FRESH CRATERS AS PROBES OF COMPOSITION IN DUST-COVERED REGIONS OF MARS. M. F. Morgan[1] and S. L. Murchie[1], [1]The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD 20723 (frank.morgan@jhuapl.edu).

Introduction: The surface mineralogy of Mars has been extensively explored from orbit using spectroscopic remote sensing [1,2,3]. However, large areas of the surface are covered by dust that obscures the underlying bedrock [4]. Recent impacts [5] may reveal the underlying mineralogy in these areas, either by exposure in the walls of the newly formed craters or by excavating material and emplacing it on the surface around the crater. We analyze spectra from MRO/CRISM [6] observations targeted to observe recent small craters in an effort to use these craters as probes of the composition of bedrock otherwise hidden by dust.

Data: We use spectra from CRISM [6] covering the range 0.4-4.0 microns, at ~20 m spatial resolution. The recent impact craters are small (~10 to 100 m) so high spatial resolution is required to distinguish exposed bedrock from surrounding dust. Targeted (FRT and ATO) observations are used to maximize spatial resolution. We search for spectral signatures of mafic composition near 1 and 2 microns, and of hydrous minerals near 1.9 and 2.4 microns.

HiRISE images provide higher resolution context for the observed spectra.

Results: We analyze ~50 crater observations of which three show signatures of interest to date.

Observation 3E33 is an example of a recent crater that exposes mafic material underlying the dust. The crater coordinates are 17.043N, 113.599W, in the Tharsis region. The CRISM image (Figure 1) shows a ~250 m dark area where exacavated material surrounds the central crater. Figure 2 shows example spectra from locations marked in Figure 1. The broad absorption at ~2.2 microns indicates high calcium pyroxene. Spectral summary parameters, mapped and compared with the higher resolution HiRISE image (Figure 3), show that high-calcium pyroxene is present in the excavated crater material. It is not observed in the crater itself or in the dust surrounding the impact area.

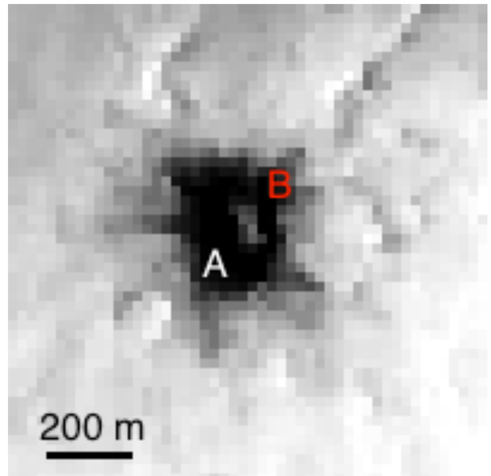

Figure 1. CRISM 1.08 micron I/F.

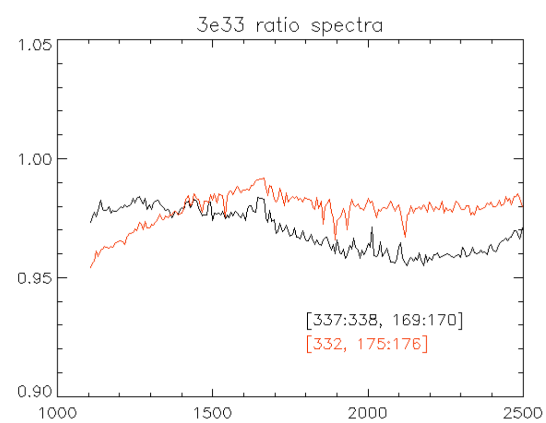

Figure 2. Spectra from points A and B in Figure 1.

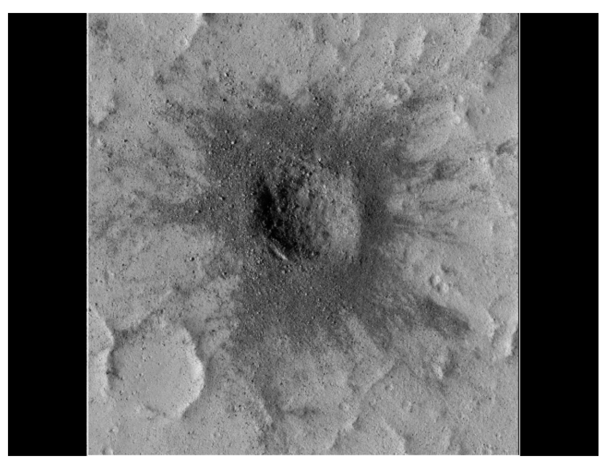
Figure 2. HiRISE PSP_002183_1970_RED subset.

References: [1] Murchie S. L. et al. (2009) JGR, 114, doi: 10.1029/2009JE003344. [2] Christensen P. R. et al. (2001) JGR, 106, 23,823–23,871. [3] Bibring J.-P. et al. (2005) Science, 307, 1576–1581. [4] Ruff S. W. and Christensen P. R. (2002) JGR, 107, doi: 10.1029/2001JE001580. [5] Malin M. C. et al. (2006) Science, 314, 1573-1577. [6] S. Murchie et al. (2007) JGR, 112, doi:10.1029/2006JE002682.