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The High Resolution Stereo Camera (HRSC) Experiment on Mars Express

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ESA's Mars Express successfully operatessince three years at Mars covering so far about 35% of the surface in stereo and color with resolutions up to 10 m/pixelel by its High Resolution Stereo Camera (HRSC) [1,2]. Mars Express is now in its extended mission phase, during which much of the remaining part of the Martian surface is envisaged to be covered in stereo and color. The HRSC instrument is designed to map the morphology, topography, structure and geologic context of the surface as well as atmospheric phenomena. As HRSC is a push-broom scanning instrument with nine CCD line detectors mounted in parallel on a focal plane, its unique feature is the ability to obtain near-simultaneous imaging data at high resolution, with along-track triple stereo, four colors and five different phase angles, avoiding any time-dependent variations of the observing conditions. The HRSC spatial resolution is 10 m/pixel at the nominal periapsis altitude of 250 km, with an image swath of 53 km, and 2.3 m/pixel for an additional framing CCD device, called Super Resolution Channel (SRC), practically working as an additional tenth channel of the HRSC and yielding nested-in black and white images for studies of small-scale geologic features. The sub-pixel accuracy of the three-dimensional point determination allows the derivation of Digital Terrain Models (DTMs) with a grid size of up to 50 m and a height accuracy of a single pixel with up to 10 m, thus enabling us to carry out detailed quantitative analyses of the surface structure. The HRSC (1) bridges the gap between the medium-high resolution Viking imagery and the very-high resolution Global Surveyor and Mars Reconnaissance missions, thus providing geological context, and (2) fills the gaps in the 3-D coverage and DTM grid of the MOLA laser altimetry data, and (3) helps char-

acterize landing sites for further in-situ measurements. HRSC also builds the basis for extended compositional mapping when combining spectral information with topographic photomaps over large areas. So far the HRSC measurements have made a significant contribution to the study of the evolution of volcanism and the role of water and ice throughout the Martian history.

References: [1] Neukum, G. et al, ESA Special Publications SP-1240, 2004. [2] Jaumann. et al, Planet. Space Sci. in press (2007).