THE ARCHED GRABEN OF VENUSIAN CORONA-NOVAE. V.- P. Kostama[1] and M. Aittola[1], [1]Astronomy, Department of Physical Sciences, P.O. Box 3000, FIN-90014, University of Oulu (<petri.kostama@oulu.fi>, <marko.aittola@oulu.fi>).

Introduction: Coronae and novae are two types of Venusian volcano-tectonic structures. Half of the Venusian novae are located within coronae [1]. In general, the novae have been interpreted to represent the initial stage of the corona evolution [2, 3, 4] and therefore are hypothesized to predate the corona rim structure [5, 6]. However, the recent studies show that the majority of the novae, which are located in the inner part of the coronae, seem to postdate the corona formation [7]. The corona structures with nova inside them have been called as corona-novae [8]. As the nova formation usually postdates the coronae annulus, the most recent phases of activity of corona-nova joint structures are in these cases the nova related features, i.e. the radial structures and the lava flows produced by the nova. However, there are some examples where very young arcuate graben are seen adjoining the structures. These arch-like systems are located on the flanks of the structures and they seem to bend away from the nova center. This is in contrast to the fractures of the annulae. Therefore they probably are of different origin.

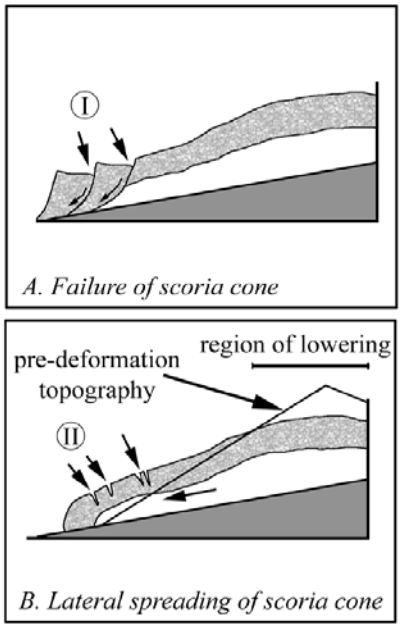

Figure 1. The deformation of the scoria cone. **A.** The rotational slumping produces backward tilted blocks and arcuate scarps (I) within the flank of the volcanic center. **B.** Overlying load depresses the coalesced layer which becomes unstable resulting in lateral spreading of the cone and in fracturing of coherent material (II) due to plastic flow of the subsequent material.

The studies of the volcano flanks of Earth have shown that horseshoe-shaped scarps are formed after the eruption, which indicate the occurrence of failure of the scoria cone (Fig. 1a) [9]. The concentric fractures and backward tilted blocks are typical of rotational slides and slumps [10]. It is also possible to have a lateral spreading of the cone resulting in fracturing of coherent material due to plastic flow of subsequent material (Fig. 1b) [9].

An example of Corona-novae with the graben: We have found evidence of the arcuate graben in at least four of the corona-novae [11] of which one is analyzed in this paper. We concentrate in measuring and analysing these suites of tectonic modification using fotogeologic and topographic information from the Magellan SAR- and GTDR-data. The SAR radar data resolution is ≈75 m/pixel and GTDR data 5km/pixel.

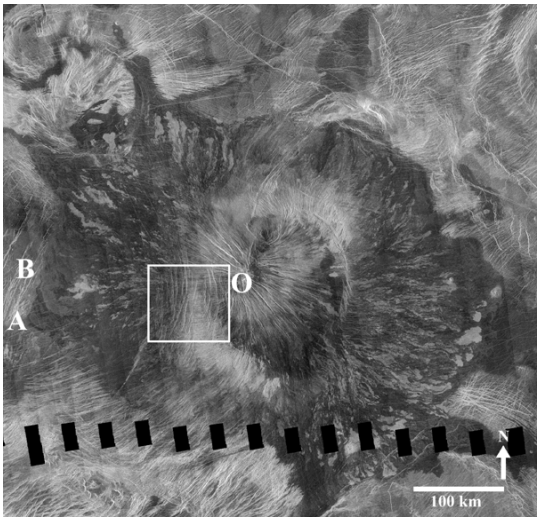

Figure 2. The Mbokomu Mons. This Corona-nova (15S/215E) has a prominent graben system to the SW of the Nova center. The high-resolution image of the suite (white box) is shown in Figure 3. The topographic profiles O-A and O-B are shown in Figure 4.

