

AN OVERVIEW OF HRSC MAP PRODUCTS. J. Albertz¹, S. Gehrke¹, H. Lehmann¹, M. Wählisch², G. Neukum³, and the HRSC Co-Investigator Team. ¹Technische Universität Berlin, Germany (albertz@igg.tu-berlin.de), ²German Aerospace Center (DLR), Berlin, Germany, ³Freie Universität Berlin, Germany.

Introduction: The High Resolution Stereo Camera (HRSC) on Mars Express began operation in January 2004. The camera is returning both full color and multiple stereo – a unique data set for systematic derivation of color orthoimages, Digital Terrain Models (DTM), and, based on that, high quality cartographic products [14]. The mission's standard map series is the Topographic Image Map Mars 1:200,000 [1,11,12]. In order to automate the map generation process, the cartographic software package Planetary Image Mapper (PIMap) has been developed at Technische Universität Berlin (TUB) [4]. Using this software, map production is carried out at TUB in cooperation with the German Aerospace Center (DLR), which is responsible for photogrammetric processing of HRSC data [9,16].

An overview of HRSC maps of the past three years is given. This comprises the sheets of the standard series as well as related topographic and thematic maps.

Topographic Image Map Mars 1:200,000: This large-scale map series was developed to allow for optimum cartographic representation of HRSC data [12]. It is based on HRSC orthoimages and features contour lines, topographic names as well as map titles, designations, and several legend entries [1,2,4]. The Martian surface is covered in 10,372 individual sheets in equal-area projections: Sinusoidal projection for latitudes between 85° north and south and Lambert Azimuthal Equal-Area projection around the poles. While all map sheets feature 2° in latitude, the longitude extent increases from 2° in the equatorial zone towards 360° at the poles. Therefore, the mapped area is similar for all sheets (about 120x120 km²). The series' cartographic concept forms the basis for special target maps in different scales and also for thematic mapping [1,2].

Map Products: Altogether 67 map sheets in 14 different regions have been derived from HRSC data between 2004 and 2006 – compare figure and table.

Topographic Standard Sheets. In general, considering HRSC image widths (> 55 km), adjacent orbits have to be mosaicked to cover a sheet of the Topographic Image Map Mars 1:200,000 series. However, maps within the regular sheet lines have already been accomplished in summer 2004 showing the Mangala Valles complex. Since then, several sheets of different regions of Mars have been produced [2,3,5,7]. These include the first large-scale maps in the north-polar region, which combine HRSC imagery and Mars Orbiter Laser Altimeter (MOLA) contour lines [7], and the northpole itself. Systematic mapping in larger scales,

i.e. 1:100,000 and 1:50,000, can be achieved by dividing standard sheets into quarters and sixteenth, respectively. The suitability of HRSC data for mapping in those scales has been demonstrated in Iani Chaos [5].

Special Target Maps. Especially in the early stage of the Mars Express mission map sheets needed to be adapted to individual orbits by location and/or scale. The very first HRSC map, e.g., was a special target map of Hydraotes Chaos in 1:100,000 [1]. A topographic map of the Sabrina Valles Region with additional information from the Catalog of Large Martian Impact Craters is presented in a companion abstract [6].

Thematic Maps have been generated in cooperation with other HRSC team members. Exemplary products are a geologic map of Gusev [2] and a new approach of a combined topographic-thematic map illustrating the geomorphology of Centauri and Hellas Montes [13].

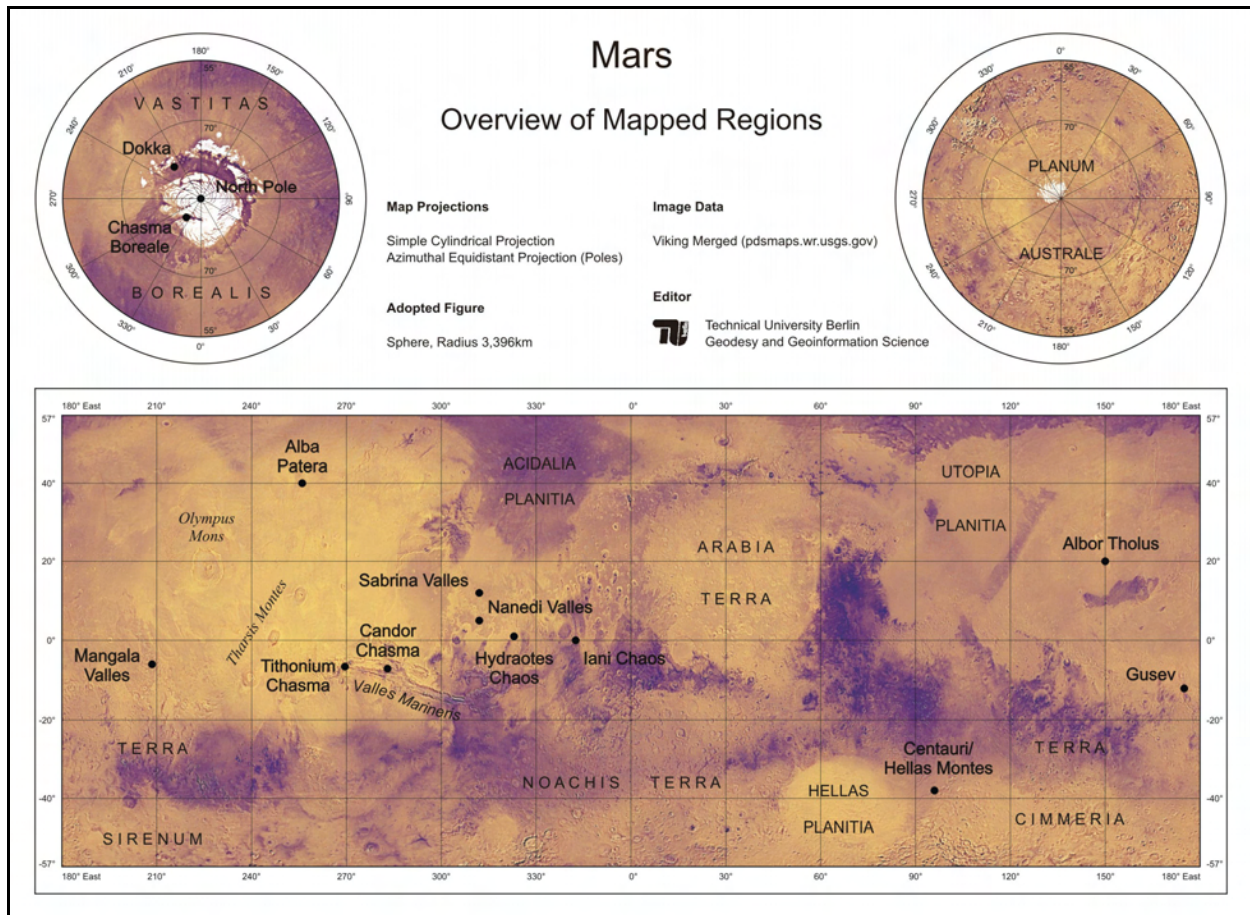
HRSC DTM Test Maps. It is evident that DTMs in highest quality are indispensable for the derivation of accurate contour lines. Besides systematic processing of all HRSC data [16] exist several enhancing and alternative approaches [2,9], which have been compared in the *HRSC DTM Test* [10]. Part of the evaluation process – particularly regarding the contour line quality – was the generation of topographic map sheets from all delivered DTMs in two different test areas.

