ANALYSIS OF AEOLIAN PROCESSES AND MORPHOLOGICAL EFFECTS IN THE MEDUSA FOSSAE REGION OF MARS. Siddharth Das, Snigdha Amara, Domenique Aclese, Daniel Castany, Timothy Prejean Cole, Zachary Jordan, Sierra Schuman. Klein High School, Spring, TX

Introduction: Last year, the Klein MSIP team presented an aeolian analysis project, but our overall data was considered inconclusive with discrepancies among our intended correlating factors. However, we discovered an intriguing trend where the 4:1 ratio in yardangs on Mars (major axis length to minor axis length) was consistent with Earth's yardangs. This year, the Klein MSIP team intended to continue our last year's project in order to complete our study of aeolian patterns, taking into account the erosional mechanisms associated in the formation of yardangs. This study was conducted to determine whether characteristics of aeolian processes are related to the characteristics of yardangs. We look to measure specific dimensions of yardangs and determine whether or not the major to minor axis ratio correlates with thermal inertia. We suspect that the unique morphology of yardangs is essential to discover the ancient wind patterns of Mars. We expect our data to show that as the major to minor axis ratio increases, thermal inertia would increase indicating that the longer and wider yardangs have more dust.

Experimental Setup:

1) From the THEMIS camera on the Mars Odyssey spacecraft, images were obtained of an area within 10° of the equator in the Medusae Fossae region of Mars.

2) We used the general hull-shape of yardangs in order to determine what actually a yardang was in the THEMIS images.

3) We selected several images from the region. After selecting each image we then placed a diamond shape over each of the five yardangs from each image. Using JMARS, we found the length of the major axis, the length of the minor axis, the orientation, latitude, longitude, the area for each yardang and thermal inertia.

4) After analyzing all THEMIS images, numerous sets of data have been obtained. The data was input for all the variables collected for each yardang to create various graphs to reveal correlations.

5) We created multiple graphs, such as comparing thermal inertia to the minor axis. We also created a boxplot graph that compared thermal inertia with the axis ratio.

6) Five data points were collected from each image. All quantities for these five data points were averaged to create a data point that represented the entire image. Based on these quantities, vectors were drawn on a Shaded Relief map, one for each image.

Results and Discussion: In order to effectively generalize the aeolian processes using yardangs in the Medusae Fossae region, there are at least four variables that must be taken into consideration: north azimuth, length to width ratio, location and thermal inertia. On Earth, a ratio of 4:1 (length to width) would be expected under ideal conditions. Although the lithography of this region is largely consistent and thus cannot be considered a possible extraneous variable, we must take in to account the particle size of the surface material. Our range for the thermal inertias found is 40 to 70.

Based on the Ratio vs. Thermal Inertia graph, we suppose that long, thin yardangs tend to correspond to low thermal inertias, while wider, smaller yardangs tend to correspond to high thermal inertias. We infer that the longer, thinner yardangs' morphology depends heavily on abrasion factors, while wider, smaller yardangs' morphology depends on deflation factors. Furthermore, it could be suggested that wind speed relates to both the depositional and erosional factors of yardangs. The possibility that the process of erosion is occurring faster than the process of deposition or that deposition is occurring faster than erosion could directly relate to the speed of the wind. The long and thin yardangs could correlate with the higher wind speeds and erosional factors, while the short and wide yardangs could correlate with the lower wind speeds and depositional factors. Looking at the boxplot graph, we notice that there is a greater variability with the greater ratio yardangs. This may indicate that they are varying degrees of wind strength among those yardangs**.** To gain more insight in the process, we will construct a shaded- relief map showing the directional fields of the yardangs.

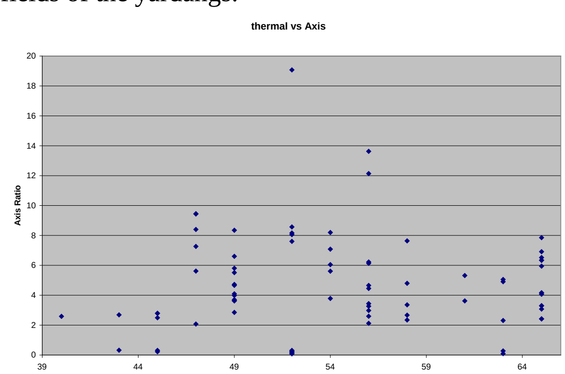

Figure 1:This is a thermal inertia vs. axis ratio graph.

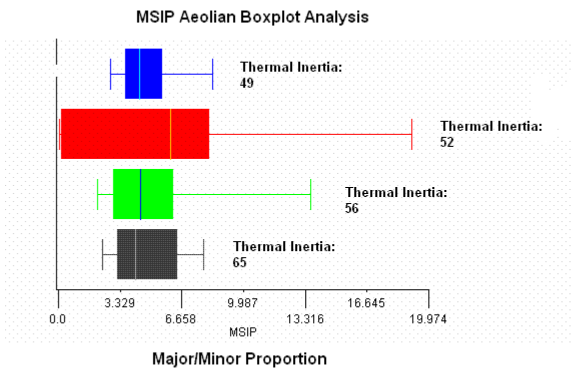

Figure 2: This boxplot compares major/minor ratio blocked using thermal inertia**.**

References: References: [1] A. J. Parsons and Athol Abrahams (2009) Geomorphology of Desert Environments, 617. [2] Eolian Processes (1997) USGS. [3] S. W. R. Tsang (2010) LPSC. [4] N. T. Bridges et al. (2003) SICM. [5] K. E. Mandt et al. (2010) LPSC.