Corona-nova 15S/215E, Mbokomu Mons: The corona-nova centered at 15S/215E shows a very prominent arched system of graben located to the southwest of the elevated nova center (Fig. 2). Actually, two separate systems can be observed (Fig. 3). The graben are located 27 to 100 km to the west of the nova and they are bent away from the nova center. The graben

tend to be wider close to the nova (1,5 - 2,5 km) and more narrow (0,35 - 0,6 km) when they are located over 50 km away from the nova center. The length of the graben varies from 8 km (>85 km from the nova) up to 35 km at distance of less than 50 km from the nova.

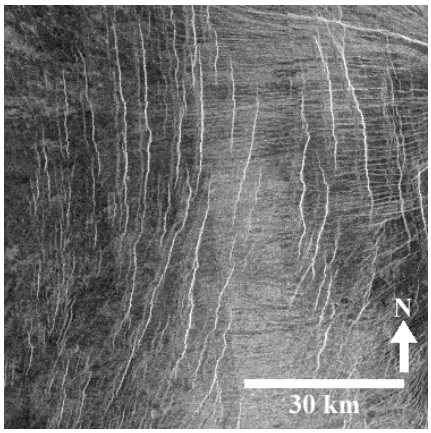

Figure 3. The high resolution Magellan SAR image of the graben of Mbokomu Mons.

The graben clearly postdate the corona-nova structures and they have deformed the lava flows associated with the latest phase of nova evolution. Thus, they represent without doubt the latest phase of activity of the corona-nova. So it is evident that the formation of the graben system is somehow connected to the mechanism of lava flow deformation. This is also supported by the locations of the graben systems on the corona-nova flanks. The location of the graben is presented in topographical profiles of the nova flank (Fig. 4). Both sets are located on prominent slopes of the lava flows, which ensures the idea of the graben forming due to lateral spreading of the flows. The graben closer to the nova center appear to locate in deeper slope, which may reflect the wider diameter of the structures compared to the graben farther from the nova.

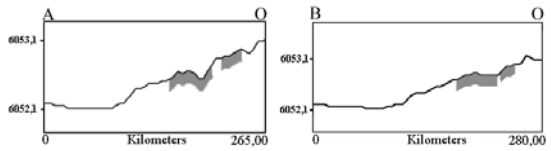

Figure 4. The topographical profiles O-A and O-B (from Fig. 2). The graben regions are shown in grey within the profiles.

Conclusions: In most cases the latest active phase of corona-nova evolution process is the elevation of the nova with radial structures and lava flows associated with it [8]. However, there are some arched graben associated with the young lava flows of some of the corona-novae, which clearly postdate the emplacement of the flows. Moreover, those graben are in most cases bent to the other direction than the corona annulus, which - together with age relations - indicates that graben are not part of the corona annulus. The graben are usually located on the slopes of the lava flows originating from the nova and there may be one or several separate systems on the same flank [11]. Considering that these studied graben are younger than the rim fractures and lava flows, are arcuate to the direction of the flows and are located in the slopes of the corona-novae, we conclude them to be representations of lava flow modification rather than produced by endogenic extension of the region.

The most presumable explanation for the formation of these graben sets, is the deformation mechanism of the lava flows by activity similar to landslide processes, such as slope failures (slumping and/or sliding) which produce arcuate scars or depressions on the slope. As shown in the studies of volcanoes on Earth such as the Izu-Oshima volcano in Japan [9], the lava flows are modified by movement of material and scoria failures (slumping and/or sliding, lateral spreading) after their emplacement [9, 10].

The studies have shown that the corona-novae are usually very young in respect to their surrounding geology [8]. This could imply that they are representations of some kind of late-type activity on Venus. Thus considering the deformation of the lava flows, the graben sets actually represent the latest stage of development of the corona-novae structures of Venus and possibly Venusian tectonics in general.

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