**CIRCULAR TROUGHS IN TESSERA TERRAINS: PRELIMINARY RESULTS FROM A GLOBAL SURVEY ON VENUS.**
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**Introduction:**

Tesseras are highly deformed terrains characterized by two or more sets of tectonic structures cross-cutting each other, which is indicative of a complex tectonic history [1]. Because these terrains mainly appear inside crustal plateaus, interpreting Tessera tectonic history can be related to their origin and evolution [2].

Detailed observations of radar images of Tessera terrains on Venus can be used to define a new tectonic structure characterized by a circular through that left inside a circular area with the average elevation of the surrounding tessera terrains. Concentric and radial tectonic lineaments appear associated to these structures. Often the circular troughs appear flooded by intra-tessera lavas, becoming more visible in radar images. These features are especially abundant in the internal areas of crustal plateaus characterized by basin and dome tectonic interference patterns, but also can be found at tessera inliers surrounded by volcanic plains. Since they can be found around Venus, these structures are probably related to a geological process of planetary importance that needs to be studied. According to their main feature we propose to call them Circular Troughs (CT).

**Methodology:**

We are currently performing a global survey covering all tessera outcrops on Venus looking for CTs. through analysis of Magellan left and right looking radar images. Based on our cartography we build up a database in order to quantify their morphology. Data includes the external radius of the trough, the radius of the inner elevated area, and width of the trough.

For several CTs we have performed detailed structural maps based on Magellan left, right and stereo looking images.

**Results:**

The statistical analysis of our preliminary database of CTs reveals that these structures have a very restricted range of sizes throughout the planet with an average total radius of 11 km (from a total range of 4 - 24 km) being 7 km the average radius of the inner elevated zone and 4 km of average through width. There is a direct relationship between total radius of the structure and trough width, indicating that a bigger structure has a wider trough.

The detailed structural cartography of one of these structures (Fig.1) provides the main tectonic features that can be found associated to CTs. The external margin of the trough is characterized by concentric graben providing a low slope towards the through sometimes characterized by a stepped morphology. The internal margin of the trough shows evidence of small concentric thrust faults vergent outside with associated low-wavelength folds. In some cases radial sets of graben and folds appear. The CT analyzed in Fig 1. shows a radial graben that transforms into a ridge exactly at the inner limit of the buried trough. A possible explanation of this structure is a tectonic inversion of the graben generating a pop-up, indicating that extension predates contraction.

**Discussion:**

Because CTs present circular shapes and concentric and radial sets of tectonics structures, they can fit into a tectonovolcanic type structure. In Venus, several tectonovolcanic structures were profusely studied: coronas [3], novas [4], arachnoids [5], and volcanic calderas [6]. All of them present circular characteristics, but both novas and arachnoids haven't got circular troughs and calderas haven't got an inner elevated zone either. However some Coronas have similar features [7]. Coronas can present concentric and radial sets of tectonics structures both grabens and thrusts, and one or more elevated rings (annulus), circular troughs and an elevated core.

In order to test if CTs should be included as a new type of small corona we compare our database with Crumpler et al.'s tectonovolcalcanic database [8]. The comparison with our database indicates that they are different structures attending to the following reasons: (1) Corona are much larger structures, most have diameters between 60 km to 500 km (some can exceed 1000 km) while CTs presents diameters from 8 km to 48 km; (2) Corona show a wide range of sizes while CTs size distribution is very restricted; (3) Corona present a wide range of possible morphologies while CTs show less variability; and finally (4) Corona can be found throughout the planet while CTs are restricted to tessera terrains.

The circular morphology of CTs together with their concentric and radial tectonic structures strongly suggests that CTs could be the superficial expression of diapirism. If that is the case, is it thermal or compositional? If they are caused by thermal diapirism their small sizes would be indicative of a high thermal regime during their formation. Nevertheless, compositional diapirism would not imply such a high thermal regime.

**Conclusion:**

We just started the study of a singular tectonic feature, CTs, present in tessera terrains on Venus. The explanation of this new tectonic feature on tessera could be crucial for understanding crustal plateau formation and evolution.

