

SPATIAL AND GENETIC RELATIONSHIPS OF CORONAE WITH GROOVE BELTS AND RIFT ZONES ON VENUS. E.N. Guseva and M.A. Ivanov, Vernadsky Institute, RAS, Kosygin st., 19, 119991, Moscow, Russia, guseva-evgeniya@ya.ru

Introduction: Coronae are large circular volcano-tectonic complexes on Venus that are characterized by prominent annulus of densely packed extensional structures [1-4]. Different catalogues of coronae list from 200 to 400 features [3; 5].

Characteristic topographic profiles allowed division of the entire population of coronae into three groups: (1) dome-like, (2) ring-like, and (3) caldera-like, which perhaps illustrate different stages of evolution of coronae [6; 7].

The main goal of our study was establishing of the spatial and genetic relationships of coronae of different topographic groups with the major zones of extensional structures.

Observations and results: The majority of coronae (~80%) are spatially associated with large zones of extensional structures. About 60% of these coronae are in association with the groove belts and ~20% of them occur in the rift zones. The ring- and caldera-like coronae are preferentially associated with the groove belts. Results of the numerical modeling [6] suggest that these coronae are at their final stages of evolution. The majority of coronae near or within the rift zones belongs to the dome-like group and occurs inside the Beta-Atla-Themis (BAT) region [8; 3; 9; 10; 7]. These coronae likely represent the earlier stages of the coronae evolution [6].

An important characteristic of coronae is their topographic configuration. So far, only three major groups of coronae (mentioned above) were described. We assessed the shape of coronae using average topographic profiles. Each point of these profiles represents a mean elevation within a concentric zone relative to the corona geographic center. To construct such profiles, we used the Venus topographic map with resolution ~ 5 km/px

[<http://astrogeology.usgs.gov/missions/magellan>].

At the first stage of our investigation, we have analyzed the shape of 83 randomly selected coronae with diameters from ~ 175 to ~ 480 km. We have defined eight topographic classes of coronae:

(1) dome-like coronae (12% of the analyzed population); (2) U-shaped depressions without rim (5%); (3) W-shaped coronae with a central rise, which is topographically lower than the annulus (22%); (4) W-shaped coronae with central rise, which is topographically higher than the annulus (19%); (5) W-shaped coronae with central rise, which is at the same level with the annulus (8%); (6) WV-shaped coronae with two central rises, which are lower than the annulus (5%); (7) WV-shaped coronae with two central rises, which are higher than the annulus (22%);

(8) WW-shaped coronae with multiple central rises (7%).

At the next stage of our study, we have established age relationships of coronae with the major zones of extensional structures, groove belts and rift zones using the global geological map of Venus [11]. The majority of the considered coronae (75%) are relatively old complexes whose annulus formed before the emplacement of the shield- and regional plains, the older coronae (Fig. 1a). About 25% of the analyzed coronae appear to be synchronous with the development of the rift zones, the younger coronae (Fig. 1b).

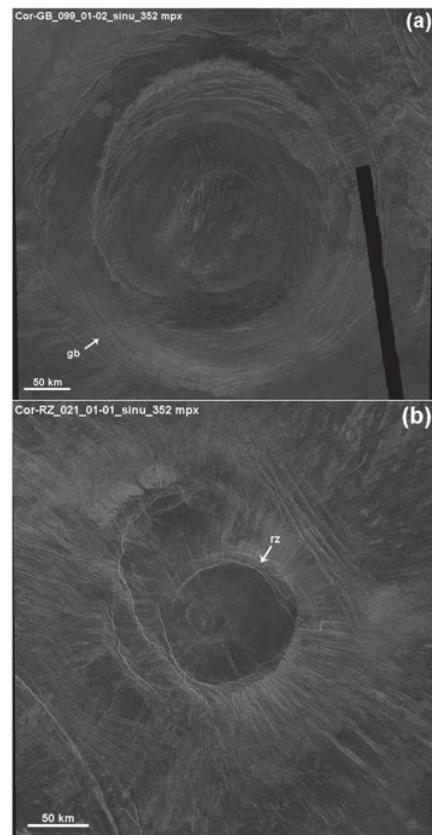


Fig. 1. (a) Older coronae with annulus of groove belts fractures and (b) younger coronae with annulus consisting of rift zone structures (rz).

The younger coronae more often show topographic profiles of groups 7 (29%), 8 (19%), and 4 (19%) (Fig. 2a).

