HYDRATED SULFATE DEPOSITS DETECTED WITHIN SCHIAPARELLI CRATER, MARS. S. M. Wiseman[1], R. E. Arvidson[1], R. V. Morris[2], S. L. Murchie[3], F. P. Seelos[3], J. C. Andrews-Hanna[4], and the CRISM Team. [1]Dept of Earth and Planetary Sciences, Washington University, St. Louis, MO , [2]NASA Johnson Space Center, Houston, TX, [3]AppliedPhysics Laboratory, Laurel, MD, [4]Dept of Geophysics, Colorado School of Mines.

Introduction: Schiaparelli, a 470 km in diameter crater, is located in western Arabia Terra to the east of the Meridiani Planum hematite unit (Fig. 1) on which the Mars Exploration Rover Opportunity [1] landed. Ridged plains units are present within the crater and adjacent to the basin rim. Crater counts suggest that ridged plains units with multiple ages are present, which likely reflects a complex history of volcanism after the impact event [2]. Although ridged plains dominate the floor of Schiaparelli crater (Fig .2), some light toned exposures, interpreted to be sedimentary in origin [3] occur in the northwestern portion of the crater floor. In this paper we present evidence for the presence of hydrated sulfate bearing deposits within the northwestern portion of Schiaparelli crater using Mars Reconnaissance Orbiter (MRO) Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) [4] spectral data.

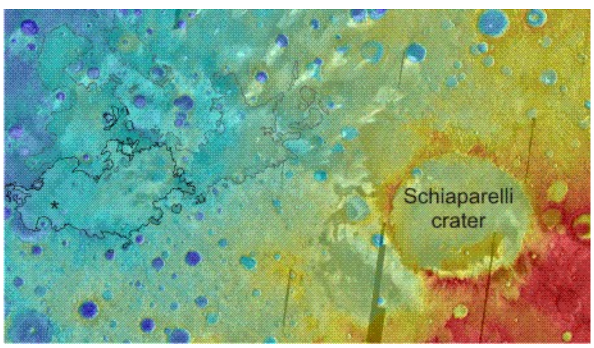

Figure 1. MOLA color coded topography (1500 to -2800m) overlain on THEMIS daytime IR. Meridiani Planum hematite deposits [5] are outlined in black. Inter crater 'etched terrain' is outlined in gray. The star indicates the location of the Opportunity landing site.

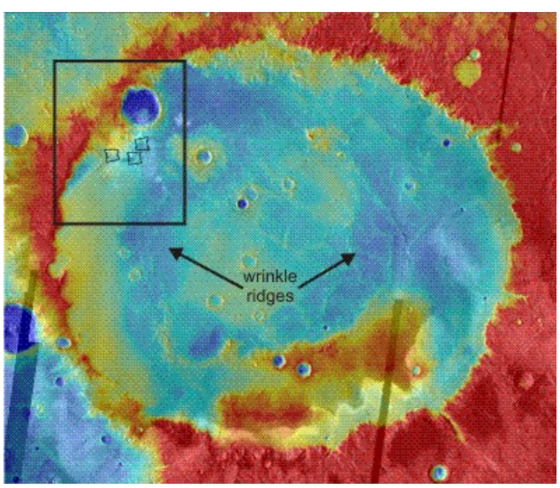

Figure 2. MOLA color coded topography (500 to -800m) of Schiaparelli crater on THEMIS daytime IR. Selected CRISM FRT footprints overlain. Black box indicates location of Fig. 3.

CRISM Dataset: The CRISM instrument is capable of acquiring both hyperspectral (544 bands between 0.36 and 3.92μm) and multispectral (72 band subset) images. Hyperspectral full resolution targeted (FRT) images at a spatial resolution of 18 m/pixel and multispectral survey (MSP) images at a spatial resolution of 200 m/pixel were utilized in this study.

