OPTICAL STUDY OF PARTICELS ON PHOENIX MAGNETS Leer[1], K., Drube[1], L., Goetz[2], W., Gunnlaugsson[5], P., Lemmon[3], M., Madsen[1], M.B., Morris[4], R.V., Smith[5], P. and the Phoenix Science Team, [1]University of Copenhagen, Julianne Mariesvej 30, 2100 Copenhagen , Denmark, kleer@fys.ku.dk, [2]Max Planck Institute, Lindau, Germany, [3]Department of Atmospheric Science, Texas A&M University, Texas, [4] SN/NJASA Johnson Space center, Houston, Texas, [5]Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona, University of Aarhus, Denmark.

Introduction: The Phoenix Mission to Mars [1] carries three identical Improved Sweep Magnets – iSweeps [2]. These magnets were designed to keep small areas as free of dust as possible to facilitate radiometric calibration of images obtained by the Surface Stereo Imager (SSI). On Sol 1 when the magnets were imaged numerous particles were seen on the iSweeps. These particles are believed to have been raised from the surface by the lander retro-rockets during the final descent. In this study we examine these particles and compare their optical spectra to dust on the magnets and CRISM data of the landing area.

Problem:

On iSweep3 several particles were present on the sweep magnets and on the surroundings of the lander deck:

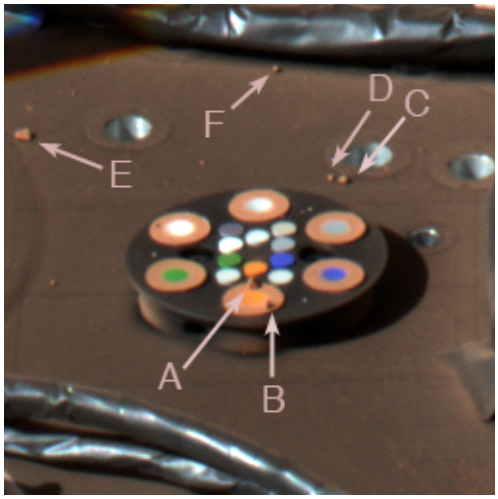

Fig 1: iSweep3 and the defintion of the particles. The structure of the iSweep is 52 mm in diameter and the particles are about 1-2 mm in diameter. From sol 72.

Two larger particles (A&B) were found on the magnetically active area. And four others (C-F) were found in the surroundings. Using 15 filter SSI observations from sol 72 and 116 optical and NIR spectra were extracted. The purpose of the study is:

⇒ Derive a spectrum of the particles, maybe identify minerals in the particles by comparing to well known reference spectra and compare to soil and telescopic spectra.

⇒ Investigate if it is possible to detect any significant differences between particles on the magnets and particles on the lander deck.

⇒ Determine if any particle moved during the mission.

Results: Images from sol 1 were compared to images from sol 116. There could not be detected any movement of the particles relative to a fixed fiducial marker on the iSweep [3] The wind events detected by the TellTale [4] and the dust devils passing by the lander [5] have apparently not affected the position of the particles. This is not at all surprising if the particles consist of consolidated soil, and probably not even if they were fluffy low-density aggregates.

Specta were extracted from SSI images of the particles:

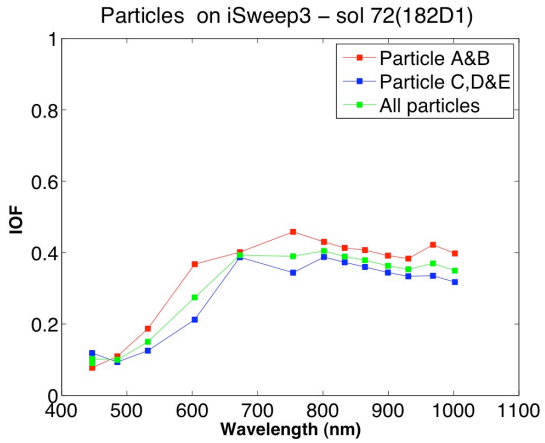

Fig 2: Reflectance spectrum of particles from sol 72. The particles on the magnets are slightly brighter than the rest of the particles.

The increase seen at 960 nm is a surprising feature which might be usefull when identifying the mineral content of the particles. It has not yet been possible to find a mineral with the same feature.

An average of all particles were made on sol 116 as well. This data was compared to CRISM data of the surroundings close to Phoenix.

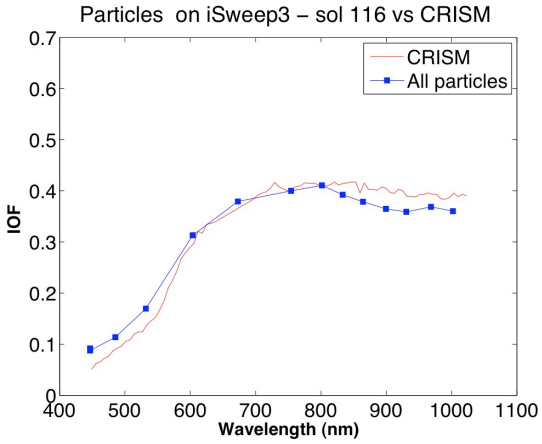

Fig 3: CRISM data vs particle A-D on sol 116. There is a relatively good match, even CRISM data does not have a peak at 960 nm.

The data from sol 116 gives a more smooth and reliable spectrum of the particles. It might be because the data from this sol was returned uncompressed. Furthermore data for particle E has been removed from the data set, since it for unknown reason has a strong fall at 750 nm, and this is believed to be an artifact.

The CRISM data was compared to dust collected by the magnet with gray scaled pigment (Note there are three other magnets with red, green and blue color pigment respectively).

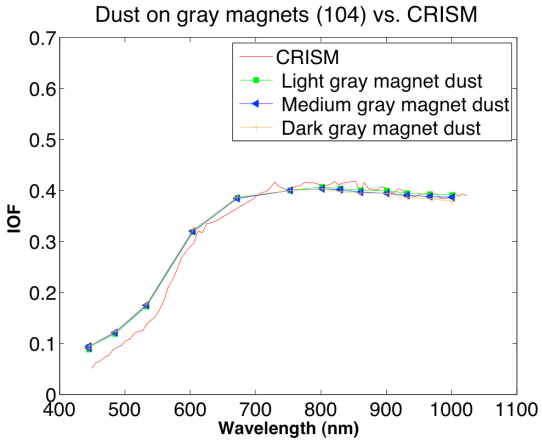

Fig 4: The dust on the magnets compared to CRISM data. There is perfect match in the NIR, but in visible the dust on the magnets is slightly brighter.

Dust from the magnets gives a better match to the CRISM data, indicating that the particles actually are different from the dust in composition. There is a strikingly good agreement when comparing dust seen by the SSI and the CRISM data. Note that the SSI spectra represents a few square cm while the footprint of the CRISM data is several hundreds of square meters! For unknown reason the SSI spectra are slightly brighter in the blue regime.

Conclusions:

Very good agreement between CRISM spectra and the dust collected by the iSweep magnets.

It has been possible to extract spectra of the particles on iSweep3. A feature has been found around 960 nm, which cannot be accounted for by neither CRISM data nor known mineral data.

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References:

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[5] Ellehoj M. D. et al (2009) *LPS XL,* Abstract #TBD.