SURFACE TEXTURES ON MARTIAN LOBATE DEBRIS APRONS: COMPARISON OF REGIONAL POPULATIONS USING CTX IMAGES. F. C. Chuang and D. A. Crown, Planetary Science Institute, 1700 E. Fort Lowell Rd., Suite 106, Tucson, AZ 85719 (e-mail: chuang@psi.edu).

Introduction: Lobate debris aprons, lineated valley fill, and concentric crater fill are among the most prominent geomorphic indicators of ice on the surface of Mars. These features are most commonly found in fretted terrains such as Deuteronilus, Protonilus, and Nilosyrtis Mensae and in areas near the Argyre and Hellas impact basins, with smaller populations along the Tempe/Mareotis dichotomy boundary and Phlegra Montes [1-10]. Their flow-like morphologies and distribution solely within the Martian mid-latitudes were apparent to early Viking-era researchers, suggesting a much different climatic regime compared to today. Recent climate modeling predicts mid-latitude volatile accumulation corresponding to certain concentrations of these features [11,12].

Background: Early studies using Viking Orbiter images suggested that lobate debris aprons (herein referred to as debris aprons) and lineated valley fill formed by flow of rock and ice mixtures, with latitudinal control attributed to seasonal frost deposition [3,4,6,8-10,13]. Debris aprons, in particular, extend from isolated massifs, mesas, canyon walls, and crater rims. They frequently form complexes, in which multiple lobes coalesce to form a composite feature, with variable preservation of individual lobes [14-16]. Recent studies of the Deuteronilus Mensae [17-20], Tempe/Mareotis [15], and eastern Hellas [14,16,21] regions using Mars Global Surveyor-era datasets suggest that apron masses may have flowed or deformed viscously based on their planform shapes, surface lineation patterns, and topographic profiles, analogous to terrestrial glaciers or rock glaciers [22-25]. Debris aprons also have surface textures that indicate a complex history of surface mantling and later degradation by aeolian processes and melting and/or sublimation of contained ice [14,15,20].

Analyses of Apron Surfaces: Using Mars Reconnaissance Orbiter Context Camera (CTX) images that cover the Martian surface at ~5-6 m/pixel, we are in the process of re-evaluating surface textures identified and characterized in earlier studies of the major apron populations. It is unclear whether textural development is confined to a surface layer that is separate from, or a part of, the apron mass. The earlier studies produced similar textural classifications, but differences were also recognized that may be related to different mantling and degradational histories and/or different internal structures or flow behaviors. In this study, we seek to determine if previously defined textures are a representative or biased record that is "image-limited" due to the smaller footprints of MOC images. Figures 1 and 2 present examples of textures seen in CTX images of the Deuteronilus Mensae and eastern Hellas regions. Discussion on the formation of these textures can be found in [14-15,19-20,25].

An additional goal is to re-examine relationships between surface texture and elevation, textural variation and slope, textural consistency and surface area for the different apron populations. As part of our effort to provide a global map of debris aprons [27], statistical information will be compiled and used to compare the different apron populations to look for similarities or differences in textural distribution. Compilation will involve the use of ESRI ArcGIS software to map textures and archive data for future work and dissemination.

The detailed analysis of mantle textures is part of a suite of tasks to catalog the global population of debris aprons on Mars. We also plan to re-map the extents of apron margins in ArcGIS and to use crater size-frequency distributions to catalog, test, and refine age interpretations from previous studies [28,29].

