TRANSVERSE AEOLIAN RIDGES AS SEEN IN HIRISE IMAGES COMPARED TO TERRESTRIAL ANALOGS. K. M. Shockey and J. R. Zimbelman, CEPS/NASM MRC 315, Smithsonian Institution, Washington, D.C., 20013-7012; Shockeyk@si.edu.

Introduction: Recent HiRISE images have allowed us to see surface features on Mars that have not been seen previously at the meter scale, with the highest resolution yet seen from orbit [1], though topographic data outside of HiRISE stereo pairs have yet to reach a comparable resolution. Photoclinometry is a tool that can allow us to derive a topographic profile for certain areas of selected portions of HiRISE images. These images have significantly influenced the study of transverse aeolian ridges (TARs) [2, 3, 4], which have been previously interpreted to be either small sand dunes or large ripples [5].

Background: TARs are mostly high albedo nearly linear features that are found globally on Mars, though more concentrated near the dichotomy boundary [5]. In our study, photoclinometry was used as a tool to extrapolate topographic profiles from HIRISE images [2, 4, 6].

To date, we have used nine HIRISE images to create profiles in order to characterize TAR morphology. From these images we have extrapolated 65 individual profiles. Using these profiles, we quantified the width, height, and symmetry of each individual feature, and described the curvature of the TAR crest and the slopes on each side of the crest [2].

Methods: The various characteristics (width, height…) that were measured for the TARs (see Shockey and Zimbelman 2010 [2]) were also measured for ten Terrestrial examples; three granule ripples and seven traverse dunes [6].

Results: For the terrestrial results, there is a very distinct divide between ripples and dunes (Fig. 1), which takes into account variations in width as a function of width/height.

Discussion: Our results indicate that we are profiling TARs that were previously too small to be characterized geomorphologically. When compared to profiles of aeolian bedforms measured in the field [4, 7], we hope that the measured Martian profiles will be able to constrain the probable origin of diverse TARs on Mars.

When compared to the ten terrestrial examples that were analyzed in the same manner as the Martian TARs, the width for the TARs fell in between fields representing dunes and megaripples (Fig. 1), with the dunes being larger and the megaripples being smaller. The TARS were bigger on average than the height, circle ratio (comparing the overall curvature at the crest to the width of the TAR), height/width, and the overall slope for both the terrestrial examples of dunes and ripples. The terrestrial examples were bigger on average than the TARs when comparing the symmetry ratio and width/height (though the maximum for the TARs was much bigger than the terrestrial examples). Taking all of these measurements as separate entities, false conclusions could be made. If we look at all of the geomorphologic characteristics as a whole and compare the Martian verses the Terrestrial examples, we get a better picture. These comparisons of the descriptors don’t seem to give us enough information to distinguish if most TARs are ripples or dunes.

Figure 1 uses a much larger terrestrial sample size than the ten terrestrial examples analyzed in the previous geomorphologic characteristic discussions. With a break between the ripples and the dunes for the terrestrial examples, the TARS fall a little more to the center of the two, though, they overlap the smaller reversing dunes. The discrepancy with the Terrestrial and Martian data could be due to differences between the two planets, for example, gravity or weathering conditions.

Conclusions: We were able to further study the shapes of individual TARs and their given characteristics, expanding on previous work that used MOC [8], through the use of photoclinometry on HiRISE image data. This gives us the highest resolution topography yet available.

Expanding on previous geomorphologic studies and adding the classification system determined by Balme et al. (2008) [3], we are able to better understand the processes that formed these TARs, such as the surficial wind directions and how active they are. Future work will include studying more HiRISE images to have a more comprehensive coverage of the Martian surface. We will also include studies of whether these features are considered to be active or not, as well as how degraded they appear. Pairing our work with these other Terrestrial studies will allow us to assess and understand these features better than what can be obtained only from the Mars images.