**References:**

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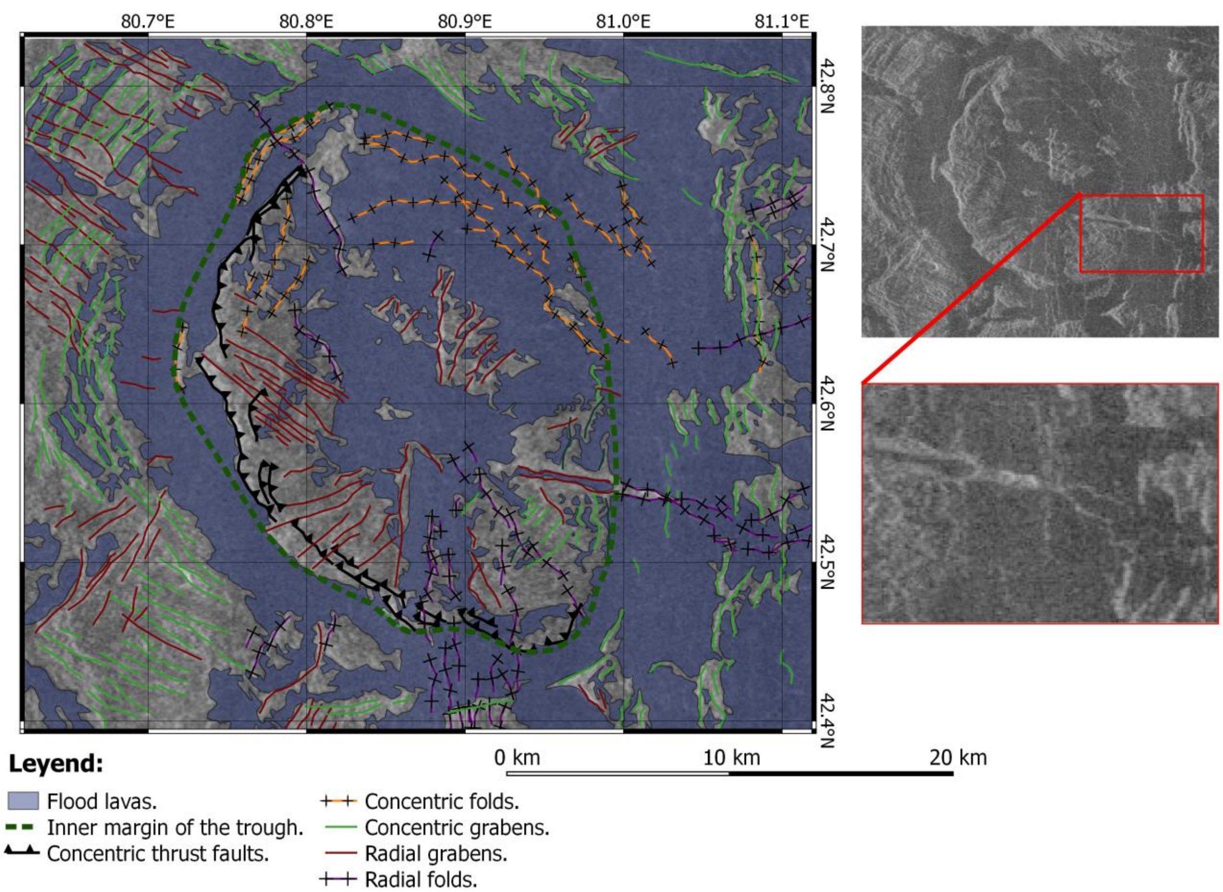


**Figure 1.** Detail map of one Circular Trough in Tellus Regio. This CT is characterized by a circular trough flooded by intra-tessera lavas. Concentric graben can be observed at the external margin of the trough. Internal margin is form by an elevated slope with small thrust faults and low-wavelength folds. In some cases, radial graben and folds appear too. The two detail images at the right of the map show a radial flooded graben that correlates with a ridge and two small folds. This can be interpreted by a tectonic inversion of a graben that generates a pop-up structure. If this is the case, radial extensional structures predate compressional ones.