Hydrated Sulfate Deposits: Mono and polyhydrated sulfates are characterized by spectral absorption features near 2.1 and 2.4 μm and 1.9 and 2.4 μm, respectively [e.g., 6]. Spectral absorption features at 1.9, 2.1, and 2.4 μm were mapped within Schiaparelli crater using CRISM spectral parameters similar to those defined by [7]. Areas that appear cyan (Fig 3) exhibit features at both 1.9 and 2.4 μm, consistent with the presence of polyhydrated sulfates. Areas with CRISM spectral signatures consistent with the presence of polyhydrated sulfates correlate with relatively high thermal inertia materials (Fig. 3). Polyhydrated sulfate detections are associated with light to medium toned outcrop that is stratigraphically above ridged plains materials (Fig. 4).

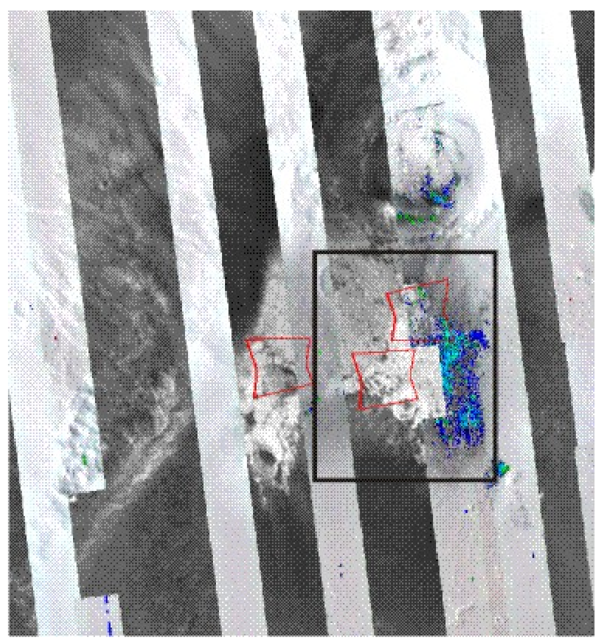

Figure 3. CRISM MSP strips on THEMIS nighttime IR with MSP parameters overlain (R=D2100, G=Sindex, B=D1900). FRT footprints (left to right) FRT00008833, FRT0000931E, FRT0000A160.

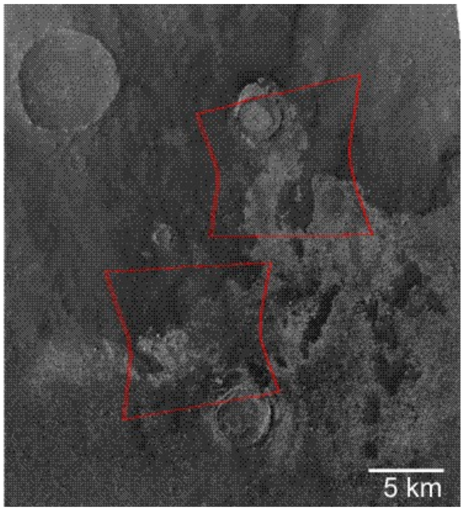

Figure 4. CTX mosaic of area outlined in black box in Fig. 3. (P02_002007_1796 and P05_0278_1797) with CRISM FRT 931E and FRT A160 footprints overlain.

Detailed analyses show that not all of the light toned material corresponds with the CRISM hydrated sulfate detections (Fig. 5). At HiRISE resolution, multiple morphological units are visible within the light to medium toned rock (Fig. 6). The fine-scale layering visible in HiRISE images is consistent with a sedimentary origin for the deposits.

