Geology and Stereo Topography of Layered Deposits on Gangis Mensa (Valles Marineris). Jennifer A. Waggoner[1] & Allan H. Treiman[2]. [1]Geology Department, South Dakota School of Mines & Technology, Rapid City, SD. [2]Lunar and Planetary Institute, 3600 Bay Area Blvd., Houston TX 77058 <treiman@lpi.usra.edu>

Within Gangis Chasma is a stack of layered deposits, Gangis Mensa: ~ 110 km long (E-W), 40-50 km wide, and ~ 3 km tall. We mapped the geology and morphology of the Mensa and environs from Viking Orbiter (VO) imagery, and made a digital elevation model from stereo of Mariner 9 (M9) images. The layered deposits are complex, but do not to contain an angular unconformity [2]. The appearance of an unconformity can be ascribed to slope angle effects and the presence of a mantling deposit.

Methods. Orthographically projected VO and M9 frames were prepared with the ISIS/PICS image processing packages. The geologic map of the Gangis Mensa area layered deposits (Fig. 1b) is based on VO images 610a13 and 897a40 (both ~200 m/px). The digital elevation model (DEM) of part of the southern slope of Gangis Mensa (Fig 2b) was built from M9 frames 207b15 and 248b03 (both ~20 m/px), using the 'Z' macro to ISIS developed by P. Schenk. Tie points for these images were along a high layer exposed clearly and extensively in both images (Fig. 2a).

Geology. Gangis Mensa and its surrounding plains are complex (Fig 1b). The chasma floor south of the Mensa is a broad sand sheet [5] penetrated by mesas or knobs, which are larger in the west (to ~ 20 km across) than the east (to 1 km across). The knobs could be eroded and embayed remnants of chaotic terrain, or could be volcanic constructs [4]. North of the Mensa, the Chasma floor appears to be predominantly landslide material from the canyon wall, overlain by dark patches of sand dunes. Few craters are visible on the Chasma floor. Two eroded circular features in rough topography east of Gangis Mensa have been interpreted as impact craters in an ancient, exhumed surface [4].

Layered Sequence. Gangis Mensa reaches ~ 3 km above the Chasma floor (Fig. 2b). From base to top, its walls expose near-horizontal layers (marked by variations in albedo and erosional morphology) that unconformably overly the exhumed craters west of the Mensa. These layers are interpreted as a sedimentary or volcaniclastic sequence comparable to those exposed elsewhere in the Valles Marineris [1-7]. The layered deposit of Gangis Mensa appear as four distinct stratigraphic units, again marked by albedo and erosional morphology. These units are named provisionally for tributaries of the Gangis River (Earth), as shown on Fig 1b.: Brahmaputra formation (fm.), Tista fm., Gandak fm., and Yamuna fm. (Fig 1b). Within the Yamuna fm., and noted separately on Fig. 1b, are several near-horizontal bench layers at the Mensa top. On Mensa's south face, the lower two formations are exposed in conspicuously fluted slopes (see also MOC image 08707). From the DEM (Fig 2), slope angles of the units are: Brahmaputra fm., 15°-30°; Tista fm., 25°-40°; Gandak fm., 10°-15°; and Yamuna fm., 60°-vertical.

Mantling Deposits. On the eastern half of Gangis Mensa's south face, these formations are overlain by a bland, unlayered, structureless deposit that is cut in several places by arcuate depressions that look like landslide scarps. The DEM (Fig. 2) includes some of this bland material adjacent to layers of the Brahmaputra fm. The bland material is inferred to be a deposit on top of, mantling, the layered formations because: it is more extensive at lower elevation; and, for a given elevation, its material extends farther south than the layered formations. The origin of the mantling deposit is not clear, although it has been interpreted as slumped material [2].

