TOPOGRAPHICAL AND MORPHOLOGICAL ANALYSIS OF MAWRTH VALLIS TO TARGET EXOMARS ROVER. M.A. Ettahri[1] and A. Kereszuri[2], H. Hargitai[1] Eotvos Lorand University H-1053 Budapest, Egyetem tér 1-3 (amine.ettahri@gmail.com) , [2]Research Centre for Astronomy and Earth Sciences, Budapest

Introduction: Small scale surface analysis of the landing siteselection [1,2,3] of Mars mission is important for both planning the traversing, sampling locations and also to see the possiblites for scientific research there. ExoMars rover of ESA [4] will conduct the first two meter deep drill on Mars and among thetwo final candidate landing sites: Oxia Panum and Mawrth Vallis the later was analyzed as an example for terrain evaluation for the rover.

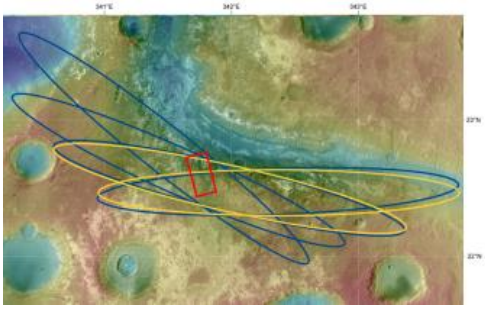

Fig. 1. Location of the study area (red rectangle) south of Mawrth Vallis. Yellow lines are 2018 landing ellipses of ExoMars, blue lines are 2020 landing ellipses. MOLA over

The area of this study is situated within the overlapping area of all landing ellipses calculated for the 2018 and 2020 ExoMars mission launch windows at the MawrthVallis candidate site (Fig. 1), where potential rover traverses run to cover part of the valley.This site is similar to a nearby candidate MSL landing site that contains some of the largest outcrops of phyllosilicate-rich rocks on Mars [5,6]. Clay minerals are in many ways favorable to the organization and preservation of organic matter, these deposits have a high preservation potential for biosignatures [7,8] and have an important scientific interest despite the strong erosion activity.

The studied area is mainly characterized by the presence of a large bright outcrop in the center and some other smaller scale locations (Fig. 2., D–D').Similar bright oucrops at another study site at an MSL candidate landing site west of Mawrth Vallis are interpreted as Fe smectite rich layer. This layer is in places fractured and polygonized. This layer occurs two sides of aN-S trending paleochannel, about 50–100 m deep and 1 km wide (Fig. 2., A–A' and C–C'), a southern tributary of Mawrth Valles, which is capped by a dark unit. A wedge shaped deposit at its terminus is also dark toned. We interpret it to be a paleodelta with minor feeder channels. A medium-toned layer, consisting of multiple strata, is covering Mawrth Valles and its broad overbank (Fig. 2., B–B'). These layered dark to gray units are similar to the capping unit of previous work in Mawrth vallis [8].There are small, heavily cratered hill-like outrops from this capping unit.The focus of this ongoing work is to highlight the topographic and morphological features of this area in order to classify and correlate with the main morphologies in the other parts of the Mawrth vallis.

Methods: All mapping activities were conducted by using the ArcMap 10.2.2 geographic information system (GIS) software package. We selected a 25 cm/px HiRISE PSP_002140_2025 orthorectified image within the candidate ExoMars landing ellipse and its corresponding HiRISE digital elevation model (DEM) (DTEEC_002074_2025_002140_2025_U01.IMG). Because the orthorectified images were processed using their corresponding DEM, no further co-registration was required in ArcMap.

We created a slope map based on the DTM and identified three classes that show small-baseline terrain roughness that can be used for rover traverse planning [9].

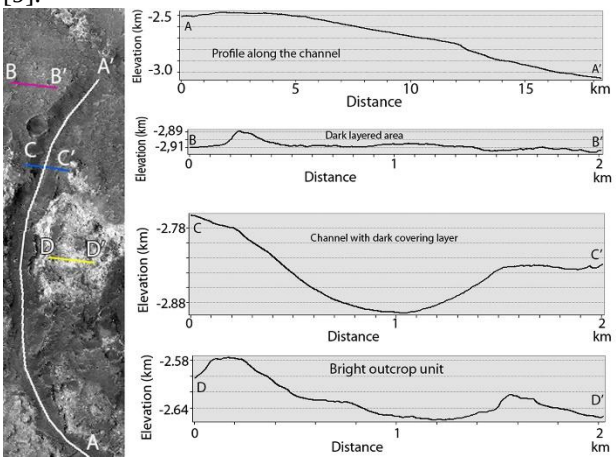

Fig. 2. Four profile lines in the Mawrth Valles study area. A shows the longitudinal profile of the terminus of the tributary to main channel Mawrth Vallis. B shows a profile along the dark layered unit, C is a cross-section of the channel and D is a part of the bright unit.

Discussion: Four views of the analyzed area are shown in Figure 3: a) a topographic view, b) the image mosaic, c) the slope map with three slope categories and d) a preliminary geologic map. The first results show that albedo and morphology correlate with differences in slope angles. While the smoothest terrain that is easiestfor traversing is the dark material at the channel which is also sand-covered in the middle of the channel. More topographic undulations are visible in the medium-toned material-covered area outside the

channel, probably because it coversthe originally rough terrain. The roughest unit corresponds to the bright outcrop.The largest slope angles (red colouring Figure 3c) occur usually along the border of the dark mantling material.

