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HIGH-RESOLUTION PHOBOS ATLAS DERIVED FROM HIGH RESOLUTION STEREO CAMERA (HRSC) IMAGES ON MARS EXPRESS

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ABSTRACT:

We deal with the Martian satellite Phobos and present a global orthomosaic and an atlas. The mosaic and maps are based on image data obtained by the High Resolution Stereo Camera (HRSC) (Jaumann et al., 2007), the pushbroom scanner on Mars Express (MEX). The new atlas is an update of the previously released version (Wählisch et al., 2010), which was derived from images of the Super Resolution Channel (SRC) (Oberst et al., 2008), the CCD frame camera of the HRSC. Due to the different nature of the camera systems (9 line CCD scanner vs. the 1K CCD frame), the orthoimage production for the mosaic differs considerably. We selected 18 HRSC scenes, obtained during MEX Phobos flybys from 2004 to 2011. We have carried out a photogrammetric adjustment for the selected scenes (5 images each) (Willner et al., 2013), which yields improved orientation data for all 90 images. As the distance between the spacecraft and Phobos varied between approx. 100 and 2240 km, image resolutions range from 3.7 m/ pixel to 98.5 m/ pixel. 10 images were selected guaranteeing the Phobos coverage for production of a global mosaic. We used the newly updated Digital Terrain Model (DTM) (Willner et al., 2013) for ortho-rectification. The 10 images (resolutions from 3.7 m/ pixel to 24.0 m/ pixel) were resampled to a uniform resolution of 16 pixels/ degree or 12.11 m/ pixel, and subsequently superimposed. Phobos is in a synchronous rotation in a near-circular orbit around Mars. A gap on the trailing hemisphere, which could not been imaged by HRSC due to the illuminating conditions, was closed by three Viking orthoimages. The atlas consists of 6 topographic image maps, which were created at a scale of 1: 50,000 (Wählisch et al., 2013). The mosaics in the equator region are in Mercator projection. Sub-mosaics using 3 images in each case were generated for the North and South poles in Stereographic projection. The atlas shows two different types of contour lines: sheet 1 (map 1 to 3) of the atlas displays dynamic height contours obtained from gravity field modelling (Shi et al., 2012), useful to identify down-slope direction and mobility of surface materials. On sheet 2 (map 1 to 3), contour lines represent geometrical heights above the sphere (Rmean = 11.1 km) derived from the global DTM. For simplicity, the same sphere was chosen as horizontal reference. Finally, 17 craters with approved names by the International Astronomical Union (IAU) are marked in the map, for which the coordinates and dimensions were re-determined.

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