THE EVOLUTION OF PARGA CHASMA AND CORONAE GROWTH ON VENUS; Mary G. Chapman, US Geological Survey, 2255 N. Gemini Drive, Flagstaff, AZ 86001

On Venus, one of the deepest sections of the northwest-trending depression of Parga Chasma (marked "a" on fig. 1) lies within the Galindo/V40 quadrangle (centered at lat 12.5° S., long 255°; 1:5,000,000 scale; fig. 1). The entire chasma is approximately 1,870 km long and roughly connects Themis Regio (lat 35° S., long 285°) and Maat Mons (lat 0°, long 195°). Parga Chasma is bound by a cluster of many asymmetric, multiple, and overlapping coronae. Within the map area, the chasma is a fractured depression (marked "a" and "b" on fig. 1) that varies in depth from 0 to 3 km. Parga cuts the tessera high that is the terminal end of a northeast-trending, western arm of Phoebe Regio (fig. 1). After its intersection with the tessera high, the chasma is offset 200 km to the south (marked "b" on fig. 1). A part of the deep section of the Parga fracture zone follows an arcuate concave path about the north end of the asymmetric Atete corona at lat 16° S., long 244° (marked "c" on fig. 1) and forms part of the corona's moat or outer trench. Another less dominant fracture zone with associated coronae (zone marked "d" on fig. 1) extends from the convex edge of this path to the northeast (off the map area), forming a triple-junction with Parga (fig. 1). This northeast triple junction forms a 2-km-deep depression and part of the west moat of another unnamed asymmetric corona (at about lat 12.5° S., long 250°; marked "e" on fig. 1); Parga forms the unnamed corona's south moat.

A 38-mgal positive gravity anomaly and a small positive geoid height are associated with Atete Corona, and these data along with the position of Parga Chasma have led Schubert et al. [1] to postulate formation by either thermally induced thickness variations in a moderately thick (about 100 km) lithosphere or a deep positive mass anomaly due to subduction or underthrusting. These authors [1] prefer the interpretation that the gravity anomaly is due to a buried mass resulting from subduction, because the anomaly is associated with the concave side of the arcuate segment of Parga together with the absence of similar high gravity anomalies over other portions of the same chasma.

However, map relations of the V40 quadrangle do not appear to support subduction at Parga. The prolific number of grabens in the map area and possibly the broken, extended terrain of the nearby Phoebe Regio belt argue for extension. Furthermore, the arcuate bend of Parga ("a" in fig. 1) seems to form part of a triple junction rift zone with the northeast fracture zone ("b" in fig. 1). Coronae, along both Parga and the less dominant northeast fracture zone, may represent rift-type clusters of aligned eruptive vents. In terrestrial rift zones, most of the basaltic section is likely to be erupted from an elevated region above a rift and flow laterally away from the rift onto an adjacent continent [2]. The placement of coronae on mostly opposite sides of Parga Chasma and their extensive flows away from the chasma is in agreement with this terrestrial eruption mode.

The usual relatively symmetric pattern of concentric and radial structures of coronae is absent around those coronae associated with the extension zones. Instead, these structures have been bent around and deflected about the fractures, grabens and depressions of extension zones; the depression of the zones even form sections of the outer moats of some of the coronae. This relation and the interlayered stratigraphy of coronal flows adjacent to extension zones indicate that these coronae are related to growth of their adjacent extension zones. In other words, coronae found along Parga and the northeast rift are coeval to the development of the triple junction.

PARGA CHASMA AND CORONAE: Chapman, M.G.

The three branches of the Parga triple junction suggest a "least effort" fracture as a result of magma-induced vertical upward loading [3], possibly related to local mantle upwelling of a quasi-stationary hotspot plume that could result in thermally induced crustal thickening. Movement of the surface above the plume would tend to be uplift above and extension away from the triple junction (fig. 1).

The southeast branch of Parga may have been offset to the south after encountering the arm of Phoebe Regio, because this is where the chasma encounters texturally and possibly dimensionally different tessera material of the Phoebe Regio highland and the topographically elevated terrain southwest of it (fig. 1).

[1] Schubert, Gerald, Moore, W.B., and Sandwell, D.T., 1994, Icarus, v. 112, p. 130-146; [2] White, Robert, and McKenzie, Dan, 1989, JGR, v. 94, p. 7685-7729; [3] Luongo, G., Cubellis, E., Obrizzo, F., and Petrazzuoli, S.M., 1991, J. Volcan. Geo. Res., v. 48, p. 173-185.

Figure 1.- Illlustrated, three-dimensional perspective view of Galindo quadrangle (composed of left-looking synthetic-aperature radar images) showing Parga Chasma (marked "a" and "b"); tessera outlined in black; arrows indicate inferred direction of surface movement; quadrangle is approximatly 3,300 km wide. Deepest section of Parga Chasma indicated by white zone marked "a." White zone marked "b" is an extension of Parga Chasma offset to south after encountering trend of tessera high. Atete Corona marked "c." Cross-hatched zone marked "d" is less deformed fracture zone trending northeast away from Parga; zone "d" forms a partial moat of corona marked "e." Flows from 2-km-high volcano marked "f" embay arm of Phoebe Regio tessera (marked "g"). Illustration H (in corner) shows surface movement away from triple zone fracture possibly similar to that formed by zones marked "a" and "d" on quadrangle.