ANALYSIS OF PATTERNS OF AEOLIAN PROCESSES IN THE MEDUSA FOSSAE REGION. Matt Figueroa, Snigdha Amara, Sid Das, Siva Nagarajan, and Thejas Prasad, Klein High School, Spring, TX

Introduction: This year, the Klein MSIP team was intrigued with atmospheric influences on Mars. Currently, the data recorded attempting to quantify the Aeolian effects on Mars is largely incomplete.

The team proposed an indirect method to quantify the wind effects on Mars' surface. Thusly, we look to measure the dimensions of yardangs, which are essentially areas of eroded rock created by Aeolian processes. This project was conducted on the basis of trying to determine whether characteristics of Aeolian processes are related to the characteristics of yardangs.

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 teardrop 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 five yardangs from each image. Using JMARS, we found the length of the major axis, the length of the minor axis, the orientation, the location, and the area for each yardang.
4) After analyzing all visual images, nine sets of data have been obtained though some variation was acceptable.
5) The data was input for all the variables collected for each yardang. The six variables collected for each yardang were latitude, longitude, major axis, minor axis, orientation, and area.
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 in the Medusae Fossae region, three different variables must be taken into consideration: north azimuth, length to width ratio, and location. The data will be plotted to scale on a shaded relief map of Medusae Fossae region. Representative quantities will be depicted graphically using vectors. This will allow us to visualize patterns of wind, both direction and magnitude. On Earth, a ratio of 4:1 (length to width) would be expected under ideal conditions (see figure 1). Unlike Earth, the lithography of this region is largely consistent, thus not considered a possible extraneous variable that poses a risk of confounding our data. With the given data, both wind direction and magnitude appear highly variable throughout the Medusae Fossae region. We are currently in the process of considering other variables that might possibly affect the interpretation of our data.

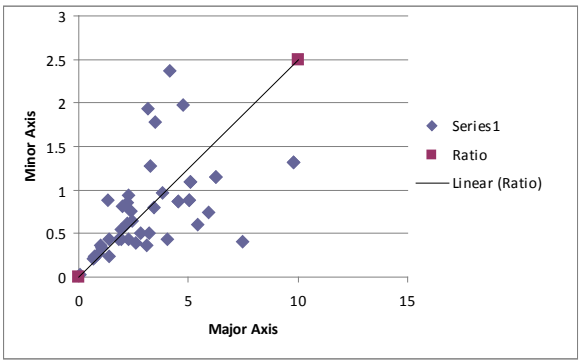

Figure 1: The graph above depicts the ratio of dimensions of the data points collected. Data points above the graphed line exhibit a ratio above 4:1 while data points below the line are less than 4:1.

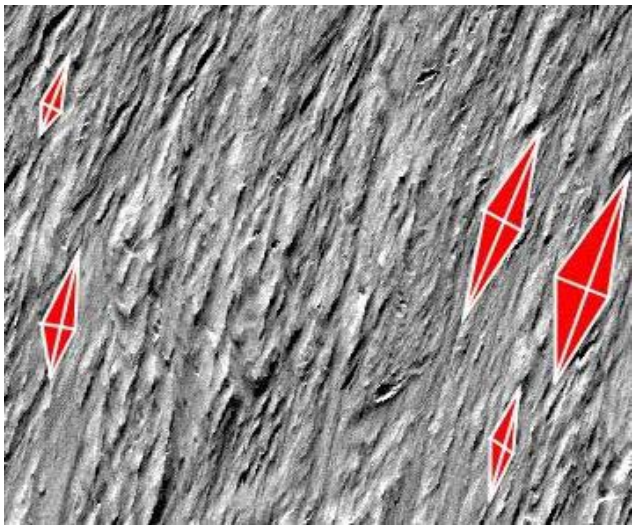

Figure 2: The image above represents the method in which data is taken for the project. The red figures depict the enclosed areas of individual yardangs. Each white line relates to either a major or minor axis.

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.