UPDATE ON MAPPING OF THE AEOLIS DORSA REGION, MARS: DISCOVERING EVER MORE DIVERSITY IN THIS INVERTED LANDSCAPE:. D. M. Burr[1], R. E. Jacobsen[1], A. Lefort [1], R. M. Borden[1], A. S. Boyd[1], and S. E. Peel[1], [1] Earth and Planetary Sciences, Department, University of Tennessee, Knoxville, TN USA 37996 (dburr1@utk.edu).

Introduction: This abstract summarizes our third year of work on a 1:500k map of the Aeolis Dorsa (AD) region [1,2]. Located within the western Medusae Fossae Formation (MFF; [3-5[), this region (Fig. 1, context) lies just north of Mars' highland-lowland boundary (HLB), southwest of the young Cerberus plains lavas and ~800 kilometers east of Gale Crater. It contains a long history of fluvial and alluvial deposition [6 and references therein], aeolian deposition and reworking [7, 8, and references therein], tectonic and potentially collapse deformation [9] and possible intracrater lacustrine events. This complex history is recorded in substantial and complex stratigraphic layering that has been locally and regionally deformed, as evidenced by topographically undulating fluvial deposits [9]. The proposed mapping effort covers landforms resulting from the fluvial, alluvial and deformation processes; we are including the aeolian mapping through a subsequent Mars Data Analysis Grant and/or through graduate student assistantships from the University of Tennessee. This abstract summarizes our progress on mapping each category of landforms. We anticipate an initial submission of the map to the USGS Astrogeology Branch this summer.

Fluvial and alluvial landforms: The surficial aqueous history of the AD is recorded in an areally extensive, morphologically varied, and stratigraphically stacked population of fluvial and alluvial features (Fig. 1). Most of these landforms are exhumed and/or inverted. Our identification and mapping of these fluvial and alluvial features is complete [6]. Previous work has provided paleodischarge estimates for these inverted features [10], but we have documented an improved technique for making such estimates [11]. We are also developing techniques for discerning confounding factors in paleodischarge estimation [12]. With these new techniques, we will estimate and provide new paleodischarge values for a sample of stratigraphically stacked fluvial deposits.

The aqueous history of the region is also recorded in regional fluvial strata. These fluvial strata include both surficial units detected in visible wavelength data from the Context Camera [13] and a surficial / near-surface thermally distinct unit [14] detected in nighttime Thermal Emission Imaging System (THEMIS) data [15]. This unit appears more widespread than the surficial inverted fluvial deposits and so suggests more extensive fluvial deposition. In our mapping to date, this unit appears to lie subjacent to the inverted surficial deposits and therefore to precede them in time, although a gradation between the surficial and near-suface deposits is possible in some areas. Completion of our mapping will allow us to give a final assessment of the stratal relationships.

Aeolian landforms: Aeolian depositional and abrasional landforms are pervasive in the AD region, as in the larger MFF [e.g., 7, and references therein]. Abrasion is evident in the form of yardangs [e.g., 16], and deposition is apparent in the form of both dark and dust-covered sand deposits [Fig. 2; e.g., 8], inferred from the presence of dune forms and/or obstacle scours [17] (Fig. 2). Our mapping to date of dune, scour, and sand sheet landforms shows that sand is more prevalent than is apparent from surface albedo alone [8]. Completion of this mapping, in conjunction with geospatial analysis to be performed on the mapping results under a separate grant, will allow us to constrain likely source(s) and origin(s) of the sand.

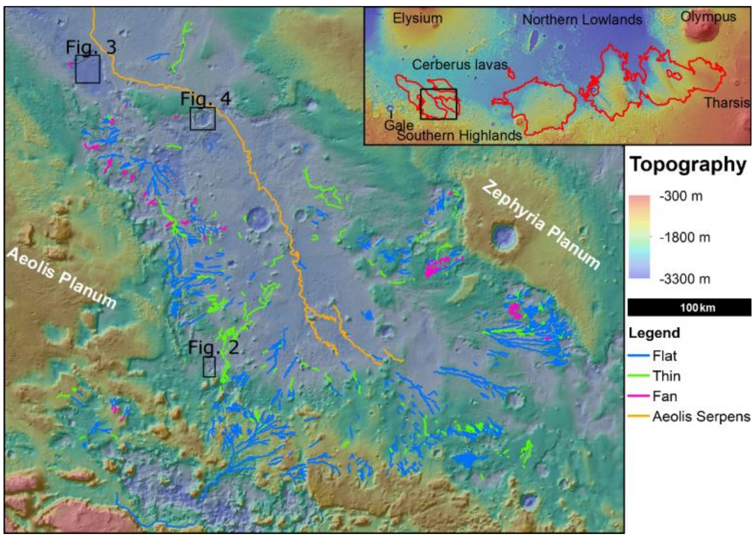
Local-scale tectonic landforms: The AD mapping region exhibits tectonic landforms at a range of size scales. The highland-lowland boundary crosses the very southern margin of the map area, just south of a kilometer-deep depression. Within this depression, rectilinear troughs and mesas suggest an extensional tectonic origin, although collapse mechanisms are also possible. At the smallest size scales, wrinkle ridges (e.g., Fig. 3) suggest the opposite tectonic strain, namely, localized contraction [18]. Our mapping [shown in 18] shows a areally scattered distribution of these landforms, suggesting areally distributed episodes of contraction.

