MORPHOLOGY AND TOPOGRAPHY OF FRETTED TERRAIN AT THE DICHOTOMY BOUNDARY IN TEMPE TERRA, MARS: GENERAL CHARACTERISTICS. E. Hauber[1], S. van Gasselt[1], and R. Jaumann[1], [1]DLR-Institute of Space Sensor Technology and Planetary Exploration, German Aerospace Center (DLR), Rutherfordstr. 2, 12489 Berlin, Germany, Ernst.Hauber@dlr.de

Introduction: Fretted terrain is „*characterized by smooth, flat, lowland areas separated from a cratered upland by abrupt escarpments of complex planimetric configuration*" [1]. Most investigations of fretted terrain were made in the eastern Martian hemisphere [2,3,4,5], but a well defined region in northern Tempe Terra in the western hemisphere (Fig. 1) also fits exactly this definition. We investigate its morphology and topography using MOC and Viking Orbiter images and MOLA data. Here, we report on the overall characteristics of the study area. A companion abstract [6] gives a detailed description of our volumetric determinations of erosional and flow features in Tempe Terra.

Observations: While our focus is on features associated with fretted terrain, the presence of a mantling deposit obscures the fine–scale texture of underlying surfaces. First, therefore, we briefly describe that mantle. Second, we report on our preliminary results from quantitative topographic measurements.

Surficial Mantling Deposit. We find abundant evidence for wide–spread mantling of both lowlands and highlands along the dichotomy border. This surficial deposit is not unique to the study area and clearly has been derived from the atmosphere [5,7,8]. It is described in detail by [9]. Here, we just note that most of the features characteristic for the mantling can also be observed in Tempe Terra. Additionally, we find some features, related to the degradation of the mantling, which resemble terrestrial glacial features (Fig. 2).

Morphometry of Fretted Terrain. The width of the fretted terrain in our study area varies between 60 km to 170 km. The undissected upland has an elevation of –2700 m at 66°W and about 0 m at 80°W. The lowland has its highest elevations also in the western part of the study area (-3000 m) and slopes gently (~0.1°) towards NE, reaching minimum elevations of –3800 m at the eastern border of the study area. The elevation difference between uplands and lowlands deceases from ~3000 m (at ~80°W) to ~1500 m (at ~66°W). This elevation difference is slighly less than that reported from the dichotomy boundary in eastern Mars (2.5 km-6 km) [13]. The highlands have a generally very flat surface, sloping at an angle of less than 0.1° when measured perpendicular to the dichotomy boundary. The surfaces of very large upland segments bounded by fretted channels (letters ***A*** and ***B*** in Fig. 1) have larger slopes toward the lowlands (1° – 2°) and might be tilted as blocks (see *fretted channels*).

Fretted Channels. Several fretted channels dissect the upland at the dichotomy boundary. Such channels have steep walls and flat floors [2], and their floors are often characterized by *"lineated valley fill"* [2,3]. In the study area, they have uniform widths of ~5-10 km and constant depths of a few hundred meters. Their orientation seems to be structurally controlled in two ways: One preferred trend is parallel to the Mareotis Fossae (N50°–60°E), a system of long and narrow grabens. The other is concentric about the center of a possible impact crater in the northern lowlands (center at ~79°W, 56°N; see Plate 1b in [14]). Although there is evidence for fluvial sapping on the uplands near the dichotomy boundary, we find no evidence for a fluvial origin and later enlargement of fretted channels.

Lobate Debris Aprons and Lineated Valley Fill. Concentric lineations in lobate debris aprons around upland mesas in the lowlands resemble the lineated valley fill of fretted channels. Since lobate debris aprons must have flown away from the scarps delineating mesas and upland blocks (i.e., perpendicular to the lineations), this observation argues against flow parallel to the lineations, i.e., along the valley floors (see also Fig. 3). More details on the morphometry of the fretted terrain, in particular the debris aprons, is given in the companion abstract [6].

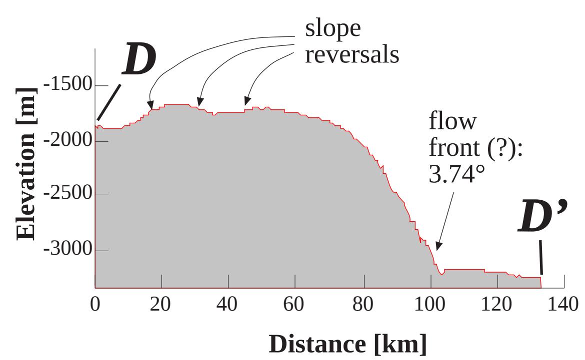


Figure 3: Topographic profile along a fretted channel floor (see dashed line ***D – D'*** in Fig. 1 for location). Slope reversals might provide evidence against along-channel transport of rock glacier–like debris. The convex shape of the profile resembles the convex-upward shape of lobate debris aprons [2,3,4,16], although the dimension is significantly larger (elevation difference >1000 m). The steepened front has an angle of 3.74°, similar but slighly less than values (up to 6°) measured by [5]. Profile shapes across debris aprons are consistent with solid ice deformation [16].

