THE LIGHT-TONED SEDIMENTS IN AND NEAR LOWER MAWRTH VALLIS MAY BE A DRAPE DEPOSIT. A. D. Howard[1] and J. M. Moore[2], [1]Dept. Environmental Sciences, University of Virginia, P.O. Box 400123, Charlottesville, VA 22904-4123 (ah6p@virginia.edu), [2]NASA Ames Research Center, M.S. 245-3, Moffett Field, CA 94035.

Introduction: Marwth Vallis and the phyllosilicate-rich deposits in and near its lower terminus constitute one of the most enigmatic landform assemblages on Mars. Marwth Vallis is generally classified as an outflow channel, but it lacks obvious concentrated flow sources in breached basins, collapse terrain or large tributary channels. The valley width remains a nearly constant 20 km over most of its ~800 km length and the valley bends only in broad curves with radii ~40 km, suggesting high volume formative flows as, for example, catastrophic fluvial floods, turbidity currents, or glacial sculpture. Interbedded dark- and light-toned deposits occur within and on the uplands surrounding the lower end of Marwth Vallis over an elevation range from about –2500 to –3700 m. Parts of these deposits exhibit extensive and concentrated phyllosilicate spectra [*1, 2*], but their origin and time of emplacement remain uncertain. Although [*1, 2*] suggest that the phyllosilicate minerals occur only on the plateaus surrounding Mawrth Vallis, their map (Fig. 4 in [*1*]) clearly shows strong phyllosilicate signatures in the floor of Mawrth Vallis in the vicinity of 341.6°E and 22.8°N including the area in Fig. 1. The prevailing interpretation suggests Mawrth Vallis has been excavated into an older, thick phyllosilicate-rich sequence, so that there is no necessary genetic coupling between vallis and deposits[*1-5*]. We suggest an alternative interpretation in which the phyllosilicates originated as a drape deposit that post-dates, or is possibly coeval with, formation of Mawrth Vallis.

Stratigraphic Relationships: Mawrth Vallis has been extensively imaged by MOC NA, THEMIS VIS and IR, and HRSC images. Despite this coverage, interpretation of stratigraphic relationships is difficult because the sedimentary layering is less distinct and repetitive than in other martian sedimentary deposits (e.g., [*3, 6*]). In examining both available MOC NA images and THEMIS VIS images, we find no exposures definitively demonstrating that the layered deposits occurring near the floor of Mawrth Valles continue into the wallrock of the Valles. Interpretation of Figs. 1-3 suggest that both the bright-toned deposits and an overlying dark mantle drape over the walls of the Valles and also comprise the layered deposits on the crater floor. Where the lower walls of Marwth Valles have been eroded into steep slopes, dark grey, poorly-layered material appears to be exposed ("#" in Fig. 1). Steep exposures across a relief of about 300 m in the multi-channel ("braided") section of lower Marwth Valles (Figs. 2, locations *a* through *f*, and Fig. 3*a,b*) are partially mantled with mass wasting debris, but show little evidence of erosional sectioning of bedded light-toned deposits. By contrast, small, fresh craters impacting on the valley floor and on the top surface of the inter-channel "islands" exhibit strong layering on upper crater walls (Figs. 2, locations *g&f*). Other gently-sloping Mawrth Valles walls, such as that shown at "$" in Fig.1, exhibit discontinuous exposures of light-toned deposits, but show little evidence of eroded, exposed layers suggestive of horizontal bedding. A similar situation occurs on the north wall of Marwth Valles in THEMIS VIS image V11322008.