References: [1] McEwen et al. (2007) JGR [2] Shockey K. M. and J. R. Zimbelman (2010) *LPSC XXXXI*, Abstract #1423. [3] Balme M. et al. (2008) *Geo-morph*, *101*, 703-720. [4] Shockey K. M. and Zimbelman J. R. (For submission to EPSL special issue from Planeetary Dunes workshope). [5] Shockey K. M. and Zimbelman J. R. (2008) *LPSC XXXIX*, Abstract #1686. [6] Zimbelman J. R. (2010) *Geomorph.* [7] Zimbelman J. R. et al. (For submission to EPSL special issue from Planetary Dunes workshop). [8] Wilson S. A. and Zimbelman J. R. (2004) *JGR 109*, E10003.

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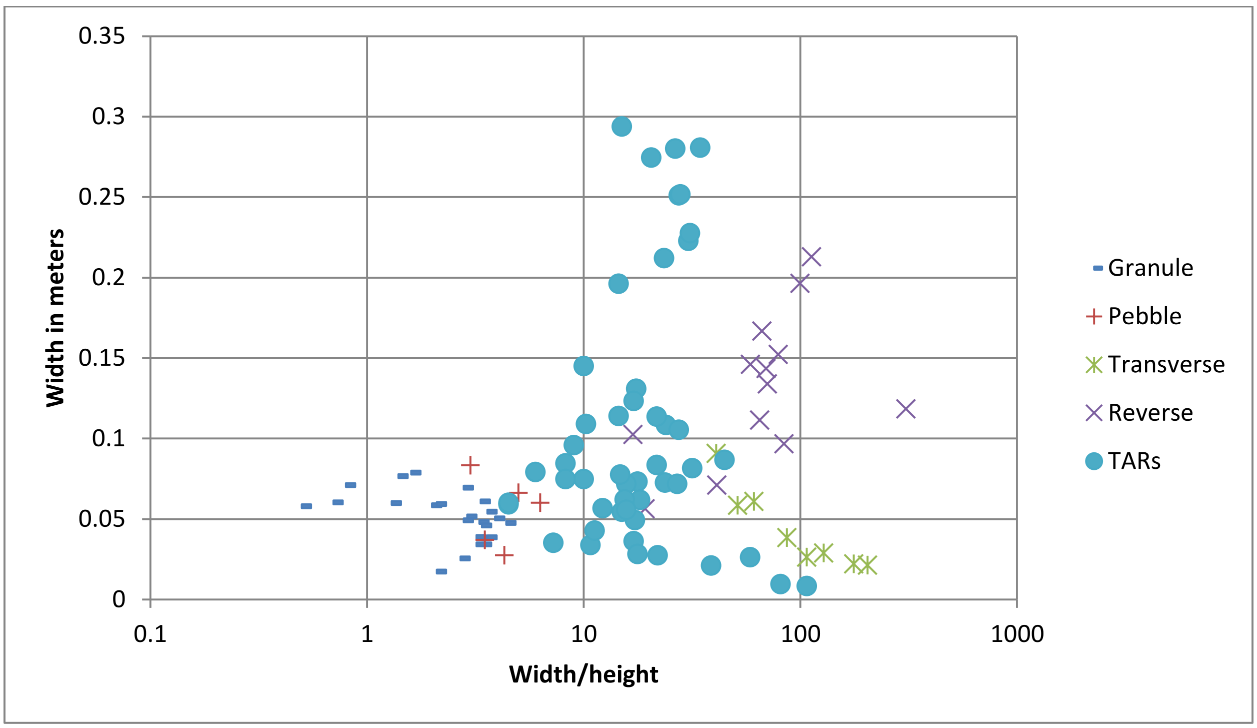

Figure 1: Terrestrial dunes (reverse and transverse) and terrestrial ripples (granule and pebble) plotted as width vs. width/height. TARs mostly overlap with the terrestrial reversing dunes, though they are intermediate between the terrestrial ripples and dunes.