Potential lacustrine landforms: In our previous abstracts [1,2], we pointed out potential lacustrine and/or groundwater-associated landforms. For example, some large craters in the central (lower) portion of the map area exhibit branching networks suggestive of groundwater flow [cf. 19] and marginal strata suggestive of shoreline deposits (e.g., Fig. 4). These potential lacustrine features were not proposed for mapping, but their identification and interpretation would substantially add to our understanding of the history of water in this region.

Summary: The primary focus of the proposed mapping work – namely, inverted fluvial deposits – is complete, and the mapping of the near-subsurface fluvial units is targeted for completion this summer. Mapping of aeolian and tectonic landforms is onging and likewise targeted for completion this summer. Mapping of the potential lacustrine and groundwater deposits is targeted for completion next year. These disparate landforms indicate the rich and diverse history to be discovered in the AD region.

References: [1] Burr D. M. and Jacobsen R. E. (2015) *Planet. Mappers Meet.*, Honolulu, HI. [2] Burr D. M. et al. (2016) *Planet. Mappers Meet.*, Flagstaff, AZ. [3] Scott D. H. and Tanaka K. L. (1986) U.S.G.S, IMAP 1802-A. [4] Greeley R. and Guest J. E. (1987) U.S.G.S., IMAP 1802-B. [5] Harrison S. K. et al. (2010) *Icarus, 209*, 2, 405–415. [6] Jacobsen R. E. and Burr D. M., *Geosphere*, in revision. [7] Kerber and Head (2010) *Icarus* 669-684. [8] Boyd A. S. and Burr D. M. (2017) *5th Internat. Planet. Dunes Work.*, St George, UT. [9] Lefort A. et al. (2010) *JGR* 117, E03007. [10] Burr D. M. et al. (2010) *JGR* 115, E07011. [11] Jacobsen R. E. and Burr D. M. (2106) *GRL* 43, doi:10.1002/2016GL070535. [12] Jacobsen R. E. and Burr D. M (2017) *LPSC XLVIII* Abs. 1285. [13] Malin M. C. (2007) *JGR 112*, E05S04. [14] Burr et al. (2016) *LPS XXXIII*, Abs. 1392. [15] Fergason R. L. et al. (2006) *JGR 111*, E12004. [16] Ward (1997) *JGR*, *84*, B14, 8147-8166. [17] Bishop M. A. (2011) *Geomorph.*, *125*, 569-574. [18] Borden R. M. and Burr D. M. (2017) *Planet. Mappers Meet.*, Flagstaff, AZ. [19] Harrison S. K. et al. (2013) *PSS 85*, 142-163.

Figure 1 (below): Context (inset upper right) with the MFF outlined in red, and mapping area for the AD region (from [6]). The background is colorized shaded relief topography and legend indicates the different morphologies of the inverted fluvial deposits visible on the surface. Black boxes indicate the locations of subsequent figures.



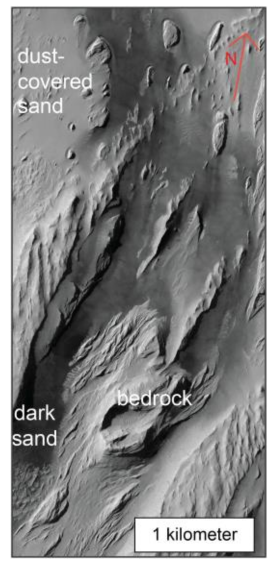


Figure 2 (right): Examples of dark sand within yardang troughs, inferred to be kept relatively free of dust due to sand movement by enhanced wind flow within the trough. On either side, outside the abraded bedrock massifs, are dust-covered sand sheets with scour marks.

Figure 3 (below): An example wrinkle ridge, with black arrows outlining trace of one segment, blue arrows indicating ridge, green arrow indicating wrinkle, and red arrows at discrete en echelon segments.

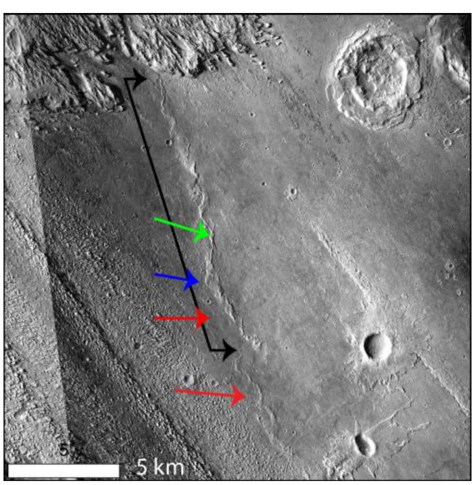


Figure 4 (right): Obock crater with branching network (short arrows) suggestive of groundwater flow and marginal strata (long arrows) suggestive of lacustrine deposits.