INITIAL ANALYSES OF CRISM DATA OVER MERIDIANI PLANUM. S. M. Wiseman[1], R. E. Arvidson[1], J. L. Griffes[2], S. Murchie[3], F. Poulet[4], and the CRISM Science Team. [1]Dept of Earth and Planetary Sciences, Washington University in Saint Louis. sandraw@levee.wustl.edu. [2]Center for Earth and Planetary Studies, Smithsonian Institution. [3]Applied Physics Lab, The John Hopkins University. [4]Institut d' Astrophysique Spatiale, Université Paris-Sud.

Introduction: The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) [1] aboard the Mars Reconnaissance Orbiter (MRO) [2] has acquired several full resolution and half resolution hyperspectral (544 bands between 0.362 and 3.92µm) images at 18 and 36m/pixel, as well as multispectral (72 band subset) images at 100 and 200 m/pixel at key locations in Meridiani Planum, including regions traversed by the Mars Exploration Rover Opportunity [3,4] and portions of a ~120km long, northwest-southeast trending valley to the north of the landing site that shows evidence for hydrated sulfate minerals in MEX OMEGA data [4-7]. In this abstract we analyze CRISM data from 0.4 to 2.6µm in concert with morphologic information derived from HiRISE [8] data.

Opportunity Landing Site and Traverse: The Opportunity traverse region from Eagle to Victoria craters is dominated by aeolian basaltic sands, nanophase ferric iron oxides, and a lag deposit of hematitic concretions that cover light toned outcrops [3,4]. The sulfate mineral jarosite has been detected within the outcrop material by the Mössbauer (MB) spectrometer [9]. CRISM spectra extracted from Endurance and Victoria craters are dominated by nanophase ferric oxide features and do not show evidence for enhanced hydration or features related to hydroxolated or hydrated sulfates. The discrepancy between the MB and CRISM observations may be explained by coatings of iron oxides thick enough to obscure reflectance signatures of underlying sulfates, but thin enough to be transparent to the gamma radiation used by the MB. Alternatively, a fine grain size or poor degree of crystallinity of the sulfates may preclude detection using VNIR data.

Northern Meridiani Planum: Several CRISM images have been acquired within and near a 120km long, northwest-southeast trending valley in northern Meridiani that contains exposures of etched terrain materials, hematite bearing plains [10-12], and Noachian cratered plains. Initial examination of OMEGA data showed that sulfate minerals [4-6] occur in the etched terrains in this region. A detailed spectral and morphologic study of this area, in which ~1km of relief is exposed, was carried out that incorporated data from OMEGA, MOC, MOLA, and THEMIS [13] (fig. 1). The etched terrain materials were divided into two distinct units termed the upper etched plains (UEP) and the lower etched plains (LEP) [13]. LEP materials occupy the valley floor, and areas with OMEGA coverage exhibit spectral signatures consistent with kieserite ($MgSO_4 \cdot H_2O$) and polyhydrated sulfates. The Opportunity landing site is located on an extensive exposure of the hematite bearing plains to the southwest [3].

CRISM Analyses: CRISM image MSW00003471_06, which contains multispectral data at 100m/pixel, was acquired over the northwest corner of the valley (fig. 1) and samples four distinct units, including the lower and upper etched plains material as well as the hematite bearing plains and a small portion of the cratered plains (fig. 2). Spectral absorption features at 1.9, 2.1, and 2.4µm were investigated because these features are diagnostic of the presence and types of sulfate minerals.

In particular, absorption features at 1.9 and 2.4µm indicate the presence of polyhydrated sulfate minerals [5]. Although the 1.9 and 2.4µm absorption features are present in several locations in the valley floor, this polyhydrated sulfate signature is strongest in the brightest LEP material. The 1.9µm feature is also enhanced in the brighter exposures in the UEP. CRISM data also show that the 1.9µm absorption is coupled with the 2.4µm feature in selected regions within the bright UEP. This is in contrast to initial results from OMEGA analyses and is probably a consequence of the higher spatial resolution of CRISM data, which allows mapping of relatively small exposures of spectrally distinct materials.

