CRISM OBSERVATIONS OF CANDIDATE LANDING SITES FOR THE 2007 PHOENIX MISSION.
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Introduction: During the first two months of Mars Reconnaissance Orbiter (MRO) primary science phase (PSP) mission operations, the three principal surface imaging instruments have followed a coordinated strategy for acquiring data of the potential landing sites for the 2007 Phoenix mission. The High Resolution Imaging Science Experiment (HiRISE) captures scenes with ~25 cm/pixel spatial resolution while the Context Imager (CTX) provides mid-resolution (6 m/pixel) data with a larger areal extent. The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) acquires visible/near infrared (0.36 to 3.92 µm) spectral information at up to ~20 m/pixel. Together, the instruments onboard MRO allow for detailed surface characerization and hazard assessment to aid in both landing site selection and scientific understanding of the northern plains.

Phoenix Landing Site Selection: Four regions (A, B, C, and D) in the 65-72°N latitudinal band of the northern plains of Mars were initially identified that met the broad engineering and scientific constraints of the Phoenix mission [1,2]. Analyses of early PSP HiRISE data within two of these regions (B and C) revealed a widespread occurrence of boulder fields and rocky terrain that resulted in an unacceptably low probability of safe landing. The remaining two regions (A and D), located adjacent to one another, have since been aggressively imaged and analyzed, and three potential landing sites selected. The combined Region A-D is located from 65-72°N and 230-270°E, with the three candidate landing error ellipses centered at 1) 68.35°N, 233.0°E, 2) 66.75°N, 247.6°E, and 3) 71.2°N, 253.0°E. Ongoing examination and interpretation of MRO data in combination with preexisting datasets will engender further distinction and ranking of the three sites, with final downselection made in advance of the August 2007 launch date.

CRISM Support Strategy and Data Coverage: CRISM's unique ability to acquire visible/near infrared data in either multispectral mapping mode (72 channels at 200 or 100 m/pixel) or hyperspectral gimbaled mode (544 channels at 40 or 20 m/pixel) allows for both global map coverage and high resolution targeted observations to be obtained [3]. Both modes of operation have been utilized to support the Phoenix mission. In the effort to maximize spatial coverage, a majority of Phoenix observations were acquired as 3-minute multispectral survey (MSP) segments, each equating to a 10 km by 540 km strip of data (Fig. 1). Through the end of 2006, 69 MSP segments have been acquired in the Phoenix Region A-D. In addition, 12 Phoenix targets have received hyperspectral full resolution targeted (FRT) coverage to facilitate spectral characterization at the 20 m/pixel spatial scale. The locations of FRT images, both acquired and planned through early February, are shown in Figure 1.

Detection of Surface Ice: Preliminary examination of the Phoenix MSP and FRT data reveal the occurrence of water ice on several north-facing slopes of crater rims and other topographically elevated features. The late summer seasonality of these observations (solar longitude 132-160°) and location generally less than 72°N makes these 1-2 km wide patches of ice surprising. Although MSP data coverage is far from complete at this time, a majority of the patches of "low-latitude" ice in Region A-D appear to be concentrated in the area from 230-240°E (Fig. 1).

FRT data show few occurrances of ice, despite the higher spatial resolution. A likely explanation for this may be that the placement of FRT data on the smoother intercrater plains (where Phoenix is more likely to land and perform *in situ* measurements) biases the acquisition of data away from north-facing slopes that may harbor ice deposits. One FRT image, however, contains an example of a relatively fresh, sub-km crater with the distinct spectral signature of water ice in its interior (Figure 2). The shape of the spectrum, particularly beyond 2.25 µm, suggests that the grain size of the ice is from 10-24 µm, or between that of frost and fine snow.

Ongoing Work: Additional MSP and FRT data will be acquired in support of the Phoenix mission until northern illumination and atmospheric conditions deteriorate. The final mosaic of MSP coverage will be used to produce summary parameter maps with focus on the three candidate landing sites. FRT images will be analyzed for mineralogic diversity and regional variation that may influence the final choice of landing site.