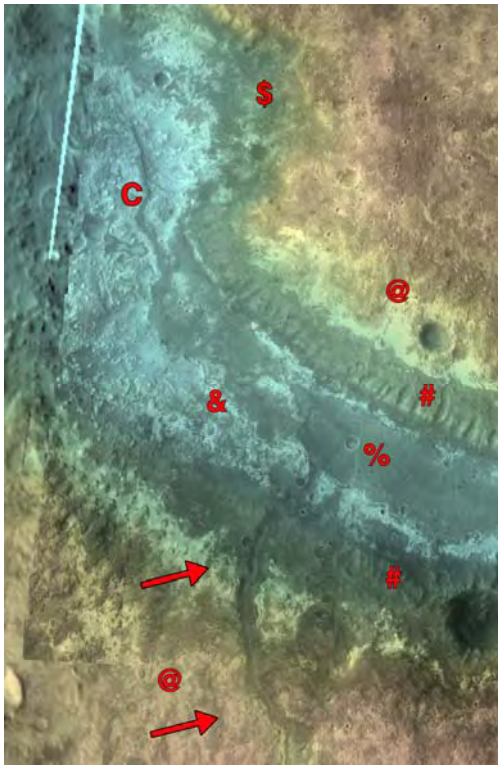

Fig. 1. Layered deposits in Mawrth Valles. Color coded with blue tint in valley bottom grading to red at valley crest. Deposits from lowest to highest are bright-toned layered deposits "&", smooth-surfaced dark deposit "%", massive dark deposit "#", bright layered deposits "@", and dark, partly eroded mantle, (arrows). A dark mantle also floors the shallow tributary valley entering from the south. The dark mantle (arrows) appears to follow the slope of the valley sides. This, and the dark mantle sloping with the tributary valley, suggests that the valley-crest dark mantle may be equivalent to the dark valley bottom mantle "%". The valley crest bright deposits "@" may likewise be contemporaneous with the similar valley-bottom deposits "&". By this interpretation the dark massive deposits "#" are the materials into which Mawrth Valles was excavated, and the bright and dark deposits would have been deposited subsequent to valley excavation. An inverted channel capped with dark deposits occurs at "C" on the bottom of Marwth Vallus. Mosaic of portions of THEMIS VIS images V14105004, V01873006, and V06342015 on a THEMIS IR

mosaic. Image width 30.5 km, centered at about 341.8°E and 22.7°N.

Conclusions: If the light- and dark-toned sediments in the lower Mawrth Vallis region are a drape deposit, then the deposit would most likely have been deposited when the topography was not much different than present. If this is the case then a wholly fluvial origin of the deposit is unlikely, because of the sharp drop-off to the northern lowlands at the end of the vallis. A coastal platform environment is a possibility, and the deposits might have derived from materials transported through Mawrth Vallis. If the layered deposits at the lower end of Mawrth Vallis post-date the formation of the valley, then deposition of phyllosilicate minerals may have occurred later in martian history than suggested by [*1, 2*]

References: [1] Bibring, J.-P. *et al.* (2006) *Science, 312*, 400-4; [2] Poulet, F. *et al.* (2005) *Nature, 438*, 623-7; [3] Edgett, K. S. (2005) *Mars: Int. J. Mars Soc. Explor., 1*, 5-58; [4] Farrand, W. H. *et al.* (2006) *EOS 87(52)*, Abstr. P22A-06; [5] Michalski, J. R. *et al.* (2006) *EOS 87(52)*, Abstr. P22A-05; [6] Malin, M. C., Edgett, K. S. (2000) *Science, 290*, 1927-37.

