CHARACTERISTICS OF MORE THAN ONE MILLION TARS ON MARS. **M. Foroutan[1], J. R. Zimbelman[2],** [1]Department of Geography, University of Calgary, Canada (foroutam@ucalgary.ca), [2]CEPS/NASM MRC 315, Smithsonian Institution, Washington, DC 20013-7012, USA (zimbelmanj@si.edu).

Introduction: Aeolian processes are the dominant geological activity on Mars and decoding surface features is important for identifying Martian climate history. Transverse Aeolian Ridges (TARs) on Mars are mysterious aeolian features, which are considered to be unique to Mars. TAR origin, formation process and sediment sources are still unknown. The existing sample sizes in the literature for evaluating TAR metrics has so far been quite small e.g. [1-3].

Statistical theories suggest that for getting a good estimate of a population parameter, the size of the sample is crucial, even more than the accuracy of the measurement [4]. The main effort of this study is to make a comprehensive remote sensing analysis of TARs and discuss the properties of these bedforms with the best available data and very large sample size.

Methodology and Data: Considering the abundance of TARs on Mars and their diversity, we do not think that sample sizes of hundreds or thousands of these aeolian features are reliable enough to evaluate their formation or to introduce a classification scheme. In this study we use more than a hundred publicly released HiRISE digital terrain models (DTMs) to acquire sufficient sample size (more than one million individual measurements) for Martian TARs (e.g., Fig. 1). All metrics were measured with high precision in ArcMap, including height, the most debated metric regarding TARs and the hardest to measure from satellite images. We studied these factors in order to get a better understanding of the attributes potentially controlling their formation. Furthermore, this study presents a classification based on statistical analysis of the metrics with the scale of one million sample size. We also compare the morphometry of the Martian TARs to large mega-ripples on Earth.

Priliminary Results: Our study is still ongoing, but our primary dataset comparison (conducted from previous and current studies with large sample size in Figure 2) shows the range of Martian TAR metrics; for example, width is significantly expanded from <2 to about 200 meters, and a limitation of about 0.5 for height-to-width ratio on Mars. Early results also indicate a more robust classification based on these metrics. Comparing this large sample size of TARs to metrics of what have been identified as terrestrial analogs of TARs in the Lut desert of Iran [5] and the Puna of Argentina [6] shows considerable differences between width among these features. Different mean and distribution of morphometric parameters (particularly width) on both planets suggests that an expectation of the exact same metrics for these features on both planets may not be realistic.

Due to the global dry conditions of Mars and the abundance of a variety of aeolian processes, the availability of sediment material withn any size fraction influences the morphometry of the features. Our classification shows that only certain classes can be considered to have terrestrial analogs on Earth while other classes may be unique to Mars.

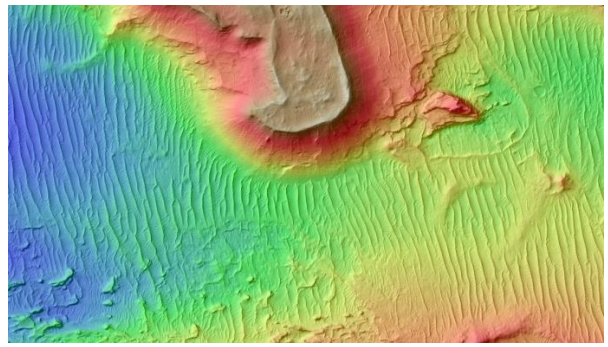

Figure 1. A view of TARS in the Aeolis/Zephyria Region of Mars from HiRISE DTM (DTEEC_020673_1750).

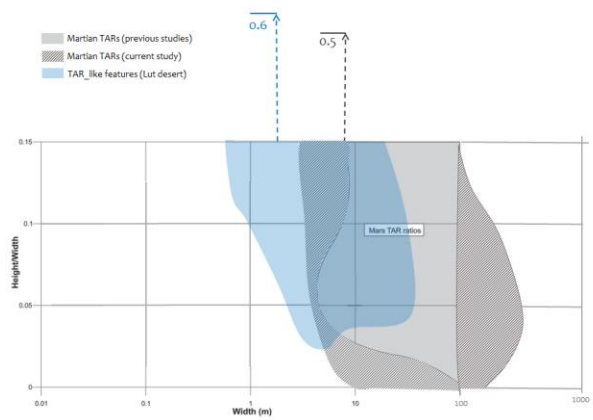

Figure 2. TAR height scaled by width, shown as a function of feature width using a logarithmic scale, which shows partial overlap with new data extracted from HiRISE DTMs and also previous extracted data from Mars. Modified from de Silva et al., 2013 [6].

References:

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