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Orbital Imaging Photometry and Surface Geologic Processes within Gusev.

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Access to the particle size and rocky fragment abundances from the sub-meter down to the microscale range is critical for the determination of geological processes that affect the planetary surfaces. Indeed, the geological processes controlling the size or being controlled by the size of particles include the volcanic processes, the surface features driven by the fluvial, aeolian or glacial activity, the landslides, the impact cratering and formation and emplacement of ejecta, and, last but not least, coating processes.

One of the new investigations from orbit that can be addressed with the multi-angular HRSC dataset generated with the nadir-looking, stereo and photometric channels, is to derive the surface photometric characteristics for mapping the variation of the soil/bedrock physical properties of Mars, and to relate them to the spectroscopic and thermal observations produced by OMEGA, TES and THEMIS instruments. Given the wealth of in situ information recently acquired within the Gusev crater, with the very successful landing of the Mars Exploration Rover, *Spirit* and its fruitful traverse to the Columbia Hills, a special emphasis has been put on the multi-angular observations made respectively on January, 16^{th} and February, 1^{st},2004 during the overlapping

MEx orbits 24 and 72 which flew over Gusev, with different observation geometries.

For this purpose, an inverse method optimizing the determination of the global set of Hapke parameters, developed and tested on experimental data produced with a laboratory wide-field multispectral imaging facility, is implemented on the HRSC orbital dataset [1, 2, 3] and maps of these photometric quantities are produced, at varying spatial scales ranging from 1.6km down to 100m/pixel. The HRSC photometric products derived at the different scales of analysis appear stable and striking variations across the crater floor reveal significant photometric changes between the different constituting units present in the crater.

Together with laboratory measurements, terrestrial field and MER, earlier Viking Lander observations and in situ Spirit MER observations, the results are consistent with the occurrence of basaltic rock surfaces or packed sands, smoothed by exposure to wind abrasion and possibly coated with dust, in alternance with surrounding rougher soil surfaces embedded in an aeolian mantling, with features such as ripples, dunes and soil patches. The results produced so far for the Gusev crater floor demonstrate that this new *MEx* orbital information can be used for characterizing the Martian surface.

References: [1] Cord A.M. et al. (2003), *Icarus , 165*, 414. [2] Pinet et al. (2005), LPSC 36^{th}, # 1721. [3] Jehl et al. (2005), this issue.