Intracrater Deposits in the Aeolis Dorsa Region, Mars: Evidence for Lakes? S. E. Peel[1] and D. M. Burr[1], [1]Department of Earth and Planetary Sciences, University of Tennessee, Knoxville (speel1@vols.utk.edu).

Introduction: The Medusae Fossae Formation on Mars, located along the dichotomy boundary east of Gale Crater and west of Tharsis (Fig. 1), is a voluminous sedimentary deposit of uncertain origins [e.g., 1-6, and citations therein]. Part of the equatorial transitional units of [7], this formation records a complex history of deposition and erosion that has resulted in extensive partial preservation of numerous depositional environments [e.g, 8 and citations therein, 9, 10]). The western portion of the Medusae Fossae Formation includes the Aeolis Dorsa region, hosting extensive inverted fluvial deposits [e.g. 11, and references therein].

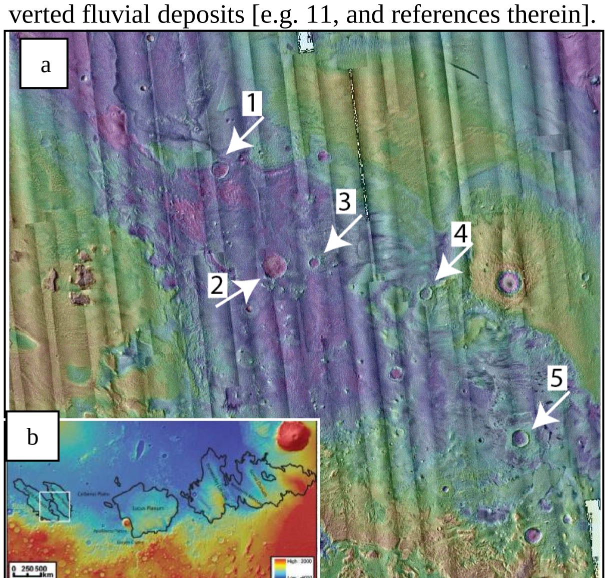


Fig. 1: (a) Aeolis Dorsa with locations of the five mapped craters on a CTX mosaic overlain with MOLA topography (area is ~500x500 km.) (b) Context image with the Medusae Fossae Formation (outlined in black) and the study area (white box), modified from [12].

During geologic mapping of the Aeolis Dorsa Region (e.g., [13-14], Fig. 1), craters have been identified with interior sedimentary deposits that exhibit complex geomorphologies and stratigraphic relationships. Using CTX [15] and HiRISE [16] images in ArcGIS [17], we have been mapping these intracrater deposits to add to our understanding of the geologic and climatic processes in this region . Here we describe a selection of these sedimentary deposits, concluding with our preliminary interpretations on the unit origins. More in depth unit descriptions and interpretations will be presented at our poster at the conference.

Brief Descriptions of Select Units:

Branching Unit – This unit erodes into surfaces that smoothly transition to different elevations over large areas. Minimal undulations across the surface occur and there is an overall branching appearance. Some surfaces erode into cliffs with no evidence of large erosive blocks. (Found in craters 2, 4 and 5.)

Highstanding Unit – This unit occurs in the form of large, semi-connected, to disconnected mounds that often taper. At HiRISE resolution, the upper surfaces of these mounds often show concentric rings forming steps in an amphitheater pattern. Where the layering is not observed, the upper surfaces of the mounds are rough in texture. Apparent grain sizes are <25cm. (In craters 2, 4 and 5.)

Sinuous Mesa Unit – This unit is distinguished by an irregular, discontinuous and undulating surface with cuspate cliff-forming edges. Areas near a unit boundary or of limited areal exposure exhibit a relatively smooth surface with oblong depressions that are often interconnected. HiRISE images show material that erodes into blocks in some areas. (In craters 1, 2 and 5.)

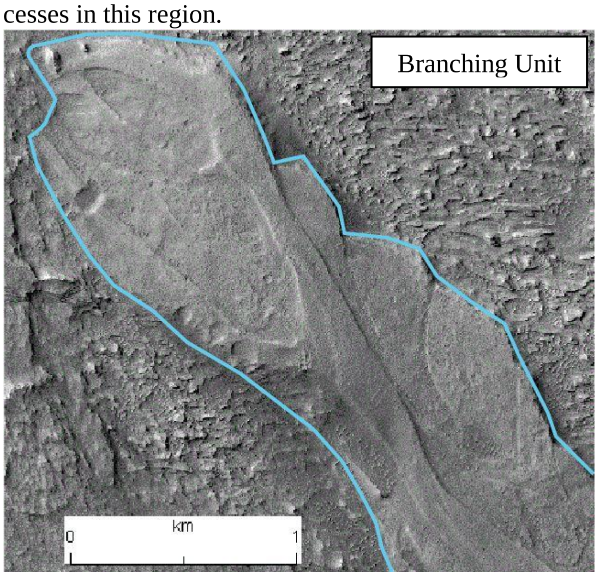
Lineated Unit – This unit is distinguished by arcuate to swirling lineations of alternating light and dark deposits. Over steep slopes, the layers alternate between protruding and recessive expressions. (Craters 1, 2 and 3.)

