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LAYERING OF THE PHYLLOSILICATES IN THE MAWRTH VALLIS REGION OF MARS, AS SEEN BY OMEGA AND HRSC COLORS AND DTM

D. Loizeau[1], N. Mangold[1], F. Poulet[2], V. Ansan[1], E. Hauber[3], J.-P. Bibring[2], Y. Langevin[2], B. Gondet[2], P. Masson[1], G. Neukum[4]. [1]IDES, Bat. 509, Universite Paris XI, 91405 Orsay cedex, France, [2]Institut d'Astrophysique Spatiale, Bat. 121, Universite Paris XI, 91405 Orsay cedex, France, [3]Institute for Planetary Exploration, German Aerospace Center (DLR), 12489 Berlin, Germany, [4]Institut für Geologische Wissenschaften, Freie Universitaet Berlin, Germany. damien.loizeau@u-psud.fr

OMEGA/Mars Express has discovered large outcrops rich in phyllosilicates in the region of the outflow channel Mawrth Vallis, Mars, around 20°W, 25°N [1,2], through the detection of absorption bands at 1.4 and 1.9 µm, and at 2.2 or 2.3 µm. Comparison with laboratory spectra reveals similarities with Al-OH smectites (with the presence of 2.2 µm band) and Mg- or Fe-OH smectites (with the 2.3 µm band) [Loizeau et al., 2007].

Those hydrated minerals are located exclusively on strongly eroded bright outcrops, exhumed from the Noachian plateaus, and cut by the outflow channel Mawrth Vallis, as seen on HRSC/MEx and MOC/MGS narrow angle images. Several MOC and HiRISE/MRO images also reveal that those bright Noachian terrains display meter-scale layers, over more than 100 meter depth as seen on some crater walls (Fig. 1). The horizontal extension of more than 300 km x 400 km of this thick phyllosilicate-rich unit implies an important volume of altered rocks, formed during the "phyllosian era" [Loizeau et al., 2007; Michalski & Noe Dobrea, 2007].

HRSC color images reveal redder terrains for the Mg- or Fe-OH smectite-rich outcrops as detected by OMEGA, whereas Al-OH smectites-rich outcrops correspond to whiter terrains on HRSC color imagery, helping to a finer mapping of those hydrated terrains. These colors reveal a thick color layering of the phyllosilicate-rich units that corresponds to the thin layers seen with MOC and HiRISE (Fig. 1). This color layering, along with the use of high resolution HRSC DTMs, help us in the understanding of the geometry of the phyllosilicate-rich unit. From this analysis we observe that stack of layers of a given composition can be followed over tens of kilometers. We also observe that Fe-OH smectite-rich and Al-OH smectite-rich layers are not only found in different geographical location but also over vertical sections, with the same alternation of layers separated by many kilometers, an important geometry to understand the sedimentary origin of the layered deposits.

Future lander missions could help to understand further the processes of formation of the unit.

References: [1] Poulet F. et al. (2005), *Nature 438*, 623-627, DOI:10.1038/nature04274. [2] Bibring J.-P. et al. (2006), *Science 312*, 400-404. [3] Loizeau D. et al. (2007), *JGR planets 112*, DOI:10.1029/2006JE002877. [4] Michalski J. R. and E. Z. Noe Dobrea (2007), *Geology 35*, 951-954, DOI:10.1131/G23854A.1.

Figure 1. Mosaic of CTX/MRO, MOC/MGS images, HRSC colors, and HRSC DTM contours (altitude in meters), centered on a 3.6 km wide crater (25°N, 19°W) on the western plateau of Mawrth Vallis.