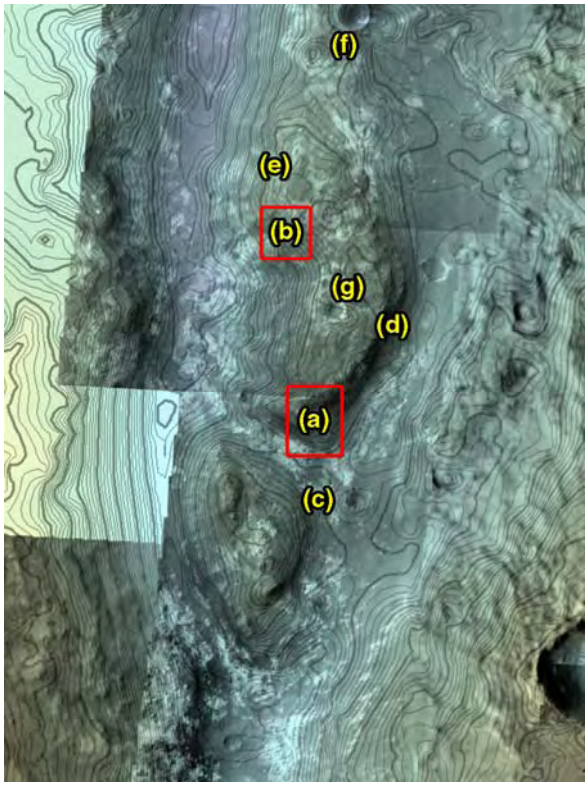

Fig. 2. Multi-channel portion of northern Mawrth Valles. Mosaic of THEMIS VIS images V11659006, V12882008 and V13194007 on a THEMIS IR mosaic, with superimposed MOLA-derived contours (contour interval 20 m). The tops of the central "islands" are about 300-500 m above the adjacent channels floors. Image centered at 341.6°N and 24.4°N. Image width 41.5 km. Labeled boxes show locations of MOC image selections in Figure 3. Label (f&g) locates craters on top of "island" exposing layered deposits.

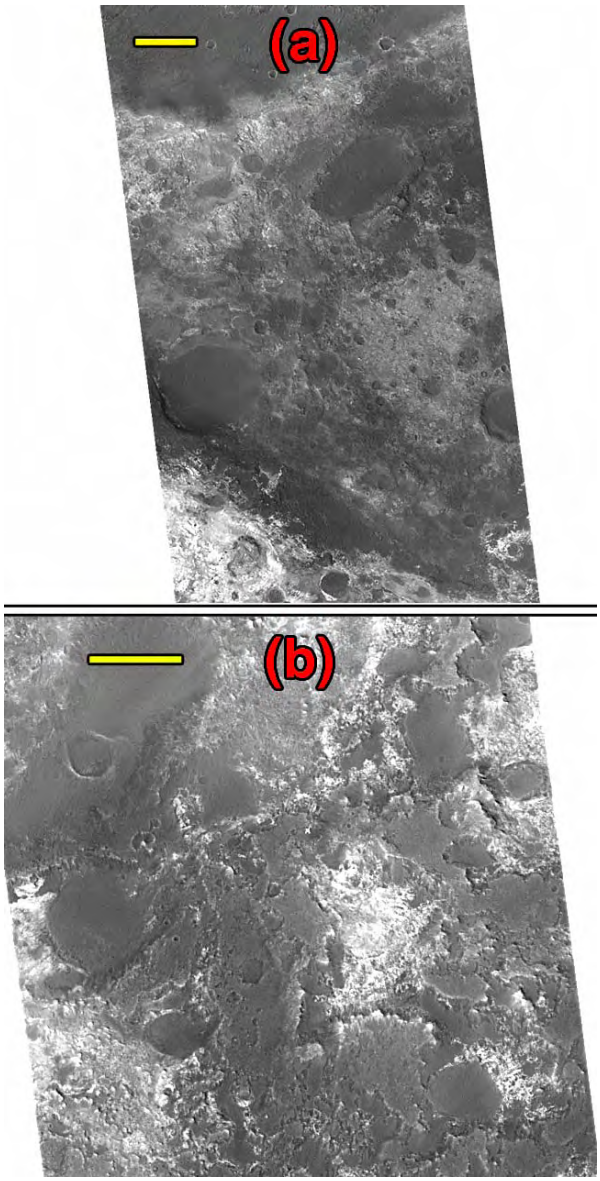

Fig. 3. Selected portions of MOC NA images covering locations shown in Fig. 2. Images selected from MOC image M0706145. Scale bars are 500 m. Image (a) shows a steep slopes with average gradients of about 0.2. Image (b) slopes at about 0.06. Note lack of horizontally bedded exposed layering.