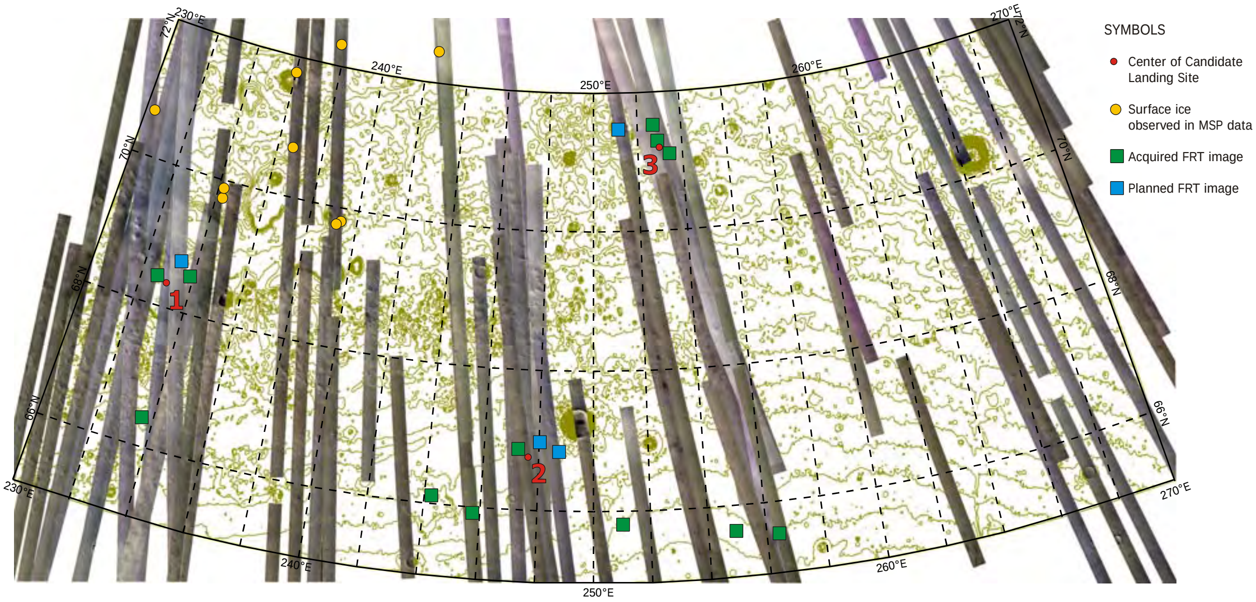

Figure 1. CRISM multispectral (MSP) coverage map in the Phoenix Region A-D (65-72°N, 230-270°E). Center coordinates of the three candidate landing sites are indicated in red. Locations of CRISM full-resolution targeted (FRT) data are designated with green and blue symbols, representing acquired and planned images at the time writing, respectively. Yellow circles signify the occurrence of surface water ice identified in MSP data; these data were acquired in the late northern summer (solar longitude 132-160°). Image is a false color RGB composite of infrared bands at 1.02, 1.51, and 2.01 µm, and is overlain on MOLA contour lines at 50 m intervals.

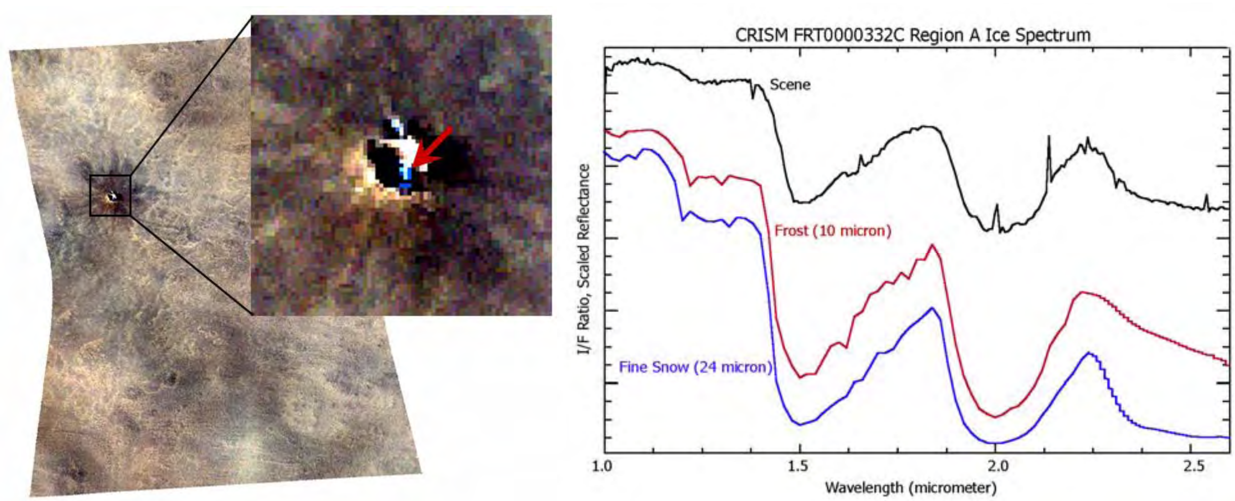

Figure 2. *(Left)* CRISM full resolution targeted (FRT) image located in northern Region A near landing site 3 shows a small, fresh crater that exhibits water ice on its north facing slopes. Image FRT0000332C_07 is false color composite of bands at 0.71, 0.60, 0.53 µm, making the patch of ice appear bluish in the enlarged portion. Image is approximately 10 km wide at center with 18 m/pixel spatial resolution, and is located at 71.1°N, 253.4°E; solar longitude at the time of acquisition was 142.6°. *(Right)* Infrared spectrum of the bluish area shown in the left image (indicated by red arrow) and comparison to reference spectra [4] of water ice at two different grain sizes. The scene spectrum was ratioed to nearby bland material to emphasize the spectral absorptions.

References: [1] Guinn, J., et al. (2006) *LPSC XXXVII*, 2051. [2] Arvidson, R.E.., et al. (2006) *LPSC XXXVII*, 1328. [3] Murchie, S., et al. (2007) *JGR*, in press. [4] ASTER Spectral Library, (http://speclib.jpl.nasa.gov).