

HENRY CRATER, MARS: THICK, LAYERED DEPOSIT PRESERVED ON A CRATER FLOOR IN THE MARTIAN HIGHLANDS; James R. Zimbelman, Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, Washington, D.C. 20560

Henry crater (11.0° N, 336.6° W) is a 165-km-diameter impact crater located in a portion of the martian highlands that extends well into the northern hemisphere of Mars. Henry crater is distinctive from numerous craters in its immediate vicinity because of the presence of an irregular mound of material on the crater floor. The mound has a smooth texture (at the >200 m/pixel resolution of the available images; see Fig. 1) that is very different from the intricate texture of the surrounding highlands surface. Several layers (representing increased competence?) are exposed along the eroded southeastern margin of the mound (Fig. 1), leading to the interpretation that the deposit is a remnant of a previously extensive mantle laid down over the cratered highland surface (1). The mechanism of deposition at Henry crater is not immediately evident in the available images, but this deposit has been interpreted as a remnant of a polar deposit emplaced when this location was at one time close to the rotation axis of Mars (1). This work presents additional information on the characteristics of this deposit.

Images obtained on different orbits of the Viking spacecraft have been combined to produce a stereogram of Henry crater and its interior layered deposit (Fig. 1). The relief visible in the stereo model shows that 1) the layered deposit is smoother than the highlands surface on both the vertical as well as the horizontal scale, 2) the deposit stands well above the crater floor but definitely below the rim of the crater, and 3) structural control is very evident in the highlands surface and, to a lesser degree, in the deposit as well (see Fig. 2). Earth-based radar measurements (described in 2) collected during 1978 (3) quantify the relief of the layered deposit as between 500 m and 1000 m, depending on the true magnitude of an apparent westward dip to the crater floor (Fig. 3). If almost 1 km of material once covered the entire highlands surface, its preservation only within craters argues for extremely intensive erosion of very weak material, with no observable erosion of the original highlands material. Radar signals were reflected from the layered deposit, in contrast to material of similar appearance located west of Tharsis that shows no reflected or scattered radar signal (4). This suggests that the Henry crater deposit is more indurated or deeply eroded than the materials west of Tharsis. Four craters on the layered deposit imply an upper Hesperian age [$N(2)=500 \pm 250/10^6 \text{ km}^2$], considerably older than the antipodal Amazonian deposits in Tharsis (5), raising a possible problem for the polar wandering mechanism.

REFERENCES: 1) P.H. Schultz and A.B. Lutz, *Icarus* 73, 91-141, 1988. 2) G.S. Downs et al., *Icarus* 26, 273-312, 1975. 3) G.S. Downs et al., *J. Geophys. Res.* 87, 9747-9754, 1982. [Digital version of topographic data provided by G. Downs, 1985]. 4) B. Butler et al., *Trans. AGU* 70(43), 1171, 1989. 5) D.H. Scott and K.L. Tanaka, *USGS Map I-1802-A*, 1986. [Supported by NAGW-1804]

