SYNTHESIZING THE HISTORY OF A DIVERSE INVERTED LANDSCAPE: MAPPING OF THE AEOLIS DORSA REGION, MARS. R. E. Jacobsen[1] and D. M. Burr[1], [1]Earth and Planetary Sciences Department, University of Tennessee, Knoxville, TN USA 37996 (RJacobse@vols.utk.edu and dburr1@utk.edu).

Introduction: This abstract provides a mid-year summary of our fourth year's work on a 1:500k geologic map of the Aeolis Dorsa region, Mars [1-3]. The Aeolis Dorsa region is located near the Mars equator, ~800 km east of Gale Crater, and along the transition zone between the ancient southern highlands and the very young Cerberus plains lavas. The geology of the region is characterized by layered aeolian and/or volcaniclastic deposits of the Medusae Fossae Formation (MFF) [4-7]. These extensive layered deposits were host to numerous episodes of fluvial and alluvial deposition [8,9], aeolian erosion and re-deposition [10,11], tectonic deformation and collapse processes [12,13], and intracrater lacustrine events [14]. Here, we describe the most dominant units and features (*sans* undivided units), interpret their record of regional processes, and present a preliminary Correlation of Map Units (COMU) that provides a framework for understanding the relative timing of processes that have shaped the region. We anticipate a submission of the map to the USGS Astrogeology Branch this summer.

Plana units: Plana units are coincident with the two elevated regions of Aeolis Planum and Zephyria Planum, which are located in the western and eastern map areas, respectively (Fig. 1). The **plana mesas (pm)** unit represents the highest elevations on Aeolis Planum. The mesas have rough, cratered upper surfaces, and wrinkle ridges [13]. The **upper plana (p_2)** and **lower plana (p_1)** units are at lower elevations, but not necessarily lower in stratigraphy. The upper plana unit consists of layered outcrops and large ridges with NW-SE orientations, though with significant local variation. The lower plana unit also consists of layered outcrops, but ridges are small and form in topographic lows, adjacent to Aeolis Dorsa fluvial units. The **plana hummocky (ph)** unit displays many shallow depressions and exposed rims of craters, which are filled with rippled material.

Interpretation: The extensive layering and numerous parallel ridges of the lower and upper plana units (p_1, p_2) are most consistent with formation by widespread deposition of aeolian and/or volcaniclastic material (i.e., MFF) and subsequent erosion by aeolian abrasion [e.g., 7,9]. The paucity of layering, preservation of craters, and wrinkle ridges suggests the plana mesas (pm) are distinct from other plana units and may be similar in origin (and age?) to transition units in the southern highlands. The plana hummocky (ph) unit is also distinct as it preserves craters and is heavily mantle by aeolian material, possibly sourced from the erosion of p_1 and p_2 units. Stratigraphically, the hummocky unit is perhaps the oldest unit as it is superposed by p_1 and p_2 and is embayed by Aeolis Dorsa units [9]. All plana units are of Hesperian age or younger based on embayment relationships with crater-age dated lavas in Elysium Planitia [9,10, and refs. therein].

Aeolis Dorsa units: Aeolis Dorsa units are generally coincident with the central depression [8] between Aeolis and Zephyria plana. The **lower Aeolis Dorsa (ad_1)** unit consists of networks of sinuous ridges oriented towards the central depression. The **middle Aeolis Dorsa (ad_2)** unit crosscuts unit ad_1 and grades into the ~600-km long feature Aeolis Serpens. Both units ad_1 and ad_2 have sinuous ridges with semi-concentric ridges on their upper surfaces. Outcrops of the **upper Aeolis Dorsa (ad_3)** unit are located adjacent to the margins of the plana and consist of ridges that radiate from an elevated fan apex.

Interpretation: The morphologies and orientations of the sinuous ridges and ridge networks suggest that unit ad_1 formed by widespread fluvial activity, with localized meandering, followed by burial, induration, exhumation and topographic inversion of the fluvial deposits [8,9 and refs. therein]. Crosscutting suggests unit ad_2 formed by fluvial valley incision and progradation of the system to form Aeolis Serpens. The distinct fan morphology and geospatial distribution of unit ad_3 suggest a significant change in the regional hydrology from widespread hydrologic activity (ad_1 and ad_2) to localized, flashy episodes of alluvial fan deposition [8,9]. All Aeolis Dorsa units are of Hesperian age or younger based on their embayment, onlapping, and crosscutting of Aeolis and Zephyria plana [9].

Crater units: The largest craters are found on Zephyria Planum and in regions adjacent to the two plana. The **crater (c)** unit consists of craters with diameters great than 4 km with or without radial deposits. The **crater fill (cf)** unit represents layered deposits, wall terraces, and branching ridges within some large craters. The **crater plains (cp)** unit, located in the northwest and northeast corners of the map, consists of surfaces that preserve hundreds of small craters, abraded ejecta, and wrinkle ridges.

