THE MEDUSAE FOSSAE FORMATION: MAPPING THE ORIGINS. K. M. Shockey[1], J. R. Zimbelman[1]; [1]Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, MRC 315, Washington, DC 20013-7012, shockeyk@si.edu, zimbelmanj@si.edu,

Introduction: To better understand the origins of the Medusae Fossae Formation (MFF), we are mapping the Gordii Dorsum escarpment and surrounding areas in the eastern part of MFF between 202.5° and 225° E longitude, which is the southeast portion of quadrangle eight on Mars. The MFF is a friable, extensive Amazonian deposit that overlies the crustal dichotomy boundary and adjacent lowlands between approximately 130° and 240°E longitude [1], between the Tharsis and Elysium volcanic provinces. The area being mapped is slightly south west of Olympus Mons. Yardangs and pedestal craters attest to considerable aeolian deflation of the MFF in recent geologic time [1, 2]. Although diverse explanations for the MFF have been proposed (summarized by [1]), recent work has focused on deposition of loess or ignimbrite by aeolian processes [1, 3–6]. The origins of MFF are still controversial; the current mapping should provide new constraints for testing the many hypotheses of origin.

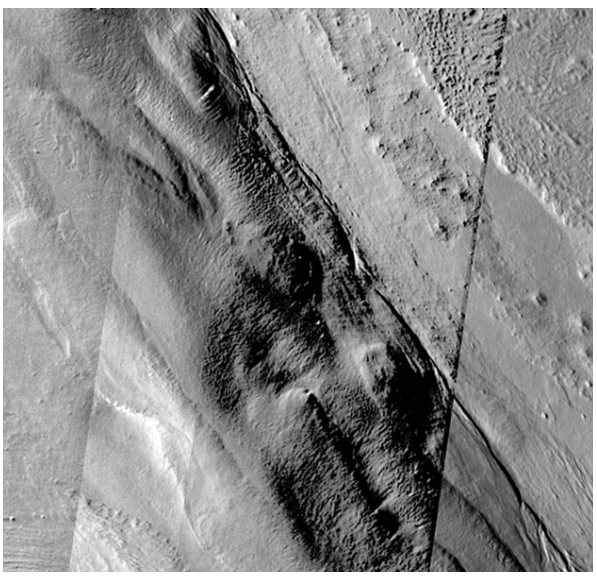

Figure 1: THEMIS daytime Infrared (IR) data show the eastern edge of the Gordii Dorsum escarpment to be much more complex then previous Viking data show. Various layering and evidence of aeolian deflation can be seen in this image. North is at the top of this and all subsequent images. Scene show is ~60 km wide.

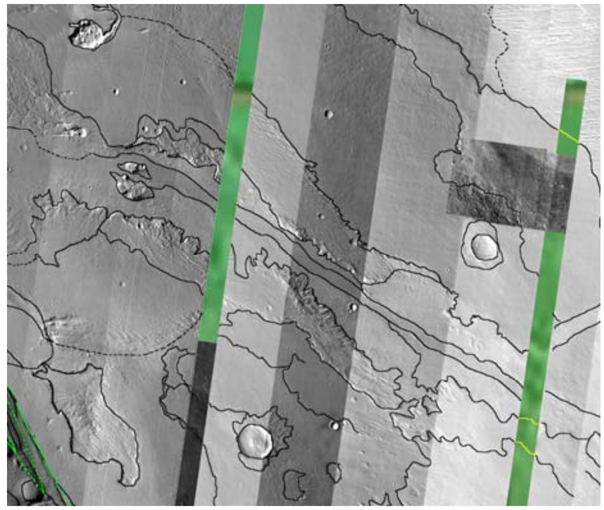

Figure 2: THEMIS daytime IR co-registered with MOLA show lava flows, Medusae Fossae Formation and a possible channel. This section of the map is directly east of the Gordii Dorsum escarpment. Scene shown is ~ 250 km wide.

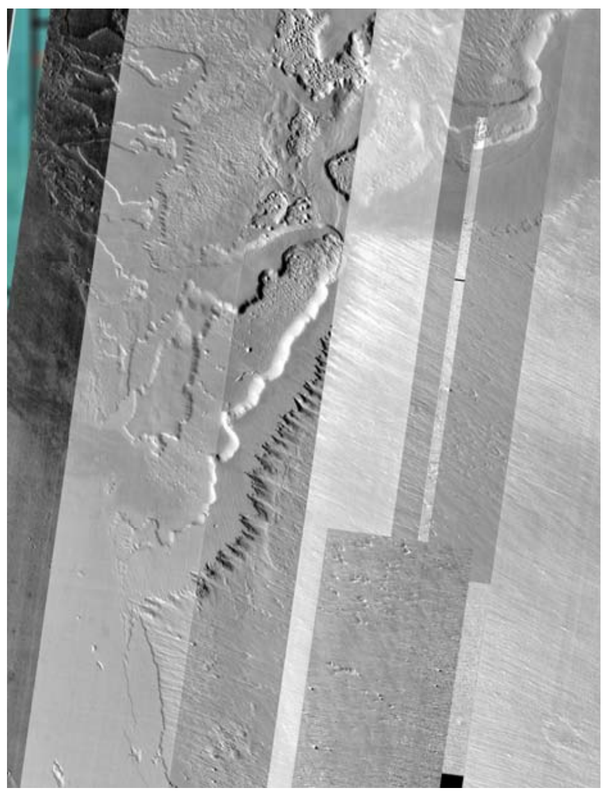

Figure 3: Northern-most tip of the Gordii Dorsum escarpment. Extensively wind-eroded area of the MFF. Scene shown is ~ 230 km wide.