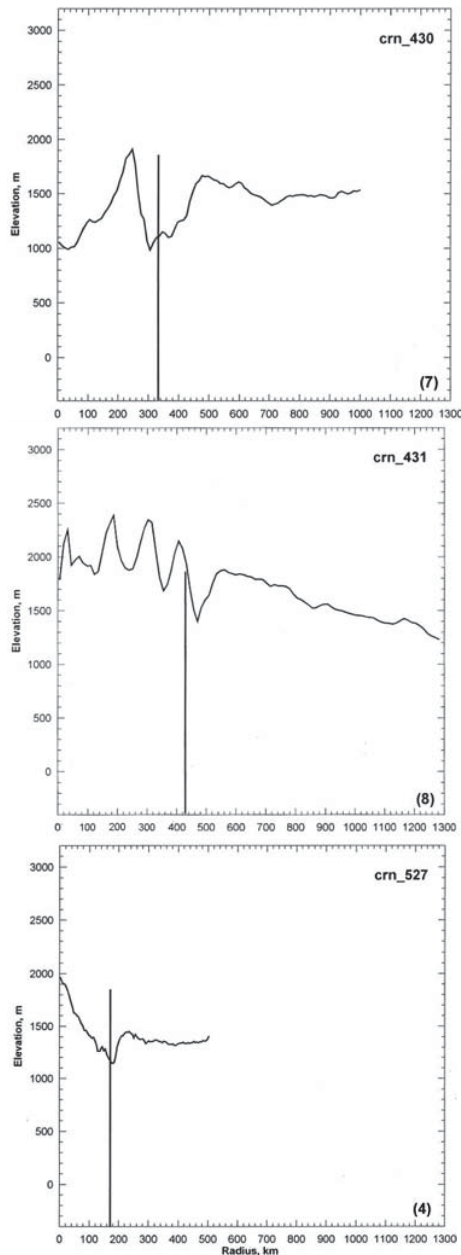


Fig. 2a. Most frequent topographic profiles (half) of the younger coronae are of the groups 7, 8 and 4.

Less frequently, these coronae belong to groups 1 (14%) (Fig. 2b), 3 (5%), and 5 (5%).

The older coronae occur in all topographic groups but the groups 3 (24%) (Fig. 3), 4 (19%), and 7 (19%) (Fig. 2a) are more frequent for the older coronae. Less frequent are groups 1 (11%) (Fig. 2b), 5 (10%), 2 (7%), 6 (7%), and 8 (3%).

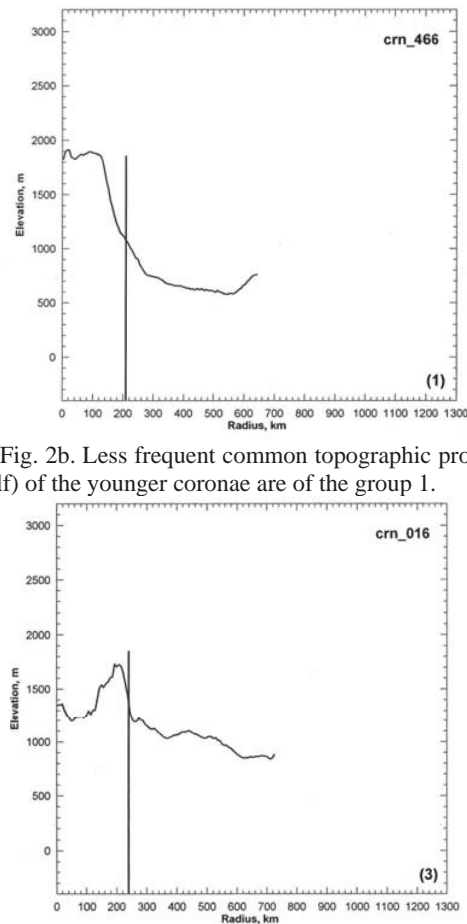


Fig. 2b. Less frequent common topographic profiles (half) of the younger coronae are of the group 1.

Fig. 3. Most frequent common topographic profiles (half) of the older coronae are of the group 3.

Thus, for the younger coronae are typical profiles with the positive topography (81%), whereas for the older coronae both positive (53%) and negative (47%) topographic profiles are about equally frequent, which likely reflect the higher degree of topographic maturation of the older coronae.

References:

- [1] Barsukov et al. (1986) *JGR*. 91. D378-D398
- [2] Head et al. (1992). *JGR*. 97. 13,153-13,197
- [3] Stofan et al. (1992). *JGR*. 97. 13,347-13,378
- [4] Johnson and Richards (2003). *JGR*, 108. 12-1-12-18
- [5] Crumpler, Aubele (2000). *Enc. of Volc.* Sigurdsson et al. (Eds.)//Acad. Press. 727-770
- [6] Smrekar, Stofan (1997). *Venus II*. Bougher et al. (Eds.)//Univ. of Arizona Press. 845-878
- [7] DeLaughter, Jurdy (1999). *Icarus*. 139. 81-92
- [8] Squyres et al. (1992). *JGR*. 97. 13,611-13,634
- [9] Stefanick, Jurdy (1996). *JGR*. 101. 4637-4643
- [10] Nagasawa et al. (1998) *Geodynam. of Venus: Evol. and Current State*. Mackwell, Phillips. (Eds.). abst. P. 10.
- [11] Ivanov, Head (2011) *PSS*. 59. 1559-1600.