GEOLOGIC MAPPING OF THE MEDUSAE FOSSAE FORMATION ON MARS (MC-8 SE AND MC-23 NW) AND THE NORTHERN LOWLANDS OF VENUS (V-16 AND V-15). J. R. Zimbelman, CEPS/NASM, Smithsonian Institution, Washington, D.C. 20013-7012 (zimbelmanj@si.edu).

Introduction: This report summarizes the status of a mapping project supported by NASA grant NNX07AP42G, funding for which became available on July 18, focusing on the mapping of the Medusae Fossae Formation (MFF) on Mars. The report also briefly discusses the status of maps of Venus and Ascraeus Mons, begun under previous NASA grants but which are still in progress.

MC-8 SE: Mapping in the eastern portion of MFF was initiated at 1:500K scale using the best available Viking images, then mapping commenced at 1:4M scale to provide a broader context. THEMIS daytime IR coverage was used for mapping at 1:2M scale, which we concluded was the best scale for portraying the MFF geology at both local and regional perspectives [1]. A 1:2M scale map for the MC-8 SE quadrangle (0° to 15°N lat., 202.5° to 225°E long.) (Fig. 1) was presented at the 2007

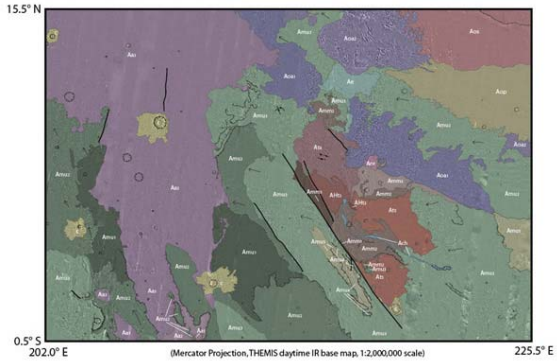

Figure 1. 2007 version of the MC-8 SE geologic map. The area shown includes a 0.5° margin beyond the actual quadrangle boundaries.

Mappers meeting, and only slight revisions have been made to the unit boundaries and structural features of that map. The map should be submitted for technical review during the fall of 2008.

As a result of the mapping, we have identified six subunits to the upper member of MFF and three subunits to the middle member of MFF, expanding on the units as designated by Scott and Tanaka [2]. Conclusive evidence for the origin of the enigmatic MFF materials remains elusive, but considerable progress has been made in using recent data sets to evaluate the numerous hypotheses of formation that have been proposed for MFF, leading to a volcanic (ignimbrite) origin as the most probable explanation [2]. Results from the MARSIS radar sounder [3] show that MFF materials are more than 2 km thick at the Gordii Dorsum escarpment (center of Fig. 1), and they appear to be superposed on relatively level northern plains materials at this location.

MC-23 NW: This quadrangle (0° to 15°S lat., 135° to 157.5°E long.) includes two large exposures of the lower member of MFF, the member displaying the largest degree of erosion of all MFF materials [4]. CTX (Fig. 2) and HiRISE (Fig. 3) data are proving to

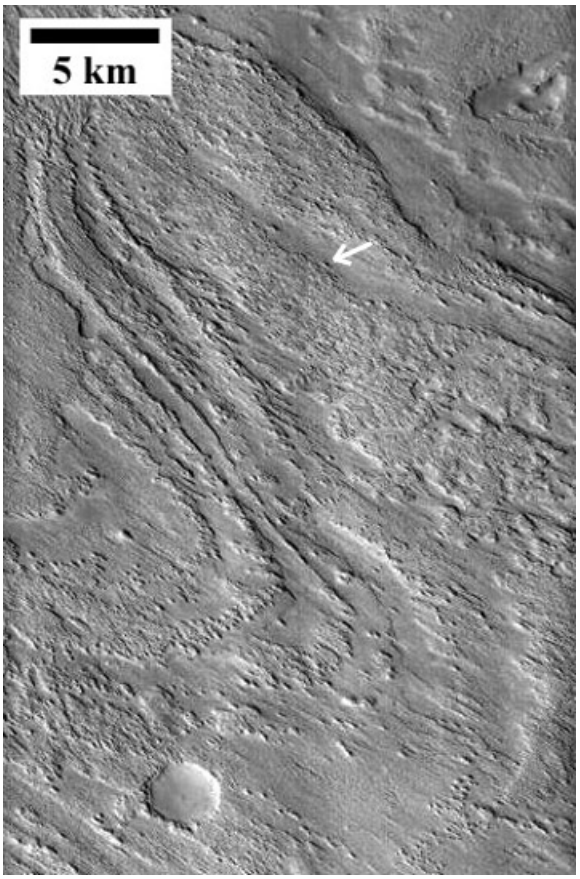

Figure 2. Portion of CTX frame PSP_003690_1756, showing arcuate layering exposed by the erosion of the lower member of MFF. Arrow indicates yardang shown in Fig. 3. 5.3 m/p, center at 5.0°S, 147.3°E, NASA/JPL/MSSS.