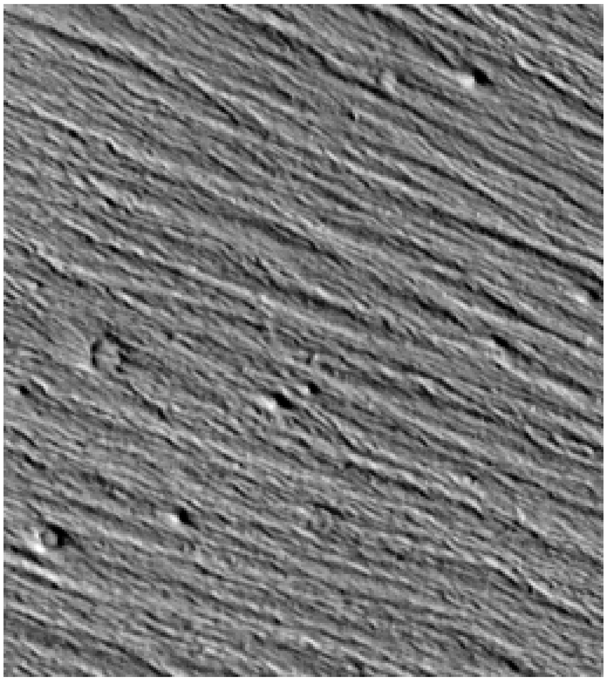

Figure 4: There are numerous yardangs found on the MFF. These yardangs, shown in THEMIS daytime IR data, are located on the northern section of the Gordii Dorsum escarpment.

Discussion: The origins of the MFF are still controversial, but the three primary hypotheses are [1]: ash flow, ash fall, and aeolianite (i.e., loess). Detailed mapping should provide constraints for evaluating the various alternatives. Ash fall and aeolianite origins may be difficult to distinguish from one another, unless diagnostic volcanic characteristics can be identified within MFF [4]. However, topographic relief should provide strength constraints that reduce the range of likely MFF materials.

During detailed mapping of the MFF at Gordii Dorsum, THEMIS data revealed many complex layers not previously seen using Viking data (Fig. 1). These layers show evidence of aeolian deflation. Due to large amounts of wind erosion, indicated by linear markings, it is difficult to tell the original shape of this feature with any certainty.

In Figure 2 we see an elongated trough or trench that we have called a channel. In none of the data sets can we see any fluvial bed forms. One possibility is a smaller channel formed from water was widened by aeolian processes. The channel was originally thought to disappear under the Gordii Dorsum Escarpment (to the west of the Fig. 2). After studying the recent IR images, new possibilities were uncovered. A possible channel runs along-side the linear portion of the escarpment (Fig. 1). These two channels may be connected. This channel may have led to sapping in the MFF (Fig. 3).

The area shown by Figure 3 is a serrated edge showing extensive aeolian activity. This is the only serrated unit currently found on the MFF. This is the most wind-eroded area of MFF. It is not currently known as to why this area of MFF would be more wind eroded then any other section.

Figure 4 shows more evidence of aeolian activity. Yardangs are present all over the MFF shown here. Current global wind models conflict with the orientation of these yardands.

Conclusions: The area mapped by Zimbelman [7] from 15° N to 15° S latitude and from 202.5° to 225° E longitude using Viking data is currently being re-mapped using the recent THEMIS data. When this is complete, a comparison will be made between the two maps in order to reformulate previous conclusions drawn on the origins of MFF. Further steps will include the analysis of yardang orientation for comparison with wind regimes and crater counting in order to determine relative ages of layers.

References: [1] Bradley, B.A. et al. (2002) *JGR107*(E8), 10.1029/2001JE001537. [2] Ward A. W. (1979) *JGR*, *84*, 8147–8166. [3] Scott D. H. and Tanaka K. L. (1982) *JGR*, *87*, 1179–1190. [4] Zimbelman J. R. (2003) GSA Abs. Prog. *35*(6) 107-7, 128. [5] Hynek B. M. et al. (2003) *JGR*, *108*(E9), doi: 10.1029/2003JE002062. [6] Head J. W. and Kreslavsky M. A. (2001) Conf. Geophys. Det. Water on Mars, LPI. abst. 7083. [7] Zimbelman, J. R. et al. (2003) *Mappers meeting*.