

THE GEOLOGY OF PAVONIS MONS, MARS. Ken Edgett, Department of Geology, Earlham College, Richmond, IN 47374, James R. Zimbelman, Lunar and Planetary Institute, 3303 NASA Rd. 1, Houston, TX 77058, and Jon W. Branstator, Department of Geology, Earlham College, Richmond, IN 47374.

A geologic map of Pavonis Mons (6°N to 5°S , 107°W to 118°W) has been compiled using Viking low to medium resolution images and Mariner 9 B-frame images. (There are no high resolution Viking images of Pavonis Mons).

Pavonis Mons is considered to be a basaltic shield volcano (1), intermediate in age between Arsia and Ascraeus Montes (2). The Pavonis region exhibits three major units; the shield, the plains, and the "landslide." The term "landslide" refers to a roughly circular lobe which extends northwestward from the NW flank of the volcano. Its origin is uncertain but thought to be related to mass-wasting processes (1,3,4,5).

At the shield summit is a circular, 45 km diameter caldera, which post-dates an adjacent 100 km diameter volcano-tectonic depression (2). The oldest shield surface is on the south and east slopes. It is characterized by numerous and distinct arcuate grabens (concentric to the volcano-tectonic depression), rille-like channels, and two embayments, one on the NE flank and the other on the SW flank. The embayments were sites of lava eruption, and they lie on a fissure that trends $\text{N}40^{\circ}\text{E}$ through the Tharsis Montes (2). The old shield surface is buried on the N-NW slope by younger volcanic material. The younger unit is characterized by an apparent burial of old grabens, and a lack of younger ones. Some grabens on the older surface are truncated at the contact between the old and new surface, and the traces of some older grabens are visible in the younger unit. The western slope has a ragged or jumbled surface, characterized by old grabens that are degraded relative to their counterparts on the south and east slopes. Grabens on the southwest flanks tend to be less degraded. This slope is a probable detachment zone for debris which makes up the "landslide" lobe to the W to NW. A similar surface was described by Carr, et. al., 1977, on the west slope of Arsia Mons, in association with a similar "landslide" lobe (3).

The plains surrounding Pavonis are younger than the shield. The plains consist of extensive lava flows, and flows from the SW embayment are among the youngest. The flows from the NE embayment may be older, as this unit is truncated by lava plains to the east and north, and it is fractured by 3-5 km wide, closely-spaced, arcuate and parallel grabens. This unit, and the grabens within it, are partially buried to the west by the debris of the "landslide."

The "landslide" is a roughly circular lobe which extends up to 250 km from the base of the W to NW flank of the shield. Similar lobes are located on the west sides of Arsia and Ascraeus Montes (1,5,6,7). The outer margin is a ridge and, in some areas to the NW, a series of parallel ridges. The interior of the lobe varies from mountainous to knobby to smooth in texture. The origin of the lobe is difficult to determine at available image resolutions. It has been interpreted as ancient terrain (5), a landslide or debris flow (1,3,4,5), and as a debris-blanket associated with the sublimation of a localized ice cap (7).

The eastern marginal ridge of the "landslide" runs down the lower flanks of the north side, and continues across the north-flank grabens. Emplacement of this material was seemingly unaffected by the presence of the grabens (See Figure). It would seem that the material either rode over the top of the grabens (if it was a landslide/debris flow), or it was deposited by a

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sublimating ice cap. However, an ice-deposit interpretation is complicated by the fact that Pavonis Mons lies on the equator.

We find no evidence of pyroclastic deposits on Pavonis, but pyroclastic material may be buried or simply invisible at available resolutions. In addition, we did not find evidence to suggest recent tectonic or volcanic activity, so it is likely that Pavonis is currently inactive. Albedo variations during the Viking mission show that aeolian transport and redistribution of fine-grained (5,8,9) materials is occurring on the shield (10).

The geologic map of Pavonis Mons will aid further studies of the Tharsis Montes. It can be used as a framework for the evaluation of other remote sensing data. Eventually, a detailed study of the geological history of Pavonis Mons can be compared with the geology of Ascraeus Mons (9) and Arsia Mons.

REFERENCES: 1) Carr, M.H. (1981) The Surface of Mars, Yale Univ. Press. 2) Crumpler, L.S. and Aubele, J.C. (1978) Icarus, 34, 496-511. 3) Carr, M.H. (1975) U.S. Geol. Surv. Map I-893. 4) Zimbelman, J.R. (1986) NASA TM #88784, 271-572. 5) Scott, D.H. and Tanaka, K.L. (1981) Icarus, 45, 304-319. 6) Carr, M.H. et. al. (1977) J. Geophys. Res., 82, 3985-4015. 7) Lucchita, B.K. (1981) Icarus, 45, 264-303. 8) Edgett, K. and Zimbelman, J.R. (1986) (abs.) in Papers Presented at the Second Annual Summer Intern Conference, L.P.I. Contrib. No. 603, 9-11. 9) Zimbelman, J.R. (1986) (abs.) Trans. Amer. Geophys. Union, 67, 1074. 10) Lee, S.W. (1986) NASA TM #88383, 251-253.



FIGURE: North Slope of Pavonis Mons

Eastern ridge (a) of the "landslide" overlies the north-flank grabens (g). To the west of the ridge, the north-flank grabens appear to be buried (b). (V.O. 358S60)

KEY:

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Shield units: (O)= old, (Y)= young, (J)= jumbled.

Others: (L)= "landslide", (E)= NE embayment, (P)= plains, (D)= volcano-tectonic depression.

Scale: 1 cm = 26.24 km

Center at: 3.22°N, 112.53°W