A GEOLOGIC ANALYSIS OF SEKMET MONS, VENUS USING MAGELLAN RADAR DATA;

M. S. Edmunds, GX Technology, 5847 San Felipe Ste. 3500, Houston, TX 77057.

The study of volcanism on Venus can tell us much about the regional and global thermal evolution of the planet. The purpose of this paper is to present results of a geologic study of Sekmet Mons using Magellan SAR and non-image data.

Sekmet Mons is a large elevated structure located in Kawelu Planitia at approximately 41°N, 244°. Previous work, using Venera imagery and PVO altimetry [1], characterized Sekmet as a shield volcano based on morphology and topography, and compared it favorably to large Martian shields. Stofan and Head [2] speculated that Sekmet was an example of a "proto-corona", based on the presence in the west-looking Venera imagery of concentric, radar bright features on its eastern flank. The small incidence angle of the Venera data, and absence of these features in higher resolution, east-looking, Magellan data indicates that the interpreted ridges are, in fact, radar-facing slopes. Helgerud and Senske [3] also characterized Sekmet as a large shield as part of their regional mapping of Kawelu Planitia.

Observations. Figure 1 is our interpreted geologic map for Sekmet. Using C145N244 as our mapping base [like 4], F45N241,in digital form, was used to determine relationships between mapped units. The cycle 1 GxDR data was examined for physical properties data in the mapped area. Sekmet is an approximately triangular area, 350 km across, and 2.5 km (6054.0 km MPR) above the surrounding plains. There is a substantial area of tessera to the west of Sekmet and small inliers to the east, southeast, and southwest. The western edge of the western tessera has a very steep margin, with the elevation contrast to the adjacent plains being ~1 km (figure 2). A similar steep margin with ~0.6 km elevation contrast occurs to the east, corresponding to the area of tessera inliers. This configuration is reminiscent of E-W altimetry profiles at Beta Regio [4]. Figure 2 also shows a N-S profile through the summit. With the exceptions of some summit structure and a sharp change in slope at approximately 45.5° N, the profile appears to be typical of a shield volcano, which is consistent with earlier results.

Three regional tectonic trends (N-S, SW-NE, NNW-SSE) converge at the edifice. These are interpreted as rift zones associated with the formation of Sekmet. They are covered by high-backscatter summit flows of (unit Fsu). The presence of a three-armed rift system suggests comparisons to triple rift junctions on Earth. The radial fractures/grabens associated with the corona to the northeast [see 3] are partially covered by sheet flows (Fsh) and completely by digitate flows (Fd), indicating that Sekmet volcanism continued while corona radial tectonism decreased over time.

Sheet flows (Fsh) are the earliest mapped Sekmet units, and extend up to 600 km from the summit. Because of the possibility that the backscatter differences of this unit may related to rheology and not age, it was not sub-divided on the map. Sheet flows appear to have been deflected to the south by the eastern tessera inliers, although at the time of deposition, the inliers probably presented a more formidable topographic barrier. Digitate flows (Fd) form an areally extensive unit that is younger than unit Fsh.. These flows are typically narrower than the sheet flows and show a complex interfingering of individual flow lobes. This unit flowed through the eastern tessera inliers and covers the sheet flows in several locations. This unit is extensively cut by fractures and graben on the east and southeast sides of Sekmet. Several of the graben are, in turn, filled by flows from the Eastern Flow Field (EFF) of [3]. Both SAR and altimetry data show the steep slope that forms the western edge of Sekmet continues to the SE until it merges with the SSE rift zone. This scarp is interpreted to be the western edge of the tessera that forms the base of Sekmet Mons. There are many small (1-5 km dia.) domes present at the summit, as well as a dark flow unit, implying differentiation of magma in a chamber below the summit. Of similar, or slightly younger age are two concentric fractures/graben proximal to the NE summit. They are not well developed, and occur over a narrow range of azimuths (~70°). These are probably associated with collapse of a magma chamber after an eruption, or may be the first manifestation of caldera formation.

Conclusions. Based on detailed geologic mapping and examination of GxDR datasets the following conclusions can be made. 1) Sekmet has developed on tessera as evidenced by the extensive western area, and the large number of widely dispersed eastern inliers. It is proposed that the entire edifice is underlain by tessera. This situation is not unlike that at Beta Regio. As Sekmet evolved, the eastern tessera, which deflected the earliest sheet flows to the south, became less of a topographic barrier. By the time that the digitate flows were emplaced, all that remained were badly embayed inliers. 2) Sekmet Mons appears older, if only slightly, than the EFF, and has reached a stage in its evolution where a magma chamber has developed below the summit, allowing the formation of domes, dark flows, and initiation of concentric fracturing about the summit. 3) Geologic mapping has revealed

an old volcanic center in the northern rift zone within the digitate flow unit (Fd). 4) The two mapped dome fields (unit Df), based on superposition relations, seem to be associated with the emplacement of the mottled plains unit (Pm) and not the smooth plains (Ps).

