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Topographic mapping of the Mars MC quadrangles using HRSC data

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The High Resolution Stereo Camera (HRSC) of ESA's Mars Express mission [1, 2] is still running nominally and delivering new image strips to fill remaining gaps that lead to a contiguous coverage of the Martian surface at high resolution stereo. As a push broom scanning instrument with nine CCD line detectors mounted in parallel, its unique feature is the ability to obtain along-track stereo images and four colors during a single orbital pass. Thus, panchromatic stereo and color images from single orbits of the HRSC have been used to produce digital terrain models (DTMs) and orthoimages of the Martian surface since 2004 [3].

Since 2010 new HRSC multi-orbit data products have been generated, which have been developed into a global mapping program organized into MC-30 half-tiles, since 2014 [4,5]. Based on continuous coverage of an area, regional DTMs and orthomosaics can be produced by combining image data from multiple orbits using specifically adapted techniques for block-adjustment, DTM interpolation and image equalization [6]. The resulting DTMs and color orthomosaics are the baseline for a controlled topographic map series of Mars. The extents of the regional products follow the MC-30 (Mars Chart) global mapping scheme of Greeley and Batson [7]. For the generation of the DTMs and color mosaics, the MC-30 quadrangles are further divided into East (E) and West (W). In parallel to the completion of the first half-tile DTM and color mosaic (MC-11-E) we developed a concept for a topographic map series of Mars [8,9]. To limit data volumes and map sizes, each quadrangle is subdivided into eight tiles (i.e. each half-tile into four tiles). The map scale of 1:700,000 is a compromise between the high DTM and orthomosaic resolution of 50 m/pxl and an acceptable hardcopy format of about 1 m in width to 2 m in height (≈14 pxl/mm). MC-11 was selected to be produced first because it contains the finally selected landing site, Oxia Planum, of ESA's ExoMars mission with the Rosalind Franklin rover. After MC-11, the Global Topography and Mosaics Task Group (GTMTG) of the HRSC Science Team focussed on MC-13, which hosts the landing site of the Perseverance rover from NASA's Mars 2020 mission, Jezero crater. The next HRSC MC quadrangles will also be equatorial ones (i.e. 19 and 20).

All maps are available for the public at the HRSC team website (http://hrscteam.dlr.de/HMC30/index.html).

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