

FLOOR DEPOSITS AND LANDSLIDES IN WEST CANDOR CHASMA, MARS. B. K. Lucchitta, U. S. Geological Survey, 2255 N. Gemini Dr., Flagstaff AZ, 86001. Blucchitta@usgs.gov.

Introduction: Huge landslide deposits derived from the chasma walls are common in the Valles Marineris troughs. Recently Quantin et al. [1] conducted a new thorough inventory of these slides and established that nearly all landslides were emplaced later than the interior layered deposits (ILD); The slides fell into voids created by either erosion [2] or faulting [3,4] of the high-standing ILD stacks. In west Candor Chasma, however, landslides are partially covered by floor materials containing light toned, layered deposits. Thus here some ILD are younger than the slides.

Ceti Mensa: Floor materials surround the ILD mound called Ceti Mensa and are composed of various units of ILD and landslide units. The mensa is an asymmetrical dome that reaches >5 km above the surrounding chasma floors. The interior of the dome consists of massive light-toned materials capped by resistant layers that can be traced from the easternmost base of the mensa [5], to the top, and down on its western flank. Since landslides about the base of the dome, the formation of the dome predates the slides, as in most other chasmata. However, a layered unit with yardangs, which rests unconformably on all lower units, not only tops the mensa on its southern flank but can also be traced into the adjacent lowlands, where it merges with floor deposits. This appears to be a late deposit.

Landslides: Two huge landslide deposits (Candor Labes) spread over much of the floor area north of Ceti Mensa. No landslides occur on the western wall of the chasma, and only two smaller ones on the southern wall.

The northeastern slide comes from a 25 km wide head-scarp in the wall (Fig. 1) and has a proximal rugged facies (30 km long) and a distal grooved facies (10 to 15 km long). The slide is relatively cratered and thus appears to be old. It impinges onto the base of the Ceti Mensa dome and is therefore younger than the dome. However, most of its grooved facies is overlapped by a floor deposit, which thus is younger than the slide. This floor deposit is characterized by chaotic blocks in the west and NNW trending yardangs in the east. No bedding is seen. The chaotic deposit appears to have been derived from Ceti Mensa because it merges with lobes of blocky material derived from the northeastern slope of the mensa (Fig. 1). Metz [6] established that the blocks in one of these lobes are underlain by sheared layers [7] suggesting that the lobe indeed slid off Ceti Mensa and transported material to the chasma floor below. Accordingly, the floor units in this area appear to be secondary mass-wasted materials overriding the landslide deposits.

The northwestern landslide has a 35 km wide scarp (Fig. 2) and a proximal rugged facies (30 km long), but no grooved facies. The slide is partially buried and embayed by floor deposits consisting of a sequence of fairly regularly bedded layers, overprinted by NW-trending yardangs. The beds are of medium tone and dip slightly S and SE toward the center of the chasma. Where they lap up onto wall rock or landslides, the layers are bright and highly folded. The orderly bedding suggests that this unit was emplaced in situ,

unlike the floor deposits farther east. This young unit rests unconformably on Ceti Mensa and on the landslide.

Only two small wall slides occur on the south side of the mensa. One is very young and was apparently dislodged by a now buried impact crater (Okubo, pers. com.). The other landslide (Ceti Labes) comes from a 6-km wide scar (Fig. 3); its proximal rugged facies (3.5 km long) gives way to a distal grooved facies (4 to 5 km long), which has at least two overlapping lobes that override the base of the Ceti Mensa edifice. The grooved part of the slide is overlain by a younger floor unit with a dark knobby surface. The dark tone comes from a thin dark mantle prevalent in this low-lying area. This knobby unit is widespread on the southwestern floor of west Candor Chasma and has been described by Chan [8] and mapped by Okubo [9,10]. Its layers dip toward the center of the basin. Farther west, the knobby unit merges with a yardang unit similar to the one in northern and northwestern Candor Chasma. It is also transitional with the yardang unit on top of the southern part of Ceti Mensa. Near the landslide, a smoother facies of the yardang unit drapes over the south side of the mensa and in one place extends onto the chasma floor, merging with the knobby unit (Okubo, pers. com.).

