Geophysical Research Abstracts,
Vol. 11, EGU2009-12979, 2009
EGU General Assembly 2009

Airborne dust and soil particles at the Phoenix landing site, Mars

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The three iSweep targets on the Phoenix lander instrument deck utilize permanent magnets and 6 different background colors for studies of airborne dust [1]. The name iSweep is short for Improved Sweep Magnet experiments and derives from MER heritage [2, 3] as the rovers carried a sweep magnet, which is a very strong ring magnet built into an aluminum structure. Airborne dust is attracted and held by the magnet and the pattern formed depends on magnetic properties of the dust. The visible/near-infrared spectra acquired of the iSweep are rather similar to typical Martian dust and soil spectra. Because of the multiple background colors of the iSweeps the effect of the translucence of thin dust layers can be studied. This is used to estimate the rate of dust accumulation and will be used to evaluate light scattering properties of the particles. Some particles raised by the retro-rockets during the final descent came to rest on the lander deck and spectra of these particles are studied and compared with those of airborne dust and with spectra obtained from other missions.
High resolution images acquired by the Optical Microscope (OM) [4] showed subtle differences between different Phoenix soil samples in terms of particle size and color. Most samples contain orange dust (particles smaller than 10 micrometer) as their major component and silt-sized (50-80 micrometer large) subrounded particles. Both particle types are substantially magnetic. Based on results from the Mars Exploration Rovers, the magnetization of the silt-sized particles is believed to be caused by magnetite. Morphology, texture and color of these particles (ranging from colorless, red-brown to almost black) suggest a multiple origin: The darkest particles probably represent lithic fragments, while the brighter ones could be impact or volcanic glasses.

[1] Leer K. et al. (2008) JGR, 113, E00A16. [2] Madsen M.B. et al. (2003) JGR, 108, 8069. [3] Madsen M.B. et al. (2008) JGR (in print). [4] Hecht M.H. et al. (2008) JGR, 113, E00A22.