THE MAP OF THE CHANNELS EAST OF OLYMPUS MONS. H. I. Hargitai1,2 and V. C. Gulick3, 1Eotvos Loránd University, 1088 Budapest, Múzeum krt 6-8. hargitai@caesar.elte.hu, 2SETI Institute, Mountain View, CA, USA.

Introduction: Multiple layers of lava flows and channels characterize the region adjacent to the eastern slope of Olympus Mons, the highest volcano on Mars. We have mapped this volcanic region to survey and classify channel systems and determine their ages and formative processes. As a final output of this mapping effort, we have produced a 1:1.6 million scale map (Fig. 1). The results of the geologic analysis had been published in [1], illustrated with small-scale maps.

Mapping details: We mapped channels, rilles, pits, streamlined forms, fractures, lava flow fronts and low volcanic shields in an area of approximately 2,800,000 km². We used 167 Mars Reconnaissance Orbiter CTX (Context Camera) images projected at 5.4–5.6 meter/pixel resolution, before the CTX global mosaic was published. Channels were mapped at a digital scale of 1:60,000, which corresponds to approximately 1:250,000 printed scale. Lava flow fronts and linear graben were mapped at 1:250,000 digital scale. We have delineated all streamlined forms and channels in this region using ArcMap, and we have identified several channels, islands and volcanic constructs that have not been previously mapped. In total, we have delineated ~1300 individual elevated forms, mostly streamlined forms that formed as islands, within the channels.

Geologic characteristics: Previous mappers identified a fluvial system within the tectonic Olympia Fossae [2] and Sulcii Gordi [3][4][5]. However, a less prominent channel with levees was found to be of lava origin [6]. Because of its complex geologic history, the channel forms in this region likely have formed by multiple processes, including hydrothermal, volcanic, tectonic and collapse, in many places along the same channel.

Nomenclature: We identified several types of channels that we grouped into channel systems. The channel systems are spatially proximal and originate from the same sources, although the channels or valleys may be morphologically distinct. We labeled each system with a local placename from the IAU nomenclature and a number. All names are informal. For example, one name was “Eunostos”. Eunostos at the time of mapping was a classical albedo name in the region, however, in 2021 we discovered that the IAU Planetary Gazetteer had a numeric misprint that misplaced the location of “Eunostos” by a hemisphere. Nevertheless, we decided to keep the Eunostos-derived informal designation here to be consistent with the published paper [1]. However, a procedure is needed on how we handle placenames that changed during the publication process.

Color ramp: The background layer shows topography, using the MOLA gridded data and THEMIS daytime IR mosaic. We developed a new color ramp for the MOLA elevations, starting from grey (depth) that transitions to yellow, and dark brown (highest elevations). The elevation difference in the scene is large: 18 km. We omitted all colors that have visual associations to vegetation or water, therefore we could only use the remaining colors, mixed from magenta, yellow and some cyan. We did not use the maximum saturation of magenta and yellow to be able to use magenta-only symbols; and we mixed grey from these colors to save black tint for the nomenclature and line symbols.

Map type. Planetary geologic maps are not the exact methodological equivalents of terrestrial geologic maps. Planetary geologic maps are generally constructed using the visible characteristics of the surface, and not 3D material (rock) mapping. We did not map geologic units, but focused on channel-associated landforms. Although the mapped features do not cover the entire surface as geomorphic units, the map shows features with different morphology, on a topographic background. While this map is a morphologic map, it is also close to physical geographic maps that synthesize the geographic knowledge of the surface and show a topographic base overlaid by thematic layers and nomenclature. In our case, the focus is on channel forms therefore the channel layer is the most prominent one, but other layers show a diverse set of landforms and features that contributed to the formation of the present surface.

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Fig. 1. The map of the channels east of Olympus Mons.