DETERMINING SURFACE CHARACTERISTICS AT CANDIDATE MSL LANDING SITES USING THEMIS HIGH-RESOLUTION ORBITAL THERMAL INERTIA DATA. R. L. Fergason[1] and P. R. Christensen[1], [1]Mars Space Flight Facility, Department of Geological Sciences, Arizona State University, PO Box 876305, Tempe, Arizona 85287-6305, robin.fergason@asu.edu.

Introduction: THEMIS thermal inertia data has been used to accurately predict the physical characteristics at the MER-Spirit landing site [1], and is a valuable dataset for selecting the MSL landing site. This high-resolution dataset can: (1) identify physical surface characteristics to constrain areas of high scientific interest; (2) provide thermal inertia values of morphologic features observed in visible images to improve the interpretation of surface materials and processes that have affected candidate sites; and (3) detect the presence of material, such as bedrock or dust, and infer the presence of surface rocks that may be hazardous to landing safety and lander mobility. The THEMIS instrument [2] acquires nighttime infrared images at 100 meters per pixel, and these temperature images are used to derive thermal inertia values (R. L. Fergason et al., 2006 “High-resolution thermal inertia derived from THEMIS: Thermal model and applications”, submitted to *J. Geophys. Res.-Planets*). This dataset provides thermophysical information at the highest spatial resolution to date and quantifies the physical properties and average particle sizes of surface textures and morphologies observed in high-resolution visible images. We, as member and PI of the THEMIS team, will provide thermal inertia values for all candidate MSL landing sites and assist in the interpretation of this dataset.

Previous Work: THEMIS-derived thermal inertia was compared to Mini-TES-derived surface thermal inertia measurements at the MER-Spirit landing site along the traverse from the CMS to Bonneville crater and the Columbia Hills to test predictions of the physical nature of the surface from orbital measurements at 100 meters per pixel (Figure 1 and Figure 2) [3]. Orbital THEMIS thermal inertia agreed with Mini-TES-derived surface thermal inertia trends observed along the traverse. For example, the thermal inertia increases along the traverse from CMS (THEMIS: 280 ± 40; Mini-TES: 175 ± 20) to Bonneville crater (THEMIS: 330 ± 50; Mini-TES: 380 ± 45) in both datasets, and is likely due to more rocky material being present as the crater ejecta material is traversed [4; 1; 3]. In addition, the average value of each dataset along this traverse differs by only ~35 units [3].

Conclusion: The MER-Spirit landing site demonstrates the ability to accurately predict the physical nature of materials present on the surface from orbital data, and this information can be used to better select appropriate landing site locations. When combined with other datasets, such as high-resolution visible images, elevation, and albedo information, thermal inertia can predict the surface terrain, and is important for selecting both scientifically interesting and safe landing sites for the MSL mission.

References: [1] Golombek M. P. et al. (2005), *Nature, 436*, doi:10.1038/nature03600. [2] Christensen P. R. et al. (2004), *Space Sci. Rev., 110*, 85-130. [3] Fergason R. L. et al. (2006), *JGR, 111*(E2), E02S21, doi:10.1029/2005JE002165. [4] Christensen P. R. et al. (2004), *Science, 305*(5685), 837-842.

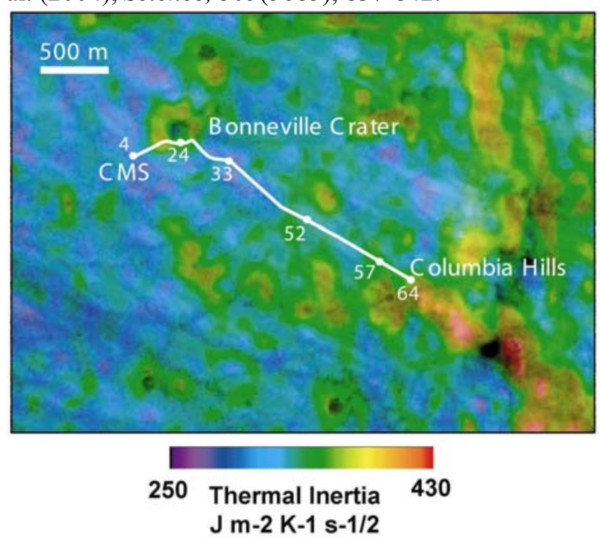

Figure 1. THEMIS-derived thermal inertia image overlaid onto a THEMIS visible image of the traverse from Columbia Memorial Station (CMS) to Bonneville Crater to the Columbia Hills at the Gusev landing site region. Numbers indicate site positions along the traverse.

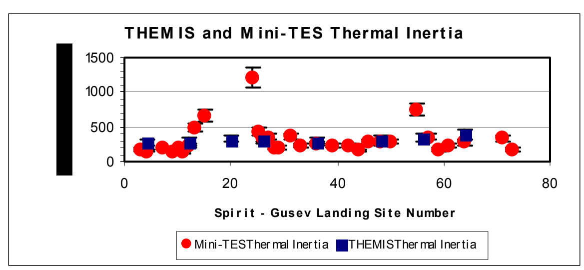

Figure 2. Plot comparing the thermal inertia trends between THEMIS-derived thermal inertia from orbit and Mini-TES-derived thermal inertia of the surface at the MER-Spirit landing site.