REDEFINING HESPERIA PLANUM, MARS, THROUGH GEOLOGIC MAPPING. Tracy K.P. Gregg[1], David A. Crown[2], [1]Department of Geology, 876 Natural Sciences Complex, University at Buffalo, Buffalo, NY 14260, tgregg@geology.buffalo.edu; [2]Planetary Science Institute, 1700 E. Ft. Lowell Rd., Suite 106, Tucson, AZ 85719, crown@psi.edu.

Introduction: Hesperia Planum, characterized by a high concentration of mare-type wrinkle ridges and ridge rings [1-4], encompasses ≥ 2million square kilometers in the southern highlands of Mars (Fig. 1). The most common interpretation is that the plains materials were emplaced as "flood" lavas that are <3 km thick [4-10]. The mare-type wrinkle ridges on its surface make Hesperia Planum the type locale for "Hesperian-aged ridged plains" on Mars [e.g., 9], and recent investigations [4] reveal that wrinkle-ridge formation occurred through time. Hesperia Planum's stratigraphic position and crater-retention age [e.g., 9, 11 - 13] define the base of the Hesperian System. However, preliminary results of geologic mapping reveal that the whole of Hesperia Planum is unlikely to be composed of the same materials, emplaced at the same geologic time. To unravel these complexities, we are generating a 1:1.5M-scale geologic map of Hesperia Planum and its surroundings (Fig. 1). To date, we have identified 4 new distinct plains units within Hesperia Planum [see also Crown et al., this volume], and are attempting to determine the nature and relative ages of these materials. Here, we present the newly identified plains units within and around Hesperia Planum. This work, in conjunction with hydrologic modeling [Jones et al., this volume] and refined crater statistics [Crown et al., this volume] will ultimately reveal a more detailed geologic history of Hesperia Planum.

Hesperia Planum Plains Materials: Geologic units within Hesperia Planum can be broadly classified as those associated with Tyrrhena Patera, and those that are not. Crown and others [this volume] discuss the characteristics and relative ages of the Tyrrhena Patera materials [14-17]. The plains materials to the south and southeast of Tyrrhena Patera are heavily affected by fluvial, ice, and possibly lacustrine processes [13, 18; see Crown et al., this volume], making interpretations of the original nature of the materials difficult. Here, we discuss previously unidentified plains units within eastern Hesperia Planum and adjacent highlands.

The region of Hesperia Planum located to the east of Tyrrhena Patera (Fig. 2) is the typical "Hesperian ridged plains" [7, 9]. Aside from Tyrrhena Patera, no obvious volcanic vents have been found within Hesperia Planum [cf. 4, 12, 14, 16-18], although lava flows can be seen at available image resolutions in the Tyrrhena Patera lava flow field [4]. We have identified distinct plains units that are preliminarily named *highland knobby plains*, *smooth plains*, *highland smooth plains* and *knobby plains*.

MOLA data reveal that the east and west boundaries of the continuous topographic basin that defines Hesperia Planum closely follow the 1-km contour, and most of what has been geologically defined as Hesperia Planum [cf. 1, 7] is contained within that contour line. In contrast, highland plains occur in isolated outcrops surrounded by highlands material (Fig. 3), and therefore have elevations >1 km. Units with the descriptor "highlands" are found above the 1-km contour. Jones and others [this volume] are investigating the potential for these basins to have held temporaroy lakes.

Knobby plains (in both highlands and in Hesperia Planum) are characterized by a mottled appearance, which, in high-resolution, is caused by differential erosion of a dark, layered material, generating isolated knobs and small mesas (Fig. 3).

Smooth plains (in both highlands and within Hesperia Planum proper) are characterized by subtle scarps and intersecting wrinkle ridges (Fig. 2). The scarps are evidence for layered deposits and subsequent erosion, although the style of erosion is distinct from that seen in the knobby plains. Furthermore, knobby plains are preferentially located within highland plains, and near or adjacent to the eastern margin of Hesperia Planum, whereas smooth plains are preferentially located within Hesperia Planum proper. This suggests either that the materials comprising these regions are distinct, or that different erosional processes have affected these regions through time. Such an interpretation also predicts that the knobby plains should have fewer small-diameter craters than the smooth plains.

