COMPARISON OF SOME PHOENIX AND GUSEV SOIL TYPES: INFERENCES ON POSSIBLE ORIGIN AND GLOBAL DISTRIBUTION. W. Goetz[1], S. F., Hviid[1], M. B. Madsen[2], W. T. Pike[3], M. H. Hecht[4], R. V. Morris[5], K. Leer[2], L. Drube[2], H. Sykulska[3], K. E. Herkenhoff[7], N. A. Cabrol[6], M.R. El Maarry[1], H. U. Keller[1], W. J. Markiewicz[1], R. E. Arvidson[8], and P. H. Smith[9], [1]Max Institute for Solar System Research, 37191 Katlenburg-Lindau, Germany (goetz@mps.mpg.de), [2]Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark, [3]Department of Electrical and Electronic Engineering, Imperial College, London, UK, [4]Jet Propulsion Laboratory, Caltech, Pasadena, CA, USA, [5]NASA Johnson Space Center, Houston, TX, USA, [6]Space Science and Astrobiology Division, NASA Ames Research Center, Moffett Field, California, USA and SETI Institute Carl Sagan Center, Mountain View, California, USA, [7]Astrogeology Team, U.S. Geological Survey, Flagstaff, Arizona, USA, [8]Washington University, St. Louis. MO, USA, [9]University of Arizona, Tucson, AZ, USA.

Introduction: The Phoenix Spacecraft (PHX) has been operated from May through October 2008 in the northpolar regions of Mars. Its science payload included an Optical Microscope (OM) that returned extraordinary microscopic color images of the soil (4 μm/px). These images reveal a very large diversity of particles, and the important question arises, how representative the imaged soil patches are for the entire planet.

Analysis: Gusev soil particles have been studied in detail in [1]. Phoenix soil particles as documented by microscopic images have been described in [2,3]. In the present abstract we are using particle size distributions, and particle size shape parameters (Figures 1-3) as well as optical reflectance properties (Figures 4-5), in order to investigate differences between different Phoenix soils (and soil particles in particular) on the one hand and differences between Phoenix and Gusev soils on the other hand. This task is difficult, as the MER-MI (Microscopic Imager onboard Spirit, 30 μm/px, gray scale) and the PHX-OM do not in general resolve the same types of soil particles. MI is a broad-band camera that is mostly sensitive in the spectral range λ = 500 to 600 nm [4].

Conclusions: The albedo range of Gusev soil particles is smaller than the one of Phoenix soil particles. More specifically the green-red albedo (λ ~ 530-630 nm) of the brightest particles at the El Dorado dunes, Gusev crater, is by a factor of less than 3 larger than the darkest soil particle in these dunes. In Phoenix soils we see overall a similar albedo range. However, a substantial fraction of Phoenix soil particles display relative albedo variations by a factor of 6-10. The brightest particles in that fraction are highly translucent, and in some cases almost transparent. We suggest that a more local origin should be investigated for those particles that may have been formed just above or below the ice table at the Phoenix landing site.

References: [1] Cabrol N. A. et al., JGR 113, E06S05, 2008. [2] Goetz et al., LPSC 2009. [3] Goetz et al., JGR, 2010 (in press). [4] Herkenhoff et al., 108(E12), 8065, 2003.

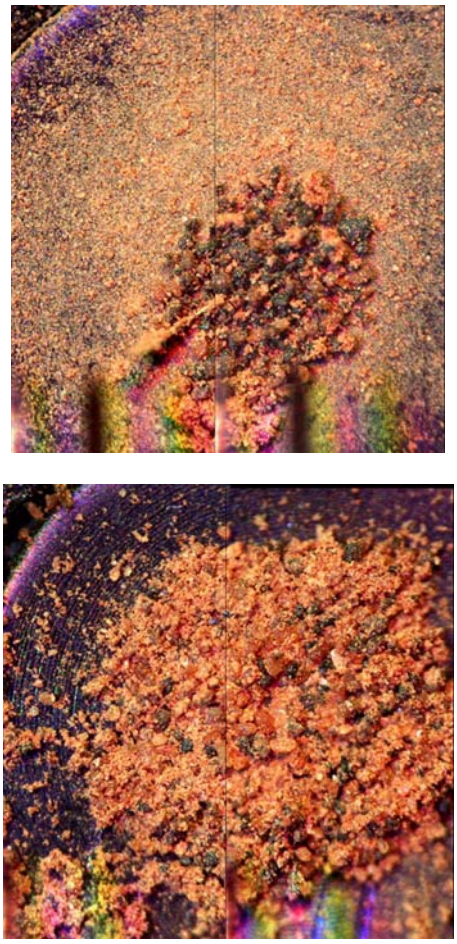

Figure 1. (a, top) Phoenix surface soil (Mama Bear, sol 21) as accumulated on the (weakly) magnetic substrate of the Optical Microscope. Note the veneer of dust on the entire substrate (circular, 3 mm in diameter). (b, bottom) Lag deposit from scraped pile above the ice (Golden Key, sol 103) as accumulated on a (strongly) magnetic substrate of the Optical Microscope. The substrate surface is almost dust free. Note the substantial difference between both samples.

