Mapping the Regional Extent of Sulfate-Rich Layers on Mars Using THEMIS Thermal Inertia

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Sulfates have been identified in the Valles Marineris of Mars by various instruments, including CRISM, OMEGA, TES and THEMIS. Sulfates are a group of minerals formed through evaporation of water on or near the surface and are thus important recorders of water-related process, and potentially biological activity, on Mars. Understanding their distribution and geologic context on the surface of Mars is important to astrobiology and to future exploration by rover missions. However, surface dust may obscure their full areal extent from orbital spectral identification.

Thermal inertia is a measure of the how much heat the upper 10-15 cm of a surface can store during the day and re-radiate at night. Thermal inertia primarily is dependent upon physical properties of the surface (e.g., particle size, degree of induration, rock abundance). Generally, fine particulate surfaces have low inertia, and rocky surfaces have high inertia resulting from their greater ability to store heat. Thermal inertia data have been used to map localized mineralogic units identified spectrally into contiguous areas where optically-thick surface dust is present, preventing spectral identification [Hamilton and Christensen, 2005]. We will use Thermal Emission Imaging System (THEMIS) thermal inertia data [Fergason et al., 2006] to characterize the inertias of sulfate outcrops in the Valles Marineris at 100-meter scales and map their extent into adjacent dusty areas. We will also augment these data with high resolution (3–18 m/pixel) visible geomorphology data.