OMEGA Regional Maps of Hydrated Minerals in Northern Meridiani Planum, Mars. R.B. Anderson[1] and J.F. Bell III[1], [1]Cornell University, Dept. of Astronomy, Ithaca NY 14853; randerson@astro.cornell.edu

Introduction: The Meridiani Planum region on Mars is recognized as geologically significant partly due to the detection of a significant crystalline hematite signature [1] and extensive layered outcrops which comprise a stratigraphic section >800 m thick and span an area greater than the Colorado Plateau [2,3]. The Opportunity rover landed at Meridiani Planum in 2004, confirmed the existence of hematite on the surface, and found sulfate minerals and other morphologic evidence of past liquid water [4,5].

Recently, several potential landing sites for the Mars Science Laboratory have been proposed in Northern Meridiani [6]. We present new regional maps of hydration, phyllosilicate, and sulfate spectral parameters in the region, based on data from the Mars Express OMEGA near-IR imaging spectrometer [7].

OMEGA Mosaic: We have developed software tools in IDL to mosaic multiple PDS-released OMEGA spectral image cubes in regions of interest. OMEGA cubes range in spatial resolution from 0.3 to 5.0 km per pixel, and cover a spectral range of 350 nm to 5100 nm in 352 channels. The spectral sampling is 7 nm from 350 to 1000 nm, 14 nm from 1000 to 2500 nm and 20 nm from 2500 to 5100 nm [8]. We divided the cubes by the solar spectrum, and then atmospherically "corrected" them by dividing by an atmospheric spectrum derived from a high-resolution pass over the summit of Olympus Mons [9]. Phase angle effects were minimized by assuming a Lambertian surface and dividing by the cosine of the incidence angle. The maps of Northern Meridiani discussed here span 6^oS – 9^oN and 352^oE – 10^oE.

Spectral Parameters: We measure the band depth of a feature of interest by defining a continuum value on both sides of the absorption band, fitting a line to the continuum, and finding the difference between the continuum value and the value at the band center. Dividing this difference by the continuum value gives the band depth in percent (*e.g.,* [10,11,12]).

For detection of minerals that are characterized by more than one absorption band, we require more than one characteristic band to be present. For example, phyllosilicates are characterized by a hydration band near 1900 nm, as well as a metal-OH band near 2200 to 2300 nm. To detect phyllosilicates, we used the same spectral parameters described by [13], requiring a band depth >2% for both the hydration band and at least one of the metal-OH bands for a positive detection. To detect and map sulfates, we adapted the CRISM sulfate parameters [14] to the OMEGA data.

Results: Figure 1a shows a map of the 1900 nm hydration band depth in Northern Meridiani and Figure 1b shows a map of the 2400 nm sulfate parameter. The regions with the strongest hydration signature reach a band depth of ~5%. Hydration band strength appears to correlate with high albedo and high thermal inertia (Figure 1c), implying that the observed hydration may be due to exposed bedrock. This unit has previously been identified as "etched" terrain due to its high relief outcrops (>100 m) likely formed from aeolian erosion of indurated layered deposits [14]. This unit has been suggested to be the result of deposition in a large body of water [15], although MER results also suggest the possibility of smaller-scale aqueous deposition [4,5].

Sulfates are widespread at a low level (Fig. 1b), but the strongest signature is much more concentrated than the hydration band. This localized sulfate signature appears in a moderate albedo and moderate thermal inertia depression. Griffes *et al.* [16] interpreted this unit as "lower etched plains" and confirmed the presence of polyhydrated sulfates there.

Phyllosilicates appear to be present in Meridiani in small (several km^2), scattered areas within the "upper etched plains" unit. Almost all of the phyllosilicates are detected by the presence of a weak 2.3 µm Fe/Mg-OH band. (Figure 1d)

Interpretations: Our maps show that Northern Meridiani exhibits extensive (thousands of km^2) regions of hydration at the ~1 km scale, and that the hydration is correlated with high thermal inertia, high albedo "etched" terrains. Phyllosilicates are present at this scale in scattered locations in the etched terrain, while sulfates are primarily concentrated in a "lower etched plains" unit. The majority of the hydration signature in Meridiani cannot definitively be attributed to either sulfates or phyllosilicates, however. We suggest that ferric oxides/oxyhydroxides (*e.g.,* goethite, ferrihydrite [17]; Figure 1d) may be responsible for this strong hydration feature in Meridiani, a hypothesis consistent with OMEGA visible wavelength evidence for enhanced ferric oxide abundance in the upper etched plains unit [16].

Further work mapping and studying the extent of the sulfate and phyllosilicate-bearing regions and their stratigraphic relationships using OMEGA and CRISM data [*e.g.,* 20] could serve as a test of the OMEGA "mineralogical timeline" hypothesis [18] and provide insights into the changing weathering regimes of ancient Mars.