Interpretation: The crater (c) unit is most consistent with formation by meteorite impact and ejecta morphologies, consistent with impacts into volatile-rich target rocks. Many of the layered deposits and sinuous ridges of the crater fill (cf) unit are most consistent with sedimentary deposition in lacustrine or nearby environments with sinuous ridges formed by topographic inversion of former fluvial systems (for more information on this unit see [14]). The many small craters and wrinkle ridges of the crater plains (cp) unit were likely formed through (secondary?) impacts into, and contraction of, lava plains. The eroded crater ejecta suggests that these lava plains were once buried by plana and Aeolis Dorsa units and have since been exhumed by aeolian abrasion. These units range in age from Hesperian to Amazonian, based on crater age dating of units and lavas north of the map area [10,15, and refs. therein].

Other units: Several units are not described in detail here, but will be included in the first draft of the map. These units include **interplana (ip)** units, which are located in the central depression and adjacent to the Aeolis Dorsa units, and the **transition (t)** units, which comprise ancient terrain of the southern highlands and the topographic depression between the highlands and the Aeolis Dorsa units.

Tectonic features: Small wrinkle ridges are located in the central depression or on the crater plains (cp) unit. Results show 19 ridges with a preferred orientation around N35E [13].

Correlation of Map Units: Deriving a uniquely accurate COMU from crater-size frequency distributions is unlikely given the friable nature of the MFF and the regional history of repeated burial and subsequent exhumation. Most surface ages are interpreted as exposure ages [7,10,15]. However, relative stratigraphic (e.g., superposition and crosscutting) relationships are well-exposed and adequate for constructing a history of processes in the AD region [8,9]. Our present COMU is shown in Figure 1.

Summary: This synthesis of the major units (i.e., plana, Aeolis Dorsa, and crater units) and their relative ages suggest a rich history of aeolian/volcaniclastic stratification, interleaved with waning hydrologic and lacustrine activity, during the Hesperian and Amazonian periods.

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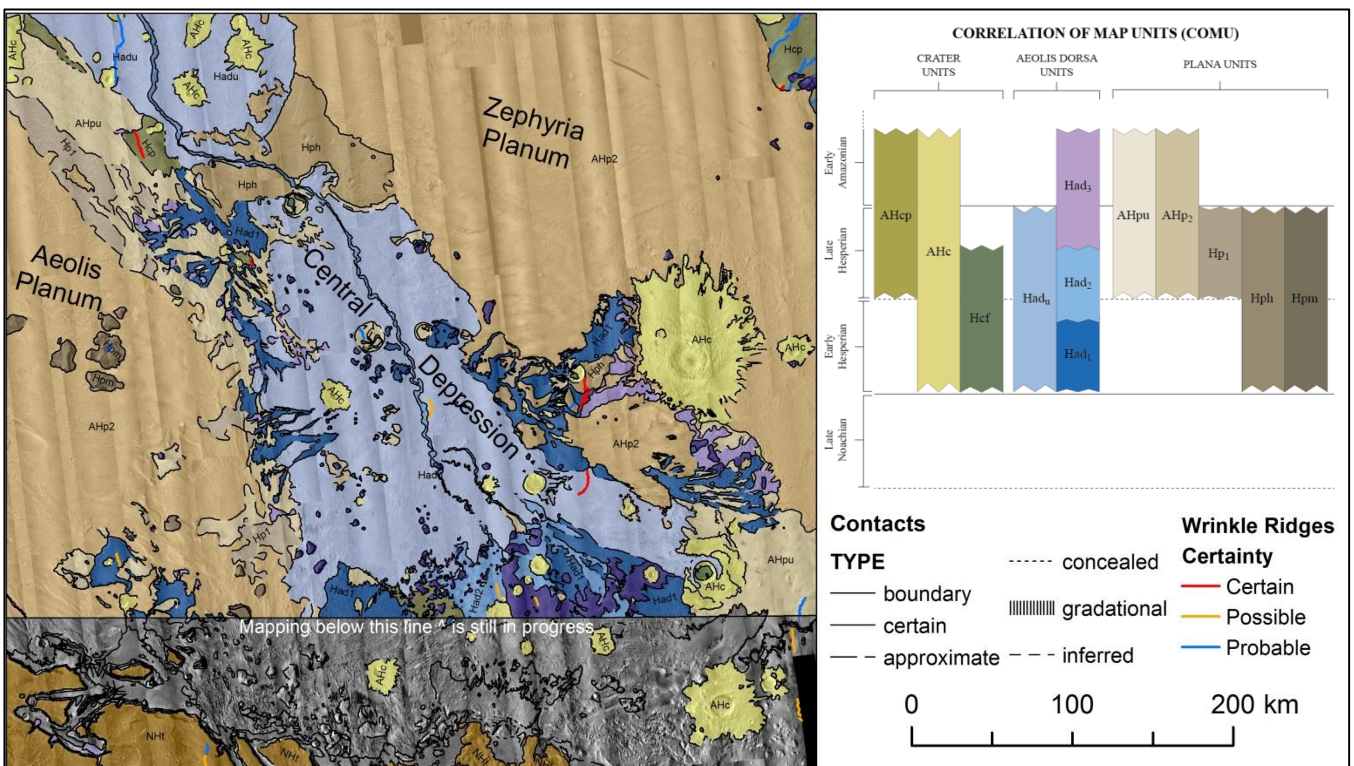

Fig.1: Preliminary 1:500k map and COMU of the Aeolis Dorsa region, Mars. Basemap is a mosaic of CTX images.