HIGH-RESOLUTION THERMAL INERTIAS AT EQUATORIAL LATITUDES ON MARS.

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Thermal inertias obtained from the highest spatial resolution thermal measurements of the Viking Infrared Thermal Mapper (IRTM) have been compiled for one-half of the equatorial region (30°N to 30°S) of Mars. These data represent an improvement of more than an order of magnitude in the spatial resolution of thermal inertia mapping of Mars. Fixed pointing sequences obtained near periapsis provide temperature measurements with spatial resolutions down to 2 km by 5 km; the resulting single-point thermal inertias have been very useful in examining many individual geologic features (1-6).

To date, high-resolution thermal inertia data have been compiled for eight of the sixteen equatorial quadrangles on Mars, representing one-half of the best resolution data (Fig. 1). Data for the Elysium and Aeolis quadrangles (225°W to 180°W) show that the regional properties obtained from the high-resolution measurements are essentially identical to the results obtained from lower resolution data, indicating a regional homogeneity of surface properties at scales greater than 5 km (7). Several aeolian features, including wind streaks and dark patches, have thermal inertias indicative of sand-sized or larger particles (8,9). Results from the Amazonis and Memnonia quadrangles (180°W to 135°W) are quite similar to those from Elysium and Aeolis but enhanced thermal inertias associated with both yardangs and wind streaks (6) are particularly well documented here. The Tharsis and Phoenicis Lacus quadrangles (135°W to 90°W) are dominated by the large shield volcanoes of the Tharsis region (Fig. 1). The extreme topographic relief of the region required incorporation of first-order elevation corrections to the thermal inertias (5,10). After elevation corrections are applied, the thermal inertias for the shield volcanoes are essentially the same as that of the surrounding plains (except the lower flanks of the Tharsis Montes, which have slightly higher thermal inertias), interpreted to indicate an extensive covering of dust on the volcanoes as well as the Tharsis region (5,11,12). The Lunae Palus and Coprates quadrangles (90°W to 45°W) include the Vallis Marineris canyon system (Fig. 2). The highest thermal inertias found in all of the high-resolution data examined thus far (>18 × 10^3 cal cm^-2 sec^-1/2 K^-1) correspond to the canyon walls and floor (13). Compilation of the high-resolution thermal inertia data for the remaining equatorial quadrangles should result in a useful composite data set for investigations of the physical properties of individual Martian features.

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Fig. 1. Groundtracks of the best high-resolution IRTM sequences. Nighttime data were collected between orbits 442 to 668 of Viking Orbiter 1 and daytime data were collected between orbits 484 to 704 of Viking Orbiter 2. The data from 45°W to 225°W have been compiled to date.

Fig. 2. Thermal inertias for the Tharsis (MC-9), Lunae Palus (MC-10), Phoenicis Lacus (MC-17) and Coprates (MC-18) quadrangles. The data are averaged in 1/4° by 1/4° lat/long bins.