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<origin>United States Geological Survey and Arizona State University</origin>

<pubdate>20140530</pubdate>

<title>THEMIS Thermal Inertia Mosaic Quantitative (32-bit) Mosaic 30S300E</title>

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<origin>Mars Data Analysis Program</origin>

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<pubplace>Flagstaff and Tempe, Arizona</pubplace>

<publish>United States Geological Survey, Astrogeology Science Center and Arizona State University, Mars Space Flight Facility</publish>

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<descript>

<abstract>This product is a quantitative (32-bit) thermal inertia image mosaic generated using Thermal Emission Imaging System (THEMIS) images from the 2001 Mars Odyssey orbiter mission using techniques as described in Fergason et al. (2006), High-resolution thermal inertia derived from the Thermal Emission Imaging System (THEMIS): Thermal model and applications, J. Geophys. Res., 111(E12004), doi:10.1029/2006JE002735. The mosaic is generated at the full spatial scale of the THEMIS infrared dataset, which is approximately 100 meters/pixel. The objective of this work is to improve our understanding of the variability of surface properties as a function of both location and season. This objective was addressed through the creation of a global thermal inertia map from high-resolution THEMIS infrared images that allows the identification, assessment, and global correlation of surface materials. The higher spatial resolution of THEMIS data (100 m per pixel), relative to Thermal Emission Spectrometer (TES) globally binned data (~3 km per pixel), enables one to quantify the physical properties of morphologic features observed in high-resolution images, and to better understand geologic processes acting on local scales. Thermophysical variations often correspond to features identified in high-resolution images, and the integration of these data sets allows more robust scientific conclusions to be reached.

</abstract>

<purpose>This work was funded by the NASA Mars Data Analysis Program (MDAP) to make high-resolution thermal inertia data available to the public.</purpose>

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<complete>When generating the thermal inertia mosaic, Thermal Emission Imaging System (THEMIS) infrared images were constrained by the latitude and longitude of the bounding coordinates of the region. We also constrained the following parameters: emission angle 0 to 30, number of lines in the image of 300 to 50,000, and a data quality of high or better. Images were manually deleted from the mosaic if the images were of poor image quality or redundant images caused mis-registration in the averaged mosaic. Areas within the mosaic that have gaps either have no THEMIS infrared coverage at the time the mosaic was created or poor quality images were removed.

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<horizpar> Errors in image position on the 2-4 pixel (200-400 meters)level (but as large as 30 pixels) are apparent and are likely to be primarily due to uncertainties in the image start time. This uncertainty is random, and there are no future plans to improve the THEMIS infrared camera model further.</horizpar>

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<horizpae>200-400 meters (2-4 pixels) estimated accuracy.</horizpae>

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<origin>Fergason, R.L., Christensen, P.R., Kieffer, H.H., High Resolution thermal inertia derived from the Thermal Emission Imaging System (THEMIS): Thermal model and applications, Journal of Geophpysical Research - Planets, 111, E12004, 2006. doi:10.1029/2006JE02735.</origin>

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<procdesc>To generate this mosaic, thermal inertia values are first derived from individual THEMIS nighttime infrared images using the technique described in Fergason et al. (2006), High-resolution thermal inertia derived from the Thermal Emission Imaging System (THEMIS): Thermal model and applications, J. Geophys. Res., 111(E12004), doi:10.1029/2006JE002735. The absolute accuracy of the THEMIS thermal inertia is ~20%. Uncertainties in the THEMIS derived thermal inertia values are primarily due to: 1) instrument calibration limitations; 2) uncertainties in model input parameters at the resolution of the THEMIS instrument; and 3) thermal model limitations. The mosaics themselves are generated using the THEMIS mosaicking procedure developed by Arizona State University (Edwards et al. (2011), Mosaicking of global planetary image datasets: 1. Techniques and data processing for Thermal Emission Imaging System (THEMIS) multi-spectral data, J. Geophys. Res., 116, E10009, doi:10.1029/2010JE003755), which uses DaVinci software scripts to post-process images (&quot;uddw&quot;) and reduce image noise (&quot;deplaid,&quot). Thermal inertia values in quantitative (32-bit) mosaics are unmodified during the mosaicking process and are therefore useful for scientific investigation. The 32-bit product will have image-to-image variations caused by a variety of factors including real phenomena, such as local weather and subsurface layering. We have attempted to minimize these image-to-image variations by selecting images for the mosaic that are from the warmest season available. These warmer images also typically include the highest quality data. The resulting mosaics are quantitative (32-bit) products appropriate for scientific analysis. The mosaics cover an area ±60˚ in latitude, are separated into 24 individual tiles (each are 30˚ in latitude and 60˚ in longitude and match the tiling scheme of the THEMIS daytime and nighttime IR mosaics), and are processed at a resolution of 100 m/pixel. We did not complete a mosaic for latitudes higher than 60˚because the THEMIS data are sparse and the temperatures are too low to enable accurate derivation of thermal inertia in most instances. Mosaic products are available in ISIS3, Geo-Tiff, and PNG data file formats.

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For the THEMIS infrared images used in the mosaic, see THEMIS\_TI\_Mosaic\_32bit\_30S300E\_filelist.txt;

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<eaover>An image mosaic is a merge of multiple THEMIS infrared images which are placed using native cameral model pointing. </eaover>

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