Discussion: Overall it appears that the *yardang unit* on top of the mensa, the *yardang unit* in northwestern west Candor Chasma, and the *knobby unit* are all transitional and represent a late phase of ILD emplacement, post-dating the deposition and deformation of the main Ceti Mensa edifice and the emplacement of the landslides. Viking images already suggested such a relation, as noted by Lucchitta [11] and Witbeck [12]. The origin of this deposit is not yet understood. The overprinting by yardangs is consistent with a major contribution of eolian material. On the other hand, yardangs on the mass wasted material in the northeast point to reworked fine materials as the source. Overall, the floor deposits in west Candor Chasma are unique in (1) post-dating the landslides, (2) being locally composed of mass wasted material, and (3) being a major, late deposit that not only unconformably draped over the southern mensa top but also over most of the floor in the western part of the chasma.

References: [1] Quantin, C. et al. (2004) *Icarus*, 172, 555–572. [2] Lucchitta, B. K. et al. (1992) in Kieffer et al. eds., University of Arizona Press, Tucson, 453-492. [3] Lucchitta, B. K. et al. (1994), *J. Geophys. Res.* 99, E2, 3783-3798. [4] Fueten F. et al. (2007) *LPS XXXVIII* Abstract #1388. [5] Fueten F. et al. (2008) *JGR*, 113, E10008, doi:10.1029/2007JE003053. [6] Metz, J. et al. (2010) *JGR*, 115, E11004, doi:10.1029/2010JE003593. [7] Lucchitta, B. K. (2010) *LPS XXXXI*, Abstract #2345. [8] Chan M. A. et al. (2010) *Icarus*, 205, 138–153. [9] Okubo C. H. et al. (2008) *JGR*, 113, E12002, doi:10.1029/2008JE003181. [10] Okubo C. H. (2010) *Icarus*, 207, 210-225. [11] Lucchitta, B. K. (1990) *Icarus*, 86, 476-509. [12] Witbeck, N. E. et al. (1991) *U. S. Geol. Survey Misc. Inv. Series*, Map I-2010.

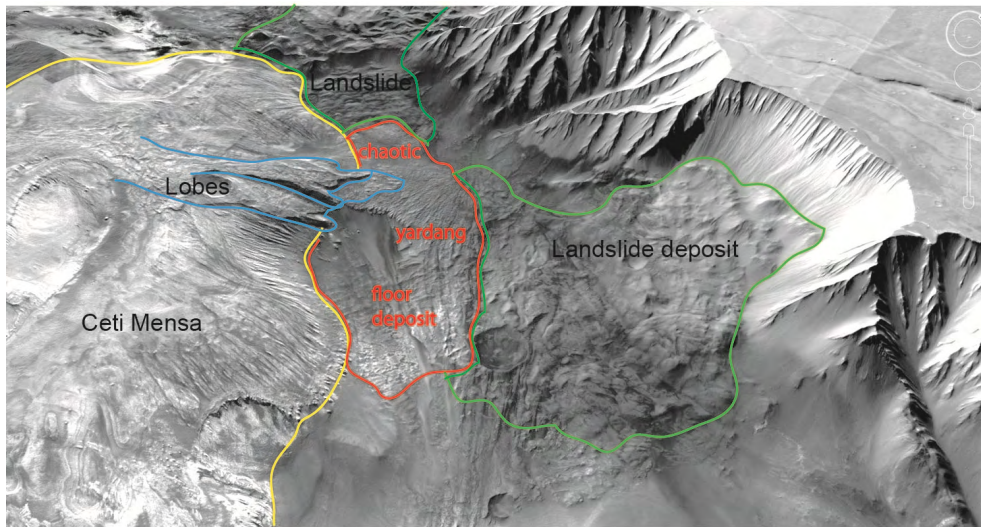


Fig. 1.

