A TOPOGRAPHIC IMAGE MAP OF THE SABRINA VALLES REGION INCLUDING INFORMATION ON LARGE MARTIAN IMPACT CRATERS. S. Gehrke[1], R. Köhring[1], N.G. Barlow[2], K. Gwinner[3], F. Scholten[3], H. Lehmann[1], J. Albertz[1]. [1]Technische Universität Berlin, Germany (stephan@igg.tu-berlin.de), [2]Northern Arizona University, Flagstaff, Arizona, [3]German Aerospace Center (DLR), Berlin, Germany.

Introduction: The High Resolution Stereo Camera (HRSC) on board of the Mars Express orbiter provides imagery in full color and stereo [8]. Based on HRSC orthoimages and Digital Terrain Models (DTM), the sheets of the Topographic Image Map Mars 1:200,000 standard series are generated. This new large-scale map series covers our neighboring planet in 10,372 sheets [1,3]. Such maps provide names of topographic surface features; 1613 features on the entire Mars are assigned with names so far – amongst them 922 craters of various diameters – and listed in the USGS Gazetteer of Planetary Nomenclature [10]. This number appears rather small if compared to the Catalog of Large Martian Impact Craters (henceforth Catalog), which contains information on more than 42,000 craters with minimum diameters of 5 km [4]. Therefore, crater IDs, when finally revised, will be systematically integrated into the sheets of the Topographic Image Map Mars 1:200,000 and provide the scientific community with the link between appearances and locations of impact craters and comprehensive further information.

To exemplarily demonstrate such an update, a special target map of the Sabrina Valles region was generated (see figure). It follows the definitions and layout scheme of the map series but was prepared in scale 1:400,000. In comparison to respective standard sheets, this specimen gives additional information on depicted impact craters in tabular form. As the region has been amongst the investigation areas of the HRSC DTM Test [7], HRSC based surface topography in highest quality was available for this mapping project.

The Catalog of Large Martian Impact Craters was originally produced in the late 1980s from Viking 1:2,000,000 photomosaics and provided location, size, and morphologic data for 42,283 impact craters larger than 5 km. It is currently being revised using MGS and Odyssey data. One of the revisions is a new crater identification system, which is based on the longitude and latitude of the crater center. The new Catalog is almost finished for the northern hemisphere of Mars; it is available in Excel and ASCII format [4].

In comparison to the Gazetteer that includes center point, bounding box, and overall size, the Catalog provides crater location as well as detailed shape information. These include maximum and minimum diameters plus orientation for elliptical impacts, dimensions of a central peak or pit as well as ejecta extent, perimeter, and area; vertical dimensions of such impact features have been measured, too. Furthermore, the Catalog gives information on preservation, morphology of ejecta and interior as well as mineralogy and thermal inertia of the surrounding terrain [4].

While named craters are labeled in various maps, Catalog data are not represented so far except for a few special products. However, the Topographic Image Map Mars 1:200,000 series and related large-scale products – like the presented example – easily allow for the integration of this huge data set.

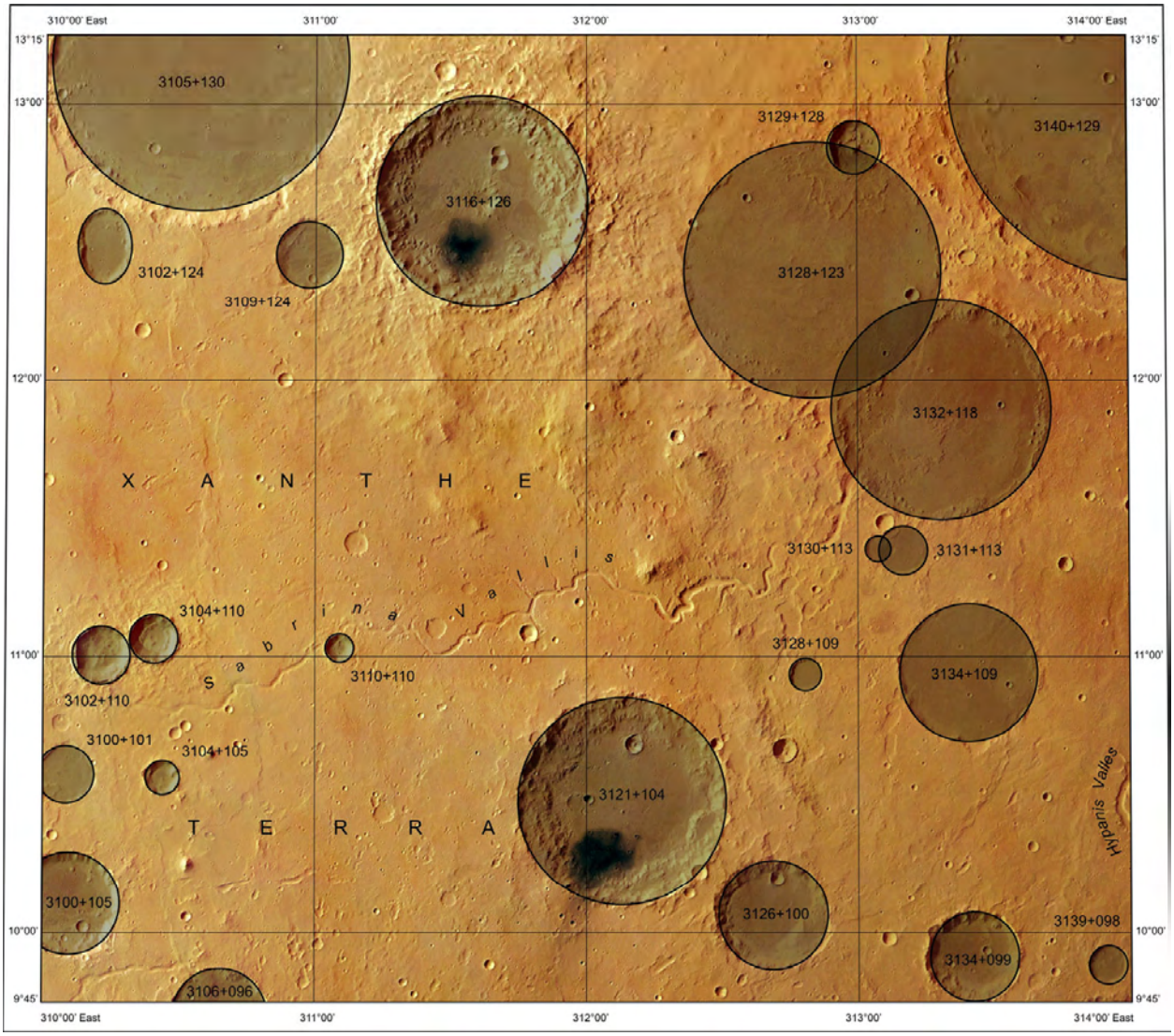
Map Generation: The map sheet of the Sabrina Valles region is based on HRSC imagery obtained during Mars Express orbits 894, 905, and 927.