REFERENCES [1] Edmunds, M. S. (1989). *Lunar Planet. Sci.* **XX**, 260-261.[2] Stofan, E. R. and J. W. Head (1990) *Icarus*, **83**, 216-243. [3] Helgerud, M. B. and D. A. Senske (1994) *Lunar Planet. Sci.* **XXV** 531-532. [4] Senske, D. A., G. G. Schaber, and E. R. Stofan (1992) *J. Geophys. Res.* **97**, 13395-13420.

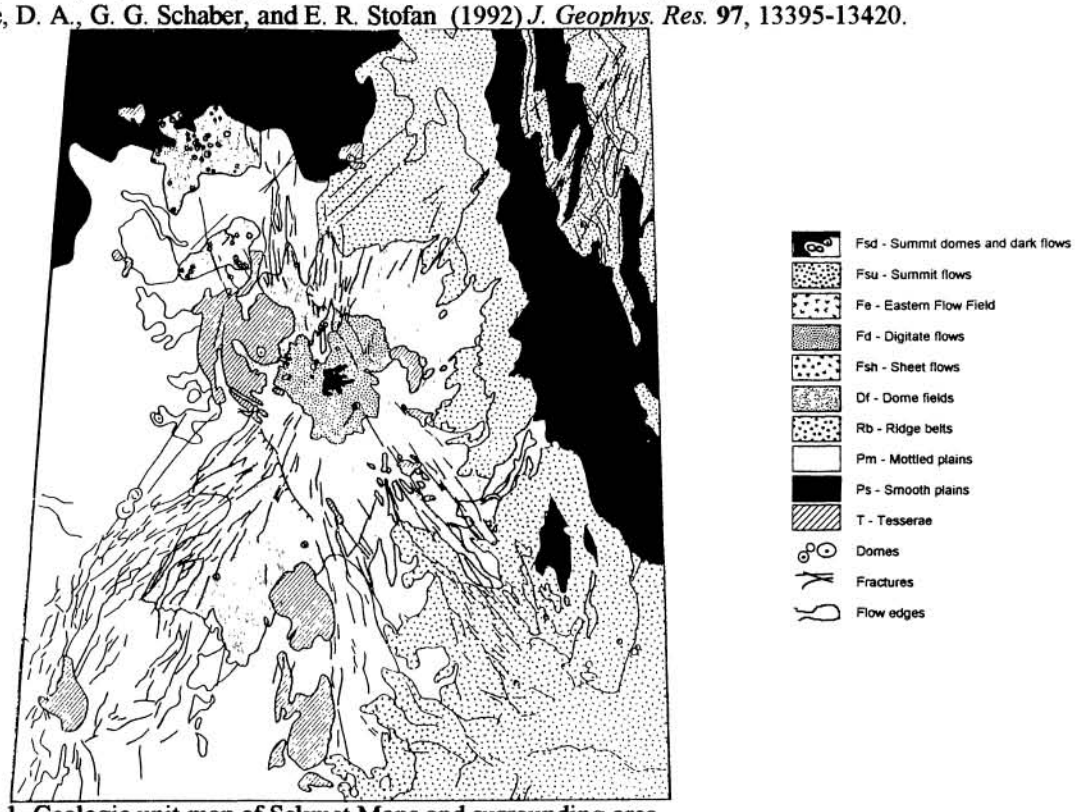

Figure 1. Geologic unit map of Sekmet Mons and surrounding area.

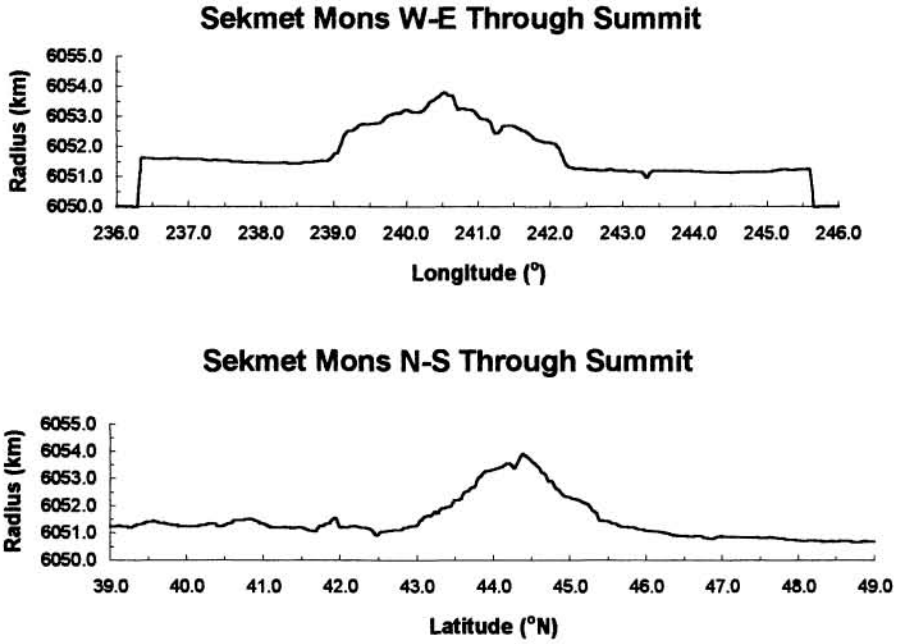

Figure 2. Altimetry profiles through Sekmet Mons summit.