SPECTRAL AND THERMAL CHARACTERISTICS OF THE SOUTHEASTERN AMENTHES REGION, MARS; S. Bougan, C. Leff, and T. Maxwell, Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, Washington D.C. 20560

In the eastern hemisphere of Mars, the hemispheric dichotomy is not overlain by the relatively recent flows from the Tharsis volcanoes, and the cratered terrain boundary (CTB) exists as highly fractured terrain adjacent to the smooth plains of the northern hemisphere. The cratered terrain in the Amenthes region (0-30°N, 225-270°W) is approximately 3-4 km above the northern plains, and the boundary is marked by broad flat-topped plateaus, mesas, and knobs which extend northward some 1000 km (1, 2). If the knobby terrain is truly remnant of the ancient cratered terrain, then the far northerly occurrence of the knobs implies that at least part of the northern plains may be underlain by ancient terrain. In order to look at possible compositional variations to test this hypothesis, the following data sets have been investigated: (a) a mid-resolution (900 m) Viking Orbiter 1 color frame, used to identify spectral variations; (b) the lower resolution (2° x 2°) Mars Consortium thermal interia data, used to assess the extent of surficial deposits; and (c) higher resolution (140-150 m) Viking Orbiter 1 frames, used to assess the local geology.

The study area (centered at 11°N, 243°W) contains part of the CTB (to the south) and is dominated by the lower end of a dark albedo feature north of the boundary which trends approximately N30°E and is 200-300 km wide and 2200 km long. This feature is characterized by an abundance of parallel crater-related bright wind streaks.

Color vs. Inertia

There is some correlation between the spectral variations seen in the image and the thermal inertia. The dark albedo feature appears mottled to dark blue in the color frame, while the plains to the east of the feature are reddish-white and the plains to the west are light blue. The feature is very distinct in the northern part of the frame, but becomes more diffuse against the boundary scarp. Thermal inertia (TI) values in this frame range from 6.4 to 9.6 ($\times 10^{-3}$ cal cm^{-2} $s^{-\frac{1}{2}}$ K). The violet to TI correlation coefficient is 0.4, with high TI values corresponding to the dark blue patches directly against the scarp and the mottled blue patch north of the scarp. The larger craters contain dark blue intracrater splotches, which are probably deposits of coarse sand or lag (3, 4), but no corresponding high TI values are evident. The red to TI correlation coefficient is -0.4 with low TI values corresponding to the smooth bright plains unit in the eastern part of the frame. These correlations are consistent with global trends (5) and suggest that the blue material (higher TI) is coarse sand or lag, while the red material (lower TI) is probably a mixture of medium sand and fine dust. The eastern boundary of the albedo feature defines a distinct zone where TI values change from higher (8-9) to lower (6-7).

Color, Inertia vs. Geology

The volcanic plains north of the CTB in this frame have been divided into a number of geologic units based on morphology and crater abundance. There is only a slight correlation between the geologic units and the color data (many smooth volcanic units are dark blue while the etched and pitted units are usually a mottled blue) and no correlation between the geology and

the TI data. There does appear to be some correlation between the location of blue material and topography in that the well-defined borders of the albedo feature correspond to mapped scarps which parallel the feature. Closer to the CTB, these scarps essentially disappear and the blue unit is more diffuse until it reaches the boundary scarp. Also, as mentioned previously, the blue material appears concentrated in the larger craters.

Interpretation

The dark albedo feature north of the CTB in the Amenthes region probably represents an area where dust is being actively stripped away, leaving behind coarser sand and lag. The color (dark blue), higher TI, and bright wind streaks all suggest erosion of surficial dust deposits. This area is at the base of a regional slope formed by Elysium Mons and appears to be preferentially stripped by easterly winds diverted slightly by the Elysium construct, much like the Cerberus albedo feature south of Elysium (6). The correlation between topography and the concentrations of dark blue material suggests that the coarser sand is also in motion and may be a factor in the erosion of the dust layer (7). The brighter plains (reddish color, lower TI, lack of bright wind streaks) east of the feature are protected by Elysium itself and may represent an area where dust is being deposited (8). West of the albedo feature, the plains are lighter blue and have an overall higher TI with some bright wind streaks, suggesting some erosion of surficial dust in this area.

The slight color variations across the dark blue feature may represent different mixtures of bright dust and coarser material (9). In this region, the coarse sand and lag is most likely derived locally and may be representative of the composition of its source, be it the younger volcanic units or the older plateaus or knobs. Given the resolution of the existing spectral data, the lack of any significant correlation between the geology and the color data suggests that (a) the volcanic plains and upland remnants (plateaus and mesas) are compositionally similar or (b) the color data is reflecting differences in the aeolian cover on a finer scale than can be seen in the high resolution images.

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