LAYERED DEPOSIT IN HENRY CRATER, MARS: J.R. Zimbelman

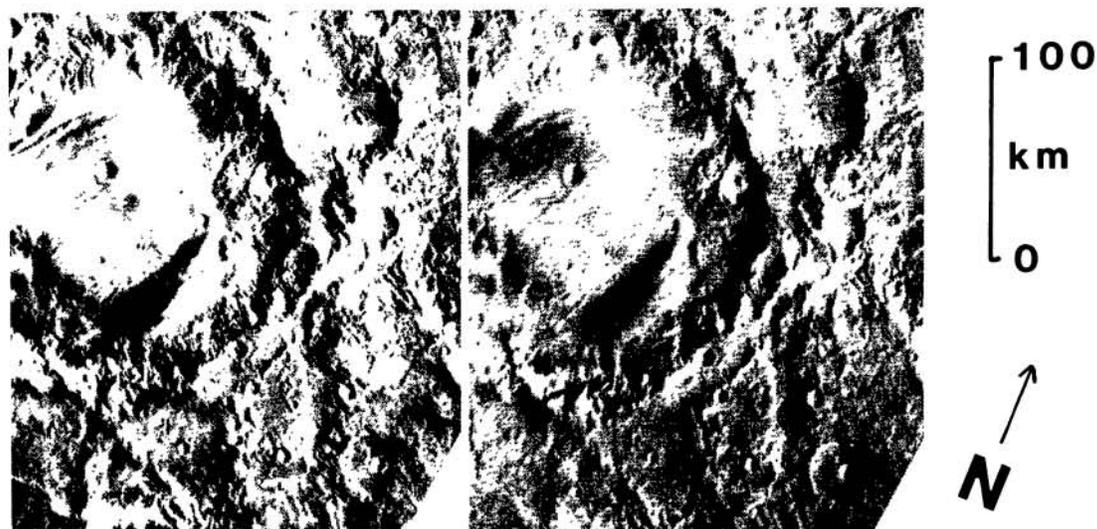


Fig. 1. Stereogram of Henry crater on Mars. An irregular mound of smooth-textured, layered material is on the crater floor (refer to Fig. 2). Low albedo material is adjacent to the southeastern margin of the layered deposit. Left: Viking frame 371S07, 219 m/pixel. Right: Viking frame 833A11, 256 m/pixel.

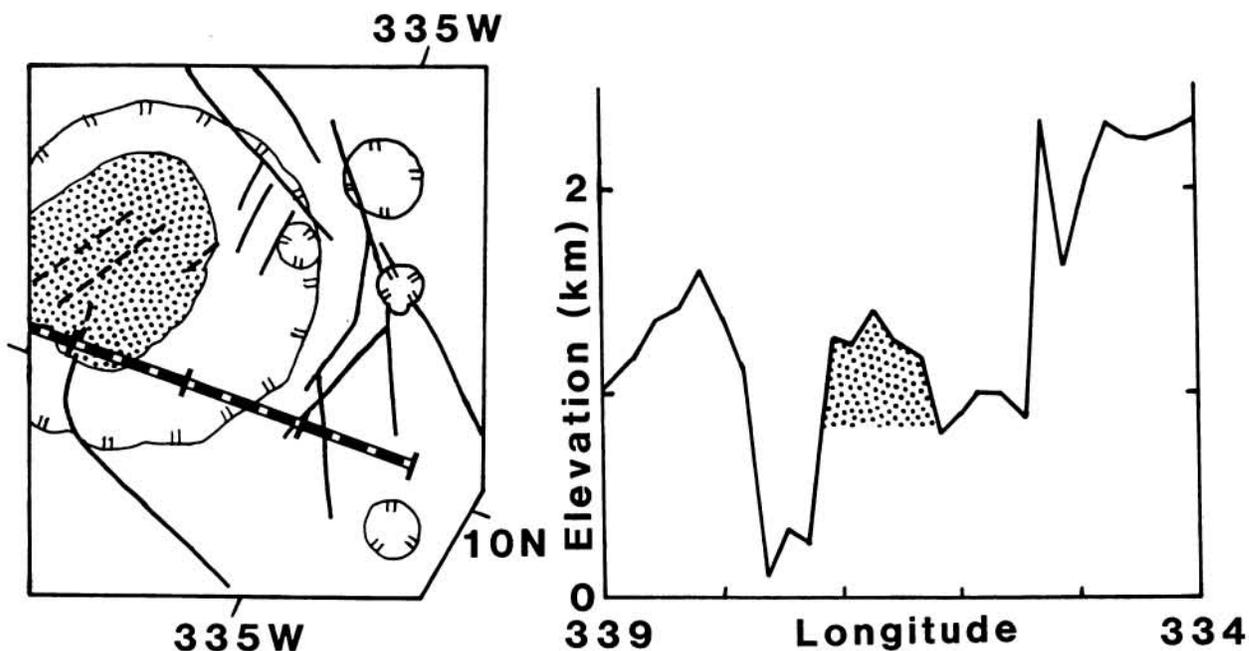


Fig. 2 (left). Sketch map of stereogram in Fig. 1. Pattern indicates layered deposit, hachured circles are crater rims, heavy lines are structural features (dashed in layered deposit), dashed line with tick marks is ground track for radar data. Fig. 3 (right). Topography obtained from Earth-based radar measurements (data described in 2,3). Pattern indicates layered deposit (see Fig. 2). 100X vertical exaggeration.