TESTING FOR [THE PRESENCE OF] CENTRAL PIT PALEO-LAKES ON MARS, AN UPDATE. S. E. Peel[1] and D. M. Burr[1], [1]University of Tennessee, Knoxville, Tennessee, USA (speel1@vols.utk.edu).

Introduction: Paleo-lakes on Mars have been proposed to occur in a variety of topographic basins including craters (e.g., [1-7]) and the central pits of central pit craters (Fig. 1; [8-9]). Previous work identified 96 floor central pit craters that contained valley networks leading towards the central pits (Fig. 2; [8]). Central pit lakes are suggested by (1) calculated paleochannel discharges showing the central pits may have filled in the past [8], (2) putative outlet channels [8], (3) putative deltas, identified by morphology, located at the termini of valleys [8], (4) sedimentary fan longitudinal profiles consistent with deltas [9], and (5) polygonal ground suggestive of dessication cracks [9].

In this work, we report on our ongoing work to test the hypothesis that the central pits of central pit craters once hosted paleo-lakes. This year, we are presenting updated results of the investigation into the potential former presence of lakes in central pits, including new criteria for identifying paleo-lakes.

Methods: *Formation of Polygonal Crack Pattern*: Polygonal ground pattern(s) can be formed due to drying (dessication cracks) or ice-content (ice-wedge polygons). In order to more quantitatively determine if the previously identified polygonal ground pattern in a central pit [9] formed by dessication, we are collecting morphometric data about the number of sides, the angles and roundness of the polygons observed and comparing them to large dessication cracks observed on Earth [10-11] and ice-wedge polygons. The morphometric data for the central pit cracks is being collected using HiRISE [12] imagery in ArcMap [13]. The data for the large Earth dessication cracks [10-11] and ice-wedge polygons are being collected using EarthExplorer (earthexplorer.usgs.gov/). Power analyses are being conducted in RStudio [14] using the *pwr* package [15] to determine the sample size necessary given selected values of α=0.017, β=0.067, P=0.933 for each of the tests and the minimum effect size (ES) that can be detected (difference from statistical null hypothesis, [16-17]).

Sedimentary Fan Grain Size Spatial Distribution: Alluvial fans and deltas have different distributions of sediment due to their differences in depositional processes. Deltas can deposit fine grains (clays and silts) from topset to bottomset beds as long as clays and muds are available in the source region, though sand-rich regions can form between the delta plain and prodelta regions [18]. Sands, cobbles and boulders are concentrated in distributaries [18]. Alluvial fans concentrate fine grains (clays and muds) at their toes [19]. Because sediment smaller than a boulder (≥25cm) cannot currently be identified visually on Mars from orbit, thermal inertia information is being used to identify the pattern of sediment deposition on the sedimentary fans within the central pits following the methodology of [20-21]. This method also allows for depositional features to be observed, as long as the resolution of the dataset is appropriate for the feature investigaged [20-21]. We use the THEMIS thermal inertia images accessible through JMars for this analysis.

Sedimentary Fan Profile Lines: Last year [9], we found that many of the sedimentary fans within the central pits have concave down longitudinal profiles. These profiles are consistent with a delta morphology, as opposed to concave up which is consistent with alluvial fans, although this correlation was not previously quantified. In order to compare the overall shape of the fans, we are quantitatively determining curvature for the sedimentary fans on Mars and Earth.

Stratigraphy: Some of the sedimentary fans that are present within central pits have been eroded to some degree, which precludes their inclusion in many of the tests used in this project. HiRISE DEMs can be used to investigate the stratigraphic relationships recorded in sedimentary fans on Mars to determine their origin [22]. We are using similar methodology to [22] to investigate the origin of the sedimentary fans in this investigation.

Spectral Analyses: We are conducting spectral analyses of the exposed deposits within the central pits in order to identify any evaporite mineral deposits present in the 96 central pits. In order to complete these analyses, CRISM multispectral and hyperspectral (where available) images [23] are being used. This criteria is limited to central pits within minimal dust coverage as identified by the THEMIS Dust Cover Index [24].

A more detailed description of our methods and results will be given in our conference presentation. We look forward to any suggestions from the community regarding our methods.

