STRUCTURAL CHARACTERIZATION OF JUVENTAE CHASMA AND THE LIGHT-TONED MOUNDS. R. Sarkar[1], P. Singh[1], K. S. Edgett[2], D. Ghosh[1], A. Porwal[1], [1]Geology and Mineral Resources Group, CSRE, Indian Institute of Technology, Bombay, (ranjan.s@iitb.ac.in; ranjan888@gmail.com); [2]Malin Space Science Systems, Inc., P.O. Box 910148, San Diego, CA 92191-0148 USA, (edgett@msss.com).

Introduction: This work is aimed at describing the structural attributes of Juventae Chasma and the light-toned mounds within it. Major lineaments spanning across Juventae Chasma are traced that are likely to be chasm-forming faults. Detailed measurements of layer attitudes are carried out across the light-toned mounts to characterize the geometry of the layers and understand deformation patterns. Faults, folds, and joints are mapped in the light-toned mounds.

Data and Methods: This work uses MOLA elevation data and DEMs generated from HiRISE and CTX stereopairs. Layer attitudes (dip, dip azimuth) are calculated using LayerTools extension [1] in a GIS environment. Dip values were accepted only if the errors were less than ±5˚, and strike values were accepted if the errors were less than ±20˚. 2D cross sections were generated using the calculated layer attitudes. The freeware Stereonet was used to construct stereograms.

Canyon-spanning faults: Based on geomorphic expressions we are able to identify five sets of lineaments that we interpret as fault traces (Fig. 1). However, due to aeolian cover and an overall degraded surface, the exact trace of each fault /plane of weakness is not observable. Hence we rely on indirect geomorphic expressions that include parallelism in the edges of well-preserved chaos blocks, long and linear grooves between mounds and knobs, and long and linear grooves on chasm floor. The parallelisms in these linear features, and their occasional extension beyond the canyon lend further support to these being sets of fault planes. Signs of faulting are also present in the form of *en echelon* normal faults. Moreover, the amphitheatre headed-tributary canyons present on the walls of Juventae Chasma do not bear signs of overland flows, for example, streams joining the heads of the amphitheatre-headed canyons, which suggest that these features have not been caused by waterfall erosion. But since groundwater-sapping is considered as one of the prime causes for the formation of amphitheatre-headed tributary canyons, the presence of faults (or planes of weakness) in the rocks could have helped channelize groundwater leading to the formation of the amphitheatre-headed tributary canyons. A second hint that these amphitheatre-headed tributary canyons may represent planes of weakness comes from the boundaries of light-toned mounds which lie on the same straight line extended from the tributary canyons.

Folds in light-toned mounds: Based on layer attitude measurements and geomorphic expressions we identified 27 folds in the light-toned layers from Mounds A, C, and D. The axial planes of these folds are shown in a stereoplot in Fig. 2. We can see that the axial planes trend mostly in the east-west direction.

2D cross-section: Using the layer attitudes, 2D cross sections are constructed. Based on the similar dip directions the light-toned layers are divided into several domains (Fig. 3). A profile section covering all the domains is drawn and the apparent dips of the layers along the direction of the profile are calculated. Next, the apparent dip angles of each domain is corrected for the vertical exaggeration, and a 2D cross section is constructed by extending the domain boundaries at the correct angle. An example section is shown in Fig. 4 that shows that there are truncations of domains, which might be unconformity and/or structure related.

Future Work: We will analyze the remaining mounds using similarly constructed 2D cross sections. These 2D cross sections will give us the structural architecture of the light-toned mounds and allow us to understand the phases of deformation, if ant, that affected the mounds, and whether these were, in any way, related to the canyon forming faults.

References:

[1] Kneissl, T., Van Gasselt, S., & Neukum, G. (2010) *LPS XLI*, Abstract #1640.

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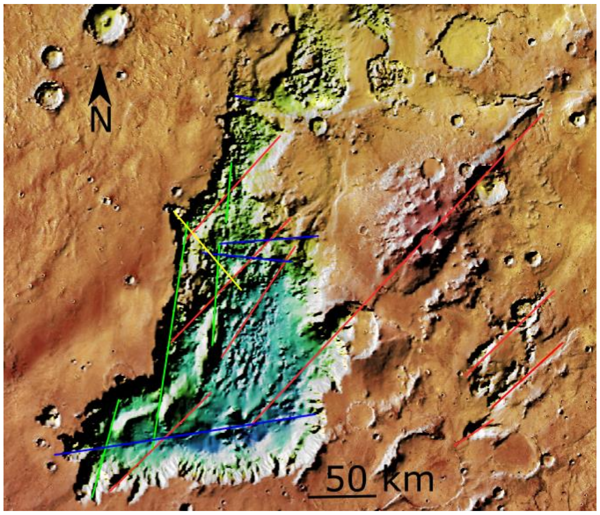

Figure 1. MOLA shaded relief showing sets of lineaments in Juventae Chasma. Parallel sets of lineaments are marked with the same colour.

