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Formation of the arachnoids on Venus: implications from the morpohologies of the associated lineaments

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Many of the previous studies model the formation process of Venusian arachnoids with the presence of intrusive magmatism that forms the radial structures around the arachnoid. The lineaments would have been thus formed by a deformation caused by intrusion of magma into the surrounding crust [1,2]. In some cases, the tectonic deformation could also be tied to the proposed ascending diapir. This may produce a dome-like rise and extensional fracturing [3,4].

Besides dike emplacement or diapiric uprise, there are also other possibilities for the formation of the arachnoid radial/semi-radial structures. The modelling of tectonic patterns and regional stresses by [4] gave comparable analogs to some of the arachnoids. Venusian wrinkle ridges may also be affected by regional stresses for example around changes of topography [5]. Relaxation of the topography and resulting shortening of the surface may also be the source of radial ridges. The survey of the arachnoid radial features [6] gave implications to several possible formation processes for the lineaments. Some of these are directly linked to the arachnoid central structure formation and some may be independently formed.

The survey also addressed the form of the tectonism in the lineament formation. According to our survey, 53 % of arachnoids have compressional lineaments (ridges, AR(r)), compared to the 30 % of arachnoids with extensional radiating structures (fractures or graben, AR(f)). In 17 % of arachnoids, both extensional and compressional features are present (AR(rf)). The discussed possible models of formation or origins for the lineaments as well as the observations of the structural composition enforce that similarly to the coronae, the arachnoid formation process is very complex,

and generalizations for the whole population cannot be made.

References: [1] Head et al. (1992) JGR; [2] Grosfils & Head (1994) GRL; [3] Squyres et al. (1992) JGR; [4] Cyr & Melosh (1993) Icarus; [5] McGill (1993) GRL; [6] Kostama (2006) http://herkules.oulu.fi/isbn9514283171/