NE slide.

Image about 80 km wide.

Chaotic and yardang floor units overlap landslide deposits.

From Google Mars, CTX images, 1.5 x vertical exaggeration.

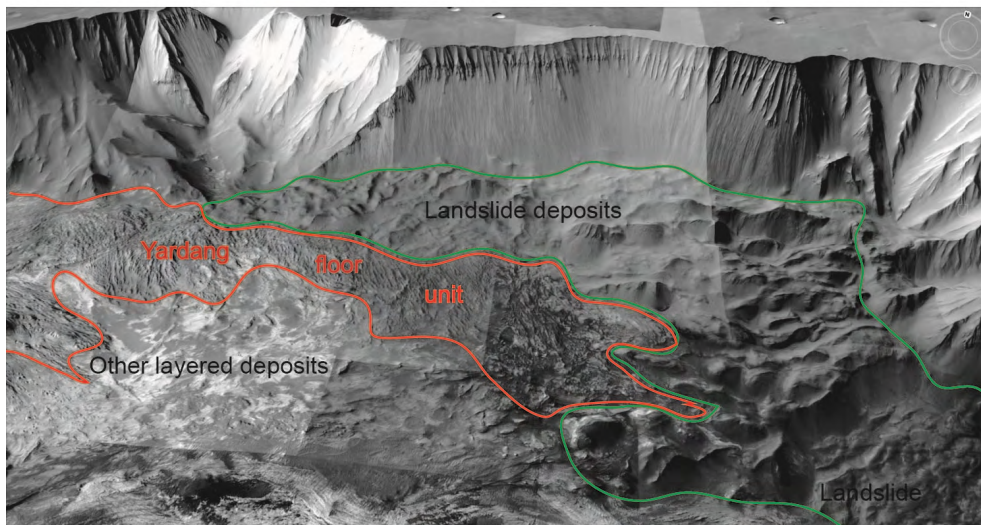


Fig. 2.

NW slide.

Image about 55 km wide.

Yardang floor unit overlaps landslide deposits.

Source as above.

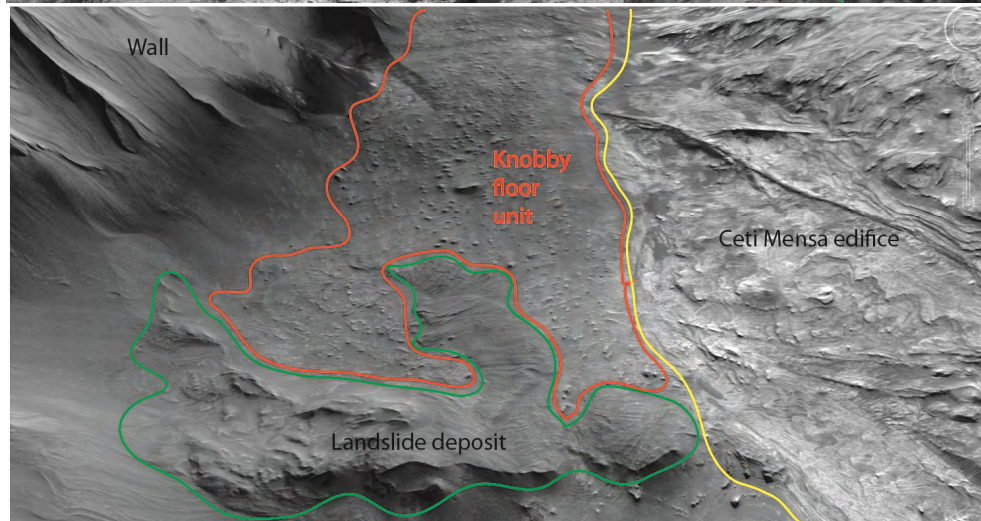


Fig. 3.

SE slide.

Image about 20 km wide.

Knobby floor unit overlaps landslide deposit.

Source as above.

Thanks to the many missions that made the data available.