

**MULTIPLE RING FEATURES IN THEMIS REGIO: EVIDENCE FOR ENDOGENIC ORIGIN** E.R. Stofan<sup>1</sup>, J.W. Head<sup>1</sup>, and D.B. Campbell<sup>2</sup> (1)Dept. of Geological Sciences, Brown Univ., Prov., R.I. 02912 (2)National Astronomy and Ionosphere Center, Arecibo, PR 00612

Previous studies (1-3) have described and classified circular features on Venus. However, unanswered questions remain concerning the modes of origin (e.g. impact, volcanic, tectonic) of various classes of circular features. Stofan *et al.* (1984) developed a classification scheme for circular features seen in radar images of Venus, including a class that has a probable volcanic mode of origin (4). In this study, we review some Class IV, or multiple ring, features in an attempt to understand their formational processes.

High resolution (1-3 km) radar images from Arecibo, obtained in the summer of 1983, reveal the presence of two types of multiple ring features in the southern hemisphere. Type I has at least two distinct, fairly continuous rings that are isolated from other ring structures. Examples of this are found at 56°S, 321° (Lise Meitner, diameter 81 km) and at 63°S, 322° (diameter about 220 km). Type II ringed features have discontinuous, sometimes merged rings of varying brightness that are associated with other ringed and bright linear features. The group of features in Themis Regio (Figures 1,2), which fall under Type II, is used to investigate potential modes of origin of these type of multiple ring features.

Themis Regio, centered at approximately 40°S, 280°, has been described as part of a northwest trending linear zone that extends for over 14,000 km from east of Themis to the northwest border of Atla Regio (5). Figure 2 illustrates that the linked ring structures are in an elevated region, that rises in places to over 3 km above the mean planetary radius. The linked ring structures appear bead-like in the northwest, in places connected by short paired lines. The beads are about 200 km in diameter, and have at least one concentric interior ring. In the central and eastern region, the ring structures appear to be merged as opposed to beaded, and are cut by bright lines that trend dominantly to the northwest, parallel to the topographic axis. The merged rings are larger than the beaded features, with diameters generally >300 km. The line segments frequently occur in pairs, spaced over 60 km apart. The lines link, cut, and/or radiate from the rings. The rings in the central and eastern area are quasi-circular, often polygonal, with some discontinuous, arcuate, concentric segments.

Several possibilities exist for the origin of these features. The high topography could be a relict highland region that has been heavily cratered. However, two observations seem to argue against an impact origin. In the northwest, the bead-like sequence of features seem unlikely to be produced by random impacts. Secondly, in the central region of Themis the linked rings appear to be merged rather than a distinctly superposed or cross-cutting sequence expected from cumulative impacts. The dominant presence of the linear features that parallel the topographic axis, and the high topography related to the regional structure (5), suggest that the features are endogenic in origin, and related to tectonic activity. The features also may be related to the features identified as coronas in the northern hemisphere (6). Major linear trends on Venus, that can be detected in several data sets (7), appear to be defined, as at Themis Regio, by significant tectonic and/or volcanic activity. It is evident that while some Class IV or multiple ring structures on Venus (Type I features) may resemble multiring impact basins on other planets, many (particularly Type II) are of internal origin, such as those in the Themis region.

*References* 1)Campbell,D.B. and Burns,B.A.(1980) *JGR*,85, 8271-8281.

2)Burns,B.A.(1982) Ph.D. Thesis, Cornell Univ.,602 pp. 3)Stofan,E.R. *et al.* (1984)

Lunar Plan. Sci. Conf. XV,824-825. 4)Stofan,E.R. *et al.*, *in preparation*

5)Schaber,G.G.(1982) *GRL*,9, 499-502. 6)Barsukov,V.L. *et al.* (1984) *Geochimia*, 12.

7)Sharpton,V.L. and Head,J.W. (1985) *Lunar Planet. Sci. Conf. XVI*, this volume.

