INVESTIGATION OF SILOE PATERA AND THE SURROUNDING AREA: POSSIBLE EVIDENCE OF AN ANCIENT VOLCANIC CALDERA ON MARS. C.A. Wilkes[1] , D.T. King, Jr.[1], S.P. Wright[1],
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Introduction: Most of the volcanic features on Mars can be characterized as flood lavas, shield volcanoes, and fields of small vents [1, 2]. However, a new type of irregularly shaped volcanic construct, labeled plains-style caldera complexes, was recently discovered within the Arabia Terra and has led to the examination of other possible ancient calderas in the surrounding area [3, 4]. These calderas are characterized by low topographic relief as well as collapsed features and plains lavas [5]. One such feature is Siloe Patera (Figure 2) which might consist of a nested set of depression possibly formed by collapse. A lack of typical impact characteristics, as well as closer examination of the structure, likely places Siloe Patera in the plains-style caldera complex category.

Siloe Patera is located in the Arabia Terra at 35.23N, 6.5E and is approximately 40 km by 30 km in diameter (NS and EW). Its age has not been dated but is suspected to be Early Hesperian or older and has likely been modified by a complex history of erosion and deposition of the Arabia Terra [6, 7]. Siloe Patera main features are characterized by two collapse features, possible sagging due to removal of a pluton at depth (S-SE), and a possible lava flow (SW). Siloe Patera shows no signs of ejecta, an impact-induced central peak, or other common characteristics of impact craters [5]. What appears to be a mass wasting event or ash that fell back into the crater could be misinterpreted as a central peak; however, when compared to that of a typical impact crater of the same size, the differences are apparent (Figures 2, 4). To the south-southeast of the rim is a feature that appears to be subsidence and due to a pluton moving out of the area at great depth (Figure 1). To the southwest, possible lava flows or pressure ridges appear and will require HiRISE images to fully analyze these features.

Materials and Methods: The Mars Reconnaissance Orbiter (MRO) provides a variety of images that are being used for this research. Images from the High Resolution Imaging Science Experiment (HiRISE) are precise enough to detect a vertical displacement of 25 cm [8]. Due to the high resolution, the entire Martian surface cannot be imaged so specific areas must be requested. These images will allow for a close up look at some of the features of Siloe Patera that are not visible with currently available images. Google Mars provides quick and easy access to many image types, including HiRISE, Context Camera (CTX), Daytime Infrared, and Nighttime Infrared. Currently, CTX images cover Siloe Patera and provide images with a resolution of 8 meters per pixel [8]. Using Jmars, a colorized elevation map was rendered out of Siloe Patera and the surrounding area to help show the depth and other features (Figure 1). Jmars also provides a feature which produces a topographic profile of a selected line segment (Figures 3, 5, 7). Using Jmars, numerous topographic profiles of craters and calderas will be rendered and compared to Siloe Patera to determine it origin (Figures 2, 3, 4, 5, 6, 7).

References: [1] Carr, M.H., (1937) JGR 78, 20. [2] Greeley, R. & Spudis, P.D., (1981), Rev. Geophys., 19. 1, 13-41. [3] Michalski et al. (2012) LPSC #1392. [4] Bleacher & Michalski (2012) GSA # 38-6. [5] Barlow, N.G., & Bradley, T.L., (1990), Icarus, 87, 156-176. [6] Fergason, R.L, & Christensen P.R., (2008), JGR 113, E12. [7] McGill, G.E., (2000), JGR, 105, E3, 6945-6959. [8] McEwen, A.S. et al., (2007), JGR 112, E05S02.

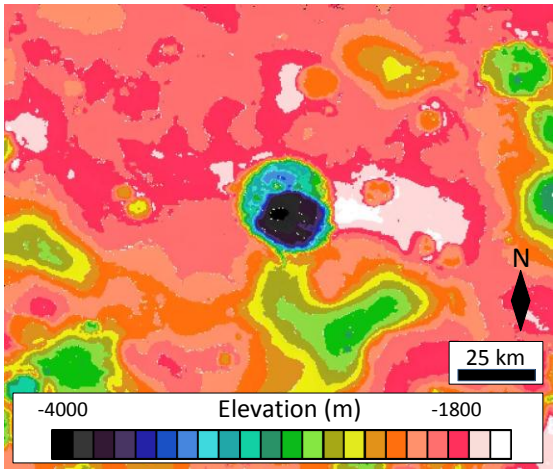

Figure 1: Colorized elevation map of Siloe Patera and the surrounding area.

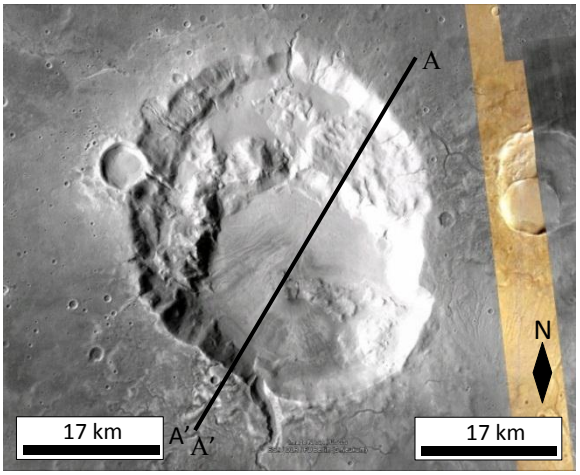

Figure 2: A CTX image of Siloe Patera.