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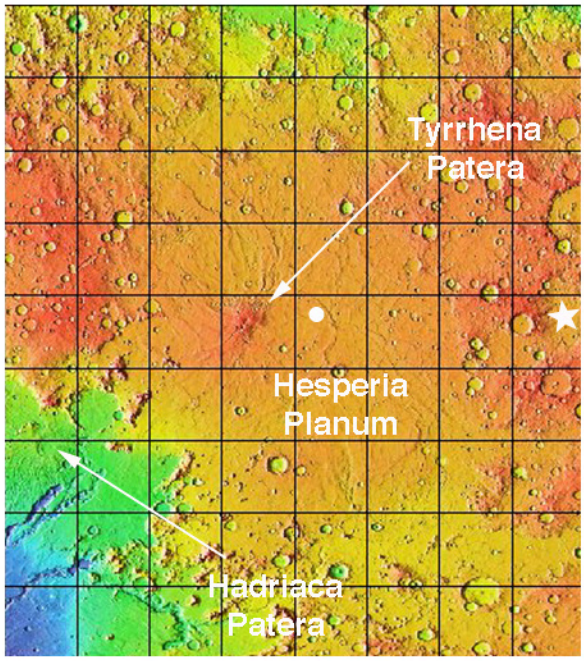
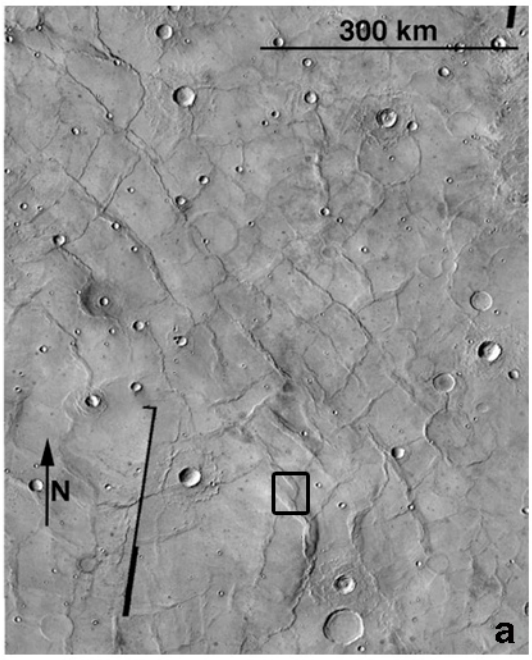


Figure 1. MOLA DEM (128 px/degree) showing the map area for Hesperia Planum. Volcanoes Tyrrhena and Hadriaca Paterae are indicated. Grid lines mark 5° boxes. Circle marks location of Figure 2; star marks location of Figure 3b.



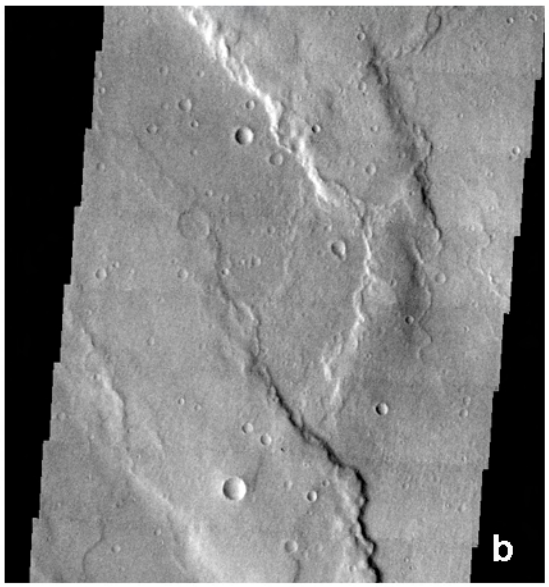
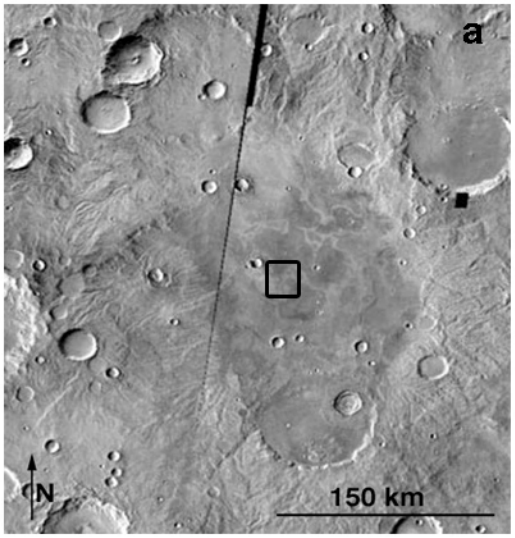


Figure 2a. Ridged plains directly east of Tyrrhena Patera. THEMIS daytime IR mosaic. Box marks location of Fig. 2b. **Figure 2b.** Portion of THEMIS visible image V07474003 from smooth plains east of Tyrrhena Patera. Image width is 17.9 km.



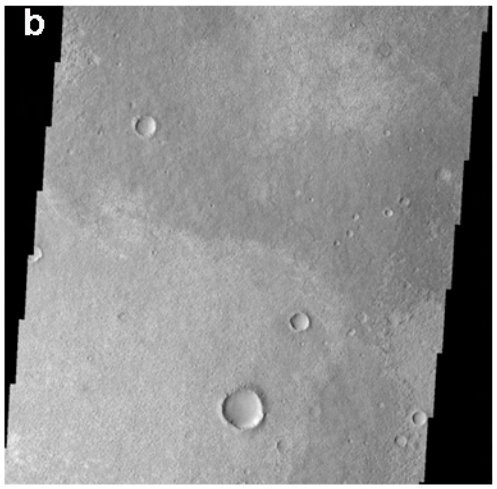


Figure 3a. Highland basin centered at 21°S, 113°E. THEMIS daytime IR mosaic. Box marks location of Fig. 3b. **Figure 3b**. Portion of THEMIS visible image V17595004 from highland knobby plains west of Hesperia Planum. Note the dark material is being eroded into knobs, generating a lighter-looking surface. Image width is 17.5 km.