GEOLOGIC MAPPING AND GEOMORPHIC ANALYSIS OF POSSIBLE QUENCHED LAVAS IN WESTERN ELYSIUM MONS, MARS. F. B. Wroblewski[1] and E. Rader[1], [1]Department of Geography and Geological Sciences, University of Idaho, Moscow, ID, 83843. (frankw@uidaho.edu)

Introduction: The Elysium Mons volcanic system is scattered with lava flows and fluvial systems across the volcanic surface. Here, we map a particular subset of this system located on the western flank (~17°N, 135°E) where lava flows units appear to interact with the surrounding fluvial system.

Areas of explosive lava-water interaction have been potentially identified on the southern and eastern edges of Elysium Mons through the presence of cone-like features juxtaposed along lava flow beds [2]. Other flow features along Elysium Mons, especially those associated with fluvial systems, may hold similar features indicative of lava-water interactions and have not been fully mapped in detail.

Here, we describe a preliminary analysis to site selection and flow mapping of possibly quenched lavas with the potential to hold key VNIR and IR signatures suggestive of lava-water interaction.

Data: Flows were identified in THEMIS day and night imagery with margins being mapped within HiRISE imagery. Maps were produced in ArcGIS Pro 2.7.3.

Lava-Water Interaction: Quenched lavas, or molten rock which rapidly solidifies from the contact of

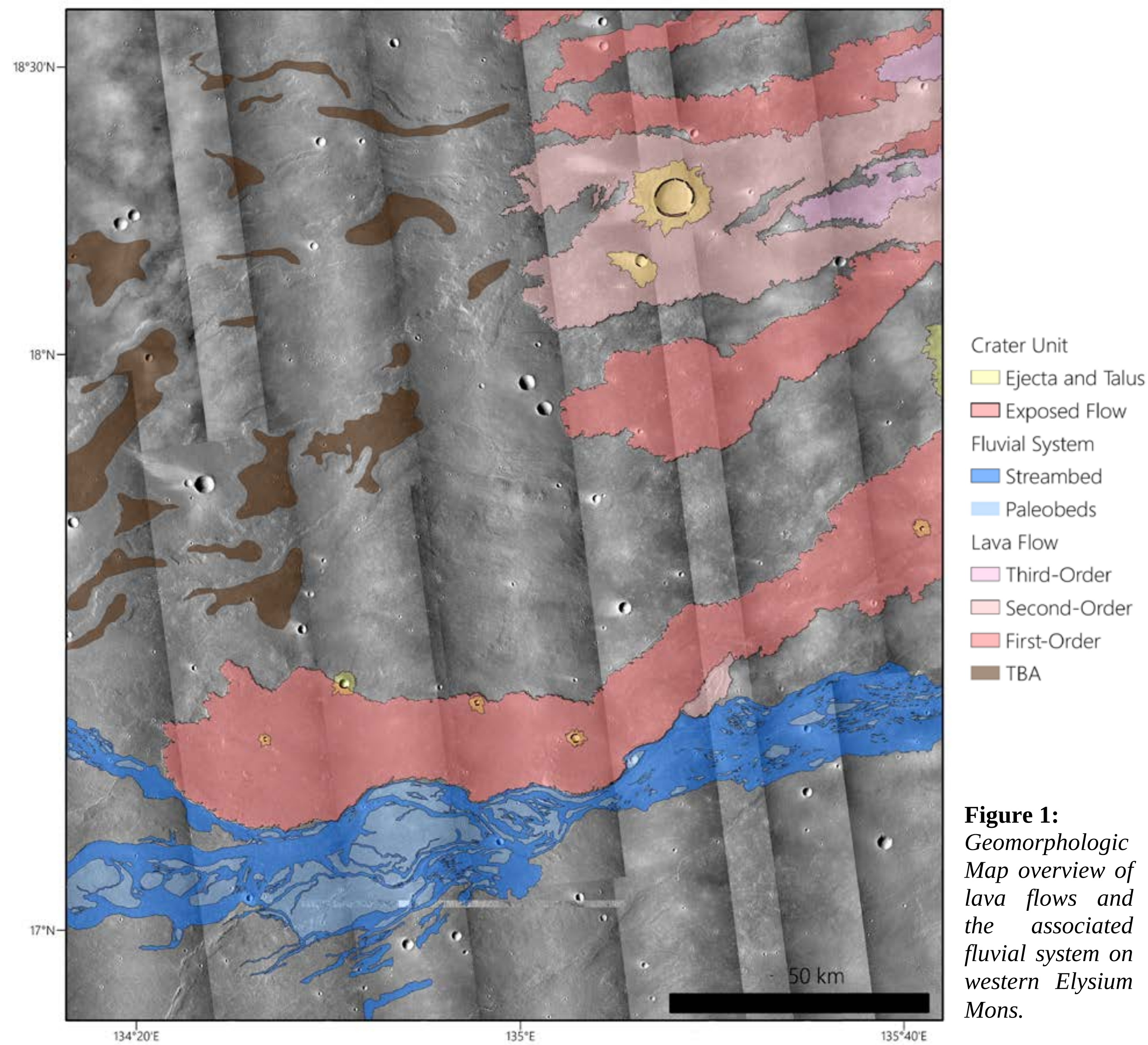

Figure 1: *Geomorphologic Map overview of lava flows and the associated fluvial system on western Elysium Mons.*

water or other cold materials, contains larger proportions of glass within their groundmass content. Our precursor studies have shown patterns within VNIR and IR reflectance compared to glass content of specific areas atop lava flows [2,3]. With changes in glass content, or crystallinity, an inference can be made connecting the cooling and quenching history of lava flows and their reflectivity.

Site selection for the analysis of VNIR and IR reflectance is on-going. In our proposed site, we examine a series of lava flows where the crosscutting relationships between volcanic, fluvial, and crater impact processes may potentially enable us to analyze VNIR and IR signatures of the lava.

Geomorphology: We mapped our study area at 1:10,000 and identified multiple series’ of lava flows, crater impact events, and fluvial systems whose origins may be coeval with the emplacement of the lava flows themselves. Classified morphologies are based on these three groups: lava flows, craters (flow exposure and unexposed), and the fluvial system (Figure 1). Mapped lava flows are defined as continuous margins delineating a specific flow unit, uninterrupted by later crater impacts. Craters of interest are positioned above or near the flow margins where the underlying material is exposed just underneath the ejecta or subsequent regolith. The fluvial system is mapped as the current or most recent stream-bed with braided mixtures of paleobeds in-between.

We further evaluated lava flow and volcanic feature distribution, and their stratigraphic position or order. Flows that intersect the southern-most and potentially quenched flows have been mapped in detail, with other older or more weathered flows highlighted for future mapping.

Future Work: VNIR and IR maps of our region analogous to the precursor study are in production. Initial site selection, such as on Elysium Mons, is important to recognize regions analogous to water-interacted lava flows, or flows which are coeval with aqueous processes.

Digital terrain model and elevation analysis will be needed to connect the morphological differences between the northern and southern sections of the area. Of particular interest currently are investigating the changes in kipuka density (regions entrained by lava flows), and the orientations between the fluvial juxtaposed flows.

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References: [1] Hamilton et al., (2010) *JGR: Planets, 115, E09006*. [2] Reeder A. et al., (2019) *50th LPSC, #2132.* [3] Odegaard K. et al., (2020) *AGU Fall Meeting*, #V016-0017.