The presence of kieserite can be inferred from absorption features near 2.1 and 2.4µm. Although a 2.4µm feature is present in most spectra extracted from the valley floor, the 2.1µm absorption is strongest in isolated patches of the floor as well as in material exposed in portions of the valley walls. The spatially isolated occurrences of the kieserite signature in the LEP suggest that kieserite may occur in a distinct stratigraphic horizon that has been exposed and eroded by wind. Analysis of HiRISE image PSP_001691_1825, which covers the northeastern portion of the valley imaged in CRISM MSW00003471_06, shows that some areas in the valley floor that exhibit the enhanced 2.1µm feature correspond to dark indurated material that overlies bright bedrock with a polyhydrated sulfate signature (fig. 2). Continued analyses of CRISM data will allow mineralogically distinct units to be correlated with detailed morphologic information derived from HiRISE and other data.

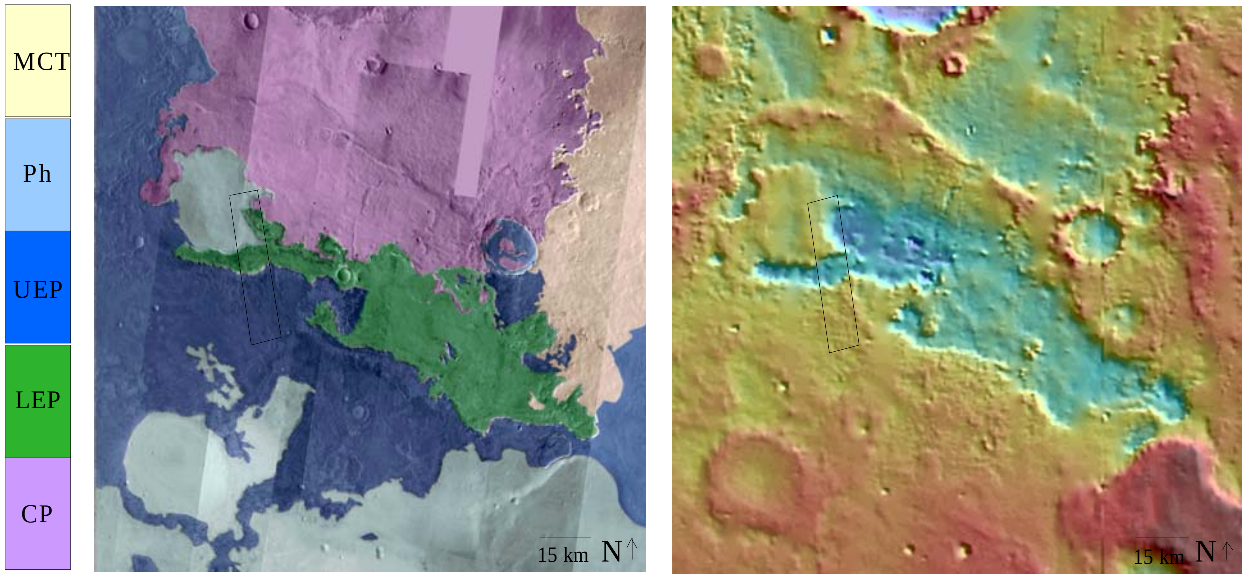

Figure 1. To the left, a subset of the area mapped by [13] is shown. The geomorphic units are overlain on a THEMIS daytime IR mosaic and include the mantled cratered terrain (MCT), hematite-bearing plains (Ph), upper etched plains (UEP), lower etched plains (UEP), and cratered plains (CP). To the right, MOLA 128m/pixel color coded topography is overlain on shaded relief. The area coved by MSW00003471_06 is outlined in black. ~300m of relief occur within the CRISM footprint.

