INFLATED PAHOHOE IN CTX IMAGES IN THARSIS REGION. R. C. Montesi[1], J. R. Zimbelman[2]. [1]St. Anselm's Abbey School, 4501 South Dakota Ave NE, Washington, D.C. ryan.montesi@gmail,com [2]CEPS/NASM, Smithsonian Institution, Washington, DC 20013-7012, zimbelmanj@si.edu

Introduction: On Earth, basaltic pahoehoe lava flows emplaced as thin sheets can undergo inflation and expand to heights of over 10 m [1, 2]. Previous research has found evidence for similar inflated flows on Mars in and around the Tharsis Montes region in Thermal Emission Imaging System (THEMIS) images, as well as in more detailed Context Imager (CTX) frames [3, 4]. The presence of inflated lava flows could indicate that some martian lava was emplaced at a far slower rate than previously imagined; on Earth, pahoehoe sheets have had flow speeds on the order of cm/s [2]. This is in contrast to turbulent flows, which to form martian topography can require velocities of 13 m/s [6]. A'a tends to have a velocity between pahoehoe and turbulent flows [8]. Now, as more CTX images have been collected, entire flows can be seen, making clear that the entire flow is likely comprised of pahoehoe lava.

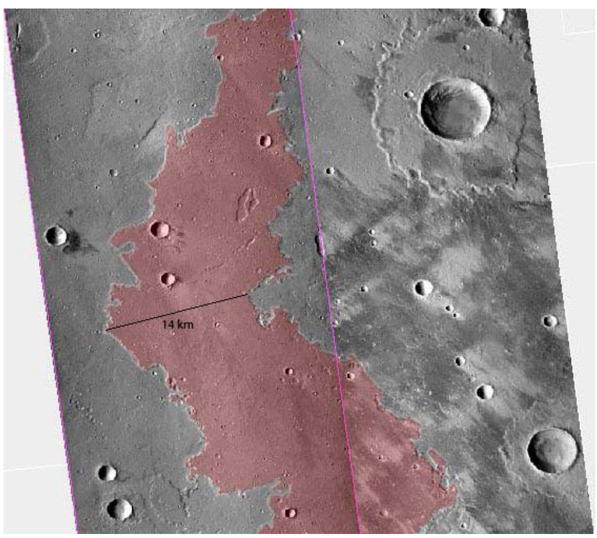

Figure 1: Outline of an inflated flow in CTX imagery near 27.721N, 271.91E. The flow margin is in places 34 m high.

Methodology: Inflated lava flows were searched for in images collected by the Context Imager (CTX) camera, mounted on the Mars Reconnaissance Orbiter. The search was constrained to the volcanic plains in and around the Tharsis Montes region of Mars. When a candidate flow was found, surrounding CTX images were analyzed to create a more complete picture of the inflated flow. In order for a feature to be considered a possible inflated flow, its surface texture had to be smooth at CTX resolutions (approx. 6m/pixel) [5]. Where possible, images from the High Resolution Imaging Science Experiment (HiRISE) [7] camera of the flow surface were also examined to ensure that the surface texture of the flow was really that of an inflated pahoehoe flow. In addition to smooth surface texture, potential inflated flows also have a clear, but irregular margin and lack a central channel [4]. Once a flow was mapped out, its height was measured using the shadow length at the margin.

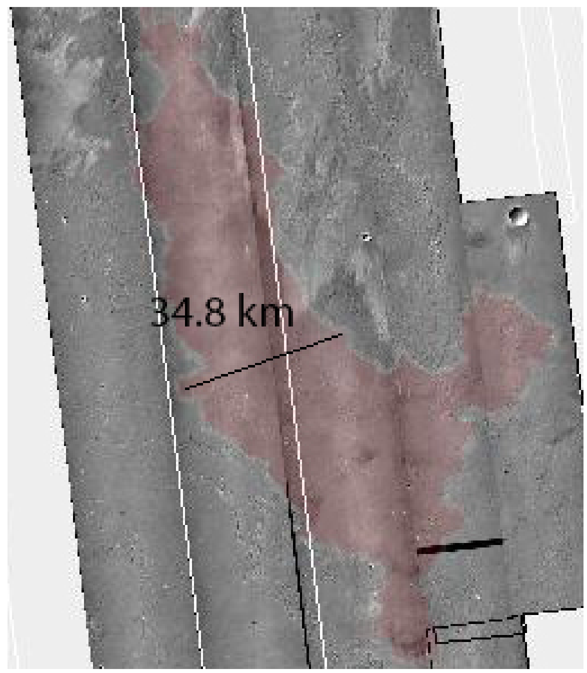

Figure 2: An inflated flow, or perhaps several seen in CTX imagery near -11.228N, 247.45E.