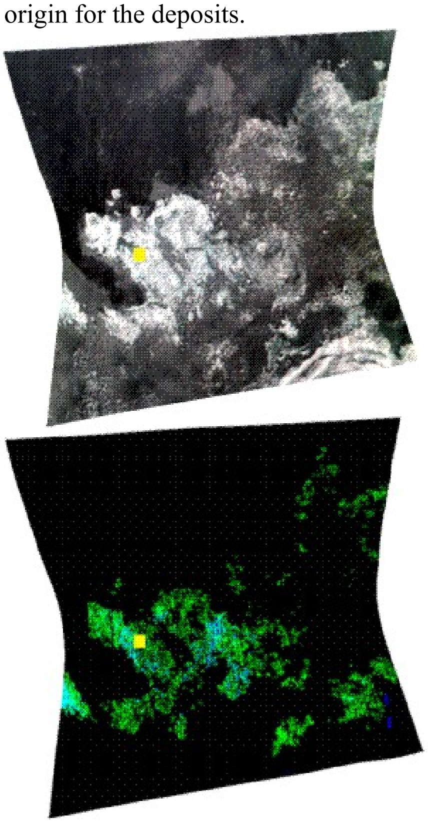

Figure 5. (left) CRISM FRT0000931E RGB image (R=2.5, G=1.5, B=1.1µm) and (right) CRISM FRT0000931E parameter map with G=Sindex and B=D1900. Yellow box indicates location of Fig. 6.

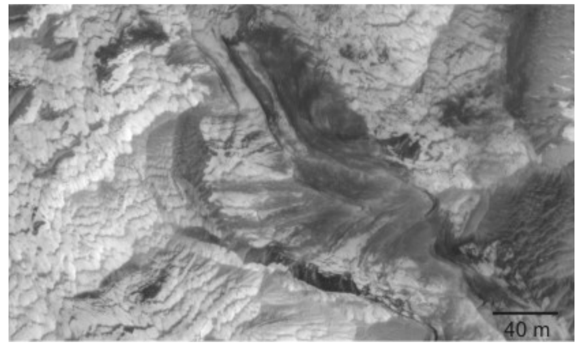

Figure 6. Subset of HiRISE PSP_006754_1790. Image location shown with yellow box in Fig. 5.

The presence of pedestal craters on the northwestern portion of the Schiaparelli crater floor (Fig. 2) standing ~400 m above the ridged plains suggests that a significant thickness of crater floor material was revmoved via differential, likely aeolian (Fig. 6) erosion. Sedimentary deposits similar to those examined in this paper may have been more extensive than suggested by the current, limited exposures.

Discussion: Hydrated sulfate deposits have been detected in several locations within the western Arabia Terra region, including Sinus Meridiani [e.g., 8, 9] and Aram Chaos. The presence of evaporitic deposits within portions of Arabia Terra, including Schiaparelli crater, is predicted by hydrologic modeling [10, 11]. The Arabia Terra region's unique topography is conducive to ground water upwelling predicted to have occurred during the late Noachian and early Hesperian periods on Mars.

Hydrated sulfate deposits within Sinus Meridiani are associated with light to medium toned high thermal inertia deposits that are stratigraphically above ridged plains units [12]. The hydrated sulfate deposits within Schiaparelli crater have a similar stratigraphy and morphology to deposits within Meridiani. Hydrated sulfate deposits within Schiaparelli crater, Meridiani, and other areas of western Arabia Terra may have formed as a consequence of ground water upwelling and evaporation. More work is needed to establish relative age relationships between the deposits exposed in Schiaparelli crater and Sinus Meridiani.

References: [1] S. W. Squyres et al. (2004) *Science,* 306. [2] S. J. Jaret and E. F. Albin *LPS XXXVI*, 1922. [3] M. Malin and K. Edgett, (2000) *Science*, 288. [4] S. Murchie et al. (2007) *JGR,* 112. [5] P. R. Christensen and S. W. Ruff (2004) *JGR,* 107. [6] E. Cloutis et al 2006 *Icarus,* 184. [7] S. Pelkey et. al *JGR*, 112. [8] A. Gendrin et al. (2005) *Science,* 307. [9] Wiseman et al (2008) *LPS XXXIX*, 1806. [10] J. C. Andrews-Hanna et al. (2007) *Nature*, 446. [11] J. C. Andrews-Hanna and M. T. Zuber (2008) *LPS XXXIX*, 1993. [12] J. L. Griffes et al. (2007) *JGR*, 112.