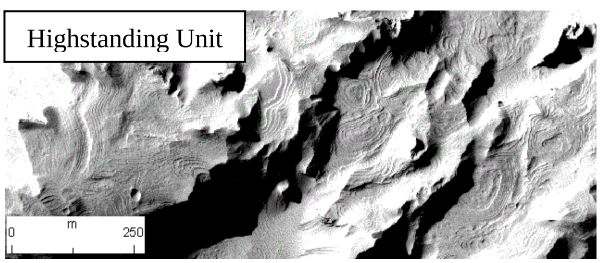
Highstanding Ridged Terrain – This high-standing unit (outlined in blue) exhibits approximately uniform elevation with parallel ridges and troughs common. The boundary of this unit forms cliffs in most instances. The unit may be either areally extensive or limited and often exhibits a discontinuous branching planform (white arrows). A morphologically similar feature was described by [18] and interpretted as an inverted valley network that deposited a fan at its terminus. (Crater 1.)

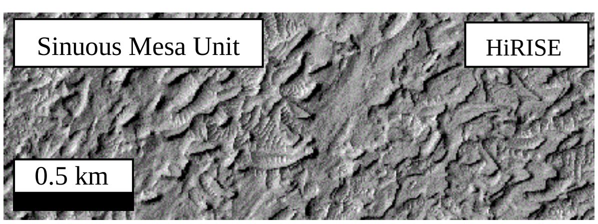
Concentric Ringed Unit – This unit is distinguished by concentric rings of pits on its surface. The pits are irregularly to sinuously edged with cliff-forming boundaries similar to that of the mesas in the Intracrater Sinuous Mesa Unit. This unit can form layers of flat topped surfaces with sinuous cliff-forming edges. (Crater 2.)

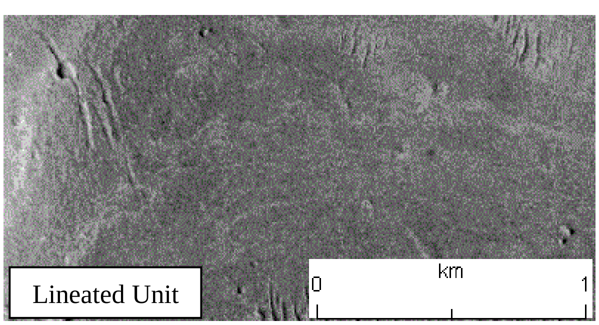
Interpretations of Unit Origins: The Branching unit is most consistent with previously identified inverted fluvial deposits [e.g., 11,18]. The Highstanding unit is most consistent with eroded fine-grained sedimentary layers formed due to aeolian or lacustrine processes. We interpret the Sinuous Mesa unit (and possibly the Concentric Ridged Unit) as formed of predominantly fine-grained sediment that was deposited in a (relatively shallow) lake environment with its undulating nature formed due to wave action. The Lineated unit is layered sedimentary deposits of alternating albedo due to chemical or grain sizes differences possibly due to seasonal or climatic variations. The Highstanding Ridged Terrain is likely a highly eroded depositional fan of deltaic origin.

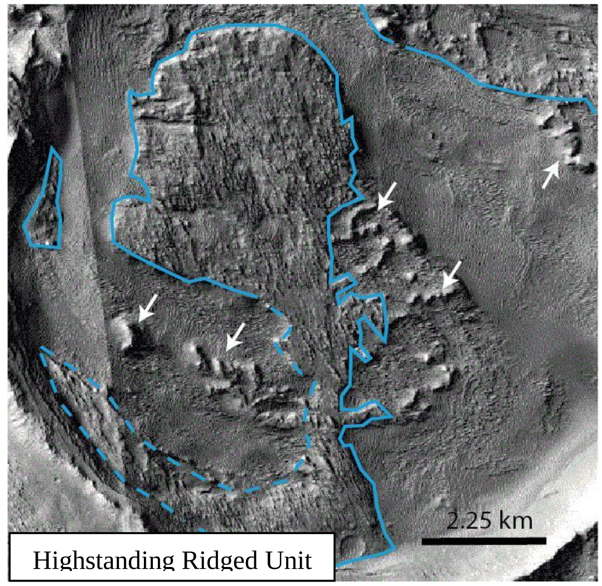
Future work: This work is part of a larger mapping effort [19]. In continued mapping, we will finalize our initial interpretions of these units and place them within a stratigraphic context (i.e., the map Correlation of Units), providing new insight into the aqueous processes in this region.

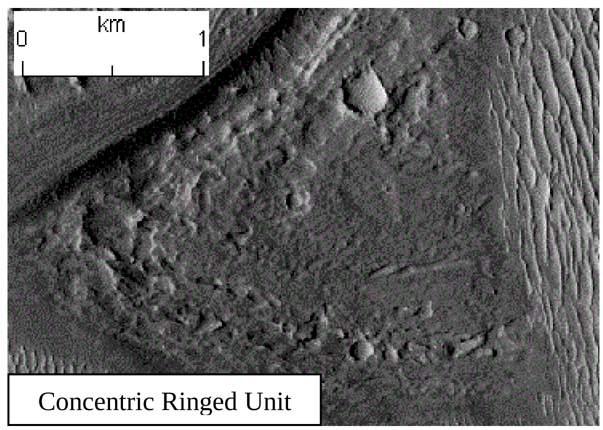












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