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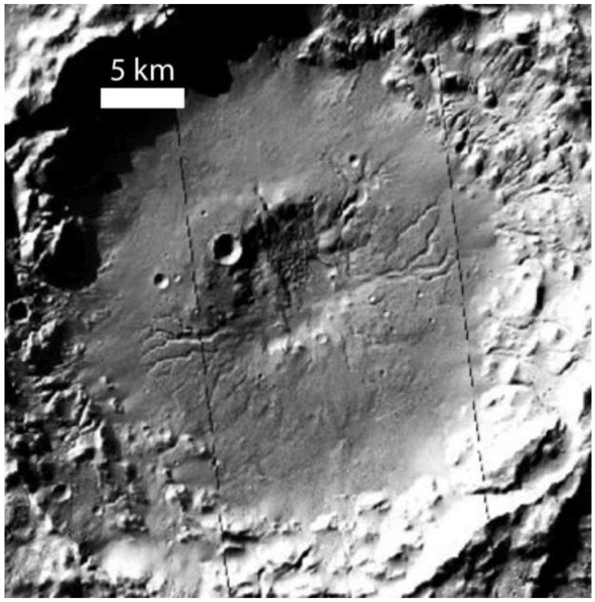

Fig. 1: Example of central pit crater in CTX imagery with interior valley networks. The central was proposed by [8] to host a paleo-lake.

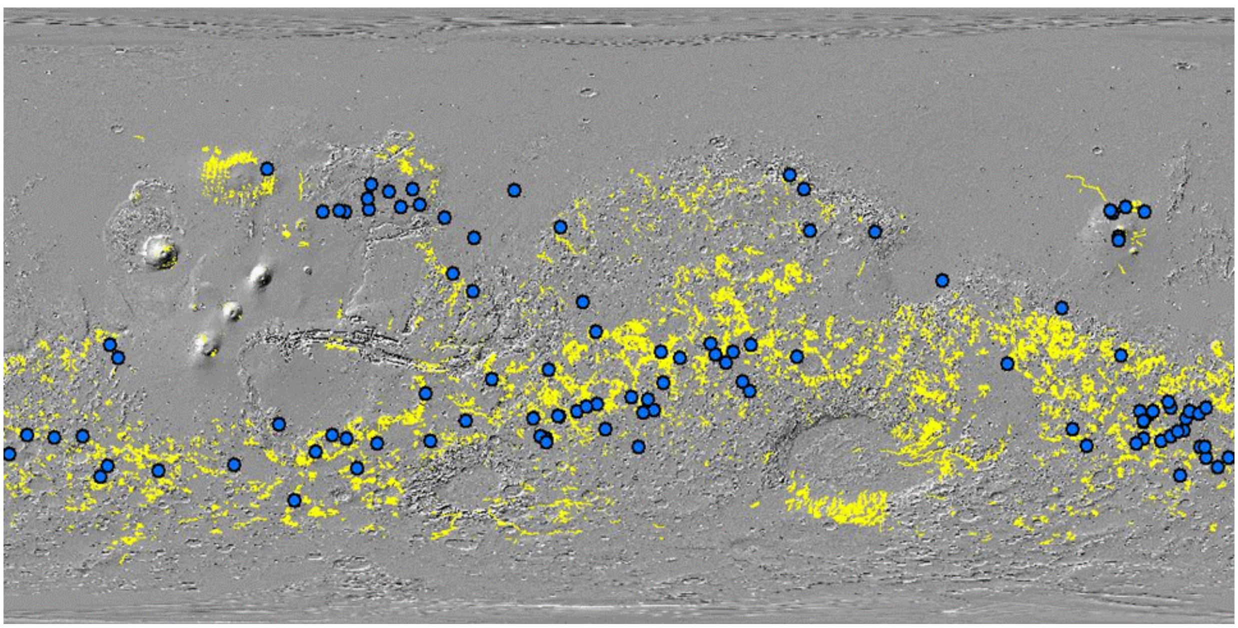

Fig. 2: MOLA hillshade basemap with the global distribution of central pit craters with valley networks as identified by [8] in blue. Yellow lines show the global distribution of valley networks identified by [25].