HIRISE IMAGES OF LAYERED DEPOSITS IN WEST CANDOR CHASMA, MARS (II): UNCONFORMITIES AND POSSIBLE GRAVITY TECTONICS. B. K. Lucchitta, U. S. Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ 86001. blucchitta@usgs.gov

Introduction: Ceti Mensa in West Candor Chasma is built of a thick stack of interior layered deposits (ILDs) (Fig. 1). Their origin is still debated. Lacustrine/fluvial [1,2], volcanic [3,4], or eolian [5] origins have been proposed. High Resolution Imaging Science Experiment (HiRISE) images of the Global Reconnaissance Orbiter (MRO) of Ceti Mensa were examined to clarify detailed relations among the top layers of the mesa. It was hoped the relations would shed light on the origin of this edifice.

Unconformities on Ceti Mensa: Ceti Mensa stands 3 to 5 km above the surrounding trough floors and is composed of light-toned deposits. The layers at the top of Ceti Mensa underwent several episodes of deposition and erosion [6]. HiRISE images clarify some of the earlier observations, but also reveal new complications. The highest part of the mesa is dissected by NW-trending yardangs. NE-trending dunes appear to be superposed on these eroded layers. The dune fabric is now recognized as cut into the underlying rock, reflecting a fossil dune shape. More recent dunes are very small and form only a thin veneer nestled within the larger dune fabric. Some dark crests on the large dune forms may be from relatively recent movement of dark grains, or the crests are remnants of a former dark-dune blanket that is now eroded.

More ambiguous is a major unconformity within the uppermost layers on the western side of Ceti Mensa. MOC and THEMIS images clearly showed a dark, bumpy unit with large oval structures superposed onto the dissected upper layers of the Mensa [6]. They also showed an even younger, light-toned, smooth unit apparently superposed onto the dark unit. HiRISE stereo images now show that the contact relations between the latter two units are ambiguous. In several places the dark unit apparently overlaps the light smooth unit (Figs. 2,3), and nearby the reverse appears to be true (Fig. 4). If the dark unit is indeed younger and superposed, as most images show, then the apparent superposition of the light unit on the dark one could be explained two ways: (1) the dark unit was deposited against a cliff in the light unit and is now deeply eroded, or (2) the light unit, even though older, later deformed and slid over the contact with the dark unit. Slumps within the light unit are seen elsewhere. The latter would be significant because it implies post-depositional deformation of the light unit, perhaps due to gravitational sliding facilitated by easily deformable evaporates within the beds of the mesa [7].

Gravity gliding? Ceti Mensa is a broad dome that dips to the north and south as much as 10 degrees. Near the top, the dome is rimmed by a set of resistant layers. At the north side of the dome, these layers acquire the shape of a lobe trending NE off the top of the edifice. MOC images show an erosional escarpment at the head of this lobe and breakup of the surface into angular blocks [8]. Farther down the slope, the blocks become more rounded and acquire rims, similar to the rounded deposits of Melas Chasma [2] (Fig. 5). In the steepest part the blocks elongate to become stringers. HiRISE images show that the rounded deposit is underlain by very fine, striated, disrupted, or smeared out layers that give the impression of having been sheared (Fig. 6). The observation supports the hypothesis that the top layers moved down slope on a malleable substrate. On the south side of Ceti Mensa, the inclined beds are internally deformed, showing many unconformities, discontinuities, and structural disturbances. As it is known that Ceti Mensa has a strong kieserite signature on its light-toned, steeper slopes [7], it is plausible that the presence of evaporates, perhaps halite or gypsum, could have induced gravity gliding on free slopes [7].

Conclusion: The top layers of Ceti Mensa show several unconformities. One ambiguous superposition relation could be explained if older rocks later slid over younger rocks by gravity-induced movement. A lobe on the north side of the Mensa may also be a gravity slide. These relations are compatible with the idea that Ceti Mensa was built of flat lying lacustrine rocks and the present domal shape is only due to gravity deformation on its flanks. However, then one has to explain why the mesas commonly are isolated mounds with free faces and do not fill the entire trough, as one would expect if the troughs were formerly filled by lakes.

I thank the HiRISE team for making the images available.

References: [1] McCauley J. F. et al. (1972) *Icarus 17*, 289-327. [2] Quantin C. et al. (2005) *GJR 110*, E12S19, doi:10.1029/2005JE002440. [3] Lucchitta B. K. (1990) *Icarus, 86*, 476-509. [4] Chapman M. G. and Tanaka, K. L. (2001) *JGR 106(E5)*, 10,087-10,100. [5] Nedell S. S. et al. (1987*), Icarus 70*, 409-441. [6] Lucchitta B. K. (2007), *LPS* Abstract # 2093. [7] Mangold N. (2007) *7th. Int. Conf. Mars*, Abstract #3141. [8] Lucchitta B. K. (2006) *LPS XXXVII,* Abstract #1952.

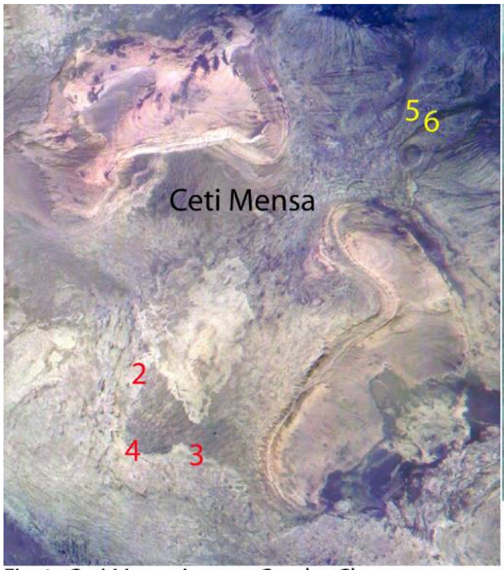

Fig. 1. Ceti Mensa in west Candor Chasma. Numbers indicate location of figures.

