

CORONAE OF PARGA CHASMA, VENUS. P. Martin¹ and E. R. Stofan² ¹Department of Physics, University of Cambridge, Cavendish Laboratory, Madingley Road, Cambridge CB3 0HE, UK (paula.martin@phy.cam.ac.uk), ² Proxemy Research, 20528 Farcroft Lane, Laytonsville, MD 20882 USA (ellen@proxemy.com).

Introduction: Parga Chasma is a 10,000km long fracture and trough system extending from Atla Regio to Themis Regio in the southern hemisphere of Venus [1, 2]. The Parga system consists of a main NW-SE trending chasma with 14 branching segments, and each of the segments have coronae along their length. The trough, fractures and coronae of the Parga system form a zone of deformation that ranges from ~150 to >400km wide. Parga and other chasmata systems are thought to result from regional extension accompanied by upwelling to form coronae [1-4]. As most coronae are located along rift systems [2], analysis of chasma coronae may further constrain the origin and evolution both of coronae and of the chasma systems. In this study, we examine the variations in size, topography, annulus characteristics, associated volcanism and relative timing of corona formation with respect to rifting along the Parga system, following an earlier preliminary study [5]. We analyse 122 coronae, including coronae along the chasma as well as those up to 1,500km away from the rift.

Corona Class: Coronae on Venus have been classified into categories based on their planform shape and annulus characteristics [1] (Table 1). The percentage of corona found in each group has not changed greatly in more recent evaluations of the total corona population [6]. We classified the 122 coronae examined in this study and compared them with the total corona population as shown in Table 1. As indicated by our preliminary study [5], there are slightly more Concentric (Double Ring), Multiple and Radial/Concentric coronae along Parga than in the total corona population, and slightly fewer Asymmetric and Concentric coronae.

	All Coronae	Parga Coronae
Concentric	55%	52%
Concentric (Double Ring)	11%	16%
Radial/Concentric	5%	7%
Asymmetric	18%	10%
Multiple	10%	14%

Table 1: Comparison of morphological classification of total corona population [1] and Parga coronae.

Corona Topography: As indicated by our preliminary study [5], coronae along Parga chasma differ topographically from the total corona population (Table 2). Parga Coronae are more likely to be either a

depression or a plateau than those in the total population. They are less likely to be rim only coronae than those in the total population, but this simply reflects the discovery that rim only coronae are more likely to be found in the plains than along chasmata or fracture belts [7].

Topographic Group	All Coronae	Parga Coronae
Dome	6%	7%
Plateau	12%	17%
Rim, inner high	22%	24%
Rimmed depression	27%	28%
Outer rim, trough, inner high	4%	5%
Outer rim, trough, depression	1%	0%
Rim only	17%	5%
Depression	8%	14%
Chaotic/none	3%	1%

Table 2: Comparison of topographic characteristics of total corona population [7] and Parga coronae.

Corona Size: We measured the size of the coronae examined in this study, defining the diameter or maximum width as the distance between the outermost annulus fractures. Domes, depressions and rimmed depressions have average diameters of 175km, 149km and 123km respectively. Plateau and other topographically high coronae have average diameters ranging from 248km to 327km, while rim only coronae have average diameters of 233km. As indicated by our preliminary study [5], all of the smaller diameter shapes are consistent with shapes predicted by models of corona formation that include delamination of the lower lithosphere [8].

Corona Timing: We examined the relationship between the coronae along Parga chasma and any local segments of the Parga rift system, using stereo images to determine whether the formation of each individual corona pre-dates, post-dates, or is synchronous with the formation of the rift segment. The relative timing of 47 of the coronae could not be determined because they are located off the rift, and that of a further 7 coronae could not be determined because they are located on Themis Regio. Of the remaining 68 coronae for which the relative timing could be determined, the vast majority (85%) are clearly active synchronous with the rift. However, almost half (47%) of the coronae located along the rift show some activity that pre-dates the rift, indicating that corona formation is

not necessarily induced by rifting. Only 26% of coronae along the rift show evidence of activity that post-dates rifting.

Corona Volcanism: We examined the coronae along Parga Chasma to determine the amount of volcanism that could be clearly associated with each of the coronae. 65% of the coronae along Parga Chasma have small amounts of associated volcanism, while 17% have moderate amounts, and 18% have high amounts. There is some correlation between corona topography and amount of associated volcanism: Domes and plateaus generally have high amounts of associated volcanism; depressions and rimmed depressions generally have low amounts of associated volcanism. Volcanism along Parga Chasma is dominated by flows from 10 large coronae, with volcanism highest on Themis Regio. Only 2 large volcanoes have been identified within the Parga system.

Corona Location: There is no clear decrease in numbers of coronae with increasing distance from the rift, and there is no clear correlation between particular rift segments or the location of junctions between rift segments and the location of coronae. Each of the branching segments of the Parga Chasma rift system were considered individually in order to identify any local correlations between size, topography, annulus characteristics, associated volcanism and relative timing of coronae formation with respect to local rifting. There are no clear trends in size, annulus characteristics or relative timing with respect to any of the rift segments, nor between coronae located along the rift and those off the rift. Although there is no definitive correlation between location and topography, coronae along some segments of the rift are more likely to be topographically high, and those along other segments of the rift are more likely to be topographically low. Similarly, although there is no definitive correlation between location and volcanism, some segments of the rift have limited amounts of associated volcanism, while others have large amounts of associated volcanism.

Conclusions: Initial analysis of 122 coronae in the Parga Chasma region suggests that these coronae differ in both annulus characteristics and topography from the total corona population. As at topographic rises [9], there are coronae both along the chasma and in the surrounding plains that have shapes that are consistent with those predicted by models of corona formation that include delamination of the lower lithosphere [8]. Although there is no clear correlation between size, annulus characteristics or relative timing with respect to local rifting and location, general trends in topography and volcanism are associated with some rift segments. In addition, domes and

plateaus generally have high amounts of associated volcanism, while depressions and rimmed depressions generally have low amounts of associated volcanism. There is no clear progression in age along the Parga Chasma system, consistent with findings at Hecate Chasma [3]. No clear trends have yet emerged from this study that may be used to further constrain the origin and evolution of either coronae or rifting in the Parga system.

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