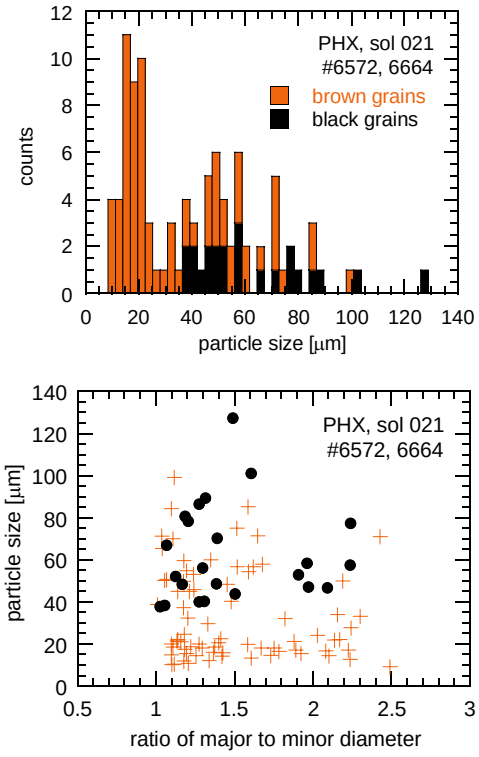

Figure 2. Size distribution and ratio of major to minor particle diameter in the sample Mama Bear shown in Fig. 1a.

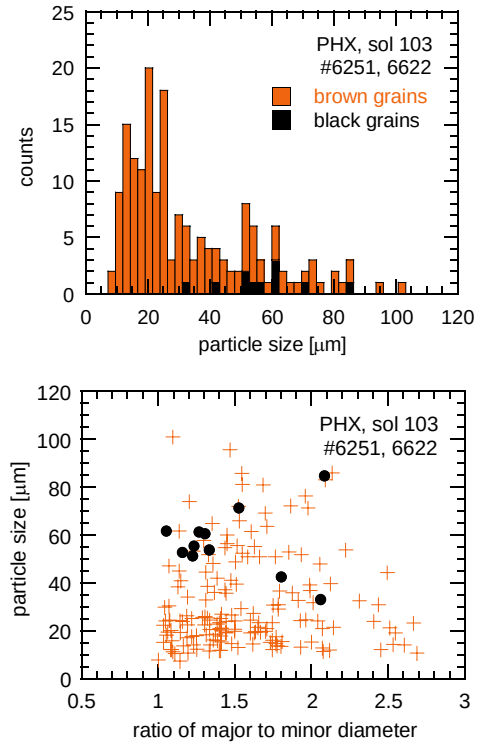

Figure 3. Size distribution and ratio of major to minor particle diameter in the sample Golden Key shown in Fig. 1b.

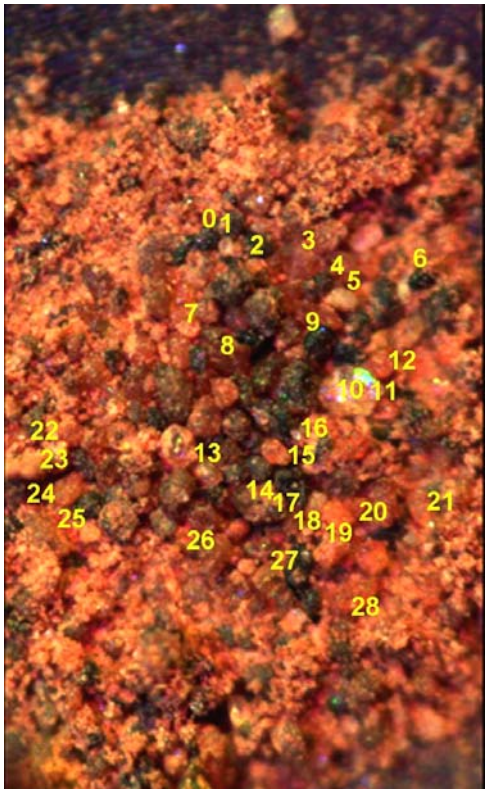

Figure 4. Phoenix soil material imaged on sol 148. Note the bright transparent particle labeled by the number "10". Such particles are rather frequent in Phoenix soils.

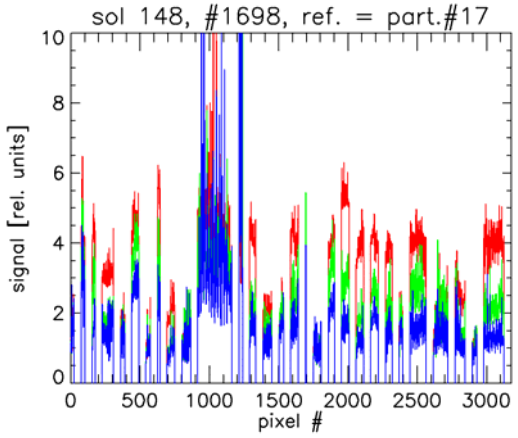

Figure 5. The albedo range for each of the 29 particles labeled from "0" through "28" in Figure 4. The blue, green and red albedo is ratioed to the one of particle #17, respectively. Particle "10" (see Figure 4) has a high relative albedo in all three spectral channels.