Photogrammetric Processing of HRSC Data was carried out at German Aerospace Center (DLR). DTM derivation was based on HRSC standard routines [9] but was refined with regard to adaptive filtering of the input imagery, interactive parameter adjustment, and quality checks [6,7]. The final DTM mosaic features a spatial resolution of 50 m. It was judged in the HRSC DTM Test to give the best overall accuracy and to represent fine detail [7]; therefore, it was chosen for our large-scale topographic map. Registration of HRSC color channels for the orthoimage mosaic with a resolution of 25 m/pixel was based on the same DTM.

Cartographic Processing. Map sheet generation was carried out at Technische Universität Berlin using the self-developed software package Planetary Image Mapper (PIMap). The entire topographic content, grids, frame lines, map titles and sheet designation as well as typical marginal elements have been automatically generated and compiled with PIMap [5]. In addition to usual revision and finishing, impact crater IDs and further information of the Catalog have been interactively integrated for this specimen map.

Final Map Sheet: The "Topographic Image Map Mars 1:400,000, M 400k 11.50N/312.00E OMKT, Sabrina Vallis Region" (cp. figure) is located in Xanthe Terra; it covers 9°45' trough 13°15' northern planetocentric latitude and 10°00' through 14°00' east longitude. Although the mapped area contains many impact craters – 23 in diameters from 5.5 km up to even 89.3 km are listed in the Catalog –, none of them is named so far; respective craters are lettered by their Catalog ID only. (In principle, names ought to be the main entry in topographic map sheets, supplemented by IDs).

The general layout of the map sheet follows the Topographic Image Map Mars 1:200,000 standard series. In addition, Catalog information on impact craters is given in tabular form. Considering map scale and relief



Overview of large impact craters (> 5 km) in the map sheet "M 400k 11.50N/312.00E OMKT, Sabrina Vallis Region" including crater IDs (composed of longitude and latitude to one decimal place), outlines, and areas as listed in the Catalog. Note that the original map sheet features topographic names, crater IDs, and contour lines but further crater information in a separate table.

energy – two craters, e.g., show markedly steep slopes – a contour line equidistance of 250 m has been chosen. While the resulting contours represent the overall surface and model fine structures as well, detailed topography of impact craters, such as depths, can only be estimated, especially for small and flat ones. Thus, the map sheet was predominantly supplemented with topography-related Catalog data, in particular crater depths, rim heights, and sizes of central peaks or pits if present.

Conclusion: The presented map of the Sabrina Valles region illustrates the integration of additional information on impact craters. Particularly the Topographic Image Map Mars 1:200,000 series – which is expected to be systematically produced on the basis of HRSC data in the future – will benefit from the Catalog.

An upgrade of PIMap regarding automatic processing of respective data is envisaged. Beyond the generation of standard map sheets, the software may then be utilized as general Catalog visualization tool.

References: [1] Albertz J. et al. (2004) *IAPRS*, 35(B4), 869-874. [2] Albertz J. et al. (2005) *PE&RS*, 71(10), 1153-1166. [3] Albertz J. et al. (2007), *38th LPSC*, #1517 (this volume). [4] Barlow N.G. (2006) *37th LPSC*, #1337. [5] Gehrke S. et al. (2006) *37th LPSC*, #1322. [6] Gwinner K. et al. (2005), *PFG*, 5/2005, 387-394. [7] Heipke C. et al. (2006) *ISPRS TC IV Symposium*, Goa. [8] Neukum G. et al. (2004) *ESA SP-1240*. [9] Scholten F. et al. (2005) *PE&RS*, 71(10), 1143-1152. [10] Gazetteer of Planetary Nomenclature, *planetarynames.wr.usgs.gov*.