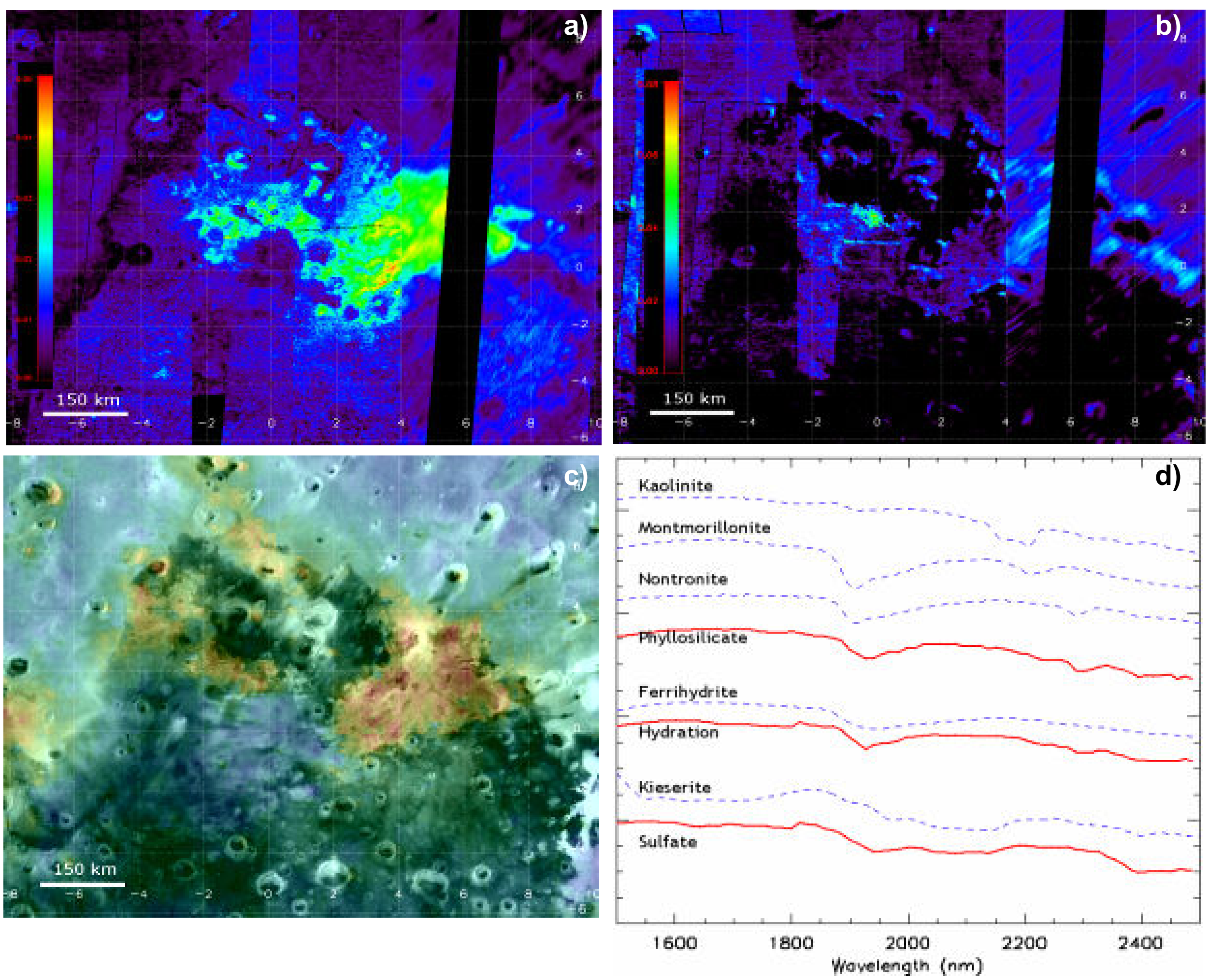

Figure 1: (a) Map of 1900 nm hydration band depth in Northern Meridiani. Color scale represents band depth, ranging from 0% (black) to ~5% (red). Sharp, linear features and black strips are artifacts of the mosaicking process. (b) Map of the 2400 nm sulfate parameter. Sulfates are concentrated in the lower etched plains unit [16]. Color scale ranges from band depth of 0% (black) to 8% (red) (c) TES thermal inertia on MOC wide-angle image of northern Meridiani. Hydration band depth correlates with thermal inertia and albedo characteristic of etched terrain. (d) USGS lab spectra (dashed blue lines) [19] and example spectra from Meridiani (solid red lines), offset for clarity. Meridiani spectra are the average of several adjacent spectra, divided by a relatively featureless spectrum from the same OMEGA observation, to remove artifacts.

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