
Introduction.
Coronae are large circular to elliptical structures characterized by an annulus of tectonic features, internal fracturing, and extensive volcanism [1,2,3] that have played an important role in the geological evolution of Venus. Based on a morphological ground, coronae are classified into five types [1]. One of these types is multiple corona, defined as those formed by two to three linked structures, with a continous annulus surrounding the entire corona. This definition exclude overlapping structures, where a clear age progression can be identified. Detailed studies of this type of coronae are not common in the scientific literature. In this work we study two structures classified as as multiple coronae [1], located in the Helen Planitia Quadrangle (V52): Oanuava Corona (32.5ºS/255.5ºE) and an unnamed corona (36.5ºS/247ºE).

Coronae description.
Oanuava Corona (32.5ºS/255.5ºE).
Oanuava Corona is formed by three NE-SW oriented structures with a clear age progression towards the NE. The first structure is horse-shoe shaped, opened in its northeastern sector. The annulus is composed of extensional tectonic features (fractures and graben). This first structure has evidence of early radial deformation in the southwestern, prior to the development of the annulus. The second structure, is less developed and lacks the radial deformation that appears in the first structure. The third structure, that overlaps the second one in its eastern sector, is symmetrical to the first one (opened to the SW). The annulus is formed by extensional features, and lacks the radial deformation previous to the annulus that the first one shows.

One important characteristic that dominates the interior of Oanuava Corona is the presence of a NE-SW set of fractures that formed contemporary with the entire corona. The fractures postdate the radial deformation produced during the first stages of the corona formation. The radial deformation is restricted to the eastern sector. In the interior there are also some small and medium size volcanic edifices that appear to be associated with N-S and E-W fractures, which postdate the formation of the corona. We also observe a set of fractures oriented E-W, which are previous to the development of the second structure. The orientation of these fractures changes outwards, eventually reaching the N-S regional direction. This supports the existence of a local stress field around the corona.

Discussion.
As shown here, the structural mapping of the two coronae indicates overlapping relationship and age progression in the structures that form both coronae. In principle this clearly prevents classification of these two structures as multiple coronae. However this exception to the general definition of multiple coronae should be taken much caution before a comprehensive model for the origin of multiple coronae is establish. As pointed out by Stofan et al., 1992[1], asymmetric and multiple coronae may represent features where the overlying lithosphere or the plume itself has undergone motion as the corona formed. Either way, a mobile lithosphere over a plume (e.g., the Hawai-Emperor volcanic chain on the Earth), or a mobile plume under a static lithosphere [4], an age progression will be produced all around the structure. In the two previous cases the formation of multiple coronae or several corona could be regarded as the consequence of a simple corona formation process, as just implies the action of a single plume or diapir and its...
evolution in time and space. Thus although the studied coronae show overlapping and age progression they should be regarded part of a `single structure´ and therefore be considered as `multiple coronae´.

Conclusions.
The study reveals a complex history on the evolution of the coronae, which resulted in structures that show overlapping and age progression during their development, and formation of local stress fields. These features prevent classification of these structures as a case of multiple coronae, but before we fully understand the process of formation of multiple corona, the cases involving overlapping with a clear age progression should not be excluded from the general definition of multiple coronae.

References.