A POSSIBLE VOLCANIC COMPONENT IN THE FINE-GRAINED MATERIALS NEAR ALBA PATERA, MARS. James R. Zimbelman[1] and Peter J. Mouginis-Mark[2]. 1: Lunar and Planetary Institute, 3303 NASA Road 1, Houston, Texas 77058; 2: Planetary Geosciences Division, Hawaii Institute of Geophysics, University of Hawaii, Honolulu, Hawaii 96822

Alba Patera (40°N, 110°W) is one of the largest volcanic centers on Mars although it lacks the tremendous relief of Olympus Mons (1). Alba Patera is also an area of very low thermal inertia (~1 X 10^{-3} cal cm^{-2} $sec^{-1/2}$ K^{-1}), indicative of a very fine particle size (2). Temperature residuals, equal to observed nighttime temperature minus the Viking thermal model temperature (3), show that the region of lowest thermal inertia is the western margin of Alba Patera in a highly area called Alba Fossae (4; Fig. 1). High-resolution thermal data provide some indications that a volcanic component may contribute to the low thermal inertia of this feature.

High-resolution thermal inertias of Alba Fossae are consistent in magnitude with the regional thermal inertias, with the lowest values (~1.0) near the central fissure and slightly higher values (~1.5) to either side. Individual fissures are distinguishable as local enhancements of nighttime temperature by about 5 K, equivalent to an increase in apparent thermal inertia of about 0.2. The significance of the subtle variation in thermal inertia is most apparent in a plot of temperature as a function of longitude for one high-resolution sequence (Fig. 2). The decrease in nighttime temperature toward Alba Fossae from both the east and west is approximately parabolic in shape, with the most rapid changes near to the central portion. If Alba Fossae were the vent area for pyroclastic eruptions of very fine ash particles then the parabolic shape of the temperatures could be explained by a decrease in areal abundance of ash with increasing distance from the vent.

A logical alternative explanation for the observed temperature is that of elevation variations. If one assumes a uniform thermal inertia covering for the entire region then the temperature decreases toward Alba Fossae could be explained by a 4 km increase in elevation going from the western plains to the Fossae and a 2 km decrease in elevation from the Fossae to the central caldera of Alba Patera. These elevations are quite inconsistent with the most recent topographic data for this region (5), particularly the decrease in elevation toward to central caldera. Also, lava flow directions do not appear to support a lower elevation for the central caldera.

Unfortunately there is no morphologic evidence to support a potential eruptive center in Alba Fossae but the spatial resolution of the available images may not be sufficient to resolve the question. Based on the available data a potential volcanic component to the fine particles that comprise the low thermal inertia material in the vicinity of Alba Patera is favored over an elevation effect interpretation.

REFERENCES: (1) M.H. Carr, The surface of Mars, pp. 103-105, Yale Univ. Press, New Haven, 1981. (2) F.D. Palluconi and H.H. Kieffer, Icarus 45, 415-426, 1981. (3) H.H. Kieffer et al., J. Geophys. Res. 82, 4249-4291, 1977. (4) J.R. Zimbelman and H.H. Kieffer, J. Geophys. Res. 84, 8239-8251, 1979. (5) S.S.C. Wu et al., NASA TM-88383, 614-617, 1986.

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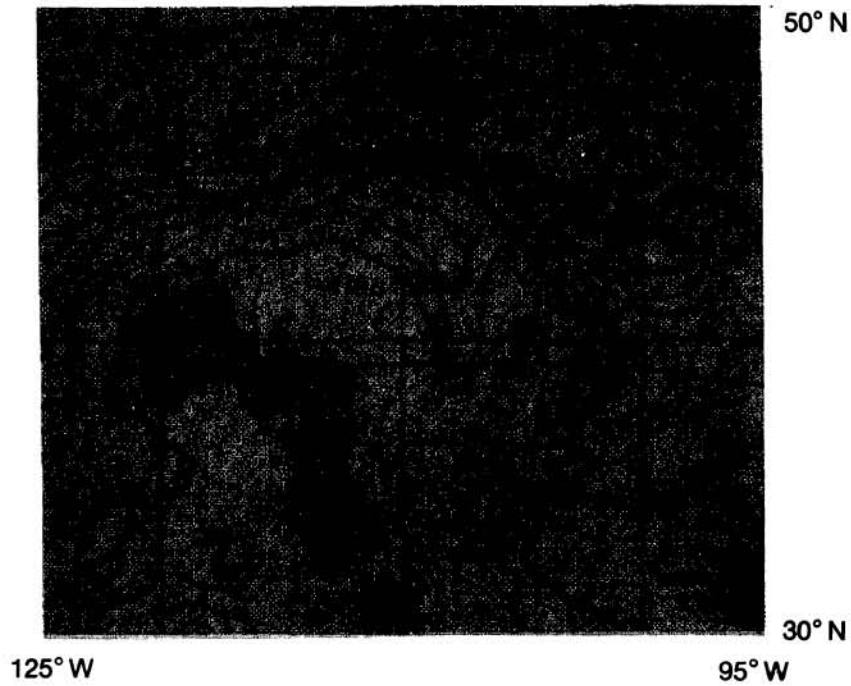

Fig. 1. Area of low thermal inertia near Alba Patera (shaded), corresponding to low temperature residuals (from ref. 3). Dashed line is groundtrack for data in Fig. 2.

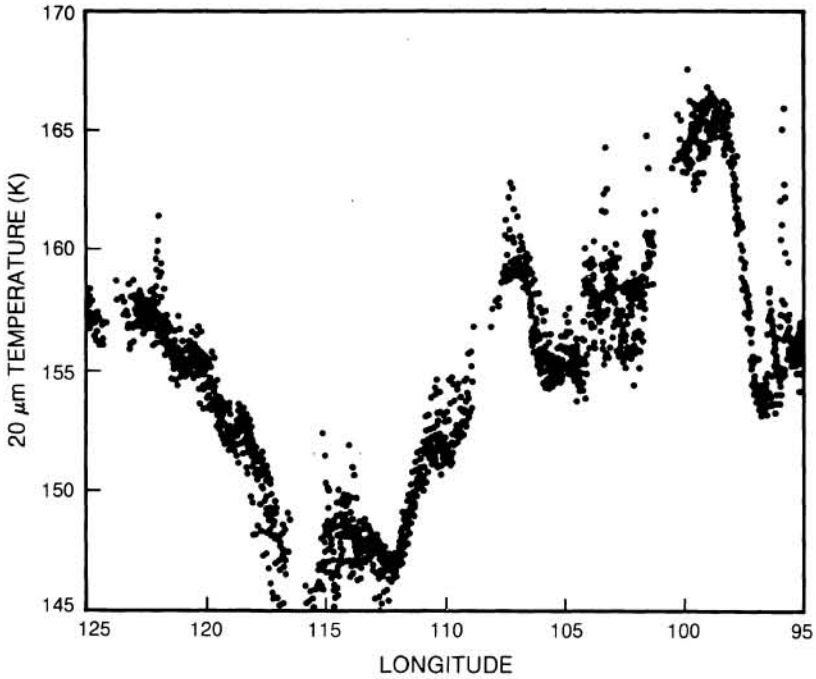

Fig. 2. 20 μm temperature as a function of longitude. Alba Fossae (115°W) has the lowest values, indicating the lowest thermal inertias. Data are from the Infrared Thermal Mapper on Viking Orbiter 1, orbit 511.