GRAIN SHAPES AND SURFACE TEXTURES OF SOME MICRO-LANDFORM, MATERIAL, AND MINERAL MARS-REGOLITH ANALOGS: IMPLICATIONS FOR INTERPRETING SAND AND SILT IMAGED BY THE PHOENIX OPTICAL MICROSCOPE AT THE PHOENIX MARS LANDER LANDING SITE.

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Introduction: The Phoenix Mars Lander (PHX) landed in Vastitas Borealis, near Mars' northern polar cap, on May 25 2008, and operated until November 2, 2008. The landing site is in a valley dominated by periglacial polygonal patterned ground with 3 to 6 meter polygons, with a thin layer of basaltic sand overlying permafrost [1]. Depth to ice was 2-6 cm. A Robotic Arm (RA) dug trenches and acquired samples of dry soil and sublimation residues from water ice. The RA delivered samples to several instrument packages containing a variety of scientific instruments, including an Optical Microscope (OM). Samples for delivery to the OM were passed through a 200 µm sieve [2]. The OM was equipped with a fixed-focus, fixed-magnification optical system, two lenses, and LEDs in red, blue, green and ultraviolet for simulating color imaging. OM image spatial resolution was determined by the pixel dimension of 4 µm/pixel [2]. A variety of substrates were distributed on a rotating wheel the movement of which enabled the OM to focus and photograph each sample individually [2]. Previous research has classified grain types by color (black and brown) [3], measured particle sizes and size distributions [4], and compared grain form among different PHX grain types [5] and with several terrestrial analogs [6-7].

This presentation reviews previous results of this campaign, and describes preliminary results of our new investigations to re-interpret grain shapes of the coarsest grains imaged by the Phoenix OM by comparison with grains from the same size fractions of well-studied terrestrial analogs of the regolith at the PHX landing site. To date, these have included the following:

JSC Mars-1. Spectroscopic and compositional analog NASA JSC Mars-1 Mars Soil Simulant consists of glassy phyllosilicate-poor palagonitic volcanic ash from the late Pleistocene Pu'u Nene cinder cone at a cold, dry site 1850 m above mean sea level (AMSL) on the south flank of Mauna Kea volcano on Hawai'i [8].

HWMK600. Lithologically similar to JSC Mars-1, HWMK600 consists of phyllosilicate-poor palagonitic volcanic tephra collected at a warm, wet site 3730 m AMSL along the side road to the Very Long Baseline Array (VLBA) Telescope on Mauna Kea [9,10].

MMS. Engineering analog Mars Mojave Simulant (MMS) consists of granular fractions collected from the Saddleback Basalt near Boron, California, in the Western Mojave Desert [11]. MMS was suggested as a Mars soil simulant because JSC Mars-1 is too hygroscopic, gaining moisture too quickly during experiments to measure water sublimation loss on excavated permafrost under ambient Mars conditions [11].

Basaltic material analog materials JSC Mars-1, HWMK600, and MMS have been previously documented to contain the primary rock-forming mineral plagioclase [8, 10-12], along with other phases including volcanic glass.

Saginaw Lowlands (Michigan, USA) periglacial polygonal patterned ground landform analog sands. The landform analog site, located in the Saginaw Lowlands, Michigan, USA., exhibits polygonal patterned ground that formed on glacial parent materials during the Wisconsinan glaciation (50,000 – 11,000 YBP). These terrestrial glacial-periglacial sands consist primarily of quartz. Polygon interior and ice wedge fill samples correspond broadly to specific PHX trench samples on similar landforms.

Results have been reported from past work on these basaltic [13-15] and periglacial [16,17] samples.

This poster will present our results from a previously unexamined mineral analog of Mars sandy regolith.

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