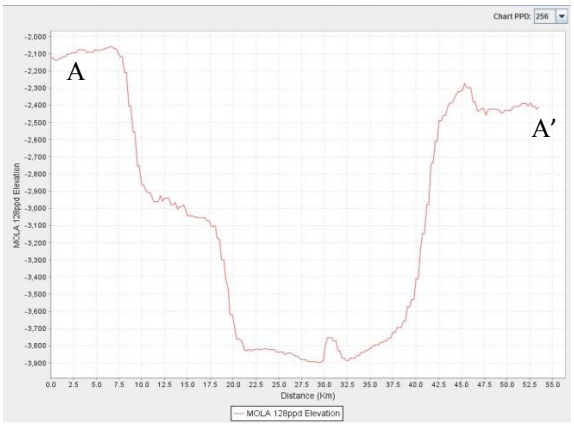

Figure 3: Topographic profile of Siloe Patera.

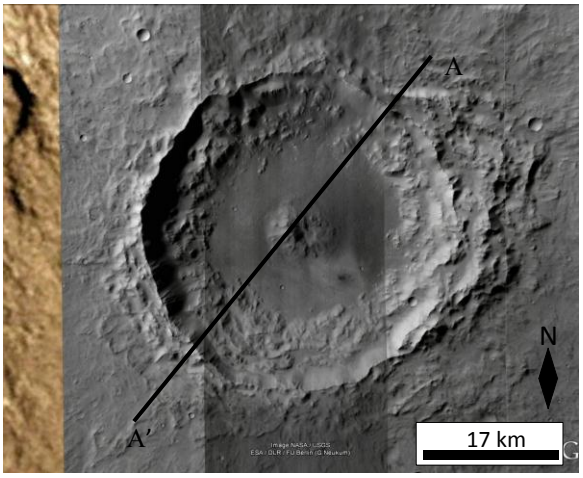

Figure 4: A CTX image of a typical crater roughly the same size as Siloe Patera.

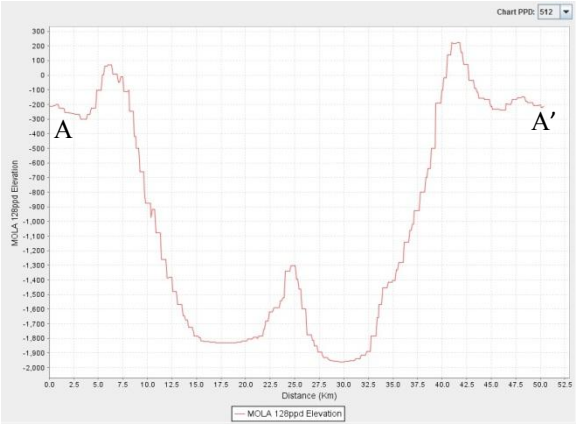

Figure 5: Topographic profile of a typical crater.

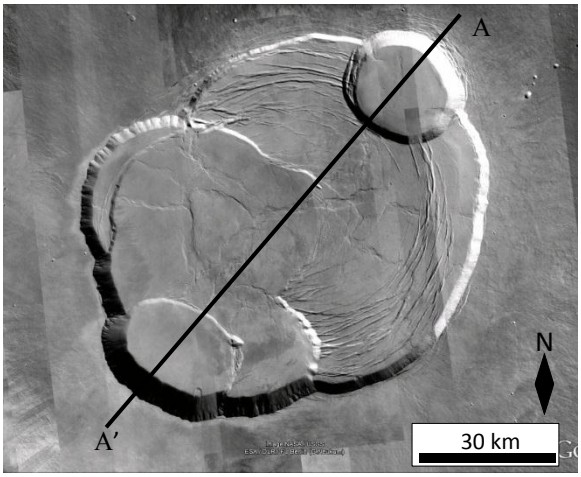

Figure 6: A CTX image of Olympus Mons's caldera.

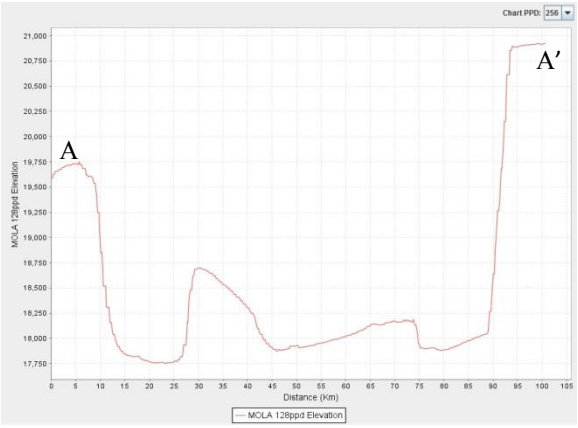

Figure 7: Topographic profile of Olympus Mons's caldera.