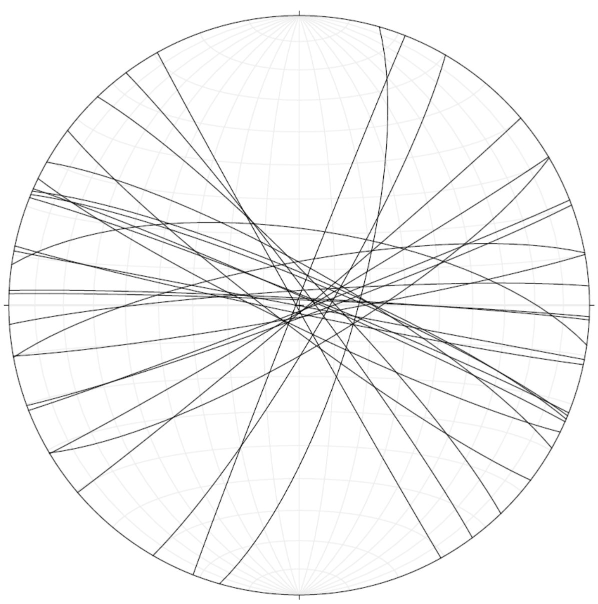

Figure 2. Equal area sterreoplot showing the axial planes of folds in the light-toned mounds of Juventae Chasma. Most axial planes are oriented in the east-west direction.

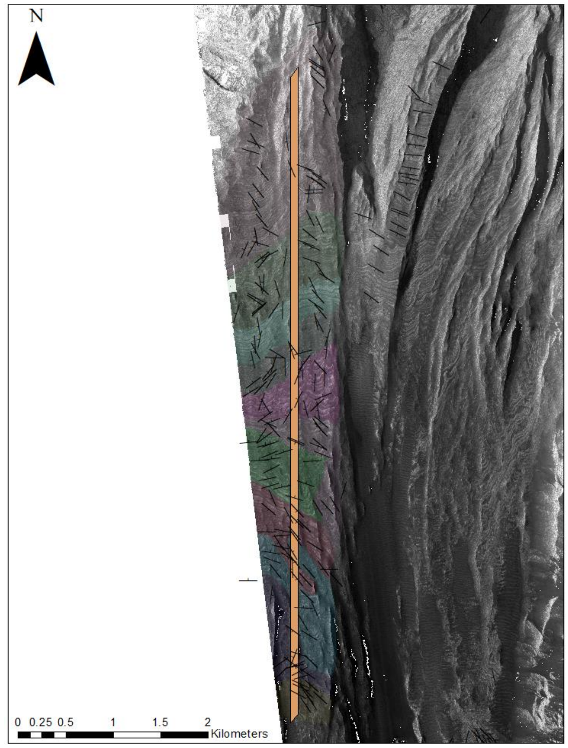

Figure 3. HiRISE image PSP_002946_1765 showing different domains of dip directions of light-toned layers in Mound C. The orange line is used to construct a 2D cross-section based on average dip values of the domains.

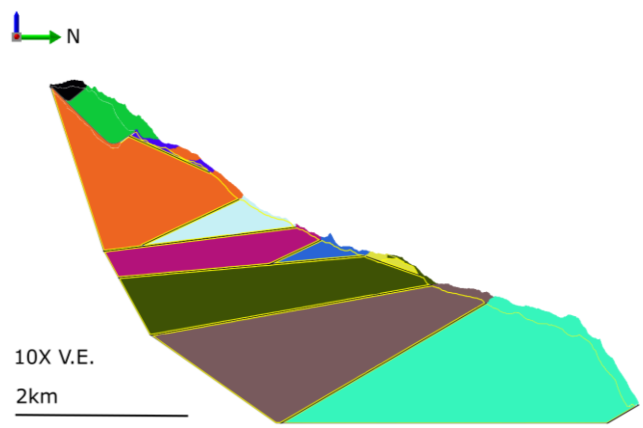

Figure 4. 2D cross section of Mound C drawn along orange line in Fig. 3. Note the truncations of domains which might be unconformity and/or structure related.