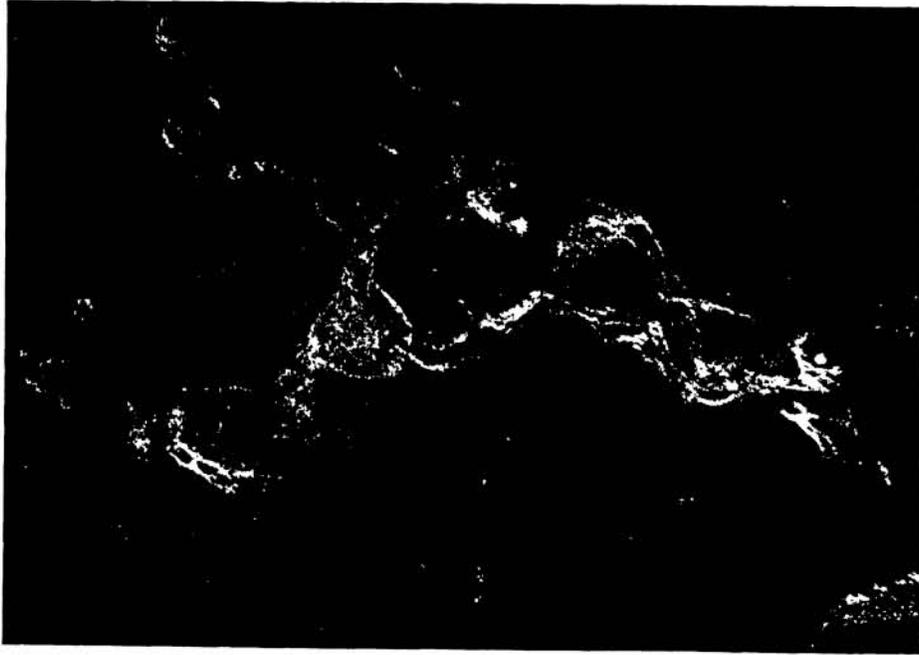


Figure 1. High resolution (1-3 km) Arecibo image of Themis Regio.

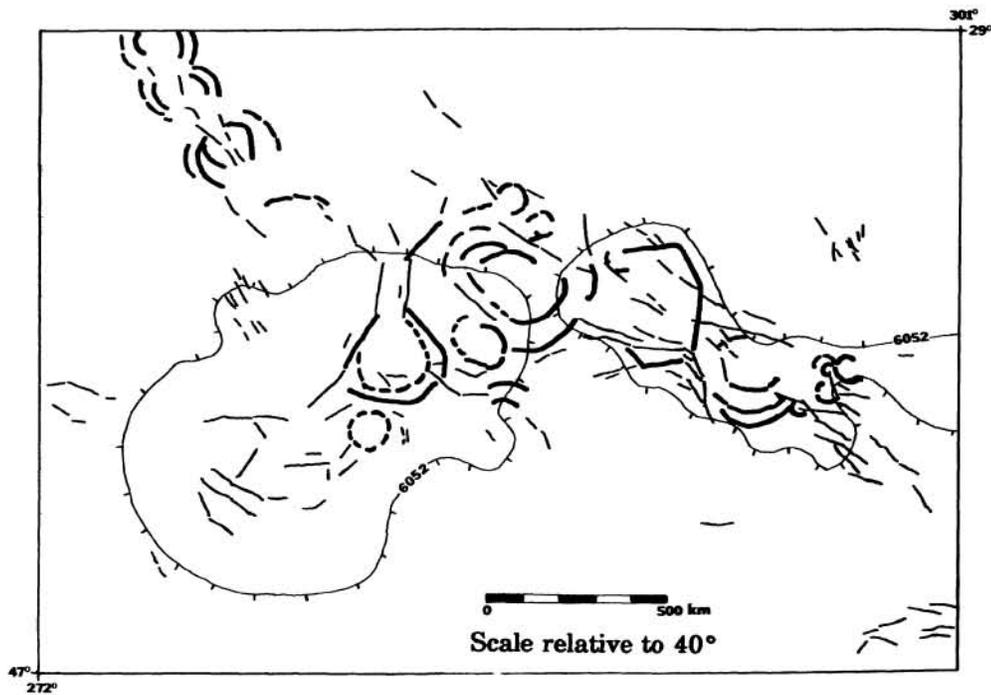


Figure 2. Sketchmap of Themis Regio with *Pioneer-Venus* topography.