Conclusions on planning traverses: The traversing activity for the rover might require the most effort when crossing borders between the different surface units. The bright bedrock outcrop also provides a difficult terrain because of the small scale inhomogenities. We are working on selecting optimal routes that extends over smooth and gently sloping areas while provinding access for drilling each different material units and also enabling the rover to view (take pictures) of vertical exposures of long, uninterrupted strata at steep walls (red in Fig. 3c).

References: [1] Arvidson et al., 2007 *JGR* 113(E6); [2] Golombek et al., 2009 *40th LPSC* #1409; [3] Bridges et al., 2003 *JGR* 108(E7) E001820; [4] Vago et al. 2014 40th *COSPAR* 1–9-14; [5] Poulet et al. 2005 *Nature* 438(7068), 623–627 ; [6] Loizeau et al. 2007 *JGR* 112, E08S08; [7] Bishop et al. 2013 *Planet. Space Sci.* 86, 130–149 ; [8] Loizeau, et al, 2015 *JGR* 120, JE004894; [9] Golombek et al. 2012 *Space Sci. Rev.* 170 (1–4), 641–737.

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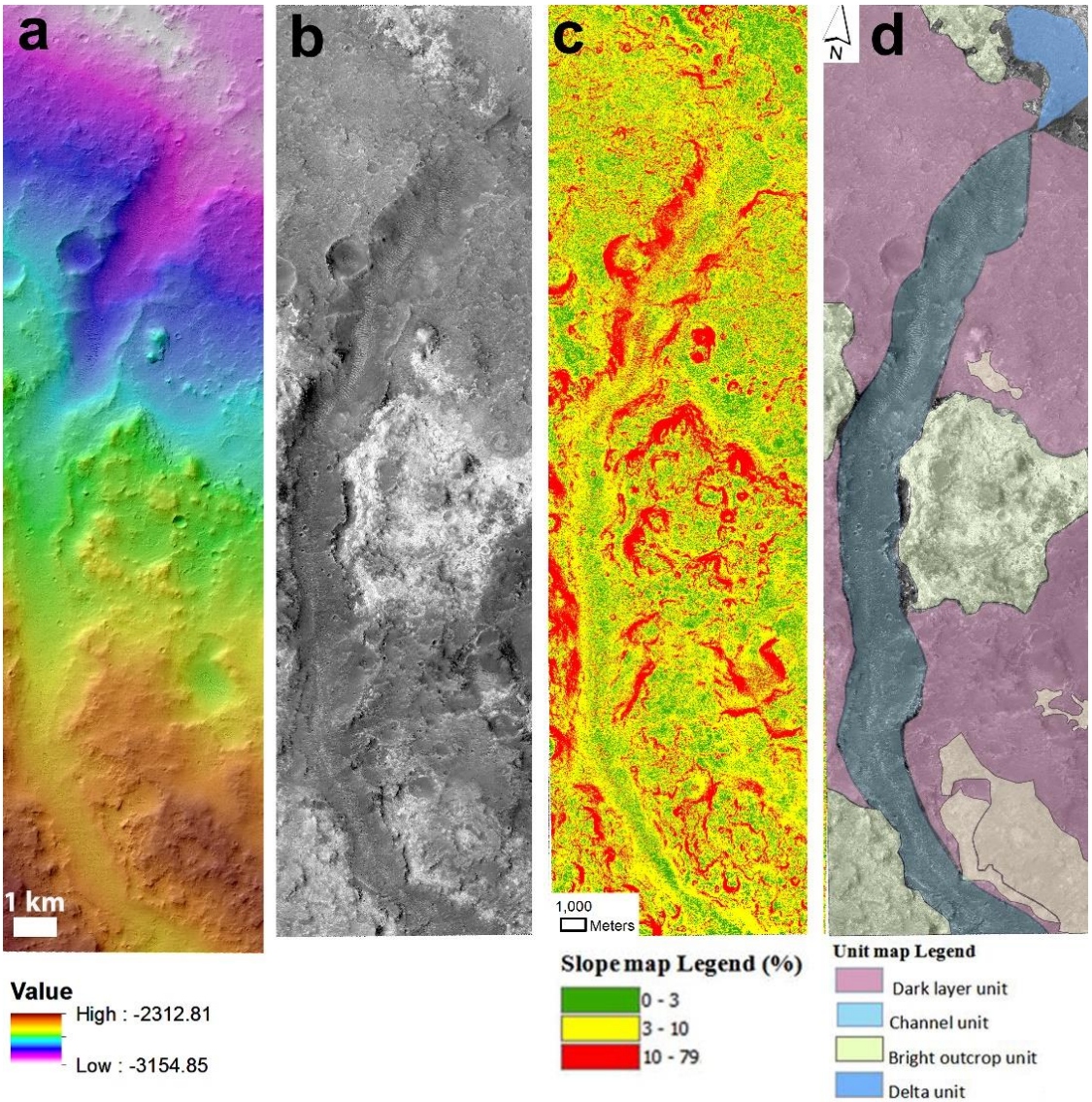

Figure 3. Thematic views of the study area. a) synthetic relief image from HiRISE DTM and hillshade image, b) HiRISE orthophoto, c) slope mapderived from DTM with 1m length scale, d) map showing preliminary units.