be particularly useful in refining the interpretations of the eroded MFF materials. For example, CTX (Fig. 2) reveals layering that could represent a plunging

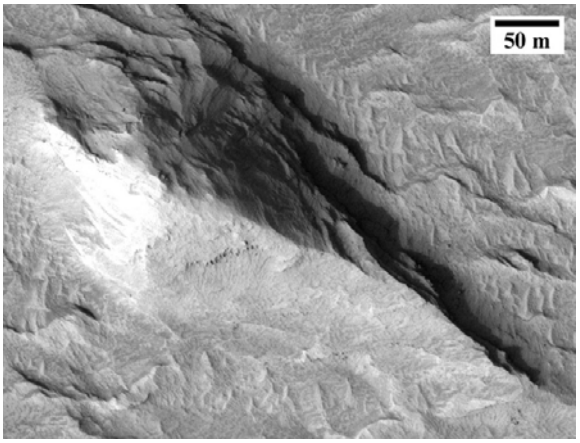

Figure 3. Portion of HiRISE frame PSP_003690_1755 showing a yardang comprised of MFF materials (see arrow in Fig. 2). Competent layers generate local cliffs within the eroded materials. 54 cm/p, center at 4.5°S, 147.3°E, NASA/JPL/U of A.

anticline, or perhaps flow unit components if emplaced as an ignimbrite [5]. HiRISE (Fig. 3) reveals competent layers in the MFF materials evidenced as prominent breaks in slope that are also the source of m-scale blocks that have collected downslope [5]. The eroded lower member of MFF has recently been recognized as displaying sinuous ridges that appear to represent inverted topography derived from the flow of sediments during the time represented by the base of the MFF deposits [6], supported in part by results obtained from the on-going mapping of MC-23 NW. We are concentrating on the mapping of MC-23 NW before starting work on MC-16 NW in order to obtain initial descriptions and interpretations of the lower member of the MFF materials, to complement the unit identifications for the middle and upper members of MFF obtained from mapping of MC-8 SE.

V-16 and V-15: Geologic mapping of both quadrangles on Venus was completed several years ago, but difficulties in matching unit lines generated on a photographic print base map to current digital base maps has delayed the review process [7]. We have been able to reposition all unit and structure lines (by hand) on the V-16 map to match the digital base, and are now proceeding to make unit polygons from the new line work. The V-16 map and text has been reviewed and thoroughly revised, but it is now waiting on having the map registered to the digital base map before proceeding further. We are hoping to have the V-16 map digital files to the USGS by the end of 2008. The V-15 line work will also need to be transferred to a digital base map, so once the V-16 map is in an acceptable state, we hope that the V-15 map can be submitted for review during 2009.

Ascraeus Mons: W. Brent Garry (post-doc at CEPS) is actively working on generating a new geologic map of the Ascraeus Mons volcano on Mars. He presented our preliminary work at the 2007 Mappers meeting [8]. However, he is very busy with a variety of other research projects at present, and we do not anticipate having a completed map ready for review until 2009 at the earliest. This map is being done in Arc-GIS, utilizing the wide variety of data sets now available for Mars. The map will be the completion of geologic mapping of the three individual Tharsis Montes volcanoes, all at 1:1M scale, that was initiated in the 1990s.

References: [1] Zimbelman, J.R. (2007) Planetary Geology Mappers Meeting Abstracts, ZIMBELMANa2007PGM.pdf. [2] Mandt, K.E., et al. (in review) JGR, 2008JE003076. [3] Watters, T.R., et al. (2007) Science, 318 (Nov. 16), 1125-1128. [4] Greeley, R., and Guest, J. (1987) USGS Map I-1802-B, 1:15,000,000 scale. [5] Zimbelman, J.R. (2008) Joint Assembly Abstract P34A-05. [6] Burr, D.M., et al. (in review) Icarus. [7] Zimbelman, J.R. (2007) Planetary Geology Mappers Meeting Abstracts, ZIMBELMANb2007PGM.pdf.[8] Gary, W.B., and Zimbelman, J.R. (2007) Planetary Geology Mappers Meeting Abstracts, GARRY2007PGM.pdf.