

VENUSIAN CORONAE: COMPARISONS WITH ALBA PATERA, MARS.

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Venera 15 and 16 radar images of the northern hemisphere of Venus revealed the existence of the mysterious structures known as ovoids or coronae (1). Coronae are 150-600 km circular to elliptical structures surrounded by numerous ridges and grooves. The interiors appear complex, displaying radar bright and dark flows, domes, and ridges. Most are located north of 30°N and in plains units near volcanic or tectonic terrains, with the majority found along the boundaries of Ishtar Terra (2). Pioneer Venus altimetry data indicate that coronae are raised above the surrounding plains by 100-800 m. Although their origin is still uncertain, various studies have linked these features to hot spot volcanism, diapirism, gravitational relaxation of topography (3), and sinker tectonics (4).

Inspection of radar images of coronae (Fig. 1) reveal a number of similarities between these features and Alba Patera (Fig. 2), a low relief volcano on Mars. Alba Patera is a slightly elliptical structure extending up to 1600 km in diameter (5). A 600-km diameter annulus of graben surrounds an interior containing a 100-km diameter caldera and numerous flows and ridges. The slopes of the volcano are very shallow and the total height of the feature probably is less than 3 km above the surrounding plains (6). Alba Patera is located at 40°N 110°W on the northern edge of the Tharsis Montes volcanic region. Although its origin is almost certainly volcanic, Alba Patera represents a different class of volcanic feature from any identified on earth or the other terrestrial planets.

Table I shows a comparison of the venusian coronae and Alba Patera. The correlations are numerous: size, location, morphology, and topographic structure all show striking similarities. The major difference between these features is the lack of an identifiable caldera within the coronae. However, the interiors of most coronae are so complex in the radar images that the calderas may not easily be identifiable as distinct features. Close inspection of several of the corona images reveal circular to elliptical features which could be interpreted as calderas. Obviously, one proceeds with caution when comparing radar and visual images, but the number of similarities seen between the venusian coronae and Alba Patera indicate that further comparative study of these features is warranted.

The similarities between Alba Patera and the coronae suggest that these features may share a common origin. Unfortunately, no convincing terrestrial analogs have been proposed for either. Recently, Mouginis-Mark, et al. (7) and Gulick and Baker (8) have proposed that the existence of apparently fluvial channels suggest the presence of pyroclastic deposits on the flanks of Alba Patera. The scenario derived by Mouginis-Mark, et al. suggests that Alba Patera formed in multiple stages of volcanic activity, beginning with emplacement

of a volatile rich ash layer followed by more basaltic lava flows. Quantitative models of volcanic eruption processes suggest that pyroclastic deposits are likely to form at lower mass eruption rates on Venus and Mars than on the Earth, and thus be more common on the former two planets (9). The morphological similarities between Alba Patera and the coronae on Venus suggest that a combination of pyroclastic and effusive volcanism similar to that proposed for Alba Patera may be responsible for the coronae.

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TABLE I

	Alba Patera	Venus Coronae
Size	Fracture ring 600 km. Caldera 100 km diameter. 1600 km diameter total extent.	150-600 km circular to elliptical structures.
Location	+40° 110°W. North edge of Tharsis volcanic province.	North of +30° lat. Most associated with volcanic/ tectonic regions, especially along boundary of Ishtar Terra.
Morphology	Large slightly elliptical feature. <3 km above surrounding plains. N-S and NE-SW trending fracture ring. Lava flow features, ridges on floor. 100-km diameter caldera.	Large elliptical to circular features. 100-800 m above surrounding plains. Annulus of multiple ridges and grooves. Features interpreted to be lava flows, domes, and ridges in central portion. Radar complex interior.

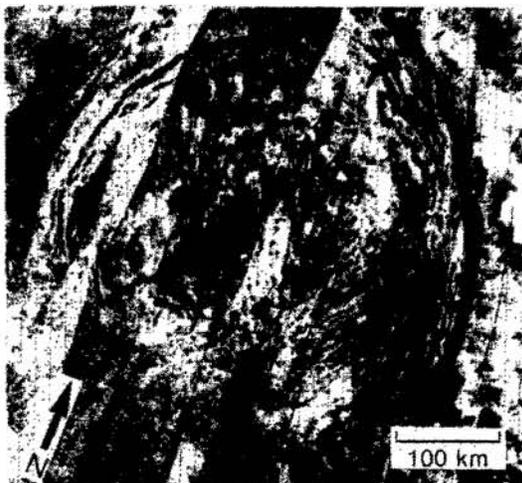


FIGURE 1. Anahit Corona, Venus. Centered at +75°, 272°E.



FIGURE 2. Alba Patera, Mars. Centered at +40°, 110°W.