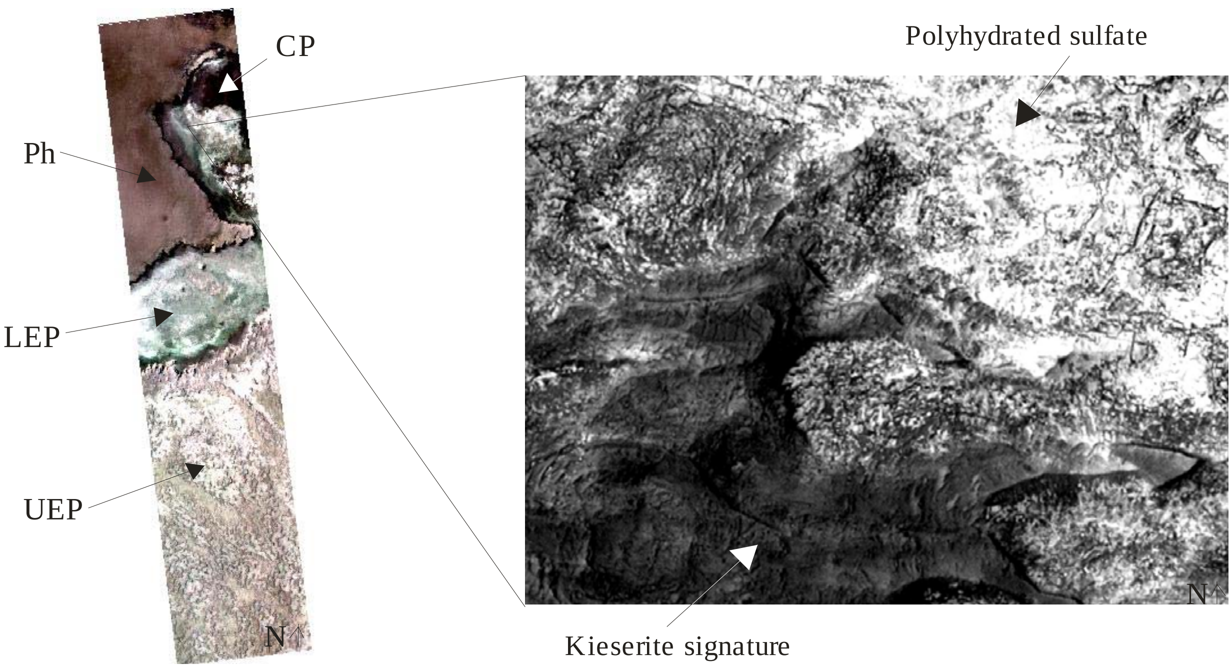

Figure 2. A false color composite (red=2.43, green=1.51, blue=1.08μm) of CRISM image MSW00003471_06 is shown on the left. The top left corner of the image is at 2.64°N, -1.46°E and the bottom left corner corresponds to 1.86°N, -1.19°E. The valley is surrounded by Ph in the north, which appears as a brownish color, and the bright mottled UEP outcrops to the south. The kieserite signature is present in the bluish colored material in the valley floor while the brightest material in the valley floor has a stronger polyhydrated signature. To the right, a subset of HiRISE image 001691_1825 shows that the darker, kieserite bearing material has been eroded away to expose the brighter polyhydrated basement material.

References: [1]Murchie et al. (2007) *JGR, in press*. [2]Graf et al. (2005) *Acta Astron*. [3]Squyres et al. (2004) *Science, 306.* [4]Arvidson et al. (2006) *JGR, 111*. [5]Gendrin et al. (2005) *Science, 307*. [6]Arvidson et al. *Science, 307*. (2005) [7]Poulet et al.(2007) *Icarus, submitted*. [8]McEwen et al. (2006) *JGR, in press*. [9]Morris et al. (2003) *Science, 306.* [10]Hynek et al. (2002) *JGR, 107*. [11]Arvidson et al. (2003) *JGR, 108*. [12]Christensen et al. (2000) *JGR, 105*. [13]Griffes et al. (2006) *JGR, submitted.*