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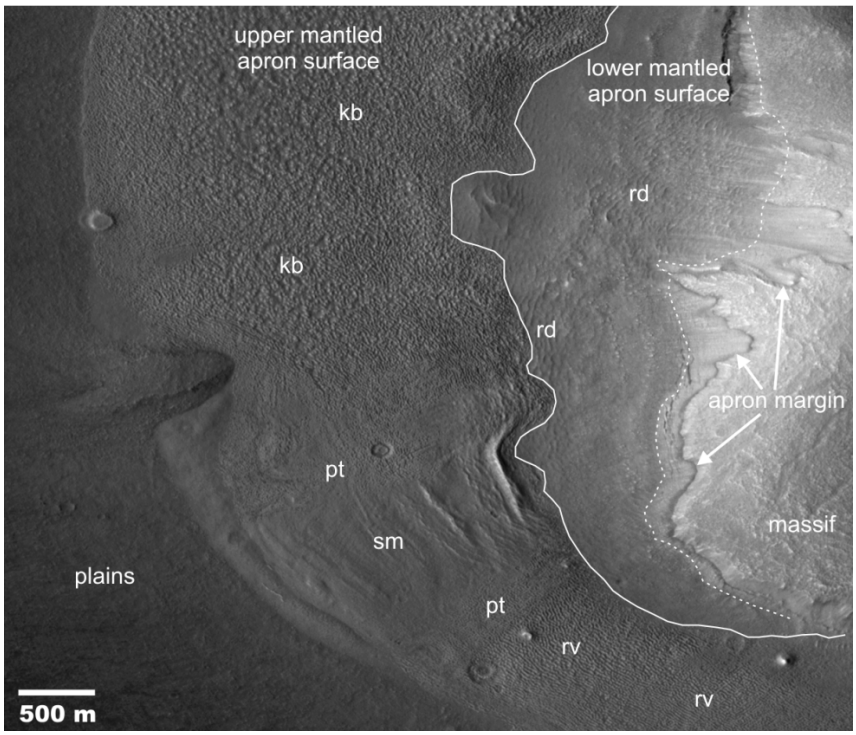

Figure 1. Textures observed on a portion of an apron surface in Deuteronilus Mensae, Mars: kb= knobby, pt= pitted, sm= smooth, rv= ridge and valley, rd= ridged. Degradation and removal of the upper mantled surface through a combination of ice melting/sublimation and aeolian processes produces various surface textures [25]. Continued degradation reveals a lower mantled surface with its characteristic textures adjacent to the massif. Portion of CTX image P01_001373_2242 (clat= 35.2 N, clon= 28.3 E). Image credit: NASA/JPL/MSSS.

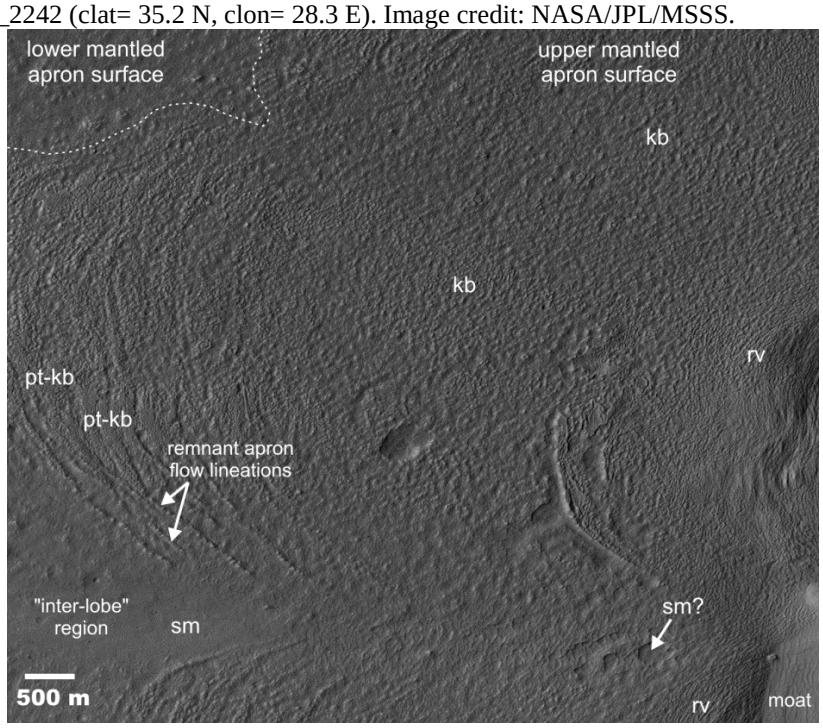

Figure 2. Textures observed on a portion of an apron surface in eastern Hellas, Mars: kb= knobby, pt-kb= pitted to knobby, sm= smooth, rv= ridge and valley. Apron flow lineations are apparent after degradation of upper mantle material. For more discussion on debris apron and mantling deposit surface textures, see [14,19]. Portion of CTX image B05_011669_1389 (clat= 40.6 S, clon= 102.6 E). Image credit: NASA/JPL/MSSS.