OCCURRENCE AND MORPHOLOGY OF CHANNEL-FORM FEATURES IN STRATIFIED DEPOSITS OF HADRIACUS CAVI, MARS. M. L. Barton[1,2], J. A. Skinner, Jr.[2], and C. M. Fortezzo[2]. [1]School of Earth Sciences and Environmental Sustainability, Northern Arizona University, Flagstaff, AZ, 86011. [2]Astrogeology Science Center, U. S. Geological Survey, 2255 N. Gemini Drive, Flagstaff, AZ, 86001 (mbarton@usgs.gov).

Introduction: Hadriacus Cavi are a series of irregularly-shaped depressions that expose Noachian-age, basin-related strata in the Martian cratered highlands, located along the northeast rim of Hellas basin [1]. The cavi are ~56 km long and ~15 km wide, centered at -27.19° N, 78.01° E. Processes of erosion and tectonism have exposed layered rocks within the basin, collectively displaying a complex depositional history. Ongoing geologic mapping at 1:24,000-scale indicate that the cavi-exposed units are likely to be variously intercalated deposits emplaced through volcanic, fluvial, mass-wasting, aeolian, and impact processes. These have resulted in a succession of predominantly alternating light- and dark-toned layers ~500 m thick (between -2404 and -2909 m elevation). Our study focuses on a 26 km long and 29 km wide region located between 77.9 and 78.4° E longitude and -27.0 and -27.5° N latitude. Within these stratified deposits, we find multiple occurrences of channel-like features that have morphometric characteristics similar to terrestrial channel-forms. We mapped the occurrences of these features and categorized them based on their stratal occurrence and morphology.

Methods and Data: We mapped and measured channel-form features in Hadriacus Cavi using 5 stereo-derived HiRISE DTMs and associated orthoimages. Topography was derived using SOCET Set and the methods described in [2]. The topographic and image base maps were overlain on a CTX mosaic to afford a context between HiRISE observations and regional data sets. Data were displayed and features were mapped and measured using Esri's ArcGIS software package. Measurements were made for each channel-form occurrence at a ~1:1,000 scale and consist of channel length, width, depth, and stratigraphic location.

Results: We identified four types of channel-form features exposed within the strata of Hadraicus Cavi based largely on stratal occurrence and morphometry (**Figs. 1 and 2**). Below, we describe dominant characteristics and measurements of each type and examine possible formational environments based on comparison with terrestrial landforms.

Lens-like features (Type A). We identified 40 lens-like features within the study area (**Fig. 2A**). Unlike other feature types that were identified in plan-view, the Type A features occur in near-vertical sections of stratified deposits. Type A features are almost exclusively light-toned and show no signs of internal stratification, though they themselves occur within – and cut across – adjacent strata. The light-toned lenses are generally asymmetric in profile. Type A features are from 13 to 183 m wide (mean of 53.1 m) and 2 to 10 m deep (mean of 4.6 m). These occur from -2403 to -2520 m elevation (mean of -2461 m). *Interpretations*: The asymmetry of these channel-body forms could be the representation of a moderately pronounced cut bank and point bar in cross section, suggesting an infilled fluvial channel bend or scour [3,4].

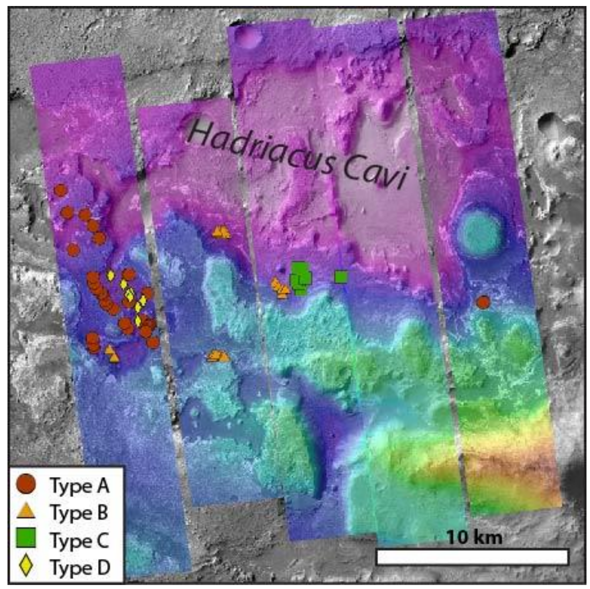

Figure 1. The Hadriacus Cavi study area. Colored image strips are stereo-derived HiRISE DTMs overlain on a CTX image mosaic. Channel-form types described herein (Types A-D) are plotted across the study area. The westernmost HiRISE defines the boundary of ongoing 1:24,000 scale geologic mapping [5].

