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TITLE: MARSTHERM: A Web-based System Providing Thermophysical Analysis Tools for Mars Research
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AUTHORS (FIRST NAME, LAST NAME): Nathaniel Edward Putzig[1], Edward M Barratt[2], Michael T Mellon[1], Timothy I Michaels[3]
INSTITUTIONS (ALL): 1. Department of Space Studies, Southwest Research Institute Boulder, Boulder, CO, United States.
2. Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO, United States.
3. SETI Institute, Mountain View, CA, United States.
ABSTRACT BODY: We introduce MARSTHERM, a web-based system that will allow researchers access to a standard numerical thermal model of the Martian near-surface and atmosphere. In addition, the system will provide tools for the derivation, mapping, and analysis of apparent thermal inertia from temperature observations by the Mars Global Surveyor Thermal Emission Spectrometer (TES) and the Mars Odyssey Thermal Emission Imaging System (THEMIS). Adjustable parameters for the thermal model include thermal inertia, albedo, surface pressure, surface emissivity, atmospheric dust opacity, latitude, surface slope angle and azimuth, season (solar longitude), and time steps for calculations and output. The model computes diurnal surface and brightness temperatures for either a single day or a full Mars year. Output options include text files and plots of seasonal and diurnal surface, brightness, and atmospheric temperatures. The tools for the derivation and mapping of apparent thermal inertia from spacecraft data are project-based, wherein the user provides an area of interest (AOI) by specifying latitude and longitude ranges. The system will then extract results within the AOI from prior global mapping of elevation (from the Mars Orbiter Laser Altimeter, for calculating surface pressure), TES annual albedo, and TES seasonal and annual-mean 2AM and 2PM apparent thermal inertia (Putzig and Mellon, 2007, Icarus 191, 68–94). In addition, a history of TES dust opacity within the AOI is computed. For each project, users may then provide a list of THEMIS images to process for apparent thermal inertia, optionally overriding the TES-derived dust opacity with a fixed value. Output from the THEMIS derivation process includes thumbnail and context images, GeoTIFF raster data, and HDF5 files containing arrays of input and output data (radiance, brightness temperature, apparent thermal inertia, elevation, quality flag, latitude, and longitude) and ancillary information. As a demonstration of capabilities, we will present results from a thermophysical study of Gale Crater (Barratt and Putzig, 2013, EPSC abstract 613), for which TES and THEMIS mapping has been carried out during system development. Public access to the MARSTHERM system will be provided in conjunction with the 2013 AGU Fall Meeting and will feature the numerical thermal model and thermal-inertia derivation algorithm developed by Mellon et al. (2000, Icarus 148, 437–455) as modified by Putzig and Mellon (2007, Icarus 191, 68–94). Updates to the thermal model and derivation algorithm that include a more sophisticated representation of the atmosphere and a layered subsurface are presently in development, and these will be incorporated into the system when they are available. Other planned enhancements include tools for modeling temperatures from horizontal mixtures of materials and slope facets, for comparing heterogeneity modeling results to TES and THEMIS results, and for mosaicking THEMIS images.
http://marstherm.boulder.swri.edu

INDEX TERMS: 5460 PLANETARY SCIENCES: SOLID SURFACE PLANETS Physical properties of materials, 6225 PLANETARY SCIENCES: SOLAR SYSTEM OBJECTS Mars, 5134 PHYSICAL PROPERTIES OF ROCKS Thermal properties, 5494 PLANETARY SCIENCES: SOLID SURFACE PLANETS Instruments and techniques.