GLOBAL MAPPING AND INDIVIDUAL MAP SHEETS – THE TOPOGRAPHIC IMAGE MAP SERIES MARS 1:200 000

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1. Introduction:
More than ever before the planet Mars is subject to exploration and mapping activities. Since 1992 the Technical University of Berlin was involved in the software development for photogrammetric and cartographic processing of image data of various planets and celestial bodies [1, 2]. As part of the camera experiment for the Mars96 Mission a digital production line for the *Topographic Image Map Series Mars 1:200,000* was developed by the Technical University of Berlin in cooperation with German Aerospace Center (DLR), Berlin-Adlershof [4, 7]. With the disastrous accident of the Russian spacecraft Mars96 in November 1996, the entire project came to an abrupt end, a serious setback for the international research of our neighbouring Planet.
Making use of the tremendous scientific achievements being invested in the German camera project a Topographic Image Map of the landing site of Mars Pathfinder was generated, based on existing Martian image data and latest scientific findings of the Mars Pathfinder Mission.

2. General Aspects:
Image data of the Martian surface provided through past space missions were only suited to generate global map series in mostly small scales. However, the German camera experiment HRSC/WAOSS was expected to provide much higher resolution, full stereo capability and systematic coverage of the planet's surface. Therefore the scale 1:200,000 was selected as the primary scale for future mapping activities, according to the potential of the cameras and in particular the spatial resolution of the image data. The new map series *Topographic Image Map Series Mars 1:200,000* is defined in equal area projection [7]. The whole planet is mapped in Sinusoidal Projection except the polar regions where Lambert Azimuthal Projection is applied. Thus a total of 10,372 map sheets will cover the planet.

3. Image Map of the Mars Pathfinder Landing Site:
Software modules developed for the Mars96 Mission were successfully used to produce the *Topographic Image Map Mars 1:200,000 Landing Site Mars Pathfinder – Mouth of Ares and Tiu Valles Region* as an individual image map sheet [7]. Processing of VIKING Orbiter imagery is based on a newly generated net of control points and upgraded rotational parameters, finally supplemented by actual informations obtained through the Mars Pathfinder Mission [8]. The Digital Terrain Model (DTM) which was used to generate ortho images was obtained by means of block adjustment [9]. This geometrical rectification process was followed by the radiometrical mosaicking, which is essential, because the radiometry of the geometrically corrected images differs significantly between adjacent scenes.

4. Reference System:
The map projection for planimetry is based on a triaxial ellipsoid centered in the Martian center of mass. The height informations however (e.g. contour lines) refer to the *Mars50c Aeroid*.

5. Cartographic Concept:
The equal-area *Sinusoidal Projection* with its useful mathematical and graphical features was also selected for the landing site map [1, 3]. This map is produced as a *Topographic Image Map*. Basic information is the orthoimage, supplemented by some topographical informations and all necessary specifications and marginal annotations. The equidistance of the contour lines is adapted to the limitations in spatial resolution of the imagery, and the resulting quality of the DTM. The graphical representation of the contour lines is

layed out in such a way, that they can be easily recognized, but the map content, in the form of the image data, is disturbed as less as possible.
The complete production line for this individual map follows the principles determined for the new *Topographic Image Map Series Mars 1:200,000*. The digital production comprises all cartographic processing steps such as compilation and nomenclature of the map content and the reproduction of the whole map frame.

6. Outlook:
From the experiences gathered during recent planetary mapping projects, the design principles of the *Topographic Image Map Series Mars 1:200,000* again proved its usefulness as a guideline for future mapping activities on planet Mars. A state-of-the-art camera system, definitely designed to meet photogrammetric and cartographic requirements and to provide high resolution panchromatic and multispectral stereo data sets, like the *High Resolution Stereo Camera* is anticipated to be part of a mission to the planet as soon as possible. Fortunately the European Space Agency (ESA) has expressed its intention to launch the mission *Mars Express* in 2003. The payload of the *Mars Express Orbiter* spacecraft includes a modified version of the German HRSC. Thus new chances are coming up for detailed topographic mapping of Mars.

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