An Orthoimage map using data obtained from the Mars Orbiter Camera of Mars Global Surveyor

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Introduction. A basic requirement for the planning of future, perhaps even manned Mars missions are precise and high resolution maps of our neighbour planet and, especially, of the landing area. Here we present a new orthoimage map of Mars using data obtained from the Mars Orbiter Camera (MOC) of the Mars Global Surveyor (MGS). Since 1998, the National Aeronautics and Space Agency (NASA) uses the MGS for exploration and mapping of the global Martian surface. The new map covers the Mars surface from 0° to 180° West and from 60° South to 60° North, respectively, with a resolution of 231m/pixel. For map composing digital image processing methods have been used. Furthermore, we have succeeded to develop a processing method for composing image mosaics based on MOC data. This method may be used for composing image mosaics using CCD line camera data and is applicable also for other mars missions, whenever a CCD line camera is employed.

Methods. Image data processing has been performed using multiple Video Image Communication and Retrieval (VICAR) programs, developed by the Jet Propulsion Laboratory (JPL), DLR and the Technical University of Berlin (TUB), Department of Photogrammetry and Cartography. Also United States Geological Survey (USGS) Integrated Software for Imagers and Spectrometers (ISIS) programs were used.

Each MOC image was been corrected for radiometric and geometric camera errors. Following visual inspection, some images were manually edited to remove image artifacts (broad stripes of pixel errors, etc.); some others were not included in the mosaic because of several artifacts. The images were georeferenced and map projected using a global Martian Digital Terrain Model (DTM), developed by the DLR and based on MGS Mars Orbiter Laser Altimeter (MOLA) data sets. In order to keep distortions at an acceptable level, the images covering the area from 0° bis 90° West were sinusoidal map projekted using 45º West as reference meridian and from 90° bis 180° West with 135º West as reference meridian. A few gaps in the coverage were filled with appropriate Mars Digital Image Mosaics (MDIM), based on VIKING-Data, with a resolution of 231m/pixel, but with only 128 gray scale levels (7 bit Viking-Vidicon Kamera).

Subsequent to composing the image mosaic and its cartographic processing, the mosaic was divided into 8 parts. The western part of Mars was divided according to Mars Digital Image Mosaics (MDIM) provided by the USGS in 2000, based on 1976 VIKING data, thus obtaining comparable data sets. Finally , latitude/longitude grids were added.

Those 8 map parts are digitally available on 3 CD-Rom's with a resolution of 231m/pixel. Subsequent to detailed cartographic processing, one part, constituting the here presented map, was finalised using Aldus Freehand and printed using a commercial oversize plotter on a scale of 1:2.000.000. The map field size is 0.89m x 1.33m.

Summary and conclusions. We present a new digital map of Mars, one part of eight as printout, which, when compared to the currently existing 7 bit Viking-Vidicon camera data, due to its 256 gray scale levels constitutes an important step forward in the process of gaining better maps of our neighbour planet.

The final map, composed of 18 parts, is intended to serve for photogeological interpretations and comparisons with previous image mosaics, derived from e.g. Viking mission data.