Conclusion: A variety of high quality HRSC maps in scales up to 1:50,000 is available from Technische Universität Berlin. The Topographic Image Map Mars 1:200,000 series has proven to be a useful and guiding standard. From the experience gained during three years HRSC cartography and operational application of PIMap it is clear that we are well prepared for systematic map generation from HRSC data.

References: [1] Albertz J. et al. (2004) *IAPRS*, 35(B4), 869-874. [2] Albertz J. et al. (2005) *22nd ICC*, A Coruna. [3] Albertz J. et al. (2005) *PE&RS*, 71(10), 1153-1166. [4] Gehrke S. et al. (2006) *37th LPSC*, #1322. [5] Gehrke S. et al. (2006) *37th LPSC*, #1325. [6] Gehrke S. et al. (2007), *38th LPSC*. [7] Gehrke S. et al. (2007), *ISPRS Extraterrestrial Mapping Workshop*, Houston. [8] Greyley R. & Batson R.M. (1990) *Cambridge University Press*. [9] Gwinner K. et al. (2005), *PFG*, 5/2005, 387-394. [10] Heipke C. et al. (2006) *ISPRS TC IV Symposium*, Goa. [11] Kirk R.L. (2005) *PE&RS*, 71(10), 1111-1126. [12] Lehmann H. et al. (1997) *18th ICC*, Stockholm, 1471-1478. [13] Lehmann H. et al. (2006), *ISPRS TC IV Symposium*, Goa. [14] Neukum G. et al. (2004) *ESA SP-1240*. [15] Map-a-Planet, *pdsmaps.wr.usgs.gov*. [16] Scholten F. et al. (2005) *PE&RS*, 71(10), 1143-1152.

Region	HRSC Orbit(s)	Covered Area: Lat/Lon		Scale(s)	Map Type(s)
Alba Patera	68	39.1N - 41.0N	255.0E - 257.5E	200k	OMKT
Albor Tholus	32	18.0N - 20.0N	149.5E - 151.1E	200k	OMKT, OMKN
Candor Chasma	1235	7.9S - 5.9S	282.3E - 284.3E	200k	OMC
Centauri/Hellas Mn.	2510	41.0S - 37.0S	95.0E - 97.5E	200k, 300k	OMKT
Chasma Boreale	1154	83.0N - 87.0N	306.0E - 336.0E	200k	OMKT, OMKN
Dokka	1177	77.0N - 79.0N	210.0E - 220.0E	200k	OMKN
Hydraotes Chaos	18	0.7N - 1.7N	322.7E - 324.6E	100k	OMKT
Iani Chaos	912, 923, 934	3.0S - 1.0N	342.0E - 344.0E	200k, 100k, 50k	OMKT
Mangala Valles	286, 299	9.0S - 3.0S	208.0E - 210.0E	200k	OMKT, OMKN
Nanedi Valles	894, 905, 927	3.8N - 5.8N	311.3E - 313.3E	200k	OMC
North Pole	1154, 1167	89.0N - 90.0N	0.0E - 360.0E	200k	OMKN
Sabrina Valles	894, 905, 927	9.8N - 13.3N	310.0E - 314.0E	400k	OMKT
Tithonium Chasma	442	7.0S - 5.0S	268.0E - 270.0E	200k	OMKT
Centauri/Hellas Mn.	2510	39.8S - 36.8S	95.0E - 97.5E	300k	G (OMKG)
Gusev	24, 27, 285, 335	18.0S - 10.0S	172.0E - 179.0E	600k	G

Regions of Mars and related HRSC map products. (Map type designators [8]: OM = orthoimage mosaic; C = contour lines, N = nomenclature, T = topography, i.e. both contours and nomenclature, G = geology; K = color)



Location of mapped regions on Mars, based on Viking color data [15]. Due to the small scale, individual map sheets cannot be shown.