Geomorphologic mapping of Mars with the High Resolution Stereo Camera (HRSC)

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The High Resolution Stereo Camera (HRSC) [1] onboard ESA's Mars Express mission is a multiple line scanner which acquires 5 stereo channels and 4 colors. One of its goals is to map Mars globally. Until March 2006, 30% of the surface have been covered with a resolution of better than 20 m. HRSC data are unique, since a single image covers very large areas (typically in the order of 10^4km^2, sometimes up to 10^5 km^2) in high resolution, and they provide quantitative 3D information. The biggest asset that HRSC provides to mapping is the large areal coverage with high resolution. Other imaging data sets may have a lateral resolution that is equally high (THEMIS-VIS: 19 m/pixel; CRISM: 20 m/pixel) or even higher (MOC: few m/pixel; HiRISE: up to 30 cm/pixel, MRO ontext imager: 6-8 m/pixel), but most have a much smaller coverage (per image and in total). Of equal importance, and unprecedented quality, is the unique stereo capability of HRSC [2,3], which is not provided by any previous, current, or planned future instrument. The resolution of the stereo channels is 10-40 m/pixel, and Digital Elevation Models (DEM) have cell sizes of 50-100 m. The combination of the global MOLA geodetic reference frame with laterally higher-resolution HRSC images and DEM yields excellent results. Very high-resolution Mars Orbiter Camera (MOC) images (few meters/pixel) can easily be combined with HRSC images and DEM. It will equally be possible to combine HRSC with the upcoming HiRISE images (30 cm/pixel) as well as with data from the MRO Context Imager. It will be particularly useful to combine HiRISE images and HRSC DEM (HiRISE will also produce DEM, but the spatial coverage will be limited). Therefore, HRSC images and DEM can serve as a bridge between lower- and higher-resolution data, and they are a perfect base map for any geoscientific mapping. The 3D morphological context for spatially resolved mineralogical information from spectrometers like OMEGA and CRISM can also conveniently be obtained through HRSC images and DEM. Geomorphological studies on a local to regional scale as well as specific topical studies like landing site selection [4] will benefit from this unique data set.

[1] Neukum et al., *ESA SP-1240*, 17-35, 2004. [2] Scholten et al., *PERS* **71**(10), 1143-1152, 2005. [3] Gwinner et al., *PFG* **5**, 387-394, 2005. [4] Hauber et al., *1st MSL Landing Site Workshop*, 2006.