Searching for Maars on Mars: Ravi Valles, Xanthe Terra, and Arena Colles. D. M. Robinson[1], C. A. Helm[1], and C. G. Hughes[1] [1]EKU Department of Geosciences, Richmond KY USA christopher.hughes@eku.edu

Introduction: Data on Mars is being collected to provide evidence for a history of groundwater beneath the Martian surface. Finding evidence for the presence of liquids beneath the surface would provide additional evidence and support for habitable conditions existing currently, or in the past, on Mars. This finding could lead to future discoveries and uncover even more about Mars and overall, increase our knowledge of the red planet. To achieve this, we are searching for maars. Maars are depressions caused by volcanic explosions, in which magma interacts with volatiles in the subsurface. Their discovery would be a key to finding groundwater beneath the Martian surface [1]. We know that if we find evidence of a volcano then we may find maars located nearby. Interactions of magma or lava from a volcano interacting with water and ice is very common on Mars [2]. When phreatomagmatic eruptions happen, there are two potential outcomes. One is less substantial, and results in gas and magma. The other is called a "wet" eruption because the magma will mix with groundwater and ground ice [2]. This leads us to the knowledge of looking for maars while attempting to discover groundwater.

Motivation: What motivates us to conduct research on Mars is the passion that we have for planetary science and its advancement. By using remote sensing and the knowledge that we have learned in our Geoscience courses, we are able to determine what the depressions might be specifically, such as craters, lava flows, or even maars. Having the opportunity to be a part of this research is a phenomenal experience and has many beneficial outcomes for the planetary science community. The ability to learn more and be able to put forth what we have been learning so recently is a one of a kind venture.

Methodology: In Ravi Valles and Xanthe Terra, we collected data through mapping depressions that are at least one kilometer wide in a 1° by 1° square. For Arena Colles, we mapped depressions smaller than 1 kilometer as well. Mapping was done using the JMars [3] program. JMars allows us to see images of Mars from different data sets, that are co-located, and to create our own polygons (or points or lines) on top of this data to show our mapped depressions. The mapping we did for this project was accomplished by using high-resolution CTX [4] images in order to better view the Martian surface. We displayed the CTX data at a resolution of 8,192 pixels per degree while mapping. We then mapped the depressions on this using a Custom Shape Layer to form our polygons, points, and lines. We also used HiRISE [5] data to get a better look at what we were mapping. We have mapped numerous surface features in the Ravi Valles (Figure 1), Xanthe Terra (Figure 2), and Arena Colles (Figure 3) areas.

Initial Results: In Arena Colles (Figure 3), there were two 1° by 1° areas mapped. Nearly 800 depressions were mapped in these two degree boxes within Arena Colles. In Ravi Valles (Figure 1), there were a total of 163 depressions mapped. In Xanthe Terra (Figure 2) there were a total of 83 depressions mapped within eight 1° by 1° areas. Most of the mapped depressions appear to be caused by primary or secondary impact craters, but there are some depressions that appear to possibly have other causes. All depressions will have a shape analysis done on them in the future, and where possible, factors such as slope and depth:diameter ratios will be examined.

References: [1] Graettinger et al. (2017) *LPSC XLVIII* #1112 [2] Brož and Hauber (2013) *JGR Planets 118*, 1656-1675. [3] Christensen et al. (2009) *AGU Fall Conference* [4] Malin et al. (2007) *JGR Planets 112* [5] McEwen et al. (2007) *JGR Planets 112*

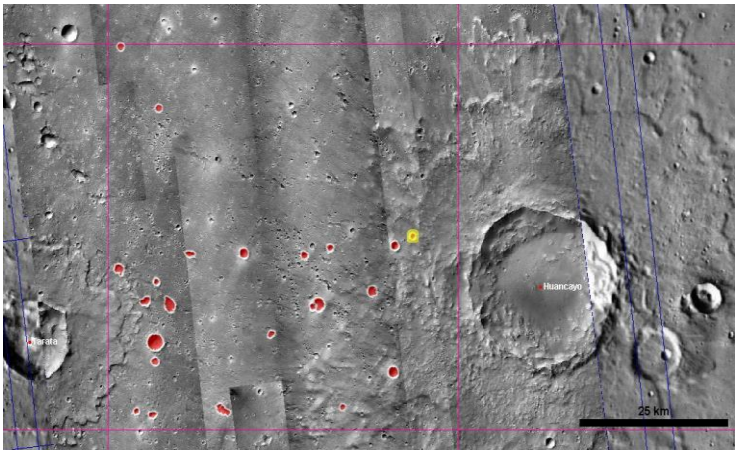

Figure 1. This is a region of Ravi Valles, centered near 319.85° E, 3.47° S and shown at 512 pixels per degree resolution. There are 23 depressions mapped within this figure, ranging in size between 1 and 2.5 kilometers in diameter.

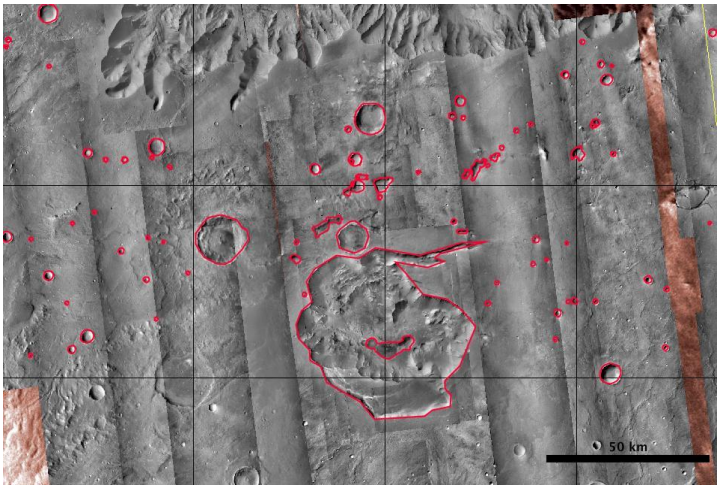

Figure 2. This is a subset of the Xanthe Terra region of interest, centered near 297.87° E, 6.31° S at 256 pixel per degree resolution. There are 83 depressions mapped within this figure, within a total of eight 1° x 1° squares. Mapped depression diameters range between 1 and 50 kilometers.

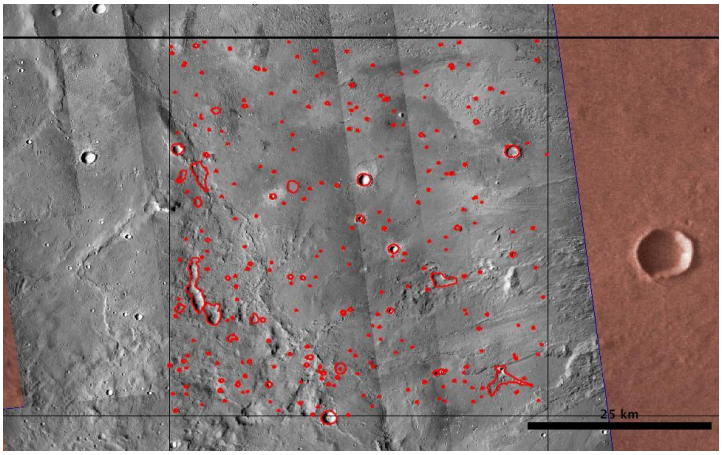

Figure 3. This is one of the two 1 x 1 squares mapped in Arena Colles, centered at 85.57° E, 29.53° N, and shown at 512 pixels per degree. There are 269 depressions mapped in this 1° x 1° square, ranging in size from 0.25 to 8 kilometers in diameter.