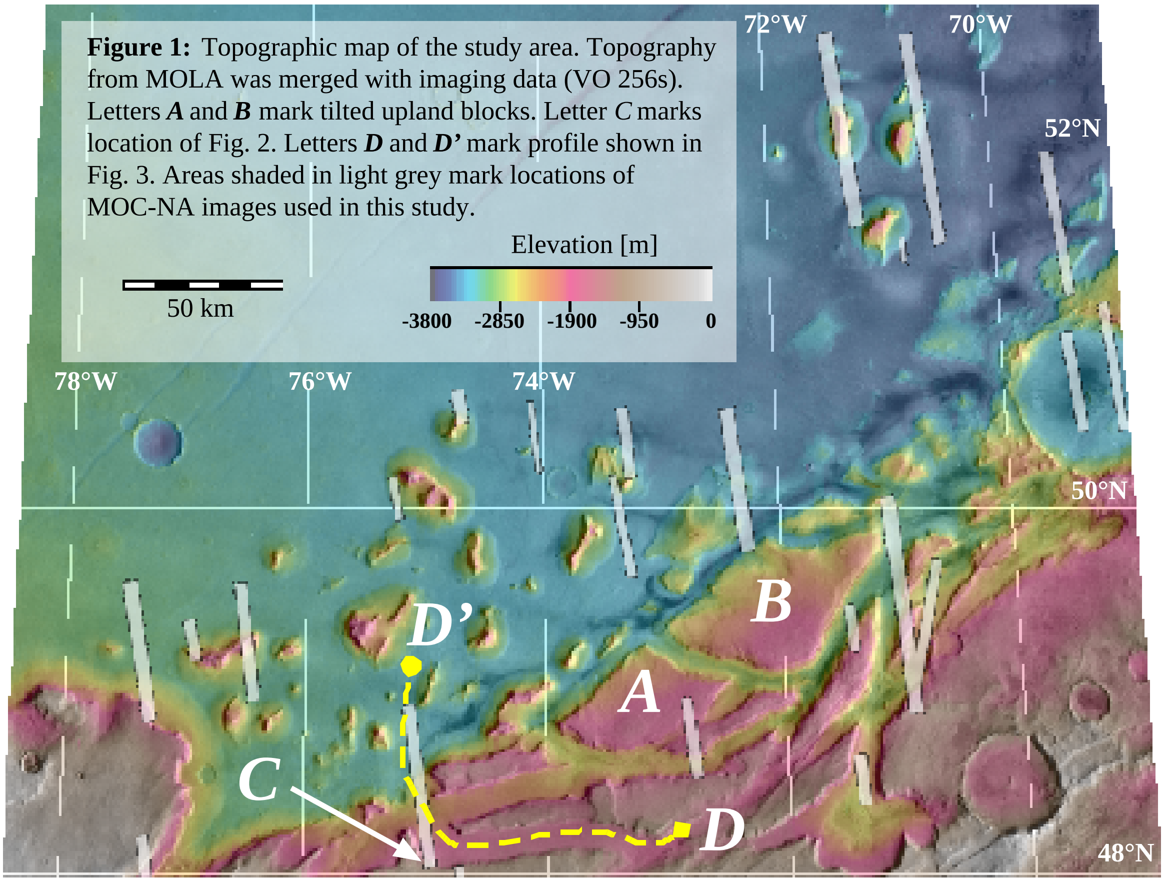
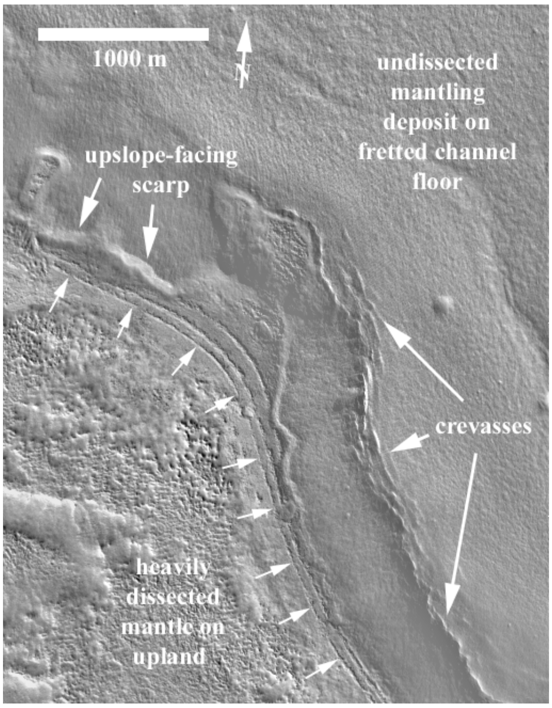


Figure 1: Topographic map of the study area. Topography from MOLA was merged with imaging data (VO 256s). Letters ***A*** and ***B*** mark tilted upland blocks. Letter *C* marks location of Fig. 2. Letters ***D*** and ***D'*** mark profile shown in Fig. 3. Areas shaded in light grey mark locations of MOC-NA images used in this study.



(left) **Figure 2:** Subframe of MOC image M03-06586 (75°W, 48°N; 6.26 m/pixel). A mantling deposit [9] is intact on the valley floor, but heavily degraded on the uplands. Crevasses on the floor of the fretted channels are similar to crevasses on glaciers and have been observed in fretted terrain before [10,11]. Three parallel, thin ridges (small arrows; ridges about 15-20 m wide) run at ± constant elevations along the upper channel wall. They resemble lateral moraines or washboard moraines [12]. Since we do not observe any evidence for transport along the valley floor (in agreement with [5] and [11]), these ridges might be related to the degradation of the mantling, and might represent zones of high resistence against erosion. We believe they are not related to layering of the channel wall bedrock [5].

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