Mars Digital Dune Database

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Abstract

Currently, there is no comprehensive, global, digital database for dune deposits on Mars. The advent of a series of successful Mars missions, coupled with advances in technology enabling a significant increase in instrument resolution, have provided a large compilation of data covering a wide range of wavelengths for the Martian surface. Given the recent availability of high-resolution data and detailed surficial information returned from orbital and rover missions, it is critical that we update the Mars global information base by creating a digital database of dune deposits that includes this new influx of data. As of spring 2004, the Thermal Emission Imaging System (THEMIS) infrared (IR) coverage of the surface of Mars was 98% for nighttime and 75% for daytime acquired images, forming a data set of global coverage at a resolution not previously possible. The combination of high-resolution and global coverage makes the THEMIS IR data set the logical choice for a planet wide inventory of dune deposits. Data sets of a global scale like those of Mars Orbiter Laser Altimeter (MOLA) and Thermal Emission Spectrometer (TES) will enable rapid and contiguous comparisons with the dune database. Other imagery like that of Mars Orbiter Camera (MOC) will provide very high-resolution, localized visual data for accurate interpretations of morphological characterizations. The dune database will provide researchers with an extensive, comprehensive and stable database for use in a wide-array of global studies. The database will also offer researchers a centralized depository for updating physical parameters with newly validated findings.

The initial construction of the database is based upon dune forms or deposits identified, classified and digitized using only THEMIS IR images. These digitized polygons are converted from THEMIS image coordinates to ARCMAP aerographical coordinates, allowing delineation of areal extent of the deposits and preserving relevant THEMIS image information such as L_s, local time, and sun azimuth/angle. The ARCMAP polygons will also retain reference to all THEMIS IR images used in their construction. Where available, THEMIS VIS and/or MOC images will be used to confirm, modify or refine original classifications. In addition to providing an improved resolution for features below the IR image threshold, this secondary examination will also provide a list of cross-referenced THEMIS VIS and MOC images for future investigations. Physical parameters such as wind direction based on slip-face geometry, dune wavelength, elevation, and volume of the deposits will be incorporated into the database on a priority-based schedule. In addition to THEMIS VIS and MOC images, supplemental data sets, such as TES and others, will be used where available to further refine and/or validate existing data on global wind patterns, sediment transport, sources and sinks, and stratigraphic units.