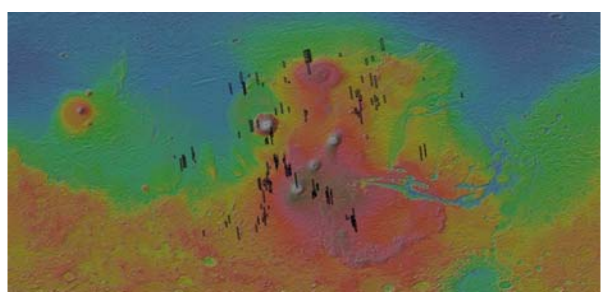

Figure 3: Outlines of the CTX stamps examined for this study on top of THEMIS Day IR imagery with MOLA background. Most of the stamps examined are located in flat plains, and rarely cover volcanic slopes.

Results: Out of 148 images examined, 33 (22.2%) showed possible inflated flows, with 34 possible flows identified (some images showed multiple flows while others showed different parts of the same flow). 8 images (16.6%) were considered to show very strong candidate potential flows. We do not believe that this high percentage of images containing potential inflation features (a previous study found flows in 1.6% of images), is due to a small sample size, but rather to the fact that the selection of images was biased towards areas where inflated flows would most likely be found, i.e., where the local terrain is relatively flat, less than 2° [4, 1]. The previous study examined images that included areas such as the slopes of volcanoes on which inflation is not possible [4].

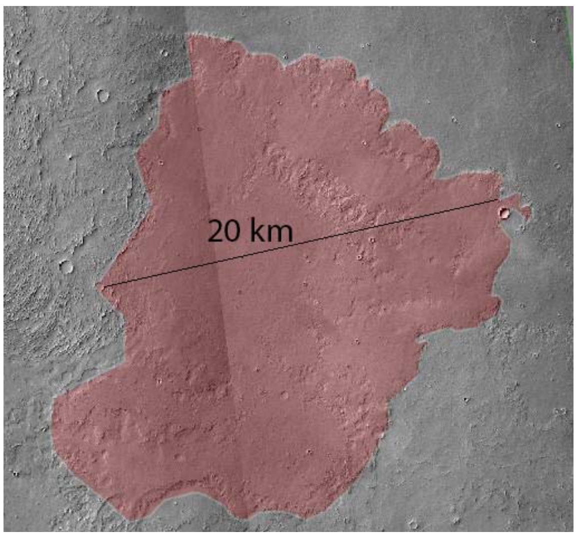

Figure 4: An inflated flow on the far right of Figure 2, seen in CTX imagery near -11.54N, 247.55E. The flow margin is in places 8 m high.

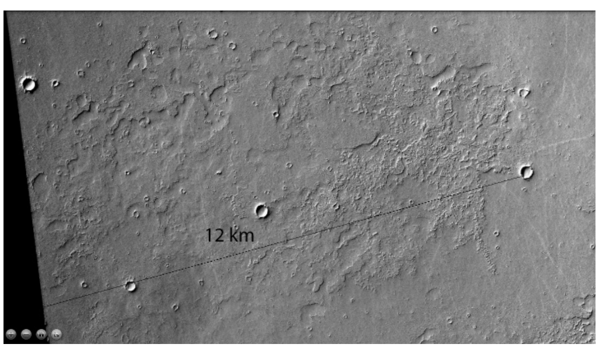

Figure 5: Closeup of one interaction between multiple flow lobes or perhaps multiple flows in Figure 2. These textures were common in the potential inflated features examined. Some can also be seen Figure 4.

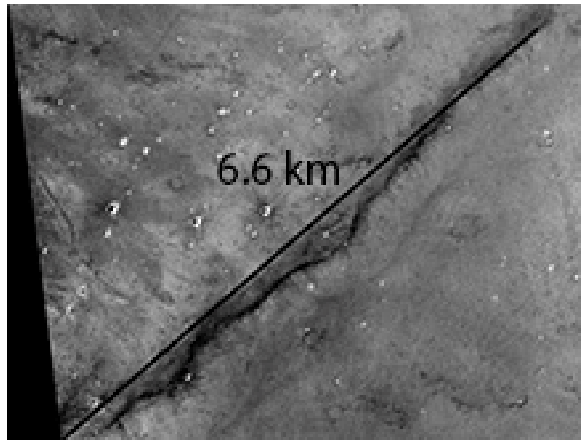

Figure 6: Though it is smooth at CTX resolution, this is likely not an inflated flow because the nature of the margin is not consistent with that of inflated flows. Taken from CTX frame B20_017373_1674_XI_12S107W.

References: [1] Hon, K. et al (1994), Geol. Soc. Am. Bull. 106 351-370. [2] Self, S, et al (1996), GRL Vol. 3 No. 19 Pages 2689-2692. [3] Wishard, C. et al (2013), LPSC XLIV Abs. 1631. [4] Graff, M and Zimbelman, J (2012), LPSC XLIII Abs. 1144. [5] Malin, M. et al (2007), JGR Vol 112, E05S04. [6] Jaeger, W. et al (2010). Icarus 205, 230-243. [7] McEwen A.S. et al. (2007) JGR Vol 112, E05S02. [8] Rowland, S. K. and Walker, G. PL (1990), Bull. Of Volcanol. 52:615-628