GEOLOGIC MAPPING OF THE MEDUSAE FOSSAE FORMATION ON MARS AND THE NORTHERN LOWLAND PLAINS OF VENUS. J. R. Zimbelman, CEPS/NASM MRC 315, Smithsonian Institution, Washington, D.C., 20013-7012; zimbelmanj@si.edu.

Introduction: This report summarizes the status of mapping projects supported by NASA grant NNX07AP42G, through the Planetary Geology and Geophysics (PGG) program. The PGG grant is focused on 1:2M-scale mapping of portions of the Medusae Fossae Formation (MFF) on Mars. Also described below is the current status of two Venus geologic maps, generated under an earlier PGG mapping grant.

Medusae Fossae Formation, Mars: Work on mapping of the heavily eroded western portions of MFF has progressed well, particularly with the assistance of Lora Griffin, a PGGURP-supported 2008 summer intern at NASM. Attributes of MFF as documented in Mars Orbiter Camera images were the basis for a reevaluation of the numerous hypotheses of the origin for MFF, with the conclusion that an ignimbrite origin is the hypothesis most consistent with the observations [1]. Interpretations of various aspects of yardangs that are abundant within the intensely eroded lower member of MFF were reported to the science community at two major conferences [2, 3] and at the 2008 Mappers meeting in Flagstaff, AZ [4]. The yardangs reveal that MFF materials have multiple series of internal layering [5], as revealed by differences in competency resulting from erosion and mass wasting, a result that appears to be most consistent with variable degrees of welding often present within volcanic (ignimbrite) deposits [1]. A preliminary geologic map of the **MC-23 NW** quadrangle (Fig. 1), which covers the southwestern edge of the MFF deposits, was presented

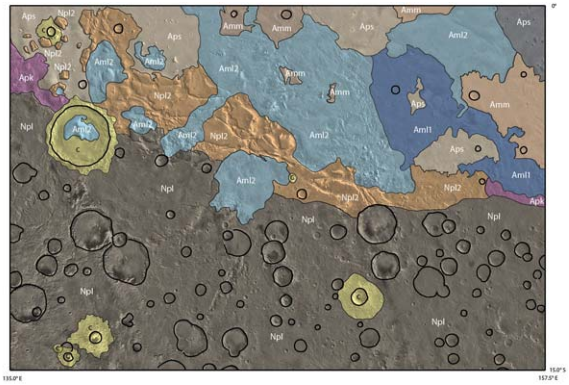

Figure 1. 2008 version of the MC-23 NW geologic map of southwestern MFF (blue and light tan units).

both at the 2008 Mappers meeting [4], and in a poster at the 40th Lunar and Planetary Science Conference [3]. The mapping reveals numerous outliers that we interpret to be portions of the lower member of MFF, suggesting that the previous extent of MFF materials may have been considerably larger than what is expressed by the present MFF deposits on Mars [3, 4].

One distinctive feature to come out of the mapping in western MFF is the common occurrence of many sinuous positive-relief ridges [5], which are particularly well exposed in portions of the lower member of MFF [6]. These sinuous ridges are interpreted to be inverted paleochannels [5-7] (Fig. 2), representing prolonged flow of a liquid perhaps coincident with the emplacement of the lower member of MFF [5-9].

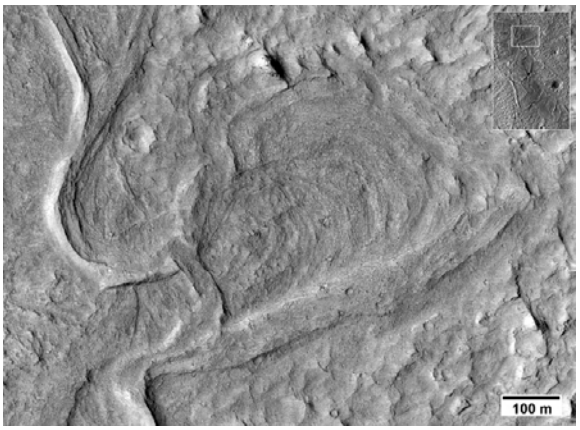

Figure 2. Sinuous ridge interpreted to be inverted topography of well-developed cut-off meander deposits [5]. Portion of HiRISE image PSP_006683_1740, 6.0S, 153.6E. Inset shows location within portion of the browse image.

In early 2009, some salary money in the current grant was reallocated (with the approval of the PGG discipline scientist) to purchase a Dell desktop computer, on which was loaded ArcGIS software through a licensing agreement with the Smithsonian Institution. The 2008 Mappers meeting made it very clear that this is the preferred software (by the USGS) for all future planetary maps, so the investment should pay dividends for mapping projects both now and in the future. The learning curve for ArcGIS is very steep, and the PI is still becoming familiar with the intricacies of the software, but already he can see the long-term advantages that it holds for geologic mapping projects. The geologic map of MC-23 NW [3, 4] will be the basis for the first geologic map produced by the PI using ArcGIS. Once the PI is familiar enough with the ArcGIS

software to generate an entire geologic map, the PI will then commence work on making an ArcGIS version of a revised geologic map for **MC-8 SE**, using the earlier (Illustrator 9) mapping product [10] as a guide to the newly mapped geology.

Northern Lowland Plains, Venus: The map and text for the Kawelu Planitia quadrangle (**V-16**) have been in review with the USGS for many years [11]. A revised version, addressing all reviewer comments, was submitted to the USGS in 2008, at which time it became apparent that the linework (which dated from mapping carried out on hardcopy base materials) was not uniformly registered to the digital photobase that is the current standard for production of published maps. Careful review of all of the linework revealed that no single shift or warp could correct the situation, due to map revisions that were made at different times to various sections of the map. Late last year, all of the V-16 linework was manually adjusted to register with the digital photobase, through the helpful assistance of a NASM volunteer. We have not yet had time to regenerate the unit polygons in Adobe Illustrator 9, the software used to make the present version of the map, but we intend to do so later this year. Once the adjusted linework is reconstituted into a map registered to the digital base, V-16 should be able to continue through the revision process. The Bellona Fossae quadrangle (**V-15**) was mapped preliminarily several years ago [12] under a previous PGG grant, also initiated on hardcopy base materials like V-16. When the V-16 map is finally back on track, we will redo the V-15 geology in ArcGIS, using the prior map as a guide while generating the new linework.

Future Plans: Plans for the third year of funding include submission of the MC-23 NW map to the USGS, completion of a revised version of the geologic map for MC-8 SE in ArcGIS, followed by completion of a revised version of the geologic map for V-15 in ArcGIS. Parallel to this effort will be any revisions needed for the ArcGIS version of the map for MC-23 NW and the Illustrator version of the V-16 map. After progress has been made on the above maps, preliminary mapping (in ArcGIS) will be started for **MC-16 NW**, the last of the MFF mapping areas identified in the original proposal.

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