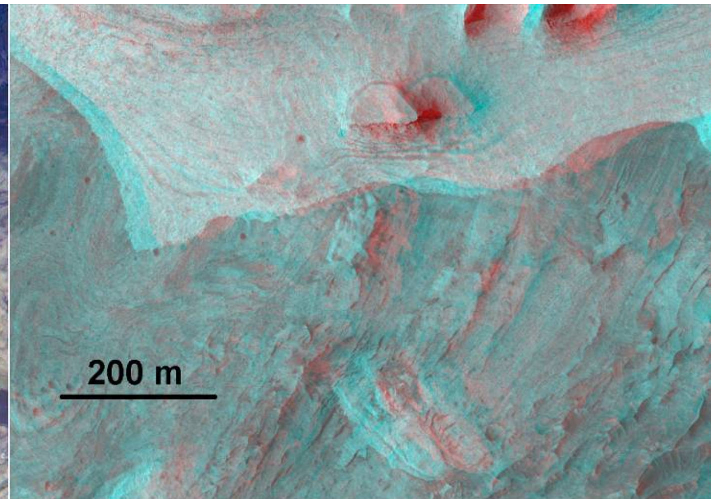

Fig. 4. Anaglyph, same as at left. Light material at top appears to overlap dark bumpy unit below. Note outlyer of light material within dark unit at center bottom.

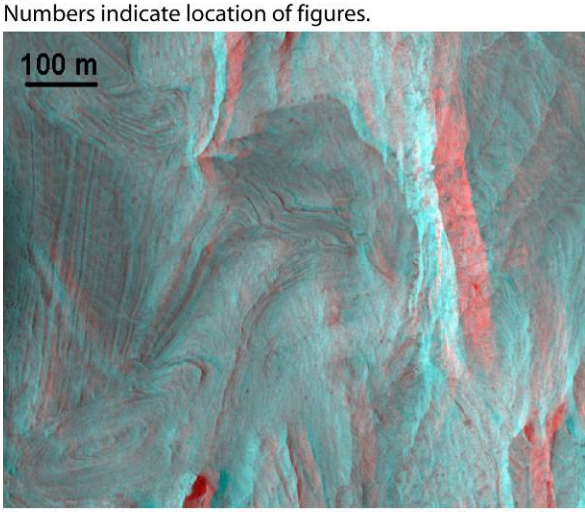

Fig. 2. Anaglyph PSP_002841_1740_PSP_003896_1740. Lobe of dark material overlaps light material.

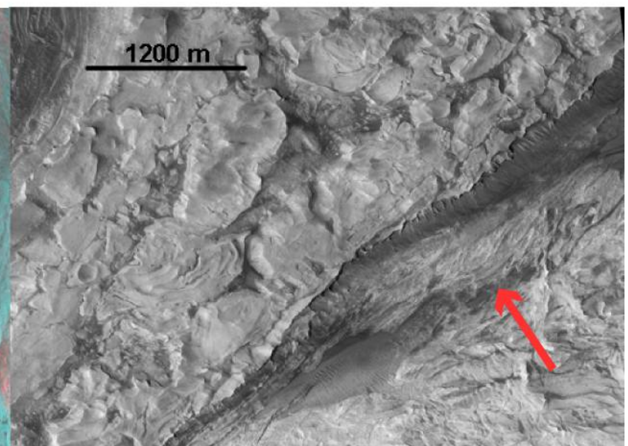

Fig. 5. PSP_005386_1745. Lobe with blocks of rounded deposit. Apparent shear zones below blocks at arrow.

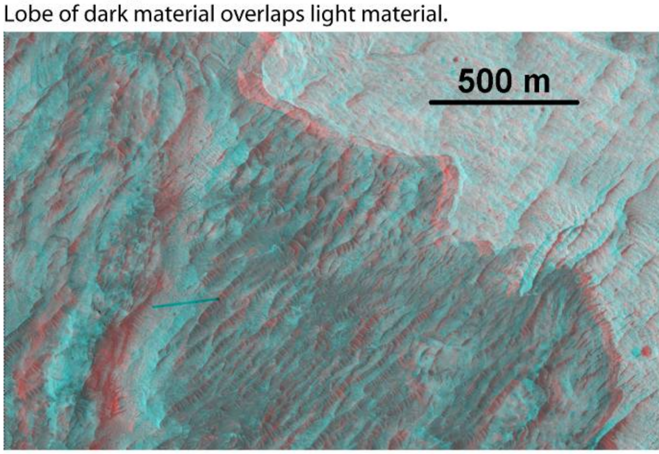

Fig. 3. Anaglyph, same as above. Dark bumpy unit overlaps eroded edges of light material.

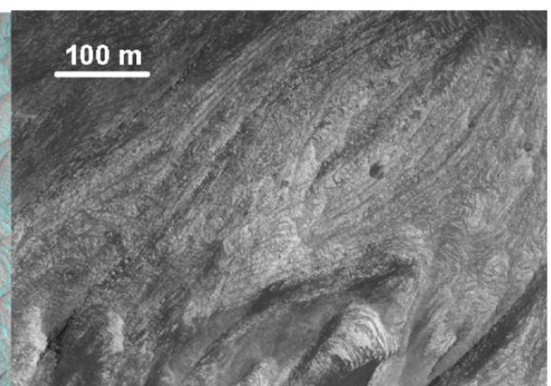

Fig. 6. Same picture as above. Shear zone near red arrow in image above.