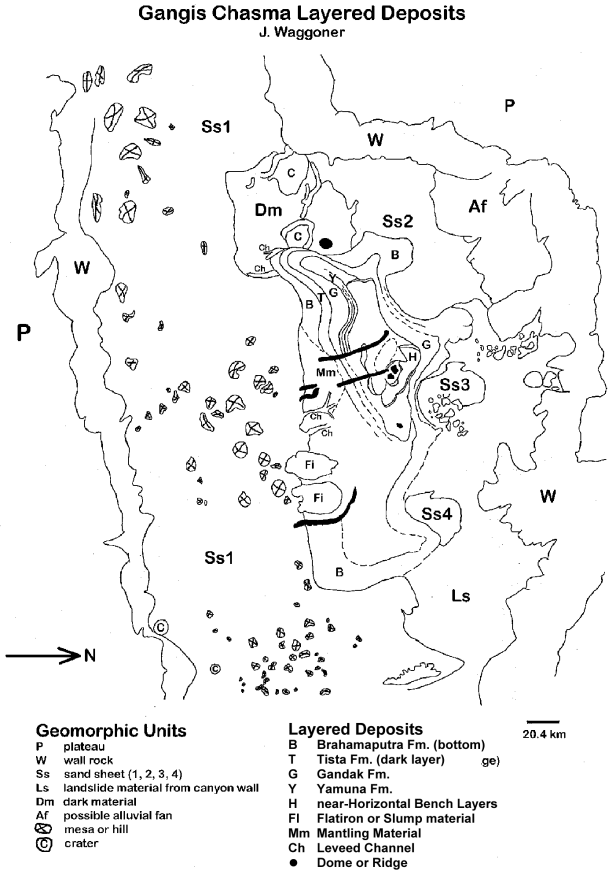
Unconformity? We cannot confirm the presence of an angular unconformity within the Gangis Mensa layered sequence [2]. Komatsu et al. [2] inferred this angular unconformity because the Tista fm. appears to tilt upwards, west to east, along the south-central face of the Mensa, and pinch out against the Gandak fm. Our DTM, however, shows that the Tista and Gandak layers are of the same, approximately horizontal, tilt.

The appearance of an angular unconformity can be ascribed to mantling and to changing slope angles. First, the areal exposure of the Brahmaputra fm decreases in this area, west to east, as it becomes covered by mantling material. Second, slope angles of the south face of the Mensa are greater in the area of the supposed unconformity than to the west where no unconformity is apparent. This increase in slope angles implies a decrease in areal exposure of the layers when viewed from above (as did the spacecraft).

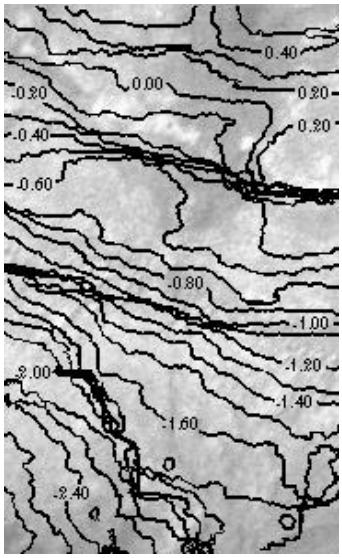
This work was done under a Lunar and Planetary Institute Summer Internship to the first author. It would not have been possible without the "Z" macro by P. Schenk. We are grateful to B. Fessler, L. Wooley, and D. Reub for technical help.

References. [1] Lucchitta B.K., et al. (1994) *JGR., 99,* 3783. [2] Komatsu G. et al. (1993) *JGR, 98,* 11105. [3] Nedell S. et al. (1987) *Icarus, 70,* 409. [4] Komatsu G. & Strom R. G. (1990) *LPSC XXI,* 651. [5] Edgett K.S. (1999) Mars 2001 Landing Site Workshop (internet). [6] Lucchitta B.K. et al. (1992) in *Mars* (U. of Az. Press), 453. [7] Weitz C.M. (1999) *LPSC XXX,* Abstr. #1277.

SEDIMENTARY DEPOSITS IN GANGIS CHASMA, MARS. WAGGONER, J. A. AND TREIMAN, A. H.



⇐ **Figure 1.** a) Viking Orbiter image 610a13 of Gangis Chasma. Arrow points to the dark Tista layer intepreted by [2] as tilted and truncated by overlying strata, forming an angular unconformity. Box shows area of stereo topography of Fig. 2. b) Geology based on VO frames 610a13 and 897a40.



⇑ **Figure 2.** a) Portion of M9 frame 207b15 of the south facing wall of Gangis Mensa (Fig. 1) and elevations from stereo imagery. Mesa crest to top (N), datum is sharply marked (bright) layer in Yamuna fm. Fluted erosional surface of Brahmaputra and Tista fms. visible at center of left edge. Bottom third of scene is mantling material.