**Introduction:** Venus as a probable single-plate planet [1] has a unique set of volcano-tectonic features. The enigmatic circular structures, coronae are of great interest in particular. The corona definition does also include other concentric features known as the “arachnoids” [2], but it does not elaborate on the details of the concentric volcano-tectonic structures. In several cases, coronae and arachnoids are mixed resulting in several controversial catalogues of the features [3,4].

Alongside with hundreds of coronae and large number of arachnoids, there are large volcanoes and smaller structures with prominent radial features. The term “nova” is used to describe this special group of Venusian volcano-tectonic structures with a stellate fracture pattern [5,6] centered on a central summit or fracture.

Coronae and novae display some interesting associations due to the fact that half of the novae are located in the interior part of the coronae [7]. Furthermore, the novae have been interpreted to represent the initial stage of the corona evolution [5,3,8] and therefore are hypothesized to predate the corona rim structure [9,10]. However, this presumption is in contrast to the recent studies. Majority of the novae which are located in the inner part of the coronae seem to postdate the corona formation. It is displayed that a nova can form within different stages of corona development, which also reflects the nova characteristics [11]. These corona structures with nova inside them have been called as “corona-novae”. Novae, which in many cases exist within coronae, are never associated similarly with arachnoids [11].

In this study we try to elaborate and analyse the characteristics of these volcano-tectonic structures which seem to share to some extent similar origin and evolution phases. We also present a classification based on their locations in different geological environments which seem to control their volcanic as well as topographic properties and morphology.

**Distribution of the features:** Our study begun as a separate studies on arachnoids and novae, two groups of clearly identifiable features that had been both associated with coronae, either as a subtype, part of corona formation process or belonging to the same class of corona-like features [3,12,13,14]. The inconsistencies in several previous studies of these features and in coronae studies [3,4] led to independent catalogue of arachnoids, novae and coronae and corona-novae as well [15].

In all, we have found 349 coronae, 96 arachnoids and 74 novae on the Cytherean surface. We also have 34 corona-nova joint structures. All groups have very different global distributions (Figs 1-4). Studying these distributions and correlating them to the differences in local geology is bound to have major impact on the understanding of formation and evolution processes of these features [7,16] as well as unveiling the geological history of the lithosphere in general.

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**Distribution of Coronae on Venus**

Coronae seem to be located almost everywhere on the surface of Venus. However, the distribution is non-random with a definitive concentration of structures to the BAT-region (Fig. 1). In a general sense, the coronae seem to favor the deformation zone areas. Examining the latitudinal and longitudinal distribution we notice the expected lack of structures in high latitudes (because of the lesser surface area) and the high concentration between 30N – 40S and 200E – 300E which corresponds well to the BAT-region.

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**Distribution of Arachnoids on Venus**

**Arachnoids:** There is a clear concentration of features in the northern hemisphere with 65.6 percent, while only 34.4 percent of the population is located in the southern hemisphere (Fig. 2). In addition to this concentration, 67.7 percent of the arachnoids is located...
between the latitudes 45N and 10S. Longitudinal and latitudinal distributions have a notable difference to the coronae distribution.

![Figure 3. Distribution of the Novae on Venus](image1)

**Novae:** The distribution of novae seems to promote the chasmata regions of Venus (Fig. 3), as 68.9 percent of features is located on or near the deformation zones. We do have a similar concentration to the BAT region as coronae. Comparing to the arachnoids we see that the novae are scarce on the plains regions. The novae do not show the expected latitudinal distribution but instead are concentrated to the southern hemisphere.

![Figure 4. Distribution of Corona-Novae on Venus](image2)

**Corona-novae:** Nearly the whole population of these joint-structures is found on the young rift zones of Venus (Fig. 4). All features are found between 20N and 40S with some emphasis to the southern hemisphere.

**Classification based on the geological environment:** Separate reasons promote the proposed classification scheme based on the geological environment of the structures. In studying the global distributions we have learned that they have been controlled by the geological properties of the various regions on Venus [e.g. 16]: The novae have clear correlation to their geological environment (Fig. 3) concentrating to the chasmata regions. Arachnoids, despite their similarity to the coronae favor totally different geological distribution (Figs. 1,2). Secondly, the studied coronae, arachnoids, novae and corona-novae are morphologic features, therefore identified by their appearances which hinders any morphological classifications. The previous studies have also proven the complexity of the formation processes of these structures [e.g. 3,11]. This means that separate structures must be analyzed in detail in order to understand the complexity of the formation process.

This classification uses four major classes based on the global Venusian environmental units. Class I are the structures associated with the deformation zones, which are generally quite young (Ia – location within the deformation zone, Ib – located close to the deformation) Class II features are located on the major plains units. Class III are classified based on their close relationship with tessera, the highly modified, possibly remnants of the older Venusian surface. The features in class IV are identified based on their locations in highly volcanic areas such as the regions of large volcanoes.

The percentages of the classes in the separate four feature groups is shown in the Figure 5. All the structures seem to favor class I (from 52% up to 69%), with arachnoids being more abundant in the class Ib than Ia, while the others have an opposite trend. Coronae and arachnoids are both numerous in the class II (20-25%) while class II novae and corona-novae are scarce (less than 10%).

![Figure 5. The class division (%) of corona-like structures](image3)


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