Sinuous ridges (Type B). We identified 24 sinuous ridges within the study area (**Fig. 2B**). Rather than cutting through previously deposited material, Type B features exist as sinuous ridge-like forms, extending above surrounding surfaces by 1-6 m. These features occur at an elevation range of -2216 to -2696 m (mean of -2456 m), are 9 to 23 m wide (mean of 13.5 m), 89 to 1246 m long (mean of 397.6 m), and most commonly coincide with scarps of topographically higher strata. Though some converge at lower elevations of surface slope, others consist of a single ridge. The surrounding mantle is typically darker than the material that constitutes the ridge. *Interpretations*: Channel inversion can be attributed to mineralization and cementation of channel bed materials, or infilling by more resistant sediment (commonly volcanic), resulting in a well cemented mold of the channel body itself [6]. The process associated with these particular channel-forms is undetermined, but the positive relief and sinuous behavior of Type B features resemble exhumed channel bodies on terrestrial landscapes. [6]

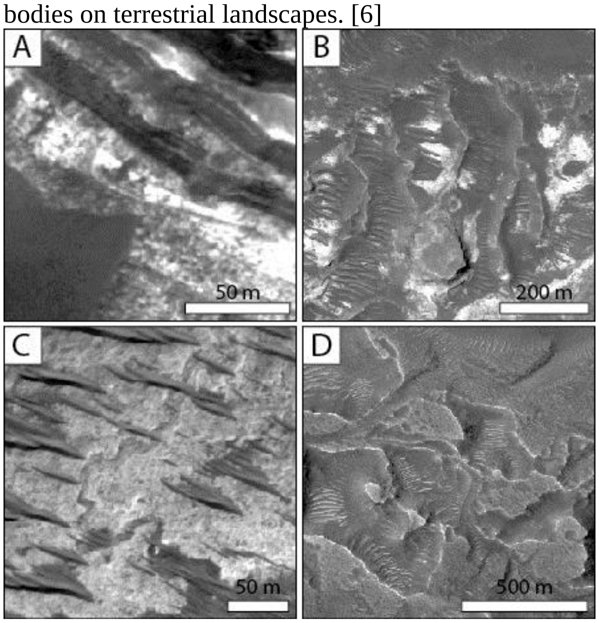

Figure 2. A compilation of HiRISE images showing examples of channel- form features A-D. (A) Asymmetrical lens-like feature found only in vertical succession.(B) Sinuous inverted channel-forms within small basin in Hadriacus Cavi, some converging at lower elevation.(C) Highly sinuous depression within lighter toned surface, partially covered by sand dunes (D) Sinuous platforms shown dissecting pot-marked surface

Sinuous depressions (Type C). We identified 8 sinuous depressions within the study area (**Fig. 2C**). These occur within a relatively small area centered at -27.27° N, 78.24° E, between -2471 and -2592 m elevation (mean of -2531 m). The features are typically darker-toned than the surrounding surface. Though we identified eight features, these could be interpreted as perhaps two longer features that are segmented by overlying sand dunes. Type C features range in width from 4 to 24 m (mean of 10.3 m) and length from 84 to 1041 m (Mean of 396.4 m). *Interpretation:*

Unlike Type B channel-forms, we interpret these features as having negative relief in comparison to the surrounding mantle, presumably caused by the erosional processes of fluvial channel systems. The negative relief and sinuous behavior of Type C channel-forms resemble meandering channel bodies that occur on Earth [3].

Sinuous platforms (Type D). We identified 7 sinuous platforms within the study region (**Fig. 2D**). These are located in the eastern region of the study area and exist between -2485 and -2571 m (mean of -2528 m). They range in width from 14 to 60 m (Mean of 30.2 m) and in length from 169 to 1896 m (mean of 804.6 m). Type C features dissect an elevated, dark-toned surface that is uniquely textured with polygonal pockmarks. *Interpretation:* The process attributed to the formation of this landform is unclear. Cementation of residual channel bodies resulting in increased resistance to weathering of the feature, coinciding with erosion of surrounding material, could have lead to the formation and exposure of a sinuous plateau-like feature [6].

Next Steps: The occurrence of landforms that have morphometric characteristics similar to several terrestrial channel-form features suggest that the strata that is exposed within Hadriacus Cavi was both emplaced through and subsequently eroded by processes akin to terrestrial fluvial and/or alluvial environments. We will continue to map and analyze the morphometric properties of the channel form features, with support of local 1:24,000 scale geologic mapping in Hadriacus Cavi. This will lead to finalized measurements and categorization of the aforementioned channel types. There are other features within the basin that could not be categorized within this particular classification scheme due to their intermediate qualities suggesting a possible spectrum of feature type. These channel features, while mapped and measured, require further analysis in order to be accurately classified.

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