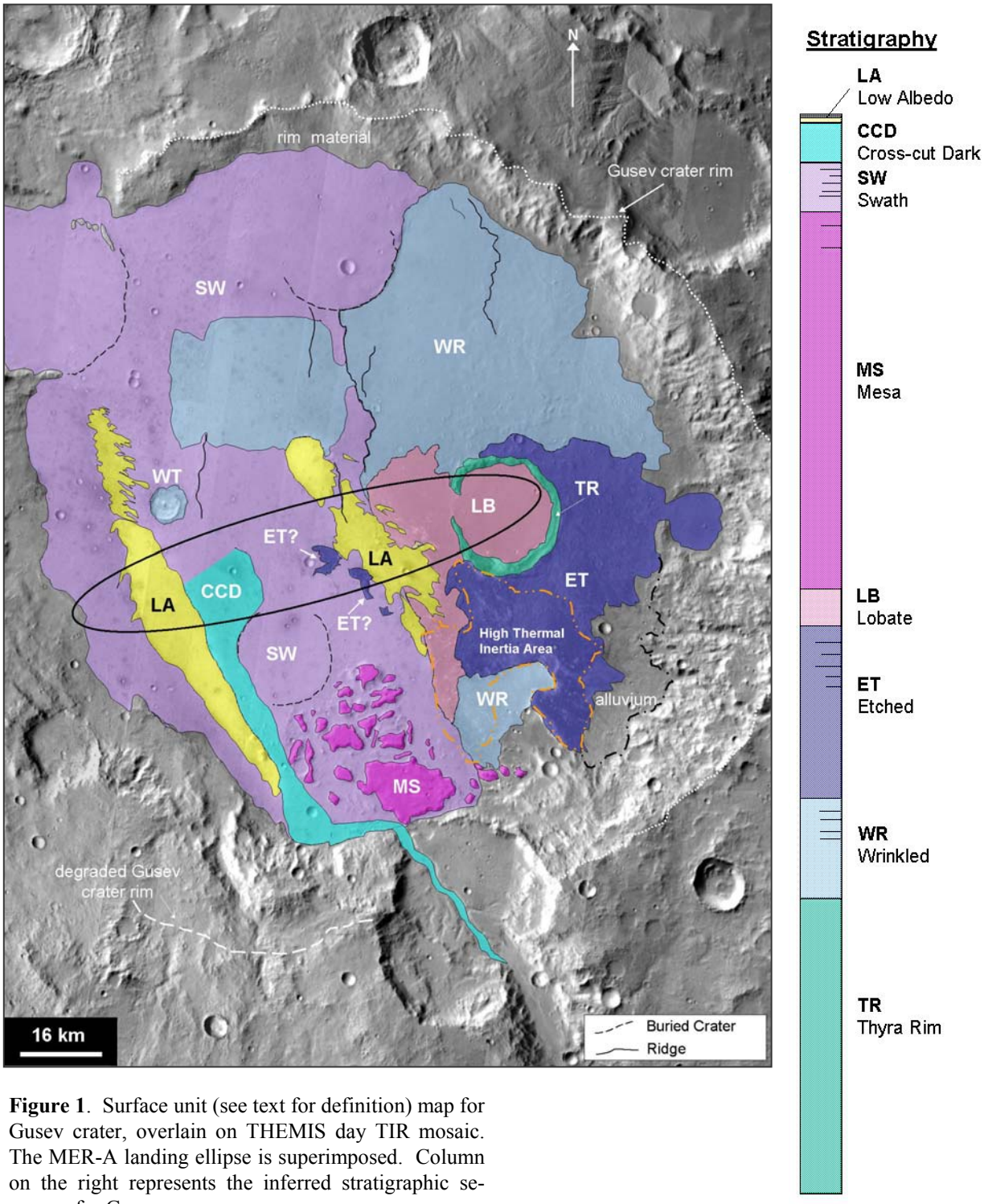


**Figure 1**. Surface unit (see text for definition) map for Gusev crater, overlain on THEMIS day TIR mosaic. The MER-A landing ellipse is superimposed. Column on the right represents the inferred stratigraphic sequence for Gusev.